Report

Phase II Hydrogeologic Investigation

Proposed Broome Industrial Park Conklin, New York

BIDA

Broome County
Industrial Development Agency
Binghamton, New York

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O'BRIEN & GERE

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REPORT

PHASE II
HYDROGEOLOGIC INVESTIGATION
BROOME INDUSTRIAL PARK
CONKLIN, NEW YORK

BROOME COUNTY
INDUSTRIAL DEVELOPMENT AGENCY
BINGHAMTON, NEW YORK

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EXECUTIVE SUMMARY

O'Brien & Gere Engineers has completed Phase II of the hydrogeologic investigation for the proposed Broome Industrial Park site in Conklin, New York. The investigation characterizes the site wide hydrogeology and identifies the hydrogeologic conditions that will affect development of the industrial park. The results from the Phase I investigation are incorporated into this report to produce an integrated hydrogeologic assessment. The Phase I investigation included an evaluation of the contamination potential and development limitations imposed by two abandoned landfills within the proposed industrial park. Below is a summary of the findings, conclusions and recommendations of both phases of the investigation.

The surficial geology at the industrial park site is comprised predominantly of two unconsolidated deposits: glacial till and outwash. The uplands of the site, including the upper landfill, are underlain by glacial till, which is a dense, unsorted deposit of rock fragments and fine-grained sediments having an extremely low permeability (less than 4×10^{-7} cm/sec). The valley area, including the lower landfill, is underlain by outwash which is composed predominantly of sand and gravel that has a high permeability (greater than 7×10^{-2} cm/sec.)

Groundwater occurs at depths of 5 to 10 feet below the surface within the outwash and 20 to 35 feet within the glacial till. Groundwater flows predominantly in an eastward direction, towards the Susquehanna River, at a rate varying from less than 2×10^{-4} ft/day within the till to 8 to 43 ft/day within the outwash.

The upgradient background groundwater quality is generally of good drinking water quality, contains a moderate amount of hardness and dissolved solids, and is relatively low in iron, chloride and heavy metal content. However, the downgradient groundwater quality at the central and northern parts of the industrial park is not suitable for drinking water. The downgradient groundwater quality in the central part of the industrial park contains elevated levels of manganese, mercury, arsenic and iron suggesting that the groundwater quality has been impacted by the lower landfill. The downgradient groundwater quality at the northern part of the site contains elevated levels of sulfate, iron, manganese and TOC which may be attributed to impacts from the upper landfill.

Due to the existing impacts of the upper and lower landfills on groundwater quality and the potential impacts of the landfills on surface water quality of Carlin Creek, it is recommended that the remedial measures previously included in the Phase I Hydrogeologic Report be implemented. These remedial measures include: 1) installing low permeability covers on the upper and lower landfills to minimize leachate generation, 2) replacing the homeowner water supplies downgradient from the lower landfill, and 3) conducting groundwater and surface water monitoring to evaluate long-term impacts from the landfills.

Potential well yields from the glacial till and bedrock are estimated to be less than 10 gpm and insufficient for industrial supplies; whereas potential well yields within the outwash are estimated to range from 10 to 500 gpm which should be suitable for most industrial uses. However, the groundwater quality within the outwash at the central and northern parts of the site is not suitable for drinking water.

The subsurface geologic conditions across most of the industrial park site are suitable for general construction purposes. The till has a fair bearing strength and deep water table: outwash has a fair to good bearing strength, and is well drained, although the water table is within ten feet of the surface. The areas least suitable for construction are those underlain by alluvium or lacustrine deposits where the materials are poorly drained, have a low bearing strength, and contain a water table that occurs just below the land surface.

Surface water drainage within the area north of Carlin Road will flow north and have a potential for recharging the groundwater aquifer that supplies water to the Town of Conklin Well No. 3. As a result, it is recommended that any industry that is a major user of hazardous substances be either prohibited from locating within this area or designed with state of the art technology to prevent any leakage spills from occurring.

The area within the industrial park that is underlain by outwash deposits is characterized by highly permeable soils and shallow groundwater and is highly susceptible to groundwater contamination from industrial discharges at the land surface. As a result, groundwater monitoring is recommended for any major industrial user of hazardous materials that is to be located within this area.

SECTION 1 - INTRODUCTION

1.01 Project Background

Broome County is currently acquiring a 619 acre tract of land in the Town of Conklin for the purpose of creating a major industrial park. The site is located south of Powers Road approximately one mile north of the Kirkwood Interchange (Figures 1 & 2). The development of the project is presently being undertaken by the Broome County Industrial Development Agency (BIDA).

A preliminary environmental assessment of the proposed industrial park prepared by the Broome County Department of Planning in May 1983 indicated that the industrial park may pose adverse impacts on the surrounding environment. Of particular concern were the potential impacts of two abandoned landfills on the quality of surface water and groundwater leaving the site. In addition, there was concern about the potential effects of the project on the hydrogeologic environment of the surrounding area, particularly the Town of Conklin Well No. 3. Based on these concerns the Broome County Industrial Development Agency requested that a hydrogeologic investigation be undertaken at the site of the proposed industrial park.

The hydrogeologic investigation requested by the BIDA includes two phases. The first phase, completed by O'Brien & Gere Engineers, Inc. in March 1984, was a determination of the hydrogeologic setting and development limitations imposed by the two abandoned landfills. The second phase is to characterize the site wide hydrogeologic setting and identify development limitations imposed by the remainder of the site. This report addresses the objectives of the second phase of hydrogeologic investigation.

1.02 Authorization and Scope

During September 1984 the Broome County Industrial Development Agency (BIDA) authorized O'Brien & Gere Engineers, Inc. to perform Phase II of the hydrogeologic investigation at the proposed Broome County Industrial Park site. The scope of work for this investigation is outlined in the Request for Proposal (RFP) dated September 6, 1984, and is described in detail in the proposal submitted by O'Brien & Gere Engineers, Inc. on September 20, 1984. In general, the scope of work includes the following:

a. Characterization of site-wide surficial geology, including the type, thickness, extent, and permeability of soils and sediments, with particular attention given to geotechnical limitations or hazards.

b. Assessment of site-wide hydrogeology, including a potentiometric contour map showing groundwater flow directions and an evaluation of the potential for on-site groundwater supply development for industrial and consumptive use.

c. Determination of the water quality in Carlin Creek and the emergent marsh wetland located on-site (wetland BE-4 in the Binghamton East Quad Wetlands Map).

d. Determination of the eastern boundary of the lower landfill facing the Delaware and Hudson Railroad right-of-way, with particular attention to the occurrence of landfill material within the right-of-way and potential impacts the landfill could have on the construction of an 18-inch sanitary sewer line within the western portion of the right-of-way.

1.03 Summary of Phase I Investigation

O'Brien & Gere Engineers, Inc. has previously completed Phase I of a hydrogeologic investigation for the proposed Broome County Industrial Park. The purpose of the Phase I investigation was to evaluate the potential for contamination and development limitations of two abandoned landfills on the proposed industrial park site. Below is a summary of the findings, conclusions and recommendations of the Phase I Hydrogeologic Investigation.

Upper Landfill

The landfill is about 25 feet thick, may contain approximately 5 million cubic feet of refuse, and is underlain by a low permeability glacial till material which significantly restricts the migration of landfill leachate into the groundwater.

It has been estimated that approximately 1.8 million gallons of leachate is generated annually by precipitation infiltrating the landfill surface and an additional 1,000 gallons of leachate is generated each year by groundwater flowing through the refuse.

The inorganic chemical analyses of the landfill leachate (Appendix A) are typical of what is found in municipal refuse. However, the presence of various organic chemicals indicates that some industrial waste may be present.

Groundwater flow from the landfill is in an east-northeast direction towards Carlin Creek at a relatively low rate of approximately 8 x 10^{-5} ft/day (.03 ft/year).

Due to the low permeability of the subsurface materials, leachate seeps may develop during wet periods of the year and could have an impact on the water quality of Carlin Creek.

Although the landfill has impacted the groundwater quality immediately adjacent to the landfill, the groundwater quality poses no threat to downgradient well users.

It was recommended that a low permeability cover be installed on the landfill to eliminate leachate seeps. In addition, continued groundwater monitoring was recommended.

Lower Landfill

The lower landfill which may contain approximately 1.4 million cubic feet of refuse, is underlain by highly permeable sand and gravel which promotes rapid recharge of landfill leachate into the groundwater system.

It has been estimated that approximately .9 million gallons of landfill leachate is generated by precipitation infiltrating the landfill surface and up to 150,000 gallons of leachate is generated by groundwater flowing through the refuse.

The chemical analyses of leachate (Appendix A) are typical of what is found in municipal solid waste landfill leachate.

Groundwater flow is eastward towards Route 7 and the Susquehanna River at an estimated flow rate of 3 to 30 feet per day.

Some of the homeowner wells downgradient from the landfill contain iron, manganese and arsenic levels in excess of NYSDEC Class GA Groundwater Standards. (Appendix A) The iron and manganese levels are believed to be attributed to the landfill, however, the source of the arsenic has not been clearly defined.

It was recommended that the homeowners water supplies be replaced by extending the Town of Conklin's water supply system along Route 7.

A low permeability cover was recommended to be installed on the landfill to minimize leachate generation.

Continued surface water monitoring and groundwater monitoring of on-site wells and homeowner wells for at least one year was recommended to evaluate long term impacts from the landfill.

Should building construction occur over the lower landfill additional geotechnical testing was recommended. The amount of testing is dependent on the type of structures to be erected but could include: test borings with standard penetration tests, in-situ plate, loading tests, and laboratory consolidation tests.

SECTION 2 - FIELD INVESTIGATIONS

2.01 General

This section presents the methods and procedures used during field investigations of the Phase II Hydrogeologic Investigation at the proposed industrial park site conducted between October 31, 1984 and December 20, 1984. During this time the following tasks were completed:

1. The completion of ten test borings located throughout the proposed site.
2. The installation and development of monitoring wells in four of the ten borings.
3. The elevation survey of all test borings and groundwater monitoring wells.
4. The measurement of static water levels in all monitoring wells.
5. The sampling and analysis of groundwater and surface water.
6. The in situ permeability testing of monitoring wells.

2.02 Test Borings

A total of ten test borings were completed between October 31, 1984 and November 14, 1984 to evaluate the on-site subsurface hydrogeologic conditions. The locations of these borings are shown on Figure 3. All test borings were completed using a bulldozer-mounted drilling rig equipped with continuous flight hollow stem augers assembled in 5-foot sections. Samples of the subsurface materials were collected every five feet using ASTM method D1586 Split Barrel Sampling.

Four of the test borings were converted into groundwater monitoring wells (Wells 17-20) to assess groundwater flow conditions. Three of the borings (B1, B2, B3) were installed to define the eastern boundary of the lower landfill. Two borings (B4-B5) were installed to assess the subsurface geologic conditions along the route of the proposed primary access road. One boring (B6) was installed to define the subsurface hydrogeologic conditions at the northern part of the industrial park.

Appendix B shows the lithologic logs from each boring as interpreted by the O'Brien & Gere Engineers, Inc. geologists and the well specifications for each monitoring well.

The proposed test borings (B1, B2, B3) along the Delaware and Hudson Railroad right-of-way were inaccessible to the drilling rig due to the steep narrow drainage ditch between the railroad and the lower landfill. An attempt was made to use a tripod setup, but this proved ineffective in penetrating the subsurface below a depth of five feet due to the extremely high density of the subsurface fill materials. The surface materials along the right-of-way are a mixture of cinders and crushed stone used in railroad construction. The impenetrable nature of subsurface materials may be attributed to years of compaction and settling as trains passed through the site.

2.03 Groundwater Monitoring Wells

Four of the seven test borings were converted into groundwater monitoring wells. These wells serve to establish a groundwater profile, provide information on the flow rate and direction of groundwater movement, and supply sampling points from which representative samples of groundwater can be withdrawn. The locations of these wells are shown on Figure 3. (Wells 17-20)

All groundwater monitoring wells were constructed of 2-inch ID flush joint threaded pvc well screen and riser pipe. The riser pipe on all wells was extended to the surface and a protective steel casing or curb box with a lock was installed on the riser pipe to prevent unauthorized entry. The method of installation was to lower the screen and casing assembly into the hollow stem auger to the selected screen depths. A washed Ottawa sand pack was then placed around the well screen and extended to a minimum of 2 feet above the top of the screen. A minimum of one foot of bentonite pellet seal was then placed on top of the sand pack. The remaining annular space between the borehole wall and casing was then filled with a bentonite slurry grout to an elevation of approximately 2 feet below the existing ground surface. The final 2 feet of borehole was filled with a bentonite/portland cement grout mixture to ensure that surface water runoff will not enter the well. Detailed designs of the wells are included in Appendix B.

Following installation, the groundwater monitoring wells were developed using a centrigfugal pump. In general, this involved lowering a polypropylene hose of sufficient length to the bottom of the well to clear the finer grained sediments from around the well screen.

2.04 Well Elevation Survey

Following well installation, a field survey was performed during December 1984 to establish locations and elevations of each of the monitoring wells. Top of casing and grade elevations were measured relative to an existing mean sea level datum using benchmarks taken from the Preliminary Broome County Industrial Park Site Plan. On December 20, 1984, water level measurements were taken at each of the monitoring wells and converted to the elevations summarized on Table 1. This groundwater elevation data was used to develop the groundwater elevation map shown on Figure 4.

2.05 In-Situ Permeability Tests

In situ permeability tests were performed on the four wells installed for this investigation and on five wells installed for the Phase I investigation in order to determine in situ permeabilities of the various subsurface materials at the industrial park site. The tests were performed by evacuating a volume of water from the well, thus creating a potential hydraulic head difference between the well and the surrounding aquifer. The rate of recovery of the water level in the well is a function of the hydraulic conductivity of the aquifer. For those wells where the well evacuation did not create a sufficient hydraulic head difference; the well was pumped at a rate of 20 gallons per minute and the drawdown was measured to estimate the permeability. The results of the in-situ permeability tests are included in Appendix C.

2.06 Groundwater/Surface Water Sampling

Groundwater samples were collected from Wells 17-20 using a stainless steel bailer. Prior to sampling, three times the volume of water contained in each well were evacuated to assure the collection of representative groundwater samples. Following sample collection all groundwater samples were properly preserved and promptly transported to the O'Brien & Gere laboratory in Syracuse, New York for analysis. The groundwater samples from the four wells were chemically analyzed for the following chemical parameters: pH, total conductance, Chemical Oxygen Demand (COD), total dissolved solids, hardness, sulfate, chloride, nitrate, aluminum, arsenic, barium, cadmium, chromium (hexavalent), copper, cyanide, iron, lead, manganese, mercury, nickel, selenium, silver, sodium, zinc, and total organic carbon. The results of these analyses are shown in Table 2.

Surface water samples were collected at three separate locations and depths from the designated wetland on-site. Although surface water samples were to be collected from Carlin Creek, the creek was dry during this investigation. A Van Dorn device was used to collect the samples to ensure that representative samples were taken at specific depths. Surface water samples were collected at the locations A, B and C on Figure 3 at the depths of .5 ft., 1 ft. and 1.0 ft. respectively. Following sample collection all samples were preserved on-site and promptly transported to the O'Brien & Gere laboratory in Syracuse where they were analyzed for the same parameters as the groundwater analyses as well as for Biological Oxygen Demand (BOD) and dissolved oxygen (D.O.). The results of the analyses are shown in Table 2.

SECTION 3 - HYDROGEOLOGIC CONDITIONS

3.01 Geology

The Broome County Industrial Park is located within the Susquehanna section of the glaciated Appalachian Plateau. This region is characterized by moderately to steeply sloping uplands and broad, flat to gently undulating valley bottoms. The landscape has been sculptured primarily by fluvial processes, which have created numerous drainage systems dissecting the plateau surface. Glacial processes have further modified the region by rounding hill tops, truncating bedrock spurs, steepening valley walls, and partially filling the Susquehanna River valley with unconsolidated deposits.

The bedrock that underlies the site consists predominately of fine-grained shale and siltstone. These units were consolidated into rock formations from sediments deposited in a shallow sea during late Devonian time (approximately 350 million years ago). Individual shale and siltstone layers dip gently to the southwest at gradients of less than 20 feet per mile. Small planar openings in the rock have developed both parallel and perpendicular to the layers. These openings, or fractures, provide the only significant avenues for groundwater movement through the otherwise impermeable bedrock.

Throughout the site, bedrock is covered by varying thicknesses of unconsolidated sediments. Most of these sediments were deposited during the advance and retreat of continental ice sheets more than 10 thousand years ago, and range in composition according to their specific mode of deposition. Three basic types of glacial sediments have been recognized at the proposed site: till, outwash, and lake deposits. Till is a dense, unsorted mixture of rock fragments dispersed in a fine-grained matrix of silt, sand and clay. This material was deposited directly by the glacier, either at its margin or beneath the ice mass. Outwash is a relatively well-sorted deposit of sand and gravel, with lesser amounts of silt, that was deposited from sediment-laden meltwater streams as they flowed away from a former ice margin. Beds of lacustrine fine-grained sand, silt and clay were deposited in glacial lakes that formed due to the blockage of meltwater drainage by the retreating ice mass. Figure 5 shows the areal distribution of the surficial geology. Figure 5 shows a typical distribution of these sediments in a cross section which extends through the central part of the site.

Glacial till is the most wide spread unconsolidated deposit present at the site. Figure 5 shows that this material mantles the bedrock everywhere, but is overlain by other deposits along the valley bottom (except under the wetlands). Although the till is generally greater than 10 feet thick, it is less than 4 feet deep on the steep slopes in the west central portion of the site (Figure 3). This thin cover of till is designated as colluvium because it has been transported downslope under the influence of gravity since the time of its deposition. The till cover may also be less than 10 feet over the hill tops along Carlin Road.

Except for the small area of colluvium, till is suitable for most construction purposes. It should be noted, however, that in some locations the till is covered by 18 to 36 inches of silt and very fine sand (especially in areas to the north and west of Carlin Creek). This upper soil mantle is easily eroded and is considered poor foundation material due to low bearing strength.

The valley bottom sediments have been classified as outwash, but the composition of subsurface materials is not simple. Figure 5 shows that up to 20 feet of sand and gravel overlie beds of fine sand, silt and clay. This complex interfingering of outwash, lake beds and alluvium has been reported in valley deposits throughout the Susquehanna River valley in the Binghamton area (Randall and Holecek, 1982; Randall, 1981; Randall and Coates, 1973; Hollyday, 1969). Apparently, the retreat of glacial ice from this valley involved numerous local blockages of meltwater before free drainage was re-established. Silt, clay and very fine-grained sand collected in small glacial lakes dammed by ice. As the ice melted away, meltwater streams were able to deposit coarse-grained sands and gravel on top of and along side the lake beds.

