ENCLOSURE D

HYDROLOGY

Documents Included in this Enclosure

1. 1985 Water Pump Flow Test numbers
2. Radiological Environmental Monitoring Manual (REMM) – with maps of wells
3. STS Well Installation (hydrology models)
4. Storm Water Pollution Prevention Plan
5. Discharge Monitoring Report (March 2009)
6. Kewaunee Power Station System Description – Circulating Water System
7. Kewaunee Power Station System Description – Service Water System
8. Excel spreadsheet, Kewaunee Power Station Potable Water Usage Documentation
9. Dominion Memorandum, 01/11/08, T. Hooker to R. Gallagher, Groundwater Usage at KPS
10. Wisconsin DNR website, DNR Drinking Water System: High Capacity Wells (Information on KPS wells)

April 20, 1985

Kewaunee Nuclear Power Plant

Kewaunee Water Pump Flow Test after Retubing

C. R. Steinhardt
G. A. Spiering

cc: D. C. Hintz
K. H. Weinhauer
W. J. Truttmann
K. H. Evers
J. T. Krueger
P. M. Lindberg
R. W. Lange
M. L. Marchi
M. T. Reinhart
J. A. Grzybowski

After the Condenser was retubed with stainless steel 439 during the 1985 Refueling, a flow test was conducted on the main circulating water pumps. A test was run on each individual pump and on both pumps operating in parallel. The results were plotted upon the attached curve titled, "Main Circulating Water Pump Head Capacity Curves for Single and Two Pump Parallel Operation, Revised 6-8-84 and Revised 6-20-85."

The 1985 Refueling test results indicate the following:

1. Both main circulating water pumps operating in parallel will meet the required flow forecast of 401,200 GPM. This flow,based on test, occurs at a total pump head of approximately 26.4 ft.

2. The 1985 pump head curves are approximately three percent less than the curves established in 1984. The writer can't believe that the impeller vane clearances have opened up that much in one year's operation to reduce the flow three percent.

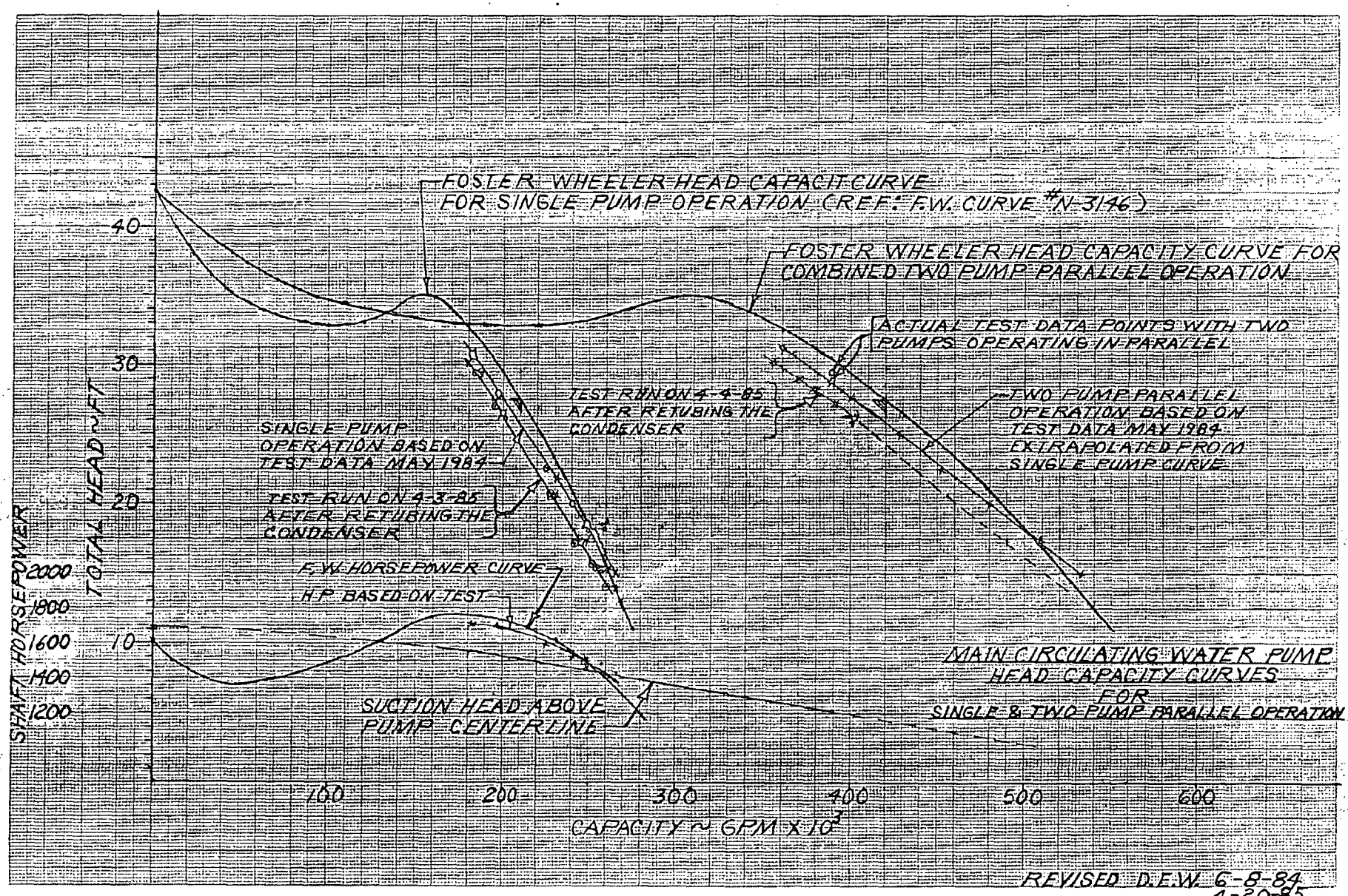
3. Maximum flow for single pump operation is 262,000 GPM. This is less than the 270,000 GPM forecast by HES. This could be due to the check valve leaking on the shutdown pump during the test.

The flows were obtained from the Westinghouse Leading Edge Flow Meter installed in the 120 inch diameter circulating water line during the 1984 Refueling. Mr. John Bristian, Service Engineer, Westinghouse Oceanic Division, read out the flow on the Flow Meter Electronics, which he brought with him. Again, this year, there was no charge for the electronics except for cost of Service Engineer to operate the electronics.

Donald E. Weinberg

Donald E. Weinberg:mel

Attachment


FOSTER WHEELER HEAD CAPACITY CURVE FOR SINGLE PUMP OPERATION (REF: F.W. CURVE #N-3146)
FOSTER WHEELER HEAD CAPACITY CURVE FOR COMBINED TWO PUMP PARALLEL OPERATION
ACTUAL TEST DATA POINTS WITH TWO PUMPS OPERATING IN PARALLEL
TEST RUN ON 4-4-85 AFTER RETUBING THE CONDENSER
TWO PUMP PARALLEL OPERATION BASED ON TEST DATA MAY 1984 EXTRAPOLATED FROM SINGLE PUMP CURVE
SINGLE PUMP OPERATION BASED ON TEST DATA MAY 1984
TEST RUN ON 4-3-85 AFTER RETUBING THE CONDENSER
F.W. HORSEPOWER CURVE
H.P. BASED ON TEST
SUCTION HEAD ABOVE PUMP CENTERLINE
SHAFT HORSEPOWER
TOTAL HEAD ~ FT
40
30
20
10
2000
1800
1600
1400
1200
100
200
300
400
500
600
CAPACITY ~ GPM X 10³
MAIN CIRCULATING WATER PUMP HEAD CAPACITY CURVES FOR SINGLE & TWO PUMP PARALLEL OPERATION
REVISED D.F.W. 6-8-84
4-20-85

CIRCULATING WATER PUMP -A & BDATA SUMMARIZED

DATE: 4-4-85

Pump Discharge Diameter = 96 inches. Area Pump Discharge = 50.27 FT.^{2}.
Pressure gauge was 36½ " above pump centerline on Pump A and 37½ " on Pump B.
Discharge head in Ft. = Gauge reading in PSI x 2.31 ÷ Spec. Gravity.
Distance from Elev. 586 to pump centerline at Elev. 569.
Rated Motor HP = 1750 @ 4000 Volts and 255 AMPS; Service Factor = 1.15; RPM = 195
Motor Eff. Assume = .927 with P.F. assumed = 0.80; HP = 1.73 x .927 x .80 x EI/746

Date	Test No.	Time of Test	Flow GPM	Depth to Water Meas'd. in Ft. from Elev. 586	Pump ¢ to W.S. @ Pump Suction in Ft. Above or Below ¢	Pump Disch. Press. Per Test Gauge	Water Temp. °F	Water Spec. Gravity Head Corr.	Gauge Corr. for Elev. Ft.	Calc. Disch. Press. in Ft.	Vel. Hd. in Ft.	Total Pump Head in Ft. @ 60°F	Motor Amps Phse.A	Motor Amps Phse.B	Motor Amps Phse.C	Motor Amps Av.	Est. Motor Volts	Est. Horse-Power	Position For All Inlet Cond. BF Valves Degrees
4/4	PUMP 1A 17	1308	--	11.667	-5.33	12.0	39	1.0012	3.02	30.74	1.25	26.69	238	234	235	235.7	4140	1678	90
4/4	PUMP 1B 17	1308	--	11.646	-5.35	11.75	39	1.0012	3.125	30.26	1.25	26.19	240	236	238	238	4120	1686	90
TOTAL			404775								AVERAGE =	26.44							
				PUMP 1A OPERATING IN PARALLEL WITH 1B															
4/4	18	1338	189988	10.750	-6.25	13.15	39	1.0012	3.02	33.40	1.10	28.28	241	238	238	239	4150	1706	55
				PUMP 1B															
4/4	18	1338	189988	10.708	-6.29	13.15	39	1.0012	3.125	33.50	1.10	28.34	242	239	240	240.3	4130	1707	55
TOTAL			379975								AVERAGE =	28.31							
				PUMP 1A OPERATING IN PARALLEL WITH 1B															
4/4	19	1359	177619	10.33	-6.67	14.2	39	1.0012	3.02	35.82	.96	30.15	243	239	239	240.3	4150	1715	47½
				PUMP 1B															
4/4	19	1359	177619	10.25	-6.75	14.2	39	1:0012	3.125	35.93	.96	30.18	244	240	241	241.7	4140	1721	47½
TOTAL			355238								AVERAGE =	30.16							

CIRCULATING WATER PUMP A & B DATA SUMMARIZED

DATE: 4-3-85

Pump Discharge Diameter = 96 inches. Area Pump Discharge = 50.27 FT.^{2}.
Pressure gauge was 36½ " above pump centerline on Pump A and 37½ " on Pump B.
Discharge head in Ft. = Gauge reading in PSI x 2.31 ÷ Spec. Gravity.
Distance from Elev. 586 to pump centerline at Elev. 569.
Rated Motor HP = 1750 @ 4000 Volts and 255 AMPS; Service Factor = 1.15; RPM = 195
Motor Eff. Assume = .927 with P.F. assumed = 0.80; HP = 1.73 x .927 x .80 x EI/746

Date	Test No.	Time of Test	Flow GPM	Depth to Water Meas'd. in Ft. from Elev. 586	Pump ¢ to W.S. @ Pump Suction in Ft. Above or Below ¢	Pump Disch. Press. Per Test Gauge	Water Temp. °F	Water Spec. Gravity Head Corr.	Gauge Corr. for Elev. Ft.	Calc. Disch. Press. in Ft.	Vel. Hd. in Ft.	Total Pump Head in Ft. @ 60°F	Motor Amps Phse.A	Phse.B	Phse.C	Av.	Est. Motor Volts	Est. Horse-Power	Position For All Inlet Cond. BF Valves Degrees
							PUMP 1A	OPERATING	IN PARALLEL WITH		PUMP 1B								
4/3	7	1407	201800	11.48	-5.52	11.9	39	1.0012	3.02	30.51	1.24	26.28	239	233	233		4180		90
							PUMP 1B												
4/3	7	1407	201800	11.46	-5.54	11.85	39	1.0012	3.125	30.50	1.24	26.24	238	232	232		4150		90
TOTAL FLOW =			403600	AS MEASURED							AVERAGE =	26.26							
4/3	8	1437	195544	11.08	-5.92	12.6	39	1.0012	3.02	32.13	1.17	27.38	240	235	235		4180		60
4/3	8		195544	11.00	-6.0	12.5	39	1.0012	3.125	32.00	1.17	27.2	241	235	236		4150		60
TOTAL FLOW =			391088	AS MEASURED							AVERAGE =	27.29							
4/3	9	1445	184594	10.375	-6.625	13.8	39	1.0012	3.02	34.90	1.04	29.35	242	237	238		4180		50
4/3	9	1445	184594	10.375	-6.625	13.6	39	1.0012	3.125	34.50	1.04	28.95	242	238	239		4150		50
TOTAL FLOW =			369188	AS MEASURED							AVERAGE =	29.15							
4/3	10	1502	150552.5	8.625	-8.375	14.6	39	1.0012	3.02	36.75	.69	29.10	208	203	203		4180		40
4/3	10		150552.5	8.625	-8.375	14.5	39	1.0012	3.125	36.62	.69	28.97	242	239	239		4150		40
TOTAL FLOW =			301105	AS MEASURED							AVERAGE =	29.03							
				DROP AMPERAGE ON PUMP 1A WAS DUE TO PUMP CAVITATION WITH BOTH PUMPS OPERATING IN PARALLEL. THIS POINT SHOULD NOT BE USED.															

CIRCULATING WATER PUMP - 1B DATA SUMMARIZED

DATE: 4-3-85

Pump Discharge Diameter = 96 inches. Area Pump Discharge = 50.27 FT.^{2}.
Pressure gauge was 36¼" above pump centerline on Pump A and 37½" on Pump B.
Discharge head in Ft. = Gauge reading in PSI x 2.31 ÷ Spec. Gravity.
Distance from Elev. 586 to pump centerline at Elev. 569.
Rated Motor HP = 1750 @ 4000 Volts and 255 AMPS; Service Factor = 1.15; RPM = 195
Motor Eff. Assume = .927 with P.F. assumed = 0.80; HP = 1.73 x .927 x .80 x EI/746

Date	Test No.	Time of Test	Flow GPM	Depth to Water Meas'd. in Ft. from Elev. 586	Pump ¢ to W.S. @ Pump Suction in Ft. Above or Below ¢	Pump Disch. Press. Per Test Gauge	Water Temp. °F	Water Spec. Gravity Head Corr.	Gauge Corr. for Elev. Ft.	Calc. Disch. Press. in Ft.	Vel. Hd. in Ft.	Total Pump Head in Ft. @ 60°F	Motor Amps Phse.A	Phse.B	Phse.C	Av.	Est. Motor Volts	Est. Horse-Power	Position For All Inlet Cond. BF Valves Degrees
4/3	11	1539	266275	8.375	-8.625	7.5	39	1.0012	3.125	20.45	2.16	14.00	202	197	197	198.7	4190	1,432	90
4/3	12	1556	261310	8.229	-8.771	8.19	39	1.0012	3.125	22.04	2.08	15.37	210	202	202	204.7	4190	1,475	60
4/3	13	1614	249225	8.063	-8.937	9.15	39	1.0012	3.125	24.26	1.89	17.23	218	210	210	212.7	4190	1,533	50
4/3	14	1632	231488	7.771	-9.229	10.85	39	1.0012	3.125	28.19	1.63	20.62	228	221	222	223.7	4190	1,612	40
4/3	15	1647	200663	7.167	-9.833	13.85	39	1.0012	3.125	35.12	1.23	26.55	239	233	236	236	4190	1,701	30
4/3	16	1704	186938	6.854	-10.146	15.25	39	1.0012	3.125	38.35	1.07	29.31	242	239	239	240	4190	1,729	27½

CIRCULATING WATER PUMP - 1A DATA SUMMARIZED

DATE: 4-4-85

Pump Discharge Diameter = 96 inches. Area Pump Discharge = 50.27 FT.^{2}.
Pressure gauge was 36¼ " above pump centerline on Pump A and 37½ " on Pump B.
Discharge head in Ft. = Gauge reading in PSI x 2.31 ÷ Spec. Gravity.
Distance from Elev. 586 to pump centerline at Elev. 569.
Rated Motor HP = 1750 @ 4000 Volts and 255 AMPS; Service Factor = 1.15; RPM = 195
Motor Eff. Assume = .927 with P.F. assumed = 0.80; HP = 1.73 x .927 x .80 x EI/746

Date	Test No.	Time of Test	Flow GPM	Depth to Water Meas'd. in Ft. from Elev. 586	Pump ¢ to W.S. @ Pump Suction in Ft. Above or Below ¢	Pump Disch. Press. Per Test Gauge	Water Temp. °F	Water Spec. Gravity Head Corr.	Gauge Corr. for Elev. Ft.	Calc. Disch. Press. in Ft.	Vel. Hd. in Ft.	Total Pump Head in Ft. @ 60°F	Motor Amps Phse.A	Motor Amps Phse.B	Motor Amps Phse.C	Motor Amps Av.	Est. Motor Volts	Est. Horse-Power	Position For All Inlet Cond. BF Valves Degrees
4/4	20	1459	263218	8.33	-8.67	7.6	39	1.0012	3.02	20.58	2.11	14.04	200	195	196	197	4190	1,420	90
4/4	21	1517	257263	8.40	-8.60	8.2	39	1.0012	3.02	21.96	2.02	15.40	204	201	201	202	4190	1,456	60
4/4	22	1538	245988	8.17	-8.83	9.2	39	1.0012	3.02	24.27	1.85	17.31	211	207	207	208.3	4200	1,505	50
4/4	23	1555	226650	7.56	-9.44	11.1	39	1.0012	3.02	28.66	1.57	20.81	225	220	221	222	4190	1,600	40
4/4	24	1610	199963	7.33	-9.67	13.8	39	1.0012	3.02	34.89	1.22	26.47	239	235	236	236.6	4190	1,705	30
4/4	25	1625	186863	7.23	-9.77	15.2	39	1.0012	3.02	38.13	1.07	29.47	241	238	238	239	4180	1,718	27½

CIRCULATING WATER PUMP - 1A DATA SUMMARIZED

DATE: 4-3-85

Pump Discharge Diameter = 96 inches. Area Pump Discharge = 50.27 FT.^{2}.
Pressure gauge was 36¼ " above pump centerline on Pump A and 37½ " on Pump B.
Discharge head in Ft. = Gauge reading in PSI x 2.31 ÷ Spec. Gravity.
Distance from Elev. 586 to pump centerline at Elev. 569.
Rated Motor HP = 1750 @ 4000 Volts and 255 AMPS; Service Factor = 1.15; RPM = 195
Motor Eff. Assume = .927 with P.F. assumed = 0.80; HP = 1.73 x .927 x .80 x EI/746

Date	Test No.	Time of Test	Flow GPM	Depth to Water Meas'd. in Ft. from Elev. 586	Pump ¢ to W.S. @ Pump Suction in Ft. Above or Below ¢	Pump Disch. Press. Per Test Gauge	Water Temp. °F	Water Spec. Gravity Head Corr.	Gauge Corr. for Elev. Ft.	Calc. Disch. Press. in Ft.	Vel. Hd. in Ft.	Total Pump Head in Ft. @ 60°F	Motor Amps Phse.A	Phse.B	Phse.C	Av.	Est. Motor Volts	Est. Horse-Power	Position For All Inlet Cond. BF Valves Degrees
4/3	1	1105	258175	8.29	-8.71	8.15	39	1.0012	3.02	21.85	2.03	15.19	203	198	199	200	4200	1,445	90
4/3	2	1128	252288	8.29	-8.71	8.4	39	1.0012	3.02	22.42	1.94	15.67	206	201	202	203	4200	1,466	60
4/3	3	1152	241050	8.08	-8.92	9.2	39	1.0012	3.02	24.27	1.77	17.14	211	204	205	206.7	4200	1,493	50
4/3	4	1214	225803	7.83	-9.17	10.9	39	1.0012	3.02	28.20	1.56	20.61	225	217	218	220	4200	1,589	40
4/3	5	1234	195400	7.25	-9.75	14.15	39	1.0012	3.02	35.71	1.16	27.15	239	234	235	236	4200	1,705	30
4/3	6	1255	184163	7.00	-10.00	15.4	39	1.0012	3.02	38.59	1.03	29.66	242	236	237	238.3	4200	1,721	27⅓

Some Offsite REMM Stations

1- K-1d	SW	FI	BS	SL		
2- K-1f	AP	AI	GR	TLD	SO	
3- K-23	GRN/GLV					
4- K-10		WW				
5- K-34	MI	GR	SO	CF		
6- K-39	MI	TLD	GR	SO	CF	
7- K-24	EG	DM				
8- K-3		MI	GR	TLD	SO	CF
9- K-31	AP	AI	TLD			
10- K-5		MI	GR	TLD	SO	CF
11- K-7	AP	AI	TLD			

AI Airborne Iodine
AP Airborne Particulate
BS Bottom Sediment
Dosimeter
CF Cattlefeed
DM Domestic Meat
EG Eggs
Vegetables

FI Fish
GR Grass
GRN Grain

MI Milk
PR Precipitation
SL Slime

SO Soil
SW Surface Water
TLD Thermoluminescent

VE Vegetables
WW Well Water
GLV Green Leafy

Kewaunee Power Station

Radiological Environmental Monitoring Manual (REMM)

Revision 15
05/13/2009

Reviewed by:	Michael J. Wilson Facility Safety Review Committee	Date:	05/13/2009
Approved by:	James M. Hale Manager, Radiological Protection and Chemistry	Date:	04/20/2009
Approved by:	Thomas L. Breene Manager, Regulatory Affairs	Date:	04/23/2009

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1.0 Introduction

1.1 Purpose

The purpose of this document is to define the Radiological Environmental Monitoring Program (REMP) for the Kewaunee Power Station (KPS). The REMP is required by KPS Technical Specification (TS) 6.16.b.2, "Radiological Environmental Monitoring Program."

This document is known as the Radiological Environmental Monitoring Manual (REMM) and is intended to serve as a tool for program administration and as a guidance document for contractors which implement the monitoring program.

1.2 Scope

This program defines the sampling and analysis schedule which was developed to provide representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the high potential radiation exposures of MEMBERS OF THE PUBLIC resulting from plant operation. This monitoring program implements Section IV.B.2 of Appendix I to 10CFR Part 50 and thereby verifies that the measurable concentrations of radioactivity and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for the development of this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. This program has been developed in accordance with NUREG 0472.

The program will provide field and analytical data on the air, aquatic, and terrestrial radioecology of the area near the Kewaunee Power Station so as to:

1. Determine the effects of the operation of the Kewaunee Power Station on the environment;
2. Serve as a gauge of the operating effectiveness of in-plant control of waste discharges; and
3. Provide data on the radiation dose to the public by direct or indirect pathways of exposure.

1.3 Implementation

This document is considered, by reference, to be part of the Offsite Dose Calculation Manual. This is as required by KPS TS 6.16.b.2. The REMM is controlled as a separate document for ease of revision, use in the field and use by contractors. This format was approved by the NRC as part of TS Amendment No. 64, which provided Radiological Effluent Technical Specifications (RETS) for KPS.

The REMP is setup to be implemented by a vendor and controlled by KPS in accordance with Nuclear Administrative Directive NAD-01.20, "Radiological Environmental Monitoring Program." Monthly reviews of the vendor's progress report are checked and approved by KPS in accordance with Surveillance Procedure SP-63-276. Annual reviews and submittals of the vendor's report and raw data are checked and approved by KPS in accordance with Surveillance Procedure SP-63-280. All sample collection, preparation, and analysis are performed by the vendor except where noted. Surveillance Procedure SP-63-164 outlines the environmental sample collection performed by KPS. Current vendor Quality Control Program Manuals and implementing procedures shall be kept on file at KPS.

Periodic reviews of monitoring data and an annual land use census will be used to develop modifications to the existing monitoring program. Upon approval, these modifications will be incorporated into this document so that it will accurately reflect the current radiological environmental monitoring program in effect for KPS.

The remainder of this document is divided into two sections. The first section, 2.0 REMP Requirements, describes the different TS and REMM requirements associated with the REMP. The second section, 3.0 REMP Implementation, describes the specific requirements used to implement the REMP.

2.0 REMP Requirements

KPS TS Amendment No. 104 implemented the guidance provided in Generic Letter 89-01, "Implementation of Programmatic Controls for Radiological Effluent Technical Specifications (RETS)." These changes included:

1. Incorporation of *programmatic controls* in the Administrative Controls section of the TS to satisfy existing regulatory requirements for RETS, and

2. Relocation of the *procedural details* on radioactive effluents monitoring, radiological environmental monitoring, reporting details, and other related specifications from the TS to the ODCM.

Relocating the procedural details to the ODCM allows for revising these requirements using the 10CFR50.59 process instead of requiring prior NRC approval using the TS Amendment process.

The RETS requirements were incorporated verbatim into the ODCM, Revision 6. Several of these requirements pertain only to the environmental monitoring program and therefore have been relocated into this document (REMM, Revision 3 and 4) and are identified as REMM requirements.

2.1 Technical Specification Requirements

Technical Specification 6.16.b.2 provides the programmatic control, which requires a program to monitor the radiation and radionuclides in the environs of the plant. This is the reason for the existence of the REMP. TS 6.16.b.2 also provides the programmatic control which requires:

a. The program to perform the monitoring, sampling, analysis, and reporting in accordance with the methodology and parameters in the ODCM,

b. A land use census to be performed, and

c. Participation in an Interlaboratory Comparison Program.

The details of each requirement are described in the REMM requirements stated below.

Technical Specification 6.9.b.1 requires an "Annual Radiological Environmental Monitoring Report" be submitted to the NRC each year. The specific contents of this report are detailed in REMM 2.4.1. Additional specific reporting requirements are listed in the other REMM requirements.

2.2 REMM Requirements

The following REMM requirements include the procedural details that were originally located in the KPS RETS section and then relocated into Revision 6 of the ODCM, as discussed above. These requirements are specific to the radiological environmental monitoring program and have been relocated into this document for ease of use and completeness.

The REMM requirements for the Monitoring Program, Land Use Census, and the Interlaboratory Comparison Program include a detailed specification (numbered 2.2.1, 2.2.2, and 2.2.3 respectively) and an associated surveillance requirement (numbered 2.3.1, 2.3.2, and 2.3.3 respectively), along with the basis for the requirement. Reporting requirements are listed in specification REMM 2.4.1.

General requirements also apply to all ODCM and REMM requirements (specifications 3.01, 3.02, 3.03, 4.01, 4.02, and 4.03). The requirements are located in the ODCM and are repeated here for convenience.

GENERAL SPECIFICATIONS

3.0.1 Compliance with the specifications contained in the succeeding text is required during the conditions specified therein; except that upon failure to meet the specifications, the associated ACTION requirements shall be met.

3.0.2 Noncompliance with a Specification shall exist when its requirements and associated ACTION requirements are not met within the specified time intervals. If the Specification is restored prior to expiration of the specified time intervals, completion of the Action requirements is not required.

3.0.3 When a Specification is not met, except as provided in the associated ACTION requirements, reporting pursuant to TS 6.9.b and REMM 2.4.1 will be initiated.

SURVEILLANCE REQUIREMENTS

4.0.1 Surveillance Requirements shall be met during the conditions specified for individual Specifications unless otherwise stated in an individual Surveillance Requirement.

4.0.2 Each Surveillance Requirement shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval.

4.0.3 Failure to perform a Surveillance Requirement within the specified time interval shall constitute a failure to meet the OPERABILITY requirements for a Specification. Exceptions to these requirements are stated in the individual Specification. Surveillance Requirements do not have to be performed on inoperable equipment.

REMM 2.2.1/2.3.1 Monitoring Program

SPECIFICATION

2.2.1 The radiological environmental monitoring program shall be conducted as specified in Table 2.2.1-A.

APPLICABILITY

At all times.

ACTION

a. With the radiological environmental monitoring program not being conducted as specified in Table 2.2.1-A, in lieu of a Licensee Event Report, prepare and submit to the Commission, in the Annual Radiological Environmental Monitoring Report required by TS 6.9.b.1 and REMM 2.4.1, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 2.2.1-D when averaged over any calendar quarter in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days, pursuant to TS 6.9.b.3, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose[1] to A MEMBER OF THE PUBLIC is less than the calendar year limits of specifications ODCM 3.3.2, 3.4.2, and 3.4.3. When more than one of the radionuclides in Table 2.2.1-D are detected in the sampling medium, this report shall be submitted if:

$$\frac{concentration(1)}{reporting\,level(1)} + \frac{concentration(2)}{reporting\,level(2)} + \ldots \geq 1.0$$

When radionuclides other than those in Table 2.2.1-D are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose[1] to a MEMBER OF THE PUBLIC is equal to or greater than the calendar year limits of specifications ODCM 3.3.2, 3.4.2, and 3.4.3. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event the condition shall be reported and described in the Annual Radiological Environmental Monitoring Report.

[1]The methodology and parameters used to estimate the potential annual dose to a member of the public shall be indicated in this report.

c. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 2.2.1-A, a sample from an alternative location will be substituted, noting the reason for the unavailability in the Annual Radiological Environmental Monitoring Report. When changes in sampling locations are permanent, the sampling schedule in the RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL (REMM) will be updated to reflect the new routine and alternative sampling locations and this revision will be described in the Annual Radiological Environmental Monitoring Report.

SURVEILLANCE REQUIREMENT

2.3.1 The radiological environmental monitoring samples shall be collected pursuant to Table 2.2.1-A from the specific locations given in the table and figure(s) in the REMM, and shall be analyzed pursuant to the requirements of Table 2.2.1-A and the detection capabilities required by Table 2.3.1-A.

BASIS

The radiological environmental monitoring program required by this specification provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10CFR Part 50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. Program changes may be initiated based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLDs). The LLDs required by Table 2.3.1-A are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits, can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Anal. Chem. 40, 586-93 (1968), and Hartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

Discussion

KPS TS 6.16.b.2(A) requires that the monitoring, sampling, analysis, and reporting of radiation and radionuclides in the environment be done in accordance with the methodology and parameters in the ODCM.

REMM 2.2.2/2.3.2 Land Use Census

SPECIFICATION

2.2.2 A land use census shall be conducted and shall identify within a distance of 8 km (5 miles) the location in each of the 10 meteorological sectors of the nearest milk animal, the nearest residence and the nearest garden[2] of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation.

APPLICABILITY

At all times.

ACTION

a. With a land use census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in ODCM Surveillance Requirement 4.4.3, in lieu of a Licensee Event Report, identify the new location(s) in the next Annual Radiological Environmental Monitoring Report pursuant to TS 6.9.b.1 and REMM 2.4.1.

b. With a land use census identifying a location(s) that yields a calculated dose or dose commitment (via the same exposure pathway) 20% greater than at a location from which samples are currently being obtained in accordance with specification REMM 2.2.1, add the new location(s) to the radiological environmental monitoring program within 30 days. The sampling location(s), excluding the control station location, having a lower calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program. In lieu of a Licensee Event Report, identify the new location(s) in the next Annual Radiological Environmental Monitoring Report pursuant to TS 6.9.b.1 and REMM 2.4.1 and also include in the report a revised figure(s) and table for the REMM reflecting the new location(s).

SURVEILLANCE REQUIREMENT

2.3.2 The land use census shall be conducted during the growing season once per 12 months using reasonable survey methods, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities. The results of the land use census shall be included in the Annual Radiological Environmental Monitoring Report pursuant to TS 6.9.b.1 and REMM 2.4.1.

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[2]Sampling of leaf vegetation may be performed at the site boundary in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census. Specifications for broad leaf vegetation sampling in Table 2.2.1-A item 4c shall be followed, including analysis of control samples.

BASIS

This specification is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the radiological environmental monitoring program are made if required by the door-to-door survey, from aerial survey or from consulting with local agricultural authorities. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10CFR Part 50. Restricting the census to gardens of greater than 50 m^2 provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/yr) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made:

1. 20% of the garden was used for growing leafy vegetation (i.e., similar to lettuce and cabbage), and
2. A vegetation yield of 2 kg/m^2.

Discussion

KPS TS 6.16.b.2(b) requires that a land use census be performed to ensure that changes in the use of areas at and beyond site boundary are identified and that modifications to the radiological environmental monitoring program are made if required by the results of this census.

Figure 2, Emergency Plan Zone Map identifying sectors for cross-reference in Land Use Census Program.

REMM 2.2.3/2.3.3 Interlaboratory Comparison Program

SPECIFICATION

2.2.3 Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program that has been approved by the Commission.

APPLICABILITY

At all times.

ACTION

a. With analyses not being performed as required above, report corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Monitoring Report pursuant to TS 6.9.b.1 and REMM 2.4.1.

SURVEILLANCE REQUIREMENT

2.3.3 The Interlaboratory Comparison Program shall be described in the REMM. A summary of the results obtained as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Monitoring Report pursuant to TS 6.9.b.1 and REMM 2.4.1.

BASIS

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10CFR Part 50.

Discussion

KPS TS 6.16.b.2(c) requires participation in an approved Interlaboratory Comparison Program to ensure that an independent check is performed of the precision and accuracy of radioactive materials measurements. This will demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10CFR Part 50.

REMM 2.4.1 Reporting Requirements

2.4.1 The Annual Radiological Environmental Monitoring Report shall include:

a. Summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with pre-operational studies, with operational controls as appropriate, and with previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of land use censuses required by specification REMM 2.2.2.

b. The results of analyses of radiological environmental samples and of environmental radiation measurements taken during the period pursuant to the locations specified in the table and figures in the Radiological Environmental Monitoring Manual (REMM), as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report when applicable.

c. A summary description of the radiological environmental monitoring program; legible maps covering all sampling locations keyed to a table giving distances and directions from the centerline of one reactor; the results of licensee participation in the Interlaboratory Comparison Program, required by specification REMM 2.2.3; discussion of all deviations from the sampling schedule of Table 2.2.1-A; and discussion of all analyses in which the LLD required by Table 2.3.1-A was not achievable.

Discussion

KPS TS 6.9.b.1 provides the programmatic control, which requires that an Annual Radiological Environmental Monitoring Report be submitted to the NRC. It also states that this report shall include summaries, interpretations, and analysis of trends of the results of the REMP for the reporting period.

The procedural details of this report are included in this specification. Specifications REMM 2.2.1/2.3.1, 2.2.2/2.3.2, and 2.2.3/2.3.3 also include specific reporting requirements. These specifications reference this REMM specification, along with TS 6.9.b.1, as the method for reporting deviations from the current program during the reporting period, and require that this information be included in the Annual Radiological Environmental Monitoring Report.

3.0 REMP Implementation

The Radiological Environmental Monitoring Program for KPS is under the direction of a Contracted Vendor (CV). This section describes this program, as required by REMM 2.2.1 and the process the CV uses to perform it.

3.1 Sampling Requirements

Table 2.2.1-A identifies the various samples required by the REMP. Identified in the "available sample locations" column in Table 2.2.1-A are the sample locations selected, in conjunction with the vendor, to meet or exceed the REMP requirements. Table 2.2.1-B includes the same requirements as in Table 2.2.1-A but presents the information in a different format by identifying the type of samples required at each location and the collection frequency. Table 2.2.1-C identifies the location and description of each sample location. Figure 1 shows the physical location of each sample point on an area map.

