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ITEM IV - GROUNDWATER PROTECTION (SUBPART F) - HAZARDOUS WASTE MANAGEMENT AREA

40 CFR 270.14 AND 40 CFR 264.90 THROUGH 100

PROJECT NO: 94315

DESIGNATION: Wayne Disposal Landfill Site No. 2

LOCATION: Van Buren Township, Wayne County, Michigan

OPERATOR: Wayne Disposal, Inc.

DATE: September 7, 1983

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INTRODUCTION

Groundwater protection provisions under 40 CFR 264.90 through 264.100, otherwise known as Subpart F, comprise the subject of this submittal. The information presented herein is required under provisions of 40 CFR 270.14. The purpose of this study is to design a groundwater monitoring system which will determine whether the groundwater protection standard, to be established in the facility permit, is being achieved. To accomplish this, the following Subpart F submittal: (1) presents the interim status monitoring results, (2) discusses the hydrogeologic environment at the site, (3) presents a proposed monitoring well system, (4) assesses the existing groundwater quality, and (5) suggests a proposed monitoring plan with appropriate groundwater parameters. It should be noted that Wayne Disposal, Inc., (WDI) does not request an exemption from Subpart F regulation according to 40 CFR 264.90(b).

This report has been prepared by Neyer, Tiseo & Hindo, Ltd. (NTH) for the exclusive use of Wayne Disposal, Inc., the U.S. Environmental Protection Agency, and the Michigan Department of Natural Resources for the specific purpose expressed above. It is intended only to serve as a portion of the Part B permit application, 40 CFR 270.14. Information concerning the site hydrogeologic conditions is presented herein and is based on two hydrogeologic reports which are submitted herewith as supporting documents. These two hydrogeologic reports were prepared in accordance with generally accepted geotechnical engineering and hydrogeologic practices. Assessments concerning the groundwater quality data included herein are based upon water samples which have been collected and analyzed by others under contract to WDI. Similarly, information concerning facility operations, history, etc. cannot be independently verified by NTH.

INTERIM STATUS GROUNDWATER DATA

Interim status groundwater monitoring data have been obtained at the Wayne Disposal Site #2 Landfill since November, 1981. This data, as well as supporting information, is reproduced herein as required under 40 CFR 270.14.

The groundwater monitoring data was obtained from sampling a system of 17 on-site monitoring wells. These wells are located as shown on Plate 1, the Test Boring and Monitoring Well Location Plan. Wells OB-1, OB-4 and OB-7 are considered upgradient background wells. Well OB-11 is remote from any on-site disposal activities and, therefore, is also considered a background well. The wellpoints of these wells were placed within the uppermost aquifer, which will be described in a subsequent section of this Subpart F submittal. Available information indicates that all the wells OB-1 through OB-17 consist of stainless steel wellpoints and galvanized steel casing. The well system was originally designed to monitor groundwater quality at a municipal refuse landfill. It was not designed to monitor specific conditions at the compliance point of the proposed hazardous waste management area.

Individual logs for each of these wells are presented in the Report on Preliminary Hydrogeologic Investigation and the Report on Final Hydrogeologic Investigation, dated November 5, 1980 and July 8, 1981, respectively. These two reports, prepared by NTH, are attached herewith as supporting documents. The logs have also been reproduced herein as Figures F-1 through F-26. The hydrogeologic reports and individual well installation logs present pertinent data concerning subsurface stratification, depths of screen, groundwater conditions, drilling contractors, and dates of installation.

Copies of the interim status water quality results, as reported by Canton Analytical Laboratory, have been included herein as Figures F-27 through F-93. Also included as Figures F-94 through F-110 are copies of the correspondence with EPA regarding the water quality analytical results.

A copy of the "Groundwater Sampling & Analysis Plan, Wayne Disposal Site #2", prepared by Wayne Disposal, Inc., is presented as Figures F-111 through F-147. Figure F-148 presents the "Groundwater Sampling Protocol, Background Period (Nov. 1981 - Dec. 1982), Wayne Disposal Site #2 Landfill". This has also been prepared by Wayne Disposal, Inc. These two documents present procedures relating to sample collection and preservation, analytical procedures, and chain-of-custody control.

HYDROGEOLOGIC CONDITIONS

Study Region - A study region has been selected for presentation of the hydrogeologic information, and is shown on Plate 2, the Water Well Location Map with Bedrock Surface Contours. The region selected includes two major hydrologic boundaries. On the south is the Huron River (Belleville Lake) which represents the principal ground and surface water discharge point for waters on or beneath the subject landfill site. Additionally, to the north, the surface water divide which separates the Huron River and River Rouge watersheds passes through the center of Willow Run Airport. This divide was also illustrated on the Generalized Water Table Map included in the preliminary hydrogeologic report for the site referenced below.

No major hydrologic boundaries exist in the immediate area east and west of the site. The western boundary was selected to include the location of the Ypsilanti Township well field (refer to Plate 2). This well field is used intermittently for public water supply. The eastern edge of the study region is arbitrarily selected as Morton-Taylor Road.

General Hydrogeology

Geology - Previous studies of the area include the work of Kunkle (1960), McGuinness, Poindexter and Otton (1944 and 1949), Mozola (1969), Russell and Leverett (1915), Sherzer (1917), Western Michigan University (1981), and Wisler, Stramel and Laird (1952). Most of the information presented here comes from these sources or from detailed subsoil investigations conducted at the landfill site.

The general geology of the study region consists of Devonian age bedrock overlain by glacial deposits. Surface features reflect the glacial origin of the landscape. The study region is located on a glacial lake plain formed during the latter part of the Wisconsin glacial period. This lake plain is a large feature extending from the City of Ypsilanti (west of landfill site) as far as the Lake

Erie shoreline, approximately 25 miles to the southeast. The principal characteristics of this lake plain are an almost flat topography, poor surface drainage, and generally fine-grained cohesive soils. Locally, the lake plain in the study region is modified by a glacial delta formed by the ancestral Huron River and by glacial and recent erosion forming the valley of the Huron River and its tributaries.

The apex of the Huron River delta is in the vicinity of the City of Ypsilanti where the Huron River exits from the Defiance Moraine and enters the glacial lake plain area. The delta extends in a fan shape to the east and south ending approximately in the Belleville area. All of the subject landfill is within the delta. Principal characteristics of the delta are a gentle increase in the ground surface to the northwest and the presence of near-surface subsoils consisting of bedded granular materials such as fine sands, silty sands, and silts.

Glacial erosion of the lake plain occurred during periods of glacial retreat and low water stages of the glacial lakes. These stages resulted in erosion by the Huron River to depths exceeding 100 feet below the present level of the river. This and subsequent erosion and filling created the existing valley of the Huron River. The valley is characterized by river terraces and a modern floodplain underlain by outwash and alluvium. In the vicinity of Belleville, the river has been dammed to form Belleville Lake. The lake is not used for public water supply.

The uppermost bedrock strata in the study region consists of the Antrim formation, a late Devonian shale deposit. The general geology of the bedrock is illustrated in Plate 3, entitled Bedrock Geology, which presents not only the bedrock formations for southeastern Michigan but the extent and thickness of the Antrim shale. Within the study region, the Antrim shale appears to be 50 to 100 feet in thickness. The general stratigraphy of bedrock in Michigan is presented in Figure F-149, which also indicates the units that are considered to be aquifers and aquicludes. The Antrim shale is considered to be an aquiclude, and is underlain by the Traverse Group, an aquifer consisting of carbonate rocks.

Plate 4, the Regional Hydrogeologic Characteristics, indicates that the site is not located in an area of known or suspected karst activity. No known major faults are located within the study region (Western Michigan University, 1981). The same reference indicates that the location is relatively aseismic, with only three recorded seismic disturbances located in Wayne or Washtenaw County. These three were recorded at Detroit. The last two, for which data are available, apparently did not exceed a Modified Mercalli intensity of IV.

Plate 2 illustrates that a bedrock channel exists beneath the Huron River. This channel was most likely created during a period of late Wisconsin glacial retreat. It is filled with both granular outwash and glacial till.

Pleistocene glacial deposits which overlie the bedrock consist primarily of glacial till which has been described by various investigators as a boulder clay. Other materials consist of lacustrine lake clays, outwash sands, and deltaic sands and silts. Details regarding these materials and their aquifer potential are presented in the section on site conditions.

Groundwater Occurrence - Perched surficial water exists within the deltaic sands and silts. These deposits occur as a surface veneer over the cohesive glacial till. Within the study region, the deltaic materials are generally less than 20 feet in thickness and consist mostly of silty fine sand. Water in the deltaic materials is perched because of the relative impermeable nature of the underlying cohesive materials. However, available information indicates that the underlying materials are at or near saturation.

At selected locations where the deltaic sands are at their maximum thickness, it may be possible to obtain a limited amount of perched water from a shallow, large diameter well. However, these materials are not considered to be an aquifer capable of yielding a significant amount of water and no drilled wells are known to be completed in the deltaic sands.

Municipal water from the Detroit Water Department is available in this part of Wayne County. A water line supplies the landfill and also the Michigan

Highway Department Rest Area just south of the landfill. A few scattered wells still exist in the area. Plate 2 identifies water wells of record located in the area based on records collected by the State of Michigan. Many of these wells are older than 15 years in age and some may no longer be in use. Water well records for these wells are included as Figures F-150 through F-186.

Because the study area is serviced by a municipal water supply system, there is limited information on the groundwater resources, except for the Ypsilanti Township well field. Within the bedrock channel beneath the Huron River and within tributary bedrock channels, the uppermost aquifer is a sand and gravel occurring at or about Elevation 600 feet. Elsewhere, fine sands and silty sands may be encountered at depths of 60 to 80 feet, corresponding to elevations in the range of 600 to 640 feet. Based on deep test borings performed at the landfill site, it appears that these finer deposits are, in places, separated from deeper, coarser materials by silts and clays. At other locations, the upper fine sands grade downward into coarser granular materials. For example, TB-114, at the landfill, encountered silty fine sand at Elevation 646 feet. This material was underlain by sand and gravel which extended to Elevation 577, where shale was encountered. For practical purposes, the uppermost aquifer is considered to be one or more layers of sand or sand and gravel existing below Elevation 640 feet and above the bedrock.

At the Ypsilanti Township well field, groundwater is withdrawn from two sand and gravel aquifers separated by 20 to 30 feet of clay. Figure F-187, a North-South Geologic Profile Along Bridge Road, Section 24, Ypsilanti Township, Washtenaw County, illustrates the relationship between the bedrock channel, the aquifers, and the Huron River. This figure was presented in the preliminary hydrogeologic report referenced above.

There is insufficient existing information to prepare a contour map of water levels existing in the uppermost aquifer throughout the study region. Water levels in this aquifer have been defined for the landfill site and are discussed in the following section.

In general, the aquifers within the study region are considered to be protected as illustrated in Plate 4. Detailed information developed for the landfill site supports this conclusion.

On-Site Hydrogeology

Field Investigation Methods - The geology and hydrology described in the following sections is based on extensive field work performed during the period 1974 through 1981. Detailed descriptions of the work performed during different periods is included in NTH's Report on Preliminary Hydrogeologic Investigation (November 5, 1980) and NTH's Report on Final Hydrogeologic Investigation (July 8, 1981). These documents present the findings from 93 test borings, 17 monitor wells, and 3 pneumatic piezometers.

Most of the test borings were performed with a rotary drilling rig utilizing 8-inch outside-diameter hollow-stem augers and 3-inch diameter rotary drilling methods. Within each boring, soil samples were generally obtained at intervals of 5.0 feet using the Standard Penetration Test Method (ASTM D-1586). Additionally, Shelby tube samples were collected from various intervals of the major cohesive subsoil units.

Most of the soil exploration work was performed under the general direction of NTH. In accordance with NTH's policy, all such work was performed under the full-time supervision of a qualified representative of NTH's staff.

Monitor wells installed at the landfill are 2-inches in diameter and are generally constructed of galvanized pipe using stainless steel screens. The well screen materials used in the construction of the oldest wells (OB-1 through OB-5) are not listed on the well logs; however, personnel involved in their installation report that stainless steel screens were used. The wells were installed using rotary drilling methods with drilling bits varying from 3-inch to 4.5-inch diameter. After placement of the well screen and casing, the wells were back flushed with clear water. This removed the bentonite drilling fluid and allowed the aquifer sands to collapse against the screen. Subsequently, the wells were pumped to remove all drilling waters as well as bentonite within the aquifer sands.

Three pneumatic piezometers were installed in the cohesive deposits. They were placed in rotary drilled holes which were backfilled with sand around the piezometer and then grouted to the surface. The piezometers are Model 51481 Pore Pressure Transducers produced by Slope Indicator Company of Seattle, Washington. These transducers are operated with pressurized dry nitrogen through two pressure leads and one vented lead.

Geology - The geology of the landfill site has been defined through an extensive drilling program, the details of which are presented in NTH's Report on Preliminary Hydrogeologic Investigation, Vol. I and II dated November 5, 1980 and Report on Final Hydrogeologic Investigation, dated July 8, 1981. For specific details, such as the logs of test borings, the reader is referred to these reports. In particular, generalized geologic profiles were presented in the referenced final report and are useful in evaluating the on-site subsoil stratification.

Overlying most of the site is a surface deposit of brown and gray fine to medium sand containing varying amounts of silt. This sand represents a deltaic deposit according to Mozola (1969). In some areas, it is underlain by sandy silt material that also may be lacustrine in origin. The deltaic and lacustrine materials are underlain by a silty clay glacial till over the entire site. The till contains varying amounts of sand and gravel incorporated within a silt and clay matrix. At its base, the till grades to gray clayey silts, silts and eventually an extensive deposit of gray silty fine sand. This lower sand contains zones of both finer and coarser material and it is sufficiently extensive to be considered a usable aquifer. Underlying these unconsolidated deposits is a dark brown or black shale considered to be a member of the Antrim Formation (Mozola, 1969). For descriptive purposes, the subsoils are subdivided into four major strata: surface sands, gray silty clay till, transition silts, and aquifer sands. These strata and their thickness are shown on the generalized geologic profiles in the referenced final hydrogeologic report. Each stratum is described more thoroughly below.

The granular surface stratum consists of brown and gray fine to medium sands with varying amounts of silt. Its thickness is somewhat variable but apparently does not exceed approximately 23 feet. In most cases, it has been found to be 12 feet or less in thickness. Perched water is sometimes encountered in this stratum. However, these relatively fine sands do not constitute a usable aquifer, as the maximum observed saturated thickness was only approximately 11 feet. This sand is removed as part of landfill construction.

An extensive deposit of glacial till forms the second major subsoil at the subject site. This till is a gray silty clay that contains varying minor percentages of sand and gravel. Seams of silt and sand are occasionally encountered.

The top surface of this till stratum is readily identifiable due to the textural difference between the surface sands and the till. However, the base of the till generally grades to clayey silt, silt and finally to silty fine sand. These textural changes are not easily detected from the soil cuttings obtained during rotary drilling. Consequently, the silty clay till thickness and base contour maps prepared for the final hydrogeologic report were developed using only those borings for which representative soil samples were collected at approximately 5-foot intervals. An isopach contour map of the silty clay till was developed and presented in the final hydrogeologic report. As indicated on the map, that this stratum was found to vary in thickness from 19.0 to 55.0 feet.

Numerous samples of the silty clay till were laboratory tested to determine physical characteristics and properties. The tests indicate that the material classifies as a CL material according to the Unified Soil Classification System (ASTM D-2487). Moisture contents and dry densities reported in the two hydrogeologic reports ranged from approximately 11 to 33 percent and 89 to 130 pounds per cubic foot, respectively. These results indicate saturation or near-saturation on almost all samples. Over 25 permeability tests on representative samples from this stratum have been performed through July of 1983. These tests yielded permeability values ranging from 3.3×10^{-9} to 1.4×10^{-7} centimeters per second (cm/sec) with a mean value less than 3×10^{-8} cm/sec. More details concerning these test results will be presented below. Hydrometer analyses were also performed on material from this stratum. Test results indicate that clay-size and colloidal material generally composed from 43 to 58 percent of the samples.

As mentioned previously, the silty clay till generally grades downward into clayey silts, silts and finally into silty fine sands. In some cases, the strata contact is sharp, going from silty clay to sand. However, most of the site exhibits a gradual transition through silty materials. These transition silts can be described as either containing appreciable amounts of clay (ML-CL) or containing little clay (ML). The former is generally classified as a clayey silt. The latter is either described as silt or sandy silt. The extent of these deposits can be seen on the generalized geologic profiles in the referenced final hydrogeologic report.

Samples of the clayey silt were tested in the laboratory to determine the moisture content and dry density. The results ranged from approximately 10 to 24 percent and 99 to 129 pounds per cubic foot, respectively. Nearly full saturation was indicated for almost all these samples. Grain-size analyses performed on samples of the clayey silt indicate that about 43 to 87 percent of each sample is silt. Permeability tests on samples from this material yielded values from 1.3×10^{-8} to 6.9×10^{-6} centimeters per second.

Various samples of the silt and sandy silt were also tested in the laboratory. Moisture contents and dry densities of this material varied from approximately 10 to 23 percent and from 101 to 114 pounds per cubic foot, respectively. Again, nearly full saturation was indicated. Grain-size analyses show that about 49 to 89 percent of each sample was silt-sized material. A limited number of permeability tests indicated results of 3.6×10^{-6} to 1.4×10^{-5} centimeters per second.

Underlying the transition silts is one or more strata of gray silty fine sand, considered to constitute the uppermost aquifer at the site. These strata are variable and include occasional clay and/or silt layers and localized zones of coarser sands with varying amounts of gravel. These strata are also illustrated in the generalized geologic profiles in the referenced final hydrogeologic report. Three test borings, TB-111, TB-114 and TB-131, were drilled to rock. The Antrim shale was encountered between Elevations 570 and 590.

Samples of the aquifer sands yielded moisture contents and dry densities from approximately 8 to 21 percent and 108 to 135 pounds per cubic foot, respectively. This indicates nearly full saturation for these samples. Grain-size analyses verified that the majority of sand is fine to medium with varying amounts of clay, silt and gravel-sized constituents. The effective grain size, D_{10} (10 percent of the sample is smaller than the effective grain size), ranged from .018 mm to .12 mm. Four permeability tests on samples from this sand yielded values from 1.7×10^{-5} to to 2.4×10^{-4} centimeters per second. These permeability values, however, are measured in a vertical direction. Horizontal permeability can normally be expected to be 10 to 100 times greater. Three field bail tests, performed on OB-7, OB-9 and OB-10 and reported in the final hydrogeologic report, resulted in permeability coefficient estimates of 2×10^{-5} to 2×10^{-4} cm/sec. Estimates of the horizontal permeability based on correlations with grain size by U.S. Department of the Army (1971) indicates horizontal permeabilities might range from 1×10^{-5} to 4×10^{-2} centimeters per second, with a most probable range near 1×10^{-3}.

Groundwater Conditions - Groundwater in the uppermost aquifer at the landfill site occurs under both water table (unconfined) and semi-confined conditions. Unconfined, perched water occurs within the surface veneer of deltaic sands. A generalized perched water table map was presented in the hydrogeologic reports.

The map was prepared by mapping surface exposures of the water table (such as the elevation of lakes and permanent streams) and is expected to generally reflect the prelandfill conditions at the site.

Although the deltaic surface sands contain perched water, the saturated thickness is generally less than 11 feet and subject to large seasonal fluctuations. Because of these conditions, the sand is not used as an aquifer.

In those portions of the landfill already constructed, the deltaic sands have been removed. Cutoff dikes have been constructed around the landfill cells to prevent the transfer of water from the sand into the landfill. Also, a subsurface drain intercepts the perched water entering the site and transfers it off site. Details of these systems are shown on the engineering plans, which are presented as part of the permit application.

Beneath the deltaic sands, the cohesive glacial till is at or very near saturation. This material constitutes an aquiclude with a mean coefficient of vertical permeability, exhibited by laboratory tests on intact samples, of approximately 3 x 10^{-8} cm/sec. Recharge conditions through this glacial till were evaluated through the installation of pneumatic piezometers installed at different depths within the till. The findings from these piezometers are presented in graphical form on Figure F-188. The information illustrates the existence of a relatively uniform, downward, natural vertical hydraulic gradient of 0.7 foot/foot. Based on Darcy's Law and assuming saturated flow, the natural vertical recharge rate through the glacial till is estimated to be approximately 0.16 gallons per year per square foot.

Recharge through the glacial till passes into the transition silts and finally into the aquifer sands which occur beneath the site. The transition silts function as an aquitard and locally create confining conditions within the aquifer. Elsewhere, water levels in the aquifer are below the base of the transition silts, and the aquifer in unconfined. For this reason, the aquifer is generally described as being semi-confined.

The top of the aquifer materials has been mapped and is presented in the final hydrogeologic report. As interpreted therein, the surface of the aquifer materials on-site varies in elevation from 661 to 610 feet. Additionally, a piezometric level contour map for the aquifer has been prepared based on the most recent set of water level measurements. Plate 5 presents the piezometric level contours.

The aquifer consists of gray silty fine sand at the top and apparently becomes coarser with increasing depth. The base of the aquifer is at or within approximately 10 feet of the bedrock surface, which was previously defined for the region on Plate 2. At various locations, the aquifer is separated into two or more units by sandy silt or clayey silt layers. Where the intervening silt units are absent, the maximum thickness of the sands is approximately 80 feet. Where the silt layers occur, the average thickness is approximately 40 feet or less.

Groundwater flow in the aquifer is generally to the south, or towards the principal discharge point, the Huron River Valley. The horizontal hydraulic gradient at the site is approximately one foot per 1,000 feet. With an estimated lateral permeability of 1×10^{-3} cm/sec (at least in the upper portions of the aquifer) and an estimated effective porosity of 10 percent, the estimated lateral seepage velocity is .03 feet per day, or approximately 11 feet per year.

Although not supported by available data, the possibility exists that the aquifer materials beneath the subject landfill site are connected to the aquifers within the bedrock valley beneath the Huron River. Water levels in the aquifer beneath the southern boundary of the site are similar to the surface level of Belleville Lake. Hence, flow from the aquifer in question to Belleville Lake is very slow. At the Ypsilanti Township well field, however, pumping levels are somewhat lower than the surface level of Belleville Lake. Hence, the Ypsilanti Township well field appears to be the lowest nearby outlet for groundwaters in the area. Therefore, if a connection between the two aquifers exists and if the well field continues to be operated, the possibility exists that groundwater beneath the landfill could eventually discharge to the well field.

It should be noted that Michigan Disposal, Inc. currently uses a water supply well on-site. This well obtains water from the uppermost aquifer described herein. The approximate location of this well is presented on Plates 1 and 2. A record of the well installation is presented in Figure F-186. This well is used to supply water to equipment within the Michigan Disposal facility, located in Master Cell VI. At present, the equipment receiving water from this well reportedly requires only 2 gallons per minute (gpm). Hence, the average yield of this well should not currently exceed approximately 2 gpm.

PROPOSED GROUNDWATER MONITORING WELL SYSTEM

The system of groundwater monitoring wells for the subject site depends upon definition of the waste management area and the point of compliance. Applicable provisions relating to the waste management area, point of compliance, and groundwater monitoring wells are contained in 40 CFR 270.14, 40 CFR 264.95, and 40 CFR 264.97.

Waste Management Area - The waste management area is described more fully elsewhere in the permit application package. This area is also delineated on the Proposed Monitoring Well Location Plan, Plate 6, included as a portion of this Subpart F submittal. It should be noted that the waste management area will include Master Cells V, VI, and VII.

Point of Compliance - The point of compliance has been designated as the southern boundary of the waste management area perimeter. As described in the hydrogeologic section above, groundwater flow in the uppermost aquifer beneath the facility is generally southward (See Plate 5). Hence, the southern boundary of the waste management area is the downgradient boundary. However, a limited number of monitoring wells will be placed on the east and west boundaries, as discussed below. This approach to the point of compliance, presented on Plate 6, will allow for minor variations in the groundwater flow direction without modifications in the groundwater monitoring system.

The point of compliance represents a vertical plane extending from the ground surface downward to the top of the Antrim shale. This passes through the uppermost aquifer as defined previously.

Proposed Monitoring Wells - The proposed monitoring well system can be subdivided into upgradient and downgradient wells.

The upgradient wells will consist of three wells located along the north boundary of the waste management area. These will include the existing OB-7 and two new wells. The group will consist of one polyvinyl chloride (PVC) well and two wells constructed with stainless steel wellpoints and galvanized steel casing. They will all be installed with their wellpoints located within the deeply buried sand described as the uppermost aquifer herein. The well locations and proposed wellpoint elevations are presented on the Proposed Monitoring Well Location Plan, Plate 6.

The downgradient wells will include 11 wells, 4 constructed of PVC materials and 7 of steel materials. These wells will be located as shown on Plate 6. Included are two well clusters to monitor water quality near the top and bottom of the uppermost aquifer.

It is anticipated that the wells would be installed upon processing of the permit application. Sampling of these wells and water quality testing will be described in a subsequent section of this Subpart F submittal. Since a waste treatment facility is currently operated by Michigan Disposal, Inc., within Master Cell VI, the wells described herein may also form all or part of the monitoring system for that facility under a separate permit. The existing wells on the site will not form part of this proposed monitoring well system (OB-7 excepted). However, monitoring of the existing wells may be continued under requirements of other permitting authorities, such as the Michigan Department of Natural Resources.

It is anticipated that well installation will be performed by a licensed test boring or well drilling contractor. The wells will be 2 inches in diameter and will be installed by rotary-wash techniques or through hollow-stem augers.

After installation of the well screen and casing, a sand filter will be placed around each screen. Bentonite pellets will then be placed as a seal in the borehole annulus above the sand filter. The remainder of the borehole annulus will be grouted with non-shrinking cement or bentonite grout. Finally, the well will be developed by use of compressed air or surging with a downhole check-valve and plunger. A locking, protective cover will be placed over each well. A schematic of an example proposed well is included as Figure F-189.

DESCRIPTION OF GROUNDWATER QUALITY

Characterization of the groundwater quality at the site requires an assessment of the available water quality data from both on-site and off-site wells. Included in this assessment is an examination of the interim status water quality data, discussed above. Applicable provisions relating to such an assessment include 40 CFR 270.14.

Surrounding Groundwater Quality - Published information concerning the groundwater quality in the study region has been collected as a part of this assessment. Apart from data concerning the Ypsilanti Township well field, very little published water quality results are available.

Figure F-190 presents the results of water quality analyses performed on samples from four wells in the study region. These results were presented in a report by McGuiness Poindexter and Otten (1944) for the U.S. Geological Survey. Three of these wells (Nos. 112, 113 and 114) were part of the Ypsilanti Township well field. Figure F-191 presents a descriptive log for each of these old wells. The fourth well, No. 117, is also located in the area of the Ypsilanti Township well field, and a descriptive log for this boring is also included on Figure F-191. It should be noted that this latter well is one of two observation wells in the well field for which water level records are kept by the U.S.G.S. (Huffman, 1979). More recent water quality data from this same well field are presented on Figure F-192. These data were obtained from the State of Michigan. Similar water quality data, reported by Twenter, et al. (1976), were presented in the preliminary hydrogeologic report. The water quality results presented herein on Figures F-190 and F-192, are reproduced as a Schoeller diagram (Freeze and Cherry, 1979) on Figure F-193. This diagram yields a pattern, based on the major cations and anions, which is a somewhat unique characteristic of the water quality. As discussed previously, this water is obtained from the bedrock valley beneath the Huron River.

Water quality in the bedrock beneath the study region is not well-documented. No wells are known to obtain their supply from the Antrim shale. However, McGuiness, et al. (1944) reports that the public water supply for Belleville depended upon poorly producing wells which obtained a potable supply from this formation. The same authors report water quality results, based upon an earlier U.S.G.S. study, for four wells which apparently penetrated the underlying bedrock aquifer formations in the Ypsilanti area. These results are tabulated in Figure F-194 and are illustrated as a Schoeller diagram in Figure F-195. Kunkle (1960) indicates that both the Traverse Group and deeper Dundee limestone in the Huron River area generally yield water high in mineral constituents with the exception of occasional shallow wells penetrating in limestone outcrop areas.

Published water quality information is unavailable for wells located within the study region that withdraw water from aquifers other than the bedrock and the Huron River bedrock valley.

On-Site Groundwater Quality

General Characterization - The on-site groundwater quality has been found to be highly variable, both temporally and spatially. In general, however, the groundwater can be characterized as alkaline and high in hardness. The major observed cations include calcium, sodium and, to a lesser extent, magnesium. The major observed anions include bicarbonate, chloride, and sulfate. For samples with pH values greater than approximately 8.5, the bicarbonate anion concentration was found to be much less than the other samples. This will be discussed in more detail below. The identification of trace constituents in some samples will also be discussed in more detail below. However, as a general rule, undesirable concentrations of iron are found throughout the site. Kunkle (1960) states that excessive concentrations of iron are common in the groundwaters in this area.

Due to the significant thickness of glacial till which overlies the uppermost aquifer defined above, no significant area of direct recharge to the aquifer has been identified. Rather, indirect recharge, at least within the study region, apparently occurs by infiltration from the surface downward through the till. This till is known to be nearly saturated. It is covered in many areas with a thin veneer of sands, the lower portions of which are saturated with perched water. Hence, downward infitration occurs under at least partially closed conditions, where the dissolution of carbonate materials in the glacial till may cause a depletion of carbon dioxide in the percolating water. Under these conditions, pH values well above 8 or 9 can be achieved as the percolating water approaches saturation with respect to the dissolved carbonate minerals (Freeze and Cherry, 1979). The high pH values observed in the on-site monitor wells suggest that such a closed or partially closed system may exist at this particular location. Of course, the actual degree of saturation with respect to carbonate minerals and, therefore, the pH values depend on a number of factors. These factors include length of percolating path and flow rate as well as dissolution rates.

On-Site Travel Times - In the evaluation of on-site groundwater quality results, it is imperative to assess whether the current and historic water quality data is expected to be affected by the on-site disposal activities.

Briefly, Wayne Disposal, Inc. has been involved in waste disposal activities on the subject site since late in the 1970's. An earlier site, located directly west of the subject site, was landfilled in the early 1970's. After closure of this early site, the subject facility was opened and filling began in Master Cell I in early 1976 (See Plate 1). Following completion of this Master Cell in late 1978, Master Cell IV was begun. This master cell was filled by late 1980, at which time filling of Master Cell V began. Four of the five cells within Master Cell V are presently filled.

Miscellaneous municipal refuse has been received throughout the life of the facility. Additionally, sludges from the City of Detroit sewage treatment facility have been received for disposal. These latter materials are also currently being accepted at the site. The sludges are treated by Michigan Disposal, Inc., at a small plant located in the center of Master Cell VI.

Lastly, hazardous wastes have been received for disposal in Master Cell V. Cells A, C, D and E therein received both general refuse and hazardous wastes. Cell B is segregated, receiving hazardous waste only. Under an existing license with the State of Michigan, non-hazardous, miscellaneous refuse is currently being disposed of elsewhere on the site, outside the waste management area described herein.

The evaluation of whether these activities may have affected the on-site water quality is based upon the estimated minimum time of arrival for leachate to reach various monitoring wells since the filling of the on-site disposal cells. In calculating these estimates, very conservative assumptions were made in general accordance with recommendations provided in 40 CFR Part 264, Preamble Section VII.D. More specifically, the analysis was based upon the following information:

1. Soil thicknesses were determined from borings presented in the previously referenced hydrogeologic reports as well as available landfill cell base elevations provided by Wayne Disposal, Inc.
2. An estimate of the maximum mean soil permeability coefficient in the till was based on numerous permeability tests on intact soil samples. Many of these soil test results, as well as the basis for estimating a mean permeability coefficient in the uppermost aquifer, were obtained from the referenced hydrogeologic reports. A more detailed presentation of these permeability coefficient estimates is presented herein on Figures F-196 through F-201.
3. Leachate density and viscosity were estimated from a study by Kimmel and Braids (1980) entitled, "Leachate Plumes in Ground Water from Babylon and Islip Landfills, Long Island, New York".

4. Full saturation of the refuse overlying any given point within the landfill was conservatively assumed.

5. Full saturation of the glacial till and the uppermost aquifer was assumed.

6. An effective, drainable porosity of 10 percent was assumed for the fine sand aquifer, 5 percent for the silty clay till.

7. Attenuation mechanisms such as adsorption and dispersion were ignored. No retardation of the chemical species was incorporated into the analysis.

8. Migration of the leachate was assumed to commence when a landfilled area was filled according to available information provided by Wayne Disposal, Inc.

The analysis is presented herein on Figure F-202 through F-207. The estimated travel time consists of two parts: vertical travel time through the natural silty clay till and subsequent lateral travel time within the upper, monitored portion of uppermost aquifer. Vertical travel time through the transition silts has been conservatively neglected. Locations chosen for analysis were based on the thinnest clay till below the base, the deepest cell base, and to some extent, date of filling.

It is estimated that the earliest date when leachate may have been expected to exit from beneath the silty clay till (after vertical travel therein) at Master Cell I was mid 1978. This location is in the vicinity of TB-17. However, lateral flow within the uppermost aquifer from this location toward the nearest downgradient wells (OB-6, OB-12, or OB-13) is estimated to take at least an additional 18 to 20 years. This places the initial arrival of potential contaminants at these wells sometime after 1996. Well OB-3, which is cross-gradient from the area around TB-17, cannot be reached by such contaminants without significant effects from dispersion and/or diffusion which also require significant amounts of time considering the distance involved. If we consider a location directly upgradient of wells OB-6, OB-8, OB-12, or OB-13, the earliest estimated date that vertically-flowing contaminants could be expected to exit from the silty clay till was early 1981 near OB-6. Assuming that the minimum lateral distance from the landfill cell base to this downgradient well is 130 feet, at least another 2.5 years would be expected prior to contaminant arrival at OB-6. Arrival at the other wells (OB-8, OB-12, and OB-13) should be later.

At Master Cell IV, a similar analysis indicates that the earliest date when vertically-flowing contaminants may have been expected to reach the base of the silty clay till was mid 1982. This estimate is for the area around TB-36. Lateral flow in the aquifer from this location to the nearest downgradient well, OB-17, would require at least an estimated additional 6 to 7 years. An estimate of the earliest arrival dates for vertically-flowing contaminants reaching the base of the till in the areas immediately adjacent to OB-17 and OB-4 are mid 1984 and near the year 2000, respectively. Lateral travel time to OB-17 is estimated to be at least another 2.5 years. These results are summarized in Table 1.

These minimum arrival times have been estimated, as discussed above, on the basis of several conservative assumptions. It should also be noted that actual travel times would be greater than those estimated where the transition silts exist between the silty clay till and the uppermost aquifer. Naturally, subsoil anomalies can affect the actual arrival times. However, to the extent that the natural conditions and the constructed facility exist as indicated by the available data, the above estimates provide the earliest arrival times that can be reasonably expected.

As noted above, an old landfill cell was constructed west of the subject site by Wayne Disposal, Inc. in the early 1970's. This closed facility is essentially cross-gradient from the subject site. Therefore, in light of the lateral travel times discussed above, leachate from this cell is not expected to be exerting any significant influence on any of the subject on-site wells with the possible exception of OB-8. .

TABLE 1

SUMMARY OF ARRIVAL TIME ESTIMATES

Location	Estimated Earliest Arrival Date at Base of Clay Till	Nearest Down-Gradient Well(s)	Estimated Earliest Arrival Date at Well
MC I, near TB-17	Mid 1978	OB-6, OB-8, OB-12	Late 1990's
MC I, adjacent to OB-6	Early 1981	OB-6	Mid 1983
MC IV, near TB-36	Mid 1982	OB-17	Late 1980's
MC IV, adjacent to OB-17	Mid 1984	OB-17	Late 1986
MC IV, adjacent to OB-4	Late 1990's	OB-4	Well is upgradient

On the basis of the analysis presented above, it is apparent that the groundwater quality as exhibited by the on-site wells to date has not been affected by the disposal activities.

Spatial and Temporal Variability - As previously mentioned, the on-site groundwater quality as indicated by the monitoring wells is highly variable. This variability is observed with respect to time as well as location. Such variability is demonstrated most strongly with respect to pH values. However, other parameters also reflect this tendency, as will be discussed below.

The variation of pH values with time is illustrated on Figure F-208. As can be seen, individual wells can yield pH values varying from over 11 to less than 8. However, a statistical comparison of the entire group of 17 wells (upstream and downstream) indicates that no statistically significant difference is apparent when comparing the overall system results for December of 1981 and May of 1983. Figures F-209 and F-210 present this comparison. Significantly, a similar comparison performed on what can be considered as downgradient wells results in a similar conclusion. There has been no statistically significant change in the pH results for the downgradient wells as a whole between December 1981 and May 1983 (see Figures F-209 and F-210).

Equally important is an evaluation of upgradient versus downgradient pH values. The "upgradient" pH results in this evaluation are assumed to be obtained from wells OB-1, OB-4, OB-7 and OB-11. The first three of these have been chosen because they are along the northern (upgradient) site boundary. Well OB-11 is included because it is far removed from the site disposal activities, past and present.

The pH results for these four wells are compared to the remaining 13 wells. For three selected dates, Figures F-210 through F-211 illustrate that, for two of the three trial dates, no statistically significant difference exists for the upgradient versus downgradient pH values, when each group is considered as a whole. However, when using the statistical test presented in 40 CFR 264,

Appendix IV, both upgradient and downgradient individual wells are seen to yield pH values which may be statistically different from a set of upgradient, background data. This finding is observed for selected individual well pH values when the first year of interim status results for wells OB-1, OB-4, OB-7 and OB-11 are assumed as the background data (see Figures F-212 through F-219). However, during the four quarterly samplings assumed as the background period, pH values from the four background wells fail three out of four times if the statistical test for 40 CFR 264, Appendix IV is applied. If the upgradient wells yield a large number of "failing" results, this basic statistical approach suggested in 40 CFR 264, Appendix IV clearly leads to questionable findings.

In assessing the spatial and temporal variability of water quality results at the site, pH has been used for demonstrative purposes. Similar but less striking variability has been demonstrated by other parameters in the water quality results to date. However, a generally similar pattern or characterization for the water quality is observed when those results are plotted in the form of Schoeller diagrams (Freeze and Cherry, 1979). The shape of these diagrams, illustrated for selected wells as Figures F-220 through F-228, can be contrasted with the Schoeller diagrams previously presented for other groundwater sources discussed herein. Such a comparison indicates that the generally similar water characteristics obtained from the on-site wells does not closely match the other groundwater sources. Similarly, Schoeller diagrams (Figures F-229 and F-230) prepared for the surface water quality results determined on samples from the on-site surface water (East Drain, West Drain, and Sedimentation Basin) contrast sharply with the groundwater quality diagrams.

The assessment of on-site groundwater quality and its variability is assisted by evaluating the charge-balance error (Freeze and Cherry, 1979) of the water quality analyses. This calculation involves the comparison of major cations and anions to determine whether electroneutrality is indicated by the water quality results. Figures F-231 through F-236 present a charge-balance error determination for all 17 on-site wells for two different sampling periods. Only the major ionic species for which analytic results are available were included in the evaluation. Trace constituents were not included. The determinations for the data obtained from the October 1982 sampling period yield charge balance errors ranging from approximately 10 percent to 84 percent. In all cases, an excess of cationic species was indicated. The data from the May 1983 sampling period yielded lower errors, ranging from less than 1 percent to nearly 75 percent. Of these later results, all but six wells had an excess of the cationic species. The other six possessed charge-balance errors less than 15 percent. Clearly, the existing water quality results suggest that one or more major anionic species has not been included in the water quality analyses to date.

Comparison of the pH values and bicarbonate concentrations with the largest charge-balance errors for the May 1983 set of data indicates that the high pH values and low bicarbonate concentrations correspond with the greatest charge-balance errors. High pH values and low bicarbonate concentrations are indicative of closed system carbonate dissolution, as discussed previously. This suggests that at least a portion of the charge-balance error is due to the presence of inorganic carbon in an undetermined concentration of carbonate anions, instead of the more common bicarbonate form. Carbonate alkalinity determinations have not heretofore been included as a regular part of the on-site water quality determinations.

The other three major indicator parameters required by 40 CFR 264.98 deserve attention. Specific conductance, total organic carbon and total organic halogen results reflect the wide variability observed in the other water quality parameters. Definition of background values based on the first year of interim status water quality results yields coefficients of variation ranging from 0.60 to 1.06. See Figures F-237 through F-249. More specifically, the mean values and standard deviations for these three parameters, based on the first year of interim status are:

Parameter	Mean	Standard Deviation	Coefficient of Variation
Specific Conductance	649 umhos/cm	390 umhos/cm	0.60
Total Organic Carbon	12.3 ug/l	13.0 ug/l	1.06
Total Organic Halogens	9.0 ug/l	5.8 ug/l	0.65

Figures F-237 through F-249 indicate that only four individual instances were observed where water quality results yielded statistically significant differences from the above values, based on 40 CFR 264, Appendix IV.

One of the most important measures of landfill leakage is normally the presence of a chloride ion plume. This anion is very stable (conservative) in the hydrogeologic environment. As will be discussed later, chloride concentrations observed in analyzed leachate samples from Master Cell V range from 560 to 6000 milligrams per liter (mg/l). The groundwater values are 1 to 2 orders of magnitude less than these levels. Therefore, the presence of leachate within the groundwater should result in an increase in chloride concentration. Hence, an evaluation of chloride data in the water quality results has also been performed.

Defining background as the chloride concentration in the water from Wells OB-1, OB-4, OB-7 and OB-11 as before, all the data from the six samplings since interim status began were combined to determine a background mean concentration and standard deviation. Comparison of these background values with the chloride concentrations found in the individual downgradient groundwater samples yielded no statistically significant increase in chloride concentrations at the 5 percent level of confidence. For this comparison, the standard t-test was used since each sample only consisted of one value. Figure F-250 presents these results.

Additionally, the most recent set of chloride concentrations (May 1983) have been presented on Plate 7, entitled Trace Constituents and Chloride Concentration Contour Map. As can be seen, the general pattern is one of slightly decreasing chloride concentrations when crossing the site in a downgradient direction. This pattern does not indicate any evidence of on-site discharges to the groundwater.

Lastly, it should be noted that part of the variability noted in the existing groundwater quality data may be due to a change in the water sampling methods that occurred halfway through the one-year background period under interim status. This change in methodology is described in Figures F-107 through F-110 herein.

Trace Constituents - Several trace constituents, which are included as hazardous constituents in 40 CFR 261, Appendix VIII have been detected on occasion in the groundwater monitoring samples. It should be noted, however, that the level of detection used by the testing laboratory to monitor these trace constituents varied between sampling periods. Nevertheless, these trace constituents, sampling quarter, and concentrations are presented for each on-site well on Plate 7. Also shown (by underlining on Plate 7) are the maximum detected levels of each of these trace constituents. As can be seen, detection of these constituents appears to have occurred randomly throughout the site. Definable patterns which would suggest an on-site source are not apparent.

Several of the detected Appendix VIII constituents are metals. These metals have been detected in trace quantities in water samples obtained from the galvanized steel wells at the site. A possibility exists that the well composition may have had an effect on these trace constituent concentrations; however, this is impossible to ascertain with the available data.

Many of the trace constituents shown on Plate 7 occur naturally in groundwaters. Whether the trace constituents can indeed be attributed to natural conditions, off-site contamination, or sampling/well characteristics (or a combination of these) cannot be ascertained with the available data. Nevertheless, if the well materials have not affected the results, the widespread and random occurrence of detectable levels of these constituents strongly suggests that they occur naturally at the site.

In this regard, copies of leachate analysis results are presented herein on Figures F-251 through F-276. These results, reported by three different laboratories, derive from leachate samples (or stormwater in contact with waste) obtained from four cells in Master Cell V. Cells A, C and E contain both miscellaneous refuse and hazardous wastes, while Cell B contains only hazardous wastes. It is important to note that two of the trace constituent concentrations reported for the groundwater samples exceed their respective concentrations in the leachates tested. These are lead and selenium.

Summary of Groundwater Quality Evaluation - As discussed above, the groundwater quality in the uppermost aquifer can generally be characterized as alkaline, high in hardness, and high in iron. Additionally, it is highly variable in quality.

The minimum estimated travel times for contaminants from the landfill cells to reach the on-site wells have been calculated. These calculations indicate that the earliest arrival of a contaminant from the landfill cells at a well should be after mid 1983. This arrival date is for OB-6, a well in close proximity to the waste disposal activities. For most of the other on-site wells, the earliest reasonable arrival time will be delayed beyond 1983 by several years or more. Wells on the far eastern portion of the site are nearly 2,000 feet from the nearest on-site waste-related activities to date. These latter wells are generally cross-gradient from the landfilling activities. Hence, the earliest contaminant arrival date at these wells should be delayed even longer. Based on these considerations, it is apparent that the groundwater quality exhibited by the on-site wells has not been affected by the disposal activities to date.

As discussed in detail above, the groundwater quality in the uppermost aquifer is highly variable. This wide variability has resulted in interim status water quality data that indicate repeated statistically significant variations in individual well pH results when evaluated according to methodology presented in 40 CFR 265.93 and 40 CFR 265, Appendix IV.

It is important to note, however, that these statistically significant variations have been observed throughout the site. Wide variations in pH are noticeable in wells on the upgradient (north) and eastern boundaries just as they are observed downgradient of the disposal activities. It should also be noted that detectable concentrations of trace constituents listed in Appendix VIII are reported for groundwater samples from wells throughout the site, both upgradient and downgradient. These have occasionally been in concentrations exceeding the reported concentrations in leachate samples. Lastly, an evaluation of chloride concentrations, which are normally considered to be a reliable indicator of a contamination plume, indicates that no increase in downgradient concentrations is apparent.

On this basis, as well as the estimated earliest contaminant arrivals discussed above, the available data suggests that, despite a high degree of variability, the groundwater quality observed at the site has not been affected by the waste disposal activities. Rather, the observed changes in groundwater quality are apparently either natural or affected by off-site activities or some combination of these. It is also conceivable that the water quality results may have been affected by the well composition, in the case of the trace metal concentrations.

PROPOSED GROUNDWATER MONITORING PROGRAM

The following groundwater monitoring program is proposed for inclusion in the facility permit. Applicable provisions include 40 CFR 264.97 and 264.98 as well as 40 CFR 270.14.

Nature of Monitoring Program - The proposed groundwater monitoring program is based on the conclusion presented above that apparently the groundwater quality exhibited by the on-site wells has not been affected by the on-site disposal activities to date. On this basis, it is suggested that a detection level monitoring system be administered. Application of a detection level monitoring system is based upon 40 CFR 264.93(a) and related Preamble comments. More specifically, 40 CFR 264.93(a) defines a hazardous constituent as Appendix VIII constituents that have been identified in the groundwater "and that are reasonably expected to be in or derived from waste contained in a regulated unit". The 40 CFR 264 Preamble, contained in 47 FR 32296, allows for the demonstration that constituents in the groundwater do not originate from the site in question. Furthermore, 47 FR 32294 states the following: "The nature of the program established in the initial permit will depend on the information available at the time of permitting. The key question is whether a regulated unit has begun to leak."

As described above, the available groundwater quality information does not indicate that the waste disposal cells have affected the groundwater quality as exhibited by the monitoring wells. Therefore, a detection monitoring program is considered appropriate. This program is detailed below.

Monitoring Parameters - As required in 40 CFR 264.98 and 270.14, a list of parameters for use in the detection monitoring program is proposed herein. See Table 2. This list has been prepared in general accordance with present agreements with the Michigan Department of Natural Resources.

It should be noted that, according to Wayne Disposal, Inc., the hazardous wastes to be disposed of on site are not expected to vary significantly from the hazardous waste received in 1981. Records for that year reportedly indicate that over 92 percent of the hazardous wastes received at the site were identified by 10 EPA waste codes (40 CFR 261). In order of decreasing quantities, these codes are: F006, D002, K061, F005, K062, F002, D006, D008, K086, and D007. More detailed information regarding these specific wastes are presented elsewhere in the permit application package.

Table 2 is divided into three categories, Indicator Parameters, Trace Constituents - List 1, and Trace Constituents - List 2. The first four indicator parameters have been required under 40 CFR 265.92 and will be continued. The remaining indicator parameters have been shown to be in relatively high concentrations in the leachates tested and are detectable with relative ease. Additionally, chloride is included because of its high stability and mobility in the hydrogeological environment.

TABLE 2

PROPOSED DETECTION LEVEL MONITORING PARAMETERS AND DETECTION LIMITS

Indicator Parameters	Detection Limits (mg/l)
Specific Conductance	-
Total Organic Carbon	2
Total Organic Halogen	0.015
pH	-
Sulphate	5
Chloride	5
Sodium	0.1
Trace Constituents List 1	
Arsenic	0.005
Cadmium	0.01
Chromium, Total	0.02
Cyanide, Total	0.03
Lead	0.05
Iron	0.1
Phenols	0.005
Zinc	0.02
Trace Constituents List 2	
Barium	0.1
Copper	0.02
Flouride	0.05
Manganese	0.02
Mercury	0.0005
Selenium	0.005
Silver	0.02
Xylene	0.001
Formaldehyde	0.05
Methyl Ethyl Ketone	0.004
Methylene Chloride	0.005
Toluene	0.001
1,1,1 - Trichloroethane	0.002

The trace constituents are included as additional parameters which have either been previously detected in the on-site wells (as discussed elsewhere herein), have been noted in significant concentrations in the leachates tested (Figures F-251 through F-276) or have been requested by the State of Michigan. The two different lists of trace constituents are included for different sampling frequencies, as will be discussed later herein.

Monitoring Well System - The proposed monitoring well system has been presented in an earlier section of this submittal. As discussed, it will consist of five wells constructed of threaded PVC materials and nine wells constructed with stainless steel wellpoints and galvanized steel casing. The locations of these wells and proposed wellpoint depths are shown on Plate 6.

After completion of these wells, air-driven positive displacement pumps will be installed for sampling. Each well will possess a pump which will be left in place to minimize the possibility of introducing contamination into the wells. A more detailed description of these pumps is provided in Figures F-111 through F-147.

Background Water Quality - The existing water quality data was obtained from widely scattered wells, only two of which (OB-3 and OB-7) lie directly adjacent to the proposed waste management area. Additionally, all of the existing data is based upon samples that were obtained from steel wells using two different sampling methodologies. For these reasons and because wide variability in water quality results has been noted throughout the site, it is suggested that the existing data should not be used for specific background values. Rather, it is suggested that background values for the monitoring parameters be determined during the first year of the permitted status after the new wells are installed.

The three upgradient wells shown on Plate 6 (OB-7, OB-18 and OB-19) will be used to determine the background water quality. These wells will be located directly upgradient of the waste management area and will more closely monitor the background water quality for the aquifer beneath the specific area of concern.

In order to define the background concentrations, each of the two steel wells (OB-7 and OB-19) will be sampled once every 3 months during the first year of permitted status. The PVC well (OB-18) will be sampled twice every 3 months during this period. Each sample will be analyzed for all of the parameters included in the detection monitoring program. At the end of the fourth sampling and analysis, 16 upgradient values for each water quality parameter will be available (4 samples from each of 4 quarters). Note that each downgradient well will also be sampled and analyzed once every 3 months during this period.

The background (upgradient) results will then be evaluated. First, a comparison for each parameter will be made to compare results between the samples from PVC well and the steel wells. Eight samples from each well type will have been tested. It is intended that this comparison for each parameter will be performed using the procedures of 40 CFR 264, Appendix IV.

For each parameter, if no statistically significant difference between well types is observed, then all 16 values of this parameter will be grouped and will be considered the background data. A mean background concentration and an estimated standard deviation will then be defined as in 40 CFR 264, Appendix IV. If, however, a statistically significant difference for a parameter is observed between PVC and steel wells, then the water quality results from the remaining 11 downgradient wells in the new monitoring system, obtained during the background period, will be added to the upgradient results for additional assessment. In such a case, 24 sample results will be available for the PVC wells and 36 results will be available for the steel wells from the first year's data. Again, a statistical comparison according to 40 CFR 264, Appendix IV will be made between the PVC well results and the steel well results for this particular parameter.

If no statistically significant difference is observed, then the well types will be considered to yield similar results. In this case, the original 16 results for this parameter (4 samples from each of 4 quarters) will be considered as the background data. A background mean and standard deviation will be derived therefrom. If the second comparison also yields a statistically significant difference between the PVC well results and the steel well results, then the background value for this parameter will be determined according to well type. The eight upgradient parameter values for each well type (i.e., 4 samplings from 2 upgradient steel wells) will define a mean concentration and standard deviation for future comparisons to water quality results from each respective well type.

At the conclusion of the one-year background period, a report detailing the statistical comparisons and resulting background values expressed as mean values and variances, should be prepared and submitted to the Regional Administrator. A statistical comparison method for use on all future data for each parameter should be proposed in that report on the basis of the observed distribution of background data.

Sampling, Analysis and Statistical Procedures - Procedures concerning sampling and analysis to be used in the detection monitoring plan are presented in the "Groundwater Sampling and Analysis Plan, Waste Disposal Site #2". This plan was prepared by Wayne Disposal, Inc. and is included herein as Figures F-111 through F-147. It should be noted that, upon permit issuance and installation of the new wells shown on Plate 6, the proposed monitoring well system and the proposed detection program parameters will be substituted for the wells and parameters presented in the sampling and analysis plan referenced above.

As previously discussed, it is intended that the statistical comparison procedures in 40 CFR 264.97(h) and Appendix IV will be used for evaluating downgradient versus upgradient water quality results. However, a comprehensive evaluation of the background data is recommended before any specific statistical procedure is chosen. Hence, the report to be submitted at the completion of the one-year background period described above will present an evaluation of the statistical procedures based on their applicability to the observed distribution of the background data.

Following the one-year background sampling period described above, sampling and analysis of the water quality from all wells included in the proposed monitoring system should be undertaken at least twice annually throughout the active life of the facility and the post-closure care period. Four sample portions from each well should be analyzed for the detection program indicator parameters shown on Table 2 at the time of each sampling and analysis. Additionally, one portion from each of the wells should be analyzed twice yearly for all of the Trace Constituents - List 1, shown on Table 2. Lastly, one portion from each well should be analyzed once yearly for each parameter shown in Table 2 as Trace Constituents - List 2.

The groundwater flow direction and rate in the uppermost aquifer should be determined on a yearly basis. It is anticipated that this will be accomplished by establishing gradients based on the water levels annually observed in each monitoring well and calculating the flow rate from Darcy's Law.

Procedures if Increase in Constituent Concentration is Noted - If a statistical increase is noted for detection program parameters when comparing the results of the periodic sampling to the background values, the procedures presented in 40 CFR 264.98 (h) must be followed. Alternatively, the procedures in 40 CFR 264.98 (i) regarding the demonstration of an off-site source must be initiated.

Respectfully submitted,

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September 7, 1983

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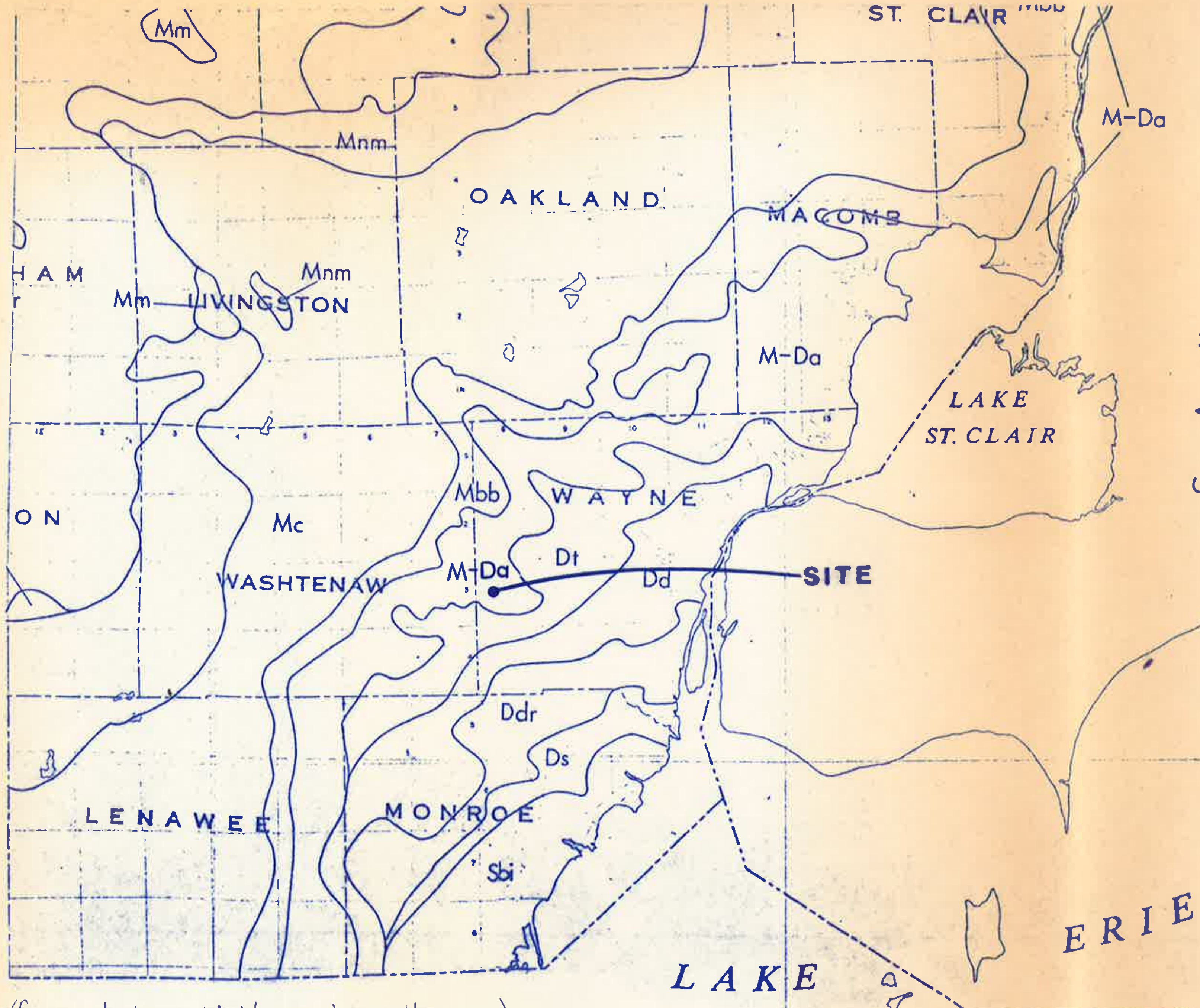
LIST OF PLATES



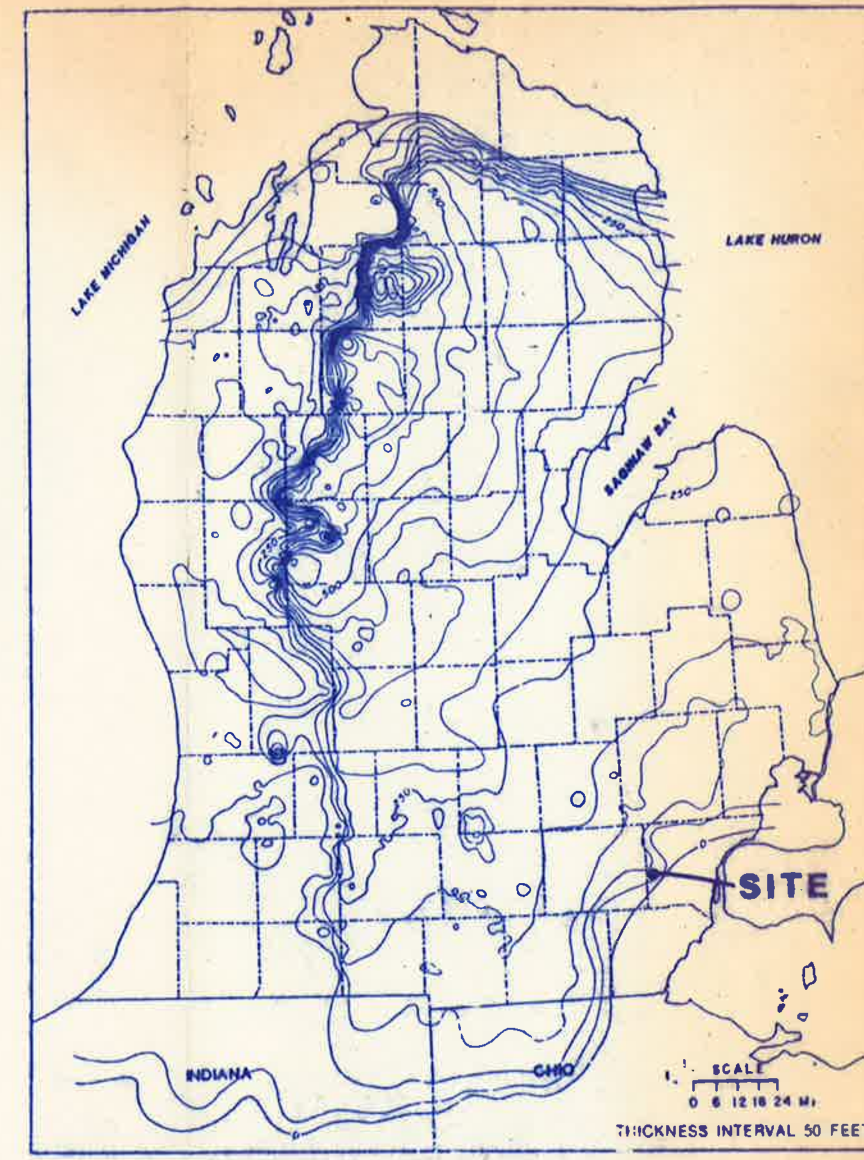
(from Western Michigan University, 1981)

BEDROCK SURFACE GEOLOGY

0 5 10 20 40
SCALE MILES

LEGEND

Mm	Michigan	Dt	Traverse
Mnm	Marshall	Ddr	Detroit River
Mc	Coldwater	Ds	Sylvania
Mbb	Berea-Bedford	Sbi	Bass Islands
M-Da	Antrim		



Thickness of the Antrim Shale

(from Western Michigan University, 1981)

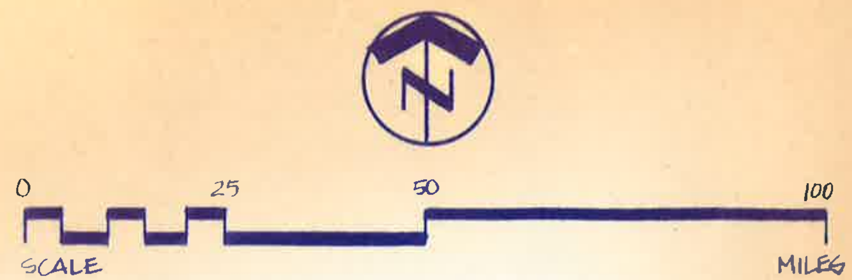
BEDROCK GEOLOGY

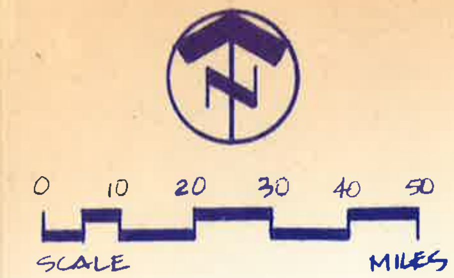
WAYNE DISPOSAL, INC.
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

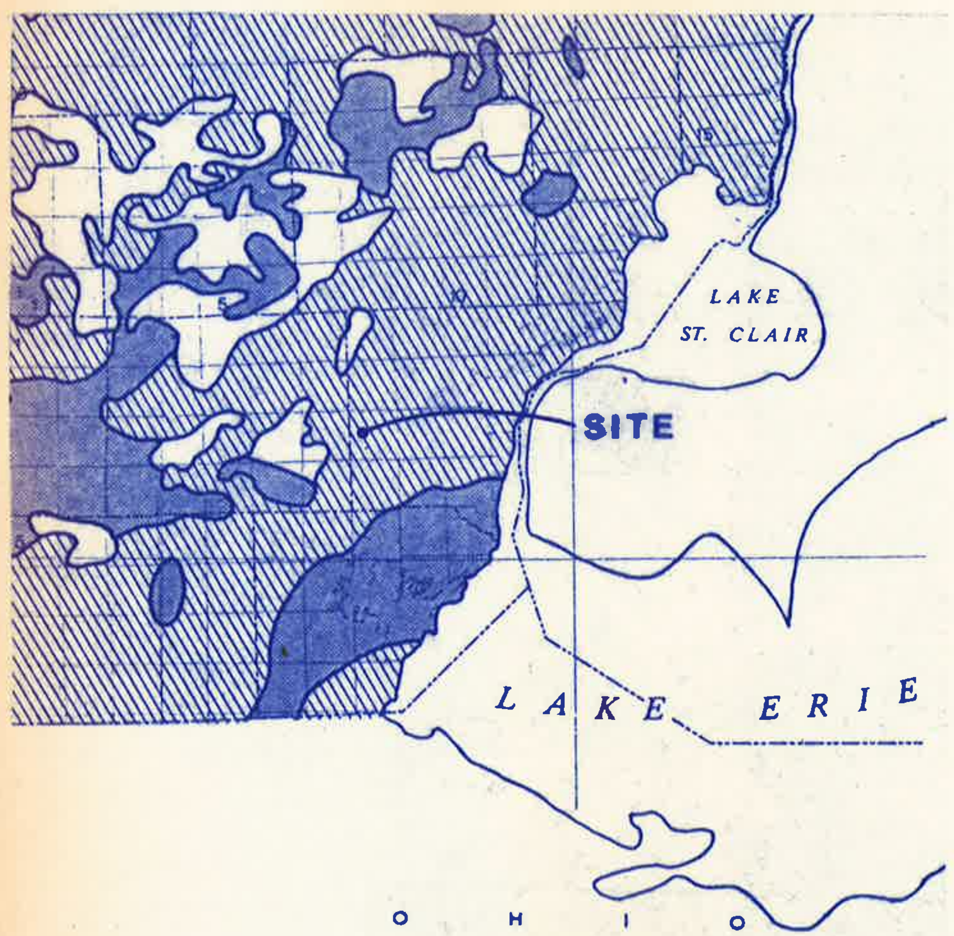
NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS
30999 TEN MILE RD. · FARMINGTON HILLS, MI 48024

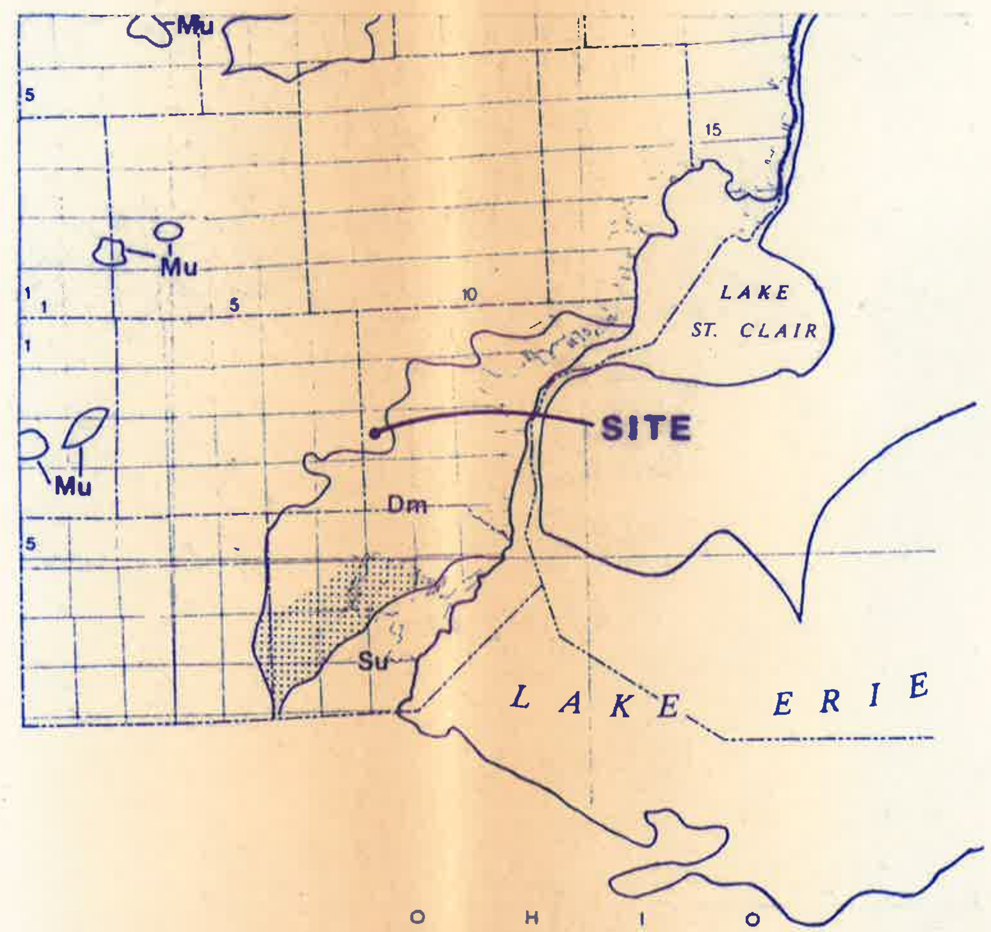
PROJECT NO.: 94315	DRAWN BY: [illegible]	DATE: 7.7.83
SCALE: AS SHOWN	CHECKED BY: WRB	SHEET 1 OF 1

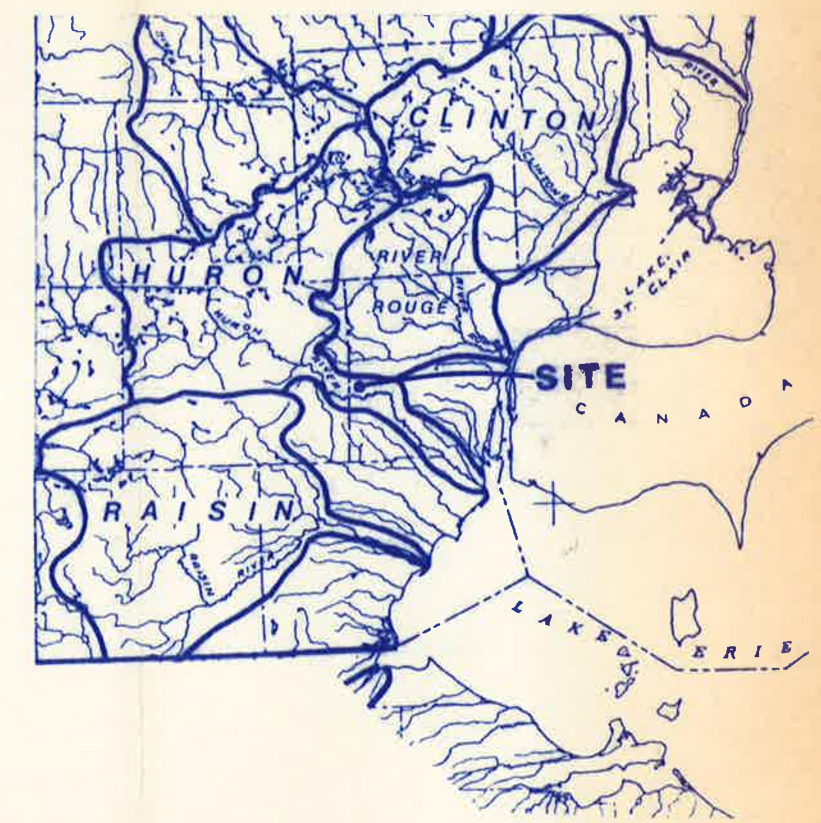
PLATE 3











RIVER DRAINAGE BASINS

NOTE: All three diagrams are adapted from Western Michigan University, 1981.

