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Golder Associates

FINAL REPORT ON

UPGRADIENT INTERCEPTOR TRENCH REDESIGN AND PERFORMANCE EVALUATION PLAN

Submitted to:

City of Olean
Department of Public Works
Municipal Building
Olean, New York 14760

Steve Brandon

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1.0 INTRODUCTION

1.1 General

Golder Associates Inc. (Golder Associates) has been retained by the City of Olean, New York (City) to provide consulting services to assist the City in addressing the effects of seepage from the closed Ischua Landfill (Landfill). The City has been working with the New York State Department of Environmental Conservation (DEC) since about 1982 with regard to seepage at the site.

1.2 Purpose and Scope

This report presents the design of an upgradient ground water interceptor trench and an associated performance evaluation plan. The intent of the interceptor trench is to at least minimize, if not eliminate, downgradient seeps previously identified at the Landfill. This report was prepared in response to item 2 of the recent Order on Consent No. 89-92 (Consent Order), between the City and the DEC. Golder Associates has prepared this report in accordance with the conceptual remedial design presented in the draft report on the evaluation of remedial alternatives for the site (Golder Associates, 1991a) and the supporting calculations submitted to the DEC in a letter dated April 11, 1991. This design has been revised based on written comments dated September 17, 1991, December 16, 1991, and April 13, 1992, received from the DEC on the original design dated August, 1991, of the interceptor trench system, and from conversations with the DEC regarding discharge of the collected ground water from the upgradient interceptor trench.

1.3 Background

The Landfill is located in the town of Ischua near the Olean municipal airport, as shown on Figure 1. The Landfill consists of three parallel trenches nominally 15 feet deep, 50 feet wide, and ranging from 800 feet to 1,300 feet in length (see Figure 2). The Landfill operated from 1972 to 1975 when it was closed with a minimal (by current standards) cover. In an effort to control reported seepage breakouts downgradient of the Landfill, the Landfill cover was improved in September 1985 with 18 inches of compacted clay and six inches of topsoil, as reported by URS Company, Inc. (URS) in 1985. The improved cover reduced the seepage volume initially, but was not effective in eliminating the seeps.

4.0 INTERCEPTOR TRENCH DESIGN

4.1 Design Overview

The selected remedial design for the Landfill has incorporated the use of a ground water interceptor trench. The interceptor trench is designed to be located hydraulically upgradient of the Landfill to intercept ground water, flowing laterally from west to east, through Zone 1 before it reaches the Landfill trenches. The proposed interceptor trench alignment and the trench profile are presented on Figures 2 and 4, respectively. Once the ground water is intercepted by this trench it will be diverted around the Landfill trenches and allowed to discharge downward into the subsurface downgradient of the Landfill area as described below.

The objective of this remedial action is to minimize or eliminate (as defined in section 6.0 of this Design Report) the occurrence of seeps downgradient of the Landfill. Details of the hydraulic design of the interceptor trench system is discussed in the following section.

4.2 Hydraulic Design

4.2.1 Interceptor Trench

As discussed previously, the conceptual ground water flow model for the site suggests that ground water is likely to migrate laterally through fractured bedrock (Zone 1) which receives vertical recharge from above. The proposed trench system for the site is designed to hydraulically intercept upgradient ground water flowing through Zone 1, before it reaches the Landfill trenches. If, during excavation of the trench, it is found that Zone 1 extends to a greater depth than that currently estimated, or zones of obviously higher hydraulic conductivity are observed, the depth of the trench will be adjusted (to the extent practical) to incorporate these conditions.

As illustrated on Figure 5 (Conceptual Flow into Trench), the ground water flowing through the fractured bedrock (Zone 1), with an estimated hydraulic conductivity of 7×10^{-4} cm/s (Golder Associates 1991b) will be intercepted by a trench (approximately 6-feet wide and 30-feet deep) backfilled with granular materials having an estimated hydraulic conductivity value of 1×10^{-1} cm/s, or greater. The permeability value of the backfilled

5.5.2

material will be verified during quality control (QC) testing as discussed in section 6.0. Because the hydraulic conductivity of the granular backfill materials is much greater than the hydraulic conductivity of the adjacent bedrock (Zone 1), most of the ground water migrating laterally through Zone 1 at the trench interface will be intercepted by the trench and flow into the highly permeable granular trench materials, and will flow downward within the trench and laterally downslope to the collection and infiltration area.

The expected ground water flow rate into the upgradient interceptor trench was evaluated through the use of a ground water flow computer model called "FLOWPATH." A steady state flow simulation based on using a hydraulic conductivity value of 7.0 X 10^{-4} cm/s for Zone 1 (see Figure 3) and a drawdown of approximately equal to the average distance from the uppermost occurrence of ground water to the bottom of the trench (about 20 feet), results in an estimated zone of influence of about 50 feet to 100 feet measured perpendicular to the trench alignment. Based on this estimated zone of influence, calculations show that the total trench inflow (assuming a trench length of 1,100 feet) will range from approximately 5 gpm to 45 gpm. These calculations support the conceptual ground water flow model considering that most of the seepage volume at the site (estimated at 14.5 gpm) is likely due to lateral ground water flow through the Landfill trenches. Based on the calculated flow rates, a 4-inch drain pipe in the trench will have sufficient capacity to convey collected ground water inflow to the collection and infiltration area. Hydraulic design analyses indicate that the upgradient interceptor trench should be effective in essentially eliminating the occurrence of seeps downgradient of the Landfill. In addition, the steady state ground water flow simulations indicate that drainage from the Landfill trenches into the interceptor trench should not be significant. Appendices A and B present supporting design calculations for ground water flow rates into the interceptor trench and the drainage pipe flow capacity, respectively.

4.2.2 Downgradient Infiltration Trench

The ground water collected by the interceptor trench will be allowed to infiltrate into the subsurface via an infiltration trench within the upper bedrock (Zone 1). The intercepted ground water will be allowed to percolate into the bedrock via a drain installed downgradient of the Landfill (Figure 4). The drain will be equipped with a totalizing flow meter to monitor the total flow through the system. The drain will also be equipped with a valve which will allow a sample of the infiltrating water to be collected if necessary. Figure 5 provides details for this system.

The infiltration trench will be excavated to a depth of two feet into the upper portion of the bedrock (Zone 1). It is anticipated at this time that the width of this trench will be six feet. It is estimated that the trench will be required to be at least 250 feet long but the final length will be determined based on the actual width of the trench. Appendix C presents supporting design calculations for determining the required length.

