RETEC

Groundwater Tritium Investigation Report

Dresden Generating Station
Morris, Illinois

Prepared by:

The RETEC Group, Inc.
8605 W. Bryn Mawr Avenue
Chicago, Illinois 60631

RETEC Project Number: EXENW-18513-400

Prepared for:

Exelon Generation
6500 North Dresden Road
Morris, Illinois 60450

December 7, 2005

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December 7, 2005

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Executive Summary

Routine groundwater sampling undertaken at the Dresden Generating Station in July 2004 detected elevated levels of tritium in shallow monitoring wells and storm sewers located near the Unit 2/3 interlock building. The tritium was traced to a release from the Condensate Storage Tank (CST) system, through a pipe that connects to the station high pressure core injection (HPCI) system. The leak was isolated on October 20, 2004, and a replacement section of pipe around the tank was installed the following month. The RETEC Group, Inc. (RETEC) was contracted by Exelon to characterize the nature of groundwater flow at the facility and evaluate the fate of the tritium, to assist Exelon in evaluating regulatory compliance issues and response options.

The scope of work for this project included reviewing historical data, installing additional monitoring wells, conducting geophysical logging in some deeper wells, surveying the locations of all monitoring points, performing two rounds of water level measurements, performing slug tests on selected wells, sampling groundwater for tritium concentrations, and evaluating all of the physical and chemical data to characterize groundwater flow and tritium migration. The field activities were completed in two phases between October 2004 and April 2005.

The geologic units underlying Dresden Station include, in descending order: topsoil and overburden, the Pottsville (or Spoon) Formation, the Divine Limestone Member (or Ft. Atkinson Limestone), the Maquoketa Shale Member of the Maquoketa Formation, and the Galena Formation (Harza, 1991). The Maquoketa Shale separates the water table aquifer from the lower aquifers. The water table aquifer consists of the Pottsville Sandstone and the Divine Limestone Member, and the lower aquifer consists of Galena Formation. The water table is independent of the piezometric surface of the lower aquifers because the Maquoketa Shale is a sufficiently impermeable confining unit.

Groundwater flow conditions were characterized using the water level measurements collected on October 28, 2004 and April 4, 2005. There is a mounding effect in the area of the CST system which extends to the southeast. The groundwater flow direction in the immediate vicinity of the liquid nitrogen tank is to the east and to the northwest. In the eastern half of the Protected Area (area within the owner-controlled area enclosed by a station security fence in which the main buildings are located), groundwater flows to the north toward the Unit 1 intake canal. West of the CST system groundwater flows westward toward the cooling canals. South of the Protected Area, groundwater flows to the southeast and southwest with a groundwater divide oriented northwest-southeast. Further south of the Protected Area in the residential area, groundwater flows from the cooling canals eastward to the Kankakee River.

The tritium-impacted groundwater is migrating in an easterly direction, as evident from the decrease in tritium concentrations in wells W3 and T6, and an increase in well T1. Tritium also appears to be migrating toward the west, based on the sudden increase in tritium concentrations in well DSP124 located northwest of the CST system. The groundwater impact from the CST system release is confined to a small area, well within the Protected Area.

The total mass of tritium discharged to groundwater flow east of the CST system was calculated as 4.18×10^{12} pCi, and the total mass of tritium discharged to groundwater flow west of the system was calculated as 1.81×10^{11} pCi. Based on a tritium concentration in the CST system of 9 to 10 million pCi/L, the combined mass (discharged to the east and west groundwater flow) equates to approximately 121,000 gallons of tritiated water released to groundwater.

The total mass of tritium discharged to the eastern storm sewer system, which outlets into the Unit 1 intake canal, was calculated as 5.27×10^{12} pCi. The total mass of tritium discharged to the western storm sewer system, which outlets into the Unit 2/3 discharge canal, was calculated as 7.33×10^{10} pCi. Based on an estimated tritium concentration in the CST system of 9 to 10 million pCi/L, this combined mass equates to approximately 148,000 gallons of tritiated water released to the storm sewer.

The combined tritium mass discharged to the groundwater and to the storm sewer from the CST system is calculated as 9.63×10^{12} pCi. Based on an estimated tritium concentration in the CST system of 9 to 10 million pCi/L, the total mass released equates to approximately 267,000 gallons of tritiated water. The average rate of tritium released to the groundwater and sewer systems, assuming that the total mass of tritium was released over the duration of the discharge from the CST system (i.e., 344 days between November 2003 and October 2004), amounts to 2.80×10^{10} pCi per day.

Based on fate and transport computer modeling (BIOSCREEN), the concentrations of tritium at the source and along the western plume will decrease to below 90 pCi/L within approximately 5 years of the pipe repair. Similarly, the concentrations at the source and along the eastern plume will drop below 290 pCi/L within approximately 8 years of the repair.

RETEC's investigation revealed that the bulk of the tritium discharged to groundwater from the CST system is flowing toward the east and northwest under the influence of the local hydraulic gradient. The tritium plume is not likely to come under the influence of the regional gradient in the southeasterly direction, and thereby impact residential wells located south of Dresden Station. Tritium sampled in the Thorsen well, which is located approximately 3,400 feet south of the Station, is not believed to be associated with the CST system release. Rather, it appears this well influenced by concentrations of tritium in the nearby cooling canals.

1 Introduction

Routine groundwater sampling results undertaken in July 2004 detected elevated levels of tritium in shallow monitoring wells and storm sewers located near the Unit 2/3 interlock building. The tritium was traced to a release from the Condensate Storage Tank (CST) system, through a pipe that connects to the station high pressure core injection (HPCI) system. The leak was isolated on October 20, 2004, and a replacement section of pipe around the tank was installed the following month.

The RETEC Group, Inc. (RETEC) was contracted by Exelon Nuclear (Exelon) to characterize the nature of groundwater flow at the facility and evaluate the fate of the tritium. The facility is located near Morris, Illinois at the corner joining Sections 25, 26, 35, and 36, Township 34 North, Range 8 East, Grundy County, Illinois (see Figure 1-1). This report presents the results of the investigation conducted at Dresden Station by RETEC between October 2004 and April 2005.

1.1 Purpose

The purpose of the investigation was to determine the nature of the groundwater flow and tritium concentrations within the area that could be affected by the CST system release and to assist Exelon in evaluating regulatory compliance matters.

1.2 Scope of Work

The scope of work for this project included reviewing historical data, installing additional monitoring wells, conducting geophysical logging in some deeper wells, surveying the locations of all monitoring points, performing two rounds of water level measurements, performing slug tests on selected wells, sampling groundwater for tritium concentrations, and evaluating all of the physical and chemical data.

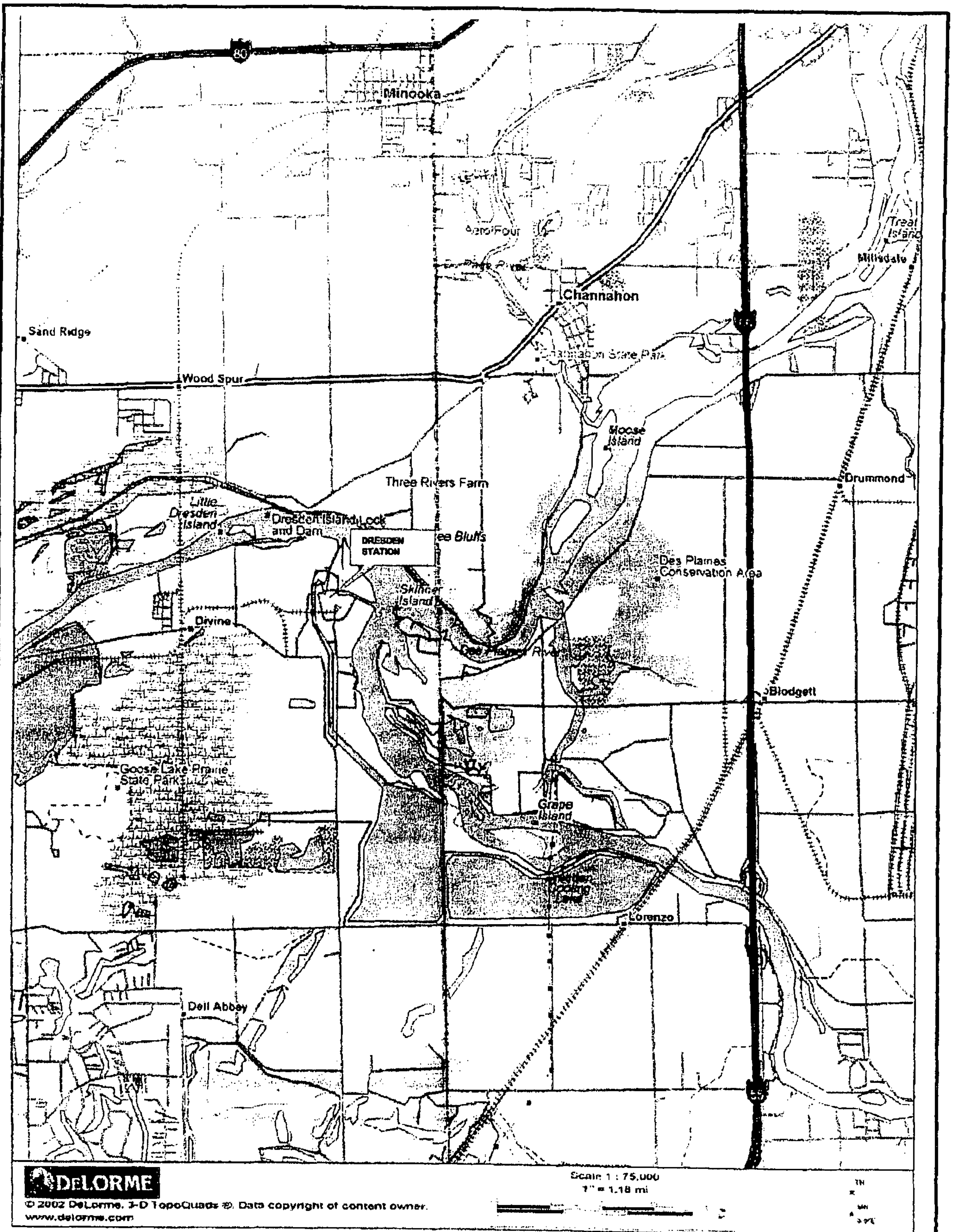
The data obtained in this investigation along with the results of this evaluation are presented this report. The historical data included more than 10 years of groundwater analytical data, residential well records, several rounds of water level measurements, and technical reports. The field activities are described in more detail in Section 2.

1.3 Report Organization

This report contains seven sections and seven appendices. Section 1 provides introductory information including purpose and scope of work. Section 2 describes the field activities performed at the site. Section 3 summarizes the regional and site-specific geologic and hydrogeologic environments. Section 4 presents the tritium results from groundwater and surface water samples.

Section 5 addresses the potential tritium impacts and the regulatory framework for tritium. Section 6 summarizes the findings of this investigation. Section 7 lists the sources of information references relied upon to support the preparation of this report.

Appendix A contains soil boring and rock coring logs, and well construction diagrams. Appendix B contains geophysical logs. Appendix C contains the site survey map. Appendix D contains the slug test data. Appendix E contains well record information. Appendix F contains historical tritium concentration data. Appendix G contains the mass flux calculations.



RETEC

EXELON GENERATION
MORRIS, ILLINOIS
EXENW-18513-400

DATE: 06/14/05 | DRWN: LP/FTC

SITE LOCATION MAP
DRESDEN STATION

FIGURE 1-1

File: U:\Dres... XENW 18513 400\Figure 1 1 Site location Map.dwg Layout: ANSI_A User: jpaul Plo... Jun 14, 2005 1:22pm Xrefs:

2 Field Investigation

The field activities were completed in two phases between October 2004 and April 2005. The first phase included surveying the locations and elevations of all existing sampling points; measuring water levels from these sampling points; and installing four shallow wells ("baby" wells) to monitor the CST system. The second phase included the installation of nine monitoring wells (three clusters of three wells each) further south of the CST system to monitor groundwater quality in the direction of residential properties, and the repair of existing monitoring well DSP149 due to anomalous data. It also included surveying and water level measurements after the new wells were installed, geophysical logging, slug testing, records search of residential wells, and a round of groundwater sampling. It should be noted that during this project Dresden Station continued its monitoring/sampling program. The sampling results obtained from the program are also presented in this report.

2.1 Drilling Activities

The drilling activities for this project included the installation of shallow wells in the Protected Area near the CST system, the installation of three downgradient well clusters south of the Protected Area toward the Kankakee River and the adjacent residential neighborhood, and the repair of existing well DSP149. The locations of the wells are shown in Figures 2-1 and 2-2. The procedures used to install each of these wells are summarized in the following subsections.

2.1.1 Baby Wells in Protected Area

There were 18 shallow, "baby wells" monitoring tritium concentrations in groundwater near the water table prior to the detection of the release. During construction activities to locate and repair the pipe from the CST system, five wells (T3, T4, T7, W1, and W2) were removed. Four new wells (E8, E9, E10, and W2R) were installed on November 23, 2004 to enhance the network of wells used to monitor any potential release from the CST system. Figure 2-2 shows the location of each baby well included in the CST system monitoring well network.

The new wells were installed by Trench-It, Inc. (Trench-It) of Union, Illinois, and Testing Services Corporation (TSC) of Carol Stream, Illinois. Trench-It performed private utility locating services, and was contracted to ensure each drilling location was clear of all utilities. Due to the shallow water table in the area (4 to 8 feet below ground surface), and the engineering manager's concern for underground utilities, Trench-It's air knife and vacuum truck were used instead of the drill rig to advance each boring. The diameter of each boring varied depending on subsurface conditions affecting the air knife's performance.

TSC personnel constructed each well using 2-inch inside diameter (ID) polyvinyl chloride (PVC) risers with 2 to 5 feet long PVC screens at the bottom. A sand pack was placed around the screen to approximately 2 feet above the screen and a bentonite seal was extended to the ground surface. The depth of these wells varies from 5.5 to 7.2 feet below ground surface. The wells were completed as flush-mounts with steel vaults and concrete pads. Well construction diagrams are included in Appendix A.

2.1.2 Downgradient Well Clusters

Three well clusters were installed to monitor groundwater quality at the water table, immediately above the lower confining unit of the shallow aquifer, and immediately below this confining unit. Well cluster DSP157 was located downgradient of the CST system outside of the Protected Area to monitor on-site water quality. Well cluster DSP158 was located southeast of the CST system near the Kankakee River to monitor the potential for impacting the river. Well cluster DSP159 was located south of the CST system, adjacent to the cooling canals and near the Thorsen well, to monitor the potential for impacting the downgradient residential wells. The locations of these well clusters are shown in Figure 2-1.

At each location, the shallow water table well was designated with a "S", the intermediate well immediately above the confining unit was designated with a "M", and the deep well immediately below the confining unit was designated with a "D". The lithology for all of the wells, except for DSP159D, were logged by observing the drill cuttings exiting the borehole as drilling advanced. Well DSP159D was logged by collecting and observing rock cores from the top of competent rock to bottom. The lithology was described using the Unified Soil Classification System (USCS) and the Field Guide for Rock Core Logging and Fracture. Significant features, such as moisture and soil or rock composition, were noted on the logs. Soil color was referenced using the Munsell Soil Color Chart, and rock color was referenced using the Geologic Society of America Rock-Color Chart. The soil boring and rock coring logs, and well construction diagrams are included in Appendix A.

The shallow wells (DSP157S, DSP158S, and DSP159S) were installed using 4-¼ inch ID hollow stem augers to drill through the topsoil and the sandstone, where present. The wells were drilled to depths varying from 13 to 16 feet below ground surface so that the top of the 10-foot screen would be set approximately 3 feet above the water table. The wells were constructed of 2-inch ID PVC risers with 10-foot lengths of 0.010-inch slotted screens. Sand filter pack was placed in the annular space around the screen, with 0.5 to 1 foot of sand below the well and 1 to 2 feet above the top of the screen. A 2-foot thick bentonite seal was placed above the filter pack. The shallow wells were completed as stick-up wells with 4-inch diameter steel protective casings set in 2- by 2-feet concrete pads.

Drilling of the intermediate and deep wells started by using 6-¼ and 8-¼ inch ID hollow stem augers, respectively, to refusal within the limestone. A tri-cone rotary bit was initially used to drill through the limestone, but due to very slow drilling rates, the tri-cone rotary bit was replaced by an air hammer. The air hammer was used to drill through the shale and the dolomite in the deep wells. The intermediate wells (DSP157M, DSP158M, and DSP159M) continued drilling with a 6-inch diameter air hammer into the upper 1 to 2 feet of the shale, at depths ranging from 51 to 59 feet below ground surface.

The deep wells continued drilling with a 8-inch diameter air hammer into the upper 2 feet of the shale and installing 6-inch diameter steel casings. The casing was grouted in place and allowed to set for approximately 24 hours prior to drilling through the shale and into the dolomite. Wells DSP157D and DSP158D were drilled using a 6-inch diameter air hammer to total depths of 130.5 and 135 feet below ground surface, respectively. Well DSP159D was drilled using NXWL wireline rock coring equipment with NQ-sized casing to a total depth of 139 feet below ground surface. Rock cores were collected in 5-foot long wooden boxes with four columns per box. Following coring, the borehole was reamed using a 6-inch diameter air hammer.

The intermediate and deep wells were constructed of 2-inch ID PVC risers with 10-foot lengths of 0.010-inch slotted screens. Sand filter pack was placed in the annular space around the screen, with approximately 1 foot of sand below the well and 2 feet of sand above the top of the screen. A 2-foot thick bentonite seal was placed on top of the filter pack, and the seal was allowed to hydrate before the remainder of the annular space was filled with grout. The intermediate and deep wells were completed as stick-up wells with 4-inch diameter steel protective casings set in 2- by 2-feet concrete pads.

2.1.3 Repair of Well DSP149

Since December 1996, well DSP149 has yielded anomalous water level measurements and tritium concentration values when compared to surrounding monitoring wells. The average depth to water in nearby wells is approximately 12 feet, but the depth to water in well DSP149 typically has been greater than 40 feet below ground surface. The average tritium concentration in well DSP155 has been 880 picocuries per liter (pCi/L) since August 1997. The average concentration in well DSP156 has been 230 pCi/L since February 2002. Both of these wells are located within 60 to 90 feet from well DSP149. The tritium concentration in well DSP149 varied from 404 to 76,488 pCi/L from August 1995 through February 2005. Due to the anomalous results from well DSP149, it was determined that well DSP149 was not yielding representative data, and, should be removed and replaced. The location of this well is shown in Figure 2-1.

Well DSP149 was overdrilled using an air rotary rig with a 6-inch diameter tri-cone roller bit. The protective casing and concrete pad were removed prior to overdrilling. The monitoring well was overdrilled to a total depth of 51 feet below ground surface, which is approximately 2 feet deeper than the original boring. A new well was constructed of 2-inch ID PVC riser with a 10-foot length of 0.010-inch slotted screen. Sand filter pack was placed around the annular space of the screen, with approximately 1 foot of sand below the well and 2 feet of sand above the top of the screen. A 2-foot thick bentonite seal was placed on top of the filter pack, and the seal was allowed to hydrate before the remainder of the borehole was filled with grout. The well was completed as a stick-up well with a 4-inch steel protective casing set in a 2- by 2-foot concrete pad. The soil boring log and well construction diagram are included in Appendix A.

2.1.4 Well Development

Following the installation of the monitoring wells, TSC developed the new monitoring wells using a modified hand pump, a whale pump, or a bailer. The purpose of the well development is to remove silts and other fine-grained sediments from within the well and surrounding formation. The shallow and intermediate wells were developed until clear water was sustained, except for well DSP157S and DSP159S (well went dry). Approximately six well volumes were purged from the shallow and intermediate wells. The deep wells were developed by adding water, surging the water, and then purging them dry due to dry conditions in these wells.

2.2 Geophysical Logging

Natural gamma ray and electromagnetic (EM) induction logging were performed on five selected wells (DSP157D, DSP158D, DSP159M, DSP159D, and DSP149), by Century Geophysical Corporation (CGC) of Tulsa, Oklahoma on March 16, 2005. The natural gamma ray logs show lithologic changes and show zones with significant clay content. The EM induction logs were used in correlation with the gamma ray logs to identify water bearing zones. CGC logged the wells using a logging tool. The logging tool was lowered to the bottom of each well and then lifted through the borehole while recording the geophysical measurements. EM induction was not effective through the steel casing of each deep well; however, natural gamma ray measurements of the lithology were recorded through the casing. The geophysical logs are included in Appendix B.

2.3 Land Surveying

Atwell-Hicks, Inc. of Naperville, Illinois was contracted to perform a land survey to generate a facility map showing the locations of all wells, storm sewers, and major features of the power plant. An initial survey was performed during the period of October 21, 2004 through October 28, 2004. The surveyors provided northing and easting coordinates for all locations. For the monitoring wells, elevations were recorded for the ground surface, top of the riser, and top of the protective casing. For the surface water locations, the surveyors cut a permanent mark into a concrete surface on a bridge or platform and measured the elevations from those marks. Elevations for the storm sewers were measured from the tops of the grates or the edges of the manhole covers. An additional survey was performed on April 4 and 5, 2005 to include the newly installed wells and additional locations not included in the first survey. Table 2-1 provides a list of all sampling locations and includes their coordinates and measured elevations. A site survey map is included in Appendix C.

2.4 Water Level Measurements

Two rounds of water levels were measured to characterize groundwater flow directions beneath the site. Water levels were measured from all accessible monitoring wells, storm sewers, and surface water measuring points. An electronic water level indicator was used, and measurements were recorded to the nearest 0.01 feet. The first round was performed in October 28, 2004 prior to installing any additional wells. New security fences were being installed at the time of the first round of measurements, and these new fences made some of the measuring points inaccessible during the second round of measurements. The second round was performed in April 4, 2005 after the four baby wells inside the Protected Area and the three well clusters south of the Protected Area were installed and well DSP149 was repaired.

2.4.1 October 2004 Measurements

The first round of water level measurements was collected on October 28, 2004 (Table 2-2a). The baby wells located near the CST system were not accessible due to construction; therefore, measurements could not be obtained from the T- and W-series wells, and storm sewers L and M.

2.4.2 April 2005 Measurements

The second round of water level measurements was collected on April 4, 2005 (Table 2-2b). The new wells were included in this round of measurements. Baby wells T3, T7, W1, and W2 were removed during pipe repair activities; however, well W2R was installed to replace water level measurements near wells W1 and W2. Storm sewer M was also removed during these construction activities.

2.5 Slug Tests

Slug tests were performed on 10 selected monitoring wells (DSP157S, DSP157M, DSP158S, DSP158M, DSP158D, DSP159S, DSP159M, DSP1579D, DSP149, and DSP121) to calculate the hydraulic conductivity of the upper (water table) and the lower aquifers. The shallow wells were used to calculate the hydraulic conductivity in the upper portion of the water table aquifer, and the intermediate wells were used to calculate the hydraulic conductivity in the lower portion of the water table aquifer. Slug tests performed in the shallow and intermediate wells used a 5-foot long solid slug to displace water. A 30-psi pressure transducer was placed more than 5 feet below the water level in order to record drawdown changes during the test.

To perform slug tests in the deep wells, 20 gallons of water was added to each well due to the limited amount of water in the wells. Drawdown was measured using an electronic water level indicator. Due to the slow recovery, measurements began at 15-second or 30-second intervals, and then increased to 1- and 5-minute intervals after 10 and 20 minutes, respectively. The data from the test were entered in the AQTESOLV for Windows Pro software (HydroSolve, Inc., 2000) to calculate hydraulic conductivity. The slug test data are included in Appendix D.

2.6 Groundwater Sampling

A complete round of water sampling was performed on April 8, 2005. RETEC personnel sampled the newly installed well clusters. Dresden personnel sampled the storm sewers and the monitoring wells in the Protected Area, and their sampling contractor sampled the monitoring wells outside the Protected Area. A total of 54 water samples were collected (including five duplicates). The storm sewers were sampled using a Teflon dipper. All the monitoring wells, with the exception of the deep wells, were sampled using disposable bailers to prevent cross contamination. The deep wells were essentially dry and did not have sufficient groundwater to collect samples.

Prior to sampling, each well was purged of three well casing volumes using a bailer or a pump. Also the depth to the water was measured. Each groundwater sample consisted of two 1-liter bottles, one for tritium analysis and the other for general chemistry parameters (pH, conductivity, and alkalinity). Dresden Chemistry performed the general chemistry analyses, and the tritium samples were shipped to Environmental, Inc. Midwest Laboratory of Northbrook, Illinois for analysis.

2.7 Records Search

Local water well and boring logs, dating from the early 1900's through the 1980's, were provided upon request from the Illinois State Geologic Survey (ISGS) to help characterize the hydrogeologic conditions in the vicinity of the facility. These logs were used to identify the thickness of the upper aquifer, and the depth and thickness of the underlying shale. The well records provided by the ISGS included well depths and construction details; however, the locations of these wells were only identified by township and range information and the property owner at the time of installation. This information could not be used to determine the exact location of the wells, and a later correlation of some of the residential wells demonstrated a discrepancy of over 1,000 feet from the locations shown from the ISGS data. The well records obtained from ISGS are included in Appendix E.

Exelon provided a list of current property owners in the neighborhood immediately south of the facility and parcel numbers to RETEC. A records search was conducted at the Grundy County Recorder's Office in an attempt to match current property owners with the ISGS well records. RETEC researched property transaction records to match them to the owners recorded on the water well permits. Computerized deed transactions were available only as far back as the late 1970's, and records that needed to be researched to earlier dates had to be traced back in the original handwritten ledgers available in the recorder's office.

While several current owners could be traced back to the well records, there were several problems encountered during the research. Property transactions that were deeded to a bank or a trust effectively terminated a direct chronological link since RETEC would then have to look at all property transactions from that institution making the continuation of the records search not reasonably ascertainable. Another problem encountered was that the deeded property owner might not have signed the signatures on the original well permits, thus making a correlation of records impossible.

Table 2-1 Monitoring Well and Surface Water Coordinates and Elevations

Monitoring Well	Northing	Easting	Ground Elevation	Top of Casing	Top of Riser
DSP 105	7339.707	15268.305	518.168	no casing	518.44
DSP 106	7339.737	15303.307	518.084	519.18	518.44
DSP 107	7425.977	15342.866	517.897	no casing	519.53
DSP 108	7561.455	15381.440	518.031	no casing	519.49
DSP 109	7770.582	15266.831	517.560	no casing	519.67
DSP 111	7836.277	14043.038	517.861	521.10	no data
DSP 112	7454.142	14219.935	518.906	no data	520.78
DSP 113	7355.322	14418.407	517.859	no casing	519.77
DSP 114	7105.869	15250.611	517.633	no casing	520.65
DSP 115	7783.899	14449.189	517.398	no data	no data
DSP 117	8062.722	15748.715	515.298	no casing	517.52
DSP 118	6960.175	15753.894	517.877	no casing	519.83
DSP 119	5982.750	15171.819	516.334	517.72	no access
DSP 121	8141.345	15419.812	514.614	516.85	516.83
DSP 122	7842.833	14571.519	517.426	519.75	519.67
DSP 123	7781.231	15269.666	517.668	520.21	520.13
DSP 124	7355.317	14428.677	517.739	519.86	519.81
DSP 125	7238.157	14854.885	517.375	519.77	519.76
DSP 126	6289.295	14166.867	523.058	525.01	524.9
DSP 127	7639.812	13694.819	517.623	519.89	519.88
DSP 147	9538.585	14643.606	521.554	523.62	523.37
DSP 148	8631.198	14778.135	518.955	520.89	520.78
DSP 149	8166.382	14621.111	516.453	518.30	518.29
DSP 150	7461.168	15922.676	516.118	518.34	518.31
DSP 151	7256.027	15532.480	517.092	519.57	519.17
DSP 152	6296.437	15641.066	517.061	519.39	519.26
DSP 153	5490.517	14817.316	516.552	518.86	518.57
DSP 154	5352.598	15245.062	512.837	514.88	514.70
DSP 155	8133.084	14564.167	516.129	518.60	518.53
DSP 156	8223.932	14695.823	515.834	518.18	518.14
DSP 157D	6420.976	14714.438	518.461	521.86	521.86
DSP 157M	6421.615	14721.743	518.470	521.79	521.8
DSP 157S	6421.842	14728.713	518.590	521.73	521.54
DSP 158D	5448.080	15934.917	507.792	511.19	510.39
DSP 158M	5442.413	15939.075	507.979	510.97	510.64
DSP 158S	5438.737	15942.476	507.738	511.01	510.78
DSP 159D	3978.341	14863.778	516.320	519.97	519.27
DSP 159M	3969.144	14863.648	516.238	519.81	519.37
DSP 159S	3962.101	14862.976	516.270	519.77	519.41
T 2	7265.506	14689.031	517.530	520.85	520.56
T 1	7273.506	14689.031	517.240	520.61	520.29
T 5	7278.006	14677.531	517.130	520.65	520.29
T 6	7278.006	14670.531	517.420	520.68	520.56
E 10	7261.946	14753.240	517.344	no casing	517.22
E 2	7273.788	14738.369	517.046	520.55	520.25
E 6	7291.771	14795.896	516.939	no casing	516.65
E 7	7301.287	14793.751	517.171	no casing	516.81
E 8	7274.629	14730.574	516.904	no casing	516.81
E 9	7256.267	14735.055	517.264	no casing	517.21
E3	7245.993	14754.697	517.458	no casing	519.54
R 1	7277.985	14714.599	516.789	520.32	519.9
R 2	7274.156	14714.169	516.940	520.5	519.99
R 3	7265.623	14717.198	517.421	520.73	520.36
W 2R	7226.534	14637.312	517.332	no casing	517.16
W 3	7228.217	14648.748	517.409	520.13	519.85

Table 2-1 Monitoring Well and Surface Water Coordinates and Elevations

Surface Water Measurement Location	Northing	Easting	Ground Elevation
CB A	7500.670	15422.648	516.750
CB B	7363.559	15425.039	516.825
CB C	7317.819	15375.345	516.199
CB D	7210.213	15086.098	515.773
CB E	7257.928	14985.036	516.408
CB G	7330.433	14890.100	516.980
CB J	7278.506	14723.531	516.394
CB K	7240.607	14734.688	517.067
CB N	7261.731	14549.464	516.893
CB P	7255.849	14568.238	516.780
CB Q	7220.625	14522.415	516.827
CB R	7256.608	14451.677	517.034
CB S	7263.811	14432.220	516.845
CB T	7264.234	14316.368	517.465
CB U	7382.908	14314.564	516.673
CB V	7620.415	14313.798	516.562
CB W	7733.868	14361.126	516.877
CB Y	7692.476	15051.164	517.657
CB Z	7315.560	14442.520	517.269
CB AA	7825.062	14190.974	516.841
CB BB	7853.232	14434.341	516.388
CB CC	7783.396	14534.069	516.309
CB DD	7695.045	15024.670	526.748
CB EE	7720.220	15710.953	515.400
CB GG	7501.708	15467.403	515.975
CB HH	7370.787	15637.733	517.671
CB JJ	7280.590	14853.794	516.600
DSP 131	7937.693	14414.922	517.069
DSP 132	7669.615	15425.033	517.201
DSP 134	7329.633	14809.944	517.911
DSP 135	7278.580	14762.030	516.810
DSP 137	7854.242	14097.530	517.667
DSP 140	7282.195	14801.931	516.652
Bridge over West (Cold) Canal	7791.953	13850.680	517.350
Bridge over East (Hot) Canal	7791.917	13945.098	517.480
Drainage Pipe @ Creek	6872.837	15746.144	513.780
Kankakee River @ Unit 1 Intake	6973.990	16981.370	508.940
Telemetry Bridge	9355.698	14954.088	514.930
Unit 2/3 Bridge over Recyling Canal	8004.466	15153.016	518.670
Bridge over Discharge Canal for Unit 1	8732.375	15370.150	513.310
Discharge Canal @ Des Plaines River	10199.892	15356.457	510.680
N. Dresden Road Bridge over South (Cold) Canal	816.827	14925.874	515.790
N. Dresden Road Bridge over North (Hot) Canal	1036.947	14928.786	515.830

Table 2-2a Water Level Measurements – October 28, 2004

Sample Location	Depth to Water* (ft)	Top of Riser Elevation (ft msl)	Ground Surface Elevation (ft msl)	Groundwater Elevation (ft msl)	Depth to Bottom* (ft)	Height of Riser Stick-Up (ft)
DSP 105	10.32	518.44	518.17	508.12	51.68	0.27
DSP 106	9.59	518.44	518.08	508.85	50.91	0.36
DSP 107	13.42	519.53	517.90	506.11	51.95	1.63
DSP 08	12.81	519.49	518.03	506.68	51.90	1.46
DSP 109	20.02	519.67	517.56	499.65	42.96	2.11
DSP 110	14.52	NM	NM	NM	42.81	NM
DSP 111	26.62	521.10	517.86	494.48	54.79	3.24
DSP 112	11.36	520.78	518.91	509.42	40.60	1.87
DSP 113	26.34	519.77	517.86	493.43	43.45	1.91
DSP 114	10.6	520.65	517.63	510.05	44.60	3.02
DSP 115	> 100	517.40	517.40	< 416.4	> 100	0.00
DSP 116	NA	--	--	--	--	--
DSP 117	11.99	517.52	515.30	505.53	51.79	2.22
DSP 118	NM	519.83	517.88	NM	NM	1.95
DSP 119	NA	--	516.33	--	--	--
DSP 121	11.74	516.83	514.61	505.09	52.20	2.22
DSP 122	11.34	519.67	517.43	508.33	37.14	2.24
DSP 123	14.85	520.13	517.67	505.28	52.56	2.46
DSP 124	7.17	519.81	517.74	512.64	37.19	2.07
DSP 125	7.08	519.76	517.38	512.68	37.47	2.38
DSP 126	16.92	524.90	523.06	507.98	55.66	1.84
DSP 127	NA	519.88	517.62	--	--	--
DSP 147	31.64	523.37	521.55	491.73	52.00	1.82
DSP 148	14.11	520.78	518.96	506.67	51.48	1.82
DSP 149	48.51	516.46	516.45	467.95	50.75	0.01
DSP 150	10.81	518.31	516.12	507.50	51.27	2.19
DSP 151	8.04	519.17	517.09	511.13	51.69	2.08
DSP 152	7.19	519.26	517.06	512.07	52.44	2.20
DSP 153	11.28	518.57	516.55	507.29	52.38	2.02
DSP 154	7.94	514.70	512.84	506.76	52.25	1.86
DSP 155	12.79	518.53	516.13	505.74	41.95	2.40
DSP 156	12.80	518.14	515.83	505.34	52.57	2.31
E 2	6.77	520.25	517.05	513.48	6.77	3.20
E 3	7.72	519.54	517.46	511.82	8.38	2.08
E 5	NA	--	--	--	--	--
E 6	4.87	516.65	516.94	511.78	6.59	-0.29
E 7	5.03	516.81	517.17	511.78	6.48	-0.36
R 1	8.80	520.32	516.90	511.52	9.58	3.42
R 2	8.88	520.50	517.26	511.62	10.07	3.24
R 3	6.83	520.73	517.34	513.90	6.83	3.39
T 1	NM	520.61	517.24	--	NM	--
T 2	NM	520.85	517.53	--	NM	--
T 3	NA	--		--	--	--
T 5	NM	520.65	517.13	--	NM	--
T 6	NM	520.68	517.42	--	NM	--
T 7	NA	--	--	--	--	--
W 1	NA	--	--	--	--	--
W 2	NA	--	--	--	--	--
W 3	NM	519.85	517.41	--	NM	--

* Measured from top of riser
NA = Not accessible
NM = Not measured

Table 2-2a Water Level Measurements – October 28, 2004

Sample Location	Depth to Water (ft)	Measuring Point Elevation (ft msl)	Surface Water Elevation (ft msl)	Depth to Bottom (ft)
DSP 131	6.81	517.07	510.26	6.81
DSP 132	10.06	517.67	507.61	10.80
DSP 134	7.20	517.91	510.71	7.20
DSP 137	5.07	517.67	512.60	5.41
DSP 140	4.64	516.65	512.01	4.64
Sewer A	9.27	516.75	507.48	9.94
Sewer B	9.38	516.83	507.45	9.82
Sewer C	7.92	516.20	508.28	8.65
Sewer D	6.66	515.77	509.11	6.66
Sewer E	5.68	516.41	510.73	5.68
Sewer F	6.72	516.88	510.16	6.72
Sewer G	7.41	516.98	509.57	7.41
Sewer H	4.95	516.89	511.94	4.95
Sewer J	3.35	516.39	513.04	3.35
Sewer K	2.39	517.07	514.68	3.19
Sewer L	NA	516.81	–	–
Sewer M	NA	–	–	–
Sewer N	2.76	516.89	514.13	2.76
Sewer P	1.82	516.78	514.96	3.92
Sewer Q	2.74	516.83	514.09	3.7
Sewer R	2.95	517.03	514.08	4.19
Sewer S	4.37	516.85	512.48	4.49
Sewer T	5.25	517.47	512.22	5.31
Sewer U	4.24	516.67	512.43	4.45
Sewer V	5.38	516.56	511.18	5.38
Sewer W	5.83	516.88	511.05	5.83
Sewer X	3.34	517.01	513.67	3.87
Sewer Y	12.52	517.66	505.14	18.48
Sewer Z	4.65	517.27	512.62	4.81
Sewer AA	2.45	516.84	514.39	2.45
Sewer BB	2.97	516.39	513.42	3.03
Sewer CC	5.02	516.31	511.29	5.02
Sewer DD	8.75	526.75	518.00	8.78
Sewer EE	NM	515.40	–	–
Sewer FF	12.14	516.30	504.16	58.71
Sewer GG	7.81	515.98	508.17	7.81
Sewer HH	28.57	517.67	489.10	28.75
Sewer JJ	4.97	516.60	511.63	4.97
Sewer KK	NM	517.23	–	–

NA = Not accessible
NM = Not measured

Table 2-2a Water Level Measurements – October 28, 2004

Sample Location	Depth to Water (ft)	Measuring Point Elevation (ft msl)	Surface Water Elevation (ft msl)	Depth to Bottom (ft)
Bridge over West (Cold) Canal	NM	517.35	--	--
Bridge over East (Hot) Canal	NM	517.48	--	--
Dranage Pipe @ Creek	2.62	513.78	511.16	2.86
Kankakee River @ Unit 1 Intake	3.85	508.94	505.09	NM
Telemetry Bridge	9.95	514.93	504.98	19.65
Unit 2/3 Bridge over Recycling Canal	NM	518.67	--	--
Bridge over Discharge Canal for Unit 1	8.43	513.31	504.88	15.55
Discharge Canal @ Des Plaines River	NM	510.68	--	--
N. Dresden Road Bridge over South (Cold) Canal	8.35	515.79	507.44	NM
N. Dresden Road Bridge over North (Hot) Canal	10.8	515.83	505.03	NM

NA = Not accessible
NM = Not measured

Table 2-2b Water Level Measurements – April 4, 2005

Sample Location	Depth to Water* (ft)	Top of Riser Elevation (ft msl)	Ground Surface Elevation (ft msl)	Groundwater Elevation (ft msl)	Depth to Bottom* (ft)	Height of Riser Stick-Up (ft)
DSP 105	9.96	518.44	518.17	508.48	51.68	0.27
DSP 106	9.21	518.44	518.08	509.23	50.91	0.36
DSP 107	13.08	519.53	517.90	506.45	51.95	1.63
DSP 108	12.58	519.49	518.03	506.91	51.90	1.46
DSP 109	14.12	519.67	517.56	505.55	42.96	2.11
DSP 110	NM	–	–	–	42.81	–
DSP 111	25.63	521.10	517.86	495.47	54.79	3.24
DSP 112	9.31	520.78	518.91	511.47	40.60	1.87
DSP 113	24.54	519.77	517.86	495.23	43.45	1.91
DSP 114	9.97	520.65	517.63	510.68	44.60	3.02
DSP-115	> 100	517.40	517.40	< 416.4	> 100	0.00
DSP 116	NA	–	–	–	–	–
DSP 117	11.04	517.52	515.30	506.48	51.79	2.22
DSP 118	7.50	519.83	517.88	NM	NM	1.95
DSP 119	NA	–	516.33	–	–	–
DSP 121	11.07	516.83	514.61	505.76	52.20	2.22
DSP 122	10.35	519.67	517.43	509.32	37.14	2.24
DSP 123	14.58	520.13	517.67	505.55	52.56	2.46
DSP 124	5.95	519.81	517.74	513.86	37.19	2.07
DSP 125	6.17	519.76	517.38	513.59	37.47	2.38
DSP 126	13.99	524.90	523.06	510.91	55.66	1.84
DSP 127	9.90	519.88	517.62	509.98	NM	2.26
DSP 147	42.91	523.37	521.55	480.46	52.00	1.82
DSP 148	11.96	520.78	518.96	508.82	51.48	1.82
DSP 149	12.64	518.29	516.45	505.65	50.75	1.84
DSP 150	10.22	518.31	516.12	508.09	51.27	2.19
DSP 151	7.11	519.17	517.09	512.06	51.69	2.08
DSP 152	5.61	519.26	517.06	513.65	52.44	2.20
DSP 153	8.98	518.57	516.55	509.59	52.38	2.02
DSP 154	7.00	514.70	512.84	507.70	52.25	1.86
DSP 155	NA	518.53	516.13	–	41.95	2.40
DSP 156	12.64	518.14	515.83	505.50	52.57	2.31
DSP 157S	10.13	521.54	518.59	511.41	15.5	2.95
DSP 157M	10.28	521.80	518.47	511.52	50.3	3.33
DSP 157D	Dry	521.86	518.46	–	135.0	3.40
DSP 158S	4.96	510.78	507.74	505.82	15.2	3.04
DSP 158M	5.55	510.64	507.98	505.09	58.9	2.66
DSP 158D	137.93	510.39	507.79	372.46	138.5	2.60
DSP 159S	10.13	519.41	516.27	509.28	18.4	3.14
DSP 159M	10.28	519.37	516.24	509.09	61.5	3.13
DSP 159D	139.35	519.27	516.32	379.92	140.5	2.95
E 2	6.41	520.25	517.05	513.84	6.77	3.20
E 3	5.73	519.54	517.46	513.81	8.38	2.08
E 5	NA	–	–	–	–	–
E 6	3.36	516.65	516.94	513.29	6.59	-0.29
E 7	3.55	516.81	517.17	513.26	6.48	-0.36
E 8	2.88	516.81	516.90	513.93	5.5	-0.09
E 9	3.21	517.21	517.26	514.00	7.0	-0.05
E 10	3.50	517.22	517.34	513.72	7.2	-0.12

* Measured from top of riser
NA = Not accessible
NM = Not measured

Table 2-2b Water Level Measurements – April 4, 2005

Sample Location	Depth to Water* (ft)	Top of Riser Elevation (ft msl)	Ground Surface Elevation (ft msl)	Groundwater Elevation (ft msl)	Depth to Bottom* (ft)	Height of Riser Stick-Up (ft)
R 1	5.92	520.32	516.90	514.40	9.58	3.42
R 2	5.99	520.50	517.26	514.51	10.07	3.24
R 3	6.36	520.73	517.34	514.37	6.83	3.39
T 1	6.28	520.61	517.24	514.33	NM	3.37
T 2	6.21	520.85	517.53	514.64	NM	3.32
T 3	NA	--		--	--	--
T 5	6.37	520.65	517.13	514.28	NM	3.52
T 6	6.67	520.68	517.42	514.01	NM	3.26
T 7	NA	--	--	--	--	--
W 1	NA	--	--	--	--	--
W 2R	3.08	517.16	517.33	514.08	6.5	-0.17
W 3	6.00	519.85	517.41	513.85	NM	2.44

* Measured from top of riser
NA = Not accessible
NM = Not measured

Table 2-2b Water Level Measurements – April 4, 2005

Sample Location	Depth to Water (ft)	Measuring Point Elevation (ft msl)	Surface Water Elevation (ft msl)	Depth to Bottom (ft)
DSP 131	6.12	517.07	510.95	6.81
DSP 132	9.98	517.67	507.69	10.80
DSP 134	7.21	517.91	510.70	7.20
DSP 137	4.86	517.67	512.81	5.41
DSP 140	4.68	516.65	511.97	4.64
Sewer A	9.24	516.75	507.51	9.94
Sewer B	9.34	516.83	507.49	9.82
Sewer C	8.98	516.20	507.22	8.65
Sewer D	6.60	515.77	509.17	6.66
Sewer E	6.70	516.41	509.71	5.68
Sewer F	7.00	516.88	509.88	6.72
Sewer G	7.48	516.98	509.50	7.41
Sewer H	5.91	516.89	510.98	4.95
Sewer J	3.38	516.39	513.01	3.35
Sewer K	1.82	517.07	515.25	3.19
Sewer L	3.67	516.81	513.14	–
Sewer N	2.69	516.89	514.20	2.76
Sewer P	1.89	516.78	514.89	3.92
Sewer Q	2.74	516.83	514.09	3.7
Sewer R	2.75	517.03	514.28	4.19
Sewer S	4.36	516.85	512.49	4.49
Sewer T	5.26	517.47	512.21	5.31
Sewer U	4.24	516.67	512.43	4.45
Sewer V	5.41	516.56	511.15	5.38
Sewer W	6.48	516.88	510.40	5.83
Sewer X	3.37	517.01	513.64	3.87
Sewer Y	12.39	517.66	505.27	18.48
Sewer Z	4.67	517.27	512.60	4.81
Sewer AA	2.15	516.84	514.69	2.45
Sewer BB	5.44	516.39	510.95	3.03
Sewer CC	4.68	516.31	511.63	5.02
Sewer DD	8.64	526.75	518.11	8.78
Sewer EE	6.05	515.40	–	NM
Sewer FF	11.78	516.30	504.52	58.71
Sewer GG	7.88	515.98	508.10	7.81
Sewer HH	29.01	517.67	488.66	28.75
Sewer JJ	4.80	516.60	511.80	4.97

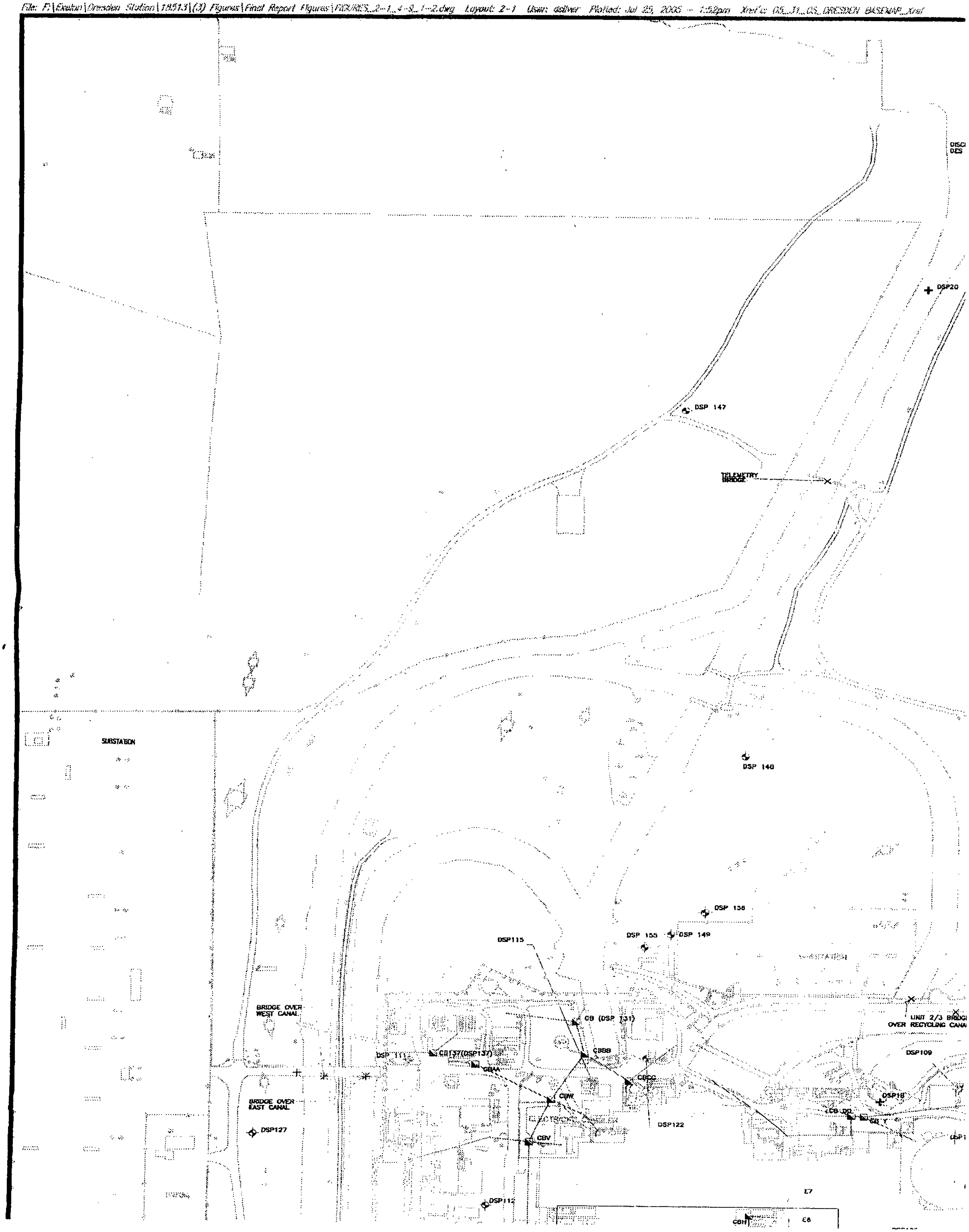
NA = Not accessible
NM = Not measured

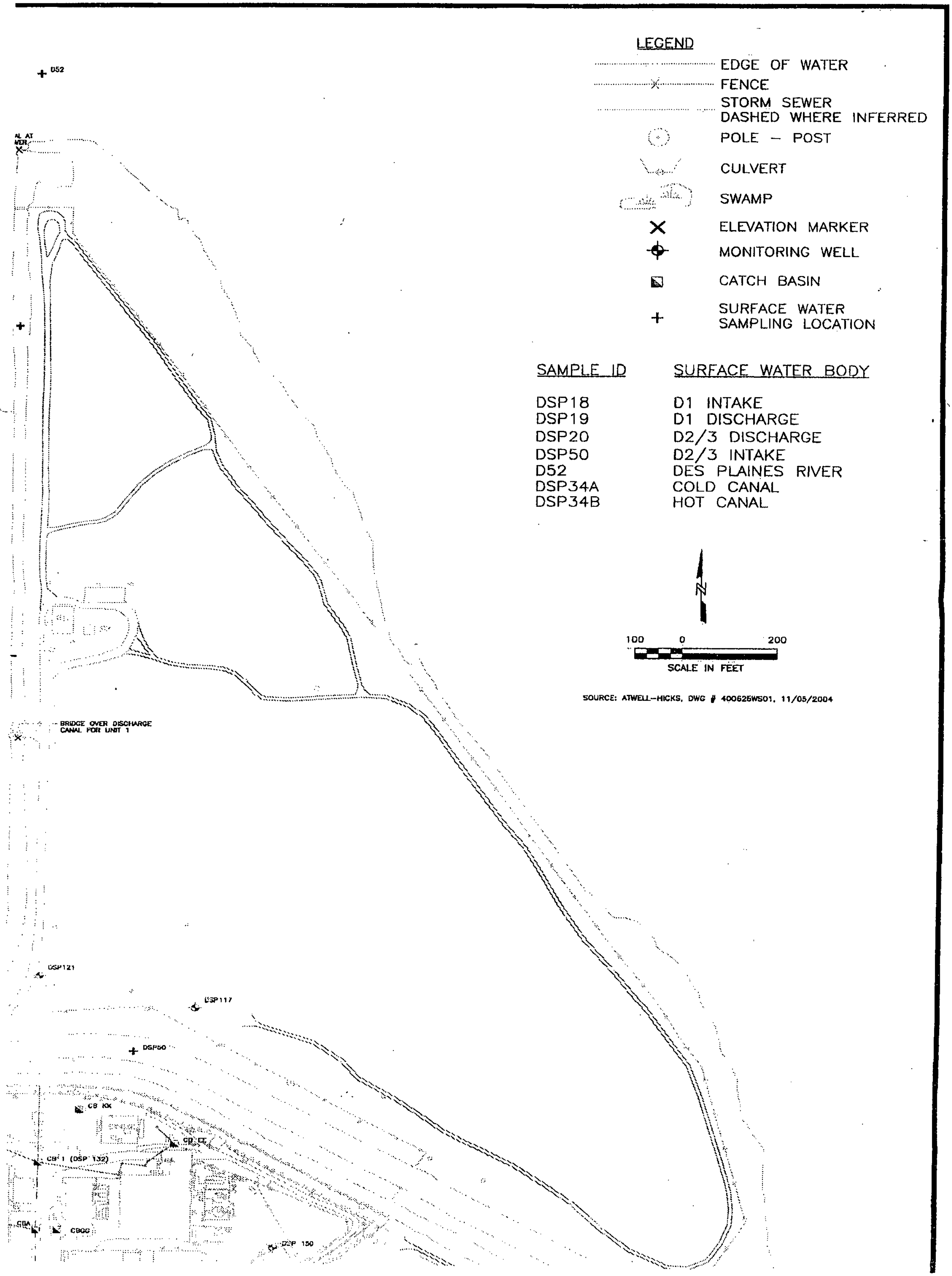
Table 2-2b Water Level Measurements – April 4, 2005

Sample Location	Depth to Water (ft)	Measuring Point Elevation (ft msl)	Surface Water Elevation (ft msl)	Depth to Bottom (ft)
Bridge over West (Cold) Canal	6.75	517.35	510.60	NM
Bridge over East (Hot) Canal	10.55	517.48	506.93	NM
Dranage Pipe @ Creek	2.6	513.78	511.18	2.86
Kankakee River @ Unit 1 Intake	3.7	508.94	505.24	NM
Telemetry Bridge	9.5	514.93	505.43	19.65
Unit 2/3 Bridge over Recycling Canal	13.35	518.67	505.32	NM
Bridge over Discharge Canal for Unit 1	7.96	513.31	505.35	15.55
Discharge Canal @ Des Plaines River	5.35	510.68	505.33	NM
N. Dresden Road Bridge over South (Cold) Canal (a)	4.65	515.79	511.14	NM
N. Dresden Road Bridge over North (Hot) Canal (a)	8.85	515.83	506.98	NM

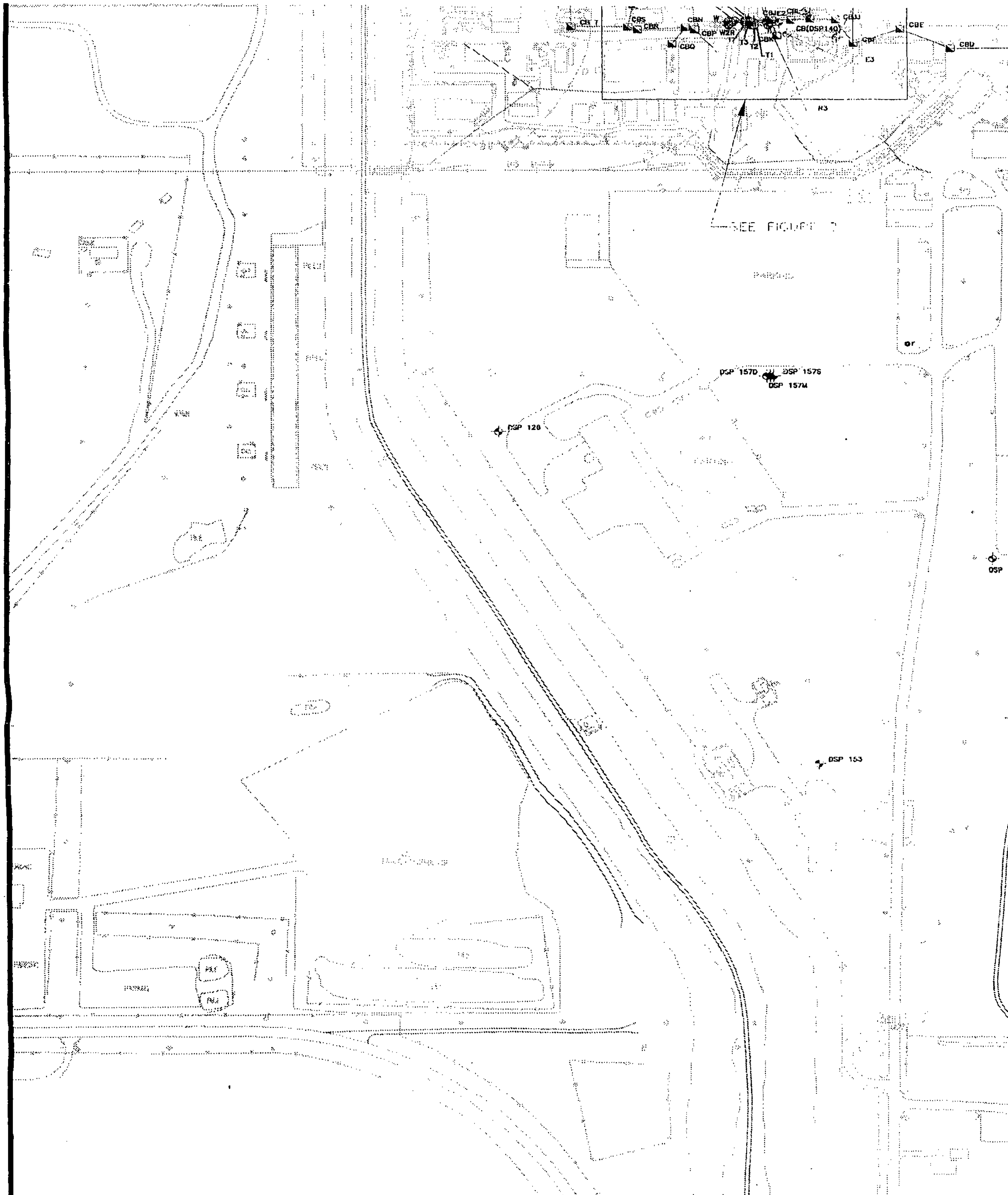
NA = Not accessible
NM = Not measured
(a) The depths to water for April 4, 2005 resulted in anomalous data that yielded northerly flow for both canals; however, based on the April 8, 2005 depths to water of 4.42 ft in the Cold Channel and 8.43 ft in the Hot Channel, RETEC assumed the April 4, 2005 measurement in the Hot Channel of 5.85 ft was misread and should be 8.85 ft. The differences in surface water elevations still shows a northerly flow of the Hot Channel; however, there may be sufficient inherent error in measuring the depth to water due to waves and ripples from a bridge that a southerly

File: F:\Exelon\Dresden Station\18513\(3) Figures\Final Report Figures\FIGURES_2-1_4-9_1-2.dwg Layout: 2-1 User: dsilver Plotted: Jul 25, 2006 - 1:52pm Xref's: 05_11_05_DRESDEN BASEMAP_Xref





LEGEND
EDGE OF WATER
FENCE
STORM SEWER
DASHED WHERE INFERRED
POLE – POST
CULVERT
SWAMP
ELEVATION MARKER
MONITORING WELL
CATCH BASIN
SURFACE WATER
SAMPLING LOCATION
SAMPLE ID
SURFACE WATER BODY
DSP18 D1 INTAKE
DSP19 D1 DISCHARGE
DSP20 D2/3 DISCHARGE
DSP50 D2/3 INTAKE
D52 DES PLAINES RIVER
DSP34A COLD CANAL
DSP34B HOT CANAL
N
100 0 200
SCALE IN FEET
SOURCE: ATWELL-HICKS, DWG # 400626WS01, 11/05/2004
D52
BRIDGE OVER DISCHARGE
CANAL FOR UNIT 1
DSP121
DSP117
DSP50
CB KK
CB EE
CB 1 (DSP 132)
CBA
CBGG
DSP 150



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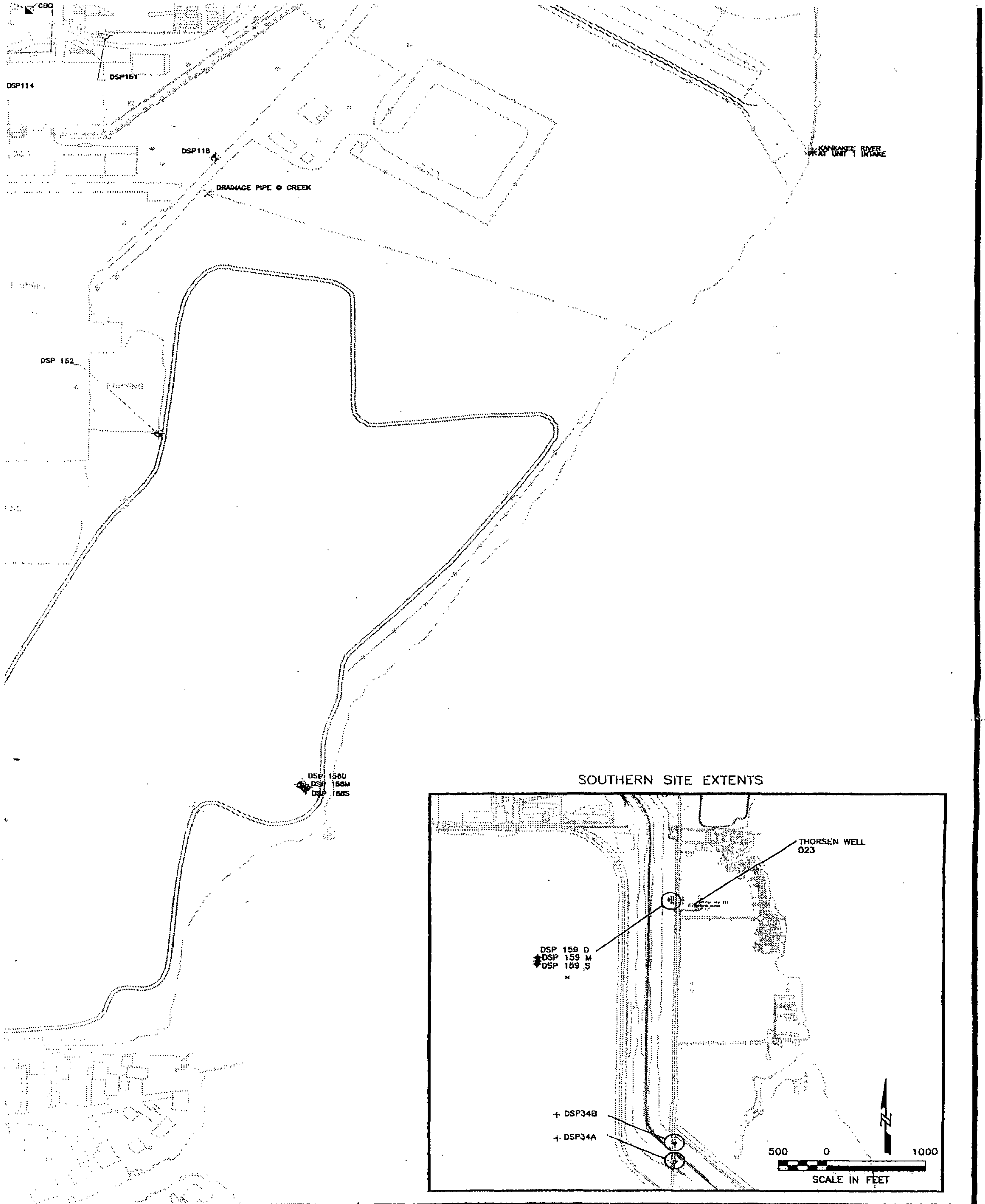

GENERATION
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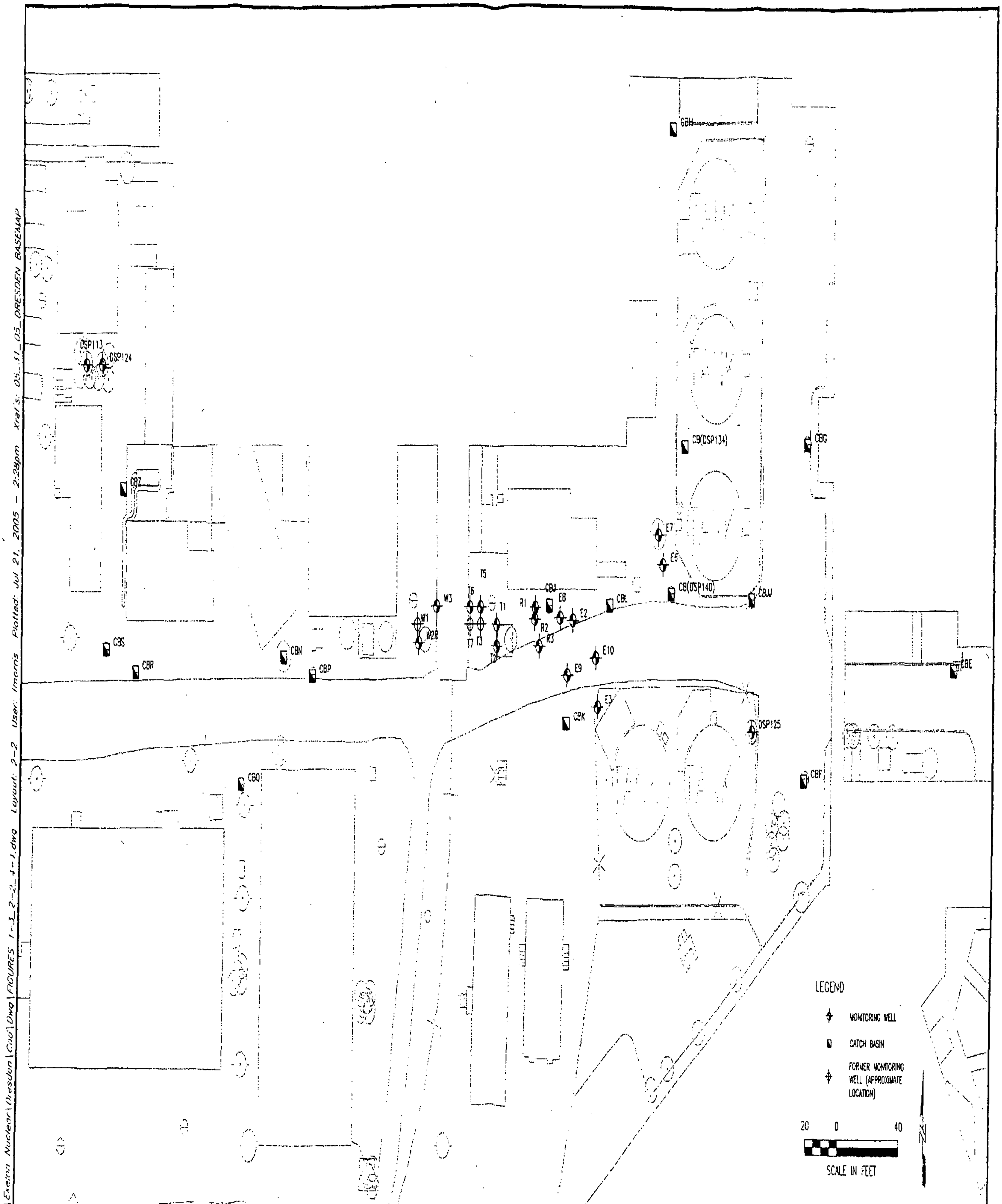
W-18513-400
_S/PGH

SITE-WIDE WATER SAMPLING LOCATIONS

DRESDEN STATION

FIGURE 2-1



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EXELON GENERATION MORRIS, ILLINOIS EXENW-18513-400	CST SYSTEM WATER SAMPLING LOCATIONS DRESDEN STATION
DATE: 07/19/05 DRWN: DLS/PGH	FIGURE 2-2

File: Z:\projects\Exelon Nuclear\Dresden\Cad\Dwg\FIGURES 1-3_2-2_4-1.dwg Layout: 2-2 User: lmorris Plotted: Jul 21, 2005 - 2:28pm Xref's: 05_31_05_DRESDEN BASEMAP

3 Geology and Hydrology

The stratigraphic terms used in this report are consistent with the terms used in the soil boring and well construction logs provided by the ISGS, and the Dresden Groundwater Study by Harza (1991), which were the primary sources of geologic information for this investigation. These documents refer to the Pennsylvanian sandstone encountered at shallow depths as the Pottsville Sandstone, and the underlying limestone is called the Divine Limestone Member of the Maquoketa Formation. These terms are not consistent with the Summary of the Geology of the Chicago Area - Circular 460 by Willman (1971). According to Willman (1971), the Pennsylvanian sandstone is typically assigned to the Spoon Formation, and the underlying limestone is the Fort Atkinson Limestone of the Maquoketa Group.

3.1 Regional Geology

The geologic layers of interest underlying Dresden Station include, in descending order: topsoil and overburden, the Pottsville Formation, the Divine Limestone Member of the Maquoketa Formation, the Maquoketa Shale Member of the Maquoketa Formation, and the Galena Formation (Harza, 1991). The topsoil and overburden consists of sands and sandy clays, and ranges in thickness from 0 to 30 feet. Due to irregular erosion of the Maquoketa Formation, there are outcrops of limestone north of the facility in areas where the Pottsville Formation and topsoil are absent.

The Pottsville Formation is predominantly sandstone exhibiting prominent cross bedding, as is shown in the outcrops along the intake and discharge canals. The sandstone also contains thin seams of carbonaceous material and calcium carbonate cement. The amount of cementation varies horizontally and vertically. The sandstone is absent north of the facility, and in some areas west and southeast of the facility. According to Harza (1991), the Pottsville Sandstone varies from 0 to 50 feet thick, and is underlain by the Divine Limestone. The surface between the Pottsville Sandstone and Divine Limestone is an unconformity.

The Divine Limestone was deposited conformably on the underlying Maquoketa Shale. The contact between these two units is transitional in some areas, with alternating layers of calcareous clays and limestone. The Divine Limestone contains occasional stylolites, solution channels, joints, cavities, and thin layers of clay. The thickness of the Divine Limestone varies from 0 to 60 feet, and the elevation of the limestone surface also varies considerably (Harza, 1991).

The Maquoketa Shale consists of dark gray to dark green dolomitic shale with layers of shale and argillaceous dolomite. The regional thickness of the shale consistently ranges between 65 and 70 feet; however, the elevation of the shale surface varies significantly. Both the Divine Limestone and the Maquoketa Shale have a regional dip to the southeast of approximately 25 feet per mile. The shale is underlain by the Galena Dolomite, which is approximately 230 feet thick.

3.2 Site Geology

The geology at the site was characterized using ISGS well records and soil boring logs completed during construction of Dresden Station, previous investigation report by Harza (1995), and drilling activities performed as part of the this hydrogeologic assessment. The geologic units characterized in this section include the topsoil, the Pottsville Formation, the Divine Limestone Member, the Maquoketa Shale, and the Galena Dolomite. The site stratigraphy is depicted on two geologic cross sections. The locations of the geologic cross sections are shown in Figure 3-1. The geologic cross sections that were prepared for this report are presented in Figures 3-2 and 3-3.

3.2.1 Topsoil

The topsoil consists of highly organic dark brown to black sandy clay with some gravel. Where present, the topsoil typically ranges between 0 and 5 feet thick across the facility. Fill material consisting of gravel and sand replaces the topsoil within the Protected Area due to construction of the facility. Also, there is 12 feet of fill material along the east bank of the "hot" cooling canal near well cluster DSP159, which is excavated material from the construction of the cooling towers. The fill material near well cluster DSP159 consists of sandy clay and limestone.

3.2.2 Pottsville Sandstone

The Pottsville Formation encountered during drilling and characterized from existing logs is hard, pale brown to gray, medium- to coarse-grained sandstone. Construction plans for the facility show the sandstone exists beneath the entire power plant, and the sandstone is also present south of the plant at well cluster DSP157. The thickness of the sandstone near the facility ranges from 25 to 30 feet. The Pottsville Sandstone was not encountered during drilling at well clusters DSP158 or DSP159.

3.2.3 Divine Limestone

The Divine Limestone is a white to gray crystalline limestone with pale green lenses of shale encountered near the top of the Maquoketa Shale. Air rotary drilling through the limestone was very slow, with a drilling rate as low as 3 feet per hour, indicating a very dense limestone. Drilling through the limestone using the air hammer at well clusters DSP158 and DSP159 yielded very little water until the drill bit approached the lower 5 feet of the limestone. The thickness of the Divine Limestone Member ranges from 25 to 50 feet across the site.

3.2.4 Maquoketa Shale

The Maquoketa Shale underlying the Divine Limestone is a hard and very dark greenish gray shale that consists of layers of shale and argillaceous dolomite. The depth to the top of the shale from borings encountered on site range from 48 to 83 feet. The thickness of the shale obtained from the three deep wells (DSP157D, DSP158D, and DSP159D) installed into the Galena Dolomite, and the deep geotechnical soil boring advanced during construction of Dresden Station ranged from 64 to 68 feet.

3.2.5 Galena Dolomite

The Galena Dolomite is a light brownish gray to pinkish white crystalline dolomite. Sub-horizontal and vertical fractures were observed in the rock cores for deep well DSP159D from 132 to 138 feet below ground surface.

3.3 Regional Hydrogeology

The Maquoketa Shale separates the water table aquifer from the two lower aquifers. The water table aquifer consists of the Pottsville Sandstone and the Divine Limestone Member of the Maquoketa Formation. The water table is independent of the piezometric surface of the lower aquifers because the Maquoketa Shale is a sufficiently impermeable confining unit. The lower aquifers are the Ancell Aquifer within the Ordovician System and the Ironton-Galesville Aquifer within the Cambrian System (Table 3-1). These two aquifers have a common piezometric surface because there is no confining unit between them.

The lower aquifers are recharged from surface water to the west and north of Dresden Station, where the Maquoketa Shale is discontinuous in some areas. Vertical migration downward from the water table aquifer is impeded where the shale is present due to its low permeability. According to Harza (1991), the piezometric surface for the lower aquifers is approximately 250 feet below ground surface in the vicinity of Dresden Station due to over-pumping in the area.

3.4 Site Hydrogeology

The site hydrogeology was characterized using previous investigation reports, well records and soil boring logs provided by ISGS, observations during drilling the newly installed wells, and slug test results. Also several rounds of water level measurements collected over several years, and tritium concentrations measured from monitoring wells, storm sewers and surface water bodies were used to evaluate on-site groundwater flow conditions and off-site movement of groundwater.

3.4.1 Hydrogeologic Units

The water table aquifer consists of the saturated overburden, the Pottsville Sandstone, and the Divine Limestone. This aquifer is monitored by several shallow monitoring wells screened across the water table, and 35- and 50-foot deep wells screened in the limestone. The Maquoketa Shale is the lower confining unit to the water table aquifer. The lower aquifer consists of the Galena Dolomite. It appears that the upper portion of the Galena dolomite is unsaturated as indicated by the dry conditions in the deep wells. The dry deep wells demonstrated the lack of hydraulic interconnection between the water table aquifer and the lower aquifer, and confirmed the occurrence of substantial drawdown of the piezometric surface in the lower aquifer.

3.4.2 Groundwater Flow

Groundwater flow conditions were characterized using the water level measurements collected on October 28, 2004 and April 4, 2005. Figures 3-4a and 3-4b present the water table contour maps of October 28, 2004 and April 4, 2005, respectively, constructed from the monitoring wells installed in the water table aquifer. Both figures show a similar groundwater flow pattern in the water table aquifer.

According to Figures 3-4a and 3-4b, there is a mounding effect in the area of the CST system which extends to the southeast. The groundwater flow direction in the immediate vicinity of the liquid nitrogen tank is to the east and to the northwest. In the eastern half of the Protected Area, groundwater flows to the north toward the Unit 1 intake canal. West of the CST system, groundwater flows westward toward the cooling canals. South of the Protected Area, groundwater flows to the southeast and southwest with a groundwater divide oriented northwest-southeast from well DSP124 to DSP152. Further south of the Protected Area in the residential area, groundwater flows from the cooling canals eastward to the Kankakee River.

Horizontal Gradients

The water table across most of the Protected Area slopes to the north and northeast toward the Unit 1 and Unit 2/3 intake canals. The horizontal hydraulic gradient values in the vicinity of the CST system calculated from the water table contour maps were 0.022 and 0.014 ft/ft to the northeast on October 28, 2004 and April 4, 2005, respectively. Table 3-2 presents horizontal hydraulic gradient calculations within the Protected Area in the vicinity of the CST system and to the west of the CST system, and also presents calculations outside of the Protected Area to the east, southeast, and south. The average horizontal hydraulic gradient outside of the Protected Area ranges from 0.0046 ft/ft toward the southwest to 0.035 ft/ft toward the northeast.

Normal Flow Conditions

The water table contour maps presented in Figures 3-4a and 3-4b show a consistent pattern of radial flow within the facility boundary with a groundwater divide in line with wells DSP124 and DSP152. Although water level elevations differ across the site by 1 to 2 ft between the October 28, 2004 and April 4, 2005 water level measurements, the similar patterns indicate both these maps represent normal groundwater flow conditions.

Influence of the Release

Water levels were not measured in the baby wells located in the vicinity of the CST system prior to October 28, 2004. During the October 28, 2004 water level gauging event, only the E- and R-series of baby wells were accessible due to construction activities associated with repairing the pipe from which a release occurred. Baby wells E8, E9, E10, and W2R were not installed until November 2004; therefore, the water levels on at these locations could not be measured during this event.

The April 4, 2005 water table contour map shows that the highest groundwater elevations exist in the vicinity of the W-, T-, and R-series of baby wells (Figure 3-4b). Although the W- and T-series of wells were not accessible during the October 28, 2004 gauging event, Figure 3-4a shows that the highest groundwater elevations were measured in the E- and R-series of wells monitoring the CST system. These higher groundwater elevations suggest the release may have influenced the water table. However, due to the porous nature of the fill material and underlying sandstone, this effect is most likely localized.

Influence of Facility Construction

The ground surface elevation at Dresden Station is approximately 517 feet above mean sea level (msl), and the average water table elevation is approximately 510 feet msl. Construction drawings for Dresden Station show that excavations to construct the Unit 2/3 turbine building are typically deeper than 500 feet msl and are as deep as 463 feet msl. Portions of the building are constructed directly on top of the Maquoketa Shale; therefore, groundwater flow in the water table aquifer is affected throughout its entire thickness around the facility. The hydraulic gradient shows groundwater flows toward the building with preferential lateral flow around the building to the east and west. This also can create a groundwater mounding effect around the building.

Following the installation of a new section of pipe to bypass the release area, the holes excavated east and west of the Unit 2/3 interlock building were backfilled with 20 percent strength grout to within approximately 1 foot of the ground surface. The remainder of the holes was backfilled with excavated materials, and a thermal berm was constructed over the new pipe to provide weather protection. The grouted material created local zones of lower hydraulic conductivity which will cause the groundwater to flow around these areas.

Influence of Surface Water Bodies

Dresden Station is surrounded by surface water bodies, as shown in Figure 1-1, which have a significant effect on groundwater flow. The facility is bordered by the Kankakee River to the east, the Des Plaines River to the north, and the hot and cold cooling canals to the west and south. The Kankakee River, the Des Plaines River, and the cooling canals act as boundary conditions and in fact control the groundwater flow. The Kankakee River supplies the Unit 1 and Unit 2/3 intake canals that flow along the northeastern edge of the Protected Area. Two discharge canals are located north of the Protected Area, as is the recycling canal. A residential neighborhood is also encircled by the cooling canals and the Kankakee River.

The normal pool elevation for the Kankakee and Des Plaines Rivers, which join to form the Illinois River, is 505 feet msl. The pool elevation is controlled by the Dresden Island Lock and Dam, located approximately 3,000 feet northwest of Dresden Station. This also controls the surface water elevations in the Unit 1 and Unit 2/3 intake canals and the Unit 1 discharge canal. The Unit 1 intake and discharge canals are basically stagnant water bodies since the Unit 1 reactor is not operating. Groundwater from Dresden Station flows toward the Kankakee and Des Plaines Rivers as shown in Figures 3-4a and 3-4b.

Water from the Unit 2/3 discharge flows south along the western edge of Dresden Station in the "hot canal", then turns to the southeast and is pumped at a lift station into Dresden Cooling Lake. Water is returned by gravity drainage in the "cold canal", located west of the hot canal. Both canals are unlined flumes cut into the bedrock. The hot canal is approximately 12 feet deep, and the bottom of the flume is at a lower elevation than the cold canal and the groundwater at Dresden Station. Both Figures 3-4a and 3-4b demonstrate that groundwater from Dresden Station flows toward the hot canal in the immediate vicinity of the plant.

The surface water elevation in the cold canal is higher than in the hot canal, and it is also higher than the groundwater elevation in the vicinity of the well cluster DSP159 and the Thorsen well. These data demonstrate that the cold canal is a source of recharge for the groundwater south of the plant.

Vertical Gradients

Vertical hydraulic gradients were calculated using the April 4, 2005 water level data from the shallow and intermediate wells located at the new well clusters (DSP157, DSP158, and DSP159). The vertical gradient calculated at well DSP157, which is closest to the Protected Area, was 0.0032 ft/ft with an upward component. The vertical gradients calculated at wells DSP158 and

DSP159 were 0.017 and 0.0044 ft/ft, respectively, with downward components. The vertical gradient at well DSP158 located near the Kankakee River was greater than the gradient for well DSP159 located between the Thorsen well and the hot canal. Table 3-3 summarizes the vertical hydraulic gradient calculations for the three well clusters.

3.4.3 Slug Test Evaluation

The slug test data were evaluated using the AQTESOLV for Windows Pro software (HydroSolve, Inc., 2000). For this data set, the software employed the Bouwer and Rice test method for unconfined aquifers (Bouwer and Rice, 1976). The geometric mean of hydraulic conductivity values calculated for the shallow wells (DSP157S, DSP158S, and DSP159S) were two orders of magnitude greater than the geometric mean for the intermediate wells (DSP157M, DSP158M, and DSP159M) installed just above the shale. The geometric mean of hydraulic conductivity for the shallow wells is 2.4×10^{-2} ft/min (34.2 ft/day), which is characteristic of unconsolidated sands or porous sandstone (Freeze and Cherry, 1979). The geometric mean of hydraulic conductivity for the intermediate wells is 4.7×10^{-4} ft/min (0.67 ft/day). Table 3-4 summarizes the slug test results for the shallow and intermediate wells. The slug test data analysis is included in Appendix D.