AQUIFER VULNERABILITY TO SURFACE CONTAMINATION

LEGEND

PROTECTED AQUIFER

The first usable aquifer is protected by impervious material from surface contamination.

UNPROTECTED AQUIFER

The first usable aquifer is not protected by impervious material from surface contamination.

UNCLASSIFIED AQUIFER

Aquifer vulnerability is undetermined because of inadequate geologic information.

KARST AREAS OF MICHIGAN

LEGEND

KNOWN OR SUSPECTED KARST AREAS

STRATIGRAPHIC UNITS

Mu Upper Mississippian
Dm Middle Devonian
Su Upper Silurian

REGIONAL HYDROGEOLOGIC CHARACTERISTICS

WAYNE DISPOSAL, INC.
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS
30999 TEN MILE RD. · FARMINGTON HILLS, MI 48024

PROJECT NO.: 94315	DRAWN BY: SML	DATE: 7·7·83
SCALE: AS SHOWN	CHECKED BY: WRB	SHEET 1 OF 1

PLATE 4

A25040

APPENDIX

... DRILLING,

20843 Northwestern Highway, Southfield, Michigan 48075

Phone 559-6442

SOIL SAMPLING RECORD

Hole No. [illegible] Surface Elevation [illegible] Sheet No. 1 of 4 sheets

Driller D. Singleton

For Layne Disposal Company

Sanitary Landfill Site

Ground Water: 0 hrs. [illegible]

24 hrs. ____

Sampler Hammer Wt. 140 lbs. Drop 30 in.

Location [illegible], Michigan

Sampler Size 2 in. O.D.

Started [illegible] Completed [illegible] Job No. [illegible]

ELEVATION	DEPTH	Drillers Log [ ] Geologist Log [ ] Consistency Color Basic Texture Moisture	SAMPLE DEPTH	BLOWS ON SAMPLE 6" INCREMENTS
		Medium compact dark brown sandy loam top soil. Moist		
	1.1'	Medium compact dark brown fine to medium sand, trace of coarse sand. Moist		
	3.2'	Medium compact gray fine to medium sand, some coarse sand. Wet		
	9.0'	Firm gray silty clay, trace of fine sand, few small pebbles and fine gravel. Moist		

(Continued on Pg. 2)

S.S. - STANDARD SAMPLE
S.T. - SHELBY TUBE
L.S. - LINER SAMPLE

USED ____ CASINGS

Signed ____

Figure F-1

SOIL SAMPLING RECORD

Phone: ~~[illegible]~~

Driller: B. Singleton
Ground Water: 0 hrs. 3.2'
24 hrs. ____
Sampler Hammer Wt. 140 lbs. Drop 30 in.
Sampler Size 2 in. O.D.

Hole No. OB-1 Surface Elevation [illegible] Sheet No. 2 of 4 sheets
For . Wayne Disposal Company
Sanitary Landfill Site
Location Belleville, Michigan
Started 1-22-75 Completed 1-24-75 Job No. 611

ELEVATION	DEPTH	Drillers Log ☐ Geologist Log ☐ Consistency Color Basic Texture Moisture	SAMPLE DEPTH	BLOWS ON SAMPLE 6" ~~12"~~ INCREMENTS
	42.0'	Firm gray silty clay, trace of fine sand, few small pebbles and fine gravel. Moist		
	52.0'	Compact gray silty fine to medium sand. Moist		
	62.0'	Very hard (hardpan) gray silty very sandy clay, few small pebbles and trace of fine to medium gravel. Moist		
	73.0'		SS 1 74.0'	117

(Continued on Pg. 3)

S.S. - STANDARD SAMPLE
S.T. - SHELBY TUBE
L.S. - LINER SAMPLE

USED ____ OF ____ CASINGS

Signed ____

Figure F-2

SOIL SAMPLING RECORD

Phone: 331-0949

Driller B. Singleton
Ground Water: 0 hrs. 3.2'
24 hrs. ____
Sampler Hammer Wt. 140 lbs. Drop 30 in.
Sampler Size 2 in. O.D.

Hole No. OB-1 Surface Elevation 696.1 Sheet No. 3 of 4 sheets
For Wayne Disposal Company
Sanitary Landfill Site
Location Belleville, Michigan
Started 1-22-75 Completed 1-24-75 Job No. 611

ELEVATION	DEPTH	Drillers Log ☐ Geologist Log ☐ Consistency Color Basic Texture Moisture	SAMPLE DEPTH	BLOWS ON SAMPLE 6" INCREMENTS
		Very hard (hardpan) gray silty sandy clay, trace of fine to medium gravel. Damp to Moist	SS 2 84.5'	51-120
	92.0'	Hard gray very silty clay, trace of extremely fine sand. Moist	SS 3 95.0'	19-28-38
	101.5'	Very compact gray very silty clayey extremely fine sand. Moist	SS 4 104.5'	43-111
	111.8'	Very hard gray silty clay with small seams of very silty extremely fine sand. Moist	SS 5 115.0'	25-55-83

(Continued on Pg. 4)

S.S. - STANDARD SAMPLE
S.T. - SHELBY TUBE
L.S. - LINER SAMPLE

USED ____ OF ____ CASINGS

Signed ____

Figure F-3

Able DRILLING, INC.

~~[illegible] Highway ... Michigan 48096~~

~~Phone 953-0069~~

SOIL SAMPLING RECORD

Driller B. Singleton
Found Water: 0 hrs. 3.2'
24 hrs. ____
Sampler Hammer Wt. 140 lbs. Drop 30 in.
Sampler Size 2 in. O.D.

Hole No. OB-1 Surface Elevation 696.1 Sheet No. 4 of 4 sheets
For Wayne Disposal Company
Sanitary Landfill Site
Location [illegible], Michigan
Started 1-[illegible] Completed 1-[illegible]-75 Job No. 611

ELEVATION	DEPTH	Drillers Log ☐ Geologist Log ☐ Consistency Color Basic Texture Moisture	SAMPLE DEPTH	BLOWS ON SAMPLE 6" [illegible]" INCREMENTS
	120.5'	Very compact gray silty fine to med. sand, trace of fine gravel and small pebbles. Very Moist	SS 6 124.0'	116
	123.6'	Disintegrated gray and black shale, trace of rock silt. Moist		
	125.3'	BORING STOPPED		

NOTE: Before installing well point--overnite water level in 3" casing was 30.7'-- Installed 2" X 30 X 36" well point with 2" pipe--depth 125.3' from ground surface--put pea gravel in--pulled 3" casing--pumped 100 gallon water through point and water level was 30.7'--pulled 4" casing and cemented in top 1.5'--2" pipe sticking up .9' above ground surface Total length of pipe and point 126.2'

Note: put 4--2½" pipe protectors around OB-1, OB-2, and OB-3 and cemented in.

NOTE: Revised Top of Casing Elevation = 697.37 on 8/2/83. Recheck of survey records by MCI confirmed this elevation.

S.S. - STANDARD SAMPLE
S.T. - SHELBY TUBE
L.S. - LINER SAMPLE

USED 13.5' OF 4" CASINGS &
111.5' " 3" "

Signed ____

Figure F-4

Able DRILLING, INC.

[illegible]

SOIL SAMPLING RECORD

Driller: B. Singleton
Ground Water: 0 hrs. 6.5'
24 hrs. ______
Sampler Hammer Wt. 140 lbs. Drop 30 in.
Sampler Size 2 in. O.D.

Hole No. OB-2 Surface Elevation 618.0 Sheet No. 1 of 3 sheets
For: Wayne Disposal Company, Sanitary Landfill Site
Location: Belleville, Michigan
Started [illegible] Completed 1-10-75 Job No. 611

ELEVATION	DEPTH	Drillers Log ☐ Geologist Log ☐ — Consistency Color Basic Texture Moisture	SAMPLE DEPTH	BLOWS ON SAMPLER 6" INCREMENTS
	.5'	Comp. brn. med. to coarse sand & gravel--fill. Moist		
	1.0'	Compact D. brn. sandy loam original top soil. Moist	SS 1 5.0'	5-6-8
	6.5'	Medium compact brown fine to medium sand, trace of coarse sand. Moist		
	8.7'	Medium compact brown fine to med. sand, some coarse sand. Moist	SS 2 10.0'	10-11-16
	13.0'	Compact gray fine to medium sand. Wet		
	13.6'	Firm gray silty sandy clay, few small pebbles. Moist	SS 3 15.0'	7-7-10
	14.5'	Medium compact gray fine to med. sand, some coarse sand. Wet		
	19.0'	Firm gray silty clay, trace of fine sand & few small pebbles & fine gra. Moist	SS 4 20.0'	8-12-15
	29.0'	Stiff gray silty clay, trace of fine sand. Moist	SS 5 25.0'	8-13-19
		Hard gray silty clay, some fine sand, few small pebbles and fine gravel. Moist	SS 6 30.0'	11-19-29
			SS 7 35.0'	9-14-22
			SS 8 40.0'	20-24-31

(Continued on Pg. 2)

S.S. - STANDARD SAMPLE
S.T. - SHELBY TUBE
L.S. - LINER SAMPLE

USED ______ OF ______ CASINGS

Signed ______________

Figure F-5

~~20663 Northwestern Highway~~ ~~Southfield, Michigan 48076~~
~~Phone: 352-8040~~

SOIL SAMPLING RECORD

Driller: R. Singleton
Ground Water: 0 hrs. 6.5'
24 hrs. ______
Sampler Hammer Wt. 140 lbs. Drop 30 in.
Sampler Size 2 in. O.D.

Hole No. 07-2 Surface Elevation 698.0 Sheet No. 2 of 3
For Wayne Disposal Company
Sanitary Landfill Site
Location Belleville, Michigan
Started 1-16-7[illegible] Completed 1-1[illegible]-75 Job No. 61[illegible]

ELEVATION	DEPTH	Drillers Log ☐ Geologist Log ☐ — Consistency Color / Basic Texture / Moisture	SAMPLE DEPTH	BLOWS ON SAMPLER 6" ~~OR~~ INCREMENTS
	42.3'			
		Very Compact gray silty clayey extremely fine sand. Moist	SS 9 44.5'	36-90
	48.0'			
			SS 10 50.0'	27-47-[illegible]
		Very compact gray fine sand. Moist	SS 11 55.0'	27-35-[illegible]
			SS 12 60.0'	25-29-[illegible]
			SS 13 65.0'	18-29-[illegible]
	68.0'			
		Very compact gray fine to medium sand. Moist	SS 14 69.5'	70-125/[illegible]
			SS 15 75.0'	44-77-[illegible]
	77.5'			
			SS 16 80.0'	19-22-[illegible]

(Continued on Pg. 3)

S.S. – STANDARD SAMPLE
S.T. – SHELBY TUBE
L.S. – LINER SAMPLE

USED ______ OF ______ CASINGS

Signed ______________________

Figure F-6

Able DRILLING, INC.

~~27305 Northwestern Highway~~ ~~Southfield, Michigan 48076~~

~~Phone 352-8242~~

SOIL SAMPLING RECORD

Driller: B. Singleton
Ground Water: 0 hrs. 6.5'
24 hrs. ____
Sampler Hammer Wt. 140 lbs. Drop 30 in.
Sampler Size 2 in. O.D.

Hole No. [illegible] Surface Elevation 698.0 Sheet No. 3 of 3 sheets
For [illegible] Company
[illegible] Landfill Site
Location [illegible]
Started [illegible] Completed [illegible] Job No. [illegible]

ELEVATION	DEPTH	Drillers Log ☐ Geologist Log ☐ — Consistency Color Basic Texture Moisture	SAMPLE DEPTH	BLOWS ON SAMPLE 6" ~~OR 12"~~ INCREMENTS
		Compact gray fine to medium sand, trace of coarse sand. Moist		
	83.5'	Very compact gray fine to medium sand, trace of coarse sand. Moist	SS 17 85.0'	32-75-68
	86.8'	Very compact gray fine sand, slight trace of silt. Moist	SS 18 90.0'	54-62-40
	91.0'	Very compact gray fine to medium sand, trace of coarse sand. Moist	SS 19 95.0'	25-44-57
	94.7'	Very compact gray medium to coarse sand and gravel. Very Moist		
	99.0'	Compact gray medium to coarse sand and gravel. Wet	SS 20 100.0'	40-21-24
	102.3'	Very compact gray medium to coarse sand and gravel. Very Moist	SS 21 105'	54-55-52
	108.0'	Compact gray medium to coarse sand and gravel. Very Moist	SS 22 110.0'	28-26-27
	110.0'	BORING STOPPED		

Note: Before installing well point--Determine water level in 3" casing was 48.5'. Installed 1¼" x 30" x 36" well point with 2" pipe--depth 110' from ground surface--put pea gravel in & pulled 3" casing--pumped 100 gallon water through point & water level was 48.5'--pulled 4" casing & cemented in top 1.5'--2" pipe sticking up 2.2' above ground surface--Total length of pipe and point 112.2'.

NOTE: Top of Casing Elevation = 700.4

S.S. - STANDARD SAMPLE
S.T. - SHELBY TUBE
L.S. - LINEN SAMPLE

USED 18.5' OF 4" & 100.5' OF 3" CASINGS

Signed ____

Figure F-7

MONITORING WELL

FORM

Able DRILLING, INC.

~~27303 Northwestern Highway Southfield, Michigan 48076~~

~~Phone: 352-0040~~

SOIL SAMPLING RECORD

Driller: B. Singleton

Ground Water: 0 hrs. 3.0'

24 hrs. ______

Sampler Hammer Wt. 140 lbs. Drop 30 in.

Sampler Size 2 in. O.D.

Hole No. OE-3 Surface Elevation [illegible].0 Sheet No. 1 of 4 sheets

For: Wayne Disposal Company Sanitary Landfill Site

Location: Belleville, Michigan

Started: 1-[illegible] Completed: 1-[illegible]-75 Job No. 611

Drillers Log ☐ Geologist Log ☐

ELEVATION	DEPTH	Consistency Color / Basic Texture / Moisture	SAMPLE DEPTH	BLOWS ON SAMPLER 6" ~~OR 12"~~ INCREMENTS
	1.0'	Medium compact D. brn. sandy loam—top soil. Moist		
	3.0'	Med. compact brown fine to med. sand, trace of coarse sand. Moist		
	7.5'	Medium compact brown fine to medium sand, some coarse sand. Wet		
	12.5'	Compact gray fine to medium sand. Wet		
	16.0'	Firm gray silty clay, some fine sand and very few small pebbles. Moist		
		Stiff gray silty clay, trace of fine sand and few small pebbles and fine gravel. Moist		

(Continued on Pg. 2)

Figure F-8

S.S. – STANDARD SAMPLE
S.T. – SHELBY TUBE
L.S. – LINER SAMPLE

USED ______ OF ______ CASINGS

Signed ______________________

FORM 2

Able DRILLING, INC.

~~27303 Northwestern Highway Southfield, Michigan 48076~~
~~Phone 352-8049~~

SOIL SAMPLING RECORD

Driller R. Singleton
Ground Water: 0 hrs. 3.0'
24 hrs. ______
Sampler Hammer Wt. 140 lbs. Drop 30 in.
Sampler Size 2 in. O.D.

Hole No. OB-3 Surface Elevation 702.0 Sheet No. 2 of 4 sheets
For Wayne Disposal Company
Sanitary Landfill Site
Location Belleville, Michigan
Started 1-20-75 Completed 1-21-75 Job No. 611

ELEVATION	DEPTH	Drillers Log ☐ Geologist Log ☐ Consistency Color Basic Texture Moisture	SAMPLE DEPTH	BLOWS ON SAMPLER 6" INCREMENTS
	53.0'	Stiff gray silty clay, few small wafer type seams of extremely fine sand. Moist		
	57.0'	Firm gray silty clay, some fine sand, few small pebbles and trace of fine to medium gravel. Moist		
	65.0'	Very compact (hardpan) gray silty clayey fine to medium sand, few small pebbles. Moist	SS 1 75.0'	33-66-122
	79.0'	(Continued on Pg. 3)		

(10)

S.S. = STANDARD SAMPLE
S.T. = SHELBY TUBE
L.S. = LINER SAMPLE

USED ______ OF ______ CASINGS

Signed ____________

Figure F-9

Able DRILLING, INC.

~~27505 Northwestern Highway~~ ~~Southfield, Michigan 48076~~
~~Phone~~

SOIL SAMPLING RECORD

Driller: B. Singleton
Ground Water: 0 hrs. 3.0'
24 hrs. ______
Sampler Hammer Wt. 140 lbs. Drop 30 in.
Sampler Size 2 in. O.D.

Hole No. CB-3 Surface Elevation 702.0 Sheet No. 3 of 4 sheets
For: Wayne Disposal Company, Sanitary Landfill #2
Location: Belleville, Michigan
Started [illegible] Completed [illegible] Job No. 611

ELEVATION	DEPTH	Drillers Log ☐ Geologist Log ☐ / Consistency Color / Basic Texture / Moisture	SAMPLE DEPTH	BLOWS ON SAMPLER 6" ~~OR 12"~~ INCREMENTS
		Very compact gray fine to medium sand, trace of coarse sand. Moist	SS 2 85.0'	30-52-54
	88.7'			
			SS 3 95.0'	45-67-50
		Very compact gray medium to coarse sand, some fine sand and gravel. Very Moist	SS 4 100.0'	41-41-55
			SS 5 105.0'	45-67-58
	114.0'		SS 6 114.4'	48-150/.

(Continued on Pg. 4)

S.S. – STANDARD SAMPLE
S.T. – SHELBY TUBE
L.S. – LINER SAMPLE

USED ______ OF ______ CASINGS

Signed ______

Figure F-10

20563 Northwestern Highway Southfield, Michigan 48076
Phone: 352-8840

SOIL SAMPLING RECORD

Driller D. Singleton
Ground Water: 0 hrs. 3.0'
24 hrs.
Sampler Hammer Wt. 140 lbs. Drop 30 in.
Sampler Size 2 in. O.D.

Hole No. OB-3 Surface Elevation 702.0 Sheet No. 4 of 4 sheets
For Wayne Disposal Company
Sanitary Landfill Site
Location Belleville, Michigan
Started [illegible] Completed [illegible] Job No. [illegible]

ELEVATION	DEPTH	Drillers Log ☐ Geologist Log ☐ Consistency Color Basic Texture Moisture	SAMPLE DEPTH	BLOWS ON SAMPLER 6" ~~OR 12"~~ INCREMENTS
		Very compact gray medium to course sand and gravel, some fine sand and gravel. Moist		
	124.1'	BORING STOPPED		
		NOTE: Water level in 3" casing was 45.2' before installing well point. Installed 1¼" x 30"x 35" well point with 2" pipe--depth 124.1' from ground surface--put pea gravel in and pulled 3" casing--pumped 100 gallon water through point and water level was 45.2'--pulled 4" casing and cemented in top 1.5'--2" pipe sticking up .8' above ground surface--Total length of pipe and point 124.9'		
		NOTE: Revised Top of Casing Elevation = 708.90 on 8/2/83 due to resurvey by MCI after casing repair.		

S.S. - STANDARD SAMPLE
T. - SHELBY TUBE
S. - LINER SAMPLE

USED 18.5' OF 4" CASINGS & 118.5' of 3" casings

Signed

105

Figure F-11

LOG OF SUBSURFACE PROFILE

CLASSIFICATIONS BY: NEYER, TISEO & HINDO, LTD.

GROUND SURFACE ELEVATION: 708.4

Depth (ft)	Description
0.0–6.0	Loose Brown MEDIUM SAND with a Trace of Silt.
6.0–11.0	Medium Compact Gray FINE SAND with Little Silt.
11.0–62.0	Stiff to Very Stiff Gray SILTY CLAY with Traces of Sand and Gravel.
62.0–66.0	Compact Gray SILT.
66.0–71.0	Compact Gray FINE SAND with Some Silt.

ELEVATION-FEET: 700, 690, 680, 670, 660, 650, 640, 630 (water level mark 0 and 1.0)

SOIL SAMPLE DATA

SAMPLE NUMBER	ELEV. (FEET)	NATURAL MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	PENETRATION* RESISTANCE
S-1	703.4	-	-	2-2-2
S-2	698.4	-	-	11-12-13
LS-1	693.4	-	-	4-6-8
LS-2	688.4	-	-	6-9-10
S-3	683.4	-	-	7-10-13
LS-3	678.4	-	-	6-9-12
LS-4	673.4	-	-	7-14-18
LS-5	668.4	-	-	11-19-21
LS-6	663.4	-	-	11-15-19
LS-7	658.4	-	-	10-12-15
LS-8	653.4	20.5	100.8	6-9-10
LS-9	648.4	-	-	9-11-15
LS-10	643.4	-	-	8-15-19
S-4	637.4	-	-	9-11-13

(Penetration resistance scale: 0 10 20 30 40 50)

NOTES:
1. Boring advanced with 8-inch outside-diameter hollow-stem auger.
2. Piezometer set at this location; tip at Elevation 638.86, top of casing at Elevation 712.56.
3. Groundwater noted 53.6 feet below surface at completion and 57.3 feet below surface 1.0 hour after completion.

NOTE: Revised Top of Casing Elevation = 712.36 on 8/2/83 due to resurvey by MCI.

TOTAL DEPTH: 71.0'
BORING STARTED: 5/23/79
BORING COMPLETED: 5/23/79
INSPECTOR: D. Harpstead
DRILLER: D. Klitz
CONTRACTOR: Geo-Tek, Inc.

WATER LEVEL IN HOLE AT INDICATED NUMBER OF HOURS AFTER COMPLETION OF BORING WITH 0 FEET OF CASING IN PLACE.

*PENETRATION RESISTANCE: NUMBER OF BLOWS REQUIRED TO DRIVE 2 INCH O.D. SOIL SAMPLER 12 INCHES, USING 140 POUND WEIGHT WITH 30 INCH FREE FALL.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

LOG OF TEST BORING NUMBER OB-4

SOIL AND GROUNDWATER STUDY
MICHIGAN DISPOSAL LANDFILL NO. 2
VAN BUREN TOWNSHIP, MICHIGAN

APPROVED BY: DH	DATE: 6/21/79
PROJECT NO. 94309	FIGURE NO. F-12

LOG OF SUBSURFACE PROFILE

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GROUND SURFACE ELEVATION:
697.0

Elev.	Description	Depth
	Loose Brown FINE TO MEDIUM SAND.	6.0
690	Medium Compact Light Brown FINE SAND (Moist).	15.0
680	Loose to Medium Compact Gray SILTY SAND (Wet).	23.0
67	Soft Gray SANDY CLAY with Some Silt.	30.0
66	Very Stiff to Hard Gray SILTY CLAY with Trace of Sand.	
65		
640	Continued on Page 2 of 2	

SOIL SAMPLE DATA

SAMPLE NUMBER	ELEV. (FEET)	NATURAL MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	PENETRATION RESISTANCE * (0 10 20 30 40 50)
LS-1	657.0	-	-	9-12-15
LS-2	652.0	-	-	10-15-18
LS-3	647.0	-	-	10-14-18

TOTAL DEPTH: 95.5'
BORING STARTED: 5/22/79
BORING COMPLETED: 5/22/79
INSPECTOR: D. Harpstead
DRILLER: D. Klitz
CONTRACTOR: Geo-Tek, Inc.

WATER LEVEL IN HOLE AT INDICATED NUMBER OF HOURS AFTER COMPLETION OF BORING WITH 0 FEET OF CASING IN PLACE.

* PENETRATION RESISTANCE:
NUMBER OF BLOWS REQUIRED TO DRIVE 2 INCH O.D. SOIL SAMPLER 12 INCHES, USING 140 POUND WEIGHT WITH 30 INCH FREE FALL.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

LOG OF TEST BORING NUMBER OB-5

SOIL AND GROUNDWATER STUDY
MICHIGAN DISPOSAL LANDFILL NO. 2
VAN BUREN TOWNSHIP, MICHIGAN

APPROVED BY: DH	DATE: 6/21/79
PROJECT NO. 94309	FIGURE NO. F-13

LOG OF SUBSURFACE PROFILE

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GROUND SURFACE ELEVATION:
697.0

Very Stiff to Hard Gray SILTY CLAY with Trace of Sand.

67.0

Medium Gray SILTY CLAY.

77.5

Medium Gray CLAYEY SILT.

87.0

Very Compact Gray SILTY FINE SAND.

95.5

NOTES:

1. Boring advanced with 8-inch outside-diameter hollow-stem auger to a depth of 70 feet and with bentonite and rotary drilling methods below that depth.
2. Piezometer set at this location; tip at Elevation 603.82, top of casing at Elevation 702.90.
3. Bentonite used in drilling fluid. Well must be purged prior to obtaining accurate water levels.

SOIL SAMPLE DATA

SAMPLE NUMBER	ELEV. (FEET)	NATURAL MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	PENETRATION RESISTANCE * (0 10 20 30 40 50)
LS-4	642.0	-	-	7-10-12
LS-5	637.0	-	-	17-19-12
LS-6	632.0	-	-	6-7-9
LS-7	627.0	-	-	6-8-8
LS-8	621.5	-	-	7-7-12
LS-9	616.5	-	-	4-5-13
LS-10	611.5	-	-	7-8-11
S-1	606.5	-	-	13-9-9
LS-11	602.0	-	-	24-29-30 (59)

NOTE: Revised Top of Casing Elevation = 699.02 on 8/2/83 due to resurvey by MCI after casing repair.

TOTAL DEPTH: 95.5'
BORING STARTED: 5/22/79
BORING COMPLETED: 5/22/79
INSPECTOR: D. Harpstead
DRILLER: D. Klitz
CONTRACTOR: Geo-Tek, Inc.

WATER LEVEL IN HOLE AT INDICATED NUMBER OF HOURS AFTER COMPLETION OF BORING WITH 0 FEET OF CASING IN PLACE.

* PENETRATION RESISTANCE: NUMBER OF BLOWS REQUIRED TO DRIVE 2 INCH O.D. SOIL SAMPLER 12 INCHES, USING 140 POUND WEIGHT WITH 30 INCH FREE FALL.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

LOG OF TEST BORING NUMBER OB-5

SOIL AND GROUNDWATER STUDY
MICHIGAN DISPOSAL LANDFILL NO. 2
VAN BUREN TOWNSHIP, MICHIGAN

APPROVED BY: DH	DATE: 6/21/79
PROJECT NO. 94309	FIGURE NO. F-14

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

Elevation (Feet)	Generalized Subsurface Profile	Depth	Well Schematic
	GROUND SURFACE ELEVATION: 702.1		TOP OF CASING: 704.62*
700	FILL.	3.0	*NOTE: Revised Top of Casing Elevation on 8/2/83 due to resurvey by MCI.
	FILL.	6.0	
690	Medium Compact Gray SILTY FINE SAND with Occasional Silt Seams.	16.5	
680–640	Very Stiff to Hard Gray SILTY CLAY with Little Sand and Trace of Gravel.	67.5	EXPANDABLE GROUT. (67.5)
630–620	Very Compact Gray SILTY SAND.		FILTER SAND. (75.0)

GROUNDWATER DATA

Date	Groundwater Elev. (Feet)	Comments
10/23/80	651.05	
11/1/80	651.39	

CASING – DIAMETER: 2"
– LENGTH: 72.0'
– MATERIAL: Galvanized

SCREEN – DIAMETER: 2"
– LENGTH: 3'6"/4'7"
– MESH: Slot 8
– MATERIAL: Stainless Steel

WELL STARTED: 9/30/80
WELL COMPLETED: 9/30/80
INSPECTOR: D. Harpstead
DRILLER: G. Canfield
CONTRACTOR: Geo-Tek, Inc.
EQUIPMENT: Trailer mounted CME 55 with 8-inc[h] hollow-stem auger

NOTE:
1. See Log of Test Boring No. 106 for detailed soil classifications.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS
38955 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL No. OB-6

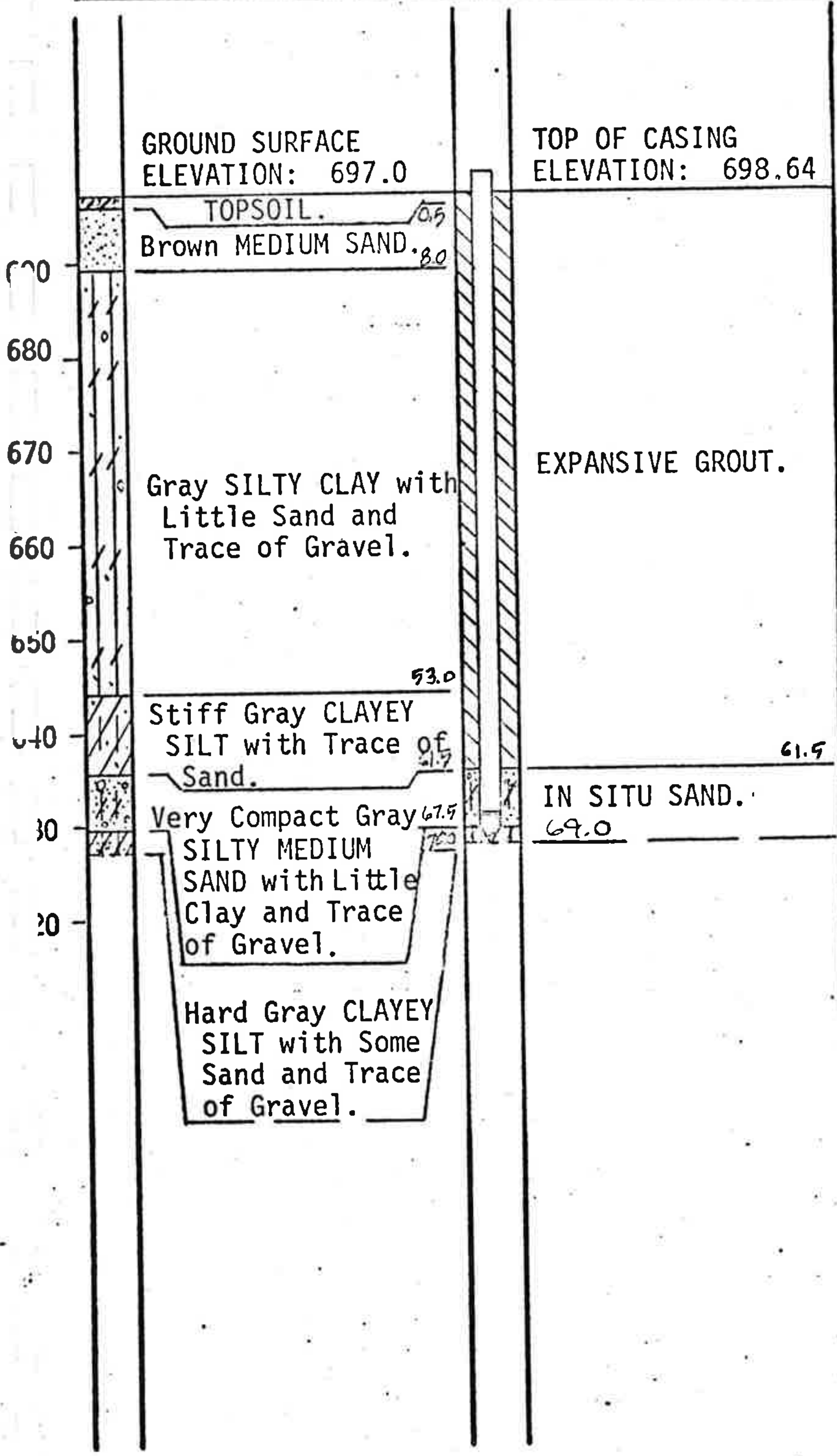
SANITARY LANDFILL
WAYNE DISPOSAL, INC.
VANBUREN TOWNSHIP, WAYNE COUNTY, MICH.

APPROVED BY:	DH	DATE:	10/29/80
PROJECT NO:	94309	FIGURE NO:	F-15

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
4/10/81	652.60	Bailed this date.
4/16/81	652.14	
4/23/81	652.22	
5/21/81	649.13	

CASING – DIAMETER: 2"
– LENGTH: 67.1'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 7 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 3/29/81
WELL COMPLETED: 3/30/81
INSPECTOR: H. Yaldo
DRILLER: G. Canfield
CONTRACTOR: Geo-Tek, Inc.
EQUIPMENT: Trailer-mounted CME-55 drilling rig utilizing 8-inch outside-diameter hollow-stem augers to 30.0 feet and 3-inch diameter rotary bit with water below 30.0 feet.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS
38900 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL NO. OB-7

RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY: WRB	DATE: 5/5/81
PROJECT NO: 94309	FIGURE NO: F-16

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC
GROUND SURFACE ELEVATION: 704.0	TOP OF CASING ELEV. 707.57*
	*NOTE: Revised Top of Casing Elevation on 8/2/83 due to resurvey by MCI.
Loose to Medium Compact Brown and Gray SILTY FINE SAND.	
18.0	
Very Stiff to Hard Gray SILTY CLAY.	EXPANDABLE GROUT.
58.0	58.0
Very Compact Gray FINE SAND.	FILTER SAND.
75.0	75.0

Elevation scale: 700, 690, 680, 6 0, 6 0, 6 0, 6'0, 630, 620

GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
10/23/80	651.36	
11/1/80	651.67	

CASING – DIAMETER: 2"
– LENGTH: 72.3'
– MATERIAL: Galvanized

SCREEN – DIAMETER: 2"
– LENGTH: 3'6"/4'7"
– MESH: 8 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 9/30/80
WELL COMPLETED: 10/1/80
INSPECTOR: D. Harpstead
DRILLER: G. Canfield
CONTRACTOR: Geo-Tek, Inc.
EQUIPMENT: Trailer mounted CME 55 with 8-inch hollow-stem augers.

NOTE:
1. See Log of Test Boring No. 26 for detailed soil descriptions.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS
38955 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL No. OB-8

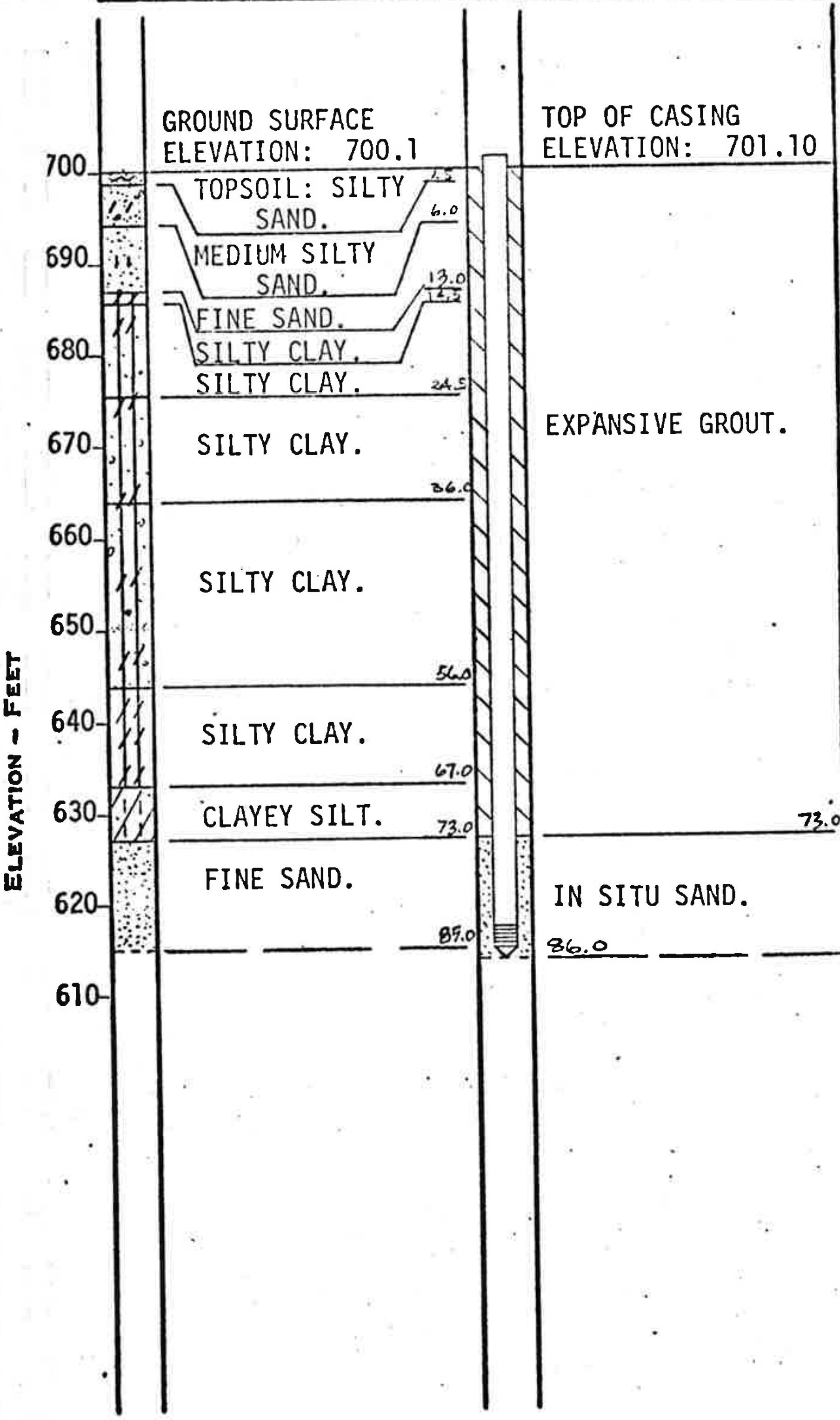
SANITARY LANDFILL
WAYNE DISPOSAL, INC.
VANBUREN TOWNSHIP, WAYNE COUNTY, MICH.

APPROVED BY: DH	DATE: 10/29/80
PROJECT NO: 94309	FIGURE NO: F-17

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC



NOTE:
1. See Log of Test Boring No. 134 for detailed soil classification.

GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
4/9/81	648.68	Bailed this date.
4/16/81	648.85	
4/23/81	647.72	
5/21/81	649.66	

CASING – DIAMETER: 2"
– LENGTH: 83.5'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 10 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 4/1/81
WELL COMPLETED: 4/1/81
INSPECTOR: H. Yaldo
DRILLER: G. Canfield
CONTRACTOR: Geo-Tek, Inc.
EQUIPMENT: Trailer mounted CME-55 drilling rig utilizing 8-inch outside-diameter hollow-stem augers to 30.0 feet and 3-inch diameter rotary bit with water below 30.0 feet.

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CONSULTING ENGINEERS
38955 TEN MILE RD., FARMINGTON HILLS, MI 48024

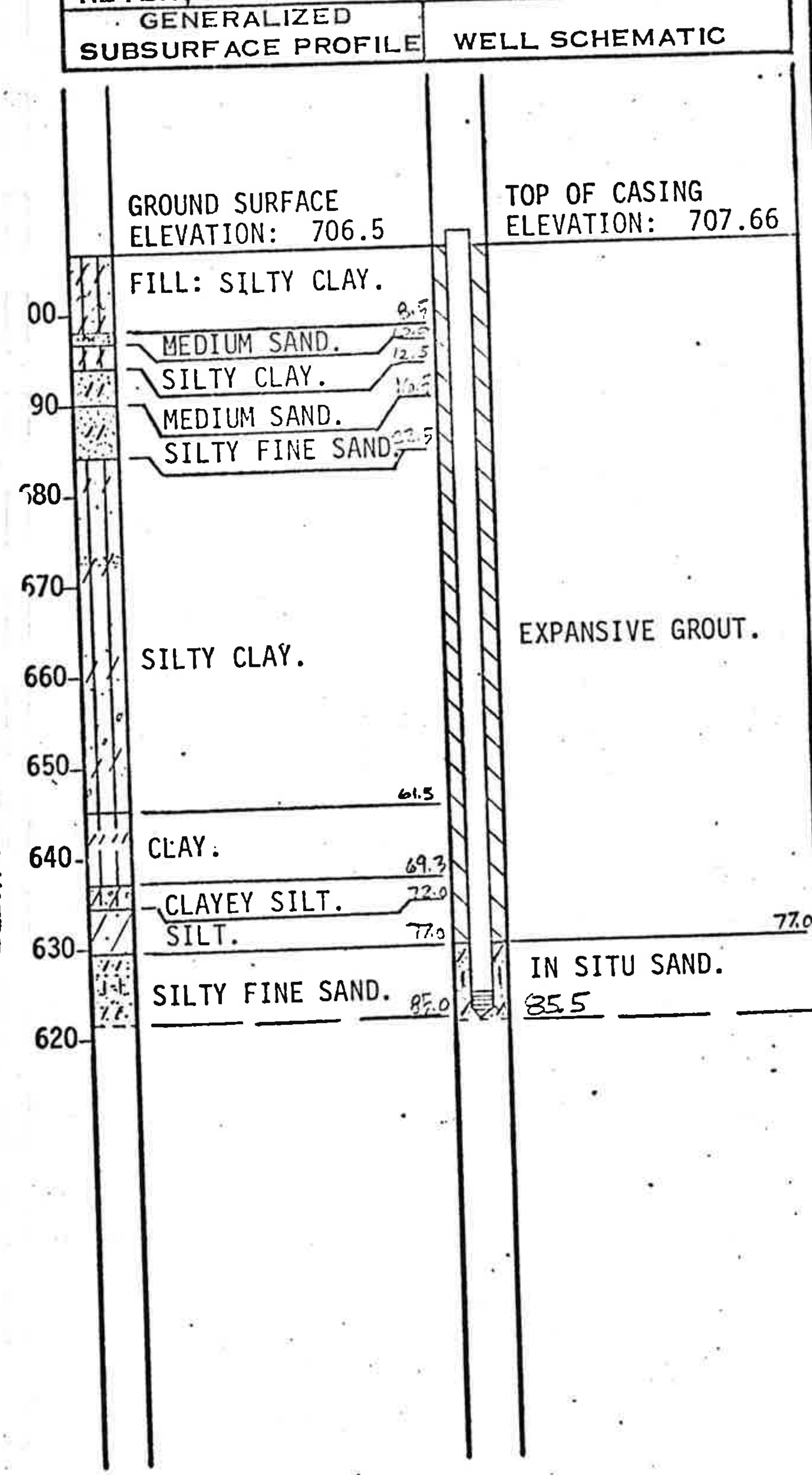
GROUNDWATER MONITORING WELL No. OB-9

RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY: WRB	DATE: 5/5/81
PROJECT NO: 94309	FIGURE NO: F-18

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.



NOTE:
1. See Log of Test Boring No. 133 for detailed soil classification.

GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
4/9/81	649.74	Bailed this date.
4/16/81	649.28	
4/23/81	649.24	
5/21/81	650.56	

CASING – DIAMETER: 2"
– LENGTH: 83.2'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 7 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 3/31/81
WELL COMPLETED: 4/1/81
INSPECTOR: H. Yaldo
DRILLER: G. Canfield
CONTRACTOR: Geo-Tek, Inc.
EQUIPMENT: Trailer mounted CME-55 drilling rig utilizing 8-inch outside-diameter hollow-stem augers to 30.0 feet and 3-inch diameter rotary bit with water below 30.0 feet.

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CONSULTING ENGINEERS
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GROUNDWATER MONITORING WELL No. OB-10

RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY:	WRB	DATE:	5/5/81
PROJECT NO:	94309	FIGURE NO:	F-19

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC
GROUND SURFACE ELEVATION: 695.3	TOP OF CASING ELEVATION: 700.50*
Medium Compact Gray SILTY MEDIUM TO COARSE SAND. (6.0)	*NOTE: Revised Top of Casing Elevation on 8/2/83 due to resurvey by MCI after casing repair.
Very Stiff Gray SILTY CLAY with Trace of Sand and Gravel. (27.0)	
Hard Gray CLAYEY SILT with Trace of Sand and Gravel. (37.0)	EXPANSIVE GROUT.
Very Compact Gray SANDY SILT with Trace of Clay. (42.0)	
Very Compact Gray SILTY FINE SAND with Trace of Clay. (52.0)	
Very Stiff Gray CLAYEY SILT with Trace of Sand. (67.0)	67.0
Very Compact Gray SILTY FINE TO MEDIUM SAND. (84.5) (85.0)	IN SITU SAND. 85.0
Very Compact Gray SANDY SILT with Trace of Clay.	

ELEVATION – FEET: 690, 680, 670, 660, 650, 640, 630, 620, 610

NOTE:
1. See Log of Test Boring No. 128 for additional information.

GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
4/10/81	649.46	Bailed this date.
4/16/81	649.43	
4/23/81	650.26	
5/21/81	650.68	

CASING – DIAMETER: 2"
– LENGTH: 82.5'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 7 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 3/25/81
WELL COMPLETED: 3/26/81
INSPECTOR: N. Smit
DRILLER: G. Canfield
CONTRACTOR: Geo-Tek, Inc.
EQUIPMENT: Trailer mounted CME-55 drilling rig utilizing 8-inch outside-diamete[r] hollow-stem augers to 30.0 feet and 3-inch diameter rotary bit with water below 30.0 feet.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS
38899 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL NO. OB-11

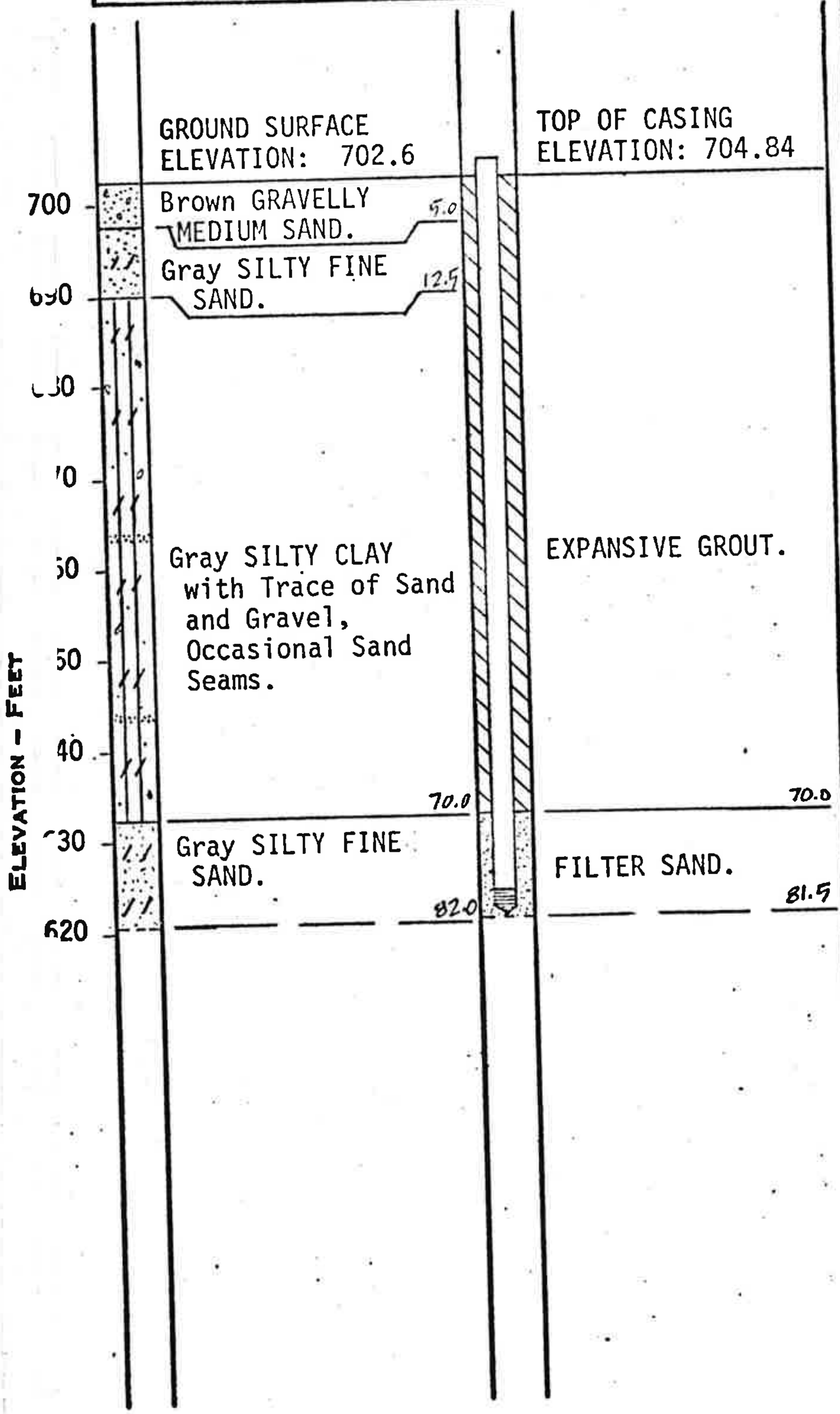
RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY: WRB	DATE: 5/5/81
PROJECT NO: 94309	FIGURE NO: F-20

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
4/9/81	649.01	
4/16/81	648.17	
4/23/81	648.67	
5/21/81	650.34	

CASING – DIAMETER: 2"
– LENGTH: 80.2'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 10 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 4/1/81
WELL COMPLETED: 4/1/81
INSPECTOR: K. Ebere
DRILLER: A. Pearson
CONTRACTOR: Pearson Well Drilling
EQUIPMENT: Truck mounted Hole-master drilling rig utilizing 4.5-inch diameter rotary bit with drilling fluid.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS
38955 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL No. OB-12

RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY: WRB	DATE: 5/5/81
PROJECT NO: 94309	FIGURE NO: F-21

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC
GROUND SURFACE ELEVATION: 700.9	TOP OF CASING ELEVATION: 703.11
Brown MEDIUM SAND AND GRAVEL. (13.0)	
Gray SILTY CLAY with Trace of Sand and Gravel, Cobbles or Boulders at 50.0 to 53.0 feet. (72.0)	EXPANSIVE GROUT. (72.0)
Gray SILTY SAND. (81.0)	SAND FILTER. (81.0)
Gray SILTY CLAY	

ELEVATION – FEET: 700, 690, 680, 670, 660, 650, 640, 630, 620, 610

GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
4/9/81	649.19	
4/16/81	648.78	
4/23/81	647.53	
5/21/81	649.57	

CASING – DIAMETER: 2"
– LENGTH: 79.7'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 10 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 4/1/81
WELL COMPLETED: 4/1/81
INSPECTOR: K. Ebere
DRILLER: A. Pearson
CONTRACTOR: Pearson Well Drilling
EQUIPMENT: Truck mounted Holemaster drilling rig utilizing 4.5-inch rotary bit with drilling fluid

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CONSULTING ENGINEERS
38955 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL No. OB-13

RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY:	WRB	DATE:	5/5/81
PROJECT NO:	94309	FIGURE NO:	F-22

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC
GROUND SURFACE ELEVATION: 697.1	TOP OF CASING ELEVATION: 701.95*
Brown SILTY CLAY with Little Sand and Trace of Gravel (12.0)	*NOTE: Revised Top of Casing Elevation on 8/2/83 after recheck of survey records by MCI.
Gray SILTY CLAY with Trace of Sand and Gravel, Occasional Sand and Silt Seams. (95.0)	EXPANSIVE GROUT. (85.0)
Gray SILTY SAND with Trace of Gravel, Occasional Clay Seams. (97.0)	SAND FILTER. (97.0)

Elevation scale: 690, 680, 6.0, 6 0, 6 0, 6 0, 6 0, 6?0, 610, 600

GROUNDWATER DATA

DATE	GROUNDWATER ELEV. (FEET)	COMMENTS
4/9/81	638.68	
4/16/81	648.35	
4/23/81	623.56	
5/21/81	648.10	

CASING – DIAMETER: 2"
– LENGTH: 96.0'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 10 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 3/27/81
WELL COMPLETED: 3/27/81
INSPECTOR: K. Ebere
DRILLER: A. Pearson
CONTRACTOR: Pearson Well Drilling
EQUIPMENT: Truck mounted Holemaster drilling rig utilizing a 4-inch diameter rotary bit with drilling fluid.

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CONSULTING ENGINEERS
38999 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL No. OB-14

RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY: WRB	DATE: 5/5/81
PROJECT NO: 94309	FIGURE NO: F-23

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC
GROUND SURFACE ELEVATION: 699.8	TOP OF CASING ELEVATION: 699.64*
FILL: Brown GRAVELLY MEDIUM SAND with Trace of Silt and Clay. (5.0)	*NOTE: Revised Top of Casing Elevation on 8/2/83 after recheck of survey records by MCI.
Gray SILTY CLAY with Trace of Sand and Gravel. (62.0)	EXPANSIVE GROUT. (75.0)
Gray SILTY CLAY with Trace of Sand and Gravel, Occasional Sand Seams. (75.0)	
Gray SILTY FINE SAND with Trace of Gravel, Occasional Clay Seams. (82.5)	SAND FILTER. (82.5)

ELEVATION – FEET: 690, 680, 670, 660, 650, 640, 630, 620, 610

GROUNDWATER DATA

DATE	GROUNDWATER ELEV. (FEET)	COMMENTS
4/9/81	665.95	
4/16/81	648.32	
4/23/81	642.74	
5/21/81	627.01	

CASING – DIAMETER: 2"
– LENGTH: 81.2'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 10 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 3/30/81
WELL COMPLETED: 3/30/81
INSPECTOR: K. Ebere
DRILLER: A. Pearson
CONTRACTOR: Pearson Well Drilling
EQUIPMENT: Truck mounted Holemast drilling rig utilizing a 4-inch diameter rota bit with drilling flui

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CONSULTING ENGINEERS
38000 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL NO. OB-15

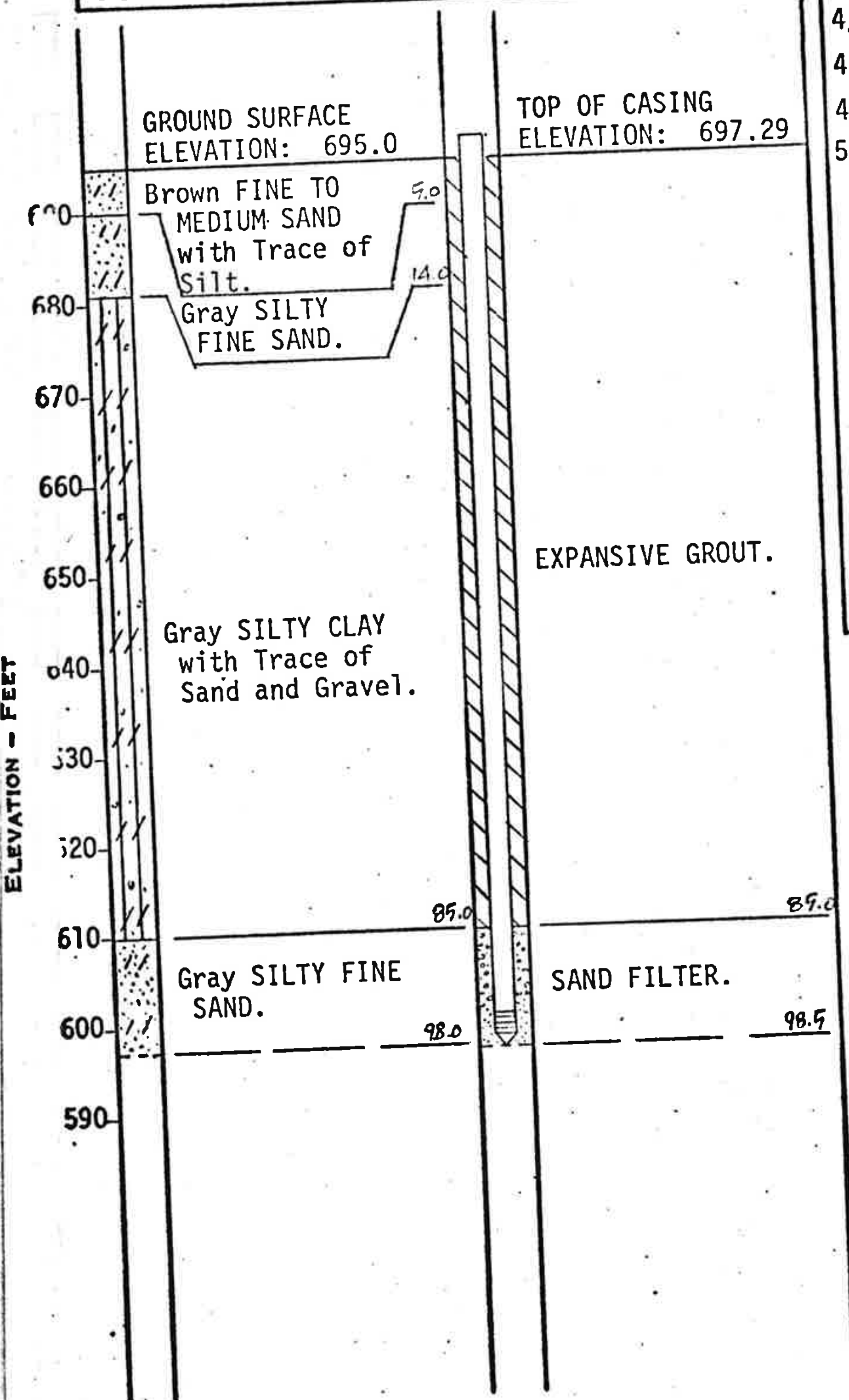
RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY: WRB	DATE: 5/5/81
PROJECT NO: 94309	FIGURE NO: F-24

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
4/9/81	650.08	
4/16/81	649.62	
4/23/81	649.87	
5/21/81	651.14	

CASING – DIAMETER: 2"
– LENGTH: 97.3'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 10 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 3/31/81
WELL COMPLETED: 3/31/81
INSPECTOR: K. Ebere
DRILLER: A. Pearson
CONTRACTOR: Pearson Well Drilling
EQUIPMENT: Truck mounted Hole-master drilling rig utilizing 4-inch diameter rotary bit with drilling fluid.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS
38800 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL No. OB-16

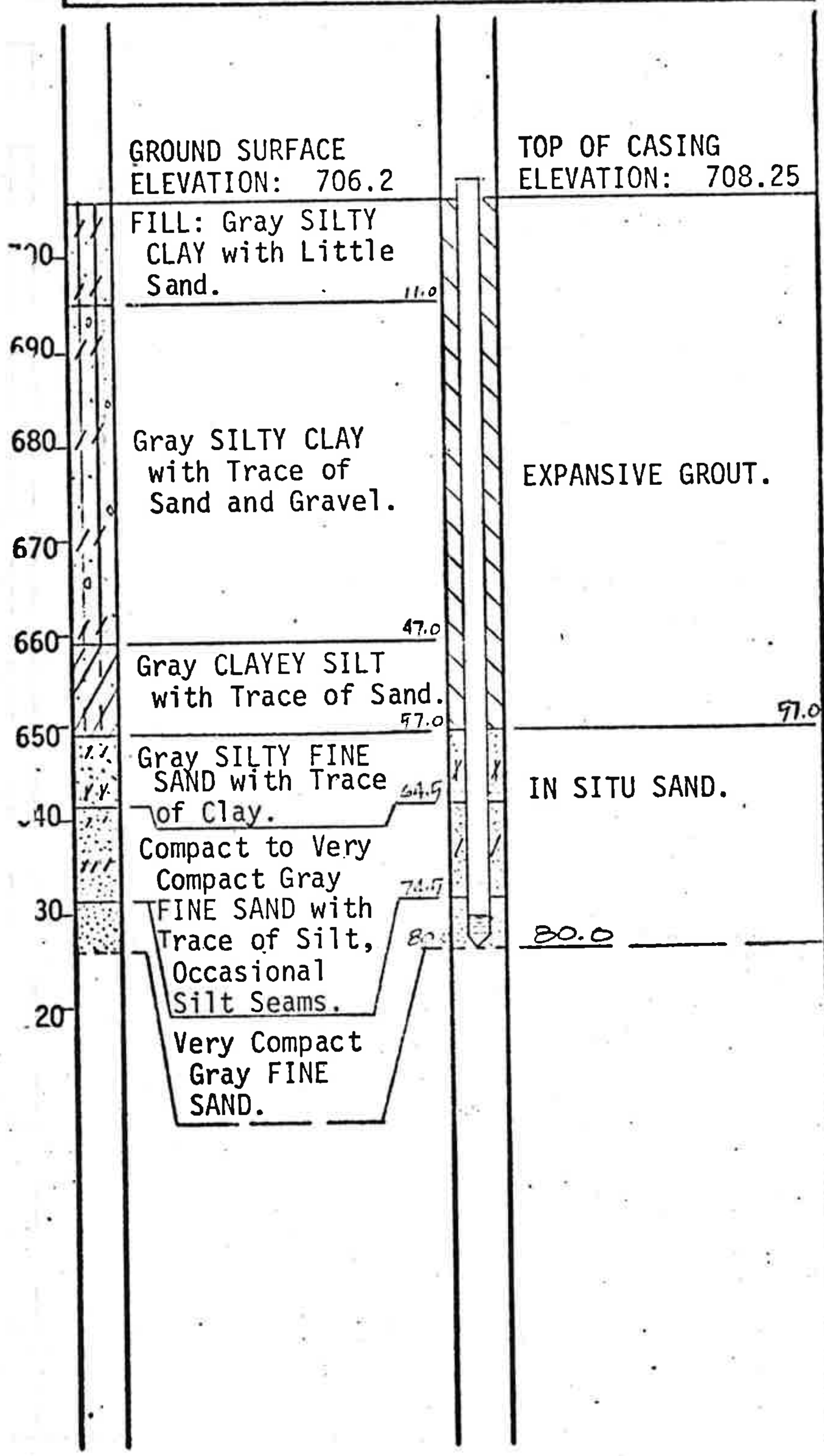
RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY: WEB	DATE: 5/5/81
PROJECT NO: 94309	FIGURE NO: F-25

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE	WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
4/10/81	651.50	Bailed this date.
4/16/81	651.58	
4/23/81	651.08	
5/21/81	651.60	

CASING – DIAMETER: 2"
– LENGTH: 78.6'
– MATERIAL: Galvanized Steel

SCREEN – DIAMETER: 2"
– LENGTH: 3.5'
– MESH: No. 10 Slot
– MATERIAL: Stainless Steel

WELL STARTED: 4/2/81
WELL COMPLETED: 4/2/81
INSPECTOR: H. Yaldo
DRILLER: G. Canfield
CONTRACTOR: Geo-Tek, Inc.
EQUIPMENT: Trailer mounted CME-55 drilling rig utilizing 8-inch outside-diameter hollow-stem augers to 30.0 feet and 3-inch diameter rotary bit with water below 30.0 feet.

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38955 TEN MILE RD., FARMINGTON HILLS, MI 48024

GROUNDWATER MONITORING WELL No. OB-17

RAWSONVILLE LANDFILL
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

APPROVED BY: WRB	DATE: 5/5/81
PROJECT NO: 94309	FIGURE NO: F-26

CAL

CANTON ANALYTICAL LABORATORY 153 Elder Street Ypsilanti MI 48197 Phone 313/483-7430

December 7, 1981

Mr. Mark Young
WAYNE DISPOSAL
P.O. Box 5187
Dearborn, Michigan 48128

Dear Mr. Young:

Enclosed are the results from the samples from Rawsonville Landfill. If we can be of further assistance, please don't hesitate to call.

Yours very truly,

Peter W. Rekshan
Laboratory Director

Parameters	Well #1	Well #2	Well #3	Well #4
Arsenic	0.0003	<0.0001	0.0002	0.0016
Barium	<0.1	0.2	0.3	0.2
Calcium	17.	63.	17.	84.
Cadmium	<0.01	0.02	<0.01	<0.01
Chromium, total	<0.01	<0.01	<0.01	<0.01
Iron	1.7	1.9	1.9	0.9
Lead	<0.05	1.1	<0.05	0.35
Magnesium	4.2	16.	18.	12.
Manganese	<0.02	0.14	0.08	0.31
Mercury	0.0091	0.0059	<0.0002	0.0150
Selenium	0.0008	0.0008	0.0008	0.0008
Silver	<0.01	<0.01	<0.01	<0.01
Sodium	87.	0.14	17.	42.
Chloride	25.	10.	10.	20.
Fluoride	1.48	0.58	0.50	1.05
Sulfate	11.	23.	1.0	2.5
Hardness	50.	220	220	80.
Nitrate-N	<0.1	<0.1	<0.1	<0.1
Nitrite-N	<0.002	0.004	0.002	0.004
Ammonia-N	0.52	1.50	1.50	0.62
Phenols, total	<0.002	<0.002	<0.002	<0.002
COD	14.	8.2	2.5	<0.1
Total Coliform/100 ml	0	0	0	0
TOC	12.	8.2	5.0	11.
	12.	8.2	5.0	11.
	12.	8.2	5.0	11.
	13.	8.2	4.0	11.
pH	9.3	7.6	7.6	9.5
	9.4	7.7	7.5	9.5
	9.4	7.6	7.5	9.5
	9.4	7.6	7.6	9,5
Specific Conductance umhos/cm	450	450	475	280
	450	450	450	280
	450	475	460	280
	450	475	450	280

Parameters	Well #1	Well #2	Well #3	Well #4
TOX, ug/l as Cl^-	6.0	17.	18.	18.
	7.0	13.	22.	15.
	14.	17.	30.	20.
	6.0	13.	21.	21.
Endrin	<0.0002	<0.0002	<0.0002	<0.0002
Lindane	<0.004	<0.004	<0.004	<0.004
Methoxychlor	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.005	<0.005	<0.005	<0.005
2,4-D	<0.01	<0.01	<0.01	<0.01
2,4,5-TP Silvex	<0.001	<0.001	<0.001	<0.001
Radiation, Gross Aplha pCi/l	1.8	3.0	<1.0	3.0
Radiation, Gross Beta pCi/l	16.	20.	77.	19.

All results in mg/l except where noted.