The industrial park site is located in a stretch of the valley that would have favored the impoundment of meltwater between the hillside and ice in the valley to the east. The former presence of a glacial lake in this area would help account for the existence of the wetlands, today. This lake was fed by meltwaters coming through the cols in the bedrock spur that is traversed by Carlin Road. A col is a glacial meltuater channel that extends across an upland divide. The deposition of outwash to the east of the wetlands probably occurred in contact with receding ice. Such an environment contributed to the heterogeneous nature of these sediments.

The least abundant sediment type found at the proposed site is modern alluvium, which has been deposited by present-day streams. Alluvial sediments flank the natural drainage channels, and may be up to 5 feet thick. Alluvium overlies till to the southwest of the upper landfill, but in most cases it covers outwash or lacustrine sediments (for example, Well 18, near the intersection of Carlin Creek and Carlin Road). Construction should be avoided in alluvium due to seasonally a high water table and the possibility of flooding.

3.02 Groundwater Flow Conditions

Part of the precipitation falling on the land surface is transported as surface water runoff, some of it returns to the atmosphere as evapotranspiration, and the remainder percolates through the soils until it reaches the water table. Once infiltrating water reaches the water table it enters the groundwater flow system and flows under the influence of gravity down the slope of the water table until it reaches a point of discharge such as a wetland, stream or river. At the industrial park site the groundwater may discharge locally into the wetland or Carlin Creek but most of the groundwater will most likely flow beneath these local discharge points and discharge into the Susquehanna River.

The groundwater elevation map illustrated on Figure 4 depicts the configuration of the potentiometric surface from the groundwater elevation data collected on December 20, 1984. Although the test boring logs show that groundwater within the glacial till occurs at depths ranging from 20 to 35 feet below the land surface, Figure 4 reveals that the potentiometric surface of the till is within five feet of the land surface. The data indicate that groundwater within the till occurs under artesian conditions. The groundwater within the outwash occurs under water table conditions at a depth ranging from five to ten feet below the surface. The groundwater gradient slopes in an eastward direction towards the Susquehanna River. The hydraulic gradient is steep in the uplands and is relatively gently sloping within the valley (See Figure 4).

The water transmitting capacity, or permeability, of the various geologic formations were estimated by conducting in-situ permeability tests on several monitoring wells. The results of the tests are included in Appendix C. The permeability test data for Wells 1 and 19 which were installed within the glacial till, indicate the permeability of the till ranges from 3.8×10^{-7} to 1.4×10^{-7} cm/sec. The permeability test data for Wells 7, 8, 9, and 10 indicate a permeability for the outwash sand and gravel ranging from 7.0×10^{-2} to 3.8×10^{-1} cm/sec. Permeability tests were also conducted on Wells 5, 6, 17, 18, and 20 however, because these wells were installed within mixed deposits of sand and gravel interbedded with silts and clays, the permeabilities were highly variable and ranged from 9.63×10^{-5} cm/sec to 1.4×10^{-3} cm/sec. The velocity of groundwater at the site can be approximated using Darcy's law and estimates of the hydraulic gradient, aquifer permeability and aquifer porocity. The groundwater flow velocity equation is as follows:

$$V = K \frac{(dh/dL)}{7.5\ a}$$

Where V = Velocity, in feet per day

K = permeability, in gal/day/ft^2

dh/dL = hydraulic gradient; in ft/ft

a = porosity

The upland area of the industrial park is underlain by glacial till which has a low permeability ranging 8.66 to 2.96×10^{-3} gpd/ft^2 (3.8 to 1.4×10^{-7} cm/sec) and an estimated porosity of .34 which is typical for glacial till (Todd, 1980). Based on this information and a hydraulic gradient of .070 (measured from Figure 4) it is estimated that the groundwater flow velocity of the upland area of the industrial park ranges from 2.2×10^{-4} to 8.13×10^{-5} ft/day.

The lowland area of the industrial park is underlain by outwash sand and gravel that has a relatively high permeability ranging from 1,485 to 8,060 gpd/ft^2 (7.0×10^{-2} - 3.8×10^{-1} cm/sec) and an estimated porocity of .25. Based on this data and a hydraulic gradient of .010 (Figure 4) it is estimated that the groundwater velocity of the lowland area of the industrial park ranges form 8 to 43 ft/day.

3.03 Groundwater/Surface Water Quality

Groundwater Quality

Groundwater monitoring Wells 17, 18, 19 and 20 were installed at the perimeter of the industrial park site to determine the groundwater quality at the upgradient and downgradient boundaries of the site. The water quality analyses from the wells are shown in Table 2. In order to evaluate the site groundwater quality with respect to natural groundwater quality, the analyses are compared to the background water quality of aquifers within the Susquehanna River Basin (Table 3). In addition, the analyses are compared to NYDOH Drinking Water Standards and to NYSDEC Class GA Groundwater Standards (Table 4) to evaluate the suitability of the groundwater as a source of potable water.

Groundwater monitoring Wells 17 and 20 are located hydraulically upgradient from most of the industrial park and therefore, the analyses from these wells should be representative of the background groundwater quality. The wells are installed within glacial till and the water quality is of good drinking water quality, contains a moderate amount of dissolved solids and hardness and is relatively low in iron, chloride, and heavy metal concentrations. The groundwater quality of those wells meets NYSDOH Drinking Water Standards and NYSDEC Class GA Groundwater Standards.

Groundwater monitoring Wells 18 and 19 are at the down-gradient boundary of the north and south extremes of the industrial park. Well 19 is installed within till and the water is of good drinking water quality, similar to the background water quality described above. However, the water quality of Well 18 exceeds the background water quality and contains elevated levels of COD, sulfate iron, manganese and total organic carbon. The elevated levels of sulfate, iron and manganese exceed the NYSDOH Drinking Water Standards.

Well 18 is located adjacent to Carlin Creek and the groundwater may have been impacted by surface water infiltration from the Creek. The elevated levels of iron, manganese and sulfate may have been caused by leachate from the upper landfill discharging into Carlin Creek which in turn infiltrated into the groundwater.

Surface Water Quality

Surface water samples were collected from the designated wetland on-site at the locations shown on Figure 3. The samples were collected at depths of .5 ft at location A, 1 ft at B and 1 ft at C. The chemical analyses of the samples shown in Table 2, reveal that the water at all three locations is of drinking water quality, contains a moderate amount of dissolved solids and is relatively low in heavy metal, chlorides, and sulfate, and TOC. The turbidity varies from moderate to high.

Surface water quality is strongly dependent on the interrelationship between groundwater flow and stream flow. If the major source of surface water is runoff, the surface water will usually be relatively low in dissolved solids and high in suspended solids and turbidity. On the other hand, if the major source of the surface water is base flow from groundwater discharge, the surface water will tend to be high in dissolved solids and low in turbidity. The moderately high levels of total dissolved solids content suggests that at least part of the surface water within the wetland can be attributed to groundwater discharge. However, due to the relatively high turbidity levels and the hydrogeologic conditions beneath the wetland, the major source of the water is believed to be from runoff. The wetland is located downgradient from the upper landfill, however, the surface water quality does not appear to be impacted by groundwater flowing from the landfill.

The surface water quality of the wetland can be evaluated relative to sustaining the productivity of aquatic organisms by examining the oxygen content of the water. Dissolved oxygen (D.O.) is a measure of the oxygen available and, in appropriate concentrations, is essential to sustaining the productivity of aquatic organisms. New York State Department of Environmental Conservation has set a standard of not less than 5 mg/l D.O. for trout waters and not less than 4 mg/l for non-trout waters. The high levels of D.O. (12.7 to 17.0 mg/l) detected within the wetland are more than sufficient to sustain the productivity of most aquatic organisms. These high D.O. levels are close to the saturation levels for the temperature of the water at the time of sampling (43°F). Based on the relative shallow depths of the wetland, sufficient D.O. levels are expected to be maintained during the summer months to sustain aquatic organisms. Field inspections of the wetland area by the BIDA indicate there is low aquatic plant productivity and a limited trophic system. This is reflected by the undetectable levels of Biochemical Oxygen Demand (BOD) which measures the removal of oxygen from the water by organic materials. This information reveals that although the wetland has a limited trophic system, it has an abundance of oxygen available to sustain the year-round productivity of most aquatic organisms.

3.04 Potential Ground Water Supplies

The development of a groundwater supply for either industrial or consumptive use would require a relatively large sustained yield. It has already been noted that the bedrock underlying this site is impermeable, except for fracture openings. However, because these fractures comprise only a small percentage of the total rock volume, groundwater flow rates are slow and well yields are generally less than 10 gallons per minute out of domestic wells. Therefore, any potential groundwater supply on site would have to be developed in the unconsolidated sediments.

Till characteristically has a low permeability due to its poor sorting, fine-grained texture and high density. Rarely are there enough interconnected void spaces between particles to transmit significant amounts of groundwater. This has been confirmed at the site by in-situ permeability tests of Wells 1 and 19 which indicate that the till at this location has a permeability of only 3.8×10^{-7} to 1.4×10^{-7} cm/sec. Therefore, till should not be considered as a potential aquifer for the industrial park.

Outwash is the best potential aquifer because of its coarseness and high degree of sorting. Well records (Randall, 1972) indicate that outwash is an important source of water supply to local homeowners along Route 7 and the Town of Conklin Well No. 3. The on-site test boring logs indicate that the saturated thickness of the outwash deposits at the industrial park site generally ranges from 5 to 15 feet. Based on this range in aquifer thickness and the aquifer permeability range of 1500 to 5000 gal/day/ft^2 (estimated from the in-situ permeability tests) well yields within the outwash aquifer at the industrial park can be expected to range from 10 to 500 gallons per minute.

Fine-grained lacustrine deposits are not productive aquifers due to low permeability. In fact, silt and clay lake beds often form impermeable confining layers between outwash units.

SECTION 4 - ENVIRONMENTAL IMPACTS

4.01 Existing Impacts

Upper Landfill

The Phase I Hydrogeologic Investigation indicated that up to 1.8 million gallons of leachate is generated at the upper landfill annually by precipitation infiltrating the landfill surface and an additional 1,000 gallons of leachate is generated annually by groundwater flowing through the refuse. This leachate generation has impacted the groundwater immediately downgradient from the upper landfill by elevating the levels of arsenic, manganese cadmium, benzene, and several volatile organic compounds, including methylene, chloride, toluene, 1,1-dichloroethane and 1,2-dichloropropane. However, due to the fine grained texture and extremely low groundwater velocities of the soils beneath the upper landfill, the groundwater flowing from the landfill should not have a significant impact on downgradient groundwater or surface water supplies.

Although the soils beneath the upper landfill are favorable for minimizing groundwater impacts, they promote the development of leachate seeps which have a potential for impacting the surface water quality of Carlin Creek. Because Carlin Creek flows over permeable sand and gravel deposits, it can recharge the groundwater by infiltration through its streambed. As a result, any leachate discharging into Carlin Creek from the upper landfill, could have a potential for impacting on the groundwater quality farther downstream. The groundwater quality adjacent to Carlin

Creek (Well 18) contains elevated levels of iron, sulfate, COD and TOC which may be attributed to the infiltration of impacted surface water of Carlin Creek.

As previously stated in the Phase I investigation, a low permeability cover installed on the upper landfill would minimize the impacts on groundwater and surface water by eliminating the amount of leachate generated by precipitation infiltrating the landfill surface.

Lower Landfill

Up to 900,000 gallons of leachate is generated at the lower landfill by precipitation infiltrating the landfill surface and up to 150,000 gallons of leachate may be generated by groundwater flowing through the refuse. This leachate generation has impacted the groundwater immediately downgradient from the lower landfill by increasing the levels of arsenic, iron, manganese, and mercury. In addition, the water quality of some of the downgradient homeowner wells along Conklin Road contained elevated levels of manganese, iron, and arsenic, suggesting the landfill may be having an impact on the quality of the water supplies. Due to the coarse grained soil texture and high groundwater flow velocity beneath the lower landfill, it is anticipated that the lower landfill will continue to have an impact on groundwater quality.

A low permeability cover installed on the landfill would minimize the impacts on groundwater by eliminating the amount of leachate generated by precipitation infiltrating the landfill surface.

4.02 Potential Impacts

Contamination Potential

The Town of Conklin Well No. 3 is located approximately 2,000 feet northeast of the Broome Industrial Park. Any surface water draining the area north of Carlin Road has a potential for infiltrating the surface soils and recharging the groundwater aquifer that is a source of groundwater for Well No. 3. Therefore any contaminants discharged at the land surface within this area could have a potential for impacting the groundwater quality of Well No. 3. As a result, industrial development controls should be developed for this area to protect the municipal water supplies for the Town of Conklin.

The area within the industrial park that is underlain by outwash deposits (see Figure 3) contains highly permeable soils and a shallow water table. Therefore, this area is highly susceptible to groundwater contamination from any potential contaminant discharges that could potentially occur at the land surface. Although the area is not directly upgradient to the Town of Conklin Well No. 3, it serves as a recharge area for the aquifer that supplies water to the homeowner along Route 7, and it has a high potential for future development of industrial water supplies. As a result, industrial development controls and a groundwater monitoring program should be developed for this area to ensure the protection of the local groundwater supplies.

General Construction Conditions

The subsurface geologic conditions across most of the industrial park site are generally suitable for most construction purposes. The areas underlain by glacial till have a high bearing strength and the water table is generally greater than ten feet deep. However, along the steeper slopes bedrock occurs within five feet of the surface which may impose limitations on foundation excavations. The areas underlain by outwash sand and gravel have a high bearing strength but the water table is generally within 8 feet of the land surface. The least suitable areas are those underlain by alluvial or lacustrine deposits where bearing strength is low to moderate and the water table is within five feet of the surface. Alluvial deposits are generally underlain by more suitable glacial till or outwash deposits within ten feet of the surface.

Groundwater Supplies

Groundwater supplies developed within the glacial till, or underlying shale/siltstone bedrock generally yield less than 10 gpm and are therefore generally not sufficient for industrial water supplies. The highest potential for the development of groundwater supplies is within the outwash sand and gravel where well yields can be expected to range between 10 and 500 gpm, depending on the thickness and texture of the deposit. Although the outwash deposits would have sufficient well yields, the groundwater quality in the vicinity of the lower landfill and Carlin Creek is not suitable for drinking water purposes. As a result, groundwater supplies developed within the outwash aquifer at the central and northern sections of the industrial park may be used as a source for cooling water and process water but should not be used as a source of drinking water.

SECTION 5 - CONCLUSIONS AND RECOMMENDATIONS

5.01 Conclusions

The geology of the Broome Industrial Park is characterized by varying thicknesses of unconsolidated sediments overlying a shale and siltstone bedrock. The unconsolidated sediments include till, outwash, lacustrine deposits and alluvium. The two most widespread deposits present at the site are till and outwash. The till occurs within the upland of the site, and consists of a dense unsorted mixture of rock fragments and fine grained materials that has an extremely low permeability ranging from 3.8×10^{-7} to 1.4×10^{-7} cm/sec. Outwash occurs along the valley bottom and consists of sand and gravel which has a high permeability ranging from 7.0×10^{-2} to 3.8×10^{-1} cm/sec.

Groundwater occurs at the site at depths varying from 5 to 30 feet below the land surface. The groundwater flows predominantly in an eastward direction at a velocity ranging from 2.2×10^{-4} to 8.13×10^{-5} ft/day within the glacial till to 8 to 43 ft/day within the outwash. The groundwater may discharge locally into the wetlands or Carlin Creek but most of the groundwater flows beneath these discharge points and discharges into the Susquehanna River.

The groundwater quality upgradient to most of the industrial park is generally of good drinking water quality, contains a moderate amount of dissolved solids and hardness, and is relatively low in iron, chloride and heavy metal content. On the other hand, the downgradient groundwater quality at the central and northern sections of the industrial park is not of suitable quality for drinking water. The groundwater quality in the central part of the site is downgradient from the lower landfill and contains elevated levels of manganese, mercury, and iron. The downgradient groundwater quality at the northern part of the industrial park contains elevated levels of sulfate, iron, manganese and TOC which may be attributed to impacts from the upper landfill.

Potential well yields from the glacial till and bedrock are estimated to be less than 10 gpm and therefore are not sufficient for industrial purposes. However, the potential well yields from outwash are estimated to range from 10 to 500 gpm which is sufficient for most industrial supplies. Because the groundwater quality at the central and northern sections of the industrial park does not meet drinking water quality, the groundwater should be used only as a source of cooling or process water and not as a source of drinking water.

The subsurface geologic conditions across most of the industrial park are suitable for most construction purposes. The glacial till has a high bearing strength and deep water table; the outwash deposit has a high bearing strength and variable water table within ten feet of the surface. The least suitable areas are those underlain by alluviam or lacustrine silt and clay that have a low bearing strength and a water table close to the land surface.

Surface water drainage from the area north of Carlin Road has a potential for recharging the groundwater that supplies water to the Town of Conklin Well No. 3. As a result, any accidental chemical discharges from an industry located within this area could have a potential for impacting the quality of the Town of Conklin's water supply.

The area underlain by outwash deposits is highly susceptible to groundwater contamination and is a recharge area for the aquifer that supplies water to the homeowners along Route 7. Therefore, any accidental industrial discharges within this area would have a high potential for impacting nearby groundwater supplies.

5.02 Recommendations

1. The hydrogeologic investigations at the industrial park site have revealed that the upper and lower landfills have impacted groundwater quality and may have impacted the surface water quality of Carlin Creek. As a result, we recommend to implement the landfill remedial measures previously included within the Phase I Hydrogeologic Investigation. These remedial measures include: 1) installing low permeability covers on the upper and lower landfills to minimize leachate generation, 2) replacing the homeowner water supplies that are downgradient from the lower landfill, and 3) conducting groundwater and surface water monitoring to evaluate the long-term impacts from the landfills.

2. Industrial development controls are recommended for the area north of Carlin Road and for the area underlain by outwash deposits. These areas are recharge areas for the aquifer that supplies water to the Town of Conklin Well No. 3 and the homeowners along Route 7. Any industrial development within either of these areas should meet the following requirements: 1) any industry located within these areas shall develop a groundwater monitoring program, and 2) any industry that is

a major user of hazardous materials shall be restricted from these areas unless the facility is designed in accordance with NYSDEC Guidelines for State of the Art Technology for the Storage of Hazardous Liquids (NYSDEC, 1983) in order to prevent leaks and spills from occurring. The major users of hazardous materials shall include at a minimum 1) any permitted hazardous waste facility as defined under the Resource Conservation and Recovery Act (RCRA), 2) any bulk petroleum storage facility as defined under 6 NYCRR Part 612 and 3) any underground or aboveground storage facility with a capacity of 1,000 gallons or more used for the storage of hazardous substances.