The slug tests in the deep wells could only be qualitatively analyzed because they were performed predominantly in unsaturated zones of the Galena Dolomite. For well DSP158D, the initial displacement was 58.5 feet, and there was only 50 percent recovery after 60 minutes. For well DSP159D, the initial displacement was 38 feet, and there was only 64 percent recovery after 60 minutes. Both test results could not adequately be analyzed but indicate a relatively low hydraulic conductivity.

3.4.4 Residential Wells

A records search was performed to correlate residential water wells to the ISGS well records. Six well records were correlated to residential properties located south of Dresden Station. None of these records corresponded to the Thorsen well (D23) located at 6310 Dresden Road. Harza (1991) referred to the Thorsen well as 110 feet deep; however, no well record was included in that report and none of the records provided by the ISGS corresponded to that depth. The two nearest records located near 6310 Dresden Road indicate a depth of 110 feet would be in the bottom of the shale or in the underlying dolomite. The well records also did not correspond to 8167 Thorsen Lane, where low tritium concentrations were detected. The approximate locations of the residential wells are shown in Figure 3-5.

The residential wells were typically cased to 40 feet below ground surface and completed at depths of 200 feet or more. The well identified by ISGS Record #2072, located at 8115 East Blanchard Circle, was installed to 101 feet below ground surface, and the well record did not identify the depth or thickness of the shale in this boring. Therefore, it is unknown from which formation this well pumps water. Another well, ISGS Record #22798, had a casing set at 58 feet below ground surface. Since all of the wells, except ISGS Record #22798, had casings set at 40 feet below ground surface and the depth to shale was consistently 60 feet below ground surface, these wells are partially pumping water from the upper aquifer as water flows down the open hole beneath the casing outside of the pump. Also the well identified by ISGS Record #22798 receives some water from the upper aquifer since the casing is set 2 feet above the top of the shale. Well construction and property identification information is presented in Table 3-5. A property map of the Thorsen Subdivision is included in Appendix E, along with the ISGS well records that were matched to residential properties.

Table 3-1 Generalized Geologic Column (after Harza, 1991)

System	Formation	Predominant Rock Type	Thickness (feet)
Pennsylvanian	Pottsville (or Spoon Formation)	(a) Sandstone	Variable (0 - 50)
Ordovician	Maquoketa Divine Limestone Member (or Ft. Atkinson Limestone)	(a) Limestone	Variable (0 - 50)
	Maquoketa Shale Member (or Scales Shale)	Dolomitic Shale	65
	Galena	Dolomite	230
	Platteville	Dolomite and Limestone	115
	Glenwood	(b) Sandstone	5 - 30
	St. Peter	(b) Sandstone	165
	Shakopee	Dolomite	70 - 90
	New Richmond	Sandstone and Dolomite	45 - 55
	Oneta	Dolomite	210
Cambrian	Trempeleau	Dolomite	200
	Franconia	Sandstone	130
	Ironton	(c) Sandstone	120
	Galesville	(c) Sandstone	> 55

Notes:
(a) - Water Table Aquifier
(b) - Ancell Aquifier
(c) - Ironton - Galesville Aquifier

Table 3-2 Horizontal Hydraulic Gradient Calculations

	October 28, 2004				April 4, 2005				
	dh (ft)	dl (ft)	Horizontal Gradient (ft/ft)	Direction	dh (ft)	dl (ft)	Horizontal Gradient (ft/ft)	Direction	Average (ft/ft)
Baby Wells	--	--	--	--	0.75	52	0.014	north-northeast	0.014
Baby Wells	--	--	--	--	0.5	17	0.029	northwest	0.029
Vicinity of the CST System to the East	2	90	0.022	northeast	1	73	0.014	northeast	0.018
North of the Turbine Building	3	101	0.030	northeast	5	124	0.040	northeast	0.035
West of the CST System	4	255	0.016	west	2	233	0.0086	west	0.012
East of the Protected Area	5	590	0.0085	east-northeast	4	525	0.0076	east-northeast	0.0080
Southeast of the Protected Area	5	500	0.010	southeast	6	570	0.011	southeast	0.010
South of the Protected Area	4	680	0.0059	southwest	2	600	0.0033	southwest	0.0046

Table 3-3 Vertical Hydraulic Gradient Calculations

Well Cluster	April 4, 2005 Shallow Well Groundwater Elevation (ft msl)	Shallow Well Elevation of Screen Midpoint (ft msl)	Intermediate Well Groundwater Elevation (ft msl)	Intermediate Well Elevation of Screen Midpoint (ft msl)	Vertical Gradient (ft/ft)	Direction (Up / Down)
DSP157S / DSP157M	511.41	511.04	511.52	476.50	0.0032	Up
DSP158S / DSP158M	505.82	500.58	505.09	456.74	-0.0167	Down
DSP159S / DSP159M	509.28	506.01	509.09	462.87	-0.0044	Down

Table 3-4 Slug Test Results

Well	Slug Test Type (Rising / Falling)	Saturated Thickness (ft)	Total Well Penetration Depth (ft)	Screen Length (ft)	Initial Drawdown (ft)	Hydraulic Conductivity (ft/min)	Hydraulic Conductivity (ft/day)
DSP121	Falling	40.75	40.75	10	1.683	2.02E-04	0.29
DSP149R	Falling	49	49	10	1.998	4.59E-04	0.66
	Rising	49	49	10	2.109	3.77E-04	0.54
DSP157S	Rising	47.15	9.7	10	2.358	3.29E-02	47.38
DSP157M	Falling	44.52	41.49	10	1.776	1.82E-03	2.63
DSP158S	Rising	52.91	9.08	10	2.98	1.45E-02	20.85
DSP158M	Falling	53	53	10	1.969	8.50E-05	0.12
DS159S	Rising	50.66	7.62	10	1.923	2.81E-02	40.48
DSP159M	Rising	49	49	10	1.659	1.93E-03	2.78

Geometric Mean: Shallow 2.37E-02 34.20

Intermediate 4.68E-04 0.67

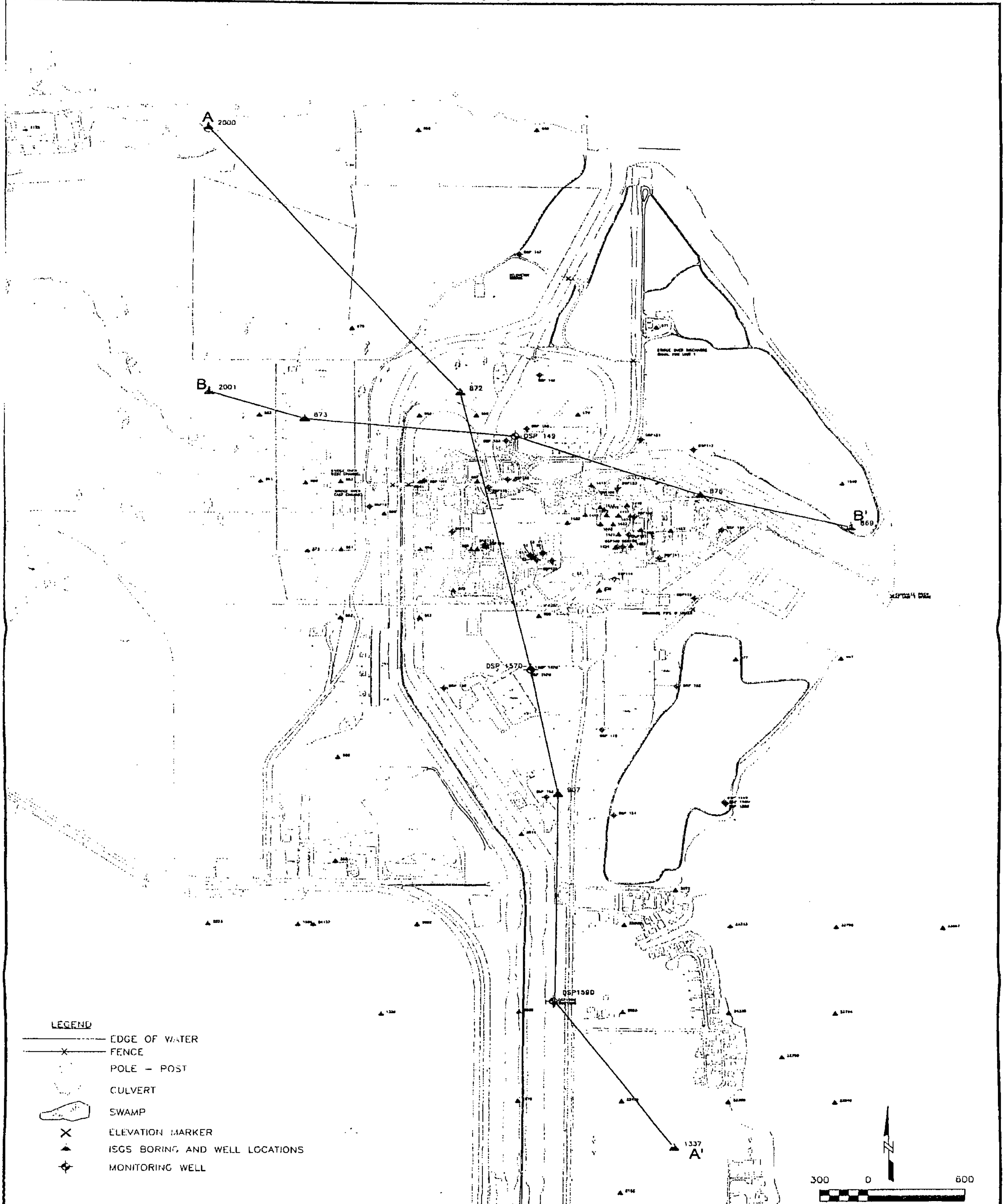
Note:

All wells are 2-inch diameter wells

Gravel pack porosity was assumed to be 20%.

Table 3-5 Residential Well Information

ISGS Record	Address	Grundy County Parcel Number	Casing Depth (ft)	Shale Interval (ft bgs)	Total Depth (ft)
22243	8183 N. Thorsen Lane	03-36-304-001	42	80-110	240
22798	8161 N. Thorsen Lane	03-36-304-012	58	60-90	205
2162	8154 N. Thorsen Lane	03-36-352-002 03-36-353-003	40	60-125	245
22428	8147 N. Thorsen Lane	03-36-353-009	40	60-125	200
2072	8115 E. Blanchard Circle	03-36-301-051	40	unknown	101
22279	8085 E. Blanchard Circle	03-36-301-048	40	60-130	240



SOURCE: ATWELL-HICKS, DWG # 400625WS01, 11/05/2004
ISGS: ILLINOIS STATE GEOLOGICAL SURVEY

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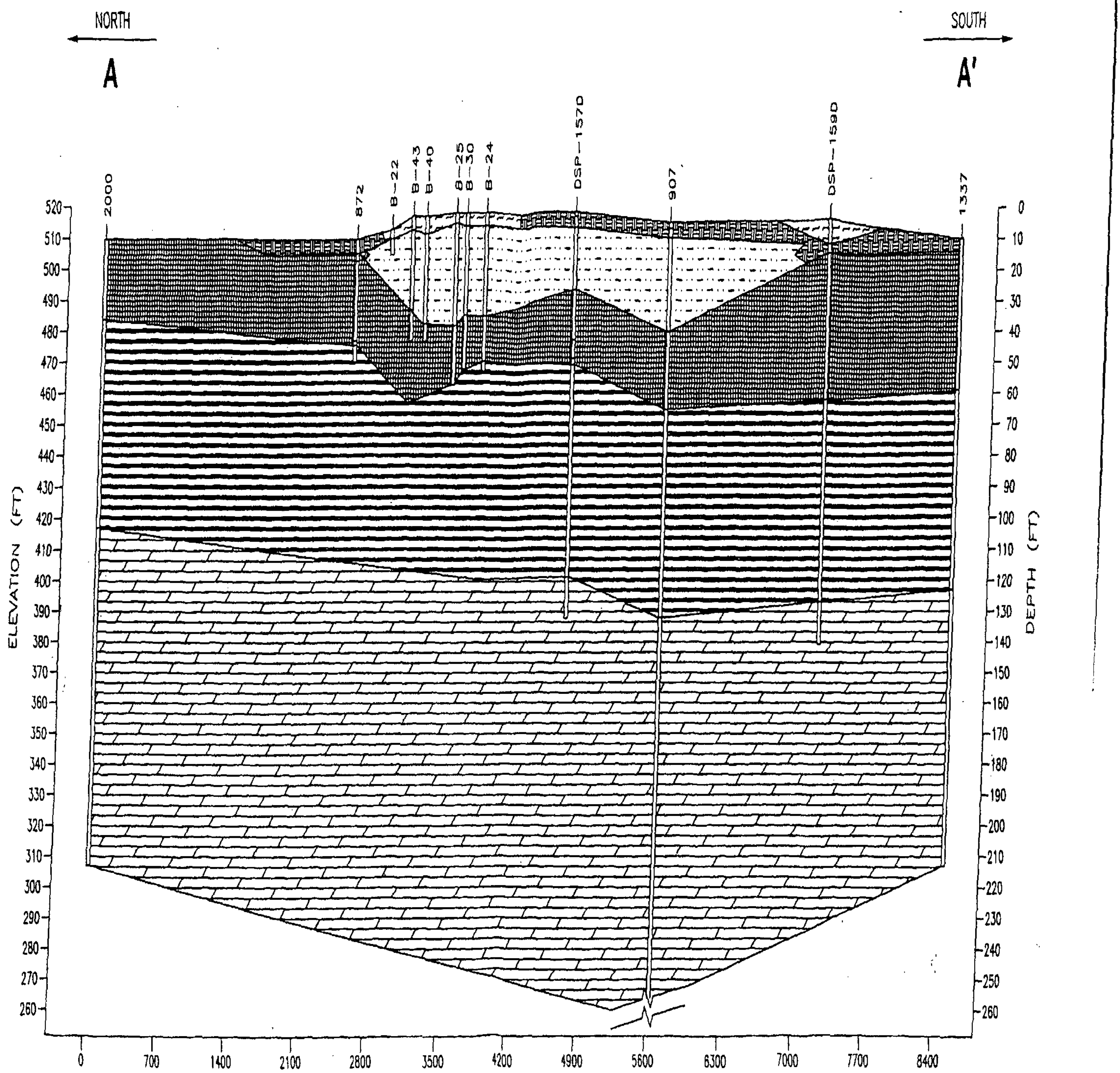


LEGEND

FILL

TOPSOIL

POTTSVILLE SANDSTONE

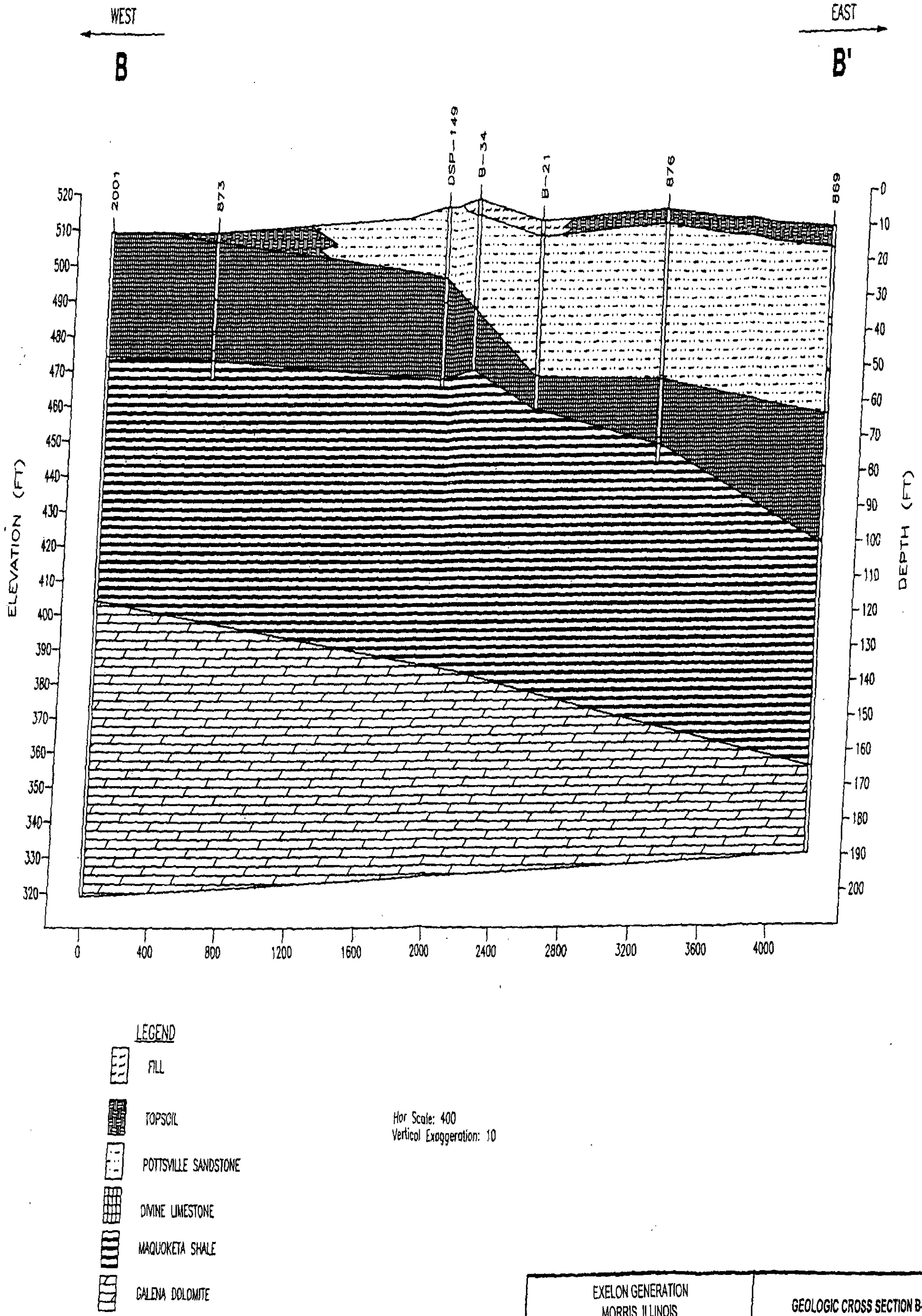
DIVINE LIMESTONE

MAQUOKETA SHALE

GALENA DOLOMITE

Hor Scale: 700
Vertical Exaggeration: 15

EXELON GENERATION MORRIS, ILLINOIS EXENW-18513-400	GEOLOGIC CROSS SECTION A-A' DRESDEN STATION



EXELON GENERATION
MORRIS, ILLINOIS
EXENW-18513-400

GEOLOGIC CROSS SECTION B-B'
DRESDEN STATION

DATE: 07/20/05 | DRWN: MDG/BIL | FIGURE 3-3

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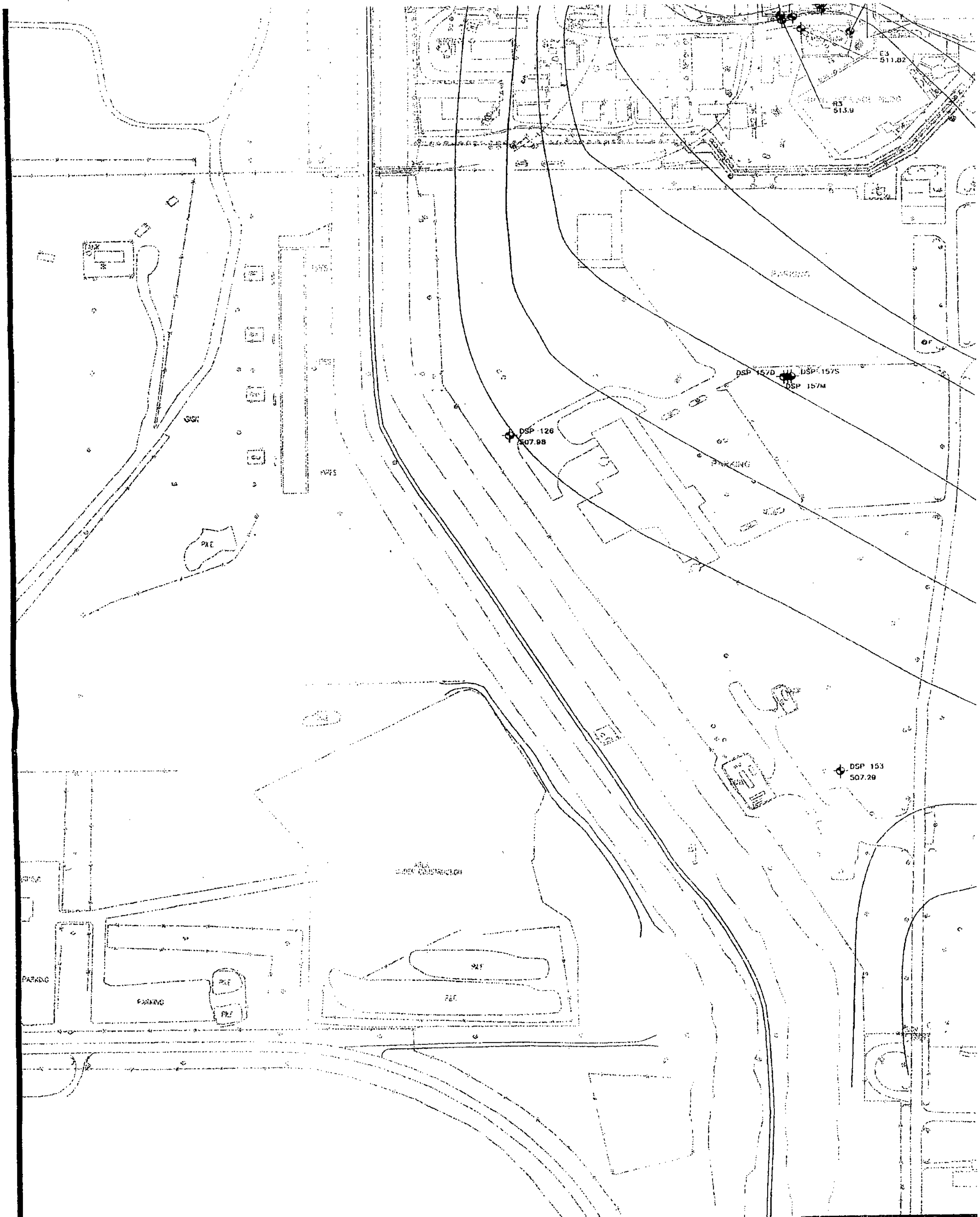

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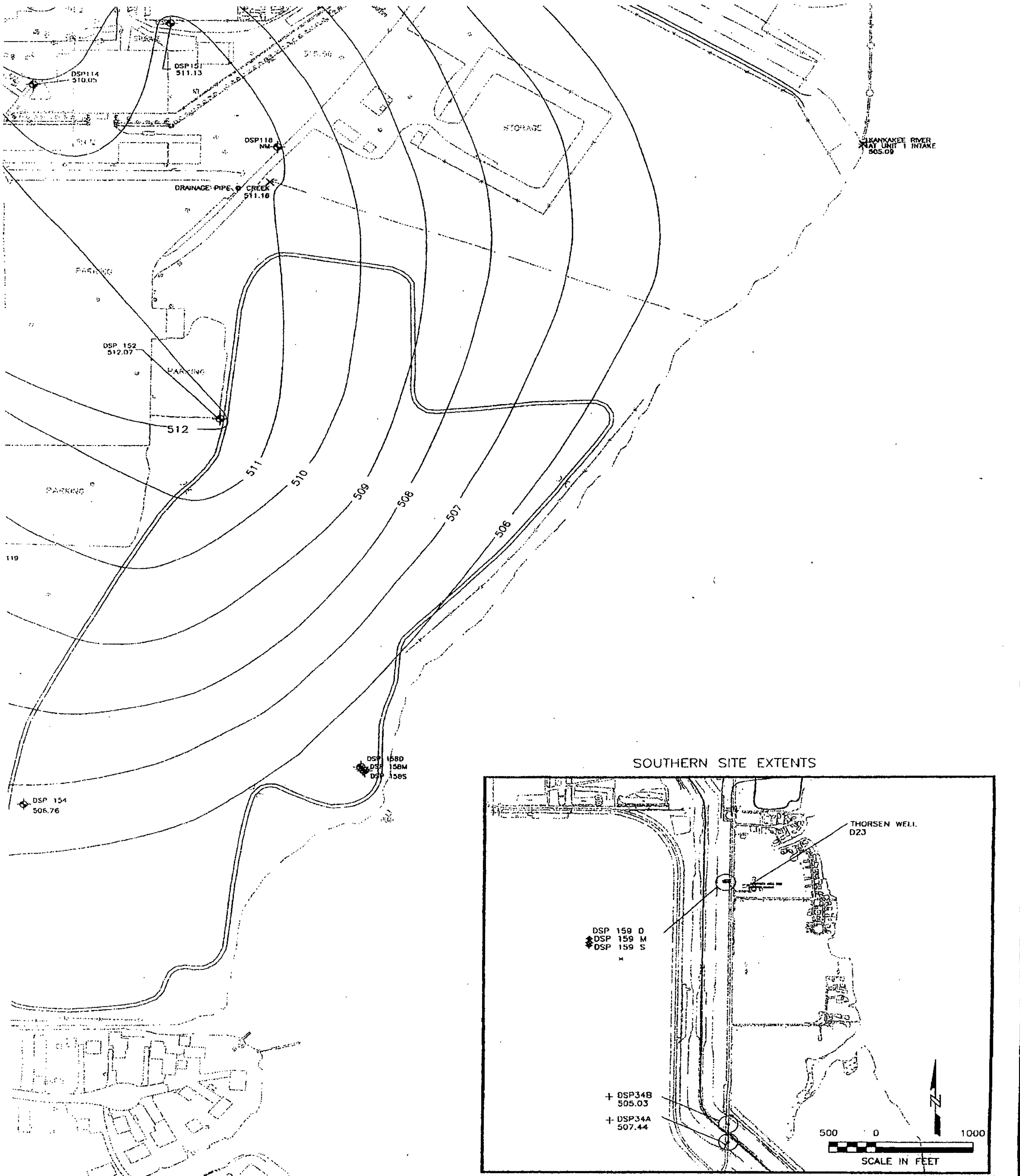


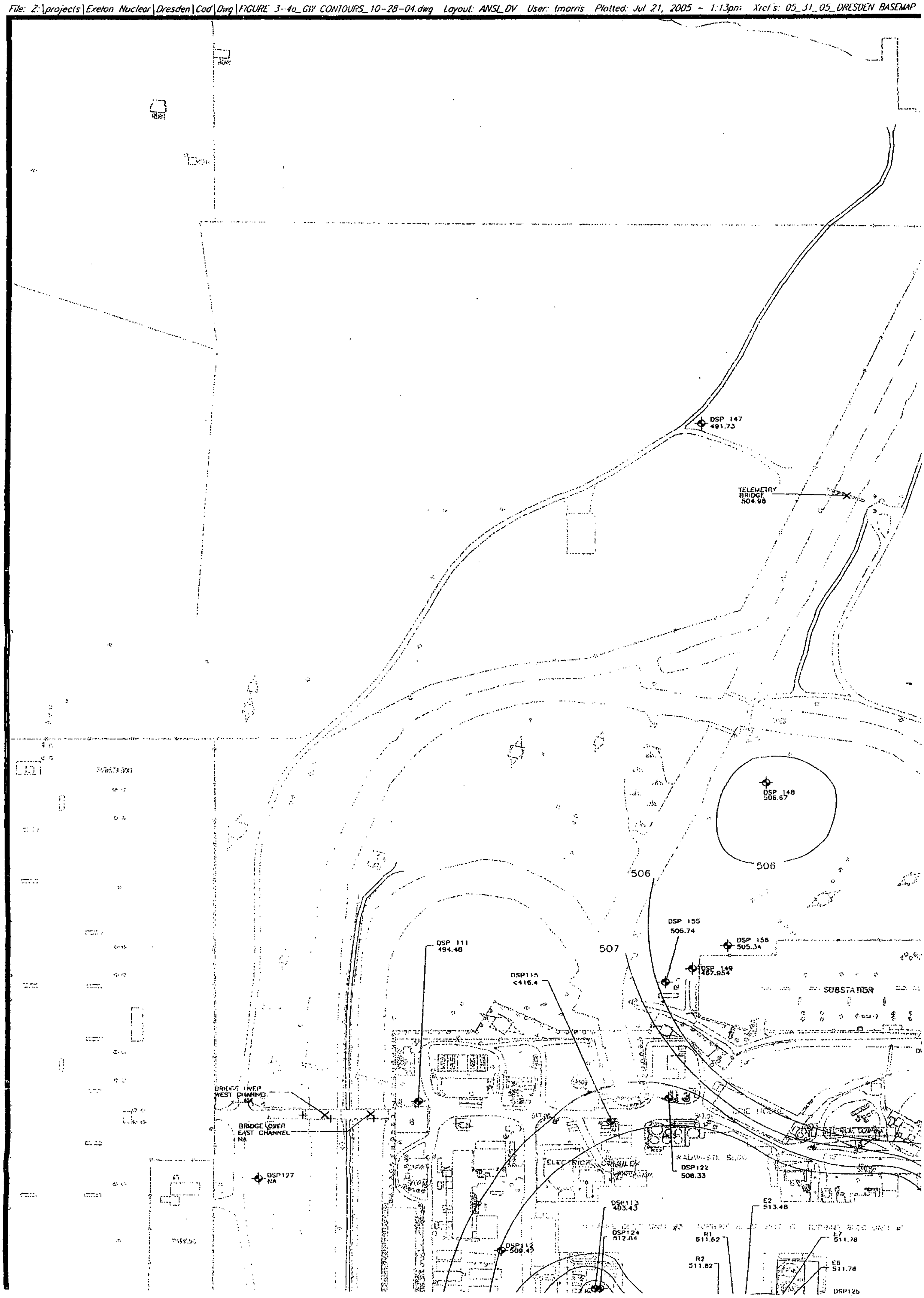
LON GENERATION
ORRIS, ILLINOIS
EXENW-18513-400
WN: DLS/PGH

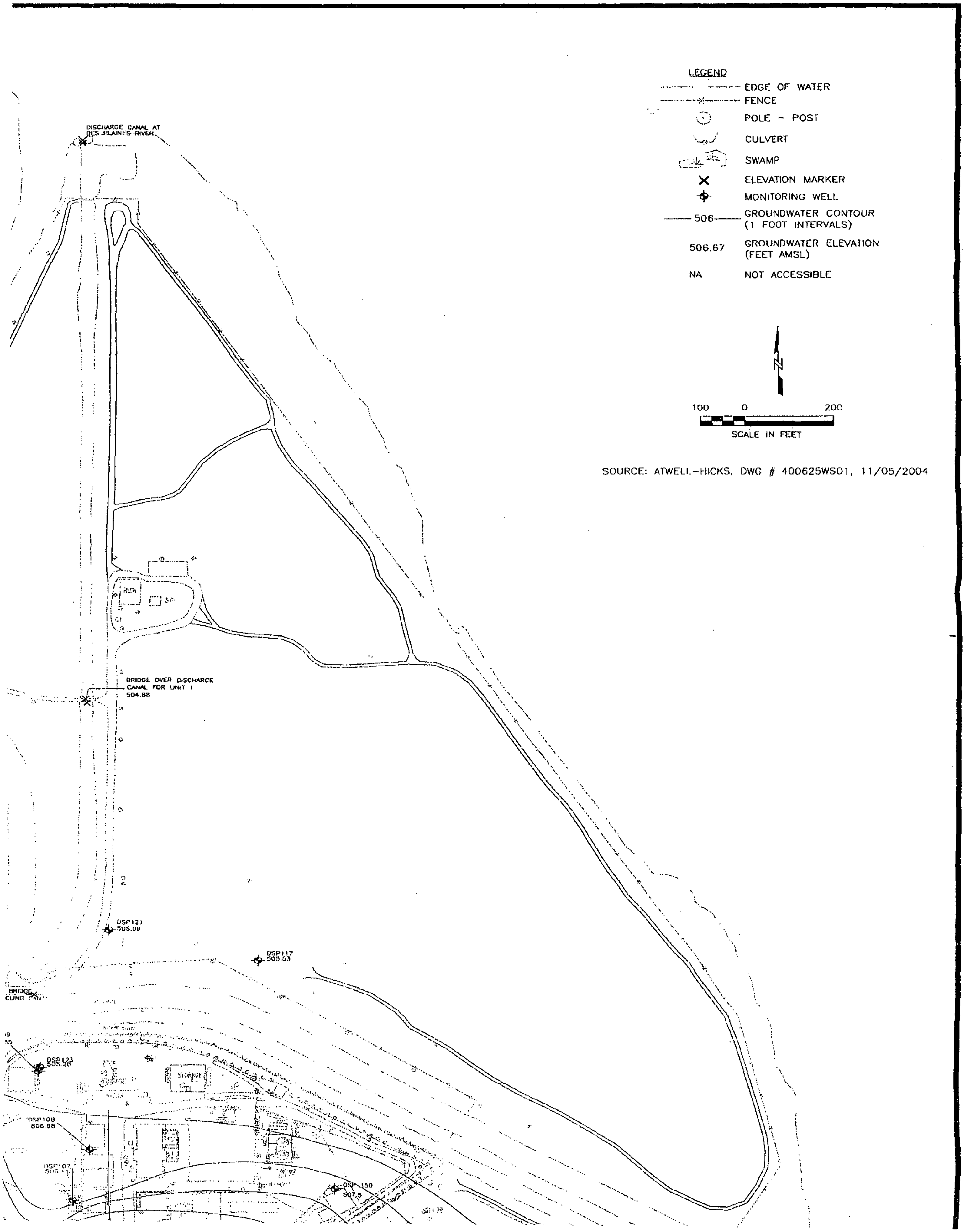
WATER TABLE CONTOUR MAP
OCTOBER 28, 2004

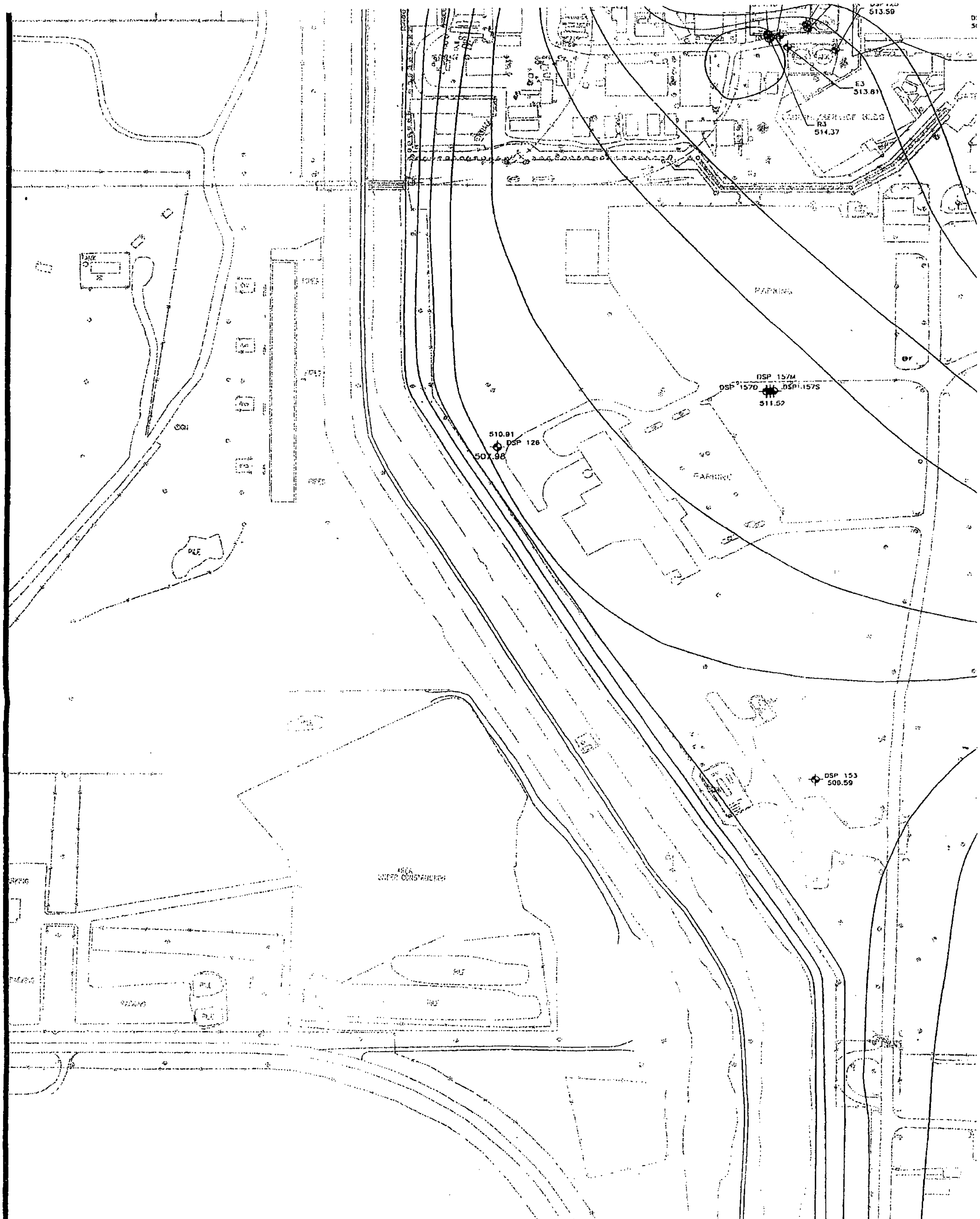
DRESDEN STATION

FIGURE 3-4a

File: Z:\projects\Exelon Nuclear\Dresden\Cad\Dwg\FIGURE 3-4a_GW CONTOURS_10-28-04.dwg Layout: ANSI_DV User: tmorris Plotted: Jul 21, 2005 - 1:13pm Xref's: 05_31_05_DRESDEN BASEMAP




LEGEND
EDGE OF WATER
FENCE
POLE - POST
CULVERT
SWAMP
ELEVATION MARKER
MONITORING WELL
506
GROUNDWATER CONTOUR (1 FOOT INTERVALS)
506.67
GROUNDWATER ELEVATION (FEET AMSL)
NA
NOT ACCESSIBLE
N
100
0
200
SCALE IN FEET
SOURCE: ATWELL-HICKS, DWG # 400625WS01, 11/05/2004
DISCHARGE CANAL AT DES PLAINES RIVER
BRIDGE OVER DISCHARGE CANAL FOR UNIT 1
504.88
DSP121
505.09
DSP117
505.53
DSP123
505.26
DSP100
506.68
DSP 150
507.5



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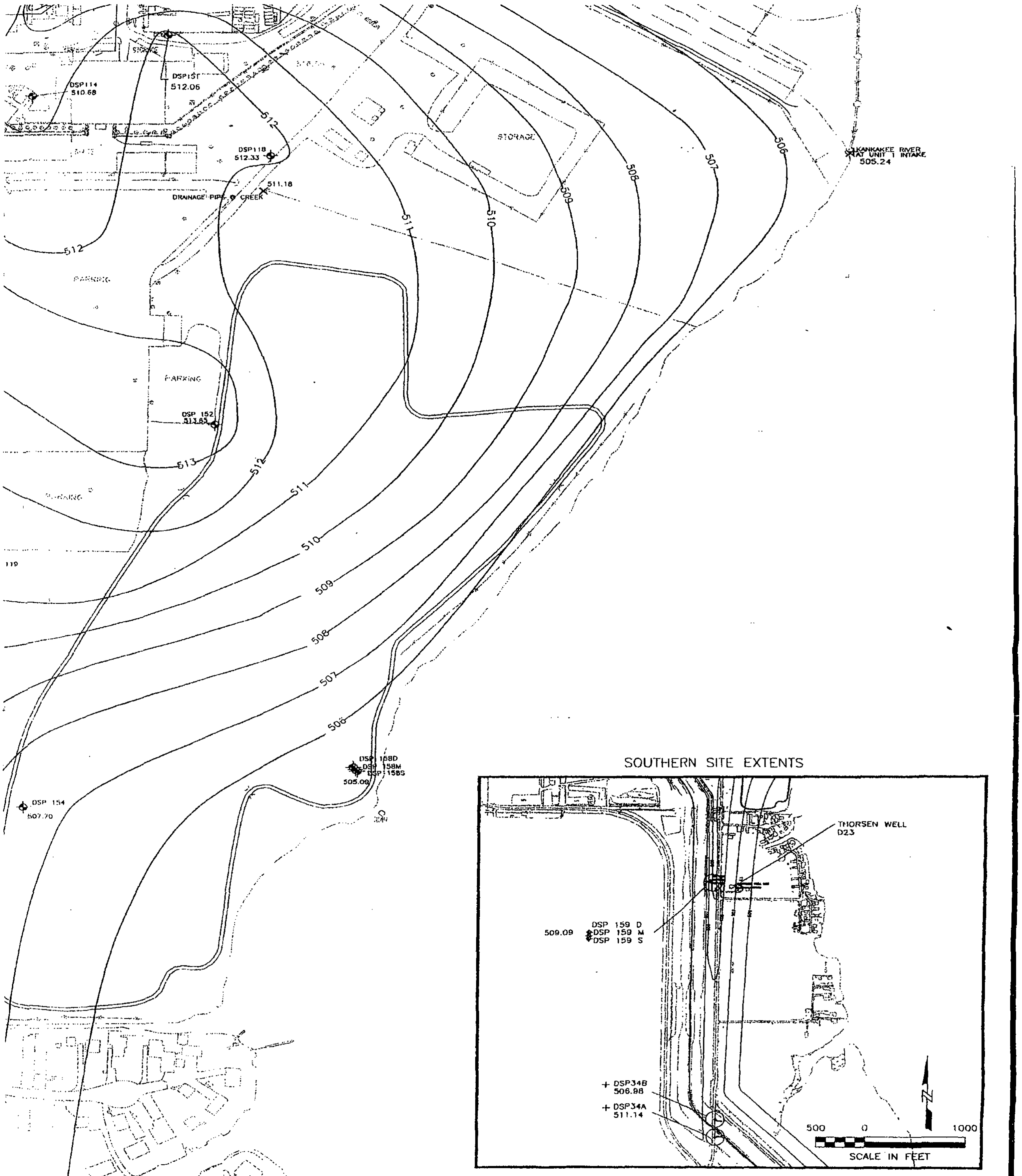
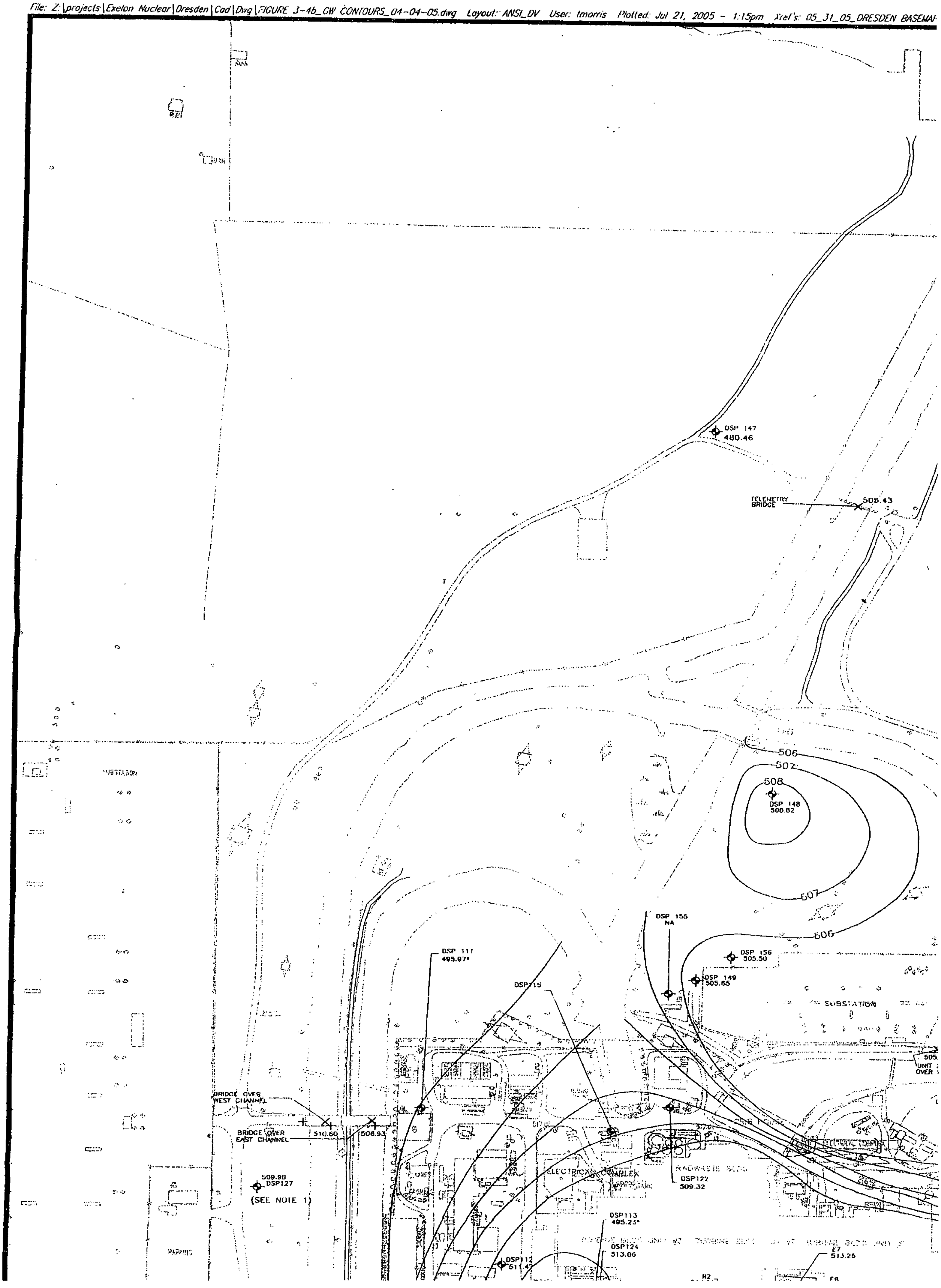
DATE: 07/19/05



;LON GENERATION ORRIS, ILLINOIS	**WATER TABLE CONTOUR MAP** **APRIL 4, 2005**
EXENW-18513-400	**DRESDEN STATION**
;RWN: DLS/PGH	**FIGURE 3-4b**

File: Z:\projects\Exelon Nuclear\Dresden\Cad\Dwg\FIGURE 3-4b_GW CONTOURS_04-04-05.dwg Layout: ANSI_DV User: tmorris Plotted: Jul 21, 2005 - 1:15pm Xref's: 05_31_05_DRESDEN BASEMA



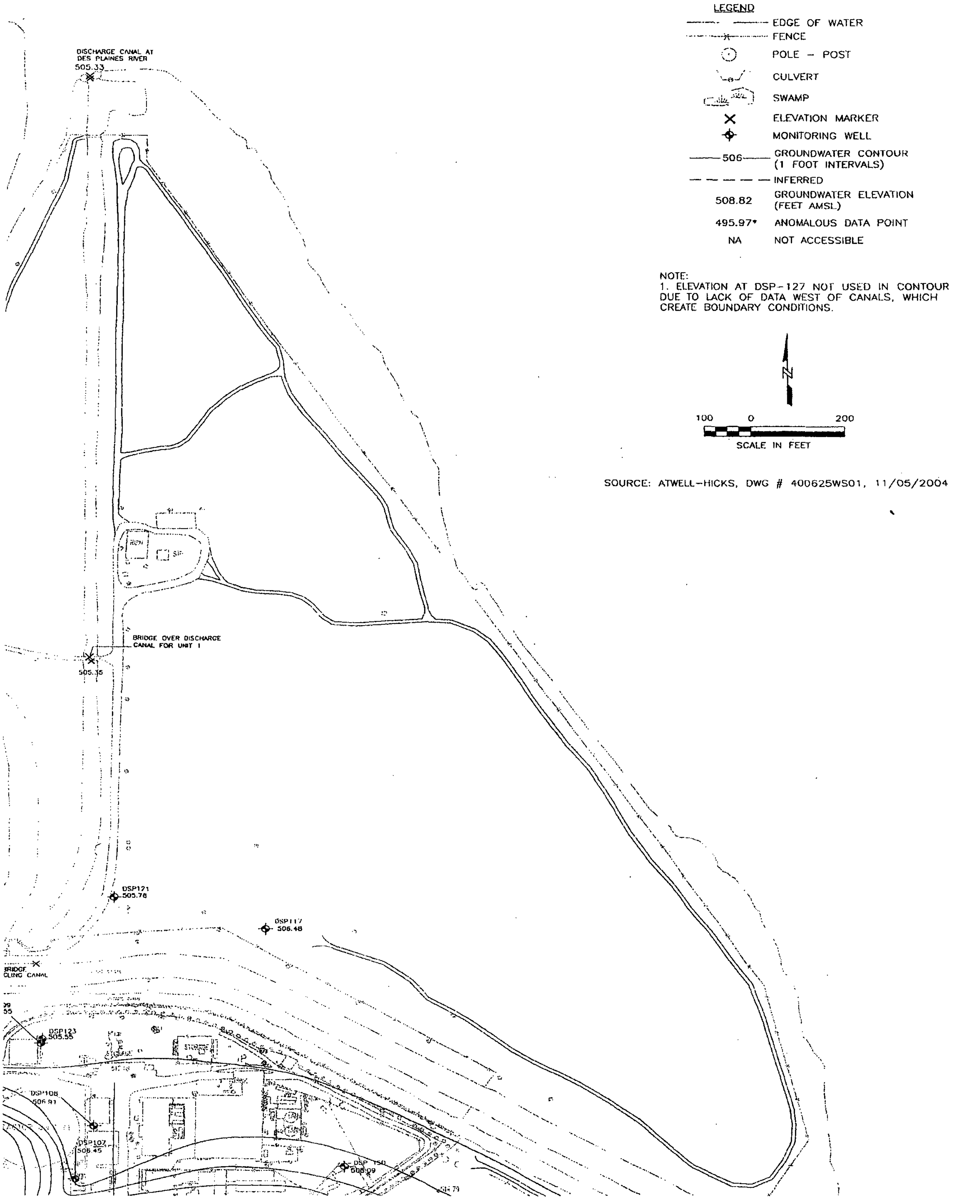

LEGEND
EDGE OF WATER
FENCE
POLE - POST
CULVERT
SWAMP
ELEVATION MARKER
MONITORING WELL
506 GROUNDWATER CONTOUR (1 FOOT INTERVALS)
INFERRED
508.82 GROUNDWATER ELEVATION (FEET AMSL)
495.97* ANOMALOUS DATA POINT
NA NOT ACCESSIBLE
NOTE:
1. ELEVATION AT DSP-127 NOT USED IN CONTOUR DUE TO LACK OF DATA WEST OF CANALS, WHICH CREATE BOUNDARY CONDITIONS.
N
100 0 200
SCALE IN FEET
SOURCE: ATWELL-HICKS, DWG # 400625WS01, 11/05/2004
DISCHARGE CANAL AT DES PLAINES RIVER
505.33
BRIDGE OVER DISCHARGE CANAL FOR UNIT 1
505.35
DSP121
505.76
DSP117
506.48
DSP123
505.55
DSP108
506.91
DSP107
506.45
DSP 150
508.09

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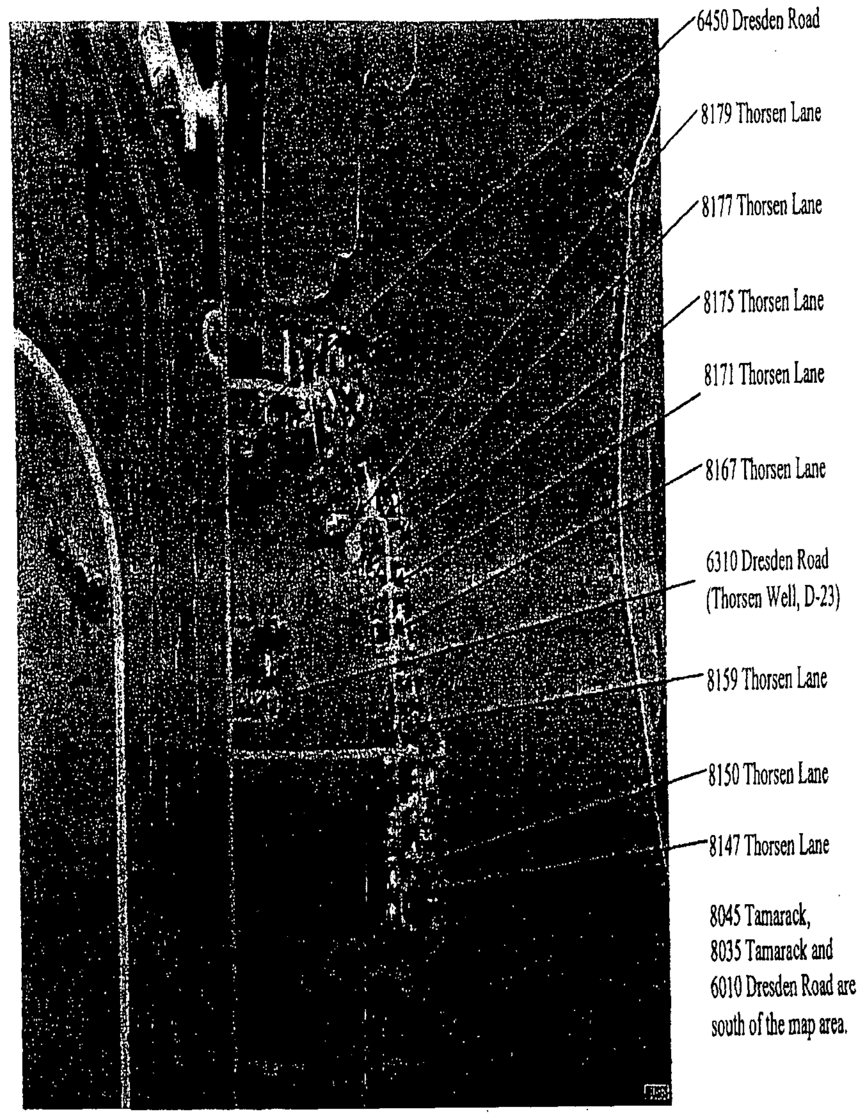
Figure 3-5 Residential Well Locations



4 Tritium Results

Tritium concentrations were obtained from groundwater, storm sewer, and surface water samples obtained from the Dresden Station under a long-term monitoring program. Upon review of data obtained from a July 31, 2004 sampling event, the presence of a release from the CST system was identified. Elevated tritium concentrations were detected in three storm sewers and all of the sampled baby wells. The following sections discuss the effect of the release on the tritium concentrations in the shallow groundwater near the CST system, and the tritium concentrations in the groundwater outside the CST system area and in the surface water. Also, the potential for off-site migration of tritium to the residential area south of the station is discussed. The historical tritium concentration data are provided in Appendix F.

4.1 Shallow Groundwater Associated with CST System

The shallow groundwater in the vicinity of the CST system is monitored by the W-, T-, R-, and E-series baby wells (Figure 4-1). The W-series baby wells monitor the groundwater located east of the liquid nitrogen tank and west of the Unit 2/3 interlock building. On July 31, 2004, the tritium concentrations detected in wells W1 and W3 were 3,612,931 and 6,125,891 pCi/L, respectively. The highest tritium concentration from any of the water samples was recorded from well W3, located adjacent to the interlock building, on September 3, 2004 at 10,312,000 pCi/L. Well W1 was located west of well W3 and had a concentration of 2,594,000 pCi/L on September 3, 2004. Well W2 was dry during this period; therefore, groundwater samples could not be collected from this location. Baby wells W1 and W2 were later removed during construction activities.

Following repair of the broken pipe in November 2004, tritium concentrations decreased drastically in well W3. This well had a concentration of 542,667 pCi/L on November 22, 2004, which decreased to 161,000 pCi/L on May 19, 2005. Replacement well W2R was installed on November 23, 2004 to replace baby wells W1 and W2, which were removed during construction activities. Another well was attempted further west; however, there were too many utilities in the area to risk using a hollow-stem auger rig to drill. Also the Pottsville Sandstone was encountered too shallow to intercept the water table using the air knife to drill a hole. Tritium concentrations in well W2R ranged from 48,000 to 301,000 pCi/L in three samples collected between December 2, 2004 and February 1, 2005, and then dropped to 182,000 pCi/L in May 19, 2005. The changes in tritium concentration with time in the W-series baby wells are presented in Figure 4-2.

The T-series baby wells monitor the groundwater located east of the Unit 2/3 interlock building. On July 31, 2004, the tritium concentration in well T6 was 1,960,331 pCi/L, which was the highest concentration measured in these wells before the pipe was repaired. Analytical results from baby well T5, which is located approximately 7 feet east of T6, reported a tritium concentration of 41,662 pCi/L on July 31, 2004 and a maximum concentration of 404,437 pCi/L on August 28, 2004.

Baby wells T7 and T3 were located approximately 10 feet south of wells T6 and T5, respectively, before their removal during construction activities. The maximum concentration for well T7 was 958,000 pCi/L measured on September 3, 2004, and the maximum concentration for well T3 was 119,763 pCi/L measured on August 28, 2004.

Tritium concentrations gradually increased in baby well T1, located approximately 35 feet east of well T3, from 7,473 to 131,000 pCi/L by March 8, 2005. The April 8, 2005 groundwater sample yielded a result of 262,990 pCi/L. Subsequent concentrations in well T1 from April and May 2005 ranged from 189,000 to 252,000 pCi/L. The maximum concentration in baby well T2 located adjacent to T1 was 58,000 on October 25, 2004. The tritium concentration in well T1 has remained near 5,000 pCi/L since the pipe was repaired. The changes in tritium concentration with time in the T-series baby wells are presented in Figure 4-3.

The R- and E-series baby wells also experienced increases in tritium concentrations as shown from the July 31, 2004 sampling events; however, concentrations in these wells have typically remained near or below 5,000 pCi/L following repair of the pipe, with the exception of well R-2. In well R-2, tritium concentrations reached a maximum of 12,000 pCi/L on October 25, 2004 and then decreased to 3,000 pCi/L on April 25, 2005. It should be noted that baby wells E8, E9, and E10 were installed on November 23, 2004. The changes in tritium concentration with time in the R- and E-series baby wells are presented in Figures 4-4 and 4-5, respectively.

Tritium concentrations for the baby wells in the vicinity of the CST system for September 3, 2004 and April 8, 2005 are presented in Figures 4-6a and 4-6b, respectively. According to these figures, the tritium-impacted groundwater is migrating east as, evident from the decrease in tritium in wells W3 and T6, and an increase in well T1. It is likely that the tritium is also migrating west as indicated by the sudden increase in the tritium concentration in well DSP124 located northwest of the CST system The directions of plume migration are consistent with the horizontal hydraulic gradient in the vicinity of the CST system as described in Section 3.4.2.

4.2 Storm Sewers

4.2.1 Flow Path of Storm Sewers

The storm sewer system layout has been determined from available data, such as catch basin location and depth, and utility drawings (Figure 4-7). In addition, it has been assumed that the sewer pipe is aligned with the bottom of the catch basins, thus the variation in the measured depth to bottom of the catch basins is representative of the slope of the sewer pipe. The depth to bottom of the catch basins ranged from 2.5 to 10 feet below ground surface. In the CST system area, the depth to bottom of the catch basins is approximately 2 feet below the water table. No additional catch basin or sewer system construction information was available for this report; therefore, it has been assumed that the roof gutter systems from turbine and office buildings drain directly to the local storm sewer, and that there is no immediate drainage to the storm sewer system from the bermed storage tank areas.

4.2.2 Stormwater Flow and Drainage Areas

There appear to be two active sewer systems located in the vicinity of the CST system (Figure 4-7). Catch basins located on each of these sewer systems have been included as part of the tritium monitoring program. Two additional sewers appear to be located to the south of the turbine building. It appears that these unmonitored sewers drain to a stormwater drainage ditch located on the south edge of the plant.

One sewer appears to originate immediately to the east of the liquid nitrogen tank. The original terminus of this sewer was catch basin (CB) M, which was demolished during excavation activities related to the pipe repair. This sewer drains the area around the southeastern and northeastern perimeter of the turbine building, in addition to the portion of the site located between Unit 1 and the Kankakee River. This sewer discharges to the Unit 1 intake canal through storm sewer DSP132, though the exact location of the discharge to the canal is unknown.

The second sewer originates immediately to the west of the liquid nitrogen tank and drains the area around the western perimeter of the turbine building, as well as the area to the northwest of the turbine building. This sewer drains to the Unit 2/3 discharge canal through an outfall located in the west side of the canal. The closest monitored catch basin to this outfall is storm sewer DSP131.

4.2.3 Potential Groundwater Ingress

A total of 24 catch basins (storm sewers) have been included in the tritium monitoring program for the April 8, 2005 sampling event. Fifteen of these catch basins are located along the eastern sewer system, including (in order of proximity to the outfall) DSP132, CB A, CB B, CB C, CB D, CB E, CB F, CB G, CB H, DSP134, DSP140, CB J, CB K, DSP135, and CB M (removed). Of the remaining 14 catch basins, elevated tritium concentrations have been detected in 11 since July 31, 2004. The only non-impacted catch basins appear to be CB C, CB E, and CB H.

The highest tritium concentrations detected were 4,305,000 pCi/L in CB M and 3,000,000 pCi/L in DSP135 during the September 2004 sampling event. The most recent sampling event for which data are available occurred in May 2005 and reported a tritium concentration of 129,000 pCi/L in DSP135. Only DSP135 (closest to the tritium source area), DSP132 (closest to the sewer outfall), DSP140 (downstream of DSP135), and DSP134 (inside a bermed tank area near DSP140) have been continuously monitored since September 2004. The changes in tritium concentration in the storm sewers over time are presented in Figure 4-8.

Nine catch basins included in the tritium monitoring program are located along the western sewer system, including (in order of proximity to the outfall) DSP131, CB V, CB U, CB T, CB S, CB R, CB Q, CB N, and CB P. The tritium concentrations in these catch basins with the exception of CN N, were between 1,000 and 4,000 pCi/L. Tritium concentration in CB N was 16,000 pCi/L on September 1, 2004 and then dropped to 1,000 pCi/L on subsequent sampling on September 4, 2004. Only DSP131 has been continuously monitored since September 2004.

Based on this data from the tritium monitoring program, tritium appears to have migrated mostly into the eastern sewer system and to a lesser extent into the western sewer system (Figure 4-7). It appears that the source of tritium in the eastern sewer system is from the CST system area, as samples from the catch basins immediately east of the liquid nitrogen tank (DSP135 and CB M) yielded the highest tritium concentrations.

Due to limited catch basin monitoring data in the western sewer system, the source of tritium is harder to identify. However, the increase in tritium concentration in DSP131 from 101 pCi/L in August 1, 2003 to 1,579 pCi/L in July 31, 2004 suggests that it was impacted by the release. The source of the tritium ingress is likely located along the sewer line between CB P and CB N, within the groundwater tritium plume.

4.3 Site-Wide Shallow Groundwater

The groundwater in the upper aquifer is monitored by 34 monitoring wells installed across the station, excluding the baby wells. The locations of these wells are shown in Figure 4-9. With the exception of three shallow wells, all other monitoring wells installed in the upper aquifer are 35 to 50 feet deep intermediate wells. The three shallow wells are 12 to 15 feet deep.

There are two wells, DSP124 and DSP125, located immediately northwest and east of the CST system area, respectively. Well DSP125 maintained consistently low tritium concentrations of less than 200 pCi/L. Well DSP124 on the other hand showed a steep increase in tritium concentration on August 1, 2004 at 91,166 pCi/L, followed by a decline to 4,060 pCi/L on April 8, 2005. This sharp increase corresponds to the release from the CST system detected on July 31, 2004. Prior to August 1, 2004, the tritium concentrations in DSP124 showed a steady decreasing trend in concentration from near 9,000 pCi/L in September 1994 to less then 2,000 pCi/L in June 2003. The changes in tritium concentration with time in wells DSP124 and DSP125 are presented in Figure 4-10.

There are five monitoring wells, DSP105, DSP106, DSP107, DSP108, and DSP123, installed near the Unit 1 reactor. The tritium concentrations in wells DSP105, DSP106, and DSP107 show a steady decrease in concentration since May 1994. Well DSP105 shows a decrease from slightly over 5,000 pCi/L in May 1994 to about 300 pCi/L in November 2004. Well DSP106 shows a decrease from 18,000 pCi/L in May 1994 to about 3,000 pCi/L in April 2005. Well DSP107 shows a decrease from 26,000 pCi/L in May 1994 to near 9,000 pCi/L in November 2004. Well DSP108 shows a sharp decrease in concentration from about 50,000 pCi/L in May 1994 to less than 3,000 pCi/L in April 2005. Well DSP123 shows a very small decrease in concentration from about 25,000 pCi/L in May 1994 to slightly over 12,000 pCi/L in April 2005. No noticeable changes in tritium concentrations were observed in these wells on July 31, 2004 or shortly afterward. The changes in tritium concentration with time in wells DSP105, DSP106, DSP107, DSP108, and DSP123 are presented in Figure 4-11.

There are five monitoring wells located north of the Unit 2/3 intake canal. Well DSP122 was installed near the Unit 2/3 discharge, and wells DSP148, DSP149, DSP155, and DSP156 were installed in the area bound by the Unit 2/3 discharge and the recycling canal. Well DSP122 shows a decrease in concentration from about 13,000 pCi/L in December 1994 to slightly over 1,000 pCi/L in April 2005. Wells DSP148 and DSP156 show low levels of tritium at less than 300 pCi/L, and well DSP155 shows tritium concentrations of less than 1,000 pCi/L, with the exception of one value of 3,713 pCi/L on February 26, 2003. Well DSP149 shows large fluctuations from April 1995 to February 2004, with maximum concentrations of 76,488 pCi/L in March 3, 2002 to minimum concentration of 404 pCi/L in May 24, 1999. As discussed in Section 2.1.3, the tritium concentration and the water level data from DSP149 were anomalous. As a result, the well was repaired, and subsequent sampling yielded a tritium concentration of 121 pCi/L on April 8, 2005. Based on the concentrations in these wells, it appears the groundwater impact from the CST system did not affect these wells. The changes in tritium concentration with time in wells DSP122, DSP148, DSP149, DSP155, and DSP156 are presented in Figure 4-12.

The tritium concentrations in the remaining monitoring wells installed farther away from the CST system were at low levels, usually below 200 pCi/L. Also very little variation of tritium was detected in these wells over time. The tritium concentrations in all monitoring wells outside the CST system area for September 3, 2004 and April 8, 2005 are presented in Figures 4-13a and 4-13b, respectively. The April 8, 2005 data are also provided in Table 4-1. As can be seen from these figures, the groundwater impact from the CST system is confined to a small area. Outside this impacted area there is no evidence of elevated tritium concentrations associated with the CST system. A slightly elevated tritium concentration was observed in the intermediate monitoring well DSP159M located across the cooling canals approximately 3,400 feet south of the CST system. The tritium concentration in this well is discussed in Section 4.5.

4.4 Surface Water

Surface water received from the Unit 2/3 intake runs through the facility outside of the reactors to control the temperature, then is discharged through the Unit 2/3 discharge flume into the hot canal. The hot canal flows southward to Dresden Cooling Lake, where the water circulates and is returned north via the cold canal. Except during typical summer conditions, some or all of the surface water is returned to the Unit 2/3 intake canal to be recycled through the facility for cooling, and the rest is discharged to the Des Plaines River.

Tritium concentrations in the Unit 2/3 intake canal (DSP50), the cold canal (DSP34A), and the Unit 2/3 discharge canal (DSP20) for the period of May 1994 to May 2005 are presented in Figure 4-14. The locations of these surface water sampling points are shown in Figure 4-9. It can be seen from Figure 4-14 that there is a similar pattern with increasing trends of tritium concentrations in these three surface water samples. The maximum concentration in DSP50 is 6,194 pCi/L on September 27, 2004; in DSP34A is 5,437 pCi/L on September 23, 2004; and in DSP20 is 5,978 pCi/L on November 1, 2004.

4.5 Off-Site Migration

The groundwater tritium plume is confined to a small area within the CST system, as discussed earlier. There is no evidence of off-site migration of tritium in groundwater from the Dresden Station, including toward the residential area to the south. Tritium concentrations in all monitoring wells south of the CST system area as well as south of the Protected Area, except for well DSP159M, had concentrations less than 200 pCi/L, which is the low limit of detection by the laboratory. Well DSP159M is located between the cooling canals and the Thorsen well, and is most likely impacted by tritium concentrations in the cooling canals rather than tritium migration from the station.

The Thorsen well, located approximately 3,400 feet south of the CST system area, consistently showed tritium concentrations below 300 pCi/L until 1995, and then a more steady increase was noticeable by 1997. Tritium concentrations ranged from 232 to 940 pCi/L between January 1997 and April 2005. The changes in tritium concentrations with time in the Thorsen well (D23) and the cold canal (DSP34A) are presented in Figure 4-15. It can be seen from this figure that tritium concentrations in the Thorsen well and the cold canal show a similar pattern. Also, there is a steady increasing trend in tritium concentrations in the Thorsen well parallel to the increasing trend in the cold canal. Water samples collected from the cold canal and well DSP159M located east of the canal on April 8, 2005 measured tritium concentrations of 1,339 and 533 pCi/L, respectively (Table 4-1). A water sample collected from the Thorsen well on April 15, 2005 measured a tritium concentration of 653 pCi/L. There appears to be a strong correlation between the Thorsen well tritium concentration and the cooling canal as groundwater flows from the cooling canals to the Kankakee River in an eastward direction.

Tritium has been detected in groundwater samples collected from only one other residential well (8167 Thorsen Lane) located east of the Thorsen well along the Kankakee River. A groundwater sample was collected from the well at 8167 Thorsen Lane on December 2, 2004, and the sample was split for analysis by two independent laboratories. Due to the discrepancy in results (366 pCi/L vs. 114 pCi/L), another sample was collected on January 13, 2005, and four aliquots were reported ranging in concentration from 360 to 480 pCi/L. Another sample was collected on April 15, 2005, and the reported tritium concentration was 542 pCi/L.