3.2 Analysis Methodology

Analytical procedures and counting methods employed by the CV will follow those recommended by the U.S. Public Health Service publication, Radioassay Procedures for Environmental Samples, January 1967; and the U.S. Atomic Energy Commission Health and Safety Laboratory, HASL Procedures Manual (HASL-300), 1972. The manual is also available on-line at www.eml.doe.gov/publications/procman.

Updated copies will be maintained in KPS's vault.

3.3 Detection Capability (LLD) Requirements

The required detection capabilities for environmental sample and analysis are tabulated in terms of lower limits of detection (LLDs) in Table 2.3.1-A. The LLDs required by Table 2.3.1-A are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits, can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Anal. Chem. 40, 586-93 (1968), and Hartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

3.4 Contracted Vendor Reporting Requirements

Monthly Progress Reports

Monthly progress reports will include a tabulation of completed analytical data on samples obtained during the previous 30 day period together with graphic representations where trends are evident, and the status of field collections. One copy of the reports will be submitted within 30 days of the reporting month.

Annual Reports

Annual reports will be submitted in two parts. Part I, to be submitted to the NRC, will be prepared in accordance with NRC Regulatory Guide 4.8. It will contain an introductory statement, a summary of results, description of the program, discussion of the results, and summary table. Part II of the annual report will include tables of analytical data for all samples collected during the reporting period, together with graphic presentation where trends are evident and statistical evaluation of the results. Gamma scan data will be complemented by figures of representative spectra. Draft copies of each annual report will be due 60 days after completion of the annual period. After final review of the draft document, one photoready copy of the revised annual report will be sent to KPS for printing.

Non-Routine Reports

If analyses of any samples collected show abnormally high levels of radioactivity, KPS will be notified by telephone immediately after data becomes available.

Action Limits

The CV will report any radioactive concentrations found in the environmental samples which exceed the reporting levels shown in Table 2.2.1-D, CV to KPS column. These levels are set below the NRC required reporting levels (KPS to NRC column) so actions can be initiated to prevent exceeding the NRC concentration limits.

3.5 Quality Control Program

To insure the validity of the data, the CV maintains a quality control (QC) program, which employs quality control checks, with documentation, of the analytical phase of its environmental monitoring studies. The program is defined in the CV's QC Program Manual, and procedures are presented in the CV QC Procedures Manual. The program shall be reviewed and meet the requirements of Regulatory Guide 4.15 and 10CFR21. All data related to quality control will be available for review by Dominion Energy Kewaunee upon reasonable prior notification. Proprietary information will be identified so that it may be treated accordingly.

Updated copies of the Quality Control Program Manual and the Quality Assurance Program Manual will be maintained in KPS's vault.

3.6 Sample Descriptions

A description of each of the samples required by this program follows:

Airborne Particulates

Airborne particulates are collected at six locations (K-1f, K-2, K-7, K-8, K-31, and K-41) on a continuous basis on a 47 mm diameter membrane filter of 0.8 micron porosity at a volumetric rate of approximately one cubic foot per minute (CFM). The filters are changed weekly, placed in glassine protective envelopes, and dispatched by U.S. Mail to the CV for Gamma Isotopic Analysis. Filter samples are analyzed weekly for gross beta activity after sufficient time (usually 3 to 5 days) has elapsed to allow decay of Radon and Thoron daughters. If gross beta concentration in air particulate samples are greater than ten (10) times the yearly mean of the control samples, gamma isotopic analysis shall be performed on the individual samples. Quarterly composites from each location receive Gamma Isotopic Analysis using a Germanium detector. All identifiable gamma-emitters are quantified. Reporting units are pCi/m^3.

Airborne Iodine

All air samplers are equipped with charcoal traps installed behind the particulate filters for collection of airborne I-131. The traps are changed once every two weeks. Iodine-131 is measured by Gamma Isotopic Analysis.

Periphyton (Slime) or Aquatic Vegetation

Periphyton (slime) or aquatic plant samples are collected at or near locations used for surface water sampling. They are collected twice during the year (2nd and 3rd quarter), if available. The samples are analyzed for gross beta activity and, if available in sufficient quantity, for Sr-89, Sr-90, and by Gamma Isotopic Analysis. Reporting units are pCi/g wet weight.

Fish

Fish are collected three times per year (second, third, and fourth quarters) near the discharge area (K-1d). Flesh is separated from the bones and analyzed for gross beta activity and by Gamma Isotopic Analysis. The bones are analyzed for gross beta activity and Sr-89 and Sr-90. Reporting units are pCi/g wet weight.

Domestic Meat

Domestic meat (chickens) may be collected once a year during the 3rd quarter, from three locations in the vicinity of the plant (K-24, K-29, and K-32). Samples may not be available every year at every location due to farmer preference. At least one control and one indicator should be collected. The flesh is analyzed for gross alpha, gross beta, and by Gamma Isotopic Analysis to identify and quantify gamma-emitting radionuclides. Reporting units are pCi/g wet weight.

Ambient Radiation

Two packets of thermoluminescent dosimeters ($CaSO_4$: Dy cards) are placed at twenty-two locations, six of which are air sampling locations (K-1f, K-2, K-7, K-8, K-31, and K-41), four of which are milk sampling locations (K-3, K-5, K-25, and K-39), eight of which are ISFSI area locations (K-11 through K-1s), and the remaining four locations are K -15, K-17, K-27, and K-30. One packet is changed quarterly and one annually. Annual TLDs will serve as an emergency set to be read when needed. They will be exchanged annually (without reading) if not read during the year. To insure the precision of the measurement, each packet will contain two cards with four dosimeters each (four sensitive areas each for a total of eight). For protection against moisture each set of cards is sealed in a plastic bag and placed in a plastic container.

Each card is individually calibrated for self-irradiation and light response. Fading is guaranteed by the manufacturer (Teledyne Isotopes) not to exceed 20% in one year. Minimum sensitivity for the multi-area dosimeter is 0.5 mR defined as 3 times the standard deviation of the background. Maximum Error (1 standard deviation) - ^{60}Co Gamma +/-0.2 mR or +/-3%, whichever is greater. The maximum spread between areas on the same dosimeter is 3.5% at 1 standard deviation.

Reporting units for TLDs are mR/91 days for quarterly TLDs and mR/exposure period for annual TLDs.

Tests for uniformity and reproducibility of TLDs as specified in ANSI N545-1981 and NRC Regulatory Guide 4.13, are performed annually.

Well Water

One gallon water samples are taken once every three months from four off-site wells, (K-10, K-11, K-13, and K-38) and two on-site wells (K-1h and K-1g). All samples are analyzed for gross beta in the total residue, K-40, tritium, and by Gamma Isotopic Analysis. Samples from one on-site well are analyzed for Sr-89, and Sr-90. Samples from K-1h and K-1g are also analyzed for gross alpha. Reporting units are pCi/l.

Precipitation

A monthly cumulative sample of precipitation is taken at Location K-11. This sample is analyzed for tritium. Reporting units are pCi/l.

Milk

Milk samples are collected from two herds that graze within three miles of the reactor site (K-38 and K-34); from four herds that graze between 3-7 miles of the reactor site (K-3, K-5, K-35, and K-39); and one from a dairy in Green Bay (K-28), 26 miles from the reactor site.

The samples are collected twice per month during the grazing period (May through October) and monthly for the rest of the year. To prevent spoilage the samples are treated with preservative. All samples are analyzed by Gamma Isotopic Analysis and for iodine -131 immediately after they are received at the laboratory. To achieve required minimum sensitivity of 0.5 pCi/l, iodine is separated on an ion exchange column, precipitated as palladium iodide and beta counted. Monthly samples and monthly composites of semimonthly samples are then analyzed for Sr-89 and Sr-90. Potassium and calcium are determined and the ^{137}Cs/gK and ^{90}Sr/gCa ratios are calculated. Reporting units are pCi/l except for stable potassium and calcium, which are reported in g/l.

If milk samples are not available, green leafy vegetables will be collected on a monthly basis (when available) from Locations K-23A, K-23B, and K-26.

Grass

Grass is collected three times per year (2nd, 3rd, and 4th quarters) from the six dairy farms (K-3, K-5, K-35, K-34, K-38, and K-39) and from two on-site locations (K-1b and K-1f). The samples are analyzed for gross beta activity, for Sr-89 and Sr-90, and Gamma Isotopic Analysis to identify and quantify gamma-emitting radionuclides. Reporting units are pCi/g wet weight.

Cattlefeed

Once per year, during the first quarter when grass is not available, cattlefeed (such as hay or silage) is collected from the six dairy farms. The analyses performed are the same as for grass. Reporting units are pCi/g wet weight.

Vegetables and Grain

Annually, during the 3rd quarter, samples of five varieties of vegetables grown and marketed for human consumption are collected from K-26, depending upon the availability of samples. If samples are not available from this location, samples may be obtained from any local source so there is some sample of record. The location will be documented. In addition, two varieties of grain or leafy vegetables from the highest predicted X/Q and D/Q, if available, are collected annually from the farmland owned by Dominion Energy Kewaunee (K-23 a and b) and rented to a private individual for growing crops. The analyses performed are the same as for grass. Reporting units are pCi/g wet weight.

Eggs

Quarterly samples of eggs can be taken from K-24 and K-32. At least one control and one indicator should be collected. The samples are analyzed for gross beta activity, for Sr-89 and Sr-90, and Gamma Isotopic Analysis to identify and quantify gamma-emitting radionuclides. Reporting units are pCi/g wet weight.

Soil

Twice during the growing season samples of the top two inches of soil are collected from the six dairy farms and from an on-site location (K-1f). The soil is analyzed for gross alpha and gross beta activities, for Sr-89 and Sr-90, and Gamma Isotopic Analysis to identify and quantify gamma-emitting manmade radionuclides. Reporting units are pCi/g dry weight.

Surface Water

Surface water is sampled monthly from Lake Michigan at the KPS discharge (K-1d), two samples (north and south ends), of Two Creeks Park, 2.5 miles south of the reactor site (K-14a, K-14b). Samples are collected monthly at the Green Bay Municipal Pumping station between Kewaunee and Green Bay (K-9). Raw and treated water is collected. Monthly samples are also taken, when available, from each of the three creeks (K-1a, K-1b, K-1e) that pass through the reactor site and from the drainage pond (K-1k) south of the plant. The samples are taken at a point near the mouth of each creek and at the shore of the drainage pond. The water is analyzed for gross beta activity in:

a. The total residue,
b. The dissolved solids, and
c. The suspended solids.

The samples are also analyzed for K-40 and by Gamma Isotopic Analysis. Quarterly composites from all locations are analyzed for tritium, Sr-89 and Sr-90. Reporting units are pCi/l.

Bottom Sediments

Five samples of Lake Michigan bottom sediments, one at the discharge (K-1d), one from 500 feet north of the discharge (K-1c), one from 500 feet south of the discharge (K-1j), and one at the Two Creeks Park (K-14), one at the Green Bay Municipal Pumping Station (K-9) are collected semi-annually (May and November). The samples are collected at the beach in about 2-3 feet of water. All samples are analyzed for gross beta activity, for Sr-89 and Sr-90 and by Gamma isotopic Analysis. Since it is known that the specific activity of the sediments (i.e., the amount of radioactivity per unit mass of sediment) increases with decreasing particle size, the sampling procedure will assure collection of very fine particles. Reporting units are pCi/g dry weight.

Ground Monitoring Wells

Figure 3 shows the location of 14 installed groundwater monitoring wells. The wells and location are identified with a diamond shape in Figure 3. The wells are labeled MW (Monitoring Well) and AB (Auxiliary Building).

The Groundwater Protection Program consists of the 14 wells in addition to the two on-site wells already in the REMM (K-1g and K-1h).

Results of analyses and a description of any event above Reporting Levels will be included in the Annual Environmental Monitoring Report for K-1g, K-1h and in the Annual Radioactive Effluent Release Report for the other 14 wells.

Table 2.2.1-A ***Radiological Environmental Monitoring Program***				
Exposure Pathway And/Or Sample	Minimum Required Samples [a]	Available Sample Locations [b]	Sampling, Collection and Analysis Frequency	Type of Analysis
1. Direct Radiation[c]	13 Inner Ring locations	**K-5, K-25, K-27, K-7, K-1f, K-30, K-1l, K-1m, K-1n, K-1o, K-1p, K-1q, K-1r, K-1s**	See Table 2.2.1-B	Gamma dose
	6 Outer Ring locations	**K-2, K-3, K-15, K-17, K-8, K-31, K-39**		
	1 Control location	**K-41**		
	1 Population center	**K-7**		
	1 Special interest location	**K-8**		
	1 Nearby resident	**K-27**		
2. Airborne Radioiodine and Particulates	3 samples close to the site boundary in highest average X/Q	**K-1f, K-2, K-7, K-8, K-31**	See Table 2.2.1.B Continuous sampler operation Iodine; charcoal	Iodine (I-131) by Gamma Isotopic[f] Particulates; gross beta analysis[e] Gamma isotopic of composite (by location) [f]
	1 sample from the closest community having the highest X/Q	**K-7**	Particulates See Table 2.2.1-B	
	1 sample from a control location	**K-41[d]**	See Table 2.2.1-B	
3. Waterborne a. Surface[g]	1 Upstream sample 1 Downstream sample	**K-1a, K-9[j], K-1d** **K-1c, K-14a, K-14b, K-1k, K-1b**	Grab sample See Table 2.2.1-B	Gross Beta, Gamma isotopic K-40 [f] Composite of grab samples for tritium, K-40 and Sr 89/90
b. Ground	1-2 location likely to be affected [d]	**K-1g, K-1h[h]**	Grab sample See Table 2.2.1-B	Gamma isotopic [f], tritium and K-40 analysis Gross Beta, one well for Sr 89/90

Table 2.2.1-A ***Radiological Environmental Monitoring Program***				
Exposure Pathway And/Or Sample	Minimum Required Samples [a]	Available Sample Locations [b]	Sampling, Collection and Analysis Frequency	Type of Analysis
c. Drinking	1-3 samples of nearest water supply	**K-10, K-11, K-13, K-38**	Grab sample See Table 2.2.1-B	Gross beta and gamma isotopic [f] analysis. Tritium and K-40 analysis of the composite of monthly grab samples. [i]
d. Sediment from shoreline	1 sample from downstream area with potential for recreational value	**K-14, K-1c, K-1d, K-1j, K-9**	Grab sample See Table 2.2.1-B	Gamma isotopic [f] analysis Gross Beta, Sr 89/90
4. Ingestion a. Milk	Samples from milking animals in 3 locations within 5 km having the highest dose potential. 1 alternate location 1 control location	**K-5[k], K-38, K-34** **K-3, K-39** **K-35, K-28**	See Table 2.2.1-B	I-131 Gamma Isotopic [f] SR 89/90
b. Fish	3 random samplings of commercially and recreationally important species in the vicinity of the discharge.	**K-1d**	See Table 2.2.1-B	Gamma isotopic [f] and Gross Beta on edible portions, Gross Beta and Sr 89/90 on bones
c. Food Products	Samples of grain or leafy vegetables grown nearest each of two different offsite locations within 5 miles of the plant if milk sampling is not performed.	2 samples **K-23a, K-23b** – and one more location if available 1 sample 15-30 km distant if milk sampling is not performed. **K-26**	See Table 2.2.1-B	Gamma isotopic [f] and I-131 Analysis.

Table 2.2.1-A ***Radiological Environmental Monitoring Program***				
Exposure Pathway And/Or Sample	Minimum Required Samples [a]	Available Sample Locations [b]	Sampling, Collection and Analysis Frequency	Type of Analysis
5. Miscellaneous samples not identified in NUREG-0472 a. Aquatic Slime	None required	K-1k K-1a, K-1b, K-1e K-14, K-1d K-9 (control)	See Table 2.2.1-B	Gross Beta activity and if available Sr-89, Sr-90 and Gamma Isotopic[f]
b. Soil	None required	K-1f, K-5, K-35, K-39 K-34, K-38 K-3, (control)	See Table 2.2.1-B	Gross Alpha/Beta Sr-89 and Sr-90 Gamma Isotopic[f]
c. Cattlefeed	None required	K-5, K-35, K-39 K-34, K-38 K-3,(control)	See Table 2.2.1-B	Gross Beta Sr-89 and Sr-90 Gamma Isotopic[f]
d. Grass	None required	K-1b, K-1f, K-35, K-39 K-5, K-34, K-38 K-3,(control)	See Table 2.2.1-B	Gross Beta Sr-89 and Sr-90 Gamma Isotopic[f]
e. Domestic Meat	None required	K-24, K-29 K-32 (control)	See Table 2.2.1-B	Gross Alpha/Beta Gamma Isotopic[f]
f. Eggs	None required	K-32 K-24	See Table 2.2.1-B	Gross Beta Sr-89/90 Gamma Isotopic[f]
g. Precipitation	None required	K-11	See Table 2.2.1-B	Tritium

Table 2.2.1-A *Radiological Environmental Monitoring Program*				
Exposure Pathway And/Or Sample	Minimum Required Samples [a]	Available Sample Locations [b]	Sampling, Collection and Analysis Frequency	Type of Analysis

Table Notations	
a.	The samples listed in this column describe the minimum sampling required to meet REMP requirements.
b.	Additional details of sample locations are provided in Table 2.2.1-C and Figure 1. The REMP requires that samples to be taken from each of the "available sample locations" listed (see section 3.1). Deviations from the required sampling schedule will occur if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, reasonable efforts shall be made to complete corrective actions prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented, as required by REMM 2.4.1.c, in the Annual Radiological Environmental Monitoring Report. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the REMM. The cause of the unavailability of samples for that pathway and the new location(s) for obtaining replacement samples will be identified in the Annual Radiological Environmental Monitoring Report.
c.	For the purposes of this table, each location will have 2 packets of thermoluminescent dosimeters (TLDs). The TLDs are CaSO4: Dy cards with 2 cards/packet and 4 dosimeters/card (four sensitive areas each for a total of eight dosimeters/packet). The NRC guidance of 40 stations is not an absolute number. The number of direct radiation monitoring stations has been reduced according to geographical limitations; e.g., Lake Michigan. The frequency of analysis or readout for TLD systems depends upon the characteristics of the specific system used and selection is made to obtain optimum dose information with minimal fading.
d.	The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites that provide valid background data may be substituted.
e.	Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.
f.	Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.
g.	The "upstream sample" shall be taken at a distance beyond significant influence of the discharge. The "downstream" sample shall be taken in an area near the mixing zone.
h.	Ground water samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.
i.	In the event elevated analysis are reported by CV for gamma isotopic or tritium, a review will be conducted with the option to retest additional analysis for hard to detect isotopes or alpha emitters. The additional test may include Fe-55, Ni-63, or alpha emitters anticipated on current plant conditions.
j.	Two samples to be collected, Raw and Treated
k.	K-5 is about 5.1 km, closest Milk Location available.

Table 2.2.1-B *Type and Frequency of Collection*							
Location	Weekly	Biweekly	Monthly	Quarterly	Semi-Annually		Annually
K-1a			SW			SL[f]	
K-1b			SW	GR[a]		SL[f]	
K-1c					BS[b]		
K-1d			SW	FI[a]	BS[b]	SL[f]	
K-1e			SW			SL[f]	
K-1f	AP[g]	AI		GR[a] TLD	SO		
K-1g				WW			
K-1h				WW			
K-1j					BS[b]		
K-1k			SW			SL[f]	
K-1l				TLD			
K-1m				TLD			
K-1n				TLD			
K-1o				TLD			
K-1p				TLD			
K-1q				TLD			
K-1r				TLD			
K-1s				TLD			
K-2	AP[g]	AI		TLD			
K-3			MI[c]	GR[a] TLD	SO		CF[d]
K-5			MI[c]	GR[a] TLD	SO		CF[d]
K-7	AP[g]	AI		TLD			
K-8	AP[g]	AI		TLD			
K-9			SW[i]		BS[b]	SL[f]	
K-10				WW			
K-11			PR	WW			
K-13				WW			
K-14			SW[h]		BS[b]	SL[f]	
K-15				TLD			
K-17				TLD			
K-23a							GRN/GLV
K-23b							GRN/GLV
K-24				EG			DM
K-25				TLD			
K-26							VE
K-27				TLD			

Table 2.2.1-B *Type and Frequency of Collection*							
Location	Weekly	Biweekly	Monthly	Quarterly	Semi-Annually		Annually
K-28			MI[c]				
K-29							DM
K-30				TLD			
K-31	AP[g]	AI		TLD			
K-32				EG			DM
K-34			MI[c]	GR[a]	SO		CF[d]
K-35			MI[c]	GR[a]	SO		CF[d]
K-38			MI[c]	GR[a] WW	SO		CF[d]
K-39			MI[c]	TLD GR[a]	SO		CF[d]
K-41	AP[g]	AI		TLD			

a. Three times a year, second (April, May, June), third (July, August, September), and fourth (October, November, December) quarters
b. To be collected in May and November
c. Monthly from November through April; semimonthly from May through October
d. First (January, February, March) quarter only
e. Alternate if milk is not available
f. Second and third quarters
g. The frequency may be increased dependent on the dust loading.
h. Two water samples are collected, North (K-14a) and South (K-14b) of Two Creeks Rd.
i. Two samples, raw and treated

Code	Description	Code	Description	Code	Description
AI	Airborne Iodine	FI	Fish	SO	Soil
AP	Airborne Particulate	GR	Grass	SW	Surface Water
BS	Bottom Sediment	GRN	Grain	TLD	Thermoluminescent Dosimeter
CF	Cattlefeed	MI	Milk	VE	Vegetables
DM	Domestic Meat	PR	Precipitation	WW	Well Water
EG	Eggs	SL	Slime	GLV	Green Leafy Vegetables

Table 2.2.1-C *Sampling Locations, Kewaunee Power Station*			
Code	**Type[a]**	**Distance (Miles)[b] and Sector**	**Location**
K-1			Onsite
K-1a	I	0.62 N	North Creek
K-1b	I	0.12 N	Middle Creek
K-1c	I	0.10 N	500′ North of Condenser Discharge
K-1d	I	0.10 E	Condenser Discharge
K-1e	I	0.12 S	South Creek
K-1f	I	0.12 S	Meteorological Tower
K-1g	I	0.06 W	South Well
K-1h	I	0.12 NW	North Well
K-1j	I	0.10 S	500′ south of Condenser Discharge
K-1k	I	0.60 SW	Drainage Pond, south of plant
K-1l	I	0.13 N	ISFSI Southeast
K-1m	I	0.15 N	ISFSI East
K-1n	I	0.16 N	ISFSI Northwest
K-1o	I	0.16 N	ISFSI North
K-1p	I	0.17 N	ISFSI Northwest
K-1q	I	0.16 N	ISFSI West
K-1r	I	0.13 N	ISFSI West
K-1s	I	0.12 N	ISFSI Southwest
K-2	C	8.91 NNE	WPS Operations Building in Kewaunee
K-3	C	5.9 N	Lyle and John Siegmund Farm, N2815 Hy 42, Kewaunee
K-5	I	3.2 NNW	Ed Paplham Farm, E4160 Old Settlers Rd, Kewaunee
K-7	I	2.51 SSW	Ron Zimmerman Farm, 17620 Nero Rd, Two Rivers
K-8	C	4.85 WSW	Saint Isadore the Farmer Church, 18424 Tisch Mills Rd, Tisch Mills
K-9	C	11.5 NNE	Green Bay Municipal Pumping Station, six miles east of Green Bay (sample source is Lake Michigan from Rostok Intake 2 miles north of Kewaunee)
K-10	I	1.35 NNE	Turner Farm, Kewaunee Site
K-11	I	0.96 NW	Harlan Ihlenfeld Farm, N879 Hy 42, Kewaunee
K-13	C	3.0 SSW	Rand's General Store, Two Creeks
K-14	I	2.6 S	Two Creeks Park, 2.5 miles south of site
K-15	C	9.25 NW	Gas Substation, 1.5 miles north of Stangelville
K-17	I	4.0 W	Jansky's Farm, N885 Cty Tk B, Kewaunee

Table 2.2.1-C *Sampling Locations, Kewaunee Power Station*			
Code	**Type[a]**	**Distance (Miles)[b] and Sector**	**Location**
K-20(c)	I	2.5 N	Carl Struck Farm, N1596 Lakeshore Dr., Kewaunee
K-23a	I	0.5 W	0.5 miles west of plant, Kewaunee site
K-23b	I	0.6N	0.6 miles north of plant, Kewaunee site
K-24	I	5.4 N	Fictum Farm, N2653 Hy 42, Kewaunee
K-25	I	1.9 SW	Wotachek Farm, E3968 Cty Tk BB, Two Rivers
K-26(d)	C	9.1 SSW	Sandy's Vegetable Stand (8.0 miles south of "BB")
K-27	I	1.53 NW	Schleis Farm, E4298 Sandy Bay Rd
K-28	C	26 NW	Hansen Dairy, 1742 University Ave., Green Bay, Wisconsin
K-29	I	5.34 W	Kunesh Farm, E3873 Cty Tk G, Kewaunee
K-30	I	0.8 N	End of site boundary
K-31	I	6.35 NNW	E. Krok Substation, Krok Road
K-32	C	7.8 N	Piggly Wiggly, 931 Marquette Dr., Kewaunee
K-34	I	2.7 N	Leon and Vicky Struck Farm, N1549 Lakeshore Drive, Kewaunee
K-35(e)	C	6.71 WNW	Duane Ducat Farm, N1215 Sleepy Hollow, Kewaunee
K-36(f)	I		Fiala's Fish Market, 216 Milwaukee, Kewaunee
K-38	I	2.45 WNW	Dave Sinkula Farm, N890 Town Hall Road, Kewaunee
K-39	I	3.46 N	Francis Wotja Farm, N1859 Lakeshore Road, Kewaunee
K-41 (g)	C	22 NW	KPS-EOF, 3060 Voyager Drive, Green Bay

a. I = indicator; C = control.
b. Distances are measured from reactor stack.
c. Location removed from program in 2007
d. Location K-18 was changed because Schmidt's Food Stand went out of business. It was replaced by Bertler's Fruit Stand (K-26). Replaced with Sandy's Vegetable in 2007.
e. Removed from the program in Fall of 2001, back to program in August 2008.
f. Removed from the program in Fall of 2001, back to program in August 2008.
g. Location replaces K-16, January of 2007

Table 2.2.1-D *Reporting Levels for Radioactivity Concentrations in Environmental Samples*			
Medium	**Radionuclide**	**Reporting Levels**	
		CV to KPS[a]	**KPS to NRC[b]**
Airborne Particulate or Gases (pCi/m3)	Gross Beta	1	--
	I-131 (Charcoal)	0.1	0.9
	Cs-134	1	10
	Cs-137	1	20
Precipitation (pCi/l)	H-3	1,000	--
Water (pCi/l)	Gross Alpha	10	--
	Gross Beta	30	--
	H-3	10,000	20,000[c]
	Mn-54	100	1,000
	Fe-59	40	400
	Co-58	100	1,000
	Co-60	30	300
	Zr-Nb-95	40	400
	Cs-134	10	30
	Cs-137	20	50
	Ba-La-140	100	200
	Sr-89	8[d]	- -
	Sr-90	8[d]	- -
	Zn-65	30	300
Milk (pCi/l)	I-131	1.0	3
	Cs-134	20	60
	Cs-137	20	70
	Ba-La-140	100	300
	Sr-89	10	- -
Grass, Cattle Feed, and Vegetables (pCi/g wet)	Gross Beta	30	- -
	I-131	0.1	0.1
	Cs-134	0.2	1
	Cs-137	0.2	2
	Sr-89	1	- -
	Sr-90	1	- -

Table 2.2.1-D *Reporting Levels for Radioactivity Concentrations in Environmental Samples*			
Medium	**Radionuclide**	**Reporting Levels**	
		CV to KPS[a]	**KPS to NRC[b]**
Eggs (pCi/g wet)	Gross Beta	30	- -
	Cs-134	0.2	1
	Cs-137	0.2	2
	Sr-89	1	- -
	Sr-90	1	- -
Soil, Bottom Sediments (pCi/g)	Gross Beta	50	- -
	Cs-134	5	- -
	Cs-137	5	- -
	Sr-89	5	- -
	Sr-90	5	- -
Meat (pCi/g wet)	Gross Beta (Flesh, Bones)	10	- -
	Cs-134 (Flesh)	1.0	1.0
	Cs-137 (Flesh)	2	2.0
	Sr-89 (Bones)	2	- -
	Sr-90 (Bones)	2	- -
Fish (pCi/g wet)	Gross Beta (Flesh, Bones)	10	--
	Mn-54	--	30.0
	Fe-59	--	10.0
	Co-58	--	30.0
	Co-60	--	10.0
	Cs-134 (Flesh)	1	1.0
	Cs-137 (Flesh)	2	2.0
	Sr-89 (Bones)	2	--
	Sr-90 (Bones)	2	--
	Zn-65 (Bones)	--	20

a. Radionuclides will be monitored by the CV and concentrations above the listed limits will be reported to KPS.

b. Concentrations above the listed limits will be reported to NRC as required by Specification 2.2.1.b.

c. For drinking water samples, this is 40CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.

d. The Sr-89/90 values are based on the EPA drinking water standards. See note "f." of Table 2.3.1-A for further information

Table 2.3.1-A
Detection Capabilities for Environmental Sample Analysis[a]
Lower Limit of Detection (LLD) [b,c]

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/kg, wet)	Milk (pCi/l)	Food Products (pCi/kg, wet)	Sediment (pCi/kg, dry)
Gross Beta	4	0.01				
H-3	2000[d]					
Mn-54	15		130			
Fe-59	30		260			
Co-58, 60	15		130			
Zr-Nb-95	15					
I-131	1[e]	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		
Zn-65	30		260			
Sr-89/90 [f]	5					

Table Notations for Table 2.3.1-A

a. This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environment Monitoring Report.

b. Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13.

c. The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \times V \times 2.22 \times Y \times \exp(-\gamma \Delta t)}$$

Where:

LLD is the a priori lower limit of detection as defined above, as picocuries per unit mass or volume,

S_b is the standard deviation of the background counting rate or of the counting rate of blank sample as appropriate, as counts per minute,

E is the counting efficiency, as counts per disintegration,

V is the sample size in units of mass or volume,

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield, when applicable,

γ is the radioactive decay constant for the particular radionuclide, and

Δt for environmental samples is the elapsed time between sample collection, or end of the sample collection period, and time of counting,

Typical values of E, V, Y, and Δt should be used in calculation.

Table Notations for Table 2.3.1-A (con't)

It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Monitoring Report.

d. If no drinking water pathway exists, a value of 3,000 pCi/l may be used.

e. LLD for drinking water samples. If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.

f. This is NOT a NUREG-0472 required value. It is based on EPA drinking water standards, which tie into the NEI Groundwater Protection Initiative that was implemented at KPS on August 4, 2006.