3) Additional field investigations are recommended to be conducted within the outwash deposits to determine the maximum yield of groundwater supplies that can be developed for industrial and consumptive use. These field investigations include installing test wells and conducting aquifer performance tests. Due to the unsuitable groundwater quality within the central and northern sections of the industrial park, it is recommended that groundwater supplies developed within these areas not be used for drinking water purposes.

4) More detailed geotechnical testing is recommended where heavy construction is anticipated within areas that have severe general construction limitations. This includes the areas that are underlain by alluvial deposits or lacustrine

silts and clays. The geotechnical testing may include test drilling, standard penetration tests and laboratory testing for compaction, atterburg limits and shrink/swell potential.

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Tables

O'BRIEN & GERE

TABLE 1

BROOME COUNTY INDUSTRIAL PARK

GROUNDWATER MONITORING WELL DATA

Well No.	Grade Elevation	Top of Steel Casing Elevation	Top of PVC Casing Elevation	Well Depth Below Grade	Groundwater Elevations 12/20/84
1	944.4	947.41	947.30	60	943.16
2	914.8	916.16	915.93	45	909.84
3	885.8	889.20	889.11	20	885.60
4	890.9	893.58	893.42	20	886.80
5	860.31	860.31	860.24	33.5	853.86
6	868.8	868.82	868.59	17.9	865.59
7	865.2	868.37	868.27	25	856.22
8	860.2	860.24	860.08	18	853.89
9	861.3	864.21	864.11	18	854.66
10	863.8	863.76	863.47	18	855.29
11	896.2	898.97	898.82	30.5	890.77
12	898.6	901.62	901.51	16	889.17
13	865.7	868.62	868.55	15	860.07
14	914.8	917.25	917.14	15	---
15	873.8	876.62	876.49	18	---
16	---	---	---	2.5	---
17	948.46	950.89	950.38	30	947.06
18	861.00	863.37	862.74	15	859.97
19	912.39	914.94	914.61	31.5	908.89
20	887.89	890.05	889.64	20.5	885.70

TABLE 2
BROOME COUNTY INDUSTRIAL PARK
WATER QUALITY DATA
(Values are in mg/l)

	Groundwater				Surface Water		
Location	Well 17	Well 18	Well 19	Well 20	SW A	SW B	SW C
pH	6.7	6.2	6.1	6.7	5.8	6.3	6.4
SPCOND	250.	170.	330.	170.	46.	46.	45.
COD	180.	420.	15.	50.	74.	170.	110.
Total Dissolved Solids	200.	260.	210.	190.	80.	140.	130.
Calcium	33.	25.	57.	34.	8.8	9.3	11.
Magnesium	9.0	5.0	12.	4.7	1.8	1.7	2.3
Hardness	120.	83.	190.	100.	29.	30.	37.
Sulfate	22.	380.	32.	49.	32.	25.	34.
Chloride	3.	19.	1.	2.	1.	1.	1.
Nitrate	0.01	0.40	0.01	0.07	0.01	0.02	0.01
Aluminum	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Arsenic	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Barium	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Cadmium	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chromium-Hex.	.05	.05	.05	.05	.05	.05	0.5
Copper	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cyanide	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Iron	0.02	2.7	0.01	0.03	0.05	0.04	0.05
Lead	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Manganese	1.4	4.1	0.46	0.43	0.13	0.19	0.21
Mercury	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	.03	0.07	0.09	0.09	0.09	0.07	0.07
Selenium	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Silver	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Sodium	10.0	6.7	14.	1.8	0.7	1.1	1.1
Zinc	0.01	0.02	0.01	0.01	0.01	0.02	0.02
Total Organic Carbon	35.	139.	10.	13.	33.	55.	35.
BOD5	---	---	---	---	1.	1.	1.
TURB (Lab)	---	---	---	---	15.	120.	15.
TURB (Secchi Disc) Pond depth/dis-appearance depth					1'/6"	2'/8"	2'/8"
Dissolved Oxygen sample depth/D.O.					6"/14.3 13"/14.9	8"/14.9 16"/12.7 30"/15.0	8"/17.0 16"/15.7 30"/15.6

TABLE 3

Groundwater Quality Within the Aquifers of the Susquehanna River Basin in New York State
(values in mg/l) (from Hollyday, 1969)

	Glacial Till and Bedrock			Lacustrine Deposits			Outwash Deposits		
*	G	M	P	G	M	P	G	M	P
Temperature	48	50	52	50	52	53	47	50	53
Silica	6.7	8.3	9.6	2.0	7.8	15	6.8	7.4	8.8
Iron	.08	.30	.65	.21	1.0	1.8	.03	.06	.15
Manganese	.01	.03	.05		.02		0	.01	.05
Calcium	29	41	51		30		45	50	74
Magnesium	3.8	8.3	9.7		9.0		6.0	12	19
Sodium	4.8	11	64		7.6		6.6	8.9	13
Potassium	.5	1.5	2.3		.5		1.1	1.4	1.6
Bicarbonate	140	170	250		130		150	180	230
Sulfate	3.6	12	27		15		25	31	50
Chloride	4.0	16	58		3.0		7.8	13	22
Fluoride	.1	.1	.2		.1		.05	.1	.2
Nitrate	.09	.18	.53		0		.24	1.0	2.1
Dissolved Solids	160	200	310		140		190	240	330
Calcium and Magnesium	54	90	140		120		150	200	220
Alkalinity	110	150	190		110	130	130	150	170
pH	7.3	7.7	8.1		7.5		7.4	7.6	7.8
Color	0	2	10		1		1	2	5

*Values tabulated are taken from a frequency distribution of reported chemical analysis of well water. Good (G), medium (M) and poor (P) refer to values equaled or exceeded for 75, 50 and 25 percent of available analyses, respectively.

TABLE 4

NEW YORK STATE WATER QUALITY STANDARDS

Parameter	NYSDOH Drinking Water Standards/Maximum Contaminant Level	NYSDEC Class GA Groundwater Standards/Maximum Allowable Concentration
Arsenic (As)	.05 mg/l	.025 mg/l
Barium (Ba)	1.0 mg/l	1.0 mg/l
Cadmium (Cd)	.01 mg/l	.01 mg/l
Chloride (Cl)	250. mg/l	250. mg/l
Chromium (Cr)	.05 mg/l	.05 mg/l
Copper (Cu)	1.0 mg/l	1.0 mg/l
Cyanide (CN)	- -	.2 mg/l
Fluoride (F)	2.2 mg/l	1.5 mg/l
Foaming Agents		.5 mg/l
Iron (Fe)	.3* mg/l	.3 mg/l
Lead (Pb)	.05 mg/l	.025 mg/l
Manganese (Mn)	.3* mg/l	.3 mg/l
Mercury (Hg)	.002 mg/l	.002 mg/l
Nitrate (N)	10. mg/l	10.0 mg/l
Phenols	- -	.001 mg/l
Selenium (Se)	.01 mg/l	.02 mg/l
Silver (As)	.05 mg/l	.05 mg/l
Sulfate (SO_4)	250. mg/l	250. mg/l
Zinc (Zn)	5.0 mg/l	5. mg/l
pH Range	- -	6.5 - 8.5
Chlordane		.1 ug/l
Endrin	.0002 mg/l	not detectable
Heptachlor	- -	not detectable
Lindane	.004 mg/l	not detectable
Methoxychlor	.1 mg/l	35. ug/l
Toxaphene	.005 mg/l	not detectable
2,4-Dichlorophenoxyacetic Acid	.1 mg/l	4.4 ug/l
2,4,5-Trichlorophenoxyproploric Acid	.01 mg/l	.26 ug/l
Vinyl Chloride	- -	5 ug/l
Benzene	- -	not detectable
Chloroform	- -	100 ug/l
Trichloroethylene	- -	10 ug/l

*If iron and manganese are both present, the total concentration of both substances should not exceed 0.5 milligrams per liter.

Figures

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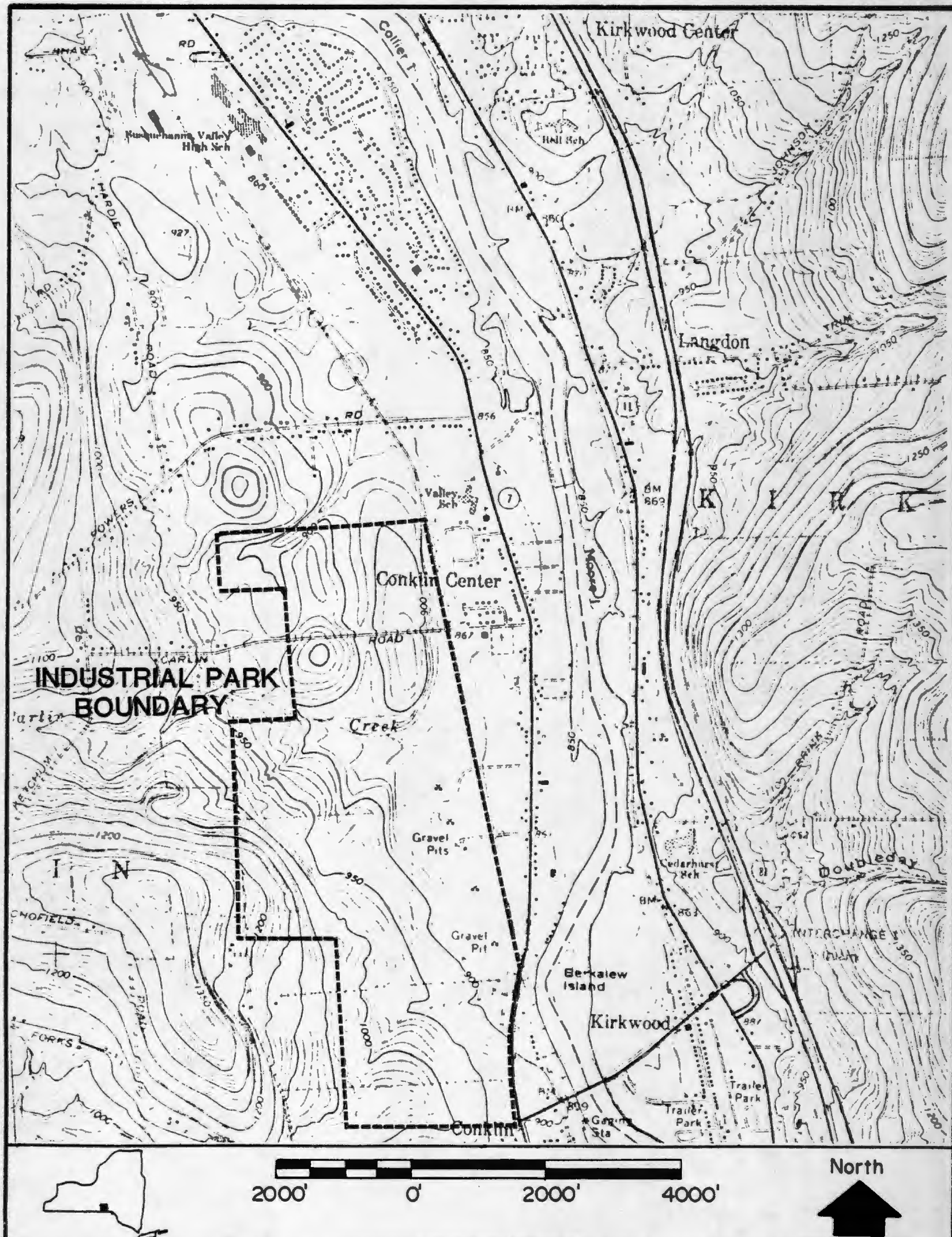
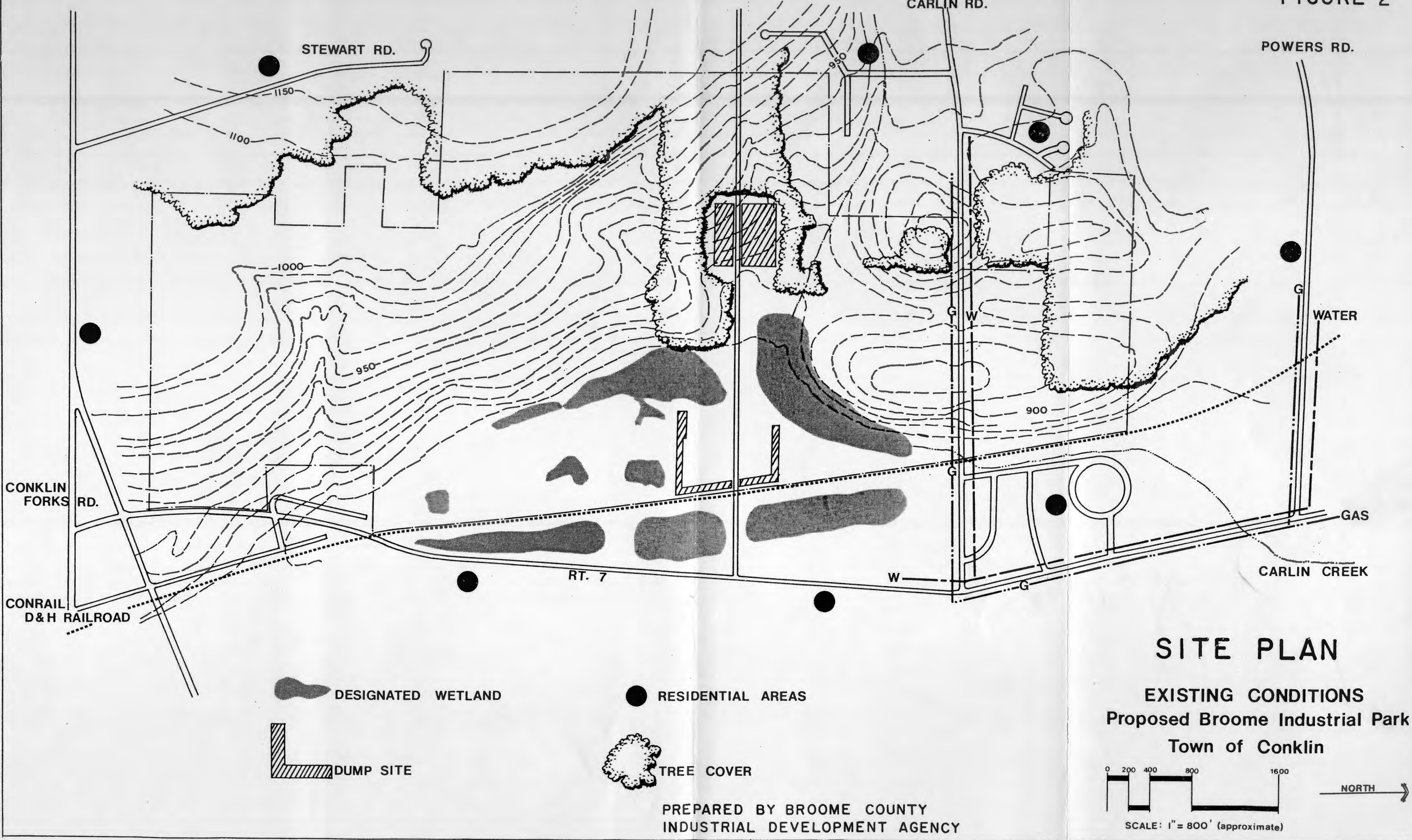


BROOME COUNTY INDUSTRIAL DEVELOPMENT AGENCY

BROOME INDUSTRIAL PARK
CONKLIN, N.Y.
LOCATION MAP

FIGURE 2



SITE PLAN

EXISTING CONDITIONS
Proposed Broome Industrial Park
Town of Conklin

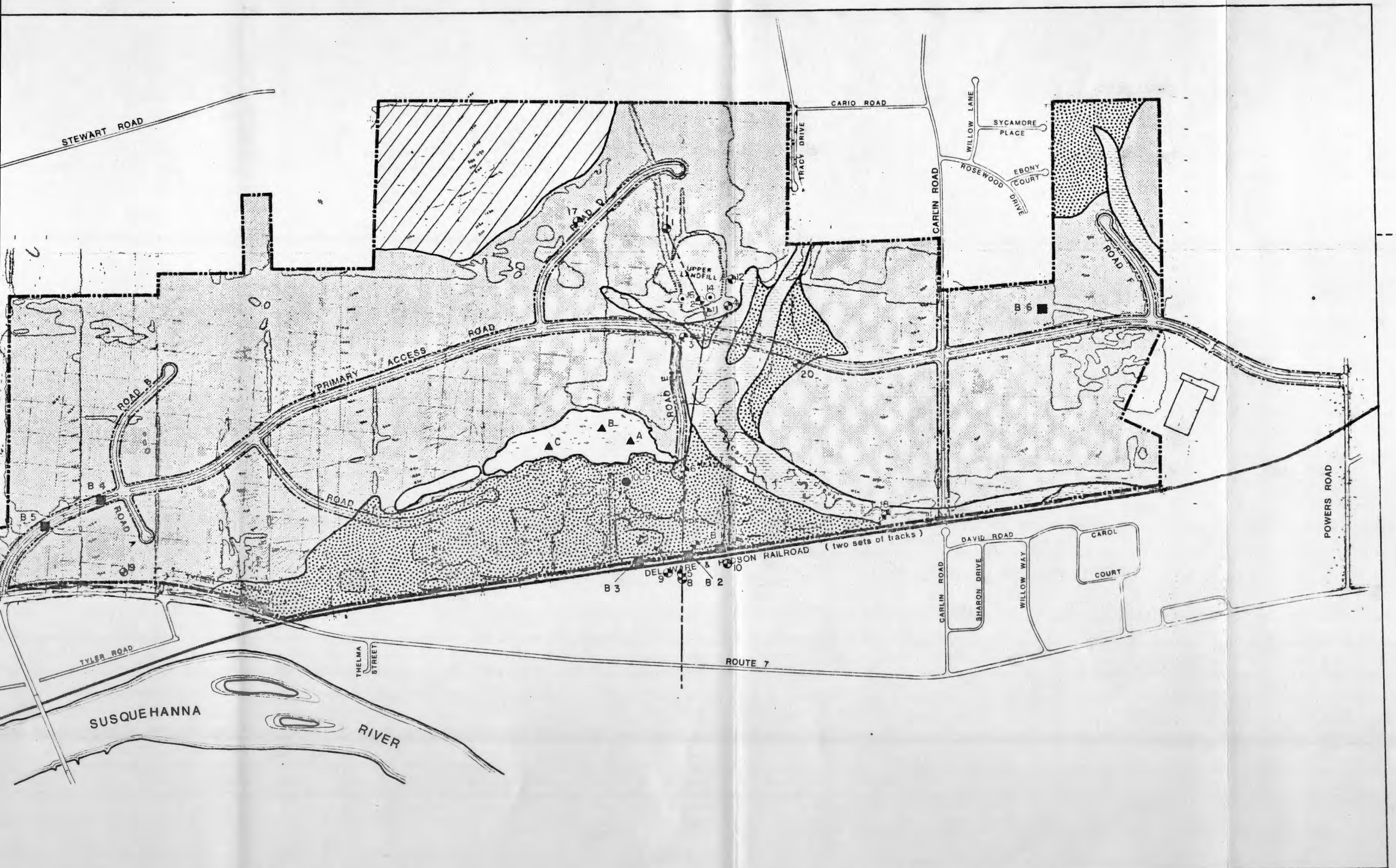


FIGURE 3

Surficial Geology Map

LEGEND

- Geologic Cross Section Line
- Surface Water Sampling Location
- Soil Test Boring
- Groundwater Monitoring Well
- Leachate/Methane Gas Monitoring Well
- Wells By Others
- Outwash - *Moderately to well-sorted sand and silt deposited by meltwater streams*
- Alluvium - *Moderately sorted silt, sand and gravel deposited by modern streams*
- Till - *Unsorted mixture of silt, sand, clay and rock fragments deposited directly by glacial ice.*
- Colluvium - *Thin-(< 4 ft. thick) till over bedrock*

