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From: Dunaway, Lynn
To: Hunt, Lauren; Bierwagen, Justin; Mullenax, Heather; Garee, Matthew J.
Subject: FW: Face to Face Meeting Request
Date: Tuesday, October 17, 2023 1:17:54 PM

All,
Please see below for Dynegy's discussion list. This will be primarily a Permit Section show. At our CCR Permits meeting last week, Darin mentioned that the Vermilion NPDES issuance will initiate a cascade of events under the consent order (CO). I think he said the first thing they'll need to do is resubmit or supplement their current permit submittal. Hopefully being under a CO it will be very complete and if there are any deficiencies they can be permit conditions, but that's a future issue. The permit timing for Part 845 will depend greatly on how completely and quickly they get back with information required by the review letters that were sent out. I'll double check with Darin, but I'm not sure any of those listed below other than Duck had a review letter go out.

Thanks,
Lynn

From: Fuller, Rhys <Rhys.Fuller@vistracorp.com>
Sent: Tuesday, October 17, 2023 12:42 PM
To: LeCrone, Darin <Darin.LeCrone@Illinois.gov>; Morris, Phil <Phil.Morris@vistracorp.com>; Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>
Cc: Modeer, Victor <Victor.Modeer@vistracorp.com>; Cravens, Stuart <Stuart.Cravens@txu.com>
Subject: [External] RE: Face to Face Meeting Request

Darin,

We don't have too many facility-specific details to discuss, but did want to get a status update on the NPDES permits at Vermilion, Newton, and Kincaid. We'd also like to talk through implications of the timing of 845 permit issuance for Vermilion, Newton, and Duck Creek in particular.

Thanks,

Rhys

From: LeCrone, Darin <Darin.LeCrone@Illinois.gov>
Sent: Tuesday, October 17, 2023 11:09 AM
To: Morris, Phil <Phil.Morris@vistracorp.com>; Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>
Cc: Fuller, Rhys <Rhys.Fuller@vistracorp.com>; Modeer, Victor <Victor.Modeer@vistracorp.com>; Cravens, Stuart <Stuart.Cravens@txu.com>
Subject: RE: Face to Face Meeting Request

EXTERNAL EMAIL

Phil,
Which facilities in particular did you want to discuss? I want to make sure I have the right staff

present.

Darin E. LeCrone, P.E.
Manager, Permit Section
Division of Water Pollution Control
Illinois Environmental Protection Agency

From: Morris, Phil <Phil.Morris@vistracorp.com>
Sent: Tuesday, October 17, 2023 10:27 AM
To: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>; LeCrone, Darin <Darin.LeCrone@Illinois.gov>
Cc: Fuller, Rhys <Rhys.Fuller@vistracorp.com>; Modeer, Victor <Victor.Modeer@vistracorp.com>; Cravens, Stuart <Stuart.Cravens@txu.com>
Subject: [External] RE: Face to Face Meeting Request

Great. We look forward to the meeting with you, Darin and your respective staffs.

Regards,

Phil

From: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>
Sent: Tuesday, October 17, 2023 10:13 AM
To: Morris, Phil <Phil.Morris@vistracorp.com>; LeCrone, Darin <Darin.LeCrone@Illinois.gov>
Cc: Fuller, Rhys <Rhys.Fuller@vistracorp.com>; Modeer, Victor <Victor.Modeer@vistracorp.com>; Cravens, Stuart <Stuart.Cravens@txu.com>
Subject: RE: Face to Face Meeting Request

EXTERNAL EMAIL

I've reserved the Mississippi River conference room for the meeting so we should have plenty of space.

From: Morris, Phil <Phil.Morris@vistracorp.com>
Sent: Tuesday, October 17, 2023 8:53 AM
To: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>; LeCrone, Darin <Darin.LeCrone@Illinois.gov>
Cc: Fuller, Rhys <Rhys.Fuller@vistracorp.com>; Modeer, Victor <Victor.Modeer@vistracorp.com>; Cravens, Stuart <Stuart.Cravens@txu.com>
Subject: [External] RE: Face to Face Meeting Request

Lynn,

Good morning.

Yesterday, I sent you an invite to meet on Oct 19 (Thursday), from 2Pm to 4PM? Does this work for you and your team? Otherwise, please propose alternate dates/times.

Regards,

Phil

From: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>
Sent: Thursday, October 12, 2023 10:24 AM
To: Morris, Phil <Phil.Morris@vistracorp.com>; LeCrone, Darin <Darin.LeCrone@Illinois.gov>
Cc: Fuller, Rhys <Rhys.Fuller@vistracorp.com>; Modeer, Victor <Victor.Modeer@vistracorp.com>; Cravens, Stuart <Stuart.Cravens@txu.com>
Subject: RE: Face to Face Meeting Request

EXTERNAL EMAIL

Phil,
Currently (subject to change daily) I have very little scheduled the next 2-3 weeks. I'm sure Darin is not so lucky. I currently am open any time Oct. 18, 19, 20, 24, 25, 26, 27, 31, Nov. 1, 2 and 3. I expect to have additional Groundwater Section staff at the meeting.

Thanks,
Lynn

From: Morris, Phil <Phil.Morris@vistracorp.com>
Sent: Thursday, October 12, 2023 10:11 AM
To: LeCrone, Darin <Darin.LeCrone@Illinois.gov>; Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>
Cc: Fuller, Rhys <Rhys.Fuller@vistracorp.com>; Modeer, Victor <Victor.Modeer@vistracorp.com>; Cravens, Stuart <Stuart.Cravens@txu.com>
Subject: [External] FW: Face to Face Meeting Request

Darin and Lynn,

Good morning. Hope you and your families are doing well.

We have a number of technical issues that we would like to discuss with you both. I am recommending a face-to-face meeting, to better facilitate a discussion.

Please let me know if you are receptive to a 1 hr meeting, over the next two to three weeks. If so, please offer dates/times that are convenient with your busy schedules.

Regards,

Phil Morris
618-606-7788

DOCUMENT

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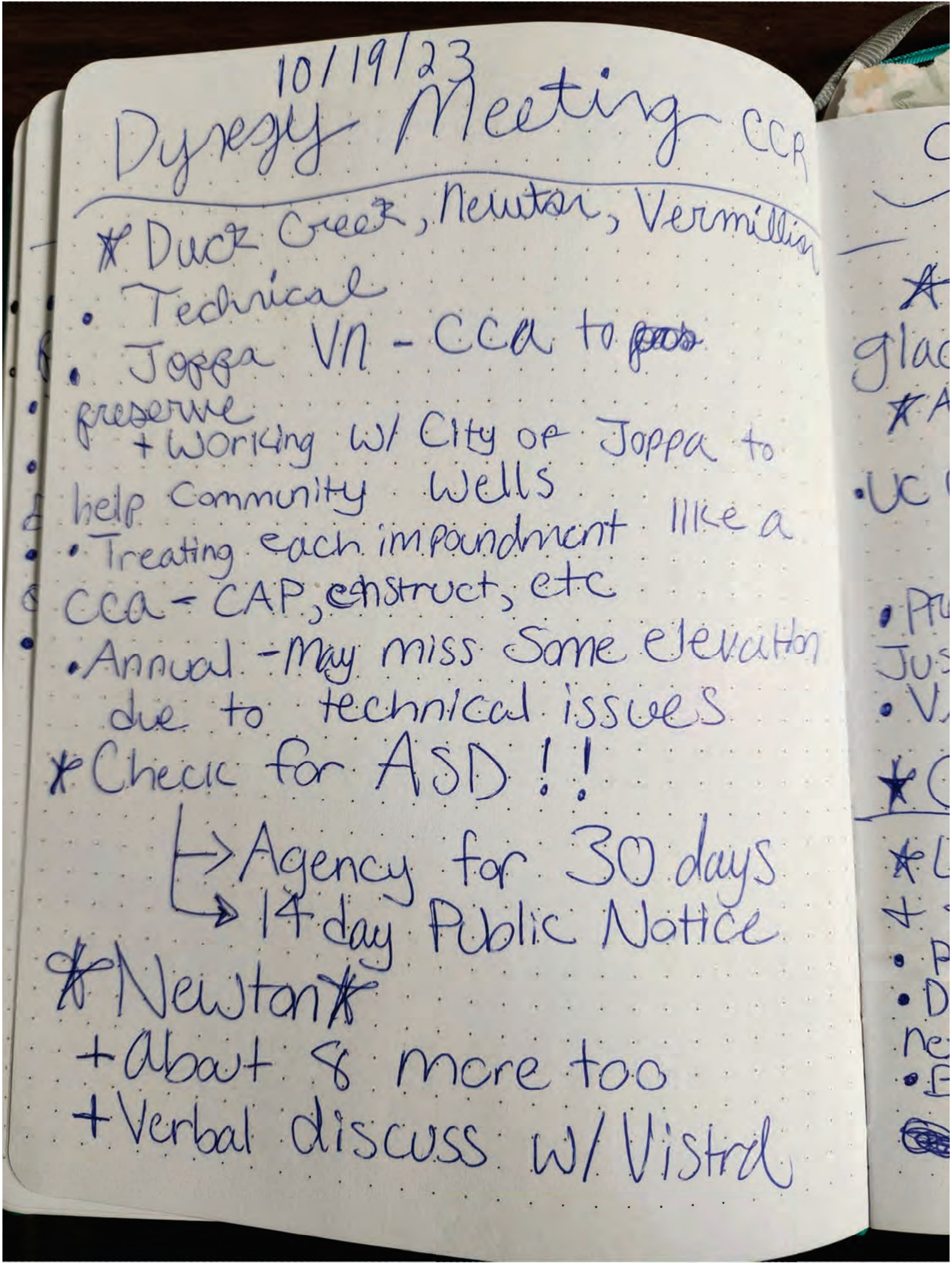


10/19/23

Dynegy Meeting CCR

* Duck Creek, Newton, Vermillion

- Technical
- Joppa VN - CCA to ~~pas~~ preserve
  - \+ Working w/ City of Joppa to help Community Wells
- Treating each impoundment like a CCA - CAP, construct, etc
- Annual - may miss some elevation due to technical issues

* Check for ASD!!

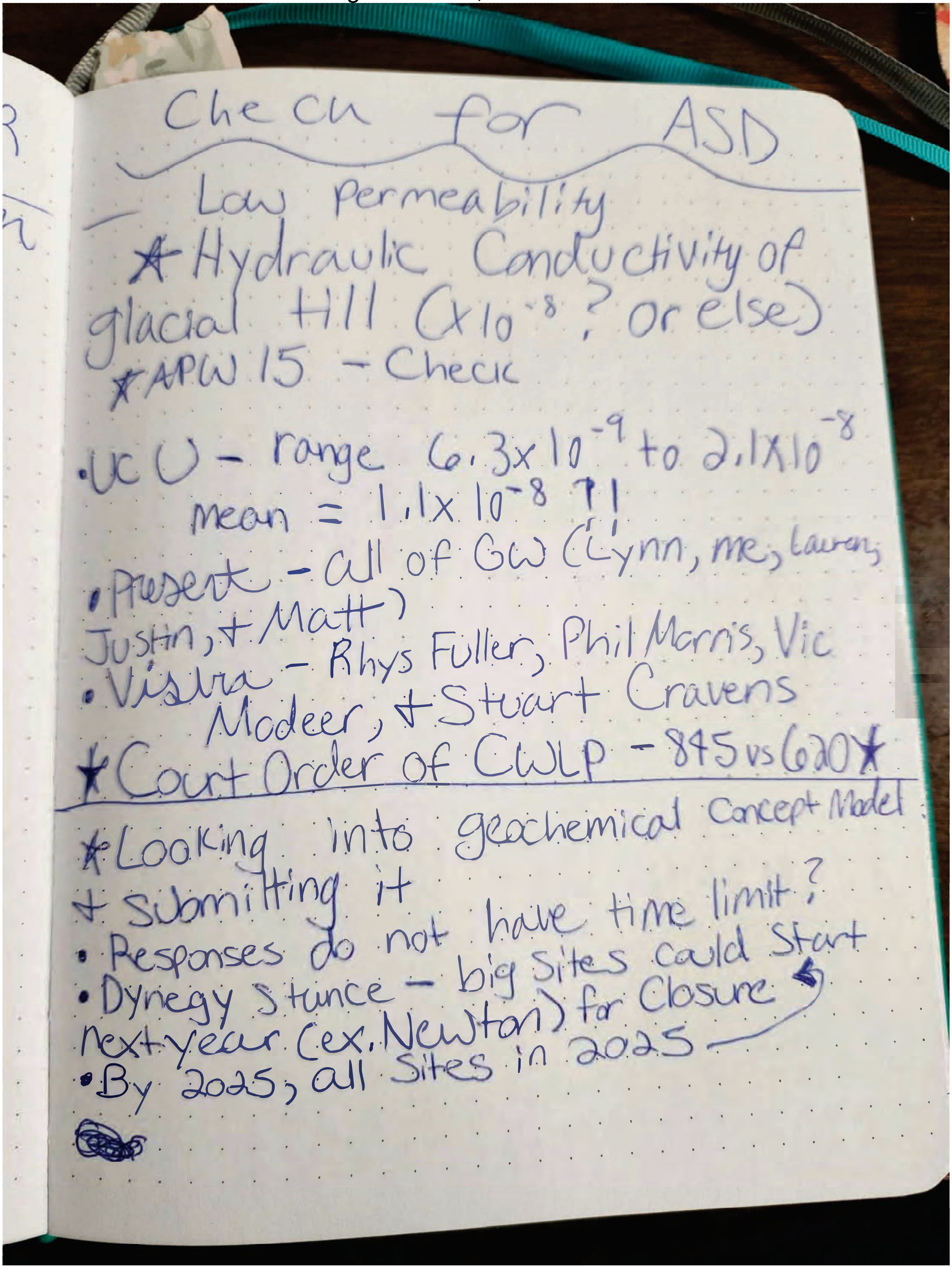
→ Agency for 30 days

→ 14 day Public Notice

* Newton *

\+ about 8 more too

\+ Verbal discuss w/ Vistra



Check for ASD

Low Permeability

★ Hydraulic Conductivity of glacial till ($x10^{-8}$? or else)

★ APW 15 – Check

- UCU – range $6.3x10^{-9}$ to $2.1x10^{-8}$
  mean = $1.1x10^{-8}$?!
- Present – all of GW (Lynn, me, Lauren, Justin, + Matt)
- Vistra – Rhys Fuller, Phil Morris, Vic Modeer, + Stuart Cravens

★ Court Order of CWLP – 845 vs 620 ★

★ Looking into geochemical Concept Model + submitting it

- Responses do not have time limit?
- Dynegy stance – big sites could start next year (ex. Newton) for closure in 2025
- By 2025, all sites

DOCUMENT

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Luminant

Electric Energy, Inc.
1500 Eastport Plaza Drive
Collinsville, IL 62234

October 21, 2023
Illinois Environmental Protection Agency
DWPC – Permits MC#15
Attn: 35 I.A.C. § 845.650(e) Alternative Source Demonstration Submittal
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

RECEIVED
OCT 20 2023
IEPA
BOW/WPC/PERMIT SECTION

Re: Joppa Power Plant East Ash Pond; IEPA ID # W1270100004-02

Dear Mr. LeCrone:

In accordance with Title 35 of the Illinois Administrative Code (35 I.A.C.) Section (§) 845.650(e), Electric Energy, Inc. (EEI) is submitting this Alternative Source Demonstration (ASD) for exceedances observed from the Quarter 2 2023 sampling event at the Joppa Power Plant East Ash Pond, identified by Illinois Environmental Protection Agency (IEPA) ID No. W1270100004-02.

This ASD is being submitted within 60 days from the date of determination of an exceedance of a groundwater protection standard (GWPS) for constituents listed in 35 I.A.C. § 845.600. As required by 35 I.A.C. § 845.650 (e)(1), the ASD was placed on the facility's website within 24 hours of submittal to the agency.

One hard copy is provided with this submittal.

Sincerely,

Dianna Tickner

Dianna Tickner
Sr. Director – Decommission and Demolition

Enclosures
Alternate Source Demonstration, Quarter 2 2023, East Ash Pond Joppa Power Plant, Joppa Illinois

Intended for
Electric Energy, Inc.

Date
October 21, 2023

Project No.
1940103649-011

35 I.A.C. § 845.650(e): ALTERNATIVE SOURCE DEMONSTRATION

EAST ASH POND
JOPPA POWER PLANT
JOPPA, ILLINOIS
IEPA ID: W1270100004-02

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Anne Frances Ackerman, a qualified professional engineer in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used other than for its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Anne Frances Ackerman
Qualified Professional Engineer
062-060586
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: October 21, 2023

ANNE FRANCES
ACKERMAN
062.060586

I, Brian G. Hennings, a professional geologist in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used other than for its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Brian G. Hennings
Professional Geologist
196-001482
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: October 21, 2023

BRIAN G. HENNINGS
196.001482

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Milwaukee, WI 53204
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CONTENTS

TABLES (IN TEXT)

FIGURES (IN TEXT)

FIGURES (ATTACHED)

APPENDICES (ATTACHED)

ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
ASD	Alternative Source Demonstration
CCR	coal combustion residuals
E001	Event 1
EAP	East Ash Pond
Geosyntec	Geosyntec Consultants
GWPS	groundwater protection standard
JPP	Joppa Power Plant
LAU	Lower aquifer unit
LCU	lower confining unit
LOE(s)	Line(s) of evidence
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NRT/OBG	Natural Resource Technology, an OBG Company
NTU	nephelometric turbidity units
OBG	O'Brien and Gere Engineers, Inc.
ORP	oxidation reduction potential
PCA	principal component analysis
PMP	potential migration pathway
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SI	surface impoundment
UA	uppermost aquifer
UCU	upper confining unit
WAP	West Ash Pond

1. INTRODUCTION

Under Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.650(e), within 60 days from the date of determination of an exceedance of a groundwater protection standard (GWPS) for constituents listed in 35 I.A.C. § 845.600, an owner or operator of a coal combustion residuals (CCR) surface impoundment (SI) may complete a written demonstration that a source other than the CCR SI caused the contamination and the CCR SI did not contribute to the contamination, or that the exceedance of the GWPS resulted from error in sampling, analysis, statistical evaluation, natural variation in groundwater quality, or a change in the potentiometric surface and groundwater flow direction (Alternative Source Demonstration [ASD]).

This ASD has been prepared on behalf of Electric Energy Inc. by Ramboll Americas Engineering Solutions, Inc (Ramboll), to provide pertinent information pursuant to 35 I.A.C. § 845.650(e) for the Joppa Power Plant (JPP) East Ash Pond (EAP) (*i.e.,* Site) located near Joppa, Illinois.

The most recent quarterly sampling event (Event 1 [E001]) was completed on May 3, 2023, and analytical data were received on June 23, 2023. In accordance with 35 I.A.C. § 845.610(b)(3)(C), comparison of statistically derived values with the GWPSs described in 35 I.A.C. § 845.600 to determine exceedances of the GWPS was completed by August 22, 2023, within 60 days of receipt of the analytical data (Ramboll, 2023). The statistical comparison identified the following GWPS exceedances at compliance groundwater monitoring wells:

- Boron at wells G06, G07, G08, G09, G10
- Cobalt at well G05
- pH at wells G11 and G51D

Pursuant to 35 I.A.C. § 845.650(e), the lines of evidence (LOE) presented in **Section 3** and **Section 4** demonstrate that sources other than the EAP are the cause of the cobalt and pH GWPS exceedances (respectively) listed above. Cobalt is believed to be naturally occurring and pH is associated with iron oxidation. This ASD was completed by October 21, 2023, within 60 days of determination of the exceedances (August 22, 2023), as required by 35 I.A.C. § 845.650(e).

Boron GWPS exceedances at the EAP will be addressed in accordance with 35 I.A.C. § 845.660.

2. BACKGROUND

2.1 Site Location and Description

The JPP is west of the Village of Joppa in Massac County, Illinois, northeast of the Ohio River in Section 14, Township 15 South, Range 3 East. The JPP property is bordered by LaFarge North America cement plant to the west, Trunkline Gas Company-Joppa Compressor Station to the north and west, the Village of Joppa to the east, and the Ohio River to the south. The EAP is located in the west half of Section 14 directly north of the JPP and is bounded immediately to the east by the railway right-of-way, which is adjacent to forested portions of residential property in the Village of Joppa.

2.2 Description of East Ash Pond CCR Unit

The JPP operated the EAP for management of CCR waste streams between 1973 and 2022. Another inactive SI, referred to as the West Ash Pond (WAP), is present in the western portion of the JPP property, and a permit exempt landfill is present in the northwestern portion of the JPP property. The landfill and the WAP are not the subject of this ASD but are relevant to the discussion of the LOEs presented below.

The EAP is an unlined CCR SI which was used to manage both fly ash and bottom ash. The EAP perimeter embankment height varies from approximately 15 to 45 feet above the outboard toe of slope and the crest is at an approximate elevation of 380 feet North American Vertical Datum of 1988 (NAVD88) (O'Brien and Gere Engineers, Inc. [OBG], 2010).

2.3 Geology and Hydrogeology

The information used to describe the hydrogeology is based on the local geology obtained from published sources, hydrogeologic investigation data, and boring data collected during site investigations conducted from 1997 to 2022 (Natural Resource Technology, an OBG Company [NRT/OBG], 2017; Ramboll, 2021a; Geosyntec, 2023).

Quaternary deposits in the Joppa area consist mainly of diamictons and lacustrine/alluvial deposits that were deposited during Illinoian and Pre-Illinoian glaciations (Lineback, 1979; Willman et al., 1975). The unconsolidated deposits include the following units (beginning at the ground surface):

- **Upper Confining Unit (UCU):** The uppermost hydrostratigraphic unit is comprised of the Equality Formation, the Silt Unit, and Metropolis Formation deposits. The average thickness of this unit is approximately 40 feet with a range of 8 to 58 feet. The UCU underlies the CCR fill in all locations and is thinnest in the southeast portion of the unit. These deposits are predominantly fine-grained, comprised of clay, silt, and silty clay with limited intervals of sandy material. This hydrostratigraphic unit was encountered at all locations and extends down to the McNairy Formation.
- **Uppermost Aquifer (UA):** The UA consists of the McNairy Formation and Mounds Gravel which are composed of highly permeable sands and gravels with isolated lenses of finer grained material. The Mounds Gravel has been interpreted as a braided river deposit, located within eroded portions of the McNairy Formation (Nelson and Masters, 2008). The McNairy formation, underlying the Mounds Gravel, at the site is mostly composed of medium to fine grained sand with mica and lenses of silt and clay. At the EAP, this unit has been further divided into the Upper McNairy Formation consisting of relatively thick fine to medium grained

sand with some gravel while the Lower McNairy exhibits more variability including lenses and zones with higher silt and clay content.

A northwest to southeast trending stratigraphic high in the UA is present through the center of the EAP and bifurcates near the eastern extent of the unit. This stratigraphic high (elevations higher than 305 ft) is illustrated on **Figure 1** where the UA is bounded by the UCU which is shaded purple where elevations extend below 305 feet. Wells screened within the UA along the southern fork of the stratigraphic high (G07, G08, G12S/D, G13S/D) generally encountered thicker gravel layers at higher elevations and reported higher hydraulic conductivities (Ramboll, 2021a; Geosyntec, 2023). The thicker gravels at higher elevations also extend east and southeast of the EAP (G12S/D, G13S/D, G16S/D) and connect to the Ohio River as illustrated in **Figure 1**. The UA was encountered at a thickness of up to 58 feet thick, with elevations ranging from 215 to 316.6 feet, and is underlain by the lower confining unit (LCU).

- **Lower Confining Unit (LCU):** Clay, silt, or chert gravel residuum in on-Site wells (Nelson, 1997) has been interpreted and characterized as part of the Lower McNairy Formation, Post Creek (Tuscaloosa) Formation, or weathered limestone residuum. This material has been encountered in all borings advanced to bedrock. Based on material descriptions (high clay and/or silt content, and partial cementation), continuous lateral extent, and vertical gradients observed between the UA and the lower aquifer unit (LAU), this unit is identified as the LCU.
- **Lower Aquifer Unit (LAU):** The LAU, composed of the Salem Limestone bedrock, is the lowermost hydrostratigraphic unit identified and is considered a potential migration pathway (PMP). The limestone bedrock is encountered at an elevation of approximately 200 feet NAVD88 below the EAP, slopes towards a syncline to the east (Nelson and Masters, 2008), and has a reported thickness of 200 to 500 feet. The Salem Limestone is used to supply water for various uses in the region and provides non-potable water for the JPP and potable water for the Village of Joppa.

Groundwater elevations in the UA (referenced to NAVD88) across the EAP ranged from approximately 312 to 322 feet during E001 (**Figure 2**). Historically they have ranged from approximately 305 feet near the Ohio River to 330 feet near the northern property boundary. Depth to groundwater measurements used to generate the groundwater elevation contours shown on **Figure 2** were collected on May 1, 2023. Groundwater elevations vary seasonally and may fluctuate by about 10 feet within a well.

Groundwater flow directions are largely a result of the aquifer geology described above. The shallow highly permeable gravels present a path of least resistance (preferential flow pathway) for groundwater migrating toward the Ohio River which is the receiving body of water in the region (**Figure 1**). Wells located to the north of the UA stratigraphic high, such as G05, were terminated shortly after penetrating the UA and did not encounter significant gravel layers indicating gravel may be at a lower elevation or not present, and flow through this area may not be as significant. Interpreted groundwater flow directions are illustrated on **Figure 1** with flow to the southeast, generally parallel to the UA stratigraphic high across the EAP, and then south toward the Ohio River.

2.4 Groundwater and EAP Monitoring

The monitoring system for the EAP is shown on **Figure 2** and consists of two background monitoring wells (G01D and G02D) and 12 compliance monitoring wells (G03, G05, G06, G07, G08, G09, G10 G11, G51D, G52D, G53D, and G54D) screened within the UA. The monitoring system also includes two temporary water level only surface water staff gage (XSG01 and SG02) to monitor potential impacts from the EAP (Ramboll, 2021b). Porewater samples are collected from locations XPW01 and XPW02 on the northern side of the EAP, and from XPW03 on the southern side of the EAP (**Figure 2**). To further delineate potential boron exceedances, 10 monitoring wells were installed in September 2021 (nests G12 through G16) and 21 wells (10 off-Site) were installed between May 2022 and September 2023 (nests G17 through G24, and G13; Geosyntec Consultants [Geosyntec], 2023).

3. ALTERNATIVE SOURCE DEMONSTRATION: LINES OF EVIDENCE FOR COBALT

As allowed by 35 I.A.C. § 845.650(e), this ASD demonstrates that sources other than the EAP (the CCR unit) caused the cobalt exceedance at G05. LOEs supporting the ASD for the pH exceedances at G11 and G51D are presented in **Section 4**. This section presents the LOEs supporting the ASD for cobalt at G05, which include the following:

1. Cobalt concentrations at G05 are consistent with cobalt mobilization from native soils due to reductive dissolution of manganese oxides.
2. Cobalt concentrations at G05 are greater than source concentrations.
3. Cobalt concentrations at G05 are not correlated with concentrations of CCR indicator parameters.

3.1 LOE #1: Cobalt Concentrations at G05 are Consistent with Cobalt Mobilization from Native Soils Due to Reductive Dissolution of Manganese Oxides

Cobalt and manganese are often closely associated with each other in soils due to their similar chemical properties (Uren, 2013). Under oxidizing conditions, manganese is present in the solid phase as manganese oxides. Cobalt sorbs strongly to manganese oxides and is thus often associated with manganese in the solid phase. When solid-phase manganese oxides in soils are dissolved by reduction of manganese to a more soluble species (a process called reductive dissolution), the cobalt previously sorbed to the manganese oxide surface is also released. If cobalt concentrations in groundwater are primarily controlled by the reductive dissolution of manganese oxides, cobalt and manganese concentrations in both soils and groundwater will be correlated with one another. This LOE demonstrates that cobalt concentrations at G05 are consistent with reductive dissolution of manganese, and the cobalt exceedance at G05 is therefore likely due to natural variation in groundwater quality. Solid phase data were used to determine if cobalt and manganese are associated in the solid phase. Groundwater redox potential and pH were assessed to determine if reductive dissolution of manganese oxides is thermodynamically favorable under observed groundwater conditions. To inform further analysis of groundwater data, wells with a geochemical signature similar to G05 were identified using principal component analysis (PCA). The relationship between cobalt and manganese in similar groundwater was then evaluated using regression analysis.

Figure A on the following page shows the relationship between total cobalt and total manganese in soil samples from the UA at five soil boring locations (data tabulated in **Appendix A**). The strong correlation between cobalt and manganese in these data (R^2 of 0.99) indicates that they are likely physically associated in soils, consistent with literature data (Uren, 2013). It is possible that cobalt released from CCR porewater could become associated with naturally occurring manganese oxides in the downgradient environment and accumulate in the soils; however, this is not likely at the site based on the following observations: 1) Cobalt is not present in CCR porewater (described further in **Section 3.2**), indicating that the EAP could not be a source of cobalt to the downgradient solid phase; 2) The ratio of cobalt to manganese is consistent across five different samples, some of which are from areas of the site with no known influence from

CCR porewater (*i.e.*, have had no reported exceedances). Therefore, the cobalt present in the UA soil is likely naturally occurring.

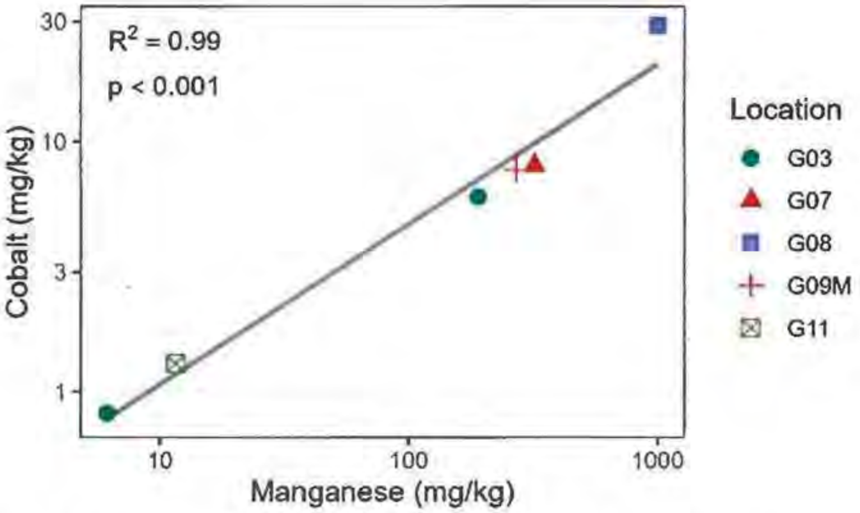

Figure A. Scatter Plot and Linear Regression Results of Cobalt and Manganese in UA Solids
mg/kg = milligrams per kilogram

The thermodynamic favorability of manganese oxide reductive dissolution depends on the oxidation reduction potential (ORP) and pH of the groundwater. The pH and ORP of the groundwater samples collected from the EAP monitoring network all indicate that manganese is expected to exist in the reduced Mn^{2+} form in groundwater (**see Appendix B**), supporting the conclusion that reductive dissolution of manganese oxides can occur in the groundwater.

To determine if cobalt and manganese are correlated in groundwater, locations with a similar groundwater signature to G05 were identified for appropriate inclusion in the correlation analysis. PCA, a multivariate statistical approach, was used to evaluate how the groundwater composition at G05 related to the groundwater composition of EAP porewater, background groundwater, and downgradient groundwater north versus south of the UA stratigraphic high (**Section 2.3**). Details about the PCA analysis are included in **Appendix B**. The PCA results indicate that the geochemical signatures of the UA wells located on either side of the northwest to southeast trending stratigraphic high in the UA that extends through the EAP are largely distinct from one another, with wells to the north of the stratigraphic high being more similar to background. This difference may be related to the differences in stratigraphic conditions, with wells to the north of the stratigraphic high having less gravel beds, while the wells to the south of the stratigraphic high have shallow highly permeable gravels which create a preferential flow pathway to the south. Groundwater from well G05 is most like other northeast wells, suggesting similar geochemical influences.

Figure B on the following page shows the relationship between total cobalt and total manganese in wells to the north of the stratigraphic high (data tabulated in **Appendix C**). To avoid potential confounding effects due to the presence of suspended solids in the groundwater sample, only samples with a turbidity less than 50 nephelometric turbidity units (NTU) were used in the correlation analysis. The strong (R^2 of 0.77) statistically significant ($p < 0.001$) correlation between total cobalt and total manganese in the groundwater suggests similar controls on concentrations.

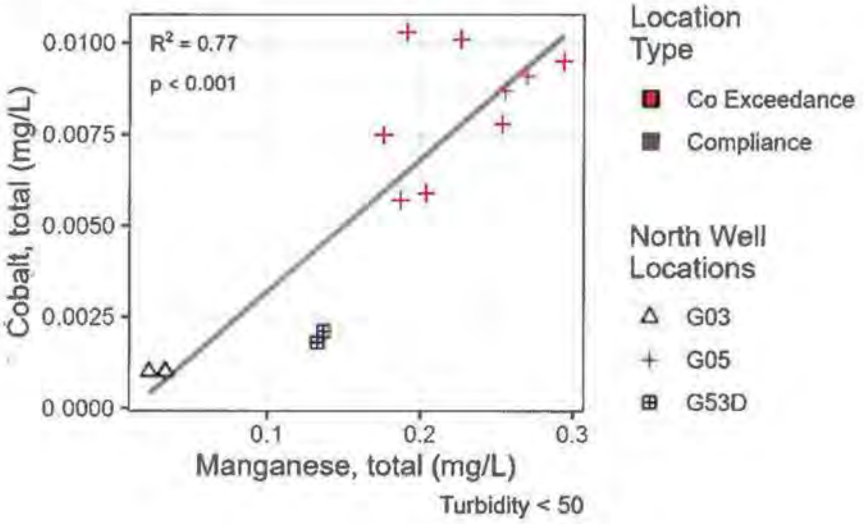

Figure B. Scatter Plot and Linear Regression Results of Total Cobalt and Total Manganese in Groundwater

The strong association between cobalt and manganese in both the soil and groundwater, in addition to groundwater conditions in the area of G05 favoring manganese reduction, supports the conclusion that reductive dissolution of manganese oxides in native soil is occurring and is strongly influencing the cobalt concentrations in the groundwater rather than the EAP.

3.2 LOE #2: Cobalt Concentrations at G05 are Greater Than Source Concentrations

Table A on the following page provides the range of cobalt concentrations detection in G05 between March 2021 and May 2023. Porewater samples collected from XPW01, XPW02 and XPW03 between March 2021 and May 2023 did not have cobalt concentrations above the reporting limit. A summary of the laboratory data is included in **Appendix C.**

Table A. Cobalt Concentration Ranges in G05 and EAP Porewater (March 2021 to May 2023).

Sample Location	Cobalt (mg/L)			
	Samples	Non-Detects	Minimum	Maximum
Composite Porewater[1]	24	24	<0.0001	<0.001
G05	11	0	0.0057	0.0103

[1] Composite Porewater includes summary statistics of data collected at EAP porewater locations XPW01, XPW02, and XPW03
mg/L = milligrams per liter

The following observations can be made from **Table A**:

- The concentration of cobalt in compliance monitoring well G05 ranged from 0.0057 mg/L to 0.0103 mg/L.
- Cobalt was not detected in EAP porewater, with reporting limits ranging from 0.0001 mg/L to 0.001 mg/L.
- The minimum cobalt concentration observed at G05 is five times the highest reporting limit for cobalt in porewater.

If the EAP were the source of cobalt in downgradient groundwater, EAP porewater concentrations of cobalt would be expected to be higher than the groundwater concentrations. Cobalt was not detected above the reporting limit in any porewater samples, indicating that cobalt concentrations are not related to the EAP.

3.3 LOE #3: Cobalt Concentrations at G05 Are Not Correlated with Concentrations of CCR Indicator Parameters

Boron is commonly used as an indicator parameter for contaminant transport of CCR because: (i) it is commonly present at elevated concentrations in coal ash leachate; (ii) it is mobile and typically not very reactive but conservative (*i.e.*, low rates of sorption or degradation) in groundwater; and (iii) it is less likely than other constituents to be present at elevated concentrations in background groundwater from natural or other anthropogenic sources. Porewater in the EAP is elevated in both boron and sulfate (**Appendix C**), indicating that these parameters are Site-specific key indicators for CCR. If an exceedance is identified for a monitored CCR parameter but concentrations of boron and sulfate are not correlated with that parameter, it is unlikely that the CCR unit is the source of the GWPS exceedance.

A scatter plot of cobalt versus boron and sulfate concentrations for G05 between March 2021 and May 2023 is presented in **Figure C** on the following page and laboratory data is included in **Appendix C.** The p-value of a Kendall correlation test for non-parametric data are also included on **Figure C**. Typically, a p-value greater than 0.05 is considered to be a statistically insignificant relationship.

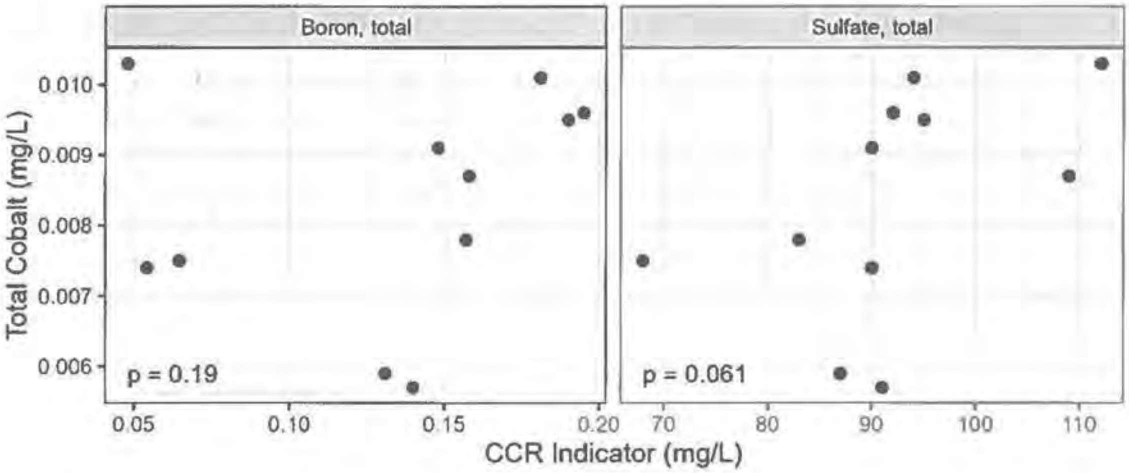

Figure C. Scatter Plot of Cobalt Versus Boron and Sulfate Concentrations at Monitoring Well G05

Calculated p-values greater than 0.05 indicate that cobalt is not correlated with boron and sulfate at monitoring well G05. A lack of correlation between cobalt and CCR indicators in the compliance monitoring well indicates the EAP is not the source of the cobalt exceedance.

4. ALTERNATIVE SOURCE DEMONSTRATION: LINES OF EVIDENCE FOR pH

As allowed by 35 I.A.C. § 845.650(e), this ASD demonstrates that sources other than the EAP (the CCR unit) caused the pH exceedances at G11 and G51D. This section presents the LOEs supporting the ASD for pH at G11 and G51D, which include the following:

1. G11 and G51D are upgradient of the EAP.
2. Groundwater chemistry at G11 and G51D is aligned with the groundwater signature observed west of the monitoring wells.
3. pH exceedances at G11 and G51D are consistent with iron oxidation.

These LOEs are summarized below and described in greater detail in **Appendix D**.

4.1 LOE #1: G11 and G51D are Upgradient of the EAP

As described in **Section 2.3** dominant UA groundwater flow direction at the EAP is to the southeast, generally parallel to the UA stratigraphic high across the EAP, and then south toward the Ohio River (**Figure 1**). Wells G11 and G51D are located on the western edge of the EAP and are upgradient of the EAP. Therefore, it is unlikely that porewater from the EAP would flow in the direction of G11 and G51D. Because the wells with pH exceedances are upgradient of the unit, it is unlikely that the EAP is the source of the exceedances.

4.2 LOE #2: Groundwater Chemistry at G11 and G51D is Aligned with the Groundwater Signature Observed West of the Monitoring Wells

Groundwater from exceedance wells G11 and G51D exhibit a high degree of similarity with groundwater from upgradient UA wells west of G11 and G51D (western groundwater) as opposed to eastern groundwater or CCR porewaters from other compliance wells in the EAP monitoring network (eastern groundwater). PCA (**Appendix D**) was used to compare the geochemical compositions of the western groundwater, CCR porewaters, and pH exceedance wells G11 and G51D. The PCA found that:

- Exceedance wells G51D and G11 exhibit a high degree of similarity with the western (*i.e.*, upgradient) wells screened in the UA.
- The CCR porewaters are distinctly separate from the groundwater samples.

The similarity of the groundwater composition at G11 and G51D to upgradient western groundwater, as opposed to eastern groundwater or CCR porewater, suggests that the EAP does not influence the groundwater at G11 and G51D and therefore is not the source of the pH exceedances.

4.3 LOE #3: pH Exceedances at G11 and G51D are Consistent with Iron Oxidation

The PCA analysis (**Appendix D**) suggests chemical evolution and/or communication within the western groundwater. The western UCU groundwater composition is dominated by the redox-sensitive parameters manganese, iron, and sulfate. The UA groundwater composition is spread between a composition similar to the UCU and a composition similar to background. Groundwater composition at wells G11 and G51D is very similar to (*i.e.*, plots close to on the PCA diagram) the background wells, all of which are dominated by alkalinity, chloride, fluoride and sodium.

Redox conditions were evaluated along the flow path from upgradient (further northwest) to downgradient (further southeast) groundwater wells. A distinct redox transition was identified, shifting from more reducing conditions in upgradient waters to more oxidizing conditions in downgradient wells, including the exceedance wells. The reducing upgradient waters are characterized by lower ORP and higher iron concentrations, while downgradient waters are largely the opposite with higher ORP and lower iron concentrations.

This change in redox condition is the likely source of acidity in G11 and G51D. It is likely that dissolved iron present in reducing environments moves downgradient with groundwater and subsequently oxidizes. The oxidation of dissolved iron to iron oxides is known to produce acidity. In this way, reduced upgradient waters from the northwest provides the constituent (*i.e.*, reduced iron) necessary to cause a drop in pH (*i.e.*, through iron oxidation) in G11 and G51D, once transported into an area with sufficient dissolved oxygen to drive the precipitation reaction. The oxidized environment in wells G11 and G51D likely results from mixing with the upgradient oxidized background groundwater. Therefore, mixing of groundwater resulting in natural variability in the groundwater conditions is the likely driver of the pH exceedances at G11 and G51D.

5. CONCLUSIONS

Based on the LOEs presented below and described in **Section 3**, it has been demonstrated that sources other than the EAP (the CCR unit) caused the cobalt exceedance at G05.

1. Cobalt concentrations at G05 are consistent with cobalt mobilization from native soils due to reductive dissolution of manganese oxides.
2. Cobalt concentrations at G05 are greater than source concentrations.
3. Cobalt concentrations at G05 are not correlated with concentrations of CCR indicator parameters.

Furthermore, based on the LOEs presented below and described in **Section 4**, it has been demonstrated that sources other than the EAP caused the pH exceedances at G11 and G51D.

1. G11 and G51D are upgradient of the EAP.
2. Groundwater chemistry at G11 and G51D is aligned with the groundwater signature observed west of the monitoring wells.
3. pH exceedances at G11 and G51D are consistent with iron oxidation.

Pursuant to 35 I.A.C. § 845.650(e), the LOEs presented in **Section 3** and **Section 4** demonstrate that sources other than the EAP were the cause of the cobalt and pH GWPS exceedances (respectively) listed above. Boron GWPS exceedances at the EAP will be addressed in accordance with 35 I.A.C. § 845.660.

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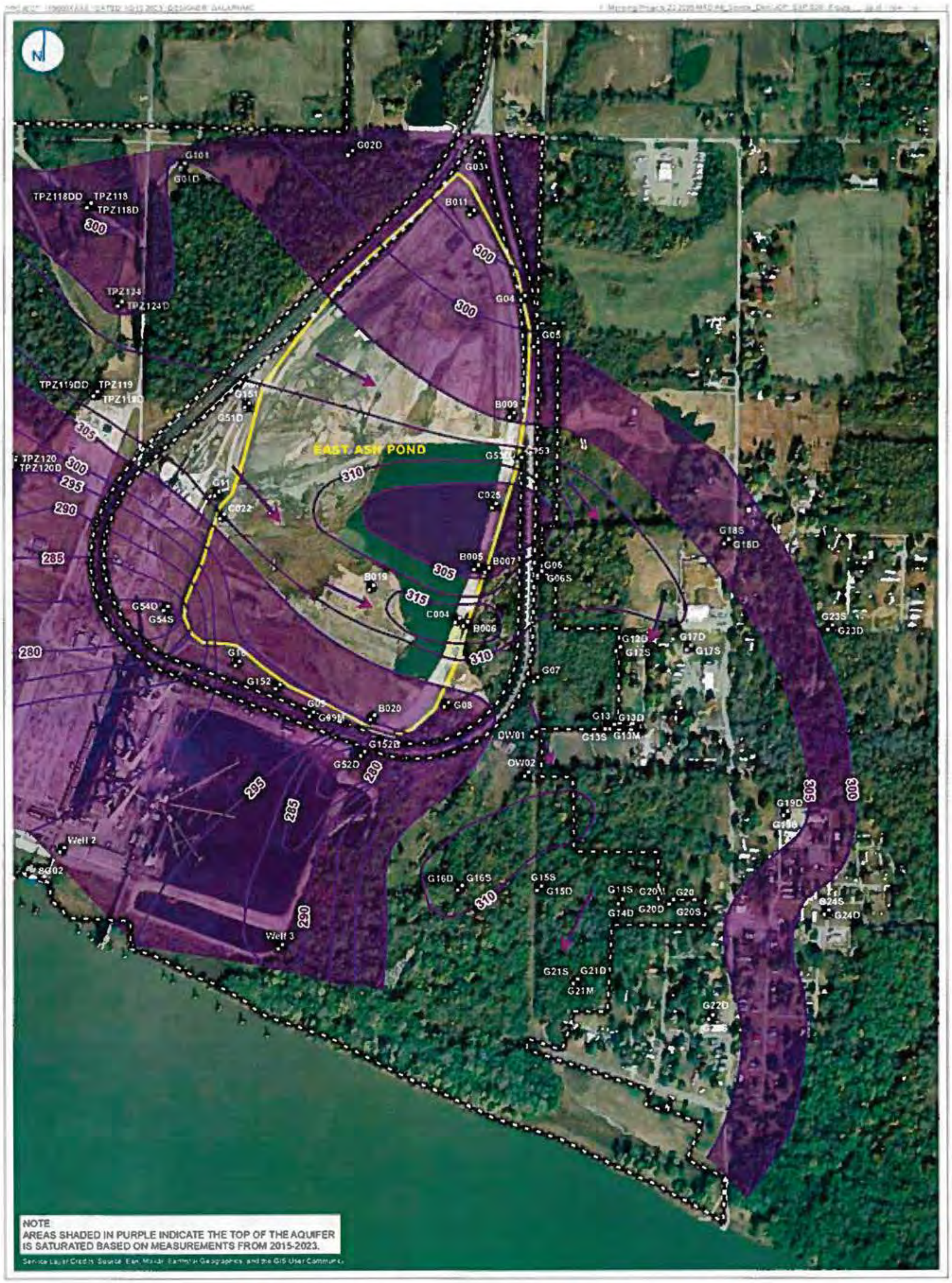
FIGURES



NOTE
AREAS SHADED IN PURPLE INDICATE THE TOP OF THE AQUIFER IS SATURATED BASED ON MEASUREMENTS FROM 2015-2023.

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

▪	MONITORING WELL
●	STAFF GAGE, RIVER
—	TOP OF MCNAIRY FORMATION ELEVATION (5-FT CONTOUR INTERVAL)
→	FLOW DIRECTION
●	AREA WHERE TOP OF AQUIFER IS SATURATED BASED ON MEASUREMENTS FROM 2015-2023
☐	REGULATED UNIT (SUBJECT UNIT)
⬚	PROPERTY BOUNDARY

TOP OF UPPERMOST AQUIFER

FIGURE 1

35 I.A.C. § 845.650(e): ALTERNATIVE
SOURCE DEMONSTRATION
EAST ASH POND
JOPPA POWER PLANT JOPPA, ILLINOIS

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- PORE WATER WELL
- STAFF GAGE, RIVER
- MONITORING WELL
- STAFF GAGE, CCR UNIT

- GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- PROPERTY BOUNDARY

0 300 600
Feet

NOTES

SAMPLING LOCATIONS AND POTENTIOMETRIC SURFACE MAP - MAY 1, 2023

FIGURE 2

35 I.A.C. § 845.650(e): ALTERNATIVE
SOURCE DEMONSTRATION
EAST ASH POND
JOPPA POWER PLANT
JOPPA, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDICES

APPENDIX A
SUPPORTING SOLID PHASE ANALYTICAL DATA

APPENDIX A.
SUPPORTING SOLIDS PHASE ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Boring ID	Sample Elevation (feet NAVD88)	Cobalt (mg/kg)	Manganese (mg/kg)
G03	284.84 - 297.34	6.0	190
G03	294.84 - 296.84	0.82	6.1
G07	294.34 - 300.34	8.0	320
G08	261.72 - 266.72	29	1000
G09M	264.60 - 266.60	7.7	270
G11	303.38 - 305.38	1.3	11.6

Notes:
NAVD88 = North American Vertical Datum of 1988
mg/kg = milligrams per kilogram

APPENDIX B

SUPPORTING ANALYSIS OF REDUCTIVE DISSOLUTION OF MANGANESE OXIDES AS A LIKELY SOURCE OF COBALT CONCENTRATIONS AT G05

RAMBOLL

ENVIRONMENT
& HEALTH

TECHNICAL MEMORANDUM

Project no.	1940103649-011
Client	Electric Energy, Inc.
Prepared by	Alison O'Connor, Ph.D.

October 12, 2023

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Supporting Analysis for Reductive Dissolution of Manganese Oxides as a Likely Source of Cobalt Concentrations at G05

Joppa Power Plant, East Ash Pond

1 INTRODUCTION

This document serves as an appendix for the October 21, 2023, Alternative Source Demonstration (ASD) for Joppa Power Plant (JPP) East Ash Pond (EAP) for monitoring Event 1 (E001), completed to fulfil the requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.650(e).

Cobalt and manganese are often closely associated in soils due to their similar chemical properties (Uren, 2013). In igneous rocks, cobalt and manganese occur together in minerals due to carrying +2 charge and having similar atomic radii (Uren, 2013). Cobalt and manganese are released together during weathering processes and are often transported together through the environment. In highly oxidizing environments, manganese 2+ can be oxidized to manganese 4+ which exists as solid phase manganese oxide minerals. Cobalt sorbs strongly to manganese oxides compared to other divalent cations (McKenzie, 1967; Backes et al., 1995). Therefore, manganese-associated cobalt is released when solid-phase manganese oxides in soils are dissolved by reduction to a more soluble species.

This line of evidence (LOE) demonstrates that cobalt concentrations at G05 are consistent with reductive dissolution of manganese, and the cobalt exceedance at G05 is therefore likely due to natural variation in groundwater quality. Solid phase data were used to determine if cobalt and manganese are associated in the solid phase. To inform further analysis of groundwater data, wells with a geochemical signature like G05 were identified using principal component analysis (PCA). The relationship between cobalt and manganese in similar groundwater was then evaluated using regression analysis.

2 METHODS

2.1 Solid Phase Measurements

Total cobalt and total manganese data were available for samples collected from the uppermost aquifer (UA) at five boring locations. Six total samples were available (two samples were collected from G03). These soil data represent the acid-digestible portion of the solids phase, which may be mobilized under environmental relevant geochemical conditions. Any metals entrained within the highly refractory aluminosilicate matrix are not extracted.

2.2 Regression Analysis

Least squares linear regression (abbreviated here as regression analysis) was used in this work to understand correlations between data. Regression analysis determines the equation for the line that minimizes the sum of the squared differences between the data and the regression estimate. Regression analysis assumes that the errors in the regression (called residuals) have a mean of zero and are randomly distributed around the mean following a normal distribution. The distribution of regression residuals can be visualized by plotting the residuals against the fitted values.

The relationship between the variables is assessed using the p value and the R^2 of the regression. The p value represents the chance the relationship between the data is due to random variability. A cut off p value of 0.05 often is used to determine if a regression is statistically significant (*i.e.*, it has less than a 5 percent (%) chance of being due to random variability). The R^2 value represents the proportion of the variance in the dependent variable that is explained by the independent variable. A higher R^2 value indicates a close relationship between the two variables (with an R^2 of 1 representing a perfectly straight line).

2.3 Principal Component Analysis

Groundwater data is frequently defined by many chemical parameters and may therefore be described statistically as "multivariate". PCA is a common multivariate statistical approach that simplifies multivariate data by combining those variables into a smaller number of new variables called principal components. This is possible because in multivariate data sets, there is often some correlation between variables. These correlations represent "redundant" information that may be mathematically removed by PCA. The principal components represent linear combinations of the original data which maximize the variance between the samples, and which are uncorrelated with one another. PCA thereby allows patterns in the data to be more easily recognized and correlations between input variables to be assessed.

The goal of this PCA was to identify wells similar to G05 and which are therefore likely affected by similar geochemical processes. The groundwater potentiometric map (E001 ASD Figure 2) and stratigraphic conditions in the UA (E001 ASD Section 2.3) suggest that wells in different areas downgradient of the EAP may be influenced by different areas of upgradient water. Additionally, as discussed in Appendix D, compliance wells G11 and G51D are strongly influenced by groundwater west of the EAP. To focus this analysis on identifying distinct populations of downgradient groundwater, the dataset for this PCA included only background wells, EAP porewater, and compliance wells east and south of the EAP (*i.e.*, downgradient from the unit; see E001 ASD Figure 2) screened in the UA.

Samples with a turbidity greater than 50 nephelometric turbidity units (NTU) were excluded from the analysis to mitigate the confounding influence of suspended solids. Geochemical parameters excluded from the PCA were to have measurements in over half the samples or to have an overall proportion of detected measurements exceeding 50 %. Individual samples missing data for more than half of the parameters (7 of 14 included in the PCA) were excluded from the analysis. Any measurements that were below the reporting limit were assumed to be half the reporting limit. Results for pH were converted to milligrams per liter (mg/L) H^+ ion for consistency with other analytes. Any missing values were imputed (*i.e.*, interpolated based on the available data) using the nearest neighbor method. The final data set (**Attachment A**) contained 1,232 parameter measurements (67 of which were imputed) from 88 individual groundwater samples at 15 wells in the vicinity of the EAP (three porewater wells, two background wells, and 10 compliance wells). All data were log transformed, scaled, and centered so that parameters with larger concentrations did not have disproportionate influence on the results.

Results of the PCA analysis are presented in a biplot. In a PCA biplot, the axes represent the new "variables," or principal components (PCs). The length of the arrows represents how strongly each individual variable contributes to the PCs, and the direction of the arrow along the respective axis represents the direction of the contribution (positive or negative). Each data point represents a sample plotted according to the PCs.

2.4 Pourbaix Diagrams

Pourbaix diagrams, also called Eh-pH diagrams, are visual representations of redox speciation under equilibrium conditions at a given pH (x axis) an Eh (y axis). Eh is the measure of redox potential based on the standard hydrogen electrode and is calculated by converting an oxidation reduction potential (ORP) measurement using an equation appropriate to the type of electrode used in the ORP sensor (typically silver/silver chloride or calomel). An Aqua TROLL field meter was used to measure ORP in the field. The equation to convert ORP to Eh for this meter is[1]:

Eh = ORP (mV) + 221.4 – 0.9*Temperature (°C)

3 RESULTS AND DISCUSSION

3.1 Regression quality

The results of the regressions of aquifer solids and groundwater data are presented in the main text of the ASD. This section discusses how the regressions meet the standard assumptions.

For the regression of aquifer solids data, the residuals are most extreme in the negative direction, but the mean of the residuals is zero and there is considerable scatter (**Figure B-1**). Therefore, the regression meets the assumptions relatively well.

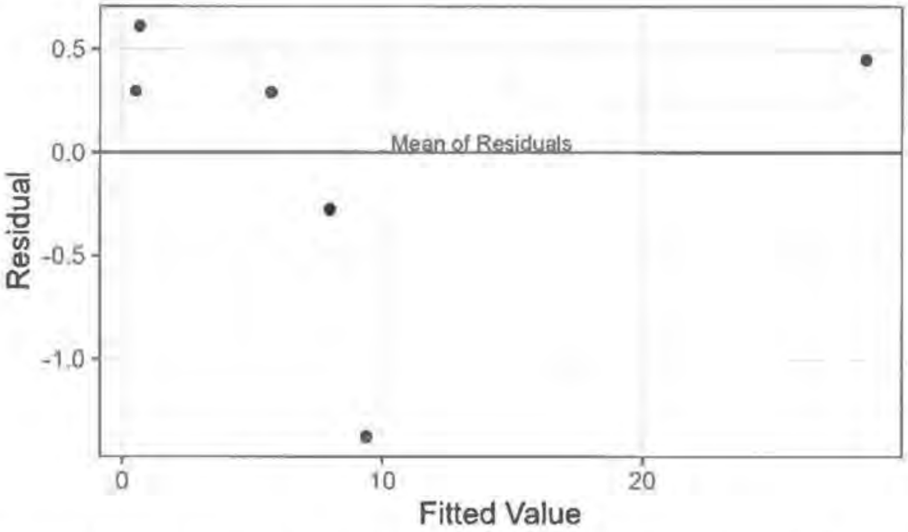

Figure B-1. Plot of residuals against fitted values for the UA solids cobalt versus manganese regression model.

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[1] As reported at https://in-situ.com/us/news/orp-field-measurements-reporting-redox-potential-oh-correctly

For the regression of groundwater data, the residuals are most extreme toward the middle of the fitted values, but the mean of the residuals is zero and there is considerable scatter (**Figure B-2**). Therefore, the regression meets the assumptions relatively well.

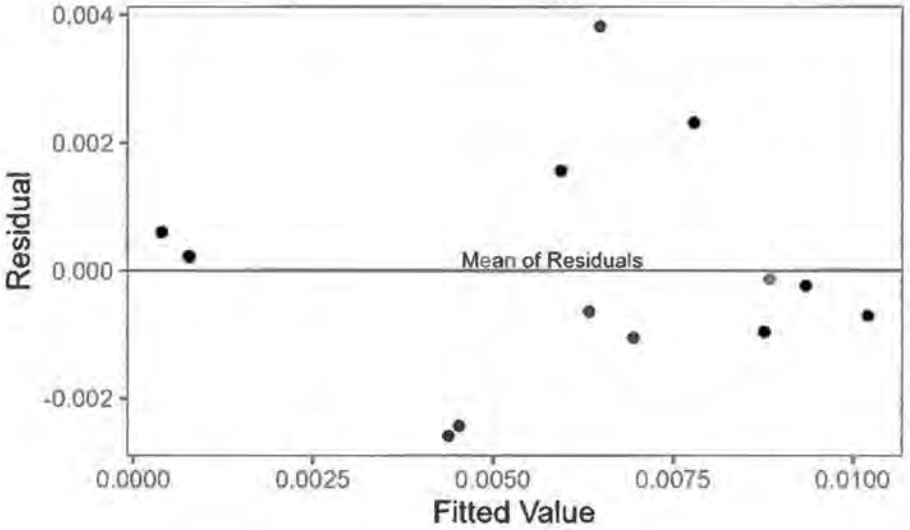

Figure B-2. Plot of residuals against fitted values for the groundwater cobalt versus manganese regression model.

3.2 Pourbaix Diagram

Figure B-3 shows the Pourbaix diagram for manganese with 2023 groundwater data plotted. Manganese is expected to exist in the reduced Mn^{2+} form at all groundwater locations (including G05), as opposed to insoluble manganese oxide mineral forms (*i.e.*, birnessite and todorokite). This indicates that reductive dissolution of manganese oxide minerals is thermodynamically favorable at G05, which supports this mechanism as a source of cobalt in the groundwater.

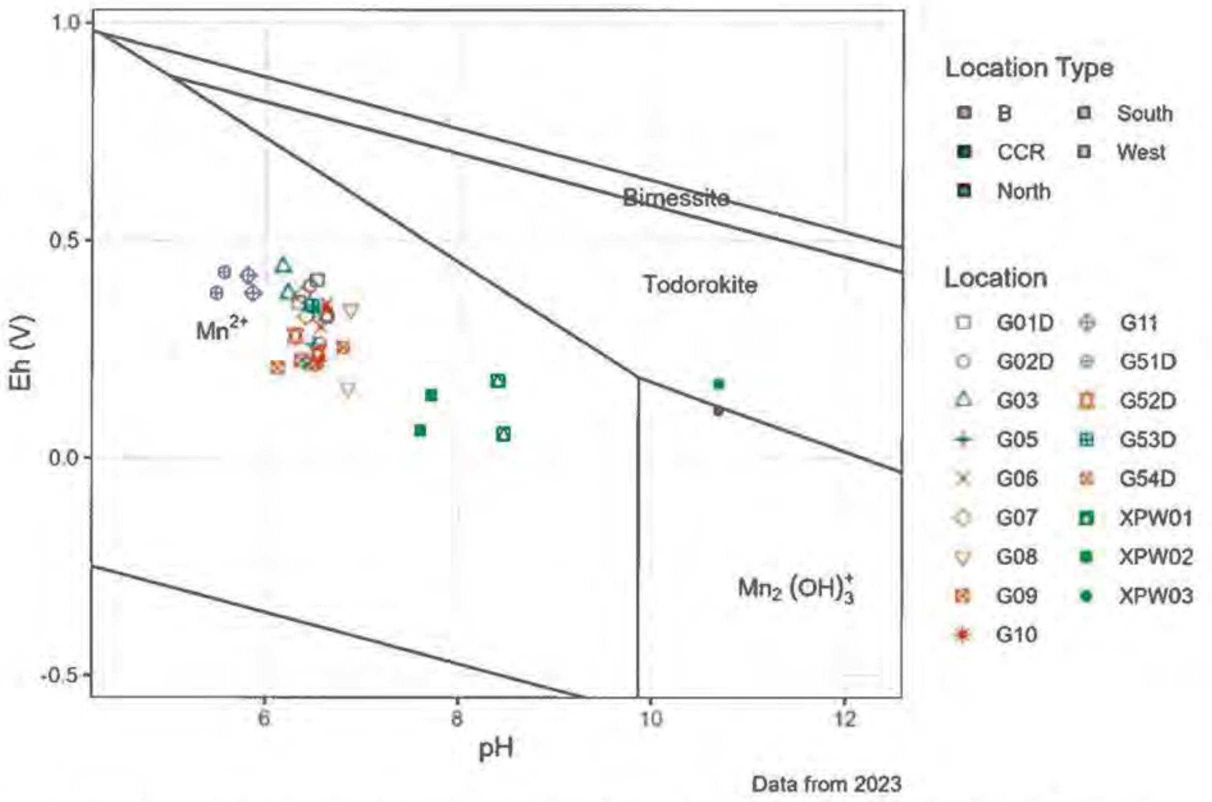

Figure B-3. Manganese Pourbaix diagram with 2023 Eh and pH data from groundwater and porewater.

3.3 PCA

The PCA biplot (**Figure B-4**) shows the results of the PCA analysis with wells colored by location type: background, CCR porewater, north of the UA stratigraphic high ("north"), south of the UA stratigraphic high ("south"), and G05 as the cobalt exceedance location. Approximately 58% of the variability in the data is encompassed in the first two principal component (PC1 explains approximately 40% of the variability in the data, and PC2 explains approximately 18%). Ninety-five % confidence ellipses for the north wells and south wells are shown in their respective location type colors. The minimal overlap of the 95% confidence ellipses shows that the groundwater compositions from the north wells and the south wells are largely distinct from one another. Well G05 plots within the 95% confidence ellipse for the north wells, indicating similarity of groundwater composition. The similarity between the north wells and dissimilarity from the south wells indicates that groundwater from these two groups of wells should be considered as distinct populations of data.

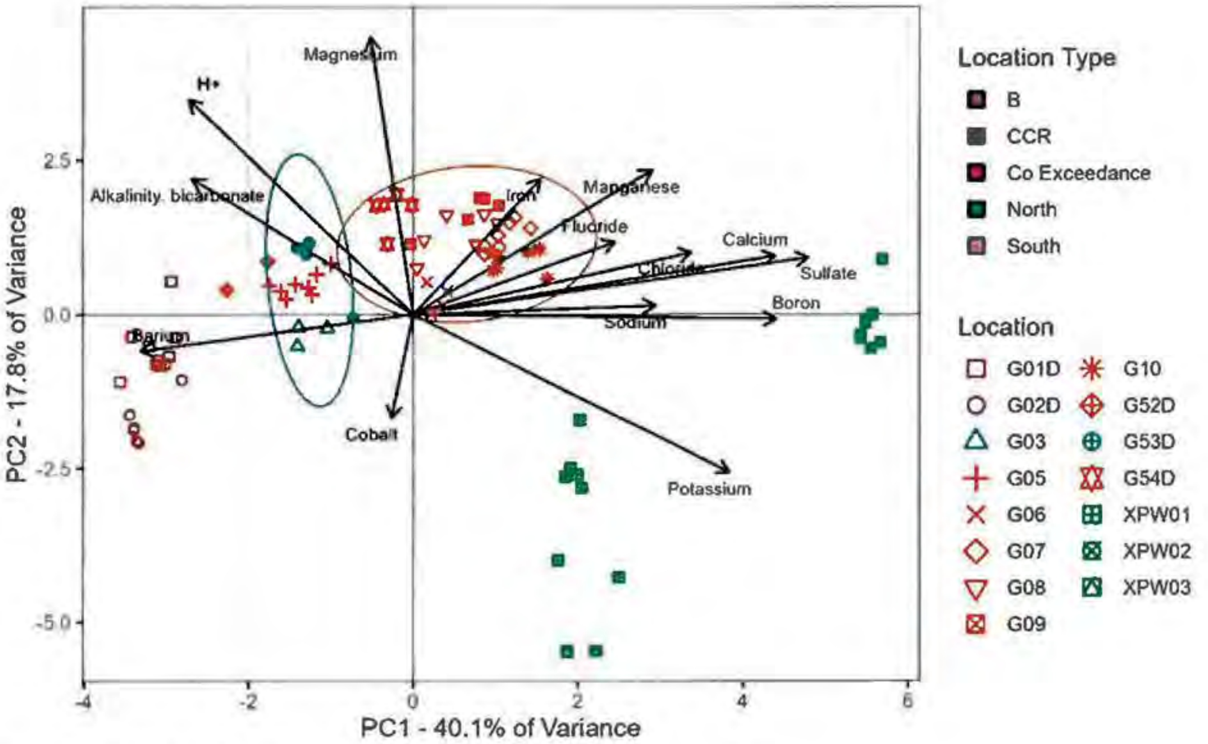

Figure B-4. Biplot of PCA results.

3.4 Redox Environment at JPP EAP

Appendix D of the associated E001 ASD, which addresses pH exceedances on the west side of the EAP, identifies a redox front west of the pond as driving iron oxidation and an associated drop in pH. The redox potential at which iron reduction/oxidation occurs is more reducing than the manganese reduction/oxidation potential. The redox potential and pH at wells G51D and G11 are consistent with an iron redox transition (Appendix D, Attachment 6-B) but all recent EAP groundwater samples fall within manganese-reducing conditions (Figure B-3). G05 is not substantially more reducing than other nearby wells without elevated cobalt. Appendix A of the E001 ASD shows that cobalt and manganese concentrations in the soil encompass 1.5 and 2.5 orders of magnitude difference, respectively, across the UA. In contrast to a redox front driving an iron speciation transition west of the EAP, local variations in solid phase cobalt and manganese concentrations appear to drive the differences in cobalt concentrations in groundwater.

4 CONCLUSIONS

The methods and results reported in this appendix support the conclusion that cobalt concentrations at G05 are consistent with mobilization due to reductive dissolution of manganese oxides. The regression analyses for cobalt and manganese correlation in solid phase material and groundwater are validated by illustrating the quality of the regressions. The Pourbaix diagram shows the manganese speciation in greater detail and concludes that reductive dissolution of manganese is thermodynamically favorable. The detailed PCA results show that the wells north and south of the UA stratigraphic high have distinct groundwater quality signatures and should be analyzed as distinct populations. Along with the strong association between cobalt and manganese in both the soil and groundwater, these results support the conclusion that the reductive dissolution of manganese oxides is a primary control on cobalt concentrations in the groundwater.

5 REFERENCES

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ATTACHMENTS

Attachment A	Electronic PCA Data

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G01D	3/3/2021	Alkalinity, bicarbonate	209	FALSE	FALSE
G01D	3/3/2021	Calcium	25.8	FALSE	FALSE
G01D	3/3/2021	Magnesium	7.79	FALSE	FALSE
G01D	3/3/2021	Sodium	79	FALSE	FALSE
G01D	3/3/2021	Potassium	1.24	FALSE	FALSE
G01D	3/3/2021	Chloride	10	FALSE	FALSE
G01D	3/3/2021	Sulfate	18	FALSE	FALSE
G01D	3/3/2021	Fluoride	0.2	FALSE	FALSE
G01D	3/3/2021	Barium	0.137	FALSE	FALSE
G01D	3/3/2021	Boron	0.158	FALSE	TRUE
G01D	3/3/2021	Cobalt	0.0015	FALSE	FALSE
G01D	3/3/2021	Iron	1.09	FALSE	FALSE
G01D	3/3/2021	Manganese	0.0232	FALSE	FALSE
G01D	3/3/2021	H+	0.000000251	FALSE	FALSE
G01D	3/24/2021	Alkalinity, bicarbonate	219	FALSE	FALSE
G01D	3/24/2021	Calcium	24.8	FALSE	FALSE
G01D	3/24/2021	Magnesium	7.06	FALSE	FALSE
G01D	3/24/2021	Sodium	73.9	FALSE	FALSE
G01D	3/24/2021	Potassium	1.05	FALSE	FALSE
G01D	3/24/2021	Chloride	9	FALSE	FALSE
G01D	3/24/2021	Sulfate	21	FALSE	FALSE
G01D	3/24/2021	Fluoride	0.21	FALSE	FALSE
G01D	3/24/2021	Barium	0.136	FALSE	FALSE
G01D	3/24/2021	Boron	0.158	FALSE	TRUE
G01D	3/24/2021	Cobalt	0.0316	FALSE	TRUE
G01D	3/24/2021	Iron	1.15	FALSE	FALSE
G01D	3/24/2021	Manganese	0.0181	FALSE	FALSE
G01D	3/24/2021	H+	0.000000324	FALSE	FALSE
G01D	4/14/2021	Alkalinity, bicarbonate	240	FALSE	FALSE
G01D	4/14/2021	Calcium	23.3	FALSE	FALSE
G01D	4/14/2021	Magnesium	7.56	FALSE	FALSE
G01D	4/14/2021	Sodium	94.5	FALSE	FALSE
G01D	4/14/2021	Potassium	0.979	FALSE	FALSE
G01D	4/14/2021	Chloride	6	FALSE	FALSE
G01D	4/14/2021	Sulfate	39	FALSE	FALSE
G01D	4/14/2021	Fluoride	0.23	FALSE	FALSE
G01D	4/14/2021	Barium	0.112	FALSE	FALSE
G01D	4/14/2021	Boron	0.158	FALSE	TRUE
G01D	4/14/2021	Cobalt	0.0316	FALSE	TRUE
G01D	4/14/2021	Iron	0.698	FALSE	FALSE
G01D	4/14/2021	Manganese	0.0117	FALSE	FALSE
G01D	4/14/2021	H+	0.0000002	FALSE	FALSE
G01D	5/12/2021	Alkalinity, bicarbonate	200	FALSE	FALSE
G01D	5/12/2021	Calcium	24.9	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G01D	5/12/2021	Magnesium	7.55	FALSE	FALSE
G01D	5/12/2021	Sodium	82.5	FALSE	FALSE
G01D	5/12/2021	Potassium	1.13	FALSE	FALSE
G01D	5/12/2021	Chloride	7	FALSE	FALSE
G01D	5/12/2021	Sulfate	20	FALSE	FALSE
G01D	5/12/2021	Fluoride	0.21	FALSE	FALSE
G01D	5/12/2021	Barium	0.133	FALSE	FALSE
G01D	5/12/2021	Boron	0.0167	FALSE	FALSE
G01D	5/12/2021	Cobalt	0.0316	FALSE	TRUE
G01D	5/12/2021	Iron	0.65	FALSE	FALSE
G01D	5/12/2021	Manganese	0.012	FALSE	FALSE
G01D	5/12/2021	H+	0.000000324	FALSE	FALSE
G01D	6/1/2021	Alkalinity, bicarbonate	198	FALSE	FALSE
G01D	6/1/2021	Calcium	24.4	FALSE	FALSE
G01D	6/1/2021	Magnesium	7.36	FALSE	FALSE
G01D	6/1/2021	Sodium	75.3	FALSE	FALSE
G01D	6/1/2021	Potassium	1.26	FALSE	FALSE
G01D	6/1/2021	Chloride	7	FALSE	FALSE
G01D	6/1/2021	Sulfate	18	FALSE	FALSE
G01D	6/1/2021	Fluoride	0.23	FALSE	FALSE
G01D	6/1/2021	Barium	0.134	FALSE	FALSE
G01D	6/1/2021	Boron	0.158	FALSE	TRUE
G01D	6/1/2021	Cobalt	0.0316	FALSE	TRUE
G01D	6/1/2021	Iron	1.92	FALSE	FALSE
G01D	6/1/2021	Manganese	0.0249	FALSE	FALSE
G01D	6/1/2021	H+	0.000000457	FALSE	FALSE
G01D	6/14/2021	Alkalinity, bicarbonate	219	FALSE	FALSE
G01D	6/14/2021	Calcium	24.4	FALSE	FALSE
G01D	6/14/2021	Magnesium	7.41	FALSE	FALSE
G01D	6/14/2021	Sodium	78.8	FALSE	FALSE
G01D	6/14/2021	Potassium	1.26	FALSE	FALSE
G01D	6/14/2021	Chloride	9	FALSE	FALSE
G01D	6/14/2021	Sulfate	20	FALSE	FALSE
G01D	6/14/2021	Fluoride	0.23	FALSE	FALSE
G01D	6/14/2021	Barium	0.136	FALSE	FALSE
G01D	6/14/2021	Boron	0.158	FALSE	TRUE
G01D	6/14/2021	Cobalt	0.0316	FALSE	TRUE
G01D	6/14/2021	Iron	0.831	FALSE	FALSE
G01D	6/14/2021	Manganese	0.0147	FALSE	FALSE
G01D	6/14/2021	H+	0.000000347	FALSE	FALSE
G01D	7/21/2021	Alkalinity, bicarbonate	204	FALSE	FALSE
G01D	7/21/2021	Calcium	26	FALSE	FALSE
G01D	7/21/2021	Magnesium	7.54	FALSE	FALSE
G01D	7/21/2021	Sodium	75.1	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G01D	7/21/2021	Potassium	1.24	FALSE	FALSE
G01D	7/21/2021	Chloride	9	FALSE	FALSE
G01D	7/21/2021	Sulfate	18	FALSE	FALSE
G01D	7/21/2021	Fluoride	0.21	FALSE	FALSE
G01D	7/21/2021	Barium	0.125	FALSE	FALSE
G01D	7/21/2021	Boron	0.158	FALSE	TRUE
G01D	7/21/2021	Cobalt	0.0316	FALSE	TRUE
G01D	7/21/2021	Iron	1.35	FALSE	FALSE
G01D	7/21/2021	Manganese	0.0121	FALSE	FALSE
G01D	7/21/2021	H+	0.000000427	FALSE	FALSE
G01D	9/20/2021	Alkalinity, bicarbonate	215	FALSE	FALSE
G01D	9/20/2021	Calcium	26	FALSE	FALSE
G01D	9/20/2021	Magnesium	7.54	TRUE	NA
G01D	9/20/2021	Sodium	75.1	TRUE	NA
G01D	9/20/2021	Potassium	1.12	TRUE	NA
G01D	9/20/2021	Chloride	9	FALSE	FALSE
G01D	9/20/2021	Sulfate	18	FALSE	FALSE
G01D	9/20/2021	Fluoride	0.21	FALSE	FALSE
G01D	9/20/2021	Barium	0.145	FALSE	FALSE
G01D	9/20/2021	Boron	0.158	FALSE	TRUE
G01D	9/20/2021	Cobalt	0.0316	FALSE	TRUE
G01D	9/20/2021	Iron	1.15	TRUE	NA
G01D	9/20/2021	Manganese	0.0147	TRUE	NA
G01D	9/20/2021	H+	0.000000309	FALSE	FALSE
G01D	9/20/2022	Alkalinity, bicarbonate	171	TRUE	NA
G01D	9/20/2022	Calcium	25.5	FALSE	FALSE
G01D	9/20/2022	Magnesium	7.79	TRUE	NA
G01D	9/20/2022	Sodium	82.5	TRUE	NA
G01D	9/20/2022	Potassium	1.13	TRUE	NA
G01D	9/20/2022	Chloride	8	FALSE	FALSE
G01D	9/20/2022	Sulfate	23	FALSE	FALSE
G01D	9/20/2022	Fluoride	0.19	FALSE	FALSE
G01D	9/20/2022	Barium	0.142	FALSE	FALSE
G01D	9/20/2022	Boron	0.014	FALSE	FALSE
G01D	9/20/2022	Cobalt	0.0007	FALSE	FALSE
G01D	9/20/2022	Iron	1.15	TRUE	NA
G01D	9/20/2022	Manganese	0.0181	TRUE	NA
G01D	9/20/2022	H+	0.000000316	FALSE	FALSE
G01D	3/7/2023	Alkalinity, bicarbonate	223	FALSE	FALSE
G01D	3/7/2023	Calcium	23	FALSE	FALSE
G01D	3/7/2023	Magnesium	7.66	FALSE	FALSE
G01D	3/7/2023	Sodium	85.8	FALSE	FALSE
G01D	3/7/2023	Potassium	1.06	FALSE	FALSE
G01D	3/7/2023	Chloride	5	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G01D	3/7/2023	Sulfate	36	FALSE	FALSE
G01D	3/7/2023	Fluoride	0.21	FALSE	FALSE
G01D	3/7/2023	Barium	0.134	FALSE	FALSE
G01D	3/7/2023	Boron	0.029	FALSE	FALSE
G01D	3/7/2023	Cobalt	0.0022	FALSE	FALSE
G01D	3/7/2023	Iron	1.09	TRUE	NA
G01D	3/7/2023	Manganese	0.0181	TRUE	NA
G01D	3/7/2023	H+	0.000000295	FALSE	FALSE
G01D	5/2/2023	Alkalinity, bicarbonate	240	FALSE	FALSE
G01D	5/2/2023	Calcium	28.8	FALSE	FALSE
G01D	5/2/2023	Magnesium	8.43	FALSE	FALSE
G01D	5/2/2023	Sodium	90.3	FALSE	FALSE
G01D	5/2/2023	Potassium	1.28	FALSE	FALSE
G01D	5/2/2023	Chloride	10	FALSE	FALSE
G01D	5/2/2023	Sulfate	26	FALSE	FALSE
G01D	5/2/2023	Fluoride	0.22	FALSE	FALSE
G01D	5/2/2023	Barium	0.213	FALSE	FALSE
G01D	5/2/2023	Boron	0.021	FALSE	FALSE
G01D	5/2/2023	Cobalt	0.0058	FALSE	FALSE
G01D	5/2/2023	Iron	4.09	FALSE	FALSE
G01D	5/2/2023	Manganese	0.345	FALSE	FALSE
G01D	5/2/2023	H+	0.000000457	FALSE	FALSE
G02D	5/12/2021	Alkalinity, bicarbonate	153	FALSE	FALSE
G02D	5/12/2021	Calcium	34.6	FALSE	FALSE
G02D	5/12/2021	Magnesium	10.4	FALSE	FALSE
G02D	5/12/2021	Sodium	53.6	FALSE	FALSE
G02D	5/12/2021	Potassium	1.17	FALSE	FALSE
G02D	5/12/2021	Chloride	18	FALSE	FALSE
G02D	5/12/2021	Sulfate	27	FALSE	FALSE
G02D	5/12/2021	Fluoride	0.18	FALSE	FALSE
G02D	5/12/2021	Barium	0.208	FALSE	FALSE
G02D	5/12/2021	Boron	0.0356	FALSE	FALSE
G02D	5/12/2021	Cobalt	0.0316	FALSE	TRUE
G02D	5/12/2021	Iron	0.316	FALSE	TRUE
G02D	5/12/2021	Manganese	0.0707	FALSE	TRUE
G02D	5/12/2021	H+	0.000000447	FALSE	FALSE
G02D	7/21/2021	Alkalinity, bicarbonate	148	FALSE	FALSE
G02D	7/21/2021	Calcium	36.6	FALSE	FALSE
G02D	7/21/2021	Magnesium	10.1	FALSE	FALSE
G02D	7/21/2021	Sodium	38.7	FALSE	FALSE
G02D	7/21/2021	Potassium	1.14	FALSE	FALSE
G02D	7/21/2021	Chloride	22	FALSE	FALSE
G02D	7/21/2021	Sulfate	20	FALSE	FALSE
G02D	7/21/2021	Fluoride	0.2	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION

JOPPA POWER PLANT

EAST ASH POND

JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G02D	7/21/2021	Barium	0.181	FALSE	FALSE
G02D	7/21/2021	Boron	0.0329	FALSE	FALSE
G02D	7/21/2021	Cobalt	0.0316	FALSE	TRUE
G02D	7/21/2021	Iron	0.0594	FALSE	FALSE
G02D	7/21/2021	Manganese	0.0026	FALSE	FALSE
G02D	7/21/2021	H+	0.000000661	FALSE	FALSE
G02D	9/20/2021	Alkalinity, bicarbonate	156	FALSE	FALSE
G02D	9/20/2021	Calcium	34.3	FALSE	FALSE
G02D	9/20/2021	Magnesium	10.2	TRUE	NA
G02D	9/20/2021	Sodium	38.7	TRUE	NA
G02D	9/20/2021	Potassium	1.12	TRUE	NA
G02D	9/20/2021	Chloride	20	FALSE	FALSE
G02D	9/20/2021	Sulfate	19	FALSE	FALSE
G02D	9/20/2021	Fluoride	0.18	FALSE	FALSE
G02D	9/20/2021	Barium	0.189	FALSE	FALSE
G02D	9/20/2021	Boron	0.0313	FALSE	FALSE
G02D	9/20/2021	Cobalt	0.0316	FALSE	TRUE
G02D	9/20/2021	Iron	0.158	TRUE	NA
G02D	9/20/2021	Manganese	0.0032	TRUE	NA
G02D	9/20/2021	H+	0.000000479	FALSE	FALSE
G02D	1/24/2023	Alkalinity, bicarbonate	136	FALSE	FALSE
G02D	1/24/2023	Calcium	35.9	FALSE	FALSE
G02D	1/24/2023	Magnesium	10.2	FALSE	FALSE
G02D	1/24/2023	Sodium	29	FALSE	FALSE
G02D	1/24/2023	Potassium	1.11	FALSE	FALSE
G02D	1/24/2023	Chloride	23	FALSE	FALSE
G02D	1/24/2023	Sulfate	12	FALSE	FALSE
G02D	1/24/2023	Fluoride	0.21	FALSE	FALSE
G02D	1/24/2023	Barium	0.19	FALSE	FALSE
G02D	1/24/2023	Boron	0.0311	FALSE	FALSE
G02D	1/24/2023	Cobalt	0.0316	FALSE	TRUE
G02D	1/24/2023	Iron	0.158	FALSE	TRUE
G02D	1/24/2023	Manganese	0.0014	FALSE	FALSE
G02D	1/24/2023	H+	0.000000229	FALSE	FALSE
G02D	3/8/2023	Alkalinity, bicarbonate	141	FALSE	FALSE
G02D	3/8/2023	Calcium	37.3	FALSE	FALSE
G02D	3/8/2023	Magnesium	10.3	FALSE	FALSE
G02D	3/8/2023	Sodium	28.3	FALSE	FALSE
G02D	3/8/2023	Potassium	1.12	FALSE	FALSE
G02D	3/8/2023	Chloride	21	FALSE	FALSE
G02D	3/8/2023	Sulfate	11	FALSE	FALSE
G02D	3/8/2023	Fluoride	0.2	FALSE	FALSE
G02D	3/8/2023	Barium	0.171	FALSE	FALSE
G02D	3/8/2023	Boron	0.027	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION

JOPPA POWER PLANT

EAST ASH POND

JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G02D	3/8/2023	Cobalt	0.0316	FALSE	TRUE
G02D	3/8/2023	Iron	0.158	TRUE	NA
G02D	3/8/2023	Manganese	0.0032	TRUE	NA
G02D	3/8/2023	H+	0.000000275	FALSE	FALSE
G02D	5/3/2023	Alkalinity, bicarbonate	140	FALSE	FALSE
G02D	5/3/2023	Calcium	38.7	FALSE	FALSE
G02D	5/3/2023	Magnesium	10.4	FALSE	FALSE
G02D	5/3/2023	Sodium	39.1	FALSE	FALSE
G02D	5/3/2023	Potassium	1.14	FALSE	FALSE
G02D	5/3/2023	Chloride	21	FALSE	FALSE
G02D	5/3/2023	Sulfate	13	FALSE	FALSE
G02D	5/3/2023	Fluoride	0.22	FALSE	FALSE
G02D	5/3/2023	Barium	0.21	FALSE	FALSE
G02D	5/3/2023	Boron	0.0412	FALSE	FALSE
G02D	5/3/2023	Cobalt	0.0316	FALSE	TRUE
G02D	5/3/2023	Iron	0.049	FALSE	FALSE
G02D	5/3/2023	Manganese	0.0032	FALSE	FALSE
G02D	5/3/2023	H+	0.000000347	FALSE	FALSE
G03	6/15/2021	Alkalinity, bicarbonate	148	FALSE	FALSE
G03	6/15/2021	Calcium	46.7	FALSE	FALSE
G03	6/15/2021	Magnesium	15.1	FALSE	FALSE
G03	6/15/2021	Sodium	40.4	FALSE	FALSE
G03	6/15/2021	Potassium	1.26	FALSE	FALSE
G03	6/15/2021	Chloride	22	FALSE	FALSE
G03	6/15/2021	Sulfate	79	FALSE	FALSE
G03	6/15/2021	Fluoride	0.22	FALSE	FALSE
G03	6/15/2021	Barium	0.0705	FALSE	FALSE
G03	6/15/2021	Boron	0.225	FALSE	FALSE
G03	6/15/2021	Cobalt	0.0316	FALSE	TRUE
G03	6/15/2021	Iron	1.69	FALSE	FALSE
G03	6/15/2021	Manganese	0.033	FALSE	FALSE
G03	6/15/2021	H+	0.000000575	FALSE	FALSE
G03	7/6/2021	Alkalinity, bicarbonate	140	FALSE	FALSE
G03	7/6/2021	Calcium	42.1	FALSE	FALSE
G03	7/6/2021	Magnesium	14	FALSE	FALSE
G03	7/6/2021	Sodium	38	FALSE	FALSE
G03	7/6/2021	Potassium	1.13	FALSE	FALSE
G03	7/6/2021	Chloride	22	FALSE	FALSE
G03	7/6/2021	Sulfate	77	FALSE	FALSE
G03	7/6/2021	Fluoride	0.22	FALSE	FALSE
G03	7/6/2021	Barium	0.0564	FALSE	FALSE
G03	7/6/2021	Boron	0.235	FALSE	FALSE
G03	7/6/2021	Cobalt	0.0316	FALSE	TRUE
G03	7/6/2021	Iron	1.06	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G03	7/6/2021	Manganese	0.0226	FALSE	FALSE
G03	7/6/2021	H+	0.000000457	FALSE	FALSE
G03	7/21/2021	Alkalinity, bicarbonate	141	FALSE	FALSE
G03	7/21/2021	Calcium	50	FALSE	FALSE
G03	7/21/2021	Magnesium	15.7	FALSE	FALSE
G03	7/21/2021	Sodium	40.2	FALSE	FALSE
G03	7/21/2021	Potassium	1.39	FALSE	FALSE
G03	7/21/2021	Chloride	24	FALSE	FALSE
G03	7/21/2021	Sulfate	92	FALSE	FALSE
G03	7/21/2021	Fluoride	0.2	FALSE	FALSE
G03	7/21/2021	Barium	0.0555	FALSE	FALSE
G03	7/21/2021	Boron	0.294	FALSE	FALSE
G03	7/21/2021	Cobalt	0.0316	FALSE	TRUE
G03	7/21/2021	Iron	2.42	FALSE	FALSE
G03	7/21/2021	Manganese	0.0334	FALSE	FALSE
G03	7/21/2021	H+	0.000000437	FALSE	FALSE
G05	3/4/2021	Alkalinity, bicarbonate	180	FALSE	FALSE
G05	3/4/2021	Calcium	55.3	FALSE	FALSE
G05	3/4/2021	Magnesium	17.2	FALSE	FALSE
G05	3/4/2021	Sodium	44.1	FALSE	FALSE
G05	3/4/2021	Potassium	1.37	FALSE	FALSE
G05	3/4/2021	Chloride	13	FALSE	FALSE
G05	3/4/2021	Sulfate	94	FALSE	FALSE
G05	3/4/2021	Fluoride	0.28	FALSE	FALSE
G05	3/4/2021	Barium	0.13	FALSE	FALSE
G05	3/4/2021	Boron	0.181	FALSE	FALSE
G05	3/4/2021	Cobalt	0.0101	FALSE	FALSE
G05	3/4/2021	Iron	0.905	FALSE	FALSE
G05	3/4/2021	Manganese	0.227	FALSE	FALSE
G05	3/4/2021	H+	0.000000316	FALSE	FALSE
G05	4/13/2021	Alkalinity, bicarbonate	206	FALSE	FALSE
G05	4/13/2021	Calcium	68.5	FALSE	FALSE
G05	4/13/2021	Magnesium	19.5	FALSE	FALSE
G05	4/13/2021	Sodium	53.7	FALSE	FALSE
G05	4/13/2021	Potassium	2.14	FALSE	FALSE
G05	4/13/2021	Chloride	21	FALSE	FALSE
G05	4/13/2021	Sulfate	95	FALSE	FALSE
G05	4/13/2021	Fluoride	0.33	FALSE	FALSE
G05	4/13/2021	Barium	0.126	FALSE	FALSE
G05	4/13/2021	Boron	0.19	FALSE	FALSE
G05	4/13/2021	Cobalt	0.0095	FALSE	FALSE
G05	4/13/2021	Iron	2	FALSE	FALSE
G05	4/13/2021	Manganese	0.294	FALSE	FALSE
G05	4/13/2021	H+	0.000000316	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G05	5/11/2021	Alkalinity, bicarbonate	193	FALSE	FALSE
G05	5/11/2021	Calcium	60.3	FALSE	FALSE
G05	5/11/2021	Magnesium	19.4	FALSE	FALSE
G05	5/11/2021	Sodium	49.6	FALSE	FALSE
G05	5/11/2021	Potassium	1.97	FALSE	FALSE
G05	5/11/2021	Chloride	19	FALSE	FALSE
G05	5/11/2021	Sulfate	109	FALSE	FALSE
G05	5/11/2021	Fluoride	0.34	FALSE	FALSE
G05	5/11/2021	Barium	0.132	FALSE	FALSE
G05	5/11/2021	Boron	0.158	FALSE	FALSE
G05	5/11/2021	Cobalt	0.0087	FALSE	FALSE
G05	5/11/2021	Iron	1.14	FALSE	FALSE
G05	5/11/2021	Manganese	0.256	FALSE	FALSE
G05	5/11/2021	H+	0.000000417	FALSE	FALSE
G05	6/1/2021	Alkalinity, bicarbonate	190	FALSE	FALSE
G05	6/1/2021	Calcium	57.1	FALSE	FALSE
G05	6/1/2021	Magnesium	18.6	FALSE	FALSE
G05	6/1/2021	Sodium	45.5	FALSE	FALSE
G05	6/1/2021	Potassium	2.18	FALSE	FALSE
G05	6/1/2021	Chloride	21	FALSE	FALSE
G05	6/1/2021	Sulfate	83	FALSE	FALSE
G05	6/1/2021	Fluoride	0.34	FALSE	FALSE
G05	6/1/2021	Barium	0.144	FALSE	FALSE
G05	6/1/2021	Boron	0.157	FALSE	FALSE
G05	6/1/2021	Cobalt	0.0078	FALSE	FALSE
G05	6/1/2021	Iron	0.81	FALSE	FALSE
G05	6/1/2021	Manganese	0.254	FALSE	FALSE
G05	6/1/2021	H+	0.000000331	FALSE	FALSE
G05	7/6/2021	Alkalinity, bicarbonate	178	FALSE	FALSE
G05	7/6/2021	Calcium	51.8	FALSE	FALSE
G05	7/6/2021	Magnesium	17.6	FALSE	FALSE
G05	7/6/2021	Sodium	45.9	FALSE	FALSE
G05	7/6/2021	Potassium	2.04	FALSE	FALSE
G05	7/6/2021	Chloride	22	FALSE	FALSE
G05	7/6/2021	Sulfate	90	FALSE	FALSE
G05	7/6/2021	Fluoride	0.34	FALSE	FALSE
G05	7/6/2021	Barium	0.139	FALSE	FALSE
G05	7/6/2021	Boron	0.148	FALSE	FALSE
G05	7/6/2021	Cobalt	0.0091	FALSE	FALSE
G05	7/6/2021	Iron	0.729	FALSE	FALSE
G05	7/6/2021	Manganese	0.27	FALSE	FALSE
G05	7/6/2021	H+	0.00000038	FALSE	FALSE
G05	7/20/2021	Alkalinity, bicarbonate	186	FALSE	FALSE
G05	7/20/2021	Calcium	55.9	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G05	7/20/2021	Magnesium	18.5	FALSE	FALSE
G05	7/20/2021	Sodium	43.4	FALSE	FALSE
G05	7/20/2021	Potassium	1.75	FALSE	FALSE
G05	7/20/2021	Chloride	20	FALSE	FALSE
G05	7/20/2021	Sulfate	87	FALSE	FALSE
G05	7/20/2021	Fluoride	0.32	FALSE	FALSE
G05	7/20/2021	Barium	0.133	FALSE	FALSE
G05	7/20/2021	Boron	0.131	FALSE	FALSE
G05	7/20/2021	Cobalt	0.0059	FALSE	FALSE
G05	7/20/2021	Iron	0.747	FALSE	FALSE
G05	7/20/2021	Manganese	0.204	FALSE	FALSE
G05	7/20/2021	H+	0.000000447	FALSE	FALSE
G05	7/26/2022	Alkalinity, bicarbonate	181	FALSE	FALSE
G05	7/26/2022	Calcium	50.6	FALSE	FALSE
G05	7/26/2022	Magnesium	17.6	FALSE	FALSE
G05	7/26/2022	Sodium	35.4	FALSE	FALSE
G05	7/26/2022	Potassium	1.07	FALSE	FALSE
G05	7/26/2022	Chloride	15	FALSE	FALSE
G05	7/26/2022	Sulfate	68	FALSE	FALSE
G05	7/26/2022	Fluoride	0.37	FALSE	FALSE
G05	7/26/2022	Barium	0.141	FALSE	FALSE
G05	7/26/2022	Boron	0.0645	FALSE	FALSE
G05	7/26/2022	Cobalt	0.0075	FALSE	FALSE
G05	7/26/2022	Iron	1.38	FALSE	FALSE
G05	7/26/2022	Manganese	0.176	FALSE	FALSE
G05	7/26/2022	H+	0.000000234	FALSE	FALSE
G05	3/9/2023	Alkalinity, bicarbonate	179	FALSE	FALSE
G05	3/9/2023	Calcium	52.6	FALSE	FALSE
G05	3/9/2023	Magnesium	19.4	FALSE	FALSE
G05	3/9/2023	Sodium	41.8	FALSE	FALSE
G05	3/9/2023	Potassium	1.59	FALSE	FALSE
G05	3/9/2023	Chloride	22	FALSE	FALSE
G05	3/9/2023	Sulfate	90	FALSE	FALSE
G05	3/9/2023	Fluoride	0.32	FALSE	FALSE
G05	3/9/2023	Barium	0.175	FALSE	FALSE
G05	3/9/2023	Boron	0.0541	FALSE	FALSE
G05	3/9/2023	Cobalt	0.0074	FALSE	FALSE
G05	3/9/2023	Iron	0.81	TRUE	NA
G05	3/9/2023	Manganese	0.204	TRUE	NA
G05	3/9/2023	H+	0.000000316	FALSE	FALSE
G05	5/3/2023	Alkalinity, bicarbonate	163	FALSE	FALSE
G05	5/3/2023	Calcium	54.4	FALSE	FALSE
G05	5/3/2023	Magnesium	19.3	FALSE	FALSE
G05	5/3/2023	Sodium	46.7	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G05	5/3/2023	Potassium	1.68	FALSE	FALSE
G05	5/3/2023	Chloride	24	FALSE	FALSE
G05	5/3/2023	Sulfate	112	FALSE	FALSE
G05	5/3/2023	Fluoride	0.38	FALSE	FALSE
G05	5/3/2023	Barium	0.212	FALSE	FALSE
G05	5/3/2023	Boron	0.0478	FALSE	FALSE
G05	5/3/2023	Cobalt	0.0103	FALSE	FALSE
G05	5/3/2023	Iron	1.5	FALSE	FALSE
G05	5/3/2023	Manganese	0.191	FALSE	FALSE
G05	5/3/2023	H+	0.000000324	FALSE	FALSE
G06	5/11/2021	Alkalinity, bicarbonate	156	FALSE	FALSE
G06	5/11/2021	Calcium	93.4	FALSE	FALSE
G06	5/11/2021	Magnesium	26.8	FALSE	FALSE
G06	5/11/2021	Sodium	52.8	FALSE	FALSE
G06	5/11/2021	Potassium	2.5	FALSE	FALSE
G06	5/11/2021	Chloride	22	FALSE	FALSE
G06	5/11/2021	Sulfate	219	FALSE	FALSE
G06	5/11/2021	Fluoride	0.26	FALSE	FALSE
G06	5/11/2021	Barium	0.0311	FALSE	FALSE
G06	5/11/2021	Boron	3.37	FALSE	FALSE
G06	5/11/2021	Cobalt	0.0316	FALSE	TRUE
G06	5/11/2021	Iron	0.702	FALSE	FALSE
G06	5/11/2021	Manganese	0.0957	FALSE	FALSE
G06	5/11/2021	H+	0.000000372	FALSE	FALSE
G06	6/1/2021	Alkalinity, bicarbonate	167	FALSE	FALSE
G06	6/1/2021	Calcium	92.6	FALSE	FALSE
G06	6/1/2021	Magnesium	25.3	FALSE	FALSE
G06	6/1/2021	Sodium	46.4	FALSE	FALSE
G06	6/1/2021	Potassium	2.5	FALSE	FALSE
G06	6/1/2021	Chloride	22	FALSE	FALSE
G06	6/1/2021	Sulfate	216	FALSE	FALSE
G06	6/1/2021	Fluoride	0.28	FALSE	FALSE
G06	6/1/2021	Barium	0.0323	FALSE	FALSE
G06	6/1/2021	Boron	3.56	FALSE	FALSE
G06	6/1/2021	Cobalt	0.0316	FALSE	TRUE
G06	6/1/2021	Iron	1.69	FALSE	FALSE
G06	6/1/2021	Manganese	0.0892	FALSE	FALSE
G06	6/1/2021	H+	0.000000275	FALSE	FALSE
G06	6/15/2021	Alkalinity, bicarbonate	170	FALSE	FALSE
G06	6/15/2021	Calcium	91.5	FALSE	FALSE
G06	6/15/2021	Magnesium	25.2	FALSE	FALSE
G06	6/15/2021	Sodium	50.7	FALSE	FALSE
G06	6/15/2021	Potassium	2.57	FALSE	FALSE
G06	6/15/2021	Chloride	21	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G06	6/15/2021	Sulfate	230	FALSE	FALSE
G06	6/15/2021	Fluoride	0.28	FALSE	FALSE
G06	6/15/2021	Barium	0.028	FALSE	FALSE
G06	6/15/2021	Boron	2.97	FALSE	FALSE
G06	6/15/2021	Cobalt	0.0316	FALSE	TRUE
G06	6/15/2021	Iron	0.379	FALSE	FALSE
G06	6/15/2021	Manganese	0.0682	FALSE	FALSE
G06	6/15/2021	H+	0.000000309	FALSE	FALSE
G06	7/6/2021	Alkalinity, bicarbonate	163	FALSE	FALSE
G06	7/6/2021	Calcium	86.7	FALSE	FALSE
G06	7/6/2021	Magnesium	23.7	FALSE	FALSE
G06	7/6/2021	Sodium	50	FALSE	FALSE
G06	7/6/2021	Potassium	2.57	FALSE	FALSE
G06	7/6/2021	Chloride	22	FALSE	FALSE
G06	7/6/2021	Sulfate	223	FALSE	FALSE
G06	7/6/2021	Fluoride	0.27	FALSE	FALSE
G06	7/6/2021	Barium	0.0272	FALSE	FALSE
G06	7/6/2021	Boron	3.93	FALSE	FALSE
G06	7/6/2021	Cobalt	0.0316	FALSE	TRUE
G06	7/6/2021	Iron	0.495	FALSE	FALSE
G06	7/6/2021	Manganese	0.0631	FALSE	FALSE
G06	7/6/2021	H+	0.000000479	FALSE	FALSE
G06	7/20/2021	Alkalinity, bicarbonate	162	FALSE	FALSE
G06	7/20/2021	Calcium	90.6	FALSE	FALSE
G06	7/20/2021	Magnesium	24.4	FALSE	FALSE
G06	7/20/2021	Sodium	47	FALSE	FALSE
G06	7/20/2021	Potassium	2.37	FALSE	FALSE
G06	7/20/2021	Chloride	21	FALSE	FALSE
G06	7/20/2021	Sulfate	213	FALSE	FALSE
G06	7/20/2021	Fluoride	0.26	FALSE	FALSE
G06	7/20/2021	Barium	0.0244	FALSE	FALSE
G06	7/20/2021	Boron	3.41	FALSE	FALSE
G06	7/20/2021	Cobalt	0.0316	FALSE	TRUE
G06	7/20/2021	Iron	0.613	FALSE	FALSE
G06	7/20/2021	Manganese	0.0456	FALSE	FALSE
G06	7/20/2021	H+	0.000000389	FALSE	FALSE
G06	3/9/2023	Alkalinity, bicarbonate	161	FALSE	FALSE
G06	3/9/2023	Calcium	87.6	FALSE	FALSE
G06	3/9/2023	Magnesium	24.1	FALSE	FALSE
G06	3/9/2023	Sodium	42.1	FALSE	FALSE
G06	3/9/2023	Potassium	2.2	FALSE	FALSE
G06	3/9/2023	Chloride	21	FALSE	FALSE
G06	3/9/2023	Sulfate	221	FALSE	FALSE
G06	3/9/2023	Fluoride	0.22	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G06	3/9/2023	Barium	0.0257	FALSE	FALSE
G06	3/9/2023	Boron	2.95	FALSE	FALSE
G06	3/9/2023	Cobalt	0.0006	FALSE	FALSE
G06	3/9/2023	Iron	0.537	TRUE	NA
G06	3/9/2023	Manganese	0.0682	TRUE	NA
G06	3/9/2023	H+	0.000000269	FALSE	FALSE
G07	3/24/2021	Alkalinity, bicarbonate	171	FALSE	FALSE
G07	3/24/2021	Calcium	92.8	FALSE	FALSE
G07	3/24/2021	Magnesium	24.2	FALSE	FALSE
G07	3/24/2021	Sodium	71.4	FALSE	FALSE
G07	3/24/2021	Potassium	3.87	FALSE	FALSE
G07	3/24/2021	Chloride	21	FALSE	FALSE
G07	3/24/2021	Sulfate	258	FALSE	FALSE
G07	3/24/2021	Fluoride	0.42	FALSE	FALSE
G07	3/24/2021	Barium	0.0643	FALSE	FALSE
G07	3/24/2021	Boron	4.67	FALSE	FALSE
G07	3/24/2021	Cobalt	0.0035	FALSE	FALSE
G07	3/24/2021	Iron	2.71	FALSE	FALSE
G07	3/24/2021	Manganese	4.48	FALSE	FALSE
G07	3/24/2021	H+	0.000000398	FALSE	FALSE
G07	4/13/2021	Alkalinity, bicarbonate	164	FALSE	FALSE
G07	4/13/2021	Calcium	126	FALSE	FALSE
G07	4/13/2021	Magnesium	24.4	FALSE	FALSE
G07	4/13/2021	Sodium	90.4	FALSE	FALSE
G07	4/13/2021	Potassium	3.98	FALSE	FALSE
G07	4/13/2021	Chloride	20	FALSE	FALSE
G07	4/13/2021	Sulfate	274	FALSE	FALSE
G07	4/13/2021	Fluoride	0.42	FALSE	FALSE
G07	4/13/2021	Barium	0.0497	FALSE	FALSE
G07	4/13/2021	Boron	5.04	FALSE	FALSE
G07	4/13/2021	Cobalt	0.0024	FALSE	FALSE
G07	4/13/2021	Iron	1.2	FALSE	FALSE
G07	4/13/2021	Manganese	4.56	FALSE	FALSE
G07	4/13/2021	H+	0.000000501	FALSE	FALSE
G07	5/11/2021	Alkalinity, bicarbonate	162	FALSE	FALSE
G07	5/11/2021	Calcium	90.4	FALSE	FALSE
G07	5/11/2021	Magnesium	22.9	FALSE	FALSE
G07	5/11/2021	Sodium	68.6	FALSE	FALSE
G07	5/11/2021	Potassium	3.9	FALSE	FALSE
G07	5/11/2021	Chloride	19	FALSE	FALSE
G07	5/11/2021	Sulfate	248	FALSE	FALSE
G07	5/11/2021	Fluoride	0.41	FALSE	FALSE
G07	5/11/2021	Barium	0.0448	FALSE	FALSE
G07	5/11/2021	Boron	4.55	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G07	5/11/2021	Cobalt	0.00185	FALSE	FALSE
G07	5/11/2021	Iron	0.537	FALSE	FALSE
G07	5/11/2021	Manganese	3.71	FALSE	FALSE
G07	5/11/2021	H+	0.000000525	FALSE	FALSE
G07	6/1/2021	Alkalinity, bicarbonate	173	FALSE	FALSE
G07	6/1/2021	Calcium	96.6	FALSE	FALSE
G07	6/1/2021	Magnesium	22.9	FALSE	FALSE
G07	6/1/2021	Sodium	67.5	FALSE	FALSE
G07	6/1/2021	Potassium	4.32	FALSE	FALSE
G07	6/1/2021	Chloride	22	FALSE	FALSE
G07	6/1/2021	Sulfate	257	FALSE	FALSE
G07	6/1/2021	Fluoride	0.43	FALSE	FALSE
G07	6/1/2021	Barium	0.054	FALSE	FALSE
G07	6/1/2021	Boron	5.23	FALSE	FALSE
G07	6/1/2021	Cobalt	0.0023	FALSE	FALSE
G07	6/1/2021	Iron	2.49	FALSE	FALSE
G07	6/1/2021	Manganese	3.54	FALSE	FALSE
G07	6/1/2021	H+	0.000000562	FALSE	FALSE
G07	6/15/2021	Alkalinity, bicarbonate	177	FALSE	FALSE
G07	6/15/2021	Calcium	89.3	FALSE	FALSE
G07	6/15/2021	Magnesium	21.8	FALSE	FALSE
G07	6/15/2021	Sodium	66.7	FALSE	FALSE
G07	6/15/2021	Potassium	3.97	FALSE	FALSE
G07	6/15/2021	Chloride	20	FALSE	FALSE
G07	6/15/2021	Sulfate	246	FALSE	FALSE
G07	6/15/2021	Fluoride	0.41	FALSE	FALSE
G07	6/15/2021	Barium	0.0429	FALSE	FALSE
G07	6/15/2021	Boron	3.91	FALSE	FALSE
G07	6/15/2021	Cobalt	0.0013	FALSE	FALSE
G07	6/15/2021	Iron	0.294	FALSE	FALSE
G07	6/15/2021	Manganese	3.7	FALSE	FALSE
G07	6/15/2021	H+	0.000000562	FALSE	FALSE
G07	7/6/2021	Alkalinity, bicarbonate	166	FALSE	FALSE
G07	7/6/2021	Calcium	84.8	FALSE	FALSE
G07	7/6/2021	Magnesium	20.5	FALSE	FALSE
G07	7/6/2021	Sodium	66.5	FALSE	FALSE
G07	7/6/2021	Potassium	3.87	FALSE	FALSE
G07	7/6/2021	Chloride	21	FALSE	FALSE
G07	7/6/2021	Sulfate	258	FALSE	FALSE
G07	7/6/2021	Fluoride	0.4	FALSE	FALSE
G07	7/6/2021	Barium	0.0373	FALSE	FALSE
G07	7/6/2021	Boron	4.95	FALSE	FALSE
G07	7/6/2021	Cobalt	0.0012	FALSE	FALSE
G07	7/6/2021	Iron	0.134	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G07	7/6/2021	Manganese	4.1	FALSE	FALSE
G07	7/6/2021	H+	0.00000105	FALSE	FALSE
G07	7/20/2021	Alkalinity, bicarbonate	166	FALSE	FALSE
G07	7/20/2021	Calcium	96.5	FALSE	FALSE
G07	7/20/2021	Magnesium	23	FALSE	FALSE
G07	7/20/2021	Sodium	67.4	FALSE	FALSE
G07	7/20/2021	Potassium	4.03	FALSE	FALSE
G07	7/20/2021	Chloride	21	FALSE	FALSE
G07	7/20/2021	Sulfate	252	FALSE	FALSE
G07	7/20/2021	Fluoride	0.4	FALSE	FALSE
G07	7/20/2021	Barium	0.047	FALSE	FALSE
G07	7/20/2021	Boron	4.48	FALSE	FALSE
G07	7/20/2021	Cobalt	0.0014	FALSE	FALSE
G07	7/20/2021	Iron	0.639	FALSE	FALSE
G07	7/20/2021	Manganese	3.28	FALSE	FALSE
G07	7/20/2021	H+	0.000000724	FALSE	FALSE
G08	4/13/2021	Alkalinity, bicarbonate	177	FALSE	FALSE
G08	4/13/2021	Calcium	142	FALSE	FALSE
G08	4/13/2021	Magnesium	31.9	FALSE	FALSE
G08	4/13/2021	Sodium	33.6	FALSE	FALSE
G08	4/13/2021	Potassium	1.6	FALSE	FALSE
G08	4/13/2021	Chloride	15	FALSE	FALSE
G08	4/13/2021	Sulfate	286	FALSE	FALSE
G08	4/13/2021	Fluoride	0.34	FALSE	FALSE
G08	4/13/2021	Barium	0.0772	FALSE	FALSE
G08	4/13/2021	Boron	5.25	FALSE	FALSE
G08	4/13/2021	Cobalt	0.0041	FALSE	FALSE
G08	4/13/2021	Iron	4.82	FALSE	FALSE
G08	4/13/2021	Manganese	6.03	FALSE	FALSE
G08	4/13/2021	H+	0.0000001	FALSE	FALSE
G08	5/11/2021	Alkalinity, bicarbonate	185	FALSE	FALSE
G08	5/11/2021	Calcium	101	FALSE	FALSE
G08	5/11/2021	Magnesium	25.4	FALSE	FALSE
G08	5/11/2021	Sodium	24.3	FALSE	FALSE
G08	5/11/2021	Potassium	1.45	FALSE	FALSE
G08	5/11/2021	Chloride	12	FALSE	FALSE
G08	5/11/2021	Sulfate	203	FALSE	FALSE
G08	5/11/2021	Fluoride	0.36	FALSE	FALSE
G08	5/11/2021	Barium	0.0685	FALSE	FALSE
G08	5/11/2021	Boron	3.77	FALSE	FALSE
G08	5/11/2021	Cobalt	0.0022	FALSE	FALSE
G08	5/11/2021	Iron	1.33	FALSE	FALSE
G08	5/11/2021	Manganese	3.09	FALSE	FALSE
G08	5/11/2021	H+	0.000000115	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G08	6/1/2021	Alkalinity, bicarbonate	201	FALSE	FALSE
G08	6/1/2021	Calcium	114	FALSE	FALSE
G08	6/1/2021	Magnesium	27.2	FALSE	FALSE
G08	6/1/2021	Sodium	25.4	FALSE	FALSE
G08	6/1/2021	Potassium	1.48	FALSE	FALSE
G08	6/1/2021	Chloride	15	FALSE	FALSE
G08	6/1/2021	Sulfate	204	FALSE	FALSE
G08	6/1/2021	Fluoride	0.34	FALSE	FALSE
G08	6/1/2021	Barium	0.0588	FALSE	FALSE
G08	6/1/2021	Boron	4.63	FALSE	FALSE
G08	6/1/2021	Cobalt	0.0041	FALSE	FALSE
G08	6/1/2021	Iron	4.43	FALSE	FALSE
G08	6/1/2021	Manganese	3.15	FALSE	FALSE
G08	6/1/2021	H+	0.00000011	FALSE	FALSE
G08	7/23/2022	Alkalinity, bicarbonate	191	FALSE	FALSE
G08	7/23/2022	Calcium	118	FALSE	FALSE
G08	7/23/2022	Magnesium	29	FALSE	FALSE
G08	7/23/2022	Sodium	30.5	FALSE	FALSE
G08	7/23/2022	Potassium	1.46	FALSE	FALSE
G08	7/23/2022	Chloride	16	FALSE	FALSE
G08	7/23/2022	Sulfate	229	FALSE	FALSE
G08	7/23/2022	Fluoride	0.3	FALSE	FALSE
G08	7/23/2022	Barium	0.0387	FALSE	FALSE
G08	7/23/2022	Boron	4.74	FALSE	FALSE
G08	7/23/2022	Cobalt	0.0028	FALSE	FALSE
G08	7/23/2022	Iron	2.25	FALSE	FALSE
G08	7/23/2022	Manganese	2.89	FALSE	FALSE
G08	7/23/2022	H+	2.57E-08	FALSE	FALSE
G08	3/9/2023	Alkalinity, bicarbonate	174	FALSE	FALSE
G08	3/9/2023	Calcium	119	FALSE	FALSE
G08	3/9/2023	Magnesium	28.9	FALSE	FALSE
G08	3/9/2023	Sodium	28.5	FALSE	FALSE
G08	3/9/2023	Potassium	1.47	FALSE	FALSE
G08	3/9/2023	Chloride	15	FALSE	FALSE
G08	3/9/2023	Sulfate	297	FALSE	FALSE
G08	3/9/2023	Fluoride	0.23	FALSE	FALSE
G08	3/9/2023	Barium	0.0495	FALSE	FALSE
G08	3/9/2023	Boron	4.33	FALSE	FALSE
G08	3/9/2023	Cobalt	0.0036	FALSE	FALSE
G08	3/9/2023	Iron	2.25	TRUE	NA
G08	3/9/2023	Manganese	0.0892	TRUE	NA
G08	3/9/2023	H+	0.000000141	FALSE	FALSE
G08	5/3/2023	Alkalinity, bicarbonate	154	FALSE	FALSE
G08	5/3/2023	Calcium	140	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G08	5/3/2023	Magnesium	32.2	FALSE	FALSE
G08	5/3/2023	Sodium	41.7	FALSE	FALSE
G08	5/3/2023	Potassium	1.67	FALSE	FALSE
G08	5/3/2023	Chloride	16	FALSE	FALSE
G08	5/3/2023	Sulfate	363	FALSE	FALSE
G08	5/3/2023	Fluoride	0.29	FALSE	FALSE
G08	5/3/2023	Barium	0.0974	FALSE	FALSE
G08	5/3/2023	Boron	5.43	FALSE	FALSE
G08	5/3/2023	Cobalt	0.0113	FALSE	FALSE
G08	5/3/2023	Iron	16.8	FALSE	FALSE
G08	5/3/2023	Manganese	2.62	FALSE	FALSE
G08	5/3/2023	H+	0.000000132	FALSE	FALSE
G09	3/4/2021	Alkalinity, bicarbonate	188	FALSE	FALSE
G09	3/4/2021	Calcium	103	FALSE	FALSE
G09	3/4/2021	Magnesium	33.8	FALSE	FALSE
G09	3/4/2021	Sodium	72	FALSE	FALSE
G09	3/4/2021	Potassium	2.78	FALSE	FALSE
G09	3/4/2021	Chloride	24	FALSE	FALSE
G09	3/4/2021	Sulfate	351	FALSE	FALSE
G09	3/4/2021	Fluoride	0.25	FALSE	FALSE
G09	3/4/2021	Barium	0.0675	FALSE	FALSE
G09	3/4/2021	Boron	3.19	FALSE	FALSE
G09	3/4/2021	Cobalt	0.0108	FALSE	FALSE
G09	3/4/2021	Iron	1.93	FALSE	FALSE
G09	3/4/2021	Manganese	4.15	FALSE	FALSE
G09	3/4/2021	H+	0.000000631	FALSE	FALSE
G09	6/1/2021	Alkalinity, bicarbonate	177	FALSE	FALSE
G09	6/1/2021	Calcium	91.3	FALSE	FALSE
G09	6/1/2021	Magnesium	31.4	FALSE	FALSE
G09	6/1/2021	Sodium	65.3	FALSE	FALSE
G09	6/1/2021	Potassium	1.87	FALSE	FALSE
G09	6/1/2021	Chloride	23	FALSE	FALSE
G09	6/1/2021	Sulfate	284	FALSE	FALSE
G09	6/1/2021	Fluoride	0.33	FALSE	FALSE
G09	6/1/2021	Barium	0.0548	FALSE	FALSE
G09	6/1/2021	Boron	3.65	FALSE	FALSE
G09	6/1/2021	Cobalt	0.0096	FALSE	FALSE
G09	6/1/2021	Iron	5.65	FALSE	FALSE
G09	6/1/2021	Manganese	3.87	FALSE	FALSE
G09	6/1/2021	H+	0.000000575	FALSE	FALSE
G09	6/15/2021	Alkalinity, bicarbonate	179	FALSE	FALSE
G09	6/15/2021	Calcium	137	FALSE	FALSE
G09	6/15/2021	Magnesium	49.3	FALSE	FALSE
G09	6/15/2021	Sodium	58.5	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G09	6/15/2021	Potassium	1.56	FALSE	FALSE
G09	6/15/2021	Chloride	21	FALSE	FALSE
G09	6/15/2021	Sulfate	294	FALSE	FALSE
G09	6/15/2021	Fluoride	0.32	FALSE	FALSE
G09	6/15/2021	Barium	0.0136	FALSE	FALSE
G09	6/15/2021	Boron	0.282	FALSE	FALSE
G09	6/15/2021	Cobalt	0.0011	FALSE	FALSE
G09	6/15/2021	Iron	0.0556	FALSE	FALSE
G09	6/15/2021	Manganese	0.104	FALSE	FALSE
G09	6/15/2021	H+	0.00000107	FALSE	FALSE
G09	7/6/2021	Alkalinity, bicarbonate	163	FALSE	FALSE
G09	7/6/2021	Calcium	79	FALSE	FALSE
G09	7/6/2021	Magnesium	28.7	FALSE	FALSE
G09	7/6/2021	Sodium	68.3	FALSE	FALSE
G09	7/6/2021	Potassium	1.65	FALSE	FALSE
G09	7/6/2021	Chloride	22	FALSE	FALSE
G09	7/6/2021	Sulfate	289	FALSE	FALSE
G09	7/6/2021	Fluoride	0.36	FALSE	FALSE
G09	7/6/2021	Barium	0.0444	FALSE	FALSE
G09	7/6/2021	Boron	4.05	FALSE	FALSE
G09	7/6/2021	Cobalt	0.0089	FALSE	FALSE
G09	7/6/2021	Iron	5.69	FALSE	FALSE
G09	7/6/2021	Manganese	4.06	FALSE	FALSE
G09	7/6/2021	H+	0.000000513	FALSE	FALSE
G09	7/21/2021	Alkalinity, bicarbonate	164	FALSE	FALSE
G09	7/21/2021	Calcium	92.1	FALSE	FALSE
G09	7/21/2021	Magnesium	32	FALSE	FALSE
G09	7/21/2021	Sodium	64.3	FALSE	FALSE
G09	7/21/2021	Potassium	1.55	FALSE	FALSE
G09	7/21/2021	Chloride	21	FALSE	FALSE
G09	7/21/2021	Sulfate	286	FALSE	FALSE
G09	7/21/2021	Fluoride	0.31	FALSE	FALSE
G09	7/21/2021	Barium	0.0454	FALSE	FALSE
G09	7/21/2021	Boron	3.75	FALSE	FALSE
G09	7/21/2021	Cobalt	0.0085	FALSE	FALSE
G09	7/21/2021	Iron	5.11	FALSE	FALSE
G09	7/21/2021	Manganese	3.17	FALSE	FALSE
G09	7/21/2021	H+	0.00000102	FALSE	FALSE
G10	3/4/2021	Alkalinity, bicarbonate	108	FALSE	FALSE
G10	3/4/2021	Calcium	107	FALSE	FALSE
G10	3/4/2021	Magnesium	35.7	FALSE	FALSE
G10	3/4/2021	Sodium	60.3	FALSE	FALSE
G10	3/4/2021	Potassium	2.54	FALSE	FALSE
G10	3/4/2021	Chloride	35	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G10	3/4/2021	Sulfate	391	FALSE	FALSE
G10	3/4/2021	Fluoride	0.29	FALSE	FALSE
G10	3/4/2021	Barium	0.0608	FALSE	FALSE
G10	3/4/2021	Boron	4.98	FALSE	FALSE
G10	3/4/2021	Cobalt	0.0109	FALSE	FALSE
G10	3/4/2021	Iron	2.38	FALSE	FALSE
G10	3/4/2021	Manganese	1.14	FALSE	FALSE
G10	3/4/2021	H+	0.0000002	FALSE	FALSE
G10	3/24/2021	Alkalinity, bicarbonate	132	FALSE	FALSE
G10	3/24/2021	Calcium	115	FALSE	FALSE
G10	3/24/2021	Magnesium	39.3	FALSE	FALSE
G10	3/24/2021	Sodium	62.1	FALSE	FALSE
G10	3/24/2021	Potassium	2.91	FALSE	FALSE
G10	3/24/2021	Chloride	31	FALSE	FALSE
G10	3/24/2021	Sulfate	369	FALSE	FALSE
G10	3/24/2021	Fluoride	0.3	FALSE	FALSE
G10	3/24/2021	Barium	0.0553	FALSE	FALSE
G10	3/24/2021	Boron	4.31	FALSE	FALSE
G10	3/24/2021	Cobalt	0.0122	FALSE	FALSE
G10	3/24/2021	Iron	4.61	FALSE	FALSE
G10	3/24/2021	Manganese	1.38	FALSE	FALSE
G10	3/24/2021	H+	0.0000002	FALSE	FALSE
G10	5/11/2021	Alkalinity, bicarbonate	134	FALSE	FALSE
G10	5/11/2021	Calcium	120	FALSE	FALSE
G10	5/11/2021	Magnesium	41.1	FALSE	FALSE
G10	5/11/2021	Sodium	56.8	FALSE	FALSE
G10	5/11/2021	Potassium	2.13	FALSE	FALSE
G10	5/11/2021	Chloride	25	FALSE	FALSE
G10	5/11/2021	Sulfate	364	FALSE	FALSE
G10	5/11/2021	Fluoride	0.28	FALSE	FALSE
G10	5/11/2021	Barium	0.0453	FALSE	FALSE
G10	5/11/2021	Boron	3.95	FALSE	FALSE
G10	5/11/2021	Cobalt	0.00754	FALSE	FALSE
G10	5/11/2021	Iron	1.12	FALSE	FALSE
G10	5/11/2021	Manganese	0.702	FALSE	FALSE
G10	5/11/2021	H+	0.000000457	FALSE	FALSE
G10	6/1/2021	Alkalinity, bicarbonate	127	FALSE	FALSE
G10	6/1/2021	Calcium	124	FALSE	FALSE
G10	6/1/2021	Magnesium	38.5	FALSE	FALSE
G10	6/1/2021	Sodium	55	FALSE	FALSE
G10	6/1/2021	Potassium	2.27	FALSE	FALSE
G10	6/1/2021	Chloride	29	FALSE	FALSE
G10	6/1/2021	Sulfate	401	FALSE	FALSE
G10	6/1/2021	Fluoride	0.29	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G10	6/1/2021	Barium	0.0444	FALSE	FALSE
G10	6/1/2021	Boron	4.73	FALSE	FALSE
G10	6/1/2021	Cobalt	0.0071	FALSE	FALSE
G10	6/1/2021	Iron	2.82	FALSE	FALSE
G10	6/1/2021	Manganese	0.608	FALSE	FALSE
G10	6/1/2021	H+	0.000000316	FALSE	FALSE
G10	6/15/2021	Alkalinity, bicarbonate	149	FALSE	FALSE
G10	6/15/2021	Calcium	128	FALSE	FALSE
G10	6/15/2021	Magnesium	40.8	FALSE	FALSE
G10	6/15/2021	Sodium	59.3	FALSE	FALSE
G10	6/15/2021	Potassium	2.25	FALSE	FALSE
G10	6/15/2021	Chloride	26	FALSE	FALSE
G10	6/15/2021	Sulfate	407	FALSE	FALSE
G10	6/15/2021	Fluoride	0.28	FALSE	FALSE
G10	6/15/2021	Barium	0.0439	FALSE	FALSE
G10	6/15/2021	Boron	3.74	FALSE	FALSE
G10	6/15/2021	Cobalt	0.005	FALSE	FALSE
G10	6/15/2021	Iron	0.864	FALSE	FALSE
G10	6/15/2021	Manganese	0.47	FALSE	FALSE
G10	6/15/2021	H+	0.000000347	FALSE	FALSE
G10	7/6/2021	Alkalinity, bicarbonate	144	FALSE	FALSE
G10	7/6/2021	Calcium	119	FALSE	FALSE
G10	7/6/2021	Magnesium	37.3	FALSE	FALSE
G10	7/6/2021	Sodium	57.6	FALSE	FALSE
G10	7/6/2021	Potassium	2.09	FALSE	FALSE
G10	7/6/2021	Chloride	26	FALSE	FALSE
G10	7/6/2021	Sulfate	415	FALSE	FALSE
G10	7/6/2021	Fluoride	0.27	FALSE	FALSE
G10	7/6/2021	Barium	0.0356	FALSE	FALSE
G10	7/6/2021	Boron	4.81	FALSE	FALSE
G10	7/6/2021	Cobalt	0.0049	FALSE	FALSE
G10	7/6/2021	Iron	0.556	FALSE	FALSE
G10	7/6/2021	Manganese	0.416	FALSE	FALSE
G10	7/6/2021	H+	0.000000309	FALSE	FALSE
G10	7/20/2021	Alkalinity, bicarbonate	141	FALSE	FALSE
G10	7/20/2021	Calcium	132	FALSE	FALSE
G10	7/20/2021	Magnesium	40	FALSE	FALSE
G10	7/20/2021	Sodium	56.5	FALSE	FALSE
G10	7/20/2021	Potassium	2.06	FALSE	FALSE
G10	7/20/2021	Chloride	26	FALSE	FALSE
G10	7/20/2021	Sulfate	410	FALSE	FALSE
G10	7/20/2021	Fluoride	0.26	FALSE	FALSE
G10	7/20/2021	Barium	0.0368	FALSE	FALSE
G10	7/20/2021	Boron	4.2	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION

JOPPA POWER PLANT

EAST ASH POND

JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G10	7/20/2021	Cobalt	0.0045	FALSE	FALSE
G10	7/20/2021	Iron	0.473	FALSE	FALSE
G10	7/20/2021	Manganese	0.348	FALSE	FALSE
G10	7/20/2021	H+	0.000000324	FALSE	FALSE
G52D	9/20/2021	Alkalinity, bicarbonate	147	FALSE	FALSE
G52D	9/20/2021	Calcium	47.8	FALSE	FALSE
G52D	9/20/2021	Magnesium	16.4	TRUE	NA
G52D	9/20/2021	Sodium	49.2	TRUE	NA
G52D	9/20/2021	Potassium	0.355	TRUE	NA
G52D	9/20/2021	Chloride	13	FALSE	FALSE
G52D	9/20/2021	Sulfate	83	FALSE	FALSE
G52D	9/20/2021	Fluoride	0.26	FALSE	FALSE
G52D	9/20/2021	Barium	0.232	FALSE	FALSE
G52D	9/20/2021	Boron	0.158	FALSE	TRUE
G52D	9/20/2021	Cobalt	0.0011	FALSE	FALSE
G52D	9/20/2021	Iron	0.537	TRUE	NA
G52D	9/20/2021	Manganese	3.71	TRUE	NA
G52D	9/20/2021	H+	0.000000513	FALSE	FALSE
G52D	3/10/2023	Alkalinity, bicarbonate	156	FALSE	FALSE
G52D	3/10/2023	Calcium	49.3	FALSE	FALSE
G52D	3/10/2023	Magnesium	15.3	FALSE	FALSE
G52D	3/10/2023	Sodium	27.7	FALSE	FALSE
G52D	3/10/2023	Potassium	0.768	FALSE	FALSE
G52D	3/10/2023	Chloride	12	FALSE	FALSE
G52D	3/10/2023	Sulfate	74	FALSE	FALSE
G52D	3/10/2023	Fluoride	0.22	FALSE	FALSE
G52D	3/10/2023	Barium	0.307	FALSE	FALSE
G52D	3/10/2023	Boron	0.0319	FALSE	FALSE
G52D	3/10/2023	Cobalt	0.0022	FALSE	FALSE
G52D	3/10/2023	Iron	0.639	TRUE	NA
G52D	3/10/2023	Manganese	3.71	TRUE	NA
G52D	3/10/2023	H+	0.000000288	FALSE	FALSE
G53D	3/25/2021	Alkalinity, bicarbonate	166	FALSE	FALSE
G53D	3/25/2021	Calcium	38.6	FALSE	FALSE
G53D	3/25/2021	Magnesium	15.7	FALSE	FALSE
G53D	3/25/2021	Sodium	50.8	FALSE	FALSE
G53D	3/25/2021	Potassium	0.278	FALSE	FALSE
G53D	3/25/2021	Chloride	19	FALSE	FALSE
G53D	3/25/2021	Sulfate	71	FALSE	FALSE
G53D	3/25/2021	Fluoride	0.71	FALSE	FALSE
G53D	3/25/2021	Barium	0.112	FALSE	FALSE
G53D	3/25/2021	Boron	0.355	FALSE	FALSE
G53D	3/25/2021	Cobalt	0.0026	FALSE	FALSE
G53D	3/25/2021	Iron	1.69	TRUE	NA

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G53D	3/25/2021	Manganese	0.0334	TRUE	NA
G53D	3/25/2021	H+	0.000000295	FALSE	FALSE
G53D	9/20/2021	Alkalinity, bicarbonate	171	FALSE	FALSE
G53D	9/20/2021	Calcium	38.5	FALSE	FALSE
G53D	9/20/2021	Magnesium	16.4	TRUE	NA
G53D	9/20/2021	Sodium	50.8	TRUE	NA
G53D	9/20/2021	Potassium	0.355	TRUE	NA
G53D	9/20/2021	Chloride	19	FALSE	FALSE
G53D	9/20/2021	Sulfate	78	FALSE	FALSE
G53D	9/20/2021	Fluoride	0.7	FALSE	FALSE
G53D	9/20/2021	Barium	0.103	FALSE	FALSE
G53D	9/20/2021	Boron	0.402	FALSE	FALSE
G53D	9/20/2021	Cobalt	0.0021	FALSE	FALSE
G53D	9/20/2021	Iron	1.69	TRUE	NA
G53D	9/20/2021	Manganese	0.0334	TRUE	NA
G53D	9/20/2021	H+	0.000000537	FALSE	FALSE
G53D	3/15/2022	Alkalinity, bicarbonate	176	FALSE	FALSE
G53D	3/15/2022	Calcium	38.1	FALSE	FALSE
G53D	3/15/2022	Magnesium	16.5	FALSE	FALSE
G53D	3/15/2022	Sodium	51.3	FALSE	FALSE
G53D	3/15/2022	Potassium	0.317	FALSE	FALSE
G53D	3/15/2022	Chloride	18	FALSE	FALSE
G53D	3/15/2022	Sulfate	74	FALSE	FALSE
G53D	3/15/2022	Fluoride	0.71	FALSE	FALSE
G53D	3/15/2022	Barium	0.0922	FALSE	FALSE
G53D	3/15/2022	Boron	0.332	FALSE	FALSE
G53D	3/15/2022	Cobalt	0.0022	FALSE	FALSE
G53D	3/15/2022	Iron	1.69	TRUE	NA
G53D	3/15/2022	Manganese	0.0334	TRUE	NA
G53D	3/15/2022	H+	0.000000316	FALSE	FALSE
G53D	7/25/2022	Alkalinity, bicarbonate	149	FALSE	FALSE
G53D	7/25/2022	Calcium	39.7	FALSE	FALSE
G53D	7/25/2022	Magnesium	17	FALSE	FALSE
G53D	7/25/2022	Sodium	49.4	FALSE	FALSE
G53D	7/25/2022	Potassium	0.3	FALSE	FALSE
G53D	7/25/2022	Chloride	19	FALSE	FALSE
G53D	7/25/2022	Sulfate	77	FALSE	FALSE
G53D	7/25/2022	Fluoride	0.72	FALSE	FALSE
G53D	7/25/2022	Barium	0.0913	FALSE	FALSE
G53D	7/25/2022	Boron	0.341	FALSE	FALSE
G53D	7/25/2022	Cobalt	0.0021	FALSE	FALSE
G53D	7/25/2022	Iron	0.281	FALSE	FALSE
G53D	7/25/2022	Manganese	0.137	FALSE	FALSE
G53D	7/25/2022	H+	1.32E-08	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G53D	3/9/2023	Alkalinity, bicarbonate	177	FALSE	FALSE
G53D	3/9/2023	Calcium	38.3	FALSE	FALSE
G53D	3/9/2023	Magnesium	16.4	FALSE	FALSE
G53D	3/9/2023	Sodium	49.2	FALSE	FALSE
G53D	3/9/2023	Potassium	0.355	FALSE	FALSE
G53D	3/9/2023	Chloride	17	FALSE	FALSE
G53D	3/9/2023	Sulfate	72	FALSE	FALSE
G53D	3/9/2023	Fluoride	0.59	FALSE	FALSE
G53D	3/9/2023	Barium	0.101	FALSE	FALSE
G53D	3/9/2023	Boron	0.37	FALSE	FALSE
G53D	3/9/2023	Cobalt	0.0022	FALSE	FALSE
G53D	3/9/2023	Iron	2.25	TRUE	NA
G53D	3/9/2023	Manganese	0.0334	TRUE	NA
G53D	3/9/2023	H+	0.000000347	FALSE	FALSE
G54D	3/24/2021	Alkalinity, bicarbonate	214	FALSE	FALSE
G54D	3/24/2021	Calcium	78.1	FALSE	FALSE
G54D	3/24/2021	Magnesium	24.2	FALSE	FALSE
G54D	3/24/2021	Sodium	62.4	FALSE	FALSE
G54D	3/24/2021	Potassium	1.12	FALSE	FALSE
G54D	3/24/2021	Chloride	23	FALSE	FALSE
G54D	3/24/2021	Sulfate	186	FALSE	FALSE
G54D	3/24/2021	Fluoride	0.32	FALSE	FALSE
G54D	3/24/2021	Barium	0.0941	FALSE	FALSE
G54D	3/24/2021	Boron	0.404	FALSE	FALSE
G54D	3/24/2021	Cobalt	0.0045	FALSE	FALSE
G54D	3/24/2021	Iron	5.11	TRUE	NA
G54D	3/24/2021	Manganese	3.87	TRUE	NA
G54D	3/24/2021	H+	0.000000275	FALSE	FALSE
G54D	9/20/2021	Alkalinity, bicarbonate	207	FALSE	FALSE
G54D	9/20/2021	Calcium	72.8	FALSE	FALSE
G54D	9/20/2021	Magnesium	24.1	TRUE	NA
G54D	9/20/2021	Sodium	49.2	TRUE	NA
G54D	9/20/2021	Potassium	1.12	TRUE	NA
G54D	9/20/2021	Chloride	24	FALSE	FALSE
G54D	9/20/2021	Sulfate	175	FALSE	FALSE
G54D	9/20/2021	Fluoride	0.29	FALSE	FALSE
G54D	9/20/2021	Barium	0.0879	FALSE	FALSE
G54D	9/20/2021	Boron	0.35	FALSE	FALSE
G54D	9/20/2021	Cobalt	0.0083	FALSE	FALSE
G54D	9/20/2021	Iron	5.11	TRUE	NA
G54D	9/20/2021	Manganese	3.87	TRUE	NA
G54D	9/20/2021	H+	0.000000331	FALSE	FALSE
G54D	3/15/2022	Alkalinity, bicarbonate	208	FALSE	FALSE
G54D	3/15/2022	Calcium	83.4	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G54D	3/15/2022	Magnesium	25.8	FALSE	FALSE
G54D	3/15/2022	Sodium	54.2	FALSE	FALSE
G54D	3/15/2022	Potassium	1.21	FALSE	FALSE
G54D	3/15/2022	Chloride	21	FALSE	FALSE
G54D	3/15/2022	Sulfate	213	FALSE	FALSE
G54D	3/15/2022	Fluoride	0.31	FALSE	FALSE
G54D	3/15/2022	Barium	0.064	FALSE	FALSE
G54D	3/15/2022	Boron	0.451	FALSE	FALSE
G54D	3/15/2022	Cobalt	0.011	FALSE	FALSE
G54D	3/15/2022	Iron	5.11	TRUE	NA
G54D	3/15/2022	Manganese	3.87	TRUE	NA
G54D	3/15/2022	H+	0.000000245	FALSE	FALSE
G54D	9/20/2022	Alkalinity, bicarbonate	171	TRUE	NA
G54D	9/20/2022	Calcium	69.7	FALSE	FALSE
G54D	9/20/2022	Magnesium	19.4	TRUE	NA
G54D	9/20/2022	Sodium	49.2	TRUE	NA
G54D	9/20/2022	Potassium	0.355	TRUE	NA
G54D	9/20/2022	Chloride	22	FALSE	FALSE
G54D	9/20/2022	Sulfate	218	FALSE	FALSE
G54D	9/20/2022	Fluoride	0.27	FALSE	FALSE
G54D	9/20/2022	Barium	0.0768	FALSE	FALSE
G54D	9/20/2022	Boron	0.252	FALSE	FALSE
G54D	9/20/2022	Cobalt	0.0048	FALSE	FALSE
G54D	9/20/2022	Iron	5.11	TRUE	NA
G54D	9/20/2022	Manganese	3.87	TRUE	NA
G54D	9/20/2022	H+	0.000000316	FALSE	FALSE
G54D	5/3/2023	Alkalinity, bicarbonate	206	FALSE	FALSE
G54D	5/3/2023	Calcium	81.5	FALSE	FALSE
G54D	5/3/2023	Magnesium	26.4	FALSE	FALSE
G54D	5/3/2023	Sodium	57	FALSE	FALSE
G54D	5/3/2023	Potassium	1.21	FALSE	FALSE
G54D	5/3/2023	Chloride	22	FALSE	FALSE
G54D	5/3/2023	Sulfate	194	FALSE	FALSE
G54D	5/3/2023	Fluoride	0.3	FALSE	FALSE
G54D	5/3/2023	Barium	0.0794	FALSE	FALSE
G54D	5/3/2023	Boron	0.555	FALSE	FALSE
G54D	5/3/2023	Cobalt	0.0106	FALSE	FALSE
G54D	5/3/2023	Iron	1.39	FALSE	FALSE
G54D	5/3/2023	Manganese	1.19	FALSE	FALSE
G54D	5/3/2023	H+	0.000000158	FALSE	FALSE
XPW01	3/5/2021	Alkalinity, bicarbonate	155	FALSE	FALSE
XPW01	3/5/2021	Calcium	162	FALSE	FALSE
XPW01	3/5/2021	Magnesium	2.25	FALSE	FALSE
XPW01	3/5/2021	Sodium	35.5	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW01	3/5/2021	Potassium	31.1	FALSE	FALSE
XPW01	3/5/2021	Chloride	10	FALSE	FALSE
XPW01	3/5/2021	Sulfate	345	FALSE	FALSE
XPW01	3/5/2021	Fluoride	0.67	FALSE	FALSE
XPW01	3/5/2021	Barium	0.165	FALSE	FALSE
XPW01	3/5/2021	Boron	10.4	FALSE	FALSE
XPW01	3/5/2021	Cobalt	0.0316	FALSE	TRUE
XPW01	3/5/2021	Iron	2.18	FALSE	FALSE
XPW01	3/5/2021	Manganese	1.24	FALSE	FALSE
XPW01	3/5/2021	H+	0.00000001	FALSE	FALSE
XPW01	3/24/2021	Alkalinity, bicarbonate	141	FALSE	FALSE
XPW01	3/24/2021	Calcium	158	FALSE	FALSE
XPW01	3/24/2021	Magnesium	1.7	FALSE	FALSE
XPW01	3/24/2021	Sodium	37.2	FALSE	FALSE
XPW01	3/24/2021	Potassium	38.1	FALSE	FALSE
XPW01	3/24/2021	Chloride	9	FALSE	FALSE
XPW01	3/24/2021	Sulfate	355	FALSE	FALSE
XPW01	3/24/2021	Fluoride	0.55	FALSE	FALSE
XPW01	3/24/2021	Barium	0.161	FALSE	FALSE
XPW01	3/24/2021	Boron	9.58	FALSE	FALSE
XPW01	3/24/2021	Cobalt	0.0316	FALSE	TRUE
XPW01	3/24/2021	Iron	1.18	FALSE	FALSE
XPW01	3/24/2021	Manganese	0.59	FALSE	FALSE
XPW01	3/24/2021	H+	3.98E-09	FALSE	FALSE
XPW01	4/14/2021	Alkalinity, bicarbonate	136	FALSE	FALSE
XPW01	4/14/2021	Calcium	156	FALSE	FALSE
XPW01	4/14/2021	Magnesium	1.28	FALSE	FALSE
XPW01	4/14/2021	Sodium	28.3	FALSE	FALSE
XPW01	4/14/2021	Potassium	34.7	FALSE	FALSE
XPW01	4/14/2021	Chloride	7	FALSE	FALSE
XPW01	4/14/2021	Sulfate	355	FALSE	FALSE
XPW01	4/14/2021	Fluoride	0.57	FALSE	FALSE
XPW01	4/14/2021	Barium	0.154	FALSE	FALSE
XPW01	4/14/2021	Boron	9.42	FALSE	FALSE
XPW01	4/14/2021	Cobalt	0.0316	FALSE	TRUE
XPW01	4/14/2021	Iron	1.36	FALSE	FALSE
XPW01	4/14/2021	Manganese	0.725	FALSE	FALSE
XPW01	4/14/2021	H+	6.31E-09	FALSE	FALSE
XPW01	5/12/2021	Alkalinity, bicarbonate	145	FALSE	FALSE
XPW01	5/12/2021	Calcium	166	FALSE	FALSE
XPW01	5/12/2021	Magnesium	1.31	FALSE	FALSE
XPW01	5/12/2021	Sodium	29.3	FALSE	FALSE
XPW01	5/12/2021	Potassium	36.9	FALSE	FALSE
XPW01	5/12/2021	Chloride	6	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW01	5/12/2021	Sulfate	309	FALSE	FALSE
XPW01	5/12/2021	Fluoride	0.62	FALSE	FALSE
XPW01	5/12/2021	Barium	0.162	FALSE	FALSE
XPW01	5/12/2021	Boron	10.2	FALSE	FALSE
XPW01	5/12/2021	Cobalt	0.0316	FALSE	TRUE
XPW01	5/12/2021	Iron	1.98	FALSE	FALSE
XPW01	5/12/2021	Manganese	1.09	FALSE	FALSE
XPW01	5/12/2021	H+	3.98E-09	FALSE	FALSE
XPW01	3/15/2022	Alkalinity, bicarbonate	104	FALSE	FALSE
XPW01	3/15/2022	Calcium	159	FALSE	FALSE
XPW01	3/15/2022	Magnesium	0.443	FALSE	FALSE
XPW01	3/15/2022	Sodium	27.4	FALSE	FALSE
XPW01	3/15/2022	Potassium	36.9	FALSE	FALSE
XPW01	3/15/2022	Chloride	5	FALSE	FALSE
XPW01	3/15/2022	Sulfate	360	FALSE	FALSE
XPW01	3/15/2022	Fluoride	0.25	FALSE	FALSE
XPW01	3/15/2022	Barium	0.113	FALSE	FALSE
XPW01	3/15/2022	Boron	10.4	FALSE	FALSE
XPW01	3/15/2022	Cobalt	0.0316	FALSE	TRUE
XPW01	3/15/2022	Iron	1.36	TRUE	NA
XPW01	3/15/2022	Manganese	0.725	TRUE	NA
XPW01	3/15/2022	H+	4.68E-09	FALSE	FALSE
XPW01	3/8/2023	Alkalinity, bicarbonate	64	FALSE	FALSE
XPW01	3/8/2023	Calcium	164	FALSE	FALSE
XPW01	3/8/2023	Magnesium	0.254	FALSE	FALSE
XPW01	3/8/2023	Sodium	27.2	FALSE	FALSE
XPW01	3/8/2023	Potassium	37.2	FALSE	FALSE
XPW01	3/8/2023	Chloride	11	FALSE	FALSE
XPW01	3/8/2023	Sulfate	414	FALSE	FALSE
XPW01	3/8/2023	Fluoride	0.16	FALSE	FALSE
XPW01	3/8/2023	Barium	0.128	FALSE	FALSE
XPW01	3/8/2023	Boron	8.79	FALSE	FALSE
XPW01	3/8/2023	Cobalt	0.0002	FALSE	FALSE
XPW01	3/8/2023	Iron	1.36	TRUE	NA
XPW01	3/8/2023	Manganese	0.725	TRUE	NA
XPW01	3/8/2023	H+	3.39E-09	FALSE	FALSE
XPW01	5/3/2023	Alkalinity, bicarbonate	130	FALSE	FALSE
XPW01	5/3/2023	Calcium	151	FALSE	FALSE
XPW01	5/3/2023	Magnesium	0.405	FALSE	FALSE
XPW01	5/3/2023	Sodium	27	FALSE	FALSE
XPW01	5/3/2023	Potassium	38.5	FALSE	FALSE
XPW01	5/3/2023	Chloride	14	FALSE	FALSE
XPW01	5/3/2023	Sulfate	345	FALSE	FALSE
XPW01	5/3/2023	Fluoride	0.34	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW01	5/3/2023	Barium	0.137	FALSE	FALSE
XPW01	5/3/2023	Boron	10.6	FALSE	FALSE
XPW01	5/3/2023	Cobalt	0.0002	FALSE	FALSE
XPW01	5/3/2023	Iron	1	FALSE	FALSE
XPW01	5/3/2023	Manganese	0.544	FALSE	FALSE
XPW01	5/3/2023	H+	3.89E-09	FALSE	FALSE
XPW02	3/4/2021	Alkalinity, bicarbonate	121	FALSE	FALSE
XPW02	3/4/2021	Calcium	591	FALSE	FALSE
XPW02	3/4/2021	Magnesium	10.9	FALSE	FALSE
XPW02	3/4/2021	Sodium	888	FALSE	FALSE
XPW02	3/4/2021	Potassium	23.4	FALSE	FALSE
XPW02	3/4/2021	Chloride	130	FALSE	FALSE
XPW02	3/4/2021	Sulfate	2380	FALSE	FALSE
XPW02	3/4/2021	Fluoride	0.42	FALSE	FALSE
XPW02	3/4/2021	Barium	0.0342	FALSE	FALSE
XPW02	3/4/2021	Boron	12.1	FALSE	FALSE
XPW02	3/4/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	3/4/2021	Iron	1.63	FALSE	FALSE
XPW02	3/4/2021	Manganese	0.47	FALSE	FALSE
XPW02	3/4/2021	H+	0.00000001	FALSE	FALSE
XPW02	3/24/2021	Alkalinity, bicarbonate	128	FALSE	FALSE
XPW02	3/24/2021	Calcium	484	FALSE	FALSE
XPW02	3/24/2021	Magnesium	11.3	FALSE	FALSE
XPW02	3/24/2021	Sodium	798	FALSE	FALSE
XPW02	3/24/2021	Potassium	26.3	FALSE	FALSE
XPW02	3/24/2021	Chloride	176	FALSE	FALSE
XPW02	3/24/2021	Sulfate	2830	FALSE	FALSE
XPW02	3/24/2021	Fluoride	0.45	FALSE	FALSE
XPW02	3/24/2021	Barium	0.0271	FALSE	FALSE
XPW02	3/24/2021	Boron	12.2	FALSE	FALSE
XPW02	3/24/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	3/24/2021	Iron	1.25	FALSE	FALSE
XPW02	3/24/2021	Manganese	0.499	FALSE	FALSE
XPW02	3/24/2021	H+	0.00000001	FALSE	FALSE
XPW02	4/14/2021	Alkalinity, bicarbonate	128	FALSE	FALSE
XPW02	4/14/2021	Calcium	551	FALSE	FALSE
XPW02	4/14/2021	Magnesium	11.3	FALSE	FALSE
XPW02	4/14/2021	Sodium	705	FALSE	FALSE
XPW02	4/14/2021	Potassium	25.3	FALSE	FALSE
XPW02	4/14/2021	Chloride	110	FALSE	FALSE
XPW02	4/14/2021	Sulfate	2410	FALSE	FALSE
XPW02	4/14/2021	Fluoride	0.44	FALSE	FALSE
XPW02	4/14/2021	Barium	0.0283	FALSE	FALSE
XPW02	4/14/2021	Boron	11.5	FALSE	FALSE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW02	4/14/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	4/14/2021	Iron	1.69	FALSE	FALSE
XPW02	4/14/2021	Manganese	0.583	FALSE	FALSE
XPW02	4/14/2021	H+	1.26E-08	FALSE	FALSE
XPW02	5/12/2021	Alkalinity, bicarbonate	123	FALSE	FALSE
XPW02	5/12/2021	Calcium	495	FALSE	FALSE
XPW02	5/12/2021	Magnesium	11.8	FALSE	FALSE
XPW02	5/12/2021	Sodium	641	FALSE	FALSE
XPW02	5/12/2021	Potassium	24.5	FALSE	FALSE
XPW02	5/12/2021	Chloride	134	FALSE	FALSE
XPW02	5/12/2021	Sulfate	2410	FALSE	FALSE
XPW02	5/12/2021	Fluoride	0.41	FALSE	FALSE
XPW02	5/12/2021	Barium	0.0287	FALSE	FALSE
XPW02	5/12/2021	Boron	10.8	FALSE	FALSE
XPW02	5/12/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	5/12/2021	Iron	2.15	FALSE	FALSE
XPW02	5/12/2021	Manganese	0.632	FALSE	FALSE
XPW02	5/12/2021	H+	1.41E-08	FALSE	FALSE
XPW02	7/21/2021	Alkalinity, bicarbonate	139	FALSE	FALSE
XPW02	7/21/2021	Calcium	494	FALSE	FALSE
XPW02	7/21/2021	Magnesium	11.1	FALSE	FALSE
XPW02	7/21/2021	Sodium	762	FALSE	FALSE
XPW02	7/21/2021	Potassium	24.7	FALSE	FALSE
XPW02	7/21/2021	Chloride	179	FALSE	FALSE
XPW02	7/21/2021	Sulfate	2330	FALSE	FALSE
XPW02	7/21/2021	Fluoride	0.4	FALSE	FALSE
XPW02	7/21/2021	Barium	0.0226	FALSE	FALSE
XPW02	7/21/2021	Boron	12	FALSE	FALSE
XPW02	7/21/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	7/21/2021	Iron	2.7	FALSE	FALSE
XPW02	7/21/2021	Manganese	0.744	FALSE	FALSE
XPW02	7/21/2021	H+	1.74E-08	FALSE	FALSE
XPW02	3/15/2022	Alkalinity, bicarbonate	144	FALSE	FALSE
XPW02	3/15/2022	Calcium	483	FALSE	FALSE
XPW02	3/15/2022	Magnesium	10.7	FALSE	FALSE
XPW02	3/15/2022	Sodium	828	FALSE	FALSE
XPW02	3/15/2022	Potassium	27.1	FALSE	FALSE
XPW02	3/15/2022	Chloride	115	FALSE	FALSE
XPW02	3/15/2022	Sulfate	2590	FALSE	FALSE
XPW02	3/15/2022	Fluoride	0.48	FALSE	FALSE
XPW02	3/15/2022	Barium	0.023	FALSE	FALSE
XPW02	3/15/2022	Boron	16	FALSE	FALSE
XPW02	3/15/2022	Cobalt	0.0316	FALSE	TRUE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION

JOPPA POWER PLANT

EAST ASH POND

JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW02	3/15/2022	Iron	1.69	TRUE	NA
XPW02	3/15/2022	Manganese	0.583	TRUE	NA
XPW02	3/15/2022	H+	1.82E-08	FALSE	FALSE
XPW02	5/3/2023	Alkalinity, bicarbonate	139	FALSE	FALSE
XPW02	5/3/2023	Calcium	451	FALSE	FALSE
XPW02	5/3/2023	Magnesium	12.3	FALSE	FALSE
XPW02	5/3/2023	Sodium	953	FALSE	FALSE
XPW02	5/3/2023	Potassium	27.4	FALSE	FALSE
XPW02	5/3/2023	Chloride	104	FALSE	FALSE
XPW02	5/3/2023	Sulfate	2650	FALSE	FALSE
XPW02	5/3/2023	Fluoride	0.48	FALSE	FALSE
XPW02	5/3/2023	Barium	0.0212	FALSE	FALSE
XPW02	5/3/2023	Boron	13.4	FALSE	FALSE
XPW02	5/3/2023	Cobalt	0.0002	FALSE	FALSE
XPW02	5/3/2023	Iron	3.49	FALSE	FALSE
XPW02	5/3/2023	Manganese	0.748	FALSE	FALSE
XPW02	5/3/2023	H+	1.91E-08	FALSE	FALSE
XPW03	5/12/2021	Alkalinity, bicarbonate	141	TRUE	FALSE
XPW03	5/12/2021	Calcium	16.4	FALSE	FALSE
XPW03	5/12/2021	Magnesium	0.316	FALSE	TRUE
XPW03	5/12/2021	Sodium	113	FALSE	FALSE
XPW03	5/12/2021	Potassium	27.5	FALSE	FALSE
XPW03	5/12/2021	Chloride	25	FALSE	FALSE
XPW03	5/12/2021	Sulfate	155	FALSE	FALSE
XPW03	5/12/2021	Fluoride	0.25	FALSE	FALSE
XPW03	5/12/2021	Barium	0.012	FALSE	FALSE
XPW03	5/12/2021	Boron	11.7	FALSE	FALSE
XPW03	5/12/2021	Cobalt	0.0316	FALSE	TRUE
XPW03	5/12/2021	Iron	0.316	FALSE	TRUE
XPW03	5/12/2021	Manganese	0.0707	FALSE	TRUE
XPW03	5/12/2021	H+	2E-11	FALSE	FALSE
XPW03	7/21/2021	Alkalinity, bicarbonate	141	TRUE	FALSE
XPW03	7/21/2021	Calcium	15.3	FALSE	FALSE
XPW03	7/21/2021	Magnesium	0.224	FALSE	TRUE
XPW03	7/21/2021	Sodium	104	FALSE	FALSE
XPW03	7/21/2021	Potassium	26.9	FALSE	FALSE
XPW03	7/21/2021	Chloride	26	FALSE	FALSE
XPW03	7/21/2021	Sulfate	148	FALSE	FALSE
XPW03	7/21/2021	Fluoride	0.26	FALSE	FALSE
XPW03	7/21/2021	Barium	0.0114	FALSE	FALSE
XPW03	7/21/2021	Boron	11.6	FALSE	FALSE
XPW03	7/21/2021	Cobalt	0.0316	FALSE	TRUE
XPW03	7/21/2021	Iron	0.158	FALSE	TRUE
XPW03	7/21/2021	Manganese	0.0447	FALSE	TRUE

Attachment A.