It should be noted that this design is based on the conceptual ground water flow model, discussed earlier, that a deeper regional water level is present in this vicinity allowing for a vertical downward gradient to exist. This assumption may impact the performance of the infiltration trench and will be qualitatively evaluated as part of the performance evaluation discussed in Section 6.0. Figure 5 provides details of the infiltration trench and associated piping.

5.0 GEOTECHNICAL DESIGN

5.1 Summary of the Site's Soil/Bedrock Strength Data

Based on the data presented in EIL's well logs (EIL, 1990), approximately 3 feet to 10 feet of overburden materials consisting of predominantly clayey silt is present at the site. Results of the Standard Penetration Testing (N-Values[2]) performed during the soil drilling operation indicate that the N-Values of this material ranged from 11 to 36. Beneath the overburden materials, a zone of weathered bedrock (Zone 1) was encountered (see Figure 3). The thickness of this zone at the site is estimated to be approximately 22 feet. The N-Values of the upper portions of this zone generally range from 36 to 96. The lower portions of this zone could not be penetrated by soil drilling techniques (N-Values in general exceeded 100 blows per 6 inches); consequently, the lower portions were diamond cored. The RQD values of the cores were generally less than 30-percent. Beneath the weathered bedrock (Zone 1), a Zone 2 is identified which consists of bedrock with RQD values greater than 30-percent (see Figure 3).

As part of the pre-design investigation (on August 6, 1991), four test pits were excavated along the proposed trench alignment to evaluate the ripability of the bedrock. The test pits were excavated with a John Deere 690 (JD-690) excavating backhoe. The bucket used in this operation was 36-inches wide and had five ripping teeth. Figures 2 and 4 illustrate the approximate location of these test pits. In summary, Test Pit No. 1 was fairly easily excavated to approximately 18.5 feet below the existing ground surface (13 feet of overburden and 5.5 feet of weathered bedrock). The excavation was terminated at this depth due to reaching the maximum arm-reach capability of the JD-690. Test Pit Nos. 2, 3, and 4 were excavated to approximately 12.5 feet below the existing grade where the maximum ripping capability of the JD-690 was reached. As such, the excavation was terminated at this depth. The thickness of the overburden materials at Test Pit Nos. 2, 3, and 4 was approximately 8 feet, 4 feet, and 0.5 feet, respectively. These results, as they relate to the trench design geometry (i.e., depth, bottom slope, etc), are discussed in more detail in section 5.3.

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2 N-Values are the number of blows per foot of split-spoon penetration as the ASTM D-1586.

Based on the results of the above described test pit program, Golder Associates recommended (within the previously submitted Design Report) that additional test pits be excavated utilizing a larger trenching machine (backhoe) in order to determine if the designed target depths of the trench could be achieved. As a result of these recommendations, two additional test pits were excavated (TP5 and TP6) on September 5, 1991. Figures 2 and 3 illustrate the approximate location of these test pits. The objective of the second test pit program was to assist in determining the final design parameters for the trench which included determining the practical depth of excavation and a practical and economical method of excavation.

In summary, utilizing the 40-inch rock bucket, TP5 was excavated to approximately 15.5 feet below the existing grade and TP6 was excavated to 12 feet below the existing grade. At these depths, the maximum practical ripping capability of the PC300 using the rock bucket was reached. The rock bucket was then replaced with the T501 hammer, and excavation continued. The T501 hammer was capable of breaking the bedrock fairly easily and advancing the test pits in 18-inch increments. Once approximately 18 inches of bedrock surface at the bottom of the test pits was broken, the T501 hammer was replaced with the rock bucket to scoop the broken pieces of bedrock out of the test pits. This procedure of rock hammering followed by removal of the rock with the bucket was repeated to advance the test pits. During this procedure, it was noted that, due to the physical dimensions of the T501 hammer, the hammer was restricted to break the bedrock at the bottom of the test pits and a more narrow trench approximately 24 inches in width was being formed within the 40-inch wide trench. This more narrow section of broken rock restricted the 40-inch rock bucket from being used to scoop the broken pieces of rock out of the test pits. As a result, TP5 was widened to approximately 68 inches to allow the rock hammer to be utilized to effectively break the rock across a 40-inch width of the trench bottom.

At mid-day, it became apparent that the time-consuming process of replacing the hammer with the bucket was not going to allow more than one test pit to be excavated (that day) to the designed target depth of the upgradient interceptor trench (approximately 30 feet below the existing grade). As such, TP6, which was advanced to approximately 13.5 feet below the existing grade was terminated and the effort for the remainder of the day was concentrated on TP5. Since the excavation procedure appeared to be successful in advancing TP5, it was concluded that the target depth of 30 feet could be achieved, although time did not allow completion of TP5 to the full depth. TP5 was terminated at approximately 20.5 feet below the existing grade at the end of the day.

5.2 Trench Layout

Figure 2 presents the designed layout of the upgradient interceptor trench system and the infiltration trench area. The interceptor trench layout is located upgradient of the Landfill trenches to intercept lateral flow of ground water which, based on the conceptual flow model, is from west to east across the Landfill site.

5.3 Trench Geometry

5.3.1 Interceptor Trench

Based on the results of this test pit program, it is Golder Associates' opinion that the design depths of the Phase I upgradient interceptor trench, as previously presented, are feasible and constructible. However, the width of the interceptor trench may need to be modified to allow the rock hammer to effectively operate in the narrow trench (as described in section 5.1). It is envisioned that during the actual construction period, two backhoes will be utilized, one of the backhoes will be equipped with a rock hammer and one with a rock bucket to maximize work efficiency during the construction of the trench. The modified interceptor trench width will be incorporated into the design specification package to be submitted to the City. The actual as-built width will be dependent on the actual equipment used during construction. Once a section of the trench (generally 100 lineal feet or as practical) has been excavated, the drain pipe and the backfill materials will be installed. As such, each trench section will need to stay open during the lateral drain pipe and backfill installation.

The interceptor trench will be excavated through the upper till and the weathered bedrock (Zone 1) to the lower, less fractured bedrock (Zone 2). Figure 4 illustrates the profile of the interceptor trench including the proposed trench depth along the trench alignment. A typical cross-section of the interceptor trench is presented on Figure 5.