FIGURE 1

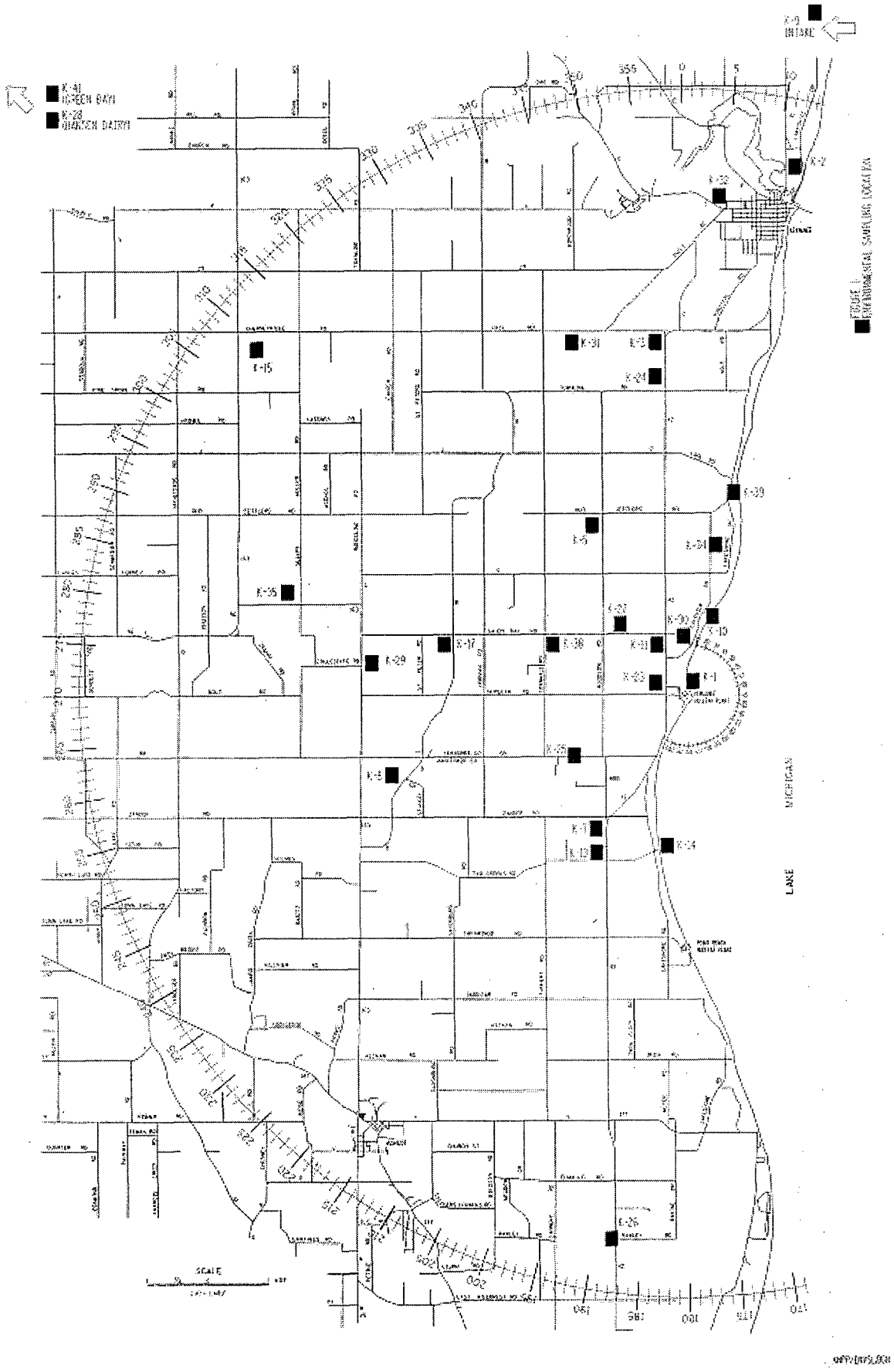

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FIGURE 2

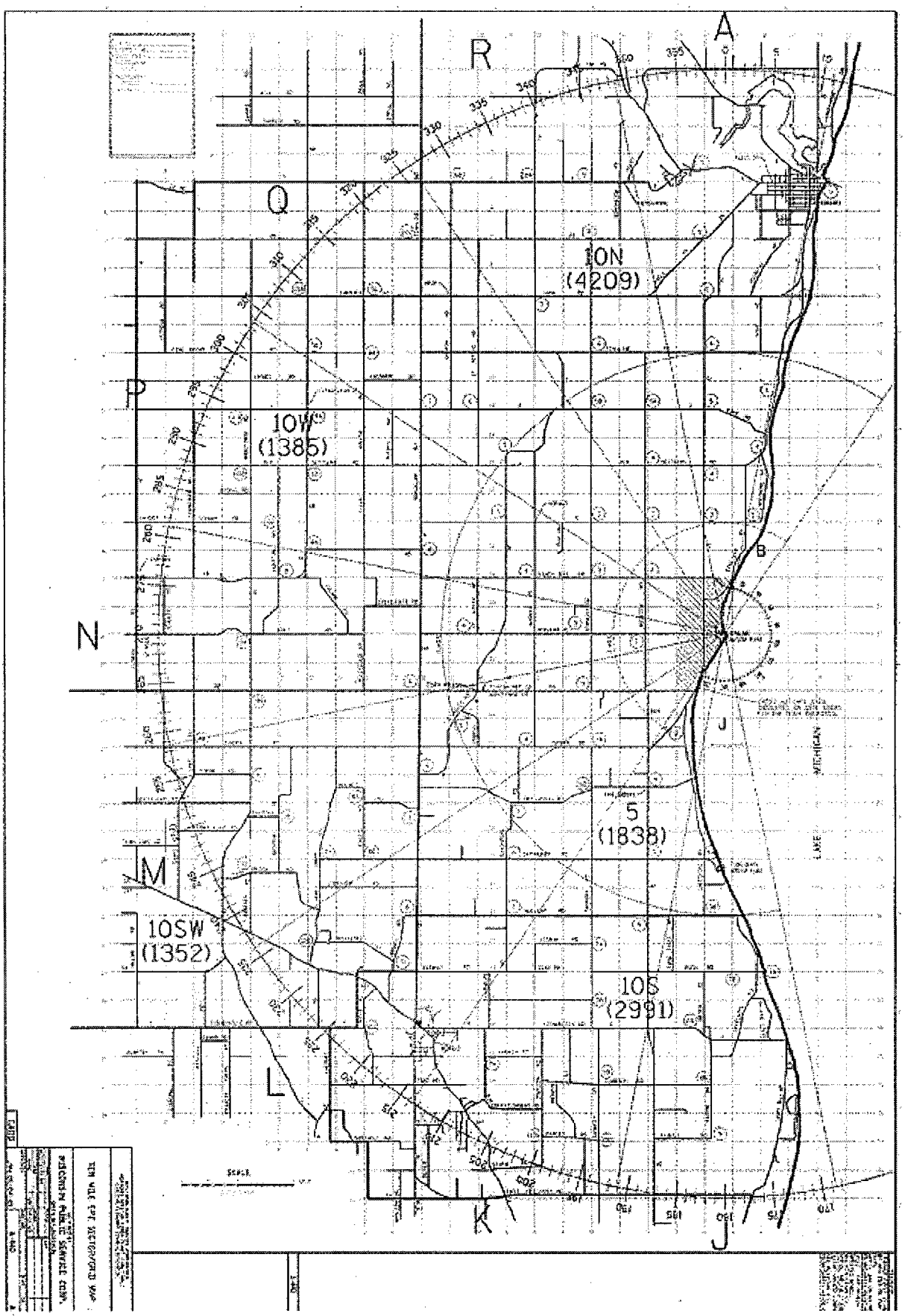

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FIGURE 3

NOTES:

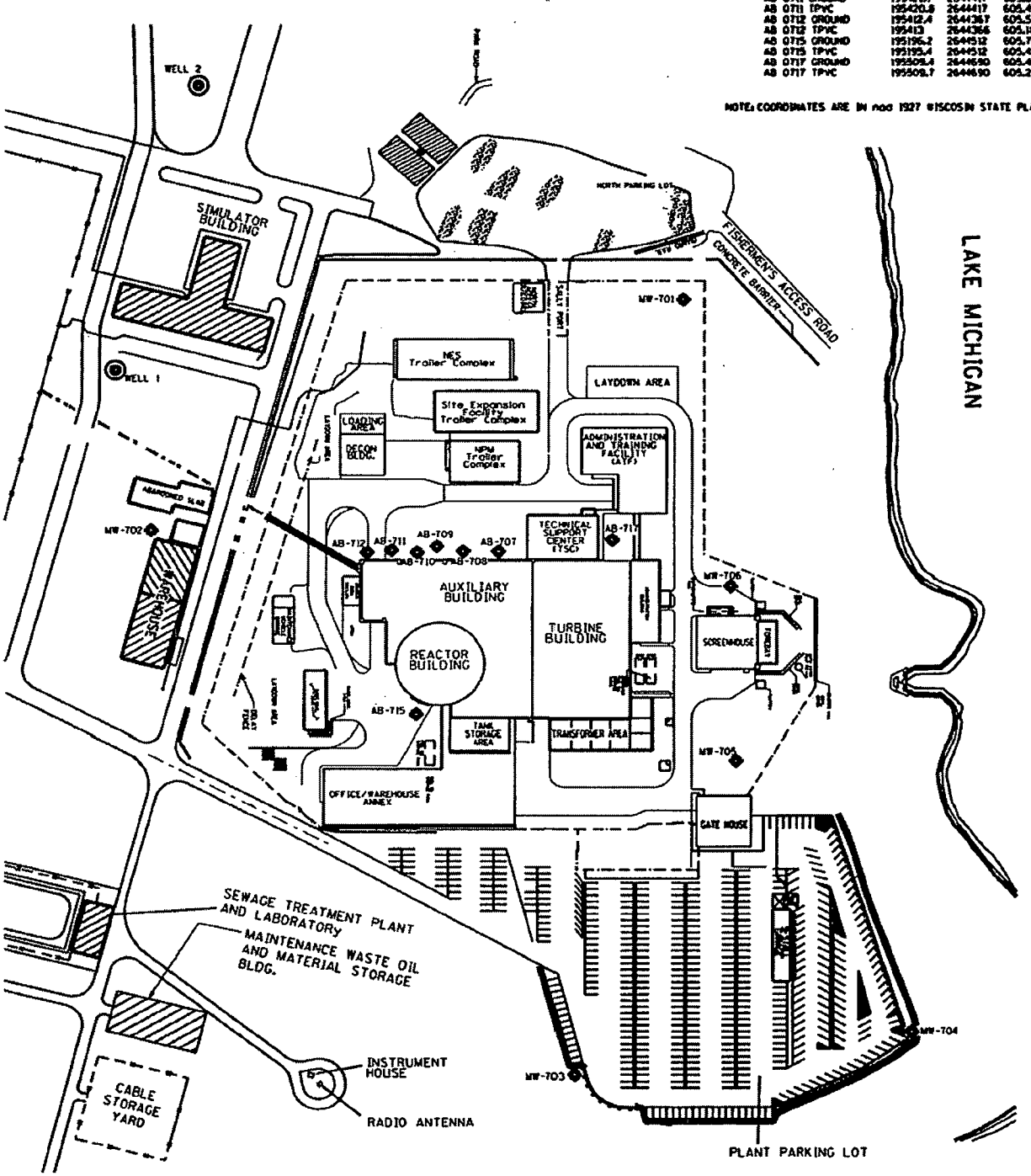
1. LOCATIONS OF MONITORING WELLS SURVEYED BY STS ON JUNE 21, 2007.
2. LOCATIONS OF WATER SUPPLY WELLS ARE ESTIMATED.

LOCATION	NORTHING	EASTING	ELEVATION
MW-0701 GROUND	195059.5	2644681	609.828
MW-0701 TPVC	195059	2644681	609.622
MW-0702 GROUND	195372.1	2644098	607.897
MW-0702 TPVC	195371.5	2644097	607.286
MW-0703 TPVC	194762.3	2644838	602.685
MW-0703 GROUND	194761.4	2644838	603.112
MW-0704 GROUND	194938.2	2645268	608.916
MW-0704 TPVC	194938.7	2645268	608.502
MW-0705 TPVC	195264.4	2644927	604.912
MW-0705 GROUND	195264.4	2644927	605.339
MW-0706 GROUND	195491.2	2644865	606.402
MW-0706 TPVC	195491.2	2644865	605.997
AB 0707 GROUND	195461	2644543	606.0853
AB 0707 TPVC	195460.4	2644543	605.6723
AB 0708 GROUND	195451.3	2644530	606.0615
AB 0708 TPVC	195451	2644529	605.5165
AB 0709 GROUND	195448.3	2644493	606.1195
AB 0709 TPVC	195448	2644493	605.8553
AB 0710 GROUND	195429.7	2644450	606.1495
AB 0710 TPVC	195429.2	2644450	605.8672
AB 0711 GROUND	195421.1	2644417	605.8849
AB 0711 TPVC	195420.8	2644417	605.4903
AB 0712 GROUND	195412.4	2644367	605.5062
AB 0712 TPVC	195413	2644366	605.1851
AB 0715 GROUND	195196.2	2644512	605.7393
AB 0715 TPVC	195195.4	2644512	605.4299
AB 0717 GROUND	195509.4	2644690	605.4798
AB 0717 TPVC	195508.7	2644690	605.2917

NOTE: COORDINATES ARE IN nad 1927 WISCOSIN STATE PLANE CENTRAL

LEGEND:

- 8' HIGH FENCE
- SUPPLY WELL
- MONITORING WELL



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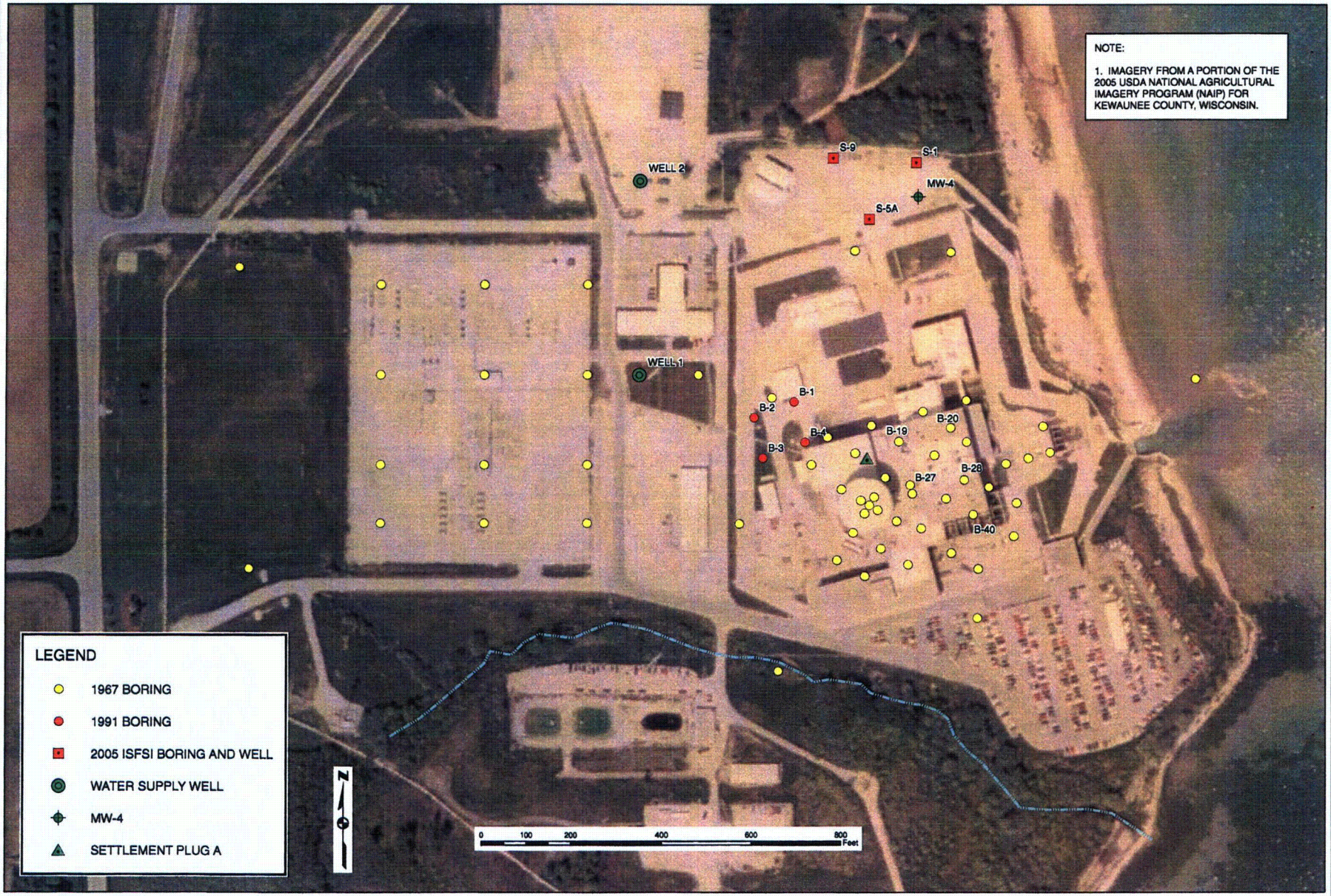

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DOMINION ENERGY
KEWAUNEE POWER STATION
KEWAUNEE COUNTY, WISCONSIN
HISTORICAL BORINGS & WATER SUPPLY WELL LOCATIONS

ISSUED
Rev Date
Description

Designed: JWK 8/27/07
Drawn: JWK 8/27/07
Checked:
Approved:

PROJECT NUMBER
200700302

REFERENCE NUMBER
Figure
2

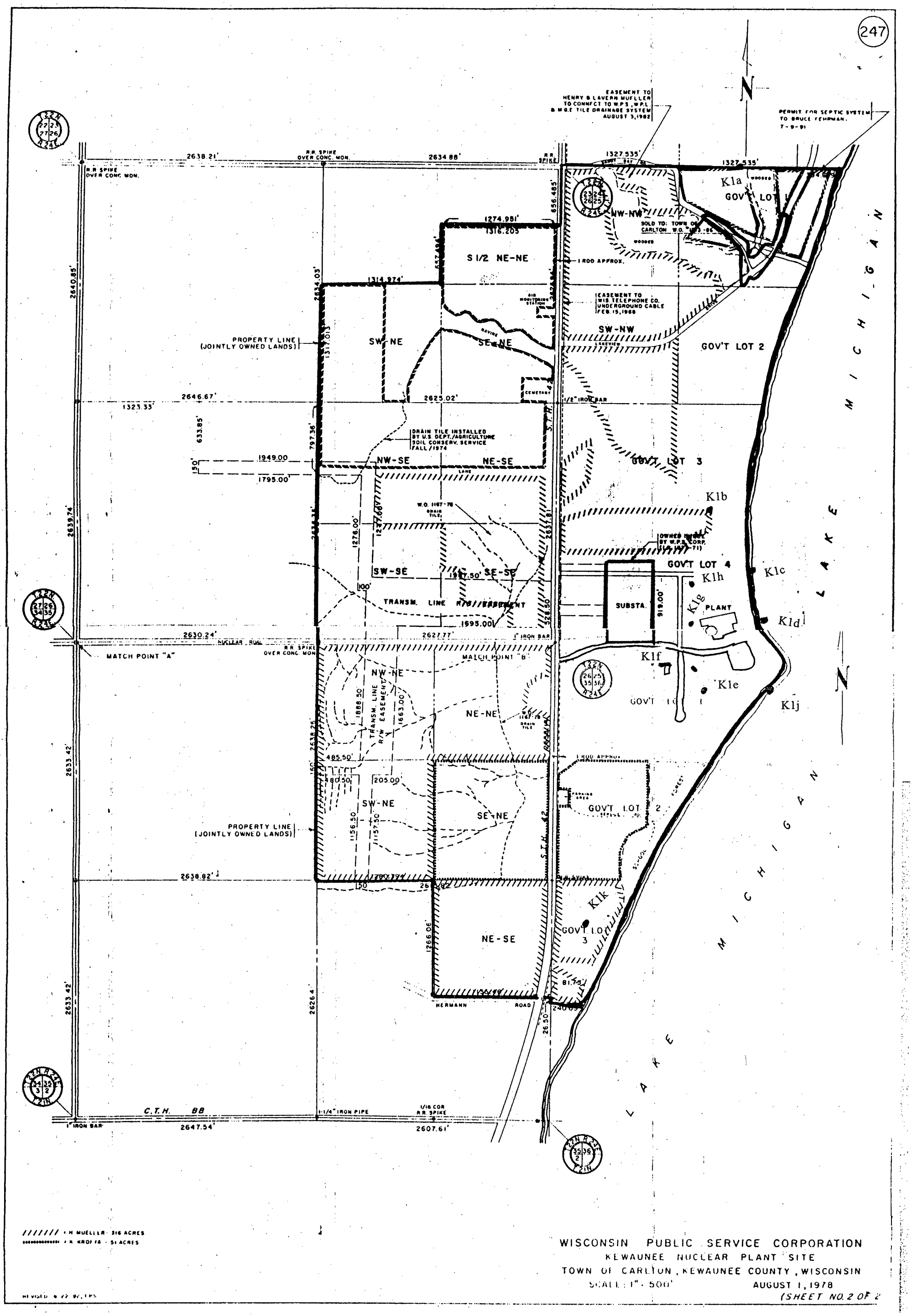
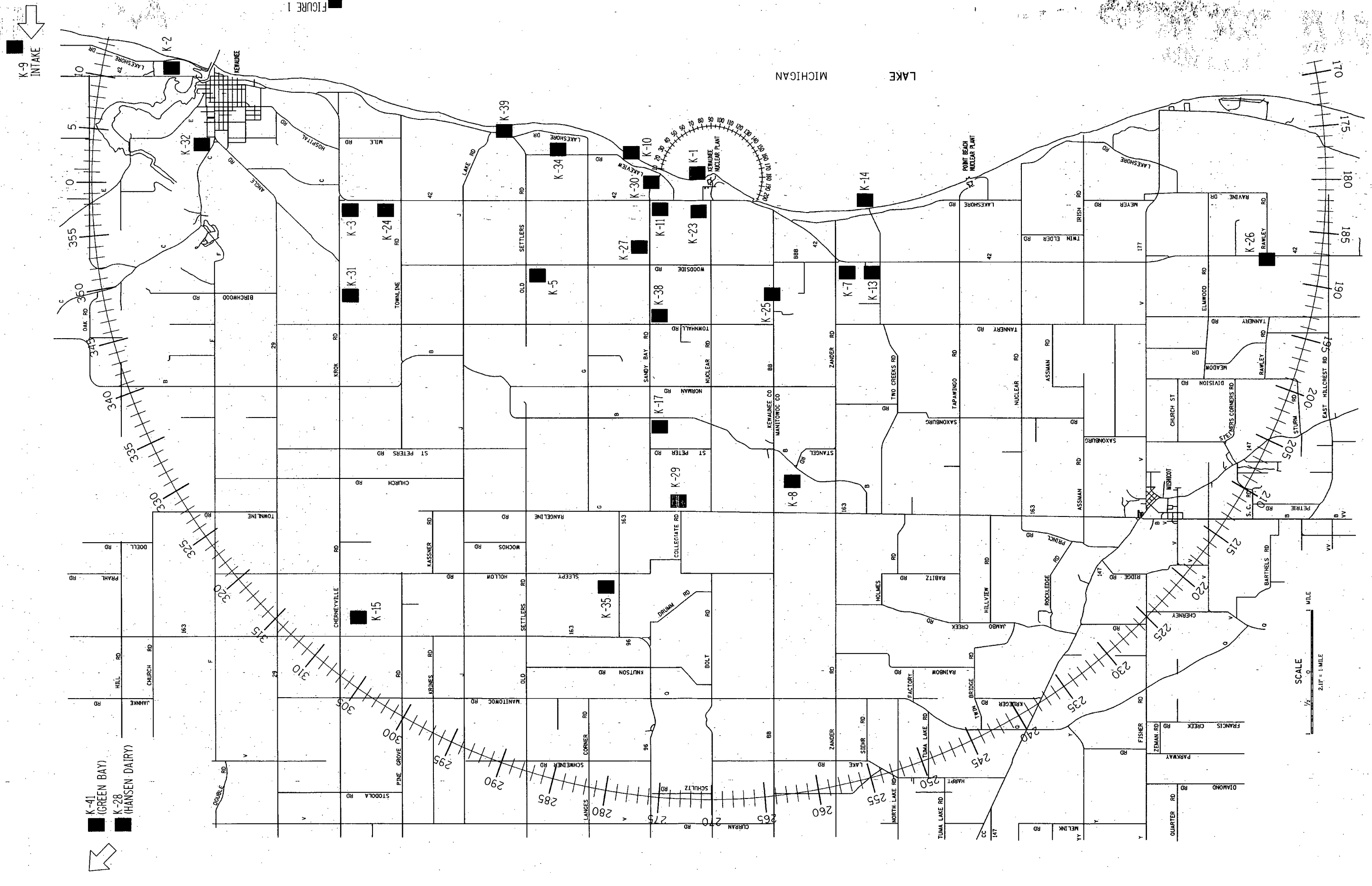

247
EASEMENT TO HENRY & LAVERN MUELLER TO CONNECT TO W.P.S., W.P.L. & M.G.E. TILE DRAINAGE SYSTEM AUGUST 3, 1982
PERMIT FOR SEPTIC SYSTEM TO BRUCE FEHRMAN. 7-9-91
R.R. SPIKE OVER CONC. MON.
2638.21'
2634.88'
1327.535'
1274.981'
1316.205
656.485'
S 1/2 NE-NE
NW-NW
SOLD TO: TOWN OF CARLTON W.O. 1183-86
Kla
GOV'T LOT 1
1 ROD APPROX.
EASEMENT TO WIS. TELEPHONE CO. UNDERGROUND CABLE FEB. 15, 1968
SW-NW
GOV'T LOT 2
PROPERTY LINE (JOINTLY OWNED LANDS)
SW-NE
SE-NE
2640.85'
2634.03'
1314.974'
1317.013
2646.67'
1323.33'
2625.02'
1/2" IRON BAR
633.85'
DRAIN TILE INSTALLED BY U.S. DEPT./AGRICULTURE SOIL CONSERV. SERVICE FALL/1974
NW-SE
NE-SE
1949.00
1795.00'
GOV'T LOT 3
Klb
W.O. 1167-78 DRAIN TILE
OWNED BY W.P.S. CORP.
GOV'T LOT 4
Klc
Klh
SW-SE
SE-SE
TRANSM. LINE R/W EASEMENT
SUBSTA.
PLANT
Kld
Klg
1695.00'
2630.24'
2627.77'
1" IRON BAR
NUCLEAR ROAD
R.R. SPIKE OVER CONC. MON.
MATCH POINT "A"
MATCH POINT "B"
Klf
NW-NE
NE-NE
Kle
GOV'T LOT 1
Klj
TRANSM. LINE R/W EASEMENT
1888.50
1663.00
2638.25'
2633.42'
485.50'
480.50
205.00
1 ROD APPROX.
SW-NE
SE-NE
GOV'T LOT 2
PROPERTY LINE (JOINTLY OWNED LANDS)
1156.50
1157.50
2638.82'
Klk
NE-SE
GOV'T LOT 3
1266.06'
2633.42'
2626.4'
HERMANN ROAD
26.50'
C.T.H. BB
1-1/4" IRON PIPE
1/16 COR R.R. SPIKE
1" IRON BAR
2647.54'
2607.61'
MICHIGAN
LAKE
N
H. MUELLER - 316 ACRES
K. KROFTA - 51 ACRES
WISCONSIN PUBLIC SERVICE CORPORATION
KEWAUNEE NUCLEAR PLANT SITE
TOWN OF CARLTON, KEWAUNEE COUNTY, WISCONSIN
SCALE: 1" = 500'
AUGUST 1, 1978
(SHEET NO. 2 OF 2)

FIGURE 1.
ENVIRONMENTAL SAMPLING LOCATION



KNPP/ENVSL.DGN

STS CONSULTANTS, LTD.

Report of Well Installation Services

Dominion Energy Kewaunee Power Station
Kewaunee, Wisconsin

STS Project No. 200700302

STS CONSULTANTS
1035 Kepler Drive
Green Bay, Wisconsin 54311
920-468-1978 Phone
920-468-3312 Fax

August 28, 2007

Mr. Donald W. Hintz, P.G.
Environmental Consultant
Dominion Generation
5000 Dominion Boulevard
Glen Allen, Virginia 23060

Mr. Richard Adams
Health Physics Specialist III
Kewaunee Power Station
N490 Highway 42
Kewaunee, Wisconsin 54216

Re: Report of Well Installation Services, Dominion Energy Kewaunee Power Station, Kewaunee, Wisconsin -- STS Project No. 200700302

Dear Mr. Hintz and Mr. Adams:

This report documents the installation, surveying, and sampling of 14 groundwater monitoring wells at the Dominion Energy Kewaunee Power Station in Kewaunee, Wisconsin. The services were completed in substantial accordance with STS' October 22, 2006, proposal and Dominion Purchase Order No. 70163903. Of the 18 well locations originally considered, 4 could not be accessed due to aboveground and or underground structures. STS purchased a submersible sampling pump for the project which has been delivered to Dominion for future sampling events. STS would be happy to assist you with future sampling events or other related services.

Thank you for allowing STS to assist you with this project. Please contact Mr. Bob Mottl or Mr. Jim Kauer at (800) 949-1978 with questions or comments regarding this report.

Sincerely,

STS

Robert J. Mottl, P.G.
Senior Project Geologist

James W. Kauer, P.G., P.H.
Associate Geologist

RJM/tjs

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Appendix A - Water Supply Well Records (7 pages)
WDNR Soil Boring Log Forms (14 pages)
WDNR Well Installation Forms (14 pages)
WDNR Well Development Forms (14 pages)

Appendix B - Groundwater Sampling Procedures

Appendix C - Laboratory Reports of Grain Size Analyses

Dominion Energy - Kewaunee Power Station
STS Project No. 200700302
August 28, 2007

EXECUTIVE SUMMARY

STS was retained by Dominion Energy Kewaunee, Kewaunee Power Station (Dominion), Kewaunee, Wisconsin, to assist with construction and sampling of groundwater monitoring wells for use in a groundwater tritium assessment at the plant. Fourteen groundwater monitoring wells were installed at the power plant. The wells were developed, surveyed, and sampled by STS.

Results of the work show:

- Soils close to the facility buildings consist primarily of up to 20 feet of sand and gravel fill soils underlain by brown silty clays and clayey silts. Farther from the building, natural soils consist of silty clay material to depths of 30 feet below ground surface (bgs).
- Groundwater is present beneath the site at depths ranging from 5 feet to 31 feet bgs. The groundwater elevation data are interpreted to show a general flow direction to the east, similar to the regional flow direction. The groundwater flow map is consistent with the assumption that the sand backfill beneath the facility functions as a preferential flow path for groundwater. No perched conditions were observed.
- A potential release of tritiated water from beneath the plant is most likely to be contained in the sand backfill beneath the building. Migration of a potential release is most likely to occur to the east toward Lake Michigan.
- Quarterly sampling and laboratory analyses for a period of one year are recommended to make observations of trends, seasonal or otherwise. An evaluation of the data should be made to determine the frequency of future sampling.

1.0 INTRODUCTION AND BACKGROUND

This report describes well installation and groundwater monitoring activities related to implementation of a groundwater monitoring program and an assessment of groundwater quality at the Kewaunee Power Station, Kewaunee County, Wisconsin, located at N490 Highway 42, Kewaunee, Wisconsin. The Kewaunee Power Station is a nuclear power plant for the generation of electricity.

1.1 Owner Information

Owner contact information is as follows:

Dominion Generation
5000 Dominion Boulevard
Glen Allen, Virginia 23060
Attention: Mr. Donald Hintz, P.G.
Phone: (804) 273-3552

Dominion Energy Kewaunee - Kewaunee Power Station
N490 Highway 42
Kewaunee, Wisconsin 54216
Attention: Mr. Rick Adams, Health Physics Specialist III
Phone: (920) 388-8360

1.2 Consultant Information

Consulting services, including groundwater monitoring well construction and groundwater sampling, were provided by STS. Contact information for STS is:

STS
1035 Kepler Drive
Green Bay, Wisconsin 54311
Attention: Mr. Bob Mottl and Mr. James Kauer
Phone: (920) 468-1978

1.3 Site Location

The Dominion facility is located on the west shoreline of Lake Michigan in Carlton Township, Wisconsin. Figure 1 (in Section 7.0) is a site location map prepared from the Two Creeks, Wisconsin, United States Geological Survey 7.5-minute quadrangle map. The majority of the Dominion facility is located in the southern portion of Section 25, Township 22 North, Range 24 East, in Kewaunee County. A small portion of the Dominion facility is located in the north portion of Section 36 in the same township and range. Dominion owns approximately 900 acres of contiguous property in the area.

1.4 Purpose of Investigation

Dominion has undertaken work to comply with a recently instituted industry initiative to establish groundwater monitoring programs at nuclear power plants. The focus of the initiative is for facility owners to determine if groundwater at a facility has been impacted by the release of radioactive material. The construction and sampling of groundwater monitoring wells at the Dominion facility is intended to aid Dominion to assess near surface groundwater quality at representative locations upgradient and downgradient of the reactor facility and a potential radioactive material release at the Auxiliary (Aux.) Building.

Dominion collected water samples from settlement plugs within the main reactor structure known as the Aux. Building in 2006. The tritium concentration in the water sample from Settlement Plug A (approximate location identified on Figure 2) was 102,000 picocurries per littler (pCi/L). This concentration is in excess of the EPA Maximum Concentration Limit (MCL) of 20,000 pCi/L established in 40 CFR 141.66. The exceedance prompted Dominion to make notifications of local, state, and federal agencies as required by the voluntary initiative.

Dominion contacted STS to assist with an evaluation of the groundwater conditions at the facility through the installation and sampling of groundwater monitoring wells. Monitoring wells were installed upgradient, sidegradient, and downgradient of the facility to characterize the hydrogeological conditions and provide an understanding of the predominant horizontal groundwater flow gradients.

1.5 Site History

The site was developed as a nuclear power-generating facility in the early 1970s. Prior to the development, land use was agricultural. STS involvement with the Kewaunee plant dates back to the 1960s during the initial geotechnical assessment for construction of the plant. In the 1960s, STS installed approximately 70 borings in and around the area of the facility for design of the structures. Over the years, STS was involved in several more geotechnical assessments for various construction projects. Most recently, in December 2005, STS conducted a geotechnical assessment for the proposed Independent Spent Fuel Storage Installation (ISFSI) facility to be located directly north of the main plant.

2.0 GEOLOGY

2.1 Regional Geology and Hydrogeology

The Wisconsin Geological and Natural History Survey (WGNHS) document titled "Water Resources of Wisconsin - Lake Michigan Basin Hydrologic Atlas HA-432" by E.L. Skinner and R.G. Borman (1973) reports that shallow soils in the area are primarily comprised of glacial lake deposits consisting of silt, sand, and clay extending to depths ranging from 50 to 100 feet bgs. The lacustrine soils are underlain by approximately 600 feet of undifferentiated Silurian dolomite. Below the Silurian dolomite there is approximately 700 feet of Ordovician shale and dolomite followed by 100 to 200 feet of Cambrian sandstone. Precambrian granite lies beneath the sandstone. The bedrock units dip to the east and represent the western portion of the Michigan basin, which is centered in the lower peninsula of Michigan.

The hydrogeologic framework of the region is described in the WGNHS document "Hydrogeology and Ground-Water Use and Quality, Brown County, Wisconsin" by J.T. Krohelski. The Quaternary deposits and Silurian formations are identified as the upper aquifer relative to the confining unit of the Ordovician shales. Regional groundwater flow in the area is generally east, toward Lake Michigan

2.2 Local Geology and Hydrogeology

STS has performed numerous subsurface assessment studies including approximately 70 borings in 1967 during initial design of the facility. The results of the local work are consistent with the regional data discussed in the literature.

Figure 2 was prepared depicting selected historical boring locations. A review of the 1967 boring logs indicates that, in general, soils observed across the site consisted of silty clays and clayey silts extending to depths approximately 50 to 60 feet below original ground surface. Some discontinuous sand lenses were observed. At approximately 50 to 60 feet bgs, granular soils consisting of sand and gravel were observed to extend to the bedrock surface, which was generally encountered at approximately 65 to 80 feet bgs (approximately 525 to 535 feet mean sea level [MSL]). The borings that terminated at the bedrock surface reflect the eastern sloping bedrock.

Borings B19 and B27, completed in 1967, in what is now the central portion of the Aux. Building, encountered sand lenses at depths of approximately 14 to 22 feet bgs (approximately +583 to +594 feet MSL). Borings B20, B28, and B-40, located just interior to the east wall of the Aux. Building, did not encounter sand lenses indicating that the lenses were not continuous through the area of construction of the plant.

In 1991, STS completed four geotechnical soil borings immediately north of the northwest corner of the Aux. Building (Figure 2). One boring (B-4) was advanced 10 feet north of the building. The soils observed in B-4 were silty sand fill with some gravel and extended to the boring termination depth of 21.5 feet bgs. A split-spoon sample collected from a depth of 20.0 to 21.5 feet in B-4 was the only sample with moisture reported in the fill soils. A second boring (B-3), installed approximately 100 feet away from the Aux. Building, encountered fill sands extending to a depth of only 4 feet with very stiff silty clay beneath the sand extending to the boring termination depth of 22 feet bgs. This suggests that fill placed during construction of the facility extends a relatively short lateral distance from the north side of the Aux. Building.

Three geotechnical soil borings (S-1, S-5A, and S-9) installed in the ISFSI area (Figure 2), near the north end of the facility in 2005, were completed with geotechnical monitoring wells. The ground surface elevation at all three borings was between +607 and +608 feet MSL. Soils reported in S-1 consisted of approximately 60 feet of silty clay over a boulder and a silty sand layer extending to the top of bedrock at 73 feet bgs (+533 feet MSL). The well at S-1 was screened in the sand layer at 63 to 73 feet bgs. Boring S-5A was advanced to a depth of 52 feet bgs and the well screened from 42 to 52 feet bgs in the silty clay. S-9 was advanced to 25 feet in shallow clays and the well screened from 15 to 25 feet bgs (+593 to +583 feet MSL). Water was present in all three wells at elevations of +576.6 feet (S-1), +584.5 feet (S-5A), and +604.5 feet (S-9) MSL. STS interpreted in the report that these water level measurements indicated a strong downward gradient. This information also suggested that saturated conditions in the unconsolidated materials on site are likely continuous. None of the data confirm the presence of perched conditions in the near surface clays.

Geotechnical borings completed for the ISFSI encountered limited petroleum contamination at Boring B-2. STS assisted with remedial action and received a Wisconsin Department of Natural Resources (WDNR) case closure for this project in early 2007. As part of the remedial action,

Monitoring Well MW-4 was installed in the ISFSI area to a depth of 20 feet, penetrating only silty clay soils. A hydraulic conductivity test was performed on this well and demonstrated that the silty clay has a low hydraulic conductivity of approximately 1×10^{-6} centimeters/second (cm/s).