ELECTRONIC PCA DATA

35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW03	7/21/2021	H+	1.07E-10	FALSE	FALSE

Note:
mg/L = milligrams per liter
RL = reporting limit

APPENDIX C
SUPPORTING GROUNDWATER AND POREWATER ANALYTICAL DATA

APPENDIX C.
SUPPORTING GROUNDWATER AND POREWATER ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Well Type	Date	Parameter	Result	Unit
G03	Compliance	06/15/2021	Cobalt, total	0.001 U	mg/L
G03	Compliance	07/06/2021	Cobalt, total	0.001 U	mg/L
G03	Compliance	07/21/2021	Cobalt, total	0.001 U	mg/L
G03	Compliance	06/15/2021	Manganese, total	0.0330	mg/L
G03	Compliance	07/06/2021	Manganese, total	0.0226	mg/L
G03	Compliance	07/21/2021	Manganese, total	0.0334	mg/L
G05	Compliance	03/04/2021	Boron, total	0.181	mg/L
G05	Compliance	03/24/2021	Boron, total	0.195	mg/L
G05	Compliance	04/13/2021	Boron, total	0.190	mg/L
G05	Compliance	05/11/2021	Boron, total	0.158	mg/L
G05	Compliance	06/01/2021	Boron, total	0.157	mg/L
G05	Compliance	06/15/2021	Boron, total	0.140	mg/L
G05	Compliance	07/06/2021	Boron, total	0.148	mg/L
G05	Compliance	07/20/2021	Boron, total	0.131	mg/L
G05	Compliance	07/26/2022	Boron, total	0.0645	mg/L
G05	Compliance	03/09/2023	Boron, total	0.0541	mg/L
G05	Compliance	05/03/2023	Boron, total	0.0478	mg/L
G05	Compliance	03/04/2021	Cobalt, total	0.0101	mg/L
G05	Compliance	03/24/2021	Cobalt, total	0.00960	mg/L
G05	Compliance	04/13/2021	Cobalt, total	0.00950	mg/L
G05	Compliance	05/11/2021	Cobalt, total	0.00870	mg/L
G05	Compliance	06/01/2021	Cobalt, total	0.00780	mg/L
G05	Compliance	06/15/2021	Cobalt, total	0.00570	mg/L
G05	Compliance	07/06/2021	Cobalt, total	0.00910	mg/L
G05	Compliance	07/20/2021	Cobalt, total	0.00590	mg/L
G05	Compliance	07/26/2022	Cobalt, total	0.00750	mg/L
G05	Compliance	03/09/2023	Cobalt, total	0.00740	mg/L
G05	Compliance	05/03/2023	Cobalt, total	0.0103	mg/L
G05	Compliance	03/04/2021	Manganese, total	0.227	mg/L
G05	Compliance	04/13/2021	Manganese, total	0.294	mg/L
G05	Compliance	05/11/2021	Manganese, total	0.256	mg/L
G05	Compliance	06/01/2021	Manganese, total	0.254	mg/L
G05	Compliance	06/15/2021	Manganese, total	0.187	mg/L
G05	Compliance	07/06/2021	Manganese, total	0.270	mg/L
G05	Compliance	07/20/2021	Manganese, total	0.204	mg/L
G05	Compliance	07/26/2022	Manganese, total	0.176	mg/L
G05	Compliance	05/03/2023	Manganese, total	0.191	mg/L
G05	Compliance	03/04/2021	Sulfate, total	94.0	mg/L
G05	Compliance	03/24/2021	Sulfate, total	92.0	mg/L
G05	Compliance	04/13/2021	Sulfate, total	95.0	mg/L
G05	Compliance	05/11/2021	Sulfate, total	109	mg/L
G05	Compliance	06/01/2021	Sulfate, total	83.0	mg/L
G05	Compliance	06/15/2021	Sulfate, total	91.0	mg/L
G05	Compliance	07/06/2021	Sulfate, total	90.0	mg/L
G05	Compliance	07/20/2021	Sulfate, total	87.0	mg/L
G05	Compliance	07/26/2022	Sulfate, total	68.0	mg/L

APPENDIX C.
SUPPORTING GROUNDWATER AND POREWATER ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Well Type	Date	Parameter	Result	Unit
G05	Compliance	03/09/2023	Sulfate, total	90.0	mg/L
G05	Compliance	05/03/2023	Sulfate, total	112	mg/L
G53D	Compliance	07/25/2022	Cobalt, total	0.00210	mg/L
G53D	Compliance	05/03/2023	Cobalt, total	0.00180	mg/L
G53D	Compliance	07/25/2022	Manganese, total	0.137	mg/L
G53D	Compliance	05/03/2023	Manganese, total	0.133	mg/L
XPW01	Porewater	03/05/2021	Boron, total	10.4	mg/L
XPW01	Porewater	03/24/2021	Boron, total	9.58	mg/L
XPW01	Porewater	04/14/2021	Boron, total	9.42	mg/L
XPW01	Porewater	05/12/2021	Boron, total	10.2	mg/L
XPW01	Porewater	07/21/2021	Boron, total	10.1	mg/L
XPW01	Porewater	03/15/2022	Boron, total	10.4	mg/L
XPW01	Porewater	03/08/2023	Boron, total	8.79	mg/L
XPW01	Porewater	05/03/2023	Boron, total	10.6	mg/L
XPW01	Porewater	03/05/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	03/24/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	04/14/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	05/12/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	07/21/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	03/15/2022	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	03/08/2023	Cobalt, total	0.0002 J	mg/L
XPW01	Porewater	05/03/2023	Cobalt, total	0.0002 J	mg/L
XPW01	Porewater	03/05/2021	Sulfate, total	345	mg/L
XPW01	Porewater	03/24/2021	Sulfate, total	355	mg/L
XPW01	Porewater	04/14/2021	Sulfate, total	355	mg/L
XPW01	Porewater	05/12/2021	Sulfate, total	309	mg/L
XPW01	Porewater	07/21/2021	Sulfate, total	328	mg/L
XPW01	Porewater	03/15/2022	Sulfate, total	360	mg/L
XPW01	Porewater	03/08/2023	Sulfate, total	414	mg/L
XPW01	Porewater	05/03/2023	Sulfate, total	345	mg/L
XPW02	Porewater	03/04/2021	Boron, total	12.1	mg/L
XPW02	Porewater	03/24/2021	Boron, total	12.2	mg/L
XPW02	Porewater	04/14/2021	Boron, total	11.5	mg/L
XPW02	Porewater	05/12/2021	Boron, total	10.8	mg/L
XPW02	Porewater	07/21/2021	Boron, total	12.0	mg/L
XPW02	Porewater	03/15/2022	Boron, total	16.0	mg/L
XPW02	Porewater	03/08/2023	Boron, total	10.8	mg/L
XPW02	Porewater	05/03/2023	Boron, total	13.4	mg/L
XPW02	Porewater	03/04/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	03/24/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	04/14/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	05/12/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	07/21/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	03/15/2022	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	03/08/2023	Cobalt, total	0.0003 J	mg/L
XPW02	Porewater	05/03/2023	Cobalt, total	0.0002 J	mg/L

APPENDIX C.
SUPPORTING GROUNDWATER AND POREWATER ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Well Type	Date	Parameter	Result	Unit
XPW02	Porewater	03/04/2021	Sulfate, total	2,380	mg/L
XPW02	Porewater	03/24/2021	Sulfate, total	2,830	mg/L
XPW02	Porewater	04/14/2021	Sulfate, total	2,410	mg/L
XPW02	Porewater	05/12/2021	Sulfate, total	2,410	mg/L
XPW02	Porewater	07/21/2021	Sulfate, total	2,330	mg/L
XPW02	Porewater	03/15/2022	Sulfate, total	2,590	mg/L
XPW02	Porewater	03/08/2023	Sulfate, total	2,450	mg/L
XPW02	Porewater	05/03/2023	Sulfate, total	2,650	mg/L
XPW03	Porewater	03/04/2021	Boron, total	12.2	mg/L
XPW03	Porewater	03/24/2021	Boron, total	11.6	mg/L
XPW03	Porewater	04/14/2021	Boron, total	9.30	mg/L
XPW03	Porewater	05/12/2021	Boron, total	11.7	mg/L
XPW03	Porewater	07/21/2021	Boron, total	11.6	mg/L
XPW03	Porewater	03/15/2022	Boron, total	11.1	mg/L
XPW03	Porewater	03/09/2023	Boron, total	8.06	mg/L
XPW03	Porewater	05/03/2023	Boron, total	9.22	mg/L
XPW03	Porewater	03/04/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	03/24/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	04/14/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	05/12/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	07/21/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	03/15/2022	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	03/09/2023	Cobalt, total	0.0001 U	mg/L
XPW03	Porewater	05/03/2023	Cobalt, total	0.0001 U	mg/L
XPW03	Porewater	03/04/2021	Sulfate, total	133	mg/L
XPW03	Porewater	03/24/2021	Sulfate, total	138	mg/L
XPW03	Porewater	04/14/2021	Sulfate, total	152	mg/L
XPW03	Porewater	05/12/2021	Sulfate, total	155	mg/L
XPW03	Porewater	07/21/2021	Sulfate, total	148	mg/L
XPW03	Porewater	03/15/2022	Sulfate, total	152	mg/L
XPW03	Porewater	03/09/2023	Sulfate, total	142	mg/L
XPW03	Porewater	05/03/2023	Sulfate, total	144	mg/L

APPENDIX C.
SUPPORTING GROUNDWATER AND POREWATER ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Notes:
mg/L = milligrams per liter
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the level of the adjusted detection limit or quantitation limit, as appropriate.

APPENDIX D
GEOCHEMICAL ANALYSIS OF JOPPA EAST ASH POND GROUNDWATER IN SUPPORT OF AN ALTERNATIVE SOURCE DEMONSTRATION (LIFE CYCLE GEO, LLC, 2023)

TECHNICAL MEMORANDUM

DATE October 21, 2023 **Reference No. 23RAM01-1**

TO Brian G. Hennings - Ramboll
Frances Ackerman - Ramboll
Allison Kreinberg - Geosyntec

CC Stu Cravens - Vistra

FROM Shannon Zahuranec, Allie Wyman, Tom Meuzelaar **EMAIL:** shannon@lifecyclegeo.com

GEOCHEMICAL ANALYSIS OF JOPPA EAST ASH POND GROUNDWATER IN SUPPORT OF AN ALTERNATIVE SOURCE DEMONSTRATION

1.0 EXECUTIVE SUMMARY

This document serves as an Appendix to the October 21, 2023, Alternative Source Demonstration (ASD) for Joppa (JOP) Power Plant East Ash Pond (EAP) for monitoring Event 1 (E001) (referred to as the E001 ASD), completed to fulfill the requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.650(e). Life Cycle Geo, LLC (LCG) has completed a review of geochemical conditions to evaluate the feasibility of an ASD at monitoring wells G11 and G51D associated with the JOP EAP. Compliance wells G11 and G51D monitor conditions in the Uppermost Aquifer (UA) to the west of the EAP and currently exhibit pH levels lower than the groundwater protection standard (GWPS) range for pH. This technical evaluation considered all available groundwater and solid-phase chemical analyses and utilized multivariate statistical analysis to conclude that low pH levels at G11 and G51D are not attributed to influence from the EAP. Further, observed pH levels are likely the result of the oxidation of dissolved iron released from chemically reducing conditions in the upgradient area to the north and west of the G11 and G51D monitoring wells (also referred to in this document as exceedance wells). Oxidation of dissolved ferrous iron and subsequent precipitation of solid-phase iron generates acidity through fundamentally established geochemical reactions discussed in Section 4.0. This scope of work was executed by subcontract to Ramboll Americas Engineering Solutions, Inc. (Ramboll) on behalf of Electric Energy, Inc.

2.0 HYDROGEOLOGY AND GROUNDWATER CONDITION

Monitoring wells G11 and G51D are screened in the UA. The UA is composed predominantly of sand and is overlain by the upper confining unit (UCU), a clay-rich, low permeability stratigraphic unit (Ramboll, 2021). Monitoring wells G11 and G51D are on the western border of the EAP, hydraulically upgradient of the EAP and the other EAP monitoring wells (Attachment 1). Monitoring wells G11 and G51D are downgradient of the northernmost part of the JOP West Ash Pond (WAP), and the sewage treatment pond (Attachment 2) situated on the northwest corner of the WAP.

Table 1: Concentration Ranges for Select Constituents in Joppa Groundwater and CCR Ponds.

	pH	Boron (mg/L)	Magnesium (mg/L)
G11	5.78-6.33	0.25-0.42	27.8-72.4
G51D	5.30-6.92	0.03-0.96	12.3-14.4
CCR porewater	6.76-11.1	4.02-34.3	ND-27.8
Western Groundwater*	5.04-7.4	ND-24.7	4.0-126
Eastern Groundwater	5.62-7.88	ND-5.43	7.1-49.3
TPZ120	2.77-3.63	2.08-3.55	52.4-63.5

ND=Not Detected
Data provided in Appendix D-1
*Western groundwater ranges presented do not include TPZ120, which is listed separately.

From March 2021 through May 2023, pH at G11 and G51D is generally below the GWPS lower limit of 6.0 standard pH units (SU) (Attachment 3). Groundwater pH elsewhere at the site has been measured as low as 5.0 SU (Table 1) but is typically between 6 and 8 SU (Attachment 3; Appendix D-1). The UCU monitoring well TPZ120 is an exception with a much lower groundwater pH (less than 4.0 SU).

This analysis focused predominantly on assessing the source of acidity in G11 and G51D as originating from either east or west of the exceedance wells to determine if the EAP (east of the exceedance wells) is the source of the low pH levels observed. To this end, monitoring wells to the east of the exceedance wells are discussed as the Eastern Wells and the monitoring wells to the west are discussed as the Western Wells. The Eastern Wells include the EAP porewater wells [XPW01, XPW02, and XPW03] as an endmember for evaluation, EAP compliance-based groundwater wells [G03, G05, G06, G07, G08, G09, G10, G52D, G53D, and G54D], and two EAP monitoring wells [G04 and G06S] that are not included in the regulatory network but are in close proximity to the compliance EAP monitoring wells. While most of these wells are downgradient of G11 and G51D, they provide a necessary comparison for assessing potential EAP impacts to G11 and G51D. The Western Wells are hydraulically upgradient or side-gradient of G11 and G51D and are used to evaluate potential alternate sources for the pH exceedances originating to the west. Western Wells included in this analysis are installed in the UA [TPZ118D, TPZ118DD, TPZ119D, TPZ119DD, TPZ120D, TPZ123, and TPZ124D] and UCU [TPZ118, TPZ120, and TPZ124], as well as the WAP porewater wells [XTPW01, XTPW02, XTPW03, and XTPW04]. The upgradient background wells G01D and G02D are assessed as the upgradient endmember reflective of groundwater uninfluenced by activity at the JOP site. This selection of Eastern and Western wells provides the best analysis of geochemical conditions and potential sources in the immediate area of G11 and G51D. Potential sources of acidity (which could drive the observed low pH levels at G11 and G51D) are assessed through comprehensive geochemical analysis, including time series analysis, correlation plots (scatterplot comparisons), Principal Components Analysis (PCA), and spatial and chemical distribution of iron.

3.0 GEOCHEMICAL ANALYSIS

3.1 CCR INDICATOR CONSTITUENT BORON

Boron is commonly used as an indicator parameter for contaminant transport of CCR because: (i) it is commonly present at elevated concentrations in coal ash leachate; (ii) it is mobile and typically not very reactive but conservative (i.e., low rates of sorption or degradation) in groundwater; and (iii) it is less likely than other constituents to be present at elevated concentrations in background groundwater from natural or other anthropogenic sources. Boron is often assessed in groundwater to identify possible end-member sources of influence in downgradient areas that could be attributed to CCR. Porewater samples collected from both the EAP and WAP exhibit elevated concentrations of boron, whereas boron concentrations in monitoring wells G11 and G51D are low relative to CCR porewater and most groundwater monitoring wells located both to the east and west (Attachment 3). While boron concentrations suggest no immediate influence from either of the CCR units, it is not otherwise relied upon for distinguishing influence as originating from either the east (i.e., EAP) or west.

3.2 OTHER PERTINENT CHEMICAL TRACERS OF INFLUENCE

Magnesium is not commonly used as a CCR indicator, yet the substantial range in magnesium concentrations observed in groundwater to the west relative to east makes it a particularly useful tracer of influence (Attachment 3). Table 1 presents the range in magnesium measured for several different endmember components assessed for influence in relation to exceedance wells G11 and G51D.

Magnesium concentrations are notably elevated in several of the western groundwater monitoring wells, both within the UA and UCU stratigraphic units. Magnesium concentrations in G11 are similarly elevated when contrasted with groundwater concentrations measured to the east. Concentrations of magnesium at G51D are more similar to background (i.e., overall low). While some Eastern Wells do exhibit magnesium concentrations above background, the range is substantially lower than G11 and the Western Wells overall. The low magnesium concentrations observed in background groundwater, eastern groundwater, and CCR porewater lead in the direction of the western groundwater as a source of high magnesium to, and therefore a dominant influence on, the exceedance wells (G11 in particular).

A strong linear relationship is observed between sulfate and magnesium in groundwater (Attachment 4; Appendix D-1), except TPZ120, which appears as an outlier for the JOP groundwater. The linear relationship between magnesium and sulfate is observed in both western and eastern groundwaters, though the magnitude of measured concentrations in the Western Wells extends beyond that of the Eastern Wells, as discussed in the previous paragraph. Concentrations from monitoring well G11 plot among the Western Wells and are distinctly separate from Eastern Wells. Furthermore, the G11 magnesium-sulfate relationship is similar to Western UCU wells. This data suggests that G11 groundwater chemistry is more similar to western groundwater chemistry than eastern groundwater chemistry. Conditions at G51D are suspected to be under the same influence from the western groundwater chemistry, but are simultaneously influenced from upgradient background groundwater, discussed further in Section 4.0. This mixing of groundwaters produces a lower magnesium concentration in G51D relative to G11.

3.3 MULTIVARIATE DATA ANALYSIS

3.3.1 METHOD

Groundwater chemistry data are by nature multivariate datasets given the high number of parameters observed per sampling location and within a given timeframe. With such a large number of variables, advanced statistical analysis of multivariate groundwater data can provide important insights into spatial, temporal, and chemical relationships influencing constituent distribution and compliance in groundwater. The multivariate technique Principal Component Analysis (PCA) is used to interrogate the groundwater chemistry around the exceedance wells.

PCA is a multivariate technique that reduces dataset dimensionality to its principal, independent components thereby revealing the inner structure of the dataset. Multivariate techniques such as PCA are valuable because they identify variables that are highly dependent on each other but do not inherently provide insights into water origin, type, or evolution. Reducing multivariate data dimensionality reduces redundant information, revealing inner structures in the data that might otherwise be obscured by these dependencies. These structures might include groups of related variables, chemical evolution through time, or spatial locations with similar chemical signatures.

PCA results are most easily viewed on a biplot (such as those provided in Attachment 5), which depicts the sample population plotted on two axes, each representing a principal component. The principal components are created from a linear combination of the original variables in the dataset and variance in the data. For natural compositional datasets, approximately 70% of the population variance can often be expressed in the first three or four principal components (in some cases less and in others, more), each representing decreasing amounts of variance in the data while remaining uncorrelated to previous principal components. The first two principal components often represent the majority of the dataset and are visualized using biplots with the variables expressed as vectors; the location of groups of samples (i.e., factor scores) relative to component vectors provides insight into geochemical relationships among groups of variables and samples.

3.3.2 DATA PREPARATION

When conducting multivariate analysis, it is first necessary to prepare the dataset. Raw chemical data requires preparation prior to analysis because the data often contains values in two forms unsuitable for advanced analytics: 1) measurements reported below a method detection limit (MDL), referred to as censored data, and 2) missing values. For this work, any sample or analyte with a high percentage (≥40%) of missing and/or censored data was assessed for meaningful statistical variance. If overall analyte variance was determined to be low, the analyte was removed, otherwise the data was included in the analysis. Any remaining censored data was converted to half the MDL. Remaining missing values were imputed, a method of assigning an estimated value that accounts for the entire distribution of the material's composition (Sanford et al., 1993) and also takes into consideration the values associated with samples of similar composition. Imputation was done with a nearest neighbor algorithm (Troyanskaya, 2001) and resulting values were checked against the overall data distribution for both the analyte and sample to ensure representative results. Imputed data represents 1.9% or less of the overall dataset in the PCA biplots presented here. Processed data for the PCA are presented in Electronic Attachment 1 and 2.

PCA also requires transformation of the dataset to address the numeric closure problem inherent within chemical compositional datasets (Aitchison, 1986). Numeric closure can often occur in water quality data since water quality concentrations are not completely independent. To address this issue, all data was converted to the same units (mg/L) and the centered-log ratio transformation (CLR; Aitchison 1986; Egozcue et al. 2011) was applied to the cleaned dataset. In practice, closure only significantly affects elements present in large concentrations (e.g., major ions in typical water quality samples), but for consistency the entire dataset (i.e., including trace metals) was CLR-transformed.

The resulting dataset includes both compliance wells and other monitoring wells and spans sampling events from 2017 through 2023. The dataset contains 18 measured analytes, including the hydrogen ion (H+), which represents acidity in groundwater and is proportional to pH. This data represents both the most recent data measured at JOP as well as the most complete set of regularly measured and detectable analytes. All data preparation was conducted using python programming language. Only total concentrations of major ions and metals were used in this analysis as those data are both relatively complete and consistent across the wells on site and are the parameters of interest for regulatory purposes.

3.3.3 RESULTS

Biplots showing principal components 1 and 2 (PC1 and PC2) are provided in Attachment 5. The PC1 and PC2 are represented on the X and Y axis and explain approximately 30% and 25% of the statistical variance in the water quality dataset, respectively. For each biplot, the first three components explain over 65% variance in the dataset, while the first four explain over 70%. Constituent variables are expressed as vectors. The grouping of samples relative to the component vectors is useful for providing immediate insight into geochemical relationships among groups of variables and samples.

Two iterations of biplots are provided; Attachment 5a depicts all Western and Eastern Wells and porewater locations with sufficient data. Attachment 5b depicts all potential endmember influences on the pH exceedances at G11 and G51D, as represented by background groundwater, EAP porewater, WAP porewater, and hydraulically upgradient groundwater wells (all of which exist to the north and west). Side-gradient western well TPZ120 is also included as it represents a geochemical endmember. While constituent vectors are arranged in a similar orientation across both biplots, biplot 5A which includes the downgradient eastern groundwater contains more noise in the dataset making it difficult to decipher meaningful inter-well trends. This biplot is provided as a reference but is not discussed further. The remaining analysis focuses on biplot 5B which contains hydraulically upgradient wells, background wells, and porewater wells as geochemical endmembers of G11 and G51D (Attachment 5b). This biplot exhibits the following key features:

- Exceedance wells G51D and G11 exhibit a high degree of similarity with the Western Wells screened in the UA.
- Groundwater samples are distributed linearly from the bottom right to the middle of the upper left quadrant, with clear separation between stratigraphic units within the spread of data. Background data plots as an endmember in the lower right quadrant, transitions into UA wells in the lower left quadrant, and continues through the UCU wells in the middle upper left quadrant.
- The EAP and WAP porewaters dominate the upper right quadrant and are distinctly separate from the groundwater samples. There is also a clear separation between EAP and WAP porewaters. The WAP porewater has a strong association with the boron and lithium vectors whereas the EAP porewater is more closely associated with arsenic, potassium, molybdenum, and selenium.
- The WAP UCU monitoring well TPZ120 plots alone in the upper left corner of the plot at the far end of the iron vector, indicating (a) iron is a key contributor to the variance associated with this location and (b) TPZ120 has a distinct chemical composition relative to the other groundwater compositions considered.

The linear spread of groundwater data suggests chemical evolution and/or communication within the aquifer system. The western UCU groundwater composition is dominated by redox sensitive vectors such as manganese, iron, and sulfate. The UA groundwater is observed to undergo a gradual chemical evolution from the UCU redox-sensitive composition endmember back to background conditions, which are dominated by alkalinity, sodium, chloride, and fluoride. The exceedance wells plot among the western UA groundwater, suggesting geochemistry is broadly similar in these wells. Furthermore, the exceedance wells plot in near association with the background groundwater wells, also indicating some multi-variate geochemical similarity to background. This positioning may indicate potential mixing between reduced upgradient groundwaters from the northwest with oxidized background water from the north, discussed further in Section 4.0. Exceedance wells G51D and G11 do not demonstrate association with the EAP porewater composition, supporting the conclusion that the EAP porewater is not a primary influence on the groundwater composition observed at G51D and G11, and is therefore not found to be responsible for the pH exceedances.

4.0 POTENTIAL ALTERNATE SOURCES

This technical review identified the likely source of acidity contributing to the low pH levels at G11 and G51D is dissolved iron in groundwater under reducing conditions and the redox transition that occurs in groundwater immediately upgradient of the G11 and G51D monitoring wells. This is demonstrated in Attachment 6, which includes figures depicting the redox condition at the site. The map included in Attachment 6A (Appendix D-2) demonstrates a distinct redox transition from more reducing conditions in upgradient waters and more oxidizing conditions near the exceedance wells. The reducing upgradient waters are characterized by lower oxidation reduction potential (ORP) and higher iron concentrations, while downgradient waters are largely the opposite with higher ORP and lower iron concentrations. This spatial gradient in redox conditions is also reflected in the Pourbaix diagram for the upgradient western groundwater network (Attachment 6B; Appendix D-3). This diagram demonstrates the predominant iron species and mineral forms under changing pH and Eh conditions (Eh is calculated from field measurements of ORP using the AquaTROLL conversion rate). There is a clear gradient from more reducing conditions in the north and west to more oxidized conditions in G11 and G51D with dissolved iron (Fe^{++}) and iron hydroxide ($Fe(OH)_3$) as the dominant forms of iron. Simultaneously, there is a drop in pH as conditions become more oxidizing.

The source of the dissolved iron and reducing condition could be attributed to three possible upgradient influences existing to the west and north of the two exceedance wells: 1) low pH and relatively high dissolved iron existing in the general area around Western Well TPZ120, 2) the WAP, and 3) the sewage treatment pond. Results of the PCA suggest groundwater monitored in the area of Western Well TPZ120 and the WAP are both potential geochemical endmembers of the chemical evolution observed upgradient and to the west (Attachment 5). Monitoring well TPZ120 has an average iron concentration of 1.2 mg/L (determined from samples with turbidity <10 NTU) and is near enough in proximity to the exceedance wells to suggest cross-gradient flow between these wells may be possible (Attachment 2). The WAP and the sewage treatment pond are both upgradient sources of reduced groundwater, though high turbidity in field samples limits the use of existing iron data for full understanding of transport and speciation of dissolved iron in response to the redox gradient. These three locations represent possible alternate sources of reduced iron to the exceedance wells.

This change in redox condition is the likely source of acidity in G11 and G51D. It is interpreted that dissolved iron is released from the sediments through the process of reductive dissolution by upgradient waters, in response to the reducing conditions (as observed by low ORP). The dissolved iron is transported downgradient with groundwater and subsequently oxidizes and precipitates when it moves into an area with sufficient dissolved oxygen to drive the oxidation reaction.

The oxidation of dissolved iron to iron hydroxide is known to produce acidity via the following reactions:

$$Fe^{2+} + \frac{1}{4}O_2 + H^+ \rightarrow Fe^{3+} + \frac{1}{2}H_2O$$

$$Fe^{3+} + 3H_2O \rightarrow Fe(OH)_3 + 3H^+$$

Acidity is highlighted in red, and the equations demonstrate a net increase in acidity through iron oxidation and precipitation. In this way, reduced upgradient waters from the north and west provides the constituent (i.e., reduced iron) necessary to cause a drop in pH (i.e., through iron oxidation) in G11 and G51D. The oxidized environment near the exceedance wells results from sufficient mixing with the upgradient oxidized background groundwater. This is particularly evident in G51D, which has a more immediate influence of dissolved iron from reduced upgradient wells and has a compositional similarity to background wells (as seen in PCA and magnesium concentrations) resulting in the lowest pH in the JOP EAP groundwater network.

5.0 CONCLUSIONS

This technical review presents evidence that demonstrates the EAP is not the source of pH exceedances at compliance wells G11 and G51D. Results of the geochemical and multivariate analysis (i.e., PCA) demonstrate that groundwater associated with monitoring wells G11 and G51D are more similar to upgradient groundwater to the north and west than the EAP porewater. This analysis was supported by examination of magnesium concentrations and the magnesium-sulfate relationship, both of which indicate G11 and G51D have a chemical signature indicative of western groundwater and background groundwater. The pH exceedances are found to be the result of chemically reduced upgradient waters carrying dissolved iron (released from the aquifer solids through the geochemical process of reductive dissolution) subsequently mixing with oxidized background groundwater in the area of G51D and G11. Further analysis revealed three potential sources of dissolved iron to the north and west of the exceedance locations; however, this investigation did not attempt to identify the primary or singular source of dissolved iron driving the pH exceedances. Upon mixing, the dissolved iron originating from more reducing groundwater subsequently oxidizes and precipitates as iron hydroxide, consequently generating acidity and lowering the groundwater pH in this specific area. The information and analysis presented thus rules out the EAP as the source of the acidity, and therefore pH exceedances, in this area.

6.0 ABBREVIATIONS

Alk	Total Alkalinity
As	Arsenic
B	Boron
Ca	Calcium
CCR	Coal combustion residual
Cl	Chloride
Co	Cobalt
Cr	Chromium
EAP	East Ash Pond
F	Fluoride
Fe	Iron
H+	Hydrogen ion, represents acidity in groundwater
JOP	Joppa
K	Potassium
Li	Lithium
Mg	Magnesium
Mn	Manganese
Mo	Molybdenum
Na	Sodium
ORP	Oxidation reduction potential
PCA	Principal components analysis
Redox	Oxidation-Reduction
Se	Selenium
SO4	Sulfate
UA	Upper Aquifer
UCU	Upper confining unit
WAP	West Ash Pond

7.0 REFERENCES

Aitchison, J. 1986. The Statistical Analysis of Compositional Data. Chapman and Hall. London

Egozcue J.J. and V. Pawlowsky-Glahn. 2011. Basic concepts and procedures.In: Pawlowsky-Glahn V, Buccianti A, editors. Compositional data analysis: theory and applications. Chichester: Wiley; 2011. pp. 12–28.

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Olga Troyanskaya, Michael Cantor, Gavin Sherlock, Pat Brown, Trevor Hastie, Robert Tibshirani, David Botstein and Russ B. Altman, Missing value estimation methods for DNA microarrays, BIOINFORMATICS Vol. 17 no. 6, 2001 Pages 520-525.

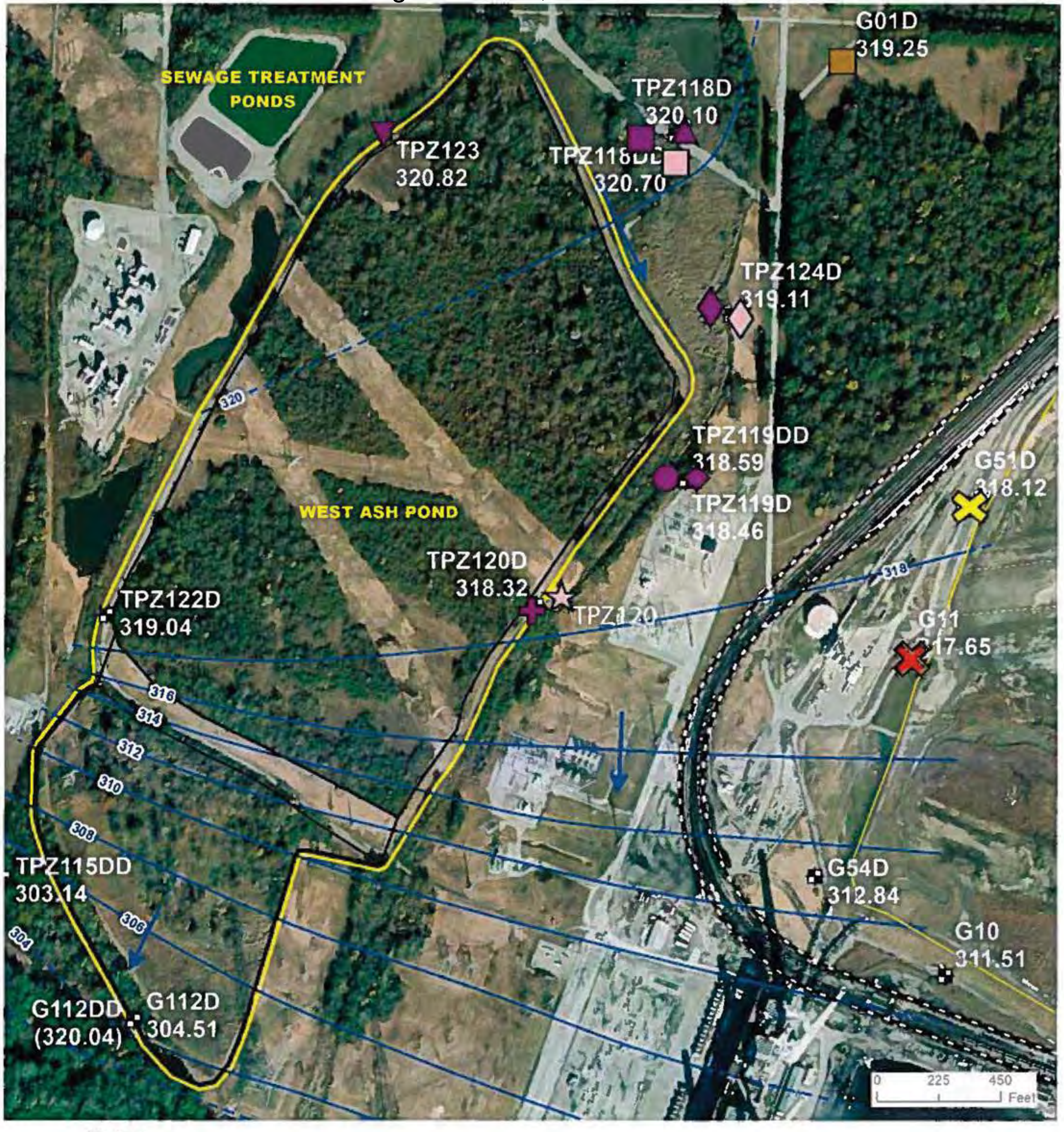
Sanford, R. F., C.T. Pierson, and R.A. Crovelli. 1993. An objective replacement method for censored geochemical data: Math. Geol., 25(1), p. 59–80.

Notes:
Wells with pH exceedances are shown with an X.
East ash pond compliance wells are light blue and monitoring wells are dark blue.
Western monitoring wells are purple (UA) and pink (UCU).
Background wells are brown. Ash ponds are outlined in yellow.
Contours are from March 2023.

LIFECYCLEGEO

Title
Joppa East Ash Pond Well Locations and Hydrology

Project Name	Project Number	Attachment
Joppa- East Ash Pond Evaluation	[23RAM01-1] Vistra CCR	1
Client Name	**Date**	
Ramboll Americas Engineering Solutions, Inc.	10/21/2023	

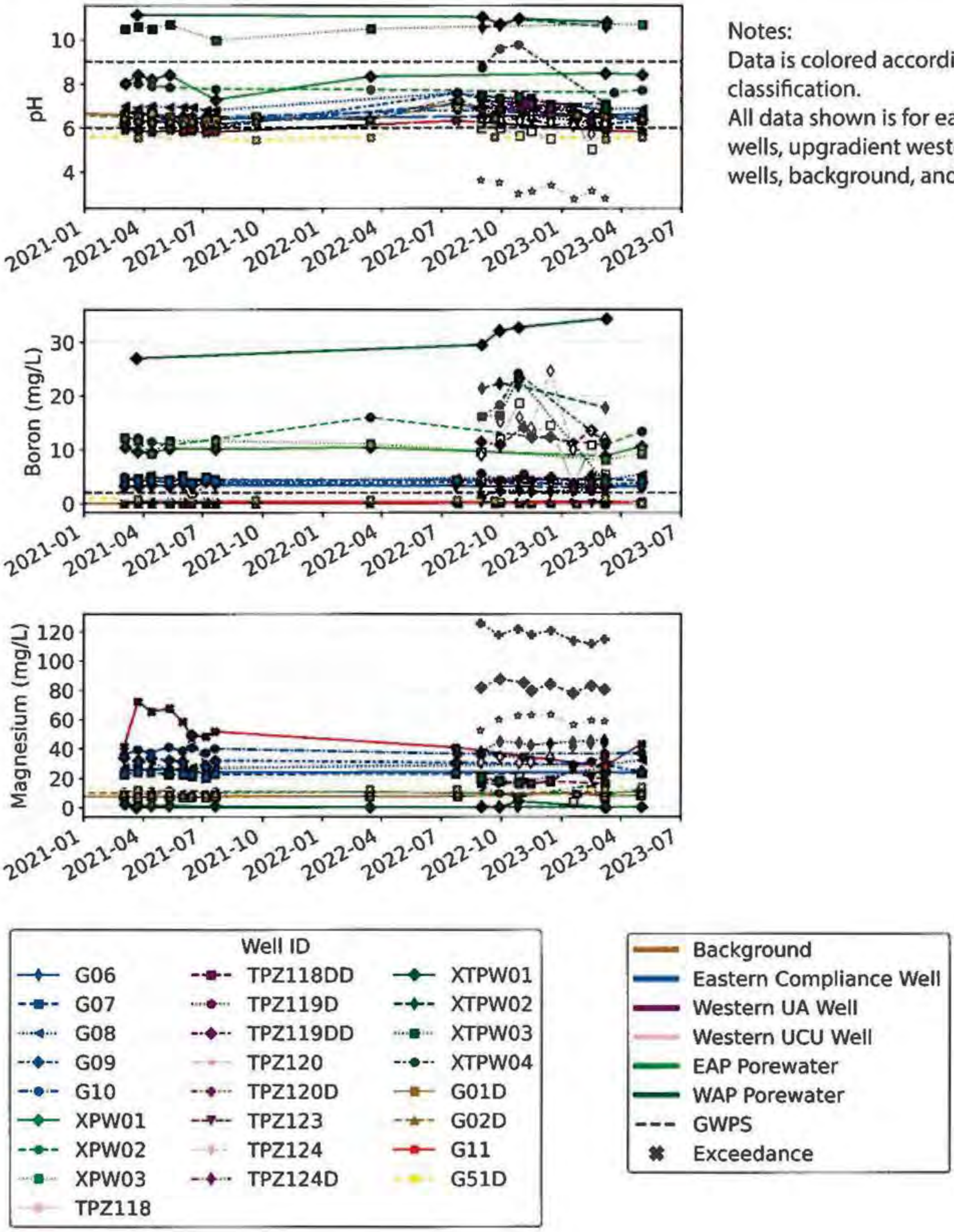


Notes:
Wells with pH exceedances are shown with an X.
Western wells are purple (UA) and pink (UCU).
Background wells are brown. Ash ponds are outlined in yellow.
Contours are from September 2022.

LIFECYCLEGEO

Title
Joppa West Ash Pond Well Locations and Upper Aquifer Groundwater Elevation

Project Name	Project Number	Attachment
Joppa- East Ash Pond Evaluation	[23RAM01-1] Vistra CCR	2
Client Name	**Date**	
Ramboll Americas Engineering Solutions, Inc.	10/21/2023	



Notes:
Data is colored according to well classification.
All data shown is for eastern compliance wells, upgradient western upgradient wells, background, and porewaters

LIFECYCLEGEO

Title
Time Series for pH, Boron, and Magnesium

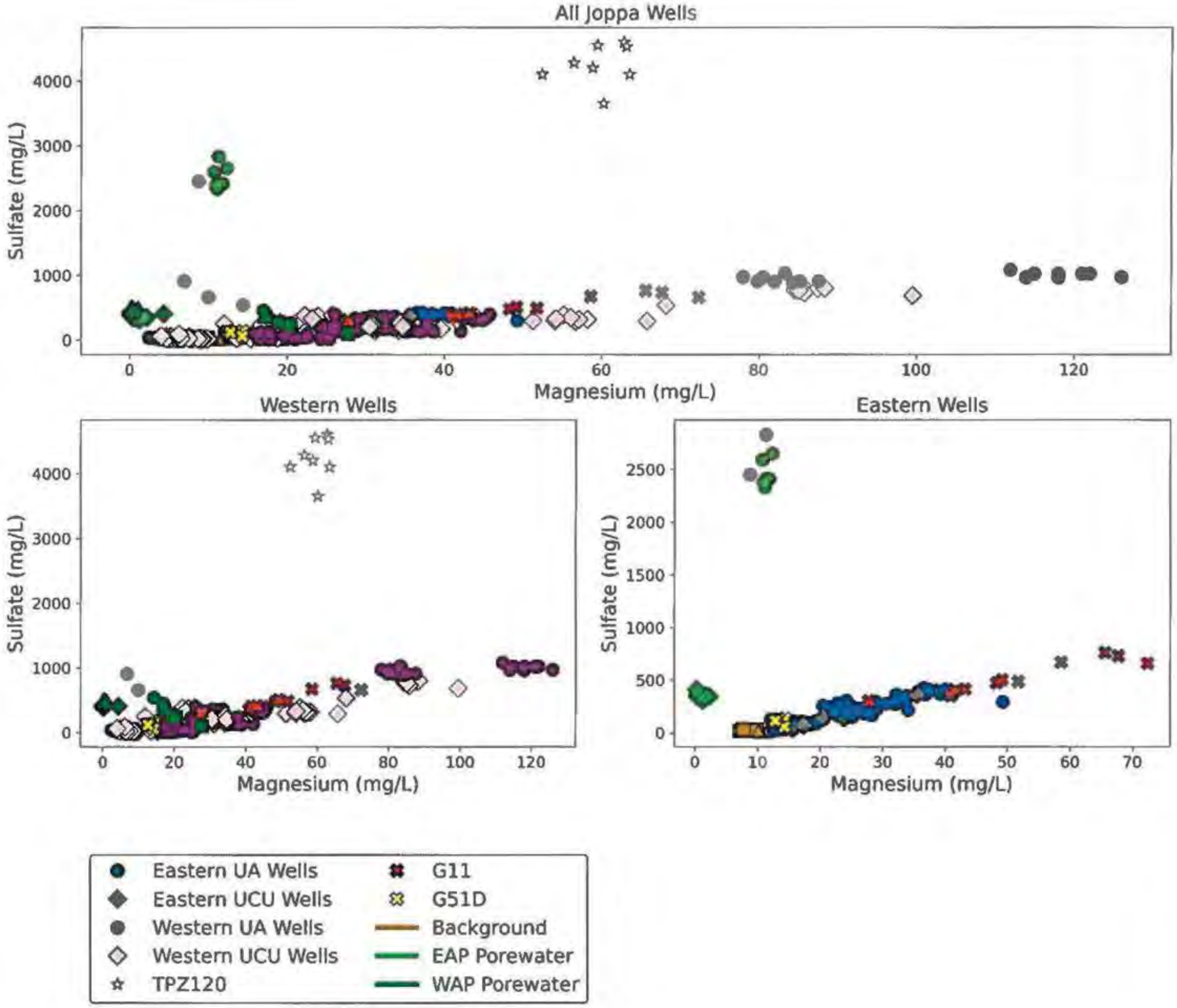
Project Name
Joppa- East Ash Pond Evaluation

Project Number
[23RAM01-1] Vistra CCR

Attachment
3

Client Name
Ramboll Americas Engineering Solutions, Inc.

Date
10/21/2023



Scatterplots of magnesium and sulfate for all Joppa wells (top), the western wells (bottom left) and eastern wells (bottom right).

LIFECYCLEGEO

Title
Joppa Magnesium-Sulfate Scatterplot

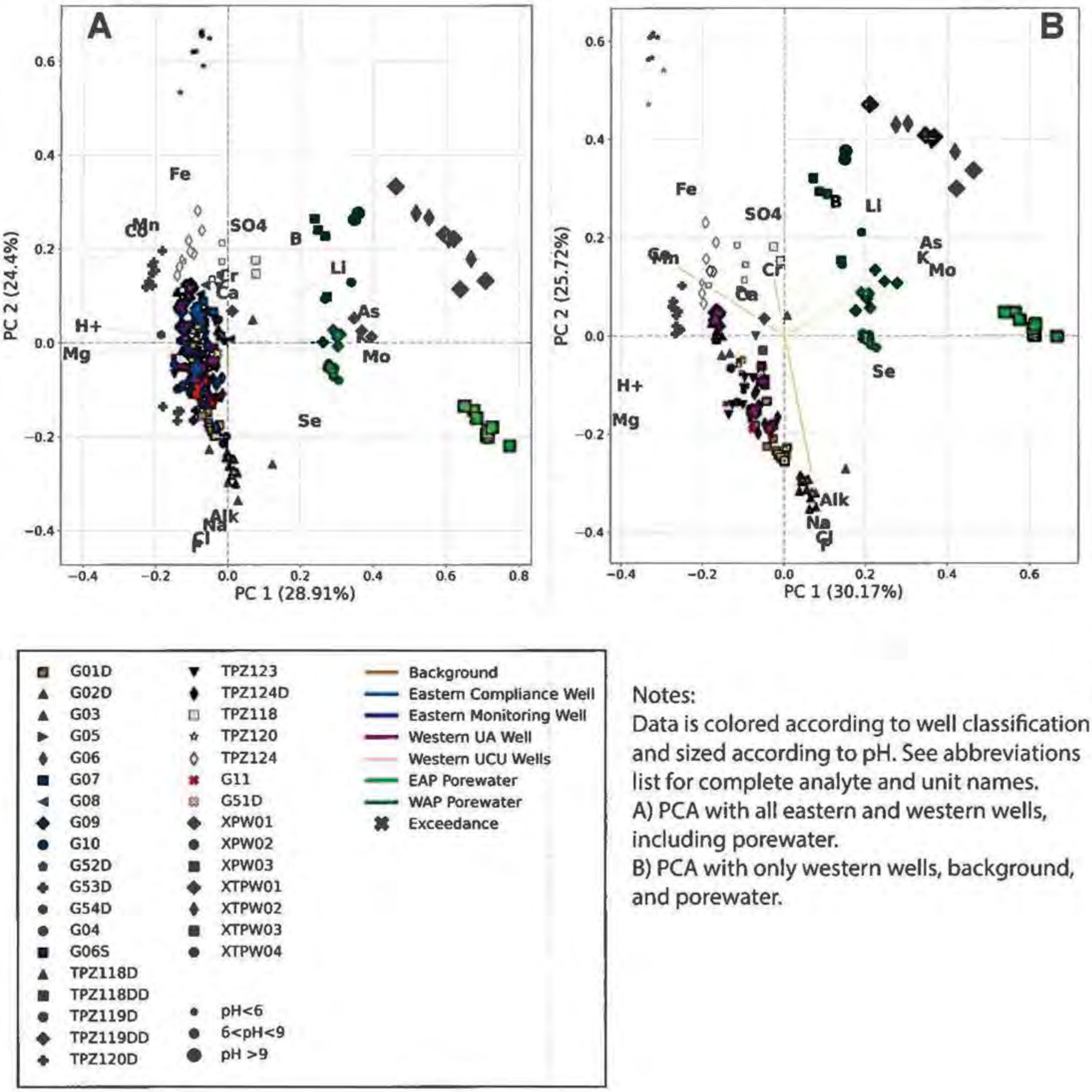
Project Name
Joppa- East Ash Pond Evaluation

Project Number
[23RAM01-1] Vistra CCR

Attachment
4

Client Name
Ramboll Americas Engineering Solutions, Inc.

Date
10/21/2023



Notes:
Data is colored according to well classification and sized according to pH. See abbreviations list for complete analyte and unit names.
A) PCA with all eastern and western wells, including porewater.
B) PCA with only western wells, background, and porewater.

LIFECYCLEGEO

Title
Joppa Principal Components Analysis Results

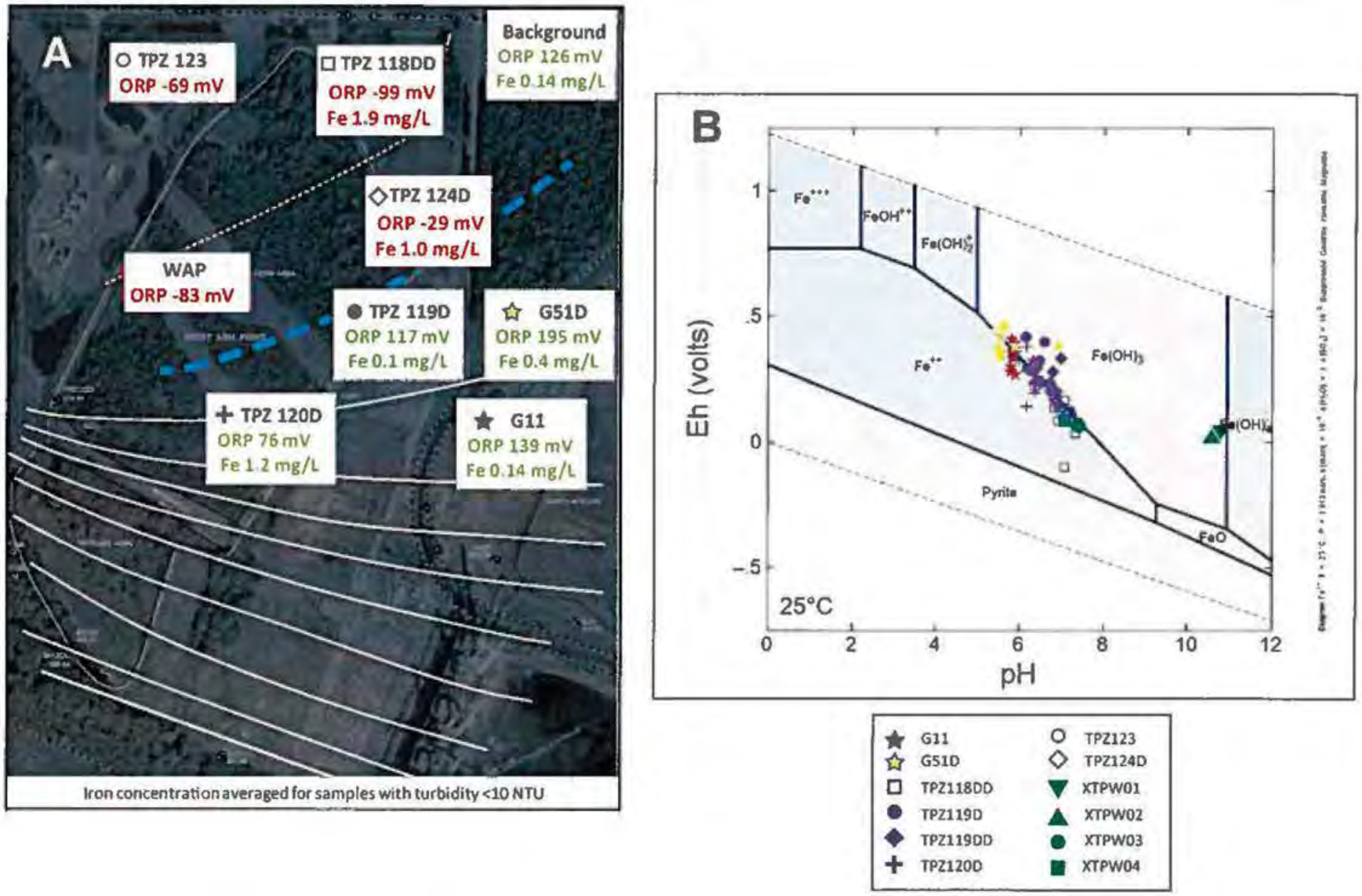
Project Name
Joppa- East Ash Pond Evaluation

Project Number
[23RAM01-1] Vistra CCR

Attachment
5

Client Name
Ramboll Americas Engineering Solutions, Inc.

Date
10/21/2023



Notes:

A) Redox conditions upgradient of G11 and G51D. White lines are upper aquifer groundwater contours, blue line indicates where conditions change from reducing to oxidizing. Contours from September 2022. Iron concentration not shown where turbidity >10 NTU.

B) Pourbaix diagram depicting iron solubility upgradient of G11 and G51D. WAP porewater is shown in green, western monitoring wells are shown in purple, G11 is red, and G51D is yellow. Blue areas are indicate aqueous phase iron; brown areas indicate solid phase iron.

LIFECYCLEGEO

Title	Joppa Oxidation Reduction Conditions
Project Name	Joppa- East Ash Pond Evaluation
Project Number	[23RAM01-1] Vistra CCR
Client Name	Ramboll Americas Engineering Solutions, Inc.
Date	10/21/2023
Attachment	6

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G01D	12/3/2015	Background	6.7	<0.025	--	20
G01D	3/15/2016	Background	6.7	0.036	--	126
G01D	6/15/2016	Background	6.9	0.0296	--	157
G01D	9/14/2016	Background	6.8	0.0416	--	129
G01D	12/14/2016	Background	6.8	<0.025	--	53
G01D	3/7/2017	Background	6.2	<0.025	--	72
G01D	6/15/2017	Background	6.7	<0.025	--	56
G01D	7/20/2017	Background	6.8	<0.025	9.87	31
G01D	11/30/2017	Background	6.8	<0.025	--	117
G01D	6/19/2018	Background	6.8	<0.025	--	70
G01D	9/5/2018	Background	7	<0.025	--	94
G01D	3/27/2019	Background	6.7	<0.025	--	30
G01D	9/9/2019	Background	6.4	<0.025	--	37
G01D	3/30/2020	Background	6.8	<0.025	7.6	35
G01D	9/23/2020	Background	6.72	<0.025	--	34
G02D	7/6/2021	Background	6.17	0.0431	9.77	22
G02D	7/21/2021	Background	6.18	0.0329	10.1	20
G02D	6/1/2021	Background	6.23	0.0433	9.39	23
G02D	4/14/2021	Background	6.3	0.0318	9.39	19
G02D	9/20/2021	Background	6.32	0.0313	--	19
G01D	7/6/2021	Background	6.33	<0.025	7.18	20
G01D	6/1/2021	Background	6.34	<0.025	7.36	18
G01D	5/2/2023	Background	6.34	0.021	8.43	26
G02D	3/24/2021	Background	6.35	0.033	9.76	18
G02D	5/12/2021	Background	6.35	0.0356	10.4	27
G02D	6/14/2021	Background	6.36	0.0352	9.84	23
G01D	7/21/2021	Background	6.37	<0.025	7.54	18
G01D	3/14/2022	Background	6.37	<0.025	7.77	22
G02D	5/3/2023	Background	6.46	0.0412	10.4	13
G01D	6/14/2021	Background	6.46	<0.025	7.41	20
G02D	12/3/2015	Background	6.7	0.0536	--	16
G02D	3/15/2016	Background	6.6	0.0494	--	17
G02D	6/15/2016	Background	6.8	0.0508	--	15
G02D	9/14/2016	Background	6.6	0.0534	--	22
G02D	12/14/2016	Background	6.3	0.0552	--	22
G02D	7/20/2017	Background	6.7	0.044	11.4	12
G02D	11/30/2017	Background	6.9	0.0496	--	17
G02D	6/19/2018	Background	6.7	0.0404	--	17
G02D	9/5/2018	Background	6.6	0.0468	--	19

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G02D	3/27/2019	Background	6.6	0.0473	--	20
G02D	9/9/2019	Background	6.5	0.0429	--	20
G02D	3/30/2020	Background	6.59	0.0449	9.96	22
G02D	9/23/2020	Background	6.62	0.0442	--	22
G02D	3/14/2022	Background	6.47	0.0283	10.6	11
G02D	9/21/2022	Background	6.48	0.0266	--	15
G01D	5/12/2021	Background	6.49	0.0167	7.55	20
G01D	3/24/2021	Background	6.49	<0.025	7.06	21
G02D	3/3/2021	Background	6.5	0.0296	9.98	21
G01D	9/20/2022	Background	6.5	<0.014	--	23
G01D	9/20/2021	Background	6.51	<0.025	--	18
G01D	3/7/2023	Background	6.53	0.029	7.66	36
G02D	3/8/2023	Background	6.56	0.027	10.3	11
G01D	3/3/2021	Background	6.6	<0.025	7.79	18
G01D	1/24/2023	Background	6.62	<0.022	9.75	24
G02D	3/8/2017	Background	6.9	0.0546	--	18
G02D	6/14/2017	Background	6.3	0.0467	--	20
G02D	1/24/2023	Background	6.64	0.0311	10.2	12
G01D	4/14/2021	Background	6.7	<0.025	7.56	39
G01D	7/26/2022	Background	7.17	<0.015	7.74	36
G02D	7/27/2022	Background	7.35	0.0322	10.1	19
G03	3/24/2021	Eastern Compliance	6.3	0.343	17.6	104
G03	4/14/2021	Eastern Compliance	6.2	0.603	28.3	168
G03	5/12/2021	Eastern Compliance	6.39	0.26	15.8	112
G03	6/1/2021	Eastern Compliance	6.35	0.232	14.9	73
G03	7/6/2021	Eastern Compliance	6.34	0.235	14	77
G03	7/21/2021	Eastern Compliance	6.36	0.294	15.7	92
G03	7/26/2022	Eastern Compliance	6.51	0.532	22.9	164
G03	5/3/2023	Eastern Compliance	6.18	0.38	16.6	97
G03	3/5/2021	Eastern Compliance	6.4	0.213	15.1	66
G03	6/15/2021	Eastern Compliance	6.24	0.225	15.1	79
G03	3/9/2023	Eastern Compliance	6.23	0.33	15.2	82
G04	3/24/2021	Eastern Monitoring	6.5	<0.025	14.6	41
G04	7/26/2022	Eastern Monitoring	6.82	<0.0092	34.1	216
G04	3/4/2021	Eastern Monitoring	6.5	<0.025	12.6	21
G04	4/13/2021	Eastern Monitoring	6.5	<0.025	17.3	63
G04	5/11/2021	Eastern Monitoring	6.28	0.0157	17.6	73
G04	7/20/2021	Eastern Monitoring	6.33	<0.025	20.6	131
G05	3/24/2021	Eastern Compliance	6.4	0.195	18.8	92

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G05	6/1/2021	Eastern Compliance	6.48	0.157	18.6	83
G05	7/6/2021	Eastern Compliance	6.42	0.148	17.6	90
G05	7/26/2022	Eastern Compliance	6.63	0.0645	17.6	68
G05	5/3/2023	Eastern Compliance	6.49	0.0478	19.3	112
G05	6/15/2021	Eastern Compliance	6.34	0.14	18.4	91
G05	3/9/2023	Eastern Compliance	6.5	0.0541	19.4	90
G05	3/4/2021	Eastern Compliance	6.5	0.181	17.2	94
G05	4/13/2021	Eastern Compliance	6.5	0.19	19.5	95
G05	5/11/2021	Eastern Compliance	6.38	0.158	19.4	109
G05	7/20/2021	Eastern Compliance	6.35	0.131	18.5	87
G06	3/24/2021	Eastern Compliance	6.6	3.4	26.6	215
G06	6/1/2021	Eastern Compliance	6.56	3.56	25.3	216
G06	7/6/2021	Eastern Compliance	6.32	3.93	23.7	223
G06	5/3/2023	Eastern Compliance	6.63	3.28	24.4	208
G06	6/15/2021	Eastern Compliance	6.51	2.97	25.2	230
G06	3/9/2023	Eastern Compliance	6.57	2.95	24.1	221
G06	3/4/2021	Eastern Compliance	6.7	2.9	25.1	250
G06	4/13/2021	Eastern Compliance	6.6	3.27	26	229
G06	5/11/2021	Eastern Compliance	6.43	3.37	26.8	219
G06	7/20/2021	Eastern Compliance	6.41	3.41	24.4	213
G06	7/23/2022	Eastern Compliance	--	3.29	24.5	216
G06S	3/24/2021	Eastern Monitoring	5.8	0.253	13.5	31
G06S	3/4/2021	Eastern Monitoring	6.2	0.229	12.9	35
G06S	4/13/2021	Eastern Monitoring	5.8	0.265	14.3	30
G06S	5/11/2021	Eastern Monitoring	5.62	0.245	15.6	31
G06S	7/20/2021	Eastern Monitoring	5.73	0.248	13	30
G06S	7/23/2022	Eastern Monitoring	6.54	0.269	13.5	30
G07	3/24/2021	Eastern Compliance	6.4	4.67	24.2	258
G07	6/1/2021	Eastern Compliance	6.25	5.23	22.9	257
G07	7/6/2021	Eastern Compliance	5.98	4.95	20.5	258
G07	5/3/2023	Eastern Compliance	6.38	4.27	23.4	260
G07	6/15/2021	Eastern Compliance	6.25	3.91	21.8	246
G07	3/9/2023	Eastern Compliance	6.42	4.55	24.3	308
G07	3/4/2021	Eastern Compliance	6.5	4.37	22.9	285
G07	4/13/2021	Eastern Compliance	6.3	5.04	24.4	274
G07	5/11/2021	Eastern Compliance	6.28	4.55	22.9	248
G07	7/20/2021	Eastern Compliance	6.14	4.48	23	252
G07	7/23/2022	Eastern Compliance	7.06	4.35	23.2	246
G08	3/24/2021	Eastern Compliance	6.9	4.39	29	225

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G08	6/1/2021	Eastern Compliance	6.96	4.63	27.2	204
G08	7/6/2021	Eastern Compliance	6.81	4.56	26.2	227
G08	5/3/2023	Eastern Compliance	6.88	5.43	32.2	363
G08	6/15/2021	Eastern Compliance	6.94	3.97	27.2	226
G08	3/9/2023	Eastern Compliance	6.85	4.33	28.9	297
G08	3/4/2021	Eastern Compliance	7	4.53	27.2	241
G08	4/13/2021	Eastern Compliance	7	5.25	31.9	286
G08	5/11/2021	Eastern Compliance	6.94	3.77	25.4	203
G08	7/20/2021	Eastern Compliance	6.81	3.98	27.1	227
G08	7/23/2022	Eastern Compliance	7.59	4.74	29	229
G09	4/14/2021	Eastern Compliance	6.3	3.48	33.7	297
G09	5/12/2021	Eastern Compliance	6.45	3.26	32.1	272
G09	6/1/2021	Eastern Compliance	6.24	3.65	31.4	284
G09	7/6/2021	Eastern Compliance	6.29	4.05	28.7	289
G09	7/21/2021	Eastern Compliance	5.99	3.75	32	286
G09	5/3/2023	Eastern Compliance	6.37	3.87	24.7	241
G09	6/15/2021	Eastern Compliance	5.97	0.282	49.3	294
G09	3/9/2023	Eastern Compliance	6.13	3.49	28.9	295
G09	3/4/2021	Eastern Compliance	6.2	3.19	33.8	351
G09	3/25/2021	Eastern Compliance	6.3	3.15	32	286
G09	7/24/2022	Eastern Compliance	7.57	3.89	30.6	278
G10	3/24/2021	Eastern Compliance	6.7	4.31	39.3	369
G10	6/1/2021	Eastern Compliance	6.5	4.73	38.5	401
G10	7/6/2021	Eastern Compliance	6.51	4.81	37.3	415
G10	7/26/2022	Eastern Compliance	6.81	4.4	36.6	388
G10	3/8/2023	Eastern Compliance	6.55	3.28	36.6	425
G10	5/3/2023	Eastern Compliance	6.6	3.08	36.9	365
G10	6/15/2021	Eastern Compliance	6.46	3.74	40.8	407
G10	3/4/2021	Eastern Compliance	6.7	4.98	35.7	391
G10	4/13/2021	Eastern Compliance	6.6	4.26	37.2	382
G10	5/11/2021	Eastern Compliance	6.34	3.95	41.1	364
G10	7/20/2021	Eastern Compliance	6.49	4.2	40	410
G11	3/8/2023	Exceedance	5.87	0.327	27.8	303
G11	7/23/2022	Exceedance	6.33	0.31	40.9	352
G11	3/4/2021	Exceedance	5.9	0.247	41.6	400
G11	5/3/2023	Exceedance	5.82	0.373	43.2	416
G11	7/6/2021	Exceedance	5.78	0.358	48.3	474
G11	7/20/2021	Exceedance	5.82	0.302	51.8	487
G11	6/14/2021	Exceedance	5.86	0.266	49.2	505

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G11	3/24/2021	Exceedance	5.9	0.42	72.4	658
G11	6/1/2021	Exceedance	5.82	0.309	58.6	671
G11	5/12/2021	Exceedance	5.9	0.321	67.7	730
G11	4/14/2021	Exceedance	5.8	0.411	65.6	761
G51D	12/3/2015	Exceedance	6.2	0.117	--	117
G51D	3/15/2016	Exceedance	5.9	0.184	--	145
G51D	6/15/2016	Exceedance	5.8	0.213	--	139
G51D	9/14/2016	Exceedance	5.6	0.263	--	136
G51D	12/14/2016	Exceedance	5.9	0.171	--	101
G51D	6/15/2017	Exceedance	5.6	0.58	--	149
G51D	7/20/2017	Exceedance	5.9	0.332	14.4	140
G51D	11/30/2017	Exceedance	5.6	0.302	--	138
G51D	6/19/2018	Exceedance	5.7	0.337	--	124
G51D	9/5/2018	Exceedance	6	0.263	--	134
G51D	3/27/2019	Exceedance	5.7	0.778	--	125
G51D	9/9/2019	Exceedance	5.3	0.501	--	109
G51D	3/30/2020	Exceedance	5.62	0.697	13.4	130
G51D	9/23/2020	Exceedance	5.72	0.863	--	121
G51D	9/20/2021	Exceedance	5.46	0.689	--	131
G51D	3/8/2023	Exceedance	5.49	0.963	12.3	131
G51D	3/24/2021	Exceedance	5.56	0.786	12.5	122
G51D	3/8/2017	Exceedance	6.2	0.309	--	146
G51D	5/3/2023	Exceedance	5.57	0.0297	14.3	59
G51D	3/15/2022	Exceedance	5.57	0.689	12.9	123
G51D	9/20/2022	Exceedance	5.58	0.551	--	125
G51D	7/25/2022	Exceedance	6.92	0.663	12.8	116
G52D	12/3/2015	Eastern Compliance	6.5	<0.025	--	65
G52D	3/15/2016	Eastern Compliance	6.3	<0.025	--	99
G52D	6/15/2016	Eastern Compliance	6.6	<0.025	--	88
G52D	9/14/2016	Eastern Compliance	6.4	<0.025	--	84
G52D	12/14/2016	Eastern Compliance	6.7	<0.025	--	82
G52D	3/7/2017	Eastern Compliance	5.9	<0.025	--	115
G52D	11/30/2017	Eastern Compliance	6	<0.025	--	97
G52D	6/19/2018	Eastern Compliance	6.4	<0.025	--	97
G52D	9/5/2018	Eastern Compliance	6.3	<0.025	--	101
G52D	3/27/2019	Eastern Compliance	6.4	<0.025	--	81
G52D	9/9/2019	Eastern Compliance	6	<0.025	--	78
G52D	3/30/2020	Eastern Compliance	6.38	<0.025	15.3	84
G52D	9/23/2020	Eastern Compliance	6.54	<0.025	--	84

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G52D	9/20/2021	Eastern Compliance	6.29	<0.025	--	83
G52D	6/14/2017	Eastern Compliance	6.2	<0.025	--	112
G52D	9/21/2022	Eastern Compliance	6.26	<0.011	--	72
G52D	5/3/2023	Eastern Compliance	6.31	0.682	12.1	129
G52D	3/25/2021	Eastern Compliance	6.25	<0.025	14.6	75
G52D	3/15/2022	Eastern Compliance	6.22	<0.025	15.1	68
G52D	3/10/2023	Eastern Compliance	6.54	0.0319	15.3	74
G52D	7/19/2017	Eastern Compliance	6.4	<0.025	17	108
G53D	12/3/2015	Eastern Compliance	6.8	0.332	--	103
G53D	3/15/2016	Eastern Compliance	6.7	0.334	--	107
G53D	6/15/2016	Eastern Compliance	6.6	0.342	--	107
G53D	9/14/2016	Eastern Compliance	6.5	0.368	--	104
G53D	12/14/2016	Eastern Compliance	6.8	0.364	--	106
G53D	6/15/2017	Eastern Compliance	6.6	0.309	--	79
G53D	7/20/2017	Eastern Compliance	6.8	0.366	19.2	94
G53D	11/30/2017	Eastern Compliance	6.6	0.427	--	98
G53D	6/19/2018	Eastern Compliance	6.6	0.361	--	84
G53D	9/5/2018	Eastern Compliance	6.8	0.392	--	81
G53D	3/27/2019	Eastern Compliance	6.6	0.269	--	54
G53D	9/9/2019	Eastern Compliance	6.2	0.385	--	80
G53D	3/30/2020	Eastern Compliance	6.7	0.334	15.7	66
G53D	9/23/2020	Eastern Compliance	6.67	0.411	--	79
G53D	9/20/2021	Eastern Compliance	6.27	0.402	--	78
G53D	9/20/2022	Eastern Compliance	6.48	0.431	--	79
G53D	3/8/2017	Eastern Compliance	7.2	0.138	--	35
G53D	5/3/2023	Eastern Compliance	6.48	0.367	15.3	68
G53D	3/9/2023	Eastern Compliance	6.46	0.37	16.4	72
G53D	3/25/2021	Eastern Compliance	6.53	0.355	15.7	71
G53D	7/25/2022	Eastern Compliance	7.88	0.341	17	77
G53D	3/15/2022	Eastern Compliance	6.5	0.332	16.5	74
G54D	12/3/2015	Eastern Compliance	7	0.663	--	191
G54D	3/15/2016	Eastern Compliance	6.8	0.513	--	176
G54D	6/15/2016	Eastern Compliance	6.6	0.508	--	160
G54D	9/14/2016	Eastern Compliance	6.6	0.557	--	149
G54D	12/14/2016	Eastern Compliance	6.7	0.564	--	144
G54D	6/15/2017	Eastern Compliance	6.8	0.685	--	170
G54D	7/20/2017	Eastern Compliance	6.8	0.58	25.2	151
G54D	11/30/2017	Eastern Compliance	6.7	0.646	--	136
G54D	6/19/2018	Eastern Compliance	6.7	0.631	--	146

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G54D	9/5/2018	Eastern Compliance	6.5	0.66	--	152
G54D	3/27/2019	Eastern Compliance	6.8	1.03	--	142
G54D	9/9/2019	Eastern Compliance	6.4	0.614	--	136
G54D	3/30/2020	Eastern Compliance	6.78	0.766	27.1	184
G54D	9/23/2020	Eastern Compliance	6.7	0.819	--	173
G54D	3/24/2021	Eastern Compliance	6.56	0.404	24.2	186
G54D	9/20/2021	Eastern Compliance	6.48	0.35	--	175
G54D	7/26/2022	Eastern Compliance	7.09	0.178	22.3	188
G54D	9/20/2022	Eastern Compliance	6.5	0.252	--	218
G54D	3/8/2017	Eastern Compliance	7.1	0.499	--	131
G54D	5/3/2023	Eastern Compliance	6.8	0.555	26.4	194
G54D	3/9/2023	Eastern Compliance	6.52	0.555	26.4	231
G54D	3/15/2022	Eastern Compliance	6.61	0.451	25.8	213
G101	7/26/2022	Other	7.31	<0.0092	5.09	30
G101	3/7/2023	Other	6.58	0.0294	5.4	28
G101	3/22/2021	Other	6.99	<0.02	7.65	39
G101	8/31/2022	Other	6.64	<0.0092	5.88	37
G101	9/28/2022	Other	6.49	<0.019	5.77	30
G101	10/26/2022	Other	6.9	0.0366	5.21	56
G101	11/15/2022	Other	6.85	<0.0092	5.51	37
G101	12/14/2022	Other	6.63	<0.0092	5.19	37
G101	1/18/2023	Other	6.58	<0.0092	5.01	32
G101	2/14/2023	Other	6.24	<0.0092	5.29	41
G101	12/14/2016	Other	6.7	<0.025	--	35
G101	3/7/2017	Other	6	<0.025	--	37
G101	11/30/2017	Other	6.6	<0.025	--	35
G101	6/19/2018	Other	6.7	<0.025	--	49
G101	3/27/2019	Other	6.7	<0.025	--	46
G101	9/9/2019	Other	6.3	<0.025	--	35
G101	3/30/2020	Other	6.76	<0.025	3.79	41
G101	9/23/2020	Other	6.51	<0.025	--	37
G101	9/20/2021	Other	6.4	<0.025	--	36
G101	3/14/2022	Other	6.48	<0.025	4.34	38
G101	9/20/2022	Other	6.58	<0.0092	--	38
G101	6/14/2017	Other	6.4	<0.025	--	51
G101	3/25/2021	Other	6.51	<0.025	4.36	37
G101	7/19/2017	Other	6.7	<0.025	4.68	52
G101	12/22/2015	Other	6.5	<0.025	--	33
G101	3/16/2016	Other	6.6	<0.025	--	86

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G101	6/14/2016	Other	6.3	<0.025	--	53
G101	9/13/2016	Other	6.4	<0.025	--	47
G101	12/6/2018	Other	6.7	<0.025	--	54
G101	3/21/2023	Other	6.59	0.0525	13.2	49
G102	3/7/2017	Other	5.8	<0.025	--	22
G102	11/30/2017	Other	6.3	<0.025	--	20
G102	6/19/2018	Other	6.5	<0.025	--	50
G102	3/27/2019	Other	6.5	<0.025	--	44
G102	9/9/2019	Other	6.1	<0.025	--	34
G102	3/30/2020	Other	6.48	<0.025	2.5	38
G102	9/23/2020	Other	6.24	<0.025	--	34
G102	9/20/2021	Other	6.38	<0.025	--	38
G102	3/14/2022	Other	6.37	<0.025	3.21	30
G102	9/20/2022	Other	6.44	<0.0092	--	41
G102	6/14/2017	Other	6.1	<0.025	--	27
G102	3/25/2021	Other	6.46	<0.025	2.64	35
G102	3/10/2023	Other	6.31	<0.02	3.6	40
G102	7/19/2017	Other	6.4	<0.025	3.3	28
G102	12/22/2015	Other	6.9	<0.025	--	15
G102	3/16/2016	Other	6.4	<0.025	--	58
G102	6/14/2016	Other	6.1	<0.025	--	65
G102	9/13/2016	Other	5.8	<0.025	--	49
G102	12/6/2018	Other	6.4	<0.025	--	28
G102	12/15/2016	Other	6.2	<0.025	--	24
G103	12/23/2015	Other	7.25	--	--	--
G104	6/23/2014	Other	6.8	<0.02	--	<50.0
G104	9/9/2014	Other	6.89	<0.02	--	<50.0
G104	12/9/2014	Other	6.9	0.0837	--	<50.0
G104	3/20/2015	Other	6.29	<0.02	--	--
G105	3/7/2017	Other	5.7	<0.025	--	12
G105	11/30/2017	Other	6.3	<0.025	--	12
G105	6/19/2018	Other	6.3	<0.025	--	12
G105	3/27/2019	Other	6.3	<0.025	--	11
G105	9/9/2019	Other	6.1	<0.025	--	12
G105	3/30/2020	Other	6.32	<0.025	9.11	13
G105	9/23/2020	Other	6.22	<0.025	--	16
G105	9/20/2021	Other	6.06	<0.025	--	13
G105	3/14/2022	Other	6.18	<0.025	8.95	12
G105	9/20/2022	Other	6.14	<0.0092	--	11

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G105	6/14/2017	Other	6.1	<0.025	--	16
G105	3/25/2021	Other	6.13	<0.025	8.53	12
G105	3/10/2023	Other	6.03	<0.011	8.78	12
G105	7/19/2017	Other	6.4	<0.025	8.8	13
G105	12/22/2015	Other	6.6	<0.025	--	12
G105	3/16/2016	Other	6.4	<0.025	--	11
G105	6/14/2016	Other	6.4	<0.025	--	12
G105	9/13/2016	Other	6.4	<0.025	--	13
G105	12/6/2018	Other	6.2	<0.025	--	11
G105	12/15/2016	Other	6.2	<0.025	--	11
G106	12/23/2015	Other	6.34	--	--	--
G107	3/7/2017	Other	6.1	<0.025	--	93
G107	11/30/2017	Other	6.5	0.0295	--	88
G107	6/19/2018	Other	6.6	<0.025	--	77
G107	3/27/2019	Other	6.4	<0.025	--	30
G107	9/9/2019	Other	6.5	0.0373	--	112
G107	3/30/2020	Other	6.68	<0.025	24.8	89
G107	9/23/2020	Other	6.73	0.0353	--	101
G107	9/20/2021	Other	6.64	0.0282	--	67
G107	3/14/2022	Other	6.42	<0.025	21.3	40
G107	9/20/2022	Other	6.59	<0.023	--	49
G107	6/14/2017	Other	6.4	<0.025	--	50
G107	3/25/2021	Other	6.48	0.0291	19.5	54
G107	3/10/2023	Other	6.42	<0.023	20.6	42
G107	7/19/2017	Other	6.8	<0.025	26.7	123
G107	12/22/2015	Other	6.9	0.0365	--	29
G107	3/16/2016	Other	6.3	<0.025	--	11
G107	6/14/2016	Other	6.9	0.0311	--	58
G107	9/13/2016	Other	6.7	<0.025	--	127
G107	12/6/2018	Other	6.6	0.027	--	72
G107	12/15/2016	Other	6.6	<0.025	--	67
G108	12/23/2015	Other	7.04	--	--	--
G109	3/7/2017	Other	6	<0.025	--	37
G109	11/30/2017	Other	6.5	<0.025	--	48
G109	6/19/2018	Other	6.9	0.0277	--	100
G109	9/5/2018	Other	7	--	--	77
G109	3/27/2019	Other	6.7	0.0309	--	55
G109	9/9/2019	Other	6.5	0.0255	--	59
G109	3/30/2020	Other	6.76	0.0272	8.21	41

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G109	9/23/2020	Other	6.6	<0.025	--	42
G109	9/20/2021	Other	6.54	<0.025	--	27
G109	3/14/2022	Other	6.55	<0.025	7.91	30
G109	9/20/2022	Other	6.49	<0.014	--	21
G109	6/14/2017	Other	6.5	<0.025	--	68
G109	3/25/2021	Other	6.35	<0.025	6.16	32
G109	3/10/2023	Other	6.32	<0.018	7.7	37
G109	7/19/2017	Other	6.7	<0.025	7.34	65
G109	12/22/2015	Other	6.7	0.0315	--	23
G109	3/16/2016	Other	6.5	<0.025	--	22
G109	6/14/2016	Other	6.4	<0.025	--	29
G109	9/13/2016	Other	6.5	<0.025	--	41
G109	12/6/2018	Other	6.7	<0.025	--	68
G109	12/15/2016	Other	6.5	<0.025	--	33
G110	12/23/2015	Other	6.87	--	--	--
G111	3/7/2023	Other	7.05	<0.0092	8.94	16
G111	3/22/2021	Other	7.34	<0.02	9.48	17
G111	1/18/2023	Other	6.88	<0.0092	8.76	14
G111	9/1/2022	Other	7.02	0.0873	9.92	16
G111	9/27/2022	Other	7.03	0.0341	9	14
G111	10/28/2022	Other	6.9	0.0389	9.32	13
G111	11/16/2022	Other	7.11	<0.0092	8.67	16
G111	12/15/2022	Other	6.89	<0.0092	8.89	15
G111	2/15/2023	Other	6.48	<0.0092	9.14	16
G111	3/7/2017	Other	6.2	0.0308	--	29
G111	11/30/2017	Other	6.7	<0.025	--	<10.0
G111	6/19/2018	Other	6.8	<0.025	--	40
G111	3/27/2019	Other	6.8	0.0256	--	46
G111	9/9/2019	Other	5.9	0.0258	--	33
G111	3/30/2020	Other	6.68	0.03	7.49	44
G111	9/23/2020	Other	6.63	<0.025	--	31
G111	9/20/2021	Other	6.51	<0.025	--	21
G111	3/14/2022	Other	6.49	<0.025	6.03	29
G111	9/20/2022	Other	6.53	<0.013	--	19
G111	6/14/2017	Other	6.6	<0.025	--	37
G111	3/25/2021	Other	6.4	<0.025	6.06	33
G111	7/19/2017	Other	6.8	<0.025	5.97	29
G111	12/22/2015	Other	6.5	<0.025	--	27
G111	3/16/2016	Other	6.5	<0.025	--	37

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G111	6/14/2016	Other	6.7	0.0265	--	39
G111	9/13/2016	Other	6.8	0.0251	--	23
G111	12/6/2018	Other	6.5	0.0404	--	32
G111	3/21/2023	Other	6.56	0.047	4.71	23
G111	12/15/2016	Other	6.8	<0.025	--	13
G112C	3/8/2023	Other	6.41	4.8	85.6	822
G112C	3/22/2021	Other	6.85	4.25	68.2	532
G112C	9/28/2022	Other	6.31	4.82	99.5	682
G112C	10/26/2022	Other	6.69	4.86	84.7	820
G112C	12/14/2022	Other	6.63	4.99	87.5	791
G112C	1/18/2023	Other	6.49	4.31	84.6	769
G112C	2/15/2023	Other	6.26	5.04	88.4	797
G112C	8/30/2022	Other	6.62	4.26	85.8	726
G112C	11/17/2022	Other	6.76	4.6	85.1	764
G112D	3/8/2023	Other	6.62	0.0464	24.3	13
G112D	9/28/2022	Other	6.8	0.101	26	<8.0
G112D	10/26/2022	Other	6.97	0.0457	24.3	<8.0
G112D	12/14/2022	Other	6.81	<0.0092	24.7	<6.0
G112D	1/18/2023	Other	6.71	0.0268	24.3	11
G112D	2/15/2023	Other	6.49	<0.0092	25.4	13
G112D	8/30/2022	Other	6.89	0.0367	24.8	<9.0
G112D	11/17/2022	Other	6.95	<0.012	24	<8.0
G112DD	3/8/2023	Other	7.03	0.104	17.7	10
G112DD	9/28/2022	Other	7.24	0.162	21	12
G112DD	10/26/2022	Other	7.42	0.12	18.6	13
G112DD	12/14/2022	Other	8.06	0.116	18.3	10
G112DD	8/30/2022	Other	7.31	0.109	19.9	12
G112DD	11/17/2022	Other	7.41	0.135	17.5	11
G113	3/7/2023	Other	6.53	<0.013	55.2	386
G113	3/22/2021	Other	6.86	<0.02	51.3	292
G113	9/28/2022	Other	6.36	0.0258	65.8	289
G113	10/26/2022	Other	6.57	0.0919	56.7	288
G113	9/1/2022	Other	6.6	<0.022	58.2	316
G113	11/16/2022	Other	6.58	<0.014	54.1	296
G113	12/15/2022	Other	6.38	<0.0092	57.1	314
G113	2/15/2023	Other	6.21	<0.0092	56.1	346
G113	1/19/2023	Other	6.32	<0.0092	54.2	327
TPZ114	3/10/2023	Other	6.15	<0.024	6.82	20
TPZ114	3/22/2021	Other	7.42	0.177	15.4	19

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
TPZ114	9/1/2022	Other	6.32	0.0746	7.86	13
TPZ114	9/27/2022	Other	6.02	0.0451	7.95	19
TPZ114	11/16/2022	Other	6.51	0.0269	8.71	21
TPZ114	12/15/2022	Other	6.22	<0.0092	7.5	24
TPZ114	2/15/2023	Other	6.09	0.0254	6.36	24
TPZ114	1/19/2023	Other	6.26	<0.0092	6.42	19
TPZ114	10/27/2022	Other	6.21	0.0251	6.52	21
TPZ115	3/8/2023	Other	6.96	<0.015	38.4	197
TPZ115	1/18/2023	Other	6.93	<0.0092	36.6	178
TPZ115	9/27/2022	Other	6.91	0.0383	34.2	147
TPZ115	12/15/2022	Other	6.87	<0.0092	38.1	180
TPZ115	2/15/2023	Other	6.68	<0.0092	37.6	179
TPZ115	8/30/2022	Other	7.12	0.0354	31.2	135
TPZ115	11/17/2022	Other	7.16	<0.013	35.5	181
TPZ115	10/27/2022	Other	6.93	0.0267	39.6	170
TPZ115D	3/8/2023	Other	7.11	0.356	21.8	37
TPZ115D	1/18/2023	Other	7.13	0.349	20.8	37
TPZ115D	9/27/2022	Other	7.24	0.467	22.5	35
TPZ115D	12/15/2022	Other	7.1	0.387	22.4	39
TPZ115D	2/15/2023	Other	6.79	0.4	22.3	37
TPZ115D	8/30/2022	Other	7.13	0.382	21.9	38
TPZ115D	11/17/2022	Other	7.37	0.387	20.9	37
TPZ115D	10/27/2022	Other	7.13	0.421	22.6	36
TPZ115DD	3/8/2023	Other	7.18	0.0915	17	13
TPZ115DD	9/27/2022	Other	7.34	0.0563	17.6	11
TPZ115DD	12/15/2022	Other	7.2	0.0657	19.2	12
TPZ115DD	8/30/2022	Other	7.36	0.0423	17.7	<8.0
TPZ115DD	11/17/2022	Other	7.36	0.0684	16.4	11
TPZ115DD	10/27/2022	Other	7.24	0.0847	18.3	11
TPZ116	3/22/2021	Other	6.99	<0.02	13.6	24
TPZ117	3/22/2021	Other	6.67	<0.02	18.8	32
TPZ117D	3/7/2023	Other	6.54	0.724	29.3	228
TPZ117D	7/27/2022	Other	7.56	0.409	36.3	134
TPZ117D	3/22/2021	Other	7.09	0.0763	19.3	187
TPZ117D	11/15/2022	Other	6.7	0.36	35.6	133
TPZ117D	12/14/2022	Other	6.53	0.353	37	127
TPZ117D	1/18/2023	Other	6.48	0.495	29.8	186
TPZ117D	9/1/2022	Other	6.62	0.41	38.7	124
TPZ117D	2/15/2023	Other	6.29	0.331	35.1	126

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
TPZ117D	9/29/2022	Other	6.57	0.394	42.1	130
TPZ117D	11/4/2022	Other	6.69	0.423	35.2	135
TPZ118	3/8/2023	Western UCU	6.56	5.44	6.3	88
TPZ118	8/31/2022	Western UCU	5.97	9.54	21.6	242
TPZ118	11/15/2022	Western UCU	5.84	13.1	16.7	233
TPZ118	12/14/2022	Western UCU	5.52	14.6	19.1	263
TPZ118	10/28/2022	Western UCU	5.65	18.7	21.1	259
TPZ118	2/15/2023	Western UCU	5.04	10.9	12	250
TPZ118	1/19/2023	Western UCU	6.41	3.35	4.04	63
TPZ118	9/29/2022	Western UCU	5.99	12.1	18.6	215
TPZ118D	3/8/2023	Western UA	6.28	7.44	30.7	358
TPZ118D	8/31/2022	Western UA	6.3	5.41	32.7	351
TPZ118D	11/15/2022	Western UA	6.55	6.13	29.8	332
TPZ118D	12/14/2022	Western UA	6.6	5.85	27.1	300
TPZ118D	10/28/2022	Western UA	6.35	7.08	31.3	352
TPZ118D	2/15/2023	Western UA	6.07	7.56	30.8	329
TPZ118D	1/19/2023	Western UA	6.31	6.35	28.7	329
TPZ118D	9/29/2022	Western UA	6.17	5.74	33.6	357
TPZ118DD	3/8/2023	Western UA	7.09	0.0776	16.8	10
TPZ118DD	8/31/2022	Western UA	7.4	0.831	19.5	73
TPZ118DD	11/15/2022	Western UA	7.34	0.054	16.4	12
TPZ118DD	12/14/2022	Western UA	7.08	0.122	17.9	12
TPZ118DD	10/28/2022	Western UA	7.26	0.112	16.5	10
TPZ118DD	9/29/2022	Western UA	6.84	0.146	17.9	17
TPZ119D	3/7/2023	Western UA	6.34	4.76	33.7	175
TPZ119D	8/31/2022	Western UA	6.49	5.58	35.5	192
TPZ119D	12/14/2022	Western UA	6.44	4.59	33.6	156
TPZ119D	1/18/2023	Western UA	6.35	3.32	29	142
TPZ119D	11/16/2022	Western UA	6.48	4.35	32.4	159
TPZ119D	2/15/2023	Western UA	6.16	4.22	31.2	154
TPZ119D	9/29/2022	Western UA	6.19	4.37	35	186
TPZ119D	11/4/2022	Western UA	6.61	5.48	33.7	156
TPZ119DD	3/7/2023	Western UA	6.76	11.8	80.5	969
TPZ119DD	8/31/2022	Western UA	6.9	11.5	82	899
TPZ119DD	12/14/2022	Western UA	6.81	12.4	84.3	886
TPZ119DD	1/18/2023	Western UA	6.74	11.1	78	972
TPZ119DD	11/16/2022	Western UA	6.94	12.3	79.8	906
TPZ119DD	2/15/2023	Western UA	6.54	13.6	83.3	1030
TPZ119DD	9/29/2022	Western UA	6.88	10.9	87.6	907

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
TPZ119DD	11/4/2022	Western UA	7	14.2	85.2	906
TPZ120	3/7/2023	Western UCU	2.8	2.36	58.8	4200
TPZ120	10/26/2022	Western UCU	3.02	3.13	62.8	4600
TPZ120	9/27/2022	Western UCU	3.53	2.53	60.2	3650
TPZ120	11/16/2022	Western UCU	3.13	2.21	63.1	4530
TPZ120	12/15/2022	Western UCU	3.4	3.55	63.5	4100
TPZ120	2/15/2023	Western UCU	3.14	2.1	59.4	4550
TPZ120	8/30/2022	Western UCU	3.63	2.08	52.4	4100
TPZ120	1/19/2023	Western UCU	2.77	2.1	56.4	4280
TPZ120D	3/7/2023	Western UA	6.2	4.77	115	1020
TPZ120D	10/26/2022	Western UA	6.35	4.51	122	1020
TPZ120D	9/27/2022	Western UA	6.37	4.14	118	960
TPZ120D	11/16/2022	Western UA	6.37	4.39	118	1020
TPZ120D	12/15/2022	Western UA	6.16	5.09	121	1020
TPZ120D	2/15/2023	Western UA	6.01	5.31	112	1080
TPZ120D	8/30/2022	Western UA	6.18	3.52	126	967
TPZ120D	1/19/2023	Western UA	6.17	3.9	114	964
TPZ122	3/7/2023	Other	6.77	5.15	27	214
TPZ122	8/31/2022	Other	6.52	0.806	19.7	234
TPZ122	1/18/2023	Other	6.12	1.17	22.3	379
TPZ122	9/27/2022	Other	6.46	1.16	18.2	270
TPZ122	11/16/2022	Other	6.35	0.945	23.4	332
TPZ122	12/15/2022	Other	6.2	1.32	24	367
TPZ122	2/15/2023	Other	5.73	1.34	25.8	381
TPZ122	10/27/2022	Other	6.24	0.988	23.2	325
TPZ122D	3/7/2023	Other	6.11	1.32	26.1	395
TPZ122D	8/31/2022	Other	6.95	4.66	26.4	193
TPZ122D	1/18/2023	Other	6.77	4.36	24.7	225
TPZ122D	9/27/2022	Other	6.65	5.43	25.7	193
TPZ122D	11/16/2022	Other	6.94	5.25	25.4	193
TPZ122D	12/15/2022	Other	6.76	4.92	25.9	213
TPZ122D	2/15/2023	Other	6.46	5.54	26.8	215
TPZ122D	10/27/2022	Other	6.78	6.6	27.7	191
TPZ123	3/7/2023	Western UA	6.84	<0.023	20.5	156
TPZ123	11/3/2022	Western UA	7.2	0.027	17.6	102
TPZ123	8/31/2022	Western UA	7.21	0.0691	17.1	85
TPZ123	1/18/2023	Western UA	6.93	0.0384	26	163
TPZ123	9/27/2022	Western UA	7.2	0.0934	15.9	89
TPZ123	11/16/2022	Western UA	7.11	<0.015	16.8	121

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
TPZ123	12/15/2022	Western UA	6.95	0.0457	17.8	122
TPZ123	2/15/2023	Western UA	6.38	0.0337	20.2	166
TPZ124	3/7/2023	Western UCU	6.17	12.2	44	357
TPZ124	8/31/2022	Western UCU	6.27	8.99	30.8	219
TPZ124	11/15/2022	Western UCU	6.57	14.1	30.8	221
TPZ124	12/14/2022	Western UCU	6.25	24.7	34.4	257
TPZ124	1/18/2023	Western UCU	6.09	10	41.6	311
TPZ124	2/14/2023	Western UCU	5.71	13.6	43.6	331
TPZ124	10/28/2022	Western UCU	6.31	16	30.5	205
TPZ124	9/29/2022	Western UCU	6.35	15.2	34.7	202
TPZ124D	3/7/2023	Western UA	6.77	2.88	45.8	394
TPZ124D	8/31/2022	Western UA	7.04	1.31	37.8	238
TPZ124D	11/15/2022	Western UA	7.07	2.21	42.5	321
TPZ124D	12/14/2022	Western UA	6.88	2.22	43.6	314
TPZ124D	1/18/2023	Western UA	6.8	2.41	44.7	313
TPZ124D	2/14/2023	Western UA	6.4	2.59	45.4	341
TPZ124D	10/28/2022	Western UA	6.84	2.46	43.9	306
TPZ124D	9/29/2022	Western UA	6.91	2.34	44.9	303
XPW01	7/21/2021	Eastern Porewater	7.27	10.1	0.917	328
XPW02	3/21/2023	Eastern Porewater	7.6	--	--	--
XPW02	5/3/2023	Eastern Porewater	7.72	13.4	12.3	2650
XPW02	3/15/2022	Eastern Porewater	7.74	16	10.7	2590
XPW02	7/21/2021	Eastern Porewater	7.76	12	11.1	2330
XPW02	5/12/2021	Eastern Porewater	7.85	10.8	11.8	2410
XPW02	4/14/2021	Eastern Porewater	7.9	11.5	11.3	2410
XPW01	3/5/2021	Eastern Porewater	8	10.4	2.25	345
XPW02	3/4/2021	Eastern Porewater	8	12.1	10.9	2380
XPW02	3/24/2021	Eastern Porewater	8	12.2	11.3	2830
XPW01	4/14/2021	Eastern Porewater	8.2	9.42	1.28	355
XPW01	3/15/2022	Eastern Porewater	8.33	10.4	0.443	360
XPW01	5/12/2021	Eastern Porewater	8.4	10.2	1.31	309
XPW01	3/24/2021	Eastern Porewater	8.4	9.58	1.7	355
XPW01	5/3/2023	Eastern Porewater	8.41	10.6	0.405	345
XPW01	3/8/2023	Eastern Porewater	8.47	8.79	0.254	414
XPW03	7/21/2021	Eastern Porewater	9.97	11.6	<0.05	148
XPW03	3/4/2021	Eastern Porewater	10.5	12.2	<0.05	133
XPW03	3/15/2022	Eastern Porewater	10.5	11.1	<0.05	152
XPW03	4/14/2021	Eastern Porewater	10.5	9.3	<0.05	152
XPW03	3/24/2021	Eastern Porewater	10.6	11.6	<0.05	138

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
XPW03	3/9/2023	Eastern Porewater	10.7	8.06	<0.021	142
XPW03	5/3/2023	Eastern Porewater	10.7	9.22	<0.03	144
XPW03	5/12/2021	Eastern Porewater	10.7	11.7	<0.1	155
XPW02	3/8/2023	Eastern Porewater	--	10.8	8.75	2450
XTPW01	3/10/2023	Western Porewater	10.8	34.3	0.0986	420
XTPW01	3/22/2021	Western Porewater	11.13	27	0.122	387
XTPW01	9/28/2022	Western Porewater	10.71	32.1	0.29	395
XTPW01	9/1/2022	Western Porewater	11.03	29.5	0.292	402
XTPW01	10/27/2022	Western Porewater	10.95	32.7	4.36	403
XTPW02	3/8/2023	Western Porewater	10.6	17.8	0.123	462
XTPW02	9/28/2022	Western Porewater	10.65	22.3	0.7	427
XTPW02	10/26/2022	Western Porewater	10.91	21.9	0.381	478
XTPW02	9/1/2022	Western Porewater	10.56	21.4	1.1	461
XTPW03	3/7/2023	Western Porewater	6.76	4.02	27.8	89
XTPW03	9/28/2022	Western Porewater	7.33	16.4	18.9	269
XTPW03	9/1/2022	Western Porewater	7.5	16.2	20.4	234
XTPW03	10/27/2022	Western Porewater	7.42	23.3	17.2	356
XTPW04	3/8/2023	Western Porewater	7.09	11.3	17	452
XTPW04	9/28/2022	Western Porewater	9.58	18.3	10	658
XTPW04	10/26/2022	Western Porewater	9.77	24.2	6.91	907
XTPW04	9/1/2022	Western Porewater	8.73	16.2	14.4	539

Notes:

mg/L = milligrams per liter

SU= standard units

< = less than analytical detection limit; data not included in Attachment 3 and 4 analyses.

-- = data not measured

Well Type: Western and Eastern as defined in main text, UA=uppermost aquifer, UCU= upper confining unit

Attachment 3: pH, boron, and magnesium data from March 2021 to May 2023. See Attachment 3 legend for full list of included wells.

Attachment 4: Magnesium and sulfate data for all sampling dates and all wells listed here.

Table 1: Inline Table 1 presents pH, boron, and magnesium data for G11, G51D, CCR Porewater, Western Groundwater, Eastern Groundwater, and TPZ120. G11, G51D, and TPZ120 data are from from March 2021 to May 2023 for those individual wells. For the same time frame, CCR Porewater includes both eastern and western porewater; Western Groundwater includes all Western UA and UCU wells except TPZ120; Eastern Groundwater includes all Eastern Compliance and Background Wells.

Appendix D-2. Supporting groundwater analytical data for Attachment 6A.

Well ID	Date	Iron (mg/L)	Oxidation Reduction Potential (mV)
G11	2021/07/06	0.071	78
G11	2021/04/14	0.084	100
G11	2021/07/20	0.036	135
G11	2023/05/03	3.35	207
G11	2021/06/01	0.086	159
G11	2021/06/14	0.052	149
G11	2023/03/08	--	166
G11	2021/03/04	0.51	69.0
G11	2021/03/24	<0.025	154
G11	2021/05/12	<0.1	194
G11	2022/07/23	0.16	122
G51D	2023/03/08	--	167
G51D	2021/03/24	--	136
G51D	2022/07/25	0.41	178
G51D	2022/03/15	--	165
G51D	2020/03/30	--	261
G51D	2023/05/03	0.82	214
G51D	2017/07/20	--	180
G51D	2019/09/09	--	157
G51D	2021/09/20	--	238
G51D	2022/09/20	--	215
G51D	2016/09/14	--	231
G51D	2017/06/15	--	168
G51D	2017/11/30	--	168
G51D	2018/06/19	--	247
G51D	2019/03/27	--	130
G51D	2020/09/23	--	292
G51D	2016/06/15	--	213
G51D	2016/12/14	--	134
G51D	2016/03/15	--	122
G51D	2018/09/05	--	217
G51D	2015/12/03	--	133
G51D	2017/03/08	--	282
TPZ118DD	2022/09/29	0.97	-65.5
TPZ118DD	2022/12/14	2.07	<-300.0
TPZ118DD	2023/03/08	2.11	-36.2
TPZ118DD	2022/10/28	1.88	-103
TPZ118DD	2022/11/15	1.60	-168

Appendix D-2. Supporting groundwater analytical data for Attachment 6A.

Well ID	Date	Iron (mg/L)	Oxidation Reduction Potential (mV)
TPZ118DD	2022/08/31	*1.70*	-124
TPZ119D	2023/02/15	0.10	217
TPZ119D	2022/09/29	0.12	90.1
TPZ119D	2023/03/07	0.051	104
TPZ119D	2023/01/18	0.12	76.0
TPZ119D	2022/12/14	0.095	96.0
TPZ119D	2022/11/16	*0.086*	38.0
TPZ119D	2022/08/31	*0.80*	123
TPZ119D	2022/11/04	--	196
TPZ120D	2023/02/15	0.89	123
TPZ120D	2022/12/15	1.30	212
TPZ120D	2023/01/19	1.30	178
TPZ120D	2022/08/30	*16.5*	-59.2
TPZ120D	2023/03/07	*1.30*	83.1
TPZ120D	2022/10/26	1.51	32.0
TPZ120D	2022/11/16	1.32	-3.20
TPZ120D	2022/09/27	2.68	43.2
TPZ123	2022/08/31	*31.9*	-78.4
TPZ123	2022/11/03	--	-89.2
TPZ123	2022/09/27	*5.11*	-81.7
TPZ123	2023/03/07	*2.74*	-24.2
TPZ123	2023/01/18	*102*	-116
TPZ123	2022/11/16	*2.46*	-116
TPZ123	2022/12/15	*5.56*	-64.0
TPZ123	2023/02/15	*2.17*	21.0
TPZ124D	2023/02/14	0.40	35.0
TPZ124D	2023/03/07	0.32	11.6
TPZ124D	2023/01/18	0.32	-8.00
TPZ124D	2022/10/28	1.13	-32.9
TPZ124D	2022/12/14	0.76	-24.0
TPZ124D	2022/09/29	*1.71*	-42.7
TPZ124D	2022/08/31	3.14	-63.7
TPZ124D	2022/11/15	0.82	-106
G01D	2017/03/07	--	80.0
G01D	2021/07/06	*1.79*	139
G01D	2023/05/02	*4.09*	145

Appendix D-2. Supporting groundwater analytical data for Attachment 6A.

Well ID	Date	Iron (mg/L)	Oxidation Reduction Potential (mV)
G01D	2021/06/01	1.92	164
G01D	2021/07/21	1.35	122
G01D	2022/03/14	--	117
G01D	2019/09/09	--	193
G01D	2021/06/14	0.83	160
G01D	2021/03/24	1.15	160
G01D	2021/05/12	0.65	180
G01D	2022/09/20	--	173
G01D	2021/09/20	--	170
G01D	2023/03/07	--	195
G01D	2021/03/03	1.09	145
G01D	2023/01/24	7.38	114
G01D	2016/03/15	--	-103
G01D	2017/06/15	--	123
G01D	2015/12/03	--	60.0
G01D	2019/03/27	--	118
G01D	2021/04/14	0.70	134
G01D	2020/09/23	--	202
G01D	2016/09/14	--	-26.0
G01D	2017/11/30	--	21.0
G01D	2016/12/14	--	113
G01D	2018/06/19	--	29.0
G01D	2017/07/20	--	102
G01D	2020/03/30	--	138
G01D	2016/06/15	--	-110
G01D	2018/09/05	--	131
G01D	2022/07/26	1.85	15.5
G02D	2021/07/06	<0.025	128
G02D	2021/07/21	0.059	100
G02D	2021/06/01	0.043	140
G02D	2017/06/14	--	95.0
G02D	2021/04/14	<0.025	151
G02D	2016/12/14	--	218
G02D	2021/09/20	--	191
G02D	2021/03/24	0.026	175
G02D	2021/05/12	<0.1	183

Appendix D-2. Supporting groundwater analytical data for Attachment 6A.

Well ID	Date	Iron (mg/L)	Oxidation Reduction Potential (mV)
G02D	2021/06/14	0.071	169
G02D	2023/05/03	0.049	182
G02D	2022/03/14	--	138
G02D	2022/09/21	--	199
G02D	2021/03/03	0.11	151
G02D	2019/09/09	--	186
G02D	2023/03/08	--	49.1
G02D	2020/03/30	--	179
G02D	2016/03/15	--	28.0
G02D	2016/09/14	--	69.0
G02D	2018/09/05	--	169
G02D	2019/03/27	--	130
G02D	2020/09/23	--	246
G02D	2023/01/24	<0.0115	109.8
G02D	2015/12/03	--	146
G02D	2018/06/19	--	187
G02D	2017/07/20	--	132
G02D	2016/06/15	--	82.0
G02D	2017/03/08	--	254
G02D	2017/11/30	--	70.0
G02D	2022/07/27	0.03	97.3
XTPW03	2023/03/07	*0.49*	50.0
XTPW03	2022/09/28	*12.8*	-69.5
XTPW03	2022/10/27	*5.64*	-136
XTPW03	2022/09/01	*18.7*	-174

Notes:

mg/L = milligrams per liter

mV = millivolts ; V = volts

Italicized samples not included in average iron presented in Attachment 6a due to turbidity >10NTU

WAP: West ash pond, represented by data from XTPW03

Backgroud: Represented by data from G01D and G02D

Appendix D-3. Supporting groundwater analytical data for Attachment 6B.

Well ID	Date	pH (SU)	Temperature (Celcius)	Oxidation Reduction Potential (mV)	Eh (V)
G11	3/4/2021	5.90	16.30	69.0	0.276
G11	3/24/2021	5.90	16.50	154	0.361
G11	4/14/2021	5.80	16.10	100	0.307
G11	5/12/2021	5.90	16.50	194	0.401
G11	6/1/2021	5.82	16.40	159	0.366
G11	6/14/2021	5.86	16.60	149	0.355
G11	7/6/2021	5.78	16.70	78.0	0.284
G11	7/20/2021	5.82	16.90	135	0.341
G11	7/23/2022	6.33	17.32	122	0.328
G11	3/8/2023	5.87	16.00	166	0.373
G11	5/3/2023	5.82	16.50	207	0.414
G51D	7/20/2017	5.90	18.92	180	0.384
G51D	3/30/2020	5.62	16.40	261	0.468
G51D	3/24/2021	5.56	17.00	136	0.342
G51D	9/20/2021	5.46	17.70	238	0.443
G51D	3/15/2022	5.57	16.10	165	0.372
G51D	7/25/2022	6.92	18.07	178	0.383
G51D	3/8/2023	5.49	15.90	167	0.374
G51D	5/3/2023	5.57	16.30	214	0.421
TPZ118DD	8/31/2022	7.40	15.94	-124	0.083
TPZ118DD	9/29/2022	6.84	15.83	-65.5	0.142
TPZ118DD	10/28/2022	7.26	15.70	-103	0.104
TPZ118DD	11/15/2022	7.34	14.77	-168	0.040
TPZ118DD	12/14/2022	7.08	14.80	-300	-0.092
TPZ118DD	3/8/2023	7.09	14.70	-36.2	0.172
TPZ119D	8/31/2022	6.49	16.55	123	0.329
TPZ119D	9/29/2022	6.19	16.92	90.1	0.296
TPZ119D	11/4/2022	6.61	16.12	196	0.403
TPZ119D	11/16/2022	6.48	14.41	38.0	0.246
TPZ119D	12/14/2022	6.44	14.80	96.0	0.304
TPZ119D	1/18/2023	6.35	14.30	76.0	0.285
TPZ119D	2/15/2023	6.16	15.10	217	0.425
TPZ119D	3/7/2023	6.34	14.90	104	0.312
TPZ119DD	8/31/2022	6.90	17.25	-1.3	0.205
TPZ119DD	9/29/2022	6.88	18.56	-3.0	0.202
TPZ119DD	11/4/2022	7.00	17.05	131	0.337
TPZ119DD	11/16/2022	6.94	12.75	-54.0	0.156
TPZ119DD	12/14/2022	6.81	14.60	76.0	0.284
TPZ119DD	1/18/2023	6.74	14.00	32.0	0.241

Appendix D-3. Supporting groundwater analytical data for Attachment 6B.

Well ID	Date	pH (SU)	Temperature (Celcius)	Oxidation Reduction Potential (mV)	Eh (V)
TPZ119DD	2/15/2023	6.54	14.90	36.0	0.244
TPZ119DD	3/7/2023	6.76	14.60	2.0	0.210
TPZ120D	8/30/2022	6.18	16.31	-59.2	0.148
TPZ120D	9/27/2022	6.37	17.00	43.2	0.249
TPZ120D	10/26/2022	6.35	17.60	32.0	0.238
TPZ120D	11/16/2022	6.37	15.23	-3.2	0.204
TPZ120D	12/15/2022	6.16	14.70	212	0.420
TPZ120D	1/19/2023	6.17	14.80	178	0.386
TPZ120D	2/15/2023	6.01	15.50	123	0.330
TPZ120D	3/7/2023	6.20	14.90	83.1	0.291
TPZ123	8/31/2022	7.21	17.13	-78.4	0.128
TPZ123	9/27/2022	7.20	16.42	-81.7	0.125
TPZ123	11/3/2022	7.20	19.43	-89.2	0.115
TPZ123	11/16/2022	7.11	13.87	-116	0.093
TPZ123	12/15/2022	6.95	14.70	-64.0	0.144
TPZ123	1/18/2023	6.93	14.30	-116	0.093
TPZ123	2/15/2023	6.38	14.70	21.0	0.229
TPZ123	3/7/2023	6.84	14.60	-24.2	0.184
TPZ124D	8/31/2022	7.04	16.98	-63.7	0.142
TPZ124D	9/29/2022	6.91	16.40	-42.7	0.164
TPZ124D	10/28/2022	6.84	14.80	-32.9	0.175
TPZ124D	11/15/2022	7.07	13.82	-106	0.103
TPZ124D	12/14/2022	6.88	14.50	-24.0	0.184
TPZ124D	1/18/2023	6.80	14.00	-8.0	0.201
TPZ124D	2/14/2023	6.40	14.00	35.0	0.244
TPZ124D	3/7/2023	6.77	14.40	11.6	0.220
XTPW01	3/10/2023	10.80	14.00	-156	0.053
XTPW02	3/8/2023	10.60	13.90	-182	0.027
XTPW03	10/27/2022	7.42	14.40	-136	0.072
XTPW04	3/8/2023	7.09	13.50	-118	0.091

Notes:

SU= standard units

mV = millivolts ; V = volts

DOCUMENT

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① No characterization of CCR

② Hydraulic Conductivities Labs?

③ Bedrock Well logs?

3. ALTERNATIVE SOURCE DEMONSTRATION: LINES OF EVIDENCE

As allowed by 35 I.A.C. § 845.650(e), this ASD demonstrates that sources other than the PAP (the CCR unit) caused the chloride exceedance at APW15. LOEs supporting this ASD include the following:

1. The PAP is separated from the UA at APW15 by a thick layer of low permeability glacial till (UCU).
2. Concentrations of primary CCR indicators in APW15 do not exceed background limits and are not increasing.
3. Concentrations of chloride at APW15 are greater than source concentrations.

These LOEs are described and supported in greater detail below.

3.1 LOE #1: The PAP is Separated from the UA at APW15 by a Thick Layer of Low Permeability Glacial Till (UCU)

Based on the boring log for monitoring well APW15, the top elevation of the UA is 424.9 feet NAVD88 (Ramboll, 2021a), which corresponds to 97.2 feet bgs on the boring log. At this location, the UA is overlain by the UCU, a low permeability (6.3×10^{-9} to 2.1×10^{-8} cm/s) glacial till. The bottom of the PAP, as presented in drawing S-69, is situated within the UCU, generally consistent with ground surface topography at the time the PAP was constructed (AECOM, 2022). The estimated bottom elevation of CCR presented on profile B-B′ of sheet 00C302 (HDR, 2022), which bisects the axis of a former drainage feature, is 485 feet and has been interpreted to be the minimum base of ash elevation across the PAP. Thus, separation between the UA and the base of ash is approximately 60 feet, which represents the thickness of the low permeability glacial till that comprises the UCU. Based upon these observations, there is no complete pathway for transport of CCR constituents to APW15, and the PAP is not the source of the chloride exceedance at that well. **Appendix B** includes the boring log for APW15, drawing S-69, and sheet 00C302 to support this LOE.

3.2 LOE #2: Concentrations of Primary CCR Indicators in APW15 Do Not Exceed Background Limits and are Not Increasing

Boron and sulfate can be indicators of CCR impacts to groundwater due to their leachability from CCR and mobility in groundwater. Porewater in the NPP PAP is elevated in both boron and sulfate, indicating that these parameters are site-specific key indicators for CCR. If the groundwater in APW15 had been impacted by CCR from the unit, boron and sulfate concentrations would be expected to be elevated above their respective background Upper Tolerance Limits (UTLs). The UTL is an upper bound on background concentrations calculated for the purpose of comparing compliance measurements to background.

Mann-Kendall (M-K) trend analysis tests were performed to determine whether there are trends in the boron and sulfate concentrations in each well. If groundwater downgradient of the PAP was being affected by CCR but boron and sulfate did not yet exceed background concentrations, boron and sulfate concentrations would be expected to be increasing. No trends in boron or sulfate concentrations were identified by the M-K tests in compliance well APW15.

DOCUMENT
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Seif, Josiah

From: EPA.CCR.Part845.Notify
Sent: Tuesday, October 24, 2023 12:57 PM
Subject: Alternate Source Demonstration - Newton Power Plant

You are receiving this message because you subscribed to the Illinois EPA Listserv for Part 845, Coal Combustion Residual (CCR) facilities. In accordance with 35 Ill. Adm. Code 845.650(e)(2) let this serve as notification that the Illinois Environmental Protection Agency (Illinois EPA) received an Alternative Source Demonstration (ASD) from **Luminant Newton Power Plant** on **October 11th 2023**.

For further information regarding this ASD, you may refer to the facility's Coal Combustion Residual (CCR) website. A link to the facility's CCR website can be found via the Illinois EPA CCR website located at:
Coal Combustion Residual Surface Impoundments - Coal Combustion Residual Surface Impoundments (illinois.gov)

Please direct any comments to **LAUREN MARTIN** at Lauren.Martin@epa.gov within 14 days of the date of this notice for consideration per 35 Ill. Adm. Code 845.650(e)(3).

DOCUMENT

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Meade, Mallory

From: Hunt, Lauren <Lauren.Hunt@Illinois.gov>
Sent: Wednesday, October 25, 2023 5:21 PM
To: Hunt, Lauren; Dunaway, Lynn; Mullenax, Heather; Bierwagen, Justin; Garee, Matthew J.
Cc: Summers, Michael
Subject: ASD Discussions--Newton and Joppa
Attachments: Joppa EastAsh-ASD-Letter-10202023.pdf; 10062023Qtr2 Ash Pond Alternative Source Demonstration(ASD)_letter.pdf; Draft ASD JEAP NonConcurrence letter Oct 2023.docx

Added a draft Joppa letter to discuss.

Hi all.
Let's discuss the ASDs for Newton (letter due by November 5th) and Joppa (letter due by November 19th).
The ASDs are attached.
We will need to discuss the following in depth to get the team up to speed on general subjects we will see a lot of coming soon:

1. Geochemistry
2. Alternative source data submittal requirements
3. Other items the team is curious about or needs to brush up on.

Thanks,
Lauren

DOCUMENT

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From:	Tickner, Dianna
To:	Hunt, Lauren
Subject:	[External] RE: Newton and Joppa ASD Questions
Date:	Thursday, October 26, 2023 10:44:16 AM

Thank you Lauren received. Phil is on vacation this week. I will check to see if anyone else can respond.

From: Hunt, Lauren <Lauren.Hunt@Illinois.gov>
Sent: Thursday, October 26, 2023 10:41 AM
To: Tickner, Dianna <Dianna.Tickner@vistracorp.com>
Subject: FW: Newton and Joppa ASD Questions

You don't often get email from lauren.hunt@illinois.gov. Learn why this is important

EXTERNAL EMAIL

Please see below…thank you. Lauren

Lauren I. Hunt, M.S.
(she/they/he)
Environmental Protection Geologist III
Illinois Environmental Protection Agency
Bureau of Water
Groundwater Section
1021 N. Grand Avenue
PO Box 13
Springfield, IL 62702
D: 217-524-9048
C: 309-361-0037
Lauren.hunt@illinois.gov
Hours: 8:30 am to 5:30 pm Tuesday through Friday
8:30 am to 4 pm Mondays and alternating Mondays off
Working remotely Mondays and Fridays.

From: Hunt, Lauren
Sent: Thursday, October 26, 2023 10:40 AM
To: Phil.Morris@vistracorp.com; Voelker, Brian <Brian.Voelker@vistracorp.com>; Cravens, Stuart <Stuart.Cravens@txu.com>
Cc: Mullenax, Heather <Heather.Mullenax@Illinois.GOV>; Garee, Matthew J. <Matthew.Garee@illinois.gov>; Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>; Summers, Michael <Michael.Summers@Illinois.gov>
Subject: Newton and Joppa ASD Questions

Hi Phil.
Heather and I are looking for technical contact information for the Newton (Heather) and Joppa (me) ASD. We have a few questions and requests and would like to discuss with your technical folks.
Thank you.

Lauren

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DOCUMENT

21

Rees, Jeromy

From: Hunt, Lauren
Sent: Thursday, October 26, 2023 1:09 PM
To: Fuller, Rhys
Cc: Dunaway, Lynn; Mullenax, Heather
Subject: Joppa and Newton ASD data gap discussion

Hi Rhys.
As discussed, here are our data gap requests for the Joppa ASD.

1. Source characterization of the CCR at the East Ash Pond must include total solids sampling, analysis and reporting in accordance with SW846.
2. Hydraulic conductivities from laboratory or insitu testing must be collected, analyzed and presented with hydrogeologic characterization of all units including aquifers and confining units. Hydraulic conductivity data must include field and software analysis.
3. Characterization to include sample and analysis in accordance with 35 IAC 845.640 of alternative source must be provided with the ASD.

Thank you.
Lauren

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(she/they/he)
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DOCUMENT

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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-3397
JB PRITZKER, GOVERNOR JOHN J. KIM, DIRECTOR

217-782-1020

October 26, 2023

Dianna Tickner
Electric Energy, Inc.
1500 Eastport Plaza drive
Collinsville, Illinois 62234

Re: Joppa Power Plant East Ash Pond; W1270100004-02
Alternative Source Demonstration Submittal

Dear Ms. Tickner:

The purpose of this correspondence is to notify you that the Illinois Environmental Protection Agency (Illinois EPA) does not concur with the Joppa East Ash Pond Alternative Source Demonstration (ASD) dated October 21, 2023. The Illinois EPA does not concur due to the following data gaps:

1. Source characterization of the CCR at the East Ash Pond must include total solids sampling in accordance with SW846.
2. Hydraulic conductivities from laboratory or insitu testing must be collected and presented with hydrogeologic characterization of all units including aquifers and confining units.
3. Characterization to include sample and analysis in accordance with 35 IAC 845.640 of alternative source must be provided with the ASD.

If you have any questions, please contact: **Lauren Hunt** Illinois EPA, Bureau of Water, PWS #13, P.O. Box 19276, Springfield, Illinois 62794-9276. If you have any questions concerning the investigation described above, please call 217-782-1020.

Sincerely,

Michael Summers, P.G.
Manager, Groundwater Section
Division of Public Water Supplies
Bureau of Water

cc: Lauren Hunt
Keegan Macdonna
WPC Files 06M

2125 S. First Street, Champaign, IL 61820 (217) 278-5800
1101 Eastport Plaza Dr., Suite 100, Collinsville, IL 62234 (618) 346-5120
9511 Harrison Street, Des Plaines, IL 60016 (847) 294-4000
595 S. State Street, Elgin, IL 60123 (847) 608-3131
2309 W. Main Street, Suite 116, Marion, IL 62959 (618) 993-7200
412 SW Washington Street, Suite D, Peoria, IL 61602 (309) 671-3022
4302 N. Main Street, Rockford, IL 61103 (815) 987-7760

PLEASE PRINT ON RECYCLED PAPER

DOCUMENT
23

Rees, Jeromy

Subject: ASD discussions with Dynegy
Location: https://illinois.webex.com/illinois/j.php?MTID=m31ebeb6a3d16bd9e64a0fa7b531d3907

Start: Tue 10/31/2023 1:00 PM
End: Tue 10/31/2023 2:00 PM

Recurrence: (none)

Meeting Status: Accepted

Organizer: Hunt, Lauren
Required Attendees: Hunt, Lauren; Dunaway, Lynn; Garee, Matthew J.; Mullenax, Heather; Bierwagen, Justin; Summers, Michael; Fuller, Rhys
Optional Attendees: Cravens, Stuart; Voelker, Brian; Morris, Phil; Modeer, Victor; Brian Hennings; Nathaniel R Keller

Categories: Meetings for EPA

-~-

-- Do not delete or change any of the following text. --

When it's time, join your Webex meeting here.

More ways to join:

Join from the meeting link
https://illinois.webex.com/illinois/j.php?MTID=m31ebeb6a3d16bd9e64a0fa7b531d3907

Join by meeting number

Meeting number (access code): 2634 381 5550

Meeting password: piJUfMi7F98

Tap to join from a mobile device (attendees only)
+1-312-535-8110,,26343815550## United States Toll (Chicago)
+1-415-655-0002,,26343815550## US Toll

Join by phone
+1-312-535-8110 United States Toll (Chicago)
+1-415-655-0002 US Toll
Global call-in numbers

Join from a video system or application
Dial 26343815550@illinois.webex.com
You can also dial 173.243.2.68 and enter your meeting number.

If you are a host, click here and login site to view host information.

Need help? Go to https://help.webex.com

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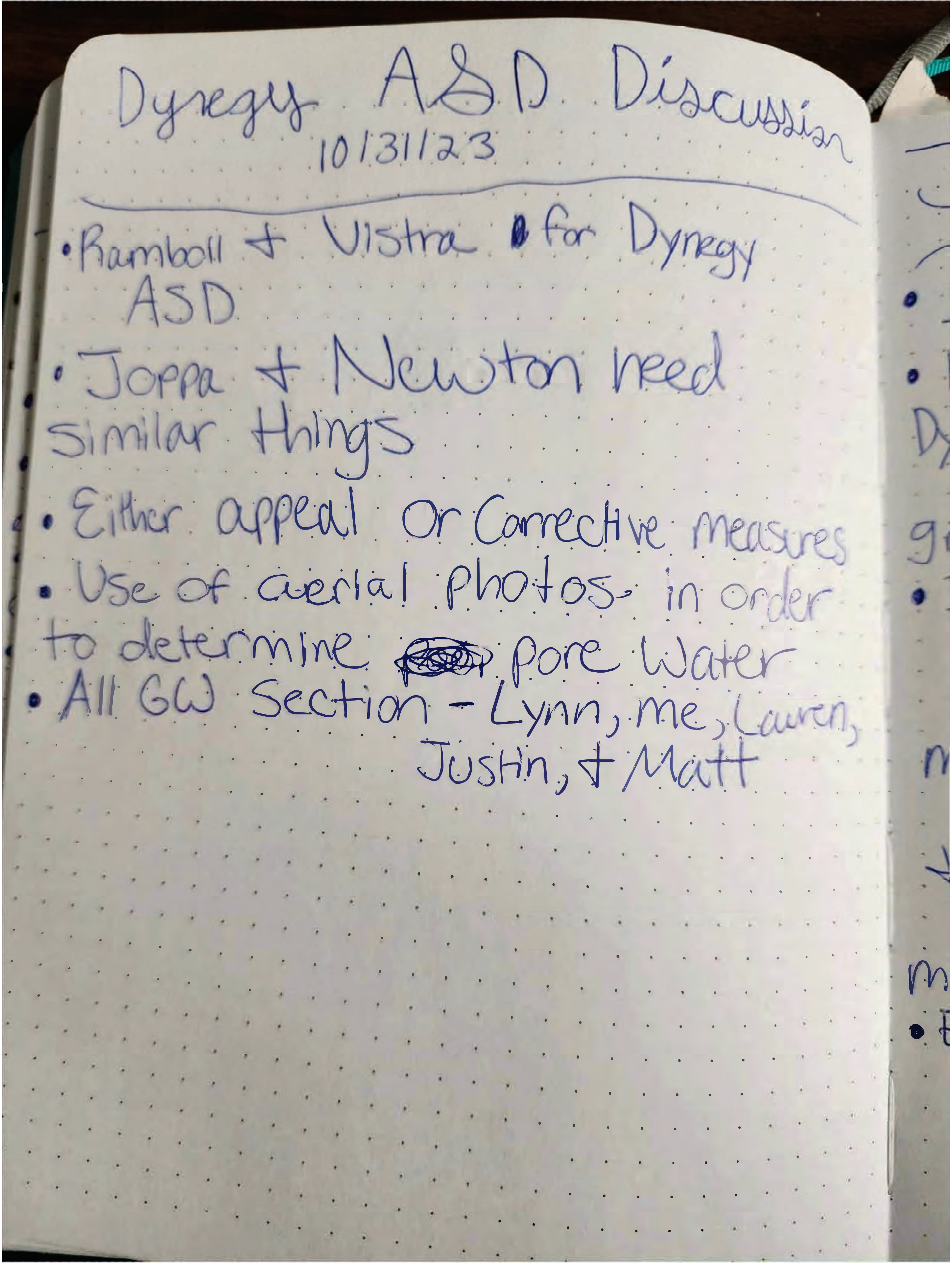

Dynegy ASD Discussion

10/31/23

- Ramboll + Vistra for Dynegy ASD
- Joppa + Newton need similar things
- Either appeal or Corrective measures
- Use of aerial photos in order to determine pore Water
- All GW Section - Lynn, me, Lauren, Justin, + Matt

DOCUMENT

25

Hunt, Lauren

From:	Summers, Michael
Sent:	Wednesday, November 1, 2023 3:32 PM
To:	Hunt, Lauren; Dunaway, Lynn
Cc:	Mullenax, Heather; Garee, Matthew J.; Bierwagen, Justin
Subject:	RE: Joppa West Adjusted Standard Recommendation Meeting follow up

Added to clarify for lawyers in red

From: Hunt, Lauren <Lauren.Hunt@Illinois.gov>
Sent: Wednesday, November 1, 2023 3:22 PM
To: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>; Summers, Michael <Michael.Summers@Illinois.gov>
Cc: Mullenax, Heather <Heather.Mullenax@Illinois.gov>; Garee, Matthew J. <Matthew.Garee@Illinois.gov>; Bierwagen, Justin <Justin.Bierwagen@Illinois.gov>
Subject: RE: Joppa West Adjusted Standard Recommendation Meeting follow up

Final draft for Lynn to pass on:

As filed, the Recommendation allows a 6-year temp. AS to allow sampling (5 years) and modeling/reporting (1 year) to prove monitored natural attenuation (MNA) will work.
USEPA has been very non-receptive to MNA demonstrations at other sites around the country.
Therefore, IEPA needs to amend the Rec to withdraw the Alt Standard suggested or not amend in which case Joppa maybe subject to USEPA enforcement. (Note: This was where the upper management decision came in, considering our goal to get primacy)

IEPA also asked for source monitoring, Joppa did install and has been doing total metals monitoring, but is not done yet, so the ask would be:
Please provide the groundwater sampling and analysis results for total metals at site wells listed in the Attachment B from Ramboll and Associates dated December 19, 2022 for 8 quarters of groundwater sampling along with the precipitation, infiltration and leaching analysis. [Note: unlikely that they have completed this at this time since we are just under two years since the submittal of our recommendation]

IEPA also asked for CCR characterization. Joppa provided 6 CCR samples with analysis. The issue is that there are roughly 5 million cubic yards of CCR in Joppa West, so the ask would be:
Please provide further CCR solids sampling and analysis to include a minimum of 1 sample location per 10% of the total cubic yards of CCR, ~~and~~ with ~~one-third of the~~ 3 samples collected from each location: ~~must be~~ one (1) from the upper 1/3 of the CCR by depth from ground surface, ~~one-third collected~~ one (1) from the middle 1/3 of the CCR by depth from ground surface, and ~~one-third collected~~ one (1) from the bottom 1/3 of the CCR by depth from ground surface. This would 30 samples over the entire site. The SPLP analysis in accordance with SW846 using the lowest pH on site of 3.5. ~~the samples must be spread out as follows:~~

Lauren I. Hunt, M.S.
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C: 309-361-0037
Lauren.hunt@illinois.gov
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8:30 am to 4 pm Mondays and alternating Mondays off
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From: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>
Sent: Wednesday, November 1, 2023 3:11 PM
To: Summers, Michael <Michael.Summers@Illinois.gov>; Hunt, Lauren <Lauren.Hunt@Illinois.gov>
Cc: Mullenax, Heather <Heather.Mullenax@Illinois.gov>; Garee, Matthew J. <Matthew.Garee@Illinois.gov>; Bierwagen, Justin <Justin.Bierwagen@Illinois.gov>
Subject: RE: Joppa West Adjusted Standard Recommendation Meeting follow up

How about something like this:

1 sample per 10% of the volume with one-third of the samples being collected as follows:
upper 1/3 of the CCR by depth from ground surface,
middle 1/3 of the CCR by depth from ground surface, and
bottom 1/3 of the CCR by depth from ground surface.

From: Summers, Michael <Michael.Summers@Illinois.gov>
Sent: Wednesday, November 1, 2023 2:43 PM
To: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>; Hunt, Lauren <Lauren.Hunt@Illinois.gov>
Cc: Mullenax, Heather <Heather.Mullenax@Illinois.gov>; Garee, Matthew J. <Matthew.Garee@Illinois.gov>; Bierwagen, Justin <Justin.Bierwagen@Illinois.gov>
Subject: RE: Joppa West Adjusted Standard Recommendation Meeting follow up

Do we have an rational for 50,000 cubic yards? If its 5 million cubic yards and one sample per 50,000 would equal 100 samples. is this an amount we want to look at?

When using a volume are we likely to run into a "disagreement" with the site on how actual large the site is? Would it be more appropriate to base sample on the surface area of the site. Or since we do have volumes (ie depth estimates) we could do a percentage of the entire volume. It is easily quantifiable, no argument on the size of the facility. Something like a shallow, mid-point and deep (3) samples collected per acre? 3 Per every 5 acres of surface area? take a look at what is a reasonable number of samples to characterize the site.

If we to end up asking for a set number of samples, we still need to make sure that various depth are mentioned in the request for samples to adequately characterize the site.

From: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>
Sent: Wednesday, November 1, 2023 11:54 AM
To: Hunt, Lauren <Lauren.Hunt@Illinois.gov>; Summers, Michael <Michael.Summers@Illinois.gov>
Cc: Mullenax, Heather <Heather.Mullenax@Illinois.gov>; Garee, Matthew J. <Matthew.Garee@Illinois.gov>; Bierwagen, Justin <Justin.Bierwagen@Illinois.gov>
Subject: RE: Joppa West Adjusted Standard Recommendation Meeting follow up

For the attorneys I would break this out more like this:

As filed, the Recommendation allows a 6-year temp. AS to allow sampling (5 years) and modeling/reporting (1 year) to prove monitored natural attenuation (MNA) will work.
USEPA has been very non-receptive to MNA demonstrations at other sites around the country.

Therefore, IEPA needs to amend the Rec to withdraw the Alt Standard suggested or not amend in which case Joppa maybe subject to USEPA enforcement. (Note: This was where the upper management decision came in, considering our goal to get primacy)

IEPA also asked for source monitoring, Joppa did install and has been doing total metals monitoring, but is not done yet, so the ask would be:
Please provide the groundwater sampling and analysis results for total metals at site wells listed in the Attachment B from Ramboll and Associates dated December 19, 2022 for 8 quarters of groundwater sampling along with the precipitation, infiltration and leaching analysis. [Note: unlikely that they have completed this at this time since we are just under two years since the submittal of our recommendation]

IEPA also asked for CCR characterization. Joppa provided 6 CCR samples with analysis. The issue is that there are roughly 5 million cubic yards of CCR in Joppa West, so the ask would be:
Please provide further CCR solids sampling and analysis to include a minimum of 1 sample per 50,000? cubic yards of CCR and SPLP analysis in accordance with SW846 using the lowest pH on site of 3.5. [Note: Mike I'll let you weigh in on volume of CCR per sample that is appropriate.

From: Hunt, Lauren <Lauren.Hunt@Illinois.gov>
Sent: Wednesday, November 1, 2023 11:31 AM
To: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>; Summers, Michael <Michael.Summers@Illinois.gov>
Cc: Mullenax, Heather <Heather.Mullenax@Illinois.gov>; Garee, Matthew J. <Matthew.Garee@Illinois.gov>; Bierwagen, Justin <Justin.Bierwagen@Illinois.gov>
Subject: Joppa West Adjusted Standard Recommendation Meeting follow up

Hi Mike and Lynn.
Please review the following for Sara and Stefanie:

1. Please provide the groundwater sampling and analysis results for total metals at site wells listed in the Attachment B from Ramboll and Associates dated December 19, 2022 for 8 quarters of groundwater sampling along with the precipitation, infiltration and leaching analysis. [unlikely that they have completed this at this time since we are just under two years since the submittal of our recommendation].
2. Please provide further CCR solids sampling and analysis to include a minimum of 1 sample per 50,000? cubic yards of CCR and SPLP analysis in accordance with SW846 using the lowest pH on site of 3.5. [Current status is 6 total samples for approximately 5 million cubic yards (or 103.5 acres and 30 feet deep).]