The proposed interceptor trench depths shown on Figure 4 are intended to allow for a maximum penetration into the Zone 1 bedrock between points A and B along the interceptor trench alignment (see Figure 2). The primary components of ground water flow through Zone 1 are anticipated to occur across this reach of the trench. Based on the core logs presented by EIL for core hole 6D, the bottom of Zone 1 is estimated to be at or near elevation 2,140 feet MSL at this location. This design elevation has been incorporated into the trench profile as a control point to establish the bottom slope, as shown on Figure 4. The trench bottom slopes about 1-percent or greater from point A to point B and follows the assumed bottom elevation of Zone 1. At point B, however, the trench bottom is sloped to allow the trench to intersect the ground surface at point D. This will allow for ease in constructing the infiltration collector system at this point.

As illustrated on Figure 5, preparation for excavation of the interceptor trench may include excavating a bench in the overburden materials and upper portion of Zone 1. This bench will provide a base for the trenching machine and will maximize the excavation capacity of the machine. The trench excavation will be performed to maintain a nominal 1 percent or greater grade along the bottom of the interceptor trench. The grade is necessary to promote gravity flow within the drain pipe located in the bottom of the trench. Figure 4 illustrates the preferred trench grade. The actual trench bottom elevation and trench slope may vary, based on field conditions.

Based on the results of the test pits performed along the trench alignment (as discussed in Section 5.1), it is concluded that a relatively large trenching machine (backhoe) will be required to meet the target depths shown on Figure 4. Based on previous experience at other sites, a CAT 245 (or larger) backhoe with a narrow bucket (2.0 feet wide preferably) and a backhoe mounted pneumatic hammer may be required.

5.3.2 Infiltration Trench

At the discharge point of the interceptor drain pipe, a flow meter assembly will be installed within a manhole as shown on Figures 4 and 5. The collected ground water will be directed downward into the gravel-lined infiltration trench, via a 4-inch diameter pipe.

The infiltration trench will be excavated approximately two to three feet below the top of the fractured zone of bedrock (Zone 1). For design considerations, the depth to the top of bedrock is estimated at about eight to ten feet. However, this depth has not been confirmed with test pits. The excavation equipment will widen the shallow bedrock infiltration trench at this point to approximately six feet.

5.4 Trench Stability

Based on the limited geological and laboratory data from the site, it appears that there will be a potential for trench instability, localized slump, tension cracks, or block failures. Since the trench excavation must stay open for a length of time during the installation of the lateral drainage pipe and backfilling operation, shoring, more than likely, will be required.

Because of potential for trench instability, localized slump or tension cracks, a contingency plan addressing construction techniques under these conditions, will be required to be prepared by the contractor and approved by the design engineer prior to the start of the construction. The General Contractor will prepare the contingency plan and the plan will be submitted to the DEC for review.

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5.5 Trench Components

5.5.1 General

The trench components will consist of a free draining backfill material, flexible drain pipe, and a clay cap. Figure 5 presents typical cross-sections of the interceptor trench, and material specifications are discussed in Appendix D.

5.5.2 Backfill Materials

The interceptor and infiltration trenches have been designed to be backfilled with a granular material with a hydraulic conductivity value of 1 X 10^{-1} cm/s, or greater. As stated previously, this permeability will be verified by laboratory permeability tests on two samples of this granular material. The granular material will be placed from the base of the trenches up to approximately the top of bedrock. A geotextile fabric will be placed between the gravel backfill and the general backfill for the entire length of the infiltration trench. Further, if a bench is cut into the overburden materials above the interceptor trench, this bench area above the bedrock may be backfilled with the over-excavated overburden materials. The upper three feet of the trench will be capped with clay materials and a 0.5 foot layer of topsoil above the clay to support vegetation. The clay cap will be compacted to achieve a permeability which is equal or less than the in-situ materials. Previous laboratory testing on one Shelby tube sample from this material indicated that this material has an estimated hydraulic conductivity of 1 x 10^{-5} cm/sec. This value will be used as a point of reference for compaction of the clay cap material, and is not viewed as a strict design criteria. This is an end-product specification as opposed to a method specification and, thus, the contractor will have some latitude to compact the clay as long as the end product permeability is reached. As such, slight deviations from the estimated value of 1 X 10^{-5} cm/sec will not compromise the primary objective of the design. Typical compaction techniques include rollers, backhoe tracks, hand held compactors, etc.

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what about interceptor trench ?

As part of the QC testing of the clay cap, two Shelby tube samples will be obtained from the in-place clay cap materials and a laboratory permeability test will be performed on each sample to document the permeability of the in-situ clay cap.

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A flexible, 4-inch diameter perforated, lateral drain pipe has been included in the design to be placed along the bottom of the interceptor trench on approximately 6 inches to 12 inches of granular backfill material which will allow for a uniform slope of the pipe without requiring a stringent criteria on the interceptor trench bottom slope. Ground water entering this pipe will be transmitted down slope within the pipe to the discharge point. The pipe will be installed from the ground surface to eliminate the need to enter the trench. Supporting calculations for the specified dimension for the lateral drain pipe are presented in Appendix B.

5.6 Surface Water Drainage Improvements

In conjunction with the installation of the interceptor and infiltration trenches, improvements to the surface water drainage ditch between Landfill Trenches 2 and 3 will be constructed. This will assure that accurate monitoring of the performance of the upgradient interceptor trench will be performed. The existing surface water drainage ditch between Landfill Trenches 2 and 3 is not capped and bedrock is exposed in several places along this ditch. Surface water runoff from portions of the cap covering Trenches 1 and 2 is directed down to this drainage ditch. Because this swale area is not capped, some of the runoff likely infiltrates through the swale and possibly into Trench 3.

The improvement will require the drainage ditch to be widened, slightly deepened, and lined with an impermeable membrane. Gravel and a perforated pipe will be placed in the excavation and will convey surface drainage to an existing drainage swale on the north end of Landfill Trench 3 (Figure 4). Figure 5 presents the improvement details. Design calculations regarding these improvements to the drainage ditch are included in Appendix F.

6.0 PROPOSED PERFORMANCE EVALUATION PLAN

The proposed remedial system should be monitored to evaluate its overall performance relative to the design expectations. The design objective is to intercept the ground water, upgradient of the Landfill and direct the flow around the Landfill before it flows through the fractured bedrock (Zone 1) into the Landfill trenches. The design calculations and analyses indicate that such a trench should be effective in nearly eliminating, the occurrence of seeps downgradient of the Landfill trenches. To check the efficiency of the trench system, measurements of ground water flows into the interceptor trench and out of the Landfill trenches will be the primary objective of the performance monitoring plan.