Table 4-1 Tritium Concentrations - April 8, 2005

Groundwater

Sampling Location	Tritium Concentration (pCi/liter)
DSP-106	3,230
DSP-108	2,670
DSP-118	107
DSP-119	14
DSP-121	46
DSP-122	1,219
DSP-123	12,414
DSP-124	4,060
DSP-125	144
DSP-126	96
DSP-127	32
DSP-149	121
DSP-150	114
DSP-151	241
DSP-152	72
DSP-153	-18
DSP-154	-3
DSP-156	161
DSP-157M	-21
DSP-157S	130
DSP-157S (DUP)	93
DSP-158M	-11
DSP-158S	78
DSP-159M	533
DSP-159S	110
E-2	541
E-3	686
E-5	-72
E-8	3,140
E-9	1,870
E-10	858
R-1	1,127
R-2	5,866
R-3	3,936
T-1	262,990
T-1 (DUP)	262,874
T-2	5,077
T-6	422,424
T-6 (DUP)	412,906
W-2R	260,948
W-3	244,229
W-3 (DUP)	241,488
Thorsen Well	653

Note: Thorsen well sampled on April 15, 2005

Surface Water

Sampling Location	Tritium Concentration (pCi/liter)
DSP-131	1,402
DSP-132	1,524
DSP-134	8,166
DSP-135	85,192
DSP-137	1,385
DSP-140	45,137
DSP-34A	1,169
DSP-34B	1,339
DSP-34B (DUP)	1,601
DSP-DOP	82
Pump&Hose	29

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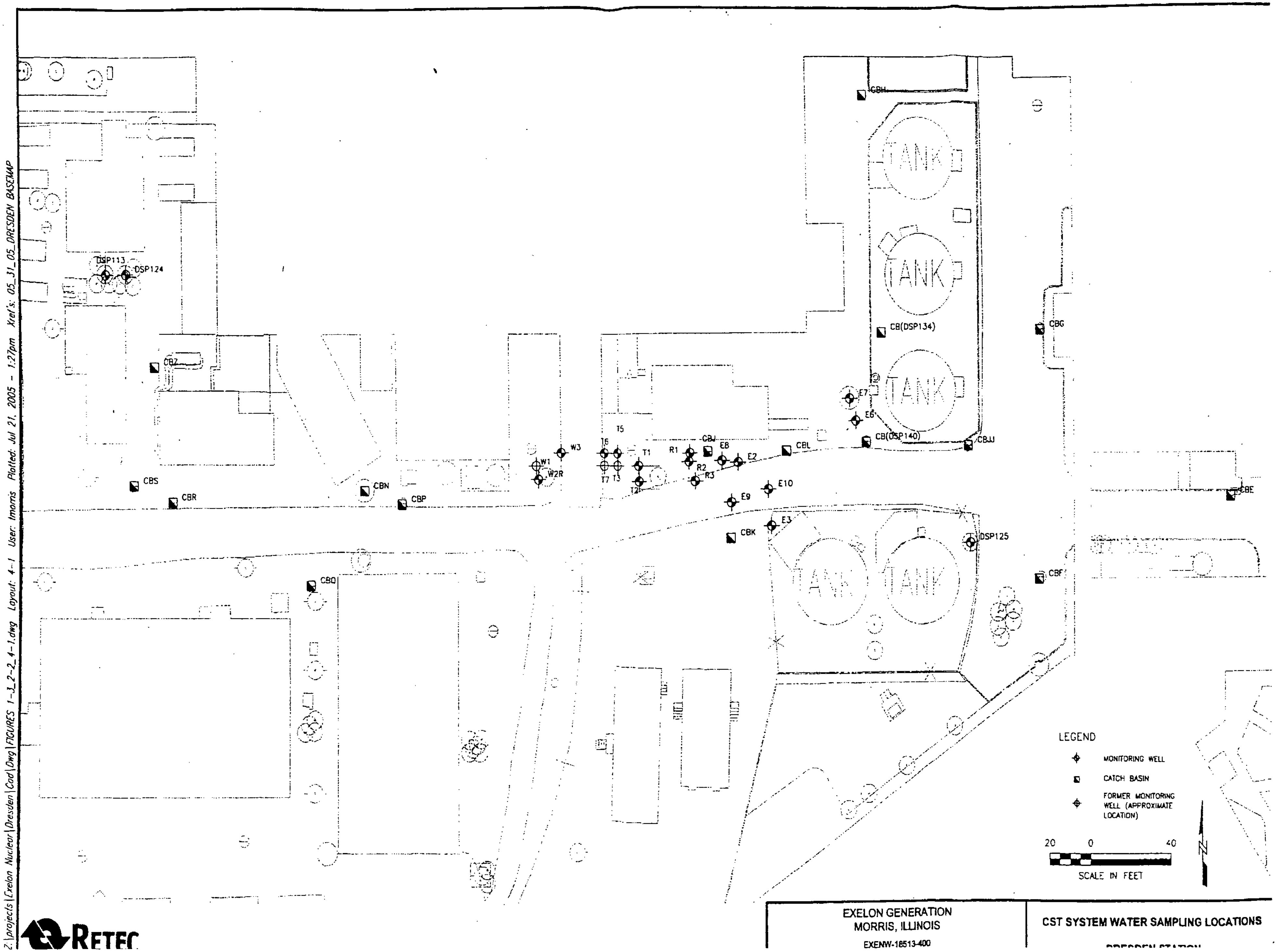


Figure 4-2 Tritium Concentration vs. Time in W-Series Baby Wells

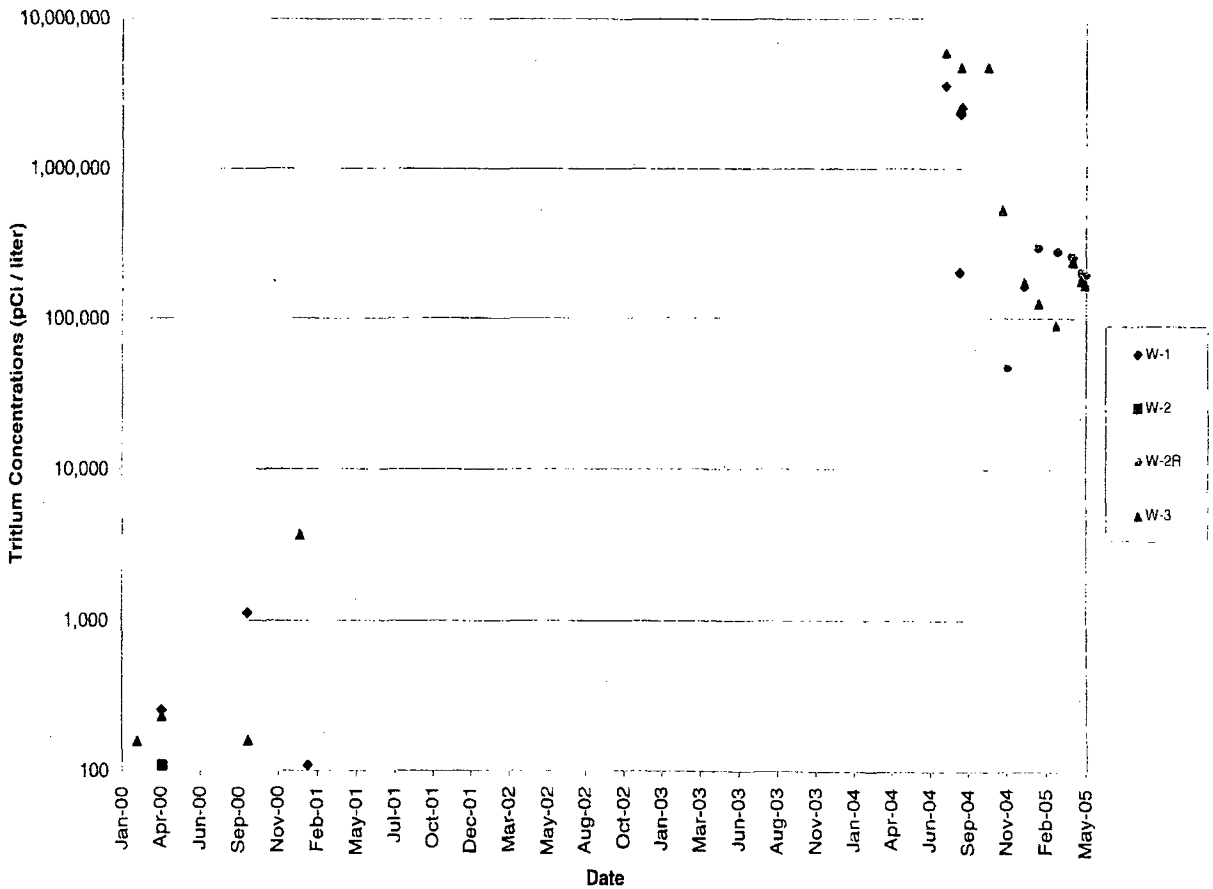


Figure 4-3 Tritium Concentration vs. Time in T-Series Baby Wells

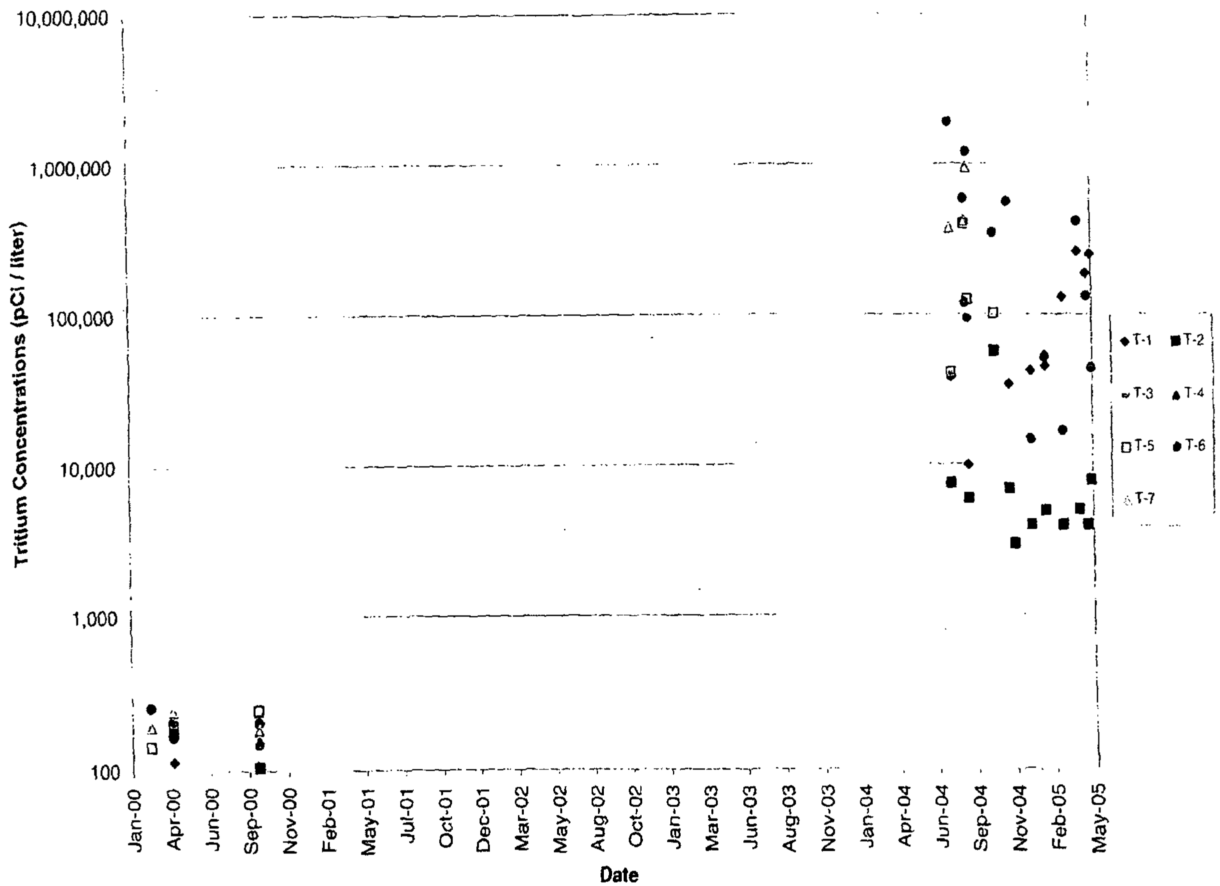


Figure 4-4 Tritium Concentration vs. Time in R-Series Baby Wells

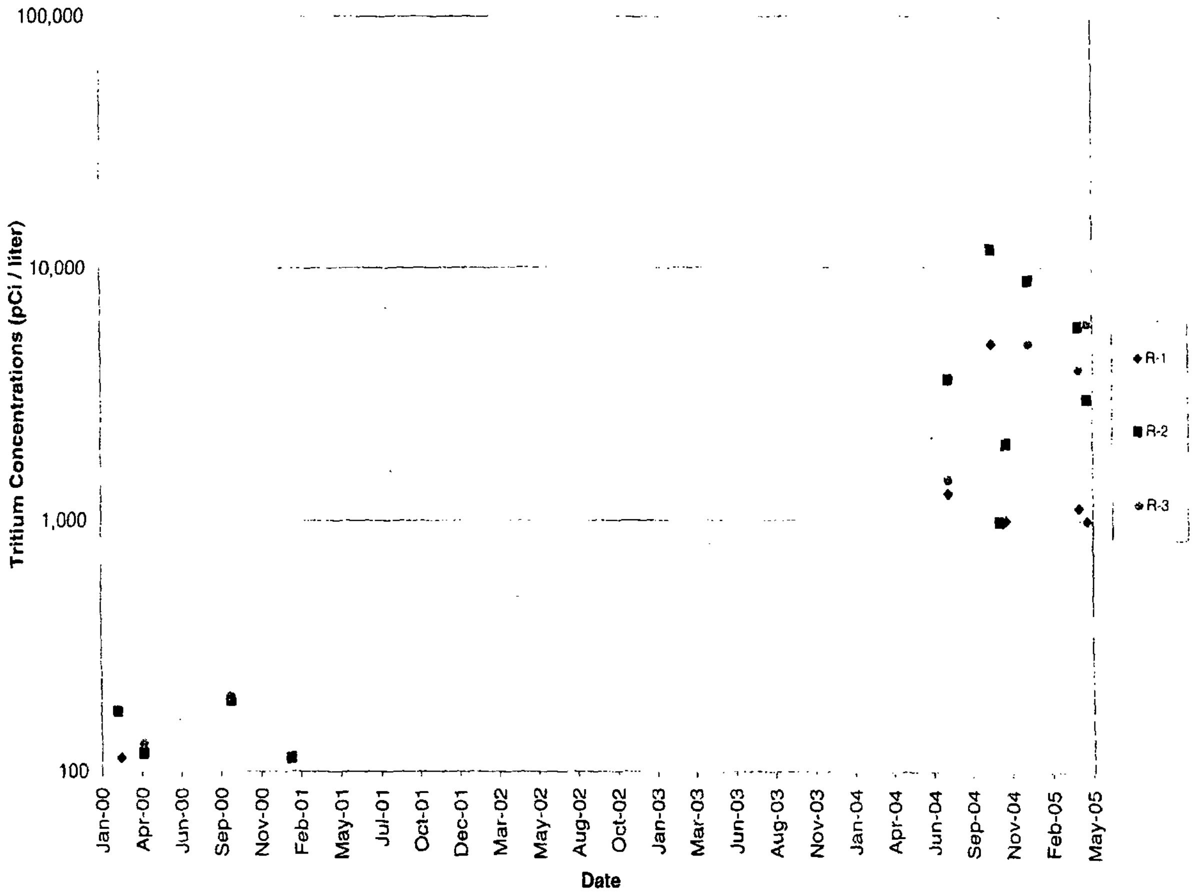
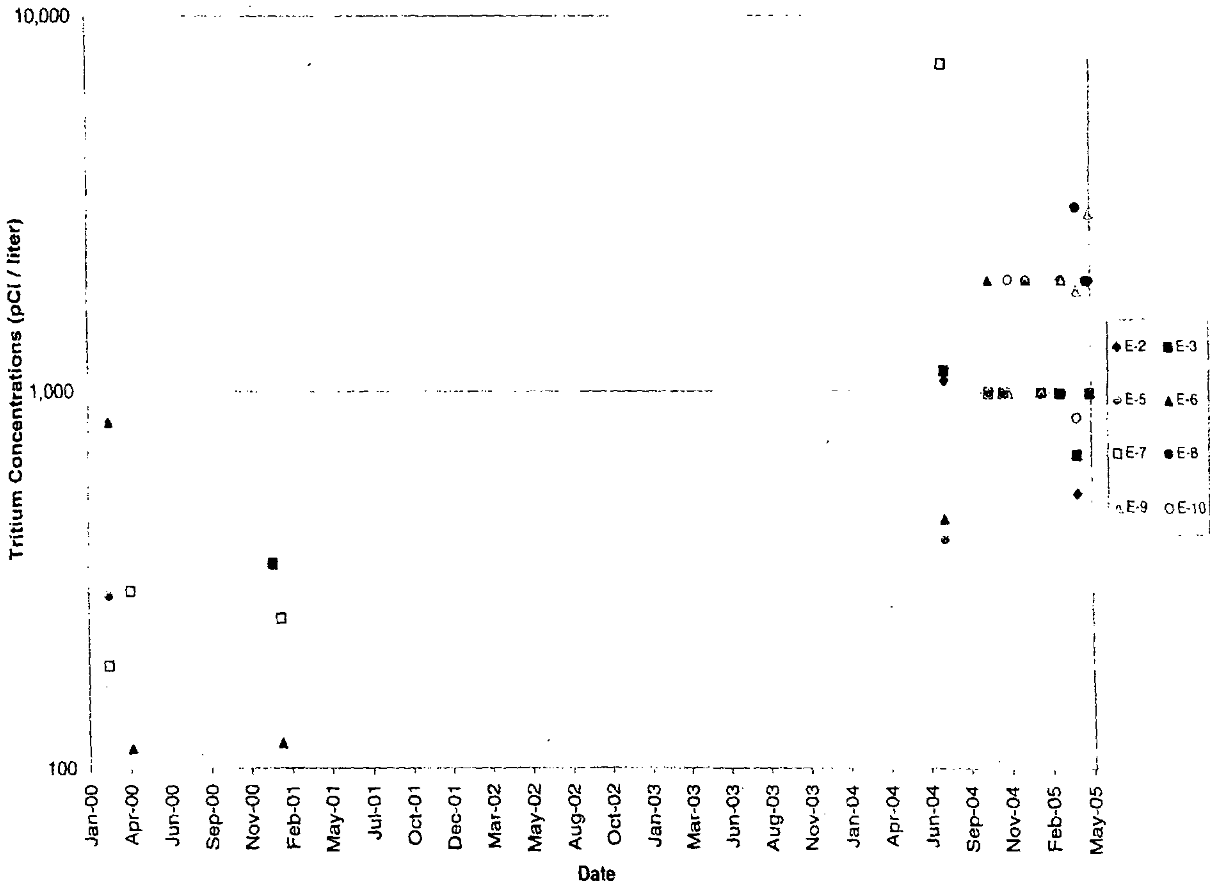
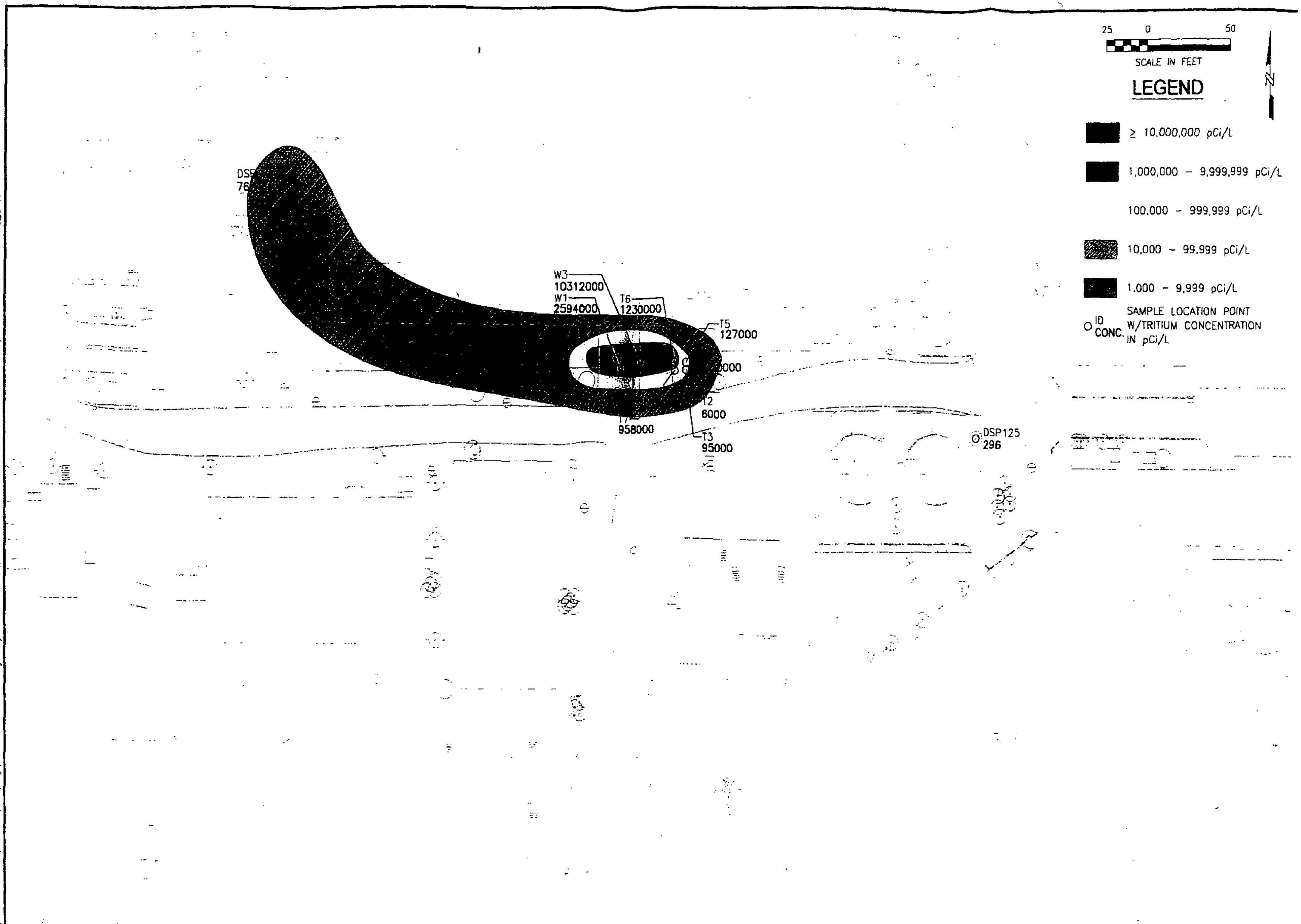


Figure 4-5 Tritium Concentration vs. Time in E-Series Baby Wells





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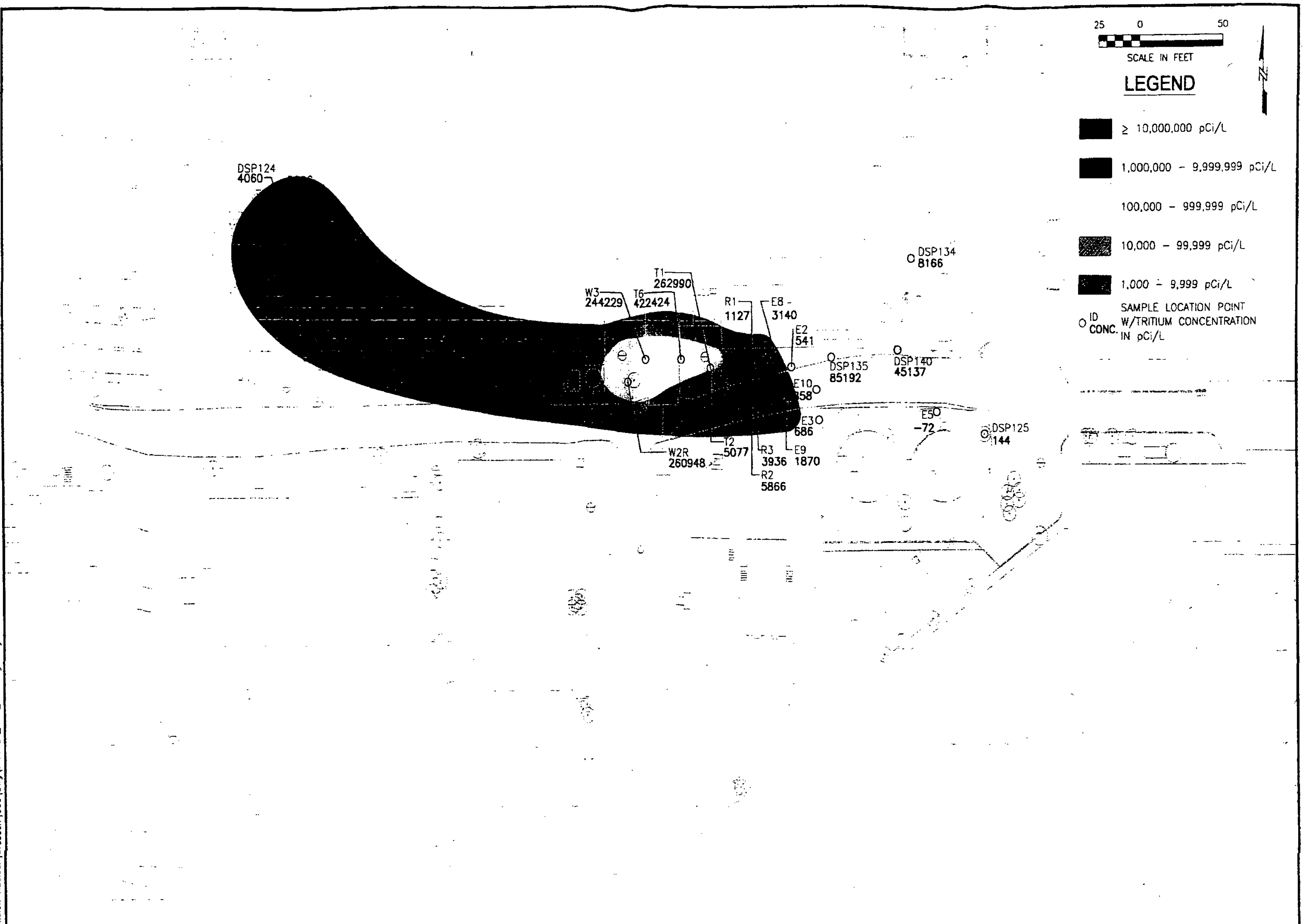
EXELON GENERATION MORRIS ILLINOIS EXENW-18513-400	TRITIUM CONCENTRATION MAP NEAR CST SYSTEM SEPTEMBER 3, 2004 DRESDEN STATION
DATE: 07/19/05 DRWN: BcV/CON	FIGURE 4-6a



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EXELON GENERATION MORRIS ILLINOIS EXENW-18513-400	TRITIUM CONCENTRATION MAP NEAR CST SYSTEM APRIL 8, 2005 DRESDEN STATION
DATE: 07/19/05 DRWN: BcV/CON	FIGURE 4-6b

File: Z:\projects\Exelon Nuclear\Dresden\Cad\Dwg\FIGURES_4-6_A&B.dwg Layout: TRIT_4-05B User: tmorris Plotted: Jul 21, 2005 - 2:26pm Xref's: EXENW-18513_BASE

File: F:\Exelon\Dresden Station\18513\(3) Figures\Final Report Figures\FIGURE 4-7_STORM SEWER LAYOUT.dwg Layout: ANSI_B User: dsilver Plotted: Jul 21, 2005 - 2:30pm Xref's: 05_J1_05_DRESDEN BASEMAP

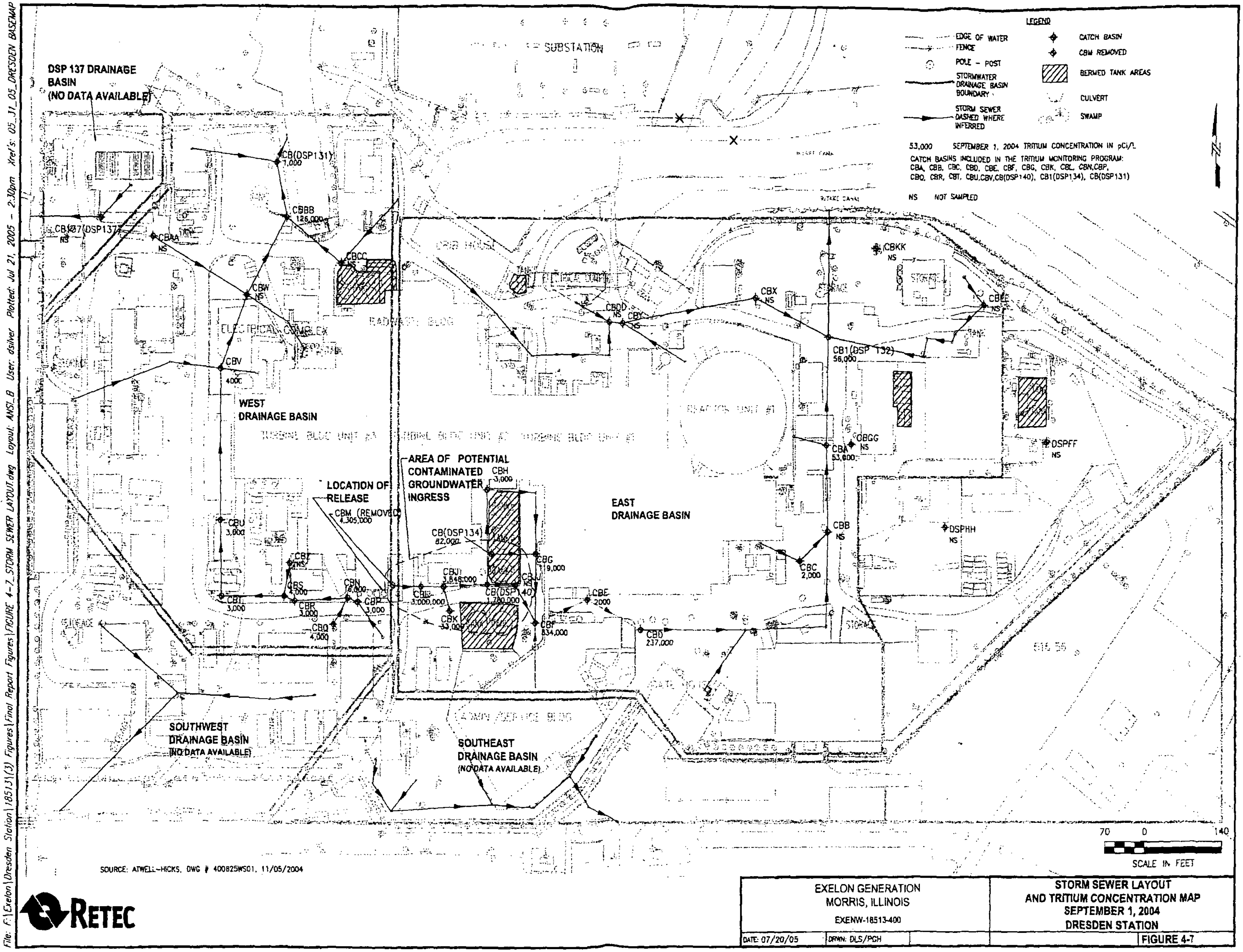
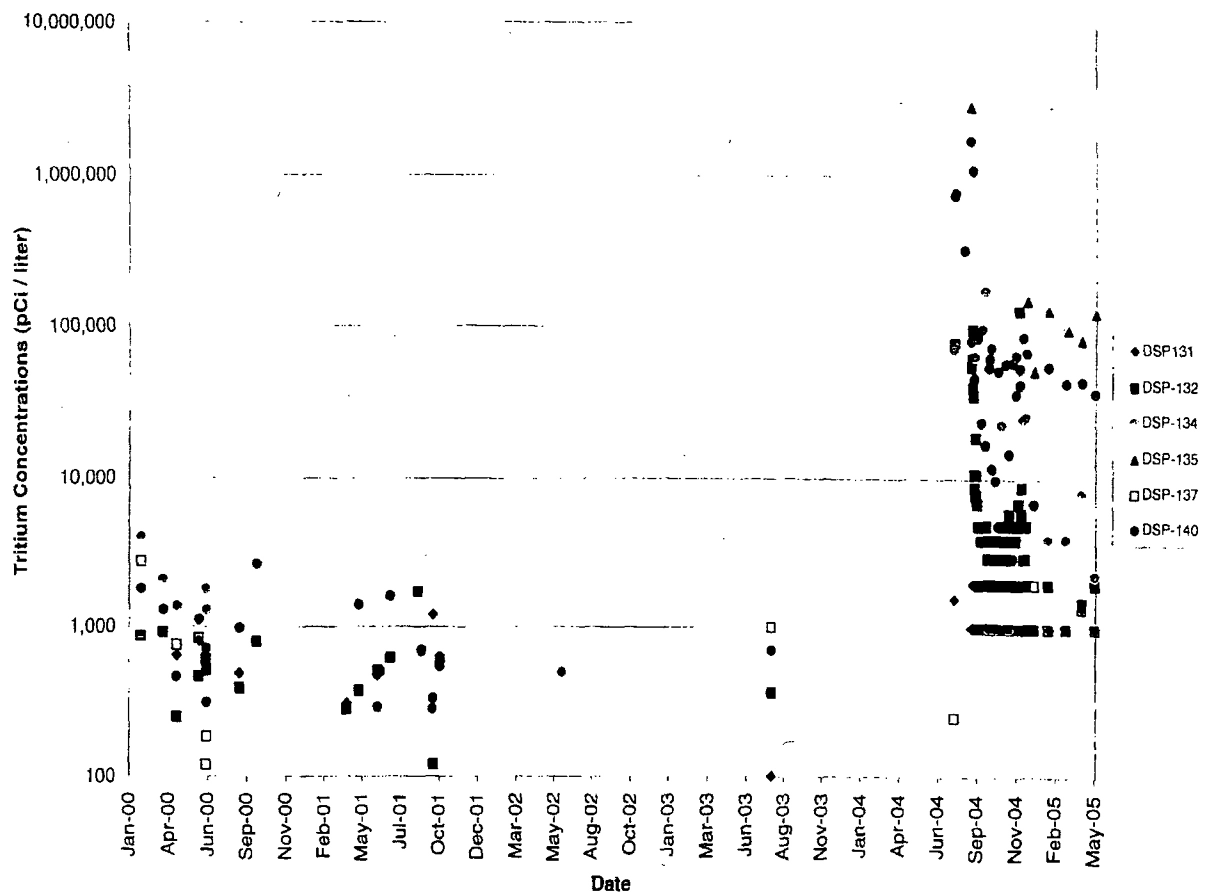
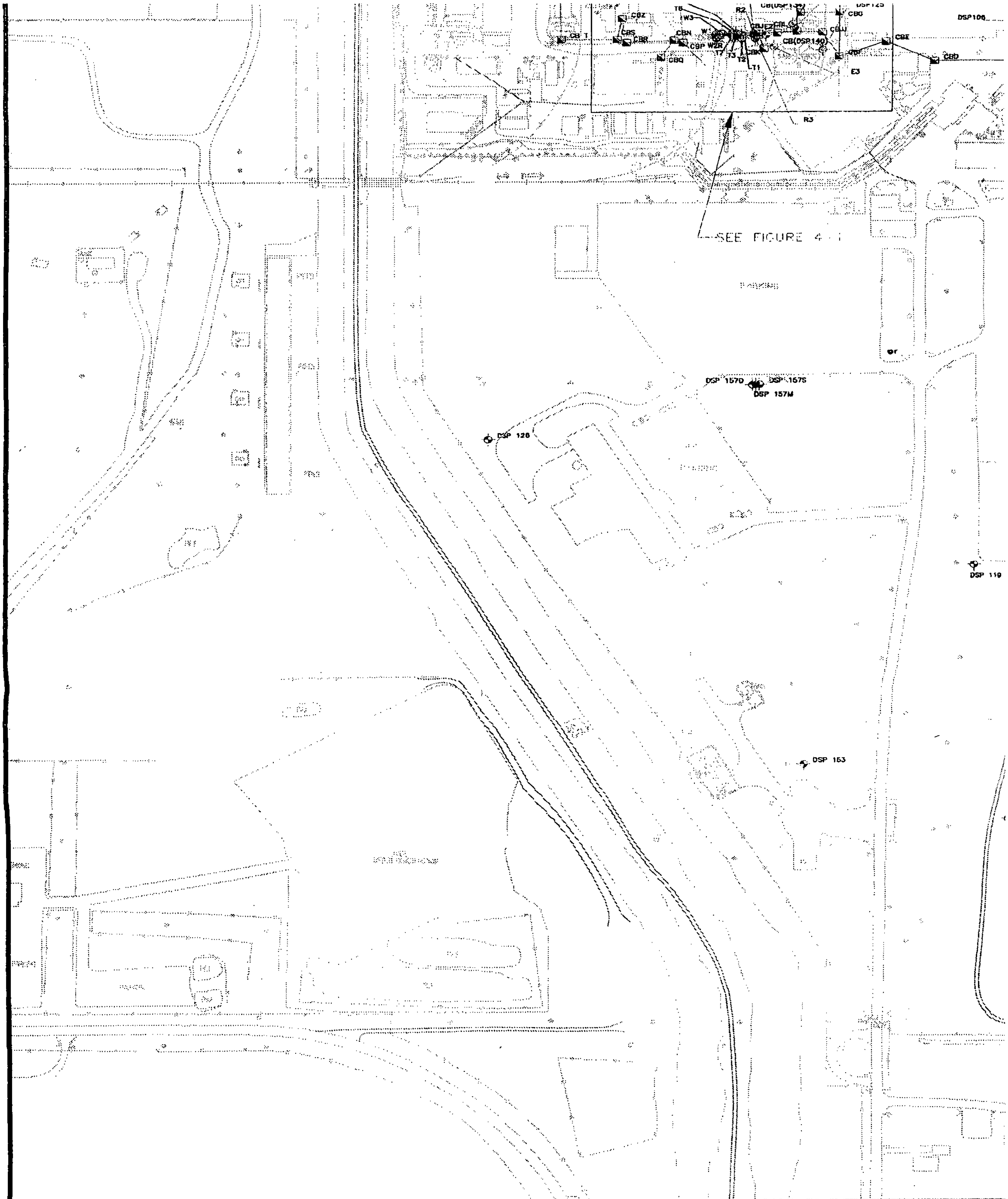


Figure 4-8 Tritium Concentration vs. Time in Storm Sewers





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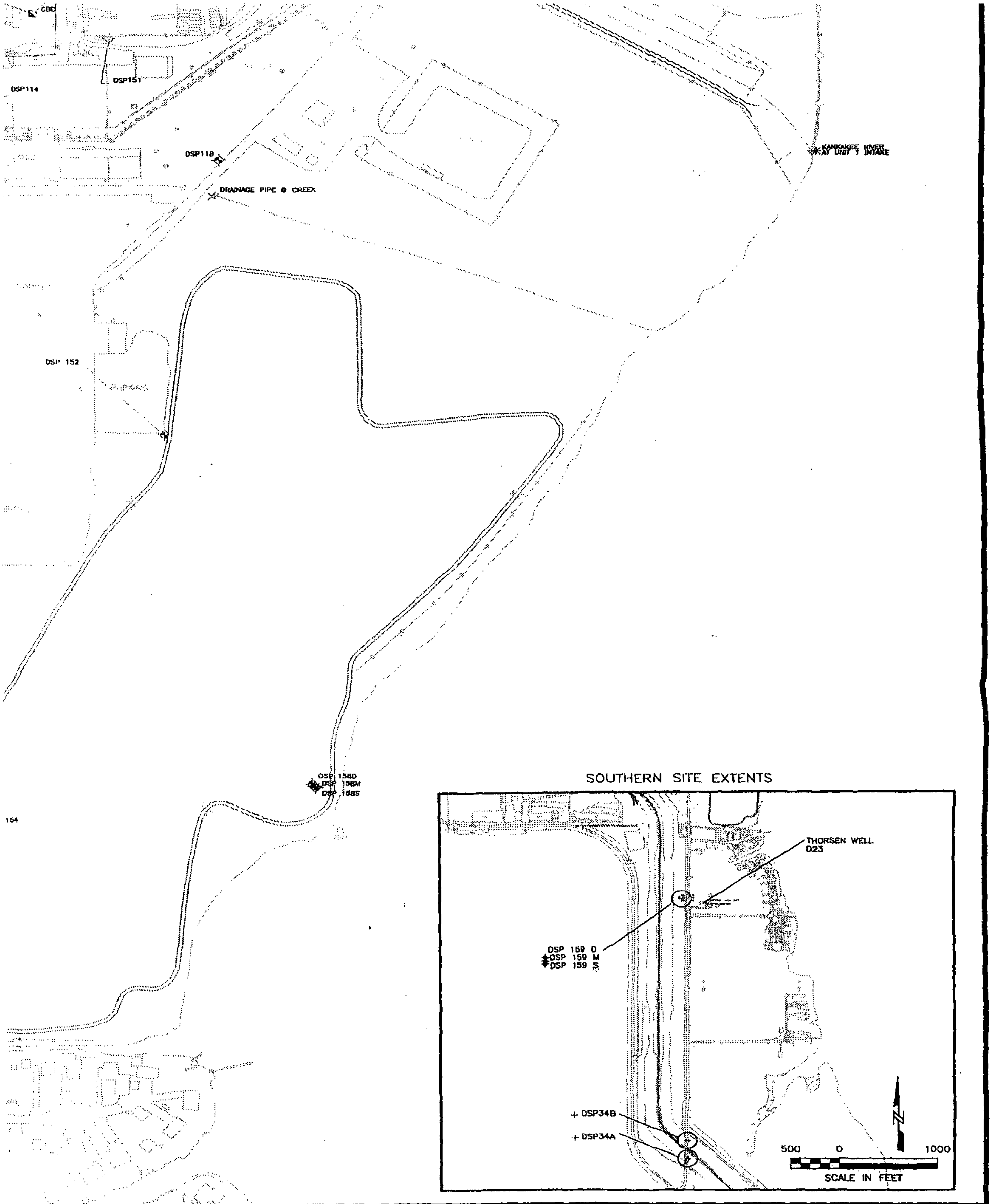
DATE: 07/25/05 | DRW



N GENERATION RIS, ILLINOIS NW-18513-400	SITE-WIDE WATER SAMPLING LOCATIONS DRESDEN STATION	
OLS/PGH		FIGURE 4-9

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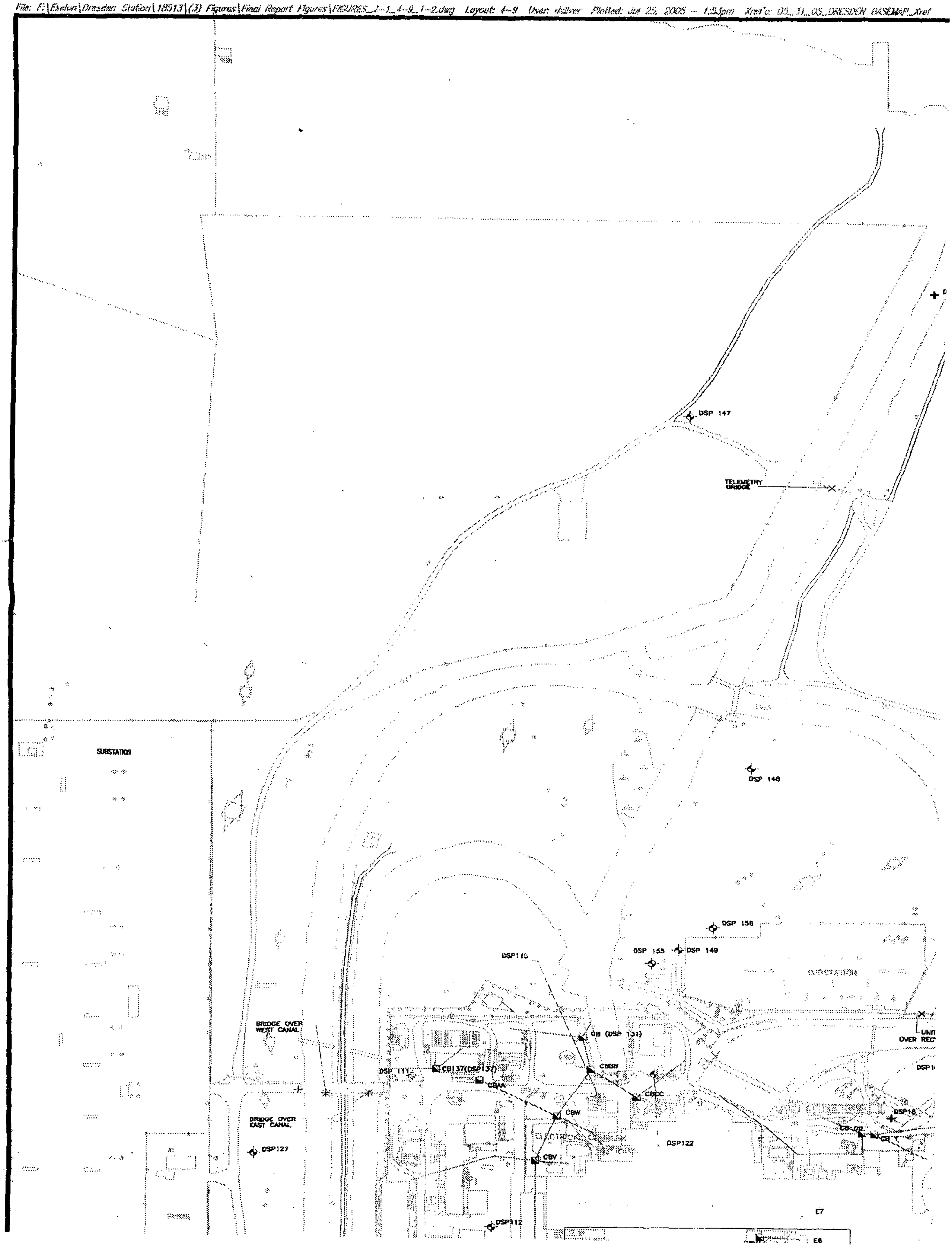


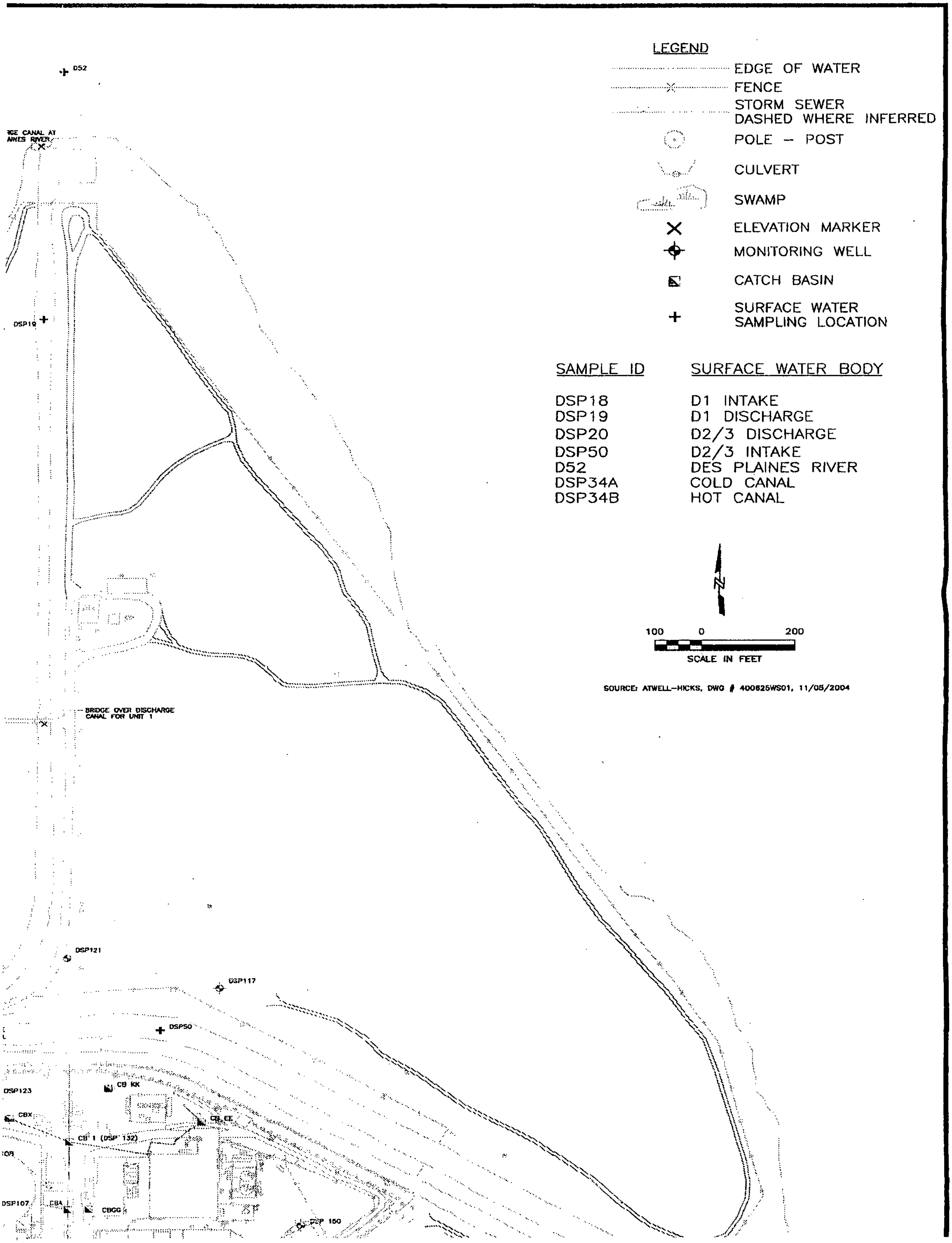

LEGEND
EDGE OF WATER
FENCE
STORM SEWER
DASHED WHERE INFERRED
POLE – POST
CULVERT
SWAMP
ELEVATION MARKER
MONITORING WELL
CATCH BASIN
SURFACE WATER
SAMPLING LOCATION
SAMPLE ID
SURFACE WATER BODY
DSP18 D1 INTAKE
DSP19 D1 DISCHARGE
DSP20 D2/3 DISCHARGE
DSP50 D2/3 INTAKE
D52 DES PLAINES RIVER
DSP34A COLD CANAL
DSP34B HOT CANAL
N
100 0 200
SCALE IN FEET
SOURCE: ATWELL–HICKS, DWG # 400625WS01, 11/05/2004
D52
DSP19
BRIDGE OVER DISCHARGE
CANAL FOR UNIT 1
DSP121
DSP117
DSP50
DSP123
CB KK
CBX
CB EE
CB 1 (DSP 132)
DSP107
CBA
CBGG
DSP 150

Figure 4-10 Tritium Concentration vs. Time in in Wells DSP124 and DSP125

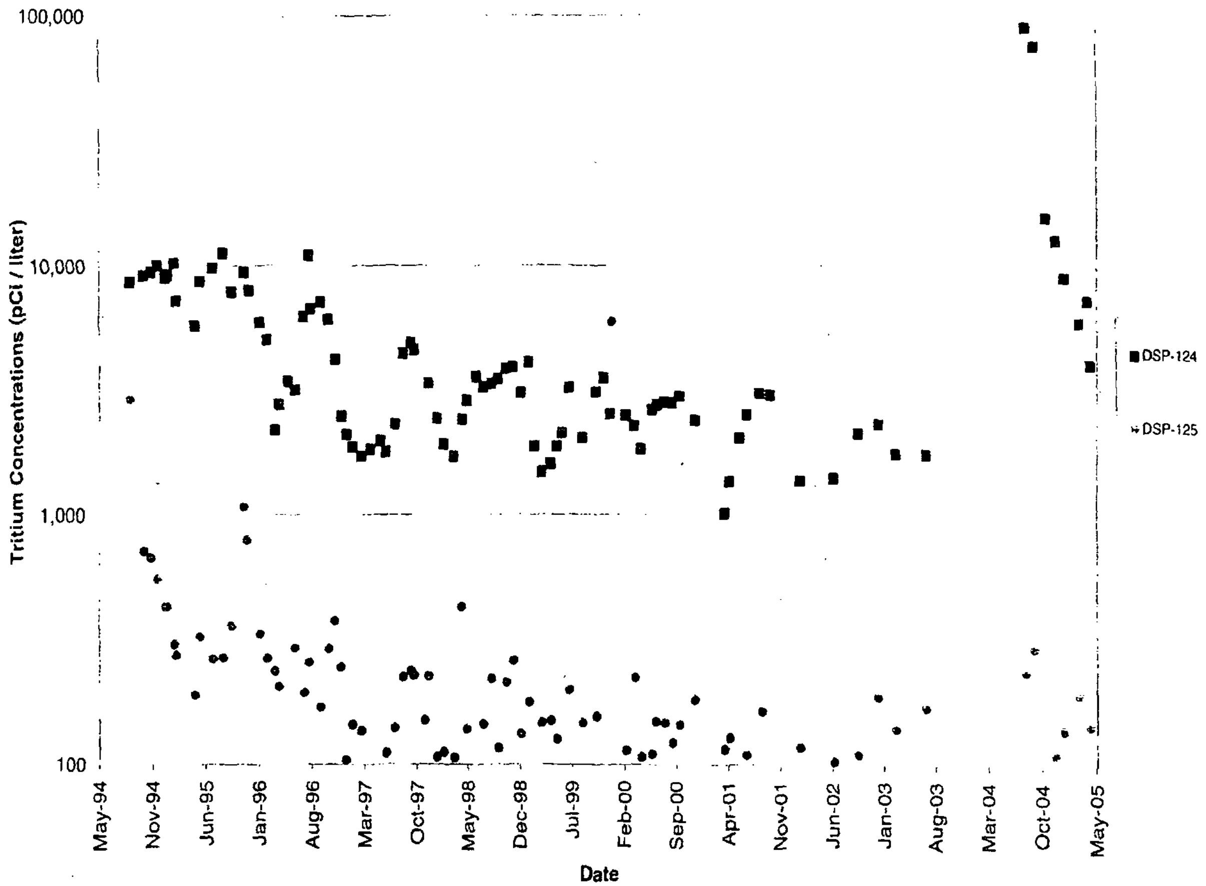


Figure 4-11 Tritium Concentration vs. Time in Wells DSP105, DSP106, DSP107, DSP108, and DSP123

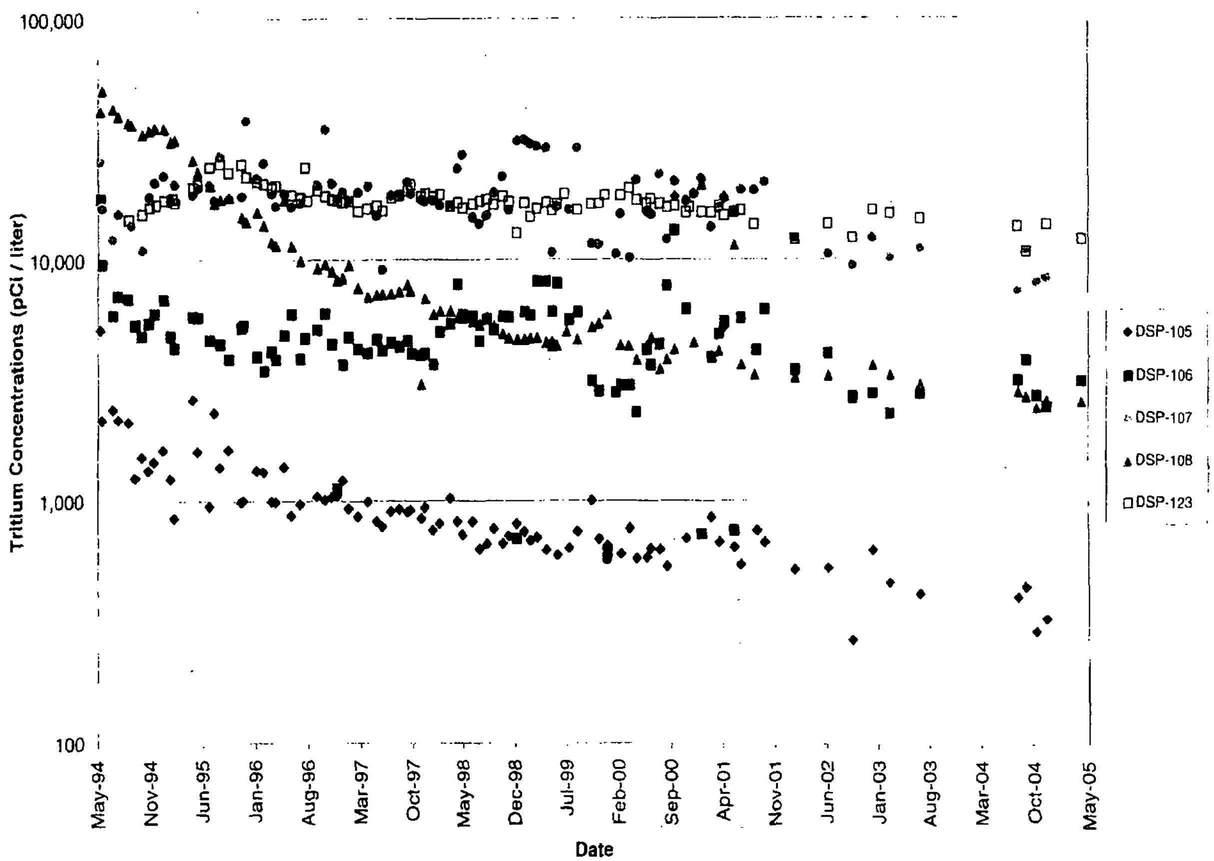
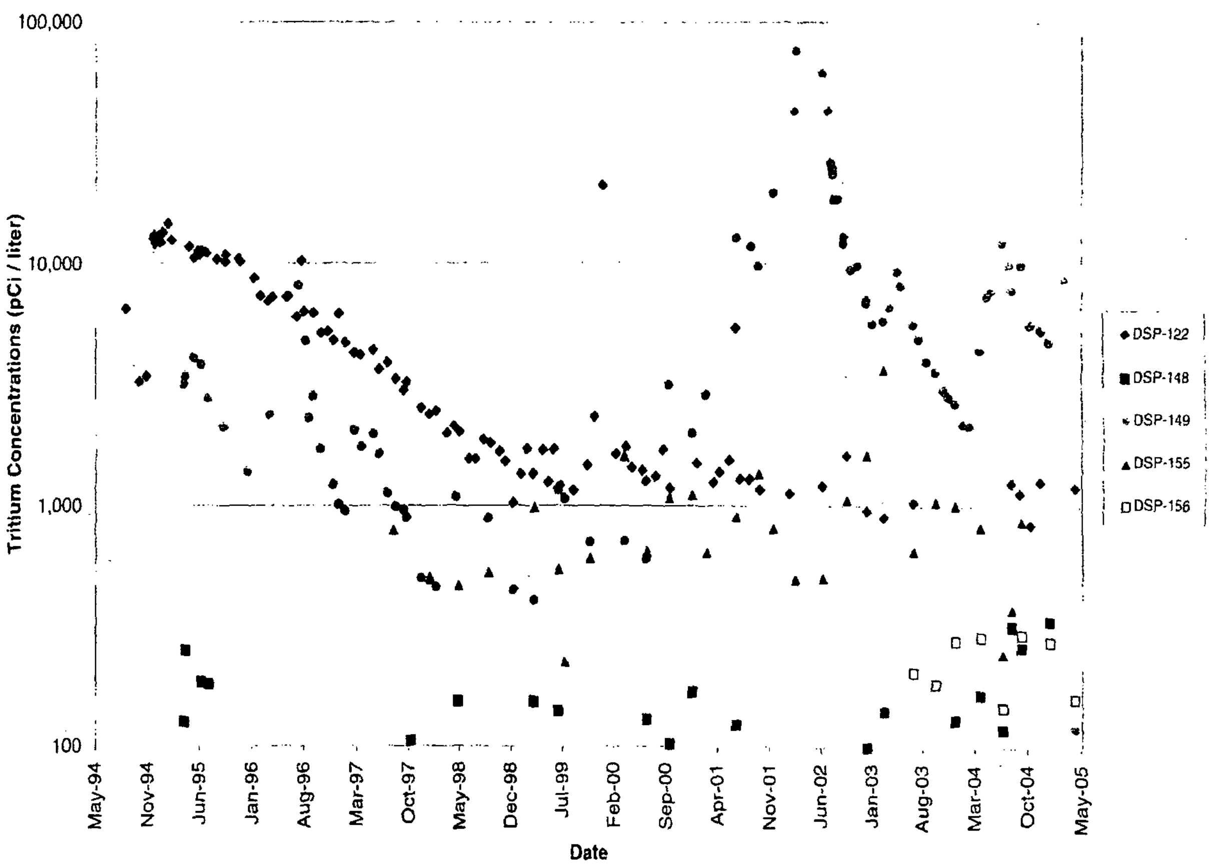
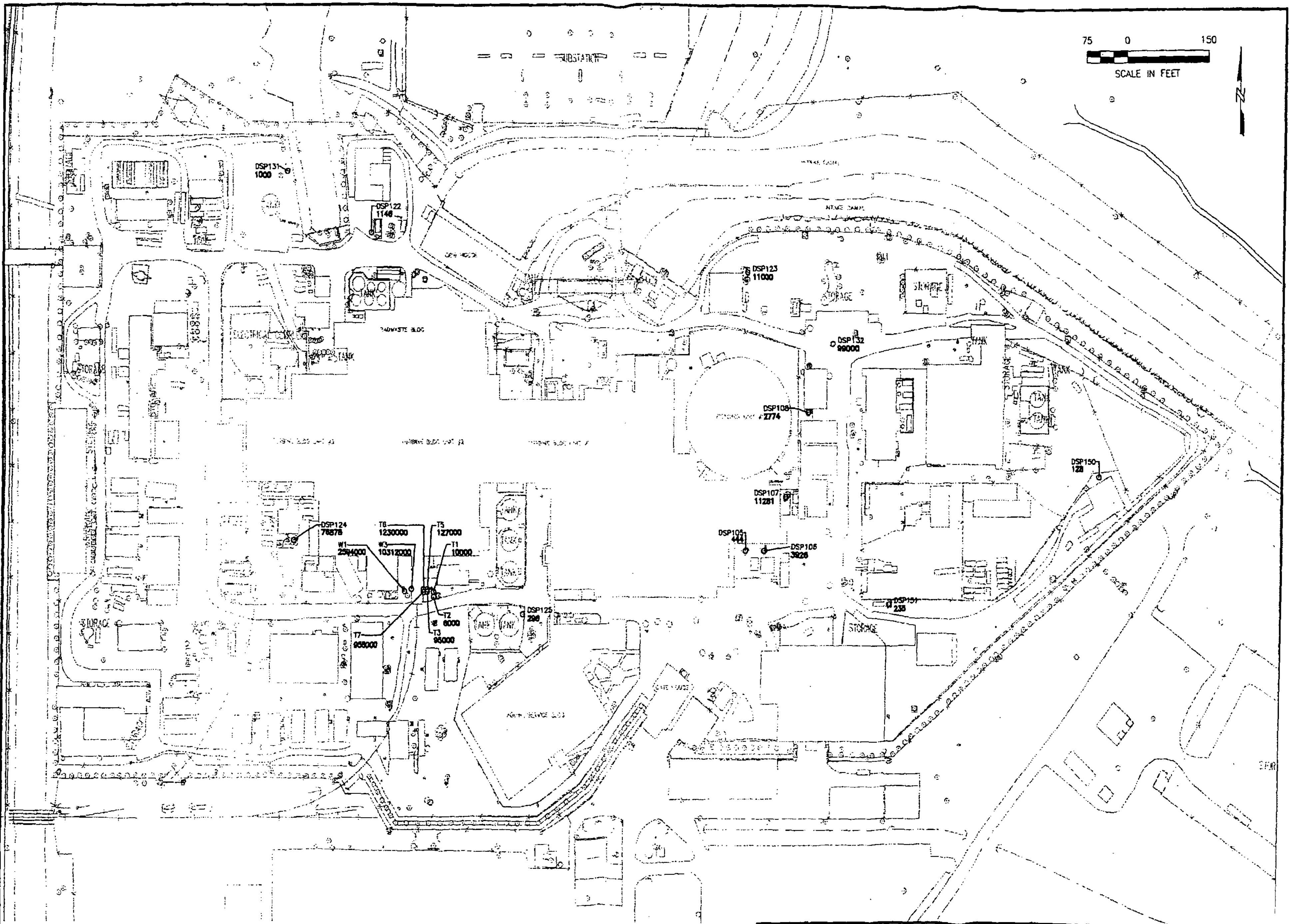


Figure 4-12 Tritium Concentration vs. Time in Wells DSP122, DSP148, DSP149, DSP 155, and DSP156

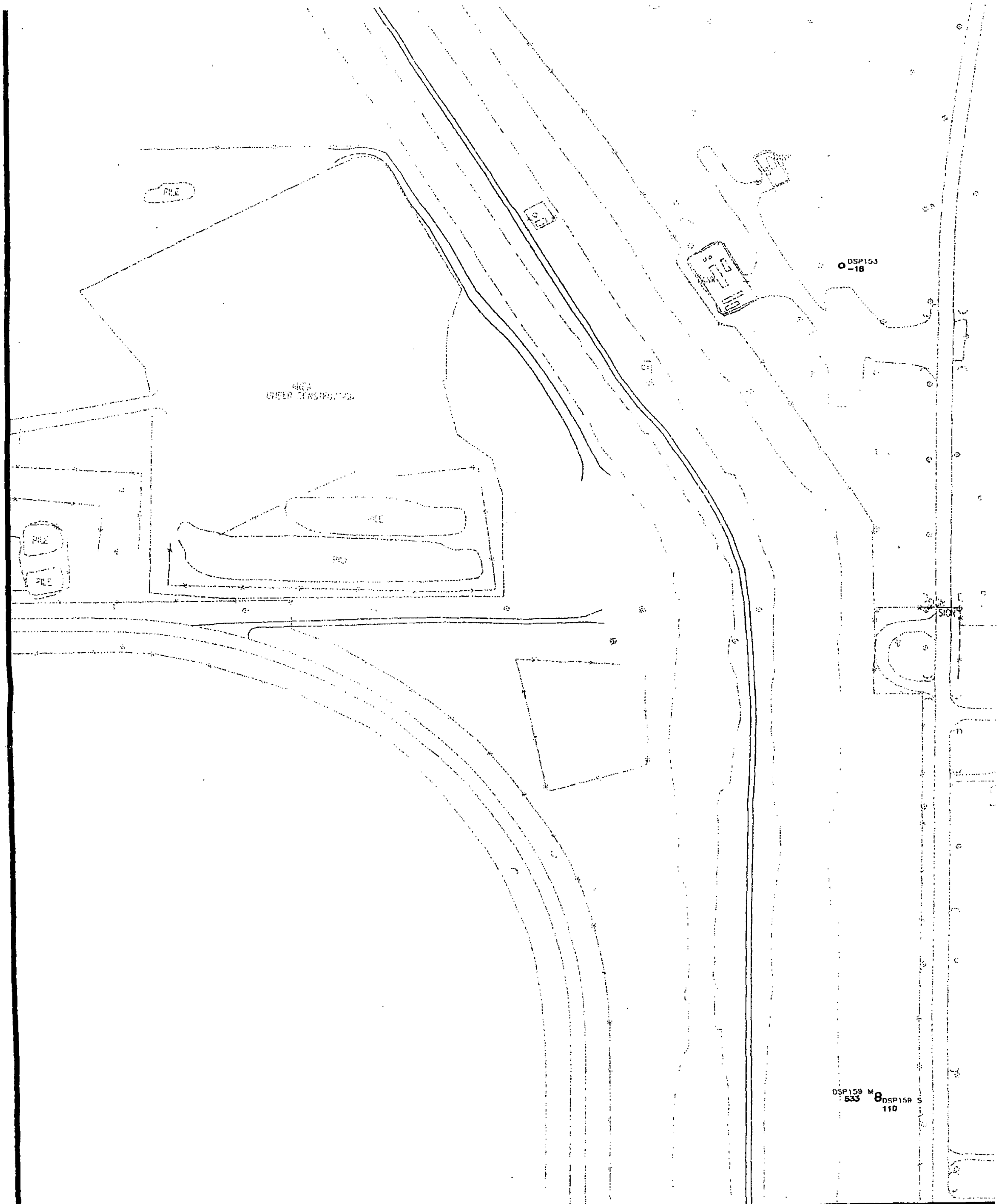




EXELON GENERATION
MORRIS ILLINOIS

TRITIUM CONCENTRATION MAP
SEPTEMBER 3, 2004

jects\Exelon Nuclear\Dresden\Cad\Dwg\FIGURES 4-13a and b.dwg Layout: TRIT_9-04_1 User: lmorris Plotted: Jul 21, 2005 - 1:39pm Xref's: EXENW-18511_BASE



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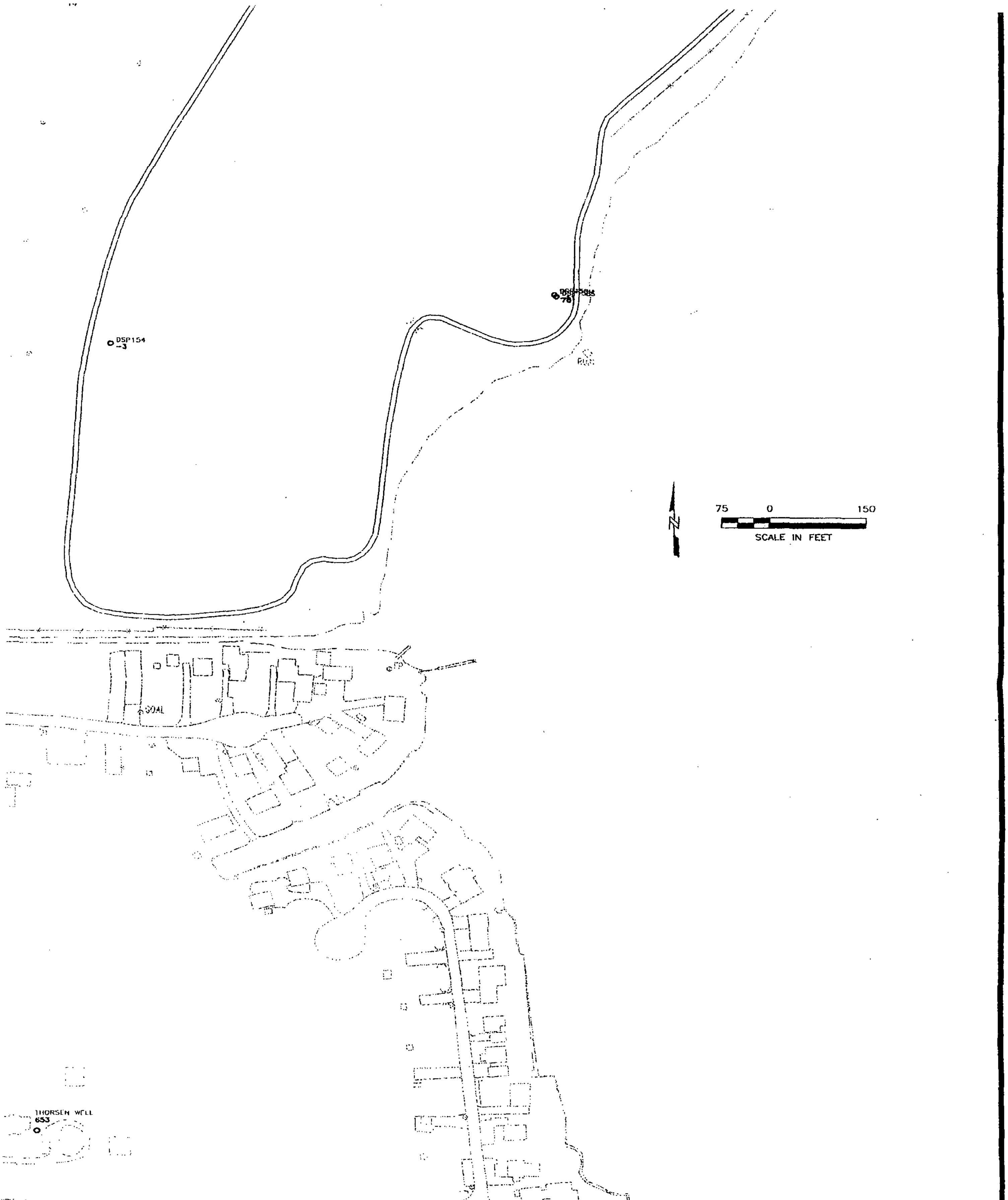
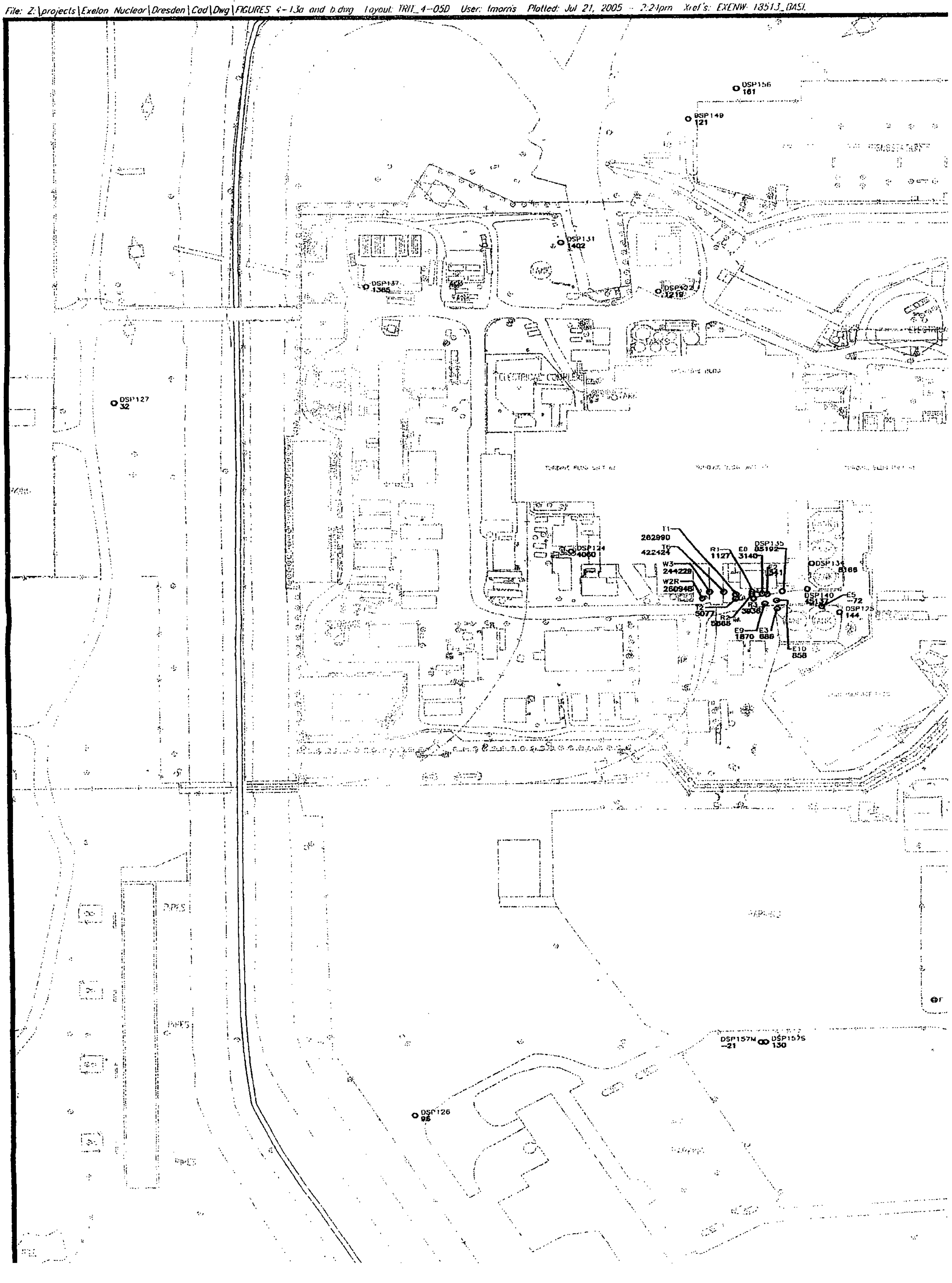


ON GENERATION ORRIS ILLINOIS EXENW-18513-400	TRITIUM CONCENTRATION MAP APRIL 4, 2005 DRESDEN STATION
WN: BcV/CON	FIGURE 4-13b

File: Z:\projects\Exelon Nuclear\Dresden\Cad\Dwg\FIGURES 4-13a and b.dwg Layout: TRIT_4-05D User: tmorris Plotted: Jul 21, 2005 - 2:24pm Xref's: EXENW-18513_BASI.



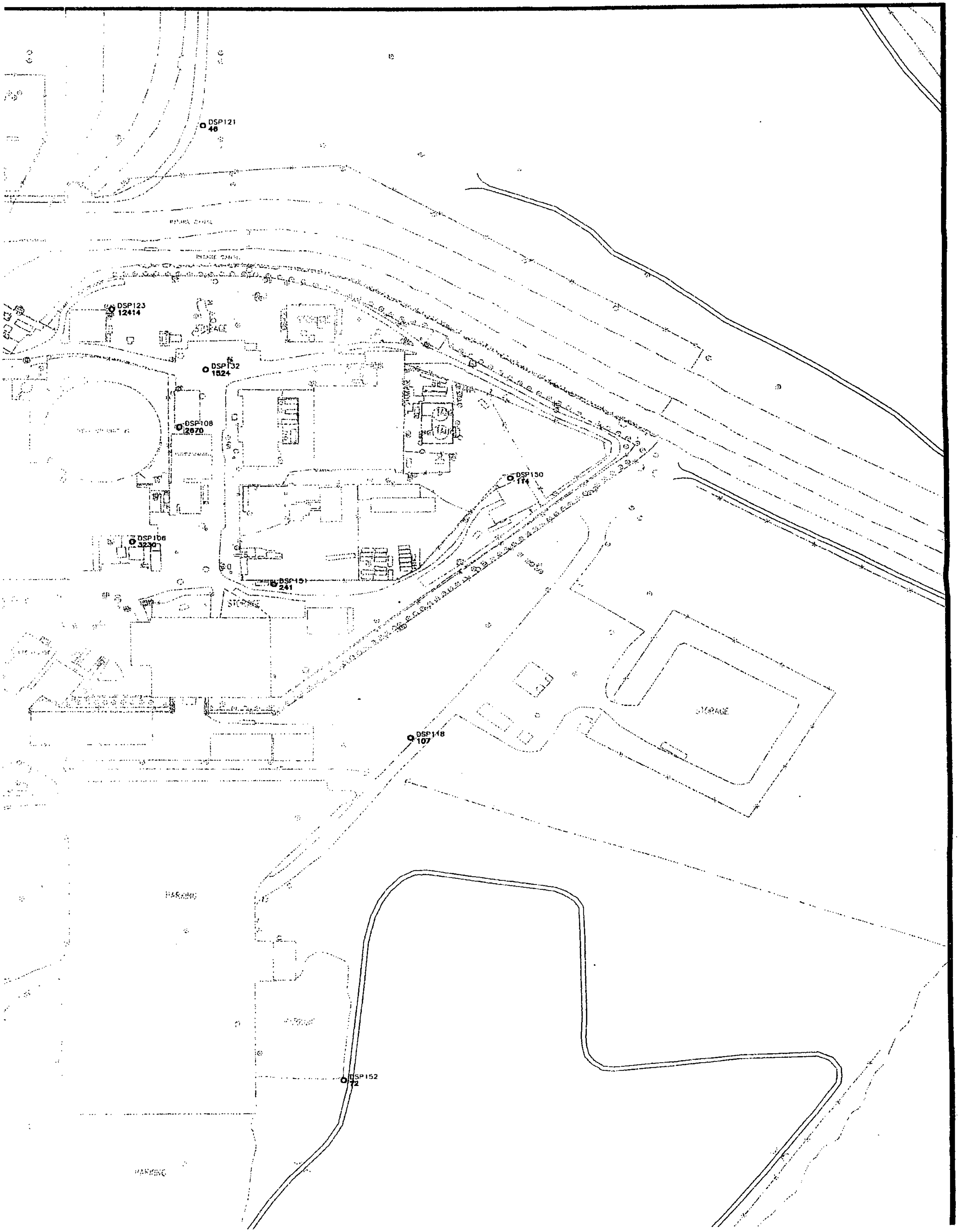

DSP121 46
DSP123 12414
STORAGE
DSP132 1524
DSP108 2670
DSP150 114
DSP106 3230
DSP151 241
STORAGE
STORAGE
DSP118 107
PARKING
DSP152 72
PARKING

Figure 4-14 Tritium Concentration vs. Time in Unit 2/3 Intake Canal, Cold Canal, and Unit 2/3 Discharge Canal

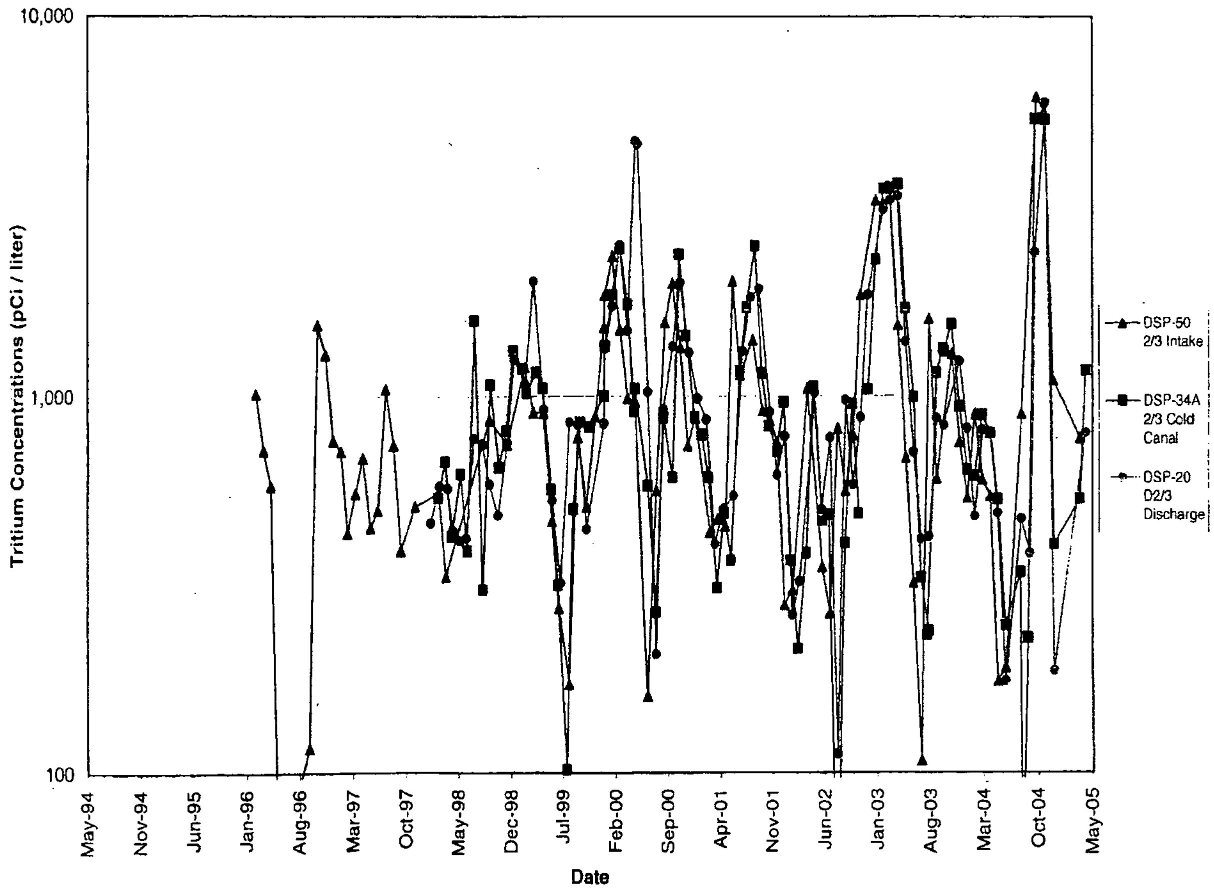
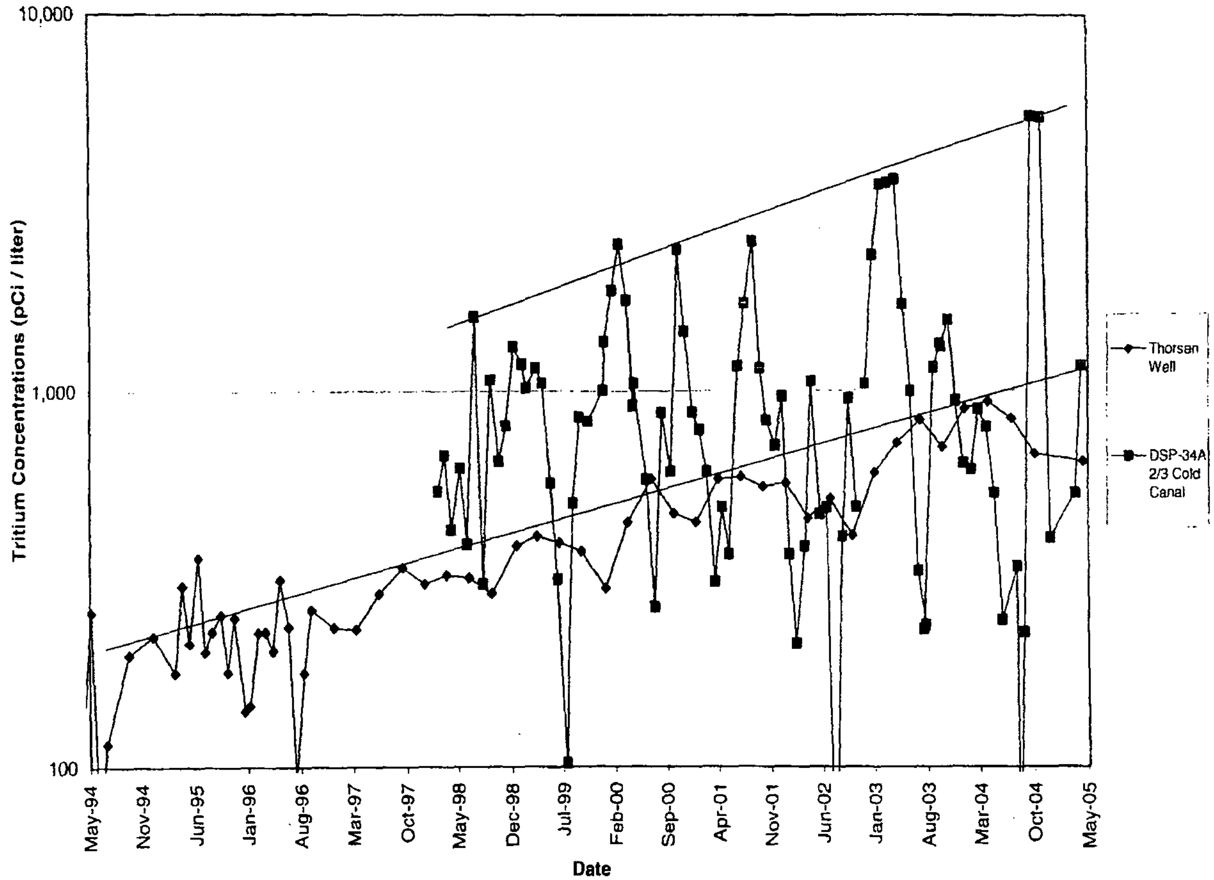


Figure 4-15 Tritium Concentration vs. Time in Thorsen Well and Cold Canal



5 Tritium Impacts Evaluation

5.1 Regional Background Tritium Levels

Tritium is a naturally occurring radioisotope of hydrogen, which decays as a beta emitter (half life of 12.3 years). It is produced in small quantities in the upper atmosphere where it is readily incorporated into water, and therefore, is present in rainwater and surface recharge to aquifer systems. In comparison to many other atmospheric radioactive isotopes, tritium is extremely rare and not affected by any chemical or biological processes. The naturally occurring tritium level in rainwater (pre-bomb era of early 1950 and before) is estimated at 5 to 10 tritium unit (TU), where one TU is equivalent to one tritium atom per 10^{18} hydrogen atoms and an equivalent gross beta radiation of 3.2 pCi/liter.

During the mid-1950s and early 1960s, the amount of tritium in the atmosphere was greatly increased as a result of nuclear weapons testing causing recharge waters to be "tagged" with excess tritium. Nuclear weapons testing resulted in atmospheric tritium levels in excess of 1,000 TU, with peaks occurring in 1963. However, since then, the values have declined due to the elimination of atmospheric nuclear weapons testing and radioactive decay. Present day background values in the range of 50 to 100 TU (i.e., 160 to 320 pCi/L) are common in the environment (Michigan DEQ, 2002). For all practical purposes, the regional background tritium level in the Dresden Station area will be considered to be equal to or less than 320 pCi/L.

5.2 Tritium Mass Release Assessment

Dresden Station personnel conservatively estimated that tritiated water was released from the CST system and discharged into the ground over a period of 344 days between November 2003 and October 2004 at a rate of 1.31 gallons per minute (gpm). The concentration of tritium in the CST system was approximately 9 to 10 million pCi/L. Based on these estimates, a total of 643,000 gallons of tritiated water, containing a total mass of approximately 2.31×10^{13} pCi of tritium, was released from the CST system.

Upon release, the tritiated water infiltrated through the unsaturated zone and into the groundwater. Because this location was situated within a groundwater mound, the release was transported in multiple directions. In addition, the depth of the foundation beneath the turbine building and reactor units extends to a depth of greater than 40 feet below ground surface, creating a hydraulic barrier to the north for shallow groundwater flow. Also, the excavation outside the foundation of the building and the backfill with permeable material (sand) created preferential pathways for groundwater flow around the building foundation. The primary local groundwater flow directions from the location of the release are to the east and to the northwest.

5.2.1 Shallow Groundwater Contribution

To represent the downstream transport of tritium using available monitoring data from the shallow monitoring wells, RETEC calculated the mass flux of tritium along several planes drawn perpendicular to the tritium plume in each groundwater flow direction. Figure 5-1 indicates the approximate limits of the tritium plume and the planes along which the mass flux was calculated. Detailed descriptions of the calculations performed in this evaluation and complete results are contained in Appendix G. The Darcy velocity was estimated using the hydraulic conductivity (K) value calculated from slug tests conducted at shallow monitoring well DSP157S and the hydraulic gradient (i) calculated from groundwater elevations measured in shallow wells in the vicinity of the CST system in April 2005:

$$\begin{aligned} v_{d,east} &= Ki = 3.29\times10^{-2}\ {}^{ft}\!/_{\min} \times 0.014\ {}^{ft}\!/_{ft} \\ &= 4.61\times10^{-4}\ {}^{ft}\!/_{\min} \times 1440\ {}^{\min}\!/_{day} \times 0.3048\ {}^{m}\!/_{ft} \\ &= 0.20\ {}^{m}\!/_{day} \end{aligned}$$

$$\begin{aligned} v_{d,west} &= Ki = 3.29\times10^{-2}\ {}^{ft}\!/_{\min} \times 0.0086\ {}^{ft}\!/_{ft} \\ &= 2.83\times10^{-4}\ {}^{ft}\!/_{\min} \times 1440\ {}^{\min}\!/_{day} \times 0.3048\ {}^{m}\!/_{ft} \\ &= 0.12\ {}^{m}\!/_{day} \end{aligned}$$

Using the average tritium concentration (C) for each plane, the mass flux was calculated as follows:

$$Flux = Cv_d$$

The mass flux observed along each plane is graphed versus time for groundwater flow to the east and west in Figures 5-2 and 5-3, respectively. As anticipated, the graph of flux east of the release indicates that planes drawn farther from the source generally show later peaks in mass flux, with peak flux values lower than planes drawn closer to the source. The distance between Plane 4 and Plane 5 divided by the time between peaks on the respective mass flux graphs for these planes gives an estimate of the travel time of the release equal to 4.7 centimeters per day (cm/day) to the east of the source area. The lack of a discernable peak in mass flux in Planes 1 through 3 likely indicates that these peaks were missed in the lag in monitoring between samples taken prior to the release and the July 2004 sample collection. Because only one monitoring plane could be drawn to represent data collected west of the release, a travel time of the release in this direction was not calculated. Note that the mass flux graph in the western direction does not show a discernable peak. It is also likely that the peak in mass flux in this direction was missed in the lag in monitoring.

To estimate the mass discharged over the area of each plane in units of pCi per square meter, the average mass flux between sample dates was multiplied by the number of days between samples. The plume cross-sectional area was then modeled as follows. The width of the plume at the source was estimated to be approximately 20 feet based on the geometry of the source area at the release. Based on the depth of the deepest shallow monitoring well, the depths of both the eastern-moving and western-moving plumes at and near the source were estimated as 10 feet. These dimensions give a cross-sectional area of 200 square feet at the source.

Based on a typical plume geometry identified in Fetter (1999), a ratio of longitudinal dispersivity (i.e., along the plume centerline) to transverse dispersivity (i.e., outward from the plume centerline) was assumed as 10:1. Therefore, based on an estimated plume length of 210 feet in the eastern direction, a maximum plume width was approximated as the source width plus twice the lateral dispersivity, or 62 feet. Likewise, using an estimated plume length of 255 feet in the western flow direction, the maximum width of the plume is approximated as 70 feet. By multiplying the mass discharged per square meter by the modeled area of the plume, the total mass discharged through each plane was estimated for each sample period. Finally, by summing the mass discharge during each sample period, the total mass of tritium discharged through each plane was approximated.