Please note: EEI shows that the hydraulic conductivities are downward from the CCR unit through the UCU (Upper confining unit) into the Upper Aquifer (UA). Total solids CCR samples show that the CCR contains all of the constituents in 845.600 whereas the surrounding formations do not contain some of those and generally contain less of the 845.600 constituents than the CCR where present.

Thanks. Lauren

Lauren I. Hunt, M.S.
(she/they/he)
Environmental Protection Geologist III
Illinois Environmental Protection Agency
Bureau of Water
Groundwater Section
1021 N. Grand Avenue
PO Box 13
Springfield, IL 62702
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C: 309-361-0037

Lauren.hunt@illinois.gov
Hours: 8:30 am to 5:30 pm Tuesday through Friday
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Working remotely Mondays and Fridays.

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26

Hunt, Lauren

From: Diers, Stefanie
Sent: Thursday, November 2, 2023 7:52 AM
To: Dunaway, Lynn; Terranova, Sara
Cc: Summers, Michael; Hunt, Lauren; Bierwagen, Justin; Mullenax, Heather; Garee, Matthew J.; Sofat, Sanjay
Subject: RE: Joppa AS

Thanks. Sara and I will review and follow up with questions we have.

From: Dunaway, Lynn <LYNN.DUNAWAY@Illinois.gov>
Sent: Wednesday, November 1, 2023 3:40 PM
To: Diers, Stefanie <Stefanie.Diers@Illinois.gov>; Terranova, Sara <Sara.Terranova@Illinois.gov>
Cc: Summers, Michael <Michael.Summers@Illinois.gov>; Hunt, Lauren <Lauren.Hunt@Illinois.gov>; Bierwagen, Justin <Justin.Bierwagen@Illinois.gov>; Mullenax, Heather <Heather.Mullenax@Illinois.gov>; Garee, Matthew J. <Matthew.Garee@Illinois.gov>; Sofat, Sanjay <Sanjay.Sofat@Illinois.gov>
Subject: Joppa AS

Mike and I have both reviewed this and Mike asked me to send this along to you.

As filed, the Recommendation allows a 6-year temp. AS to allow sampling (5 years) and modeling/reporting (1 year) to prove monitored natural attenuation (MNA) will work.
USEPA has been very non-receptive to MNA demonstrations at other sites around the country.
Therefore, IEPA needs to amend the Rec to withdraw the Alt Standard suggested or not amend in which case Joppa maybe subject to USEPA enforcement. (Note: This was where the upper management decision came in, considering our goal to get primacy)

IEPA also asked for source monitoring, Joppa did install and has been doing total metals monitoring, but is not done yet, so the ask would be:
Please provide the groundwater sampling and analysis results for total metals at site wells listed in the Attachment B from Ramboll and Associates dated December 19, 2022 for 8 quarters of groundwater sampling along with the precipitation, infiltration and leaching analysis. [Note: unlikely that they have completed this at this time since we are just under two years since the submittal of our recommendation]

IEPA also asked for CCR characterization. Joppa provided 6 CCR samples with analysis. The issue is that there are roughly 5 million cubic yards of CCR in Joppa West, so the ask would be:
Please provide further CCR solids sampling and analysis to include a minimum of 1 sample location per 10% of the total cubic yards of CCR, with 3 samples collected from each location: one (1) from the upper 1/3 of the CCR by depth from ground surface, one (1) from the middle 1/3 of the CCR by depth from ground surface, and one (1) from the bottom 1/3 of the CCR by depth from ground surface. This would 30 samples over the entire Joppa West site. The SPLP analysis in accordance with SW846 using the lowest pH on site of 3.5.

DOCUMENT

27

Seif, Josiah

From: Seif, Josiah
Sent: Thursday, November 2, 2023 4:20 PM
To: EPA.CCR.Part845.Notify
Cc: Hunt, Lauren; Mullenax, Heather; Dunaway, Lynn
Subject: RE: Alternate Source Demonstration - Newton Power Plant

Please see below for edited contact information.

From: EPA.CCR.Part845.Notify
Sent: Tuesday, October 24, 2023 12:57 PM
Subject: Alternate Source Demonstration - Newton Power Plant

You are receiving this message because you subscribed to the Illinois EPA Listserv for Part 845, Coal Combustion Residual (CCR) facilities. In accordance with 35 Ill. Adm. Code 845.650(e)(2) let this serve as notification that the Illinois Environmental Protection Agency (Illinois EPA) received an Alternative Source Demonstration (ASD) from **Luminant Newton Power Plant** on **October 11th 2023**.

For further information regarding this ASD, you may refer to the facility's Coal Combustion Residual (CCR) website. A link to the facility's CCR website can be found via the Illinois EPA CCR website located at:
Coal Combustion Residual Surface Impoundments - Coal Combustion Residual Surface Impoundments (illinois.gov)

Please direct any comments to **HEATHER MULLENAX** at heather.mullenax@illinois.gov within 14 days of the date of this notice for consideration per 35 Ill. Adm. Code 845.650(e)(3).

DOCUMENT

28

Seif, Josiah

From:	Voelker, Brian <Brian.Voelker@vistracorp.com>
Sent:	Friday, November 3, 2023 6:20 PM
To:	Mullenax, Heather; Hunt, Lauren; EPA.CCR.Part845.Notify; EPA.CCR.Part845.Coordinator
Cc:	Morris, Phil; Mitchell, David; More, Joshua; Fuller, Rhys; Modeer, Victor; Cravens, Stuart; Davies, Sam; Vodopivec, Cynthia
Subject:	[External] Alternate Source Demonstration - Newton Power Plant
Attachments:	Newton ASD Nov. 3 2023 Comment Letter.pdf

Heather and Lauren,
Illinois Power Generating Company is submitting the additional information (attached) as follow-up to communication with the agency regarding the ASD submitted for the Newton Power Plant Primary Ash Pond on October 6, 2023.

The listserve notice was received on October 24, and this submittal is within the 14-day period allowed for written comments.

Let me know if you have issues opening the attachment.

Thanks,

Brian Voelker
Environmental Manager
(217) 412-6605
brian.voelker@vistrcorp.com

DOCUMENT
29

Illinois Power Generating Company
1500 Eastport Plaza Drive
Collinsville, IL 62234

November 3, 2023

VIA E-MAIL
heather.mullenax@illinois.gov
EPA.CCR.PART845.COORDINATOR@ILLINOIS.GOV
EPA.CCR.Part845.Notify@Illinois.gov

Re: Alternative Source Demonstration (“ASD”) for Newton Power Plant Primary Ash Pond

To Whom It May Concern:

On October 6, 2023, Illinois Power Generating Company (“IPGC”) submitted an ASD for the Newton Power Plant Primary Ash Pond (“Newton PAP”) to the Illinois Environmental Protection Agency (“IEPA”) pursuant to 35 Ill. Admin. Code 845.650(e). On October 24, 2023, IEPA provided notice to its listserve regarding the posting of the ASD submittal, triggering a 14-day period for written comments on the ASD submittal pursuant to 35 Ill Admin. Code 845.650(e)(3). Between October 19 and 31, 2023, IPGC and IEPA engaged in communications regarding the Newton PAP ASD submittal. IPGC submits this letter and its attachments, within the 14-day period for written comments, to provide additional information to IEPA in response to those communications. As explained below and in the attached materials, IPGC’s October 6 ASD submittal was comprehensive in scope and used scientifically supported, industry standard methodologies.

IEPA requested certain additional data as part of its communications with IPGC. While IPGC does not agree that any additional data is necessary in support of the ASD submittal, IPGC has compiled and is providing, as Attachment 1 to this letter, the hydraulic conductivity and boring log data requested by IEPA, all of which was previously provided or referenced in the Newton PAP operating permit application and/or construction permit application. Because both of these applications were used and relied upon in preparing the Newton PAP ASD and both contain information IEPA has sought in connection with its review of the ASD, IPGC (with this letter) is incorporating by reference the entirety of its October 25, 2021 operating permit application for the Newton PAP and July 28, 2022 construction permit application for the Newton PAP into its Newton PAP ASD submittal.

In its communications with IPGC, IEPA also requested (1) source characterization of CCR that includes total solids sampling, analysis and reporting in accordance with SW-846 leach testing methods and (2) sampling and analysis in accordance with 35 Ill. Admin. Code 845.640 of the alternative source. Collecting this information would be a considerable undertaking that IPGC would not be able to complete prior to the decision deadline or within the comment period for the Newton PAP ASD. Additionally, this information is not required by law and is unnecessary to support the Newton PAP ASD. First, there is no requirement under Part 845 that source characterization of CCR be conducted in accordance with SW-846. While Part 845.150 incorporates by reference SW-846, that incorporation does not create an affirmative obligation to analyze all samples in accordance with SW-846. As set forth in Chapter 2 of SW-846, the methods are not “mandatory” unless specifically specified in the regulation. Groundwater samples taken under Part 845 are the only samples specifically required by Part 845 to be analyzed using SW-846. In particular, Part 845.640(e) requires groundwater samples taken under a groundwater monitoring program be analyzed in accordance with SW-846. Notably, samples collected under the Newton PAP’s groundwater monitoring program have been analyzed in accordance with SW-846 (and were otherwise collected and analyzed in accordance with 35 Ill. Admin. Code 845.640). Attachment 2 to this letter explains how CCR source characterization was conducted for the Newton PAP ASD and explains why the methodology used is more appropriate than SW-846 leach testing methods for characterizing the source material.

Second, there is no requirement under 35 Ill Admin. Code 845.640, 35 Ill. Admin. Code 845.650 or elsewhere in Part 845 to identify, sample or analyze an alternative source. Section 845.650(e), which governs alternative source demonstrations, simply requires a determination that a source other than the CCR surface impoundment caused the contamination and that the CCR surface impoundment did not contribute to the contamination. As described in Attachment 2, this demonstration is made through a multiple lines of evidence analysis in the Newton PAP ASD submittal. Nevertheless, as explained in Attachment 2, an alternative source was also identified in the Newton PAP ASD submittal and its identification further supports that the Newton PAP is not the source of the chloride exceedance in APW15. However, identification and a full characterization of that alternative source is not required for the ASD or necessary to determine that a source other than the Newton PAP caused the chloride exceedance and that the Newton PAP did not contribute to the exceedance.

Finally, given that this submittal responds to questions and requests raised by IEPA regarding the Newton PAP ASD, IPGC hereby incorporates this letter and its attachments (including the references set forth in those attachments) into its Newton PAP submittal.

Should you have any questions regarding the information contained in this letter or its attachments, please feel free to reach out.

Sincerely,

Phil Morris, PE
Senior Director, Environmental

ATTACHMENT 1

HYDRAULIC CONDUCTIVITY DATA

INFORMATION AND DATA PREVIOUSLY PROVIDED IN THE HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

SUBMITTED TO IEPA ON OCTOBER 29, 2021

TABLE 2-1. GEOTECHNICAL DATA SUMMARY
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
NEWTON POWER PLANT
PRIMARY ASH POND
NEWTON, ILLINOIS

Sample ID	Field Location ID	Top of Sample (ft bgs)	Bottom of Sample (ft bgs)	HSU	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Calculated Porosity ^{1} (%)	Vertical Hydraulic Conductivity (cm / s)	LL	PL	PI	Laboratory USCS	Gravel (%)	Sand (%)	Fines (%)
Sangamon Soil																
APW11	APW11	10	12	UD	17.8	111.7	2.645	32	8.57E-08	28	12	16	CL	1.1	45.1	53.8
APW15	APW15	20	22	UD	18.5	109.8	2.686	34	3.21E-08	33	10	23	CL	0.0	40.8	59.2
Hagarstown Member																
APW12	APW12	20	22	UD/PMP	15.1	118.3	2.694	30	1.07E-07	27	12	15	SC	7.4	46.8	45.8
APW12	APW12	25.5	26	UD/PMP	8.4	113.0	2.654	32	8.43E-06	10	13	NP	SP-SM	24.3	69.5	6.2
APW13	APW13	25	27	UD/PMP	21.2	87.1	2.649	47	9.63E-05	9	10	NP	SP-SM	0.0	88.9	11.1
Vandalia Till Member																
APW14	APW14	45	47	UCU	12.4	119.6	2.706	29	9.65E-08	26	14	12	CL	4.4	32.3	63.3
APW17	APW17	40	42	UCU	16.6	108.8	2.709	36	3.34E-08	26	13	13	CL	1.3	27.6	71.1
SB300	APW18	50	52	UCU	12.9	122.7	2.700	27	7.29E-08	32	12	20	CL	0.8	22.4	76.8
SB301	SB301	48	50	UCU	14.1	117.3	2.697	30	6.63E-08	27	14	13	CL	0.4	34.2	65.4
Mulberry Grove Member																
APW13	APW13	60.5	61	UA	14.5	114.3	2.661	31	2.18E-04	8	13	NP	SM	0.3	75.2	24.5
APW15	APW15	100.5	101	UA	12.1	116.4	2.665	30	3.50E-06	15	12	3	SM	4.4	49.8	45.8
APW17	APW17	71	71.5	UA	7.8	110.2	2.660	34	7.21E-04	5	9	NP	SW-SM	14.3	76.8	8.9
APW17	APW17	90.5	91	UA	6.1	116.8	2.672	30	6.39E-04	6	8	NP	SP-SM	28.2	65.1	6.7
SB300	APW18	61	61.5	UA	13.6	109.6	2.686	35	1.85E-05	5	9	NP	SM	4.7	78.2	17.1
Smithboro Till Member																
APW11	APW11	61	61.5	LCU	17.8	110.5	2.686	34	1.87E-07	27	18	9	CL	0.0	21.4	78.6
APW11	APW11	80	82	LCU	16.5	116.1	2.705	31	2.94E-08	32	14	18	CL	0.0	21	79
APW12	APW12	85	87	LCU	14.4	116.4	2.711	31	2.36E-08	29	14	15	CL	0.3	19.5	80.2
APW14	APW14	55.5	56	LCU	18.0	104.6	2.709	38	2.74E-07	25	15	10	CL	0.0	27.8	72.2
APW15	APW15	105	107	LCU	19.1	107.8	2.695	36	8.20E-08	29	13	16	CL	0.0	23.8	76.2
SB300	APW18	62.5	63	LCU	11.1	124.6	2.659	25	4.32E-06	20	14	6	CL-ML	0.0	42.4	57.6
SB300	APW18	105	107	LCU	14.1	116.4	2.710	31	4.28E-08	28	13	15	CL	0.0	30.7	69.3
SB301	SB301	68.5	69	LCU	13.1	121.3	2.723	29	4.05E-08	23	14	9	CL	0.0	31.3	68.7
SB301	SB301	98	100	LCU	15.7	118.2	2.720	30	6.13E-08	37	15	22	CL	0.0	17.8	82.2
CCR																
XPW01	XPW01	8.5	9	CCR	18.6	87.7	2.675	47	1.71E-04	47	57	NP	SP-SM	37.1	51.1	11.8
XPW01	XPW01	15.5	16	CCR	12.6	84.4	2.741	51	1.58E-05	35	17	18	CL	4.6	34.1	61.3
XPW03	XPW03	6	6.5	CCR	17.4	75.3	2.663	55	1.34E-03	33	27	6	SM	6.8	71.7	21.5
XPW03	XPW03	15.5	16	CCR	16.7	103.6	2.689	38	9.70E-05	12	19	NP	SM	16.4	67.3	16.3
XPW04	XPW04	6.5	7	CCR	31.1	73.9	2.697	56	1.61E-04	41	38	3	SM	1.6	84.5	13.9
XPW04	XPW04	15.5	16	CCR	31.1	80.8	2.650	51	7.83E-05	46	42	4	SM	15.7	51	33.3

TABLE 2-1. GEOTECHNICAL DATA SUMMARY
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
NEWTON POWER PLANT
PRIMARY ASH POND
NEWTON, ILLINOIS

Sample ID	Field Location ID	Top of Sample (ft bgs)	Bottom of Sample (ft bgs)	HSU	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Calculated Porosity [1] (%)	Vertical Hydraulic Conductivity (cm/s)	LL	PL	PI	Laboratory USCS	Gravel (%)	Sand (%)	Fines (%)
Fill																
XPW02	XPW02	8	8.5	CCR	29.1	92.9	2.691	45	6.07E-08	36	16	20	CL	0.3	44.8	54.9
XPW02	XPW02	16.5	17	CCR	21.8	103.7	2.694	38	7.38E-08	36	14	22	CL	0.0	19.8	80.2

[O: SSW 04/22/21, U:EDP 08/23/21, U: SSW 08/26/21, C: LDC 08/31/21; U: LDC 09/16/21, C: SSW 09/21/21]

Notes:
[1] Porosity calculated as relationship of bulk density to particle density (n = 100[1- (pb/pd)])
% = Percent
bgs = below ground surface
CCR = coal combustion residuals
cm/s = centimeters per second
ft = foot/feet
in = inch
LL = Liquid limit
NP = Non Plastic
pcf = pounds per cubic foot
PI = Plastic Index
PL = Plasticity Limit

HSU = Hydrostratigraphic Unit
LCU = lower confining unit
PMP = potential migration pathway
UA = uppermost aquifer
UCU = upper confining unit
UD = upper drift

USCS = Unified Soil Classification System
CL - Lean Clay
CL-ML = Silty Lean Clay
SC = Clayey Sand
SM = Silty Sand
SP-SM = Poorly Graded Sand with Silt
SW-SM = Well Graded Sand with Silt

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Laboratory Services Group **192 Exchange Blvd** **Glendale Heights, Illinois 60139** **Ph. (630) 717-4263**

TERRACON PROJECT NO. **11215019** **4/9/2021**
PROJECT NAME: **NEWTON POWER STATION**
CLIENT: **RAMBOLL ENVIRON US CORP**
LOCATION : **NEWTON, IL**

SUMMARY OF TEST RESULTS

BORING NO. APW-14

TIME SAMPLED: 9:55

DEPTH: 45.0'-47.0'

CLASSIFICATION BROWN SANDY LEAN CLAY

	INITIAL	FINAL	SPECIMEN PHOTO
DRY UNIT WEIGHT (pcf)	119.6	120.3	
WATER CONTENT (%)	12.4	14.2	
DIAMETER (cm)	7.380	7.372	
LENGTH (cm)	10.775	10.736	
B VALUE PARAMETER:	0.98		
HYDRAULIC GRADIENT (MAXIMUM)	18.54		
PERCENT SATURATION	100.5		(Percent saturation calculation is based on final measurements and a measured specific gravity.)
HYDRAULIC CONDUCTIVITY k (cm/sec)	9.65E-08		

Deaired water was used as the liquid permeant.

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Laboratory Services Group **192 Exchange Blvd** **Glendale Heights, Illinois 60139** **Ph. (630) 717-4263**

TERRACON PROJECT NO. **11215019** **4/9/2021**
PROJECT NAME: **NEWTON POWER STATION**
CLIENT: **RAMBOLL ENVIRON US CORP**
LOCATION : **NEWTON, IL**

SUMMARY OF TEST RESULTS

BORING NO.	APW-17
TIME SAMPLED:	9:45
DEPTH:	40.0'-42.0'
CLASSIFICATION	GRAY LEAN CLAY WITH SAND

	INITIAL	FINAL	SPECIMEN PHOTO
DRY UNIT WEIGHT (pcf)	108.8	109.5	
WATER CONTENT (%)	16.6	19.6	
DIAMETER (cm)	7.262	7.262	
LENGTH (cm)	9.605	9.545	
B VALUE PARAMETER:	0.98		
HYDRAULIC GRADIENT (MAXIMUM)	28.12		
PERCENT SATURATION	98.4		(Percent saturation calculation is based on final measurements and a measured specific gravity.)
HYDRAULIC CONDUCTIVITY k (cm/sec)	3.34E-08		

Deaired water was used as the liquid permeant.

HYDRAULIC CONDUCTIVITY DETERMINATION

ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Laboratory Services Group **192 Exchange Blvd** **Glendale Heights, Illinois 60139** **Ph. (630) 717-4263**

TERRACON PROJECT NO. **11215019** **4/9/2021**
PROJECT NAME: **NEWTON POWER STATION**
CLIENT: **RAMBOLL ENVIRN US CORP**
LOCATION : **NEWTON , IL**

SUMMARY OF TEST RESULTS

BORING NO. SB-300

TIME SAMPLED: 8:25

DEPTH: 50.0'-52.0'

CLASSIFICATION GRAY LEAN CLAY WITH SAND

	INITIAL	FINAL	SPECIMEN PHOTO
DRY UNIT WEIGHT (pcf)	122.7	123.5	
WATER CONTENT (%)	12.9	13.3	
DIAMETER (cm)	7.242	7.217	
LENGTH (cm)	10.288	10.288	
B VALUE PARAMETER:	0.98		
HYDRAULIC GRADIENT (MAXIMUM)	19.42		
PERCENT SATURATION	99.1		(Percent saturation calculation is based on final measurements and a measured specific gravity.)
HYDRAULIC CONDUCTIVITY k (cm/sec)	7.29E-08		

Deaired water was used as the liquid permeant.

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Laboratory Services Group **192 Exchange Blvd** **Glendale Heights, Illinois 60139** **Ph. (630) 717-4263**

TERRACON PROJECT NO. **11215019** **4/9/2021**
PROJECT NAME: **NEWTON POWER STATION**
CLIENT: **RAMBOLL ENVIRON US CORP**
LOCATION : **NEWTON, IL**

SUMMARY OF TEST RESULTS

BORING NO. SB-301

TIME SAMPLED: 13:30

DEPTH: 48.0'-50.0'

CLASSIFICATION BROWN AND GRAY SANDY LEAN CLAY

	INITIAL	FINAL	SPECIMEN PHOTO
DRY UNIT WEIGHT (pcf)	117.3	117.7	
WATER CONTENT (%)	14.1	15.8	
DIAMETER (cm)	7.204	7.230	
LENGTH (cm)	10.348	10.239	
B VALUE PARAMETER:	0.99		
HYDRAULIC GRADIENT (MAXIMUM)	19.30		
PERCENT SATURATION	99.6		(Percent saturation calculation is based on final measurements and a measured specific gravity.)
HYDRAULIC CONDUCTIVITY k (cm/sec)	6.63E-08		

Deaired water was used as the liquid permeant.

2021 HYDRAULIC CONDUCTIVITY TEST DATA

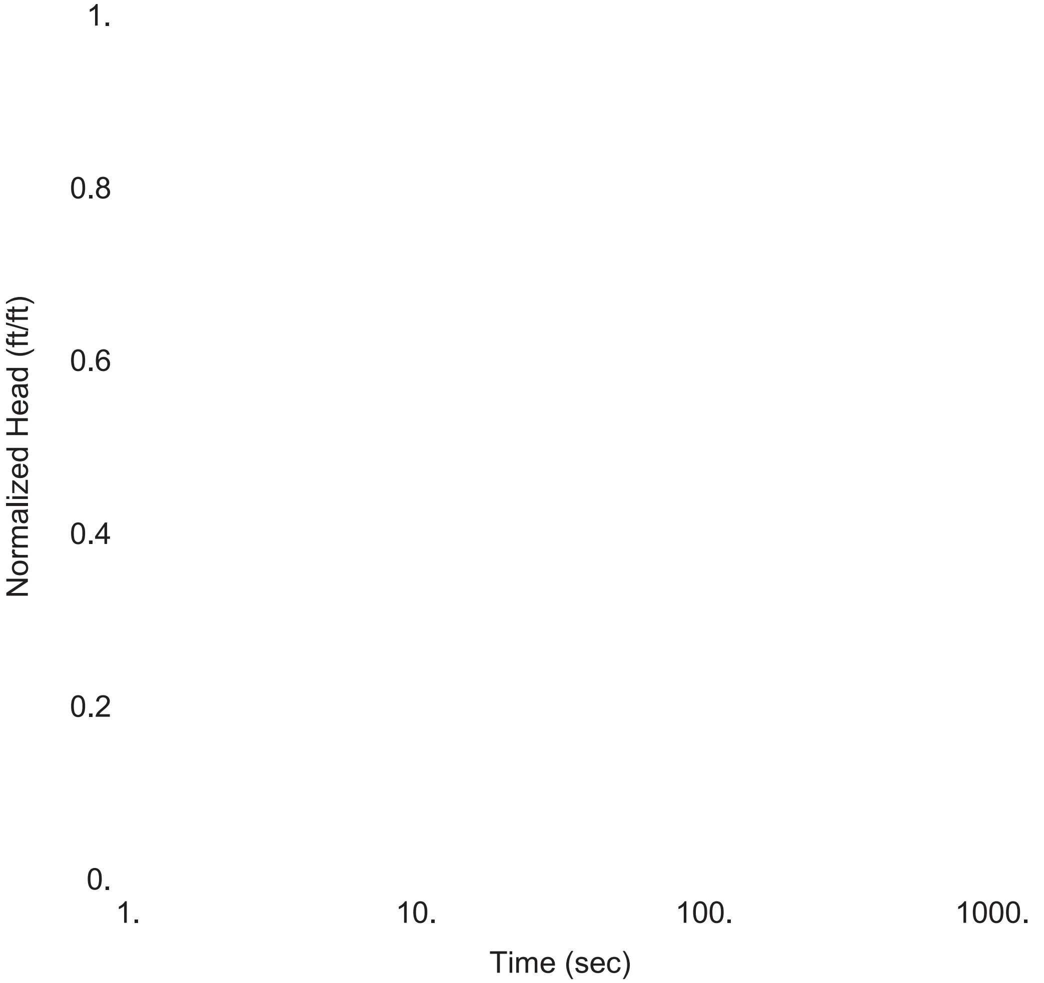
TABLE 3-3. FIELD HYDRAULIC CONDUCTIVITIES
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
NEWTON POWER STATION
PRIMARY ASH POND
NEWTON, ILLINOIS

Well ID	Gradient Position	Bottom of Screen Elevation (ft NAVD88)	Screen Length[1] (ft)	Field Identified Screened Material	Slug Type	Analysis Method	Falling Head (Slug In) K (cm/s)			Rising Head (Slug Out) K (cm/s)			Minimum Hydraulic Conductivity (cm/s)	Maximum Hydraulic Conductivity (cm/s)	Hydraulic Conductivity Geometric Mean (cm/s)
							1	2	3	1	2	3			
Upper Drift Unit/Potential Migration Pathway															
APW5S	U	521.05	10	SP	Solid	C-B-P	8.9E-04	7.4E-04		6.1E-04	8.5E-04		6.1E-04	1.5E-02	3.1E-03
APW12	U	513.33	10	SP	Solid	C-B-P	1.3E-02	9.8E-03		1.3E-02	1.5E-02				
Uppermost Aquifer															
APW11	U	471.05	5	SP-SC/GP	Solid	KGS Model	6.8E-03	5.9E-03		3.5E-03	7.8E-03		2.0E-04	1.5E-01	6.8E-03
APW13	D	471.66	5	SM	Solid	C-B-P	1.6E-03	1.5E-03	3.3E-03	3.8E-03	3.4E-03				
APW14	D	468.85	5	SC	Solid	KGS Model	3.9E-03	4.3E-03		3.2E-04	3.2E-04	2.8E-03			
APW15	D	419.06	5	SP-SM	Solid	KGS Model	4.9E-04	2.0E-04	1.4E-01	1.5E-01	1.5E-01				
APW16	D	443.66	5	SP	Solid	B-Z	1.24E-01	1.41E-01		7.60E-02	7.96E-02				
APW17	D	437.84	5	(SW)g/(SP)g	Solid	C-B-P	1.13E-01	1.15E-02							
APW18	D	460.55	5	(SW)g/SC	Solid	C-B-P	2.67E-04								
Ash Pond															
XPW01	CCR	531.62	10	(SW)g	Solid	Bouwer-Rice	1.8E-01	1.3E-02		2.4E-02	1.4E-02		1.0E-03	2.3E-01	2.0E-02
XPW02	CCR	535.97	10	(SW)g	Solid	Bouwer-Rice	2.0E-03	2.6E-03							
XPW03	CCR	530.81	10	(SW)g/SP	Solid	Bouwer-Rice	5.7E-02	7.2E-02	2.3E-01	1.5E-01	1.2E-01	1.4E-01			
XPW04	CCR	531.90	10	(SW)g	Solid	KGS Model		2.1E-03		1.2E-03	1.0E-03				

[O: SSW 7/1/20; U:SSW 8/20/21; C:LDC 08/31/21]

Notes:
[1] All wells are constructed from 2 inch PVC with 0.01 inch slotted screens.
Test not analyzed/performed
B-Z = Butler-Zhan Test Solution
C-B-P = Cooper-Bredehoeft-Papadopulos Slug Test Solution
CCR = coal combustion residuals
cm/s = centimeters per second
D = downgradient
ft = foot/feet
K = hydraulic conductivity
KGS = Kansas Geological Survey
NAVD88 = North American Vertical Datum of 1988
U = upgradient

USCS = Unified Soil Classification System
GP = Poorly Graded Gravel
SC = Clayey Sand
SM = Silty Sand
SP = Poorly Graded Sand
SP-SC = Poorly Graded Sand to Clayey Sand
SP-SM = Poorly Graded Sand with Silt
(SW)g = Well Graded Sand with Gravel



APW-5S FH1

Data Set: \...\NEW_APW-5S FH1_07202021.aqt
Date: 10/21/21 Time: 14:56:12

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-5S
Test Date: 2/16/2021

AQUIFER DATA

Saturated Thickness: 3.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-5S)

Initial Displacement: 0.986 ft
Static Water Column Height: 12.6 ft
Total Well Penetration Depth: 3.2 ft
Screen Length: 3.2 ft
Casing Radius: 0.08625 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

$T = 0.087\ \mathrm{cm}^2/\mathrm{sec}$

$S = 0.000403$

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.087	cm^2/sec
S	0.000403	

K = T/b = 0.000892 cm/sec
Ss = S/b = 0.0001259 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.08962	0.02397	+/- 0.04765	3.739	cm^2/sec

```
        S          0.0003389      0.000496    +/- 0.0009861      0.6832
```

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0009188 cm/sec
Ss = S/b = 0.0001059 1/ft

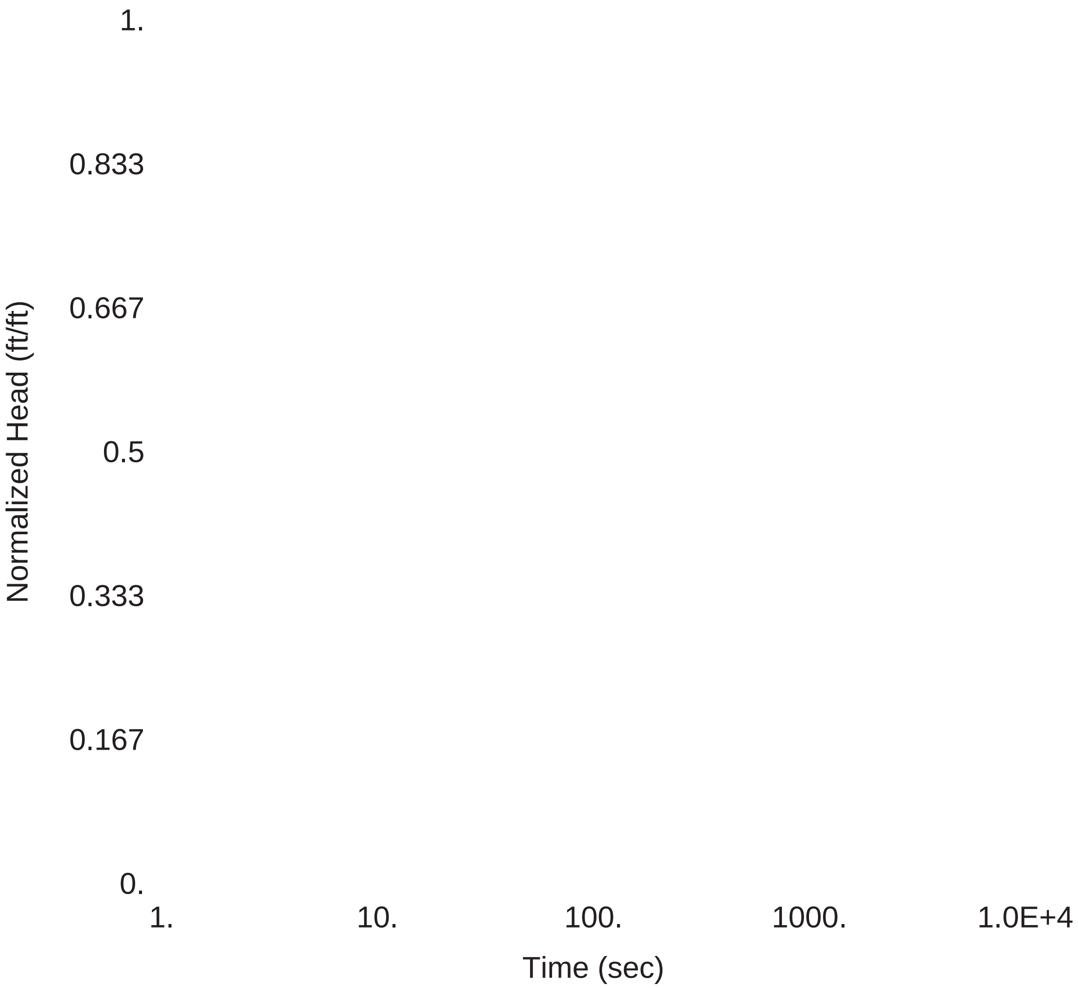
Parameter Correlations

	T	S
T	1.00	-0.97
S	-0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares.....	0.9777 ft^2
Variance..................	0.01124 ft^2
Std. Deviation.........	0.106 ft
Mean........................	0.01073 ft
No. of Residuals.....	89
No. of Estimates.....	2



APW-5S FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-5S
Test Date: 2/16/2021

AQUIFER DATA

Saturated Thickness: 3.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-5S)

Initial Displacement: 1.01 ft
Static Water Column Height: 12.6 ft
Total Well Penetration Depth: 3.2 ft
Screen Length: 3.2 ft
Casing Radius: 0.086 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.0718 cm^2/sec
S = 0.000454

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
21.	0.799	419.5	0.125
22.5	0.787	449.5	0.113
24.	0.777	481.5	0.104
25.	0.769	516.5	0.093
27.	0.758	554.	0.085
28.5	0.748	595.	0.076
30.	0.737	639.5	0.069
32.	0.725	687.5	0.06
34.	0.714	739.5	0.053
36.	0.702	796.	0.047
38.	0.691	857.5	0.042
40.	0.68	924.	0.036
42.5	0.666	997.	0.03
45.	0.655	1076.	0.025
47.5	0.642	1162.5	0.02
50.5	0.629	1257.	0.017
53.	0.618	1360.	0.015
56.5	0.603	1472.5	0.011
59.5	0.59	1595.5	0.006
63.	0.576	1730.	0.006
66.5	0.563	1877.5	0.007

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0718	cm^2/sec
S	0.000454	

K = T/b = 0.0007361 cm/sec
Ss = S/b = 0.0001419 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.07177	0.01724	+/- 0.03421	4.163	cm^2/sec
S	0.0004536	0.0005595	+/- 0.00111	0.8107	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0007359 cm/sec
Ss = S/b = 0.0001418 1/ft

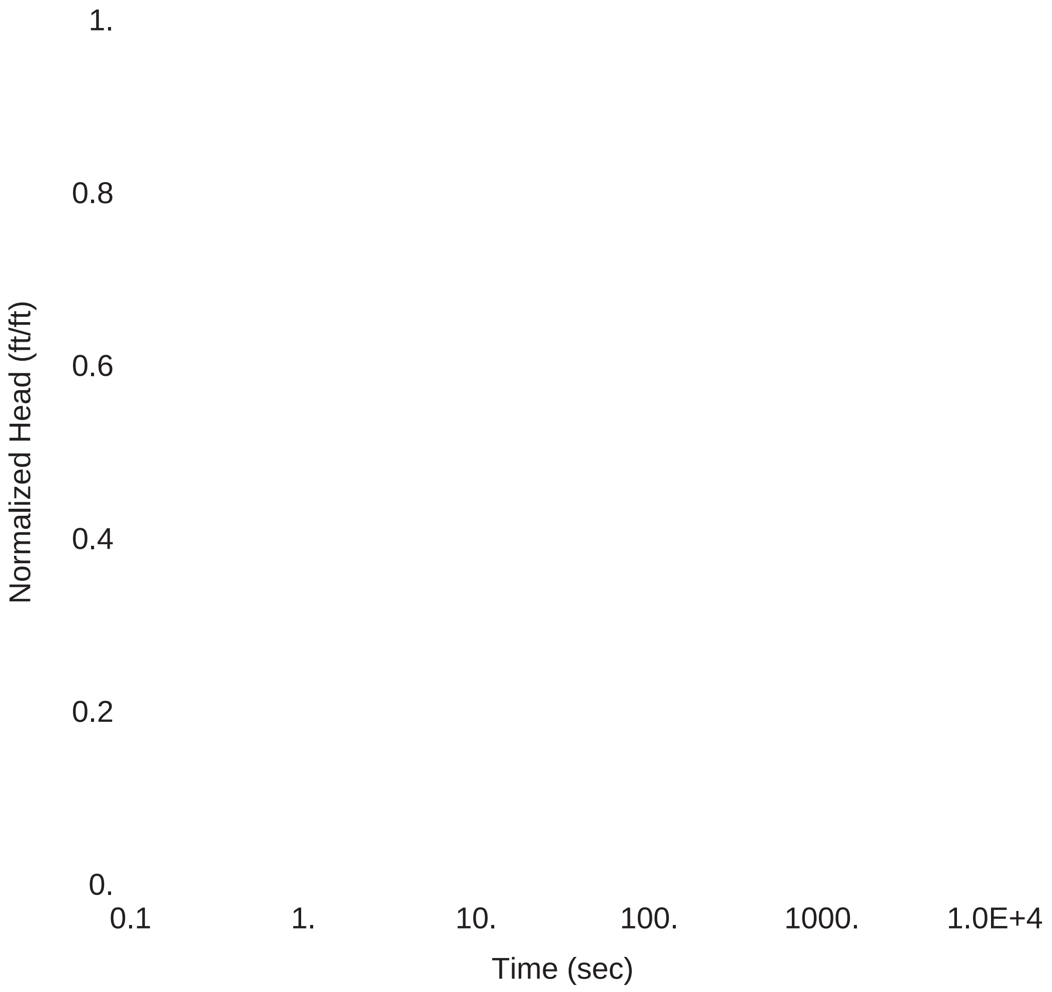
Parameter Correlations

	T	S
T	1.00	-0.97
S	-0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . . 1.028 ft^2
Variance . . . . 0.01049 ft^2



APW-5S RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-5S
Test Date: 2/16/2021

AQUIFER DATA

Saturated Thickness: 3.2 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-5S)

Initial Displacement: 1.1 ft
Total Well Penetration Depth: 3.2 ft
Casing Radius: 0.08625 ft

Static Water Column Height: 12.6 ft
Screen Length: 3.2 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.0591 cm^2/sec

S = 0.00178

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
20.	0.842	366.5	0.155
21.	0.833	392.	0.142
22.5	0.818	419.5	0.129
24.	0.809	449.5	0.117
25.	0.8	481.5	0.105
27.	0.786	516.5	0.097
28.5	0.776	554.	0.088
30.	0.765	595.	0.078
32.	0.754	639.5	0.069
34.	0.743	687.5	0.061
36.	0.73	739.5	0.054
38.	0.718	796.	0.046
40.	0.706	857.5	0.038
42.5	0.695	924.	0.033
45.	0.681	997.	0.025
47.5	0.668	1076.	0.02
50.5	0.655	1162.5	0.016
53.	0.645	1257.	0.012
56.5	0.63	1360.	0.005
59.5	0.616		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0591	cm^2/sec
S	0.00178	

K = T/b = 0.0006059 cm/sec
Ss = S/b = 0.0005562 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.05907	0.01974	+/- 0.03919	2.992	cm^2/sec
S	0.001784	0.002265	+/- 0.004496	0.7877	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0006056 cm/sec
Ss = S/b = 0.0005575 1/ft

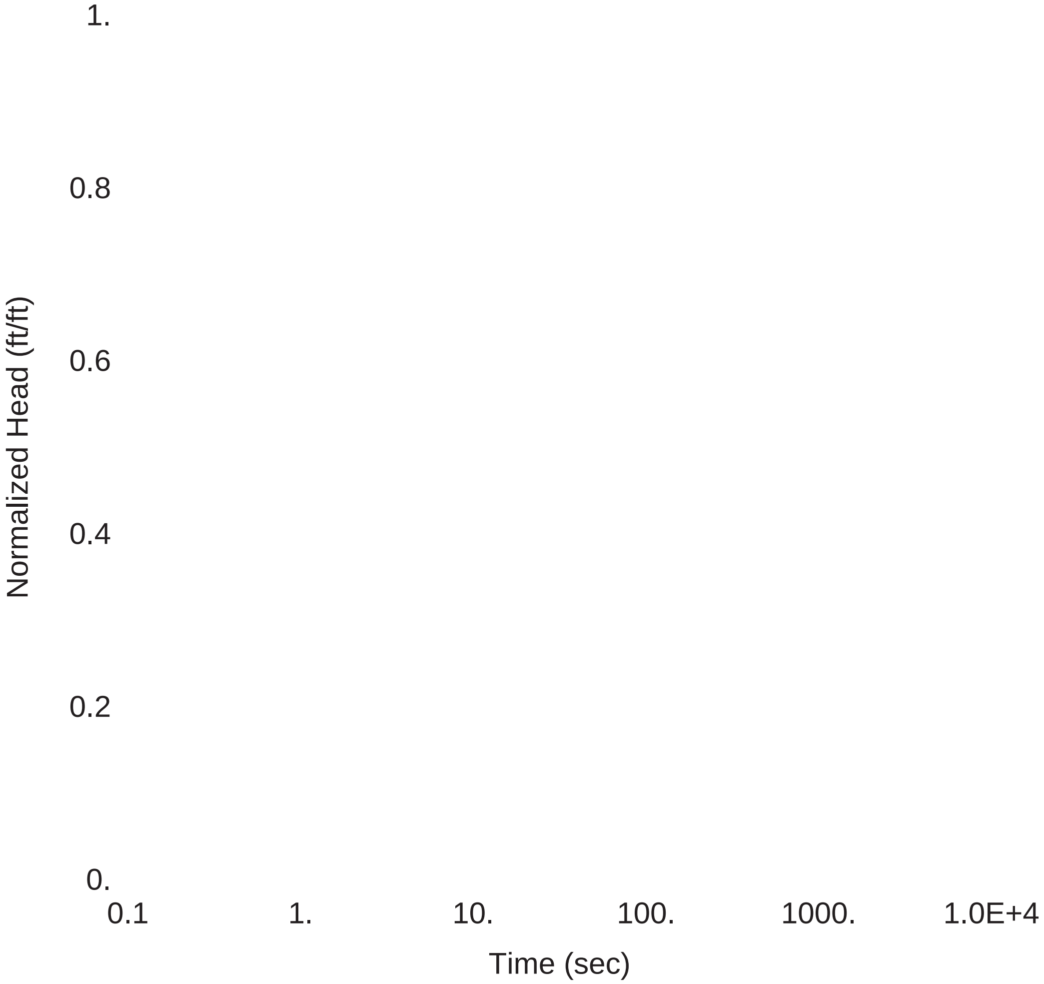
Parameter Correlations

	T	S
T	1.00	-0.96
S	-0.96	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . . 2.725 ft^2
Variance . . . . 0.02869 ft^2
Std. Deviation . . . . 0.1694 ft



APW-5S RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-5S
Test Date: 2/16/2021

AQUIFER DATA

Saturated Thickness: 3.2 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-5S)

Initial Displacement: 1.13 ft
Total Well Penetration Depth: 3.2 ft
Casing Radius: 0.08625 ft

Static Water Column Height: 12.6 ft
Screen Length: 3.2 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.0825 cm^2/sec

S = 0.000391

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
20.	0.885	281.5	0.185
21.	0.876	300.5	0.169
22.5	0.858	321.	0.152
24.	0.848	343.	0.134
25.	0.84	366.5	0.119
27.	0.826	392.	0.108
28.5	0.815	419.5	0.096
30.	0.803	449.5	0.079
32.	0.79	481.5	0.064
34.	0.778	516.5	0.051
36.	0.766	554.	0.043
38.	0.754	595.	0.029
40.	0.742	639.5	0.021
42.5	0.728	687.5	0.01
45.	0.715	739.5	0.005
47.5	0.701		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0825	cm^2/sec
S	0.000391	

K = T/b = 0.0008458 cm/sec
Ss = S/b = 0.0001222 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.08245	0.03155	+/- 0.06271	2.614	cm^2/sec
S	0.0003915	0.0007946	+/- 0.00158	0.4927	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0008454 cm/sec
Ss = S/b = 0.0001223 1/ft

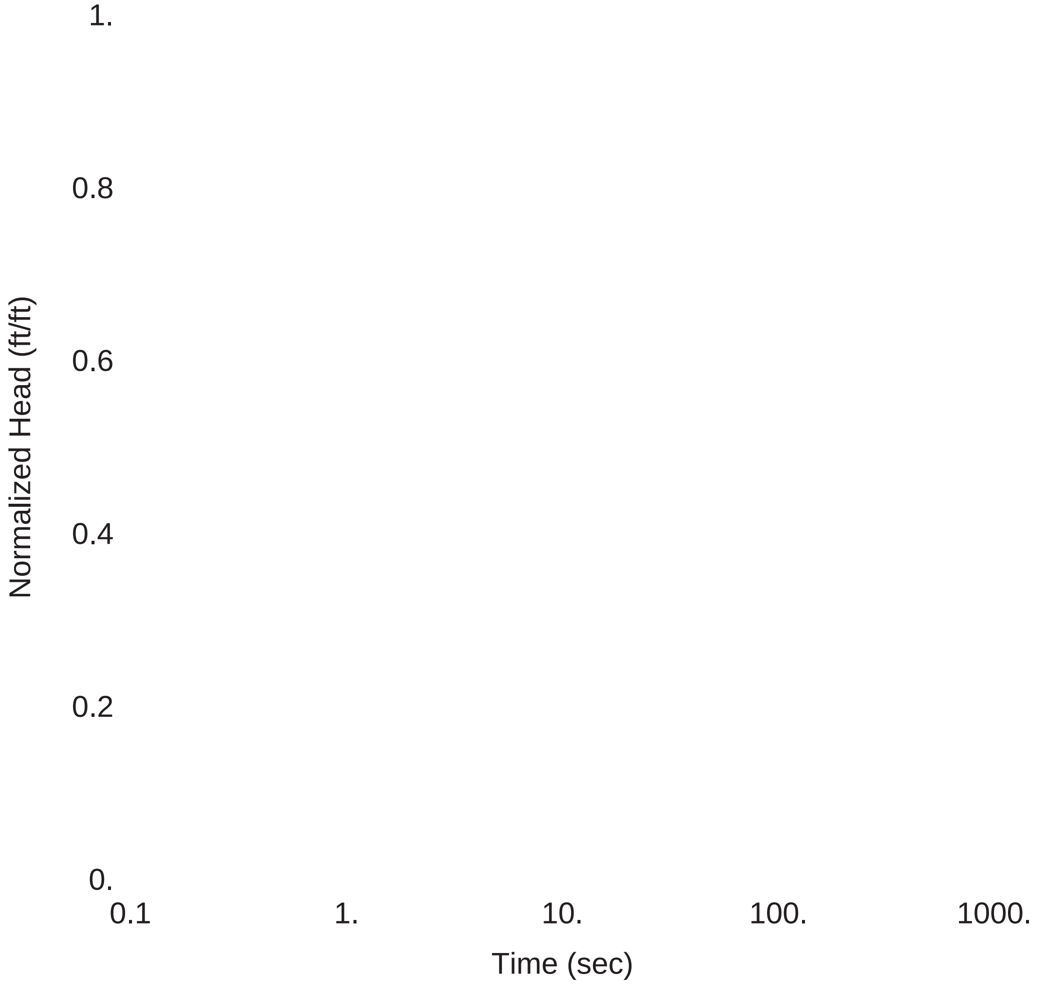
Parameter Correlations

	T	S
T	1.00	-0.97
S	-0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . . 2.682 ft^2
Variance . . . . 0.03083 ft^2
Std. Deviation . . . . 0.1756 ft
Mean . . . . -0.02888 ft
No. of Residuals 89
No. of Estimates 2



APW-11 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-11
Test Date: 3/11/2021

AQUIFER DATA

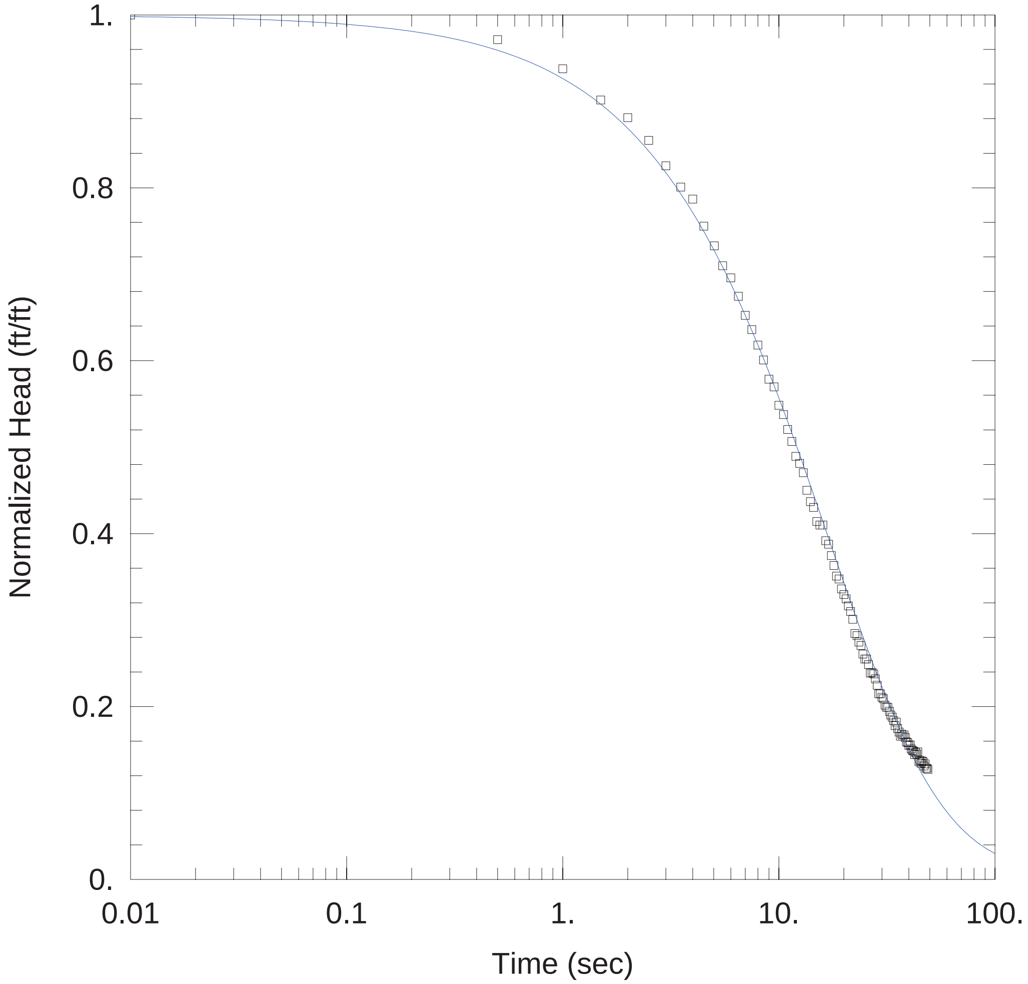
Saturated Thickness: 9.2 ft

WELL DATA (APW-11)

Initial Displacement: 0.98 ft	Static Water Column Height: 43.37 ft
Total Well Penetration Depth: 7. ft	Screen Length: 5. ft
Casing Radius: 0.086 ft	Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined	Solution Method: KGS Model
Kr = 0.0078 cm/sec	Ss = 1.09E-9 ft^{-1}
Kz/Kr = 1.	



APW-11 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-11
Test Date: 3/11/2021

AQUIFER DATA

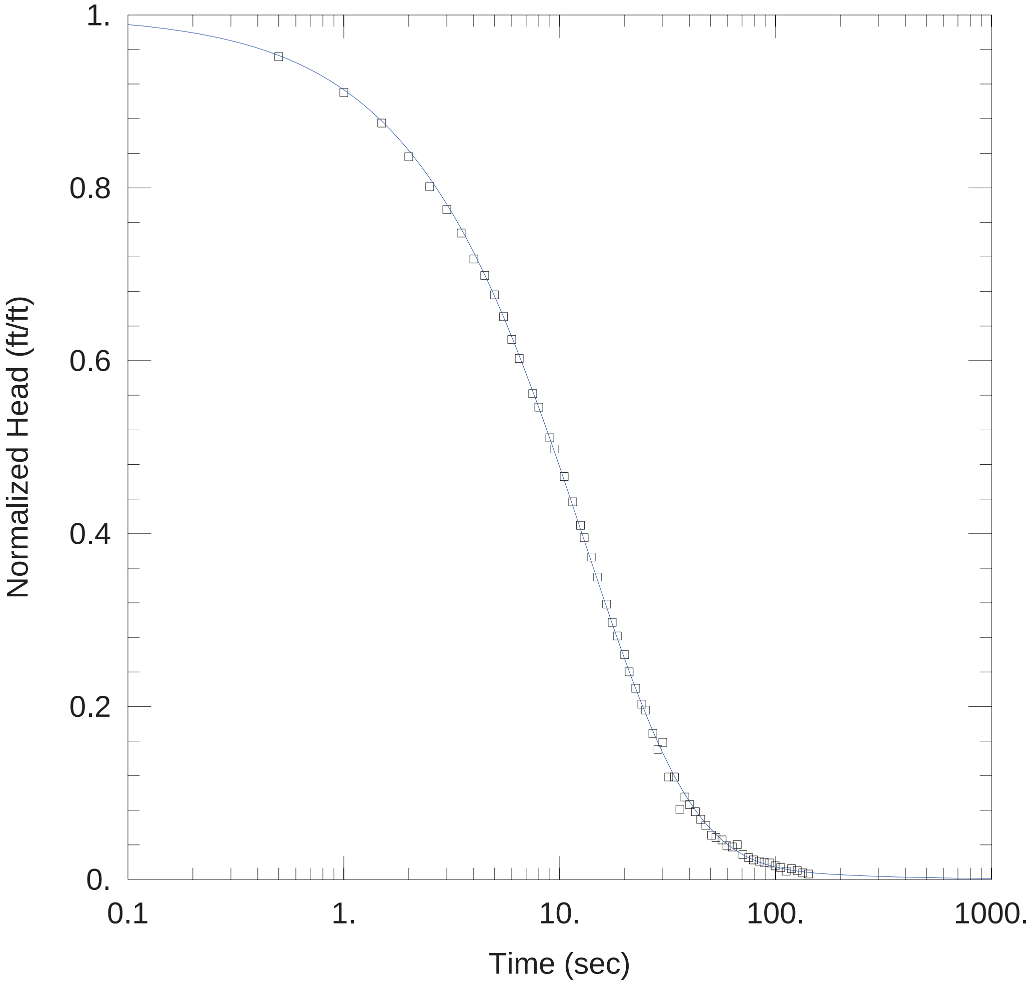
Saturated Thickness: 9.2 ft

WELL DATA (APW-11)

Initial Displacement: 1.22 ft	Static Water Column Height: 43.53 ft
Total Well Penetration Depth: 7. ft	Screen Length: 5. ft
Casing Radius: 0.086 ft	Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined	Solution Method: KGS Model
Kr = 0.00351 cm/sec	Ss = 6.23E-6 ft^{-1}
Kz/Kr = 1.	



APW-11 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-11
Test Date: 3/11/2021

AQUIFER DATA

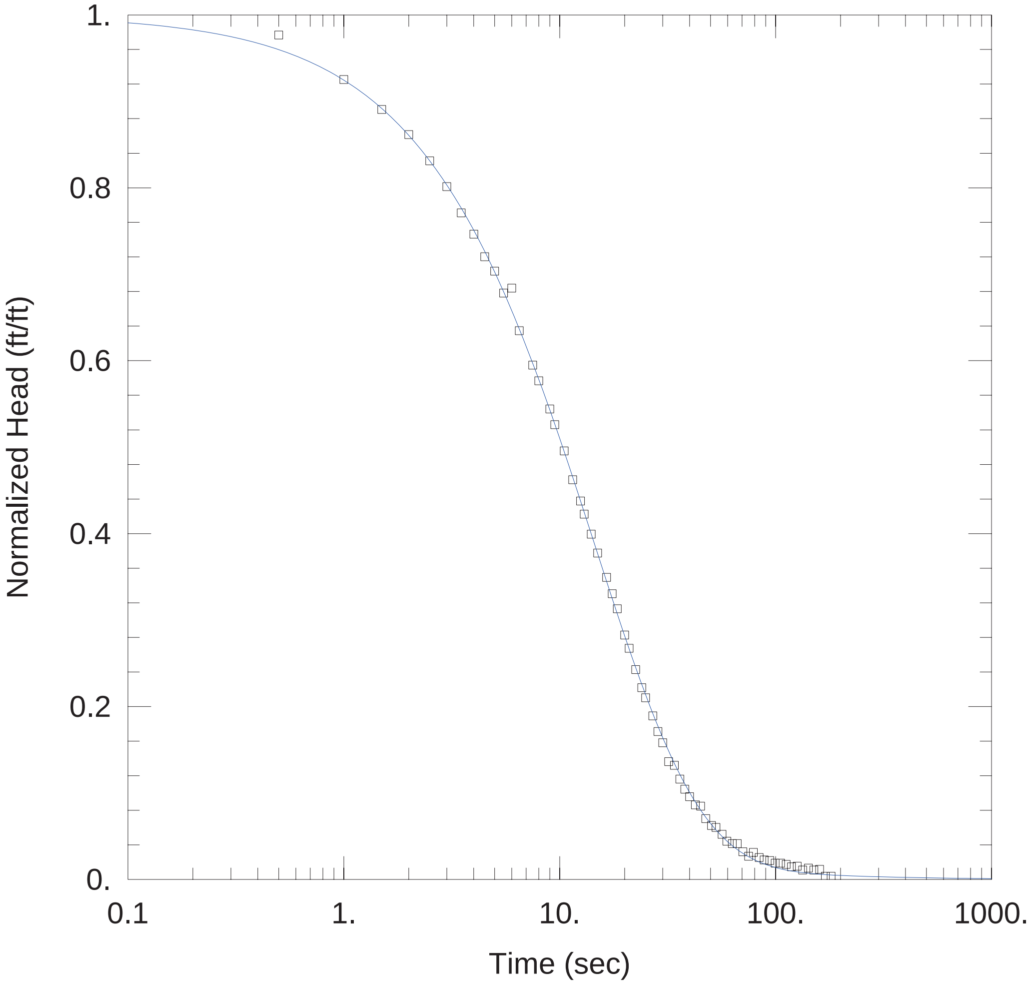
Saturated Thickness: 9.2 ft

WELL DATA (APW-11)

Initial Displacement: 1.47 ft	Static Water Column Height: 43.48 ft
Total Well Penetration Depth: 7. ft	Screen Length: 5. ft
Casing Radius: 0.086 ft	Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined	Solution Method: KGS Model
Kr = 0.00588 cm/sec	Ss = 3.02E-7 ft^{-1}
Kz/Kr = 1.	



APW-11 RH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-11
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 9.2 ft

WELL DATA (APW-11 RH02)

Initial Displacement: 1.38 ft
Total Well Penetration Depth: 7. ft
Casing Radius: 0.086 ft

Static Water Column Height: 43.53 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

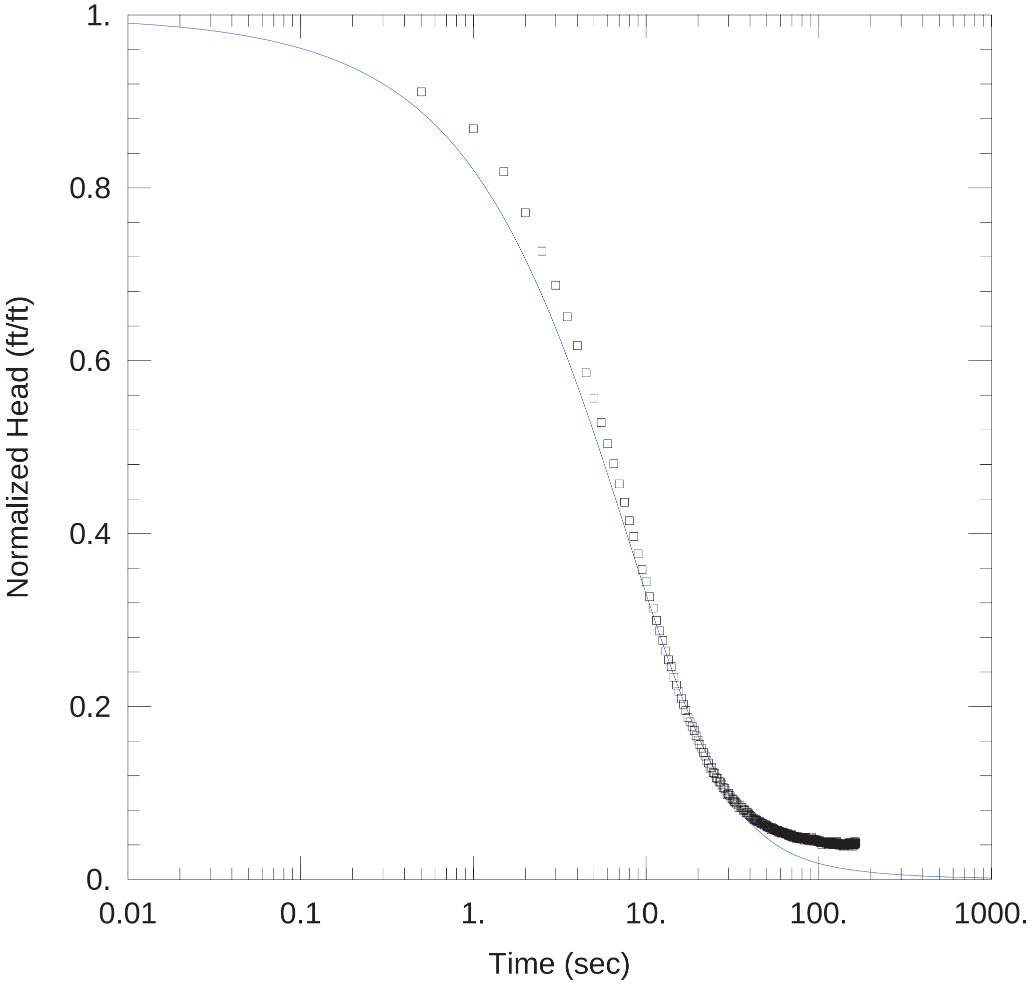
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00676 cm/sec
Kz/Kr = 1.

Ss = 6.55E-9 ft^{-1}



APW-12 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-12
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-12)

Initial Displacement: 0.988 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.086 ft
Static Water Column Height: 19.03 ft
Screen Length: 3.5 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.05 cm^2/sec
S = 0.000733

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
75.5	0.049	160.5	0.041
76.	0.047	161.	0.04
76.5	0.047	161.5	0.043
77.	0.047	162.	0.04
77.5	0.048	162.5	0.041
78.	0.047	163.	0.041
78.5	0.047	163.5	0.041
79.	0.047	164.	0.042
79.5	0.046		

SOLUTION

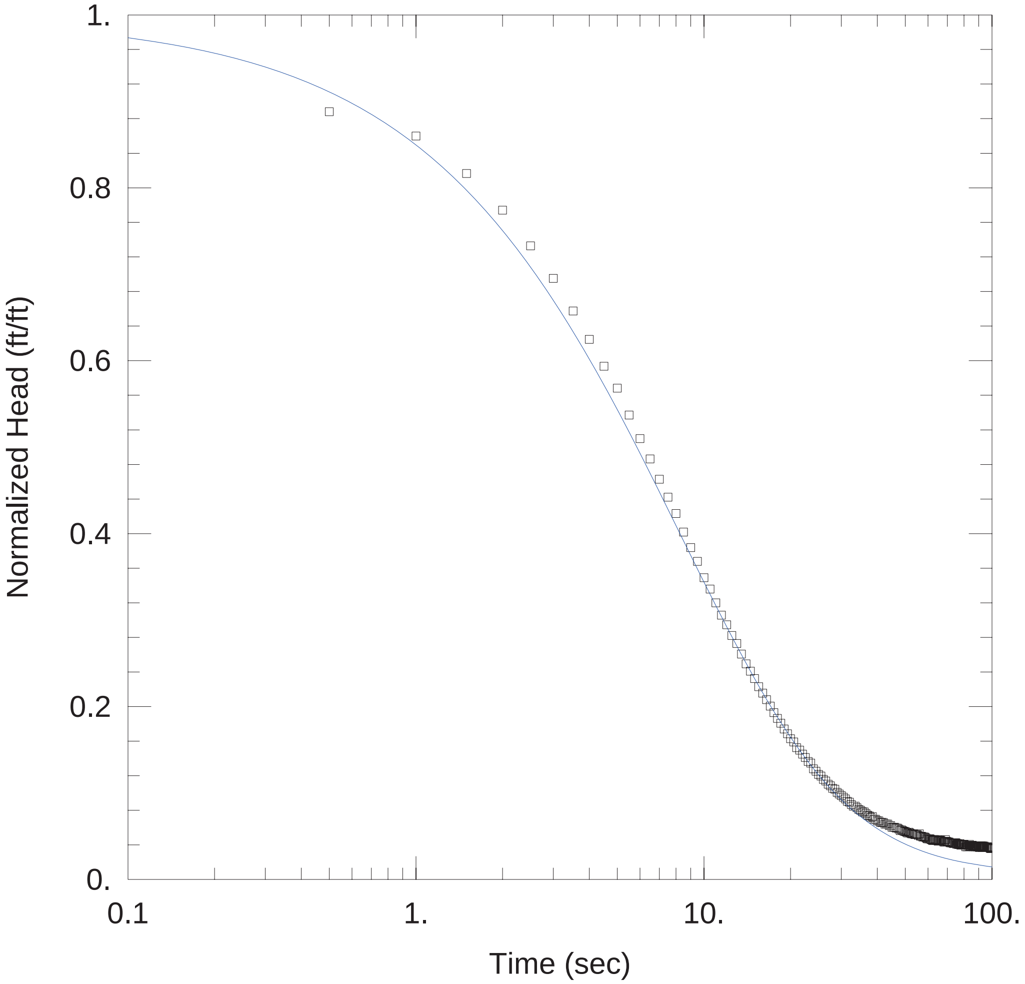
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.05	cm^2/sec
S	0.000733	

K = T/b = 0.009843 cm/sec
Ss = S/b = 0.0002094 1/ft



APW-12 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-12
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-12)

Initial Displacement: 1.063 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 19.06 ft
Screen Length: 3.5 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.35 cm^2/sec
S = 0.000108

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
40.	0.072	94.5	0.04
40.5	0.072	95.	0.04
41.	0.07	95.5	0.04
41.5	0.07	96.	0.04
42.	0.07	96.5	0.039
42.5	0.068	97.	0.039
43.	0.068	97.5	0.039
43.5	0.068	98.	0.04
44.	0.066	98.5	0.038
44.5	0.066	99.	0.038
45.	0.064	99.5	0.038
45.5	0.064	100.	0.039
46.	0.064	100.5	0.036
46.5	0.063	101.	0.038

SOLUTION

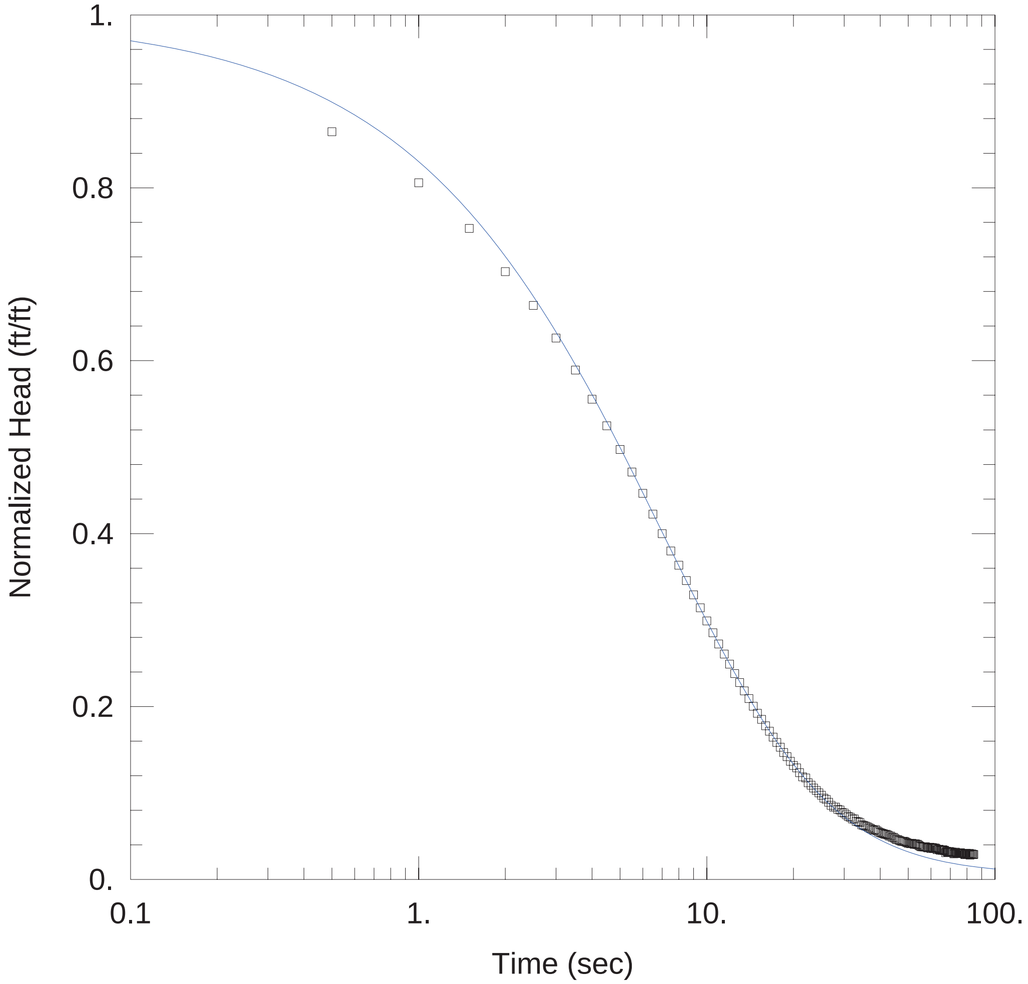
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.35	cm^2/sec
S	0.000108	

K = T/b = 0.01265 cm/sec
Ss = S/b = 3.086E-5 1/ft



APW-12 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-12
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-12)

Initial Displacement: -1.458 ft
Static Water Column Height: 19.06 ft
Total Well Penetration Depth: 3.5 ft
Screen Length: 3.5 ft
Casing Radius: 0.08625 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.57 cm^2/sec
S = 0.000114

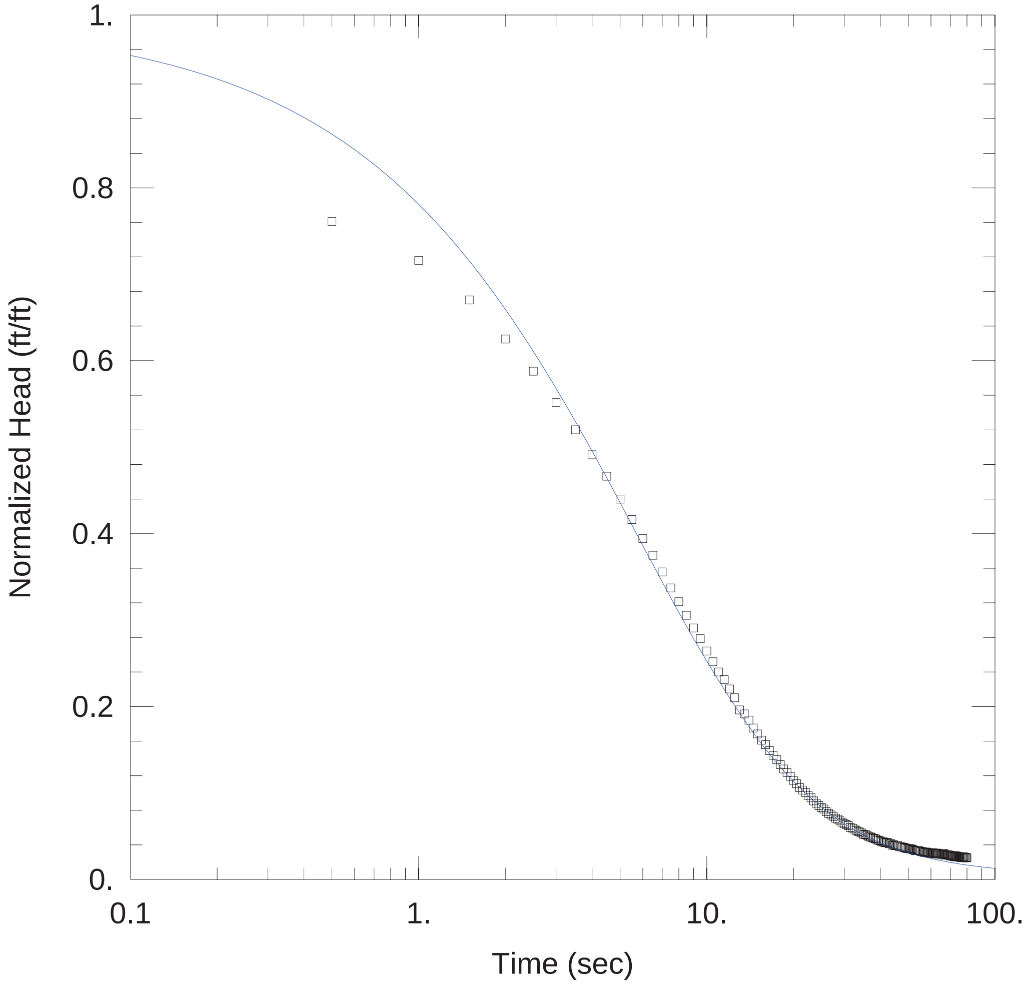
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.57	cm^2/sec
S	0.000114	

K = T/b = 0.01472 cm/sec
Ss = S/b = 3.257E-5 1/ft



APW-12 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-12
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-12)

Initial Displacement: -1.771 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 19.06 ft
Screen Length: 3.5 ft
Well Radius: 0.25 ft

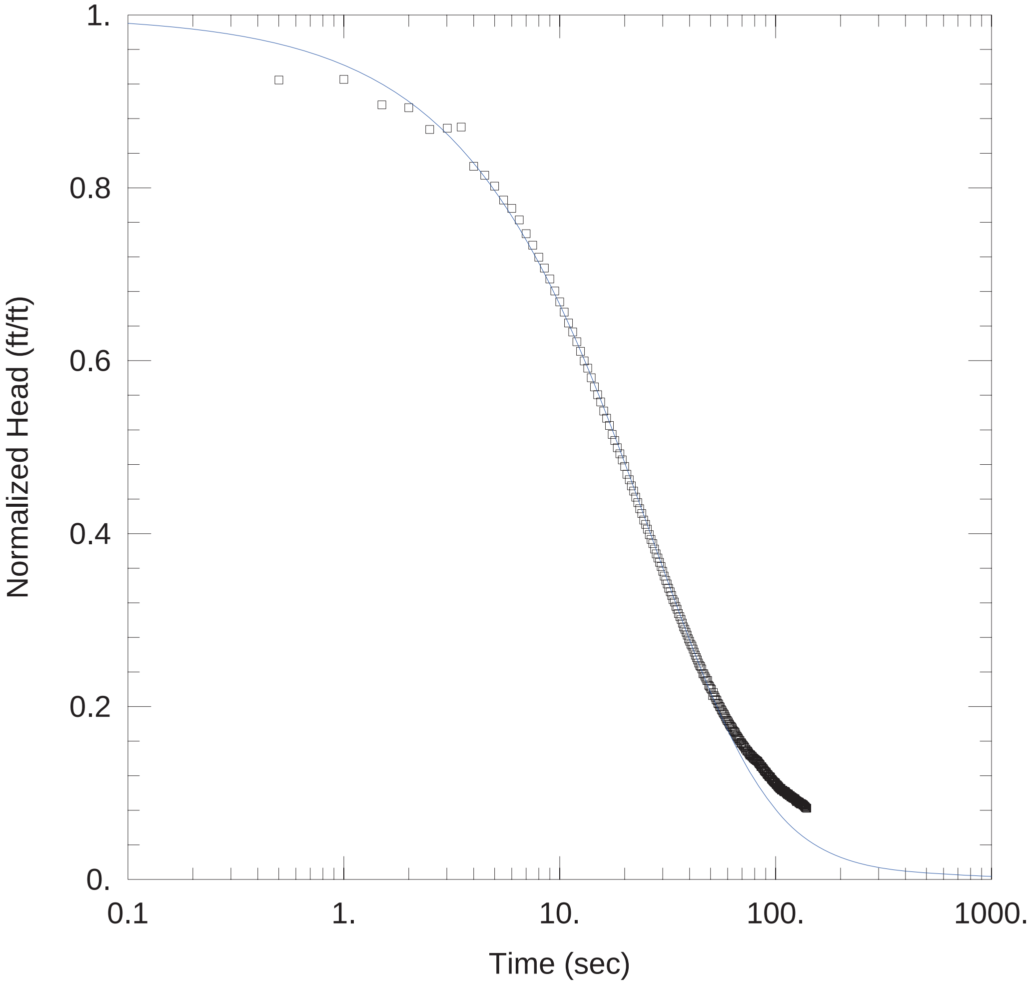
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.433 cm^2/sec
S = 0.000733

Estimated Parameters

Parameter	Estimate	
T	1.433	cm^2/sec
S	0.000733	

K = T/b = 0.01343 cm/sec
Ss = S/b = 0.0002094 1/ft



APW-13 FH-01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-13
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 7.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-13)

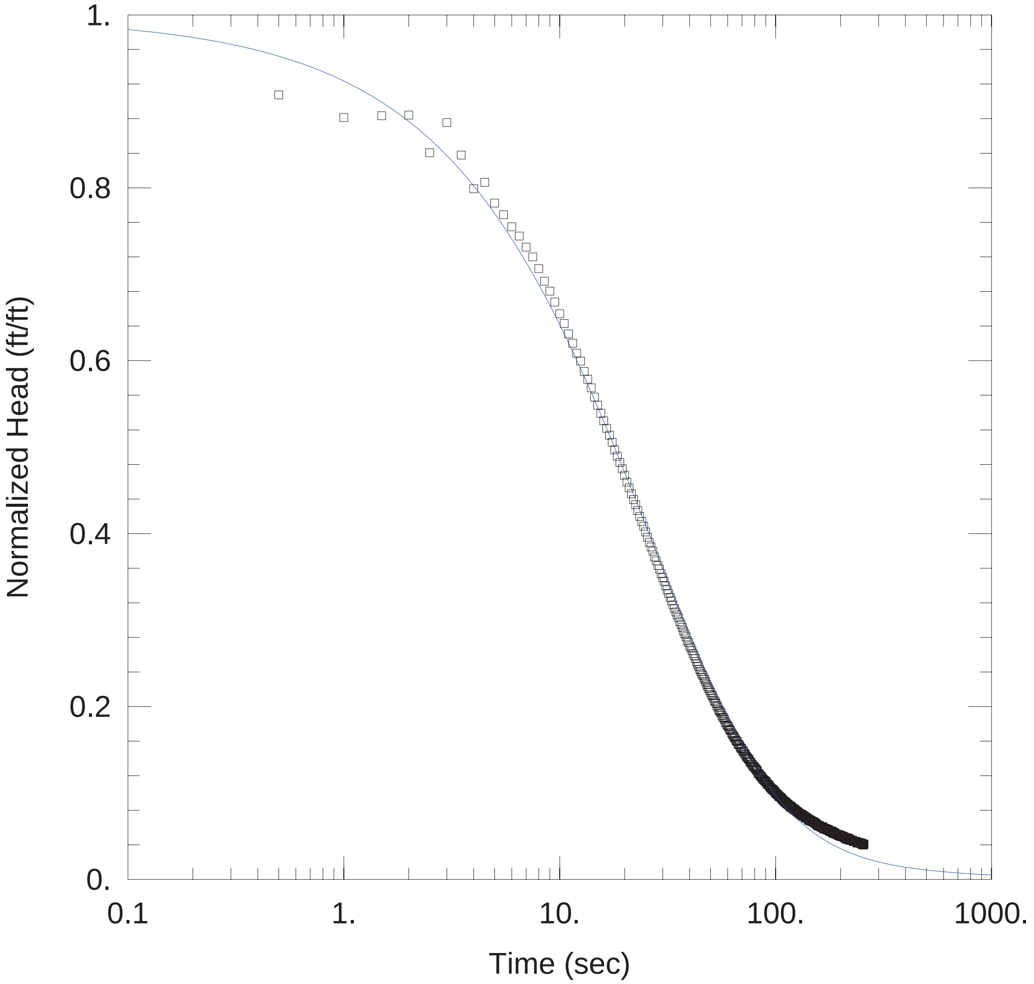
Initial Displacement: 1.434 ft
Static Water Column Height: 34.23 ft
Total Well Penetration Depth: 5.9 ft
Screen Length: 5. ft
Casing Radius: 0.08625 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.475 cm^2/sec
S = 4.47E-5

S	4.47E-5

K = T/b = 0.002106 cm/sec
Ss = S/b = 6.041E-6 1/ft



APW-13 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-13
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 7.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-13)

Initial Displacement: 1.493 ft
Static Water Column Height: 34.26 ft
Total Well Penetration Depth: 5.9 ft
Screen Length: 5. ft
Casing Radius: 0.086 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.329 cm^2/sec
S = 0.000562

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
106.	0.141	238.5	0.064
106.5	0.14	239.	0.063
107.	0.139	239.5	0.064
107.5	0.138	240.	0.063
108.	0.137	240.5	0.064
108.5	0.137	241.	0.063
109.	0.136	241.5	0.063
109.5	0.135	242.	0.063
110.	0.134	242.5	0.064
110.5	0.134	243.	0.063
111.	0.134	243.5	0.063
111.5	0.132	244.	0.064
112.	0.133	244.5	0.063
112.5	0.131	245.	0.063
113.	0.13	245.5	0.063
113.5	0.13	246.	0.062
114.	0.13	246.5	0.063
114.5	0.129	247.	0.063
115.	0.129	247.5	0.063
115.5	0.127	248.	0.062
116.	0.127	248.5	0.062
116.5	0.126	249.	0.063
117.	0.127	249.5	0.062
117.5	0.124	250.	0.062
118.	0.125	250.5	0.061
118.5	0.125	251.	0.062
119.	0.125	251.5	0.062
119.5	0.123	252.	0.06
120.	0.123	252.5	0.061
120.5	0.123	253.	0.061
121.	0.121	253.5	0.06
121.5	0.121	254.	0.061
122.	0.122	254.5	0.061
122.5	0.12	255.	0.061
123.	0.12	255.5	0.06
123.5	0.119	256.	0.059
124.	0.119	256.5	0.061
124.5	0.119	257.	0.061

SOLUTION

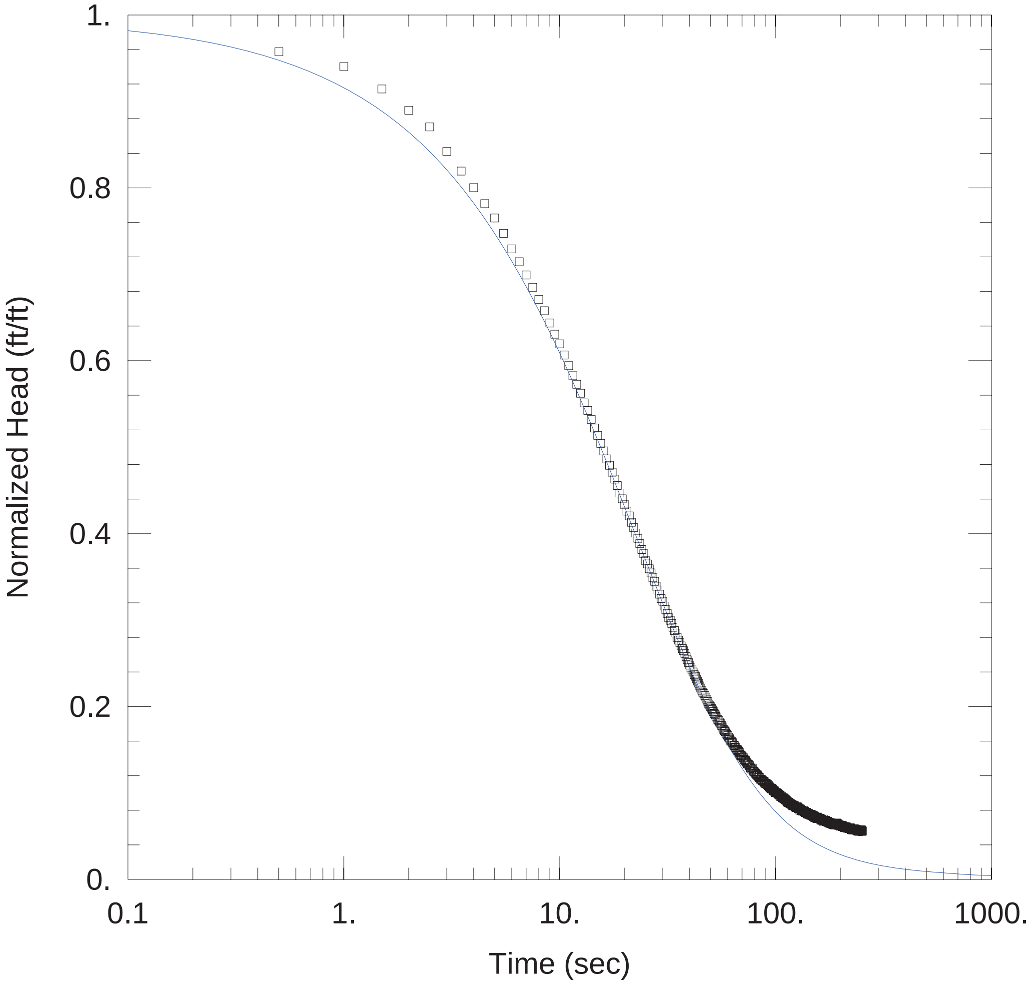
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.329	cm^2/sec
S	0.000562	

K = T/b = 0.001459 cm/sec
Ss = S/b = 7.595E-5 1/ft



APW-13 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-13
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 7.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-13)

Initial Displacement: -1.622 ft
Total Well Penetration Depth: 5.9 ft
Casing Radius: 0.086 ft
Static Water Column Height: 34.22 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.384 cm^2/sec
S = 0.000541

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
106.5	-0.155	236.5	-0.093
107.	-0.155	237.	-0.094
107.5	-0.153	237.5	-0.093
108.	-0.153	238.	-0.092
108.5	-0.152	238.5	-0.091
109.	-0.153	239.	-0.092
109.5	-0.152	239.5	-0.092
110.	-0.151	240.	-0.091
110.5	-0.15	240.5	-0.092
111.	-0.149	241.	-0.092
111.5	-0.149	241.5	-0.093
112.	-0.149	242.	-0.092
112.5	-0.147	242.5	-0.09
113.	-0.146	243.	-0.092
113.5	-0.146	243.5	-0.092
114.	-0.144	244.	-0.091
114.5	-0.145	244.5	-0.093
115.	-0.145	245.	-0.091
115.5	-0.144	245.5	-0.093
116.	-0.143	246.	-0.093
116.5	-0.142	246.5	-0.092
117.	-0.142	247.	-0.092
117.5	-0.142	247.5	-0.093
118.	-0.141	248.	-0.092
118.5	-0.141	248.5	-0.092
119.	-0.14	249.	-0.092
119.5	-0.14	249.5	-0.093
120.	-0.138	250.	-0.092
120.5	-0.139	250.5	-0.092
121.	-0.139	251.	-0.091
121.5	-0.139	251.5	-0.09
122.	-0.138	252.	-0.091
122.5	-0.138	252.5	-0.091

SOLUTION

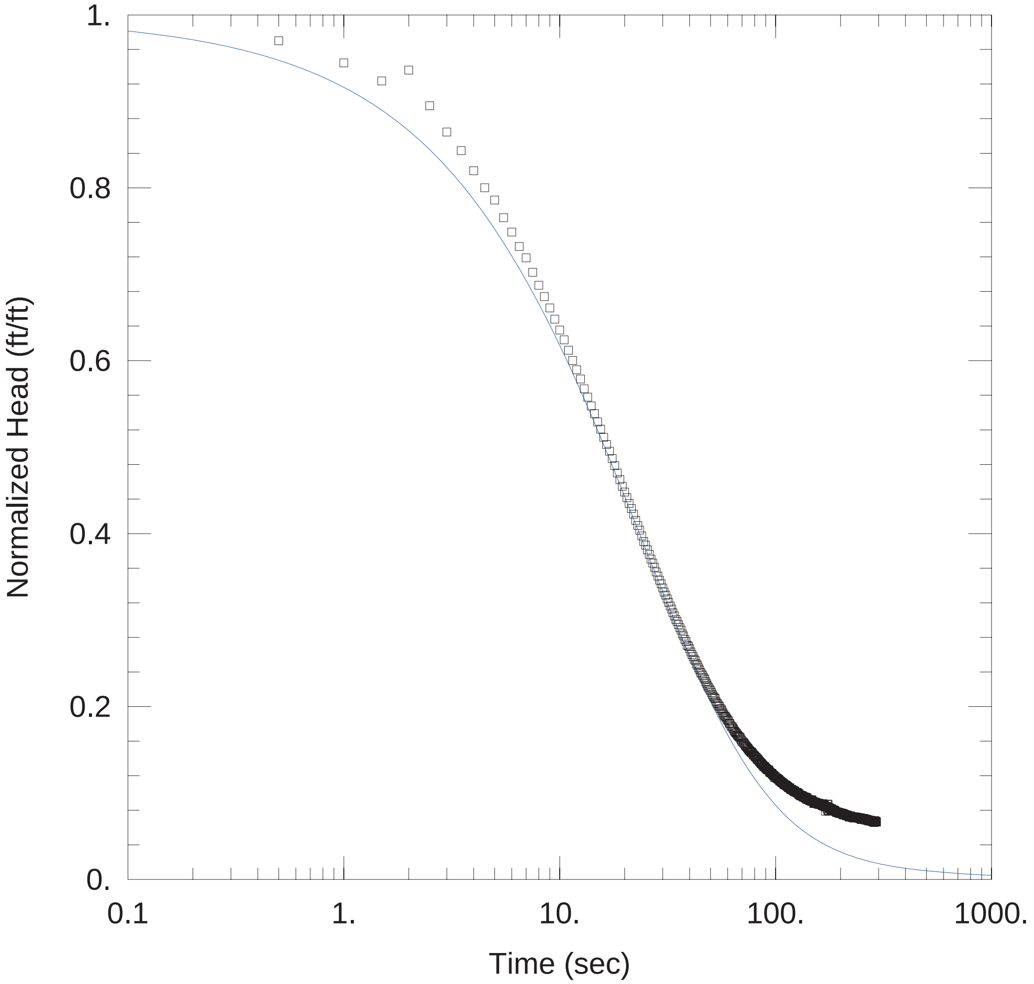
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.384	cm^2/sec
S	0.000541	

K = T/b = 0.001702 cm/sec
Ss = S/b = 7.311E-5 1/ft



APW-13 RH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-13
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 7.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-13)

Initial Displacement: -1.676 ft
Total Well Penetration Depth: 5.9 ft
Casing Radius: 0.086 ft
Static Water Column Height: 34.26 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.353 cm^2/sec
S = 0.000661

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
140.	-0.157	290.5	-0.111
140.5	-0.156	291.	-0.112
141.	-0.155	291.5	-0.113
141.5	-0.155	292.	-0.112
142.	-0.155	292.5	-0.111
142.5	-0.155	293.	-0.112
143.	-0.154	293.5	-0.111
143.5	-0.153		

SOLUTION

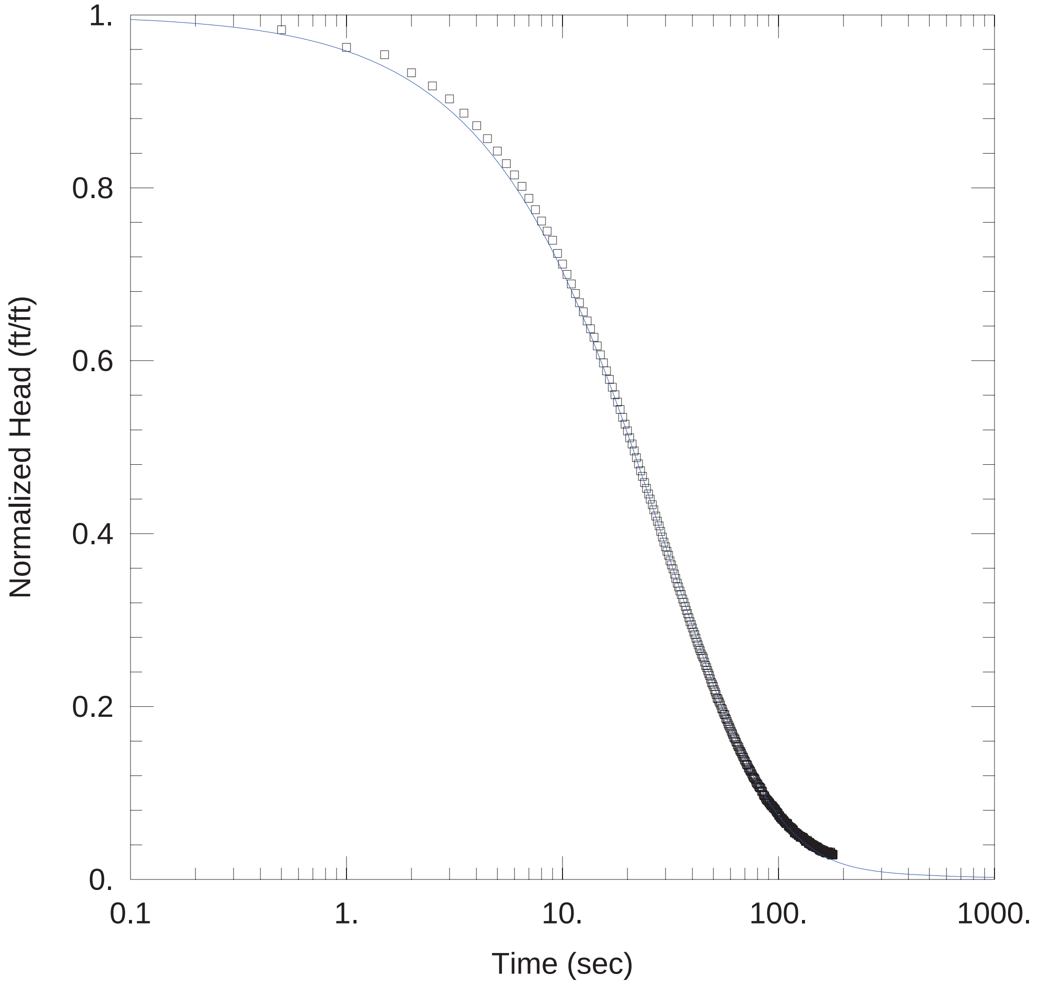
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.353	cm^2/sec
S	0.000661	

K = T/b = 0.001565 cm/sec
Ss = S/b = 8.932E-5 1/ft



APW-14 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

Initial Displacement: 1.523 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.086 ft

Static Water Column Height: 36.72 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

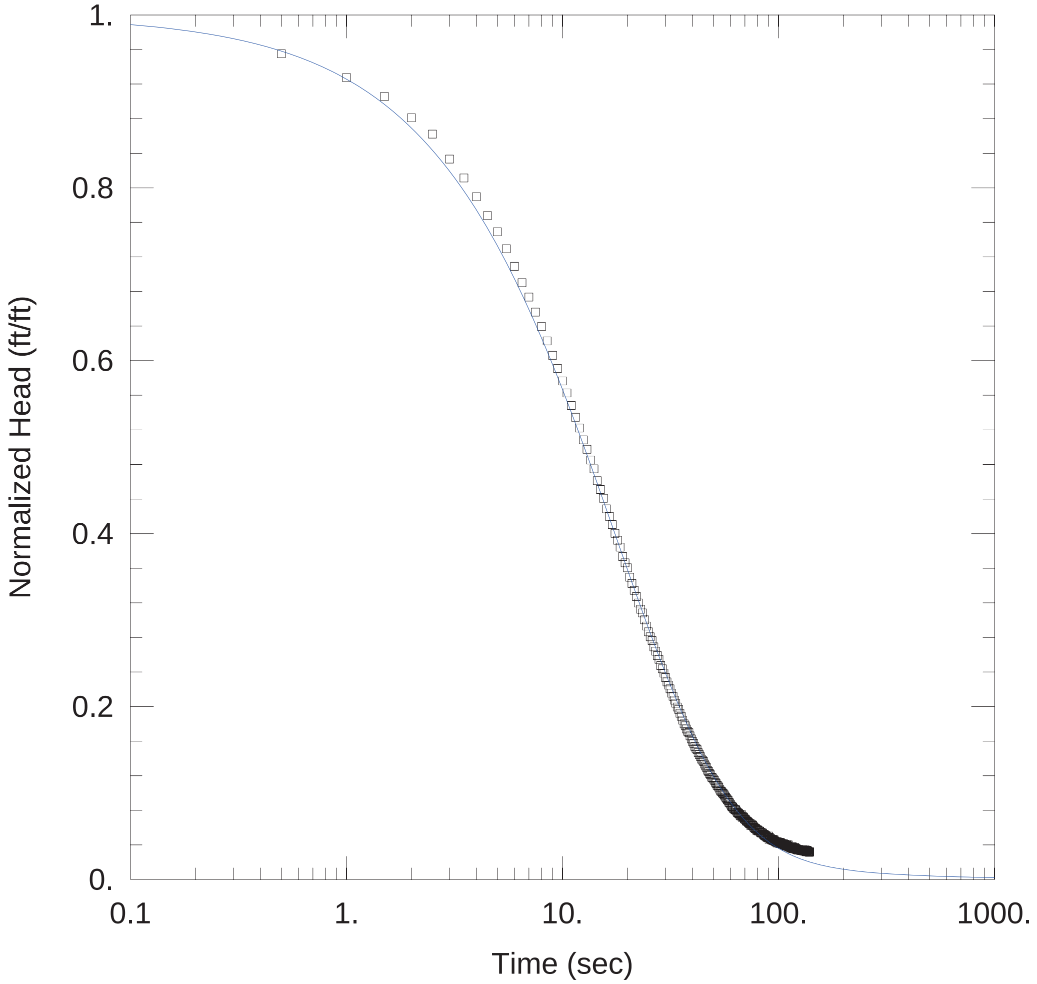
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00388 cm/sec
Kz/Kr = 1.

Ss = 4.23E-8 ft^{-1}



APW-14 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

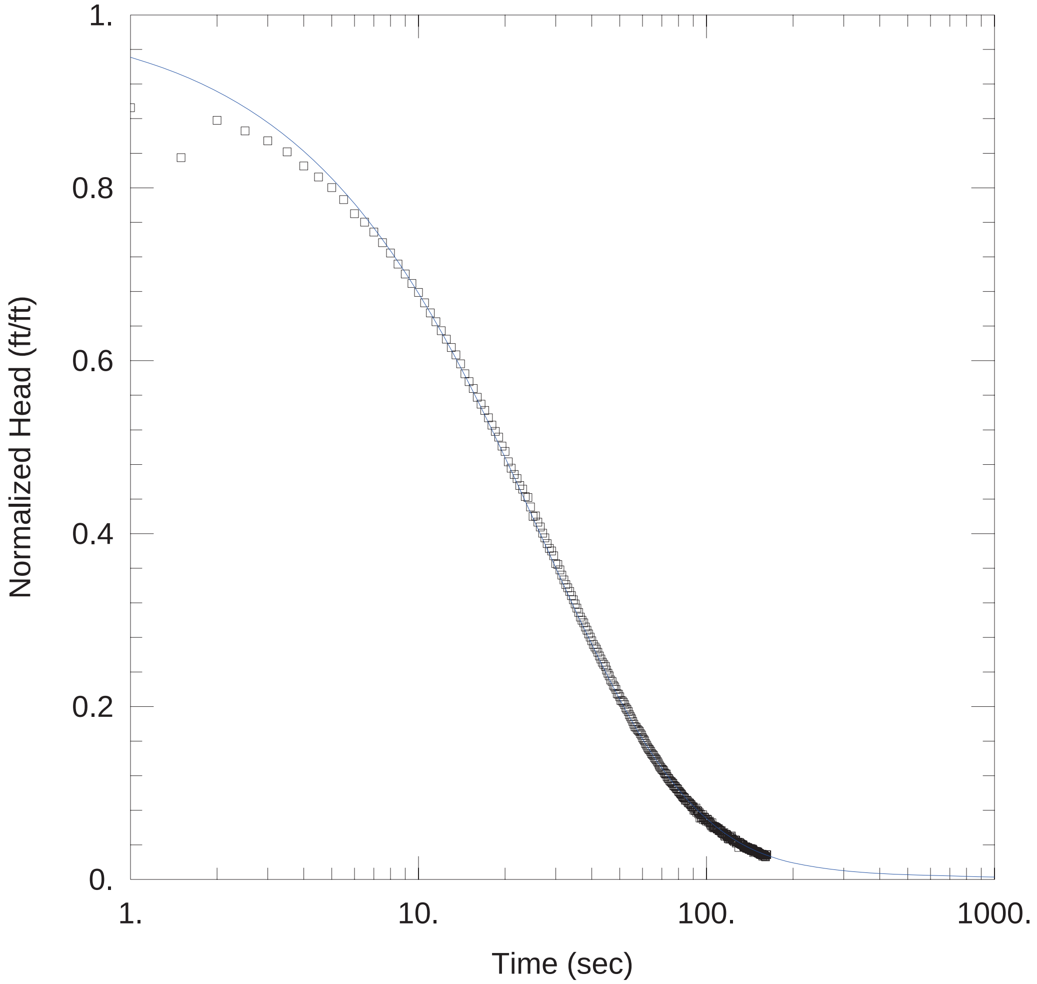
WELL DATA (APW-14)

Initial Displacement: 1.379 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.086 ft
Static Water Column Height: 36.73 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00433 cm/sec
Kz/Kr = 1.
Ss = 4.29E-6 ft^{-1}



APW-14 FH3

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

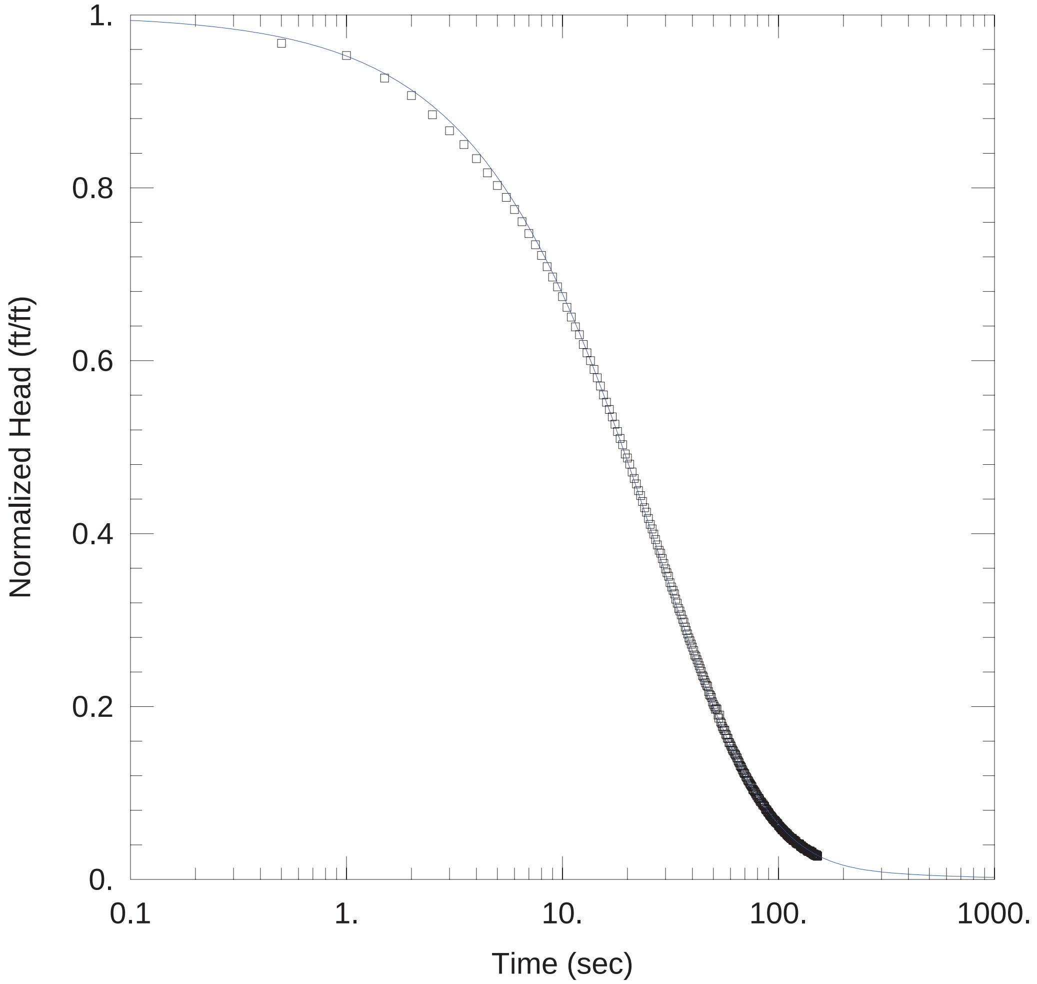
Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

Initial Displacement: 1.648 ft	Static Water Column Height: 36.72 ft
Total Well Penetration Depth: 5. ft	Screen Length: 5. ft
Casing Radius: 0.086 ft	Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined	Solution Method: KGS Model
Kr = 0.00332 cm/sec	Ss = 8.98E-7 ft^{-1}
Kz/Kr = 1.	



APW-14 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

Initial Displacement: -1.768 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.086 ft

Static Water Column Height: 36.76 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

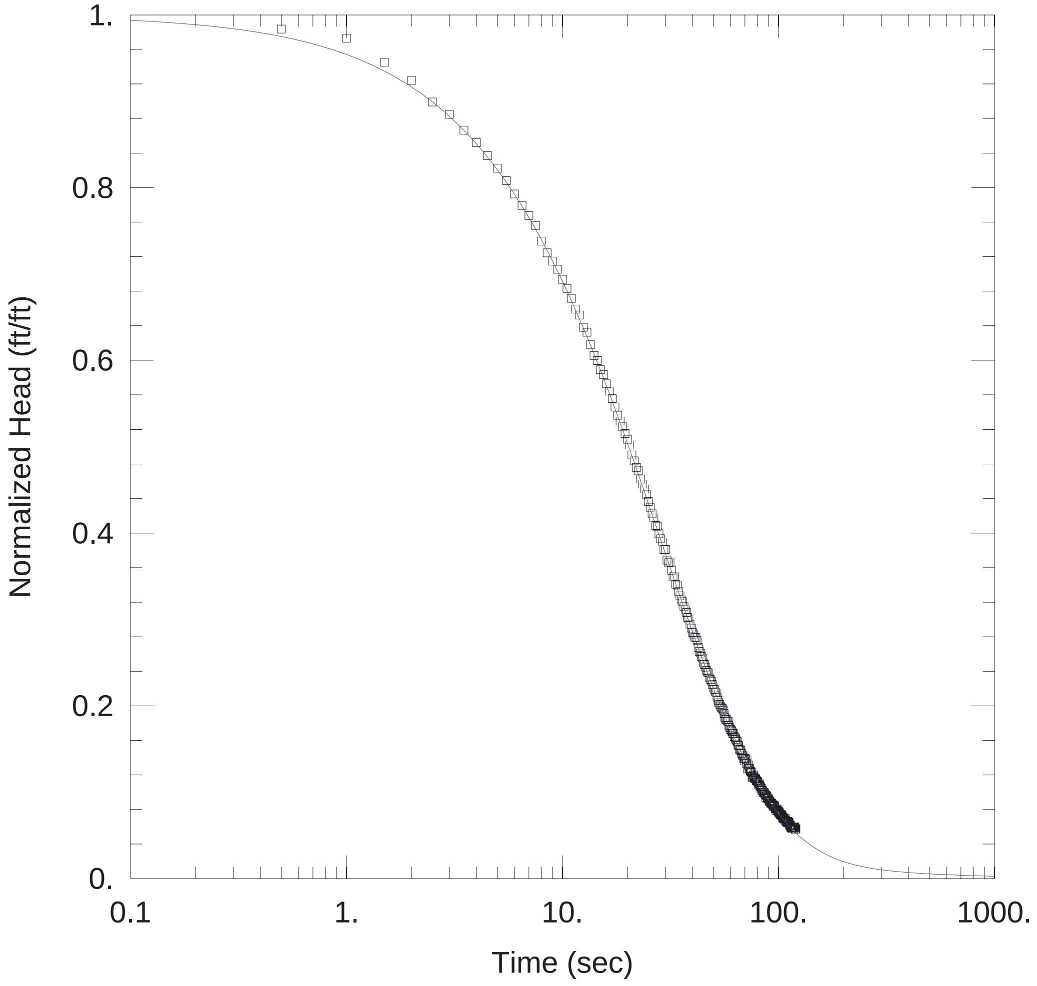
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00381 cm/sec
Kz/Kr = 1.

Ss = 2.12E-7 ft^{-1}



APW-14 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

Initial Displacement: -1.042 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.086 ft

Static Water Column Height: 36.72 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

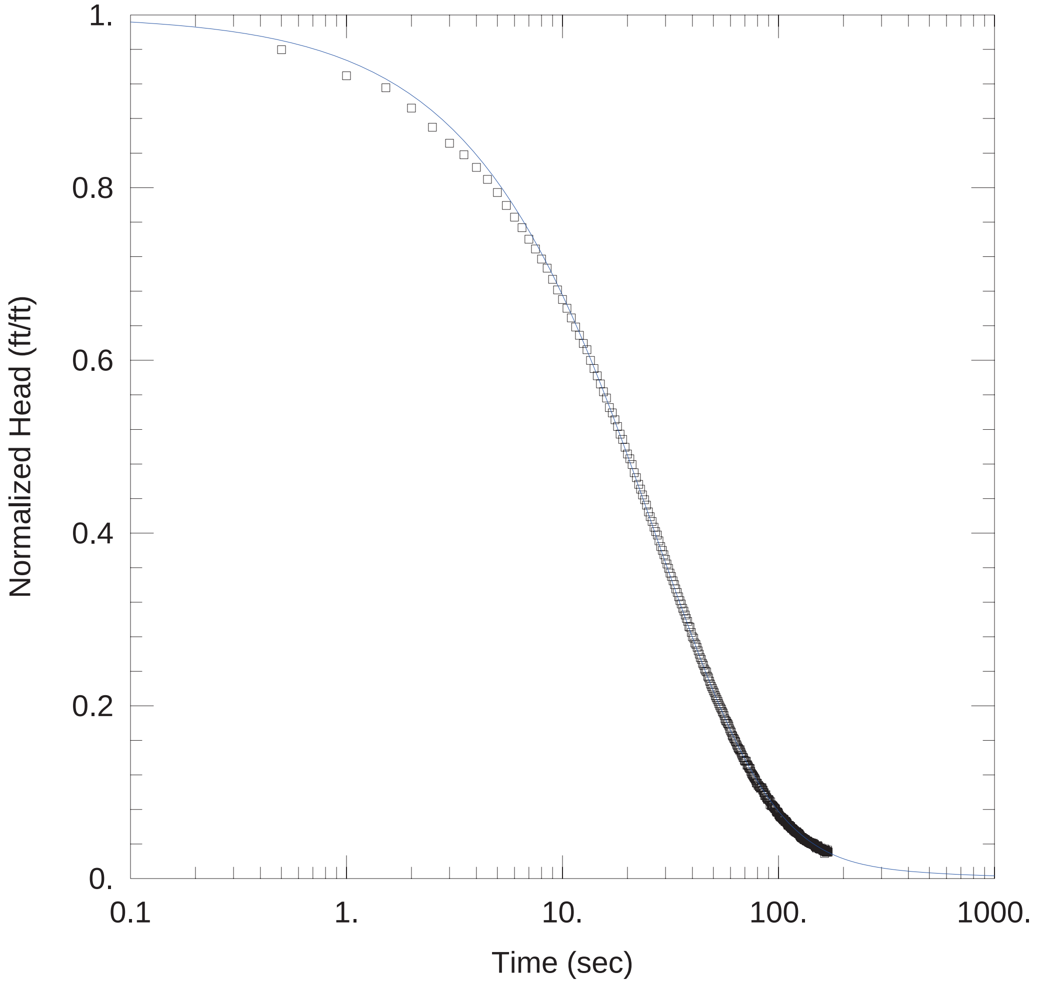
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00336 cm/sec
Kz/Kr = 1.

Ss = 4.36E-7 ft^{-1}



APW-14 RH3

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

Initial Displacement: -1.79 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.08625 ft

Static Water Column Height: 36.75 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

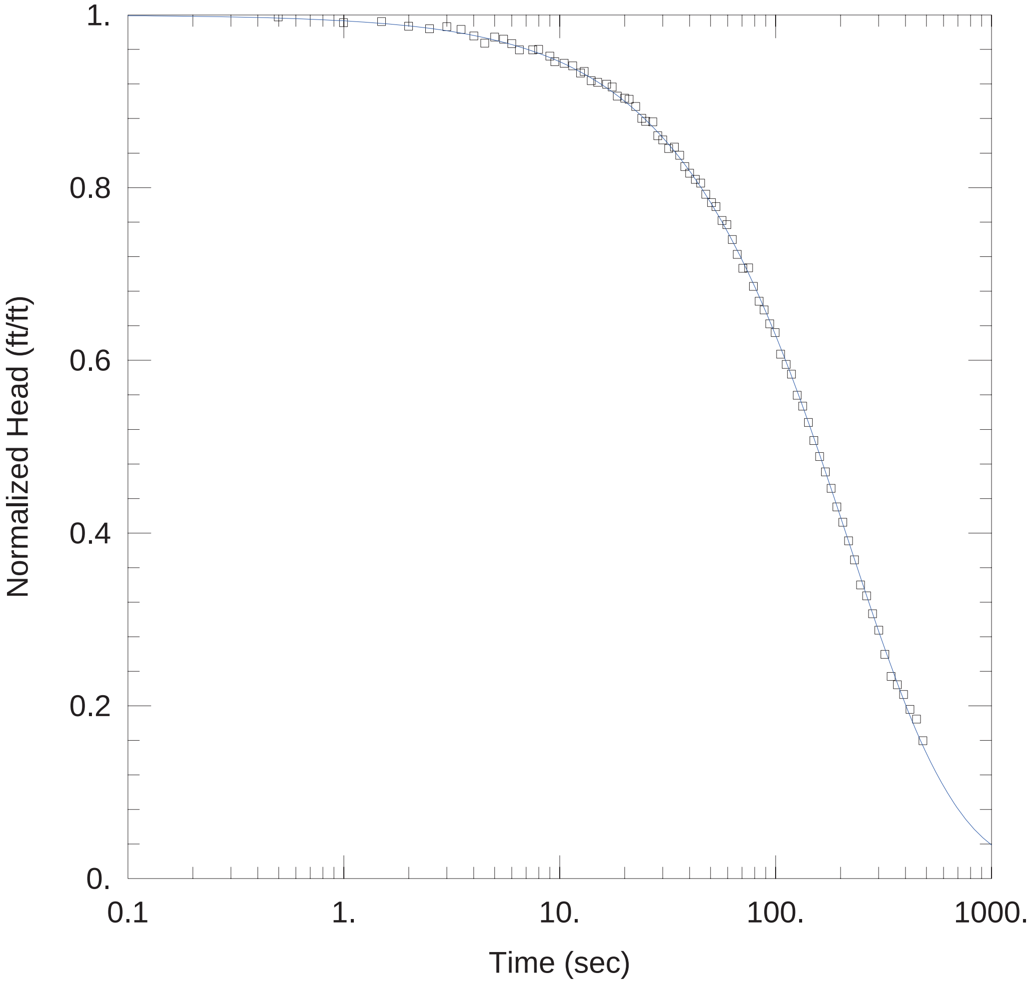
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0028 cm/sec
Kz/Kr = 1.

Ss = 4.94E-6 ft^{-1}



APW-15 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-15
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 7.1 ft

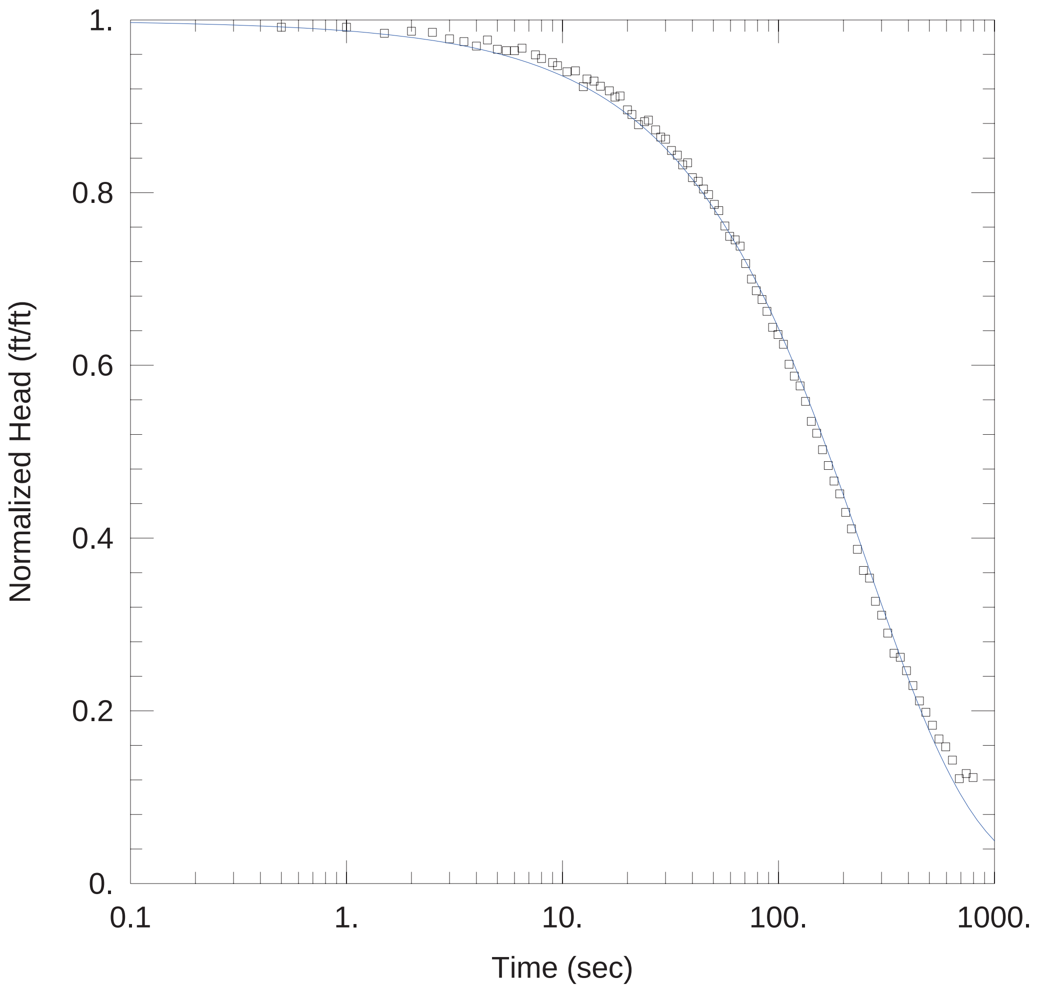
WELL DATA (APW-15)

Initial Displacement: 1.68 ft
Total Well Penetration Depth: 50.5 ft
Casing Radius: 0.086 ft
Static Water Column Height: 82.47 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.000485 cm/sec
Kz/Kr = 1.
Ss = 3.29E-7 ft^{-1}



APW-15 FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-15
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 51.8 ft

WELL DATA (APW-15)

Initial Displacement: 1.68 ft
Total Well Penetration Depth: 50.5 ft
Casing Radius: 0.086 ft

Static Water Column Height: 82.32 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

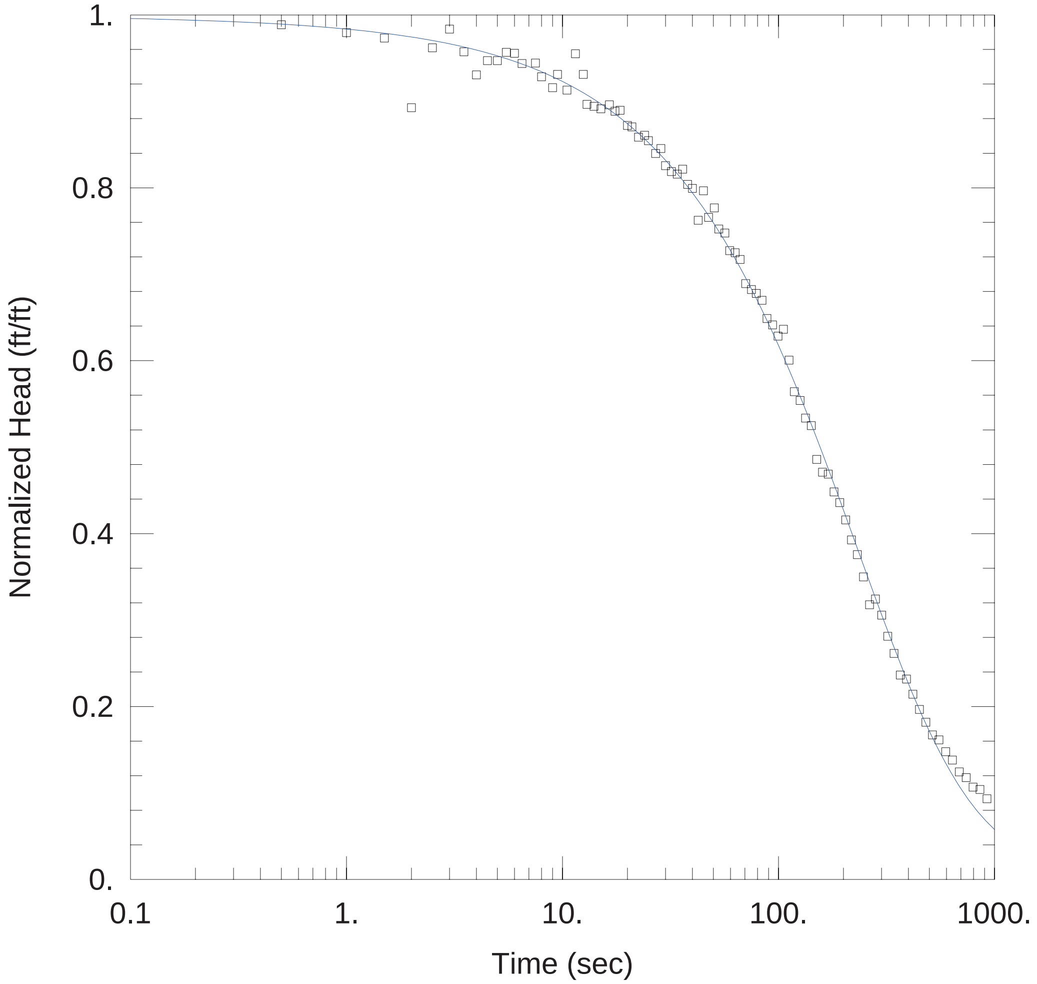
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0002 cm/sec
Kz/Kr = 1.

Ss = 5.25E-5 ft^{-1}



APW-15 RH-01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-15
Test Date: 3/31/2021

AQUIFER DATA

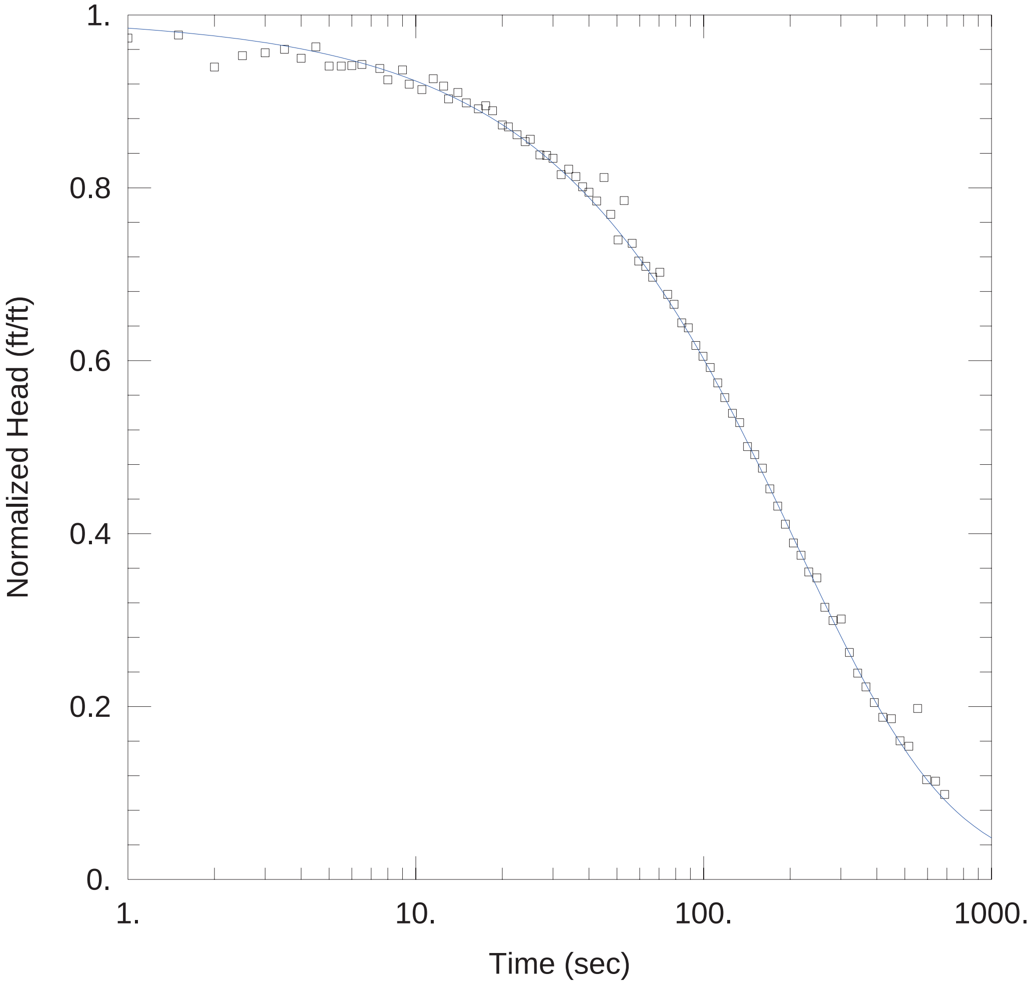
Saturated Thickness: 7.1 ft

WELL DATA (APW-15)

Initial Displacement: 1.76 ft	Static Water Column Height: 82.59 ft
Total Well Penetration Depth: 50.5 ft	Screen Length: 5. ft
Casing Radius: 0.086 ft	Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined	Solution Method: KGS Model
Kr = 0.000281 cm/sec	Ss = 0.000132 ft^{-1}
Kz/Kr = 1.	



APW-15 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-15
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 7.1 ft

WELL DATA (APW-15)

Initial Displacement: 1.76 ft
Total Well Penetration Depth: 50.5 ft
Casing Radius: 0.086 ft

Static Water Column Height: 82.52 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

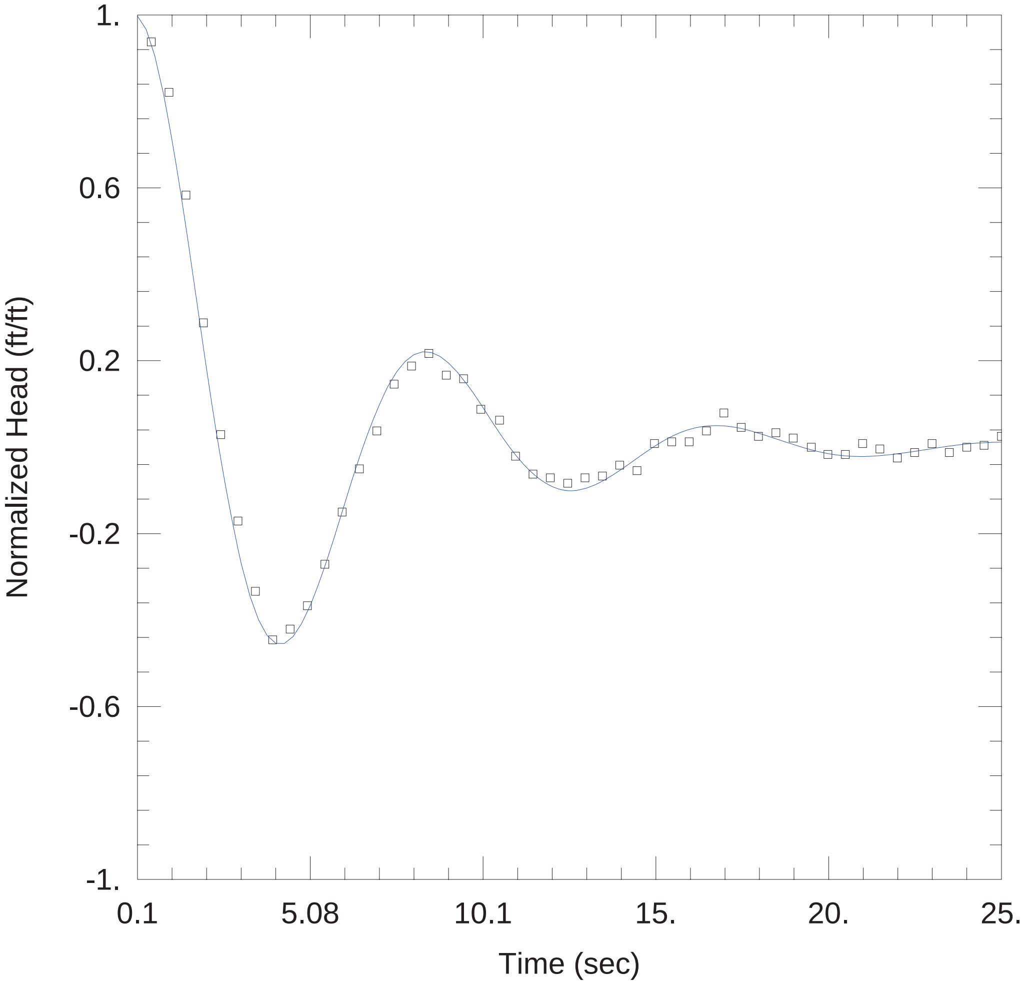
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00032 cm/sec
Kz/Kr = 1.

Ss = 8.48E-5 ft^{-1}



APW-16 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

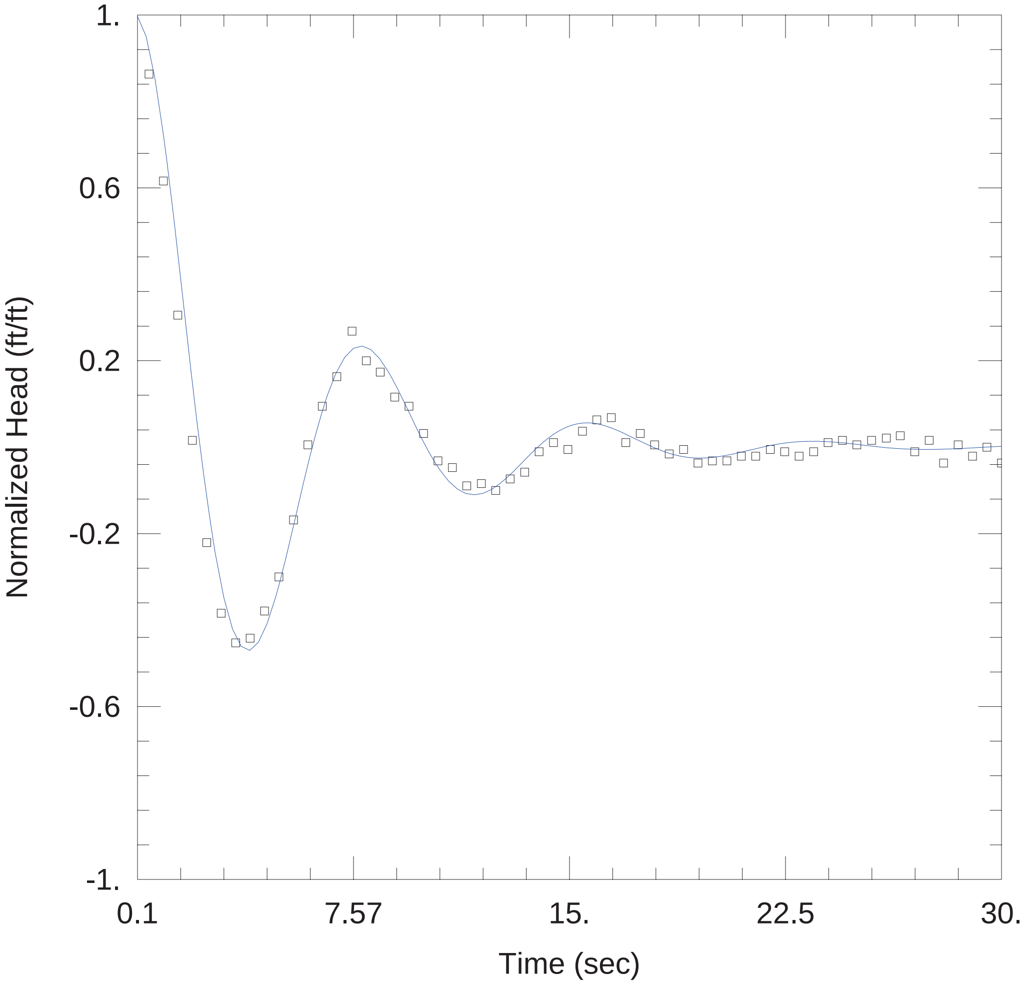
WELL DATA (APW-16)

Initial Displacement: 0.24 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.086 ft
Static Water Column Height: 64.37 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.124 cm/sec
Kz/Kr = 1.
Ss = 8.12E-7 ft^{-1}
Le = 56.01 ft



APW-16 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

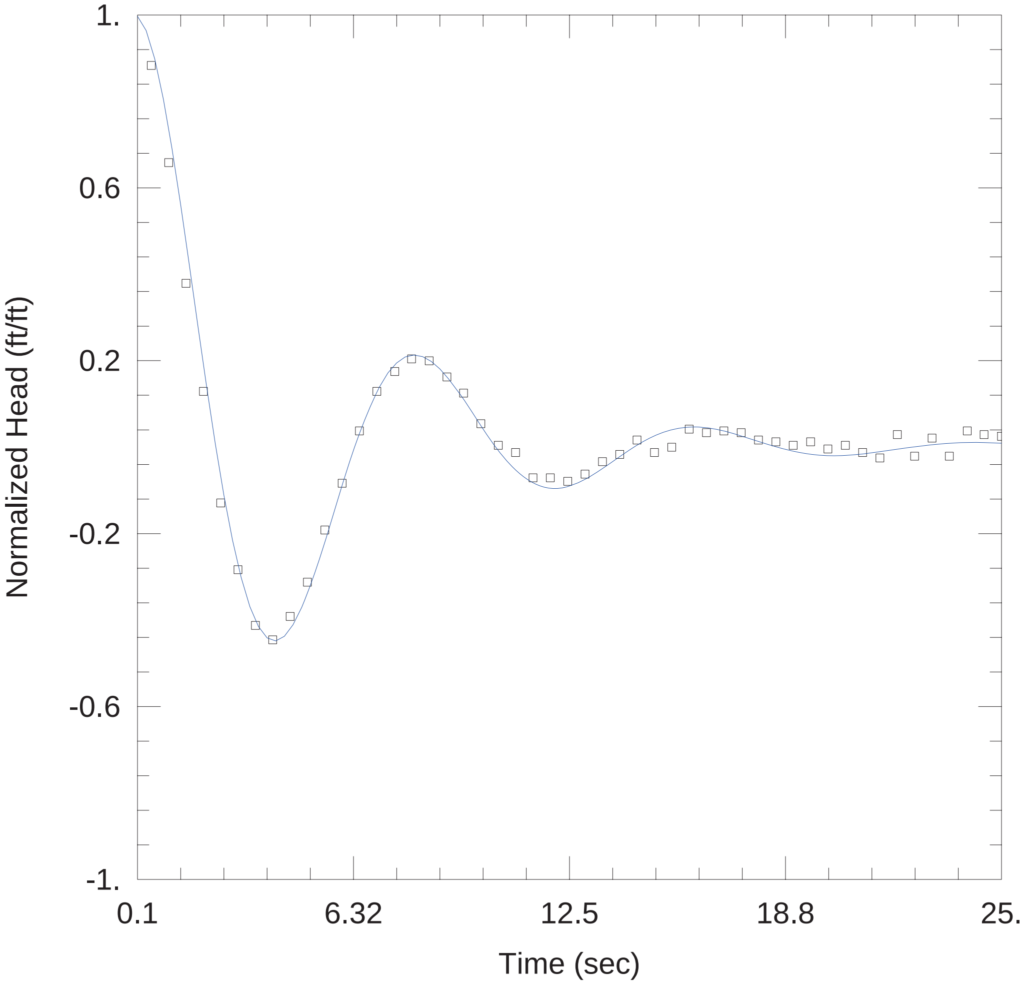
WELL DATA (APW-16)

Initial Displacement: 0.19 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 64.22 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.141 cm/sec
Kz/Kr = 1.
Ss = 6.55E-7 ft^{-1}
Le = 48.91 ft



APW-16 FH03

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

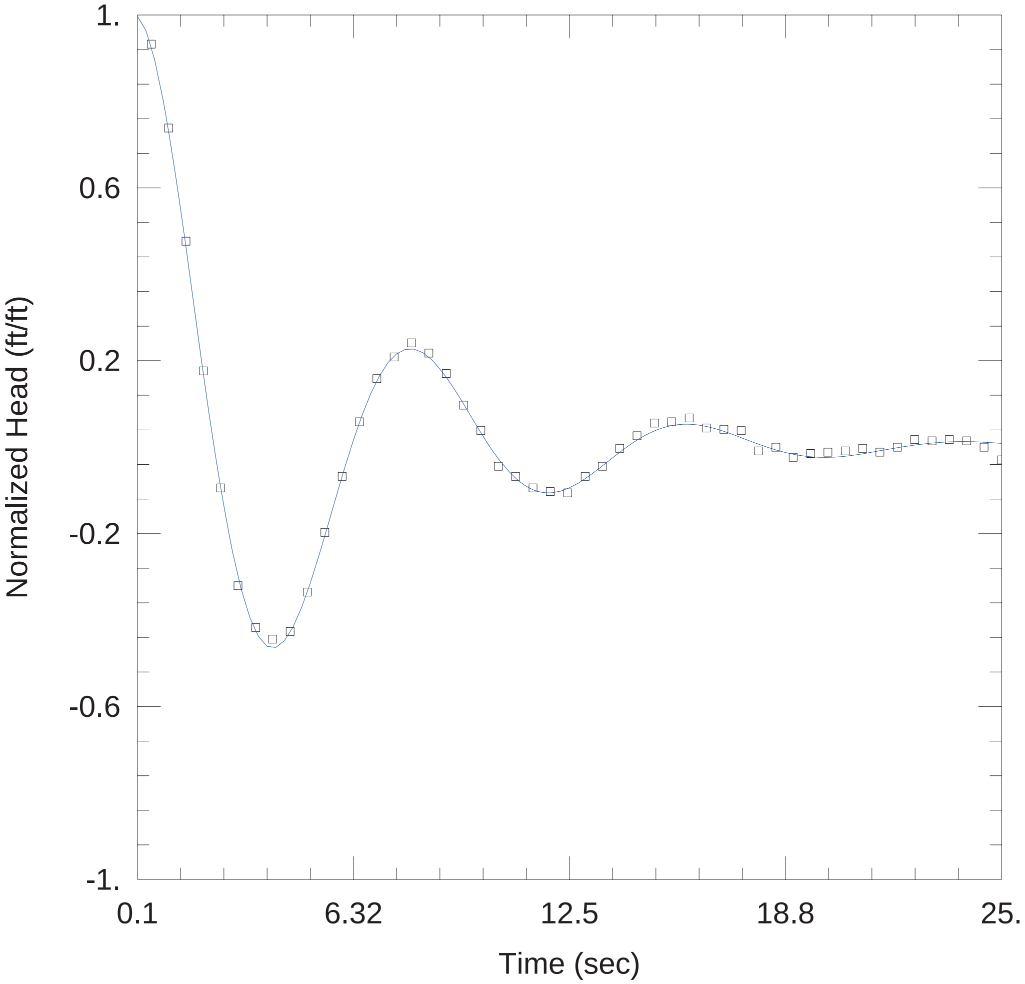
WELL DATA (APW-16)

Initial Displacement: 0.24 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.086 ft
Static Water Column Height: 64.49 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.135 cm/sec
Kz/Kr = 1.
Ss = 1.65E-7 ft^{-1}
Le = 51.68 ft



APW-16 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

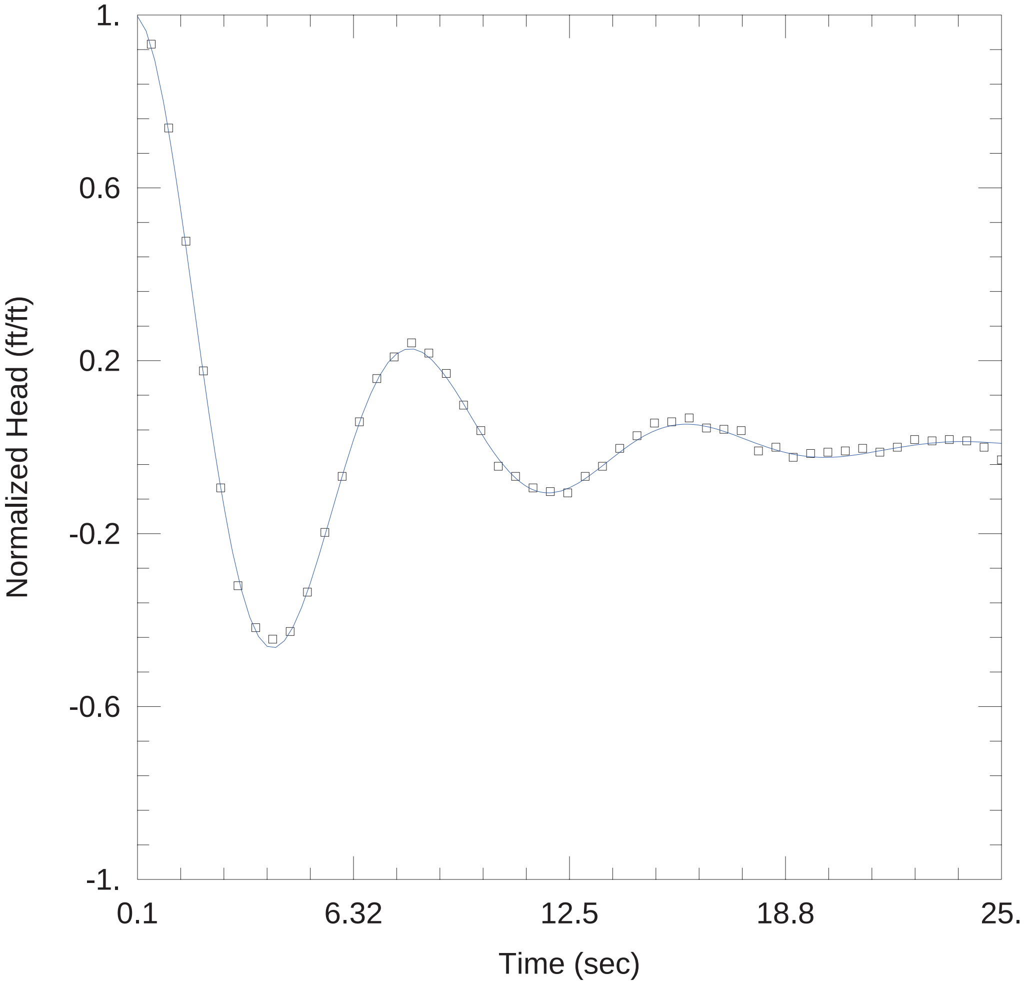
WELL DATA (APW-16)

Initial Displacement: 0.34 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.086 ft
Static Water Column Height: 64.49 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.145 cm/sec
Kz/Kr = 1.
Ss = 1.21E-7 ft^{-1}
Le = 50.37 ft



APW-16 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

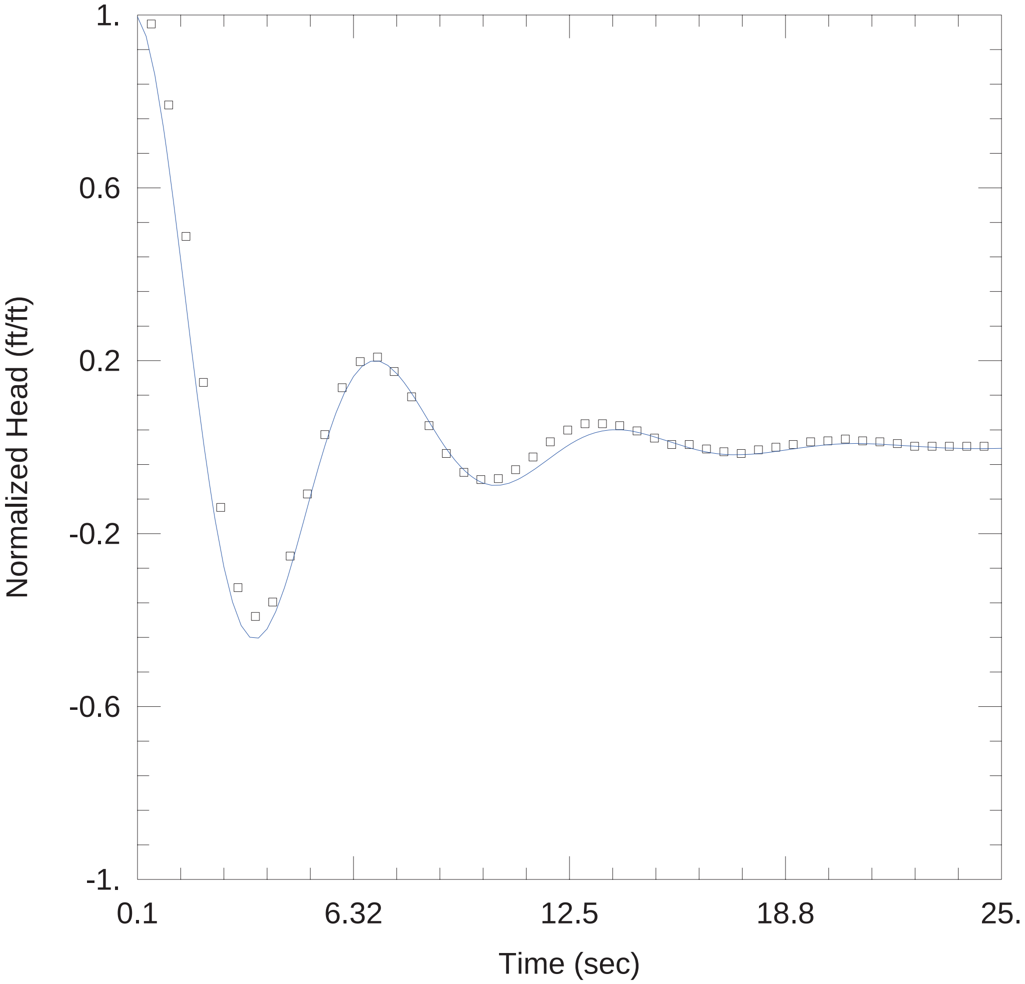
WELL DATA (APW-16)

Initial Displacement: 0.34 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.086 ft
Static Water Column Height: 64.49 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.145 cm/sec
Kz/Kr = 1.
Ss = 1.21E-7 ft^{-1}
Le = 50.37 ft



APW-17 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-17
Test Date: 02/16/2021

AQUIFER DATA

Saturated Thickness: 84.7 ft
Anisotropy Ratio (Kz/Kr): 1.