Parameters	Well #5	Well #6	Well #7	Well #8
Arsenic	0.0005	0.0032	0.0041	0.0064
Barium	0.2	0.8	<0.1	0.2
Calcium	25.	410	22.	17.
Cadmium	<0.01	<0.01	<0.01	<0.01
Chromium, total	<0.01	<0.01	<0.01	<0.01
Iron	0.80	2.40	0.36	1.70
Lead	<0.05	<0.05	<0.05	<0.05
Magnesium	13.	16.	0.5	9.3
Manganese	<0.01	2.3	<0.01	0.13
Mercury	0.0009	<0.0002	0.0085	0.0003
Selenium	0.0030	0.0019	0.0009	0.0009
Silver	<0.01	<0.01	<0.01	<0.01
Sodium	58.	54.	0.13	38.
Chloride	35.	10.	15.	10.
Fluoride	0.58	<0.2	2.30	0.42
Sulfate	6.0	50.	5.5	10.
Hardness	110	100	30.	80.
Nitrate-N	<0.1	<0.1	<0.1	<0.1
Nitrite-N	0.004	<0.002	0.008	<0.002
Ammonia-N	1.84	0.90	0.52	0.60
Phenols, total	<0.002	<0.002	<0.002	<0.002
COD	5.8	4.9	4.1	3.3
Total Coliform/100 ml	0	0*	0	0
TOC	11.	6.2	11.	4.2
	8.2	7.2	11.	3.2
	8.2	5.0	11.	4.2
	8.2	7.2	10.	3.2
pH	8.3	9.9	10.7	8.9
	8.3	9.8	10.7	8.9
	8.3	9.8	10.7	8.9
	8.3	9.8	10.7	8.9
Specific Conductance umhos/cm	475	310	380	260
	480	300	380	260
	460	300	375	270
	450	300	375	260

*unidentified organisms-80

Figure F-30 CAL

Parameters	Well #5	Well #6	Well #7	Well #8
TOX, ug/l as Cl^-	25.	17.	17.	24.
	34.	23.	15.	17.
	18.	18.	10.	20.
	40.	10.	13.	27.
Endrin	<0.0002	<0.0002	<0.0002	<0.0002
Lindane	<0.004	<0.004	<0.004	<0.004
Methoxychlor	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.005	<0.005	<0.005	<0.005
2,4-D	<0.01	<0.01	<0.01	<0.01
2,4,5-TP Silvex	<0.001	<0.001	<0.001	<0.001
Radiation, Gross Alpha pCi/l	4.8	19.	1.2	4.8
Radiation, Gross Beta pCi/l	94.	80.	23.	19.

All results in mg/l except where noted.

Parameters	Well #9	Well #10	Well #11	Well #12
Arsenic	0.0040	0.0006	0.0110	0.0001
Barium	0.01	0.1	0.2	0.2
Calcium	10.	140	95.	200
Cadmium	<0.01	<0.01	<0.01	<0.01
Chromium, total	<0.01	<0.01	<0.01	<0.01
Iron	0.15	0.35	1.50	5.70
Lead	<0.05	0.10	0.75	<0.05
Magnesium	1.1	2.4	4.9	23.
Manganese	<0.01	<0.02	0.16	1.50
Mercury	0.0060	0.0017	<0.0002	0.0005
Selenium	0.0016	0.0043	0.0079	0.0013
Silver	<0.01	<0.01	<0.01	<0.01
Sodium	36.	29.	46.	41.
Chloride	10.	25.	15.	10.
Fluoride	1.00	0.24	1.05	0.53
Sulfate	8.0	22.	34.	7.5
Hardness	20.	500	170	70.
Nitrate-N	<0.1	<0.1	<0.1	<0.1
Nitrite-N	<0.002	0.002	<0.002	<0.002
Ammonia-N	0.50	2.40	0.77	0.47
Phenols, total	<0.002	<0.002	0.005	<0.002
COD	8.2	5.3	26.	2.5
Total Coliform/100 ml	0	0	0	0
TOC	10.	7.2	10.	6.2
	11.	10.	10.	7.2
	10.	7.2	10.	5.0
	11.	7.2	9.2	7.2
pH	10.4	11.5	11.0	8.9
	10.4	11.6	11.0	8.9
	10.4	11.6	11.1	8.9
	10.4	11.6	11.1	8.9
Specific Conductance umhos/cm	250	2000	850	290
	250	2100	840	290
	250	2000	800	280
	250	2000	800	280

Parameters	Well #9	Well #10	Well #11	Well #12
TOX , ug/l as Cl⁻	13.	15.	15.	17.
	14.	11.	7.0	15.
	12.	9.0	10.	13.
	10.	16.	13.	8.0
Endrin	<0.0002	<0.0002	<0.0002	<0.0002
Lindane	<0.004	<0.004	<0.004	<0.004
Methoxychlor	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.005	<0.005	<0.005	<0.005
2,4-D	<0.01	<0.01	<0.01	<0.01
2,4,5-TP Silvex	<0.001	<0.001	<0.001	<0.001
Radiation, Gross Alpha pCi/l	1.8	4.2	74.	5.4
Radiation, Gross Beta pCi/l	21.	26.	290	23.

All results in mg/l except where noted.

Parameters	Well #13	Well #14	Well #15	Well #16
Arsenic	0.0110	0.0029	0.0120	0.0035
Barium	0.5	0.2	<0.1	<0.1
Calcium	150	15.	6.0	38.
Cadmium	<0.01	<0.01	<0.01	<0.01
Chromium, total	<0.01	<0.01	<0.01	<0.01
Iron	14.	0.01	0.75	0.75
Lead	<0.05	<0.05	<0.05	<0.05
Magnesium	23.	6.8	0.8	12.
Manganese	1.6	0.07	<0.01	0.13
Mercury	0.0012	0.0006	0.0006	<0.0002
Selenium	0.0009	0.0008	0.0009	0.0009
Silver	<0.01	<0.01	<0.01	<0.01
Sodium	54.	49.	49.	28.
Chloride	15.	15.	10.	10.
Fluoride	4.80	0.71	1.00	0.39
Sulfate	<10.	3.0	13.	5.0
Hardness	80.	90.	30.	120
Nitrate-N	<0.1	<0.1	<0.1	<0.1
Nitrite-N	0.004	0.004	0.006	0.004
Ammonia-N	0.31	1.52	2.05	1.56
Phenols, total	<0.002	<0.002	<0.002	<0.002
COD	11.	9.1	2.5	6.6
Total Coliform/100 ml	0*	0	0	0
TOC	10.	9.2	12.	13.
	10.	9.2	12.	13.
	9.2	9.2	12.	14.
	11.	10.	13.	14.
pH	9.6	9.1	10.6	8.3
	9.7	9.1	10.7	8.3
	9.7	9.1	10.7	8.3
	9.7	9.1	10.7	8.3
Specific Conductance umhos/cm	250	310	375	340
	230	310	360	340
	230	310	350	325
	250	310	350	325

*unidentified organisms-Too numerous to count

Figure F-34

Parameters	Well #13	Well #14	Well #15	Well #16
TOX, ug/l as Cl⁻	10.	7.0	12.	6.0
	7.0	<5.0	12.	13.
	9.0	7.0	8.0	8.0
	7.0	12.	6.0	5.0
Endrin	<0.0002	<0.0002	<0.0002	<0.0002
Lindane	<0.004	<0.004	<0.004	<0.004
Methoxychlor	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.005	<0.005	<0.005	<0.005
2,4-D	<0.01	<0.01	<0.01	<0.01
2,4,5-TP Silvex	<0.001	<0.001	<0.001	<0.001
Radiation, Gross Alpha pCi/l	4.8	6.0	2.4	9.5
Radiation, Gross Beta pCi/l	64.	30.	16.	77.

All results in mg/l except where noted.

Parameters	Well #17	Sedimentation Basin	East Edge Drain	West Edge Drain
Arsenic	0.0037	0.0013	0.0010	0.0021
Barium	<0.1	0.1	0.1	<0.1
Calcium	44.	120	140	140
Cadmium	<0.01	<0.01	<0.01	<0.01
Chromium, total	<0.01	<0.01	<0.01	<0.01
Iron	1.70	0.35	0.90	2.10
Lead	<0.05	<0.05	<0.05	<0.05
Magnesium	14.	23.	17.	18.
Manganese	0.17	0.30	0.65	0.76
Mercury	0.0057	<0.0002	<0.0002	<0.0002
Selenium	0.0008	0.0010	0.0009	0.0008
Silver	<0.01	<0.01	<0.01	<0.01
Sodium	20.	71.	10.	9.0
Chloride	10.	125	15.	15.
Fluoride	0.37	0.39	0.60	0.21
Sulfate	3.0	290	290	215
Hardness	90.	400	410	410
Nitrate-N	<0.1	<0.1	<0.1	<0.1
Nitrite-N	0.002	0.008	0.002	0.004
Ammonia-N	0.47	0.45	0.30	0.65
Phenols, total	<0.002	<0.002	<0.002	<0.002
COD	2.5	11.	4.1	8.2
Total Coliform/100 ml	0	0	0	18.
TOC	11.	15.	12.	12.
	10.	14.	11.	12.
	8.2	14.	11.	12.
	7.2	15.	12.	11.
pH	9.4	8.2	7.5	6.8
	9.4	8.2	7.4	6.8
	9.4	8.2	7.4	6.7
	9.4	8.2	7.4	6.8
Specific Conductance umhos/cm	225	1000	725	750
	225	1000	725	750
	225	1000	725	725
	225	1000	725	740

Figure F-36

Parameters	Well #17	Sedimentation Basin	East Edge Drain	West Edge Drain
TOX, ug/l as Cl^-	<5.	22.	9.0	46.
	<5.	32.	11.	43.
	<5.	29.	8.0	43.
	<5.	27.	7.0	42.
Endrin	<0.0002	<0.0002	<0.0002	<0.0002
Lindane	<0.004	<0.004	<0.004	<0.004
Methoxychlor	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.005	<0.005	<0.005	<0.005
2,4-D	<0.01	<0.01	<0.01	<0.01
2,4,5-TP Silvex	<0.001	<0.001	<0.001	<0.001
Radiation, Gross Alpha pCi/l	7.2	17.	4.2	4.2
Radiation, Gross Beta pCi/l	89.	84.	18.	20.

All results in mg/l except where noted.

 CAL

Mark -
These values are based on the α radiation values -

Pete

psilanti, MI 48197 Phone 313/483-7430

Nov. 1981

	Radium pCi/l
	< 1.0
	< 1.0
	< 1.0
	< 1.0
	< 5.0
	< 20.
	< 1.0
	< 1.0
	< 1.0
	< 1.0
	< 80.
	< 1.0
	< 5.0
	< 1.0
	< 1.0
	< 10.
Well 17	< 8.0
East Drain	< 1.0
West Drain	< 1.0
Sediment Basin	< 20.

CANTON ANALYTICAL LABORATORY

By: ______________________

Peter W. Rekshan
Laboratory Director

Figure F-38

CAL

CANTON ANALYTICAL LABORATORY 153 Elder Street Ypsilanti MI 48197 Phone 313 483-7430

TO: Mr. Mark Young
WAYNE DISPOSAL
P.O. Box 5187
Dearborn, Michigan 48128

Date: May 12, 1982

Re: Rawsonville Landfill Samples Nov. 1981

Results:

	Radium pCi/l
Well 1	< 1.0
Well 2	< 1.0
Well 3	< 1.0
Well 4	< 1.0
Well 5	< 5.0
Well 6	< 20.
Well 7	< 1.0
Well 8	< 1.0
Well 9	< 1.0
Well 10	< 1.0
Well 11	< 80.
Well 12	< 1.0
Well 13	< 5.0
Well 14	< 1.0
Well 15	< 1.0
Well 16	< 10.
Well 17	< 8.0
East Drain	< 1.0
West Drain	< 1.0
Sediment Basin	< 20.

CANTON ANALYTICAL LABORATORY

By: ____________________
Peter W. Rekshan
Laboratory Director

ENVIRONMENTAL ANALYSIS

CAL

CANTON ANALYTICAL LABORATORY 153 Elder Street Ypsilanti, MI 48197 Phone 313/483-7430

April 28, 1982

Mr. Mark Young
WAYNE DISPOSAL
P.O. Box 5187
Dearborn, Michigan 48128

Dear Mr. Young:

Enclosed you will find the laboratory results from the Rawsonville Landfill. If you have any questions or if we can be of further assistance, please do not hesitate to call.

Yours very truly,

Peter W. Rekshan

Peter W. Rekshan
laboratory Director

LABORATORY ANALYSIS

Rawsonville Landfill

for

WAYNE DISPOSAL INC.
P.O. BOX 5187
Dearborn, Michigan 48128

By:

Canton Analytical Laboratory
153 Elder Street
Ypsilanti, Michigan 48197

April 28, 1982

	3-24-82 Well #1	3-24-82 Well #2	4-7-82 Well #3
Arsenic	< 0.001	0.002	< 0.001
Barium	< 0.10	0.28	< 0.10
Calcium	110	24.	33.
Cadmium	0.013	< 0.01	< 0.01
Chromium, total	< 0.05	< 0.05	< 0.05
Iron	16.	5.2	8.6
Magnesium	9.1	20.	11.
Manganese	0.3	< 0.1	< 0.1
Mercury	< 0.001	0.001	< 0.001
Selenium	< 0.001	< 0.001	< 0.001
Silver	< 0.05	< 0.05	< 0.05
Sodium	93.	24.	16.
Chloride	35.	20.	15.
Fluoride	2.4	0.62	1.0
Sulfate	2.0	52.	< 1.0
Hardness as $CaCO_3$	100	270	210
Nitrate-N	< 0.1	< 0.1	0.18
Nitrite-N	0.002	0.001	0.002
Ammonia-N	0.74	0.77	0.45
Phenol	< 0.005	0.005	0.005
COD	11.	4.0	1.6
Total Coliform, organisms per 100 ml	<10.	<10.	<10.
Endrin	< 0.0002	< 0.0002	< 0.0002
Lindane	< 0.004	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01	< 0.001
Toxaphene	< 0.005	< 0.005	< 0.005
2,4,-D	< 0.01	< 0.01	< 0.01
2,4,5-TP Silvex	< 0.001	< 0.001	< 0.001
Gross Alpha Radiation, pCi/l	147.	< 1.0	< 1.0
Gross Beta Radiation, pCi/l	215.	< 1.0	14.
Radium, pCi/l	< 1.0	< 1.0	< 1.0
TOX, mg Cl^-/l	0.012 0.018 0.026 0.009	0.009 0.006 0.009 0.007	< 0.005 < 0.005 < 0.005 < 0.005

Figure F-42

	Well #1	Well #2	Well #3
TOC	9.0 13. 10. 13.	4.0 4.0 4.0 4.0	2.0 2.0 3.0 4.0
pH	8.5 8.6 8.5 8.5	7.6 7.6 7.6 7.6	7.1 7.1 7.1 7.1
Specific Conductance umhos/cm	510 510 510 510	570 570 570 570	400 400 400 400
Lead	< 0.05	< 0.05	< 0.05

	4-7-82 Well #4	3-26-82 Well #5	3-26-82 Well #6
Arsenic	0.0012	0.0010	0.0071
Barium	< 0.10	0.22	0.14
Calcium	56.	50.	35.
Cadmium	< 0.01	< 0.01	< 0.01
Chromium, total	0.50	< 0.05	< 0.05
Iron	1.2	2.3	2.7
Lead	< 0.05	< 0.05	< 0.05
Magnesium	1.5	10.	8.2
Manganese	< 0.10	< 0.10	< 0.10
Mercury	< 0.001	< 0.001	< 0.001
Selenium	< 0.001	< 0.001	< 0.001
Silver	< 0.05	< 0.05	< 0.05
Sodium	34.	53.	35.
Chloride	100	30.	15.
Fluoride	1.02	1.3	1.4
Sulfate	6.0	34.	4.0
Hardness as $CaCO_3$	420	160	110
Nitrate-N	< 0.10	< 0.10	< 0.10
Nitrate-N	< 0.001	< 0.001	< 0.001
Ammonia-N	0.50	0.70	0.68
Phenol	< 0.005	< 0.005	< 0.005

	Well #4	Well #5	Well #6
COD	1.0	4.8	3.2
Total Coliform, organisms per 100ml	< 10.	< 10.	<10.
Endrin	< 0.0002	< 0.0002	< 0.0002
Lindane	< 0.004	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01	< 0.01
Toxaphene	< 0.005	< 0.005	< 0.005
2,4,-D	< 0.01	< 0.01	< 0.01
2,4,5-TP Silvex	< 0.001	< 0.001	< 0.001
Gross Alpha Radiation, pCi/l	< 1.0	< 1.0	68.
Gross Beta Radiation, pCi/l	12.	< 1.0	114
Radium, pCi/l	< 1.0	< 1.0	< 1.0
TOX, mg Cl^-/l	< 0.005 < 0.005 < 0.005 0.008	0.006 0.011 0.012 0.011	< 0.005 0.005 0.008 0.008
TOC	11. 11. 15. 15.	< 1.0 < 1.0 1.0 2.0	3.0 3.0 8.0 10.
pH	11.5 11.5 11.5 11.5	8.7 8.7 8.7 8.7	8.6 8.6 8.6 8.6
Specific Conductance umhos/cm	1750 1750 1750 1750	475 475 475 475	330 330 330 330

	4-7-82 Well #7	3-26-82 Well #8	3-26-82 Well #9
Arsenic	0.0046	0.0045	0.0085
Barium	< 0.10	0.16	0.15
Calcium	16.	36.	22.
Cadmium	< 0.01	< 0.01	<0.01
Chromium, total	< 0.05	< 0.05	<0.05
Iron	3.5	1.4	2.4
Lead	< 0.05	< 0.05	<0.05

 CAL

	Well #7	Well #8	Well #9
Magnesium	5.8	8.2	4.4
Manganese	0.1	< 0.1	0.1
Mercury	< 0.001	0.012	< 0.001
Selenium	< 0.001	< 0.001	< 0.001
Silver	< 0.05	< 0.05	< 0.05
Sodium	51.	25.	36.
Chloride	20.	12.	15.
Fluoride	1.9	1.0	1.9
Sulfate	3.0	8.0	8.0
Hardness as $CaCO_3$	70.	130	65.
Nitrate-N	< 0.10	< 0.10	< 0.10
Nitrite-N	0.005	0.001	< 0.001
Ammonia-N	0.40	0.80	0.50
Phenol	< 0.005	< 0.005	< 0.005
COD	3.2	2.4	4.0
Total Coliform, organisms per 100 ml	< 10.	< 10.	<10.
Endrin	< 0.0002	< 0.0002	< 0.0002
Lindane	< 0.004	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01	< 0.01
Toxaphene	< 0.005	< 0.005	< 0.005
2,4-D	< 0.01	< 0.01	< 0.01
2,4,5-TP Silvex	< 0.001	< 0.001	< 0.001
Gross Alpha Radiation, pCi/l	< 1.0	< 1.0	< 1.0
Gross Beta Radiation, pCi/l	4.8	< 1.0	16.3
Radium, pCi/l	< 1.0	< 1.0	< 1.0
TOX, mg Cl^-/l	< 0.005 < 0.005 < 0.005 < 0.005	0.011 0.019 < 0.005 < 0.005	0.016 0.009 0.016 0.016
TOC	11. 11. 11. 15.	< 1.0 < 1.0 1.0 2.0	8.0 7.0 5.0 2.0
pH	10.4 10.4 10.4 10.4	8.6 8.6 8.6 8.6	9.6 9.6 9.5 9.5

	Well #7	Well #8	Well #9
Specifc Conductance umhos/cm	350 350 350 350	350 350 350 350	270 270 270 270

	4-7-82 Well #10	4-7-82 Well #11	3-26-82 Well #12
Arsenic	0.0020	0.0014	0.0089
Barium	< 0.10	< 0.10	0.14
Calcium	32.	23.	620
Cadmium	< 0.01	< 0.01	0.012
Chromium, total	< 0.05	< 0.05	< 0.05
Iron	0.40	0.40	13.
Lead	0.63	0.88	< 0.05
Magnesium	0.80	0.50	42.
Manganese	< 0.10	< 0.10	2.1
Mercury	< 0.001	< 0.001	< 0.001
Selenium	< 0.001	0.0014	< 0.001
Silver	< 0.05	< 0.05	< 0.05
Sodium	32.	51.	33.
Chloride	30.	30.	20.
Fluoride	1.13	1.08	1.60
Sulfate	31.	90.	16.
Hardness, as $CaCO_3$	100	120	100
Nitrate-N	< 0.10	< 0.10	< 0.10
Nitrite-N	0.002	0.001	< 0.001
Ammonia-N	0.35	0.50	0.52
Phenol	0.005	0.009	< 0.005
COD	3.2	29.	3.2
Total Coliform, organisms per 100ml	< 10.	< 10.	<10.
Endrin	< 0.0002	< 0.0002	< 0.0002
Lindane	< 0.004	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01	< 0.01
Toxaphene	< 0.005	< 0.005	< 0.005
2,4-D	< 0.01	< 0.01	< 0.01
2,4,5-TP Silvex	< 0.001	< 0.001	< 0.001

	Well #10	Well #11	Well #12
Gross Alpha Radiation, pCi/l	< 1.0	< 1.0	< 1.0
Gross Beta Radiation, pCi/l	4.3	< 1.0	18.4
Radium, pCi/l	< 1.0	< 1.0	[illegible] 1.0
TOX, mg Cl^-/l	< 0.005 < 0.005 0.009 0.020	0.008 0.009 0.013 0.007	0.007 < 0.005 < 0.005 0.010
TOC	20. 22. 22. 22.	22. 22. 20. 20.	68. 68. 58. 68.
pH	10.7 10.7 10.7 10.7	10.9 10.9 10.9 10.9	8.9 8.9 8.9 8.9
Specific Conductance umhos/cm	500 500 500 500	650 650 650 650	310 310 300 300

	4-7-82 Well #13	3-30-82 Well #14	3-30-82 Well #15
Arsenic	< 0.001	0.001	0.0065
Barium	< 0.10	0.13	0.14
Calcium	200	96.	30.
Cadmium	< 0.01	< 0.01	< 0.01
Chromium, total	< 0.05	< 0.05	< 0.05
Iron	9.7	5.5	2.6
Lead	< 0.05	0.05	2.0
Magnesium	12.	15.	3.4
Manganese	1.3	0.3	0.1
Mercury	< 0.001	< 0.001	< 0.001
Selenium	< 0.001	< 0.001	< 0.001
Silver	< 0.05	< 0.05	< 0.05
Sodium	32.	43.	60.
Chloride	30.	15.	28.
Fluoride	1.80	4.0	3.2
Sulfate	2.0	< 1.0	3.0

	Well #13	Well #14	Well #15
Hardness, as $CaCO_3$	100	100	60.
Nitrate-N	< 0.10	< 0.10	< 0.10
Nitrite-N	0.002	0.001	0.002
Ammonia-N	0.33	0.67	1.3
Phenol	0.005	< 0.005	< 0.005
COD	15.	2.4	1.0
Total Colfiorm, organisms per 100 ml	< 10.	< 10.	< 10.
Endrin	< 0.0002	< 0.0002	< 0.0002
Lindane	< 0.004	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01	< 0.01
Toxaphene	< 0.001	< 0.001	< 0.001
2,4-D	< 0.01	< 0.01	< 0.01
2,4,5-TP Silvex	< 0.001	< 0.001	< 0.001
Gross Alpha Radiation, pCi/l	< 1.0	< 1.0	< 1.0
Gross Beta Radiation, pCi/l	12.1	< 1.0	30.5
Radium, pCi/l	< 1.0	< 1.0	< 1.0
TOX, mg Cl^-/l	< 0.005 < 0.005 < 0.005 0.010	< 0.005 < 0.005 < 0.005 0.007	< 0.005 < 0.005 < 0.005 < 0.005
TOC	200 200 180 180	< 1.0 1.0 1.0 1.0	1.0 1.0 1.0 2.0
pH	9.3 9.3 9.3 9.3	9.2 9.3 9.3 9.3	10.5 10.5 10.5 10.5
Specific Conductance umhos/cm	225 225 225 225	220 220 220 220	420 420 420 420

	3-26-82 Well #16	4-7-82 Well #17	4-7-82 East Drain
Arsenic	0.0035	< 0.001	0.002
Barium	< 0.10	0.80	< 0.10
Calcium	220	32.	185

 CAL

	Well #16	Well #17	East Drain
Cadmium	0.01	< 0.01	< 0.01
Chromium, toal	< 0.05	< 0.05	< 0.05
Iron	12.	1.8	6.5
Lead	< 0.05	0.38	< 0.05
Magnesium	39.	10.	33.
Manganese	0.75	< 0.10	1.0
Mercury	< 0.001	< 0.001	< 0.001
Selenium	< 0.001	< 0.001	< 0.001
Silver	< 0.05	< 0.05	< 0.05
Sodium	27.	14.	9.0
Chloride	20.	20.	20.
Fluoride	1.9	0.83	0.64
Sulfate	6.0	1.0	240
Hardness, as $CaCO_3$	150	220	390
Nitrate-N	< 0.10	< 0.10	< 0.10
Nitrite-N	< 0.001	0.002	0.003
Ammonia-N	0.59	0.72	0.10
Phenol	< 0.005	0.005	< 0.005
COD	2.4	14.4	3.2
Total Coliform, organisms per 100 ml	< 10.	< 10.	30.
Endrin	< 0.0002	< 0.0002	< 0.0002
Lindane	< 0.004	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01	< 0.01
Toxaphene	< 0.001	< 0.001	< 0.001
2,4-D	< 0.01	< 0.01	< 0.01
2,4,5-TP Silvex	< 0.001	< 0.001	< 0.001
Gross Alpha Radiation, pCi/l	2.0	< 1.0	1.5
Gross Beta Radiation, pCi/l	8.3	< 1.0	16.9
Radium, pCi/l	< 1.0	< 1.0	< 1.0
TOX, mg Cl^-/l	< 0.005 < 0.005 < 0.005 < 0.005	0.007 < 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005 < 0.005
TOC	2.0 1.0 1.0 3.0	11. 11. 8.0 8.0	13. 13. 15. 17.

CAL

	Well #16	Well #17	East Drain
pH	8.4 8.4 8.4 8.4	7.9 7.9 7.9 7.9	7.0 7.0 7.0 7.0
Specific Conductance umhos/cm	360 360 360 360	425 425 425 425	800 800 800 800

	3-26-82 West Drain	3-26-82 Sediment Basin
Arsenic	0.002	0.001
Barium	< 0.10	< 0.10
Calcium	190	33.
Cadmium	< 0.01	< 0.01
Chromium, total	< 0.05	< 0.05
Iron	3.0	2.1
Lead	< 0.05	< 0.05
Magnesium	18.	3.9
Manganese	0.80	0.18
Mercury	< 0.001	< 0.001
Selenium	< 0.001	< 0.001
Silver	< 0.05	< 0.05
Sodium	7.0	10.
Chloride	22.	40.
Fluoride	0.50	0.48
Sulfate	120	16.
Hardness, as $CaCO_3$	310	150
Nitrate-N	< 0.10	< 0.10
Nitrite-N	0.007	0.005
Ammonia-N	0.46	0.46
Phenol	< 0.005	< 0.005
COD	6.0	10.4
Total Coliform, organisms per 100 ml	< 10.	< 10.
Endrin	< 0.0002	< 0.0002

 CAL

	West Drain	Sediment Basin
Lindane	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01
Toxaphene	< 0.005	< 0.005
2,4-D	< 0.01	< 0.01
2,4,5-TP Silvex	< 0.001	< 0.001
Gross Alpha Radiation, pCi/l	< 1.0	< 1.0
Gross Beta Radiation, pCi/l	< 1.0	< 1.0
Radium, pCi/l	< 1.0	< 1.0
TOX, mg Cl^-/l	< 0.005 < 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005 < 0.005
TOC	5.0 5.0 3.0 2.0	3.0 3.0 3.0 1.0
pH	7.0 7.0 7.0 7.0	7.7 7.7 7.7 7.7
Specific Conductance umhos/cm	800 800 810 800	225 225 225 225
Turbidity, NTU	--	14.

All results in mg/l except where noted.

RAWSONVILLE LANDFILL
GROUND WATER
MONITORING

October 1982

CAL

CANTON ANALYTICAL LABORATORY
153 ELDER STREET
YPSILANTI, MICHIGAN 48197
(313) 483-7430

Figure F-52

Parameter	Detection Limit	Well #1	Well #2	Well #3
Arsenic	0.001	ND	ND	ND
Barium	0.1	ND	ND	ND
Calcium	0.1	91.	250.	99.
Cadmium	0.01	ND	ND	ND
Chromium, total	0.02	ND	ND	ND
Chromium hexavalent	0.02	ND	ND	ND
Iron	0.05	3.8	1.1	1.8
Lead	0.05	ND	ND	0.14
Magnesium	0.1	9.4	19.	17.
Manganese	0.01	0.12	0.03	0.06
Mercury	0.001	0.0024	0.0024	ND
Selenium	0.001	ND	ND	ND
Silver	0.01	ND	ND	ND
Sodium	0.1	98.	25.	12.
Copper	0.01	0.01	0.04	0.01
Zinc	0.05	1.6	0.14	0.09
Chloride	5.	40.	20.	25.
Fluoride	0.1	1.7	0.94	0.64
Sulfate	1.	2.	29.	ND
Hardness, as $CaCO_3$	1.	50.	350.	230.
Bicarbonate Alkalinity	5.	260.	250.	250.
Ammonia-N	0.1	0.32	0.27	0.32
Nitrate-N	0.1	ND	ND	ND
Nitrite-N	0.001	ND	ND	ND
Phenols	0.002	ND	ND	ND
COD	1.	7.2	8.0	6.4
TOC	1.	ND	15.	5.
		ND	15.	5.
		ND	10.	8.
		ND	10.	8.
pH, S.U.	0.1	7.7	7.4	8.2
		7.7	7.4	8.2
		7.7	7.5	8.2
		7.7	7.5	8.2

ND - None Detected
All results expressed in mg/l, except where noted

Parameter	Detection Limit	Well #1	Well #2	Well #3
Specific Conductance umhos/cm	0.1	650	625	550
		650	625	550
		650	625	550
		650	625	550
Total Organic Halide (as Cl^-)	0.005	ND	ND	ND
		ND	ND	ND
		ND	ND	ND
		ND	ND	ND
Gross Alpha, pCi/l	1.	4.6	1.0	ND
Gross Beta, pCi/l	1.	ND	ND	ND
Radium, pCi/l	1.	ND	ND	ND
Total Coliform/100 ml	1.	TNTC*	0	0
Turbidity, NTU	1.	-	-	-
Xylene	0.005	-	-	-
Formaldehyde	0.005	-	-	-
Methyl Ethyl Ketone	0.01	-	-	-
Methylene Dichloride	0.02	-	-	-
Toluene	0.01	-	-	-
1,1,1-Trichloroethane	0.02	-	-	-
Endrin	0.0002	ND	ND	ND
Lindane	0.004	ND	ND	ND
Methoxychlor	0.01	ND	ND	ND
Toxaphene	0.005	ND	ND	ND
2,4-D	0.01	ND	ND	ND
2,4,5-TP, Silvex	0.001	ND	ND	ND

* Too Numerous to count

ND - None Detected

All results expressed in mg/l, except where noted.

Parameter	Detection Limit	Well #4	Well #5	Well #6
Arsenic	0.001	0.001	0.0025	0.0032
Barium	0.1	ND	ND	ND
Calcium	0.1	90.	99.	61.
Cadmium	0.01	ND	ND	ND
Chromium, total	0.02	0.02	ND	0.02
Chromium hexavalent	0.02	ND	ND	ND
Iron	0.05	0.45	0.46	0.20
Lead	0.05	0.14	ND	ND
Magnesium	0.1	0.63	17.	10.
Manganese	0.01	0.03	0.06	0.02
Mercury	0.001	0.0016	0.0020	0.0014
Selenium	0.001	ND	ND	ND
Silver	0.01	ND	ND	ND
Sodium	0.1	31.	40.	37.
Copper	0.01	0.03	0.02	0.04
Zinc	0.05	2.0	0.23	0.33
Chloride	5.	100.	30.	15.
Fluoride	0.1	0.74	1.0	0.76
Sulfate	1.	2.	11.	1.
Hardness, as $CaCO_3$	1.	240.	310.	100.
Bicarbonate Alkalinity	5.	ND	240.	120.
Ammonia-N	0.1	0.56	0.19	0.43
Nitrate-N	0.1	ND	ND	ND
Nitrite-N	0.001	ND	ND	ND
Phenols	0.002	ND	ND	ND
COD	1.	8.0	21.	9.0
TOC	1.	8.	14.	7.
		10.	14.	7.
		13.	10.	6.
		10.	15.	8.
pH, S.U.	0.1	9.9	7.4	8.7
		9.9	7.4	8.7
		9.9	7.4	8.7
		9.9	7.4	8.7

ND - None Detected
All results expressed in mg/l, except where noted

 CAL

Parameter	Detection Limit	Well #4	Well #5	Well #6
Specific Conductance umhos/cm	0.1	1050	600	324
		1050	600	324
		1050	600	324
		1050	600	324
Total Organic Halide (as Cl^-)	0.005	ND	ND	ND
		ND	ND	ND
		ND	ND	ND
		ND	ND	ND
Gross Alpha, pCi/l	1.	ND	ND	1.3
Gross Beta, pCi/l	1.	ND	ND	ND
Radium, pCi/l	1.	ND	ND	ND
Total Coliform/100 ml	1.	0	0	0
Turbidity, NTU	1.	-	-	-
Xylene	0.005	-	-	ND
Formaldehyde	0.005	-	-	ND
Methyl Ethyl Ketone	0.01	-	-	ND
Methylene Dichloride	0.02	-	-	ND
Toluene	0.01	-	-	ND
1,1,1-Trichloroethane	0.02	-	-	ND
Endrin	0.0002	ND	ND	ND
Lindane	0.004	ND	ND	ND
Methoxychlor	0.01	ND	ND	ND
Toxaphene	0.005	ND	ND	ND
2,4-D	0.01	ND	ND	ND
2,4,5-TP, Silvex	0.001	ND	ND	ND

ND - None Detected

All results expressed in mg/l, except where noted.

Parameter	Detection Limit	Well #7	Well #8	Well #9
Arsenic	0.001	0.0030	0.0052	0.0050
Barium	0.1	ND	ND	ND
Calcium	0.1	51.	74.	86.
Cadmium	0.01	ND	ND	ND
Chromium, total	0.02	ND	ND	ND
Chromium hexavalent	0.02	ND	ND	ND
Iron	0.05	1.3	0.32	2.8
Lead	0.05	0.51	0.06	0.10
Magnesium	0.1	2.3	12.	10.
Manganese	0.01	0.03	0.07	0.08
Mercury	0.001	0.0020	ND	ND
Selenium	0.001	ND	ND	ND
Silver	0.01	ND	ND	ND
Sodium	0.1	52.	20.	34.
Copper	0.01	0.03	ND	ND
Zinc	0.05	4.3	0.11	1.1
Chloride	5.	27.	20.	19.
Fluoride	0.1	1.3	2.0	1.22
Sulfate	1.	2.	1.	3.
Hardness, as $CaCO_3$	1.	100.	130.	80.
Bicarbonate Alkalinity	5.	ND	150.	120.
Ammonia-N	0.1	0.49	0.16	0.18
Nitrate-N	0.1	ND	ND	ND
Nitrite-N	0.001	ND	ND	ND
Phenols	0.002	ND	ND	0.002
COD	1.	8.0	3.2	7.2
TOC	1.	10.	5.	7.
		10.	5.	8.
		10.	2.	8.
		9.	2.	10.
pH, S.U.	0.1	9.3	8.4	8.7
		9.3	8.4	8.7
		9.3	8.4	8.7
		9.3	8.4	8.7

ND - None Detected
All results expressed in mg/1, except where noted

Parameter	Detection Limit	Well #7	Well #8	Well #9
Specific Conductance umhos/cm	0.1	325	400	300
		325	400	300
		325	400	300
		325	400	300
Total Organic Halide (as Cl^-)	0.005	ND	ND	ND
		ND	ND	ND
		ND	ND	ND
		ND	ND	ND
Gross Alpha, pCi/l	1.	2.4	2.7	ND
Gross Beta, pCi/l	1.	19.2	ND	6.4
Radium, pCi/l	1.	ND	ND	ND
Total Coliform/100 ml	1.	0	0	0
Turbidity, NTU	1.	-	-	-
Xylene	0.005	ND	-	-
Formaldehyde	0.005	ND	-	-
Methyl Ethyl Ketone	0.01	ND	-	-
Methylene Dichloride	0.02	ND	-	-
Toluene	0.01	ND	-	-
1,1,1-Trichloroethane	0.02	ND	-	-
Endrin	0.0002	ND	ND	ND
Lindane	0.004	ND	ND	ND
Methoxychlor	0.01	ND	ND	ND
Toxaphene	0.005	ND	ND	ND
2,4-D	0.01	ND	ND	ND
2,4,5-TP, Silvex	0.001	ND	ND	ND

ND - None Detected

All results expressed in mg/l, except where noted.

Parameter	Detection Limit	Well #10	Well #11	Well #12
Arsenic	0.001	0.0048	0.0014	0.0079
Barium	0.1	ND	ND	ND
Calcium	0.1	84.	90.	100.
Cadmium	0.01	ND	ND	ND
Chromium, total	0.02	ND	ND	ND
Chromium hexavalent	0.02	ND	ND	ND
Iron	0.05	0.17	0.10	1.0
Lead	0.05	ND	0.16	ND
Magnesium	0.1	8.7	18.	16.
Manganese	0.01	0.03	0.02	0.11
Mercury	0.001	0.0014	0.0035	ND
Selenium	0.001	ND	ND	ND
Silver	0.01	ND	ND	ND
Sodium	0.1	31.	42.	24.
Copper	0.01	0.01	0.01	0.01
Zinc	0.05	0.11	6.0	0.90
Chloride	5.	14.	20.	15.
Fluoride	0.1	1.0	1.2	1.1
Sulfate	1.	2.	43.	9.
Hardness, as $CaCO_3$	1.	150.	180.	180.
Bicarbonate Alkalinity	5.	70.	120.	220.
Ammonia-N	0.1	0.28	0.61	0.43
Nitrate-N	0.1	ND	ND	ND
Nitrite-N	0.001	ND	ND	ND
Phenols	0.002	ND	ND	0.002
COD	1.	4.8	8.8	13.
TOC	1.	20.	ND	3.
		20.	ND	3.
		23.	ND	2.
		25.	ND	2.
pH, S.U.	0.1	8.0	8.0	8.2
		8.0	8.0	8.2
		8.0	8.0	8.2
		8.0	8.0	8.2

ND - None Detected
All results expressed in mg/l, except where noted

CAL

Parameter	Detection Limit	Well #10	Well #11	Well #12
Specific Conductance umhos/cm	0.1	250	600	550
		250	600	550
		250	600	550
		250	600	550
Total Organic Halide (as Cl^-)	0.005	ND	ND	ND
		ND	ND	ND
		ND	ND	ND
		ND	ND	ND
Gross Alpha, pCi/l	1.	1.2	ND	1.3
Gross Beta, pCi/l	1.	8.6	ND	ND
Radium, pCi/l	1.	ND	ND	ND
Total Coliform/100 ml	1.	0	0	0
Turbidity, NTU	1.	-	-	-
Xylene	0.005	-	-	-
Formaldehyde	0.005	-	-	-
Methyl Ethyl Ketone	0.01	-	-	-
Methylene Dichloride	0.02	-	-	-
Toluene	0.01	-	-	-
1,1,1-Trichloroethane	0.02	-	-	-
Endrin	0.0002	ND	ND	ND
Lindane	0.004	ND	ND	ND
Methoxychlor	0.01	ND	ND	ND
Toxaphene	0.005	ND	ND	ND
2,4-D	0.01	ND	ND	ND
2,4,5-TP, Silvex	0.001	ND	ND	ND

ND-None Detected

All results expressed in mg/l, except where noted.

Parameter	Detection Limit	Well #13	Well #14	Well #15
Arsenic	0.001	0.0023	ND	0.0058
Barium	0.1	ND	ND	ND
Calcium	0.1	47.	42.	65.
Cadmium	0.01	ND	ND	ND
Chromium, total	0.02	ND	ND	ND
Chromium hexavalent	0.02	ND	ND	ND
Iron	0.05	5.0	0.26	7.2
Lead	0.05	0.06	0.09	0.13
Magnesium	0.1	15.	0.31	4.2
Manganese	0.01	0.07	0.02	0.19
Mercury	0.001	0.0038	0.0050	ND
Selenium	0.001	ND	ND	ND
Silver	0.01	ND	ND	ND
Sodium	0.1	40.	51.	57.
Copper	0.01	0.05	0.01	0.03
Zinc	0.05	8.3	0.97	0.76
Chloride	5.	20.	30.	18.
Fluoride	0.1	0.94	0.98	1.9
Sulfate	1.	7.	1.	1.
Hardness, as $CaCO_3$	1.	70.	60.	100.
Bicarbonate Alkalinity	5.	20.	ND	ND
Ammonia-N	0.1	0.51	0.33	0.27
Nitrate-N	0.1	ND	ND	ND
Nitrite-N	0.001	ND	ND	ND
Phenols	0.002	ND	ND	0.008
COD	1.	8.8	7.2	8.8
TOC	1.	25.	ND	18.
		25.	ND	18.
		25.	ND	18.
		28.	ND	19.
pH, S.U.	0.1	9.3	9.4	9.4
		9.3	9.4	9.4
		9.3	9.5	9.5
		9.3	9.5	9.5

ND - None Detected
All results expressed in mg/l, except where noted

CAL

Parameter	Detection Limit	Well #13	Well #14	Well #15
Specific Conductance umhos/cm	0.1	300	650	440
		300	650	440
		300	650	450
		300	650	450
Total Organic Halide (as Cl^-)	0.005	ND	ND	ND
		ND	ND	ND
		ND	ND	ND
		ND	ND	ND
Gross Alpha, pCi/l	1.	4.4	ND	10.5
Gross Beta, pCi/l	1.	23.2	10.8	25.8
Radium, pCi/l	1.	ND	ND	ND
Total Coliform/100 ml	1.	0	8	0
Turbidity, NTU	1.	-	-	-
Xylene	0.005	ND	-	ND
Formaldehyde	0.005	ND	-	0.005
Methyl Ethyl Ketone	0.01	ND	-	ND
Methylene Dichloride	0.02	ND	-	ND
Toluene	0.01	ND	-	ND
1,1,1-Trichloroethane	0.02	ND	-	ND
Endrin	0.0002	ND	ND	ND
Lindane	0.004	ND	ND	ND
Methoxychlor	0.01	ND	ND	ND
Toxaphene	0.005	ND	ND	ND
2,4-D	0.01	ND	ND	ND
2,4,5-TP, Silvex	0.001	ND	ND	ND

ND-None Detected

All results expressed in mg/l, except where noted.

Parameter	Detection Limit	Well #16	Well #17
Arsenic	0.001	0.0080	ND
Barium	0.1	ND	ND
Calcium	0.1	820.	99.
Cadmium	0.01	ND	ND
Chromium, total	0.02	ND	ND
Chromium hexavalent	0.02	ND	ND
Iron	0.05	4.0	1.3
Lead	0.05	0.11	0.05
Magnesium	0.1	73.	16.
Manganese	0.01	0.66	0.04
Mercury	0.001	ND	0.0010
Selenium	0.001	ND	ND
Silver	0.01	ND	ND
Sodium	0.1	21.	14.
Copper	0.01	0.02	0.01
Zinc	0.05	2.0	0.45
Chloride	5.	15.	20.
Fluoride	0.1	1.4	0.78
Sulfate	1.	1.	1.
Hardness, as $CaCO_3$	1.	160.	310.
Bicarbonate Alkalinity	5.	200.	210.
Ammonia-N	0.1	0.42	0.27
Nitrate-N	0.1	ND	ND
Nitrite-N	0.001	ND	ND
Phenols	0.002	ND	ND
COD	1.	11.	8.8
TOC	1.	ND	20.
		ND	20.
		ND	20.
		ND	20.
pH, S.U.	0.1	8.2	7.5
		8.2	7.5
		8.2	7.5
		8.2	7.5

ND - None Detected
All results expressed in mg/l, except where noted

Parameter	Detection Limit	Well #16	Well #17
Specific Conductance umhos/cm	0.1	450	500
		450	500
		450	500
		450	500
Total Organic Halide (as Cl^-)	0.005	ND	ND
		ND	ND
		ND	ND
		ND	ND
Gross Alpha, pCi/l	1.	ND	ND
Gross Beta, pCi/l	1.	ND	4.4
Radium, pCi/l	1.	ND	ND
Total Coliform/100 ml	1.	0	0
Turbidity, NTU	1.	-	-
Xylene	0.005	ND	-
Formaldehyde	0.005	ND	-
Methyl Ethyl Ketone	0.01	ND	-
Methylene Dichloride	0.02	ND	-
Toluene	0.01	ND	-
1,1,1-Trichloroethane	0.02	ND	-
Endrin	0.0002	ND	ND
Lindane	0.004	ND	ND
Methoxychlor	0.01	ND	ND
Toxaphene	0.005	ND	ND
2,4-D	0.01	ND	ND
2,4,5-TP, Silvex	0.001	ND	ND

ND - None Detected

All results expressed in mg/l, except where noted.

Parameter	Detection Limit	Sediment Basin	West Drain	East Drain
Arsenic	0.001	0.0022	0.0015	ND
Barium	0.1	ND	ND	ND
Calcium	0.1	380.	480.	460.
Cadmium	0.01	ND	ND	ND
Chromium, total	0.02	ND	ND	ND
Chromium hexavalent	0.02	ND	ND	ND
Iron	0.05	0.74	3.3	0.50
Lead	0.05	ND	ND	0.06
Magnesium	0.1	29.	17.	16.
Manganese	0.01	0.14	0.70	0.43
Mercury	0.001	ND	0.0014	0.0054
Selenium	0.001	ND	ND	ND
Silver	0.01	ND	ND	ND
Sodium	0.1	91.	9.2	9.0
Copper	0.01	0.01	0.02	0.01
Zinc	0.05	0.01	ND	0.01
Chloride	5.	210.	30.	30.
Fluoride	0.1	0.58	0.38	0.54
Sulfate	1.	200.	90.	130.
Hardness, as $CaCO_3$	1.	350.	350.	400.
Bicarbonate Alkalinity	5.	130.	320.	230.
Ammonia-N	0.1	0.76	0.61	0.67
Nitrate-N	0.1	ND	ND	ND
Nitrite-N	0.001	ND	ND	ND
Phenols	0.002	ND	ND	ND
COD	1.	15.	10.	7.2
TOC	1.	15.	6.	ND
		15.	2.	ND
		20.	2.	ND
		20.	2.	ND
pH, S.U.	0.1	8.4	8.1	7.9
		8.4	8.1	7.9
		8.4	8.1	7.9
		8.4	8.1	7.9

ND - None Detected
All results expressed in mg/l, except where noted

Parameter	Detection Limit	Sediment Basin	West Drain	East Drain
Specific Conductance umhos/cm	0.1	300	925	850
		300	925	850
		300	925	850
		300	925	850
Total Organic Halide (as Cl^-)	0.005	ND	ND	ND
		ND	ND	ND
		ND	ND	ND
		ND	ND	ND
Gross Alpha, pCi/l	1.	4.6	ND	ND
Gross Beta, pCi/l	1.	15.2	ND	ND
Radium, pCi/l	1.	ND	ND	ND
Total Coliform/100 ml	1.	TNTC*	0	TNTC*
Turbidity, NTU	1.	17.	-	-
Xylene	0.005	-	-	-
Formaldehyde	0.005	-	-	-
Methyl Ethyl Ketone	0.01	-	-	-
Methylene Dichloride	0.02	-	-	-
Toluene	0.01	-	-	-
1,1,1-Trichloroethane	0.02	-	-	-
Endrin	0.0002	ND	ND	ND
Lindane	0.004	ND	ND	ND
Methoxychlor	0.01	ND	ND	ND
Toxaphene	0.005	ND	ND	ND
2,4-D	0.01	ND	ND	ND
2,4,5-TP, Silvex	0.001	ND	ND	ND

TNTC - Too Numerous to count

ND - None Detected

All results expressed in mg/l, except where noted.

CAL

CANTON ANALYTICAL LABORATORY 153 Elder Street Ypsilanti, MI 48197 Phone 313/483-7430

To: Mr. Mark Young
WAYNE DISPOSAL
P.O. Box 5187
Dearborn, Michigan 48128

Date: January 21, 1983

Re: Addendum to water quality report of 10-6-82.

Results:

Site	Cyanide, total mg/l	Site	Cyanide, total mg/l
Well 1	< 0.05	Well 11	< 0.05
Well 2	< 0.05	Well 12	< 0.05
Well 3	< 0.05	Well 13	< 0.05
Well 4	< 0.05	Well 14	< 0.05
Well 5	< 0.05	Well 15	< 0.05
Well 6	< 0.05	Well 16	< 0.05
Well 7	< 0.05	Well 17	< 0.05
Well 8	< 0.05	Sediment Basin	< 0.05
Well 9	< 0.05	West Drain	< 0.05
Well 10	< 0.05	East Drain	< 0.05

CANTON ANALYTICAL LABORATORY

By: Peter W. Rekshan
Peter W. Rekshan
Laboratory Director

RAWSONVILLE LANDFILL
GROUND WATER
MONITORING
December, 1982

CAL

CANTON ANALYTICAL LABORATORY
153 ELDER STREET
YPSILANTI, MICHIGAN 48197
(313) 483-7430

Figure F-68

December, 1982

	Well #1	Well #2	Well #3	Well #4
Arsenic	< 0.001	< 0.001	< 0.001	< 0.001
Barium	0.11	0.15	0.44	< 0.1
Calcium	27	57	430	140
Cadmium	0.01	0.01	0.02	0.01
Chromium, Total	0.03	< 0.02	0.06	< 0.02
Chromium, Hexavalent	< 0.02	< 0.02	0.02	< 0.02
Iron	1.7	1.1	54	1.1
Lead	< 0.05	< 0.05	0.25	0.29
Magnesium	6.6	20	42	5.6
Manganese	0.09	0.03	1.3	0.07
Mercury	< 0.001	0.0014	< 0.001	< 0.001
Selenium	< 0.001	< 0.001	< 0.001	< 0.001
Silver	< 0.01	< 0.01	0.02	< 0.01
Sodium	110	23	15.	27
Copper	< 0.01	< 0.01	0.02	0.01
Zinc	1.1	0.12	5.2	8.6
Chloride	30	13	9	77
Fluoride	1.4	1.1	0.42	1.0
Sulfate	4	31	4	6
Hardness, as $CaCO_3$	100	240	210	390
Bicarbonate Alkalinity	250	240	240	< 2
Ammonia-N	0.65	0.28	0.63	0.15
Nitrate-N	< 0.1	< 0.1	< 0.1	< 0.1
Nitrite-N	0.0015	0.007	0.0015	0.020
Phenols	0.010	0.010	0.040	0.030
Cyanide	< 0.01	< 0.01	< 0.01	< 0.01
OD	9.6	1.6	16	< 1
TOC	< 5	< 5	< 5	< 5
	< 5	< 5	< 5	< 5
	< 5	< 5	< 5	< 5
	< 5	< 5	< 5	< 5
pH, S.U.	7.6	7.3	7.1	10.3
	7.6	7.3	7.1	10.3
	7.6	7.3	7.1	10.3
	7.6	7.3	7.1	10.3
Specific Conductance umhos/cm	575	400	450	1250
	575	400	450	1250
	575	400	450	1250
	575	400	450	1250
Total Organic Halide (as Cl)	< 0.005	< 0.005	< 0.005	0.024
	< 0.005	< 0.005	< 0.005	0.022
	< 0.005	< 0.005	< 0.005	0.020
	< 0.005	< 0.005	< 0.005	0.018

All results expressed in mg/l except where noted.

Figure F-69

December, 1982

	Well #1	Well #2	Well #3	Well #4
Turbidity	-	-	-	-
Xylene	-	-	-	-
Formaldehyde	-	-	-	-
Methyl Ethyl Ketone	-	-	-	-
Methylene Dichloride	-	-	-	-
Toluene	-	-	-	-
1,1,1,-Trichloroethane	-	-	-	-
Endrin	< 0.0002	<0.0002	<0.0002	< 0.0002
Lindane	< 0.004	<0.004	<0.004	< 0.004
Methoxychlor	< 0.01	<0.01	<0.01	< 0.01
Toxaphene	< 0.005	<0.005	<0.005	< 0.005
2,4 - D	< 0.01	<0.01	<0.01	< 0.01
2,4,5 - TP Silvex	< 0.001	<0.001	<0.001	< 0.001
Gross Alpha, pCi/l	< 1	< 1	< 1	< 1
Gross Beta, pCi/l	< 1	< 1	< 1	< 1
Radium	< 1	< 1	< 1	< 1
Total Coliform /100 ml	4	0	0	0

All results expressed in mg/l except where noted.

Figure F-70

December, 1982	Well #5	Well #6	Well #7	Well #8
Arsenic	< 0.001	0.0048	< 0.001	0.0018
Barium	0.21	0.20	< 0.10	0.12
Calcium	35	16	7.6	13
Cadmium	0.01	< 0.01	0.01	< 0.01
Chromium, Total	< 0.02	< 0.02	< 0.02	< 0.02
Chromium, Hexavalent	< 0.02	< 0.02	< 0.02	< 0.02
Iron	0.09	0.09	0.03	0.4
Lead	0.06	< 0.05	< 0.05	< 0.05
Magnesium	13	10	2.1	12
Manganese	0.04	< 0.02	0.01	0.02
Mercury	< 0.001	< 0.001	0.0012	< 0.001
Selenium	< 0.001	< 0.001	< 0.001	< 0.001
Silver	< 0.01	< 0.01	< 0.01	< 0.01
Sodium	35	35	52	28
Copper	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	0.11	0.22	0.85	0.07
Chloride	12	22	10	13
Fluoride	1.8	2.0	1.2	0.9
Sulfate	7.5	6	1	7
Hardness, as $CaCO_3$	300	140	40	90
Bicarbonate Alkalinity	200	180	14	160
Ammonia-N	0.71	0.10	0.65	0.33
Nitrate-N	<0.1	< 0.1	< 0.1	< 0.1
Nitrite-N	0.0015	0.0010	0.0015	0.0015
Phenols	0.010	< 0.002	0.127	< 0.002
Cyanide	< 0.01	< 0.01	< 0.01	< 0.01
COD	< 1	< 1	74	4.0
TOC	< 5	< 5	54	< 5
	< 5	< 5	57	< 5
	< 5	< 5	60	< 5
	< 5	< 5	62	< 5
pH, S.U.	7.1	8.1	9.3	8.0
	7.2	8.1	9.3	8.0
	7.1	8.1	9.3	8.0
	7.2	8.1	9.3	8.0
Specific Conductance umhos/cm	325	250	300	240
	325	250	300	240
	325	250	300	240
	325	250	300	240
Total Organic Halide (as Cl^-)	< 0.005	0.019	< 0.005	0.053
	< 0.005	0.019	< 0.005	0.047
	< 0.005	0.018	< 0.005	0.049
	< 0.005	0.023	< 0.005	0.054

All results expressed in mg/l except where noted

Figure F-71

I ecember, 1982

	Well #5	Well #6	Well #7	Well #8
Turbidity	-	-	-	-
Xylene	-	< 0.0005	< 0.0005	-
ormaldehyde	-	< 0.005	< 0.005	-
Methyl Ethyl Ketone	-	< 0.001	< 0.001	-
ethylene Dichloride	-	< 0.002	< 0.002	-
Toluene	-	< 0.0002	< 0.0002	-
,1,1,-Trichloroethane	-	< 0.003	< 0.003	-
Endrin	< 0.0002	< 0.0002	< 0.0002	< 0.0002
indane	< 0.004	< 0.004	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01	< 0.01	< 0.01
oxaphene	< 0.005	< 0.005	< 0.005	< 0.005
2,4 - D	< 0.01	< 0.01	< 0.01	< 0.01
,4,5 - TP Silvex	< 0.001	< 0.001	< 0.001	< 0.001
Gross Alpha, pCi/l	1.0	< 1	< 1	< 1
Gross Beta, pCi/l	< 1	2.4	< 1	< 1
Radium	< 1	< 1	< 1	< 1
Total Coliform /100 ml	0	0	0	0

All results expressed in mg/l except where noted.

Figure F-72

December, 1982

	Well #9	Well #10	Well #11	Well #12
Arsenic	0.0011	0.0019	0.0040	0.0018
Barium	< 0.10	< 0.10	0.23	0.20
Calcium	23	22	27	40
Cadmium	0.01	< 0.01	0.01	0.01
Chromium, Total	< 0.02	< 0.02	< 0.02	0.03
Chromium, Hexavalent	< 0.02	< 0.02	< 0.02	< 0.02
Iron	0.50	< 0.02	0.04	0.58
Lead	< 0.05	< 0.05	< 0.05	< 0.05
Magnesium	9.4	9.7	18	16
Manganese	0.03	0.01	< 0.02	0.10
Mercury	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	< 0.001	< 0.001	< 0.001	< 0.001
Silver	< 0.01	< 0.01	< 0.01	< 0.01
Sodium	32	35	40	26
Copper	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	1.0	0.19	0.28	0.80
Chloride	11	9	11	18
Fluoride	1.8	0.90	0.95	1.8
Sulfate	7	5	33	4
Hardness, as $CaCO_3$	130	90	180	200
Bicarbonate Alkalinity	120	110	200	220
Ammonia-N	0.42	0.65	0.36	0.77
Nitrate-N	< 0.1	< 0.1	< 0.1	< 0.1
Nitrite-N	0.0015	0.0015	0.0015	0.001
Phenols	0.040	< 0.002	0.010	0.030
Cyanide	< 0.01	< 0.01	< 0.01	< 0.01
COD	2.4	15	15	< 1
TOC	< 5	< 5	< 5	< 5
–	< 5	< 5	< 5	< 5
–	< 5	< 5	< 5	< 5
–	< 5	< 5	< 5	< 5
pH, S.U.	8.2	8.2	7.9	7.2
–	8.2	8.2	7.9	7.2
–	8.3	8.2	7.9	7.2
	8.3	8.2	7.9	7.2
Specific Conductance umhos/cm	250	250	450	350
	250	250	450	350
–	250	250	450	350
–	250	250	450	350
Total Organic Halide (as Cl)	0.007	< 0.005	< 0.005	0.030
	0.007	< 0.005	< 0.005	0.025
–	0.011	< 0.005	< 0.005	0.029
–	0.015	< 0.005	< 0.005	0.031

All results expressed in mg/l except where noted.

Figure F-73

ecember, 1982

	Well #9	Well #10	Well #11	Well #12
Turbidity	-	-	-	-
Xylene	-	-	-	-
Formaldehyde	-	-	-	-
Methyl Ethyl Ketone	-	-	-	-
Methylene Dichloride	-	-	-	-
Toluene	-	-	-	-
1,1,1,-Trichloroethane	-	-	-	-
Endrin	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Lindane	< 0.004	< 0.004	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01	< 0.01	< 0.01
Toxaphene	< 0.005	< 0.005	< 0.005	< 0.005
2,4 - D	< 0.01	< 0.01	< 0.01	< 0.01
2,4,5 - TP Silvex	< 0.001	< 0.001	< 0.001	< 0.001
Gross Alpha, pCi/l	< 1	< 1	< 1	< 1
Gross Beta, pCi/l	< 1	< 1	< 1	5.2
Radium	< 1	< 1	< 1	< 1
Total Coliform /100 ml	0	560	0	0

All results expressed in mg/l except where noted.

	Well #13	Well #14	Well #15	Well #16
Arsenic	< 0.001	< 0.001	0.0015	< 0.001
Barium	< 0.10	< 0.10	< 0.10	0.18
Calcium	2.2	19	4.3	98
Cadmium	< 0.01	< 0.01	0.01	0.01
Chromium, Total	< 0.02	0.03	< 0.02	< 0.02
Chromium, Hexavalent	< 0.02	< 0.02	< 0.02	< 0.02
Iron	0.23	0.25	0.72	1.6
Lead	< 0.05	0.20	0.15	0.06
Magnesium	0.80	0.20	0.52	24
Manganese	0.01	0.01	0.03	0.21
Mercury	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	< 0.001	< 0.001	< 0.001	< 0.001
Silver	< 0.01	< 0.01	< 0.01	0.02
Sodium	40	52	67	27
Copper	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	1.8	0.49	1.5	0.61
Chloride	9	22	16	10
Fluoride	0.90	0.71	1.2	0.95
Sulfate	1	1	4	1
Hardness, as $CaCO_3$	30	50	20	150
Bicarbonate Alkalinity	< 5	< 5	< 5	180
Ammonia-N	1.6	1.6	1.1	0.88
Nitrate-N	< 0.1	< 0.1	< 0.1	< 0.1
Nitrite-N	0.0015	0.005	0.002	0.002
Phenols	0.010	0.005	0.005	0.010
Cyanide	< 0.01	< 0.01	< 0.01	< 0.01
BOD	7.2	7.2	15	4.8
TOC	< 5	< 5	< 5	< 5
	< 5	< 5	< 5	< 5
	< 5	< 5	< 5	< 5
	< 5	< 5	< 5	< 5
pH, S.U.	9.7	10.8	10.6	7.9
	9.7	10.9	10.6	7.9
	9.7	10.9	10.6	7.9
	9.7	10.9	10.6	7.9
Specific Conductance umhos/cm	200	675	450	350
	200	675	450	350
	200	675	450	350
	200	675	450	350
Total Organic Halide (as Cl)	< 0.005	0.050	0.006	< 0.005
	< 0.005	0.054	0.008	< 0.005
	< 0.005	0.052	0.007	< 0.005
	< 0.005	0.053	0.006	< 0.005

All results expressed in mg/l except where noted.

Figure F-75

December, 1982

	Well #13	Well #14	Well #15	Well #16
Turbidity	-	-	-	-
Xylene	<0.0005	-	<0.0005	<0.0005
Formaldehyde	<0.005	-	<0.005	<0.005
Methyl Ethyl Ketone	<0.001	-	<0.001	<0.001
Methylene Dichloride	<0.002	-	<0.002	<0.002
Toluene	<0.0002	-	<0.0002	<0.0002
1,1,1,-Trichloroethane	<0.003	-	<0.003	<0.003
Endrin	< 0.0002	<0.0002	<0.0002	< 0.0002
Lindane	< 0.004	<0.004	<0.004	< 0.004
Methoxychlor	< 0.01	<0.01	<0.01	< 0.01
Toxaphene	< 0.005	<0.005	<0.005	< 0.005
2,4 - D	< 0.01	<0.01	<0.01	< 0.01
2,4,5 - TP Silvex	< 0.001	<0.001	<0.001	< 0.001
Gross Alpha, pCi/l	< 1	< 1	< 1	< 1
Gross Beta, pCi/l	< 1	< 1	< 1	< 1
Radium	< 1	< 1	< 1	< 1
Total Coliform / 100 ml	0	0	0	0

All results expressed in mg/l except where noted.

Figure F-76

December, 1982

	Well#17	West Drain	East Drain	Sedimentation Basin
rsenic	< 0.001	< 0.001	< 0.001	< 0.001
Barium	0.28	< 0.10	< 0.10	< 0.10
alcium	44	150	130	140
Cadmium	< 0.01	0.01	0.01	0.01
hromium, Total	< 0.02	0.03	< 0.02	< 0.02
Chromium, Hexavalent	< 0.02	< 0.02	< 0.02	< 0.02
ron	1.1	2.4	1.4	0.52
ead	< 0.05	0.06	0.05	< 0.05
Magnesium	18	22	19	32
anganese	0.04	0.78	0.55	0.23
Mercury	0.0012	0.0011	0.0010	< 0.001
elenium	< 0.001	< 0.001	< 0.001	< 0.001
Silver	< 0.01	< 0.01	< 0.01	< 0.01
odium	14	70	8.8	99
Copper	< 0.01	< 0.01	0.01	0.08
inc	0.91	0.03	0.03	0.05
hloride	14	21	13	170
luoride	0.74	0.16	0.22	0.50
ulfate	2	170	140	200
Hardness, as $CaCO_3$	90	470	440	470
icarbonate Alkalinity	230	350	240	230
Ammonia-N	0.76	0.82	0.57	1.0
itrate-N	< 0.1	< 0.1	< 0.1	< 0.1
Nitrite-N	0.001	0.0025	0.019	0.002
henols	0.010	0.010	0.005	0.049
Cyanide	< 0.01	< 0.01	< 0.01	< 0.01
OD	14.	6.4	8.0	37
OC	< 5	< 5	< 5	< 5
	< 5	< 5	< 5	< 5
	< 5	< 5	< 5	< 5
	< 5	< 5	< 5	< 5
pH, S.U.	7.4	6.3	6.6	6.9
	7.4	6.3	6.6	6.9
	7.4	6.3	6.6	6.9
	7.4	6.3	6.6	6.9
pecific Conductance mhos/cm	425	950	875	1550
	425	950	875	1550
	425	950	875	1550
	425	950	875	1550
otal Organic Halide (as Cl)	0.018	< 0.005	< 0.005	< 0.005
	0.015	< 0.005	< 0.005	< 0.005
	0.020	< 0.005	< 0.005	< 0.005
	0.016	< 0.005	< 0.005	< 0.005

l1 results expressed in mg/1 except where noted.

Figure F-77

December, 1982

	Well #17	West Drain	East Drain	Sedimentation Basin
Turbidity	-	-	-	17
Xylene	-	-	-	-
Formaldehyde	-	-	-	-
Methyl Ethyl Ketone	-	-	-	-
Methylene Dichloride	-	-	-	-
Toluene	-	-	-	-
1,1,1,-Trichloroethane	-	-	-	-
Endrin	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Lindane	< 0.004	< 0.004	< 0.004	< 0.004
Methoxychlor	< 0.01	< 0.01	< 0.01	< 0.01
Toxaphene	< 0.005	< 0.005	< 0.005	< 0.005
2,4 - D	< 0.01	< 0.01	< 0.01	< 0.01
2,4,5 - TP Silvex	< 0.001	< 0.001	< 0.001	< 0.001
Gross Alpha, pCi/l	< 1	< 1	< 1	< 1
Gross Beta, pCi/l	< 1	< 1	< 1	5.6
Radium	< 1	< 1	< 1	< 1
Total Coliform/100 ml	0	0	0	140

All results expressed in mg/l except where noted.

Figure F-78

CAL

CANTON ANALYTICAL LABORATORY 153 Elder Street Ypsilanti MI 48197 Phone 313/483-7430

March 3, 1983

Mr. Mark Young
WAYNE DISPOSAL
P.O. Box 5187
Dearborn, Michigan 48128

Dear Mr. Young:

Enclosed are the results of Rawsonville Landfill, Groundwater Monitoring samples of February, 1983.

If you have any questions, plèase do not hesitate to call.

Very truly yours,

Richard A. Yarmain
General Manager

RAY/sls

		Well #1	Well #2	Well #3	Well #4
Static Water Level		649.58	650.62	668.05	648.81
Chloride		26	8	10	20
Sulfate		< 1	32	3.5	2
HCO_3 Alkalinity as $CaCO_3$		260	230	230	< 2
Iron		1.7	1.2	44	0.65
Magnesium		8.2	21	33	4.6
Calcium		25	38	160	130
Sodium		120	20	16	26
COD		< 3.2	29	3.2	6.4
Chromium, hexavalent		< 0.02	< 0.02	< 0.02	< 0.02
Cyanide, oxidiable		< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, total		< 0.01	< 0.01	< 0.01	< 0.01
Copper		< 0.01	< 0.01	0.01	0.01
Zinc		0.74	0.12	4.8	8.5
pH, S.U.	1.	8.0	7.7	7.6	11.3
	2.	8.0	7.7	7.6	11.3
	3.	8.0	7.7	7.6	11.3
	4.	8.0	7.7	7.6	11.3
Specific Conductance umhos/cm	1.	450	450	300	1200
	2.	450	450	300	1200
	3.	450	450	300	1200
	4.	450	450	300	1200
TOC	1.	< 5	< 5	< 5	< 5
	2.	< 5	< 5	< 5	< 5
	3.	< 5	< 5	< 5	< 5
	4.	< 5	< 5	< 5	< 5
Total Organic Halide (as Cl^-)	1.	< 0.005	< 0.005	< 0.005	< 0.005
	2.	< 0.005	< 0.005	< 0.005	< 0.005
	3.	< 0.005	< 0.005	< 0.005	< 0.005
	4.	< 0.005	< 0.005	< 0.005	< 0.005
Xylene		-	-	-	-
Formaldehyde		-	-	-	-
Methyl Ethyl Ketone		-	-	-	-
Methylene Dichloride		-	-	-	-
Toluene		-	-	-	-
1,1,1-Trichloroethane		-	-	-	-
Chromium, total		-	-	-	-
Lead		-	-	-	-
Cadmium		-	-	-	-

All results expressed in mg/l except where noted.

