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SOMERSET RAILROAD PROJECT

HYDROGEOLOGIC STUDY
DANIELEWICZ ROUTE
STATION 51 + 810 TO 52 + 330

FEBRUARY 1982

BECHTEL ASSOCIATES PROFESSIONAL CORPORATION

ATTACHMENT 7.2-1

SOMERSET RAILROAD CORPORATION

HYDROGEOLOGIC STUDY

DANIELEWICZ ROUTE

Station 51+810 to 52+330

BECHTEL CIVIL & MINERALS, INC.

JOB NO. 14818

FEBRUARY 1982

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EXECUTIVE SUMMARY

The hydrogeologic study of the Danielewicz Route from Station 51+810 to 52+330 authorized September 15, 1981, in letter BNE-142, has as its objectives the determination of ground water flow direction relative to the proposed railroad cut through this area, and, based upon chemical indicators, the possibility of movement of known landfill constituents into the ground water intercepted by the proposed railroad cut. The study utilized ground water monitoring wells in concert with the analysis of selected chemical parameters to fulfill these objectives.

Analysis of ground water level data indicate that flows are generally east to west within the rock strata intercepted by the railroad cut. Due to the direction of ground water flow and the relative elevations of the Van De Mark Landfill and the railroad, the proposed cut should not receive any ground water from the Van De Mark Landfill which lies to the west. Chemical analyses of ground water samples from the response tested and bailed wells utilizing parameters indicative of inputs from the Van De Mark Landfill confirm this conclusion.

The study area was explored to a maximum depth of 109 feet, the approximate elevation of Eighteenmile Creek. Four relatively isolated zones of ground water were found, each occurring at different depths. The upper two zones consist of a shallow ground water zone (Zone 1) found in the area of the Norton Landfill to the east of the railroad cut, and a somewhat deeper zone (Zone 2) which occurs along the contact between the Grimsby and Power Glen Formations. The two lower zones found along the contacts between the Power Glen and Whirlpool Formations (Zone 3) and the Whirlpool and Queenston Formations (Zone 4) will not be intercepted by the cut.

The railroad cut will occur within Zone 2 rock strata near the Grimsby-Power Glen Formation contact. However, since this rock has a low to negligible permeability, the quantity of Zone 2 ground water reaching the

cut should be very small. Zone 1 water may not reach the cut due to the intervening Zone 2 rock. Initial chemical analyses of Zone 1 ground water from the unpurged wells indicated levels of iron, grease, and oil which, for reference purposes only, would exceed United States Environmental Protection Agency (EPA) industrial discharge regulations. Subsequent chemical analyses and samples following purging of the wells indicated that grease and oil levels were within the recommended limits.

Bechtel purged the observation wells in early November in preparation for a more detailed round of chemical analyses conducted after November 15 by Bechtel and others. The resampling and reanalysis conducted for Bechtel by RECRA Research, Inc. showed a substantial reduction in the oil and grease levels from the Zone 1 wells to below the EPA industrial discharge regulations.

SOMERSET RAILROAD CORPORATION
HYDROGEOLOGIC STUDY IN THE VICINITY
OF THE VAN DE MARK LANDFILL

1.0 INTRODUCTION

This report presents the results of the hydrogeologic investigation performed for the Somerset Railroad Corporation along the proposed Danielewicz Route from (approximately) Station 51+810 to 52+330 in the city of Lockport, New York (Figure 1). In this vicinity, the railroad grade descends to the north at a grade of approximately 1.6 percent. The descent from a bridge section crossing West Jackson Street and the Gulf requires a cut section between two landfills: the Van De Mark Landfill (VDM) on the west, and the Norton/McGonigle & Hilger (N/MH) Landfill on the east. The study was authorized pursuant to letter BNE-142 dated September 15, 1981, from Bechtel to New York State Electric and Gas Corporation.

Preliminary investigations performed during the Somerset Railroad alternative route selection analyses involved geologic field mapping and areal reconnaissance of the landfills and surrounding area. Concurrent with the field work was a search for existing data on the landfills from the files of owners and various public agencies.

The results of the preliminary investigation indicated that ground water levels in the area of the landfills could be at an elevation high enough to be intercepted by the cut between the two landfills (Figure 2). Sufficient data was not available, however, to determine the ground water flow direction nor the quality of the water which may be emanating from the landfills. To provide data necessary to evaluate the ground water levels, flow direction, and chemistry, 22 observation wells were installed. In-hole permeability testing was performed, water levels obtained and samples collected for chemical analysis. On the basis of these studies, an evaluation of the local ground water regime and a prediction of its interaction with the proposed railroad cut are presented.

2.0 CONCLUSIONS

Based upon data obtained through November 1981 the following observations are made:

a. The permeability of the rock that will be exposed in the proposed cut is low to negligible (Section 7.0).

b. Ground water occurs in relatively isolated zones in the rock and there is little to no vertical movement between zones. Only the upper two zones encountered may be affected by the proposed cut. The first zone is ground water encountered in the Norton Landfill, and the second zone is ground water present along the contact between the Grimsby and Power Glen Formations.

c. Ground water in Zone 2 moves westerly, derived from the east. The proposed cut for the railroad will intercept that flow but the quantity discharging to the cut will be small.

d. The potential for ground water in Zone 2 to move from the vicinity of the Van De Mark Landfill into the railroad cut, a reversal of present flow direction, is determined to be negligible.

e. Ground water encountered in the Norton Landfill is identified as Zone 1 and may or may not reach the cut.

f. Comparison of the chloride concentrations measured in ground water from the Zone 2 wells with similar chemical analyses conducted by the Van De Mark Chemical Corporation at its own landfill monitoring wells provides further indication that ground water from the Van De Mark Landfill is not moving in the direction of the proposed railroad right-of-way (Section 8.2.1).

g. Ground water that may move into the railroad cut from the east is expected to have a chemical quality similar to that found in the Zone 1 and 2 wells (Section 8.2.2).

h. Initial sampling of one of the Zone 1 wells (D-70) installed in the Norton Landfill had grease and oil levels which exceeded United States Environmental Protection Agency (EPA) regulations for industrial discharges (30 ppm). The initial high reading is believed to be derived from drilling activities. Subsequent sampling and analyses of the Zone 1 and 2 wells in mid-November, following well development and purging, revealed that the oil and grease levels in the Zone 1 wells were substantially below the EPA industrial discharge regulations. Well D-69, which is 75 feet westerly from well D-70, did not show significant levels of these two chemical parameters with regard to the EPA regulations in either round of sampling. Water moving from Zone 1 into the railroad cut may in time demonstrate a quality approaching that of well D-70 (Section 8.2.2).

3.0 LANDFILL DESCRIPTION

The following descriptions of the two landfills and general methods of the disposal operations are based on information contained in the files of the New York State Department of Environmental Conservation (DEC) and the Niagara County Department of Health, and from results of Bechtel field investigations.

3.1 Van De Mark Landfill

The VDM Landfill (Figure 2) contains chemical waste by-products from the Van De Mark Chemical Company of Lockport, New York. The landfill is in a former open pit quarry excavated in sandstone and limestone; the area is approximately two acres. It is located on a plateau bounded on the west and south sides by slopes descending to Eighteenmile Creek. Relief in the area is about 80 feet from Eighteenmile Creek to the relatively level area of the landfill. Access to the landfill is gained from the east along Mill Street located to the north of the landfill. Site access is controlled by a locked gate at Mill Street and another locked gate at the entrance to the landfill.

At its closest point, the landfill is approximately 125 feet west of the centerline of the proposed cut section. The elevation of the landfill is approximately 440 feet msl.

According to the Van De Mark Chemical Company's landfill application to DEC (1977), the method of disposal of wastes within the landfill consists of the excavation of a 7-foot-deep by 12-foot-wide trench. The trench bottom is then lined with fine crushed limestone for the treatment of waste and 55 gallon drums of waste are placed on top of the limestone. The space between the drums is backfilled with fine crushed limestone, the drums are punctured, sacks of limestone are placed on top of the drums, and the trench is backfilled to the original grade.

According to reports in the files of DEC, the waste material consists of 30 to 70 percent hexachlorodisiloxane, 10 to 50 percent silicon tetrachloride, and 5 to 30 percent carbon and silicon carbide. The hexachlorodisiloxane and silicon tetrachloride decompose into sand (silicon dioxide) and hydrochloric acid. Carbon and silicon carbide remain unchanged. The hydrochloric acid reacts with the limestone forming a neutral chloride salt. The residue is buried in drums; the owner reports that in 4 to 8 months the only visible remains are part of the drum rings used to seal the open head drum tops. According to the Van De Mark Chemical Company's landfill application to DEC, the entire waste mass will eventually become a sand pile with some salt content.

Presently, the active sections of the waste area are located within the southern one-third of the landfill (Figure 2). Prior to 1977, untreated waste was placed on the western portion of the landfill and allowed to decompose without the addition of limestone. DEC has given this landfill a code identification of "E" which indicates a closed controlled landfill in which monitoring is required.

3.2 Norton/McGonigle & Hilger Landfill

The Norton Landfill is situated approximately 400 feet east of the VDM Landfill, as shown on Figure 2. It is overlain in part by the McGonigle & Hilger Landfill. The areal extent of the Norton Landfill is unknown. The composite of these two landfills occupies about 4 to 5 acres. The area of the landfills is bounded on the north by Mill Street and on the south by a cliff leading down to Eighteenmile Creek. The east and southeast boundaries are formed by various manufacturing buildings. The landfill is about 110 feet above Eighteenmile Creek. Access to the landfill is gained from the east along Mill Street. The western boundary of this landfill extends to within approximately 60 feet of the centerline of the proposed railroad cut. The elevation of the landfill is about 473 feet msl. Depending on the final configuration of the cut in this vicinity, the western boundary of the Norton Landfill could extend to within 10 feet of the upper portions of the proposed railroad cut.

The Norton Landfill was used for the storage and recycling of thermoset plastic castings manufactured by Norton Laboratories, Inc., a facility located at the northwest intersection of North Transit Road and Mill Street but which is no longer in operation. Pieces of castings were noted in samples obtained from exploration holes, and during a reconnaissance of the area.

According to the DEC reports, waste lubricating oil in the amount of about 250 gallons/year was also stored there for recycling. Some documented spillage of the waste oil was reported. The period in which this occurred is unknown.

A portion of the site is now used by the McGonigle & Hilger Roofing Company for the disposal of roofing and general construction debris resulting from structural demolition. Asphalt, insulating material, tar paper, and general construction rubble are scattered over the site and a portion of the slope leading down to Eighteenmile Creek. Waste materials from the McGonigle & Hilger operations are deposited on the ground surface and spread periodically, probably by loader or bulldozer. A cover of natural soil material has been placed on top of some of the waste deposits. In the northern part of the area this waste is being spread over the Norton Landfill to a depth of about 6 to 8 feet. The western boundary of the McGonigle & Hilger Landfill is located 200 to 270 feet from the centerline of the proposed railroad cut.

DEC has given the Norton/McGonigle & Hilger Landfill a code identification of "F" which indicates that there is no toxic hazard.

4.0 EXISTING LANDFILL MONITORING

The only site investigation of the Norton Landfill complex is cited in the brief report from the DEC dated April 16, 1980. The coding assigned by DEC does not require the monitoring of ground water.

The Van De Mark Chemical Company documents the construction of four observation wells within the landfill boundary in their application to the DEC (1977). The wells were constructed in 1977 and are located within the disposal area of the landfill. Two additional wells were constructed in 1980 and are located at the foot of the escarpment adjacent to Eighteenmile Creek. Well locations are shown on Figures 2 and 3 and tabulated data regarding the wells is presented in Table 1.

Construction of each well is similar. On completion of drilling to the prescribed depth, an assembly of 2 to 5 feet of 1-inch-diameter well screen and 1-inch-diameter PVC riser casing was placed in the hole. The wells were sand-packed above the screen and a bentonite seal installed. However, the location of the seal is reported only for wells VDM-5 and 6. A steel protective pipe and a locking cap complete the surface installation.

Wells VDM-5 and 6 were sand-packed to within 1 foot of the top of rock surface, 4.4 feet and 5 feet below ground surface, respectively, and a 6-inch bentonite seal was placed prior to grouting to ground surface. Wells VDM-1 and 2 are shallow (less than 25 feet deep), penetrating about 14 feet into the Power Glen Formation to an elevation of about 422 feet msl. Wells VDM-3 and 4 are within the landfill and are 90 feet deep. They are completed in the Queenston Formation (see geology discussion, Section 6.0) to about elevation 350 feet msl.

Wells VDM-5 and 6 near Eighteenmile Creek were drilled to elevations of about 345 feet msl, and are also within the Queenston Formation.

5.0 SUBSURFACE INVESTIGATION AND OBSERVATION WELL INSTALLATION PROGRAM

The subsurface investigation began with the arrival of the first drilling rig at the site on October 13, 1981, and was completed on October 31, 1981. Eventually five drilling rigs were moved on site and work was performed 24 hours a day from October 23 through October 30, 1981. All drilling and well installation was performed by Empire Soils Investigations, Inc., Orchard Park, New York, under the technical direction of Bechtel geologists.

The investigation consisted of drilling 22 borings at the locations shown on Figure 3. Boring locations were chosen in order to provide a sufficient number of monitoring points to establish ground water elevation(s) and gradient(s). From this information the component of ground water flow into the proposed railroad cut from the east and west could be established. The holes were drilled to selected depths and completed as ground water observation wells. Borings were advanced by rotary coring with either standard or wire-line split inner-tube core barrels. Coring of the rock was performed in order to adequately determine the rock characteristics of the formations penetrated and to assist in the determination of the placement of the well screen and sand pack intervals. All holes were cored with NX and NQ side discharge diamond impregnated core bits. Water from the City of Lockport water system was used as drilling fluid in all holes to minimize and control the amount of unknown substances introduced into the hydrogeologic system.

At each of six locations between the two landfill areas, nests of three holes were drilled to shallow, intermediate, and deep levels, at which ground water observation wells were installed. A nest of two holes, intermediate and shallow, was drilled at a seventh location. In addition, two shallow holes were drilled within the Norton Landfill. The deepest hole at each location was pressure tested to determine the permeability of the fractures in the vicinity. Data on the well nests are summarized in Table 1 and locations are shown on Figure 3. Boring logs of the drill holes are presented in Appendix A.

After coring, each hole was reamed with a rock roller bit to a nominal diameter of 6 inches. This was done to facilitate the installation of a sand pack around the screen and riser pipe for the ground water observation wells.

Ground water observation wells are constructed of 2-inch flush coupled PVC pipe. Each well is completed with 10 to 40 feet of screen having machined horizontal slots measuring 0.010 inch in width. Riser pipe made of Schedule 40 or Schedule 80 PVC pipe is attached to the screen and extended about 2 feet above ground surface. A fine to medium sand designated as 2Q by the supplier, Pennsylvania Glass Sand, Inc., is placed around the screen and a minimum of 2 feet above the screen. The grain size analysis of the sand is presented in Figure 4. A minimum of 2 feet of bentonite pellets is placed on top of the sand to ensure that the appropriate zone is sealed. The annular space above the seal is grouted to the surface with portland cement grout and a steel protective casing with locking cap is installed. After installation, each well is response tested to ensure that the screen and sand pack are not clogged and allow the free passage of ground water. A typical well installation is presented in Figure 5. The selection of the monitored intervals has as its basis the geologic reconnaissance of the area which suggested that ground water movement occurs at or near the formation contacts. In general, the intervals screened and sampled are the fractured and more permeable zones in the following intervals: (1) from 15 feet below the base of the proposed cut section to approximately 5 feet above the Grimsby/Power Glen contact, Zone 2; (2) the contact between the Power Glen and Whirlpool Formations, Zone 3; (3) the contact between the Whirlpool and Queenston Formations, Zone 4. The placement of screen within definite zones allows the determination of interconnection between the various ground water zones and the amount of artesian confinement, if any, which may exist within the upper portions of the Queenston Formation.

Two additional observation wells were constructed to monitor a fourth interval (Zone 1) to determine water levels in the Norton Landfill. This

interval was added to the program because ground water was encountered while placing surface casing for nest 7. Data for these wells are also summarized in Table 2. Ground Water Observation Well Reports for each well are presented in Appendix B.

5.1 Permeability Tests

The deepest hole at each location was pressure tested to determine permeability. Pressure testing was performed in other holes at pre-selected intervals as directed by the geologist. Constant-head, in-situ permeability tests were performed in selected drilled holes in accordance with Designation E-18 of the U.S.B.R. Earth Manual (Ref. 7).

Pneumatic packers were used to seal off intervals of the borehole for testing. The test was begun by adding water through a metering system to maintain a constant pressure head. From recorded pressure, rate of flow, and time data, a permeability was calculated for the interval tested. Prior to testing and lowering of the test equipment, the borehole was surged and washed with clear water to remove cuttings from pores and joints of the rock. Table 5 summarizes the results of the tests.

5.2 Well Purging

Purging of the monitoring wells was conducted from November 9, 1981, through November 17, 1981, to acquire a representative sample of ground water for chemical analysis, and to reduce the amount of water that may have been affected by drilling and well construction. Secondary to purging, recovery rates for the purged wells were recorded and values of permeability were calculated from the data. The two methods used for well purging were nitrogen gas airlifting and hand bailing. Tables 6 and 7 summarize the well purging results.

5.2.1 Nitrogen Purging

The majority of the observation wells were purged using an air lift type apparatus utilizing bottled nitrogen gas rather than compressed air. Dry

nitrogen gas was used for purging due to its essentially inert properties and lack of volatiles, such as water vapor, which could alter the well water chemistry. The nitrogen gas was contained in 224 cubic feet capacity bottles, purchased from a local Airco distributor.

The apparatus consisted of 1/4- to 3/8-inch-diameter gas line with one end connected to the nitrogen bottle through a two-stage pressure regulator. The gas line extended along the outside of the water discharge hose with the other end inserted approximately 1 foot up inside the bottom of the discharge hose. The discharge hose was 1/2 or 3/4-inch black polyethylene pipe. The discharge and gas lines were taped together and inserted down the 2-inch PVC pipe of the observation well, keeping the lower end of the lines about 1 foot off the bottom of the well. The water was discharged into either calibrated 5-gallon plastic buckets or 20-gallon galvanized garbage containers.

5.2.2 Bailing

Hand bailing of six observation wells was required (D54, 55, 57, 60, 62, 68A). These wells contained less than 10 feet of water, which made the air lifting apparatus ineffective and inefficient due to lack of submergence.

Bailing was performed using a PVC bailer attached to a polypropylene rope. The wells could generally be bailed dry within a few minutes of bailing, therefore, the wells were allowed to recover and then rebailed in order to retrieve a sufficient well volume.

5.2.3 Volumes Purged

A minimum of two well volumes of water was purged from all wells. The majority of the wells were purged to over 4 well volumes. Calculation of well volume was based on adding the water volume within the PVC pipe and the pore volume in the sand pack between the outside of the PVC and the

wall of the drill hole. In calculating the exterior water volume, a 25-percent porosity of the sand pack was assumed. If the water level was below the bentonite seal capping the sand pack, then the calculated volume was only for the saturated column.

Observation wells D51, 52, 53, 55, 57, 69, and 70 were designated as priority holes requiring a minimum of 2 well volumes from purging. Wells which could be bailed dry were also purged to a minimum of 2 well volumes. Two well volumes for this condition are twice the requirement specified by the Environmental Protection Agency (EPA, 1977). The remainder of the observation wells were purged at a minimum of 4 well volumes as specified by the EPA (EPA, 1977). Observation wells D54, 55, 64, 66, 68A, 69, and 70 had approximately 10 additional gallons of water purged from them by Woodward-Clyde Consultants while in the process of obtaining water samples. These additional volumes have been considered in the calculation of well volumes purged.

6.0 GEOLOGY

The bluff on which the study area is situated is near the base of the Niagara escarpment, a major geomorphic feature that extends in an east-west direction across northern Niagara County.

The bedrock consists of nearly flat-lying (horizontal) sedimentary beds with a thin cover of unconsolidated glacial deposits, soil, and talus. The glacial deposits consist of unsorted fine to coarse sand with some traces of fine gravel, silt, and clay. The materials are commonly stiff and very compact.

The formations underlying the bluff are well-exposed in the road cut along West Jackson Street directly south of the landfills. These formations include, from oldest to youngest, the Queenston Formation of Ordovician age, and the Whirlpool, Power Glen, and Grimsby Formations of Silurian age. A stratigraphic column outlining the characteristics of all formations of the Niagara escarpment in the vicinity is presented in Table 3.

Bedding generally strikes N65W to east/west and dips less than one degree to the south. Considerable variation in orientation of bedding was observed in the cross-bedded sandstones of the Silurian formations. A geologic map prepared from field investigations and boring logs is presented in Figure 6. Geologic cross sections representing interpretation of drill hole data are presented in Figure 7, sheets 1 through 5.

The Queenston Formation, the lowermost formation exposed in the area, consists of reddish-brown shale with thin interbeds of greenish-gray shale and siltstone. Approximately 23 feet of the Queenston Formation is exposed in the West Jackson Street roadcut and 43.9 feet of the Formation was penetrated in drill hole D-56. Total thickness of the formation is reported to be 1200 feet. The elevation of the top of the Queenston is 397 feet msl at West Jackson Street and 404 feet msl in the vicinity of Mill Street.

The Whirlpool Formation is a gray to white sandstone. This unit is very hard and fine to medium grained with thin bands of gray shale. In the study area, the Whirlpool Formation outcrops are approximately 11 feet thick and the top of the unit at the West Jackson Street roadcut is at elevation 408 feet. Within the study area total thickness of the Whirlpool Formation as determined from rock cores ranged from 9.4 feet in D-63A to 14.6 feet in D-67.

The Power Glen Formation is a greenish-gray shale and siltstone interbedded with limestone, dolomite, and calcareous sandstone. Total thickness at West Jackson Street is not known due to a talus covering on the slope. Total thickness of the formation penetrated in the core holes ranged from 18.5 feet in D-67 to 28.6 feet in D-63A.

The Grimsby Formation includes a lower white to pale-green fine-grained sandstone and an upper reddish-brown sandstone with interbedded siltstone and shale.

The jointing characteristics of the various formations are shown in Table 4. Jointing in exposures of bedrock is uniform in orientation and character. Observations from rock core indicate the joints tend to be more open to the east near the bluff. The frequency of jointing ranges from 3 to 6 foot spacing. Three near-vertical joint sets present have orientations of N45W to N70W, N55E to N75E, and N10E to N30E. In addition, horizontal bedding joints are present. The near-vertical joints dip predominantly from 85° to vertically. Joint openings measured at outcrops near the Van De Mark Landfill ranged from closed to as much as 2 inches.

7.0 GROUND WATER OCCURRENCE

The rocks underlying the study area appear to have little to no primary (porous) permeability. The occurrence and movement of ground water is in the fractures and joints of the rocks. The core from the exploratory holes and the permeability testing indicate that more open jointing tends to occur near the contacts between formations. However, none of the zones tested are even of moderate permeability (Table 5). More open and frequent jointing appears to be present within the Whirlpool and Power Glen Formations near the cliff adjacent to West Jackson Street, which indicates that stress relief has occurred adjacent to this feature.

Water levels have been measured in the observation wells constructed during this program and the existing Van De Mark Landfill wells. They show that large differences in levels are present between ground water zones. To illustrate those relationships, water level contour maps shown on Figures 8 through 10, hydrographs shown on Figure 11 (sheets 1 through 8), and sections shown on Figure 7 (sheets 1 through 5) have been prepared. In addition, water levels recorded in the Van De Mark wells are shown on Figure 12. These data show that at least four zones of ground water are present between the ground surface and the Queenston Formation.

The first zone monitored (Zone 1) is ground water present in the area of the Norton Landfill. Only observation wells D-69 and D-70 are monitoring this zone. As illustrated by the section shown on Figure 7, sheet 5, the water level in Zone 1 is more than 20 feet higher than the level in Zone 2, the Grimsby/Power Glen contact. Considering the large difference in head and the low permeability of the formations underlying the landfill, this indicates little to no vertical movement of ground water. It can be seen on the section that ground water in this zone may extend to the cut. The upper portions of the cut will be within 10 feet of the backfill contained in the Norton Landfill.

The second zone monitored (Zone 2) is ground water at the Grimsby/Power Glen contact. Section D-D' (Figure 7, sheet 4) has been constructed along the proposed cut alignment. It can be seen on the section that

ground water of Zone 2 will be intercepted by the cut and that ground water zones below Zone 2 will not be encountered by the cut. Further evidence is given by Sections A-A', B-B', C-C' (Figure 7, sheets 1 through 3).

The apparent direction of ground water movement in Zone 2 is to the west. Thus, the proposed cut would intercept flow in Zone 2 moving from the east or in the vicinity of the Norton Landfill and prevent it from continuing beneath the Van De Mark Landfill. Because of this interception there will be a small reversal of gradient along the western embankment between the cut and the Van De Mark Landfill. Because of the lack of recharge that would be available west of the cut and the small gradient that would develop, flow in Zone 2 from beneath the Van De Mark Landfill to the cut should not occur.

The third and fourth zones monitored (Zone 3 and Zone 4) are the ground waters at the Power Glen/Whirlpool and Whirlpool/Queenston contacts, respectively. The apparent direction of ground water movement in these zones is to the south. Water in these zones is below the base of the cut, therefore, Zones 3 and 4 will not be encountered by the cut.

The permeability measurements made in the Grimsby and Power Glen Formations range from 2.1×10^{-3} to 1.27×10^{-6} cm/sec., and the four measurements beneath the Norton Landfill taken in D-67 were less than 5.1×10^{-5} cm/sec. These measurements are supported by the permeability measurements made from the well purging data. The higher permeabilities measured were from drill holes close to the bluff, for example, D-53 and D-55. This probably reflects the condition of the jointing. Near the bluff, the rock is more jointed and permeable. Away from the bluff and with depth, joints become less frequent and tight. It is probable that the effective permeability of Zone 2 along the shortest path between the Norton Landfill and the proposed cut is less than 10^{-5} cm/sec. Along other possible paths closer to the bluff, the effective permeability may

be as high as 10^{-4} cm/sec. Considering this range of permeability and the available hydraulic gradient indicated by the water level contours of Figure 8, the rate of discharge to the proposed cut that can be expected will be very small.

The potential for inflow to the proposed cut from Zone 1 cannot be estimated with the available data. The extent of Zone 1 and the permeability of the materials are not well-defined.

8.0 GROUND WATER QUALITY

The centerline of the proposed Danielewicz right-of-way passes through a cut approximately 125 feet (at its closest point) east of the Van De Mark Chemical Company Landfill and approximately 60 feet (at its closest point) west of the Norton Landfill. A description of these landfills is presented in Section 3.0.

The base of the cut is below existing water table elevations. For this reason, a ground water quality program was initiated to provide additional indicators of the movement of ground water into the railroad cut from the landfill areas to the east and west.

8.1 Sampling and Analytical Procedures

Based on an investigation of the existing New York State Department of Environmental Conservation records, Niagara County Health Department files, and other investigations of the history of the two landfills, a list of chemical parameters to be determined in the ground water was established. The list consisted of eight chemical parameters (Tables 8 through 10) of which chloride was expected to be the prime indicator of chemical contribution to ground water from the Van De Mark Landfill and oil and grease from the Norton Landfill. Twenty-two wells were installed at the locations and depths shown in Figure 3. The details of well construction are given in Figure 5 and Section 5.0.

Sampling and chemical analyses were performed by RECRA Research Incorporated of Tonawanda, New York. Two rounds of sampling and analyses were undertaken in November, 1981. The first round of sampling occurred on November 2 and 3, following completion of drilling and response testing of the wells. Each of the Zone 1, 2, 3, and 4 wells was sampled at that time, with samples split in the field to facilitate duplicate analyses. Following receipt of the first round analytical results, it was determined that the Zone 1 and 2 wells would be resampled. These wells were then purged according to EPA guidelines in preparation for the second round of sampling and analyses (Section 5.2).

The second round samples were withdrawn from the purged Zone 1 and 2 wells in mid-November. All sampling was accomplished using a steel pipe bailer, with a new bailer utilized to sample each well. Conductivity, pH, and temperature determinations were made in the field at the time of sampling. All other analyses were performed in RECRA Research, Incorporated's laboratory facilities in Tonawanda, New York. All laboratory analyses were performed in accordance with EPA methodologies. The results of the first round analyses are shown in Tables 8A, B, C, and D. Appendices C-1 and C-2 contain the laboratory data sheets from both the first and second round of analyses. The second round analyses included additional chemical parameters at the direction of Somerset Railroad Corporation.

8.2 Discussion of Results

8.2.1 Van De Mark Landfill

Tables 9 and 10 contain the most recent quarterly analyses of ground water samples taken from Van De Mark Chemical Company monitoring wells installed at that company's landfill as part of their routine landfill monitoring program. Locations of the wells are shown on Figures 2 and 3 and marked VDM 1, 2, 3, and 4. They are presented here for comparison with analyses taken in the area of the proposed railroad right-of-way, to the east of the landfill.

Tables 8A, B, C, and D show results of the first round analyses from the 22 unpurged wells installed at the different elevations necessary to allow sampling of each of the water bearing zones in the area independently.

- Table 8-A shows results from the Grimsby-Power Glen interval (Zone 2).
- Table 8-B shows results from the Power Glen-Whirlpool interval (Zone 3).

- Table 8-C shows results from the Whirlpool-Queenston interval (Zone 4).

- Table 8-D shows results from shallow wells at the topsoil - Grimsby (Zone 1).

The laboratory data sheets for the first round analyses are found in Appendix C-1, with the second round analyses in Appendix C-2. The base of the railroad cut as it passes near the Van De Mark Landfill varies from approximately elevations 436 feet msl to 442 feet msl. If ground water is intercepted in this area, it is expected to be of a quality similar to that of Zone 2.

A comparison of the Zone 2 chloride concentrations from the first and second rounds of sampling (Table 8A and Appendices C-1 and C-2) with those taken from the Van De Mark monitoring wells shown in Tables 7 and 8 provides further indication that no movement of ground water from the Van De Mark Landfill towards the railroad right-of-way occurs, consequently, no encroachment of ground water into the cut from this landfill is expected.

8.2.2 Norton Landfill

The Norton Landfill is described in Section 3.2 of this report. The edge of the proposed cut passes approximately 10 feet to the west of the landfill at its closest point. The elevation of the centerline at the base of the cut varies from approximately 431 feet msl at Mill Street to 442 feet msl at the bridge transition on the north side of the Gulf. Due to the proximity of the proposed railroad cut to Zones 1 and 2, illustrated in Figure 7, sheet 5, ground water intercepted by the cut in this area is expected to be of a chemical quality similar to that found in Zones 1 and 2. Wells D-69 and D-70 were installed in the landfill with screening at the overburden/Grimsby interface (Zone 1). The first round of chemical analyses (Table 8D) showed recoverable oil and grease concentrations (73

and 31 mg/1) from well D-70 which, as a means of comparison, exceeded EPA industrial discharge regulations (30 mg/1). Well D-69, 75 feet to the west of D-70, did not show similar levels of oil and grease. The second round of analyses following purging of the wells (Appendix C-2) showed a recoverable oil and grease concentration in the D-70 sample (7 mg/1) which was substantially less than the first round results, and below the EPA industrial discharge regulation. It is suspected that well D-70 may have been contaminated by the drill rig or other activity prior to initial sampling.

Following purging, an expanded program was undertaken by others to further define the quality of the Zone 1 and 2 ground water that may be intercepted by the railroad cut.

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TABLE 1

SUMMARY OF DATA ON VAN DE MARK
OBSERVATION WELLS

WELL NO.	SOUNDED DEPTH (FT)	DRILLED DEPTH (FT)	GROUND ELEVETATION AT WELL (FT. MSL)	ELEVATION BOTTOM OF OPEN AREAS (MSL)	FORMATION WELL COMPLETED IN	REMARKS
1	18.8	22	442.2	420.2	Power Glen	Response test calculations show permeability of 2.48 x 10^{-6} cm/sec. Water level elevations range from 434.5 ft. to 430.2 ft. from 4-12-81 to 11-20-81.
2	23.0	23.0	441.7	418.7	Power Glen	No response test performed, blockage in casing. Since 4-13-81 water levels have fluctuated from 427.8 to 430.4.
3	84.0	90.0	442.18	352.18	Queenston	Well responded to test, recovery levels too slow to calculate permeability. Assume permeability is very low. Since 4-13-81 water levels have fluctuated between 373.7 and 362.1 ft. msl.
4	71.4	90.0	437.66	347.66	Queenston	Well responded to test, no calculation of permeability done. Well responded too quickly to take measurements. Water level elevations consistently recorded between 405.5 and 406.4 ft. msl.
5	18.7	20	365.6	345.6	Queenston	Well responded to test, no calculations done. Response of well too slow. Since 9-1-81 water levels have fluctuated from 347 ft. to 352 ft. msl.
6	16.9	20	365.6	345.6	Queenston	No response test performed, not enough water to bail. Since 9-1-81 water levels have fluctuated from 349 ft. to 353 ft. msl.

For location of wells see Figure 3

TABLE 2

SOMERSET RAILROAD
VAN DE MARK/NORTON McGONIGLE HILGER LANDFILL
OBSERVATION WELL DATA

BORING NO.	WELL NEST NO.	GROUND SURFACE ELEVATION	ELEV. OF BOTTOM WELL	RISER ELEV.	SCREEN INTERVAL (EL.)	FORMATION SCREENED
D-49	1	459.8	408.5	461.90	409.5 - 418.8	Power Glen/Whirlpool
D-50	1	460.8	369.8	462.69	373.2 - 410.3	Whirlpool/Queenston
D-51	1	459.5	418.5	461.77	419.5 - 444.8	Grimsby/Power Glen
D-52	2	466.5	380.5	468.69	381.5 - 405.5	Whirlpool/Queenston
D-53	2	467.4	421.8	469.18	422.8 - 442.3	Grimsby/Power Glen
D-54	2	466.4	408.4	468.46	409.4 - 424.3	Power Glen/Whirlpool
D-55	3	467.4	422.4	469.36	423.3 - 439.4	Grimsby/Power Glen
D-56	3	467.3	360.3	469.44	362.3 - 407.5	Whirlpool/Queenston
D-57	3	467.0	407.5	469.27	408.5 - 426.2	Power Glen/Whirlpool
D-58	4	465.7	414.5	467.68	415.6 - 440.7	Grimsby/Power Glen
D-59	4	465.0	365.0	467.25	366.0 - 409.1	Whirlpool/Queenston
D-60	4	465.7	407.7	467.75	408.9 - 422.7	Power Glen/Whirlpool
D-61	5	467.4	421.5	469.31	422.5 - 441.4	Grimsby/Power Glen
D-62	5	469.0	409.9	471.04	410.9 - 422.7	Power Glen/Whirlpool
D-63A	6	469.6	368.6	471.63	369.4 - 404.6	Whirlpool/Queenston

TABLE 2 (Continued)

BORING NO.	WELL NEST NO.	GROUND SURFACE ELEVATION	ELEV. OF BOTTOM WELL	RISER ELEV.	SCREEN INTERVAL (EL.)	FORMATION SCREENED
D-64	6	469.1	421.4	471.37	422.4 - 437.1	Grimsby/Power Glen
D-65	6	469.1	406.1	471.33	407.1 - 422.1	Power Glen/Whirlpool
D-66	7	464.4	426.4	466.33	427.4 - 440.4	Grimsby/Power Glen
D-67	7	462.9	362.9	465.91	363.9 - 408.9	Whirlpool/Queenston
D-68A	7	465.2	407.2	467.55	408.2 - 421.2	Power Glen/Whirlpool
D-69		464.4	447.0	466.11	447.2 - 458.4	Grimsby/Soil Landfill
D-70		466.3	446.9	468.10	447.2 - 458.3	Grimsby/Soil Landfill

TABLE 3

STRATIGRAPHIC COLUMN OF THE NIAGARA ESCARPMENT
ALONG THE DANIELEWICZ ROUTE

SYSTEM	SERIES	GROUP	FORMATION	MEMBER	THICKNESS	DESCRIPTION
Silurian	Niagaran	Lockport	Lockport	Goat Island	8'+	Limestone: Medium to dark gray, thin to medium-bedded, medium hard, coarsely crystalline, fresh to slightly weathered. Abundant fossils. Occasional thin dolomite interbeds. Frequent irregular wavy bedding planes.
				Gasport	5'	Dolomite: Medium brown to medium gray, medium-bedded to massive, hard, fine to very fine crystalline, fresh to slightly weathered.
				Decew	4-5'	Dolomite: Medium brown to dark gray, thin-bedded, medium hard, very fine crystalline, slightly to moderately weathered. Occasional shell lenses, faint lamination and pitted surfaces. Gradational contact with Rochester formation.
		Clinton	Rochester		~70'	Shale: Dolomitic, dark gray, thin-bedded fissile, medium hard, microcrystalline, severely weathered. Occasional thin dolomite and limestone interbeds. Seldom more than 5' exposed before completely weathered to clay. Clay minerals: illite, chlorite, kaolinite, occasional montmorillonite.
			Irondequoit	Unnamed	12'	Limestone: Medium brown to medium gray with pinkish tint, thin to medium-bedded, hard, coarsely crystalline, fresh to slightly weathered, fossiliferous. Pink crystals: Rhodochrosite?

TABLE 3 (Continued)

SYSTEM	SERIES	GROUP	FORMATION	MEMBER	THICKNESS	DESCRIPTION
Silurian	Niagaran	Clinton	Irondequoit	Rockaway	9.0'+	Limestone: Dark gray, hard, fine to coarsely crystalline, occasional shale partings. Fresh to severely weathered at shale partings.
			Reynales		1.0'	Lime Dolomite: Medium to dark gray, thin to medium-bedded, medium hard to hard, very fine to coarsely crystalline, slightly to severely weathered, contorted beds and occasional clay filled solution cavities.
			Neahga		1.0'-1.5'	Shale: Dark gray, thin-bedded, very soft, fresh.
		Medina	Thorold		2.0'	Mudstone: Light green, medium soft, calcareous, fresh.
			Grimsby	Zone B	15.0'	Sandstone: Red to green, medium-bedded to massive, medium hard, fine grained, fresh to severely weathered. Occasional shale partings and siltstone and claystone interbeds.
				Zone A	~60'	Sandstone, Siltstone with interbedded Shale: Dark red brown to light green to white sandstone and siltstone with red and green shale interbeds. Sandstone/Siltstone: Thin to medium-bedded, very fine to medium grained, medium hard to very hard, fresh, occasional green mottling, fossiliferous. Shale: Thin bedded to fissile, medium soft, moderately to severely weathered.

TABLE 3 (Continued)

SYSTEM	SERIES	GROUP	FORMATION	MEMBER	THICKNESS	DESCRIPTION
Silurian	Niagaran	Medina	Power Glen		27.0'	Shale: With interbedded Dolomite and calcareous Sandstone: 60% shale, 40% dolomite and sandstone. Shale: dark gray to green, thin-bedded to fissile, medium soft to soft, microcrystalline, severely weathered. Dolomite and Sandstone: dark gray to green thin-bedded, medium hard, fine-grained, fresh to moderately weathered. Sandstone is cross-bedded.
			Whirlpool		12.0'	Sandstone: White with black speckling (quartz and unknown black mineral), thin-bedded in upper 2', medium-bedded to massive in remainder, fine-grained, hard to very hard, fresh. Cross-bedded, ripple marks.
Ordovician	Cincinnatian	Richmond	Queenston		1200'+	Claystone: Dark reddish-brown with pale green mottling and occasional thin pale green claystone interbeds, medium soft to very soft, calcareous, fresh to completely weathered.