Since no monitoring plane exists at or near the source in the western direction, the source concentrations in this direction were estimated based on monitoring at Plane 10. An analytical model (BIOSCREEN) was applied to simulate a one-dimensional solute distribution using site-specific and constituent-specific information (USEPA, 1997). The model inputs are described in more detail in Section 5.4.1. For calculation of the western source concentration, the plume length was set equal to 255 feet, as shown in Figure 5-1. The tritium source was modeled as a continuous source for a period of one year. The source concentration was then adjusted iteratively until the concentration at the end of the plume, approximated the value of 55,000 pCi/L based on the concentration detected at well DSP-124 on July 31, 2004. The resulting western source concentration is estimated at 200,000 pCi/L during the release. Using the degradation rate of concentrations detected at DSP-124, a degradation rate was applied to the western source concentration for each sample date to approximate a total mass discharged to the west through the theoretical plane drawn at the source location.

Based on the modeled planes nearest the source, approximately 4.18×10^{12} pCi has been discharged to groundwater flow east of the release and 1.81×10^{11} pCi has been discharged to groundwater flow west of the release, for a total mass of 4.36×10^{12} pCi discharged to groundwater. Based on a tritium concentration in the CST system of 9 to 10 million pCi/L, as estimated by Dresden Station personnel, this mass equates to approximately 121,000 gallons of tritiated water released to groundwater.

5.2.2 Storm Sewer Contribution

A portion of the Dresden Station storm sewer lies within the identified area of the tritium plume. Groundwater measured in shallow wells in the vicinity of the CST system is approximately 2 feet higher in elevation than measured invert elevations along the plant storm sewers (assumed to be 18 inches in diameter). Analysis of samples collected from storm sewer catch basins within the identified tritium plume (DSP134 and DSP135) and at the outlets of storm sewers draining east to the Unit 1 intake canal (DSP132) and west toward the Unit 2/3 discharge canal (DSP131), indicate significant increases in tritium concentrations following the estimated time of release from the CST system. These observations indicate that a portion of the tritium released to groundwater is infiltrating into the storm sewers flowing in each direction and discharging to the respective storm sewer outlets into the Unit 1 intake canal and Unit 2/3 discharge canal. Tritium discharged to the Unit 1 intake canal lies stagnant in the non-operational intake, while that discharged to the Unit 2/3 discharge canal flows through the hot canal to Dresden Cooling Lake prior to return flow through the cold canal, and out to the Des Plaines River or back into the Unit 2/3 intake.

Daily precipitation data from the Dresden Island Weather Station, obtained from *accuweather.com*, was used to estimate an average daily rate of runoff over the east-draining and west-draining storm sewer drainage areas. Since the majority of the drainage area for the storm sewers is covered in impervious material (e.g., asphalt or rooftops), it was assumed that 85% of the precipitation flows to the sewers as runoff. The volume of daily runoff was therefore calculated as 85% of the precipitation depth multiplied by the drainage basin area for each daily precipitation depth.

A base flow rate, due to groundwater ingress into the storm sewers, was also estimated for each sewer. It was assumed that approximately 10% of the sewer pipe surface area was cracked, allowing groundwater ingress through the cracks. Assuming that groundwater ingress occurs over approximately one-half the surface area of the pipe, the area subject to ingress was estimated by multiplying the pipe circumference times the length times 0.5. The groundwater seepage velocity was estimated in each direction using the hydraulic conductivity value and hydraulic gradient values identified above, with an assumed effective porosity of sandstone equal to 15% based on a typical value stated in USEPA (1989).

$$v_{s,east} = \frac{Ki}{n} = \frac{3.29\times10^{-2}\ ft/_{min}\times 0.014\ ft/_{ft}}{0.15}$$
$$= 3.07x10^{-3}\ ft/_{min}\times 1440\ min/_{day}\times 0.3048\ m/_{ft}$$
$$= 1.35\ m/_{day}$$

$$v_{s,west} = \frac{Ki}{n} = \frac{3.29\times10^{-2}\ ft/_{min}\times 0.0086\ ft/_{ft}}{0.15}$$
$$= 1.89\times10^{-3}\ ft/_{min}\times 1440\ min/_{day}\times 0.3048\ m/_{ft}$$
$$= 0.83\ m/_{day}$$

The base ingress flow for each storm sewer was then estimated as the ingress area times 10% (cracked percentage of pipe) times the seepage velocity calculated as discussed above.

Based on addition of the estimated runoff and base flows, a daily storm sewer flow was estimated for each sewer. Daily tritium concentrations in the outlet catch basins were estimated based on a linear interpolation between sampling dates. By multiplying the daily tritium concentration in the outlet catch basin by the estimated daily flow rate, the daily mass of tritium discharged through each outlet was estimated. Summing these results since the estimated start of the release indicate that a total of $5.27x10^{12}$ pCi has been discharged to the Unit 1 intake canal and $7.33x10^{10}$ pCi has been discharged to the Unit 2/3 discharge canal, for a total mass of tritium discharged through the plant storm sewers of approximately $5.34x10^{12}$ pCi. Based on an estimated tritium source concentration of 9 to 10 million pCi/L by Dresden Station personnel, this mass equates to approximately 148,000 gallons of tritiated water released to the storm sewer.

5.2.3 Net Release of Tritium Mass

The net release of tritium mass was evaluated from the analyses of discharge to groundwater and storm sewers as follows. Since the mass discharged to groundwater in the western direction greatly exceeds the mass discharged to the western storm sewer, and the western storm sewer lies downgradient of the release, it is assumed that the mass observed in the western sewer represents a portion of the mass observed in groundwater. In the eastern direction, however, the estimated source mass discharged to stormwater exceeds the mass discharged to groundwater at the monitoring point nearest the source (i.e., Plane 1 in Figure 5-1). Since the eastern storm sewer originates immediately within the source area and follows near the plume centerline, it appears that much of the source mass may be discharging to the storm sewer upgradient of Plane 1. Therefore, the total mass discharged in the eastern direction is estimated by adding the contribution observed in groundwater at Plane 1 to the estimated mass discharged to the eastern storm sewer.

Based on these analyses, the net tritium mass discharged to the groundwater and to the storm sewer from the CST system is approximated by adding the mass discharged to the western flowing groundwater (i.e., mass at the theoretical source plane), the mass discharged to the eastern flowing groundwater (i.e., mass at Plane 1), and the mass discharged to the eastern storm sewer (i.e., through DSP132). This provides a net tritium mass of 9.63×10^{12} pCi released to the groundwater and storm sewer system in the vicinity of the liquid nitrogen tank. Based on an estimated tritium source concentration of 9 to 10 million pCi/L by Dresden Station personnel, this total mass represents approximately 267,000 gallons of tritiated water released from the CST system, which is 42% of the volume estimated originally by the Dresden Station personnel.

5.3 Rate of Tritium Release

Based on the analysis presented in the previous section and a total mass of tritium released over the duration of the discharge from the CST system (i.e., 344 days between November 2003 and October 2004 based on communication with Dresden Station personnel), the net rate of tritium released to the Dresden Station groundwater and sewer systems amounts to 2.80×10^{10} pCi per day.

5.4 Potential Impacts to Groundwater

5.4.1 Shallow Groundwater

RETEC developed a conceptual model of fate and transport of tritium in the above-described groundwater plumes for the purposes of identifying the approximate length of time required for groundwater to deplete tritium concentrations at the source of the release. The solute transport modeling effort employed an analytical solution, developed by Domenico (1987), as the governing equation for transport of a decaying solute. The analytical model (BIOSCREEN) simulated a one-dimensional solute distribution using site-specific and constituent-specific information developed in the conceptual model (USEPA, 1997).

The source area defined in the conceptual model was the area surrounding the approximated location of the release. The estimated maximum plume length in each flow direction (i.e., east toward the Unit 1 intake canal and west toward the hot canal) was based on the maximum distance the tritium would travel in groundwater prior to entering plant canals. The source thickness was estimated at 10 feet saturated thickness, based on the shallow depth of the pipe where release occurred (approximately 3 to 5 feet below ground surface).

The concentration of tritium at the source was modeled as a finite soluble mass, with a distinct source mass assigned to each direction of flow. The source mass contributing to the plume moving west from the source was estimated by subtracting the total tritium mass discharged through the storm sewer to DSP131 from the total mass discharged to groundwater in the western flow direction. It was assumed that preferential flow through the sewer reduces the mass in the plume downgradient of the point at which the total mass discharged to groundwater was evaluated (i.e., at the theoretical source plane). The source mass discharging east of the liquid nitrogen tank was taken as the total mass discharging to the groundwater. The calculated mass discharging to stormwater in the eastern direction exceeds the mass discharging to groundwater, indicating that (1) tritium enters the storm sewer upgradient of the monitoring points evaluated for discharge to groundwater (i.e., Plane 1), and/or (2) limited data during the early period of the release may miss the peak in tritium concentrations nearest the source, resulting in an underestimation of the mass discharged to groundwater.

Dissolved tritium migrates in the direction of groundwater flow through the process of advection, dispersion, and degradation. Advective transport is controlled by the direction and magnitude of the groundwater seepage velocity. Groundwater seepage velocity was calculated using site-specific values for hydraulic conductivity and hydraulic gradient, and an assumed value for effective porosity based on the sandstone aquifer. The hydraulic conductivity was taken as the value calculated from the slug test conducted at shallow monitoring well DSP157S, which is similar in lithology to the area of the CST. The average hydraulic gradient was estimated from water table contour maps developed from measurements of groundwater elevation during the sampling event conducted on April 8, 2005. The effective porosity was derived as the typical value for nonfractured rocks such as sandstone (USEPA, 1989). These parameters provide an estimate of uniform seepage velocity for the shallow aquifer.

The amount of dispersion is a function of the dissolved-phase plume size. The longitudinal dispersivity was modeled as a function of plume length using methods given by Xu and Eckstein (1995). The transverse dispersivity was taken as 10% of the longitudinal dispersivity (Gelhar et al., 1992). The vertical dispersivity was taken as 10% of the transverse dispersivity (ASTM, 1995). These relationships represent the low-end of typical dispersivity values presented in literature.

Degradation of tritium occurs through radioactive decay. Degradation of tritium was modeled as a first order decay reaction. The rate of degradation is described by the time it takes for the initial constituent mass to decay and is commonly referred to as the half-life (t_h). The half-life value for tritium used in the modeling was based on a value of 12.3 years (Michigan DEQ, 2002).

Attenuation factors were established for each compound within BIOSCREEN based on the input parameters described above and listed in Table 5-1. After inputting these parameters, the simulation time was varied to identify the time after which concentrations of tritium in the plume were reduced to levels below background (typically 160 to 320 pCi/L).

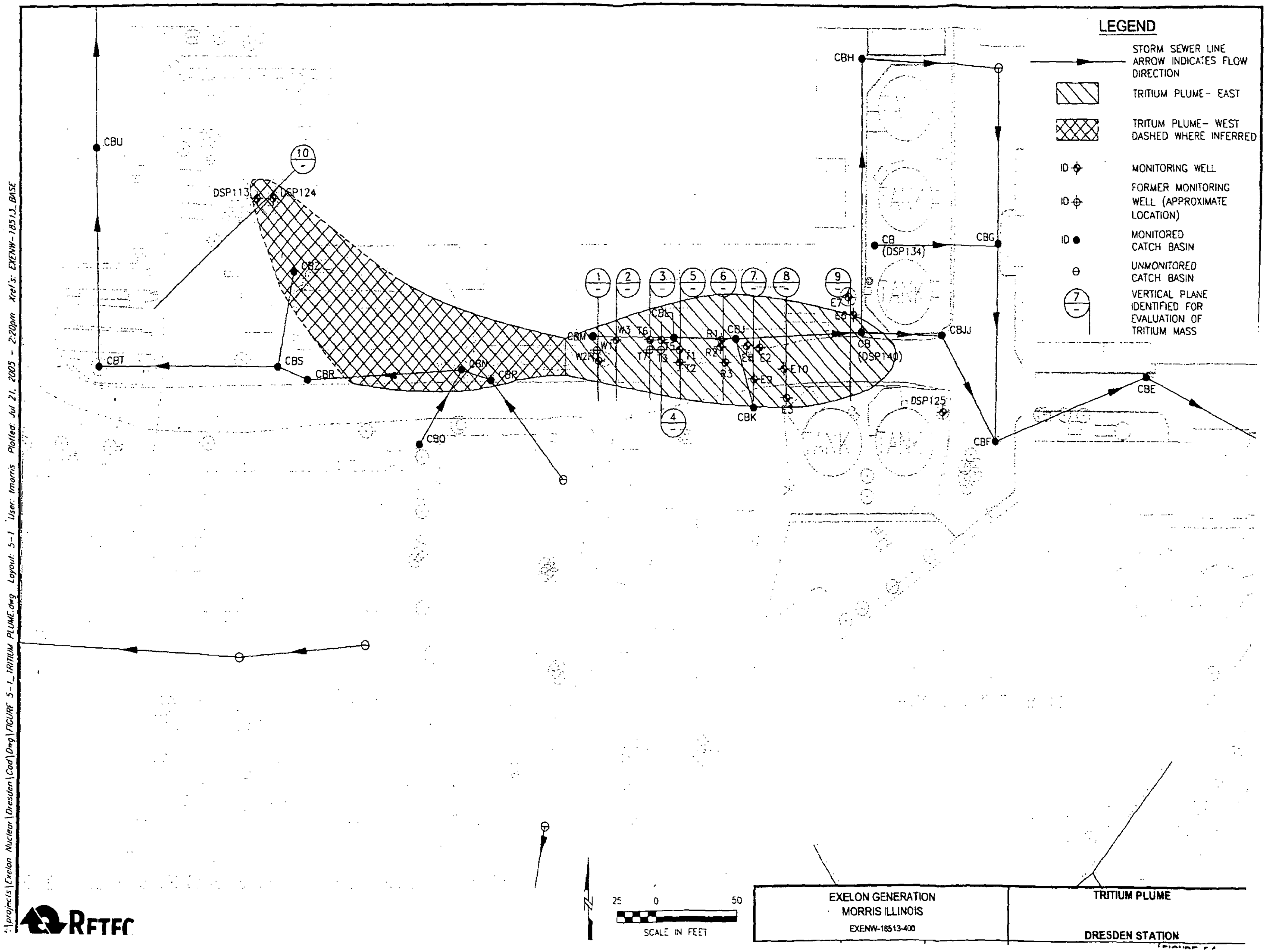
Based on the results of the modeling, concentrations of tritium at the source and along the western plume (toward the hot canal) will decrease to below 90 pCi/L after approximately 5 years from the pipe repair. Similarly, the concentrations at the source and along the eastern plume will drop below 290 pCi/L after approximately 8 years. Results for these time periods appear to be conservative based on a comparison of current monitoring data with the 1-year predictions from the BIOSCREEN modeling.

5.4.2 Residential Wells

Based on the analysis of the site hydrogeology, it is most likely that the bulk of the tritium discharge to groundwater is flowing in the easterly and northwesterly directions under the influence of the local hydraulic gradient. The relatively high seepage velocity calculated in shallow groundwater indicates that movement of the plume will likely continue to follow the local hydraulic gradient in each direction, flowing east alongside plant building foundations and northeasterly toward the Unit 1 intake canal, and flowing west alongside plant building foundations and northwesterly toward the hot canal. Because of this preferential flow path, the tritium plume is not likely to come under the influence of the regional gradient in the southeasterly direction, which is the only way groundwater impacted by tritium from the CST system could impact the residential wells south of Dresden Station.

Table 5-1 BIOSCREEN Modeling Site-Specific Input Parameters

Input Parameter	Value	Reference
Hydraulic Conductivity, K	1.67E-02 cm/s	Value from calculations from slug test data (2005) for shallow well DSP-157S
Hydraulic Gradient, i_{east}	0.014 feet/feet	Calculated horizontal gradient from groundwater elevation data collected 4/2005 within the shallow aquifer.
Hydraulic Gradient, i_{west}	0.0086 feet/feet	
Porosity, n	15 %	Typical Effective Porosity of Sandstone (USEPA, 1989)
Plume Length, $L_{p, east}$	1330 feet	Maximum plume length upgradient of former Unit 1 Intake Canal
Plume Length, $L_{p, west}$	890 feet	Maximum plume length upgradient of Unit 2/3 Discharge (Hot) Canal
Transverse Dispersivity, a_y	a_x/10 feet	Zheng and Bennet (1995). Taken as an order of magnitude smaller than a_x
Vertical Dispersivity, a_z	a_x/100 feet	Zheng and Bennet (1995). Taken as two orders of magnitude smaller than a_x
Modeled Source Thickness, Z	10 feet	Assumed depth of impacts at source
Source $Mass_{east}$	4.18E+12 pCi	Total mass estimated at nearest monitoring points to source. A larger component of source mass is likely discharged to storm sewer upgradient of nearest monitoring points.
Source $Mass_{west}$	1.08E+11 pCi	Total mass estimated in groundwater at nearest monitoring point to source minus total mass discharged through west storm sewer.
Tritium Half-Life	12.3 years	Michigan DEQ


LEGEND
STORM SEWER LINE ARROW INDICATES FLOW DIRECTION
TRITIUM PLUME- EAST
TRITUM PLUME- WEST DASHED WHERE INFERRED
MONITORING WELL
FORMER MONITORING WELL (APPROXIMATE LOCATION)
MONITORED CATCH BASIN
UNMONITORED CATCH BASIN
VERTICAL PLANE IDENTIFIED FOR EVALUATION OF TRITIUM MASS
CBU
CBT
CBS
CBR
CBZ
CBO
CBN
CBP
CBM
CBL
CBJ
CBK
CBH
CBG
CBJJ
CBF
CBE
CB (DSP134)
CB (DSP140)
DSP113
DSP124
DSP125
W1
W2
W3
T1
T2
T3
T5
T6
T7
R1
R2
R3
E2
E3
E6
E7
E8
E9
E10
SCALE IN FEET
EXELON GENERATION
MORRIS ILLINOIS
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TRITIUM PLUME
DRESDEN STATION
RETEC

Figure 5-2 Mass Flux East of Release Area

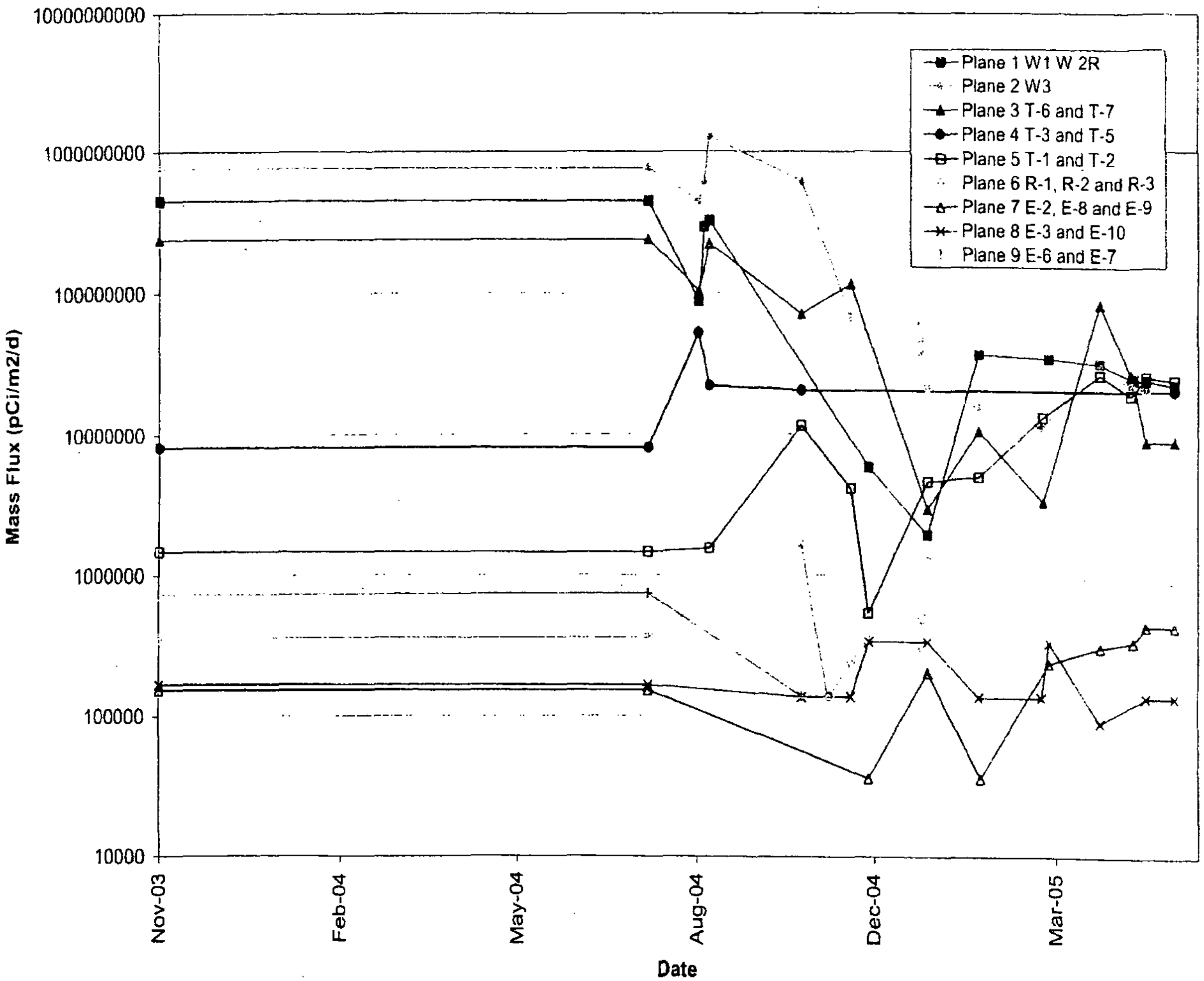
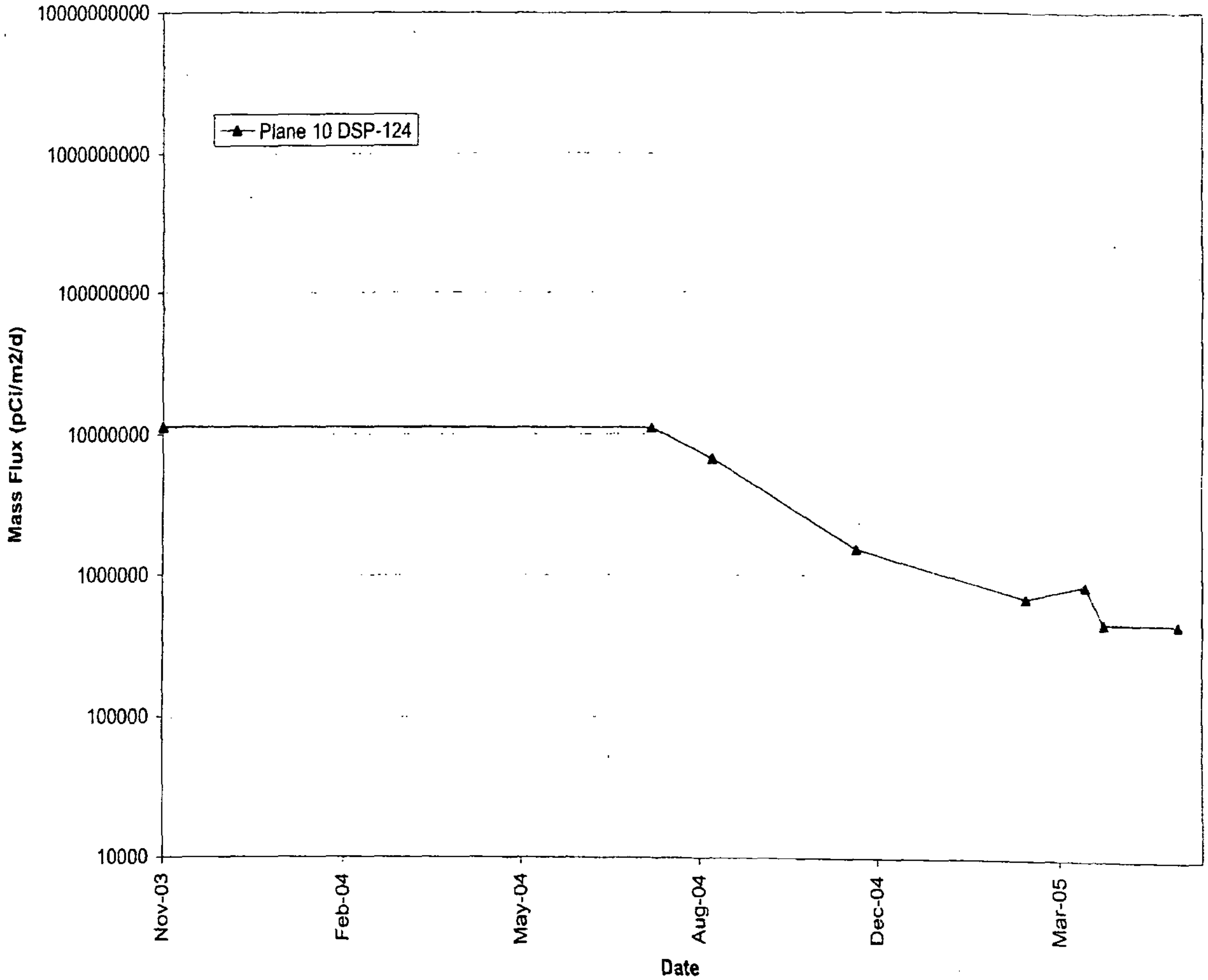


Figure 5-3 Mass Fl[illegible] West of Release Area



6 Summary

Routine groundwater sampling results undertaken in July 2004 detected elevated levels of tritium in shallow monitoring wells and storm sewers located near the Unit 2/3 interlock building. The tritium originated from a release in the CST system through a pipe that passed under a liquid nitrogen tank. The pipe was shut down on October 20, 2004 and a replacement section of pipe around the tank was installed the following month. RETEC was contracted by Exelon to characterize the nature of groundwater flow at the facility and evaluate the fate of the tritium.

The following paragraphs summarize the results of this investigation:

- The groundwater flow direction in the immediate vicinity of the liquid nitrogen tank is to the east and to the northwest. In the eastern half of the Protected Area, groundwater flows to the north toward the Unit 1 intake canal. West of the CST system groundwater flows westward toward the cooling canals. South of the Protected Area, groundwater flows to the southeast and southwest with a groundwater divide oriented northwest-southeast from well DSP124 to DSP152. Further south of the Protected Area in the residential area, groundwater flows from the cooling canals eastward to the Kankakee River.

- The horizontal hydraulic gradient values in the vicinity of the CST system calculated from the water table contour maps were 0.022 and 0.014 ft/ft to the northeast on October 28, 2004 and April 4, 2005, respectively. The average horizontal hydraulic gradient outside of the Protected Area ranges from 0.0046 ft/ft toward the southwest to 0.035 ft/ft toward the northeast.

- Portions of the building are constructed directly on top of the Maquoketa Shale; therefore, groundwater flow in the water table aquifer is affected throughout its entire thickness around the facility. The hydraulic gradient shows groundwater flows toward the building with preferential lateral flow around the building to the east and west. This also can create a groundwater mounding effect around the building.

- Dresden Station is surrounded by surface water bodies that have a significant effect on groundwater flow.

- The vertical gradient calculated at well DSP157, which is closest to the Protected Area, was 0.0032 ft/ft with an upward component. The vertical gradients calculated at wells DSP158 and DSP159 were 0.017 and 0.0044 ft/ft, respectively, with downward components.

- The geometric mean of hydraulic conductivity values calculated for the shallow wells were two orders of magnitude greater than the geometric mean for the intermediate wells installed just above the shale. The geometric mean of hydraulic conductivity for the shallow wells is $2.4x10^{-2}$ ft/min (34.2 ft/day), and the geometric mean of hydraulic conductivity for the intermediate wells is $4.7x10^{-4}$ ft/min (0.67 ft/day).

- A records search was performed to correlate residential water wells to the ISGS well records; however, none of these records corresponded to the Thorsen well located at 6310 Dresden Road. The well records also did not correspond to the residential well located at 8167 Thorsen Lane.

- The residential wells were typically cased to 40 feet below ground surface and completed at depths of 200 feet or more. A well identified as ISGS Record #22798 had a casing set at 58 feet below ground surface. Since all of the wells, except ISGS Record #22798, had casings set at 40 feet below ground surface and the depth to shale was consistently 60 feet below ground surface, these wells are partially pumping water from the upper aquifer as water flows down the open hole beneath the casing outside of the pump.

- The tritium-impacted groundwater is migrating east as evident from the decrease in tritium in wells W3 and T6, and a consequential increase in well T1. It is likely that the tritium is also migrating west as indicated by the sudden increase in the concentration in well DSP124 located northwest of the CST system.

- There appear to be two active sewer systems located in the vicinity of the CST system. One sewer originates immediately to the east of the liquid nitrogen tank and drains the area around the southeastern and northeastern perimeter of the turbine building. This sewer discharges to the Unit 1 intake canal through storm sewer DSP132. The second sewer originates immediately to the west of the liquid nitrogen tank and drains the area around the western perimeter of the turbine building. This sewer drains to the Unit 2/3 discharge canal through an outfall located in the west side of the canal.

- Tritium appears to have migrated mostly into the eastern sewer system and to a lesser extent into the western sewer system. It appears that the source of tritium in the eastern sewer system is from the CST system, as the catch basins immediately east of the liquid nitrogen tank have resulted in the highest tritium concentrations.

- Tritium concentrations in the monitoring wells installed farther away from the CST system were at low levels, usually below 200 pCi/L, with very little variation over time. The groundwater impact from the CST system is confined to a small area. Outside this area there is no evidence of elevated tritium concentrations associated with the CST system.

- Tritium concentrations in the Unit 2/3 intake canal (DSP50), the cold canal (DSP34A), and the Unit 2/3 discharge canal (DSP20) for the period of May 1994 to May 2005 show that there is a similar pattern with increasing trends of tritium concentrations in these three surface water samples.

- Based on the distribution of tritium in groundwater and the geometry of the release area, the width of the plume at the source was estimated to be approximately 20 feet. The depths of both the eastern-moving and western-moving plumes at and near the source were estimated as 10 feet. The plume length was estimated as 210 feet in the eastern direction with a maximum plume width of approximately 62 feet. Likewise, the plume length was estimated as 255 feet in the western flow direction with a maximum width of approximated as 70 feet.

- The total mass of tritium discharged to groundwater flow east of the release was calculated as 4.18×10^{12} pCi, and the total mass of tritium discharged to groundwater flow west of the release was calculated as 1.81×10^{11} pCi. Based on a tritium concentration in the CST system of 9 to 10 million pCi/L, this mass equates to approximately 121,000 gallons of tritiated water released to groundwater.

- The total mass of tritium discharged to the eastern storm sewer system, which outlets into the Unit 1 intake canal, was calculated as 5.27×10^{12} pCi. The total mass of tritium discharged to the western storm sewer system, which outlets into the Unit 2/3 discharge canal, was calculated as 7.33×10^{10} pCi. Based on an estimated tritium concentration in the CST system of 9 to 10 million pCi/L, this mass equates to approximately 148,000 gallons of tritiated water released to the storm sewer.

- The net tritium mass discharged to the groundwater and to the storm sewer from the CST system is calculated as 9.63×10^{12} pCi. Based on an estimated tritium concentration in the CST system of 9 to 10 million pCi/L, this total mass represents approximately 267,000 gallons of tritiated water released from the CST system.

- The net rate of tritium released to the Dresden Station groundwater and sewer systems, assuming that the total mass of tritium was released over the duration of the discharge from the CST system (i.e., 344 days between November 2003 and October 2004), amounts to 2.80×10^{10} pCi per day.

- Based on fate and transport computer modeling (BIOSCREEN), the concentrations of tritium at the source and along the western plume will decrease to below 90 pCi/L after approximately 5 years from the pipe repair. Similarly, the concentrations at the source and along the eastern plume will drop below 290 pCi/L after approximately 8 years.

- The investigation concluded it is most likely that the bulk of the tritium discharge to groundwater is flowing in the easterly and northwesterly directions under the influence of the local hydraulic gradient. Movement of the plume will likely continue to follow the local hydraulic gradient in each direction. Because of this preferential flow path, the tritium plume is not likely to come under the influence of the regional gradient in the southeasterly direction, which is the only way tritium-impacted groundwater from the CST system could impact the residential wells south of Dresden Station.

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Appendix A

Soil Boring/Rock Coring Logs and Well Construction Diagrams

RETEC

Boring Log

Boring #: DSP-149R
Sheet 1 of 1

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 8166.38 Easting: 14621.11
Client: Exelon Nuclear	Bit Type: 6" Tricone	Ground Elevation (ft. msl): 516.45
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 51.00
Start Date: 03/29/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris
Finish Date: 03/31/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample: Type & Number	Sample: Back-ground PID (ppm)	Sample: PID (ppm)	Sample: Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft. msl)	Drilling Progress	Comments
					0	SAND: Clayey Sand, loose, fine grained, moist to very wet, yellowish brown (2.5Y 6/4) to grayish brown (10YR 5/2).	515		
					5		510		
					10		505		
					15		500		
					20	CLAY: Sandy Clay, stiff, very wet, gray (Gley 1 6/N), hard pockets of limestone gravels.	495		
					25		490		
					30	LIMESTONE: Limestone, very hard, moist to wet, light gray(Gley 1 7/N) to gray (Gley 1 6/N). At 40 feet cuttings indicate possibble transitional zone with pale green (Gley 1 6/2) shale (clay) cutting coming up hole.	485		
					35		480		
					40		475		
					45		470		
					50	SHALE: Shale, hard, wet, very dark greenish gray (Gley 1 3/1).			

Remarks and Datum Used:		Sample Type
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Boring Log

Boring #: DSP-157S
Sheet 1 of 1

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 6421.84 Easting: 14728.71
Client: Exelon Nuclear	Bit Type: 4 1/4" ID Auger	Ground Elevation (ft. msl): 518.59
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 13.00
Start Date: 02/25/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris
Finish Date: 02/25/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample: Type & Number	Back-ground PID (ppm)	PID (ppm)	Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					0	TOPSOIL: Topsoil, soft, moist, black to dark brown (Gley 1 2.5/1).			
						CLAY: Sandy Lean Clay, soft, moist, yellowish brown (10YR 6/3) to redish yellow (7.5YR 6/8).			
						SANDSTONE: Sandstone, hard, moist to very moist, pale brown (10YR 6/3) from 3 to 6 feet, gray (10YR 6/1) from 6 foot to depth.	515		
					5				
							510		
					10				

Remarks and Datum Used:	Sample Type
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Boring Log

Boring #: DSP-157M
Sheet 1 of 1

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 6421.61 Easting: 14721.74
Client: Exelon Nuclear	Bit Type: 6" Tricone	Ground Elevation (ft. msl): 518.47
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 53.75
Start Date: 02/17/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris
Finish Date: 02/21/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample: Type & Number	Sample: Background PID (ppm)	Sample: PID (ppm)	Sample: Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					0	TOPSOIL: Topsoil, soft, moist, black to dark brown (Gley 1 2.5/1).			
						CLAY: Sandy Lean Clay, soft, moist, yellowish brown (10YR 5/4).	515		
					5	SANDSTONE: Sandstone, hard, moist to wet, pale brown (10YR 6/3) to gray (10YR 6/1).	510		
					10		505		
					15		500		
					20		495		
					25	LIMESTONE: Limestone, very hard, wet, white to light gray (5Y 7/1) to pinkish white (7.5YR 8/2), occasional pyrite, clay and sand stringers.	490		
					30		485		
					35		480		
					40	LIMESTONE: Transitional zone, Limestone and Shale Interbedding, Limestone (same as above) majority of zone, Shale (weathered small servaral inch thick lenses), hard, wet, pale green (Gley 1 6/2).	475		
					45		470		
					50	SHALE: Shale, hard, moist to wet, very dard greenish gray (Gley 1 3/1).	465		

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Sample Type
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Boring Log

Boring #: DSP-157D
Sheet 1 of 3

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 6420.97 Easting: 14714.44
Client: Exelon Nuclear	Bit Type: 8" Tricone	Ground Elevation (ft. msl): 518.46
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 130.50
Start Date: 02/16/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris
Finish Date: 02/25/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample: Type & Number	Sample: Back-ground PID (ppm)	Sample: PID (ppm)	Sample: Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					0	TOPSOIL: Topsoil, soft, moist, black to dark brown (Gley 1 2.5/1).			
						CLAY: Sandy Lean Clay, soft, moist, yellowish brown (10YR 5/4).	515		
					5	SANDSTONE: Sandstone, hard, moist to wet, pale brown (10YR 6/3) to gray (10YR 6/1), black mica stringers.			
							510		
					10				
							505		
					15				
							500		
					20				
							495		
					25	LIMESTONE: Limestone, hard, wet, white to light gray (5Y 7/1), pyrite, clay stringers.			
							490		
					30				
							485		
					35				
							480		

Remarks and Datum Used:

Sample Type
SS = Soil Sample

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Sample Type & Number	Back-ground PID (ppm)	PID (ppm)	Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft. msl)	Drilling Progress	Comments
					40				
						LIMESTONE: Transitional zone, Limestone, Sandstone and Shale Interbedding, Limestone (same as above) majority of zone, Shale (weathered small several inch thick lenses), hard, wet, pale green (Gley 1 6/2), at 41.5 to 42 feet Sandstone lense.	475		
					45				
						SHALE: Shale (weathered), hard, wet, pale green (Gley 1 6/2).	470		
					50	SHALE: Shale, hard, wet, very dark greenish gray (Gley 1 3/1).			
							465		
					55				
							460		
					60				
							455		
					65				
							450		
					70				
							445		
					75				
							440		
					80				
							435		
					85				

Remarks and Datum Used:

Sample Type
SS = Soil Sample

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Boring Log

Sample: Type & Number	Back-ground PID (ppm)	PID (ppm)	Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft. msl)	Drilling Progress	Comments
							430		
					90				
							425		
					95				
							420		
					100				
							415		
					105				
							410		
					110				
							405		
					115				
						DOLOMITE: Dolomite, very hard, moist to wet, light brownish gray (2.5Y 6/2), crystaline, pyrite stringers.	400		
					120				
							395		
					125				
							390		
					130				

Remarks and Datum Used:

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Sample Type
SS = Soil Sample

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Boring Log

Boring #: DSP-158S
Sheet 1 of 1

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 5438.73 Easting: 16942.48
Client: Exelon Nuclear	Bit Type: 4 1/4" ID Auger	Ground Elevation (ft. msl): 507.73
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 13.50
Start Date: 02/28/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris
Finish Date: 03/04/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample: Type & Number	Back-ground PID (ppm)	PID (ppm)	Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					0	TOPSOIL: Topsoil, soft, moist, black to dark brown (Gley 1 2.5/1).			
						CLAY: Sandy Lean Clay, soft, moist, light yellowish brown (2.5Y 6/4).	505		
					5				
						CLAY: Lean Clay with sand, hard, moist, pale yellow (5Y 7/3).	500		
					10				
						LIMSTONE: Limestone, very hard, moist, white (5Y 8/1) to gray (5Y5/1), crystaline.	495		

Remarks and Datum Used:

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Sample Type
SS = Soil Sample

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Boring Log

Boring #: DSP-158M
Sheet 1 of 1

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 5442.41 Easting: 15939.08
Client: Exelon Nuclear	Bit Type: 6" Air Hammer	Ground Elevation (ft. msl): 507.97
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 57.50
Start Date: 03/02/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris
Finish Date: 03/02/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample: Type & Number	Sample: Back-ground PID (ppm)	Sample: PID (ppm)	Sample: Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					0	TOPSOIL: Topsoil, soft, moist, black to dark brown (Gley 1 2.5/1).	505		
					5	CLAY: Sandy Lean Clay, soft, moist, yellowish brown (2.5Y 6/4).			
					10	CLAY: Lean Clay, stiff, moist, redish yellow (5YR 6/8) to gray (Gley 1 6/N) to dark gray (Gley 1 4/N), laminated.	500		
					15, 20, 25, 30, 35, 40, 45	LIMESTONE: Limestone, very hard, dry to very moist, crystaline, light gray (Gley 1 7/N) to gray (Gley 1 6/N) 11 to 22 feet bgs, light greenish gray (Gley 1 8/1) to white (Gley 1 8/N) below 22, small very dark gray (Gley 1 3/N) shale stingers from 11 to 22 feet bgs.	495, 490, 485, 480, 475, 470, 465		
					50, 55	LIMESTONE: Transitional zone, Limestone and Shale interbedding, Limestone (same as above) majority of zone, Shale (weathered small several inch thick lenses), hard, wet, pale green (Gley 1 6/2).	460, 455		
						SHALE: Shale, hard, moist to wet, very dark greenish gray (Gley 1 3/1).			

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Sample Type
SS = Soil Sample

Boring Log

RETEC

Boring #: DSP-158D
Sheet 1 of 3

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 5448.08 Easting: 15934.92
Client: Exelon Nuclear	Bit Type: 8" & 6" Air Hammer	Ground Elevation (ft. msl): 507.79
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 135.00
Start Date: 02/25/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris
Finish Date: 03/03/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample Type & Number	Back-ground PID (ppm)	PID (ppm)	Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					0	TOPSOIL: Topsoil, soft, moist, black to dark brown (Gley 1 2.5/1).			
						CLAY: Sandy Lean Clay, moist, soft, light yellowish brown (2.5Y 6/4).	505		
					5				
						CLAY: Lean Clay, hard, moist, dark gray (Gley 1 4/N), some Limestone pieces mixed in clay.	500		
					10				
						LIMESTONE: Limestone, very hard, dry to wet, light gray (Gley 1 7/N) to gray (Gley 1 6/N), crystaline, fossils can be seen in larger cuttings.	495		
					15				
							490		
					20				
							485		
					25				
							480		
					30				
							475		
					35				
							470		
					40				

Remarks and Datum Used:

Sample Type
SS = Soil Sample

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Sample: Type & Number	Sample: Background PID (ppm)	Sample: PID (ppm)	Sample: Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					45		465		
					50		460		
					50–55	LIMESTONE: Transitional zone, Limestone and Shale interbedding, Limestone (same as above with color change to light greenish gray (Gley 1 8/1)), Shale (weatherd small several inch thick lenses), hard, wet, pale green (Gley 1 6/2).	455		
					55	SHALE: Shale, hard, wet, very dark greenish gray (Gley 1 3/1).	450		
					60		445		
					65		440		
					70		435		
					75		430		
					80		425		
					85		420		
					90		415		

Remarks and Datum Used:

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Sample Type
SS = Soil Sample

RETEC

Boring Log

Sample: Type & Number	Sample: Back-ground PID (ppm)	Sample: PID (ppm)	Sample: Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					95				
							410		
					100				
							405		
					105				
							400		
					110				
							395		
					115				
							390		
					120				
						DOLOMITE: Dolomite, very hard, moist to wet, light brownish gray (2.5Y 6/2), crystaline	385		
					125				
							380		
					130				
							375		
					135				

Remarks and Datum Used:		Sample Type
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Boring Log

Boring #: DSP-159S
Sheet 1 of 1

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 3962.1 Easting: 14862.98
Client: Exelon Nuclear	Bit Type: 3 1/4" ID Auger	Ground Elevation (ft. msl): 516.27
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 16.00
Start Date: 03/04/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris
Finish Date: 03/07/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample: Type & Number	Sample: Back-ground PID (ppm)	Sample: PID (ppm)	Sample: Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft. msl)	Drilling Progress	Comments
					0	FILL: Fill	515		
					5		510		
						CLAY: Sandy Lean Clay, soft, very moist, yellowish brown (10YR 5/4).			
					10	LIMESTONE: Limestone, hard, wet, white (5Y 8/1) to gray (5Y 5/1), crystalline.	505		
					15				

Remarks and Datum Used:

The RETEC Group, Inc.
8605 W. Bryn Mawr Ave, Ste. 301
Chicago, IL 60631
Phone: (773) 714-9900
Fax: (773) 714-9805

Sample Type
SS = Soil Sample

RETEC Boring Log

Boring #: DSP-159M
Sheet 1 of 1

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 3969.14 Easting: 14863.65
Client: Exelon Nuclear	Bit Type: 6" Air Hammer	Ground Elevation (ft. msl): 516.23
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 59.30
Start Date: 03/11/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris/Randy Mackay
Finish Date: 03/14/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample Type & Number	Back-ground PID (ppm)	PID (ppm)	Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					0	FILL: Fill	515		
					5		510		
					10	CLAY: Sandy Lean Clay, soft, very moist, yellowish brown (10YR 5/4).	505		
					15	LIMESTONE: Limestone, light blueish gray (Gley 2 7/1), with white (Gley 1 8/1) speckles, texture is microcrystaline to fine grained, conformable, dry, small Shale lenses thoughout dark blueish gray (Gley 2 4/1) to pale green (Gley 1 6/2), fractured, pyrite stringers	500		
					20		495		
					25		490		
					30		485		
					35		480		
					40		475		
					45		470		
					50		465		
					55		460		
						SHALE: Shale, hard moist to very moist, gray (Gley 1 10Y 5/1) to very dark greenish gray (Gley 1 3/1) when wet, slightly fractured to fractured, conformable, strong, microcrystaline, uniform, fresh, competent, shear, undulating to planar, clean, pyrite nodules.			

Remarks and Datum Used:

Sample Type
SS = Soil Sample

The RETEC Group, Inc.
8605 W. Bryn Mawr Ave., Ste. 301
Chicago, IL 60631
Phone: (773) 714-8900
Fax: (773) 714-9805

RETEC

Boring Log

Boring #: DSP-159D
Sheet 1 of 3

Project: Dresden Power Station	Drill Rig Type: Gus Pech GP-750C	Location: Dresden, Illinois
Project #: EXENW-18513-320	Method:	Northing: 3978.34 Easting: 14863.78
Client: Exelon Nuclear	Bit Type: 8" & 6" Air Hammer	Ground Elevation (ft. msl): 516.32
Contractor: TSC	Boring Diameter:	Total Depth (ft. bgs): 137.00
Start Date: 03/07/2005	Backfill: Bentonite Chips	Logged By: Torrey Morris/Randy Mackay
Finish Date: 03/14/2005	Completion:	Checked by:
Sample Method:		Depth to Groundwater:

Sample Type & Number	Background PID (ppm)	PID (ppm)	Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					0	FILL: Fill	515		
					5		510		
					10	CLAY: Sandy Lean Clay, soft, very moist, yellowish brown (10YR 5/4).			
						LIMESTONE: Limestone, light blueish gray (Gley 2 7/1), with white (Gley 1 8/1) speckles, texture is microcrystaline to fine grained, conformable, dry, small Shale lenses thoughout dark bluelsh gray (Gley 2 4/1) to pale green (Gley 1 6/2), fractured, pyrite stringers	505		
					15		500		
					20		495		
					25		490		
					30		485		
					35		480		
					40		475		

Remarks and Datum Used:

Sample Type
SS = Soil Sample

The RETEC Group, Inc.
8605 W. Bryn Mawr Ave, Ste. 301
Chicago, IL 60631
Phone: (773) 714-9900
Fax: (773) 714-9805

Sample: Type & Number	Sample: Back-ground PID (ppm)	Sample: PID (ppm)	Sample: Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft. msl)	Drilling Progress	Comments
					45		470		
					50		465		
					55		460		
					60	SHALE: Shale, hard moist to very moist, gray (Gley 1 10Y 5/1) to very dark greenish gray (Gley 1 3/1) when wet, slightly fractured to fractured, conformable, strong, microcrystalline, uniform, fresh, competent, shear, undulating to planar, clean, pyrite nodules.	455		
					65		450		
					70		445		
					75		440		
					80		435		
					85		430		
					90		425		

Remarks and Datum Used:

The RETEC Group, Inc.
8605 W. Bryn Mawr Ave, Ste. 301
Chicago, IL 60631
Phone: (773) 714-9900
Fax: (773) 714-9805

Sample Type
SS = Soil Sample

RETEC

Boring Log

Sample: Type & Number	Back-ground PID (ppm)	PID (ppm)	Sampled Interval	Graphic	Depth (ft. bgs)	Soil and Rock Description (Classification Scheme: USCS/ASTM)	Elevation (ft. msl)	Drilling Progress	Comments
					95		420		
					100		415		
					105		410		
					110		405		
					115		400		
					120		395		
					125	DOLOMITE: Dolomite, very stong, very light gray and light gray (mottled), microcrystalline, vuggy, some subhorizontal fractures, (~ 1 foot intervals), vertical fracturing from 132-135.5 feet and 137-138 feet.	390		
					130		385		
					135		380		

Remarks and Datum Used:

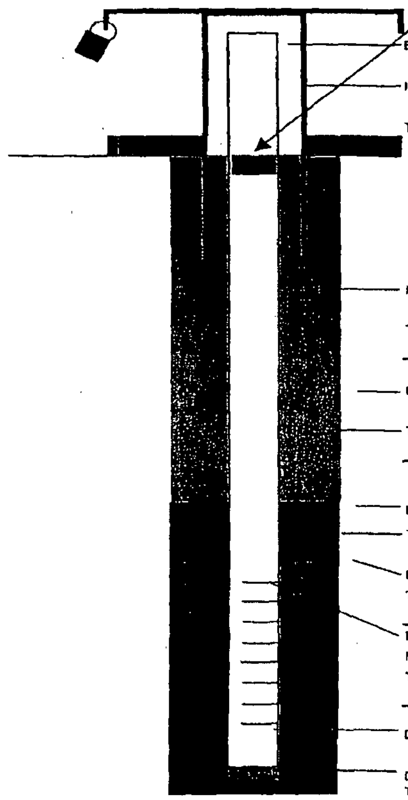
The RETEC Group, Inc.
8605 W. Bryn Mawr Ave, Ste. 301
Chicago, IL 60631
Phone: (773) 714-9900
Fax: (773) 714-9805

Sample Type
SS = Soil Sample

RETEC

6

Project Name	HydroGeologic Assesment	Monitoring Well No.	DSP-149R
Project Number	EXENW-18512-312		
Date of Installation	March 31, 2005		
Drilling Company	Testing Service Corporation (TSC)		
Field Engineer	Torrey Morris		



Flush Mount

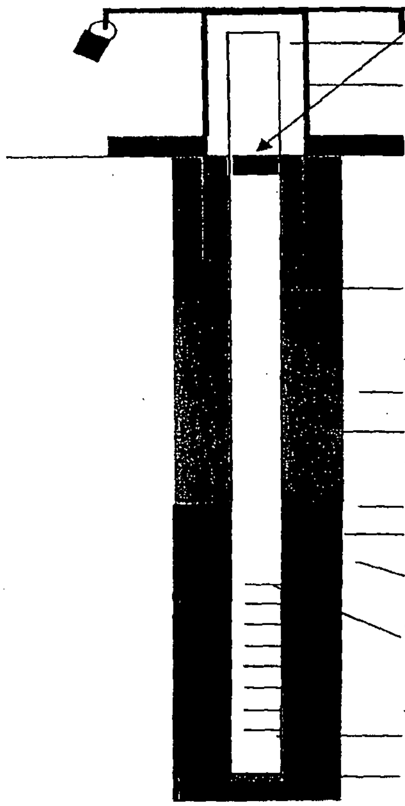
Elevation of Top of Riser Pipe	516.29 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	6 inch
Type of Backfill	Bentonite Grout
Depth to Top of Seal	29 ft bgs
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	36 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	40 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	50 ft bgs
Depth to Bottom of Sediment Trap	50.5 ft bgs
Depth to Bottom of Borehole	51 ft bgs

NOT TO SCALE

RETEC

Project Name	HydroGeologic Assesment
Project Number	EXENW-18512-312
Date of Installation	February 25, 2005
Drilling Company	Testing Service Corporation (TSC)
Field Engineer	Torrey Morris

Monitoring Well No. DSP-157S



Flush Mount

Elevation of Top of Riser Pipe	521.54 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	6 inch
Type of Backfill	3/8 inch Bentonite Chips
Depth to Top of Seal	Surface
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	1 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	2 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	12 ft bgs
Depth to Bottom of Sediment Trap	12.5 ft bgs
Depth to Bottom of Borehole	13 ft bgs

NOT TO SCALE

RETEC

Project Name	HydroGeologic Assesment
Project Number	EXENW-18512-312
Date of Installation	February 21, 2005
Drilling Company	Testing Service Corporation (TSC)
Field Engineer	Torrey Morris

Monitoring Well No. DSP-157M

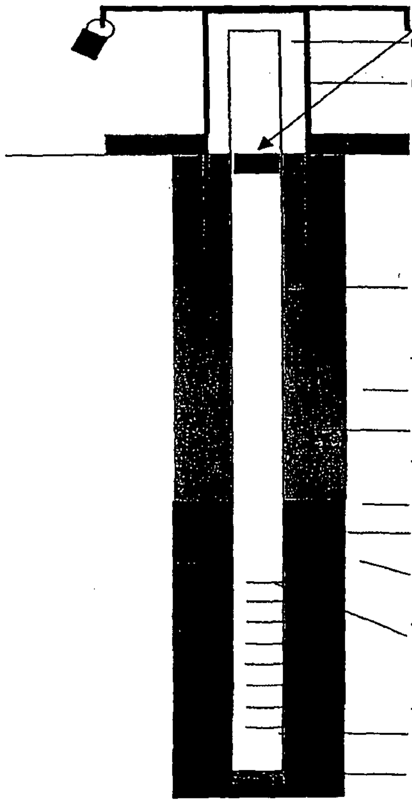
Flush Mount	
Elevation of Top of Riser Pipe	521.80 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	6 inch
Type of Backfill	Bentonite Grout
Depth to Top of Seal	33 ft bgs
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	35.5 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	38 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	48 ft bgs
Depth to Bottom of Sediment Tran	48.5 ft bgs
Depth to Bottom of Borehole	53.75 ft bgs

NOT TO SCALE

RETEC

Project Name	HydroGeologic Assesment
Project Number	EXENW-18512-312
Date of Installation	February 25, 2005
Drilling Company	Testing Service Corporation (TSC)
Field Engineer	Torrey Morris

Monitoring Well No. DSP-157D



Flush Mount	
Elevation of Top of Riser Pipe	521.86 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	8 inch (0-50 ft)/6 inch (50-130 ft)
Type of Backfill	Bentonite Grout
Depth to Top of Seal	114.2 ft bgs
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	118 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	120 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	130 ft bgs
Depth to Bottom of Sediment Trap	130.5 ft bgs
Depth to Bottom of Borehole	130.5 ft bgs

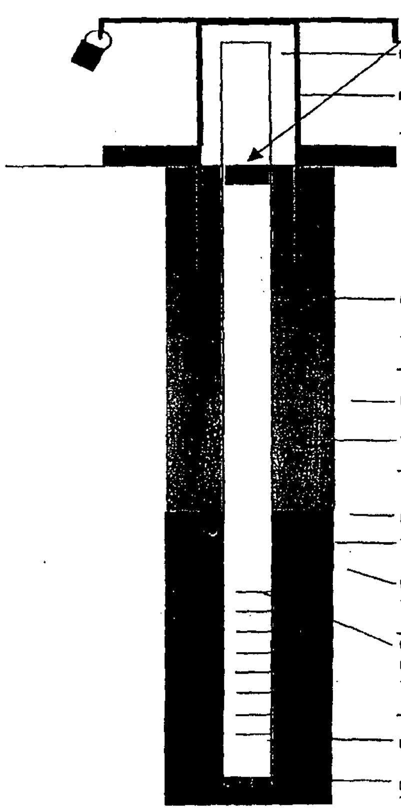
NOT TO SCALE

Remarks: To confine the lower aquifer from the upper aquifer during drilling, a 6 inch ID steel casing was placed down hole from 0 to 50 feet bgs (top of shale layer), then the outside was sealed with bentonite grout.

RETEC

Project Name	HydroGeologic Assesment
Project Number	EXENW-18512-312
Date of Installation	March 4, 2005
Drilling Company	Testing Service Corporation (TSC)
Field Engineer	Torrey Morris

Monitoring Well No. DSP-158S



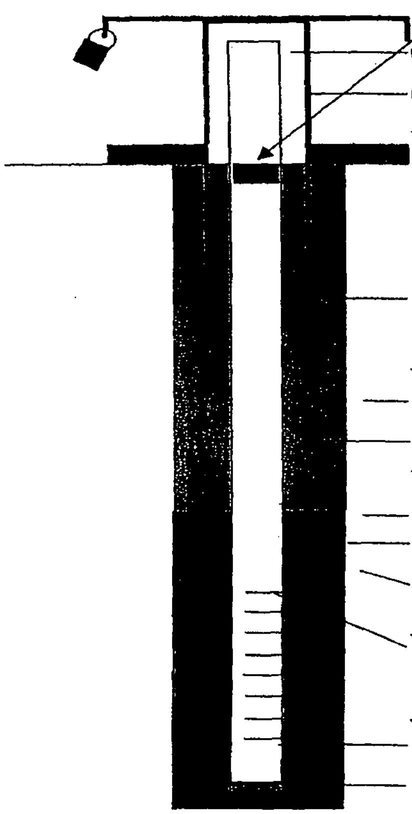
Flush Mount	
Elevation of Top of Riser Pipe	510.78 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	6 inch
Type of Backfill	3/8 inch Bentonite Chips
Depth to Top of Seal	Surface
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	1 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	2 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	12 ft bgs
Depth to Bottom of Sediment Trap	12.5 ft bgs
Depth to Bottom of Borehole	13.5 ft bgs

NOT TO SCALE

RETEC

Project Name	HydroGeologic Assesment
Project Number	EXENW-18512-312
Date of Installation	March 2, 2005
Drilling Company	Testing Service Corporation (TSC)
Field Engineer	Torrey Morris

Monitoring Well No. DSP-158M



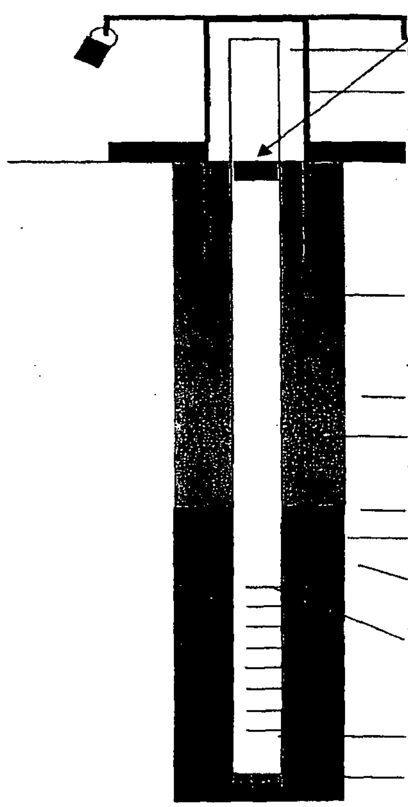
Elevation of Top of Riser Pipe	510.64 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	6 inch
Type of Backfill	Bentonite Grout and Portland Cement mix
Depth to Top of Seal	41 ft bgs
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	43.5 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	46 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	56 ft bgs
Depth to Bottom of Sediment Trap	56.5 ft bgs
Depth to Bottom of Borehole	57.5 ft bgs

NOT TO SCALE

RETEC

6

Project Name	HydroGeologic Assesment	Monitoring Well No.	DSP-158D
Project Number	EXENW-18512-312		
Date of Installation	March 3, 2005		
Drilling Company	Testing Service Corporation (TSC)		
Field Engineer	Torrey Morris		



Flush Mount	
Elevation of Top of Riser Pipe	510.39 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	8 inch (0-57 ft)/6 inch (57-135 ft)
Type of Backfill	Bentonite Grout and Portland Cement Mix
Depth to Top of Seal	121 ft bgs
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	123 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	125 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	134.5 ft bgs
Depth to Bottom of Sediment Trap	135 ft bgs
Depth to Bottom of Borehole	135 ft bgs

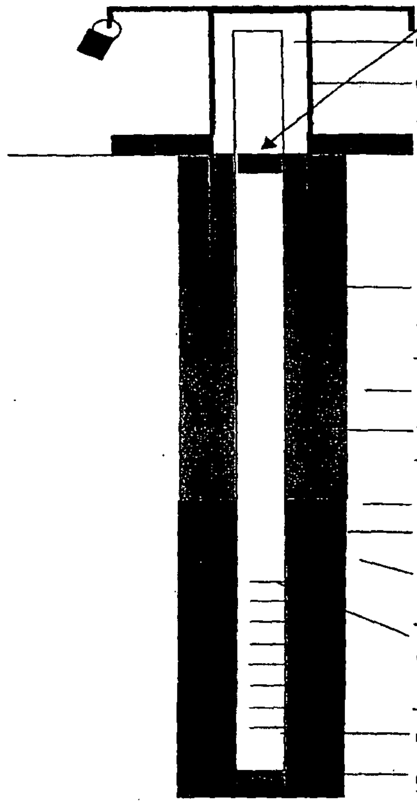
NOT TO SCALE

Remarks: To confine the lower aquifer from the upper aquifer during drilling, a 8 inch ID steel casing was placed down hole from 0 to 57 feet bgs (top of shale layer), then the outside was sealed with bentonite quickgel and portland cement mix..

RETEC

Project Name	HydroGeologic Assesment	Monitoring Well No.	DSP-159S
Project Number	EXENW-18512-312		
Date of Installation	March 7, 2005		
Drilling Company	Testing Service Corporation (TSC)		
Field Engineer	Torrey Morris		

Flush Mount



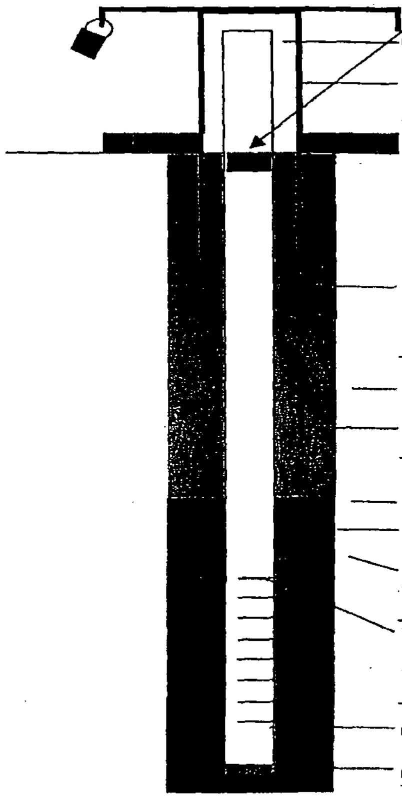
Elevation of Top of Riser Pipe	519.41 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	6 inch
Type of Backfill	3/8 inch Bentonite Chips
Depth to Top of Seal	Surface
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	3 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	5 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	15 ft bgs
Depth to Bottom of Sediment Trap	15.5 ft bgs
Depth to Bottom of Borehole	16 ft bgs

NOT TO SCALE

RETEC

Project Name	HydroGeologic Assesment
Project Number	EXENW-18512-312
Date of Installation	March 11, 2005
Drilling Company	Testing Service Corporation (TSC)
Field Engineer	Torrey Morris

Monitoring Well No. DSP-159M



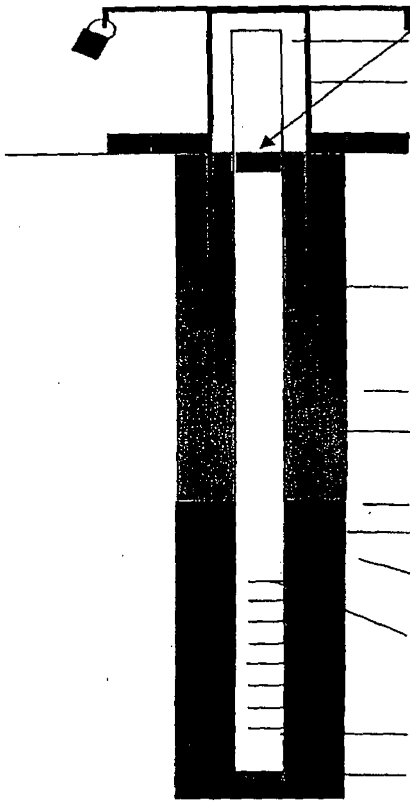
Flush Mount

Elevation of Top of Riser Pipe	619.37 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	6 inch
Type of Backfill	Bentonite Grout
Depth to Top of Seal	43.75 ft bgs
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	46 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	48 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	58 ft bgs
Depth to Bottom of Sediment Trap	58.5 ft bgs
Depth to Bottom of Borehole	59.3 ft bgs

NOT TO SCALE

RETEC

Project Name	HydroGeologic Assesment	Monitoring Well No.	DSP-159D
Project Number	EXENW-18512-312		
Date of Installation	March 14, 2005		
Drilling Company	Testing Service Corporation (TSC)		
Field Engineer	Torrey Morris		



Flush Mount

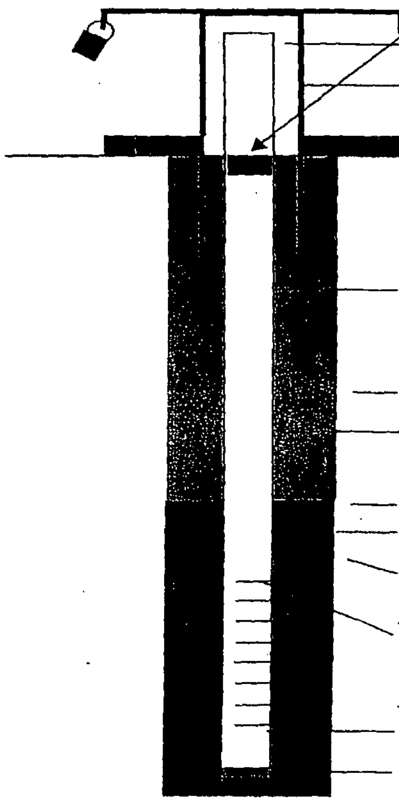
Elevation of Top of Riser Pipe	519.27 ft msl
I.D. of Protective Casing	4 inch
Type of Protective Casing	Steel Casing
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	8 inch (0-60 ft)/6 inch (60-137 ft)
Type of Backfill	Bentonite Grout and Portland Cement Mix
Depth to Top of Seal	122 ft bgs
Type of Seal	3/8 inch Bentonite Chips
Depth to Top of Sandpack	124 feet bgs
Type of Sandpack	10x20 Colorado Silica Sand
Depth to Top of Screen	126 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	2 inch Schedule 40 Screen 0.010 Slot Flush Thread (PVC)
Depth to Bottom of Screen	136 ft bgs
Depth to Bottom of Sediment Trap	136.5 ft bgs
Depth to Bottom of Borehole	137 ft bgs

NOT TO SCALE

Remarks: To confine the lower aquifer from the upper aquifer during drilling, a 6 inch ID steel casing was placed down hole from 0 to 60 feet bgs (top of shale layer), then the outside was sealed with a bentonite grout and portland cement mix.

Project Name	HydroGeologic Assesment
Project Number	EXENW-18512-312
Date of Installation	November 23, 2004
Drilling Company	Testing Service Corporation (TSC)
Field Engineer	Randy MacKay

Monitoring Well No. W-2R



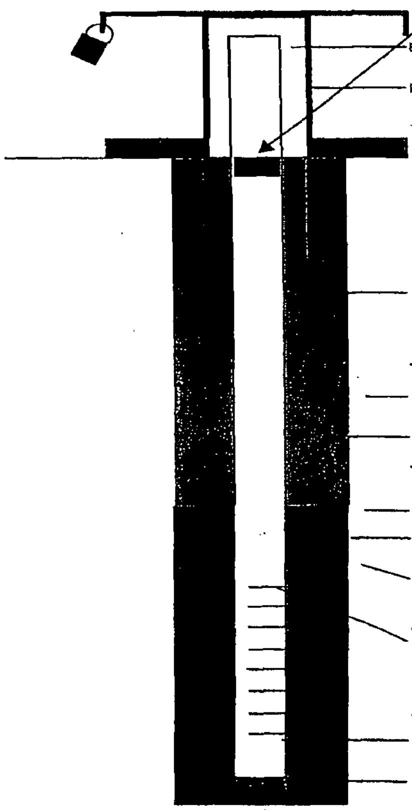
Flush Mount	
Elevation of Top of Riser Pipe	
I.D. of Protective Casing	8 inch
Type of Protective Casing	Flushmount
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	approximately 12 inch
Type of Backfill	Bentonite Grout
Depth to Top of Seal	0.5 ft bgs
Type of Seal	Bentonite Chips
Depth to Top of Sandpack	3.5 feet bgs
Type of Sandpack	Silica Sand
Depth to Top of Screen	4.5 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	10 slot PVC
Depth to Bottom of Screen	6.5 ft bgs
Depth to Bottom of Sediment Trap	6.5 ft bgs
Depth to Bottom of Borehole	6.5 ft bgs

NOT TO SCALE

RETEC

Project Name: HydroGeologic Assesment
Project Number: EXENW-18512-312
Date of Installation: November 23, 2004
Drilling Company: Testing Service Corporation (TSC)
Field Engineer: Randy MacKay

Monitoring Well No. E-8



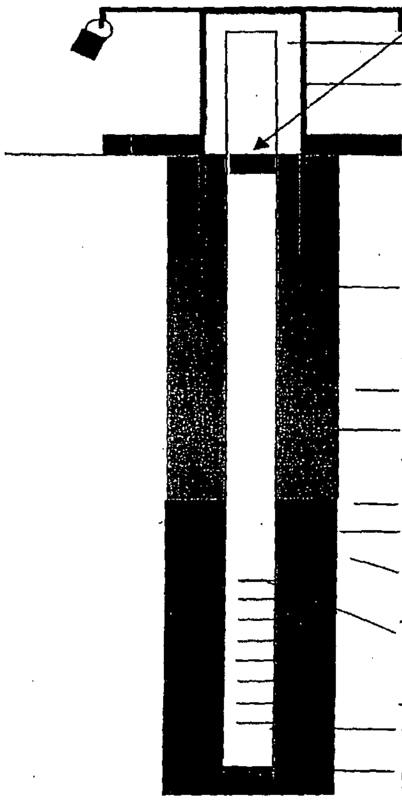
Flush Mount

Elevation of Top of Riser Pipe	
I.D. of Protective Casing	6 inch
Type of Protective Casing	Flushmount
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	approximately 12 inch
Type of Backfill	Bentonite Grout, Concrete pad to set flushmount vault
Depth to Top of Seal	0 ft bgs
Type of Seal	Bentonite Chips
Depth to Top of Sandpack	2.4 feet bgs
Type of Sandpack	Silica Sand
Depth to Top of Screen	2.5 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	10 slot PVC
Depth to Bottom of Screen	5.4 ft bgs
Depth to Bottom of Sediment Trap	5.4 ft bgs
Depth to Bottom of Borehole	5.4 ft bgs

NOT TO SCALE

RETEC

Project Name	HydroGeologic Assesment	Monitoring Well No.	E-9
Project Number	EXENW-18512-312		
Date of Installation	November 23, 2004		
Drilling Company	Testing Service Corporation (TSC)		
Field Engineer	Randy MacKay		

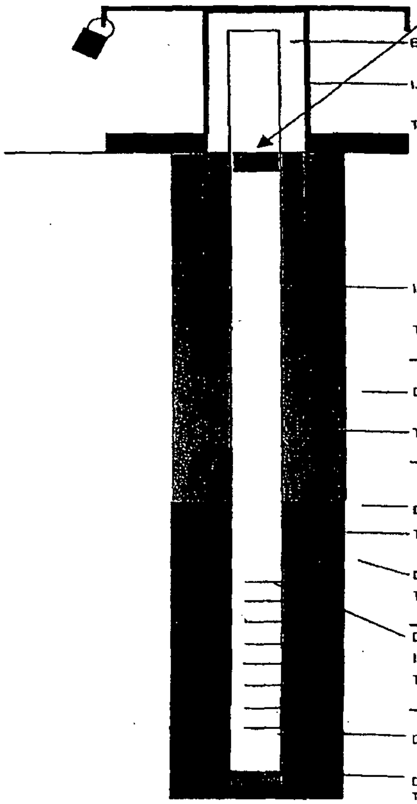


Elevation of Top of Riser Pipe	
I.D. of Protective Casing	8 inch
Type of Protective Casing	Flushmount
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	approximately 12 inch
Type of Backfill	None
Depth to Top of Seal	0 ft bgs
Type of Seal	Bentonite Chips to ground surface
Depth to Top of Sandpack	1 feet bgs
Type of Sandpack	Silica Sand
Depth to Top of Screen	2 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	10 slot PVC
Depth to Bottom of Screen	7 ft bgs
Depth to Bottom of Sediment Trap	7 ft bgs
Depth to Bottom of Borehole	7 ft bgs

NOT TO SCALE

RETEC

Project Name	HydroGeologic Assesment	Monitoring Well No.	E-10
Project Number	EXENW-18512-312		
Date of Installation	November 23, 2004		
Drilling Company	Testing Service Corporation (TSC)		
Field Engineer	Randy MacKay		



Elevation of Top of Riser Pipe	
I.D. of Protective Casing	6 inch
Type of Protective Casing	Flushmount
I.D. of Riser Pipe	2 inch
Type of Riser Pipe	2 inch Schedule 40 Flush Threaded Casing (PVC)
Diameter of Borehole	approximately 12 inch
Type of Backfill	None
Depth to Top of Seal	0 ft bgs
Type of Seal	Bentonite Chips to ground surface
Depth to Top of Sandpack	1.2 ft bgs
Type of Sandpack	Silica Sand
Depth to Top of Screen	2.2 ft bgs
I.D. of Well Screen	2 inch
Type of Well Screen	10 slot PVC
Depth to Bottom of Screen	7.2 ft bgs
Depth to Bottom of Sediment Trap	7.2 ft bgs
Depth to Bottom of Borehole	7.2 ft bgs

NOT TO SCALE

Appendix B
Geophysical Logs

Century GEOPHYSICAL CORP.

century-geo.com

DSP-149

COMPANY	: DRESDEN STATION
WELL	: DSP-149
FIELD	:
COUNTY	: GRUNDY
STATE	: ILL
LOCATION	: NONE
SECTION	:
TOWNSHIP	:
RANGE	:
API NO.	: None
UNIQUE WELL ID.	: None
PERMANENT DATUM	:
LOG MEASURED FROM	: G.L.
DRL MEASURED FROM	:
DATE	: 03/16/05
RUN NO.	: 1
DEPTH DRILLER	: 48
BIT SIZE	: 8
LOG TOP	: -1.70
LOG BOTTOM	: 45.10
CSNG OD	: Z
CSNG BOTTOM	:
CSNG TYPE	: PVC
BOREHOLE FLUID	: 0
TEMPERATURE	: 0
MUD RES	: 0
WITNESSED BY	: None
RECORDED BY	: T.NEAL
REMARKS 1	:
REMARKS 2	:

ELEVATION KB:
ELEVATION DF:
ELEVATION GL:

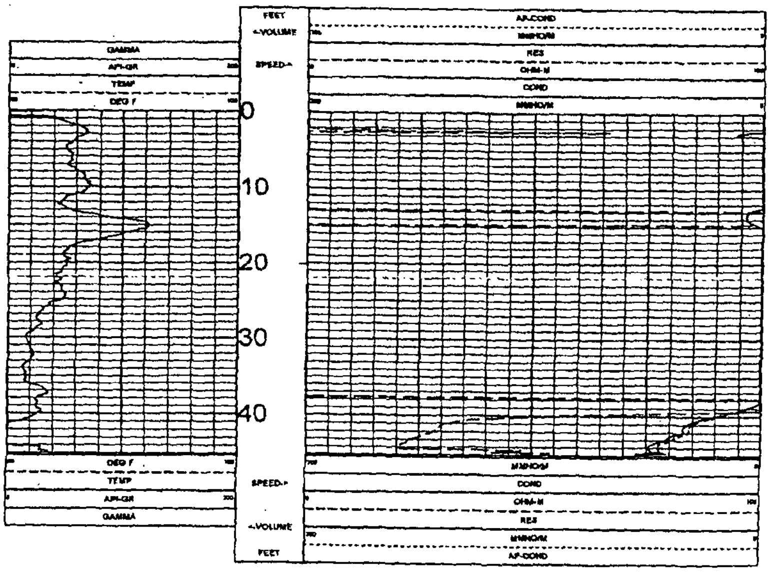
OTHER SERVICES:

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

GAMMA-INDUCTION DSP-149 03/16/05

LOG PARAMETERS

MATRIX DENSITY : 2.65
MAGNETIC DECL : 0
NEUTRON MATRIX : SANDSTONE
ELECT. CUTOFF : 2500
MATRIX DELTA T : 54
BIT SIZE : 8



GAMMA-INDUCTION DSP-149 03/16/05

LOG PARAMETERS

MATRIX DENSITY : 2.65
MAGNETIC DECL : 0
NEUTRON MATRIX : SANDSTONE
ELECT. CUTOFF : 2500
MATRIX DELTA T : 54
BIT SIZE : 8

Century
GEOPHYSICAL CORP.

century-geo.com

DSP-157D

COMPANY	: DRESDEN STATION	OTHER SERVICES:
WELL	: DSP-157D	
FIELD	:	
COUNTY	: GRUNDY	
STATE	: ILL	

LOCATION	: NONE
SECTION	:
TOWNSHIP	:
RANGE	:
API NO.	: None
UNIQUE WELL ID.	: None

PERMANENT DATUM	:	ELEVATION KB:	
LOG MEASURED FROM:	G.L.	ELEVATION DF:	
DRL MEASURED FROM	:	ELEVATION GL:	

DATE	: 03/16/05
RUN NO.	: 1
DEPTH DRILLER	: 131.5
BIT SIZE	: 6
LOG TOP	: -2.90
LOG BOTTOM	: 127.30
CASING OD	: 2"
CASING BOTTOM	: 136
CASING TYPE	: PVC
BOREHOLE FLUID	: 0
RM TEMPERATURE	: 0
MUD RES	: 0
WITNESSED BY	: None
RECORDED BY	: T.NEAL
REMARKS 1	:
REMARKS 2	:

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

GAMMA-INDUCTION DSP-157D 03/16/05

LOG PARAMETERS

MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 54
MAGNETIC DECL : 0	ELECT. CUTOFF : 2500	BIT SIZE : 6

Century
GEOPHYSICAL CORP.

century-geo.com

DSP-158D

COMPANY	: DRESDEN STATION	OTHER SERVICES:
WELL	: DSP-158D	
FIELD	:	
COUNTY	: GRUNDY	
STATE	: ILL.	