6.1 Performance Evaluation Criteria

Based on discussions with the DEC, a 95-percent reduction in the "normal" seepage flow rate from that measured prior to construction of the upgradient trench is the performance criteria which will be used to evaluate the success of this system. The seepage flow data obtained from the perimeter weirs prior to construction will be used to determine the "normal" seepage flow rate.

Although it is calculated that a 12-month period would be required for ground water in the Landfill to "drain" via its present pathway after the upgradient trench is installed (see Appendix E for supporting calculations), the performance evaluation monitoring will be continued for 18 months.

6.2 Monitoring

The flow measurements of the downgradient weirs are expected to gradually diminish. The success of the system will be based on the measured reduction of flow of the Landfill seeps to the 95-percent criteria. Quarterly reports presenting the results of the measured flow rates will be submitted to the DEC on a quarterly basis for a period of 18 months. At the end of the 18-month period, a summary report evaluating the success of the remedial system will be prepared and submitted to the DEC. If the seeps have not been eliminated to the 95-percent reduction criteria, then a Phase II remedial action plan will be submitted to the DEC. The chosen plan will be based on the alternatives discussed in the report "Conceptual Phase II Remedial Alternatives," prepared by Golder Associates and submitted to the DEC in September 1991 (Golder Associates, 1991c).

In addition to the above monthly ground water flow measurements, water level data will be obtained from the on-site monitoring wells on a monthly basis for the 18-month period, as part of the flow rate measurements described above. The water level data obtained will be used to evaluate the effect of the interceptor trench on the potentiometric surfaces at the site. Additionally, flow measurements of the in-line flow meter will be recorded each quarter. This evaluation and data will be submitted with the quarterly reports and summarized in the summary report.

As requested by the DEC, the ground water discharge from the interceptor trench will be sampled and analyzed once for the Part 360 Baseline Parameter List of compounds. This is to assure no impact to the ground water is occurring by the interceptor system. The results of this monitoring will be presented in the summary report submitted at the end of the 18-month evaluation.

7.0 DESIGN SPECIFICATIONS

The design drawings for the interceptor trench are presented herein on Figures 1 through 5 to this report and the design specifications and material specifications to these drawings are presented in Appendix D. Construction shall be performed as generally described in this report and per design drawings. The work included for this project consists of, but is not limited to, the following components:

- Trench excavation (interceptor and infiltration);
- Dewatering during construction;
- Surveying of the trench bottom during excavation;
- Installation of the drain pipe and granular backfill materials;
- Surveying of the invert elevation of the drain pipe;
- Installation of interceptor trench collector system;
- Placement of general fill and/or clay cap;
- Seeding and mulching; and
- Surface water rerouting.

8.0 CONSTRUCTION DOCUMENTATION AND QUALITY ASSURANCE/QUALITY CONTROL

Documentation and QA/QC of the construction work activities is required for development of detailed record drawings and to evaluate the quality of the final product. Documentation of the quantities, material testing, and performance testing will be required. As a minimum, the following components will be documented during the construction of the trench:

- Trench construction activities;
- Condition of trench bottom;
- Trench excavation depths;
- Layout of the trench;
- Slope of the bottom of the trench;
- Location of local failures during trench construction (if any occur);
- Interceptor and infiltration trench cross-section and profile;
- Verifications of construction materials;
- Quality control (QC) testing of the granular backfill materials;
- QC testing of the general backfill;
- QC testing of the clay cap; and
- Drainage ditch improvements between Landfill Trenches 2 and 3.

9.0 SUMMARY

Golder Associates has been retained by the City to prepare this design report in response to Item 2 of an Order on Consent No. 89-92. This report describes the design of a proposed upgradient interceptor trench, downgradient infiltration trench, and associated performance monitoring plan. The design of this upgradient interceptor trench is consistent with the revised conceptual remedial design, submitted to and approved by the DEC. The objective of the design is to intercept ground water flow upgradient of the Landfill trench using an interceptor trench to essentially eliminate seepage breakouts which occur downgradient from the Landfills. The intercepted ground water will be diverted around the Landfill trenches and discharged back to the subsurface via an infiltration trench. This report constitutes Phase I of the site's remedial action plan.

The report presents the design criteria and the design specifications of the proposed trench and discusses a proposed performance monitoring plan. This report also summarizes the geological and hydrogeological data and the conceptual ground water flow models, which have been presented in reports previously prepared and submitted to the DEC.

GOLDER ASSOCIATES INC.

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SSN\WBL:cr

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TABLE 4
SUMMARY OF VARIABLE HEAD TEST RESULTS (1)