TABLE 4

JOINTING CHARACTERISTICS OF ROCKS
IN VDM LANDFILL AREA

FORMATION/ROCK TYPE	PREDOMINANT JOINT ORIENTATION OPEN SPACE (IN.)/SPACING		
Grimsby/Sandstone, Siltstone, Shale	N60W to E-W Closed* to 2"/3"-30"	N60 to 70E Closed to ¼"/6"-30"	N20 to 30E Closed to 2"/18"-24"
Power Glen/Sandstone, Siltstone, Shale, Limestone, Dolomite	N45 to 70W Tight**/3'-6'	N65 to 70W Tight/2'-6'	
Whirlpool/Sandstone, Ortho-quartzite	N55 to 70W Closed to 2"/2'	N70E Closed to 1"/2'-4'	
Queenston/Siltstone, Shale	N70W Closed /2'-6'	N55 to 75E Closed/2'-6'	N10 to 30E Closed/2'-4'

Note: Dip of joints consistently 85° to vertical measured from the horizontal.

* "Closed" describes open space ≤0.1 mm.
**"Tight" describes open space 0.1 mm to 1 mm.

TABLE 5

SOMERSET RAILROAD
PRESSURE TEST RESULTS

BORING NO.	ELEVATION INTERVAL TESTED (MSL)	PERMEABILITY CM/SEC	FORMATION
D-50	372.6 - 383.4	No Water Take*	Queenston
	382.9 - 393.4	No Water Take**	Queenston
	392.9 - 403.4	No Water Take**	Queenston
	402.9 - 413.4	No Water Take*	Whirlpool
	412.9 - 423.4	5.2×10^{-4}	Power Glen
	422.9 - 433.4	4.8×10^{-4}	Power Glen
	437.9 - 443.4	7.7×10^{-6}	Grimsby
D-52	379.0 - 389.5	No Water Take*	Queenston
	386.0 - 396.5	No Water Take*	Queenston
	396.0 - 406.5	2.0×10^{-5}	Queenston
	406.0 - 416.5	1.5×10^{-4}	Whirlpool
	416.0 - 426.5	2.1×10^{-6}	Power Glen
D-53	421.5 - 432.27	2.74×10^{-6}	Power Glen
	434.9 - 445.4	1.3×10^{-3}	Grimsby
D-55	423.4 - 433.9	1.7×10^{-4}	Power Glen
	436.2 - 441.2	2.1×10^{-3}	Grimsby
D-56	359.8 - 370.3	No Water Take*	Queenston
	366.8 - 377.3	4.8×10^{-7}	Queenston
	376.8 - 387.3	Test Invalid	Queenston
	386.8 - 397.3	1.0×10^{-2}	Queenston
	396.8 - 407.3	2.1×10^{-6}	Queenston
	406.8 - 417.3	1.5×10^{-4}	Whirlpool
	416.8 - 427.3	Test Invalid	Power Glen
	426.8 - 437.3	Test Invalid	Power Glen
D-59	368.6 - 379.1	1.8×10^{-4}	Queenston
	378.6 - 389.1	7.9×10^{-7}	Queenston
	388.6 - 399.1	No Water Take†	Queenston
	398.6 - 409.1	3.5×10^{-6}	Queenston
	408.6 - 419.1	4.4×10^{-6}	Whirlpool
	418.6 - 429.1	3.4×10^{-6}	Power Glen
	428.6 - 439.1	7.0×10^{-7}	Power Glen

TABLE 5 (Continued)

BORING NO.	ELEVATION INTERVAL TESTED (MSL)	PERMEABILITY CM/SEC	FORMATION
D-63A	372.25 - 381.75	No Water Take*	Queenston
	379.5 - 390.0	No Water Take*	Queenston
	389.5 - 400.0	No Water Take*	Queenston
	399.5 - 410.0	1.3×10^{-6}	Whirlpool
	409.5 - 420.0	7.3×10^{-5}	Power Glen
	419.5 - 430.0	1.3×10^{-6}	Power Glen
	429.5 - 440.0	1.3×10^{-5}	Power Glen
	439.5 - 450.0	4.3×10^{-4}	Grimsby
	449.5 - 460.0	2.3×10^{-4}	Grimsby
D-67	368.03 - 378.52	3.7×10^{-6}	Queenston
	378.02 - 388.52	3.7×10^{-6}	Queenston
	388.02 - 398.52	3.7×10^{-6}	Queenston
	398.02 - 408.52	3.7×10^{-6}	Whirlpool
	408.02 - 418.52	1.0×10^{-5}	Whirlpool
	418.02 - 428.52	5.1×10^{-5}	Power Glen
	428.02 - 438.52	3.7×10^{-6}	Power Glen
	438.02 - 448.52	1.27×10^{-6}	Grimsby

*Test performed at 10, 15, and 20 psi.
**Test performed at 10 and 15 psi.
†Test performed at 15, 20, and 25 psi.

TABLE 6

RESPONSE TEST RESULTS FROM WELL PURGING

BORING NO.	TEST INTERVAL	PERMEABILITY CM/SEC	REMARKS
D-49	409.5 - 420.1	2.07×10^{-5}	
D-50	373.2 - 410.3	1.21×10^{-5}	
D-51	419.5 - 440.3	9.1×10^{-6}	
D-52	381.5 - 405.5	5.8×10^{-6}	
D-53	422.8 - 441.6	2.4×10^{-4}	
D-54			insufficient recovery
D-55			insufficient recovery
D-56	362.2 - 407.5	2.9×10^{-7}	
D-57	408.5 - 412.1	1.4×10^{-4}	
D-58			dry
D-59	366.0 - 409.1	1.4×10^{-5}	
D-60			insufficient recovery
D-61	422.5 - 436.4	4.0×10^{-5}	
D-62	410.9 - 419.0	4.2×10^{-5}	
D-63	369.4 - 404.6	1.3×10^{-6}	
D-64	422.4 - 437.1	2.8×10^{-5}	
D-65			insufficient recovery
D-66	427.4 - 439.2	2.2×10^{-5}	
D-67	363.9 - 408.9	2.1×10^{-6}	
D-68	408.2 - 412.6	2.4×10^{-5}	
D-69	447.2 - 458.4	1.5×10^{-4}	
D-70	447.2 - 458.3	1.6×10^{-4}	

TABLE 7

WELL PURGING SUMMARY SHEET

BORING NO.	AMOUNT CALCULATED TO BE PURGED	AMOUNT ACTUALLY PURGED	WELL VOLUMES PURGED	DATE COMPLETED
D-49	25.4	27.4	4.3	11/16
D-50	74.2	73.0	4.0	11/18
D-51	19.8	35.0	3.6	11/11
D-52	24.8	38.5	3.1	11/11
D-53	18.3	32.5	3.3	11/11
D-54	3.9	4.75 +10	7.5	11/18
D-55	9.7	5 +10	3.1	11/12
D-56	90.1	86.1	3.95	11/17
D-57	4.05	4	2.0	11/14
D-58	--	--	--	--
D-59	83.5	88.3	4.2	11/18
D-60	4.3	10.0	5.0	11/17
D-61	28.1	33.5	4.8	11/13
D-62	14.4	10.25	2.9	11/17
D-63A	70.9	90	5.1	11/13
D-64	32.6	42 +10	6.3	11/13
D-65	22.1	--	--	--
D-66	23.0	23 +10	5.7	11/16
D-67	85.6	89.3	4.2	11/16
D-68	9.9	4.5 +10	2.9	11/18
D-69	21.2	25 +10	3.3	11/12
D-70	22.1	28 +10	3.4	11/12

TABLE 8-A

RESULTS OF CHEMICAL ANALYSES PERFORMED BY RECRA RESEARCH, INC.

ZONE 2	GRIMSBY/POWER GLEN CONTACT ELEV. 419 - 437.2							
Well No.	Temp. (C)	pH	Specific Conductance µmhos/cm	TOC mg/l	TDS mg/l	CL mg/l	Oil & Grease mg/l	T Fe mg/l
D51	12.5	6.90	295	2.4	260	28	<5	6.1
	12	7.15	295	5.2	260	27	<5	14
D53	12	6.65	353	8.1	280	32	<5	3.8
	12	6.75	360	4.2	340	32	<5	2.5
D55	12	6.55	430	4.8	370	37	<5	7.1
	11.5	6.80	430	4.7	360	37	<5	4.8
D58	DRY HOLE							DRY HOLE
D61	10	6.65	420	6.0	410	36	26	2.0
	10	6.75	510	10	390	36	<5	11
D64	11.5	8.20	244	5.7	180	24	8	1.8
	13.0	8.45	242	6.8	170	23	<5	21
D66	13	7.50	1,040	4.0	860	200	<5	8.0
	12.5	7.45	1,000	4.4	830	190	<5	1.6

TABLE 8-B

RESULTS OF CHEMICAL ANALYSES PERFORMED BY RECRA RESEARCH, INC.

ZONE 3	POWER GLEN - WHIRLPOOL CONTACT ELEV. 407.1 - 420.2							
Well No.	Temp. (C)	pH	Specific Conductance µmhos/cm	TOC mg/l	TDS mg/l	CL mg/l	Oil & Grease mg/l	T Fe mg/l
D49	11.5	8.85	283	1.1	290	20	<5	16
	12	9.00	305	1.3	290	20	<5	8.8
D54	11	9.50	1,480	2.4	1,400	290	<5	22
	11	9.65	1,480	6.4	1,400	270	<5	49
D57	10	8.10	483	3.8	540	39	<5	9.8
	10	8.15	415	3.7	660	40	<5	11
D62	10	9.95	510	3.3	550	19	6	17
	10	10.25	505	1.5	520	19	<5	18
D65	11.5	7.85	1,290	4.5	1,200	37	<5	4.8
	11.5	8.30	1,290	9.5	1,100	37	<5	3.3
D68-A	12	8.75	255	1.8	230	19	<5	8.4
	12	8.95	258	2.5	240	20	<5	6.7
D60	10.5	7.35	1,680	8.1	1,700	36	<5	16
	10.5	7.55	1,700	7.3	1,800	30	<5	2.9

TABLE 8-C

RESULTS OF CHEMICAL ANALYSES PERFORMED BY RECRA RESEARCH, INC.

ZONE 4	WHIRLPOOL - QUEENSTON ELEV. 362.3 - 405.9							
Well No.	Temp. (C)	pH	Specific Conductance µmhos/cm	TOC mg/l	TDS mg/l	CL mg/l	Oil & Grease mg/l	T Fe mg/l
D50	12	11.90	1,830	4.5	790	33	<5	0.91
	11.5	11.90	1,830	5.7	750	33	<5	0.90
D52	12.5	6.35	3,000	8.8	2,700	1,100	30	1.4
	12	7.15	2,690	9.6	2,300	910	6	0.70
D56	11	10.45	500	6.4	460	79	<5	5.6
	11	10.70	600	5.0	480	79	<5	7.2
D59	10.5	8.30	249	4.5	220	22	<5	2.6
	10.5	8.25	251	7.9	220	22	<5	2.8
D63-A	12	9.65	255	5.6	270	23	<5	4.7
	11	9.80	275	5.8	270	24	<5	3.0
D67	13	10.65	540	3.2	410	33	<5	3.1
	12.5	10.75	530	2.0	410	33	15	3.5

TABLE 8-D

RESULTS OF CHEMICAL ANALYSES PERFORMED BY RECRA RESEARCH, INC.

ZONE 1		MISC. SOIL - ELEV. 447.2 - 456.6						
Well No.	Temp. (C)	pH	Specific Conductance µmhos/cm	TOC mg/1	TDS mg/1	CL mg/1	Oil & Grease mg/1	T Fe mg/1
D69	14	6.7	800	6.8	670	29	14	7.4
	14	6.8	780	8.7	730	29	<5	89
D70	14.5	6.85	640	24	570	31	73	120
	13	6.80	540	33	590	32	31	260

TABLE 9

ANALYSIS OF VAN DE MARK SAMPLES
BY
ADVANCED ENVIRONMENTAL SYSTEMS, INC.

Sample Date April 1981

Sample Site	pH	TDS mg//1	TOC mg/1	DO mg/1	CL mg/1	Specific Conductance µmhos/cm
Eighteenmile Creek Site No. 1	8.27	411	11.5	10.1	53.2	609
Eighteenmile Creek Site No. 2	8.26	429	12.8	10.0	52.1	619
Eighteenmile Creek Site No. 3	8.39	439	15.6	8.90	48.9	612
Landfill Well No. 1 (22' Deep)	8.27	1,820	30.9	7.65	1,010.	2,540
Landfill Well No. 2 (23' Deep)	10.2	1,710	50.0	6.90	417.	2,350
Landfill Well No. 3 (90' Deep)*	7.08	21,200	374.	4.40	4,470.	19,400
Landfill Well No. 4 (90' Deep)*	4.71	19,930	90.2	0.90	12,300.	24,300
Landfill Swale	7.05	784	18.1	9.05	245.	1,250

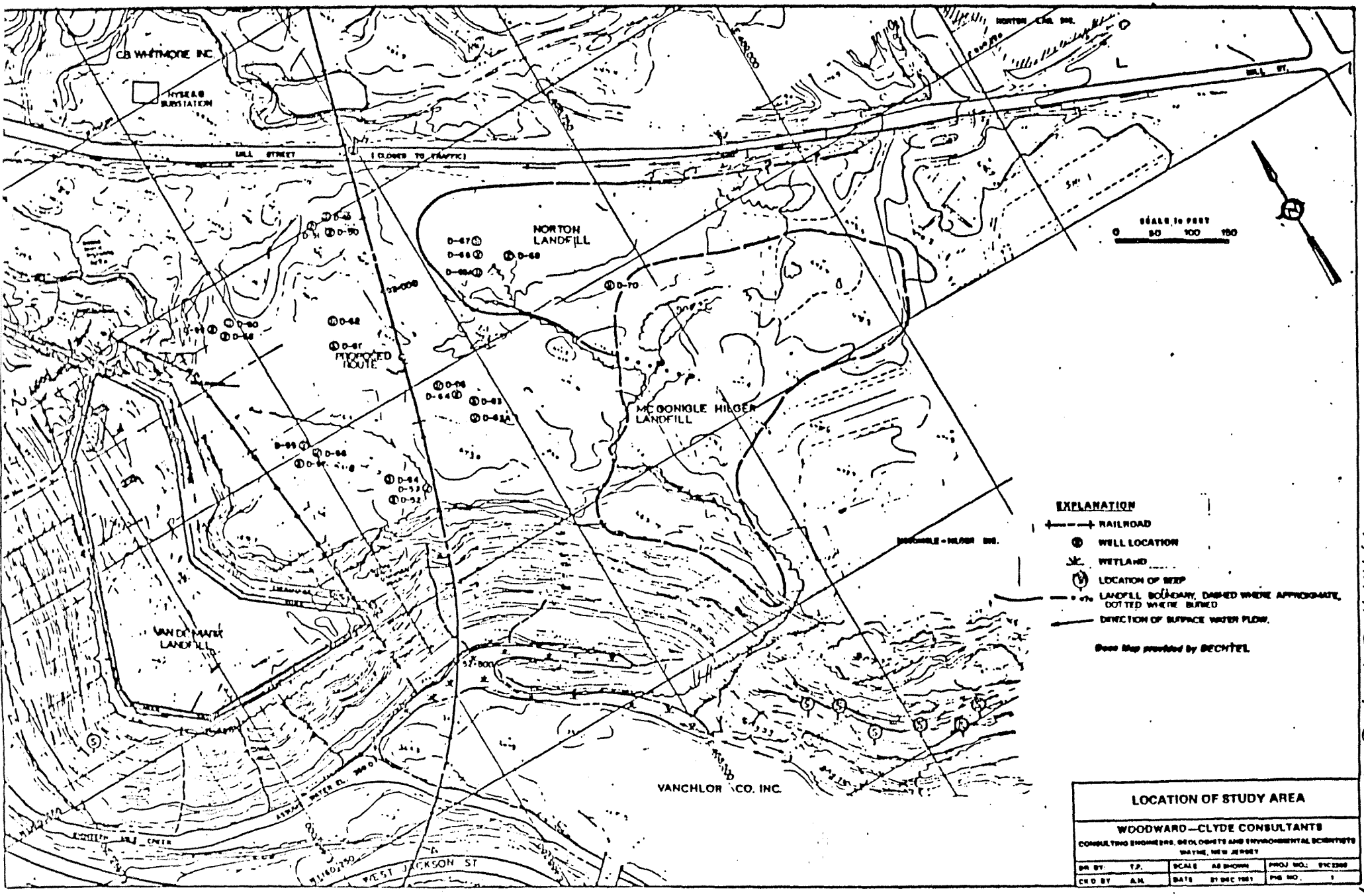
*Wells 3 & 4 are transposed on Figures 2 and 3.

TABLE 10

ANALYSIS OF VAN DE MARK SAMPLES
BY
ADVANCED ENVIRONMENTAL SYSTEMS, INC.

Sample Site	pH	TDS mg/1	TOC mg/1	DO mg/1	CL mg/1	Specific Conductance µmhos/cm
	Sample Date October 1981					
Eighteenmile Creek Site No. 1	7.56	38.3	5.1	9.3	39	520
Eighteenmile Creek Site No. 2	6.97	561.2	11.0	7.9	138	830
Eighteenmile Creek Site No. 3	7.08	540.1	7.87	7.1	131	791
Landfill Well No. 1 (22' Deep)	7.63	1,938.2	29.7	1.8	856	3,270
Landfill Well No. 2 (23' Deep)	9.55	776.4	19.5	6.1	236	1,300
Landfill Well No. 3 (90' Deep)*	2.56	36,898.	64.6	15.3	13,895	32,800
Landfill Well No. 4 (90' Deep)*	4.12	30,356.4	97.3	--	11,996	28,800
Landfill Swale	4.72	9,121.	7.2	0.1	3,498	10,360

*Wells 3 and 4 are transposed on Figures 2 and 3.



LOCATION OF STUDY AREA

WOODWARD—CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR BY	T.P.	SCALE	AS SHOWN	PROJ NO.	91C1560
CHK'D BY	A.H.	DATE	31 DEC 1991	FIG NO.	1

ATTACHMENT 7.3-1

PRINTED
NOV 27 1987

SURVEY INFORMATION TAKEN FROM:
"CHEMICAL WASTE LANDFILL SITE LOCATION PLAN-CLOSURE"
DWG. No. VDM-2246 BY WILLIAM W. WHITMORE, CONSULTING ENGINEERS

LEGEND
- BECHTEL WELL
- VDM WELL
- VDM BORING

No	Revision	Date	Initial

Approved

Van De Mark Chemical Co., Inc.

LANDFILL CLOSURE RECORD PLANS

PRE-CLOSURE CONDITIONS

CRA
CONESTOGA-ROVERS & ASSOCIATES
651 Colby Drive, Waterloo, Ontario Canada N2V 1C2

Drawn by: T.J.S.	Scale: 1" = 50'	Date: SEPTEMBER, 1987	File No. / Rev. No.: 48
Designed by: D.B.			
Checked by:	Field book:	Project No.: 1277 AR	Drawing No.: 19 PLAN 1

C.B. WHITMORE INC.

NYSE&G SUBSTATION

NORTON LAB. INC.

MILL ST.

MILL STREET (CLOSED TO TRAFFIC)

E 469,000

E 468,750

N 161,250

N 161,000

N 160,750

N 160,500

52+000

52+500

NORTON LANDFILL

MCGONIGLE HILGER LANDFILL

MCGONIGLE - HILGER INC.

VANCHLOR CO. INC.

PROPOSED ℄ ROUTE

VAN DE MARK LANDFILL

ACTIVE DISPOSAL SITE

LIMITS OF UNCONTROLLED WASTE AREA

DRAINAGE DITCH

ASSUME WATER EL. 389.0

EIGHTEEN MILE CREEK

STONE RD.

WEST JACKSON ST.

D-49 D-51 D-50 D-67 D-66 D-68A D-69 D-70 D-59 D-60 D-58 D-62 D-61 D-65 D-64 D-63 D-63A D-55 D-56 D-57 D-54 D-53 D-52

VDM 1 VDM 2 VDM 3 VDM 4 VDM 5 VDM 6

0 50 100 150
Scale in Feet

NOTE:

1. TRACK ORIENTATION TAKEN FROM SK-C-085 REV B.

EXPLANATION

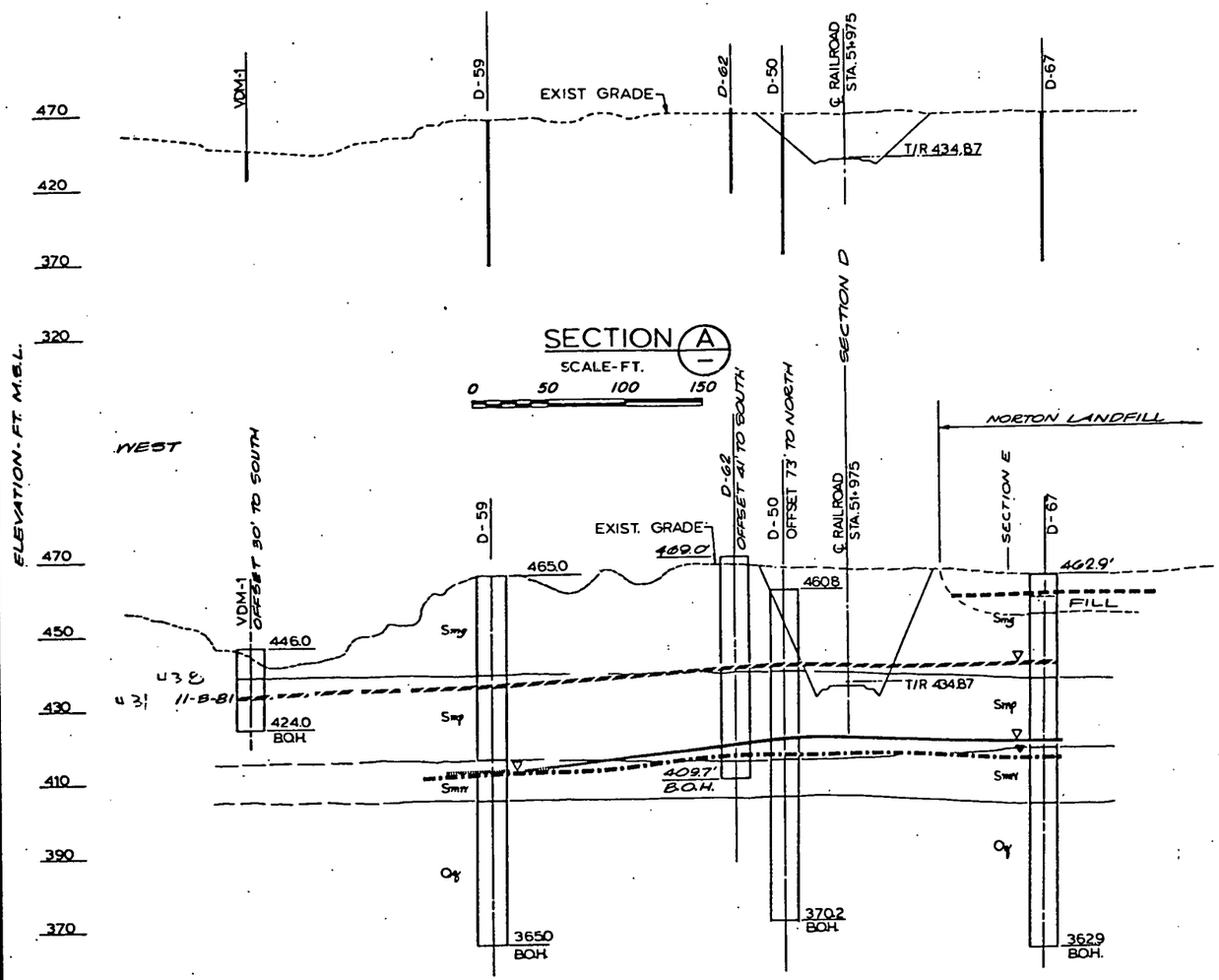
NOTE: SEE TEXT FOR DESCRIPTION OF ROCK UNITS.

- GRIMSBY FM.
- POWER GLEN FM.
- WHIRLPOOL FM.
- QUEENSTON FM.
- GEOLOGIC CONTACT OR LIMIT OF SURFACE EXPOSURE, DASHED WHERE APPROXIMATE
- STRIKE AND DIP OF BEDDING
- HORIZONTAL BEDDING
- STRIKE OF VERTICAL JOINT
- STRIKE AND DIP OF JOINT
- LOCATION OF SEEP
- LANDFILL BOUNDARY, DASHED WHERE APPROXIMATE, DOTTED WHERE BURIED.
- LOCATION OF VDM BORING WITH OBSERVATION WELL.
- LOCATION OF VDM BORING.
- LOCATION OF BECHTEL BORING WITH OBSERVATION WELL
- LOCATION OF CROSS-SECTION.
- DIRECTION OF SURFACE WATER FLOW.
- MARSH

Existing Well Locations
VDM Landfill

REVISED AND REPRODUCED BY PERMISSION OF VAN DE MARK CHEMICAL CO. INC.

DESIGNED BY / DRAWN BY / CHECKED BY / IN CHARGE / DATE	SOMERSET RAILROAD CORPORATION REVIEWED BY / DATE BECHTEL ASSOCIATES PROFESSIONAL CORPORATION	DANIELEWICZ ROUTE STA. 52+330 TO 51+810 GEOLOGIC MAP OF LANDFILL AREA
		SCALE JOB NO. 14818 FIGURE 6



SECTION A
SCALE FT.
HORIZ. 0 50 100 150
VERT. 0 10 20 40 60

EXPLANATION

- 465.0' GROUND ELEVATION AT WELL
- GEOLOGIC FORMATION CONTACT, DASHED WHERE APPROXIMATE
- 365.0' B.O.H. BOTTOM OF HOLE
- T/R TOP OF RAIL
- ▼ WATER LEVEL FROM WELL SHOWN IN SECTION
- ▽ WATER LEVEL FROM ADJACENT WELL IN NEST NOT SHOWN IN SECTION
- Smg GRIMSBY FM.
- Smp POWER GLEN FM.
- Smw WHIRLPOOL FM.
- Oq QUEENSTON FM.
- ZONE 1 WATER LEVEL
- ZONE 2 WATER LEVEL
- ZONE 3 WATER LEVEL
- ZONE 4 WATER LEVEL

NOTES

1. WATER LEVELS MEASURED ON 11-4-81, UNLESS OTHERWISE INDICATED.
2. FOR LOCATION OF GEOLOGICAL SECTIONS, SEE FIGURE 3
3. SEE TEXT FOR DESCRIPTION OF GEOLOGICAL FORMATIONS.

Section $\frac{A}{6}$

Location
Ground Water
VDM Landfill

NO.	DATE	REVISIONS	BY	CHK	PROJ. ENG

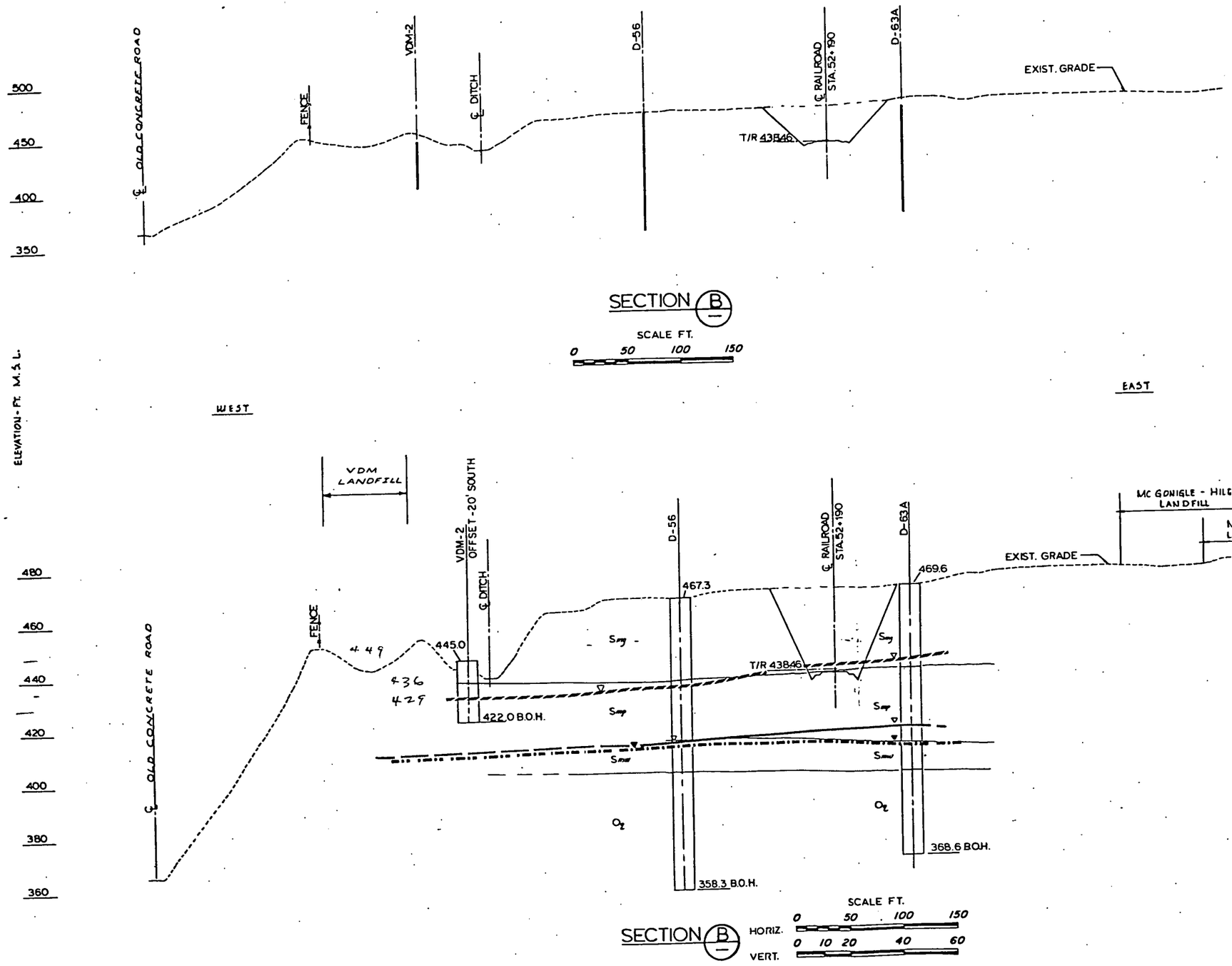
DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE

SOMERSET RAILROAD CORPORATION
REVIEWED BY DATE
BECHTEL ASSOCIATES PROFESSIONAL CORPORATION

DANIELEWICZ ROUTE
STA. 52+330 TO 51+810
CROSS SECTION A

SCALE
JOB NO. 14818
FIGURE 7 SHEET NO. 1 OF 5

22 x 34 "D" SIZE



NOTE:

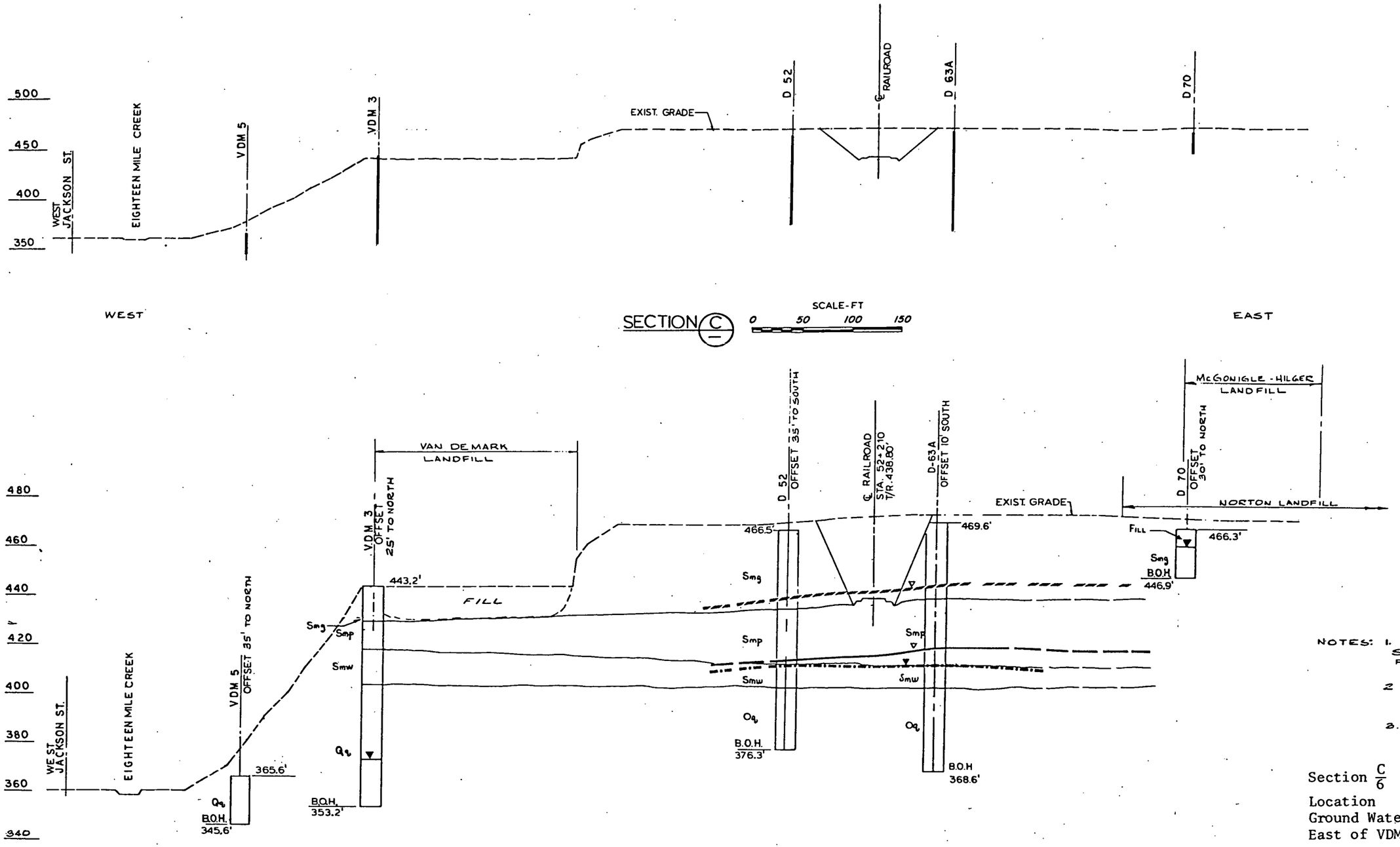
1. FOR EXPLANATION OF SYMBOLS SEE FIGURE 7 SHEET 1
2. FOR LOCATION OF SECTION SEE FIGURE 3
3. SEE TEXT FOR DESCRIPTION OF GEOLOGIC FORMATIONS.
4. WATER LEVELS MEASURED ON 11-4-81 UNLESS OTHERWISE INDICATED.

Section $\frac{B}{6}$

Location
Ground Water
East of VDM Landfill

DESIGNED BY	SOMERSET RAILROAD CORPORATION	DANIELEWICZ ROUTE	SCALE
DRAWN BY	REVIEWED BY / DATE	STA. 52+330 TO 51+810	JOB NO. 14818
CHECKED BY	BECHTEL ASSOCIATES PROFESSIONAL CORPORATION	CROSS SECTION B	FIGURE 7 / SHEET NO. 2 OF 5
IN CHARGE			
DATE			
PROJ.			

22 x 34 "D" SIZE



NOTES: 1. FOR LOCATION OF SECTION SEE FIGURE 3.

2 FOR EXPLANATION OF SYMBOLS SEE FIGURE 7 SHEET 1

3. SEE TEXT FOR DESCRIPTION OF GEOLOGICAL FORMATIONS.

Section C/6

Location
Ground Water
East of VDM Landfill

SCALE-FT.
VERT. 0 10 20 40 60
HORIZ. 0 50 100 150

NO.	DATE	REVISIONS	BY	CHK	PROJ. ENG.	NO.	DATE	REVISIONS	BY	CHK	PROJ. ENG.

DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE

SOMERSET RAILROAD CORPORATION

REVIEWED BY | DATE

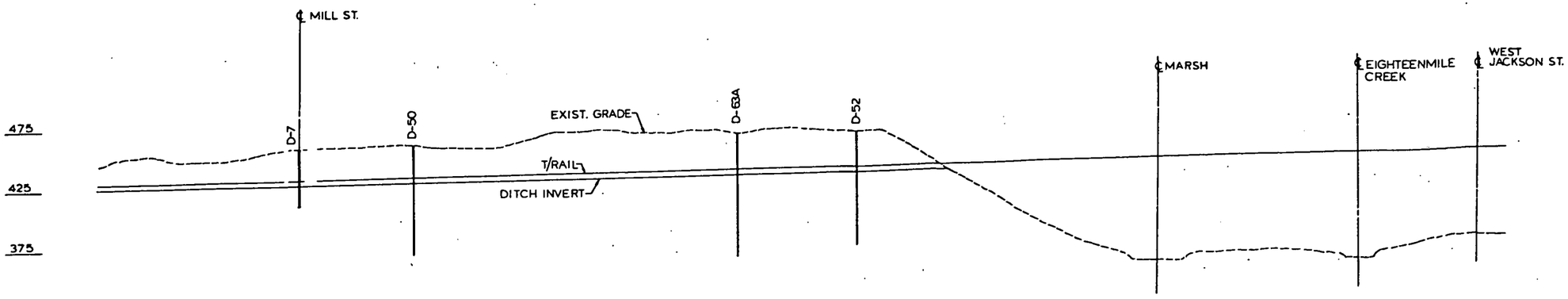
BECHTEL ASSOCIATES PROFESSIONAL CORPORATION

DANIELEWICZ ROUTE
STA. 52+330 TO 51+810
CROSS SECTION C

SCALE

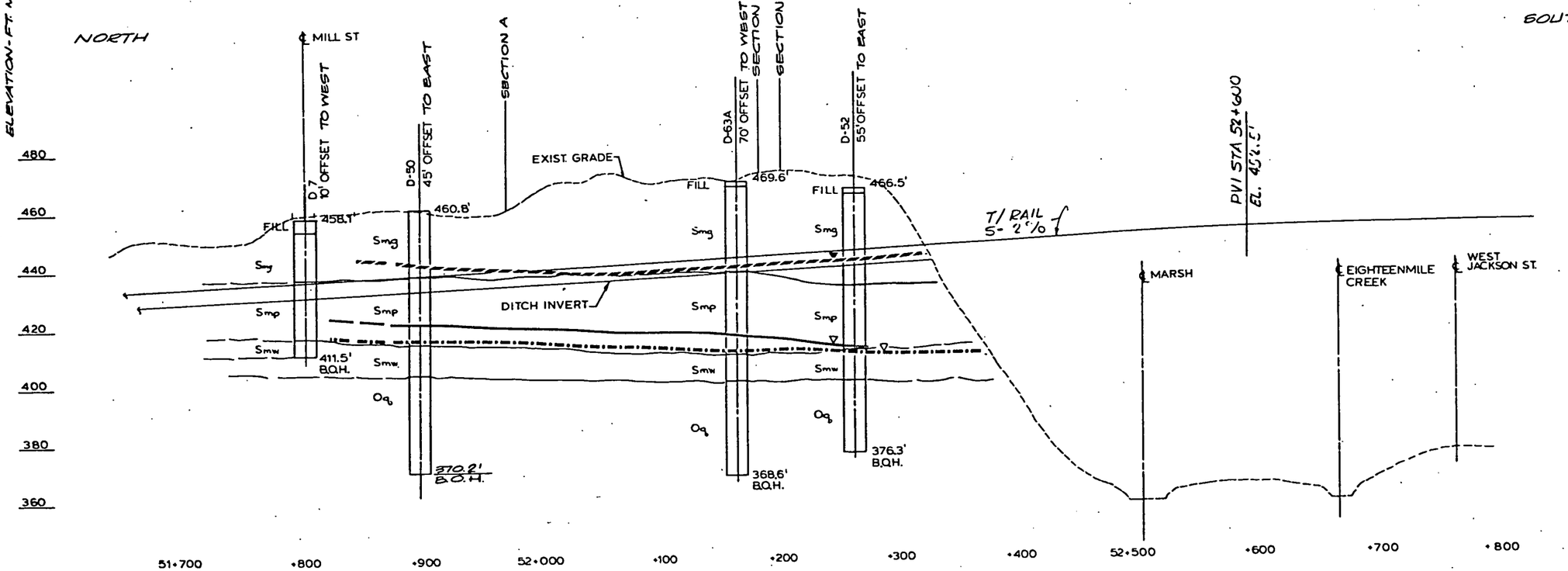
JOB NO. 14818

FIGURE 7 | SHEET NO. 3 OF 5



SECTION D

SCALE-FT. 0 50 100 150



SECTION D & TRACK STATIONING

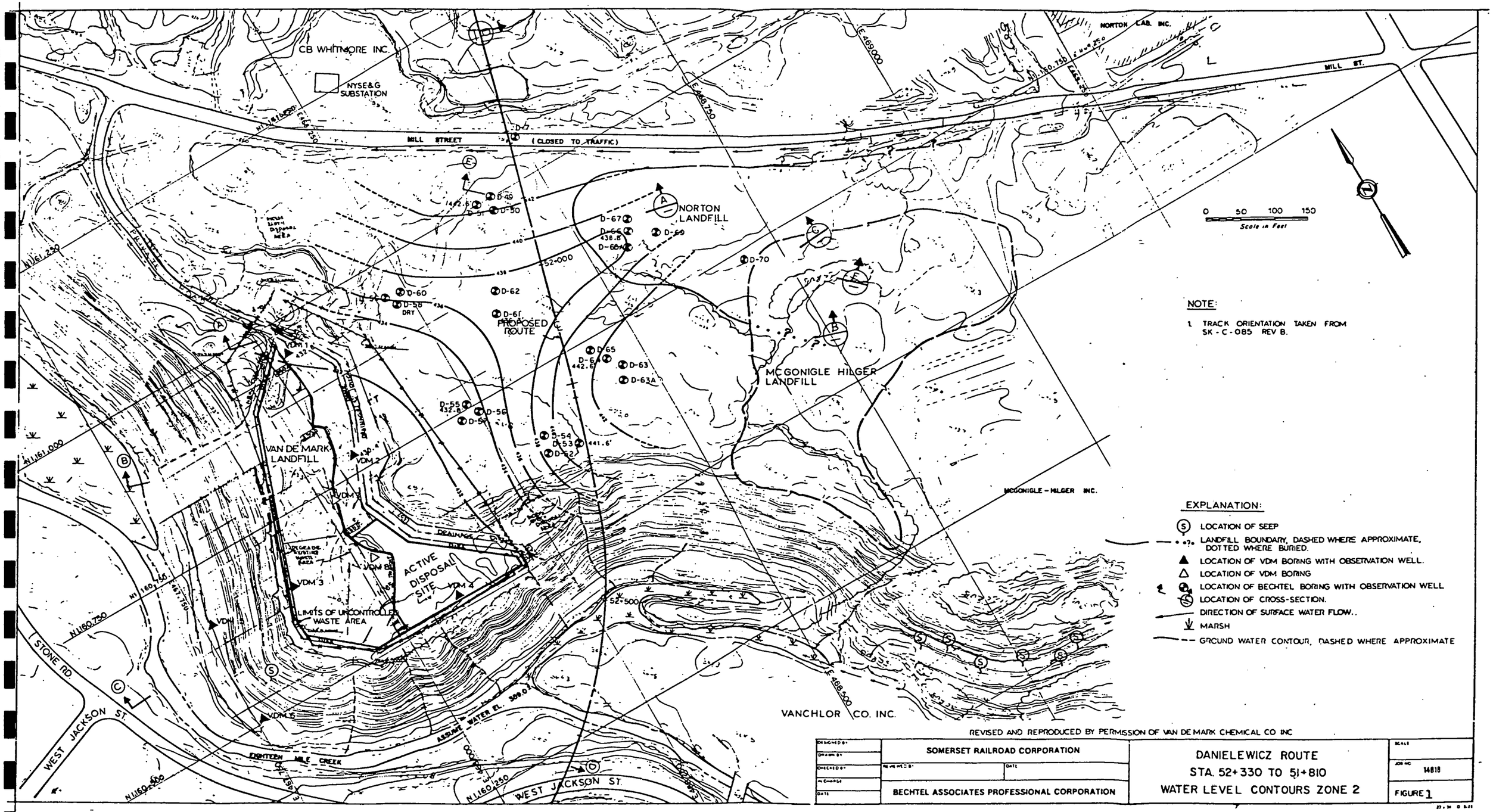
SCALE-FT.
HORIZ. 0 50 100 150
VERT. 0 10 20 40 60

NOTE
1. FOR LOCATION OF SECTION, SEE FIGURE 3.
2. FOR EXPLANATION OF SYMBOLS, SEE FIGURE 7 SHEET 1.
3. SEE TEXT FOR DESCRIPTION OF GEOLOGICAL FORMATIONS.
4. TRACK CURVE AND ELEVATION DATA FROM SK-C-085, REV. B.

Section $\frac{D}{6}$

Location
Ground Water
VDM Landfill

DESIGNED BY	SOMERSET RAILROAD CORPORATION	DANIELEWICZ ROUTE	SCALE
DRAWN BY		STA. 52+330 TO 51+810	JOB NO. 14818
CHECKED BY	REVIEWED BY / DATE	CROSS SECTION D	FIGURE 7 / SHEET NO. 4 OF 5
IN CHARGE	BECHTEL ASSOCIATES PROFESSIONAL CORPORATION		
DATE			



NOTE:

1. TRACK ORIENTATION TAKEN FROM SK-C-085 REV B.

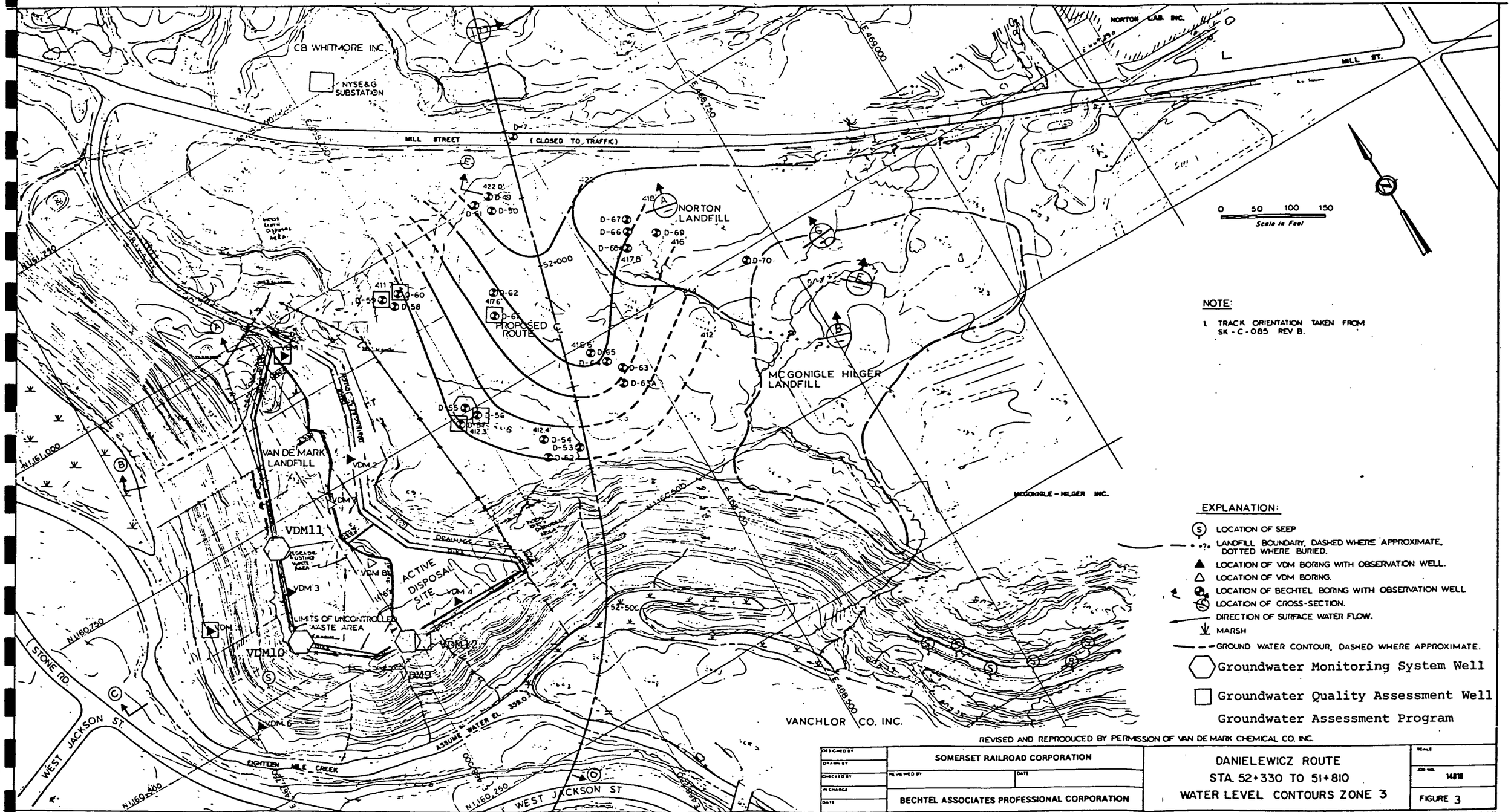
EXPLANATION:

- (S) LOCATION OF SEEP
- LANDFILL BOUNDARY, DASHED WHERE APPROXIMATE, DOTTED WHERE BURIED.
- ▲ LOCATION OF VDM BORING WITH OBSERVATION WELL.
- △ LOCATION OF VDM BORING
- LOCATION OF BECHTEL BORING WITH OBSERVATION WELL
- LOCATION OF CROSS-SECTION.
- DIRECTION OF SURFACE WATER FLOW..
- MARSH
- GROUND WATER CONTOUR, DASHED WHERE APPROXIMATE

REVISED AND REPRODUCED BY PERMISSION OF VAN DE MARK CHEMICAL CO INC

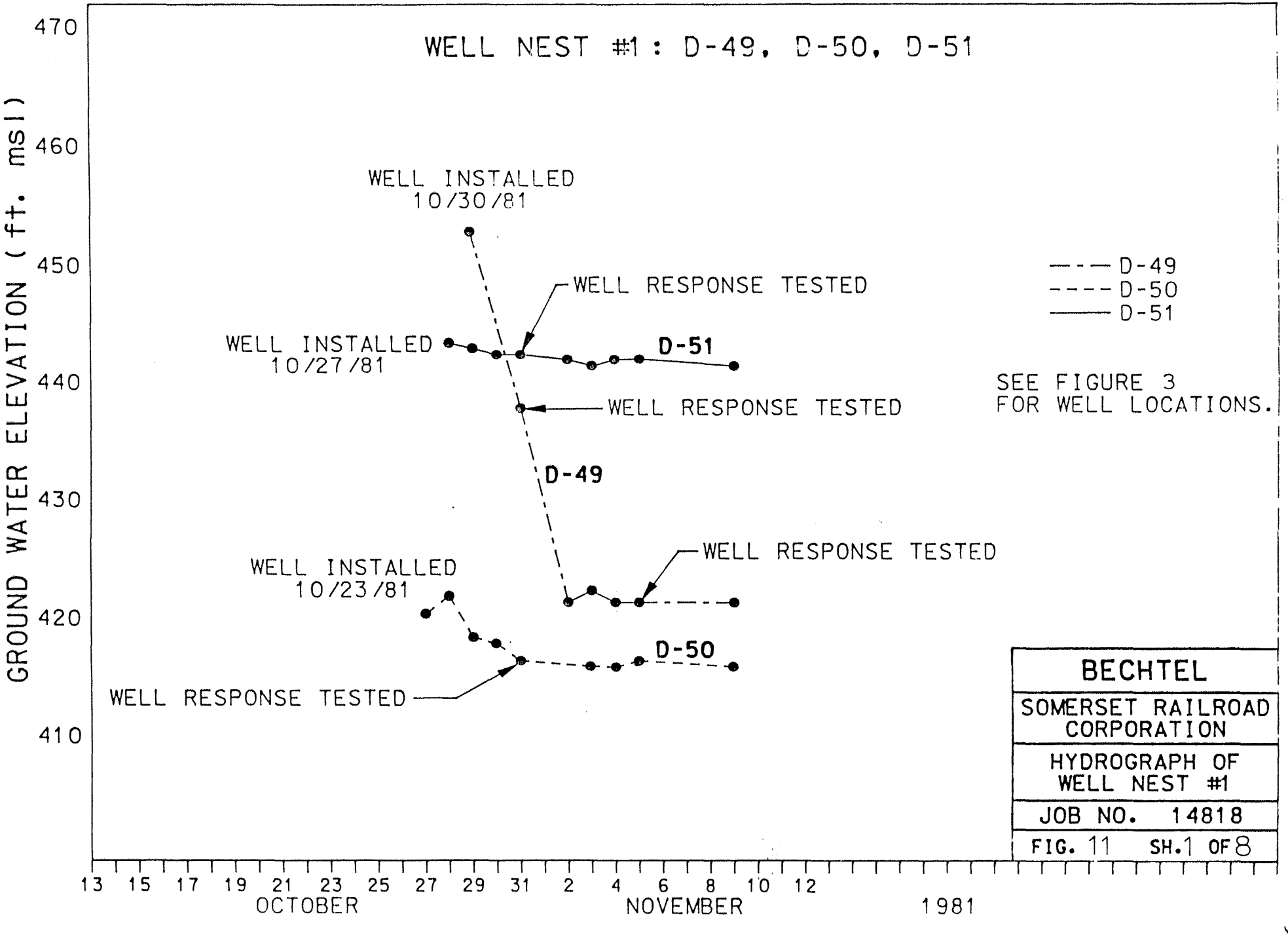
DESIGNED BY	SOMERSET RAILROAD CORPORATION	SCALE
DRAWN BY		
CHECKED BY	DATE	JOB NO. 14818
APPROVED		
DATE	BECHTEL ASSOCIATES PROFESSIONAL CORPORATION	FIGURE 1

DANIELEWICZ ROUTE
STA. 52+330 TO 51+810
WATER LEVEL CONTOURS ZONE 2

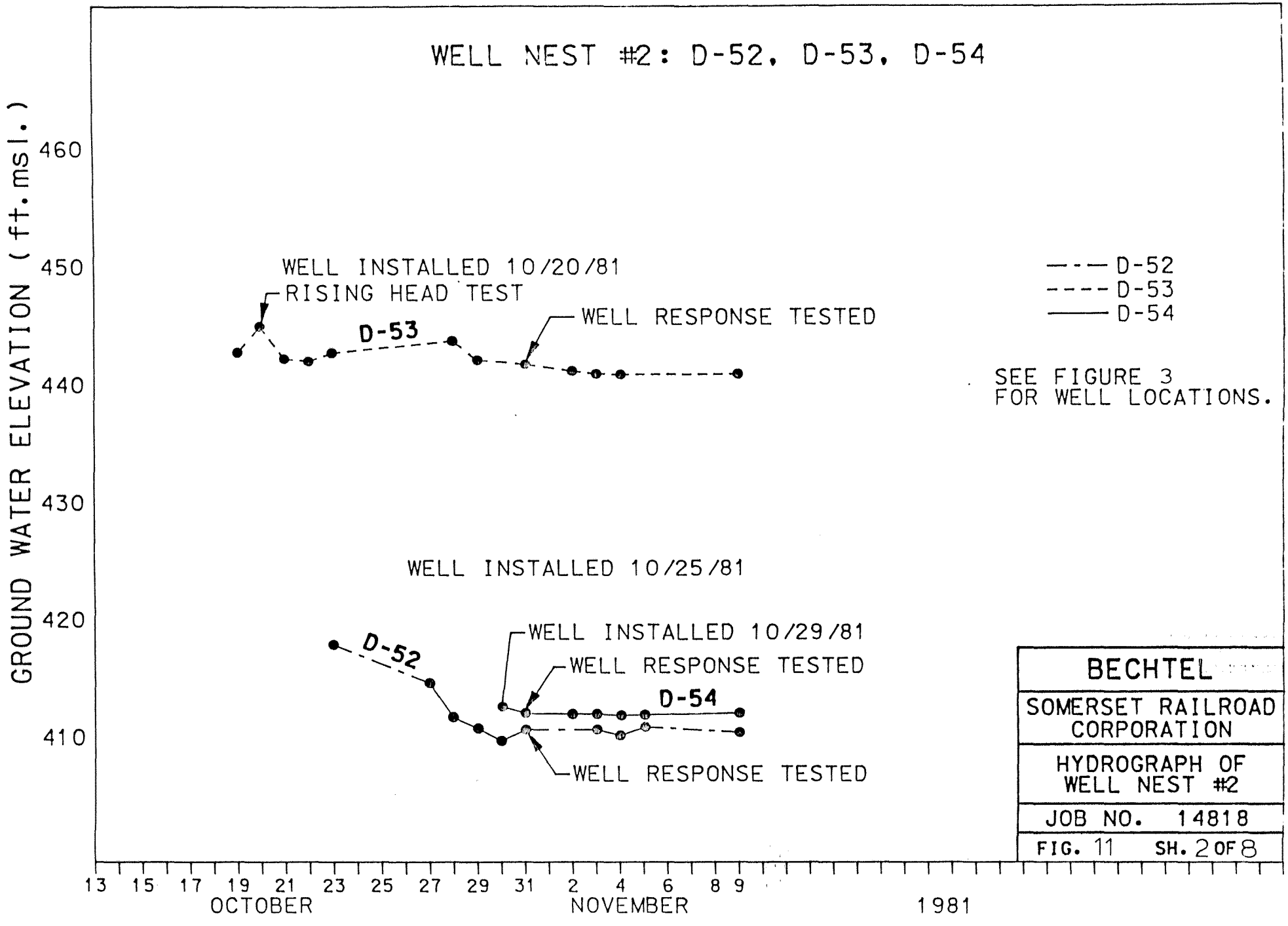


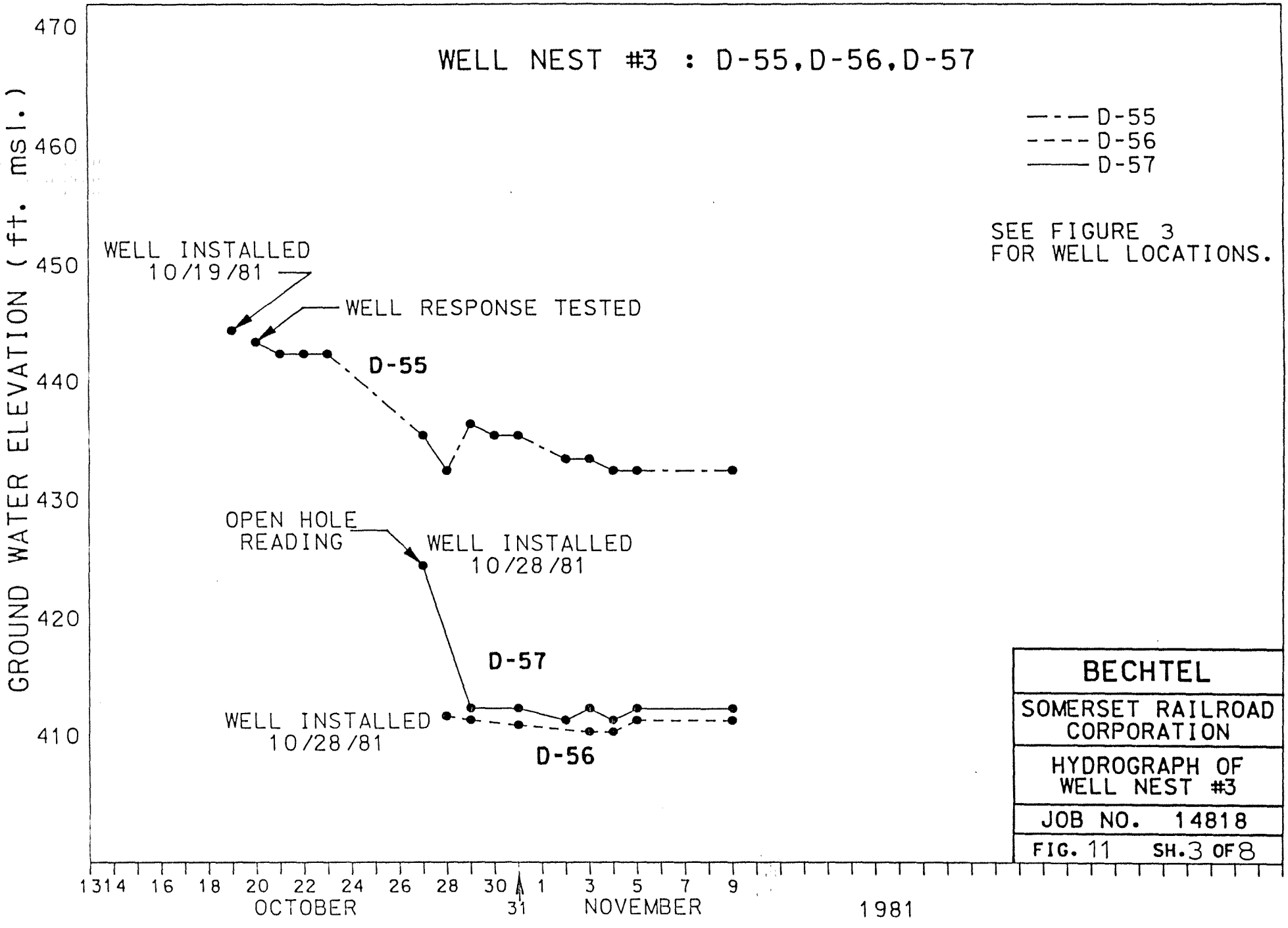
REVISED AND REPRODUCED BY PERMISSION OF VAN DE MARK CHEMICAL CO. INC.

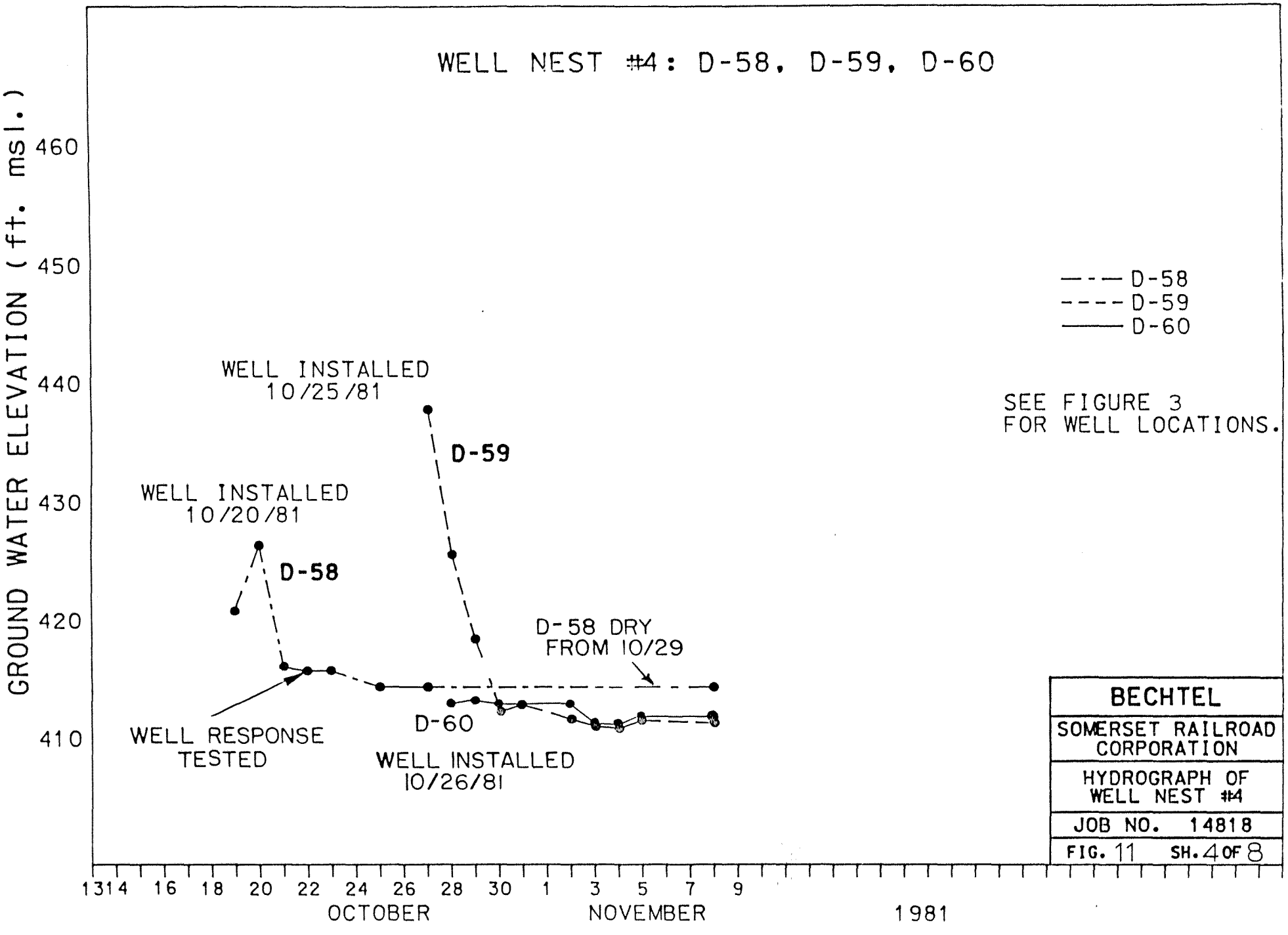
DESIGNED BY / DRAWN BY / CHECKED BY / IN CHARGE / DATE	SOMERSET RAILROAD CORPORATION REVISED BY / DATE BECHTEL ASSOCIATES PROFESSIONAL CORPORATION	DANIELEWICZ ROUTE STA 52+330 TO 51+810 WATER LEVEL CONTOURS ZONE 3
		SCALE JOB NO. 14818 FIGURE 3

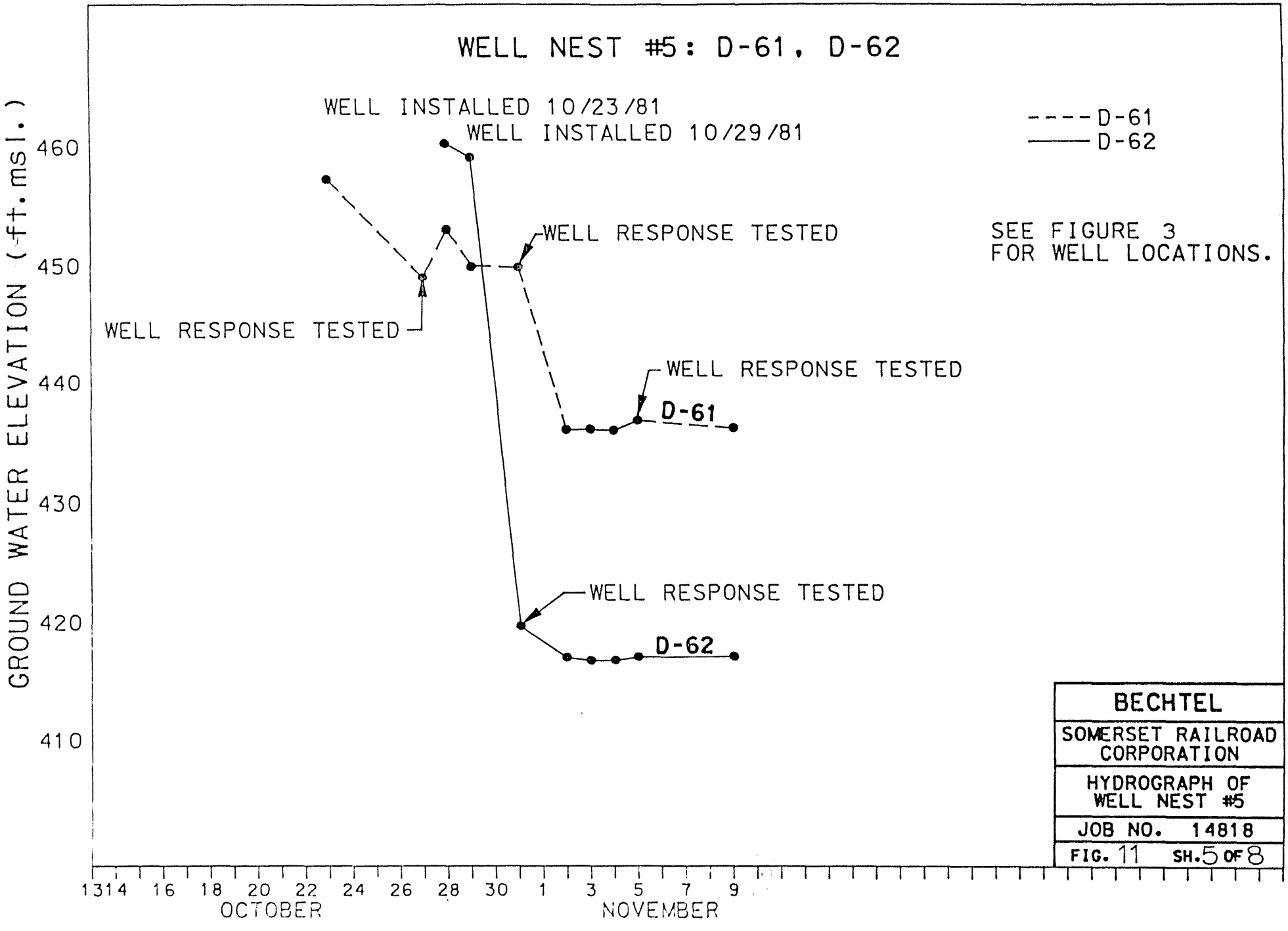


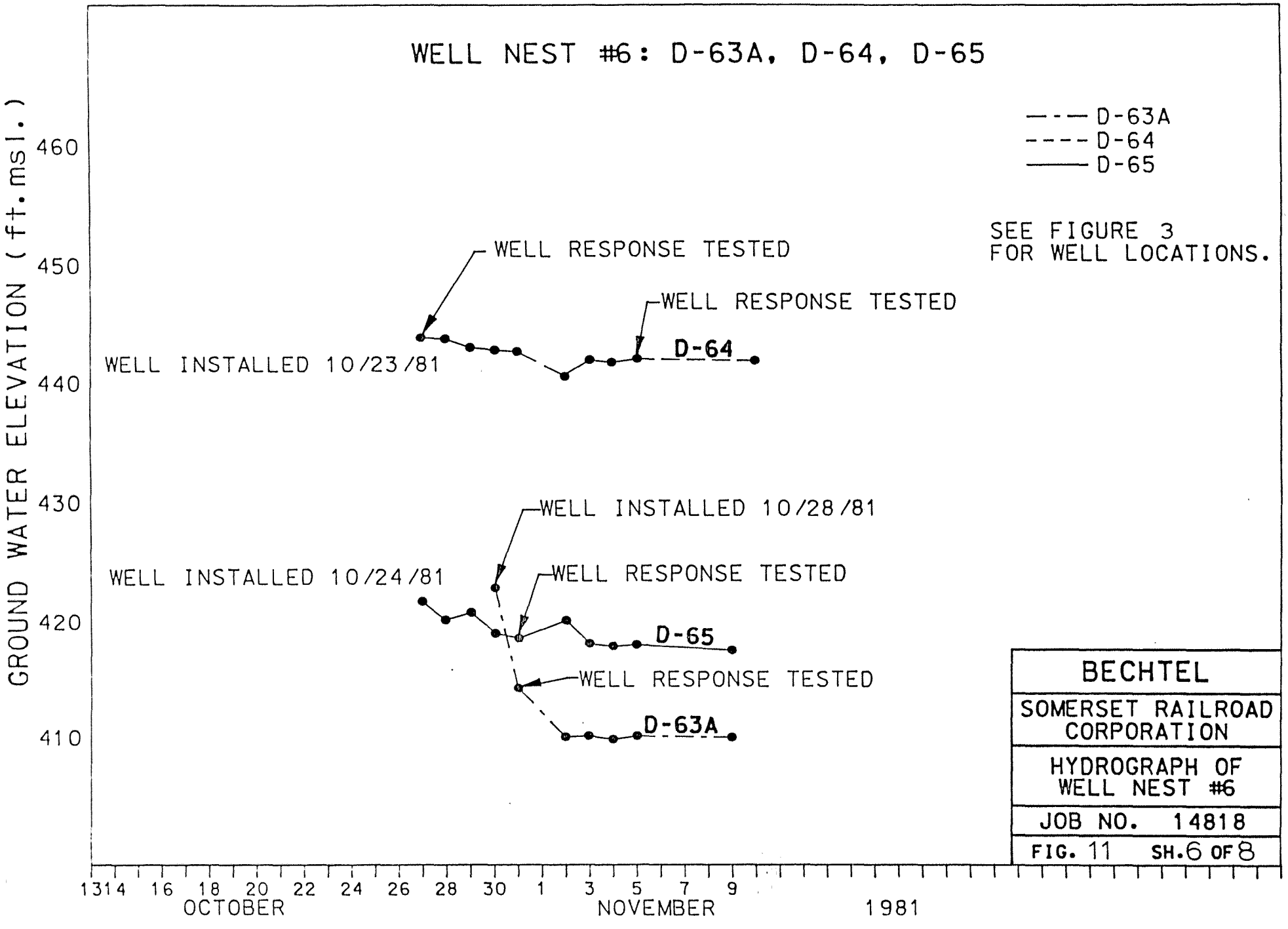
Attachment 7.1-2 (Cont.)