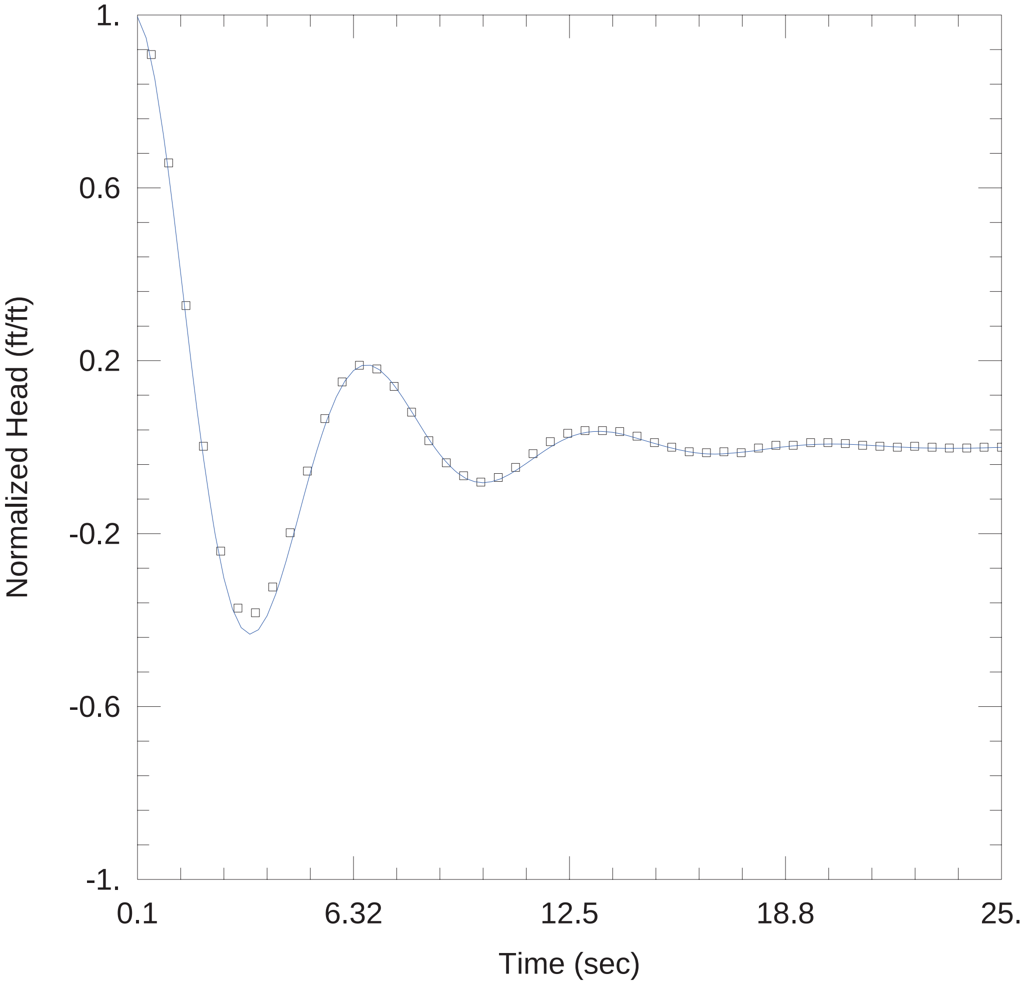
WELL DATA (APW-17)

Initial Displacement: 0.48 ft
Total Well Penetration Depth: 79.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 53.93 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.113 cm/sec
Kz/Kr = 1.
Ss = 5.88E-7 ft^{-1}
Le = 37.31 ft



APW-17 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-17
Test Date: 02/16/2021

AQUIFER DATA

Saturated Thickness: 84.7 ft
Anisotropy Ratio (Kz/Kr): 1.

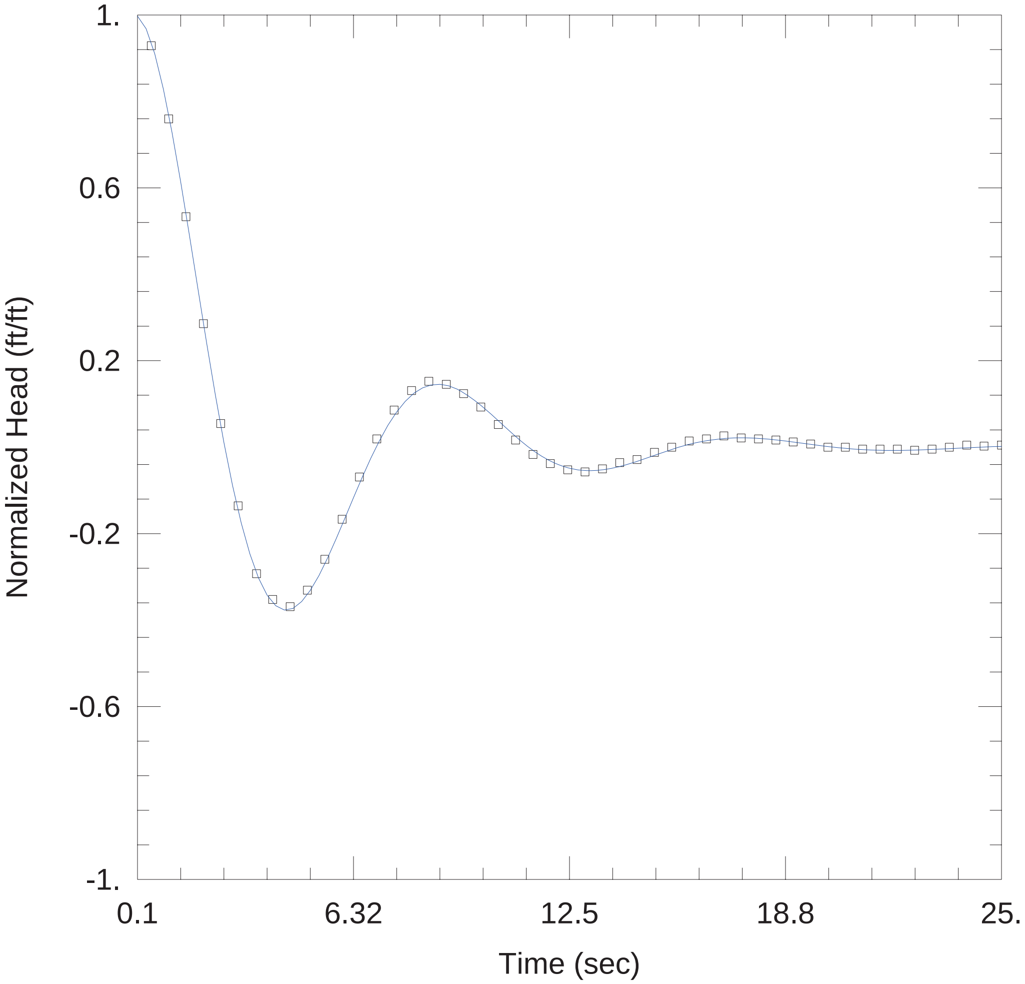
WELL DATA (APW-17)

Initial Displacement: 0.47 ft
Total Well Penetration Depth: 79.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 53.93 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.115 cm/sec
Kz/Kr = 1.
Ss = 2.88E-7 ft^{-1}
Le = 34.54 ft



APW-17 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-17
Test Date: 02/16/2021

AQUIFER DATA

Saturated Thickness: 84.7 ft
Anisotropy Ratio (Kz/Kr): 1.

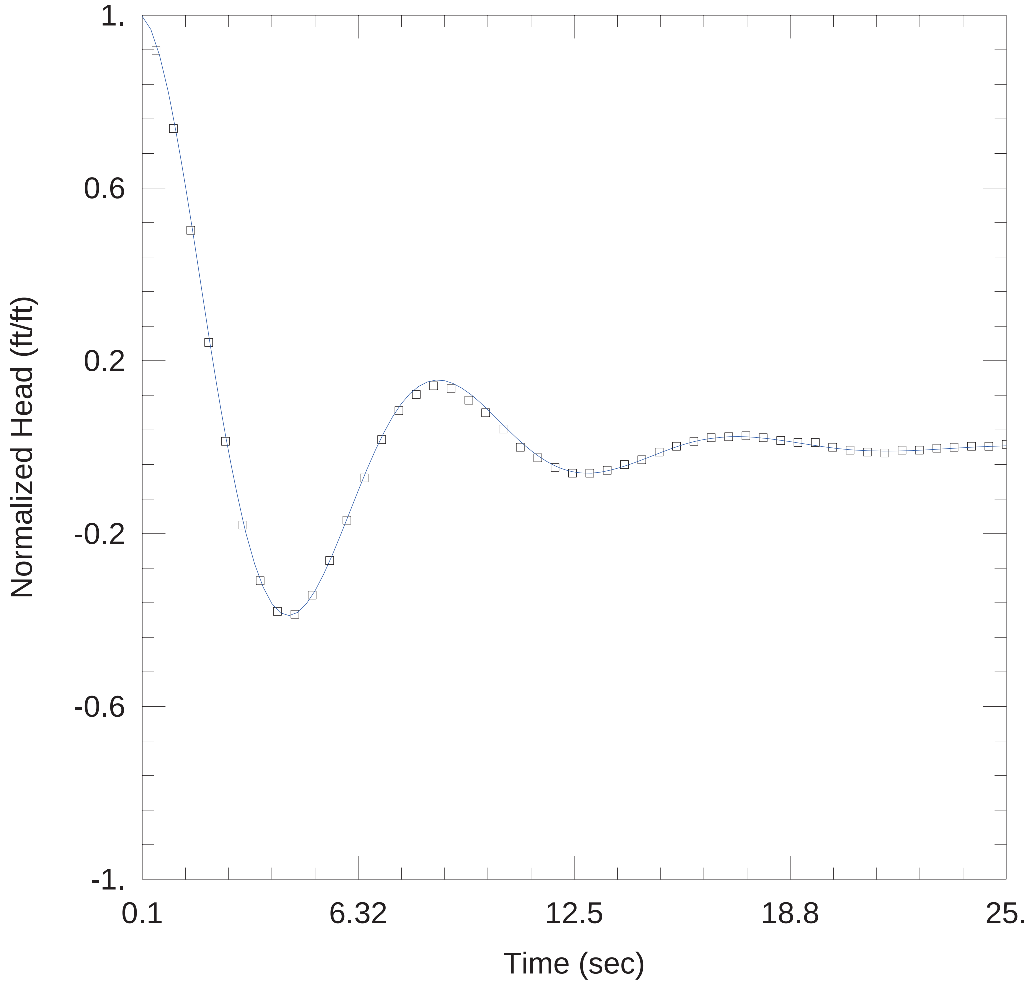
WELL DATA (APW-17)

Initial Displacement: 0.42 ft
Total Well Penetration Depth: 79.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 53.93 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.076 cm/sec
Kz/Kr = 1.
Ss = 2.88E-7 ft^{-1}
Le = 57.77 ft



APW-17 RH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-17
Test Date: 02/16/2021

AQUIFER DATA

Saturated Thickness: 84.7 ft
Anisotropy Ratio (Kz/Kr): 1.

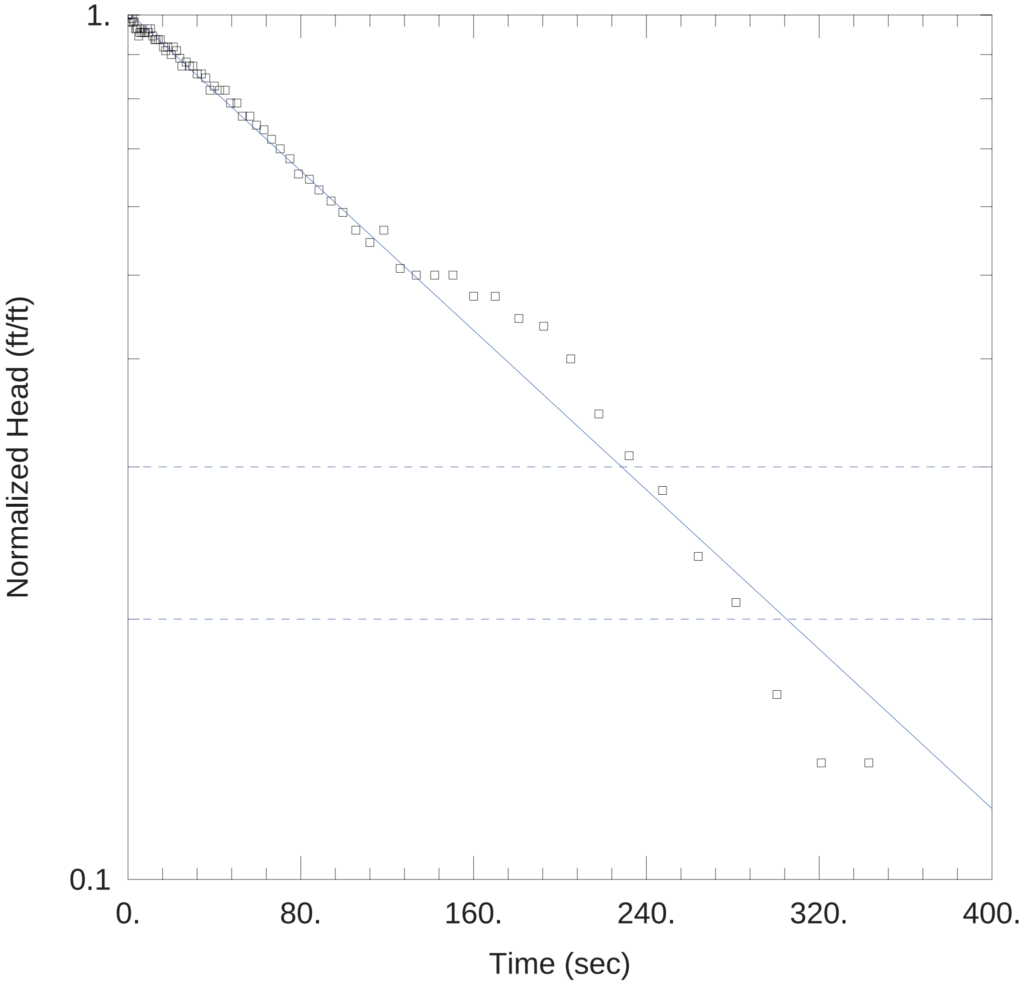
WELL DATA (APW-17)

Initial Displacement: 0.45 ft
Total Well Penetration Depth: 79.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 53.93 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.0796 cm/sec
Kz/Kr = 1.
Ss = 2.88E-7 ft^{-1}
Le = 56.31 ft



APW-18 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-18
Test Date: 2/16/21

AQUIFER DATA

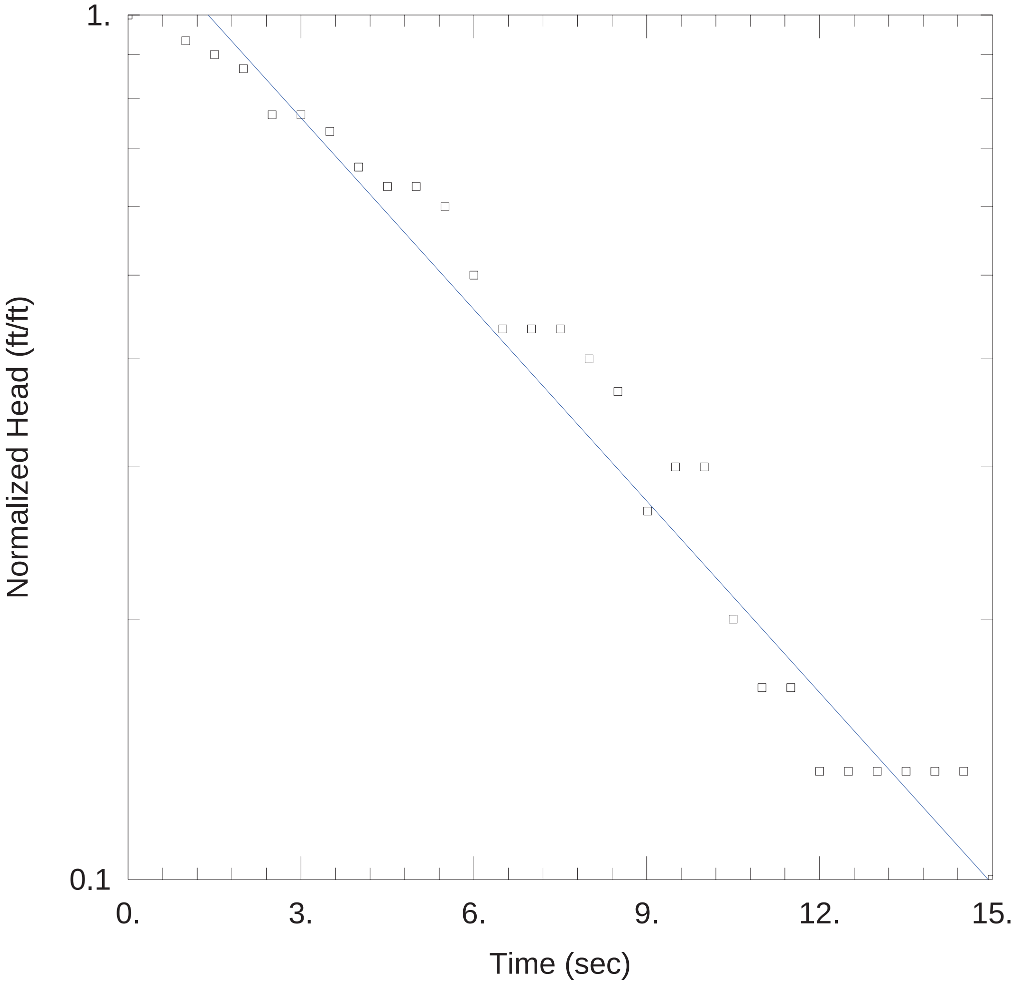
Saturated Thickness: 78.8 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-18)

Initial Displacement: 0.11 ft
Static Water Column Height: 31.38 ft
Total Well Penetration Depth: 51.1 ft
Screen Length: 5. ft
Casing Radius: 0.086 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.000267 cm/sec
y0 = 0.111 ft



XPW-01 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW-01
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

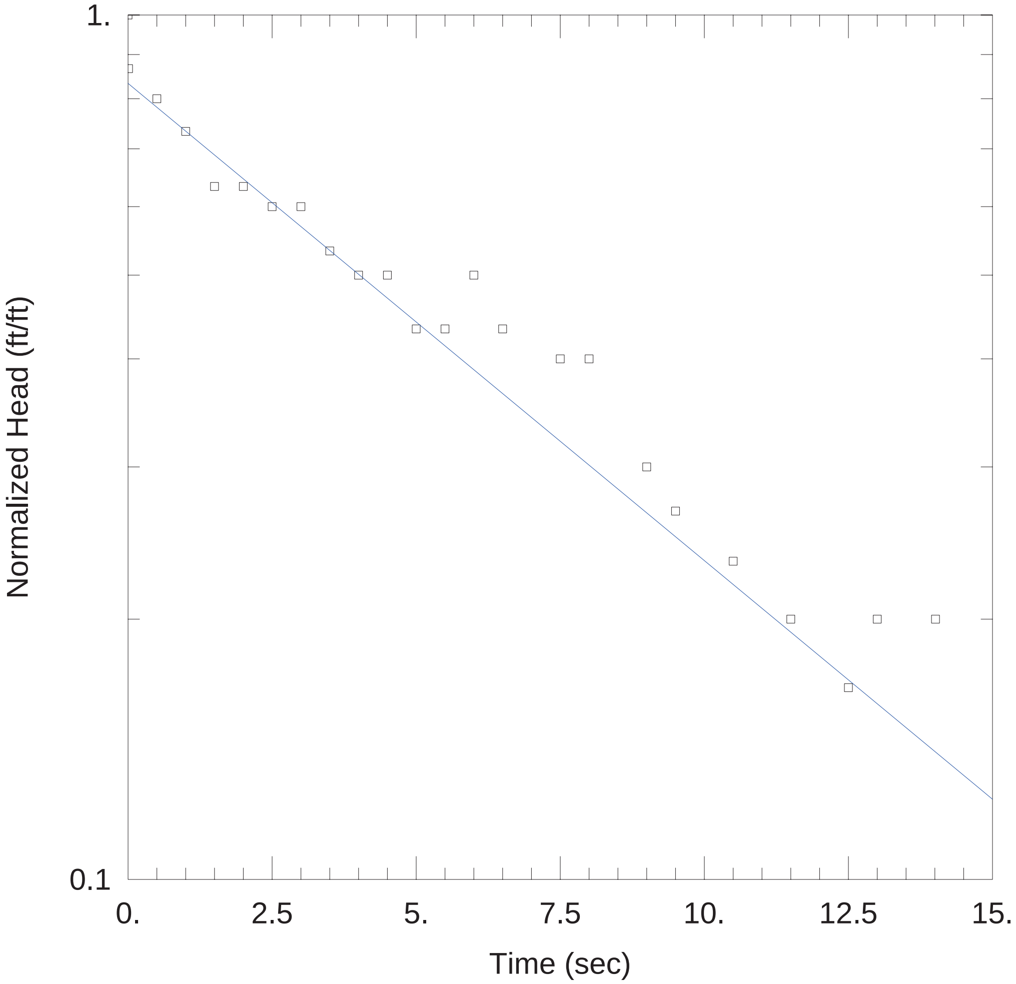
WELL DATA (XPW-01)

Initial Displacement: 0.03 ft
Total Well Penetration Depth: 8.033 ft
Casing Radius: 0.086 ft
Static Water Column Height: 8.033 ft
Screen Length: 8.033 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.183 cm/sec
y0 = 0.038 ft



XPW-01 FH-02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW-01
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

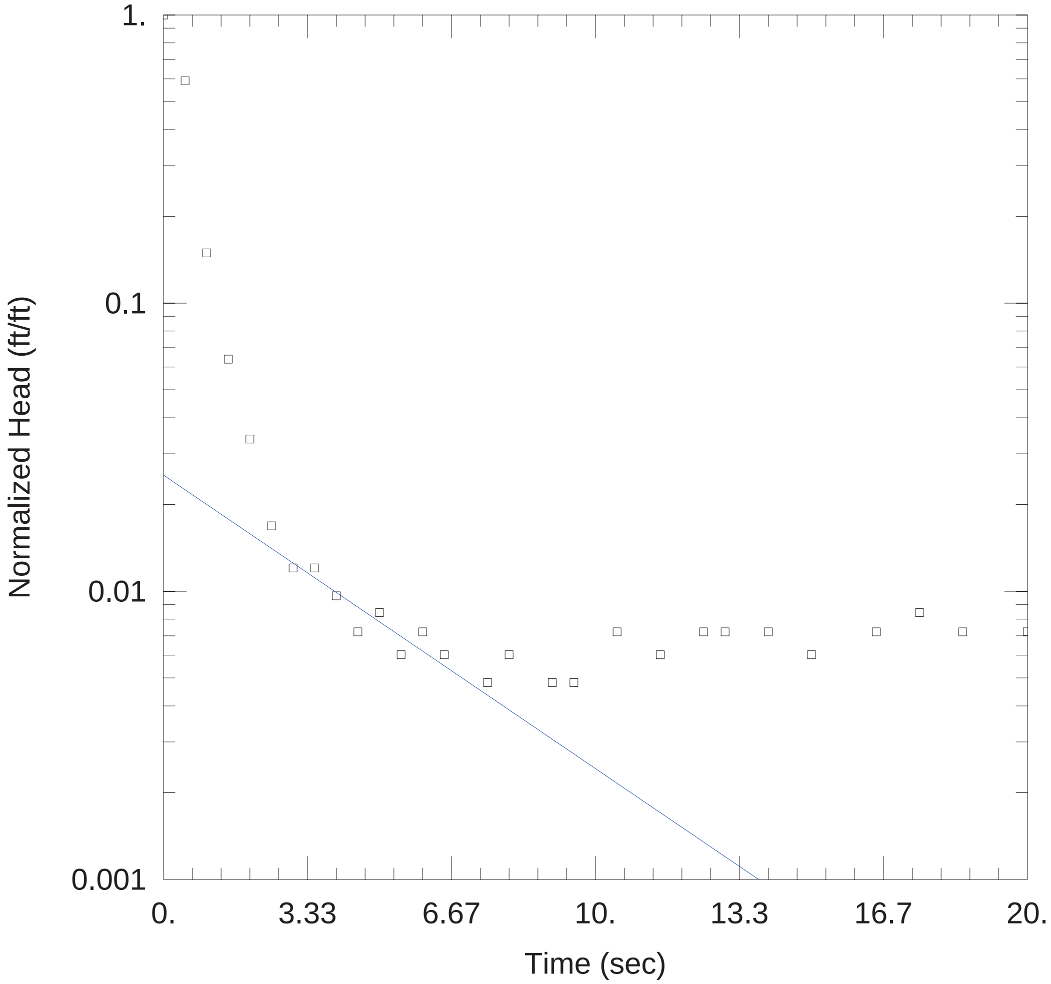
WELL DATA (XPW-01)

Initial Displacement: 0.03 ft
Total Well Penetration Depth: 8.033 ft
Casing Radius: 0.086 ft
Static Water Column Height: 8.033 ft
Screen Length: 8.033 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0129 cm/sec
y0 = 0.025 ft



XPW-01 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW-01
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

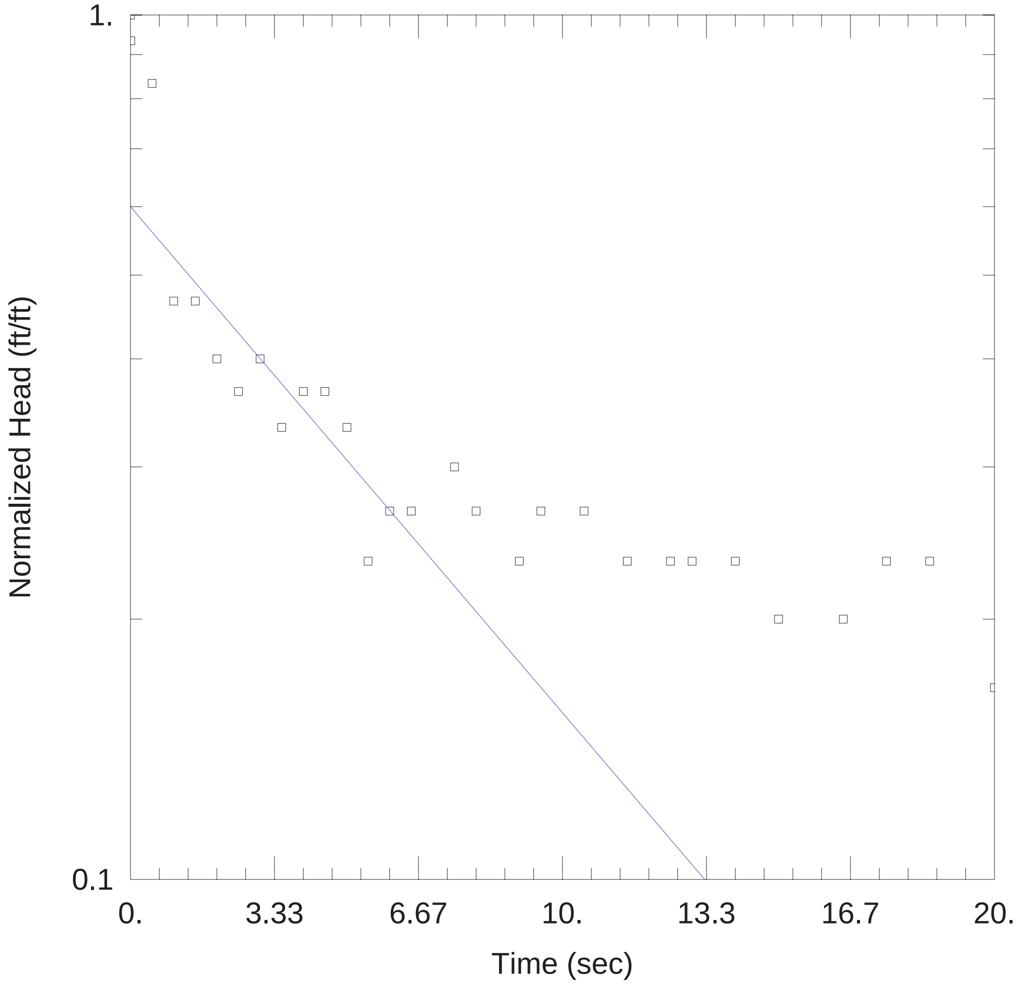
WELL DATA (XPW-01)

Initial Displacement: 0.83 ft
Total Well Penetration Depth: 8.033 ft
Casing Radius: 0.086 ft
Static Water Column Height: 8.033 ft
Screen Length: 8.033 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0238 cm/sec
y0 = 0.021 ft



XPW-01 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW-01
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

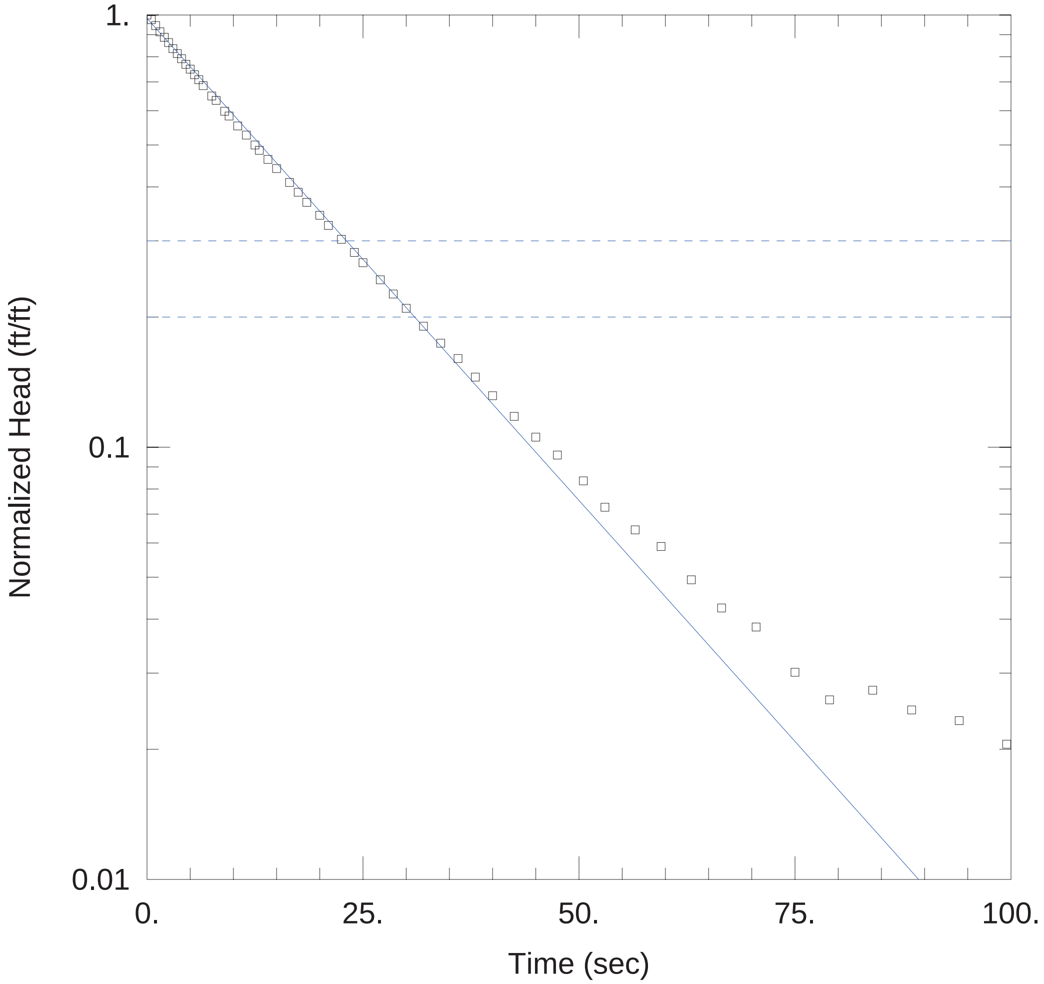
WELL DATA (XPW-01)

Initial Displacement: 0.03 ft
Total Well Penetration Depth: 8.033 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 8.033 ft
Screen Length: 8.033 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0137 cm/sec
y0 = 0.018 ft



XPW02 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW02
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 7.259 ft
Anisotropy Ratio (Kz/Kr): 1.

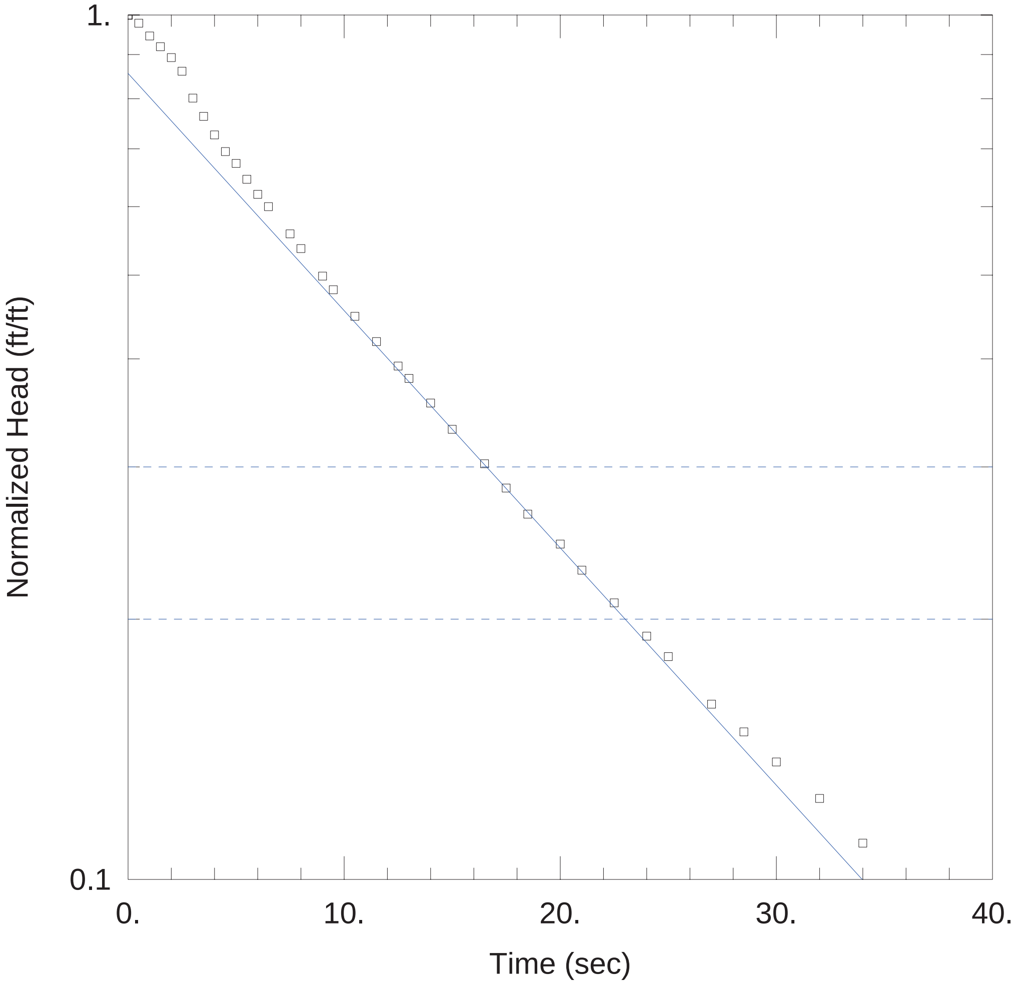
WELL DATA (XPW02)

Initial Displacement: 0.73 ft
Total Well Penetration Depth: 7.259 ft
Casing Radius: 0.086 ft
Static Water Column Height: 9.759 ft
Screen Length: 7.259 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00197 cm/sec
y0 = 0.717 ft



XPW02 FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW02
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 7.259 ft
Anisotropy Ratio (Kz/Kr): 1.

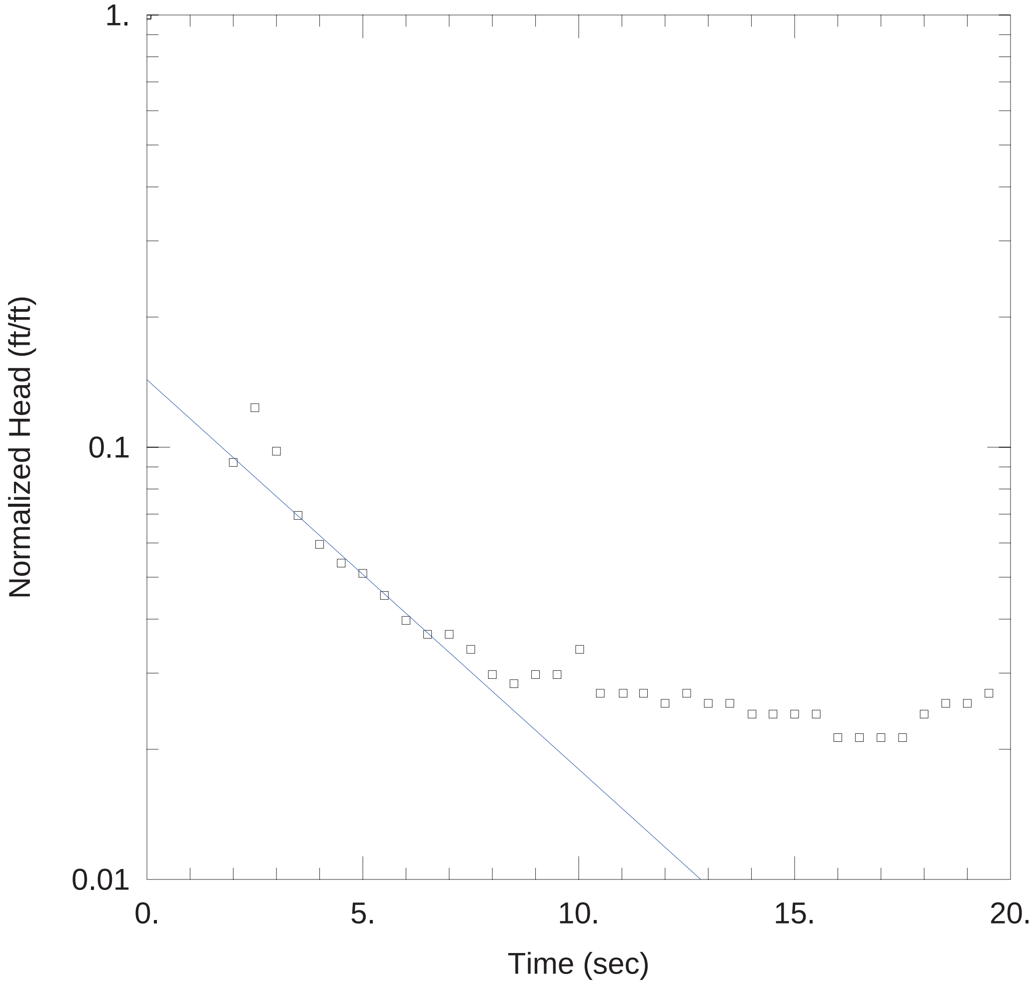
WELL DATA (XPW02)

Initial Displacement: 0.79 ft
Total Well Penetration Depth: 7.259 ft
Casing Radius: 0.086 ft
Static Water Column Height: 9.759 ft
Screen Length: 7.259 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00257 cm/sec
y0 = 0.676 ft



XPW03 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

Saturated Thickness: 7.958 ft
Anisotropy Ratio (Kz/Kr): 1.

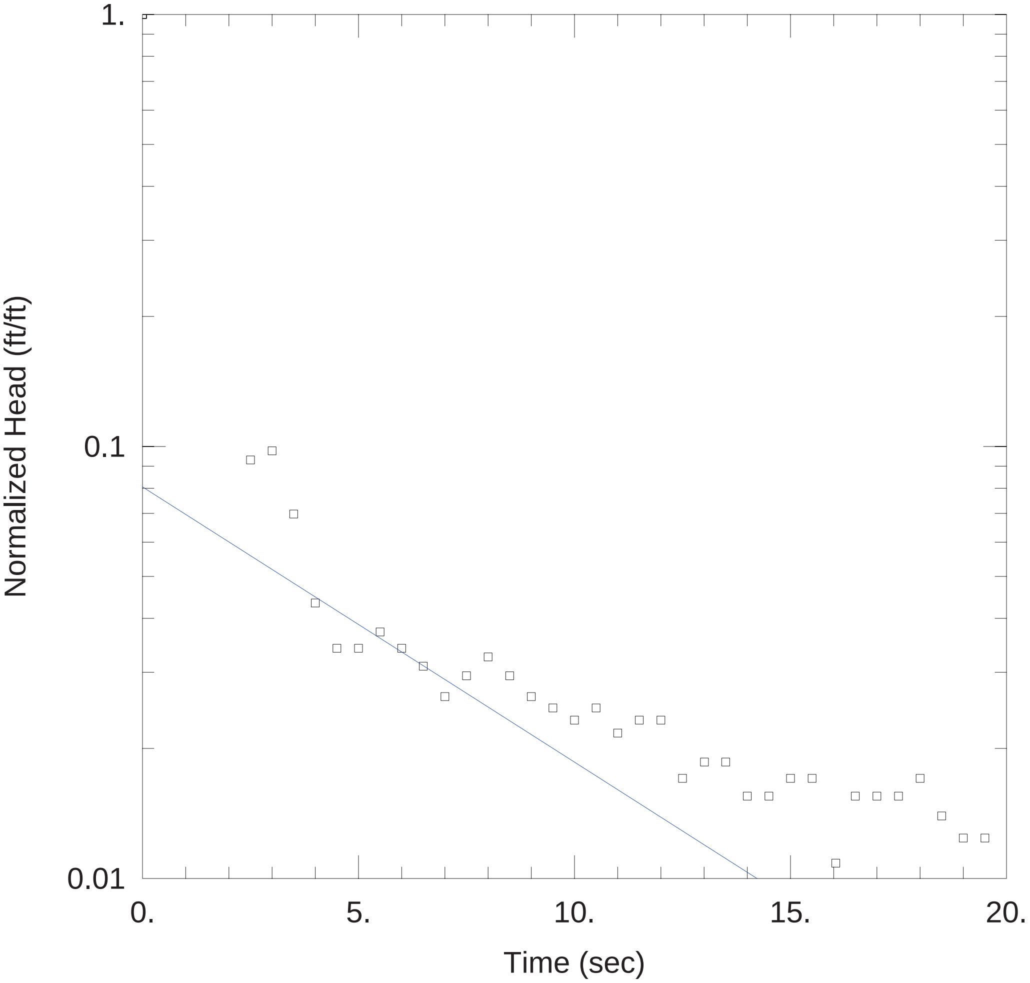
WELL DATA (XPW03)

Initial Displacement: 0.705 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 13.26 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0573 cm/sec
y0 = 0.101 ft



XPW03 FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

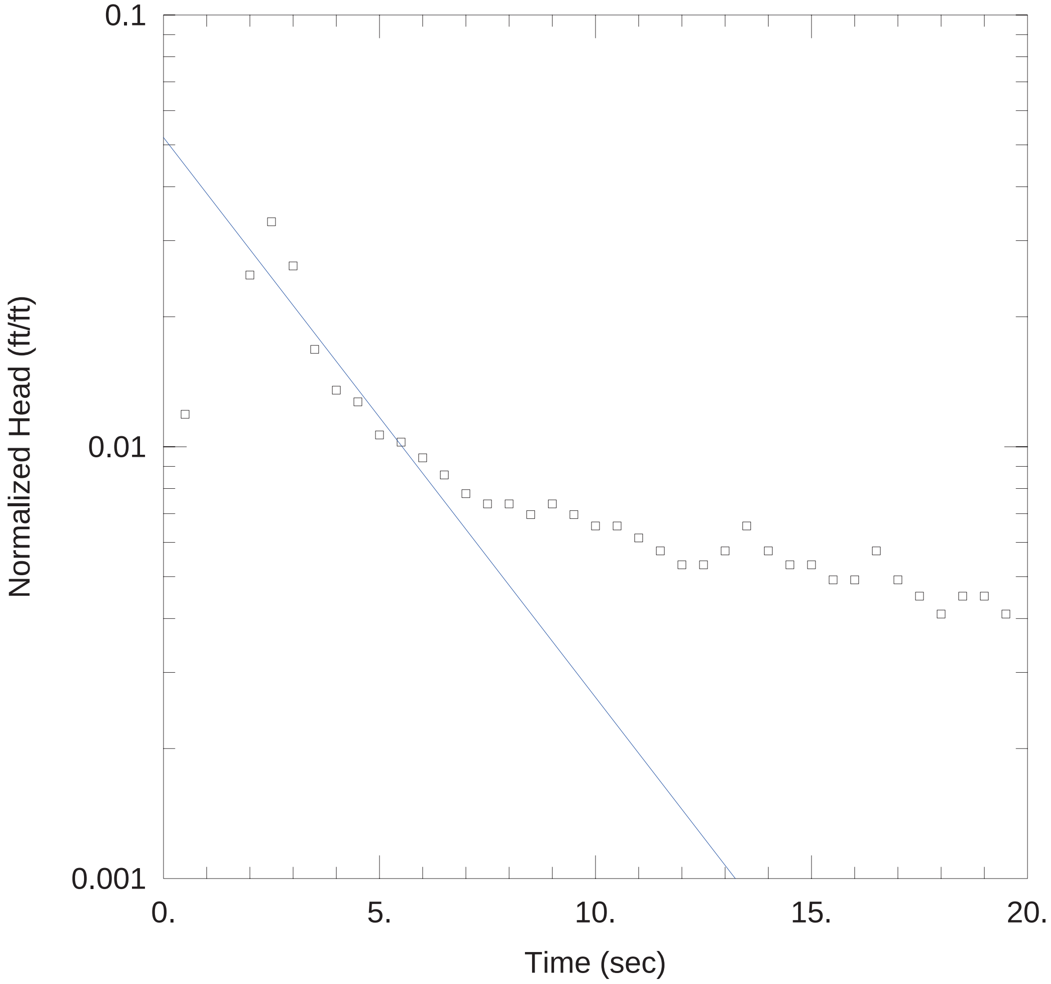
Saturated Thickness: 7.938 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW03)

Initial Displacement: 0.645 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 13.24 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.072 cm/sec
y0 = 0.052 ft



XPW03 FH3

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

Saturated Thickness: 7.948 ft
Anisotropy Ratio (Kz/Kr): 1.

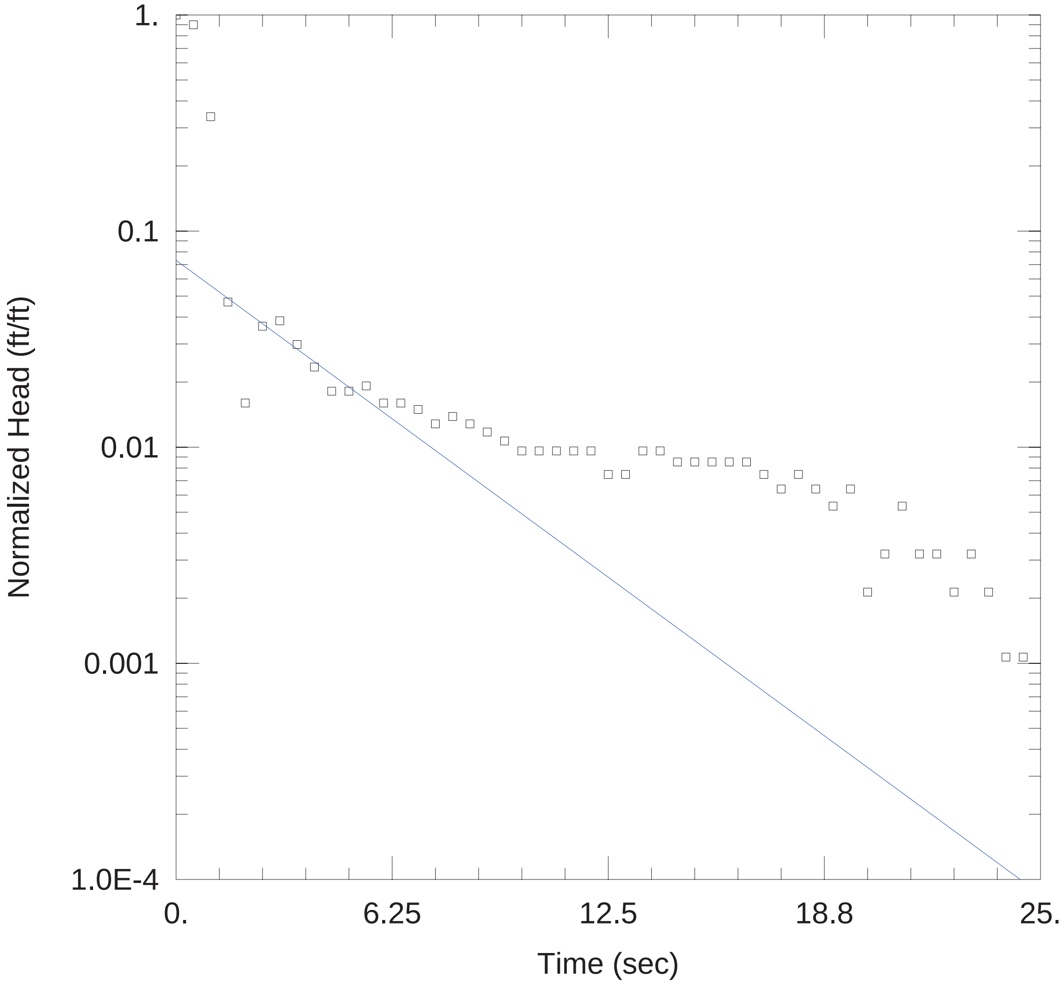
WELL DATA (XPW03)

Initial Displacement: 2.441 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 13.25 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.227 cm/sec
y0 = 0.127 ft



XPW03 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

Saturated Thickness: 7.948 ft
Anisotropy Ratio (Kz/Kr): 1.

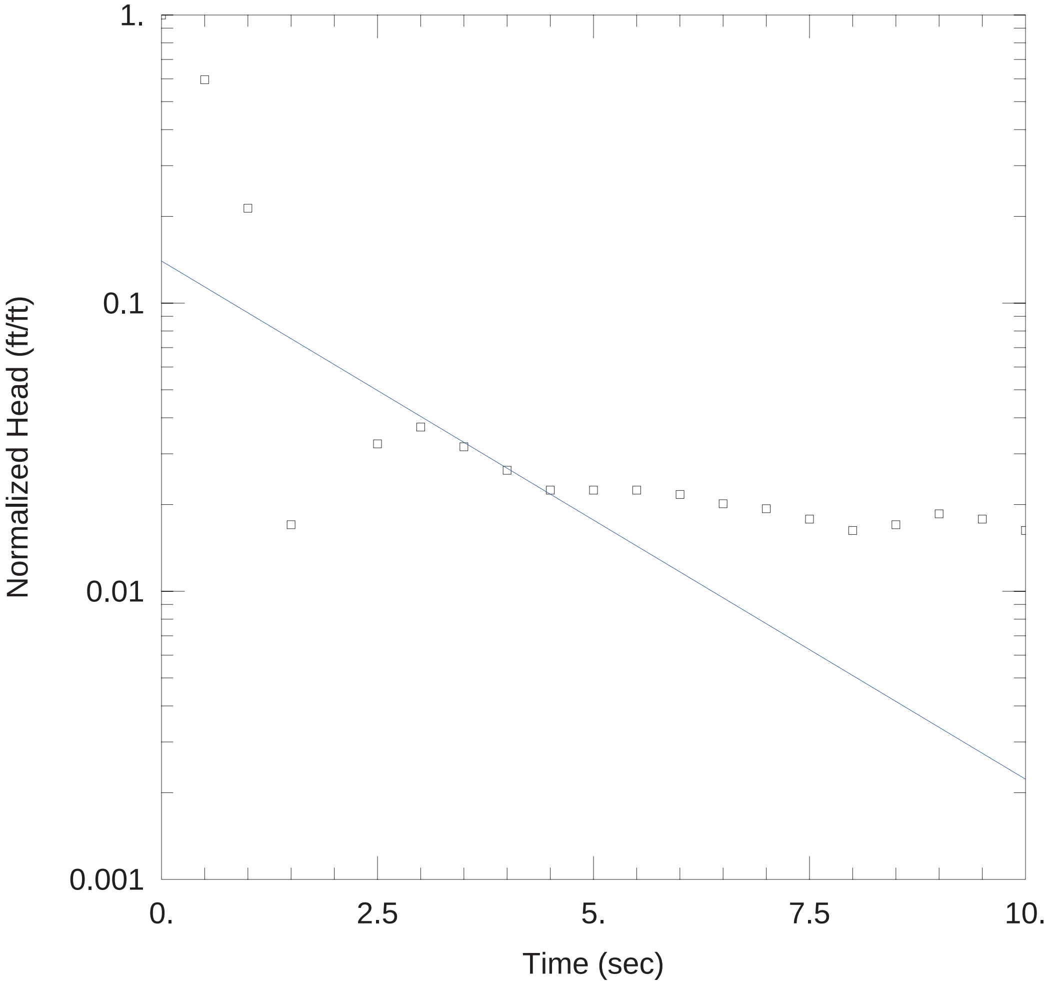
WELL DATA (XPW03)

Initial Displacement: -0.937 ft
Static Water Column Height: 13.25 ft
Total Well Penetration Depth: 4.7 ft
Screen Length: 4.7 ft
Casing Radius: 0.086 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.146 cm/sec
y0 = -0.0686 ft



XPW03 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

Saturated Thickness: 7.948 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW03)

Initial Displacement: -1.293 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft

Static Water Column Height: 13.25 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

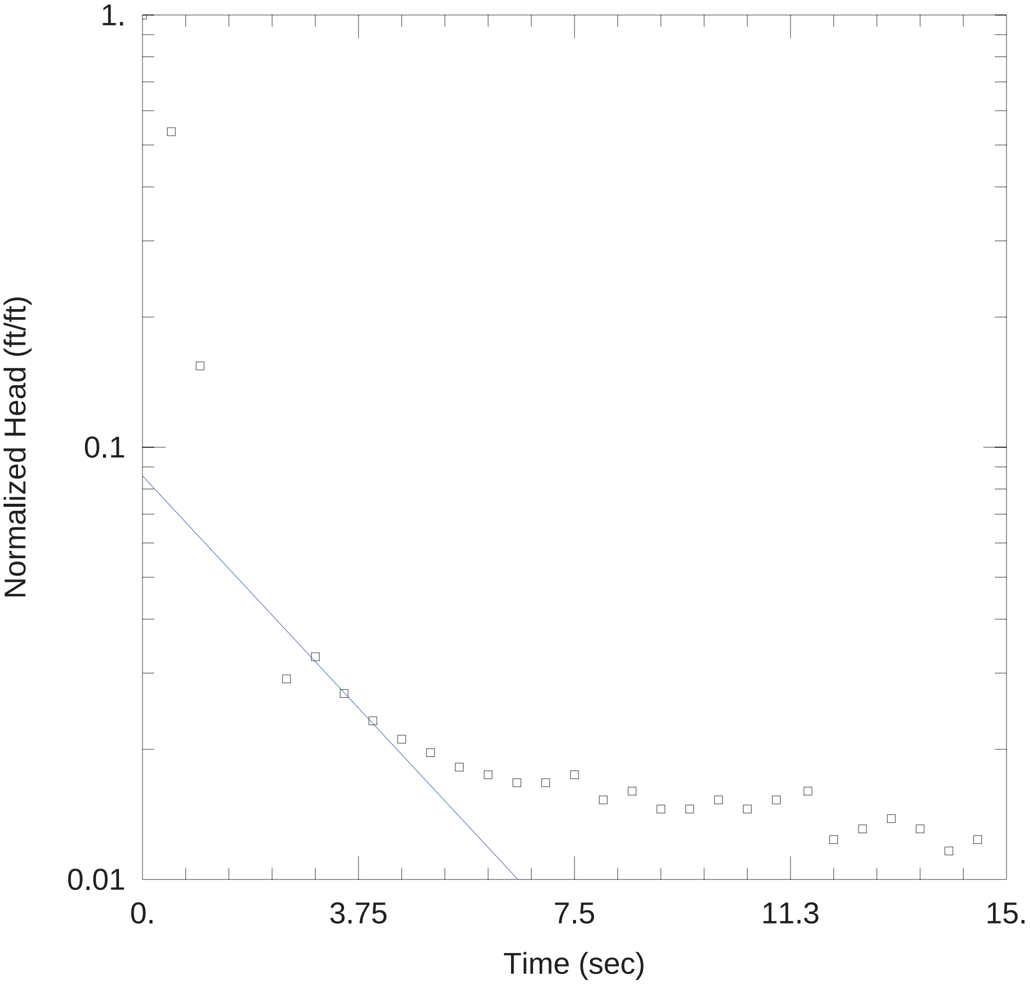
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.117 cm/sec

y0 = -0.181 ft



XPW03 RH3

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

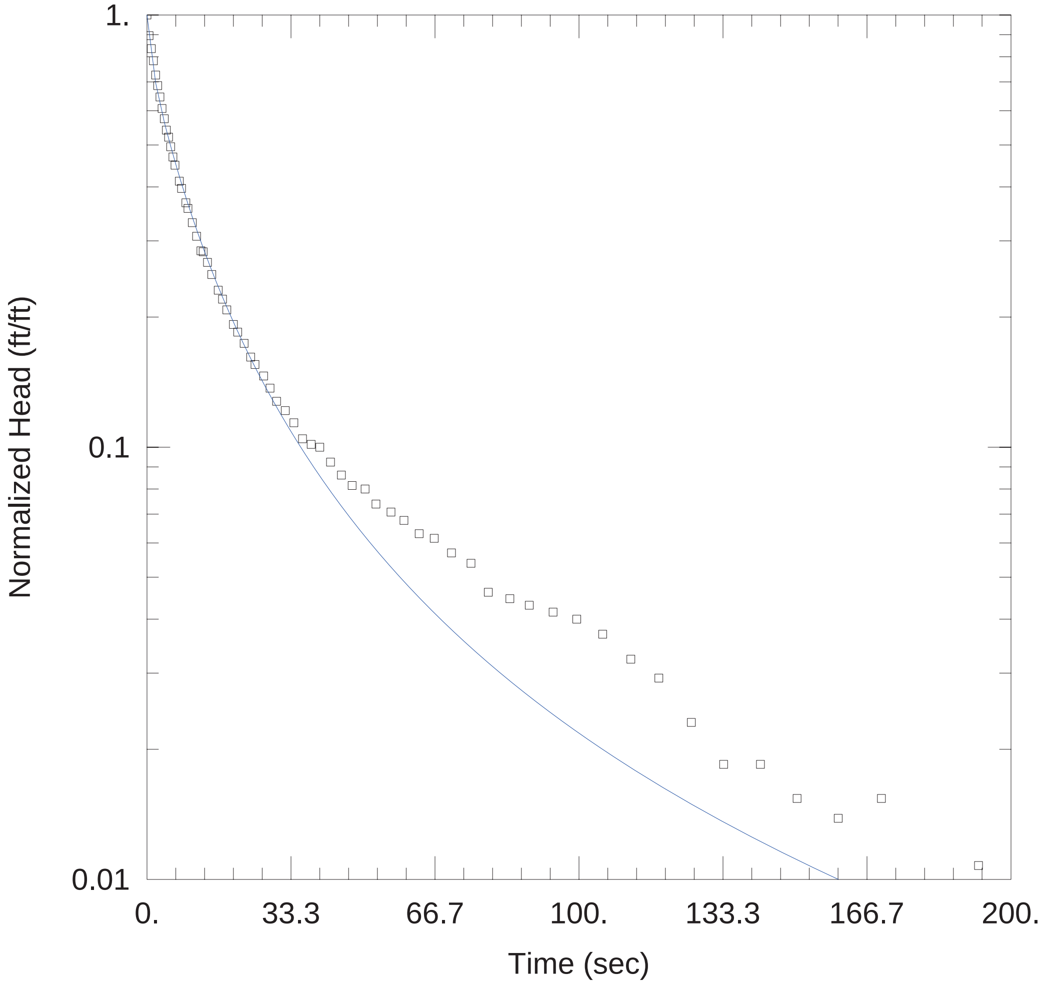
Saturated Thickness: 7.948 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW03)

Initial Displacement: -1.375 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 13.25 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.143 cm/sec
y0 = -0.118 ft



XPW04 FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW04
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 9.9 ft

WELL DATA (XPW04)

Initial Displacement: 0.65 ft
Total Well Penetration Depth: 9.9 ft
Casing Radius: 0.086 ft

Static Water Column Height: 10.4 ft
Screen Length: 9.5 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

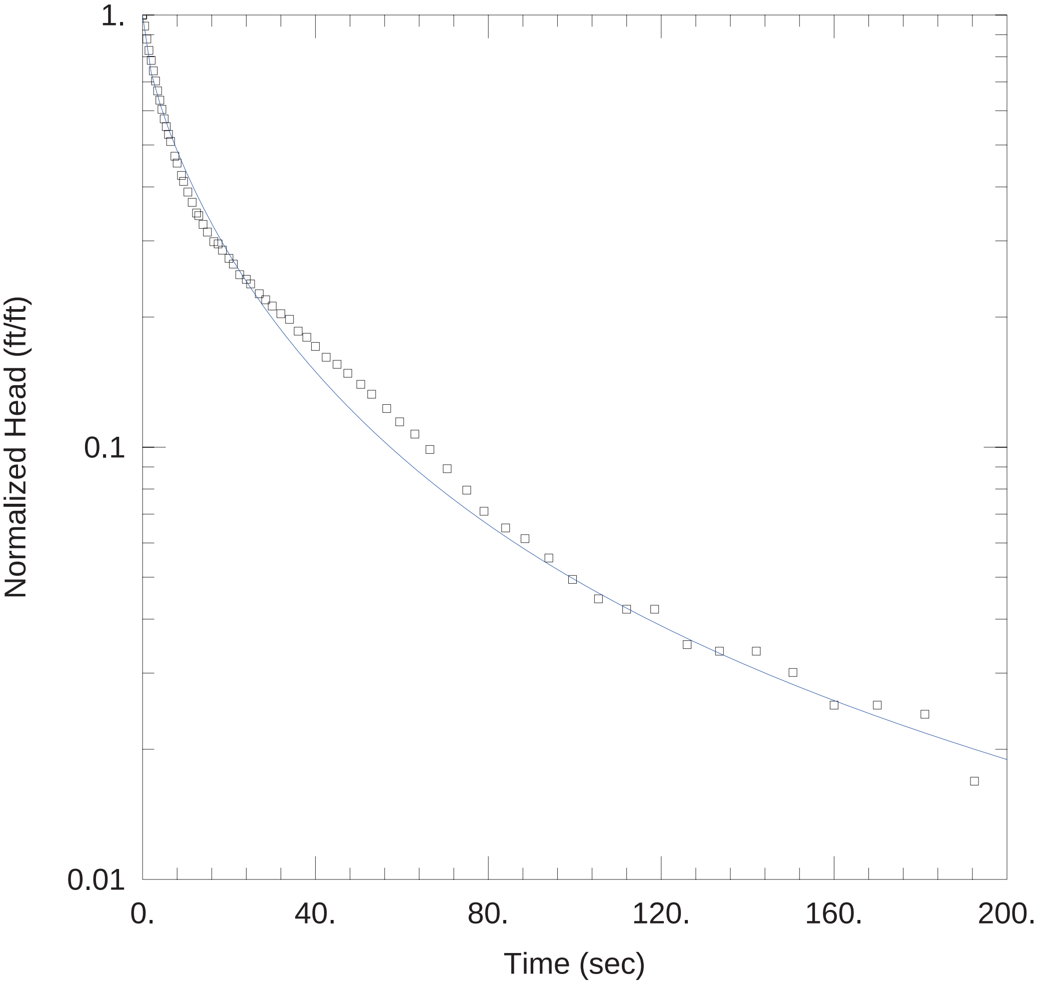
SOLUTION

Aquifer Model: Unconfined

Solution Method: KGS Model

Kr = 0.0021 cm/sec
Kz/Kr = 1.

Ss = 0.00051 ft^{-1}



XPW04 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW04
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 9.9 ft

WELL DATA (XPW04)

Initial Displacement: 0.83 ft
Total Well Penetration Depth: 9.9 ft
Casing Radius: 0.086 ft

Static Water Column Height: 10.4 ft
Screen Length: 9.5 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

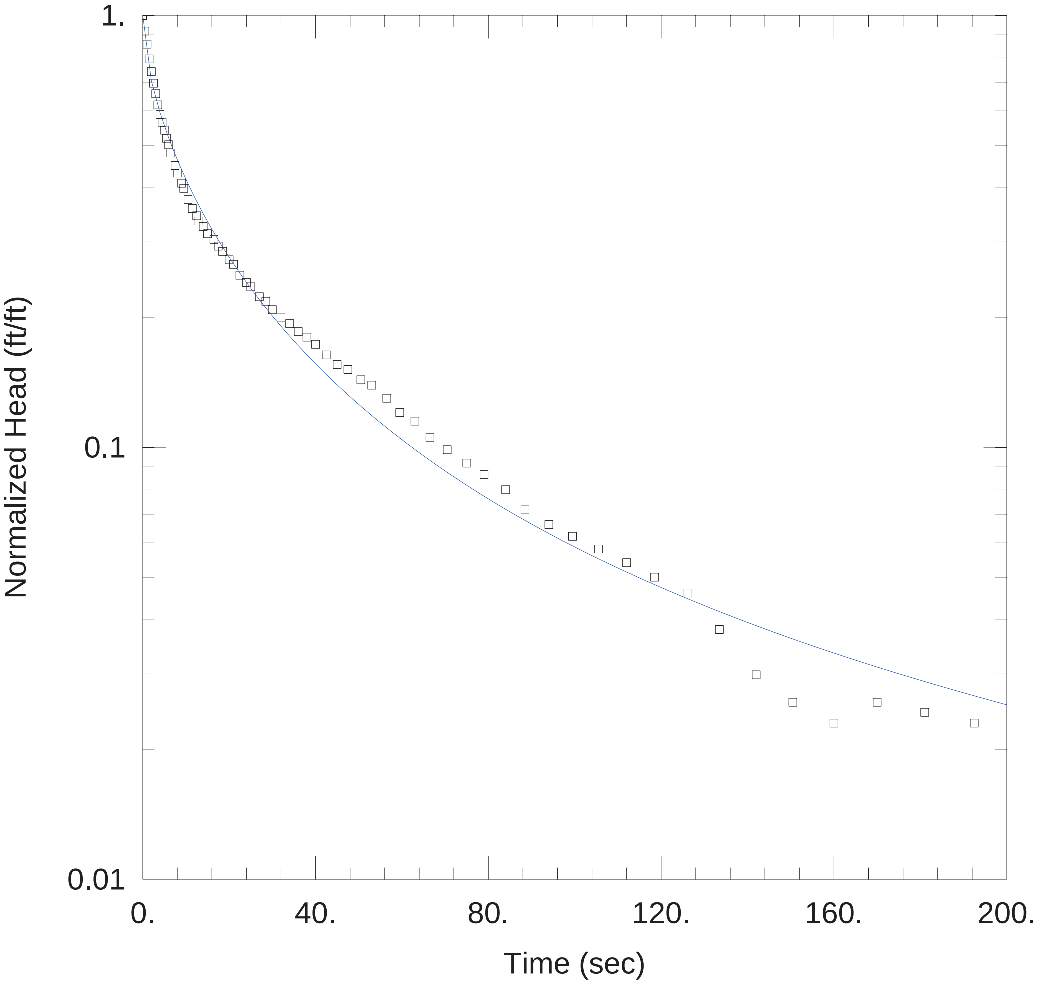
SOLUTION

Aquifer Model: Unconfined

Solution Method: KGS Model

Kr = 0.00122 cm/sec
Kz/Kr = 1.

Ss = 0.00094 ft^{-1}



XPW04 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW04
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 9.9 ft

WELL DATA (XPW04)

Initial Displacement: 0.74 ft
Total Well Penetration Depth: 9.9 ft
Casing Radius: 0.086 ft

Static Water Column Height: 10.4 ft
Screen Length: 9.5 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined

Solution Method: KGS Model

Kr = 0.00101 cm/sec
Kz/Kr = 1.

Ss = 0.0019 ft^{-1}

2017 HYDRAULIC CONDUCTIVITY TEST DATA

Appendix C - Table 1
Newton Power Station
Slug Test Results - Primary Ash Pond Wells (ID 501)
Hydrogeologic Monitoring Plan

Well ID	Slug In 1	Slug In 2	Slug In 3	Slug Out 1	Slug Out 2	Slug Out 3	Slug Out 4	MIN	MAX	GEOMEAN	Solution
APW2	▨	4.41E-05	▨	4.52E-05	▨	3.45E-05	▨	3.45E-05	4.52E-05	4.1E-05	Bouwer-Rice
APW3	8.44E-06	▨	▨	8.61E-06	▨	▨	▨	8.44E-06	8.61E-06	8.5E-06	Bouwer-Rice
APW4	6.66E-06	▨	▨	5.14E-06	▨	▨	▨	5.14E-06	6.66E-06	5.8E-06	Bouwer-Rice
APW5	5.66E-04	1.42E-03	▨	1.54E-04	2.74E-04	2.56E-04	▨	1.54E-04	1.42E-03	3.9E-04	Bouwer-Rice
APW6	1.64E-03	2.18E-03	▨	▨	2.09E-03	1.98E-03	▨	1.64E-03	2.18E-03	2.0E-03	Bouwer-Rice
APW7	2.25E-03	▨	▨	▨	3.24E-03	2.99E-03	2.75E-03	2.25E-03	3.24E-03	2.8E-03	Bouwer-Rice
APW8	6.60E-04	1.31E-03	▨	▨	1.06E-03	7.89E-04	▨	6.60E-04	1.31E-03	9.2E-04	Bouwer-Rice
APW9	3.21E-03	3.28E-03	▨	3.40E-03	3.00E-03	▨	▨	3.00E-03	3.40E-03	3.2E-03	Bouwer-Rice
APW10	5.27E-04	5.49E-04	▨	▨	5.73E-04	5.60E-04	▨	5.27E-04	5.73E-04	5.5E-04	Bouwer-Rice

All slug test (i.e. hydraulic conductivity) results are in centimeters per second

▨ Not Applicable

Appendix C - Table 2

Newton Power Station

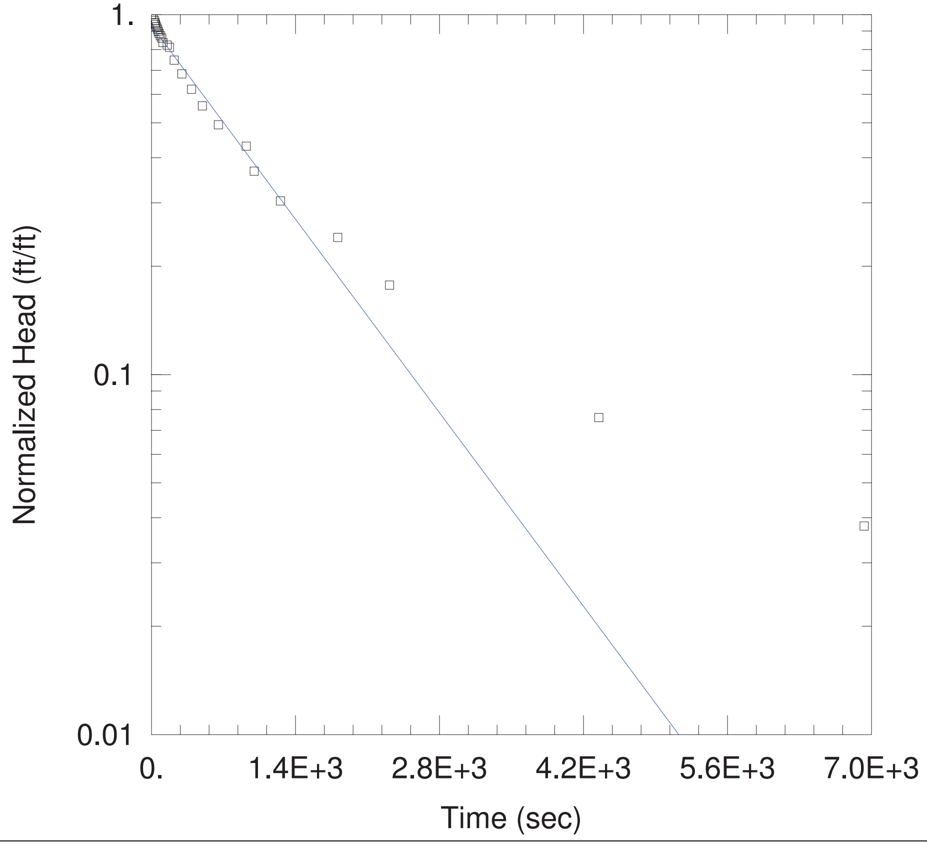
Slug Test Results - Landfill 2 CCR Wells (ID 502)

Hydrogeologic Monitoring Plan

Well ID	Slug In 1	Slug In 2	Slug In 3	Slug Out 1	Slug Out 2	Slug Out 3	MIN	MAX	GEOMEAN	Solution
G06D	▨	▨	▨	3.92E-08	▨	▨	3.92E-08	3.92E-08	3.9E-08	Bouwer-Rice
G202	1.70E-02	1.43E-02	▨	▨	2.87E-02	2.33E-02	1.43E-02	2.87E-02	2.0E-02	Bouwer-Rice
G203	2.53E-02	▨	▨	2.42E-02	3.47E-02	▨	2.42E-02	3.47E-02	2.8E-02	Bouwer-Rice
G208	▨	▨	▨	1.32E-08	▨	▨	1.32E-08	1.32E-08	1.3E-08	Bouwer-Rice
G217D	2.27E-04	2.92E-04	▨	▨	▨	3.03E-04	2.27E-04	3.03E-04	2.7E-04	Bouwer-Rice
G220	▨	▨	▨	3.51E-07	▨	▨	3.51E-07	3.51E-07	3.5E-07	Bouwer-Rice
G222	▨	▨	▨	1.54E-06	▨	▨	1.54E-06	1.54E-06	1.5E-06	Bouwer-Rice
G223	5.19E-05	2.50E-05	▨	1.37E-05	1.79E-05	▨	1.37E-05	5.19E-05	2.4E-05	Bouwer-Rice
G224	5.15E-02	1.90E-02	4.64E-02	4.31E-02	▨	2.97E-02	1.90E-02	5.15E-02	3.6E-02	Bouwer-Rice

All slug test (i.e. hydraulic conductivity) results are in centimeters per second

▨ Not Applicable



WELL TEST ANALYSIS

Data Set: P:\...\APW2 SI2.aqt
Date: 10/09/17 Time: 15:04:26

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW2
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

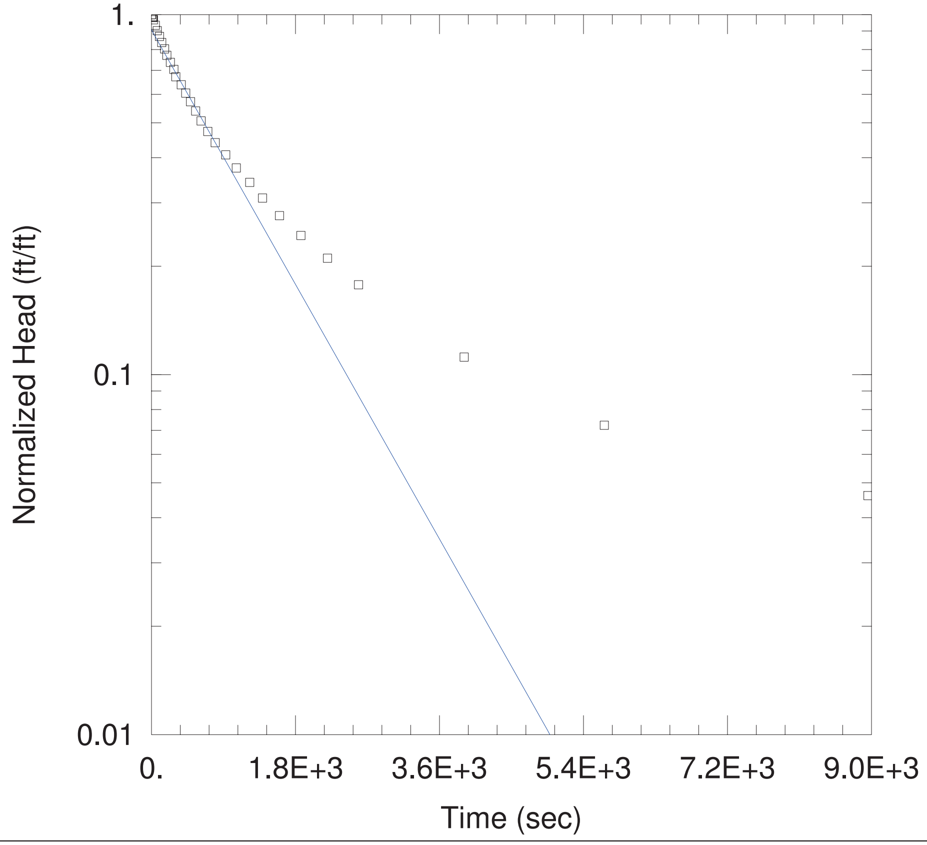
K = 4.414E-5 cm/sec
y0 = 0.7361 ft

AQUIFER DATA

Saturated Thickness: 9. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW2 SI2)

Initial Displacement: 0.79 ft
Total Well Penetration Depth: 6.4 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 9. ft
Screen Length: 3.4 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW2 SO1.aqt
Date: 10/09/17 Time: 15:05:33

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW2
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

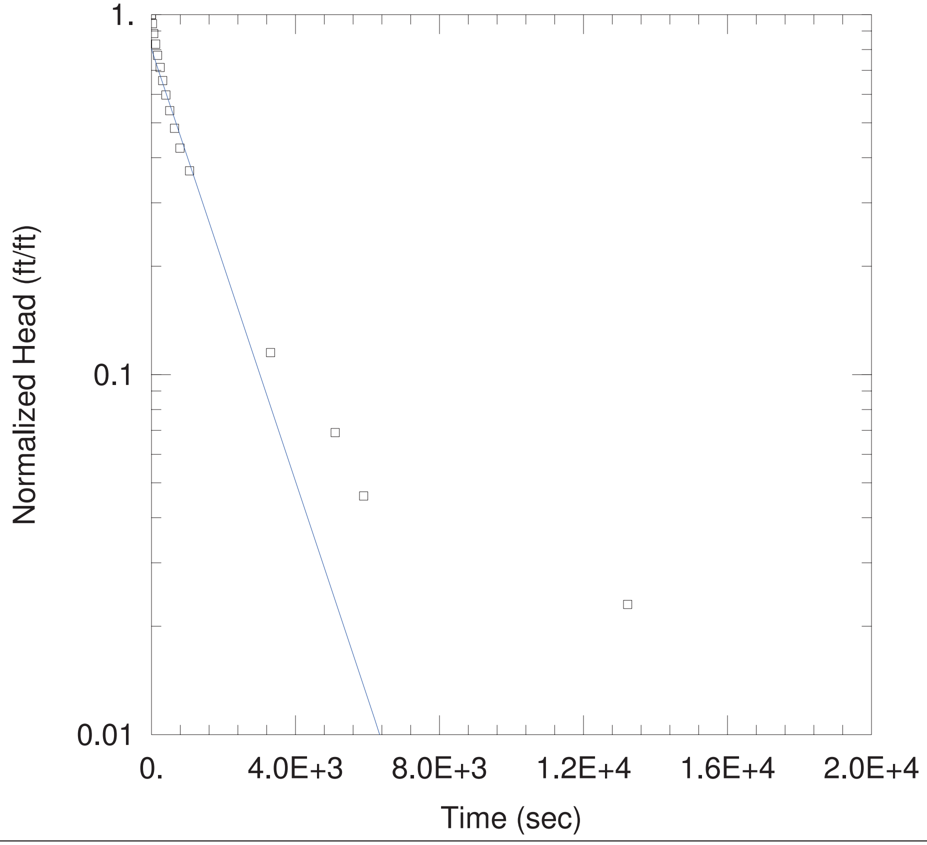
K = 4.517E-5 cm/sec
y0 = 1.38 ft

AQUIFER DATA

Saturated Thickness: 9. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW2 SO1)

Initial Displacement: 1.52 ft
Total Well Penetration Depth: 6.4 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 9. ft
Screen Length: 3.4 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW2 SO3.aqt
Date: 10/09/17 Time: 15:06:23

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW2
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

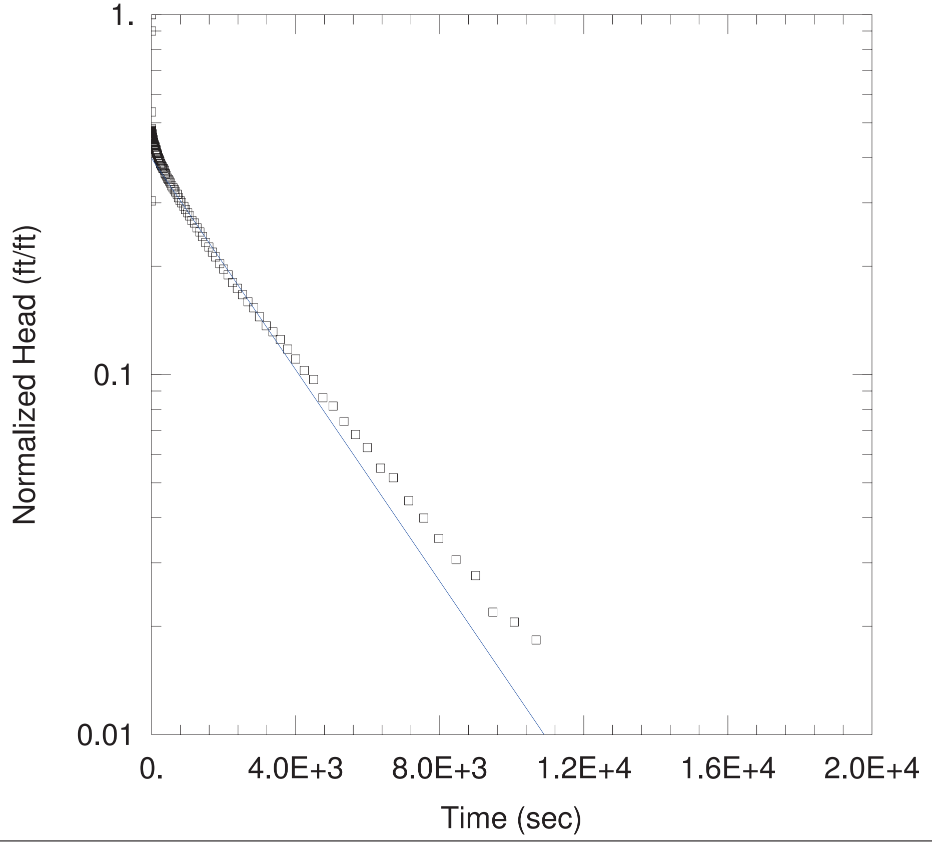
K = 3.449E-5 cm/sec
y0 = 0.698 ft

AQUIFER DATA

Saturated Thickness: 9. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW2 SO3)

Initial Displacement: 0.87 ft
Total Well Penetration Depth: 6.4 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 9. ft
Screen Length: 3.4 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW 3 SI1.aqt
Date: 10/09/17 Time: 15:13:21

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW3
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

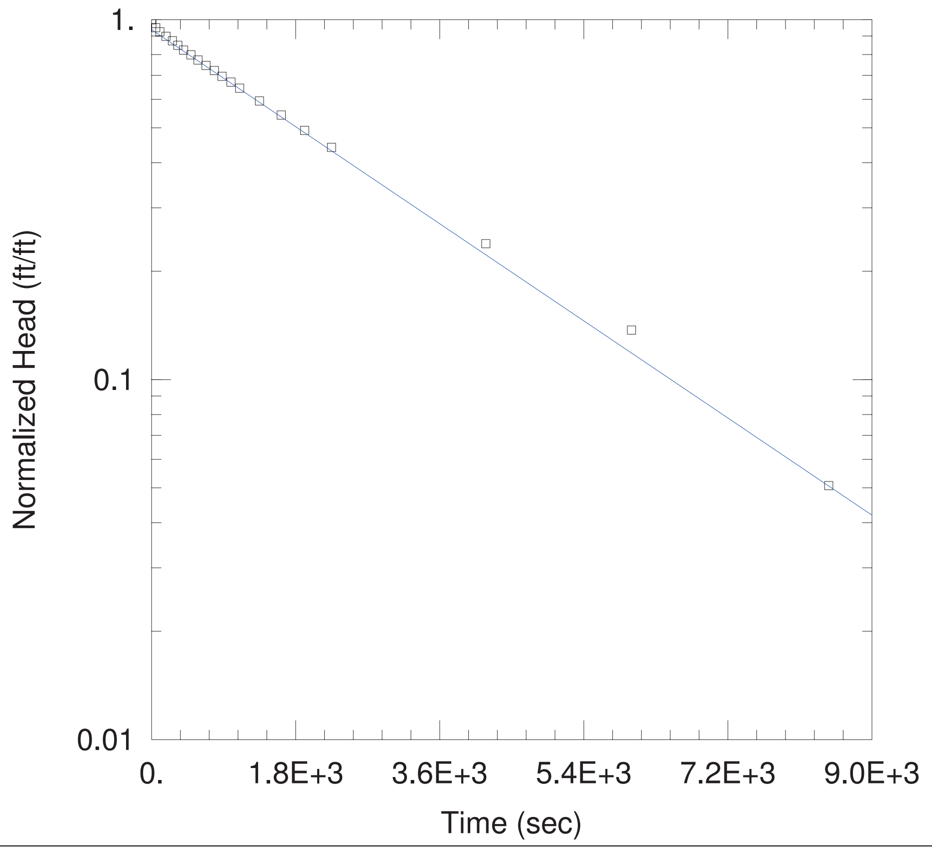
K = 8.437E-6 cm/sec
y0 = 1.458 ft

AQUIFER DATA

Saturated Thickness: 14. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW3 SI1)

Initial Displacement: 3.656 ft
Total Well Penetration Depth: 11.5 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 14. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW 3 SO1.aqt
Date: 10/09/17 Time: 15:08:16

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW3
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

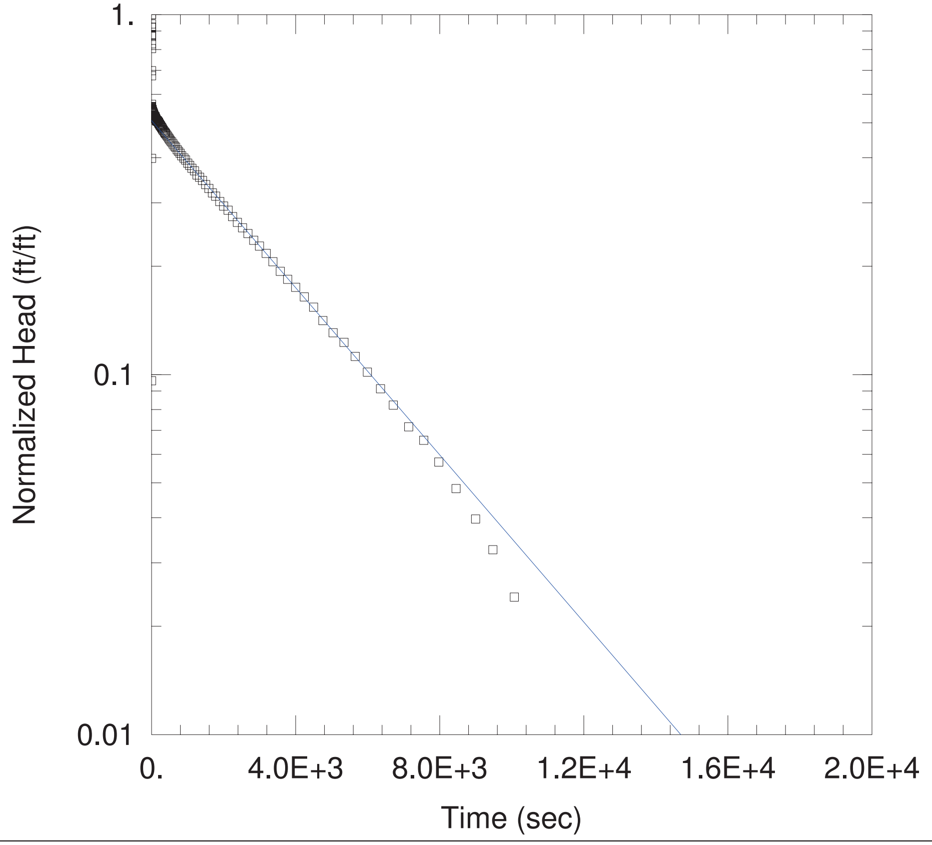
K = 8.611E-6 cm/sec
y0 = 1.848 ft

AQUIFER DATA

Saturated Thickness: 14. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW3 SO1)

Initial Displacement: 1.97 ft
Total Well Penetration Depth: 11.5 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 14. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW 4 SI1.aqt
Date: 10/09/17 Time: 15:15:09

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW4
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

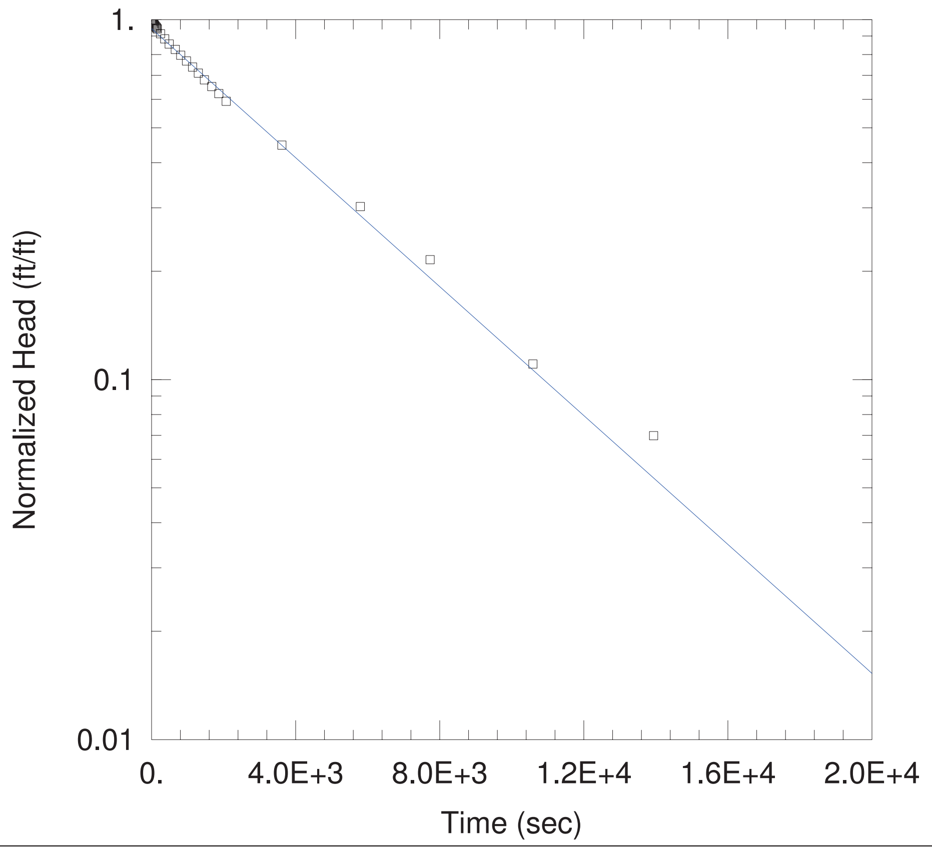
K = 6.66E-6 cm/sec
y0 = 1.37 ft

AQUIFER DATA

Saturated Thickness: 11. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW4 S11)

Initial Displacement: 2.697 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 11. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW 4 SO1.aqt
Date: 10/09/17 Time: 15:15:46

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW4
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

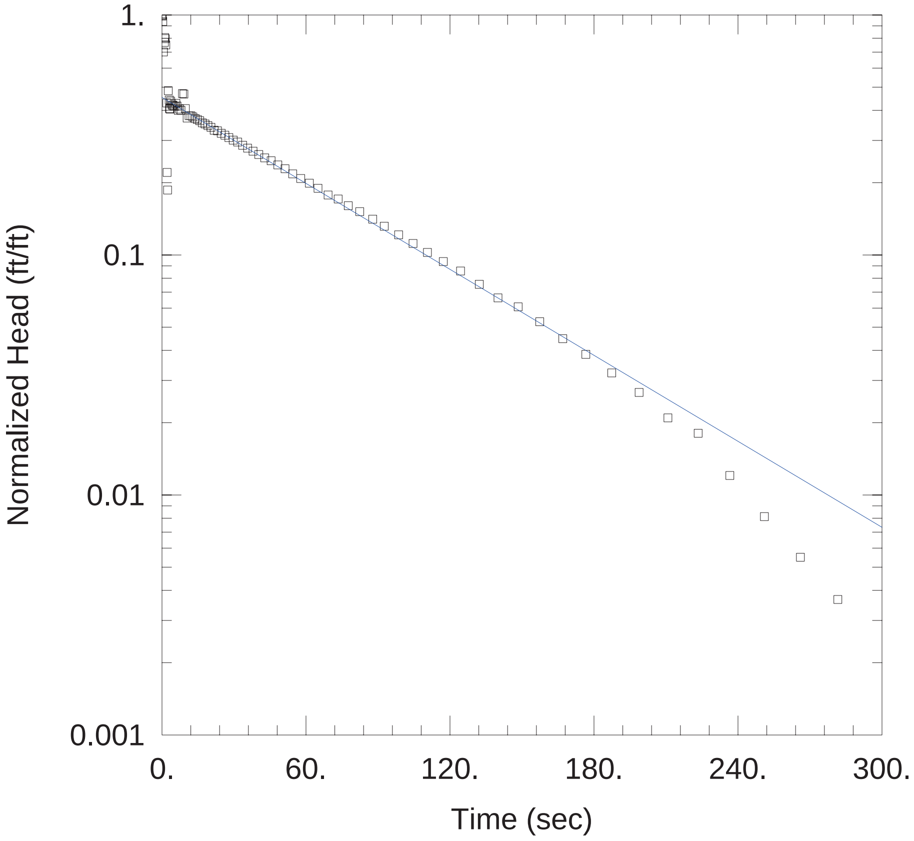
K = 5.137E-6 cm/sec
y0 = 1.622 ft

AQUIFER DATA

Saturated Thickness: 11. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW4 SO1)

Initial Displacement: 1.72 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 11. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SI1.aqt
Date: 06/15/17 Time: 11:53:01

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

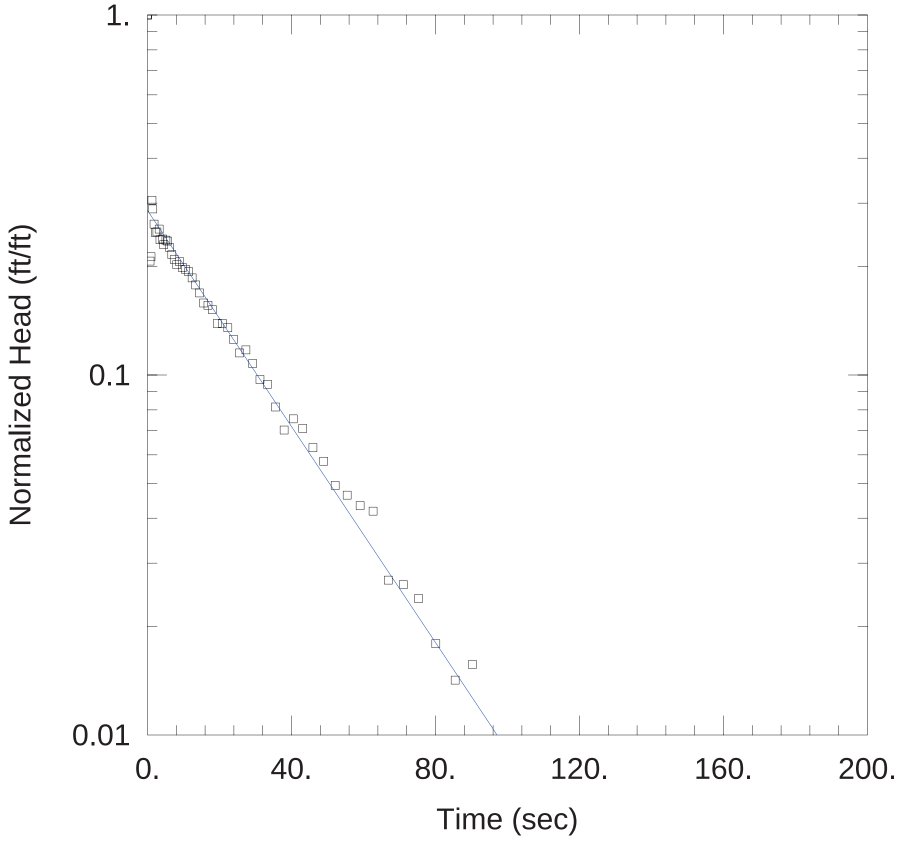
K = 0.0005655 cm/sec
y0 = 1.731 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SI1)

Initial Displacement: 3.818 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SI2.aqt
Date: 05/12/17 Time: 17:23:52

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

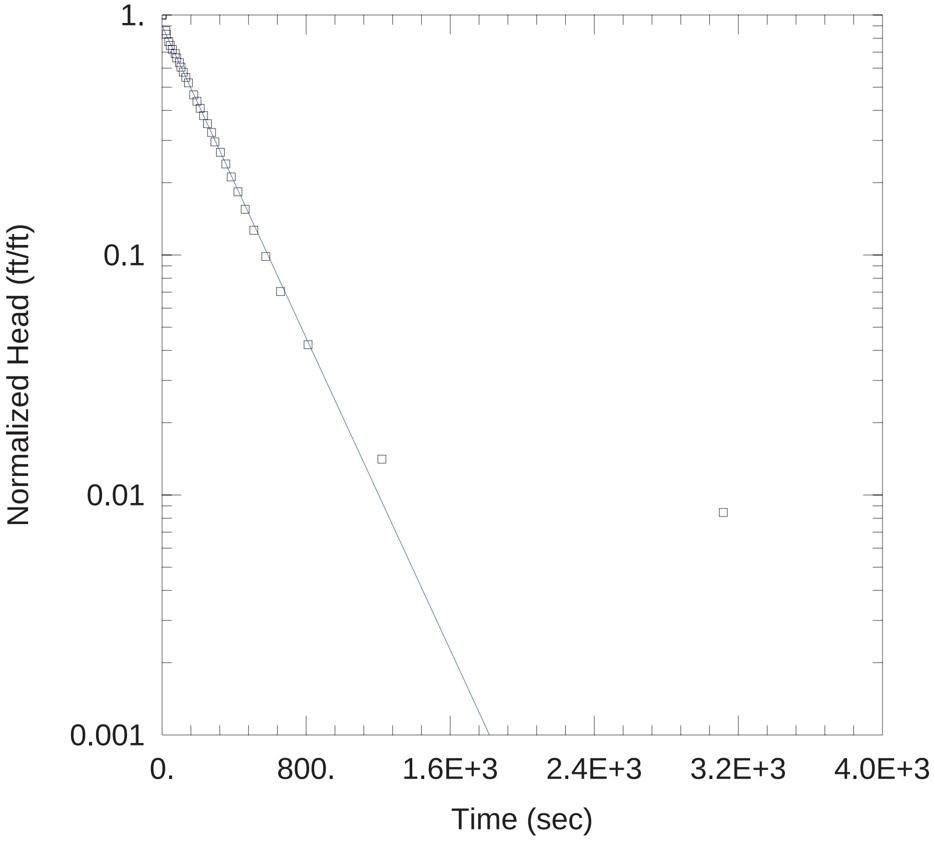
K = 0.001421 cm/sec
y0 = 0.383 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SI2)

Initial Displacement: 1.338 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SO1.aqt
Date: 05/12/17 Time: 17:30:12

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

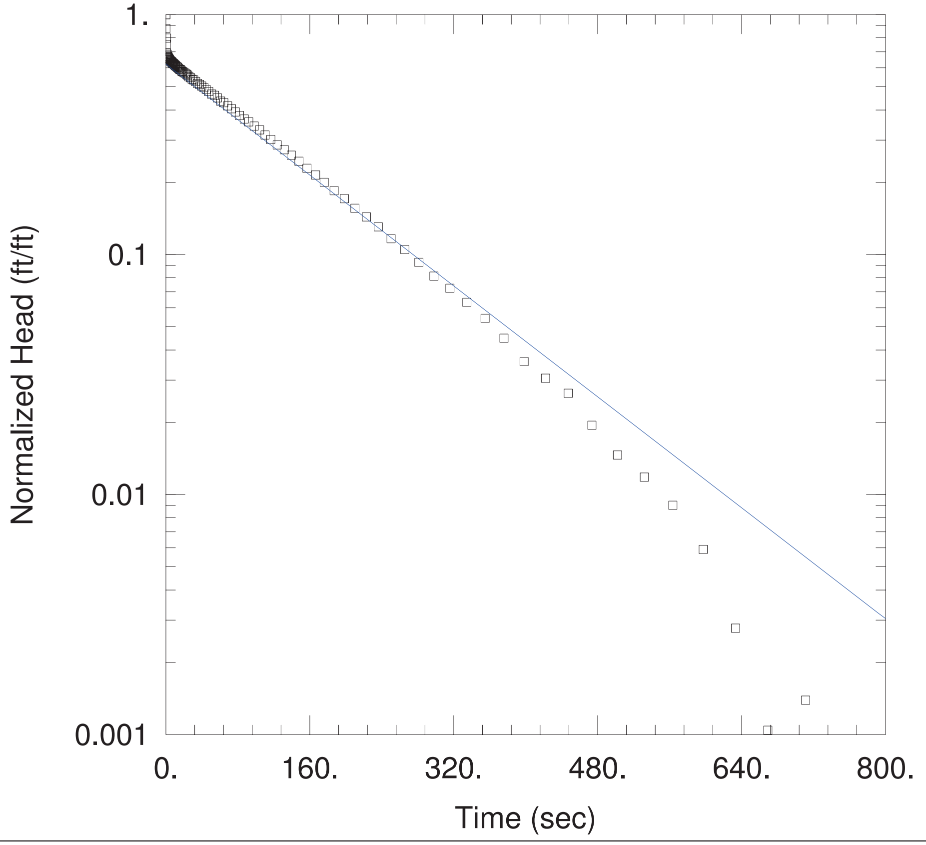
K = 0.0001539 cm/sec
y0 = 3.197 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SO1)

Initial Displacement: 3.55 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SO2.aqt
Date: 10/09/17 Time: 14:59:07

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

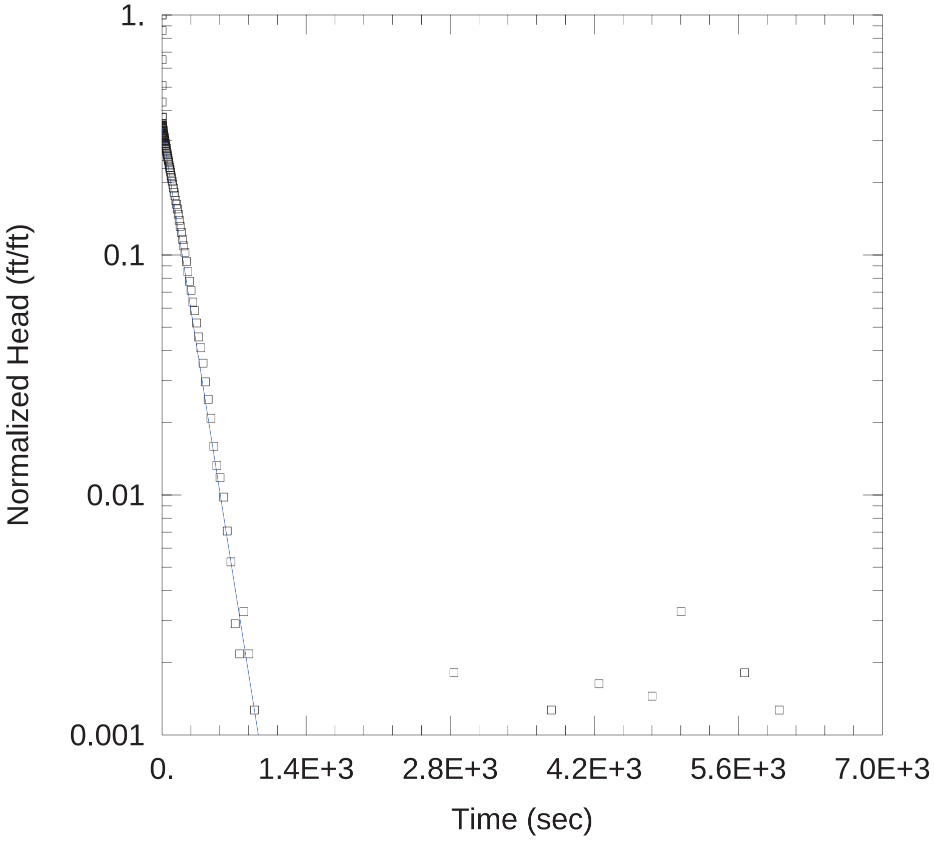
K = 0.0002735 cm/sec
y0 = 1.789 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SO2)

Initial Displacement: 2.879 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SO3.aqt
Date: 06/15/17 Time: 11:57:15

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

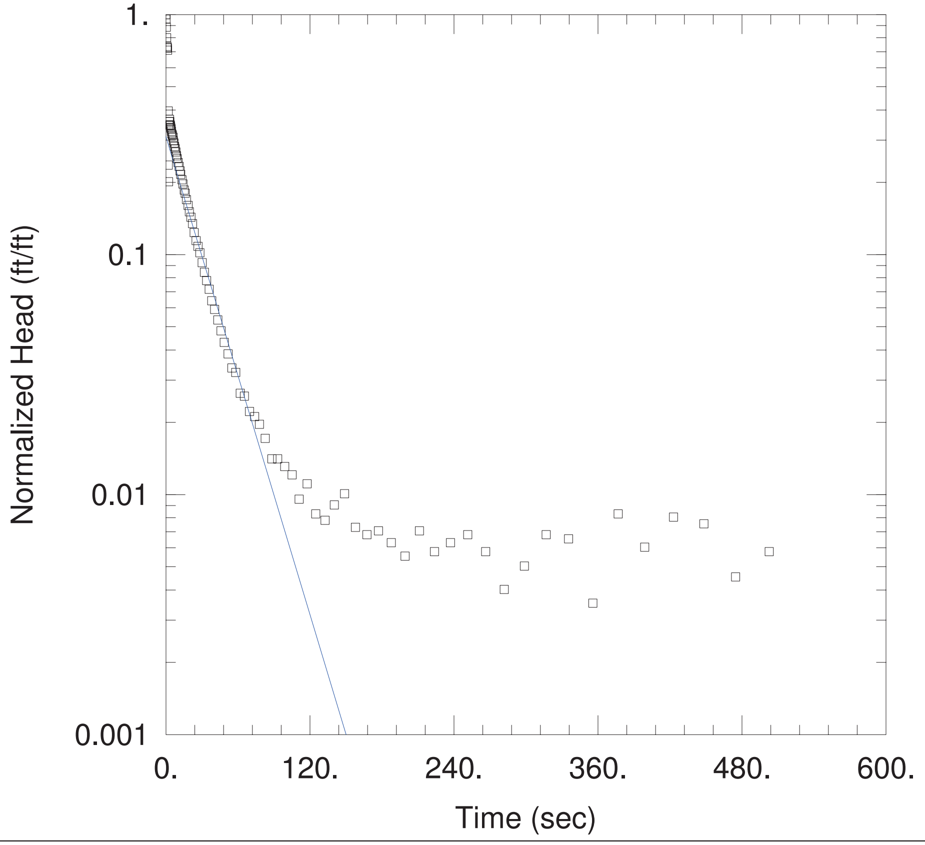
K = 0.0002559 cm/sec
y0 = 1.858 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SO3)

Initial Displacement: 5.512 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW6 SI1.aqt
Date: 10/10/17 Time: 08:43:51

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW6
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.001642 cm/sec
y0 = 1.231 ft

AQUIFER DATA

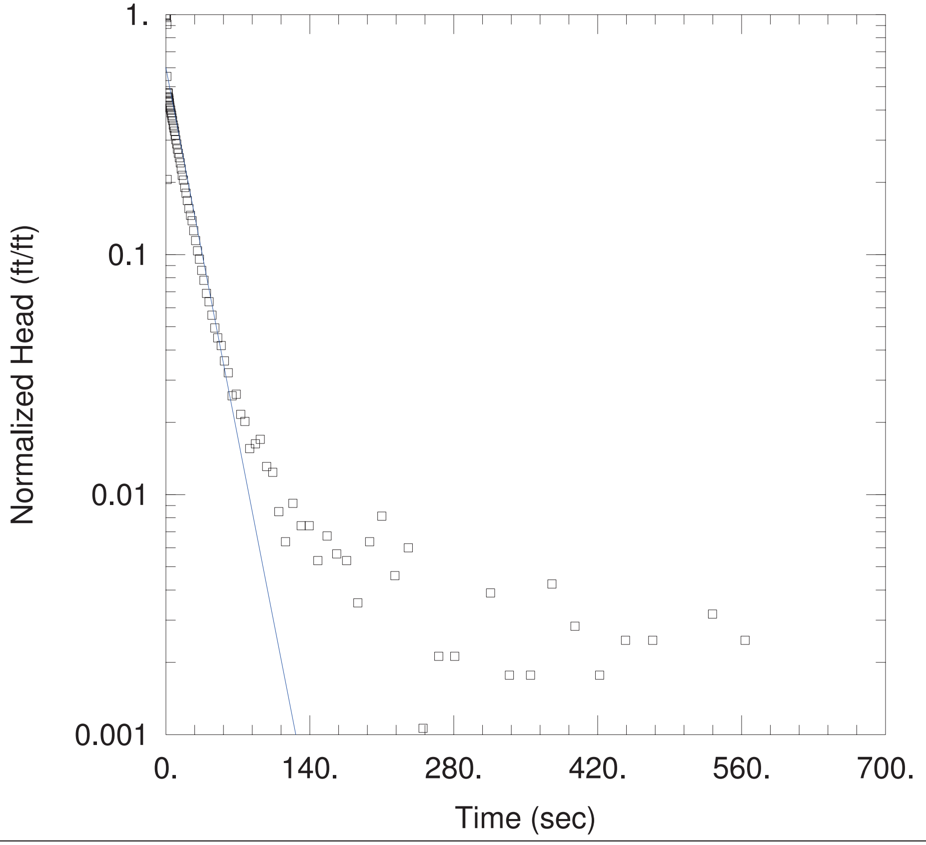
Saturated Thickness: 6.5 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW6 SI1)

Initial Displacement: 3.973 ft
Total Well Penetration Depth: 3.3 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 6.5 ft
Screen Length: 3.3 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW6 SI2.aqt
Date: 10/10/17 Time: 08:45:57

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW6
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

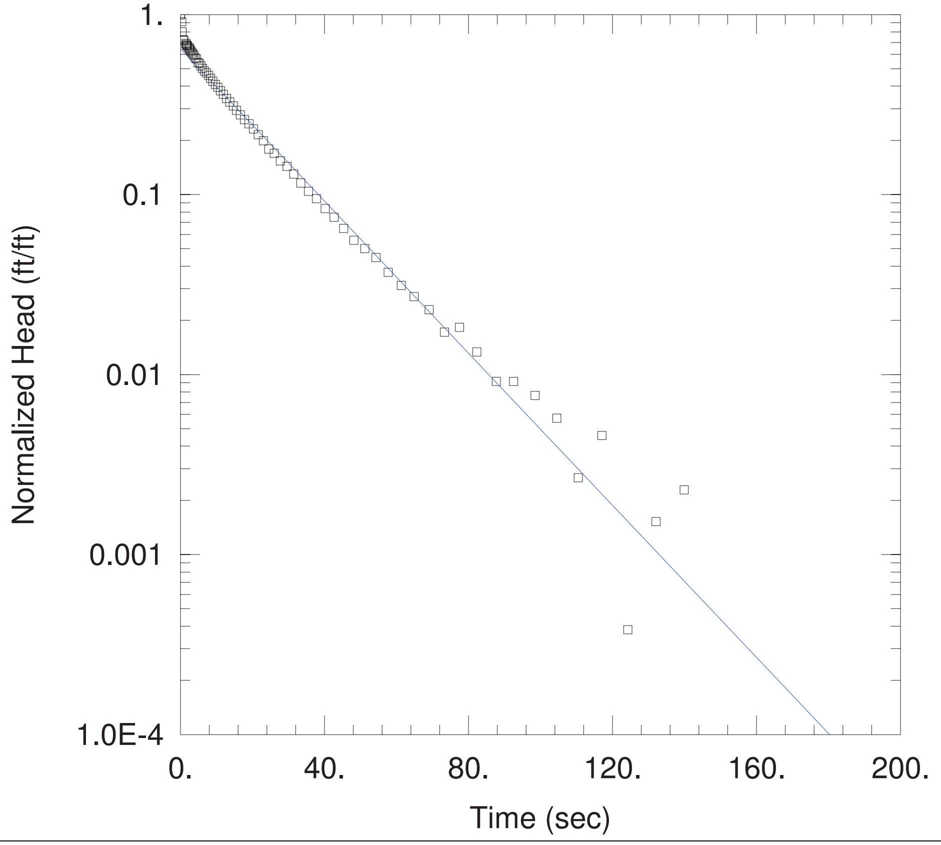
K = 0.002177 cm/sec
y0 = 1.702 ft

AQUIFER DATA

Saturated Thickness: 6.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW6 SI2)

Initial Displacement: 2.83 ft
Total Well Penetration Depth: 3.3 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.5 ft
Screen Length: 3.3 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW6 SO2.aqt
Date: 10/10/17 Time: 08:48:43

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW6
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

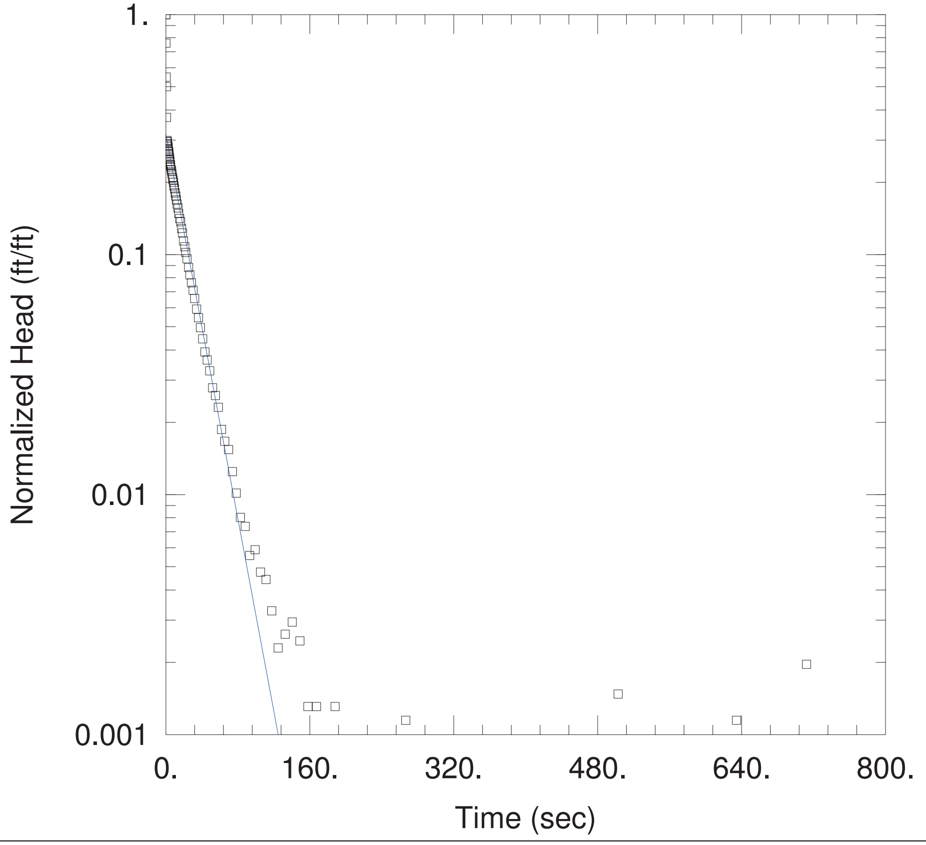
K = 0.002091 cm/sec
y0 = 1.689 ft

AQUIFER DATA

Saturated Thickness: 6.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW6 SO2)

Initial Displacement: 2.62 ft
Total Well Penetration Depth: 3.3 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.5 ft
Screen Length: 3.3 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW6 SO3.aqt
Date: 10/10/17 Time: 08:51:05

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW6
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

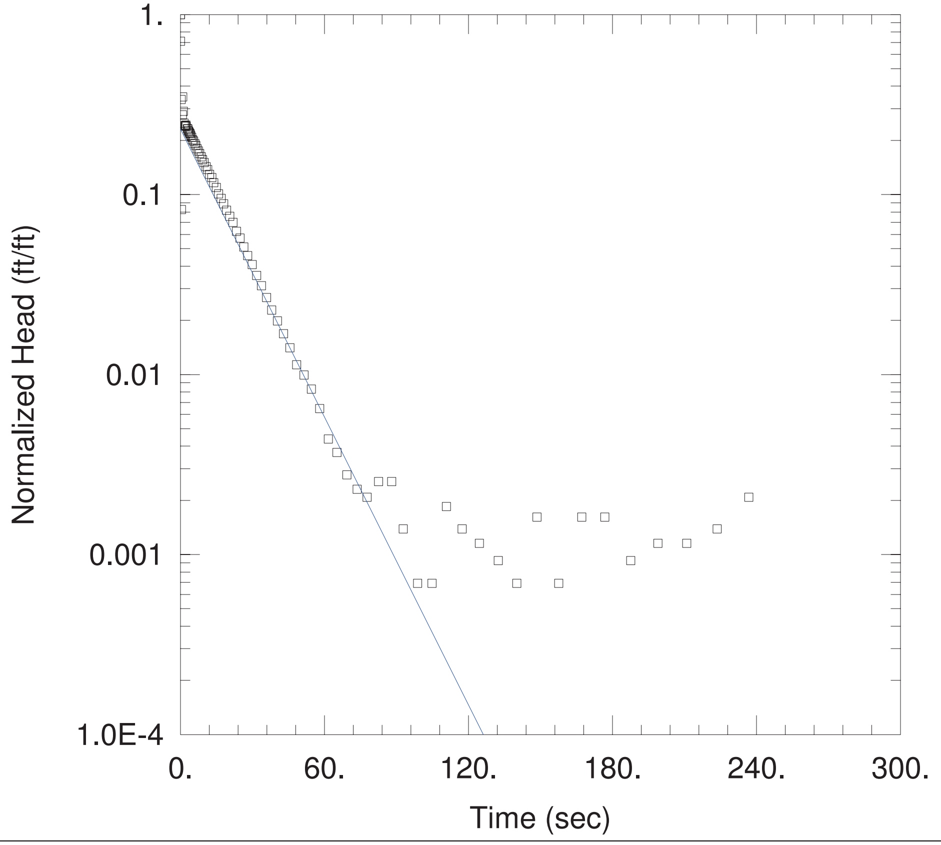
K = 0.001979 cm/sec
y0 = 1.936 ft

AQUIFER DATA

Saturated Thickness: 6.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW6 SO3)

Initial Displacement: 6.109 ft
Total Well Penetration Depth: 3.3 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.5 ft
Screen Length: 3.3 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW7 SI1.aqt
Date: 10/10/17 Time: 09:03:20

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW7
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

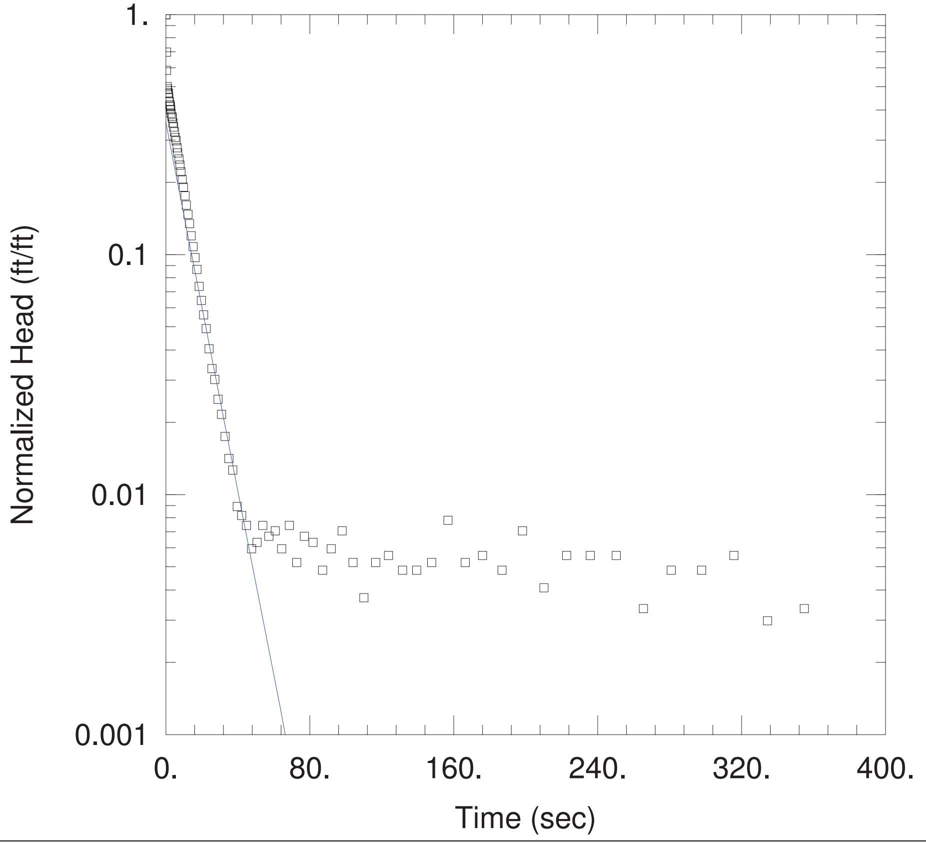
K = 0.00225 cm/sec
y0 = 1.004 ft

AQUIFER DATA

Saturated Thickness: 7.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW7 SI1)

Initial Displacement: 4.331 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 7.1 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW7 SO2.aqt
Date: 10/10/17 Time: 09:05:47

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW7
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

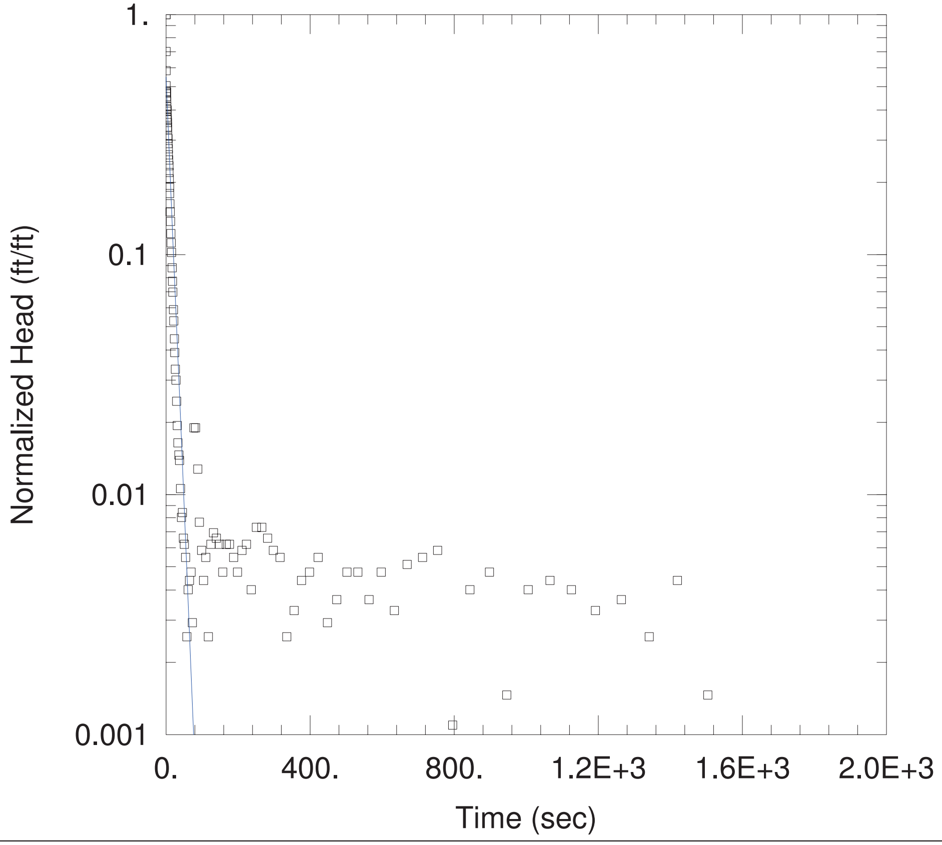
K = 0.003237 cm/sec
y0 = 0.9561 ft

AQUIFER DATA

Saturated Thickness: 7.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW7 S02)

Initial Displacement: 2.69 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 7.1 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW7 SO3.aqt
Date: 10/10/17 Time: 09:07:38

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW7
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

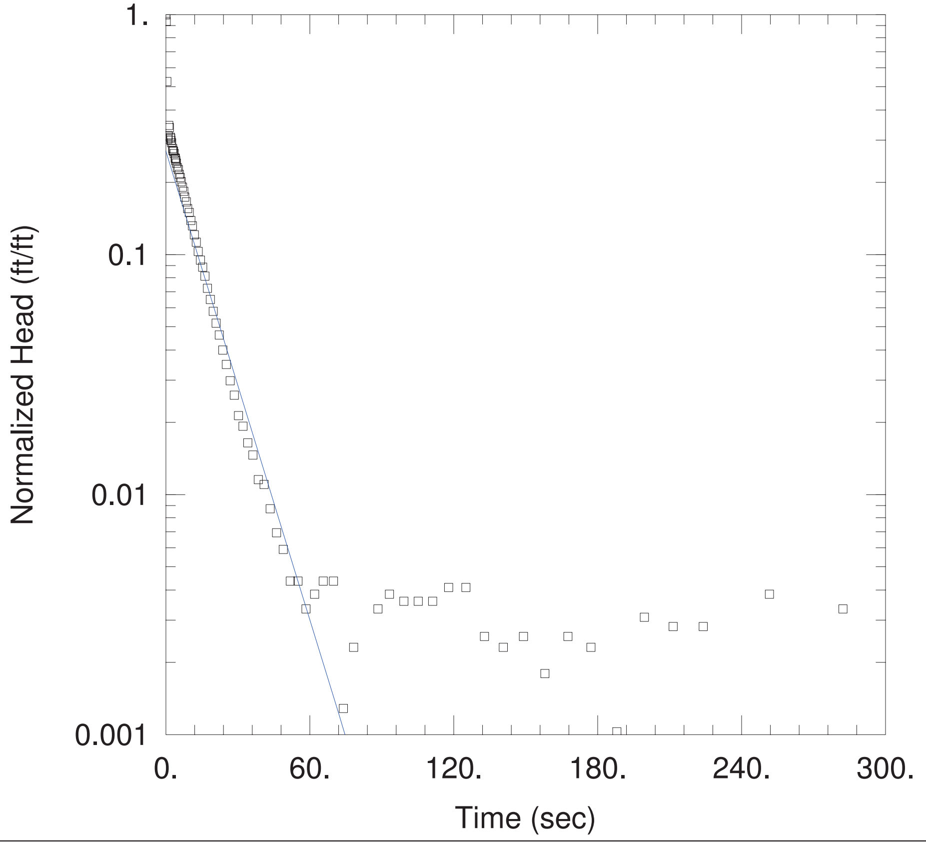
K = 0.002989 cm/sec
y0 = 1.503 ft

AQUIFER DATA

Saturated Thickness: 7.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW7 S03)

Initial Displacement: 2.738 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 7.1 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW7 SO4.aqt
Date: 10/10/17 Time: 09:09:26

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW7
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

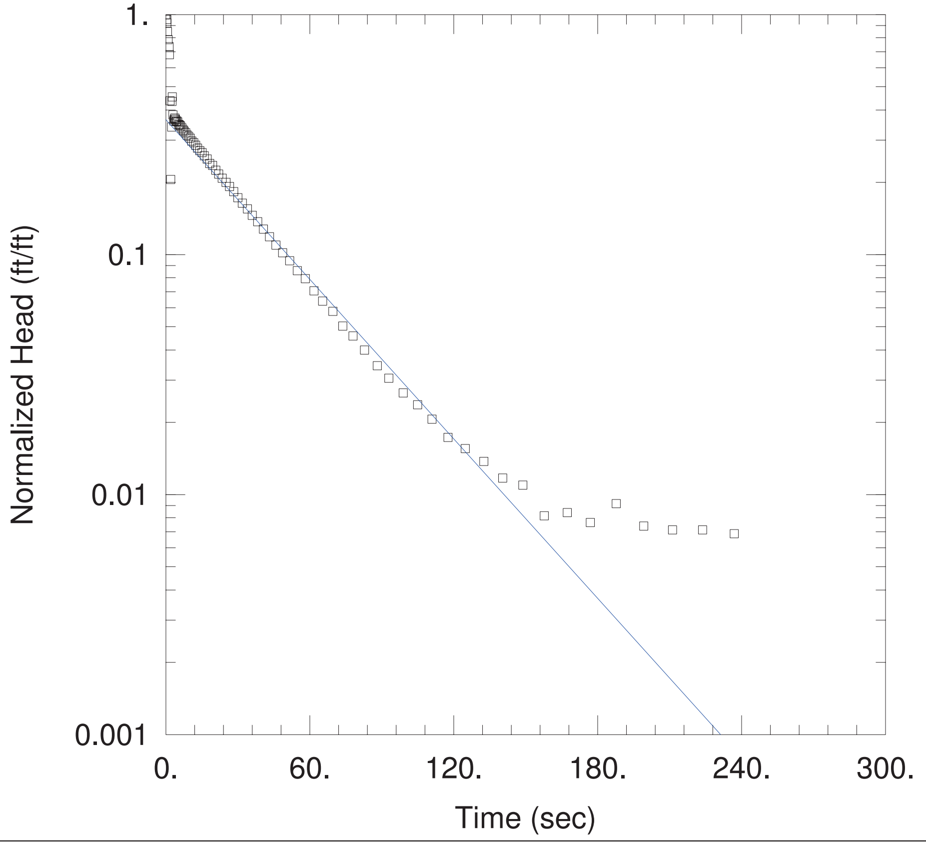
K = 0.002745 cm/sec
y0 = 1.052 ft

AQUIFER DATA

Saturated Thickness: 7.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW7 SO4)

Initial Displacement: 3.899 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 7.1 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW8 SI1.aqt
Date: 10/10/17 Time: 09:12:16

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW8
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

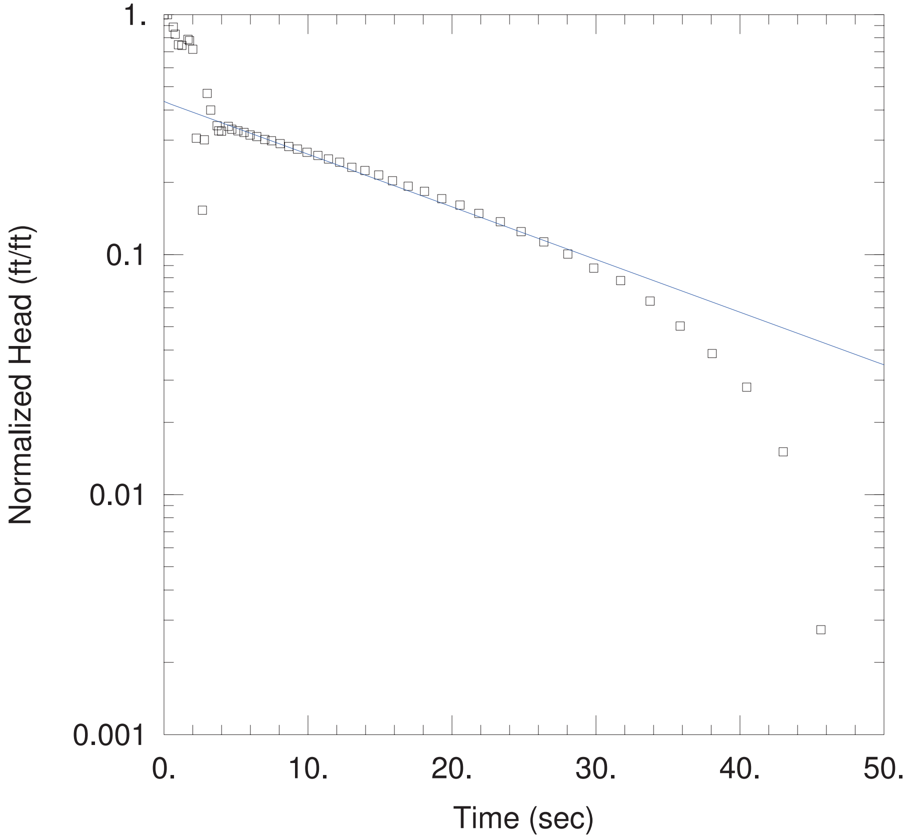
K = 0.0006602 cm/sec
y0 = 1.431 ft

AQUIFER DATA

Saturated Thickness: 16.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW8 SI1)

Initial Displacement: 3.929 ft
Total Well Penetration Depth: 12.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 16.3 ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW8 SI2.aqt
Date: 10/10/17 Time: 09:39:50

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW8
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

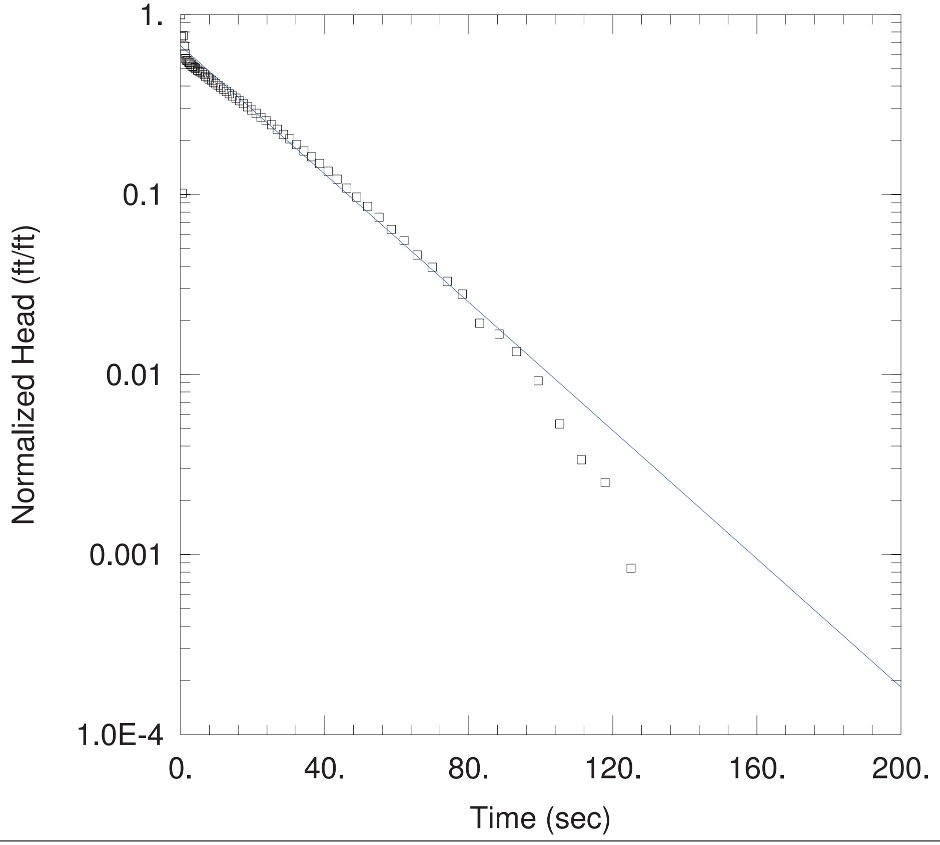
K = 0.001308 cm/sec
y0 = 1.269 ft

AQUIFER DATA

Saturated Thickness: 16.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW8 SI2)

Initial Displacement: 2.924 ft
Total Well Penetration Depth: 12.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 16.3 ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW8 SO2.aqt
Date: 10/10/17 Time: 09:41:42

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW8
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

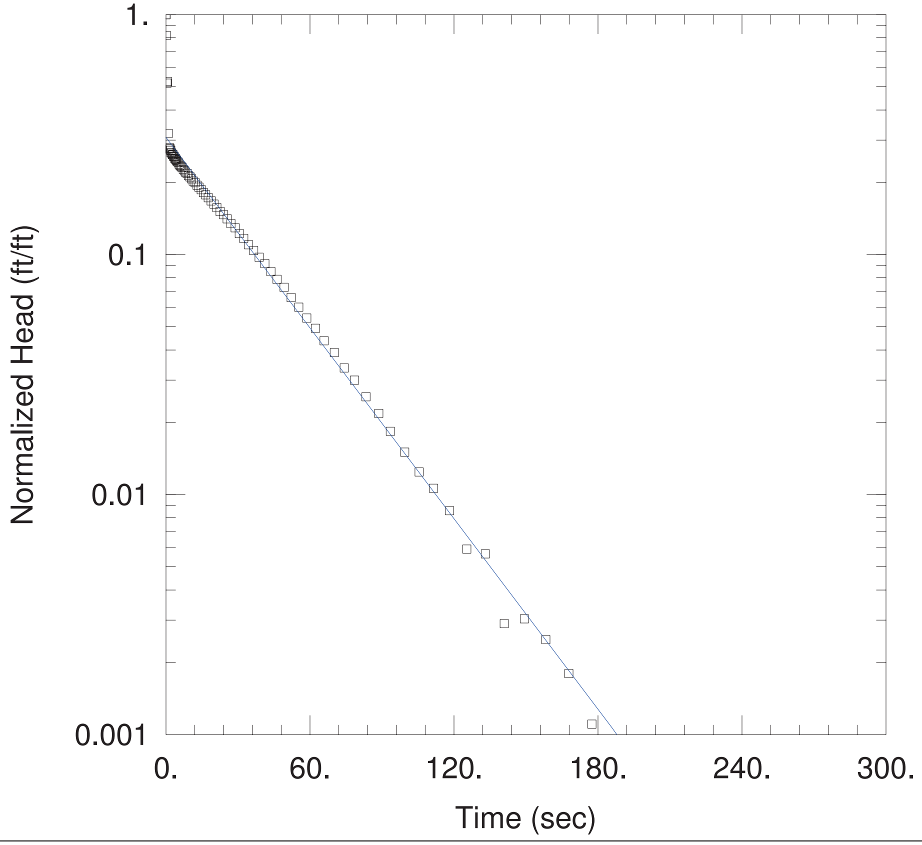
K = 0.001062 cm/sec
y0 = 2.403 ft

AQUIFER DATA

Saturated Thickness: 16.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW8 SO2)

Initial Displacement: 3.577 ft
Total Well Penetration Depth: 12.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 16.3 ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW8 SO3.aqt
Date: 10/10/17 Time: 09:43:26

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW8
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0007891 cm/sec
y0 = 2.233 ft