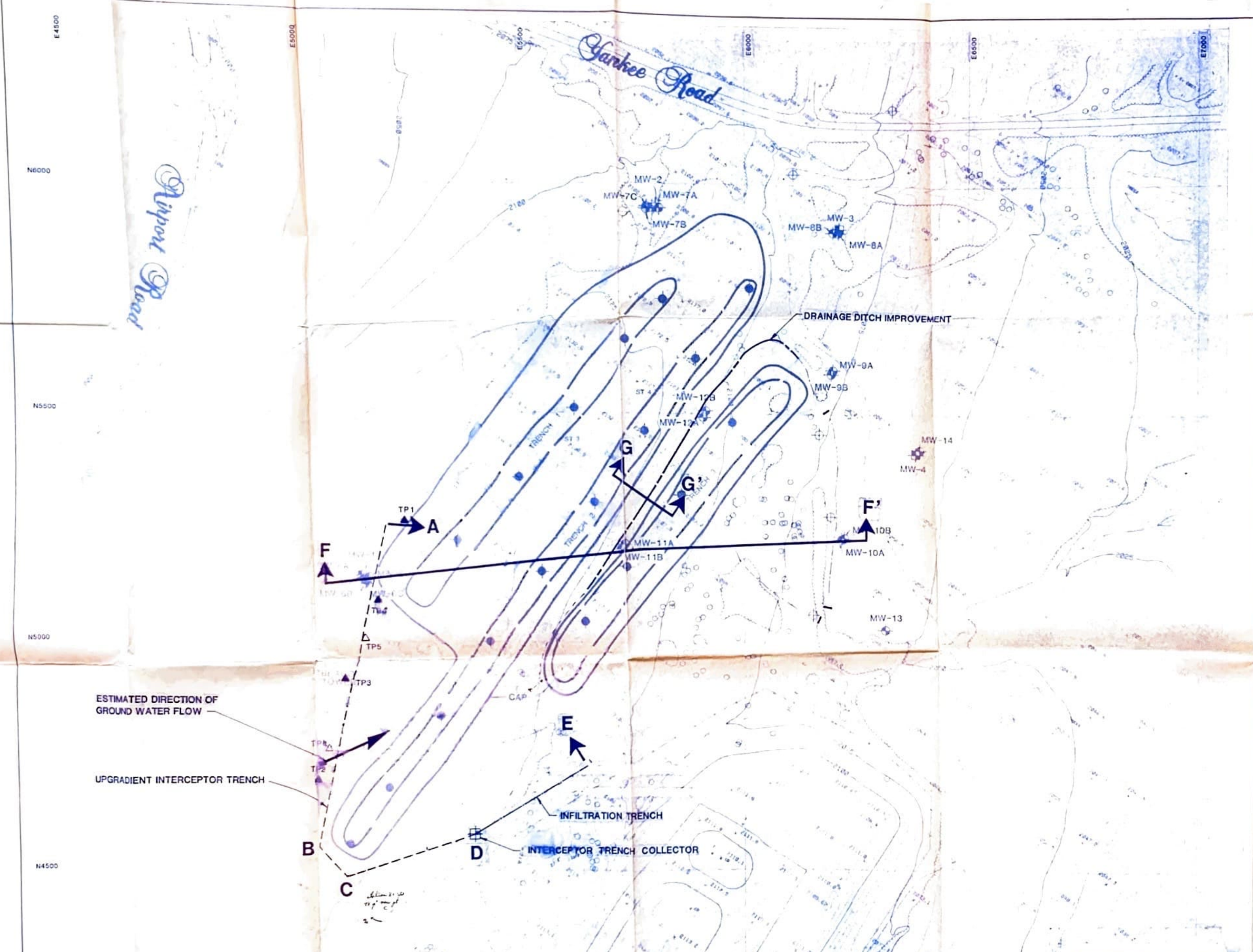
WELL NUMBER	SCREEN INTERVAL (FT AMSL)			SCREEN INTERVAL (FT BGS)			HYDRAULIC CONDUCTIVITY (CM/S)
6A	2154.70	to	2159.70	10.50	to	15.50	4.69E-05
6B	2140.32	to	2150.32	21.00	to	31.00	5.51E-06
6C	2098.26	to	2108.26	62.70	to	72.70	1.31E-06
6D	2069.26	to	2079.26	91.40	to	101.40	9.31E-06
7A	2096.37	to	2101.37	4.70	to	9.70	1.03E-03
7B	2084.01	to	2094.01	12.00	to	22.00	9.25E-06
7C	2063.76	to	2073.76	32.00	to	42.00	1.52E-05
8A	2073.70	to	2078.70	7.20	to	12.20	1.46E-05
8B	2059.91	to	2069.91	16.50	to	26.50	4.39E-04
9A	2064.26	to	2069.26	9.00	to	14.00	5.11E-04
9B	2047.12	to	2057.12	21.50	to	31.50	2.65E-04
10A	2047.64	to	2052.64	10.40	to	15.40	1.64E-05
10B	2031.20	to	2041.20	21.50	to	31.50	7.86E-04
11A	2100.98	to	2105.98	6.00	to	11.00	1.29E-05
11B	2095.68	to	2100.68	11.50	to	16.50	7.61E-06
12A	2093.75	to	2098.75	6.00	to	11.00	3.04E-03
12B	2085.70	to	2090.70	14.70	to	19.70	1.06E-03
13	2046.06	to	2051.06	4.80	to	9.80	9.56E-06
14	2036.44	to	2041.44	16.50	to	21.50	4.50E-07

NOTES:

1. DATA OBTAINED FROM EIL MAY 1990 HYDROGEOLOGIC DATA REPORT.

AMSL = Average Mean Sea Level
BGS = Below Ground Surface

N: TAB4FIN.WK1



LEGEND

- ▲ TEST PIT PERFORMED AS PART OF A PRE-DESIGN INVESTIGATION
- △ TEST PIT PERFORMED ON SEPTEMBER 5, 1991.
- MONITORING WELL (URS)
- MONITORING WELL (EIL)
- SEEP
- GAS WELL
- WEIR
- INFILTRATION TRENCH
- CLAY CAP (APPROX.)
- TRENCH (APPROX.)
- INTERCEPTOR TRENCH
- —2075— EXISTING GROUND GRADE
- 2067.7 × SURVEY ELEVATION AND LOCATION
- A—E CROSS SECTION LOCATION
- DRAINAGE DITCH

NOTES:

1. LIMITS OF THE CLAY CAP AND THE TRENCHES (1, 2, AND 3) ARE OBTAINED FROM URS DRAWING NO. D-1107-1 (07/25/85).
2. TOPOGRAPHIC SURVEY PERFORMED BY D. MICHAEL CANADA, N.Y.S.L.S. #49215 (06/27/91).
3. ELEVATIONS REFER TO MEAN SEA LEVEL DATUM. CONTOUR INTERVAL IS 25 FEET.
4. SURVEY GRID IS BASED ON LOCAL COORDINATE SYSTEM.
5. REFER TO FIGURE 4 FOR CROSS-SECTION A-E. REFER TO FIGURE 3 FOR CROSS-SECTION F-F. REFER TO FIGURE 5 FOR CROSS SECTION G-G.