Two water supply wells are located at the facility at the locations depicted on Figure 2. WGNHS provided three copies of Wisconsin Well Constructor's Reports (WCRs) and two geologic logs documenting the installation of these wells in 1968 (Appendix A). Two of the three WCRs are for the same well, which was first drilled to a depth of 250 feet in March 1968 and later extended to 310 feet in July 1968. The WCRs and logs for these wells indicate that clay soils were noted in the borings to a depth of 75 to 80 feet at which point Silurian dolomite bedrock was reported. The wells were drilled to depths of 310 and 320 feet and both were cased into bedrock to a depth of 95 feet. There was no reference to sandy soils or water bearing zones in the glacial soils above bedrock on the WCRs.

2.3 Conceptual Model for Assessment Strategy and Selection of Well Locations

In March 2007, the Electric Power Research Institute (EPRI) issued a draft document entitled, "Guideline for Implementing a Groundwater Protection Program at Nuclear Power Plants, Final Draft Report." Section 5.0 of the report is entitled "Establishing a Site Conceptual Model." Development of a conceptual model is the basis for the design of a groundwater monitoring program. Sources of information and factors to consider in the development of a conceptual model include:

- Aerial Photos and Engineering Drawings
- Previous Hydrogeologic Reports
- Potential On- and Off-site Receptors
- State and Local Regulations
- Preliminary Estimates of Groundwater Flow Characteristics

The conceptual model developed for the groundwater monitoring program and assessment activities at the facility generally incorporated these items.

Following are the basic elements of the conceptual model:

- Natural unconsolidated materials on site consist of relatively low permeability silty clays and clayey silts with discontinuous sand lenses;

- Sandy backfill material is present in the immediate vicinity of the constructed features and extends east to the Lake Michigan shoreline;
- Saturated conditions in the natural materials are encountered within 5 to 10 feet of the ground surface;
- Horizontal groundwater flow in the natural materials at the water table is generally east toward Lake Michigan;
- Strong downward gradients exist in the unconsolidated clayey and silty materials;
- The natural shallow horizontal groundwater flow regime is disturbed by the higher permeability sandy backfill present around the structures and extends to the shoreline;
- The sandy backfill expedites the flow of groundwater as it passes from west of the facility, underneath the plant, and east to Lake Michigan;
- A potential release of contaminated water from the area beneath the plant is likely to flow through the preferential pathway of the sand backfill toward Lake Michigan; migration to the north, west, or south into the lower permeability natural materials is less likely.

The general locations of groundwater monitoring wells were chosen to evaluate conditions in the near surface, natural, unconsolidated materials and to evaluate the potential for contamination to migrate from beneath the Aux. Building. Specific well locations were determined after considering the presence of underground utilities and traffic areas.

To explore the conditions in the natural materials, perimeter borings and wells were planned to evaluate the groundwater flow pattern on the property north, west, and south of the plant. Additional borings and wells were planned to explore conditions of the fill material proximate to the Aux. Building. These wells and wells positioned to the east toward Lake Michigan were intended to aid in the assessment of the groundwater flow beneath the plant.

The well installations, as planned, meet the intent of Guidance Statement 5.7.1a contained in Appendix B of the March 2007 EPRI draft document regarding well design. The guidance identifies ASTM D5092-04e1, ASTM D5978-96 (2005), the US EPA handbook, and the local state regulations as recognized standards for well construction. The wells were designed to comply with Chapter NR 141, Wisconsin Administrative Code, which specifies methods for drilling, construction, and development of groundwater monitoring wells in Wisconsin. The Code is generally consistent with the ASTM standards and US EPA handbook.

3.0 METHODS

3.1 Hydrovac Excavation

The potential for the existence of underground utilities caused Dominion to request that STS consider means to minimize potential damage to underground utilities and/or structures during boring advancement. In addition to using Dominion record drawings, a hydrovac system was required to be used to penetrate the ground surface for the first 5 feet of depth for each boring. STS rented a "*DITCHWITCH*" brand Hydro-excavator to advance each of the 14 borings completed to depths between 5 to 7 feet bgs. This allowed visual observation of the first 5 to 7 feet of depth to verify that buried utilities were not present in the shallow subsurface. The machine consists of a high pressure water-spray wand that dislodges the soil and forms a soil-water slurry. The device also has a vacuum suction pump which removes the soil-water slurry from the boring and pumps the mix into a temporary holding tank. Use of the hydrovac system is noted on each of the boring logs in the attachments.

3.2 Soil Borings

Between May 14 and June 8, 2007, an STS drill crew was on site and installed 14 soil borings/groundwater monitoring wells at the locations depicted on Figure 3. The installation consisted of six perimeter wells labeled MW-0701 through MW-0706 and eight Aux. Building Wells labeled AB-707, AB-708, AB-709, AB-710, AB-711, AB-712, AB-715, and AB-717. The original drilling plan had included a total number of 18 wells comprised of 6 perimeter wells and 12 Aux. Building wells. However as the project progressed, it became apparent that only 14 locations could be safely accessed based on utilities. During all boring activities, either an STS Environmental Engineer or Environmental Geologist was on site to monitor drilling operations.

Soil borings were advanced to depths between 20 and 37 feet bgs. All borings but Boring MW-0704 were advanced using hollow-stem auger. Because of an apparent boulder at a depth of approximately 23 feet bgs, MW-704 was advanced from 23 feet to 37 feet using 6-inch diameter steel casing and clear-water rotary drilling technique.

During drilling, soil samples were collected using a split-spoon sampling device in accordance with ASTM D1586, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils." Soil samples were transferred from the split-spoon to new, pint-size plastic jars and

described in the field by STS personnel. Soil samples contained in the pint-size plastic jars were returned to the STS soils laboratory where they were examined and classified according to the Unified Soil Classification System (USCS). In accordance with Chapter NR 141, Wisconsin Administrative Code, WDNR Soil Boring Log Information Forms (Form 4400-122) were prepared and are provided in the Appendix A.

3.3 Groundwater Monitoring Well Installation and Development

Monitoring wells were constructed in the 14 borings consisting of 2-inch-diameter, Schedule 40 PVC with flush-threaded joints. The screened portion of each well consisted of a 15-foot length of 2-inch-diameter, Schedule 40 PVC with 0.006-inch, factory-cut slots. The annulus around the well casing was backfilled with uniformly graded silica sand (Badger 40/60) to a level approximately 1 to 4 feet above the top of the screen. The remainder of the annulus was backfilled with 3/8-inch chipped bentonite, allowing room for a steel, flush-mounted protector pipe.

Following installation, the monitoring wells were developed by purging the water from each well using dedicated, disposable bailers. To account for approximately 250 gallons of drill water used during installation of MW-704, approximately 250 gallons of water was pumped from MW-704. A WDNR Monitoring Well Construction Form (4400-113A) and a Well Development Form (4400-113B) was completed for each well installed (Appendix A). STS surveyed the monitoring well locations on June 21, 2007, at the time that water levels were recorded in each of the wells. Wisconsin State Plane Coordinates (NAD 1927, Central) and USGS mean sea level elevations were determined for each well location and are provided on the WDNR forms as well as Table 1 in Section 8.0.

3.4 Physical Analyses of Soil Samples

Soil samples from the screened intervals of the six perimeter monitoring wells were transported to an STS geo-technical laboratory and analyzed for grain size distribution using combined sieve and hydrometer methods. Laboratory reports for the analyses are in Appendix B.

3.5 Groundwater Sampling

After allowing several days for the wells to stabilize following development, an STS Environmental Engineer visited the site during the week of June 25, 2007, to assist Dominion in collecting groundwater samples from the 14 wells. For the sampling, STS purchased a low-flow capable, battery-operated, submersible pump which was delivered to Dominion for use in future water sampling events. The sampling procedure used is described in Appendix C.

4.0 RESULTS

4.1 Soil Field Observations

4.1.1 Perimeter Borings

Soils from perimeter Borings MW-701 (most northern boring) and MW-702 (most western boring) consisted of brown silty clays with trace amounts of sand, fine gravel, or organics to the boring termination depths. Soils from perimeter Borings MW-703 and MW-704 (southern parking lot) consisted of possible fill or disturbed silty clay soils to a depth of 17 to 20 feet bgs. Below the 17- to 20-foot depth, interbedded sand and or silts were present with a 2-foot boulder at a depth of 24 to 26 feet bgs in MW-704. The sand soils extended to the boring termination depth at MW-704 (35 feet) and silty clay to the termination depth at MW-703 (26 feet bgs). Borings MW-705 and MW-706 were installed to the east between the Aux. Building and Lake Michigan shoreline as close as was safely possible to the Lake Michigan intake/discharge pipe system. Sand fill was observed in Borings MW-705 and MW-706 to depths between 18 to 23 feet bgs underlain by clayey silt at boring termination depths of 28 feet bgs (MW-705) and 31 feet bgs (MW-706).

4.1.2 Auxiliary Building Borings

Soils from the Aux. Building borings (AB-707, AB-708, AB-709, AB-710, AB-711, AB-712, AB-715, and AB-717) consisted of 17 to 22 feet of sand and gravel fill soils overlying a brown silty clay, which appeared to be disturbed in several of the locations (this soil would have been at the base of the construction excavation for the plant). Figure 4 is a cross-section through Aux. Building Borings AB-707 through AB-712 and AB-17 along with Perimeter Borings MW-702 and MW-706, and depicts the strata contact between the sand and gravel fill and the clay soils along the north side of the Aux. Building.

4.2 Soil Physical Analyses Results

Soil grain size analyses for the six samples from the screened intervals of the perimeter wells were completed to confirm the visual classification of the soils. The laboratory reports are included in Appendix B. A review of the results shows that the soil generally had more than 50% by weight passing the No. 200 sieve (silt and clay size particles).

4.3 Groundwater Flow Pattern and Field Sampling Results

Groundwater elevations recorded on June 21, 2007, are summarized on Table 1. The depth to groundwater varies considerably over the site from approximately 5 feet bgs (MW-702) to 31 feet bgs (MW-704) translating to groundwater elevations of +601 feet MSL (MW-702) to +577 feet MSL (MW-704). The June 21 groundwater elevations were used to prepare a groundwater table contour map (Figure 5). Figure 5 indicates groundwater flow generally to the east. With a distance of approximately 1,250 feet between MW-702 and MW-704, the horizontal hydraulic gradient between MW-702 and MW-704 was approximately 0.02 feet per foot. The gradient increases to approximately 0.06 foot in the northern portion of the property. In addition to groundwater levels, during the well sampling the week of June 25, field parameters including pH, specific conductance, temperature, color, odor, and turbidity were also recorded for documentation purposes. The results are summarized on Table 1 in Section 8.0.

4.4 Hydraulic Conductivity Testing

In early June 2007, in conjunction with well development tasks, rising head hydraulic conductivity testing was performed on Monitoring Wells MW-701, MW-703, MW-705, MW-706, AB-707, AB-710, and AB-717. The field data and hydraulic conductivity test results are included in Section 7.0. Drawdown data were analyzed using the Bouwer and Rice Method (Bouwer, 1989)[1] for a partially penetrating monitoring well in an unconfined aquifer. Where the water level is below the top of the well screen during the test, Bouwer (1989) developed the equivalent radius (r_{eq}), which was used for hydraulic conductivity calculations instead of the unmodified casing radius (r_c). The equivalent casing radius is the radius of a circle whose area equals the total free water surface area of the well plus the filter pack (the free water surface area in the filter pack is adjusted for the filter pack porosity).

The hydraulic conductivities ranged from a low of approximately $2.5X10^{-6}$ cm/s in perimeter Well MW-705 to approximately 2.1×10^{-3} cm/s in Aux. Building Well AB-707. Assuming a soil porosity of 30% and based on the hydraulic gradient of 0.02 to 0.06 feet per foot, we estimate the seepage velocity in the natural silty clay soils to be approximately 0.5 foot per year and in sand and gravel fill soils approximately 140 to 420 feet per year. Due to the disturbance of subsurface conditions during drilling and well construction, future testing performed on the wells, after complete stabilization, may yield different results.

5.0 CONCLUSIONS AND RECOMMENDATIONS

We interpret the results of the soil borings and water level measurements to be consistent with the site conceptual model developed for the facility. The following is a summary of the work and our findings:

- Between May 14 and June 8, 2007, 14 groundwater monitoring wells were installed at Kewaunee Power Station. The wells were developed, surveyed, and sampled by STS.
- The soils close to the facility buildings consist primarily of up to 20 feet of sand and gravel fill soils underlain by brown silty clays and clayey silts. Farther from the building, natural soils consist of silty clay material to depths of 30 feet bgs.
- Groundwater is present beneath the site at depths ranging from 5 feet to 31 feet bgs. The groundwater elevation data are interpreted to show a general flow direction to the east, similar to the regional flow direction. The groundwater flow map is consistent with the assumption that the sand backfill beneath the facility functions as a preferential flow path for groundwater. The groundwater table along the north edge of the Aux. Building is present only 1 to 2 feet above the fill/clay soil contact. No perched conditions were observed.
- A potential release of contaminated water from beneath the plant is most likely to be contained in the sand backfill beneath the building. Migration of a potential release is most likely to occur to the east toward Lake Michigan.

We recommend that the results of the analyses of groundwater samples be used as baseline data for comparison to the results of future analytical results. Additional sampling of the wells is recommended at a quarterly frequency to observe for trends, seasonal or otherwise. An evaluation of the four initial rounds of data should be made to determine the frequency of additional sampling.

---

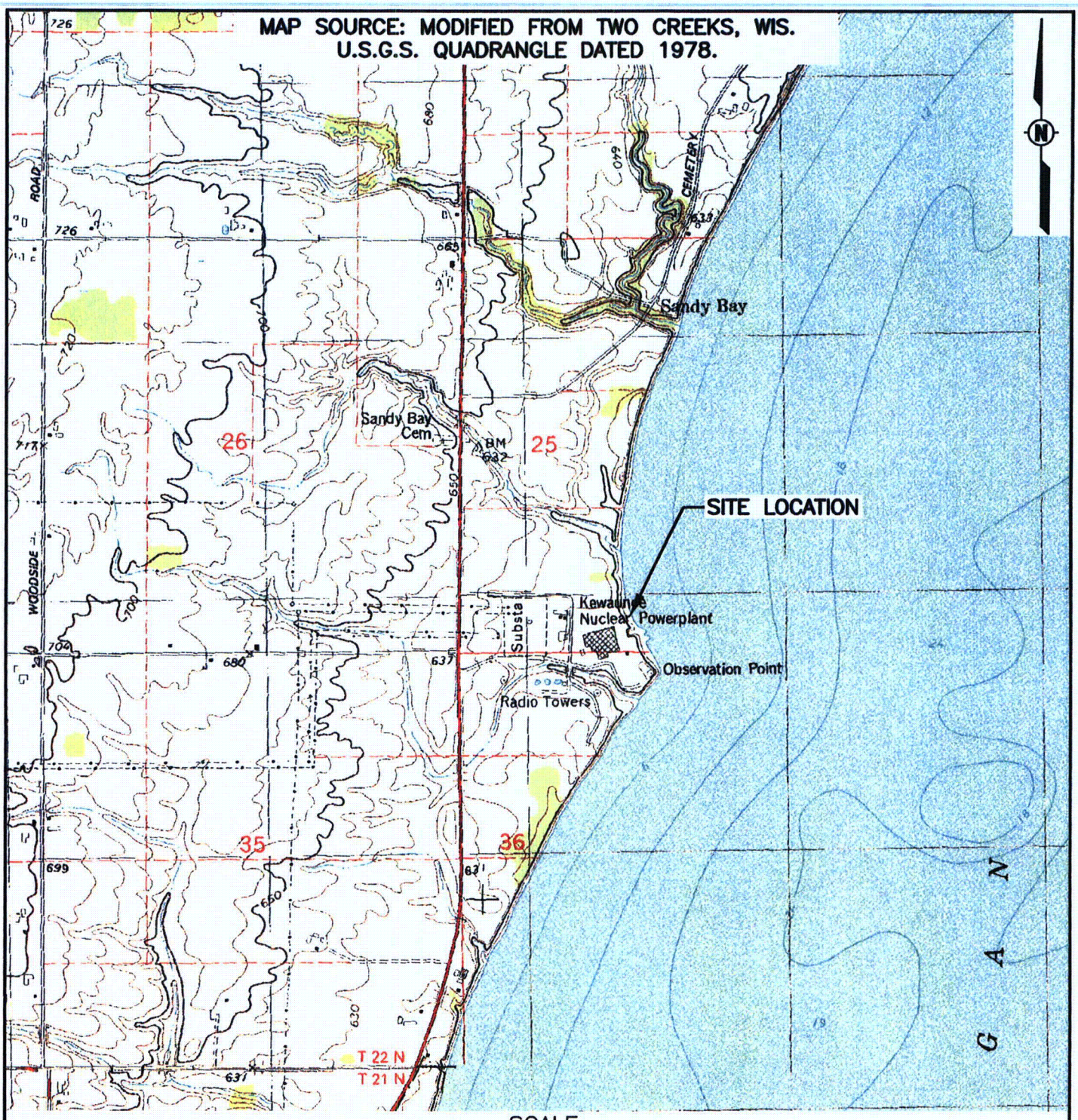
[1] Bouwer, H., 1989, The Bouwer and Rice Slug Test - An Update: Ground Water, Volume 27, No. 3, Pages 304-309.

6.0 GENERAL QUALIFICATIONS

The scope of this report is limited to the project and location described herein. The conclusions in this report are based on subsurface conditions as observed in soil borings conducted by STS, the subsurface conditions existing at the time of the study, laboratory test results conducted in the STS soils lab, and STS' professional interpretation of this data. Stratification lines on boring logs represent approximate boundaries between soil types. Variation may exist in both horizontal and vertical directions between borings. Disturbance of the subsurface during drilling and well construction may cause additional time to be required for conditions to stabilize. Seasonal groundwater fluctuations are likely to occur. This report should be used for the purpose intended. No other warranty is expressed or implied. Because the split-spoon blow counts were recorded as the borings were advanced with hollow stem augers, the blow count information may be used as a general reference of soil density but should not be used for foundation design.

7.0 FIGURES

- Figure 1 - Site Location Map
- Figure 2 - Historical Borings & Water Supply Well Locations
- Figure 3 - Groundwater Monitoring Well Location Diagram
- Figure 4 - Cross-Section
- Figure 5 - Groundwater Table Contour Map (6/21/07)



SCALE

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

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DOMINION ENERGY
KEWAUNEE POWER STATION
KEWAUNEE COUNTY, WISCONSIN
SITE LOCATION MAP

Drawn:	JRL	07/18/2007
Checked:	RJM	07/18/2007
Approved:		
PROJECT NUMBER	200700302	
FIGURE NUMBER	1	

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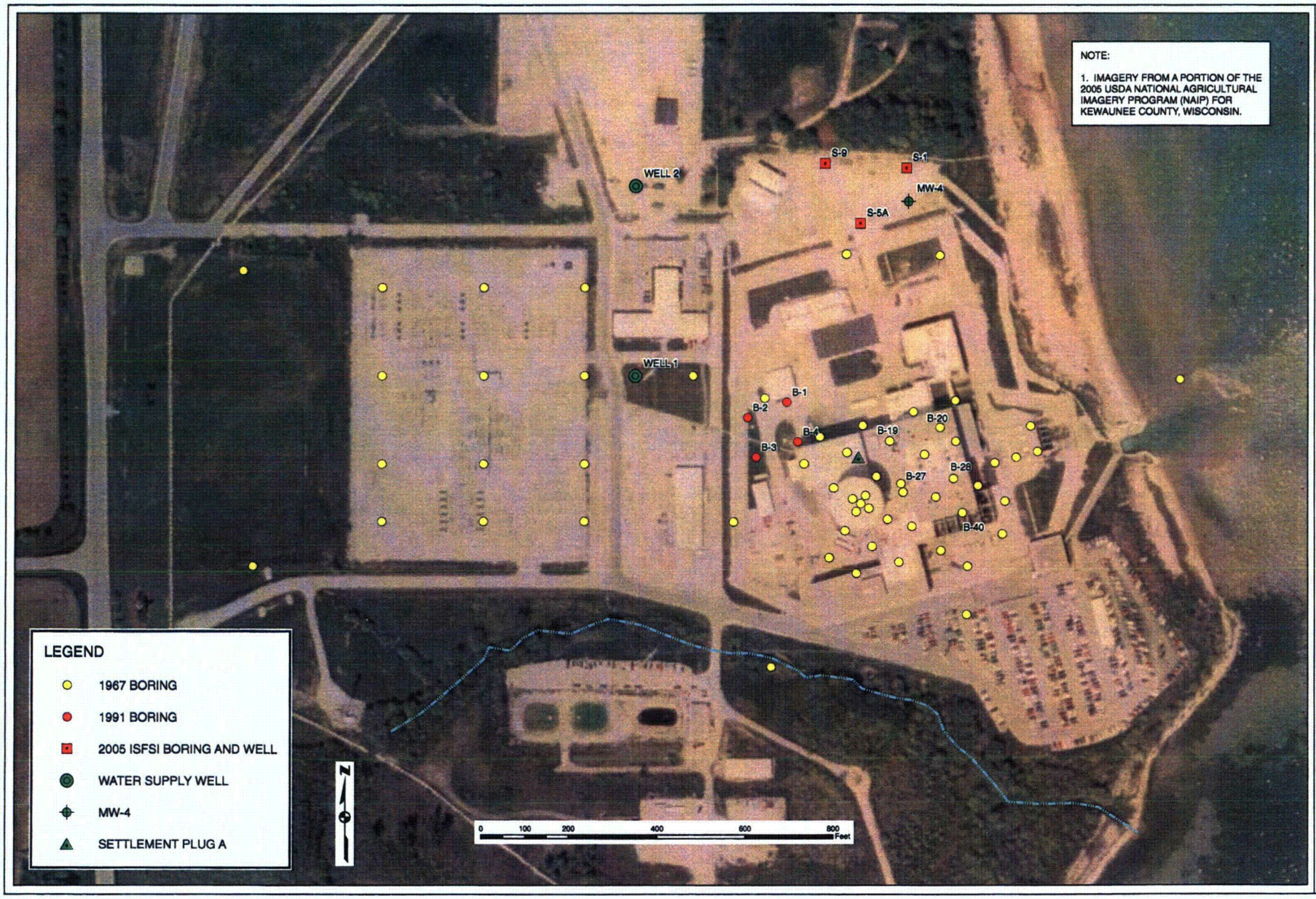

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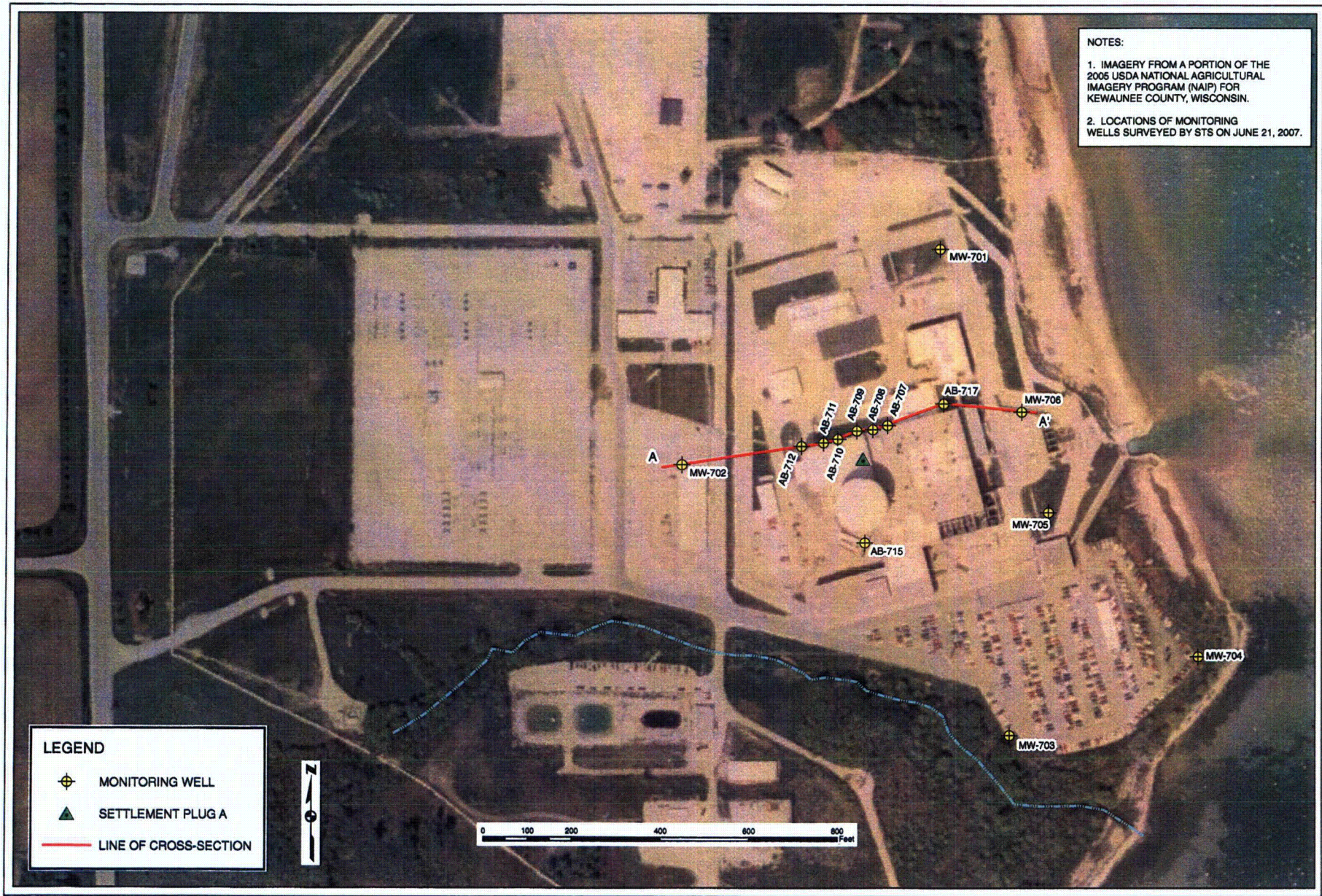
DOMINION ENERGY
KEWAUNEE POWER STATION
KEWAUNEE COUNTY, WISCONSIN
HISTORICAL BORINGS & WATER SUPPLY WELL LOCATIONS

ISSUED
Rev Date
Description

Designed: JWK 6/27/07
Drawn: JWK 6/27/07
Checked:
Approved:

PROJECT NUMBER
200700302
REFERENCE NUMBER
Figure
2



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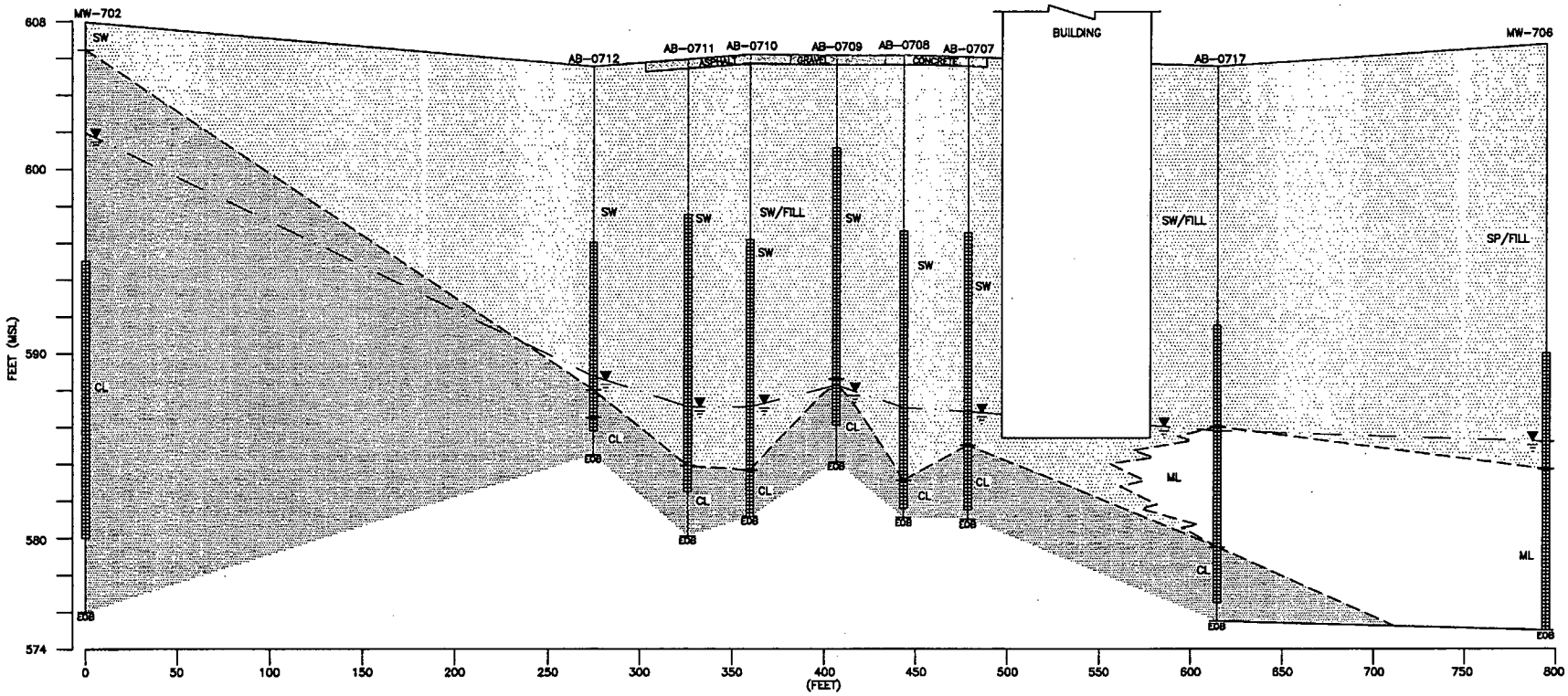
DOMINION ENERGY
KEWAUNEE POWER STATION
KEWAUNEE COUNTY, WISCONSIN
GROUNDWATER MONITORING WELL LOCATION DIAGRAM

ISSUED
Rev Date
Description

Designed: JWK 6/27/07
Drawn: JWK 6/27/07
Checked:
Approved:

PROJECT NUMBER
200700302

REFERENCE NUMBER
Figure
3



SCALE: 1"=60' HORIZONTAL
1"= 4' VERTICAL

LEGEND

AB-0712	– MONITORING WELL NUMBER
	– GROUNDWATER ELEVATION (FEET MSL) (6-21-07)
CL	– UNIFIED SOIL CLASSIFICATION
	– WELL SCREEN
EOB	– END OF BORING
CL	– INORGANIC CLAY
ML	– INORGANIC SILT AND VERY FINE SAND
SW	WELL-GRADED SAND

NOTE: SEE FIGURE 2 FOR CROSS-SECTION LOCATION.