BROOME COUNTY INDUSTRIAL DEVELOPEMENT AGENCY

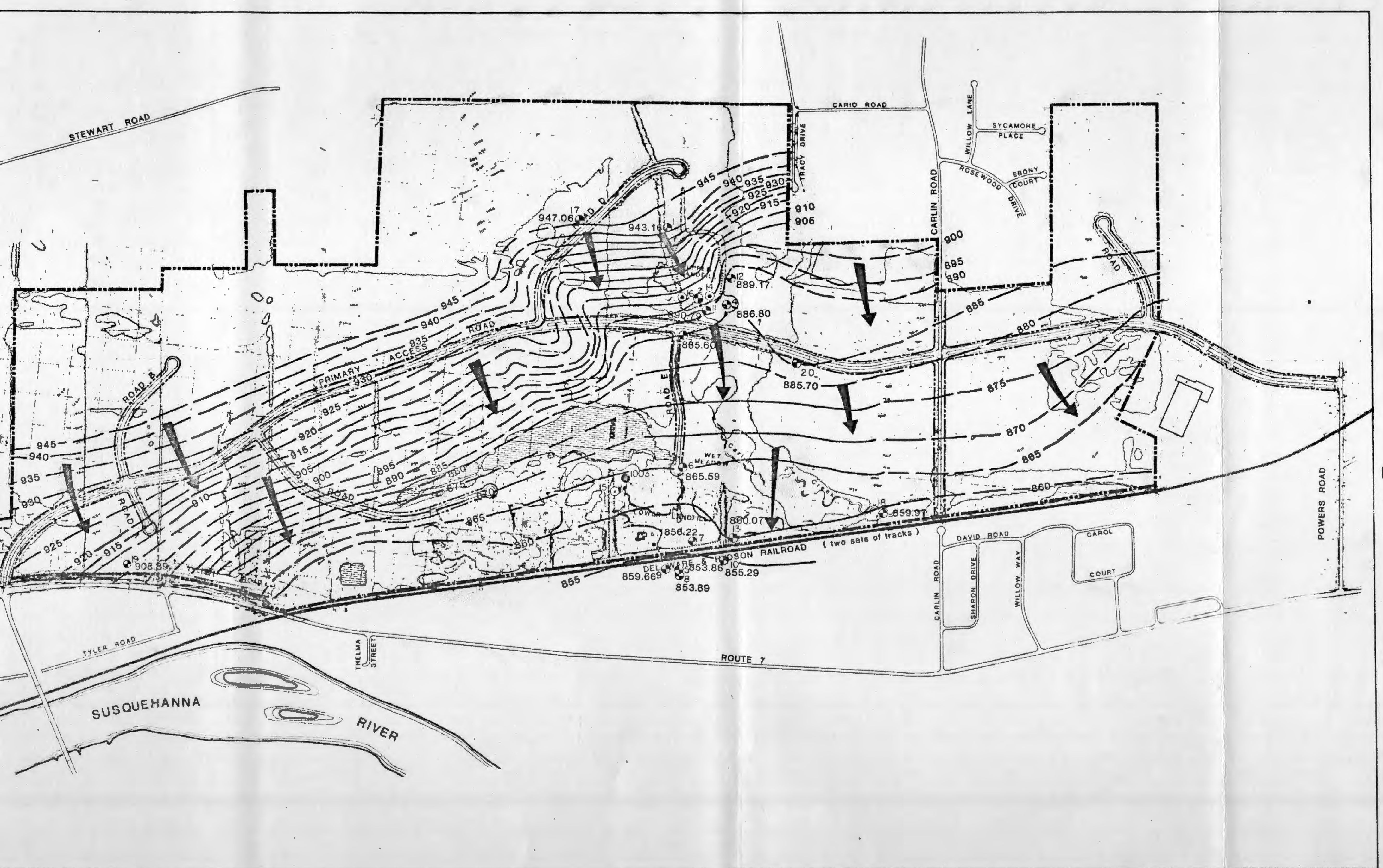
N

Scale: 1.400

400 0 400 800

FIGURE 4

Groundwater Elevation Map



LEGEND

- Groundwater Monitoring Well
- Leachate/Methane Gas Monitoring Well
- Wells By Others
- Groundwater Equipotential Line (Dec. 20, 1984)
- Groundwater Flow Direction

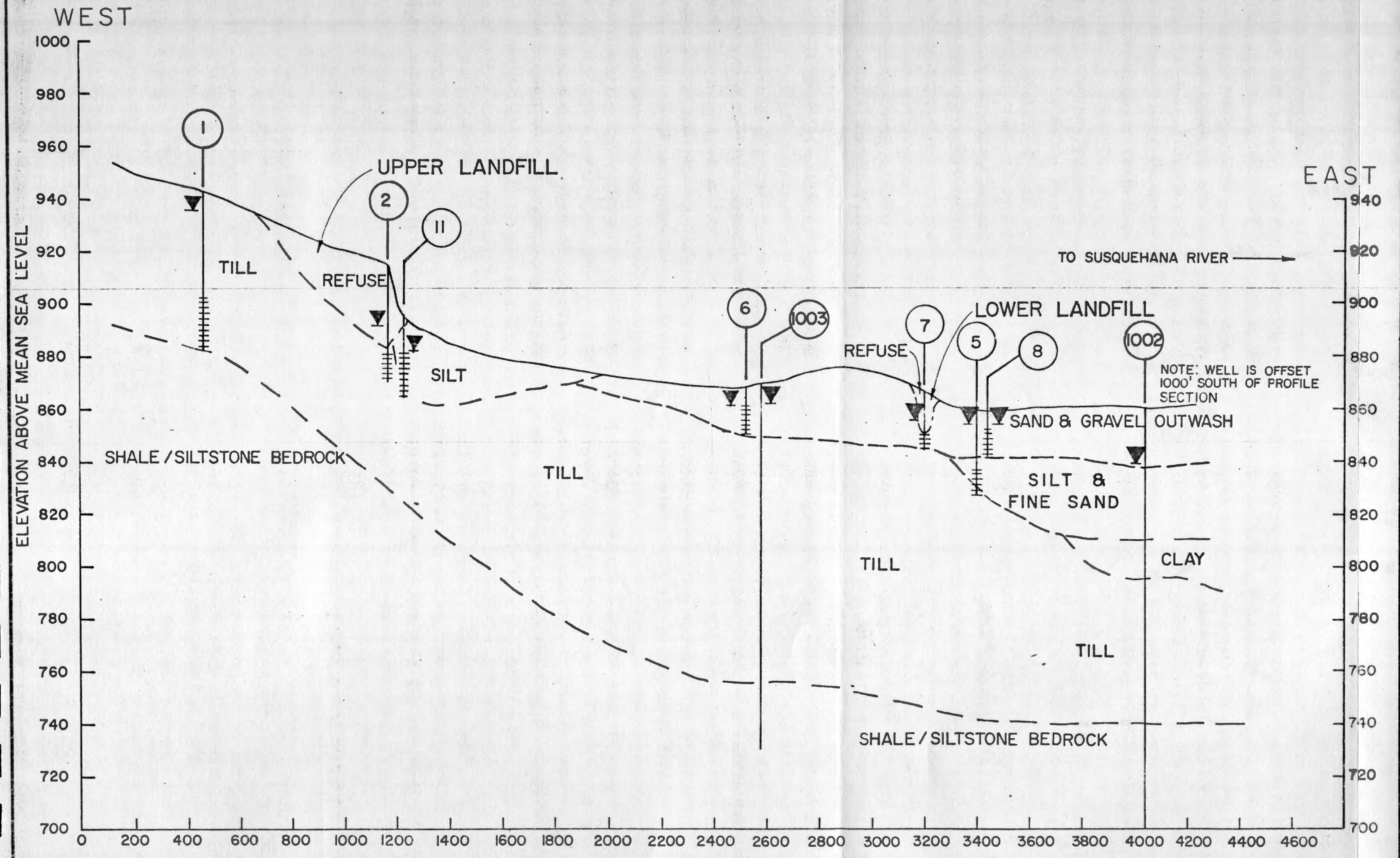
Scale: :400

400 0 400 800

BROOME COUNTY INDUSTRIAL DEVELOPEMENT AGENCY

FIGURE 5

Geologic Cross Section



LEGEND

Groundwater Monitoring Well

Groundwater Monitoring Well Screen Interval

Groundwater Elevation

BROOME COUNTY INDUSTRIAL DEVELOPEMENT AGENCY

NOTE: Groundwater Well 1002 & 1003 Are Randall 1972

O'BRIEN & GERE

O'Brien & Gere Engineers, Inc.

Appendices

O'BRIEN & GERE

APPENDIX A

WATER QUALITY DATA FROM

PHASE I HYDROGEOLOGIC INVESTIGATION

TABLE 4
BROOME COUNTY INDUSTRIAL PARK
INORGANIC ANALYSES - WELL SITES*

WELL	DATE	SAMPLE	AL	AS	BA	CD	CR	CU	FE	PB	MN	HG	NI	SE	NA	ZN	CA	MG	HARD	TALK	PH	SPCOND
1	08/05/83	4385	<.1	<.01		<.01	<.01	.01	<.01	<.01	.18	<.5	<.01		10.	<.01					7.8	330.
1	11/09/83	4890	<.1	<.01	<.1	<.01	<.01	<.01	<.01	<.01	.02	<.5	<.01	<.01	14.	<.01	44.	11.	160.	132.	8.3	319.
2	08/05/83	4386	<.1	<.01		<.01	<.01	.01	<.01	<.01	.31	<.5	<.01		10.	.07					7.5	310.
2	11/09/83	4891	<.1	.06	.6	<.01	<.01	.03	.38	<.01	1.9	4.6	<.01	<.01	43.	.05	56.	11.	190.	174.	7.6	420.
2	01/19/84	4137		.01																		
3	08/05/83	4387	<.1	<.01		.015	<.01	.02	<.01	<.01	.40	<.5	<.01		7.0	.05					6.7	200.
3	11/09/83	4892	<.1	.02	.1	<.01	<.01	<.01	<.01	<.01	1.3	<.5	<.01	<.01	6.2	<.01	30.	6.7	100.	61.	7.8	212.
3	01/19/84	4138		<.01																		
4	08/05/83	4388	<.1	<.01		<.01	<.01	<.01	.05	<.01	.33	<.5	<.01		11.	<.01					7.0	160.
4	11/09/83	4893	<.1	<.01	.1	<.01	<.01	<.01	.01	<.01	<.01	6.7	<.01	<.01	5.6	.02	21.	5.1	73.	42.	8.2	160.
4	01/19/84	4139		<.01																		
5	08/05/83	4389	<.1	.02		<.01	<.01	.12	<.01	<.01	1.4	<.5	<.01		13.	<.01					7.1	190.
5	11/09/83	4894	<.1	.01	.2	<.01	<.01	<.01	.02	<.01	1.9	3.9	<.01	<.01	6.7	.03	24.	3.7	75.	<1.	8.3	161.
5	01/19/84	4140		<.01																		
6	08/08/83	62892	<.1	<.01		<.01	<.01	.01	2.4	<.01	2.8	<.5	<.01		11.	.01					5.9	140.
6	11/09/83	4895	<.1	.08	.3	<.01	<.01	.01	38.	<.01	4.1	2.2	<.01	<.01	4.5	.06	11.	3.0	40.	19.	6.6	115.
6	01/19/84	4141		.01																		
7	08/05/83	4390	<.1	<.01		<.01	<.01	.05	<.01	<.01	4.1	<.5	<.01		5.0	.02					6.2	90.
7	11/09/83	4896	<.1	.07	.2	<.01	<.01	.01	7.8	<.01	4.3	<.5	<.01	<.01	3.8	.03	11.	1.9	35.	19.	7.1	94.4
7	01/19/84	4142		.01																		
8	08/05/83	4391	<.1	<.01		<.01	<.01	.05	<.01	<.01	4.4	<.5	<.01		5.0	.02					6.2	90.
8	11/09/83	4897	<.1	.08	.3	<.01	<.01	<.01	10.	<.01	4.8	<.5	<.01	<.01	3.6	.04	8.6	1.7	28.	14.	7.1	84.3
8	01/19/84	4143		.01																		
9	08/05/83	4392	<.1	<.01		<.01	<.01	.18	<.01	<.01	1.7	<.5	<.01		9.0	.02					6.2	90.
9	11/09/83	4898	<.1	<.01	.2	<.01	<.01	<.01	.03	<.01	2.0	<.5	<.01	<.01	3.7	.02	12.	2.2	39.	16.	7.0	100.
10	08/05/83	4393	<.1	<.01		<.01	<.01	.34	<.01	<.01	3.3	<.5	<.01		11.	.02					6.8	100.
10	11/09/83	4899	<.1	<.01	.2	<.01	<.01	<.01	.07	<.01	2.3	<.5	<.01	<.01	4.4	.02	14.	3.0	47.	19.	7.5	106.
10	01/19/84	4144		<.01																		
11	08/08/83	62893	<.1	<.01		<.01	<.01	.26	<.01	<.01	4.4	.6	<.01	14.6	21.	<.01					7.1	750.
11	11/09/83	4900	<.1	.06	.3	<.01	<.01	.02	2.2	<.01	11.	<.5	<.01	<.01	22.	.03	160.	39.	560.	350.	7.7	995.
11	01/19/84	4145		<.01																		
13	08/08/83	62894	.1	<.01		<.01	<.01	2.4	3.6	<.01	16.	<.5	<.01		43.	.03					6.8	430.
13	08/20/83	63217	<.1	<.01		<.01	1.9	2.5	.84	<.01	15.	25.	<.01		14.	.01					6.6	272.
14	08/08/83	62895	.4	<.01		<.01	.05	.20	190.	<.01	110.		.49		650.	23.					6.0	10342.
14	08/19/83	63218	.4	<.01		.03	.65	.2	640.	<.01	120.	5.	.43		680.	16.					5.9	11458.
15	08/08/83	62896	.2	<.01		<.01	<.01	.78	<.01	<.01	7.2	<.5	<.01		45.	.08					6.8	330.
15	08/20/83	63220	<.1						.03		15.		<.01		16.	.11						
16	08/20/83	63219	<.1	<.01		<.01	.55	.3	4.3	<.01	.80	2.	.07		560.	.20					7.7	4586.

* Chemical concentrations are in mg/l, except for Hg which is in ug/l.

TABLE 4
BROOME COUNTY INDUSTRIAL PARK
INORGANIC ANALYSES - WELL SITES*

WELL	DATE	SAMPLE	TDS	SO4	CL	NO3N	CN	PHENOL	TOC	AG
1	08/05/83	4385	210.	9.	12.	<.01	<.05			<.01
1	11/09/83	4890	190.	8.	2.	<.01	<.5	<.001	8.	<.01
2	08/05/83	4386	240.	65.	18.	<.01	.07			<.01
2	11/09/83	4891	300.	<1.	8.	<.01	<.5	.02	390.	<.01
2	01/19/84	4137								
3	08/05/83	4387	180.	27.	23.	<.01	<.05			<.01
3	11/09/83	4892	150.	3.	1.	.03	<.5	<.001	59.	<.01
3	01/19/84	4138								
4	08/05/83	4388	170.	81.	15.	.15	<.05			<.01
4	11/09/83	4893	90.	12.	1.	.05	<.5	<.001	1.	<.01
4	01/19/84	4139								
5	08/05/83	4389	200.	31.	23.	.14	<.05			.01
5	11/09/83	4894	110.	11.	4.	<.01	<.5	<.001	14.	<.01
5	01/19/84	4140								
6	08/08/83	62892	220.	34.	27.	<.01	<.05			<.01
6	11/09/83	4895	100.	5.	4.	.02	<.5	<.001	19.	<.01
6	01/19/84	4141								
7	08/05/83	4390	90.	71.	13.	.02	<.05			<.01
7	11/09/83	4896	110.	11.	4.	.02	<.5	<.001	4.	<.01
7	01/19/84	4142								
8	08/05/83	4391	100.	35.	16.	.08	<.05			<.01
8	11/09/83	4897	80.	12.	3.	.02	<.5	<.001	4.	<.01
8	01/19/84	4143								
9	08/05/83	4392	120.	100.	21.	.05	<.05			<.01
9	11/09/83	4898	100.	16.	3.	.01	<.5	<.001	2.	<.01
10	08/05/83	4393	170.	23.	26.	.08	<.05			.01
10	11/09/83	4899	120.	37.	4.	<.01	<.5	<.001	3.	<.01
10	01/19/84	4144								
11	08/08/83	62893	360.	72.	47.	<.01	<.05			.01
11	11/09/83	4900	740.	1.	43.	<.01	<.5	.07	280.	<.01
11	01/19/84	4145								
13	08/08/83	62894	310.	41.	27.	<.01	<.05			<.01
13	08/20/83	63217	230.	13.0	90.	3.6	<.05			<.01
14	08/08/83	62895	13750.	890.	840.	.18	.5			.03
14	08/19/83	63218	15900.	814.0	860.	.4	.14			<.01
15	08/08/83	62896	280.	113.	47.	.10	<.05			.03
15	08/20/83	63220								
16	08/20/83	63219	2660.	11.0	760.	.3	<.1			<.01

* Chemical concentrations are in mg/l, except for Hg which is in ug/l.