SCALE IN FEET

0 100 200 300 400

REVISIONS

DESCRIPTION	BY	DATE
1. REVISED INFILTRATION TRENCH COLLECTOR AND INFILTRATION TRENCH LOCATION ADDED DRAINAGE DITCH IMPROVEMENT, MOVED FLOW DIRECTION.	SBN	8/92

OLEAN/LANDFILL COVER/NY

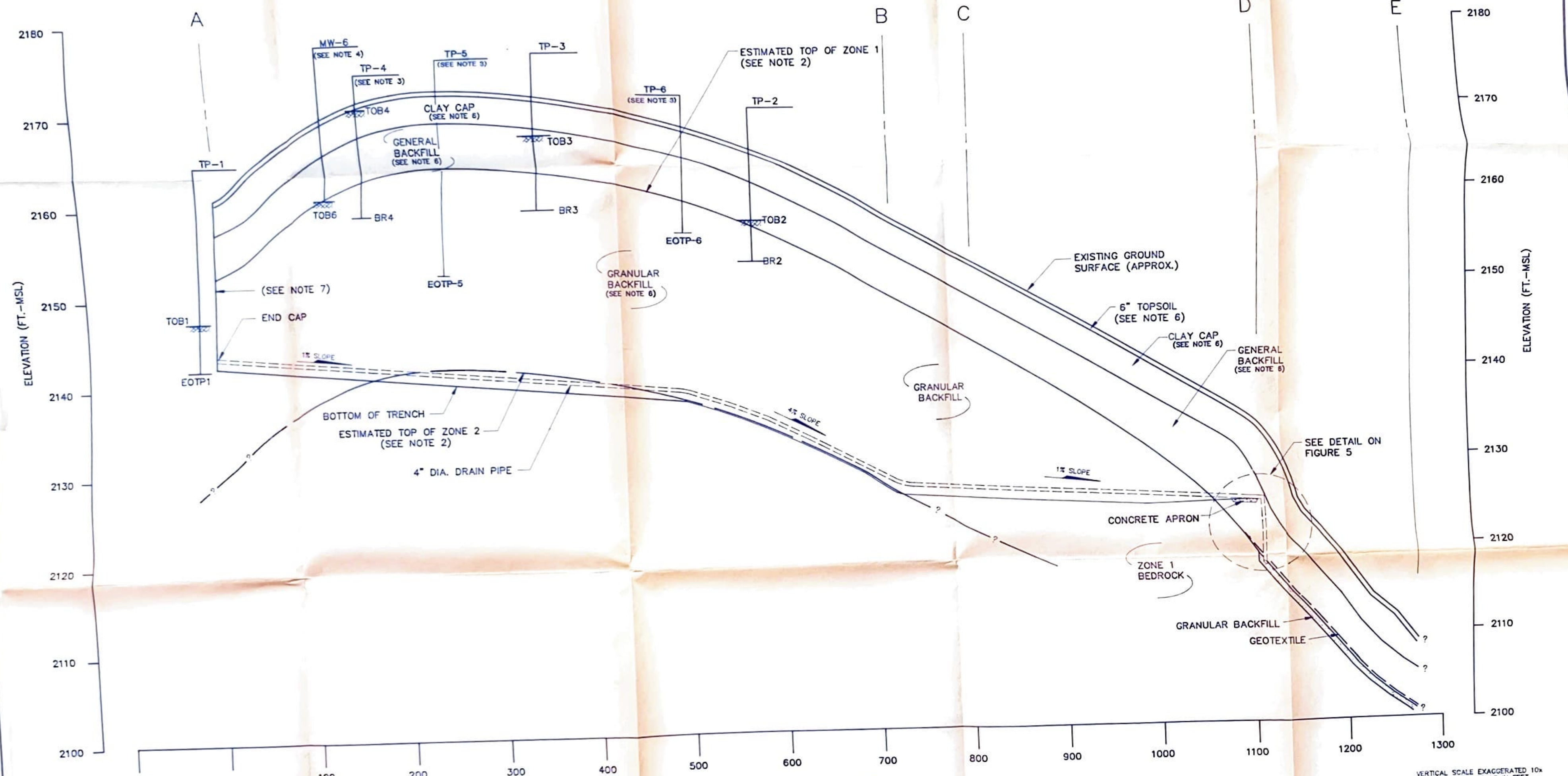
TITLE

INTERCEPTOR TRENCH LAYOUT

DRAWN	EAH	SCALE	AS SHOWN	DATE	7/30/91
CHECKED	[signature]	REVIEWED	[signature]	JOB NO.	913-9001
				DWG NO.	18
				FIGURE	2

Golder Associates
Buffalo, New York

913-9001



VERTICAL SCALE EXAGGERATED 10x
HORIZONTAL SCALE IN FEET
0 50 100

CROSS SECTION A-E

LEGEND

- TP-1 — TEST PIT/MONITORING WELL LOCATION
- TOB1 — TOP OF BEDROCK AT THE LOCATION OF RESPECTIVE TEST PIT OR MONITORING WELL
- EOTP1 — END OF TEST PIT AT THE LOCATION OF RESPECTIVE TEST PIT (MAX. "ARM REACH" CAPABILITY OF THE BACKHOE WAS EXCEEDED)
- BR4 — BACKHOE REFUSAL (MAX. RIPPING CAPABILITY OF THE BACKHOE WAS EXCEEDED)
- ====== 4 IN. DIA. DRAIN PIPE
- 1% SLOPE — SLOPE OF DRAIN PIPE

NOTES:

1. ACTUAL TRENCH PROFILE MAY VARY BASED ON FIELD CONDITIONS ENCOUNTED DURNING EXCAVATION.
2. TOP OF ZONE 1 AND ZONE 2 ARE BASED ON AN AVERAGE VALUE OBTAINED FROM CROSS SECTIONS A-A' AND A'-A" OF HYDROGOELOGIC UPDATE REPORT (GOLDER ASSOCIATES, INC., JAN. 1991)

CONT..

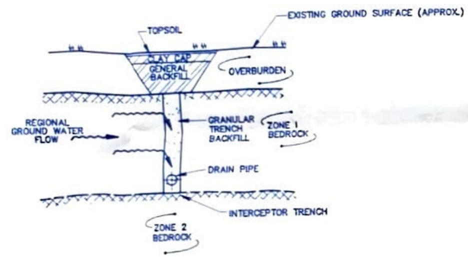
3. TEST PITS (1-4) PERFORMED ON AUG. 8, 1991. TEST PITS 5 AND 6 PERFORMED ON SEPT. 5, 1991.
4. MONITORING WELL LOCATION FROM THE HYDRO-GEOLOGIC UPDATE REPORT (GOLDER ASSOCIATES, INC., JAN. 1991)
5. UNLESS OTHERWISE NOTED ALL NOTES ARE INTENDED TO BE TYPICAL.
6. TYPICAL TRENCH CROSS SECTION SHOWN ON FIG. 5 DESIGN SPECIFICATIONS AND MATERIAL SPECIFICATIONS INCLUDED IN APPENDIX C OF THE DESIGN REPORT (GOLDER ASSOCIATES INC., AUG. 1991 AND REVISED IN JUNE 1992.)
7. ACTUAL SLOPE OF TRENCH WALL AT END OF TRENCH TO BE CUT TO NATURAL ANGLE OF REPOSE TO PROVIDE PROPOSED DEPTHS AT STATION 0.