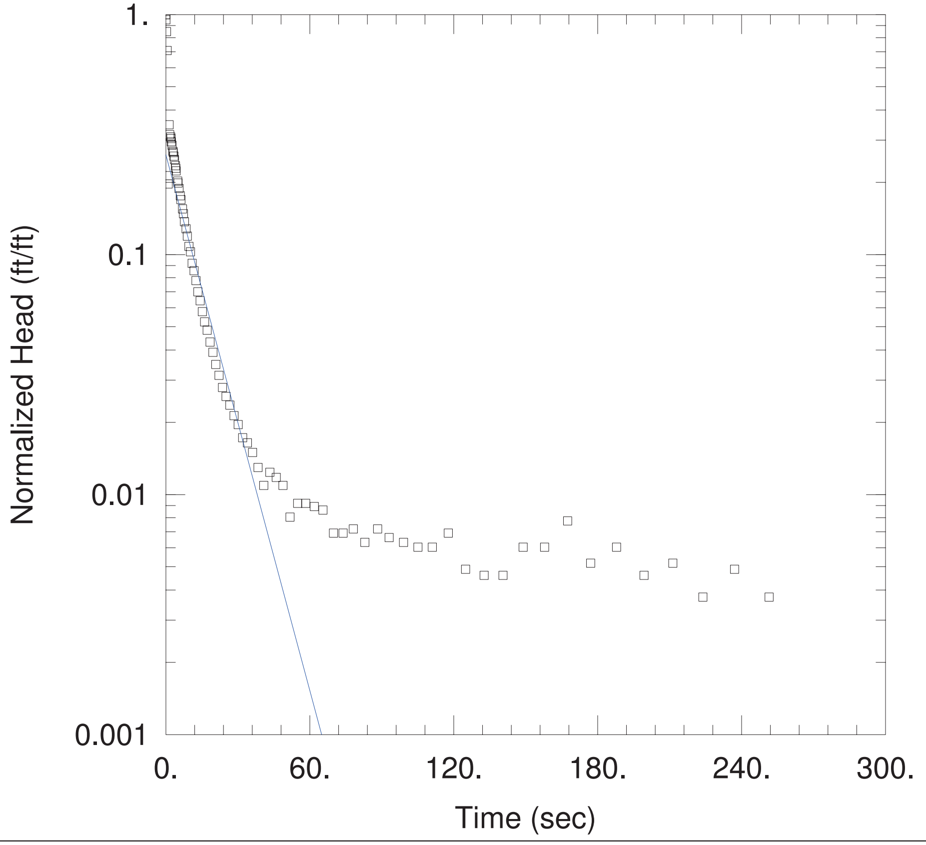
AQUIFER DATA

Saturated Thickness: 16.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW8 SO3)

Initial Displacement: 7.249 ft
Total Well Penetration Depth: 12.8 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 16.3 ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW9 SI1.aqt
Date: 10/10/17 Time: 09:48:54

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW9
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

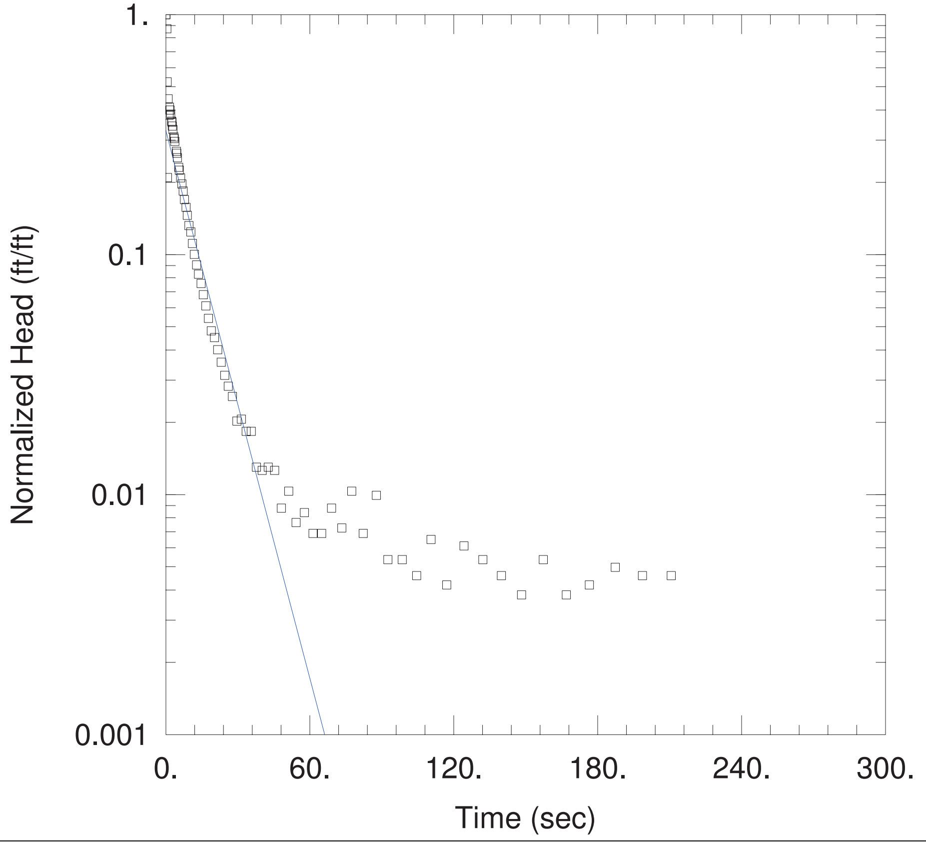
K = 0.00321 cm/sec
y0 = 0.9059 ft

AQUIFER DATA

Saturated Thickness: 6.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW9 SI1)

Initial Displacement: 3.477 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.3 ft
Screen Length: 4.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW9 SI2.aqt
Date: 10/10/17 Time: 09:50:42

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW9
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.003282 cm/sec
y0 = 0.8588 ft

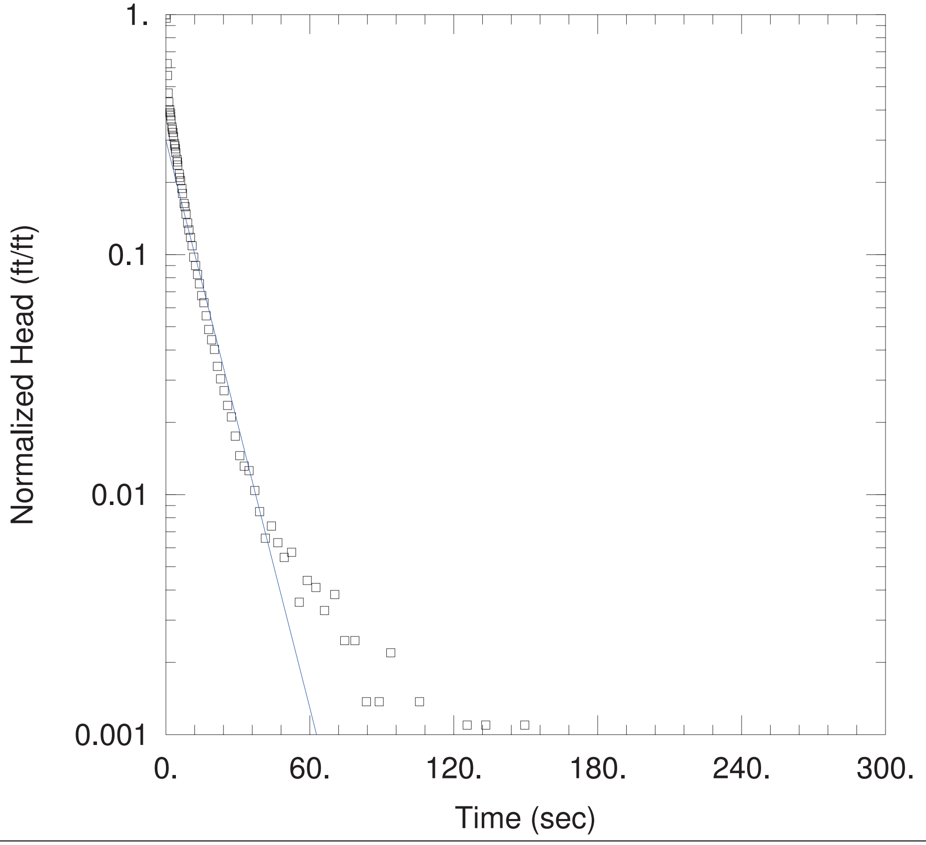
AQUIFER DATA

Saturated Thickness: 6.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW9 SI2)

Initial Displacement: 2.617 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 6.3 ft
Screen Length: 4.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW9 SO1.aqt
Date: 10/10/17 Time: 09:52:04

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW9
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

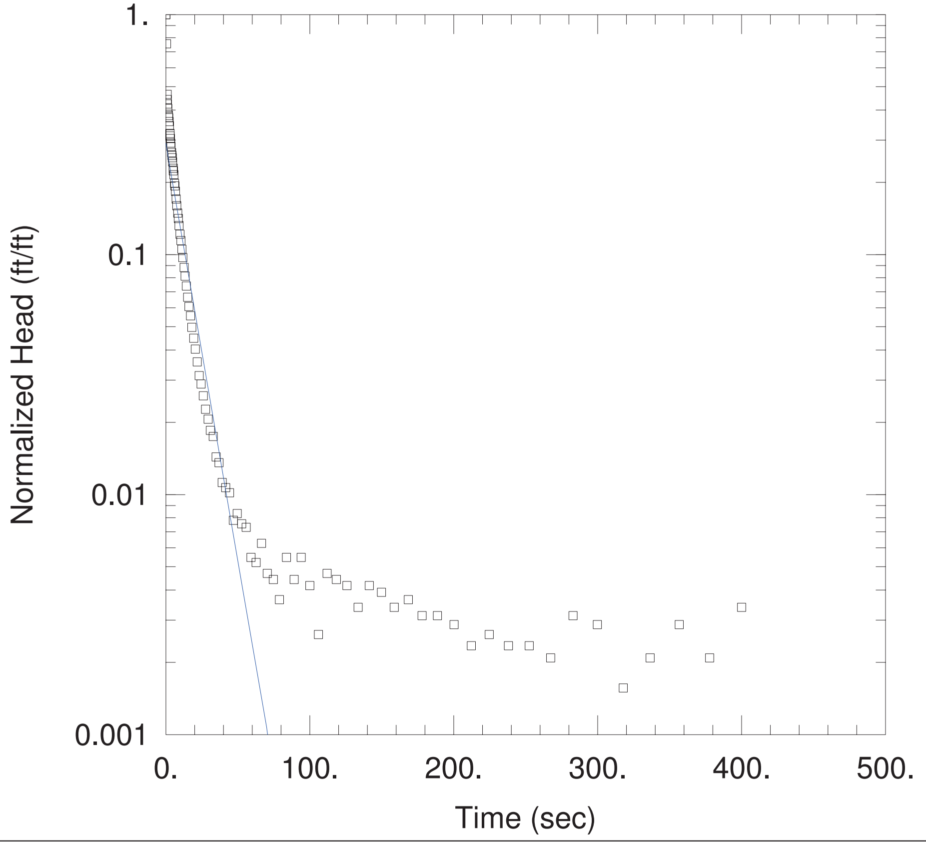
K = 0.003404 cm/sec
y0 = 1.094 ft

AQUIFER DATA

Saturated Thickness: 6.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW9 SO1)

Initial Displacement: 3.654 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.3 ft
Screen Length: 4.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW9 SO2.aqt
Date: 10/10/17 Time: 09:53:49

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW9
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

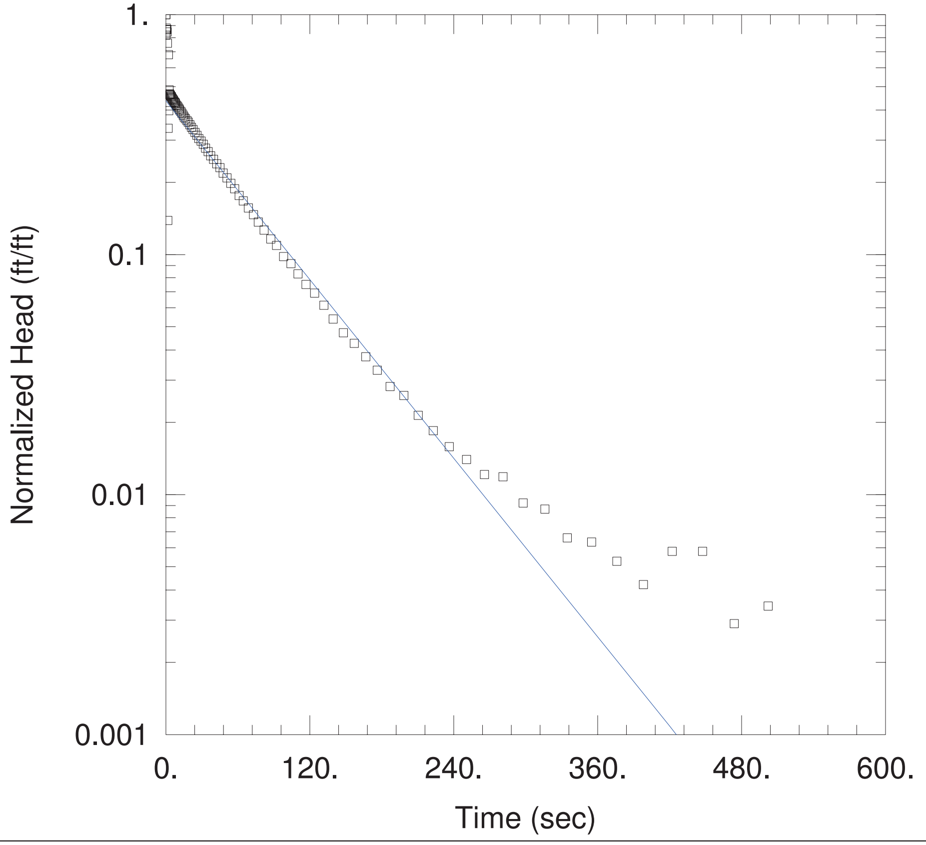
K = 0.003003 cm/sec
y0 = 1.117 ft

AQUIFER DATA

Saturated Thickness: 6.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW9 SO2)

Initial Displacement: 3.837 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.3 ft
Screen Length: 4.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW10 SI1.aqt
Date: 10/10/17 Time: 09:56:32

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW10
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0005269 cm/sec
y0 = 1.656 ft

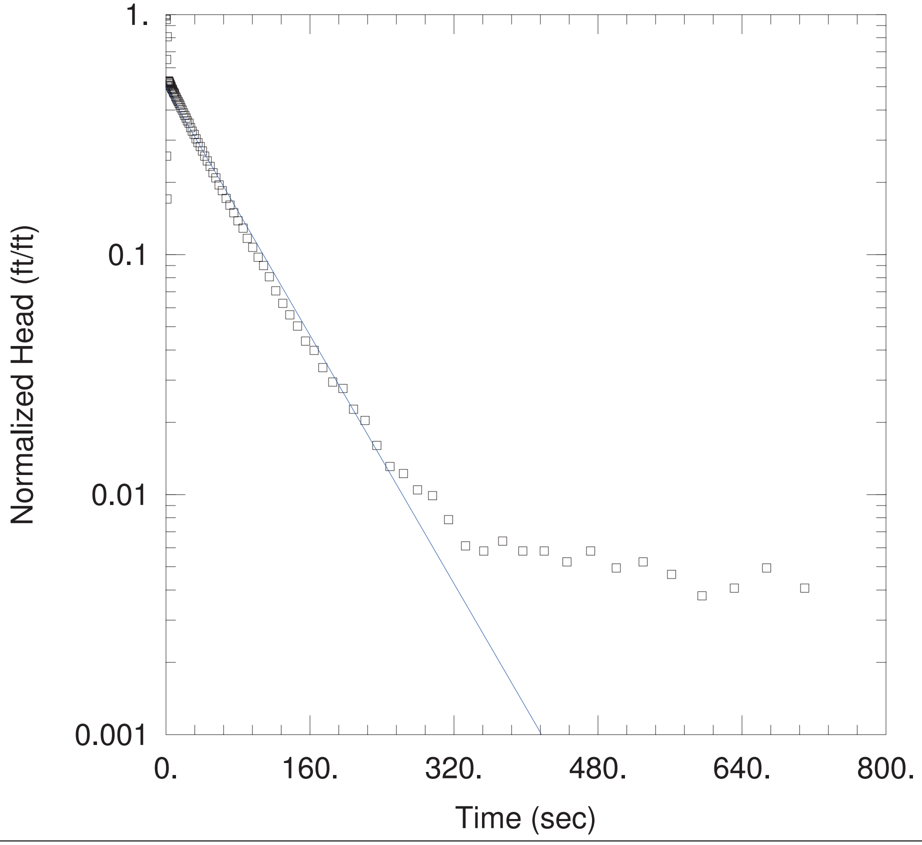
AQUIFER DATA

Saturated Thickness: 6.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW10 SI1)

Initial Displacement: 3.792 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 6.7 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW10 SI2.aqt
Date: 10/10/17 Time: 09:59:35

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW10
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

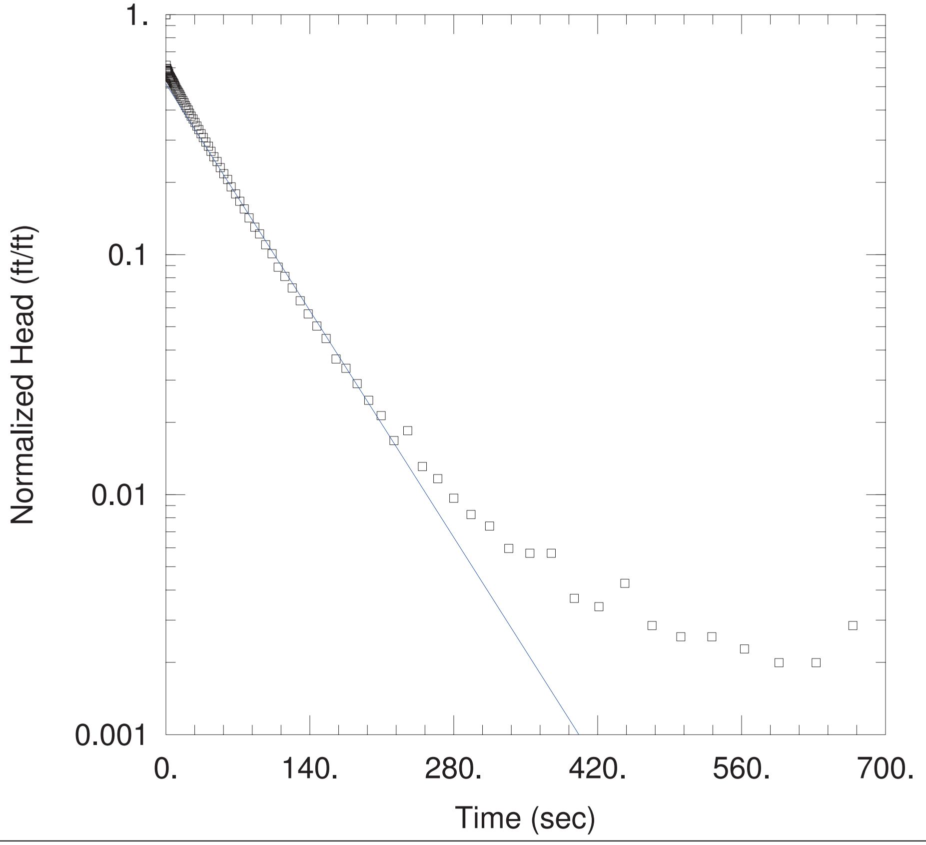
K = 0.0005491 cm/sec
y0 = 1.716 ft

AQUIFER DATA

Saturated Thickness: 6.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW10 SI2)

Initial Displacement: 3.438 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.7 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW10 SO2.aqt
Date: 10/10/17 Time: 10:01:28

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW10
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

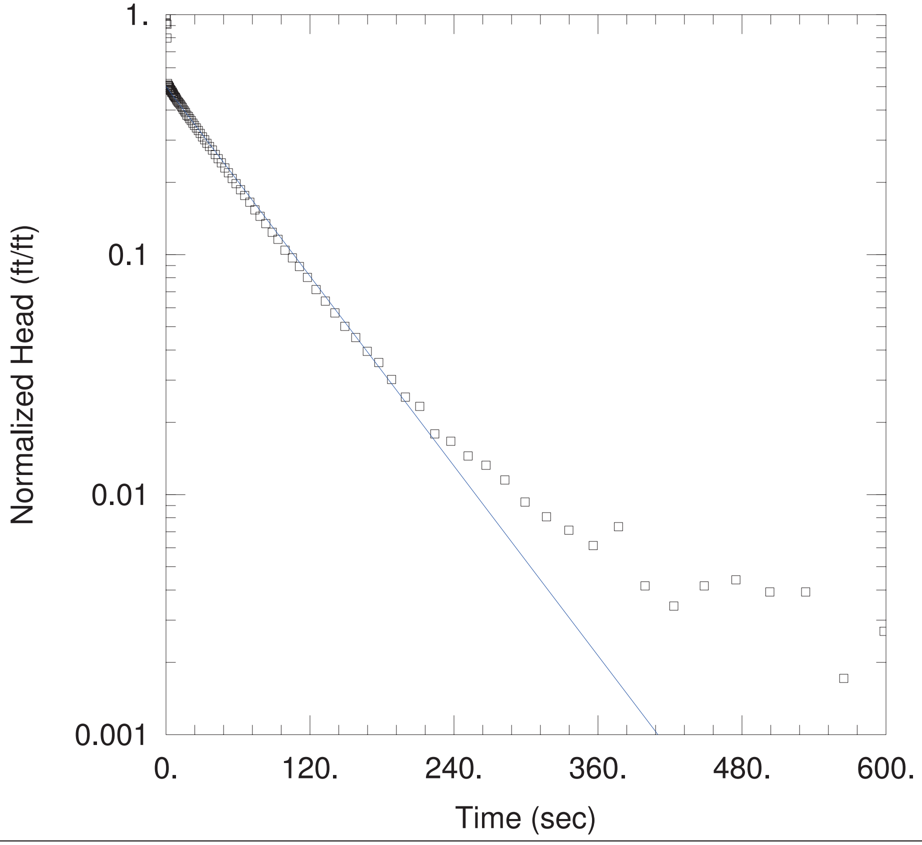
K = 0.0005731 cm/sec
y0 = 1.809 ft

AQUIFER DATA

Saturated Thickness: 6.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW10 SO2)

Initial Displacement: 3.518 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.7 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW10 SO3.aqt
Date: 10/10/17 Time: 10:09:04

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW10
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0005595 cm/sec
y0 = 2.048 ft

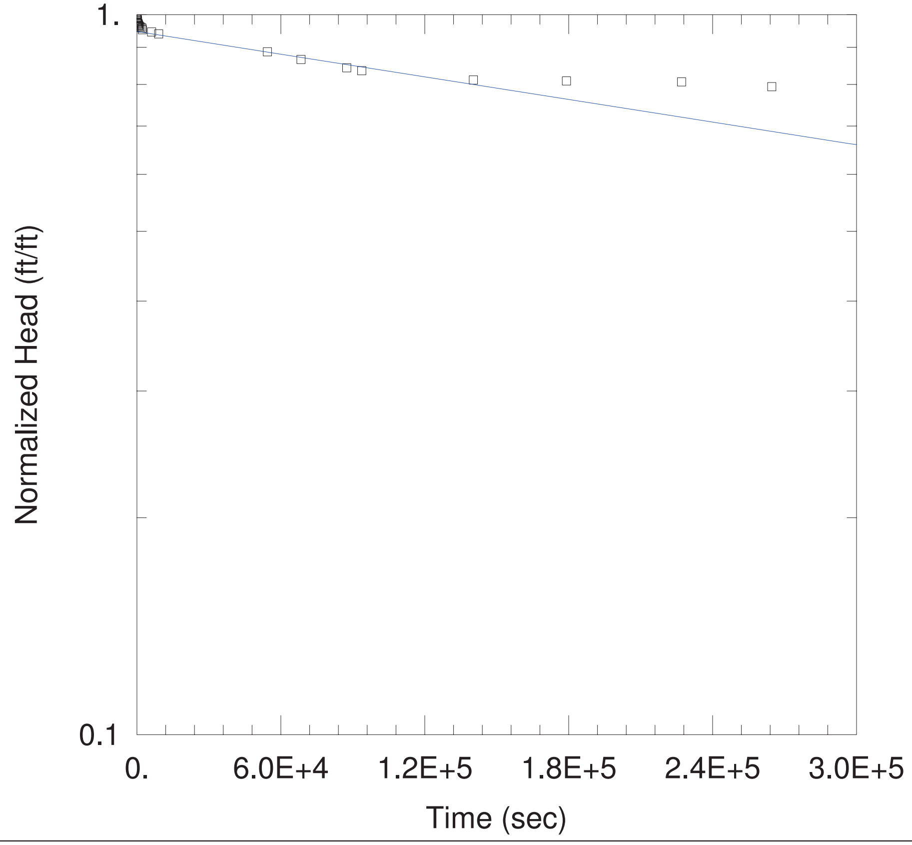
AQUIFER DATA

Saturated Thickness: 6.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW10 SO2)

Initial Displacement: 4.081 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 6.7 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G06D SO1.aqt
Date: 10/10/17 Time: 10:15:04

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G06D
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

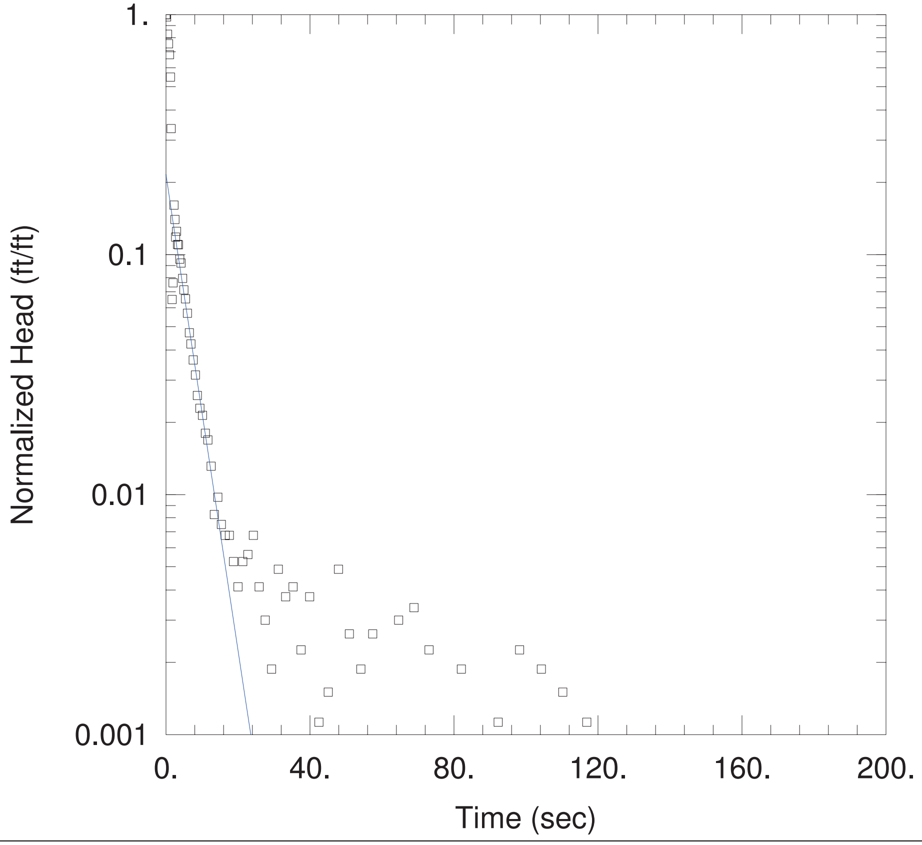
K = 3.917E-8 cm/sec
y0 = 3.807 ft

AQUIFER DATA

Saturated Thickness: 0.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G06D)

Initial Displacement: 4.02 ft
Total Well Penetration Depth: 0.4 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 0.4 ft
Screen Length: 0.4 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G202 SI1.aqt
Date: 10/10/17 Time: 10:19:06

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G202
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

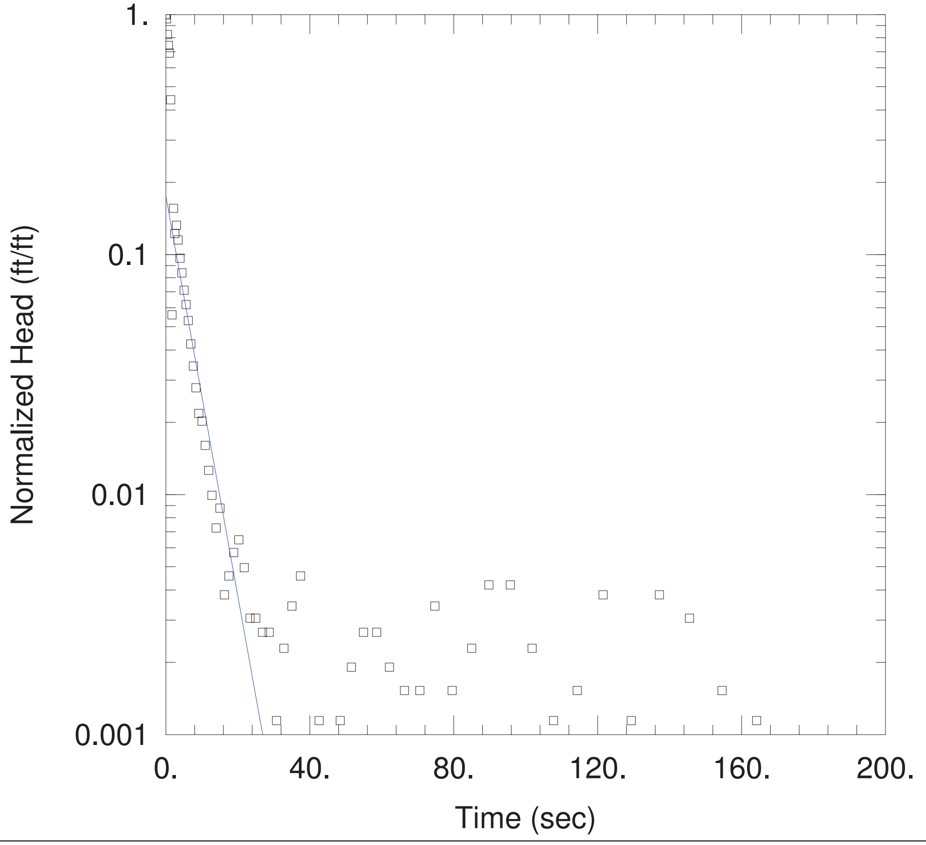
K = 0.01698 cm/sec
y0 = 0.5744 ft

AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G202 SI1)

Initial Displacement: 2.666 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G202 SI2.aqt
Date: 10/10/17 Time: 10:20:26

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G202
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

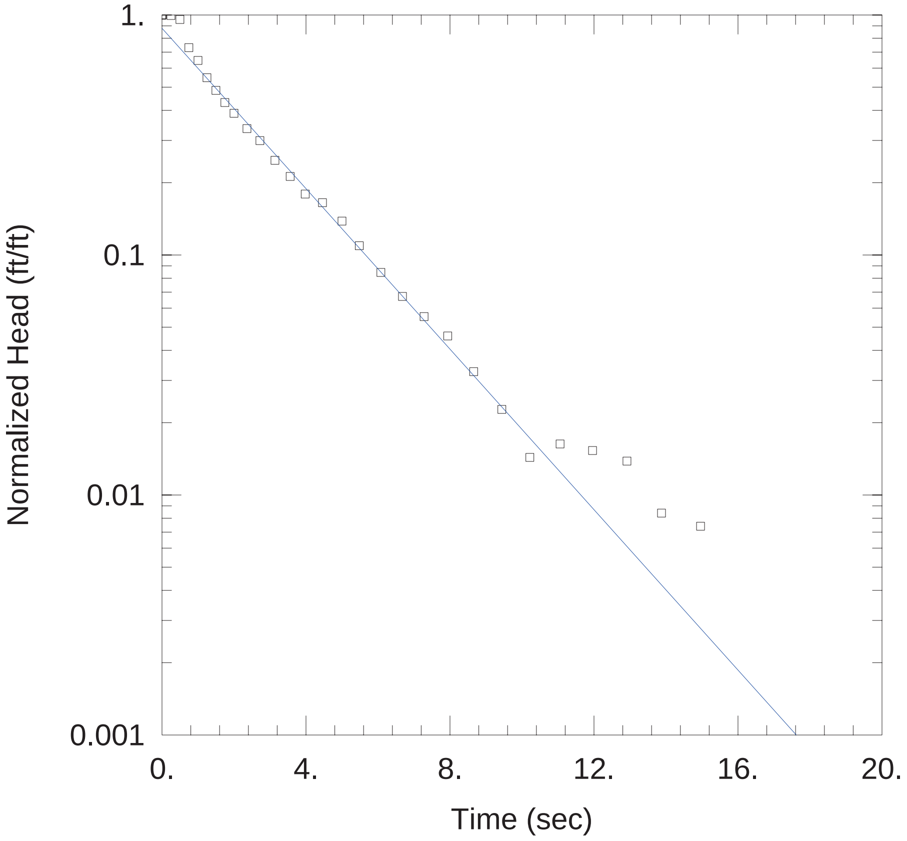
K = 0.0143 cm/sec
y0 = 0.4599 ft

AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G202 SI2)

Initial Displacement: 2.621 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G202 SO2.aqt
Date: 06/15/17 Time: 10:21:12

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G202
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.02868 cm/sec
y0 = 1.781 ft

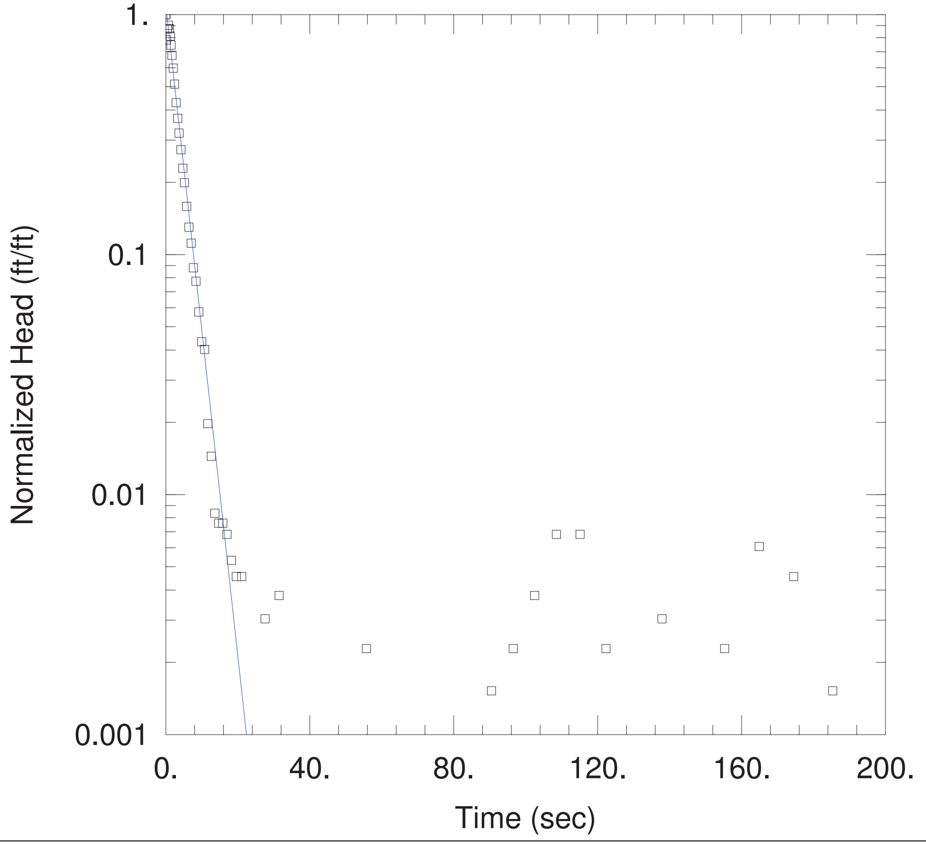
AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G202 SO2)

Initial Displacement: 2.024 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G202 SO3.aqt
Date: 10/10/17 Time: 10:21:38

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G202
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

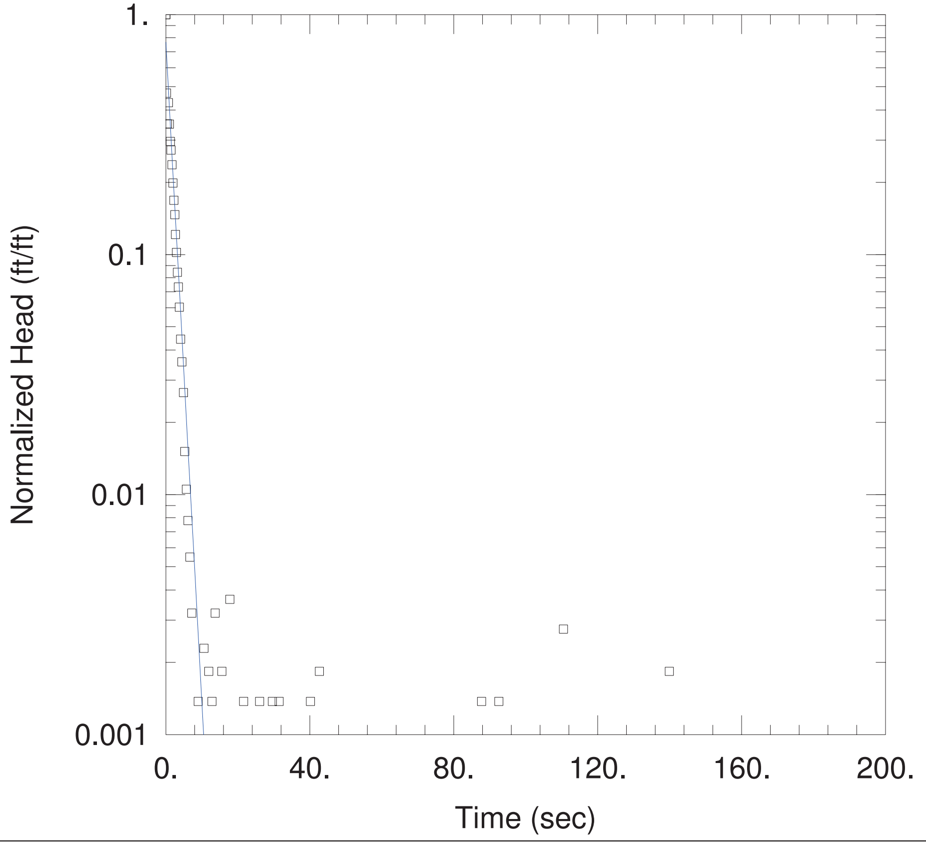
K = 0.02325 cm/sec
y0 = 1.444 ft

AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G202 SO3)

Initial Displacement: 1.317 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G203 SI1.aqt
Date: 10/10/17 Time: 10:24:55

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G203
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.02529 cm/sec
y0 = 1.676 ft

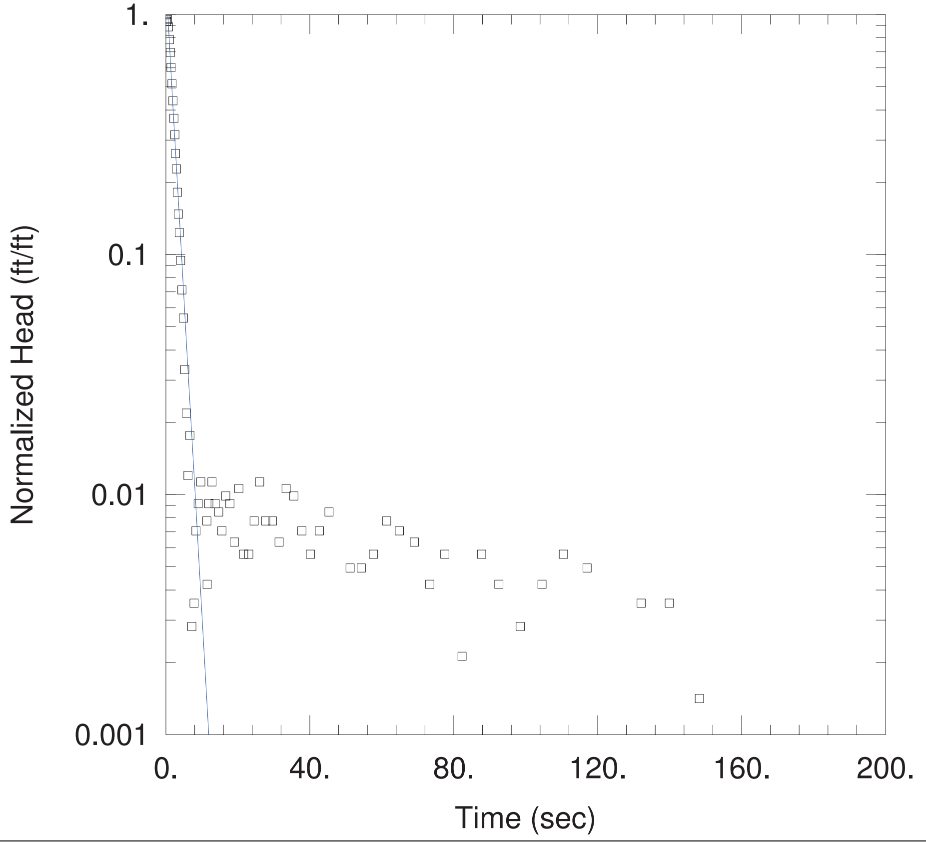
AQUIFER DATA

Saturated Thickness: 6.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G203 SI1)

Initial Displacement: 2.184 ft
Total Well Penetration Depth: 3.9 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 6.9 ft
Screen Length: 3.9 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G203 SO1.aqt
Date: 10/10/17 Time: 10:28:31

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G203
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

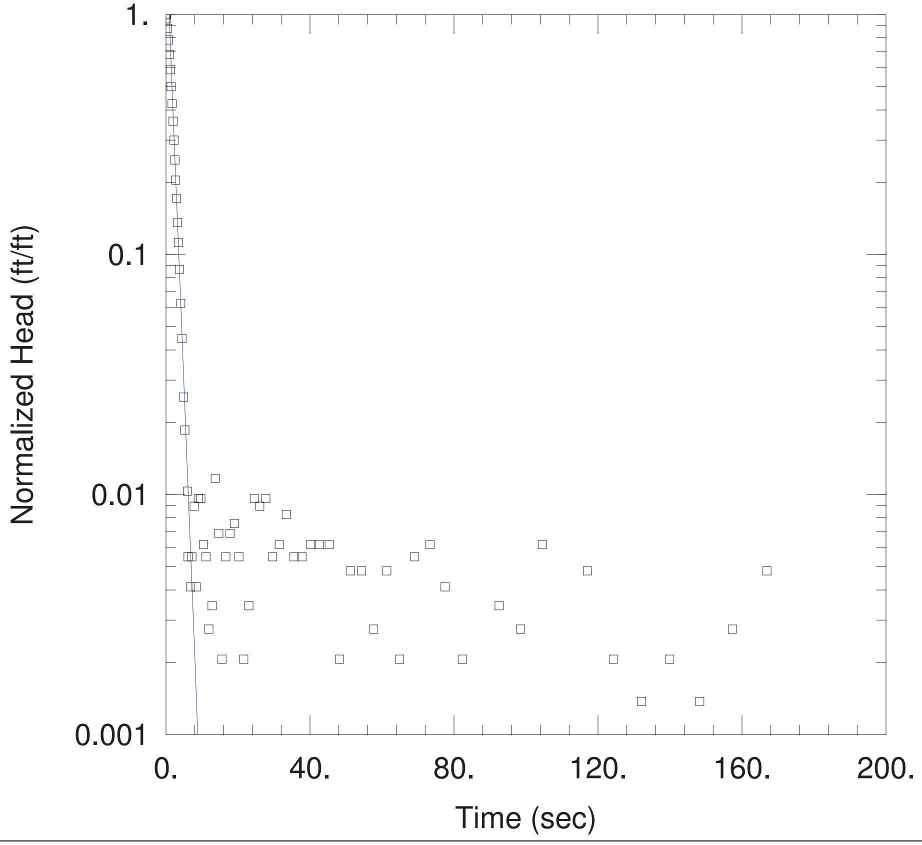
K = 0.02421 cm/sec
y0 = 1.958 ft

AQUIFER DATA

Saturated Thickness: 6.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G203 SO1)

Initial Displacement: 1.418 ft
Total Well Penetration Depth: 3.9 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.9 ft
Screen Length: 3.9 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G203 SO2.aqt
Date: 10/10/17 Time: 10:30:34

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G203
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

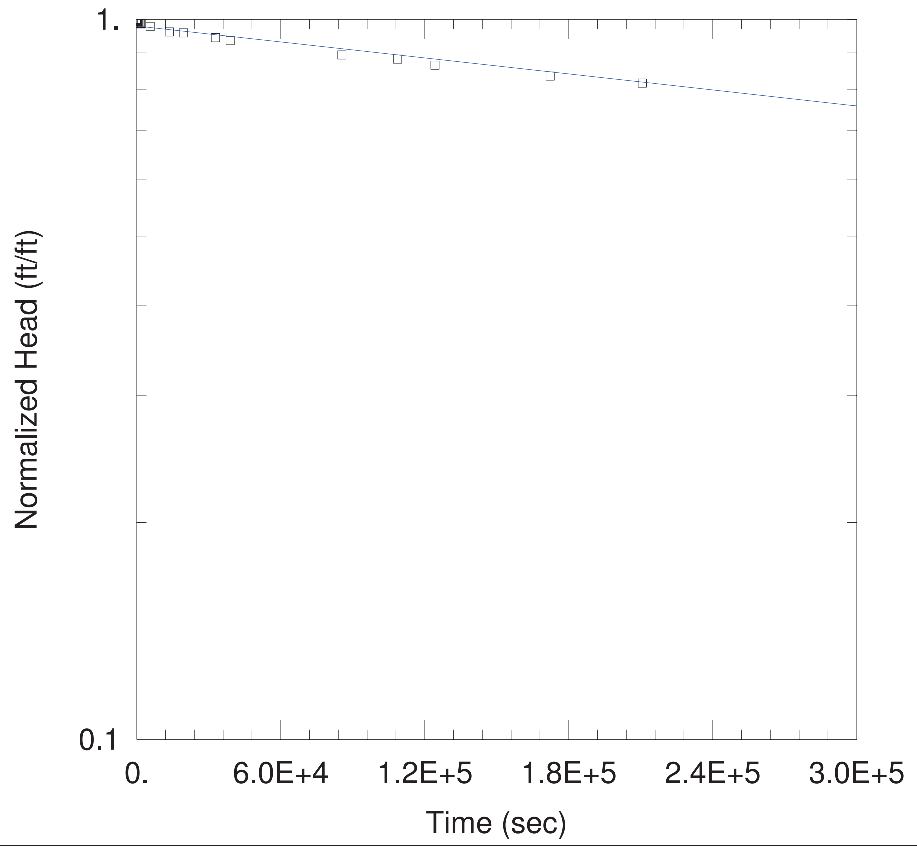
K = 0.03469 cm/sec
y0 = 3.185 ft

AQUIFER DATA

Saturated Thickness: 6.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G203 SO2)

Initial Displacement: 1.454 ft
Total Well Penetration Depth: 3.9 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.9 ft
Screen Length: 3.9 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G208 SO1.aqt
Date: 10/10/17 Time: 10:33:25

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G208
Test Date: 4/4/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

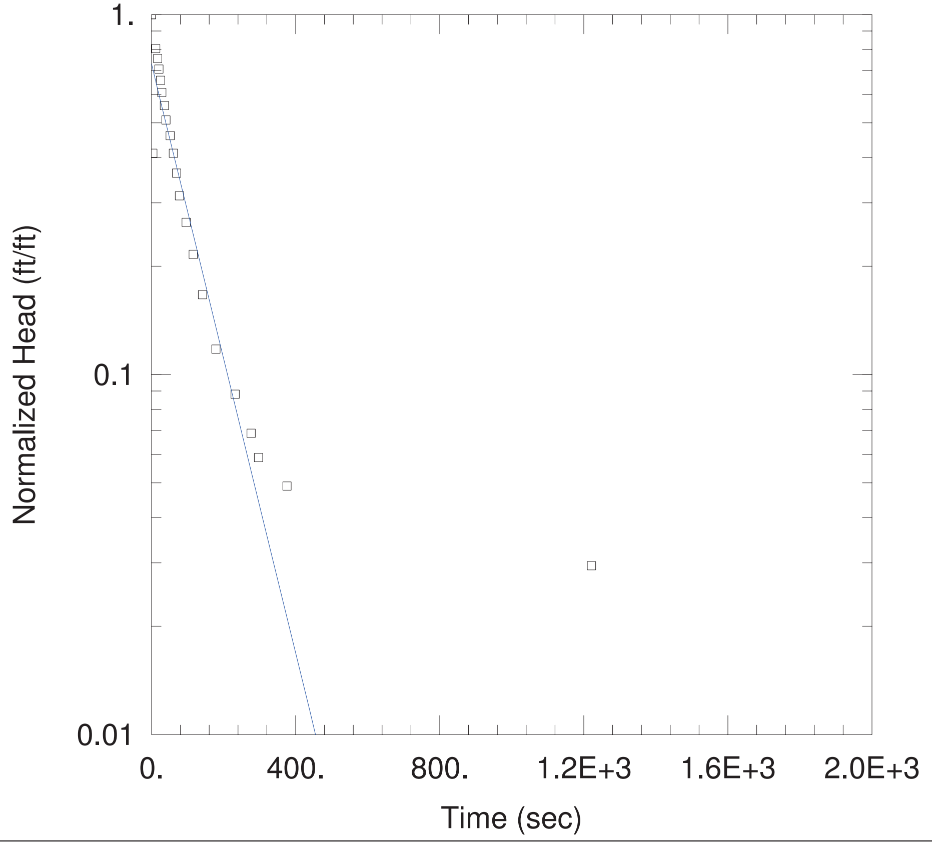
K = 1.315E-8 cm/sec
y0 = 10.16 ft

AQUIFER DATA

Saturated Thickness: 22.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G208 SO1)

Initial Displacement: 10.38 ft
Total Well Penetration Depth: 19.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 22.1 ft
Screen Length: 19.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G217D SI1.aqt
Date: 10/10/17 Time: 10:35:45

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G217D
Test Date: 4/4/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

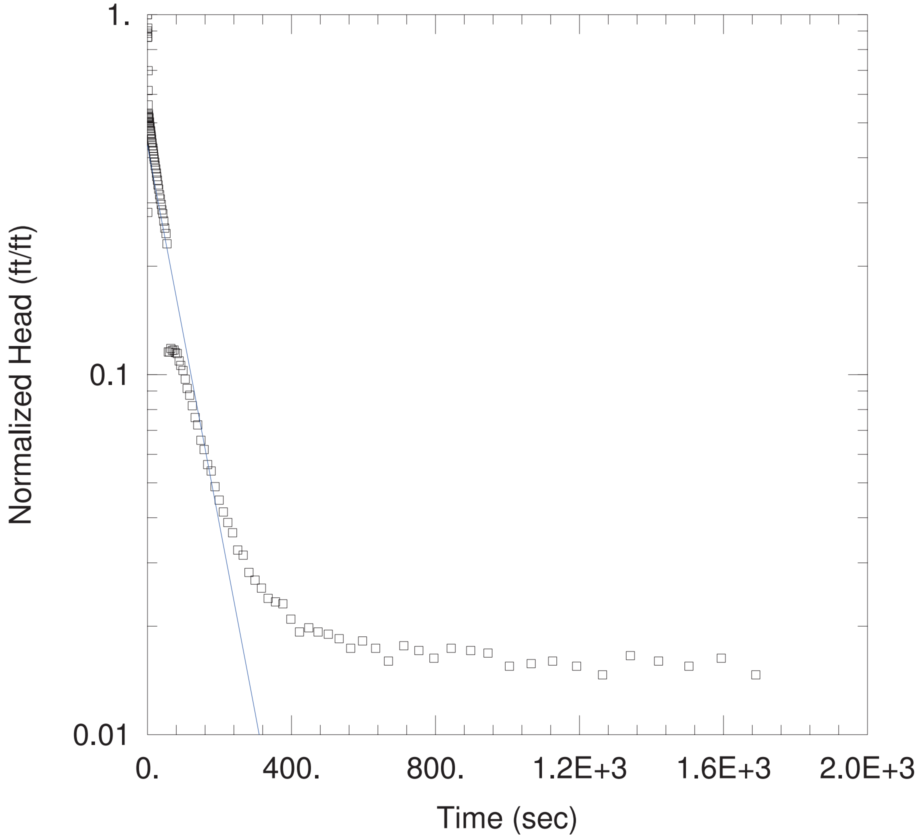
K = 0.0002266 cm/sec
y0 = 0.743 ft

AQUIFER DATA

Saturated Thickness: 13. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G217D SI1)

Initial Displacement: 1.02 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G217D SI2.aqt
Date: 10/10/17 Time: 10:38:05

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G217D
Test Date: 4/4/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

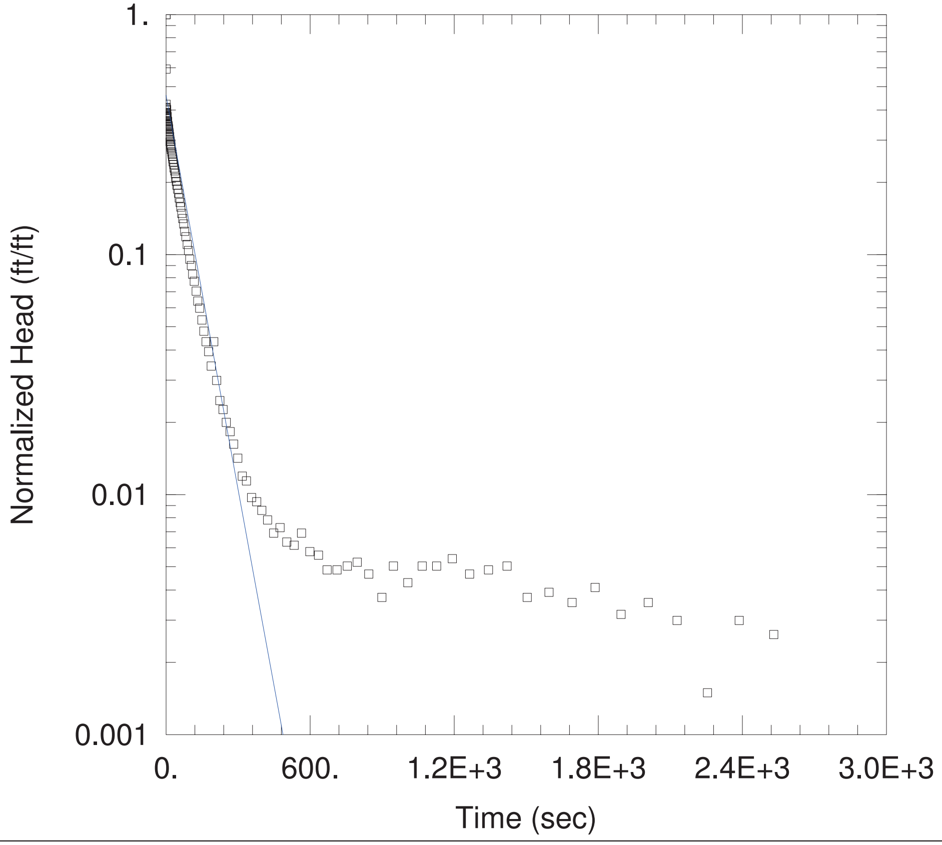
K = 0.0002919 cm/sec
y0 = 1.598 ft

AQUIFER DATA

Saturated Thickness: 13. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G217D SI2)

Initial Displacement: 3.685 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G217D SO3.aqt
Date: 10/10/17 Time: 10:40:18

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G217D
Test Date: 4/4/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

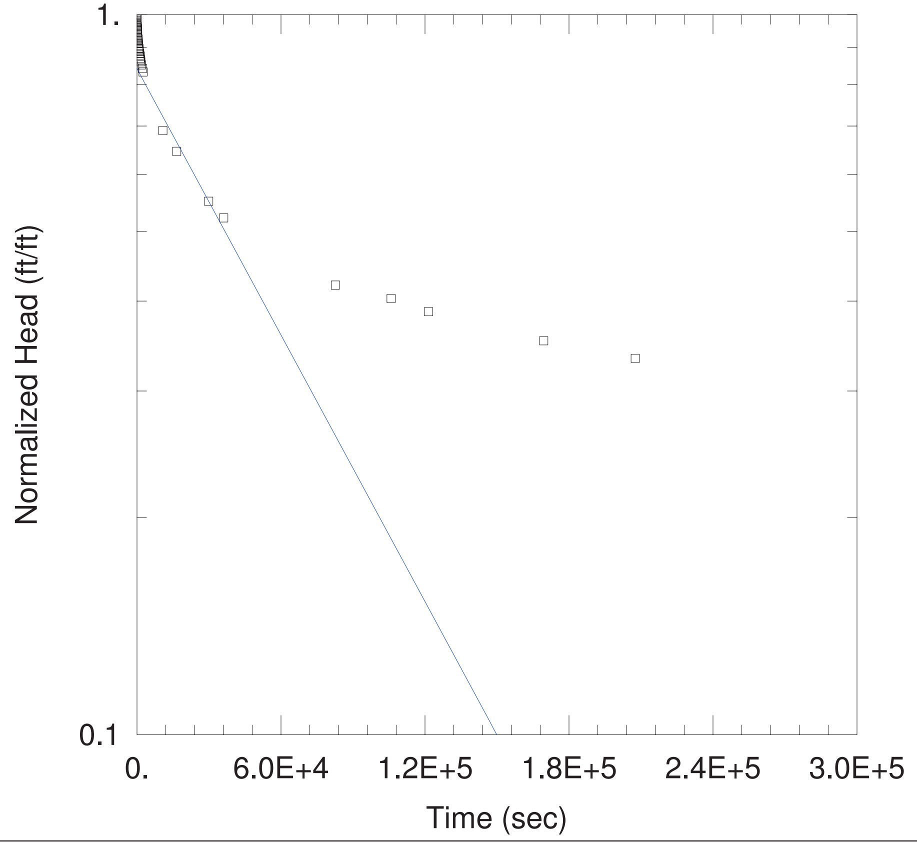
K = 0.0003032 cm/sec
y0 = 2.469 ft

AQUIFER DATA

Saturated Thickness: 13. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G217D SO3)

Initial Displacement: 5.362 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G220 SO1.aqt
Date: 10/10/17 Time: 10:42:50

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G220
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 3.513E-7 cm/sec
y0 = 9.098 ft

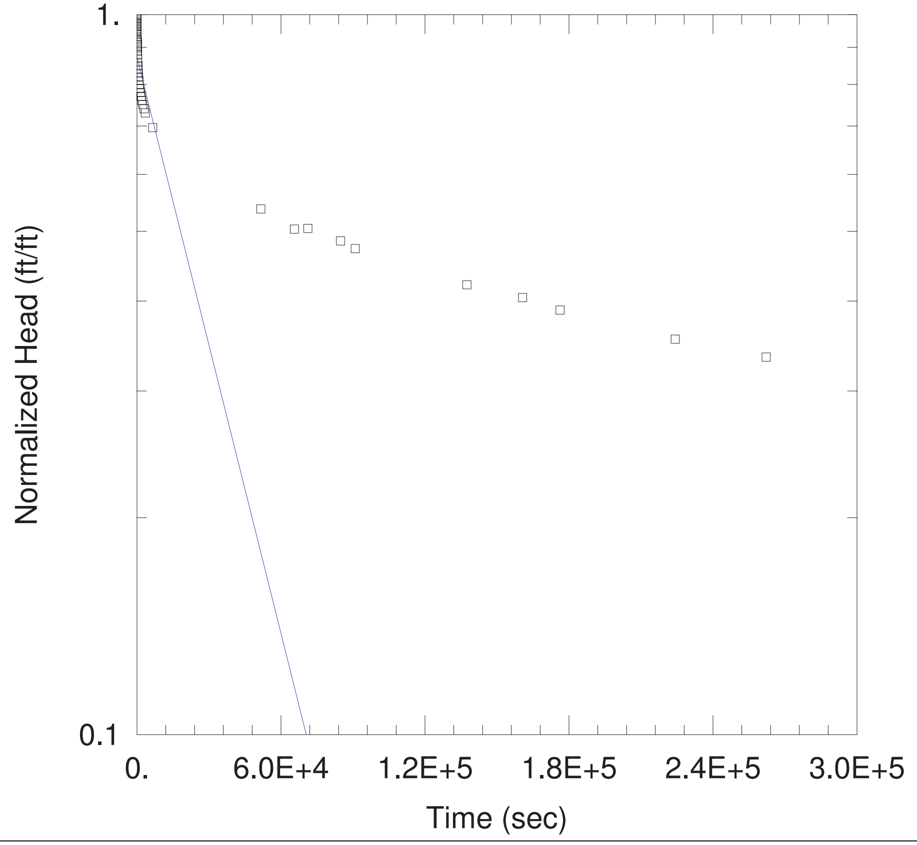
AQUIFER DATA

Saturated Thickness: 12. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G220 SO1)

Initial Displacement: 10.81 ft
Total Well Penetration Depth: 9.7 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 12. ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G222 SO1.aqt
Date: 10/10/17 Time: 10:49:55

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G222
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

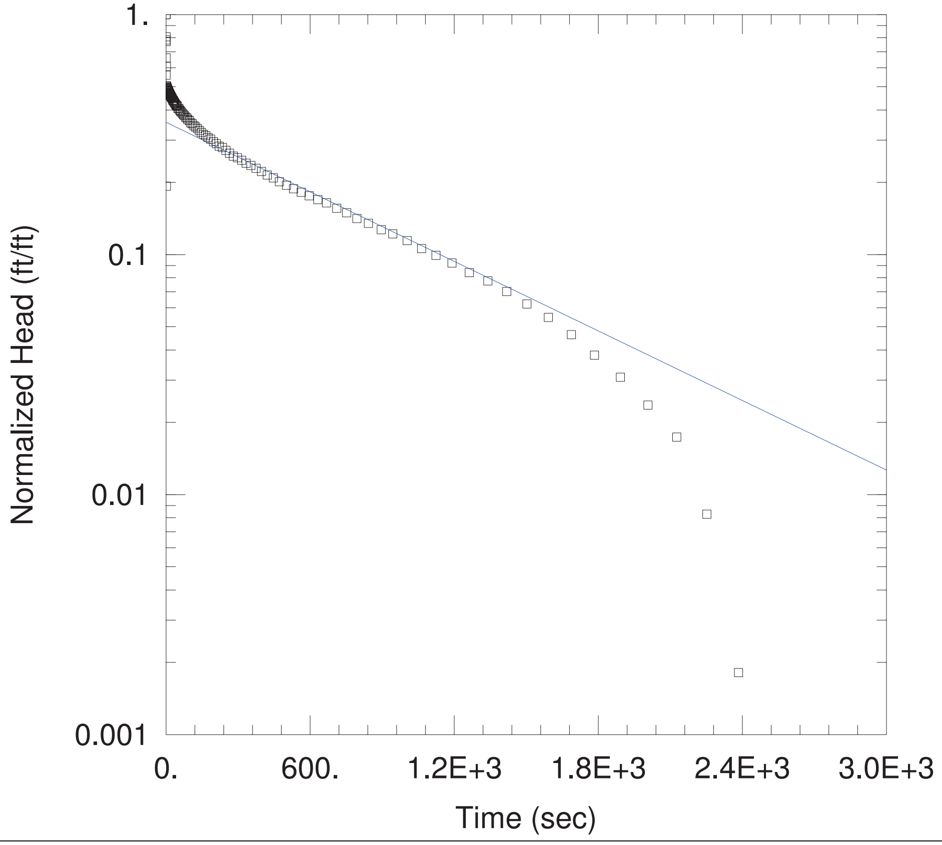
K = 1.541E-6 cm/sec
y0 = 8.832 ft

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G222 SO1)

Initial Displacement: 10.11 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 3.5 ft
Screen Length: 3.5 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G223 SI1.aqt
Date: 10/10/17 Time: 10:55:09

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G223
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

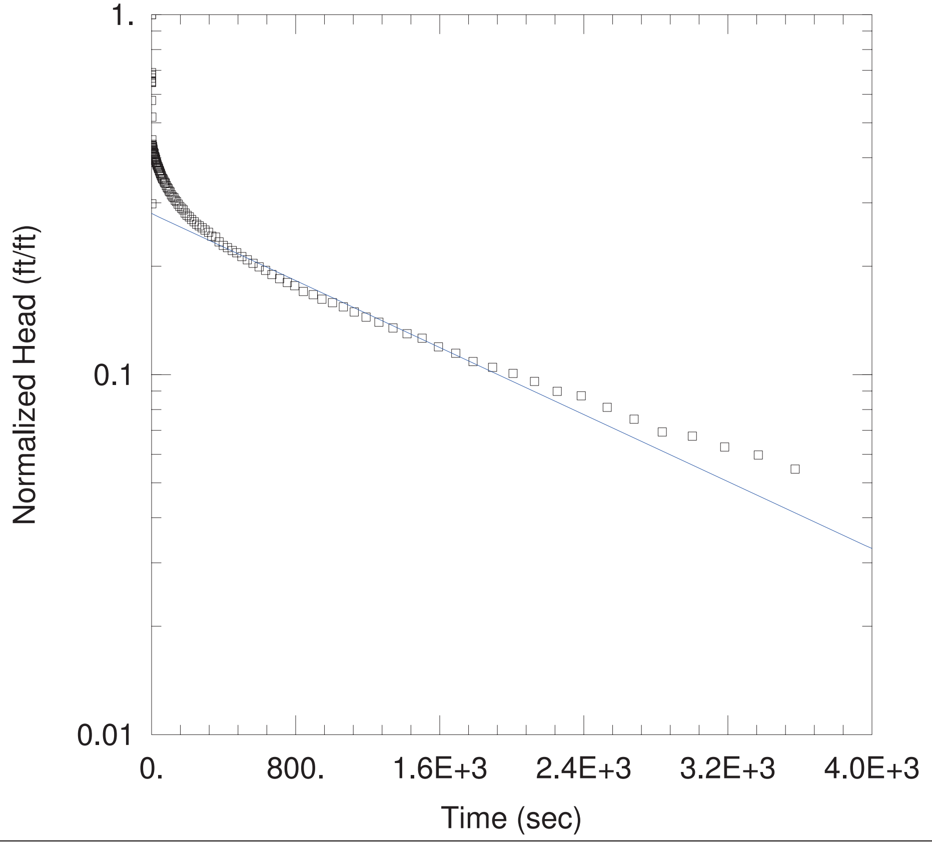
K = 5.19E-5 cm/sec
y0 = 1.374 ft

AQUIFER DATA

Saturated Thickness: 4. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G223 SI1)

Initial Displacement: 3.86 ft
Total Well Penetration Depth: 4. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 4. ft
Screen Length: 4. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G223 SI2.aqt
Date: 10/10/17 Time: 10:57:35

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G223
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

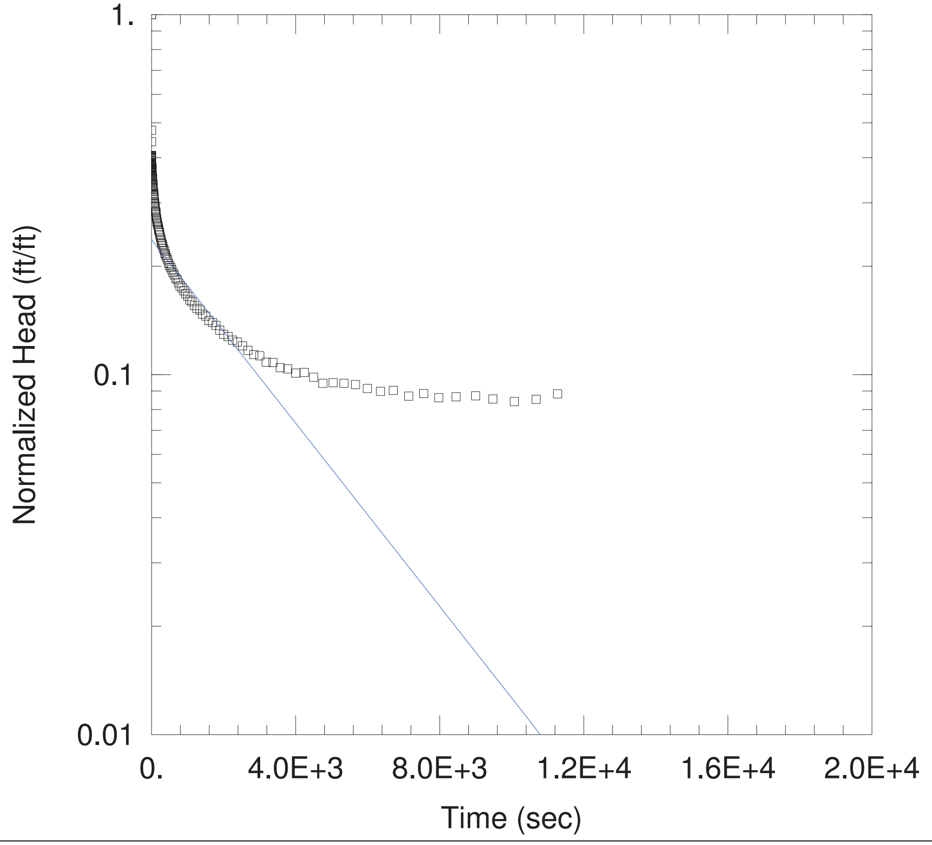
K = 2.5E-5 cm/sec
y0 = 1.251 ft

AQUIFER DATA

Saturated Thickness: 4. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G223 SI2)

Initial Displacement: 4.466 ft
Total Well Penetration Depth: 4. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 4. ft
Screen Length: 4. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G223 SO1.aqt
Date: 10/10/17 Time: 11:00:37

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G223
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

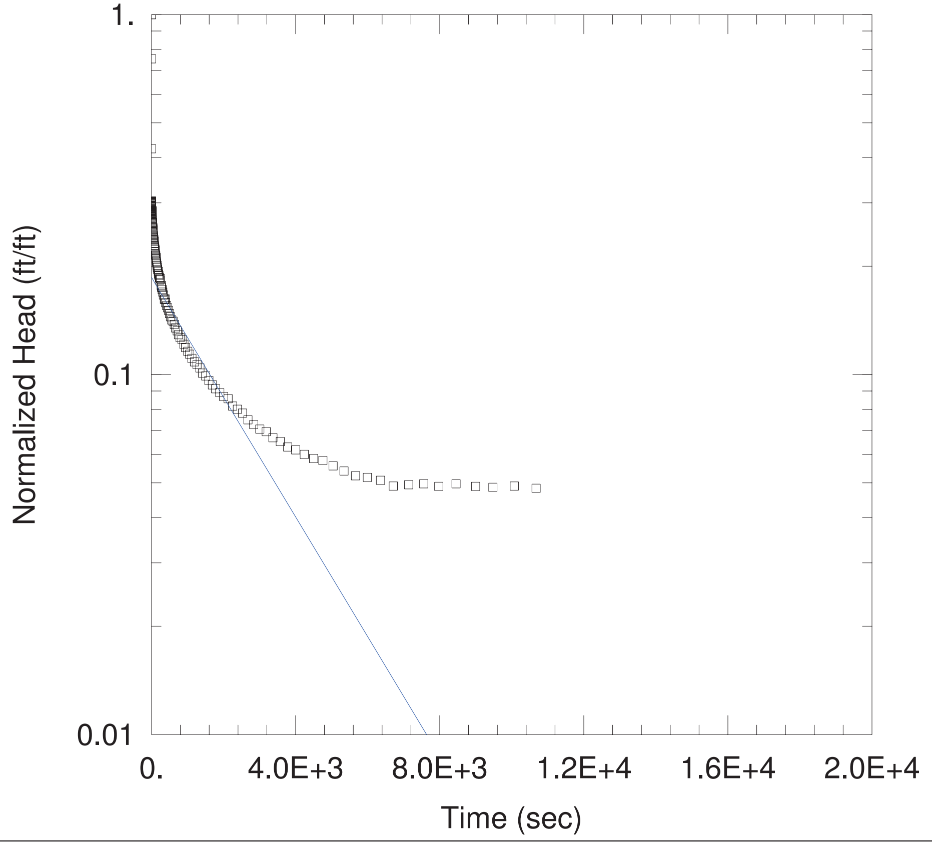
K = 1.368E-5 cm/sec
y0 = 1.281 ft

AQUIFER DATA

Saturated Thickness: 4. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G223 SO1)

Initial Displacement: 5.412 ft
Total Well Penetration Depth: 4. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 4. ft
Screen Length: 4. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G223 SO2.aqt
Date: 10/10/17 Time: 11:01:58

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G223
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

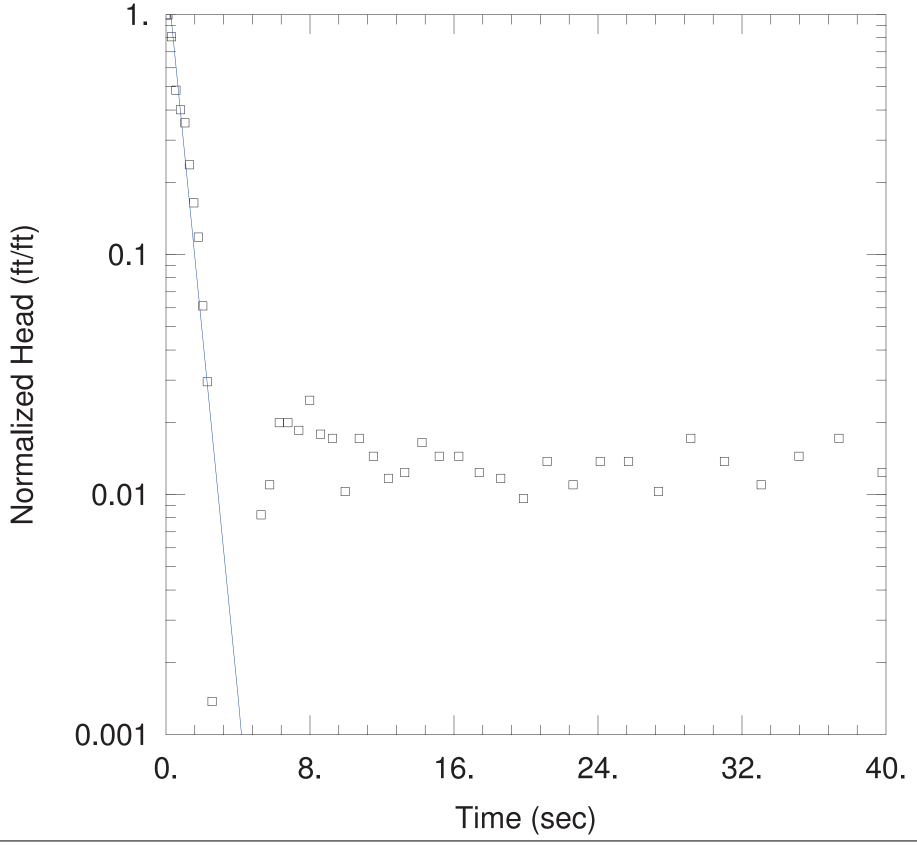
K = 1.786E-5 cm/sec
y0 = 1.359 ft

AQUIFER DATA

Saturated Thickness: 4. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G223 SO2)

Initial Displacement: 7.304 ft
Total Well Penetration Depth: 4. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 4. ft
Screen Length: 4. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SI1.aqt
Date: 10/10/17 Time: 11:04:28

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

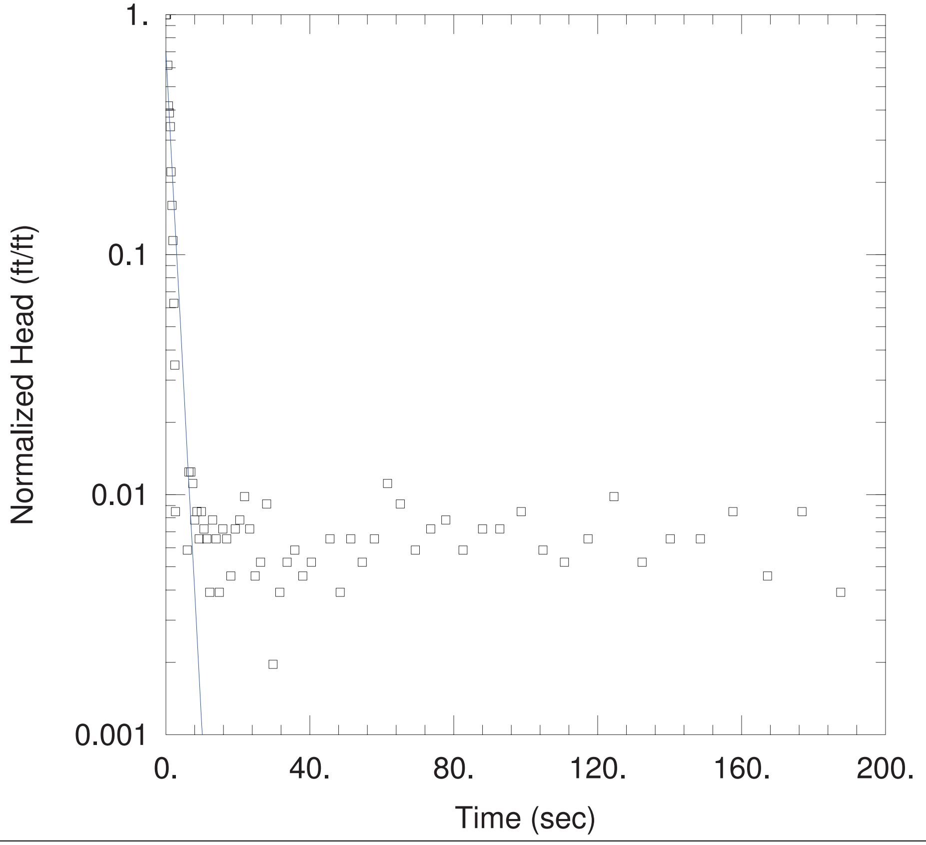
K = 0.05146 cm/sec
y0 = 2.38 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SI1)

Initial Displacement: 1.457 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SI2.aqt
Date: 10/10/17 Time: 11:06:55

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

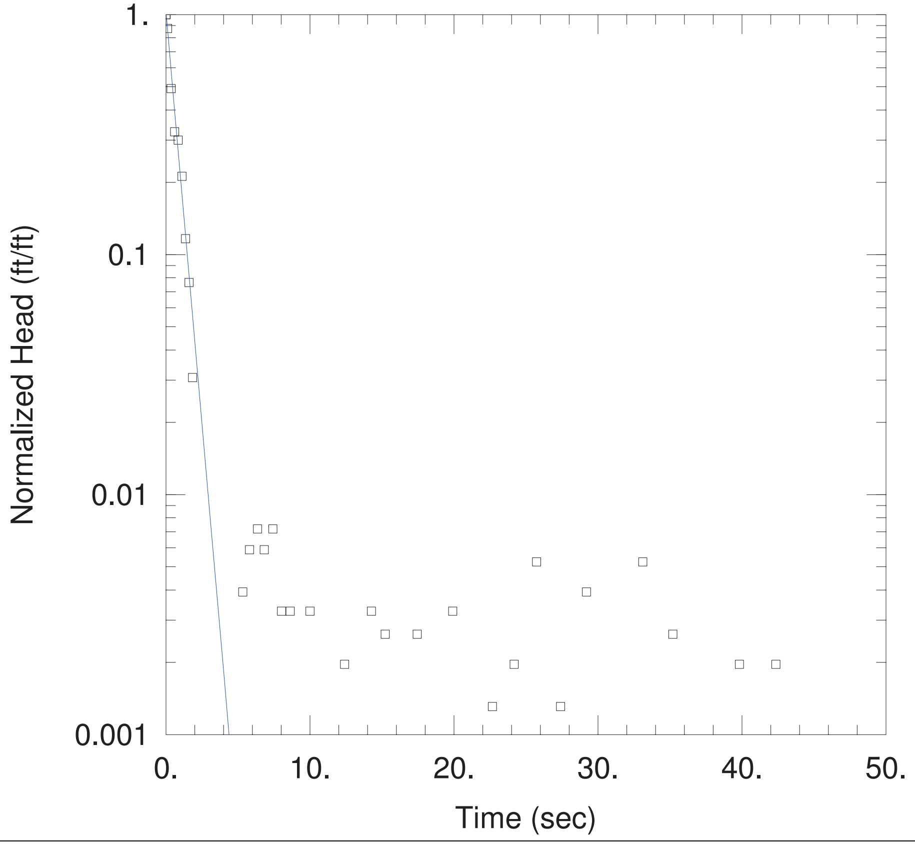
K = 0.01897 cm/sec
y0 = 1.081 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SI2)

Initial Displacement: 1.531 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SI3.aqt
Date: 10/10/17 Time: 11:08:48

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

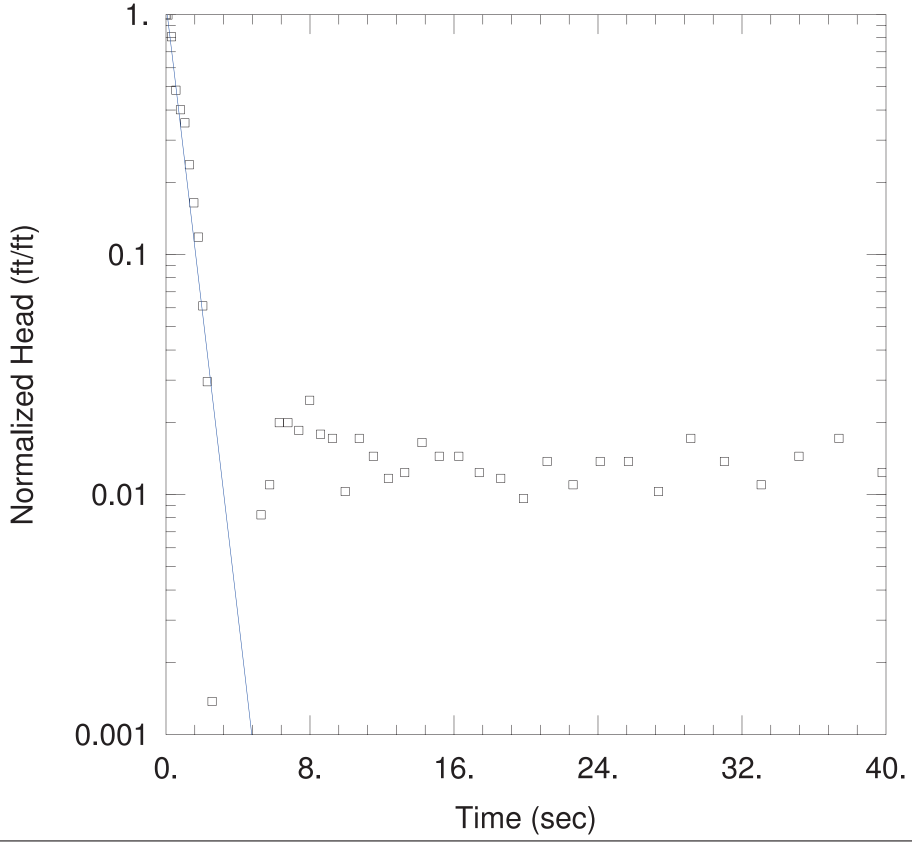
K = 0.04637 cm/sec
y0 = 1.586 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SI3)

Initial Displacement: 1.529 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SO1.aqt
Date: 10/10/17 Time: 11:10:44

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.04312 cm/sec
y0 = 1.657 ft

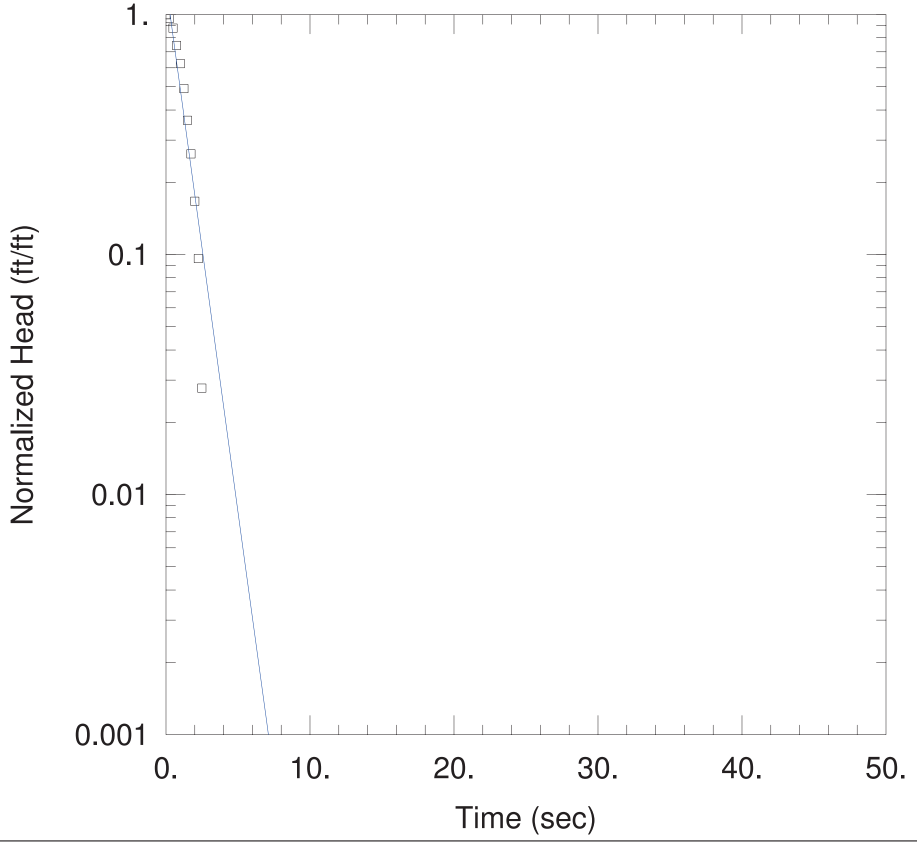
AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SI1)

Initial Displacement: 1.457 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SO3.aqt
Date: 10/10/17 Time: 11:12:56

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0297 cm/sec
y0 = 1.264 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SO2)

Initial Displacement: 0.936 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft

INFORMATION AND DATA PROVIDED IN THE NEWTON POWER STATION LANDFILL, APPLICATION FOR LANDFILL PERMIT

SUBMITTED BY RAPPS TO IEPA IN 1997

from: Rapps, 1997. “Newton Power Station Landfill, Application for Landfill Permit”, Rapps Engineering and Applied Sciences, Springfield, IL

VOLUME III

APPENDIX 5.0

HYDROGEOLOGIC INVESTIGATION AND
GROUNDWATER MONITORING PROGRAM
CIPS - NEWTON POWER STATION LANDFILL
JASPER COUNTY, ILLINOIS

TABLE OF CONTENTS

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FIGURE 3-2
CROSS SECTION KEY
NEWTON POWER STATION LANDFILL
CENTRAL ILLINOIS PUBLIC SERVICE
NEWTON, ILLINOIS

TABLE 3-1
LABORATORY AND IN-SITU HYDRAULIC CONDUCTIVITY TESTS

WELL BORING	TESTED INTERVAL	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC UNIT MONITORED
G105	11-26 ft	2.39×10^{-6} (F)	Upper Drift
G106	21-36 ft	7.53×10^{-6} (F)	Upper Drift
G115	8-18 ft	1.42×10^{-5} (F)	Upper Drift
G116	10-20 ft	3.09×10^{-5} (F)	Upper Drift
G119	10-20 ft	6.10×10^{-5} (F)	Upper Drift
G139	10-20 ft	5.14×10^{-5} (F)	Upper Drift
G201	57-67 ft	1.58×10^{-4} (F)	Uppermost Aquifer
G203	60-70 ft	5.14×10^{-3} (F)	Uppermost Aquifer
G204	55.5-64.5 ft	5.99×10^{-3} (F)	Uppermost Aquifer
G205	67-80 ft	2.54×10^{-6} (F)	Uppermost Aquifer
G207	57-70 ft	7.19×10^{-5} (F)	Uppermost Aquifer
B-141 (R)	20-25 ft	1.69×10^{-8} (L)	Vandalia Till Aquitard
B-141	27-28.5 ft	6.34×10^{-9} (L)	Vandalia Till Aquitard
B-142	27.5-30 ft	9.25×10^{-9} (L)	Vandalia Till Aquitard
B-142 (R)	28-32 ft	2.11×10^{-8} (L)	Vandalia Till Aquitard
B-143	21-22.5 ft	9.55×10^{-9} (L)	Vandalia Till Aquitard
G104D	79-87 ft	1.4×10^{-7} (F)	Lower Drift Aquitard

(F) From in-situ field test
(L) From laboratory analysis of site boring samples
(R) Re-molded Sample

Table 3-2 lists the number of tests, range of hydraulic conductivities (K), and the mean K for each hydrostratigraphic unit.

SKS ENGINEERS, INC.

CONSULTING ENGINEERS

2900 N. MARTIN LUTHER KING, JR. DRIVE • DECATUR, ILLINOIS 62526 • 217-877-2100 • FAX 217-877-4816

PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION
LANDFILL
CLIENT: RAPPS

DATE: November 22, 1996
PROJECT NO.: 66398
REPORT NO: 66398-1
Sheet 1 of 5

SAMPLE IDENTIFICATION: B-141
DEPTH/ELEV: 20' - 25'

CLASSIFICATION; USCS:

DESCRIPTION: Gray, medium plasticity, SILTY CLAY, trace sand, trace gravel

SOIL PARTICLE SIZES
GRAVEL %: SAND %: SILT %: CLAY %: *

NATURAL MOISTURE %: 12.2
LIQUID LIMIT :
PLASTICITY INDEX :

DENSITY;lb/ft3 NATURAL: 0.0
MAX. DRY;lb/ft3: 126.3 REMOLDED: 120.1
PROCTOR;DEG OF COMPACTION (D698): 95.1

PERMEABILITY (k), cm/sec: 1.69E-8 **

= = = = = = = = = = = = PERMEABILITY TEST DETAILS = = = = = = = = = = = =

SAMPLES OBTAINED BY: CLIENT
TYPE OF SAMPLE: REMOLDED

SPECIMEN DATA
DIAMETER;cm: 7.264
LENGTH;cm: 7.442
AREA;cm2: 41.45
VOLUME;cm3: 308.5
INITIAL SATURATION; %: 23.46
TEST APPARATUS: GEOTEST

INITIAL DENSITY;pcf: 134.8
DRY UNIT DENSITY;pcf: 120.1
INITIAL MOISTURE; %: 12.2
FINAL MOISTURE; %:
FLOW ORIENTATION: -V

TEST PRESSURES
CELL/CONFINING; psi: 30.0
SAMPLE BACK PRESSURE;psi: 25.0
DRIVING PRESSURE; psi: 2.0
HYDRAULIC GRADIENT: 18.9
PERMEANT LIQUID: 0.005 N $CaSO_4$

TIME OF TEST; SATURATION: 40.5 Hrs PERMEABILITY: 170.0 Hrs
FLOW THRU SPECIMEN; TOTAL: 13.41 ml PERMEABILITY TEST: 8.23 ml
TEMPERATURE CORRECTION; TEMPERATURE: 20.6 C FACTOR: 0.986

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

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PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION
LANDFILL
CLIENT: RAPPS

DATE: November 22, 1996
PROJECT NO.: 66398
REPORT NO: 66398-1
Sheet 1 of 5

SAMPLE IDENTIFICATION: B-142
DEPTH/ELEV: 28' - 32'

CLASSIFICATION; USCS:

DESCRIPTION: Gray, medium plasticity, SILTY CLAY, trace sand, trace gravel

SOIL PARTICLE SIZES
GRAVEL %: SAND %: SILT %: CLAY %: *

NATURAL MOISTURE %: 12.5
LIQUID LIMIT :
PLASTICITY INDEX :

DENSITY;lb/ft3 NATURAL: 0.0
MAX. DRY;lb/ft3: 126.3 REMOLDED: 118.6
PROCTOR;DEG OF COMPACTION (D698): 93.9

PERMEABILITY (k), cm/sec: 2.11E-8 **

PERMEABILITY TEST DETAILS

SAMPLES OBTAINED BY: CLIENT
TYPE OF SAMPLE: REMOLDED

SPECIMEN DATA
DIAMETER;cm: 7.264
LENGTH;cm: 7.595
AREA;cm2: 41.45
VOLUME;cm3: 314.8
INITIAL SATURATION; %: 23.79
TEST APPARATUS: GEOTEST

INITIAL DENSITY;pcf: 133.4
DRY UNIT DENSITY;pcf: 118.6
INITIAL MOISTURE; %: 12.5
FINAL MOISTURE; %: 12.7
FLOW ORIENTATION: -V

TEST PRESSURES
CELL/CONFINING; psi: 30.0
SAMPLE BACK PRESSURE;psi: 25.0
DRIVING PRESSURE; psi: 2.0
PERMEANT LIQUID: 0.005 N CaSO4

HYDRAULIC GRADIENT: 18.5

TIME OF TEST; SATURATION: 19.7 Hrs PERMEABILITY: 167.5 Hrs
FLOW THRU SPECIMEN; TOTAL: 10.81 ml PERMEABILITY TEST: 10.10 ml
TEMPERATURE CORRECTION; TEMPERATURE: 21.46 C FACTOR: 0.966

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

SKS
ENGINEERS, INC.
CONSULTING ENGINEERS
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PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION
LANDFILL
DATE: November 10, 1996
PROJECT NO.: 66398
CLIENT: RAPPS
REPORT NO: 66398-1
Sheet 1 of 3

SAMPLE IDENTIFICATION: B-141
DEPTH/ELEV: 27' - 28.5

CLASSIFICATION; USCS:

DESCRIPTION: Gray, medium plasticity, SILTY CLAY, trace sand, trace gravel

SOIL PARTICLE SIZES
GRAVEL %:
SAND %:
SILT %:
CLAY %: *

NATURAL MOISTURE %: 13.0
DENSITY;lb/ft3 NATURAL: 124.6
LIQUID LIMIT :
MAX. DRY;lb/ft3:
REMOLDED: 0.0
PLASTICITY INDEX :
PROCTOR;DEG OF COMPACTION (D698):

PERMEABILITY (k), cm/sec: 6.34E-9 **

= = = = = = = = = = = PERMEABILITY TEST DETAILS = = = = = = = = = = =

SAMPLES OBTAINED BY: CLIENT
TYPE OF SAMPLE: 3" THIN-WALL TUBE

SPECIMEN DATA
DIAMETER;cm: 7.264
LENGTH;cm: 7.188
AREA;cm2: 41.45
VOLUME;cm3: 297.9
INITIAL SATURATION; %: 26.01
TEST APPARATUS: GEOTEST
INITIAL DENSITY;pcf: 140.8
DRY UNIT DENSITY;pcf: 124.6
INITIAL MOISTURE; %: 13.0
FINAL MOISTURE; %: 13.8
FLOW ORIENTATION: -V

TEST PRESSURES
CELL/CONFINING; psi: 30.0
SAMPLE BACK PRESSURE;psi: 25.0
DRIVING PRESSURE; psi: 2.0
HYDRAULIC GRADIENT: 19.6
PERMEANT LIQUID: 0.005 N CaSO4

TIME OF TEST; SATURATION: 115.2 Hrs
PERMEABILITY: 167.0 Hrs
FLOW THRU SPECIMEN; TOTAL: 6.98 ml
PERMEABILITY TEST: 3.24 ml
TEMPERATURE CORRECTION; TEMPERATURE: 22.06 C
FACTOR: 0.953

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

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PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION LANDFILL
DATE: November 10, 1996
PROJECT NO.: 66398
CLIENT: RAPPS
REPORT NO: 66398-1
Sheet 2 of 3

SAMPLE IDENTIFICATION: B-142
DEPTH/ELEV: 27.5' - 30

CLASSIFICATION; USCS:

DESCRIPTION: Gray, medium plasticity, SILTY CLAY, trace sand, trace gravel

SOIL PARTICLE SIZES
GRAVEL %:
SAND %:
SILT %:
CLAY %: *

NATURAL MOISTURE %: 11.9
LIQUID LIMIT :
PLASTICITY INDEX :
DENSITY;lb/ft3 NATURAL: 124.1
MAX. DRY;lb/ft3: REMOLDED: 0.0
PROCTOR;DEG OF COMPACTION (D698):

PERMEABILITY (k), cm/sec: 9.25E-9 **

PERMEABILITY TEST DETAILS

SAMPLES OBTAINED BY: CLIENT
TYPE OF SAMPLE: 3" THIN-WALL TUBE

SPECIMEN DATA
DIAMETER;cm: 7.264
LENGTH;cm: 7.696
AREA;cm2: 41.45
VOLUME;cm3: 319.0
INITIAL SATURATION; %: 23.69
TEST APPARATUS: GEOTEST
INITIAL DENSITY;pcf: 138.9
DRY UNIT DENSITY;pcf: 124.1
INITIAL MOISTURE; %: 11.9
FINAL MOISTURE; %: 12.9
FLOW ORIENTATION: -V

TEST PRESSURES
CELL/CONFINING; psi: 30.0
SAMPLE BACK PRESSURE;psi: 25.0
DRIVING PRESSURE; psi: 2.0
PERMEANT LIQUID: 0.005 N CaSO4
HYDRAULIC GRADIENT: 18.3

TIME OF TEST; SATURATION: 115.2 Hrs
PERMEABILITY: 167.0 Hrs
FLOW THRU SPECIMEN; TOTAL: 9.41 ml
PERMEABILITY TEST: 4.42 ml
TEMPERATURE CORRECTION; TEMPERATURE: 22.06 C
FACTOR: 0.953

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

SKS

ENGINEERS, INC.

CONSULTING ENGINEERS

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PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION LANDFILL

DATE: November 10, 1996

PROJECT NO.: 66398

CLIENT: RAPP

REPORT NO: 66398-1

Sheet 3 of 3

SAMPLE IDENTIFICATION: B-143

DEPTH/ELEV: 21' - 22.5

CLASSIFICATION; USCS:

DESCRIPTION: Gray, Silty Clay, trace sand, trace gravel

SOIL PARTICLE SIZES

GRAVEL %: SAND %: SILT %: CLAY %: *

NATURAL MOISTURE %: 11.4

LIQUID LIMIT :

PLASTICITY INDEX :

DENSITY;lb/ft3 NATURAL: 125.4

MAX. DRY;lb/ft3: REMOLDED: 0.0

PROCTOR;DEG OF COMPACTION (D698):

PERMEABILITY (k), cm/sec: 9.55E-9 **

= = = = = = = = = = = PERMEABILITY TEST DETAILS = = = = = = = = = = =

SAMPLES OBTAINED BY: CLIENT

TYPE OF SAMPLE: 3" THIN-WALL TUBE

SPECIMEN DATA

DIAMETER;cm: 7.264

LENGTH;cm: 7.595

AREA;cm2: 41.45

VOLUME;cm3: 314.8

INITIAL SATURATION; %: 22.89

TEST APPARATUS: GEOTEST

INITIAL DENSITY;pcf: 139.7

DRY UNIT DENSITY;pcf: 125.4

INITIAL MOISTURE; %: 11.4

FINAL MOISTURE; %: 14.3

FLOW ORIENTATION: -V

TEST PRESSURES

CELL/CONFINING; psi: 30.0

SAMPLE BACK PRESSURE;psi: 25.0

DRIVING PRESSURE; psi: 2.0

PERMEANT LIQUID: 0.005 N CaSO4

HYDRAULIC GRADIENT: 18.5

TIME OF TEST; SATURATION: 73.4 Hrs PERMEABILITY: 117.0 Hrs

FLOW THRU SPECIMEN; TOTAL: 6.40 ml PERMEABILITY TEST: 3.27 ml

TEMPERATURE CORRECTION; TEMPERATURE: 22.4 C FACTOR: 0.944

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

APW15 BORING LOG

SOIL BORING LOG INFORMATION

Page 1 of 6

Facility/Project Name Newton Power Station	License/Permit/Monitoring Number	Boring Number APW15

Boring Drilled By: Name of crew chief (first, last) and Firm Adam Jochimsen Cascade Drilling	Date Drilling Started 1/21/2021	Date Drilling Completed 1/22/2021	Drilling Method Mini Sonic

Common Well Name APW15	Final Static Water Level Feet (NAVD88)	Surface Elevation 522.06 Feet (NAVD88)	Borehole Diameter 6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 821,107.90 N, 997,938.87 E [✓ E]/ W

1/4 of 1/4 of Section 26, T 6 N, R 8 E

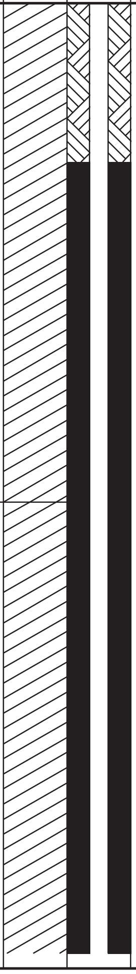
Lat 38° 55' 17.71"

Long -88° 17' 6.79"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County Jasper	State IL	Civil Town/City/ or Village Newton



Sample: Number and Type	Sample: 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 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
1 CS	60 54		1 2 3 4	0 - 6.3' **FILL, LEAN CLAY:** CL, brown (10YR 5/3), silt (15-25%) sand (0-5%), stiff, no dilatancy, low toughness, medium plasticity, moist.	(FILL) CL				1.75 1.75					CS= Core Sample
2 CS	60 40		5 6 7 8 9	6.3 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%) sand (0-5%), gravel (0-5%), organic material (0-5%), very stiff to stiff, no dilatancy, medium toughness, medium plasticity, moist.	CL				2.25 4					
3 CS	60 50		10 11 12						1					

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

Signature

Firm Ramboll
234 W. Florida Street, Milwaukee, WI 53204

Tel: (414) 837-3607
Fax: (414) 837-3608

Boring Number APW15 Page 2 of 6

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	
			13	6.3 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%) sand (0-5%), gravel (0-5%), organic material (0-5%), very stiff to stiff, no dilatancy, medium toughness, medium plasticity, moist. *(continued)*					2.5					
4 CS	60 54		15						1.5					
			16		CL									
			17						2.25					
			19	19.2' brown (10YR 4/3), yellowish brown (10YR 5/6) mottling (10-15%), stiff.					2.5					
5 SH	24 23		20	20 - 22' **LEAN CLAY:** CL.	CL					18.5	33	23	59.2	SH= Shelby Tube
6 CS	96 96		22	22 - 23.5' **LEAN CLAY:** CL, brown (10YR 4/3), yellowish brown (10YR 5/6) mottling (10-15%), stiff, no dilatancy, medium toughness, medium plasticity, moist.	CL				1.25					
			23						1					
			24	23.5 - 26.7' **SANDY LEAN CLAY:** s(CL), brown (10YR 5/3), gray (10YR 5/1) mottling (5-10%), stiff, slow dilatancy, low toughness, medium plasticity, moist.	s(CL)				3.75					
			27	26.7 - 39.2' **LEAN CLAY:** CL, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling (10-15%), gray (10YR 5/1) mottling (5-10%), sand (5-10%), gravel (0-5%), cobbles (0-5%), very stiff to hard, no dilatancy, medium toughness, medium plasticity, dry to moist.					4.5					
			29		CL				4.5					
6 CS	60 49		30	30' hard, dry.										
			31						4.5					
			32											

RAMBOLL

SOIL BORING LOG INFORMATION SUPPLEMENT

Boring Number APW15

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	
				26.7 - 39.2' **LEAN CLAY:** CL, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling (10-15%), gray (10YR 5/1) mottling (5-10%), sand (5-10%), gravel (0-5%), cobbles (0-5%), very stiff to hard, no dilatancy, medium toughness, medium plasticity, dry to moist. *(continued)*										
			33						4.5					
			34											
7 CS	60 49		35						4.5					
			36		CL									
			37						4.5					
			38											
			39						4.5					
				39.2 - 52.5' **LEAN CLAY:** CL, dark gray (10YR 4/1), no mottling, organic material (0-5%), sand (5-10%), gravel (0-5%), cobbles (0-5%), hard, no dilatancy, medium toughness, medium plasticity, dry, silt stringers 1mm to 3mm diameter fracture planes.										
8 CS	60 60		40											
			41						4.5					
			42											
			43						4.5					
			44											
9 CS	60 60		45						4.5					
			46		CL									
			47						4.5					
			48											
			49						4.5					
10 CS	60 60		50											
			51						4.5					
			52											

SOIL BORING LOG INFORMATION SUPPLEMENT

Boring Number APW15

Page 4 of 6

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			53	52.5 - 61.4' **SILT:** ML, dark gray (10YR 4/1), clay (15-25%), hard, no dilatancy, medium toughness, non-plastic, dry.					4.5					
			54											
11 CS	60 57		55						4.5					
			56											
			57		ML				4.5					
			58											
			59						4.5					
12 CS	60 52		60											
			61						4.5					
			62	61.4 - 97.2' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%), sand (0-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist to dry.										
			63						2.75					
			64											
13 CS	60 60		65						2.75					
			66											
			67		CL				2.25					
			68											
			69						2					
14 CS	60 60		70											
			71						2.5					
			72											

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			73	61.4 - 97.2' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%), sand (0-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist to dry. *(continued)*					2.5					
			74											
15 CS	60 53		75						2					
			76											
			77						2.5					
			78											
			79						2.25					
16 CS	60 60		80											
			81						2.25					
			82		CL									
			83						4.5					
			84	83.8' - 83.9' layer of silty sand, moist.										
17 CS	60 60		85	85' - 85.4' later of silty sand, moist.					2.75					
			86											
			87						2.5					
			88											
			89						2.75					
18 CS	60 60		90											
			91						2.5					
			92											

SOIL BORING LOG INFORMATION SUPPLEMENT

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			93 94	61.4 - 97.2' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%), sand (0-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist to dry. *(continued)*	CL				2.75					
19 CS	60 60		95 96 97											
			98 99	97.2 - 100' **POORLY-GRADED SAND WITH SILT:** SP-SM, dark gray (10YR 4/1), subrounded to rounded, medium to fine sand, loose, wet.	SP-SM									
20 SH	24 24		100 101	100 - 102' **SILTY SAND:** SM.	SM					12.1	15	3	45.8	
21 CS	36 36		102 103 104	102 - 104.3' **SANDY SILT:** s(ML), gray (10YR 5/1), firm, slow dilatancy, low toughness, non-plastic, wet.	s(ML)				1					
				104.3 - 105' **LEAN CLAY:** CL, dark gray (10YR 4/1), sand (5-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, medium toughness, medium plasticity, moist.	CL									
22 MC	24 24		105 106	105 - 107' **LEAN CLAY:** CL.	CL					19.1	29	16	76.2	MC= Modified California Sample
23 CS	36 36		107 108 109	107 - 110' **LEAN CLAY:** CL, dark gray (10YR 4/1), sand (5-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist.	CL				2.25 2.5					
			110	110' End of Boring.										

ATTACHMENT 2

RAMBOLL RESPONSE LETTER DATED NOVEMBER 3, 2023

RAMBOLL

ENVIRONMENT
& HEALTH

November 3, 2023

VIA E-MAIL
heather.mullenax@illinois.gov
EPA.CCR.PART845.COORDINATOR@ILLINOIS.GOV
EPA.CCR.Part845.Notify@Illinois.gov

Re: Newton Power Plant Primary Ash Pond Alternative Source Demonstration Response to IEPA Comments

To Whom It May Concern:

This letter addresses the following requests for information from the Illinois Environmental Protection Agency (IEPA) provided on October 26, 2023 via email from Lauren Hunt regarding the Newton Power Plant Primary Ash Pond alternative source demonstration (ASD) submitted on October 6, 2023:

1. Source characterization of the CCR at the Primary Ash Pond must include total solids sampling, analysis and reporting in accordance with SW846.
2. Hydraulic conductivities from laboratory or insitu testing must be collected, analyzed and presented with hydrogeologic characterization of all units including aquifers and confining units. Hydraulic conductivity data must include field and software analysis.
3. Characterization to include sample and analysis in accordance with 35 IAC 845.640 of alternative source must be provided with the ASD.

Background

Alternative source demonstrations use a multiple lines of evidence approach to support the conclusions that 1) the coal combustion residuals (CCR) unit is not the source of an exceedance, and 2) there is an alternative source of the exceedance. The multiple lines of evidence approach is consistent with the approach used in many areas of environmental analysis such as ecological risk assessment, monitored natural attenuation (MNA), and vapor intrusion (USEPA, 2016; USEPA, 1999; ITRC, 2007). The goal of a multiple lines of evidence approach is to provide robust support for a causal relationship based on many smaller individual qualitative or quantitative pieces of evidence (USEPA, 2016). Critically, no individual line of evidence will be completely conclusive, and each will have varying degrees of certainty. The final determination of a conclusion is based on the totality of the evidence provided.

ASDs based on a multiple lines of evidence approach are routinely prepared by environmental consultants to comply with federal CCR rules (Title 40 of the Code of Federal Regulations [40 C.F.R.] § 257) and State CCR rules (Title 35 of the Illinois Administrative Code [35 I.A.C.] § 845). In Georgia, where the CCR permitting authority has been delegated to the State, the Georgia Environmental Protection Division has approved ASDs using multiple lines of evidence to satisfy the requirements of federal CCR rule. An example of such approval is documented in the summary section (page 3) of the 2023 Annual Groundwater Monitoring and Corrective Action Report found in the publicly accessible files linked here: https://www.georgiapower.com/content/dam/georgia-power/pdfs/company-pdfs/plant-mcmanus/20230731_2023agwmcar_mcm_ap-1.pdf.

The Primary Ash Pond ASD was completed in conformance with the Electric Power Research Institute (EPRI) guidance for development of ASDs at CCR sites (EPRI, 2017). The EPRI document presents an approach for developing ASD lines of evidence that relies, where possible, on leachate samples collected from leachate wells, lysimeters, and/or leachate collection systems to provide samples that are representative of interstitial porewater. This direct approach for evaluating the potential for the Primary Ash Pond to impact groundwater is in contrast to the indirect approach implied by the IEPA request to characterize the CCR at the Primary Ash Pond using methods in accordance with SW-846 (specifically those used for waste characterization [*e.g.,* EP, TCLP, SPLP, LEAF[1]]), as discussed below.

Additionally, the lines of evidence as presented as section headings in the Primary Ash Pond ASD commonly contain multiple qualitative and quantitative pieces of information that contribute to the body of evidence that support the conclusion that the CCR surface impoundment (SI) is not the source of an exceedance.

Response to Request Number 1: SW-846 Characterization of CCR Material

The CCR porewater most accurately represents the mobile constituents associated with the waste management activity within the CCR SI (EPRI, 2017). The composition of CCR porewater accumulated at the base of the CCR unit, which is derived from, and represents contact with, CCR material above and around the well screen, is the truest representation of mobile constituents throughout the CCR SI. Leach tests presented in SW-846 (*e.g.*, TCLP, SPLP, LEAF 1313 - 1316) are inconsistent predictors or surrogates of *in situ* porewater chemical concentrations (EPRI, 2020; EPRI, 2021; and EPRI, 2022). Indeed, laboratory leach test effectiveness is determined by comparing results to porewater data (USEPA, 2014; EPRI, 2020; EPRI, 2021; and EPRI, 2022). These laboratory leach tests most accurately predict porewater concentrations when conditions in the test closely reflect conditions present in the field (USEPA, 2019). In many cases, the pH and/or redox potential of porewater is poorly represented by any laboratory leach test conditions. For these reasons, analysis of actual CCR porewater is more representative of potential contributions to groundwater observed in compliance monitoring wells than laboratory leach testing. The uncertainty in comparing the laboratory leach test results with the actual porewater concentrations means that the contribution of laboratory leach test data as a line of evidence to an ASD would be minimal.

Prior to performing hydrogeologic investigations in 2021, Ramboll completed a review of existing data to determine whether sufficient information existed to meet the requirements of 35 I.A.C. § 845. Based on the review, Ramboll developed an approach to fully characterize the CCR material as part of the 2021 investigation. Five locations for porewater wells were selected by evaluating the extent of ash through time on aerial photographs (**Figure 1**), identifying visible differences (color) in surficial materials, and capturing a representative spatial distribution. Porewater was encountered at an elevation of approximately 540 feet in 2021 (Ramboll, 2021). For the purpose of visualization, **Figure 2** shows the areas within the SI that were not accessible for potential sampling and testing as illustrated by different colored portions of the Primary Ash Pond. Of the 404 acre unit only about 12% was accessible. A total of four porewater wells were installed in 2021, because the fifth location was not able to be accessed safely after evaluation with contractors in the field.

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[1] Extraction Procedure, Toxic Characteristic Leaching Procedure, Synthetic Precipitation Leaching Procedure, Leaching Environmental Assessment Framework

During installation of the porewater wells, the borings were logged, and solid samples were collected from eight intervals for geotechnical and chemical analysis. Samples were analyzed for total metal concentrations via EPA Method 6010B and 6020A (SW-846) and results were summarized in the Hydrogeologic Site Characterization Report (Ramboll, 2021) and submitted in the 2021 Operating Permit (Burns and McDonnell, 2021).

As established above, testing porewater is a direct source term for evaluating potential influence on groundwater. SW-846 provides analytical methods for evaluating solid waste using leach tests that are designed to replicate potential *in situ* conditions (either current or future). The goal of these laboratory leach tests is to predict the potential concentration of chemicals under laboratory controlled conditions (*e.g.*, landfill leachate, synthetic precipitation, variable pH) which may or may not represent conditions observed in the field. The use of leach test results performed under variable conditions collected from any number of locations within the CCR SI to estimate a total potential for chemical leaching from CCR into groundwater under a variety of different conditions is irrelevant to an ASD. ASDs are prepared to evaluate the potential for actual porewater leaking from a CCR SI to be the cause of a detected exceedance observed in a compliance well.

Response to Request Number 2: Provide Hydraulic Conductivity Data

Responses to Request Number 2 are provided in the cover letter to this Attachment and in Attachment 1 to that cover letter.

Response to Request Number 3: Alternative Source Characterization

In the ASD, the multiple lines of evidence approach is appropriate for identifying that a source other than the Primary Ash Pond caused, and that the Primary Ash Pond did not contribute to, the chloride exceedance in APW15. Additionally, Ramboll's investigation and analysis determined bedrock is likely the source of chloride in APW15. Ramboll reviewed available power plant and public well records which did not yield any bedrock monitoring wells in the immediate vicinity to provide site-specific groundwater analytical results. However, the references provided in Section 2.3.2 of the ASD indicate chloride is present in bedrock groundwater in many locations within the Illinois Basin which underlies approximately 70% of Illinois. That and the observation of a saline spring approximately 10 miles from the site near the Clay City Anticline (a structural feature which could provide fractures that act as conduits to bring brines near the land surface) are strong indicators that the bedrock beneath the Primary Ash Pond also contains chloride.

Conclusions

The combined strength of the lines of evidence in the Primary Ash Pond ASD demonstrates that the Primary Ash Pond is not the source of the chloride exceedance at APW15 (and did not contribute to the chloride exceedance at APW15) and that the likely source is native bedrock. Ramboll does not believe that additional lines of evidence based on leach test data or testing of the alternative source would change the conclusion of the full body of evidence presented in the ASD that the Primary Ash Pond is not the source of the chloride exceedance at APW15 and did not contribute to the chloride exceedance at APW15.

References

Burns & McDonnell, 2021. Initial Operating Permit. Newton Ash Pond. October 25.

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Electric Power Research Institute (EPRI), 2022. Evaluation and Comparison of Leach Test and Porewater Variability for Multiple Coal Combustion Product Management Units. EPRI, Palo Alto, CA: 2022. 3002024214.

Electric Power Research Institute (EPRI), 2021. Leaching, Geotechnical, and Hydrologic Characterization of Coal Combustion Products from an Active Coal Ash Management Unit: Plant 42197. EPRI, Palo Alto, CA: 2021. 3002018780.

Electric Power Research Institute (EPRI), 2020. Leaching, Geotechnical, and Hydrologic Characterization of Coal Combustion Products from a Closed Coal Ash Impoundment: Capped Unit. EPRI, Palo Alto, CA: 2020. 3002017363.

Electric Power Research Institute (EPRI), 2017. Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites. EPRI, Palo Alto, CA: 2017. 3002010920.

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United States Environmental Protection Agency (USEPA), 2019. Leaching Environmental Assessment Framework (LEAF) How-To Guide. SW-846 Update VII. Revision 1. May.

United States Environmental Protection Agency (USEPA), 2016. Weight of Evidence in Ecological Assessment. EPA/100/R-16/001. December.

United States Environmental Protection Agency (USEPA), 2014. Leaching Test Relationships, Laboratory-to-Field Comparisons and Recommendations for Leaching Evaluation using the Leaching Environmental Assessment Framework. EPA 600/R-14/061 September.

United States Environmental Protection Agency (USEPA), 1999. Use of Monitoring Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. OSWER Directive Number 9200.4-17P.

Attachments

Figure 1	CCR Characterization
Figure 2	2022 Conditions

If you have any questions about this letter, please do not hesitate to contact Brian Hennings or Frances Ackerman, as referenced below.

Sincerely,

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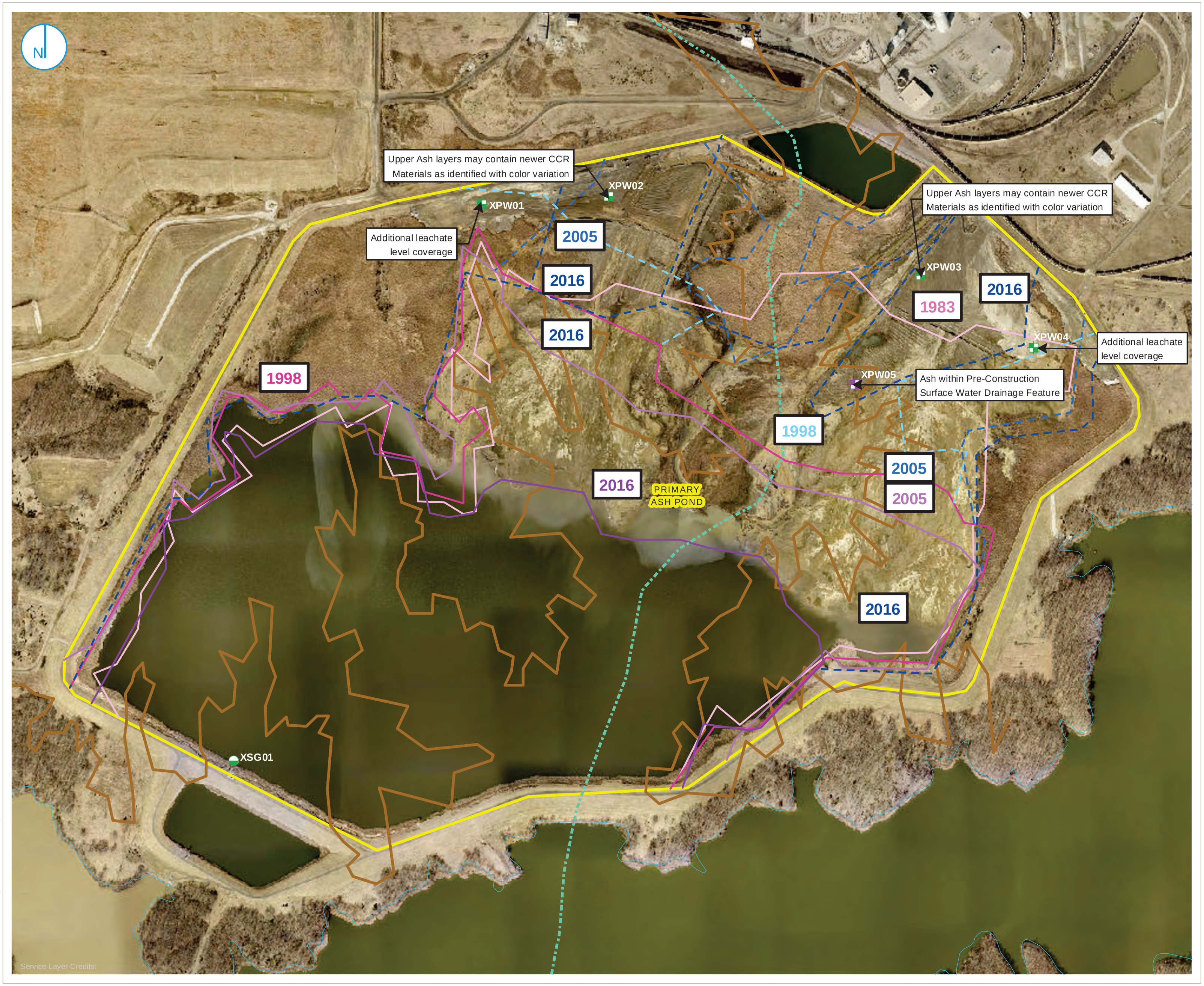
ATTACHMENTS



PORE WATER WELL

STAFF GAGE, CCR UNIT

PROPOSED LOCATION COULD NOT BE ACCESSED

APPROXIMATE LOCATION OF STREAM BASED ON 1953 TOPOGRAPHIC MAP (BASE OF STREAM ELEVATION DECREASES SOUTH TOWARD NEWTON LAKE)

APPROXIMATE LOCATION OF 530 FOOT GROUND SURFACE ELEVATION CONTOUR BASED ON 1953 TOPOGRAPHIC MAP (PRE-CONSTRUCTION SURFACE WATER DRAINAGE FEATURE)

APPROXIMATE LIMITS OF ASH BASED ON 1983 AERIAL

APPROXIMATE LIMITS OF ASH BASED ON 1998 AERIAL

APPROXIMATE LIMITS OF ASH BASED ON 2005 AERIAL

APPROXIMATE LIMITS OF ASH BASED ON 2016 AERIAL

APPROXIMATE LIMITS OF VARIANCE IN CCR MATERIAL COLORATION AS OBSERVED IN 1998 AERIAL

APPROXIMATE LIMITS OF VARIANCE IN CCR MATERIAL COLORATION AS OBSERVED IN 2005 AERIAL

APPROXIMATE LIMITS OF VARIANCE IN CCR MATERIAL COLORATION AS OBSERVED IN 2016 AERIAL

SURFACE WATER FEATURE

CCR MONITORED UNIT, SUBJECT SITE

0 275 550 Feet

CCR CHARACTERIZATION

NEWTON PRIMARY ASH POND (UNIT ID: 501)

NEWTON POWER STATION
NEWTON, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 11/3/2023 | DESIGNER: GALARNMC

Y:\Mapping\Projects\22\2285\MXD\845\Newton\2023\INTERACTIVE_Figure 1_Newton_CCR Characterization.mxd

2022 CONDITIONS

NEWTON POWER PLANT
NEWTON, ILLINOIS

FIGURE 2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\845\Newton\2023\Figure 2_NEW 2022 Conditions.mxd

PROJECT: 169000XXXX | DATED: 11/3/2023 | DESIGNER: GALARNMC

DOCUMENT

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Rees, Jeromy

From: Jenny Cassel <jcassel@earthjustice.org>
Sent: Monday, November 6, 2023 1:13 PM
To: Hunt, Lauren; Mullenax, Heather; Dunaway, Lynn
Cc: Faith Bugel; arehn; Mychal Ozaeta; Lauren Piette
Subject: [External] Environmental Groups' Comments on Joppa, Baldwin, and Newton ASDs
Attachments: FINAL 11.6.23 Earthjustice, PRN and SC comments on ASDs for Joppa, Newton, and Baldwin.pdf

Ms. Hunt, Ms. Mullenax, and Mr. Dunaway,

Please see attached comments from Earthjustice. Prairie Rivers Network, and Sierra Club on proposed Alternative Source Determinations (ASDs) for CCR surface impoundments at the Joppa, Newton, and Baldwin facilities. Please don’t hesitate to reach out if you have any questions or would like to discuss further.

Thank you,
Jenny Cassel

Jenny Cassel
Senior Attorney, Clean Energy Program
Earthjustice
311 S. Wacker Drive, Suite 1400
Chicago, IL 60606
T: 312-500-2198 (direct)
jcassel@earthjustice.org

November 6, 2023

Lauren Hunt
Illinois Environmental Protection Agency
lauren.hunt@Illinois.gov

Heather Mullenax
Illinois Environmental Protection Agency
heather.mullenax@Illinois.gov

RE: Public Comments on Alternative Source Demonstrations for Joppa, Baldwin, and Newton CCR surface impoundments

Dear Ms. Hunt and Ms. Mullenax,

Pursuant to 35 I.A.C. § 845.650(e)(3), Earthjustice, Prairie Rivers Network, and Sierra Club (collectively, "Commenters") respectfully submit these public comments concerning the "alternative source demonstrations" submitted for the Joppa, Newton, and Baldwin facilities.

Under the Part 845 rules, an alternative source demonstration ("ASD") is a:

> demonstration . . . that a source other than the CCR surface impoundment caused the contamination and the CCR surface impoundment *did not contribute* to the contamination, or that the exceedance . . . resulted from error in sampling, analysis, statistical evaluation, natural variation in groundwater quality, or a change in potentiometric surface and groundwater flow direction.

35 I.A.C. § 845.650(e) (emphasis added).

Commenters cannot meaningfully comment on the ASD submissions because Illinois EPA has not yet, for any of these facilities, issued an operating permit that sets out an approved groundwater monitoring program. Without an approved groundwater monitoring program, the Agency likewise cannot make a supported decision that the purported "demonstration" in fact establishes that the impoundment has not contributed to the contamination. Accordingly, the Agency should deny the ASDs.

An approved groundwater monitoring program – which includes appropriate locations, depths, and number of background and downgradient monitoring wells, as well as satisfactory sampling procedures and determinations of which wells accurately represent "background" groundwater quality – is an essential prerequisite for any ASD. Without an approved program, owners/operators may be engaging in a variety of erroneous monitoring practices that result in contamination from the CCR surface impoundment not being fully detected or characterized. Among other flaws, owners or operators may have set up a groundwater monitoring system that is missing contaminant pathways; treating CCR-contaminated wells as "background" wells, resulting in pollution associated with the CCR surface impoundment improperly not being classified as an exceedance; or failing to account for "mounding" or other hydrogeological characteristics that affect groundwater flow direction. **In short, without an IEPA-approved program properly revealing what contamination is coming from a CCR surface impoundment, there is insufficient information for IEPA to determine—or for owners/operators to demonstrate—that pollution is NOT coming from the impoundment**.

Our concerns about serious flaws in groundwater monitoring performed by industry, absent review and approval (after public comment) from the Agency, are far from hypothetical. USEPA has reviewed the groundwater monitoring systems of multiple CCR surface impoundments – including one here in Illinois[1] – and found, or proposed to find, numerous grave errors in how that monitoring is being carried out.

Many of these evaluations have come in the form of USEPA's review of owners/operators' "Part A" applications. To obtain an extension of the deadline to cease receipt of CCR in a CCR surface impoundment that is required to close, owners/operators were required to demonstrate, among other things, full compliance with the CCR rule at the entire facility where the CCR surface impoundment is located.[2] As of this writing, USEPA has issued thirteen proposed decisions on Part A applications, one of which it finalized.[3] It evaluated compliance with the groundwater monitoring mandates of the CCR rule at eight of those facilities.[4]

At *every* site that USEPA reviewed as part of its Part A evaluations, it identified serious problems with facilities' groundwater monitoring systems:

- At the Gavin coal-fired power plant, USEPA found that the owner/operator failed to thoroughly characterize groundwater flow direction, failed to properly establish background wells, and lacked adequate downgradient wells, among other flaws.[5]

- At the Waukegan plant, USEPA proposed to find that Midwest Generation did not properly characterize groundwater flow direction, lacked sufficient wells to fully monitor potential contamination, improperly used "intrawell" statistical analysis of monitoring results, and used improper "background" wells that were dug through CCR.[6]

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[1] *See* https://www.epa.gov/coalash/coal-combustion-residuals-ccr-part-implementation (noting proposed denial of Waukegan "Part A" application, with link to proposed denial).

[2] USEPA, Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure, 85 Fed. Reg. 53,516 (Aug. 28, 2020).

[3] *See* https://www.epa.gov/coalash/coal-combustion-residuals-ccr-part-implementation (listing CCR surface impoundments for which USEPA has issued proposed and final decisions).

[4] *See id*. (noting proposed decisions, including complete and incomplete or ineligible applications).

[5] *See* final Gavin Part A decision at 45-54 and 70-76, available at https://www.regulations.gov/document/EPA-HQ-OLEM-2021-0590-0100.

[6] *See* proposed Waukegan Part A decision at 31-47, available at https://www.regulations.gov/document/EPA-HQ-OLEM-2023-0209-0001.

- At the Ottumwa, Clifty Creek, and Spurlock plants, USEPA proposed to find that, among other deficiencies, the groundwater monitoring wells were too far apart or not properly sited, leaving potential contaminant pathways unmonitored.[7]

- At A.B. Brown, USEPA proposed to find, among other concerns, that the groundwater monitoring wells were not placed in sufficient locations to detect all potential contaminant pathways, that groundwater flow characterization was inadequate, and samples were improperly evaluated using "intrawell" statistical analysis.[8]

- At Mountaineer, USEPA proposed to find, among other flaws, that the company did not appropriately locate either background or downgradient wells, and improperly analyzed groundwater monitoring data, including by excluding so-called "outlier" data and by using intrawell analysis.[9]

- At the Calaveras plant, USEPA proposed to find, among other flaws, that groundwater monitoring wells are improperly spaced, inadequate in number, and not located at the waste boundary, and the company did not appropriately identify background wells.[10]

USEPA has likewise identified severe deficiencies in the groundwater monitoring programs at multiple CCR facilities in Alabama[11] and at one facility in Kansas to which it sent a letter summarizing conversations regarding compliance concerns.[12] In effect, *every time* USEPA has taken a close look at the groundwater monitoring program for a CCR surface impoundment or landfill, it has identified deficiencies that could lead to contamination from those CCR units being released undetected. There is no reason to believe those deficiencies are limited to sites outside of Illinois; indeed, as noted, one facility where USEPA found those deficiencies is the Waukegan plant. Until IEPA fulfills the critical oversight role assigned to it by the Coal Ash Pollution Prevention Act and Part 845, namely, it has reviewed and approved groundwater monitoring programs for Joppa, Baldwin, and Newton, **ASDs for those sites should be denied**.

Commenters reserve the right to provide additional comment on these or any other ASDs for Joppa, Newton, or Baldwin once approved groundwater monitoring systems, set out in IEPA-approved operating permits, are in place.

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[7] *See* proposed Ottumwa Part A decision at 43-46, available at https://www.regulations.gov/document/EPA-HQ-OLEM-2021-0593-0002; proposed Clifty Creek Part A decision at 44-45, available at https://www.regulations.gov/document/EPA-HQ-OLEM-2021-0587-0023; and proposed Spurlock Part A decision at 55-56, available at https://www.regulations.gov/document/EPA-HQ-OLEM-2021-0595-0002;

[8] *See* proposed A.B. Brown Part A decision at 31-47, available at https://www.regulations.gov/document/EPA-HQ-OLEM-2022-0335-0001.

[9] *See* proposed Mountaineer Part A decision at 33-48, available at https://www.regulations.gov/document/EPA-HQ-OLEM-2021-0842-0001.

[10] See proposed Calaveras Part A decision at 47-55, available at https://www.regulations.gov/document/EPA-HQ-OLEM-2022-0333-0001.

[11] Alabama: Denial of State Coal Combustion Residuals Permit Program, 88 Fed. Reg. 55,220, 55,239 - 55,241, 55,249 - 55,253, 55,260 - 55,267, and 55,271 - 55,272 (Aug. 14, 2023).

[12] USEPA, Letter re: Notice of Potential Violations/Opportunity to Confer, Tecumseh Energy Center, Tecumseh, Kansas, Enclosure 1 at 1-4 (Jan. 2021), attached hereto.

Thank you kindly for taking these comments into consideration.

Best,

Jennifer Cassel
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mozaeta@earthjustice.org
lpiette@earthjustice.org

On behalf of Earthjustice

Andrew Rehn
arehn@prairierivers.org

Prairie Rivers Network

Faith Bugel
fbugel@gmail.com

On behalf of Sierra Club

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
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Lenexa, Kansas 66219

SENT BY ELECTRONIC MAIL
RECEIPT CONFIRMATION REQUESTED
jared.morrison@evergy.com

Mr. Jared Morrison
Director, Water and Waste Programs
Evergy Kansas Central, Inc.
818 S. Kansas Avenue
P.O. Box 889
Topeka, Kansas 66601

Re: Notice of Potential Violations/Opportunity to Confer
Tecumseh Energy Center, Tecumseh, Kansas

Dear Mr. Morrison:

Thank you for taking the time on January 25, 2021, and March 9, 2021, to discuss disposal of coal combustion residuals (CCR) at the Evergy Tecumseh Energy Center (TEC) located near Tecumseh, Kansas, and the requirements of 40 C.F.R. Part 257, Subpart D (the CCR Rule). After further review of the information posted on your publicly accessible CCR compliance web site (TEC CCR web site), the U.S. Environmental Protection Agency (the EPA or the Agency) continues to be concerned about compliance with the CCR Rule at TEC.

According to the TEC CCR web site, two units at the facility are subject to requirements in the CCR Rule: one surface impoundment (Bottom Ash Settling Area or BASA) and one landfill (322 Landfill). The Agency has reviewed the following documents posted for these units:

- Annual Groundwater Monitoring and Corrective Action (GWMCA) Reports (2017, 2018, 2019 and 2020, revised March 6, 2021)
- Groundwater Monitoring Systems Certification (2017, revised March 9, 2021)
- Statistical Method Certifications (2017, 2018, 2019)
- Closure Plan TEC Industrial Landfill 322 (2016, revised Mar 4, 2021)
- Post-Closure Plan TEC Industrial Landfill 322 (2016, revised March 4, 2021)

This review identified several missing, erroneous, or incomplete elements, which represent potential violations, described in Enclosure 1. The EPA's priority is to ensure Evergy is operating in compliance with the CCR Rule. While we appreciate Evergy's efforts to date to comply with the CCR Rule, and offers to perform additional work, the EPA has continuing concerns as to whether some requirements are being met. Based on the issues highlighted in the May 13, 2021, letter from Mr. Mark Anstoetter, and the results of the January and March meetings, we believe that further discussions are warranted. The EPA is interested in discussing the issues identified in Mr. Anstoetter's letter and developing an agreed-upon compliance schedule to address areas of noncompliance if possible. A proposed compliance schedule is set forth in Enclosure 2.

The EPA also believes that these potential violations are likely significant enough to warrant the assessment of a civil penalty. The terms of any agreed-upon resolution of areas of noncompliance, a compliance schedule and penalty would be incorporated into a Consent Agreement and Final Order issued pursuant to Section 3008(a) of RCRA, 42 U.S.C. § 6928(a).

Any submittal that TEC prepares to comply with the CCR Rule must be maintained, placed in the operating record, and posted by TEC in accordance with the recordkeeping, notification and publicly accessible CCR web site requirements, pursuant to 40 C.F.R. §§ 257.105, 257.106 and 257.107. Please note that original versions of documents must remain on the CCR web site for 5 years, in accordance with 40 C.F.R. § 257.107(c).

To schedule a call to discuss these issues, please contact Kelley Catlin in the Office of Regional Counsel within 10 calendar days of receipt of this letter at (913) 551-7110 or Bob Aston, at (913) 551-7392. Thank you for your prompt attention to this important matter.

Sincerely,

Wendy Lubbe
Acting Director
Enforcement and Compliance Assurance Division

cc: Mark Anstoetter, Esq.
Shook, Hardy and Bacon
manstoetter@shb.com

Julie Coleman, Director (e-copy)
Bureau of Waste Management
Kansas Department of Health and Environment

ENCLOSURE 1
Potential Violations
Tecumseh Energy Center

1) Reporting monitoring data

- 40 C.F.R. § 257.90(e)(3) – The Annual Groundwater Monitoring and Corrective Action (GWMCA) Reports must include all monitoring data obtained under 40 C.F.R. §§ 257.90 through 257.98. This includes results of laboratory analysis of groundwater or other environmental media samples for the presence of constituents in Appendices III and IV to 40 C.F.R. part 257 (or of other constituents, such as those supporting characterization of site conditions that may ultimately affect a remedy), any required statistical analyses performed on those results, measured groundwater elevations, and calculated groundwater flow rate and direction. The posted Annual GWMCA Reports do not include all the required information.

2) Groundwater monitoring system

- 40 C.F.R. § 257.91 – The performance standards require that a groundwater monitoring system consist of a sufficient number of wells, installed at appropriate locations and depths, to accurately characterize the quality of groundwater upgradient and passing the downgradient boundary of the unit. The following issues with the groundwater monitoring system have been identified:
    - 40 C.F.R. § 257.91(c) – Each groundwater monitoring system is required to have a sufficient number of wells to accurately characterize groundwater quality, including at least three downgradient wells[1]. In December 2019 at the BASA, MW-9 was not monitored due to lack of water in the well. This resulted in failure of the BASA groundwater monitoring system to meet the requirement to have a minimum of 3 downgradient wells in the BASA groundwater monitoring system during this semi-annual period.

    - 40 C.F.R. § 257.91(f) – The certification by a professional engineer (P.E.) that the groundwater monitoring systems have been designed and constructed to meet the requirements of 40 C.F.R. § 257.91 must document the basis supporting the determination for monitoring systems using only one upgradient and three downgradient wells. The groundwater monitoring systems for both the BASA and the 322 Landfill each consist of only one upgradient and three downgradient wells. The P.E. certification for the systems does not include the basis for the certification. This basis must include the criteria specified in 40 C.F.R. § 257.91(b), which is required to

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[1] As the EPA explained in the preamble to the CCR Rule (see 80 FR 21400), "As a practical matter, the EPA expects that there will be few cases, if any, where four wells will be sufficient, given that this requirement was originally developed for hazardous waste management units that are typically much smaller than CCR units. As mentioned above, a small unit with simple geology, a flat and constant hydraulic gradient, uniform hydraulic conductivity, low seepage velocity, and high dispersivity potential would be the type of unit for which the minimum number of wells could be sufficient to meet the overall performance standard. Although the EPA is finalizing a requirement for one upgradient and three downgradient wells as a regulatory minimum, the Agency expects large CCR units to have many more wells because most CCR sites have hydrologic settings that are too complex for the regulatory minimum to be adequate."

be considered when determining the appropriate number, spacing and depths of groundwater monitoring wells.

TEC has not provided any of the information required to support the design of the groundwater monitoring systems in the system certifications, except potentiometric maps included in the Annual GWMCA Reports. Some of the potentiometric maps appear to be based on an insufficient number of groundwater elevation data points to support the contours drawn. Moreover, there is evidence that both the BASA and the 322 Landfill groundwater monitoring systems do not meet the performance standard in 40 C.F.R. § 257.91.

With regard to the BASA, the analysis and data included in the BASA Alternate Source Demonstrations (ASDs) indicate background groundwater quality may not be properly characterized. Potentiometric maps included in the revised 2018 Annual GWMCA Report indicate at least a 90-degree shift in groundwater flow direction. This shift in flow direction results in monitoring well MW-11, which is designated as a side gradient well, being downgradient during 2018. This shift in flow direction similarly affects upgradient well MW-7. During 2018, MW-7 is depicted as either side gradient and potentially downgradient of the BASA unit and may not represent true background conditions. This shift in groundwater flow direction is not noted in the revised 2018 GWMCA Report. Additionally, the BASA is located next to a water feature that appears to exert seasonal or temporal influence on groundwater flow direction.

With regard to the 322 Landfill, this unit is too large for one upgradient and three downgradient wells to be spatially adequate to represent groundwater quality. The unit is approximately 56 acres, and its western and eastern boundaries are each approximately 2500 feet long. However, there are no groundwater monitoring wells along the western boundary of the unit and only one downgradient well on the eastern boundary of the unit, approximately 300 feet south of the northeast corner of the unit (see Figure 1 in the 2020 Annual GWMCA Report). Potentiometric flow maps depict groundwater flow toward the north/northeast, and groundwater is depicted as migrating toward the unit in this direction along the entire length of the western boundary and away from it along the entire length of the eastern boundary. 40 C.F.R. § 257.91(a)(2) requires that the downgradient monitoring system be "installed at the waste boundary that ensures detection of groundwater contamination," such that "all potential contaminant pathways must be monitored." Thus, the existence of over 2,000 feet of unmonitored, downgradient waste boundary along the eastern side of the landfill does not ensure detection of groundwater contamination.

The number, spacing, and depths of groundwater monitoring wells needed to sufficiently monitor upgradient groundwater quality and at the downgradient boundary must be determined using site-specific information as required by 40 C.F.R. § 257.91(b), which is currently missing from the reports and certifications available for review. However, simply based on size and available information it appears that neither background groundwater quality nor groundwater quality at the downgradient unit boundary are accurately characterized at either the BASA or the 322 Landfill.

3) Groundwater sampling and analysis requirements

- 40 C.F.R. § 257.93(d) – Background groundwater quality must be established for each constituent in a hydraulically upgradient well, or a background well that meets the requirements of 40 C.F.R. § 257.91(a)(1). 40 C.F.R. § 257.91(a)(1) allows background groundwater quality to be established in a well that has not been affected by leakage from a CCR unit and is not hydraulically upgradient if either of two criteria is met:

  - o inability to determine a groundwater flow gradient; or

  - o samples from other wells are as representative or more representative of background groundwater quality than samples from a hydraulically upgradient well.

  Intrawell comparisons conducted at the BASA do not appear to meet these requirements, as discussed below.

- 40 C.F.R. § 257.93(c) – The rate and direction of groundwater flow must be determined each time groundwater is sampled. The determination of the rate of groundwater flow has not been included in the Annual GWMCA Reports.

When conducting "intrawell" data comparison, samples taken at different times from the same well are used to characterize both background groundwater quality and downgradient groundwater quality. When conducting "interwell" data comparison, samples from one or more upgradient or side-gradient wells characterize background groundwater quality and samples from one or more down-gradient wells characterize groundwater quality down-gradient from the unit.

TEC has utilized intrawell comparisons at certain wells for certain constituents in Appendix IV to 40 C.F.R. part 257, for which interwell comparisons would have yielded a statistically significant level (SSL) (e.g., see Table II in the 2019 Annual GWMCA Report for the BASA for MW-9 for arsenic and cobalt and MW-10 for arsenic). This approach was implemented for the October 2019 sampling event, after TEC prepared an ASD in which TEC claimed there was natural variation in groundwater quality occurring below the BASA, for particular Appendix IV constituents only.

TEC has not provided data that indicate a groundwater flow gradient is not present at the BASA. Accordingly, the first criterion set forth at 40 C.F.R. § 257.91(a)(1)(i), that would allow background to be established in a non-upgradient well, is not met. With respect to the second criterion set forth at 40 C.F.R. § 257.91(a)(1)(ii), TEC has provided no information that indicates that the samples taken from the downgradient wells at the BASA are as or more representative of background groundwater quality than could be obtained from an up-gradient well.

If background groundwater quality samples are obtained from either an upgradient or a side-gradient well, interwell data comparisons would necessarily be used to identify SSIs or SSLs, because samples to characterize groundwater quality at the downgradient unit boundary would necessarily come from different wells than background samples. Additionally, samples that characterize background groundwater quality must always be taken from a well unimpacted by releases from a CCR unit.

If it can be demonstrated that samples obtained from wells located at the downgradient boundary of the CCR unit characterize background groundwater quality as accurately or more accurately than samples from an upgradient well, then all data analyzed for SSIs or SSLs would come from the same wells, and intrawell data comparisons would be used. As noted above, samples that characterize background groundwater quality must always be taken from a well unimpacted by releases from the CCR unit. Like many other CCR units, the BASA operated for decades (since construction in 1968) prior to becoming regulated by the CCR Rule. The 2019 Annual GWMCA Report indicates in a footnote to Table II that data collected through June 2019 were used to characterize background in the intrawell statistical analysis of the October 2019 groundwater data. Samples would need to have been obtained from these wells long before that time in order for them to be known to be unimpacted by the CCR unit. Therefore, intrawell data comparisons are inappropriate to demonstrate compliance with the requirements of the CCR Rule at the BASA.

4) Assessment Monitoring program

Whenever there is an SSI over background levels for one or more of the constituents in Appendix III to 40 C.F.R. part 257 at any monitoring well at the waste boundary, an assessment monitoring program must be established. The following issues with the assessment monitoring program at the BASA have been identified:

- 40 C.F.R. § 257.95(b) – The assessment monitoring program requires annual sampling for all constituents in Appendix IV to 40 C.F.R. part 257. This sampling was last conducted at the BASA on June 25, 2019. No sampling was conducted in 2020 to meet this requirement, as reported in Section 2.3.3 of the 2020 Annual GWMCA Report (amended March 6, 2021).

- 40 C.F.R. § 257.95(d)(1) – The assessment monitoring program requires semi-annual monitoring at all wells for all constituents in Appendix III to 40 C.F.R. part 257 and for those constituents in Appendix IV to 40 C.F.R. part 257 that were detected in the sampling event conducted in accordance with 40 C.F.R. § 257.93(b). This sampling was last conducted timely on March 20-21, 2019. The next sampling event occurred on October 10, 2019, beyond the semi-annual timeframe. No sampling was conducted in 2020 to meet this requirement, as reported in Section 2.3.3 of the 2020 Annual GWMCA Report (amended March 6, 2021).