STS CONSULTANTS
1035 Kepler Drive
Green Bay, Wisconsin 54311
920-468-1978
www.stsconsultants.com
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DOMINION ENERGY
KEWAUNEE POWER STATION
KEWAUNEE COUNTY, WISCONSIN
CROSS-SECTION

Drawn:	JRL	07/18/2007
Checked:	RJM	07/18/2007
Approved:	JWK	07/18/2007
PROJECT NUMBER	200700302	
FIGURE NUMBER	4	

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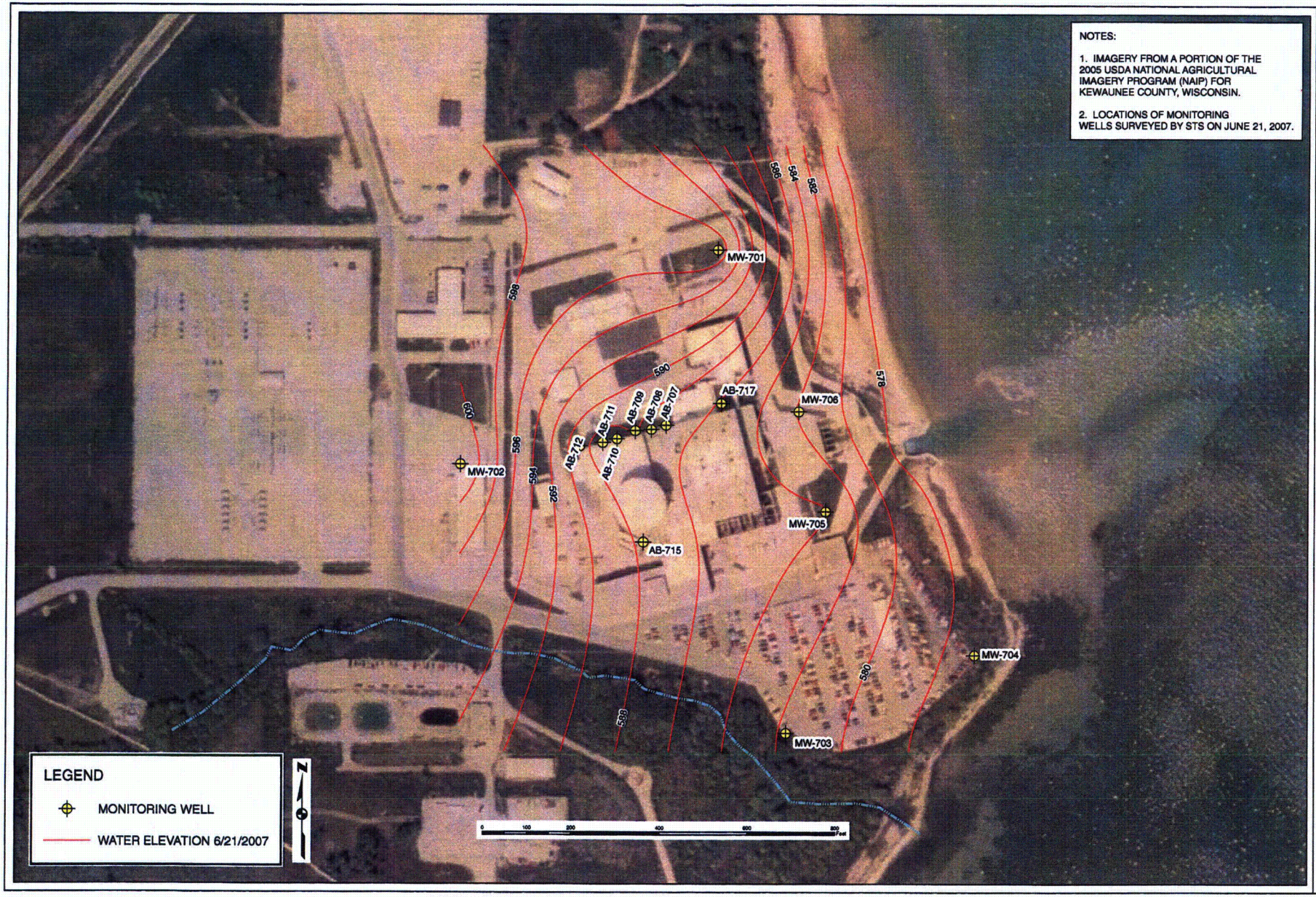

NOTES:

1. IMAGERY FROM A PORTION OF THE 2005 USDA NATIONAL AGRICULTURAL IMAGERY PROGRAM (NAIP) FOR KEWAUNEE COUNTY, WISCONSIN.

2. LOCATIONS OF MONITORING WELLS SURVEYED BY STS ON JUNE 21, 2007.

STS Consultants, Ltd.
1035 Kepler Drive
Green Bay, WI 54311-6320
Tel: (920) 468-1978
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DOMINION ENERGY
KEWAUNEE POWER STATION
KEWAUNEE COUNTY, WISCONSIN
GROUNDWATER TABLE CONTOUR MAP
JUNE 21, 2007

ISSUED
Rev Date
Description

Designed: JMK 7/19/07
Drawn: JMK 7/19/07
Checked:
Approved:

PROJECT NUMBER
200700302
REFERENCE NUMBER
Figure
5

8.0 DATA TABLES, AND HYDRAULIC CONDUCTIVITY DATA

- Table 1 - Monitoring Well Installations Details and Groundwater Sampling Observations
- Hydraulic Conductivity data (23 pages)

Table 1
Monitoring Well Installations Details and Groundwater Sampling Observations
Dominion Energy - Kewaunee Power Station
Kewaunee, Wisconsin
STS Project No. 200700302

	Monitoring Well Installation Details								Groundwater Sampling Observations										
Monitoring Well	Unique Well No.	Location NORTHING (Wisconsin State Plane)	Location EASTING (Wisconsin State Plane)	Ground Elevation (feet MSL)	TPVC Elevation (feet MSL)	Top of Well Screen Elevation (feet MSL)	Bottom of Well Screen Elevation (feet MSL)	Hydraulic Conductivity (cm/sec)	Date Sampled	TPVC Elevation (feet MSL)	Water Level (feet TPVC)	Water Elevation (feet MSL)	pH	Conductivity (umhos/cm)	Temperature (Celsius)	Color	Turbidity	Odor	Purge Water (gallons)
MW-0701	VT620	195859	2644681	605.83	605.62	600.8	585.8	5.0E-05 to 3.0E-04	6/21/07	605.62	8.30	597.32	--	--	--	--	--	--	--
									6/25/07	605.62	8.51	597.11	7.15	788	14.5	light brown	moderate	none	8
MW-0702	PM556	195372	2644097	607.90	607.39	594.9	579.9	--	6/21/07	607.39	5.33	602.06	--	--	--	--	--	--	--
									6/28/07	607.39	5.30	602.09	7.27	266	14.6	light brown	moderate	none	13 (dry)
MW-0703	PM554	194762	2644838	603.11	602.69	593.1	578.1	4.5E-03	6/21/07	602.69	21.02	581.67	--	--	--	--	--	--	--
									6/28/07	602.69	21.11	581.58	6.67	2810	11.9	light brown	moderate	none	3
MW-0704	PM557	194939	2645268	608.92	608.50	590.4	575.4	--	6/21/07	608.50	31.22	577.28	--	--	--	--	--	--	--
									6/29/07	608.50	31.20	577.30	6.86	1189	10.8	clear	low	none	2
MW-0705	PM558	195264	2644927	605.34	604.91	592.3	577.3	2.5E-05	6/21/07	604.91	20.70	584.21	--	--	--	--	--	--	--
									6/25/07	604.91	20.71	584.20	7.40	786	19.9	clear	low	none	4.5 (dry)
MW-0706	PM559	195491	2644865	606.40	606.00	590.4	575.4	8.2E-06	6/21/07	606.00	24.19	581.81	--	--	--	--	--	--	--
									6/26/07	606.00	24.23	581.77	7.22	855	14.6	clear	low	none	3 (dry)
AB-0707	VT626	195460	2644563	606.02	605.67	596.5	581.5	4.2E-04 to 1.5E-03	6/21/07	605.67	18.85	586.82	--	--	--	--	--	--	--
									6/27/07	605.67	18.87	586.80	7.44	1004	17.4	light brown	moderate	none	4
AB-0708	VT627	195451	2644529	606.06	605.52	596.6	581.6	--	6/21/07	605.52	18.48	587.04	--	--	--	--	--	--	--
									6/27/07	605.52	18.48	587.04	7.24	984	17.6	light brown	moderate	none	4
AB-0709	VT621	195448	2644493	608.12	605.86	601.1	586.1	--	6/21/07	605.86	17.61	588.25	--	--	--	--	--	--	--
									6/26/07	605.86	17.63	588.23	7.30	856	21.3	clear	low	none	1 (dry)
AB-0710	VT622	195429	2644450	606.15	605.87	596.2	581.2	2.1E-03	6/21/07	605.87	18.79	587.08	--	--	--	--	--	--	--
									6/26/07	605.87	18.81	587.06	7.13	1632	17.5	clear	low	none	4.5
AB-0711	VT625	195421	2644417	605.89	605.49	597.9	582.9	--	6/21/07	605.49	18.40	587.09	--	--	--	--	--	--	--
									6/26/07	605.49	18.41	587.08	7.18	1626	17.0	light brown	moderate	none	4
AB-0712	VT623	195413	2644366	605.51	605.19	595.5	585.5	--	6/21/07	605.19	16.45	588.74	--	--	--	--	--	--	--
									6/26/07	605.19	16.04	589.15	7.07	975	15.5	clear	low	none	1.5 (dry)
AB-0715	VT624	195195	2644512	605.74	605.43	595.7	580.7	--	6/21/07	605.43	17.75	587.68	--	--	--	--	--	--	--
									6/27/07	605.43	17.84	587.59	7.24	1771	19.8	clear	low	none	5
AB-0717	PM560	195510	2644690	605.48	605.29	591.5	576.5	1.5E-05	6/21/07	605.29	19.51	585.78	--	--	--	--	--	--	--
									6/27/07	605.29	19.46	585.83	7.70	599	16.4	clear	low	none	5 (dry)

TPVC = top of PVC casing

MSL = Mean Sea Level

MW-0701

Static Water Level: 7.42 feet from top of PVC
Well Bottom: 20.0 feet from top of PVC

Elapsed Time (Minutes)	Water Level Reading (feet TPVC)	Drawdown (feet)
0.5	17.40	9.98
1.0	16.65	9.23
1.5	16.05	8.63
2.0	15.35	7.93
2.5	14.82	7.40
3.0	14.28	6.86
3.5	13.75	6.33
4.0	13.25	5.83
4.5	12.84	5.42
5.0	12.41	4.99
5.5	12.04	4.62
6.0	11.66	4.24
6.5	11.35	3.93
7.0	11.10	3.68
7.5	11.00	3.58
8.0	10.92	3.50
8.5	10.85	3.43
9.0	10.78	3.36
9.5	10.70	3.28
10.0	10.63	3.21
10.5	10.57	3.15
11.0	10.50	3.08
11.5	10.44	3.02
12.0	10.31	2.89
12.5	10.23	2.81
13.0	10.17	2.75
13.5	10.11	2.69
14.0	10.09	2.67
14.5	10.05	2.63
15.0	10.01	2.59
15.5	9.95	2.53
16.0	9.92	2.50
17.0	9.85	2.43
18.0	9.78	2.36
19.0	9.72	2.30
20.0	9.64	2.22
21.0	9.58	2.16
22.0	9.50	2.08
23.0	9.45	2.03
24.0	9.39	1.97
25.0	9.32	1.90
26.0	9.26	1.84
27.0	9.22	1.80
28.0	9.16	1.74
29.0	9.12	1.70
30.0	9.08	1.66
35.0	8.89	1.47
40.0	8.71	1.29
45.0	8.57	1.15
50.0	8.46	1.04
55.0	8.35	0.93
60.0	8.25	0.83
65.0	8.16	0.74
70.0	8.08	0.66
75.0	8.01	0.59
96.0	7.80	0.38
136.0	7.63	0.21
166.0	7.58	0.16

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		MW-0702

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - E. Schmidt - STS Project No. 200700302	5/17/2007	5/17/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PM556		MW-0702	602.09 Feet MSL	607.9 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,372 N, 2,644,097 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			3, 6	Hydrovac - No samples collected										
1 SS	24 24	12	9	Brown silty clay - trace gravel, trace sand, trace organics at 24.0 feet - stiff to hard - wet at 24.0 feet	CL									
2 SS	24 18	17	12											
3 SS	24 20.5	17												
4 SS	24 21.5	14	15											
5 SS	24 19	11												
6 SS	24 7	11	18											
7 SS	24 24	14	21										77.6	
8 SS	24 24	15												
9 SS	24 24	13	24											
10 SS	24 24	10	27	Brown silty clay - trace gravel, trace sand, trace organics - wet - stiff to very stiff	CL									
11 SS	24 24	14												
12 SS	24 21.5	15	30											
				End of Boring Boring advanced to 32.0 feet with 4 1/4" ID HSA. Installed monitoring well at 28.0 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Robert J. Mottl	STS 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-0702
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: PM556 / DNR Well Number:
Facility ID	St. Plane 195,372 ft. N, 2,644,097 ft. E. S/C/N	Date Well Installed: 05/17/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: ____ 1/4 of SW 1/4 of Sec. 25 T. 22 N, R. 24 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Luke Cravillion, STS
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:

A. Protective pipe, top elevation 607.90 ft. MSL

B. Well casing, top elevation 607.39 ft. MSL

C. Land surface elevation 607.9 ft. MSL

D. Surface seal, bottom 607.4 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 607.4 ft. MSL or 0.5 ft.

F. Fine sand, top 599.9 ft. MSL or 8.0 ft.

G. Filter pack, top 599.9 ft. MSL or 8.0 ft.

H. Screen joint, top 594.9 ft. MSL or 13.0 ft.

I. Well bottom 579.9 ft. MSL or 28.0 ft.

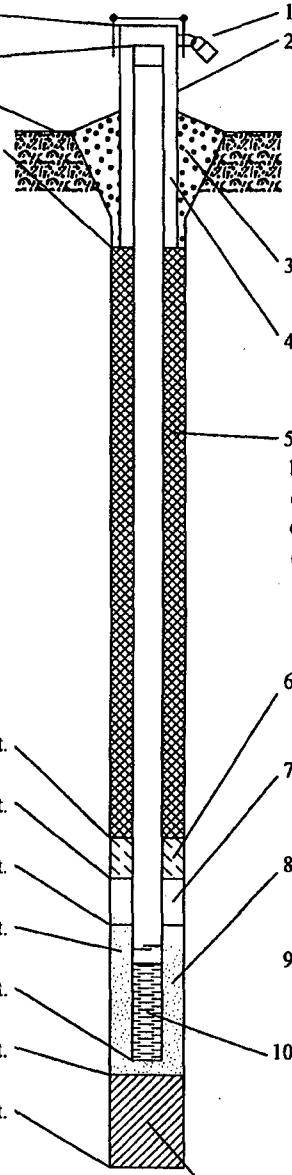
J. Filter pack, bottom 577.9 ft. MSL or 30.0 ft.

K. Borehole, bottom 575.9 ft. MSL or 32.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 0 4
____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 3 0
Concrete ☐ 0 1
____ Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
____ Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. 3.5 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 3 2
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
____ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
____ Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 1 4
____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Robert J. Mottl	Firm: STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	MW-0702

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PM556	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☒	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 55 min.

4. Depth of well (from top of well casing) 28.0 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 20.0 gal.

7. Volume of water removed from well 27.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	5.08 ft.	27.50 ft.
Date	b.	5/31/2007	6/12/2007
Time	c.	05:00 ☐ a.m. ☒ p.m.	08:20 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Robert J. Mottl & Eric Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: N490 State Highway 41

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Robert J. Mottl

Print Name: Robert J. Mottl

Firm: STS Consultants, Ltd.

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		MW-0703

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - E. Schmidt - STS Project No. 200700302	5/16/2007	5/16/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PM554		MW-0703	581.58 Feet MSL	603.1 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 194,762 N, 2,644,838 E S/C/N
1/4 of NW 1/4 of Section 36, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Hydrovac - No sample collected										
			2.5											
			5.0											
			7.5											
1 SS	24 18	9		Possible fill: Brown silty clay - trace sand seams - very stiff to hard										
2 SS	24 18	11	10.0											
3 SS	24 14	8	12.5		CL									
4 SS	24 12	11	15.0											
5 SS	24 17	8		Possible fill or Disturbed Soil: Dark brown to brown silty clay - trace gravel - trace sand - trace organics - stiff to very stiff - moist									86.2	
6 SS	24 17	8	17.5		CL									
7 SS	24 11	2	20.0	Brown silty fine sand - wet - wood in tip	SM									
8 SS	24 23.5	9	22.5	Brown silty clay to clayey silt - trace sand - trace gravel										
9 SS	24 ?	25	25.0		CL									
				End of Boring Boring advanced to 26.0 feet with 4 1/4" ID HSA. nstalled monitoring well at 25.0 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Robert J. Mottl	STS 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

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State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐N. ☐S. ____ ft. ☐E. ☐W.	Well Name: MW-0703
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: PM554 / DNR Well Number:
Facility ID	St. Plane 194,762 ft. N, 2,644,838 ft. E. S/C/N	Date Well Installed: 05/16/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: 1/4 of NW 1/4 of Sec. 36, T. 22 N, R. 24 ☒E ☐W	Well Installed By: (Person's Name and Firm): Luke Cravillion
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ / STS

A. Protective pipe, top elevation 603.11 ft. MSL

B. Well casing, top elevation 602.69 ft. MSL

C. Land surface elevation 603.1 ft. MSL

D. Surface seal, bottom 602.6 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50 Hollow Stem Auger ☒ 41 Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 602.6 ft. MSL or 0.5 ft.

F. Fine sand, top 599.1 ft. MSL or 4.0 ft.

G. Filter pack, top 599.1 ft. MSL or 4.0 ft.

H. Screen joint, top 593.1 ft. MSL or 10.0 ft.

I. Well bottom 578.1 ft. MSL or 25.0 ft.

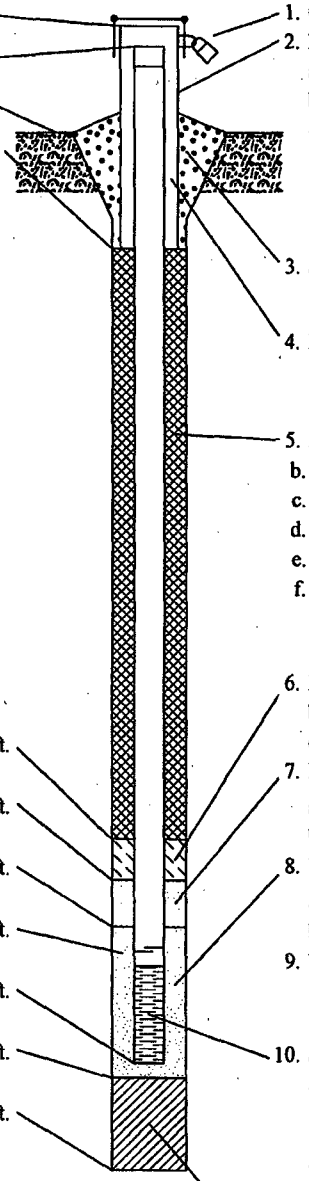
J. Filter pack, bottom 577.1 ft. MSL or 26.0 ft.

K. Borehole, bottom 577.1 ft. MSL or 26.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 8.0 in.
   b. Length: 1.0 ft.
   c. Material: Steel ☒ 04 Other ☐ ____
   d. Additional protection? ☐ Yes ☒ No
   If yes, describe: ____
3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30 Other ☒ ____
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
   d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
   e. 3.5 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
   c. ____ Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
   a. 45/55 Badger
   b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. 45/55 Badger
   b. Volume added 5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 Other ☐ ____
10. Screen material: PVC
    a. Screen Type: Factory cut ☒ 11 Continuous slot ☐ 01 Other ☐ ____
    b. Manufacturer Buffalo
    c. Slot size: 0.006 in.
    d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14 Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Robert J. Mott	STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

Please complete both forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	MW-0703

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PM554	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☒	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 70 min.

4. Depth of well (from top of well casing) 25.0 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 4.0 gal.

7. Volume of water removed from well 22.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	20.71 ft.	24.00 ft.
Date	b.	5/31/2007	6/11/2007
Time	c.	03:00 ☐ a.m. ☒ p.m.	03:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☐ 20 Turbid ☒ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Robert J. Mottl & Eric Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: N490 State Highway 41

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Robert J. Mottl

Print Name: Robert J. Mottl

Firm: STS Consultants, Ltd.

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		MW-0704

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - E. Schmidt - STS Project No. 200700302	5/18/2007	5/18/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PM557		MW-0704	577.30 Feet MSL	608.9 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 194,939 N, 2,645,268 E S/C/N
1/4 of NW 1/4 of Section 36, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Hydrovac - No sample collected										
			2.5											
			5.0	Possible fill: Brown silty clay - trace sand seams - trace gravel - very stiff to hard										
1 SS	24 21.5	12												
2 SS	24 21.5	11	7.5											
3 SS	24 24	21	10.0											
4 SS	24 24	10			CL									
5 SS	24 24	10	12.5											
6 SS	24 24	17	15.0											
7 SS	24 18	40	17.5											
				Light brown silty fine sand - trace cobbles										
8 SS	24 17	38	20.0											
9 SS	24 19	47			SM									
10 SS	24 11	84	22.5											
			25.0	No samples collected Apparent boulder										
				Brown fine to coarse sand and gravel	SW								35.5	
11 SS	24 12	40	27.5	Brown fine to medium silty sand - some gravel										
12 SS	24 21.5	40			SM									
13 SS	24 21.5	57	30.0											
14 SS	18 23	101	32.5	Brown medium to coarse sand and gravel	SW									
				No samples collected										
			35.0											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Robert J. Mott	STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW-0704 Use only as an attachment to Form 4400-122.

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				No samples collected *(continued)*										
				End of Boring Boring advanced to 24.5 feet with hollow-stem auger. 6-inch casing driven to 25.0 feet. Boring advanced from 25.0 feet to 37.0 feet with roller bit and wash water rotary During wash water rotary 250 gallon was water was lost. Installed monitoring well at 33.5 feet. Source of Water: Dominion Energy Supply Well										

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-0704
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: PM557 / DNR Well Number:
Facility ID	St. Plane 194,939 ft. N, 2,645,268 ft. E. S/C/N	Date Well Installed: 05/21/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: ____ 1/4 of NW 1/4 of Sec. 36, T. 22 N, R. 24 ☒ E ☐ W	Well Installed By: (Person's Name and Firm) Luke Cravillion STS
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:

A. Protective pipe, top elevation 608.92 ft. MSL

B. Well casing, top elevation 608.50 ft. MSL

C. Land surface elevation 608.9 ft. MSL

D. Surface seal, bottom 608.4 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 608.4 ft. MSL or 0.5 ft.

F. Fine sand, top 594.9 ft. MSL or 14.0 ft.

G. Filter pack, top 594.9 ft. MSL or 14.0 ft.

H. Screen joint, top 590.4 ft. MSL or 18.5 ft.

I. Well bottom 575.4 ft. MSL or 33.5 ft.

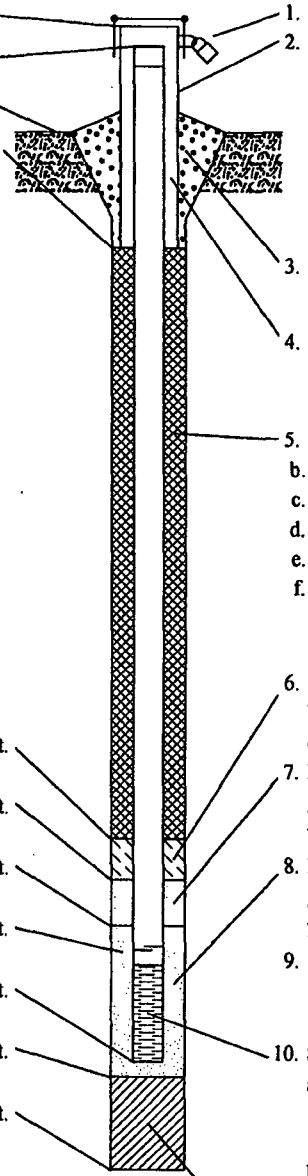
J. Filter pack, bottom 575.4 ft. MSL or 33.5 ft.

K. Borehole, bottom 571.9 ft. MSL or 37.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 0 4
____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 3 0
Concrete ☐ 0 1
____ Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
____ Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. 3.5 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 3 2
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
____ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
____ Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 1 4
____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Robert J. Mottl	Firm: STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	MW-0704

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PM557	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☒	50
other _____	☐	

3. Time spent developing well 120 min.

4. Depth of well (from top of well casing) 33.5 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 2.0 gal.

7. Volume of water removed from well 250.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added Dominion water supply

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	31.00 ft.	31.00 ft.
Date	b.	6/5/2007	6/28/2007
Time	c.	09:40 ☒ a.m. ☐ p.m.	02:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Cloudy clear, trace brown color - cloudy brown	Clear ☐ 20 Turbid ☒ 25 (Describe) cloudy brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Matt Bowman
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name:

Firm: Dominion Energy - Kewaunee Power Station

Street: N490 State Highway 41

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Eric Schmidt / RPM

Print Name: Eric C. Schmidt

Firm: STS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		MW-0705

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - E. Schmidt - STS Project No. 200700302	5/21/2007	5/21/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PM558		MW-0705	584.20 Feet MSL	605.3 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,264 N, 2,644,927 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Hydrovac - No samples collected										
			3											
			6											
				Fill: Light brown to brown fine to medium sand (SM) - some gravel										
1 SS	24 21	64	9											
2 SS	24 19	46												
3 SS	24 21	41	12		SM									
4 SS	24 18	27	15											
5 SS	24 17	19												
6 SS	24 14	12	18	Possible Fill: Brown fine to medium sand (SM) - trace gravel - wet	SM									
7 SS	24 24	8	21	Brown silty clay to clayey silt - trace sand - moist to wet - stiff to very stiff									99.2	
8 SS	24 24	7												
9 SS	24	7	24		ML									
10 SS	24 24	5	27											
				End of Boring Boring advanced to 28.0 feet with 4 1/4" ID HSA. Installed monitoring well at 28.0 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Robert J. Mottl

Firm STS
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

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State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐N. ☐S. ____ ft. ☐E. ☐W.	Well Name: MW-0705
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: PM558 / DNR Well Number:
Facility ID	St. Plane 195,264 ft. N, 2,644,927 ft. E. S/C/N	Date Well Installed: 05/21/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: ____ 1/4 of SW 1/4 of Sec. 25, T. 22 N, R. 24 ☒E ☐W	Well Installed By: (Person's Name and Firm): Luke Cravillion, STS
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:

A. Protective pipe, top elevation 605.34 ft. MSL

B. Well casing, top elevation 604.91 ft. MSL

C. Land surface elevation 605.3 ft. MSL

D. Surface seal, bottom 604.8 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☒ 41
____ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 604.8 ft. MSL or 0.5 ft.

F. Fine sand, top 596.1 ft. MSL or 9.2 ft.

G. Filter pack, top 596.1 ft. MSL or 9.2 ft.

H. Screen joint, top 592.3 ft. MSL or 13.0 ft.

I. Well bottom 577.3 ft. MSL or 28.0 ft.

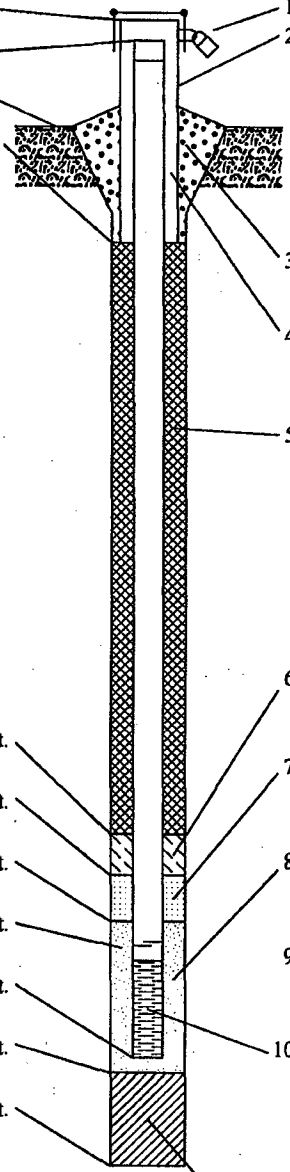
J. Filter pack, bottom 577.3 ft. MSL or 28.0 ft.

K. Borehole, bottom 577.3 ft. MSL or 28.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 04
____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____

3. Surface seal: Bentonite ☒ 30
Concrete ☐ 01
____ Other ☐

4. Material between well casing and protective pipe:
Bentonite ☐ 30
____ Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. 3.5 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01
Tremie pumped ☐ 02
Gravity ☒ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 1 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 23
Flush threaded PVC schedule 80 ☐ 24
____ Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11
Continuous slot ☐ 01
____ Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.

11. Backfill material (below filter pack): None ☒ 14
____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Robert J. Mott	STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	MW-0705

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PM558	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☒ 10
   - pumped only ☐ 51
   - pumped slowly ☐ 50
   - other _____ ☐

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 27.7 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 6.0 gal.

7. Volume of water removed from well 5.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	20.62 ft.	27.70 ft.
Date	b.	6/8/2007	6/8/2007
Time	c.	11:10 ☒ a.m. ☐ p.m.	11:40 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Eric C. Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: N490 State Highway 41

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Eric Schmidt / RJM

Print Name: Eric C. Schmidt

Firm: STS Consultants, Ltd.

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		MW-0706

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - E. Schmidt - STS Project No. 200700302	5/22/2007	5/22/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PM559		MW-0706	581.77 Feet MSL	606.4 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,491 N, 2,644,865 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Hydrovac - No samples collected										
			3											
			6											
1 SS	24 / 12	34		Fill: Brown fine to coarse sand - some to gravel gravel										
2 SS	24 / 12	28	9											
3 SS	24 / 12	10	12											
4 SS	24 / 8.5	20			SP									
5 SS	24 / 13	8	15											
6 SS	24 / 12	14	18											
7 SS	24 / 11	4												
8 SS	24 / 13	3	21											
9 SS	24	6	24	Brown silty sandy clay to clayey silt - trace wet sand									97.7	
10 SS	24 / 12	5												
11 SS	24 / 18	5	27		ML									
12 SS	24 / 9	1	30											
				End of Boring Boring advanced to 31.0 feet with 4 1/4" ID HSA. Installed monitoring well at 31.0 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Robert J. Motta

Firm STS
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-0706
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ___ ° ___ ' ___ " Long. ___ ° ___ ' ___ " or	Wis. Unique Well No.: PM559 / DNR Well Number:
Facility ID	St. Plane 195,491 ft. N, 2,644,865 ft. E. S/C/N	Date Well Installed: 05/22/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: ___ 1/4 of SW 1/4 of Sec. 25, T. 22 N, R. 24 ☒ E ☐ W	Well Installed By: (Person's Name and Firm) Luke Cravillion
Distance from Waste/Source ___ ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ___ / STS

A. Protective pipe, top elevation 606.40 ft. MSL

B. Well casing, top elevation 606.00 ft. MSL

C. Land surface elevation 606.4 ft. MSL

D. Surface seal, bottom 605.9 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☒ 41
___ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe ___

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 605.4 ft. MSL or 1.0 ft.

F. Fine sand, top 594.3 ft. MSL or 12.1 ft.

G. Filter pack, top 594.3 ft. MSL or 12.1 ft.

H. Screen joint, top 590.4 ft. MSL or 16.0 ft.

I. Well bottom 575.4 ft. MSL or 31.0 ft.

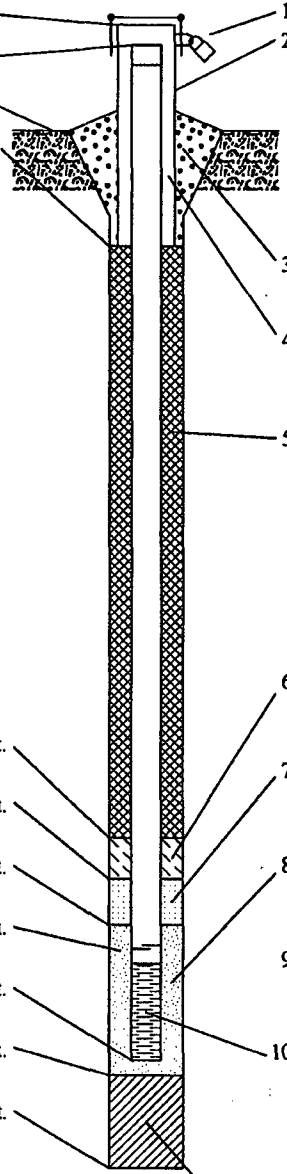
J. Filter pack, bottom 575.4 ft. MSL or 31.0 ft.

K. Borehole, bottom 575.4 ft. MSL or 31.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 04
___ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ___
3. Surface seal: Bentonite ☒ 30
Concrete ☐ 01
___ Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐ 30
___ Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ___ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ___ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. ___ % Bentonite . . . Bentonite-cement grout ☐ 50
e. 3.5 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01
Tremie pumped ☐ 02
Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ___ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23
Flush threaded PVC schedule 80 ☐ 24
___ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11
Continuous slot ☐ 01
___ Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14
___ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Kevin J. Motte	Firm: STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

Please complete both forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	MW-0706

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PM559	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 31.0 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 7.0 gal.

7. Volume of water removed from well 4.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	23.30 ft.	31.00 ft.
Date	b.	6/8/2007	6/8/2007
Time	c.	10:05 ☒ a.m. ☐ p.m.	10:35 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Eric C. Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: N490 State Highway 41

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Eric Schmidt / RSM

Print Name: Eric C. Schmidt

Firm: STS Consultants, Ltd.

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		AB-0707

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - E. Schmidt - STS Project No. 200700302	6/5/2007	6/6/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
VT626		AB-0707	586.80 Feet MSL	606.0 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,460 N, 2,644,563 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Concrete	Concrete									
				Hydrovac - No samples collected										
			2.5											
			5.0											
1 SS	24 / 16.5	42	7.5	Fill: Brown fine to coarse sand - trace to some gravel - trace silt - wet at 19.0 feet	SW									
2 SS	24 / 18	13	10.0											
3 SS	24 / 2	8	12.5											
4 SS	24 / 12	9												
5 SS	24 / 14	19	15.0											
6 SS	24 / 9.5	12	17.5											
7 SS	24 / 18	12	20.0											
8 SS	24 / 18	5		Possible Fill or Disturbed Soil: Brown clayey silt - trace gravel - wood at 25.0 feet - stiff	CL									
9 SS	24 / 7.2	7	22.5											
			25.0	End of Boring Boring advanced to 24.5 feet with 4 1/4" ID HSA. Installed monitoring well at 24.5 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Robert J. Mottl

Firm STS
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

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State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐N. ☐S. ____ ft. ☐E. ☐W.	Well Name: AB-0707
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: VT626 / DNR Well Number:
Facility ID	St. Plane 195,460 ft. N, 2,644,563 ft. E. S/C/N	Date Well Installed: 06/05/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: 1/4 of SW 1/4 of Sec. 25 T. 22 N, R. 24 ☒E ☐W	Well Installed By: (Person's Name and Firm) Luke Cravillion STS
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:

A. Protective pipe, top elevation 606.02 ft. MSL

B. Well casing, top elevation 605.67 ft. MSL

C. Land surface elevation 606.0 ft. MSL

D. Surface seal, bottom 605.5 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe

17. Source of water (attach analysis, if required):
Dominion Energy - Kewaunee Power Station

E. Bentonite seal, top 605.0 ft. MSL or 1.0 ft.

F. Fine sand, top 601.0 ft. MSL or 5.0 ft.

G. Filter pack, top 601.0 ft. MSL or 5.0 ft.

H. Screen joint, top 596.5 ft. MSL or 9.5 ft.

I. Well bottom 581.5 ft. MSL or 24.5 ft.

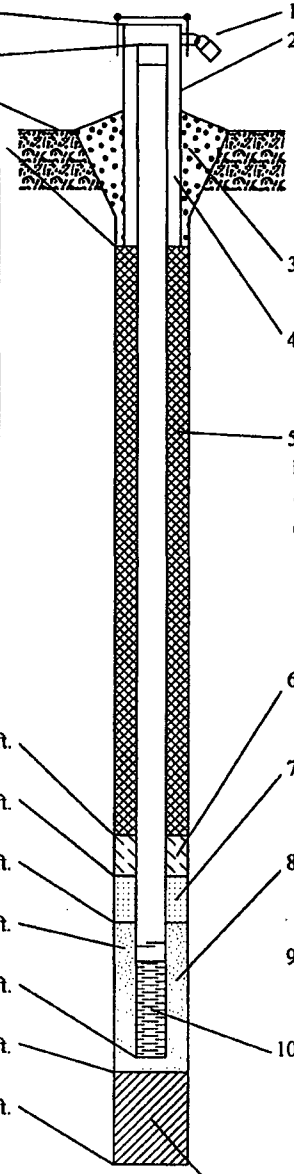
J. Filter pack, bottom 581.5 ft. MSL or 24.5 ft.

K. Borehole, bottom 581.0 ft. MSL or 25.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 0 4
Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe:

3. Surface seal: Bentonite ☐ 3 0
Concrete ☒ 0 1
Other ☐

4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☐ 3/8 in. ☒ 1/2 in. Bentonite chips ☒ 3 2
c. Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 1 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.

11. Backfill material (below filter pack): None ☐ 1 4
Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Robert J. Mottl	Firm: STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	AB-0707

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	VT626	

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 45 min.

4. Depth of well (from top of well casing) 24.0 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 5.0 gal.

7. Volume of water removed from well 38.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	18.49 ft.	24.00 ft.
Date	b.	6/6/2007	6/11/2007
Time	c.	03:00 ☐ a.m. ☒ p.m.	01:15 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Browm	Clear ☐ 20 Turbid ☒ 25 (Describe) light brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Eric C. Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: Hwy. 42

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Eric Schmidt /BSM

Print Name: Eric C. Schmidt

Firm: STS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		AB-0708

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - E. Schmidt - STS Project No. 200700302	6/6/2007	6/7/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
VT627		AB-0708	587.04 Feet MSL	606.1 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,451 N, 2,644,529 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Concrete	Concrete									
				Hydrovac - No Samples collected										
			2.5											
			5.0											
1 SS	24 12	29	7.5	Fill: Brown fine to coarse sand - some gravel - trace silt - wet at 19.0 feet	SW									
2 SS	24 19	15	10.0											
3 SS	24 15.5	26	12.5											
4 SS	24 14.5	23												
5 SS	24 14.5	30	15.0											
6 SS	24 14.5	20	17.5											
7 SS	24 15.5	15	20.0											
8 SS	24 12	14	22.5											
9 SS	24	5		Possible Fill or Disturbed Soil: Brown silty clay - some sand - wood at 25.0 feet	CL									
			25.0	End of Boring Boring advanced to 25.0 feet with 4 1/4" ID hollow-stem auger. Installed monitoring well at 24.5 feet										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Robert J. Mott

Firm STS
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AB-0708
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: VT627 / DNR Well Number:
Facility ID	St. Plane 195,451 ft. N, 2,644,529 ft. E. S/C/N	Date Well Installed: 06/07/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: ____ 1/4 of SW 1/4 of Sec. 25 T. 22 N, R. 24 ☒ E ☐ W	Well Installed By: (Person's Name and Firm) Luke Cravillion STS
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:

A. Protective pipe, top elevation 606.06 ft. MSL

B. Well casing, top elevation 605.52 ft. MSL

C. Land surface elevation 606.1 ft. MSL

D. Surface seal, bottom 605.6 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 605.1 ft. MSL or 1.0 ft.

F. Fine sand, top 601.1 ft. MSL or 5.0 ft.

G. Filter pack, top 601.1 ft. MSL or 5.0 ft.

H. Screen joint, top 596.6 ft. MSL or 9.5 ft.

I. Well bottom 581.6 ft. MSL or 24.5 ft.

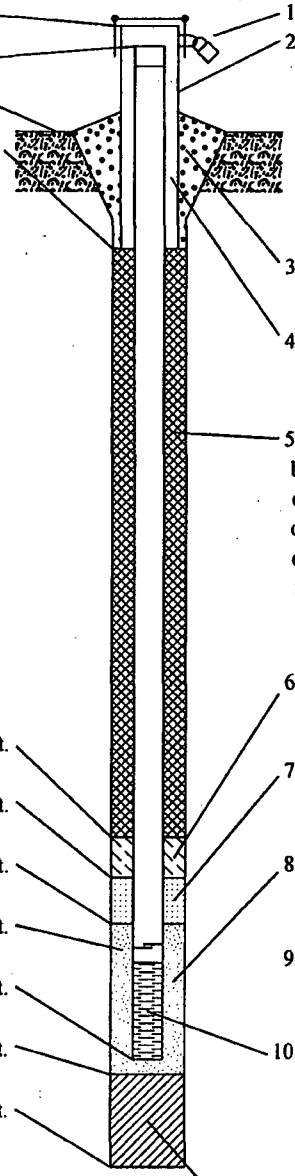
J. Filter pack, bottom 581.1 ft. MSL or 25.0 ft.