	Well #5	Well #6	Well #7	Well #8
Static Water Level	653.90	649.70	653.64	648.77
Chloride	15	12	19	5
Sulfate	3	3	< 1	1
HCO_3 Alkalinity as $CaCO_3$	170	150	16	130
Iron	0.06	< 0.02	0.13	0.04
Magnesium	12	10	2.0	14
Calcium	17	9.2	9.6	8.3
Sodium	41	35	58	26
COD	3.2	16	< 3.2	13
Chromium, hexavalent	< 0.02	< 0.02	< 0.02	< 0.02
Cyanide, oxidiable	< 0.01	< 0.01	0.03	< 0.01
Cyanide, total	< 0.01	< 0.01	0.03	< 0.01
Copper	< 0.01	< 0.01	0.01	0.01
Zinc	0.23	0.44	0.59	0.28
pH, S.U. 1.	8.4	8.3	9.4	8.4
2.	8.4	8.3	9.4	8.4
3.	8.4	8.3	9.4	8.4
4.	8.4	8.3	9.4	8.4
Specific Conductance umhos/cm 1.	275	350	250	225
2.	275	350	250	225
3.	275	350	250	225
4.	275	350	250	225
TOC 1.	< 5	< 5	< 5	< 5
2.	< 5	< 5	< 5	< 5
3.	< 5	< 5	< 5	< 5
4.	< 5	< 5	< 5	< 5
Total Organic Halide (as Cl^-) 1.	0.0097	< 0.005	< 0.005	< 0.005
2.	0.011	< 0.005	< 0.005	< 0.005
3.	0.010	< 0.005	< 0.005	< 0.005
4.	0.012	< 0.005	< 0.005	< 0.005
Xylene	-	< 0.001	< 0.001	-
Formaldehyde	-	< 0.01	< 0.01	-
Methyl Ethyl Ketone	-	< 0.001	< 0.001	-
Methylene Dichloride	-	< 0.002	< 0.002	-
Toluene	-	< 0.0002	0.0006	-
1,1,1-Trichloroethane	-	< 0.003	< 0.003	-
Chromium, total	-	-	-	-
Lead	-	-	-	-
Cadmium	-	-	-	-

All results expressed in mg/l except where noted.

	Well #9	Well #10	Well #11	Well #12
Static Water Level	646.43	650.74	649.19	649.84
Chloride	6	15	10	8
Sulfate	3	< 1	3.5	5
HCO_3 Alkalinity as $CaCO_3$	94	110	140	210
Iron	0.78	0.06	0.06	0.24
Magnesium	10	10	15	16
Calcium	25	32	21	27
Sodium	32	32	39	25
COD	13	6.4	3.2	6.4
Chromium, hexavalent	< 0.02	< 0.02	< 0.02	< 0.02
Cyanide, oxidiable	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, total	< 0.01	< 0.01	< 0.01	< 0.01
Copper	< 0.01	0.01	< 0.01	< 0.01
Zinc	2.2	0.44	0.30	0.88
pH, S.U. 1.	8.9	8.3	8.3	8.0
2.	8.9	8.3	8.3	8.0
3.	8.9	8.3	8.3	8.0
4.	8.9	8.3	8.3	8.0
Specific Conductance umhos/cm 1.	225	250	350	300
2.	225	250	350	300
3.	225	250	350	300
4.	225	250	350	300
TOC 1.	< 5	< 5	< 5	< 5
2.	< 5	< 5	< 5	< 5
3.	< 5	< 5	< 5	< 5
4.	< 5	< 5	< 5	< 5
Total Organic Halide (as Cl^-) 1.	< 0.005	0.007	< 0.005	0.009
2.	< 0.005	0.006	< 0.005	0.010
3.	< 0.005	< 0.005	< 0.005	0.010
4.	< 0.005	< 0.005	< 0.005	0.010
Xylene	-	-	-	-
Formaldehyde	-	-	-	-
Methyl Ethyl Ketone	-	-	-	-
Methylene Dichloride	-	-	-	-
Toluene	-	-	-	-
1,1,1-Trichloroethane	-	-	-	-
Chromium, total	-	-	-	-
Lead	-	-	-	-
Cadmium	-	-	-	-

All results expressed in mg/l except where noted.

Figure F-82

CAL

	Well #13	Well #14	Well #15	Well #16
Static Water Level	649.19	649.56	654.37	649.87
Chloride	10	11	15	8
Sulfate	12	1	12	< 1
HCO_3 Alkalinity as $CaCO_3$	110	< 2	< 2	170
Iron	0.54	0.08	1.5	0.74
Magnesium	12	0.11	0.64	16
Calcium	23	11	2.1	34
Sodium	31	57	66	26
COD	3.2	6.4	6.4	3.2
Chromium, hexavalent	< 0.02	< 0.02	< 0.02	< 0.02
Cyanide, oxidiable	< 0.01	0.01	0.02	< 0.01
Cyanide, total	< 0.01	0.01	0.02	< 0.01
Copper	0.01	< 0.01	< 0.01	0.01
Zinc	0.89	1.0	1.1	0.30
pH, S.U. 1.	8.5	11.0	10.5	7.8
2.	8.5	11.0	10.5	7.8
3.	8.5	11.0	10.5	7.8
4.	8.5	11.0	10.5	7.8
Specific Conductance umhos/cm 1.	225	500	400	275
2.	225	500	400	275
3.	225	500	400	275
4.	225	500	400	275
TOC 1.	< 5	< 5	< 5	< 5
2.	< 5	< 5	< 5	< 5
3.	< 5	< 5	< 5	< 5
4.	< 5	< 5	< 5	< 5
Total Organic Halide (as Cl^-) 1.	0.038	< 0.005	0.011	< 0.005
2.	0.038	< 0.005	0.014	< 0.005
3.	0.036	0.006	0.016	< 0.005
4.	0.035	0.006	0.013	< 0.005
Xylene	< 0.001	-	< 0.001	< 0.001
Formaldehyde	< 0.01	-	< 0.01	< 0.01
Methyl Ethyl Ketone	< 0.001	-	< 0.001	< 0.001
Methylene Dichloride	< 0.002	-	< 0.002	< 0.002
Toluene	< 0.0002	-	0.0009	0.001
1,1,1-Trichloroethane	< 0.003	-	< 0.003	< 0.003
Chromium, total	-	-	-	-
Lead	-	-	-	-
Cadmium	-	-	-	-

All results expressed in mg/l except where noted.

Figure F-83

	Well #17	East Edge Drain	West Edge Drain	Sedimentation Basin
Static Water Level	652.42	-	-	-
Chloride	5	10	15	55
Sulfate	5	190	150	280
HCO_3 Alkalinity as $CaCO_3$	230	220	320	140
Iron	0.92	0.70	2.8	2.1
Magnesium	19	18	20	26
Calcium	33	90	110	130
Sodium	13	7.8	7.8	26
COD	6.4	9.6	13	19
Chromium, hexavalent	< 0.02	< 0.02	< 0.02	< 0.02
Cyanide, oxidiable	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, total	< 0.01	< 0.01	< 0.01	< 0.01
Copper	< 0.01	< 0.01	< 0.01	0.02
Zinc	0.59	0.02	0.04	0.21
pH, S.U. 1.	7.6	8.2	7.4	7.5
2.	7.6	8.2	7.4	7.5
3.	7.6	8.2	7.4	7.5
4.	7.6	8.2	7.4	7.5
Specific Conductance umhos/cm 1.	350	600	700	650
2.	350	600	700	650
3.	350	600	700	650
4.	350	600	700	650
TOC 1.	< 5	< 5	< 5	< 5
2.	< 5	< 5	< 5	< 5
3.	< 5	< 5	< 5	< 5
4.	< 5	< 5	< 5	< 5
Total Organic Halide (as Cl^-) 1.	0.009	< 0.005	0.027	0.013
2.	0.008	< 0.005	0.025	0.015
3.	0.007	< 0.005	0.023	0.015
4.	0.008	< 0.005	0.026	0.013
Xylene	-	-	-	-
Formaldehyde	-	-	-	-
Methyl Ethyl Ketone	-	-	-	-
Methylene Dichloride	-	-	-	-
Toluene	-	-	-	-
1,1,1-Trichloroethane	-	-	-	-
Chromium, total	-	-	-	< 0.02
Lead	-	-	-	< 0.05
Cadmium	-	-	-	< 0.01

All results expressed in mg/l except where noted.

Figure F-84

CAL

CAL

CANTON ANALYTICAL LABORATORY 153 Elder Street Ypsilanti, MI 48197 Phone 313/483-7430

July 7, 1983

Mr. Don Vilnuis
Wayne Disposal, Inc.
P.O. Box 5187
Dearborn, Michigan 48128

Dear Mr. Vilnuis:

The samples which you submitted to us have been analyzed as requested.

It is a pleasure to be of assistance to you. If you have questions concerning any aspects of this report, please do not hesitate to call.

Very truly yours,

Peter W. Rekshan

Peter W. Rekshan
Laboratory

PR/dd

Wayne Disposal
Site #2 Landfill

652.22 CASING ELEVATION ERROR

		Well #1	Well #2	Well #3	Well #4	Well #5
Date Collected:		6/ 8/83	5/18/83	6/2/83	5/5/83	5/18/83
Static Water Level		652.80	651.78	646.20	654.76	655.90
Chloride		32	8	18	52	10
Sulfate		3	30	7	1	10
HCO_3 Alkalinity as $CaCO_3$		250	230	230	0	150
Iron		0.03	0.03	< 0.02	0.02	< 0.02
Specific Conductance	1.	450	400	400	2000	320
	2.	450	400	400	2000	320
	3.	450	400	400	2000	320
	4.	450	400	400	2000	320
Chromium Hexavalent		<0.02	<0.02	<0.02	<0.02	<0.02
Copper		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc		0.24	0.04	0.16	0.50	0.02
Magnesium		3.3	17	14.	< 0.1	8.7
Calcium		15.	59	43	150	30
Sodium		110	21	16	25	38
Chemical Oxygen Demand		<1	38	9.6	9.0	<1

Figure F-86

Wayne Disposal
Site #2 Landfill

		Well #1	Well #2	Well #3	Well #4	Well#5
Date Collected		6/8/83	5/18/83	6/2/83	5/5/83	5/18/83
Total Organic Carbon	1.	<5	<5	<5	<5	<5
	2.	<5	<5	<5	<5	<5
	3.	<5	<5	<5	<5	<5
	4.	<5	<5	<5	<5	<5
Cyanide, Oxidizable		<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, Total		<0.01	<0.01	<0.01	<0.01	<0.01
PH, S.U.	1.	8.1	7.8	7.6	11.5	8.5
	2.	8.1	7.8	7.6	11.5	8.5
	3.	8.1	7.8	7.6	11.5	8.5
	4.	8.1	7.8	7.6	11.5	8.5
Xylene		--	--	--	--	--
Formaldehyde		--	--	--	--	--
Methyl Ethyl Ketone		--	--	--	--	--
Methylene Dichloride		--	--	--	--	--
Toluene		--	--	--	--	--
1,1,1-Trichlorethane		--	--	--	--	--
Chromium, Total		--	--	--	--	--
Lead		--	--	--	--	--
Cadmium		--	--	--	--	--

Figure F-87

CAL 9

Wayne Disposal
Site #2 Landfill

		Well #6	Well #7	Well #8	Well #9	Well #10
Date Collected:		5/10/83	5/20/83	5/10/83	5/6/83	5/16/83
Static Water Level		651.62	653.81	650.90	651.95	652.41
Chloride		8	32	7	15	10
Sulfate		<1	<1	<1	1	<1
HCO_3 Alkalinity as $CaCO_3$		130	0	74	98	120
Iron		0.02	0.03	<0.02	0.02	0.02
Specific Conductance umhos/cm	1.	240	230	190	230	200
	2.	240	230	190	230	200
	3.	240	230	195	230	200
	4.	240	230	195	230	200
Chromium, Hexavalent		<0.02	<0.02	<0.02	<0.02	<0.02
Copper		<0.01	<0.01	<0.01	<0.01	0.02
Zinc		0.14	0.04	0.10	0.06	0.13
Magnesium		12	2.4	9.5	5.6	6.2
Calcium		15	6.5	7.2	18	15
Sodium		36	54	29	36	31
Chemical Oxygen Demand		9.6	<1	<1	3.2	3.2

Figure F-88

Wayne Disposal
Site #2 Landfill

		Well #6	Well #7	Well #8	Well #9	Well #10
Date Collected		5/10/ 83	5/20/83	5/10/83	5/6/83	5/16/83
Total Organic Carbon	1.	<5	<5	<5	<5	<5
	2.	<5	<5	<5	<5	<5
	3.	<5	<5	<5	<5	<5
	4.	<5	<5	<5	<5	<5
Cyanide, Oxidizable		<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, Total		<0.01	<0.01	<0.01	<0.01	<0.01
pH, S.U.	1.	9.0	9.9	9.2	9.5	8.8
	2.	9.0	9.9	9.2	9.5	8.8
	3.	9.0	9.9	9.2	9.5	8.8
	4.	9.0	9.9	9.2	9.5	8.8
Xylene		<0.001	<0.001	--	--	--
Formaldehyde		<0.005	<0.005	--	--	--
Methyl Ethyl Ketone		<0.001	<0.001	--	--	--
Methylene Dichloride		<0.002	<0.002	--	--	--
Toluene		<0.0002	<0.0002	--	--	--
1,1,1-Trichlorethane		<0.003	<0.003	--	--	--
Chromium, Total		--	--	--	--	--
Lead		--	--	--	--	--
Cadmium		--	--	--	--	--

Figure F-89

Wayne Disposal
Site #2 Landfill

		Well #11	Well #12	Well #13	Well #14	Well #15
Date Collected		6/7/83	5/10/83	5/9/83	5/27/83	5/27/83
Static Water Level		647.76	651.68	651.78	659.97	654.95
Chloride		12	11	8	15	20
Sulfate		4	<1	2	<1	1
HCO_3 Alkalinity as $CaCO_3$		190	170	100	ø	ø
Iron		0.03	0.04	<0.02	<0.02	<0.02
Specific Conductance	1.	300	260	210	230	430
	2.	300	260	210	230	430
	3.	300	260	210	230	430
	4.	300	260	210	230	430
Chromium Hexavalent		<0.02	<0.02	<0.02	<0.02	<0.02
Copper		<0.01	<0.01	<0.01	<0.01	0.02
Zinc		0.10	0.24	0.08	0.22	0.14
Magnesium		16	8.9	4.9	0.06	0.06
Calcium		26	29	13	8.6	2.1
Sodium		37	26	33	60	67
Chemical Oxygen Demand		<1	9.6	6.4	6.4	6.4

Figure F-90

CAL 9

Wayne Disposal
Site #2 Landfill

		Well #11	Well #12	Well #13	Well #14	Well #15
Date Collected		6/7/83	5/10/83	5/9/83	5/27/83	5/27/83
Total Organic Carbon	1.	<5	<5	<5	<5	<5
	2.	<5	<5	<5	<5	<5
	3.	<5	<5	<5	<5	<5
	4.	<5	<5	<5	<5	<5
Cyanide, Oxidizable		<0.01	<0.01	<0.01	<0.01	< 0.01
Cyanide, Total		<0.01	<0.1	<0.01	<0.01	< 0.01
pH, S.U.	1.	8.7	8.7	9.2	11.1	10.8
	2.	8.7	8.7	9.2	11.1	10.8
	3.	8.7	8.7	9.2	11.1	10.8
	4.	8.7	8.7	9.2	11.1	10.8
Xylene		--	--	<0.001	--	<0.001
Formaldehyde		--	--	<0.005	--	<0.005
Methyl Ethyl Ketone		--	--	<0.001	--	<0.001
Methylene Dichloride		--	--	<0.002	--	<0.002
Toluene		--	--	<0.0002	--	<0.0002
1,1,1-Trichlorethane		--	--	<0.003	--	<0.003
Chromium, Total		--	--	--	--	--
Lead		--	--	--	--	--
Cadmium		--	--	--	--	--

Figure F-91

CAL 9

Wayne Disposal
Site #2 Landfill

		Well #16	Well #17	Well #18 (E.E. DRAIN)	Well #19 (WEST E. DRAIN)	Well #20 (SED. BASIN)
Date Collected		5/17/83	5/18/83	6/2/83	5/20/83	5/20/83
Static Water Level		652.04	650.00	--	--	--
Chloride		6	6	25	25	145
Sulfate		4	11	110	86	210
HCO_3 Alkalinity as $CaCO_3$		150	220	200	330	210
Iron		<0.02	<0.02	0.03	0.03	0.07
Specific Conductance umhos/cm	1.	250	320	650	700	1000
	2.	250	320	650	700	1000
	3.	250	320	650	700	1000
	4.	250	320	650	700	1000
Chromium Hexavalent		<0.02	<0.02	<0.02	<0.02	<0.02
Copper		<0.01	<0.01	<0.01	0.02	0.01
Zinc		0.06	0.06	0.04	0.04	0.04
Magensium		7.9	12	16	19	24
Calcium		23	41	97	140	110
Sodium		26	13	7.4	7.2	76
Chemical Oxygen Demand		6.4	3.2	<1	19	6.4

Figure F-92

CAL

Wayne Disposal
Site #2 Landfill

		Well #16	Well #17	East Edge Drain	West Edge Drain	Sedimentation Basin
Date Collected		5/17/83	5/18/83	6/2/83	5/20/83	5/20/83
Total Organic Carbon	1.	<5	<5	<5	<5	5.8
	2.	<5	<5	<5	<5	5.8
	3.	<5	<5	<5	<5	5.1
	4.	<5	<5	<5	<5	5.1
Cyanide, Oxidizable		<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, Total		<0.01	<0.01	<0.01	<0.01	<0.01
pH, S.U.	1.	8.4	7.9	8.0	7.4	7.7
	2.	8.4	7.9	8.0	7.4	7.7
	3.	8.4	7.9	8.0	7.4	7.7
	4.	8.4	7.9	8.0	7.4	7.7
Xylene		<0.001	--	--	--	--
Formaldehyde		<0.005	--	--	--	--
Methyl Ethyl Ketone		<0.001	--	--	--	--
Methylene Dichloride		<0.002	--	--	--	--
Toluene		<0.0002	--	--	--	--
1,1,1-Trichlorethane		<0.003	--	--	--	--
Chromium, Total		--	--	--	--	<0.02
Lead		--	--	--	--	<0.05
Cadmium		--	--	--	--	0.01

Wayne Disposal Inc.

P. O. Box 5187
Dearborn, Michigan 48128
(313) 326-0200

February 1, 1983

U.S. Environmental Protection Agency
Waste Management Division
230 South Dearborn Street
Chicago, Illinois 60604

Attention: Technical, Permits and Compliance Section

Re: Groundwater Monitoring Reporting Violations
Wayne Disposal, Inc., Site #2, MID 048 090 633
Michigan Disposal, Inc., MID 000 724 831

This letter is in response to the two attached letters from EPA, dated January 10, 1983, to Wayne Disposal and Michigan Disposal concerning violations in groundwater monitoring reporting. We are dealing with both monitoring programs together, since the Michigan Disposal facility is located in the interior of the Wayne Disposal Site #2 Landfill. As explained in our letters dated July 10, 1982 and January 11, 1983 to Mr. Karl Klepitsch, Jr., of your branch, the monitoring well system around the Wayne Disposal site serves the monitoring needs of Michgian Disposal as well. The results of the fourth quarterly sampling analysis were transmitted with the January 11th letter to Mr. Klepitsch.

Values of parameters whose concentrations exceeded maximum levels listed in Appendix III were separately identified for the first and second quarterly analyses and transmitted to Mr. Klepitsch in our July 10th letter. Attached is a listing (Table A) of all such parameter concentrations for all four quarterly analyses.

Also attached (Table B) are quarterly averages and the yearly average for the indicator parameters measured for each monitoring well.

Finally, we have attached a map of our site, showing monitoring well locations and the elevation of standing water in each (USGS Datum), as measured in January 1983. The elevations shown confirm a southernly movement of groundwater for which our monitoring system was designed.

If any questions arise, please do not hesitate to contact me.

Sincerely,

Mark A. Young, P.E.

MAY/pj
enclosures

cc: Alan J. Howard, MDNR

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
111 West Jackson Blvd.
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF:

5HW-TUB

JAN 10 1983

RECEIVED
JAN 18 1983

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Donald Vilnius, General Manager
Wayne Disposal, Inc. Site 2
P.O. Box 5187
Dearborn, Michigan 48128

RE: Letter of Warning
Company Name: Wayne Disposal, Inc. Site 2
Location: 49350 N. Service Drive
Belleville, Michigan 48111
EPA ID #: MID048090633

Dear Mr. Vilnius:

Notice is hereby given that the United States Environmental Protection Agency (U.S. EPA) has determined that the above facility is in violation of requirements of Subtitle C of the Resource Conservation and Recovery Act of 1976, as amended (RCRA). Specifically, it has been determined that Wayne Disposal, Inc., Site 2 is in violation of Section 3004 of RCRA (42 USC 6924).

The groundwater monitoring reports that your facility submitted to U.S. EPA have been reviewed pursuant to the requirements of 40 CFR Part 265 Subpart F. This review has identified the following areas of non-compliance:

> The results of the fourth quarterly sampling analysis have not been reported to the Regional Administrator. Values of parameters whose concentrations exceeded maximum levels listed in Appendix III were not been separately identified for each well within 15 days of completion of the second, and third quarterly analyses [40 CFR 265.94(a)(2)(i)].

You are hereby requested to provide documentation to this office, within 15 days after receipt of this letter, informing us of action taken to correct these violations and/or to prevent future violations. Such documentation should include a time frame for bringing your facility into compliance with Part 265 Subpart F. Please address such documentation to:

U.S. Environmental Protection Agency
Waste Management Division
230 South Dearborn Street
Chicago, Illinois 60604.
Attn: Technical, Permits and Compliance Section

Figure F-96

A copy of this information should also be sent to:

Michigan Department of Natural Resources
Alan J. Howard, Chief
Office of Hazardous Materials Control
P.O. Box 30038
Lansing, Michigan 48909

This notice only addresses our findings regarding your facility's compliance with certain reporting requirements of 40 CFR 265.90-94. Other RCRA violations which may be surfaced as a result of an inspection will be addressed at that time.

Please contact Mr. James Brossman of my staff at (312) 886-3785, if you have any questions.

Very truly yours,

William H. Miner

William H. Miner, Chief
Technical, Permits and Compliance Section

cc: Alan J. Howard, MDNR

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
111 West Jackson Blvd.
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF:

5HW-TUB

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

JAN 10 1983

Walter Tomyn, Chief Engineer
Michigan Disposal Inc.
P.O. Box 5187
Dearborn, Michigan 48128

RE: Letter of Warning
Company Name: Michigan Disposal Inc.
Location: 49350 N. Service Drive
Belleville, Michigan 48111
EPA ID #: MID000724831

Dear Mr. Tomyn:

Notice is hereby given that the United States Environmental Protection Agency (U.S. EPA) has determined that the above facility is in violation of requirements of Subtitle C of the Resource Conservation and Recovery Act of 1976, as amended (RCRA). Specifically, it has been determined that Michigan Disposal, Inc. is in violation of Section 3004 of RCRA (42 USC 6924).

The groundwater monitoring reports that your facility submitted to U.S. EPA have been reviewed pursuant to the requirements of 40 CFR Part 265 Subpart F. This review has identified the following areas of non-compliance:

> The results of the fourth quarterly sampling analysis have not been reported to the Regional Administrator. Values of parameters whose concentrations exceeded maximum levels listed in Appendix III were not been separately identified for each well within 15 days of completion of the second, and third quarterly analyses [40 CFR 265.94(a)(2)(i)].

You are hereby requested to provide documentation to this office, within 15 days after receipt of this letter, informing us of action taken to correct these violations and/or to prevent future violations. Such documentation should include a time frame for bringing your facility into compliance with Part 265 Subpart F. Please address such documentation to:

U.S. Environmental Protection Agency
Waste Management Division
230 South Dearborn Street
Chicago, Illinois 60604.
Attn: Technical, Permits and Compliance Section

Figure F-98

A copy of this information should also be sent to:

Michigan Department of Natural Resources
Alan J. Howard, Chief
Office of Hazardous Materials Control
P.O. Box 30038
Lansing, Michigan 48909

This notice only addresses our findings regarding your facility's compliance with certain reporting requirements of 40 CFR 265.90-94. Other RCRA violations which may be surfaced as a result of an inspection will be addressed at that time.

Please contact Mr. James Brossman of my staff at (312) 886-3785, if you have any questions.

Very truly yours,

William H. Miner

William H. Miner, Chief
Technical, Permits and Compliance Section

cc: Alan J. Howard, MDNR

Figure F-99

TABLE A

Parameter Concentrations above PDWS

MID 048 090 633 - MID 000 724 831

1. Arsenic (0.05)

None

2. Barium (1.0)

None

3. Cadmium (0.01)

November 1981
#2 - 0.02

March 1982
#1 - 0.013, #12 - 0.012

December 1982
#3 - 0.02

4. Chromium (0.05)

March 1982
#4 - 0.50

December 1982
#3 - 0.06

5. Fluoride (1.4 - 2.4)

November 1981
#13 - 4.8

March 1982
#14 - 4.0, #15 - 3.2

6. Lead (0.05)

November 1981
#2 - 1.1, #4 - 0.35, #10 - 0.1, #11 - 0.75

March 1982
#10 - 0.63, #11 - 0.88, #15 - 2.0, #17 - 0.38

August 1982
#3 - 0.14, #4 - 0.14, #7 - 0.51, #8 - 0.06, #9 - 0.10,
#11 - 0.16, #13 - 0.06, #14 - 0.09, #15 - 0.13, #16 - 0.11

December 1982
#3 - 0.25, #4 - 0.29, #5 - 0.06, #14 - 0.20, #15 - 0.15,
#16 - 0.06

Table A

7. Mercury (0.002)

November 1981
#1 - 0.0091, #2 - 0.0059, #4 - 0.015, #7 - 0.0085, #9 - 0.006, #17 - 0.0057

March 1982
#8 - 0.012

August 1982
#1 - 0.0024, #2 - 0.0024, #11 - 0.0035, #13 - 0.0038, #14 - 0.005

8. Nitrate as N (10)

None

9. Selenium (0.01)

None

10. Silver (0.05)

None

11. Endrin (0.0002)

None

12. Lindane (0.004)

None

13. Methoxychlor (0.1)

None

14. Toxaphene (0.005)

None

15. 2,4-D (0.1)

None

16. 2,4,5 - TP Silvex (0.01)

None

17. Radium (5)

November 1981
#6 - less than 20, #11 - less than 80, #16 - less than 10, #17 - less than 8

18. Gross Alpha (15)

November 1981
#6-19, #11 - 74

March 1982
#1 - 147, #6 - 68

19. Gross Beta (4 millirem/yr)

All of our results have been reported in pCi/liter. Our laboratory does not have a conversion figure.

20. Turbidity (1)

March 1982
Sedimentation Basin - 14

August 1982
Sedimentation Basin - 17

December 1982
Sedimentation Basin - 17

21. Coliform Bacteria (1/100 ml)

November 1981
West Edge Drain - 18

March 1982
East Edge Drain - 30

August 1982
#1 - too numerous to count
#14 - 8, Sed. Basin - too numerous to count, East Edge Drain - too numerous to count

December 1982
#1 - 4, #10 - 560, Sed. Basin - 140

TABLE B

Background Arithmetic Mean for Indicator Parameters
MID 048 090 633 - MID 000 724 831

well 1	Nov 81	Mar 82	Aug 82	Dec 82	Yearly Mean
OC	12.25	11.25	<1.0	<5.0	7.38
H	9.38	8.53	7.70	7.60	8.30
Spec. Cond.	450	510	650	575	546
OH	0.0083	0.0163	<0.005	<0.005	0.0087
Well 2					
OC	8.20	4.00	12.5	<5.0	7.43
pH	7.63	7.60	7.45	7.30	7.50
pec. Cond.	463	570	625	400	515
OH	0.015	0.0078	<0.005	<0.005	0.0082
Well 3					
OC	4.75	2.75	6.50	<5.0	4.75
pH	7.55	7.10	8.20	7.10	7.49
pec. Cond.	459	400	550	450	465
OH	0.0228	<0.005	<0.005	<0.005	0.0095
ell 4					
TOC	11.00	13.00	10.25	<5.0	9.81
H	9.50	11.50	9.90	10.30	10.30
pec. Cond.	280	1750	1050	1250	1083
OH	0.0185	0.0056	<0.005	0.021	0.0125
ell 5					
TOC	8.90	1.25	13.25	<5.0	7.10
H	8.30	8.70	7.40	7.15	7.89
pec. Cond.	466	475	600	325	467
TOH	0.017	0.010	<0.005	<0.005	0.0123
ell 6					
TOC	6.40	6.00	7.00	<5.0	6.10
H	9.83	8.60	8.70	8.10	8.81
Spec. Cond.	303	330	324	250	302
TOH	0.017	0.0065	<0.005	0.0198	0.0121
ell 7					
OC	10.80	12.00	9.75	58.25	22.70
H	10.70	10.40	9.30	9.30	9.93
Spec. Cond.	378	350	325	300	338
OH	0.0138	<0.005	<0.005	<0.005	0.0072

Figure F-103

Table B

Well 8	Nov 81	Mar 82	Aug 82	Dec 82	Yearly Mean
TOC	3.70	1.25	3.50	< 5.0	3.36
pH	8.90	8.60	8.40	8.00	8.48
Spec. Cond.	263	350	400	240	313
TOH	0.022	0.0075	< 0.005	0.0508	0.0213
Well 9					
TOC	10.50	5.50	8.25	< 5.0	7.31
pH	10.40	9.55	8.70	8.25	9.23
Spec. Cond.	250	270	300	250	268
TOH	0.0123	0.0143	< 0.005	0.010	0.0104
Well 10					
TOC	7.90	21.50	22.00	< 5.0	14.10
pH	11.58	10.70	8.00	8.20	9.62
Spec. Cond.	2025	500	250	250	756
TOH	0.0128	0.0098	< 0.005	< 0.005	0.0082
Well 11					
TOC	9.80	21.00	< 1.00	< 5.0	9.20
pH	11.05	10.90	8.00	7.90	9.46
Spec. Cond.	823	650	600	450	631
TOH	0.0113	0.0093	< 0.005	< 0.005	0.0077
Well 12					
TOC	6.40	65.50	2.50	< 5.0	19.85
pH	8.90	8.90	8.20	7.20	8.30
Spec. Cond.	285	305	550	350	373
TOH	0.0133	0.0068	< 0.005	0.0288	0.0135
Well 13					
TOC	10.05	190.0	25.75	< 5.0	57.70
pH	9.68	9.30	9.30	9.70	9.50
Spec. Cond.	240	225	300	200	241
TOH	0.0083	0.0063	< 0.005	< 0.005	0.0062
Well 14					
TOC	9.40	1.00	< 1.00	< 5.0	4.10
pH	9.10	9.28	9.45	10.88	9.68
Spec. Cond.	310	220	650	675	464
TOH	0.0078	0.0055	< 0.005	0.0523	0.0177

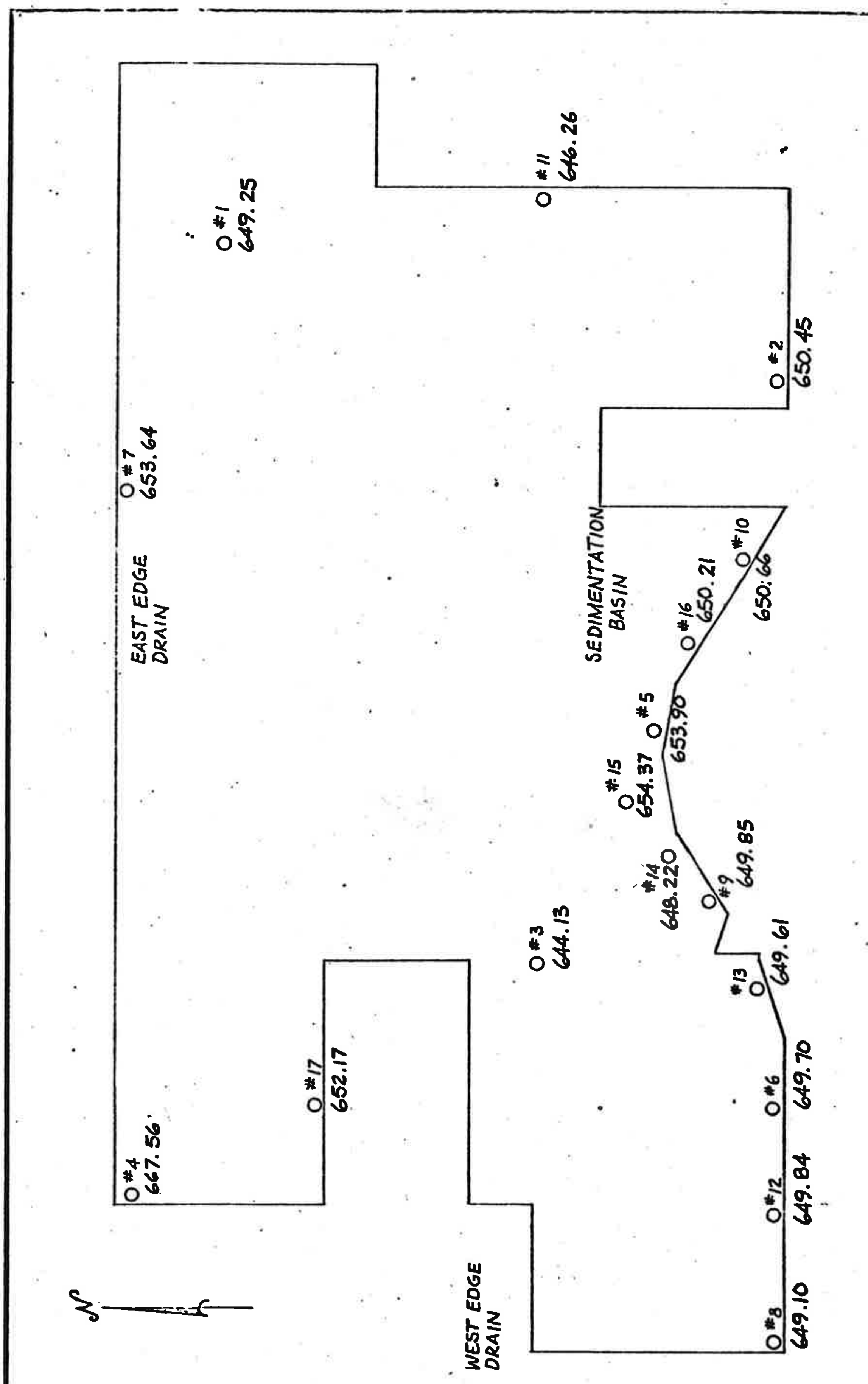
Figure F-104

Well 15	Nov 81	Mar 82	Aug 82	Dec 82	Yearly Mean
TOC	12.25	1.25	18.25	<5.0	9.19
pH	10.68	10.50	9.45	10.60	10.31
Spec. Cond.	359	420	445	450	419
TOH	0.0095	<0.005	<0.005	0.0068	0.0066

Well 16	Nov 81	Mar 82	Aug 82	Dec 82	Yearly Mean
TOC	13.50	1.75	<1.00	<5.0	5.31
pH	8.30	8.40	8.20	7.90	8.20
Spec. Cond.	333	360	450	350	373
TOH	0.008	<0.005	<0.005	<0.005	0.0058

Well 17	Nov 81	Mar 82	Aug 82	Dec 82	Yearly Mean
TOC	9.10	9.50	20.00	<5.0	10.90
pH	9.40	7.90	7.50	7.40	8.05
Spec. Cond.	225	425	500	425	394
TOH	<0.005	0.0055	<0.005	0.0173	0.0082

Figure F-105



TITLE WAYNE DISPOSAL SITE NO. 2 LANDFILL	DATE 12-16-81	MICHIGAN ENVIRONMENTAL CONSULTING CO.
SCALE 1" = 600'	SHEET OF	P.O. BOX 5187 - DEARBORN, MICHIGAN 48128
REVISIONS	DRAWN BY MAY	(313) 326-0200
STANDING WATER LEVELS 2-1-83	CHECKED BY	

Figure F-106

WAYNE DISPOSAL, INC.
POST OFFICE BOX 5187, DEARBORN, MICHIGAN 48128 • (313) 326-0200

August 10, 1983

U.S. Environmental Protection Agency
Waste Management Division
230 South Dearborn Street
Chicago, Illinois 60604

ATTN: Technical, Permits & Compliance Section

Re: Statistical Tests on Groundwater Results
Wayne Disposal Site #2, MID048090633
Michigan Disposal, Inc., MID000724831

This letter reports the results of statistical tests for significance on groundwater monitoring data for 1983. As described in our last letter of February 1, 1983, the Michigan Disposal Waste Processing Facility lies totally within the site and monitoring network of Wayne Disposal Site #2, and we have used data from this system for both facilities.

We have sampled ground water in February and May this year, and will again sample in August and November. Our semi-annual testing for indicator parameters was done in February, and will be done again this month.

Before discussing the results of this year's tests, we would like to address an omission in our last letter. That letter reported background arithmetic means for indicator parameters at each well but omitted the variance for all parameters at all wells:

Well No.	TOC	SC	pH	TOX
1	23.58	5,912	0.549	36.78
2	13.39	8,336	0.014	19.36
3	2.73	3,152	0.217	68.26
4	11.23	298,313	0.597	59.20
5	22.68	10,149	0.431	126.76
6	3.45	1,064	0.391	51.13
7	453.70	886	0.429	17.10
8	2.66	4,490	0.114	350.73
9	6.12	447	0.725	18.65
10	65.37	583,958	2.568	27.00
11	60.16	19,006	2.445	11.72
12	748.32	11,807	0.517	98.93
13	6,313.07	1,472	0.041	3.58

-continued-

Well No.	TOC	SC	pH	TOX
14	12.86	43,298	0.530	429.98
15	46.03	1,439	0.266	5.60
16	26.50	2,220	0.037	4.33
17	33.94	11,125	0.685	30.43

Groundwater data has been analyzed in accordance with 40 CFR 265.93 (b). Of 68 comparisons of February 1983 data to background using the Student's t-test at the 0.01 level of significance, fourteen statistical tests qualified as "significant." The fourteen significant results are as follows:

Upgradient Wells

Well #4 - pH, Well #7 - pH, Well #11 - pH.

Downgradient Wells

Well #2 - pH, Well #5 - pH, Well #6 - pH,
Well #6 - Specific Conductivity, Well #8 - TOC,.
Well #10 - pH, Well #13 - pH, Well #13 - TOX,
Well #14 - pH, Well #15 - TOX, Well #16 - pH.

The first impression upon reviewing this data is the prevalence of significant pH results. Ten of the fourteen significant results are for pH. When these results were obtained throughout the site, both upgradient and downgradient, only 90 days after completion of the background monitoring period, we began to search for an explanation.

An examination of our groundwater data already in your files will indicate great variability in its character, even at a single sampling station. The background variances reported earlier in this letter attest to this. Concerning pH, values have ranged from 7.1 to 11.6 at our site, with many wells exhibiting pH ranges of 2 units or more.

Two different sampling methodologies were utilized during the background period. Air displacement was used during November 1981 and March 1982, while a dedicated, submersible pump system was used for the last two quarters and all following quarters. One possible explanation for 10 significant pH results in February 1983 was that pH had been affected by the sampling methods used. The effect has been documented often in related literature. However, examination of the data has shown that pH is now higher for some wells than when measured after sampling with air displacement, pH is lower for other wells, and still other wells are unaffected.

Another interesting result was the significance in TOC at Well #8. Due to changing detection limits at the laboratory, less than 1 mg/liter at times and less than 5 mg/liter at other times, we found that our newly established detection limit, for consistency's sake, at 5 mg/liter would always yield a significant result. Such results and the inability of the Student's t-test to take into account concentrations which were below detection limits caused us to suspect a problem with the test itself.

It is our experience that a measured pH as little as 0.2 different from the background mean will yield a significant result. Further, if the test was applied to each portion of the background data, many of the individual concentrations measured would be found significant.

Our statistical analysis was performed in March, and it lead to an abbreviated sampling program in April 1983, involving only those 4 wells with significant, non-pH test results. The results are as follows:

Downgradient Wells

Well #6 - pH, Well #8 - pH, Well #13 - TOX.

Significance at Well #13 for TOX was repeated.

A second investigation made during the April 1983 sampling involved pH measurement in the field immediately after sampling, at our site laboratory sometime later and as measured by our analytical laboratory. The following results were obtained:

Well #6

Sampled at 2:30
pH=10.1 at 2:35 (field)
pH=10.0 at 3:05 (our lab)
pH= 9.9 in lab report

Well #8

Sampled at 1:30
pH=9.75 at 1:35 (field)
pH=9.7 at 3:05 (our lab)
pH=10.0 in lab report

Well #13

Sampled at 3:25
pH=9.45 at 3:40 (field)
pH=9.6 at 3:55 (our lab)
pH=9.6 in lab report

Well #15

Sampled at 2:15
pH=10.7 at 2:20 (field)
pH=10.8 at 2:35 (our lab)
pH=10.7 in lab report

Of interest here is that while samples from all wells were handled identically, pH remained relatively constant for two samples, while rising for one sample and falling for another. No conclusions could be made concerning time effects in pH measurement.

Groundwater was again sampled in May and June this year; however, TOX was not included in the list of parameters last quarter since we planned to analyze for TOX semi-annually in

February and August. Again the Student's t-test was used at the 0.01 level of significance. The results were as follows:

Upgradient Wells

Well #4 - pH, Well #4 - Specific Conductivity

Downgradient Wells

Well #2 - pH, Well #5 - pH, Well #8 - pH,
Well #13 - pH, Well #14 - pH, Well #15 - pH,
Well #16 - pH.

Again, none of the results of the statistical analysis of groundwater data has been previously reported to EPA. We have delayed this report because of our efforts to examine our sampling methods, and to better understand the Students t-test. The vast majority of significant test results have concerned pH concentrations. For reasons previously discussed, we believe that the test is too sensitive or that it is not properly designed to make conclusions about our pH results. Our pH measurements at the site are highly variable.

It has come to our attention that the agency is reassessing the use of the Student's t-test in its present form by hazardous waste facilities. We understand that virtually all sites are reporting statistically significant groundwater results. Further, it was reported in the July 20, 1983 issue of Pesticide & Toxic Chemical News that all 52 RCRA facilities selected by EPA for statistical analysis by an independent contractor reported statistically significant impacts for at least one indicator parameter.

Excluding our problems with pH significance, only one parameter at one well was found to be significant and subsequently confirmed: Well #13 - TOX. We are sampling our wells this week and will have another TOX result for Well #13 shortly.

We are presently preparing our Part B permit application and have retained the firm of Neyer, Tiseo & Hindo, Ltd. to assist us with the requirements of Subpart F. A portion of their work deals with the results of interim status monitoring. We refer you to this part of our application, to be submitted shortly, for a more detailed discussion of groundwater monitoring results.

We are interested of course in any changes the agency may make in this area. We believe some changes are needed and would be happy to describe our experience further with the EPA, in the interest of forumlating such changes. We will promptly inform you of any significant results from this month's sampling. If you have any questions, please don't hesitate to call.

Sincerely,

WAYNE DISPOSAL, INC.

Mark A. Young

Mark A. Young, P.E.

Figure F-110

WAYNE DISPOSAL, INC.
POST OFFICE BOX 5187, DEARBORN, MICHIGAN 48128 • (313) 326-0200

Groundwater Sampling & Analysis Plan
Wayne Disposal Site #2

Equipment

At Wayne Disposal Site #2, we employ the "Well Wizard" system of dedicated pumps. This means each well has a submersible pump within it. The control unit and compressor are the other components which complete this system. The system was manufactured by QED of Ann Arbor. Problems with equipment should be drawn to the attention of Mark Young, Don Vilnius of Dave Dickinson at QED, (313) 995-2547.

Sample bottles are obtained from the testing laboratory, which at this time is Canton Analytical Laboratory in Ypsilanti, (313) 483-7430. Our contact at the lab is Mr. Peter Rekshan.

The chemical parameters being tested for at each of the vanious sampling points for each monitoring period of 1983 are included in this plan as attachment A. Since we do not filter groundwater samples, nitric acid preservative (HNO_3) should not be added to the empty sample bottles for metals prior to sampling. This preservative should be requested and added after filtering at the laboratory.

For recordkeeping, two items are required. A small notebook is maintained on-site in which all pertinent monitoring well data are noted. These items include name of sampler, date, time, sampling point, static water level, calculations for determining purging time of the well pump prior to sampling, results of any field tests and any other special conditions of the sample or sampling environment. This notebook is kept in the files at the manifest check-in trailer.

Also required for recordkeeping is a blank copy of the "Field Sampling Report & Chain of Custody Record" for each point to be sampled. A copy of this sheet is included as Attachment B. This sheet must be filled out fully. When samples are surrenderred at the laboratory, each sheet must be signed by the person transporting the samples to the lab, and by a representative of the lab. The laboratory will copy each sheet for us and keep the originals. The copies should be forwarded directly to Mark Young at the office.

Other equipment you will need includes coolers and ice, electric water level probe, a measuring tape, keys for well entry, the Well Wizard control unit and compressor and clock or watch.

Figure F-111

Standing Water Level

Before any water is removed from the wells, the depth to standing water must be determined for all wells. It is necessary that this be accompleshed on one day, due to barometric pressure effects on the water levels. The depth to standing water is always measured from the top of casing or TOC. The top of the well casing is exposed by removing the well head. Removing the well head is necessary when measuring the depth to standing water with the electric water level probe, but not needed if only the Well Wizard static water level measurement system is used. At present and until further notice, we will continue to measure water level depth with both methods.

When using the electric probe, make certain that the probe tip is cleaned with distilled water and a clean rag, followed by a distilled water rinse. This prevents cross contamination between wells. Lower the electrode into the casing slowly while watching the needle. Carefully determine the water level by raising and lowering the probe at the water surface, by watching the needle. Méasure the distance from the point on the cable at TOC to the nearest gold clip on the cable within the well to the nearest 0.01 foot. Refer to chart included as attachment C to get the corrected depth to the clip, and add your measurement to top of casing. Record this depth in our notebook.

The well head is not removed for the Well Wizard water level measurement. Follow the instructions given in the Well Wizard operating manual included as Attachment D. Note the depth to groundwater written inside the well head cap. This corresponds to a reading of 25.0 inches on the large pressure gauge. If your reading is less than 25.0 inches, then the standing water level is below the water level depth recorded in the well head cap. If greater that 25.0 inches, then the water level is above the calibrated water level depth. Compute the difference between your reading (to the nearest ¼ inch) and 25.0, simply add or subtract this difference to the water level depth indicated in the well head cap, as descrebed in Attachment D. Record your calculations and computed water level for submittal to the main office.

Well Purging

Before purging a well, it is necessary to determine the amount of water standing in the well. This is done by subtracting the depth to the standing water level from the depth to the well screen. The depth to the well screen for each well is listed on Attachment E. With this amount of water, refer to Attachment F. The depth to the well screen is used in the graph to determine D_T. The number of standing volumes to be purged, V, is always three according to Michigan regulations. Compute the total purge time using the formula on Attachment F. Again record all calculations in the notebook. Now using the procedure for pump operation in Attachment D, purge the well for the duration you have computed.

In a number of cases, the pumping may cease before the purging period is complete. This is due to very slow recharge of groundwater to some of our wells. If this occurs, cease work on this well and return in 2 to 3 days. Note such occurrances in your well sampling record book. Michigan regulations permit immediate sampling of such a well when you return.

Sample Collection & Preservation

Upon completion of the purge period or return to well which has run dry during previous purging, you are ready to sample the water. Make sure each sample bottle for a given point has a label which contains our facility name, the sampling point, the date and the samplers initials. If a preservative has been included by the lab, such a note should be shown on the label.

Fill each bottle to the very top and allow minimal headspace (air bubbles when capped and tipped). No headspace is permitted in the small glass volatile organics sample bottles. This may require several attempts but it can and must be done. Make certain not to touch the inside of bottle necks or caps. Record the samples taken and the sampling time on the Chain of Custody sheet.

When all bottles are filled, place them in a cooler with ice and transport them back to the manifest check-in trailer for storage in the refrigerator before beginning work on the next well.

Remember, keep the samples cold at all times and request nitric acid preservative (HNO_3) after filtering at the lab when the samples are surrenderred. Sample preservation guidelines for the laboratory (and sampling) are shown on Attachment G.

Sample Shipment & Chain of Custody

At the close of the day, place all samples in coolers, ice them down thoroughly and transport them to the laboratory. Take along all chain of custody sheets prepared through the day. As described earlier, sign and date all forms at the lab, and have a lab representative do the same. Obtain capies of these forms and forward them to the main office. A copy of Canton Analytical chain of custody procedures is included as Attachment H.

Analytical Procedures

The analytical procedures employed by Canton Analytical Laboratory are listed in the sheets included as Attachment I.

If you have any question concerning groundwater sampling, please contact Mark Young at the main office.

FEBRUARY 1983

Wells #1-17, East Edge Drain, West Edge Drain, Sed. Basin

Cholride
Sulfate
Bicarbonate
Iron
Spec. Cond (4)
Magnesium
Calcium
Sodium
COD
TOC (4)
pH (4)
Total Organic Halogen (4)
Chromium, hexavalent
Cyanide, oxidizable
Cyanide, total
Copper
Zinc

#6, 7, 13, 15, and 16

Xylene
Formaldehyde
Methyl Ethyl Ketone
Methylene Dichloride
Toluene
1,1,1-Trichloroethane

Sed. Basin Only

Chromium, total
Lead
Cadmium

MAY 1983

Wells #1-17, East Edge Drain, West Edge Drain, Sed. Basin

Chloride
Sulfate
Bicarbonate
Iron
Spec. Cond. (4)
Magnesium
Calcium
Sodium
COD
TOC (4)
Chromium, hexavalent
Cyanide, oxidizable
Cyanide, total
Copper
Zinc

#6, 7, 13, 15, and 16

Xylene
Formaldehyde
Methyl Ethyl Ketone
Methylene Dichloride
Toluene
1,1,1-Trichloroethane

Sed. Basin Only

pH (4)
Chromium, total
Lead
Cadmium

AUGUST 1983

Wells #1-17, East Edge Drain, West Edge Drain, Sed. Basin

Chloride
Sulfate
Bicarbonate
Iron
Spec. Cond. (4)
Total Chromium
Magnesium
Calcium
Sodium
COD
TOC (4)
Total Lead
pH (4)
Phenols
Nitrate Nitrogen
Ammonia Nitrogen
Total Cadmium
Barium
Fluoride
Mercury
Selenium
Silver
Manganese
Copper
Cyanide, oxidizable
Total Organic Halogen (4)

Sed Basin Only

Chromium, hexavalent

NOVEMBER 1983

Wells #1-17, East Edge Drain, West Edge Drain, Sed. Basin

Chloride
Sulfate
Bicarbonate
Iron
Spec. Cond. (4)
Magnesium
Calcium
Sodium
COD
TOC (4)
Cyanide, oxidizable

#6, 7, 13, 15, and 16

Xylene
Formaldehyde
Methyl Ethyl Ketone
Methylene Dichloride
Toluene
1,1,1-Trichloroethane

Sed Basin Only

pH (4)
Chromium, total
Chromium, hexavalent
Lead
Cadmium

CAL

CANTON ANALYTICAL LABORATORY 153 Eddy Street Ypsilanti MI 48197 Phone 313 483-7430

FIELD SAMPLING REPORT & CHAIN OF CUSTODY RECORD

Customer: WAYNE Disposal

Plant Location: Belleville

Site Description: Well #9

Date: 8/11/82

Sample	Quantity	Time	By	Comments
1	2 l	9:30	JSC	UNP
2	1/2 l	9:35	JSC	UNP
3	1/2 l	9:36	JSC	H_2SO_4
4	1/2 l	9:37	JSC	HNO_3
5	1/2 l	9:38	JSC	TOX
6	150 ml	9:39	JSC	UNP (coliform)
7	100 ml	9:40	JSC	NaOH
8				
9				
10				
11				
12				
Composite				

Dispached By:	Date	Time	Received at Lab By:	Date	Time
[signature]	8/11/82	4:00PM	Carol Sanford	8/11/82	4:00PM
Method of Shipment: Cooler transport to lab.					
Relinquished By: Signature			Received By: Signature		
Relinquished By: Signature			Received By: Signature		
Relinquished By: Signature			Received By: Signature		

ANALYSIS OF FOOD AND WATER

Figure F-119

CAL

CANTON ANALYTICAL LABORATORY 1539 [illegible] Street Ypsilanti, MI 48197 Phone 313-483-7430

FIELD SAMPLING REPORT & CHAIN OF CUSTODY RECORD

Customer: WAYNE DISPOSAL

Plant Location: BELLEVILLE

Site Description: WAYNE DISPOSAL WELL # 6

Date: 5/10/83

Sample	Quantity	Time	By	Comments
1		3:28	JC	CHLORIDES SULFATES ETC.
2	FILL	3:32	JC	H_2SO_4
3	IN	3:35	JC	CN
4	FULLY !	3:38	JC	METALS
5		3:41	JC	FORMALDEHYDE
6		3:44	JC	VOLATILES
7				
8				
9				
10				
11				
12				
Composite				

Dispached By:	Date	Time	Received at Lab By:	Date	Time
Jeff Gurinn	5/10/83	4:25	Carol Sanford	5/10/83	4:25
Method of Shipment: Cooler transport to lab.					
Relinquished By: Signature			Received By: Signature		
Relinquished By: Signature			Received By: Signature		
Relinquished By: Signature			Received By: Signature		

ANALYSIS OF FOOD AND WATER

CONVERSIONS FOR ELECTRIC WATER LEVEL PROBE

SUPPOSED LENGTH	CLIP MARKING	CUMULATIVE ACTUAL LENGTH
5'	Blank	5.04
10'	1	10.01
15'	Blank	14.99
20'	2	19.90
25'	Blank	24.84
30'	3	29.81
35'	Blank	34.76
40'	4	39.72
45'	Blank	44.68
50'	5	50.23
55'	Blank	55.18
60'	6	60.15
65'	Blank	65.08
70'	7	70.06
75'	Blank	75.02
80'	8	79.97
85'	Blank	84.93
90'	9	89.89
95'	Blank	94.89
100'	10	100.44

Figure F-121

MODEL 3Ø12 AUTOMATIC CONTROLLER

DESCRIPTION

The Model 3Ø12 automatic controller both controls operation of the Well Wizard pump and measures static head level. When connected to an appropriate compressed gas source, the Model 3Ø12 controller alternately pressurizes, then vents the air supply line to the pump. The unit is pneumatically operated and requires no electrical power supply. The duration of the pressurization and vent cycles can be adjusted to optimize the pumping rate.

Figure 1 shows the control panel of the Model 3Ø12 automatic controller and identifies the components.

It is recommended that the compressed gas source be of high quality, such as breathing quality air or from an oilless compressor of the type offered in the Well Wizard product line.

WARNING: Pressure applied to the controller must not exceed 125 psig. Higher pressures may create hazardous conditions, and will void system warranties.

OPERATING INSTRUCTIONS

A. WELL PURGING AND SAMPLING

1. Attach the compressed gas source to the long quick-connect nipple labeled Pump Pressure Inlet on the face of the controller panel (See Figure 1), using female portion of coupling supplied.

2. Connect either end of the yellow, self-coiling controller air hose to the short brass quick-connect nipple labeled Pump Supply on the right side of the control panel (See Figure 1). Connect the other end of the controller air hose to the same type of quick-connect nipple located in the well cap assembly.

3. To begin operation of the Well Wizard pump, actuate the supply of compressed gas connected to the controller block. Five to fifteen pumping cycles are required to purge the air from the pump and tubing. Full water flow from the sample supply tube should then begin.

4. To reduce the water flow rate during sample collection, turn the throttle control on the left side of the control panel in the counterclockwise direction (See Figure 1) For increased flow rate during well purging, turn the throttle control clockwise.

5. The refill and discharge control knobs as shipped should

be in proper position (12 o'clock as shown in Figure 2) for average well depths with refill and discharge cycle times of 6 to 8 seconds each. To optimize pumping efficiency for a specific well depth, the following three-step procedure can be followed:

a. Adjust the refill and discharge cycles to 10-15 seconds each. Measure the water volume discharged in a single discharge cycle.

b. Shorten the discharge cycle period (by counter-clockwise knob adjustment) until the end of the discharge cycle just begins to coincide with the end of water flow from the Well Wizard pump outlet tube.

c. Shorten the refill cycle period until the water volume per discharge cycle decreases 10-25% from the maximum value measured in Step a.

6. Operating guidelines

a. Deeper wells require both the refill and discharge cycles to be lengthened, by turning the control knobs clockwise up to one-quarter turn.

b. The compressed gas source is applied to the Well Wizard pump to discharge water during the discharge cycle. The pump is vented to atmosphere to refill during the refill cycle.

c. Equal length refill and discharge cycles are generally desirable.

d. If the controller does not sound as if it is alternating between cycles (pressurizing and venting), the control knobs are adjusted for excessively long cycle times, and should be adjusted counterclockwise.

e. The full range of usefull refill and discharge cycle lengths is 3 to 15 seconds each.

f. Higher compressed gas pressure levels provide higher pumping rates. Lower compressed gas pressure levels pump more water per unit volume of gas.

g. The volume of water pumped per cycle should be approximately 300-350 ml. If the pumping rate is unsatisfactory, and the volume per cycle is below 300 ml, recheck the cycle lengths according to the three-step procedure. If the pumping rate is still unsatisfactory, check all air fitting connections for leaks.

7. Maintenance

No regular maintenance of the controller is required, except for periodically draining water from the internal accumulator filter bowl. The bowl is drained by depressing the valve button at the upper left corner of the control panel as shown in Figure 1. It is recommended that the bowl be drained after every 8 hours of controller operation, especially in humid conditions. The button should be held down for five seconds while the controller is operating.

B. STATIC HEAD LEVEL MEASUREMENT

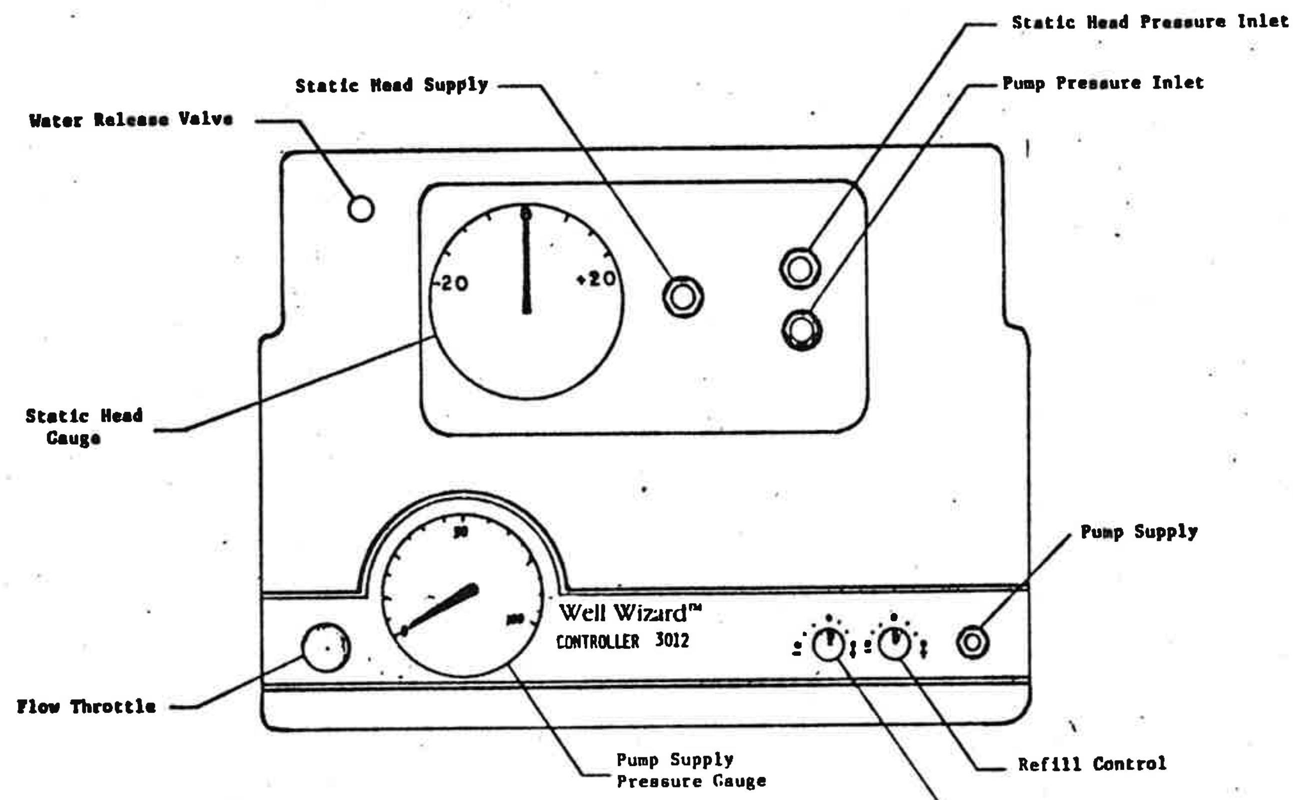
To determine the static head (standing water level) in well, perform the following sequence:

1. Connect the compressor air hose to the "Static Head Pressure Inlet" quick-connect fitting on the control panel. (See Figure 1).

2. Connect one end of the clear, PVC static head tubing to the "Static Head Air Supply" fitting on the control panel, and the other end to the static head tube stub in the well cap. (See Figure 3).

3. Start the compressor by connecting it to its 12 VDC power supply, then observe the static head gauge. Record the gauge reading after it steadies. The reading is either subtracted from or added to the original water level of the well, as recorded on the inside of the well cap cover.

FIGURE 1

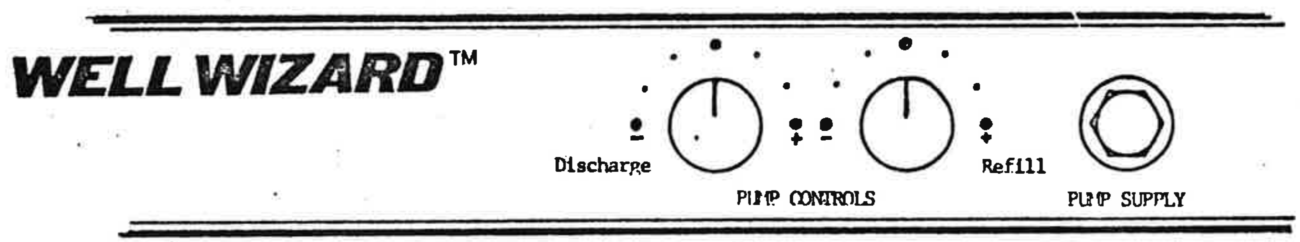


Q.E.D. CORPORATION a subsidiary of environmental dynamics, Inc.

TITLE CONTROL PANEL DIAGRAM WELL WIZARD MODEL 3012 CONTROLLER			
SIZE A	DATE 4-4-83	DWG NO.	REV.
SCALE: N.T.S.		SHEET OF	

Figure F-127

FIGURE 2



NOTE:

1. Pump Discharge and Refill cycle periods are increased by clockwise adjustment, maximum ¼ turn from position shown above

2. Pump Discharge and Refill cycle periods are decreased by counter clockwise adjustment, maximum ¼ turn from position shown above

Q.E.D. CORPORATION a subsidiary of environmental dynamics, inc.

TITLE
PUMP CONTROL
ADJUSTMENT DIAGRAM
WELL WIZARD AUTOMATIC CONTROLLERS

SIZE	DATE	DWG NO.	REV.
A	4-4-83		

SCALE: N.T.S. SHEET OF

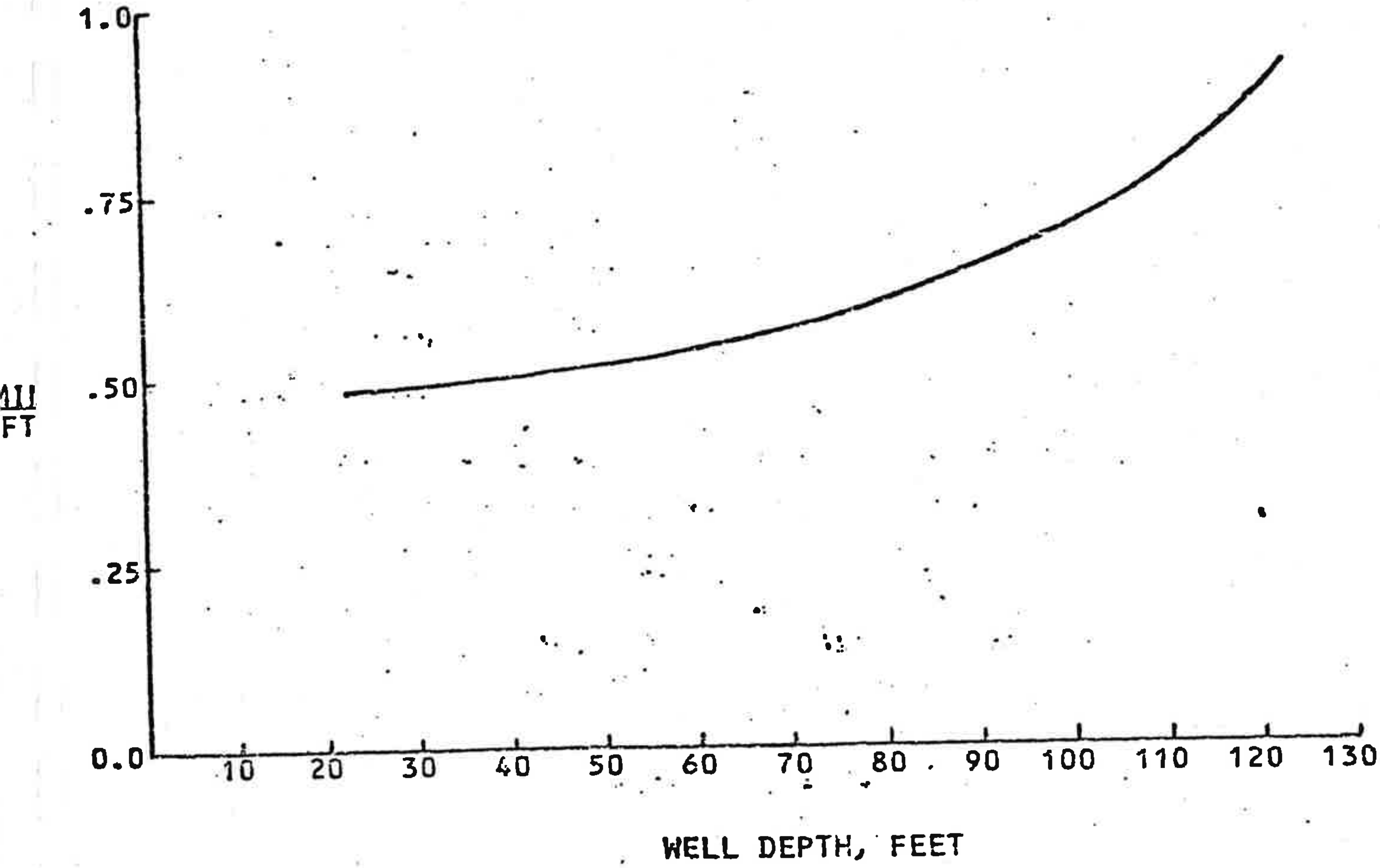
Figure F-128

Depth to Well Screens
Wayne Disposal Site #2 Landfill

Well Number	Depth to Screen (feet)
1	125
2	110
3	124
4	69
5	93
6	75
7	69
8	75
9	86
10	85
11	85
12	82
13	81
14	97
15	82
16	98
17	80

Q.E.D. environmental systems inc.