5) The Alternate Source Demonstrations (ASD)

In order to rebut the site-specific monitoring data and analysis that resulted in an SSI or SSL, an ASD must be supported by site-specific facts and analytical data. Merely speculative or theoretical bases for the conclusions are insufficient. An ASD should be conclusive, rather than probable or possible.

At the BASA, constituents in Appendix IV to 40 C.F.R. part 257 were detected at SSLs in September 2018 and March 2019. The 2019 Annual GWMCA Report included ASDs for these sampling events. These ASDs do not support a determination that the SSLs detected (arsenic in MW-9 and MW-10 and cobalt in MW-9) in both September 2018 and March 2019 are due to an alternate source rather than the BASA, in accordance with requirements in 40 C.F.R. § 257.95(g)(3)(ii). Specific concerns regarding the validity of the ASDs include:

- No alternative source was credibly identified that would have contributed to the SSIs/SSLs detected. The EPA has previously outlined the expectations for a valid ASD in the Solid Waste Disposal Facility Criteria, Technical Manual[2] for the Municipal Solid Waste Landfill regulatory program at 40 C.F.R. part 258. In Chapter 5, beginning on page 286, and further explained on page 280, a facility seeking an ASD must document that "*an* alternative source exists" and that a hydraulic connection exists between *the* alternative source and the well with the significant increase. Furthermore, the facility must document that "constituents (or precursor constituents) are present at *the alternative source* or along the flow path *from the alternative source* prior to possible release from the regulated unit." The ASD regulatory

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[2] Solid Waste Disposal Facility Criteria, Technical Manual (November 1993), EPA530-93-017 https://archive.epa.gov/epawaste/nonhaz/municipal/web/pdf/subparte.pdf

language at 40 C.F.R. part 258 tracks the ASD regulatory language at 40 C.F.R. part 257. Just as this approach makes sense and has been appropriate for ASDs under Part 258 for over 25 years, the Agency believes the same approach is appropriate for Part 257.

- Claims that variation in groundwater quality between upgradient and downgradient wells is occurring naturally are unsupported by data in the ASD. While the ASD highlights average decreasing concentrations of some constituents (e.g., boron, chloride and sulfate) from upgradient to downgradient wells as evidence of the BASA not impacting groundwater, the ASD neglects to address that higher calcium concentrations exist downgradient, and fluoride concentration patterns are mixed; the Appendix III sampling data are inconclusive in proving natural groundwater variation. Some Appendix IV sampling data show similar uneven concentration patterns, but some are more clearly at elevated levels downgradient for key constituents like arsenic. Sampling results do not indicate the presence of Appendix IV constituents at unexpected high concentrations in the aquifer matrix downgradient of the background wells. Other possible reasons for such variations include improper characterization of background groundwater quality (see prior discussion on the 2018 groundwater potentiometric maps), or changes in groundwater chemistry below the unit caused by releases from the BASA to the aquifer. Sampling from additional wells or other environmental media could better substantiate a claim of groundwater natural variability as the cause of constituent concentration patterns.

- The leachate tests are of limited value for the following reasons:

    - Not enough information is provided about the sampling collection protocols (e.g., depth, volume, location of samples), the typical residence time of ash in the unit, or how the composition of ash being disposed may have changed over time.

    - Ash collected from the impoundment may have already leached a substantial fraction of the contaminant mass and provide an incomplete estimate of total release potential.

    - Not enough information is provided to determine whether the selected leachate test accurately reflects field conditions. This is in part due to the lack of field parameter results in Annual GWMCA Reports. These tests are not useful in an ASD if they are not similar to conditions in the unit (e.g., pH of liquid or the liquid to solid ratio).

    - The leaching test results do not provide evidence to refute that elevated arsenic and cobalt at MW-9 and MW-10 are being at least partially caused by the unit.

- The evidence presented, primarily leachability testing, does not outweigh the significant amount of field data indicating the detections are the result of a leak in the BASA. This evidence includes the following:

    - The BASA does not have a liner to inhibit infiltration of releases into the underlying, uppermost aquifer.

    - Approximately 20 feet of hydraulic head was present within the BASA during operation to drive the sluiced ash water into the underlying, uppermost aquifer throughout the 35 years of operational history.

  - Following dewatering of the BASA in September 2019, the groundwater elevations dropped approximately nine feet in MW-8, MW-9 and MW-10, confirming a direct hydraulic connection between sluiced ash in BASA and groundwater at these downgradient wells.
  - Multiple SSIs above background occurred at all three downgradient wells (MW-8, MW-9, MW-10) in each of the four monitoring events in 2018 and 2019.

Because an ASD meeting the requirements of 40 C.F.R. § 257.95(g)(3)(ii) was not completed within 90 days of finding that an SSL was detected, TEC became subject to the requirements of 40 C.F.R. § 257.95(g) and was also required to initiate an Assessment of Corrective Measures within 90 days after detecting the SSL in accordance with 40 C.F.R. § 257.96.

While the EPA is not foreclosing TEC from continuing its efforts to identify an alternative source, TEC must, in parallel, work through the assessment monitoring and corrective action program.

6) Closure and post-closure requirements

For the reasons stated above, the EPA believes the BASA is subject to corrective action requirements. Accordingly, the Closure Plan must be amended, and a Post-closure Care Plan must be developed to reflect that the unit has triggered corrective action requirements. The Post-closure Care Plan must incorporate changes necessary to reflect that closure will be complete when constituent concentrations throughout the unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standards, in accordance with 40 C.F.R. § 257.102(c).

Regarding the 322 Landfill, the EPA identified issues associated with the Post-closure Care Plan. In general, the plan should document actions to be taken to comply with the performance standards for post-closure care in 40 C.F.R. § 257.104. The Post-closure Care Plan lacked specificity regarding actions to be taken, frequency or timing of activities discussed, and criteria for implementing described contingencies. By failing to provide specific measures or any guiding procedures or principles, it fails to serve as a plan. As such, the Landfill Post-closure Care Plan does not meet the requirements at 40 C.F.R. § 257.104(d):

- 40 C.F.R. § 257.104(d)(1)(i) requires that the plan contain a description of monitoring and maintenance activities required in 40 C.F.R. § 257.104(b)(1), to maintain the integrity and effectiveness of the final cover system. Section 5.1 of the Landfill Post-closure Plan states that inspections will initially occur weekly, then quarterly or semi-annually, and that "Inspection frequency will be reduced as final cover conditions are found to be stable and depending on the need for periodic maintenance." The Plan does not provide any criteria for evaluating stability or any method for conducting inspections. It does not specify what level of periodic maintenance might warrant more or less frequent inspections.

- Additionally, potential damage to the final cover, due to the lack of planned actions to restrict public access to the cover, necessitates the need for more frequent inspections than semi-annual.

- Section 5.2 of the Landfill Post-closure Plan provides a list of possible measures that could be used to control public access to the landfill (e.g., site security, fencing, lockable gates, and/or site surface water features) to prevent cover damage. This list simply represents a broad range of options, all or none of which may be implemented. If any of these measures were to be implemented, there is no information about their design (e.g., fence height) or requirements for maintenance or inspection.

ENCLOSURE 2
Proposed Compliance Schedule
Tecumseh Energy Center

#	CCR Rule	Summary of Issues Discussed	Projected Time Frame for Correction
1	40 C.F.R. § 257.90(e)	Incomplete Reports	30 days
2	40 C.F.R. § 257.91(c)	BASA groundwater monitoring system lacked sufficient number of wells	30 days
3	40 C.F.R. § 257.91(f)	Incomplete groundwater monitoring system certification	30 days
4	40 C.F.R. § 257.93(c)	Failure to report groundwater flow rate	30 days
5	40 C.F.R. § 257.95(b)	Conduct annual assessment monitoring for all constituents in Appendix III and IV	30 days
6	40 C.F.R. § 257.95(d)	Conduct semi-annual assessment monitoring for all constituents in Appendix III and for Appendix IV identified in sampling required by item 5	90 days
7	40 C.F.R. § 257.91	Submit a plan to install additional wells at 322 Landfill	45 days
8	40 C.F.R. § 257.95(g) and 40 C.F.R. § 257.96	Submit a plan to conduct initial fieldwork to characterize nature and extent of release from BASA and initiate an assessment of corrective measures (ACM)	45 days
9	40 C.F.R. § 257.93(d) and § 257.91(a)(1)	Establish background levels in wells as required and re-analyze groundwater monitoring data to identify SSLs for inclusion in ACM	45 days
10	40 C.F.R. § 257.104 and §§ 257.102(b), (c)	Develop a BASA Post-closure Care Plan and amend the Closure Plan to reflect the fact that corrective actions requirements apply	45 days
11	40 C.F.R. §257.104	Amend 322 Landfill Post-closure Plan to identify planned land use and to include a plan for actions in accordance with requirements to prevent damage to cap.	45 days
12	40 C.F.R. § 257.105-257.107	Notification and reporting requirements	Ongoing

DOCUMENT

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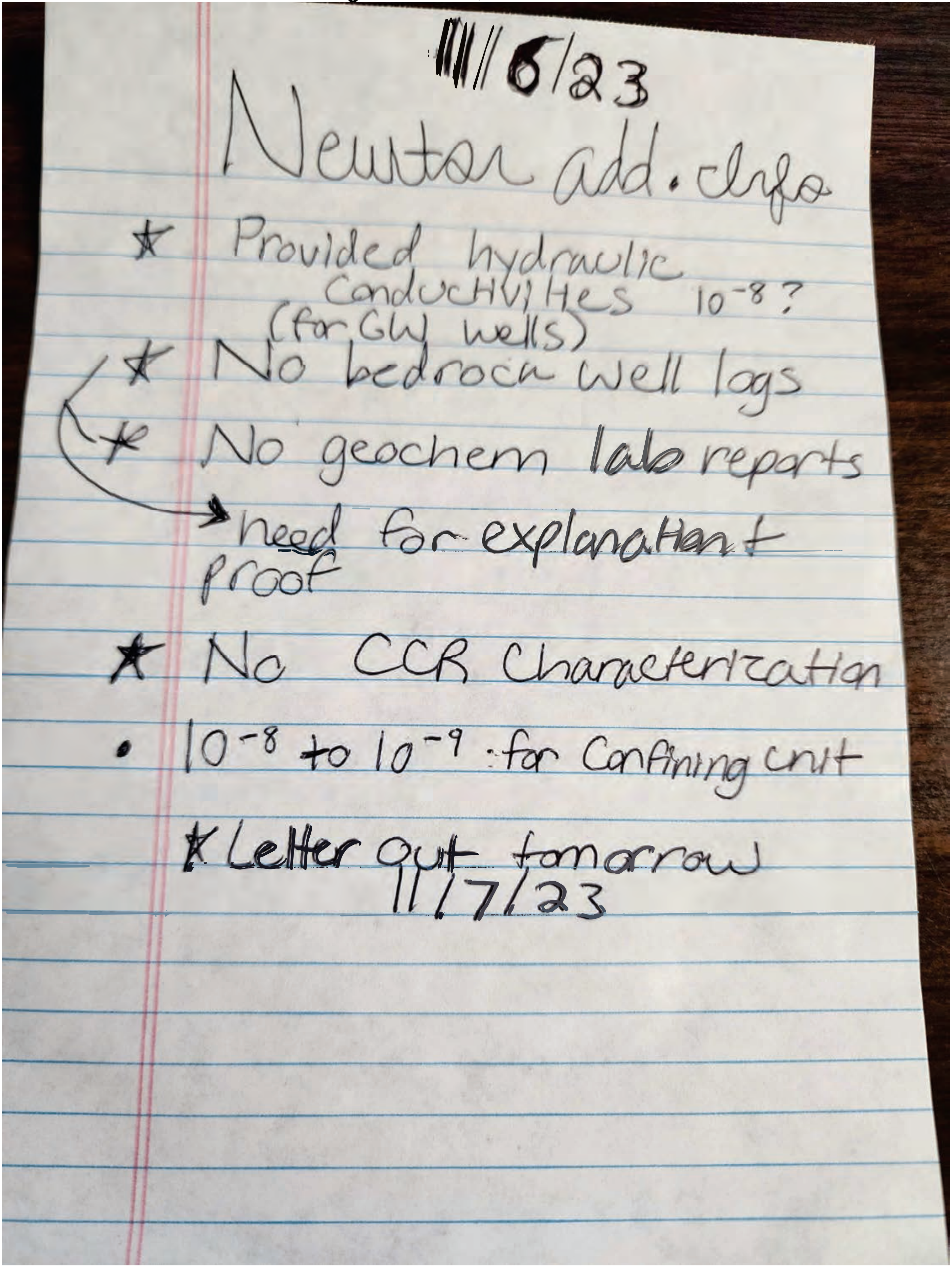

11/6/23

Newton add. info

- ★ Provided hydraulic conductivities 10^{-8}? (for GW wells)
- ★ No bedrock well logs
- ★ No geochem lab reports
  - → need for explanation + proof
- ★ No CCR Characterization
- • 10^{-8} to 10^{-9} for Confining unit
- ★ Letter out tomorrow 11/7/23

DOCUMENT

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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 · (217) 782-3397
JB PRITZKER, GOVERNOR
JOHN J. KIM, DIRECTOR

217-782-1020

November 7, 2023

Phil Morris
Illinois Power Generating Company
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

Re: Newton Power Plant Primary Ash Pond – W079807001-01
Alternative Source Demonstration Submittal

Dear Mr. Morris:

The purpose of this correspondence is to notify you that the Illinois Environmental Protection Agency (Illinois EPA) does not concur with the Newton Primary Ash Pond Alternative Source Demonstration (ASD) dated October 6, 2023. The Illinois EPA does not concur due to the following data gaps:

1. Source characterization of the CCR at the Primary Ash Pond must include total solids sampling in accordance with SW846.
2. Hydraulic conductivities from laboratory or in-situ testing must be collected, analyzed, and presented with hydrogeologic characterization of bedrock unit.
3. Characterization to include sample and analysis in accordance with 35 IAC 845.640 of alternative source must be provided with the ASD.

If you have any questions, please contact: **Heather Mullenax** Illinois EPA, Bureau of Water, PWS #13, P.O. Box 19276, Springfield, Illinois 62794-9276. If you have any questions concerning the investigation described above, please call 217-782-1020.

Sincerely,

Michael Summers, P.G.
Manager, Groundwater Section
Division of Public Water Supplies
Bureau of Water

cc: Heather Mullenax
Francisco Herrera
WPC Files 06M

2125 S. First Street, Champaign, IL 61820 (217) 278-5800
1101 Eastport Plaza Dr., Suite 100, Collinsville, IL 62234 (618) 346-5120
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2309 W. Main Street, Suite 116, Marion, IL 62959 (618) 993-7200
412 SW Washington Street, Suite D, Peoria, IL 61602 (309) 671-3022
4302 N. Main Street, Rockford, IL 61103 (815) 987-7760

DOCUMENT

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BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

ILLINOIS POWER GENERATING COMPANY

Petitioner

v.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

Respondent.

PCB 2023-________

NOTICE OF FILING

To: Pollution Control Board, Attn: Clerk
100 West Randolph Street
James R. Thompson Center
Suite 11-500
Chicago, Illinois 60601-3218
PCB.Clerks@illinois.gov

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 N. Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276
epa.dlc@illinois.gov

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Pollution Control Board the attached **PETITION FOR REVIEW OF ILLINOIS ENVIRONMENTAL PROTECTION AGENCY'S NON-CONCURRENCE WITH ALTERNATIVE SOURCE DEMONSTRATION UNDER 35 ILL. ADMIN. CODE PART 845 AND MOTION FOR STAY**; **APPEARANCES OF JOSHUA MORE, BINA JOSHI, AND SAMUEL RASCHE**; and a **CERTIFICATE OF SERVICE**, copies of which are herewith served upon you.

/s/ *Samuel A. Rasche*
Dated: December 15, 2023

ARENTFOX SCHIFF LLP
Joshua R. More
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Attorneys for Illinois Power Generating Co.

BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

ILLINOIS POWER GENERATING COMPANY

Petitioner

v.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

Respondent.

PCB 2023-________

APPEARANCE OF JOSHUA R. MORE AND CONSENT TO E-MAIL SERVICE

I, Joshua R. More, hereby enter my appearance on behalf of ILLINOIS POWER GENERATING COMPANY and authorize the service of documents on me by email in lieu of receiving paper documents in the above-captioned proceeding. My email address to receive service is as follows:

Joshua.More@afslaw.com

/s/ *Joshua R. More*
Joshua R. More

Dated: December 15, 2023

Joshua R. More
233 South Wacker Drive, Suite 7100
Chicago, Illinois 60606
(312) 258-5500
Joshua.More@afslaw.com

Attorney for Illinois Power Generating Co.

BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

ILLINOIS POWER GENERATING COMPANY Petitioner **v.** **ILLINOIS ENVIRONMENTAL PROTECTION AGENCY** Respondent.	**PCB 2023-________**

APPEARANCE OF BINA JOSHI AND CONSENT TO E-MAIL SERVICE

I, Bina Joshi, hereby enter my appearance on behalf of ILLINOIS POWER GENERATING COMPANY and authorize the service of documents on me by email in lieu of receiving paper documents in the above-captioned proceeding. My email address to receive service is as follows:

Bina.Joshi@afslaw.com

/s/ *Bina Joshi*
Bina Joshi

Dated: December 15, 2023

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Chicago, Illinois 60606
(312) 258-5500
Bina.Joshi@afslaw.com

Attorney for Illinois Power Generating Co.

BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

ILLINOIS POWER GENERATING COMPANY

Petitioner

v.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

Respondent.

PCB 2023-________

APPEARANCE OF SAMUEL A. RASCHE AND CONSENT TO E-MAIL SERVICE

I, Samuel A. Rasche, hereby enter my appearance on behalf of ILLINOIS POWER GENERATING COMPANY and authorize the service of documents on me by email in lieu of receiving paper documents in the above-captioned proceeding. My email address to receive service is as follows:

Sam.Rasche@afslaw.com

/s/ *Samuel A. Rasche*
Samuel A. Rasche

Dated: December 15, 2023

Samuel A. Rasche
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(312) 258-5500
Sam.Rasche@afslaw.com

Attorney for Illinois Power Generating Co.

BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

ILLINOIS POWER GENERATING COMPANY

Petitioner

v.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

Respondent.

PCB 2023-________

PETITION FOR REVIEW OF ILLINOIS ENVIRONMENTAL PROTECTION AGENCY'S NON-CONCURRENCE WITH ALTERNATIVE SOURCE DEMONSTRATION UNDER 35 ILL. ADM. CODE PART 845 AND MOTION FOR STAY

Petitioner Illinois Power Generating Company ("IPGC"), pursuant to Sections 105.200 *et seq.* and 845.650(e) of Title 35 of the Illinois Administrative Code, 35 Ill. Adm. Code §§ 105.200 *et seq.* and § 845.650(e), appeals the final decision of the Illinois Environmental Protection Agency ("IEPA" or the "Agency") that did not concur with the Alternative Source Demonstration (the "Newton ASD") for the Newton Primary Ash Pond submitted to the Agency on October 6, 2023. IEPA's non-concurrence is stated in a letter from IEPA Bureau of Water Groundwater Section Manager Michael Summers to IPGC dated November 7, 2023, and served upon IPGC on November 10, 2023, via U.S. Mail, which is attached as **Exhibit A** (the "IEPA Denial"). As detailed in Section II below, IEPA's Denial is contrary to the applicable regulations and arbitrary and capricious. For the reasons set forth in Section III below, Petitioner also requests a partial stay of Part 845 requirements as they apply to the detection of chloride that is the subject of the Newton ASD.

In support of this Petition and Motion for Stay, IPGC states as follows:

I. BACKGROUND

Regulatory Background

1. IEPA regulates coal combustion residuals ("CCR") surface impoundments under 35 Ill. Adm. Code. Part 845 ("Part 845").[1] Part 845 includes requirements for regular groundwater monitoring. 35 Ill. Adm. Code § 845.650.

2. If, during groundwater monitoring, one or more constituents are detected and confirmed to be in exceedance of the groundwater protection standards in Section 845.600 ("GWPS"), a series of additional steps are triggered.

3. Within 60 days after detecting an exceedance of a GWPS, an owner or operator may submit an Alternative Source Demonstration ("ASD") to IEPA demonstrating "that a source other than the CCR surface impoundment caused the contamination and the CCR surface impoundment did not contribute to the contamination, or that the exceedance of the GWPS resulted from error in sampling, analysis, statistical evaluation, natural variation in groundwater quality, or a change in the potentiometric surface and groundwater flow direction." 35 Ill. Adm. Code § 845.650(e).

4. The ASD must "include a report that contains the factual or evidentiary basis for any conclusions and a certification of accuracy by a qualified professional engineer." *Id.*

5. IEPA must send a public notice of the ASD, and members of the public may submit written comments to IEPA within 14 days of the notice. *Id.*

6. Within 30 days after receiving an ASD, IEPA must provide a written response to the owner or operator of the CCR surface impoundment either concurring or not with the ASD. If

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[1] Subsequent references in this petition to "Section 845.xxx" or "§ 845.xxx" shall be to 35 Ill. Adm. Code, Part 845, unless otherwise specified.

IEPA concurs, the owner or operator must continue groundwater monitoring, but is not required to take additional actions in connection with the identified exceedance, including initiating an assessment of corrective measures. If IEPA does not concur, the owner or operator may petition the Board for review of the non-concurrence. *Id.*

7. Other requirements are prompted in the absence of an ASD, or in the event an ASD is denied and a stay is not granted. For example, within 90 days after detecting an exceedance of a GWPS, the owner or operator of the CCR surface impoundment must initiate an assessment of corrective measures. 35 Ill. Adm. Code § 845.660(a). The owner or operator must, within 90 days of initiating its assessment of corrective measures (or up to 60 days longer if an extension is requested and granted), submit to the Agency an assessment of corrective measures. *Id.* at § 845.660(a)(2). Within a year of completing the assessment of corrective measures, an owner or operator must submit a construction permit application and corrective action plan to IEPA identifying the selected remedy. *Id* at § 845.670(b).

B. IPGC's Alternative Source Demonstration

8. IPGC owns and operates the Newton Power Plant ("Newton") located approximately 7 miles southwest of the town of Newton in Jasper County, Illinois. Newton includes the Primary Ash Pond ("PAP"), a CCR surface impoundment regulated under Part 845.

9. On August 7, 2023, groundwater monitoring at Newton identified a GWPS exceedance of chloride at a single monitoring well (well # APW15).[2] IPGC notified IEPA of its groundwater monitoring results, including this exceedance, placed the information in its operating

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[2] IPGC also detected GWPS exceedances of lithium, sulfate, and total dissolved solids at different wells. IPGC concluded the PAP may have caused or contributed to these exceedances and, therefore, did not address these exceedances in the Newton ASD. IPGC is addressing these exceedances by taking additional steps in accordance with Part 845, including 35 Ill. Adm. Code § 845.660.

record, and contracted with an environmental consultant to further investigate the cause of the GWPS exceedances. Newton Power Plant Primary Ash Pond; IEPA ID # W0798070001-01, Groundwater Monitoring data and Detected Exceedances Quarter 2 2023 (Aug. 7, 2023), available at 2023-Newton 2023 2Q 35 IAC 845 GW Rpt-W0798070001-01-Newton-Primary Ash Pond-W0798070001-01.pdf (luminant.com).

10. On October 6, 2023, IPGC submitted the Newton ASD to IEPA. The Newton ASD concluded that a source other than the PAP was responsible for the chloride GWPS exceedance at APW15 and that the PAP did not contribute to the chloride exceedance. The Newton ASD identified three lines of evidence to demonstrate that the PAP was not the cause of or contributing to the exceedance and that chloride in bedrock was a likely source of the chloride observed in APW15. The Newton ASD is attached as **Exhibit B**.

11. First, the Newton ASD explained that the PAP is separated from the uppermost aquifer at APW15 by a thick layer (approximately 60 feet) of low permeability glacial till. Accordingly, the ASD concluded there is "no complete pathway for transport of CCR constituents to APW 15, and the PAP is not the source of the chloride exceedance at that well." **Exhibit B** at 7.

12. Second, the Newton ASD noted that "concentrations of primary CCR indicators in APW15 do not exceed background limits and are not increasing." Id. at 7. The Newton ASD explains that boron and sulfate are common indicators of CCR impacts to groundwater "due to their leachability from CCR and mobility in groundwater," and as such boron and/or sulfate concentrations "would be expected to be elevated above their respective background Upper Tolerance Limits" if "groundwater in APW15 had been impacted by CCR from the [PAP]." Id.

The Newton ASD reports that the concentrations of boron and sulfate in APW15 are below their respective Upper Tolerance Limits. *Id.*

13. Combined with the fact that there is not an increasing trend of boron and sulfate concentrations in APW15, the Newton ASD concludes that these facts "indicate that [APW15] has not been affected by CCR from the [Newton] PAP." *Id.* at 8.

14. Third, the Newton ASD reported that "concentrations of chloride at APW15 are greater" than the concentrations in the PAP. By comparing the chloride concentrations of porewater in the PAP to APW15, the Newton ASD concluded that the "median chloride concentration observed in porewater is an order of magnitude lower than the median chloride concentrations observed in . . . APW15" and that the "maximum observed chloride concentration in . . . APW15 is approximately four times the concentration observed in porewater." *Id.*

15. The Newton ASD explains that "if the PAP was the source of chloride in downgradient groundwater, chloride concentrations in PAP porewater would be expected to be greater than the groundwater concentrations." Because the chloride concentration in APW15 is greater than the concentrations observed in PAP porewater, the Newton ASD concluded that the chloride concentrations in the groundwater "are not related to the PAP." *Id.*

16. For the above reasons, the Newton ASD concluded that the "preponderance of evidence" demonstrated the PAP is not the source of elevated chloride detected in APW15. *Id.* at 9.

17. The Newton ASD further concluded that "chloride concentrations in bedrock groundwater" are a likely source of the chloride exceedance at APW15. The Newton ASD supported this conclusion with three reasons. *Id.* at 9.

18. First, the Newton ASD presented evidence that chloride is present in Pennsylvanian shale bedrock in Jasper County at concentrations above those detected in APW15. *Id.*

19. Second, "[u]pward vertical hydraulic gradients and fractures near geologic features provide conduits for these chloride-rich waters to migrate. The Clay City Anticline is present east of the PAP and a saline spring has been mapped adjacent to this anticline approximately 10 miles south of the PAP in Clay County." *Id.*

20. Third, the Newton ASD notes that APW15 is "located in close proximity to bedrock" and the high hydraulic conductivity" of the uppermost aquifer at that location relative to the "low hydraulic conductivity of the underlying bedrock . . . provides a potential pathway" for chloride to migrate from the bedrock into the uppermost aquifer. The Newton ASD also observes that this would explain why APW15 was the only well affected by elevated chloride. *Id.*

21. The Newton ASD was certified by a qualified professional engineer and a professional geologist. *Id.*

C. IEPA's Review of the Newton ASD

22. On October 24, 2023, IEPA provided notice to its listserve regarding the posting of the Newton ASD submittal, triggering a 14-day period for written comments on the Newton ASD submittal pursuant to Section 845.650(e)(3).

23. Between October 19 and 31, 2023, IPGC and IEPA engaged in communications regarding the Newton ASD submittal. On November 3, 2023, within the 14-day period for written comments, IPGC submitted a written comment providing additional support for the Newton ASD in the form of a letter to IEPA (the "Comment Letter"). The Comment Letter was delivered to IEPA via email and is attached as **Exhibit C.**

24. In response to requests from IEPA, the Comment Letter provided hydraulic conductivity and boring log data, "all of which was previously provided or referenced in the

Newton PAP operating permit application and/or construction permit application." The Comment Letter also notified IEPA that "IPGC (with this letter) is incorporating by reference the entirety of its October 25, 2021, operating permit application for the Newton PAP and July 28, 2022, construction permit application for the Newton PAP into its Newton PAP ASD submittal." **Exhibit C** at 1.

25. The Comment Letter also included a detailed explanation of why IEPA's requests for "source characterization that includes total solids sampling, analysis and reporting in accordance with SW-846 testing methods and [] sampling and analysis in accordance with 25 Ill. Admin. Code 845.640 of the alternative source" were impractical and unfounded. The Comment Letter attached an additional letter from IPGC's qualified professional engineer detailing why IEPA's requests were unnecessary. *Id.*

D. The IEPA Denial

26. On November 7, 2023, four days after receiving the Comment Letter, IEPA sent a one-page letter notifying IPGC of IEPA's non-concurrence with the Newton ASD (the "IEPA Denial"). The IEPA Denial states that "IEPA does not concur" due to three "data gaps." **Exhibit A**. The three listed data gaps according to IEPA are:

27. First, "[s]ource characterization of the CCR at the Primary Ash Pond must include total solids sampling in accordance with SW846" ("Data Gap 1").

28. Second, "[h]ydraulic conductivities from laboratory or in-situ testing must be collected, analyzed, and presented with hydrogeologic characterization of bedrock unit" ("Data Gap 2").

29. Third, "[c]haracterization to include sample and analysis in accordance with 35 IAC 845.640 of alternative source must be provided with ASD" ("Data Gap 3").

30. These three "Data Gaps" are similar to the three issues discussed in IPGC's Comment Letter. However, the IEPA Denial does not respond to or acknowledge the existence of the Comment Letter.

II. Discussion

31. IEPA's bases for its non-concurrence, the three "Data Gaps," are each arbitrary and capricious and not supported by IEPA's regulatory authority under Section 845.650.

A. There are no data gaps in the ASD.

32. IEPA's Denial unreasonably demands data and analysis that is not required by Section 845.650. The regulation requires only that IPGC submit a "demonstration . . . that a source other than the CCR surface impoundment caused the contamination and the CCR surface impoundment did not contribute to the contamination." 35 Ill. Adm. Code § 845.650(e). In support of the demonstration, the regulations require that an ASD "include a report that contains the factual or evidentiary basis for any conclusions and a certification of accuracy by a qualified professional engineer." *Id.* The Newton ASD report does just that through a scientifically supported analysis that contains multiple lines of evidence. **Exhibit B**; *See also*, Declaration of Melinda W. Hahn at 2-7 (December 15, 2023), attached as **Exhibit D**. The information identified by IEPA's "Data Gaps" is not necessary to form a "factual and evidentiary basis" for the conclusions reached in an ASD. The information would not lead to a different result, and the fact the data was not submitted is inadequate to support the Agency's nonconcurrence with the Newton ASD.

1. <u>"Data Gap 1"</u>

33. "Data Gap 1" demands that the Newton ASD should have included a "source characterization of the CCR at the Primary Ash Pond" including "total solids sampling in accordance with SW846." **Exhibit A**. However, there is no requirement in Part 845 that source characterization of CCR for an ASD be conducted "in accordance with SW846," and IEPA's

Denial provides no justification for its demand. Further, from a technical basis, the porewater analysis conducted in the Newton ASD is a more appropriate and accurate method to characterize the PAP's source material than SW846.

34. There is no legal requirement that a source characterization for purposes of an ASD conducted under Section 845.650(e) utilize SW846. Method SW846 is incorporated by reference into Part 845 by Section 845.150. However, inclusion in the general "incorporations by reference" section of Part 845 does not create an affirmative obligation to use SW846 in all circumstances. The Board has explained that where Illinois rules incorporate analytical methods by reference via a "centralized listing of incorporations by reference" such as Section 845.150, "Illinois rules further indicate where each method is used *in the body of the substantive provisions*." *See In the Matter of: SDWA Update, USEPA Amendments (January 1, 2013 through June 30, 2013)*, R 14-8, slip op. at 24-25 (Jan. 23, 2014) (emphasis added). Further, Chapter 2 of SW846 states that the methods in that document are not "mandatory" unless specifically specified as such by regulation. United States Environmental Protection Agency ("USEPA"), *SW-846 Update V*, (July 2014) at 1.[3] USEPA guidance also makes clear that SW846 is only legally required where "explicitly specified" in a regulation. USEPA, *Disclaimer for Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)*, (July 2014), at 1.[4] The only substantive provision of Part 845 specifically requiring analysis using SW846 is Section 845.640(e), which applies to analyzing groundwater monitoring samples under a groundwater monitoring program and is not at issue here. 35 Ill. Adm. Code § 845.640(e). There is no requirement to use SW846 under Section 845.650(e).

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[3] Available at https://www.epa.gov/sites/default/files/2015-10/documents/chap2_1.pdf.
[4] Available at https://www.epa.gov/sites/default/files/2015-10/documents/disclaim.pdf.

The plain language of the rules does not require the utilization of SW846 for purposes of an ASD, and IEPA has provided no justification for any alternative interpretation.

35. Additionally, source characterization of the PAP was conducted using the best scientifically available procedure. As detailed in the November 3, 2023, letter from Ramboll to IEPA included with the Comment Letter, laboratory leach tests such as those prescribed by SW846 are used "to predict the potential concentration of chemicals under laboratory controlled conditions . . . which may or may not represent conditions observed in the field." **Exhibit C** at Attachment 2, pp. 2-3. Because "ASDs are prepared to evaluate the potential of actual porewater leaking from a CCR [surface impoundment] to be the cause of a detected exceedance observed," SW846's "use of leach test results performed under variable conditions collected from any number of locations within the CCR [surface impoundment] to estimate a total potential for chemical leaching from CCR into groundwater under a variety of different conditions is irrelevant to an ASD." *Id.* The porewater analysis used for the Newton ASD is the best and most accurate scientifically available information for source characterization of the PAP. *Id.*; **Exhibit D** at 4-9.

36. The IEPA Denial is not clear regarding what procedure under SW846 IEPA believes should have been utilized for source characterization including total solids sampling in accordance with SW846. **Exhibit A**. However, no method under SW846 would have been preferable to or provide better information than the source characterization methodology utilized for the Newton ASD. **Exhibit D** at 8-9. That sampling would have included laboratory simulated and/or indirect analysis of potential leaching from material in the PAP, while the methodology utilized for the Newton ASD included a direct analysis of porewater to determine what constituents are actually leaching from the PAP. *Id.*

37. If source characterization of CCR at the PAP did include total solids sampling in accordance with SW846, it would not be expected to change the results of the Newton ASD. **Exhibit D** at 9.

38. IEPA's denial of the Newton ASD based on "Data Gap 1" is accordingly arbitrary and capricious.

2. <u>"Data Gaps" 2 & 3</u>

39. "Data Gaps" 2 and 3 each relate to characterization of the bedrock, the alternative source identified in the Newton ASD. "Data Gap 2" demands that the Newton ASD should have included hydraulic conductivity data and hydrogeologic characterization of the bedrock unit. **Exhibit A**. "Data Gap 3" demands that the Newton ASD should have provided a characterization "in accordance with 35 IAC 845.640 of [the] alternative source . . ." **Exhibit A**. However, there is no requirement in Section 845.640, 845.650, or anywhere else in Part 845 to collect and analyze hydraulic conductivity data and do a hydrogeologic characterization of an alternative source for an ASD as suggested by "Data Gap 2." Nor is there a requirement to conduct groundwater monitoring of an alternative source in accordance with Section 845.640 as part of an ASD as suggested by "Data Gap 3." IEPA has not provided any justification for its demands related to the alternative source characterization and a characterization of the bedrock as set forth in "Data Gaps" 2 and 3 is unnecessary to support the Newton ASD.

40. The Newton ASD included a detailed explanation of how each conclusion was reached and the evidence supporting each conclusion, and provided significant data as attachments as well as references to any report or other document referred to or relied on. This is more than sufficient to provide the "factual and evidentiary basis" required by Section 845.650(e).

41. No provision of Part 845 requires a characterization including hydraulic conductivity data, hydrogeologic characterization, or sampling and analysis of the alternative

source as part of an ASD conducted under Section 845.650(e). The facts and evidence provided with the Newton ASD are supportive of a conclusion that "a source other than the CCR surface impoundment caused the contamination and the CCR surface impoundment did not contribute to the contamination." **Exhibit C** at Attachment 2, p. 3; **Exhibit D** at 4.

42. As noted above in Section II.A., the Newton ASD was prepared using a multiple lines of evidence approach in accordance with the Electric Power Research Institute ("EPRI") guidance for the development of ASDs at CCR sites. **Exhibit C** at Attachment 2, p. 2. Following the EPRI guidance, the Newton ASD reviewed "regional literature and site-specific bedrock conditions" and reached the conclusion that "chloride concentrations in bedrock groundwater are a likely source of chloride observed in APW15 . . ." **Exhibit B** at 9. More specifically, the Newton ASD demonstrated that chloride is present at elevated levels in the bedrock throughout Jasper County and that a specific geologic formation (the Clay City Anticline) exists in the vicinity of the Newton PAP and presents a likely conduit for chlorine-rich water to migrate into the groundwater. **Exhibit B** at 9; **Exhibit D** at 3, 10. Additionally, the Newton ASD evaluated the site-specific groundwater and geologic data to note that the specific location of APW15 made it likely that it would be impacted by chloride in the bedrock, explaining the otherwise anomalous fact that APW15 was the *only* monitoring well affected by a chloride exceedance. *Id.* Collecting and analyzing hydraulic conductivity data with a hydrogeologic characterization of the bedrock unit or conducting groundwater sampling and analysis of the bedrock would not change the conclusion of the Newton ASD. **Exhibit D** at 10.

43. The Newton ASD's use of site-specific information and identification of a specific geological feature and likely hydraulic connection between the affected well and chloride-containing bedrock (along with all the other information provided in the Newton ASD) is more

than sufficient to provide the "demonstration" required by the rules. IEPA's request for a complete characterization of the surrounding bedrock is unfounded, unexplained, and, as detailed below in Section II.B., practically infeasible. Accordingly, IEPA's use of "Data Gaps" 2 & 3 as a grounds for nonconcurrence is arbitrary and capricious.

B. IEPA's Denial imposes practically infeasible requirements.

44. IEPA's interpretation of Section 845.650(e) is further unreasonable because the "Data Gaps" demand complex sampling and analysis that cannot feasibly be completed within the timeframes contemplated by the regulations. Section 845.650(e) requires owners and operators to submit an ASD within 60 days after detecting a GWPS exceedance. The regulations further require IEPA to reach a final decision within 30 days after receiving an ASD. 35 Ill Adm. Code § 845.650(e)(4).

45. "Data Gap 1" requests that IPGC provide source characterization of the CCR at the PAP that includes "total solids sampling in accordance with SW846." **Exhibit A**. Such a characterization could take approximately 21 to 42 weeks to complete. **Exhibit E**, Declaration of Cynthia Vodopivec at 1. There would be no reason for an owner or operator to begin such a characterization until after a GWPS exceedance is detected. Thus, even if IPGC anticipated IEPA's request for this data and began the CCR source characterization at the exact moment the GWPS exceedance is detected, the characterization could not reasonably be completed until months *after* IEPA's deadline to reach a final decision on the Newton ASD (let alone IPGC's deadline to submit an ASD).

46. "Data Gaps" 2 & 3 request hydraulic conductivity data with hydrogeologic characterization of the bedrock unit and a full characterization of the alternative source bedrock "in accordance with 35 IAC 845.640[.]" **Exhibit A**. This additional characterization of the bedrock

would require approximately 20 to 30 weeks to complete. **Exhibit E** at 1.[5] Again, there is no regulatory requirement that IPGC maintain a full source characterization of nearby bedrock, and thus there would have been no reason for IPGC to begin any such characterization until a GWPS exceedance is detected. Once again, even if IPGC had fully anticipated IEPA's requests, it would not have been able to complete the bedrock characterization until months past the deadline to submit an ASD.

47. The data IEPA's Denial categorizes as "gaps" in the Newton ASD could not feasibly be completed before the prescribed deadline for submitting an ASD. IEPA's interpretation that Section 845.650 requires these characterizations would thus make the entire ASD provision meaningless, as it would be impossible for any owner or operator to submit a sufficient ASD.

48. Accordingly, IEPA's Denial is arbitrary and capricious and also ignores reality.

49. Furthermore, even if the data requested was required to be collected elsewhere under Part 845, there is no requirement in Section 845.650 that such data be used in connection with an ASD. Here, qualified professionals used best available information to develop an ASD within the regulatory deadline and in conformance with regulatory requirements. Certainly, additional lines of evidence could be added to the ASD analysis; however, professional judgment and practicality dictate that every possible line of evidence need not and cannot be developed. **Exhibit D** at 3-4. Doing so would take an unreasonable amount of time. Additionally, doing so is

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[5] Undertaking the steps required to provide the information IEPA seeks through "Data Gaps" 1 and 3 would also be costly: collecting the information requested by "Data Gap 1" would likely cost approximately $450,000 to $800,000, while "Data Gap 3" would cost approximately $150,000. **Exhibit E** at 1. While cost is not a driver of actions taken for completing an ASD, as Dr. Hahn explains, accepted scientific practice is to not develop costly additional lines of evidence when sufficient evidence exists from other, better lines of evidence to support a conclusion. **Exhibit D** at 4 (explaining that "lines of evidence are developed until sufficient confidence is achieved").

unnecessary when existing information is sufficient to support the conclusion that an alternative source caused the contamination detected and that the CCR surface impoundment at issue did not contribute to that contamination. **Exhibit D**.

C. IEPA's Denial was not based on a reasonable review of the data presented.

50. Finally, IEPA simply failed to fully evaluate the information presented to it before issuing its nonconcurrence. As noted above, IPGC submitted its Comment Letter via email on November 3, 2023, 10 days after IEPA provided public notice of the Newton ASD and well within the 14-day period for written comments required by Section 845.650(e)(3). The Comment Letter included significant information regarding the "Data Gaps" identified in the IEPA Denial.

51. However, the IEPA Denial, dated November 7, 2023 (four days *after* IEPA received the Comment Letter), makes no reference to the Comment Letter whatsoever.

52. IEPA's failure to address or consider data and arguments provided to it well within the prescribed comment period was arbitrary and capricious.

III. MOTION FOR PARTIAL STAY

53. Because Part 845 does not authorize an automatic stay, IPGC asks the Board to stay the requirements of Sections 845.650(d), 845.660, 845.670, and 845.680 for the GWPS exceedance for chloride at issue in this Petition until the later of (a) the Board's final resolution of this Petition, or (b) if this Petition is granted, IEPA's issuance of a concurrence.

A. The Board has authority to issue a stay.

54. The Board has long recognized its authority under Illinois law to issue discretionary stays. *See Community Landfill Co. and City of Morris v. IEPA*, PCB 01-48, PCB 01-49 (consol.), slip op. at 4 (Oct. 19, 2000); *see also, e.g., Ill. Power Generating Co. v. IEPA*, PCB 16-60, slip op. at 1 (Dec. 17, 2015). Section 845.650(e)(7), which authorizes a petition for review of an IEPA nonconcurrence with an ASD, "would be rendered meaningless" if the Board had no authority to

stay the associated regulations. *See Id.* An IEPA nonconcurrence with an ASD triggers corrective measure requirements that must be initiated within a short timeframe, likely far before the Board reaches a final resolution of this petition.[6]

55. Further, the rules specifically contemplate that the Board may stay certain regulatory requirements pending resolution of a petition for review: "The filing of a petition for review under subsection (e)(7) does not automatically stay any requirements of this Part as to the owner or operator, including the 90-day deadline to initiate an assessment of corrective measures (see Section 845.660(a)(1))." Section 845.650(e)(7). If the Board had no authority to stay the corrective measure requirements, there would have been no need for the rules to specify that the stay is not automatic.

B. A partial stay is appropriate under Illinois law.

56. The Board considers four factors[7] when determining whether to grant a discretionary stay of a final Agency decision:

a. a certain and clearly ascertainable right needs protection;

b. irreparable injury will occur without injunction;

c. adequate remedy at law exists;

d. a probability of success on the merits.

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[6] Section 845.660(a) requires: "The assessment of corrective measures must be initiated within 90 days after finding [of any GWPS exceedance]" and the "assessment of corrective measures must be completed and submitted to the Agency within 90 days after initiation of assessment of corrective measures . . ."

[7] When reviewing a request for a discretionary stay in the context of a permit appeal or appeal of final agency decision, the Board has held that "although there are no specific standards set by the Board for issuing stays, Illinois law provides for standards under which such equitable relief is appropriate." *Motor Oils Refining Co. v. IEPA*, PCB 89-116, slip op. at 1 (Aug. 31, 1989), *citing Junkunc v. S.J. Advanced Technology & Mfg.*, 101 Ill. Dec. 671, 498 N.E.2d 1179 (Ill. App. 1 Dist. 1986).

PCB 16-60, slip op. at 2 (Dec. 17, 2015), citing *Community Landfill Co. and City of Morris v. IEPA*, PCB 01-48, PCB 01-49 (consol.), slip op. at 4 (Oct. 19, 2000). The Board need not find that all of these factors exist in order to grant a discretionary stay. *Id.* The Board will also consider the likelihood of environmental harm should stay be granted. *Id.*, citing *Motor Oils Refining Co. v. IEPA*, PCB 89-116, slip op. at 2 (Aug. 31, 1989).

57. For the reasons stated in this Petition, a stay is necessary to protect IPGC's right to appeal the IEPA Denial and to prevent IPGC from being unlawfully and unreasonably required to comply with costly and potentially unnecessary corrective measure requirements before it is able to exercise its right to appeal and be heard by the Board. Accordingly, IGPC has an ascertainable right that needs protection.

58. IPGC will suffer irreparable injury if it is subject to the corrective measure requirements of Sections 845.650(d), 845.660, 845.670, and 845.680 for the chloride GWPS exceedance at issue in this Petition. Compliance with these requirements would require IPGC to expend resources to complete an assessment of corrective measures, prepare a corrective action plan and take other steps under Part 845 for an alleged discharge that, as explained in detail in the Newton ASD and this Petition, likely never occurred. The assessment of corrective measures alone would likely cost approximately $35,000. **Exhibit E** at 1. Selecting an appropriate remedy and developing a corrective action plan could cost an additional $800,000. *Id*. at 2. These expenditures would further divert resources from the corrective measures IPGC is currently conducting in response to GWPS exceedances not at issue in this Petition. *Id.* If IPGC complied with the corrective measure requirements for chloride at the Newton PAP and then succeeded on the merits of this Petition, costs, as well as time and other resources, would be lost. *Id*. Thus, IPGC would suffer irreparable injury.

59. IPGC has no other adequate remedy at law to prevent these injuries or to contest the IEPA Denial.

60. It is also likely that IPGC will succeed on the merits of this Petition. IPGC has demonstrated by a preponderance of the evidence that an alternative source other than the PAP is responsible for the GWPS exceedance for chloride detected at APW15 and that the PAP did not contribute to that contamination as evidenced through the thorough analysis of a qualified professional engineer, and IGPC is prepared to demonstrate that IEPA's nonconcurrence was arbitrary and capricious and/or inconsistent with applicable laws and regulations. *See, e.g.*, **Exhibit C**; **Exhibit D**.

61. Finally, no harm to human health or the environment will result from a stay of these requirements. The exceedance is limited to a single monitoring well. As demonstrated in the Newton ASD and this Petition, the Newton PAP is not the source of the chloride GWPS exceedance. Notably, the IEPA Denial does not suggest that IEPA believes the PAP is the cause of or is contributing to the GWPS exceedance – rather, the IEPA Denial is based on alleged "data gaps." **Exhibit A**. Moreover, the corrective measure requirements of Sections 845.650(d), 845.660, 845.670, and 845.680 include an assumption that the impoundment under assessment is at least a partial cause of the exceedance.[8] It is impossible to complete a corrective action assessment or to determine the optimal corrective action for a source that is not the cause of the exceedance, and to do so would provide no benefit to human health and the environment. Further, IPGC has conducted a human health and risk assessment for the PAP demonstrating that there is no exposure pathway for the PAP to impact residential drinking water or irrigation sources, and

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[8] *See*, *e.g.*, Section 845.660(a) (". . .the owner or operator must initiate an assessment of corrective measures to prevent further releases, to remediate any releases, and to restore the affected area.").

that risks from other potential exposure pathways are "indistinguishable from normal background risks." Human Health and Ecological Risk Assessment, Primary Ash Pond, Newton Power Plant, Newton, Illinois at 14, 31 (Jul. 28, 2022), available at https://www.luminant.com/documents/ccr/Illinois/Newton/2022/Newton%20PAP%20Construction%20Permit%20Application.pdf. Lastly, IPGC has and will continue to be subject to the groundwater monitoring requirements of Section 845.650, which ensures that any changes in circumstances during the stay that could pose a risk to human health or the environment will be quickly identified.

IV. CONCLUSION

62. For the above reasons, IPGC respectfully requests that the Board stay the requirements of Sections 845.650(d), 845.660, 845.670, and 845.680 relating to the GPWS exceedance for chloride at issue in this Petition until the later of (a) the Board's final resolution of this Petition, or (b) if this Petition is granted, IEPA's issuance of a concurrence. Moreover, IPGC respectfully requests that the Board grant this Petition for Review and remand to IEPA to issue a new final written response concurring with the Newton ASD.

Respectfully submitted,

/s/ Samuel A. Rasche
Samuel A. Rasche

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Attorneys for Illinois Power Generating Company

BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

ILLINOIS POWER GENERATING COMPANY

Petitioner

v.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

Respondent.

PCB 2023-________

CERTIFICATE OF SERVICE

I, the undersigned, certify that on this 15th day of December, 2023:

I have electronically served a true and correct copy of the attached Petition for Review of Illinois Environmental Protection Agency's Non-Concurrence with Alternative Source Demonstration Under 35 Ill. Admin. Code Part 845 and Motion for Stay and Appearances of Joshua R. More, Bina Joshi, and Samuel A. Rasche by electronically filing with the Clerk of the Illinois Pollution Control Board and by e-mail upon the following persons:

Pollution Control Board, Attn: Clerk
100 West Randolph Street
James R. Thompson Center
Suite 11-500
Chicago, Illinois 60601-3218
PCB.Clerks@illinois.gov

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 N. Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276
epa.dlc@illinois.gov

My e-mail address is sam.rasche@afslaw.com

The number of pages in the e-mail transmission is 248.

The e-mail transmission took place before 5:00 p.m.

/s/ Samuel A. Rasche
Samuel A. Rasche

Dated: December 15, 2023

ARENTFOX SCHIFF LLP
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Attorneys for Illinois Power Generating Company

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Respondent.

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INDEX OF EXHIBITS

Exhibit A	Letter from Michael Summers, P.G., Manager, Groundwater Section, Division of Public Water Supplies, Bureau of Water, Illinois Environmental Protection Agency to Phil Morris, Illinois Power Generating Company (November 7, 2023)
Exhibit B	Ramboll, 35 I.A.C. § 845.650(e): Alternative Source Demonstration, Primary Ash Pond, Newton Power Plant, Newton, Illinois, IEPA ID: W07980001-1 (October 6, 2023)
Exhibit C	Letter from Phil Morris, PE, Senior Director, Environmental, Illinois Power Generating Company to Heather Mullenax, Illinois Environmental Protection Agency (November 3, 2023)
Exhibit D	Declaration of Melinda W. Hahn, PhD (December 15, 2023)
Exhibit E	Declaration of Cynthia Vodopivec on behalf of Illinois Power Generating Company (December 15, 2023)

Exhibit A

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 · (217) 782-3397
JB PRITZKER, GOVERNOR
JOHN J. KIM, DIRECTOR

217-782-1020

November 7, 2023

Phil Morris
Illinois Power Generating Company
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

Re: Newton Power Plant Primary Ash Pond – W079807001-01
Alternative Source Demonstration Submittal

Dear Mr. Morris:

The purpose of this correspondence is to notify you that the Illinois Environmental Protection Agency (Illinois EPA) does not concur with the Newton Primary Ash Pond Alternative Source Demonstration (ASD) dated October 6, 2023. The Illinois EPA does not concur due to the following data gaps:

1. Source characterization of the CCR at the Primary Ash Pond must include total solids sampling in accordance with SW846.
2. Hydraulic conductivities from laboratory or in-situ testing must be collected, analyzed, and presented with hydrogeologic characterization of bedrock unit.
3. Characterization to include sample and analysis in accordance with 35 IAC 845.640 of alternative source must be provided with the ASD.

If you have any questions, please contact: **Heather Mullenax** Illinois EPA, Bureau of Water, PWS #13, P.O. Box 19276, Springfield, Illinois 62794-9276. If you have any questions concerning the investigation described above, please call 217-782-1020.

Sincerely,

Michael Summers, P.G.
Manager, Groundwater Section
Division of Public Water Supplies
Bureau of Water

cc: Heather Mullenax
Francisco Herrera
WPC Files 06M

2125 S. First Street, Champaign, IL 61820 (217) 278-5800
1101 Eastport Plaza Dr., Suite 100, Collinsville, IL 62234 (618) 346-5120
9511 Harrison Street, Des Plaines, IL 60016 (847) 294-4000
595 S. State Street, Elgin, IL 60123 (847) 608-3131
2309 W. Main Street, Suite 116, Marion, IL 62959 (618) 993-7200
412 SW Washington Street, Suite D, Peoria, IL 61602 (309) 671-3022
4302 N. Main Street, Rockford, IL 61103 (815) 987-7760

Exhibit B

Luminant

Illinois Power Generating Company
1500 Eastport Plaza Drive
Collinsville, IL 62234

October 6, 2023
Illinois Environmental Protection Agency
DWPC – Permits MC#15
Attn: 35 I.A.C. § 845.610 Quarterly Report Submittal
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: Newton Power Plant Primary Ash Pond; IEPA ID # W0798070001-01

Dear Mr. LeCrone:

In accordance with Title 35 of the Illinois Administrative Code (35 I.A.C.) Section (§) 845.650(e), Illinois Power Generating Company (IPGC) is submitting this Alternative Source Demonstration (ASD) for exceedances observed from the Quarter 2 2023 sampling event at the Newton Power Plant Primary Ash Pond, identified by Illinois Environmental Protection Agency (IEPA) ID No. W0798070001-01.

This ASD is being submitted within 60 days from the date of determination of an exceedance of a groundwater protection standard (GWPS) for constituents listed in 35 I.A.C. § 845.600. As required by 35 I.A.C. § 845.650 (e)(1), the ASD was placed on the facility's website within 24 hours of submittal to the agency.

One hard copy is provided with this submittal.

Sincerely,

Phil Morris, PE
Senior Director, Environmental

Enclosures
Alternate Source Demonstration, Quarter 2 2023, Primary Ash Pond Newton Power Plant, Newton Illinois

Intended for
Illinois Power Generating Company

Date
October 6, 2023

Project No.
1940103649-013

35 I.A.C. § 845.650(E): ALTERNATIVE SOURCE DEMONSTRATION

PRIMARY ASH POND
NEWTON POWER PLANT
NEWTON, ILLINOIS
IEPA ID: W0798070001-1

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Anne Frances Ackerman, a qualified professional engineer in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used other than for its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Anne Frances Ackerman
Qualified Professional Engineer
062-060586
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: October 6, 2023

ANNE FRANCES ACKERMAN
062.060586

I, Brian G. Hennings, a professional geologist in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used other than for its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Brian G. Hennings
Professional Geologist
196-001482
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: October 6, 2023

BRIAN G. HENNINGS
196.001482

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CONTENTS

TABLES (IN TEXT)

FIGURES (ATTACHED)

APPENDICES

ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
ASD	Alternative Source Demonstration
bgs	below ground surface
CCR	coal combustion residuals
cm/s	centimeters per second
E001	Event 1
GWPS	groundwater protection standard
LCU	lower confining unit
LF2	Landfill 2
LOE(s)	Line(s) of evidence
M-K	Mann-Kendall
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NPDES	National Pollutant Discharge Elimination System
NPP	Newton Power Plant
NRT/OBG	Natural Resource Technology, an OBG Company
PAP	Primary Ash Pond
PMP	primary migration pathway
Ramboll	Ramboll Americas Engineering Solutions, Inc.
Rapps	Rapps Engineering and Applied Science
TDS	total dissolved solids
UA	uppermost aquifer
UCU	upper confining unit
UD	upper drift
UTL	Upper Tolerance Limit

1. INTRODUCTION

Under Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.650(e), within 60 days from the date of determination of an exceedance of a groundwater protection standard (GWPS) for constituents listed in 35 I.A.C. § 845.600, an owner or operator of a coal combustion residuals (CCR) surface impoundment may complete a written demonstration that a source other than the CCR surface impoundment caused the contamination and the CCR surface impoundment did not contribute to the contamination, or that the exceedance of the GWPS resulted from error in sampling, analysis, statistical evaluation, natural variation in groundwater quality, or a change in the potentiometric surface and groundwater flow direction (Alternative Source Demonstration [ASD]).

This ASD has been prepared on behalf of Illinois Power Generating Company, by Ramboll Americas Engineering Solutions, Inc (Ramboll), to provide pertinent information pursuant to 35 I.A.C. § 845.650(e) for the Newton Power Plant (NPP) Primary Ash Pond (PAP) located near Newton, Illinois.

The most recent quarterly sampling event (Event 1 [E001]) was completed on April 28, 2023, and analytical data were received on June 8, 2023. In accordance with 35 I.A.C. § 845.610(b)(3)(C), comparison of statistically derived values with the GWPSs described in 35 I.A.C. § 845.600 to determine exceedances of the GWPS was completed by August 7, 2023, within 60 days of receipt of the analytical data (Ramboll, 2023). The statistical determination identified the following GWPS exceedances at compliance groundwater monitoring wells:

- Chloride at well APW15
- Lithium at well APW02
- Sulfate at wells APW02, APW04, APW05S, and APW10
- Total dissolved solids (TDS) at wells APW02, APW04, and APW05S

Pursuant to 35 I.A.C. § 845.650(e), the lines of evidence (LOEs) presented in **Section 3** demonstrate that sources other than the PAP were the cause of the chloride GWPS exceedance listed above. This ASD was completed by October 6, 2023, within 60 days of determination of the exceedances (August 7, 2023), as required by 35 I.A.C. § 845.650(e).

Lithium, sulfate, and TDS exceedances will be addressed in accordance with 35 I.A.C. § 845.660.

2. BACKGROUND

2.1 Site Location and Description

The NPP is located in Jasper County in the southeastern part of central Illinois, approximately 7 miles southwest of the town of Newton. The plant is located on the north side of Newton Lake. The area is bounded by Newton Lake and agricultural land to the west, south, and east, and agricultural land to the north. Beyond the lake is additional agricultural land.

2.2 Description of Primary Ash Pond CCR Unit

The NPP's sole CCR surface impoundment, the PAP, was constructed in 1977 and has a design capacity of approximately 9,715 acre-feet. The PAP has a surface area of 400 acres and a height of approximately 71 feet above grade. The PAP currently receives bottom ash, fly ash, and low-volume wastewater from the plant's two coal-fired boilers, and is operated per National Pollutant Discharge Elimination System (NPDES) Permit IL0049191, Outfall 001. The PAP was not excavated during construction, except for native borrow materials used to build the containment berms.

2.3 Geology and Hydrogeology

2.3.1 Site Hydrogeology

The information used to describe the hydrogeology is based on the local geology obtained from published sources, hydrogeologic investigation data, and boring data collected during site investigations conducted from 1997 to 2021 (Natural Resource Technology, an OBG Company [NRT/OBG], 2017; Ramboll, 2021a).

Quaternary deposits in the Newton area consist mainly of diamictons and outwash deposits that were deposited during Illinoian and Pre-Illinoian glaciations (Lineback, 1979; Willman et al., 1975). The unconsolidated deposits include the following units (beginning at the ground surface):

- **Upper Drift (UD) / Potential Migration Pathway (PMP):** The upper drift is composed of the low permeability silts and clays of the Peoria Silt and Sangamon Soil and the sandier soils of the Hagarstown Member. The hydraulic conductivity of this unit, calculated from field hydraulic test data from monitoring wells screened between 8 and 36 feet below ground surface (bgs), was observed to range from 2.4 x 10^{-6} to 6.1 x 10^{-5} centimeters per second (cm/s) with a geometric mean of 1.3 x 10^{-5} cm/s (Rapps Engineering and Applied Science [Rapps], 1997).
    - **Hagarstown Member / PMP**: The Hagarstown Member consists of the discontinuous, sandier deposits of the UD where present and overlies the Vandalia Till. Results of field hydraulic conductivity tests in wells screened within the Hagarstown PMP (APW05S and APW12) ranged from 6.1 x 10^{-4} to 1.5 x 10^{-2} cm/s, with a geometric mean hydraulic conductivity of 3.1 x 10^{-3} cm/s (Ramboll, 2021a).
- **Upper Confining Unit (UCU)**: The UCU consists of a thick package of the low permeability clay and silt of the Vandalia Till Member. This unit is a laterally continuous layer between the base of the upper drift and the top of the uppermost aquifer (UA). The hydraulic conductivity of this unit was observed to range from 6.3 x 10^{-9} to 2.1 x 10^{-8} cm/s with a geometric mean of 1.1 x 10^{-8} cm/s (Rapps, 1997).

- **Uppermost Aquifer (UA):** The UA is composed of the Mulberry Grove Member, which has been classified as poorly graded sand, silty sand, clayey sand, and gravel. The top of the UA is highest in elevation in the north and east portions of the unit and slopes downward toward APW15. The top of unit elevations range from approximately 482 feet (APW05 and APW10) to 425 feet (APW15) North American Vertical Datum of 1988 (NAVD88). Field hydraulic conductivity tests conducted in 2021 at monitoring wells screened in the UA ranged from 2.0 x 10^{-4} to 1.5 x 10^{-1} cm/s with a geometric mean hydraulic conductivity of 6.8 x 10^{-3} cm/s. The highest conductivities are measured in APW15, APW16, and APW17 (Ramboll, 2021a).
- **Lower Confining Unit (LCU):** The LCU is comprised of low permeability silt and clay of the Smithboro Till Member and the Banner Formation. The hydraulic conductivity of this unit was observed to be 1.4 x 10^{-7} cm/s (Rapps, 1997).
- **Bedrock Unit:** Shale bedrock of the Pennsylvanian-age Mattoon Formation (Willman et al., 1967) was encountered at the NPP during recent and historical investigations. Based on boring logs, the bedrock surface elevation at the NPP ranges from 408 feet NAVD88 (B141) (**Appendix A**) to 445 feet NAVD88 (APW13) (Ramboll, 2021a). Bedrock was not encountered at APW15, which was advanced to approximately 412 feet NAVD88 (Ramboll, 2021a). This indicates that APW15, which is screened within the UA from 424 to 419 feet NAVD88, is located in close proximity to the bedrock surface.

2.3.2 Regional Bedrock Geology

Regional investigations of the Illinois Basin have identified bedrock (specifically brines within the bedrock formations) as a source of chloride in groundwater (Kelley et al, 2012; Panno et al, 2018). Studies by Cartwright (1970) and Siegel (1989) indicate that groundwater migrates toward the center of the Illinois Basin and discharges upward through overlying confining units. The “Saline groundwater and brines can be brought near or to the land surface by natural conditions, such as migrating up prominent fractures and/or faults in bedrock, or by anthropogenic activities, such as exploration for and exploitation of petroleum. The mixing of upward-migrating saline groundwater with fresh groundwater from shallow aquifers can make groundwater from private wells undrinkable and can present a very expensive problem for municipalities (Panno and Hackley, 2010). ”A saline spring was identified in Clay County (Kelley et al, 2012) approximately 10 miles south of the NPP and is adjacent to the Clay City Anticline which runs north into Jasper County and east of the NPP. Concentrations of chloride in groundwater collected from the Pennsylvanian shale in Jasper County range from 100 to 5,000 milligrams per liter (mg/L) (Panno et al, 2017).

2.3.3 Water Table Elevation and Groundwater Flow Direction

Groundwater elevations in the UA (referenced to NAVD88) across the PAP ranged from approximately 491 to 530 feet during E001 (**Figure 1**). Depth to groundwater measurements used to generate the groundwater elevation contours shown on **Figure 1** were collected on April 24, 2023. Groundwater flow in the UA beneath the eastern portion of the PAP is generally to the south, with flow direction diverging to the southwest beneath the western portion of the PAP, toward Landfill 2 (LF2), where groundwater flow in the area is converging along the major axis of LF2 Cells 1 and 2.

2.4 Groundwater and PAP Monitoring

The monitoring system for the PAP is shown on **Figure 1** and consists of two background monitoring wells (APW05 and APW06), 16 compliance monitoring wells (APW02, APW03, APW04, APW05S, APW07, APW08, APW09, APW10, APW11, APW12, APW13, APW14, APW15, APW16, APW17, and APW18), and two temporary water level only surface water staff gages (XSG01 and SG02) to monitor potential impacts from the PAP (Ramboll, 2021b). These monitoring wells are screened within the UD (APW02, APW03, APW04, APW05S, and APW12) and the UA (APW05, APW06, APW07, APW08, APW09, APW10, APW11, APW13, APW14, APW15, APW16, APW17, and APW18) along the perimeter of the PAP. Porewater samples are collected from locations XPW01 and XPW02 on the northern side of the PAP, and from XPW03 and XPW04 on the northeastern side of the PAP (**Figure 1**).

3. ALTERNATIVE SOURCE DEMONSTRATION: LINES OF EVIDENCE

As allowed by 35 I.A.C. § 845.650(e), this ASD demonstrates that sources other than the PAP (the CCR unit) caused the chloride exceedance at APW15. LOEs supporting this ASD include the following:

1. The PAP is separated from the UA at APW15 by a thick layer of low permeability glacial till (UCU).
2. Concentrations of primary CCR indicators in APW15 do not exceed background limits and are not increasing.
3. Concentrations of chloride at APW15 are greater than source concentrations.

These LOEs are described and supported in greater detail below.

3.1 LOE #1: The PAP is Separated from the UA at APW15 by a Thick Layer of Low Permeability Glacial Till (UCU)

Based on the boring log for monitoring well APW15, the top elevation of the UA is 424.9 feet NAVD88 (Ramboll, 2021a), which corresponds to 97.2 feet bgs on the boring log. At this location, the UA is overlain by the UCU, a low permeability (6.3×10^{-9} to 2.1×10^{-8} cm/s) glacial till. The bottom of the PAP, as presented in drawing S-69, is situated within the UCU, generally consistent with ground surface topography at the time the PAP was constructed (AECOM, 2022). The estimated bottom elevation of CCR presented on profile B-B' of sheet 00C302 (HDR, 2022), which bisects the axis of a former drainage feature, is 485 feet and has been interpreted to be the minimum base of ash elevation across the PAP. Thus, separation between the UA and the base of ash is approximately 60 feet, which represents the thickness of the low permeability glacial till that comprises the UCU. Based upon these observations, there is no complete pathway for transport of CCR constituents to APW15, and the PAP is not the source of the chloride exceedance at that well. **Appendix B** includes the boring log for APW15, drawing S-69, and sheet 00C302 to support this LOE.

3.2 LOE #2: Concentrations of Primary CCR Indicators in APW15 Do Not Exceed Background Limits and are Not Increasing

Boron and sulfate can be indicators of CCR impacts to groundwater due to their leachability from CCR and mobility in groundwater. Porewater in the NPP PAP is elevated in both boron and sulfate, indicating that these parameters are site-specific key indicators for CCR. If the groundwater in APW15 had been impacted by CCR from the unit, boron and sulfate concentrations would be expected to be elevated above their respective background Upper Tolerance Limits (UTLs). The UTL is an upper bound on background concentrations calculated for the purpose of comparing compliance measurements to background.

Mann-Kendall (M-K) trend analysis tests were performed to determine whether there are trends in the boron and sulfate concentrations in each well. If groundwater downgradient of the PAP was being affected by CCR but boron and sulfate did not yet exceed background concentrations, boron and sulfate concentrations would be expected to be increasing. No trends in boron or sulfate concentrations were identified by the M-K tests in compliance well APW15.

The concentration of boron in compliance well APW15 (0.13 mg/L) is less than the boron UTL (0.26 mg/L) and the concentration of sulfate in APW15 (0.40 mg/L) is also less than the sulfate UTL (35.84 mg/L), and the lack of increasing trends in boron and sulfate concentrations at monitoring well APW15 indicate that this well has not been affected by CCR impacts from the NPP PAP (Ramboll 2021b; Ramboll 2023). Analytical data to support this LOE are included in **Appendix C**.

3.3 LOE #3: Concentrations of Chloride at APW15 are Greater than Source Concentrations

Table A below provides summary statistics for chloride in APW15 and PAP porewater collected from XPW01, XPW02, XPW03, and XPW04.

Table A. Summary Statistics for Chloride in APW15 and PAP Porewater (February 2021 to April 2023)

Sample Location	Chloride (mg/L)		
	Minimum	Maximum	Median
Composite Porewater[1]	8.1	62.0	12.5
APW15	130	270	235

[1] Composite Porewater includes summary statistics of data collected at porewater locations XPW01, XPW02, XPW03, and XPW04

The following observations can be made from **Table A**:

- Concentrations of chloride in compliance monitoring well APW15 ranged from 130 mg/L to 270 mg/L, with a median chloride concentration of 235 mg/L.
- Concentrations of chloride within PAP porewater ranged from 8.1 mg/L to 62.0 mg/L, with a median chloride concentration of 12.5 mg/L.
- The median chloride concentration observed in porewater is an order of magnitude lower than the median chloride concentrations observed in compliance monitoring well APW15.
- The maximum observed chloride concentration in compliance monitoring well APW15 is approximately four times the concentration observed in porewater.

Analytical data to support the summary statistics presented in **Table A** are included in **Appendix C**. If the PAP was the source of chloride in downgradient groundwater, chloride concentrations in PAP porewater would be expected to be greater than the groundwater concentrations. However, the median chloride concentration observed in compliance groundwater monitoring well APW15 is greater than the median chloride concentrations observed porewater, indicating that chloride concentrations are not related to the PAP.

4. CONCLUSIONS

Based on the three LOEs presented below and described in the previous section, it has been demonstrated that the GWPS exceedance of chloride at APW15 is not due to the PAP but is from a source other than the CCR unit.

1. The PAP is separated from the UA at APW15 by a thick layer of low permeability glacial till (UCU).
2. Concentrations of primary CCR indicators in APW15 do not exceed background limits and are not increasing.
3. Concentrations of chloride at APW15 are greater than source concentrations.

Given the preponderance of evidence demonstrating that the PAP is not the source of elevated chloride in groundwater compliance well APW15, regional literature was reviewed to identify an alternative source. Based on the literature discussed in **Section 2.3.2**, elevated chloride concentrations (ranging 100 to 5,000 mg/L) are present in bedrock at concentrations above those detected in APW15. The UA was encountered at the lowest elevation onsite at APW15 (~425 feet NAVD88), and the screened elevation of this well (424 to 419 feet NAVD88) indicates that it is in close proximity to the bedrock surface, which is known to range between 408 and 445 feet NAVD88 at the NPP. Upward migration of chloride-containing groundwater from the shale bedrock into the overlying unlithified materials above the bedrock valley has the potential to impact groundwater within the UA.

Based on the review of regional literature and site-specific bedrock conditions, chloride concentrations in bedrock groundwater are a likely source of chloride observed in APW15 for the following reasons:

- Chloride is present in Pennsylvanian shale in Jasper County at concentrations ranging from 100 to 5,000 mg/L.
- Upward vertical hydraulic gradients and fractures near geologic features provide conduits for these chloride-rich waters to migrate. The Clay City Anticline is present east of the PAP and a saline spring has been mapped adjacent to this anticline approximately 10 miles south of the PAP in Clay County.
- Well APW15 is located in close proximity to bedrock and screened at a lower elevation than other wells monitoring the UA which could explain why this is the only affected well. The screened interval is estimated to be 10 to 15 feet lower than the top of bedrock in adjacent wells. The high hydraulic conductivity of the UA relative to the low hydraulic conductivity of underlying bedrock (Mehnert et al, 1990) at this location provides a potential pathway for interaction with upward-migrating chloride-containing bedrock groundwater.

This information serves as the written ASD prepared in accordance with 35 I.A.C. § 845.650(e), demonstrating that the chloride exceedance observed at APW15 during the E001 sampling event was not due to the PAP. Therefore, assessment of corrective measures is not required for chloride at the PAP.

Lithium, sulfate, and TDS exceedances will be addressed in accordance with 35 I.A.C. § 845.660.

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Figures

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R002013

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- 🟦 COMPLIANCE MONITORING WELL
- 🟧 BACKGROUND MONITORING WELL
- ⬛ MONITORING WELL
- 🟩 PORE WATER WELL
- ⊕ LEACHATE WELL
- ◐ STAFF GAGE, CCR UNIT
- ◐ STAFF GAGE, LAKE
- — GROUNDWATER ELEVATION CONTOUR (5-FT CONTOUR INTERVAL, NAVD88)
- - - INFERRED GROUNDWATER ELEVATION
- → GROUNDWATER FLOW DIRECTION
- 🟨 REGULATED UNIT (SUBJECT UNIT)
- ☐ SITE FEATURE

NOTES:

1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

0 400 800 Feet

SAMPLING LOCATIONS AND POTENTIOMETRIC SURFACE MAP
APRIL 24, 2023

ALTERNATIVE SOURCE DEMONSTRATION
PRIMARY ASH POND
NEWTON POWER PLANT
NEWTON, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

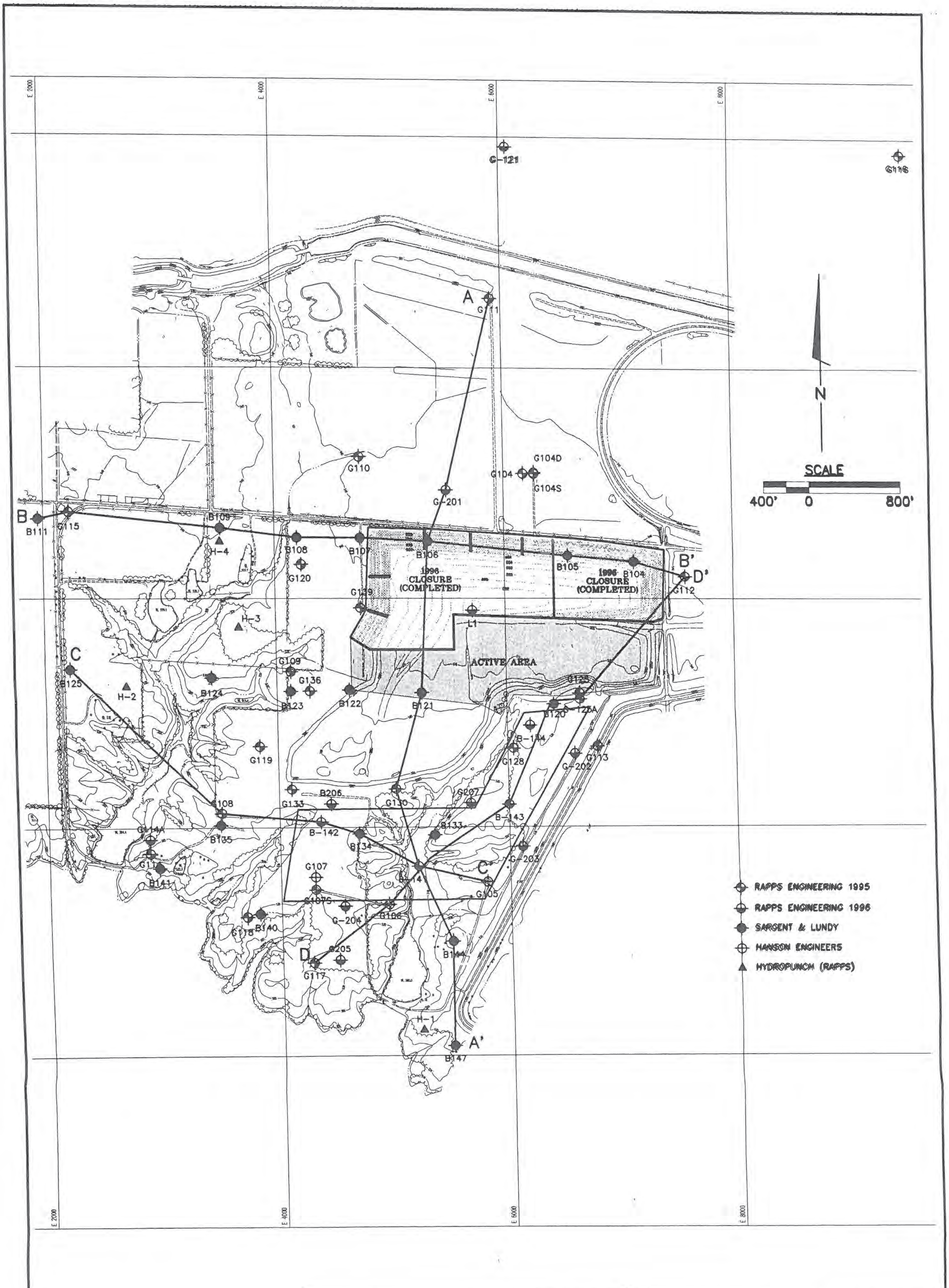
PROJECT: 169000XXXX | DATED: 9/20/2023 | DESIGNER: GALARNMC

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2023\Newton\PAP_501\NEW 501 PAP Pot Surface 20230424.mxd

Appendix A

Soil Boring B141 Location and Boring Log

RAPPS ENGINEERING & APPLIED SCIENCE C:\FILES\SA96083\FIGURES\XSECKEY



- ⊕ RAPPS ENGINEERING 1995
- ⊕ RAPPS ENGINEERING 1996
- ● SARGENT & LUNDY
- ⊕ HANSON ENGINEERS
- ▲ HYDROPUNCH (RAPPS)

RAPPS
ENGINEERING & APPLIED SCIENCE
821 S. DURKIN DR • SPRINGFIELD, IL 62704 • (217) 787-2118
1601 BROADWAY • MT. VERNON, IL 62864 • (618) 244-2611

FIGURE 3-2
CROSS SECTION KEY
NEWTON POWER STATION LANDFILL
CENTRAL ILLINOIS PUBLIC SERVICE
NEWTON, ILLINOIS

F 344-4 5C PADS

TEST BORING REPORT

RAYMOND

CONCRETE PILE DIVISION

To SARGENT & LUNDY — Date FEBRUARY 14, 1974 Job No. C8-21241-K
Location of Borings NEWTON, ILLINOIS — PROPOSED POWER PLANT EXPANSION

All borings are plotted to a scale of 1" = 8'. ft. using ELEVATIONS AS FURNISHED as a fixed datum.

No. 141

GROUND SURFACE

525 ELEV. 524.5' 0.0'
LIGHT GREY SILTY TOP SOIL 0.5'
520 20
BROWN CLAYEY SILT
515 9
11.3'
FINE SAND & SMALL TO MEDIUM GRAVEL 11.5'
510 BROWN CLAYEY SANDY SILT 43 14.5'
BROWN SANDY SILT 15.0'
505 BROWN COMPACT SANDY 60/6
CLAYEY SILT TR. GRAVEL
500 44
27.0'
SMALL TO MED. GRAVEL & SAND 27.9'
495 BROWN SANDY SILTY CLAY TR. GRAVEL 36
32.0'
SMALL TO MED. GRAVEL & SAND 33.1'
BROWN SANDY SILTY CLAY 34 34.4'
490
485 38
480 47
GREY SANDY
475 55
CLAYEY SILT
470 47
TR. GRAVEL
465 35

No. 142

GROUND SURFACE

ELEV. 534.8' 0
GREY SILTY TOP SOIL 0
6
BROWN & GREY SILTY CLAY
14
11
FINE SAND & GRAVEL 11
BROWN & GREY SILTY CLAY
22
16.
SAND & GRAVEL
18.
BROWN COMPACT FINE SAND 60/9
22.
FINE TO COURSE SAND & MED. TO LARGE GRAVEL 60/11 25.
60
GREY COMPACT SANDY CLAYEY 60/11
SILT TR. GRAVEL SOME
38
SAND SEAMS
39
48.
43
BROWN & GREY SANDY
SILTY CLAY TR. GRAVEL
51
56.
GREY COMPACT SANDY CLAYEY SILT TR. GRAVEL 57.
58.
FINE SAND & SMALL TO MED. GRAVEL SEAM 41
43
GREY COMPACT
44

5. SAND & SMALL TO MED. GRAVEL 68.3'
60/9 69.0'

LIGHT GREY SANDY CLAYEY
SILT TR. GRAVEL

450 74.0'
60/8

COMPACT SANDY SILT

445 TR. GRAVEL & CLAY 60/7

83.0'

440 21

435 GREY SILTY 25

430 CLAY TR. SAND 24

425 & GRAVEL 20

(TR. WOOD) 23

415 21

410 114.0'
BLACK SILTY SAND & WOOD 60/11
60/1 116.0'
SHALE OR BOULDER
BORING ADVANCED BY AUGER.
WATER ENCOUNTERED @ [illegible].
WATER LEVEL @ 13.0' 24 HRS. AFTER COMPLETION.
USED 20.0' OF BX CASING.

405

37

41

88

37
GREY SANDY SILTY CLAY
TR. GRAVEL
34

SAND & GRAVEL 98

36
GREY SILTY CLAY
TR. GRAVEL
30 108

SAND & GRAVEL 108

29

GREY SANDY SILTY
26
CLAY TR. GRAVEL

24 128
BORING ADVANCED BY AUGER TO 20.0'.
WATER ENCOUNTERED @ 16.0'.
WATER LEVEL @ 10.0' 24 HRS. AFTER
COMPLETION.
USED 20.0' OF BX CASING.

FIGURES IN RIGHT HAND COLUMN SHOWN AS FRACTIONS
NUMERATOR — NUMBER OF BLOWS
DENOMINATOR — PENETRATION (IN INCHES)

Classifications are made by visual inspection.

Water levels (WL). Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc., may cause changes in these levels.

Figures in right hand column indicate number of blows required to drive 2" O.D. sampling pipe one foot, using 140 lb. weight falling 30 inches.

Total Footage 231.0'
Foreman M. McCAFFERY
Classification by FOREMAN
Sheet of

Appendix B

Supporting Materials for LOE#1

RAMBOLL

SOIL BORING LOG INFORMATION

Page 1 of 6

Facility/Project Name Newton Power Station	License/Permit/Monitoring Number	Boring Number APW15

Boring Drilled By: Name of crew chief (first, last) and Firm Adam Jochimsen Cascade Drilling	Date Drilling Started 1/21/2021	Date Drilling Completed 1/22/2021	Drilling Method Mini Sonic

Common Well Name APW15	Final Static Water Level Feet (NAVD88)	Surface Elevation 522.06 Feet (NAVD88)	Borehole Diameter 6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 821,107.90 N, 997,938.87 E [✓ E]/ W

1/4 of 1/4 of Section 26, T 6 N, R 8 E

Lat 38° 55' 17.71"

Long -88° 17' 6.79"

Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County Jasper	State IL	Civil Town/City/ or Village Newton

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 54			0 - 6.3' **FILL, LEAN CLAY:** CL, brown (10YR 5/3), silt (15-25%) sand (0-5%), stiff, no dilatancy, low toughness, medium plasticity, moist.										CS= Core Sample
			1						1.75					
			2											
			3		(FILL) CL				1.75					
			4											
2 CS	60 40		5											
			6											
				6.3 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%) sand (0-5%), gravel (0-5%), organic material (0-5%), very stiff to stiff, no dilatancy, medium toughness, medium plasticity, moist.										
			7						2.25					
			8											
			9		CL				4					
3 CS	60 50		10											
			11						1					
			12											

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

Signature	Firm Ramboll 234 W. Florida Street, Milwaukee, WI 53204	Tel: (414) 837-3607 Fax: (414) 837-3608

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				6.3 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%) sand (0-5%), gravel (0-5%), organic material (0-5%), very stiff to stiff, no dilatancy, medium toughness, medium plasticity, moist. *(continued)*										
			13						2.5					
			14											
4 CS	60 54		15						1.5					
			16		CL									
			17						2.25					
			18											
			19	19.2' brown (10YR 4/3), yellowish brown (10YR 5/6) mottling (10-15%), stiff.					2.5					
5 SH	24 23		20	20 - 22' **LEAN CLAY:** CL.						18.5	33	23	59.2	SH= Shelby Tube
			21		CL									
6 CS	96 96		22	22 - 23.5' **LEAN CLAY:** CL, brown (10YR 4/3), yellowish brown (10YR 5/6) mottling (10-15%), stiff, no dilatancy, medium toughness, medium plasticity, moist.	CL				1.25					
			23						1					
			24	23.5 - 26.7' **SANDY LEAN CLAY:** s(CL), brown (10YR 5/3), gray (10YR 5/1) mottling (5-10%), stiff, slow dilatancy, low toughness, medium plasticity, moist.										
			25		s(CL)				3.75					
			26											
			27	26.7 - 39.2' **LEAN CLAY:** CL, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling (10-15%), gray (10YR 5/1) mottling (5-10%), sand (5-10%), gravel (0-5%), cobbles (0-5%), very stiff to hard, no dilatancy, medium toughness, medium plasticity, dry to moist.					4.5					
			28											
			29		CL				4.5					
6 CS	60 49		30	30' hard, dry.										
			31						4.5					
			32											

SOIL BORING LOG INFORMATION SUPPLEMENT

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	26.7 - 39.2' **LEAN CLAY:** CL, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling (10-15%), gray (10YR 5/1) mottling (5-10%), sand (5-10%), gravel (0-5%), cobbles (0-5%), very stiff to hard, no dilatancy, medium toughness, medium plasticity, dry to moist. *(continued)*					4.5					
			34											
7 CS	60 49		35						4.5					
			36		CL									
			37						4.5					
			38											
			39						4.5					
8 CS	60 60		40	39.2 - 52.5' **LEAN CLAY:** CL, dark gray (10YR 4/1), no mottling, organic material (0-5%), sand (5-10%), gravel (0-5%), cobbles (0-5%), hard, no dilatancy, medium toughness, medium plasticity, dry, silt stringers 1mm to 3mm diameter fracture planes.										
			41						4.5					
			42											
			43						4.5					
			44											
9 CS	60 60		45						4.5					
			46		CL									
			47						4.5					
			48											
			49						4.5					
10 CS	60 60		50											
			51						4.5					
			52											

SOIL BORING LOG INFORMATION SUPPLEMENT

Boring Number APW15

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	
			53	52.5 - 61.4' **SILT:** ML, dark gray (10YR 4/1), clay (15-25%), hard, no dilatancy, medium toughness, non-plastic, dry.					4.5					
			54											
11 CS	60 57		55						4.5					
			56											
			57		ML				4.5					
			58											
			59						4.5					
12 CS	60 52		60											
			61						4.5					
			62	61.4 - 97.2' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%), sand (0-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist to dry.										
			63						2.75					
			64											
13 CS	60 60		65						2.75					
			66											
			67		CL				2.25					
			68											
			69						2					
14 CS	60 60		70											
			71						2.5					
			72											

SOIL BORING LOG INFORMATION SUPPLEMENT

Boring Number APW15

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	
			73	61.4 - 97.2' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%), sand (0-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist to dry. *(continued)*					2.5					
			74											
15 CS	60 53		75						2					
			76											
			77						2.5					
			78											
			79						2.25					
16 CS	60 60		80											
			81						2.25					
			82		CL									
			83						4.5					
			84	83.8' - 83.9' layer of silty sand, moist.										
17 CS	60 60		85	85' - 85.4' later of silty sand, moist.					2.75					
			86											
			87						2.5					
			88											
			89						2.75					
18 CS	60 60		90											
			91						2.5					
			92											

SOIL BORING LOG INFORMATION SUPPLEMENT

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			93 94	61.4 - 97.2' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%), sand (0-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist to dry. *(continued)*					2.75					
19 CS	60 60		95 96 97		CL									
			98 99	97.2 - 100' **POORLY-GRADED SAND WITH SILT:** SP-SM, dark gray (10YR 4/1), subrounded to rounded, medium to fine sand, loose, wet.	SP-SM									
20 SH	24 24		100 101	100 - 102' **SILTY SAND:** SM.	SM					12.1	15	3	45.8	
21 CS	36 36		102 103 104	102 - 104.3' **SANDY SILT:** s(ML), gray (10YR 5/1), firm, slow dilatancy, low toughness, non-plastic, wet.	s(ML)				1					
				104.3 - 105' **LEAN CLAY:** CL, dark gray (10YR 4/1), sand (5-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, medium toughness, medium plasticity, moist.	CL									
22 MC	24 24		105 106	105 - 107' **LEAN CLAY:** CL.	CL					19.1	29	16	76.2	MC= Modified California Sample
23 CS	36 36		107 108 109	107 - 110' **LEAN CLAY:** CL, dark gray (10YR 4/1), sand (5-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist.	CL				2.25 2.5					
			110	110' End of Boring.										

S-69

POINT NO.	SIDE	CURVE NO.	R	T	Δ	L	D
8	ASH POND		100	52.87'	49°43' 13.6"	86.78	57°17' 45.60"
8	SECONDARY ASH POND		65'	140.29'	130°16' 46.4"	147.80	88°08' 51.69"
21	LAKESIDE (A)		165'	49.55	33°25' 06.4"	96.27	34°43' 29.00"
21	LAKESIDE (B)		65'	70.49'	94°36' 00.0"	107.32	88°08' 51.69"
36	ASH POND (A)		57.5'	57.50	90°00' 00.0"	90.27	99°38' 41.53"
36	SECONDARY (B) POND		57.5	77.59	106°54' 52.35"	107.24	99°38' 41.53"
39	SECONDARY POND		57.5	161.37	140°46' 29.17"	141.21	99°58' 41.53"

PLANT 45°
NORTH
NORTH

NOTES

7. THE WATER LEVEL IN ASH POND SHALL BE MAINTAINED AT AN ELEVATION 10'-0" ABOVE THE SEDIMENT LEVEL FOR ENVIRONMENTAL PURPOSES.

NOTES

1. FOR GENERAL NOTES SEE DWG. S-14.
2. ALL WORK SHOWN IN THIS DRAWING SHALL BE DONE BY SUPERSTRUCTURE CONTRACTOR IN ACCORDANCE WITH JOB SPEC. A-3022.
3. ALL EXTERIOR SIDE SLOPES OF DIKE BELOW ELEV. 510.0' THAT IS TO BE CONSTRUCTED BEFORE LAKE FILLING. SHALL BE PROVIDED WITH 24" STONE RIPRAP ON 24" SAND AND GRAVEL FILTER BEDDING AS SHOWN ON DWG. S-70. AND ALL DIKE CONSTRUCTION SHALL BE DONE IN ACCORDANCE WITH JOB SPEC. A-3017 AND A-3022.
4. ALL DIKE TOPS AND SIDE SLOPES AND ALL EXTERNAL DITCHES SHALL BE PROVIDED WITH 4" TOPSOIL AND SEEDED IN ACCORDANCE WITH JOB SPEC. A-3017 AND A-3022.
5. EXISTING LOW AREAS SHALL BE FILLED WITH SPOILMATERIAL AS REQUIRED FOR SPOIL DISPOSAL SPOILS SHALL BE PLACED IN LAYERS AND GRADED PROPERLY FOR DRAINAGE.
6. REMOVED "HOLD" FROM SO_2 POND AREAS FOR CLEARING. SLOPE STAKING & CROSS- SECTIONING ONLY.

REFERENCE DRAWINGS

S-19	SITE CONTOURS AND DEVELOPMENT PLAN SHEET 4.
S-39	GRADING AND DRAINAGE PLAN. PLANT AREA SHEET 2.
S-40	GRADING AND DRAINAGE PLAN. PLANT AREA SHEET 3.
S-50	WEIR BOX STRUCTURES AT PRIMARY AND SECONDARY SETTLING PONDS.
S-70	ASH POND DIKE PROFILE DETAILS & SECTION
S-507	GRADING & DRAINAGE PLAN- PLANT AREA- SHT7.

Drawing Release Record

Rv	Date	Init	Description
N	07-29-94	TM	SCANNED BY S&L
A	11-29-74	CRB	REV. ALGNMT. ASH POND & ADD NOTES & GRADING
B	2-10-75	[illegible]	REMOVED SO_2 # 2 REV. [illegible] FOR [illegible]
C			HOLD SO_2 POND DIKE & REMOVE FENCE.
D	7-15-75	[illegible]	REV. DIKE [illegible]
E	12-21-75	CRB	REMOVED HOLD OF SO_2 POND
F	7-12-76	CRB	REV. DIKE [illegible]
G	9-13-76	CRB	ADD WEIR BOX #3 & REMOVE HOLD ON WEIR BOX # 1 & # 2 DEL. TRK. [illegible]
	--	—	REV. ROAD ARRANGEMENT
H	1-24-77	CRB	ADD. [illegible]
J	10-21-77	SPL	SHOWN LIMIT OF STONE RIPRAP
K	11-8-79	ENK	REV. STORAGE CAPACITIES CORRESPONDING TO DIKE EL [illegible]
L	7-8-80	RJJ	RSC REVISION
M	2-20-8[illegible]	[illegible]	SENT TO CLIENT

ASH POND & SO_2
DISPOSAL POND
NEWTON POWER STATION UNIT 1
CENTRAL ILL PUBLIC SERVICE CO.
NEWTON, ILLINOIS

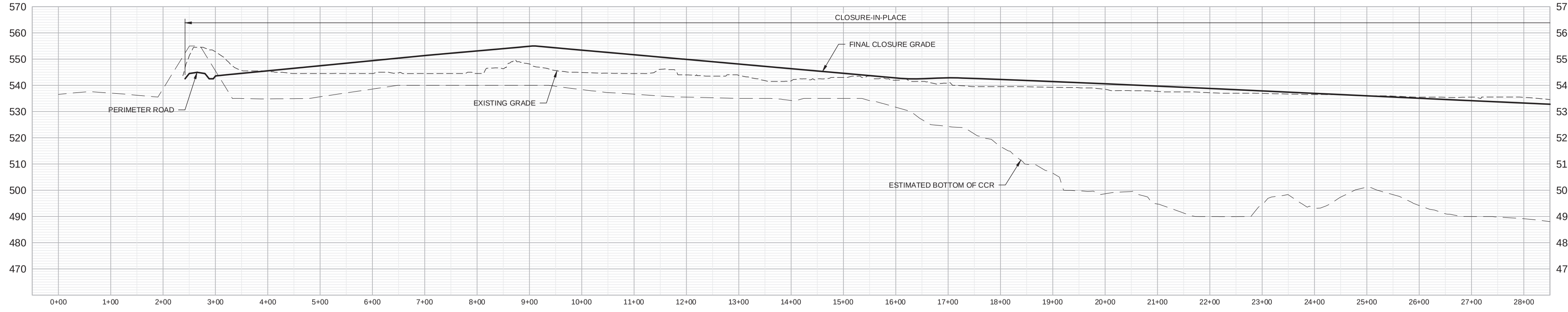
SCALE 1" = 400'-0" & U.N.
DRAWN B. SANCHEZ 8-6-74
CHECKED C. R. Bhattacharya 8-6-74
ENGINEER A. J. Skale 8-6-74
APPROVED [illegible]
JOB NO. 4136-03 4136-15 [illegible]

SARGENT & LUNDY
ENGINEERS
CHICAGO

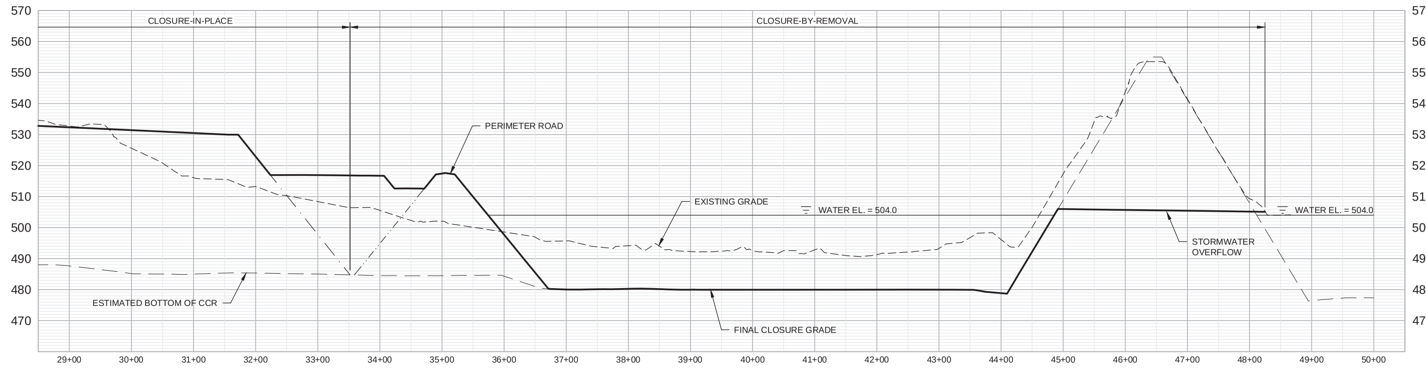
DRAWING NO.
S-69

EDWIN P. SHIRES
2988

SCANNED BY S&L



B-B
00C106
SECTION B-B
HORIZ: 1" = 100' | VERT: 1" = 20'



B-B
00C106
SECTION B-B (cont.)
HORIZ: 1" = 100' | VERT: 1" = 20'

ISSUE	DATE	DESCRIPTION
0	07/28/2022	ISSUED TO IEPA

PROJECT MANAGER	M. ROBERTS
CIVIL	G. WILLIAMS
CIVIL	K. KINLEY
DRAWN BY	M. BICKFORD
PROJECT NUMBER	10296144

ILLINOIS POWER GENERATING COMPANY
NEWTON POWER PLANT
PRIMARY ASH POND CLOSURE

CROSS SECTIONS

0 1" 2"

FILENAME	00C302.DWG
SCALE	AS NOTED

SHEET
00C302

c:\pwworking\central01\d2372207\00C302.dwg, Layout1, 7/25/2022 12:56:07 PM, MBICKFORD

Appendix C

Supplemental Analytical Data

APPENDIX C.
SUPPORTING GROUNDWATER ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
NEWTON POWER PLANT
PRIMARY ASH POND
NEWTON, IL

Well ID	Well Type	Date	Parameter	Result	Unit
APW15	Compliance	02/23/2021	Boron, total	0.140	mg/L
APW15	Compliance	03/10/2021	Boron, total	0.130	mg/L
APW15	Compliance	03/31/2021	Boron, total	0.160	mg/L
APW15	Compliance	04/28/2021	Boron, total	0.130	mg/L
APW15	Compliance	05/24/2021	Boron, total	0.150	mg/L
APW15	Compliance	06/17/2021	Boron, total	0.130	mg/L
APW15	Compliance	06/30/2021	Boron, total	0.130	mg/L
APW15	Compliance	07/14/2021	Boron, total	0.160	mg/L
APW15	Compliance	03/14/2023	Boron, total	0.180	mg/L
APW15	Compliance	04/26/2023	Boron, total	0.130	mg/L
APW15	Compliance	02/23/2021	Chloride, total	260	mg/L
APW15	Compliance	03/10/2021	Chloride, total	250	mg/L
APW15	Compliance	03/31/2021	Chloride, total	240	mg/L
APW15	Compliance	04/28/2021	Chloride, total	230	mg/L
APW15	Compliance	05/24/2021	Chloride, total	230	mg/L
APW15	Compliance	06/17/2021	Chloride, total	240	mg/L
APW15	Compliance	06/30/2021	Chloride, total	230	mg/L
APW15	Compliance	07/14/2021	Chloride, total	130	mg/L
APW15	Compliance	03/14/2023	Chloride, total	230	mg/L
APW15	Compliance	04/26/2023	Chloride, total	270	mg/L
APW15	Compliance	02/23/2021	Sulfate, total	1 U	mg/L
APW15	Compliance	03/10/2021	Sulfate, total	1 U	mg/L
APW15	Compliance	03/31/2021	Sulfate, total	1 U	mg/L
APW15	Compliance	04/28/2021	Sulfate, total	1 U	mg/L
APW15	Compliance	05/24/2021	Sulfate, total	1 U	mg/L
APW15	Compliance	06/17/2021	Sulfate, total	1 U	mg/L
APW15	Compliance	06/30/2021	Sulfate, total	1 U	mg/L
APW15	Compliance	07/14/2021	Sulfate, total	1 U	mg/L
APW15	Compliance	03/14/2023	Sulfate, total	0.6 J	mg/L
APW15	Compliance	04/26/2023	Sulfate, total	0.4 J	mg/L
XPW01	Porewater	02/17/2021	Boron, total	9.50	mg/L
XPW01	Porewater	03/09/2021	Boron, total	11.0	mg/L
XPW01	Porewater	03/30/2021	Boron, total	9.90	mg/L
XPW01	Porewater	04/28/2021	Boron, total	10.0	mg/L
XPW01	Porewater	07/14/2021	Boron, total	12.0	mg/L
XPW01	Porewater	02/23/2022	Boron, total	12.0	mg/L
XPW01	Porewater	08/15/2022	Boron, total	13.0	mg/L
XPW01	Porewater	02/01/2023	Boron, total	15.0	mg/L
XPW01	Porewater	04/27/2023	Boron, total	14.0	mg/L
XPW01	Porewater	02/17/2021	Chloride, total	49.0	mg/L
XPW01	Porewater	03/09/2021	Chloride, total	38.0	mg/L
XPW01	Porewater	03/30/2021	Chloride, total	32.0	mg/L
XPW01	Porewater	04/28/2021	Chloride, total	33.0	mg/L
XPW01	Porewater	07/14/2021	Chloride, total	27.0	mg/L
XPW01	Porewater	02/23/2022	Chloride, total	25.0	mg/L
XPW01	Porewater	06/14/2022	Chloride, total	14.0	mg/L

APPENDIX C.
SUPPORTING GROUNDWATER ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
NEWTON POWER PLANT
PRIMARY ASH POND
NEWTON, IL

Well ID	Well Type	Date	Parameter	Result	Unit
XPW01	Porewater	08/15/2022	Chloride, total	11.0	mg/L
XPW01	Porewater	02/01/2023	Chloride, total	9.70	mg/L
XPW01	Porewater	04/27/2023	Chloride, total	8.10	mg/L
XPW01	Porewater	02/17/2021	Sulfate, total	19,000	mg/L
XPW01	Porewater	03/09/2021	Sulfate, total	14,000	mg/L
XPW01	Porewater	03/30/2021	Sulfate, total	19,000	mg/L
XPW01	Porewater	04/28/2021	Sulfate, total	12,000	mg/L
XPW01	Porewater	07/14/2021	Sulfate, total	11,000	mg/L
XPW01	Porewater	02/23/2022	Sulfate, total	9,300	mg/L
XPW01	Porewater	06/14/2022	Sulfate, total	6,100	mg/L
XPW01	Porewater	08/15/2022	Sulfate, total	5,900	mg/L
XPW01	Porewater	02/01/2023	Sulfate, total	4,200	mg/L
XPW01	Porewater	04/27/2023	Sulfate, total	2,900	mg/L
XPW02	Porewater	02/17/2021	Boron, total	2.30	mg/L
XPW02	Porewater	03/09/2021	Boron, total	2.50	mg/L
XPW02	Porewater	03/30/2021	Boron, total	2.40	mg/L
XPW02	Porewater	04/28/2021	Boron, total	2.60	mg/L
XPW02	Porewater	07/14/2021	Boron, total	2.50	mg/L
XPW02	Porewater	02/23/2022	Boron, total	2.40	mg/L
XPW02	Porewater	08/15/2022	Boron, total	2.40	mg/L
XPW02	Porewater	02/01/2023	Boron, total	2.30	mg/L
XPW02	Porewater	04/27/2023	Boron, total	2.30	mg/L
XPW02	Porewater	02/17/2021	Chloride, total	10.0	mg/L
XPW02	Porewater	03/09/2021	Chloride, total	9.60	mg/L
XPW02	Porewater	03/30/2021	Chloride, total	9.90	mg/L
XPW02	Porewater	04/28/2021	Chloride, total	9.70	mg/L
XPW02	Porewater	07/14/2021	Chloride, total	10.0	mg/L
XPW02	Porewater	02/23/2022	Chloride, total	12.0	mg/L
XPW02	Porewater	06/14/2022	Chloride, total	8.60	mg/L
XPW02	Porewater	08/15/2022	Chloride, total	8.90	mg/L
XPW02	Porewater	02/01/2023	Chloride, total	8.40 B	mg/L
XPW02	Porewater	04/27/2023	Chloride, total	8.80	mg/L
XPW02	Porewater	02/17/2021	Sulfate, total	160	mg/L
XPW02	Porewater	03/09/2021	Sulfate, total	150	mg/L
XPW02	Porewater	03/30/2021	Sulfate, total	160	mg/L
XPW02	Porewater	04/28/2021	Sulfate, total	190	mg/L
XPW02	Porewater	07/14/2021	Sulfate, total	160	mg/L
XPW02	Porewater	02/23/2022	Sulfate, total	210	mg/L
XPW02	Porewater	06/14/2022	Sulfate, total	170	mg/L
XPW02	Porewater	08/15/2022	Sulfate, total	160	mg/L
XPW02	Porewater	02/01/2023	Sulfate, total	150	mg/L
XPW02	Porewater	04/27/2023	Sulfate, total	150	mg/L
XPW03	Porewater	02/17/2021	Boron, total	1.30	mg/L
XPW03	Porewater	03/09/2021	Boron, total	1.20	mg/L
XPW03	Porewater	03/30/2021	Boron, total	0.840	mg/L
XPW03	Porewater	04/28/2021	Boron, total	1.20	mg/L

APPENDIX C.
SUPPORTING GROUNDWATER ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
NEWTON POWER PLANT
PRIMARY ASH POND
NEWTON, IL

Well ID	Well Type	Date	Parameter	Result	Unit
XPW03	Porewater	07/14/2021	Boron, total	1.30	mg/L
XPW03	Porewater	02/23/2022	Boron, total	1.70	mg/L
XPW03	Porewater	08/16/2022	Boron, total	1.40	mg/L
XPW03	Porewater	02/02/2023	Boron, total	1.70	mg/L
XPW03	Porewater	04/27/2023	Boron, total	1.80	mg/L
XPW03	Porewater	02/17/2021	Chloride, total	14.0	mg/L
XPW03	Porewater	03/09/2021	Chloride, total	9.20	mg/L
XPW03	Porewater	03/30/2021	Chloride, total	13.0	mg/L
XPW03	Porewater	04/28/2021	Chloride, total	11.0	mg/L
XPW03	Porewater	07/14/2021	Chloride, total	11.0	mg/L
XPW03	Porewater	02/23/2022	Chloride, total	13.0	mg/L
XPW03	Porewater	06/15/2022	Chloride, total	11.0	mg/L
XPW03	Porewater	08/16/2022	Chloride, total	11.0	mg/L
XPW03	Porewater	02/02/2023	Chloride, total	9.60	mg/L
XPW03	Porewater	04/27/2023	Chloride, total	9.70	mg/L
XPW03	Porewater	02/17/2021	Sulfate, total	92.0	mg/L
XPW03	Porewater	03/09/2021	Sulfate, total	93.0	mg/L
XPW03	Porewater	03/30/2021	Sulfate, total	94.0	mg/L
XPW03	Porewater	04/28/2021	Sulfate, total	96.0	mg/L
XPW03	Porewater	07/14/2021	Sulfate, total	120	mg/L
XPW03	Porewater	02/23/2022	Sulfate, total	130	mg/L
XPW03	Porewater	06/15/2022	Sulfate, total	150	mg/L
XPW03	Porewater	08/16/2022	Sulfate, total	180	mg/L
XPW03	Porewater	02/02/2023	Sulfate, total	98.0	mg/L
XPW03	Porewater	04/27/2023	Sulfate, total	120	mg/L
XPW04	Porewater	02/17/2021	Boron, total	2.50	mg/L
XPW04	Porewater	03/09/2021	Boron, total	2.40	mg/L
XPW04	Porewater	03/29/2021	Boron, total	2.10	mg/L
XPW04	Porewater	04/28/2021	Boron, total	2.80	mg/L
XPW04	Porewater	07/14/2021	Boron, total	2.30	mg/L
XPW04	Porewater	02/23/2022	Boron, total	2.20	mg/L
XPW04	Porewater	08/16/2022	Boron, total	3.70	mg/L
XPW04	Porewater	02/01/2023	Boron, total	3.50	mg/L
XPW04	Porewater	04/28/2023	Boron, total	4.00	mg/L
XPW04	Porewater	02/17/2021	Chloride, total	62.0	mg/L
XPW04	Porewater	03/09/2021	Chloride, total	34.0	mg/L
XPW04	Porewater	03/29/2021	Chloride, total	31.0	mg/L
XPW04	Porewater	04/28/2021	Chloride, total	37.0	mg/L
XPW04	Porewater	07/14/2021	Chloride, total	34.0	mg/L
XPW04	Porewater	02/23/2022	Chloride, total	30.0	mg/L
XPW04	Porewater	06/15/2022	Chloride, total	50.0	mg/L
XPW04	Porewater	08/16/2022	Chloride, total	54.0	mg/L
XPW04	Porewater	02/01/2023	Chloride, total	46.0	mg/L
XPW04	Porewater	04/28/2023	Chloride, total	59.0	mg/L
XPW04	Porewater	02/17/2021	Sulfate, total	2,200	mg/L
XPW04	Porewater	03/09/2021	Sulfate, total	1,400	mg/L

APPENDIX C.
SUPPORTING GROUNDWATER ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
NEWTON POWER PLANT
PRIMARY ASH POND
NEWTON, IL

Well ID	Well Type	Date	Parameter	Result	Unit
XPW04	Porewater	03/29/2021	Sulfate, total	600	mg/L
XPW04	Porewater	04/28/2021	Sulfate, total	3,800	mg/L
XPW04	Porewater	07/14/2021	Sulfate, total	1,600	mg/L
XPW04	Porewater	02/23/2022	Sulfate, total	1,800	mg/L
XPW04	Porewater	06/15/2022	Sulfate, total	7,500	mg/L
XPW04	Porewater	08/16/2022	Sulfate, total	4,000	mg/L
XPW04	Porewater	02/01/2023	Sulfate, total	6,200	mg/L
XPW04	Porewater	04/28/2023	Sulfate, total	9,500	mg/L

Notes:
mg/L = milligrams per liter
B = The analyte was found in sample and in associated method blank.
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the level of the adjusted detection limit or quantitation limit, as appropriate.

Exhibit C

Luminant

Illinois Power Generating Company
1500 Eastport Plaza Drive
Collinsville, IL 62234

November 3, 2023

VIA E-MAIL
heather.mullenax@illinois.gov
EPA.CCR.PART845.COORDINATOR@ILLINOIS.GOV
EPA.CCR.Part845.Notify@Illinois.gov

Re: Alternative Source Demonstration ("ASD") for Newton Power Plant Primary Ash Pond

To Whom It May Concern:

On October 6, 2023, Illinois Power Generating Company ("IPGC") submitted an ASD for the Newton Power Plant Primary Ash Pond ("Newton PAP") to the Illinois Environmental Protection Agency ("IEPA") pursuant to 35 Ill. Admin. Code 845.650(e). On October 24, 2023, IEPA provided notice to its listserve regarding the posting of the ASD submittal, triggering a 14-day period for written comments on the ASD submittal pursuant to 35 Ill Admin. Code 845.650(e)(3). Between October 19 and 31, 2023, IPGC and IEPA engaged in communications regarding the Newton PAP ASD submittal. IPGC submits this letter and its attachments, within the 14-day period for written comments, to provide additional information to IEPA in response to those communications. As explained below and in the attached materials, IPGC's October 6 ASD submittal was comprehensive in scope and used scientifically supported, industry standard methodologies.

IEPA requested certain additional data as part of its communications with IPGC. While IPGC does not agree that any additional data is necessary in support of the ASD submittal, IPGC has compiled and is providing, as Attachment 1 to this letter, the hydraulic conductivity and boring log data requested by IEPA, all of which was previously provided or referenced in the Newton PAP operating permit application and/or construction permit application. Because both of these applications were used and relied upon in preparing the Newton PAP ASD and both contain information IEPA has sought in connection with its review of the ASD, IPGC (with this letter) is incorporating by reference the entirety of its October 25, 2021 operating permit application for the Newton PAP and July 28, 2022 construction permit application for the Newton PAP into its Newton PAP ASD submittal.

In its communications with IPGC, IEPA also requested (1) source characterization of CCR that includes total solids sampling, analysis and reporting in accordance with SW-846 leach testing methods and (2) sampling and analysis in accordance with 35 Ill. Admin. Code 845.640 of the alternative source. Collecting this information would be a considerable undertaking that IPGC would not be able to complete prior to the decision deadline or within the comment period for the Newton PAP ASD. Additionally, this information is not required by law and is unnecessary to support the Newton PAP ASD. First, there is no requirement under Part 845 that source characterization of CCR be conducted in accordance with SW-846. While Part 845.150 incorporates by reference SW-846, that incorporation does not create an affirmative obligation to analyze all samples in accordance with SW-846. As set forth in Chapter 2 of SW-846, the methods are not "mandatory" unless specifically specified in the regulation. Groundwater samples taken under Part 845 are the only samples specifically required by Part 845 to be analyzed using SW-846. In particular, Part 845.640(e) requires groundwater samples taken under a groundwater monitoring program be analyzed in accordance with SW-846. Notably, samples collected under the Newton PAP's groundwater monitoring program have been analyzed in accordance with SW-846 (and were otherwise collected and analyzed in accordance with 35 Ill. Admin. Code 845.640). Attachment 2 to this letter explains how CCR source characterization was conducted for the Newton PAP ASD and explains why the methodology used is more appropriate than SW-846 leach testing methods for characterizing the source material.

Second, there is no requirement under 35 Ill Admin. Code 845.640, 35 Ill. Admin. Code 845.650 or elsewhere in Part 845 to identify, sample or analyze an alternative source. Section 845.650(e), which governs alternative source demonstrations, simply requires a determination that a source other than the CCR surface impoundment caused the contamination and that the CCR surface impoundment did not contribute to the contamination. As described in Attachment 2, this demonstration is made through a multiple lines of evidence analysis in the Newton PAP ASD submittal. Nevertheless, as explained in Attachment 2, an alternative source was also identified in the Newton PAP ASD submittal and its identification further supports that the Newton PAP is not the source of the chloride exceedance in APW15. However, identification and a full characterization of that alternative source is not required for the ASD or necessary to determine that a source other than the Newton PAP caused the chloride exceedance and that the Newton PAP did not contribute to the exceedance.

Finally, given that this submittal responds to questions and requests raised by IEPA regarding the Newton PAP ASD, IPGC hereby incorporates this letter and its attachments (including the references set forth in those attachments) into its Newton PAP submittal.

Should you have any questions regarding the information contained in this letter or its attachments, please feel free to reach out.

Sincerely,

Phil Morris, PE
Senior Director, Environmental

ATTACHMENT 1

HYDRAULIC CONDUCTIVITY DATA

INFORMATION AND DATA PREVIOUSLY PROVIDED IN THE HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

SUBMITTED TO IEPA ON OCTOBER 29, 2021

TABLE 2-1. GEOTECHNICAL DATA SUMMARY
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
NEWTON POWER PLANT
PRIMARY ASH POND
NEWTON, ILLINOIS

Sample ID	Field Location ID	Top of Sample (ft bgs)	Bottom of Sample (ft bgs)	HSU	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Calculated Porosity [1] (%)	Vertical Hydraulic Conductivity (cm / s)	LL	PL	PI	Laboratory USCS	Gravel (%)	Sand (%)	Fines (%)
Sangamon Soil																
APW11	APW11	10	12	UD	17.8	111.7	2.645	32	8.57E-08	28	12	16	CL	1.1	45.1	53.8
APW15	APW15	20	22	UD	18.5	109.8	2.686	34	3.21E-08	33	10	23	CL	0.0	40.8	59.2
Hagarstown Member																
APW12	APW12	20	22	UD/PMP	15.1	118.3	2.694	30	1.07E-07	27	12	15	SC	7.4	46.8	45.8
APW12	APW12	25.5	26	UD/PMP	8.4	113.0	2.654	32	8.43E-06	10	13	NP	SP-SM	24.3	69.5	6.2
APW13	APW13	25	27	UD/PMP	21.2	87.1	2.649	47	9.63E-05	9	10	NP	SP-SM	0.0	88.9	11.1
Vandalia Till Member																
APW14	APW14	45	47	UCU	12.4	119.6	2.706	29	9.65E-08	26	14	12	CL	4.4	32.3	63.3
APW17	APW17	40	42	UCU	16.6	108.8	2.709	36	3.34E-08	26	13	13	CL	1.3	27.6	71.1
SB300	APW18	50	52	UCU	12.9	122.7	2.700	27	7.29E-08	32	12	20	CL	0.8	22.4	76.8
SB301	SB301	48	50	UCU	14.1	117.3	2.697	30	6.63E-08	27	14	13	CL	0.4	34.2	65.4
Mulberry Grove Member																
APW13	APW13	60.5	61	UA	14.5	114.3	2.661	31	2.18E-04	8	13	NP	SM	0.3	75.2	24.5
APW15	APW15	100.5	101	UA	12.1	116.4	2.665	30	3.50E-06	15	12	3	SM	4.4	49.8	45.8
APW17	APW17	71	71.5	UA	7.8	110.2	2.660	34	7.21E-04	5	9	NP	SW-SM	14.3	76.8	8.9
APW17	APW17	90.5	91	UA	6.1	116.8	2.672	30	6.39E-04	6	8	NP	SP-SM	28.2	65.1	6.7
SB300	APW18	61	61.5	UA	13.6	109.6	2.686	35	1.85E-05	5	9	NP	SM	4.7	78.2	17.1
Smithboro Till Member																
APW11	APW11	61	61.5	LCU	17.8	110.5	2.686	34	1.87E-07	27	18	9	CL	0.0	21.4	78.6
APW11	APW11	80	82	LCU	16.5	116.1	2.705	31	2.94E-08	32	14	18	CL	0.0	21	79
APW12	APW12	85	87	LCU	14.4	116.4	2.711	31	2.36E-08	29	14	15	CL	0.3	19.5	80.2
APW14	APW14	55.5	56	LCU	18.0	104.6	2.709	38	2.74E-07	25	15	10	CL	0.0	27.8	72.2
APW15	APW15	105	107	LCU	19.1	107.8	2.695	36	8.20E-08	29	13	16	CL	0.0	23.8	76.2
SB300	APW18	62.5	63	LCU	11.1	124.6	2.659	25	4.32E-06	20	14	6	CL-ML	0.0	42.4	57.6
SB300	APW18	105	107	LCU	14.1	116.4	2.710	31	4.28E-08	28	13	15	CL	0.0	30.7	69.3
SB301	SB301	68.5	69	LCU	13.1	121.3	2.723	29	4.05E-08	23	14	9	CL	0.0	31.3	68.7
SB301	SB301	98	100	LCU	15.7	118.2	2.720	30	6.13E-08	37	15	22	CL	0.0	17.8	82.2
CCR																
XPW01	XPW01	8.5	9	CCR	18.6	87.7	2.675	47	1.71E-04	47	57	NP	SP-SM	37.1	51.1	11.8
XPW01	XPW01	15.5	16	CCR	12.6	84.4	2.741	51	1.58E-05	35	17	18	CL	4.6	34.1	61.3
XPW03	XPW03	6	6.5	CCR	17.4	75.3	2.663	55	1.34E-03	33	27	6	SM	6.8	71.7	21.5
XPW03	XPW03	15.5	16	CCR	16.7	103.6	2.689	38	9.70E-05	12	19	NP	SM	16.4	67.3	16.3
XPW04	XPW04	6.5	7	CCR	31.1	73.9	2.697	56	1.61E-04	41	38	3	SM	1.6	84.5	13.9
XPW04	XPW04	15.5	16	CCR	31.1	80.8	2.650	51	7.83E-05	46	42	4	SM	15.7	51	33.3

TABLE 2-1. GEOTECHNICAL DATA SUMMARY

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
NEWTON POWER PLANT
PRIMARY ASH POND
NEWTON, ILLINOIS

Sample ID	Field Location ID	Top of Sample (ft bgs)	Bottom of Sample (ft bgs)	HSU	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Calculated Porosity [1] (%)	Vertical Hydraulic Conductivity (cm/s)	LL	PL	PI	Laboratory USCS	Gravel (%)	Sand (%)	Fines (%)
Fill																
XPW02	XPW02	8	8.5	CCR	29.1	92.9	2.691	45	6.07E-08	36	16	20	CL	0.3	44.8	54.9
XPW02	XPW02	16.5	17	CCR	21.8	103.7	2.694	38	7.38E-08	36	14	22	CL	0.0	19.8	80.2

[O: SSW 04/22/21, U:EDP 08/23/21, U: SSW 08/26/21, C: LDC 08/31/21; U: LDC 09/16/21, C: SSW 09/21/21]

Notes:

[1] Porosity calculated as relationship of bulk density to particle density (n = 100[1- (pb/pd)])

% = Percent
bgs = below ground surface
CCR = coal combustion residuals
cm/s = centimeters per second
ft = foot/feet
in = inch
LL = Liquid limit
NP = Non Plastic
pcf = pounds per cubic foot
PI = Plastic Index
PL = Plasticity Limit

HSU = Hydrostratigraphic Unit
LCU = lower confining unit
PMP = potential migration pathway
UA = uppermost aquifer
UCU = upper confining unit
UD = upper drift

USCS = Unified Soil Classification System
CL - Lean Clay
CL-ML = Silty Lean Clay
SC = Clayey Sand
SM = Silty Sand
SP-SM = Poorly Graded Sand with Silt
SW-SM = Well Graded Sand with Silt

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Terracon
Consulting Engineers & Scientists

Laboratory Services Group **192 Exchange Blvd** **Glendale Heights, Illinois 60139** **Ph. (630) 717-4263**

TERRACON PROJECT NO. **11215019** **4/9/2021**
PROJECT NAME: **NEWTON POWER STATION**
CLIENT: **RAMBOLL ENVIRON US CORP**
LOCATION : **NEWTON, IL**

SUMMARY OF TEST RESULTS

BORING NO.	APW-14
TIME SAMPLED:	9:55
DEPTH:	45.0'-47.0'
CLASSIFICATION	BROWN SANDY LEAN CLAY

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	119.6	120.3
WATER CONTENT (%)	12.4	14.2
DIAMETER (cm)	7.380	7.372
LENGTH (cm)	10.775	10.736
B VALUE PARAMETER:	0.98	
HYDRAULIC GRADIENT (MAXIMUM)	18.54	
PERCENT SATURATION	100.5	
HYDRAULIC CONDUCTIVITY k (cm/sec)	9.65E-08	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

Deaired water was used as the liquid permeant.

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Terracon
Consulting Engineers & Scientists

Laboratory Services Group **192 Exchange Blvd** **Glendale Heights, Illinois 60139** **Ph. (630) 717-4263**

TERRACON PROJECT NO. **11215019** **4/9/2021**
PROJECT NAME: **NEWTON POWER STATION**
CLIENT: **RAMBOLL ENVIRON US CORP**
LOCATION : **NEWTON, IL**

SUMMARY OF TEST RESULTS

BORING NO.	APW-17
TIME SAMPLED:	9:45
DEPTH:	40.0'-42.0'
CLASSIFICATION	GRAY LEAN CLAY WITH SAND

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	108.8	109.5
WATER CONTENT (%)	16.6	19.6
DIAMETER (cm)	7.262	7.262
LENGTH (cm)	9.605	9.545
B VALUE PARAMETER:	0.98	
HYDRAULIC GRADIENT (MAXIMUM)	28.12	
PERCENT SATURATION	98.4	
HYDRAULIC CONDUCTIVITY k (cm/sec)	3.34E-08	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Laboratory Services Group **192 Exchange Blvd** **Glendale Heights, Illinois 60139** **Ph. (630) 717-4263**

TERRACON PROJECT NO. **11215019** **4/9/2021**
PROJECT NAME: **NEWTON POWER STATION**
CLIENT: **RAMBOLL ENVIRN US CORP**
LOCATION : **NEWTON , IL**

SUMMARY OF TEST RESULTS

BORING NO. SB-300

TIME SAMPLED: 8:25

DEPTH: 50.0'-52.0'

CLASSIFICATION GRAY LEAN CLAY WITH SAND

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	122.7	123.5
WATER CONTENT (%)	12.9	13.3
DIAMETER (cm)	7.242	7.217
LENGTH (cm)	10.288	10.288
B VALUE PARAMETER:	0.98	
HYDRAULIC GRADIENT (MAXIMUM)	19.42	
PERCENT SATURATION	99.1	
HYDRAULIC CONDUCTIVITY k (cm/sec)	7.29E-08	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

Deaired water was used as the liquid permeant.

Terracon
Consulting Engineers & Scientists

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Laboratory Services Group **192 Exchange Blvd** **Glendale Heights, Illinois 60139** **Ph. (630) 717-4263**

TERRACON PROJECT NO. **11215019** **4/9/2021**
PROJECT NAME: **NEWTON POWER STATION**
CLIENT: **RAMBOLL ENVIRON US CORP**
LOCATION : **NEWTON, IL**

SUMMARY OF TEST RESULTS

BORING NO. SB-301

TIME SAMPLED: 13:30

DEPTH: 48.0'-50.0'

CLASSIFICATION BROWN AND GRAY SANDY LEAN CLAY

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	117.3	117.7
WATER CONTENT (%)	14.1	15.8
DIAMETER (cm)	7.204	7.230
LENGTH (cm)	10.348	10.239
B VALUE PARAMETER:	0.99	
HYDRAULIC GRADIENT (MAXIMUM)	19.30	
PERCENT SATURATION	99.6	
HYDRAULIC CONDUCTIVITY k (cm/sec)	6.63E-08	

SPECIMEN PHOTO

(Percent saturation calculation is based on final measurements and a measured specific gravity.)

Deaired water was used as the liquid permeant.

2021 HYDRAULIC CONDUCTIVITY TEST DATA

TABLE 3-3. FIELD HYDRAULIC CONDUCTIVITIES

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
NEWTON POWER STATION
PRIMARY ASH POND
NEWTON, ILLINOIS

Well ID	Gradient Position	Bottom of Screen Elevation (ft NAVD88)	Screen Length[1] (ft)	Field Identified Screened Material	Slug Type	Analysis Method	Falling Head (Slug In) K (cm/s)			Rising Head (Slug Out) K (cm/s)			Minimum Hydraulic Conductivity (cm/s)	Maximum Hydraulic Conductivity (cm/s)	Hydraulic Conductivity Geometric Mean (cm/s)
							1	2	3	1	2	3			
Upper Drift Unit / Potential Migration Pathway															
APW5S	U	521.05	10	SP	Solid	C-B-P	8.9E-04	7.4E-04	▨	6.1E-04	8.5E-04	▨	6.1E-04	1.5E-02	3.1E-03
APW12	U	513.33	10	SP	Solid	C-B-P	1.3E-02	9.8E-03	▨	1.3E-02	1.5E-02	▨			
Uppermost Aquifer															
APW11	U	471.05	5	SP-SC/GP	Solid	KGS Model	6.8E-03	5.9E-03	▨	3.5E-03	7.8E-03	▨	2.0E-04	1.5E-01	6.8E-03
APW13	D	471.66	5	SM	Solid	C-B-P	1.6E-03	1.5E-03	3.3E-03	3.8E-03	3.4E-03	▨			
APW14	D	468.85	5	SC	Solid	KGS Model	3.9E-03	4.3E-03	▨	3.2E-04	3.2E-04	2.8E-03			
APW15	D	419.06	5	SP-SM	Solid	KGS Model	4.9E-04	2.0E-04	1.4E-01	1.5E-01	1.5E-01	▨			
APW16	D	443.66	5	SP	Solid	B-Z	1.24E-01	1.41E-01	▨	7.60E-02	7.96E-02	▨			
APW17	D	437.84	5	(SW)g/(SP)g	Solid	C-B-P	1.13E-01	1.15E-02	▨	▨	▨	▨			
APW18	D	460.55	5	(SW)g/SC	Solid	C-B-P	2.67E-04	▨	▨	▨	▨	▨			
Ash Pond															
XPW01	CCR	531.62	10	(SW)g	Solid	Bouwer-Rice	1.8E-01	1.3E-02	▨	2.4E-02	1.4E-02	▨	1.0E-03	2.3E-01	2.0E-02
XPW02	CCR	535.97	10	(SW)g	Solid	Bouwer-Rice	2.0E-03	2.6E-03	▨	▨	▨	▨			
XPW03	CCR	530.81	10	(SW)g/SP	Solid	Bouwer-Rice	5.7E-02	7.2E-02	2.3E-01	1.5E-01	1.2E-01	1.4E-01			
XPW04	CCR	531.90	10	(SW)g	Solid	KGS Model	▨	2.1E-03	▨	1.2E-03	1.0E-03	▨			

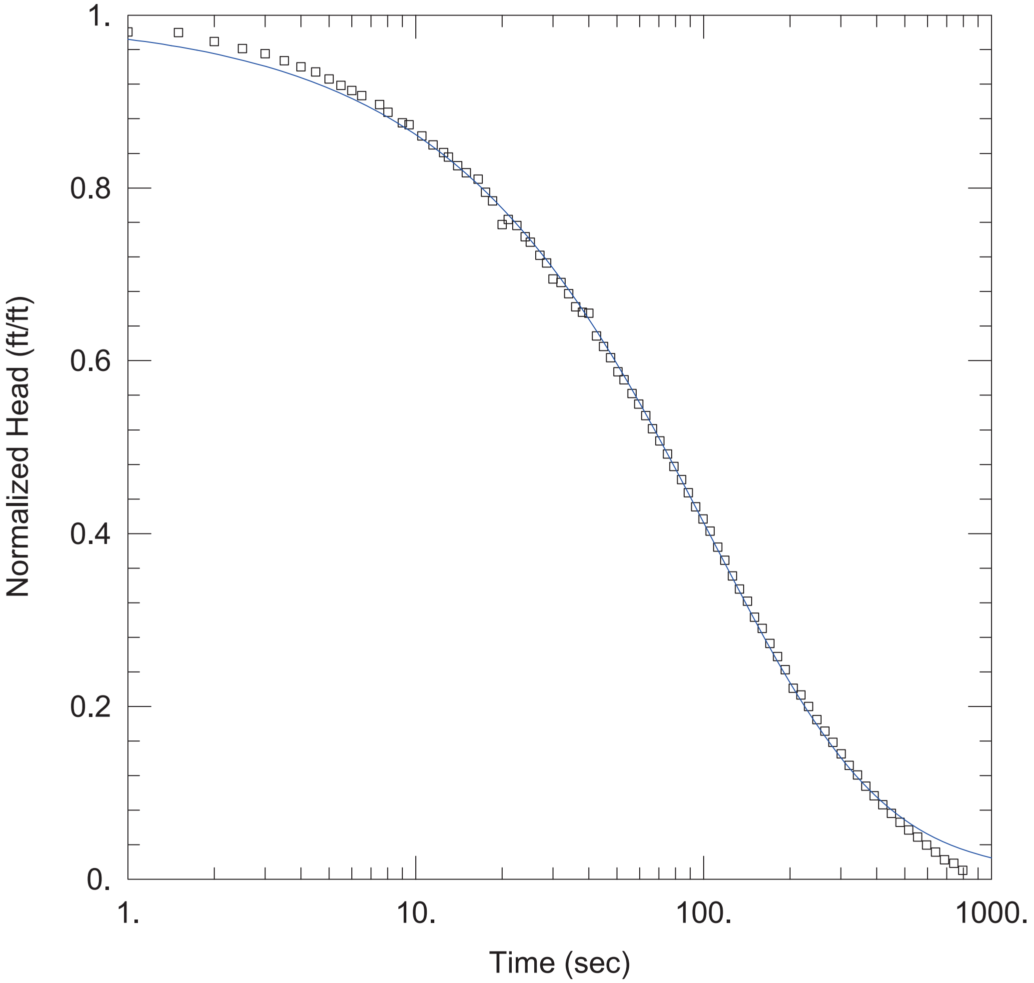
[O: SSW 7/1/20; U:SSW 8/20/21; C:LDC 08/31/21]

Notes:

[1] All wells are constructed from 2 inch PVC with 0.01 inch slotted screens.

▨ Test not analyzed/performed
B-Z = Butler-Zhan Test Solution
C-B-P = Cooper-Bredehoeft-Papadopulos Slug Test Solution
CCR = coal combustion residuals
cm/s = centimeters per second
D = downgradient
ft = foot/feet
K = hydraulic conductivity
KGS = Kansas Geological Survey
NAVD88 = North American Vertical Datum of 1988
U = upgradient

USCS = Unified Soil Classification System
GP = Poorly Graded Gravel
SC = Clayey Sand
SM = Silty Sand
SP = Poorly Graded Sand
SP-SC = Poorly Graded Sand to Clayey Sand
SP-SM = Poorly Graded Sand with Silt
(SW)g = Well Graded Sand with Gravel



APW-5S FH1

Data Set: \...\NEW_APW-5S FH1_07202021.aqt
Date: 10/21/21 Time: 14:56:12

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-5S
Test Date: 2/16/2021

AQUIFER DATA

Saturated Thickness: 3.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-5S)

Initial Displacement: 0.986 ft
Static Water Column Height: 12.6 ft
Total Well Penetration Depth: 3.2 ft
Screen Length: 3.2 ft
Casing Radius: 0.08625 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.087 cm^2/sec
S = 0.000403

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.087	cm^2/sec
S	0.000403	

K = T/b = 0.000892 cm/sec
Ss = S/b = 0.0001259 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.08962	0.02397	+/- 0.04765	3.739	cm^2/sec

```
        S          0.0003389      0.000496    +/- 0.0009861      0.6832
```

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0009188 cm/sec
Ss = S/b = 0.0001059 1/ft

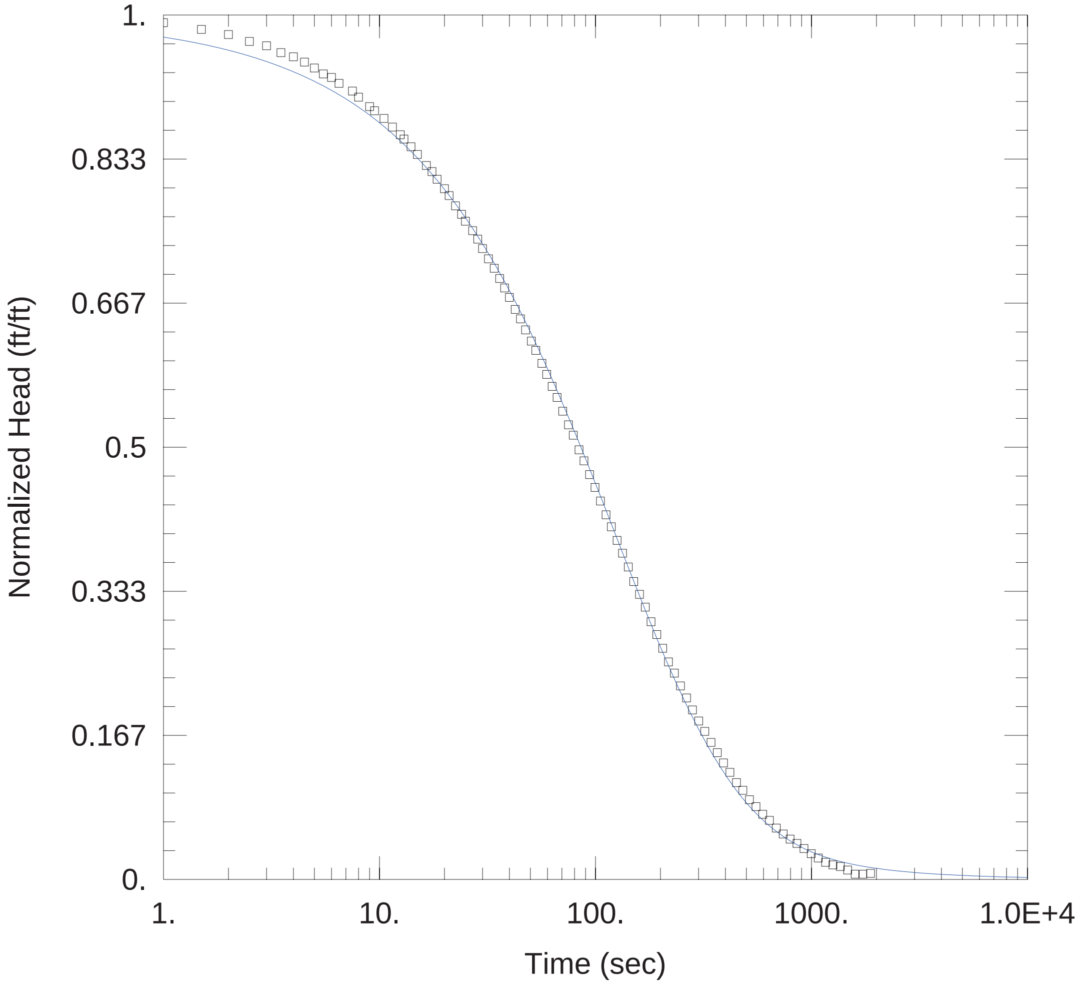
Parameter Correlations

```
        T      S
  T  1.00  -0.97
  S -0.97   1.00
```

Residual Statistics

for weighted residuals

Sum of Squares..... 0.9777 ft^2
Variance .... 0.01124 ft^2
Std. Deviation......... 0.106 ft
Mean......................... 0.01073 ft
No. of Residuals..... 89
No. of Estimates..... 2



APW-5S FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-5S
Test Date: 2/16/2021

AQUIFER DATA

Saturated Thickness: 3.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-5S)

Initial Displacement: 1.01 ft
Total Well Penetration Depth: 3.2 ft
Casing Radius: 0.086 ft
Static Water Column Height: 12.6 ft
Screen Length: 3.2 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.0718 cm^2/sec
S = 0.000454

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
21.	0.799	419.5	0.125
22.5	0.787	449.5	0.113
24.	0.777	481.5	0.104
25.	0.769	516.5	0.093
27.	0.758	554.	0.085
28.5	0.748	595.	0.076
30.	0.737	639.5	0.069
32.	0.725	687.5	0.06
34.	0.714	739.5	0.053
36.	0.702	796.	0.047
38.	0.691	857.5	0.042
40.	0.68	924.	0.036
42.5	0.666	997.	0.03
45.	0.655	1076.	0.025
47.5	0.642	1162.5	0.02
50.5	0.629	1257.	0.017
53.	0.618	1360.	0.015
56.5	0.603	1472.5	0.011
59.5	0.59	1595.5	0.006
63.	0.576	1730.	0.006
66.5	0.563	1877.5	0.007

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0718	cm^2/sec
S	0.000454	

K = T/b = 0.0007361 cm/sec
Ss = S/b = 0.0001419 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.07177	0.01724	+/- 0.03421	4.163	cm^2/sec
S	0.0004536	0.0005595	+/- 0.00111	0.8107	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0007359 cm/sec
Ss = S/b = 0.0001418 1/ft

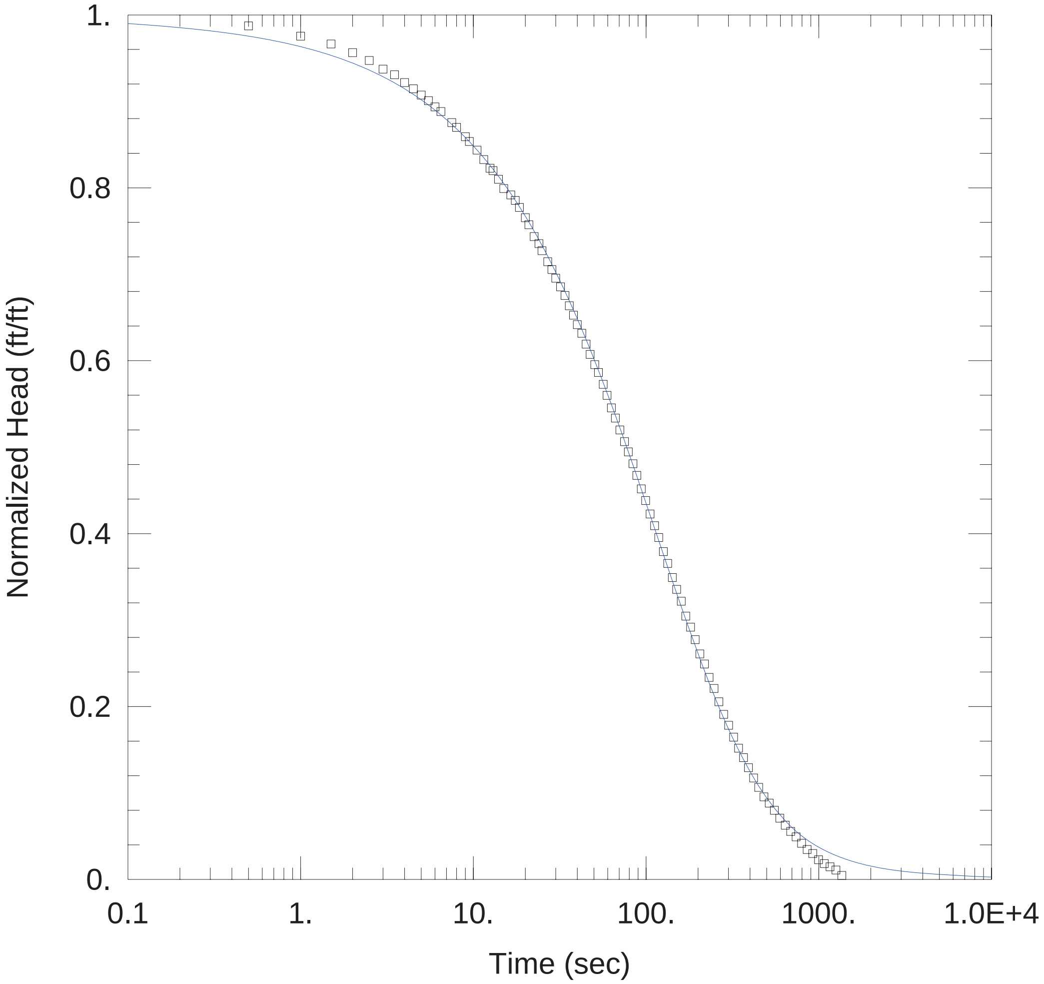
Parameter Correlations

	T	S
T	1.00	-0.97
S	-0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . . 1.028 ft^2
Variance . . . . 0.01049 ft^2



APW-5S RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-5S
Test Date: 2/16/2021

AQUIFER DATA

Saturated Thickness: 3.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-5S)

Initial Displacement: 1.1 ft
Total Well Penetration Depth: 3.2 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 12.6 ft
Screen Length: 3.2 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.0591 cm^2/sec
S = 0.00178

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
20.	0.842	366.5	0.155
21.	0.833	392.	0.142
22.5	0.818	419.5	0.129
24.	0.809	449.5	0.117
25.	0.8	481.5	0.105
27.	0.786	516.5	0.097
28.5	0.776	554.	0.088
30.	0.765	595.	0.078
32.	0.754	639.5	0.069
34.	0.743	687.5	0.061
36.	0.73	739.5	0.054
38.	0.718	796.	0.046
40.	0.706	857.5	0.038
42.5	0.695	924.	0.033
45.	0.681	997.	0.025
47.5	0.668	1076.	0.02
50.5	0.655	1162.5	0.016
53.	0.645	1257.	0.012
56.5	0.63	1360.	0.005
59.5	0.616		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0591	cm^2/sec
S	0.00178	

K = T/b = 0.0006059 cm/sec
Ss = S/b = 0.0005562 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.05907	0.01974	+/- 0.03919	2.992	cm^2/sec
S	0.001784	0.002265	+/- 0.004496	0.7877	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0006056 cm/sec
Ss = S/b = 0.0005575 1/ft

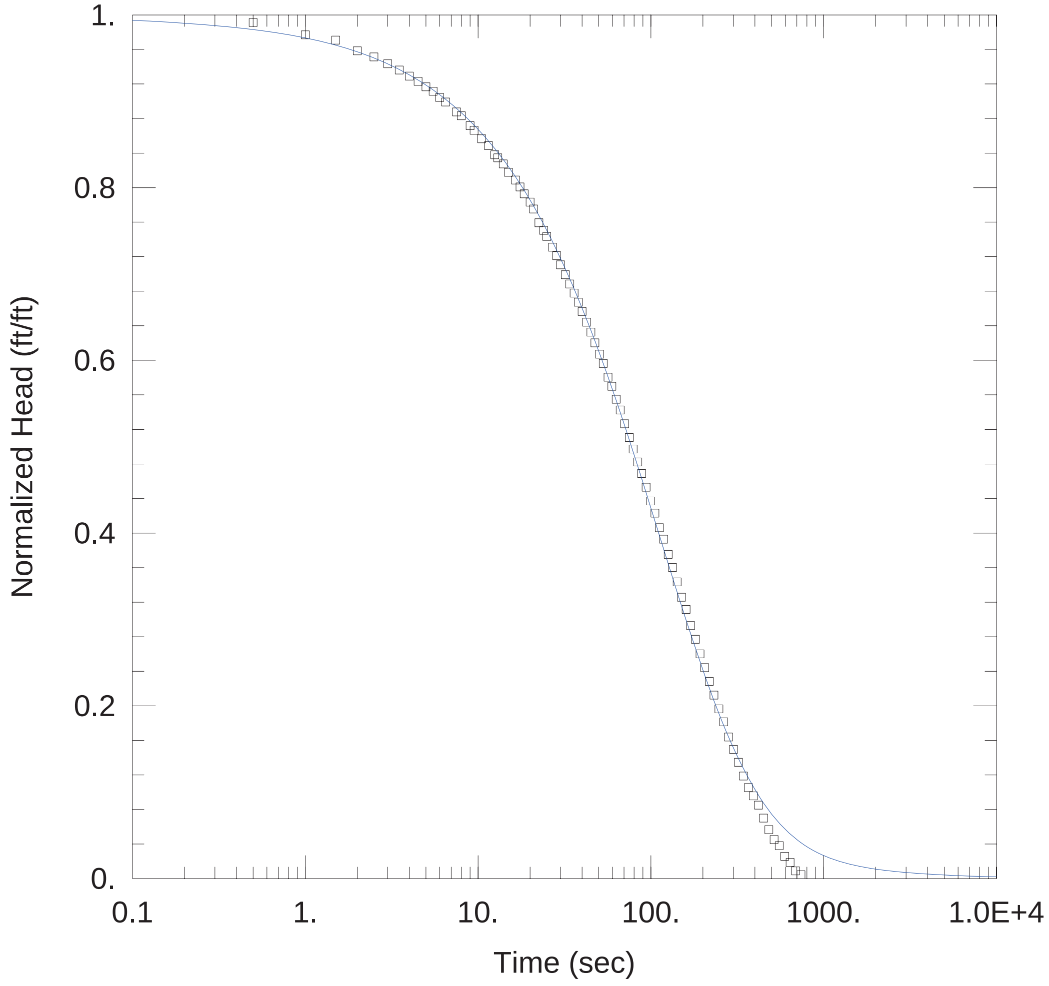
Parameter Correlations

	T	S
T	1.00	-0.96
S	-0.96	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . . 2.725 ft^2
Variance . . . . 0.02869 ft^2
Std. Deviation . . . . 0.1694 ft



APW-5S RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-5S
Test Date: 2/16/2021

AQUIFER DATA

Saturated Thickness: 3.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-5S)

Initial Displacement: 1.13 ft
Static Water Column Height: 12.6 ft
Total Well Penetration Depth: 3.2 ft
Screen Length: 3.2 ft
Casing Radius: 0.08625 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.0825 cm^2/sec
S = 0.000391

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
20.	0.885	281.5	0.185
21.	0.876	300.5	0.169
22.5	0.858	321.	0.152
24.	0.848	343.	0.134
25.	0.84	366.5	0.119
27.	0.826	392.	0.108
28.5	0.815	419.5	0.096
30.	0.803	449.5	0.079
32.	0.79	481.5	0.064
34.	0.778	516.5	0.051
36.	0.766	554.	0.043
38.	0.754	595.	0.029
40.	0.742	639.5	0.021
42.5	0.728	687.5	0.01
45.	0.715	739.5	0.005
47.5	0.701		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0825	cm^2/sec
S	0.000391	

K = T/b = 0.0008458 cm/sec
Ss = S/b = 0.0001222 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.08245	0.03155	+/- 0.06271	2.614	cm^2/sec
S	0.0003915	0.0007946	+/- 0.00158	0.4927	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0008454 cm/sec
Ss = S/b = 0.0001223 1/ft

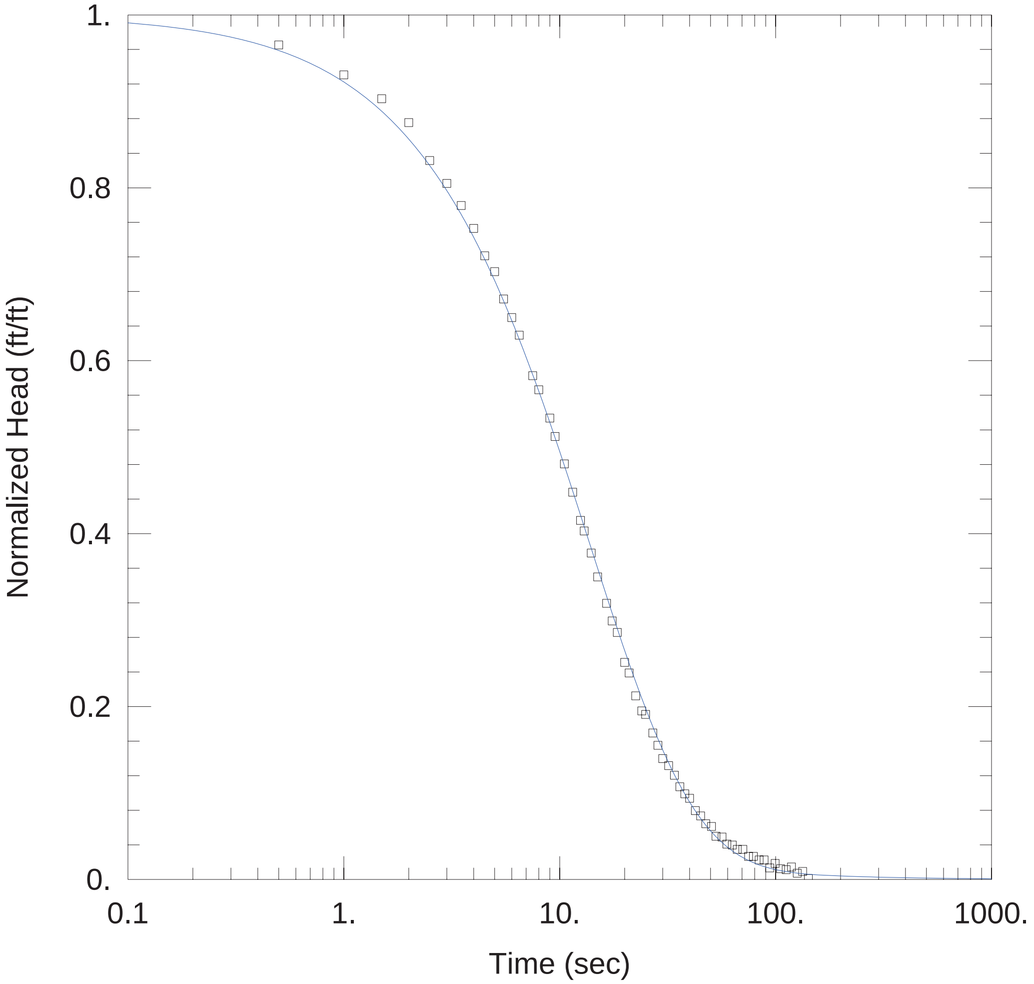
Parameter Correlations

	T	S
T	1.00	-0.97
S	-0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . . 2.682 ft^2
Variance . . . . 0.03083 ft^2
Std. Deviation . . . . 0.1756 ft
Mean . . . . -0.02888 ft
No. of Residuals 89
No. of Estimates 2



APW-11 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-11
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 9.2 ft

WELL DATA (APW-11)

Initial Displacement: 0.98 ft
Total Well Penetration Depth: 7. ft
Casing Radius: 0.086 ft

Static Water Column Height: 43.37 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

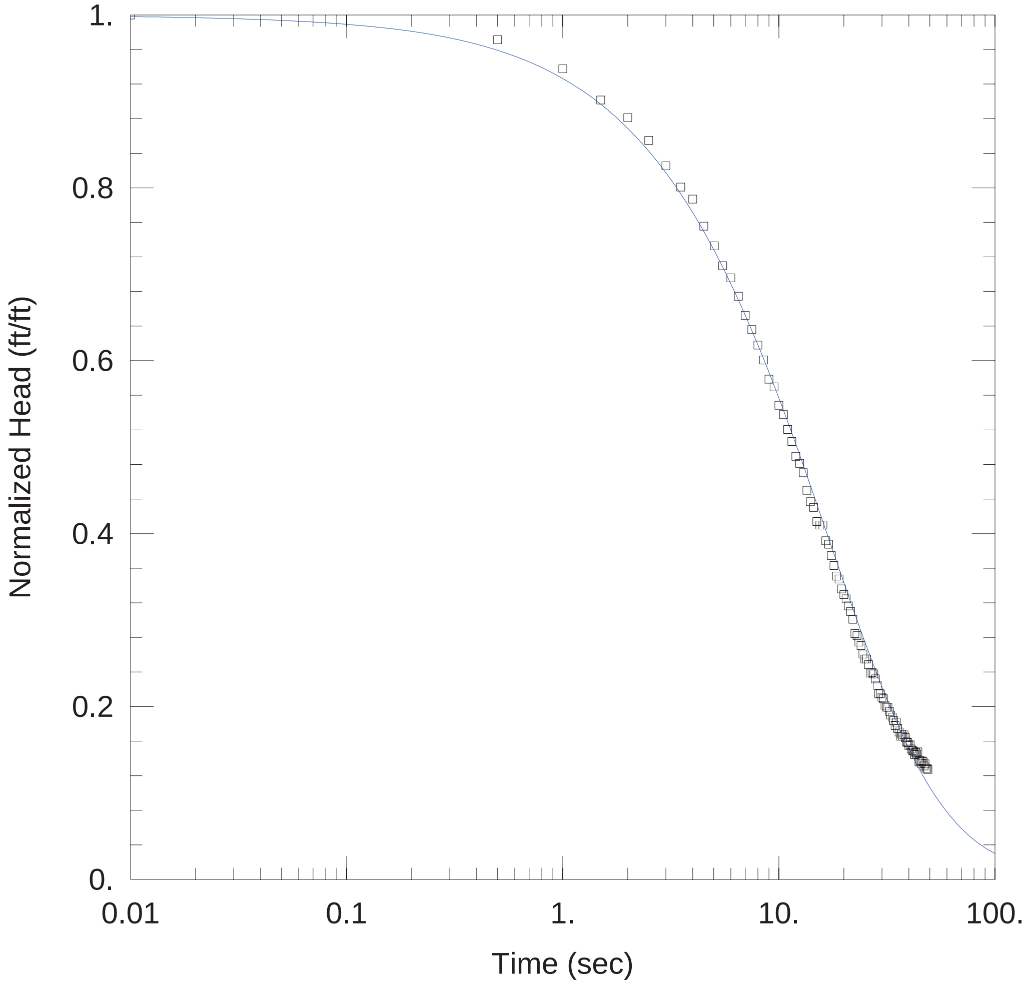
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0078 cm/sec
Kz/Kr = 1.