LOCATION	: NONE
SECTION	:
TOWNSHIP	:
RANGE	:
API NO.	: None
UNIQUE WELL ID.	: None

PERMANENT DATUM	:	ELEVATION KB:
LOG MEASURED FROM:	G.L.	ELEVATION DF:
DRL MEASURED FROM:		ELEVATION GL:

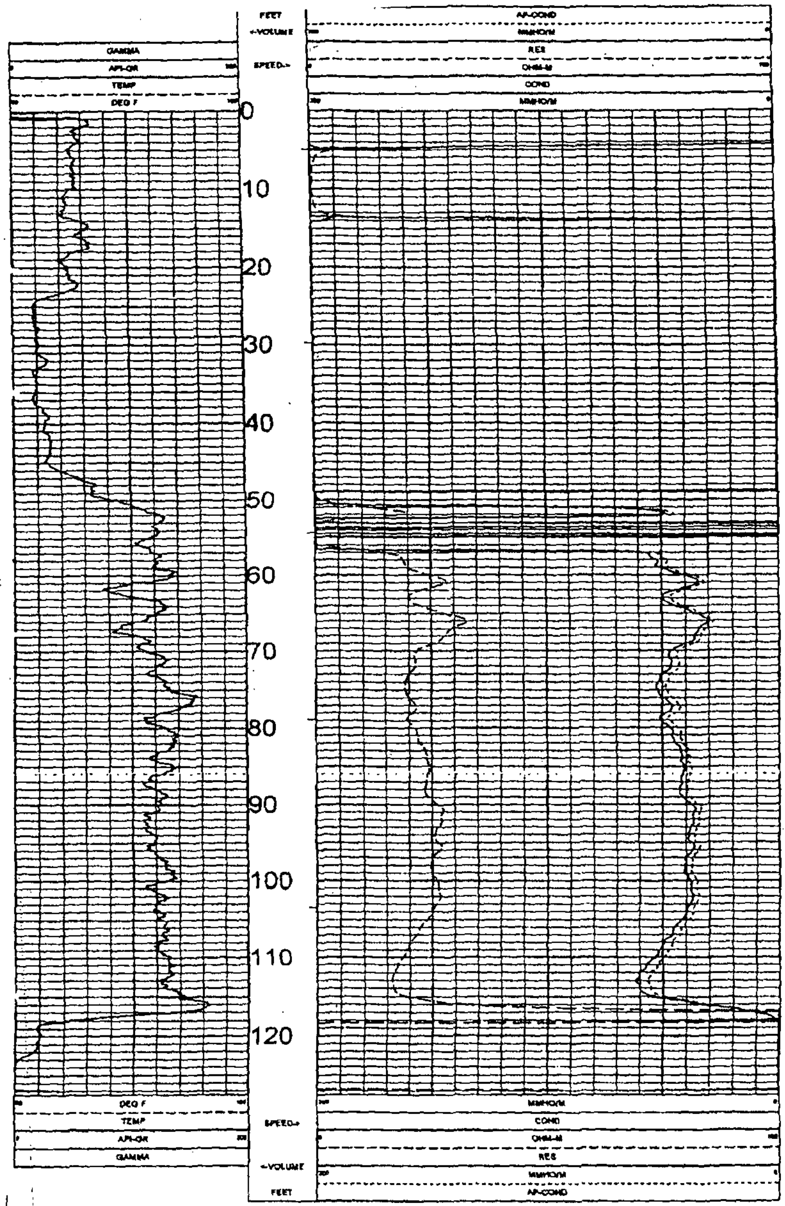
DATE	: 03/16/05
RUN NO.	: 1
DEPTH DRILLER	: 136
BIT SIZE	: 6
LOG TOP	: -2.10
LOG BOTTOM	: 129.00
CASING OD	: 2"
CASING BOTTOM	: 136
CASING TYPE	: PVC
BOREHOLE FLUID	: 0
RM TEMPERATURE	: 0
MUD RES	: 0
WITNESSED BY	: None
RECORDED BY	: T.NEAL
REMARKS 1	:
REMARKS 2	:

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

GAMMA-INDUCTION DSP-158D 03/16/05

LOG PARAMETERS

MATRIX DENSITY : 2.65
NEUTRON MATRIX : SANDSTONE
MATRIX DELTA T : 54
MAGNETIC DECL : 0
ELECT. CUTOFF : 2500
BIT SIZE : 6



GAMMA-INDUCTION DSP-157D 03/16/05

LOG PARAMETERS

MATRIX DENSITY : 2.65 NEUTRON MATRIX : SANDSTONE MATRIX DELTA T : 54

Century GEOPHYSICAL CORP.

century-geo.com

DSP-159D

COMPANY	: DRESDEN STATION	OTHER SERVICES:
WELL	: DSP-159D	
FIELD	:	
COUNTY	: GRUNDY	
STATE	: ILL	
LOCATION	: NONE	
SECTION	:	
TOWNSHIP	:	
RANGE	:	
API NO.	: None	
UNIQUE WELL ID.	: None	
PERMANENT DATUM	:	ELEVATION KB:
LOG MEASURED FROM:	G.L.	ELEVATION DF:
DRL MEASURED FROM:		ELEVATION GL:
DATE	: 03/16/05	
RUN NO.	: 1	
DEPTH DRILLER	: 137	
BIT SIZE	: 6	
LOG TOP	: -2.50	
LOG BOTTOM	: 133.60	
CASING OD	: 2"	
CASING BOTTOM	:	
CASING TYPE	: PVC	
BOREHOLE FLUID	: 0	
RM TEMPERATURE	: 0	
MUD RES	: 0	
WITNESSED BY	: None	
RECORDED BY	: T.NEAL	
REMARKS 1	:	
REMARKS 2	:	

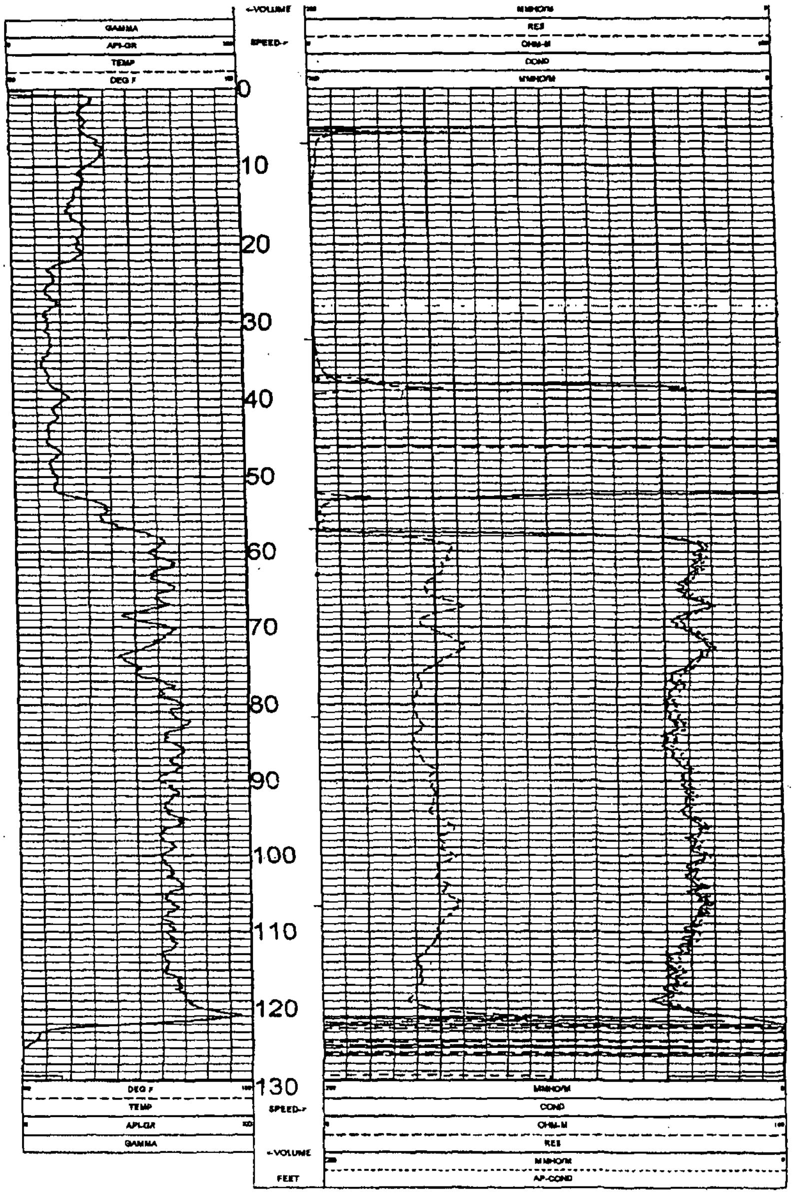
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

GAMMA-INDUCTION DSP-159D 03/16/05

LOG PARAMETERS

MATRIX DENSITY : 2.65 NEUTRON MATRIX : SANDSTONE MATRIX DELTA T : 54

MAGNETIC DECL : 0 ELECT. CUTOFF : 2500 BIT SIZE : 6



GAMMA-INDUCTION DSP-158D 03/16/05

LOG PARAMETERS

MATRIX DENSITY : 2.65	NEUTRON MATRIX : SANDSTONE	MATRIX DELTA T : 54
MAGNETIC DECL : 0	ELECT. CUTOFF : 2500	BIT SIZE : 6

Century
GEOPHYSICAL CORP.

century-geo.com

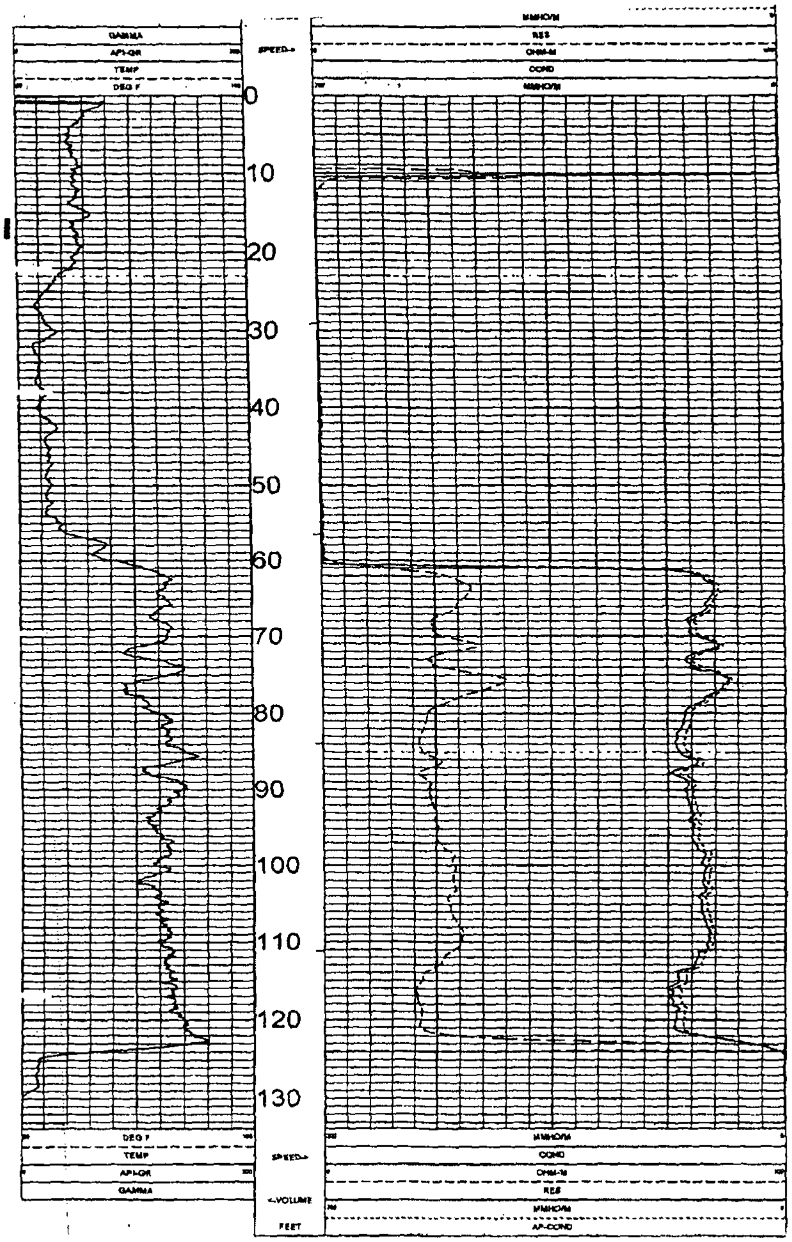
DSP-159M

COMPANY	: DRESDEN STATION	OTHER SERVICES:
WELL	: DSP-159M	
FIELD	:	
COUNTY	: GRUNDY	
STATE	: ILL.	

LOCATION	: NONE
SECTION	:
TOWNSHIP	:
RANGE	:
API NO.	: None
UNIQUE WELL ID.	: None

PERMANENT DATUM	:	ELEVATION KB:
LOG MEASURED FROM	: G.L.	ELEVATION DF:
DRL MEASURED FROM	:	ELEVATION GL:

DATE	: 03/16/05
RUN NO.	: 1
DEPTH DRILLER	: 58
BIT SIZE	: 6
LOG TOP	: -2.60
LOG BOTTOM	: 54.60
CASING OD	: 2"
CASING BOTTOM	:
CASING TYPE	: PVC
BOREHOLE FLUID	: 0
RM TEMPERATURE	: 0
MUD RES	: 0
WITNESSED BY	: None
RECORDED BY	: T.NEAL
REMARKS 1	:
REMARKS 2	:

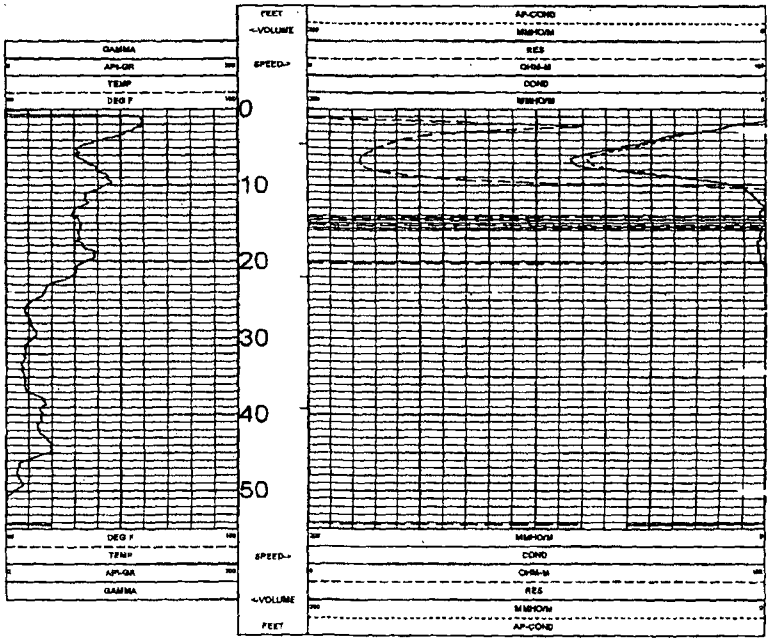


GAMMA-INDUCTION DSF-159D 03/16/05

GAMMA-INDUCTION DSP-159M 03/16/05

LOG PARAMETERS

MATRIX DENSITY : 2.65
MAGNETIC DECL : 0
NEUTRON MATRIX : SANDSTONE
ELECT. CUTOFF : 2500
MATRIX DELTA T : 54
BIT SIZE : 6



GAMMA-INDUCTION DSP-159M 03/16/05

LOG PARAMETERS

MATRIX DENSITY : 2.65
MAGNETIC DECL : 0
NEUTRON MATRIX : SANDSTONE
ELECT. CUTOFF : 2500
MATRIX DELTA T : 54
BIT SIZE : 6

Appendix G
Mass Flux Calculations

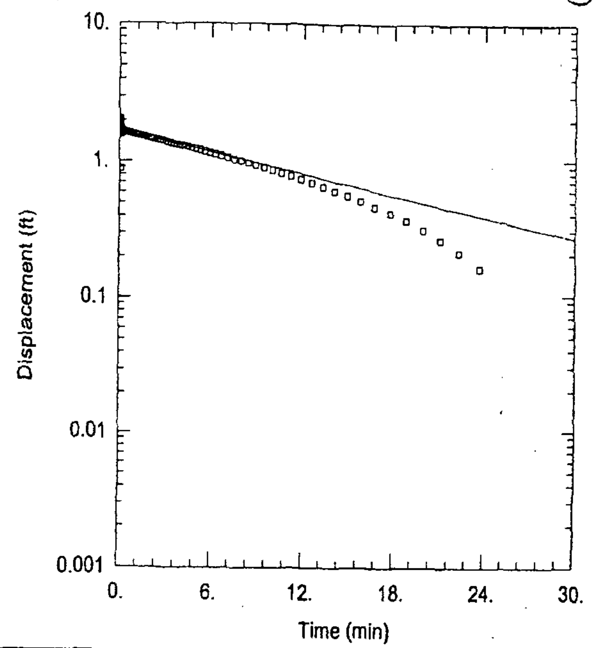
Appendix G
Mass Flux Calculations

Appendix C

Site Survey Map

(Not Included)

Appendix D
Slug Test Data



DRESDEN STATION SLUG TESTS (APRIL 2005)

Data Set: C:\...\DSP121-in.aqt
Date: 06/02/05 Time: 13:36:18

PROJECT INFORMATION

Company: The RETEC Group, Inc.
Client: Exelon Generation
Project: EXENW-18513
Test Location: Dresden Station
Test Well: DSP-121
Test Date: 4/11/05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0002023 ft/min
y0 = 1.683 ft

AQUIFER DATA

Saturated Thickness: 40.75 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (DSP-121)

Initial Displacement: 2.05 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.2
Casing Radius: 0.083 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 40.75 ft

In-Situ Inc.	MiniTroll Pro
Report generated:	04/13/2005 14:11:38
Report from file:	...\SN12682 2005-04-11 162344 DSP-121 in.bin
Win-Situ Version	4.51
Serial number:	12682
Firmware Version	3.09
Unit name:	30-psi miniTROLL
Test name:	DSP-121 in
Test defined on:	04/11/2005 16:22:43
Test started on:	04/11/2005 16:23:44
Test stopped on:	N/A N/A

Data gathered using Logarithmic testing

Maximum time between data points:	600.0	Seconds.
Number of data samples:		116

TOTAL DATA SAMPLES	116

Channel number [1]

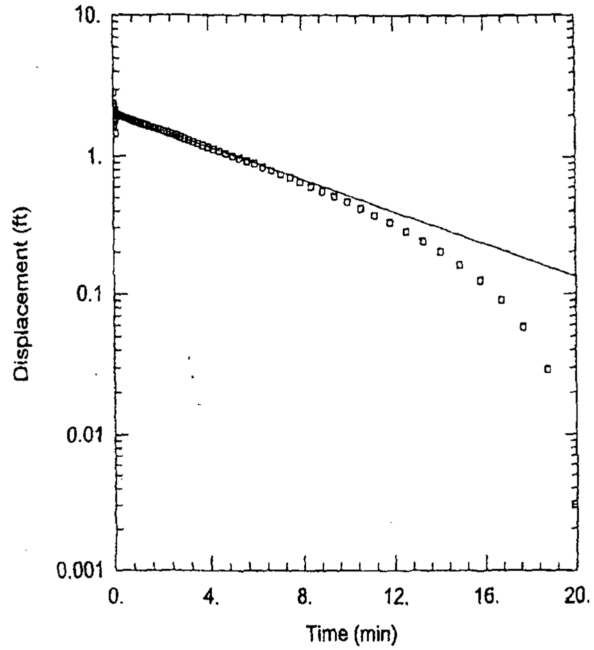
Measurement type:	Temperature
Channel name:	

Channel number [2]

Measurement type:	Pressure
Channel name:	drawdown
Sensor Range:	30 PSIG.
Density:	1.000 g/cm3
Latitude:	45 degrees
Elevation:	152.400 meters (500.000 feet)
Mode:	TOC
User-defined reference:	0.45 Feet H2O
Referenced on:	channel definition.
Pressure head at reference:	20.742 Feet H2O

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	16:23:44	0	-1.814
04/11/2005	16:23:44	0.3	-2.023
04/11/2005	16:23:44	0.6	-1.933
04/11/2005	16:23:45	0.9	-1.97
04/11/2005	16:23:45	1.2	-1.84
04/11/2005	16:23:45	1.5	-1.807
04/11/2005	16:23:46	1.8	-2.006
04/11/2005	16:23:46	2.1	-1.891
04/11/2005	16:23:46	2.4	-1.734
04/11/2005	16:23:46	2.7	-1.801
04/11/2005	16:23:47	3	-1.75
04/11/2005	16:23:47	3.3	-1.83
04/11/2005	16:23:47	3.6	-1.852
04/11/2005	16:23:48	3.9	-2.06
04/11/2005	16:23:48	4.2	-1.691
04/11/2005	16:23:48	4.5	-0.875
04/11/2005	16:23:49	4.8	-1.965
04/11/2005	16:23:49	5.1	-1.663
04/11/2005	16:23:49	5.4	-1.822
04/11/2005	16:23:49	5.7	-1.581
04/11/2005	16:23:50	6	-1.744
04/11/2005	16:23:50	6.4	-1.691
04/11/2005	16:23:51	6.7	-1.599
04/11/2005	16:23:51	7.1	-1.752
04/11/2005	16:23:51	7.5	-1.681
04/11/2005	16:23:52	8	-1.693
04/11/2005	16:23:52	8.4	-1.695
04/11/2005	16:23:53	8.9	-1.69
04/11/2005	16:23:53	9.5	-1.691
04/11/2005	16:23:54	10	-1.68
04/11/2005	16:23:54	10.6	-1.674
04/11/2005	16:23:55	11.3	-1.67
04/11/2005	16:23:56	11.9	-1.668
04/11/2005	16:23:56	12.6	-1.668
04/11/2005	16:23:57	13.4	-1.664
04/11/2005	16:23:58	14.2	-1.663
04/11/2005	16:23:59	15	-1.659
04/11/2005	16:24:00	15.9	-1.657
04/11/2005	16:24:01	16.8	-1.655
04/11/2005	16:24:02	17.8	-1.649

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	16:24:03	18.9	-1.647
04/11/2005	16:24:04	20	-1.645
04/11/2005	16:24:05	21.2	-1.642
04/11/2005	16:24:06	22.4	-1.642
04/11/2005	16:24:08	23.6	-1.64
04/11/2005	16:24:09	25.2	-1.63
04/11/2005	16:24:10	26.7	-1.63
04/11/2005	16:24:12	28.2	-1.63
04/11/2005	16:24:14	29.8	-1.625
04/11/2005	16:24:15	31.5	-1.621
04/11/2005	16:24:17	33.3	-1.619
04/11/2005	16:24:19	35.2	-1.617
04/11/2005	16:24:21	37.3	-1.613
04/11/2005	16:24:23	39.5	-1.609
04/11/2005	16:24:26	41.8	-1.605
04/11/2005	16:24:28	44.3	-1.599
04/11/2005	16:24:31	46.9	-1.596
04/11/2005	16:24:33	49.7	-1.592
04/11/2005	16:24:36	52.6	-1.588
04/11/2005	16:24:39	55.7	-1.582
04/11/2005	16:24:43	59	-1.574
04/11/2005	16:24:46	62.5	-1.569
04/11/2005	16:24:50	66.2	-1.563
04/11/2005	16:24:54	70.1	-1.571
04/11/2005	16:24:58	74.3	-1.557
04/11/2005	16:25:02	78.7	-1.542
04/11/2005	16:25:07	83.4	-1.534
04/11/2005	16:25:12	88.4	-1.53
04/11/2005	16:25:17	93.7	-1.521
04/11/2005	16:25:23	99.3	-1.513
04/11/2005	16:25:29	105.2	-1.501
04/11/2005	16:25:35	111.5	-1.491
04/11/2005	16:25:42	118.1	-1.481
04/11/2005	16:25:49	125.1	-1.472
04/11/2005	16:25:56	132.6	-1.46
04/11/2005	16:26:04	140.5	-1.446
04/11/2005	16:26:13	148.9	-1.436
04/11/2005	16:26:22	157.8	-1.423
04/11/2005	16:26:31	167.2	-1.409
04/11/2005	16:26:41	177.2	-1.396
04/11/2005	16:26:52	187.8	-1.378
04/11/2005	16:27:03	199	-1.361
04/11/2005	16:27:15	210.9	-1.345
04/11/2005	16:27:27	223.5	-1.326
04/11/2005	16:27:41	236.6	-1.31
04/11/2005	16:27:55	250.9	-1.289
04/11/2005	16:28:10	265.8	-1.267
04/11/2005	16:28:25	281.6	-1.244
04/11/2005	16:28:42	298.4	-1.223
04/11/2005	16:29:00	316.2	-1.2
04/11/2005	16:29:19	335	-1.174
04/11/2005	16:29:39	354.9	-1.149
04/11/2005	16:30:00	376	-1.122
04/11/2005	16:30:22	398.4	-1.093
04/11/2005	16:30:48	422.1	-1.064
04/11/2005	16:31:11	447.2	-1.031
04/11/2005	16:31:38	473.8	-1
04/11/2005	16:32:06	502	-0.967
04/11/2005	16:32:36	531.9	-0.931
04/11/2005	16:33:07	563.5	-0.894
04/11/2005	16:33:41	597	-0.856
04/11/2005	16:34:16	632.5	-0.818
04/11/2005	16:34:54	670.1	-0.778
04/11/2005	16:35:34	709.9	-0.736
04/11/2005	16:36:16	752.1	-0.694
04/11/2005	16:37:01	796.8	-0.65
04/11/2005	16:37:48	844.2	-0.604
04/11/2005	16:38:38	894.4	-0.558
04/11/2005	16:39:31	947.5	-0.51
04/11/2005	16:40:28	1003.8	-0.466
04/11/2005	16:41:27	1063.4	-0.416
04/11/2005	16:42:30	1126.6	-0.365
04/11/2005	16:43:37	1193.5	-0.313
04/11/2005	16:44:48	1264.4	-0.262
04/11/2005	16:46:03	1339.5	-0.209
04/11/2005	16:47:23	1419	-0.159



DRESDEN STATION SLUG TESTS (APRIL 2005)

Data Set: C:\...\DSP149R-in.aqt
Date: 06/02/05 Time: 13:36:55

PROJECT INFORMATION

Company: The RETEC Group, Inc.
Client: Exelon Generation
Project: EXENW-18513
Test Location: Dresden Station
Test Well: DSP-149R
Test Date: 4/11/05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0004589 ft/min
y0 = 1.998 ft

AQUIFER DATA

Saturated Thickness: 49. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (DSP-149R)

Initial Displacement: 1.76 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.2
Casing Radius: 0.083 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 49. ft

In-Situ Inc. MiniTroll Pro

Report generated: 04/13/2005 14:07:33
Report from file: ...\SN12682 2005-04-11 150530 DSP-149R In.bin
Win-Situ Version 4.51

Serial number: 12682
Firmware Version 3.09
Unit name: 30-psi miniTROLL

Test name: DSP-149R In

Test defined on: 04/11/2005 14:58:53
Test started on: 04/11/2005 15:05:30
Test stopped on: N/A N/A

Data gathered using Logarithmic testing
Maximum time between data points: 600.0 Seconds.
Number of data samples: 113

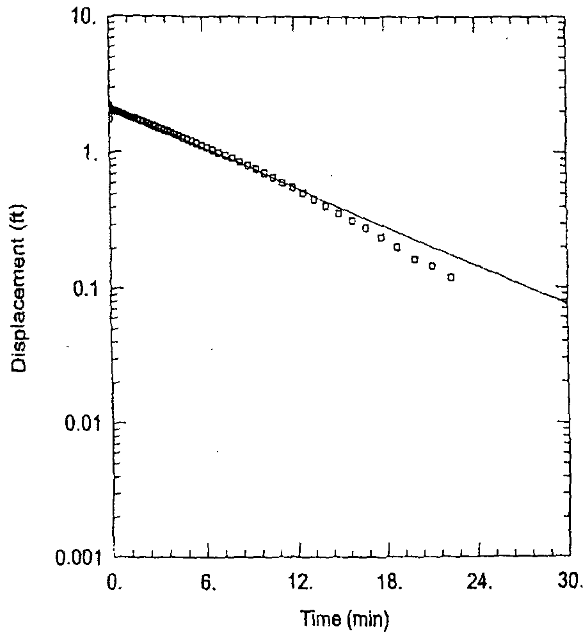
TOTAL DATA SAMPLES 113

Channel number [1]
Measurement type: Temperature
Channel name:

Channel number [2]
Measurement type: Pressure
Channel name: drawdown
Sensor Range: 30 PSIG.
Density: 1.000 g/cm3
Latitude: 45 degrees
Elevation: 152.400 meters (500.000 feet)
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 17.154 Feet H2O

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	15:05:30	0	0
04/11/2005	15:05:30	0.3	-0.913
04/11/2005	15:05:31	0.6	-0.214
04/11/2005	15:05:31	0.9	-0.4
04/11/2005	15:05:31	1.2	-0.442
04/11/2005	15:05:32	1.5	-0.392
04/11/2005	15:05:32	1.8	0.116
04/11/2005	15:05:32	2.1	0.247
04/11/2005	15:05:32	2.4	-0.174
04/11/2005	15:05:33	2.7	-0.296
04/11/2005	15:05:33	3	-0.282
04/11/2005	15:05:33	3.3	-0.308
04/11/2005	15:05:34	3.6	-0.127
04/11/2005	15:05:34	3.9	0.473
04/11/2005	15:05:34	4.2	0.091
04/11/2005	15:05:35	4.5	-0.096
04/11/2005	15:05:35	4.8	-0.198
04/11/2005	15:05:35	5.1	-0.016
04/11/2005	15:05:35	5.4	-0.051
04/11/2005	15:05:36	5.7	-0.064
04/11/2005	15:05:36	6	-0.06
04/11/2005	15:05:36	6.4	-0.058
04/11/2005	15:05:37	6.7	-0.058
04/11/2005	15:05:37	7.1	-0.056
04/11/2005	15:05:38	7.5	-0.054
04/11/2005	15:05:38	8	-0.053
04/11/2005	15:05:39	8.4	-0.066
04/11/2005	15:05:39	8.9	-0.072
04/11/2005	15:05:40	9.5	-0.068
04/11/2005	15:05:40	10	-0.059
04/11/2005	15:05:41	10.6	-0.053
04/11/2005	15:05:41	11.3	-0.047
04/11/2005	15:05:42	11.9	-0.045
04/11/2005	15:05:43	12.6	-0.042
04/11/2005	15:05:43	13.4	-0.036
04/11/2005	15:05:44	14.2	-0.032
04/11/2005	15:05:45	15	-0.028
04/11/2005	15:05:46	15.9	-0.022
04/11/2005	15:05:47	16.8	-0.018
04/11/2005	15:05:48	17.8	-0.012

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	15:05:49	18.8	-0.005
04/11/2005	15:05:50	20	-0.002
04/11/2005	15:05:51	21.2	0.006
04/11/2005	15:05:53	22.4	0.009
04/11/2005	15:05:54	23.8	0.017
04/11/2005	15:05:56	25.2	0.023
04/11/2005	15:05:57	26.7	0.029
04/11/2005	15:05:58	28.2	0.037
04/11/2005	15:06:00	29.8	0.044
04/11/2005	15:06:02	31.5	0.052
04/11/2005	15:06:03	33.3	0.058
04/11/2005	15:06:05	35.2	0.068
04/11/2005	15:06:07	37.3	0.076
04/11/2005	15:06:10	39.5	0.086
04/11/2005	15:06:12	41.8	0.095
04/11/2005	15:06:14	44.3	0.107
04/11/2005	15:06:17	46.9	0.119
04/11/2005	15:06:20	49.7	0.131
04/11/2005	15:06:23	52.6	0.144
04/11/2005	15:06:26	55.7	0.157
04/11/2005	15:06:29	59	0.168
04/11/2005	15:06:33	62.5	0.184
04/11/2005	15:06:36	66.2	0.198
04/11/2005	15:06:40	70.1	0.213
04/11/2005	15:06:44	74.3	0.231
04/11/2005	15:06:49	78.7	0.249
04/11/2005	15:06:53	83.4	0.266
04/11/2005	15:06:58	88.4	0.286
04/11/2005	15:07:04	93.7	0.305
04/11/2005	15:07:09	99.3	0.327
04/11/2005	15:07:15	105.2	0.349
04/11/2005	15:07:22	111.5	0.374
04/11/2005	15:07:28	118.1	0.398
04/11/2005	15:07:35	125.1	0.423
04/11/2005	15:07:43	132.6	0.449
04/11/2005	15:07:51	140.5	0.476
04/11/2005	15:07:59	148.9	0.504
04/11/2005	15:08:08	157.8	0.533
04/11/2005	15:08:17	167.2	0.564
04/11/2005	15:08:27	177.2	0.594
04/11/2005	15:08:38	187.8	0.628
04/11/2005	15:08:49	199	0.661
04/11/2005	15:09:01	210.9	0.697
04/11/2005	15:09:14	223.5	0.734
04/11/2005	15:09:27	236.8	0.771
04/11/2005	15:09:41	250.9	0.809
04/11/2005	15:09:56	265.8	0.85
04/11/2005	15:10:12	281.6	0.89
04/11/2005	15:10:28	298.4	0.931
04/11/2005	15:10:46	316.2	0.972
04/11/2005	15:11:05	335	1.016
04/11/2005	15:11:25	354.9	1.044
04/11/2005	15:11:46	376	1.103
04/11/2005	15:12:08	398.4	1.148
04/11/2005	15:12:32	422.1	1.194
04/11/2005	15:12:57	447.2	1.239
04/11/2005	15:13:24	473.8	1.285
04/11/2005	15:13:52	502	1.332
04/11/2005	15:14:22	531.9	1.377
04/11/2005	15:14:54	563.5	1.424
04/11/2005	15:15:27	597	1.469
04/11/2005	15:16:03	632.5	1.516
04/11/2005	15:16:40	670.1	1.56
04/11/2005	15:17:20	709.9	1.603
04/11/2005	15:18:02	752.1	1.649
04/11/2005	15:18:47	796.8	1.691
04/11/2005	15:19:34	844.2	1.731
04/11/2005	15:20:24	894.4	1.769
04/11/2005	15:21:18	947.5	1.805
04/11/2005	15:22:14	1003.8	1.84
04/11/2005	15:23:13	1063.4	1.872
04/11/2005	15:24:17	1126.8	1.901
04/11/2005	15:25:24	1193.5	1.927



DRESDEN STATION SLUG TESTS (APRIL 2005)

Data Set: C:\...\DSP149R-out.aqt
Date: 06/02/05 Time: 13:37:43

PROJECT INFORMATION

Company: The RETEC Group, Inc.
Client: Exelon Generation
Project: EXENW-18513
Test Location: Dresden Station
Test Well: DSP-149R
Test Date: 4/11/05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0003772 ft/min
y0 = 2.109 ft

AQUIFER DATA

Saturated Thickness: 49. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (DSP-149R)

Initial Displacement: 1.76 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.2
Casing Radius: 0.083 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 49. ft

In-Situ Inc. MiniTroll Pro

Report generated: 04/13/2005 14:09:44
Report from file: ...\SN12682 2005-04-11 154042 DSP-149R out.bin
Win-Situ Version 4.51

Serial number: 12682
Firmware Version 3.09
Unit name: 30-psi miniTROLL

Test name: DSP-149R out

Test defined on: 04/11/2005 15:40:09
Test started on: 04/11/2005 15:40:42
Test stopped on: N/A N/A

Data gathered using Logarithmic testing
Maximum time between data points: 600.0 Seconds.
Number of data samples: 115

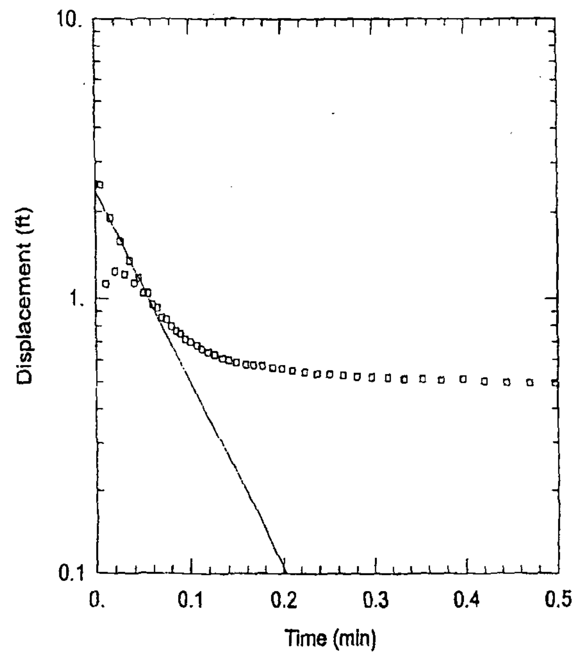
TOTAL DATA SAMPLES 115

Channel number [1]
Measurement type: Temperature
Channel name:

Channel number [2]
Measurement type: Pressure
Channel name: drawdown
Sensor Range: 30 PSIG.
Density: 1.000 g/cm3
Latitude: 45 degrees
Elevation: 152.400 meters (500.000 feet)
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: channel definition.
Pressure head at reference: 15.108 Feet H2O

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	15:40:42	0	1.724
04/11/2005	15:40:42	0.3	2.18
04/11/2005	15:40:42	0.6	2.203
04/11/2005	15:40:42	0.9	2.164
04/11/2005	15:40:43	1.2	2.147
04/11/2005	15:40:43	1.5	2.135
04/11/2005	15:40:43	1.8	2.127
04/11/2005	15:40:44	2.1	2.127
04/11/2005	15:40:44	2.4	2.106
04/11/2005	15:40:44	2.7	2.106
04/11/2005	15:40:45	3	2.102
04/11/2005	15:40:45	3.3	2.1
04/11/2005	15:40:45	3.6	2.094
04/11/2005	15:40:45	3.9	2.092
04/11/2005	15:40:46	4.2	2.09
04/11/2005	15:40:46	4.5	2.086
04/11/2005	15:40:46	4.8	2.084
04/11/2005	15:40:47	5.1	2.08
04/11/2005	15:40:47	5.4	2.079
04/11/2005	15:40:47	5.7	2.074
04/11/2005	15:40:48	6	2.072
04/11/2005	15:40:48	6.4	2.071
04/11/2005	15:40:48	6.7	2.067
04/11/2005	15:40:49	7.1	2.065
04/11/2005	15:40:49	7.5	2.061
04/11/2005	15:40:50	8	2.059
04/11/2005	15:40:50	8.4	2.056
04/11/2005	15:40:51	8.9	2.051
04/11/2005	15:40:51	9.5	2.047
04/11/2005	15:40:52	10	2.052
04/11/2005	15:40:52	10.6	2.051
04/11/2005	15:40:53	11.3	2.049
04/11/2005	15:40:53	11.9	2.047
04/11/2005	15:40:54	12.6	2.044
04/11/2005	15:40:55	13.4	2.042
04/11/2005	15:40:56	14.2	2.04
04/11/2005	15:40:57	15	2.036
04/11/2005	15:40:57	15.9	2.032
04/11/2005	15:40:58	16.8	2.03
04/11/2005	15:40:59	17.8	2.027

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	15:41:00	18.9	2.023
04/11/2005	15:41:02	20	2.019
04/11/2005	15:41:03	21.2	2.015
04/11/2005	15:41:04	22.4	2.011
04/11/2005	15:41:05	23.8	2.006
04/11/2005	15:41:07	25.2	2.001
04/11/2005	15:41:08	26.7	1.995
04/11/2005	15:41:10	28.2	1.989
04/11/2005	15:41:11	29.8	1.983
04/11/2005	15:41:13	31.5	1.979
04/11/2005	15:41:15	33.3	1.972
04/11/2005	15:41:17	35.2	1.967
04/11/2005	15:41:19	37.3	1.959
04/11/2005	15:41:21	39.5	1.952
04/11/2005	15:41:23	41.8	1.944
04/11/2005	15:41:26	44.3	1.934
04/11/2005	15:41:28	46.9	1.926
04/11/2005	15:41:31	49.7	1.916
04/11/2005	15:41:34	52.6	1.906
04/11/2005	15:41:37	55.7	1.895
04/11/2005	15:41:41	59	1.885
04/11/2005	15:41:44	62.5	1.873
04/11/2005	15:41:48	66.2	1.859
04/11/2005	15:41:52	70.1	1.846
04/11/2005	15:41:56	74.3	1.834
04/11/2005	15:42:00	78.7	1.82
04/11/2005	15:42:05	83.4	1.806
04/11/2005	15:42:10	88.4	1.789
04/11/2005	15:42:15	93.7	1.773
04/11/2005	15:42:21	99.3	1.755
04/11/2005	15:42:27	105.2	1.736
04/11/2005	15:42:33	111.5	1.717
04/11/2005	15:42:40	118.1	1.697
04/11/2005	15:42:47	125.1	1.676
04/11/2005	15:42:54	132.6	1.656
04/11/2005	15:43:02	140.5	1.633
04/11/2005	15:43:10	148.9	1.609
04/11/2005	15:43:19	157.8	1.584
04/11/2005	15:43:29	167.2	1.559
04/11/2005	15:43:39	177.2	1.529
04/11/2005	15:43:49	187.8	1.502
04/11/2005	15:44:01	199	1.473
04/11/2005	15:44:12	210.9	1.442
04/11/2005	15:44:25	223.5	1.413
04/11/2005	15:44:38	236.8	1.379
04/11/2005	15:44:52	250.9	1.346
04/11/2005	15:45:07	265.8	1.311
04/11/2005	15:45:23	281.6	1.274
04/11/2005	15:45:40	298.4	1.236
04/11/2005	15:45:58	316.2	1.199
04/11/2005	15:46:17	335	1.158
04/11/2005	15:46:36	354.9	1.119
04/11/2005	15:46:58	376	1.076
04/11/2005	15:47:20	398.4	1.031
04/11/2005	15:47:44	422.1	0.989
04/11/2005	15:48:09	447.2	0.943
04/11/2005	15:48:35	473.8	0.899
04/11/2005	15:49:04	502	0.85
04/11/2005	15:49:33	531.9	0.803
04/11/2005	15:50:05	563.5	0.754
04/11/2005	15:50:39	597	0.706
04/11/2005	15:51:14	632.5	0.655
04/11/2005	15:51:52	670.1	0.604
04/11/2005	15:52:31	709.9	0.56
04/11/2005	15:53:14	752.1	0.506
04/11/2005	15:53:58	796.8	0.455
04/11/2005	15:54:46	844.2	0.408
04/11/2005	15:55:36	894.4	0.361
04/11/2005	15:56:29	947.6	0.316
04/11/2005	15:57:25	1003.8	0.28
04/11/2005	15:58:25	1063.4	0.239
04/11/2005	15:59:28	1126.6	0.201
04/11/2005	16:00:35	1193.5	0.163
04/11/2005	16:01:46	1264.4	0.146
04/11/2005	16:03:01	1339.5	0.119



DRESDEN STATION SLUG TESTS (APRIL 2005)

Data Set: C:\..\DSP157S-out.aqt
Date: 06/02/05 Time: 13:32:36

PROJECT INFORMATION

Company: The RETEC Group, Inc.
Client: Exelon Generation
Project: EXENW-18513
Test Location: Dresden Station
Test Well: DSP-157S
Test Date: 4/11/05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0329 ft/min
y0 = 2.358 ft

AQUIFER DATA

Saturated Thickness: 47.15 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (DSP-157S)

Initial Displacement: 2.5 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.2

Casing Radius: 0.083 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 9.7 ft

In-Situ Inc. MiniTroll Pro

Report generated: 04/13/2005 14:12:44
Report from file: ...\SN12682 2005-04-11 173216 DSP-157S-out.bin
Win-Situ Version 4.51

Serial number: 12682
Firmware Version 3.09
Unit name: 30-psi miniTROLL

Test name: DSP-157S-out

Test defined on: 04/11/2005 17:17:35
Test started on: 04/11/2005 17:32:16
Test stopped on: 04/11/2005 17:55:37

Data gathered using Logarithmic testing
Maximum time between data points: 600.0 Seconds.
Number of data samples: 115

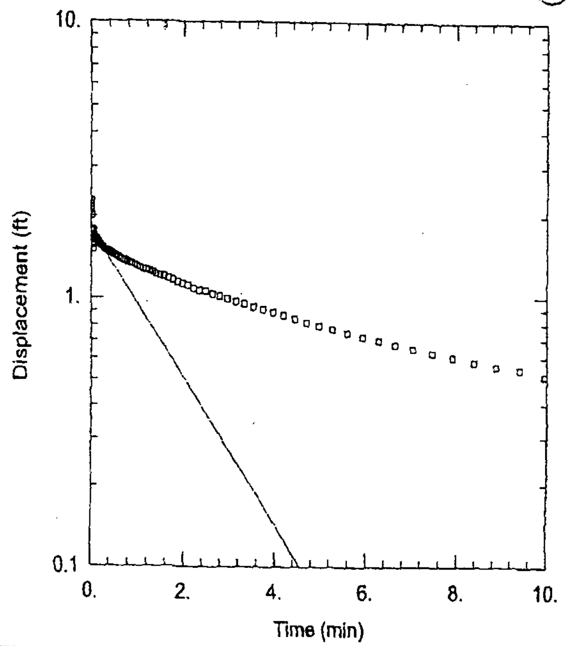
TOTAL DATA SAMPLES 115

Channel number [1]
Measurement type: Temperature
Channel name:

Channel number [2]
Measurement type: Pressure
Channel name: drawdown
Sensor Range: 30 PSIG.
Density: 1.000 g/cm3
Latitude: 45 degrees
Elevation: 152.400 meters (500.000 feet)
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: channel definition.
Pressure head at reference: 6.585 Feet H2O

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	17:32:16	0	0.776
04/11/2005	17:32:16	0.3	2.482
04/11/2005	17:32:16	0.6	1.122
04/11/2005	17:32:17	0.9	1.899
04/11/2005	17:32:17	1.2	1.242
04/11/2005	17:32:17	1.5	1.57
04/11/2005	17:32:17	1.8	1.211
04/11/2005	17:32:18	2.1	1.348
04/11/2005	17:32:18	2.4	1.132
04/11/2005	17:32:18	2.7	1.174
04/11/2005	17:32:19	3	1.04
04/11/2005	17:32:19	3.3	1.04
04/11/2005	17:32:19	3.6	0.96
04/11/2005	17:32:20	3.9	0.928
04/11/2005	17:32:20	4.2	0.856
04/11/2005	17:32:20	4.5	0.84
04/11/2005	17:32:20	4.8	0.795
04/11/2005	17:32:21	5.1	0.767
04/11/2005	17:32:21	5.4	0.748
04/11/2005	17:32:21	5.7	0.715
04/11/2005	17:32:22	6	0.701
04/11/2005	17:32:22	6.4	0.679
04/11/2005	17:32:22	6.7	0.66
04/11/2005	17:32:23	7.1	0.642
04/11/2005	17:32:23	7.5	0.628
04/11/2005	17:32:24	8	0.609
04/11/2005	17:32:24	8.4	0.599
04/11/2005	17:32:25	8.9	0.585
04/11/2005	17:32:25	9.5	0.577
04/11/2005	17:32:26	10	0.575
04/11/2005	17:32:26	10.6	0.571
04/11/2005	17:32:27	11.3	0.563
04/11/2005	17:32:28	11.9	0.557
04/11/2005	17:32:28	12.6	0.549
04/11/2005	17:32:29	13.4	0.541
04/11/2005	17:32:30	14.2	0.533
04/11/2005	17:32:31	15	0.531
04/11/2005	17:32:32	15.9	0.527
04/11/2005	17:32:32	16.8	0.521
04/11/2005	17:32:33	17.8	0.519

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	17:32:35	18.9	0.517
04/11/2005	17:32:36	20	0.511
04/11/2005	17:32:37	21.2	0.51
04/11/2005	17:32:38	22.4	0.506
04/11/2005	17:32:39	23.6	0.51
04/11/2005	17:32:41	25.2	0.502
04/11/2005	17:32:42	26.7	0.496
04/11/2005	17:32:44	28.2	0.494
04/11/2005	17:32:45	29.8	0.493
04/11/2005	17:32:47	31.5	0.489
04/11/2005	17:32:49	33.3	0.488
04/11/2005	17:32:51	35.2	0.484
04/11/2005	17:32:53	37.3	0.482
04/11/2005	17:32:55	39.5	0.478
04/11/2005	17:32:57	41.8	0.474
04/11/2005	17:33:00	44.3	0.472
04/11/2005	17:33:03	46.9	0.466
04/11/2005	17:33:05	49.7	0.467
04/11/2005	17:33:08	52.6	0.462
04/11/2005	17:33:11	55.7	0.464
04/11/2005	17:33:15	59	0.46
04/11/2005	17:33:18	62.5	0.457
04/11/2005	17:33:22	66.2	0.447
04/11/2005	17:33:26	70.1	0.446
04/11/2005	17:33:30	74.3	0.446
04/11/2005	17:33:34	78.7	0.439
04/11/2005	17:33:39	83.4	0.437
04/11/2005	17:33:44	88.4	0.433
04/11/2005	17:33:49	93.7	0.427
04/11/2005	17:33:55	99.3	0.427
04/11/2005	17:34:01	105.2	0.419
04/11/2005	17:34:07	111.5	0.415
04/11/2005	17:34:14	118.1	0.411
04/11/2005	17:34:21	125.1	0.409
04/11/2005	17:34:28	132.6	0.399
04/11/2005	17:34:36	140.5	0.405
04/11/2005	17:34:45	148.9	0.401
04/11/2005	17:34:53	157.8	0.391
04/11/2005	17:35:03	167.2	0.385
04/11/2005	17:35:13	177.2	0.38
04/11/2005	17:35:23	187.8	0.374
04/11/2005	17:35:35	199	0.372
04/11/2005	17:35:47	210.9	0.364
04/11/2005	17:35:59	223.5	0.358
04/11/2005	17:36:12	236.8	0.352
04/11/2005	17:36:27	250.9	0.347
04/11/2005	17:36:41	265.8	0.341
04/11/2005	17:36:57	281.6	0.335
04/11/2005	17:37:14	298.4	0.327
04/11/2005	17:37:32	316.2	0.323
04/11/2005	17:37:51	335	0.316
04/11/2005	17:38:11	354.9	0.31
04/11/2005	17:38:32	376	0.304
04/11/2005	17:38:54	398.4	0.292
04/11/2005	17:39:18	422.1	0.288
04/11/2005	17:39:43	447.2	0.279
04/11/2005	17:40:09	473.8	0.271
04/11/2005	17:40:38	502	0.263
04/11/2005	17:41:08	531.9	0.253
04/11/2005	17:41:39	563.5	0.257
04/11/2005	17:42:13	597	0.241
04/11/2005	17:42:48	632.5	0.231
04/11/2005	17:43:26	670.1	0.219
04/11/2005	17:44:06	709.9	0.217
04/11/2005	17:44:48	752.1	0.209
04/11/2005	17:45:32	796.8	0.201
04/11/2005	17:46:20	844.2	0.197
04/11/2005	17:47:10	894.4	0.183
04/11/2005	17:48:03	947.5	0.174
04/11/2005	17:48:59	1003.8	0.151
04/11/2005	17:49:59	1063.4	0.135
04/11/2005	17:51:02	1126.6	0.123
04/11/2005	17:52:09	1193.5	0.111
04/11/2005	17:53:20	1264.4	0.104
04/11/2005	17:54:35	1339.5	0.102



DRESDEN STATION SLUG TESTS (APRIL 2005)

Data Set: C:\...\DSP157M-in.aqt
Date: 06/02/05 Time: 13:39:51

PROJECT INFORMATION

Company: The RETEC Group, Inc.
Client: Exelon Generation
Project: EXENW-18513
Test Location: Dresden Station
Test Well: DSP-157M
Test Date: 4/11/05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.001823 ft/min
y0 = 1.776 ft

AQUIFER DATA

Saturated Thickness: 44.52 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (DSP-157M)

Initial Displacement: 2.254 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.2
Casing Radius: 0.083 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 41.49 ft

In-Situ Inc. MiniTroll Pro

Report generated: 04/13/2005 14:14:17
Report from file: ...\SN12682 2005-04-11 182623 DSP-157M in.bin
Win-Situ Version 4.61

Serial number: 12682
Firmware Version 3.09
Unit name: 30-psi miniTROLL

Test name: DSP-157M in

Test defined on: 04/11/2005 18:04:09
Test started on: 04/11/2005 18:26:23
Test stopped on: N/A N/A

Data gathered using Logarithmic testing
Maximum time between data points: 600.0 Seconds.
Number of data samples: 124

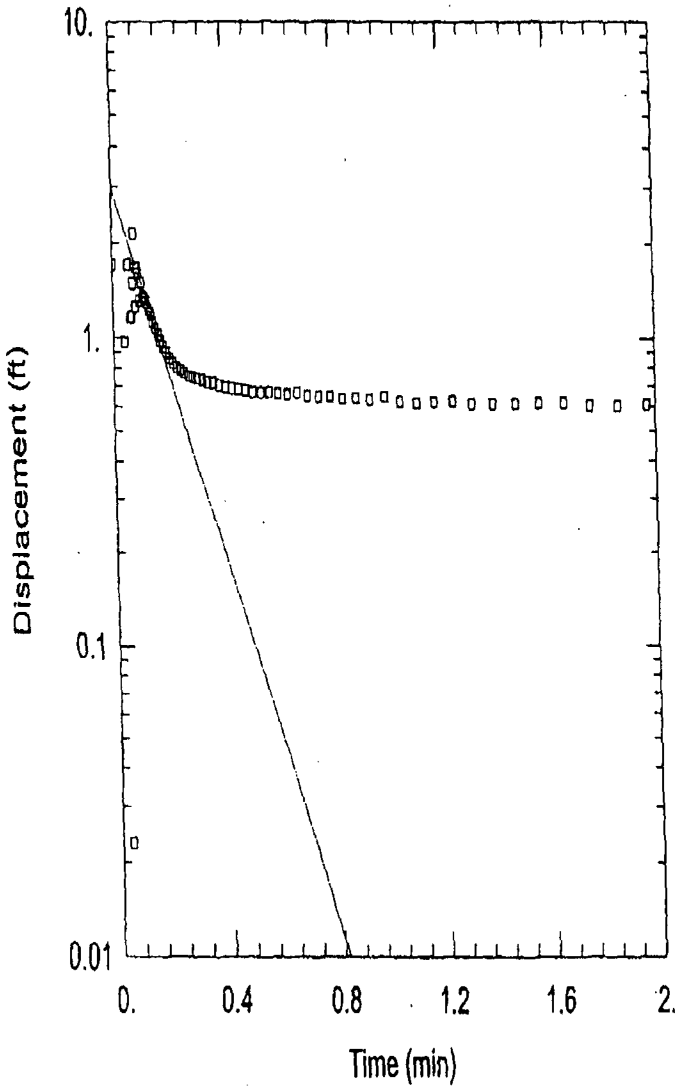
TOTAL DATA SAMPLES 124

Channel number [1]
Measurement type: Temperature
Channel name:

Channel number [2]
Measurement type: Pressure
Channel name: drawdown
Sensor Range: 30 PSIG.
Density: 1.000 g/cm3
Latitude: 45 degrees
Elevation: 152.400 meters (500.000 feet)
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: channel definition.
Pressure head at reference: 23.202 Feet H2O

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	18:26:23	0	-1.215
04/11/2005	18:26:23	0.3	-1.769
04/11/2005	18:26:23	0.6	-2.143
04/11/2005	18:26:24	0.9	-2.254
04/11/2005	18:26:24	1.2	-2.197
04/11/2005	18:26:24	1.5	-2.094
04/11/2005	18:26:25	1.8	-2.007
04/11/2005	18:26:25	2.1	-1.784
04/11/2005	18:26:25	2.4	-1.601
04/11/2005	18:26:25	2.7	-1.613
04/11/2005	18:26:26	3	-1.675
04/11/2005	18:26:26	3.3	-1.644
04/11/2005	18:26:26	3.6	-1.703
04/11/2005	18:26:27	3.9	-1.758
04/11/2005	18:26:27	4.2	-1.764
04/11/2005	18:26:27	4.5	-1.662
04/11/2005	18:26:28	4.8	-1.644
04/11/2005	18:26:28	5.1	-1.638
04/11/2005	18:26:28	5.4	-1.648
04/11/2005	18:26:28	5.7	-1.657
04/11/2005	18:26:29	6	-1.663
04/11/2005	18:26:29	6.4	-1.657
04/11/2005	18:26:29	6.7	-1.648
04/11/2005	18:26:30	7.1	-1.642
04/11/2005	18:26:30	7.5	-1.636
04/11/2005	18:26:31	8	-1.632
04/11/2005	18:26:31	8.4	-1.628
04/11/2005	18:26:32	8.9	-1.62
04/11/2005	18:26:32	9.5	-1.614
04/11/2005	18:26:33	10	-1.597
04/11/2005	18:26:33	10.6	-1.585
04/11/2005	18:26:34	11.3	-1.58
04/11/2005	18:26:35	11.9	-1.574
04/11/2005	18:26:35	12.6	-1.564
04/11/2005	18:26:36	13.4	-1.557
04/11/2005	18:26:37	14.2	-1.549
04/11/2005	18:26:38	15	-1.541
04/11/2005	18:26:39	15.9	-1.541
04/11/2005	18:26:40	16.8	-1.516
04/11/2005	18:26:41	17.8	-1.512
04/11/2005	18:26:42	18.9	-1.51
04/11/2005	18:26:43	20	-1.501
04/11/2005	18:26:44	21.2	-1.493
04/11/2005	18:26:45	22.4	-1.483
04/11/2005	18:26:46	23.8	-1.475

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	18:26:48	25.2	-1.465
04/11/2005	18:26:49	26.7	-1.458
04/11/2005	18:26:51	28.2	-1.448
04/11/2005	18:26:52	29.8	-1.438
04/11/2005	18:26:54	31.5	-1.43
04/11/2005	18:26:56	33.3	-1.421
04/11/2005	18:26:58	35.2	-1.409
04/11/2005	18:27:00	37.3	-1.397
04/11/2005	18:27:02	39.5	-1.388
04/11/2005	18:27:04	41.8	-1.38
04/11/2005	18:27:07	44.3	-1.368
04/11/2005	18:27:10	46.9	-1.355
04/11/2005	18:27:12	49.7	-1.345
04/11/2005	18:27:15	52.6	-1.333
04/11/2005	18:27:18	55.7	-1.321
04/11/2005	18:27:22	59	-1.308
04/11/2005	18:27:25	62.5	-1.292
04/11/2005	18:27:29	66.2	-1.279
04/11/2005	18:27:33	70.1	-1.267
04/11/2005	18:27:37	74.3	-1.255
04/11/2005	18:27:41	78.7	-1.239
04/11/2005	18:27:46	83.4	-1.222
04/11/2005	18:27:51	88.4	-1.206
04/11/2005	18:27:56	93.7	-1.195
04/11/2005	18:28:02	99.3	-1.177
04/11/2005	18:28:08	105.2	-1.161
04/11/2005	18:28:14	111.5	-1.142
04/11/2005	18:28:21	118.1	-1.128
04/11/2005	18:28:28	125.1	-1.108
04/11/2005	18:28:35	132.6	-1.085
04/11/2005	18:28:43	140.5	-1.065
04/11/2005	18:28:52	148.9	-1.055
04/11/2005	18:29:00	157.8	-1.034
04/11/2005	18:29:10	167.2	-1.015
04/11/2005	18:29:20	177.2	-0.994
04/11/2005	18:29:30	187.8	-0.972
04/11/2005	18:29:42	199	-0.953
04/11/2005	18:29:54	210.9	-0.93
04/11/2005	18:30:06	223.5	-0.912
04/11/2005	18:30:19	236.8	-0.89
04/11/2005	18:30:34	250.9	-0.865
04/11/2005	18:30:48	265.8	-0.843
04/11/2005	18:31:04	281.6	-0.817
04/11/2005	18:31:21	298.4	-0.792
04/11/2005	18:31:39	316.2	-0.769
04/11/2005	18:31:58	335	-0.746
04/11/2005	18:32:18	354.9	-0.721
04/11/2005	18:32:39	376	-0.698
04/11/2005	18:33:01	398.4	-0.672
04/11/2005	18:33:25	422.1	-0.648
04/11/2005	18:33:50	447.2	-0.625
04/11/2005	18:34:16	473.8	-0.602
04/11/2005	18:34:45	502	-0.578
04/11/2005	18:35:15	531.9	-0.555
04/11/2005	18:35:46	563.5	-0.541
04/11/2005	18:36:20	597	-0.508
04/11/2005	18:36:55	632.5	-0.489
04/11/2005	18:37:33	670.1	-0.467
04/11/2005	18:38:13	709.9	-0.451
04/11/2005	18:38:55	752.1	-0.434
04/11/2005	18:39:39	796.8	-0.415
04/11/2005	18:40:27	844.2	-0.401
04/11/2005	18:41:17	894.4	-0.387
04/11/2005	18:42:10	947.5	-0.381
04/11/2005	18:43:06	1003.8	-0.356
04/11/2005	18:44:06	1063.4	-0.343
04/11/2005	18:45:09	1126.6	-0.327
04/11/2005	18:46:16	1193.5	-0.317
04/11/2005	18:47:27	1264.4	-0.308
04/11/2005	18:48:42	1339.5	-0.305
04/11/2005	18:50:02	1419	-0.299
04/11/2005	18:51:26	1503.3	-0.298
04/11/2005	18:52:55	1592.6	-0.294
04/11/2005	18:54:30	1687.1	-0.289
04/11/2005	18:56:10	1787.2	-0.285
04/11/2005	18:57:56	1893.3	-0.285
04/11/2005	18:59:48	2005.7	-0.287
04/11/2005	19:01:47	2124.7	-0.286
04/11/2005	19:03:53	2250.8	-0.28



DRESDEN STATION SLUG TESTS (APRIL 2005)

Data Set: C:\...\DSP158S-out.aqt
Date: 06/02/05 Time: 13:42:41

PROJECT INFORMATION

Company: The RETEC Group, Inc.
Client: Exelon Generation
Project: EXENW-18513
Test Location: Dresden Station
Test Well: DSP-158S
Test Date: 4/12/05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.01448 ft/min
y0 = 2.98 ft

AQUIFER DATA

Saturated Thickness: 52.91 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (DSP-158S)

Initial Displacement: 1.7 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.2
Casing Radius: 0.083 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 9.08 ft

In-Situ Inc. MiniTroll Pro

Report generated: 04/13/2005 14:15:41
Report from file: ...\SN12682 2005-04-12 120218 DSP-158S out.bin
Win-Situ Version 4.51

Serial number: 12682
Firmware Version 3.09
Unit name: 30-psi miniTROLL

Test name: DSP-158S out

Test defined on: 04/12/2005 12:00:47
Test started on: 04/12/2005 12:02:18
Test stopped on: N/A N/A

Data gathered using Logarithmic testing
Maximum time between data points: 600.0 Seconds.
Number of data samples: 129

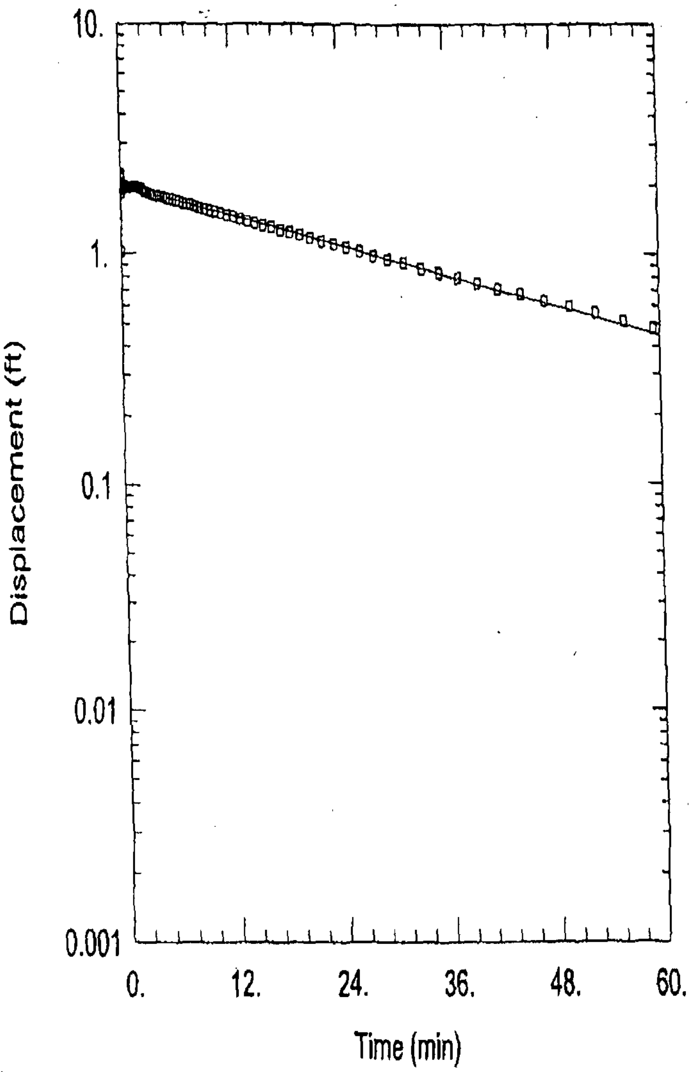
TOTAL DATA SAMPLES 129

Channel number [1]
Measurement type: Temperature
Channel name:

Channel number [2]
Measurement type: Pressure
Channel name: drawdown
Sensor Range: 30 PSIG.
Density: 1.000 g/cm3
Latitude: 45 degrees
Elevation: 152.400 meters (500.000 feet)
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: channel definition.
Pressure head at reference: 7.664 Feet H2O

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/12/2005	12:02:18	0	0
04/12/2005	12:02:18	0.3	-0.011
04/12/2005	12:02:19	0.6	-0.013
04/12/2005	12:02:19	0.9	-0.018
04/12/2005	12:02:19	1.2	-0.022
04/12/2005	12:02:20	1.5	-0.02
04/12/2005	12:02:20	1.8	-0.022
04/12/2005	12:02:20	2.1	0.023
04/12/2005	12:02:20	2.4	0.967
04/12/2005	12:02:21	2.7	-0.032
04/12/2005	12:02:21	3	-0.283
04/12/2005	12:02:21	3.3	1.7
04/12/2005	12:02:22	3.6	1.158
04/12/2005	12:02:22	3.9	1.156
04/12/2005	12:02:22	4.2	1.476
04/12/2005	12:02:23	4.5	2.135
04/12/2005	12:02:23	4.8	1.25
04/12/2005	12:02:23	5.1	1.655
04/12/2005	12:02:23	5.4	1.598
04/12/2005	12:02:24	5.7	1.305
04/12/2005	12:02:24	6	1.482
04/12/2005	12:02:24	6.4	1.352
04/12/2005	12:02:25	6.7	1.329
04/12/2005	12:02:25	7.1	1.291
04/12/2005	12:02:26	7.5	1.227
04/12/2005	12:02:26	8	1.189
04/12/2005	12:02:26	8.4	1.117
04/12/2005	12:02:27	8.9	1.068
04/12/2005	12:02:27	9.5	1.019
04/12/2005	12:02:28	10	0.973
04/12/2005	12:02:29	10.6	0.932
04/12/2005	12:02:29	11.3	0.897
04/12/2005	12:02:30	11.9	0.859
04/12/2005	12:02:31	12.6	0.83
04/12/2005	12:02:31	13.4	0.804
04/12/2005	12:02:32	14.2	0.786
04/12/2005	12:02:33	15	0.769
04/12/2005	12:02:34	15.9	0.753
04/12/2005	12:02:35	16.8	0.745
04/12/2005	12:02:36	17.8	0.739
04/12/2005	12:02:37	18.9	0.731
04/12/2005	12:02:38	20	0.72
04/12/2005	12:02:39	21.2	0.716
04/12/2005	12:02:40	22.4	0.702
04/12/2005	12:02:42	23.8	0.696
04/12/2005	12:02:43	25.2	0.686
04/12/2005	12:02:45	26.7	0.684
04/12/2005	12:02:46	28.2	0.68

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/12/2005	12:02:48	29.8	0.672
04/12/2005	12:02:49	31.5	0.668
04/12/2005	12:02:51	33.3	0.67
04/12/2005	12:02:53	35.2	0.662
04/12/2005	12:02:55	37.3	0.658
04/12/2005	12:02:57	39.5	0.668
04/12/2005	12:03:00	41.8	0.652
04/12/2005	12:03:02	44.3	0.648
04/12/2005	12:03:05	46.9	0.648
04/12/2005	12:03:08	49.7	0.637
04/12/2005	12:03:11	52.6	0.639
04/12/2005	12:03:14	55.7	0.633
04/12/2005	12:03:17	59	0.645
04/12/2005	12:03:20	62.5	0.623
04/12/2005	12:03:24	66.2	0.619
04/12/2005	12:03:28	70.1	0.621
04/12/2005	12:03:32	74.3	0.625
04/12/2005	12:03:37	78.7	0.615
04/12/2005	12:03:41	83.4	0.613
04/12/2005	12:03:46	88.4	0.613
04/12/2005	12:03:52	93.7	0.617
04/12/2005	12:03:57	99.3	0.619
04/12/2005	12:04:03	105.2	0.603
04/12/2005	12:04:09	111.5	0.601
04/12/2005	12:04:16	118.1	0.607
04/12/2005	12:04:23	125.1	0.597
04/12/2005	12:04:31	132.6	0.585
04/12/2005	12:04:38	140.5	0.601
04/12/2005	12:04:47	148.9	0.603
04/12/2005	12:04:56	157.8	0.593
04/12/2005	12:05:05	167.2	0.589
04/12/2005	12:05:15	177.2	0.585
04/12/2005	12:05:26	187.8	0.579
04/12/2005	12:05:37	199	0.577
04/12/2005	12:05:49	210.9	0.573
04/12/2005	12:06:01	223.5	0.581
04/12/2005	12:06:15	236.8	0.581
04/12/2005	12:06:29	250.9	0.577
04/12/2005	12:06:44	265.8	0.571
04/12/2005	12:07:00	281.6	0.575
04/12/2005	12:07:16	298.4	0.559
04/12/2005	12:07:34	316.2	0.553
04/12/2005	12:07:53	335	0.555
04/12/2005	12:08:13	354.9	0.553
04/12/2005	12:08:34	376	0.553
04/12/2005	12:08:56	398.4	0.551
04/12/2005	12:09:20	422.1	0.545
04/12/2005	12:09:45	447.2	0.541
04/12/2005	12:10:12	473.8	0.551
04/12/2005	12:10:40	502	0.538
04/12/2005	12:11:10	531.9	0.538
04/12/2005	12:11:41	563.5	0.528
04/12/2005	12:12:15	597	0.53
04/12/2005	12:12:50	632.5	0.522
04/12/2005	12:13:28	670.1	0.526
04/12/2005	12:14:08	709.9	0.528
04/12/2005	12:14:50	752.1	0.514
04/12/2005	12:15:35	796.8	0.513
04/12/2005	12:16:22	844.2	0.508
04/12/2005	12:17:12	894.4	0.504
04/12/2005	12:18:05	947.5	0.5
04/12/2005	12:19:02	1003.8	0.492
04/12/2005	12:20:01	1063.4	0.491
04/12/2005	12:21:05	1126.6	0.489
04/12/2005	12:22:11	1193.5	0.48
04/12/2005	12:23:22	1264.4	0.502
04/12/2005	12:24:37	1339.5	0.473
04/12/2005	12:25:57	1419	0.471
04/12/2005	12:27:21	1503.3	0.479
04/12/2005	12:28:51	1592.6	0.459
04/12/2005	12:30:25	1687.1	0.455
04/12/2005	12:32:05	1787.2	0.451
04/12/2005	12:33:51	1893.3	0.446
04/12/2005	12:35:44	2005.7	0.438
04/12/2005	12:37:43	2124.7	0.434
04/12/2005	12:39:49	2250.8	0.428
04/12/2005	12:42:02	2384.4	0.432
04/12/2005	12:44:24	2525.9	0.418
04/12/2005	12:46:54	2675.8	0.412
04/12/2005	12:49:33	2834.6	0.409
04/12/2005	12:52:21	3002.8	0.399



DRESDEN STATION SLUG TESTS (APRIL 2005)

Data Set: C:\...\DSP158M-in.aqt
Date: 06/02/05 Time: 13:41:24

PROJECT INFORMATION

Company: The RETEC Group, Inc.
Client: Exelon Generation
Project: EXENW-18513
Test Location: Dresden Station
Test Well: DSP-158M
Test Date: 4/12/05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 8.501E-05 ft/min
y0 = 1.969 ft

AQUIFER DATA

Saturated Thickness: 53. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (DSP-158M)

Initial Displacement: 2.2 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.2
Casing Radius: 0.083 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 53. ft

In-Situ Inc. MiniTroll Pro

Report generated: 04/13/2005 14:17:08
Report from file: ...\SN12682 2005-04-12 142637 DSP-158M in.bin
Win-Situ Version 4.51

Serial number: 12682
Firmware Version 3.09
Unit name: 30-psi miniTROLL

Test name: DSP-158M in

Test defined on: 04/12/2005 13:05:48
Test started on: 04/12/2005 14:26:37
Test stopped on: N/A N/A

Data gathered using Logarithmic testing
Maximum time between data points: 600.0 Seconds.
Number of data samples: 133

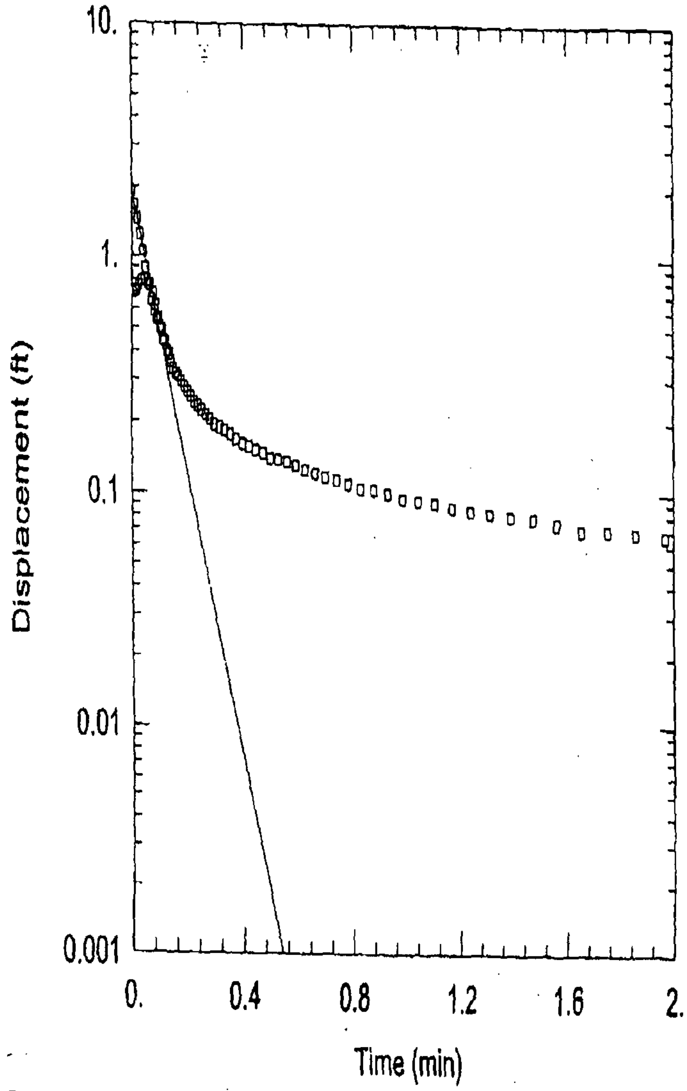
TOTAL DATA SAMPLES 133

Channel number [1]
Measurement type: Temperature
Channel name:

Channel number [2]
Measurement type: Pressure
Channel name: drawdown
Sensor Range: 30 PSIG.
Density: 1.000 g/cm3
Latitude: 45 degrees
Elevation: 152.400 meters (500.000 feet)
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: channel definition.
Pressure head at reference: 14.742 Feet H2O

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/12/2005	14:26:37	0	0.005
04/12/2005	14:26:37	0.3	-0.006
04/12/2005	14:26:38	0.6	-0.012
04/12/2005	14:26:38	0.9	-0.013
04/12/2005	14:26:38	1.2	-0.017
04/12/2005	14:26:38	1.5	-0.017
04/12/2005	14:26:39	1.8	-0.019
04/12/2005	14:26:39	2.1	-0.019
04/12/2005	14:26:39	2.4	-0.019
04/12/2005	14:26:40	2.7	-0.019
04/12/2005	14:26:40	3	-0.019
04/12/2005	14:26:40	3.3	-0.019
04/12/2005	14:26:41	3.6	-0.021
04/12/2005	14:26:41	3.9	-0.021
04/12/2005	14:26:41	4.2	-0.019
04/12/2005	14:26:41	4.5	-0.019
04/12/2005	14:26:42	4.8	-0.019
04/12/2005	14:26:42	5.1	-0.019
04/12/2005	14:26:42	5.4	-0.021
04/12/2005	14:26:43	5.7	-0.019
04/12/2005	14:26:43	6	-0.017
04/12/2005	14:26:43	6.4	-0.017
04/12/2005	14:26:44	6.7	-0.019
04/12/2005	14:26:44	7.1	-0.016
04/12/2005	14:26:44	7.5	-0.019
04/12/2005	14:26:45	8	-0.019
04/12/2005	14:26:45	8.4	-0.017
04/12/2005	14:26:46	8.9	-0.016
04/12/2005	14:26:46	9.5	-0.016
04/12/2005	14:26:47	10	-0.013
04/12/2005	14:26:48	10.6	-0.009
04/12/2005	14:26:48	11.3	-0.003
04/12/2005	14:26:49	11.9	-0.004
04/12/2005	14:26:50	12.6	-0.008
04/12/2005	14:26:50	13.4	-1.016
04/12/2005	14:26:51	14.2	-1.934
04/12/2005	14:26:52	15	-1.952
04/12/2005	14:26:53	15.9	-1.987
04/12/2005	14:26:54	16.8	-2.154
04/12/2005	14:26:55	17.8	-2.109
04/12/2005	14:26:56	18.9	-1.832
04/12/2005	14:26:57	20	-2.186
04/12/2005	14:26:58	21.2	-2.005
04/12/2005	14:26:59	22.4	-1.984
04/12/2005	14:27:01	23.8	-1.99
04/12/2005	14:27:02	25.2	-1.976
04/12/2005	14:27:04	26.7	-1.9
04/12/2005	14:27:05	28.2	-1.972
04/12/2005	14:27:07	29.8	-1.972
04/12/2005	14:27:08	31.5	-1.971

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/12/2005	14:27:10	33.3	-1.971
04/12/2005	14:27:12	35.2	-1.969
04/12/2005	14:27:14	37.3	-1.969
04/12/2005	14:27:16	39.5	-1.965
04/12/2005	14:27:19	41.8	-1.965
04/12/2005	14:27:21	44.3	-1.961
04/12/2005	14:27:24	46.9	-1.959
04/12/2005	14:27:27	49.7	-1.955
04/12/2005	14:27:30	52.6	-1.953
04/12/2005	14:27:33	55.7	-1.951
04/12/2005	14:27:36	59	-1.947
04/12/2005	14:27:39	62.5	-1.946
04/12/2005	14:27:43	66.2	-1.942
04/12/2005	14:27:47	70.1	-1.938
04/12/2005	14:27:51	74.3	-1.932
04/12/2005	14:27:56	78.7	-1.93
04/12/2005	14:28:00	83.4	-1.926
04/12/2005	14:28:05	88.4	-1.92
04/12/2005	14:28:11	93.7	-1.926
04/12/2005	14:28:16	99.3	-1.949
04/12/2005	14:28:22	105.2	-1.943
04/12/2005	14:28:28	111.6	-1.939
04/12/2005	14:28:35	118.1	-1.931
04/12/2005	14:28:42	125.1	-1.928
04/12/2005	14:28:50	132.6	-1.928
04/12/2005	14:28:57	140.5	-1.918
04/12/2005	14:29:06	148.9	-1.917
04/12/2005	14:29:15	157.8	-1.904
04/12/2005	14:29:24	167.2	-1.853
04/12/2005	14:29:34	177.2	-1.843
04/12/2005	14:29:45	187.8	-1.833
04/12/2005	14:29:56	199	-1.824
04/12/2005	14:30:08	210.9	-1.813
04/12/2005	14:30:20	223.5	-1.803
04/12/2005	14:30:34	236.8	-1.791
04/12/2005	14:30:48	250.9	-1.78
04/12/2005	14:31:03	265.8	-1.77
04/12/2005	14:31:19	281.6	-1.758
04/12/2005	14:31:35	298.4	-1.742
04/12/2005	14:31:53	316.2	-1.726
04/12/2005	14:32:12	335	-1.716
04/12/2005	14:32:32	354.9	-1.703
04/12/2005	14:32:53	376	-1.685
04/12/2005	14:33:15	398.4	-1.67
04/12/2005	14:33:39	422.1	-1.651
04/12/2005	14:34:04	447.2	-1.634
04/12/2005	14:34:31	473.6	-1.618
04/12/2005	14:34:59	502	-1.596
04/12/2005	14:35:29	531.9	-1.576
04/12/2005	14:36:00	563.5	-1.554
04/12/2005	14:36:34	597	-1.534
04/12/2005	14:37:09	632.5	-1.51
04/12/2005	14:37:47	670.1	-1.486
04/12/2005	14:38:27	709.9	-1.463
04/12/2005	14:39:09	752.1	-1.438
04/12/2005	14:39:54	796.8	-1.409
04/12/2005	14:40:41	844.2	-1.382
04/12/2005	14:41:31	894.4	-1.351
04/12/2005	14:42:24	947.5	-1.323
04/12/2005	14:43:21	1003.8	-1.292
04/12/2005	14:44:20	1063.4	-1.259
04/12/2005	14:45:24	1126.6	-1.227
04/12/2005	14:46:30	1193.6	-1.195
04/12/2005	14:47:41	1264.4	-1.162
04/12/2005	14:48:56	1339.5	-1.127
04/12/2005	14:50:16	1419	-1.093
04/12/2005	14:51:40	1503.3	-1.059
04/12/2005	14:53:10	1592.6	-1.019
04/12/2005	14:54:44	1687.1	-0.98
04/12/2005	14:56:24	1787.2	-0.946
04/12/2005	14:58:10	1893.3	-0.905
04/12/2005	15:00:03	2005.7	-0.868
04/12/2005	15:02:02	2124.7	-0.826
04/12/2005	15:04:08	2250.8	-0.785
04/12/2005	15:06:21	2384.4	-0.747
04/12/2005	15:08:43	2525.9	-0.705
04/12/2005	15:11:13	2675.8	-0.666
04/12/2005	15:13:52	2834.6	-0.624
04/12/2005	15:16:40	3002.8	-0.591
04/12/2005	15:19:38	3180.9	-0.553
04/12/2005	15:22:47	3369.6	-0.512
04/12/2005	15:26:06	3569.5	-0.478
04/12/2005	15:29:38	3781.2	-0.45



DRESDEN STATION SLUG TESTS (APRIL 2005)

Data Set: C:\...\DSP159S-out.aqt
Date: 06/02/05 Time: 13:46:10

PROJECT INFORMATION

Company: The RETEC Group, Inc.
Client: Exelon Generation
Project: EXENW-18513
Test Location: Dresden Station
Test Well: DSP-159S
Test Date: 4/11/05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.02811 ft/min
y0 = 1.923 ft

AQUIFER DATA

Saturated Thickness: 50.66 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (DSP-159S)

Initial Displacement: 1.921 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.2

Casing Radius: 0.083 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 7.62 ft

In-Situ Inc. MiniTroll Pro

Report generated: 04/13/2005 13:35:09
Report from file: ...\SN12682 2005-04-11 111513 DSP-159S out.bin
Win-Situ Version 4.51

Serial number: 12682
Firmware Version 3.09
Unit name: 30-psi miniTROLL

Test name: DSP-159S out

Test defined on: 03/29/2005 20:38:12
Test started on: 04/11/2005 11:15:13
Test stopped on: N/A N/A

Data gathered using Logarithmic testing
Maximum time between data points: 600.0 Seconds.
Number of data samples: 122