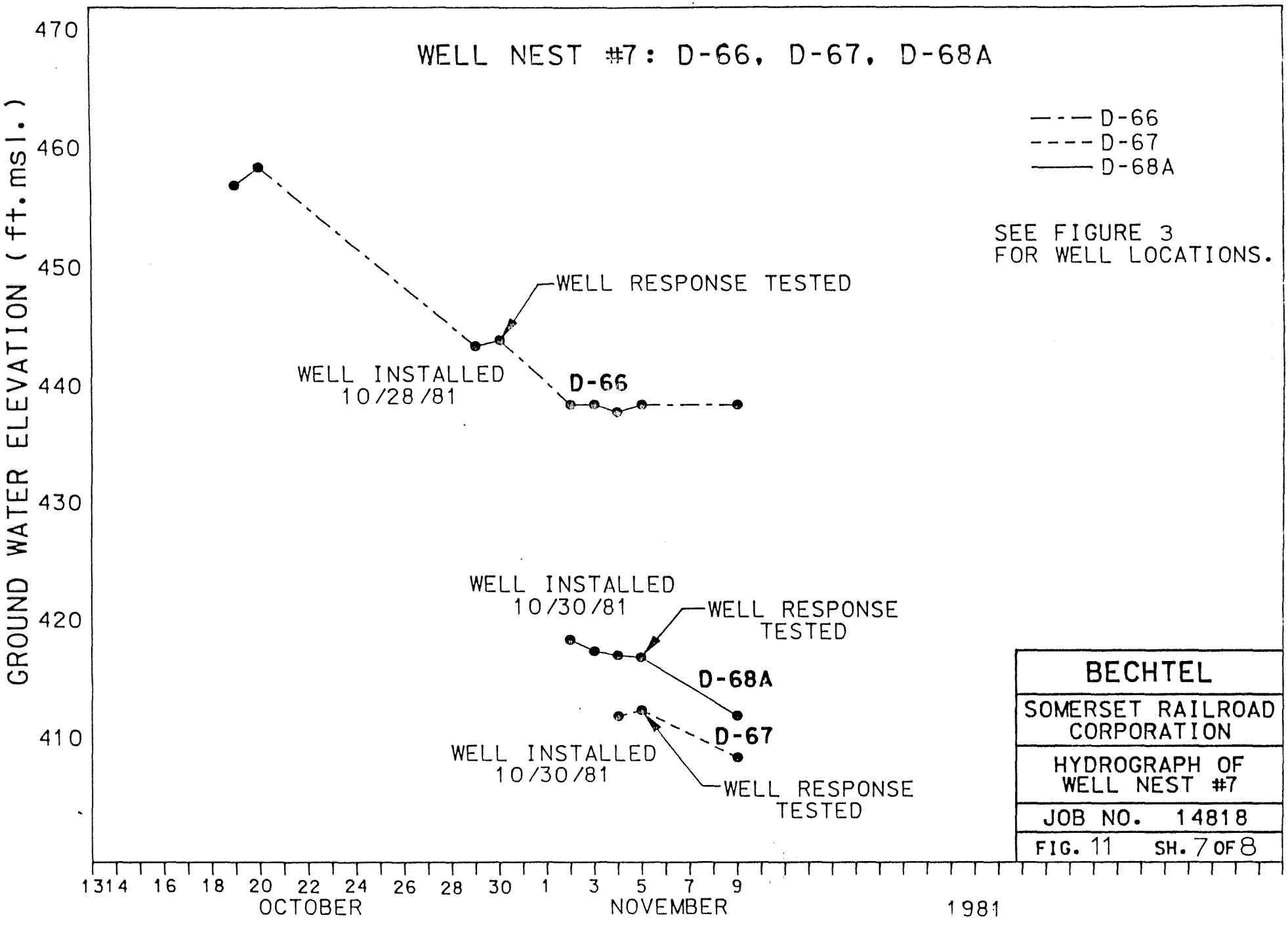

WELL NEST #2: D-52, D-53, D-54
GROUND WATER ELEVATION (ft. msl.)
460
450
440
430
420
410
WELL INSTALLED 10/20/81
RISING HEAD TEST
D-53
WELL RESPONSE TESTED
D-52
D-53
D-54
SEE FIGURE 3
FOR WELL LOCATIONS.
WELL INSTALLED 10/25/81
D-52
WELL INSTALLED 10/29/81
WELL RESPONSE TESTED
D-54
WELL RESPONSE TESTED
13 15 17 19 21 23 25 27 29 31 2 4 6 8 9
OCTOBER
NOVEMBER
1981
BECHTEL
SOMERSET RAILROAD CORPORATION
HYDROGRAPH OF WELL NEST #2
JOB NO. 14818
FIG. 11 SH. 2 OF 8

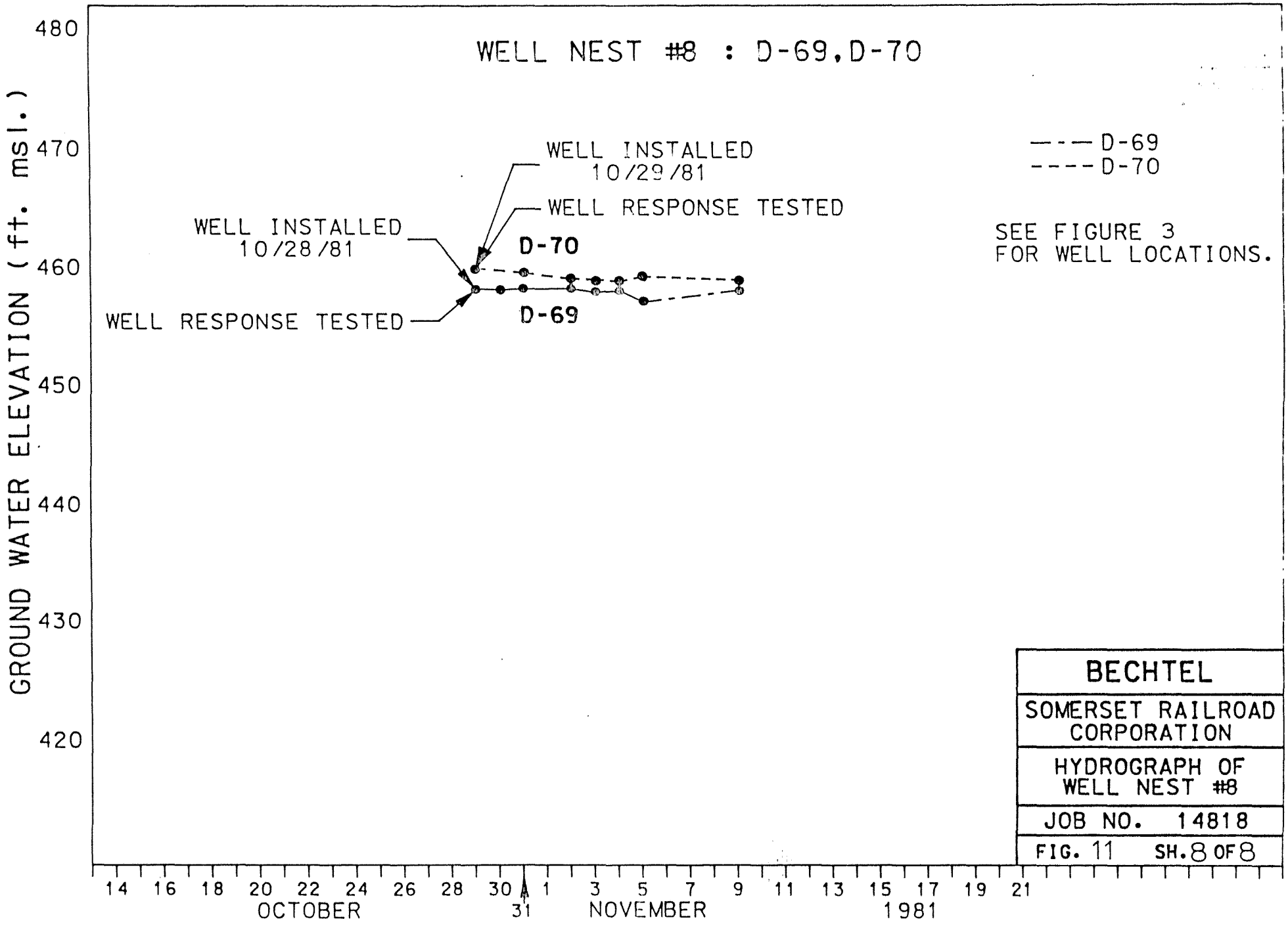

WELL NEST #3 : D-55, D-56, D-57
D-55
D-56
D-57
SEE FIGURE 3
FOR WELL LOCATIONS.
GROUND WATER ELEVATION (ft. msl.)
470
460
450
440
430
420
410
WELL INSTALLED
10/19/81
WELL RESPONSE TESTED
D-55
OPEN HOLE
READING
WELL INSTALLED
10/28/81
D-57
WELL INSTALLED
10/28/81
D-56
13 14 16 18 20 22 24 26 28 30 1 3 5 7 9
OCTOBER
31
NOVEMBER
1981
BECHTEL
SOMERSET RAILROAD CORPORATION
HYDROGRAPH OF WELL NEST #3
JOB NO. 14818
FIG. 11 SH. 3 OF 8

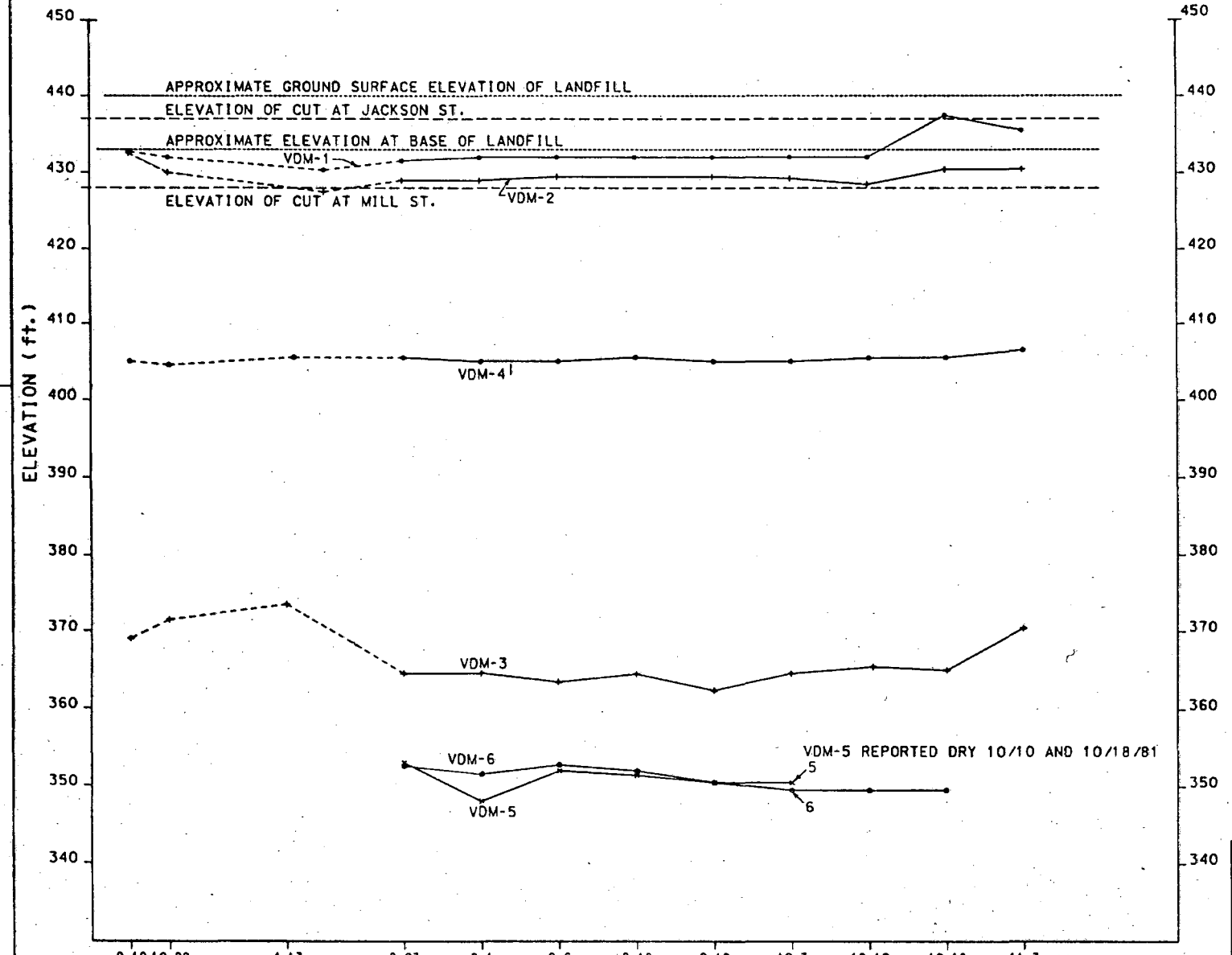

WELL NEST #4: D-58, D-59, D-60
GROUND WATER ELEVATION (ft. msl.)
460
450
440
430
420
410
D-58
D-59
D-60
SEE FIGURE 3
FOR WELL LOCATIONS.
WELL INSTALLED
10/25/81
D-59
WELL INSTALLED
10/20/81
D-58
D-58 DRY
FROM 10/29
WELL RESPONSE
TESTED
D-60
WELL INSTALLED
10/26/81
13 14 16 18 20 22 24 26 28 30 1 3 5 7 9
OCTOBER
NOVEMBER
1981
BECHTEL
SOMERSET RAILROAD CORPORATION
HYDROGRAPH OF WELL NEST #4
JOB NO. 14818
FIG. 11 SH. 4 OF 8


WELL NEST #5: D-61, D-62
WELL INSTALLED 10/23/81
WELL INSTALLED 10/29/81
D-61
D-62
WELL RESPONSE TESTED
WELL RESPONSE TESTED
WELL RESPONSE TESTED
D-61
WELL RESPONSE TESTED
D-62
SEE FIGURE 3
FOR WELL LOCATIONS.
GROUND WATER ELEVATION (ft. msl.)
460
450
440
430
420
410
13 14 16 18 20 22 24 26 28 30 1 3 5 7 9
OCTOBER
NOVEMBER
BECHTEL
SOMERSET RAILROAD CORPORATION
HYDROGRAPH OF WELL NEST #5
JOB NO. 14818
FIG. 11 SH. 5 OF 8


WELL NEST #6: D-63A, D-64, D-65
D-63A
D-64
D-65
SEE FIGURE 3
FOR WELL LOCATIONS.
GROUND WATER ELEVATION (ft. msl.)
460
450
440
430
420
410
WELL RESPONSE TESTED
WELL RESPONSE TESTED
D-64
WELL INSTALLED 10/23/81
WELL INSTALLED 10/28/81
WELL INSTALLED 10/24/81
WELL RESPONSE TESTED
D-65
WELL RESPONSE TESTED
D-63A
13 14 16 18 20 22 24 26 28 30 1 3 5 7 9
OCTOBER
NOVEMBER
1981
BECHTEL
SOMERSET RAILROAD CORPORATION
HYDROGRAPH OF WELL NEST #6
JOB NO. 14818
FIG. 11 SH. 6 OF 8


WELL NEST #7: D-66, D-67, D-68A
D-66
D-67
D-68A
SEE FIGURE 3
FOR WELL LOCATIONS.
GROUND WATER ELEVATION (ft. msl.)
470
460
450
440
430
420
410
WELL INSTALLED
10/28/81
WELL RESPONSE TESTED
D-66
WELL INSTALLED
10/30/81
WELL RESPONSE
TESTED
D-68A
D-67
WELL INSTALLED
10/30/81
WELL RESPONSE
TESTED
13 14 16 18 20 22 24 26 28 30 1 3 5 7 9
OCTOBER
NOVEMBER
1981
BECHTEL
SOMERSET RAILROAD
CORPORATION
HYDROGRAPH OF
WELL NEST #7
JOB NO. 14818
FIG. 11 SH. 7 OF 8


WELL NEST #8 : D-69, D-70
GROUND WATER ELEVATION (ft. msl.)
480
470
460
450
440
430
420
WELL INSTALLED 10/29/81
WELL RESPONSE TESTED
D-70
WELL INSTALLED 10/28/81
WELL RESPONSE TESTED
D-69
D-69
D-70
SEE FIGURE 3 FOR WELL LOCATIONS.
14 16 18 20 22 24 26 28 30 1 3 5 7 9 11 13 15 17 19 21
OCTOBER
31
NOVEMBER
1981
BECHTEL
SOMERSET RAILROAD CORPORATION
HYDROGRAPH OF WELL NEST #8
JOB NO. 14818
FIG. 11 SH. 8 OF 8



SEE FIGURE 3 FOR WELL LOCATIONS.

BECHTEL
GAITHERSBURG, MARYLAND

SOMERSET RAILROAD CORPORATION

HYDROGRAPH OF VAN DE MARK WELLS
VDM 1 THROUGH VDM 6

14818

APPENDICES

TO

'SOMERSET RAILROAD CORPORATION

HYDROGEOLOGIC STUDY

DANIELEWICZ ROUTE

STATION 51+810 to 52+330

BECHTEL CIVIL & MINERALS, INC.

Job No. 14818

February 1982'

(To be read in conjunction with report prepared for Van DeMark Chemical Co. entitled "Closure Plan - Former Landfill Site")

APPENDIX A

LOGS OF BORINGS

WELLS D-7 AND D-49 THROUGH D-70

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 of 2	D-7

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Danielewicz Route	N 1,161,058 E 468,495	90 °	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
9/23/81	9/25/81	J. Jensen/Empire	CME 55	7	4.6	42	46.6

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
41.8/99.5	3	3	—	458.1'	Dry	4.6/453.5

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	None	C. F. Wall

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							458.1				0'-4.6'	
SS	2	0.9	38	40	26	12				1	Black to yellow-brown, loose, fine to coarse SAND, some fine gravel (COAL), moist, fill.	Drilling with 3/4" hollow-stem augers.
SS	2	0.1	10	9	3	7				2	Dk brown, loose, med. stiff, fine to coarse SAND & silty CLAY, tr. gravel & organics, wet.	
SS		0.7		28	100/0	—				3		Auger refusal at 4.6'.
				RQD %	FT	MIN	453.5	5			4.6'-19.3' GRIMSBY FM.	
NX	2.5	2.5	100	0.4/16	1 2½	3 3½				RUN 1	Dk reddish brown to pale green, hard to v. soft slightly to completely weathered, fine grained to microcrystalline interbedded SANDSTONE & SHALE, shale completely weathered to clay, bedding thin and horizontal with occasional bedding plane separations. 6.0'-6.4' vertical joints, rough, no coating.	No loss of return water. Volume occasionally decreasing at fractures.
NX	5.0	5.0	100	0	1 2 3 4 5	2½ 2½ 3-1/6 4½ 4½	446.9	10		RUN 2		
NX	5.0	4.9	98	3.0/60	1 2 3 4 5	4 6 4½ 4½ 4		15		RUN 3	Pale greenish white, v. hard, fresh to slightly weathered, fine grained SANDSTONE, horizontally bedded with slight staining (yellow-brown) on bedding separations.	
NX	4.9	4.8	98	2.9/59	1 2 3 4 0.9	4½ 5½ 3½ 3½ 3-3/4		20		RUN 4	19.3'-41.3' POWER GLEN FM.	
NX	5.0	4.9	98	3.0/60	1 2 3 4 5	4½ 4½ 4½ 5 4		25		RUN 5	Dk. reddish brown to pale green to grayish green to white to med. to dk. gray, v. soft to v. hard, slightly to completely weathered, v. fine grained to microcrystalline, interbedded SHALE, LIMESTONE, DOLOMITE, & calcareous SANDSTONE. Bedding is thin, horizontal, irregular with occasional banding slump structures, occasional bedding joints. 20.0-20.3 Vertical joints, rough, 21.5-21.8 irregular, no coatings.	
NX	5.0	4.7	94	3.7/74	1 2 3 4 5	4 3-1/6 3½ 3-3/4 3½		30		RUN 6		
NX	5.0	4.9	98	4.8/96	1 2 3	3 3 3½				RUN 7		

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Danielewicz Route

HOLE NO.: D-7

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 of 2	D-7

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS / 1'-0" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH - FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %	FT	MIN				7	19.3'-41.3' POWER GLEN FM. (cont.)	
NX	4.7	5.0	106	3.5/74	1 2 3 4 0.7	3.5 5 5 5 5	417.1	40		RUN 8		Bore hole reamed with 3-3/4" roller-rock bit to 45.5.
											41.3'-46.6' WHIRLPOOL FM. Grayish white, hard to v. hard, fresh to slightly weathered, fine to medium grained SANDSTONE, slightly calcareous, bedding massive with bands of shale, 43.3-44.6 Vertical joints, rough, no coating. 45.3-45.7 Joint at 66°, vertical joints, rough, no coating.	
NX	5.0	5.1	102	3.5/76	1 2 3 4 5	4 4 4½ 4½ 4½	411.5	45		RUN 9		
											Boring completed at 46.6'. Boring completed as observation well. See observation well completion report for construction details.	Screened interval 35.8' to 45.3'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Danielewicz Route

HOLE NO. D-7

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-49

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,161,003 E 468,422	90°	--

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/28/81	10/28/81	B.Scirra/Empire	CME 45C Skid	NX/6	0.9	49.6	50.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
48.2/97	4	1	461.9	459.8	37.6/422.2	1.4/458.35

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
--	--	J. A. Stone/D. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH	CORE RUN	SAMPLE RECOVERY	CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							RQD %			459.8					
										458.4				Top of Rock 1.4'-22.0' GRIMSBY FM. SANDSTONE, SILTSTONE, SHALE: interbedded 60-65%SS/40-45% sh. SANDSTONE & SILTSTONE: dk. red brown to pale green to lt. gray, fine to v. fine grained, thin-bedded (horizontal) medium hard to hard, fresh to moderately weathered, cross-bedded, occ. pale green blotchy patches (mottling), gradational change between sandstone & siltstone. SHALE: dk. red brown to pale green, thin-bedded to fissile (horizontal) soft, moderately to completely weathered to clay. Bedding plane joints (Fe stained w/clay residue): 8.7-9.2, 9.7-10.0, 12.1, 12.4-12.6, 13.0, 14.2-14.3, 14.6, 14.8, 15.0, 15.1, 15.9, 16.1-16.5, 22.9, 23.0, 23.5. Vertical joints (Fe stained) 7.4-7.9, 8.1-8.7.	
NX	5.0	5.0	100								5		RUN 1		10" hollow stem auger used to a depth of 1.4', 8" PVC surface casing cemented in place. Water used as drilling fluid.
NX	5.0	4.7	94	0									RUN 2		
											10				
NX	2.4	2.2	91	17									RUN 3		
NX END BOX 1	4.0	3.6	90	22							15		RUN 4		
NX	4.2	5.0	119	98									RUN 5		
											20				
										437.8				22.0'-45.1' POWER GLEN FM. SHALE, DOLOMITE calcareous SANDSTONE interbedded. SHALE: med.-dk. gray, thin-bedded to fissile, med. hard to med. soft, fresh to completely weathered to clay. Fossiliferous, burrows, clay inclusions. DOLOMITE/calcareous SANDSTONE: lt-med. gray, fine grained, thin-bedded, hard, fresh, fossiliferous, cross-bedded, clay inclusions.	
NX	5.0	4.6	92	56									RUN 6		
											25				
NX END BOX 2	5.0	4.9	98	44									RUN 7		
											30				
NX	5.0	4.8	96	52									RUN 8		
										424.8					

SS = SPLIT SPOON; ST = SHELBY TUBE; O = OSTERSON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-49

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 of 2	D-49

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							424.8					
			RQD %								22.0'-45.1' POWER GLENN FM.(cont.) Bedding plane joints (Fe stained &/w clay residue on surface): 23.9-24.3, 24.9, 25.0, 25.2, 25.5, 32.2, 32.4, 33.8, 34.2, 35.2, 36.5-36.8, 41.5-42.2, 42.6, 43.0, 43.5, 44.1, 44.2-45.5. Vertical joints (Fe stain on surface): 41.6-42.0, 42.6-42.9, Power Glen fm.	
NX	5.0	5.0	100	70				40		RUN 9		
NX END BOX 3	5.0	3.9	78	38			414.7	45		RUN 10	45.1'-50.5' WHIRLPOOL FM. SANDSTONE: lt. gray, fine grained, thin-bedded to massive, hard, fresh, unknown black mineral gives speckled look. Cross-bedded, occ. shale partings. No joints or fractures in this section.	Boring reamed 6" Diam. to 58.0'. Obsv. well installed to 51.3' depth.
NX	4.0	4.5	112	10			409.3	50		RUN 11		
END BOX 4											Bottom of hole @ 50.5'. Boring completed as observation well. See observation well completion report for construction details.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-49

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 3	D-50

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,983 E 468,415	90°	--

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/13/81	10/16/81	Empire	CME 45	NX/6	2.8	87.8	90.6

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
85.65/98	6	2	462.69	460.8	44.2/416.6	2.8/458.0

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	--	J. C. Isham

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
						74th	460.8					
SS/ 2"	2.0 .5	1.5 0.0	17 REF.	25	13	4/3	458.0			1 2	0.0'-2.8' reddish brown weathered & fractured shale & sandstone. Top of rock.	6" hollow stem auger used to a depth of 2.8 ft.
NX	5.0	3.7	74	RQD % 13				5		RUN 1	2.8'-22.8' GRIMSBY FM.: reddish brown and mottled reddish brown & pale green sandstone, interbedded with reddish brown shale, sandstone is hard, massive to thinly bedded, horizontal bedding with cross-bedding at approx. 20' from horizontal.	NX casing installed to a depth of 2.8 ft. Water used as a drilling fluid.
NX	5.0	5.0	100	64				10		RUN 2	Shale, weathered to firm.	10" hollow stem auger used to a depth of 2.8 ft & 8" PVC surface casing cemented in place after NX coring. Water level: 7.45 10-14-81 boring at 22.81, 18.45 10-16-81 boring at 85.6.
NX	5.0	5.0	100	58				15		RUN 3	16.3'-22.8' Basal unit of GRIMSBY FM. Pale green sandstone	
NX	5.0	4.85	97	56	Packer Test #7 7.7 x 10 cm/sec		6	20		RUN 4		
							438.0					
NX	5.0	5.0	100	54				25		RUN 5	22.8'-45.95' POWER GLEN FM.: Dark reddish brown to pale green & grayish green, v. hard to soft, fresh to slightly weathered, v. fine grained to microcrystalline interbedded calcareous sandstone, shale & dolomite thin horizontal bedding with slump structures & cross-bedding, iron oxide staining on some joints, vertical fractures- 22.5-22.8, 25.2-25.45.	
NX	5.0	5.0	100	78	Packer Test #6 4.8 x 10 cm/sec		4	30		RUN 6	Horizontal fracture zones: 23.1'-23.45', 23.8'-24.0'.	
NX	2.8	2.8	100	14						RUN 7		
							425.8	35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-50

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 of 3	D-50

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC
							425.8					
NX	5.0	5.0	100	RQD % 90				40		RUN 8	22.8'-45.95' POWER GLEN FM. (cont.)	
NX	5.0	5.0	100	71	Packer Test #5 5.2×10^{-4} cm/sec					RUN 9		▽
NX	5.0	5.0	100	90			414.85	45		RUN 10		
NX	5.0	5.0	100	94	Packer Test #4 Zero Flow			50		RUN 11	45.95'-56.5' WHIRLPOOL FM.: Gray to lt. gray, v. hard sandstone, massive to thin bedding, iron oxide staining at some joints with black shale partings.	
NX	5.0	4.7	94	66			404.3	55		RUN 12	56.5'-90.6' QUEENSTON FM.: Dark reddish brown, firm shale, banded and mottled with blue-green shale, calcareous, fresh, massive, some open and calcite filled vugs. Core breaks along a preferential plane of weakness at an angle of 20° to 30° from horizontal. 56.5-57.3 soft weathered blue-green shale.	
NX	5.0	5.0	100	68	Packer Test #3 Zero Flow			60		RUN 13		
NX	5.0	5.0	100	86				65		RUN 14		
NX	5.0	4.8	96	45	Packer Test #2 Zero Flow		385.8	70		RUN 15		
								75				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-50

BECHTEL

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 3 OF 3 | HOLE NO.: D-50

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / CORE RUN LENGTH	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							385.8					
NX	5.0	4.9	98	RQD % 89						RUN 16	56.5'-90.6' QUEENSTON FM. (cont.): Bands of blue-green firm shale: 66.2-66.35, 68.1-68.2, 69.3-69.8, 75.7-75.85, 76.1-76.3, 90.3-90.6. Mottled zones of dark red-brown & blue-green shale: 58.0-58.4, 60.8-61.3, 76.8-77.6, 79.0-79.8, 89.4-90.0.	
					Packer Test #1 Zero Flow			80				
NX	5.0	4.9	98	60						RUN 17		
								85				
NX	5.0	5.0	100	74						RUN 18		
								90				
							370.2				Bottom of Boring: 90.6 ft. Boring completed as observation well. See well completion report for construction details.	Boring reamed to 6" Diam. to 91.0'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark | HOLE NO.: D-50

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-51

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,161,001 E 468,399	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/2/81	10/21/81	J. Lamb/Empire	CME 45	NX/6	1.0	42.3	43.3

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
39.8/94	3	—	461.77	459.5	16.9/442.6	1.0/458.5

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	—	D. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							459.5					
0							458.5				0'-1.0' Reddish brown, weathered & fractured SHALE & SANDSTONE, top of rock.	NX diamond core split inner barrel. Water used as drilling fluid. 10" hollow stem auger used to a depth of 1' & 8" PVC surface casing cemented in place.
				RQD %							1.0'-21.7' GRIMSBY FM.	
NX	3.3	2.0	61	30						RUN 1	Dk.red-brown to pale green to green to grey, fresh to severely weathered, soft to med. hard, fine grained to micro-crystalline interbedded, SANDSTONE, SILTSTONE, SHALE, shale friable to completely weathered to clay occasional cross-bedding & banding, horizontally & vertically jointed, yellow-brown coatings present, 15.5'.	
NX	5.0	5	100	0.8/16				5		RUN 2		
NX	5.0	4.8	96	2.4/48				10		RUN 3	7.6'-8.2' vertical fracture with yellow brown coating.	Lost all water 1-3'. Water level: 6.2' 10-22-81 am boring logged from core box.
NX	5.0	5	100	3.6/72			444.0	15		RUN 4	15.5'-21.7' GRIMSBY FM. Pale green to gray, fresh, med. hard, fine grained, SANDSTONE few horizontal joints, zone of green clay at 20.2, vertical joints at 19.5-19.9, 21.6-22.2.	
NX	5.0	4.9	98	2.7/54				20		RUN 5		
							437.8				21.7'-43.3' POWER GLEN FM. Dk. red-brown to brown to pale green to gray, fresh to slightly weathered, soft to med. hard, fine grained to microcrystalline interbedded SHALE, LIMESTONE, calcareous SANDSTONE, DOLOMITE, siltstone, occasional banding & slump features, hori-zontal & vertical joints present, occasional yellow brown coating on joints, few vugs. in calcareous SANDSTONE.	
NX	5.0	5	100	0.85/17				25		RUN 6		
NX	5.0	3.5	70	0.8/16				30		RUN 7	Vertical joint, stained, in calc. sandstone at 23.4'-23.55', 23.8'-24.8', and occasional vugs. 24.0'-24.4' vertical joint to weathered clay zone, clay zone at 24.4'.	
							424.5	35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO: D-51

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 of 2	D-51

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							424.5					
NX	5.0	4.8	96	RQD % 1.2 / 24						RUN 8	21.7'-43.3' POWER GLEN FM. (cont.) Vertical fracture from horizontal joints at 23.2'-23.6'.	Boring reamed to 6" diameter to 43.3'.
NX	5.0	4.8	96	0.6 / 12				40		RUN 9		
							416.2				Boring completed to 43.3'.	
								45			Boring completed as observation well. See observation well completion report for construction details.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-51

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 3	D-52

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,634 E 468,308	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/14/81	10/23/81	J. Jensen/Empire	CME 55	NX/6	1.5	88.7	90.2

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
80.8/91	6	1	468.69	466.5	55.3/411.2(12/15/81)	1.5/465.0

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	—	J. C. Isham/D. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE/LENGTH CORE RUN	SAMPLE RECOVERY/CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							466.5					
SS 2	18	8	105	5	5	100	465.0			1	0'-1.5' Red brown, fine to coarse grained SAND, trace clay & pebbles.	Water used as drilling fluid.
NX 3	5.0	5.0	100	RQD% 17				5		RUN 1	1.5'-32.6' GRIMSBY FM: Reddish brown & mottled reddish brown, and pale green sandstone interbedded with reddish brown shale. Sandstone is hard, massive to thinly bedded, horizontal bedding with cross-bedding at approx. 20° from horizontal. Shale is weathered to firm some slump structures fracture spacings .1' to .5'. Vertical fractures at: 6.0-6.5, 8.0-9.0, 13.0-13.3, 16.5-17.0, 17.6-31.0	Lost 50% of water at 2'.
NX	1.0	1.0	100	0						2		10" hollow stem auger used to a depth of 1.5' & 8" surface casing installed & cemented.
NX	1.3	1.2	92	0						3		
NX	.2	.2	100							4		
NX	2.0	1.6	80	0				10		RUN 5		
NX	2.0	2.0	100	0						RUN 6		
NX	4.0	3.7	93	35				15		RUN 7		
NX	2.9	2.9	100	39						RUN 8		
NX	4.1	4.1	100	73				20		RUN 9		
NX	5.0	4.8	96	50				25		RUN 10	25.0'-32.6' GRIMSBY FM. basal unit.	
NX	4.9	4.9	100	29				30		RUN 11		
							433.9				32.6'-54.6' POWER GLEN FM.: banded and mottled dark reddish brown, pale green & blue-green, interbedded sandstone and shale (cont.)	
							431.5	35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO: D-52

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 OF 3	D-52

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							431.5					
NX	4.8	4.7	98	RQD % 60						RUN 12	32.6'-54.6' POWER GLEN FM.(cont.): with some slump structures & cross-bedding horizontal fractures of approx. .2'-.5' spacings. 34.3-36.0 blue-green sandstone. 36.0-37.5 dark red-brown shale. 37.5-38.1 mottled green & dark red brown sandstone. 38.1-39.4 blue-green sandstone.	
NX	4.4	4.4	100	69	Packer Test #1 2.1 x 10^{-5} cm/sec			40		RUN 13		
NX	10.0	10.0	100	76				45		RUN 14		
					Packer Test #4 1.5 x 10^{-4} cm/sec		411.9	50				
NX	10.0	9.8	98					55		RUN 15	54.6'-65.6' WHIRLPOOL FM.: gray to white hard to v. hard fresh sandstone, massive to thinly bedded horizontal joint stained with FeO, 55.3. Vertical fractures: 55.3-55.9, 56.0-57.1, 58.3-59.1.	▽ pH of drilling fluid is 9.5.
					Packer Test #3 2.0 x 10^{-5} cm/sec			60				
NX	10.0	9.6	96	24			400.9	65		RUN 16	65.6'-90.2' QUEENSTON FM: Dark reddish brown with blue-green mottling, soft massive shale, horizontal joints on .2-.3 spacings, some joints at 20°-30°. 65.6-66.1 blue-green 66.1-68.2 dk. red-brown 68.2-68.5 mottled green & red 68.5-74.4 dk. red-brown 74.4-75.7 banded green & red-brown	
					Packer Test #2 Zero Flow			70				
							391.5	75				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-52

BECHTEL

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 3 OF 3 | HOLE NO.: D-52

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS /6" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							391.5					
NX	10.0 / 10.0		100	RQD % 70	Packer Test #1 Zero Flow			80		RUN 17	65.6'-90.2' QUEENSTON FM. (cont.): 75.7-77.1 dk. red-brown 77.1-77.5 green 77.5-78.6 dk. red-brown 78.0-79.15 green 79.15-79.55 dark red-brown 79.55-79.8 green 79.8-90.2 dark red-brown	
NX	6.9	6.9	100	75				85		RUN 18		
							376.3	90			Bottom of boring 90.2 ft. Boring completed as observation well. See observation well completion report for construction details.	Boring reamed to 6" diameter to 90.2'.
								95				
								100				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark | HOLE NO.: D-52

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-53

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,626 E 468,353	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/15/81	10/17/81	J. Genoves/Empire	CME 45B	NX/NQ 6	2.6	43.3	45.9

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
41.9/91	3	2	469.18	467.4	32.3/435.1 (12-15-81)	2.6/464.8

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	—	D. L. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	PERCENT CORE RECOVERY	SAMPLE BLOWS "N"	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
								467.4					
SS	2	0.7	49		20	35	14				1	0'-2' Reddish brown, fine to coarse loose SAND, moist, some fine gravel some cobbles, trace of clay.	Set 8" PVC surface casing to depth of 2.6 ft to contain surface flow, used 10" hollow stem auger.
SS	0.6	0.2			100/.1	—	—				2		
					RQD %			464.9				Red brown, fine to coarse loose SAND, moderate amount of fine gravel.	
NX	5.0	4.7	94		7						RUN 1	2.6'-33.1' GRIMSBY FM.: Dk. red brown to pale green to white, fresh to severely weathered, soft to med. hard, fine grained to microcrystalline SANDSTONE, SILTSTONE, SHALE, horizontal jointing predominant, some joints 20°-30° shale completely weathered to clay. Occasional shale & bedding plane separations, yellow-brown coatings present in some joints, joint spacing range 0.05'-0.8', yellow-brown stains in horizontal joints at 6.6', 15.9', 16.3'-16.6', 26.3', 30.9'.	Lost 10%-15% of water at 26.6. Lost all water at 29.6. Water level before packer test 24.2.
NQ	8.7	8.7	100		47				10		RUN 2		
END BOX 1									15				
NQ	9.3	8.8	95		17				20		RUN 3		
												26.1'-33.1' Basal GRIMSBY FM.: Mottled pale green to white to red-brown, v. hard, fresh to slightly weathered, fine grained, SANDSTONE horizontal & vertical jointing w/yellow-brown coatings.	
									25			26.3'-27.0', vertical joint w/rust colored to red-brown to black coating, 28.3'-29.2' dk. brown to black stains, presence of reddish-brown dots about the size of a pin head. 29.4 - rust color dots. 30.0 - thin zone of black dots about size of straight pin head. 30.9 Horizontal joint w/yellow-brown stains.	
NQ	10.0	10.0	100		29				30		RUN 4		
								434.3				33.1'-45.9' POWER GLEN FM.	
								432.4					

Packer Test #2 — 1.3×10^{-3} cm/sec — 441.4

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE	HOLE NO
Van De Mark	D-53

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset	14818	2 of 2	D-53

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %			432.4					
NQ	10.0	10.0	100	72/72	Packer Test #1 2.74 x 10^{-6} cm/sec			40		RUN 5	33.1'-45.9' POWER GLEN FM. (cont.): Dk. red-brown to white to green, v. soft to med. hard, fine grained to microcrystalline, SHALE, LIMESTONE, calcareous SANDSTONE, DOLOMITE, SILTSTONE, occasional separation along bedding planes. Vuggy zone at 35.0-35.6 dk. red ppt. in vugs. Minor amount of vugs at 39.6. Yellow-brown stains in horizontal joints at 36.0, 38.3, 39.6.	
END BOX 3							421.5	45			Boring completed at 45.9 ft. Boring completed as observation well. See well completion report for construction details.	Boring reamed to 6" diameter following coring. Reamed to 45.6'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-53

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO
Somerset Railroad	14818	1 OF 2	D-54

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,660 E 468,316	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/27/81	10/29/81	J. Jensen/Empire	CME 55	NX/6	0.7	57.1	57.8

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
53.2/94	4	—	468.46	466.4	54.4/412.0 (12-15-81)	0.7/465.7

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	C. F. Wall

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PER CENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							466.4					
			RQD %				465.7			RUN 1	0'-0.7' Residual Soil 0.7'-35.3' GRIMSBY FM. SANDSTONE with interbedded SHALE: dk. reddish brown to pale green to grayish green, v. hard to med. soft (sandstone) and med. soft to v. soft (shale), fresh to completely weathered, sandstone is fine grained, cross-bedded and fossiliferous.	Drilling with NX split-tube core barrel to 57.6 ft. Reamed with 5-7/8" roller-rock bit to 58.0 ft.
NX	1.1	1.0	91	0								
NX	3.0	1.5	50	40						RUN 2		
								5				
NX	8.0	6.9	86	30						RUN 3	Bedding separations @ 1.4, 4.7-5.8 (com. weath. & broken), 9.8, 10.0 (sl. staining), 12.4, 13.1, 16.3, 16.4, 18.0, 20.8, 21.1, 21.2, 21.6, 25.3, 28.0, 28.7, 32.1, 32.3, 34.1, 34.4, 34.7 (occasional staining). Vertical joints @5.2-5.8 (uneven, rough surface, no stain.), 6.0-6.5 (rough surface, no stain.), 8.4-12.3 (uneven, rough surface, sl. staining, occasionally rehealed), 16.2-16.7 (uneven, rough surface, stained), 18.0-18.2 (rehealed), 23.0-24.1 (uneven, rough surface, partially rehealed), 30.1-30.5(rehealed).	
								10				
NX	10.0	9.7	97	65						RUN 4		
END BOX 1												
							446.4	20				
								25		RUN 5		
NX	10.0	9.9	99	95								
								30				
END BOX 2												

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-54

BECHTEL

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 2 OF 2 | HOLE NO.: D-54

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			RQD %				431.1				35.3'-54.5' POWER GLEN FM.	
NX	10.0	9.5	95 / 75					40		RUN 6	SHALE, calcareous sandstone, limestone: dk. reddish brown to pale red to pale green to grayish green to med. to dk. gray to white, v. hard to med. hard, fresh to mod. weathered, fine grained to microcrystalline, banded, thin to med. bedded.	
NX END BOX 3	10.0	10.1	101 / 99					45 50		RUN 7	Bedding separations @ 36.0, 36.2 (stained) 51.8, 54.3 (orange & bl. staining) Vertical joints @ 36.0-36.7 (rough surface, tr. staining), 38.3-38.7 (rough surface, no staining), 35.0-35.3 (uneven, rough surface, bl. staining), 53.2-53.6 (rehealed).	
NX	3.0	4.6	92 / 80				411.9	55		RUN 8	54.5'-57.8' WHIRLPOOL FM. SANDSTONE: white, v. hard, fresh to sl. weathered, fine grained, cross-bedded, with shale partings. Bed. Sep. @ 54.6, 55.6 (orange & black staining) Vertical joint @ 53.2-53.6 (rehealed).	▽
END BOX 4							408.6	60			Boring completed at 57.8 ft. Observation well installed. See observation well completion report for construction details.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark | HOLE NO.: D-54