TIME PER FOOT WATER
DEPTH REMOVAL
VS
WELL DEPTH



PURGE CALCULATION

$T = D_T \times D_S \times V$

T = TOTAL PURGE TIME IN MINUTES

D_T = MIN/FT FOR GIVEN WELL DEPTH (FROM GRAPH)

D_S = DEPTH OF STANDING WATER IN FEET

V = NUMBER OF STANDING VOLUMES TO BE PURGED = 3

1254 N. Main St. • P.O. Box 7209 • Ann Arbor, Michigan 48107 • (313) 995-2547

SAMPLE PRESERVATION

CANTON ANALYTICAL LABORATORY

Parameter	Minimum Required Sample Volume (ml)	U.S. EPA Recommended Preservation Method	Container Type	U.S. EPA Recommended Holding Type
Zinc (Zn)	100	HNO_3 to pH < 2	glass or plastic	6 months
Copper (Cu)	100	HNO_3 to pH < 2	glass or plastic	6 months
Nickel (Ni)	100	HNO_3 to pH < 2	glass or plastic	6 months
Total Chromium (Cr)	100	HNO_3 to pH < 2	glass or plastic	6 months
Cyanide (CN)	500	NaOH to pH > 12	glass or plastic	14 days 24 hrs when sulfide is presnet
Lead (Pb)	100	HNO_3 to pH < 2	glass or plastic	6 months
Cadmium (Cd)	100	HNO_3 to pH < 2	glass or plastic	6 months
Mercury (Hg)	100	HNO_3 to pH < 2	glass or plastic	28 days
Arsenic (As)	100	HNO_3 to pH < 2	glass or plastic	6 months
Selenium (Se)	100	HNO_3 to pH < 2	glass or plastic	6 months
Silver (Ag)	100	HNO_3 to pH < 2	glass or plastic	6 months
Volatile Chlorinated Halocarbon Scan	40	Cool, 4^oC 0.008% $Na_2S_2O_3$	glass, teflon-lined septums	14 days
Phenolic Scan	1,000	Cool, 4^oC 0.008% $Na_2S_2O_3$, H_2SO_4 to pH < 2	glass, teflon-lined cap	7 days until extraction 40 days after extraction
Chemical Oxygen Demand (COD)	50	Cool, 4^oC H_2SO_4 to pH < 2	glass or plastic	28 days
Total Organic Carbon (IOC)	25	Cool, 4^oC H_2SO_4 to pH < 2	glass or plastic	28 days
Pthalate Ester Scan	1,000	Cool, 4^oC	glass, teflon-lined cap	7 days until extraction 40 days after extraction

Figure F-131

SAMPLE PRESERVATION

CANTON ANALYTICAL LABORATORY

Parameter	Minimum Required Sample Volume (ml)	U.S. EPA Recommended Preservation Method	Container Type	U.S. EPA Recommended Holding Time
Physical Properties				
Conductance	100	cool, 4^oC	glass or plastic	24 hours
Hardness	100	cool, 4^oC HNO_3 to pH < 2	glass or plastic	6 months
pH	25	determine on site; none	glass or plastic	2 hours
Metals				
Dissolved	200	fiter on site HNO_3 to pH < 2	glass or plastic	6 months
Suspended	200	filter on site	glass or plastic	6 months
Total	100	HNO_3 to pH < 2	glass or plastic	6 months
Mercury, dissolved	100	filter on site HNO_3 to pH < 2	glass or plastic	28 days
Mercury, total	100	HNO_3 to pH < 2	glass or plastic	28 days
Inorganics				
Chloride	50	none required	glass or plastic	28 days
Cyanides	500	cool, 4^oC NaOH to pH>12; 0.008% $Na_2S_2O_3$	glass or plastic	14 days
Fluoride	300	none	plastic	28 days
Nitrogen, Ammonia	400	cool, 4^oC H_2SO_4 to pH <2	plastic or glass	28 days
Nitrogen, Nitrate	100	cool, 4^oC	plastic or glass	48 hours
Nitrogen, Nitrite	50	cool, 4^oC	plastic or glass	48 hours
Sulfate	50	cool, 4^oC	plastic or glass	28 days

Figure F-132

Parameter	Minimum Required Sample Volume (ml)	U.S. EPA Recommended Preservation Method	Container Type	U.S. EPA Recommended Holding Time
Organics				
COD	50	cool, 4°C H_2SO_4 to pH <2	plastic or glass	28 days
TOC	25	cool, 4°C H_2SO_4 to pH<2	plastic or glass	28 days
Phenolics	500	cool, 4°C H_2SO_4 to pH <2	glass	28 days
TOX	250	cool, 4°C No headspace	glass or plastic	14 days
Chlorinated Organics		cool, 4°C 0.008% $Na_2S_2O_3$	glass, teflon-lined cap	7 days (until extracted) 30 days (after extracted)
Extractables (including phthalates, nitrosamines, organochlorine pesticides, PCB, nitroaromatics, isophorne, polynuclear aromatic hydrocarbons, haloethers, chlorinated hydrocarbons and TCDD)	1000	cool, 4°C 0.008% $Na_2S_2O_3$	glass, teflon-lined cap	7 days (until extracted) 30 days (after extracted)
Extractables, Phenols	1000	cool, 4°C 0.008% $Na_2S_2O_3$	glass, teflon-lined cap	7 days (until extracted) 30 days (after extracted)
Purgeables (halocarbons & aromatics)		cool, 4°C 0.008% $Na_2S_2O_3$	glass, teflon-lined septum	14 days
Radiological				
Gross Alpha		HNO_3 to pH < 2	glass or plastic	6 months
Gross Beta		HNO_3 to pH < 2	glass or plastic	6 months
Bacteriological				
Total Coliform	10	cool, 4°C	glass or plastic	6 hours

I. Chain of Custody Procedure

A. Indroduction

The protocal developed by the USEPA (part I-F) has been used as the framework for developing this procedure. Its purpose is to provide an accurate written record which can be used to trace the possession and handling of the sample(s) from collection through analysis and introduction as evidence.

A sample is in someone's "custody" if:

1.) It is in one's actual physical possession, or

2.) It is in one's view, after being in one's physical possession, or

3.) It is in one's physical possession and then locked up so that no one can tamper with it, or

4.) It is kept in a secured area restricted to authorized personnel only.

B. Sample Collection, Handling and Identification

A minimum number of people will be involved in sample collection and handling. In most instances this will include the sample collector(s), the sample custodian and the analyst(s).

A Field Sampling Report and Chain of Custody Record (Exhibit I) will be completed at the time of sample collection by the sample collector(s).

All records and labels (Exhibit II) will be filled out legibly in ink.

C. Transfer of Custody

Samples and records will be kept in 'custody' as described above. When transfering the possession of the sample(s), the transferee must sign and record the date and time on the Chain of Custody Record. Every person who takes custody must fill in the appropriate section of the Chain of Custody Record.

All samples sent to the laboratory must be accompanied by the Chain of Custody Record and other pertinent forms. A copy of the forms should be retained by the originator (either carbon or photo copy).

Shipping receipts are retained as part of the permanent chain of custody documentation.

CAL

CANTON ANALYTICAL LABORATORY · 153 Elder Street · Ypsilanti MI 48197 · Phone 313-483-7430

FIELD SAMPLING REPORT
&
CHAIN OF CUSTODY RECORD

Customer: WAYNE Disposal

Plant Location: Belleville

Site Description: Well #9

Date: 8/11/82

Sample	Quantity	Time	By	Comments
1	2 l	9:30	JSC	UNP
2	½ l	9:35	JSC	UNP
3	½ l	9:36	JSC	H_2SO_4
4	½ l	9:37	JSC	HNO_3
5	½ l	9:38	JSC	TOX
6	150 ml	9:39	JSC	UNP (coliform)
7	100 ml	9:40	JSC	NaOH
8				
9				
10				
11				
12				
Composite				

Dispached By:	Date	Time	Received at Lab By:	Date	Time
Jeffrey S. Clark	8/11/82	4:00PM	Carol Sanford	8/11/82	4:00 PM
Method of Shipment: Cooler transport to lab.					
Relinquished By: Signature			Received By: Signature		
Relinquished By: Signature			Received By: Signature		
Relinquished By: Signature			Received By: Signature		

CAL

CANTON ANALYTICAL LABORATORY

Environmental Analysis

153 Elder Street / Ypsilanti, MI 48197 2300 Dixie Hwy. / Pontiac, MI 48055

Lab No.	Date	Time
Client Name		Grab
Sample Point		Comp.

Parameters

Remarks/Preserv.

Sampler: ____________

EXHIBTT J1

I. Chain of Custody Procedure Cont'd

D. Laboratory Custody Procedure

Carol Sanford is the designated COC Custodian and Lynne Riley is the alternate designated to act as custodian in the custodian's absence. All incoming samples are received by the custodian who indicates receipt by signing the accompanying custody forms and retains the signed forms as permanent records.

Permanent log books are maintained by the custodian for each and every sample.

All chain of custody records and samples are kept under lock and the keys are kept by the COC Custodian. The custodian shall see that samples are properly stored and maintained prior to analysis.

Distribution of samples to the analysts will be made only by the custodian. To remove samples from storage, the analyst must sign for the samples on the Chain of Custody log sheet (Exhibit III). The sample log sheet will be maintaind by the custodian. Chain of custody samples must be returned to the custodian and to secured storage at the end of each day or when analyses are completed.

Analysts must maintain sample custody as described in the introduction above.
All analytical work is recorded in chain of custody log books. The books are distributed to the analyst(s) by the custodian. The log books must be returned to the custodian and to the secured file at the end of each day or when analyses are completed. The unused portion of samples will be retained under 'custody' until destroyed or returned to the client. All laboratory records will be retained in the locked chain of custody file.

E. Laboratory Security

All laboratory doors will be kept locked to assure access to CAL employees only or non-employees accompanied by a CAL employee.

CHAIN-OF-CUSTODY SAMPLE LOG SHEET

Project Number	Sample Numbers	Signature of Analyst Responsible for Samples	Date	Time Out	Time In

Exihibit III

CAL

4. ANALYTICAL METHODS AND REFERENCES

CANTON ANALYTICAL LABORATORY

Parameter		Detection Limits	References Test Methods
Chloride (Cl^-)	Argentometric Method	5. mg/1	(1) 407 A
Sulfate (SO_4)	Turbidimetric Method	1. mg/1	(1) 426 C
Turbidity	Nepthelometric	0.1 NTU	(2) 180.1
Iron (Fe)	Digestion followed by Atomic Absorption	0.02 mg/1	(2) 236.1
Specific Conductance	Wheatstone Bridge Conductance Meter	0.1 umhos/cm	(2) 120.1
pH	Electrometric	0.1 S.U.	(2) 150.1
Manganese (Mn)	Digestion followed by Atomic Absorption	0.01 mg/1	(2) 243.1
Calcium (Ca)	Digestion followed by Atomic Absorption	0.1 mg/1	(2) 215.1
Sodium (Na)	Digestion followed by Atomic Absorption	0.1 mg/1	(2) 273.1
C.O.D.	Distillation followed by Titration	1. mg/1	(2) 410.1.2.3
T.O.C.	Combustion	1. mg/1	(2) 415.1
Nitrate-N (NO_3)	Colorimetric, cadmium reduction	0.1 mg/1	(2) 353.1
Fluoride (F^-)	Potentiometric	0:01mg/1	(1) 393
Phenols	Spectrophotometer, MBTH with distillation	0.002 mg/1	(2) 420.3
Chromium, total (Cr)	Digestion followed by Atomic Absorption	0.02 mg/1	(2) 218.1
Lead (Pb)	Digestion followed by Atomic Absorption	0.05 mg/1	(2) 239.1
Cadmium (Cd)	Digestion followed by Atomic Absorption	0.01 mg 1	(2) 213.1
Total Coliform	Membrane Counter	1 c/100ml	(1) 806
Barium (Ba)	Digestion followed by Atomic Absorption	0.1 mg/1	(2)208.1
Mercury (Hg)	Cold Vapor followed by Atomic Absorption	0.001 mg/1	(2) 245.1
Selenium (Se)	Hydride; followed by Atomic Absorption	0.001 mg/1	(2) 270.3
Silver (Ag)	Digestion followed by Atomic Absorption	0.01 mg/1	(2) 272.1

ANALYTICAL METHODS AND REFERENCES

CANTON ANALYTICAL LABORATORY

Parameter	Method	Detection Limit	Percent Recovery	Reference Test Meth.
Zinc (Zn)	Digestion followed by Atomic Absorption	0.01 mg/1	100	(1) 289.1
Copper (Cu)	Digestion followed by Atomic Absorption	0.01 mg/1	99	(1) 220.1
Nickel (Ni)	Digestion followed by Atomic Absorption	0.02 mg/1	99	(1) 218.1
Total Chromium (Cr)	Digestion followed by Atomic Absorption	0.02 mg/1	95	(1) 218.1
Cyanide (CN)	Distillation followed by pyridine barbituric acid, colorimetric, automated	0.01 mg/1	100	(2) 361
Lead (Pb)	Digestion followed by Atomic Absorption	0.05 mg/1	100	(1) 239.1
Cadmium (Cd)	Digestion followed by Atomic Absorption	0.01 mg/1	97	(1) 213.1
Mercury (Hg)	Digestion followed by Atomic Absorption	0.01 mg/1	98	(1) 245.1
Arsenic (As)	Digestion followed by Atomic Absorption	0.002 mg/1	80	(1) 206.3
Selenium (Se)	Digestion followed by Atomic Absorption	0.001 mg/1	90	(1) 270.3
Silver (Ag)	Digestion followed by Atomic Absorption	0.01 mg/1	80	(1) 272.1
Volatile Chlorinated Hydrocarbon Scan	Gas Chromatography, Purge and Trap	0.01 mg/1	100	(3) 601
Phenolic Scan	Gas Chromatography, Flame Ionization Detector	0.01 mg/1	90	(3) 604
Chemical Oxygen Demand (COD)	Digestion followed by Titration	1 mg/1	90	(2) 490
Total Organic Carbon TOC)	Combustion, Infrared Method	5 mg/1	100	(2) 471
Pthalate Ester Scan	Gas Chromatography, Electron Capture Detector	0.0001 mgl	90	(3) 606

Figure F-140

ANALYTICAL METHODS AND REFERENCES

CANTON ANALYTICAL LABORATORY

Parameter		Detection Limit	Reference Test Methods
Zinc (Zn)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 289.1
Copper (Cu)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 220.1
Barium (Ba)	Digestion followed by Atomic Absorption	0.1 mg/1	(1) 208.1
Total Chromium (Cr)	Digestion followed by Atomic Absorption	0.02 mg/1	(1) 218.1
Cyanide (CN)	Distillation followed by pyridine barbituric acid, colorimetric	0.01 mg/1	(2) 361
Lead (Pb)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 239.1
Cadmium (Cd)	Digestion followed by Atomic Absorption	0.01 mg/1	(1) 213.1
Mercury (Hg)	Digestion followed by Atomic Absorption	0.002mg/1	(1) 245.1
Arsenic (As)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 206.3
Selenium (Se)	Digestion followed by Atomic Absorption	0.01 mg/1	(1) 270.3
Silver (Ag)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 272.1
pH	Electrometric	0.1 S.U.	(1) 150.1
Pesticides	Gas Chromatography		(3) 509-A
Endrin		2. mg/kg	
Lindane		1. mg/kg	
Methoxychlor		4. mg/kg	
Toxaphene		8. mg/kg	
Herbicides	Gas Chromatography		(3) 509-B
2,4,-D		4. mg/kg	
2,4,5-TP Silvex		2. mg/kg	
Extraction Procedure			(4)

Figure F-141

ANALYTICAL METHODS AND REFERENCES

CANTON ANALYTICAL LABORATORY

Parameter		Detection Limit	Reference Test Methods
Zinc (Zn)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 289.1
Copper (Cu)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 220.1
Nickel (Ni)	Digestion followed by Atomic Absorption	0.02 mg/1	(1) 218.1
Total Chromium (Cr)	Digestion followed by Atomic Absorption	0.02 mg/1	(1) 218.1
Cyanide (CN)	Distillation followed by pyridine barbituric acid, colorimetric	0.01 mg/1	(2) 361
Lead (Pb)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 239.1
Cadmium (Cd)	Digestion followed by Atomic Absorption	0.01 mg/1	(1) 213.1
Mercury (Hg)	Digestion followed by Atomic Absorption	0.002mg/1	(1) 245.1
Arsenic (As)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 206.3
Selenium (Se)	Digestion followed by Atomic Absorption	0.01 mg/1	(1) 270.3
Silver (Ag)	Digestion followed by Atomic Absorption	0.05 mg/1	(1) 272.1
Aromatic Hydrocarbons	Gas chromatography, purge and trap		(3) 602
Benzene		0.01 mg/1	
Ethylbenzene		0.01 mg/1	
Styrene		0.01 mg/1	
Toluene		0.01 mg/1	
Xylene		0.01 mg/1	
Chlorinate Hydrocarbons	Gas chromatography, purge and trap		(3) 601
Methylene Chloride		0.01 mg/1	
Chloroform		0.01 mg/1	
Carbon Tetrachloride		0.01 mg/1	
Trichloroethylene		0.01 mg/1	
Perchloroethylene		0.01 mg/1	
PCB Scan	Gas Chromatorgraphy	0.0001mg/1	(3) 608
Phenolics	Spectrophotometer MBTH with distillation	0.005mg/1	(1) 420.1

Figure F-142

ATTACHMENT I REFERENCES

(1) Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1979 EPA 600/4-79-020.

(2) Standard Methods for the Examination of Water and Wastewater, 14th Edition, APHA, Washington, D.C. 1975.

(3) Federal Register, Vol. 44, No. 233/Monday Dec 3, 1979. Guidlines Establishing Test Procedures for the Analysis of Polutants; Proposed Regulations.

4. ANALYTICAL METHODS AND REFERENCES

CANTON ANALYTICAL LABORATORY

Parameter		Detection Limits	References Test Methods
Chloride (Cl^-)	Argentometric Method	5. mg/1	(1) 407 A
Sulfate (SO_4)	Turbidimetric Method	1. mg/1	(1) 426 C
Bicarbonate Alkalinity	Titration	2. mg/1	(2) 310.1
Iron (Fe)	Digestion followed by Atomic Absorption	0.02 mg/1	(2) 236.1
Specific Conductance	Wheatstone Bridge Conductance Meter	0.1 umhos/cm	(2) 120.1
pH	Electrometric	0.1 S.U.	(2) 150.1
Magnesium (Mg)	Digestion followed by Atomic Absorption	0.01 mg/1	(2) 242.1
Calcium (Ca)	Digestion followed by Atomic Absorption	0.1 mg/1	(2) 215.1
Sodium (Na)	Digestion followed by Atomic Absorption	0.1 mg/1	(2) 273.1
C.O.D.	Distillation followed by Titration	1. mg/1	(2) 410.1.2.3
T.O.C.	Combustion	1. mg/1	(2) 415.1
Nitrate-N (NO_3)	Colorimetric, cadmium reduction	0.1 mg/1	(2) 353.1
Ammonia-N (NH_3)	Direct Nesslerization	0.05 mg/1	(1) 417 B
Phenols	Spectrophotometer, MBTH with distillation	0.002 mg/1	(2) 420.3
Chromium, total (Cr)	Digestion followed by Atomic Absorption	0.02 mg/1	(2) 218.1
Lead (Pb)	Digestion followed by Atomic Absorption	0.05 mg/1	(2) 239.1
Cadmium (Cd)	Digestion followed by Atomic Absorption	0.01 mg 1	(2) 213.1
Phosphorus	Colorimetric	0.01 mg 1	(1) 424 E

(1) Standard Methods for the Examination of Water and Wastewater. 15th Edition, APHA Washington, D.C., 1981

(2) Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 1979 EPA 600/4-79-020.

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CANTON ANALYTICAL LABORATORY

Parameter			
Chloride, (Cl^-)	Argentometric Method	5. mg/1	(1) 407 A
Sulfate, (SO_4)	Turbidimetric Method	1. mg/1	(1) 426 C
Bicarbonate Alkalinity	Titration	2. mg/1	(2) 310.1
Iron, (Fe)	Digestion followed by Atomic Absorption	0.02 mg/1	(2) 236.1
Specific Conductance	Wheatstone Bridge Conductance Meter	0.1 umhos/cm	(2) 120.1
pH	Electrometric	0.1 S.U.	(2) 150.1
Magnesium, (Mg)	Digestion followed by Atomic Absorption	0.01 mg/1	(2) 242.1
Calcium , (Ca)	Digestion followed by Atomic Absorption	0.1 mg/1	(2) 215.1
Sodium, (na)	Digestion followed by Atomic Absorption	0.1 mg/1	(2) 273.1
C.O.D.	Distrillation followed by Titration	1. mg/1	(2) 410.1.2.2
T.O.C.	Combustion	1. mg/1	(2) 415.1
Nitrite-N (NO_2)	Manual Colorimetric	0.02 mg/1	(1) 434
Nitrate-N (NO_3)	Colorimetric, cadmium reduction	0.1 mg/1	(2) 353.1
Ammonia-N (NH_3)	Direct Nesslerization	0.05 mg/1	(1) 417 B
Chromium, total (Cr)	Digestion followed by Atomic Absorption	0.02 mg/1	(2) 218.1
Lead, (Pb)	Digestion follwoed by Atomic Absorption	0.05 mg/1	(2) 239.1
Cadmium (Cd)	Digestion followed by Atomic Absorption	0.01 mg/1	(2) 213.1
IOX	Pyrolysis/Microcoulometry	0.005 mg/1	Method 450.1 USEPA

(1) Standard Methods for the Examination of Water and Wastewater. 15th Editon, APHA Washington, D.C., 1981.

(2) Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 1979 EPA 600/4-79-020.

Figure F-145

ANALYTICAL METHODS AND REFERENCES

Canton Analytical Laboratory

Parameter	Methods	Reference
Cadmium	Digestion, followed by Atomic Absorption	(1) 213.1
Mercury	Cold Vapor, Atomic Absorption	(1) 245.1
Lead	Digestion , followed by Atomic Absorption	(1) 239.1
Copper	Digestion, followed by Atomic Absorption	(1) 220.1
Nickel	Digestion, followed by Atomic Absorption	(1) 249.1
Zinc	Digestion, followed by Atomic Absorption	(1) 289.1
Chromium, total	Digestion, followed by Atomic Absorption	(1) 218.1
Potassium, total	Digestion, followed by Atomic Absorption	(1) 258.1
Phosphorus, total	Colorimetric	(2) 424 E
Total Kjeldahl Nitrogen	Colorimetric, Semi-Automated Block Digester II	(1) 351.2
Ammonia-N	Colorimetric, Automated Phenate	(1) 350.1
Nitrite-N	Colorimetric, Diazotization	(2) p. 434
Nitrate-N	Cadmium Reduction	(2) p. 423
Total Organic Halide	Microcoulometris titration	(1) 450.1
PCB	Gas Chromatography	(3) 608

(1) Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1979 EPA 600/4-79-020.

(2) Standard Methods for the Examination of Water and Wastewater, 14th Edition, APHA, Washington, D.C. 1975.

(3) Federal Register, Vol. 44, No. 233/Monday Dec. 3, 1979. "Guidelings Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations."

Figure F-146

ANALYTICAL METHODS AND REFERENCES

Canton Analytical Laboratory

Parameter		Detection Limits	References Test Methods
Gross Alpha	Evaporation	1 pCi/l	(1)703
Gross Beta	Evaporation	1 pCi/l	(1)703
Gross Radium	Evaporation	1 pCi/l	(1)703

(1) Standard Methods for The Examination of Water and Wastewater. 15th Edition, APHA Washington, D.C., 1981

Figure F-147

WAYNE DISPOSAL, INC.

POST OFFICE BOX 5187, DEARBORN, MICHIGAN 48128 • (313) 326-0200

July 25, 1983

Groundwater Sampling Protocol
Background Period (Nov. 1981 - Dec. 1982)
Wayne Disposal Site #2 Landfill

Two different methods of groundwater sample collection were employed during the background monitoring period at Wayne Disposal Site #2 Landfill.

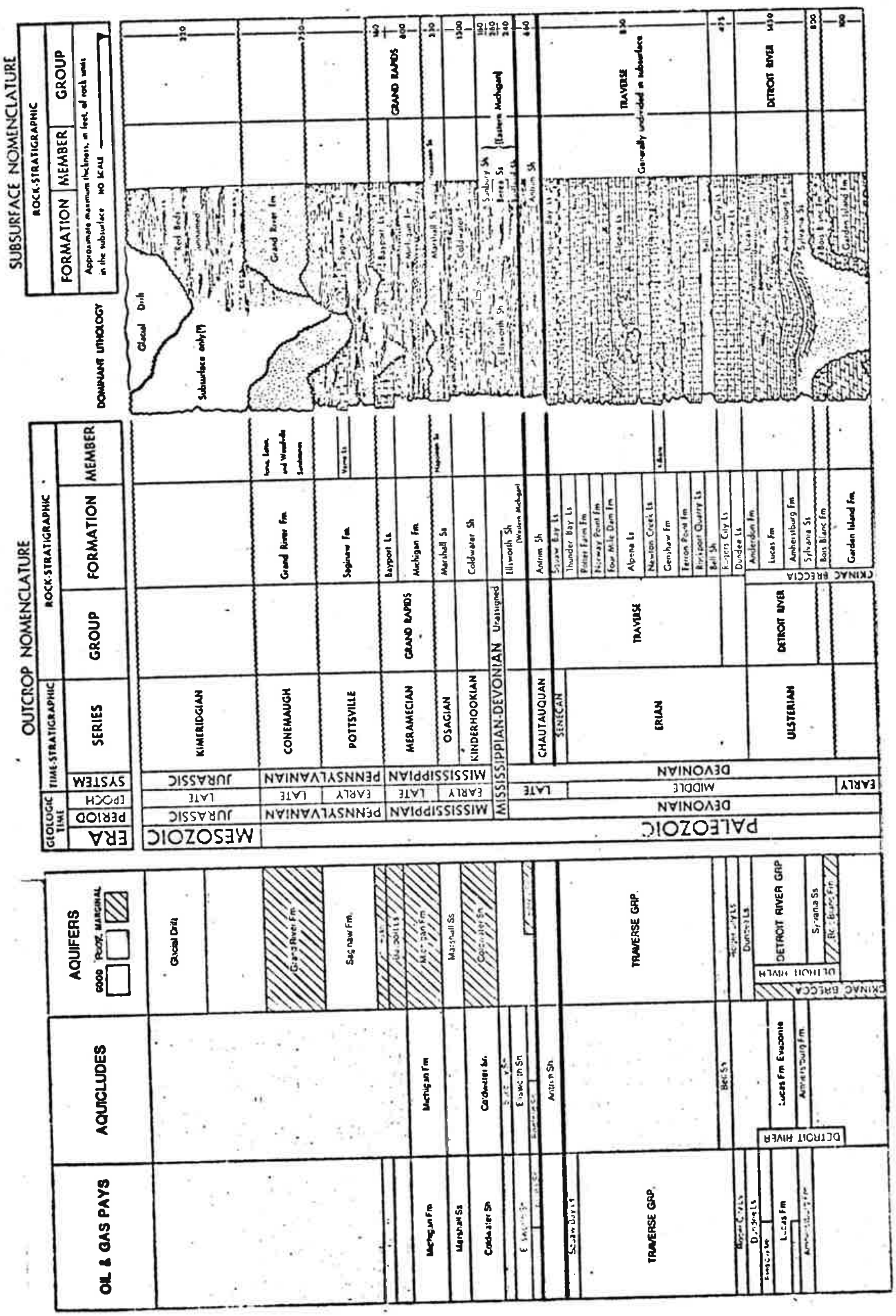
The first two groups of samples were obtained using air displacement. A smaller diameter black plastic pipe extended downward to the screen, inside of the well casing. The black pipe led to a "spigot" through the well cap. Compressed air was introduced at a valve on the cap, pressuring the annular space between the inner pipe and outer casing. This pressure forced well water both upward in the black inner pipe to the surface and back through the well screen into the formation.

Wells were purged by visiting each three times to blow all standing water out. Sampling was done on the fourth and subsequent visits if necessary. All appropriate sample preservatives were added to the empty bottles at the lab before sampling. No field filtering was employed. Collected samples were not stored in coolers between trips to the trailer refrigerator or to the lab.

The second two groups of samples were collected through the use of a dedicated submersible pump at each well, making up a system known as the Well Wizard. Compressed air from a compressor and control unit on the surface travels down a pipeline to the pump, actuating a bladder within, forcing the water upward through a check valve, up another line to the surface. Compressed air does not contact the well water.

Purging of the well is accomplished in one visit by computing the standing water and total time to remove three times this volume and allowing the pump to run for this period. Refer to the Groundwater Sampling & Analysis Plan. Sample preservatives were added to the bottles by the lab beforehand, and no field filtering was done. Cooler transport of samples was begun on the second round of samples after completion of the background monitoring period.

STRATIGRAPHIC COLUMN OF MICHIGAN



WATER WELL RECORD
ACT 294 PA 1965

Well No. 1

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
Wayne	Van Buren	SW¼ NW¼ SW¼	18	3 N/S.	8 E/W.

Distance And Direction from Road Intersections: 1000' N. I-94 Service Rd. Dead end of Rawsonville Rd.

OWNER No.

Street address & City of Well Location: 785 Rawsonville Rd.

3 OWNER OF WELL: Thompson + McCally

Address

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Top Soil-Sandy	1	1
Sand-yellow	9	10
Gray Sand & Fine Gravel	6	16
Clay, Light Gray Soft + Plastic	37	53
Clay-Soft-Silty Sand-Some Gravel	14	67
Clayey	9	76
Clay w/embedded Gravel	8	84
Gravel-Fine To medium w/some Sand water Bearing	11	95
Washed Screen w/ 1000 Gal. Fresh water - Developed with Air Lift		

4 WELL DEPTH: (completed) 95 ft. Date of Completion 10-18-67

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

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

7 CASING: Threaded ☑ Welded ☐ Height: Above/Below
Diam. 4 in. to 91 ft. Depth surface ____ ft.
Weight ____ lbs/ft.
____ in. to ____ ft. Depth Drive Shoe? Yes ☑ No ☐

8 SCREEN:
Type Red Brass Slotted Dia. 3 inch
Slot/Gauze 30 Length 4 Feet
Set between 91 ft. and 95 ft.
Fittings: Closed Bottom - 1' Blank at Top w/ Hemp Packer

9 STATIC WATER LEVEL
60 ft. below land surface

10 PUMPING LEVEL below land surface
80 ft. after 2 hrs. pumping 18-20 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 ☐ 80 Vis Bentonite
Depth: From 21 ft. 61 ft. + Clay cuttings

14 SANITARY:
Nearest Source of possible contamination
75 feet N Direction Septic Type
Well disinfected upon completion ☑ Yes ☐ No

15 PUMP:
Manufacturer's Name UEH Gould
Model Number ____ HP ½
Length of Drop Pipe 74 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:

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.

R.B. Slusser — REGISTERED BUSINESS NAME
0388 — REGISTRATION NO.

Address 715 Cambridge, Ypsilanti, Mich

Signed R.B. Slusser AUTHORIZED REPRESENTATIVE Date Nov 27 67

67D FORM 6-66

AUG 2 1968

GEOLOGICAL SURVEY COPY

Figure F-150

MICHIGAN
DEPARTMENT OF CONSERVATION
GEOLOGICAL SURVEY DIVISION

WELL SCHEDULE

Date September 28, 19 59 Field No. ______

Record by JHK Office No. ______

Source of data Driller's Log

1. *Location:* State Michigan County Wayne-Van Buren
   Map Willow Gardens Sub #3, Lot 190
   SW NW SW ¼ NE ¼ sec. 16 T 3S N/S R 8E E/W
2. *Owner:* Country Home Builders Address ______
   Tenant Edward Kittle Address Contractor &
   Driller [illegible] Address Driller
3. *Topography* ______
4. *Elevation* ______ ft. above/below ______
5. *Type:* Dug, drilled, driven, bored, jetted 9-25 19 53
6. *Depth:* Rept. 140 ft. Meas. ______ ft.
7. *Casing:* Diam. 3 in., to ______ in., Type blk.
   Depth ______ ft., Finish ______
8. *Chief Aquifer* ______ From ______ ft. to ______ ft.
   Others ______
9. *Water level* 80 ft. rept./meas. ______ 19 ______ above/below ______ which is ______ ft. above/below surface
10. *Pump:* Type ______ Capacity ______ G. M. ______
    Power: Kind ______ Horsepower ______
11. *Yield:* Flow ______ G. M., Pump 12 G. M., Meas., Rept. Est.
    Drawdown 10 ft. after ______ hours pumping ______ G. M.
12. *Use:* Dom., Stock, PS., RR., Ind., Irr., Obs. ______
    Adequacy, permanence ______
13. *Quality* ______ Temp ______ °F.
    Taste, odor, color ______ Sample Yes/No ______
    Unfit for ______
14. *Remarks:* (Log, Analyses, etc.) ______

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM	DEPTH TO WATER	REMARKS
Sand, yellow	14	14		
Clay, blue	62	76		
Hardpan	6	82		
Gravel & clay	6	88		
Hardpan	16	104		
Quicksand	26	130		
Gravel and Sand	7	137		
Shale, black	3	140		

Figure F-151

Well No. 3

MICHIGAN
DEPARTMENT OF CONSERVATION
GEOLOGICAL SURVEY DIVISION

WELL SCHEDULE

Date November 5, 1952 Field No.
Record by JHK Office No.
Source of data Driller's log

1. *Location:* State Michigan County Wayne-Van Buren
Map Willow Gardens Sub. #3, lot No. 197
SW SW ¼ NE ¼ sec. 16 T 3S N/S R 8E E/W
2. *Owner:* Country Home Bldrs. Address
Tenant Ed. Kittle, Contr. Address
Driller C. A. Locke Address
3. *Topography*
4. *Elevation* ft. above/below
5. *Type:* Dug, drilled, driven, bored, jetted 19
6. *Depth:* Rept. 132 ft. Meas. ft.
7. *Casing:* Diam. 3 in., to in., Type
Depth ft., Finish
8. *Chief Aquifer* From ft. to ft.
Others
9. *Water level* 90 ft. rept./meas. 19 above/below
which is ft. above/below surface
10. *Pump:* Type Capacity G. M.
Power: Kind Horsepower
11. *Yield:* Flow G. M., Pump 6 G. M., Meas., Rept. Est.
Drawdown 10 ft. after hours pumping G. M.
12. *Use:* Dom., Stock, PS., RR., Ind., Irr., Obs.
Adequacy, permanence
13. *Quality* Temp °F.
Taste, odor, color Sample Yes/No
Unfit for
14. *Remarks:* (Log, Analyses, etc.)

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM	DEPTH TO WATER	REMARKS
Sand, yellow	12	12		
Clay, blue	66	78		
Hardpan	25	103		
Clay, blue	9	112		
Quicksand	7	119		
Gravel & sand	11	130		
Shale; black	2	132		

Figure F-152

MICHIGAN
DEPARTMENT OF CONSERVATION
GEOLOGICAL SURVEY DIVISION

WELL SCHEDULE

Date 10/7/44, 19__ Field No. 2
Record by J. G. R. Office No. ______
Source of data Communication from village of Bellville

1. *Location:* State Michigan County Wayne, Van Buren
Map Belleville, test well # 2
SE NE ¼ SW ¼ sec. 31 T 3 S R 8 E
2. *Owner:* Village of Belleville Address ______
Tenant / Address ______
Driller R. E. Dunbar & Sons Address Delta, Ohio
3. *Topography* ______
4. *Elevation* ______ ft. above/below ______
5. *Type:* Dug, drilled, driven, bored, jetted ______ 1944
6. *Depth:* Rept. ______ ft. Meas. ______ ft.
7. *Casing:* Diam. ______ in., to ______ in., Type ______
Depth ______ ft., Finish ______
8. *Chief Aquifer* ______ From ______ ft. to ______ ft.
Others ______
9. *Water level* ______ ft. rept./meas. ______ 19__ above/below ______
______ which is ______ ft. above/below surface
10. *Pump:* Type ______ Capacity ______ G. M. ______
Power: Kind ______ Horsepower ______
11. *Yield:* Flow ______ G.M., Pump 40 G.M., Meas., Rept. Est. ______
Drawdown ______ ft. after ______ hours pumping ______ G. M.
12. *Use:* Dom., Stock, PS., RR., Ind., Irr., Obs. ______
Adequacy, permanence ______
13. *Quality* ______ Temp ______ °F.
Taste, odor, color ______ Sample Yes/No ______
Unfit for ______
14. *Remarks:* (Log, Analyses, etc.) Across lake, westerly from present water tower on cemetary property. Interference with present wells, at tip of peninsula.
abandoned

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM	DEPTH TO WATER	REMARKS
Yellow sand and clay	12	12		
Blue clay	53	65		
Fine, dirty sand and clay little water	5	70	55	
Blue clay	34	104		
Black, loose shale and gas	5	109	55	

Figure F-153

Have no logs for #6 and 7 locations.
Would expect these to be somewhat similar to #8

Ford Motor Company Bomber Plant
Water works at Rawsonville Dam

24" well No.2 - Just west of Rawsonville dam on north side of river, ½ mi. E of No.12 location

Sand, clay boulders	0	35
Sand, little clay	5	40
Coarse sand and fine gravel	55	95
Gravel, sand, and clay	5	100
Boulder clay	30	130
Hard shale	5	135

Layne NORTHERN COMPANY
INCORPORATED

INDIANAPOLIS • MISHAWAKA • LANSING

249

☒ TEST Observation Well for pumping test of pumping Well No. 5

☐ PERMANENT

Job No. L-32338

WELL LOG No. 69-E CITY YPSILANTI TOWNSHIP County Washtenaw

Owner YPSILANTI TOWNSHIP Township Ypsilanti

W 1/2, SW 1/4 Section 24, T. 3 S., R. 7 E.

Location 687' State Michigan

From Land Description 25' West of Well No. 5 ; just W of Water Treatment Plant

From Street or Road and W of Bridge St.

FORMATION FOUND — DESCRIBE FULLY	FROM NATURAL GROUND LEVEL			
	Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
Brown clay	0	16	16	
Brown sand	16	17	1	
Blue grey clay with stones	17	33	16	
Sand & gravel, fine sand, brown	33	34	1	
Brown clay	34	38	4	
Sand & gravel, coarse	38	41	3	
Grey clay	41	42	1	
Sand & gravel - coarse	42	45	3	
Sand & gravel - medium	45	50	5	
Sand & gravel - medium with fines	50	60	10	
Sand & gravel - medium with fines & coarse	60	75	15	
Sand & gravel	75	80	5	
Sand & gravel - medium	80	85	5	
Sand & gravel - fine material black	85	90	5	[illegible]
Sand & gravel	90	106	13	± 50'
Hard shale - black, slabby	106	117	17	
Soft shale - clay like - grey	117	125	8	
Black shale, slabby	125	131	6	
Limestone	131	135	4	

Hole 5 5/8 "Dia Drilled by: Cable Tool ____ Rotary X Jetting ____ Reverse Circ. ____ Bucket ____ Auger ____

Rotary Hole Grouted: Neat Cement ____ Drilling Mud ____ Other ____

Casing 2 "OD From 2 1/2 "above ground to 99 feet below ground. Weight ____ Pounds per foot

Screen 1 1/4 " Set from 99 to 103 feet Make Johnson Type 1 1/4" Point Slot .025

Pumping test ____ GPM drawdown to ____ feet after ____ hours pumping

Date Completed 10/8/67 Driller Burrows - McCracken

Well No. 7

Layne NORTHERN COMPANY
INCORPORATED
INDIANAPOLIS • MISHAWAKA • LANSING

24-7

☐ TEST
☒ PERMANENT

Job No. L-32082

WELL LOG No. 9 CITY YPSILANTI County WASHTENAW

Owner YPSILANTI TOWNSHIP Township YPSILANTI

Section 24

Location SE NE SE State MICHIGAN

From Land Description 170' West of guardrail of Rawsonville Road

From Street or Road 610' South of Huron river (South bank)

FORMATION FOUND — DESCRIBE FULLY	FROM NATURAL GROUND LEVEL			
	Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
Fill - clay	0	2	2	
Top fill & rocks	2	4	2	
Clay - brown	4	9	5	
Clay - sand & gravel	9	18	9	
Sand & gravel - some clay	18	25	7	
Coarse sand & fine gravel	25	49	24	
Sand & gravel - rocks & shale	49	78	29	22'3"
Shale	78	80	2	
Some of the shale in thick strips				
(?? + 607')				
EL ≈ + 685' TOPO 7½ - (SWL + 663')				
ADDED INFO. BY DRILLER, ITEM NO.				
*CORRECTED BY:				
**ADDITION BY:				

Hole 36 "Dia Drilled by: Cable Tool ____ Rotary ____ Jetting ____ Reverse Circ. X Bucket ____ Auger ____

Rotary Hole Grouted: Neat Cement X Drilling Mud ____ Other ____

Casing 36 "OD From 1'6" "above ground to 35 feet below ground. Weight ____ Pounds per foot

Screen 16 " Set from 79 to 59 feet Make LAYNE Type S.S. Slot 15" #3 4' #4

(SEE WELL PRINT)

XXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Date Completed 9/9/68 Driller L.D. COONROD

APR 8

Figure F-156

Cons.7401 Rev.12/63

MICHIGAN DEPARTMENT OF CONSERVATION
GEOLOGICAL SURVEY DIVISION
SW NE SE
WATER WELL RECORD
Well No. 8
L-31390

Page of
Sample No.

Permit No. 24-8
Owner No. #6

County	Twp.		Sec.	Town	Range
Wastenaw	Ypsilanti	SE NE & SW & SE	24	3 S.	7 E.

Distance from Roads, Section Lines, etc.
Approx. 875' w. of Rowsonville rd } (or intersection
1850' N of Textile rd } is SE corner sec 24)

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Gravel	5	5
clay	7	12
clay & rock	10	22
clay	10	32
Clay and rocks	10	42
clay and sandy gravel	10	52
clay	8	60
sand & gravel	2	62
gravel	30	92
clay & shale	10	102 ?
[illegible] - 55'		
([illegible])		

Owner: Ypsilanti township

Address:

Driller and Address: Layne Northern - J. Turner

Well Depth: 102 ft. Date of Completion: 10-22-65

☐ Cable tool ☐ Rotary ☐ Dug ☒ R.C.
☐ Driven ☐ Jetted ☐ Bored

Use: ☐ Domestic ☒ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Dewatering
☐ Test Well ☐

Casing: Diam. 34 in. to 61 ft. Depth
in. to ft. Depth

Height: Above/Below surface ft.
Type-Weight

Screen:
Type: Dia:
Slot/Gauze Length
Set between ft. and ft.
Accessories:

Water level:
ft. above/below
ft. above/below
Meas. by Date

Drawdown: 75'6" P.L.
ft. after hrs. pumping 1400 g.p.m.
ft. after hrs. pumping g.p.m.
Meas. by Date

Flow:
g.p.m./g.p.h. Temp: °F

Water Quality in Parts Per Million:
Iron (Fe) Chlorides (Cl)
Hardness

Elevation:
±685' topo ft. above

Source of data:

Record by:
Date:

Remarks:

Figure F-157

GEOLOGICAL SURVEY SAMPLE No.

OCT 4 1972

WATER WELL RECORD

ACT 294 PA 1965

Well No. 9 ✓

13

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
WASHT.	Ypsilant.	NE¼ NE¼ SW	[illegible]	3 N (S)	7 (E) W.

Distance And Direction from Road Intersections: 1560 Woodale

Street address & City of Well Location
Locate with "X" in section below — Sketch Map:

1 MILE / 1 MI.

3 OWNER OF WELL: Clinton Farr
Address: 1560 Woodale, Ypsilant

4 WELL DEPTH: (completed) 91 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: Threaded ☑ Welded ☐ Height: Above/Below
Diam. 4 in. to 87 ft. Depth; ___ in. to ___ ft. Depth
Surface ___ ft. Weight 11 lbs./ft. Drive Shoe? Yes ☑ No ☐

8 SCREEN:
Type: RED BRASS Dia.: 4"
Slot/Gauze 25 Length 4'
Set between 87 ft. and 91 ft.
Fittings:

9 STATIC WATER LEVEL
___ ft. below land surface

10 PUMPING LEVEL below land surface
80 ft. after 2 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 ___ 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 Gould
Model Number ULJ HP ½ Volts 230
Length of Drop Pipe 63 ft. capacity ___ G.P.M.
Type: ☐ Submersible ☐ Jet ☐ Reciprocating

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand Gravel	12	12
Clay Blue	63	75
Sand Gravel	16	91

ADDED INFO. BY DRILLER, ITEM NO.
CORRECTED BY JH
ADDITION BY
USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.
Replacement Well

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.
R.B. SLUSSER WELL DRILLING Co. 0388
REGISTERED BUSINESS NAME — REGISTRATION NO.
Address 715 CAMBRIDGE, YPSILANTI, MICH.
Signed Richard Allen Date 8-2-71
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

Figure F-158

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

✓ DEC 06 1979

WATER WELL RECORD
ACT 294 PA 1965

Well No. 10

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
WAYNE	VAN BUREN	SW¼ SE¼ SE¼	4	3 ~~N~~/S.	8 E/~~W~~.

Distance And Direction from Road Intersections: 45830 ECORSE RD NORTH SIDE OF ROAD 1/4 MILE WEST OF BELLEVILLE RD

Street address & City of Well Location

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

N / W / E / S; ¼ MI.; 1 MILE — (X) marked in SE corner of section

3 OWNER OF WELL: GENERAL MOTORS - ARGONAUT DIVISION
Address 485 WEST MILWAUKEE DETROIT - MI. 48202

4 WELL DEPTH: (completed) 167 ft. Date of Completion 11-12-79

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 122 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
YELLOW SAND	8	8
GRAY SAND	6	14
HARD BLUE CLAY	46	60
SOFT BLUE CLAY	25	85
HARD BLUE CLAY & GRAVEL	42	127
HARD GRAY SHALE	18	145
SOFT BLUE CLAY	22	167

• USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: NONE Dia.: ______ Slot/Gauze ______ Length ______ Set between ____ ft. and ____ ft. Fittings:

9 STATIC WATER LEVEL 30 ft. below land surface

10 PUMPING LEVEL below land surface 115 ft. after 2 hrs. pumping 4½ 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 SE Direction DRAINFIELD Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name AERMOTOR
Model Number SD12 HP 1/2 Volts 230
Length of Drop Pipe 112 ft. capacity 12 G.P.M.
Type: ☒ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY B
**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.
SLUSSER DRILLING CO., INC. — REGISTERED BUSINESS NAME — 81-0388 REGISTRATION NO.
Address 1201 WEST MICHIGAN - YPSILANTI
Signed Richard A. [signature] AUTHORIZED REPRESENTATIVE Date 11-16-79

D67d 100M (Rev. 12-68)

Figure F-159

GEOLOGICAL SURVEY SAMPLE NO.

DEC 06 1979

WATER WELL RECORD
ACT 294 PA 1965

Well No. 11

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Wayne	Van Buren	SW¼ SE¼ SE¼	4	3 N/S.	8 E/W.

Distance And Direction from Road Intersections

45870 Ecorse Rd. North Side of Road 1/4 Mile West of Belleville Rd.

Street address & City of Well Location

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

N / S / E / W — 1 MILE — 1 MI.

3 OWNER OF WELL: General Motors - Argonaut Division

Address 485 West Milwaukee Detroit - MI 48202

4 WELL DEPTH: (completed) 129 ft. Date of Completion 11-14-79

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 126 ft. Depth; ____ in. to ____ ft. Depth

Weight 11 lbs./ft. Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Yellow Sand	8	8
Gray Sand	6	14
Soft Blue Clay	26	40
Hard Blue Clay	25	65
Hard Blue Clay & Gravel	61	126
Hard Shale	3	129

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: None Dia.: ____ Slot/Gauze ____ Length ____ Set between ____ ft. and ____ ft. Fittings:

9 STATIC WATER LEVEL 30 ft. below land surface

10 PUMPING LEVEL below land surface 84 ft. after 2 hrs. pumping 8 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 SW Direction Drainfield Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name Aermotor

Model Number SD12 HP 1/2 Volts 230

Length of Drop Pipe 84 ft. capacity 12 G.P.M.

Type: ☒ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY B
**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.

Slusser Drilling Co., Inc — REGISTERED BUSINESS NAME; 81-0388 — REGISTRATION NO.

Address 1701 West Michigan - Ypsilanti

Signed [signature] AUTHORIZED REPRESENTATIVE Date 11-16-79

D67d 4.1COM (Rev. 12-68)

GEOLOGICAL SURVEY COPY

Figure F-160

DEC 06 1979

WATER WELL RECORD
ACT 294 PA 1965

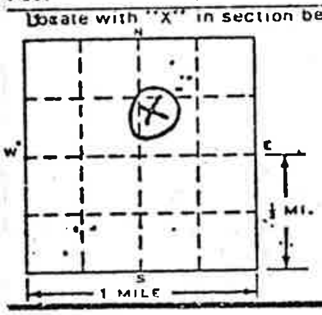
Well No. 12

LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
WAYNE	VAN BUREN	NW¼ SW¼ NE¼	4	3 N/S.	8 E/W.

Distance And Direction from Road Intersections
46025 VAN BURN SOUTH SIDE OF ROAD
1/4 MILE WEST OF BELLEVILLE RD.
Street address & City of Well Location

Locate with "X" in section below



Sketch Map:

3 OWNER OF WELL: GENERAL MOTORS- ARGONAUT DIVISION
Address 485 WEST MILWAUKEE
DETROIT - MI. 48202

4 WELL DEPTH: (completed) 89 ft. Date of Completion 11-14-79

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 85 ft. Depth; ____ in. to ____ ft. Depth
Height: Above/Below Surface ____ ft. Weight 11 lbs./ft. Drive Shoe? Yes ☒ No ☐

8 SCREEN: Type: STAINLESS Dia.: 4"
Slot/Gauze 10 Length 4ft
Set between 85 ft. and 89 ft.
Fittings: HEMP PACKER & PLUG

9 STATIC WATER LEVEL 6 ft. below land surface

10 PUMPING LEVEL below land surface
40 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
115 feet S Direction DRAINFIELD Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name AERMOTOR
Model Number SD12 HP 1/2 Volts 230
Length of Drop Pipe 42 ft. capacity 12 G.P.M.
Type: ☒ Submersible ☐ Jet ☐ Reciprocating

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
YELLOW SAND	5	5
YELLOW CLAY	9	14
HARD BLUE CLAY	26	40
FINE GRAY SAND	20	60
SOFT BLUE CLAY	10	70
FINE SAND & GRAVEL	19	89

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.
ADDED INFO BY DRILLER, REM'KS
•CORRECTED BY B
••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.
SLUSSER DRILLING CO., INC. 81-0388
REGISTERED BUSINESS NAME REGISTRATION NO.
Address 1901 WEST MICHIGAN - YPSILANTI
Signed [signature] AUTHORIZED REPRESENTATIVE Date 11-16-79

D67d 100M (Rev. 12-68)

Figure F-161

GEOLOGICAL SURVEY COPY

Industrial (45)
TD 951 in Sylvania (38)
Brine

Well No. 13

1-3S-7E

Ypsilanti Twp. (Washtenaw Co.)

Michigan Consolidated Gas Company

Willow Brine Disposal No. 1 — Permit No. BD 142

Drilling Contractor: North American Drilling Co. (Rotary 0-750) (Cable 750-951)

Location: SW$\frac{1}{4}$ NE$\frac{1}{4}$ SE$\frac{1}{4}$ Section 1, T.3S, R.7E.
800' from north and 893' from east line of quarter section

Elevation: 723 feet above sea level (rot. bush.)

Record by: Peter Caterino from sample log; submitted by the company; some formation tops from Schlumberger Laterolog-Gamma Ray-Neutron (Sj)

	Thickness (feet)	Depth (feet)
PLEISTOCENE:		
Drift:		
Gravels and coarse Sand	103	103 Sj
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, dark brown, pyritic	28	131 Sj
DEVONIAN:		
Traverse Formation:		
Shale, medium gray, calcareous	48	179 Sj
Traverse Limestone:		
Dolomite, gray-brown, very finely crystalline, fossil shadows, broken slight porosity, no shows; and Chert, milky, conchoidal	5	184
Dolomite, gray, very fine grained, fair crystalline porosity, no shows	10	194
Dolomite, gray-brown, very finely crystalline, fossil shadows, N.V.P., and Chert, milky white, conchoidal	4	198
Dolomite, gray-brown, finely crystalline, slight crystalline porosity, no shows	22	220
Shale, medium gray, calcareous	20	240
Limestone, medium gray, micritic, fossiliferous, N.V.P., and Shale, gray	17	257
Shale, medium gray, calcareous	31	288
Limestone, gray, micritic, fossiliferous, N.V.P.	2	290
Shale, medium gray, calcareous	14	304
Limestone, gray, micritic, fossiliferous, N.V.P.	2	306
Shale, medium gray, calcareous	43	349 Sj
	(170)	
Dundee:		
Limestone, light brown, skeletal, micritic, fossiliferous, N.V.P.	51	400
Limestone, light brown, fragmental, fine to medium fragments and crystals, fossiliferous, fair to good fragmental porosity, no shows	76	476
	(127)	

L.P.G. (33)
TD 2137 in Salina (42) ✓
Facility

Well No. 14
1-3S-7E
Ypsilanti Twp. (Washtenaw Co.)

Michigan Consolidated Gas Co.

Willow Cavern No. 1 — Permit No. 26603

Drilling Contractor: North American Drilling Co. (Rotary 0-2137)

Location: W½ NE¼ SE¼ Section 1, T.3S, R.7E
537 feet from North and 1055 feet from East line of quarter section.

Elevation: 723 feet above sea level (rot. bush.)

Record by: P. Caterino from sample log and core descriptions submitted by the company; some formation tops from Schlumberger Gamma Ray-Neutron (Sj)

	Thickness (feet)	Depth (feet)
PLEISTOCENE:		
Drift:		
Sand, brown and gray, fine to coarse grained, scattered varicolored grains, well rounded, poorly sorted, loosely compacted, washed hole	14	14
Sand, light to medium brown, fine grained, sub-rounded, well sorted, loosely compacted, washed hole to 30'	25	39
Clay, medium gray, homogeneous color, very sticky	11	50
Gravel, clear to light brown, scattered varicolored grains, fine to medium size, poorly sorted, drilled 20' in 2 minutes	20	70
Gravel, medium grained, medium to very coarse in size, varicolored, poorly sorted, well rounded, drilled 27' in 2 minutes, lost circulation at 97', mixed fresh water mud and loss circulation material	38 (108)	108 S
MISSISSIPPIAN - DEVONIAN:		
Antrim:		
Gravel, gray to brown and varicolored, fine to very coarse, scattered large gravel 1/8" diameter, drilled roughly	7	115
Gravel, varicolored, fine to coarse with many 1/4" to 1/2" in diameter, well rounded, drilled roughly	15	130
Shale, dark gray to black, platy, mixed with gravels from above	9 (31)	139 S
DEVONIAN:		
Traverse Formation:		
Shale, medium gray, soft	40	179 S
Traverse Lime:		
Dolomite, gray, medium to coarsely crystalline, broken fair porosity, no shows; chert, light gray, conchoidal	7	186
Shale, gray	6	192
Dolomite, gray, micritic, no visible porosity	8	200
Shale, gray	2	202
Dolomite, medium gray, micritic, no visible porosity; chert, light gray, conchoidal	16	218
Shale, medium gray, calcareous	30	248
Limestone, gray, dense	4	252
Shale, medium gray, calcareous	32	284

GEOLOGICAL SURVEY SAMPLE No.

MAY 26 1976

Well No. 15

WATER WELL RECORD

ACT 294 PA 1965

SESE NE

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

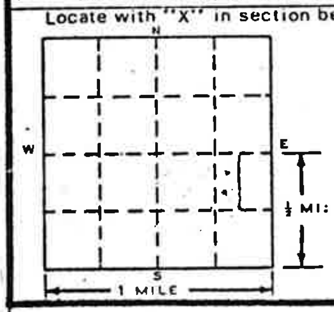
1 LOCATION OF WELL

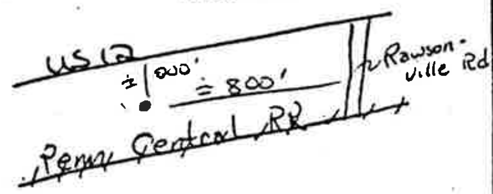
County	Township Name	Fraction	Section Number	Town Number	Range Number
Washtenaw	Ypsilanti	¼	1	3 N/S	7 E/W.

Distance And Direction from Road Intersection:
Rawsonvile Road and Michigan
Approx 2950 Michigan Ave

Street address & City of Well Location

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





3 OWNER OF WELL:
Michigan Consolidated Gas Co.
Address: One Woodward Ave. Garden Bldg
Detroit 48226 Att: Mr. D. Beaver

4 WELL DEPTH: (completed) 80 ft. Date of Completion 10-7-75

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. 6 in. to 75-4 ft. Depth; ___ in. to ___ ft. Depth
Height: Above Surface 8" ft.
Weight 19.45 lbs./ft.
Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sandy Clay	4'	4'
Dry Sand	18'	22'
Gravily Clay	50'	72'
Medium Coarse Gravel	8'	80'

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: Johnson SS Dia.: 6 inch
Slot/Gauge ___ Length 5 Ft.
Set between 74-8" ft. and 80 ft.
Fittings: 5" X 18" nipple

9 STATIC WATER LEVEL
12 ft. below land surface

10 PUMPING LEVEL below land surface
18 ft. after 1½ hrs. pumping 60 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) 1.1 Chlorides (Cl) 68
Hardness 272 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 unknown Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name Red Jacket
Model Number 500T4-5LB HP 5 Volts 230
Length of Drop Pipe 63 ft. capacity 85 G.P.M.
Type: ☒ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Test Well

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY 3
**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.

O.O. Corsaut Inc. — REGISTERED BUSINESS NAME — 0025 REGISTRATION NO.

Address 15101 W. 11 Mile Road, Oak Park 48237

Signed [signature] AUTHORIZED REPRESENTATIVE Date Nov. 6, 1975

Phone 1-LI 1 1117

D47d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

Figure F-164

Well No. 16

24-3S-7E
Ypsilanti Twp. (Washtenaw Co.)

Wildcat (00)
TD 3973 in Trempealeau (61)
Dry

Adolph E. Rovsek

Wabash Railroad Co. No. 1 — Permit No. 25482

Drilling Contractor: Muskegon Development Company (Cable)

Location: SE¼ SE¼ NW¼ Section 24, T. 3S, R. 7E
380' from South and 330' from East line of quarter section

Elevation: 693.5 feet above sea level (rig fl.)

Record by: William Mantek from incomplete samples; some formation tops from Schlumberger Gamma Ray-Neutron Log (Schj)

	Thickness (feet)	Depth (feet)
PLEISTOCENE:		
Drift:		
"Drift"	97	97 Schj
MISSISSIPPIAN - DEVONIAN:		
Antrim:		
Shale, brown	38	135 Schj
DEVONIAN:		
Traverse Formation:		
Shale, gray	42	177 Schj
Traverse Limestone:		
Lime, gray (water @ 195')	50	227
Shale, gray	23	250
Lime, gray	13	263
Shale, gray	94	357 Schj
	(180)	
Dundee:		
Lime, gray	8	365
From Samples:		
Limestone, buff, fragmental and fine grained, very fossiliferous	10	375
Limestone, buff, white to buff, fragmental, very fossiliferous, sparry and chalky in part	8	383
Limestone, buff to brown, fragmental, very fossiliferous, dolomitic in part	6	389
Limestone, buff, fragmental, very fossiliferous, very sparry in part; trace porosity (Pre-report Hole full water @ 393)	21	410
Limestone, buff white to buff, fragmental, very fossiliferous, sparry in part (412 CTM = 418 SLM)	8	418
Limestone, buff, fragmental, very fossiliferous, dolomitic, porous; trace dead black oil	21	439
Limestone, buff and buff whit e, fragmental and finely crystalline, fossiliferous, dolomitic, porous; trace dead black oil	7	446
Limestone, buff, as above; some Chert, white, granular and chalky, dolomitic	10	456
Dolomite, buff, finely crystalline, fossiliferous and calcareous in part, porous (7 bailers water per hour @ 456')	9	465
Dolomite, buff, medium crystalline, very porous, sandy with clear quartz grains, fine to medium, rounded and frosted	24	489 Schj
	(132)	

(C)

12-3S-7E
Ypsilanti Twp. (Washtenaw Co.)
Well No. 17
Ford Test Well No. 44

Well No. Y-12-1

Drilling Contractor: Foe Company

Location: NW¼ Section 12, T.3S., R.7E.,
By old barn and spur track at NW corner of Section 12,
of Ecorse Road or Ward Road.

Record by: Testimony from driller.

	Distance Down Feet
Yellow sand and a few stones	5
Clay and a few stones	10
Clay, sand, few stones	15
Fine sand	20
Sand, clay	25
Blue clay, few stones	30, 35, 40, 45
Clay, few stones	50
Clay, stones	55
Clay, few fine stones	60
Clay and stones	65, 70, 75
Sand, gravel, clay	80
Clay, few stones	85
Clay and stones	90, 95, 100, 105, 110, 115, 120, 125, 130
Fine Sand	135
Gravel	136
Fine sand	140

Date Drilled: 7-30-41
Pumping conditions: At 135' water came to 78' level.
At 136' water came to 55' level.

Figure F-166

2

Well No. 18

GEOLOGICAL SURVEY SAMPLE NO.

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
WAYNE	VAN BUREN	SW¼ SW¼ SW¼	16	3 N/S.	8 E/W

Distance And Direction from Road Intersections

11200 BECK RD.

Street address & City of Well Location

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

3 OWNER OF WELL: SZABO

Address: 11200 BECK RD. BELLEVILLE

4 WELL DEPTH: (completed) 95 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: Threaded ☐ Welded ☐ Diam. 6 in. to 91 ft. Depth; ___ in. to ___ ft. Depth

Height: Above/Below Surface ___ ft. Weight 17 lbs./ft. Drive Shoe? Yes ☐ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
YELLOW SAND	7	7
GRAY SAND	4	11
HARD BLUE CLAY	49	60
SOFT SILTY SAND & CLAY	25	85
FINE SAND	7	92
COARSE SAND & GRAVEL	3	95

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: STAINLESS Dia.: 6" Slot/Gauze 10 Length 4 FT. Set between 91 ft. and 95 ft. Fittings: HEMP PACKER PLUG 1 FT. BLANK

9 STATIC WATER LEVEL 55 ft. below land surface

10 PUMPING LEVEL below land surface 90 ft. after 4 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 ☑ 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 NE Direction DRAINFIELD Type. Well disinfected upon completion ☑ Yes ☐ No

15 PUMP: ☐ Not installed. Manufacturer's Name GOULD. Model Number 13EM HP 3/4 Volts 230. Length of Drop Pipe 82 ft. capacity ___ G.P.M. Type: ☑ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY
**ADDITION BY
ELEVATION
DEPTH TO ROCK

50 H.

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.

SLUSSER DRILLING CO., INC. — REGISTERED BUSINESS NAME; 0388 — REGISTRATION NO.

Address 1201 W. MICHIGAN, YPSILANTI

Signed [signature] AUTHORIZED REPRESENTATIVE Date 11-4-74

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

Figure F-167

GEOLOGICAL SURVEY SAMPLE NO.

DEC 19 1972

Well No. 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
WAYNE	VAN BUREN	NE¼ NW¼ NE	6	3 S.	8 E.

Distance And Direction from Road Intersections: 50070 E. MICHIGAN

Street address & City of Well Location

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

N / S / E / W — ½ MI. — 1 MILE

3 OWNER OF WELL:
Address: ROBERT JOHNSON, 50070 E. MICHIGAN, ~~YPSILANTI~~ BELLEVILLE

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: Threaded ☐ Welded ☐ Height: Above/Below Surface ____ ft.
Diam. ____ in. to ____ ft. Depth; ____ in. to ____ ft. Depth; Weight ____ lbs./ft.; Drive Shoe? Yes ☐ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
YELLOW SAND	7	7
GRAY SAND	5	12
BLUE CLAY	82	94
BLACK SHALE	21	115
BLUE SHALE	30	145
HARD BROWN SHALE	12	157
SALT WATER		
CALLED DRY HOLE - PULLED PIPE		
PLUGGED WITH BENTONITE & CUTTINGS		

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: ____ Dia.: ____ Slot/Gauze ____ Length ____ Set between ____ ft. and ____ ft. Fittings: ____

9 STATIC WATER LEVEL 94 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 ☐ 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 ____ Model Number ____ HP ____ Volts ____ Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.
ADDED INFO. BY DRILLER, ITEM NO.
CORRECTED BY
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.
SLUSSER DRILLING CO. INC — REGISTERED BUSINESS NAME; 0388 — REGISTRATION NO.
Address 1701 W. MICHIGAN YPSILANTI
Signed [signature] AUTHORIZED REPRESENTATIVE Date ____

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

Figure F-168

GEOLOGICAL SURVEY SAMPLE No.

✓ AUG 17 1979

Well No. 20

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

5

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Wayne	Van Buren	S½ ¼ NW ¼ NW ¼	5	3 S.	8 E.

Distance And Direction from Road Intersections: S. of Michigan Ave 1/4 mi. E. of Denton

Street address & City of Well Location: 5945 Hancock Rd.

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

(Section grid N/S/E/W, X in NW corner; 1 MILE, ½ MI.)

3 OWNER OF WELL: Donald Vojtkofsky
Address 42042 Lincoln St.
Belleville, 48111

4 WELL DEPTH: (completed) 126 ft. Date of Completion 7-20-79

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 118 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
Yellow Sand	4	4
Gray Sand	3	7
Hard Blue Clay	48	55
Hard Blue Clay & Gravel	55	110
Hard Blue Clay	4	114
Soft Gray Shale	4	118
Hard Limestone	8	126

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: None Dia.: ____ Slot/Gauze ____ Length ____ Set between ____ ft. and ____ ft. Fittings:

9 STATIC WATER LEVEL 8 ft. below land surface

10 PUMPING LEVEL below land surface 40 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 ____ feet ____ Direction City Sewer 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

16 Remarks, elevation, source of data, etc.
ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY B.
**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.
Slusser Drilling Co., Inc — 0388
REGISTERED BUSINESS NAME — REGISTRATION NO.
Address 1701 W. Michigan, Ypsilanti
Signed Richard A. Slusser (AUTHORIZED REPRESENTATIVE) Date 7-31-79

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

Figure F-169

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

LOCATION OF WELL — Van Buren Well No. 21

County	Twp.	Fraction	Section No.	Town	Range
Wayne	~~Canton~~	SE ¼ NE ¼ NE ¼	5	3 N(S)	8 (E)/W.

Distance And Direction from Road Intersections: 6070 Beck Rd

Street address & City of Well Location: Plymouth

OWNER No.

3 OWNER OF WELL: David Duncan,
Address: 6070 Beck Rd. Plymouth, Mich.

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Clay		4
Sand		10
Clay		40
Rocks		50
Sandy clay		77
Water gravel		79

~~PUMP INSTALLED BY~~
KREZEL PUMP SERVICE
~~22000 Meadowbrook Rd.~~ Northville, Mich.
~~REG. NO. 0699~~
(signature)

4 WELL DEPTH: (completed) 79 ft. Date of Completion 9-28-67

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 [ ]

8 SCREEN:
Type: Wire wound Dia.: 4
Slot/Gauze 35 Length 4
Set between ___ ft. and ___ ft.
Fittings:

9 STATIC WATER LEVEL
17 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 ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit
[X] Pitless Adapter [X] 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 [X] Yes [ ] No

15 PUMP:
Manufacturer's Name Red Jacket
Model Number 50 7B HP 1/2
Length of Drop Pipe 63 ft. capacity 10 G.P.M.
Type: [X] Submersible [ ] ___
[ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.

Pumped 8 gpm. at 60 ft.

ADDED INFO. BY DRILLER. ~~REM NO~~

CORRECTED BY: RTS

ADDITION BY: RTS

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.

4107¼ W. 7 Mile Rd. Northville, Mich — Address

Signed (signature) AUTHORIZED REPRESENTATIVE Date

367D 100M 6-66

GEOLOGICAL SURVEY COPY

Figure F-170

GEOLOGICAL SURVEY SAMPLE No. ______

DEC 06 1979

Well No. 22

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

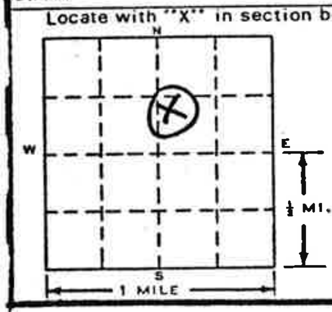
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
WAYNE	VAN BUREN	NW¼ SW¼ NE¼	4	3 N/S.	8 E/W.

Distance And Direction from Road Intersections: 46025 VAN BORN SOUTH SIDE OF ROAD 1/4 MILE WEST OF BELLEVILLE RD.

Street address & City of Well Location

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



3 OWNER OF WELL: GENERAL MOTORS-ARGONAUT DIVISION

Address 485 WEST MILWAUKEE DETROIT - MI. 48202

4 WELL DEPTH: (completed) 89 ft. Date of Completion 11-14-79

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 85 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
YELLOW SAND	5	5
YELLOW CLAY	9	14
HARD BLUE CLAY	26	40
FINE GRAY SAND	20	60
SOFT BLUE CLAY	10	70
FINE SAND & GRAVEL	19	89

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: STAINLESS Dia.: 4" Slot/~~Gauze~~ 10 Length 4 ft Set between 85 ft. and 89 ft. Fittings: HEMP PACKER & PLUG

9 STATIC WATER LEVEL 6 ft. below land surface

10 PUMPING LEVEL below land surface 40 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 115 feet S Direction DRAINFIELD Type. Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed. Manufacturer's Name AERMOTOR Model Number 5D12 HP 1/2 Volts 230 Length of Drop Pipe 42 ft. capacity 12 G.P.M. Type: ☒ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY B
**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.

SLUSSER DRILLING CO., INC. — REGISTERED BUSINESS NAME; 81-0358 — REGISTRATION NO.