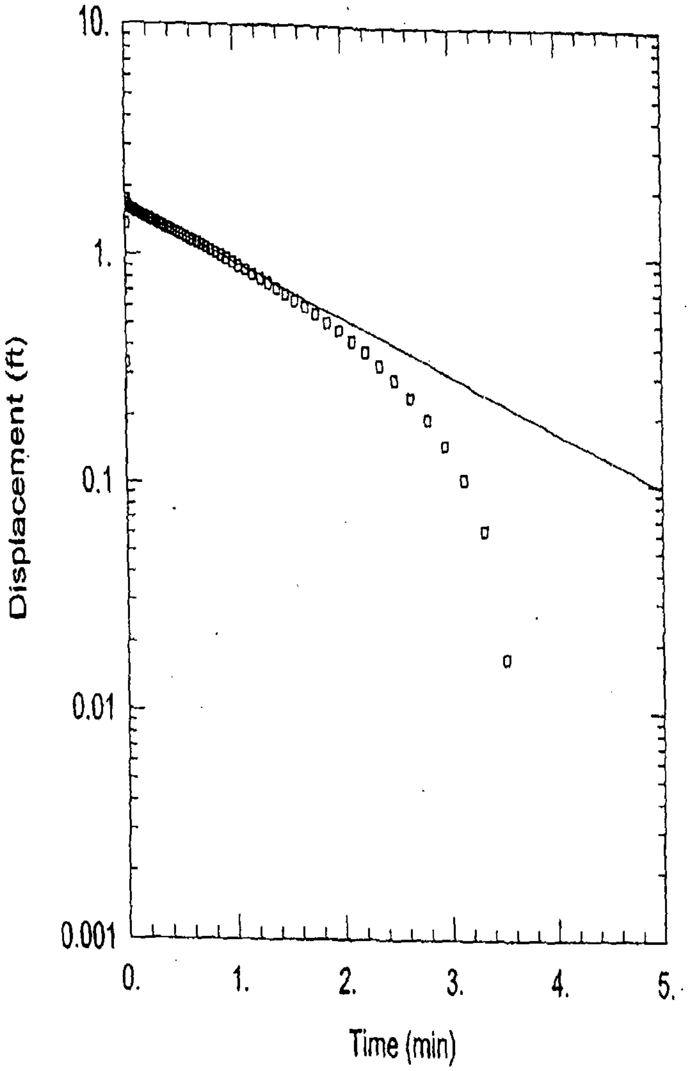
TOTAL DATA SAMPLES 122

Channel number [1]
Measurement type: Temperature
Channel name:

Channel number [2]
Measurement type: Pressure
Channel name: drawdown
Sensor Range: 30 PSIG.
Density: 1.000 g/cm3
Latitude: 45 degrees
Elevation: 152.400 meters (500.000 feet)
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 4.311 Feet H2O

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	11:15:13	0	0
04/11/2005	11:15:13	0.3	-1.22
04/11/2005	11:15:13	0.6	-0.254
04/11/2005	11:15:14	0.9	-1.208
04/11/2005	11:15:14	1.2	-0.473
04/11/2005	11:15:14	1.5	-1.172
04/11/2005	11:15:15	1.8	-0.88
04/11/2005	11:15:15	2.1	-1.14
04/11/2005	11:15:15	2.4	-0.875
04/11/2005	11:15:16	2.7	-1.127
04/11/2005	11:15:16	3	-1.04
04/11/2005	11:15:16	3.3	-1.138
04/11/2005	11:15:16	3.6	-1.172
04/11/2005	11:15:17	3.9	-1.168
04/11/2005	11:15:17	4.2	-1.27
04/11/2005	11:15:17	4.5	-1.226
04/11/2005	11:15:18	4.8	-1.338
04/11/2005	11:15:18	5.1	-1.303
04/11/2005	11:15:18	5.4	-1.383
04/11/2005	11:15:19	5.7	-1.376
04/11/2005	11:15:19	6	-1.421
04/11/2005	11:15:19	6.4	-1.436
04/11/2005	11:15:20	6.7	-1.478
04/11/2005	11:15:20	7.1	-1.487
04/11/2005	11:15:20	7.5	-1.525
04/11/2005	11:15:21	8	-1.538
04/11/2005	11:15:21	8.4	-1.584
04/11/2005	11:15:22	8.9	-1.589
04/11/2005	11:15:22	9.5	-1.605
04/11/2005	11:15:23	10	-1.615
04/11/2005	11:15:23	10.6	-1.629
04/11/2005	11:15:24	11.3	-1.643
04/11/2005	11:15:25	11.9	-1.657
04/11/2005	11:15:25	12.6	-1.668
04/11/2005	11:15:26	13.4	-1.681
04/11/2005	11:15:27	14.2	-1.69
04/11/2005	11:15:28	15	-1.7
04/11/2005	11:15:29	15.9	-1.71
04/11/2005	11:15:30	16.8	-1.718
04/11/2005	11:15:31	17.8	-1.728
04/11/2005	11:15:32	18.9	-1.733
04/11/2005	11:15:33	20	-1.739
04/11/2005	11:15:34	21.2	-1.745
04/11/2005	11:15:35	22.4	-1.753

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	11:15:37	23.8	-1.759
04/11/2005	11:15:38	25.2	-1.763
04/11/2005	11:15:40	26.7	-1.769
04/11/2005	11:15:41	28.2	-1.773
04/11/2005	11:15:43	29.8	-1.781
04/11/2005	11:15:44	31.5	-1.783
04/11/2005	11:15:46	33.3	-1.786
04/11/2005	11:15:48	35.2	-1.79
04/11/2005	11:15:50	37.3	-1.796
04/11/2005	11:15:52	39.5	-1.8
04/11/2005	11:15:55	41.8	-1.804
04/11/2005	11:15:57	44.3	-1.808
04/11/2005	11:16:00	46.9	-1.812
04/11/2005	11:16:03	49.7	-1.816
04/11/2005	11:16:06	52.6	-1.818
04/11/2005	11:16:09	55.7	-1.822
04/11/2005	11:16:12	59	-1.826
04/11/2005	11:16:15	62.5	-1.828
04/11/2005	11:16:19	66.2	-1.83
04/11/2005	11:16:23	70.1	-1.834
04/11/2005	11:16:27	74.3	-1.837
04/11/2005	11:16:32	78.7	-1.839
04/11/2005	11:16:36	83.4	-1.841
04/11/2005	11:16:41	88.4	-1.843
04/11/2005	11:16:47	93.7	-1.847
04/11/2005	11:16:52	99.3	-1.851
04/11/2005	11:16:58	105.2	-1.851
04/11/2005	11:17:04	111.5	-1.853
04/11/2005	11:17:11	118.1	-1.855
04/11/2005	11:17:18	125.1	-1.857
04/11/2005	11:17:25	132.6	-1.861
04/11/2005	11:17:33	140.5	-1.86
04/11/2005	11:17:42	148.9	-1.861
04/11/2005	11:17:51	157.8	-1.863
04/11/2005	11:18:00	167.2	-1.865
04/11/2005	11:18:10	177.2	-1.867
04/11/2005	11:18:21	187.8	-1.869
04/11/2005	11:18:32	199	-1.869
04/11/2005	11:18:44	210.9	-1.871
04/11/2005	11:18:56	223.5	-1.874
04/11/2005	11:19:10	236.8	-1.874
04/11/2005	11:19:24	250.9	-1.874
04/11/2005	11:19:39	265.8	-1.876
04/11/2005	11:19:54	281.6	-1.878
04/11/2005	11:20:11	298.4	-1.879
04/11/2005	11:20:29	316.2	-1.881
04/11/2005	11:20:48	335	-1.883
04/11/2005	11:21:08	354.9	-1.887
04/11/2005	11:21:29	376	-1.887
04/11/2005	11:21:51	398.4	-1.887
04/11/2005	11:22:15	422.1	-1.885
04/11/2005	11:22:40	447.2	-1.889
04/11/2005	11:23:07	473.8	-1.887
04/11/2005	11:23:35	502	-1.891
04/11/2005	11:24:05	531.9	-1.894
04/11/2005	11:24:36	563.5	-1.892
04/11/2005	11:25:10	597	-1.894
04/11/2005	11:25:46	632.5	-1.897
04/11/2005	11:26:23	670.1	-1.893
04/11/2005	11:27:03	709.9	-1.897
04/11/2005	11:27:45	752.1	-1.896
04/11/2005	11:28:30	796.8	-1.9
04/11/2005	11:29:17	844.2	-1.901
04/11/2005	11:30:07	894.4	-1.902
04/11/2005	11:31:00	947.5	-1.904
04/11/2005	11:31:57	1003.8	-1.906
04/11/2005	11:32:58	1063.4	-1.905
04/11/2005	11:33:59	1126.6	-1.906
04/11/2005	11:35:08	1193.5	-1.907
04/11/2005	11:36:17	1264.4	-1.911
04/11/2005	11:37:32	1339.5	-1.911
04/11/2005	11:38:52	1419	-1.912
04/11/2005	11:40:16	1503.3	-1.914
04/11/2005	11:41:45	1592.6	-1.914
04/11/2005	11:43:20	1687.1	-1.917
04/11/2005	11:45:00	1787.2	-1.917
04/11/2005	11:46:46	1893.3	-1.919
04/11/2005	11:48:39	2005.7	-1.921



DRESDEN STATION SLUG TESTS (APRIL 2005)

Data Set: C:\...\DSP159M-out.aqt
Date: 06/02/05 Time: 13:44:37

PROJECT INFORMATION

Company: The RETEC Group, Inc.
Client: Exelon Generation
Project: EXENW-18513
Test Location: Dresden Station
Test Well: DSP-159M
Test Date: 4/11/05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00193 ft/min
y0 = 1.659 ft

AQUIFER DATA

Saturated Thickness: 49. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (DSP-159M)

Initial Displacement: 1.76 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.2

Casing Radius: 0.083 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 49. ft

In-Situ Inc. MiniTroll Pro

Report generated: 04/13/2005 14:03:57
Report from file: ...\SN12682 2005-04-11 124214 DSP-159M out.bin
Win-Situ Version 4.51

Serial number: 12682
Firmware Version 3.09
Unit name: 30-psi miniTROLL

Test name: DSP-159M out

Test defined on: 04/11/2005 12:40:20
Test started on: 04/11/2005 12:42:14
Test stopped on: N/A N/A

Data gathered using Logarithmic testing
Maximum time between data points: 600.0 Seconds.
Number of data samples: 104

TOTAL DATA SAMPLES 104

Channel number [1]
Measurement type: Temperature
Channel name:

Channel number [2]
Measurement type: Pressure
Channel name: drawdown
Sensor Range: 30 PSIG.
Density: 1.000 g/cm3
Latitude: 45 degrees
Elevation: 152.400 meters (500.000 feet)
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 15.212 Feet H2O

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	12:42:14	0	0
04/11/2005	12:42:14	0.3	0.334
04/11/2005	12:42:15	0.6	1.364
04/11/2005	12:42:15	0.9	1.759
04/11/2005	12:42:15	1.2	1.618
04/11/2005	12:42:16	1.5	1.626
04/11/2005	12:42:16	1.8	1.665
04/11/2005	12:42:16	2.1	1.628
04/11/2005	12:42:16	2.4	1.614
04/11/2005	12:42:17	2.7	1.622
04/11/2005	12:42:17	3	1.608
04/11/2005	12:42:17	3.3	1.593
04/11/2005	12:42:18	3.6	1.593
04/11/2005	12:42:18	3.9	1.591
04/11/2005	12:42:18	4.2	1.585
04/11/2005	12:42:19	4.5	1.581
04/11/2005	12:42:19	4.8	1.571
04/11/2005	12:42:19	5.1	1.566
04/11/2005	12:42:19	5.4	1.562
04/11/2005	12:42:20	5.7	1.558
04/11/2005	12:42:20	6	1.548
04/11/2005	12:42:20	6.4	1.54
04/11/2005	12:42:21	6.7	1.536
04/11/2005	12:42:21	7.1	1.53
04/11/2005	12:42:22	7.5	1.524
04/11/2005	12:42:22	8	1.517
04/11/2005	12:42:23	8.4	1.509
04/11/2005	12:42:23	8.9	1.501
04/11/2005	12:42:24	9.5	1.491
04/11/2005	12:42:24	10	1.493
04/11/2005	12:42:25	10.6	1.485
04/11/2005	12:42:25	11.3	1.477
04/11/2005	12:42:26	11.9	1.469
04/11/2005	12:42:27	12.6	1.459
04/11/2005	12:42:27	13.4	1.449

Date	Time	ET (sec)	Chan[2] Pressure Feet H2O
04/11/2005	12:42:28	14.2	1.437
04/11/2005	12:42:29	15	1.428
04/11/2005	12:42:30	15.9	1.416
04/11/2005	12:42:31	16.8	1.404
04/11/2005	12:42:32	17.8	1.39
04/11/2005	12:42:33	18.9	1.377
04/11/2005	12:42:34	20	1.363
04/11/2005	12:42:35	21.2	1.347
04/11/2005	12:42:37	22.4	1.329
04/11/2005	12:42:38	23.8	1.316
04/11/2005	12:42:39	25.2	1.3
04/11/2005	12:42:41	26.7	1.281
04/11/2005	12:42:42	28.2	1.263
04/11/2005	12:42:44	29.8	1.246
04/11/2005	12:42:46	31.5	1.226
04/11/2005	12:42:47	33.3	1.207
04/11/2005	12:42:49	35.2	1.185
04/11/2005	12:42:51	37.3	1.162
04/11/2005	12:42:54	39.5	1.138
04/11/2005	12:42:56	41.8	1.111
04/11/2005	12:42:58	44.3	1.085
04/11/2005	12:43:01	46.9	1.056
04/11/2005	12:43:04	49.7	1.028
04/11/2005	12:43:07	52.6	0.999
04/11/2005	12:43:10	55.7	0.966
04/11/2005	12:43:13	59	0.937
04/11/2005	12:43:17	62.5	0.901
04/11/2005	12:43:20	66.2	0.869
04/11/2005	12:43:24	70.1	0.833
04/11/2005	12:43:28	74.3	0.796
04/11/2005	12:43:33	78.7	0.759
04/11/2005	12:43:37	83.4	0.72
04/11/2005	12:43:42	88.4	0.679
04/11/2005	12:43:48	93.7	0.638
04/11/2005	12:43:53	99.3	0.599
04/11/2005	12:43:59	105.2	0.556
04/11/2005	12:44:06	111.5	0.51
04/11/2005	12:44:12	118.1	0.467
04/11/2005	12:44:19	125.1	0.42
04/11/2005	12:44:27	132.6	0.377
04/11/2005	12:44:35	140.5	0.33
04/11/2005	12:44:43	148.9	0.287
04/11/2005	12:44:52	157.8	0.241
04/11/2005	12:45:01	167.2	0.193
04/11/2005	12:45:11	177.2	0.148
04/11/2005	12:45:22	187.8	0.103
04/11/2005	12:45:33	199	0.062
04/11/2005	12:45:45	210.9	0.017
04/11/2005	12:45:58	223.5	-0.024
04/11/2005	12:46:11	236.8	-0.063
04/11/2005	12:46:25	250.9	-0.101
04/11/2005	12:46:40	265.8	-0.138
04/11/2005	12:46:56	281.6	-0.173
04/11/2005	12:47:12	298.4	-0.206
04/11/2005	12:47:30	316.2	-0.237
04/11/2005	12:47:49	335	-0.266
04/11/2005	12:48:09	354.9	-0.291
04/11/2005	12:48:30	376	-0.314
04/11/2005	12:48:52	398.4	-0.333
04/11/2005	12:49:16	422.1	-0.354
04/11/2005	12:49:41	447.2	-0.37
04/11/2005	12:50:08	473.8	-0.383
04/11/2005	12:50:36	502	-0.399
04/11/2005	12:51:06	531.9	-0.409
04/11/2005	12:51:38	563.5	-0.417
04/11/2005	12:52:11	597	-0.423
04/11/2005	12:52:47	632.5	-0.429
04/11/2005	12:53:24	670.1	-0.451
04/11/2005	12:54:04	709.9	-0.439

Appendix E

Well Record Information

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
clay	0	15
limestone	15	60
clay	60	90
limestone	90	205
Total Depth		205

Casing: 5" SCH 40 PVC 2.87# from 0' to 58'

Size hole below casing: 5"

Water from limestone at 90' to 205'.
Static level 60' below casing top which is 1' above GL
Pumping level 140' when pumping at 12 gpm for 1 hour

Permanent pump installed at 160' on July 18, 1984, with a capacity of 12 gpm

Additional location info: Lot #12, Thorson #2 subdivision.

Location source: Location from permit

Permit Date: February 9, 1984 Permit #: 111185

COMPANY Pykes, Charles N.
FARM (b)(6)
DATE DRILLED February 9, 1984 NO. 1
ELEVATION 0 COUNTY NO. 22798
LOCATION SW NW SW
LATITUDE 41.379741 LONGITUDE - 88.267348
COUNTY Grundy API 120632279800 36 - 34N - 8E

), STATE OFFICE BUILDING, SPRINGFIELD,
AL / WATER SURVEYS SECTION. BE SURE TO

GEOLOGICAL AND WATER SURVEYS WELL RECORD
(b)(6) eted 8-2-72

10. Property (b)(6) Well No. 1
Address (b)(6)
Driller Lockport Well & Pump License No. 180
11. Permit No. 18929 Date 7-8-72
12. Water from Limestone (Formation) 13. County Grundy
at depth 40 to 245 ft. Sec. 36
14. Screen: Diam. ____ in. Twp. 34N
Length: ____ ft. Slot ____ Rge. 8E
Elev. ____
15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 15 lbs.	0'	40'

SHOW LOCATION IN SECTION PLAT
SW SW SW
(Permit)

16. Size Hole below casing: 5 in.
17. Static level 40 ft. below casing top which is +1 ft. above ground level. Pumping level 160 ft. when pumping at 10 gpm for 1 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Top Soil	1'	1'
Clay	6'	7'
Limestone	53'	60'
Limeshale	65'	125'
Limestone	120'	245'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Sykes DATE 9-8-72

COUNTY No. 2162

Sand of Rcs
S of Drs. Sta

...UESTED AND MAIL ORIGINAL TO STATE
OF ENVIRONMENTAL HEALTH, 535 WEST
DO NOT DETACH GEOLOGICAL/WATER
ROPER WELL LOCATION.

GEOLOGICAL AND WATER SURVEYS WELL RECORD

[redacted] mpleted 11-7-73

0. Property [redacted] Well No. 1

Address [redacted]

Driller Charles Sykes License No. 83

11. Permit No. 26124 Date 10/23/73

12. Water from Limestone 13. County Will[illegible]
Formation

at depth 42 to 245 ft. Sec. 36

14. Screen: Diam. ____ in. Twp. 34N

Length: ____ ft. Slot ______ Rge. 9E

Elev. 512 TM

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 Blk.	0'	82'

SHOW LOCATION IN SECTION PLAT
SW NW SW
(permit)

16. Size Hole below casing: 5 in.

17. Static level 135 ft. below casing top which is +1 ft. above ground level. Pumping level 135 ft. when pumping at 10 gpm for 1 hours. Submersible pump set at 165'.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Clay	6'	6'
Limestone	74'	80'
Shale	30'	110'
Limestone	130'	240'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Sykes DATE 12/3/73

COUNTY No. 22243

res neighborhood
S of Dres Stn.

REQUESTED AND MAIL ORIGINAL TO STATE
:AU OF ENVIRONMENTAL HEALTH, 535 WEST
701. DO NOT DETACH GEOLOGICAL/WATER
E PROPER WELL LOCATION.

GEOLOGICAL AND WATER SURVEYS WELL RECORD

(b)(6) [redacted] d 8-29-74

10. Property owne (b)(6) [redacted]
    Addres [redacted]
    Driller [redacted] License No. 23
11. Permit No. 33163 Date 9/19/74
12. Water from Limestone (Formation) 13. County Grundy
    at depth 40 to 240 ft. Sec. 26
14. Screen: Diam. ______ in. Twp. 34N
    Length: ____ft. Slot __________ Rge. 7E
    Elev. ______
15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 15/16s	0'	40'

SHOW LOCATION IN SECTION PLAT

Lot 9, Thorse[...]
Lane #2, NE S[...]
SW (Permit)

16. Size Hole below casing: 5 in.
17. Static level 40 ft. below casing top which is +1 ft. above ground level. Pumping level 40 ft. when pumping at 10 gpm for 1 hours. Sub. pump set at 180'

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Clay	5'	5'
Broken Limestone	9'	14'
Limestone	46'	60'
Shale	70'	130'
Limestone	110'	240'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Sayles DATE 10/16/74

COUNTY NO. 22279

GRUNDY

Res Area
S. of Dres Sta

QUESTED AND MAIL ORIGINAL TO STATE DE-
16, STATE OFFICE BUILDING, SPRINGFIELD,
CAL/WATER SURVEYS SECTION. BE SURE TO

GEOLOGICAL AND WATER SURVEYS WELL RECORD

(b)(6) [redacted] mpleted 6-28-71

10. Property owner (b)(6) [redacted]
Address [redacted]
Driller [redacted] License No. 92-58
11. Permit No. 13011 Date June 14, 1971
12. Water from ______ (Formation) 13. County Kankakee Mund
at depth ___ to ___ ft. Sec. 36
14. Screen: Diam. ___ in. Twp. 34N
Length: ___ ft. Slot ______ Rge. 8E
70'S 646'E NW NW NW SW-permit Elev. ____
15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5	Black pipe	0	40

SHOW LOCATION IN SECTION PLAT
70' N line,
646'W line,
NW NW SW
(Permit)

16. Size Hole below casing: 4-7/8 in.
17. Static level 2 ft. below casing top which is ______ ft. above ground level. Pumping level 46 ft. when pumping at 15 gpm for 3 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Clay	13	13
Lime	88	101

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED E. C. Wehling DATE June 30, 1971

COUNTY No. 2072

Res Area
S. of Dres Sta.

GEOLOGICAL AND WATER SURVEYS WELL RECORD

10. Property owner (b)(6) Well No. ______

Address (b)(6)

Driller Knierim, Phillip E. License No. 102-841

11. Permit No. 112622 Date 05/31/84

12. Water from rock 13. County Grundy

at depth 80 to 200 ft. Sec. 36

14. Screen: Diam.______in. Twp. 34 N

Length:____ft. Slot ______ Rge. 8 E

Elev. ____

15. Casing and Liner Pipe NW SW SW

Diam. (in.)	Kind and Weight	From (ft)	To (ft)
5	PLASTIC	0	40

16. Size hole below casing: 5 in.

17. Static level 80 ft. below casing top which is 1 ft. above ground level. Pumping level 160 ft. when pumping at ______ gpm for ______ hours.

18. Formations passed through	Thickness	Bottom
top soil	2	2
clay	3	5
rock	55	60
hard & soft shale	65	125
rock	75	200

Grundy 12-063-22428-00 36-

UESTED AND MAIL ORIGINAL TO STATE
OF ENVIRONMENTAL HEALTH, 535 WEST
DO NOT DETACH GEOLOGICAL/WATER
ROPER WE[illegible] LOCATION

6

GEOLOGICAL AND WATER SURVEYS WELL RECORD

(b)(6) [redacted] -27-73

). Property [redacted] ell No. 1

Address (b)(6) [redacted]

Driller Charles Sykes License No. 83

1. Permit No. 24520 Date 7/27/73

2. Water from Limestone 13. County Grundy
Formation

at depth 42 to 94 ft. Sec. 36

4. Screen: Diam. ______ in. Twp. 34N

Length: ____ ft. Slot __________ Rge. 8E

Elev. ______

5. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 15 lbs.	0'	42'

SHOW LOCATION IN SECTION PLAT

Lot #15, Phe-sant Trail-McIntoch Subd., SE (Permit)

16. Size Hole below casing: 5 in.

17. Static level 40 ft. below casing top which is +1 ft. above ground level. Pumping level 40 ft. when pumping at 10 gpm for 1 hours.

Across Kank R.
S of Des Pl R

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Shale	15'	15'
Limestone	27'	42'
Shale	38'	80'
Limestone	14'	94'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Sykes DATE 8/7/73

COUNTY No. 2219

REQUESTED AND MAIL ORIGINAL TO STATE
AU OF ENVIRONMENTAL HEALTH, 535 WEST
'01. DO NOT DETACH GEOLOGICAL/WATER
E PROPER WELL LOCATION.

GEOLOGICAL AND WATER SURVEYS WELL RECORD

10. Property owner (b)(6) [redacted]
Address (b)(6) [redacted]
Driller [illegible] License No. 23
11. Permit No. 27792 Date 2/22/74
12. Water from Limestone (Formation) 13. County Grundy
at depth 12 to 245 ft. Sec. 36
14. Screen: Diam. ______ in. Twp. 34N
Length: ____ ft. Slot ________ Rge. 8E
Elev. ____

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 12 lbs	0'	12'

SHOW LOCATION IN SECTION PLAT

NE SW SW (permit)

16. Size Hole below casing: 5 in.
17. Static level 40 ft. below casing top which is +1 ft. above ground level. Pumping level 40 ft. when pumping at 10 gpm for 1 hours. Submersible pump set at 140'

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Clay	12'	12'
Limestone	233	245

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Sykes DATE 6/14/74

COUNTY No. 22264

GRUNDY

Res. area S. of Dres Sta.

QUESTED AND MAIL ORIGINAL TO STATE
) OF ENVIRONMENTAL HEALTH, 535 WEST
.. DO NOT DETACH GEOLOGICAL/WATER
PROPER... LOCATI...

GEOLOGICAL AND WATER SURVEYS WELL RECORD

(b)(6) [redacted] ...eted 7-11-73

10. Property owner [redacted] Well No. 1

Address (b)(6) [redacted]

Driller [illegible] License No. 023

11. Permit No. 23865 Date 6/28/73

12. Water from Limestone 13. County Grundy
Formation

at depth 42 to 125 ft. Sec. 36

14. Screen: Diam. ______ in. Twp. 34N

Length: ____ ft. Slot ________ Rge. 8E

Elev. ______

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 , 12 lbs.	0'	42'

SHOW LOCATION IN SECTION PLAT

SE NW SE (Permit)

16. Size Hole below casing: 5 in.

17. Static level 60 ft. below casing top which is +1 ft. above ground level. Pumping level 60 ft. when pumping at 10 gpm for 1 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Clay & Gravel	42'	42'
Limestone	48'	90'
Shale	10'	100'
Limestone	25'	125'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles [illegible] DATE 7/19/73

COUNTY No. 2213

across Kank R.
S. of Des Pl. R.

...QUESTED AND MAIL ORIGINAL TO STATE DE-
616, STATE OFFICE BUILDING, SPRINGFIELD,
...ICAL / WATER SURVEYS SECTION. BE SURE TO

GEOLOGICAL AND WATER SURVEYS WELL RECORD

(b)(6) [redacted] ...ed 6-29-71

10. Property [redacted] (b)(6)
Address [redacted]
Driller [redacted] License No. 180
11. Permit No. 12732 Date MAY 24, 1971
12. Water from LIMESTONE (Formation) 13. County GRUNDY
at depth 40 to 100 ft. Sec. 36
14. Screen: Diam. ______ in. Twp. 34N
Length: ____ ft. Slot __________ Rge. 8E
Elev. 508 TM
15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 15lbs.	0'	40

SHOW LOCATION IN SECTION PLAT
SE NW SE
(Permit)

16. Size Hole below casing: 5 in.
17. Static level 20 ft. below casing top which is +1 ft. above ground level. Pumping level 20 ft. when pumping at 10 gpm for 1 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
TOP SOIL	1'	1'
CLAY	9'	10'
LIMESTONE	15'	25'
SAND STONE	45'	70'
LIMESHALE	30'	100'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Sybey DATE 7-10-71

COUNTY No. 2068

across Kank. R.
btn Kank + Des Pl. Rs

QUESTED AND MAIL ORIGINAL TO STATE DE-
15, STATE OFFICE BUILDING, SPRINGFIELD,
CAL / WATER SURVEYS SECTION. BE SURE TO

GEOLOGICAL AND WATER SURVEYS WELL RECORD

Frank Kodiak (b)(6) ted 6-10-71 6

10. Property (b)(6)

Address

Driller [illegible] License No. 180 [illegible]

11. Permit No. 12755 Date 5-25-71

12. Water from LIMESTONE 13. County GRUNDY
Formation

at depth 40 to 125 ft.

14. Screen: Diam. ______ in.

Length: ____ ft. Slot ________

Sec. 36

Twp. 34N

Rge. 8E

Elev. ____

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 15 lbs.	0'	40

SHOW LOCATION IN SECTION PLAT

Lot 29, Subdv.
NE SE (Permit)

16. Size Hole below casing: 5 in.

17. Static level 50 ft. below casing top which is +1 ft. above ground level. Pumping level 50 ft. when pumping at 10 gpm for 1 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
TOP SOIL	2'	2'
GRAY CLAY	38'	40'
LIMESTONE	35'	75'
SHALE	50'	125'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Fyfer DATE 6-14-71

COUNTY No. 2063

Across Rivers

...S, STATE OFFICE BUILDING, SPRINGFIELD,
...CAL / WATER SURVEYS SECTION. BE SURE TO

GEOLOGICAL AND WATER SURVEYS WELL RECORD

Walter Leon [redacted] (b)(6) ...ted 11-20-72 6

10. Property owner [redacted] (b)(6)

Address [redacted] (b)(6)

Driller [redacted] License No. 0180

11. Permit No. 28961 Date 11-15-72

12. Water from Limestone (Formation) 13. County Grundy

at depth 43 to 100 ft. Sec. 36

14. Screen: Diam. ______ in. Twp. 34N

Length: ____ ft. Slot __________ Rge. 8E

Elev. ______

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 15lbs	0'	43'

SHOW LOCATION IN SECTION PLAT

Lot 19 McIntosh SE (Permit)

16. Size Hole below casing: 5 in.

17. Static level 25 ft. below casing top which is +1 ft. above ground level. Pumping level 25 ft. when pumping at 10 gpm for 1 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Top Soil	1'	1'
Clay	42'	43'
Limestone	57'	100'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Gupe DATE 12-1-72

COUNTY No. 2184

Amos Rivers

UESTED AND MAIL ORIGINAL TO STATE
MER HEALTH PROTECTION, 535 WEST
DO NOT DETACH GEOLOGICAL/WATER
ROPER ... LOCATIC

GEOLOGICAL AND WATER SURVEYS WELL RECORD

(b)(6) [redacted] ted 2-20-75

6

10. Property owner [redacted] Well No. 908

Address (b)(6) [redacted]

Driller ... Culligan License No. 102-43

11. Permit No. 36626 Date 2-20-75

12. Water from Limestone (Formation) 13. County Grundy

at depth 30 to 104 ft. Sec. 36

14. Screen: Diam. ______ in. Twp. 34N

Length: ____ ft. Slot __________ Rge. 8E

Elev. ____

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5	Black	0	30

SHOW LOCATION IN SECTION PLAT

Lot 73 Wild Feather Sub., section(permit)

probably across river

16. Size Hole below casing: ________ in.

17. Static level ____ ft. below casing top which is __________ ft. above ground level. Pumping level ____ ft. when pumping at ____ gpm for ____ hours. Sub. pump set at 30'

18.

FORMATIONS PASSED THROUGH	THICKNESS TOP	DEPTH OF BOTTOM
Clay & Gravel	0	30
Limestone.	30	104

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

6

SIGNED Peter Rob DATE 3-1-75

COUNTY No. 22287

GRUNDY

QUESTED AND MAIL ORIGINAL TO STATE
OF ENVIRONMENTAL HEALTH, 535 WEST
DO NOT DETACH GEOLOGICAL/WATER
ROPER WELL LOCATION.

GEOLOGICAL AND WATER SURVEYS WELL RECORD

(b)(6) ted 5-8-73

0. Property (b)(6)
Address
Driller CHARLES SYKES License No. 23
1. Permit No. 32946 Date 5/3/73
2. Water from LIMESTONE (Formation) 13. County West Grundy
at depth 41 to 125 ft. Sec. 36
4. Screen: Diam. ____ in. Twp. 34N
Length: ____ ft. Slot ____ Rge. 8E
Elev. ____

		X	

.5. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 17lbs	0	41'

SHOW LOCATION IN SECTION PLAT

Lot 78 McIntoch SE (Permit)

16. Size Hole below casing: 5 in.
17. Static level 36 ft. below casing top which is +1 ft. above ground level. Pumping level 36 ft. when pumping at 10 gpm for 1 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
TOP SOIL	4'	4'
GRAY CLAY	13'	17'
GRAY SHALEY CLAY	24'	41'
LIMESTONE	84'	125'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Sykes DATE 6/16/73

COUNTY No. 2208

Across River

FICE BUILDING, SPRINGFIELD,
SURVEYS SECTION. BE SURE TO

GEOLOGICAL WATER SURVEYS WATER WELL RECORD

Completed 8-13-68

10. Dept. Mines and Minerals permit No. 5439 Year 1968

6

11. Property [redacted] (b)(6) o. 1

Address [redacted] (b)(6)

Driller E. C. Wehling License No. 92-56

12. Water from ________ 13. County Grundy
Formation

at depth ____ to ____ ft. Sec. 36

14. Screen: Diam. ____ in. Twp. 34N

Length: ____ ft. Slot ________ Rng. 8E

200'N 40'W SE SE SE NE Elev. ____

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
6	Galv. Seamless	0	52
5	Galv. Seamless	286	306

SHOW LOCATION IN SECTION PLAT

6"0-308
5"-308-375
200'N, 40'W
SE/c SE SE NE

16. Size Hole below casing: 4-7/8 in.

17. Static level 155 ft. below casing top which is (Permit) ft. above ground level. Pumping level 180 ft. when pumping at 15 gpm for 3 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
top soil	3	3
Gravel	7	10
Clay	22	32
Shale	28	60
Lime	30	90
Sand Stone	10	100
Lime (See reverse side)	~~XX~~ 5	105
(CONTINUE ON SEPARATE SHEET IF NECESSARY)		

SIGNED E. C. Wahling, President DATE August 28, 1968

COUNTY No. 1524

…ESTED AND MAIL ORIGINAL TO STATE …
, STATE OFFICE BUILDING, SPRINGFIELD,
…AL / WATER SURVEYS SECTION. BE SURE TO

GEOLOGICAL AND WATER SURVEYS WELL RECORD

Al Zaletel (b)(6) [redacted] …ted 4-26-71

6

10. Property … [redacted] …ell No. 1
Address (b)(6) [redacted]
Driller LOCKPORT WELL + PUMP License No. 180

11. Permit No. 11906 Date 3-15-71

12. Water from LIMESTONE (Formation) 13. County GRUNDY
at depth 42 to 125 ft.

Sec. 36
Twp. 34N
Rge. 8E
Elev. ____

14. Screen: Diam. ____ in.
Length: ____ ft. Slot ____

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A-53 15lbs.	0'	42'

SHOW LOCATION IN SECTION PLAT

			X

Lot 29, McIntosh Sub.
SE NW SE
(Permit)

16. Size Hole below casing: 5 in.

17. Static level 30 ft. below casing top which is +1' ft. above ground level. Pumping level 30 ft. when pumping at 10 gpm for 1 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
TOP SOIL	3'	3'
CLAY	17'	20'
LIMESTONE	60'	80'
SHALE	45'	125'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Piper DATE 5-20-71

COUNTY No. 2057

across pieces

EQUESTED AND MAIL ORIGINAL TO STATE
U OF ENVIRONMENTAL HEALTH, 535 WEST
1. DO NOT DETACH GEOLOGICAL/WATER
PROPER WELL LOCATION.

GEOLOGICAL AND WATER SURVEYS WELL RECORD

(b)(6) [redacted]

10. Property owner (b)(6) [redacted]
Address [redacted]
Driller [redacted]

11. Permit No. ?30811 Date 8/27/73

12. Water from Limestone (Formation) 13. County Bundy

at depth 40 to 320 ft.

Sec. 36
Twp. 3N
Rge. 8E
Elev. ____

14. Screen: Diam. ____ in.
Length: ____ ft. Slot ____

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5"	A53 15/ft	0'	40'

SHOW LOCATION IN SECTION PLAT
Lot 17, McIntoch Subd., SE
(Permit)

16. Size Hole below casing: 5 in.

17. Static level 120 ft. below casing top which is +1 ft. above ground level. Pumping level 170 ft. when pumping at 10 gpm for 1 hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Top Soil	2'	2'
Clay	38'	40'
Limestone	45'	85'
Hard Shale	60'	145'
Limestone	175'	320'

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED Charles Hayes DATE 10/10/73

COUNTY N... [illegible]

(83844—50M—9-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

~~CONFIDENTIAL~~ Released 1-1-58 by John B. Millis

Strata	Thickness	Top	Bottom
Soil		0	2
Sandstone		2	25
Limestone		25	52
Shale		52	125
Limestone		125	255
Shale		255	258
Limestone		258	275
Shale		275	279
Limestone		279	288
Shale		288	292
Limestone		292	468
Sandstone		468	633
Shale		633	639
Sandstone		639	657
Limestone		657	692
Red rock		692	695
Limestone		695	730
Shale		730	733
Sandstone		733	738
Limestone		738	755
Sandstone		755	775
Limestone		775	788 TD

Static water level 76'

29" hole to 181'9"

Casing: 26" pipe cemented in 181'9"

Specific capacity - 0.65

Pumping test and water analysis filed in Ground Water.

S.S.#30332

Log of production test filed.

(continued)

COMPANY Commonwealth Edison Company

FARM Dresden Nuclear Power Plant NO. 1

DATE DRILLED 1957 COUNTY NO. 908

AUTHORITY John B. Millis

ELEVATION 510' Est. - T.M.

LOCATION 600' ...

	Thickness	Top	Bottom
This well was drilled deeper by E.C. Wehling December 24, 1968 under permit # 7010.			
Lime	394		1182
Shale	7		1189
Shale and lime	16		1205
Lime	6		1211
Lime and shale sandy	15		1226
Lime	3		1229
Lime and shale	36		1265
Lime	50		1315
Lime - sandy	9		1324
Lime	14		1338
Lime sandy	13		1351
Sand	4		1355
Sandy lime	37		1392
Sand	20		1412
Sandy lime	5		1417
Sand	7		1424
Sand and shells	50		1474
Sand	11		1485
Shale, sand and lime	4		1489
Sandy lime	6		1495
Lime	4		1499
Total Depth			1499

Size of hole - 19"
Static water level - 158' below casing top; Non - pumping level - 174'
Casing: 20" black pipe from 0 - 788'
Length of airline - 600'

Well Test Data filed.
S.S. # 56258
Work on the original well was also done by Wehling Well Works.

(22444—50M—6-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

~~CONFIDENTIAL~~ Strata Released 1-1-58 by John B. Millis	Thickness	Top	Bottom
Summary Sample Study by G. H. Emrich 9/57			
PENNSYLVANIAN SYSTEM			
Sandstone, silty, calcareous, light gry to white, fine to medium, angular compact to friable, micaceous	5		5
Sandstone, silty, calcareous, light gray, fine to medium, angular, incoherent, micaceous	20		25
ORDOVICIAN SYSTEM			
Cincinnatian series			
Maquoketa formation			
Dolomite, slightly calcareous at top, light gray to white, fine to medium, little coarse, crystalline	27		52
Shale, dolomitic, brown to grayish-brown, brittle to tough; interbedded with little limestone, very silty, dolomitic, brownish-gray, fine, crystalline	23		75
Shale, slightly dolomitic, brown, tough to brittle, little weak	50		125
Mohawkian series			
Galena formation			
Dolomite, slightly silty, light buff to buff, very fine to fine, crystalline	25		150
Dolomite, slightly silty, light buff, fine to very fine, crystalline	40		190
Dolomite, slightly silty, light buff to buff, very fine to medium, crystalline	70		260
Dolomtie, slightly silty, light buff to light grayish-buff, very fine to			

COMPANY Commonwealth Edison Company

FARM Dresden Nuclear Power Plant NO. 1

DATE DRILLED 1957 COUNTY NO. 908

AUTHORITY G. H. Emrich

ELEVATION 510' Est. - T.M

LOCATION 600'N 1/[illegible]

Strata	Thickness	Top	Bottom
fine, little medium, crystalline	40		300
Dolomite, slightly cherty, slightly silty, buff to light grayish-buff, fine to very fine, little medium crystalline	30		330
Dolomite, slightly silty, buff to light grayish-buff, very fine to fine, little medium, crystalline, slightly cherty at base	25		355
Platteville formation			
Dolomite, silty, gray, buff, very fine to fine, slightly mottled	25		380
Dolomite, silty, light buff to light gray, very fine to fine, crystalline	20		400
Dolomite, silty, light buff to buff, gray, fine to very fine, granular	15		415
Dolomite, silty, light buff to buff, very fine to fine, crystalline	15		430
Dolomite, silty, buff to brown, very fine, crystalline, slightly speckled (red, black).	20		450
Dolomite,, slightly silty, light buff to grayish-buff, very fine to fine, crystalline	18		468
Glenwood formation			
Sandstone, very dolomitic, silty, light gray, fine to medium, little coarse, rounded, frosted, incoherent, compact; grading to trace of dolomite, sandy, silty, light gray, extra fine	5		473
Chazy Series			
St. Peter formation			
Sandstone, white, fine to medium rounded, frosted, incoherent	27		500
Sandstone, as above, silty	15		515
Sandstone, silty, light gray, very fine to fine, little medium,			

Strata	Thickness	Top	Bottom
rounded, frosted, incoherent to friable	28		535
Sandstone, light gray, very fine to fine to medium, rounded, frosted, incoherent to friable	70		605
Sandstone, as above, silty	20		625
Snadstone, white, very fine to fine, little medium, rounded, frosted, incoherent	8		633
Shale, sandy, slightly glauconitic, light gray, weak to brittle	6		639
Prairie du Chien series			
Shakopee formation			
Dolomite, very sandy, slightly silty, light gray to buff, very fine to extra fine, crystalline; little sandstone, dolomitic, light gray, very fine to medium, rounded, frosted, compact	18		657
Dolomite, buff to gray, extra fine to very fine, crystalline	23		680
Dolomite, slightly silty, brown to buff, fine to very fine, crystalline	12		692
Dolomite, silty, buff to reddish-brown, very fine to fine, crystalline	3		695
Dolomite, slightly cherty (oolitic) slightly silty, light buff to grayish-buff, very fine, crystalline	35		730
New Richmond formation			
Shale, sandy, white to light gray, weak	3		733
Sandstone, slightly dolomitic, white fine to medium, little coarse, rounded, incoherent, little compact	5		738

Strata	Thickness	Top	Bottom
Dolomite, buff to grayish-buff, very fine to fine, crystalline	17		755
Sandstone, white to light gray, very fine to coarse, rounded, incoherent	10		765
Sandstone, silty, light gray, very fine to fine, little medium to coarse, rounded, incoherent, little compact	10		775
Oneota formation			
Dolomite, buffish-gray, little pinkish-buff, fine to crystalline	5		780
Dolomite, little gray to light buffish-gray, very fine to fine crystalline	5		785
"Limestone "	3		788
			TD

(87329—20M—6-56) 2

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Loose rock		0	5½
Sandstone		5½	13
Sandy lime		13	16
Sandy shale		16	24
Lime		24	62
Shale		62	125
Lime		125	358
Shale		358	364
Lime		364	400
Broken lime, shells and shale		400	407
Lime		407	462
Sandstone		462	495
Shale		495	502
Sand		502	504
Sandy lime		504	515
Shale		515	518
Sand		518	527
Sand and shale		527	534
Sand		543	651
Shale		651	657
Lime		657	700
Red rock		700	702
Lime		702	705
Red rock		705	710
Lime		710	769
Sand		769	780
Shale		780	787
Lime		787	908
906'6" shale breakL			
Lime		908	1022
Red rock		1022	1024
Lime, crude oil noted		1024	1205

COMPANY Bechtel Corporation

FARM Dresden Nuclear Power Sta. NO. 2

DATE DRILLED 1957 COUNTY NO. 907

AUTHORITY Jack Millis

ELEVATION 530' Estimated - T.W

(17744—20M—5-55)

Strata	Thickness	Top	Bottom
Shale		1205	1211
Lime		1211	1213
Sand		1213	1240
Sand and lime		1240	1249
Sandy lime		1249	1270
Lime and shale		1270	1280
Sand		1280	1290
Lime		1290	1298
Lime and shale		1298	1308
Sand		1308	1331
Lime		1331	1337
Sand		1337	1500 TD

S.S.#29050

Bechtel Comm[illegible]

(37339—10M—5-56)

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Summary Sample Study by G. H. Emrich 5/7/57			
PLEISTOCENE SERIES			
Soil	2		2
Till, yellowish-buff, oxidized, leached	1		3
No Sample	2		5
PENNSYLVANIAN SYSTEM			
Siltstone, slightly sandy, dolomitic, micaceous, gray, weak, trace of coal	20		25
No Sample	10		35
ORDOVICIAN SYSTEM			
Cincinnatian series			
Maquoketa formation			
Limestone, very dolomitic, white to light gray, fine to coarse, crystalline	15		50
Dolomite, very calcareous, light gray to light buff, fine to coarse, crystalline	10		60
Dolomite, very calcareous, slightly silty, light brown to light gray, fine to medium, crystalline; little shale dolomitic, light greenish-gray, brittle to weak, slightly laminated	7		67
Shale, dolomitic, brown to brownish-gray, tough to brittle, little weak, slightly laminated	60		127
Mohawkian series			
Galena formation			
Dolomite, light buff to grayish-buff, very fine to medium, crystalline	18		145

COMPANY Bechtel Corporation

FARM Dresden Nuclear Power Station NO. 2

DATE DRILLED 1957 COUNTY NO. 909

AUTHORITY G. H. Emrich

ELEVATION 530'-Estimated - T.M.

LOCATION

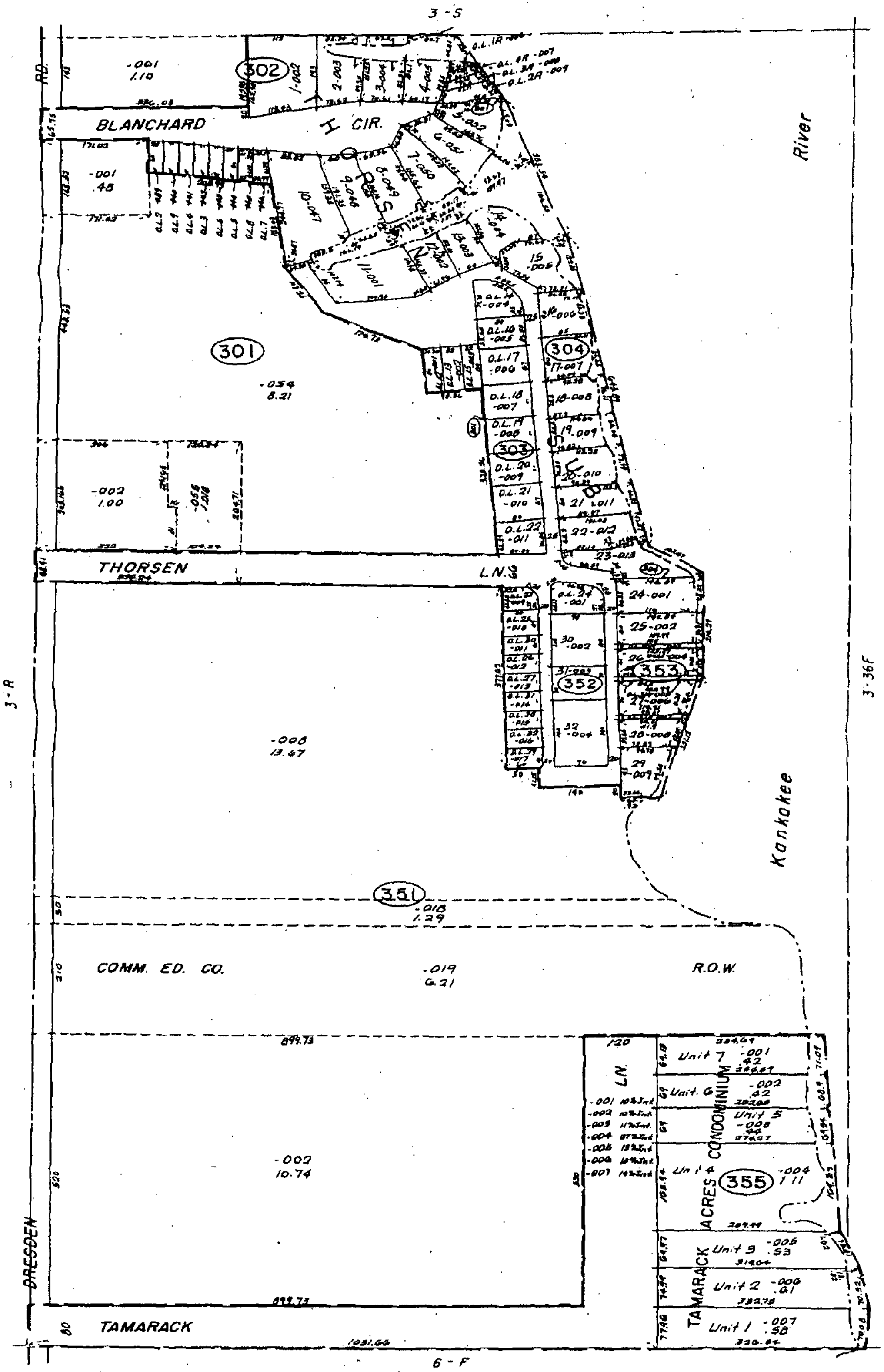
Strata	Thickness	Top	Bottom
Dolomite, slightly silty, buff, very fine to fine, crystalline	10		155
Dolomite, buff to grayish-buff, very fine to fine, crystalline	5		160
Dolomite, slightly calcareous, slightly silty, buff to grayish-buff, very fine to medium, crystalline	30		190
Dolomite, slightly silty, buff to grayish-buff, very fine to medium, crystalline	15		205
Dolomite, buff to grayish-buff, coarse, fine, crystalline	25		230
Dolomite, buff to grayish-buff, very fine to medium, crystalline, slightly speckled, (black)	10		240
Dolomite, light buff to light grayish-buff, fine to coarse, crystalline	20		260
Dolomite, buff to light grayish-buff, little pinkish-buff, very fine to fine, little medium to coarse, crystalline	20		280
Dolomite, pinkish-buff to buff, fine to coarse, crystalline	15		295
Dolomite, slightly silty, light buff to grayish-brown to gray, very fine to medium, crystalline	20		315
Dolomite, slightly silty, grayish-brown to brownish- gray, buff, fine to coarse, crystalline	25		340
Dolomite, slightly silty to silty, buff to grayish-brown, very fine to fine, little medium, crystalline	15		355
Platteville formation			
Dolomite, calcareous, silty, gray to little buff, very fine, crystalline			

Strata	Thickness	Top	Bottom
Slightly mottled	15		370
Limestone, dolomitic, silty, gray to buff, very fine, crystaline, mottled	40		410
Shale, calcareous, light green, brittle to weak	5		415
Dolomite, buff, very fine, little fine to medium, crystalline	20		435
Dolomite, slightly silty, buff to brown, fine to very fine, crystalline	25		460
Dolomite, trace of sand, slightly silty, lighte buff to buff, very fine to fine, crystalline	10		470
Glenwood formation			
Sandstone, silty, slightly dolomitic, light gray, very fine to fine, little medium to coarse, rounded, frosted, incoherent little, compact	25		495
Shale, slightly sandy, light green to light gray, brittle to weak	5		500
Chazy series			
St. Peter formation			
Sandstone, white, very fine to medium little coarse, rounded, frosted, incoherent	15		515
Sandstone, silty, light gray, very fine to fine, little medium to coarse, rounded, frosted, incoherent	10		525
No Sample	5		530
Sandstone, light gray, very fine to medium, little coarse, rounded, frosted, incoherent	30		560
Sandstone, light gray, very fine to fine, little medium, rounded, frosted, incoherent, little, compact	15		575

Strata	Thickness	Top	Bottom
Shale, light gray to light greenish-gray, brittle to weak	5		580
Sandstone, as above			615
Sandstone, white to light gray, very fine to medium, rounded, frosted, incoherent, little compact	37		652
Shale, slightly sandy, light brown to light grayish-brown, tough, little weak	3		655
Sandstone, silty, light gray, very fine to fine, little medium, rounded, frosted, incoherent	5		660
Sandstone, light gray, fine to coarse, rounded, frosted, incoherent	2		662
Prairie du Chien series			
Shakopee formation			
Dolomite, silty, light grayish-brown to light pinkish-brown, very fine, crystalline	8		670
Dolomite, slightly sandy, slightly silty to silty, light buff to brown, little light gray, very fine to fine, crystalline	25		695
Dolomite, silty, brown to buff to redish-brown, very fine to fine, crystalline	15		710
Dolomite, slightly cherty, slightly sandy, silty, buff to brown to redish-brown, very fine to fine, crystalline	20		730
New Richmond formation			
Sandstone, slightly dolomitic, light gray, fine to medium, little coarse, rounded, incoherent, compact; little dolomite, very sandy, light gray to light buff, very fine/crystalline, to extra fine/	15		745

Strata	Thickness	Top	Bottom
Dolomite, trace of sand, silty, buff to brown, very fine to fine, little medium, crystalline	15		760
Sandstone, light gray, fine to medium, little coarse to very coarse, rounded, frosted, incoherent, little compact; little dolomite at top, slightly sandy, slightly silty, light buff to light gray, very fine to fine, crystalline	10		770
Sandstone, silty to very silty, light gray, very fine to fine, little medium to very coarse, rounded, incoherent, compact.	15		785
Oneota formation			
Dolomite, silty, little buff to pinkish-buff, extra fine to fine, crystalline	10		795
Dolomite, slightly silty, light gray to pinkish-buff, very fine to fine, little medium, crystalline, slightly cherty in lower half.	30		825
Dolomite, slightly silty, white to light buff, very fine to medium, crystalline	15		840
Dolomite, white to light buff, pink, very fine to medium, little coarse, crystalline	35		875
Dolomite, cherty (oolitic), light buff to buff, very fine to fine, little medium, crystalline	45		920
No Sample	5		925
Dolomite, slightly cherty, (oolitic), silty, light buff to buff, very fine to medium, crystalline	10		935
Dolomite, very cherty (oolitic), silty, to very silty, light buff to light gray, very fine to fine, little medium, crystalline	20		955

Strata	Thickness	Top	Bottom
Dolomite, cherty to slightly cherty (oolitic, silty to slightly silty, trace of sand, light buff to buff, extra fine to fine, crystalline	30		985
Dolomite, very cherty(oolitic), slightly sandy, buff to orange, light gray, very fine to fine, crystalline; sandstone, silic, white to light gray, medium coarse, compact	10		995
CAMBRIAN SYSTEM			
St. Croxin series			
Trempealeau formation			
Dolomite, light gray to buffish-gray, extra fine to very fine, crystalline	10		1005
Dolomite, argillaceous, light gray to grayish-buff, very fine to fine, crystalline	25		1030
Dolomite, very silty, pinkish-buff, gray, very fine to fine, crystalline	10		1040
Dolomite, slightly sandy, slightly silty, light buff to light gray to pinkish-gray, very fine to fine, crystalline	15		1055
Dolomite, silty, light buff to grayish-buff, very fine to fine, little medium, crystalline	45		1100
Dolomite, slightly glauconitic to glauconitic, sandy, silty, buff to gray, very fine to fine, crystalline	35		1135
Dolomite, silty to very silty, grayish brown to grayish-buff, very fine to fine, little medium, crystalline slightly mottled	45		1180
Dolomite, silty, light buff to buff, grayish-brown, fine to medium, crystalline	18		1198
Franconia formation			
Dolomite, glauconitic, sandy to very			



GRUNDY CO., IL

SCALE: 1" = 100'

3-36E

GOOSE LAKE TWP.

W. 1/2 S.W. 1/4 SEC. 36 T.34N. R.8E.

Strata	Thickness	Top	Bottom
sandy, slightly silty, light greenish-bray to pinkish-buff, fine to medium, crystalline, trace shale, sandy, green, weak	22		1220
Sandstone, glauconitic, dolomitic, silty, light greenish-gray to buff, very fine to medium, incoherent	13		1233
Sandstone, very dolomitic, glauconitic, slightly silty, light gray to light greenish-gray, very fine to fine, rounded, compact, to incoherent; grading to dolomite, glauconitic, sandy to very sandy, light greenish-gray to gray, fine to very fine, crystalline	22		1255
Sandstone, glauconitic, dolomitic, silty, brownish-gray to greenish-gray, very fine to fine, compact to incoherent; grading to little dolomite, as above	15		1270
Sandstone, glauconitic, dolomitic, silty, gray to buff, very fine, compact, little incoherent; interbedded with dolomite, glauconitic, slightly sandy, silty, brown to light gray, fine, crystalline	56		1326
Ironton formation			
Sandstone, slightly dolomitic, light gray, fine to coarse, rounded, incoherent; interbedded with dolomite, sandy, buff to brown, very fine to medium, crystalline	19		1345
Sandstone, light gray, fine to coarse, rounded, frosted, incoherent; interbeded with dolomite, sandy, buff to brown, extra fine to fine, crystalline	30		1375

Strata	Thickness	Top	Bottom
Sandstone, as above; interbedded with little dolomite, as above	15		1390
Sandstone, slightly silty to silty, light gray, fine to coarse, rounded, frosted, incoherent, interbedded with little dolomite, very sandy, buff, very fine, crystalline	25		1415
Sandstone, slightly silty, light gray, very fine to coarse, rounded, frosted, incoherent	20		1435
Sandstone, slightly silty to silty, light gray, very fine to medium, little coarse, rounded, frosted, incoherent	10		1445
Galesville formation			
Sandstone, slightly silty, light gray, very fine to medium, rounded, frosted, incoherent	5		1450
Sandstone, light gray, fine to medium, rounded frosted, incoherent to friable	15		1465
Sandstone, silty, light buffish-gray, very fine to fine, rounded, frosted, incoherent to friable	5		1470
Sandstone, light buffish-gray, fine little medium, rounded, frosted, incoherent to friable	20		1490
Sandstone, very silty, light gray, very fine to fine, rounded, frosted, friable to incoherent	5		1495
Sandstone, light buffish-gray, very fine to fine, rounded, frosted, incoherent	5		1500

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
No. 2-680' E. line, 200' N. line NW.NE. COUNTY No. 860			
Elev. 517.4'			
Topsoil, dark brown	0-9		0-9
Sand, medium, yellow-brown	2-1		2-10
Sandstone, gray-brown	0-5		3-3
Water-level @ 1'7"			
No. 7-180' E. line, 200' N. line NW.NE.			
Elev. 515.8'			
Topsoil, dark brown COUNTY No. 861	2-0		2-0
Sandstone, gray-brown	1-1		3-1
Water-level @ 2'6"			
No. 8-180' E. line, 700' N. line NW.NE.			
Elev. 518.0'			
Topsoil, dark brown COUNTY No. 862	2-0		2-0
Sandstone, gray-brown	1-5		3-5

See maps -- file no. 4103.G72, n3-1, sheets 1-17

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuclear Power Station NO.
DATE DRILLED June 1955 COUNTY NO.
AUTHORITY Driller's logs-Pittsburgh Testing Laboratory
ELEVATION
LOCATION

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
No. 9-1000' E. line, 700' N. line NE.NE.			
Elev. 516.0'			
Topsoil, dark brown COUNTY No. 863	2-0		2-0
Sandstone, gray-brown	0-6		2-6
Water-level @ 2'6"			
No. 10-1000' E. line, 200' N. line NE.NE.			
Elev. 518.8'			
Topsoil, dark brown COUNTY No. 864	1-6		1-6
Sandstone, gray-brown	1-1		2-7
Water-level @ 2'0"			
No. 15-640' E. line, 200' N. line NE.NE.			
Elev. 516.0'			
Topsoil, dark brown COUNTY No. 865	2-5		2-5
Sandstone, gray-brown	1-0		3-5
No. 19-180' E. line, 420' N. line SW.NE.			
Elev. 515.4'			
Topsoil, black COUNTY No. 866	2-4		2-4
Sandstone, gray	0-8		3-0

See maps -- file no. 4103.G72, n3-1, sheets 1-17

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuclear Power Station NO.
DATE DRILLED June 1955 COUNTY NO.
AUTHORITY Driller's logs-Pittsburgh Testing Laboratory
ELEVATION
LOCATION

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Topsoil and 1.5' decomposed limestone		0	2-0
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Limestone, coarse grained, hard, very light gray to light pinkish gray; fractured and weathered 2'-7'			10-0
Same, numerous pyritic green shale partings; irregular pyrite masses near base			15-0
Dolomite, medium grained, hard, vuggy, light gray; numerous green shale partings; scattered pyrite			28-6
Dolomite, fine grained, locally slightly vuggy, gray; many partings and wavy laminae of green shale; pyritic			30-2
Shale, calcareous, soft to firm, laminated, grayish green; badly broken			31-1
Lower shale			
Shale, firm, silty, laminated, grayish brown; locally calcareous; many unweathered fractures, some nearly vertical, others inclined about 60, 45, and 20 degrees to axis of core; fractures at 41'-42', 44'-45', 47'-48', 52'-54', 57'6", 58', 59'6", 65'-66', 67'6"-68'6", 73', 73'6", 80'3", 83'9"-84'6", 88'-88'6", 89'-91', 61'9"			91-6

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 20

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 868

AUTHORITY Core study by W.C.S. & G.E.E.

ELEVATION 521.5

(22565—20M—1-51)

Strata	Thickness	Top	Bottom
Shale, as above, but finely platy, dark grayish brown; fractures at 95'6", 96'10"-97'8"			98-9
Shale, firm, grayish green, pyritic			99-0
Galena dolomite			
Dolomite, medium grained, hard, vuggy, light gray; green shale in widely spaced partings, pockets and seams; many fractures. Badly broken at 106'6"-107', 112'-112'6", 114'3"-114'9", 117'-117'9", 122'-123'			124-0

See maps -- file no. 4103.G72, n3-1, sheets 1-17

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Not sampled		0	4-0
PENNSYLVANIAN SYSTEM			
Sandstone, medium grained, micaceous, slightly weathered, brownish gray			9-0
Sandstone, medium grained, micaceous, calcareous, gray; coal partings at 9'6"-10', 14'-14'10"			21-6
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Limestone, coarse grained, hard, very light gray; core in short segments			29-4
Dolomite, medium grained, hard, vuggy, light gray; some shale filled fractures 39'-41'6"			41-7
Dolomite fine grained, locally slightly vuggy, gray; partings and wavy laminae of green shale; shale filled fractures 41'6"-44'			46-7
Shale, calcareous, soft to firm, laminated, grayish green			47-7
Lower shale			
Shale, firm, silty, laminated, grayish brown; locally calcareous; fractures at 66'4"-67'2", 82'-83', 90'9"-91'9"			101-8
Shale, as above, not finely platy, dark brownish gray; badly broken 104-109			116-6
Shale, firm, grayish green			116-11
Galena dolomite			
Dolomite, medium grained, hard, vuggy,			

COMPANY Commonwealth Edison Company et al
FARM Dresden Nuclear Power Station NO. 26
DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 874
AUTHORITY Core study by W.C.S.
ELEVATION 517.5
LOCATION 210' N. line, ...

Strata	Thickness	Top	Bottom
light gray; green shale in widely spaced partings, pockets, and seams; some fractures; badly broken 130'-132'6", 138'-140'			142-6

See maps -- file no. 4103.G72, n3-1, sheets 1-17

(62310—30M—4-53)

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Not sampled		0	3-6
PENNSYLVANIAN SYSTEM			
Sandstone, medium grained, micaceous, calcareous, coaly partings, gray; slightly weathered, light brownish gray 3'6"-4'6"			18-6
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Limestone, coarse grained, hard, very light gray; slightly vuggy, some pyrite 19'3"-20'			22-0
Dolomite, medium grained, hard, vuggy, light gray; few green shale partings; badly broken 24'-27'			31-1
Dolomite, fine grained, locally slightly vuggy, locally pyritic, locally shaly, gray and greenish gray			37-2
Shale, calcareous, soft to firm, laminated, grayish green; fossiliferous			38-2
Lower shale			
Shale, silty, laminated, firm, locally calcareous, grayish brown			43-6

See maps — file no. 4103.G72, n3-1, sheets 1-17

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COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 27

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 875

AUTHORITY Core study by G.E.E. & W.O.S.

ELEVATION 515.5

(12210—20M—3-55)

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-6
Sandstone, medium, brown, carbonaceous streaks			7-3
Sandstone, fine, gray, carbonaceous streaks			11-6
Sandstone, coarse, gray, carbonaceous streaks			20-0
Shale, gray			20-3
Sandstone, fine to medium, gray			22-0
Sandstone, coarse, gray, carbonaceous streaks			48-0
Lost drill water @ 48 ft.			
Apparent void			48-6
Sandstone, coarse, gray			48-8
Apparent void			49-0
Sandstone, coarse, gray, carbonaceous streaks			51-6
Shale, gray, dark			52-0
Conglomerate, shale and limestone, gray			57-0
Limestone, broken, with large green shale seams			61-6
Limestone, gray, fractured			64-6
Limestone, broken, green shale seams			65-6
Limestone, gray, fractured			68-0
Limestone, honeycombed, fractured, gray, thin green shale seams			90-0
Shale, green, sandy			91-0
Shale, dark gray			96-0
Bottom of Hole			

Recovery

2'6" to 7' 100%

7' to 12' 93%

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 37

DATE DRILLED October 1956 COUNTY NO. 1420

AUTHORITY Driller's log

ELEVATION 518

LOCATION 10'N. line, 70' E. line NE. NE.

COUNTY GRUNDY

(91183—30M—4-54)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Core study by George E. Ekblaw, 10-26-56			
TYPED BY ENGINEERING SECTION			
No core		0	2-6
PENNSYLVANIAN SYSTEM			
Sandstone, light gray with brown streaks, some carbonaceous partings, medium grained, calcareous streaks			6-0
Sandstone, fine grained, noncalcareous, with a few calcareous spots, gray, carbonaceous partings, crossbedded			11-6
Sandstone, mostly medium grained, calcareous, gray with carbonaceous partings, crossbedded, coarser grained in lower 10 feet; very calcareous 49' to 49'4", and 50'6" to 51'6"			51-6
Shale, noncalcareous, laminated, dark gray			51-7
Shale, clayey, heavily calcareous, nonlaminated			52-0
ORDOVICIAN SYSTEM			
Breccia of limestone fragments, up to 4" diameter, in grayish green shale; some of the shale is soft green clay, especially at the base (gouge?)			61-6
Limestone, coarse grained, greenish and pinkish; high-angle fracture and shale 62'6" to 63'6"; greenish clayey shale (gouge?) at 65' and 65'6"; low-angle fractures elsewhere in core			67-6

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 37

DATE DRILLED October 1956 COUNTY NO. 1420

AUTHORITY Core study

ELEVATION 518

LOCATION 10' N. line, 70' E. line NE. NW.

Strata		Thickness	Top	Bottom
12' to 37'	100%			
37' to 42'	93%			
42' to 47'	97%			
47' to 52'	82%			
52' to 57'	95%			
57' to 61'6"	78%			
61'6" to 66'6"	95%			
66'6" to 72'	100%			
72' to 76'	84%			
76' to 81'	85%			
81' to 86'	94%			
86' to 91'	85%			
91' to 96'	92%			
One day after drilling, depth to water 10 ft. 2 in.				

Strata	Thickness	Top	Bottom
Dolomite, vuggy, gray, more or less broken, a few high-angle fractures			88-0
Dolomite, fine grained, with a few greenish partings, pyritic			89-0
Dolomite, very argillaceous, light greenish gray			91-0
Shale, dark grayish brown, finely pyritic, high-angle and some nearly vertical fractures.			96-0
Bottom of hole			

(68210—20M—4-51)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
1 Topsoil and badly weathered brown sandstone		0	6-0
PENNSYLVANIAN SYSTEM = Pottsville Sandstone			
Sandstone, medium grained, micaceous, weathered, soft, brown and yellowish brown			14-0
2 Sandstone, medium grained, micaceous, calcareous, cross-bedded, brownish gray			26-3
Shale, firm, gray, fractured			28-3
Sandstone, medium grained, micaceous, calcareous, crossbedded, brownish gray			40-9
Shale, firm, dark brownish gray			41-4
Sandstone, medium grained, micaceous, calcareous, crossbedded, brownish gray; fractured 50'6"-51'			53-4
ORDOVICIAN SYSTEM			
Maquoketa formation			
3 Divine limestone member			
Limestone, coarse grained, hard, very light gray; fractured and badly broken 57'6"-60'9", 66'-68'6"			68-6
Dolomite, medium grained, hard, vuggy, light gray; very badly broken, much core loss 68'6"-74', fractured, broken 79'3"-80'3"			84-2
Dolomite, fine grained, locally slightly vuggy, gray; many partings and laminae of green shale; bady broken; about 1.5' core loss at top			89-4

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 21

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 869

AUTHORITY Core study by H.C.S.

ELEVATION 510.5

LOCATION 5' S. line, 280' ...

Strata	Thickness	Top	Bottom
Shale, calcareous soft to firm, laminated, grayish green; badly broken			90-0
4 → Lower shale			
Shale, firm, silty, laminated, grayish brown; locally calcareous; many nearly vertical and high-angle fractures; core badly broken			154-0
Shale, firm, grayish green; broken			154-5
5 → Galena dolomite			
Dolomite, medium grained, hard, vuggy, light gray; green shale in widely spaced partings, pockets, and seams; many fractures; core broken 165'6"-178'6"			179-6

See maps — file no. 4103.G72, n3-1, sheets 1-17

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Not sampled		0	2-9
PENNSYLVANIAN SYSTEM			
Sandstone, medium grained, micaceous, calcareous, gray, locally light gray; weathered, no core 2'9"-4'; coal parting at 12'9"; siltstone 15'9"-16'			25-11
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Dolomite, medium grained, hard, vuggy, light gray; green shale partings; fractured, broken 26'-35'			40-8
Dolomite, fine grained, many green shale partings, light greenish gray; pyrite along fractures 45'1"			45-3
Shale, calcareous, soft to firm, laminated, grayish green			46-10
Lower shale			
Shale, firm, silty, laminated, grayish brown; locally calcareous; badly broken 49'-54'; flow of gas from this zone for at least 10 days; fractures at 60'-63'; 67'8"-68'3", 76'6"-78'			79-0
Shale, as above, but finely platy, greenish brown; fractures at 82'3"-82'8", 107'-107'6", 110'8"-111'; pyrite 116'6"-116'9"			116-9

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 31

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 879

AUTHORITY Core study by G.E.E. & W.C.S.

ELEVATION 509.5

LOCATION 51 W 11-- ---

Strata	Thickness	Top	Bottom
Galena dolomite			
Dolomite, medium grained, hard, vuggy, light gray; green shale in widely spaced partings, pockets, and seams; core fractured and in short segments			132-0
Same, badly broken, and ground up			142-6

See maps — file no. 4103.G72, n3-1, sheets 1-17

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Not sampled		0	3-0
PENNSYLVANIAN SYSTEM			
Sandstone, medium to coarse grained, micaceous, weathered, soft, brown and yellowish brown; many partings of coal and dark shale			9-6
Same, gray			13-6
Sandstone, medium to coarse grained, micaceous, calcareous, crossbedded, gray; many partings of coal and dark shale			23-5
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Limestone, coarse grained, hard, very light gray with pinkish tone; fracture at 27'6"			30-4
Dolomite, medium grained, hard, vuggy, light gray; irregular partings of green shale; fracture at 31'3", 39', 41'-43'			46-7
Dolomite, fine grained, locally slightly vuggy, gray; partings and wavy laminae of green shale; pyrite-filled fracture 46'6"-47'			51-8
Shale, calcareous, soft to firm, laminated, grayish green			52-6

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 23

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 877

AUTHORITY Core study by G.E.E. & W.C.S.

ELEVATION 514.5

LOCATION 500' N. line, 170' ...

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Not sampled		0	4-0
PENNSYLVANIAN SYSTEM			
Sandstone, coarse grained, brownish gray			8-7
Sandstone, medium grained, micaceous, crossbedded, calcareous, coaly partings, gray; fine grained, very few partings at 8'6"-10', 14'-15'			47-2
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Limestone, light pinkish gray, and Dolomite, light gray; breciated, slickensided, green shale partings			48-0
Dolomite, medium grained, hard, slightly vuggy, light gray; calcite-healed fracture 50'-53'6", green shale parting 55'9"-56'			56-0
Dolomite, fine grained, locally slightly vuggy, gray; few partings and wavy laminations of green shale; fractures at 56'-57', 58'-58'6", large vug at 60'2"			64-9
Shale, calcareous, soft to firm, laminated, grayish green; fracture at 65'			66-6
Lower shale			
Shale, silty, laminated, firm, locally calcareous, grayish brown; fractures at 69'8", 70'3"			72-8

~~See maps — file no. 4103.073, n3-1, sheets 1-17~~

OMPANY Commonwealth Edison Company et al

ARM Dresden Nuclear Power Station NO. 28

ATE DRILLED Oct.-Nov. 1955 COUNTY NO. 876

UTHORITY Core study by G.E.E. & W.C.S.

VATION 512.0

ATION 220' S. line, 550' E. line SW

(33645—20M—1-61)

Strata	Thickness	Top	Bottom
Lower shale			
Shale, firm, silty, locally calcareous, laminated, grayish brown			55-6

See maps -- file no. 41-3.G72, n3-1, sheets 1-17

(13210—30M—3-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Topsoil	4-0		4-0
Sandstone	43-0		47-0
Limestone	17-9		64-9
Shale	7-3		72-0

See maps — file no. 4103.G72, n3-1, sheets 1-17

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuclear Power Station NO. 28
DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 876
AUTHORITY Driller's log-Pittsburgh Testing Laboratory
ELEVATION 512.0
LOCATION 2201 S. [illegible]

(91133—39M—4-54)

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-6
Sandstone, brown, coarse, soft			6-6
Sand, some hard sandstone fragments, brown			6-9
Sandstone, brown, coarse			8-0
Sandstone, fine, gray, with thin black seams			18-0
Sandstone, coarse, gray, with thin black seams			22-0
Sandstone, coarse, gray			52-0
Limestone, broken, with shale seams			54-6
Shale, soft, green			56-0
Limestone, gray, fractured			63-6
Conglomerate, green shale and gray limestone			66-0
Shale, gray green			68-6
Limestone, gray, fractured, with soft green shale seams			75-6
Shale, green with some trace of lime-stone			78-0
Shale, dark gray			84-0

Shelby tube sample from 6 inches to 2 ft. 6 in.

Recovery

2'6" to 8'	68%
8' to 13'	78%
13' to 18'	100%
18' to 23'	98%
23' to 28'	97%
28' to 33'	90%
33' to 43'	84%

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al
FARM Dresden Nuc. Pow. Sta. NO. 39
DATE DRILLED October 1956 COUNTY NO. 1415
AUTHORITY Driller's log
[illegible]ATION 516
[illegible]ATION 275' S. line. 85' W. [illegible]

Strata		Thickness	Top	Bottom
43' to 52'	87%			
52' to 54'	38%			
54' to 55'6"	61%			
55'6" to 58'	45%			
58' to 63'	77%			
63' to 63'6"	100%			
63'6" to 69'	99%			
69' to 74'	88%			
74' to 79'	96%			
79' to 84'	97%			

Boring No. 39 Dresden Nuc. Pow. Sta.

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Core study by George E. Ekblaw, 10-17-56			
No core		0	2-6
PENNSYLVANIAN SYSTEM			
Sandstone, medium to coarse grained, weathered, partly soft, stained brownish			8-0
Sandstone, medium to coarse grained, calcareous, most strongly calcareous in coarser beds, slightly crossbedded, dark gray; carbonaceous streaks; generally coarse to very coarse below 25'; highly calcareous in lower 2'; coaly streak at 48'			52-0
ORDOVICIAN SYSTEM			
Breccia of limestone, dolomite, and a few chert fragments, up to 3" diameter, in calcareous, clayey matrix			57-6
Dolomite, vuggy, broken into fragments 2 to 3 inches long, grey with greenish tinge			64-0
Breccia of dolomite as above in matrix of slightly calcareous green, clayey, slickensided shale			67-0
Shale, noncalcareous, light greenish gray; beds at angle of about 40° from the vertical; slickensides on bedding planes; Sample 68' to 68'5"			68-10
Dolomite, vuggy, more or less broken; shale-filled, high-angle fracture at 73'			75-2

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuc. Pow. Sta. NO. 39
DATE DRILLED October 1956 COUNTY NO. 1415
AUTHORITY Core study
ELEVATION 516
LOCATION 275' S ...

(23565—30M—1-51)

Strata	Thickness	Top	Bottom
Shale, noncalcareous, greenish, fractured, with flecks and local streaks calcareous			77-10
Shale, noncalcareous, dark grayish brown, hard; a few fractures at varying angles; occasional pyritic and calcitic streaks; bedding horizontal			84-0
Bottom of hole			

(13210—20M—8-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, brown, silty		0	2-3
Sandstone, brown, soft			4-0
Augered to 4 ft. to seat casing			
Began coring at 4 ft.			
Sandstone, hard, gray, with some clay seams			29-0
Sandstone, gray, coarse, soft, with some clay seams			44-0
Sandstone, fine, gray, with some intermediate thin black seams			47-0
Sandstone, coarse, gray, with some intermediate thin black seams			50-6
Conglomerate, gray limestone and green shale, with some clay seams			55-0
Limestone, gray, honeycombed			68-0
Conglomerate, gray limestone and green shale			71-0
Shale, gray green			73-6
Limestone, fine, gray, with green streaks, and with some clay seams			81-0
Conglomerate, gray limestone and green shale, with some clay seams			83-6
Limestone, gray, with green streaks			109-6
Shale, green, broken			110-6
Limestone, gray, fractured			113-0
Shale, dark gray			115-0
Shale, gray green, with some limestone fragments			119-0
Bottom of Hole			
"Ring" sample from 1 ft. 6 in. to 2 ft.			
Hole caved at 36 ft. and lost some drill water			

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 40

DATE DRILLED October 1956 COUNTY NO. 1416

AUTHORITY Driller's log

ELEVATION 516

LOCATION 50' S. line, 45' W ...

Strata		Thickness	Top	Bottom
Recovery				
4' to 9'	95%			
9' to 14'	90%			
14' to 19'	94%			
19' to 24'	98%			
24' to 29'	89%			
29' to 34'	100%			
34' to 39'	92%			
39' to 44'	98%			
44' to 50'	100%			
50' to 54'	65%			
54' to 67'	100%			
67' to 72'	79%			
72' to 81'	100%			
81' to 83'6"	60%			
83'6" to 94'	100%			
94' to 104'	98%			
104' to 116'	96%			
116' to 119'	81%			

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Core study by George E. Ekblaw, 10-17-56			
No core		0	4-0
TYPED BY ENGINEERING SECTION			
PENNSYLVANIAN SYSTEM			
Sandstone, fine grained, slightly silty, few thin streaks of carbonaceous material, gray			11-0
Same, medium to coarse grained, gray; firm, generally horizontally bedded, few thin streaks of carbonaceous material			35-0
Sandstone, coarse grained, slightly calcareous, thin streaks of carbonaceous material, horizontal bedding, gray			44-0
Sandstone, fine to medium grained, noncalcareous, horizontal bedding, numerous streaks of carbonaceous material, gray			46-6
Sandstone, very coarse grained, calcareous, slightly crossbedded, thin streaks of carbonaceous material, gray			50-0
ORDOVICIAN SYSTEM			
Breccia of limestone fragments, up to 3" size, in noncalcareous light green shale matrix; a few small black nodules (sulfides) about 3" below top; base of breccia makes angle of about 30° with vertical			53-4
Dolomite, fine grained, finely vuggy, light gray; fractures at angles of			

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 40

DATE DRILLED October 1956 COUNTY NO. 1416

AUTHORITY Core study

ELEVATION 516

LOCATION 50' S. [illegible]

Strata	Thickness	Top	Bottom
30° to 45° from vertical, some with greenish surfaces; becomes greenish and pinkish in lower 5 feet			70-0
Shale, noncalcareous, greenish gray; more or less shattered, somewhat slickensided			73-9
Limestone, fine grained, mottled pink and green, with green partings at angles of 45° from the vertical (bedding?); fractures, some with recrystallized calcite, also at high angles; at 90 ft. the angle of "bedding" is about 30° with the vertical, and at 104 ft. it is nearly vertical			110-0
Shale, calcareous, greenish gray; badly shattered; contact with limestone above at high angle			111-0
Limestone, like that above, but with numerous sealed irregular vertical fractures; sharp (?) contact with shale below			113-0
Shale, calcareous, dark gray; heavily shattered with high-angle fractures; slickensides.			119-0
Bottom of hole			

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-6
Sandstone, coarse, broken, brown			7-0
Shale, gray, sandy and clayey			8-0
Sandstone, fine, gray, carbonaceous streaks			9-0
Sandstone, coarse, gray			14-6
Sandstone, fine, fractured, gray			18-0
Bottom of Hole			

Recovery

2-6 to 4-6	77%
4-6 to 5-6	83%
5-6 to 8-0	93%
8-0 to 18-0	100%

Shelby tube sample from 6" to 2'6"

Six days after drilling, depth to water 10 ft. 6 in.

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al
FARM Dresden Nuc. Pow. Sta. NO. 42
DATE DRILLED October 1956 COUNTY NO. 1412
AUTHORITY Driller's log
ELEVATION

(13310--30M--3-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-6
Sandstone, fine, very soft, carbonaceous streaks			5-0
Sandstone, fine, gray, carbonaceous streaks			8-0
Sandstone, coarse, brown			9-0
Sandstone, fine, gray, carbonaceous streaks			11-0
Sandstone, coarse, gray			13-0
Bottom of hole			

Lost drill water at 9 ft.