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-55

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,756 E 468,241	90°	--

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/14/81	10/16/81	J. Jensen/Empire	CME 55	NX	2.7	44	46.7

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
42.4/96.4	3	2	469.36	467.4	34.6/432.8	2.7/464.7

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	--	D. L. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							467.4					
SS	2	0.7	17	5	7	10				1	0'-2.7' Red-brown, fine to coarse, m. dense SAND, moist, trace organics, some fine gravel, some angular cobbles.	8" PVC surface casing cemented to a depth of 3 ft.
SS	0.7	0.1		100/.2	--	--	464.7			2	Red-brown to white, loose, moist, fine SAND, two angular cobbles.	
				RQD %						RUN 1	2.7'-31.9' GRIMSBY FM. Dk. red brown to pale green, med. hard to v. soft, fresh to highly weathered, fine grained to microcrystalline interbedded SANDSTONE, SILTSTONE & SHALE, shale weathered to clay, bedding thin & horizontal with few bedding plane separations. Highly jointed, horizontal to 30° in SS iron oxide stains present in some joints.	Water used as drilling fluid.
NX	5.0	5.0	100	19				5				Lost 50% of water at 11.2.
NX	2.0	2.0	100	32								Lost all water at 28.2. Lost water in highly fractured vuggy zone.
										2		
NX	2.0	1.6	80	0				10		RUN	Yellow-brown stains in horizontal joints at 13.1, 18.2, 23.1, 23.3, 25.0.	Changed core bits at end of Run 4. Metal from auger tooth at bottom hole. Lost diamond core bit at end of run 4, used old bit to TD. Fished out plenty metal shavings.
NX	5.0	4.7	94	16								
								15		RUN 4		
END BOX 1												
NX	5.0	4.4	88	57						RUN 5		
							447.1	20			20.3'-31.9' Basal GRIMSBY FM.: Mottled pale green to white, red-brown, v. hard, fresh to slightly weathered, fine grained SANDSTONE, horizontal bedding, some beds angle at 30°, horizontal & vertical joints. Horizontal joint spacing .2'-.9' yellow-brown staining on joints 27.8 vertical fracture to 28.0 yellow-brown stains.	
NX	5.0	4.9	98	88						UN 6		
								25				
NX	5.0	4.9	98	46	Packer Test #2 2.1 x 10^{-3} cm/sec					RUN 7	28.15-29.0 vertical joint extends from horizontal joint at 28.15, at 29.0 vertical joint fades out. Dk. red brown to black stains present. 29.65-30.3 See page 2 for tabulation of joints.	
								30				
END BOX 2							435.5					
NX	5.0	5	100	18						RUN 8	31.9'-46.7' POWER GLEN FM.: Dk. reddish brown to pale green to green to white, v. soft to v. hard, slight to severely weathered, v. fine grained to microcrystalline, SHALE calcareous	
							432.4					

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-55

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 OF 2	D-55

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %			432.4			8	31.9'-46.7' POWER GLEN FM. (cont.): SANDSTONE, LIMESTONE, DOLOMITE, SILTSTONE, occasional slump features. Bedding is thin & horizontal. Occasional bedding joints. 31.7-31.9 vertical joints. 31.9-32.1 severely weathered zone, weathered to clay, rock fragments present.	
NX	5.0	4.9	98	78	Packer Test #1 1.7 x 10^{-4} cm/sec			40		RUN 9		
NX	5.0	5	100	16			420.7	45		RUN 10		
END BOX 3								50			Boring completed at 46.7 ft. Boring completed as observation well. See observation well completion report for construction details. Horizontal bedding joints exist throughout the rock. Vertical joints 27.8-28.0 coating 28.15-30.3 coating 38.9-39.0 coating 39.1-39.2 coating 46.7-47.2 no coating 29.65-30.3 severely weathered zone, v. vuggy, looks eaten away, no visible coatings in vugs. joint spacing 2 cm, 28.1-30.3 connected by vertical joint.	Boring reamed to 6" nom. diam. Reamed to 45'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-55

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 of 3	D-56

SITE	COORDINATES		ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,739	E 468,251	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/24/81	10/25/81	M. Fuhrmann/Empire	CME 45C (Skid)	6	2.6	107.45	110.05

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
107.55/100.1	8	1	469.49	467.3	56.1/411.2	2.6/464.7

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	D. Middleton/C. F. Wall/J. C. Isham

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY	CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %				467.3				0'-2.6' Red-brown fine to coarse grained SAND, trace organics some gravel, Top of rock 2.6'.	8" PVC surface casing cemented to a depth of 4.8', 10" hollow stem augers used.
NX	2.7	3.1	114					464.7			RUN 1	2.6-4.1 grout. 2.6'-32.0' GRIMSBY FM.: 4.1'-5.2' grout, SHALE intermixed completely weathered to clay, occ. chunks of pale green sandstone.	Water used as drilling fluid.
NX	5.0	5.0	100	30					5		RUN 2	SANDSTONE, SILTSTONE, SHALE interbedded. Dk. red-brown to red-brown to green fine grained to microcrystalline, soft to moderately hard, fresh to moderately weathered.	Lost all water at 15.0'.
NX	4.75	4.75	100						10		RUN 3	Bedding joints (Fe. stained, occ. clay residue): 7.5', 10.3', 12.15', 16.5', 18.3', 24.7', 24.8', 26.4',26.7', 27.0', 27.6'. Vertical joints: 8.5'-8.8', 11.1'-12.15', 20.6'-21.1'.	
END BOX 1									15				
NX	10.0	9.8	98	70					20		RUN 4	Horiz. joints: 27.8, 30.0, 30.9, 30.95, 31.55. Vert. joints: 25.5'-26.75', 27.85'-28.05', 28.6-29.5. Grimsby Fm.	
NX	10.0	10.0	100	49					25		RUN 5		
END BOX 2					Packer Test #8 Invalid			435.3	30			32.0': 2 cm red-brn. plastic CLAY, 32.0'-54.0' POWER GLEN FM.	
								432.3					

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-56

BECHTEL

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 2 of 3 | HOLE NO.: D-56

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS /ft. N / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %							37.0'-54.0' POWER GLEN FM.(cont.): SHALE, LS, calcareous SANDSTONE, light to dark red-brown to dark green, fresh to sli. weath., soft to med. hard, occ. banding, slump structures.	
NX	10.0	10.0	100	68	Packer Test #8 Invalid					RUN 6	33.6-34.0 - vertical joint. 36.2-36.4 - vertical joint. Horiz. joints: 34.1, 34.35(20°), 34.65, 35.5, 35.8-35.95 (several), 36.2, 36.4, 36.75, 37.2, 37.5, 37.8, 38.0 38.25, 38.3, 38.45, 38.7, 38.9, 39.7, 40.2, 41.1, 42.3, 42.5, 42.55, 42.75, 43.5, 44.6, 45.35, 45.37, 45.6, 47.15, 52.05, 52.65.	
					Packer Test #7 Invalid							
END BOX 3												
NX	10.0	10.0	100	74	Packer Test #6 1.5×10^{-4} cm/sec		413.3			RUN 7	37.25'-54.0': light gray to dark gray interbedded SHALE, LS, and calc. SS, fresh, soft to med. hard, f. grained to microcrystalline.	
											54.0'-66.1' WHIRLPOOL FM. SANDSTONE: white to gray, fresh, v. hard f. grained, massive. Horiz. joints: 54.05, 54.2, 54.3, 54.7, 54.75.	
NX	10.0	9.6	96	74	Packer Test #5 2.1×10^{-6} cm/sec					RUN 8		
END BOX 4							401.2					
										RUN 9	66.1'-110.05' QUEENSTON FM. MUDSTONE: dk. red brown w/pale green mottling, mod. soft, fresh to mod. weathered. Bedding separations: 67.1, 67.4, 68.6, 68.8, 69.1, 69.4, 71.1, 71.5, 71.6, 72.6, 72.7, 74.5, 74.6.	
NX	10.0	10.1	101	75	Packer Test #4 1.0×10^{-2} cm/sec		392.3					

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark | HOLE NO.: D-56

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	3 OF 3	D-56

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							392.3				66.1'-110.05' WHIRLPOOL FM. (cont.): Bedding separations: 77.7-77.8 (Broken zone), 78.2, 80.1, 80.4, 81.4, 81.8, 82.7, 84.8, Vertical joint (edge) @ 84.7-84.9 (no stain, rough). 80.5-83.5 severely weath. Bedding @ 30°.	
END BOX 5				RQD %						RUN 10		
NX	10.0	10.2	102	72	Packer Test #4 1.0 x 10^{-2} cm/sec			80			87.0': joint @ 75°. Horiz. joints: 87.4, 89.2, 90.4 (w/calcite), 92.3, 94.3. Joints: 91.75 (20°), 91.95 (20°), 92.4 (10°), 92.7 (20°), 93.5 (10°), 93.9 (20°) w/calcite, 94.4 (20°) w/ calcite.	
					Packer Test #3 Invalid			85		RUN 11		
END BOX 6												
NX	10.0	9.7	97	92	100.5' to 90' Packer Test #2 4.8 x 10^{-7} cm/sec			90				
								95		RUN 12	Bedding separations: 95.2, 96.6.	
NX	10.0	9.9	99	96	Packer Test #1 Zero Flow			100				
END BOX 7								105		RUN 13	Bedding separation: 106.7 no stain.	
NX	5.0	5.4	108	54								
							357.25	110			Hole completed at 110.05. Hole completed as observation well. See well completion report for construction detail.	Hole reamed to 6" diam. to 109'.
END BOX 8								115				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE	HOLE NO.
Van De Mark	D-56

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 of 2	D-57

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,739 E 468,229	90°	--

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/25/81	10/27/81	M. Goudy, J. Genevese/Empire	CME 45B	6	1.2	58.1	59.3

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
56.3/95	4	--	469.27	467.0	54.6/412.4	1.2/465.8

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
--	--	S. Balone/J. C. Isham/ C. F. Wall

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD	%		467.0					
NX	3.4	3.0	88	0.4	12		465.8			RUN 1	0'-1.2' Residual Soil 1.2'-35.2' GRIMSBY FM. SANDSTONE: Dk. reddish brown to lt. greenish gray, hard to med., hard to med. soft, mod. to severely weathered, with shale bedding partings, sandstone v. fine to fine grained and sl. silty.	Drilling with NX split-tube core barrel to 59.0 ft. Reaming with 5-7/8 roller-rock bit to 58.0 ft.
NX	8.2	6.7	82	2.0	24			5		RUN 2		
NX	0.5	0.46	92	0	0			10		RUN 3	Numerous bedding plane separations, essentially horizontal, with weathering staining and clay coatings occur from 1.2' to 7.0'. From 11.8 to 38.2 there is sl. weathering and occasional staining.	
NX	2.2	2.1	95	1.6	71					RUN 4		
NX	5.0	4.9	98	2.6	52			15		RUN 5	Vertical joints @ 1.2-2.4 (weathered not continuous), 6.5-7.5(weathered, thin clay coating), 14.3-14.5(weathered, tight), 32.4-32.8(rough surface, no staining), 33.3-33.6(uneven, rough surface, no staining). Broken zones @ 7.0-9.0, 13.9-14.3.	
NX	5.0	4.9	98	4.03	81			20		RUN 6	14 bedding plane joints from 19.7' to 24.2', horiz., closed and fresh to open 1/8" and severely weathered. 24.2': horiz. joint, 1/8" filled w/clay & severely weathered shale.	
NX	5.0	4.83	97	3.95	79			25		RUN 7	7 bedding plane joints from 24.7' to 27.5', 0° to 20° fr. horiz., tight, sli. weath. to weath. 27.45'-28.7': Vert. joint, tight to closed, sli. weath.	
NX	5.0	5.0	100	3.5	70		432.0	30		RUN 8		
								35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE	HOLE NO.
Van De Mark	D-57

BECHTEL

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 2 OF 2 | HOLE NO.: D-57

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD	%		431.8				35.2'-54.2' POWER GLEN FM. SHALE with interbedded limestone and calcareous sandstone: reddish brown to grayish green to lt. gray to med. gray, v. hard to med. soft, fresh to mod. weathered.	
NX	5.0	5.0	100	0.75	15					RUN 9		
NX	5.0	5.0	100	1.1	22			40		RUN 10	Bedding separations with slight staining are numerous from 35.2 to 44.0. Vertical joints @ 35.6-36.0 (rough surface, no staining), 41.1-41.6 (no staining), 52.4-53.9 (rough surface, no staining).	
NX	5.0	4.3	86	3.2	64			45		RUN 11	Bedding separation @ 52.5 w/orange staining. Completely weathered & broken @ 53.0-54.0.	
NX	5.0	5.1	102	2.4	48			50		RUN 12		
NX	5.0	5.0	100	0.9	18		412.8	55		RUN 13	54.2'-59.3' WHIRLPOOL FM. SANDSTONE: white, v. hard to hard, fresh to mod. weathered, with occasional shale partings. Bedding separations @ 54.25, 54.5, 55.4, 55.9, 56.1 (no staining), 58.7, 58.8 (orange & black staining). Weathered zone w/banded shale partings @ 56.7-57.2. Vertical joints @ 54.6-55.1, 55.7-55.8 (rehealed, stained), 56.1-57.0 (rough surface, uneven, stained), 57.2-57.8 (rough surface, stained) 58.8-58.9 (rough surface, brilliant green mineralization).	
							407.7	60			Bottom of boring @ 59.3 ft. Boring completed as observation well. See well completion report for construction details.	Reamed to 6" nom. diam. to 58.0'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-57

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-58

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,948 E 468,241	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/17/81	10/17/81	Empire	CME 45	NX	1.5	50.0	51.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
49.25/98.5	4	1	467.68	465.7	50.7/415(Dry)	1.5/464.3

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	J. C. Isham

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
10"	Auger						465.7					
							464.2				0.0-1.5 ft red-brown, weathered & fractures Shale & Sandstone, top of rock.	8" PVC surface casing cemented to a depth of 1.5 ft.
NX	5.0	5.0	100 / RQD % 0							RUN 1	1.5-27.85 ft GRIMSBY FM: Dark reddish brown and mottled reddish brown & pale green to white sandstone interbedded with dark reddish brown shale. Sandstone is v. hard to hard, fresh, jointed at .2' to .3', spacing joints are horizontal to 20°-30° from horizontal, massive to thinly bedded.	Water used as a drilling fluid.
NX	5.0	4.7	94	38				5		RUN 2	Shale is v. soft to soft, highly weathered to weathered horizontal joints at .2'-.3' spacings. Some FeO staining in joints. Vertical Joints 3.7'-4.1' & 6.5'-9.7'.	Driller indicates lost all return water at 15.0' probably lost water in weather to highly weathered soft to v. soft fractured interbedded sandstone & shale from 11.5' to 14.5'.
NX	5.0	5.0	100	45				10		RUN 3		
END BOX 1 NX	5.0	4.7	94	77				15		RUN 4		
NX	5.0	5.0	100	88				20		RUN 5	21.55'-27.85' Basal unit of GRIMSBY FM. Pale green-blue sandstone.	Note: As of 10/29/81 the water elevation measured is that which is in the sump.
NX	5.0	5.0	100	56			437.85	25		RUN 6	27.85-51.5 ft. POWER GLEN FM. Dark reddish brown to pale green & grayish green, v. hard to soft, fresh to slightly weathered, fractured, interbedded fine grained calcareous sandstone and shale, banded & thinly bedded with slump structures, FeO staining on some joints, joints range from .2'-.5' spacing.	
END BOX 2 NX	5.0	5.0	100	46			430.7	30		RUN 7		

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO: D-58

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 OF 2	D-58

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %			430.7				27.85'-51.5' POWER GLEN FM. (cont.)	
NX	5.0	4.85	97	75				40		RUN 8		
NX	5.0	5.0	100	94				45		RUN 9		
END BOX 3 NX	5.0	5.0	100	66				50		RUN 10		
							414.2					
END BOX 4											Bottom of Boring: 51.5 ft. Boring completed as observation well. See well completion report for construction details.	Boring reamed to 6" diameter following coring. Reamed to 51.3'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-58

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO
Somerset Railroad	14818	1 OF 3	D-59

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,951 E 468,216	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/23/81	10/25/81	M. Gaudy/Empire	CME 45B	6	2.4	97.6	100.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
97.0/98	7	—	467.68	465.0	53.6/411.4	2.4/462.7

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	D. Middleton/J. C. Isham/S. Balone

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS /6" PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			RQD%				465.0				0'-2.4' Residual soil & grout.	Drilled w/NW 80 split inner-tube core barrel, 10' long.
NW	3.2	3.0	94	0			462.6			RUN 1	2.4'-27.3' GRIMSBY FM. SANDSTONE & SHALE: dark red-brown to gray, fresh to severely weath., soft to med. hard, f. grained to microxtalline Joints horiz. to 3.4'; 30° to 3.8'. Vert. joint 2.5'-3.05', ylw-or. coating. Clay seams 2.5'-2.7', 2.8-2.9', 3.1-3.2. Color varies to pale green. 10.6'-11.0': vert. joint. 11.8'-12.0': vert. joint w/dark red-brn. coating. 12.0'-12.2': vert. joint w/red-brn.coat. 14.25'-15.5': red-brn. to pale green fresh, massive, f. grain SS, banded.	20% return water. 11.0': lost all water return. 8" PVC surface casing cemented to a depth of 2.1 ft.
NW	5.0	4.4	88	0				5		RUN 2		
NW	3.0	3.0	100	57				10		RUN 3	18.0'-19.7': fossiliferous SS.	
NW	3.5	3.5	100	26						RUN 4		
END BOX 1								15			v. hard, fine grained, SS, pale green, fresh, massive.	
NW	9.1	9.0	99	86						RUN 5		
								20				
								25			25.3'-25.9': vertical fractures.	
							437.7			RUN 6	27.3'-49.5' POWER GLEN FM. Dark red-brown to dark green to pale green SHALE, LS, SS, DOL., SLT ST., fresh to slightly weath., soft to med. hard, occ. slump structures, locally fossiliferous. 28.95: vuggy zone.	
NW	10.0	10.0	100	93				30				
END BOX 2					Packer Test #7							
					7.0×10^{-7} cm/sec							
							430.0					

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO: D-59

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 of 3	D-59

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			RQD %								27.3'-49.5' POWER GLEN FM. (cont.):	
NW	10.0	9.9	99	88		Packer Test #6 3.4 x 10^{-6} cm/sec		40		RUN 7	41.6': 1.5 cm fragmented zone. Horizontal joints 46.3', 47.1', 48.95'.	
END BOX 3								45		RUN 8		
NW	10.0	10.0	100	69		Packer Test #5 4.4 x 10^{-6} cm/sec	415.5	50			49.5'-60.6' WHIRLPOOL FM. Light gray, fresh to sl. weath., well cemented f. gr. SANDSTONE, hard to v. hard. 50.1-51.7: vertical joint w/yellow-tan coating. 59.74-60.6': weath. zone. LS & shale. Horizontal joints 52.9', 53.45', 54.0', 54.4', 55.69', 57.2', 57.9', 58.37', 59.13', 59.51', 59.74', 60.2', 60.53. thin calcite coatings	48': lost all return water.
END BOX 4								55		RUN 9	59.74'-60.6': weath. zone in SS	
NW	10.0	9.95	99			Packer Test #4 3.5 x 10^{-6} cm/sec	404.4	60			60.6'-100' QUEENSTON FM. Lt. greenish-red SANDSTONE and MUDSTONE, mod. fractured, SS is hard. Horiz. fractures: 60.65, 60.97, 61.6, 61.78-61.88, 62.00, 62.50, 63.03.	
								65		RUN 10	Red-brown SS, SLTST, SH, w/green lenses, scratched w/fingernail. Joints: 65.05 @ 30°, open, 65.7' horiz. & jagged, 65.82' 30°, 65.9' & 66.0' conjugate @ 30° & 45°, 66.12' horiz., 66.25 @ 20°, 66.32 @ 30°, 66.42 @ 30°, 66.75 horiz., 66.85 @ 30°, Horiz. : 67.36, 67.81, 68.10, 68.12.	
NW	10.0	9.92	99			Packer Test #3 Zero Flow		70				90% water return.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-59

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	3 OF 3	D-59

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS /" PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH, FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC
				RQD %							60.6'-100' QUEENSTON FM. (cont.): 74.6'-74.9': Pale green. 74.9'-80.7': mottled dark red-brown & green. 80.7'-81.6': dk. reddish-brown. 81.6'-81.9': green. 82.9'-83.6': fracture zone. 81.9'-86.1': dark red-brown. 86.1'-86.7': mottled green & dk. red-brn.	
NW	9.6	9.35	97	53	Packer Test #2 7.9 x 10^{-7} cm/sec			80		RUN 11		
								85		RUN 12	86.7-94.0': dark red-brown.	
NW END BOX 6	10.0	10.0	100	50	Packer Test #1 1.8 x 10^{-4} cm/sec			90				
NW	5.9	4.96	84	67				95		RUN 13	Red-brown siltstone, med. hard (can be scratched by screw), horizontal bedding, fractured parallel to bedding, HCl test negative. Color change to wht-gray 95.3' to 95.6', 97.2' to 97.3'.	
END BOX 7	B.	O.	H. =	100.0			365.0	100			Fractures: 94.5': 0°, closed, fresh, smooth. 94.7': 0°, closed, fresh, smooth, mechanical. 95.5': <5°, tight, fresh. 96.1': <5°, tight, fresh, 1/4" frag's. 96.4': 0°, tight, fresh to sl. weath. v. thin brown clay coating. 96.8': 5°, tight, fresh to sli. weath. v. thin brown clay coating. 98.3': mechanical. Boring completed to 100'. Boring completed as observation well. See well completion report for construction details.	Driller reports 0.9' of core left in bottom of hole. Boring reamed to 6" diameter following coring. Reamed to 100'.
								105				
								110				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-59

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-60

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,934 E 468, 227	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/24/81	10/26/81	Empire	Acker	NX/6	1.4	55.65	57.05

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
	4	1	467.75	465.7	54.1/411.6	1.4/456.4

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	J. C. Isham/B. Blodnikar

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
6" FA			RQD %				465.7				0'-1.4' Silty CLAY red-brown to red w/4" blocks of shale & siltstone.	8 PVC surface casing cemented in place to a depth of 1.4'.
NX	3.6	2.65 / 74	0				464.3			RUN 1	1.4'-28.2' GRIMSBY: Banded and mottled dark reddish brown & pale green interbedded sandstone & shale. 1.4 to 15.3' weathered, fractured to highly fractured, hard to soft. Some FeO staining on fractures. vertical fractures: 11.7-12.3 & 12.9-13.3.	Water used as a drilling fluid.
NX	5.0	4.7 / 94	16					5		RUN 2		
NX	5.0	5.0 / 100	0					10		RUN 3		
NX	5.0	5.0 / 100	76					15		RUN 4	15.3'-28.2' unweathered fresh, massive to thinly bedded, some cross-bedding horizontal fractures. 15.85 with FeO staining. 16.4 with FeO staining. 16.9-17.2 fracture zone. 18.05-18.1 green clay seam. 19.35, 19.7, 20.4, & 20.6 green clay partings.	
END BOX 1												
NX	4.5	3.05 / 68	64					20		RUN 5	21.65'-28.2 Basal GRIMSBY gray, very hard sandstone. 25.3 & 25.8 green clay seam horizontal fracture 24.9.	
NX	1.8	1.8 / 100	100					25		RUN 6		
NX	5.0	4.9 / 98	70				437.5			RUN 7	28.2-50' POWER GLEN FM.: Dark reddish brown, white & green interbedded SANDSTONE & SHALE, thinly bedded, soft, vuggy, horizontal joints at .2-.4 spacings, some clay filled joints.	
END BOX 2								30		RUN 8		
							430.7					

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-60

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 of 2	D-60

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS N' / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD	CORE	RATE						
NX	10.0	9.99	100%		5 min/ft			40		RUN 8	28.2'-50' POWER GLEN FM. (cont.) Occ. LS layers, foss. siltstone & calc. cemented SS. Horiz. fractures: 31.4, 31.8, 32.75, 31.7-31.74 (thin crushed zone), 33.05, 33.66, 34.0, 34.6, 36.02, 36.94, 37.3, 37.97 (20°), 38.08, 38.45, 38.58 @ 45° 39.32, 40.14, 40.9, 41.99, 42.56, 42.6 43.38, 47.7'-48.3' vertical, 43.42' (30°), 43.99, 46.24, 46.78, 47.62(1/4" clay), 49.3', 49.4', 49.97'.	
NX END BOX 3	10.0	10.0	100%		5 min/ft			45		RUN 9		
							415.7	50			50'-57.05' Light gray hard SANDSTONE, thin bedded upper 1.2' is weathered, f. to med. grained, locally calc. cemented, WHIRLPOOL FM.	
NX	5.75							55		RUN 10	Fractures: horizontal except as noted. 50.22', 50.22'-50.68'(90°), 51.08, 51.18, 52.22 (30°), 53.2 (30°), 53.27 (30°), 54.9, 54.9-56.5 (arcuate near-vertical), 55.1, 55.3, 55.4, 55.6, 56.04, 56.16, 56.8.	▽
							407.7					
END BOX 4	T.D. = 57.05'							60			Boring completed to 57.05'. Boring completed as observation well after reaming. See well completion report for construction details.	After coring, boring reamed to 6" nom. diam. to 58.0'.
								65				
								70				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-60

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-61

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,865 E 468,343	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/21/81	10/21/81	J. Genovese/Empire	CME 45B	NX/NQ/6	2.8	43.3	46.1

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
95.8	3	2	469.31	467.4	31.1/436.3	2.8/464.6

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	—	D. L. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE	LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
								467.4					
SS	2	0.4	24		6	4	20				1	0'-2.8' Reddish brown to white, fine to coarse grained, v. dry SAND, shale weathered to stiff red clay. Yellow-brown stain at 2.1'.	NX & NQ Diamond core barrel split inner tube.
SS	0.8	0.2			100/.2			464.6			2		
					RQD %	FT	MIN					2.8'-30.1' GRIMSBY FM. Dark red brown to pale green to gray, fresh to severely weathered, soft to medium, hard, fine grained to microcrystalline, interbedded. SANDSTONE, SILTSTONE, SHALE, horizontal jointing predominant, shale weathered to clay, occasional cross-bedding and slump features. Yellow brown stains at 4.1-4.5, 10° from horizontal. 20.8-21.3 - vertical fracture in sandstone with tan acicular or needlelike precipitate formed. Precipitate forms semi-radial patterns, does not react with HCl. Yellow-brown coating on horizontal joint at 6.7'.	Water used as drilling fluid. 10" hollow stem auger used to a depth of 2.8' & 8" PVC surface casing cemented in place. Lost all water at 7.4'. Water level: 2.0' 10-22-81 boring at 37'.
NX 2-1/8	5.0	4.9	98		14				5		RUN 1		
NQ 1-7/8	5.6	3.7	66		15	1 2 3 4 5	5 5 5 5 5		10		RUN 2		
NQ	3.1	3.1	100		64	1 2 3	3 3 3		15		RUN 3		
END BOX 1						1 2 3 4 5 6 7 8 9 10	7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5				RUN 4		
NQ	10.0	9.85	98		70			444.2	20			23.0'-30.1' Basal GRIMSBY FM. Pale green to gray, fresh, medium hard, fine grained SANDSTONE, very tight, 1 cm thick clay seam at 28.3. Green clay or shale, soft, fresh.	
NQ	10.0	9.95	99		66	1-10	7.5	437.3	25		RUN 5	30.1'-46.1' POWER GLEN FM. Dark red brown to brown, pale green to green, soft to medium hard, fresh to slightly weathered fine-grained to microcrystalline interbedded, SHALE, LIMESTONE, calcareous SANDSTONE DOLOMITE, Siltstone, horizontally (cont.)	
END BOX 2								432.4	30				
									35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO: D-61

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 OF 2	D-61

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %	FT	MIN	432.4				30.1'-46.1' POWER GLEN FM. (cont.)	
NQ	10.0	10.0	100	100	1-10	7.5		40		RUN 6	jointed, occasional banding and slump features, overall rock is tight. 34.5 - color of rock turns to shades of gray, lt. gray to dk. gray. 34.0' - horizontal joint with yellow-brown coatings.	
							421.3	45				
END BOX 3								50			Boring completed to 46.1 ft. Boring completed as observation well. See well completion report for construction details.	Boring reamed to 6" diameter following coring. Reamed to 45.9'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-61

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-62

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,878 E 468,358	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/28/81	10/29/81	Empire	CME 45C	NX/6	1.0	58.6	60.3

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
57.6/98	5	—	471.04	469.0	51.7/417.3	1.0/468.0

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	J. A. Stone/D. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %				469				0'-1.0' Residual Soil	
								468			RUN 1	1.0'-30.95' GRIMSBY FM: SANDSTONE, SILTSTONE, SHALE interbedded. 70-75% SS + slts./25-30% sh.	Drilling with NX split tube core barrel to 60.3'.
NX	5.0	3.4	68	56								SANDSTONE - dk. red brown to pale green to white, fine-grained, thin-bedded (horizontal) hard, fresh to mod. weathered, occasional burrows, cross-bedding and clay inclusions. Occasional pale green blotches in red-brown sandstone.	Boring reamed to 6" nom. diam. Reamed to 59.1'.
									5				
NX	5.0	4.9	98	16							RUN 2	SILTSTONE - dk. red brown to pale green, v. fine grained, thin bedded (horizontal), mod. hard, fresh to mod. weathered. Gradational change to sandstone.	Water used as drilling fluid.
									10				Lost return water @ 2.0'.
NX	5.0	4.8	96	27							RUN 3	SHALE - dk. red brown to pale green, thin bedded to fissile, soft, mod. to completely weathered.	Minimal return of drill water throughout drilling of remainder of hole.
									15			Bedding plane joints (Fe stained w/clay residue): 4.8, 5.3-5.5, 5.8, 6.3-6.5, 6.7, 7.1-7.6, 8.3-8.5, 8.9, 11.0-13.0, 13.3-14.0, 16.2-16.4, 16.8, 17.3-17.7, 18.8-19.4, 19.8-20.0, 21.5-21.8, 23.3-23.8, 24.3, 24.5, 24.6, 24.7, 25.0.	
END BOX 1											RUN 4	Vertical joints (Fe stained): 1.3-1.4, 1.8-2.1, 7.7-8.2, 8.4, 8.9, 13.1-13.3, 17.7-18.6.	
NX	5.0	5.0	100	22					20				
NX	5.0	4.9	98	79							RUN 5		
									25				
NX	5.0	5.0	100	82							RUN 6	26.0'-30.95' Basal GRIMSBY FM., lt. gray to pale green, fine grained massive, hard, fresh.	
END BOX 2									30			30.95'-53.6' POWER GLEN FM. SHALE and LIMESTONE: interbedded, dk. gray to lt. gray, thin bedded, moderately hard to soft, fresh to slightly weathered. Occasional banding in shale. Limestone is cross-bedded and contains bedding joints.	
								438.05					
NX	5.0	5.0	100	28							RUN 7		
								434.0	35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO: D-62

BECHTEL

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 2 OF 2 | HOLE NO.: D-62

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS /6" PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %							30.95'-53.6' POWER GLEN FM. (cont.) Bedding joints: 36.5, 36.8, 36.9.	
NX	5.0	4.8	96	0				40		RUN 8		
NX END BOX 3	5.0	4.8	96	26				45		RUN 9		
NX	3.5	3.5	100	66						RUN 10	POWER GLEN FM.	
NX	3.8	3.8	100					50		RUN 11		
NX END BOX 4	5.0	5.0	100	58			414.4	55		RUN 12	54.6'-60.3' WHIRLPOOL FM. SANDSTONE: lt. to dk. gray, fine grained, very hard to soft, fresh to slightly weathered occasional interbedded shale seams (1 mm-2 cm thick) occur in upper 3' of unit. Bedding joints: 56.1, 56.3	
NX	2.0	2.0	100				408.7	60		RUN 13		
											Bottom of Hole 60.3'. Hole completed as observation well. See well completion report for construction details.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark | HOLE NO.: D-62

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-63

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,693 E 468,464	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/24/81	10/24/81	J. Lamb/Empire	CME 45	NX/3	0.5	37.5	38.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
37.1/99	3	—	—	469.7	—	0.5/469.2

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	3"NW rods & barrel/16 ft	C. F. Wall

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PER CENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD	%		469.7				0'-0.5' Residual Soil	
NX	4.5	4.5	100	0	0					RUN 1	GRIMSBY FM. SANDSTONE with interbedded SHALE: dk reddish brown to pale green, v. hard (sandstone) to v. soft (shale) fresh to completely weathered (shale), fossiliferous. Sandstone is fine grained, cross-bedded.	Drilling with NX split-tube core barrel.
NX	4.0	4.0	100	0.7	17			5		RUN 2	Completely to severely weathered sandstone and shale @6.8-6.9, 7.3-7.7, 9.2-9.9, 11.4-12.3, 12.5-13.6, 14.0-18.0, 20.0-20.1, 34.3-34.8.	
NX	4.0	4.1	102	0	0			10		RUN 3	Bedding separations and/or broken zones with staining @ 0.6-20.3, 23.0-23.3, 24.3-24.4, 24.9-25.1, 29.0, 30.2, 33.2, 33.6, 33.9, 34.1-34.7, 35.0-37.6.	
NX END BOX 1	5.0	4.8	98	3.1	62			15		RUN 4	Vertical joints @ 13.6-13.9 (uneven, rough surface, with orange staining & clay coating), 18.8-19.2(rehealed), 18.0-18.3 & 19.6-19.9 (uneven, rough surface, with black & orange staining), 33.4-33.8 & 33.9-34.2 (rehealed), 35.8-36.6 (uneven, rough surface, orange staining-rehealed from 36.3).	Lost drilling water at 18.5 ft.
NX	5.0	4.9	98	3.2	64			20		RUN 5		
NX	5.0	4.8	96	3.5	70			25		RUN 6		
NX END BOX 2	5.0	4.9	98	4.7	94			30		RUN 7		

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO: D-63

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 or 2	D-63

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY	CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					RQD	%		434.7			R U N		
NX	5.0	5.1	102		1.6	32		431.7			8		
END BOX 3								427.7	40 45			NOTE: Core barrel fused to rock @ 42.0 ft. Unable to retrieve. Steel left in hole from 26.0-42.0 ft. Hole grouted to surface.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-63

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 3	D-63A

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,674 E 468,453	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/26/81	10/28/81	J. Jensen/Empire	CME 55	NX/6	1.5	99.8	101.3

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
96.45/97	7	13	471.63	469.6	59.2/410.4	1.5/468.1

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	C. F. Wall/D. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %				469.6				0'-1.5' Residual Soil	Drilling with NX split-tube core barrel.
NX	4.5	3.5	78	0				468.1			RUN 1	1.5'-30.7' GRIMSBY FM. SANDSTONE with interbedded SHALE: dk. reddish brown to pale green, v. hard (sandstone) to v. soft (shale), fresh to severely weathered (sandstone) and severely to completely weathered (shale). Sandstone is fine grained and cross-bedded & fossiliferous.	
NX	2.0	1.8	90	15					5		RUN 2	Severely to completely weathered shale @ 2.1-5.4. Sandstone is severely weathered @ 1.5-2.1, 5.4-8.0, 11.0-16.5. Bedding separations with clay filling or orange staining @ 6.5, 6.7, 7.4, 8.1, 8.4, 8.9, 9.3, 10.1, 10.3, 10.7-16.5 (broken zone w/orange & black staining), 16.9, 18.1, 18.2, 26.3, 30.7. Bed. sep. w/no staining @ 21.9, 22.0. Vertical joints @ 8.2-8.6(rough surface, sl. weath. stain), 9.2-9.8 (rehealed to 9.4, rough surface w/staining to 9.8), 12.9-16.0 (v. rough surface, uneven, no staining).	
NX	8.5	7.1	83	0					10		RUN 3		
					Packer Test #9								
					2.3 x 10^{-4} cm/sec								
NX END BOX 1	5.0	5.0	108	66					15		RUN 4		
NX	2.0	1.85	93	80					20		RUN 5		
					Packer Test #8								
					4.3 x 10^{-4} cm/sec								
NX	8.0	7.7	96	93					25		RUN 6		
								438.9				30.7'-59.3' POWER GLEN FM. SHALE, calcareous SANDSTONE & LIMESTONE dk. reddish brown to white to med. to dk. gray, v. hard to med. soft, fresh to mod. weathered, fossiliferous, banded, fine grained to microcrystalline,	
					Packer Test #7								
NX END BOX 2	10.0	10.0	100	78	1.3 x 10^{-5}			434.6	35		RUN 7		

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-63A

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 of 3	D-63A

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %			434.6					
See Sheet 1.					Packer Test #7 1.3 x 10^{-5} cm/sec			40		RUN 7	3.7'-59.3' POWER GLEN FM. (cont.): occasionally vuggy. Bed. sep. @ 32.1, 37.5 (no stain.) Vertical joint @ 37.2-37.5 (uneven, rough surface, orange staining).	
NX	10.0	10.0	100	100	Packer Test #6 1.3 x 10^{-6} cm/sec			45		RUN 8		
END BOX 3								50				
NX	10.0	9.9	99	75	Packer Test #5 7.3 x 10^{-5} cm/sec		410.3	55		RUN 9	Interbedded SHALE, calcareous SANDSTONE, LIMESTONE, banded. Horizontal joints, except as noted: 52.6, 53.1, 53.7, 54.45, 54.95, 55.95, 56.7, 57.5, 57.65, 58.0, 58.2, 58.5, 59.3, 57.55. 57.0'-57.55: vertical. 58.2'-58.5': vertical. 57.15, 57.15-57.65, 58.0, 59.3.	▽
END BOX 4					Packer Test #4 1.3 x 10^{-6} cm/sec			60				
NX	10.0	9.9	99%	55				65		RUN 10	59.3'-68.7' WHIRLPOOL FM. SANDSTONE, white to light gray, v. hard, fresh to slightly weathered, f.grained. 59.3-59.95: vertical joint. 60.0-60.2: vertical joint. Horiz. joints: 62.4, 62.8, 63.8, 64.6, 65.1, 67.65, 67.1-67.8: vert. fract., vuggy.	
							400.9	70				
See Sheet 3.					Packer Test # 3 Zero Flow		394.6	75		RUN 11	68.7'-101.31' QUEENSTON FM. SHALE, red, fresh, Horiz. joints: 69.0, 69.65, 69.7, 69.8, 71.7, 71.9, 72.0, 72.75, 73, 73.5, 73.7, 73.85, 74.2, 74.3, 75.7, 75.95, 77.1.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-63A

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 3 of 3 | HOLE NO.: D-63A

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							394.6					
NX END BOX 5	10.0	10.1	101 / 67	RQD %	Packer Test #3 Zero Flow			80		RUN 11	68.7'-101.31' QUEENSTON FM (cont.): Horiz joints (cont'd): 78.8, 80.5, Fractured core @ 77.7.	
NX	10.0	10.0	100 / 76		Packer Test #2 Zero Flow			85		KUN 12	Green seams @ 81.9-82.0, 87.2-87.8, 88.2-88.4. Common mechanically created horizontal joints.	
END BOX 6 NX	9.8	9.6	98 / 61		Packer Test #1 Zero Flow			90 95		RUN 13	92.6-92.7: clay seam washed out by coring.	
							368.3	100				
END BOX 7	T.	D. =	101.3'								Boring completed to 101.3. Boring completed as observation well. See well completion reports for construction details.	Boring reamed to 6" nominal diameter to 101'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark | HOLE NO.: D-63A