K. Borehole, bottom 581.1 ft. MSL or 25.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 0 4
____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____

3. Surface seal: Bentonite ☐ 3 0
Concrete ☒ 0 1
____ Other ☐

4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
____ Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 3 2
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 1 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
____ Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
____ Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.

11. Backfill material (below filter pack): None ☒ 1 4
____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Robert J. Mott	Firm: STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	AB-0708

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	VT627	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 23.9 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 5.0 gal.

7. Volume of water removed from well 2.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	18.97 ft.	23.90 ft.
Date	b.	6/7/2007	6/7/2007
Time	c.	10:00 ☒ a.m. ☐ p.m.	10:30 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Light brown	Clear ☐ 20 Turbid ☒ 25 (Describe) light brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Eric C. Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: Hwy. 42

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Eric Schmidt/RSM

Print Name: Eric C. Schmidt

Firm: STS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		AB-0709

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - E. Schmidt - STS Project No. 200700302	5/24/2007	5/29/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
VT621		AB-0709	588.23 Feet MSL	606.1 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,448 N, 2,644,493 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Hydrovac - No samples collected										
			2.5											
			5.0											
			7.5											
1 SS	24 12	16		Fill: Brown fine to coarse sand - some gravel										
			10.0											
2 SS	24 1	22												
3 SS	24 13	10	12.5		SW									
4 SS	24 7.2	5	15.0											
5A SS	20.5 14	14												
			17.5	Possible Fill or Disturbed Soil: Brown silty clay - trace sand										
5B SS	3.5 24	2												
6 SS	13 24	6	20.0		CL									
7 SS	15.5													
				End of Boring Boring advanced to 20.0 feet with 4 1/4" ID hollow-stem auger and from 20.0 feet to 22.0 feet with split-spoon Installed monitoring well at 20.0 feet										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	STS 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AB-0709
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: VT621 / DNR Well Number:
Facility ID	St. Plane 195,448 ft. N, 2,644,493 ft. E. S/C/N	Date Well Installed: 05/29/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: ____ 1/4 of SW 1/4 of Sec. 25, T. 22 N, R. 24 ☒ E ☐ W	Well Installed By: (Person's Name and Firm) Luke Cravillion, STS
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:

A. Protective pipe, top elevation 606.12 ft. MSL

B. Well casing, top elevation 605.86 ft. MSL

C. Land surface elevation 606.1 ft. MSL

D. Surface seal, bottom 605.6 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe _____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 605.1 ft. MSL or 1.0 ft.

F. Fine sand, top 602.3 ft. MSL or 3.8 ft.

G. Filter pack, top 602.3 ft. MSL or 3.8 ft.

H. Screen joint, top 601.1 ft. MSL or 5.0 ft.

I. Well bottom 586.1 ft. MSL or 20.0 ft.

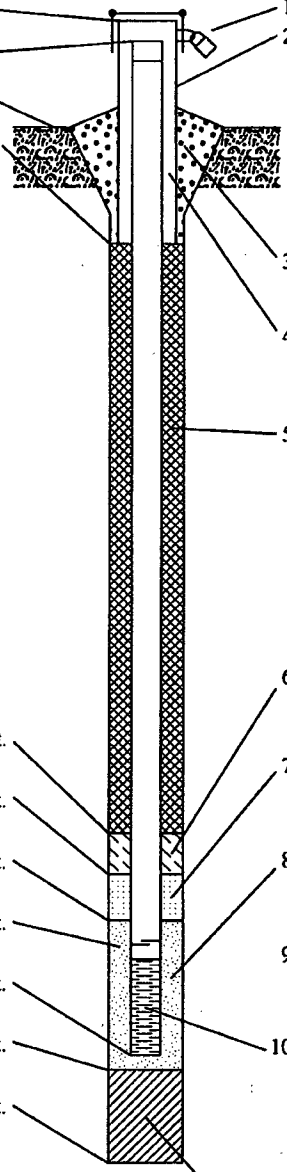
J. Filter pack, bottom 584.1 ft. MSL or 22.0 ft.

K. Borehole, bottom 584.1 ft. MSL or 22.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____

3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐

4. Material between well casing and protective pipe: Bentonite ☐ 30; Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Badger - Silica
b. Volume added 1 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. Badger - Silica
b. Volume added 5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.

11. Backfill material (below filter pack): None ☐ 14; Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Robert J. Mattie

Firm: STS Consultants, Ltd.
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	AB-0709

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	VT621	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 19.7 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 2.0 gal.

7. Volume of water removed from well 2.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	17.54 ft.	19.70 ft.
Date	b.	6/6/2007	6/6/2007
Time	c.	02:00 ☐ a.m. ☒ p.m.	02:30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Light brown	Clear ☐ 20 Turbid ☒ 25 (Describe) light brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Eric C. Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: Hwy. 42

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Eric Schmidt / RPM

Print Name: Eric C. Schmidt

Firm: STS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		AB-0710

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - L. Cravillion - STS Project No. 200700302	5/29/2007	5/30/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
VT622		AB-0710	586.88 Feet MSL	606.2 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,429 N, 2,644,450 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Asphalt	Asphalt									
				Hydrovac - No samples collected										
			2.5											
			5.0											
1 SS	24 13	27	7.5	Fill: Brown fine to coarse sand - trace to some gravel - wet at 19.0 feet	SW									
2 SS	24 12	23	10.0											
3 SS	24 11	17	12.5											
4 SS	24 13	17												
5 SS	24 14	17	15.0											
6 SS	24 11	8	17.5											
7 SS	24 12	5	20.0											
8 SS	18 12	2	22.5											
8A SS	6 6	1		Possible Fill or Disturbed Soil: Brown silty clay - trace gravel	CL									
9 SS	24 12		25.0	End of Boring Boring advanced to 25.0 feet with 4 1/4" ID HSA. Installed monitoring well at 25.0 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Robert J. Mott

Firm STS
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

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State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AB-0710
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: VT622 / DNR Well Number:
Facility ID	St. Plane 195,429 ft. N, 2,644,450 ft. E. S/C/N	Date Well Installed: 05/30/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: ____ 1/4 of SW 1/4 of Sec. 25 T. 22 N, R. 24 ☒ E ☐ W	Well Installed By: (Person's Name and Firm) Luke Cravillion
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known / Gov. Lot Number:	STS

A. Protective pipe, top elevation 606.15 ft. MSL

B. Well casing, top elevation 605.87 ft. MSL

C. Land surface elevation 606.2 ft. MSL

D. Surface seal, bottom 605.7 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 605.2 ft. MSL or 1.0 ft.

F. Fine sand, top 599.4 ft. MSL or 6.8 ft.

G. Filter pack, top 599.4 ft. MSL or 6.8 ft.

H. Screen joint, top 596.2 ft. MSL or 10.0 ft.

I. Well bottom 581.2 ft. MSL or 25.0 ft.

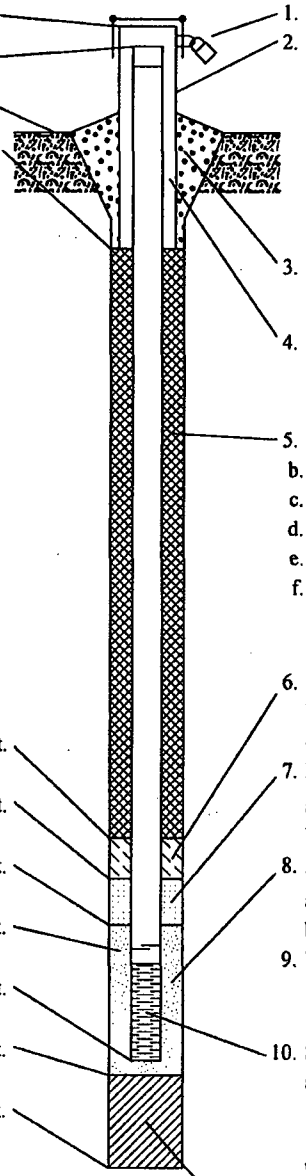
J. Filter pack, bottom 581.2 ft. MSL or 25.0 ft.

K. Borehole, bottom 581.2 ft. MSL or 25.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 9.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 0 4
____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☐ 3 0
Concrete ☒ 0 1
____ Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
____ Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 3 2
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. ____
b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
____ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
____ Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 1 4
____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Robert J. Mostel

Firm: STS Consultants, Ltd.
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	AB-0710

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	VT622	

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☒ 10
   - pumped only ☐ 51
   - pumped slowly ☐ 50
   - other _____ ☐

3. Time spent developing well 80 min.

4. Depth of well (from top of well casing) 24.7 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 5.0 gal.

7. Volume of water removed from well 25.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	18.70 ft.	22.00 ft.
Date	b.	5/31/2007	6/11/2007
Time	c.	12:15 ☐ a.m. ☒ p.m.	10:00 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Brown - cloudy - sandy	Clear ☐ 20 Turbid ☒ 25 (Describe) cloudy - very very light brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Matt Bowman & Eric Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: Hwy. 42

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Matt Bowman /RTM

Print Name: Matt Bowman

Firm: STS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		AB-0711

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - L. Cravillion - STS Project No. 200700302	6/4/2007	6/4/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
VT625		AB-0711	587.08 Feet MSL	605.9 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,421 N, 2,644,417 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Asphalt	Asphalt									
			2.5	Fill: Brown fine to coarse sand - trace to some gravel - wet at 18.0 feet										
			5.0											
1 SS	24 12	19	7.5											
2 SS	24 12	23	10.0											
3 SS	24 12	14	12.5		SW									
4 SS	24 12	16	15.0											
5 SS	24 3.5	14	17.5											
6 SS	24 12	7	20.0											
7 SS	24 12	3	22.5											
8 SS	12 6	1 1/6"		Possible fill or Disturbed Soil: Brown silty clay - trace sand	CL									
8A SS	12 11	1 1/6"	25.0											
9 SS	24 12			End of Boring Boring advanced to 23.0 feet with 4 1/4" ID HSA. Boring advanced from 23.0 to 25.0 feet with solid-stem auger Installed monitoring well at 23.0 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Robert J. Mott
Firm STS
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: AB-0711
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ___° ___' ___" Long. ___° ___' ___" or	Wis. Unique Well No.: VT625 / DNR Well Number:
Facility ID	St. Plane 195,421 ft. N, 2,644,417 ft. E. S/C/N	Date Well Installed: 06/04/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: 1/4 of SW 1/4 of Sec. 25, T. 22 N, R. 24 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Luke Cravillion, STS
Distance from Waste/Source ___ ft. Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:

A. Protective pipe, top elevation 605.88 ft. MSL

B. Well casing, top elevation 605.49 ft. MSL

C. Land surface elevation 605.9 ft. MSL

D. Surface seal, bottom 605.4 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50 Hollow Stem Auger ☒ 41 ____ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 604.9 ft. MSL or 1.0 ft.

F. Fine sand, top 599.9 ft. MSL or 6.0 ft.

G. Filter pack, top 599.9 ft. MSL or 6.0 ft.

H. Screen joint, top 597.9 ft. MSL or 8.0 ft.

I. Well bottom 582.9 ft. MSL or 23.0 ft.

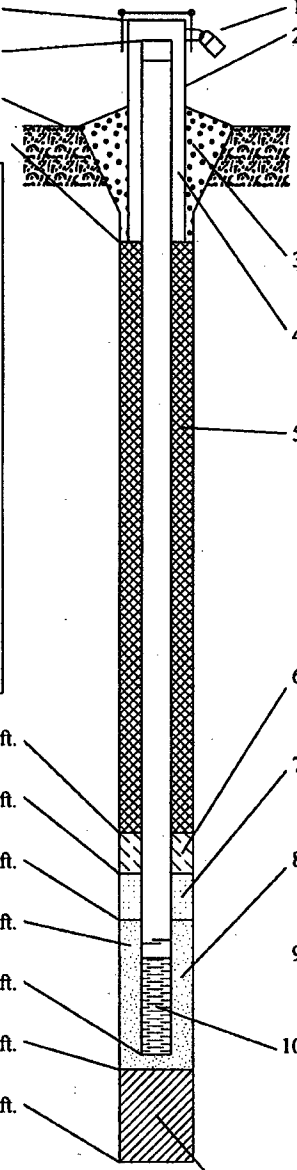
J. Filter pack, bottom 580.9 ft. MSL or 25.0 ft.

K. Borehole, bottom 580.9 ft. MSL or 25.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 04 ____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____

3. Surface seal: Bentonite ☐ 30 Concrete ☒ 01 ____ Other ☐

4. Material between well casing and protective pipe: Bentonite ☐ 30 ____ Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 1 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 ____ Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11 Continuous slot ☐ 01 ____ Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.

11. Backfill material (below filter pack): None ☒ 14 ____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Robert J. Mottl

Firm: STS Consultants, Ltd.
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	AB-0711

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	VT625	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☒ 10
   - pumped only ☐ 51
   - pumped slowly ☐ 50
   - other _____ ☐

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 23.3 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 5.0 gal.

7. Volume of water removed from well 2.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	18.37 ft.	23.30 ft.
Date	b.	6/6/2007	6/6/2007
Time	c.	02:30 ☐ a.m. ☒ p.m.	03:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Eric C. Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: Hwy. 42

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Eric Schmidt/BM

Print Name: Dominion Energy - Kewaunee Power Station

Firm: STS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		AB-0712

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - L. Cravillion - STS Project No. 200700302	5/30/2007	5/30/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
VT623		AB-0712	589.15 Feet MSL	605.5 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,413 N, 2,644,366 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Hydrovac - No samples collected										
			2.5											
			5.0											
1 SS	24 14	20	7.5	Fill: Brown fine to coarse sand - trace to some gravel - trace silt										
2 SS	24 12	27	10.0											
3 SS	24 13	16	12.5		SW									
4 SS	24 7	12												
5 SS	18 8	3	15.0											
5A SS	6 3.5	1	17.5	Possible fill or Disturbed Soil: Brown silty clay - trace sand - trace gravel - moist to wet	CL									
6 SS	24 15.5	11	20.0	Brown silty clay - trace sand - wet										
7 SS	24 20.5													
				End of Boring Boring advanced to 21.0 feet with 4 1/4" ID HSA. Installed monitoring well at 21.0 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Robert J. Mott

Firm STS
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

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State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐N. ☐S. ____ ft. ☐E. ☐W.	Well Name: AB-0712
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: VT623 / DNR Well Number:
Facility ID	St. Plane 195,413 ft. N, 2,644,366 ft. E. S/C/N	Date Well Installed: 05/30/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: ____ 1/4 of SW 1/4 of Sec. 25 T. 22 N, R. 24 ☒E ☐W	Well Installed By: (Person's Name and Firm): Luke Cravillion
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known / Gov. Lot Number:	STS

A. Protective pipe, top elevation 605.51 ft. MSL

B. Well casing, top elevation 605.19 ft. MSL

C. Land surface elevation 605.5 ft. MSL

D. Surface seal, bottom 605.0 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☒ 41
____ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 604.5 ft. MSL or 1.0 ft.

F. Fine sand, top 598.7 ft. MSL or 6.8 ft.

G. Filter pack, top 598.7 ft. MSL or 6.8 ft.

H. Screen joint, top 595.5 ft. MSL or 10.0 ft.

I. Well bottom 585.5 ft. MSL or 20.0 ft.

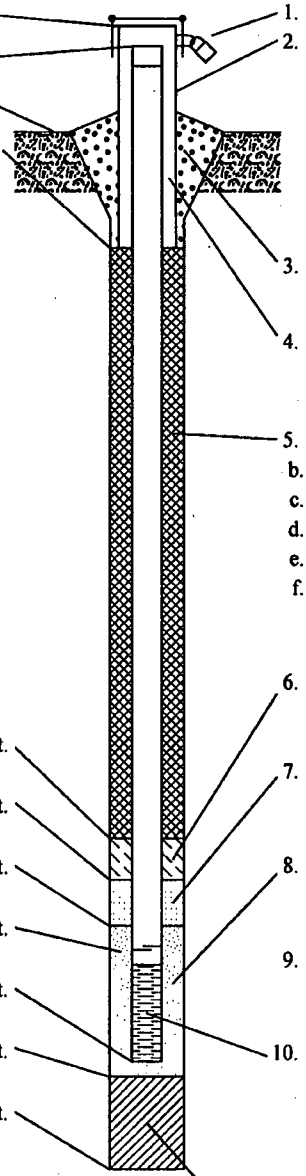
J. Filter pack, bottom 584.5 ft. MSL or 21.0 ft.

K. Borehole, bottom 584.5 ft. MSL or 21.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 04
____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____

3. Surface seal: Bentonite ☐ 30
Concrete ☒ 01
____ Other ☐

4. Material between well casing and protective pipe:
Bentonite ☐ 30
____ Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01
Tremie pumped ☐ 02
Gravity ☒ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 1 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 23
Flush threaded PVC schedule 80 ☐ 24
____ Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11
Continuous slot ☐ 01
____ Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.

11. Backfill material (below filter pack): None ☐ 14
____ Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Robert J. Mottl	Firm: STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	AB-0712

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	VT623	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☒ 10
   - pumped only ☐ 51
   - pumped slowly ☐ 50
   - other _____ ☐

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 19.7 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 2.0 gal.

7. Volume of water removed from well 1.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	18.18 ft.	19.70 ft.
Date	b.	6/7/2007	6/7/2007
Time	c.	11:00 ☒ a.m. ☐ p.m.	11:30 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☒ 10 Turbid ☐ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Eric C. Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: Hwy. 42

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Eric Schmidt / BDM

Print Name: Eric C. Schmidt

Firm: STS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		AB-0715

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - E. Schmidt - STS Project No. 200700302	5/30/2007	6/1/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
VT624		AB-0715	587.59 Feet MSL	605.7 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,195 N, 2,644,512 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				Hydrovac - no samples collected										
			2.5											
			5.0											
1 SS	24 8.5	10	7.5	Fill: Brown fine to coarse sand (SW) - trace to some gravel - wood at 20.0 feet										
2 SS	24 7.5	6	10.0											
3 SS	24 11	4	12.5											
4 SS	24 3.5	8			SW									
5 SS	24 8.5	5	15.0											
6 SS	24 3.5	1	17.5											
7 SS	24 1.8	8	20.0											
8 SS	12 5.2	3	22.5	Possible Fill or Disturbed Soil: Brown silty clay (CL)	CL									
8A SS	12 3.5	6		No Recovery - two attempts										
9 SS	24 0	5	25.0	Brown silty sandy clay (CL) - with gravel - wet	CL									
10 SS	24 8.5													
				End of Boring Boring advanced to 25.0 feet with 4 1/4" ID hollow-stem auger and from 25.0 feet to 27.0 feet with split-spoon. Installed monitoring well at 25.0 feet										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Robert J. Mottl

Firm STS
1035 Kepler Dr. Green Bay, WI 54311
Tel: 920-468-1978
Fax: 920-468-3312

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐N. ☐S. ____ ft. ☐E. ☐W.	Well Name: AB-0715
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: VT624 / DNR Well Number:
Facility ID	St. Plane 195,195 ft. N, 2,644,512 ft. E. S/C/N	Date Well Installed: 06/01/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: 1/4 of SW 1/4 of Sec. 25 T. 22 N, R. 24 ☒E ☐W	Well Installed By: (Person's Name and Firm) Luke Cravillion
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____ / STS

A. Protective pipe, top elevation 605.74 ft. MSL

B. Well casing, top elevation 605.43 ft. MSL

C. Land surface elevation 605.7 ft. MSL

D. Surface seal, bottom 605.2 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☒ 41
____ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 604.7 ft. MSL or 1.0 ft.

F. Fine sand, top 598.7 ft. MSL or 7.0 ft.

G. Filter pack, top 598.7 ft. MSL or 7.0 ft.

H. Screen joint, top 595.7 ft. MSL or 10.0 ft.

I. Well bottom 580.7 ft. MSL or 25.0 ft.

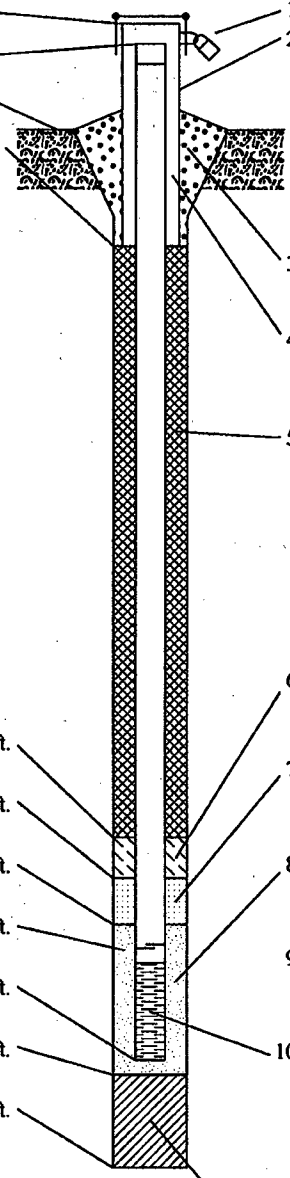
J. Filter pack, bottom 580.7 ft. MSL or 25.0 ft.

K. Borehole, bottom 578.7 ft. MSL or 27.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 9.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 04 Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☐ 30 Concrete ☒ 01 Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30 ____ Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☒ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. 45/55 Badger
b. Volume added 5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 ____ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11 Continuous slot ☐ 01 ____ Other ☐
b. Manufacturer Buffalo
c. Slot size: 0.006 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☐ 14 ____ Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Robert J. Motta	Firm: STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	AB-0715

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	VT624	

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 24.6 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 6.0 gal.

7. Volume of water removed from well 35.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	17.49 ft.	20.00 ft.
Date	b.	6/7/2007	6/7/2007
Time	c.	12:00 ☐ a.m. ☒ p.m.	01:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Browm	Clear ☐ 20 Turbid ☒ 25 (Describe) light brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Eric C. Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: Hwy. 42

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Eric Schmidt /ROM

Print Name: Eric C. Schmidt

Firm: STS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Dominion Energy - Kewaunee Power Station		AB-0717

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
STS - L. Cravillion - STS Project No. 200700302	5/22/2007	5/23/2007	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PM560		AB-0717	585.88 Feet MSL	605.5 Feet MSL	8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 195,510 N, 2,644,690 E S/C/N
1/4 of SW 1/4 of Section 25, T 22 N, R 24 E
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			3, 6	Hydrovac - No samples collected										
1 SS	24 12	28	9	Fill: Brown fine to coarse sand - trace to some gravel - moist to wet at 19.0 feet	SW									
2 SS	24 12	10												
3 SS	24 7	13	12											
4 SS	24 12	35												
5 SS	24 14	21	15											
6 SS	24 11	11												
7 SS	24 14	36	18											
8 SS	1.4 14	90 82/11"	21	Possible fill or Disturbed Soil: Brown fine silty sand to sandy silt - some gravel - cobble at 23.0 feet - moist	ML									
9 SS	24 14	30	24											
10 SS	24 20.5	10												
11 SS	24 24	10	27	Brown silty clay - trace sand - very stiff	CL									
			30	End of Boring Boring advanced to 30.0 feet with 4 1/4" ID hollow-stem auger. Installed monitoring well at 29.0 feet										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Todd Mott	STS 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

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State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Dominion Energy - Kewaunee Power Station	Local Grid Location of Well: ____ ft. ☐N. ☐S. ____ ft. ☐E. ☐W.	Well Name: AB-0717
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: PM560 / DNR Well Number:
Facility ID	St. Plane 195,510 ft. N, 2,644,690 ft. E. S/C/N	Date Well Installed: 05/23/2007
Type of Well: Well Code 11/mw	Section Location of Waste/Source: 1/4 of SW 1/4 of Sec. 25 T. 22 N, R. 24 ☒E ☐W	Well Installed By: (Person's Name and Firm): Luke Cravillion, STS
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:

A. Protective pipe, top elevation 605.48 ft. MSL

B. Well casing, top elevation 605.29 ft. MSL

C. Land surface elevation 605.5 ft. MSL

D. Surface seal, bottom 605.0 ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe _____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 604.5 ft. MSL or 1.0 ft.

F. Fine sand, top 595.5 ft. MSL or 10.0 ft.

G. Filter pack, top 595.5 ft. MSL or 10.0 ft.

H. Screen joint, top 591.5 ft. MSL or 14.0 ft.

I. Well bottom 576.5 ft. MSL or 29.0 ft.

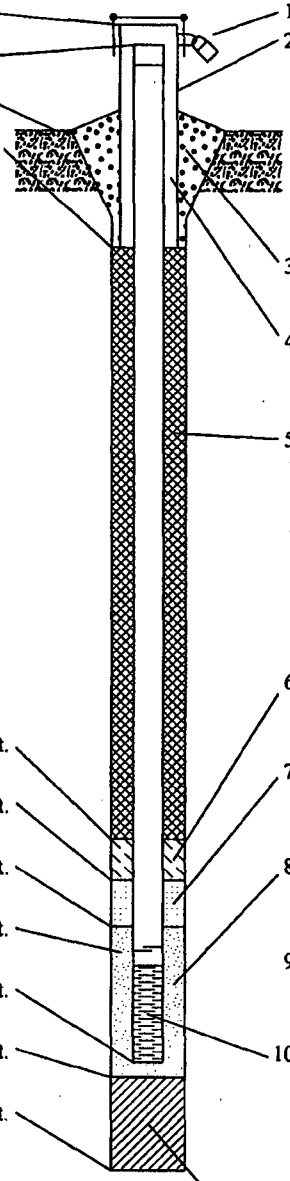
J. Filter pack, bottom 575.5 ft. MSL or 30.0 ft.

K. Borehole, bottom 575.5 ft. MSL or 30.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.25 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 8.0 in.
   b. Length: 1.0 ft.
   c. Material: Steel ☒ 04; Other ☐
   d. Additional protection? ☐ Yes ☒ No
   If yes, describe: _____
3. Surface seal: Bentonite ☐ 30; Concrete ☒ 01; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
   d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
   e. 3.5 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
   c. _____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. 45/55 Badger
   b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. 45/55 Badger
   b. Volume added 5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐
10. Screen material: PVC
    a. Screen Type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
    b. Manufacturer Buffalo
    c. Slot size: 0.006 in.
    d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Robert J. Mott	STS Consultants, Ltd. 1035 Kepler Dr. Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Dominion Energy - Kewaunee Power Station	Kewaunee	AB-0717

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PM560	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 100 min.

4. Depth of well (from top of well casing) 29.0 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 9.0 gal.

7. Volume of water removed from well 10.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	19.30 ft.	28.60 ft.
Date	b.	5/31/2007	6/8/2007
Time	c.	03:10 ☐ a.m. ☒ p.m.	12:55 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches

13. Water clarity

Before Development	After Development
Clear ☒ 10	Clear ☒ 20
Turbid ☐ 15	Turbid ☐ 25
(Describe)	(Describe)
Clear - light.	
Cloudy - clear	

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Matthew Bowman Bowman & Eric Schmidt
STS

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: Dominion Energy - Kewaunee Power Station

Street: Hwy. 42

City/State/Zip: Kewaunee, Wisconsin 54216

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Matthew Bowman /BM

Print Name: Matthew Bowman

Firm: STS

NOTE: See instructions for more information including a list of county codes and well type codes.

Dominion Energy - Kewaunee Power Station
STS Project No. 200700302

Appendix B

Groundwater Sampling Procedures

Groundwater Sampling Procedures

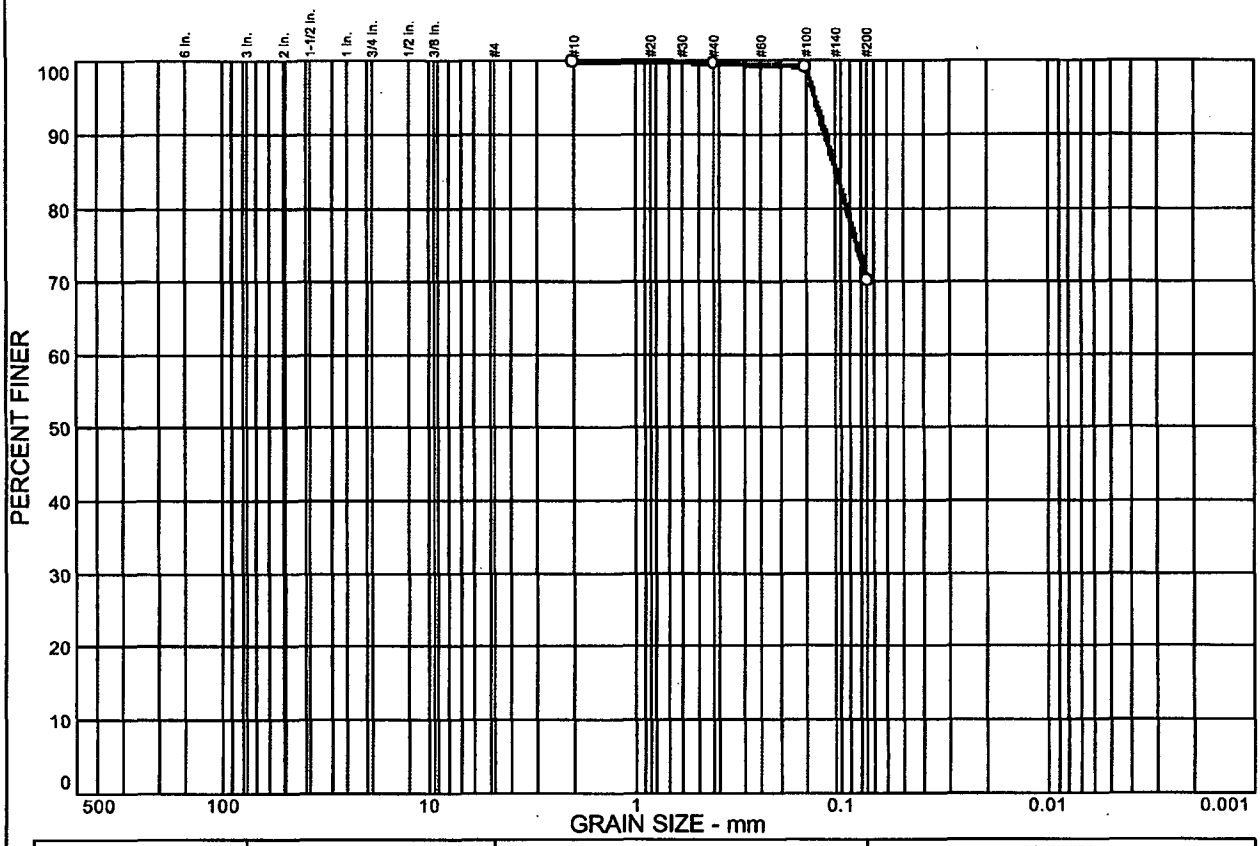
- Obtain appropriate sample containers (from Dominion Energy Kewaunee Power Station).
- Mobilize to the selected monitoring well.
- Remove flush-mounted protector pipe cover from the selected monitoring well.
- Remove the PVC well cap from top of 2-inch diameter Schedule 40 PVC monitoring well.
- Allow the air pressure in PVC well to stabilize for at least two minutes prior to measuring static groundwater depth.
- Lower a water level tape into the well until the electronic beeper sounds indicating the presence of water. Record the depth to water, to the nearest 0.01 foot relative to the highest point at the top of the PVC casing.
- Remove the electronic water tape from the well and rinse the tape using distilled or de-ionized water. Wipe the water tape probe dry or allow it to air dry prior to use in the next monitoring well.
- Lower the stainless steel submersible pump with new low-density polyethylene (LDPE) tubing and support rope/cable into the monitoring well to the approximate center of the water column. If possible, avoid placement of the pump at the bottom of the well to minimize the amount of sediment passing through the pump. During the pumping, if the well recharges slowly, the pump may have to be lowered to allow more purge water be removed.
- Activate the pump and allow water to begin to flow through the tubing using the voltage regulator on the control unit to maintain a water purge volume of less than 1 liter/minute.
- Verify that 4 well volumes are removed from the well casing or that the well was pumped dry.
- Place purge water in drums for possible disposal following receipt of analytical results. Water from each monitoring well is separated into individual drums and labeled according to monitoring well number.
- Label sample bottles prior to filling using a non water soluble ink.
- For quality control, collect two duplicate samples from two (MW-703 and MW-704) of the 14 monitoring wells. Duplicate samples to be labeled in the field as MW-703DUP and MW-704DUP and documented on field notes as to the "duplicate status."
- Allow distilled or de-ionized water to pass through the pump for decontamination. Decontamination water is directed to drums pending analytical results. Discard used LDPE tubing and support rope/cable.
- Repeat the steps for each successive well.
- Upon completion of sampling, return the filled sample containers to Dominion for analysis.