Recovery
2-6 to 5 ft. 64%
5 to 8 ft. 83%
8 to 13 ft. 100%

Six days after drilling, depth to water 10 ft. 4 in.
Shelby tube sample from 6" to 2'6"

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al
FARM Dresden Nuclear Power Sta. NO. 45
DATE DRILLED October 1956 COUNTY NO. 1413
AUTHORITY Driller's log
ELEVATION

(13310—30M—3-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, brown, silty		0	3-0
Sandstone, brown, coarse, soft			6-0
Sandstone, gray, fine, hard			10-0
Sandstone, brown, coarse			12-0
Sandstone, gray			21-0
Sandstone, gray, dark, with intermediate thin black seams			31-0
Sandstone, gray			44-6
Shale, dark gray			45-0
Sandstone, gray			45-9
Limestone, gray white			50-0
Very soft 2" seam at 49.5 ft.			
Lost drilling water at 49.5 ft.			
Limestone, honeycombed, gray white, with shale seams			60-0
Limestone, fractured, gray white			62-0
Limestone, honeycombed, gray white			67-6
Limestone, honeycombed, gray white, with green shale seams			70-0
Limestone, fractured, with green shale seams			71-6
Limestone, shaly, greenish gray			72-0
Shale, green, soft, clayey			72-3
Limestone, shaly, greenish gray			72-9
Shale, dark gray			81-0
Bottom of hole			
Shelby tube sample from 1' to 3'			
Lost drilling water at 49'6"			
Recovery			
3' to 6' 64%			
6' to 11' 75% TYPED BY ENGINEERING SECTION			

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 49

DATE DRILLED October 1956 COUNTY NO. 1417

[AUT]HORITY Driller's log

[ELEV]ATION 516

(22565—20M—1-51)

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata		Thickness	Top	Bottom
11' to 21'	99%			
21' to 31'	97%			
31' to 41'	99%			
41' to 51'	98%			
51' to 71'	100%			
71' to 81'	96%			

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Core study by George E. Ekblaw, 10-17-56			
No core		0	3-0
PENNSYLVANIAN SYSTEM			
Sandstone, medium grained, weathered, brownish, soft			6-0
Sandstone, mostly fine to medium grained, gray; numerous thin carbonaceous streaks; bedding horizontal			10-6
Sandstone, more or less calcareous, medium to coarse grained, with carbonaceous streaks, gray; either crossbedded or uniformly bedded at dips about 20° from horizontal			44-6
Shale, noncalcareous, carbonaceous, laminated, very dark gray			45-0
Sandstone, like that above			45-10
ORDOVICIAN SYSTEM			
Limestone, coarse grained, dense, gray			50-3
Dolomite, vuggy, gray with some green partings; 55' to 57' vertical fracture with green shale in fracture and at top and bottom			62-10
Dolomite, with greenish shale layers, locally vuggy, greenish gray; with vertical fractures, sealed and pyritized through all but upper foot			71-7
Shale, calcareous, light greenish gray			72-7
Shale, hard, noncalcareous, dark grayish brown; some fractures at angles of 15° to 45° from vertical			81-0
Bottom of hole			

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 49

DATE DRILLED October 1956 COUNTY NO. 1417

AUTHORITY Core study

ELEVATION 516

LOCATION 50' S. line, 255' W. line SW. SW.

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, brown, silty		0	1-8
Sandstone, brown, soft, carbonaceous streaks			3-2
Sandstone, gray, soft, many carbonaceous streaks			5-6
Sandstone, gray, medium to coarse, carbonaceous streaks			22-9
Sandstone, gray, fine			25-6
Sandstone, gray, medium to coarse, carbonaceous streaks			45-0
Limestone, gray, honeycombed, fractured, green shale seams			65-6
Shale, green, sandy			66-1
Shale, dark gray			72-0
Bottom of hole			

Recovery

1'8" to 5'	64%
5' to 8'	72%
8' to 12'	98%
12' to 17'	92%
17' to 22'	100%
22' to 27'	95%
27' to 32'	98%
32' to 37'	97%
37' to 47'	100%
47' to 52'	90%
52' to 72'	100%

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 51

DATE DRILLED October 1956 COUNTY NO. 1418

AUTHORITY Driller's log

ELEVATION 516

LOCATION 130' S. line, 210' W. line [illegible]

(13310—30M—4-55)

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Core study by George E. Ekblaw, 10-26-56			
No core		0	2-8
PENNSYLVANIAN SYSTEM			
Sandstone, fine grained, horizontally bedded, brown with carbonaceous partings			3-2
Same, gray with numerous carbonaceous partings and a few brown streaks			6-6
Same, few carbonaceous partings			7-6
Sandstone, medium to coarse grained, calcareous, gray with carbonaceous partings, crossbedded; sharp contact at base			45-0
ORDOVICIAN SYSTEM			
Dolomite, vuggy, with green partings, gray; not badly broken, but high-angle and nearly vertical fractures begin at 51'; fractured from 45' to 46'2"			61-0
Dolomite, with numerous green shale partings, gray; lower 4 inches pyritic			65-3
Shale, dolomitic, green			66-6
Shale, dark grayish brown, with calcareous spots; few low-angle fractures			72-0
Bottom of hole			

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 51

DATE DRILLED October 1956 COUNTY NO. 1418

AUTHORITY Core study

ELEVATION 516

LOCATION 1301' S ...

(13310—20M—3-55)

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-6
Sandstone, coarse, soft, brown			5-0
Sandstone, fine, gray, carbonaceous streaks			8-0
Sandstone, medium to coarse, gray			11-6
Sandstone, very soft, gray			11-9
Sandstone, coarse, gray, carbonaceous streaks			13-0
Bottom of hole			

Shelby tube sample from 6" to 2'6"
Five days after drilling, depth to water 11 ft.

Recovery

2-6 to 5-0	80%
5-0 to 8-0	75%
8-0 to 13-0	100%

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al
FARM Dresden Nuc. Pow. Sta. NO. 53
DATE DRILLED October 1956 COUNTY NO. 1414
AUTHORITY Driller's log
ELEVATION

(91123—30M—4-64)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	3-0
Sandstone, brown, fine, fractured			8-6
Sandstone, brown, coarse, fractured			11-6
Sandstone, gray, fine, fractured			15-0
Sandstone, gray, coarse			16-6
Sandstone, gray, fine, fractured, broken, carbonaceous streaks			32-0
Sandstone, gray, coarse, fractured, carbonaceous streaks			52-3
Limestone, gray, fractured, vertical seams of green shale			56-3
Limestone, gray, broken, with green shale seams			57-0
Limestone, gray, fractured			60-0
Limestone, gray, honeycombed, broken, fractured			76-0
Limestone, gray, honeycombed, broken, fractured, green shale seams			82-0
Shale, green, sandy			83-9
Shale, dark gray ___ Bottom of Hole			89-0
One day after drilling, depth to water 10 ft. 8 in.			

Recovery

3' to 5'	58%
5' to 8'	72%
8' to 12'	99%
12' to 17'	80%
17' to 22'	50%
22' to 27'	85%
27' to 32'	92%
32' to 37'	97%
37' to 42'	100%
42' to 47'	97%

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al
FARM Dresden Nuc. Pow. Sta. NO. 69
DATE DRILLED October 1956 COUNTY NO. 1419
AUTHORITY Driller's log
ELEVATION
LOCATION 95' S. line. 165' W. line. SW. SW

(13210—30M—3-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Core study by George E. Ekblaw, 10-26-56			
No core		0	3-0
PENNSYLVANIAN SYSTEM			
Sandstone, fine grained, gray, with carbonaceous partings and brown streaks; fractured from 5' to 8'			8-6
Sandstone, coarse grained, crossbedded, heavily iron-stained, brown, with high-angle fractures			11-6
Same, calcareous, gray, some carbonaceous partings; high-angle fractures from 12' to 13', 17' to 22'; badly broken from 18' to 22' and 22'6" to 23'; high-angle fractures from 25' to 27', 30' to 30'6", and 36' to 37'			37-4
Sandstone, as above but darker gray; not badly fractured; very calcareous from 50' to 52'4"			52-4
ORDOVICIAN SYSTEM			
Limestone, coarse grained, high-angle fractures filled with green clay and breccia, slickensides			56-6
Dolomite, vuggy, with green partings, grey; same fractures			78-0
Dolomite, vuggy, numerous wavy green shale partings, gray; lower foot pyritic			82-0
Shale, dolomitic, firm, green, slightly brecciated			83-8
Shale, dark grayish brown, with calcareous spots			89-0
Bottom of hole			

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 69

DATE DRILLED October 1956 COUNTY NO. 1419

AUTHORITY Core study

ELEVATION

LOCATION [illegible]

Strata		Thickness	Top	Bottom
47' to 52'	93%			
52' to 57'	88%			
57' to 62'	100%			
62' to 67'	92%			
67' to 71'	88%			
71' to 76'	100%			
76' to 86'	97%			
86' to 89'	100%			

Boring No. 69 Dresden Nuc. Pow. Sta.

(12210—30M—3-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Top soil		0	1-0
Sand, coarse, gravelly, light brown			2-6
PENNSYLVANIAN SYSTEM			
Sandstone, brown to gray, weathered; water level at 4'			7-6
Sandstone, gray			14-0
Sandstone, soft, with thin clay seams			15-6
Sandstone, gray			29-6
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Limestone, gray			45-0
Lower shale			
Siltstone, dark gray; some thin seams of clay shale at 71'-75'			78-0

See maps — file no. 4103.G72, n3-1, sheets 1-17

Strip Log filed

COMPANY Commonwealth Edison Company et al

FARM Dresdan Nuclear Power Station NO. 1

DATE DRILLED June 1955 COUNTY NO. 850

AUTHORITY Copy-from graphic log-Pittsburgh Testing Laboratory

ELEVATION 516.1

(11310—30M—3-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
No. 3-680' E. line, 300' S. line SW. SE.			
Elev. 510.7'			
Topsoil, dark brown COUNTY No. 851	1-0		1-0
Sand, medium-brown	1-9		2-9
Sandstone, gray-brown	0-2		2-11
Water-level @ 2'7"			
No. 4 - 680' E. line, 800' S. line SW. SE.			
Elev. 512.0'			
Topsoil, black COUNTY No. 852	1-7		1-7
Clay, sandy, gray	1-9		3-4
Sandstone, brown-gray	0-8		4-0
No. 6 - 180' E. line, 300' S. line SW. SE.			
Elev. 510.5'			
Topsoil, black COUNTY No. 853	3-0		3-0
Sandstone, brown	3-5		6-5
Water-level @ 2'			
No. 11 - 1000' E. Line, 300' S. Line SE. SE.			
Elev. 515.1'			
Topsoil, black COUNTY No. 854	3-0		3-0
Sandstone, brown-gray	0-6		3-6
Water-level @ 3'3"			
See maps — file no. 4103.G72, n3-1, sheets 1-17			

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuclear Power Station NO.
DATE DRILLED June 1955 COUNTY NO.
AUTHORITY Driller's logs-Pittsburgh Testing Laboratory
ELEVATION
LOCATION

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
No. 12-1000' E. line, 800' S. line SE. SE.			
Elev. 515.0'			
Topsoil, black	1-0		1-0
Sand, medium, brown	1-3		2-3
Sandstone, gray	0-11		3-2
COUNTY No. 855			
No. 13-640' E. line, 800' S. line SE.SE.			
Elev. 514.0'			
Topsoil, black	1-6		1-6
Sand, medium, brown	1-3		2-9
Sandstone, red-brown	0-3		3-0
Water-level @ 2'1"			
COUNTY No. 856			
No. 14-640' E. line, 300' S. line SE.SE.			
Elev. 517.5'			
Topsoil, black	1-6		1-6
Sandstone, gray-brown	1-3		2-9
Water-level @ 2'5"			
COUNTY No. 857			
No. 17-1000' E. line, 310' S. line SE.NE.			
Elev. 511.0'			
Topsoil	1-6		1-6
Sand, medium, brown	1-11		3-5
Limestone	0-7		4-0
COUNTY No. 858			
No. 18-250' E. line, 310' S. line SE.NE.			
Elev. 509.0'			
Topsoil	1-0		1-0
Limestone	-1		1-1
COUNTY No. 859			
See maps — file no. 4103.G72, n3-1, sheets 1-17			

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuclear Power Station NO.
DATE DRILLED June 1955 COUNTY NO.
AUTHORITY Driller's logs-Pittsburgh Testing Laboratory
ELEVATION
LOCATION

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Topsoil	5-0		5-0
Shale	41-0		46-0
Limestone	20-0		66-0
Shale	44-0		110-0
Dolomite	25-0		135-0

See maps -- file no. 4103.G72, n3-1, sheets 1-17

Core # C4604

Stratigraphic pick by DRK & JDT -

Galena (Top) - 110'

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuclear Power Station NO. 22
DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 670
AUTHORITY Driller's log-Pittsburgh Testing Laboratory
ELEVATION 505.0
LOCATION 150' S. line, 100' E ...

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Not sampled		0	5-0
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone and Maquoketa shale, brecciated and disturbed in fault zone			
Limestone, argillaceous, brownish gray			6-0
Shale, green			6-7
Limestone			6-11
Shale, green			7-7
Limestone, argillaceous, greenish gray			8-0
Shale, greenish gray to brownish gray; fractures at 10', 12', 13'6"; broken 15'-17', 23'-25'			25-0
Shale, greenish gray; some angular fragments of greenish gray, dolomitic shale			31-10
Limestone, brecciated			33-5
Limestone, coarse grained			34-6
Shale, greenish gray; many angular fragments of argillaceous dolomite; badly broken 36'-40', 45'-46'2"			46-3
Limestone, coarse grained, locally slightly vuggy, very light pinkish gray			55-11
Shale, grayish green; broken; slickensides at 56'6"			56-6
Dolomite, medium grained, hard, vuggy, light gray			60-0
Shale, greenish gray			60-6

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 22

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 870

AUTHORITY Core study by G.E.E. & W. C. S.

ELEVATION 505.0

LOCATION 150' S. line, 100' ...

Strata	Thickness	Top	Bottom
Dolomite, medium grained, hard, very vuggy, gray; bedding at 45 degrees to axis of core			65-6
Lower shale			
Shale, firm, silty, laminated, brownish gray; locally calcareous; some fractures; badly broken 65'6"-68'6", 105'-110'; bedding at 45 degrees to axis of core 65'6"-66' (part of disturbed rock in fault zone)			110-0
Shale, greenish gray; broken			110-3
Galena dolomite			
Dolomite, medium grained, hard, slightly vuggy, light gray; green shale in widely spaced partings, pockets, and seams; some fractures; badly broken 125'-135'			135-0

See maps — file no. 4103.G72, n3-1, sheets 1-17

(93310—30M—4-53)

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Not sampled		0	4-6
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Limestone, coarse grained, hard, very light gray to light pinkish gray; weathered 5'6"-6'6"			7-0
Dolomite, medium grained, hard, vuggy, light gray; some green shale partings; some pyrite; fractured 14'-14'6"			17-8
Same, fractured and broken			27-8
Dolomite, fine grained, locally shaly, slightly vuggy, gray; partings and laminations of green shale; badly broken 28'-29'6"			32-6
Same, very shaly			33-3
Shale, calcareous, soft to firm, laminated, grayish green			34-3
Lower shale			
Shale, silty, locally calcareous, laminated, firm, grayish brown; fractured 34'6"-35', 36'-38'3"			39-6

See maps — file no. 4103.G72, n3-1, sheets 1-17

COMPANY Commonwealth Edison Company et al
FARM Dresden Nuclear Power Station NO. 24
DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 872
AUTHORITY Core study by G.E.E. & W.C.S.
ELEVATION 512.3
LOCATION 330' N. line 580' " " —

(12216—20M—8-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Topsoil	5-0		5-0
Limestone	28-0		33-0
Shale	6-6		39-6

See maps -- file no. 4103.G72, n3-1, sheets 1-17

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuclear Power Station NO. 24
DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 172
AUTHORITY Driller's Log-Pittsburgh Testing Laboratory
ELEVATION 512.3
LOCATION 330' N. line, 580' W. line SE SE

(65310—30M—4-53)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Topsoil and badly weathered limestone		0	2-6
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Limestone, coarse grained, hard, light gray with pinkish tone; green shale partings, stylolites; weathered partings 2'6"-7', 15'6", 18'; weathered fracture at 17'6"			18-9
Dolomite, medium grained, hard, locally finely vuggy, light gray; green shale partings; fractures at 21'6", 23'3", 26'-27'			27-6
Limestone, gray with pinkish cast, some pyrite			28-4
Dolomite, fine grained, locally slightly vuggy, gray; partings and wavy laminae of green shale; some high-angle fractures			33-10
Shale, calcareous, soft to firm, laminated, grayish green			36-0
Lower shale			
Shale, silty, laminated, firm, locally calcareous, grayish brown			41-4

See maps — file no. 4103.G72, n3-1, sheets 1-17

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 25

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 873

AUTHORITY Core study by W.C.S.

ELEVATION 516.5

(13310—30M—3-53)

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Topsoil	2-6		2-6
Limestone	31-3		33-9
Shale	7-0		40-9

See maps — file no. 4103.G72, n3-1, sheets 1-17

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuclear Power Station NO. 25
DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 873
AUTHORITY Driller's log-Pittsburgh Testing Laboratory
ELEVATION 516.5
LOCATION 400' E. line, 530' [illegible]

(11X10—20M—3-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Not sampled		0	5-0
PENNSYLVANIAN SYSTEM			
Sandstone, coarse grained, calcareous, micaceous, crossbedded, gray; contains coal partings; noncalcareous siltstone 8'6"-9'2"			10-0

See maps -- file no. 4103.G72, n3-1, sheets 1-17

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 32

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 886

AUTHORITY Core study by G.E.E. & W.C.S.

ELEVATION 512.0

LOCATION 400' E [illegible]

(13310—20M—3-55)

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
No. 16-380' W. line, 700' N. line NE.NW.			
Elev. 507.5'			
Topsoil, brown	3-0		3-0
Clay, sandy, brown	1-7		4-7
Sandstone, brown-gray	0-3		4-10

COUNTY No. 867

See maps -- file no. 4103.G72, n3-1, sheets 1-17

COMPANY Commonwealth Edison Company et al.
FARM Dresden Nuclear Power Station NO.
DATE DRILLED June 1955 COUNTY NO. 867
AUTHORITY Driller's logs-Pittsburgh Testing Laboratory
ELEVATION
LOCATION

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM			
Not sampled		0	3-6
PENNSYLVANIAN SYSTEM			
Sandstone, medium grained, micaceous, crossbedded, weathered, soft, yellowish brown			5-6
Sandstone, medium grained, micaceous, crossbedded, coal parting; gray			11-10
Same, calcareous			23-9
ORDOVICIAN SYSTEM			
Maquoketa formation			
Divine limestone member			
Limestone, coarse grained, hard, slightly vuggy, light gray; green shale partings; stylolites; green shale filled fracture 24'4"-24'9"; pyrite filled fracture 29'7"-30'2"; green shale and pyrite along open fracture 39'10"-42'10"; core badly broken 41'9"-42'10"; some fractures healed			42-10
Dolomite, medium grained, hard, vuggy, shaly, light gray; many green shale partings; green shale and pyrite filled fracture 42'10"-44'3"; badly broken 45'2"-48'3"			51-4
Dolomite, fine grained, locally slightly vuggy, gray; green shale partings; fracture 52'-52'6"			54-10
Shale, slightly calcareous, soft to firm, laminated, grayish green; fracture 56'4"			58-3

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 29

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 877

AUTHORITY Core study by W.C.S.

ELEVATION 512.8

LOCATION 3101 S. [illegible]

(84185—30M—1-64)

Strata	Thickness	Top	Bottom
Lower shale Shale, silty, laminated, firm, grayish brown; locally calcareous; fracture 61'6"			64-0

See maps -- file no. 4103.G72, n3-1, sheets 1-17

Dresden

(13210—30M—3-55)

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
PLEISTOCENE SYSTEM Not sampled		0	2-6
PENNSYLVANIAN SYSTEM Sandstone, medium to coarse grained, micaceous, crossbedded, calcareous below 7 ft., brownish gray; very few coal partings; slightly weathered and slightly stained with iron oxide 2'6"-4'6"; very tightly cemented 23'-23'5"			23-5
ORDOVICIAN SYSTEM Maquoketa formation Divine limestone member Limestone, coarse grained, hard, very light gray; green shale partings; pyrite at 28'; fractures 29'6"-30'6", 33'6"			33-11
Dolomite, medium grained, hard, vuggy, light gray; many green shale partings			40-5
Dolomite, fine grained, gray; green shale partings.			43-6
Shale, calcareous, soft to firm, laminated, grayish green			44-8
Lower shale Shale, firm, silty, laminated, grayish brown; locally calcareous; many fractures, some nearly vertical, others about 60, 45, and 20 degrees to axis of core; fractures not			

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuclear Power Station NO. 30

DATE DRILLED Oct.-Nov. 1955 COUNTY NO. 878

AUTHORITY Core study by W.C.S.

ELEVATION 513.5

LOCATION 130' W. line 500' N

Strata	Thickness	Top	Bottom
weathered; fractures at 50'6"-51', 53', 55'6"-58', 70'8"-71'1", 73'3", 75'2", 76'11", 78'3", 82'			
Shale, as above, but finely platy, dark grayish brown; badly broken at 84'8"-85'6", 86'5"-87'3"; fractures at 89', 93'6", 94', 100'4", 102'6"			109-8
Galena dolomite			
Dolomite, medium grained, hard, vuggy, very light brownish gray; green shale in widely spaced partings, pockets, and seams; many fractures; pyrite-filled fracture at 109'8"-110'10"; calcite-filled fracture 110'10"-111'4"; fractures at 127'6"-128'6", 135'6"-136'9"; core broken at 128'10"-129'11"			136-9

See maps — file no. 4103.G72, n3-1, sheets 1-17

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-0
Sandstone, fine, soft, gray			3-8
Sandstone, coarse, brown, soft			7-0
Sandstone, fine, gray, carbonaceous streaks			9-6
Sandstone, coarse, gray			12-0
Bottom of Hole			

Recovery

2-5	feet	81%
5-8	"	92%
8-12	"	100%

Six days after drilling, depth to water 10 ft. 8 in.

Shelby tube sample 3" to 2 ft.

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 43

DATE DRILLED October 1956 COUNTY NO. 1422

AUTHORITY Driller's log

ELEVATION

LOCATION 1E4 ...

(13210—30M—3-55)

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-6
Sandstone, coarse, soft, brown			7-9
Sandstone, coarse, gray, carbonaceous streaks			11-6
Sandstone, coarse, brown			13-0
Bottom of Hole			

Shelby tube sample from 6" to 2'6"
Very soft seam 12' to 12'4"

Recovery

2-6 to 5-0	80%
5-0 to 8-0	83%
8-0 to 13-0	94%

Six days after drilling, depth to water 10 ft. 8 in.

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al
FARM Dresden Nuclear Power Sta. NO. 47
DATE DRILLED October 1956 COUNTY NO. 1423
AUTHORITY Driller's log
ELEVATION
LOCATION 15' N. line. 220' W. line [illegible]

(13210—30M—3-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-6
Sandstone, coarse, soft, brown			5-6
Sandstone, fine to medium, gray, carbonaceous streaks			13-0
Bottom of Hole			
Recovery			
2-6 to 5-0 53%			
5-0 to 13-0 83%			
Hole caved after 24 hours			
TYPED BY ENGINEERING SECTION			

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 48

DATE DRILLED October 1956 COUNTY NO. 1424

AUTHORITY Driller's log

ELEVATION

LOCATION 1800' ...

Page 1 ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, grayish brown		0	3-6
Sandstone, brown, soft, coarse			6-6
Sand, brown			7-6
Sandstone, gray, fine			11-0
Sandstone, fine, gray, with brown texture			18-0
Sandstone, gray, coarse, with thin black seams			50-9
Sandstone, gray, with coal and slate mixtures			51-9
Shale, gray and green, soft			53-0
Clay, with some gravel, gray			53-3
Limestone, gray, with shale seams			54-6
Limestone, gray			66-6
Limestone, gray, honeycombed and fractured			89-6
Shale, gray green			91-0
Shale, dark gray, fractured			96-0
Bottom of hole			
Lost drilling water at 52 ft.			
Shelby tube sample from 1'6" to 3'6"			
Eight days after drilling, depth to water 11 ft.			
Recovery			
3'6" to 6' 83%			
6' to 11' 68%			
11' to 21' 100%			
21' to 31' 91%			
31' to 41' 97%			
41' to 51' 95%			
51' to 53' 77%			
53' to 57' 89%			
57' to 72' 100%			

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al.

FARM Dresden Nuc. Pow. Sta. NO. 50

DATE DRILLED October 1956 COUNTY NO. 1421

AUTHORITY Driller's log

ELEVATION 516

LOCATION 85' N. line...

Strata	Thickness	Top	Bottom
72' to 77' 93%			
77' to 87' 100%			
87' to 92' 93%			
92' to 96' 100%			

(13310—30M—3-55)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Core study by George E. Ekblaw, 10-17-56			
No core		0	3-6
PENNSYLVANIAN SYSTEM			
Sandstone, mostly medium grained, brownish gray			7-6
Sandstone, fine grained, gray			8-3
Sandstone, calcareous, medium to coarse grained, thin carbonaceous streaks, horizontal or low-angle bedding, gray			52-0
Conglomerate, dark gray shale with fragments of limestone (may be weathered zone on limestone)			53-6
ORDOVICIAN SYSTEM			
Limestone, coarse grained, crystalline, gray			63-3
Dolomite, vuggy, gray with greenish streaks; few fractures; very vuggy at base			85-0
Same, with greenish argillaceous dolomite; some fractures			89-0
Shale, greenish			90-0
Shale, dark grayish brown; some high-angle fractures			96-0
Bottom of hole			

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 50

DATE DRILLED October 1956 COUNTY NO. 1421

AUTHORITY Core study

ELEVATION 516 GGLS [illegible]

LOCATION 85' N. line. 285' W. line [illegible]

(13210—30M—3-55)

sgs 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-0
Sandstone, coarse, soft, brown			2-9
Sandstone, medium to coarse, brown, flecks			8-3
Sandstone, fine, gray, carbonaceous streaks			10-0
Sandstone, coarse, gray			12-0
Bottom of hole			
Recovery			
2 ft. to 5 ft. 66%			
5 ft. to 8 ft. 75%			
8 ft. to 12 ft. 100%			
Five days after drilling, depth to water 11 ft. 4 in.			
TYPED BY ENGINEERING SECTION			

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 54

DATE DRILLED October 1956 COUNTY NO. 1425

AUTHORITY Driller's log

ELEVATION

(13210—30M—3-55)

ags 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, silty, brown		0	2-0
Sandstone, coarse, brown, and brown flecks			7-0
Sandstone, fine, brown, and brown flecks			9-0
Sandstone, fine, gray, carbonaceous streaks			10-3
Sandstone, coarse, gray, carbonaceous streaks			12-0
Bottom of Hole			
Recovery			
2 ft. to 5 ft. 66%			
5 ft. to 8 ft. 81%			
8 ft. to 12 ft. 100%			
Five days after drilling, depth to water 11 ft. 1 in.			
TYPED BY ENGINEERING SECTION			

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 55

DATE DRILLED October 1956 COUNTY NO. 1426

AUTHORITY Driller's log

ELEVATION

LOCATION 50' N. line, 305' W. line

(18210—20M—3-55)

age 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Sand, brown, silty		0	3-0
Sandstone, brown, coarse			4-2
Sandstone, brown, fine, fractured			6-0
Sandstone, brown, coarse, fractured			8-0
Sandstone, gray, fine to medium, high-angle fractures			10-0
Carbonaceous seam			10-1
Sandstone, gray, medium to coarse, high-angle fractures			11-0
Bottom of hole			

Recovery

3 ft. to 5 ft.	75%
5 ft. to 8 ft.	75%
8 ft. to 11 ft.	95%

TYPED BY ENGINEERING SECTION

COMPANY Commonwealth Edison Company et al

FARM Dresden Nuc. Pow. Sta. NO. 56

DATE DRILLED October 1956 COUNTY NO. 1427

AUTHORITY Driller's log

ELEVATION 514.5

(3811—50M—8-49) 14

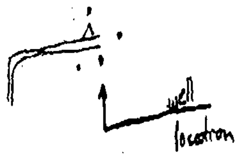
ILLINOIS GEOLOGICAL SURVEY, URBANA

No permit	Thickness	Top	Bottom
Till - topsoil		0	32
Limestone - Divine LS		32	36
Shale - Lower Shale		36	160
Limestone - Galena-Platteville Fm		160	220
No record		220	225 TD

Hole Record: 8" 0-50'
4-7/8" 50-225'

Casing: 5" 0-50' cemented
Chief aquifer: dolomite from 160-220'
Nonpumping level 57' below measuring point after pumping at 7 gallons per minute for 3¼ hours
Measuring point for test: ground surface

Topo Map



NO ENVELOPE

COMPANY U.S.Army Corps of Engineers
FARM Dresden Locks & Dam NO.
DATE DRILLED April 1972 COUNTY NO. 2125
AUTHORITY State Water Survey
ELEVATION 510' G. L.
LOCATION

(38981—30M—3-67)37-0

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
0-35 = Penn SS or Divine LS			
35' to soapstone (Lower Shale)			
105' to limestone Galena			
Total depth			190
Casing: 48' of 4" galvanized.			

W. of Substation and cooling canals

] ENVELOPE

COMPANY T.F. Anderson

FARM (b)(6) NO.

DATE DRILLED January 23, 1911 COUNTY NO. 2001

AUTHORITY State Water Survey

ELEVATION

LOCATION NW SW SE

6

(38941—50M—8-67)37-6

ILLINOIS GEOLOGICAL SURVEY, URBANA

age 1

Permit #5718	Thickness	Top	Bottom
Drift	29		29
Shale	51		80
Lime	408		488
Sand	165		653
Shale & sandy lime	89		742
Lime	46		788
			TD

Casing: 22" - 0-91',
12" - 0-150' cemented in place,
10" - 647-708'.

Size of hole 23"- 0-91',
15"- 150',
12"- 708',
10"- 788'.

Well Test Data Sheet filed.

between/near cooling canals

COMPANY Wehling Well Works, Inc.

FARM General Electric Co. NO.

DATE DRILLED October 31, 1968 COUNTY NO. 1519

AUTHORITY Company

ELEVATION 509 TM

FICE BUILDING, SPRINGFIELD,
SURVEYS SECTION, BE SURE TO

GEOLOGICAL WATER SURVEYS WATER WELL RECORD

Completed 5-22-68

10. Dept. Mines and Minerals permit No. 1685 Year 1968
11. Property owner G.E.Similator Bldg. Well No. 1
Address Morris, Ill.
Driller Wehling Well Works, Inc License No. 92-56
12. Water from DOLOMITE (Formation) 13. County Grundy
at depth 101 to 383 ft. Sec. 35
14. Screen: Diam. ____ in. Twp. 34N
Length: ____ ft. Slot ____ Rng. 8E
Elev 529' Mean Sea Level
30'S 230'E NWc $NE\frac{1}{4}$ $NW\frac{1}{4}$ $SE\frac{1}{4}$
15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
6"		0	140
	Cemented in		

SHOW LOCATION IN SECTION PLAT

16. Size Hole below casing: 5-7/8" in.
17. Static level 132 ft. below casing top which is ____ ft. above ground level. Pumping level 142 ft. when pumping at 30 gpm for 8 hours. ~~As per attached~~

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Dirt	6"	6"
Lime	$39\frac{1}{2}$'	40'
Shale	60	100
Lime	283	383
(CONTINUE ON SEPARATE SHEET IF NECESSARY)		

SW of Dres. Stn.

SIGNED Wehling Well Works, Inc., DATE 5/31/68

COUNTY No. 1309 S.S# 55591

(38941—30M—9-67)57-0

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
46' to soapstone			
115' to limestone			
Total Depth			204
Water level: flow			
Casing: 115' of 4"			

between cooling canals? S of Dres Sta.

O ENVELOPE

OMPANY T.F. Anderson
ARM (b)(6) [redacted]
NO.
ATE DRILLED July 1, 1905 COUNTY NO. 2014
UTHORITY State Water Survey
EVATION

6

LOG OF WATER WELL permit #415

Property owner National Concrete Unit #2 Dresden Well No. 2217

Drilled by E. C. Welling Year Dec. 1965

Formations passed through	Thickness	Depth of Bottom
Sandy black dirt	3	3
Lime	42	45
Gray Shale	5	50
Lime	252	302
COUNTY No 23159		
S.S.#52732		
Received from Naperville Office. 3-2-66		

[Continue on back if necessary]

Finished in 252 ft of rock at 50 to 302 ft.

Cased with 6 inch Galv. casing from 0 to 30 ft.

and ____ inch ____ from ____ to ____ ft.

Size hole below casing ____ inch. Static level from surf. 93 ft.

Tested capacity 30 gal. per min. Temperature 52 °F.

Water lowered to 54 ft ____ in. in ____ hrs ____ min.

Length of test 3 hrs. ____ min. Screen ____

Slot ____ Diam ____ Length ____ Bottom set at ____ ft.

[Show location in Section Plat]

Township name ____ Elev. 515' MSL Sec. 35

Grundy Co.

Description of location 200' S, 400' W

temporary well for

NE c construction purposes, will

be abandoned

Twp. 34N

Rge. 8E

Signed E. C. Welling County Grundy

46

(36041—30M—3-67)ST-0 2

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
No record	32		32
Soapstone	28		60
Limestone	86		146
			TD

Water level: flow

Casing: 36'6" of 4"

SW of Dres Stn
near Ind. Waste Pond

NO ENVELOPE

6

OMPANY T.F. Anderson

ARM (b)(6)

NO.

ATE DRILLED April 22, 19[illegible]4

COUNTY NO. 2021

UTHORITY State Water Survey

VATION

CATION [illegible]

(36941—30M—3-67)37-0

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
No record	20		20
Soapstone	70		90
Limestne	110		200
			TD

Water level: flow

Casing: 54'6" of 4"

S of Dres. Sta.
4 in canals?

NO ENVELOPE

6

COMPANY T.F. Anderson
FARM (b)(6)
DATE DRILLED April 4, 19[illegible]
AUTHORITY State Water Survey
ELEVATION

NO.
COUNTY NO. 2020

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
32' to soapstone			
37' to limestone			
Total Depth			267
Water level: flow			
Casing: 42' of 4"			

S of Dres Sta
@ curve in Collins Rd

NO ENVELOPE

COMPANY T.F. Anderson
FARM (b)(6) NO.
DATE DRILLED October 5, 190[illegible] COUNTY NO. 2022
AUTHORITY State Water Survey
ELEVATION

6

(38841—30M—3-61)37-4

'age 1 ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
26- to soapstone			
88' to limestone			
Total Depth			200
Casing: 30' of 4"			
*Location questionable.			
NO ENVELOPE			

near #2022
SE of Dres. Sta.
@ curve in Collins Rd.

6

COMPANY T.F. Anderson
FARM [redacted]
NO.
DATE DRILLED July 16, 1915
COUNTY NO. 2023
AUTHORITY State Water Survey
ELEVATION
LOCATION [illegible]

(38041—30M—3-67)37-0 2

ge 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
Drift	10		10
Granite	24		34
Soapstone	63		97
Limestone	17		114
			TD

Casing: 39' of 4"

SW of Dr's Sta
@ Collins + Lock Rds.

NO ENVELOPE

6

OMPANY T.F. Anderson
ARM (b)(6) NO.
ATE DRILLED November 23, 1915 COUNTY NO. 2024
UTHORITY State Water Survey
LEVATION

John C. Moore Corporation, Rochester, N. Y.

TOWN Divine, 2 mi. East TOWNSHIP MAP No. 1

COMPANY T. F. Anderson 8E

FARM (b)(6) [redacted]

AUTHORITY J. T. Anderson 34 36

ELEVATION 524 TxMA HOLE No. N SW

COLLECTOR DATE DRILLED 1920 NW

June 11

No. G #1237

STRATA	THICKNESS FEET	THICKNESS IN.	DEPTH FEET	DEPTH IN.
Surface	5		5	
Rock, hard	44		49	
Soapstone	64		113	
Lime, brown	90		203	

Casing: 64' 8" of 4"

S-SE of Pres. Sta in Res Area S of plant (one of closest to plant)

NO. ENVELOPE

(36941—5031—3-67)37-0 2

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
Soil – Topsoil	25		25
Sandstone – Penn. System = Pottsville Sandstone	5		30
Granite → dolomite/LS (Divine LS member)	35		65
Soapstone → shale (Lower Shale)	12		77
Limestone – Galena-Platteville Fm.	120		197
			TD

Water level - flow

NO ENVELOPE

OMPANY T.F. Anderson

ARM (b)(6)

ATE DRILLED May, 1901

NO.

COUNTY NO. 1999

UTHORITY State Water Survey

.EVATION

6

(36941—503—3-67)27-4

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
Limerock - Divine	26		26
Soapstone - Lower Shale	67		93
Limestone - Galena	110		203
			TD

East of Dresden Island

NO ENVELOPE

COMPANY T.F. Anderson

FARM State of Illinois NO.

DATE DRILLED February 4, 1929 COUNTY NO. 2000

AUTHORITY State Water Survey

ELEVATION 518 TM

LOCATION SW SW NE

10

TOWN Morris TOWNSHIP

MAP NO. 8R

COMPANY (b)(6) [redacted]

FARM

AUTHORITY Th. Anderson 34 36

ELEVATION 508' T.M. HOLE No. 99

COLLECTOR Culver DATE DRILLED May 1920

C #1337

No.	STRATA	THICKNESS FEET	Elev.	DEPTH FEET
1	Limestone, gray-white with pink tone which is prominent in powder, crystalline, quite pure, with less than 10/o foreign matter, largely calcite, very rare fragment of shell impressions - brachiopods?	44	459	49
2	Shale, medium gray, calcareous, without grit, some pyrite grains and concretions of maximum diameter 1/8	64	395	113
3	Dolomite, grayish-buff with black specks not rare, fine xtaln dolomite with some calcite, shale fragments from above, more pyrite than in No.2, a few white calcite grains as though from No.1.	2		115
[illegible]	Dolomite, light gray with cream tones, fine xtaln, few foreign fragments of gray shale, etc., neither [illegible] nor fossils	15		130
[illegible]	Dolomite, same as No. [illegible] except showing some pyrite [illegible]	[illegible]		[illegible]

John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves, each Patented

SHEET 2 T. 34N R. 8E S. 36

COMPANY HOLE No.

No.	STRATA	Thickness Feet	Thickness In.	Depth Feet	Depth In.
			Elev.		
6	Dolomite: grayish-buff, lighter than No. 3, few shale fragments. Larger pieces 3/8" show small geodes; some pyrite with the dolomite	15		160	
7	Dolomite: like above, grayish-buff, finely xtaln, porous with dark specks; few shale pieces; some pyrite. Faint impression of shells (brach'd?)	20		180	
8	Dolomite: like above except showing some light green shale	20		200	

Note. The first two samples were labeled 51-49' and 49-113' respt. Below them the samples received only the lower depth which presumably is the depth at which they were taken. Actual thickness of the beds is thus left in some doubt.

County Grundy Index No. 013

DRILL RECORD

(36841—10M—2-67) 37-4

Page 1 ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
60' to soapstone			
136' to limestone			
Total Depth			203
Water level - flow			
Casing: 134' of 4"			
*Location questionable. Osbourne land not shown here.			
NO ENVELOPE			

Res Area
S. of Dres Stk

OMPANY T.F. Anderson

ARM (b)(6)

6

NO.

ATE DRILLED June 14, 1905

COUNTY NO. 2025

UTHORITY State Water Survey

LEVATION

John C. Moore Corporation, Rochester, N.Y. Binder and holes in leaves, ...

(575—5M—7-33)

TOWN	TOWNSHIP		MAP No.
COMPANY			8E
FARM			
AUTHORITY		34	35
ELEVATION 525'. T.M.	HOLE No.	N	
COLLECTOR	DATE DRILLED		

uncertain of geol. interpretation

No.	STRATA		Elev.	Thickness Feet	Thickness In.	Depth Feet	Depth In.
	Surface	topsoil	505	15		15	
	Sandstone	Penn. SS	475	30		45	
	Limestone	Dunn LS	418	57		102	

MICROFILMED

COUNTY No. 23758

South of Dr. Sta. adj. to cold (discharge) canal

NO ENVELOPE

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Studied by P.M. Busch 4/51			
PLEISTOCENE SYSTEM			
Till, calcareous, yellowish gray	5		5
PENNSYLVANIAN SYSTEM			
Shale, calcareous, grayish green, weak	65		70
ORDOVICIAN SYSTEM			
Maquoketa formation			
Dolomite, calcareous, light gray, fine to coarse; calcite	40		115
Dolomite, calcareous, light gray to light yellowish brown, fine to coarse	5		120
Shale, dolomitic, grayish green to grayish brown, weak	15		135
Shale, dolomitic, yellowish gray to grayish brown, weak to firm	50		185
Galena formation			
Dolomite, pale yellowish brown, fine to coarse	25		210
Dolomite, calcareous, pale yellowish brown to light gray, fine to coarse; calcite, at base	50		260
Dolomite, calcareous, yellowish gray, fine to coarse, broken	95		355
Dolomite, yellowish gray to yellowish brown, fine to coarse	15		370

Across rivers

6

COMPANY Joliet Pump Co. NO.

FARM (b)(6) NO.

DATE DRILLED 1950 COUNTY NO. 1338

AUTHORITY Summary Sample Study

ELEVATION 508? est. T.M.

LOCATION

Appendix F

Historic Tritium Concentration Data

(Not Included)

Appendix G

Mass Flux Calculations

GROUNDWATER TRITIUM CALCULATIONS

Project No. [illegible] | Page 1 of 21
Client | Date [illegible]
Site | By [illegible]
Subject [illegible] | App. [illegible]

RETEC

OBJECTIVE: ESTIMATE DARCY VELOCITY (V_d) OF SHALLOW GROUNDWATER FLOWING IN THE WEST & EAST [illegible]

GIVEN: ① [illegible] HYDRAULIC CONDUCTIVITY K [illegible] (BH157S) SOUTH OF PLANT AREA [illegible] LITHOLOGY TO [illegible] BEDROCK

② HYDRAULIC GRADIENT, i [illegible] NORTHEAST [illegible] AND [illegible]

$i_{WEST} = 0.014$ [illegible]

$i_{EAST} = 0.014$

[illegible] $V_d = Ki$

$K = 3.29(10^{-2})\frac{FT}{MIN}$ = SLUG TEST [illegible]

V_d (WEST) $= 3.29(10^{-2})$ FT/MIN × [illegible]

$= 4.61(10^{-4})$ [illegible] 0.66 [illegible] 20

V_d (EAST) $3.29(10^{-2})$ FT/MIN × [illegible]

$2.63(10^{-4})$ FT/[illegible] 0.41 FT/[illegible] [illegible]

[illegible] ③ [illegible]

[illegible]

[illegible] 9.4 [illegible]

[illegible]

Given:

Hydraulic Conductivity, K =	3.29E-02 ft/min	(slug test result at DSP-157S)
Hydraulic Gradient to East, i_e =	1.40E-02 ft/ft	(local shallow gradient)
Hydraulic Gradient to West, i_w =	8.60E-03 ft/ft	(local shallow gradient)

Calculate darcy velocity, v

		East of Breach	West of Breach
$v = Ki =$	=	4.61E-04 ft/min	2.83E-04 ft/min
	=	0.66 ft/day	0.41 ft/day
	=	0.20 m/day	0.12 m/day

Modeled Planes along Plume	Wells	Distance from Source (ft)	July 31, 2004 Tritium (pCi/L)
1	W-3	20	6,125,000
2	W-1 and W-2R	33	3,600,000
3	T-6 and T-7	54	1,168,750
4	T-3 and T-5	61	40,274
5	T-1 and T-2	73	7,533
6	R-1, R-2 and R-3	100	2,108
7	E-2, E-8 and E-9	118	1,071
8	E-3 and E-10	138	1,142
9	E-6 and E-7	180	3,989
10	DSP-124	230	91,166

Modeled Planes along Plume	Wells	Distance from Source (ft)	April 8, 2005 Tritium (pCi/L)
1	W-3	20	244,229
2	W-1 and W-2R	33	260,948
3	T-6 and T-7	54	422,424
5	T-1 and T-2	73	134,034
6	R-1, R-2 and R-3	100	3,643
7	E-2, E-8 and E-9	118	1,850
8	E-3 and E-10	138	772
10	DSP-124	230	4,060

Modeled Planes along Plume	Wells	Distance from Source (ft)	September 3, 2004 Tritium (pCi/L)
1	W-3	20	10,312,000
2	W-1 and W-2R	33	2,590,000
3	T-6 and T-7	54	1,093,500
4	T-3 and T-5	61	111,000
5	T-1 and T-2	73	8,000
10	DSP-124	230	55,000

Modeled Planes along Plume	Wells	Distance from Source (ft)	April 25, 2005 Tritium (pCi/L)
1	W-3	20	183,000
2	W-1 and W-2R	33	204,000
3	T-6 and T-7	54	134,000
5	T-1 and T-2	73	96,500
6	R-1, R-2 and R-3	100	3,333
7	E-2, E-8 and E-9	118	2,000

Modeled Planes along Plume	Wells	Distance from Source (ft)	October 25, 2004 Tritium (pCi/L)
1	W-3	20	4,931,000
3	T-6 and T-7	54	354,000
4	T-3 and T-5	61	103,000
5	T-1 and T-2	73	58,000
6	R-1, R-2 and R-3	100	8,500
8	E-3 and E-10	138	1,000
9	E-6 and E-7	180	1,000
10	DSP-124	230	NM

Modeled Planes along Plume	Wells	Distance from Source (ft)	May 3, 2005 Tritium (pCi/L)
1	W-3	20	171,000
2	W-1 and W-2R	33	199,000
3	T-6 and T-7	54	45,000
5	T-1 and T-2	73	130,000
7	E-2, E-8 and E-9	118	2,500
8	E-3 and E-10	138	1,000

Modeled Planes along Plume	Wells	Distance from Source (ft)	November 22, 2004 Tritium (pCi/L)
1	W-3	20	542,667
3	T-6 and T-7	54	573,705
5	T-1 and T-2	73	21,026
6	R-1, R-2 and R-3	100	1,502
8	E-3 and E-10	138	1,001
10	DSP-124	230	12,889

Project No.	Page 3 of 21	RETEC
Client	Date [illegible]	
Site	By [illegible]	
Subject	App.	

[illegible] (3) CALCULATE FLUX ACROSS [illegible] [illegible] TO [illegible] (SEE [illegible] 4)

[illegible] [illegible]

→ USE AVERAGE C DETECTED [illegible]

→ SUBTRACT BACKGROUND CONCENTRATION = 320 pCi/L ([illegible] FROM [illegible])

FOR DATA [illegible] 7/3/04:

$C_{Avg} = (1,960,321 + 377,162)/2$

$= 1,168,750\ pCi/L - 320\ pCi/L$

$= 1,168,430\ pCi/L$

FLUX = C × [illegible] 1,168,430 × $\frac{1000\,L}{m^3}$ × [illegible]

$= 2.34(10^{?})$ [illegible]

[illegible] (4)

[illegible] [illegible] ([illegible])

[illegible]

[illegible]

[illegible] $2.34(10^{8})$ [illegible]

FLUX = $1.63(10^{8})$ [illegible]

[illegible] FLUX [illegible] 1.63 [illegible]

[illegible]

RETEC

Project No. [illegible] Page 6 of 21
Client — Date [illegible]
Site — By [illegible]
Subject [illegible] App.

[illegible] (5), [illegible] CONT'D

FOR [illegible] PLUME A_L = 255' [illegible] 25'

MAX WIDTH OF PLUME = 20' + 2(25) = [illegible]'

CALCULATE AREA FOR EACH [illegible]
[illegible]

BANK #	WIDTH (FT)	[illegible]	AREA (FT)^2
1	30	10	300
2	40	10	400
3	46	10	460
4	50	10	500
5	54	10	540
6	60	10	600
7	[illegible]	10	[illegible]
8	58	10	580
9	46	10	460
10	[illegible]	34	1700

EXAMPLE [illegible] 3 [illegible] 4.72 [illegible]

4.72 [illegible] $\frac{pCi}{ft^2}$ x 460 [illegible] x [illegible] TOTAL =

M = 2.02 (10 [illegible]) pCi

[illegible]

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence Version 1.4

EXENW-18513-400
Transport West of Leak
Run Name

Data Input Instructions:

115	*1. Enter value directly....or*
↑ or	*2. Calculate by filling in grey*
0.02	*cells below. (To restore formulas, hit button below).*
Variable*	*Data used directly in model.*
20	*Value calculated by model. (Don't enter any data).*

1. HYDROGEOLOGY

Seepage Velocity*	Vs	991.4	(ft/yr)
or		↑ or	
Hydraulic Conductivity	K	1.7E-02	(cm/sec)
Hydraulic Gradient	i	0.0086	(ft/ft)
Porosity	n	0.15	(-)

2. DISPERSION

Longitudinal Dispersivity	alpha x	12.7	(ft)
Transverse Dispersivity*	alpha y	1.3	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		↑ or	
Estimated Plume Length	Lp	255	(ft)

3. ADSORPTION

Retardation Factor*	R	1.0	(-)
or		↑ or	
Soil Bulk Density	rho	NA	(kg/l)
Partition Coefficient	Koc	NA	(L/kg)
FractionOrganicCarbon	foc	NA	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	5.6E-2	(per yr)
or		↑ or	
Solute Half-Life	t-half	12.30	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO	1.65	(mg/L)
Delta Nitrate*	NO3	0.7	(mg/L)
Observed Ferrous Iron*	Fe2+	16.6	(mg/L)
Delta Sulfate*	SO4	22.4	(mg/L)
Observed Methane*	CH4	6.6	(mg/L)

5. GENERAL

Modeled Area Length*	255	(ft)
Modeled Area Width*	71	(ft)
Simulation Time*	1	(yr)

L W

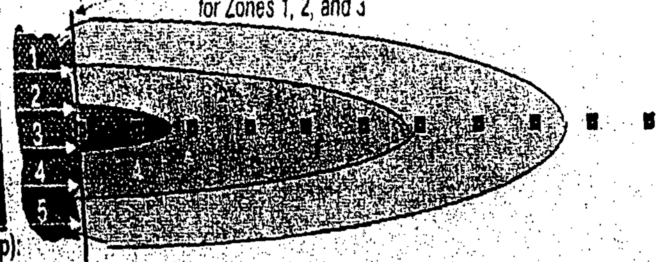
6. SOURCE DATA

Source Thickness in Sat.Zone 10 (ft)

Source Zones:

Width* (ft)	Conc. (mg/L)*
0	0
0	0
20	200000
0	0
0	0

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Source Halflife (see Help):

Inst. React.	1st Order	
Infinite	Infinite	(yr)

Soluble Mass Infinite (Kg)
In Source NAPL, Soil

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)											
Dist. from Source (ft)	0	26	51	77	102	128	153	179	204	230	255

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

RUN ARRAY

Help

Recalculate This Sheet

Paste Example Dataset

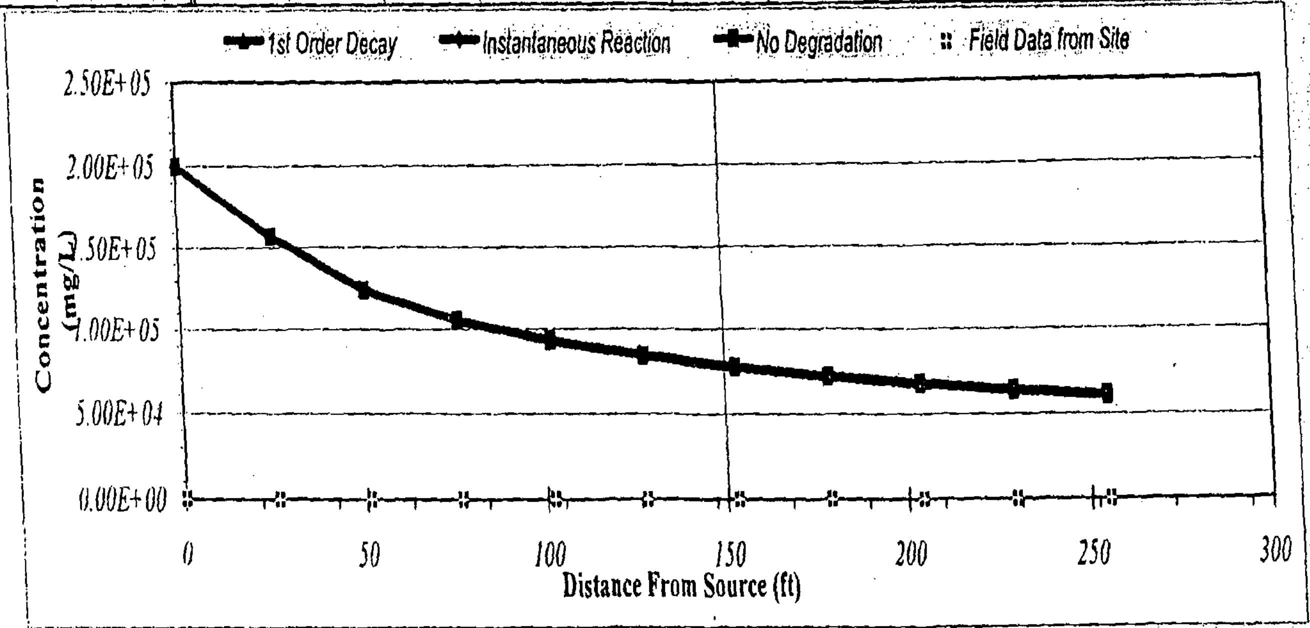
View Output

View Output

Restore Formulas for Vs, Dispersivities, R, lambda, other

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft) 0	26	51	77	102	128	153	179	204	230	255
No Degradation	2.00E+05	1.57E+05	1.24E+05	1.05E+05	9.32E+04	8.44E+04	7.77E+04	7.24E+04	6.80E+04	6.43E+04	6.12E+04
1st Order Decay	2.00E+05	1.57E+05	1.24E+05	1.05E+05	9.27E+04	8.38E+04	7.70E+04	7.16E+04	6.72E+04	6.35E+04	6.03E+04
Inst. Reaction	2.00E+05	1.57E+05	1.24E+05	1.05E+05	9.32E+04	8.44E+04	7.77E+04	7.24E+04	6.80E+04	6.43E+04	6.12E+04
Field Data from Site											



Calculate Animation

Time:

1 Years

Return to Input

Recalculate This Sheet

Project No.
Client
Site
Subject

Page 2 of 2
Date
By
App.

RETEC

ESTIMATE ... OF ... AT ... BASE ... ON ...

GIVEN ... MASS = ...
(SEE CALCULATIONS P. 3 FOR ...)

$$C = C_0 e^{-kt}$$

WHERE C = ... AT TIME t
C_0 = ORIGINAL CONCENTRATION
k = DECAY ... RATE
t = TIME

C_0 = ... 7/31/2004 ... DSP ...
C = 4000 ... 4/8/2005

Δt = 251 DAYS

$4.4\times$ ... $e^{-k(251\,d)}$

$\ln$ ... $= -251k$

Project No. [illegible] | Page 10 of 24
Client | Date [illegible]
Site | By [illegible]
Subject [illegible] | App.

RETEC

[illegible] TRAIN [illegible]

GIVEN [illegible]
TRAIN [illegible] SOURCE [illegible]

$C = 9-10\ (10^6)$ PCi/L

— USE AVG 9.5 (10^6) $\frac{PCi}{L}$

TOTAL = [illegible] (10^{12}) pCi × $\frac{L}{[illegible]}$, pCi × $\frac{[illegible]}{[illegible]}$
[illegible]

[illegible]

[illegible] MASS [illegible] TO [illegible] TO MASS
[illegible] 6.4A (10^{12}) [illegible]
MASS [illegible] TO GROUND [illegible] TO MAST [illegible]

[illegible]
[illegible] DISCHARGE [illegible]
[illegible]

[illegible]
BASE FOR [illegible] IF APPROP.
[illegible]
[illegible] AT [illegible])

Calculate mass discharged along a plane through W-1 and W-2R:

Sample Date	Tritium Concentration (pCi/L) W-1	W-2R	Average	Mass Flux** ($pCi/m^2/d$)	Mass Discharged per Area*** (pCi/m^2)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	3,600,000	NM	3,600,000	4.47E+08	0	0.00E+00
7/31/2004	3,600,000	NM	3,600,000	4.47E+08	1.22E+11	3.40E+12
8/28/2004	703,375	NM	703,375	8.73E+07	7.48E+09	2.08E+11
8/31/2004	2,348,000	NM	2,348,000	2.92E+08	5.68E+08	1.58E+10
9/3/2004	2,590,000	NM	2,590,000	3.22E+08	9.20E+08	2.56E+10
12/2/2004	NM	48,000	48,000	5.92E+06	1.47E+10	4.11E+11
1/4/2005	NM	16,000	16,000	1.95E+06	1.30E+08	3.62E+09
2/1/2005	NM	301,000	301,000	3.73E+07	5.50E+08	1.53E+10
3/11/2005	NM	284,000	284,000	3.52E+07	1.38E+09	3.84E+10
4/8/2005	NM	260,948	260,948	3.24E+07	9.46E+08	2.64E+10
4/26/2005	NM	204,000	204,000	2.53E+07	5.19E+08	1.45E+10
5/3/2005	NM	199,000	199,000	2.47E+07	1.75E+08	4.87E+09
5/19/2005	NM	182,000	182,000	2.26E+07	3.78E+08	1.05E+10
Total Mass Discharged to Groundwater						**4.18E+12**

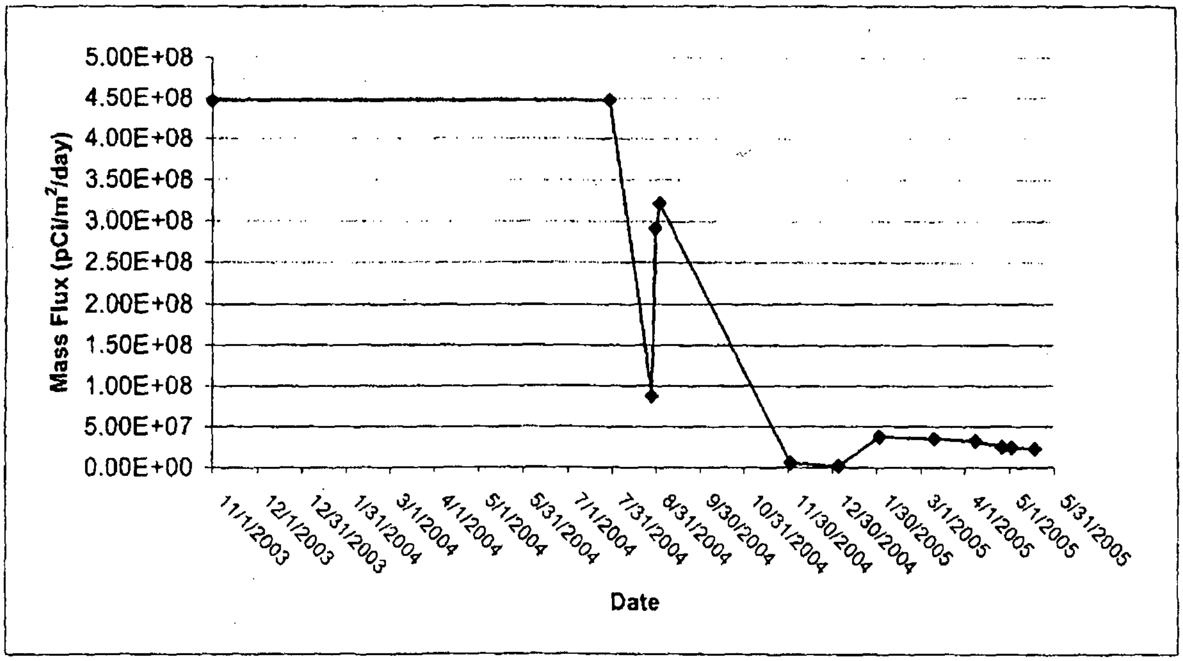
Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration

**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)

***Assumed area of plume:

Width =	30 ft	Area =	300 ft^2
Saturated Depth =	10 ft		28 m^2

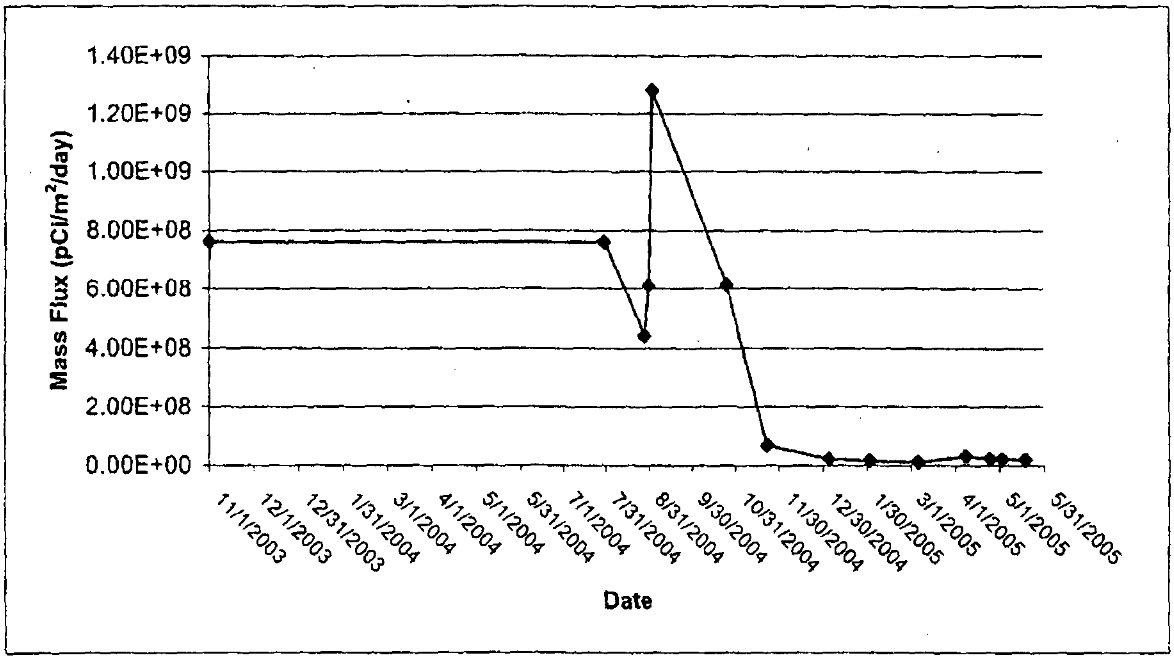


Calculate mass discharged along a plane through W-3:

Sample Date	Tritium Concentration (pCi/L) W-3	Mass Flux** ($pCi/m^2/d$)	Mass Discharged per Area*** (pCi/m^2)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	6,125,000	7.61E+08	0	0.00E+00
7/31/2004	6,125,000	7.61E+08	2.08E+11	7.72E+12
8/28/2004	3,551,350	4.41E+08	1.68E+10	6.25E+11
8/31/2004	4,908,000	6.09E+08	1.58E+09	5.86E+10
9/3/2004	10,312,000	1.28E+09	2.84E+09	1.05E+11
10/25/2004	4,931,000	6.12E+08	4.92E+10	1.83E+12
11/22/2004	542,667	6.74E+07	9.52E+09	3.54E+11
1/4/2005	177,000	2.19E+07	1.92E+09	7.13E+10
2/1/2005	129,000	1.60E+07	5.31E+08	1.97E+10
3/7/2005	92,000	1.14E+07	4.65E+08	1.73E+10
4/8/2005	244,229	3.03E+07	6.67E+08	2.48E+10
4/25/2005	183,000	2.27E+07	4.50E+08	1.67E+10
5/3/2005	171,000	2.12E+07	1.76E+08	6.52E+09
5/19/2005	161,000	2.00E+07	5.11E+08	1.90E+10
Total Mass Discharged to Groundwater				**1.09E+13**

Note:
*Assume constant discharge beginning at time of leak equal to first available sampled concentration
**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)
***Assumed area of plume:

Width =	40 ft	Area =	400 ft^2
Saturated Depth =	10 ft		37 m^2



Calculate mass discharged along a plane through T-6 and T-7:

Sample Date	Tritium Concentration (pCi/L) T-6	T-7	Average	Mass Flux** (pCi/m²/d)	Mass Discharged per Area*** (pCi/m²)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	1,960,331	377,168	1,168,750	2.36E+08	0	0.00E+00
7/31/2004	1,960,331	377,168	1,168,750	2.36E+08	6.45E+10	2.76E+12
8/28/2004	598,986	419,783	509,385	1.03E+08	4.75E+09	2.03E+11
9/3/2004	1,229,000	958,000	1,093,500	2.21E+08	9.72E+08	4.15E+10
10/25/2004	354,000	NM	354,000	7.15E+07	7.61E+09	3.25E+11
11/22/2004	573,705	NM	573,705	1.16E+08	2.62E+09	1.12E+11
1/4/2005	15,000	NM	15,000	2.97E+06	2.56E+09	1.09E+11
2/1/2005	53,000	NM	53,000	1.06E+07	1.91E+08	8.15E+09
3/8/2005	17,000	NM	17,000	3.37E+06	2.45E+08	1.05E+10
4/8/2005	422,424	NM	422,424	8.53E+07	1.37E+09	5.88E+10
4/25/2005	134,000	NM	134,000	2.70E+07	9.55E+08	4.08E+10
5/3/2005	45,000	NM	45,000	9.03E+06	1.44E+08	6.16E+09
* 5/19/2005	45,000	NM	45,000	9.03E+06	1.45E+08	6.18E+09
Total Mass Discharged to Groundwater						**3.68E+12**

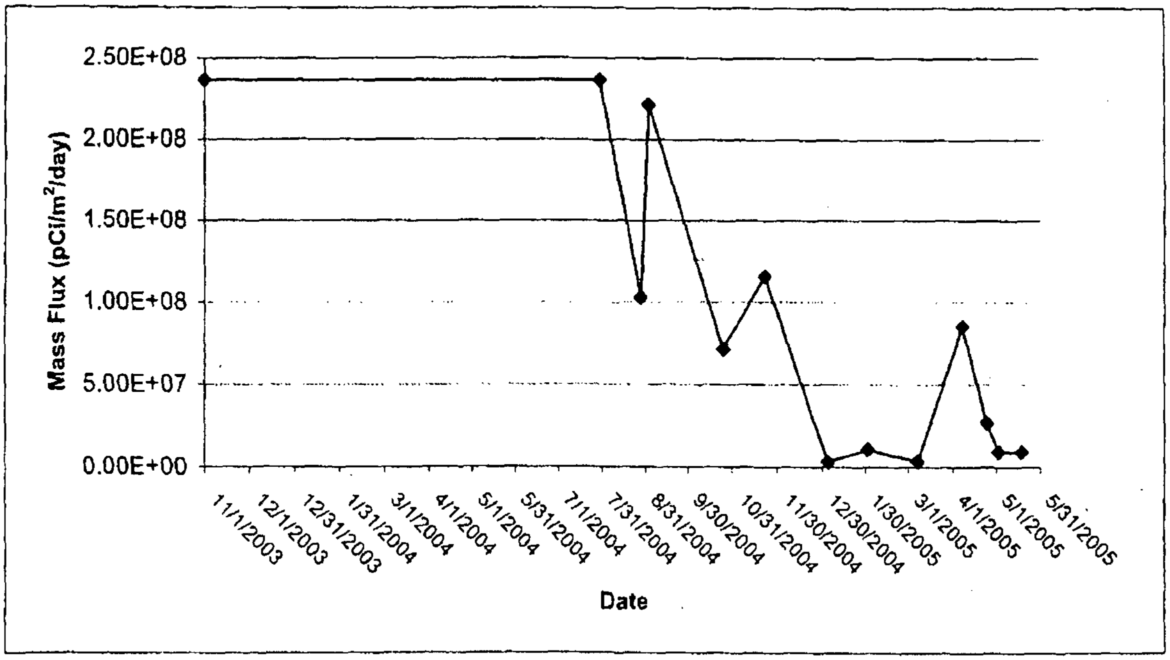
Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration
Assume constant discharge between most recent sampled concentration to present

**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)

***Assumed area of plume:

Width =	46 ft	Area =	460 ft²
Saturated Depth =	10 ft		43 m²



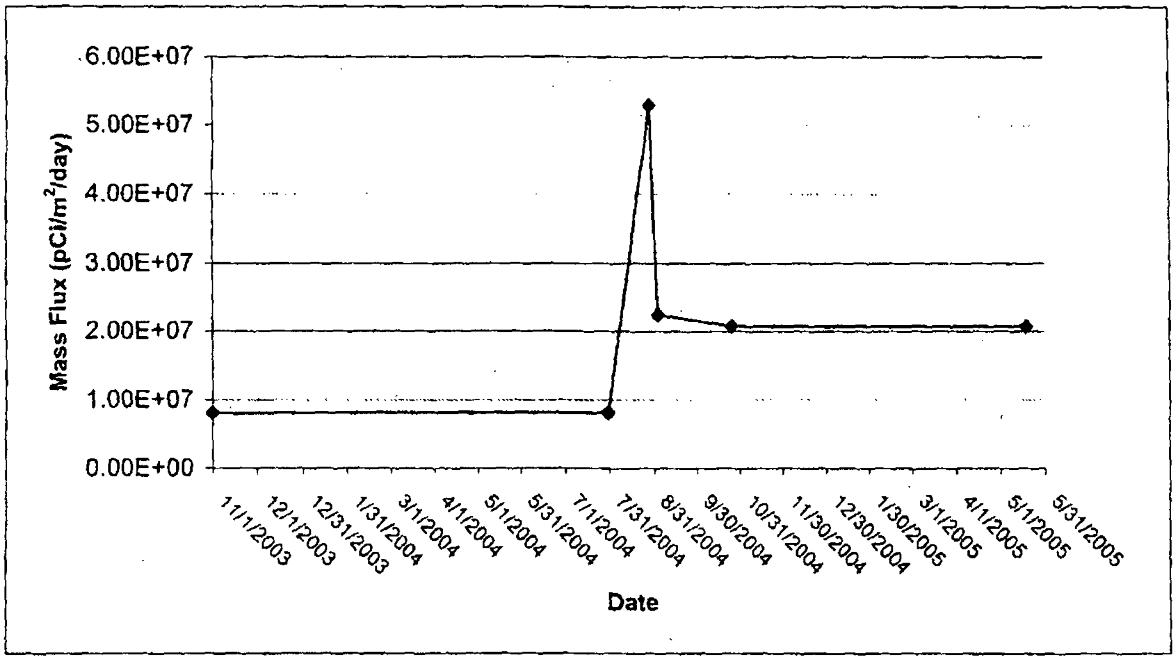
Calculate mass discharged along a plane through T-3 and T-5:

Sample Date	Tritium Concentration (pCi/L) T-3	T-5	Average	Mass Flux** ($pCi/m^2/d$)	Mass Discharged per Area*** (pCi/m^2)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	38,885	41,662	40,274	8.08E+06	0	0.00E+00
7/31/2004	38,885	41,662	40,274	8.08E+06	2.21E+09	1.02E+11
8/28/2004	119,763	404,437	262,100	5.29E+07	8.54E+08	3.97E+10
9/3/2004	95,000	127,000	111,000	2.24E+07	2.26E+08	1.05E+10
10/25/2004	NM	103,000	103,000	2.08E+07	1.12E+09	5.21E+10
* 5/19/2005	NM	103,000	103,000	2.08E+07	4.28E+09	1.99E+11
Total Mass Discharged to Groundwater						**4.03E+11**

Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration
Assume constant discharge between most recent sampled concentration to present
**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)
***Assumed area of plume:

Width =	50 ft	Area =	500 ft^2
Saturated Depth =	10 ft		46 m^2



Calculate mass discharged along a plane through T-1 and T-2:

Sample Date	Tritium Concentration (pCi/L) T-1	T-2	Average	Mass Flux** ($pCi/m^2/d$)	Mass Discharged per Area*** (pCi/m^2)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	7,473	7,592	7,533	1.46E+06	0	0.00E+00
7/31/2004	7,473	7,592	7,533	1.46E+06	3.98E+08	2.00E+10
9/3/2004	10,000	6,000	8,000	1.55E+06	5.12E+07	2.57E+09
10/25/2004	NM	58,000	58,000	1.17E+07	3.44E+08	1.72E+10
11/22/2004	35,043	7,009	21,026	4.19E+06	2.22E+08	1.11E+10
12/2/2004	3,000	3,000	3,000	5.42E+05	2.36E+07	1.19E+09
1/4/2005	43,000	4,000	23,500	4.69E+06	8.63E+07	4.33E+09
2/1/2005	46,000	5,000	25,500	5.09E+06	1.37E+08	6.87E+09
3/8/2005	131,000	4,000	67,500	1.36E+07	3.27E+08	1.64E+10
4/8/2005	262,990	5,077	134,034	2.70E+07	6.30E+08	3.16E+10
4/25/2005	189,000	4,000	96,500	1.94E+07	3.95E+08	1.98E+10
5/3/2005	252,000	8,000	130,000	2.62E+07	1.83E+08	9.16E+09
5/19/2005	241,000	4,000	122,500	2.47E+07	4.07E+08	2.04E+10
Total Mass Discharged to Groundwater						**1.61E+11**

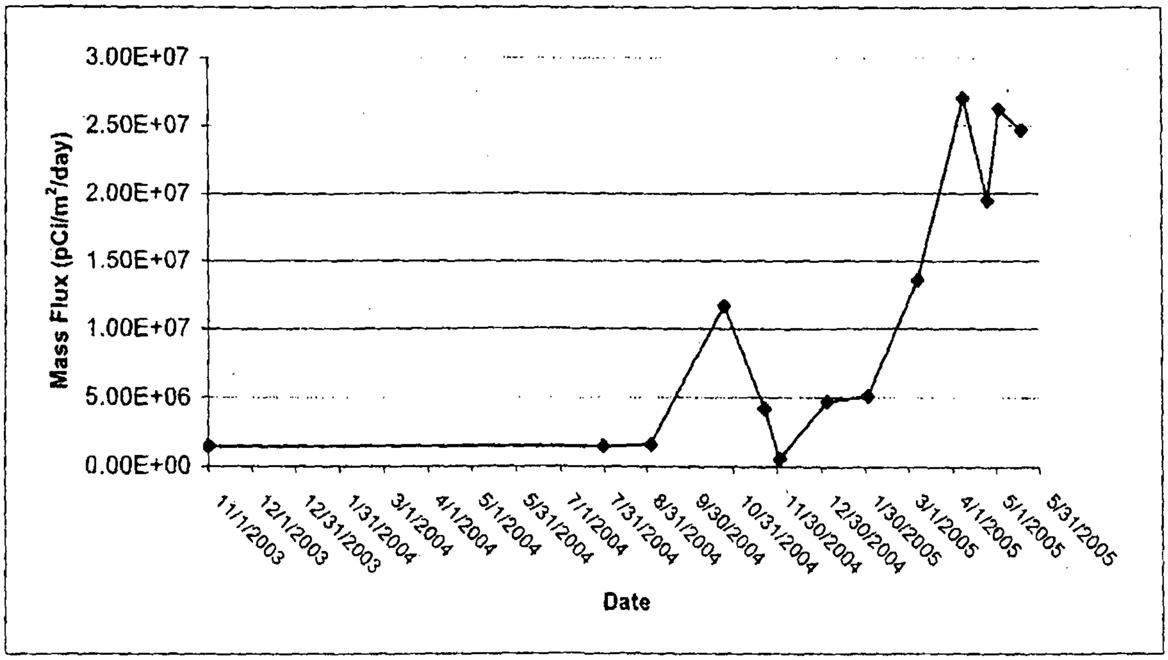
Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration

**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)

***Assumed area of plume:

Width =	54 ft	Area =	540 ft^2
Saturated Depth =	10 ft		50 m^2



Calculate mass discharged along a plane through R-1, R-2, and R-3:

Sample Date	Tritium Concentration (pCi/L) R-1	R-2	R-3	Average	Mass Flux (pCi/m²/d)**	Mass Discharged per Area*** (pCi/m²)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	1,280	3,591	1,452	2,108	3.61E+05	0	0.00E+00
7/31/2004	1,280	3,591	1,452	2,108	3.61E+05	9.87E+07	5.50E+09
10/25/2004	5,000	12,000	NM	8,500	1.65E+06	8.66E+07	4.83E+09
11/9/2004	NM	1,000	NM	1,000	1.37E+05	1.34E+07	7.49E+08
11/10/2004	1,000	NM	NM	1,000	1.37E+05	1.37E+05	7.66E+06
11/22/2004	1,001	2,002	NM	1,502	2.39E+05	2.26E+06	1.26E+08
1/4/2005	NM	9,000	5,000	7,000	1.35E+06	3.42E+07	1.90E+09
4/8/2005	1,127	5,866	3,936	3,643	6.72E+05	9.50E+07	5.30E+09
4/25/2005	1,000	3,000	6,000	3,333	6.09E+05	1.09E+07	6.07E+08
5/19/2005	NM	NM	4,000	4,000	7.44E+05	1.62E+07	9.05E+08
Total Mass Discharged to Groundwater							**1.99E+10**

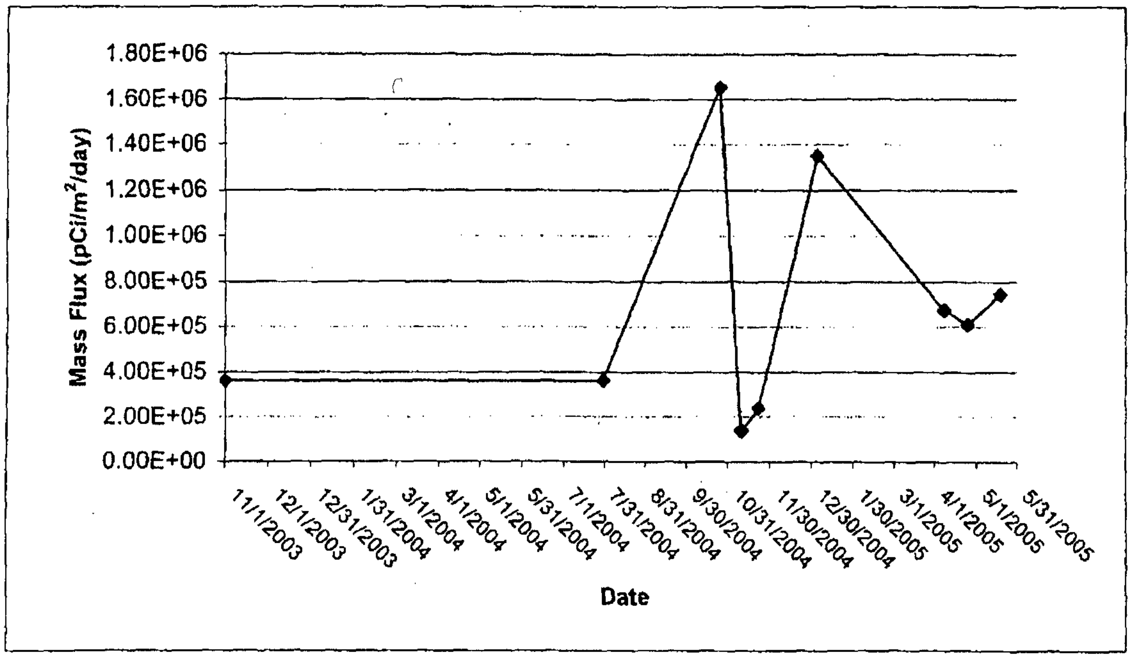
Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration

**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)

***Assumed area of plume:

Width =	60 ft	Area =	600 ft²
Saturated Depth =	10 ft		56 m²



Calculate mass discharged along a plane through E-2, E-8, and E-9:

Sample Date	Tritium Concentration (pCi/L) E-2	E-8	E-9	Average	Mass Flux ($pCi/m^2/d$)**	Mass Discharged per Area*** (pCi/m^2)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	1,071	NM	NM	1,071	1.52E+05	0	0.00E+00
7/31/2004	1,071	NM	NM	1,071	1.52E+05	4.14E+07	2.39E+09
12/2/2004	NM	0	1,000	500	3.64E+04	1.17E+07	6.72E+08
1/4/2005	0	2,000	2,000	1,333	2.05E+05	3.98E+06	2.29E+08
2/2/2005	NM	0	1,000	500	3.64E+04	3.50E+06	2.01E+08
3/11/2005	NM	1,000	2,000	1,500	2.39E+05	5.09E+06	2.93E+08
4/8/2005	541	3,140	1,870	1,850	3.09E+05	7.67E+06	4.42E+08
4/26/2005	NM	2,000	NM	2,000	3.40E+05	5.84E+06	3.36E+08
5/3/2005	NM	2,000	3,000	2,500	4.41E+05	2.73E+06	1.57E+08
* 5/19/2005	NM	2,000	3,000	2,500	4.41E+05	2.73E+06	1.57E+08
Total Mass Discharged to Groundwater							**4.88E+09**

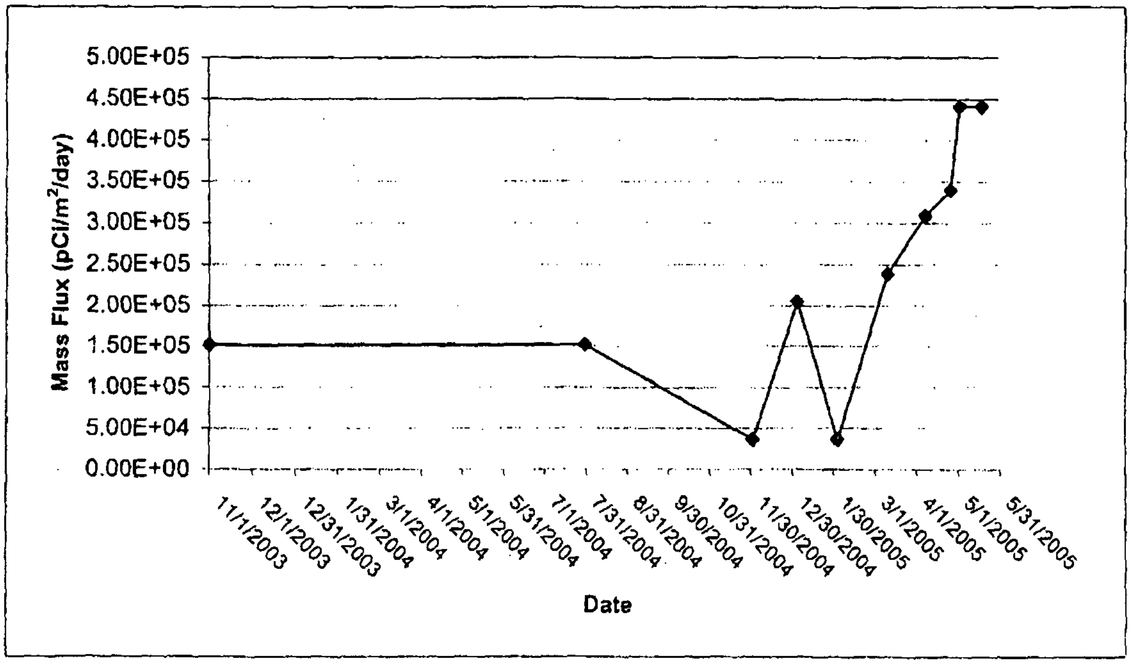
Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration
Assume constant discharge between most recent sampled concentration to present