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 of 2	D-64

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,161,713 E 468,448	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/22/81	10/23/81	J. Jensen/Empire	CME 45	NX/6	1.2	47.5	48.7

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
46.1/97.0	4	10	471.37	469.1	26.5/442.6	1.2/467.9

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	C. F. Wall

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD	%		467.9			RUN 1	0'-1.2' Residual Soil 1.2'-37.6' GRIMSBY FM. SANDSTONE with interbedded SHALE: dk. reddish brown with lt. gray and pale green mottling, v. hard (sandstone) to v. soft (shale), fresh to completely weathered, fine grained & thin bedded, cross-bedding in sandstones, occasionally fossiliferous. Numerous bedding separations with slight staining to 18.0 ft. Severely to completely weathered shale beds @ 2.0-2.2, 3.2-3.5, 4.8-5.0, 6.5-6.9, 8.7-9.6, 12.1-13.7, 20.5-20.9. Vertical joints @ 4.9-5.0 (no staining), 10.3-11.8 (curvilinear with rough surface, orange & black staining), 11.9-12.9 (no staining) 22.5-23.0 (rehealed), 27.3-27.8 (slight orange staining) 36.6-37.1 (rough surface with orange staining). Moderate to severely weathered sandstone @ 14.5-19.6. Bedding separations with slight staining @ 19.4, 19.9, 20.9, 22.5, 23.4, 25.9, 27.1. 28.7 to 37.6: banded fine grained sandstone with thin shale interbeds. Separations @ shale beds with no staining. Bedding is predominately horizontal.	Drilled with NX split-tube core barrel to 48.7 ft. Reamed with 5-7/8 roller-rock bit to 47.7 ft. Lost return water at 9.7 ft.
NX	5.0	2.4	96	0	0							
NX	5.0	4.2	84	0.75	15			5		RUN 2		
NX	5.0	5.1	102	0	0			10		RUN 3		
NX	5.0	4.9	98	3.5	70			15		RUN 4		
NX	5.0	5.1	102	3.6	72			20		RUN 5		
NX	5.0	5.0	100	3.7	74			25		RUN 6		
NX	5.0	5.1	102	4.1	82			30		RUN 7		
See Sheet 2.							434.1	35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO: D-64

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 2 of 2 | HOLE NO.: D-64

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS /6" PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD	%		434.1	35			1.2'-37.6' GRIMSBY FM. (cont.)	
NX	5.0	4.5	90	2.0	40		431.5			RUN 8	37.6'-48.7' POWER GLEN FM. SHALE with interbedded limestone, dolomite and calcareous sandstone: dk. reddish brown to pale green to grayish green to greenish gray, v. hard to v. soft, slightly to severely weathered.	
NX	5.0	5.1	102	0.5	10			40		RUN 9	No staining on numerous horizontal bedding breaks. Clay layer @ 40.5-40.6.	
NX END BOX 3	5.0	4.7	94	3.1	62		420.4	45 48.7'		RUN 10	Vertical joints @ 40.6-41.1 (rough surface, orange staining), 42.5-42.7 (uneven, no staining).	
END BOX 4								50			Bottom of Boring @ 48.7. Boring completed as observation well See well completion report for details.	Boring reamed to 6" diam. to 47.7'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark | HOLE NO.: D-64

BECHTEL

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-65

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,161,735 E 468,433	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/23/81	10/24/81	J. Jensen/Empire	CME 55	NX/6	2.5	58.0	60.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
58/100	4	12	471.33	469.1	50.4/418.7	2.5/466.6

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	C. F. Wall

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD	%		469.1				0'-2.5' Residual Soil	Drilled to 60.5 ft with NX split-tube core barrel. Reamed to 63.0 ft with 5-7/8" roller-rock bit.
NX	3.0	3.1	103	0	0		466.6			RUN 1	2.5'-38.2' GRIMSBY FM. SANDSTONE with interbedded SHALE: dk. reddish brown with pale green mottling, v. hard to v. soft (shale), fresh to completely weathered (shale).	
NX	5.0	4.9	98	0.45	9			5		RUN 2	Sandstone is fine grained, thin to thick bedded, cross-bedded and occasionally fossiliferous.	
NX	5.0	4.8	96	0.78	16			10		RUN 3	Completely to severely weathered shale beds @ 4.2-4.4, 7.3-7.4, 10.6-10.7, 12.2-13.1, 13.6-13.7, 14.1-14.2, 18.3-18.8, 21.6-22.1, 23.9-24.2, 33.2-33.4.	
END BOX 1 NX	5.0	5.1	102	0.8	16			15		RUN 4	Completely to severely weathered sandstone beds @ 15.0-17.8, 23.0-23.9. Bedding separations coincident with weathered zones. In addition, bedding separations @3.2, 19.5. Vertical joints @ 2.5-3.1, 4.5-5.3 (curvilinear, rough surface, orange staining), 6.4-6.8, 7.4-7.7, 14.6-15.0, (rough surface, no staining), 15.7-15.8, 17.8-18.8, 20.4-21.0 (rough surface,no to slight staining), 24.2-24.7 (rough surface, slight staining), 26.8-27.2 (rough surface, black & orange staining), 31.7-32.4 (rehealed), 33.4-33.6 (rough surface, red. br. staining), 34.9-35.2 (rough surface, orange staining), 35.9-37.1 (uneven, rough surface, bland orange staining), 37.3-38.2 (curvilinear, rough surface, slight staining).	
NX	5.0	4.9	98	3.0	60			20		RUN 5		
NX	5.0	5.1	102	3.7	74			25		RUN 6	Joint @ 21.5 @ 50° (rough surface, stained).	
END BOX 2 NX	5.0	4.9	98	2.6	52		434.1	30		RUN 7		

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-65

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 2 OF 2 | HOLE NO.: D-65

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS /ft PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD %			434.1				2.5'-38.2' GRIMSBY FM. (cont.)	
NX	5.0	5.1	102	2.3	46		430.9			RUN 8	38.2'-56.7' POWER GLEN FM. SHALE with interbedded calcareous SANDSTONE and LIMESTONE (calcarenite): greenish gray to lt. gray to dk. reddish brown, v. hard to med. soft, slightly to mod. weathered.	Moderate loss of drilling water from 38.2 ft.
								40				
NX	5.0	5.0	100	2.6	52					RUN 9	Vertical joint @ 40.0-40.5 (3 joints, curvilinear, rough surface, slight staining), 54.3-54.6 (rough surface, no staining).	NOTE: Bedding separations difficult to detect in P.G. because of weak character of rock parallel to bedding.
								45				
END BOX 3 NX	5.0	5.0	100	4.2	84					RUN 10		Breaks (whether from drilling or natural) are numerous in the P.G., however, no staining was evident.
								50				
NX	5.0	4.9	98	3.7	74					RUN 11		
								55				
NX	5.0	5.2	104	1.5	30		412.4			RUN 12	56.7'-60.5' WHIRLPOOL SANDSTONE SANDSTONE: pale greenish gray to white, fine grained, v. hard, fresh to sl. weathered, with occasional shale partings, bedding locally contorted.	Reamed to 5-7/8" diam. to 63.0 ft.
END BOX 4							408.6	60.5			Bedding separations usually at shale partings @ 56.7, 57.1, 57.3, 57.8, 58.3, 58.8 to 59.2 (no staining). Vertical joints @ 57.9-59.6 (uneven, rough surface, black and orange staining), 59.8-60.5 (uneven, rough surface, with black and orange staining and spots of brilliant green (5G6/6) mineralization).	
											Boring completed to 60.5'. Boring completed as observation well. See well completion reports for details of well construction.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark | HOLE NO.: D-65

PORTION OF
BECHTEL'S HYDROGEOLOGIC STUDY
OF JANIELEWICZ RTE (Feb. '82)

ATTACHMENT 7.2-1 (Continued)

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 of 1	D-66

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,859 E 468,567	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/26/81	10/27/81	J. Genovese/Empire	CME 45B	NX/5-7/8	11.0	24.5	35.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
23.5/86	2	—	466.33	464.4	25.6/438.8	11.0/453.4

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
—	—	C. F. Wall

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				RQD	%		464.4				0'-11.0' Residual Soil	Drilling with NX split-tube core barrel to 35.5 ft. Reamed with 5-7/8 roller-rock bit to 38.0 ft. Installed 3" flush-joint casing to 13.0 ft.
NX	3.8	2.3	61	0	0			5		RUN 1		
3" CASING							453.4	10			11.0'-31.7' GRIMSBY FM. SANDSTONE and interbedded SHALE: dk. reddish brown to pale green, v. hard to med. hard (sds) and mod. hard to v. soft (shale), fresh to completely weathered, fossiliferous, banded, fine grained to microcrystalline.	
NX	3.6	3.5	97	2.0	56			15		RUN 2	Bed. Sep. @13.1,13.3, 13.4, 13.6, 16.9, 17.4, 17.6, 17.7, 18.2, 20.0, 20.1, 20.2, 31.1, 31.7 (weathering staining).	
NX	10.0	7.7	77	6.4	64			20		RUN 3	Vertical joints @ 31.1-32.9 (rough surface, uneven, no staining), 34.3-34.8 (uneven, rough surface, no staining, 2 joints), 35.25-35.35 (gray clay filled).	
END BOX 1								25				
NX	9.9	10.0	101	4.0	40		432.7	30		RUN 4	31.7'-35.5' SHALE w/interbedded limestone & calcareous SANDSTONE: dk. reddish brown to grayish green, v. hard to med. hard, sl. to severely weathered.	Boring completed at 35.5 ft. Completed as observation well. See well completion report for construction details.
								35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE 428.9 Van De Mark

HOLE NO. D-66

GPD 13234 Rev. 1/82 (Form 10070-1)

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 5	D-67

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,874 E 468,575	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/25/81	10/26/81	M. Gaudy/Empire	CME 45B	NX/6	9.5	90.5	100.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
82.8/93	6	1	465.91	462.9	50.1/412.8	9.5/453.4

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	—	J. C. Isham/S. Balone/D. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH, FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							462.9					
SS	24"	4"	7	3	3	4					0'-9.5' FILL, v. fine to coarse SAND, some plastic (fill), some plastic silty CLAY, trace gravel.	Odor similar to methane during soil sampling.
SS	24"	4"	10	4	5	5						
SS	24"	5"	10	2	4	6		5				
SS	24"	4"	35	7	27	8						
SS	24"		120+	47	70	50/0"	453.4					
			REC.	RQD%				10		RUN 1	9.5'-32' GRIMSBY FM. SANDSTONE w/interbedded SHALE, dark red-brown, yellow-brown, and pale green, shale is soft. Horiz. fractures: 13.95 (clay-filled), 14.4, 14.6 (clay filled), 15.42, 18.1 Fractures: 14.85(20°), 15.2(10°), 15.8-16.3, 16.85-17.35, 17.8-18.3 vertical, FeO stain. Red-brown to light gray silty banded fine-grained SS, weathered, med. hard to hard, well indurated, common shaly partings at 0° dip, otherwise irregular bedding, near horizontal. SS varies to med. grained 18.52'-18.68'. 19.1': 1/2" long lenticular storm clasts, irregular bedding. 18.5'-19.7': Thinly interbedded (0°) gray v. f. sandy to silty shale.	
NX	2.5'	1.0	40	18								
NX	CASING											
NX	5.0	4.85	97	44	Packer Test #8 1.27 x 10^{-6} cm/sec			15		RUN 2		
NX	1.2'	1.2'	100	86						RUN 3		
NX	6.9'	6.85	99	91		..		20		RUN 4		
END BOX 1					Packer Test #7 3.7 x 10^{-6} cm/sec			25			32.0 -46.4' POWER GLEN FM. Red-brn. laminated SHALE, med. soft, fresh to slightly weathered, horizontal bedding. Thinly interbedded red-brown to light gray f. to med. SS and green-gray soft SHALE. SS is med. soft to med. hard, mod. well indurated; flame structures and boudin shaped lenses present. Bedding varies 0° to 5°. Light red-brn. f. grn. SS, faint cross-bedding.	
NX	10.0	9.81	98	57		2	430.9	30		RUN 5		
							427.9	35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-67

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 OF 5	D-67

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
NX	See Sheet 1.			RQD %			427.9				27.9'-46.4' POWER GLEN FM. (cont.) 30.1-30.45: red-brn. laminated SHALE, med. soft, fresh to slightly weathered. Color change to silver-gray @30.3. Irregular near-horizontal bedding. 30.45' - 3 mm diam. calcite vugs.	
NX END BOX 2	10.0	9.68	97	49	Packer Test #6 5.1 x 10^{-5} cm/sec			40		RUN 6	30.8'-32.05': similar to 27.9' to 28.5' with thin inter/x-bedded SS. 32.05'-32.5': dark steel-gray soft to med. soft thin-bedded shale w/thin lenses lt. brown to gray f. grained SS, bedding 0°. 32.5-33.15': similar to 29.8'-30.1'. 33.15'-42.8': v. similar to 32.05'-32.5', med. soft. Numerous thin interbeds of lt. gray f.-grained SS. Alternates thin-bedded (poker chips) to massive to laminated; where massive varies to mudstone. Bedding 0° to 3°. SS lenses become thicker, more numerous with depth.	
							416.5	45				
NX END BOX 3	10.0	9.91	99	76	Packer Test #5 1.0 x 10^{-5} cm/sec			50		RUN 7	42.8'-46.4': Similar to above, but SS here predominated w/thin to med. interbeds of dark steel gray shale & mudstone, locally soft. SS is lt. gray, f. grained, hard, locally massive, fresh, v. well indurated, bedding varies 0° to 15°.	▽
								55			46.4'-61.0' WHIRLPOOL FM: lt. gray-white f. grained sandstone/qtzite., v. hard, v. well indurated, massive but interbedded to 55.2' w/dk. steel gray shale described above. Below 55.2', common shaly laminae 1/32" thick.	
NX	10.0	9.75	98	72	Packer Test #4 3.7 x 10^{-6} cm/sec		401.9	60		RUN 8	61.0'-100' QUEENSTON FM. 61.0'-61.4': Dark green-gray mudstone, massive, med. soft, fresh to slightly weathered, sharp upper contact. 63.48'-63.7': green shale interbed. 69.0-69.3: green shale interbed. 74.3-74.4: green shale interbed.	
								65				
NX END BOX 4	10.0	9.55	96	86	Packer Test #3 3.7 x 10^{-6} cm/sec			70		RUN 9	61.4'-100.0': dark red-brown shale and silty shale, med. soft to med. hard, fresh to slightly weathered, thin-bedded @ 0°, clayey zone 61.9'-62.15'. Intermittent thin green shale beds, 79.2-80.05, 80.25-80.58, 83.31-83.73, 84.06-84.23, 93.85-93.95, 94.15-94.7, 97.4-97.5.	
				See page 3			367.9	75				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-67

BORING LOG

PROJECT: Somerset Railroad | JOB NO.: 14818 | SHEET NO.: 3 of 5 | HOLE NO.: D-67

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS / N / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
NX	See Sheet 2.						387.9				61.0'-100' WHIRLPOOL FM (cont.)	
NX	10.0	9.78	98 / 56	RQD %	Packer Test #2	3.7 x 10^{-6} cm/sec		80		RUN 10	Boring completed to 100'. Boring completed as observation well. See well completion report for construction details.	
END BOX 5					Packer Test #1	3.7 x 10^{-6} cm/sec		85			Fractures 18.4 0° mod. weath. irregular smooth. 18.43 0° tight thin gray clayey silt coating. 18.52 0° weath. open 1/16", mustard-yellow discoloration, smooth. 18.58-18.68: (4) 0° bedding plane partings, weath., tight, smooth, flat, 1/16" thick shaly layers @ partings. 18.74 0°, tight, hi. weath., mustard-ylw. discoloration. 18.96 0°, open 1/16", hi.weath., gray shaly coating.	
NX	10.0	8.70	87 / 64					90		RUN 11	19.02: 5°, tight, rough, hi. weath. 19.58: 0°, weath.,open 1/16" 19.7: 0°, weath.,open > 1/16" 19.71-19.73: (3) 0°, weath., tight, smooth. 21.27':5°, sli. weath., open 1/16", rough 23.15: 10°, fresh, tight, smooth. 26.03: 0°, fresh, closed, rough. 26.0'-26.4': 90°, fresh, closed. 26.65': 50°, sli. weath., tight, smooth. 26.87: 40°, tight, weath., rough. 27.28: 20°, open ∠ 1/16", weath., rough.	
NX	3.6	1.73	38 / 48					95		RUN 12	28.0: 5°, sli. weath., open 1/4", irregular 28.56: 0°, fresh, tight to open 1/16". 28.78: 5°, tight, sli. weath. 29.10: 0°, weath., open ∠ 1/16". 29.17: 0°, weath., open ∠ 1/16". 29.30: 0°, closed, sli. weath.	
END BOX 6			B.O.H. 100.0'				362.9	100			29.84: 20° tight, sli. weath. 29.84-30.2: 90°, fresh, closed. 30.0: 0°, closed, fresh (mech. break). 30.2: 0°, sli. weath., open 1/16". 30.29: 0°, sli. weath., open 1/16" to 1/4". 30.4: 10° weath., open ∠ 1/16". 30.52: 50°, weath., open 1/16" to 1/4". 30.52-30.9: 90°, open < 1/16", calcite coated, sli. weath. 30.9: 0°, fresh, smooth, spun core. 31.0: 35°, tight, fresh, smooth. 31.17: 15°, tight, fresh, smooth. 31.32: 5°, open 1/16"-1/4", fresh, smooth. 32.04: 0°, fresh, tight to open 1/16", smooth. 32.15: 0° fresh, tight to open 1/16", smooth. 32.27: 0°, fresh, tight to open 1/16" smooth. 32.57: 5°, fresh, tight, smooth. 33.09: 0°, fresh, closed, smooth. 33.24: 5°,tight, thin weath. calcite. 33.44: 0°, fresh, closed, smooth. 33.68: 0°, fresh, open 1/16-1/4, smooth.	Driller reports he left 1.9' of core in hole on last run of hole. Boring reamed to 6" diameter following coring.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark | HOLE NO.: D-67

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	4 of 5	D-67

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
											34.07: 0°, fresh, tight, smooth. 34.41: 0°, fresh, tight, smooth. 34.54: 0°, fresh, open 1/16", smooth. 35.1: 0°, fresh, closed, smooth. 35.23: 0°, fresh, tight, irregular. 35.84: 0°, fresh, tight, smooth. 36.16: 0°, fresh, open 1/16", smooth. 36.52: 0°, fresh, open 1/16". Unless otherwise noted, the following fractures dip 0° to 5° & are tight to open 1/16": 36.62, 36.8, 36.9, 37.1, 37.25, 37.55, 37.8, 37.95, 38.15, 38.3, 38.5, 38.85, 39.0, 39.15, 39.63, 39.7, 39.9, 40.27, 40.4, 40.95, 41.4, 41.47, 41.6, 41.9, 42.13: 0°, 1/4" clay and shale frag's. 42.33, 42.53, 42.6: 1/2" shale frag's., 0°. 42.85, 43.82, 44.0, 44.35, 44.5, 45.35, 45.9, 47.65, 47.93. 47.93 to 48.88: 90°, tight, ylw. weathering, 48.88, 48.95, 49.10, 49.78, 50.23, 51.14, 51.52, 52.5, 52.8, 52.88, 53.07, 53.1-53.4: 90°, closed. 53.25, 53.55, 53.67, 54.20, 54.78, 54.8, 55.14. 55.34: < 1/4" clay & shale frag's., 0° 55.98, 56.32.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-67

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	5 of 5	D-67

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
											Unless noted otherwise, all fractures listed below are near horizontal, tight, and fresh. 56.55, 57.3, 57.55, 58.06, 58.1, 60.1, 61.0, 61.23, 61.3 (crushed zone from coring to 61.4), 61.54, 61.9, 62.12: 0°, 2" zone of clay & weathered shale, 62.45, 62.74. 62.83 to 62.92: 0°, crushed zone from drilling. 63.14: 20°, tight. 63.19-63.3: crushed from coring, 63.48. 64.1: 20°, tight. 64.48: 30°, tight. 64.89: 10°, tight, shale partings. 65.21: 0°, 1/2" clay seam. 65.68: irregular fract., w/crushed frag's. 65.9, 66.07, 66.5, 67.02, 67.07, 67.07-67.17 - zone of crushed frag's. from coring 67.65, 67.7, 67.73, 68.02 - zone of crushed core 1/4" thick 68.45, 68.52, 69.3, 74.62 (mechanical), 75.05, 75.58, 76.44, 76.6: 40°, fresh, poor fit. 76.72, 77.3, 77.53, 77.61, 77.7, 77.86, 77.99, 78.12, 78.32, 78.33, 78.45, 78.58, 78.81. 78.96: 45°, fresh, poor fit. 79.1: 30°, fresh. 79.25-79.3: 1/2" zone of crushed core. 79.49: 50°, fresh. 79.78, 79.92, 81.15, 81.54, 82,32, 82.63, 84.23, 84.25, 84.43, 84.52, 84.65, 84.86, 85.1, 85.21, 85.28, 85.41, 85.51, 86.1, 87.64, 87.76, 87.99. 88.27: 40°, tight. 88.52, 88.68, 89.31, 89.5, 89.45: 30°, tight. 90.4: 0°, crushed core, poor fit. 90.63: 20°, tight. 91.2: 15°, tight. 91.8, 91.95, 92.1, 92.13, 92.79, 92.94, 93.05, 94.11.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-67

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 2	D-68A

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Van De Mark	N 1,160,838 E 468,555	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/24/81	10/26/81	S. Gaudy/Empire	CME 45B	NX/3	10.0	44.2	54.2

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
39.8/97	3	7	467.55	465.2	47.4/417.8	10.0/455.2

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	—	J. C. Isham/C. F. Wall

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			1st	2nd	3rd	4th	465.2					
SS 2"	2.0'	2.0'	10 1	3	4	6				1	0.0'-10.0' Fill. Dk. reddish brown, mixture of gravel, clay & black plastic industrial waste.	8" PVC surface casing installed to a depth of 12.5 ft. Water used as a drilling fluid.
SS 2"	2.0'	0	5 3	2	2	3				2		
SS 2"	2.0'	1.0'	6 2	3	2	4		5		3		
SS 2"	2.0'	1.5'	58 40	10	41	17				4		
SS 2"	2.0'		143 57	42	53	90				5		
SS 2"	1.3'		150	23	50	100/4"	455.2	10		6	Top of weathered rock.	
10" Auger												
SS	.5'	0		104/6						7	Top of unweathered rock.	
			RQD %								10.0'-29.0' GRIMSBY FM.	
NX	3.4	3.4	100	32				15		RUN 1	Banded & mottled dark reddish brown & pale green interbedded hard sandstone & soft shale. Horizontal fractures: 13.7, 13.75, 13.8, 14.15, 14.25, 14.5, 14.55, 14.8, some with FeO stains. Fracture zone 15.1-15.35. Vertical fracture 15.7-16.4.	
NX	1.6	1.6	100	36						RUN 2		
NX	8.4	7.3	87	53				20		RUN 3	Horizontal fractures: 16.45, 16.5, 16.6, 16.9, 17.5, 17.6, 17.7, 17.75, 18.7, 18.8, 18.85, 19.3, 20.05, 20.3, 20.4, some with FeO stains. Vertical fracture 18.85-19.3, FeO. Horizontal frac. 20.55, 20.65, 21.2-21.4, 21.9-22.0, 21.3, 22.15, 22.6, 23.0, 23.4, 23.75. Vert. frac. 20.65-21.2. Basal GRIMSBY FM. 21.45-29.0.	
								25				
										RUN	Horizontal fractures: 26.95, 27.05. Shale bed 28-28.25.	
END BOX 1							436.2	30		4	29.0'-52.4' POWER GLEN FM. banded & mottled dark reddish brown, pale green & gray, interbedded sandstone and shale, 30° fracture at 33.5. Horizontal fractures: 30.7, 31.1, 31.5 to 32.2, 32.05-33.0, 33.35, 34.05, 34.75.	
NX	8.6	7.85	91	58								
							430.2	35				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Van De Mark

HOLE NO. D-68A

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	2 OF 2	D-68A

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			RQD %				430.2					
NX	5.0	5.0	110	18						RUN 5	29.0'-52.4' POWER GLEN FM. (cont.) Vert. joints 30.4-30.9, 31.4-31.8, 32.3-32.5, 34.9-35.5. 35.5-52.4: interbedded LS, SH, calc. SS, med. soft to med. hard, med. to dark gray, slightly to moderately weathered.	
								40				
NX	5.0	4.7	96	36						RUN 6	Horiz. joints: 36.5, 39.4. Vert. joints: 37.9-38.1, 39.8-40.0, 51.2-51.4.	
END BOX 2								45				
NX	4.4	4.95	113	85						RUN 7		
								50				
NX	5.0	5.0	100	69			412.8			RUN 8	52.4'-54.2' WHIRLPOOL FM. SANDSTONE, lt. gray to white, very hard, fresh to sli. weath., f. grained, occ. shale partings. Vert. fract.: 52.8-53.1, 53.5-54.0.	
END BOX 3							411.0	55			Bottom of boring: 54.2 ft. Boring completed as observation well. See well completion report for construction details.	Boring reamed to 6" diam. to 58.0'.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; F = FITCHER; O = OTHER

SITE: Van De Mark

HOLE NO.: D-68A

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 1	D-69

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Norton	N 1,160,836 E 468,601	90°	--

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/28/81	10/28/81	J. Genovese/Empire	CME 45B	6	12.7	3.7	16.4

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
3.7/74	1	1	466.11	464.4	5.8/458.6	12.7/451.7

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	—	C. P. Wall

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
						4th	464.4	0				
2" SS	2	0.6	12	6	7	5/4				1	0'-12.7' Fill: tan to br. to bl. to creme silty CLAY and clayey SAND and plastic, metal fibers, loose to med. dense to v. dense, wet, tr. gravel, occasional orange staining.	Drilling with 5" ID hollow-stem augers to 11.4
SS	2	0.9	10	2	3	7/9				2		
SS	2	0.7	8	6	4	4/2		5		3		Drilling with NX split-tube core barrel to 16.4'.
SS	2	0	12	5	2	10/12				4		
SS	2	0.9	52	50	37	15/30				5 SA		Reaming w/5-7/8 roller-rock bit to 18.0'.
SS	1.4	0.7	70	14	24	46/.4		10		6	12.7'-16.4' GRIMSBY FM. SANDSTONE w/interbedded SHALE: dk. reddish brown to pale green, v. hard to med. hard to soft, sl. to completely weathered, fine-grained.	
				RDQ	%		451.7			R U N 1	Bed. Sep. @ 13.2 (clay), 13.7 (sl. orange stain.), 13.9 (tr. clay), 14.1 (0.01 clay), 14.3 (0.01 clay), 14.5 (blueish-yellowish green clay 0.05' thick), 14.9 (0.04' same as @ 14.5) 16.0-16.1 (shale bed w/yellow-green clay coating). Vertical joint @ 12.8-13.2 (rough surface, v. sl. orange staining), 14.9-15.0 (rough surface, no staining).	
NX	5.0	3.7	74	0	0		448.0'	15				
								20			Bottom of boring @ 16.4 ft. Boring completed as observation well. See well completion report for construction details.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Norton

HOLE NO. D-69

BORING LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Somerset Railroad	14818	1 OF 1	D-70

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
Norton	N 1,160,737 E 468,896	90°	—

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE (INCHES)	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH (FT.)
10/28/81	10/29/81	Empire	CME 45B	6	14.0	5.0	19.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING (FT.)	GROUND EL. (FT.)	DEPTH/EL. GROUND WATER (FT.)	DEPTH/EL. TOP OF ROCK (FT.)
3.9/78	1	7	468.10	466.3	6.7/459.6	14/452.3

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140#/30"	—	C. F. Wall/D. Middleton

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS "N" / PERCENT CORE RECOVERY	PENETRATION BLOWS 1ST 6"	2ND 6"	3RD 6"	ELEVATION (FT.)	DEPTH-FT	UNIFIED SOIL CLASSIFICATION	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							466.3					
2" SS	2	0.7	10	1	3	7/4				1	0'-14' Fill: dk. reddish brown, loose, moist, v. fine clayey SAND and plastic, metal, carbon rods, tr. med. sand	Drilling with 5" ID hollow-stem augers to 6.9 ft.
SS	2	0.2	6	3	3	3/4				2		
SS	2	1.0	40	5	10	30/40		5		3		
SS	0.9	0.1	—	20	100/4	—				4		
SS	2.0	0.8	8	4	4	4/7				5		
								10				
SS	2.0	0.9	29	17	15	14/70				6		
SS	1.5	0.9	79	19	29	50				7	Top of rock.	Ream with 6" roller rock bit to 19.4'.
							452.3				14.0'-19.0' GRIMSBY FM.	
NX	5.0'	3.9	78	RQD 1.05 / 21%				15		RUN 1	Dark red-brown to pale green, fresh to severely weathered, fine grained to microcrystalline, interbedded SANDSTONE, SILTSTONE, and SHALE, shale completely weathered to clay.	
							447.3					
								20			Bottom of boring @ 19.0. Boring completed as observation well. See well completion reports for construction details.	
								25				
								30				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Norton

HOLE NO.: D-70

GPO-13234 Rev. 1-82 (Form 10070-1)

APPENDIX B

GROUND WATER OBSERVATION WELL REPORTS

WELLS D-7 AND D-49 THROUGH D-70

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad

LOCATION Danielewicz Route - Sta. 51+810

Date Completed 9/25/81 Original Depth 46.6

Inspected By C. F. Wall Date 9/25/81

Checked By D. L. Middleton Date 1/20/82

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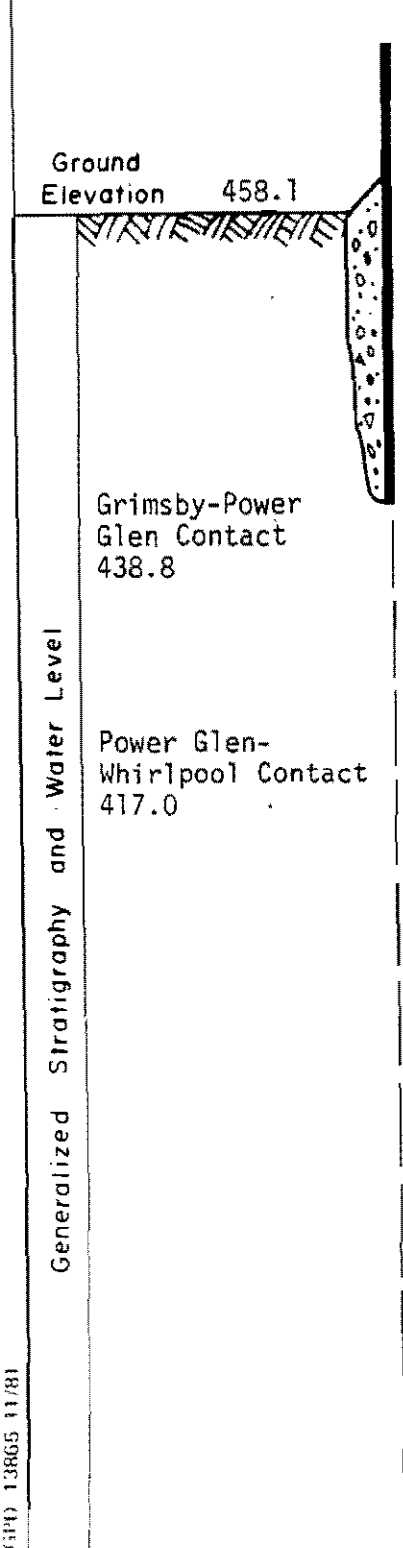
Well No. D-7

Aquifer Whirlpool-Power Glen

Elev. Interval 428.7-413.1

NOTE: December 15, 1981, Dry Hole



Elevation of top of surface casing / riser pipe.	460.5/460.4
Heigth of top of surface casing / riser pipe above ground surface.	2.4'/2.3'
Depth of surface seal below ground surface	2.5'
Type of surface seal: Cement Bentonite	
I.D of surface casing.	4"
Type of surface casing: Steel with locking cap	
Depth of surface casing below ground	2.8'
I. D. of riser pipe.	2"
Type of riser pipe: Schedule 40 PVC	
Diameter of borehole	3.75"
Depth of borehole	46.6'
Type of backfill: Bentonite-cement grout	
Elev./depth top of seal.	429.2/28.9'
Type of seal: Bentonite	
Elev./depth bottom of seal.	427.8/30.3'
Type of sand pack. 2-Q Sand	
Depth of top of sand pack.	30.3'
Elev./depth top of screened section.	422.3/35.8'
Type of screened section: Sch 40 PVC	
Discribe openings 0.010" machine slot-horizontal slot	
I.D. of screened section.	2"
Elev /depth bottom of screened section.	413.1/45.0'
Length of blank section.	0.3
Elev. / depth bottom of plugged blank section.	412.8/45.3'
Elev. / depth bottom of sand column	411.5/46.6'
Type of backfill below observation pipe Natural Gravel	
Elev /depth of hole.	411.5/46.6'

(GPO) 13865 11/81

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,161,003 E468.422

Date Completed 10/30/81 Original Depth 58'

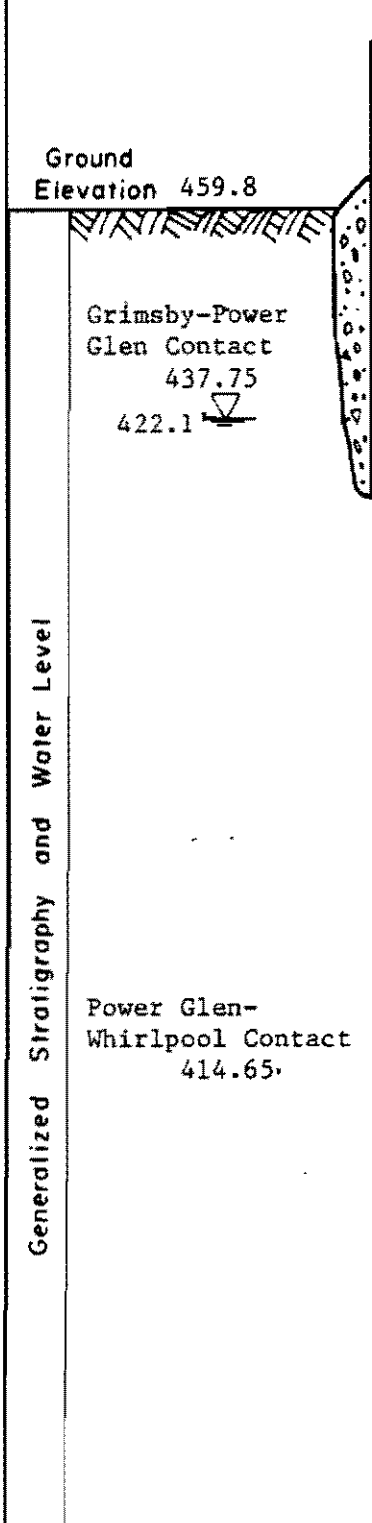
Inspected By D. L. Middleton Date 10/30/81

Checked By _____ Date _____

Well No. D-49

Aquifer Power Glen Whirlpool Contact

Elev. Interva 408.45-428.75



Elevation of top of surface casing / riser pipe.	461.95/461.90
Heigth of top of surface casing / riser pipe above ground surface.	2.2/2.15
Depth of surface seal below ground surface	27.5'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	51.3'
Type of backfill: Cement	
Elev./depth top of seal.	432.3/27.5'
Type of seal: Bentonite	
Elev./depth bottom of seal.	428.8/31'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	31'
Elev./depth top of screened section.	418.8/41.0'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	409.5/50.3'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	408.5/51.3'
Elev./depth bottom of sand column.	408.5/51.3'
Type of backfill below observation pipe. N/A	
Elev./depth of hole.	408.5/51.3'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,983 E468.415

Date Completed 10/23/81 Original Depth 91.0'

Inspected By D. L. Middleton Date 10/23/81

Checked By _____ Date _____

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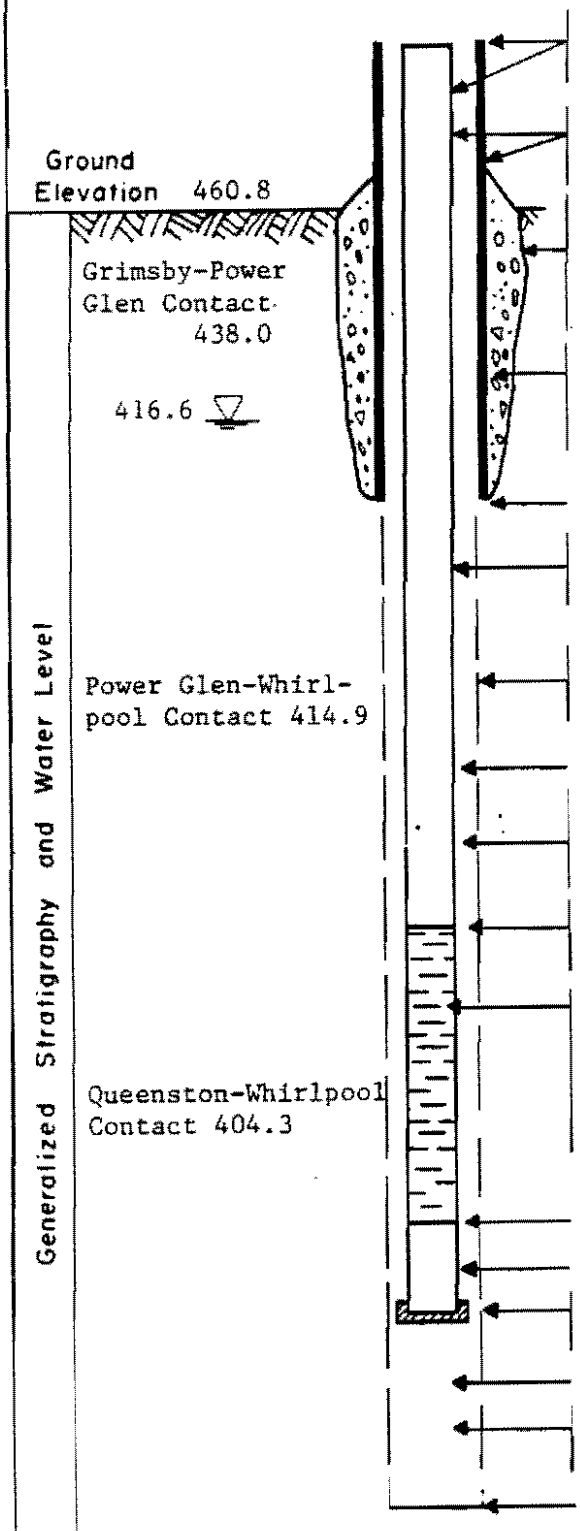
Well No. D-50