REVISIONS		
DESCRIPTION	BY	DATE
1. REVISED PROFILE AND INTERCEPTOR TRENCH COLLECTOR, ADDED SEC. E, REVISED NOTE 6. ADDED TP-6 &TP-6	SSN	6/92

OLEAN/LANDFILL COVER/NY					
TITLE	TRENCH PROFILE				
DRAWN	EAH	SCALE	AS SHOWN	DATE	7/31/91
CHECKED	DJM	REVIEWED	WBL	JOB NO.	903-9001
Golder Associates		Buffalo, New York		DWG. NO.	20
				FIGURE	4

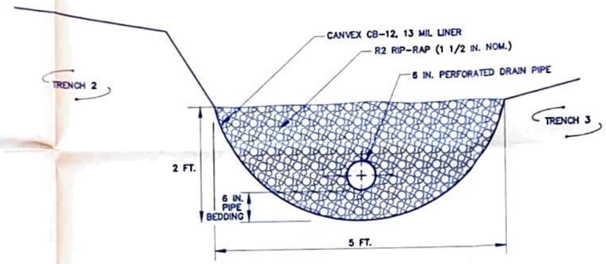
FILE NO. 903-9001

FILE NO. 903-9001



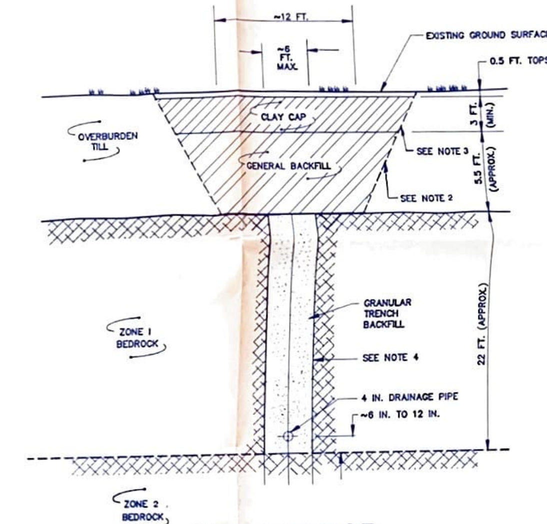
CONCEPTUAL FLOW INTO TRENCH

N.T.S.



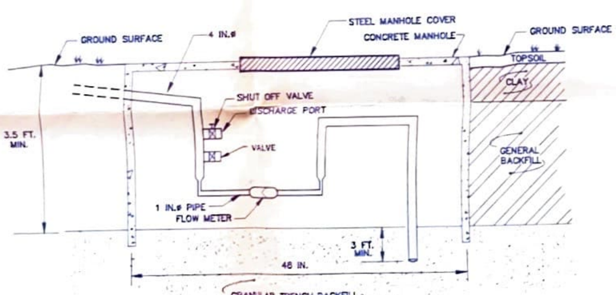
DRAINAGE DITCH IMPROVEMENT CROSS SECTION G-G'

N.T.S.



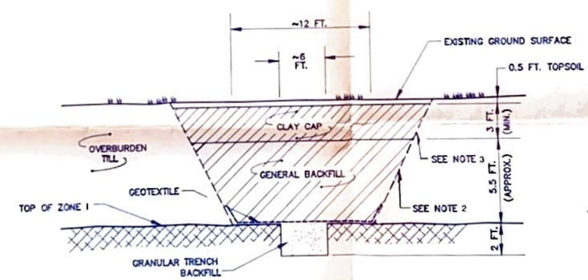
INTERCEPTOR TRENCH CROSS SECTION (TYPICAL)

N.T.S.



INTERCEPTOR TRENCH COLLECTOR DETAIL

N.T.S.



INFILTRATION TRENCH CROSS SECTION (TYP.)

N.T.S.

NOTES:

1. UNLESS OTHERWISE NOTED, ALL DETAILS, SECTIONS AND NOTES ARE INTENDED TO BY TYPICAL.
2. THE EXPOSED SURFACE SHALL BE SCARIFIED PRIOR TO PLACEMENT OF GENERAL BACKFILL MATERIALS.
3. CONTRACTOR SHALL PROVIDE SHORING OR OTHER MEANS OF SUPPORT TO ASSURE SLOPE STABILITY OF THE SIDE SLOPES IN PROVIDING A SAFE JOBSITE (SEE DESIGN SPECIFICATIONS INCLUDED IN APPENDIX D).
4. DESIGN SPECIFICATIONS AND MATERIAL SPECIFICATIONS ARE INCLUDED IN APPENDIX D OF THE DESIGN REPORT.