Address 1901 WEST MICHIGAN - YPSILANTI

Signed [signature] AUTHORIZED REPRESENTATIVE Date 11-16-79

D47d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

Figure F-171

EB 23 1981 — Act 218, P.A. 1972 — Well No. 23 — OF PUBLIC HEALTH

1 LOCATION OF WELL

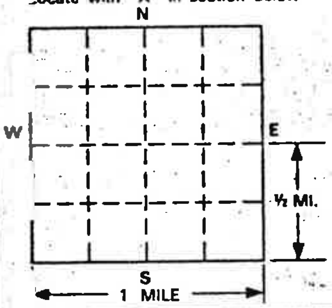
County	Township Name	Fraction	Section Number	Town Number	Range Number
Washtenaw	Ypsilanti	NE ¼ NE ¼ SE ¼	1	N/S	E/W

STARTING POINT:
Distance and Direction from Nearest Road Intersection

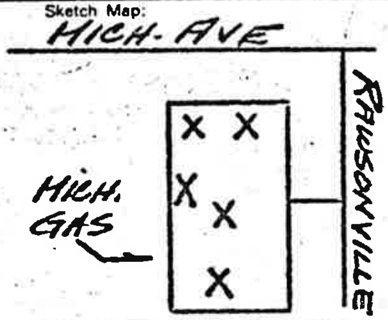
1/2 Mile South of Michigan Avenue
on Rawsonville Road

LOCATION:
From Eng. Plan Sheet No. ______
Other: ______
Engineering Firm: ______

Locate with "X" in section below



Sketch Map:



PROJECT OWNER: Michigan Consolidated Gas
Address: Ypsilanti, Michigan
Project Name: ______
Type of Project: ☐ Sewer ☐ Pumping Station ☐ Foundations Other:

2
☐ Single Well
☒ Several Wells: Total Number of Wells 5
Total Distance Covered ______ ft, N/S/E/W
Includes Wells From Station ______ to Station ______

Well Depth — Range 18 ft. ______ ft.
Date of Drilling 6 Month 80 Year

4
☐ Cable Tool ☒ Rotary ☐ Bored (Auger)
☐ Jetted ☐ Driven ☐ ______

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sandy Gravel	4'	4'
Wet Gravel	2'	6'
Sand	4'	10'
Blue Clay	8'	18'

(USE REMARKS SECTION IF NEEDED)

5 CONSTRUCTION DETAILS:
☐ Drive Points ☐ Rock Well
☐ Natural Pack ☒ Gravel Pack

Drill Hole Size: Diam 36" in Depth 18' ft
Casing: Diam 26" in Depth 17-18 ft
Gravel Pack: From 18 ft to 0 ft
Pack Material: Pea Stone ENS
Screened From 12 ft to 20 ft

6 STATIC WATER LEVEL
4 ft ~~above~~/below land surface

7 DEWATERED LEVEL ______ ft
Pump Operated 24 hr/day,
Pump Capacity ______ gpm
Discharge Point Pond 200' West
Water filtered with Straw
(river, pond, lake, storm sewer, etc.)

8 ABANDONMENT PROCEDURES:
Wells under 40 feet
☒ Parent Material: from ______ ft to ______ ft
☐ Finer Textured Soils: from ______ ft to ______ ft
☐ Other: ______

Wells over 40 feet:
Bentonite-Fine Textured Soil Mixture
from ______ ft to ______ ft
Other: ______

Special Cases: ☐ Gas ☐ Flowing Well
☐ Bedrock ☐ ______

Grout
☐ Bentonite Grout ☐ Neat Cement Grout
from ______ ft to ______ ft

10 REMARKS, Water Quality, Gas, etc.
Low Yield

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY
**ADDITION BY
ELEVATION
DEPTH TO ROCK

ABANDONMENT CERTIFICATION
This well has been abandoned under my jurisdiction and this report is true to the best of my knowledge and belief.

UNION CONSTRUCTION CO. — D 1315
REGISTERED CONTRACTOR NAME — REGISTRATION NUMBER
Address 505 TERRITORIAL ROAD, MANCHESTER, MICH
Signed [signature] — 6/16/80
AUTHORIZED REPRESENTATIVE — DATE

11 DRILLING CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report true to the best of my knowledge and belief.

UNION CONSTRUCTION CO. — D 1315
REGISTERED CONTRACTOR NAME — REGISTRATION NUMBER
Address 505 TERRITORIAL ROAD, MANCHESTER, MICH.
Signed James Wilde — 6/13/80
AUTHORIZED REPRESENTATIVE — DATE

D67k

GEOLOGICAL SURVEY COPY

Figure F-172

DEWATERING WELL RECORD
Act 218, P.A. 1972

SEP 21 1981

Well No. 24

OF PUBLIC HEALTH

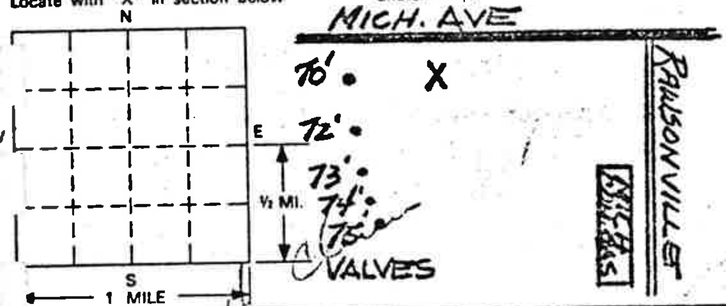
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Washtenaw	Ypsilanti	NE ¼ NE ¼ SE ¼	1	N/S.	E/W.

STARTING POINT:
Distance and Direction from Nearest Road Intersection
600' South of Michigan Ave.
250' West of Rawsonville Road

LOCATION:
From Eng. Plan Sheet No.
Other:
Engineering Firm:

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



PROJECT OWNER: Michigan Consolidated Gas
Address:
Project Name:
Type of Project: ☐ Sewer ☐ Pumping Station ☐ Foundations Other:

2 ☒ Single Well
☐ Several Wells: Total Number of Wells
Total Distance Covered ft, N/S/E/W
Includes Wells From Station to Station

Well Depth — Range 20 ft. ft.

Date of Drilling 7/22 Month 1981 Year

4 ☐ Cable Tool ☒ Rotary ☐ Bored (Auger)
☐ Jetted ☐ Driven ☐

3

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sandy Clay	6	6
Silty Sand	5	11
Blue Clay	9	20

(USE REMARKS SECTION IF NEEDED)

5 CONSTRUCTION DETAILS: ☐ Drive Points ☐ Rock Well ☐ Natural Pack ☒ Gravel Pack
Drill Hole Size: Diam 36 in Depth ft
Casing: Diam 24 in Depth 0 ft
Gravel Pack: From 20 ft to 0 ft
Pack Material: Pea Stone Mason Sand
Screened From 14 ft to 20 ft

6 STATIC WATER LEVEL ft above/below land surface

7 DEWATERED LEVEL ft
385-7872
Pump Operated 24 hr/day,
Pump Capacity gpm
Discharge Point Creek 100' West
(river, pond, lake, storm sewer, etc.)

8 ABANDONMENT PROCEDURES:
Wells under 40 feet
☐ Parent Material: from ft to ft
☐ Finer Textured Soils: from ft to ft
☐ Other:
Wells over 40 feet:
Bentonite-Fine Textured Soil Mixture
from ft to ft
Other:

Special Cases: ☐ Gas ☐ Flowing Well ☐ Bedrock ☐

Grout
☐ Bentonite Grout ☐ Neat Cement Grout
from ft to ft

10 REMARKS, Water Quality, Gas, etc.

9 ABANDONMENT CERTIFICATION
This well has been abandoned under my jurisdiction and this report is true to the best of my knowledge and belief.

UNION CONSTRUCTION CO. — D 1315
REGISTERED CONTRACTOR NAME — REGISTRATION NUMBER
Address 505 TERRITORIAL ROAD
MANCHESTER, MICHIGAN 48158
Signed [signature] 7/27/81
AUTHORIZED REPRESENTATIVE — DATE

11 DRILLING CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

UNION CONSTRUCTION CO. — D 1315
REGISTERED CONTRACTOR NAME — REGISTRATION NUMBER
Address 505 TERRITORIAL ROAD
MANCHESTER, MICHIGAN 48158
Signed [signature] 7/22/81
AUTHORIZED REPRESENTATIVE

Figure F-173

D67k

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE NO.

Well No. 25

81-DEC 16 1981

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

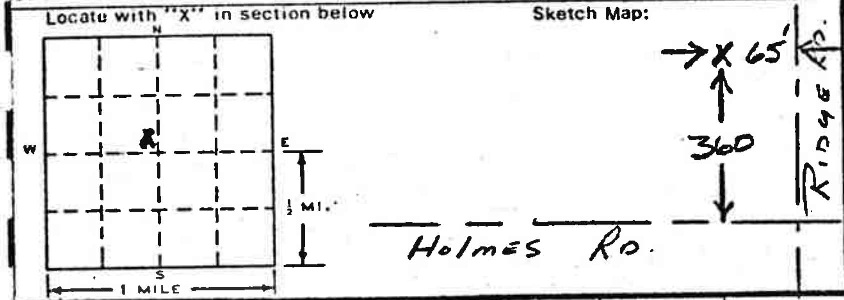
County	Township Name	Fraction	Section Number	Town Number	Range Number
Washtenaw	Ypsilanti	¼ SE ¼ NW ¼	1	3 S.	7 E/W.

Distance And Direction from Road Intersections

360' N. of C/L Holmes Rd.
65' W. of C/L Edge Road

Street address & City of Well Location

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



3 OWNER OF WELL: Ypsilanti Community Utility Authority
Address 2770 Clark Road
Ypsilanti, Mich. 48197

4 WELL DEPTH: (completed) 10 ft. Date of Completion 23 Oct. 81

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

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☒ W.L. Monitoring

7 CASING: Threaded ☒ Welded ☐ Diam. ____ in. to ____ ft. Depth; ____ in. to ____ ft. Depth
Height: Above/Below Surface 11.0" ft. Weight ____ lbs./ft. Drive Shoe? Yes ☐ No ☒

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Silty, Sandy, Clay Topsoil	6"	6"
Yellowish Tan trace of Gravel Silty, Sandy, Clay	2'	2½'
Variegated Lt. Gray & Yellow Gravelly, Sandy, Silty, Clay	1'	3½'
Tannish Gray Clayey, Very Fine & Fine - Med. Sand	1½'	5'
Gray trace of Clay Very Fine & Fine Sand	1'	6'
Gray Sandy, Silty, Clay	3'	9'
Gray Clayey, Very Fine Sand	1'	10'+

ADDED INFO. BY DRILLER, DEM NO.

CORRECTED BY

CONDITION BY

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: Johnson Dia.: 1½" Slot/Gauge #7 Length 36" Set between 8 ft. and 10 ft. Fittings: threaded

9 STATIC WATER LEVEL 3½ ft. below land surface

10 PUMPING LEVEL below land surface ____ ft. after ____ hrs. pumping ____ g.p.m.
Slug test 7½ GPM does not fill to top of 2" Pipe 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 — threaded cap

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: N/A ☐ Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Glenn Miller, Consulting Geologist

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.

Sterling Drilling Co. — REGISTERED BUSINESS NAME — 0666 REGISTRATION NO.

Address 6236 W. Grand River, Brighton, MI 48116

Signed ____ AUTHORIZED REPRESENTATIVE Date 30 Oct. 81

D67d 100M (Rev. 12-68)

Figure F-174

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. DEC 16 1981

Well No. 26

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

81-4

1 LOCATION OF WELL

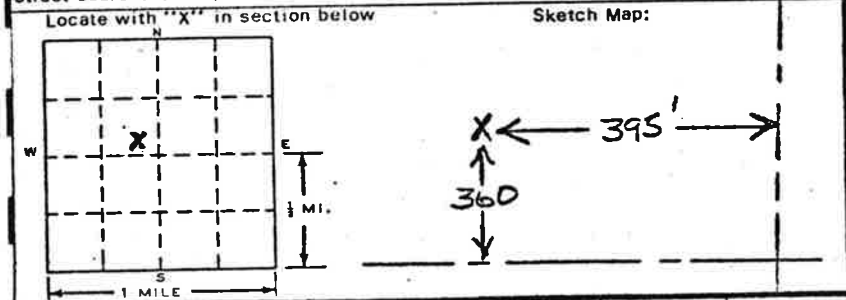
County	Township Name	Fraction	Section Number	Town Number	Range Number
Washtenaw	Ypsilanti	¼ SE¼ NW¼	1	3 N/S.	7 E/W.

Distance And Direction from Road Intersections

360' N. of C/L Holmes Rd.
395' W. of C/L Ridge Rd.

Street address & City of Well Location

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



3 OWNER OF WELL: Ypsilanti Community Utility Authority
Address: 2770 Clark Rd. Ypsilanti, Mich. 48197

4 WELL DEPTH: (completed) 19 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 ☒ W.L. Monitoring

7 CASING: Threaded ☒ Welded ☐ Diam. ____ in. to ____ ft. Depth; ____ in. to ____ ft. Depth. Height: Above/Below Surface 3/33 ft. Weight ____ lbs./ft. Drive Shoe? Yes ☐ No ☒

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Sand Topsoil Typical Fill	2"	2"
Variegated Yellow & Tan Clayey, Silty, Gravelly Sand	1'10"	2'
Yellow Silty, Clayey, Very Fine & Fine Sand	1'	3'
Yellow Clayey, Silty, Very Fine Sand	3'	6'
Black Sludge	2½'	8½'
Greenish Gray Silty, Clayey, Very Fine Sand	1½'	10'
Gray Very Fine & Fine Sand	3'	13'
Vraiegated Greenish Gray & Gray Clayey, Very Fine Sand, Silt	5'	18'
Gray Sandy, Silty, Clay	14'	32'
Gray Sandy, Silty, Clay	18'	50'
ADDED INFO. BY DRILLER, ITEM NO.		
CORRECTED BY:		

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: Johnson Dia.: 1¼" Slot/Gauze: #7 Length 36" Set between 16 ft. and 19 ft. Fittings: threaded

9 STATIC WATER LEVEL 12½' ft. below land surface

10 PUMPING LEVEL below land surface ____ ft. after ____ hrs. pumping ____ g.p.m.
Slug test 7½ GPM Fills to top of Pipe
____ 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 — threaded cap

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: N/A ☐ Not installed. Manufacturer's Name ____ Model Number ____ HP ____ Volts ____ Length of Drop Pipe ____ ft. capacity ____ G.P.M. Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Glenn Miller, Consulting Geologist

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.

Sterling Drilling Co. — REGISTERED BUSINESS NAME — 0666 REGISTRATION NO.
Address 6236 W. Grand River, Brighton, MI
Signed ____ AUTHORIZED REPRESENTATIVE Date 30 Oct. 81

D47d 100M (Rev. 12-68)

Figure F-175

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No.

DEC 16 1981

Well No. 27

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

81-3

1 LOCATION OF WELL

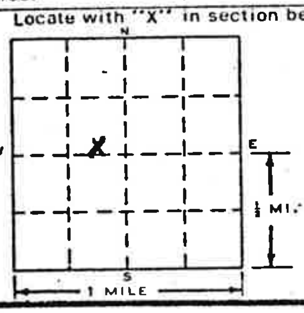
County	Township Name	Fraction	Section Number	Town Number	Range Number
Washtenaw	Ypsilanti	¼ SE ¼NW ¼	1	3 ~~N~~S.	7 E/W.

Distance And Direction from Road Intersections

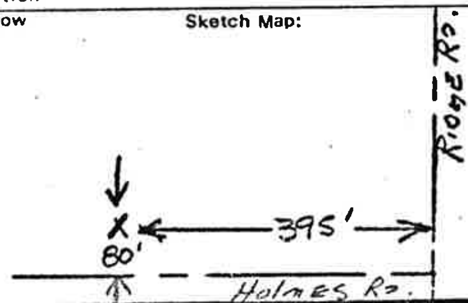
80' N. of C/L Holmes Rd.
395' W. of C/L Ridge Rd.

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL:

Ypsilanti Community Utility Authority
Address 2770 Clark Rd.
Ypsilanti, Mich. 48197

4 WELL DEPTH: (completed) 15 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 ☒ W.L. Monitoring

7 CASING: Threaded ☒ Welded ☐ Diam. ____ in. to ____ ft. Depth; ____ in. to ____ ft. Depth. Height: Above/~~Below~~ Surface 11" ft. Weight ____ lbs./ft. Drive Shoe? Yes ☐ No ☒

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Sand Topsoil	2"	2"
Tannish Yellow Very Fine & Fine Sand	2'10"	3'
Yellow-occasionally w/1/2" x 3" brown topsoil lens Clayey, Silty, Fine & Very Fine Sand	2'	5'
Whitish Tan trace fine gravel Med.& Fine & Very Fine Sand	2'	7'
Lt. Tan Gravelly Sand	1'	8'
Gray Gravelly, Sand	4'	12'
Gray Med.-Fine & Very Fine Sand	3'	15'+

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: Johnson Dia.: 1½" Slot ~~xxxxx~~ #7 Length 36"; Set between 12 ft. and 15 ft. Fittings: threaded

9 STATIC WATER LEVEL 9½ ft. below land surface

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

Slug test 12½ GPM fails to fill to top of 2" Pipe

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

12 WELL HEAD COMPLETION: ☐ In Approved Pit threaded cap ☐ 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: N/A ☐ Not installed. Manufacturer's Name ____ Model Number ____ HP ____ Volts ____ Length of Drop Pipe ____ ft. capacity ____ G.P.M. Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Glenn Miller, Consulting Geologist

ADDED INFO. BY DRILLER, ITEM NO.

CORRECTED 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.

Sterling Drilling Co. — REGISTERED BUSINESS NAME — 0666 REGISTRATION NO.

Address 6236 W. Grand River, Brighton, MI 48116

Signed ____ AUTHORIZED REPRESENTATIVE Date Oct. 30, 1981

D67d 100M (Rev. 12-68) ADDITION

Figure F-176

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. DEC 16 1981

Well No. 28

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

81-2

1 LOCATION OF WELL

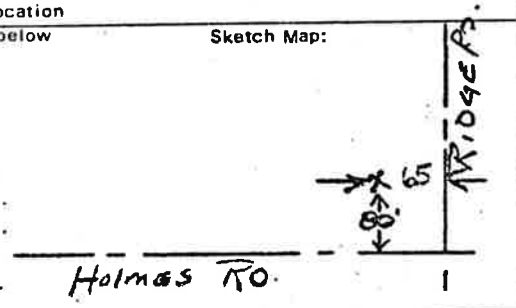
County	Township Name	Fraction	Section Number	Town Number	Range Number
Washtenaw	Ypsilanti	¼ SE ¼ - NW ¼	1	3 N/S.	7 E/W.

Distance And Direction from Road Intersections:
80' N. of C/L Holmes Rd.
65' W. of C/L Ridge Rd.

Street address & City of Well Location

Locate with "X" in section below (N, S, E, W; ½ MI.; 1 MILE) — X marked in NW quarter

Sketch Map:



3 OWNER OF WELL:

Ypsilanti Community Utility Authority
Address 2770 Clark Road
Ypsilanti, Mich. 48197

4 WELL DEPTH: (completed) Date of Completion

16 ft.

5

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

6 USE:

☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ W.L. Monitoring

7 CASING:

Threaded ☒ Welded ☐
Diam. ____ in. to ____ ft. Depth
____ in. to ____ ft. Depth
Height: Above/Below Surface 9" ft.
Weight ____ lbs./ft.
Drive Shoe? Yes ☐ No ☒

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Dark Brown Silty, Sand, Clay topsoil	6"	6"
Variegated Gray & Yellow Lt. Tan Silty, Sandy, Clay	1½'	2'
Variegated gray & Lt. Tan Silty, Sandy, Clay	1/2'	2½'
Gray Sandy, Silty, Clay	1'	3½'
Gray Silty, Sandy, Clay	1½'	5'
Gray Sand & Gravel - Clean	3½'	8'
Gray Sandy, Silty, Clay	1½'	10'
ADDED INFO. BY DRILLER, ITEM NO.		
CORRECTED BY		
USE A 2ND SHEET IF NEEDED		

8 SCREEN:

Type: Johnson Dia.: 1½"
Slot/Gauze #7 Length 36"
Set between 4 ft. and 7 ft.
Fittings: threaded

9 STATIC WATER LEVEL

3.5 ft. below land surface

10 PUMPING LEVEL below land surface

____ ft. after ____ hrs. pumping ____ g.p.m.
Slug test 1 pint/min. fills to top of
____ ft. after ____ hrs. pumping 2" Pipe g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION:

threaded cap
☐ 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:

N/A ☐ Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Glenn Miller, Consulting Geologist

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.

Sterling Drilling Co. — 0666
REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 6236 W. Grand River, Brighton, MI 48116

Signed [signature] AUTHORIZED REPRESENTATIVE Date 30 Oct. 81

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

Figure F-177

GEOLOGICAL SURVEY SAMPLE No.

JUN 04 1969

WATER WELL RECORD

ACT 294 PA 1965

Well No. 29

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp	Fraction	Section No.	Town	Range
WASHTENAW	YPSILANTI	¼ NW¼ NE¼	13	3S N/S.	7E E/W.

Distance And Direction from Road Intersections

OWNER No.

3050 TYLER RD.

Street address & City of Well Location

3 OWNER OF WELL: J. FONS CO.

Address 3651 HAMLIN ROAD UTICA MICH 48087

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	18	0 to 18
3 Water Sand	3	18 to 21

4 WELL DEPTH: (completed) 21 ft. Date of Completion 3-19-69

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. Threaded ☐ Welded ☐

___ in. to 14 ft. Depth

___ in. to ___ ft. Depth

Height: Above/Below surface ___ ft. Weight ___ lbs/ft. Drive Shoe? Yes ☐ No ☐

8 SCREEN: Type: Johnson Dia.: 1¼

Slot/Gauze 10 Length 36"

Set between ___ ft. and ___ ft.

Fittings:

9 STATIC WATER LEVEL 16 ft. below land surface

10 PUMPING LEVEL below land surface

16 ft. after 1 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 ___

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

ABOVE INFO. OF DRILLER, ITEM No.

*CORRECTED BY:

**ADDITION BY:

16 Remarks, elevation, source of data, etc.

Well #1

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.

John Rattee — REGISTERED BUSINESS NAME — 0175 REGISTRATION NO.

Address 2635 Lon grein Rochester

Signed John Rattee — AUTHORIZED REPRESENTATIVE — Date Mar 31 1969

D67D 100M 6-66

GEOLOGICAL SURVEY COPY

Figure F-178

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

Well No. 30

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
WASHTENAW	YPSILANTI	~~NE~~ ¼ NW¼ NE¼	13	3 S N/S.	7 E E/W.

Distance And Direction from Road Intersections

OWNER No.

3050 TYLER RD.

Street address & City of Well Location

3 OWNER OF WELL: J. FONS CO.
Address 3651 HAMLIN ROAD UTICA MICH 48087

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	12	0 to 12
Sand Water	6	12 to 18

4 WELL DEPTH: (completed) ft. Date of Completion 3-19-69

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 ☐ Height: Above/Below
Diam. ___in. to 14 ___ft. Depth surface___ft.
___in. to ___ft. Depth Weight___lbs/ft.
Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: Johnson Dia.: 14
Slot/Gauze 10 Length 36
Set between 15 ft. and 18 ft.
Fittings:

9 STATIC WATER LEVEL
12 ft. below land surface

10 PUMPING LEVEL below land surface
15 ft. after 1 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
___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

DRILLER, ...
CORRECTED BY
ADDITION BY

16 Remarks, elevation, source of data, etc.

Well #2

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.

John Pattee 8175
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 2635 Longview Palatine

Signed John Pattee Date Mar 31 1969
AUTHORIZED REPRESENTATIVE

D67D 100M 6-66

JUN 4 1969

Figure F-179

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No.

WATER WELL RECORD

ACT 294 PA 1965

Well No. 31

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1. LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
WASHTENAW	YPSILANTI	NE ¼ NW¼ NE ¼	13	3 S N/S.	7E E/W.

Distance And Direction from Road Intersections

OWNER No.

3050 TYLER RD.

Street address & City of Well Location

3 OWNER OF WELL: J. FONS CO.

Address 3651 HAMLIN ROAD UTICA MICH 48087

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	23	0 to 23
Clay	1	23 to 24

4 WELL DEPTH: (completed) ft. Date of Completion 3-19-69

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. 1¼ in. to ____ ft. Depth ____ in. to ____ ft. Depth

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

8 SCREEN: Type: Johnson Dia.: 1¼ Slot/Gauze 10 Length 36 Set between 21 ft. and 24 ft. Fittings:

9 STATIC WATER LEVEL Dry ft. below land surface

10 PUMPING LEVEL below land surface Dry 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 ____

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

16 Remarks, elevation, source of data, etc.

Well #3

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.

John Rattee — REGISTERED BUSINESS NAME — 0175 REGISTRATION NO.

Address 2635 Lakeview Rochester

Signed John Rattee AUTHORIZED REPRESENTATIVE Date Mar 31 1969

Figure F-180

D67D 100M 6-66

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No.

WATER WELL RECORD

ACT 294 PA 1965

Well No. 32

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
WASHTENAW	YPSILANTI	¼ NW ¼ NE ¼	13	3S N/S.	7E E/W.

Distance And Direction from Road Intersections

OWNER No.

3050 TYLER RD.

Street address & City of Well Location

3 OWNER OF WELL: J. FONS CO.

Address 3651 HAMLIN ROAD UTICA MICH 48087

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	16	0 to 16
Clay	1	16 to 17

4 WELL DEPTH: (completed) ___ ft. Date of Completion 3-19-69

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. Threaded ☐ Welded ☐ ___ in. to 1¼ ___ ft. Depth ___ in. to ___ ft. Depth

Height: Above/Below surface ___ ft. Weight ___ lbs/ft. Drive Shoe? Yes ☐ No ☐

8 SCREEN: Type: Johnson Dia.: 1¼ Slot/Gauze 10 Length ___ Set between 14 ft. and 17 ft. Fittings:

9 STATIC WATER LEVEL Dry ft. below land surface

10 PUMPING LEVEL below land surface Dry 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 ___

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

ADDED INFO. BY DRILLER. ITEM NO

*CORRECTED BY:

**ADDITION BY:

16 Remarks, elevation, source of data, etc.

Well # 4

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.

John Rattee REGISTERED BUSINESS NAME 0175 REGISTRATION NO.

Address 2635 Longview Rochester

Signed John Rattee AUTHORIZED REPRESENTATIVE Date Mar 31 1969

D67D 100M 6-66

GEOLOGICAL SURVEY COPY

Figure F-181

WATER WELL RECORD
ACT 294 PA 1965
Well No. 33

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
WASHTENAW	YPSILANTI	NE ¼ NW ¼ NE ¼	13	3S N/S.	7E E/W.

Distance And Direction from Road Intersections

OWNER No.

3050 TYLER RD.

Street address & City of Well Location

3 OWNER OF WELL: J. FONS CO.
Address 3651 HAMLIN ROAD
UTICA MICH 48087

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	19	0 to 19
Clay	12	19 to 31

4 WELL DEPTH: (completed) ft. Date of Completion 3-19-69

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 ☐ Height: Above/Below surface ___ ft.
Diam. ___ in. to ___ ft. Depth 1¼ Weight ___ lbs/ft.
___ in. to ___ ft. Depth Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: Johnson Dia.: 1¼
Slot/Gauze 10 Length 36
Set between 28 ft. and 31 ft.
Fittings: pack Sand 19 to 31

9 STATIC WATER LEVEL
Dry ft. below land surface

10 PUMPING LEVEL below land surface
Dry 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 ___

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

ADDED INFO. BY DRILLER, ITEM NO.
*CORRECTED BY:
**ADDITION BY

16 Remarks, elevation, source of data, etc.

Well # 5

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.

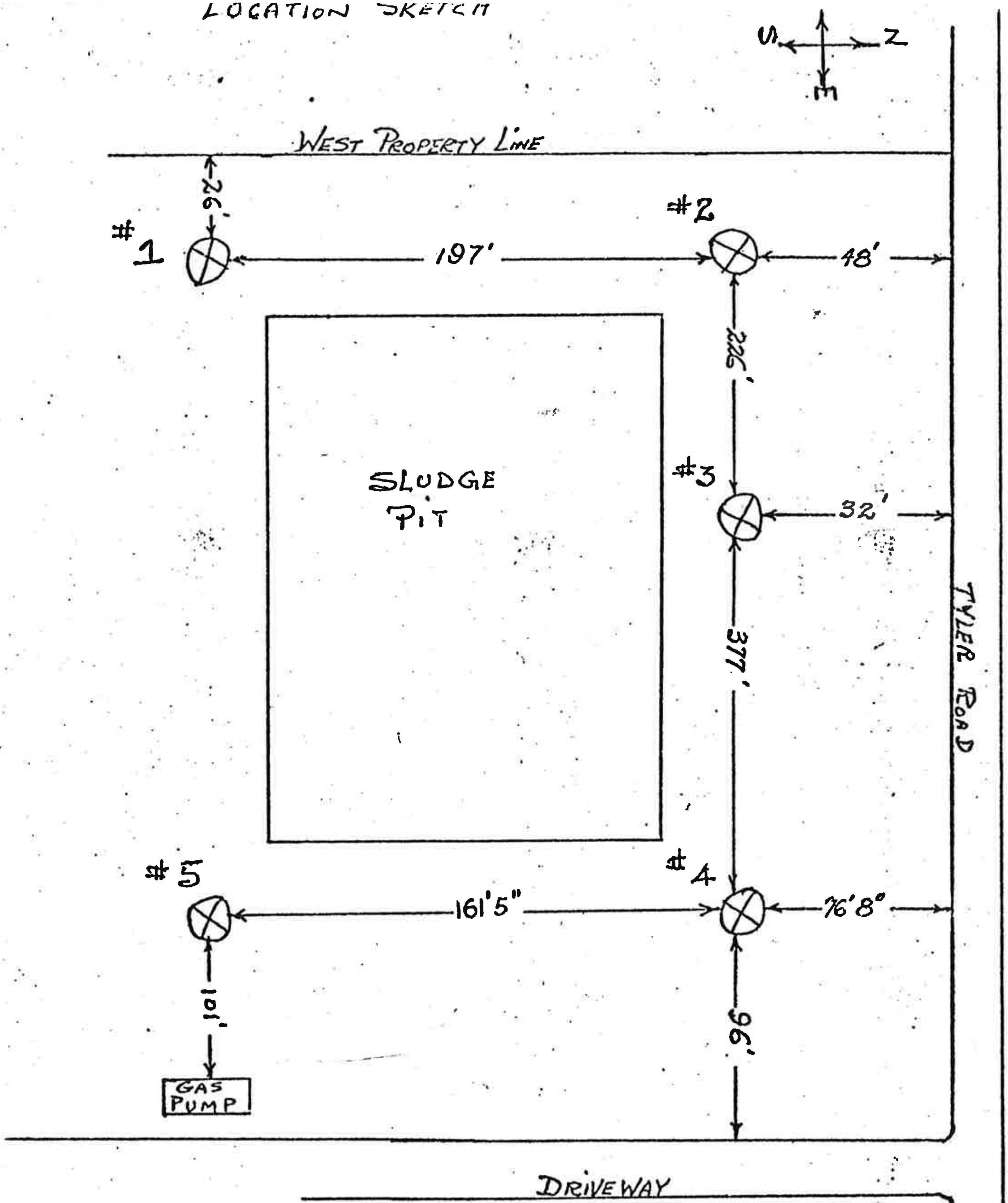
John Rattee — REGISTERED BUSINESS NAME 0175 — REGISTRATION NO.
Address 2635 Longview Rochester
Signed John Rattee — AUTHORIZED REPRESENTATIVE Date Mar 31 1969

D67D 100M 6-66

JUN 4 1969 GEOLOGICAL SURVEY COPY

Figure F-182

LOCATION SKETCH



(X) TEST WELLS

#1 18' SAND - 3' WATER SAND = 21' TOTAL - 9 GPM - SALTY
#2 12' SAND - 6' WATER SAND = 18' TOTAL - 12 GPM - SALTY
#3 23' SAND - 1' CLAY = 24' TOTAL - DRY
#4 16' SAND - 1' CLAY = 17' TOTAL - DRY
#5 19' SAND - 12 CLAY = 31' TOTAL - DRY

NO SCALE

Figure F-183

GEOLOGICAL SURVEY SAMPLE NO.

Well No. 34

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

R

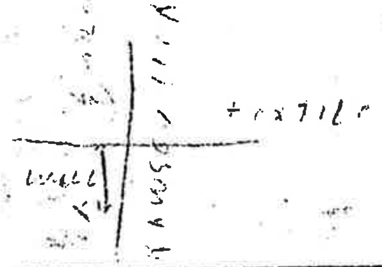
1 LOCATION OF WELL

County: Washtenaw
Township Name: Ypsilanti
Fraction: E ¼ ¼ ¼
Section Number: 5
Town Number: 3 N/S.
Range Number: 7 E/W.

Distance And Direction from Road Intersections / Street address & City of Well Location: [illegible handwriting] Rawsonville Rd ... Washtenaw

Locate with "X" in section below — N, E, S, W; ½ MI.; 1 MILE

Sketch Map:



3 OWNER OF WELL: Antioch Baptist Church
Address: 9738 Rawsonville Rd, Ypsilanti 48197

4 WELL DEPTH: (completed) 96 ft. Date of Completion 11/11/71

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

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

7 CASING: Threaded [X] Welded [ ]
Diam. 4 in. to 92 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
Fill Sand	2	2
Top Soil	1	3
Gravel	15	18
Clay Blue	50	68
Gravel	1	69
Clay + Stones	3	72
Clay Blue	18	90
Gravel Stones Large	1	91
Sand Gravell	5	96

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: Johnson Dia.: 3"
Slot/Gauze 25 Length 4
Set between 92 ft. and 96 ft.
Fittings: Packer

9 STATIC WATER LEVEL 44 ft. below land surface

10 PUMPING LEVEL below land surface
70 ft. after 4 hrs. pumping 18 g.p.m.
5 ft. after 1 hrs. pumping 24 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 Sewer Type
Well disinfected upon completion [X] Yes [ ] No

15 PUMP: [ ] Not installed
Manufacturer's Name Red A
Model Number ___ HP 1 Volts 220
Length of Drop Pipe 84 ft. capacity ___ G.P.M.
Type: [X] Submersible [ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.

Well only permit
75-3

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.
Lindstrom Well Drilling 07[illegible]
REGISTERED BUSINESS NAME — REGISTRATION NO.
Address 1901 Bemis Rd Ypsilanti
Signed [signature] AUTHORIZED REPRESENTATIVE Date 11-11-71

D67d 100M (Rev. 12-68)

Figure F-184

LOCAL HEALTH DEPT. COPY

ACT 294 PA 1965

OF PUBLIC HEALTH

Well No. 35

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
Washtenaw	Ypsilanti	NE ¼ NW ¼ SE ¼	25	3 S.	7 E.

Distance And Direction from Road Intersections: 2000 FT. So. Huron River Dr. 450 FT. East McKean Rd

OWNER No.

Street address & City of Well Location: 6601 McKean Rd

3 OWNER OF WELL: Auto Products
Address: 14840 Puritan, Detroit Mich. 48227

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
medium Sand	18	18
Clay	104	122
Hard Rock	?	
Bottom of Hole 150' still Rock		

4 WELL DEPTH: (completed) 150 ft. Date of Completion 4-10-67

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

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

7 CASING: Threaded ☒ Welded ☐
Diam. 4 in. to 123 ft. Depth
___ in. to ___ ft. Depth
Height: Above/Below surface 1 ft.
Weight 11 lbs/ft.
Drive Shoe? Yes ☒ No ☐

8 SCREEN:
Type: NONE Dia.:
Slot/Gauze Length
Set between ___ ft. and ___ ft.
Fittings:

9 STATIC WATER LEVEL
65 ft. below land surface

10 PUMPING LEVEL below land surface
100 ft. after 3 hrs. pumping 2 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

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

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
250 feet S. Direction Septic Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP:
Manufacturer's Name UNKNOWN
Model Number HP
Length of Drop Pipe ___ ft. capacity ___ G.P.M.
Type: ☐ Submersible ☐ ___ ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

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.

Earl Neiman — REGISTERED BUSINESS NAME — 64 REGISTRATION NO.

Address 8430 Canton Center, Plymouth

Signed Earl Neiman (AUTHORIZED REPRESENTATIVE) Date 5-22-67

D87D 100M 6-66

LOCAL HEALTH DEPT. COPY

Figure F-185

GEOLOGICAL SURVEY NO

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PART 127 ACT 368, P.A. 1978 — Well No. 36

PERMIT NUMBER

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Wayne	Van Buren	SE ¼ ¼ ¼	18	3XXS	8 EXX

Distance And Direction From Road Intersection

49350 North I-94 Service Drive

Street Address & City of Well Location

Locate with "X" in Section Below — Sketch Map

N / S / E / W — ½ MI. — 1 MILE

3 OWNER OF WELL

Wayne Disposal, Inc.
Address P. O. Box 5187
Dearborn, MI 48128

Address Same As Well Location? ☐ Yes ☒ No

4 WELL DEPTH (completed) 116 ft — Date of Completion 12-6-82

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Auger ☐ Jetted ☐ ______

6 USE ☐ Domestic ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat pump ☐ Test Well ☐ Type IIb Public ☒ Processing

7 CASING Diameter ☒ Steel ☒ Threaded ☐ Plastic ☐ Welded

4 in to 108 ft depth
______ in to ______ ft depth

Grouted Drill Hole Diameter
______ in to ______ ft depth
______ in to ______ ft depth

Height Above/Below Surface ______ ft
Weight 11 lbs/ft
Drive Shoe ☒ Yes ☐ No

2 FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Yellow Sand	6	6
Gray Sand	5	11
Soft Blue Clay	22	33
Hard Blue Clay	33	66
Fine Silty Sand	29	95
Fine Sand & Gravel	20	115
Black Shale	1	116

USE A 2ND SHEET IF NEEDED

8 SCREEN ☐ Not Installed

Type Stainless Diameter 4"
Slot/XXXX 12 Length 8'
Set between 108 ft and 116 ft
FITTINGS ☐ K-Packer ☐ Lead Packer ☐ Bremer Check
☒ Blank above screen 1 ft Other Hemp Packer

9 STATIC WATER LEVEL 60 ft below land surface ☐ Flow

10 PUMPING LEVEL below land surface
100 ft after 2 hrs pumping at 35 G.P.M.
______ ft after ______ hrs pumping at ______ G.P.M.

11 WELL HEAD COMPLETION ☒ Pitless adapter ☐ 12" above grade ☐ Basement offset ☐ Approved pit

12 WELL GROUTED? ☐ No ☒ Yes From ______ to ______ ft.
☐ Neat cement ☒ Bentonite ☐ Other ______
No. of bags of cement ______ Additives ______

13 Nearest source of possible contamination
Type ______ Distance ______ ft. Direction ______
Well disinfected upon completion? ☒ Yes ☐ No

14 PUMP: ☐ Not Installed ☐ Pump Installation Only
Manufacturer's name Aermotor
Model number 4ST30 HP 3 Volts 220
Length of Drop Pipe 100 ft capacity ______ G.P.M.
TYPE ☒ Submersible ☐ Jet ______
PRESSURE TANK
Manufacturer's name Well X Trol
Model number WX252 Capacity ______ Gallons

15 Remarks, elevation, source of data, etc.

16 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

Slusser Drilling Co., Inc. — 81-0388/1760
REGISTERED BUSINESS NAME — REGISTRATION NO.
Address 1701 W. Michigan Ave Ypsilanti, MI
Signed Richard A. Slusser — Date 12-28-82
AUTHORIZED REPRESENTATIVE

D67d (Rev. 10-80)

IMPORTANT: File with deed.

Figure F-186

WELL OWNER COPY

PROJECT NO. 94309	NEYER, TISEO & HINDO, LTD.	SHEET 1 OF 1

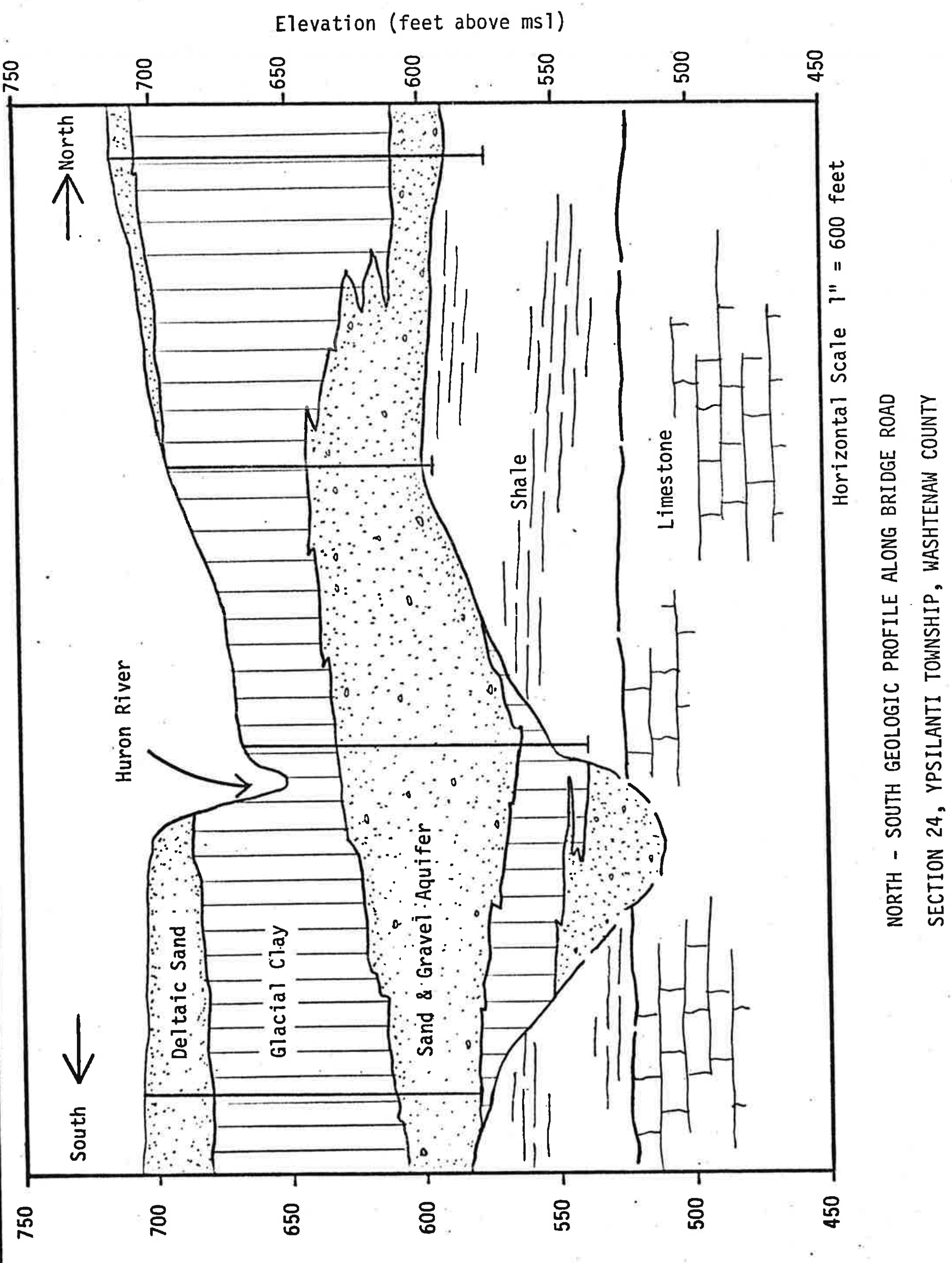
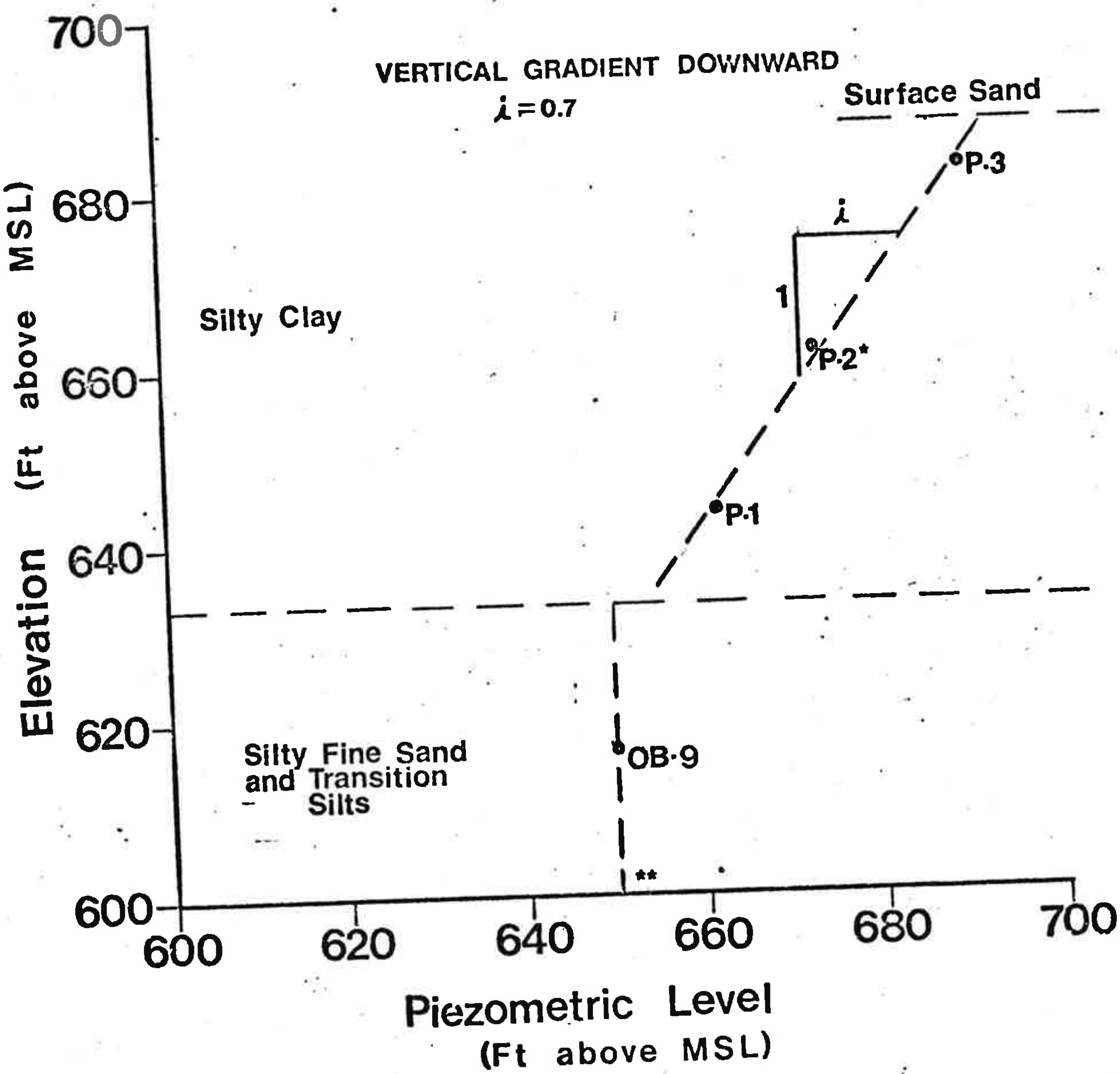


Figure F-187

PROJECT NO. 94309	NEYER, TISEO & HINDO, LTD.	SHEET 1 OF 1



*Full stabilization of this instrument is not yet verified.

**The aquifer sands are assumed to possess a negligible vertical gradient.

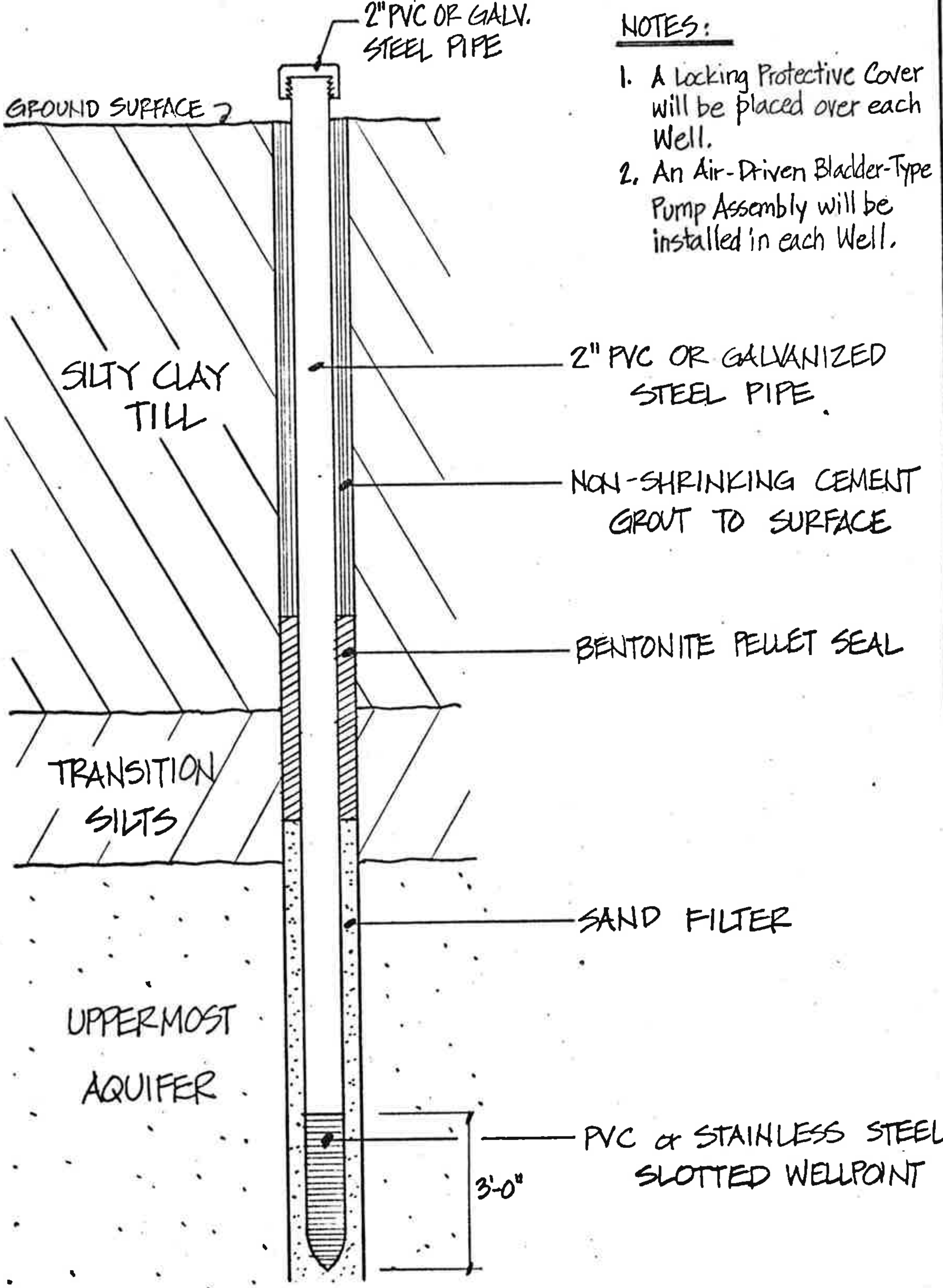
PIEZOMETER NEST AND MONITORING WELL DATA

5/21/81

Figure F-18

SCHEMATIC DIAGRAM · TYPICAL MONITORING WELL ASSEMBLY

NOT TO SCALE



NOTES:

1. A Locking Protective Cover will be placed over each Well.
2. An Air-Driven Bladder-Type Pump Assembly will be installed in each Well.

FIGURE F·189

Early Water Quality Results
Ypsilanti Township Well Field

Parameters	Well #112 10/31/41	Well #112 11/16/45	Well #113 12/19/41	Well #114 11/16/43	Well #117 2/26/44	Well #117 2/28/44	Well #117 2/29/44
Silica (SiO_2)	4	7	10	8	-	-	-
Calcium (C_a)	82	77	64	82	90	75	75
Magnesium (Mg)	20	20	30	23	26	19	19
Iron (Fe)	.5	.7	1.5	.7	.1	1.5	2.5
Carbonate (CO_3)	0	-	0	-	0	0	0
Bicarbonate (BCO_3)	309	301	316	283	336	322	321
Sulfate (SO_4)	17	44	9	73	66	22	34
Chloride (Cl)	22	19	64	35	160	11	11
Nitrate (NO_3)	0	0	0	0	-	-	-
Free Carbondioxide (CO_2)	10	-	6	-	-	-	-
Total Hardness as $CaCO_3$	287	275	263	299	332	265	265
Noncarbonate (permanent) Hardness as $CaCO_3$	34	28	84	67	57	-	-
Total Solids	280	332	351	473	-	-	-
pH	7.4	7.5	7.6	7.5	7.6	7.6	7.6

From McGuiness, Poindexter and Gotton (1944). These wells were originally known as the Ford Motor Company supply wells for the Willow Run Bomber Plant.

Figure F-190

Descriptive Logs - Old Wells in Ypsilanti Township Well Field (McGuiness, et al, 1944)

	Thickness	Depth
Well #112 - Ford Motor Company supply well 1. Altitude 668.		
Clay	3	3
Gravel and Sand	45	48
Boulders and Gravel	39	87
Well #113 - Ford Motor Company supply well 2. Altitude 661.5.		
Sand, Clay and Stones	10	10
Coarse Sand, Gravel and Boulders	71	81
Boulders and Clay	11	92
Gravel	5	97
Well #114 - Ford Motor Company supply well 3. Altitude 665±.		
Topsoil	5	5
Coarse Sand	10	15
Fine Gravel	5	20
Coarse Sand	10	30
Medium Sand	15	45
Clay and Gravel	5	50
Sand, Gravel and Clay	5	55
Fine Gravel, Coarse Sand, Some Boulders	25	80
Shale	2	82
Well #117 (FWA 13) - 50 feet south of Huron River, just below Ford Rawsonville Dam opposite well field of Willow Run Bomber Plant. Altitude 658.		
Reddish-Brown Soil and Pebbles	5	5
Red Gravel with Some Red Sandy Clay	5	10
Brown Gravel with Silt	10	20
Gravel with Gray Mud and Silt; not as well sorted as material from 10 to 20 feet	10	30
Medium to Fine Gravel	5	35
Fine to Coarse Gravel, Some Pebbles up to 3 inches in diameter	15	50
Fine to Medium Gravel, Pebbles up to 1 inch in diameter	10	60
Clean Medium Gravel with Sand in Lower Part	10	70
Loose Gravel, Some Pebbles up to 2 inches in diameter	8	78
Fine Gravel, Clay and Sand ("hardpan")	2	80
Gray Angular Gravel and sand, similar to "hardpan"	5	85
Gray Angular Gravel Composed of Cemented Limestone and Shale Pebbles; low permeability	5	90
Moderately Loose Gravel and Sand, probably equivalent to "salt water" bed in Ford Well 2	5	95
Brown Limestone with Some Hard White Chert (Traverse Formation?)	2	97
Hard White Chert	3	100

Recent Water Quality Results
Ypsilanti Township Well Field

Parameters	Well #1 1/28/83	Well #3 12/1/58	Well #6 & #7 1/28/83	Well #9 3/22/73
HCO_3	300	261	288	310
Ca	113.3	88	148.0	160
Cl	87	13	101	86
COND	850	620	1050	1100
F	0.6	0.3	0.4	0.3
Total Hardness	406	320	505	310
Fe	3.78	1.20	1.66	5.00
Mg	29.1	25	34.1	37
Mn	.18	0	.20	.22
NO_3	0.0	0.0	0.0	0.0
pH	7.5	7.3	7.7	7.4
K	3.4	1.5	4.0	3.2
Si	14.8	13	14.3	14
Na	52	12.0	52	43.0
SO_4	69	63	164	190
TDS	549	400	691	764

From files at Michigan State Department of Public Health.

Figure F-192

PROJECT NO. 94315	NEYER, TISEO & HINDO, LTD.	PAGE 1 OF 1

SCHOELLER DIAGRAM

YPSILANTI TOWNSHIP WELL FIELD

(Data From McGuinness et.al., 1944, As Well As Recent Files At Michigan Department of Public Health)

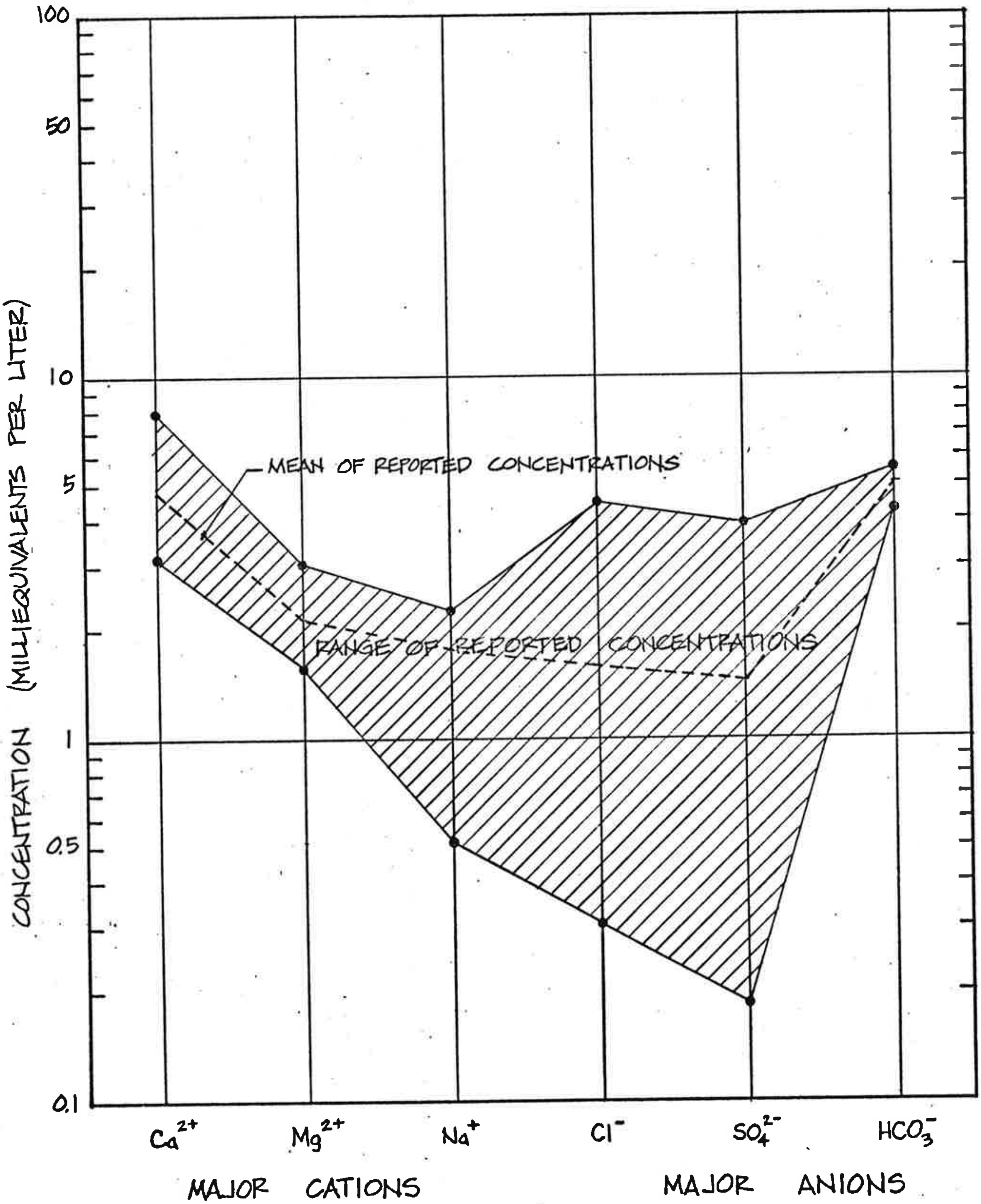


Figure F-193

Bedrock Wells - Water Quality[1]

	1	2	3	4
Silica (SiC_2)	24	340	459	15
Iron (Fe)	Tr.	Tr.	14	—
Calcium (Ca)	1,160	2,167	2,316	1,610
Magnesium (Mg)	495	943	1,064	780
Sodium (Na)	5,734	10,714	14,556	13,576
Potassium (K)	104	295	88	236
Carbonate (CO_3)[2]	379	589	613	496
Sulfate (SO_4)	3,233	3,852	3,659	1,814
Chloride (Cl)	9,368	19,553	26,185	24,221
Bromide (Br)	53	163	180	168
Total Solids	20,636	38,679	49,114	42,916
Hydrogen sulfide (H_2S), cc. per liter	91	140	155	67

1) Adapted from U.S. Geological Survey Folio 155, 1908.
2) Presumably in solution both as carbonate, CO_3, and as bicarbonate, HCO_3.

1. Well 81 (Cornwell well, "Ypsilanti Mineral Spring"). Analysis by A. B. Prescott of sample taken March 31, 1883.

2. Well 69 (Moorman well). Analysis by J.H. Shepard of sample taken September 5, 1884. Well cased to 500 feet; water from Dundee limestone.

3. Well 69. Analysis by LeForest Ross of sample taken September 13, 1897. Well cased to 185 feet; some water obtained from Bersa sandstone.

4. Well 53 (Atlantis well). Analysis by J. H. Shepard and W. F. Pett of sample taken July 26, 1884, at a depth of about 360 feet.

From McGuiness, et al., 1944.

SCHOELLER DIAGRAM

FOUR BEDROCK WELLS IN YPSILANTI AREA

(Data From McGuinness, et. al., 1944)

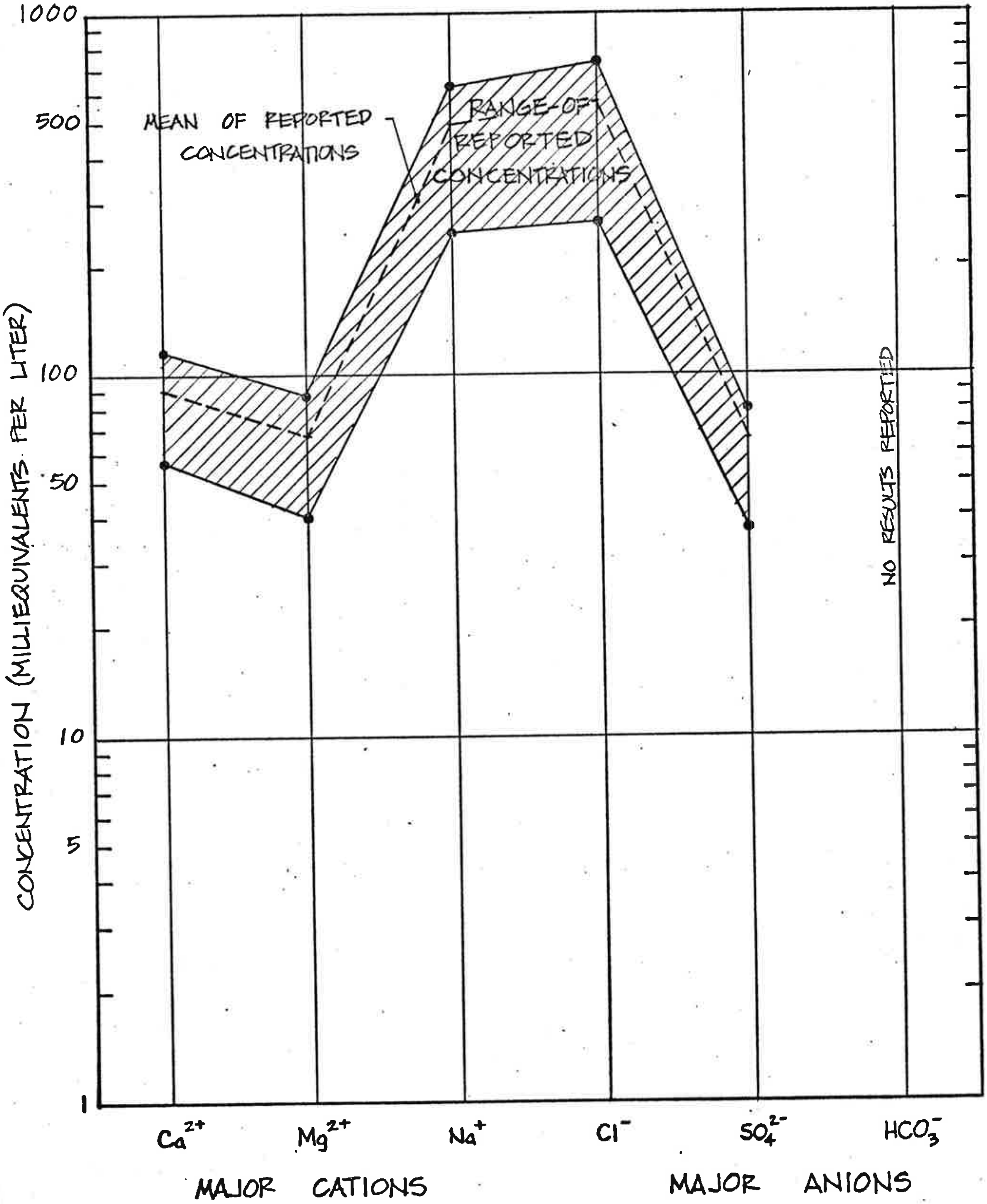


Figure F-195

NTH CONSULTING ENGINEERS

NEYER, TISEO & HINDO, LTD.

30999 Ten Mile Road • Farmington Hills, MI 48024 • (313) 471-0750
2053 South Dort Highway • Flint, MI 48503 • (313) 232-9652
2615 Comerica Building • Detroit, MI 48226 • (313) 965-0036

JOB Wayne Disposal, Inc PROJECT NO. 943150W SHEET NO. 1 of 6
SUBJECT Permeability Data Analysis BY WRP DATE 8/2/83
CHK. BY MKV DATE 8.2.83

SILTY CLAY TILL

Falling-head test results to data in ascending order

Boring	Sample	K (cm/sec)	Remarks
TB-103	LS-5	3.3×10^{-9}	
Push sample w/advance trimming		6×10^{-9}	tested by others for WDI
TB-39	LS-3	8.1×10^{-9}	
TB-104	LS-19	8.1×10^{-9}	
TB-106	LS-9	9.1×10^{-9}	
TB-110	LS-6	9.6×10^{-9}	
TB-102	LS-8	1.1×10^{-8}	
TB-125	LS-5	1.1×10^{-8}	
TB-110	LS-9	1.3×10^{-8}	
TB-44	LS-5	1.3×10^{-8}	
TB-122	LS-5	1.4×10^{-8}	
TB-132	LS-5	1.4×10^{-8}	
TB-127	LS-7	1.5×10^{-8}	
TB-45	LS-4	1.8×10^{-8}	
TB-122	LS-10	2.4×10^{-8}	
TB-107	LS-8	3.2×10^{-8}	
TB-109	LS-7	4.8×10^{-8}	

NTH
CONSULTING ENGINEERS

NEYER, TISEO & HINDO, LTD.

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TB-115	LS-5	5.7×10^{-8}	$u_{K_F} = 3.1 \times 10^{-8}$
OB-4	LS-8	7.5×10^{-8}	$S_{K_F} = 3.9 \times 10^{-8}$
TB-28	LS-6	1.3×10^{-7}	$COV_{K_F} = 126\%$
TB-27	LS-7	1.4×10^{-7}	

Consolidation test data (from which permeability was backcalculated - values are average from loads of 0.5, 1.0 & 2.0 tsf)

Push samples obtained by DNR and WDI	#114C	2.1×10^{-8}	
"	#109B	2.5×10^{-8}	
"	#109A	2.6×10^{-8}	Tested by DNR
"	#114A	2.9×10^{-8}	Tested by DNR
"	#114B	2.9×10^{-8}	Tested by DNR
Sta. 9+52	ST-3	1.3×10^{-8}	
Sta. 12+02	ST-4	1.6×10^{-8}	

$u_{K_C} = 2.3 \times 10^{-8}$ $S_{K_C} = 6.3 \times 10^{-9}$ $COV_{K_C} = 27\%$

While the samples used for the falling head tests were not undisturbed, our experience indicates that they yield permeability data which is representative of data obtained by other methods, such as consolidation tests on relatively undisturbed samples. Bergstrom and Kunkle (1983) indicate that the falling head data, obtained as the data above from fills in southeast Michigan, are modelled closely by use of a lognormal probability distribution. The same reference indicates that the more conservative (higher) permeability values from the falling head tests should not be combined with the

NEYER, TISEO & HINDO, LTD.

CONSULTING ENGINEERS

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consolidation values.