Aquifer Whirlpool - Queenston Contact

Elev. Interval 369.8-410.3



Elevation of top of surface casing / riser pipe.	462.9/462.69
Heigth of top of surface casing / riser pipe above ground surface	2.1/1.97'
Depth of surface seal below ground surface	46.10
Type of surface seal: Cement	
I.D. of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	91.0'
Type of backfill: Cement	
Elev./depth top of seal.	414.7/46.10'
Type of seal: Bentonite	
Elev./depth bottom of seal.	410.3/50.5'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	410.3/50.5'
Elev./depth top of screened section.	402/58.8'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	373.2/87.6'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	372.2/88.6'
Elev./depth bottom of sand column.	372.2/88.6'
Type of backfill below observation pipe. Cuttings	
Elev./depth of hole.	369.8/91.0'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,161,001 E468,399

Date Completed 10/27/81 Original Depth 43.3'

Inspected By R. L. Blodnikar Date 10/27/81

Checked By _____ Date _____

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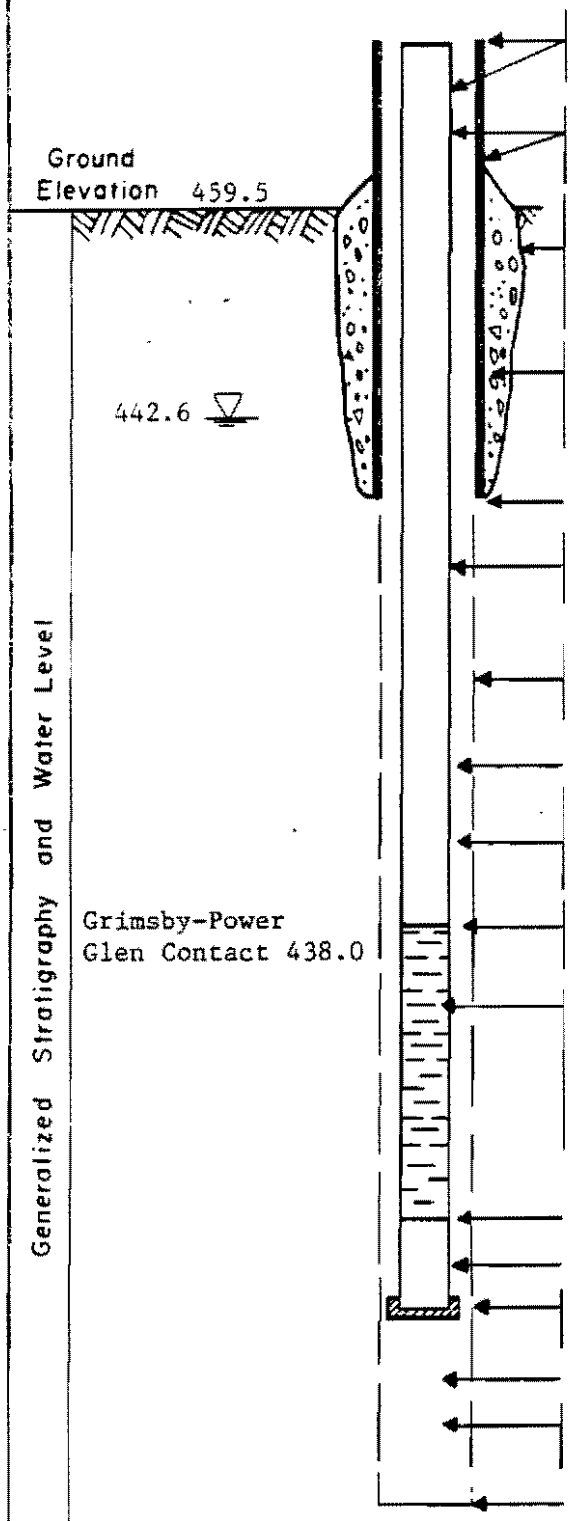
Well No. D-51

Aquifer Grimsby/ Power Glen Contact

Elev. Interval 416.2-444.75



Elevation of top of surface casing / riser pipe.	462/461.77'
Heigth of top of surface casing / riser pipe above ground surface.	2.5'/2.27
Depth of surface seal below ground surface	11.75
Type of surface seal: Cement	
I D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I. D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	41'
Type of backfill: Cement	
Elev./depth top of seal.	447.75/11.75'
Type of seal: Bentonite	
Elev./depth bottom of seal.	444.75/14.75'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	14.75'
Elev./depth top of screened section.	437.22/22.28'
Type of screened section: Sch 40 PVC	
Describe openings 0.010 machine slot- horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	419.5/40'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	418.5/41'
Elev./depth bottom of sand column.	418.5/41'
Type of backfill below observation pipe. Cuttings	
Elev./depth of hole.	416.2/43.3'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,634 E468,308

Date Completed 10/25/81 Original Depth 90.2'

Inspected By D. L. Middleton Date 10/25/81

Checked By _____ Date _____

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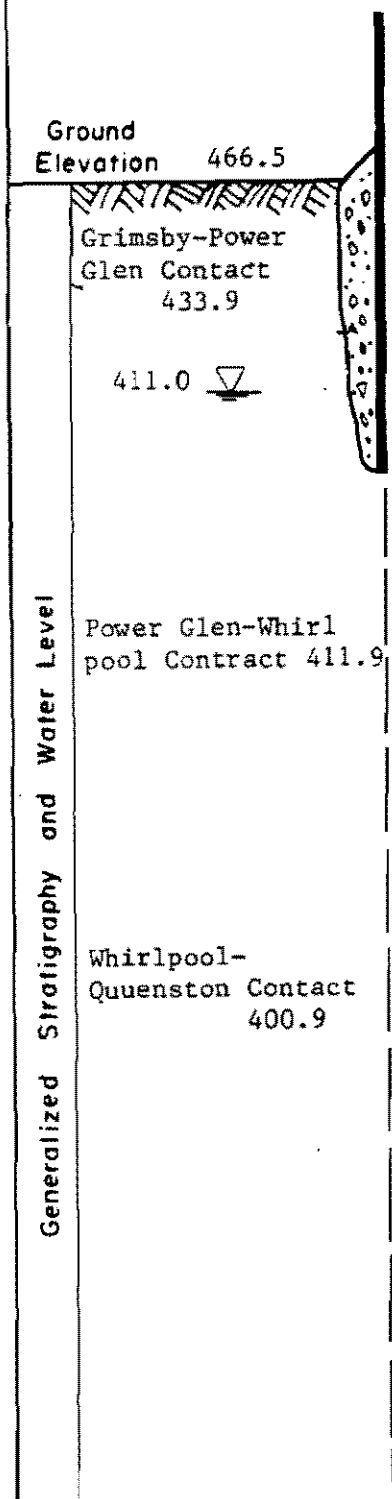
Well No. D-52

Aquifer Whirlpool-Queenston Contact

Elev. Interval 376.3-405.5



Elevation of top of surface casing / riser pipe.	468.8/468.69'
Heigth of top of surface casing / riser pipe above ground surface.	2.1/1.97
Depth of surface seal below ground surface	3'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	90.2'
Type of backfill: Cement	
Elev./depth top of seal.	409.5/57'
Type of seal: Bentonite	
Elev./depth bottom of seal.	405.5/61'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	61'
Elev./depth top of screened section.	399.1/67.4'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	381.5/85'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	380.5/86'
Elev./depth bottom of sand column.	380.5/86'
Type of backfill below observation pipe. Cuttings	
Elev./depth of hole.	376.3/90.2'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,626 E468,353

Date Completed 10/20/81 Original Depth 45.9' (cored)

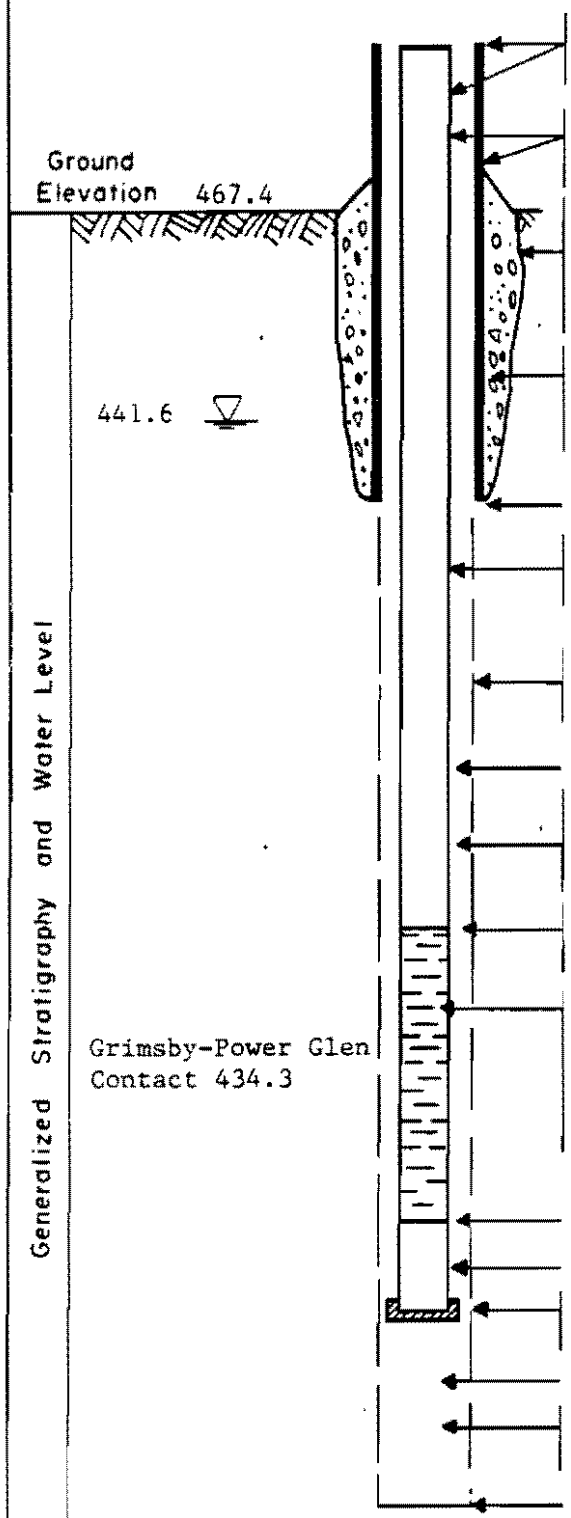
Inspected By J. C. Isham Date 10/20/81

Checked By _____ Date _____

Well No. D-53

Aquifer Grimsby-Power Glen Contact

Elev. Interval 421.5-442.34'



Elevation of top of surface casing / riser pipe.	469.18/469.18'
Heigth of top of surface casing / riser pipe above ground surface.	2.0'/2.0'
Depth of surface seal below ground surface	3.0'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3.0'
I. D. of riser pipe.	2"
Type of riser pipe: Sch 80 PVC	
Diameter of borehole	0.5'
Depth of borehole	46.0'
Type of backfill: Cement	
Elev./depth top of seal.	445.4/22.0'
Type of seal: Bentonite	
Elev./depth bottom of seal.	442.34/25.06'
Type of sand pack. O-02 (fine to med. sand)	
Depth of top of sand pack.	442.34/25.06'
Elev./depth top of screened section.	437.2/30.2'
Type of screened section: Sch 80 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	422.8/44.6"
Length of blank section.	1.0'
Elev./depth bottom of plugged blank section.	421.8/45.6
Elev./depth bottom of sand column.	421.8/45.6
Type of backfill below observation pipe. Cuttings	
Elev./depth of hole.	421.5/45.9

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,660 E468,316

Date Completed 10/29/81 Original Depth 58'

Inspected By J. Stone Date 10/29/81

Checked By _____ Date _____

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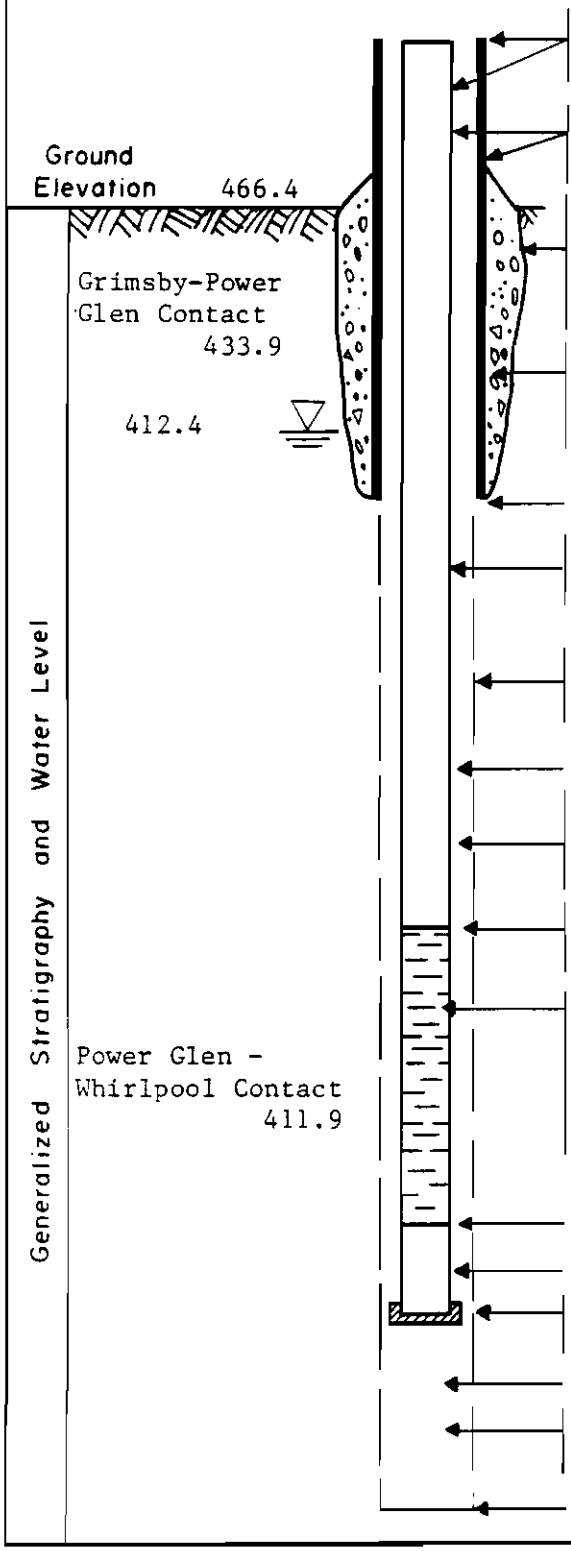
Well No. D-54

Aquifer Power Glen Whirlpool Contact

Elev. Interval 408.4-424.3



Elevation of top of surface casing / riser pipe.	468.7/468.46'
Heigth of top of surface casing / riser pipe above ground surface.	2.4/2.16'
Depth of surface seal below ground surface	38.4'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I. D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	58'
Type of backfill: Cement	
Elev./depth top of seal.	428/38.4'
Type of seal: Bentonite	
Elev./depth bottom of seal.	424.3/42.1'
Type of sand pack. O-02 (fine to med. sand)	
Depth of top of sand pack.	424.3/42.1'
Elev./depth top of screened section.	418.7/47.7'
Type of screened section: Sch 40 PVC	
Discribe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev /depth bottom of screened section.	409.4/57.0'
Length of blank section	1'
Elev. / depth bottom of plugged blank section.	408.4/58'
Elev. / depth bottom of sand column.	408.4/58'
Type of backfill below observation pipe N/A	
Elev /depth of hole.	408.4/58'

GPO 13865 11/81

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,756 E468,241

Date Completed 10/19/81 Original Depth 46.7 (cored)

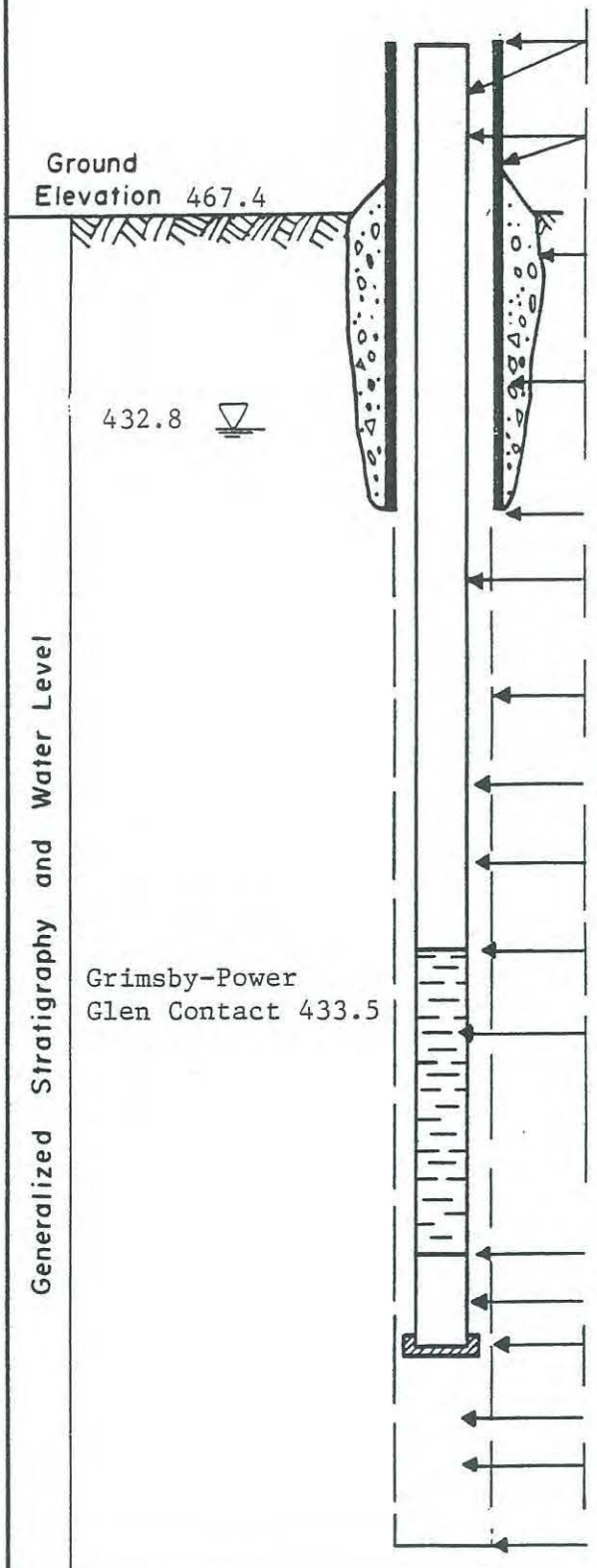
Inspected By J. C. Isham Date 10/19/81

Checked By _____ Date _____

Well No. D-55

Aquifer Grimsby-Power Glen Contact

Elev. Interval 420.7-439.4'



Elevation of top of surface casing / riser pipe.	469.36/469.36'
Heigth of top of surface casing / riser pipe above ground surface.	2.0/2.0'
Depth of surface seal below ground surface	3.0'
Type of surface seal: Cement	
I. D. of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3.0'
I. D. of riser pipe.	2"
Type of riser pipe: Sch 80 PVC	
Diameter of borehole	0.5'
Depth of borehole (reamed)	45.0'
Type of backfill: Cement	
Elev./depth top of seal.	442.3/25.1'
Type of seal: Bentonite	
Elev./depth bottom of seal.	439.4/28.0'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	439.4/28.0'
Elev./depth top of screened section.	432.9/34.5'
Type of screened section: Sch 80 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2.0"
Elev./depth bottom of screened section.	423.3/44.1'
Length of blank section.	0.9'
Elev./depth bottom of plugged blank section.	422.4/45.0'
Elev./depth bottom of sand column.	422.4/45.0'
Type of backfill below observation pipe. Cuttings	
Elev./depth of hole.	420.7/46.7'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,739 E468.251

Date Completed 10/28/81 Original Depth 109.0'

Inspected By J. C. Isham Date 10/28/81

Checked By _____ Date _____

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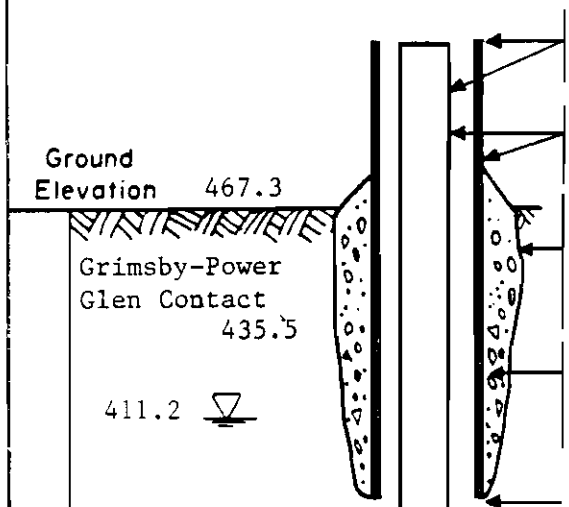
Well No. D-56

Aquifer Whirlpool - Queenston Contact

Elev. Interval 358.3-407.5



Generalized Stratigraphy and Water Level

Elevation of top of surface casing / riser pipe.	469.7/469.44'
Heigth of top of surface casing / riser pipe above ground surface.	2.4/2.14'
Depth of surface seal below ground surface	3'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3.0'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	109.0'
Type of backfill: Cement	
Elev./depth top of seal.	411.1/56.2'
Type of seal: Bentonite	
Elev./depth bottom of seal.	407.5/59.8'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	407.5/59.8'
Elev./depth top of screened section.	405.7/61.6'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	362.3/105.0'
Length of blank section.	2.0'
Elev./depth bottom of plugged blank section.	360.3/107.0'
Elev./depth bottom of sand column.	360.3/107.0'
Type of backfill below observation pipe. Cuttings	
Elev./depth of hole.	358.3/109.0'

Two screened sections: Bottom 105.0-90.6 Top 80.8-61.6

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,739 E468,229

Date Completed 10/28/81 Original Depth 59.3 (cored)

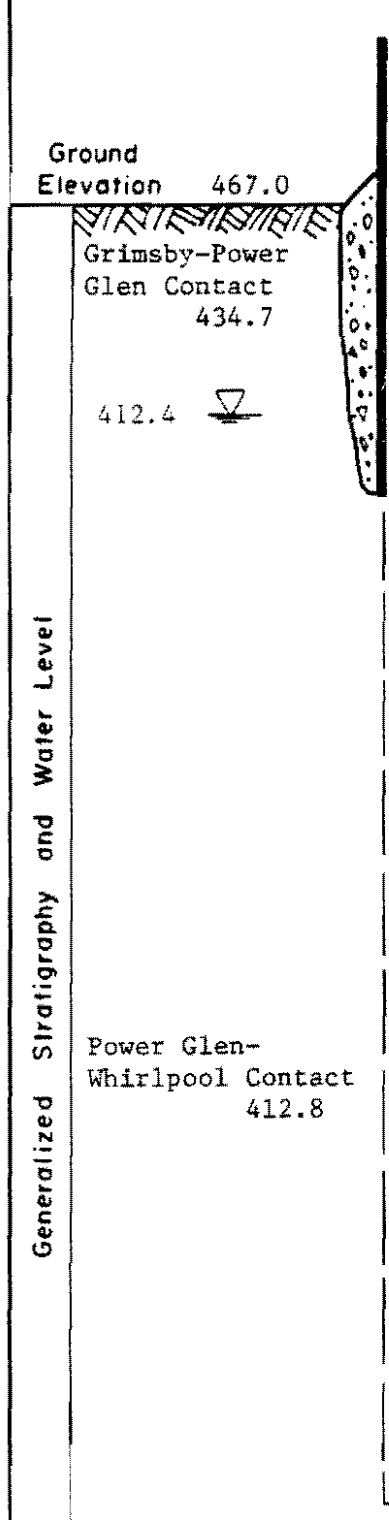
Inspected By D. L. Middleton Date 10/28/81

Checked By _____ Date _____

Well No. D-57

Aquifer Power Glen Whirlpool Contact

Elev. Interval 408.0-426.2



Elevation of top of surface casing / riser pipe.	469.55/469.27'
Heigth of top of surface casing / riser pipe above ground surface.	2.3/2.02'
Depth of surface seal below ground surface	37.8'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	58.5'
Type of backfill: Cement	
Elev./depth top of seal.	429.2/37.8'
Type of seal: Bentonite	
Elev./depth bottom of seal.	426.2/40.8'
Type of sand pack. 0-02 (fine to med. sand)	
Depth of top of sand pack.	40.8'
Elev./depth top of screened section.	418.8/48.2'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	409.5/57.5'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	408.5/58.5'
Elev./depth bottom of sand column.	408.5/58.5'
Type of backfill below observation pipe. Cuttings	
Elev./depth of hole.	4077/59.3'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,948 E468,241

Date Completed 10/20/81 Original Depth 51.5' (cored)

Inspected By J. C. Isham Date 10/20/81

Checked By _____ Date _____

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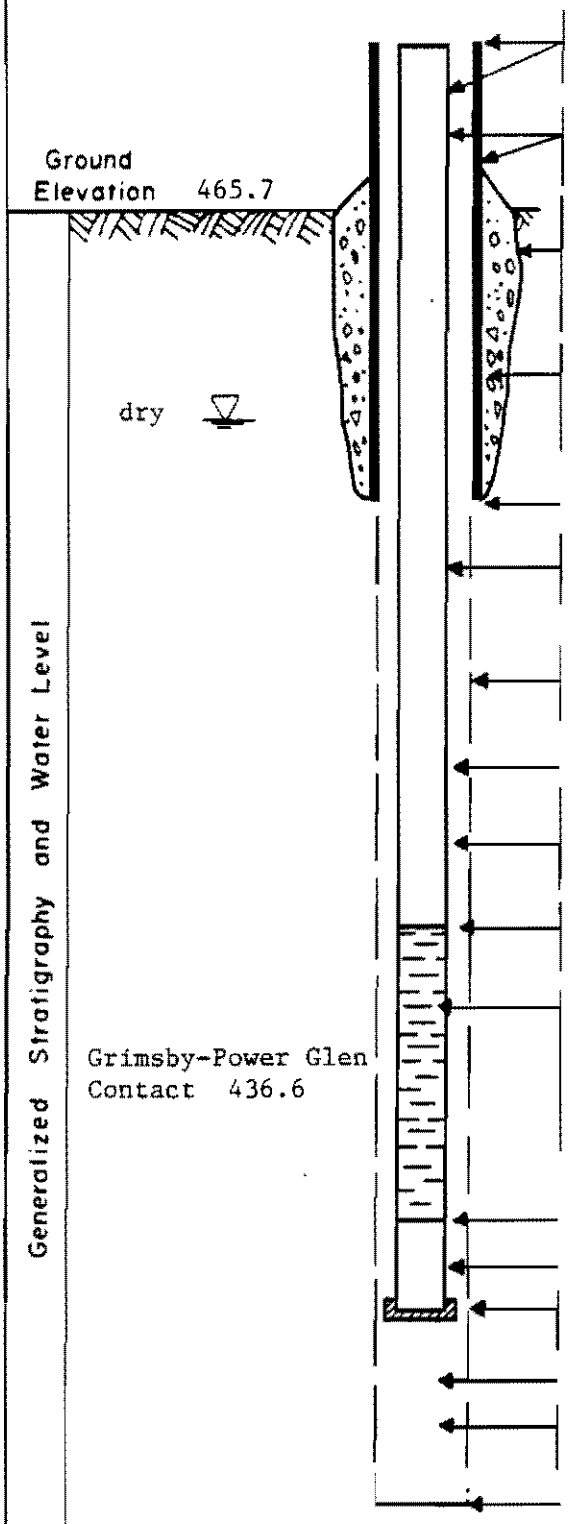
Well No. D-58

Aquifer Grimsby-Power Glen Contact

Elev. Interval 414.2-440.7'



Elevation of top of surface casing / riser pipe.	467.68/467.68'
Heigth of top of surface casing / riser pipe above ground surface.	2.0/2.0'
Depth of surface seal below ground surface	3.0'
Type of surface seal: Cement	
I.D. of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3.0'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 80 PVC	
Diameter of borehole	0.5'
Depth of borehole (reamed)	51.0'
Type of backfill: Cement	
Elev./depth top of seal.	444.4/21.3'
Type of seal: Bentonite	
Elev./depth bottom of seal.	440.7/25.00'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	25.00'
Elev./depth top of screened section.	425.15/40.55'
Type of screened section: Sch 80 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	415.55/50.15'
Length of blank section.	1.15'
Elev./depth bottom of plugged blank section.	414.4/51.3'
Elev./depth bottom of sand column.	414.4/51.3'
Type of backfill below observation pipe. Cuttings	
Elev./depth of hole.	414.2/51.5'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,951 E468,216

Date Completed 10/25/81 Original Depth 100'

Inspected By D. L. Middleton Date 10/25/81

Checked By _____ Date _____

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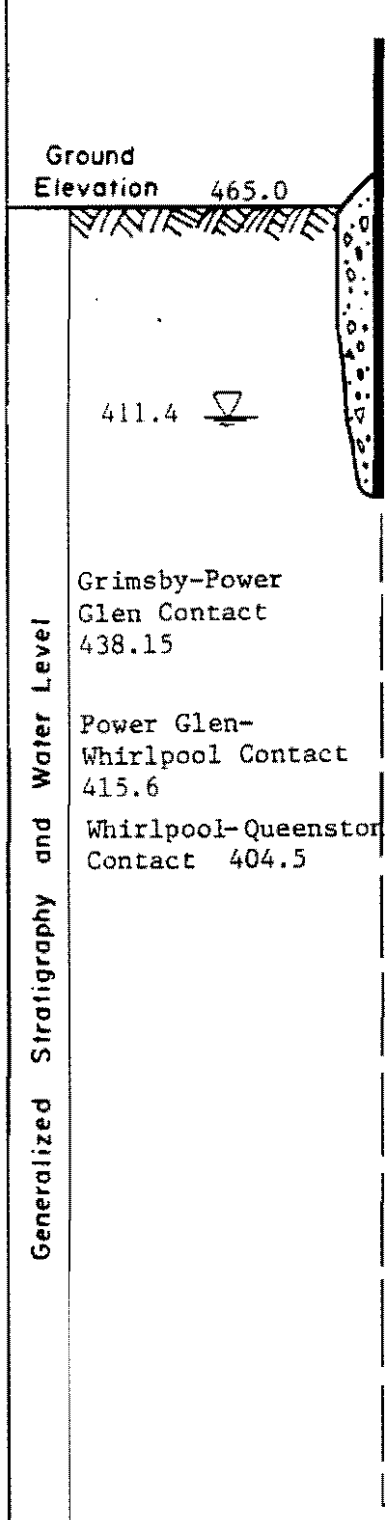
Well No. D-59

Aquifer Whirlpool - Queenston Contact

Elev. Interval 365.0-409.0'



Elevation of top of surface casing / riser pipe.	467.7/467.25'
Heigth of top of surface casing / riser pipe above ground surface	2.7/2.25'
Depth of surface seal below ground surface	59'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	100'
Type of backfill: Cement	
Elev./depth top of seal.	406.0/59'
Type of seal: Bentonite	
Elev./depth bottom of seal.	409.0/56'
Type of sand pack. 0-02 (fine to med. sand)	
Depth of top of sand pack.	409.0/56'
Elev./depth top of screened section.	395.4/69.6'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	366.0/99'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	365.0/100'
Elev./depth bottom of sand column.	365.0/100'
Type of backfill below observation pipe. N/A	
Elev./depth of hole.	365.0/100'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,934 E468,227

Date Completed 10/26/81 Original Depth 58.0'

Inspected By C. F. Wall Date 10/26/81

Checked By _____ Date _____

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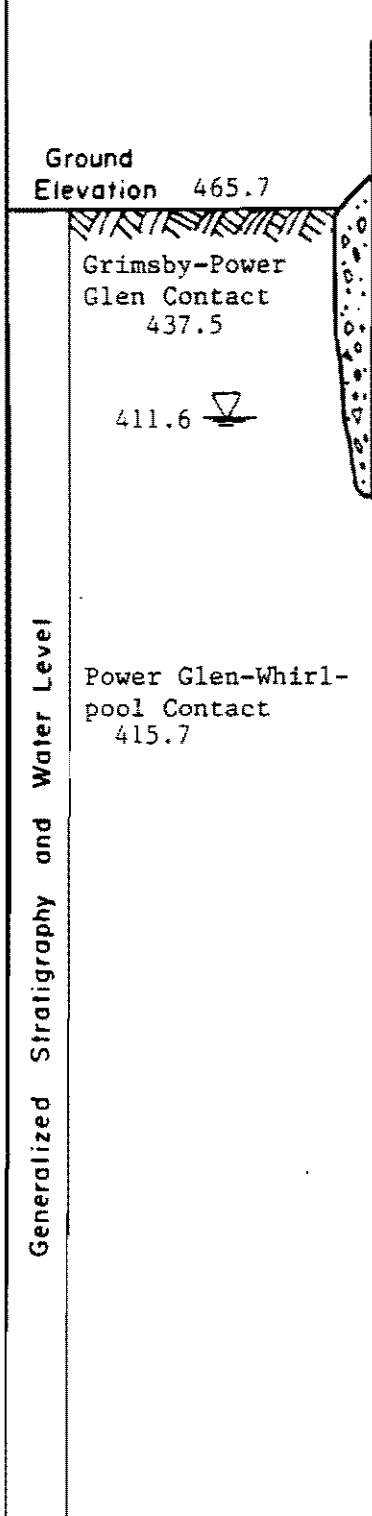
Well No. D-60

Aquifer Power Glen-Whirlpool Contact

Elev. Interval 399.8-414.8'



Elevation of top of surface casing / riser pipe.	467.85/467.75
Height of top of surface casing / riser pipe above ground surface.	2.1/2.0'
Depth of surface seal below ground surface	39.9'
Type of surface seal: Cement	
I.D. of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	58.0'
Type of backfill: Cement	
Elev./depth top of seal.	425.8/39.9'
Type of seal: Bentonite	
Elev./depth bottom of seal.	422.7/43.0'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	43.0'
Elev./depth top of screened section.	418.4/47.3'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	408.9/56.8'
Length of blank section.	1.2'
Elev./depth bottom of plugged blank section.	407.7/58.0'
Elev./depth bottom of sand column.	407.7/58.0'
Type of backfill below observation pipe. None	
Elev./depth of hole.	407.7/58.0'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,865 E468,343

Date Completed 10/23/81 Original Depth 46.0' (cored)

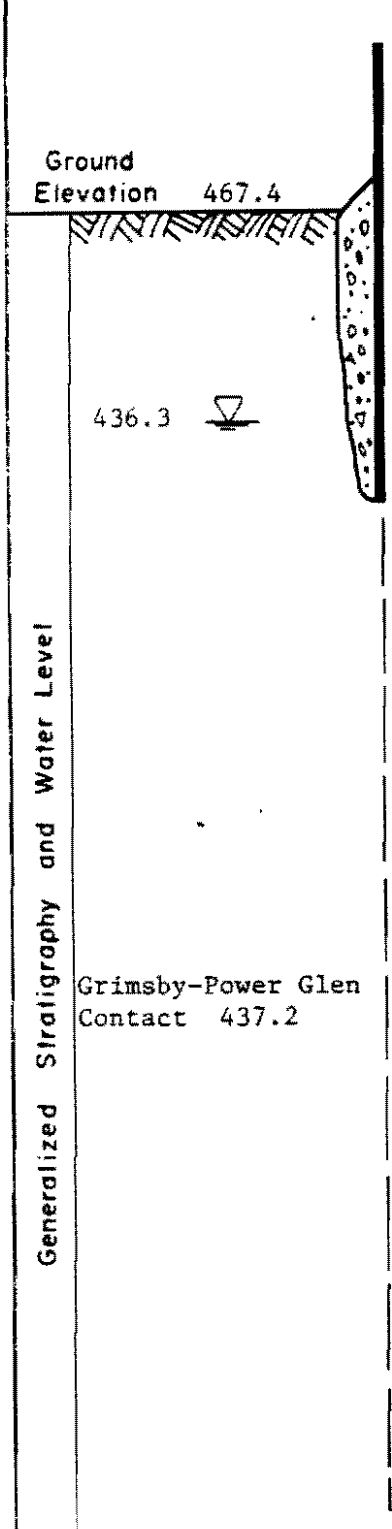
Inspected By J. C. Isham Date 10/23/81

Checked By _____ Date _____

Well No. D-61

Aquifer Grimsby-Power Glen Contact

Elev. Interval 421.4-441.4'



Elevation of top of surface casing / riser pipe.	469.31/469.31'
Heigth of top of surface casing / riser pipe above ground surface.	1.85/1.85'
Depth of surface seal below ground surface	3.0'
Type of surface seal: Cement	
I.D. of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3.0'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 80 PVC	
Diameter of borehole	0.5'
Depth of borehole	46.0'
Type of backfill: Cement	
Elev./depth top of seal.	444.4/23.0'
Type of seal: Bentonite	
Elev./depth bottom of seal.	441.4/26.0'
Type of sand pack. 0-02 (fine to med. sand)	
Depth of top of sand pack.	26.0'
Elev./depth top of screened section.	432.1/35.3'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	422.5/44.9'
Length of blank section.	1.0'
Elev./depth bottom of plugged blank section.	421.5/45.9'
Elev./depth bottom of sand column.	421.5/45.9'
Type of backfill below observation pipe. Cuttings	
Elev./depth of hole.	421.3/46.3'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,878 E468,358

Date Completed 10/29/81 Original Depth 59.3'

Inspected By D. L. Middleton Date 10/29/81

Checked By _____ Date _____

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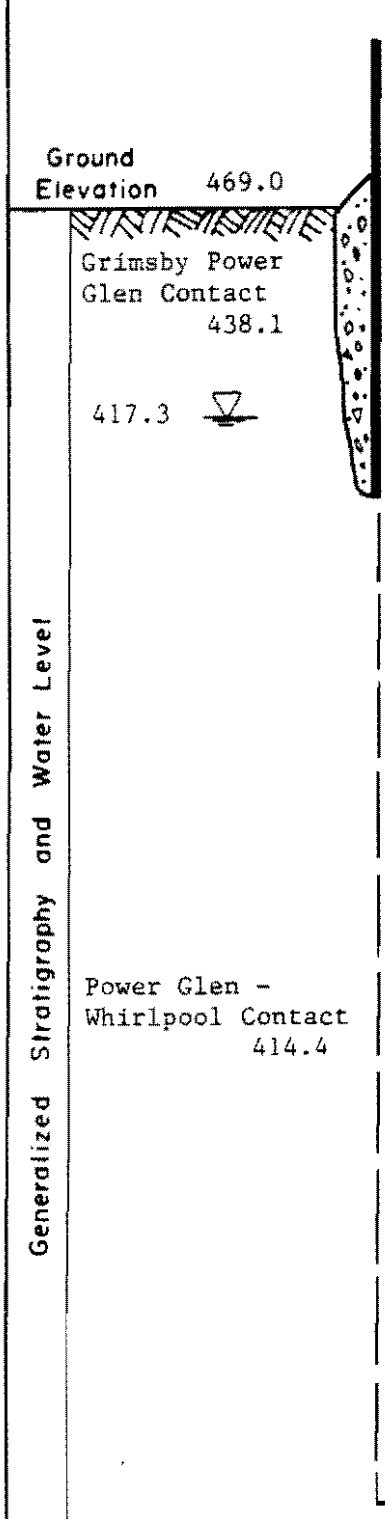
Well No. D-62