Ss = 1.09E-9 ft^{-1}



APW-11 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-11
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 9.2 ft

WELL DATA (APW-11)

Initial Displacement: 1.22 ft
Total Well Penetration Depth: 7. ft
Casing Radius: 0.086 ft

Static Water Column Height: 43.53 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

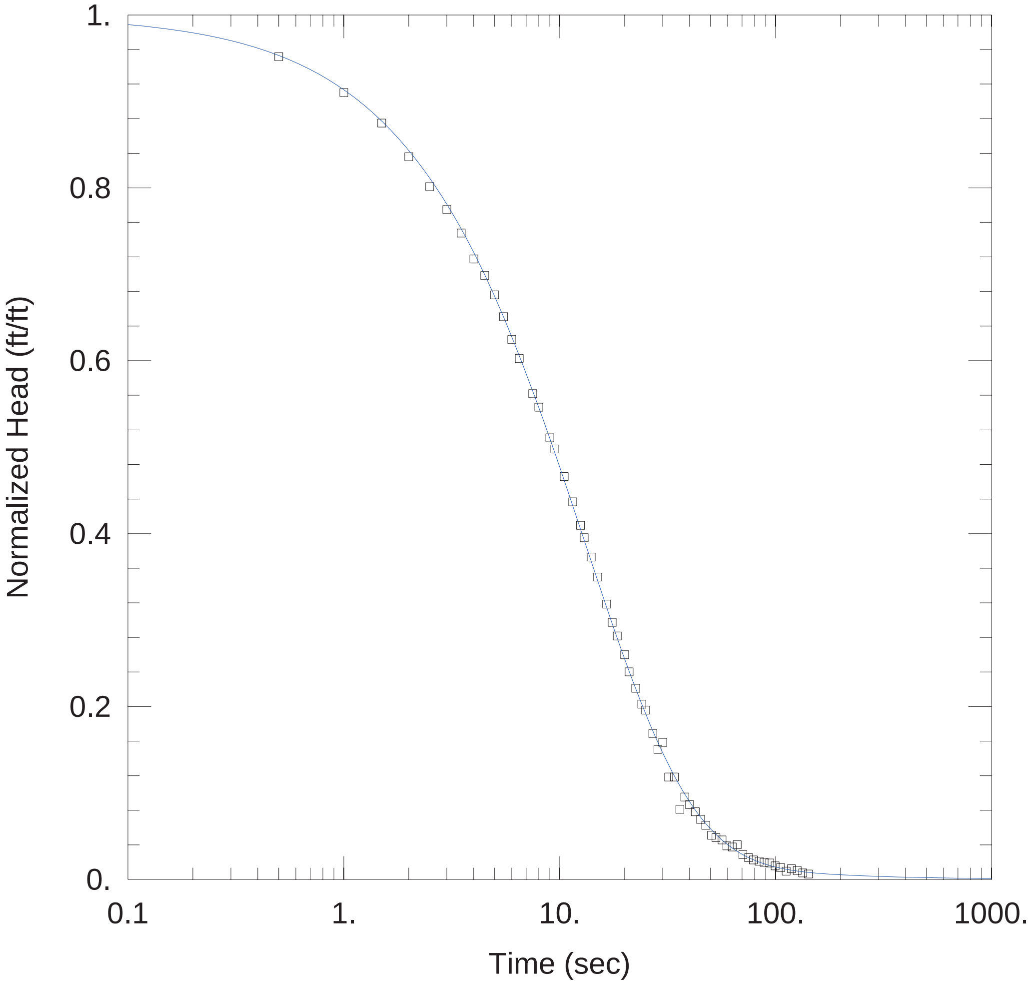
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00351 cm/sec
Kz/Kr = 1.

Ss = 6.23E-6 ft^{-1}



APW-11 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-11
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 9.2 ft

WELL DATA (APW-11)

Initial Displacement: 1.47 ft
Total Well Penetration Depth: 7. ft
Casing Radius: 0.086 ft

Static Water Column Height: 43.48 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

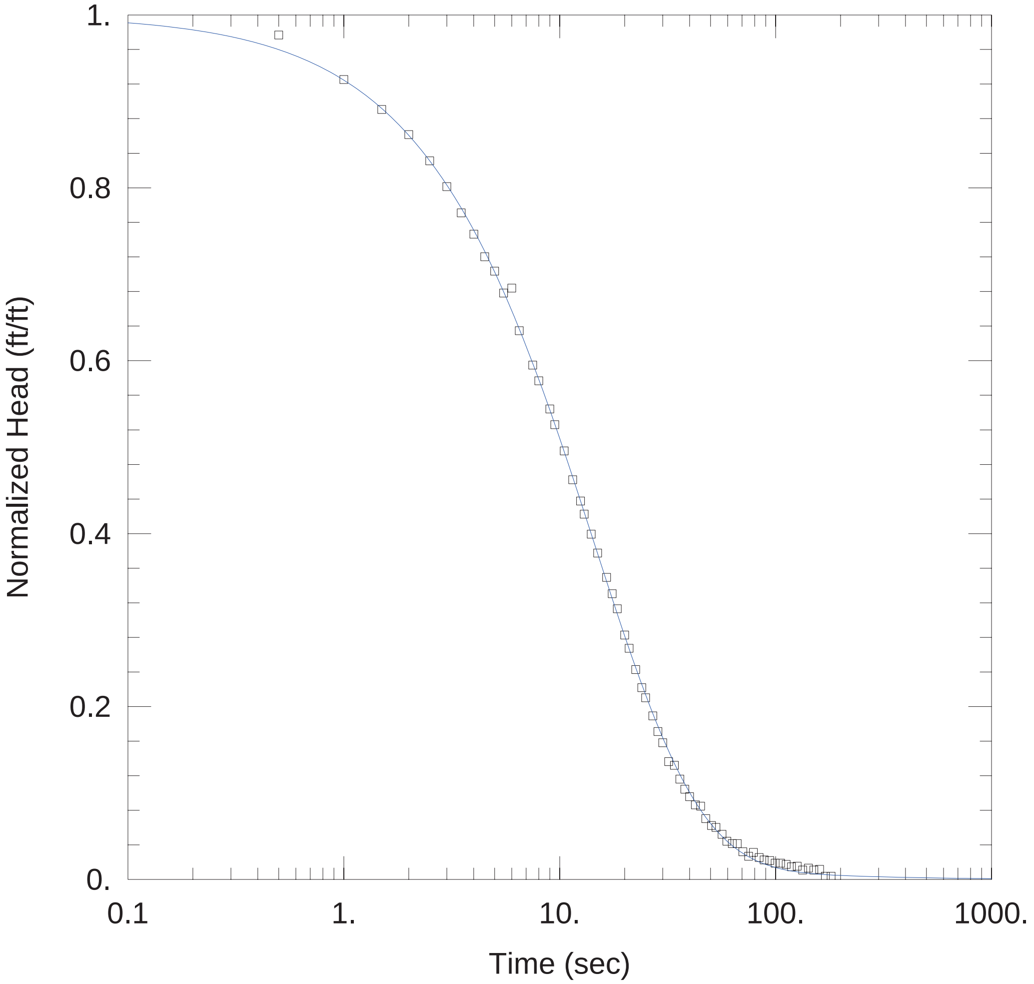
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00588 cm/sec
Kz/Kr = 1.

Ss = 3.02E-7 ft^{-1}



APW-11 RH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-11
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 9.2 ft

WELL DATA (APW-11 RH02)

Initial Displacement: 1.38 ft
Total Well Penetration Depth: 7. ft
Casing Radius: 0.086 ft

Static Water Column Height: 43.53 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

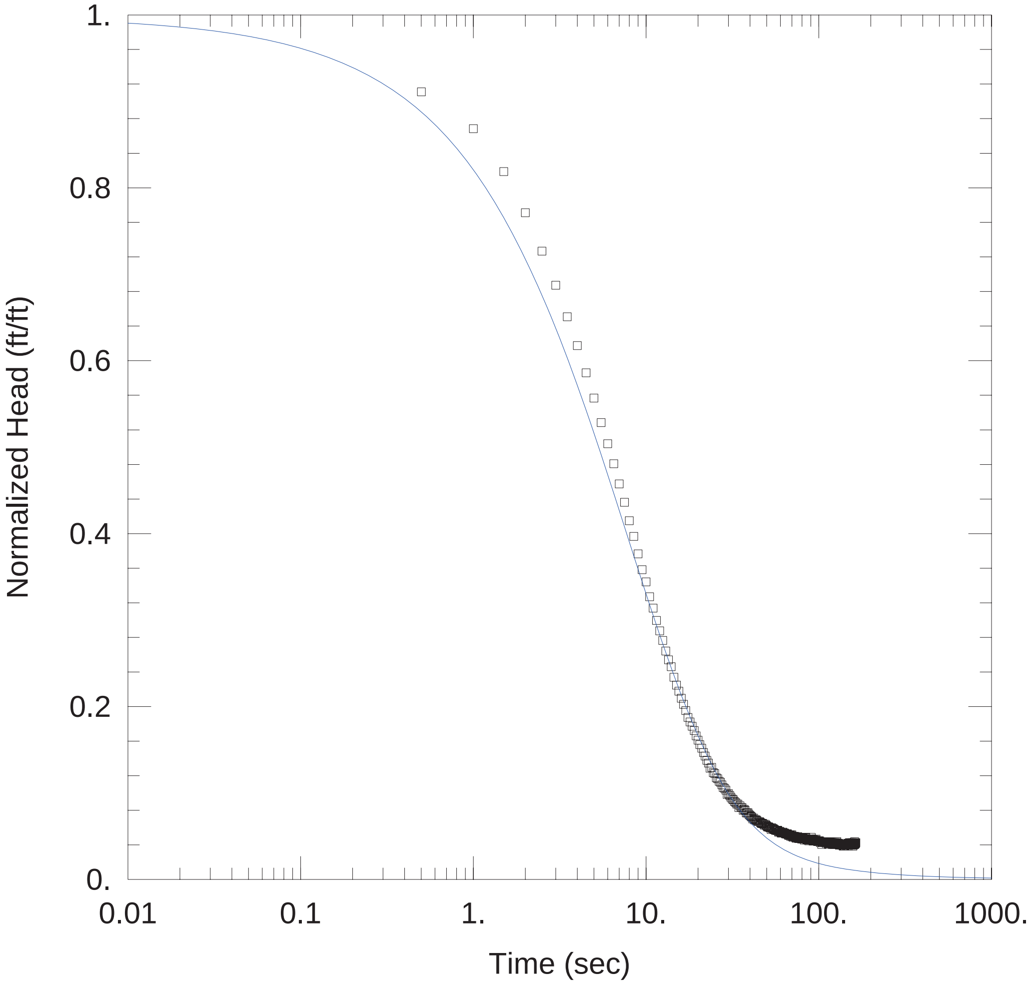
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00676 cm/sec
Kz/Kr = 1.

Ss = 6.55E-9 ft^{-1}



APW-12 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-12
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-12)

Initial Displacement: 0.988 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.086 ft
Static Water Column Height: 19.03 ft
Screen Length: 3.5 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.05 cm^2/sec
S = 0.000733

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
75.5	0.049	160.5	0.041
76.	0.047	161.	0.04
76.5	0.047	161.5	0.043
77.	0.047	162.	0.04
77.5	0.048	162.5	0.041
78.	0.047	163.	0.041
78.5	0.047	163.5	0.041
79.	0.047	164.	0.042
79.5	0.046		

SOLUTION

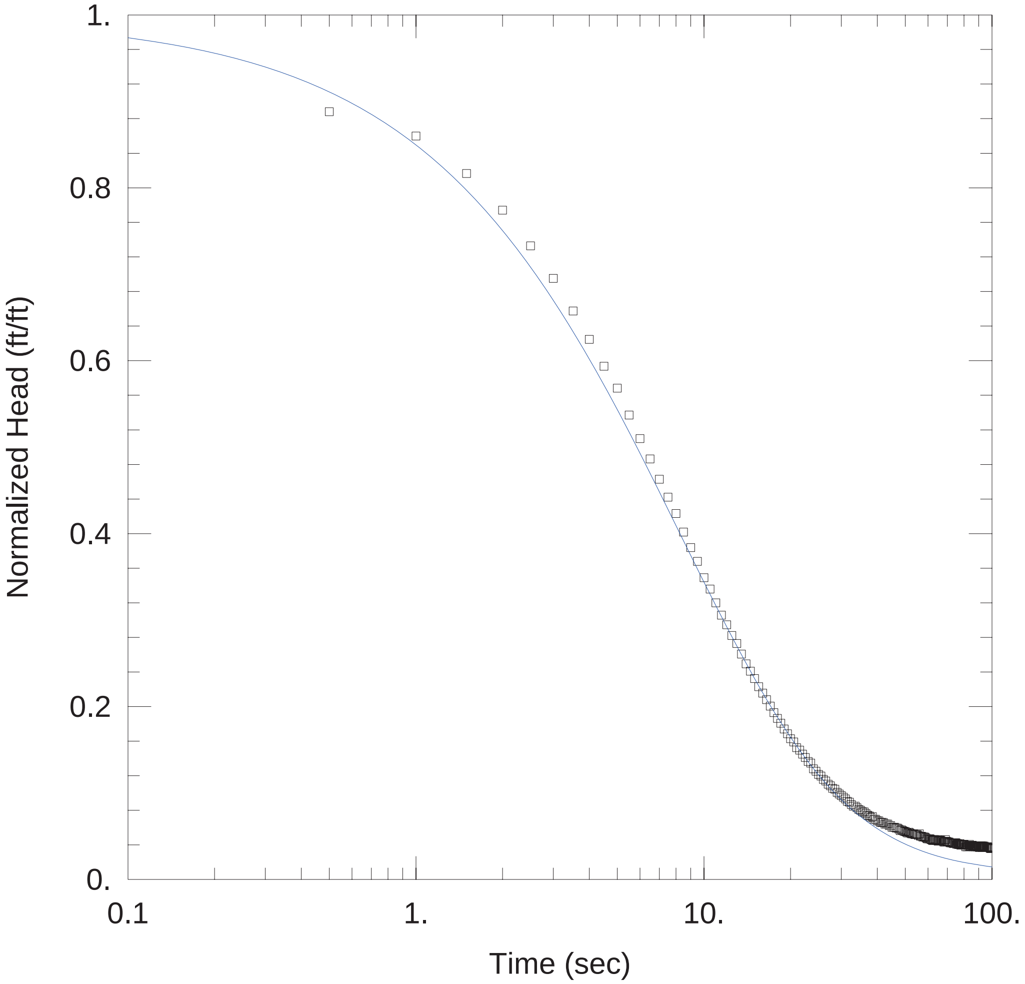
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.05	cm^2/sec
S	0.000733	

K = T/b = 0.009843 cm/sec
Ss = S/b = 0.0002094 1/ft



APW-12 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-12
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-12)

Initial Displacement: 1.063 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 19.06 ft
Screen Length: 3.5 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.35 cm^2/sec
S = 0.000108

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
40.	0.072	94.5	0.04
40.5	0.072	95.	0.04
41.	0.07	95.5	0.04
41.5	0.07	96.	0.04
42.	0.07	96.5	0.039
42.5	0.068	97.	0.039
43.	0.068	97.5	0.039
43.5	0.068	98.	0.04
44.	0.066	98.5	0.038
44.5	0.066	99.	0.038
45.	0.064	99.5	0.038
45.5	0.064	100.	0.039
46.	0.064	100.5	0.036
46.5	0.063	101.	0.038

SOLUTION

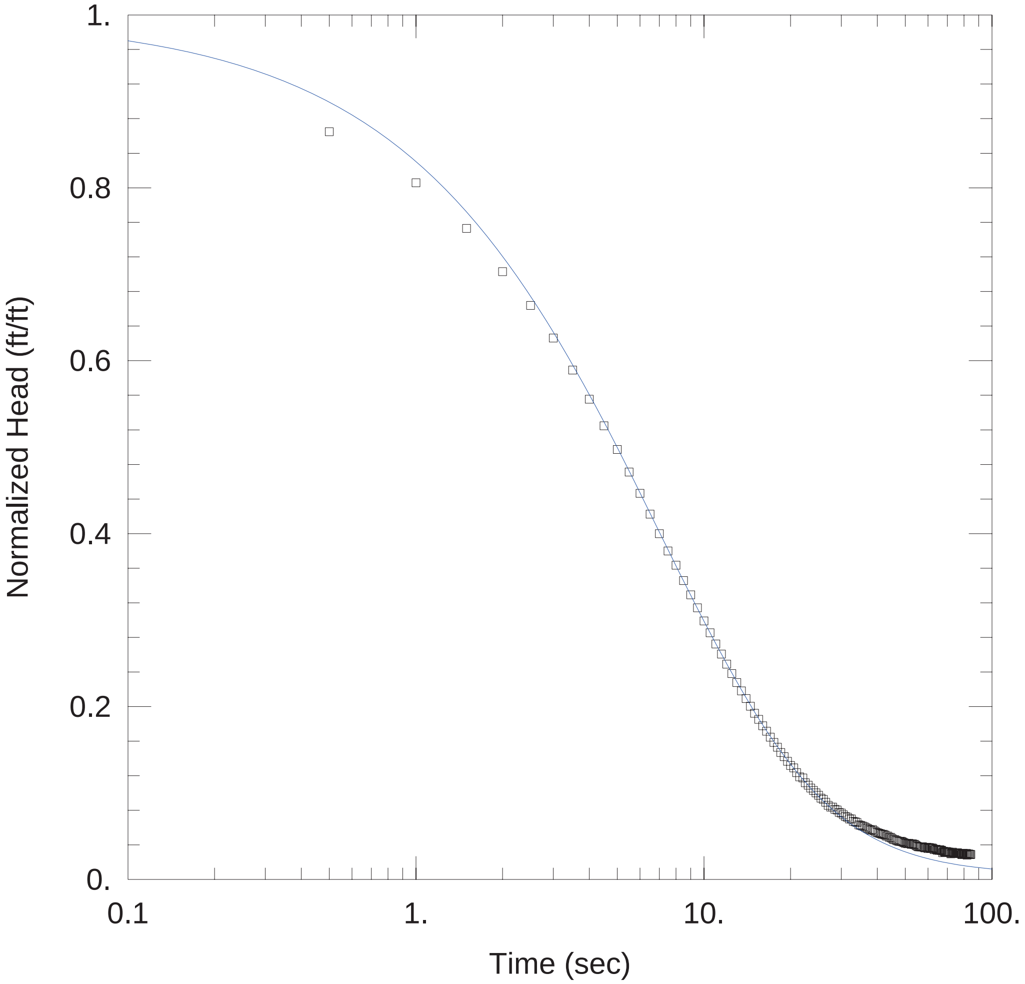
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.35	cm^2/sec
S	0.000108	

K = T/b = 0.01265 cm/sec
Ss = S/b = 3.086E-5 1/ft



APW-12 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-12
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-12)

Initial Displacement: -1.458 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 19.06 ft
Screen Length: 3.5 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.57 cm^2/sec
S = 0.000114

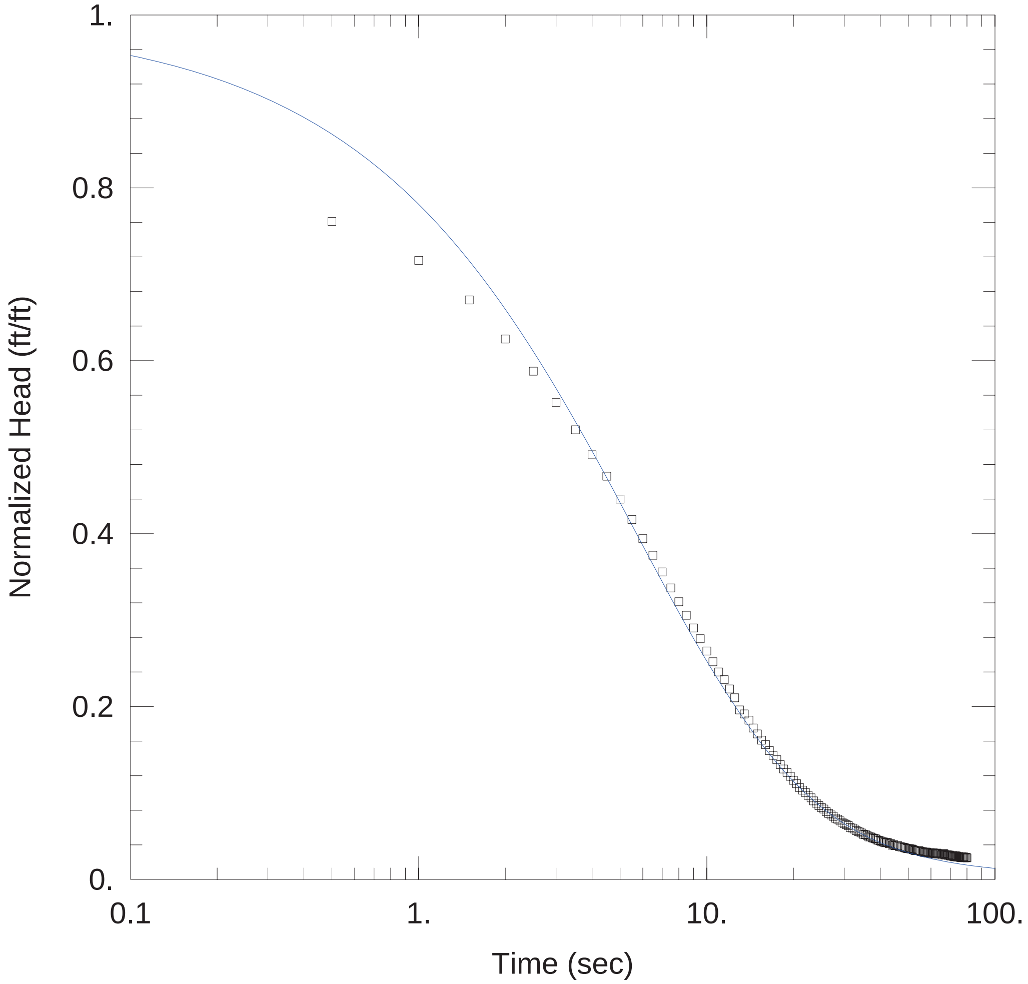
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.57	cm^2/sec
S	0.000114	

K = T/b = 0.01472 cm/sec
Ss = S/b = 3.257E-5 1/ft



APW-12 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-12
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-12)

Initial Displacement: -1.771 ft
Static Water Column Height: 19.06 ft
Total Well Penetration Depth: 3.5 ft
Screen Length: 3.5 ft
Casing Radius: 0.08625 ft
Well Radius: 0.25 ft

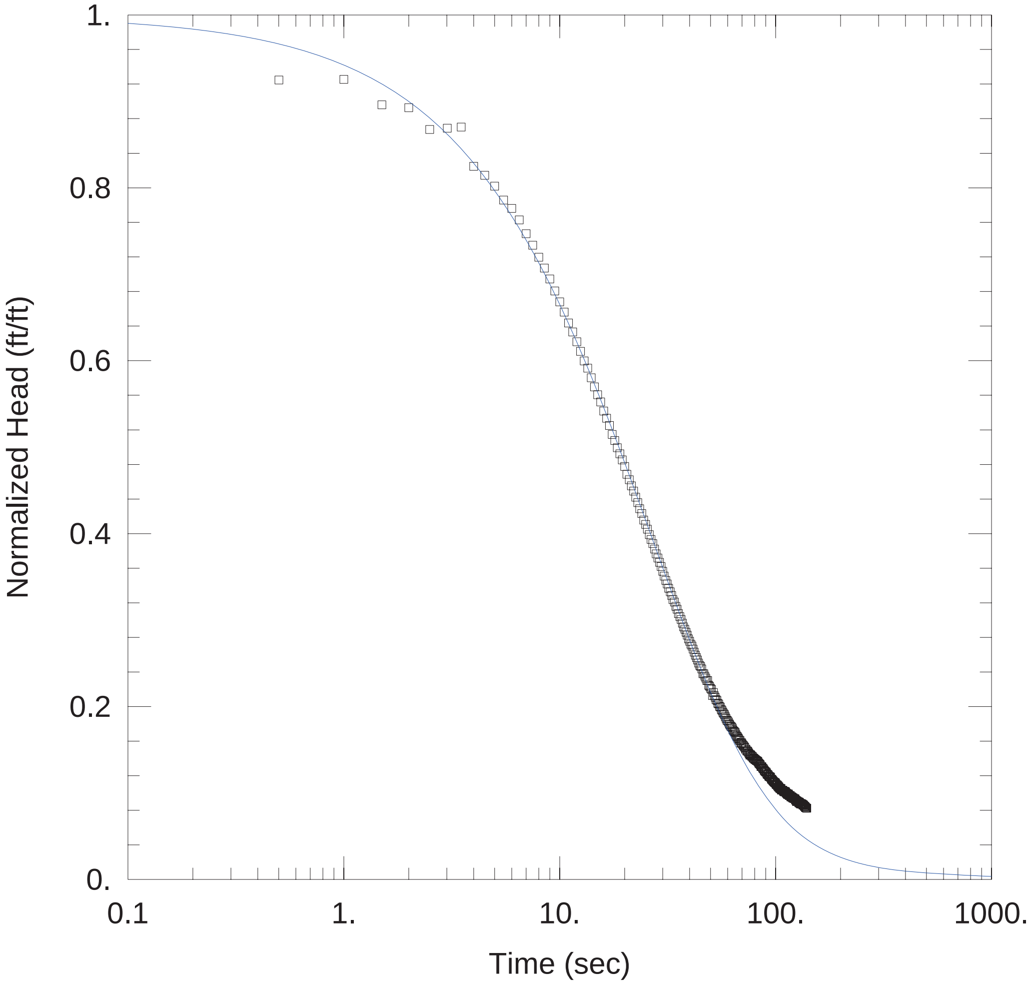
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.433 cm^2/sec
S = 0.000733

Estimated Parameters

Parameter	Estimate	
T	1.433	cm^2/sec
S	0.000733	

K = T/b = 0.01343 cm/sec
Ss = S/b = 0.0002094 1/ft



APW-13 FH-01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-13
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 7.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-13)

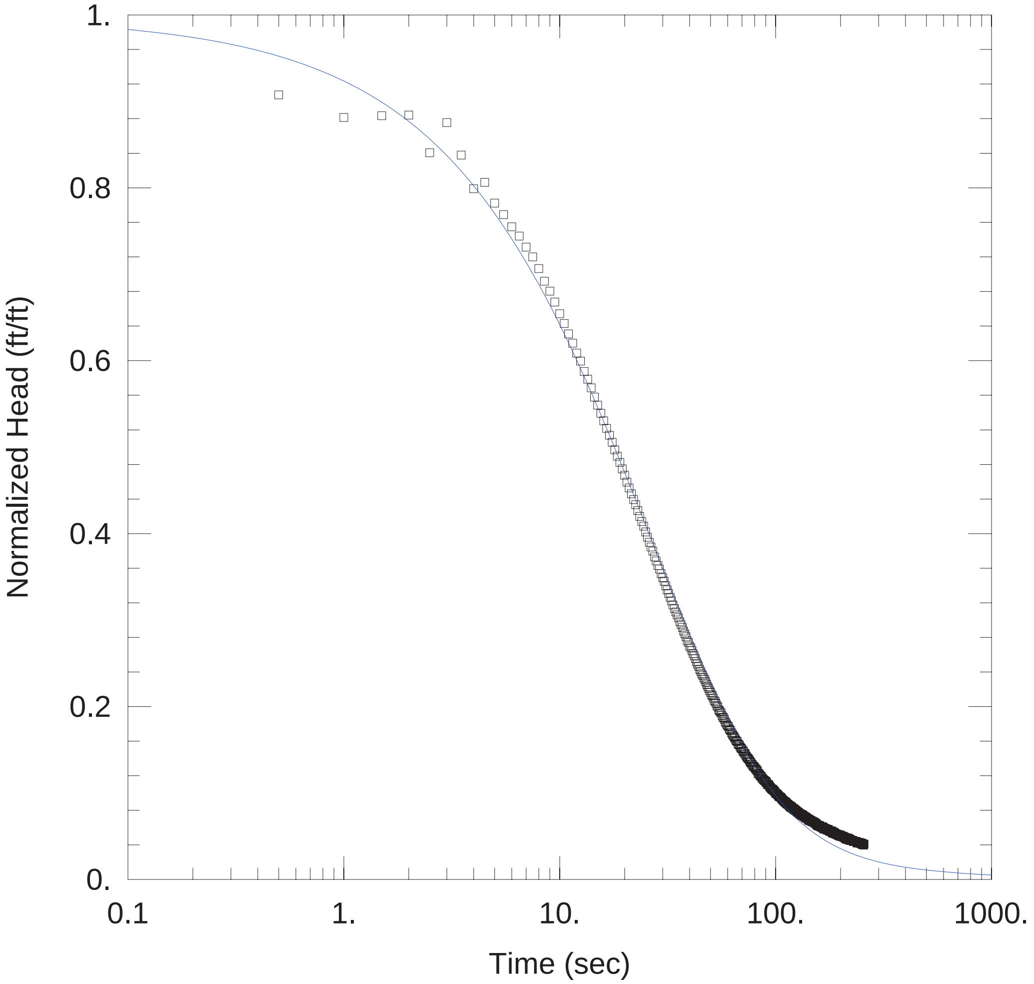
Initial Displacement: 1.434 ft
Total Well Penetration Depth: 5.9 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 34.23 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.475 cm^2/sec
S = 4.47E-5

S	4.47E-5

K = T/b = 0.002106 cm/sec
Ss = S/b = 6.041E-6 1/ft



APW-13 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-13
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 7.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-13)

Initial Displacement: 1.493 ft
Total Well Penetration Depth: 5.9 ft
Casing Radius: 0.086 ft
Static Water Column Height: 34.26 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.329 cm^2/sec
S = 0.000562

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
106.	0.141	238.5	0.064
106.5	0.14	239.	0.063
107.	0.139	239.5	0.064
107.5	0.138	240.	0.063
108.	0.137	240.5	0.064
108.5	0.137	241.	0.063
109.	0.136	241.5	0.063
109.5	0.135	242.	0.063
110.	0.134	242.5	0.064
110.5	0.134	243.	0.063
111.	0.134	243.5	0.063
111.5	0.132	244.	0.064
112.	0.133	244.5	0.063
112.5	0.131	245.	0.063
113.	0.13	245.5	0.063
113.5	0.13	246.	0.062
114.	0.13	246.5	0.063
114.5	0.129	247.	0.063
115.	0.129	247.5	0.063
115.5	0.127	248.	0.062
116.	0.127	248.5	0.062
116.5	0.126	249.	0.063
117.	0.127	249.5	0.062
117.5	0.124	250.	0.062
118.	0.125	250.5	0.061
118.5	0.125	251.	0.062
119.	0.125	251.5	0.062
119.5	0.123	252.	0.06
120.	0.123	252.5	0.061
120.5	0.123	253.	0.061
121.	0.121	253.5	0.06
121.5	0.121	254.	0.061
122.	0.122	254.5	0.061
122.5	0.12	255.	0.061
123.	0.12	255.5	0.06
123.5	0.119	256.	0.059
124.	0.119	256.5	0.061
124.5	0.119	257.	0.061

SOLUTION

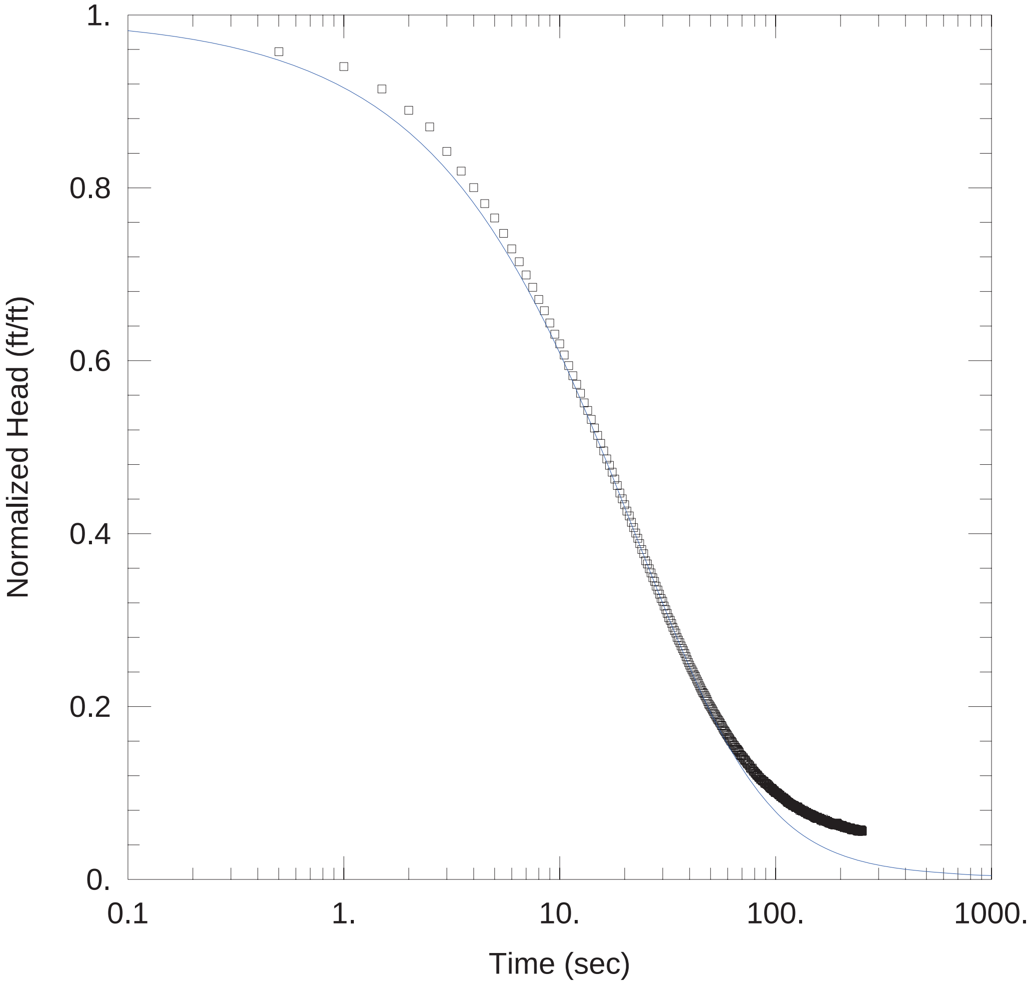
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.329	cm^2/sec
S	0.000562	

K = T/b = 0.001459 cm/sec
Ss = S/b = 7.595E-5 1/ft



APW-13 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-13
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 7.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-13)

Initial Displacement: -1.622 ft
Total Well Penetration Depth: 5.9 ft
Casing Radius: 0.086 ft
Static Water Column Height: 34.22 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.384 cm^2/sec
S = 0.000541

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
106.5	-0.155	236.5	-0.093
107.	-0.155	237.	-0.094
107.5	-0.153	237.5	-0.093
108.	-0.153	238.	-0.092
108.5	-0.152	238.5	-0.091
109.	-0.153	239.	-0.092
109.5	-0.152	239.5	-0.092
110.	-0.151	240.	-0.091
110.5	-0.15	240.5	-0.092
111.	-0.149	241.	-0.092
111.5	-0.149	241.5	-0.093
112.	-0.149	242.	-0.092
112.5	-0.147	242.5	-0.09
113.	-0.146	243.	-0.092
113.5	-0.146	243.5	-0.092
114.	-0.144	244.	-0.091
114.5	-0.145	244.5	-0.093
115.	-0.145	245.	-0.091
115.5	-0.144	245.5	-0.093
116.	-0.143	246.	-0.093
116.5	-0.142	246.5	-0.092
117.	-0.142	247.	-0.092
117.5	-0.142	247.5	-0.093
118.	-0.141	248.	-0.092
118.5	-0.141	248.5	-0.092
119.	-0.14	249.	-0.092
119.5	-0.14	249.5	-0.093
120.	-0.138	250.	-0.092
120.5	-0.139	250.5	-0.092
121.	-0.139	251.	-0.091
121.5	-0.139	251.5	-0.09
122.	-0.138	252.	-0.091
122.5	-0.138	252.5	-0.091

SOLUTION

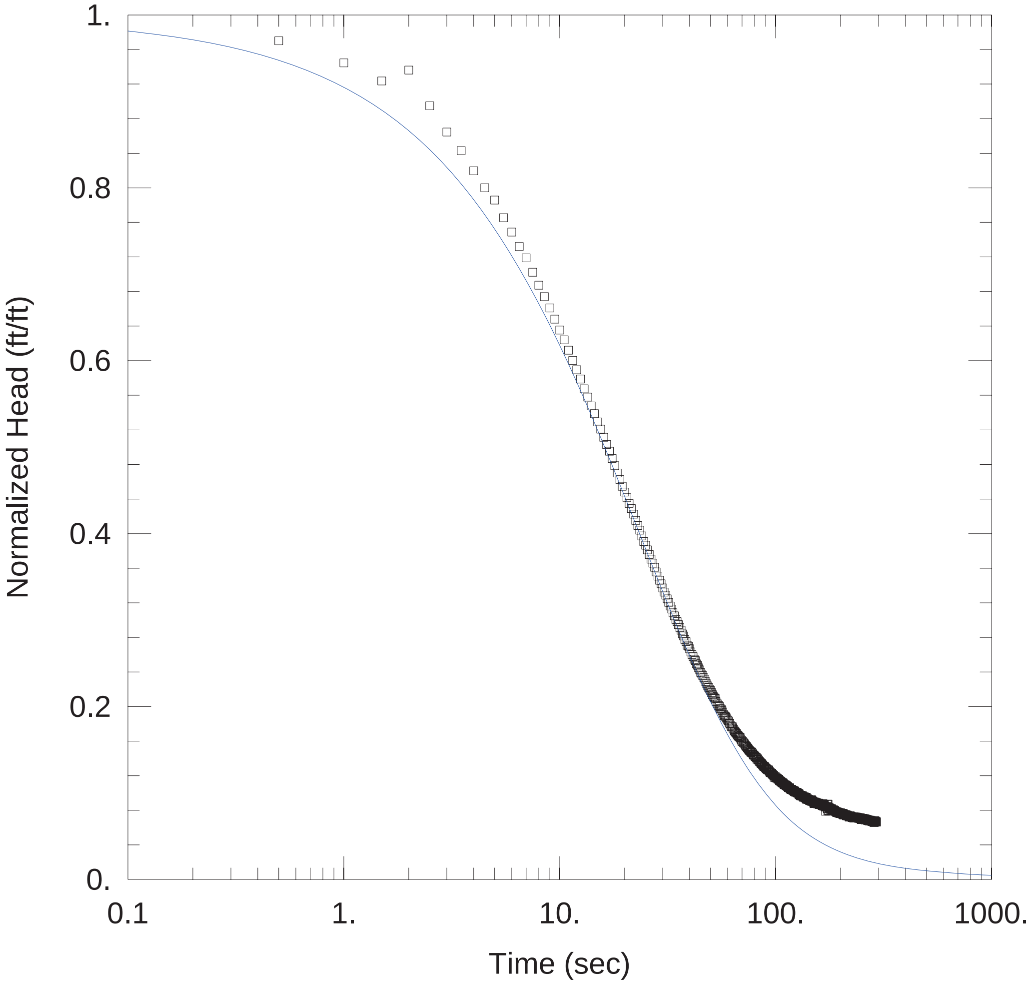
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.384	cm^2/sec
S	0.000541	

K = T/b = 0.001702 cm/sec
Ss = S/b = 7.311E-5 1/ft



APW-13 RH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-13
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 7.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-13)

Initial Displacement: -1.676 ft
Total Well Penetration Depth: 5.9 ft
Casing Radius: 0.086 ft
Static Water Column Height: 34.26 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.353 cm^2/sec
S = 0.000661

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
140.	-0.157	290.5	-0.111
140.5	-0.156	291.	-0.112
141.	-0.155	291.5	-0.113
141.5	-0.155	292.	-0.112
142.	-0.155	292.5	-0.111
142.5	-0.155	293.	-0.112
143.	-0.154	293.5	-0.111
143.5	-0.153		

SOLUTION

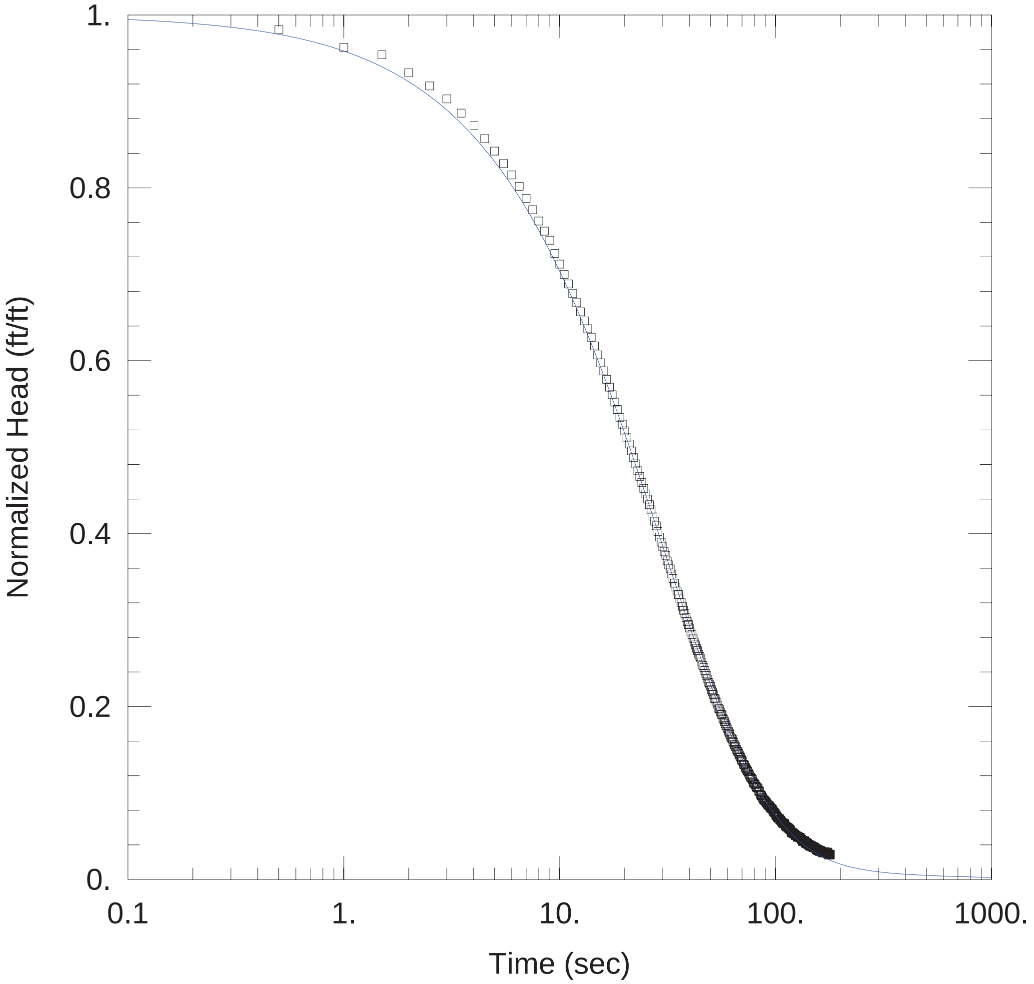
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.353	cm^2/sec
S	0.000661	

K = T/b = 0.001565 cm/sec
Ss = S/b = 8.932E-5 1/ft



APW-14 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

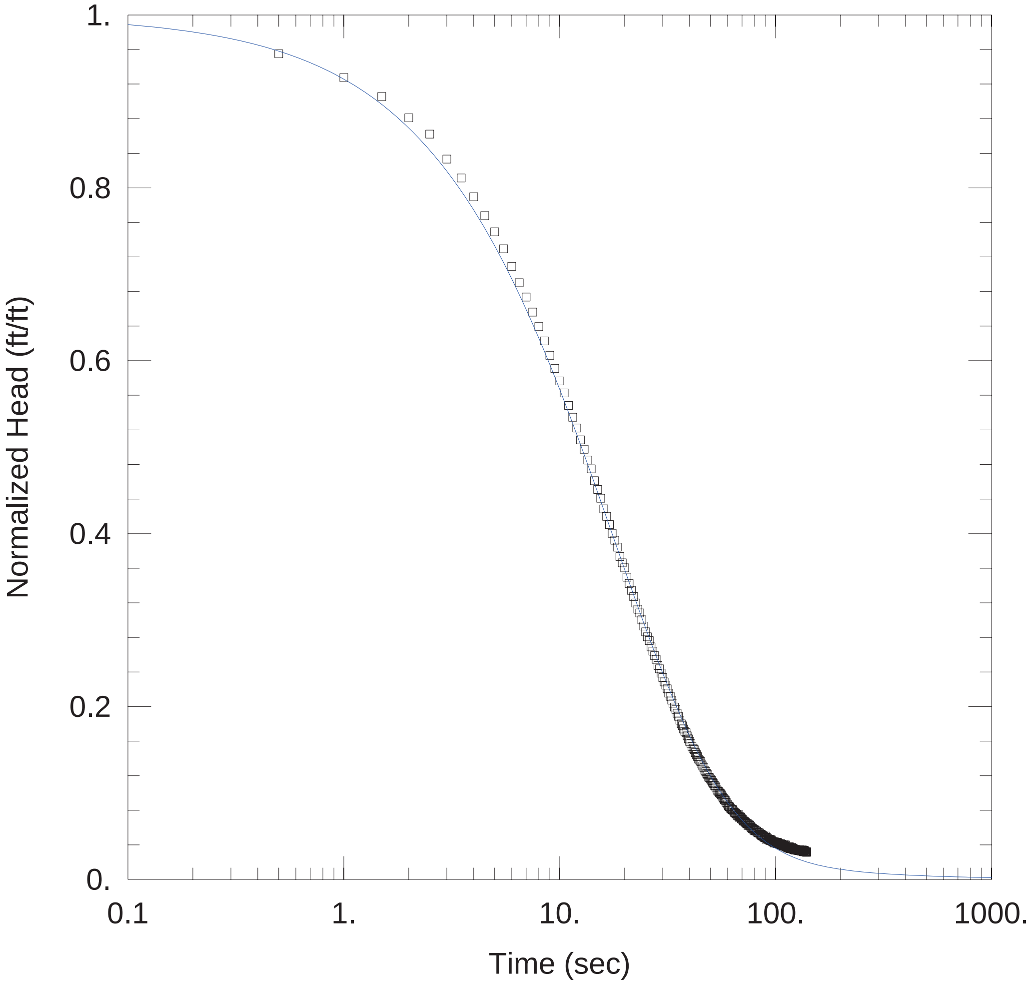
Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

Initial Displacement: 1.523 ft	Static Water Column Height: 36.72 ft
Total Well Penetration Depth: 5. ft	Screen Length: 5. ft
Casing Radius: 0.086 ft	Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined	Solution Method: KGS Model
Kr = 0.00388 cm/sec	Ss = 4.23E-8 ft^{-1}
Kz/Kr = 1.	



APW-14 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

Initial Displacement: 1.379 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.086 ft

Static Water Column Height: 36.73 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

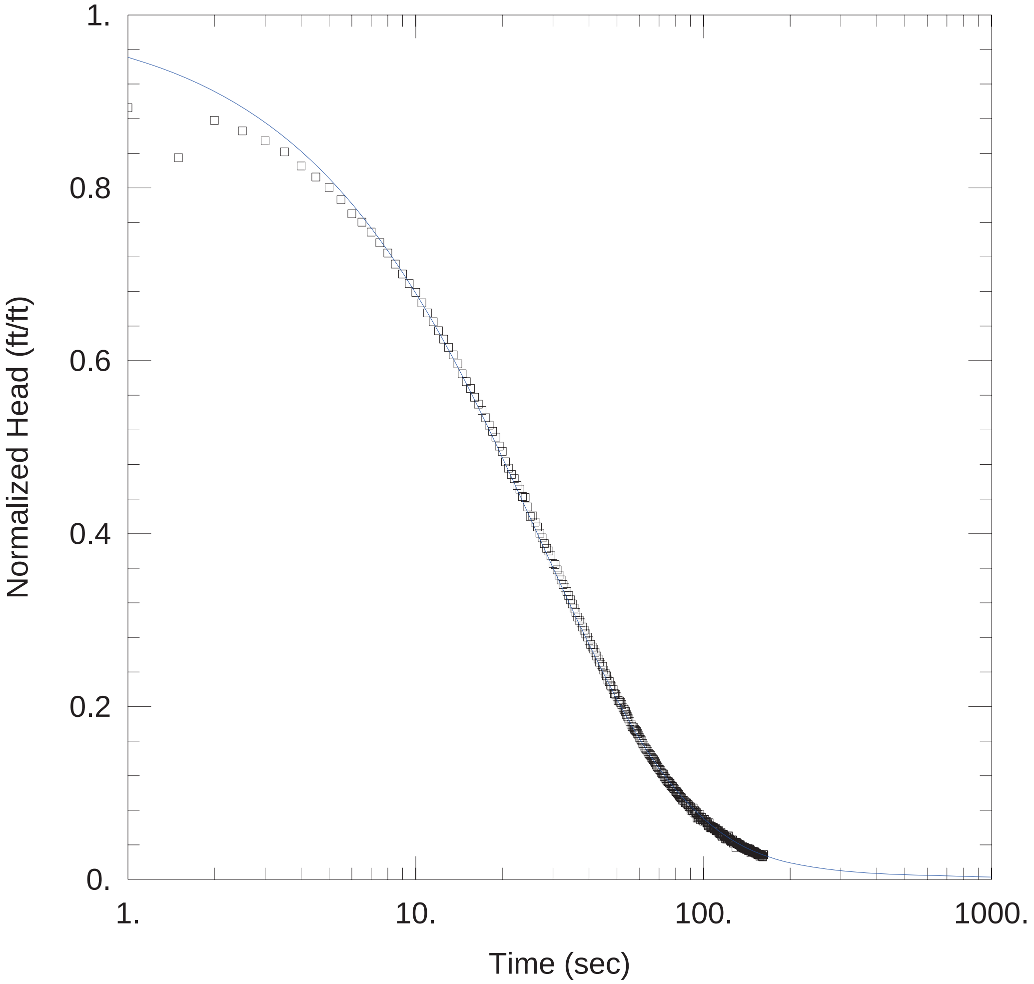
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00433 cm/sec
Kz/Kr = 1.

Ss = 4.29E-6 ft^{-1}



APW-14 FH3

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

Initial Displacement: 1.648 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.086 ft

Static Water Column Height: 36.72 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

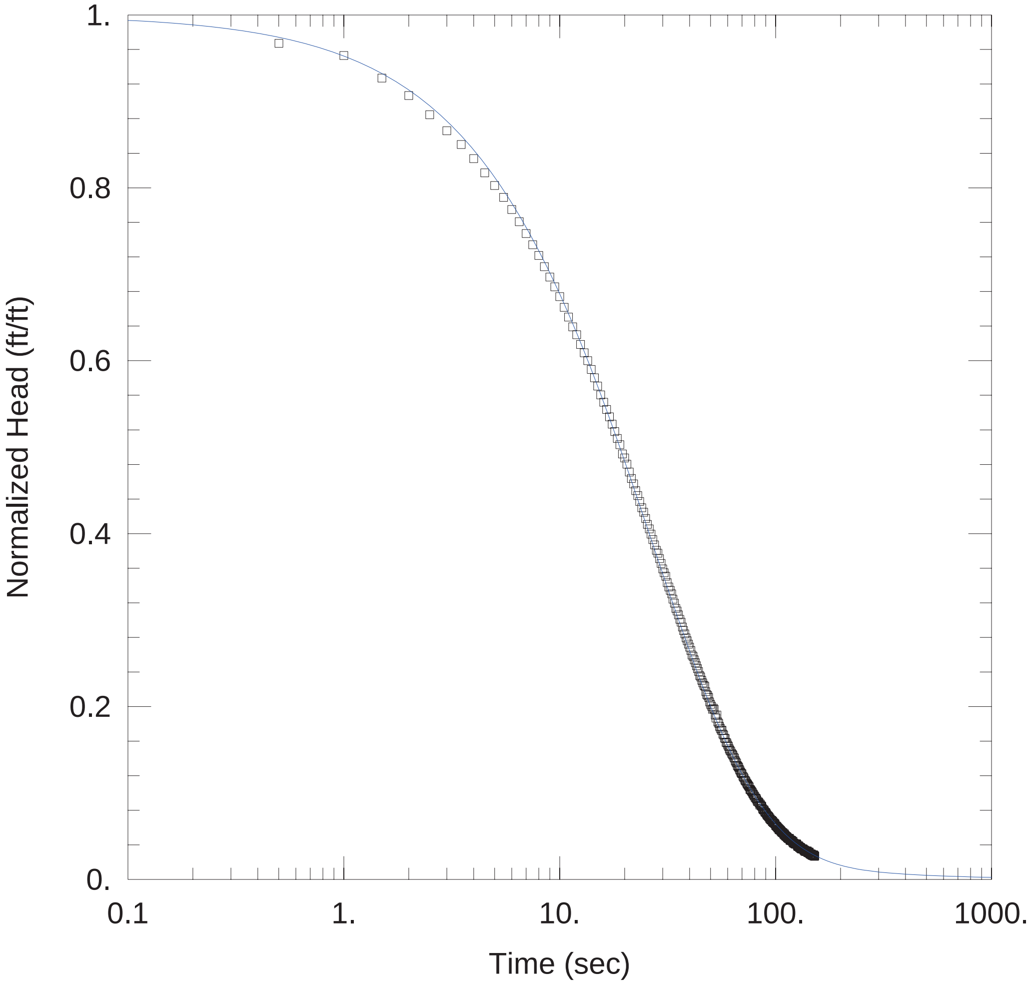
SOLUTION

Aquifer Model: Confined

Kr = 0.00332 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 8.98E-7 ft^{-1}



APW-14 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

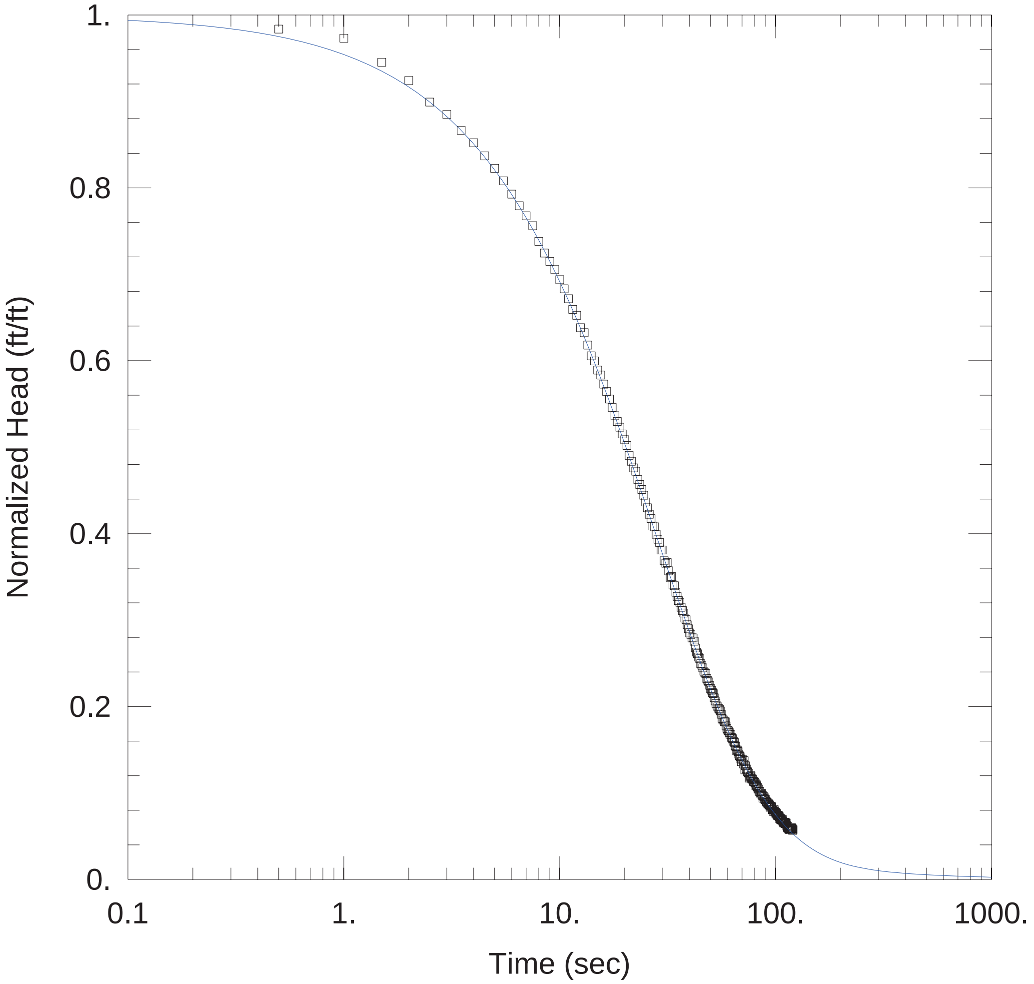
Initial Displacement: -1.768 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.086 ft

Static Water Column Height: 36.76 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00381 cm/sec
Kz/Kr = 1.
Ss = 2.12E-7 ft^{-1}



APW-14 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

Initial Displacement: -1.042 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.086 ft

Static Water Column Height: 36.72 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

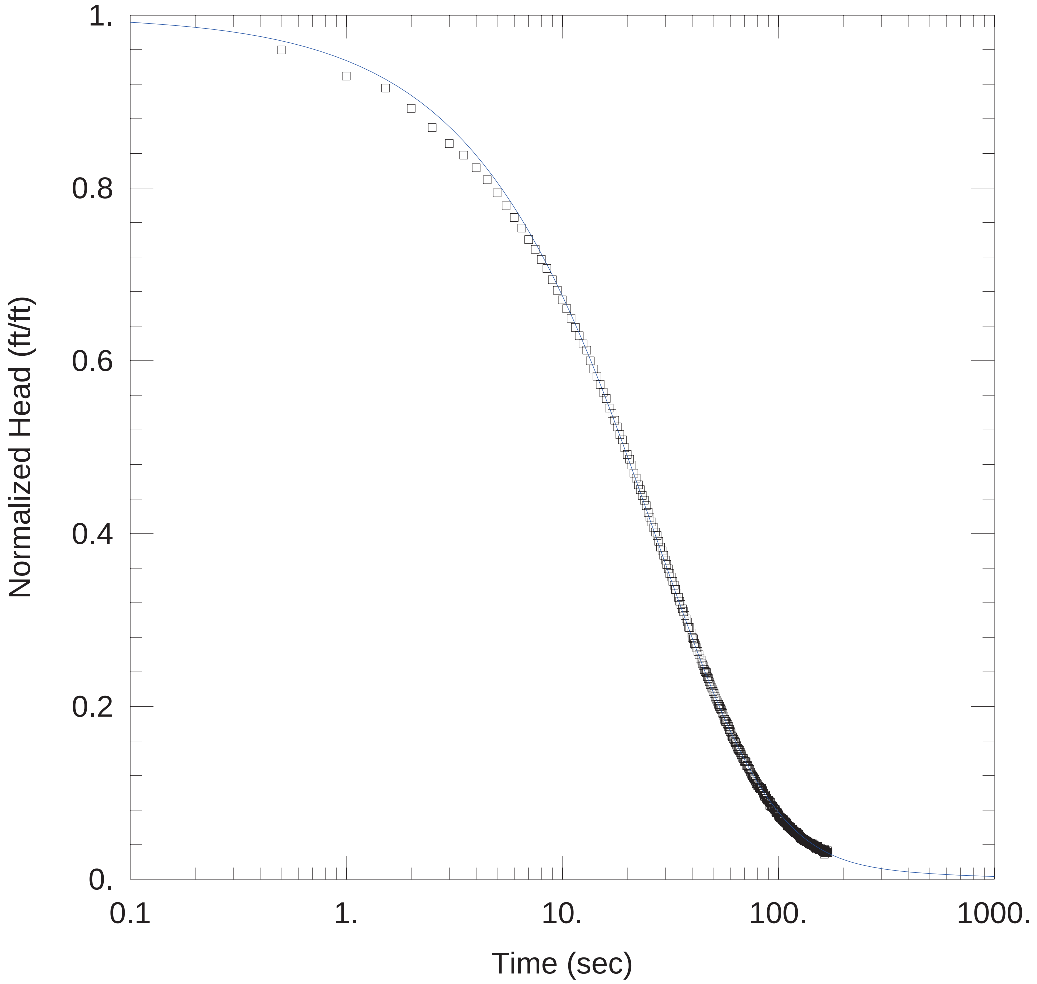
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00336 cm/sec
Kz/Kr = 1.

Ss = 4.36E-7 ft^{-1}



APW-14 RH3

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-14
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 6.3 ft

WELL DATA (APW-14)

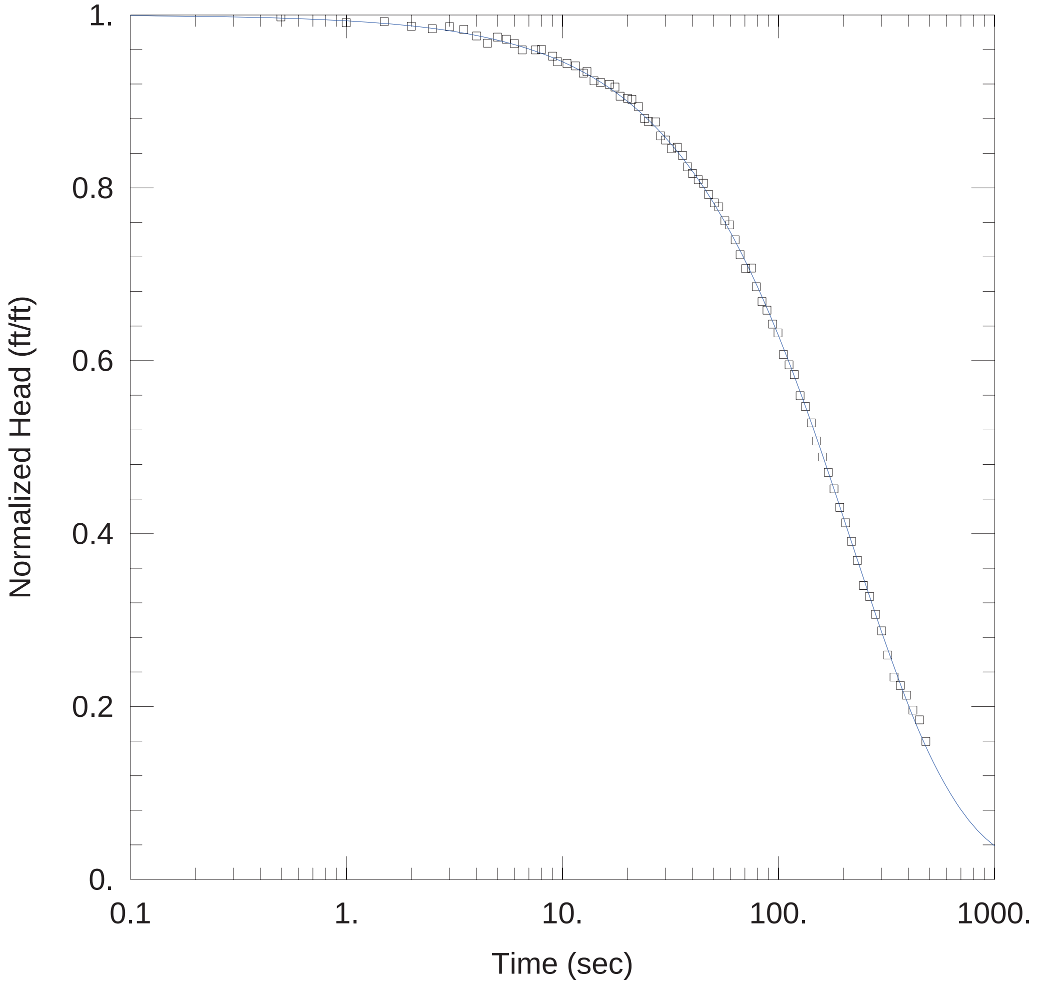
Initial Displacement: -1.79 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.08625 ft

Static Water Column Height: 36.75 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Kr = 0.0028 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model
Ss = 4.94E-6 ft^{-1}



APW-15 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-15
Test Date: 3/31/2021

AQUIFER DATA

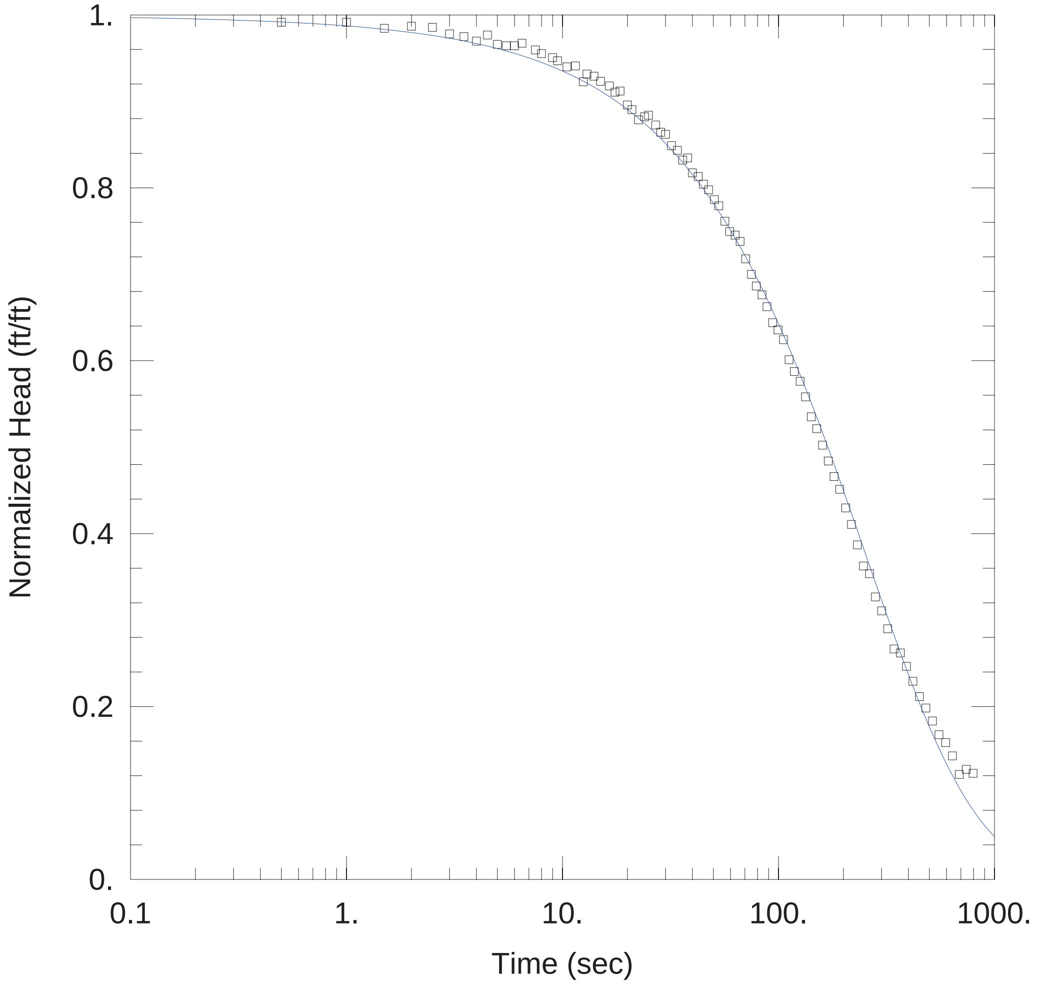
Saturated Thickness: 7.1 ft

WELL DATA (APW-15)

Initial Displacement: 1.68 ft	Static Water Column Height: 82.47 ft
Total Well Penetration Depth: 50.5 ft	Screen Length: 5. ft
Casing Radius: 0.086 ft	Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined	Solution Method: KGS Model
Kr = 0.000485 cm/sec	Ss = 3.29E-7 ft^{-1}
Kz/Kr = 1.	



APW-15 FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-15
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 51.8 ft

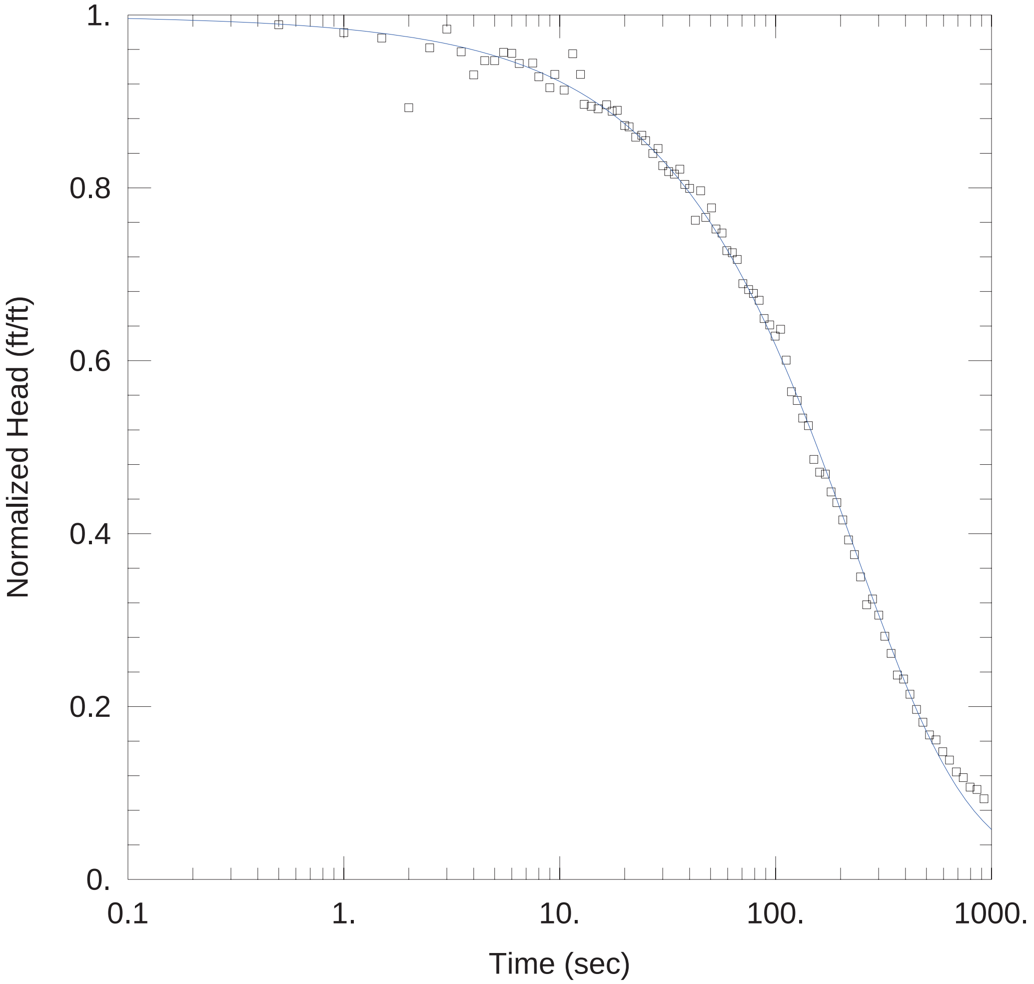
WELL DATA (APW-15)

Initial Displacement: 1.68 ft
Total Well Penetration Depth: 50.5 ft
Casing Radius: 0.086 ft
Static Water Column Height: 82.32 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0002 cm/sec
Kz/Kr = 1.
Ss = 5.25E-5 ft^{-1}



APW-15 RH-01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-15
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 7.1 ft

WELL DATA (APW-15)

Initial Displacement: 1.76 ft
Total Well Penetration Depth: 50.5 ft
Casing Radius: 0.086 ft

Static Water Column Height: 82.59 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

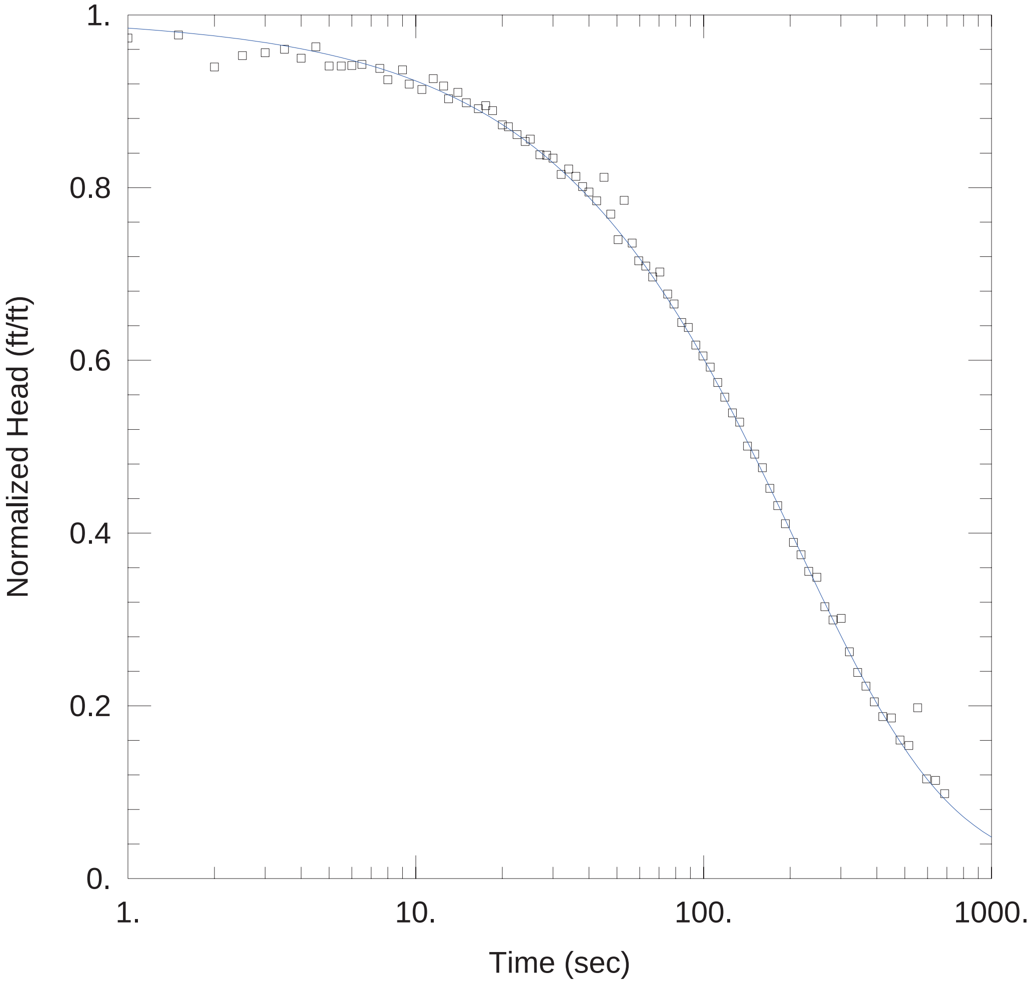
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.000281 cm/sec
Kz/Kr = 1.

Ss = 0.000132 ft^{-1}



APW-15 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-15
Test Date: 3/31/2021

AQUIFER DATA

Saturated Thickness: 7.1 ft

WELL DATA (APW-15)

Initial Displacement: 1.76 ft
Total Well Penetration Depth: 50.5 ft
Casing Radius: 0.086 ft

Static Water Column Height: 82.52 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

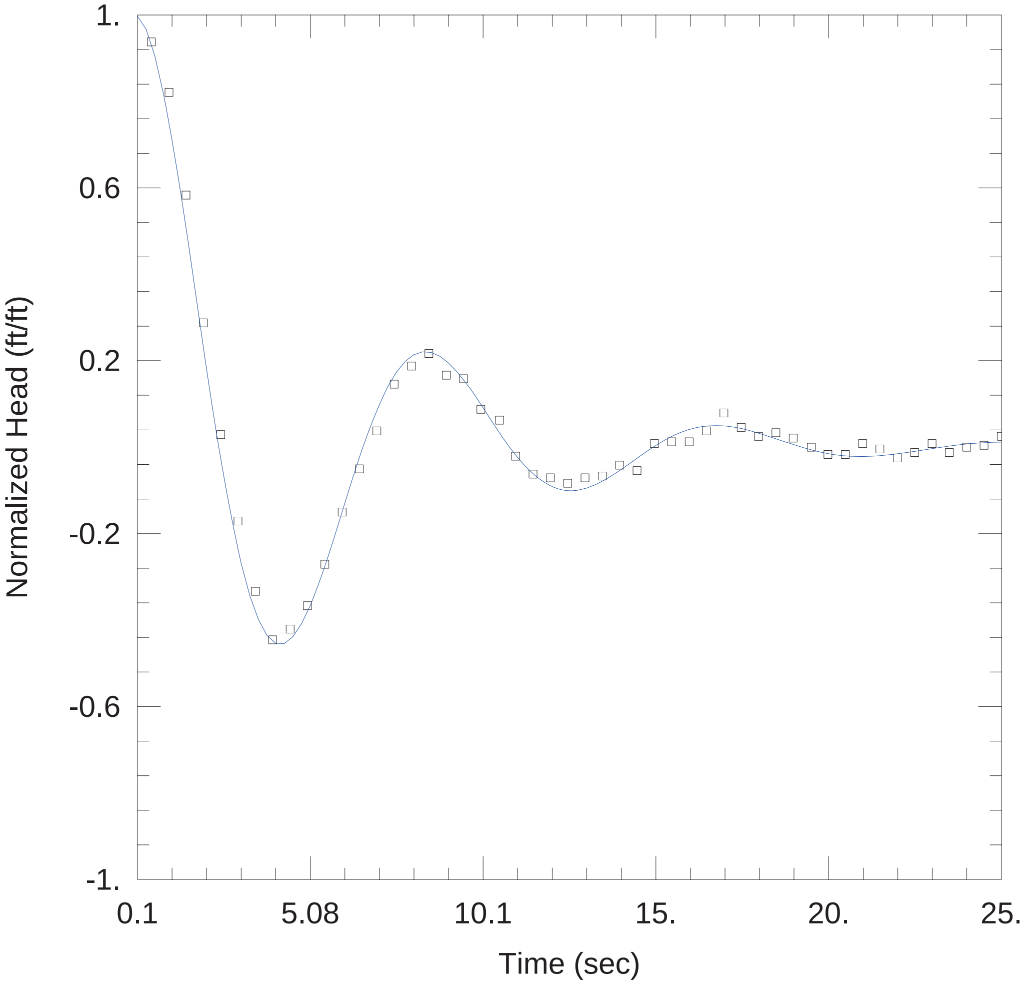
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00032 cm/sec
Kz/Kr = 1.

Ss = 8.48E-5 ft^{-1}



APW-16 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

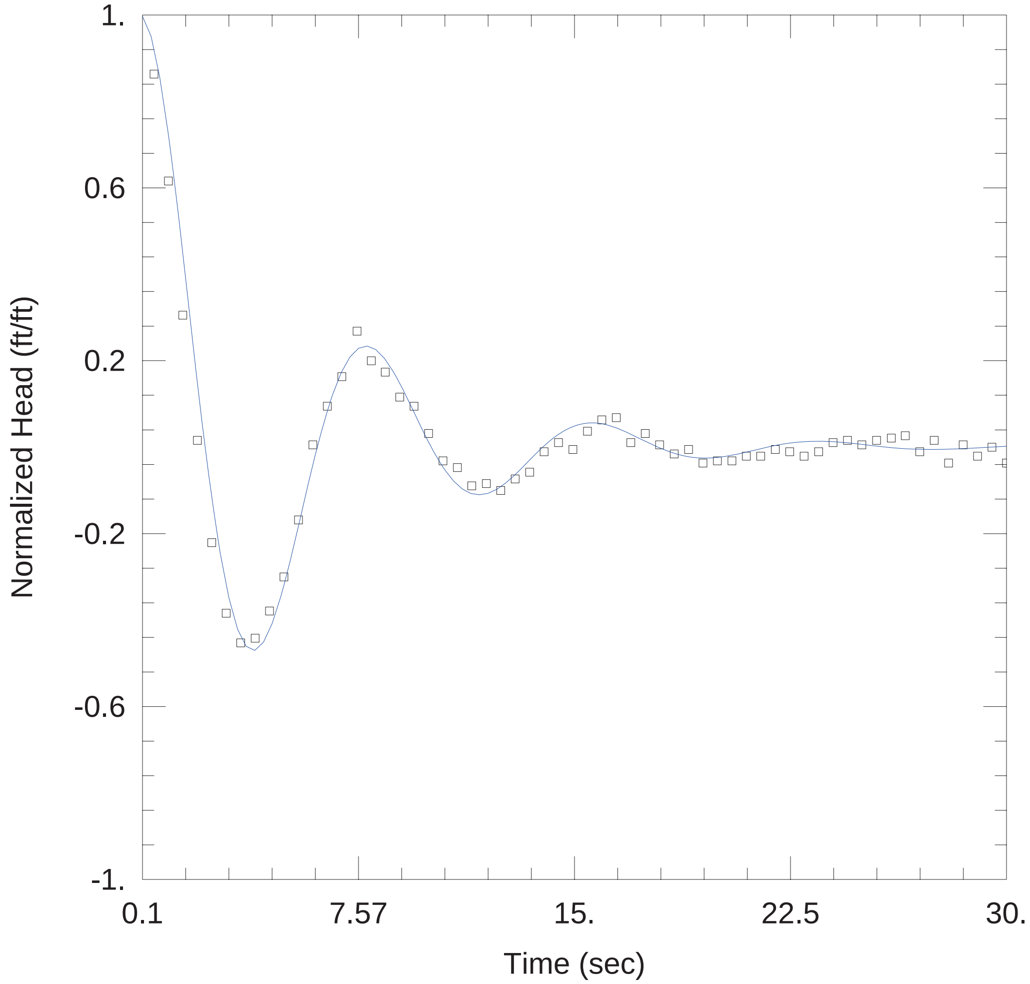
WELL DATA (APW-16)

Initial Displacement: 0.24 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.086 ft
Static Water Column Height: 64.37 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.124 cm/sec
Kz/Kr = 1.
Ss = 8.12E-7 ft^{-1}
Le = 56.01 ft



APW-16 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

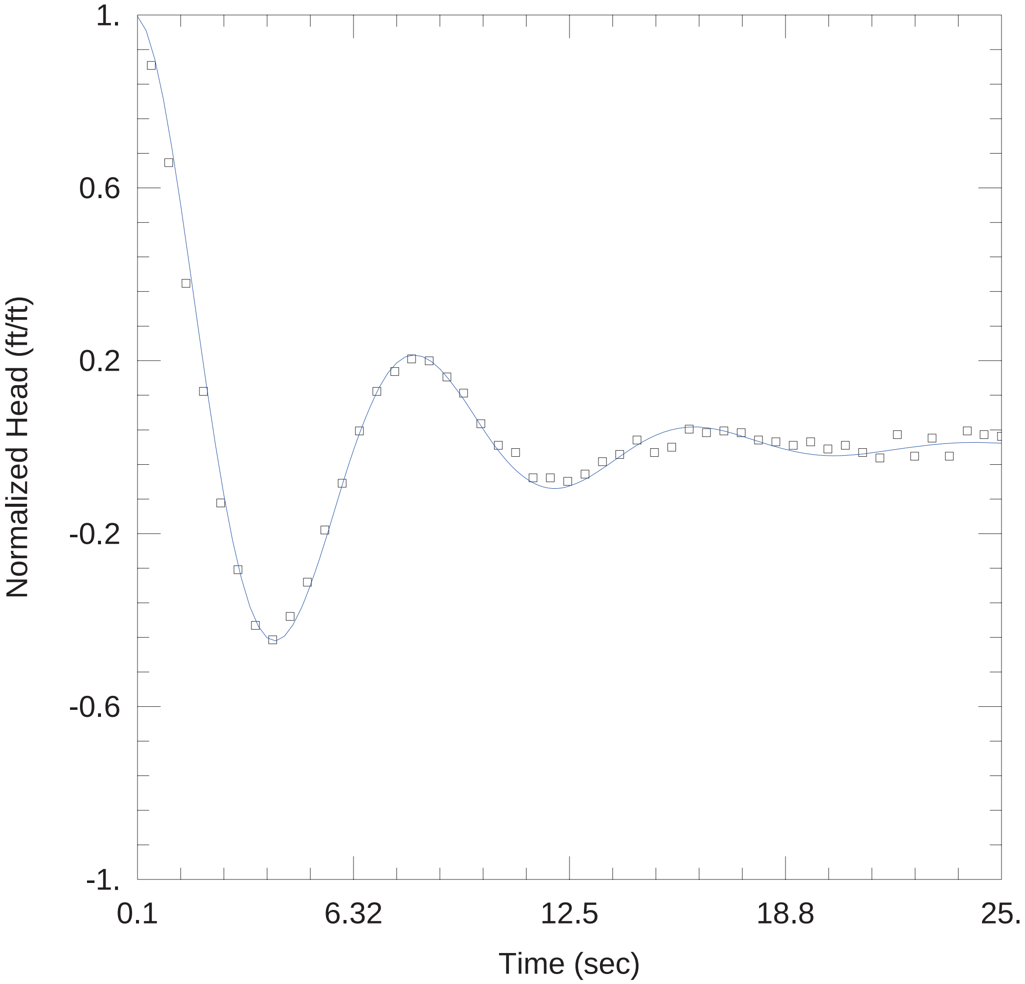
WELL DATA (APW-16)

Initial Displacement: 0.19 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 64.22 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.141 cm/sec
Kz/Kr = 1.
Ss = 6.55E-7 ft^{-1}
Le = 48.91 ft



APW-16 FH03

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

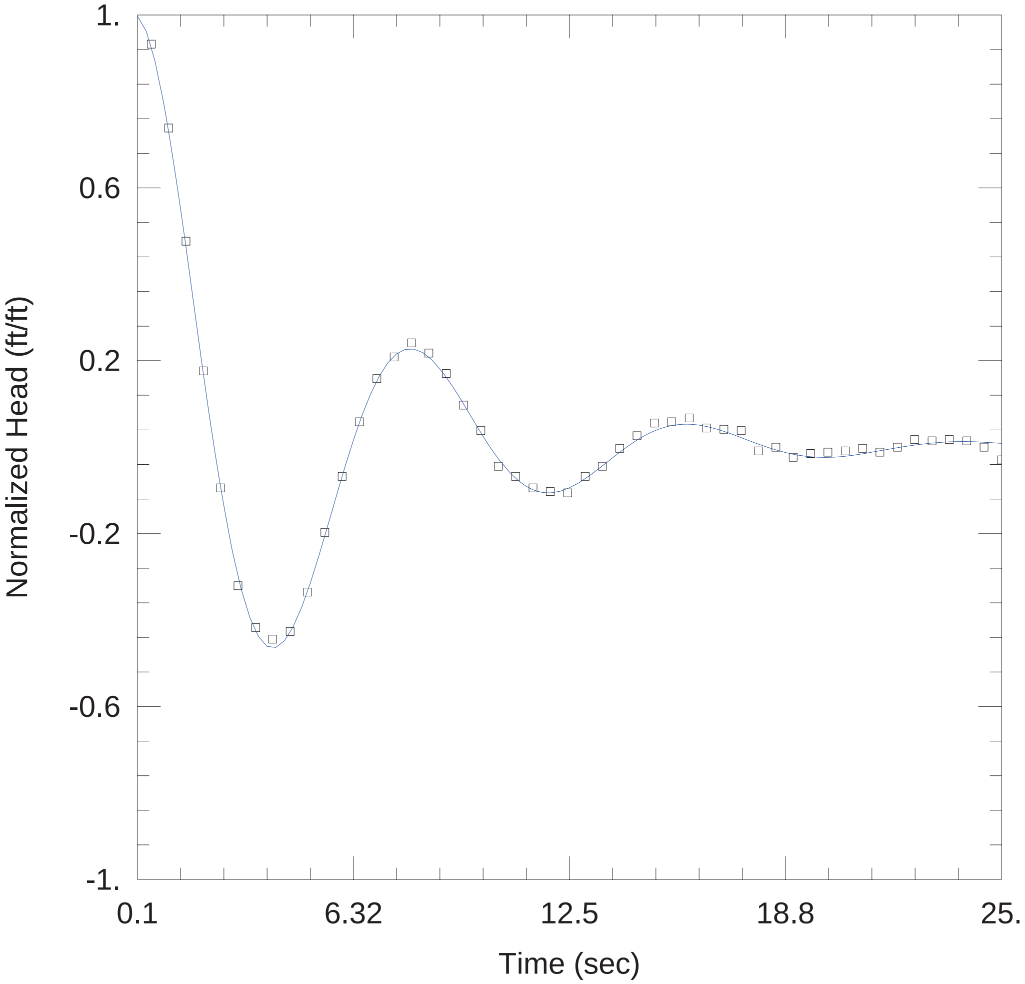
WELL DATA (APW-16)

Initial Displacement: 0.24 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.086 ft
Static Water Column Height: 64.49 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.135 cm/sec
Kz/Kr = 1.
Ss = 1.65E-7 ft^{-1}
Le = 51.68 ft



APW-16 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

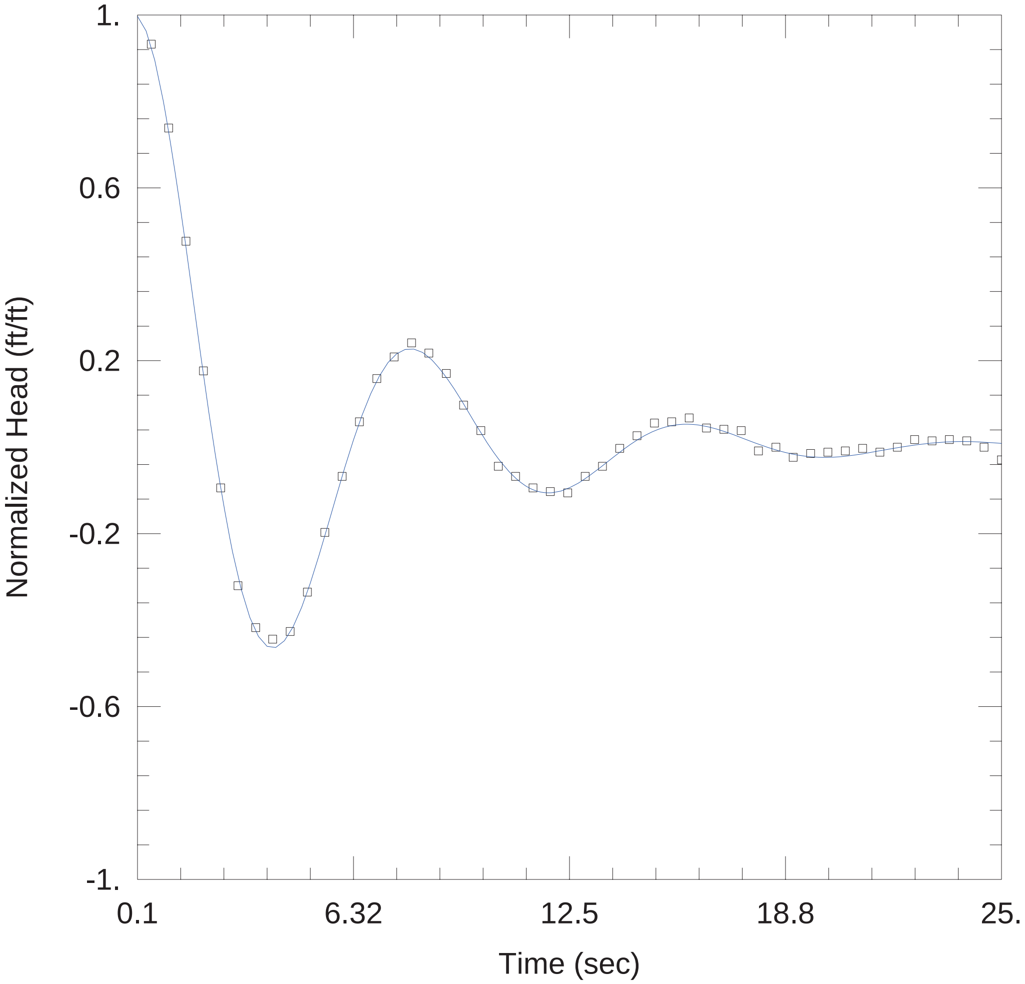
WELL DATA (APW-16)

Initial Displacement: 0.34 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.086 ft
Static Water Column Height: 64.49 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.145 cm/sec
Kz/Kr = 1.
Ss = 1.21E-7 ft^{-1}
Le = 50.37 ft



APW-16 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-16
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 16.4 ft
Anisotropy Ratio (Kz/Kr): 1.

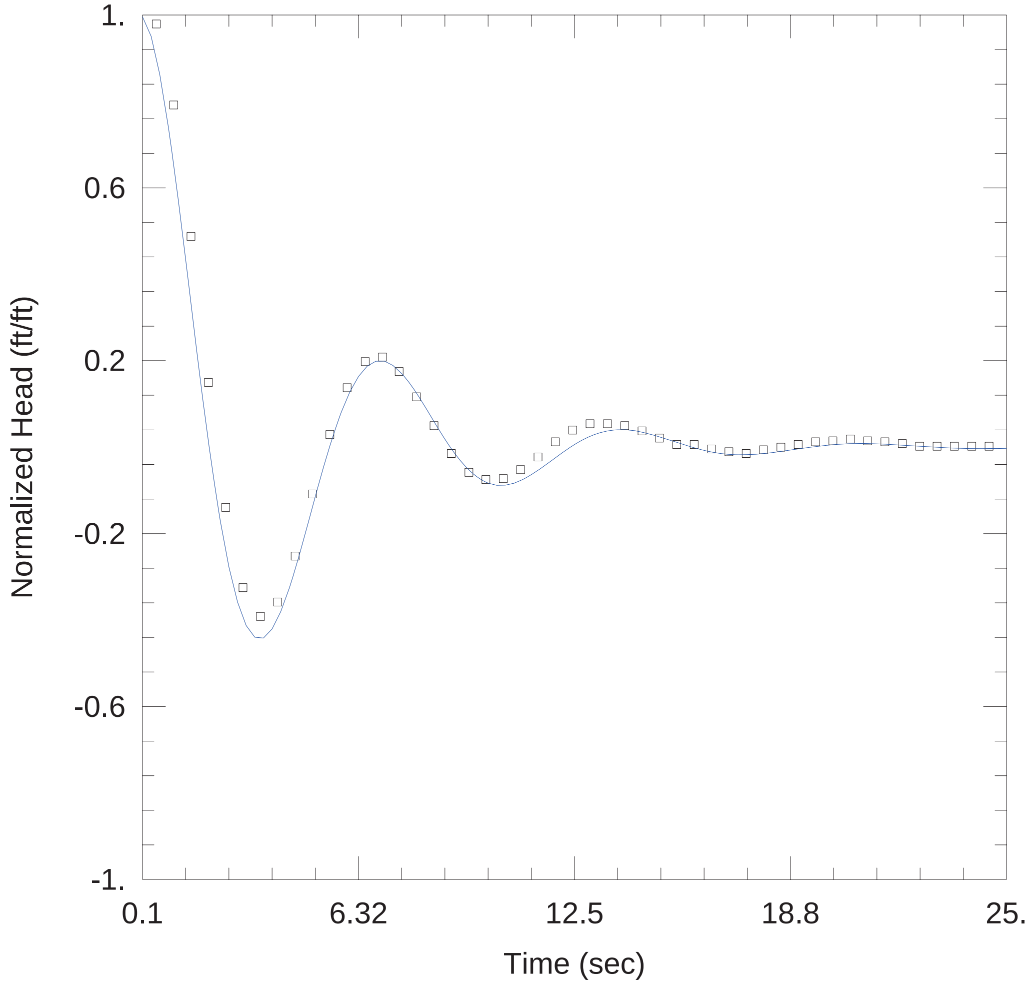
WELL DATA (APW-16)

Initial Displacement: 0.34 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.086 ft
Static Water Column Height: 64.49 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.145 cm/sec
Kz/Kr = 1.
Ss = 1.21E-7 ft^{-1}
Le = 50.37 ft



APW-17 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-17
Test Date: 02/16/2021

AQUIFER DATA

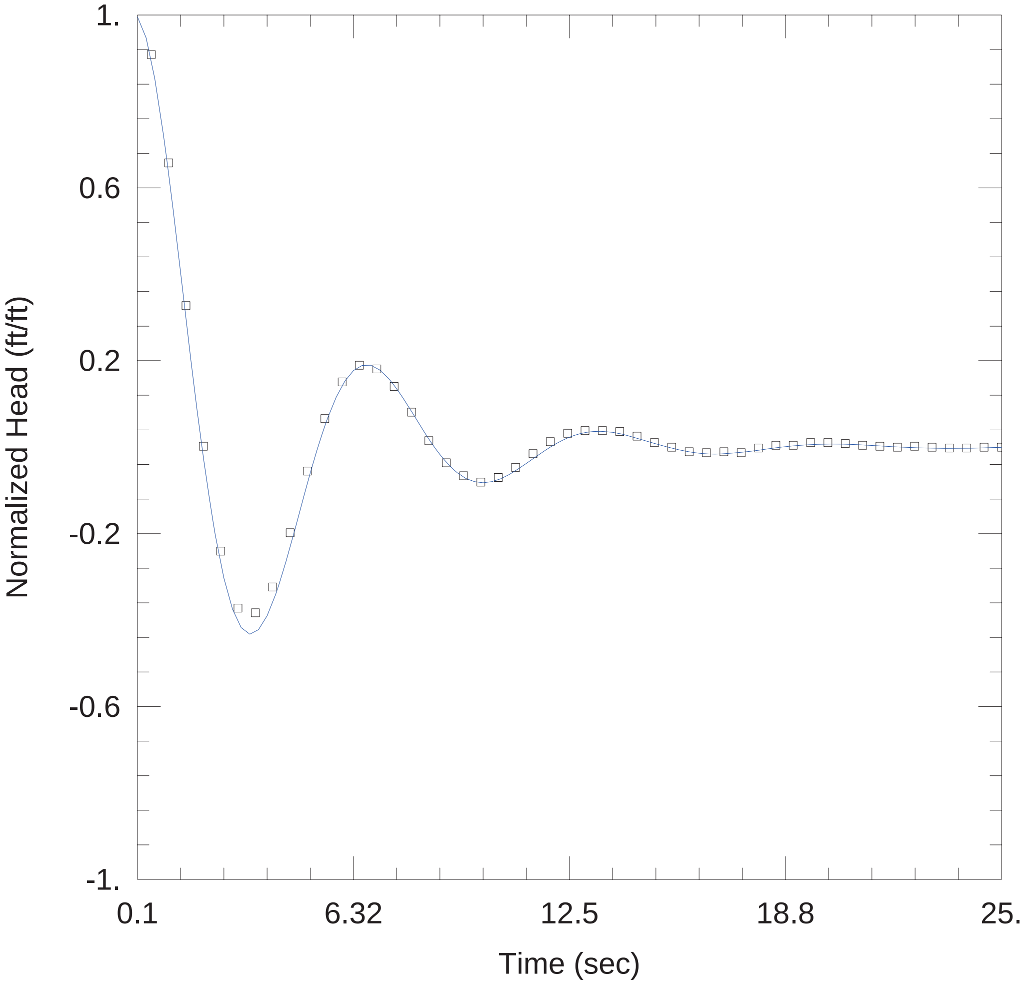
Saturated Thickness: 84.7 ft	Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-17)

Initial Displacement: 0.48 ft	Static Water Column Height: 53.93 ft
Total Well Penetration Depth: 79.7 ft	Screen Length: 5. ft
Casing Radius: 0.086 ft	Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined	Solution Method: Butler-Zhan
Kr = 0.113 cm/sec	Ss = 5.88E-7 ft^{-1}
Kz/Kr = 1.	Le = 37.31 ft



APW-17 FH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-17
Test Date: 02/16/2021

AQUIFER DATA

Saturated Thickness: 84.7 ft
Anisotropy Ratio (Kz/Kr): 1.

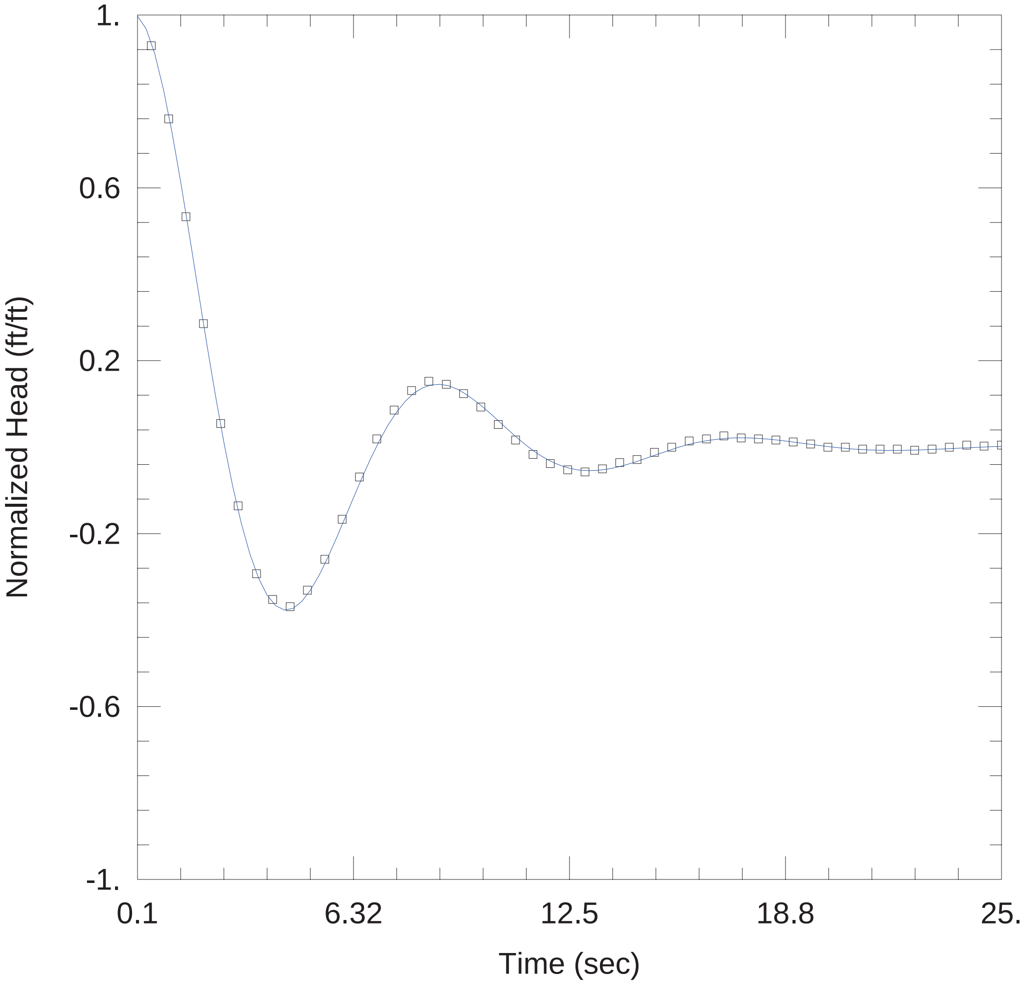
WELL DATA (APW-17)

Initial Displacement: 0.47 ft
Total Well Penetration Depth: 79.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 53.93 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.115 cm/sec
Kz/Kr = 1.
Ss = 2.88E-7 ft^{-1}
Le = 34.54 ft



APW-17 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-17
Test Date: 02/16/2021

AQUIFER DATA

Saturated Thickness: 84.7 ft
Anisotropy Ratio (Kz/Kr): 1.

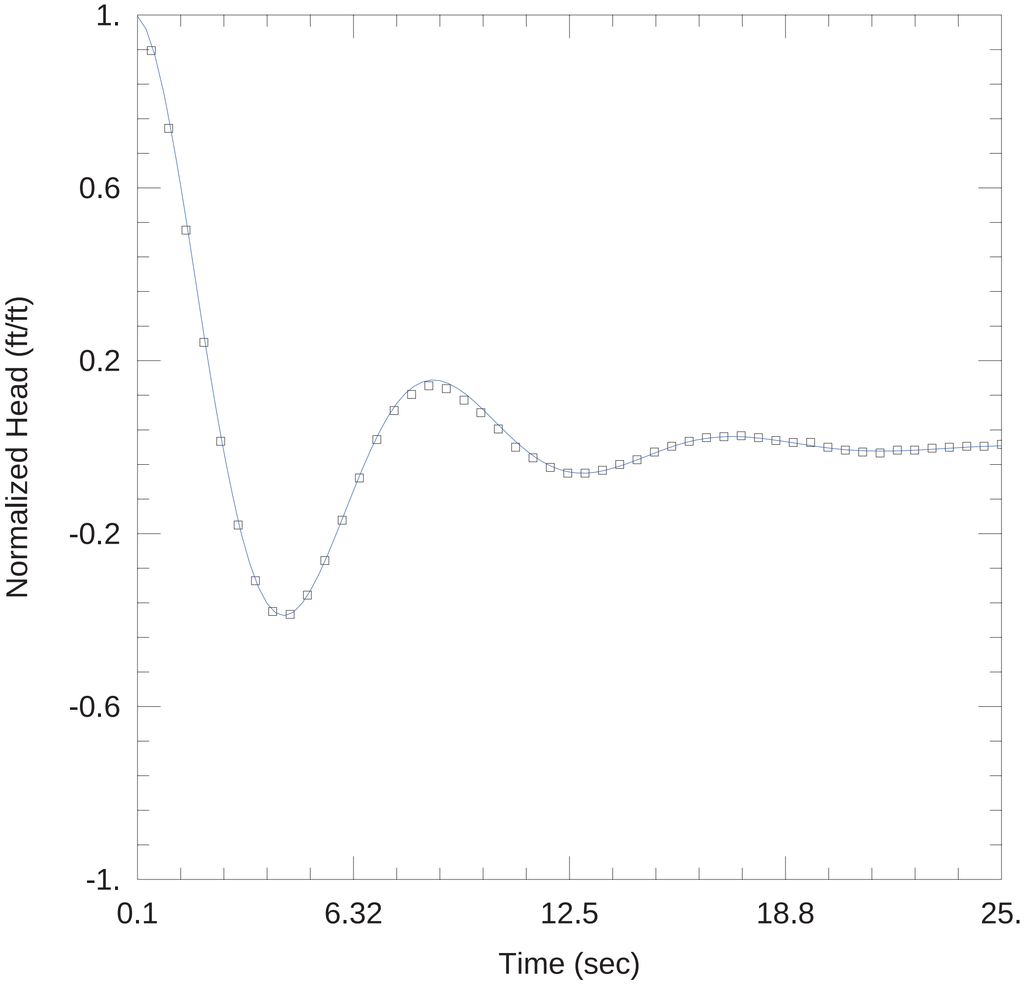
WELL DATA (APW-17)

Initial Displacement: 0.42 ft
Total Well Penetration Depth: 79.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 53.93 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.076 cm/sec
Kz/Kr = 1.
Ss = 2.88E-7 ft^{-1}
Le = 57.77 ft



APW-17 RH02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-17
Test Date: 02/16/2021

AQUIFER DATA

Saturated Thickness: 84.7 ft
Anisotropy Ratio (Kz/Kr): 1.

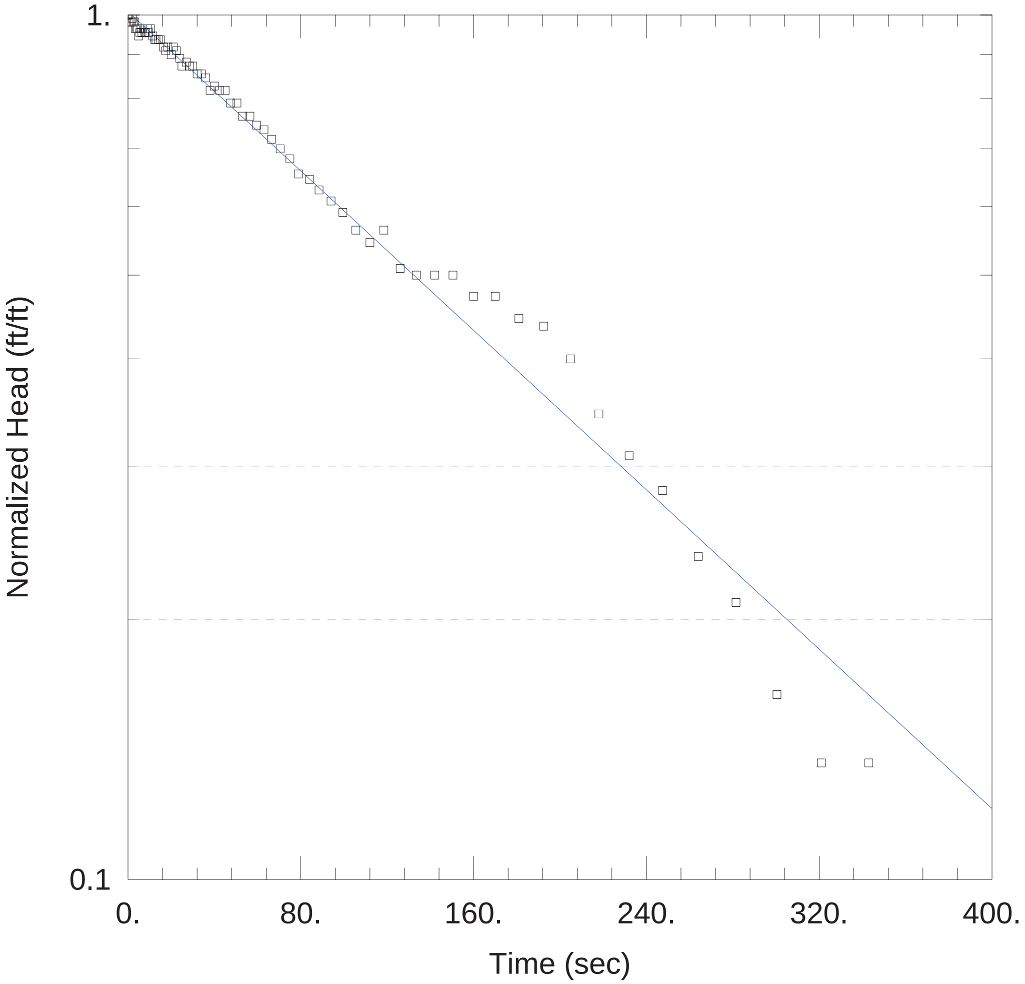
WELL DATA (APW-17)

Initial Displacement: 0.45 ft
Total Well Penetration Depth: 79.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 53.93 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 0.0796 cm/sec
Kz/Kr = 1.
Ss = 2.88E-7 ft^{-1}
Le = 56.31 ft



APW-18 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: APW-18
Test Date: 2/16/21

AQUIFER DATA

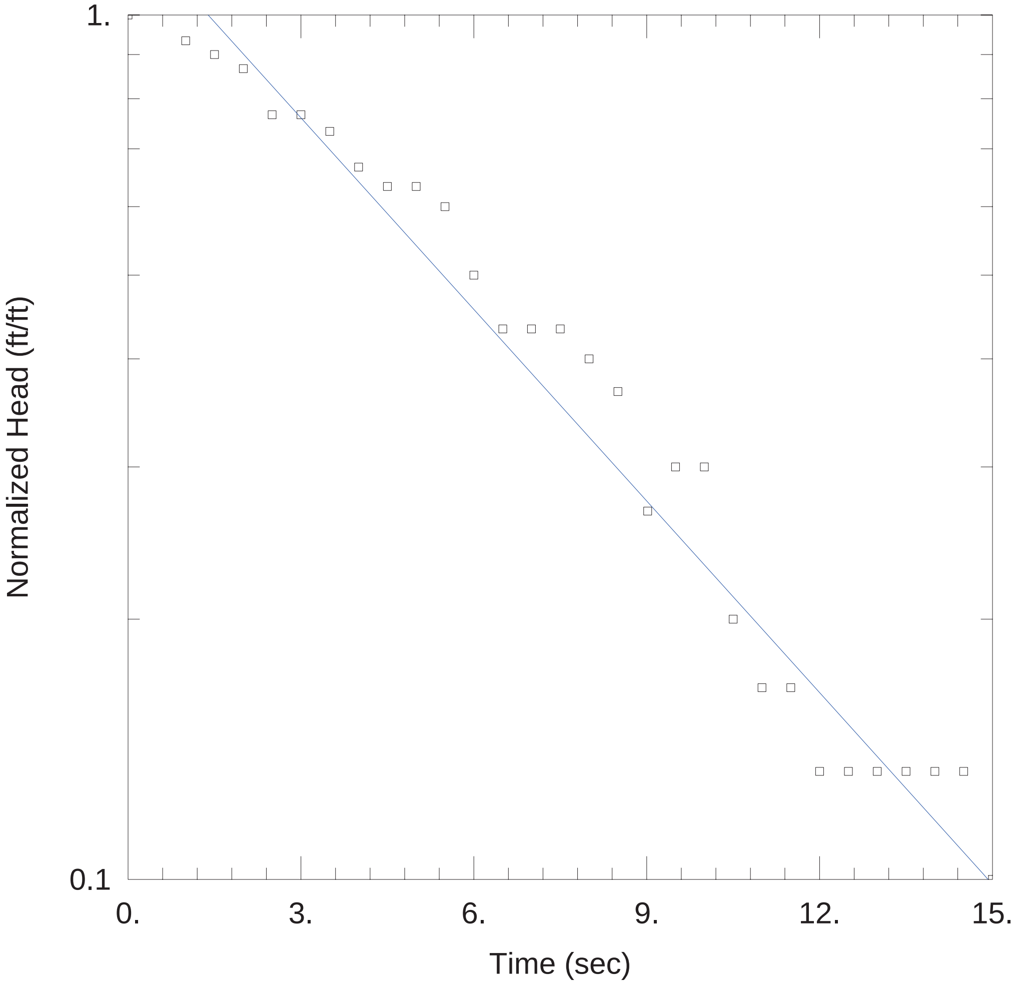
Saturated Thickness: 78.8 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW-18)

Initial Displacement: 0.11 ft
Static Water Column Height: 31.38 ft
Total Well Penetration Depth: 51.1 ft
Screen Length: 5. ft
Casing Radius: 0.086 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.000267 cm/sec
y0 = 0.111 ft



XPW-01 FH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW-01
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

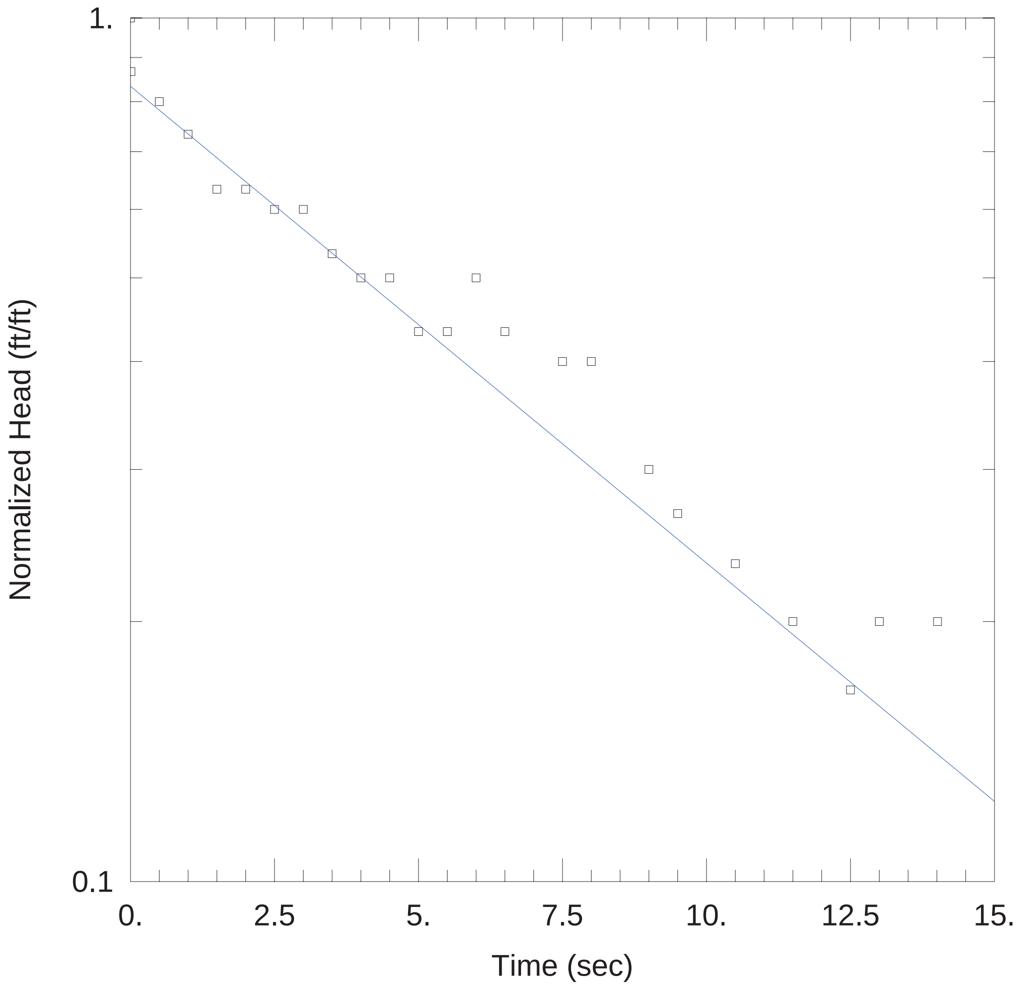
WELL DATA (XPW-01)

Initial Displacement: 0.03 ft
Total Well Penetration Depth: 8.033 ft
Casing Radius: 0.086 ft
Static Water Column Height: 8.033 ft
Screen Length: 8.033 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.183 cm/sec
y0 = 0.038 ft



XPW-01 FH-02

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW-01
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

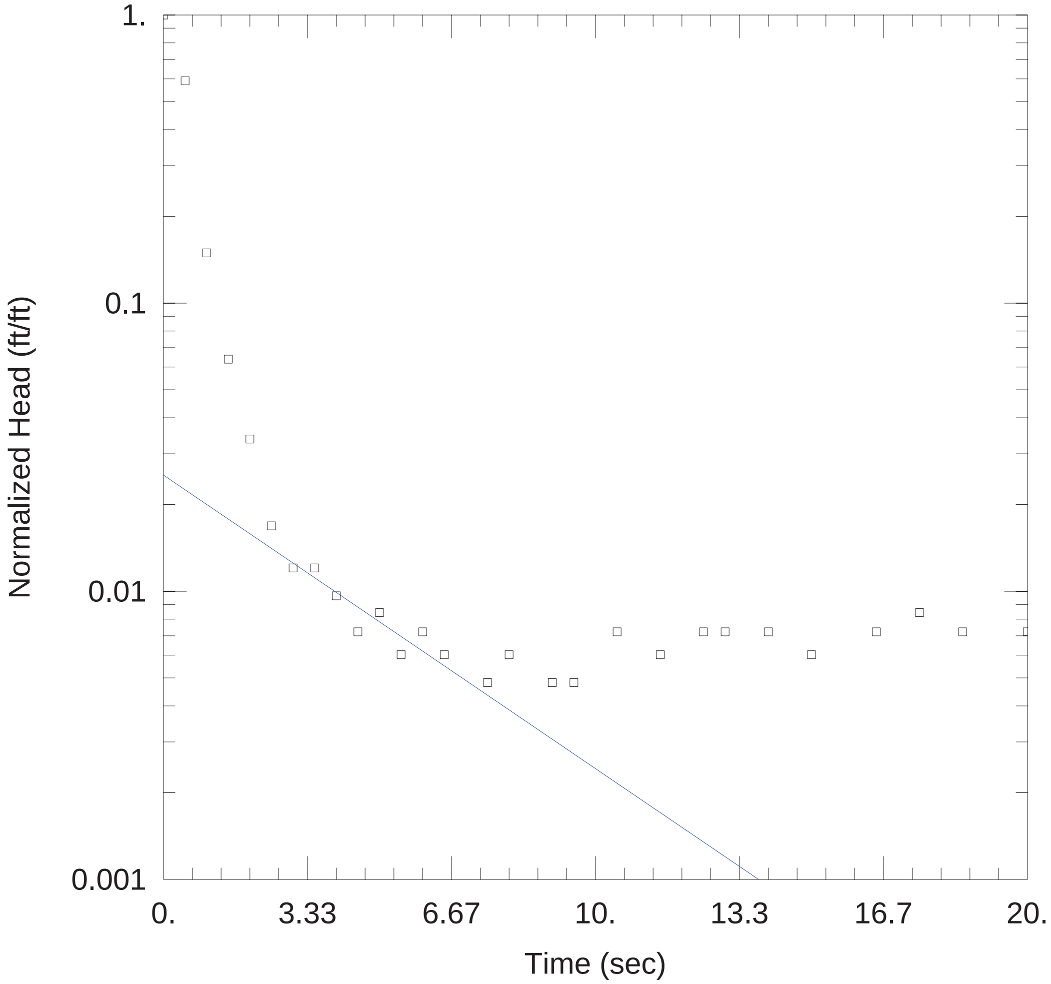
WELL DATA (XPW-01)

Initial Displacement: 0.03 ft
Total Well Penetration Depth: 8.033 ft
Casing Radius: 0.086 ft
Static Water Column Height: 8.033 ft
Screen Length: 8.033 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0129 cm/sec
y0 = 0.025 ft



XPW-01 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW-01
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

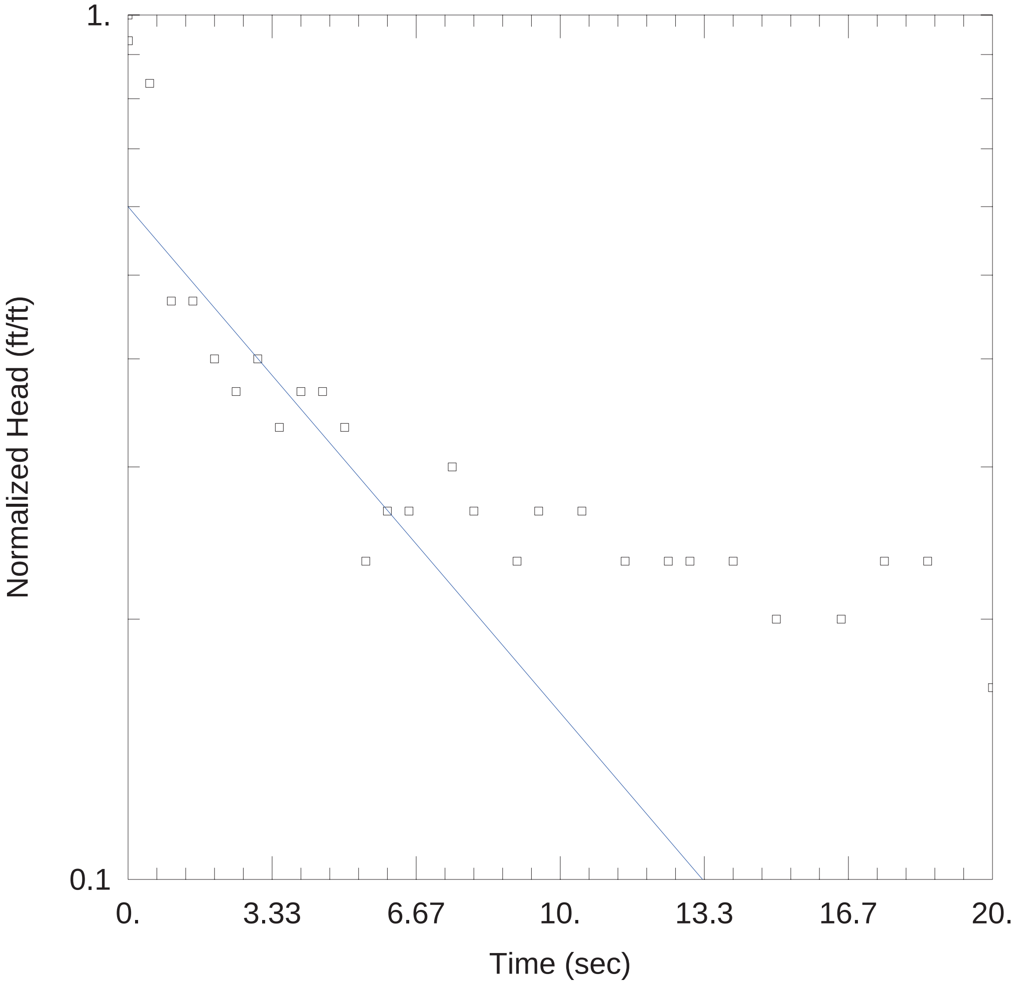
WELL DATA (XPW-01)

Initial Displacement: 0.83 ft
Total Well Penetration Depth: 8.033 ft
Casing Radius: 0.086 ft
Static Water Column Height: 8.033 ft
Screen Length: 8.033 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0238 cm/sec
y0 = 0.021 ft



XPW-01 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW-01
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

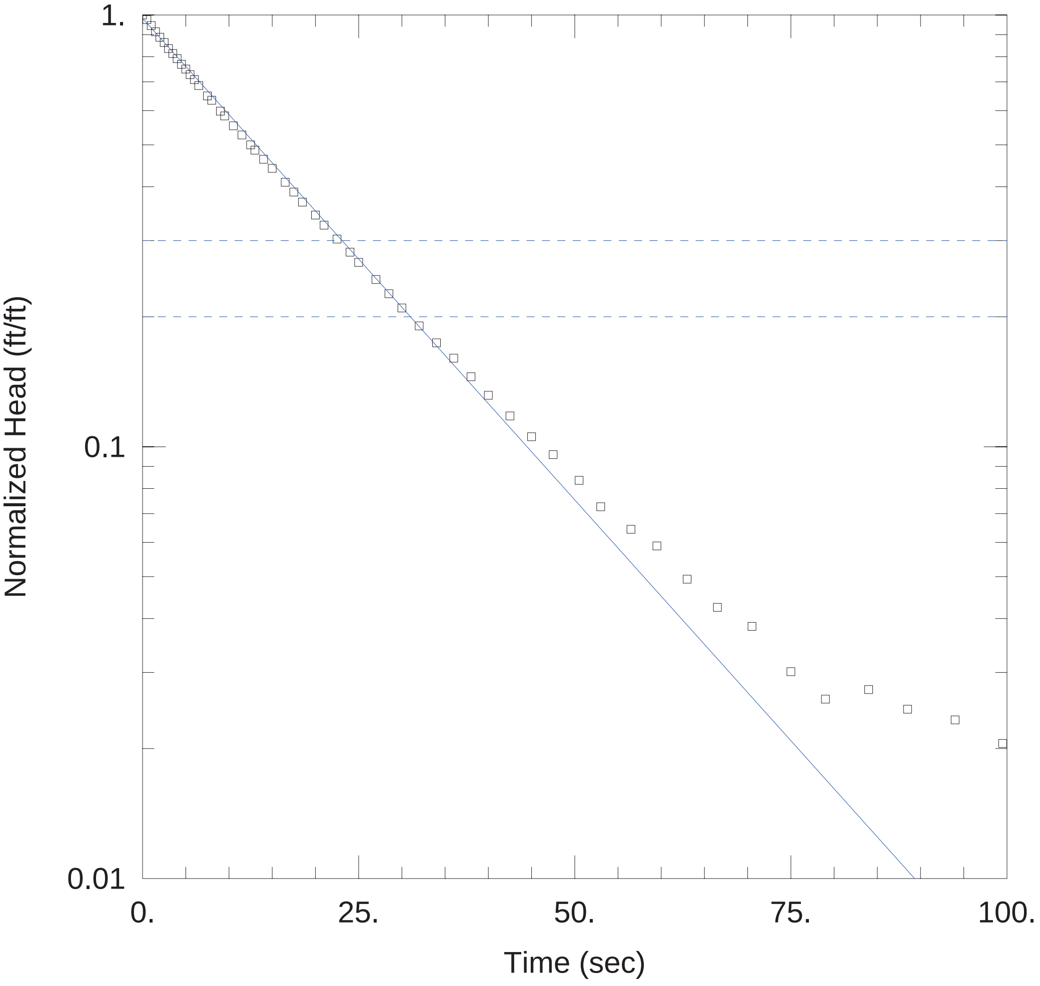
WELL DATA (XPW-01)

Initial Displacement: 0.03 ft
Total Well Penetration Depth: 8.033 ft
Casing Radius: 0.08625 ft
Static Water Column Height: 8.033 ft
Screen Length: 8.033 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0137 cm/sec
y0 = 0.018 ft



XPW02 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW02
Test Date: 3/11/21

AQUIFER DATA

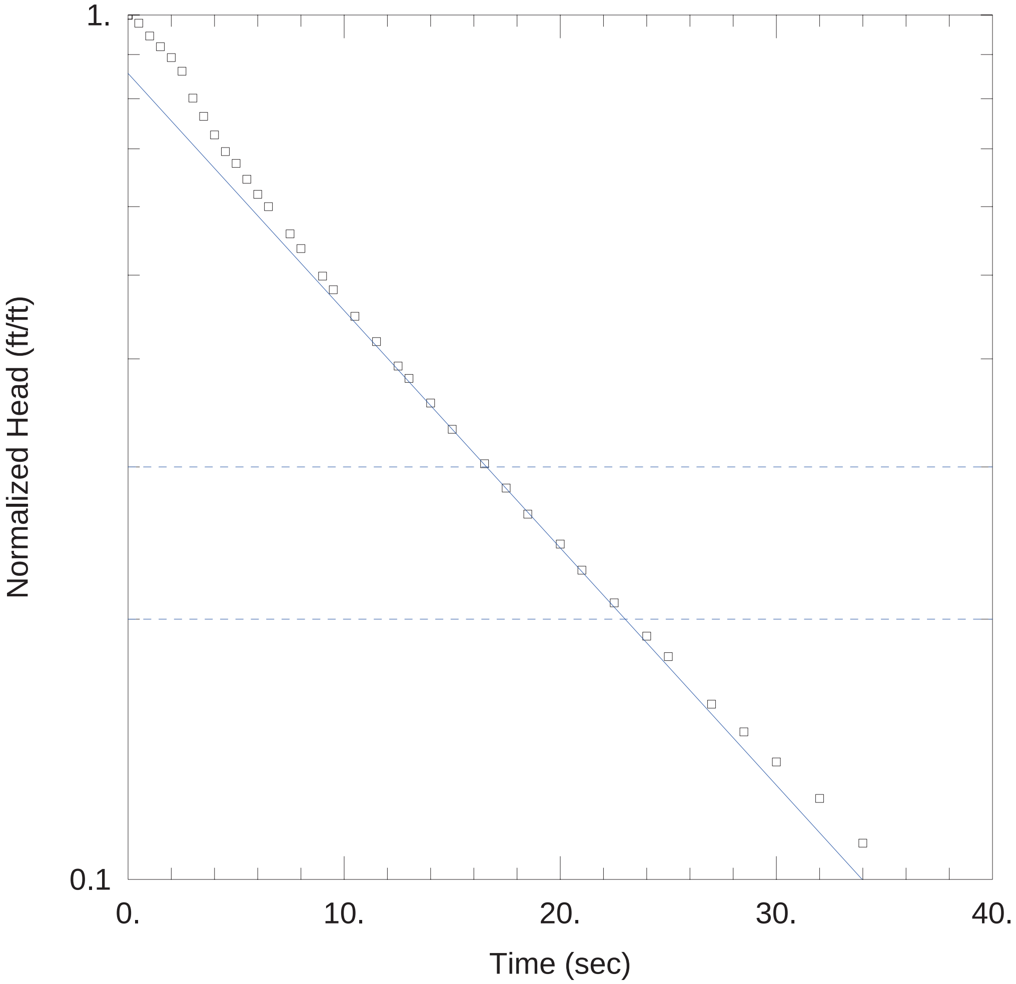
Saturated Thickness: 7.259 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW02)

Initial Displacement: 0.73 ft
Total Well Penetration Depth: 7.259 ft
Casing Radius: 0.086 ft
Static Water Column Height: 9.759 ft
Screen Length: 7.259 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.00197 cm/sec
y0 = 0.717 ft



XPW02 FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW02
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 7.259 ft
Anisotropy Ratio (Kz/Kr): 1.