**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)

***Assumed area of plume:

Width =	62 ft	Area =	620 ft^2
Saturated Depth =	10 ft		58 m^2



Calculate mass discharged along a plane through E-3 and E-10:

Sample Date	Tritium Concentration (pCi/L) E-3	E-10	Average	Mass Flux** (pCi/m²/d)	Mass Discharged per Area*** (pCi/m²)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	1,142	NM	1,142	1.66E+05	0	0.00E+00
7/31/2004	1,142	NM	1,142	1.66E+05	4.54E+07	2.44E+09
10/25/2004	1,000	NM	1,000	1.37E+05	1.31E+07	7.04E+08
11/22/2004	1,001	NM	1,001	1.38E+05	3.85E+06	2.08E+08
12/2/2004	NM	2,000	2,000	3.40E+05	2.39E+06	1.29E+08
1/4/2005	NM	2,000	2,000	3.40E+05	1.12E+07	6.04E+08
2/1/2005	1,000	1,000	1,000	1.37E+05	6.68E+06	3.60E+08
3/7/2005	1,000	NM	1,000	1.37E+05	4.67E+06	2.52E+08
3/11/2005	NM	2,000	2,000	3.40E+05	9.54E+05	5.14E+07
4/8/2005	686	858	772	9.14E+04	6.03E+06	3.25E+08
5/3/2005	1,000	1,000	1,000	1.37E+05	2.86E+06	1.54E+08
* 5/19/2005	1,000	1,000	1,000	1.37E+05	2.20E+06	1.19E+08
Total Mass Discharged to Groundwater						**5.35E+09**

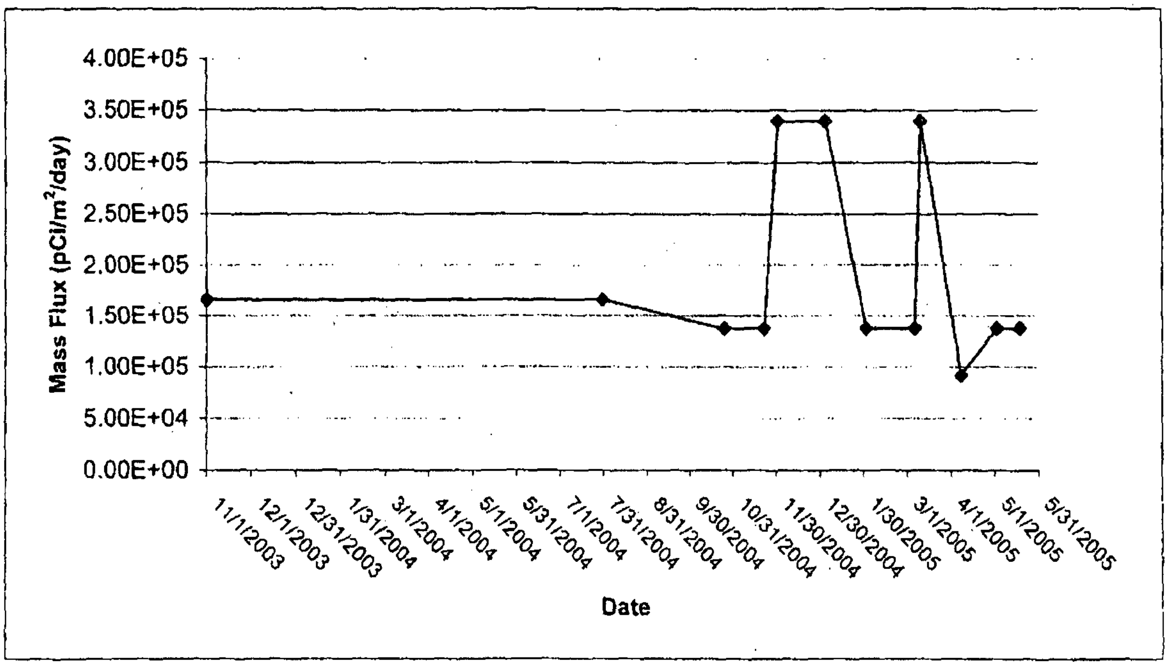
Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration
Assume constant discharge between most recent sampled concentration to present

**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)

***Assumed area of plume:

Width =	58 ft	Area =	580 ft²
Saturated Depth =	10 ft		54 m²



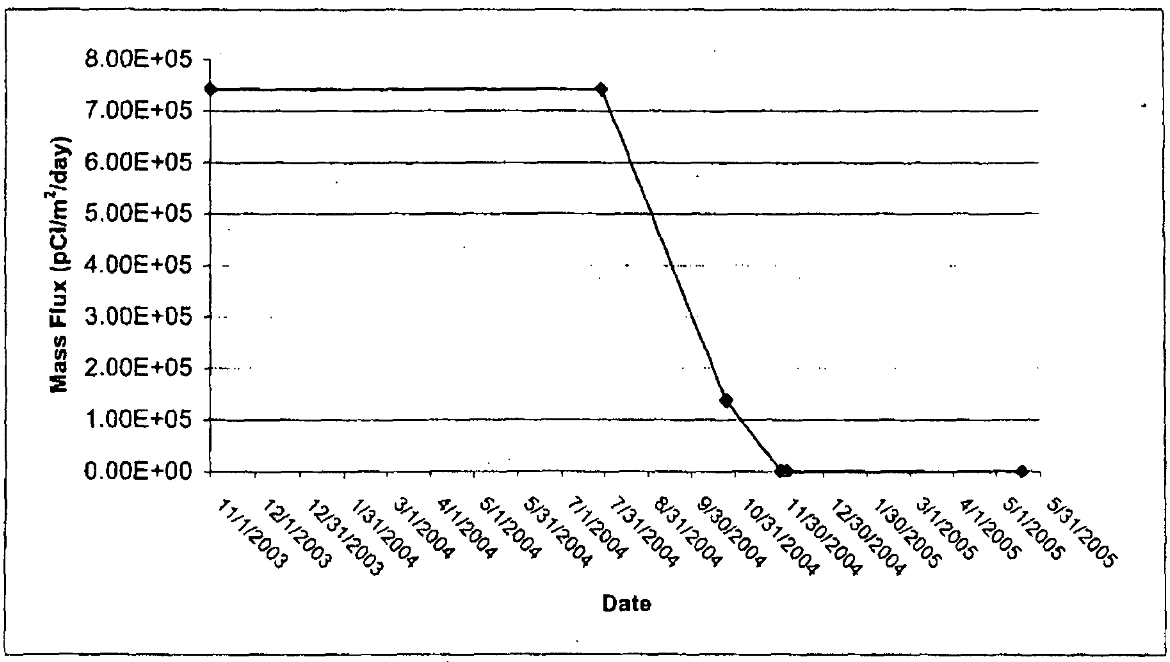
Calculate mass discharged along a plane through E-6 and E-7:

Sample Date	Tritium Concentration (pCi/L) E-6	E-7	Average	Mass Flux** ($pCi/m^2/d$)	Mass Discharged per Area*** (pCi/m^2)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	465	7,513	3,989	7.42E+05	0	0.00E+00
7/31/2004	465	7,513	3,989	7.42E+05	2.02E+08	8.65E+09
10/25/2004	2,000	0	1,000	1.37E+05	3.78E+07	1.62E+09
12/2/2004	0	0	0	0.00E+00	2.61E+06	1.12E+08
12/6/2004	0	0	0	0.00E+00	0.00E+00	0.00E+00
* 5/19/2005	0	0	0	0.00E+00	0.00E+00	0.00E+00
Total Mass Discharged to Groundwater						**1.04E+10**

Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration
Assume constant discharge between most recent sampled concentration to present
**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)
***Assumed area of plume:

Width =	46 ft	Area =	460 ft^2
Saturated Depth =	10 ft		43 m^2



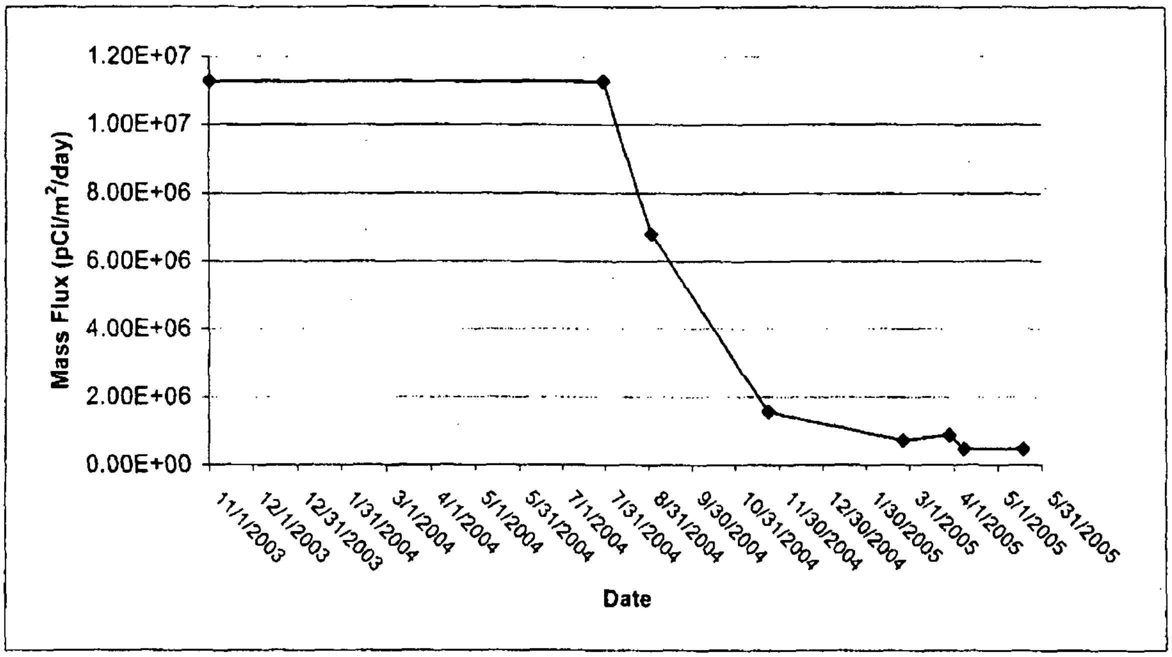
Calculate mass discharged along a plane through DSP-124:

Sample Date	Tritium Concentration (pCi/L) DSP-124	Mass Flux** (pCi/m²/d)	Mass Discharged per Area*** (pCi/m²)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	91,166	1.13E+07	0	0.00E+00
7/31/2004	91,166	1.13E+07	3.08E+09	1.95E+11
9/3/2004	55,000	6.79E+06	3.07E+08	1.94E+10
11/23/2004	12,889	1.56E+06	3.38E+08	2.14E+10
2/25/2005	5,990	7.04E+05	1.06E+08	6.73E+09
3/29/2005	7,354	8.74E+05	2.52E+07	1.59E+09
4/8/2005	4,060	4.64E+05	6.69E+06	4.23E+08
* 5/19/2005	4,060	4.64E+05	1.90E+07	1.20E+09
Total Mass Discharged to Groundwater				**2.45E+11**

Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration
Assume constant discharge between most recent sampled concentration to present
**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)
***Assumed area of plume:

Width =	20 ft	Area =	680 ft²
Saturated Depth =	34 ft		63 m²



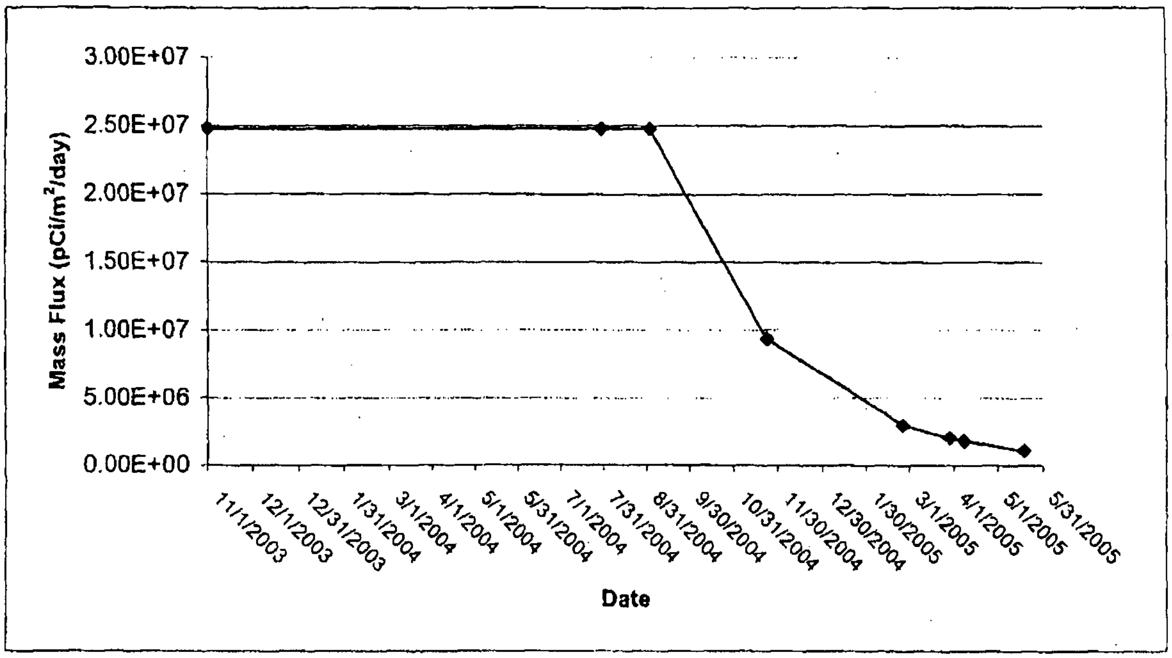
Calculate mass discharged along a plane through western source (theoretical):

Sample Date	Tritium Concentration (pCi/L) DSP-124	Mass Flux** (pCi/m²/d)	Mass Discharged per Area*** (pCi/m²)	Total Mass Discharged through Plane (pCi)
* 11/1/2003	200,000	2.48E+07	0	0.00E+00
7/31/2004	200,000	2.48E+07	6.77E+09	1.26E+11
9/3/2004	200,000	2.48E+07	8.43E+08	1.57E+10
11/23/2004	75,665	9.36E+06	1.38E+09	2.57E+10
2/25/2005	24,491	3.00E+06	5.81E+08	1.08E+10
3/29/2005	16,682	2.03E+06	8.05E+07	1.50E+09
4/8/2005	14,795	1.80E+06	1.91E+07	3.56E+08
* 5/19/2005	9,046	1.08E+06	5.91E+07	1.10E+09
Total Mass Discharged to Groundwater				**1.81E+11**

Note:

*Assume constant discharge beginning at time of leak equal to first available sampled concentration
Assume constant discharge between most recent sampled concentration to present
**Assume background tritium concentration = 320 pCi/L (subtract from average monitored value)
***Assumed area of plume:

Width =	20 ft	Area =	200 ft²
Saturated Depth =	10 ft		19 m²



STORMWATER TRITIUM CALCULATIONS

Project No. EXENW 18513		Page 1 of 17	**RETEC**
Client —		Date 7/15/05	
Site		By BDM	
Subject STORMWATER TRITIUM MASS		App. TA	

OBJECTIVE: (1) ESTIMATE AVERAGE FLOW THROUGH EACH STORM SEWER DRAINAGE BASIN (SEE MAP P. —)

GIVEN: DAILY PRECIPITATION DATA FROM 11/1/03 – 5/19/05 FOR DRESDEN ISLAND WEATHER STATION MORRIS, ILLINOIS. SOURCE: www.accuweather.com

DRAINAGE AREA (WEST) = 447,068 FT^2
DRAINAGE AREA (EAST) = 761,075 FT^2
} CALCULATED BY CAD USING FIG 4-7

ASSUME: 85% OF PRECIPITATION BECOMES RUNOFF BASED ON PRIMARILY IMPERVIOUS DRAINAGE OVER ASPHALT AND ROOFTOPS

PRECIPITATION FOR "TRACE" OBSERVATIONS = 0.0"

CALCULATE VOLUME (V_R) OF DAILY RUNOFF FROM EACH DRAINAGE BASIN

$$V_R = P \times 0.85 \times \frac{1\ FT}{12\ in} \times A$$

P = PRECIPITATION (in)
A = DRAINAGE AREA (FT^2)

EXAMPLE, FOR WEST SEWER USING 11/3/03 DATA

$$V_R = \frac{0.12\ in\ (0.85)\ (447{,}068)\ FT^2}{12\ in/FT} = 3800\ FT^3$$

OBJECTIVE (1) SOLN CONT'D

CONVERT TO LITERS

$$V_{R(L)} = V_{(FT^3)} \times \frac{28.32\ L}{FT^3}$$

$$= 3800\ FT^3 \times 28.32\ L/FT^3 = 1.08(10^5)\ L$$

OBJECTIVE (2):

ADD BASE FLOW VOLUME FROM GROUNDWATER INGRESS INTO STORM SEWER

ASSUME: - SEWER DIAMETER = 18" (TYPICAL)
- CRACKED PERCENT OF SEWER PIPE = 10% (GUESS)
- INFILTRATION OCCURS ALONG 1/2 OF SEWER CIRCUMFERENCE

GIVEN: HYDRAULIC CONDUCTIVITY, $K = 3.29(10^{-2})$ FT/MIN
(GEOMETRIC MEAN OF SLUG TEST RESULTS @ 3 SHALLOW WELLS

HYDRAULIC GRADIENT, $i_{(\text{WEST OF LEAK})} = 0.0086$

$i_{(\text{EAST OF LEAK})} = 0.014$

EFFECTIVE POROSITY, $n = 0.15$ FOR NON FRACTURED ROCK SUCH AS SANDSTONE. SOURCE: USEPA STATISTICAL ANALYSIS OF GROUNDWATER MONITORING (USEPA, 1989)

LENGTH OF MAIN SEWER = EAST = 1,770 FT
WEST = 1,020 FT

SCALED FROM BASEMAP

Project No. EXENW 18513
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OBJECTIVE (2) SOLN CONT'D:

CALCULATE SURFACE AREA OF SEWER

$$A = \text{CIRCUMFERENCE} \times \text{LENGTH} = \pi(D)(L)$$
$$= \pi\left(18\,\text{in}/12\,\text{in/FT}\right) \times 1770 = 8341\ \text{FT}^2\ (\text{EAST})$$
$$= \pi\left(18/12\right) \times 1020 = 4807\ \text{FT}^2\ (\text{WEST})$$

ESTIMATE SEEPAGE VELOCITY, v

$$v_{EAST} = \frac{Ki}{n} = \frac{3.29(10^{-2})\ \text{FT/MIN} \times 0.014\ \text{FT/FT}}{0.15}$$
$$v_{EAST} = 3.07(10^{-3})\ \text{FT/MIN}$$
$$v_{WEST} = \frac{Ki}{n} = \frac{3.29(10^{-2})\ \text{FT/MIN} \times 0.0086}{0.15}$$
$$v_{WEST} = 1.89(10^{-3})\ \text{FT/MIN}$$

ESTIMATE $Q_{\text{GROUNDWATER INGRESS}}$

$$Q = 1/2\ A_{SEWER} \times \text{CRACKED}\ \% \times v$$
$$Q_{EAST} = 1/2(8341)\ \text{FT}^2 \times 10\% \times 3.07(10^{-3})\ \text{FT/MIN}$$
$$= 1.28\ \text{FT}^3/\text{MIN} \times 28.32\ \text{L/FT}^3 \times 1440\ \text{MIN/d}$$
$$= 52,219\ \text{L/d}$$
$$Q_{WEST} = 1/2(4807)\ \text{FT}^2 \times 10\% \times 1.89(10^{-3})\ \text{FT/MIN}$$
$$= 0.45\ \text{FT}^3/\text{MIN} \times 28.32\ \text{L/FT}^3 \times 1440\ \text{MIN/d}$$
$$= 18,485\ \text{L/d}$$

ADD BASE FLOW FROM EACH SEWER TO RUNOFF Q (OBJ 1)
SEE RESULTS P. 5-17

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RETEC

OBJECTIVE (3)

BASED ON SAMPLES COLLECTED AT OUTLET OF EACH SEWER, ESTIMATE DAILY AND TOTAL MASS OF TRITIUM DISCHARGED.

GIVEN: TRITIUM SAMPLING DATA FOR DSP-131 (EAST SEWER) DSP-132 (WEST SEWER)

SOLUTION:

CALCULATE MASS (m) OF TRITIUM DISCHARGED THROUGH CATCH BASIN

$$m = C_{(pCi/L)} \times V_T$$

C = TRITIUM CONCENTRATION
V_T = RUNOFF + BASE FLOW VOLUME

EXAMPLE, FOR DSP-132 USING 9/6/04 DATA:

$$m = 36{,}000 \frac{pCi}{L} \times 82{,}749\,L = 2.98(10^9)\,pCi$$

SEE RESULTS p. 5-17

SUM PERIOD OF RECORD SINCE BEGINNING OF LEAK TO ESTIMATE TOTAL MASS DISCHARGED TO DATE

NOTE: ASSUME CONSTANT C FROM 11/1/03 - 7/31/04 (DATE OF FIRST SAMPLE COLLECTION)

LINEARLY INTERPOLATE DAILY C BETWEEN SAMPLES

ASSUME CONSTANT C FROM 5/4/05 - 5/19/05 (DATE OF MOST RECENT GROUNDWATER SAMPLES)

Calculate Average Daily Runoff for Each Storm Sewer

Area of East Sewer (DSP-132) = 761,075 ft^2
Area of West Sewer (DSP-131) = 447,068 ft^2
Runoff as Percent of Precipitation = 85%

Calculate Average Infiltration Rate of Groundwater Into Sewer (Base Flow)

Sewer Diameter = 18 in
Cracked Percent of Sewer Wall = 10%
Hydraulic Conductivity, K = 3.29E-02 ft/min
Effective Porosity (sandstone) = 0.15

Hydraulic Gradient, i	East	0.0140 ft/ft	West	0.0086 ft/ft
Seepage Velocity	East	3.07E-03 ft/min	West	1.89E-03 ft/min
Length of Main Sewer =	East	1770 ft	West	1020 ft
Base Infiltration Flow =	East	52219 L/d	West	18485 L/d

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters)		Tritium Concentration (pCi/L)		Tritium Mass Discharged (pCi)	
		West Sewer (DSP-131)	East Sewer (DSP-132)	DSP-131	DSP-132	DSP-131	DSP-132
11/1/2003	1.06	969,007	1,670,358	1,579	79,351	1.53E+09	1.33E+11
11/2/2003	0.26	251,632	449,121	1,579	79,351	3.97E+08	3.56E+10
11/3/2003	0.12	126,091	235,404	1,579	79,351	1.99E+08	1.87E+10
11/4/2003	0.88	807,597	1,395,579	1,579	79,351	1.28E+09	1.11E+11
11/5/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/6/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/7/2003	trace	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/8/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/9/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/10/2003	0.04	54,354	113,280	1,579	79,351	8.58E+07	8.99E+09
11/11/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/12/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/13/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/14/2003	0.05	63,321	128,546	1,579	79,351	1.00E+08	1.02E+10
11/15/2003	trace	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/16/2003	0.08	90,223	174,342	1,579	79,351	1.42E+08	1.38E+10
11/17/2003	1.22	1,112,482	1,914,605	1,579	79,351	1.76E+09	1.52E+11
11/18/2003	0.53	493,746	861,288	1,579	79,351	7.80E+08	6.83E+10
11/19/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/20/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/21/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/22/2003	trace	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/23/2003	0.8	735,860	1,273,456	1,579	79,351	1.16E+09	1.01E+11
11/24/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/25/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/26/2003	0.06	72,288	143,811	1,579	79,351	1.14E+08	1.14E+10
11/27/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/28/2003	0.08	90,223	174,342	1,579	79,351	1.42E+08	1.38E+10
11/29/2003	trace	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
11/30/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/1/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/2/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
12/3/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/4/2003	0.25	242,665	433,855	1,579	79,351	3.83E+08	3.44E+10
12/5/2003	0.26	251,632	449,121	1,579	79,351	3.97E+08	3.56E+10
12/6/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/7/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/8/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/9/2003	0.3	287,501	510,182	1,579	79,351	4.54E+08	4.05E+10
12/10/2003	0.01	27,452	67,484	1,579	79,351	4.33E+07	5.35E+09
12/11/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/12/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/13/2003	0.25	242,665	433,855	1,579	79,351	3.83E+08	3.44E+10
12/14/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/15/2003	0.01	27,452	67,484	1,579	79,351	4.33E+07	5.35E+09
12/16/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/17/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/18/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/19/2003	0.03	45,387	98,015	1,579	79,351	7.17E+07	7.78E+09
12/20/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/21/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/22/2003	0.05	63,321	128,546	1,579	79,351	1.00E+08	1.02E+10
12/23/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/24/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/25/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/26/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/27/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/28/2003	0.1	108,157	204,873	1,579	79,351	1.71E+08	1.63E+10
12/29/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/30/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
12/31/2003	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/1/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/2/2004	0.01	27,452	67,484	1,579	79,351	4.33E+07	5.35E+09
1/3/2004	0.09	99,190	189,608	1,579	79,351	1.57E+08	1.50E+10
1/4/2004	0.5	466,844	815,492	1,579	79,351	7.37E+08	6.47E+10
1/5/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/6/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/7/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/8/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/9/2005	0.02	36,419	82,749	1,579	79,351	5.75E+07	6.57E+09
1/10/2005	0.04	54,354	113,280	1,579	79,351	8.58E+07	8.99E+09
1/11/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/12/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/13/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/14/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/15/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/16/2004	0.15	152,993	281,200	1,579	79,351	2.42E+08	2.23E+10
1/17/2004	0.1	108,157	204,873	1,579	79,351	1.71E+08	1.63E+10
1/18/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters)		Tritium Concentration (pCi/L)		Tritium Mass Discharged (pCi)	
		West Sewer (DSP-131)	East Sewer (DSP-132)	DSP-131	DSP-132	DSP-131	DSP-132
1/19/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/20/2004	trace	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/21/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/22/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/23/2004	0.12	126,091	235,404	1,579	79,351	1.99E+08	1.87E+10
1/24/2005	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/25/2004	0.09	99,190	189,608	1,579	79,351	1.57E+08	1.50E+10
1/26/2004	0.12	126,091	235,404	1,579	79,351	1.99E+08	1.87E+10
1/27/2005	0.04	54,354	113,280	1,579	79,351	8.58E+07	8.99E+09
1/28/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/29/2004	0.5	466,844	815,492	1,579	79,351	7.37E+08	6.47E+10
1/30/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
1/31/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/1/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/2/2004	0.08	90,223	174,342	1,579	79,351	1.42E+08	1.38E+10
2/3/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/4/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/5/2004	0.16	161,960	296,466	1,579	79,351	2.56E+08	2.35E+10
2/6/2004	0.03	45,387	98,015	1,579	79,351	7.17E+07	7.78E+09
2/7/2004	0.06	72,288	143,811	1,579	79,351	1.14E+08	1.14E+10
2/8/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/9/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/10/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/11/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/12/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/13/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/14/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/15/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/16/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/17/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/18/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/19/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/20/2004	0.18	179,894	326,997	1,579	79,351	2.84E+08	2.59E+10
2/21/2004	0.04	54,354	113,280	1,579	79,351	8.58E+07	8.99E+09
2/22/2004	0.01	27,452	67,484	1,579	79,351	4.33E+07	5.35E+09
2/23/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/24/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/25/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/26/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/27/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/28/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
2/29/2004	0.01	27,452	67,484	1,579	79,351	4.33E+07	5.35E+09
3/1/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/2/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/3/2004	0.01	27,452	67,484	1,579	79,351	4.33E+07	5.35E+09
3/4/2004	0.69	637,221	1,105,536	1,579	79,351	1.01E+09	8.77E+10
3/5/2004	0.41	386,140	678,103	1,579	79,351	6.10E+08	5.38E+10

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
3/6/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/7/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/8/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/9/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/10/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/11/2004	0.02	36,419	82,749	1,579	79,351	5.75E+07	6.57E+09
3/12/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/13/2004	0.03	45,387	98,015	1,579	79,351	7.17E+07	7.78E+09
3/14/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/15/2004	0.11	117,124	220,139	1,579	79,351	1.85E+08	1.75E+10
3/16/2004	0.06	72,288	143,811	1,579	79,351	1.14E+08	1.14E+10
3/17/2004	0.02	36,419	82,749	1,579	79,351	5.75E+07	6.57E+09
3/18/2004	0.16	161,960	296,466	1,579	79,351	2.56E+08	2.35E+10
3/19/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/20/2004	0.03	45,387	98,015	1,579	79,351	7.17E+07	7.78E+09
3/21/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/22/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/23/2004	0.18	179,894	326,997	1,579	79,351	2.84E+08	2.59E+10
3/24/2004	0.26	251,632	449,121	1,579	79,351	3.97E+08	3.56E+10
3/25/2004	0.1	108,157	204,873	1,579	79,351	1.71E+08	1.63E+10
3/26/2004	0.27	260,599	464,386	1,579	79,351	4.11E+08	3.68E+10
3/27/2004	0.06	72,288	143,811	1,579	79,351	1.14E+08	1.14E+10
3/28/2004	0.99	906,236	1,563,499	1,579	79,351	1.43E+09	1.24E+11
3/29/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
3/30/2004	0.45	422,008	739,164	1,579	79,351	6.66E+08	5.87E+10
3/31/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/1/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/2/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/3/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/4/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/5/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/6/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/7/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/8/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/9/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/10/2004	trace	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/11/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/12/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/13/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/14/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/15/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/16/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/17/2004	trace	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/18/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/19/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/20/2004	0.66	610,319	1,059,739	1,579	79,351	9.64E+08	8.41E+10
4/21/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	Average Daily Runoff + Base Flow Volume (liters) East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	Tritium Concentration (pCi/L) DSP-132	Tritium Mass Discharged (pCi) DSP-131	Tritium Mass Discharged (pCi) DSP-132
4/22/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/23/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/24/2004	0.72	664,122	1,151,332	1,579	79,351	1.05E+09	9.14E+10
4/25/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/26/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/27/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/28/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
4/29/2004	0.41	386,140	678,103	1,579	79,351	6.10E+08	5.38E+10
4/30/2005	0.63	583,418	1,013,943	1,579	79,351	9.21E+08	8.05E+10
5/1/2004	0.36	341,304	601,775	1,579	79,351	5.39E+08	4.78E+10
5/2/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/3/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/4/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/5/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/6/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/7/2004	0.67	619,287	1,075,005	1,579	79,351	9.78E+08	8.53E+10
5/8/2004	0.01	27,452	67,484	1,579	79,351	4.33E+07	5.35E+09
5/9/2004	0.14	144,026	265,935	1,579	79,351	2.27E+08	2.11E+10
5/10/2004	0.03	45,387	98,015	1,579	79,351	7.17E+07	7.78E+09
5/11/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/12/2004	0.12	126,091	235,404	1,579	79,351	1.99E+08	1.87E+10
5/13/2004	0.57	529,615	922,350	1,579	79,351	8.36E+08	7.32E+10
5/14/2004	0.64	592,385	1,029,208	1,579	79,351	9.35E+08	8.17E+10
5/15/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/16/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/17/2004	0.38	359,238	632,306	1,579	79,351	5.67E+08	5.02E+10
5/18/2004	0.14	144,026	265,935	1,579	79,351	2.27E+08	2.11E+10
5/19/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/20/2004	0.01	27,452	67,484	1,579	79,351	4.33E+07	5.35E+09
5/21/2004	0.03	45,387	98,015	1,579	79,351	7.17E+07	7.78E+09
5/22/2004	0.45	422,008	739,164	1,579	79,351	6.66E+08	5.87E+10
5/23/2004	0.05	63,321	128,546	1,579	79,351	1.00E+08	1.02E+10
5/24/2004	0.43	404,074	708,633	1,579	79,351	6.38E+08	5.62E+10
5/25/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/26/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/27/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/28/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/29/2004	trace	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
5/30/2004	0.1	108,157	204,873	1,579	79,351	1.71E+08	1.63E+10
5/31/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/1/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/2/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/3/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/4/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/5/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/6/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/7/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
6/8/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/9/2004	0.1	108,157	204,873	1,579	79,351	1.71E+08	1.63E+10
6/10/2004	0.76	699,991	1,212,394	1,579	79,351	1.11E+09	9.62E+10
6/11/2004	0.87	798,630	1,380,314	1,579	79,351	1.26E+09	1.10E+11
6/12/2004	0.83	762,761	1,319,252	1,579	79,351	1.20E+09	1.05E+11
6/13/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/14/2004	0.66	610,319	1,059,739	1,579	79,351	9.64E+08	8.41E+10
6/15/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/16/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/17/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/18/2004	0.09	99,190	189,608	1,579	79,351	1.57E+08	1.50E+10
6/19/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/20/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/21/2004	0.4	377,173	662,837	1,579	79,351	5.96E+08	5.26E+10
6/22/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/23/2004	trace	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/24/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/25/2004	0.01	27,452	67,484	1,579	79,351	4.33E+07	5.35E+09
6/26/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/27/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/28/2004	0.1	108,157	204,873	1,579	79,351	1.71E+08	1.63E+10
6/29/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
6/30/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/1/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/2/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/3/2004	0.2	197,829	357,528	1,579	79,351	3.12E+08	2.84E+10
7/4/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/5/2004	0.03	45,387	98,015	1,579	79,351	7.17E+07	7.78E+09
7/6/2004	0.13	135,059	250,670	1,579	79,351	2.13E+08	1.99E+10
7/7/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/8/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/9/2004	0.76	699,991	1,212,394	1,579	79,351	1.11E+09	9.62E+10
7/10/2004	0.04	54,354	113,280	1,579	79,351	8.58E+07	8.99E+09
7/11/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/12/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/13/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/14/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/15/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/16/2004	0.23	224,730	403,324	1,579	79,351	3.55E+08	3.20E+10
7/17/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/18/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/19/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/20/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/21/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/22/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/23/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/24/2004	0.08	90,223	174,342	1,579	79,351	1.42E+08	1.38E+10

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
7/25/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/26/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/27/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/28/2004	0	18,485	52,219	1,579	79,351	2.92E+07	4.14E+09
7/29/2004	0.2	197,829	357,528	1,579	79,351	3.12E+08	2.84E+10
7/30/2004	0.56	520,647	907,085	1,579	79,351	8.22E+08	7.20E+10
7/31/2004	0	18,485	52,219	**1,579**	**79,351**	2.92E+07	4.14E+09
8/1/2004	0	18,485	52,219	1,562	78,621	2.89E+07	4.11E+09
8/2/2004	0	18,485	52,219	1,545	77,892	2.86E+07	4.07E+09
8/3/2004	1.27	1,157,318	1,990,933	1,528	77,162	1.77E+09	1.54E+11
8/4/2004	0.2	197,829	357,528	1,511	76,432	2.99E+08	2.73E+10
8/5/2004	0	18,485	52,219	1,494	75,702	2.76E+07	3.95E+09
8/6/2004	0	18,485	52,219	1,477	74,973	2.73E+07	3.91E+09
8/7/2004	0.01	27,452	67,484	1,460	74,243	4.01E+07	5.01E+09
8/8/2004	0	18,485	52,219	1,443	73,513	2.67E+07	3.84E+09
8/9/2004	0	18,485	52,219	1,426	72,784	2.64E+07	3.80E+09
8/10/2004	0	18,485	52,219	1,409	72,054	2.60E+07	3.76E+09
8/11/2004	0	18,485	52,219	1,392	71,324	2.57E+07	3.72E+09
8/12/2004	0	18,485	52,219	1,375	70,594	2.54E+07	3.69E+09
8/13/2004	0	18,485	52,219	1,358	69,865	2.51E+07	3.65E+09
8/14/2004	0	18,485	52,219	1,341	69,135	2.48E+07	3.61E+09
8/15/2004	0	18,485	52,219	1,324	68,405	2.45E+07	3.57E+09
8/16/2004	trace	18,485	52,219	1,307	67,676	2.42E+07	3.53E+09
8/17/2004	0.45	422,008	739,164	1,290	66,946	5.44E+08	4.95E+10
8/18/2004	0.75	691,024	1,197,128	1,272	66,216	8.79E+08	7.93E+10
8/19/2004	0.42	395,107	693,368	1,255	65,486	4.96E+08	4.54E+10
8/20/2004	0.61	565,483	983,412	1,238	64,757	7.00E+08	6.37E+10
8/21/2004	0	18,485	52,219	1,221	64,027	2.26E+07	3.34E+09
8/22/2004	0	18,485	52,219	1,204	63,297	2.23E+07	3.31E+09
8/23/2004	0	18,485	52,219	1,187	62,567	2.19E+07	3.27E+09
8/24/2004	0	18,485	52,219	1,170	61,838	2.16E+07	3.23E+09
8/25/2004	1.9	1,722,250	2,952,657	1,153	61,108	1.99E+09	1.80E+11
8/26/2004	0.55	511,680	891,819	1,136	60,378	5.81E+08	5.38E+10
8/27/2004	0.55	511,680	891,819	1,119	59,649	5.73E+08	5.32E+10
8/28/2004	1.12	1,022,810	1,761,951	1,102	58,919	1.13E+09	1.04E+11
8/29/2004	0	18,485	52,219	1,085	58,189	2.01E+07	3.04E+09
8/30/2004	0	18,485	52,219	1,068	57,459	1.97E+07	3.00E+09
8/31/2004	0	18,485	52,219	1,051	56,730	1.94E+07	2.96E+09
9/1/2004	0	18,485	52,219	1,034	**56,000**	1.91E+07	2.92E+09
9/2/2004	0	18,485	52,219	1,017	**63,000**	1.88E+07	3.29E+09
9/3/2004	0	18,485	52,219	**1,000**	**99,000**	1.85E+07	5.17E+09
9/4/2004	0.03	45,387	98,015	**1,000**	**41,000**	4.54E+07	4.02E+09
9/5/2004	0	18,485	52,219	**1,000**	**87,000**	1.85E+07	4.54E+09
9/6/2004	0.02	36,419	82,749	**2,000**	**36,000**	7.28E+07	2.98E+09
9/7/2004	0	18,485	52,219	**1,000**	**11,000**	1.85E+07	5.74E+08
9/8/2004	0	18,485	52,219	**1,000**	**9,000**	1.85E+07	4.70E+08
9/9/2004	0	18,485	52,219	**1,000**	**8,000**	1.85E+07	4.18E+08

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
9/10/2004	0	18,485	52,219	1,000	19,000	1.85E+07	9.92E+08
9/11/2004	0	18,485	52,219	1,000	11,000	1.85E+07	5.74E+08
9/12/2004	0	18,485	52,219	1,000	8,000	1.85E+07	4.18E+08
9/13/2004	0	18,485	52,219	1,000	7,000	1.85E+07	3.66E+08
9/14/2004	0	18,485	52,219	1,000	7,000	1.85E+07	3.66E+08
9/15/2004	0.74	682,057	1,181,863	1,000	5,000	6.82E+08	5.91E+09
9/16/2004	0.01	27,452	67,484	1,000	2,000	2.75E+07	1.35E+08
9/17/2004	0	18,485	52,219	1,000	5,000	1.85E+07	2.61E+08
9/18/2004	0	18,485	52,219	1,000	5,000	1.85E+07	2.61E+08
9/19/2004	0	18,485	52,219	1,000	5,000	1.85E+07	2.61E+08
9/20/2004	0	18,485	52,219	2,000	5,000	3.70E+07	2.61E+08
9/21/2004	0	18,485	52,219	1,000	4,000	1.85E+07	2.09E+08
9/22/2004	0	18,485	52,219	1,000	5,000	1.85E+07	2.61E+08
9/23/2004	0	18,485	52,219	1,000	5,000	1.85E+07	2.61E+08
9/24/2004	0	18,485	52,219	1,000	5,000	1.85E+07	2.61E+08
9/25/2004	0	18,485	52,219	1,000	5,000	1.85E+07	2.61E+08
9/26/2004	0	18,485	52,219	1,000	4,000	1.85E+07	2.09E+08
9/27/2004	0	18,485	52,219	1,000	4,000	1.85E+07	2.09E+08
9/28/2004	0	18,485	52,219	1,000	4,000	1.85E+07	2.09E+08
9/29/2004	0	18,485	52,219	1,000	4,000	1.85E+07	2.09E+08
9/30/2004	0	18,485	52,219	0	4,000	0.00E+00	2.09E+08
10/1/2004	0.31	296,468	525,448	0	5,000	0.00E+00	2.63E+09
10/2/2004	0	18,485	52,219	2,000	2,000	3.70E+07	1.04E+08
10/3/2004	0	18,485	52,219	0	3,000	0.00E+00	1.57E+08
10/4/2004	0	18,485	52,219	1,000	3,000	1.85E+07	1.57E+08
10/5/2004	0	18,485	52,219	1,000	3,000	1.85E+07	1.57E+08
10/6/2004	0	18,485	52,219	0	1,000	0.00E+00	5.22E+07
10/7/2004	0	18,485	52,219	0	3,000	0.00E+00	1.57E+08
10/8/2004	0.39	368,205	647,572	1,000	2,000	3.68E+08	1.30E+09
10/9/2004	0.24	233,698	418,590	1,000	2,000	2.34E+08	8.37E+08
10/10/2004	0	18,485	52,219	1,000	3,000	1.85E+07	1.57E+08
10/11/2004	0	18,485	52,219	0	3,000	0.00E+00	1.57E+08
10/12/2004	0.39	368,205	647,572	125	3,000	4.60E+07	1.94E+09
10/13/2004	0	18,485	52,219	250	4,000	4.62E+06	2.09E+08
10/14/2004	0.38	359,238	632,306	375	2,000	1.35E+08	1.26E+09
10/15/2004	0.04	54,354	113,280	500	1,000	2.72E+07	1.13E+08
10/16/2004	0	18,485	52,219	625	2,000	1.16E+07	1.04E+08
10/17/2004	0	18,485	52,219	750	3,000	1.39E+07	1.57E+08
10/18/2004	0.02	36,419	82,749	875	2,000	3.19E+07	1.65E+08
10/19/2004	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
10/20/2004	0	18,485	52,219	1,000	3,000	1.85E+07	1.57E+08
10/21/2004	0	18,485	52,219	1,000	3,000	1.85E+07	1.57E+08
10/22/2004	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
10/23/2004	0.43	404,074	708,633	1,000	0	4.04E+08	0.00E+00
10/24/2004	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
10/25/2004	0	18,485	52,219	1,000	3,000	1.85E+07	1.57E+08
10/26/2004	0.1	108,157	204,873	1,000	4,000	1.08E+08	8.19E+08

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
10/27/2004	0	18,485	52,219	1,000	**2,000**	1.85E+07	1.04E+08
10/28/2004	0.03	45,387	98,015	1,000	**3,000**	4.54E+07	2.94E+08
10/29/2004	0.05	63,321	128,546	1,000	**2,000**	6.33E+07	2.57E+08
10/30/2004	0	18,485	52,219	1,000	**2,000**	1.85E+07	1.04E+08
10/31/2004	0.04	54,354	113,280	1,000	**2,000**	5.44E+07	2.27E+08
11/1/2004	1.24	1,130,416	1,945,136	**1,000**	**0**	1.13E+09	0.00E+00
11/2/2004	0	18,485	52,219	857	**1,000**	1.58E+07	5.22E+07
11/3/2004	0.36	341,304	601,775	714	**1,000**	2.44E+08	6.02E+08
11/4/2004	0.36	341,304	601,775	571	**1,000**	1.95E+08	6.02E+08
11/5/2004	0	18,485	52,219	429	**5,000**	7.92E+06	2.61E+08
11/6/2004	0	18,485	52,219	286	**0**	5.28E+06	0.00E+00
11/7/2004	0	18,485	52,219	143	**2,000**	2.64E+06	1.04E+08
11/8/2004	0	18,485	52,219	**0**	**1,000**	-1.89E-08	5.22E+07
11/9/2004	0	18,485	52,219	143	**2,000**	2.64E+06	1.04E+08
11/10/2004	0	18,485	52,219	286	**2,000**	5.28E+06	1.04E+08
11/11/2004	0	18,485	52,219	429	**4,000**	7.92E+06	2.09E+08
11/12/2004	0	18,485	52,219	571	**5,000**	1.06E+07	2.61E+08
11/13/2004	0	18,485	52,219	714	5,333	1.32E+07	2.78E+08
11/14/2004	0	18,485	52,219	857	5,667	1.58E+07	2.96E+08
11/15/2004	0	18,485	52,219	**1,000**	**6,000**	1.85E+07	3.13E+08
11/16/2004	0	18,485	52,219	857	**3,000**	1.58E+07	1.57E+08
11/17/2004	0	18,485	52,219	714	**3,000**	1.32E+07	1.57E+08
11/18/2004	0.6	556,516	968,146	571	**5,000**	3.18E+08	4.84E+09
11/19/2004	0.21	206,796	372,793	429	**1,000**	8.86E+07	3.73E+08
11/20/2004	0	18,485	52,219	286	**2,000**	5.28E+06	1.04E+08
11/21/2004	0	18,485	52,219	143	**5,000**	2.64E+06	2.61E+08
11/22/2004	0	18,485	52,219	**0**	**5,000**	-1.89E-08	2.61E+08
11/23/2004	0	18,485	52,219	143	**5,000**	2.64E+06	2.61E+08
11/24/2004	0.14	144,026	265,935	286	**0**	4.12E+07	0.00E+00
11/25/2004	0	18,485	52,219	429	**1,000**	7.92E+06	5.22E+07
11/26/2004	0.14	144,026	265,935	571	**0**	8.23E+07	0.00E+00
11/27/2004	0.46	430,976	754,430	714	**0**	3.08E+08	0.00E+00
11/28/2004	0.06	72,288	143,811	857	**4,000**	6.20E+07	5.75E+08
11/29/2004	0.16	161,960	296,466	**1,000**	**4,000**	1.62E+08	1.19E+09
11/30/2004	0.53	493,746	861,288	857	**0**	4.23E+08	0.00E+00
12/1/2004	0	18,485	52,219	714	**0**	1.32E+07	0.00E+00
12/2/2004	0	18,485	52,219	571	**5,000**	1.06E+07	2.61E+08
12/3/2004	0	18,485	52,219	429	**5,000**	7.92E+06	2.61E+08
12/4/2004	0	18,485	52,219	286	**7,000**	5.28E+06	3.66E+08
12/5/2004	0.38	359,238	632,306	143	**132,000**	5.13E+07	8.35E+10
12/6/2004	0.46	430,976	754,430	**0**	**2,000**	-4.41E-07	1.51E+09
12/7/2004	0.76	699,991	1,212,394	0	**0**	0.00E+00	0.00E+00
12/8/2004	0	18,485	52,219	0	**2,000**	0.00E+00	1.04E+08
12/9/2004	0	18,485	52,219	0	**6,000**	0.00E+00	3.13E+08
12/10/2004	trace	18,485	52,219	0	**9,000**	0.00E+00	4.70E+08
12/11/2004	0	18,485	52,219	0	**2,000**	0.00E+00	1.04E+08
12/12/2004	0	18,485	52,219	0	**0**	0.00E+00	0.00E+00

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
12/13/2004	0	18,485	52,219	**0**	**0**	0.00E+00	0.00E+00
12/14/2004	0	18,485	52,219	0	**3,000**	0.00E+00	1.57E+08
12/15/2004	0	18,485	52,219	0	**3,000**	0.00E+00	1.57E+08
12/16/2004	0	18,485	52,219	0	**1,000**	0.00E+00	5.22E+07
12/17/2004	0	18,485	52,219	0	**3,000**	0.00E+00	1.57E+08
12/18/2004	0	18,485	52,219	0	**1,000**	0.00E+00	5.22E+07
12/19/2004	0	18,485	52,219	0	**5,000**	0.00E+00	2.61E+08
12/20/2004	0	18,485	52,219	**0**	**2,000**	0.00E+00	1.04E+08
12/21/2004	0	18,485	52,219	67	1,933	1.23E+06	1.01E+08
12/22/2004	0	18,485	52,219	133	1,867	2.46E+06	9.75E+07
12/23/2004	0	18,485	52,219	200	1,800	3.70E+06	9.40E+07
12/24/2004	0	18,485	52,219	267	1,733	4.93E+06	9.05E+07
12/25/2004	0	18,485	52,219	333	1,667	6.16E+06	8.70E+07
12/26/2004	0	18,485	52,219	400	1,600	7.39E+06	8.35E+07
12/27/2004	0	18,485	52,219	467	1,533	8.63E+06	8.01E+07
12/28/2004	0	18,485	52,219	533	1,467	9.86E+06	7.66E+07
12/29/2004	0	18,485	52,219	600	1,400	1.11E+07	7.31E+07
12/30/2004	0	18,485	52,219	667	1,333	1.23E+07	6.96E+07
12/31/2004	0	18,485	52,219	733	1,267	1.36E+07	6.61E+07
1/1/2005	0.84	771,729	1,334,518	800	1,200	6.17E+08	1.60E+09
1/2/2005	0.22	215,763	388,059	867	1,133	1.87E+08	4.40E+08
1/3/2005	0.54	502,713	876,554	933	1,067	4.69E+08	9.35E+08
1/4/2005	0.19	188,862	342,262	**1,000**	**1,000**	1.89E+08	3.42E+08
1/5/2005	0.4	377,173	662,837	1,000	1,036	3.77E+08	6.87E+08
1/6/2005	0	18,485	52,219	1,000	1,071	1.85E+07	5.59E+07
1/7/2005	0	18,485	52,219	1,000	1,107	1.85E+07	5.78E+07
1/8/2005	0	18,485	52,219	1,000	1,143	1.85E+07	5.97E+07
1/9/2005	0.19	188,862	342,262	1,000	1,179	1.89E+08	4.03E+08
1/10/2005	0.28	269,566	479,652	1,000	1,214	2.70E+08	5.82E+08
1/11/2005	0.19	188,862	342,262	1,000	1,250	1.89E+08	4.28E+08
1/12/2005	1.26	1,148,350	1,975,667	1,000	1,286	1.15E+09	2.54E+09
1/13/2005	0.12	126,091	235,404	1,000	1,321	1.26E+08	3.11E+08
1/14/2005	0	18,485	52,219	1,000	1,357	1.85E+07	7.09E+07
1/15/2005	trace	18,485	52,219	1,000	1,393	1.85E+07	7.27E+07
1/16/2005	0	18,485	52,219	1,000	1,429	1.85E+07	7.46E+07
1/17/2005	0	18,485	52,219	1,000	1,464	1.85E+07	7.65E+07
1/18/2005	0.1	108,157	204,873	1,000	1,500	1.08E+08	3.07E+08
1/19/2005	0.1	108,157	204,873	1,000	1,536	1.08E+08	3.15E+08
1/20/2005	0.03	45,387	98,015	1,000	1,571	4.54E+07	1.54E+08
1/21/2005	0.02	36,419	82,749	1,000	1,607	3.64E+07	1.33E+08
1/22/2005	0.07	81,255	159,077	1,000	1,643	8.13E+07	2.61E+08
1/23/2005	0.14	144,026	265,935	1,000	1,679	1.44E+08	4.46E+08
1/24/2005	0	18,485	52,219	1,000	1,714	1.85E+07	8.95E+07
1/25/2005	0	18,485	52,219	1,000	1,750	1.85E+07	9.14E+07
1/26/2005	0.01	27,452	67,484	1,000	1,786	2.75E+07	1.21E+08
1/27/2005	0	18,485	52,219	1,000	1,821	1.85E+07	9.51E+07
1/28/2005	0	18,485	52,219	1,000	1,857	1.85E+07	9.70E+07

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
1/29/2005	trace	18,485	52,219	1,000	1,893	1.85E+07	9.88E+07
1/30/2005	0	18,485	52,219	1,000	1,929	1.85E+07	1.01E+08
1/31/2005	0	18,485	52,219	1,000	1,964	1.85E+07	1.03E+08
2/1/2005	0	18,485	52,219	1,000	**2,000**	1.85E+07	1.04E+08
2/2/2005	0	18,485	52,219	1,000	1,971	1.85E+07	1.03E+08
2/3/2005	0	18,485	52,219	**1,000**	1,943	1.85E+07	1.01E+08
2/4/2005	0	18,485	52,219	1,000	1,914	1.85E+07	1.00E+08
2/5/2005	0	18,485	52,219	1,000	1,886	1.85E+07	9.85E+07
2/6/2005	0.19	188,862	342,262	1,000	1,857	1.89E+08	6.36E+08
2/7/2005	0.16	161,960	296,466	1,000	1,829	1.62E+08	5.42E+08
2/8/2005	0.01	27,452	67,484	1,000	1,800	2.75E+07	1.21E+08
2/9/2005	0.04	54,354	113,280	1,000	1,771	5.44E+07	2.01E+08
2/10/2005	0	18,485	52,219	1,000	1,743	1.85E+07	9.10E+07
2/11/2005	0	18,485	52,219	1,000	1,714	1.85E+07	8.95E+07
2/12/2005	0	18,485	52,219	1,000	1,686	1.85E+07	8.80E+07
2/13/2005	0.18	179,894	326,997	1,000	1,657	1.80E+08	5.42E+08
2/14/2005	0.03	45,387	98,015	1,000	1,629	4.54E+07	1.60E+08
2/15/2005	0.04	54,354	113,280	1,000	1,600	5.44E+07	1.81E+08
2/16/2005	0	18,485	52,219	1,000	1,571	1.85E+07	8.21E+07
2/17/2005	0	18,485	52,219	1,000	1,543	1.85E+07	8.06E+07
2/18/2005	0	18,485	52,219	1,000	1,514	1.85E+07	7.91E+07
2/19/2005	0.01	27,452	67,484	1,000	1,486	2.75E+07	1.00E+08
2/20/2005	0.06	72,288	143,811	1,000	1,457	7.23E+07	2.10E+08
2/21/2005	0.01	27,452	67,484	1,000	1,429	2.75E+07	9.64E+07
2/22/2005	0	18,485	52,219	1,000	1,400	1.85E+07	7.31E+07
2/23/2005	0	18,485	52,219	1,000	1,371	1.85E+07	7.16E+07
2/24/2005	0	18,485	52,219	1,000	1,343	1.85E+07	7.01E+07
2/25/2005	0	18,485	52,219	1,000	1,314	1.85E+07	6.86E+07
2/26/2005	0	18,485	52,219	1,000	1,286	1.85E+07	6.71E+07
2/27/2005	0.03	45,387	98,015	1,000	1,257	4.54E+07	1.23E+08
2/28/2005	0.03	45,387	98,015	1,000	1,229	4.54E+07	1.20E+08
3/1/2005	0	18,485	52,219	1,000	1,200	1.85E+07	6.27E+07
3/2/2005	0	18,485	52,219	1,000	1,171	1.85E+07	6.12E+07
3/3/2005	0	18,485	52,219	1,000	1,143	1.85E+07	5.97E+07
3/4/2005	0.02	36,419	82,749	1,000	1,114	3.64E+07	9.22E+07
3/5/2005	0	18,485	52,219	1,000	1,086	1.85E+07	5.67E+07
3/6/2005	0	18,485	52,219	1,000	1,057	1.85E+07	5.52E+07
3/7/2005	0	18,485	52,219	1,000	1,029	1.85E+07	5.37E+07
3/8/2005	0	18,485	52,219	**1,000**	**1,000**	1.85E+07	5.22E+07
3/9/2005	0	18,485	52,219	1,013	1,017	1.87E+07	5.31E+07
3/10/2005	0.11	117,124	220,139	1,026	1,034	1.20E+08	2.28E+08
3/11/2005	0	18,485	52,219	1,039	1,051	1.92E+07	5.49E+07
3/12/2005	0	18,485	52,219	1,052	1,068	1.94E+07	5.57E+07
3/13/2005	0	18,485	52,219	1,065	1,085	1.97E+07	5.66E+07
3/14/2005	0	18,485	52,219	1,078	1,101	1.99E+07	5.75E+07
3/15/2005	0	18,485	52,219	1,091	1,118	2.02E+07	5.84E+07
3/16/2005	0	18,485	52,219	1,104	1,135	2.04E+07	5.93E+07

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
3/17/2005	0	18,485	52,219	1,117	1,152	2.06E+07	6.02E+07
3/18/2005	0	18,485	52,219	1,130	1,169	2.09E+07	6.10E+07
3/19/2005	0.09	99,190	189,608	1,143	1,186	1.13E+08	2.25E+08
3/20/2005	0	18,485	52,219	1,156	1,203	2.14E+07	6.28E+07
3/21/2005	0	18,485	52,219	1,169	1,220	2.16E+07	6.37E+07
3/22/2005	0.46	430,976	754,430	1,182	1,237	5.09E+08	9.33E+08
3/23/2005	0	18,485	52,219	1,195	1,254	2.21E+07	6.55E+07
3/24/2005	0.32	305,435	540,713	1,207	1,270	3.69E+08	6.87E+08
3/25/2005	0	18,485	52,219	1,220	1,287	2.26E+07	6.72E+07
3/26/2005	0	18,485	52,219	1,233	1,304	2.28E+07	6.81E+07
3/27/2005	0	18,485	52,219	1,246	1,321	2.30E+07	6.90E+07
3/28/2005	0	18,485	52,219	1,259	1,338	2.33E+07	6.99E+07
3/29/2005	0	18,485	52,219	1,272	1,355	2.35E+07	7.08E+07
3/30/2005	0.1	108,157	204,873	1,285	1,372	1.39E+08	2.81E+08
3/31/2005	0	18,485	52,219	1,298	1,389	2.40E+07	7.25E+07
4/1/2005	0.11	117,124	220,139	1,311	1,406	1.54E+08	3.09E+08
4/2/2005	0	18,485	52,219	1,324	1,423	2.45E+07	7.43E+07
4/3/2005	0	18,485	52,219	1,337	1,439	2.47E+07	7.52E+07
4/4/2005	0	18,485	52,219	1,350	1,456	2.50E+07	7.61E+07
4/5/2005	0	18,485	52,219	1,363	1,473	2.52E+07	7.69E+07
4/6/2005	0.09	99,190	189,608	1,376	1,490	1.36E+08	2.83E+08
4/7/2005	0	18,485	52,219	1,389	1,507	2.57E+07	7.87E+07
4/8/2005	0	18,485	52,219	**1,402**	**1,524**	2.59E+07	7.96E+07
4/9/2005	0	18,485	52,219	1,387	1,542	2.56E+07	8.05E+07
4/10/2005	0	18,485	52,219	1,371	1,561	2.53E+07	8.15E+07
4/11/2005	0.02	36,419	82,749	1,356	1,579	4.94E+07	1.31E+08
4/12/2005	0.87	798,630	1,380,314	1,340	1,597	1.07E+09	2.20E+09
4/13/2005	0.01	27,452	67,484	1,325	1,616	3.64E+07	1.09E+08
4/14/2005	0	18,485	52,219	1,309	1,634	2.42E+07	8.53E+07
4/15/2005	0	18,485	52,219	1,294	1,652	2.39E+07	8.63E+07
4/16/2005	0	18,485	52,219	1,278	1,670	2.36E+07	8.72E+07
4/17/2005	0.01	27,452	67,484	1,263	1,689	3.47E+07	1.14E+08
4/18/2005	0	18,485	52,219	1,247	1,707	2.31E+07	8.91E+07
4/19/2005	0	18,485	52,219	1,232	1,725	2.28E+07	9.01E+07
4/20/2005	0.28	269,566	479,652	1,216	1,744	3.28E+08	8.36E+08
4/21/2005	0.25	242,665	433,855	1,201	1,762	2.91E+08	7.64E+08
4/22/2005	0.17	170,927	311,731	1,186	1,780	2.03E+08	5.55E+08
4/23/2005	0.01	27,452	67,484	1,170	1,799	3.21E+07	1.21E+08
4/24/2005	0	18,485	52,219	1,155	1,817	2.13E+07	9.49E+07
4/25/2005	0	18,485	52,219	1,139	1,835	2.11E+07	9.58E+07
4/26/2005	0	18,485	52,219	1,124	1,854	2.08E+07	9.68E+07
4/27/2005	0	18,485	52,219	1,108	1,872	2.05E+07	9.77E+07
4/28/2005	0	18,485	52,219	1,093	1,890	2.02E+07	9.87E+07
4/29/2005	0	18,485	52,219	1,077	1,908	1.99E+07	9.97E+07
4/30/2005	0	18,485	52,219	1,062	1,927	1.96E+07	1.01E+08
5/1/2005	0	18,485	52,219	1,046	1,945	1.93E+07	1.02E+08
5/2/2005	0	18,485	52,219	1,031	1,963	1.91E+07	1.03E+08

Date	Precipitation (in)	Average Daily Runoff + Base Flow Volume (liters) West Sewer (DSP-131)	East Sewer (DSP-132)	Tritium Concentration (pCi/L) DSP-131	DSP-132	Tritium Mass Discharged (pCi) DSP-131	DSP-132
5/3/2005	0	18,485	52,219	1,015	1,982	1.88E+07	1.03E+08
5/4/2005	0	18,485	52,219	**1,000**	**2,000**	1.85E+07	1.04E+08
5/5/2005	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
5/6/2005	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
5/7/2005	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
5/8/2005	0.01	27,452	67,484	1,000	2,000	2.75E+07	1.35E+08
5/9/2005	0.13	135,059	250,670	1,000	2,000	1.35E+08	5.01E+08
5/10/2005	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
5/11/2005	1	915,204	1,578,765	1,000	2,000	9.15E+08	3.16E+09
5/12/2005	0.08	90,223	174,342	1,000	2,000	9.02E+07	3.49E+08
5/13/2005	0.08	90,223	174,342	1,000	2,000	9.02E+07	3.49E+08
5/14/2005	0.26	251,632	449,121	1,000	2,000	2.52E+08	8.98E+08
5/15/2005	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
5/16/2005	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
5/17/2005	0	18,485	52,219	1,000	2,000	1.85E+07	1.04E+08
5/18/2005	0.89	816,565	1,410,845	1,000	2,000	8.17E+08	2.82E+09
5/19/2005	0.78	717,926	1,242,925	1,000	2,000	7.18E+08	2.49E+09
						7.33E+10	**5.27E+12**
Total Mass Discharged Since Start of Leak							**5.34E+12**

Precipitation data from Dresden Island Weather Station, Morris, Illinois

Trace precipitation observations treated as 0.00 inches

Bold concentration values indicate actual sampled concentrations. Remaining concentrations are linearly interpolated between sample dates, except those prior to first sample date (constant concentration projected backward) and those since most recent sample date (constant concentration projected forward)

BIOSCREEN INPUT AND OUTPUT SCREENS

Input Parameter	Value	Reference
Hydraulic Conductivity, K	1.67E-02 cm/s	Value from calculations from slug test data (2005) for shallow well DSP-157S
Hydraulic Gradient, i_{east}	0.014 feet/feet	Calculated horizontal gradient from groundwater elevation data collected 4/2005 within the shallow aquifer.
Hydraulic Gradient, i_{west}	0.0086 feet/feet	
Porosity, ϕ_e	15 %	Typical Effective Porosity of Sandstone (USEPA, 1989)
Plume Length, $L_{p,\,east}$	1330 feet	Maximum plume length upgradient of former Unit 1 Intake Canal
Plume Length, $L_{p,\,west}$	890 feet	Maximum plume length upgradient of Unit 2/3 Discharge (Hot) Canal
Transverse Dispersivity, a_y	a_x/10 feet	Zheng and Bennet (1995). Taken as an order of magnitude smaller than a_x
Vertical Dispersivity, a_z	a_x/100 feet	Zheng and Bennet (1995). Taken as two orders of magnitude smaller than a_x
Modeled Source Thickness, Z	10 feet	Assumed depth of impacts at source
Source $Mass_{east}$	4.18E+12 pCi	Total mass estimated at nearest monitoring points to source. A larger component of source mass is likely discharged to storm sewer upgradient of nearest monitoring points.
Source $Mass_{west}$	1.08E+11 pCi	Total mass estimated in groundwater at nearest monitoring point to source minus total mass discharged through west storm sewer.
Tritium Half-Life	12.3 years	Michigan DEQ

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence *Version 1.4*

EXENW-18513-400
Transport East of Leak
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ or 2. Calculate by filling in grey
0.02 cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	1613.9	(ft/yr)
or		↑ or	
Hydraulic Conductivity	K	1.7E-02	(cm/sec)
Hydraulic Gradient	i	0.014	(ft/ft)
Porosity	n	0.15	(-)

2. DISPERSION

Longitudinal Dispersivity	alpha x	27.5	(ft)
Transverse Dispersivity*	alpha y	2.7	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		↑ or	
Estimated Plume Length	Lp	1320	(ft)

3. ADSORPTION

Retardation Factor*	R	1.0	(-)
or		↑ or	
Soil Bulk Density	rho	NA	(kg/l)
Partition Coefficient	Koc	NA	(L/kg)
FractionOrganicCarbon	foc	NA	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	5.6E-2	(per yr)
or		↑ or	
Solute Half-Life	t-half	12.30	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO	1.65	(mg/L)
Delta Nitrate*	NO3	0.7	(mg/L)
Observed Ferrous Iron*	Fe2+	16.6	(mg/L)
Delta Sulfate*	SO4	22.4	(mg/L)
Observed Methane*	CH4	6.6	(mg/L)

5. GENERAL

Modeled Area Length*	1330	(ft)
Modeled Area Width*	286	(ft)
Simulation Time*	8	(yr)

6. SOURCE DATA

Source Thickness in Sat.Zone* 10 (ft)

Source Zones:

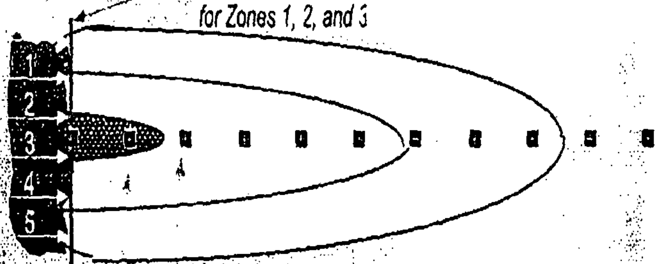
Width* (ft)	Conc. (mg/L)*
0	0
0	0
20	3600000
0	0
0	0

Source Halflife (see Help):

<1	<1	(yr)
Inst. React.	1st Order	

Soluble Mass 4180000 (Kg)
In Source NAPL, Soil

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)											
Dist. from Source (ft)	0	133	266	399	532	665	798	931	1064	1197	1330

8. CHOOSE TYPE OF OUTPUT TO SEE:

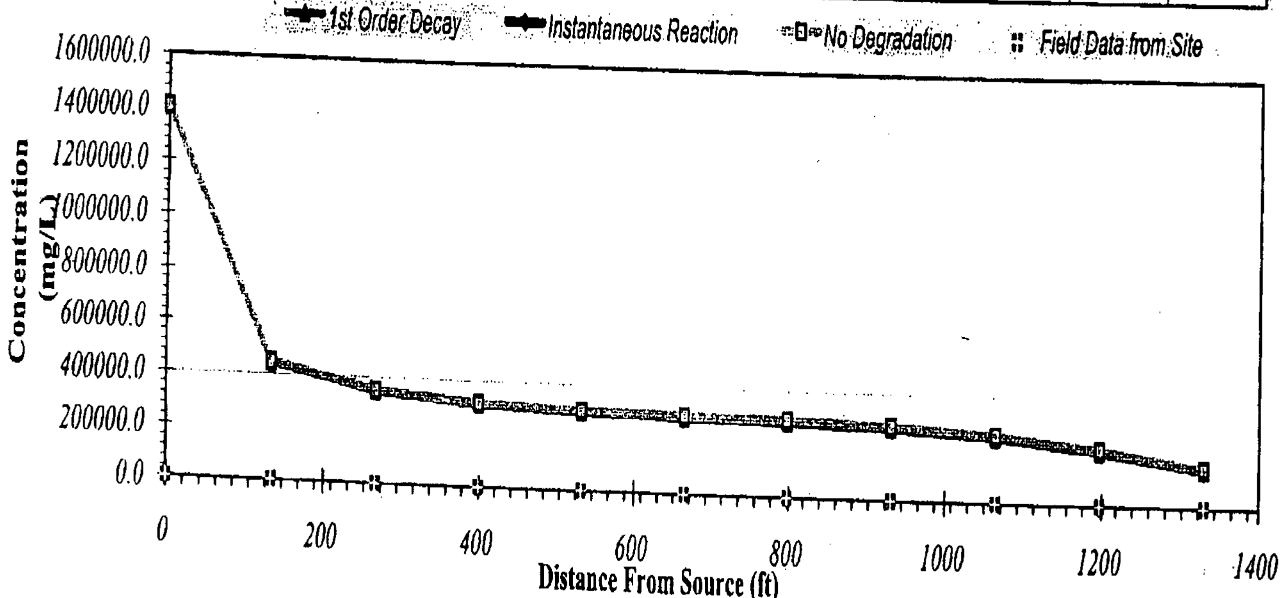
RUN CENTERLINE | RUN ARRAY | Help | Recalculate This Sheet

View Output | View Output | Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	133	266	399	532	665	798	931	1064	1197	1330
No Degradation	1.40E+06	4.46E+05	3.51E+05	3.17E+05	3.03E+05	2.97E+05	2.92E+05	2.81E+05	2.55E+05	2.11E+05	1.48E+05
1st Order Decay	1.40E+06	4.43E+05	3.48E+05	3.13E+05	2.97E+05	2.90E+05	2.84E+05	2.72E+05	2.46E+05	2.03E+05	1.43E+05
Inst. Reaction	1.40E+06	4.46E+05	3.51E+05	3.17E+05	3.03E+05	2.97E+05	2.92E+05	2.81E+05	2.55E+05	2.11E+05	1.48E+05
Field Data from Site											



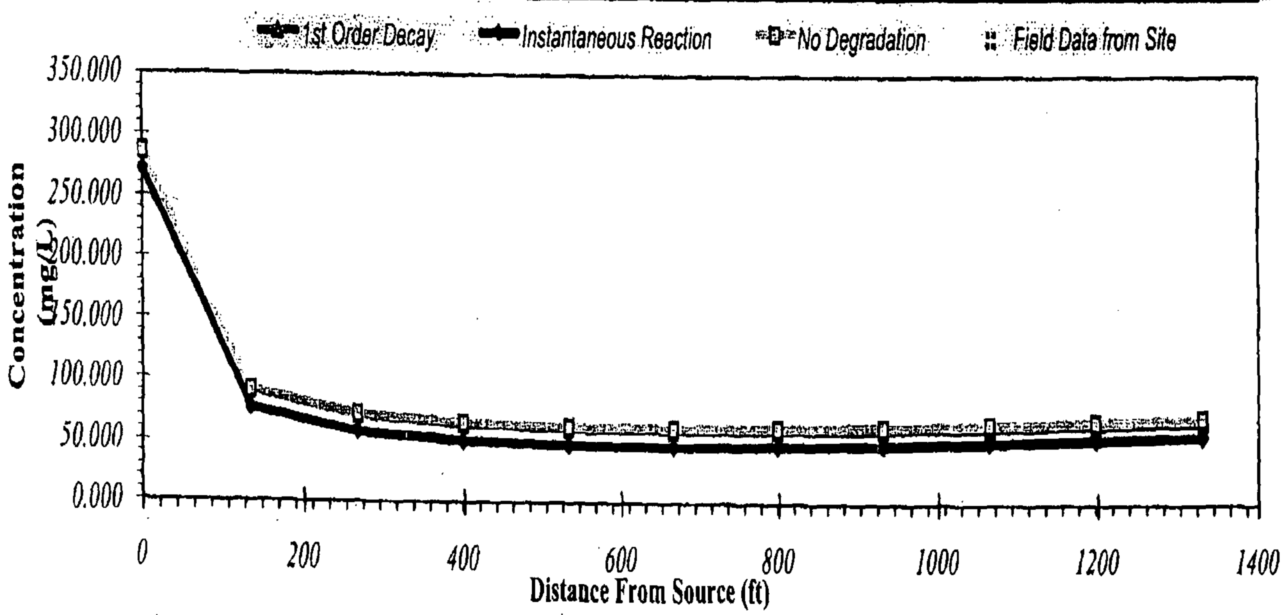
Replay Animation | Next Timestep | Prev Timestep

Time: 1 Years

Return to Input | Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft): 0	133	266	399	532	665	798	931	1064	1197	1330
No Degradatio	285.881	90.950	71.682	64.759	61.919	[illegible]	61.528	62.815	64.797	[illegible]	[illegible]
1st Order Decay	285.881	90.529	71.020	63.855	60.781	59.707	59.839	60.809	62.427	64.588	67.236
Inst. Reaction	271.214	76.290	57.022	50.090	47.260	46.449	46.869	48.157	50.127	52.682	55.769
Field Data from Site											



Calculate Animation

Time:

8 Years

Return to Input

Recalculate This Sheet

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence *Version 1.4*

EXENW-18513-400
Transport West of Leak
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ or 2. Calculate by filling in grey
0.02 cells below. (To restore formulas, hit button below).
Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	991.4	(ft/yr)
or		↑ or	
Hydraulic Conductivity	K	1.7E-02	(cm/sec)
Hydraulic Gradient	i	0.0088	(ft/ft)
Porosity	n	0.15	(-)

2. DISPERSION

Longitudinal Dispersivity	alpha x	22.4	(ft)
Transverse Dispersivity*	alpha y	2.2	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		↑ or	
Estimated Plume Length	Lp	810	(ft)

3. ADSORPTION

Retardation Factor*	R	1.0	(-)
or		↑ or	
Soil Bulk Density	rho	NA	(kg/l)
Partition Coefficient	Koc	NA	(L/kg)
FractionOrganicCarbon	foc	NA	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	5.6E-2	(per yr)
or		↑ or	
Solute Half-Life	t-half	12.30	(year)
or Instantaneous Reaction Mode			
Delta Oxygen*	DO	1.65	(mg/L)
Delta Nitrate*	NO3	0.7	(mg/L)
Observed Ferrous Iron*	Fe2+	16.6	(mg/L)
Delta Sulfate*	SO4	22.4	(mg/L)
Observed Methane*	CH4	6.6	(mg/L)

5. GENERAL

Modeled Area Length*	890	(ft)
Modeled Area Width*	198	(ft)
Simulation Time*	5	(yr)

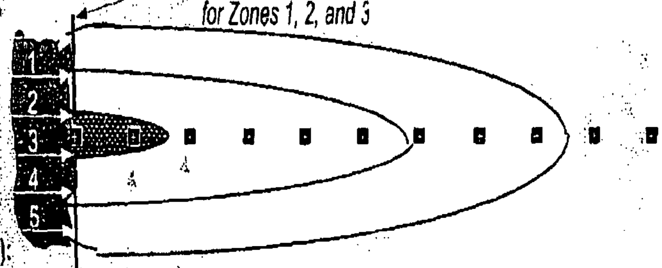
6. SOURCE DATA

Source Thickness in Sat.Zone 10 (ft)

Source Zones:

Width* (ft)	Conc. (mg/L)*
0	0
0	0
20	200000
0	0
0	0

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Source Halflife (see Help):

<1	<1	(yr)
Inst. React.	1st Order	
Soluble Mass	108000	(Kg)

In Source NAPL, Soil

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)											
Dist. from Source (ft)	0	89	178	267	356	445	534	623	712	801	890

8. CHOOSE TYPE OF OUTPUT TO SEE:

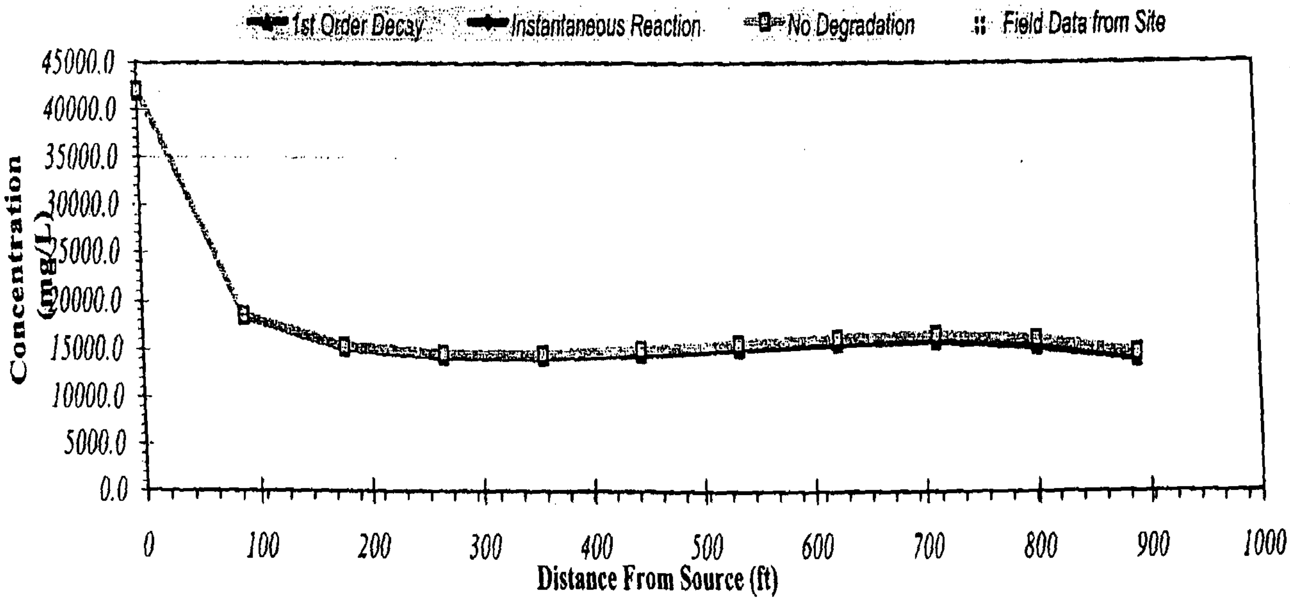
RUN CENTERLINE | RUN ARRAY | Help | Recalculate This Sheet

View Output | View Output | Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft) 0	89	178	267	356	445	534	623	712	801	890
No Degradation	42080.405	18574.638	15417.715	14575.742	14534.727	14952.547	15560.657	[illegible]	16466.522	[illegible]	[illegible]
1st Order Decay	42080.405	18481.056	15262.779	14356.706	14264.298	14581.996	15102.933	15617.666	15838.907	15417.534	14071.013
Inst. Reaction	42064.025	18559.410	15402.743	14560.936	14540.071	14938.044	15546.320	16148.425	16442.541	16058.814	14695.383
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

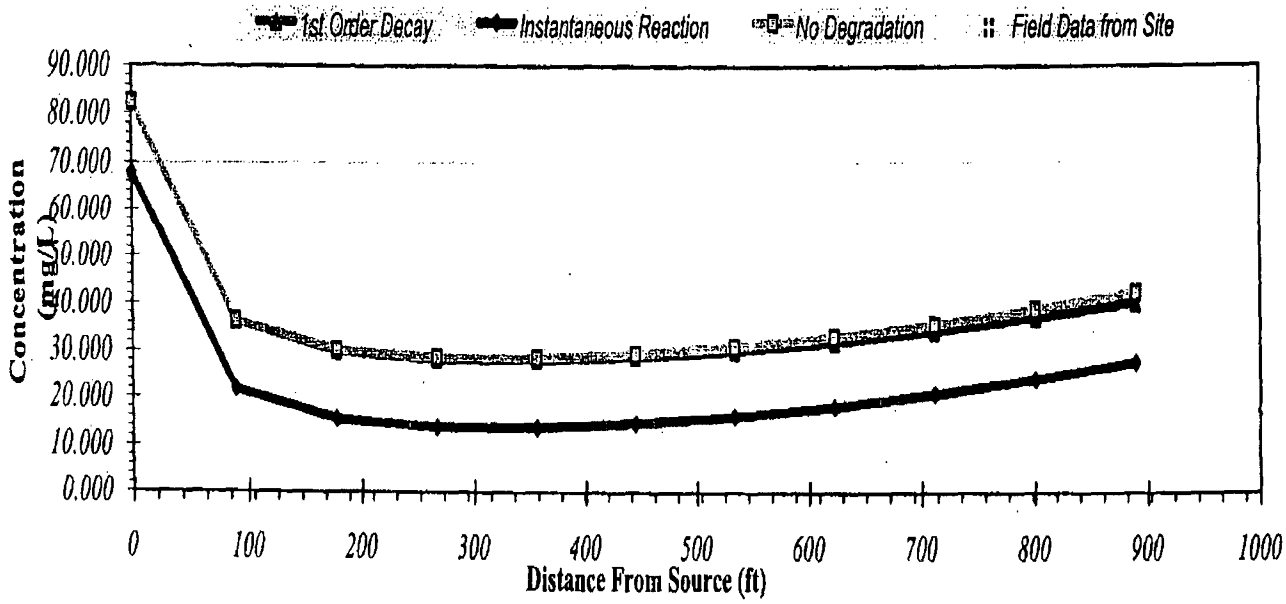
1 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	89	178	267	356	445	534	623	712	801	890
No Degradation	82.467	36.402	30.216	28.573	28.560	29.442	30.957	32.998	35.529	38.55[illegible]	42.084
1st Order Decay	82.467	36.218	29.913	28.143	27.989	28.708	30.033	31.851	34.122	36.837	40.011
Inst. Reaction	67.768	21.727	15.545	13.902	13.890	14.772	16.286	18.326	20.857	23.877	27.410
Field Data from Site											



Calculate Animation

Time:

5 Years

Return to Input

Recalculate This Sheet

Mr. Slawinski,

(RETEC)

In response to your request for information for the tables, figures, and appendices for the October 19, 2005 Final Draft Groundwater Tritium Investigation Report for Dresden Generating Station, I am sending the December 7, 2005 Groundwater Tritium Investigation Report for Dresden Generating Station. The report dated Oct 19 is a draft that was circulated for internal review within Exelon, and did not contain the requested tables, figures, and appendices. Instead, it relied on the use of this supporting data from previous drafts. The Dec 7 report is complete with the requested information. I also verified that the Dec 7 report Table of Contents for the figures, tables, and appendices matched that of the Oct 19 report.

Please contact me if you have any questions.

Respectfully,

J. R. Kalb
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Dresden Generating Station Chemistry
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randy.kalb@exeloncorp.com

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