Aquifer Power Glen Whirlpool Contact

Elev. Interval 409.7-422.7'



Elevation of top of surface casing / riser pipe.	471.16/471.04'
Heigth of top of surface casing / riser pipe above ground surface.	2.3/2.18'
Depth of surface seal below ground surface	43.3'
Type of surface seal: Cement	
I.D. of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	59.1'
Type of backfill: Cement	
Elev./depth top of seal.	425.7/43.3'
Type of seal: Bentonite	
Elev./depth bottom of seal.	422.7/46.3'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	46.3'
Elev./depth top of screened section.	420.2/48.8'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine Slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	410.9/58.1'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	409.9/59.1'
Elev./depth bottom of sand column.	409.9/59.1'
Type of backfill below observation pipe. Cuttings	
Elev/depth of hole.	408.7/60.3

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160.674 E468.453

Date Completed 10/28/81 Original Depth 101'

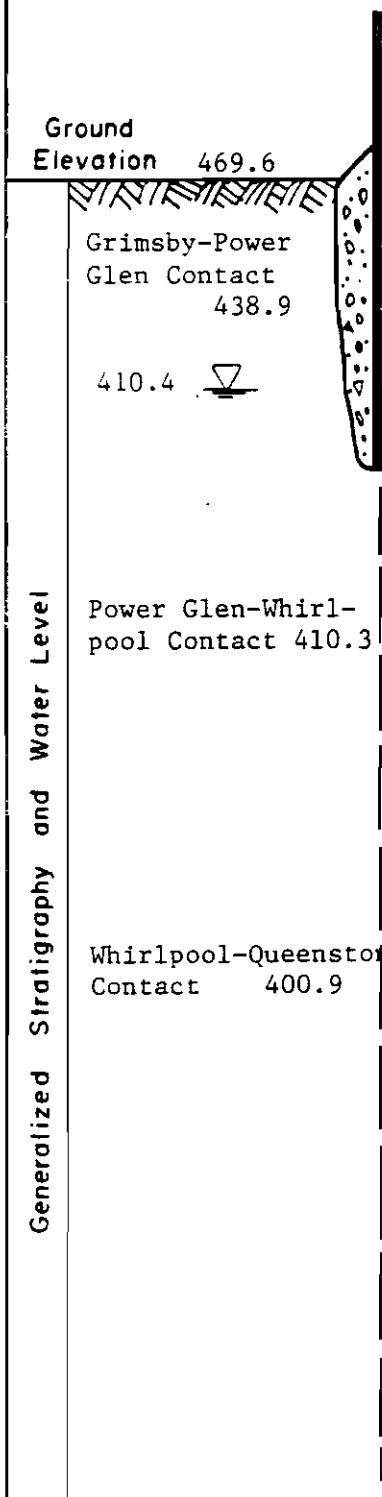
Inspected By R. L. Blodnikar Date 10/28/81

Checked By _____ Date _____

Well No. D-63A

Aquifer Whirlpool-Queenston Contact

Elev. Interval 368.6-404.6'



Elevation of top of surface casing / riser pipe.	471.73/471.63'
Heigth of top of surface casing / riser pipe above ground surface.	2.13/2.03'
Depth of surface seal below ground surface	61'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3.17'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	101'
Type of backfill: Cement	
Elev./depth top of seal.	400.6/61'
Type of seal: Bentonite	
Elev./depth bottom of seal.	404.6/65'
Type of sand pack Q-02 (fine to med. sand)	
Depth of top of sand pack.	65'
Elev./depth top of screened section.	397.3/72.3'
Type of screened section: Sch 80 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	369.4/100.2'
Length of blank section.	0.8'
Elev./depth bottom of plugged blank section.	368.6/101'
Elev./depth bottom of sand column.	368.6/101'
Type of backfill below observation pipe. None	
Elev./depth of hole.	368.6/101'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,713 E468,448

Date Completed 10/23/81 Original Depth 47.7'

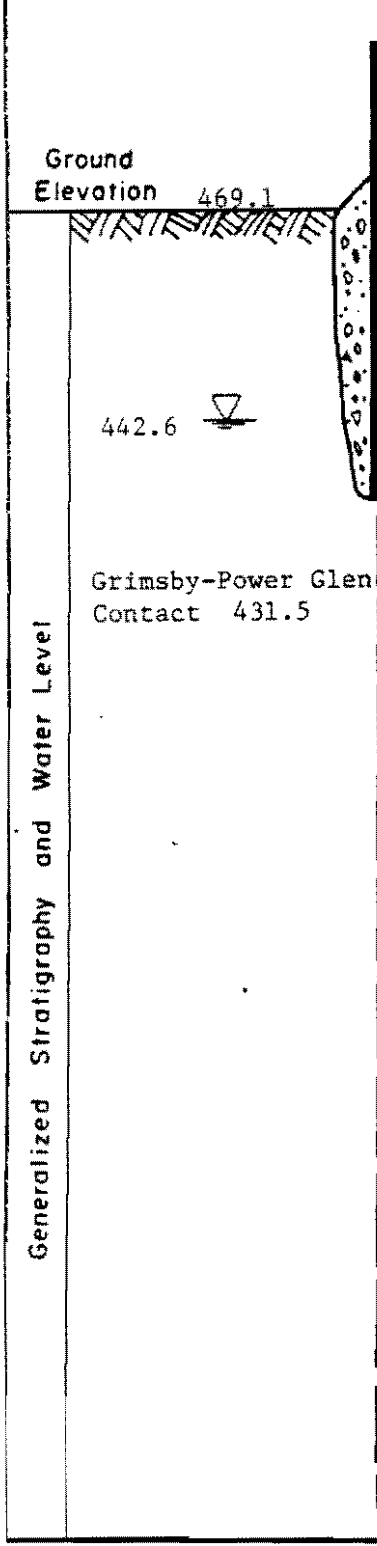
Inspected By D. L. Middleton Date 10/23/81

Checked By _____ Date _____

Well No. D-64

Aquifer Grimsby-Power Glen Contact

Elev. Interval 421.4-437.1'



Elevation of top of surface casing / riser pipe.	471.55/471.37'
Heigth of top of surface casing / riser pipe above ground surface	2.5/2.32'
Depth of surface seal below ground surface	29'
Type of surface seal: Cement	
I D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I. D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	47.7'
Type of backfill: Cement	
Elev./depth top of seal.	440.1/29'
Type of seal: Bentonite	
Elev./depth bottom of seal.	437.1/32'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	437.1/32'
Elev./depth top of screened section.	432.2/36.9'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	422.4/46.7'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	421.4/47.7'
Elev./depth bottom of sand column.	421.4/47.7'
Type of backfill below observation pipe. N/A	
Elev./depth of hole.	421.4/47.7'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,735 E468,433

Date Completed 10/24/81 Original Depth 63'

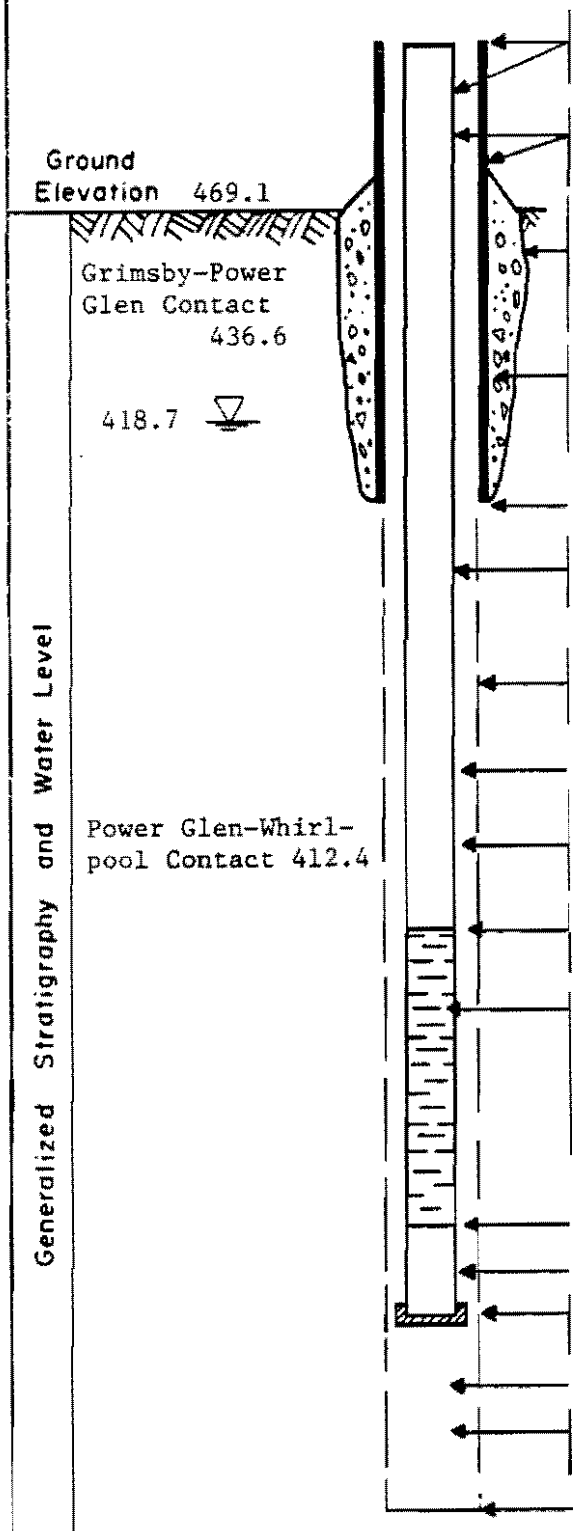
Inspected By D. L. Middleton Date 10/24/81

Checked By _____ Date _____

Well No. D-65

Aquifer Power Glen-Whirlpool Contact

Elev. Interval 406.1-422.1



Elevation of top of surface casing / riser pipe.	471.43/471.33'
Heigth of top of surface casing / riser pipe above ground surface.	2.2/2.1'
Depth of surface seal below ground surface	43.2'
Type of surface seal: Cement	
I D of surface casing.	4"
Type of surface casing: 4" Cast iron with lock cap	
Depth of surface casing below ground	3'
I. D. of riser pipe.	2"
Type of riser pipe: 2" Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	63'
Type of backfill: Cement	
Elev./depth top of seal:	425.9/43.2'
Type of seal: Cement	
Elev./depth bottom of seal.	422.1/47'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	47'
Elev./depth top of screened section.	416.9/52.2'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	407.1/62'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	406.1/63'
Elev./depth bottom of sand column.	406.1/63'
Type of backfill below observation pipe.	
Elev./depth of hole.	406.1/63'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,859 E468,567

Date Completed 10/28/81 Original Depth 38.0'

Inspected By J. C. Isham Date 10/28/81

Checked By _____ Date _____

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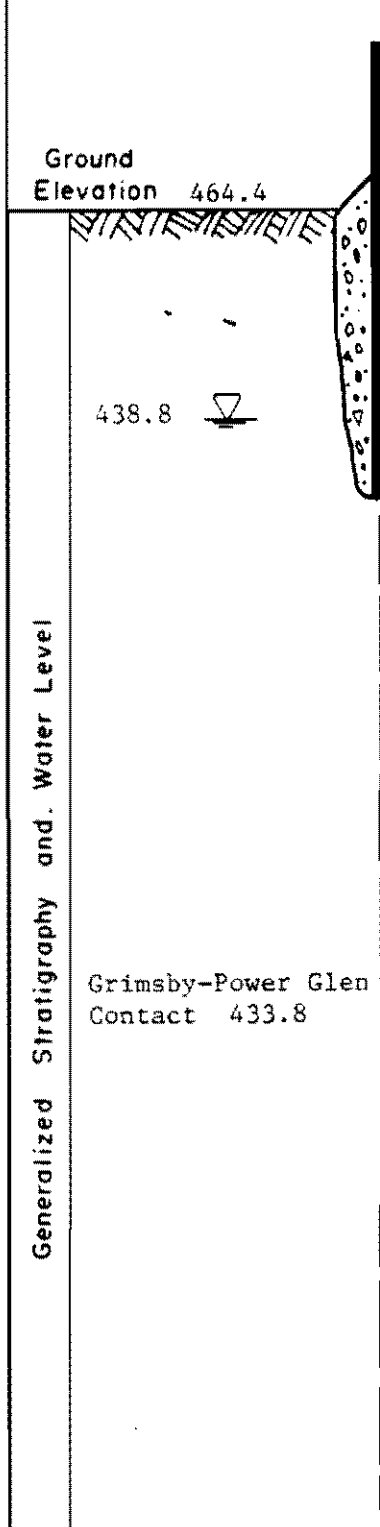
Well No. D-66

Aquifer Grimsby-Power Glen Contact

Elev. Interval 426.4-440.4'



Elevation of top of surface casing / riser pipe.	466.53/466.33
Heigth of top of surface casing / riser pipe above ground surface.	2.2/2.0'
Depth of surface seal below ground surface	20.8'
Type of surface seal: Cement	
I.D. of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3.0'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	
Depth of borehole	38.0'
Type of backfill: Cement	
Elev./depth top of seal.	443.6/20.8'
Type of seal: Bentonite	
Elev./depth bottom of seal.	440.4/24.0'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	440.4/24.0'
Elev./depth top of screened section.	437.0/27.4'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	427.4/37.0'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	426.4/38.0'
Elev./depth bottom of sand column.	426.4/38.0'
Type of backfill below observation pipe.	
Elev./depth of hole.	426.4/38.0'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,874 E468,575

Date Completed 10/30/81 Original Depth 100'

Inspected By J. Stone Date 10/30/81

Checked By _____ Date _____

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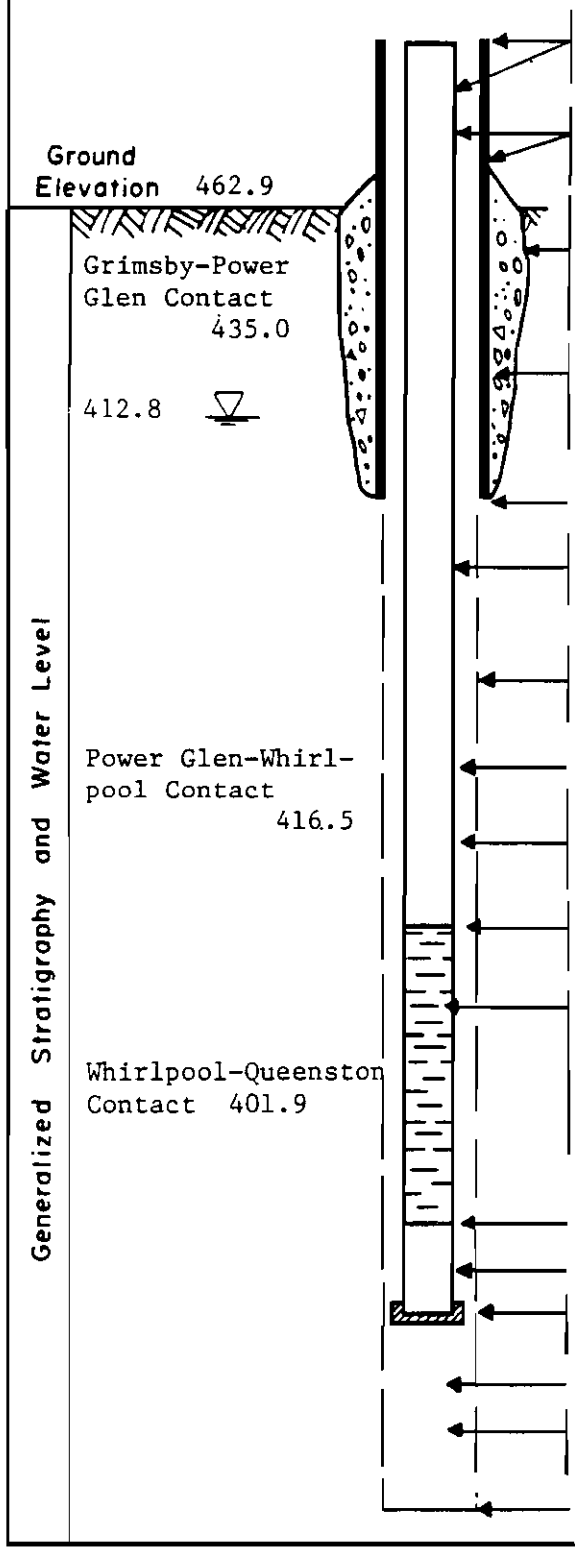
Well No. D-67

Aquifer Whirlpool-Queenston Contact

Elev. Interval 362.9-408.9'



Elevation of top of surface casing / riser pipe.	466.21/465.91'
Heigth of top of surface casing / riser pipe above ground surface.	2.0/1.7'
Depth of surface seal below ground surface	52'
Type of surface seal: Cement	
I D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I. D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	100'
Type of backfill: Cement	
Elev./depth top of seal.	410.9/52'
Type of seal: Bentonite	
Elev./depth bottom of seal.	408.9/54'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	54'
Elev./depth top of screened section.	405.9/57'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev /depth bottom of screened section.	363.9/99.0'
Length of blank section.	1'
Elev. / depth bottom of plugged blank section.	362.9/100'
Elev. / depth bottom of sand column.	N/A
Type of backfill below observation pipe. N/A	
Elev./depth of hole.	362.9/100'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,838 E468,555

Date Completed 10/30/81 Original Depth 58'

Inspected By D. L. Middleton Date 10/30/81

Checked By _____ Date _____

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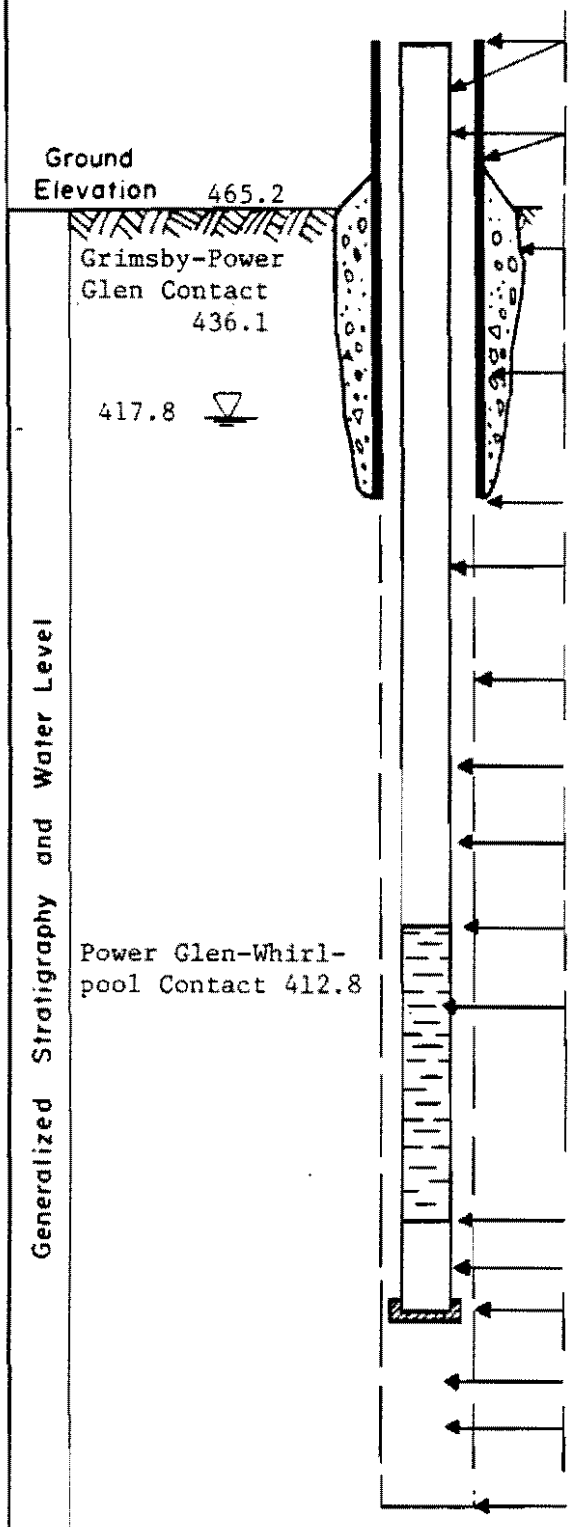
Well No. D-68A

Aquifer Power Glen Whirlpool Contact

Elev. Interva 407.2-421.2'



Elevation of top of surface casing / riser pipe.	467.8/467.55'
Heigth of top of surface casing / riser pipe above ground surface.	1.9/1.65'
Depth of surface seal below ground surface	36.0'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3'
I. D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	6"
Depth of borehole	58'
Type of backfill: Cement	
Elev./depth top of seal.	429.2/36.0'
Type of seal: Bentonite	
Elev./depth bottom of seal.	421.2/44.0'
Type of sand pack: Q-02 (fine to med. sand)	
Depth of top of sand pack.	421.2/44.0'
Elev./depth top of screened section.	417.5/47.7'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" Machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	408.2/57'
Length of blank section.	1'
Elev./depth bottom of plugged blank section.	407.2/58'
Elev./depth bottom of sand column.	407.2/58'
Type of backfill below observation pipe. N/A	
Elev./depth of hole.	407.2/58'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,836 E468,601

Date Completed 10/28/81 Original Depth 18'

Inspected By C. F. Wall Date 10/28/81

Checked By _____ Date _____

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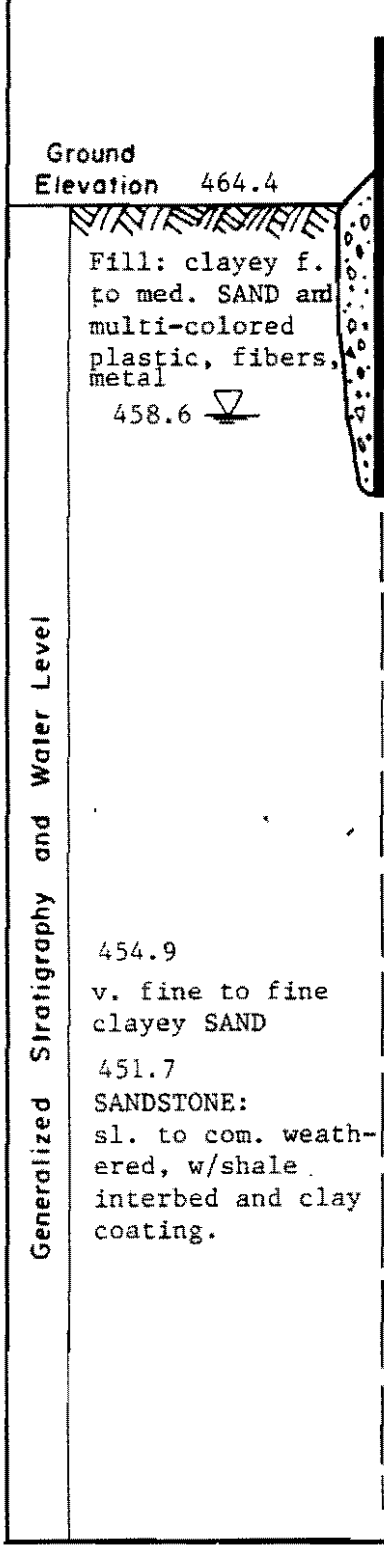
Well No. D-69

Aquifer Grimsby-Soil-Landfill

Elev. Interval 446.4-458.4'



Elevation of top of surface casing / riser pipe.	466.56/466.11'
Heigth of top of surface casing / riser pipe above ground surface.	2.2/1.75'
Depth of surface seal below ground surface	4.2'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3"
I.D. of riser pipe.	2"
Type of riser pipe: Sch 40 PVC	
Diameter of borehole	10" to 11.4' 6" to 18.0'
Depth of borehole	18.0'
Type of backfill: Cement	
Elev./depth top of seal.	460.2/4.2'
Type of seal: Bentonite	
Elev./depth bottom of seal.	458.4/6.0'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	6.0'
Elev./depth top of screened section.	456.65/7.75'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	447.25/17.15'
Length of blank section.	0.25'
Elev./depth bottom of plugged blank section.	447/17.4'
Elev./depth bottom of sand column.	447/17.4'
Type of backfill below observation pipe. Natural material	
Elev./depth of hole.	446.4/18.0'

GROUND WATER OBSERVATION WELL REPORT

PROJECT Somerset Railroad - Van De Mark

LOCATION N1,160,737 E468,696

Date Completed 10/29/81 Original Depth 19.4'

Inspected By J. C. Isham Date 10/29/81

Checked By _____ Date _____

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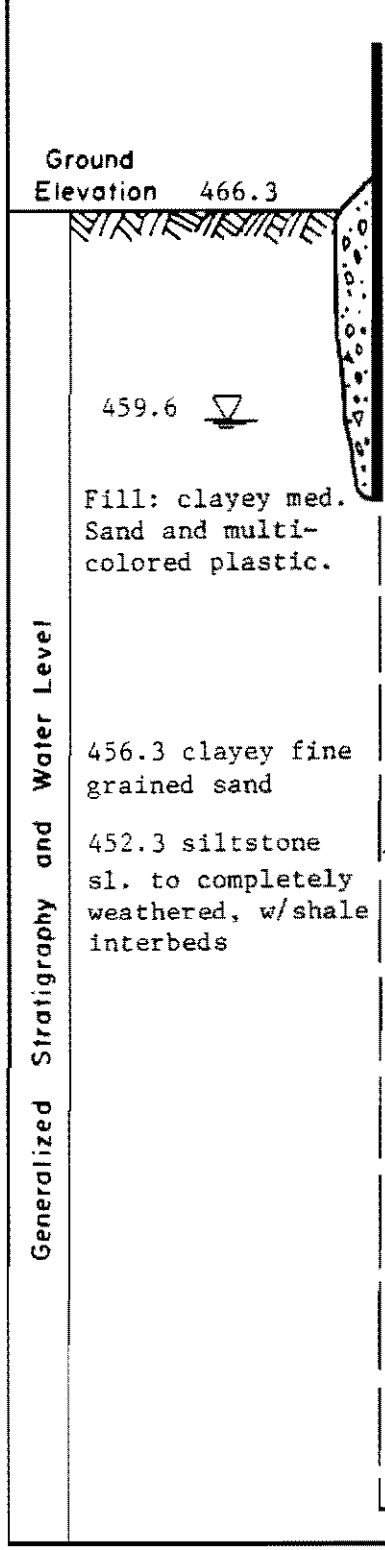
Well No. D-70

Aquifer Grimsby-Soil Landfill

Elev. Interva 446.9-458.3'



Elevation of top of surface casing / riser pipe.	468.35/468.10'
Heigth of top of surface casing / riser pipe above ground surface.	2.2/1.95'
Depth of surface seal below ground surface	3.0'
Type of surface seal: Cement	
I.D of surface casing.	4"
Type of surface casing: Cast iron with lock cap	
Depth of surface casing below ground	3.0'
I.D. of riser pipe.	2"
Type of riser pipe: Sch 80 PVC	
Diameter of borehole	6"
Depth of borehole	19.4'
Type of backfill: Cement	
Elev./depth top of seal.	461.3/5.0'
Type of seal: Bentonite	
Elev./depth bottom of seal.	458.3/8.0'
Type of sand pack. Q-02 (fine to med. sand)	
Depth of top of sand pack.	8.0'
Elev./depth top of screened section.	456.6/9.7'
Type of screened section: Sch 40 PVC	
Describe openings 0.010" machine slot - horizontal slot	
I.D. of screened section.	2"
Elev./depth bottom of screened section.	447.2/19.1'
Length of blank section.	.3'
Elev./depth bottom of plugged blank section.	446.9/19.4'
Elev./depth bottom of sand column.	446.9/19.4'
Type of backfill below observation pipe.	
Elev./depth of hole.	446.9/19.4'

APPENDIX C-1

CHEMICAL ANALYSES OF GROUND WATER SAMPLES

DATA SHEETS FROM RECRA RESEARCH, INC.

FIRST ROUND ANALYSES

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-49A (11/3/81)	D-49B (11/3/81)	D-50A (11/2/81)	D-50B (11/2/81)
pH (field)	Standard Units	8.85	9.00	11.90	11.90
Specific Conductance (field)	µmhos/cm	283	305	1,830	1,830
Temperature (field)	°C	11.5	12	12	11.5
Total Organic Carbon	mg/l	1.1	1.3	4.5	5.7
Total Filterable Residue (180°C)	mg/l	290	290	790	750
Chloride	mg/l	20	20	33	33
Total Iron	mg/l	16	8.8	0.91	0.90
Total Recoverable Oil and Grease	mg/l	<5	<5	<5	<5

COMMENTS: Comments pertain to data on all pages of this report. Samples were collected by Recra personnel on 11/2/81 and 11/3/81. The specific date of collection is located under the sample identification.

FOR RECRA RESEARCH, INC. R. V. Fann

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-51A (11/3/81)	D-51B (11/3/81)	D-52A (11/2/81)	D-52B (11/2/81)
pH (field)	Standard Units	6.90	7.15	6.35	7.15
Specific Conductance (field)	µmhos/cm	295	295	3,000	2,690
Temperature (field)	°C	12.5	12	12.5	12
Total Organic Carbon	mg/l	2.4	5.2	8.8	9.6
Total Filterable Residue (180°C)	mg/l	260	260	2,700	2,300
Chloride	mg/l	28	27	1,100	910
Total Iron	mg/l	6.1	14	1.4	0.70
Total Recoverable Oil and Grease	mg/l	<5	<5	30	6

COMMENTS: Analyses were performed according to U.S. Environmental Protection Agency methodologies.

FOR RECRA RESEARCH, INC. R. V. Zinn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-53A (11/2/81)	D-53B (11/2/81)	D-54A (11/3/81)	D-54B (11/3/81)
pH (field)	Standard Units	6.65	6.75	9.50	9.65
Specific Conductance (field)	µmhos/cm	353	360	1,480	1,480
Temperature (field)	°C	12	12	11	11
Total Organic Carbon	mg/l	8.1	4.2	2.4	6.4
Total Filterable Residue (180°C)	mg/l	280	340	1,400	1,400
Chloride	mg/l	32	32	290	270
Total Iron	mg/l	3.8	2.5	22	49
Total Recoverable Oil and Grease	mg/l	<5	<5	<5	<5

COMMENTS: pH, Specific Conductance, and Temperature analyses were performed on site by Recra personnel.

FOR RECRA RESEARCH, INC. R. V. Finn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-55A (11/2/81)	D-55B (11/2/81)	D-56A (11/3/81)	D-56B (11/3/81)
pH (field)	Standard Units	6.55	6.80	10.45	10.70
Specific Conductance (field)	µmhos/cm	430	430	500	600
Temperature (field)	°C	12	11.5	11	11
Total Organic Carbon	mg/l	4.8	4.7	6.4	5.0
Total Filterable Residue (180°C)	mg/l	370	360	460	480
Chloride	mg/l	37	37	79	79
Total Iron	mg/l	7.1	4.8	5.6	7.2
Total Recoverable Oil and Grease	mg/l	<5	<5	<5	<5

COMMENTS: Values reported as "less than" (<) indicate the working detection limit for the particular sample or parameter.

FOR RECRA RESEARCH, INC. R. J. Fenn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-57A (11/3/81)	D-57B (11/3/81)	D-59A (11/2/81)	D-59B (11/2/81)
pH (field)	Standard Units	8.10	8.15	8.30	8.25
Specific Conductance (field)	µmhos/cm	483	415	249	251
Temperature (field)	°C	10	10	10.5	10.5
Total Organic Carbon	mg/l	3.8	3.7	4.5	7.9
Total Filterable Residue (180°C)	mg/l	540	660	220	220
Chloride	mg/l	39	40	22	22
Total Iron	mg/l	9.8	11	2.6	2.8
Total Recoverable Oil and Grease	mg/l	<5	<5	<5	<5

COMMENTS: Refer to pages 1 through 4.

FOR RECRA RESEARCH, INC. D. V. Zinn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-60A (11/2/81)	D-60B (11/2/81)	D-61A (11/3/81)	D-61B (11/3/81)
pH (field)	Standard Units	7.35	7.55	6.65	6.75
Specific Conductance (field)	µmhos/cm	1,680	1,700	420	510
Temperature (field)	°C	10.5	10.5	10	10
Total Organic Carbon	mg/l	8.1	7.3	6.0	10
Total Filterable Residue (180°C)	mg/l	1,700	1,800	410	390
Chloride	mg/l	36	30	36	36
Total Iron	mg/l	16	2.9	2.0	11
Total Recoverable Oil and Grease	mg/l	<5	<5	26	<5

COMMENTS: Refer to pages 1 through 4.

FOR RECRA RESEARCH, INC. D. V. Zinn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-62A (11/3/81)	D-62B (11/3/81)	D-63AA (11/3/81)	D-63AB (11/3/81)
pH (field)	Standard Units	9.95	10.25	9.65	9.80
Specific Conductance (field)	µmhos/cm	510	505	255	275
Temperature (field)	°C	10	10	12	11
Total Organic Carbon	mg/l	3.3	1.5	5.6	5.8
Total Filterable Residue (180°C)	mg/l	550	520	270	270
Chloride	mg/l	19	19	23	24
Total Iron	mg/l	17	18	4.7	3.0
Total Recoverable Oil and Grease	mg/l	6	<5	<5	<5

COMMENTS: Refer to pages 1 through 4.

FOR RECRA RESEARCH, INC. Q. V. Zinn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-64A (11/2/81)	D-64B (11/2/81)	D-65A (11/2/81)	D-65B (11/2/81)
pH (field)	Standard Units	8.20	8.45	7.85	8.30
Specific Conductance (field)	µmhos/cm	244	242	1,290	1,290
Temperature (field)	°C	11.5	13	11.5	11.5
Total Organic Carbon	mg/l	5.7	6.8	4.5	9.5
Total Filterable Residue (180°C)	mg/l	180	170	1,200	1,100
Chloride	mg/l	24	23	37	37
Total Iron	mg/l	1.8	21	4.8	3.3
Total Recoverable Oil and Grease	mg/l	8	<5	<5	<5

COMMENTS: Refer to pages 1 through 4.

FOR RECRA RESEARCH, INC. D. V. Zinn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-66A (11/3/81)	D-66B (11/3/81)	D-67A (11/3/81)	D-67B (11/3/81)
pH (field)	Standard Units	7.50	7.45	10.65	10.75
Specific Conductance (field)	µmhos/cm	1,040	1,000	540	530
Temperature (field)	°C	13	12.5	13	12.5
Total Organic Carbon	mg/l	4.0	4.4	3.2	2.0
Total Filterable Residue (180°C)	mg/l	860	830	410	410
Chloride	mg/l	200	190	33	33
Total Iron	mg/l	8.0	1.6	3.1	3.5
Total Recoverable Oil and Grease	mg/l	<5	<5	<5	15

COMMENTS: Refer to pages 1 through 4.

FOR RECRA RESEARCH, INC. R. V. Zinn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		D-68A (11/3/81)	D-68B (11/3/81)	D-69A (11/3/81)	D-69B (11/3/81)
pH (field)	Standard Units	8.75	8.95	6.70	6.80
Specific Conductance (field)	µmhos/cm	255	258	800	780
Temperature (field)	°C	12	12	14	14
Total Organic Carbon	mg/l	1.8	2.5	6.8	8.7
Total Filterable Residue (180°C)	mg/l	230	240	670	730
Chloride	mg/l	19	20	29	29
Total Iron	mg/l	8.4	6.7	7.4	89
Total Recoverable Oil and Grease	mg/l	<5	<5	14	<5

COMMENTS: Refer to pages 1 through 4.

FOR RECRA RESEARCH, INC. R. V. Finn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

ANALYTICAL RESULTS

BECHTEL CIVIL & MINERALS, INC.

Report Date: 11/11/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)	
		D-70A (11/3/81)	D-70B (11/3/81)
pH (field)	Standard Units	6.85	6.80
Specific Conductance (field)	umhos/cm	640	540
Temperature (field)	°C	14.5	13
Total Organic Carbon	mg/l	24	33
Total Filterable Residue (180°C)	mg/l	570	590
Chloride	mg/l	31	32
Total Iron	mg/l	120	260
Total Recoverable Oil and Grease	mg/l	73	31

COMMENTS: Refer to pages 1 through 4.

FOR RECRA RESEARCH, INC. R. V. Finn

DATE 11/11/81

RECRA RESEARCH, INC.

I.D. #81-1000

APPENDIX C-2

CHEMICAL ANALYSES OF GROUND WATER SAMPLES

DATA SHEETS FROM RECRA RESEARCH, INC.

SECOND ROUND ANALYSES

ANALYTICAL RESULTS

BECHTEL CIVIL AND MINERALS, INC.

Report Date: 11/18/81
Date Received: 11/13/81 - 11/17/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION			
		D-51	D-53	D-55	D-61
pH (field)	Standard Units	7.15	6.15	6.85	6.25
Conductance (25°C)	umhos/cm	480	430	430	500
Chloride	mg/l	74	42	42	47
Fluoride	mg/l	0.50	0.36	0.54	0.30
Total Organic Carbon	mg/l	10	3.7	2.8	7.3
Total Cyanide	µg/l	<10	<10	<20	<20
Total Zinc	mg/l	0.226	0.212	0.161	0.266
Soluble Zinc	mg/l	0.054	0.189	0.198	0.118
Soluble Antimony	mg/l	<0.3	<0.3	<0.3	<0.3
Total Recoverable Oil and Grease	mg/l	<5	<5	<5	<5

COMMENTS: Samples were collected by Recra personnel on 11/13/81, 11/16/81, and 11/17/81. Analyses were performed according to U.S. Environmental Protection Agency methodologies.

FOR RECRA RESEARCH, INC. D. V. Finn

DATE 11/18/81

RECRA RESEARCH, INC.

I.D. #81-1051

ANALYTICAL RESULTS

BECHTEL CIVIL AND MINERALS, INC.

Report Date: 11/18/81
Date Received: 11/13/81 - 11/17/81

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION			
		D-64	D-66	D-69	D-70
pH (field)	Standard Units	6.75	7.30	6.40	6.15
Conductance (25°C)	µmhos/cm	670	810	615	490
Chloride	mg/1	84	100	31	36
Fluoride	mg/1	0.33	0.36	0.39	0.26
Total Organic Carbon	mg/1	33	8	7.6	7.6
Total Cyanide	µg/1	<10	<10	<10	<20
Total Zinc	mg/1	0.083	0.235	1.4	3.4
Soluble Zinc	mg/1	0.099	0.125	0.443	0.533
Soluble Antimony	mg/1	<0.3	<0.3	<0.3	<0.3
Total Recoverable Oil and Grease	mg/1	<5	<5	<5	7

COMMENTS: Values reported as "less than" (<) indicate the working detection limit for the particular sample or parameter.

FOR RECRA RESEARCH, INC. R. V. Zinn

DATE 11/18/81

RECRA RESEARCH, INC.

I.D. #81-1051