REVISIONS

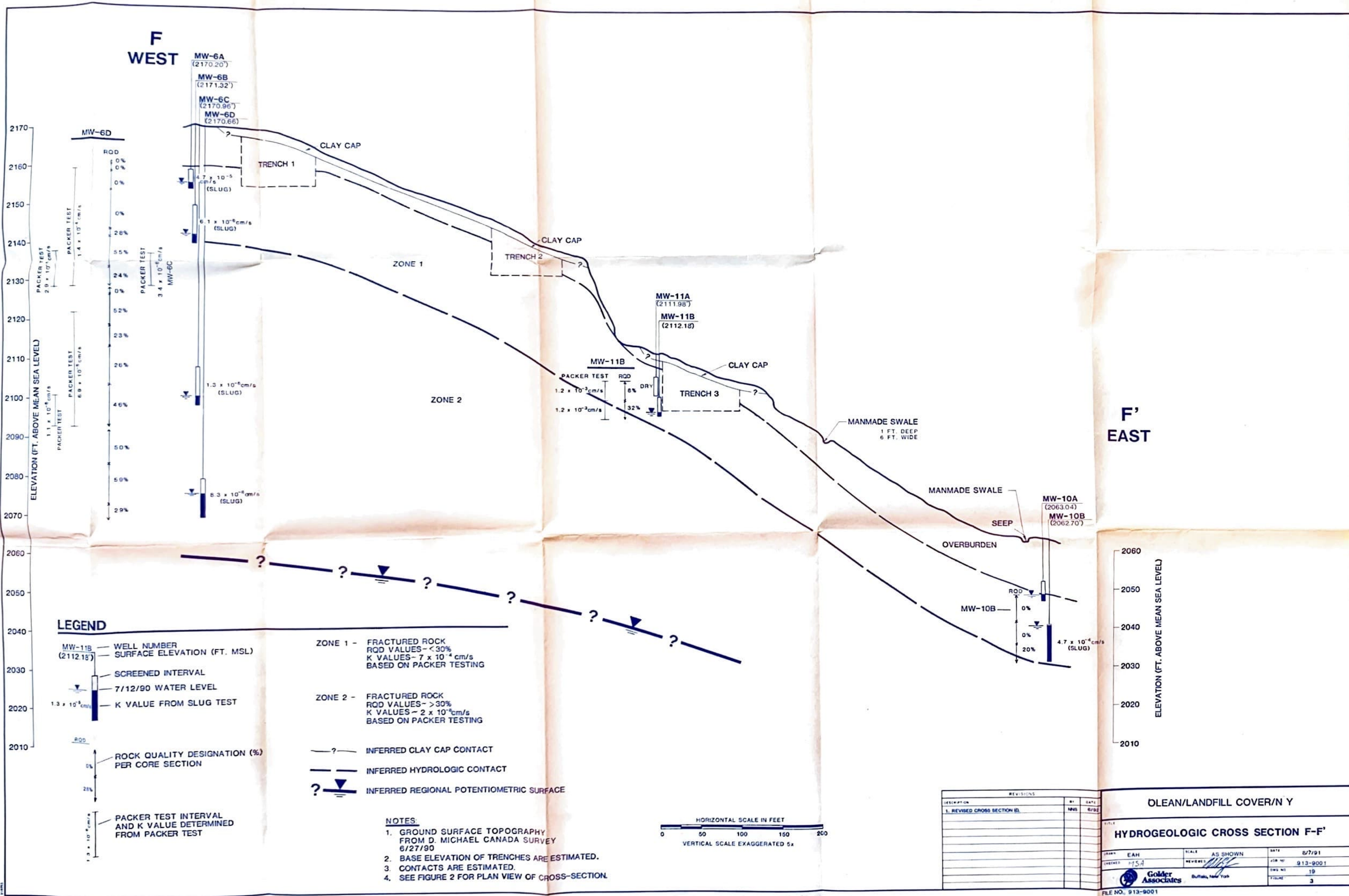
DESCRIPTION	BY	DATE
1 REMOVED FLUME DETAILS, ADDED INTERCEPTOR TRENCH COLLECTOR DETAIL, INFILTRATION TRENCH CROSS SECTION AND CROSS SECTION G-G'. REMOVED STEP CUTS.	SSN	5/92

OLEAN/LANDFILL COVER/NY

TITLE: CROSS SECTIONS AND DETAILS

DRAWN	EAH	SCALE	AS SHOWN	DATE	7/30/91
CHECKED	MSA	REVIEWED	WBL	JOB NO.	903-9001
				DWG. NO.	21
Golder Associates		Buffalo, New York		FIGURE	5

FILE NO. 903-9001


F
WEST
F'
EAST
ELEVATION (FT. ABOVE MEAN SEA LEVEL)
2170
2160
2150
2140
2130
2120
2110
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
MW-6A (2170.20')
MW-6B (2171.32')
MW-6C (2170.96')
MW-6D (2170.66')
MW-6D
RQD
0%
0%
0%
0%
28%
55%
24%
0%
52%
23%
26%
46%
50%
59%
29%
PACKER TEST 2.9 x 10^-4 cm/s
PACKER TEST 1.4 x 10^-4 cm/s
PACKER TEST 6.9 x 10^-5 cm/s
1.1 x 10^-5 cm/s PACKER TEST
PACKER TEST 3.4 x 10^-5 cm/s MW-6C
4.7 x 10^-5 cm/s (SLUG)
6.1 x 10^-5 cm/s (SLUG)
1.3 x 10^-5 cm/s (SLUG)
8.3 x 10^-5 cm/s (SLUG)
TRENCH 1
CLAY CAP
TRENCH 2
CLAY CAP
ZONE 1
ZONE 2
MW-11A (2111.98')
MW-11B (2112.18')
MW-11B
PACKER TEST
RQD
1.2 x 10^-3 cm/s
1.2 x 10^-3 cm/s
6%
32%
DRY
TRENCH 3
CLAY CAP
MANMADE SWALE 1 FT. DEEP 6 FT. WIDE
MANMADE SWALE
SEEP
OVERBURDEN
MW-10A (2063.04')
MW-10B (2062.70')
MW-10B
RQD
0%
0%
20%
4.7 x 10^-4 cm/s (SLUG)
LEGEND
MW-11B (2112.18') — WELL NUMBER — SURFACE ELEVATION (FT. MSL)
SCREENED INTERVAL
7/12/90 WATER LEVEL
1.3 x 10^-5 cm/s — K VALUE FROM SLUG TEST
RQD 0% 28% — ROCK QUALITY DESIGNATION (%) PER CORE SECTION
1.3 x 10^-5 cm/s — PACKER TEST INTERVAL AND K VALUE DETERMINED FROM PACKER TEST
ZONE 1 - FRACTURED ROCK
RQD VALUES-<30%
K VALUES- 7 x 10^-4 cm/s
BASED ON PACKER TESTING
ZONE 2 - FRACTURED ROCK
RQD VALUES- >30%
K VALUES- 2 x 10^-5 cm/s
BASED ON PACKER TESTING
INFERRED CLAY CAP CONTACT
INFERRED HYDROLOGIC CONTACT
INFERRED REGIONAL POTENTIOMETRIC SURFACE
NOTES:
1. GROUND SURFACE TOPOGRAPHY FROM D. MICHAEL CANADA SURVEY 6/27/90
2. BASE ELEVATION OF TRENCHES ARE ESTIMATED.
3. CONTACTS ARE ESTIMATED.
4. SEE FIGURE 2 FOR PLAN VIEW OF CROSS-SECTION.
HORIZONTAL SCALE IN FEET
0 50 100 150 200
VERTICAL SCALE EXAGGERATED 5x
REVISIONS
DESCRIPTION BY DATE
1. REVISED CROSS SECTION ID. NNS 6/92
OLEAN/LANDFILL COVER/N Y
TITLE
HYDROGEOLOGIC CROSS SECTION F-F'
DRAWN EAH
CHECKED HSA
SCALE AS SHOWN
DATE 8/7/91
JOB NO. 913-9001
DWG NO. 19
FIGURE 3
Golder Associates Buffalo, New York
FILE NO. 913-9001