Dominion Energy - Kewaunee Power Station
STS Project No. 200700302

Appendix C

Laboratory Reports of Grain Size Analyses

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.3	29.5	70.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.7		
#100	99.2		
#200	70.2		

* (no specification provided)

Soil Description

Silt with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.107 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

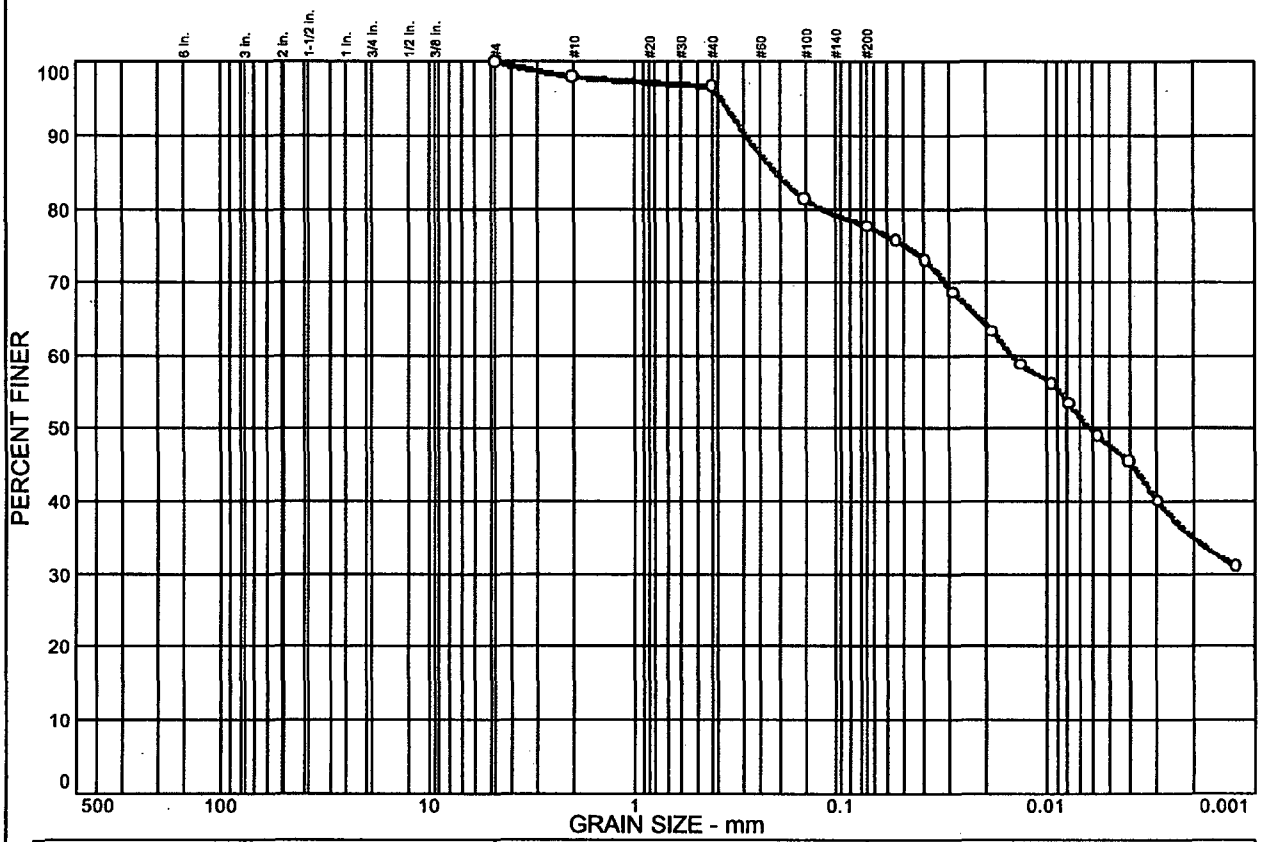
Sample No.: S-3 **Source of Sample:** ON SITE **Date:** 06/25/07
Location: MW 0701 **Elev./Depth:** 12.0' - 14.0'

STS Consultants, Ltd.
1035 Kepler Drive
Green Bay, WI 54311

Client: DOMINION ENERGY KEWAUNEE INC
Project: DOMINION KEWAUNEE TRITIUM ASSESSMENT

Project No: 200700302 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	2.1	1.3	19.0	29.9	47.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.9		
#40	96.6		
#100	81.3		
#200	77.6		

* (no specification provided)

Soil Description

Silty clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.209 D_{60}= 0.0148 D_{50}= 0.0062
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

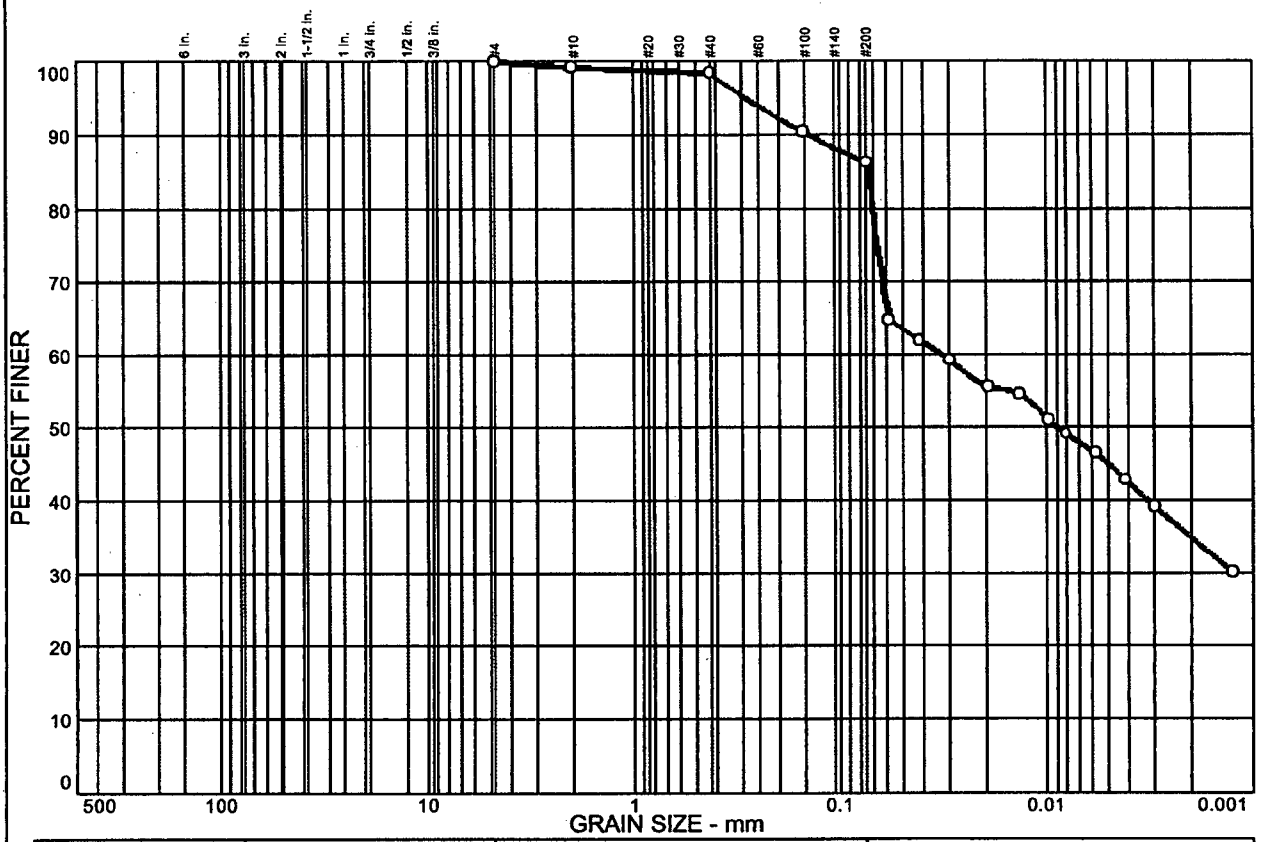
Sample No.: S-7 **Source of Sample:** ON SITE **Date:** 06/26/07
Location: MW-0702 **Elev./Depth:** 20.0' - 22.0'

STS Consultants, Ltd.
1035 Kepler Drive
Green Bay, WI 54311

Client: DOMINION ENERGY KEWAUNEE INC
Project: DOMINION KEWAUNEE TRITIUM ASSESSMENT

Project No: 200700302 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.8	0.8	12.2	41.2	45.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#40	98.4		
#100	90.3		
#200	86.2		

* (no specification provided)

Soil Description

Silty clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0741 D_{60}= 0.0326 D_{50}= 0.0089
D_{30}= 0.0012 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

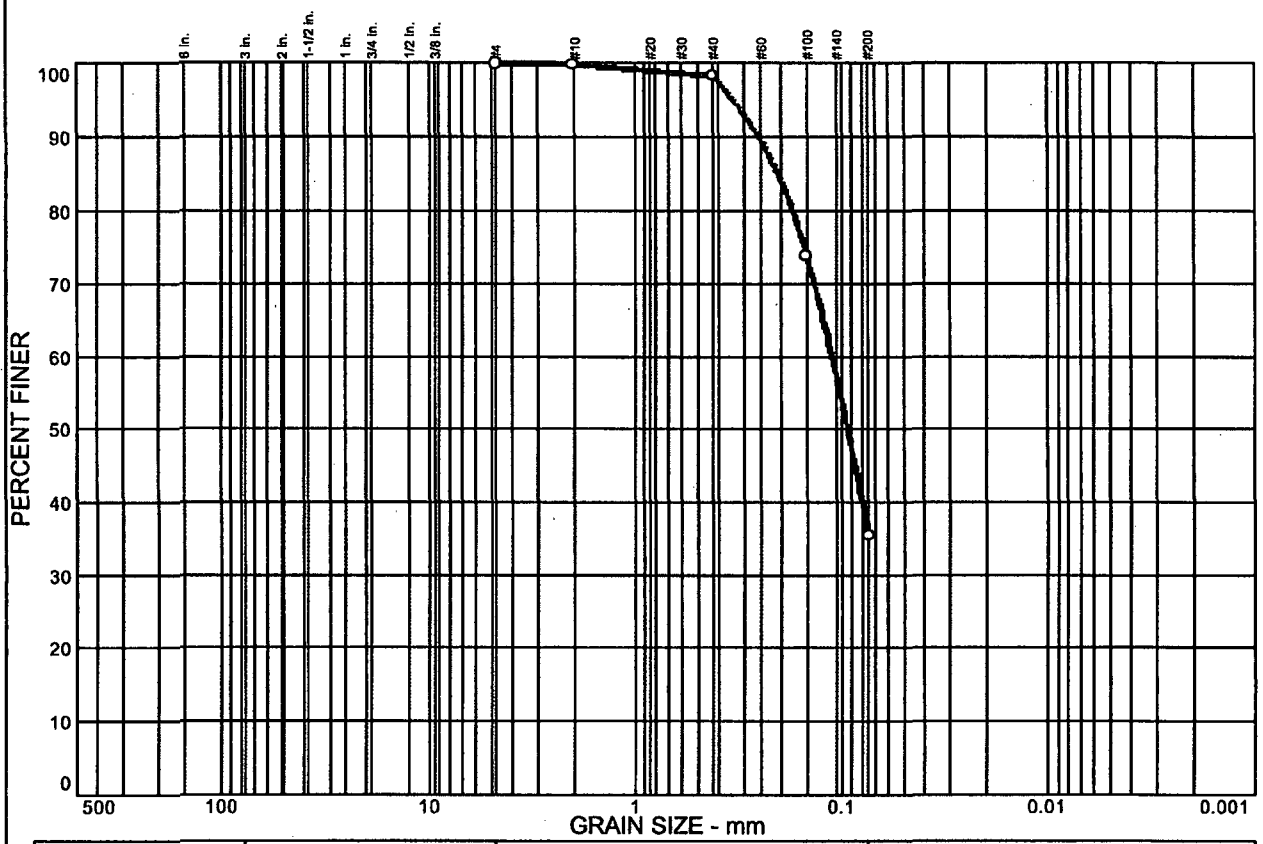
Sample No.: S-5 **Source of Sample:** ON SITE **Date:** 06/26/07
Location: MW-0703 **Elev./Depth:** 16.0' - 18.0'

STS Consultants, Ltd.
1035 Kepler Drive
Green Bay, WI 54311

Client: DOMINION ENERGY KEWAUNEE INC
Project: DOMINION KEWAUNEE TRITIUM ASSESSMENT

Project No: 200700302 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.2	1.5	62.8	35.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#40	98.3		
#100	73.8		
#200	35.5		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.207 D_{60}= 0.113 D_{50}= 0.0952
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

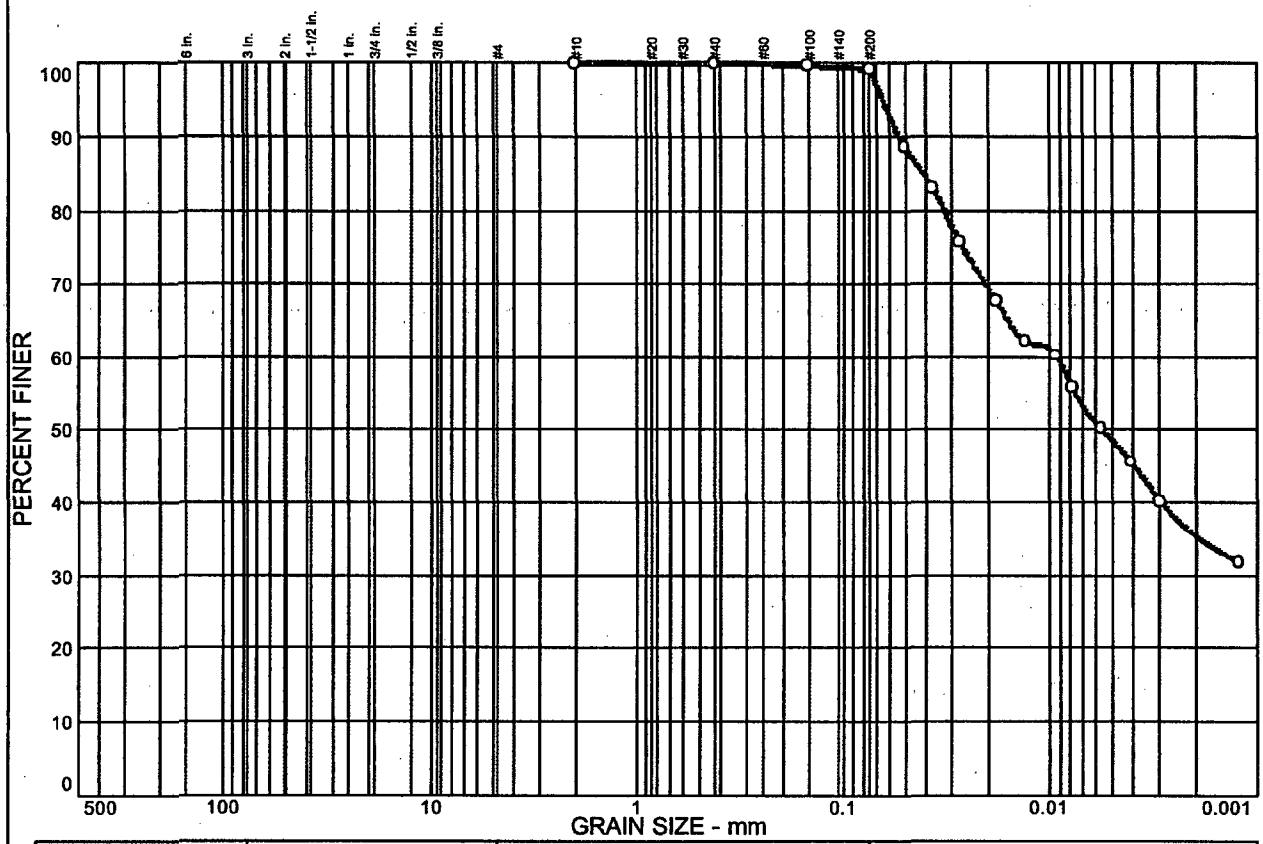
Sample No.: S-11B **Source of Sample:** ON SITE **Date:** 06/25/07
Location: MW 0704 **Elev./Depth:** 26.5' - 28.0'

STS Consultants, Ltd.
1035 Kepler Drive
Green Bay, WI 54311

Client: DOMINION ENERGY KEWAUNEE INC
Project: DOMINION KEWAUNEE TRITIUM ASSESSMENT

Project No: 200700302 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.0	0.8	50.6	48.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	100.0		
#100	99.6		
#200	99.2		

* (no specification provided)

Soil Description

Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0414 D_{60}= 0.0093 D_{50}= 0.0056
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

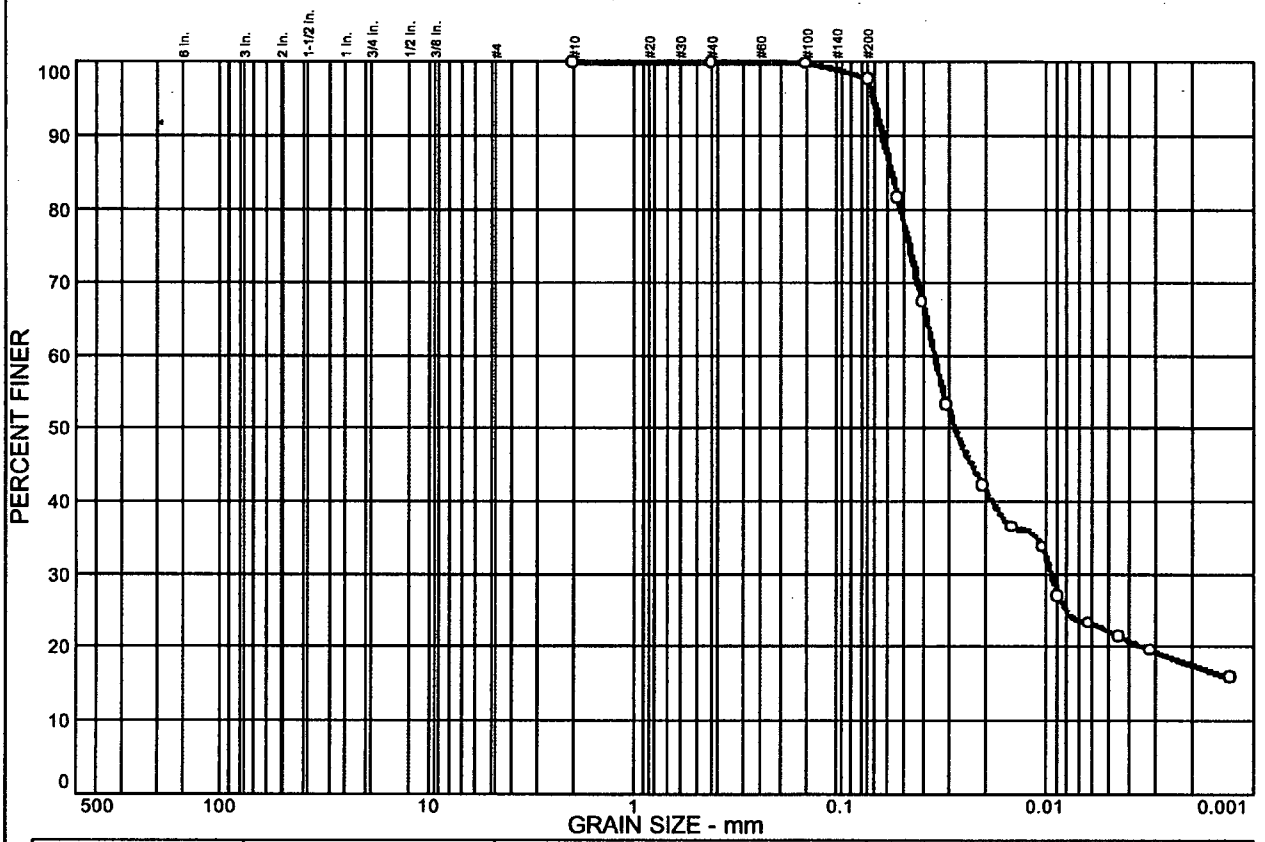
Sample No.: S-7 **Source of Sample:** ON SITE **Date:** 06/26/07
Location: MW-0705 **Elev./Depth:** 20.0' - 22.0'

STS Consultants, Ltd.
1035 Kepler Drive
Green Bay, WI 54311

Client: DOMINION ENERGY KEWAUNEE INC
Project: DOMINION KEWAUNEE TRITIUM ASSESSMENT

Project No: 200700302 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.0	2.3	75.5	22.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	100.0		
#100	99.8		
#200	97.7		

* (no specification provided)

Soil Description

Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0578 D_{60}= 0.0355 D_{50}= 0.0281
D_{30}= 0.0095 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

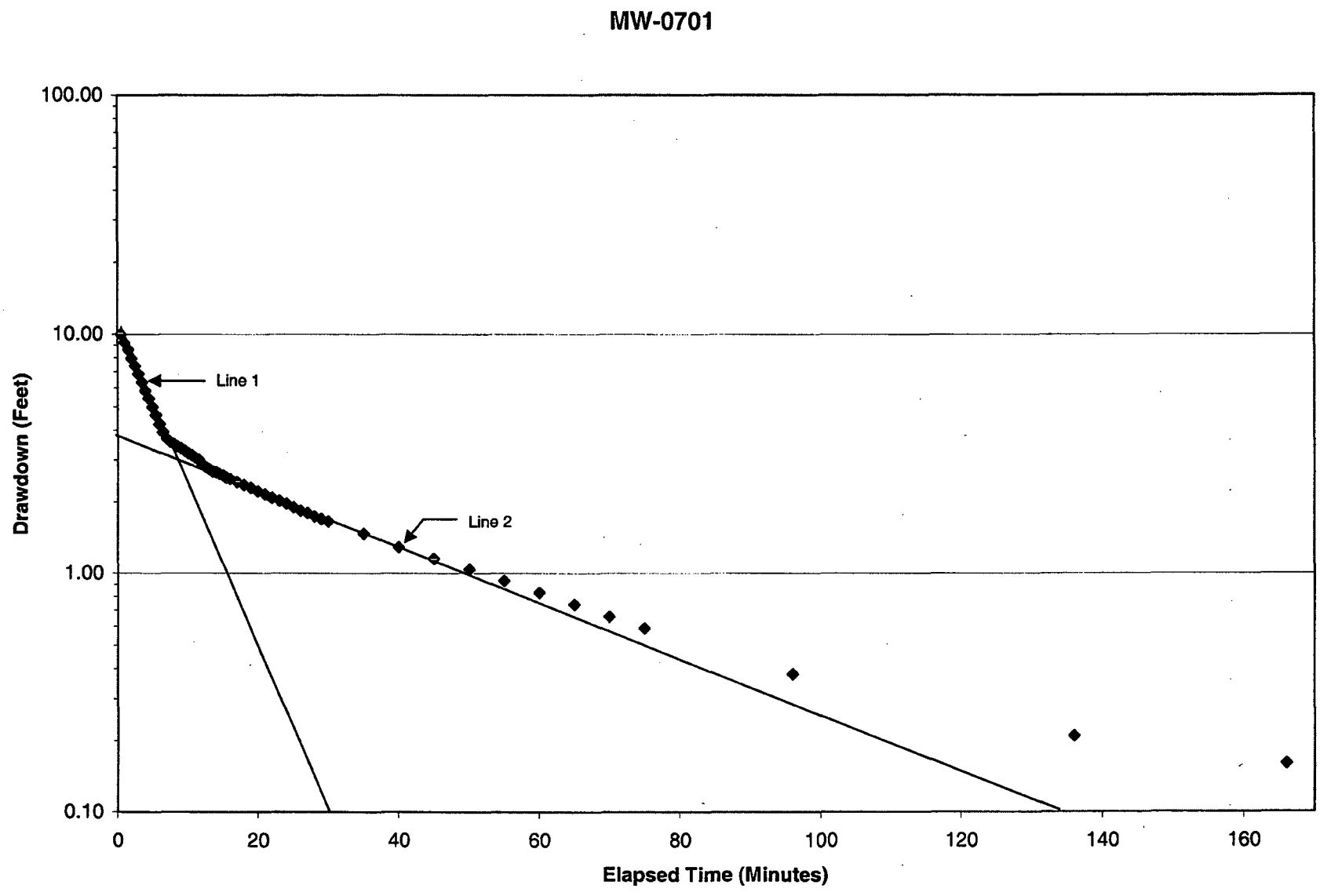
Remarks

Sample No.: S-9 **Source of Sample:** ON SITE **Date:** 06/26/07
Location: MW-0706 **Elev./Depth:** 23.0' - 25.0'

STS Consultants, Ltd.
1035 Kepler Drive
Green Bay, WI 54311

Client: DOMINION ENERGY KEWAUNEE INC
Project: DOMINION KEWAUNEE TRITIUM ASSESSMENT

Project No: 200700302 **Figure**


MW-0701
100.00
10.00
1.00
0.10
Drawdown (Feet)
Line 1
Line 2
0
20
40
60
80
100
120
140
160
Elapsed Time (Minutes)

Dominion - Kewaunee Power Station
Field Hydraulic Conductivity Analysis: **MW-0701, Line 1**
Bouwer & Rice Method
Partially Penetrating Well in an Unconfined Aquifer

	ft	cm	
r_c	0.085	2.6	Radius of Well Casing
r_w	0.33	10.1	Radius of Borehole/Well
L_w	12.58	383.4	Vertical Distance from Static Water Level to Bottom of Well
L_e	12.58	383.4	Vertical Length of Saturated Filter Pack
H	25.16	766.9	Vertical Distance from Static Water Level to Impermeable Boundary
n	0.3	0.3	Filter Pack Porosity
r_{eq}	0.19	5.92	Equivalent Casing Radius
y_o	11	335.3	Change in Water Level at Time 0
y_t	6.33	192.9	Change in Water Level at Time t
t	210	210	Time which Corresponds to y_t (sec)
A	2.4	2.4	Well Geometry Parameter (dimensionless)
B	0.4	0.4	Well Geometry Parameter (dimensionless)
Part1	0.302	0.302	Portion of $\ln(R_e/r_w)$ Calculation
Part2	0.101	0.101	Portion of $\ln(R_e/r_w)$ Calculation
$\ln(R_e/r_w)$	2.480	2.480	
	(ft/sec)	(cm/sec)	
K	9.8E-06	3.0E-04	**Hydraulic Conductivity**

Where:

$$K = \frac{r_{eq}^{\ 2} \times \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \times \frac{1}{t} \times \ln\left(\frac{y_o}{y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left\{ \frac{1.1}{\ln\left(\frac{L_w}{r_w}\right)} + \frac{A + B\left[\frac{(H - L_w)}{r_w}\right]}{\frac{L_e}{r_w}} \right\}^{-1}$$

$$\ln\left(\frac{R_e}{r_w}\right) = \{Part1 + Part2\}^{-1}$$

Note:
* H is assumed to be 2 x L_w.

Calculated by: Eric C. Schmidt (06/22/07)

Checked by: RJM 7/17/07

Dominion - Kewaunee Power Station
Field Hydraulic Conductivity Analysis: **MW-0701, Line 2**
Bouwer & Rice Method
Partially Penetrating Well in an Unconfined Aquifer

	ft	cm	
r_c	0.085	2.6	Radius of Well Casing
r_w	0.33	10.1	Radius of Borehole/Well
L_w	12.58	383.4	Vertical Distance from Static Water Level to Bottom of Well
L_e	12.58	383.4	Vertical Length of Saturated Filter Pack
H	25.16	766.9	Vertical Distance from Static Water Level to Impermeable Boundary
n	0.3	0.3	Filter Pack Porosity
r_{eq}	0.19	5.92	Equivalent Casing Radius
y_o	3.8	115.8	Change in Water Level at Time 0
y_t	1.29	39.3	Change in Water Level at Time t
t	2400	2400	Time which Corresponds to y_t (sec)
A	2.8	2.8	Well Geometry Parameter (dimensionless)
B	0.4	0.4	Well Geometry Parameter (dimensionless)
Part1	0.302	0.302	Portion of $\ln(R_e/r_w)$ Calculation
Part2	0.112	0.112	Portion of $\ln(R_e/r_w)$ Calculation
$\ln(R_e/r_w)$	2.417	2.417	
	(ft/sec)	(cm/sec)	
K	1.6E-06	5.0E-05	**Hydraulic Conductivity**

Where:

$$K = \frac{r_{eq}^{\ 2} \times \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \times \frac{1}{t} \times \ln\left(\frac{y_o}{y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left\{ \frac{1.1}{\ln\left(\frac{L_w}{r_w}\right)} + \frac{A + B\left[\frac{(H - L_w)}{r_w}\right]}{\frac{L_e}{r_w}} \right\}^{-1}$$

$$\ln\left(\frac{R_e}{r_w}\right) = \{Part1 + Part2\}^{-1}$$

Note:
* H is assumed to be 2 x L_w.

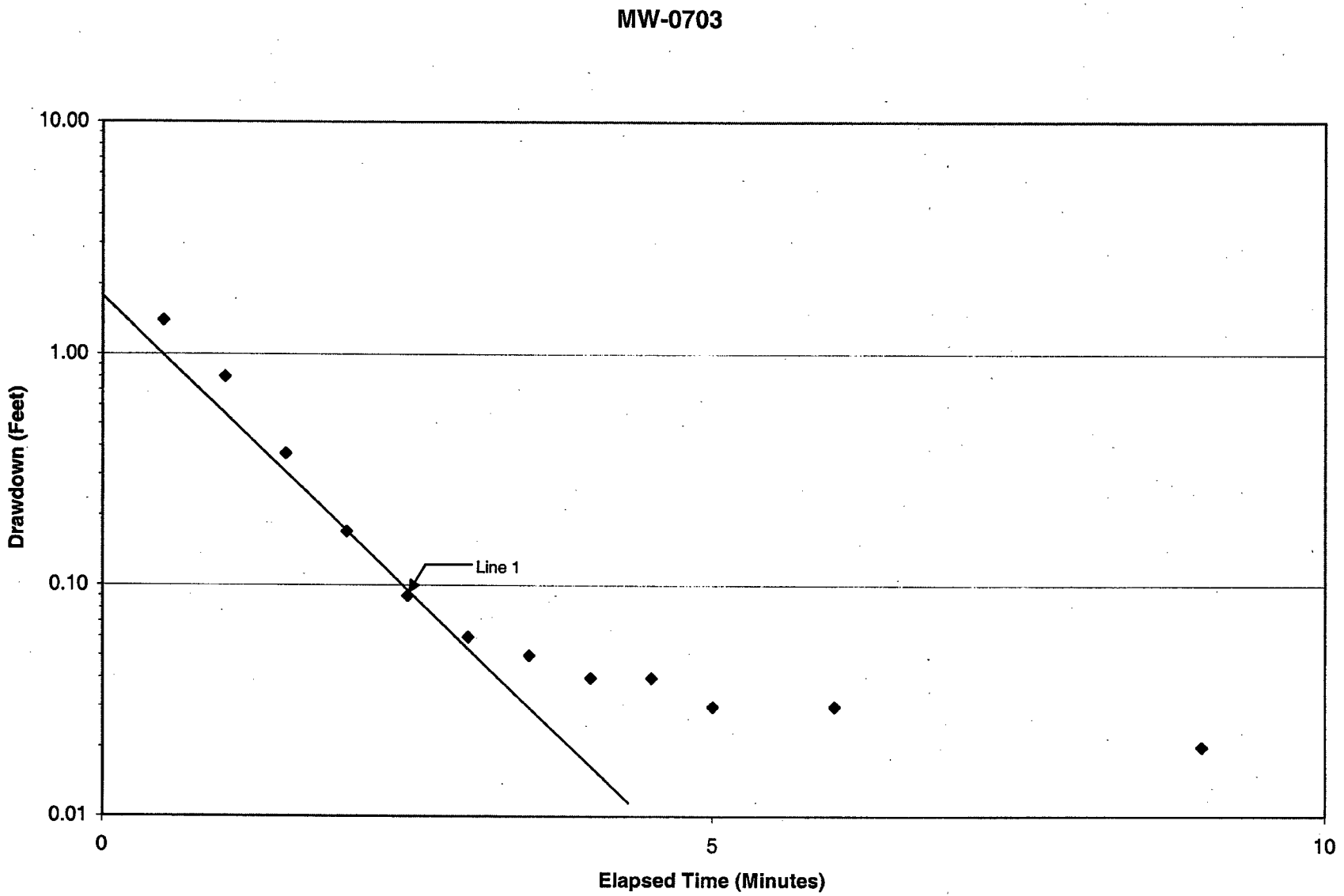
Calculated by: Eric C. Schmidt (06/22/07)

Checked by: RJM 7/17/07

MW-0703

Static Water Level: 20.91 feet from top of PVC
Well Bottom: 24.8 feet from top of PVC

Elapsed Time (Minutes)	Water Level Reading (feet TPVC)	Drawdown (Feet)
0.5	22.31	1.40
1	21.71	0.80
1.5	21.28	0.37
2	21.08	0.17
2.5	21.00	0.09
3	20.97	0.06
3.5	20.96	0.05
4	20.95	0.04
4.5	20.95	0.04
5	20.94	0.03
6	20.94	0.03
9	20.93	0.02


MW-0703
10.00
1.00
0.10
0.01
Drawdown (Feet)
Line 1
0
5
10
Elapsed Time (Minutes)

Dominion - Kewaunee Power Station
Field Hydraulic Conductivity Analysis: **MW-0703**
Bouwer & Rice Method
Partially Penetrating Well in an Unconfined Aquifer

	ft	cm	
r_c	0.085	2.6	Radius of Well Casing
r_w	0.333	10.1	Radius of Borehole/Well
L_w	3.89	118.6	Vertical Distance from Static Water Level to Bottom of Well
L_e	3.89	118.6	Vertical Length of Saturated Filter Pack
H	7.78	237.1	Vertical Distance from Static Water Level to Impermeable Boundary
n	0.3	0.3	Filter Pack Porosity
r_{eq}	0.20	5.97	Equivalent Casing Radius
y_o	1.8	54.9	Change in Water Level at Time 0
y_t	0.09	2.7	Change in Water Level at Time t
t	150	150	Time which Corresponds to y_t (sec)
A	1.8	1.8	Well Geometry Parameter (dimensionless)
B	0.3	0.3	Well Geometry Parameter (dimensionless)
Part1	0.448	0.448	Portion of $\ln(R_e/r_w)$ Calculation
Part2	0.217	0.217	Portion of $\ln(R_e/r_w)$ Calculation
$\ln(R_e/r_w)$	1.504	1.504	
	(ft/sec)	(cm/sec)	
K	1.5E-04	4.5E-03	**Hydraulic Conductivity**

Where:

$$K = \frac{r_{eq}^{\ 2} \times \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \times \frac{1}{t} \times \ln\left(\frac{y_o}{y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left\{ \frac{1.1}{\ln\left(\frac{L_w}{r_w}\right)} + \frac{A + B\left[\frac{(H - L_w)}{r_w}\right]}{\frac{L_e}{r_w}} \right\}^{-1}$$

$$\ln\left(\frac{R_e}{r_w}\right) = \{Part1 + Part2\}^{-1}$$

Note:
* H is assumed to be 2 x L_w.