TABLE 5
BROOME COUNTY INDUSTRIAL PARK
ORGANIC ANALYSES OF ON-SITE WELLS *
1983

	Well 1		Well 2		Well 3		Well 4		Well 5		Well 6		Well 7		Well 8		Well 9		Well 10		Well 11		Well 13		Well 14		Well 15		Well 16	
	8/5	11/10	8/5	11/10	8/5	11/10	8/5	11/9	8/5	11/9	8/5	11/9	8/5	11/9	8/5	11/9	8/5	11/9	8/5	11/9	8/5	11/9	8/8	8/20	8/8	8/19	8/8	8/20	8/20	8/20
Benzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	3	2	< 1	40	27	< 1	< 1		7
a-Trifluorotoluene		< 1		2		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
Toluene	< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	110	17	13	1100	1200	< 1	< 1		8
Ethylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	8	5	34	59	< 1	< 1		< 1
1-Chlorocyclohexene-1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
p-Xylene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		4								
m-Xylene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
Chlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6	2	< 1	< 1	< 1	< 1	< 1		< 1
o-Xylene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
Isopropylbenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
Styrene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
p-Bromofluorobenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
n-Propylbenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
o-Chlorotoluene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
tert-Butylbenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
Bromobenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
sec-Butylbenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
1,3,5-Trimethylbenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
1,2,4-Trimethylbenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
p-Cymene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
p-Dichlorobenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
Cyclopropylbenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
n-Butylbenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
m-Dichlorobenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
2,3-Benzofuran		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
o-Dichlorobenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
Hexachloro-1,3-butadiene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
1,2,4-Trichlorobenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
Naphthalene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
1,2,3-Trichlorobenzene		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1								
Chloromethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1		< 1
Bromomethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	2	< 1	< 1			< 1	< 1		< 1
Vinyl Chloride	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	16	< 1	< 1	< 1	36	25	< 1	< 1		< 1
Chloroethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	5	18	< 1	< 1	19	15	< 1	< 1		< 1
Methylene chloride	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	2	32	< 1	2	1600	2100	2	4		4
1,1-Dichloroethene	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
1,1-Dichloroethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	26	150	< 1	< 1	62	80	< 1	< 1		< 1
t-1,2-Dichloroethene	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	8	10	< 1	< 1		< 1
Chloroform	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
1,2-Dichloroethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	3	< 1	< 1	6	10	< 1	< 1		< 1
1,1,1-Trichloroethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	8	< 1	2	< 1	< 1	< 1	< 1	< 1		< 1
Carbon tetrachloride	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
Bromodichloromethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
1,2-Dichloropropane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	40	< 1	< 1	150	350	15	20		< 1
t-1,3-Dichloropropene	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
Trichloroethene	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	23	23	< 1	< 1		< 1
Dibromochloromethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
1,1,2-Trichloroethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
c-1,3-Dichloropropene	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
2-Chloroethylvinyl ether	< 10	< 10	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10		< 10
Bromoform	< 10	< 10	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10		< 10
1,1,2,2-Tetrachloroethane	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
Tetrachloroethene	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1

* Chemical concentrations are in ug/l.

TABLE 6
BROOME COUNTY INDUSTRIAL PARK
INORGANIC ANALYSES - HOMEOWNER WELLS *

HOME	DATE	SAMPLE	AL	AS	BA	CD	CR	CU	FE	PB	MN	HG	NI	SE	NA	ZN	CA	MG	HARD	TALK	PH	SPCOND	TDS
1	11/14/83	71229	<.1	<.01	.3	<.01	<.01	<.01	2.1	<.01	1.5	<.5	<.01	<.01	10.	.02	19.	4.3	65.	70.	7.3	158.	130.
2	11/14/83	71230	<.1	.04	.2	<.01	<.01	<.01	<.01	<.01	.06	<.5	<.01	<.01	130.	.01	7.9	1.4	25.	270.	8.8	524.	340.
2	01/19/84	4146		.033																			
3	11/14/83	71231	<.1	<.01	.1	<.01	<.01	.10	<.01	<.01	.14	<.5	<.01	<.01	40.	.02	30.	6.5	100.	46.	6.3	426.	260.
4	11/14/83	71232	<.1	<.01	<.1	<.01	<.01	.01	<.01	<.01	1.1	<.5	<.01	<.01	26.	.03	53.	5.8	160.	174.	8.8	379.	250.
5	11/14/83	71233	<.1	.02	.2	<.01	<.01	<.01	.03	<.01	.45	<.5	<.01	<.01	14.	.01	34.	5.4	110.	122.	8.9	223.	180.
6	11/15/83	71234	<.1	<.01	<.1	<.01	<.01	.12	<.01	<.01	.01	<.5	<.01	<.01	6.2	.03	12.	3.0	42.	16.	5.9	112.	80.
7	11/14/83	71235	<.1	.03	.1	<.01	<.01	<.01	.04	<.01	.54	<.5	<.01	<.01	11.	.02	33.	5.4	105.	114.	7.7	236.	140.
7	01/19/84	4147		.01																			
8	11/14/83	71236	<.1	.01	.4	<.01	<.01	<.01	.01	<.01	.13	<.5	<.01	<.01	23.	.06	27.	5.0	88.	120.	8.0	248.	140.
9	11/14/83	71237	<.1	.11	.1	<.01	<.01	.01	.04	<.01	.42	<.5	<.01	<.01	75.	.03	27.	4.8	87.	224.	7.9	399.	270.
9	01/19/84	4148		.033																			
10	11/14/83	71238	<.1	<.01	.1	<.01	<.01	.33	<.01	<.01	<.01	<.5	<.01	<.01	65.	.03	26.	6.3	91.	44.	6.3	517.	320.
11	11/14/83	71239	<.1	<.01	<.1	<.01	<.01	.01	<.01	<.01	1.0	<.5	<.01	<.01	27.	.01	44.	5.1	130.	162.	7.7	348.	220.
12	11/15/83	71240	<.1	<.01	.1	<.01	<.01	.23	<.01	<.01	<.01	<.5	<.01	<.01	69.	.26	26.	4.7	84.	40.	6.2	539.	320.
13	11/15/83	50315	<.05	.023	.5	<.002	<.01	<.05	.44	<.01	.27	<.4	<.05	<.01	53.	.14			88.	190.	7.6	386.	206.
14	11/15/83	50316	<.05	<.01	<.5	<.002	<.01	<.05	6.6	<.01	1.9	<.4	<.05	<.01	12.	.09			129.	107.	7.0	281.	204.
15	11/15/83	50317	<.05	<.01	<.5	<.002	<.01	<.05	8.4	<.01	.22	<.4	<.05	<.01	5.8	<.05			57.	38.	6.5	142.	87.
16	11/15/83	50318	<.05	<.01	<.5	<.002	<.01	<.05	<.02	<.01	.08	<.4	<.05	<.01	55.	<.05			1.	105.	7.5	256.	162.
17	11/15/83	50319	<.05	<.01	<.5	<.002	<.01	<.1	.66	<.01	.20	<.4	<.05	<.01	4.7	<.05			43.	23.	6.6	118.	71.

* Chemical concentrations are in mg/l except for Hg which is in ug/l.

TABLE 6
BROOME COUNTY INDUSTRIAL PARK
INORGANIC ANALYSES - HOMEOWNER WELLS *

HOME	DATE	SAMPLE	SO4	CL	NO3N	CN	PHENOL	TOC	AG
1	11/14/83	71229	14.	6.	<.01	<.05	<.001	6.	<.01
2	11/14/83	71230	<1.	29.	<.01	<.05	<.001	14.	<.01
2	01/19/84	4146							
3	11/14/83	71231	30.	65.	4.7	<.05	<.001	8.	<.01
4	11/14/83	71232	14.	23.	<.01	<.05	<.001	10.	<.01
5	11/14/83	71233	7.	8.	<.01	<.05	<.001	7.	<.01
6	11/15/83	71234	11.	17.	1.13	<.05	<.001	4.	<.01
7	11/14/83	71235	12.	8.	<.01	<.05	<.001	8.	<.01
7	01/19/84	4147							
8	11/14/83	71236	4.	7.	<.01	<.05	<.001	9.	<.01
9	11/14/83	71237	3.	27.	<.01	<.05	<.001	11.	<.01
9	01/19/84	4148							
10	11/14/83	71238	25.	116.	5.0	<.05	<.001	8.	<.01
11	11/14/83	71239	12.	14.	<.01	<.05	<.001	9.	<.01
12	11/15/83	71240	37.	114.	4.6	<.05	<.001	6.	<.01
13	11/15/83	50315	2.2	14.					<.02
14	11/15/83	50316	20.	13.					<.02
15	11/15/83	50317	15.	11.					<.02
16	11/15/83	50318	20.	5.6					<.02
17	11/15/83	50319	18.	8.5					<.02

*Chemical concentrations are in mg/l except for Hg which is in ug/l.

TABLE 7
BROOME COUNTY INDUSTRIAL PARK
ORGANIC ANALYSES OF HOMEOWNER WELLS *

WELL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
OWNER	D. Eckelburger	G. Tamkins	R. Edminster	M. Smith	D. Kornan	J. Villano	D. Desimone	A. Dahterla	R. Johnson	A. Allen	J. Hoover	R. Gleason	D. Hamm	Town Hall	R. Rowse	T. Butchko	S. Lasky
DATE	11/9/83	11/9/83	11/9/83	11/9/83	11/9/83	11/9/83	11/9/83	11/9/83	11/9/83	11/9/83	11/9/83	11/9/83	11/15/84	11/15/84	11/15/84	11/15/84	11/15/84
Benzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
a-Trifluorotoluene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	10
Toluene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1-Chlorocyclohexene-1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
p-Xylene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
m-Xylene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
o-Xylene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Isopropylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Styrene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
p-Bromofluorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Propylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
o-Chlorotoluene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
p-Chlorotoluene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
tert-Butylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
sec-Butylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,3,5-Trimethlbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
p-Cymene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
p-Dichlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cyclopropylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Butylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
m-Dichlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2,3-Benzofuran	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
o-Dichlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Hexachloro-1,3-butadiene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2,4-Trichlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Naphthalene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2,3-Trichlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloromethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromomethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Vinyl Chloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Methylene chloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
t-1,2-Dichloroethene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroform	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2	2	< 1	< 1	< 1
1,2-Dichloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,1-Trichloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon tetrachloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromodichloromethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
t-1,3-Dichloropropene	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	9
Trichloroethene	< 1	< 1	< 1	< 1	< 1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
c-1,3-Dichloropropene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2-Chloroethylvinyl ether	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bromoform	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
1,1,2,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tetrachloroethene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

* Chemical concentrations are in ug/l.

APPENDIX B

TEST BORING LOGS/WELL DETAILS

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER ______
SHEET 1 OF 1
DATE ______ FILE 2733.004.130

PROJECT LOCATION	Conklin, NY	SAMPLER	
HOLE NUMBER	Well 17	TYPE:	Split Spoon
		HAMMER	
		FALL	

GROUNDWATER READINGS			
DATE	DEPTH		
12/20	1.4		

BORING CO. Parratt Wolff

FOREMAN Mike Hurley

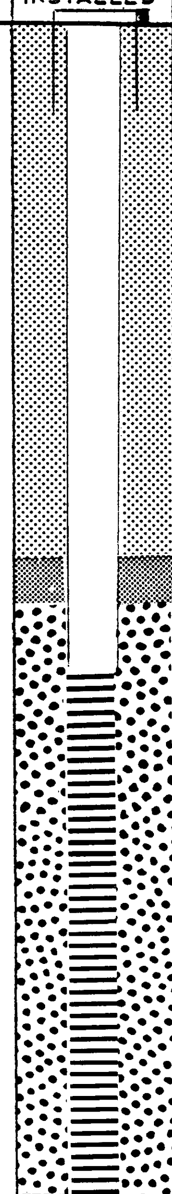
OBG ENGINEER D. Ozvath

BORING LOCATION See Figure 3

GROUND ELEV. 948.46

DATE STARTED 10/31/84 DATE ENDED 11/1/84

DEPTH	CAS. BL. /FT.	SAMPLE NO.	SAMPLE PEN./REC.	SAMPLE DEPTH	SAMPLE BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	3/5	Brown moist SILT and fine to coarse GRAVEL, trace fine SAND				
					16					
5'		2		5-6.5	16/15					
					42					
10'		3		10-11.5	20/28	Grey-brown moist fine to coarse GRAVEL and SILT, some fine to coarse SAND				
					42					
15'		4		15-16.5	8/9	Grey-brown moist SILT, trace CLAY				
					17					
20'		5		20-21.5	16/18	Grey-brown wet fine to coarse GRAVEL and SILT, some to trace fine to medium SAND				
					25					
25'		6		25-26.5	35/38					
					31					
30'		7		30-31.5	18/28					
					42	Bottom of Boring 31.5'				



REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER ______
SHEET 1 OF 1
DATE ______ FILE 2733.004.130

PROJECT LOCATION: Conklin, NY
HOLE NUMBER: Well 18

SAMPLER
TYPE: Split Spoon
HAMMER ______
FALL ______

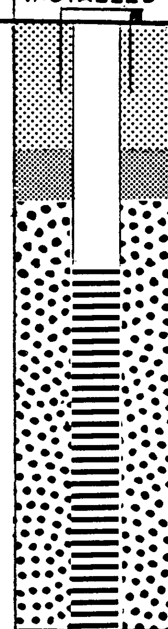
GROUNDWATER READINGS

DATE	DEPTH		
12/20	1.03		

BORING CO.: Parratt Wolff
FOREMAN: Mike Hurley
OBG ENGINEER: D. Ozvath

BORING LOCATION: See Figure 3
GROUND ELEV.: 861.00
DATE STARTED: 11/1/84 DATE ENDED: 11/1/84

DEPTH	CAS. BL. /FT.	SAMPLE NO.	PEN./REC.	SAMPLE DEPTH	BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	2/3					
					4	Grey-brown moist SILT and fine SAND				
5'		2		5-6.5	2/1					
					1	Grey wet fine to coarse SAND and PEAT, trace SILT				
10'		3		10-	8/8					
				11.5	12					
						Grey-brown wet fine to coarse SAND and fine GRAVEL, trace SILT				
15'		4		15-	10/9					
				16.5	13	Bottom of Boring 16.5'				



REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER ______
SHEET 1 OF 1
DATE ______ FILE 2733.004.130

PROJECT LOCATION: Conklin, NY
HOLE NUMBER: Well 19

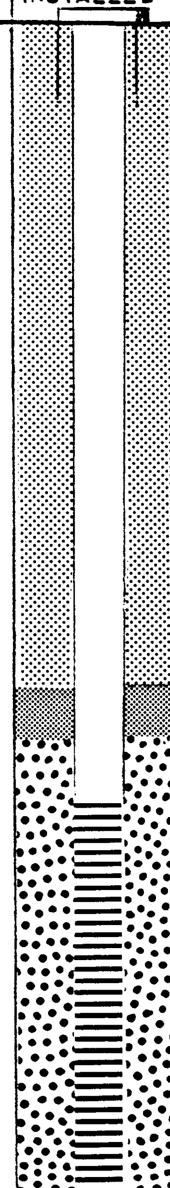
SAMPLER
TYPE: Split Spoon
HAMMER FALL: ______

GROUNDWATER READINGS

DATE	DEPTH	
12/20	3.5	

BORING CO.: Parratt Wolff
FOREMAN: Mike Hurley
OBG ENGINEER: D. Ozvath
BORING LOCATION: See Figure 3
GROUND ELEV.: 912.39
DATE STARTED: 11/5/84 DATE ENDED: 11/5/84

DEPTH	CAS. BL. /FT.	SAMPLE NO.	PEN./REC.	SAMPLE DEPTH	BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	3/3 6	Brown moist SILT, some fine to medium SAND				
5'		2		5-6.5	9/12 15	Grey and brown moist fine to medium SAND and SILT				
10'		3		10-11.5	14/16 13	Grey moist fine to coarse GRAVEL and SILT, little fine SAND				
15'		4		15-16.5	14/13 13	Grey moist SILT, little fine to medium SAND, trace fine GRAVEL				
20'		5		20-21.5	9/13 50(.3')	Grey wet SILT and fine to coarse GRAVEL, little fine to medium SAND, trace CLAY				
25'		6		25-	50(.4')					
30'		7		30-31.5	60					
						Bottom of Boring 31.5'				



REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER ______
SHEET 1 OF 1
DATE ______ FILE 2733.004.130

PROJECT LOCATION Conklin, NY
HOLE NUMBER Well 20

SAMPLER
TYPE: Split Spoon
HAMMER FALL ______

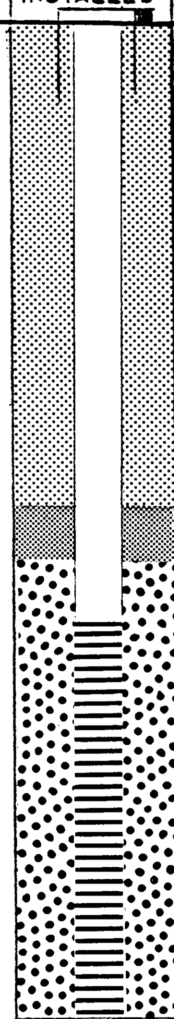
GROUNDWATER READINGS

DATE	DEPTH		
12/20	2.19		

BORING CO. Parratt Wolff
FOREMAN Mike Hurley
OBG ENGINEER D. Ozvath

BORING LOCATION See Figure 3
GROUND ELEV. 887.89
DATE STARTED 11/6/84 DATE ENDED 11/6/84

DEPTH	CAS. BL. /FT.	SAMPLE NO.	SAMPLE PEN./REC.	SAMPLE DEPTH	SAMPLE BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	3/3	Dark brown moist SILT and ROOTS, some fine SAND				
					4					
						Brown moist fine SAND and SILT				
5'		2		5-6.5	5/10					
					20	Brown moist fine to coarse SAND and GRAVEL, some SILT				
						Grey-brown wet SILT and fine to coarse SAND, some fine GRAVEL				
10'		3		10-	10/20					
				11.5	20					
						Brown wet fine to coarse SAND and fine to coarse GRAVEL, little SILT				
15'		4		15-	15/11					
				16.5	15	Brown moist SILT and CLAY				
						Brown wet fine to coarse SAND and fine to coarse GRAVEL				
20'		5		20-	8/11					
				21.5	19					
						Grey moist SILT, some fine to coarse GRAVEL, trace fine SAND				
25'		6		25-	15/26					
				26.5	67					
						Bottom of Boring 26.5'				



REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER
SHEET 1 OF 1
DATE
FILE 2733.004.130