Use the falling head data only (conservative)

Apply the lognormal distribution –

Harr (1977) indicates: $S^2_{\ln k} = \ln(1 + COV^2_k)$ and

$$u_{\ln k} = \ln u_k - \frac{S^2_{\ln k}}{2}$$

$u_{k_F} = 3.1 \times 10^{-8}$ $COV_{k_F} = 1.26$

$S^2_{\ln k} = \ln(1 + 1.26^2) = 0.95$ $S_{\ln k} = 0.98$

$u_{\ln k} = \ln(3.1 \times 10^{-8}) - \frac{0.95}{2} = -17.76$

Check for outliers –

Neville & Kennedy (1964) suggest the use of Chauvent's criterion for the possible rejection of extreme values

$n = 21$ $\frac{1}{2n} = \frac{1}{42} = .0238$ Normal, symmetric distribution

area beneath each tail of the normal curve $= \frac{.0238}{2} = .0119$

area under each ½ of normal curve $= .5 - .0119 = 0.4881$

this corresponds to $2.26 \times S_{\ln k}$ either side of the mean as a limit

$$\frac{|\ln k - u_{\ln k}|}{S_{\ln k}} \leq 2.26$$

$$-17.76 - 2.26(0.98) \leq \ln k \leq -17.76 + 2.26(.98)$$

$$-19.97 \leq \ln k \leq -15.55$$

$2.1 \times 10^{-9} \leq k \leq 1.8 \times 10^{-7}$ → All the falling-head data are in this range – no rejections

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JOB Wayne Disposal, Inc. PROJECT NO. 943150W SHEET NO. 4 of 6
SUBJECT Permeability Data Analysis BY WRB DATE 8/2/83
CHK. BY MKV DATE 8.2.83

Test the data for normalcy (after conversion to the lognormal form)

n < 30 → use "W" test
Shapiro & Wilk (1965)

Data ranked in order	ln k	a (from reference)			
3.3×10^{-9}	-19.53	.4643	X	(15.78-19.53)	= -1.74
6×10^{-9}	-18.93	.3185	X	(15.86-18.93)	= -0.98
8.1×10^{-9}	-18.63	.2578	X	(16.41-18.63)	= -0.57
8.1×10^{-9}	-18.63	.2119	X	(16.68-18.63)	= -0.41
9.1×10^{-9}	-18.52	.1736	X	(16.85-18.52)	= -0.29
9.6×10^{-9}	-18.46	.1399	X	(17.26-18.46)	= -0.17
1.1×10^{-8}	-18.32	.1092	X	(17.54-18.32)	= -0.08
1.1×10^{-8}	-18.32	.0804	X	(17.83-18.32)	= -0.04
1.3×10^{-8}	-18.16	.0530	X	(18.02-18.16)	= -0.01
1.3×10^{-8}	-18.16	.0263	X	(18.08-18.16)	= -0.00
1.4×10^{-8}	-18.08	.0000			
1.4×10^{-8}	-18.08				
1.5×10^{-8}	-18.02				
1.8×10^{-8}	-17.83				
2.4×10^{-8}	-17.54				
3.2×10^{-8}	-17.26				
4.8×10^{-8}	-16.85				
5.7×10^{-8}	-16.68				
7.5×10^{-8}	-16.41				
1.3×10^{-7}	-15.86				
1.4×10^{-7}	-15.78				

$b = \Sigma = -4.29$

$b^2 = 18.40$

$S^2 = s^2_{\ln k}(n-1) = .95(20) = 19.0$

$W = \frac{b^2}{S^2} = \frac{18.40}{19.0} = 0.968$

Ok @ 50% level

Data are modelled well by the lognormal function according to this test.

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Establish a confidence level for the mean permeability –

$$P\left[\bar{u}_{\ln k} \leq u_{\ln k} + t_\alpha \frac{S_{\ln k}}{\sqrt{n}}\right] = 1-\alpha$$

$\bar{u}_{\ln k}$ ↑ estimate of population mean; $u_{\ln k}$ ↑ sample mean

Choose a confidence level at 99%

$1-\alpha = .99 \quad \alpha = 0.01$

$$\bar{u}_{\ln k} \leq -17.76 + 2.528 \frac{0.98}{\sqrt{21}}$$

2.528 ↑ one-tailed t-value w/ $\alpha = 0.01$

$$\bar{u}_{\ln k} \leq -17.22$$

Estimate of population mean permeability —

$$\bar{K} \leq e^{\bar{u}_{\ln k} + \frac{(S_{\ln k})^2}{2}} = e^{-17.22 + \frac{(.98)^2}{2}} = 5.4 \times 10^{-8} \text{ cm/sec}$$

On the basis of the test results, the mean conductivity is estimated to lie below 5.4×10^{-8} cm/sec at the 99% confidence level.

AQUIFER SANDS

Direct tested samples —

TB-104	LS-16	1.7×10^{-5} cm/sec
TB-111	LS-12	1.0×10^{-4} cm/sec
TB-112	LS-10	3.1×10^{-5} cm/sec
TB-116	LS-14	2.4×10^{-4} cm/sec

D_{10} (effective grain size) values range from approximately 0.02 mm to slightly above 0.1 mm.

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JOB Wayne Disposal Inc. PROJECT NO. 94315 SHEET NO. 6 of 6
SUBJECT Permeability Data Analysis BY WRB DATE 8/2/83
CHK. BY MKV DATE 8.2.83

Three wells were bail-tested for recovery rates. The recovery response was analyzed according to Cooper, Bredehoeft & Papadopulos (1967). Reported in the final hydro report, the results ranged from 2×10^{-5} to 2×10^{-4} cm/sec.

A most probable mean permeability has been chosen at 1×10^{-3} cm/sec to reflect lateral flow versus lower vertical values. A value of 5×10^{-3} has been chosen as a reasonable maximum mean value for use in estimates to help account for variability/anomolies.

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Figure F-201

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JOB Wayne Disposal, Inc PROJECT NO. 943150W SHEET NO. 1 of 4
SUBJECT Flow through clay liner BY WRB DATE 7/1/83
CHK. BY MKV DATE 7-29-83

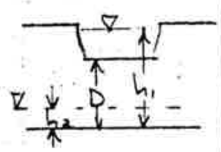
Flow through natural clay liner

Assume:

1. Cells are filled to the natural ground surface with saturated material
2. Effective, drainable porosity ≈ 0.05 (Todd, 1959)
3. Saturated clay till below cells.
4. Ignore effects of attenuation (adsorption, dispersion, etc)
5. Leachate density → SG ≤ 1.02 (Kimmel & Braids) ↑(see text for complete reference)
6. Kinematic viscosity of strong electrolyte and water is similar at 20°c → approx. temp. of perm. tests (Kimmel & Braids)

$$\text{Travel time} = \text{Distance}/\text{seepage velocity} = \frac{D}{\left(\frac{ik}{n_e}\right)} = \frac{D n_e}{ik}$$

D = thickness of clay liner



$$i = \text{hydraulic gradient} = \frac{1.02(h_1) - h_2}{D}$$

n_e = effective porosity (0.05)

Permeability –

1. Consolidation test results (5 tests to date) range from 2 to 3 $\times 10^{-8}$ cm/sec in approx. overburden load range
2. Falling head tests (21 tests to date) have been analyzed statistically. They range from 3.3×10^{-9} to 1.4×10^{-7} cm/sec. Using a lognormal distribution, fitted to the data, it

Figure F-202

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is estimated that the mean permeability test result of all possible tests should lie below 4.5×10^{-8} cm/sec with a 95% confidence level.

$$4.5 \times 10^{-8} \text{cm/sec} \left(\frac{\text{in}}{2.54\text{cm}}\right)\left(\frac{\text{ft}}{12\text{ in}}\right)\left(\frac{3600\text{ sec}}{\text{hr}}\right)\left(\frac{24\text{ hr}}{\text{day}}\right)$$

$$K_{mean} = 1.28 \times 10^{-4} \text{ ft/day}$$

$$\text{Travel time} = \frac{D n_e}{i k} = \frac{D(.05)}{i(1.28\times10^{-4}\text{ ft/day})} = 392 \frac{D}{i} \left(\frac{\text{day}}{\text{ft}}\right)$$

Master Cell IV

Consider two points: ① lowest base elevation
② thinnest clay base

① Lowest base elevation reported at elev. 663
Base clay to 645 or below
Fill surface elevation ≈ 710 (assumed cell is saturated)
Piezometric surface ≈ 650

$D = 663 - 645 = 18$ ft $\quad i = \frac{1.02(710-645) - (650-645)}{18}$

$i = 3.41$

$T = 392\left(\frac{18}{3.41}\right) = 2069$ days $= 5.7$ years ✓

This area was reportedly filled in June, 1980

② Thinnest clay near TB-36 → clay base @ ≈ 663
Base of cell ≈ 673
Fill surface ≈ 725
Piezometric surface ≈ 652

$D = 673 - 663 \approx 10$ ft $\quad i = \frac{1.02(725-663) - 0}{10} = 6.32$ ← neglect capillarity since silts below clay are very near or at saturation

$T = 392\left(\frac{10}{6.32}\right) = 620$ days $= 1.7$ years

This area was reportedly filled in January, 1981

Figure F-203

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JOB Wayne Disposal, Inc. PROJECT NO. 943150W SHEET NO. 3 of 4
SUBJECT Flow through clay liner BY WRR DATE 7/1/83
CHK. BY MKV DATE 7-29-83

Consider a point just upgradient of OB-17

Lowest base elevation ≈ 677
Base clay @ ≈ 659 (Based on log for OB-17)
Fill surface @ ≈ 715
Piezometric surface @ ≈ 650

$D = 677 - 659 = 18$ feet $i = \frac{1.02(715-659)}{18} = 3.17$

$T = 392\left(\frac{18}{3.17}\right) = 2226$ days = 6.1 years

This area was reportedly filled in mid 1979

Consider a point just downgradient from OB-4

Lowest base elevation ≈ 677
Base clay @ ≈ 637 (Based on log for OB-4)
Fill surface @ ≈ 710
Piezometric Surface @ ≈ 652

$D = 677 - 637 = 40$ feet $i = \frac{1.02(710-637)-(652-637)}{40}$

$i = 1.49$

$T = 392\left(\frac{40}{1.49}\right) = 10{,}524$ days = 28.8 years

This area was reportedly filled in mid 1979.

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JOB Wayne Disposal Inc. PROJECT NO. 943150W SHEET NO. 4 of 4
SUBJECT Flow through clay liner BY WRB DATE 2/1/83
CHK. BY MKV DATE 7.29.83

Check Master Cell I

Lowest base elevation ≈ 655 (middle of Cell IV)
Base clay @ ≈ 646 (also thinnest clay)
Fill surface @ ≈ 717
Piezometric surface @ ≈ 650

$D = 655 - 646 = 9$ ft $\quad i = \frac{1.02(717-646) - (650-646)}{9}$

$i = 7.60$

$T = 392\left(9/7.60\right) = 464$ days = 1.3 years ✓

This area was filled in early 1977.

Consider a point just upgradient of OB-6, OB-8, OB-12 or OB-13. Thinnest base clay below Cell V of MCI → Near TB 106/OB-6

Lowest base elevation ≈ 659
Base clay @ 645
Fill surface @ 710
Piezometric Surface @ ≈ 650

$D = 659 - 645 = 14$ feet $\quad i = \frac{1.02(710-645) - (650-645)}{14}$

$i = 4.4$

$T = 392\left(14/4.4\right) = 1247$ days = 3.4 years

This area was reportedly filled in October, 1977.

Figure F-205

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JOB Wayne Disposal, Inc. PROJECT NO. 943150W SHEET NO. 1 of 2
SUBJECT Lateral Flow in Uppermost Aquifer BY WRB DATE 7/20/83
CHK. BY MKV DATE 7 29 83

Lateral Flow in Uppermost Aquifer Sand

Assume:

1. Full saturation
2. Effective, drainable porosity ≈ 0.10 (40 CFR 264, Subpart F)
3. No attenuation (i.e. adsorption, dispersion, etc.)
4. Current groundwater quality test results indicate low concentrations of ions → SG ≈ 1.00
5. Lateral permeability ≈ 1×10^{-3} cm/sec to 5×10^{-3} cm/sec (Final Hydrogeological Report)
   ↑ maximum estimate – see other calculations
6. Estimate of permeability is based on published pump test data with groundwater at ambient temperatures. Temperature effects on groundwater kinematic viscosity should therefore be minimal. As in (4) above, low concentrations should not affect the viscosity. Hence, use the permeability estimate in (5) above.

$$\text{Travel time} = \frac{D\,n_e}{i\,k} = \frac{D}{i}\left(\frac{.10}{1\times10^{-3}\,\text{cm/sec}}\right)\left(\frac{2.54\,\text{cm}}{\text{in}}\right)\left(\frac{12\,\text{in}}{\text{ft}}\right)\left(\frac{\text{hr}}{3600\,\text{sec}}\right)\left(\frac{\text{day}}{24\,\text{hr}}\right)$$

$k = 5\times10^{-3}$ cm/sec

$$\frac{D}{i}\left(.00706\ \frac{\text{day}}{\text{ft}}\right) \le T \le \frac{D}{i}\left(.03528\ \text{day}/\text{ft}\right)$$

$k = 1\times10^{-3}$ cm/sec

Gradient ≈ .001 ft/ft

Distance (D) ft	K (cm/sec) 1×10^{-3}	5×10^{-3}
50	4.83 yrs	0.97
100	9.67	1.93
200	19.33	3.89
500	48.32	9.67
1000	96.65	19.33
2000	193.30	38.66

→ Travel time in years

Figure F-206

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JOB Wayne Disposal, Inc PROJECT NO. 9431SOW SHEET NO. 2 of 2
SUBJECT Lateral Flow in Uppermost Aquifer BY WRB DATE 8/2/83
CHK. BY MKV DATE 8.2.83

Starting Location	Downgradient Well	Distance (feet)	Travel Time (Minimum)
MCI, near TB-17	OB-6, OB-8 or OB-12	≈1000	19.6 years
MCI, near OB-6	OB-6	130	2.6 years
MCIV, near TB-36	OB-17	350	6.9 years
MCIV, near OB-17	OB-17	150	2.9 years

Figure F-207

PROJECT NO. 94315	NEYER, TISEO & HINDO, LTD.	PAGE 1 OF 1

WATER QUALITY DATA · pH vs. TIME

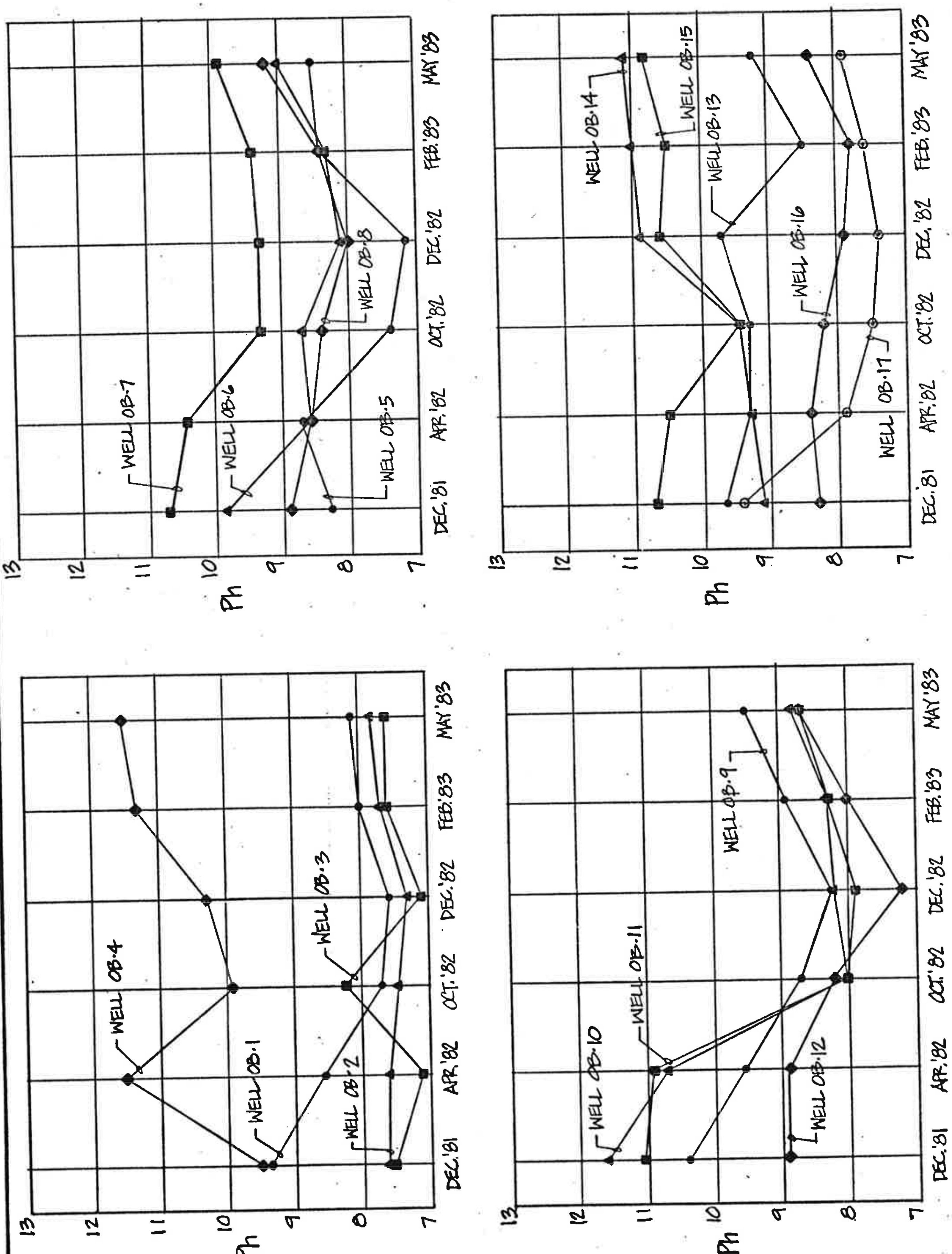

Figure F-208

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JOB: WAYNE DISPOSAL, INC. PROJECT NO. 943150W SHEET NO. 1 of 11
SUBJECT: pH EVALUATION BY MKV DATE 8.2.83
CHK. BY WRR DATE 8/4/83

DEC '81 - ALL WELLS, ALL READINGS

Well	Reading 1	Reading 2	Reading 3	Reading 4
#1	9.3	9.4	9.4	9.4
#2	7.6	7.7	7.8	7.6
#3	7.6	7.5	7.5	7.6
#4	9.5	9.5	9.5	9.5
#5	8.3	8.3	8.3	8.3
#6	9.9	9.8	9.8	9.8
#7	10.7	10.7	10.7	10.7
#8	8.9	8.9	8.9	8.9
#9	10.4	10.4	10.4	10.4
#10	11.5	11.6	11.6	11.6
#11	11.0	11.0	11.1	11.1
#12	8.9	8.9	8.9	8.9
#13	9.6	9.7	9.7	9.7
#14	9.1	9.1	9.1	9.1
#15	10.6	10.7	10.7	10.7
#16	8.3	8.3	8.3	8.3
#17	9.4	9.4	9.4	9.4

$\mu_x = 9.47$

$S_x = 1.13$

MAY '83 - ALL WELLS, ALL READINGS

Well	Reading 1	Reading 2	Reading 3	Reading 4
#1	8.1	8.1	8.1	8.1
#2	7.8	7.8	7.8	7.8
#3	7.6	7.6	7.6	7.6
#4	11.5	11.5	11.5	11.5
#5	8.5	8.5	8.5	8.5
#6	9.0	9.0	9.0	9.0
#7	9.9	9.9	9.9	9.9
#8	9.2	9.2	9.2	9.2
#9	9.5	9.5	9.5	9.5
#10	8.8	8.8	8.8	8.8
#11	8.7	8.7	8.7	8.7
#12	8.7	8.7	8.7	8.7
#13	9.2	9.2	9.2	9.2
#14	11.1	11.1	11.1	11.1
#15	10.8	10.8	10.8	10.8
#16	8.4	8.4	8.4	8.4
#17	7.9	7.9	7.9	7.9

$\mu_y = 9.10$

$S_y = 1.12$

Figure F-209

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JOB Wayne Disposal, Inc. PROJECT NO. 943150W SHEET NO. 2 of 11
SUBJECT pH EVALUATION BY MKV DATE 8.2.83
CHK. BY WRB DATE 8/4/83

I) COMPARING DEC '81 AND MAY '83, all wells:

$$t^* = \frac{|9.10 - 9.47|}{\sqrt{\frac{1.13^2}{68} + \frac{1.12^2}{68}}} = 1.92$$

$$W_B = \frac{1.12^2}{68} \qquad W_M = \frac{1.13^2}{68}$$

$$t_c = \frac{\frac{1.12^2}{68}(2.0) + \frac{1.13^2}{68}(2.0)}{\frac{1.12^2}{68} + \frac{1.13^2}{68}} = 2.0$$

$t^* < t_c$
∴ there was no significant difference.

II) OMITTING WELLS # 1,4,7,11:

DEC '81
$\bar{x} = 9.25$
$s_x = 1.15$

MAY '83: $\bar{x} = 8.96$
$s_x = 1.02$

COMPARING DEC. '81 AND MAY '83; "DOWNGRADIENT" WELLS ONLY:

$$t^* = \frac{|8.96 - 9.25|}{\sqrt{\frac{1.15^2}{52} + \frac{1.02^2}{52}}} = 1.36$$

$$W_B = \frac{1.02^2}{52} \qquad W_M = \frac{1.15^2}{52}$$

$$t_c = 2.01$$

$t^* < t_c$
∴ there was no significant difference

III) DEC '81; WELLS 1,4,7,11, ALL READINGS
$\bar{x} = 10.16$
$s_x = 0.76$

DEC '82: WELLS 1,4,7,11:
$\bar{x} = 8.78$
$s_x = 1.13$

MAY '83; WELLS 1,4,7
$\bar{x} = 9.55$
$s_x = 1.34$

DEC '81; ALL WELLS EXCEPT 1,4,7,11; ALL RDGS
$\bar{x} = 9.25$
$s_x = 1.15$

DEC '82:
$\bar{x} = 8.29$
$s_x = 1.25$

MAY '83
$\bar{x} = 8.96$
$s_x = 1.02$

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JOB WAYNE DISPOSAL, INC PROJECT NO. 943150W SHEET NO. 3 of 11
SUBJECT PH ANALYSIS BY MKV DATE 8.2.83
CHK. BY DATE

COMPARING UPGRADIENT VS DOWNGRADIENT WELLS:

DEC '81: $t^* = \dfrac{|10.16 - 9.25|}{\sqrt{\frac{.76^2}{16} + \frac{1.15^2}{52}}} = 3.67$

$t_c = \dfrac{\frac{1.15^2}{52}(2.01) + \frac{.76^2}{16}(2.131)}{\frac{1.15^2}{52} + \frac{.76^2}{16}} = 2.08$

$t^* > t_c$ ∴ this indicates a significant difference

DEC '82: $t^* = \dfrac{|8.78 - 8.29|}{\sqrt{\frac{1.13^2}{16} + \frac{1.25^2}{52}}} = 1.48$

$t_c = \dfrac{\frac{1.25^2}{52}(2.01) + \frac{1.13^2}{16}(2.131)}{\frac{1.25^2}{52} + \frac{1.13^2}{16}} = 2.10$

$t^* < t_c$ there was no significant difference

MAY '83: $t^* = \dfrac{|9.55 - 8.96|}{\sqrt{\frac{1.34^2}{16} + \frac{1.02^2}{52}}} = 1.62$

$t_c = \dfrac{\frac{1.02^2}{52}(2.01) + \frac{1.34^2}{16}(2.131)}{\frac{1.02^2}{52} + \frac{1.34^2}{16}} = 2.11$

$t^* < t_c$ there was no significant difference

Figure F-211

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JOB: WAYNE DISPOSAL, INC. PROJECT NO. 94315OW SHEET NO. 4 of 11
SUBJECT: pH; MEAN, STD. DEVIATION BY: MV DATE: 6-16-83
CHK. BY: WRB DATE: 8/2/83

	WELL #1	WELL #4	WELL #7	WELL #11
DEC 81	9.3	9.5	10.7	11.0
	9.4	9.5	10.7	11.0
	9.4	9.5	10.7	11.1
	9.4	9.5	10.7	11.1
APR 82	8.5	11.5	10.4	10.9
	8.6	11.5	10.4	10.9
	8.5	11.5	10.4	10.9
	8.5	11.5	10.4	10.9
OCT 82	7.7	9.9	9.3	8.0
	7.7	9.9	9.3	8.0
	7.7	9.9	9.3	8.0
	7.7	9.9	9.3	8.0
DEC 82	7.6	10.3	9.3	7.9
	7.6	10.3	9.3	7.9
	7.6	10.3	9.3	7.9
	7.6	10.3	9.3	7.9
u_x	8.300	10.300	9.925	9.462
S_x	.7412	.7729	.6547	1.5637

$\mu_x = 9.497$

$$\mu_x = \frac{8.3 + 10.3 + 9.925 + 9.462}{4} = 9.497$$

$s_x = 1.2376$

For comparison with individual well results, assume there will be a std. deviation of 0 with the 4 well replicates. Determine the range of pH results which would not show a significant difference under these conditions (5% level).

$$\frac{|X_m - 9.497|}{\sqrt{\frac{1.2376^2}{64}}} = 2.00 \qquad |X_m - 9.497| = 0.309$$

$$9.19 \le X_m \le 9.81$$

Figure F-212

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JOB: WAYNE DISPOSAL INC — PROJECT NO. 94215OW — SHEET NO. 5 of 11
SUBJECT: pH ANALYSIS — BY: MKV — DATE: 8.2.83
CHK. BY: WRR — DATE: 8/4/83

COMPARE OB-6, OB-8, OB-15, OB-10, OB-2 ON DEC. 81, DEC '82, MAY '83 AGAINST UPGRADIENT BACKGROUND (DEC 81 THRU DEC 82)

DEC '81:

OB-2: $\mu_x = 7.63$, $s_x = 0.05$

$$t^* = \frac{|9.497 - 7.63|}{\sqrt{\frac{1.238^2}{64} + \frac{.05^2}{4}}} = 11.91$$

$$t_c = \frac{\frac{.05^2}{4}(3.182) + \frac{1.238^2}{64}(2.0)}{\frac{.05^2}{4} + \frac{1.238^2}{64}} = 2.03$$

$t^* > t_c$; Indicates a significant difference

OB-6: $\mu_x = 9.83$, $s_x = 0.05$

$$t^* = \frac{|9.497 - 9.83|}{\sqrt{\frac{1.238^2}{64} + \frac{.05^2}{4}}} = 2.12$$

$t_c = 2.03$ — $t^* > t_c$; Indicates a significant difference

OB-8: $\mu_x = 8.9$, $s_x = 0$

$$t^* = \frac{|9.497 - 8.9|}{\sqrt{\frac{1.238^2}{64}}} = 3.86$$

$t_c = 2.00$

$t^* > t_c$ Indicates a Significant Difference

OB-10: $\mu_x = 11.05$, $s_x = 0.058$

$$t^* = \frac{|9.497 - 11.05|}{\sqrt{\frac{1.238^2}{64} + \frac{.058^2}{4}}} = 9.86$$

$$t_c = \frac{.058^2/4\,(3.182) + 1.238^2/64\,(2.00)}{\sqrt{1.238^2/64 + .058^2/4}} = 2.04$$

$t^* > t_c$; Indicates a Significant difference

OB-15: $\mu_x = 10.68$, $s_x = 0.05$

$$t^* = \frac{9.497 - 10.68}{\sqrt{\frac{1.238^2}{64} + \frac{.05^2}{4}}} = 7.55$$

$t_c = 2.03$

$\therefore t_c > t^*$; Indicates no significant difference

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JOB: WAYNE DISPOSAL, INC. PROJECT NO. 943150W SHEET NO. 6 of 11
SUBJECT: pH Analysis BY: MKU DATE: 8·2·83
CHK. BY: WRB DATE: 8/4/83

DEC '82:

OB-2: $u_x = 7.3$, $S_x = 0$

$$t^* = \frac{|9.497 - 7.3|}{\sqrt{\frac{1.238^2}{64}}} = 14.20$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference

OB-6: $u_y = 8.1$, $S_y = 0$

$$t^* = \frac{|9.497 - 8.1|}{\sqrt{\frac{1.238^2}{64}}} = 9.03$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference

OB-8: $u_x = 8.0$, $S_x = 0$

$$t^* = \frac{|9.497 - 8.0|}{\sqrt{\frac{1.238^2}{64}}} = 9.67$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference

OB-10: $u_x = 8.2$, $S_x = 0$

$$t^* = \frac{|9.497 - 8.2|}{\sqrt{\frac{1.238^2}{64}}} = 8.38$$

$$t_c = \frac{\frac{1.238^2}{64}(2.0)}{\frac{1.238^2}{64}} = 2.0$$

$t^* > t_c$; Indicates a significant difference

OB-15: $u_x = 10.6$, $S_x = 0$

$$t^* = \frac{|9.497 - 10.6|}{\sqrt{\frac{1.238^2}{64}}} = 7.13$$

$t_c = 2.0$

$t^* > t_c$; Indicates a significant difference.

Figure F-214

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JOB Wayne Disposal, Inc. PROJECT NO. 94350W SHEET NO. 7 of 11
SUBJECT pH Analysis BY MKV DATE 8.2.83
CHK. BY WRB DATE 8/4/83

MAY '83:

OB-2 $u_x = 7.8$, $s_x = 0$

$$t^* = \frac{|9.497 - 7.8|}{\sqrt{\frac{1.2376^2}{64}}} = 10.97$$

$t_c = 2.0$

$t^* > t_c$ ∴ Indicates a significant difference

OB-6: $u_x = 9.0$, $s_x = 0$

$$t^* = \frac{|9.497 - 9.0|}{\sqrt{\frac{1.2376^2}{64}}} = 3.21$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference

OB-8: $u_x = 9.2$, $s_x = 0$

$$t^* = \frac{|9.497 - 9.2|}{\sqrt{\frac{1.2376^2}{64}}} = 1.92$$

$t_c = 2.0$

$t^* < t_c$ ∴ There was no significant difference

OB-10: $u_x = 8.8$, $s_x = 0$

$$t^* = \frac{|9.497 - 8.8|}{\sqrt{\frac{1.2376^2}{64}}} = 4.51$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference

OB-15: $u_x = 10.8$, $s_x = 0$

$$t^* = \frac{|9.497 - 10.8|}{\sqrt{\frac{1.2376^2}{64}}} = 8.42$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference.

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JOB: WAYNE DISPOSAL, INC — PROJECT NO. 913150W — SHEET NO. 8 of 11
SUBJECT: pH ANALYSIS — BY: MKV — DATE: 8-4-83
CHK. BY: WRB — DATE: 8/4/83

COMPARE OB-1, OB-4, OB-7, OB-11 WITH BACKGROUND DATA FOR DEC '81, APR '82, OCT '83, DEC

Aggregate background → pH mean = 9.497
pH std. dev. = 1.238

DEC. '81

OB-1 $u_x = 9.38$, $s_x = 0.05$

$$t^* = \frac{|9.38 - 9.497|}{\sqrt{\frac{1.238^2}{64} + \frac{.05^2}{4}}} = .746$$

$t^* < t_c$ ∴ There was no significant difference

$$t_c = \frac{1.238^2/64\,(2.00) + .05^2/4\,(3.182)}{1.238^2/64 + .05^2/4} = 2.03$$

OB-4 $u_x = 9.5$, $s_x = 0$

$$t^* = \frac{|9.5 - 9.497|}{\sqrt{\frac{1.238^2}{64}}} = 0.019$$

$t_c = 2.0$

$t^* < t_c$ ∴ there was no significant difference.

OB-7 $u_x = 10.7$, $s_x = 0$

$$t^* = \frac{|10.7 - 9.497|}{\sqrt{\frac{1.238^2}{64}}} = 7.77$$

$t_c = 2.0$

$t^* > t_c$ ∴ Indicates a significant difference

OB-11 $u_x = 11.05$, $s_x = 0.06$

$$t^* = \frac{|11.05 - 9.497|}{\sqrt{\frac{1.238^2}{64} + \frac{.06^2}{4}}} = 9.85$$

$t^* > t_c$ Indicates a significant difference.

$$t_c = \frac{1.238^2/64\,(2.00) + .06^2/4\,(3.182)}{1.238^2/64 + .06^2/4} = 2.04$$

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JOB: WAYNE DISPOSAL INC — PROJECT NO. 945150W — SHEET NO. 9 of 11
SUBJECT: PH ANALYSIS — BY: MKV — DATE: 8.4.83
CHK. BY: WRB — DATE: 8/4/83

APRIL '82

OB-1 $u_x = 8.53$, $S_x = 0.05$

$$t^* = \frac{|8.53 - 9.497|}{\sqrt{\frac{.05^2}{4} + \frac{1.238^2}{64}}} = 6.17$$

$$t_c = \frac{\frac{.05^2}{4}(3.182) + \frac{1.238^2}{64}(2.0)}{.0246} = 2.03$$

$t^* > t_c$; Indicates a significant difference.

OB-4 $u_x = 11.5$, $S_x = 0$

$$t^* = \frac{|11.5 - 9.497|}{\sqrt{\frac{1.238^2}{64}}} = 12.94$$

$$t_c = 2.0$$

$t^* > t_c$ Indicates a significant difference

OB-7 $u_x = 10.4$, $S_x = 0$

$$t^* = \frac{|10.4 - 9.497|}{\sqrt{\frac{1.238^2}{64}}} = 5.84$$

$$t_c = 2.0$$

$t^* > t_c$. Indicates a significant difference

OB-11 $u_x = 10.9$, $S_x = 0$

$$t^* = \frac{|10.9 - 9.497|}{\sqrt{\frac{1.238^2}{64}}} = 9.07$$

$$t_c = 2.0$$

$t^* > t_c$ ∴ Indicates a significant d...

Figure F-217

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JOB WAYNE DISPOSAL PROJECT NO. 91350W SHEET NO. 10 of 11
SUBJECT PH ANALYSIS BY MKV DATE 8.2.83
CHK. BY WRB DATE 8/4/83

OCT '82

OB-1 $u_x = 7.7$ $S_x = 0$

$$t^* = \frac{|9.497 - 7.7|}{\sqrt{\frac{1.238^2}{64}}} = 11.61$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference.

OB-4 $u_x = 9.9$ $S_x = 0$

$$t^* = \frac{|9.497 - 9.9|}{\sqrt{\frac{1.238^2}{64}}} = 2.6$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference

OB-7 $u_x = 9.3$ $S_x = 0$

$$t^* = \frac{|9.497 - 9.3|}{\sqrt{\frac{1.238^2}{64}}} = 1.27$$

$t_c = 2.0$

$t^* < t_c$ Indicates there was no significant difference

OB-11 $u_x = 8.0$ $S_x = 0$

$$t^* = \frac{|9.497 - 8.0|}{\sqrt{\frac{1.238^2}{64}}} = 9.67$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference

Figure F-218

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JOB WAYNE DISPOSAL, INC. PROJECT NO. 913150W SHEET NO. 11 of 11
SUBJECT pH ANALYSIS BY MKV DATE 8.2.83
CHK. BY DATE

DEC. '82 :

OB-1: $u_x = 7.6$, $s_x = 0$

$$t^* = \frac{9.497 - 7.6}{\sqrt{\frac{1.238^2}{64}}} = 12.24$$

$t_c = 2.0$

$t^* > t_c$ ∴ Indicates a significant difference

OB-4: $u_x = 10.3$, $s_x = 0$

$$t^* = \frac{9.497 - 10.3}{\sqrt{\frac{1.238^2}{64}}} = 5.19$$

$t_c = 2.0$

$t^* > t_c$; Indicates a significant difference

OB-7: $u_x = 9.3$, $s_x = 0$

$$t^* = \frac{9.497 - 9.3}{\sqrt{\frac{1.238^2}{64}}} = 1.27$$

$t_c = 2.0$

$t^* < t_c$ ∴ there was no significant difference

OB-11: $u_x = 7.9$, $s_x = 0$

$$t^* = \frac{9.497 - 7.9}{\sqrt{\frac{1.238^2}{64}}} = 10.32$$

$t_c = 2.0$

$t^* > t_c$ Indicates a significant difference.

During the 1-year background period, 4 upgradient wells were sampled 4 time (4 pH tests on each sample). Background is defined by these 64 pH values. If we apply the resulting background values to each sampling of the individual upgradient wells during the same period as above, 12 of the 16 samplings "fail" the statistical test.

Figure F-219

SCHOELLER DIAGRAM

WELL OB-1

(Six Samplings From December 1981 Through May/June 1983)

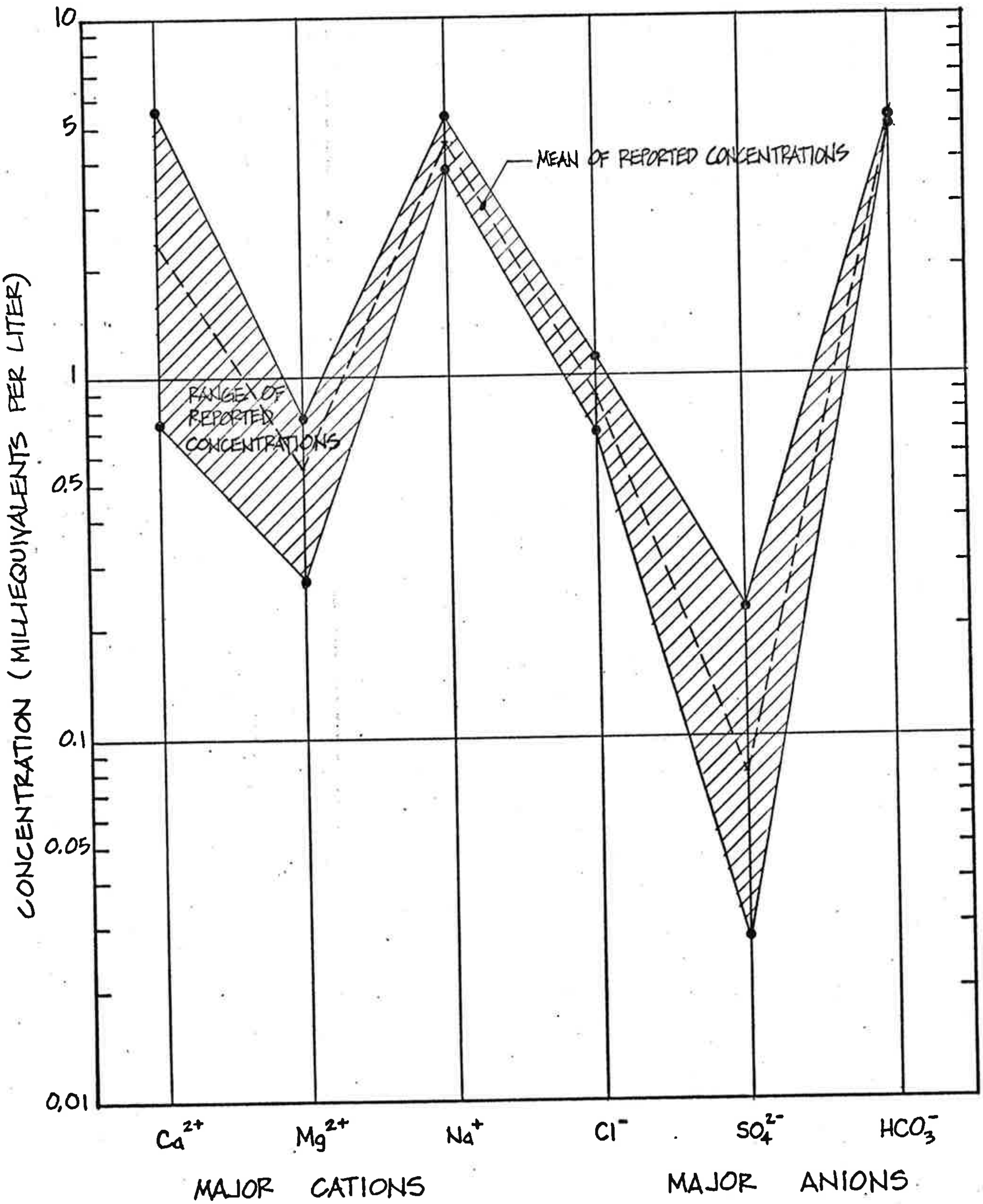

Figure F-220

SCHOELLER DIAGRAM

WELL OB·4

(Six Samplings From December 1981 Through May/June 1983)

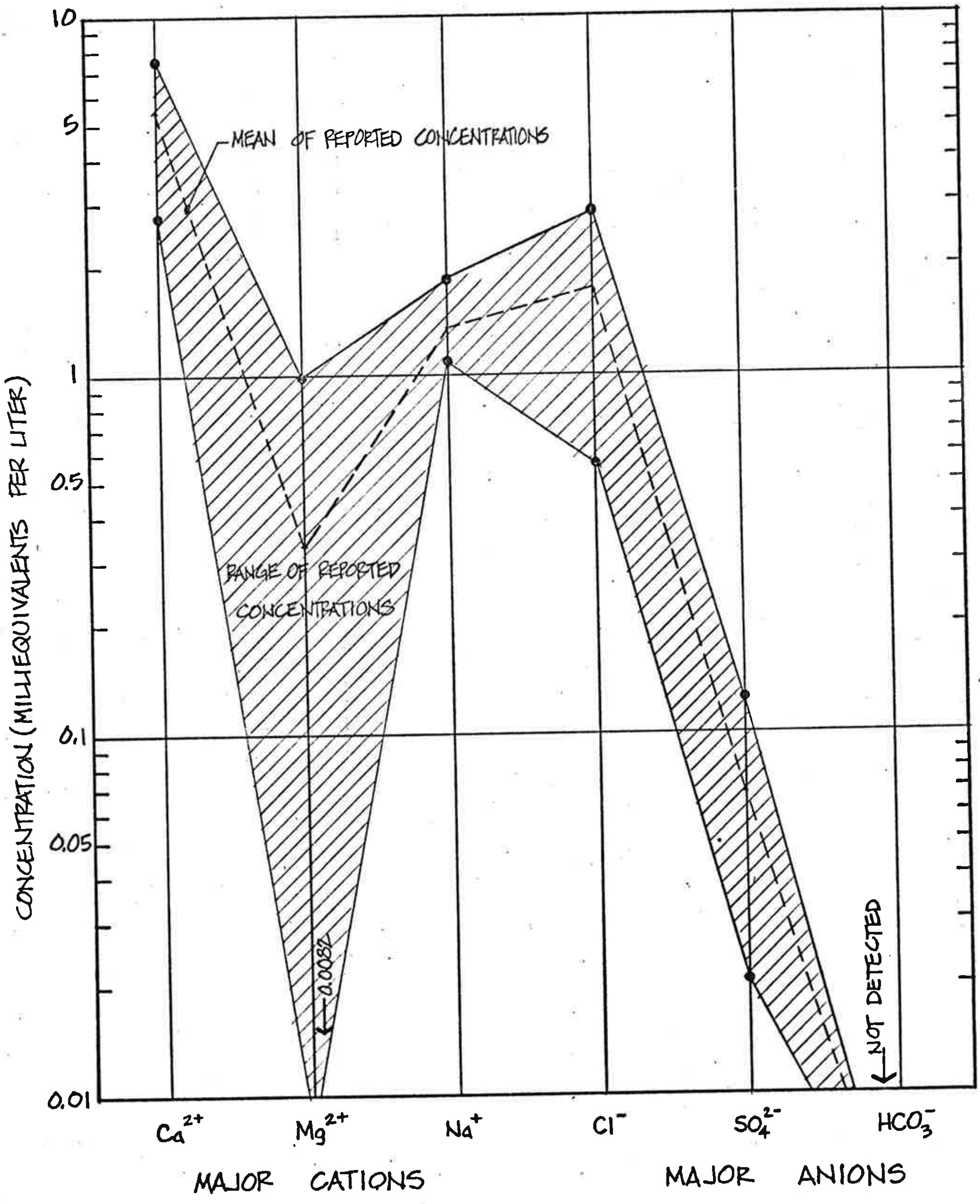

Figure F-221

SCHOELLER DIAGRAM
WELL OB·6
(Six Samplings From December 1981 Through May/June 1983)

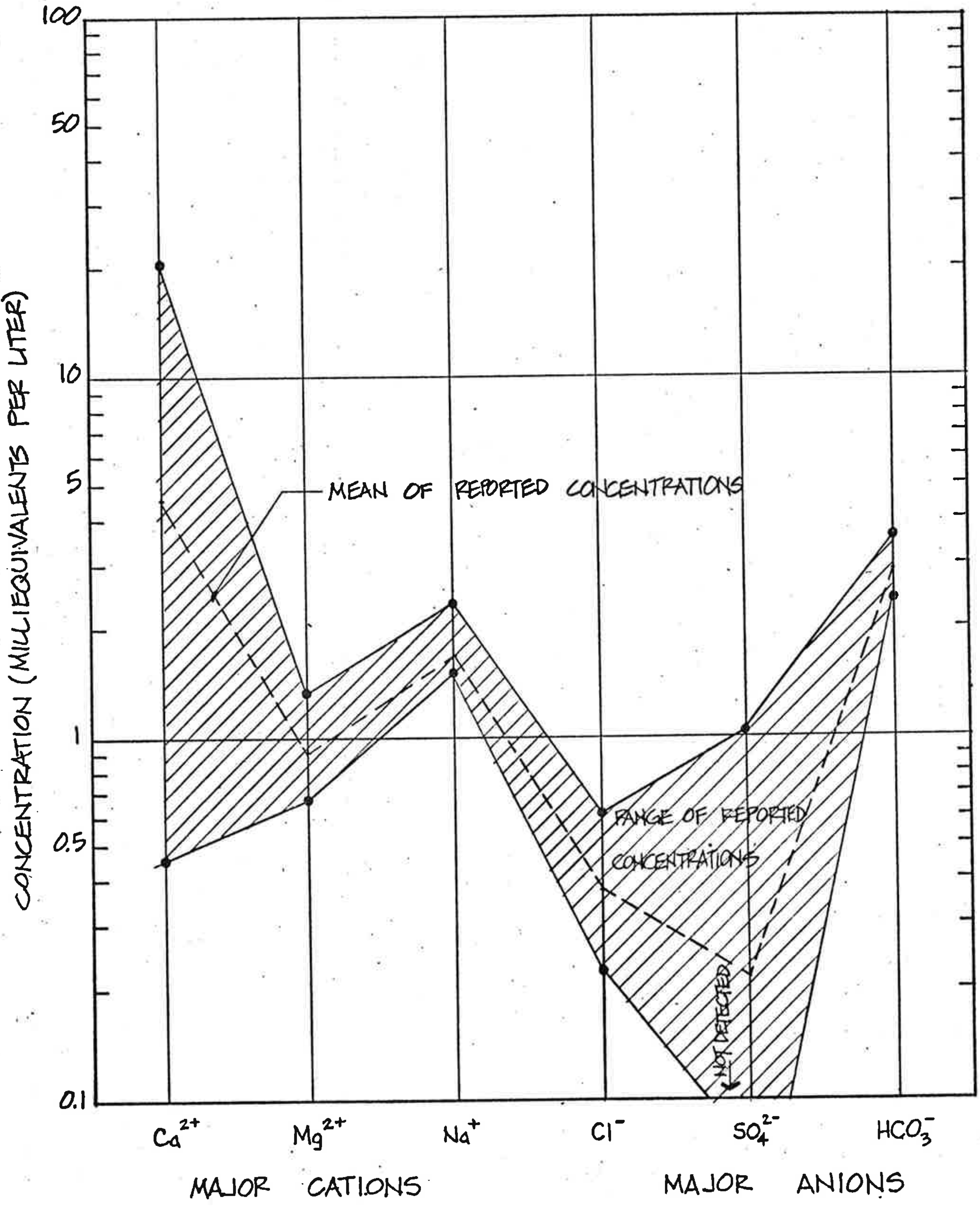

Figure F-222

SCHOELLER DIAGRAM
WELL OB-7
(Six Samplings From December 1981 Through May/June 1983)

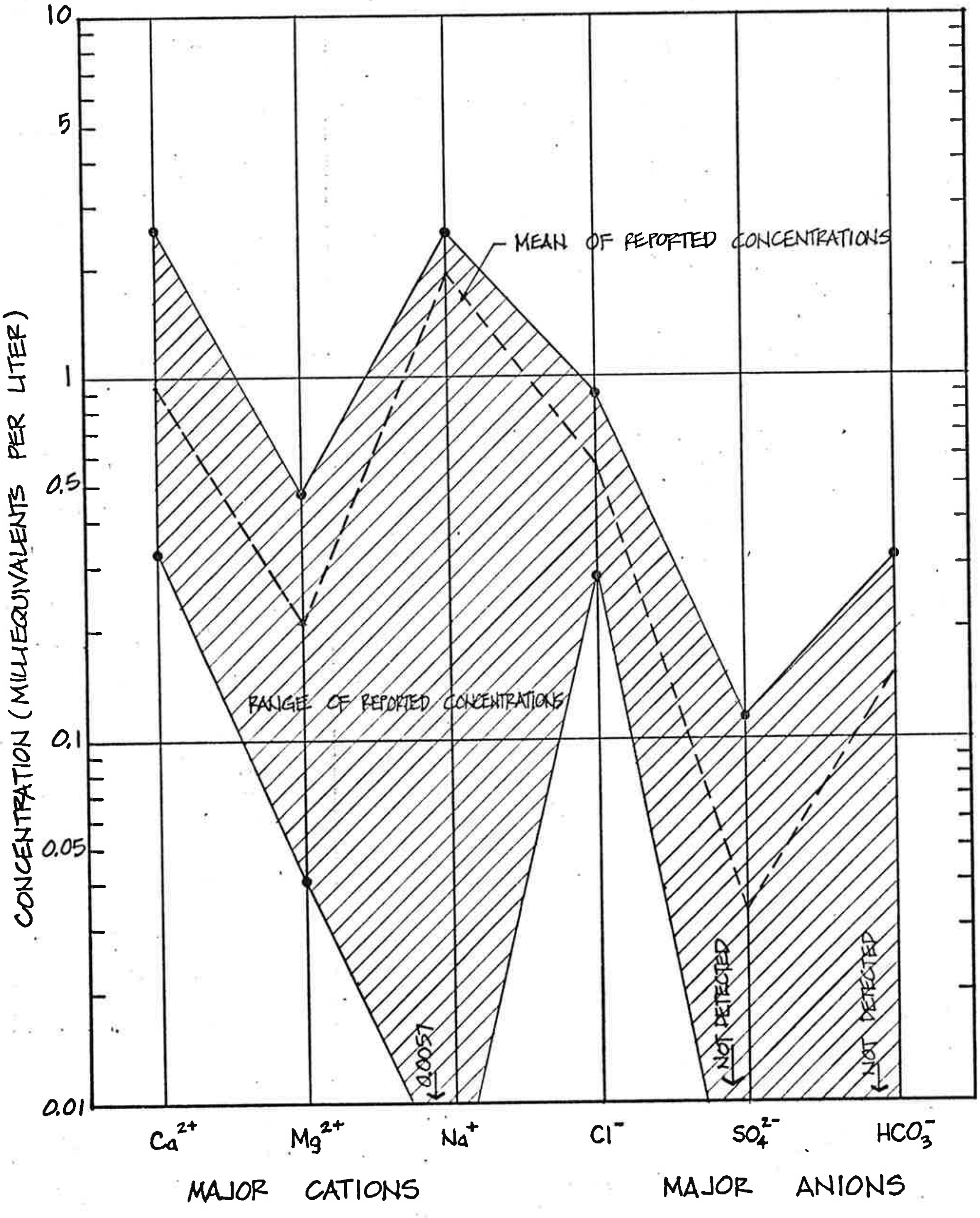

Figure F-223

SCHOELLER DIAGRAM

WELL OB-8

(Six Samplings From December 1981 Through May/June 1983)

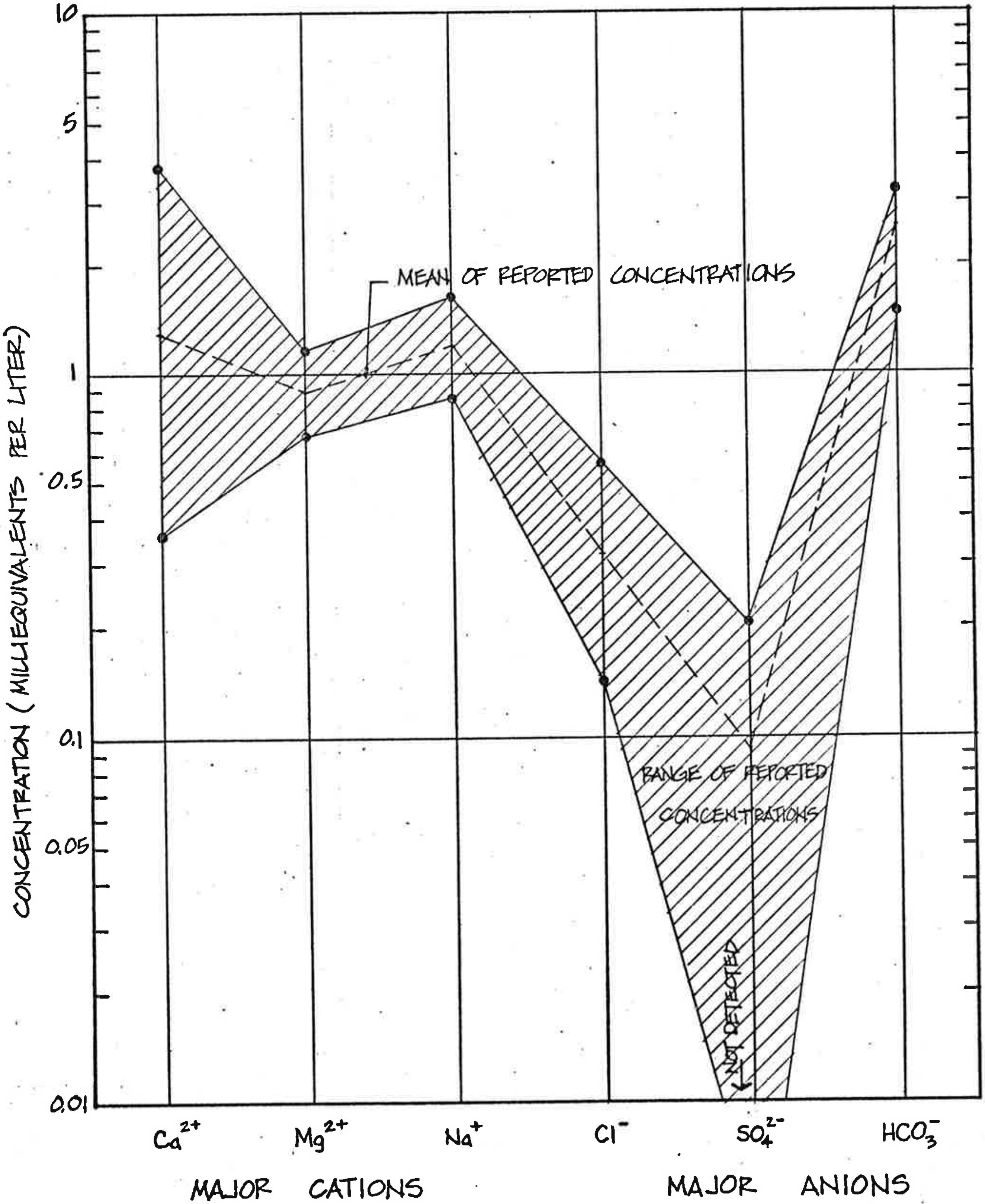

Figure F-224

PROJECT NO. 94315 | NEYER, TISEO & HINDO, LTD. | PAGE 1 OF 1

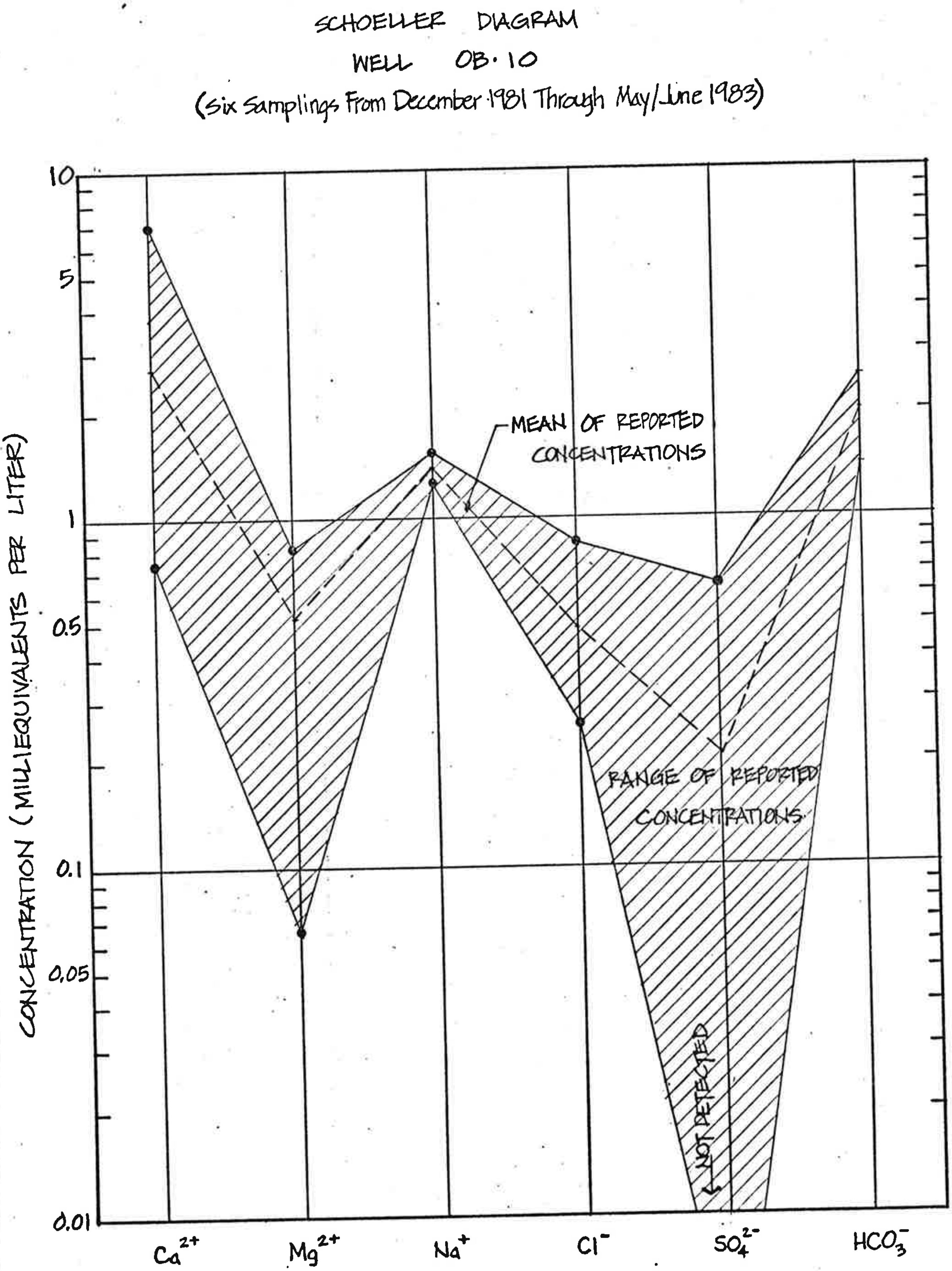

Figure F-225

SCHOELLER DIAGRAM

WELL OB-11

(Six Samplings From December 1981 Through May/June 1983)

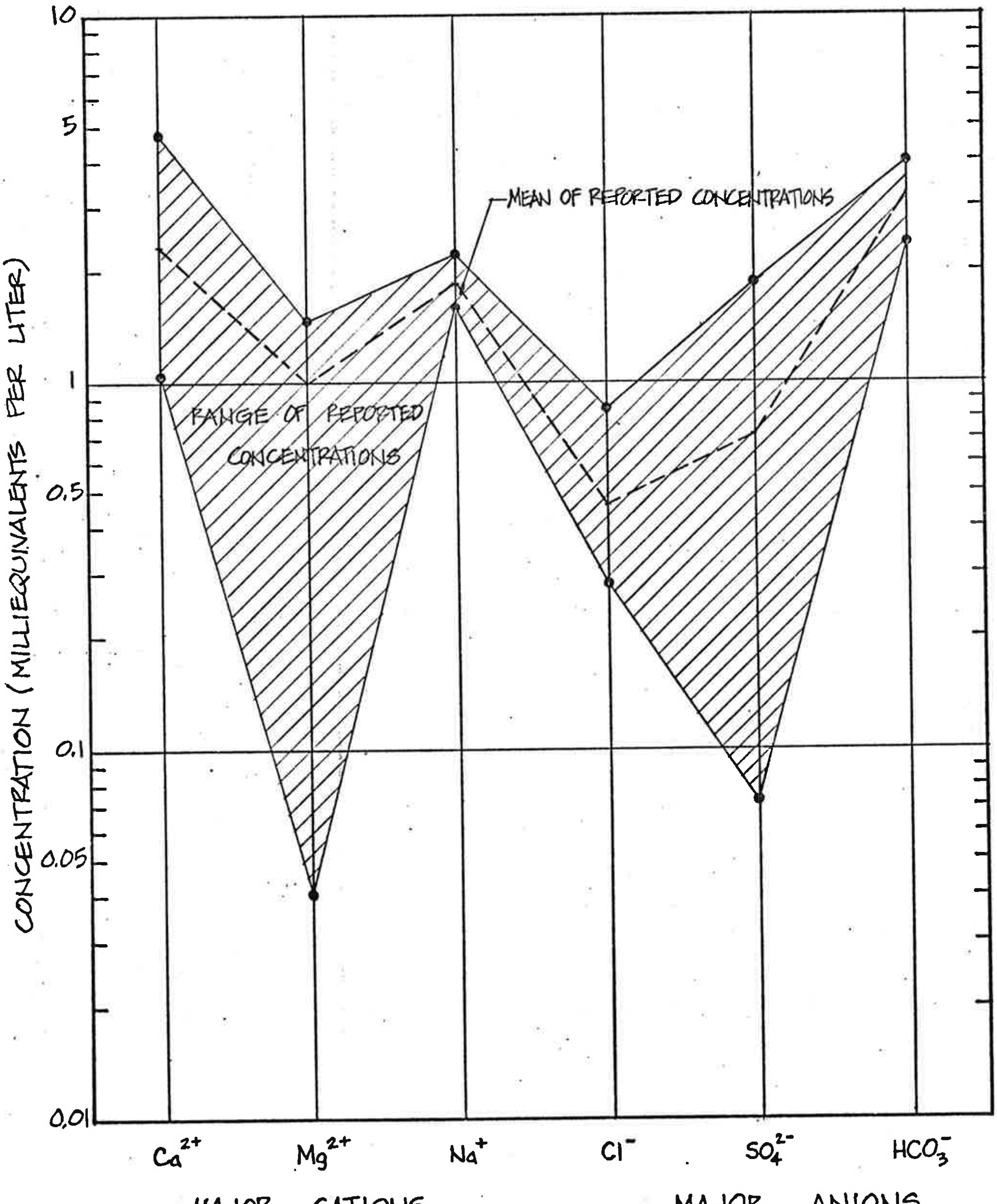

Figure F-226

PROJECT NO. 94315	NEYER, TISEO & HINDO, LTD.	PAGE 1 OF 1

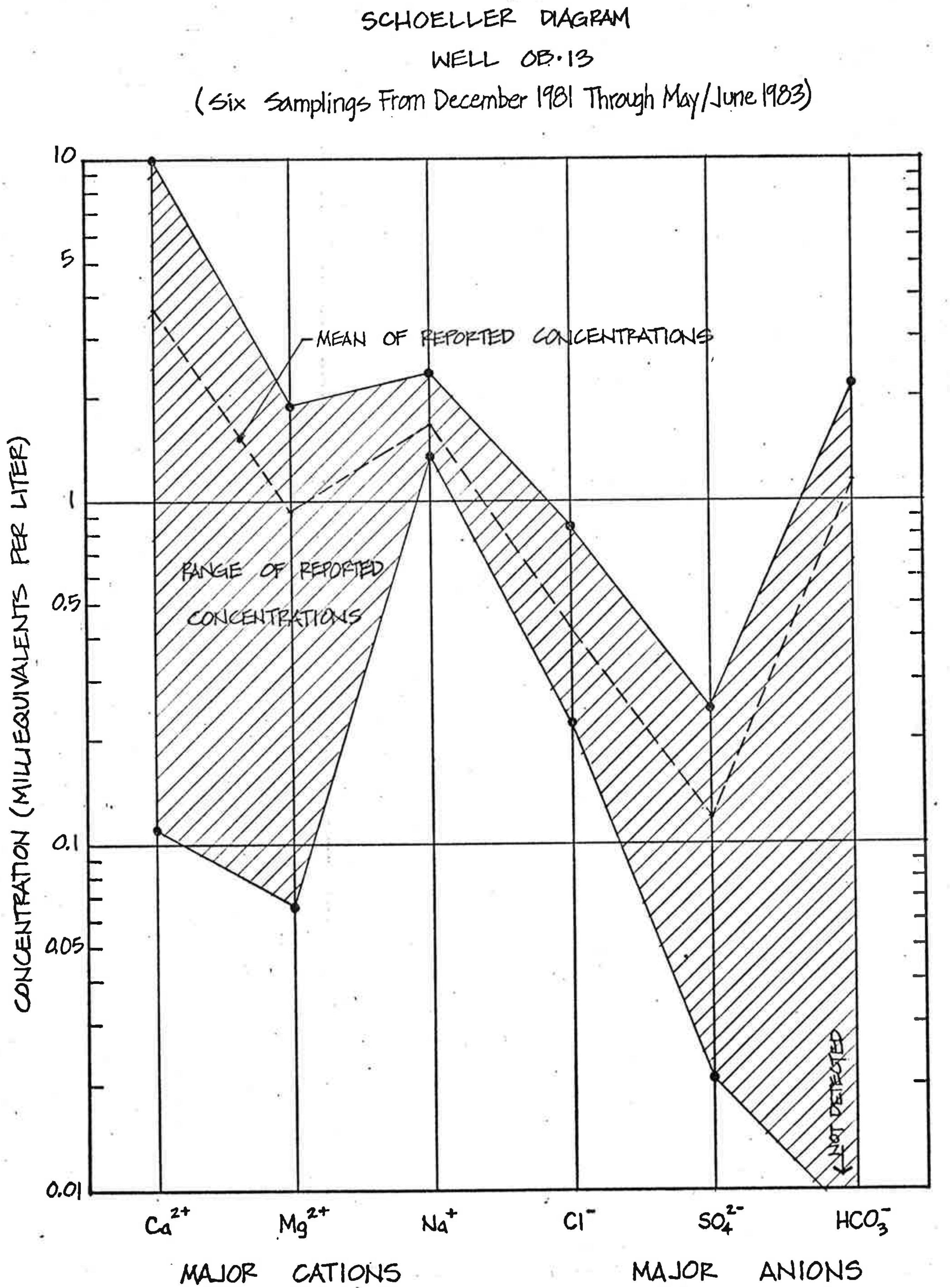

Figure F-227

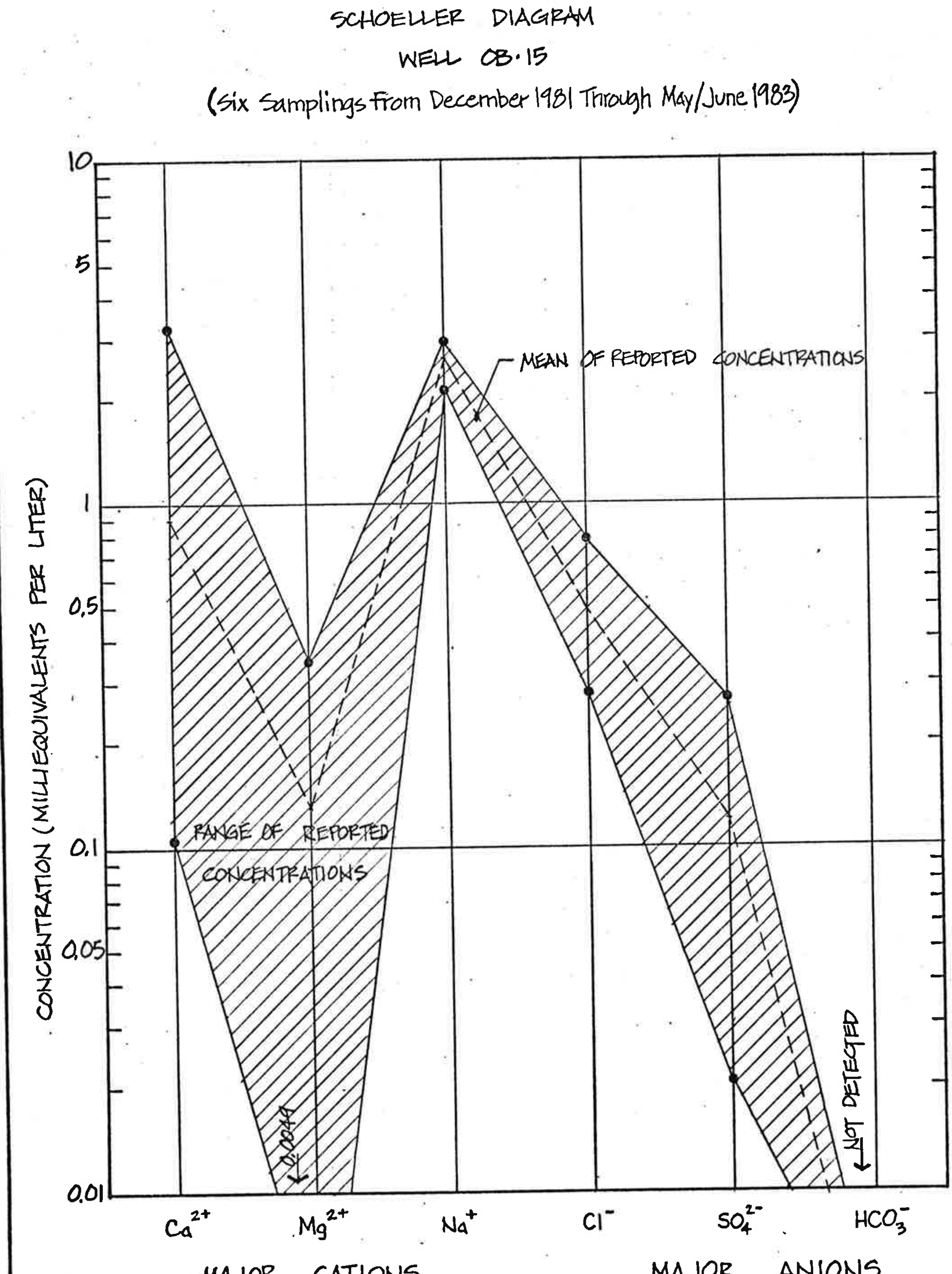
SCHOELLER DIAGRAM
WELL OB-15
(Six Samplings From December 1981 Through May/June 1983)
10
5
1
0.5
0.1
0.05
0.01
CONCENTRATION (MILLIEQUIVALENTS PER LITER)
MEAN OF REPORTED CONCENTRATIONS
RANGE OF REPORTED CONCENTRATIONS
0.0049
NOT DETECTED
Ca2+
Mg2+
Na+
Cl-
SO42-
HCO3-
MAJOR CATIONS
MAJOR ANIONS