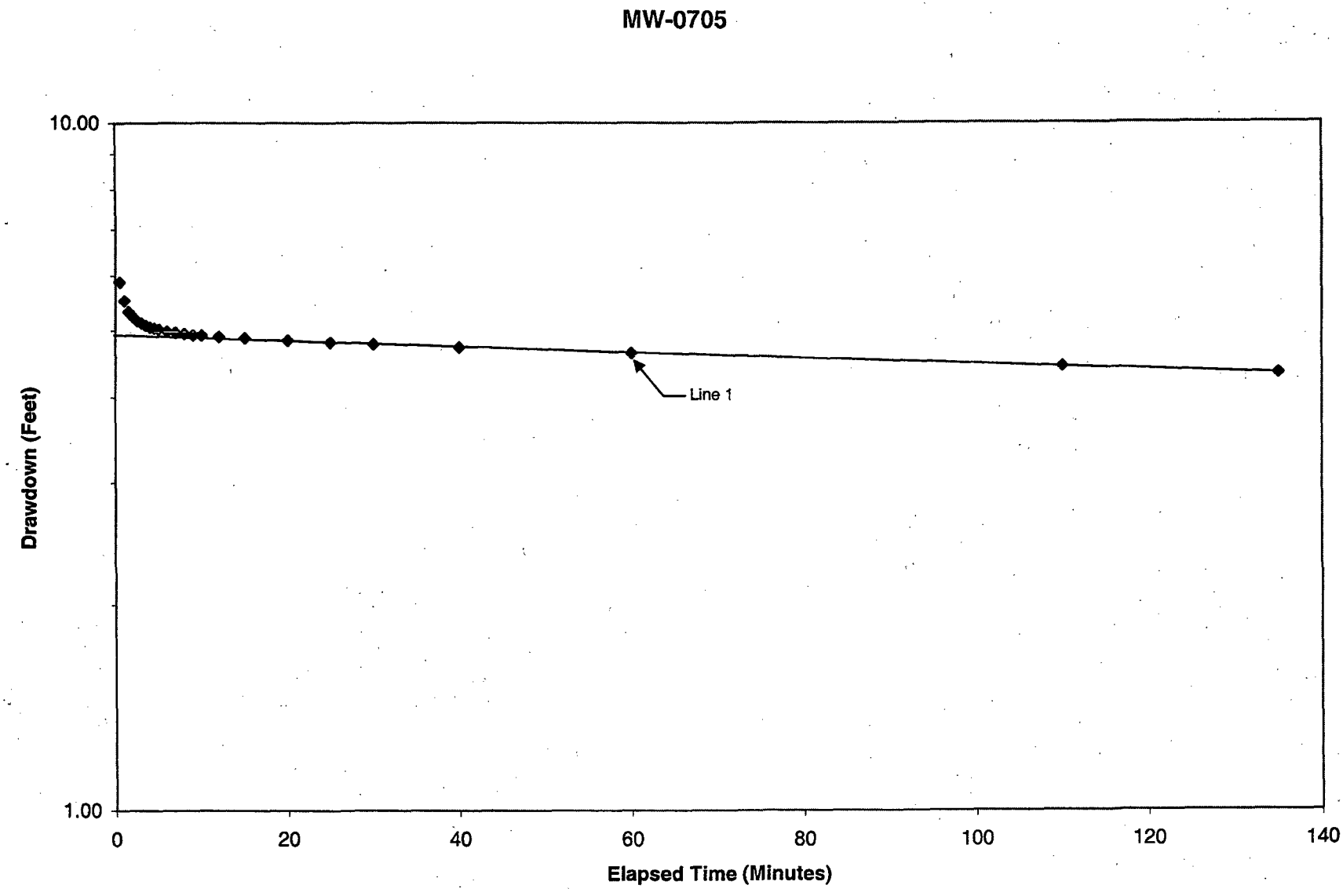
Calculated by: Eric C. Schmidt (06/22/07)

Checked by: RJM 7/17/07

MW-0705

Static Water Level: 20.62 feet from top of PVC
Well Bottom: 27.7 feet from top of PVC

Elapsed Time (Minutes)	Water Level Reading (feet TPVC)	Drawdown (Feet)
0.5	26.50	5.88
1	26.15	5.53
1.5	25.95	5.33
2	25.86	5.24
2.5	25.79	5.17
3	25.75	5.13
3.5	25.71	5.09
4	25.68	5.06
4.5	25.66	5.04
5	25.64	5.02
6	25.61	4.99
7	25.59	4.97
8	25.57	4.95
9	25.55	4.93
10	25.54	4.92
12	25.52	4.90
15	25.50	4.88
20	25.46	4.84
25	25.43	4.81
30	25.40	4.78
40	25.35	4.73
60	25.26	4.64
110	25.06	4.44
135	24.95	4.33
4345	20.80	0.18


MW-0705
10.00
1.00
Drawdown (Feet)
Line 1
0
20
40
60
80
100
120
140
Elapsed Time (Minutes)

Dominion - Kewaunee Power Station
Field Hydraulic Conductivity Analysis: **MW-0705**
Bouwer & Rice Method
Partially Penetrating Well in an Unconfined Aquifer

	ft	cm	
r_c	0.085	2.6	Radius of Well Casing
r_w	0.333	10.1	Radius of Borehole/Well
L_w	7.08	215.8	Vertical Distance from Static Water Level to Bottom of Well
L_e	7.08	215.8	Vertical Length of Saturated Filter Pack
H	14.16	431.6	Vertical Distance from Static Water Level to Impermeable Boundary
n	0.3	0.3	Filter Pack Porosity
r_{eq}	0.20	5.97	Equivalent Casing Radius
y_o	4.9	149.4	Change in Water Level at Time 0
y_t	4.64	141.4	Change in Water Level at Time t
t	3600	3600	Time which Corresponds to y_t (sec)
A	2.1	2.1	Well Geometry Parameter (dimensionless)
B	0.3	0.3	Well Geometry Parameter (dimensionless)
Part1	0.360	0.360	Portion of $\ln(R_e/r_w)$ Calculation
Part2	0.142	0.142	Portion of $\ln(R_e/r_w)$ Calculation
$\ln(R_e/r_w)$	1.993	1.993	
	(ft/sec)	(cm/sec)	
K	8.2E-08	2.5E-06	**Hydraulic Conductivity**

Where:

$$K = \frac{r_{eq}^{\,2} \times \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \times \frac{1}{t} \times \ln\left(\frac{y_o}{y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left\{ \frac{1.1}{\ln\left(\frac{L_w}{r_w}\right)} + \frac{A + B\left[\frac{(H - L_w)}{r_w}\right]}{\frac{L_e}{r_w}} \right\}^{-1}$$

$$\ln\left(\frac{R_e}{r_w}\right) = \{Part1 + Part2\}^{-1}$$

Note:
* H is assumed to be 2 x L_w.

Calculated by: Eric C. Schmidt (06/22/07)

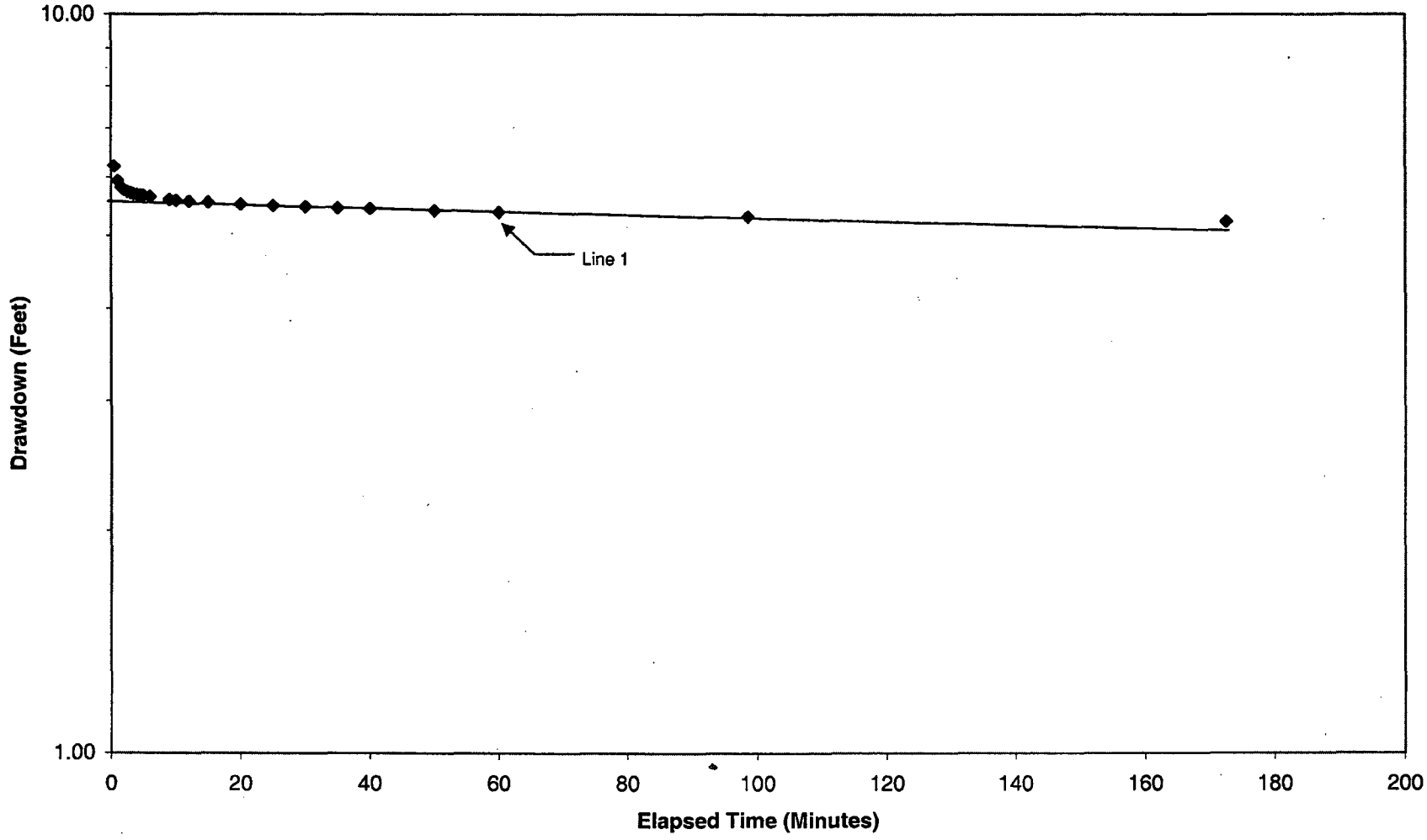
Checked by: RJM 7/17/07

MW-0706

Static Water Level: 23.33 feet from top of PVC
Well Bottom: 31.0 feet from top of PVC

Elapsed Time (Minutes)	Water Level Reading (feet TPVC)	Drawdown (Feet)
0.5	29.55	6.22
1	29.27	5.94
1.5	29.15	5.82
2	29.10	5.77
2.5	29.07	5.74
3	29.05	5.72
3.5	29.03	5.70
4	29.02	5.69
4.5	29.01	5.68
5	29.00	5.67
6	28.98	5.65
9	28.93	5.60
10	28.92	5.59
12	28.90	5.57
15	28.88	5.55
20	28.85	5.52
25	28.83	5.50
30	28.81	5.48
35	28.79	5.46
40	28.78	5.45
50	28.75	5.42
60	28.72	5.39
98.5	28.64	5.31
172.5	28.56	5.23
216.5	28.52	5.19
4426.5	26.79	3.46

MW-0706


10.00
1.00
Drawdown (Feet)
Line 1
0
20
40
60
80
100
120
140
160
180
200
Elapsed Time (Minutes)

Dominion - Kewaunee Power Station
Field Hydraulic Conductivity Analysis: **MW-0706**
Bouwer & Rice Method
Partially Penetrating Well in an Unconfined Aquifer

	ft	cm	
r_c	0.085	2.6	Radius of Well Casing
r_w	0.333	10.1	Radius of Borehole/Well
L_w	7.67	233.8	Vertical Distance from Static Water Level to Bottom of Well
L_e	7.67	233.8	Vertical Length of Saturated Filter Pack
H	15.34	467.6	Vertical Distance from Static Water Level to Impermeable Boundary
n	0.3	0.3	Filter Pack Porosity
r_{eq}	0.20	5.97	Equivalent Casing Radius
y_o	6.5	198.1	Change in Water Level at Time 0
y_t	5.39	164.3	Change in Water Level at Time t
t	3600	3600	Time which Corresponds to y_t (sec)
A	2.1	2.1	Well Geometry Parameter (dimensionless)
B	0.3	0.3	Well Geometry Parameter (dimensionless)
Part1	0.351	0.351	Portion of $\ln(R_e/r_w)$ Calculation
Part2	0.132	0.132	Portion of $\ln(R_e/r_w)$ Calculation
$\ln(R_e/r_w)$	2.072	2.072	
	(ft/sec)	(cm/sec)	
K	2.7E-07	8.2E-06	**Hydraulic Conductivity**

Where:

$$K = \frac{r_{eq}^{\ 2} \times \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \times \frac{1}{t} \times \ln\left(\frac{y_o}{y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left\{ \frac{1.1}{\ln\left(\frac{L_w}{r_w}\right)} + \frac{A + B\left[\frac{(H - L_w)}{r_w}\right]}{\frac{L_e}{r_w}} \right\}^{-1}$$

$$\ln\left(\frac{R_e}{r_w}\right) = \{Part1 + Part2\}^{-1}$$

Note:
* H is assumed to be 2 x L_w.

Calculated by: Eric C. Schmidt (06/22/07)

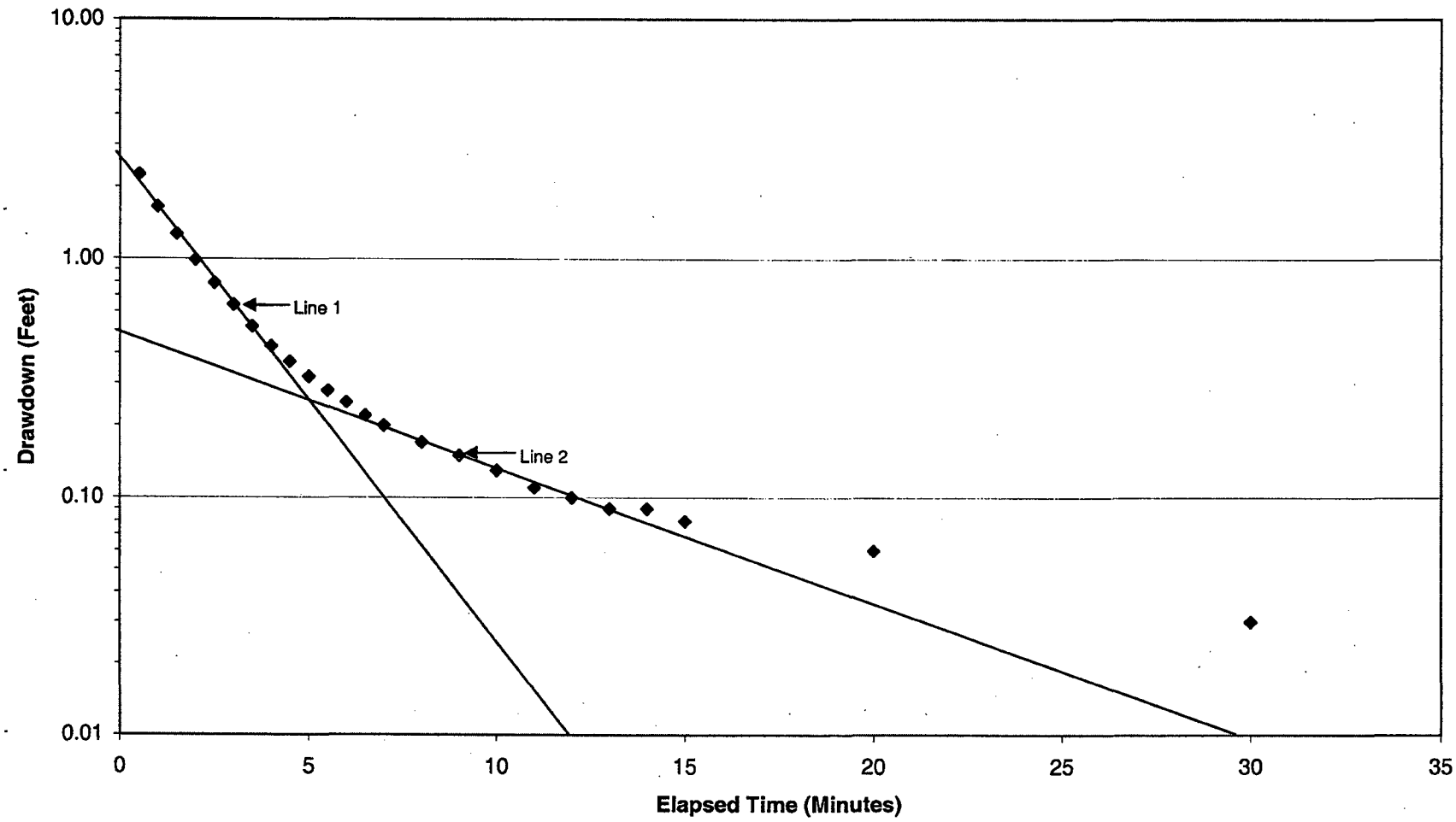
Checked by: RJM 7/17/07

AB-0707

Static Water Level: 18.48 feet from top of PVC
Well Bottom: 24.0 feet from top of PVC

Elapsed Time (Minutes)	Water Level Reading (feet TPVC)	Drawdown (Feet)
0.5	20.74	2.26
1	20.13	1.65
1.5	19.75	1.27
2	19.47	0.99
2.5	19.27	0.79
3	19.12	0.64
3.5	19.00	0.52
4	18.91	0.43
4.5	18.85	0.37
5	18.80	0.32
5.5	18.76	0.28
6	18.73	0.25
6.5	18.70	0.22
7	18.68	0.20
8	18.65	0.17
9	18.63	0.15
10	18.61	0.13
11	18.59	0.11
12	18.58	0.10
13	18.57	0.09
14	18.57	0.09
15	18.56	0.08
20	18.54	0.06
30	18.51	0.03

AB-0707


10.00
1.00
0.10
0.01
Drawdown (Feet)
Line 1
Line 2
0
5
10
15
20
25
30
35
Elapsed Time (Minutes)

Dominion - Kewaunee Power Station
Field Hydraulic Conductivity Analysis: **AB-0707, Line 2**
Bouwer & Rice Method
Partially Penetrating Well in an Unconfined Aquifer

	ft	cm	
r_c	0.085	2.6	Radius of Well Casing
r_w	0.333	10.1	Radius of Borehole/Well
L_w	5.52	168.2	Vertical Distance from Static Water Level to Bottom of Well
L_e	5.52	168.2	Vertical Length of Saturated Filter Pack
H	11.04	336.5	Vertical Distance from Static Water Level to Impermeable Boundary
n	0.3	0.3	Filter Pack Porosity
r_{eq}	0.20	5.97	Equivalent Casing Radius
y_o	0.5	15.2	Change in Water Level at Time 0
y_t	0.15	4.6	Change in Water Level at Time t
t	540	540	Time which Corresponds to y_t (sec)
A	2	2	Well Geometry Parameter (dimensionless)
B	0.3	0.3	Well Geometry Parameter (dimensionless)
Part1	0.392	0.392	Portion of $\ln(R_e/r_w)$ Calculation
Part2	0.171	0.171	Portion of $\ln(R_e/r_w)$ Calculation
$\ln(R_e/r_w)$	1.776	1.776	
	(ft/sec)	(cm/sec)	
K	1.4E-05	4.2E-04	**Hydraulic Conductivity**

Where:

$$K = \frac{r_{eq}^{\ 2} \times \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \times \frac{1}{t} \times \ln\left(\frac{y_o}{y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left\{ \frac{1.1}{\ln\left(\frac{L_w}{r_w}\right)} + \frac{A + B\left[\frac{(H - L_w)}{r_w}\right]}{\frac{L_e}{r_w}} \right\}^{-1}$$

$$\ln\left(\frac{R_e}{r_w}\right) = \{Part1 + Part2\}^{-1}$$

Note:
* H is assumed to be 2 x L_w.

Calculated by: Eric C. Schmidt (06/22/07)

Checked by: RJM 7/17/07

Dominion - Kewaunee Power Station
Field Hydraulic Conductivity Analysis: **AB-0707, Line 1**
Bouwer & Rice Method
Partially Penetrating Well in an Unconfined Aquifer

	ft	cm	
r_c	0.085	2.6	Radius of Well Casing
r_w	0.333	10.1	Radius of Borehole/Well
L_w	5.52	168.2	Vertical Distance from Static Water Level to Bottom of Well
L_e	5.52	168.2	Vertical Length of Saturated Filter Pack
H	11.04	336.5	Vertical Distance from Static Water Level to Impermeable Boundary
n	0.3	0.3	Filter Pack Porosity
r_{eq}	0.20	5.97	Equivalent Casing Radius
y_o	2.8	85.3	Change in Water Level at Time 0
y_t	0.64	19.5	Change in Water Level at Time t
t	180	180	Time which Corresponds to y_t (sec)
A	2	2	Well Geometry Parameter (dimensionless)
B	0.3	0.3	Well Geometry Parameter (dimensionless)
Part1	0.392	0.392	Portion of $\ln(R_e/r_w)$ Calculation
Part2	0.171	0.171	Portion of $\ln(R_e/r_w)$ Calculation
$\ln(R_e/r_w)$	1.776	1.776	
	(ft/sec)	(cm/sec)	
K	5.1E-05	1.5E-03	**Hydraulic Conductivity**

Where:

$$K = \frac{r_{eq}^{\,2} \times \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \times \frac{1}{t} \times \ln\left(\frac{y_o}{y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left\{ \frac{1.1}{\ln\left(\frac{L_w}{r_w}\right)} + \frac{A + B\left[\frac{(H - L_w)}{r_w}\right]}{\frac{L_e}{r_w}} \right\}^{-1}$$

$$\ln\left(\frac{R_e}{r_w}\right) = \{Part1 + Part2\}^{-1}$$

Note:
* H is assumed to be 2 x L_w.

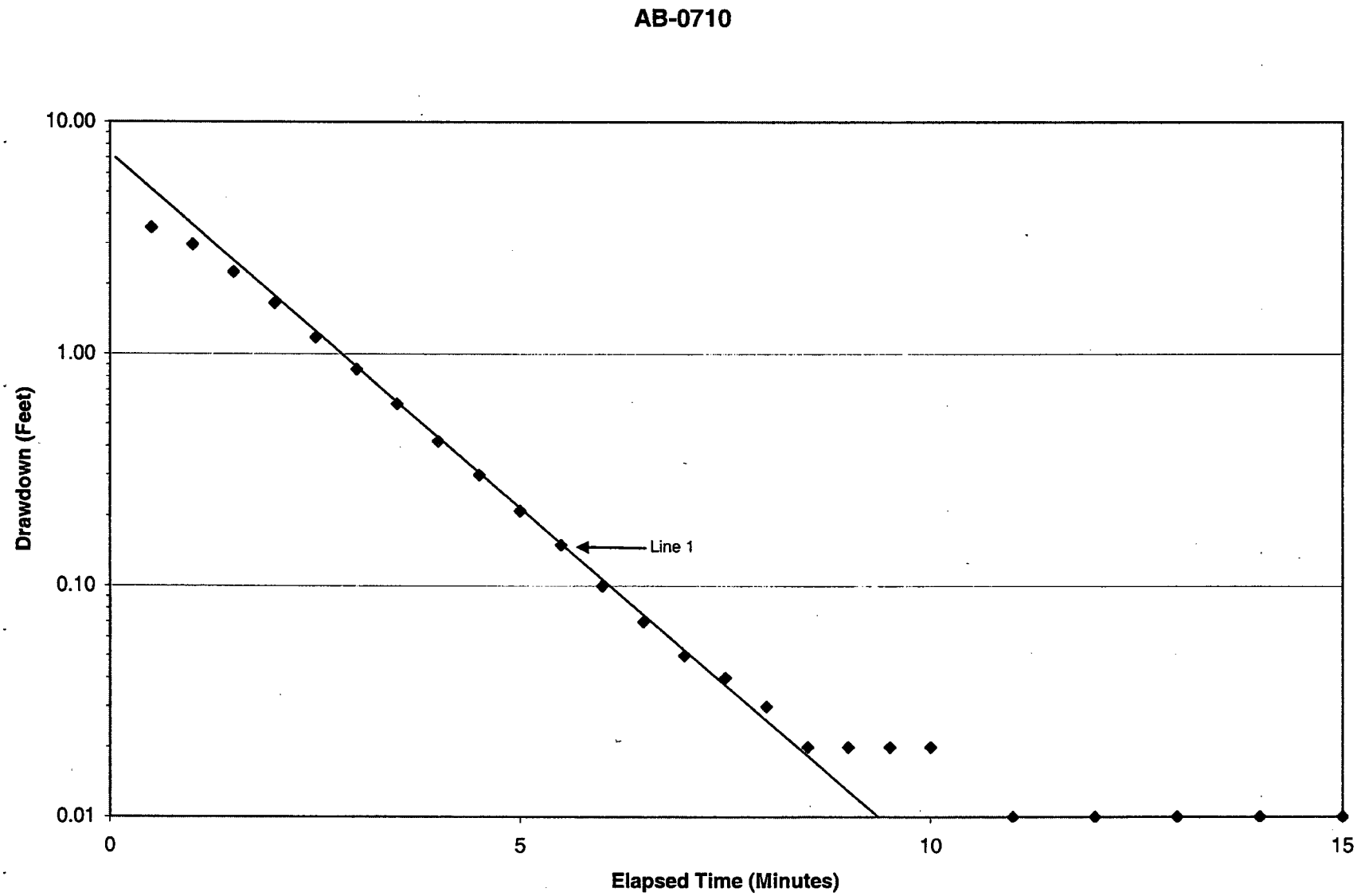
Calculated by: Eric C. Schmidt (06/22/07)

Checked by: RJM 7/17/07

AB-0710

Static Water Level: 18.79 feet from top of PVC
Well Bottom: 25.0 feet from top of PVC

Elapsed Time (Minutes)	Water Level Reading (feet TPVC)	Drawdown (Feet)
0.5	22.30	3.51
1	21.76	2.97
1.5	21.05	2.26
2	20.45	1.66
2.5	19.97	1.18
3	19.65	0.86
3.5	19.40	0.61
4	19.21	0.42
4.5	19.09	0.30
5	19.00	0.21
5.5	18.94	0.15
6	18.89	0.10
6.5	18.86	0.07
7	18.84	0.05
7.5	18.83	0.04
8	18.82	0.03
8.5	18.81	0.02
9	18.81	0.02
9.5	18.81	0.02
10	18.81	0.02
11	18.80	0.01
12	18.80	0.01
13	18.80	0.01
14	18.80	0.01
15	18.80	0.01


AB-0710
10.00
1.00
0.10
0.01
Drawdown (Feet)
Line 1
0
5
10
15
Elapsed Time (Minutes)

Dominion - Kewaunee Power Station
Field Hydraulic Conductivity Analysis: **AB-0710**
Bouwer & Rice Method
Partially Penetrating Well in an Unconfined Aquifer

	ft	cm	
r_c	0.085	2.6	Radius of Well Casing
r_w	0.333	10.1	Radius of Borehole/Well
L_w	6.21	189.3	Vertical Distance from Static Water Level to Bottom of Well
L_e	6.21	189.3	Vertical Length of Saturated Filter Pack
H	12.42	378.6	Vertical Distance from Static Water Level to Impermeable Boundary
n	0.3	0.3	Filter Pack Porosity
r_{eq}	0.20	5.97	Equivalent Casing Radius
y_o	7.3	222.5	Change in Water Level at Time 0
y_t	0.15	4.6	Change in Water Level at Time t
t	330	330	Time which Corresponds to y_t (sec)
A	2	2	Well Geometry Parameter (dimensionless)
B	0.3	0.3	Well Geometry Parameter (dimensionless)
Part1	0.376	0.376	Portion of $\ln(R_e/r_w)$ Calculation
Part2	0.154	0.154	Portion of $\ln(R_e/r_w)$ Calculation
$\ln(R_e/r_w)$	1.886	1.886	
	(ft/sec)	(cm/sec)	
K	6.9E-05	2.1E-03	**Hydraulic Conductivity**

Where:

$$K = \frac{r_{eq}^{\ 2} \times \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \times \frac{1}{t} \times \ln\left(\frac{y_o}{y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left\{ \frac{1.1}{\ln\left(\frac{L_w}{r_w}\right)} + \frac{A + B\left[\frac{(H - L_w)}{r_w}\right]}{\frac{L_e}{r_w}} \right\}^{-1}$$

$$\ln\left(\frac{R_e}{r_w}\right) = \{Part1 + Part2\}^{-1}$$

Note:
* H is assumed to be 2 x L_w.

Calculated by: Eric C. Schmidt (06/22/07)

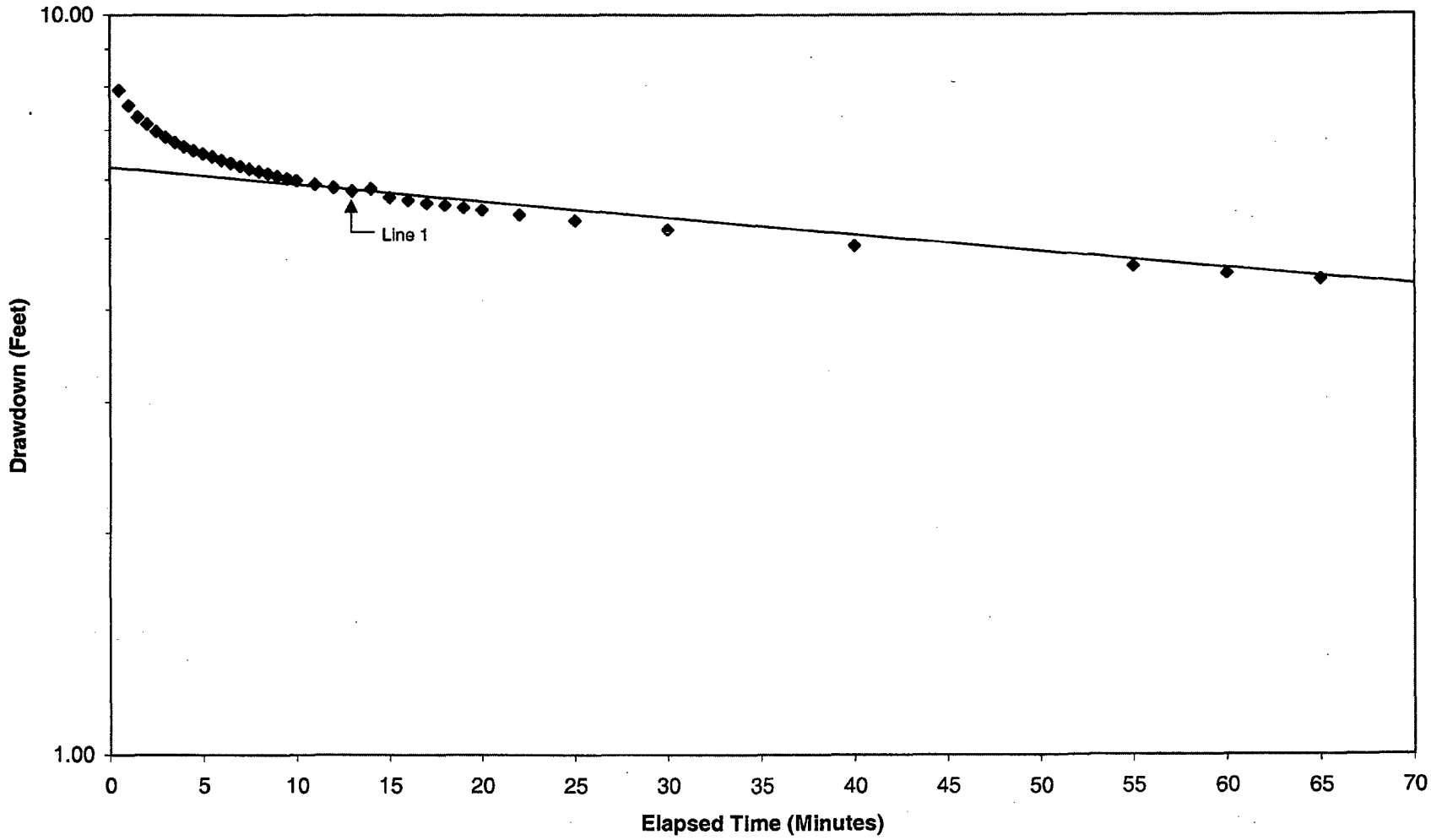
Checked by: RJM 7/17/07

AB-0717

Static Water Level: 19.55 feet from top of PVC
Well Bottom: 29.2 feet from top of PVC

Elapsed Time (Minutes)	Water Level Reading (feet TPVC)	Drawdown (Feet)
0.5	27.47	7.92
1	27.10	7.55
1.5	26.84	7.29
2	26.68	7.13
2.5	26.52	6.97
3	26.40	6.85
3.5	26.29	6.74
4	26.20	6.65
4.5	26.12	6.57
5	26.06	6.51
5.5	26.00	6.45
6	25.93	6.38
6.5	25.87	6.32
7	25.81	6.26
7.5	25.76	6.21
8	25.71	6.16
8.5	25.67	6.12
9	25.62	6.07
9.5	25.58	6.03
10	25.54	5.99
11	25.47	5.92
12	25.41	5.86
13	25.35	5.80
14	25.39	5.84
15	25.24	5.69
16	25.19	5.64
17	25.14	5.59
18	25.10	5.55
19	25.06	5.51
20	25.02	5.47
22	24.94	5.39
25	24.84	5.29
30	24.69	5.14
40	24.44	4.89
55	24.13	4.58
60	24.03	4.48
65	23.95	4.40

AB-0717


10.00
1.00
Drawdown (Feet)
Line 1
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Elapsed Time (Minutes)

Dominion - Kewaunee Power Station
Field Hydraulic Conductivity Analysis: **AB-0717**
Bouwer & Rice Method
Partially Penetrating Well in an Unconfined Aquifer

	ft	cm	
r_c	0.085	2.6	Radius of Well Casing
r_w	0.333	10.1	Radius of Borehole/Well
L_w	9.65	294.1	Vertical Distance from Static Water Level to Bottom of Well
L_e	9.65	294.1	Vertical Length of Saturated Filter Pack
H	19.3	588.3	Vertical Distance from Static Water Level to Impermeable Boundary
n	0.3	0.3	Filter Pack Porosity
r_{eq}	0.20	5.97	Equivalent Casing Radius
y_o	6.2	189.0	Change in Water Level at Time 0
y_t	5.8	176.8	Change in Water Level at Time t
t	780	780	Time which Corresponds to y_t (sec)
A	2.4	2.4	Well Geometry Parameter (dimensionless)
B	0.4	0.4	Well Geometry Parameter (dimensionless)
Part1	0.327	0.327	Portion of $\ln(R_e/r_w)$ Calculation
Part2	0.129	0.129	Portion of $\ln(R_e/r_w)$ Calculation
$\ln(R_e/r_w)$	2.193	2.193	
	(ft/sec)	(cm/sec)	
K	3.7E-07	1.1E-05	**Hydraulic Conductivity**

Where:

$$K = \frac{r_{eq}^{\ 2} \times \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \times \frac{1}{t} \times \ln\left(\frac{y_o}{y_t}\right)$$

$$\ln\left(\frac{R_e}{r_w}\right) = \left\{ \frac{1.1}{\ln\left(\frac{L_w}{r_w}\right)} + \frac{A + B\left[\frac{(H - L_w)}{r_w}\right]}{\frac{L_e}{r_w}} \right\}^{-1}$$

$$\ln\left(\frac{R_e}{r_w}\right) = \{Part1 + Part2\}^{-1}$$

Note:
* H is assumed to be 2 x L_w.

Calculated by: Eric C. Schmidt (06/22/07)

Checked by: RJM 7/17/07