PROJECT LOCATION Conklin, NY
HOLE NUMBER B-1

SAMPLER
TYPE: Split Spoon
HAMMER
FALL

GROUNDWATER READINGS

DATE	DEPTH		

BORING CO. Parratt Wolff
FOREMAN Mike Hurley
OBG ENGINEER D. Ozvath

BORING LOCATION
GROUND ELEV.
DATE STARTED
DATE ENDED

DEPTH	CAS. BL. /FT.	SAMPLE NO.	PEN./REC.	DEPTH	BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	1/2	Black cinders and organic				
					4	matter				
						(construction fill)				
5'		2		5-5.05	50(.05)	Brown, dry, very dense				
						SAND, SILT, GRAVEL				
						Refusal at 5.05'				

REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER
SHEET 1 OF 1
DATE
FILE 2733.004.130

PROJECT LOCATION Conklin, NY
HOLE NUMBER B-2

SAMPLER
TYPE: Split Spoon
HAMMER
FALL

GROUNDWATER READINGS

DATE	DEPTH		

BORING CO. Parratt-Wolff
FOREMAN Mike Hurley
OBG ENGINEER D. Ozvath

BORING LOCATION
GROUND ELEV.
DATE STARTED DATE ENDED

DEPTH	CAS. BL. /FT.	SAMPLE NO.	SAMPLE PEN./REC.	SAMPLE DEPTH	SAMPLE BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	1/1	Black cinders and organic matter				
					1	(construction fill)				
		2		3.5-	100(3')	Brown, dry, very dense SAND, SILT, GRAVEL				
				3.8'						
5'						Refusal at 3.8'				

REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER
SHEET 1 OF 1
DATE
FILE 2733.004.130

PROJECT LOCATION Conklin, NY

HOLE NUMBER B-3

SAMPLER
TYPE: Split Spoon
HAMMER
FALL

GROUNDWATER READINGS

DATE	DEPTH		

BORING CO. Parratt Wolff
FOREMAN Mike Hurley
OBG ENGINEER D. Ozvath

BORING LOCATION
GROUND ELEV.
DATE STARTED DATE ENDED

DEPTH	CAS. BL. /FT.	SAMPLE NO.	SAMPLE PEN./REC.	SAMPLE DEPTH	SAMPLE BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	2/2	Black cinders and organic matter				
					10	(construction fill)				
5'		2		4.8-	100(4)	Brown, dry very dense SAND,				
				5.2		SILT, GRAVEL				
						Refusal at 5.2'				

REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER ____
SHEET 1 OF 1
DATE ____ FILE 2733.004.130

PROJECT LOCATION Conklin, NY
HOLE NUMBER B-4

SAMPLER
TYPE: ____
HAMMER ____
FALL ____

GROUNDWATER READINGS

DATE	DEPTH		

BORING CO. Parratt Wolff
FOREMAN Mike Hurley
OBG ENGINEER D. Ozvath

BORING LOCATION ____
GROUND ELEV. ____
DATE STARTED 11/13/84 DATE ENDED 11/13/84

DEPTH	CAS. BL. /FT.	SAMPLE NO.	SAMPLE PEN./REC.	SAMPLE DEPTH	SAMPLE BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	2/3 6	Brown dry SILT, some fine to coarse GRAVEL, little SAND				
5'		2		5-6.5	24/25 14	Grey and brown moist SILT, some fine to coarse GRAVEL, little fine to medium SAND				
10'		3		10-11.5	11/16 30	Grey-brown moist SILT and fine to coarse GRAVEL, trace fine SAND, trace CLAY				
15'		4		15-16.5	11/18 19					
20'		5		20-21.5	12/14 18					
25'		6		25-26.5	18/30 44	Brown-grey moist SILT, some fine GRAVEL, trace CLAY				
						Bottom of Boring 26.5'				
30'		7		30-31.5						

REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER
SHEET 1 OF 1
DATE
FILE 2733.004.130

PROJECT LOCATION Conklin, NY
HOLE NUMBER B-5

SAMPLER
TYPE:
HAMMER
FALL

GROUNDWATER READINGS

DATE	DEPTH		

BORING CO. Parratt Wolff
FOREMAN Mike Hurley
OBG ENGINEER D. Ozvath

BORING LOCATION
GROUND ELEV.
DATE STARTED 11/13/84 DATE ENDED 11/14/84

DEPTH	CAS. BL. /FT.	SAMPLE NO.	PEN./REC.	DEPTH	BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	1/2	Brown moist SILT, some fine to coarse GRAVEL, trace CLAY				
					6					
5'		2		5-6.5	11/16	Brown moist SILT and fine to coarse GRAVEL, little fine SAND, trace CLAY				
					34					
10'		3		10-	14/14					
				11.5	16					
15'		4		15-	13/14					
				16.5	23					
20'		5		20-	13/24					
				21.5	23					
25'		6		25-	24/23					
				26.5	24	Bottom of Boring 26.5'				
30'		7		30-						
				31.5						

REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER
SHEET 1 OF 2
DATE
FILE 2733.004.130

PROJECT LOCATION Conklin, NY
HOLE NUMBER B-6

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

DATE	DEPTH		

BORING CO. Parratt Wolff
FOREMAN Mike Hurley
OBG ENGINEER D. Ozvath

BORING LOCATION
GROUND ELEV.
DATE STARTED 11/2/84 DATE ENDED 11/2/84

DEPTH	CAS. BL. /FT.	SAMPLE NO.	SAMPLE PEN./REC.	SAMPLE DEPTH	SAMPLE BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
0'		1		0-1.5	3/4	Brown dry SILT, trace fine SAND				
					10					
						Brown dry SILT and fine SAND				
5'		2		5-6.5	12/13					
					50(.3')	Brown moist SILT and fine to coarse GRAVEL, trace to little fine SAND				
10'		3		10-	11/13					
				11.5	16					
15'		4		15-	18/24					
				16.5	28					
20'		5		20-	50(4')					
				21.5						
25'		6		25-	11/26					
				26.5	21					
30'		7		30-	11/13					
				31.5	16					

REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING NUMBER ______
SHEET 2 OF 2
DATE ______ FILE 2733.004.130

PROJECT LOCATION Conklin, NY

HOLE NUMBER B-6

SAMPLER

TYPE: ______

HAMMER FALL ______

GROUNDWATER READINGS

DATE	DEPTH		

BORING CO. Parratt Wolff

FOREMAN Mike Hurley

OBG ENGINEER D. Ozvath

BORING LOCATION ______

GROUND ELEV. ______

DATE STARTED ______ DATE ENDED ______

DEPTH	CAS. BL. /FT.	SAMPLE NO.	SAMPLE PEN./REC.	SAMPLE DEPTH	SAMPLE BLOWS / 6"	SAMPLE DESCRIPTION	STRA. CHG. GEN. DESC.	EQUIPMENT INSTALLED	FIELD TESTING	RMKS
35'		8			19/21					
					38	Grey moist SILT and fine to coarse GRAVEL, little fine to medium SAND				
40'		9			15/27					
					17					
45'		10			20/22					
					35					
						Bottom of Boring 46.5'				

REMARKS:

APPENDIX C

PERMEABILITY TEST LOGS

O'BRIEN & GERE

IN–SITU PERMEABILITY TEST FIELD LOG

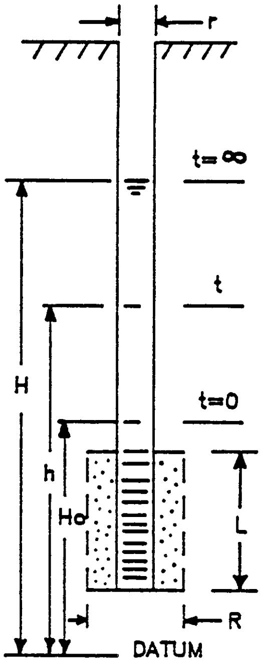
PROJECT BROOME CO. IDA

WELL NUMBER Well 1

DATE 12/13/84

LOCATION See Plan

ELEVATION



STATIC HEAD (H) 1,550

PIPE RADIUS (r) 2.54

SCREEN RADIUS (R) 7.62

SCREEN LENGTH (L) 609

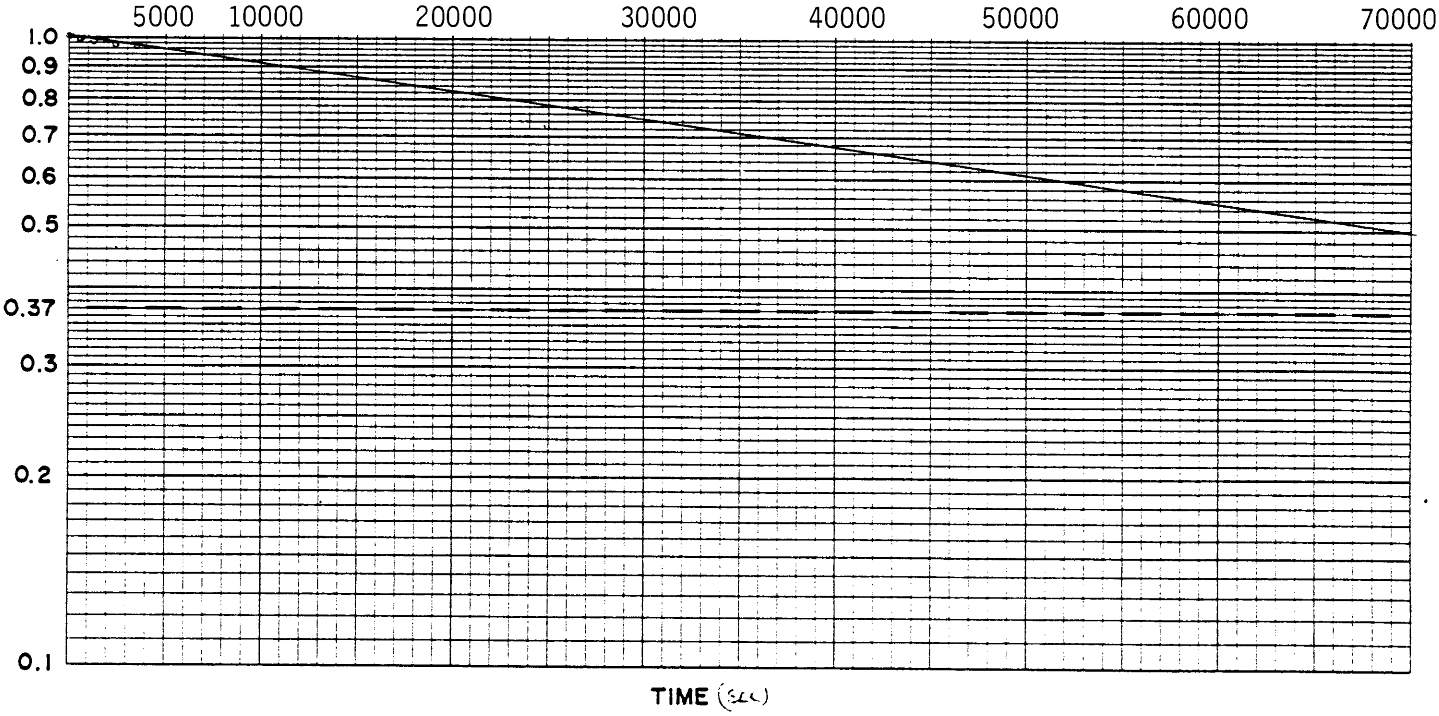
INITIAL HEAD (Ho) 415

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o} = \frac{6.45\ (609/7.62)}{2(609)101{,}000}$$

K= 2.29 X 10^{-7} cm/sec.

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
1	1413	60	415	1
5	1403	300	425	.99
10	1397	600	431	.985
16	1395	960	433	.984
20	1393	1200	435	.982
30	1390	1800	438	.980
40	1387	2400	441	.976
50	1385	3000	443	.974
60	1382	3600	446	.972



O'BRIEN & GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

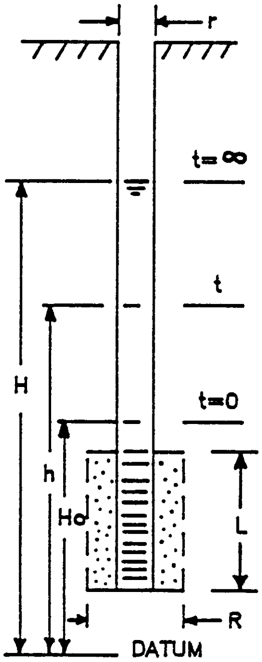
PROJECT BROOME CO. IDA

WELL NUMBER Well 5

DATE 12/13/84

LOCATION See Plan

ELEVATION



STATIC HEAD (H) 855.11

PIPE RADIUS (r) .167

SCREEN RADIUS (R) .583

SCREEN LENGTH (L) 10

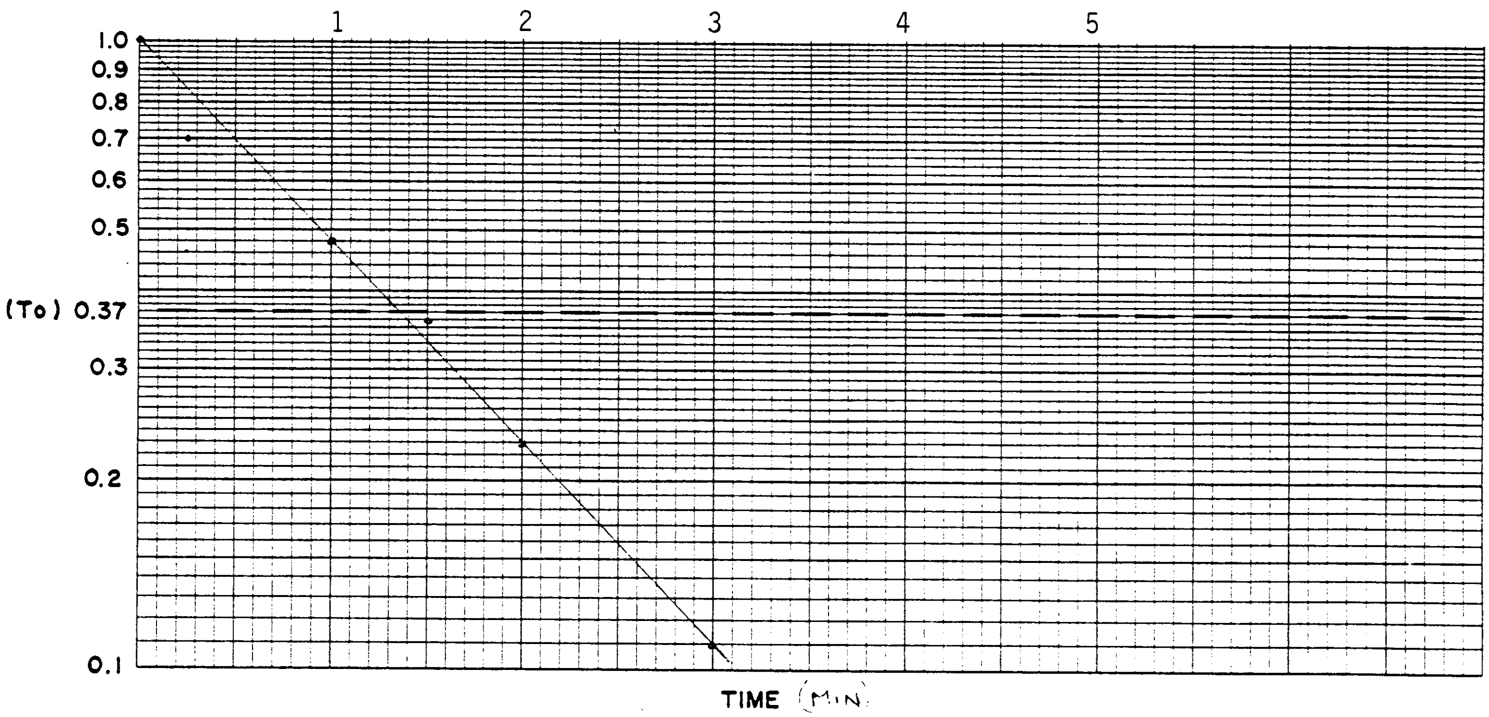
INITIAL HEAD (Ho) 842.31

HYDRAULIC CONDUCTIVITY :

$$K=\frac{r^2 \ln(L/R)}{2LT_o} = \frac{(.167)^2 \ln(10/.583)}{2(10)(1.45)}$$

K= 0027 ft/min = 1.4×10^{-3} cm/sec

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-H_o}$
		0	842.31	1
		.25	846.31	.69
		.5	847.16	.62
		1	849.31	.47
		1.5	850.46	.36
		2	852.06	.23
		3	853.64	.11
		5	854.51	.05



O'BRIEN & GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

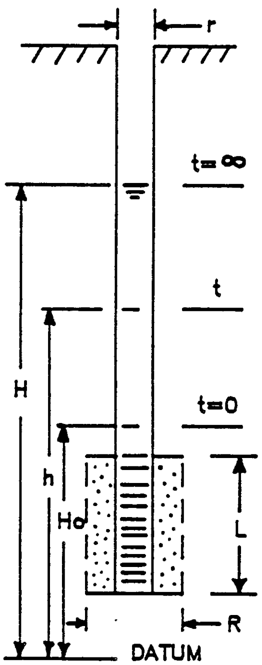
PROJECT BROOME CO. IDA

WELL NUMBER Well 6

DATE 12/13/84

LOCATION See Plan

ELEVATION TOC Elevation 886.82



STATIC HEAD (H) 865.43

PIPE RADIUS (r) .167

SCREEN RADIUS (R) .583

SCREEN LENGTH (L) 10

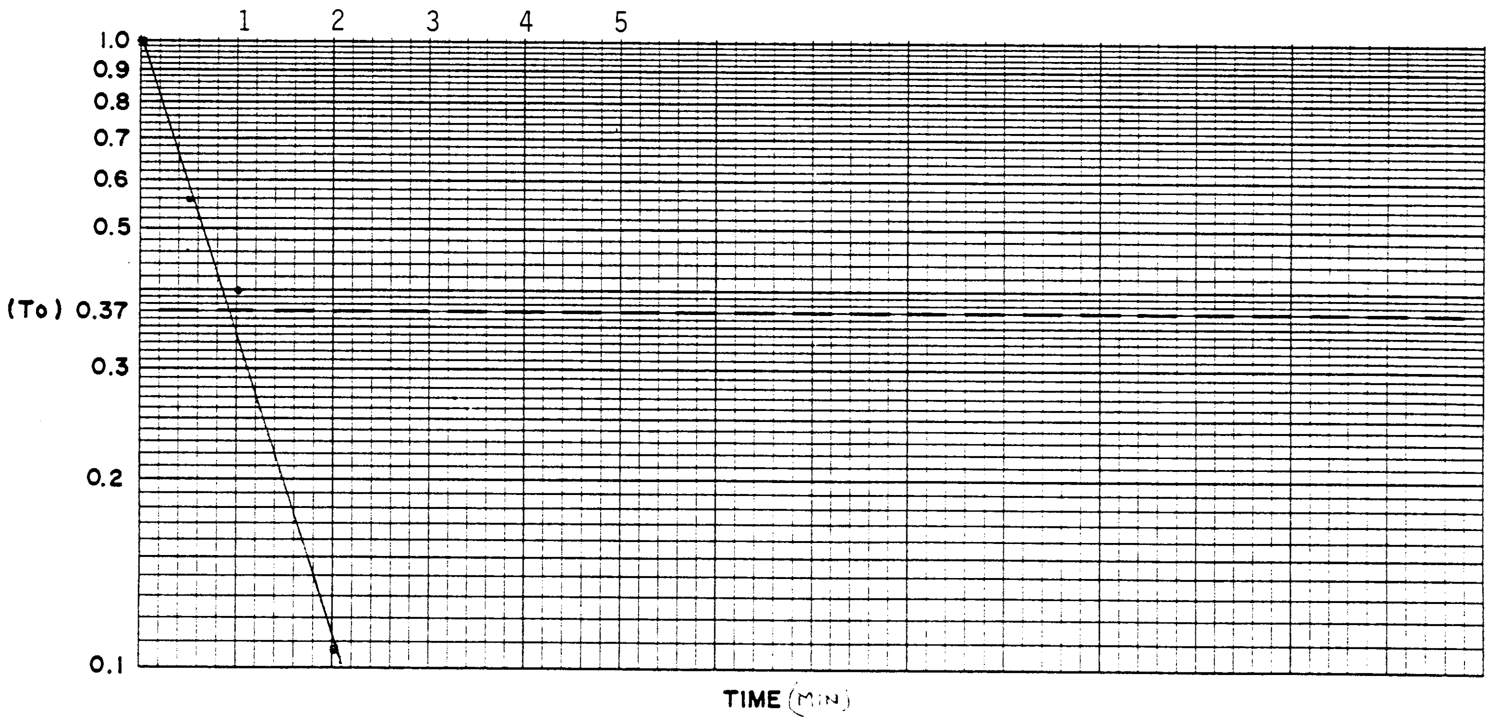
INITIAL HEAD (Ho) 859.8

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o} = \frac{(.03)\ln(10/.583)}{2(10)(1.1)}$$