Figure F-228

SCHOELLER DIAGRAM

EAST AND WEST DRAINS

(Six Samplings From December 1981 Through May/June 1983)

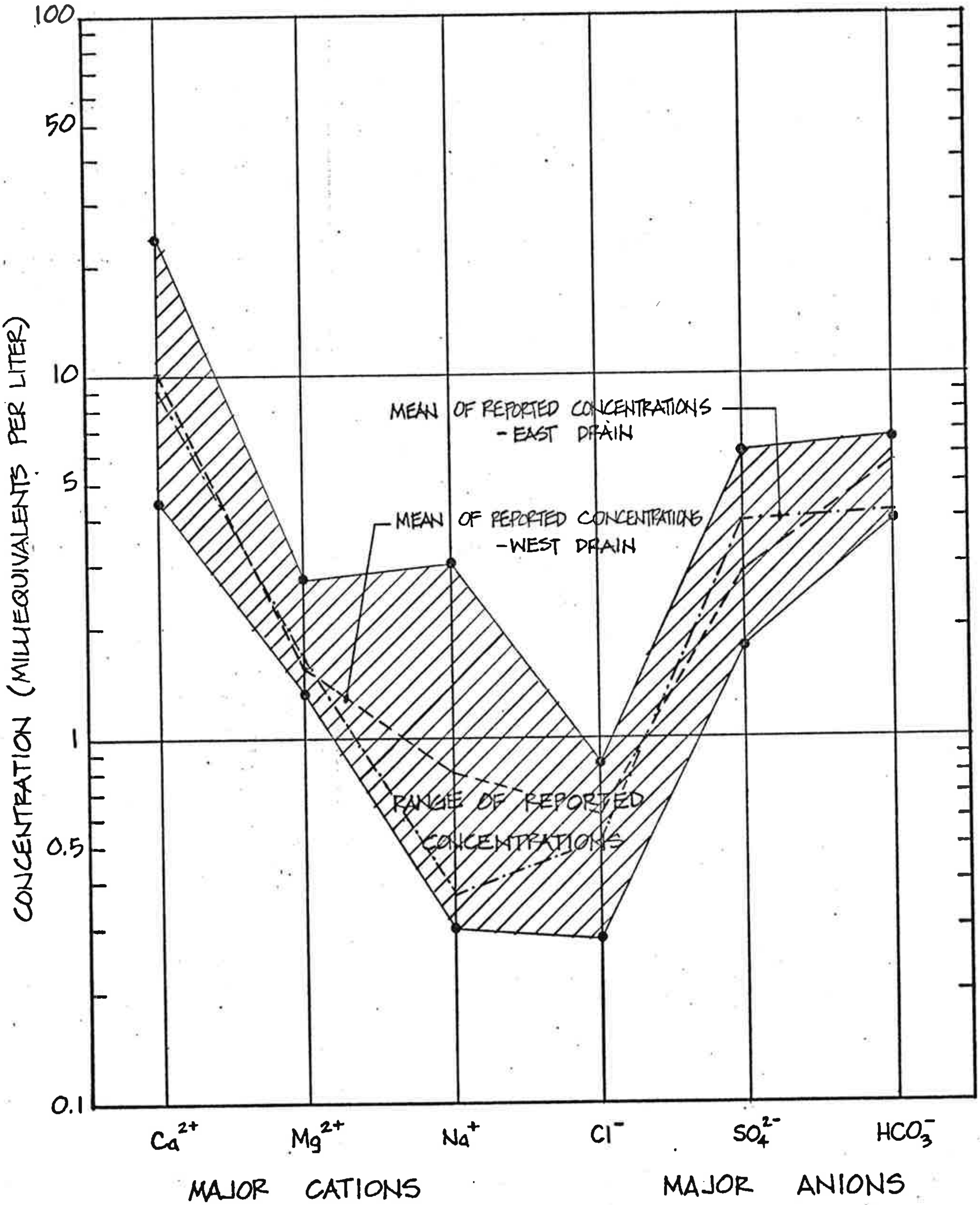

Figure F-229

PROJECT NO. 94315	NEYER, TISEO & HINDO, LTD.	PAGE 1 OF 1

SCHOELLER DIAGRAM
SEDIMENTATION BASIN
(Six Samplings From December 1981 Through May/June 1983)

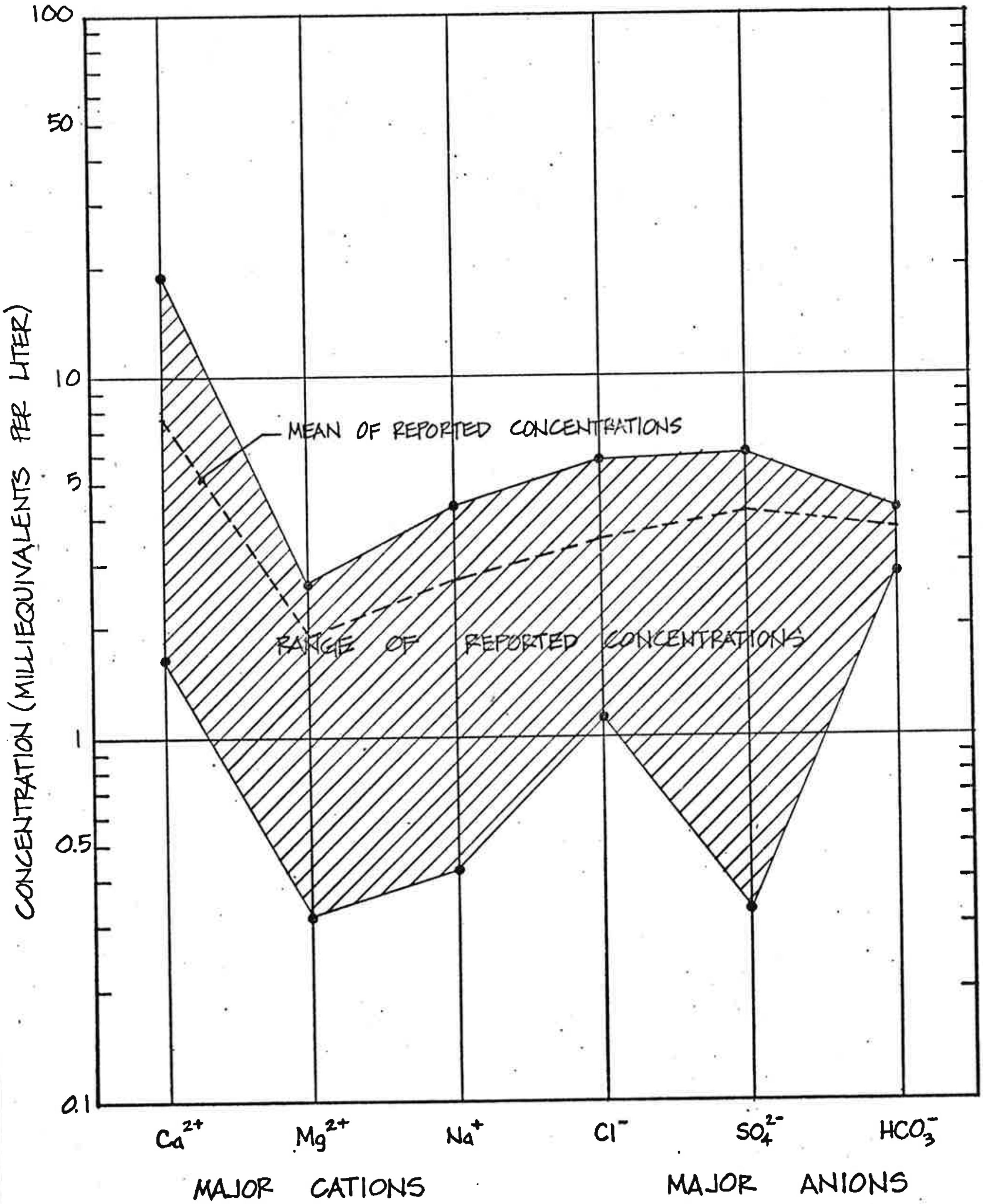

Figure F-230

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JOB Wayne Disposal Inc. PROJECT NO. 94315 SHEET NO. 1/6
SUBJECT Charge-balance JULY 1983 BY MV DATE 7/19/83
CHK. BY WRB DATE 7/25/83

$Na + 2Mg + 2Ca = Cl + HCO_3 + 2SO_4$

Molarity ≈ Molality = $\frac{mg/l}{1000(F.W)}$

WELL #1:

$(\text{Molality})_{Na^+} = \frac{110}{1000(22.99)} = .00478$

$Mg^{2+} = \frac{3.3}{1000(24.31)} = .00014$

$Ca^{2+} = \frac{15}{1000(40.08)} = .00037$

$Cl^- = \frac{32}{1000(35.45)} = .00090$

$HCO_3^- = \frac{250}{1000(61)}(1.22) = .00500$

$SO_4^{2-} = \frac{3}{1000(96.1)} = .000031$

Bicarbonate expressed as $CaCO_3$ ↓

$CaCO_3 \times 1.22 \rightarrow HCO_3^-$ ↑ Bicarbonate expressed as HCO_3^-

H = 1
C = 12
$O_3 = 16 \times 3$
61

S = 32.1
$O_4 = 16 \times 4$
96.1

$\Sigma z M_c = .00580$

$\Sigma z M_a = .00596$

z is valence

$E = \frac{\Sigma z M_c - \Sigma z M_a}{\Sigma z M_c + \Sigma z M_a} = -1.4\%$ ← Negative indicates excess of anions

pH = 8.1

WELL #2:

Na^+: .00091	Cl^-: .00023	E = -3.7%
Mg^{2+}: .00070	HCO_3^-: .00460	
Ca^{2+}: .00147	SO_4: .00031	pH = 7.8
$\Sigma z M_c$ = .00525	$\Sigma z M_a$ = .00545	

WELL #3:

Na^+: .00070	Cl^-: .00051	
Mg^{2+}: .00058	HCO_3^-: .00460	E = -13.5%
Ca^{2+}: .00107	SO_4: .00007	
$\Sigma z M_c$ = .00400	$\Sigma z M_a$ = .00528	pH = 7.6

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JOB Wayne Disposal — PROJECT NO. 94315 — SHEET NO. 2/6
SUBJECT Lab accuracy; — BY MV — DATE 7-18-83
CHK. BY WRB — DATE 7/25/83

WELL #4
Na^+ : .00109 — Cl^- : .00147
Mg^{2+} : .00000 — HCO_3 : 0
Ca^{2+} : .00374 — SO_4 : .00001
ΣZM_c = .00857 — ΣZM_a = .00149
E = 70.4%
pH = 11.5

WELL #5:
Na^+ : .00165 — Cl^- : .00028
Mg^{2+} : .00036 — HCO_3^- : .00300
Ca^{2+} : .00075 — SO_4 : .00010
ΣZM_c = .00387 — ΣZM_a = .00348
E = 5.1%
pH = 8.5

WELL #6:
Na^+ : .00157 — Cl^- : .00023
Mg^{2+} : .00049 — HCO_3^- : .00260
Ca^{2+} : .00037 — SO_4^- : .00001
ΣZM_c = .00329 — ΣZM_a = .00285
E = 7.2%
pH = 9.0

WELL #7:
Na : .00235 — Cl : .00090
Mg : .00010 — HCO_3 : 0
Ca : .00016 — SO_4 : .00001
ΣZM_c = .00287 — ΣZM_a = .00092
E = 51.3%
pH = 9.9

WELL #8:
Na : .00126 — Cl : .00020
Mg : .00039 — HCO_3 : .00148
Ca : .00018 — SO_4 : .00001
ΣZM_c = .00240 — ΣZM_a = .00170
E = 17.1%
pH = 9.2

WELL #9:
Na : .00157 — Cl : .00042
Mg : .00023 — SO_4 : .00001
Ca : .00045 — HCO_3 : .00196
ΣZM_c = .00293 — ΣZM_a = .00240
E = 9.9%
pH = 9.5

WELL #10:
Na : .00135 — Cl : .00028
Mg : .00026 — SO_4 : .00001
Ca : .00037 — HCO_3 : .00240
ΣZM_c = .00262 — ΣZM_a = .00270
E = -1.5%
pH = 8.8

WELL #11:
Na : .00161 — Cl : .00034
Mg : .00066 — SO_4 : .00004
Ca : .00065 — HCO_3 : .00380
ΣZM_c = .00423 — ΣZM_a = .00422
E = 0.1%
pH = 8.7

Figure F-232

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JOB Wayne Disposal Inc PROJECT NO. 91315 SHEET NO. 3/6
SUBJECT Lab accuracy BY MV DATE 7.18.83
CHK. BY WRB DATE 7/25/83

WELL #12: Na: .00113 Mg: .00037 Ca: .00072 ΣZM_c = .00331
Cl: .00031 SO_4: .00001 HCO_3: .00340 ΣZM_a = .00373
E = -6.0% pH = 8.7

WELL #13: Na: .00144 Mg: .00020 Ca: .00032 ΣZM_c = .00248
Cl: .00023 SO_4: .000021 HCO_3: .00200 ΣZM_a = .00227
E = 4.6% pH = 9.2

WELL #14: Na: .00261 Mg: .00000 Ca: .00021 ΣZM_c = .00304
Cl: .00042 SO_4: .00001 HCO_3: 0 ΣZM_a = .00044
E = 74.5% pH = 11.1

WELL #15: Na: .00291 Mg: .00000 Ca: .00005 ΣZM_c = .00302
Cl: .00056 SO_4: .00001 HCO_3: 0 ΣZM_a = .00058
E = 67.5% pH = 10.8

WELL #16: Na: .00113 Mg: .00032 Ca: .00057 ΣZM_c = .00291
Cl: .00017 SO_4: .00004 HCO_3: .00300 ΣZM_a = .00325
E = -5.5% pH = 8.4

WELL #17 Na: .00057 Mg: .00049 Ca: .00102 ΣZM_c = .00360
Cl: .00017 SO_4: .00011 HCO_3: .00440 ΣZM_a = .00479
E = -14.3% pH = 7.9

E.E. DRAIN: ΣZM_c = .00648 ΣZM_a = .00699 E = -3.8% pH = 8.0

W.E. DRAIN: ΣZM_c = .00886 ΣZM_a = .00910 E = -1.3% pH = 7.4

SED. BASIN: ΣZM_c = .01077 ΣZM_a = .01266 E = -8.1% pH = 7.7

Figure F-233

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JOB Wayne Disposal PROJECT NO. 94315 SHEET NO. 4 of 6
SUBJECT Charge-balance OCT. 1982 BY MV DATE 7-19-83
CHK. BY WRB DATE 7/25/83

	Cations	Anions	E	(pH)
WELL #1	Na = .00426 2Mg = .00077 2Ca = .00454 ΣzM_c = .00958	Cl = .00113 HCO_3 = .00520 $2SO_4$ = .00004 ΣzM_a = .00637	E = 20.1 %	(7.7)
WELL #2	Na = .00109 2Mg = .00156 2Ca = .01248 ΣzM_c = .01513	Cl = .00056 HCO_3 = .00500 $2SO_4$ = .00060 ΣzM_a = .00617	E = 42.1 %	(7.4)
WELL #3	Na = .00052 2Mg = .00140 2Ca = .00494 ΣzM_c = .00686	Cl = .00071 HCO_3 = .00500 $2SO_4$ = 0 ΣzM_a = .00571	E = 9.2 %	(8.2)
WELL #4	Na = .00135 2Mg = .00005 2Ca = .00449 ΣzM_c = .00589	Cl = .00282 HCO_3 = 0 $2SO_4$ = .00004 ΣzM_a = .00286	E = 34.6 %	(9.9)
WELL #5	Na = .0017 2Mg = .0014 2Ca = .00494 ΣzM_c = .00808	Cl = .00085 HCO_3 = .00480 $2SO_4$ = .00023 ΣzM_a = .00588	E = 15.8 %	(7.4)
WELL #6	Na = .00161 2Mg = .00082 2Ca = .00304 ΣzM_c = .00548	Cl = .00042 HCO_3 = .00240 $2SO_4$ = .00002 ΣzM_a = .00284	E = 31.6 %	(8.7)
WELL #7	Na = .00226 2Mg = .00019 2Ca = .00254 ΣzM_c = .00500	Cl = .00076 HCO_3 = 0 $2SO_4$ = .00004 ΣzM_a = .00080	E = 72.3 %	(9.3)

Figure F-234

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JOB WAYNE DISPOSAL PROJECT NO. 94315 SHEET NO. 5 of 6
SUBJECT BY MV DATE 7-19-83
CHK. BY WRE DATE 7/25/83

WELL #8:
Na : .00087
2Mg: .00099
2Ca: .00369
ΣZM_c = .00555
Cl = .00056
HCO_3 = .00300
$2SO_4$ = .00002
ΣZM_a = .00358
E = 21.5% (8.4)

WELL #9:
Na = .00148
2Mg = .00082
2Ca = .00429
ΣZM_c = .00659
Cl = .00054
HCO_3 = .00240
$2SO_4$ = .00006
ΣZM_a = .00300
E = 37.5% (8.7)

WELL #10:
Na = .00135
2Mg = .00072
2Ca = .00419
ΣZM_c = .00626
Cl = .00039
HCO_3 = .00140
$2SO_4$ = .00004
ΣZM_a = .00184
E = 54.6% (8.0)

WELL #11:
Na = .00183
2Mg = .00148
2Ca = .00449
ΣZM_c = .00780
Cl = .00056
HCO_3 = .00240
$2SO_4$ = .00019
ΣZM_a = .00386
E = 33.8% (8.0)

WELL #12:
Na = .00104
2Mg = .00132
2Ca = .00499
ΣZM_c = .00735
Cl = .00042
HCO_3 = .00440
$2SO_4$ = .00019
ΣZM_a = .00501
E = 18.9% (8.2)

WELL #13:
Na = .00174
2Mg = .00123
2Ca = .00235
ΣZM_c = .00532
Cl = .00056
HCO_3 = .00040
$2SO_4$ = .00015
ΣZM_a = .00111
E = 65.5% (9.3)

WELL #14:
Na = .0022
2Mg = .00003
2Ca = .00210
ΣZM_c = .00434
Cl = .00085
HCO_3 = 0
$2SO_4$ = .00002
ΣZM_a = .00087
E = 66.7% (9.4)

Figure F-235

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JOB: Wayne Disposal
PROJECT NO. 94315

SUBJECT: Lab Accuracy - April 1982
BY: MV DATE: 7-19-83
CHK. BY: WRB DATE: 7/25/83

WELL #15

$Na = .00248$
$2Mg = .00034$
$2Ca = .00324$
$\Sigma ZM_c = .00607$

$Cl = .00051$
$HCO_3 = 0$
$2SO_4 = .00002$
$\Sigma ZM_a = .00053$

E = 84.0 % (9.4)

WELL #16

$Na = .00091$
$2Mg = .00601$
$2Ca = .04092$
$\Sigma ZM_c = .04784$

$Cl = .00042$
$HCO_3 = .00400$
$2SO_4 = .00002$
$\Sigma ZM_a = .00444$

E = 83.0 % (8.2

WELL #17.

$Na = .00061$
$2Mg = .00132$
$2Ca = .00494$
$\Sigma ZM_c = .00687$

$Cl = .00056$
$HCO_3 = .00420$
$2SO_4 = .00002$
$\Sigma ZM_a = .00478$

E = 17.9% (7.5

SED BASIN

$Na = .00396$
$2Mg = .00239$
$2Ca = .01896$
$\Sigma ZM_c = .02531$

$Cl = .00592$
$HCO_3 = .00260$
$2SO_4 = .00416$
$\Sigma ZM_a = .01268$

E = 33.2 % (8.4)

WEST DRAIN

$Na = .00040$
$2Mg = .00140$
$2Ca = .02395$
$\Sigma ZM_c = .02575$

$Cl = .00085$
$HCO_3 = .00640$
$2SO_4 = .00187$
$\Sigma ZM_a = .00912$

E = 47.7% (8.1

E. DRAIN

$Na = .00039$
$2Mg = .00132$
$2Ca = .02295$
$\Sigma ZM_c = .02466$

$Cl = .00085$
$HCO_3 = .00460$
$2SO_4 = .00271$
$\Sigma ZM_a = .00815$

E = 50.3% (7.

Figure F-236

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JOB Wayne Disposal, Inc. PROJECT NO. 94315 SHEET NO. 1
SUBJECT Specific conductance BY WRB DATE 6/16/83
CHK. BY [illegible] DATE [illegible]

Specific Conductance

Background

OB-1	OB-4	OB-7	OB-11
450 umhos/cm	280	380	850
450	280	380	840
450	280	375	800
450	280	375	800
510	1750	350	650
510	1750	350	650
510	1750	350	650
510	1750	350	650
650	1050	325	600
650	1050	325	600
650	1050	325	600
650	1050	325	600
575	1250	300	450
575	1250	300	450
575	1250	300	450
575	1250	300	450
u=546	u=1082	u=338	u=631
S=77	S=546	S=30	S=138

Total → n=64 u= 649 S= 390

Coefficient of variation $= \frac{390}{649} = 0.60$

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JOB: WAYNE DISPOSAL INC PROJECT NO. 94150W SHEET NO. 1/4
SUBJECT: SPEC. COND. analysis; FEB '83 is BACKGROUND BY MKY DATE 8.4.83
CHK. BY WRP DATE 8/9/83

FEBRUARY '83

WELL #1
$u_x = 450$
$S_x = 0$

$t^* = \frac{450-649}{\sqrt{\frac{390^2}{64}+0}} = -4.08$

$t_c = \frac{W_B(1.671)}{W_B} = 1.671$

t^* Negative ∴ No significant increase

#2
$u_x = 450$
$S_x = 0$

$t^* = -4.08$
$t_c = 1.671$

t^* Negative

#3
$u_x = 300$
$S_x = 0$

$t^* = \frac{300-649}{\sqrt{\frac{390^2}{64}}} = -7.16$

t^* Negative

#4
$u_x = 1200$
$S_x = 0$

$t^* = \frac{1200-649}{\sqrt{\frac{390^2}{64}}} = 11.30$

$t_c = 1.671$

$t^* > t_c$ ∴ Significant increase

#5
$u_x = 275$
$S_x = 0$

$t^* = \frac{275-649}{48.75} = -7.67$

t^* Negative

#6
$u_x = 350$
$S_x = 0$

$t^* = \frac{350-649}{48.75} = -6.13$

t^* Negative

#7
$u_x = 250$
$S_x = 0$

$t^* = \frac{250-649}{48.75} = -8.18$

t^* Negative

#8
$u_x = 225$
$S_x = 0$

$t^* = \frac{225-649}{48.75} = -8.70$

t^* Negative

Figure F-238

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JOB: WAYNE DISPOSAL INC — PROJECT NO. 94315OW — SHEET NO. 2/4
SUBJECT: SPEC. COND. ANALYSIS; FEB '83 V. BACKGROUND — BY: MCV — DATE: 8 4 83
CHK. BY: WRP — DATE: 8/9/83

WELL #9
$u_x = 225$
$S_x = 0$

$t^* = \frac{225-649}{\sqrt{\frac{390^2}{64}+0}} = -8.70$ — t^* Negative ∴ No significant increase

#10
$u_x = 250$
$S_x = 0$

$t^* = \frac{250-649}{48.75} = -8.18$ — t^* Negative

#11
$u_x = 350$
$S_x = 0$

$t^* = \frac{350-649}{48.75} = -6.13$ — t^* Negative

#12
$u_x = 300$
$S_x = 0$

$t^* = \frac{300-649}{48.75} = -7.16$ — t^* Negative

#13
$u_x = 225$
$S_x = 0$

$t^* = \frac{225-649}{48.75} = -8.70$ — t^* Negative

#14
$u_x = 500$
$S_x = 0$

$t^* = \frac{500-649}{48.75} = -3.06$ — t^* Negative

#15
$u_x = 400$
$S_x = 0$

$t^* = \frac{400-649}{48.75} = -5.11$ — t^* Negative

#16
$u_x = 275$
$S_x = 0$

$t^* = \frac{275-649}{48.75} = -7.67$ — t^* Negative

#17
$u_x = 350$
$S_x = 0$

$t^* = \frac{350-649}{48.75} = -6.13$ — t^* Negative

Figure F-239

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JOB: WAYNE DISPOSAL INC. PROJECT NO. 94315DW SHEET NO. 3/4
SUBJECT: SPEC. COND. ANALYSIS; MAY '83 V. BACKGROUND BY MKV DATE 8.4.83
CHK. BY WRB DATE 8/9/83

MAY '83

WELL #1
$u_x = 450$
$S_x = 0$

$t^* = \frac{450-649}{\sqrt{\frac{390^2}{64}}} = -4.08$ t^* Negative ∴ No significant increase

#2
$u_x = 400$
$S_x = 0$

$t^* = \frac{400-649}{\sqrt{\frac{390^2}{64}}} = -5.11$ t^* Negative

#3
$u_x = 400$
$S_x = 0$

$t^* = \frac{400-649}{48.75} = -5.11$ t^* Negative

#4
$u_x = 2000$
$S_x = 0$

$t^* = \frac{2000-649}{48.75} = 27.71$ $t^* > t_c$ Indicates a significant increase

$t_c = \frac{W_B(1.671)}{W_B} = 1.671$

#5
$u_x = 320$
$S_x = 0$

$t^* = \frac{320-649}{48.75} = -6.75$ t^* Negative

#6
$u_x = 240$
$S_x = 0$

$t^* = \frac{240-649}{48.75} = -8.39$ t^* Negative

#7
$u_x = 230$
$S_x = 0$

$t^* = \frac{230-649}{48.75} = -8.59$ t^* Negative

#8
$u_x = 192.5$
$S_x = 789$

$t^* = \frac{192.5-649}{\sqrt{\frac{289^2}{4} + \frac{390^2}{64}}} = -9.36$ t^* Negative

Figure F-240

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JOB: WAYNE DISPOSAL INC — PROJECT NO. 943150W — SHEET NO. 4/4
SUBJECT: SPEC. COND ANALYSIS ; MAY 83 V. BACKGROUND — BY MKV — DATE 8.4.83
CHK. BY WRD — DATE 8/9/83

WELL #9
$u_x = 230$
$S_x = 0$

$t^* = \dfrac{230-649}{\sqrt{\frac{3120}{64}}} = -8.59$ — t^* Negative

#10
$u_x = 200$
$S_x = 0$

$t^* = \dfrac{200-649}{48.75} = -9.21$ — t^* Negative

#11
$u_x = 300$
$S_x = 0$

$t^* = \dfrac{300-649}{48.75} = -7.16$ — t^* Negative

#12
$u_x = 260$
$S_x = 0$

$t^* = \dfrac{260-649}{48.75} = -7.98$ — t^* Negative

#13
$u_x = 210$
$S_x = 0$

$t^* = \dfrac{210-649}{48.75} = -9.01$ — t^* Negative

#14
$u_x = 230$
$S_x = 0$

$t^* = \dfrac{230-649}{48.75} = -8.59$ — t^* Negative

#15
$u_x = 430$
$S_x = 0$

$t^* = \dfrac{430-649}{48.75} = -4.49$ — t^* Negative

#16
$u_x = 250$
$S_x = 0$

$t^* = \dfrac{250-649}{48.75} = -8.18$ — t^* Negative

#17
$u_x = 320$
$S_x = 0$

$t^* = \dfrac{320-649}{48.75} = -6.75$ — t^* Negative

Figure F-241

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JOB: WAYNE DISPOSAL — PROJECT NO. 943150W — SHEET NO. 19
SUBJECT: TOC — BY: MV — DATE: 6-16-83
CHK. BY: WRB — DATE: 9/2/83

WELL #1	WELL #4	WELL #7	WELL #11
12 ug/l	11	11	10
12	11	11	10
12	11	11	10
13	11	10	9.2
9	11	11	22
13	11	11	22
10	15	11	20
13	15	15	20
<1	8	10	<1
<1	10	10	<1
<1	13	10	<1
<1	10	9	<1
<5	<5	54	<5
<5	<5	57	<5
<5	<5	60	<5
<5	<5	62	<5
$u_x = 7.375$	$u_x = 9.812$	$u_x = 22.688$	$u_x = 9.200$
S_x 4.856	$S_x = 3.351$	$S_x = 21.300$	$S_x = 7.756$

$$\mu_x = \frac{7.375 + 9.812 + 22.688 + 9.200}{4} = 12.269$$

$\mu_x = 12.269$

Coefficient of variation $= \frac{12.970}{12.269} = 1.06$

$S_x = 12.970$

Figure F-242

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JOB WAYNE DISPOSAL INC. PROJECT NO. 943150W SHEET NO. 1/4
SUBJECT TOC - t-test ; FEBRUARY 83 VS BACKGROUND BY MKV DATE 8.3.83
CHK. BY LJRE DATE 8/9/83

FEB '83 TOC

WELL #		
1	$u_x = 5$, $s_x = 0$	$t^* = -4.48$
2	$u_x = 5$, $s_x = 0$	↓
3	$u_x = 5$, $s_x = 0$	↓
4	$u_x = 5$, $s_x = 0$	↓
5	$u_x = 5$, $s_x = 0$	↓
6	$u_x = 5$, $s_x = 0$	↓
7	$u_x = 5$, $s_x = 0$	↓
8	$u_x = 5$, $s_x = 0$	↓
9	$u_x = 5$, $s_x = 0$	↓
10	$u_x = 5$, $s_x = 0$	↓
11	$u_x = 5$, $s_x = 0$	↓
12	$u_x = 5$, $s_x = 0$	

t^* Negative - Indicates no significant increase (applies to all wells)

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JOB WAYNE DISPOSAL INC — PROJECT NO. 9315W — SHEET NO. 2/4
SUBJECT TOC t-test; FEB '83 VS. BACKGROUND — BY MLV — DATE 8.3.83
CHK. BY URB — DATE 8/9/83

WELL #			
13	$u_x = 5$, $s_x = 0$	$t^* = -4.48$	t^* Negative - indicates no significant increase
14	$u_x = 5$, $s_x = 0$	↓	↓
15	$u_x = 5$, $s_x = 0$	↓	↓
16	$u_x = 5$, $s_x = 0$	↓	↓
17	$u_x = 5$, $s_x = 0$		↓

Figure F-244

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JOB: WAYNE DISPOSAL INC — PROJECT NO. 94350W — SHEET NO. 3/4
SUBJECT: TOC Analysis; MAY '83 vs BACKGROUND — BY: MKV — DATE: 8.3.83
CHK. BY: WRB — DATE: 8/9/83

MAY '83 TOC

WELL #		
1	$u_x = 5$, $S_x = 0$	$t^* = -4.48$
2	$u_x = 5$, $S_x = 0$	↓
3	$u_x = 5$, $S_x = 0$	↓
4	$u_x = 5$, $S_x = 0$	↓
5	$u_x = 5$, $S_x = 0$	↓
6	$u_x = 5$, $S_x = 0$	↓
7	$u_x = 5$, $S_x = 0$	↓
8	$u_x = 5$, $S_x = 0$	↓
9	$u_x = 5$, $S_x = 0$	↓
10	$u_x = 5$, $S_x = 0$	↓
11	$u_x = 5$, $S_x = 0$	↓
12	$u_x = 5$, $S_x = 0$	↓
13	$u_x = 5$, $S_x = 0$	

t^* Negative; Indicates no significant increase (applies to all wells)

Figure F-245

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JOB WAYNE DISPOSAL INC — PROJECT NO. 943150W — SHEET NO. 4/4
SUBJECT t-test TOC; MAY '83 VS. BACKGROUND — BY MKV — DATE 8.3.83
CHK. BY WKB — DATE 8/9/83

TOC · MAY '83

WELL #			
14	$u_x = 5$, $S_x = 0$	$t^* = -4.48$	t^* Negative; Indicates no significant increase
15	$u_x = 5$, $S_x = 0$	↓	↓
16	$u_x = 5$, $S_x = 0$	↓	↓
17	$u_x = 5$, $S_x = 0$	↓	↓

Figure F-246

NTH CONSULTING ENGINEERS

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JOB: WAYNE DISPOSAL — PROJECT NO. 943150 W — SHEET NO. 20
SUBJECT: TOX; MEAN, STD. DEVIATION — BY: MV — DATE: 6-16-83
CHK. BY: WRB — DATE: 8/2/83

WELL #1 (µg)	WELL #4 (µg)	WELL #7 (µg)	WELL #11 (µg)
6	18	17	15
7	15	15	7
14	20	10	10
6	21	13	13
12	<5	<5	8
18	<5	<5	9
26	<5	<5	13
9	8	<5	7
<5	<5	<5	<5
<5	<5	<5	<5
<5	<5	<5	<5
<5	<5	<5	<5
<5	24	<5	<5
<5	22	<5	<5
<5	20	<5	<5
<5	18	<5	<5
$\mu_x = 8.625$	$\mu_x = 12.562$	$\mu_x = 7.188$	$\mu_x = 7.625$
$S_x = 6.065$	$S_x = 7.694$	$S_x = 4.135$	$S_x = 3.423$

$\mu_x = 9$

$$\mu_x = \frac{8.625 + 12.562 + 7.188 + 7.625}{4} = 9.000$$

$S_x = 5.855$

$$\text{Coefficient of Variation} = \frac{5.855}{9.000} = 0.65$$

Figure F-247

NTH CONSULTING ENGINEERS

NEYER, TISEO & HINDO, LTD.

30999 Ten Mile Road • Farmington Hills, MI 48024 • (313) 471-0750
2053 South Dort Highway • Flint, MI 48503 • (313) 232-9652
2615 Comerica Building • Detroit, MI 48226 • (313) 965-0036

JOB WAYNE DISPOSAL INC PROJECT NO. 943150W SHEET NO. 1/2
SUBJECT TOX - t-test FEB '83 BY MKV DATE 8.3.83
CHK. BY WRB DATE 8/9/83

FEBRUARY '83 – Comparison with 1-year background (OB-1, 4, 7, 11)

Well		t	Result
WELL #1	u_x = <5 ug/l, S_x = 0	$t^* = \frac{5-9}{\sqrt{\frac{5.855^2}{64}}} = -5.47$; $t_c = \frac{W_B(1.671)}{W_B} = 1.671$	t^* Negative – Indicates no significant increase
WELL #2	u_x = <5, S_x = 0	$t^* = -5.47$	t^* Negative
WELL #3	u_x = <5, S_x = 0	$t^* = -5.47$	t^* Negative
WELL #4	u_x = <5, S_x = 0	$t^* = -5.47$	t^* Negative
WELL #5	u_x = 10.68, S_x = 1.04	$t^* = \frac{10.68-9}{\sqrt{\frac{5.855^2}{64}+\frac{1.04^2}{4}}} = 1.87$; $t_c = \frac{\frac{5.855^2}{64}(1.671)+\frac{1.04^2}{4}(2.353)}{\frac{5.855^2}{64}+\frac{1.04^2}{4}} = 1.90$	$t^* < t_c$ Indicates no significant difference.
WELL #6	u_x = 5, S_x = 0	$t^* = -5.47$	t^* Negative
WELL #7	u_x = 5, S_x = 0	$t^* = -5.47$	t^* Negative
WELL #8	u_x = 5, S_x = 0	$t^* = -5.47$	t^* Negative
WELL #9	u_x = 5, S_x = 0	$t^* = -5.47$	t^* Negative
WELL #10	u_x = 5.75, S_x = 0.96	$t^* = \frac{5.75-9}{\sqrt{\frac{5.855}{64}+\frac{.96^2}{4}}} = -3.71$	t^* Negative

Figure F-248

NTH
CONSULTING ENGINEERS

NEYER, TISEO & HINDO, LTD.

30999 Ten Mile Road • Farmington Hills, MI 48024 • (313) 471-0750
2053 South Dort Highway • Flint, MI 48503 • (313) 232-9652
2615 Comerica Building • Detroit, MI 48226 • (313) 965-0036

JOB WAYNE DISPOSAL INC PROJECT NO. 913150W SHEET NO. 2/2
SUBJECT TOX t-test FEB '83 BY MKV DATE 8.3.83
CHK. BY WRB DATE 8/9/83

WELL #11	$u_x = 5$ $S_x = 0$	$t^* = -5.47$	t^* Negative
WELL #12	$u_x = 9.75$ $S_x = 0.5$	$t^* = \frac{9.75 - 9}{\sqrt{\frac{.5^2}{4} + \frac{5.855^2}{64}}} = .97$ $t_c = \frac{\frac{.5^2}{4}(2.353) + \frac{5.855^2}{64}(1.671)}{.578} = 1.74$	$t^* < t_c$ Indicates no significant difference.
WELL #13	$u_x = 36.75$ $S_x = 1.50$	$t^* = \frac{36.75 - 9}{\sqrt{\frac{1.5^2}{4} + \frac{5.855^2}{64}}} = 26.48$ $t_c = \frac{\frac{1.5^2}{4}(2.353) + \frac{5.855^2}{64}(1.671)}{\frac{1.5^2}{4} + 5.855^2/64} = 2.02$	$t^* > t_c$ Indicates a significant increase
WELL #14	$u_x = 5.5$ $S_x = 0.58$	$t^* = \frac{5.5 - 9}{\sqrt{\frac{.58^2}{4} + \frac{5.855^2}{64}}} = -4.45$	t^* Negative
WELL #15	$u_x = 13.50$ $S_x = 2.08$	$t^* = \frac{13.5 - 9}{1.27} = 3.54$ $t_c = \frac{\frac{2.08^2}{4}(2.353) + \frac{5.855^2}{64}(1.671)}{1.611} = 2.14$	$t^* > t_c$; significant increase
WELL #16	$u_x = 5$ $S_x = 0$	$t^* = -5.47$	t^* Negative
WELL #17	$u_x = 8.0$ $S_x = 0.82$	$t^* = \frac{8 - 9}{\sqrt{\frac{.82^2}{4} + \frac{5.855^2}{64}}} = -1.19$	t^* Negative

No TOX results were reported for May of 1983.

Figure F-249

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS
30999 Ten Mile Road • Farmington Hills, MI 48024 • (313) 471-0750
2053 South Dort Highway • Flint, MI 48503 • (313) 232-9652
2615 Comerica Building • Detroit, MI 48226 • (313) 965-0036

JOB: WAYNE DISPOSAL INC. PROJECT NO. 94315OW SHEET NO. 1/2
SUBJECT: CHLORIDE ANALYSIS - t test BY: MKV DATE: 7.28.83
CHK. BY: WRB DATE: 8/4/83

	WELL #1	WELL #4	WELL #7	WELL #11
DEC '81	25	20	15	15
APRIL '82	35	100	20	30
OCT '82	40	100	27	20
DEC '82	30	77	10	11
MARCH '83	26	20	19	10
MAY '83	32	52	32	12

Use t-test with 5% level of significance (one-tailed)

$n = 24$

$u_x = 32.42$

$S_x = 25.53$

$S_x^2 = 651.78$

$t_c = 1.714$

← Max test value

$$t^* = \frac{X_M - 32.42}{\sqrt{\frac{651.78}{24}}} = 1.714$$

MAXIMUM ALLOWABLE CHLORIDE VALUE BY t-TEST = $X_M = 41.35$

MAXIMUM CHLORIDE VALUE OF ALL WELLS EXCEPT #1,4,7,11 : 35 mg/l WELL #5 (DEC '81)

Hence, no downgradient test results (DEC 81 to present) showed a significant increase over the aggregate upgradient values.

Figure F-250

CAL

MH 5A

CANTON ANALYTICAL LABORATORY 153 Elder Street Ypsilanti, MI 48197 Phone 313/483-7430

To: Mr. Don Vilnuis
WAYNE DISPOSAL
P.O. Box 5187
Dearborn, Michigan 48128

Date: October 5, 1981 5A

Re: Water Sample-Leachate Collection System, rec'd 9-24-81

Results:

	mg/l
COD	2160
TOC	2500
Specific Conductance (umhos/cm)	28,000
pH	7.8
Chloride	5800
Sulfate	200
Bicarbonate	6920
Nitrate-N	< 0.1
Nitrite-N	< 0.02
Ammonia-N	1540
Sodium	3400
Magnesium	370
Lead	0.91
Chromium, total	0.31
Iron	7.7
Calcium	46.
Arsenic	0.0044
Barium	0.5
Cadmium	0.1
Copper	0.55
Cyanide	1.7
Mercury	0.010
Selenium	0.0013
Silver	< 0.05
Zinc	5.0

CANTON ANALYTICAL LABORATORY

By:
Peter W. Rekshan/Laboratory Director

ENVIRONMENTAL ANALYSIS

CAL

CANTON ANALYTICAL LABORATORY 153 Elder St. Ypsilanti, MI 48197 Phone 313-483-[illegible]

TO: Mr. Mark Young
WAYNE DISPOSAL
P.O. Box 5187
Dearborn, Michigan 48128

DATE: November 24, 1981

RE: Priority ~~Pollutant~~ Analysis of Manhole 5A sample, received 11-5-81, CAL #WD-11-33.

RESULTS:

	mg/l
BOD	2700
Total Suspended Solids	512
Total Phosphorus	1.21
pH	7.6
Oil and Grease	1.0
Phenols	3.6
Asbestos	No fibers detected
Antimony	0.0054
Arsenic	0.0066
Beryllium	<0.005
Cadmium	0.02
Chromium	0.57
Copper	0.47
Cyanide	0.04
Lead	0.75
Mercury	0.068
Nickel	0.40

Figure F-252

	mg/l
Selenium	0.0049
Silver	<0.01
Thallium	<0.05
Zinc	2.7

Organic Analysis Summary

		µg/l
I.	Volatile Compounds	
	Chlorobenzene	8.4
	1,1-dichloroethane	6.2
	methylene chloride	8.2
	Toluene	450
	Vinyl Chloride	19.2

II. Acid Compounds

No priority pollutants detected, <5 µg/l

III. Base/Neutral Compounds

Napthalene 440 ug/l

CANTON ANALYTICAL LABORATORY

BY: Peter W. Rekshan

Peter W. Rekshan
Laboratory Director (MK)

WAYNE DISPOSAL

6/1/83

"A"

COMPOUND	Master Cell 5 Cell 5 Leachate Manhole, mg/l	Master Cell V Cell E Leachate Manhole. mg/l	Wheel Wash, mg/l	Road Sweepings From-Sweeper, mg/kg
Chemical Oxygen Demand	2,900	15,000	2,000	35,000
Total Organic Carbon	1,400	5,500	135	900
Phenol	2.1	19.2	2.0	19.2
Nitrate-Nitrite-N	1.4	1.4	3.9	20
Ammonia-N	700	250	5.8	35
Total Kjeldahl Nitrogen	2,300	1,100	121	5,800
Total Phosphorus	0.10	0.96	2.4	920
pH, S.U.	9.9	10.4	11.9	11.8
Color, APHA	700	95	20	Brown
Ortho Phosphorus	0.10	0.50	0.72	2.0
MBAS	< 1	< 1	< 1	< 1
Sulfite	< 2	< 2	< 2	< 20
Acidity, Total as $CaCO_3$	< 1	< 1	< 1	< 1
Alkalinity, Total as $CaCO_3$	14,000	6,400	1,000	1,000
Specific Conductance, umhos/cm	30,000	32,000	3,700	16,000
Fluoride	23	23	3.3	26
Chloride	5,000	6,000	440	180
Bromide	< 1	< 1	< 1	< 1
Iodide	< 0.5	< 0.5	< 0.5	< 0.5

CAL 9

Figure F-254

Page

...NE ...POSAL

CELL A

6/1/83

COMPOUND	Master Cell 5 Cell 5 Leachate Manhole, mg/l	Master Cell V Cell E Leachate Manhole, mg/l	Wheel Wash, mg/l	Road Sweepings From Sweeper, mg/kg
Boron	0.72	1.3	< 0.01	< 0.1
Silicates	< 2	< 2	< 2	< 2
Sulfate	750	550	600	450
Cyanide	0.16	1.0	0.73	13
Chromium, hexavalent	< 0.01	< 0.01	4.4	10
Antimony	0.80	< 1.0	0.66	6.9
Arsenic	0.093	< 0.02	0.05	0.12
Beryllium	< 0.02	< 0.02	0.02	0.40
Cadmium	0.08	0.18	0.93	1.9
Chromium	0.11	0.16	15	130
Copper	0.07	0.12	18	290
Lead	0.10	0.54	31.	410
Mercury	< 0.005	0.021	0.015	0.32
Nickel	1.9	0.84	16	160
Selenium	< 0.01	< 0.01	< 0.01	0.53
Silver	< 0.02	< 0.02	0.03	0.40
Thallium	< 0.04	0.46	0.38	9.2
Zinc	0.40	0.24	230	2,100

Figure F-25

CAL 2

VOLATILES EPA METHOD 601

COMPOUND	Detection Limit, mg/l	Master Cell 5 Cell 5 Leachate Manhole, mg/l	Master Cell V Cell E Leachate Manhole, mg/l	Wheel Wash, mg/l	Road Sweepings From Sweeper, mg/kg
Bromoform	0.01	N.D.	N.D.	N.D.	N.D.
Bromodichloromethane	0.003	N.D.	N.D.	N.D.	N.D.
Chlorodibromomethane	0.003	N.D.	N.D.	N.D.	N.D.
Chloroform	0.005	N.D.	N.D.	N.D.	N.D.
Carbon tetrachloride	0.005	0.1	N.D.	N.D.	0.0096
Dichloromethane	0.005	N.D.	43	0.030	0.030
1,1-Dichloroethane	0.002	0.23	1	N.D.	0.005
1,2-Dichloroethane	0.002	0.39	25	N.D.	0.14
1,1-Dichloroethene	0.002	0.0036	N.D.	N.D.	N.D.
trans-1,2-Dichloroethene	0.002	N.D.	0.3	N.D.	N.D.
1,1,1-Trichloroethane	0.002	0.036	3.1	N.D.	0.016
1,1,2-Trichloroethane	0.002	N.D.	N.D.	N.D.	N.D.
Trichloroethene	0.002	0.042	0.042	N.D.	N.D.
1,1,2,2-Tetrachloroethane	0.002	N.D.	N.D.	N.D.	N.D.
Tetrachloroethene	0.002	0.013	N.D.	N.D.	0.010
1-Bromo-3-Chloroethane	0.002	N.D.	N.D.	N.D.	N.D.
1,2-Dichloropropane	0.002	N.D.	N.D.	N.D.	N.D.
Chlorobenzene	0.0005	0.018	0.053	N.D.	0.0054

Figure F-256

CAL 2

VOLATILES EPA METHOD 602

COMPOUND	Detection Limit, Mg/l	Master Cell 5 Cell 5 Leachate Manhole, mg/l	Master Cell V Cell E Leachate Manhole, mg/l	Wheel Wash, mg/l	Road Sweepings From Sweeper, mg/kg
Benzene	0.0002	N.D.	0.19	N.D.	0.0019
Toluene	0.0002	0.64	0.58	0.012	0.011
Xylenes	0.0005	0.71	0.61	0.011	0.026
Ethylbenzene	0.0002	0.18	0.060	0.0099	0.014
Sytrene	0.0002	N.D.	N.D.	N.D.	N.D.

Figure F-257

CAL 9

CAL

CANTON ANALYTICAL LABORATORY 153 Elder Street Ypsilanti MI 48197 Phone 313/483-7430

To: Mr. Don Vilnuis
WAYNE DISPOSAL
P.O.Box 5187
Dearborn, Michigan 48128

Date: May 9, 1983

Re: Belleville Hazardous Cell B

STORM water IN Contact with waste VS "LEAChate"

Results:

	mg/l
Cyanide	0.36
Phenol	3.9
Total Suspended Solids	52
Oil & Grease	< 0.1
COD	1200
Antimony	< 0.10
Arsenic	0.0037
Beryllium	< 0.01
Cadmium	< 0.01
Chromium	0.24
Copper	12.
Lead	0.07
Mercury	<0.001
Nickel	2.4
Selenium	0.004
Silver	0.01
Thallium	0.06
Zinc	0.05
Iron	2.3

ENVIRONMENTAL ANALYSIS

Results continued:

VOA SCAN:

	mg/l
Chloroethane	0.18
Methylene chloride	< 0.05
1,1-Dichloroethene	0.007
1,1-Dichloroethane	0.21
trans-1,2-Dichloroethene	0.0088
Chloroform	< 0.005
1,2-Dichloroethane	2.1
1,1,1-Trichloroethane	0.21
Carbon tetrachloride	< 0.005
Trichloroethene	0.058
Benzene	0.0053
Tetrachloroethene	0.054
Toluene	0.20
Ethylbenzene	0.17
Chlorobenzene	< 0.0002
Xylenes	0.27
o-Dichlorobenzene	< 0.0005
m-Dichlorobenzene	< 0.0005
Bromodichloromethane	< 0.008
Dibromochloromethane	< 0.008
Bromoform	< 0.01
1,2-Dichloropropane	< 0.002
cis-1,3-Dichloropropene	< 0.002
trans-1,3-Dichloropropene	< 0.002
1,1,2,2-Tetrachloroethane	< 0.002
1,1,2-Trichloroethane	< 0.002

CANTON ANALYTICAL LABORATORY

By: Richard A. Yarmain
Richard A. Yarmain
General Manager

... ENVIRONMENTAL QUALITY - WATER - GENERAL USAGE

PROJ CODE	2/82
COST CENTER	60683
PR	JB
COLLECTED BY	D. Stone, B. Montgomery
TRANSFERED TO	Supernatant Analyzed except EG
RECEIVED AT LAB	BL
EXAMINED	[illegible]
SEND RESULTS TO (NAME & SECTION)	D. Montgomery - Haz Waste Division - Mason Bldg
STATION	Wayne Disposal Inc. Landfill - MC IV B
SAMPLE REMARKS	Leachate Sample - Haz. Waste Landfill

DO NOT PUNCH

	DESCRIPTION OF SAMPLING SITE OR SAMPLE	REF NO.	STORET NUMBER	START DATE YYMMDD	TIME MIL HHMM	DEPTH FEET	LAB NO. 1 P00008	FIELD pH S.U. 00400	LAB pH S.U. 00403	LAB COND. US/CM 00095	OXYGEN DIS. MG/L 00300	C.O.D. LOW MG/L 00335	T.O.C. MG/L 00680	PHENOL T. REC UG/L 32730	CN TOTAL MG/L 00720
-1	Leachate Sample MC IV B @ 11+90 E	I01		830513	14:38		[illegible]	D				2500	830	7100	0.019
-2	Leachate Sample MC IV B @ 11+90 E	I02		830513	14:50		[illegible]	D				2500	840	5900	0.026
3-0	Field Blank E4, E6	I03		830513	15:23		[illegible]	D				K3	K0.2	K2	K0.005
		I04						D							
		I05						D							
		I06						D							
		I07						D							
		I08						D							
		I09						D							
		I10						D							

[illegible]	[illegible] TOTAL MG/L 00620	NO2 TOTAL MG/L N 00615	NH3 TOTAL MG/L N 00610	ORG N TOTAL MG/L N 00605	KJEL N TOTAL MG/L N 00625	ORTH.P TOTAL MG/L P 70507	PHOS. TOTAL MG/L P 00665	CR6+ TOTAL UG/L 01032	CL TOTAL MG/L 00940	S= TOTAL MG/L S 00745	SO4= TOTAL MG/L 00945	ALK. TOTAL MG/L 00410	BICARB HCO3- MG/L 00440	CARB. CO3= MG/L 00445	pH 00403	Spec. Cond. 00095
K0.5 DS	K0.5 DS		22.	C 88			0.80 DS	4 PS	890		660	550	615	28	8.6	5250
K0.5 DS	K0.5 DS		24.	C 85			0.72 DS	K2 PS	890		680	560	655	13	8.4	5250
K0.01	K0.01		K0.01	C 0.04			K0.01	NOS	NOS		NOS	NOS	NOS	NOS	NOS	NOS
	C			C												
	C			C												
	C			C												
	C			C												
	C			C												
	C			C												
	C			C												

ESD-3203 REV. 12/82

Cell B
DNR 5/13/83
STORM water uncertified 1800 area
IN contact with waste

Figure F-260

MICHIGAN DEPT. OF NATURAL RESOURCES, ENVIRONMENTAL LABORATORY

LAB LOG# 2182 PROJ CODE ---- COST CENTER 60603 PR 1B COLLECTED BY [illegible] TRANSFERED TO ---- RECIEVED AT LAB ---- BC EXAMINER Nordlund

LOCATION SAMPLED Wayne Disposal Inc. Landfill - MC I B SAMPLE REMARKS Leachate Sample-Haz Waste LF SEND RESULTS TO (NAME & SECTION) [illegible]

FIELD NO.	'DO NOT PUNCH' DESCRIPTION OF SAMPLING SITE OR SAMPLE	REF NO.	STORET NUMBER	START DATE YYMMDD	TIME MIL HHMM	S.T OR B	NUM SAM-PLES	END DATE YYMMDD	TIME MIL HHMM	DEP-TH FEET	LAB NO. 1 P00008	HARD. TOTAL MG/L 00900	CA TOTAL MG/L 00916	MG TOTAL MG/L 00927	NA TOTAL MG/L	K TOTAL MG/L
L-1	Leachate Sample MC I-B @ 11:90-E	C01		830513	14:38						[illegible]		250	16	560	460
L-2	Leachate Sample MC V-B @ 11:90-E	C02		830513	14:50						[illegible]		240	16	560	470
B.O	Field Blank	C03		830513	15:23						[illegible]		K1	K1	K1	K.1
		C04														
		C05														
		C06														
		C07														
		C08														
		C09														
		C10														

REF NO.	CD * TOTAL UG/L 01027	CR * TOTAL UG/L 01034	CU * TOTAL UG/L 01042	NI * TOTAL UG/L 01067	PB * TOTAL UG/L 01051	ZN * TOTAL UG/L 01092	FE TOTAL UG/L 01045	HG TOTAL UG/L 71900	AS TOTAL UG/L 01002	SE TOTAL UG/L 01147
01	K20	200	11000	3100	95	420	2700	K.5	2.1	4.9
02		230	11000	3000	160	360	4000		4.1	4.1
03		K50	K20	K50	K50	K50	K100		K.5	K.5
04										
05										
06										
07										
08										
09										
10										

* BASIC METALS ANALYSIS INCLUDES CD, CR, CU, NI, PB, AND ZN.

ESD - 04300 08/81

Figure F-261

CAL

CANTON ANALYTICAL LABORATORY   [illegible] Street   Ypsilanti, MI 48197   Phone 313/483-7430

To: Mr. Mark Young
WAYNE DISPOSAL
P.O. Box 5187
Dearborn, Michigan 48128

Date: December 3, 1982

Re: Samples rec'd 11-5-82

Results:

	C	E
Antimony	0.46	0.15
Arsenic	0.0012	0.0022
Berylium	< 0.01	< 0.01
Cadmium	0.05	0.01
Chromium	0.03	0.03
Copper	0.07	0.20
Lead	0.20	< 0.05
Mercury	< 0.002	< 0.002
Nickel	0.32	0.77
Selemium	0.0016	0.0020
Silver	0.06	0.02
Thallium	0.22	< 0.05
Zinc	1.8	0.19
Iron	15	1.8
Cyanide	0.33	0.28
Phenols	8.0	2.0

WAYNE DISPOSAL
Page 2

	C	E
Asbestos, fibers/l	<5000	<5000
TOC	400	420
TOX*	0.38	0.26
Ammonia-N	54.	63.
Chloride	2000	560
Sulfate	30	80

Results expressed in mg/l except where noted.

* mg Total Organic Halide (as Cl^-)/l

CANTON ANALYTICAL LABORATORY

By: Peter W. Rekshan
Peter W. Rekshan
Laboratory Director

Figure F-263
CAL

SHRADER
ANALYTICAL AND CONSULTING
LABORATORIES INC.
• Mass Spectrometry • Gas Chromatography • Supporting Services

REPORT OF ANALYTICAL SERVICES

SUBMITTED TO :

WAYNE DISPOSAL
P. O. BOX 5187
DEARBORN, MICHIGAN 48128

ATTN: MR. DON VILNUS

We are pleased to provide the enclosed analytical results for the following sample(s). Should you have any questions regarding the methods and/or results, please feel free to write or call.

Customer sample : C and E

SL # : 8066-8067

Sample description : LEACHATE

Analysis requested : PRIORITY POLLUTANT GC/MS

Date received : 05-NOVEMBER-82

Date completed : 03-DECEMBER-82

Report date : 03-DECEMBER-82

Approved ______________ Stephen Shrader-Ph.D. Analyst ______________ Oladipo Oyinsan

Enclosure(s)

-Continued-

3814 Vinewood • Detroit, Michigan 48208 • (313) 894-4440

Analytical Procedures

The leachate samples were analyzed according to EPA methods 624 and 625 for volatile, acidic and base/neutral organic compounds. Concentrations of "priority pollutants" were determined by comparison with calibration curves of each compound and an internal standard. Concentrations of other organics were estimated based on their total ion current response.

Results

"G" represents one of a large family of glycol ethers, all of which give similar mass spectra and cannot be differentiated.

"T" represents one of a large family of terpenes which are also difficult to differentiate.

"A" represents one of a large family of long chain carboxylic acids.

-Continued-

3814 Vinewood • Detroit, Michigan 48208 • (313) 894-4440

SHRADER
ANALYTICAL AND CONSULTING
LABORATORIES INC.
• Mass Spectrometry • Gas Chromatography • Supporting Services

LEACHATE SAMPLE "C" (SL #8066)

VOLATILES

SCAN	COMPOUND	CONC(micrograms/liter)
	benzene	3
	1,1-dichloroethylene	35
113	ethyl benzene	140
13-21	methylene chloride	24000
94	toluene	86
36	methyl ethyl ketone	200
40	?	100
43	?	100
77	methyl isobutyl ketone	300
83	methyl methacrylate	80
115	2-heptanone	100
128-131	xylene	500

ACIDS

SCAN	COMPOUND	CONC(micrograms/liter)
7	isovaleric acid	10000
15	pentanoic acid	5000
24	hexanoic acid	>10000
27	"A"	>10000
33	Cresol	5000

-Continued-

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ACIDS (continued)

SCAN	COMPOUND	CONC(micrograms/liter)
33	"A"	>10000
59	Benzoic acid	10000
71	Phenylacetic acid	4000
78	phenylpropionic acid	7000

BASE/NEUTRAL

SCAN	COMPOUND	CONC(micrograms/liter)
12	1,2-diethoxyethane	800
18	"T"	200
20	phenyl n-propyl ether	200
24-30	"G"	>10000
33	"G"	800
41	"G"	100
45	"G"	200
51	"G"	100
57	"G"	1000
61	"G"	1000
65	"G"	400
70	"G"	800
75	"G"	1000
88	"G"	1500

-Continued-

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BASE/NEUTRAL (continued)

SCAN	COMPOUND	CONC(micrograms/liter)
91	"G"	400
96	"G"	1000
101	"G"	1000
105	"G"	800
110	"G"	800
114	"G"	400
119	"G"	200

LEACHATE SAMPLE "E" (SL #8067)

VOLATILES

SCAN	COMPOUND	CONC(micrograms/liter)
	1,2-dichloroethane	23
	1,1-dichloroethylene	20
115	ethyl benzene	50
15-40	methylene chloride	37000
90	tetrachloroethylene	11
96	toluene	210
	1,2-t-dichloroethylene	18
56	trichloroethylene	44
35	methyl ethyl ketone	50

-Continued-

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VOLATILES (continued)

SCAN	COMPOUND	CONC(micrograms/liter)
79	methyl isobutyl ketone	20
130-132	xylene	500
141	benzofuran	20
146	C-9 alkyl benzene	10

ACIDS

SCAN	COMPOUND	CONC(micrograms/liter)
32	phenol	450
9	"G"	1000
11	isovaleric acid	1500
15	pentanoic acid	1000
24	hexanoic acid	800
34	"G"	900
39	cresol	500
40	"G"	700
48	"A"	1000
64	benzoic acid	3000
74	"G"	300
78	phenylacetic acid	900
84	phenyl propionic acid	700

-Continued-

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BASE/NEUTRAL

SCAN	COMPOUND	CONC(micrograms/liter)
71	anthracene	13
21	naphthalene	58
11	"G"	300
12	indene	200
17	"T"	50
20	"T"	60
24	"G"	900
29	"G"	300
31	"T"	200
32	2-phenoxyethanol	200
41	?	60
55	"G"	200
58	"G"	60
65	2,6-diisopropyl phenol	20
68	"G"	200
72	"G"	300
86	elemental sulfur (S)	1000

OO

OO/kal

Figure F-270

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WAYNE DISPOSAL

6/1/83

"A"

COMPOUND	Master Cell 5 Cell 5 Leachate Manhole, mg/l	Master Cell V Cell E Leachate Manhole, mg/l	Wheel Wash, mg/l	Road Sweepings From-Sweeper, mg/kg
Chemical Oxygen Demand	2,900	15,000	2,000	35,000
Total Organic Carbon	1,400	5,500	135	900
Phenol	2.1	19.2	2.0	19.2
Nitrate-Nitrite-N	1.4	1.4	3.9	20
Ammonia-N	700	250	5.8	35
Total Kjeldahl Nitrogen	2,300	1,100	121	5,800
Total Phosphorus	0.10	0.96	2.4	920
pH, S.U.	9.9	10.4	11.9	11.8
Color, APHA	700	95	20	Brown
Ortho Phosphorus	0.10	0.50	0.72	2.0
MBAS	< 1	< 1	< 1	< 1
Sulfite	< 2	< 2	< 2	< 20
Acidity, Total as $CaCO_3$	< 1	< 1	< 1	< 1
Alkalinity, Total as $CaCO_3$	14,000	6,400	1,000	1,000
Specific Conductance, umhos/cm	30,000	32,000	3,700	16,000
Fluoride	23	23	3.3	26
Chloride	5,000	6,000	440	180
Bromide	< 1	< 1	< 1	< 1
Iodide	< 0.5	< 0.5	< 0.5	< 0.5

CAL 9

WAYNE DISPOSAL

6/1/83

CELL A

COMPOUND	Master Cell 5 Cell 5 Leachate Manhole, mg/l	Master Cell V Cell (E) Leachate Manhole, mg/l	Wheel Wash, mg/l	Road Sweepings From Sweeper, mg/kg
Boron	0.72	1.3	< 0.01	< 0.1
Silicates	< 2	< 2	< 2	< 2
Sulfate	750	550	600	450
Cyanide	0.16	1.0	0.73	13
Chromium, hexavalent	< 0.01	< 0.01	4.4	10
Antimony	0.80	< 1.0	0.66	6.9
Arsenic	0.093	< 0.02	0.05	0.12
Beryllium	< 0.02	< 0.02	0.02	0.40
Cadmium	0.08	0.18	0.93	1.9
Chromium	0.11	0.16	15	130
Copper	0.07	0.12	18	290
Lead	0.10	0.54	31.	410
Mercury	< 0.005	0.021	0.015	0.32
Nickel	1.9	0.84	16	160
Selenium	< 0.01	< 0.01	< 0.01	0.53
Silver	< 0.02	< 0.02	0.03	0.40
Thallium	< 0.04	0.46	0.38	9.2
Zinc	0.40	0.24	230	2,100

VOLATILES EPA METHOD 601

COMPOUND	Detection Limit, mg/l	Master Cell 5 Cell 5 Leachate Manhole, mg/l	Master Cell V Cell E Leachate Manhole, mg/l	Wheel Wash, mg/l	Road Sweepings From Sweeper, mg/kg
Bromoform	0.01	N.D.	N.D.	N.D.	N.D.
Bromodichloromethane	0.003	N.D.	N.D.	N.D.	N.D.
Chlorodibromomethane	0.003	N.D.	N.D.	N.D.	N.D.
Chloroform	0.005	N.D.	N.D.	N.D.	N.D.
Carbon tetrachloride	0.005	0.1	N.D.	N.D.	0.0096
Dichloromethane	0.005	N.D.	43	0.030	0.030
1,1-Dichloroethane	0.002	0.23	1	N.D.	0.005
1,2-Dichloroethane	0.002	0.39	25	N.D.	0.14
1,1-Dichloroethene	0.002	0.0036	N.D.	N.D.	N.D.
trans-1,2-Dichloroethene	0.002	N.D.	0.3	N.D.	N.D.
1,1,1-Trichloroethane	0.002	0.036	3.1	N.D.	0.016
1,1,2-Trichloroethane	0.002	N.D.	N.D.	N.D.	N.D.
Trichloroethene	0.002	0.042	0.042	N.D.	N.D.
1,1,2,2-Tetrachloroethane	0.002	N.D.	N.D.	N.D.	N.D.
Tetrachloroethene	0.002	0.013	N.D.	N.D.	0.010
1-Bromo-3-Chloroethane	0.002	N.D.	N.D.	N.D.	N.D.
1,2-Dichloropropane	0.002	N.D.	N.D.	N.D.	N.D.
Chlorobenzene	0.0005	0.018	0.053	N.D.	0.0054

Figure F-273

CAL 2

VOLATILES EPA METHOD 602

COMPOUND	Detection Limit, Mg/l	Master Cell 5 Cell 5 Leachate Manhole, mg/l	Master Cell V Cell E Leachate Manhole, mg/l	Wheel Wash, mg/l	Road Sweepings From Sweeper, mg/kg
Benzene	0.0002	N.D.	0.19	N.D.	0.0019
Toluene	0.0002	0.64	0.58	0.012	0.011
Xylenes	0.0005	0.71	0.61	0.011	0.026
Ethylbenzene	0.0002	0.18	0.060	0.0099	0.014
Sytrene	0.0002	N.D.	N.D.	N.D.	N.D.

Figure F-274

CAL 2

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Analytical Procedures

Samples from Site C and Site E taken on 7/05, 7/06 and 7/07/83 were composited prior to extraction and analyses.

The samples were analyzed by EPA methods 624 and 625 for volatile and extractable priority pollutants.

A blank was also extracted and analyzed in the same manner. 2-fluorobiphenyl was added at a level of 67 micrograms/liter to check method efficiency.

Results

Complete priority pollutant reports are enclosed for the volatile, acid and base/neutral compounds and are tabulated below.

VOLATILE PRIORITY POLLUTANTS - SITE "C" - SL #8919

SCAN	COMPOUND	CONC(ugr/L)
17	Methylene chloride	1449.5
28	1,1-Dichloroethane	251.8
31	1,2-trans-dichloroethylene	54.0
37	1,2-Dichloroethane	67.3
60	Trichloroethylene	22.9
62	Benzene	28.8
99	Toluene	786.4
107	Chlorobenzene	3.4
117	Ethyl benzene	88.4

-Continued-

Figure F-275

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VOLATILE PRIORITY POLLUTANTS - SITE E - SL #8922

SCAN	COMPOUND	CONC(ugr/L)
22	1,1-Dichloroethane	14.8
25	1,2-trans-dichloroethylene	35.7
49	Benzene	5.8
85	Toluene	229.4
103	Ethyl benzene	58.3

ACID PRIORITY POLLUTANTS

SITE "C" (SL #8926C)

SCAN	COMPOUND	CONC(ugr/L)
32	Phenol	3124.5

SITE "E" (SL #8929C)

SCAN	COMPOUND	CONC(ugr/L)
29	Phenol	57.0

BASE/NEUTRAL PRIORITY POLLUTANTS

SITE "C" (SL #8926BN)

None detected.

SITE "E" (SL #8929C)

SCAN	COMPOUND	CONC(ugr/L)
94	Bis-(2-ethyl hexyl phthalate)	84.0

-Continued-

Figure F-276

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