K= .0039 ft/min = 2.0 x 10^{-3} cm/sec

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
0	9.00	0	859.8	1
.5	6.55	.5	862.25	.56
1	5.64	1	863.16	.40
2	4.00	2	864.8	.11
4	3.75	4	865.05	.07
5	3.37	5	865.43	0



O'BRIEN & GERE

IN-SITU PERMEABILITY TEST FIELD LOG

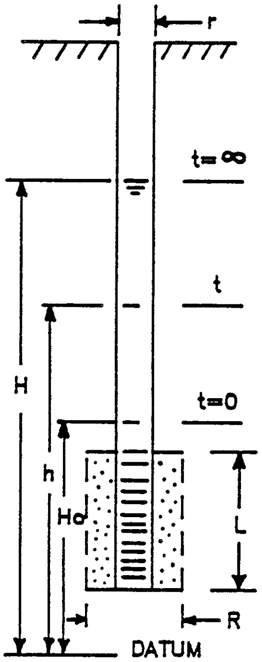
PROJECT BROOME CO. IDA

WELL NUMBER Well 7

DATE 12/20/84

LOCATION See Plan

ELEVATION (TOC) 868.37



STATIC HEAD (H) 856.22

PIPE RADIUS (r) .167

SCREEN RADIUS (R) .583

SCREEN LENGTH (L) 5

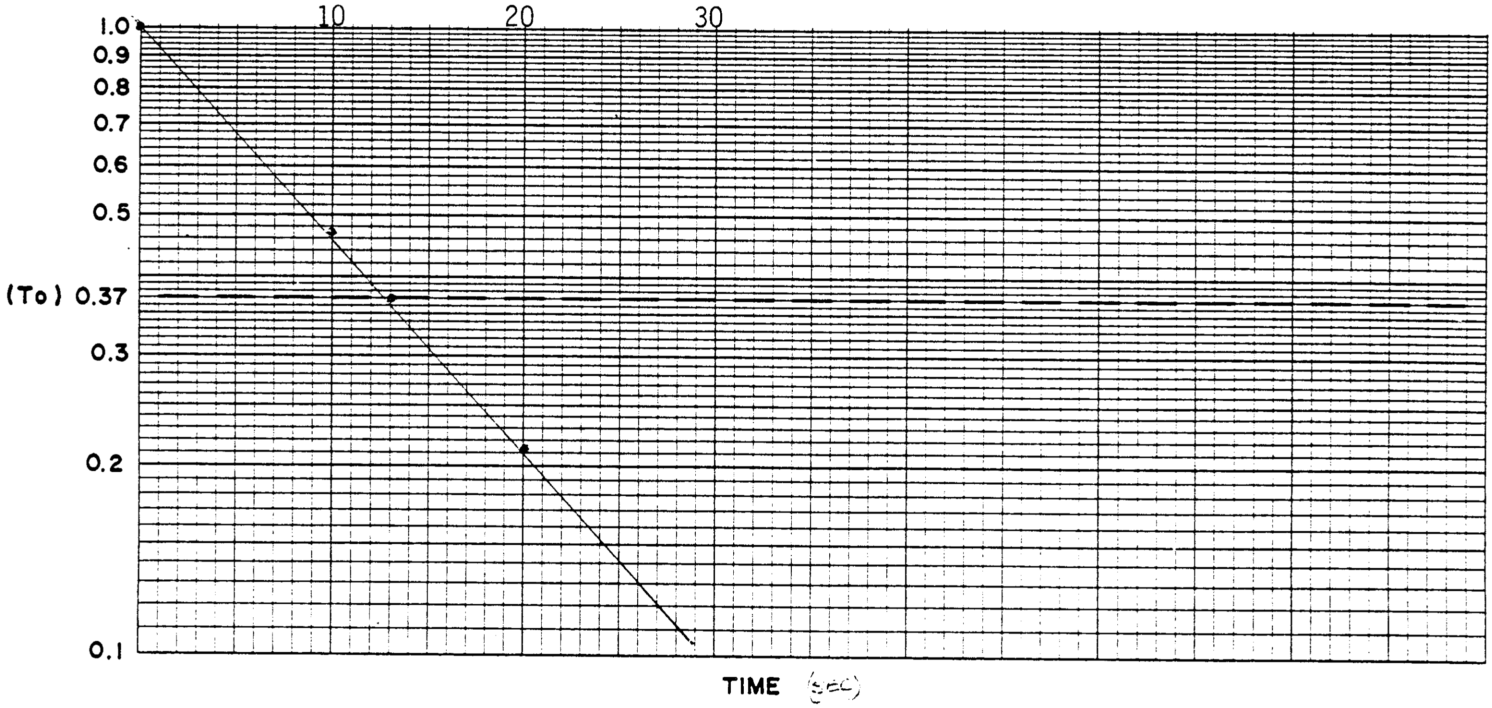
INITIAL HEAD (Ho) 846.37

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o} = \frac{(.34)\ln(5/.583)}{2(5)(.22)}$$

K= 33 ft/min = 1.7×10^{-1} cm/sec

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-H_o}$
		0	846.37	1
		10	851.57	.47
		20	854.15	.21
		30	856.22	0

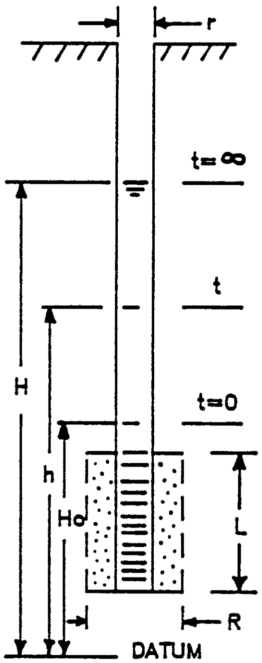


O'BRIEN & GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

PROJECT BROOME CO. IDA
WELL NUMBER Well 9
DATE 12/20/84

LOCATION Lower Landfill
ELEVATION (TOC) 864.21



STATIC HEAD (H) 854.66

PIPE RADIUS (r) .167

SCREEN RADIUS (R) .583

SCREEN LENGTH (L) 10'

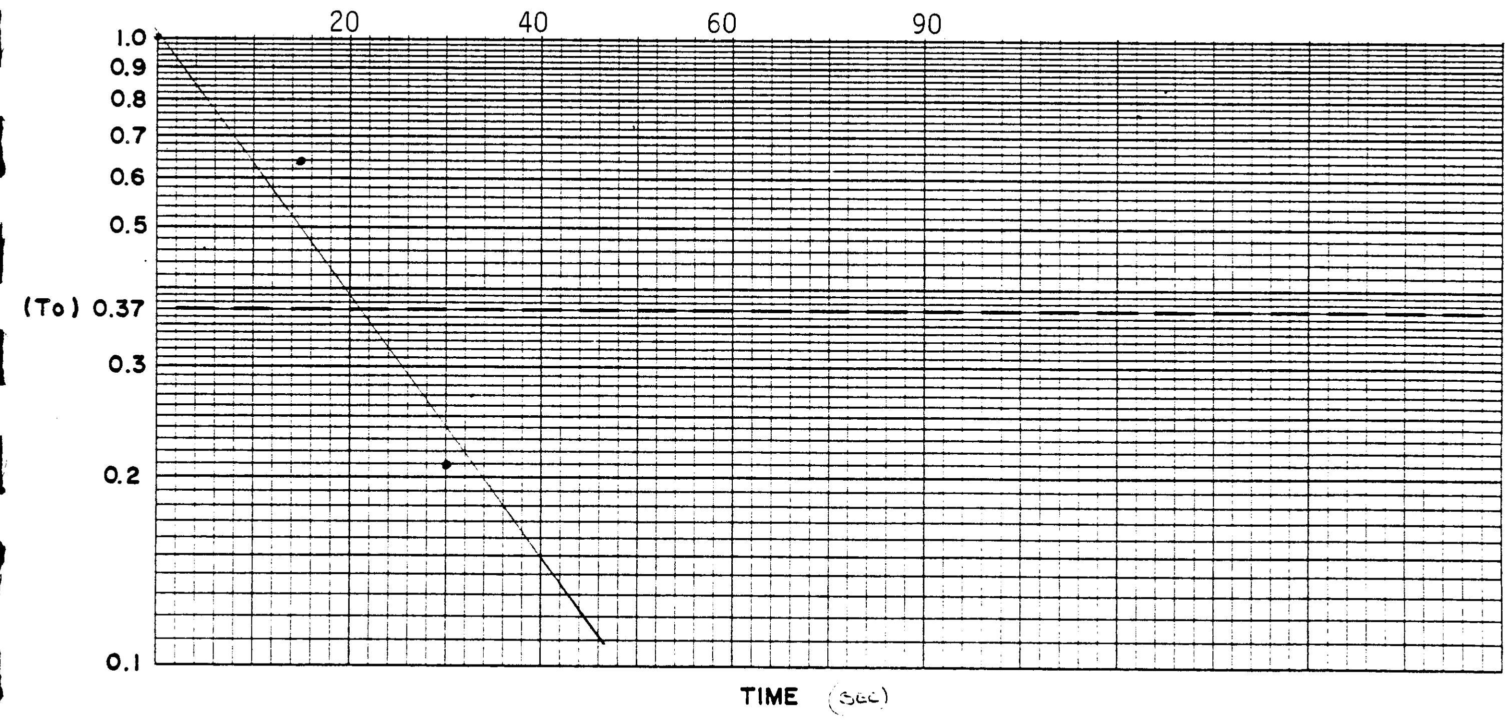
INITIAL HEAD (Ho) 844.21

HYDRAULIC CONDUCTIVITY :

$$K=\frac{r^2\ln(L/R)}{2LTo} = \frac{(.34)\ln(10/.583)}{(2)(10)(.35)}$$

K= .14 ft/min = 7 x 10^{-2} cm/sec

TIME	WATER DEPTH	t	h	(H−h)/(H−Ho)
		0	844.21	1
		15	848.01	.64
		30	852.71	.21
		60	853.96	.07
		90	854.66	0



O'BRIEN & GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

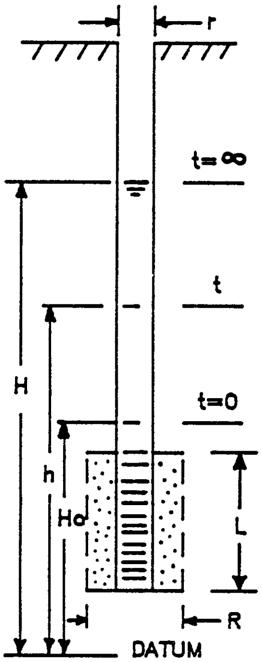
PROJECT BROOME CO. IDA

WELL NUMBER Well 10

DATE 12/20/84

LOCATION Lower Landfill

ELEVATION (TOC) 863.76



STATIC HEAD (H) 855.29

PIPE RADIUS (r) .167

SCREEN RADIUS (R) .583

SCREEN LENGTH (L) 10

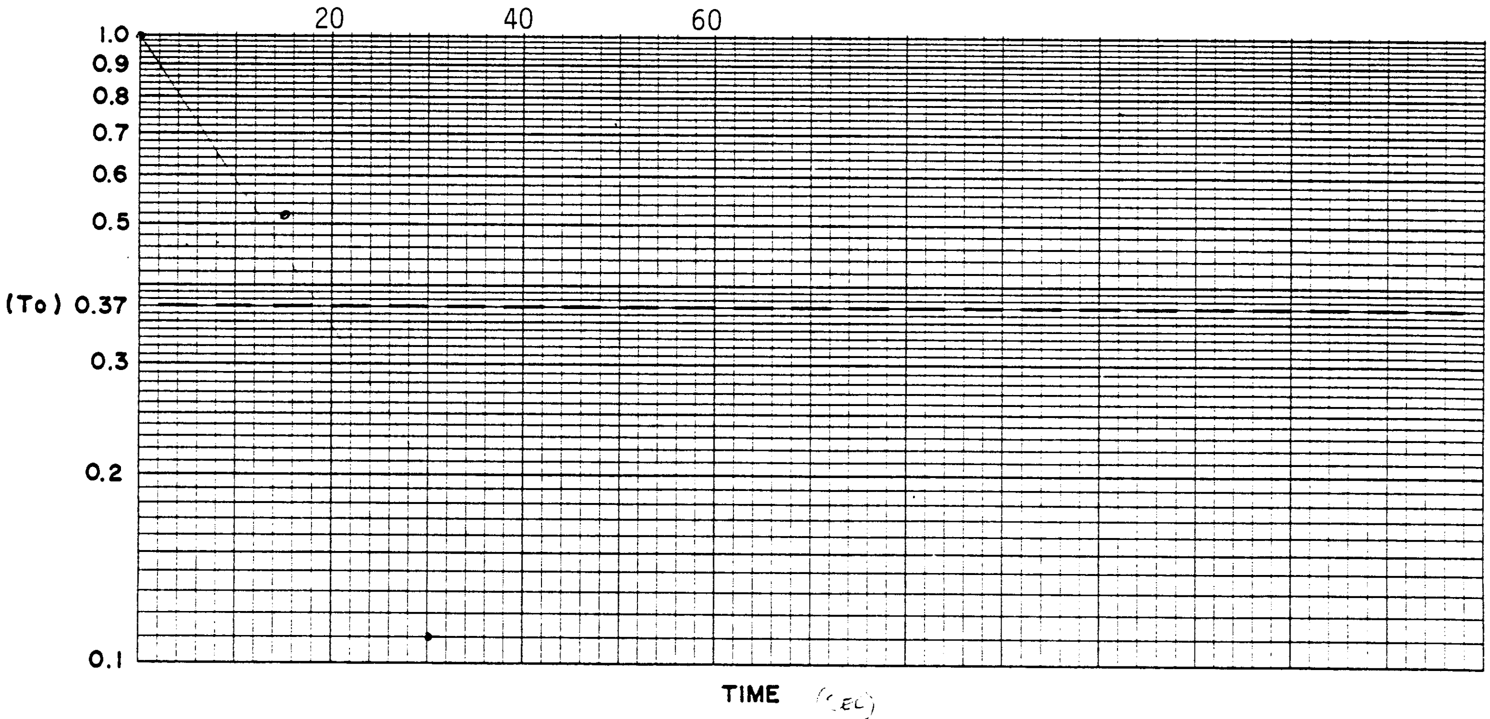
INITIAL HEAD (Ho) 847.76

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o} = \frac{(34)\ln(10/.583)}{2(10)(.3)}$$

K= .16 ft/min = 8.2 x 10^{-2} cm/sec

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
		0	847.26	1
		15	851.37	.52
		30	854.39	.12
		45	855.26	.003
		60	855.26	.003



O'BRIEN & GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

Confined Condition

PROJECT BROOME CO. IDA

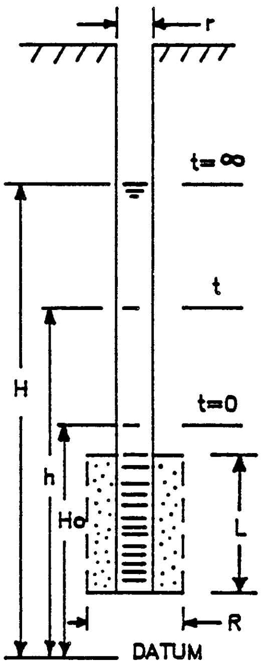
WELL NUMBER Well 17

DATE ______

LOCATION See Plan

ELEVATION (TOC) 950.89

(GRD) 948.46



STATIC HEAD (H) 871

PIPE RADIUS (r) 2.54

SCREEN RADIUS (R) 7.62

SCREEN LENGTH (L) 457

INITIAL HEAD (Ho) 485

HYDRAULIC CONDUCTIVITY :

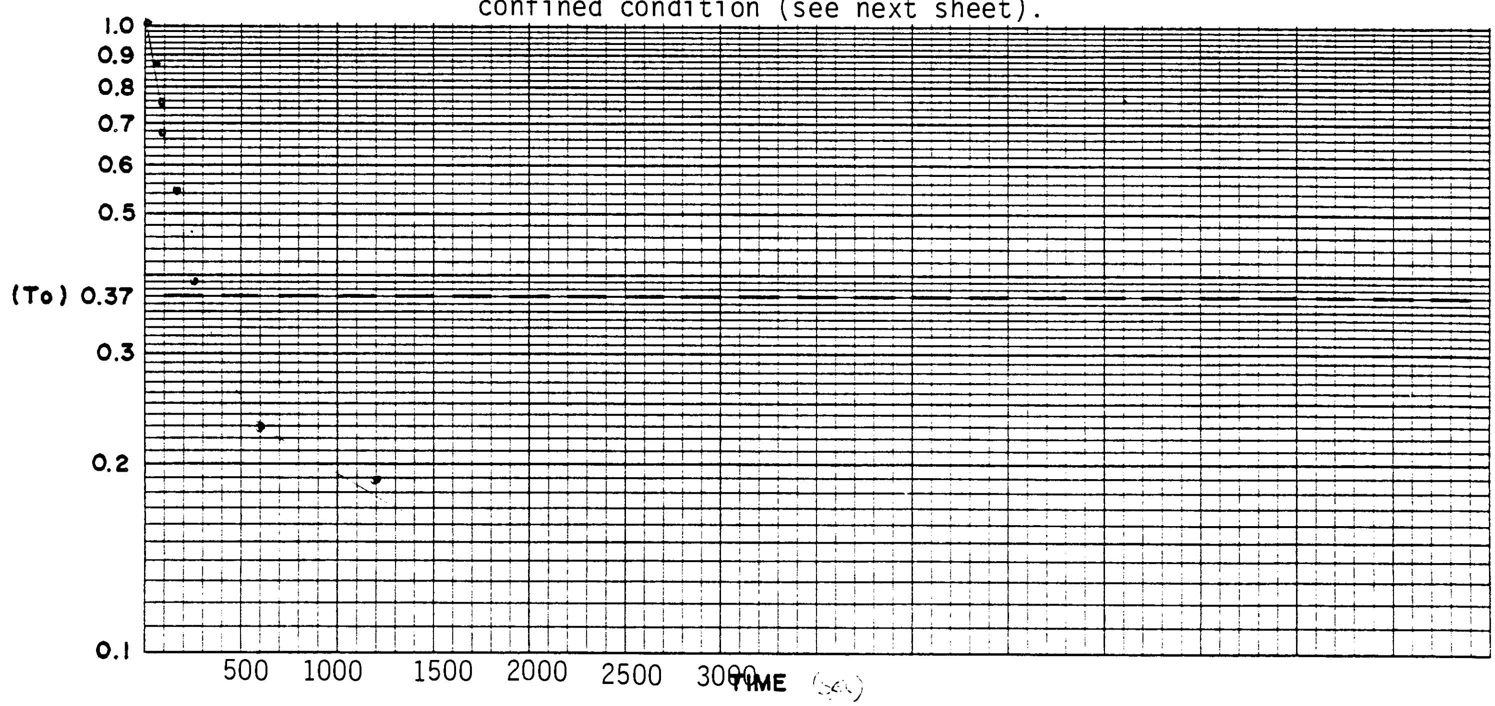
$$K = \frac{r^2 \ln(L/R)}{2LT_o} = \frac{6.45 \ln(457/7.62)}{2(457)(300)}$$

K= 9.63 x 10^{-5} cm/sec → 8.08 x 10^{-4} to 9.63 x 10^{-5} Range of K

Mean K = 4.52 x 10^{-4}

Using Hvorslev's unconfined formula for confined condition (see next sheet).

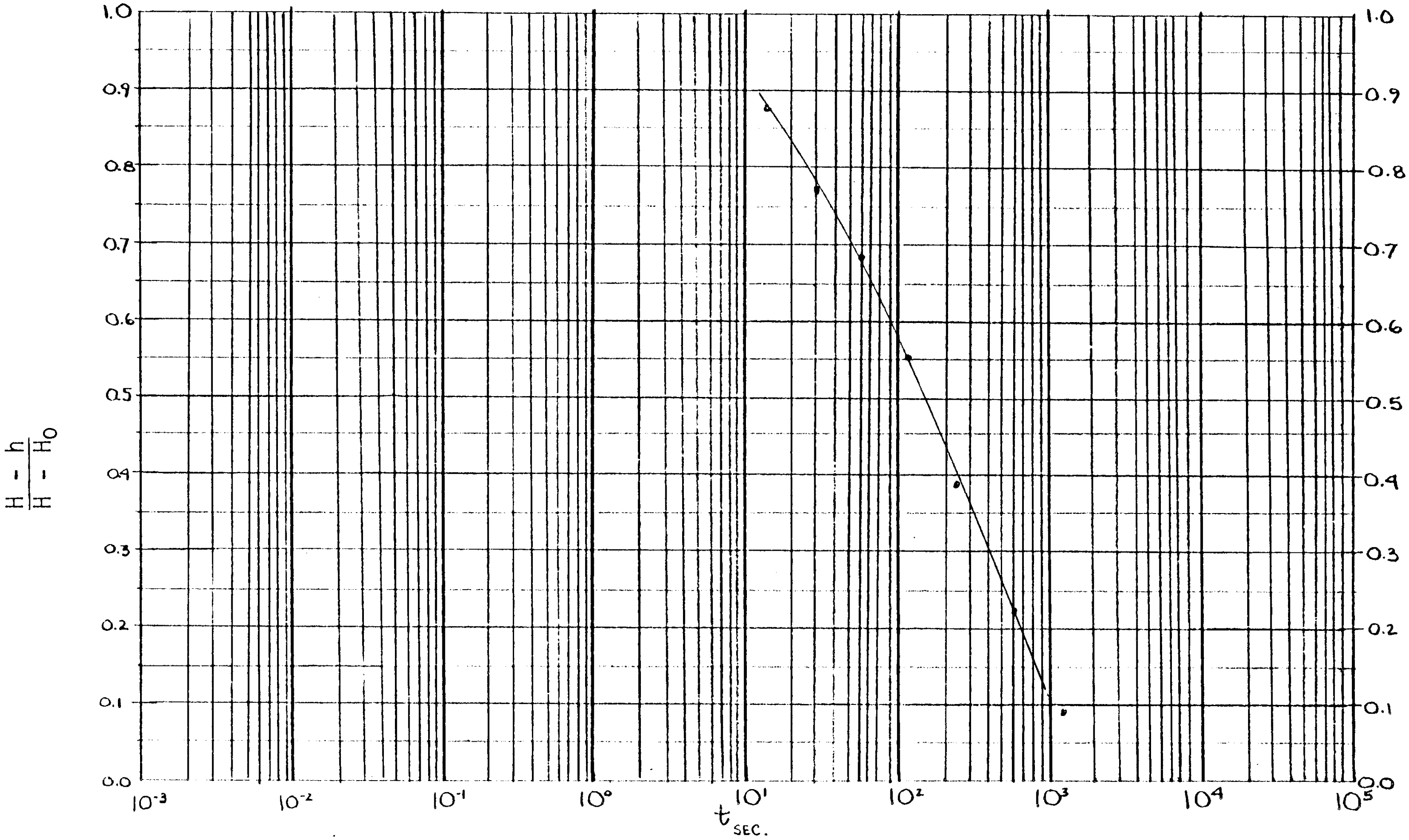
TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
0	429	0	485	1
15	378	15	536	.87
30	337	30	577	.76
60	305	60	609	.68
120	256	120	658	.55
240	193	240	721	.39
600	132	600	782	.23
1200	77	1200	837	.09
1800	43	1800	871	0



B-1 BROOME COUNTY INDUSTRIAL PARK

PAPADOPOULOUS CONFINED SLUG TEST

(Assuming entire confined thickness screened which is not the case at B-1, therefore take range of Hvorslev and Papadopoulous)



$$T = \frac{1.0(7.62)^2}{180 \text{ sec}}$$

$T = .32$

$T = Kb$

$.32 = K\ 396 \text{ cm}$

$K = 8.08 \times 10^{-4} \text{ cm/sec}$

GRAPH FOR PAPADOPOULOS TYPE CURVES IN WELL OF FINITE DIAMETER

O'BRIEN & GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

PROJECT BROOME CO. IDA

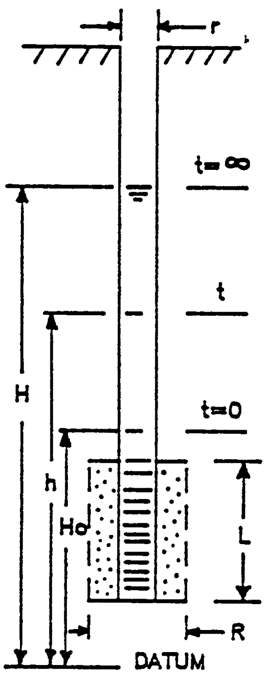
WELL NUMBER Well 18

DATE ____________

LOCATION See Plan

ELEVATION (TOC) 863.37

(GRD) 861



STATIC HEAD (H) 426

PIPE RADIUS (r) 2.54

SCREEN RADIUS (R) 7.62

SCREEN LENGTH (L) 305

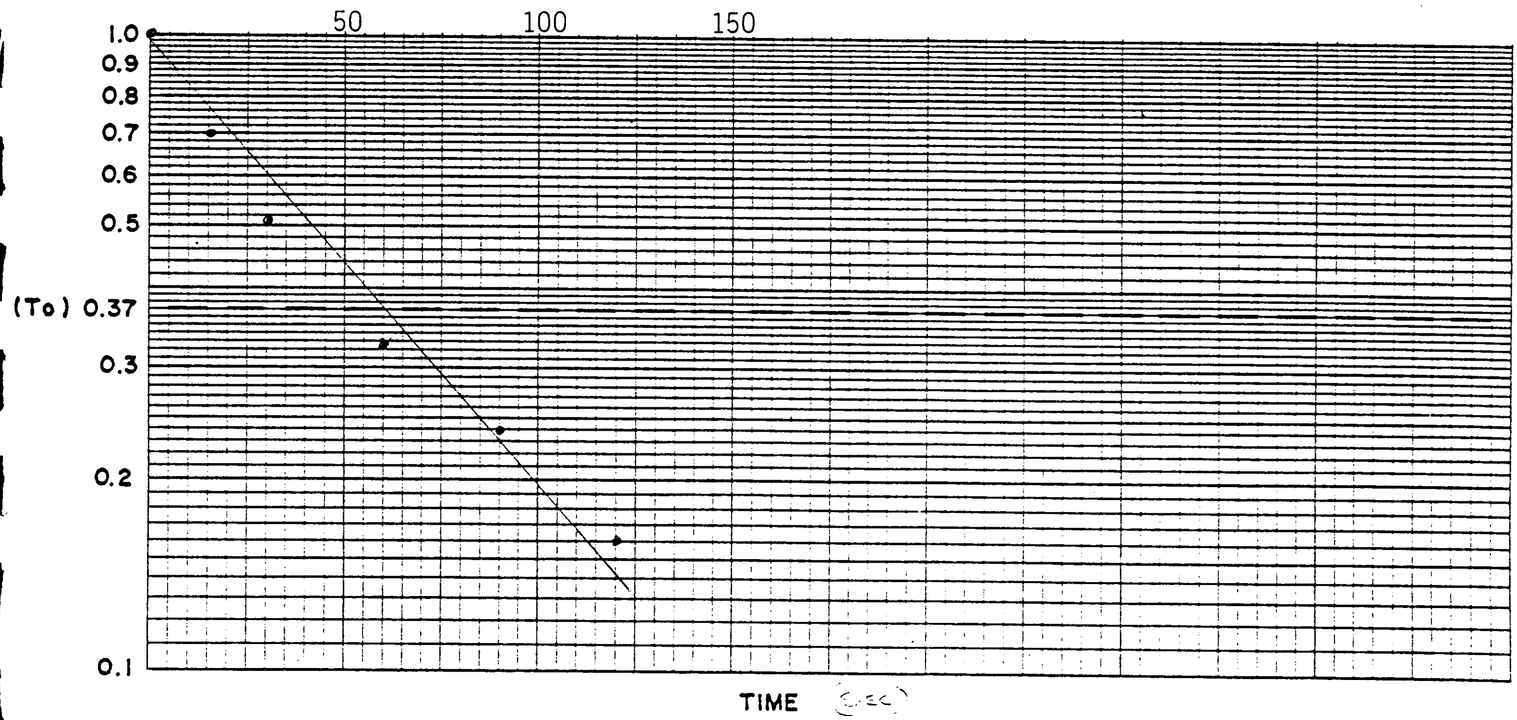
INITIAL HEAD (Ho) 225

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o} = \frac{6.45 \ln 305/7.62}{(2)(305)57}$$

K = 6.84×10^{-4} cm/sec.

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
0	232	0	225	1
15	172	15	285	.70
30	133	30	324	.51
60	97	60	360	.33
90	79	90	378	.24
120	44	120	413	.06

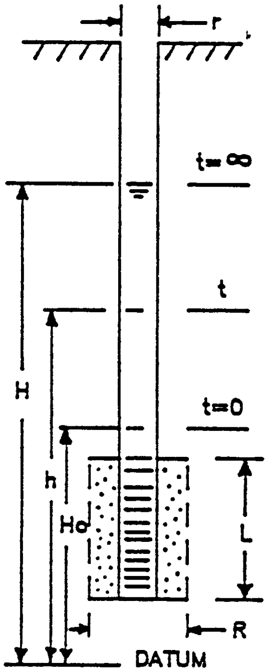


O'BRIEN & GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

PROJECT BROOME CO. IDA
WELL NUMBER Well 19
DATE ________

LOCATION See Plan
ELEVATION (TOC) 914.94
(GRD) 912.39



STATIC HEAD (H) 853

PIPE RADIUS (r) 2.54

SCREEN RADIUS (R) 7.62

SCREEN LENGTH (L) 305

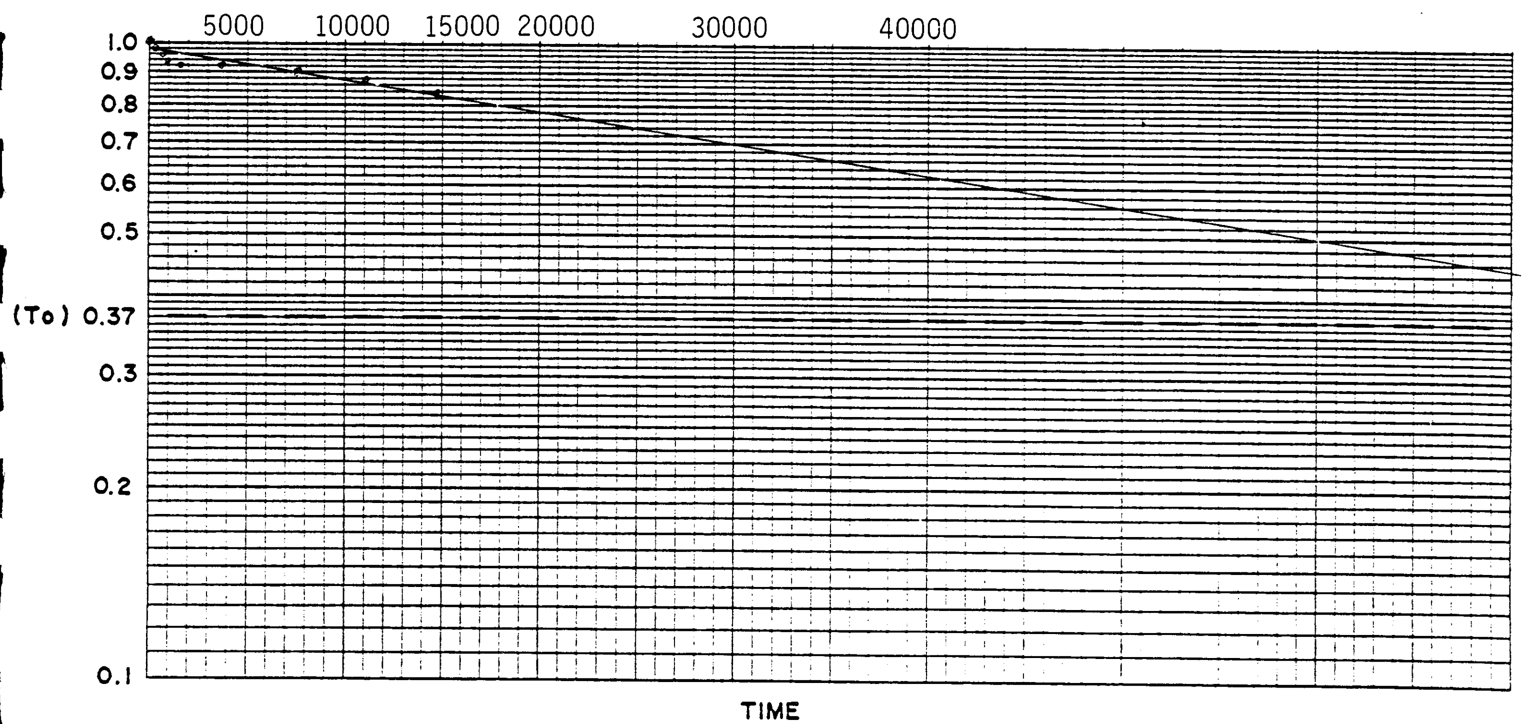
INITIAL HEAD (Ho) 229

HYDRAULIC CONDUCTIVITY :

$$K=\frac{r^2\ln(L/R)}{2LT_o}=\frac{6.45\ \ln(305/7.62)}{2(305)102{,}500}$$

K= 3.80×10^{-7} cm/sec.

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-H_o}$
0	731	0	229	1
1	731	60	229	1
2	716	120	244	.98
5	710	300	250	.97
10	708	600	252	.96
20	707	1200	253	.96
60	695	3600	265	.94
120	675	7200	285	.91
180	657	10800	303	.88
240	638	14400	322	.85

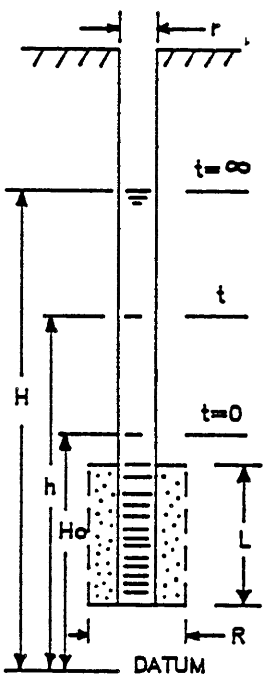


O'BRIEN & GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

PROJECT BROOME CO. IDA
WELL NUMBER Well 20
DATE 12/20/84

LOCATION
ELEVATION (TOC) 890.05
(GRD) 887.89



STATIC HEAD (H) 558

PIPE RADIUS (r) 2.54

SCREEN RADIUS (R) 7.62

SCREEN LENGTH (L) 305

INITIAL HEAD (Ho) 271

HYDRAULIC CONDUCTIVITY :

$$K=\frac{r^2 \ln(L/R)}{2LT_o} = \frac{6.45 \ln(305/762)}{(2)(305)15}$$

K= 2.60×10^{-3} cm/sec

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
0	353	0	271	1
15	170	15	454	.36
30	117	30	507	.18
45	91	45	533	.09
60	85	60	539	.07
120	79	120	545	.04