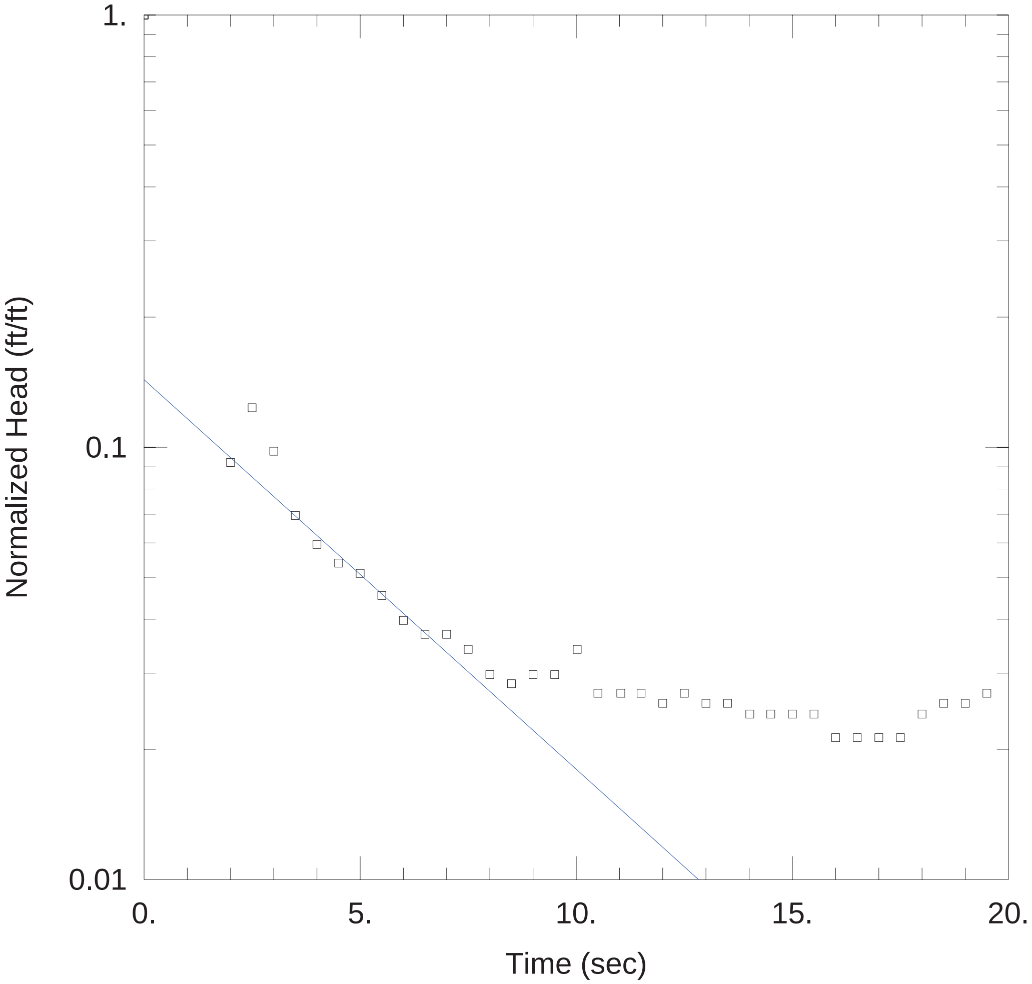
WELL DATA (XPW02)

Initial Displacement: 0.79 ft
Total Well Penetration Depth: 7.259 ft
Casing Radius: 0.086 ft
Static Water Column Height: 9.759 ft
Screen Length: 7.259 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00257 cm/sec
y0 = 0.676 ft



XPW03 FH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

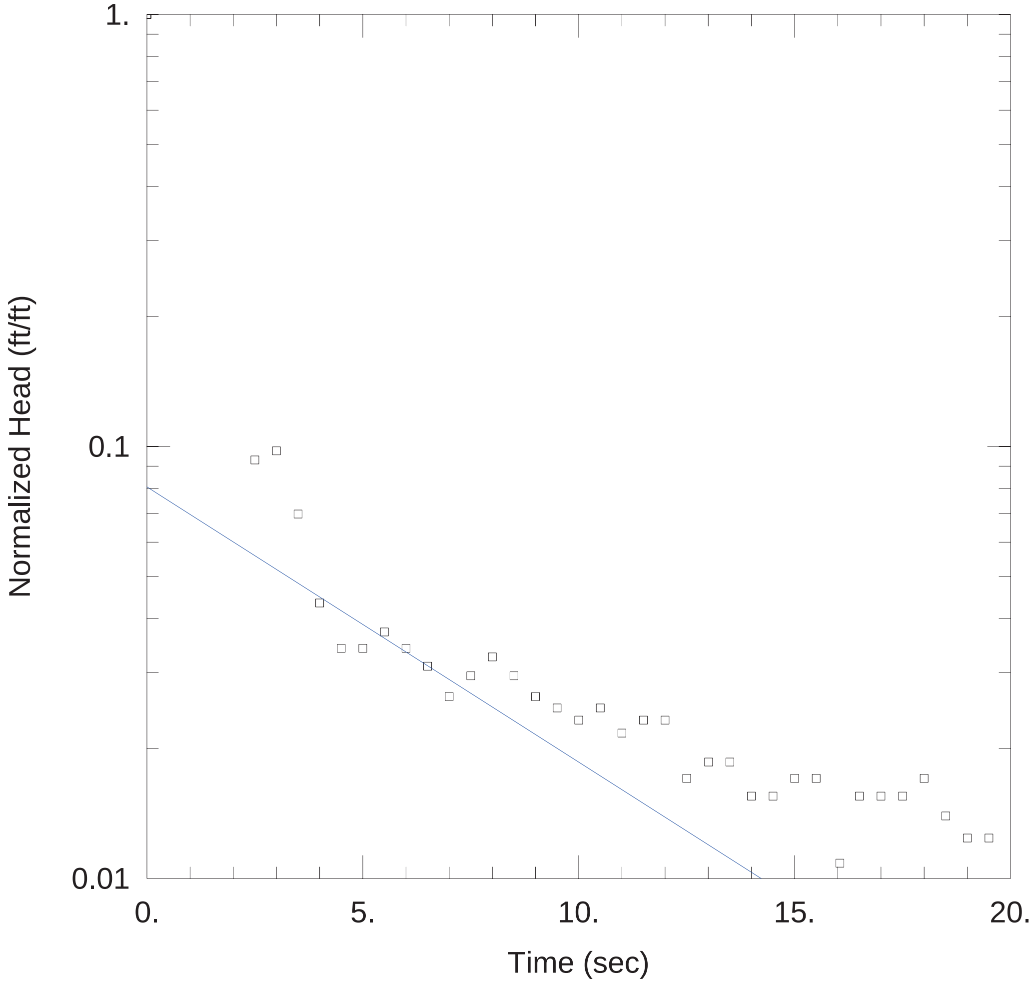
Saturated Thickness: 7.958 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW03)

Initial Displacement: 0.705 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 13.26 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0573 cm/sec
y0 = 0.101 ft



XPW03 FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

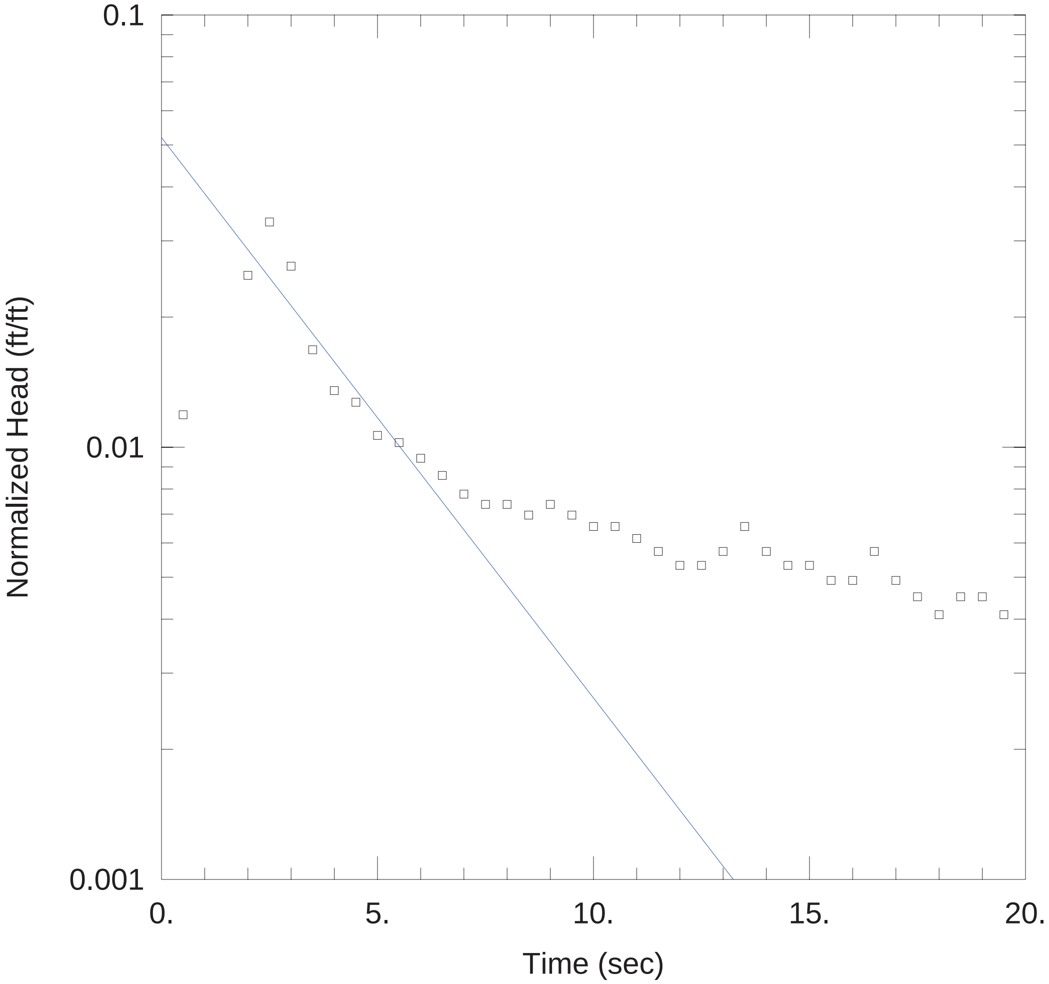
Saturated Thickness: 7.938 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW03)

Initial Displacement: 0.645 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 13.24 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.072 cm/sec
y0 = 0.052 ft



XPW03 FH3

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

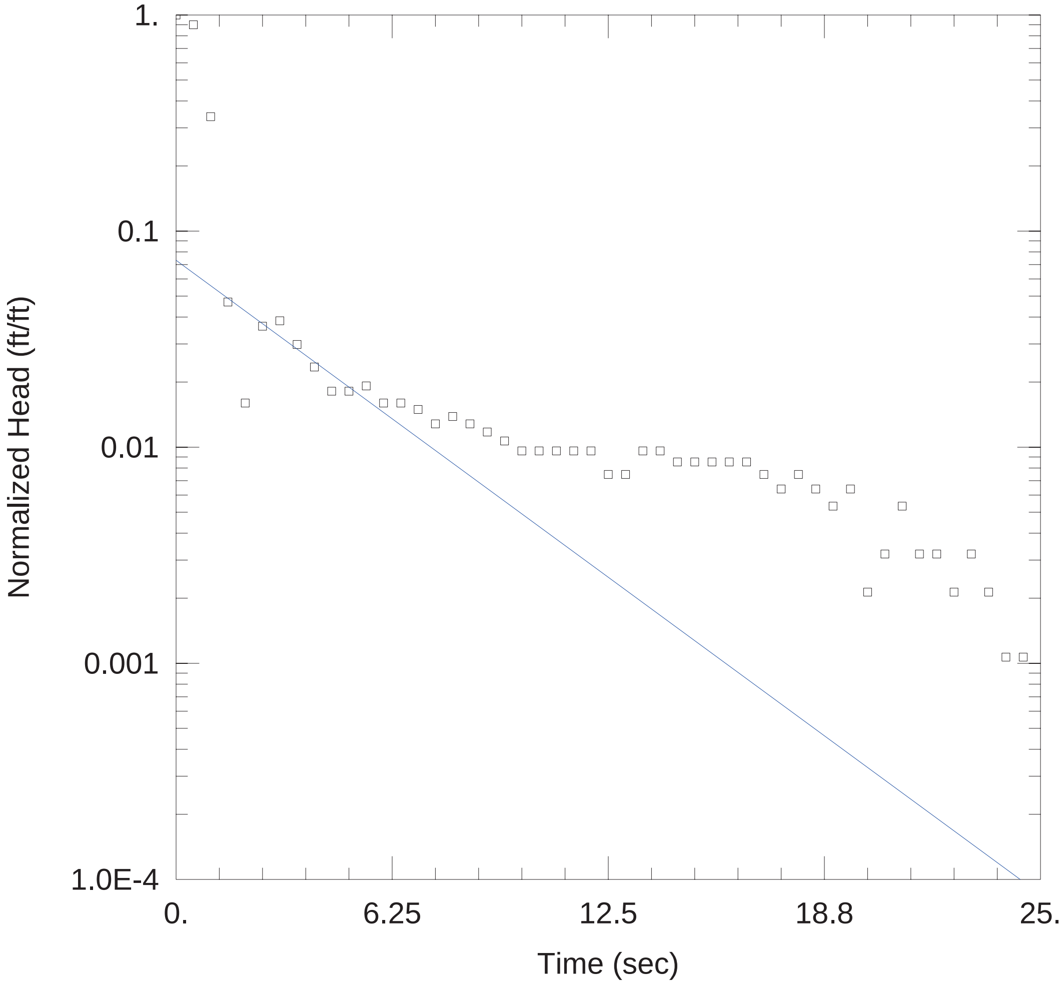
Saturated Thickness: 7.948 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW03)

Initial Displacement: 2.441 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 13.25 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.227 cm/sec
y0 = 0.127 ft



XPW03 RH01

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

Saturated Thickness: 7.948 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (XPW03)

Initial Displacement: -0.937 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft

Static Water Column Height: 13.25 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

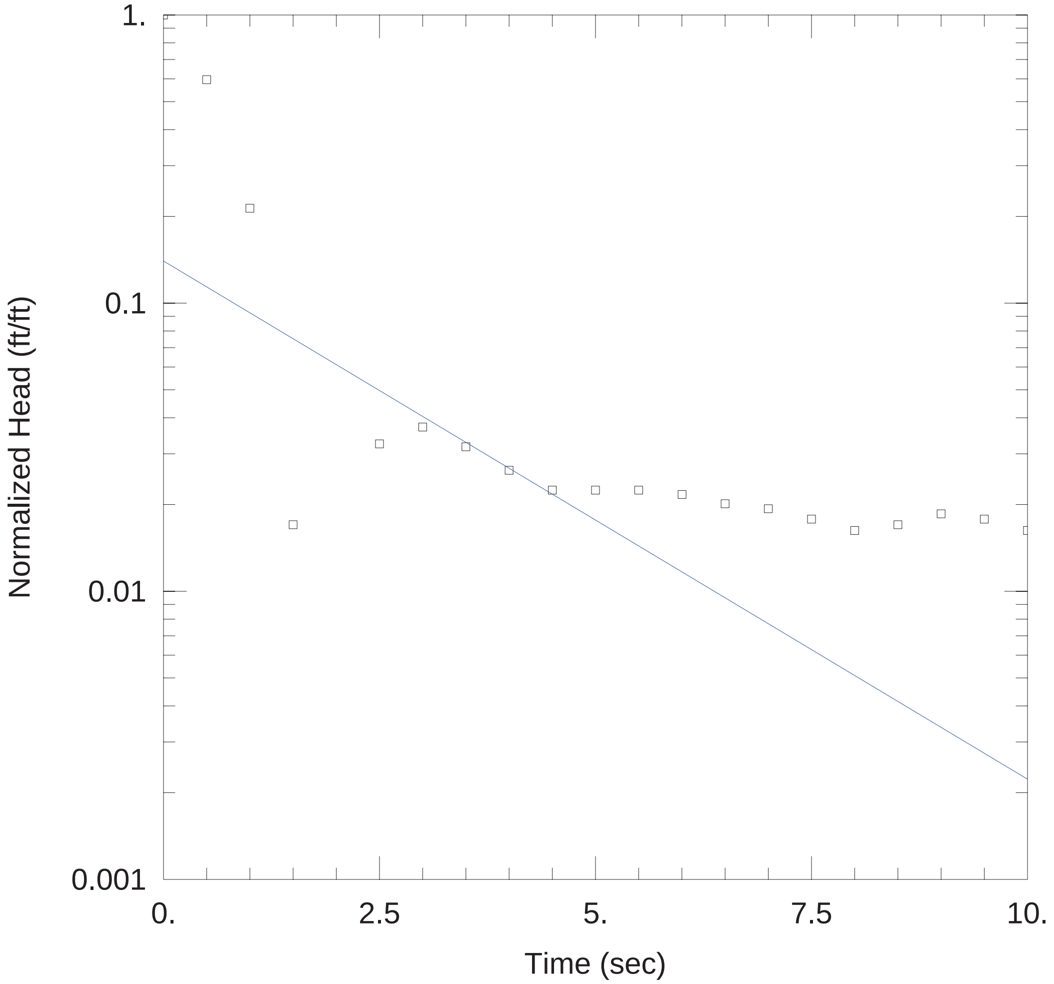
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.146 cm/sec

y0 = -0.0686 ft



XPW03 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

Saturated Thickness: 7.948 ft
Anisotropy Ratio (Kz/Kr): 1.

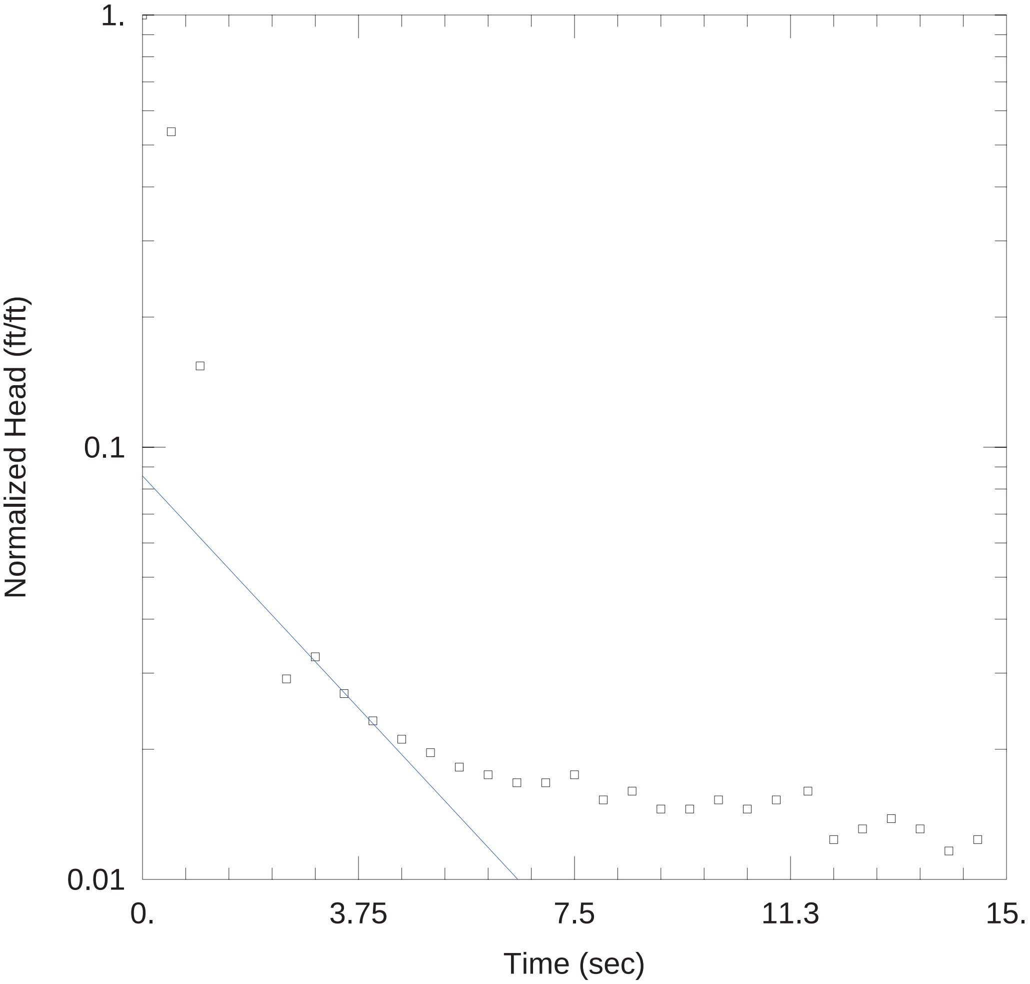
WELL DATA (XPW03)

Initial Displacement: -1.293 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 13.25 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.117 cm/sec
y0 = -0.181 ft



XPW03 RH3

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW03
Test Date: 3/31/21

AQUIFER DATA

Saturated Thickness: 7.948 ft
Anisotropy Ratio (Kz/Kr): 1.

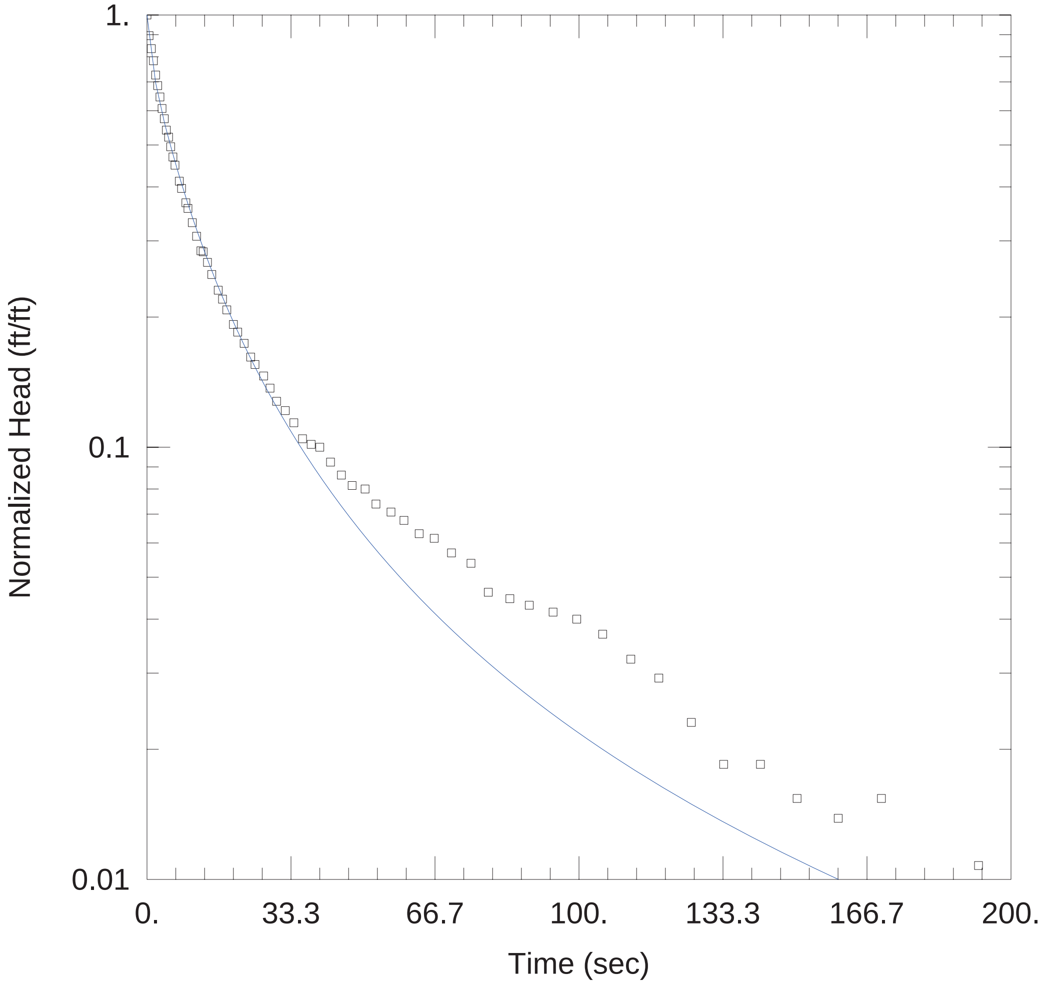
WELL DATA (XPW03)

Initial Displacement: -1.375 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.086 ft
Static Water Column Height: 13.25 ft
Screen Length: 4.7 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.143 cm/sec
y0 = -0.118 ft



XPW04 FH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW04
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 9.9 ft

WELL DATA (XPW04)

Initial Displacement: 0.65 ft
Total Well Penetration Depth: 9.9 ft
Casing Radius: 0.086 ft

Static Water Column Height: 10.4 ft
Screen Length: 9.5 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

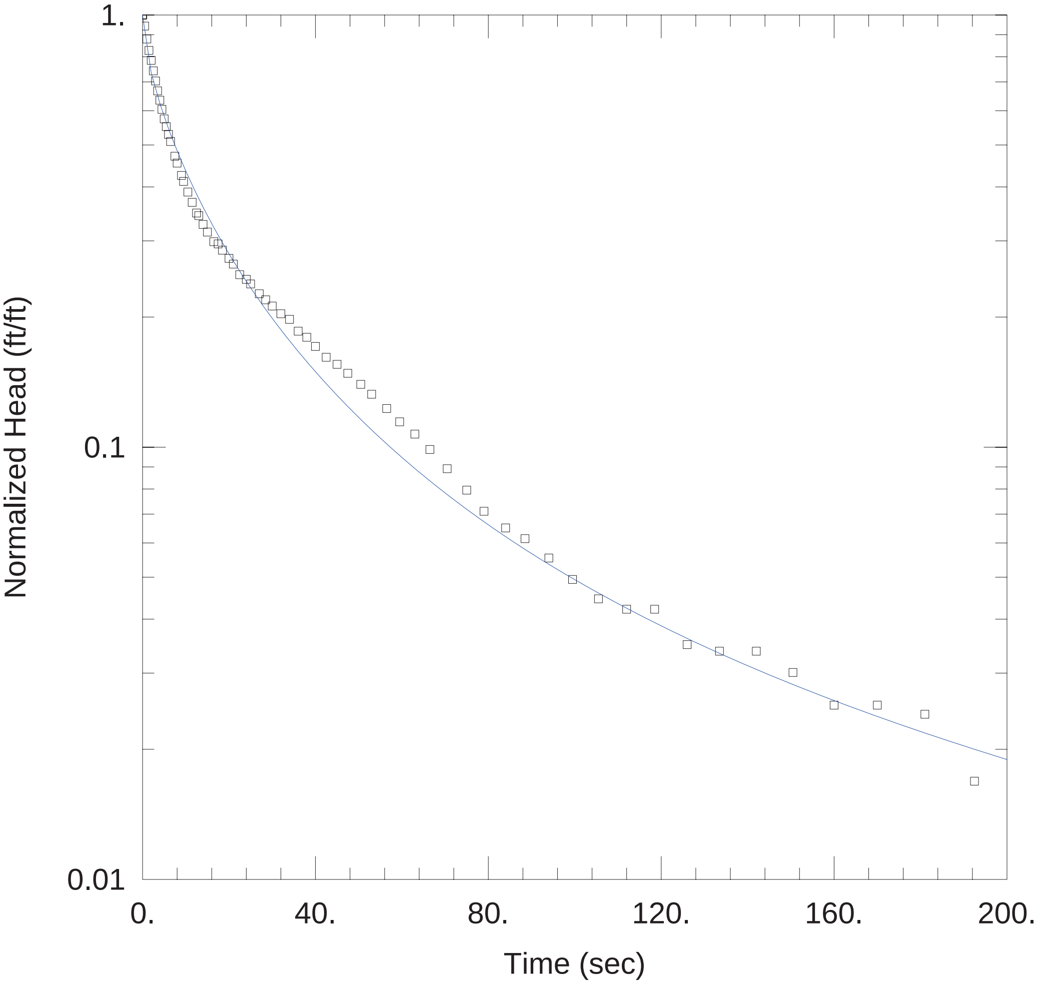
SOLUTION

Aquifer Model: Unconfined

Solution Method: KGS Model

Kr = 0.0021 cm/sec
Kz/Kr = 1.

Ss = 0.00051 ft^{-1}



XPW04 RH1

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW04
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 9.9 ft

WELL DATA (XPW04)

Initial Displacement: 0.83 ft
Total Well Penetration Depth: 9.9 ft
Casing Radius: 0.086 ft

Static Water Column Height: 10.4 ft
Screen Length: 9.5 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

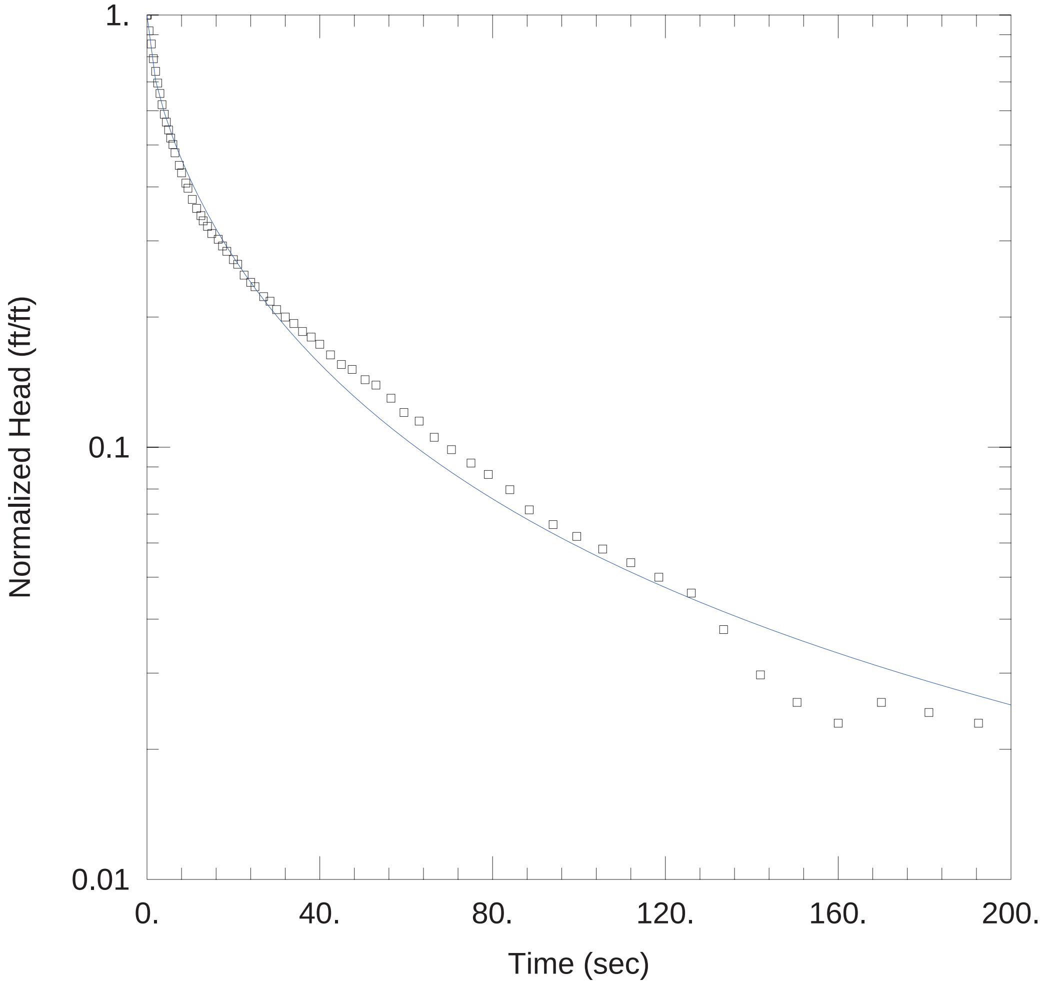
SOLUTION

Aquifer Model: Unconfined

Solution Method: KGS Model

Kr = 0.00122 cm/sec
Kz/Kr = 1.

Ss = 0.00094 ft^{-1}



XPW04 RH2

PROJECT INFORMATION

Company: Ramboll
Client: IPGC
Project: 1940100499-001
Location: Newton
Test Well: XPW04
Test Date: 3/11/21

AQUIFER DATA

Saturated Thickness: 9.9 ft

WELL DATA (XPW04)

Initial Displacement: 0.74 ft
Total Well Penetration Depth: 9.9 ft
Casing Radius: 0.086 ft

Static Water Column Height: 10.4 ft
Screen Length: 9.5 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined

Solution Method: KGS Model

Kr = 0.00101 cm/sec
Kz/Kr = 1.

Ss = 0.0019 ft^{-1}

2017 HYDRAULIC CONDUCTIVITY TEST DATA

Appendix C - Table 1
Newton Power Station
Slug Test Results - Primary Ash Pond Wells (ID 501)
Hydrogeologic Monitoring Plan

Well ID	Slug In 1	Slug In 2	Slug In 3	Slug Out 1	Slug Out 2	Slug Out 3	Slug Out 4	MIN	MAX	GEOMEAN	Solution
APW2	▨	4.41E-05	▨	4.52E-05	▨	3.45E-05	▨	3.45E-05	4.52E-05	4.1E-05	Bouwer-Rice
APW3	8.44E-06	▨	▨	8.61E-06	▨	▨	▨	8.44E-06	8.61E-06	8.5E-06	Bouwer-Rice
APW4	6.66E-06	▨	▨	5.14E-06	▨	▨	▨	5.14E-06	6.66E-06	5.8E-06	Bouwer-Rice
APW5	5.66E-04	1.42E-03	▨	1.54E-04	2.74E-04	2.56E-04	▨	1.54E-04	1.42E-03	3.9E-04	Bouwer-Rice
APW6	1.64E-03	2.18E-03	▨	▨	2.09E-03	1.98E-03	▨	1.64E-03	2.18E-03	2.0E-03	Bouwer-Rice
APW7	2.25E-03	▨	▨	▨	3.24E-03	2.99E-03	2.75E-03	2.25E-03	3.24E-03	2.8E-03	Bouwer-Rice
APW8	6.60E-04	1.31E-03	▨	▨	1.06E-03	7.89E-04	▨	6.60E-04	1.31E-03	9.2E-04	Bouwer-Rice
APW9	3.21E-03	3.28E-03	▨	3.40E-03	3.00E-03	▨	▨	3.00E-03	3.40E-03	3.2E-03	Bouwer-Rice
APW10	5.27E-04	5.49E-04	▨	▨	5.73E-04	5.60E-04	▨	5.27E-04	5.73E-04	5.5E-04	Bouwer-Rice

All slug test (i.e. hydraulic conductivity) results are in centimeters per second

▨ Not Applicable

Appendix C - Table 2

Newton Power Station

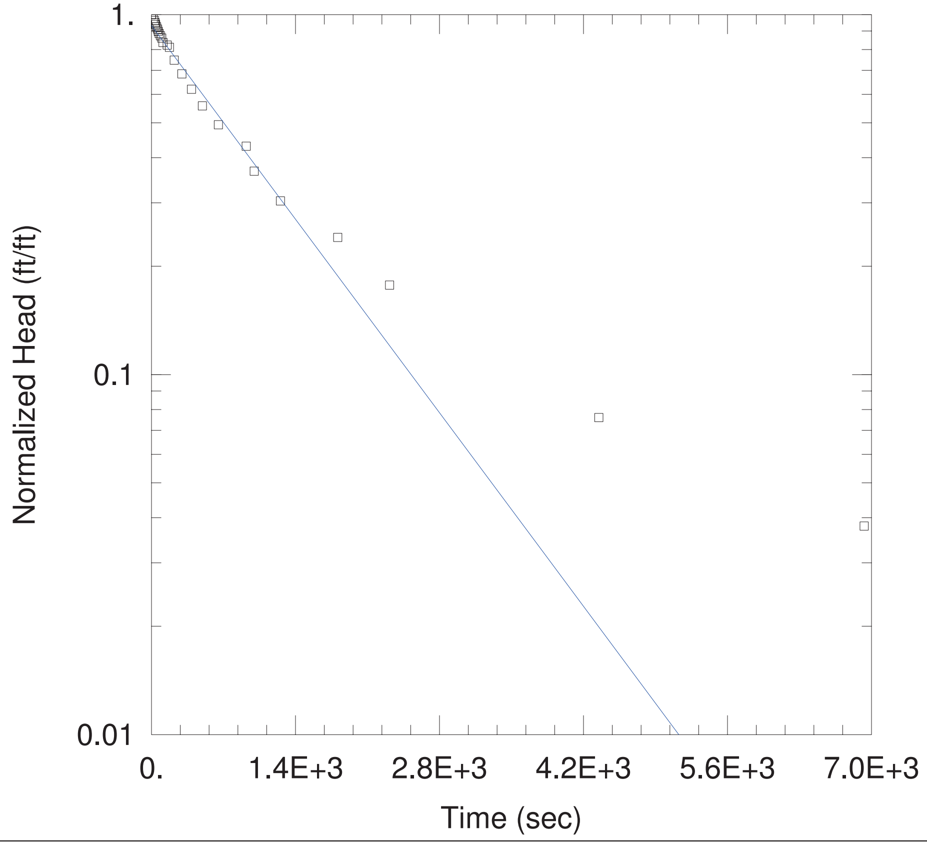
Slug Test Results - Landfill 2 CCR Wells (ID 502)

Hydrogeologic Monitoring Plan

Well ID	Slug In 1	Slug In 2	Slug In 3	Slug Out 1	Slug Out 2	Slug Out 3	MIN	MAX	GEOMEAN	Solution
G06D	▨	▨	▨	3.92E-08	▨	▨	3.92E-08	3.92E-08	3.9E-08	Bouwer-Rice
G202	1.70E-02	1.43E-02	▨	▨	2.87E-02	2.33E-02	1.43E-02	2.87E-02	2.0E-02	Bouwer-Rice
G203	2.53E-02	▨	▨	2.42E-02	3.47E-02	▨	2.42E-02	3.47E-02	2.8E-02	Bouwer-Rice
G208	▨	▨	▨	1.32E-08	▨	▨	1.32E-08	1.32E-08	1.3E-08	Bouwer-Rice
G217D	2.27E-04	2.92E-04	▨	▨	▨	3.03E-04	2.27E-04	3.03E-04	2.7E-04	Bouwer-Rice
G220	▨	▨	▨	3.51E-07	▨	▨	3.51E-07	3.51E-07	3.5E-07	Bouwer-Rice
G222	▨	▨	▨	1.54E-06	▨	▨	1.54E-06	1.54E-06	1.5E-06	Bouwer-Rice
G223	5.19E-05	2.50E-05	▨	1.37E-05	1.79E-05	▨	1.37E-05	5.19E-05	2.4E-05	Bouwer-Rice
G224	5.15E-02	1.90E-02	4.64E-02	4.31E-02	▨	2.97E-02	1.90E-02	5.15E-02	3.6E-02	Bouwer-Rice

All slug test (i.e. hydraulic conductivity) results are in centimeters per second

▨ Not Applicable



WELL TEST ANALYSIS

Data Set: P:\...\APW2 SI2.aqt
Date: 10/09/17 Time: 15:04:26

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW2
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

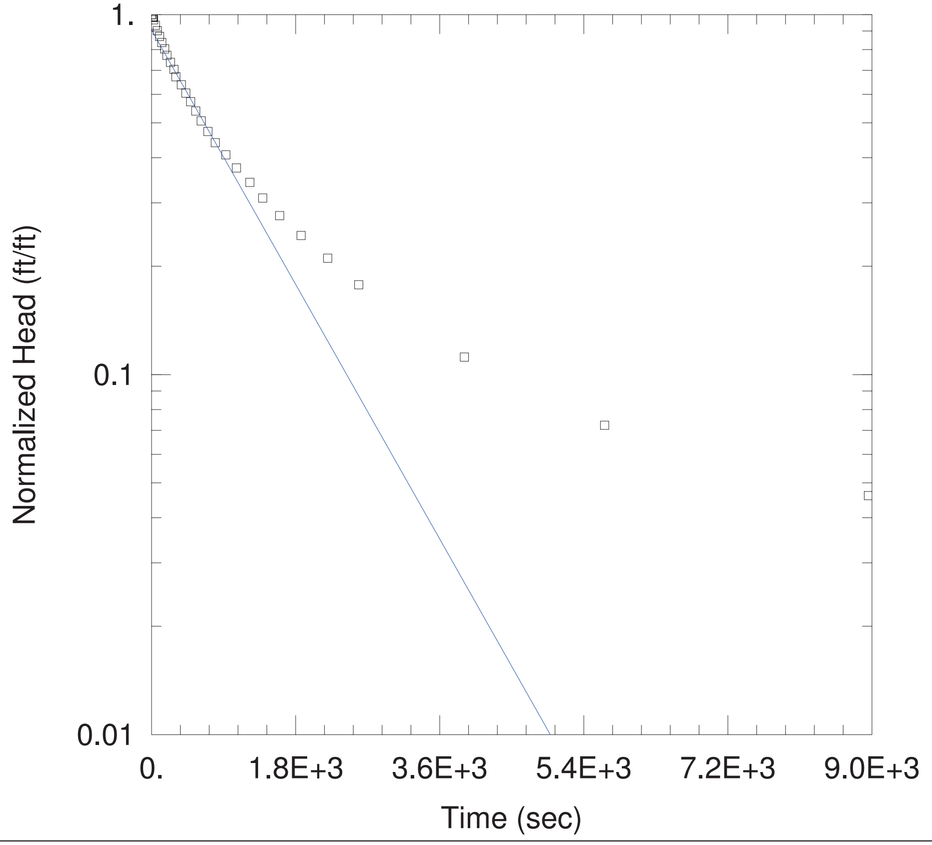
K = 4.414E-5 cm/sec
y0 = 0.7361 ft

AQUIFER DATA

Saturated Thickness: 9. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW2 SI2)

Initial Displacement: 0.79 ft
Total Well Penetration Depth: 6.4 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 9. ft
Screen Length: 3.4 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW2 SO1.aqt
Date: 10/09/17 Time: 15:05:33

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW2
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

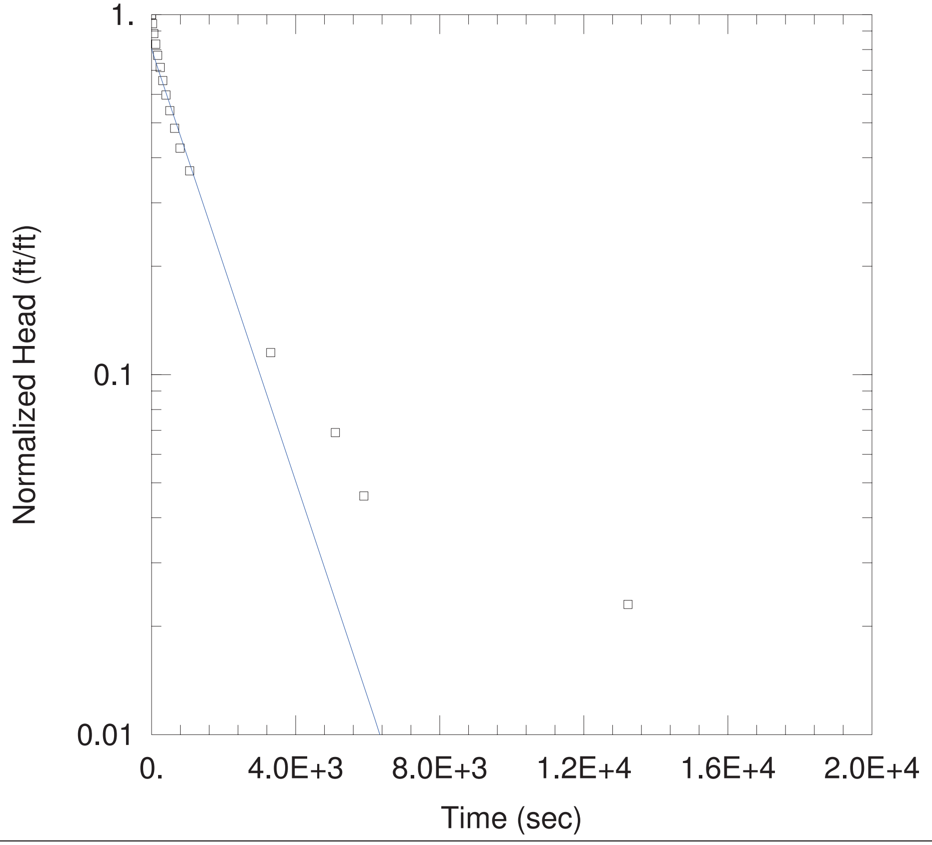
K = 4.517E-5 cm/sec
y0 = 1.38 ft

AQUIFER DATA

Saturated Thickness: 9. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW2 SO1)

Initial Displacement: 1.52 ft
Total Well Penetration Depth: 6.4 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 9. ft
Screen Length: 3.4 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW2 SO3.aqt
Date: 10/09/17 Time: 15:06:23

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW2
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

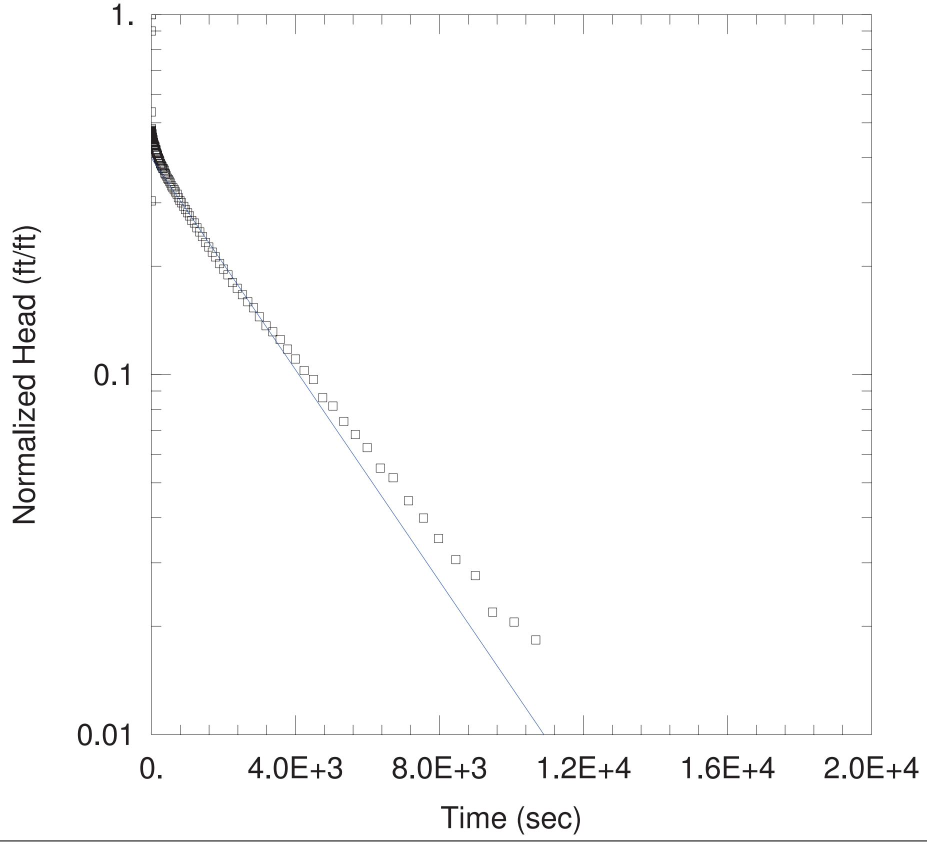
K = 3.449E-5 cm/sec
y0 = 0.698 ft

AQUIFER DATA

Saturated Thickness: 9. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW2 SO3)

Initial Displacement: 0.87 ft
Total Well Penetration Depth: 6.4 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 9. ft
Screen Length: 3.4 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW 3 SI1.aqt
Date: 10/09/17 Time: 15:13:21

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW3
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

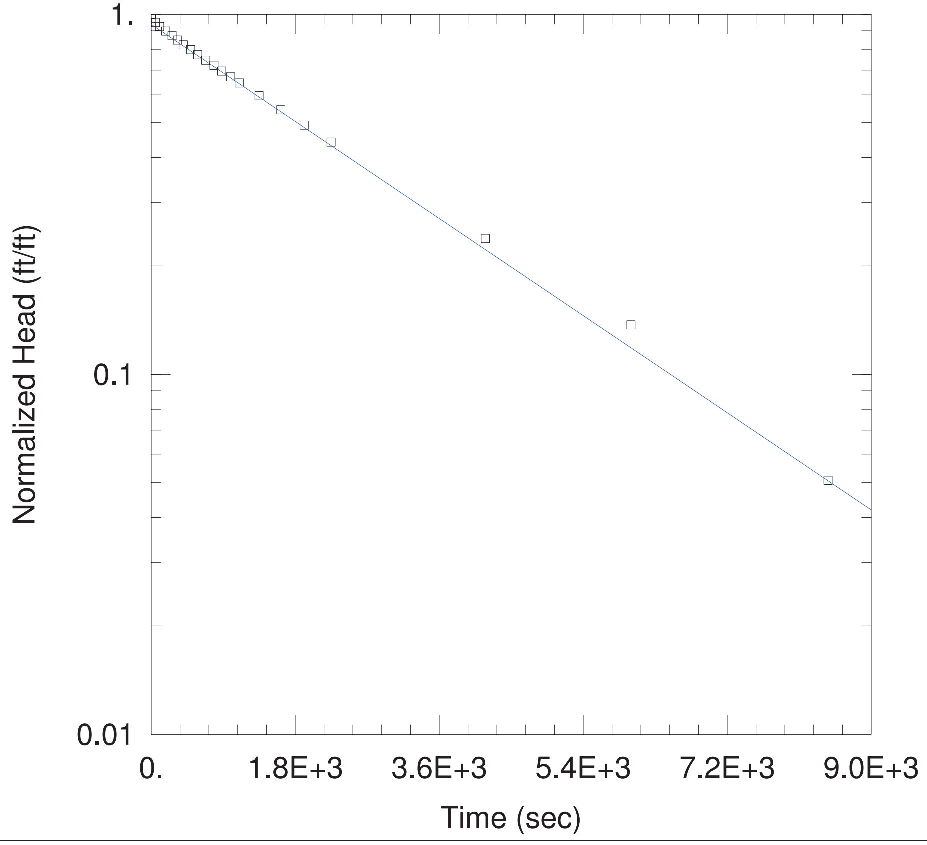
K = 8.437E-6 cm/sec
y0 = 1.458 ft

AQUIFER DATA

Saturated Thickness: 14. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW3 SI1)

Initial Displacement: 3.656 ft
Total Well Penetration Depth: 11.5 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 14. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW 3 SO1.aqt
Date: 10/09/17 Time: 15:08:16

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW3
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

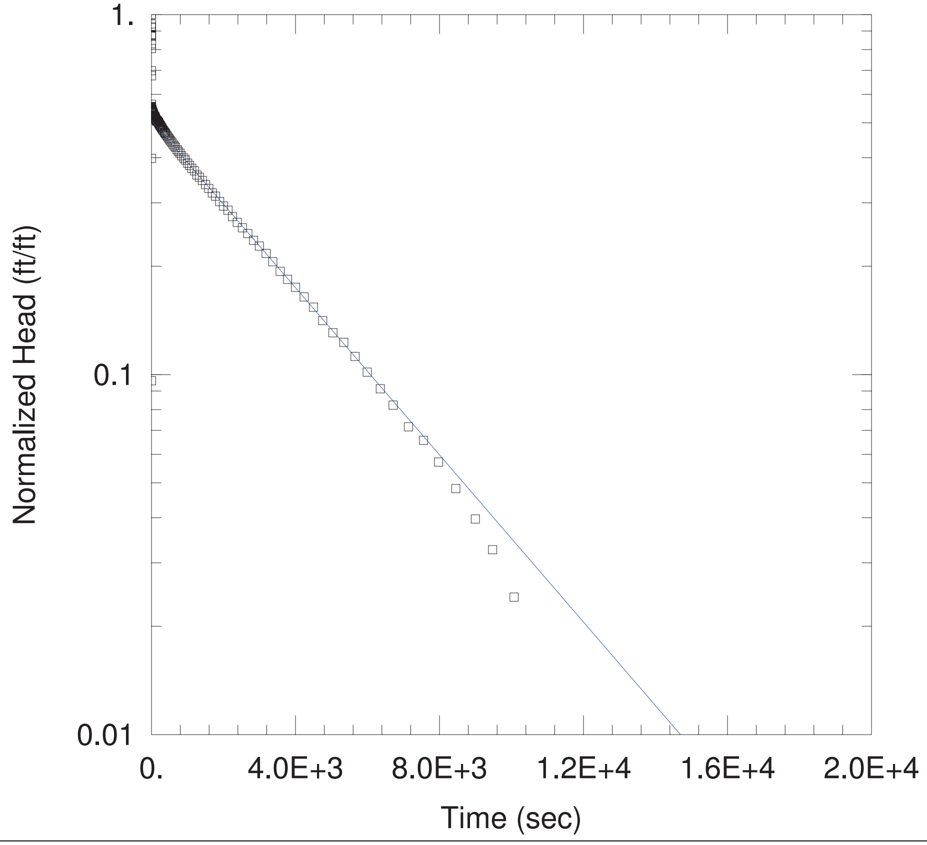
K = 8.611E-6 cm/sec
y0 = 1.848 ft

AQUIFER DATA

Saturated Thickness: 14. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW3 SO1)

Initial Displacement: 1.97 ft
Total Well Penetration Depth: 11.5 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 14. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW 4 SI1.aqt
Date: 10/09/17 Time: 15:15:09

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW4
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

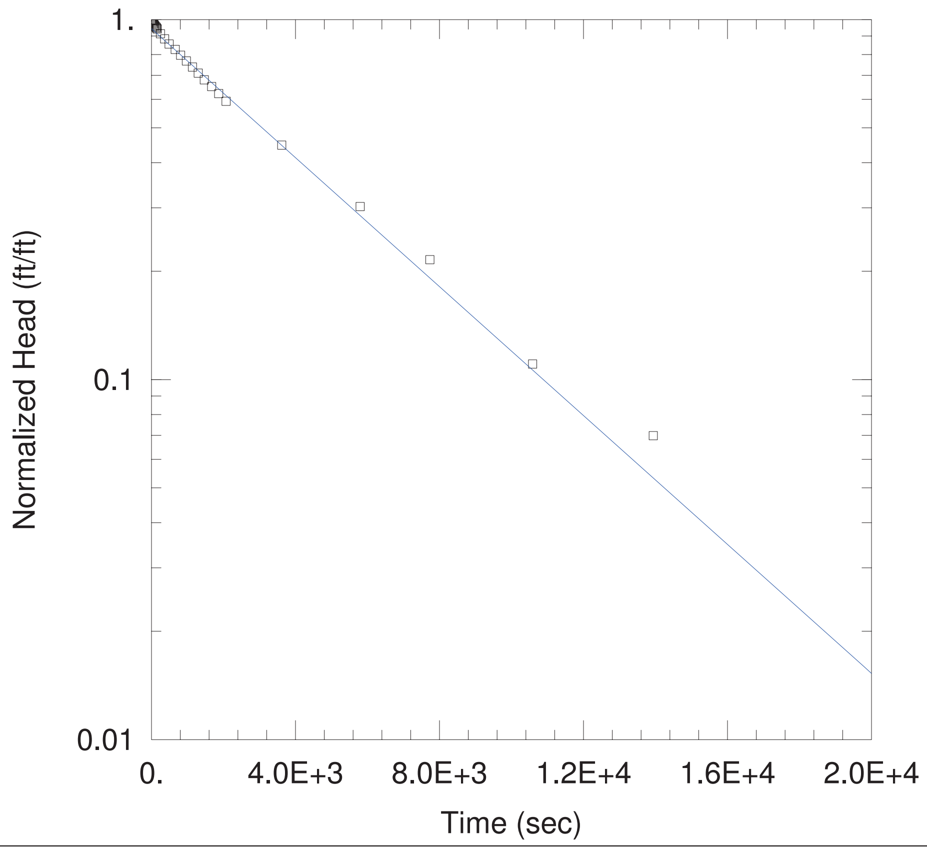
K = 6.66E-6 cm/sec
y0 = 1.37 ft

AQUIFER DATA

Saturated Thickness: 11. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW4 S11)

Initial Displacement: 2.697 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 11. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW 4 SO1.aqt
Date: 10/09/17 Time: 15:15:46

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW4
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

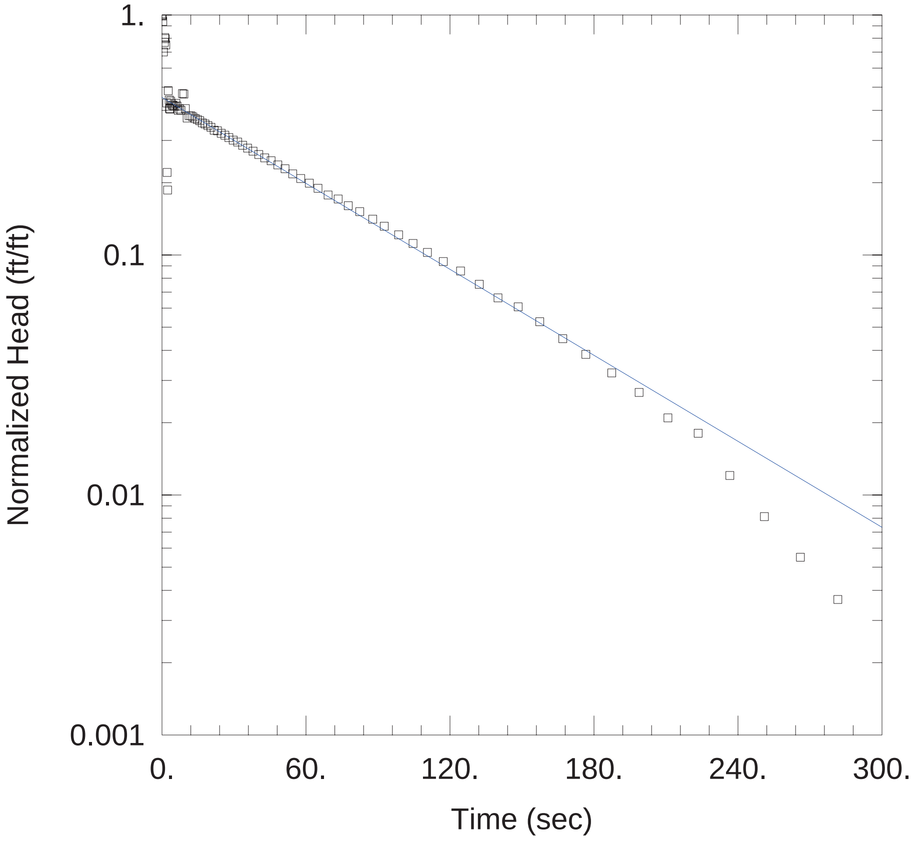
K = 5.137E-6 cm/sec
y0 = 1.622 ft

AQUIFER DATA

Saturated Thickness: 11. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW4 SO1)

Initial Displacement: 1.72 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 11. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SI1.aqt
Date: 06/15/17 Time: 11:53:01

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0005655 cm/sec
y0 = 1.731 ft

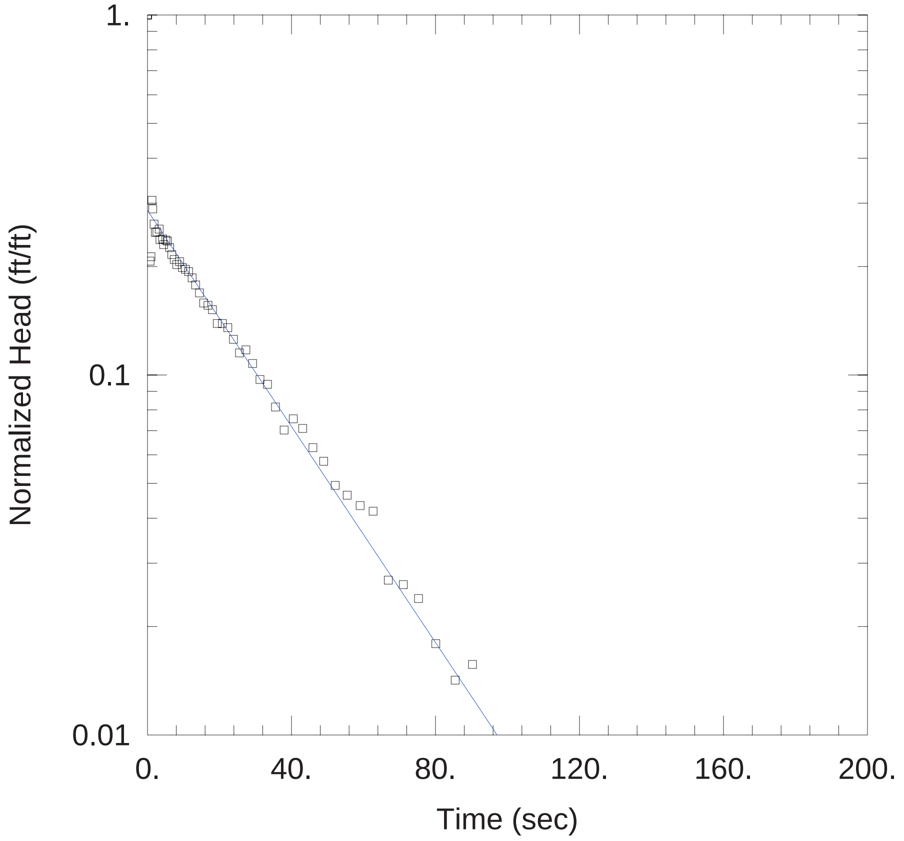
AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SI1)

Initial Displacement: 3.818 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SI2.aqt
Date: 05/12/17 Time: 17:23:52

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.001421 cm/sec
y0 = 0.383 ft

AQUIFER DATA

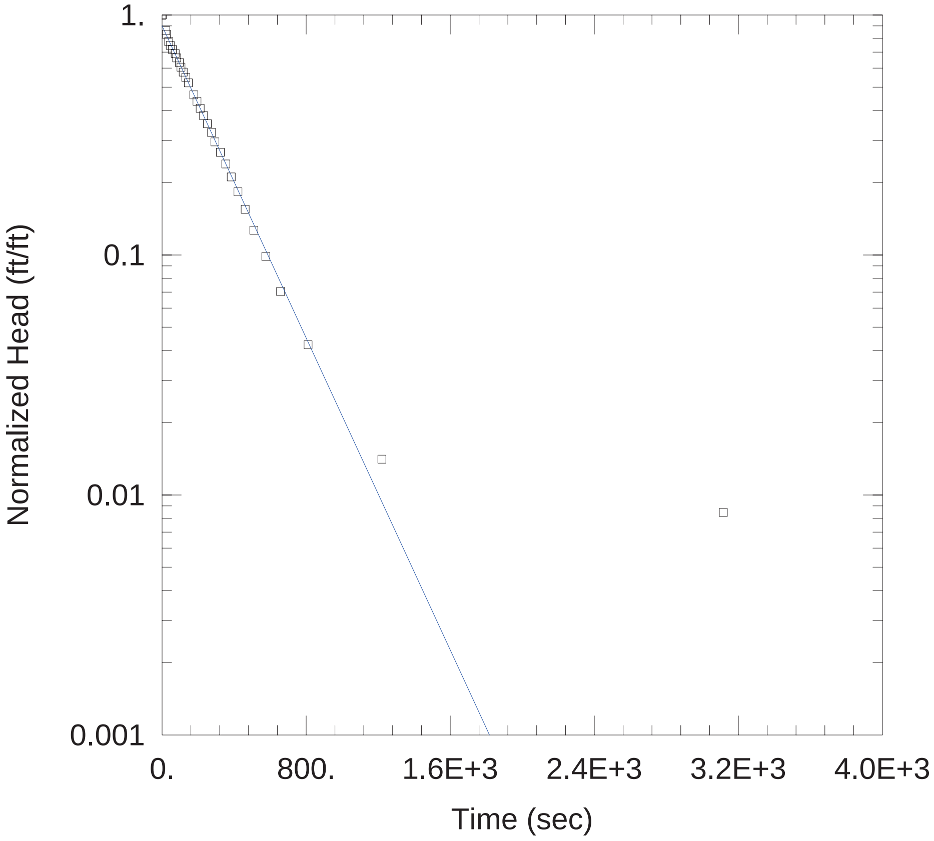
Saturated Thickness: 8.5 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SI2)

Initial Displacement: 1.338 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SO1.aqt
Date: 05/12/17 Time: 17:30:12

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

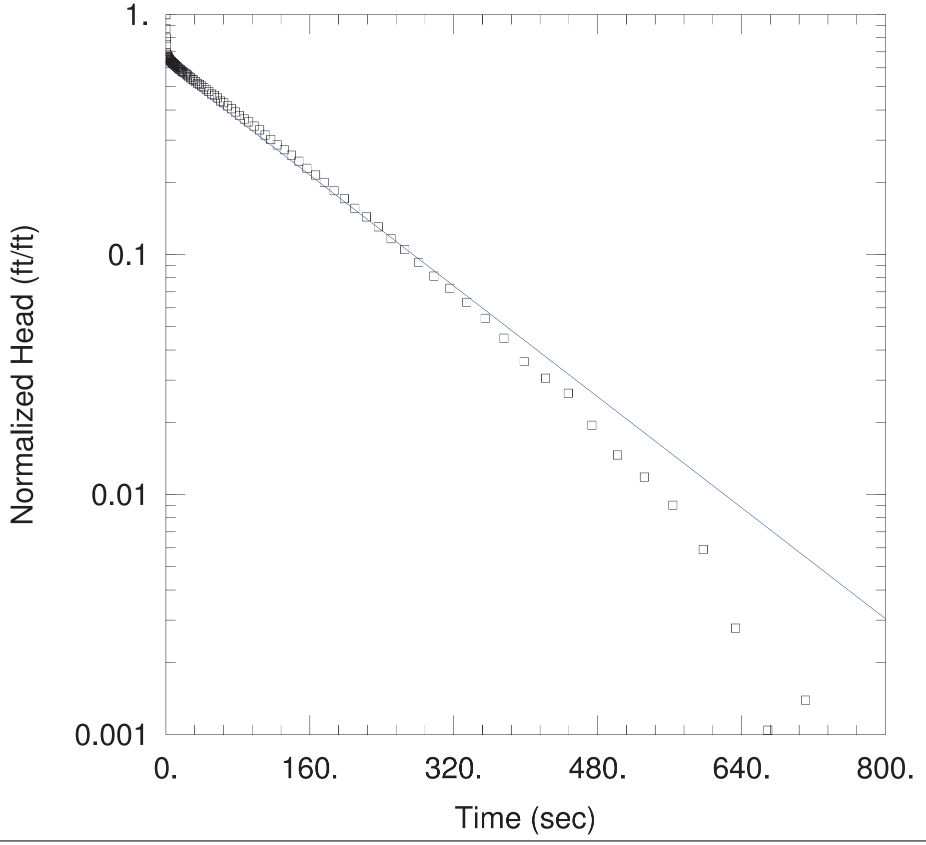
K = 0.0001539 cm/sec
y0 = 3.197 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SO1)

Initial Displacement: 3.55 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SO2.aqt
Date: 10/09/17 Time: 14:59:07

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

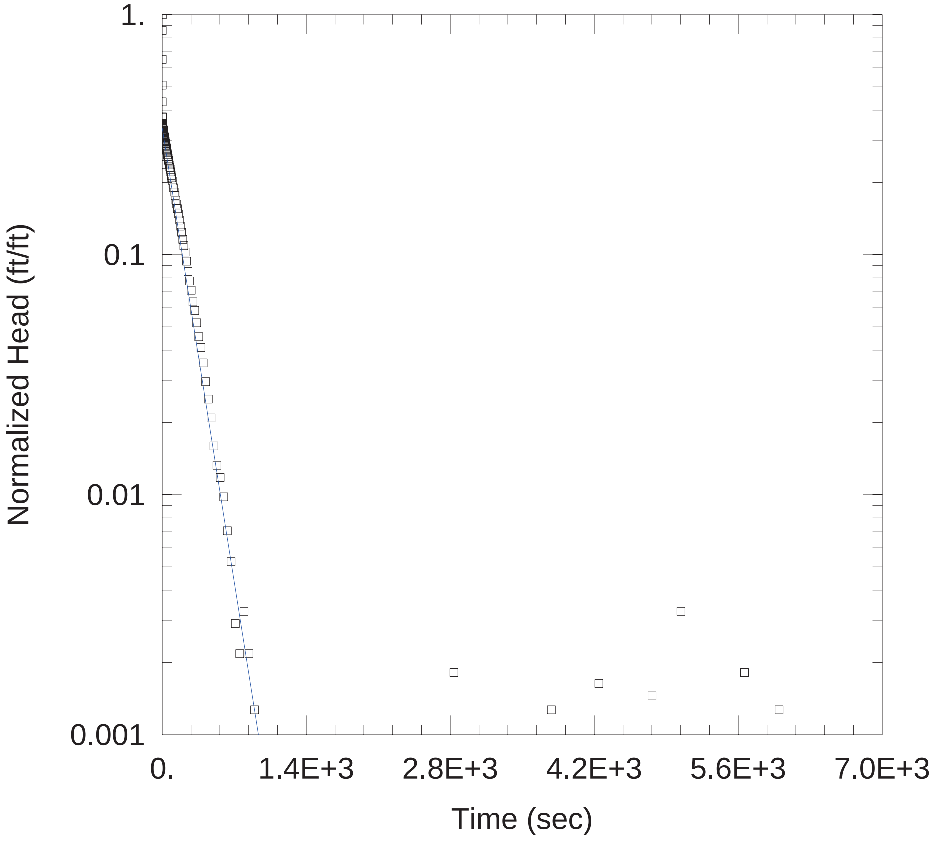
K = 0.0002735 cm/sec
y0 = 1.789 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SO2)

Initial Displacement: 2.879 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW5 SO3.aqt
Date: 06/15/17 Time: 11:57:15

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW5
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0002559 cm/sec
y0 = 1.858 ft

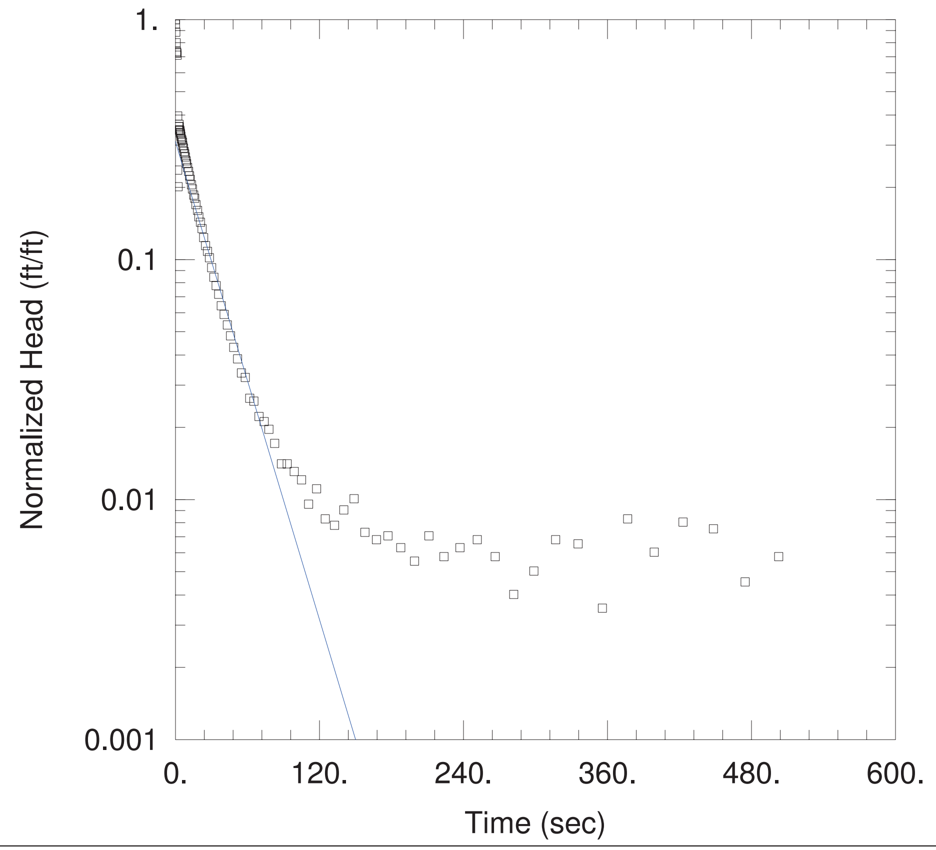
AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW5 SO3)

Initial Displacement: 5.512 ft
Total Well Penetration Depth: 6.81 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.5 ft
Screen Length: 4.68 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW6 SI1.aqt
Date: 10/10/17 Time: 08:43:51

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW6
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

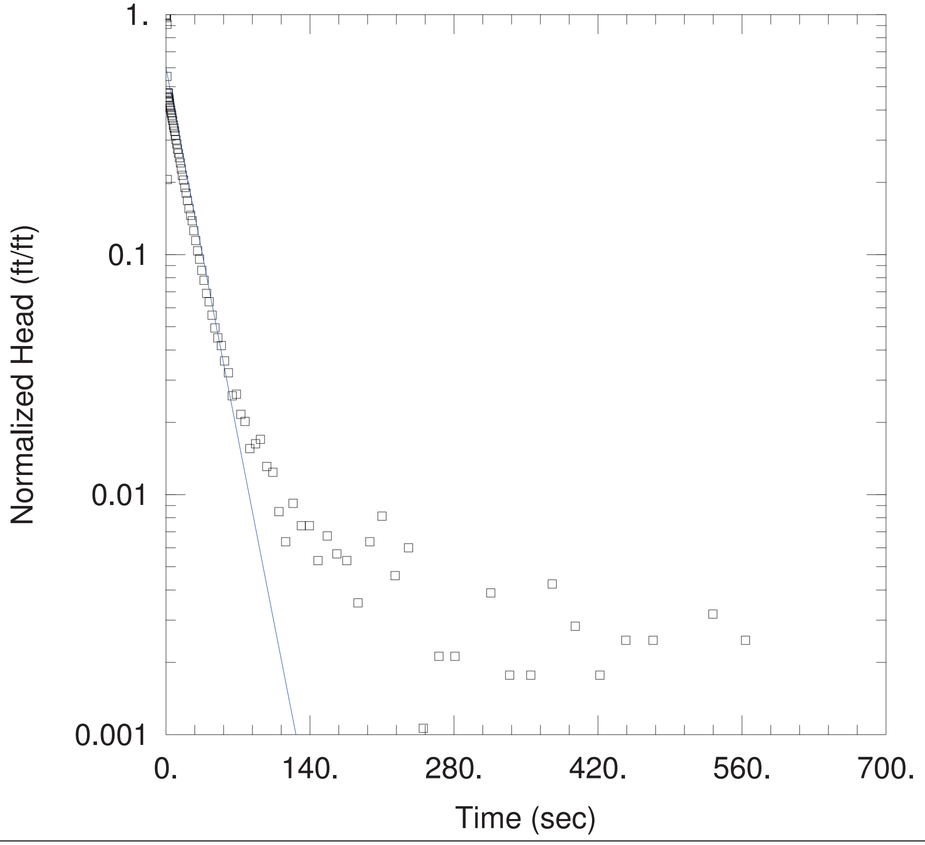
K = 0.001642 cm/sec
y0 = 1.231 ft

AQUIFER DATA

Saturated Thickness: 6.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW6 SI1)

Initial Displacement: 3.973 ft
Total Well Penetration Depth: 3.3 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.5 ft
Screen Length: 3.3 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW6 SI2.aqt
Date: 10/10/17 Time: 08:45:57

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW6
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

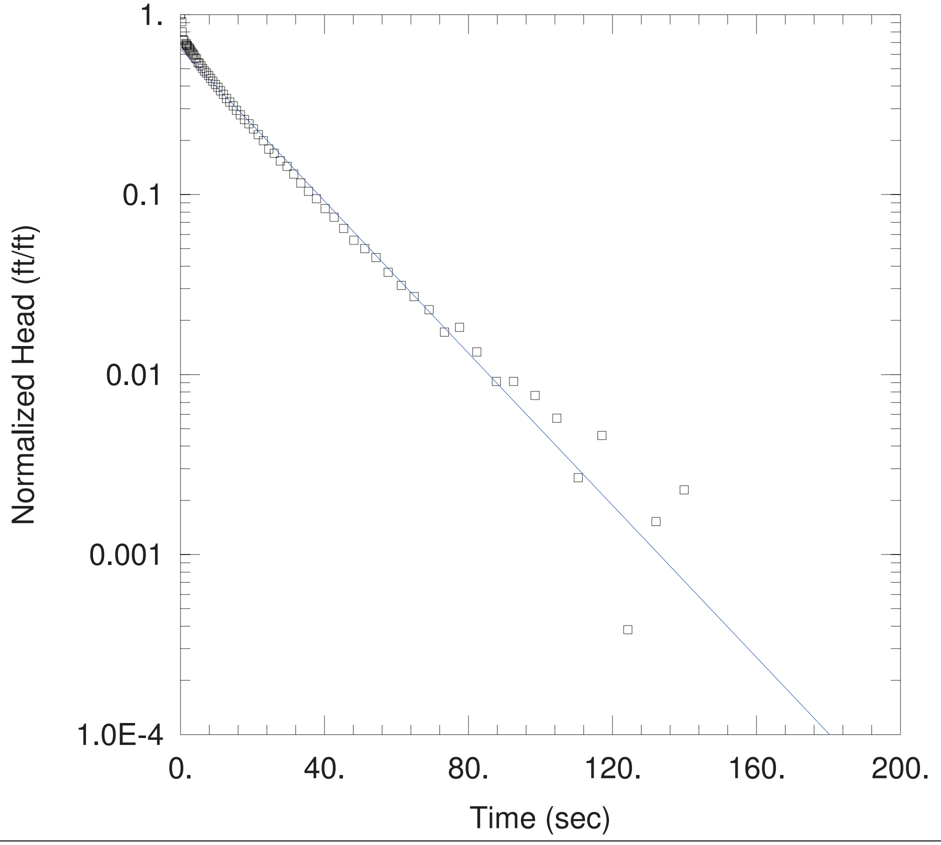
K = 0.002177 cm/sec
y0 = 1.702 ft

AQUIFER DATA

Saturated Thickness: 6.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW6 SI2)

Initial Displacement: 2.83 ft
Total Well Penetration Depth: 3.3 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.5 ft
Screen Length: 3.3 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW6 SO2.aqt
Date: 10/10/17 Time: 08:48:43

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW6
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

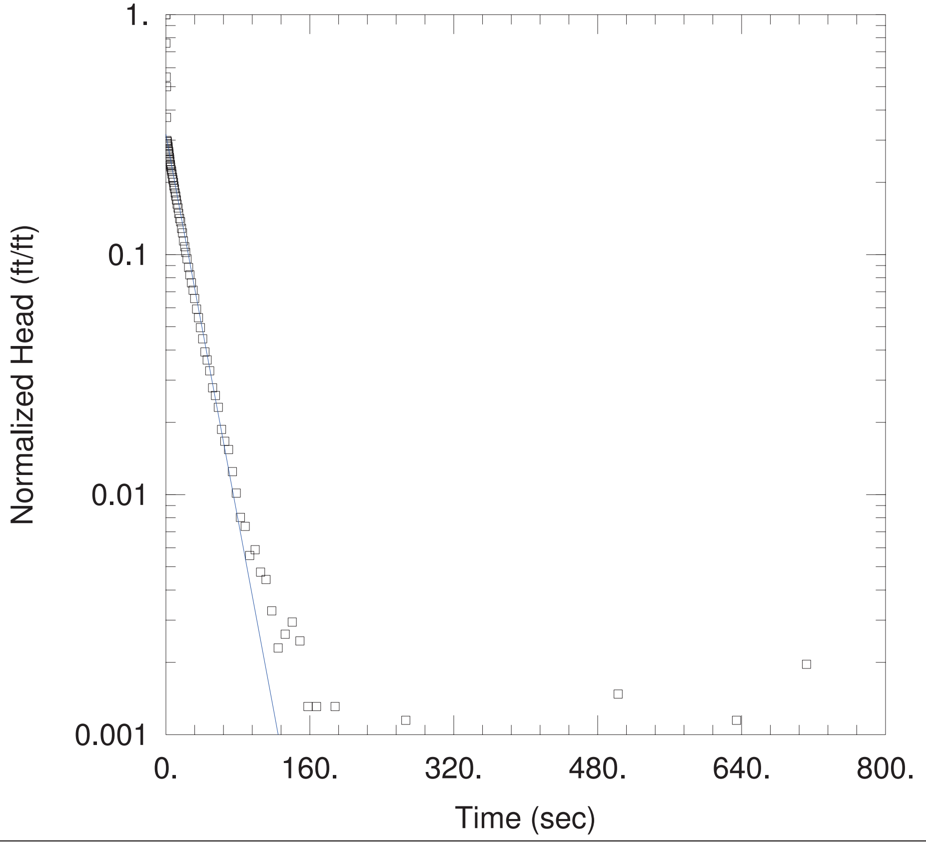
K = 0.002091 cm/sec
y0 = 1.689 ft

AQUIFER DATA

Saturated Thickness: 6.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW6 SO2)

Initial Displacement: 2.62 ft
Total Well Penetration Depth: 3.3 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.5 ft
Screen Length: 3.3 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW6 SO3.aqt
Date: 10/10/17 Time: 08:51:05

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW6
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

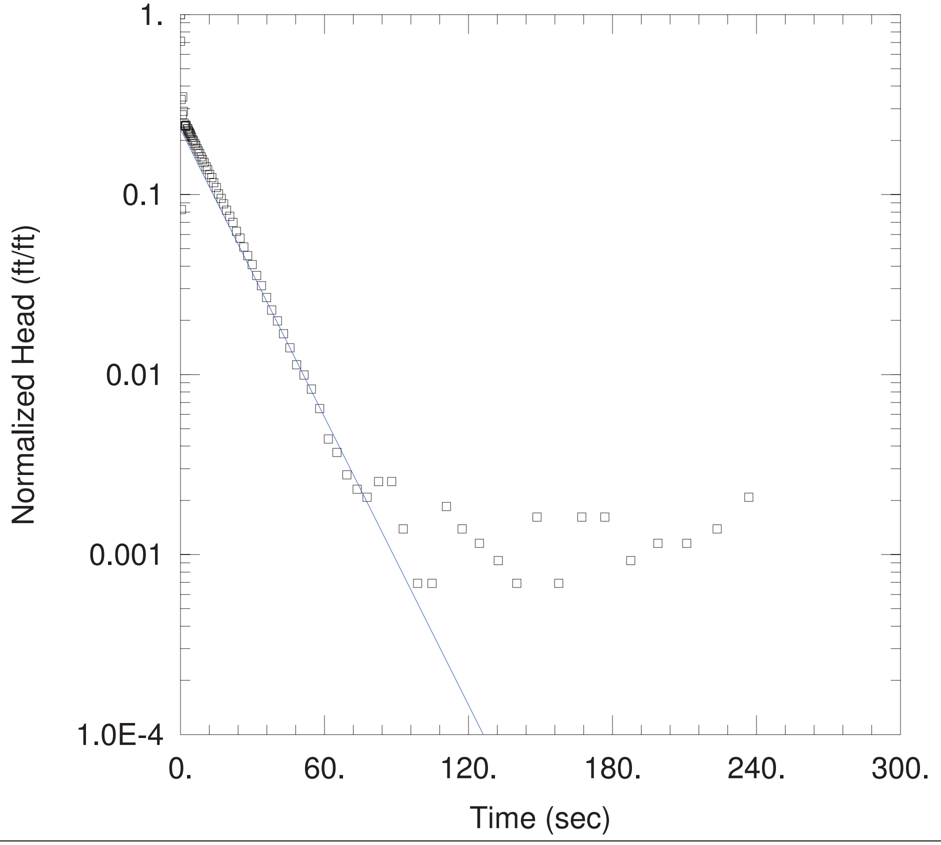
K = 0.001979 cm/sec
y0 = 1.936 ft

AQUIFER DATA

Saturated Thickness: 6.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW6 SO3)

Initial Displacement: 6.109 ft
Total Well Penetration Depth: 3.3 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.5 ft
Screen Length: 3.3 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW7 SI1.aqt
Date: 10/10/17 Time: 09:03:20

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW7
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.00225 cm/sec
y0 = 1.004 ft

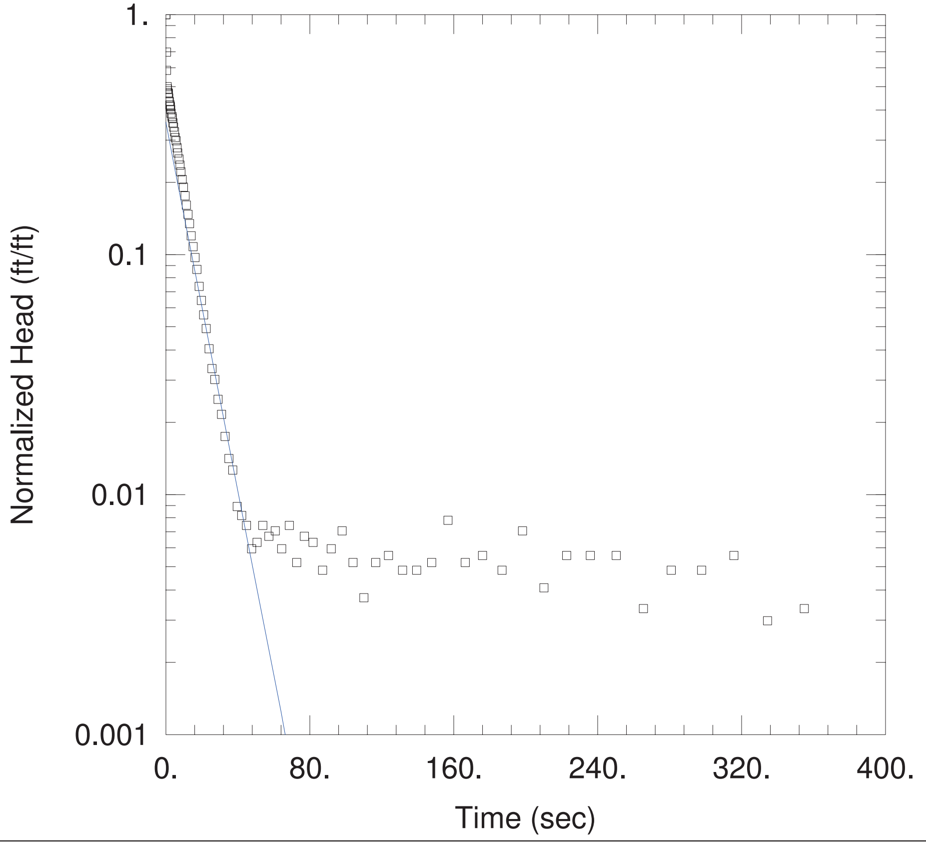
AQUIFER DATA

Saturated Thickness: 7.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW7 SI1)

Initial Displacement: 4.331 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 7.1 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW7 SO2.aqt
Date: 10/10/17 Time: 09:05:47

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW7
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

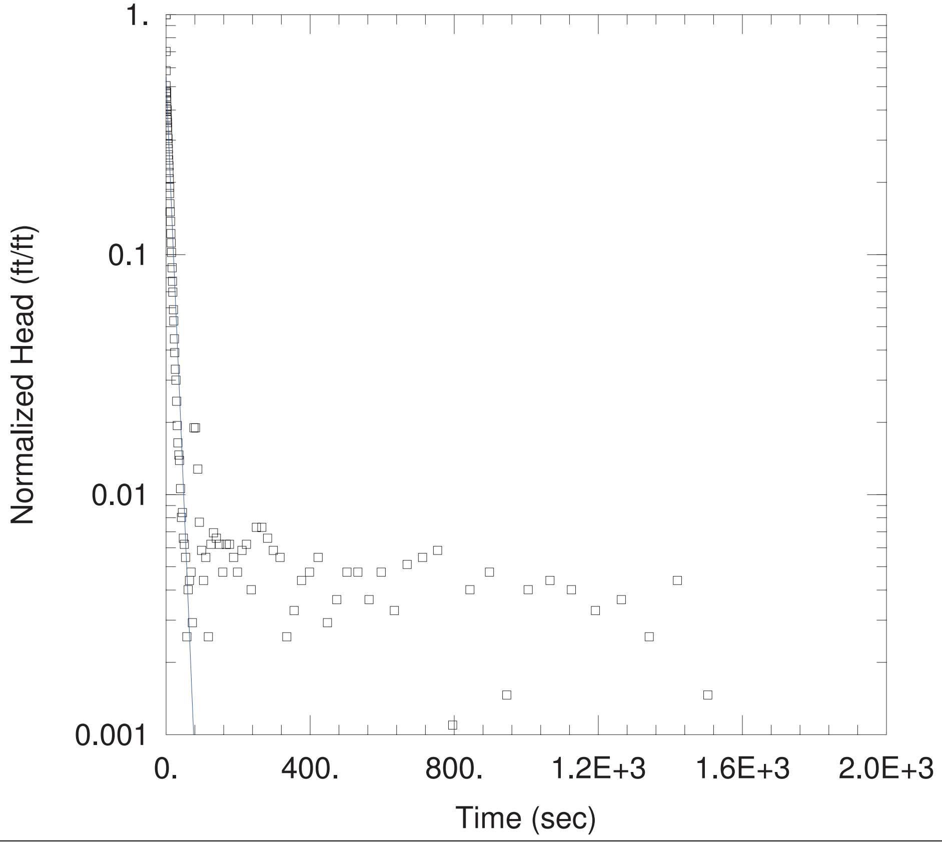
K = 0.003237 cm/sec
y0 = 0.9561 ft

AQUIFER DATA

Saturated Thickness: 7.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW7 S02)

Initial Displacement: 2.69 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 7.1 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW7 SO3.aqt
Date: 10/10/17 Time: 09:07:38

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW7
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

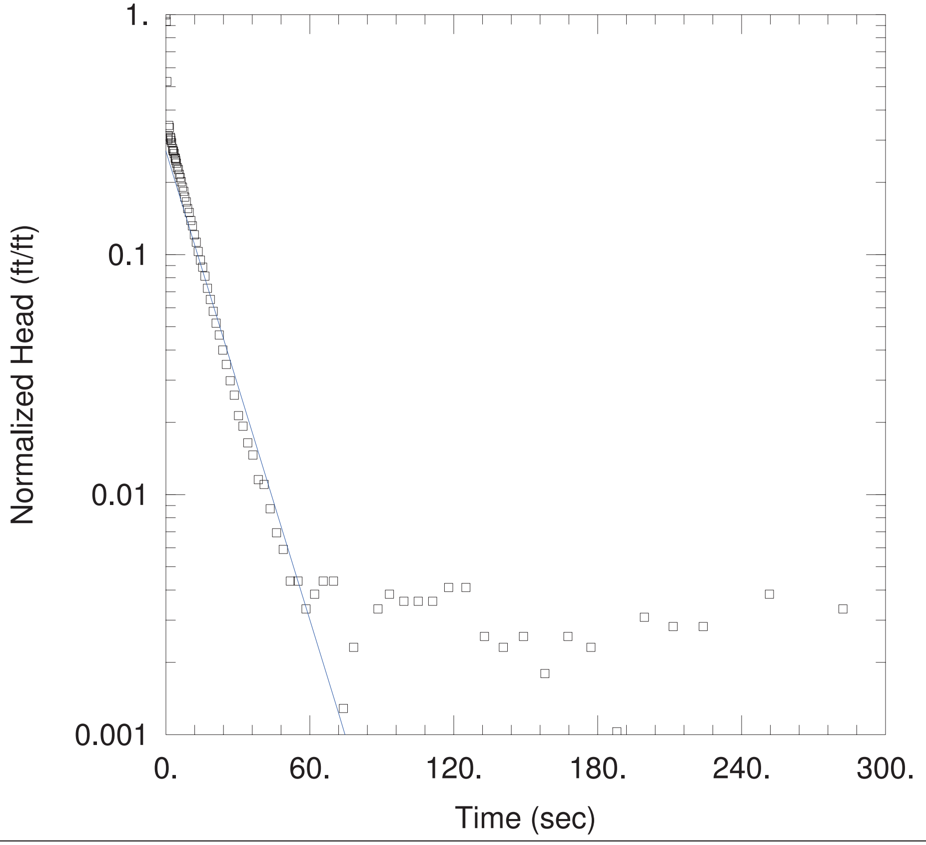
K = 0.002989 cm/sec
y0 = 1.503 ft

AQUIFER DATA

Saturated Thickness: 7.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW7 S03)

Initial Displacement: 2.738 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 7.1 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW7 SO4.aqt
Date: 10/10/17 Time: 09:09:26

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW7
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

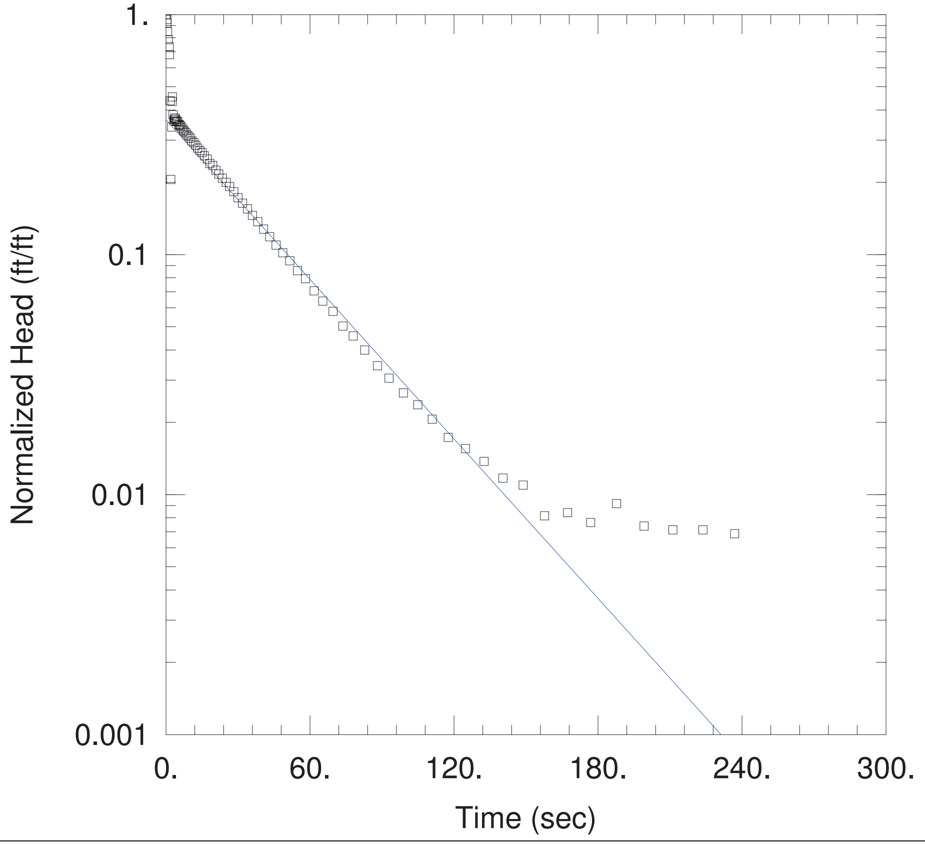
K = 0.002745 cm/sec
y0 = 1.052 ft

AQUIFER DATA

Saturated Thickness: 7.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW7 SO4)

Initial Displacement: 3.899 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 7.1 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW8 SI1.aqt
Date: 10/10/17 Time: 09:12:16

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW8
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

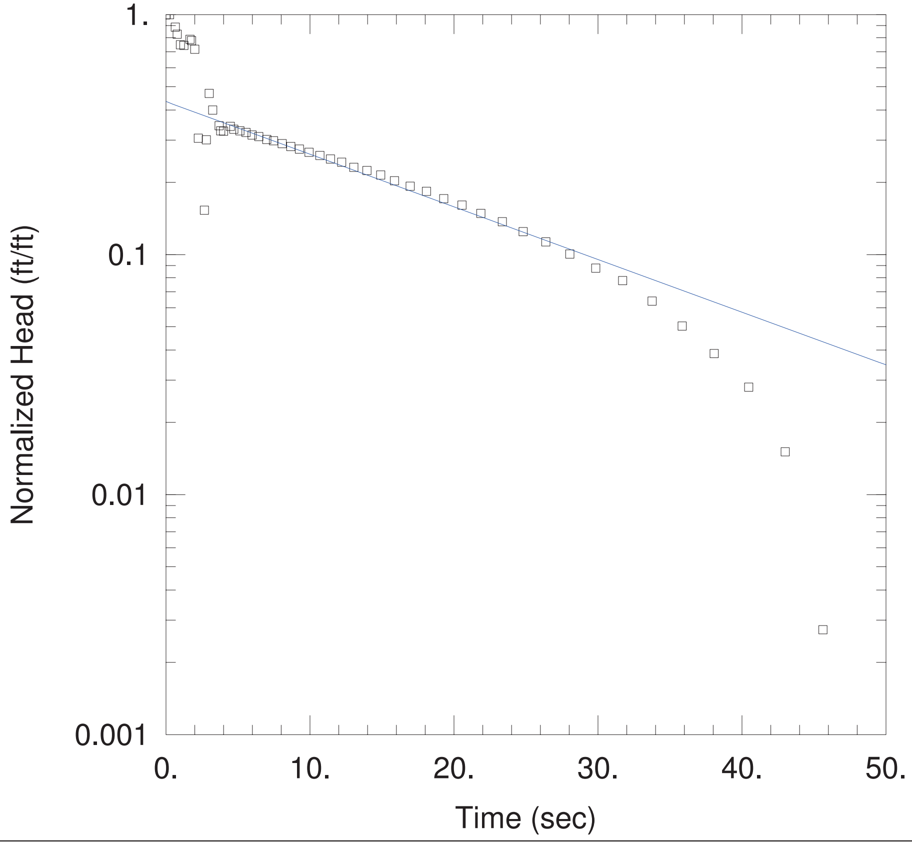
K = 0.0006602 cm/sec
y0 = 1.431 ft

AQUIFER DATA

Saturated Thickness: 16.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW8 SI1)

Initial Displacement: 3.929 ft
Total Well Penetration Depth: 12.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 16.3 ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW8 SI2.aqt
Date: 10/10/17 Time: 09:39:50

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW8
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

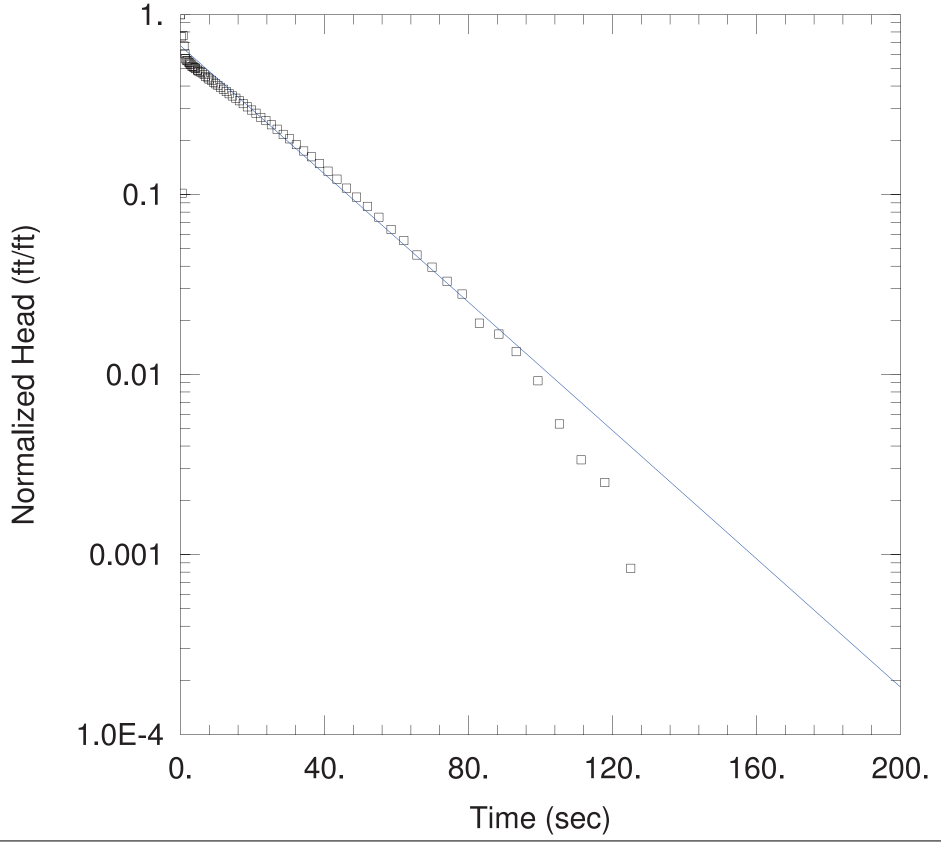
K = 0.001308 cm/sec
y0 = 1.269 ft

AQUIFER DATA

Saturated Thickness: 16.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW8 SI2)

Initial Displacement: 2.924 ft
Total Well Penetration Depth: 12.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 16.3 ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW8 SO2.aqt
Date: 10/10/17 Time: 09:41:42

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW8
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

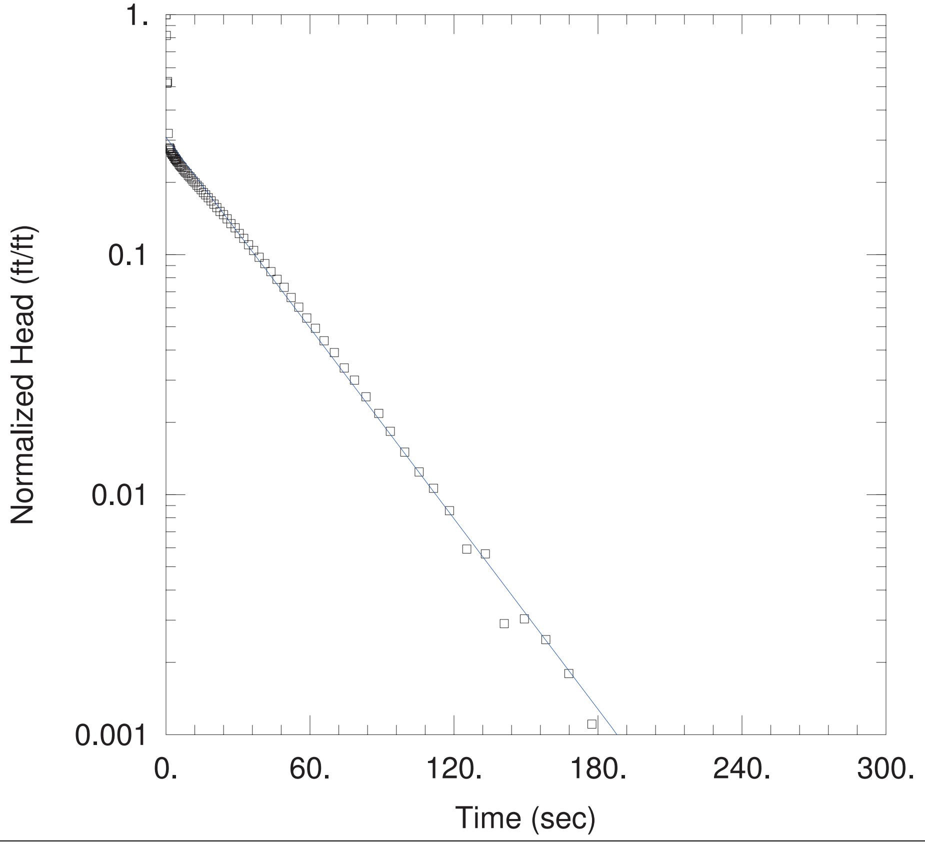
K = 0.001062 cm/sec
y0 = 2.403 ft

AQUIFER DATA

Saturated Thickness: 16.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW8 SO2)

Initial Displacement: 3.577 ft
Total Well Penetration Depth: 12.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 16.3 ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW8 SO3.aqt
Date: 10/10/17 Time: 09:43:26

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW8
Test Date: 4/6/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

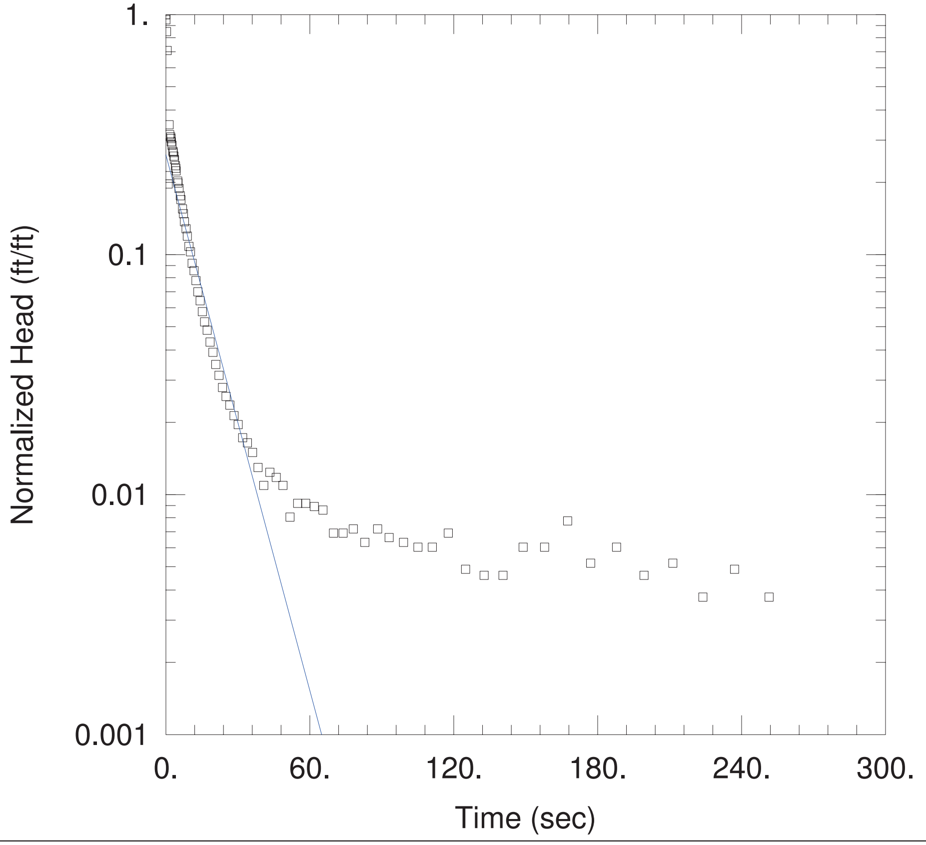
K = 0.0007891 cm/sec
y0 = 2.233 ft

AQUIFER DATA

Saturated Thickness: 16.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW8 SO3)

Initial Displacement: 7.249 ft
Total Well Penetration Depth: 12.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 16.3 ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW9 SI1.aqt
Date: 10/10/17 Time: 09:48:54

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW9
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

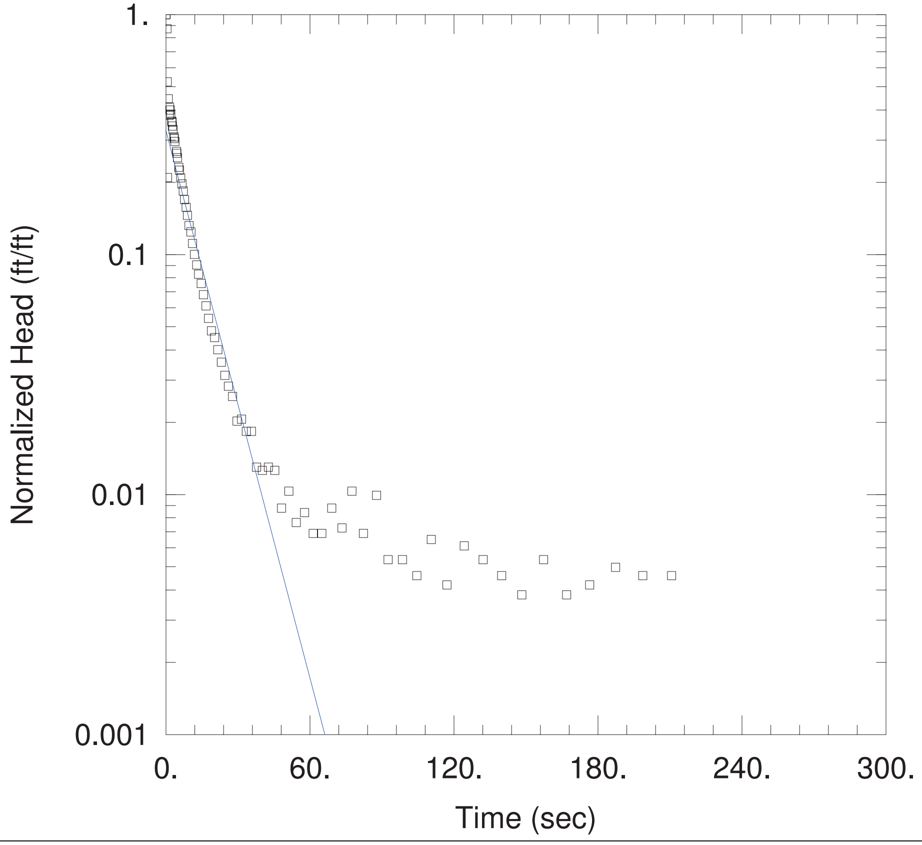
K = 0.00321 cm/sec
y0 = 0.9059 ft

AQUIFER DATA

Saturated Thickness: 6.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW9 SI1)

Initial Displacement: 3.477 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.3 ft
Screen Length: 4.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW9 SI2.aqt
Date: 10/10/17 Time: 09:50:42

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW9
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

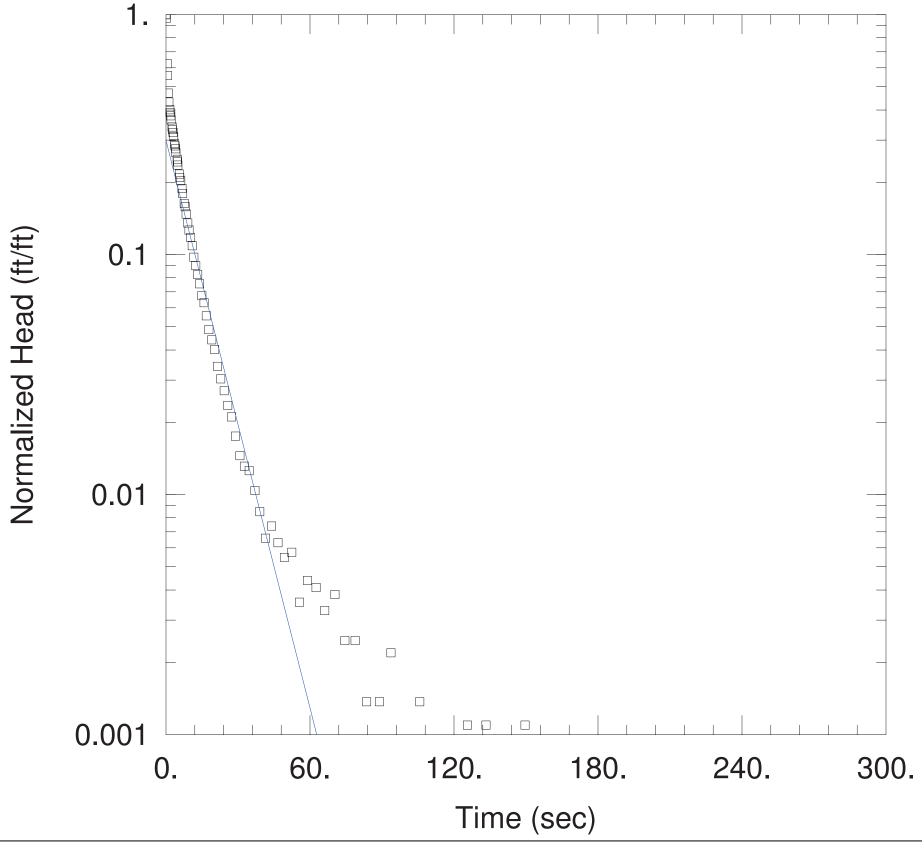
K = 0.003282 cm/sec
y0 = 0.8588 ft

AQUIFER DATA

Saturated Thickness: 6.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW9 SI2)

Initial Displacement: 2.617 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.3 ft
Screen Length: 4.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW9 SO1.aqt
Date: 10/10/17 Time: 09:52:04

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW9
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

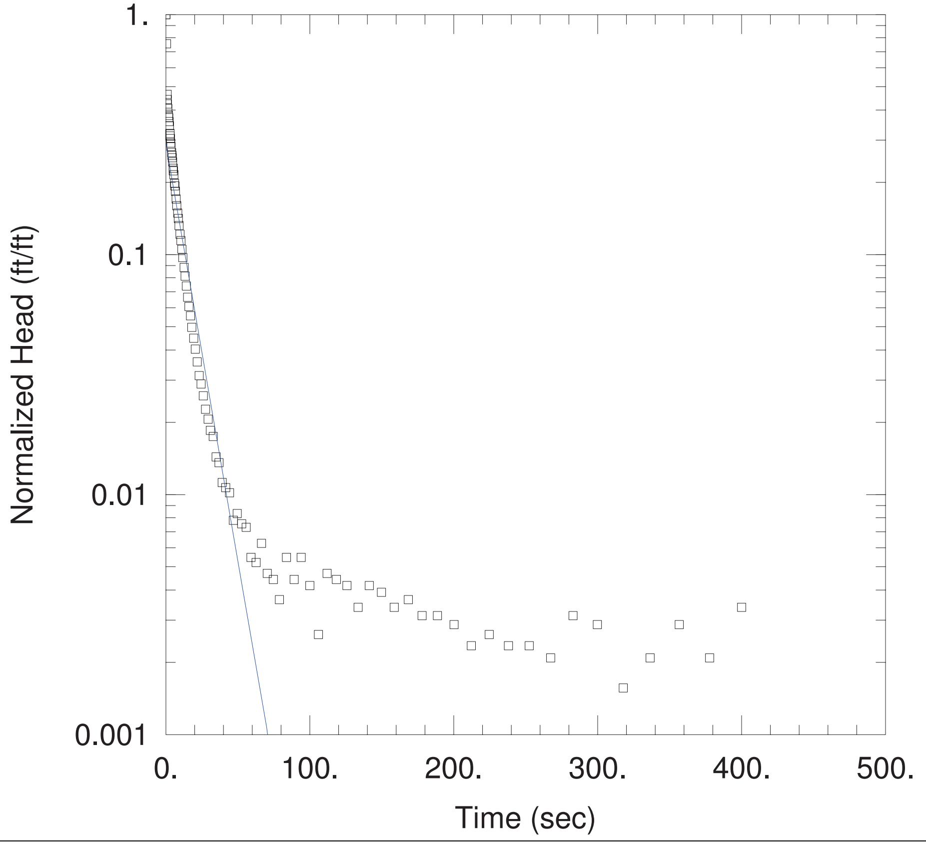
K = 0.003404 cm/sec
y0 = 1.094 ft

AQUIFER DATA

Saturated Thickness: 6.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW9 SO1)

Initial Displacement: 3.654 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.3 ft
Screen Length: 4.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW9 SO2.aqt
Date: 10/10/17 Time: 09:53:49

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW9
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

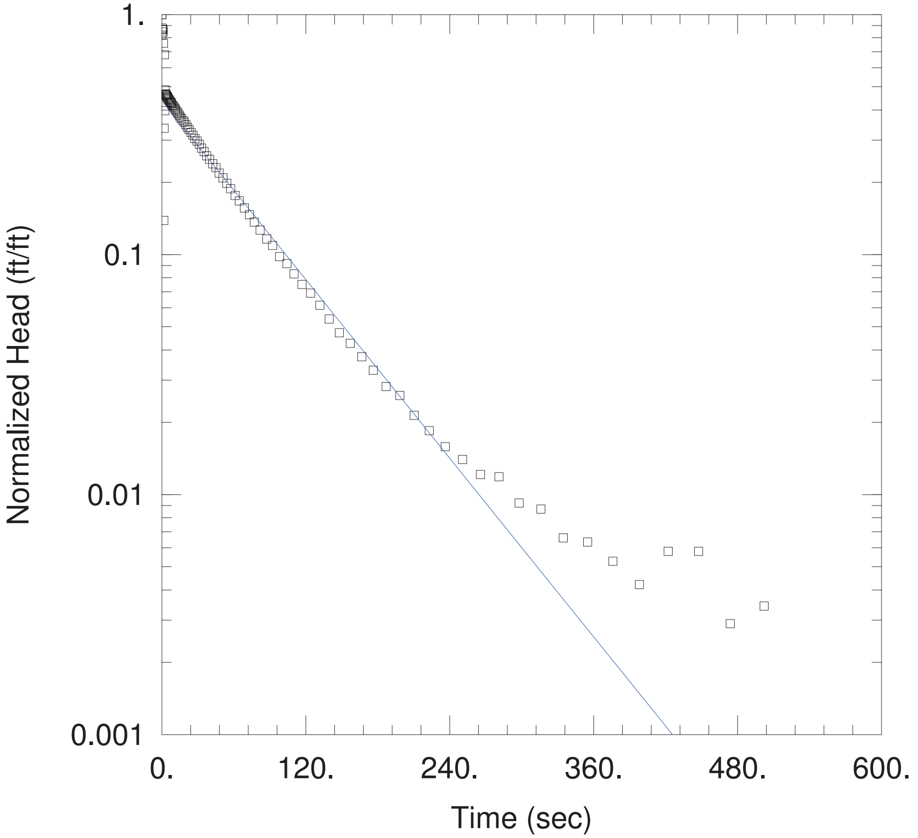
K = 0.003003 cm/sec
y0 = 1.117 ft

AQUIFER DATA

Saturated Thickness: 6.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW9 SO2)

Initial Displacement: 3.837 ft
Total Well Penetration Depth: 4.7 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.3 ft
Screen Length: 4.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW10 SI1.aqt
Date: 10/10/17 Time: 09:56:32

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW10
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

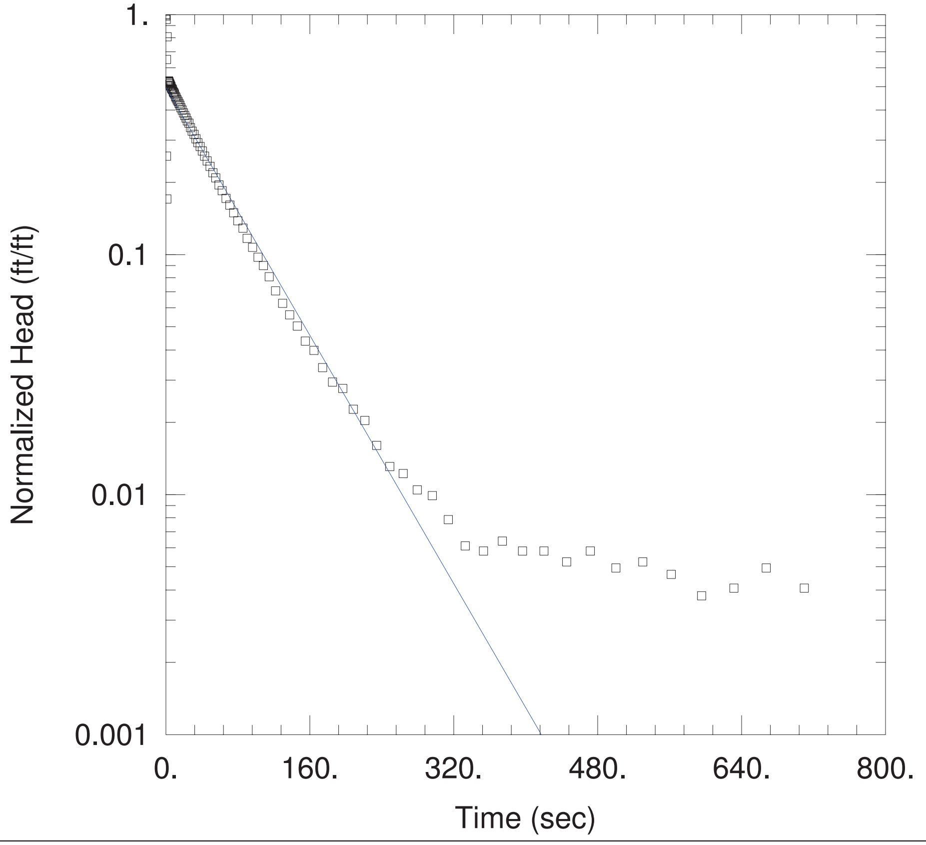
K = 0.0005269 cm/sec
y0 = 1.656 ft

AQUIFER DATA

Saturated Thickness: 6.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW10 SI1)

Initial Displacement: 3.792 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.7 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW10 SI2.aqt
Date: 10/10/17 Time: 09:59:35

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW10
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

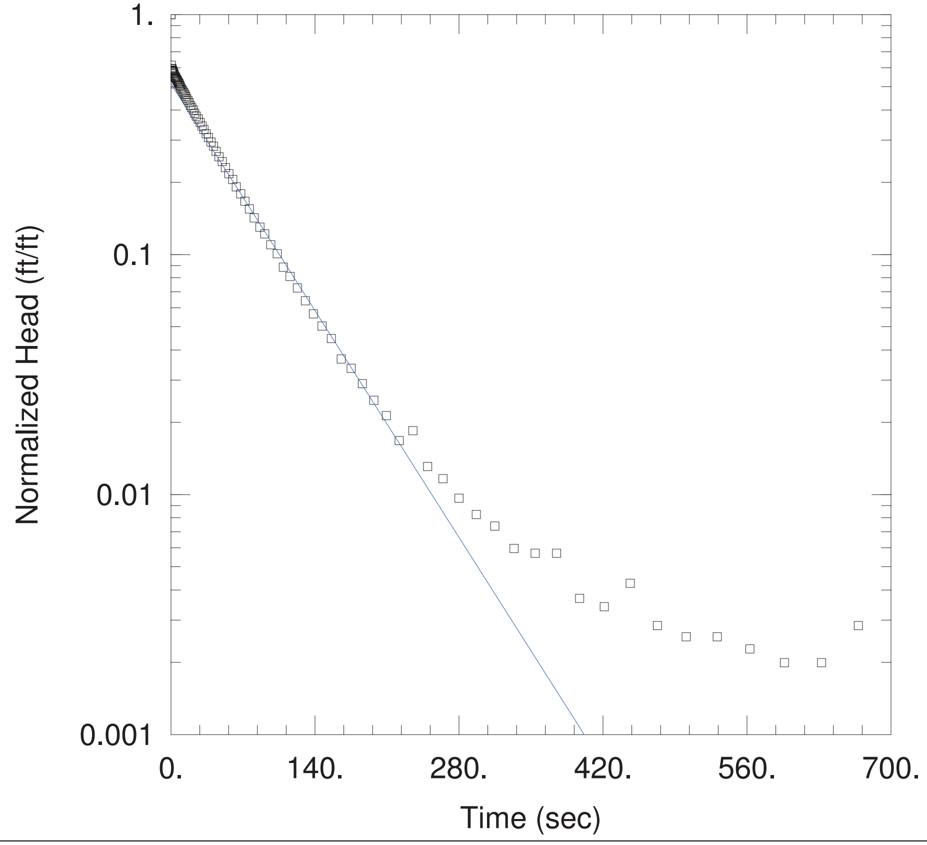
K = 0.0005491 cm/sec
y0 = 1.716 ft

AQUIFER DATA

Saturated Thickness: 6.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW10 SI2)

Initial Displacement: 3.438 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.7 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW10 SO2.aqt
Date: 10/10/17 Time: 10:01:28

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW10
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

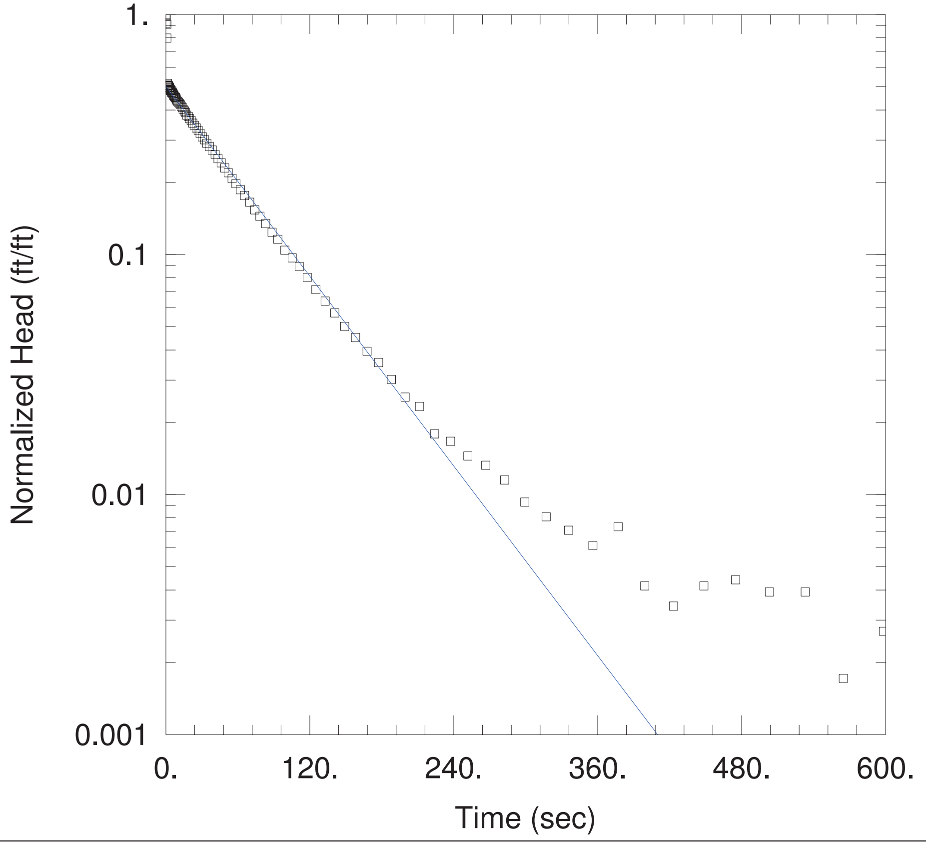
K = 0.0005731 cm/sec
y0 = 1.809 ft

AQUIFER DATA

Saturated Thickness: 6.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW10 SO2)

Initial Displacement: 3.518 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.7 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\APW10 SO3.aqt
Date: 10/10/17 Time: 10:09:04

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Primary Ash Pond
Test Well: APW10
Test Date: 4/7/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

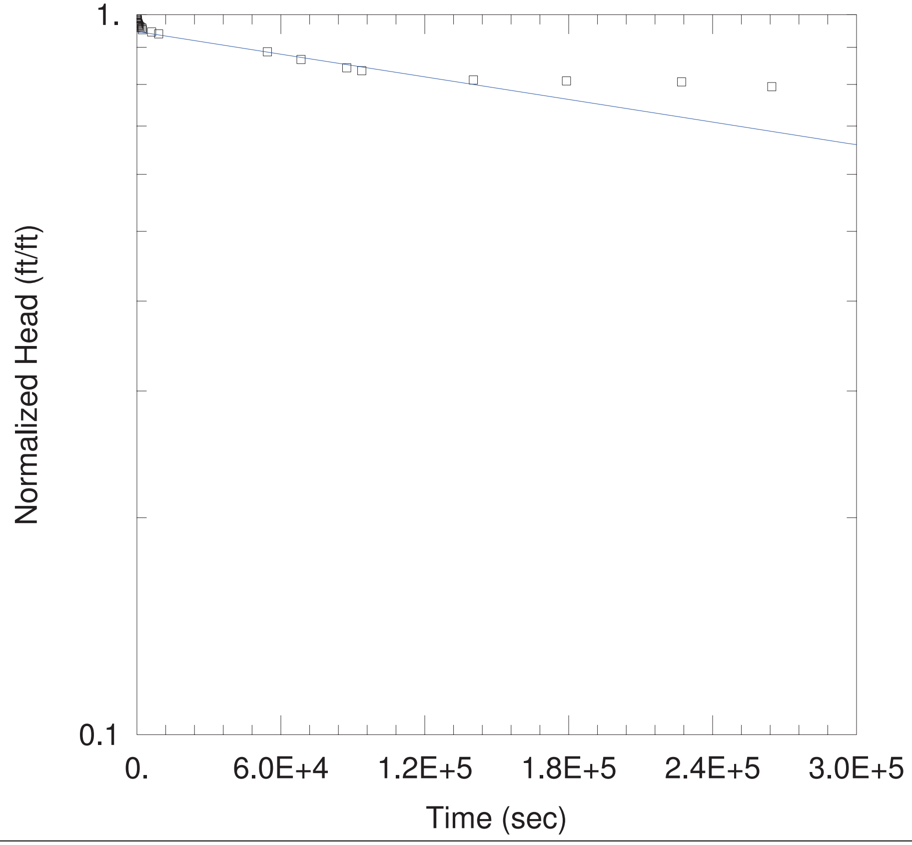
K = 0.0005595 cm/sec
y0 = 2.048 ft

AQUIFER DATA

Saturated Thickness: 6.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (APW10 SO2)

Initial Displacement: 4.081 ft
Total Well Penetration Depth: 4.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.7 ft
Screen Length: 4.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G06D SO1.aqt
Date: 10/10/17 Time: 10:15:04

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G06D
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

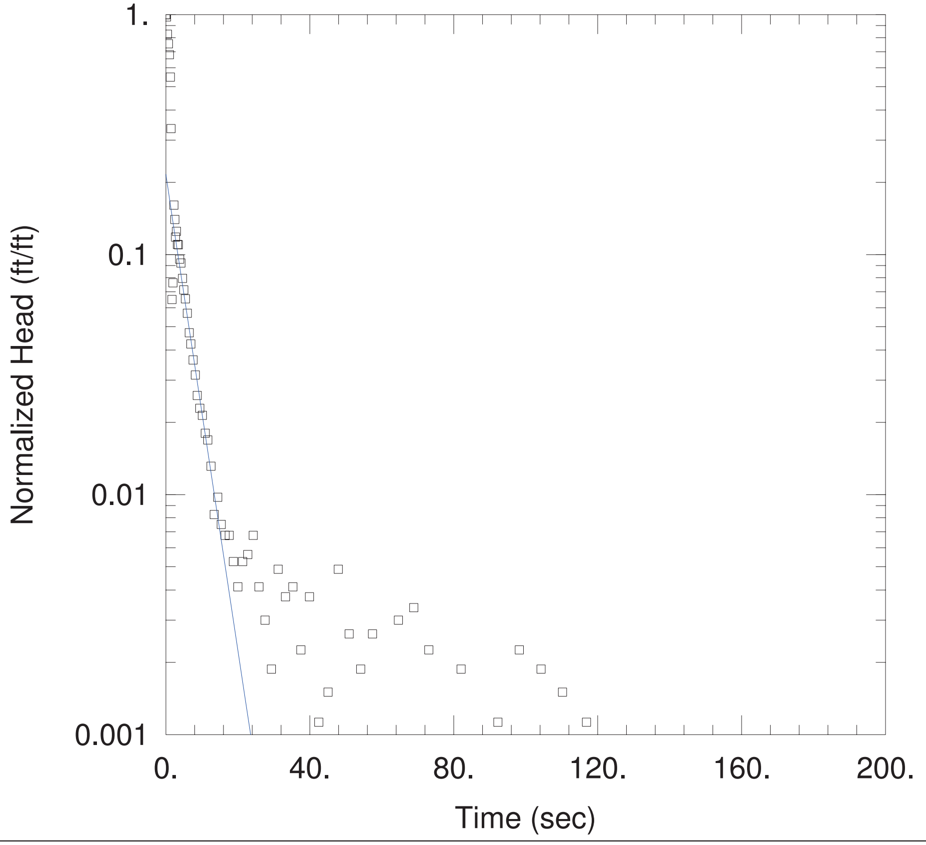
K = 3.917E-8 cm/sec
y0 = 3.807 ft

AQUIFER DATA

Saturated Thickness: 0.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G06D)

Initial Displacement: 4.02 ft
Total Well Penetration Depth: 0.4 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 0.4 ft
Screen Length: 0.4 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G202 SI1.aqt
Date: 10/10/17 Time: 10:19:06

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G202
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.01698 cm/sec
y0 = 0.5744 ft

AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

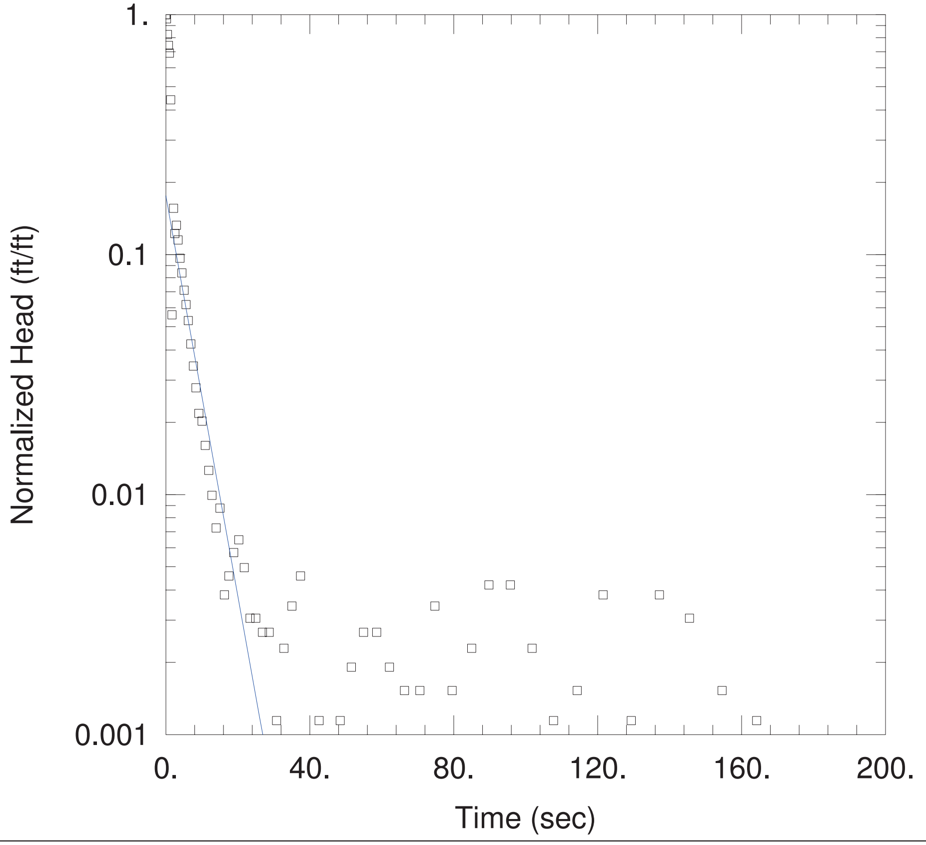
WELL DATA (G202 SI1)

Initial Displacement: 2.666 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.3458 ft

Electronic Filing: Received, Clerk's Office 03/26/2024

R002146



WELL TEST ANALYSIS

Data Set: P:\...\G202 SI2.aqt
Date: 10/10/17 Time: 10:20:26

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G202
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

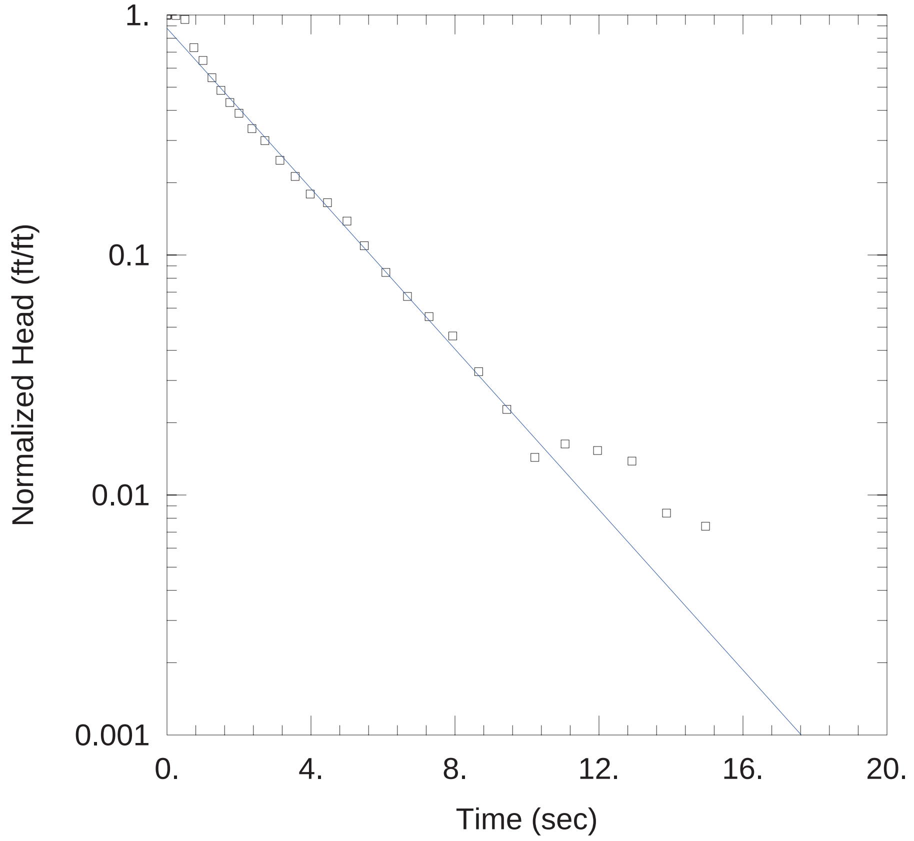
K = 0.0143 cm/sec
y0 = 0.4599 ft

AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G202 SI2)

Initial Displacement: 2.621 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G202 SO2.aqt
Date: 06/15/17 Time: 10:21:12

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G202
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

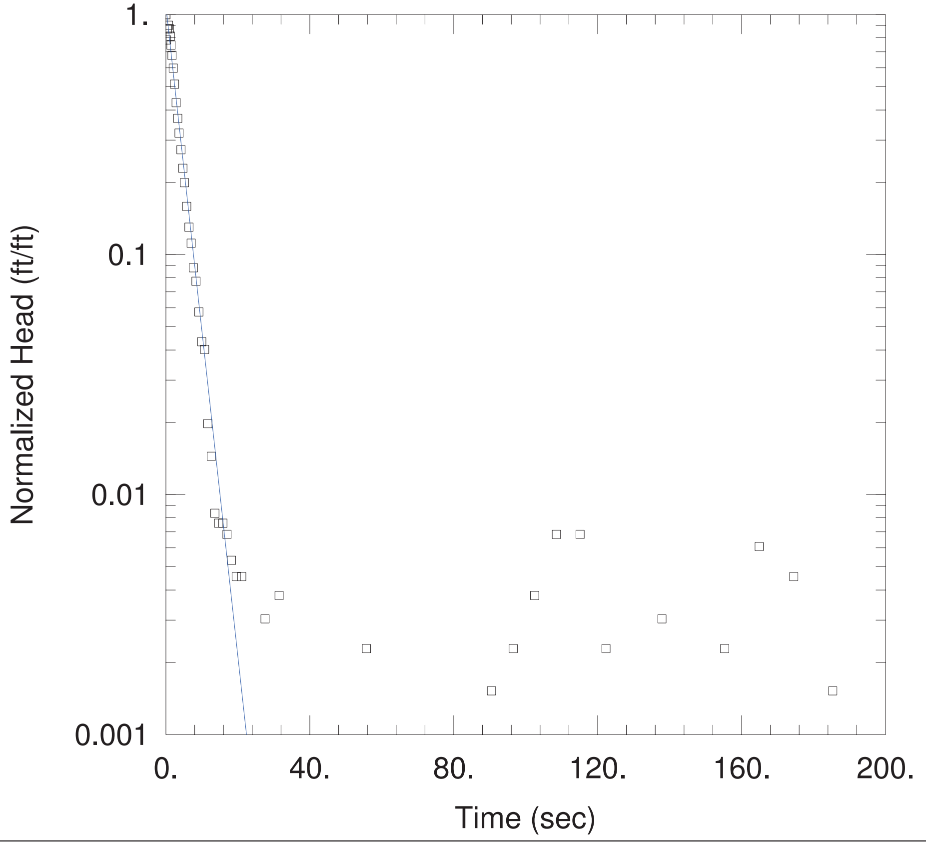
K = 0.02868 cm/sec
y0 = 1.781 ft

AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G202 SO2)

Initial Displacement: 2.024 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G202 SO3.aqt
Date: 10/10/17 Time: 10:21:38

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G202
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

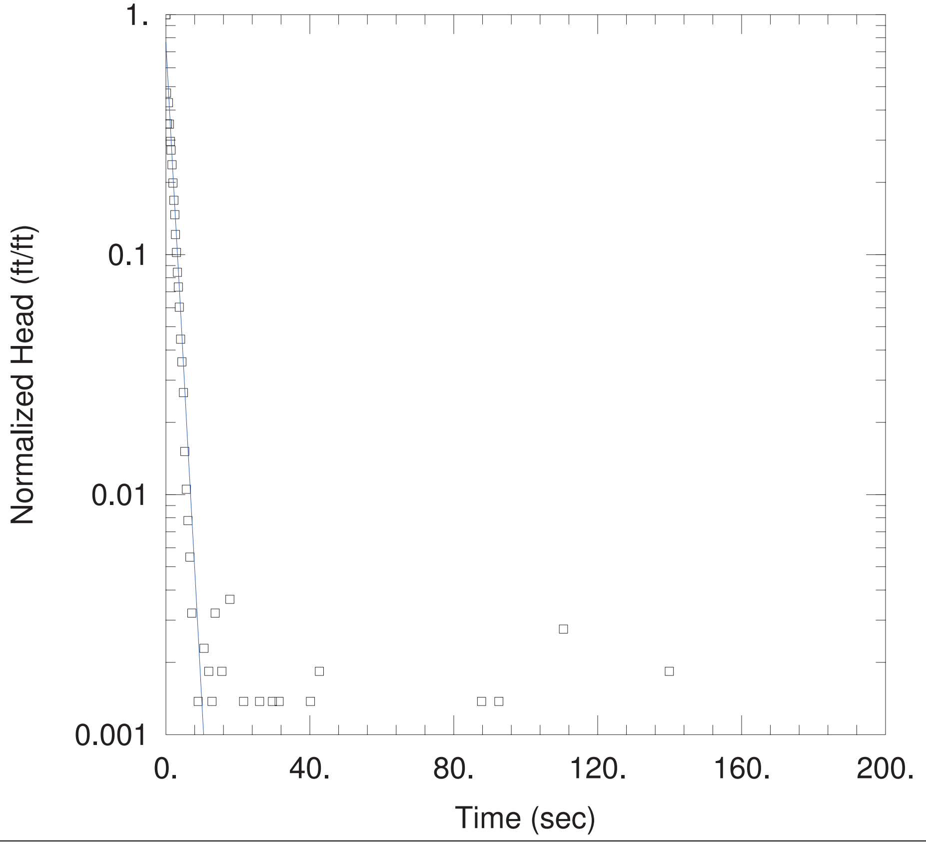
K = 0.02325 cm/sec
y0 = 1.444 ft

AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G202 SO3)

Initial Displacement: 1.317 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G203 SI1.aqt
Date: 10/10/17 Time: 10:24:55

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G203
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

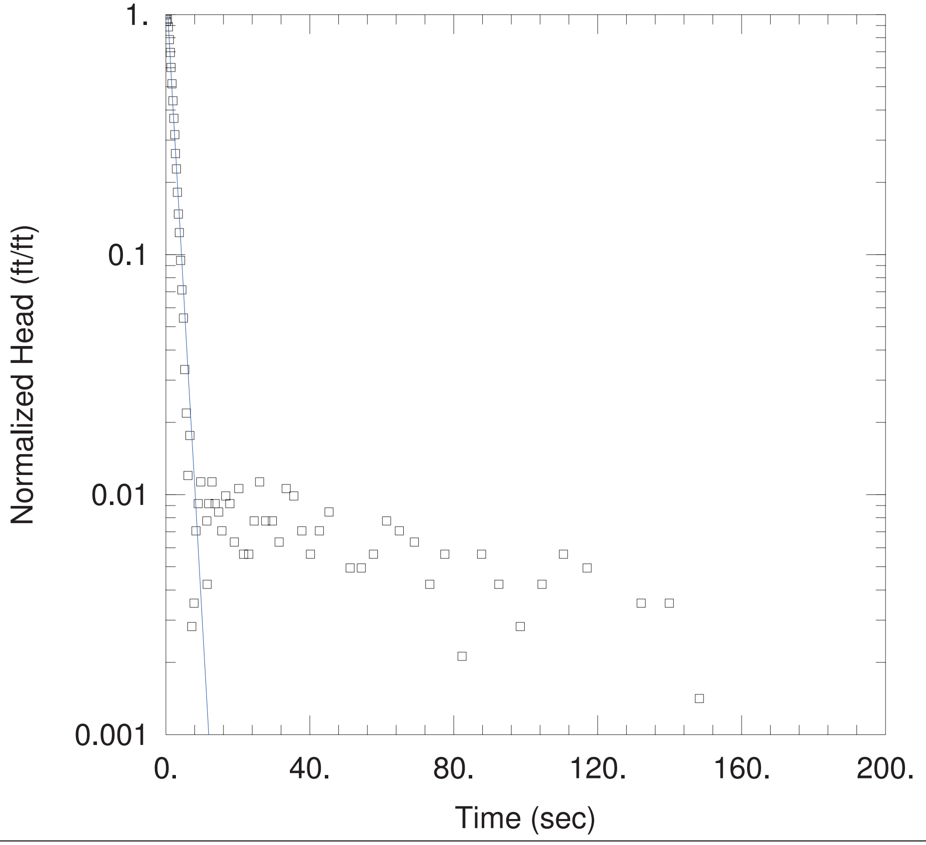
K = 0.02529 cm/sec
y0 = 1.676 ft

AQUIFER DATA

Saturated Thickness: 6.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G203 SI1)

Initial Displacement: 2.184 ft
Total Well Penetration Depth: 3.9 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.9 ft
Screen Length: 3.9 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G203 SO1.aqt
Date: 10/10/17 Time: 10:28:31

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G203
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

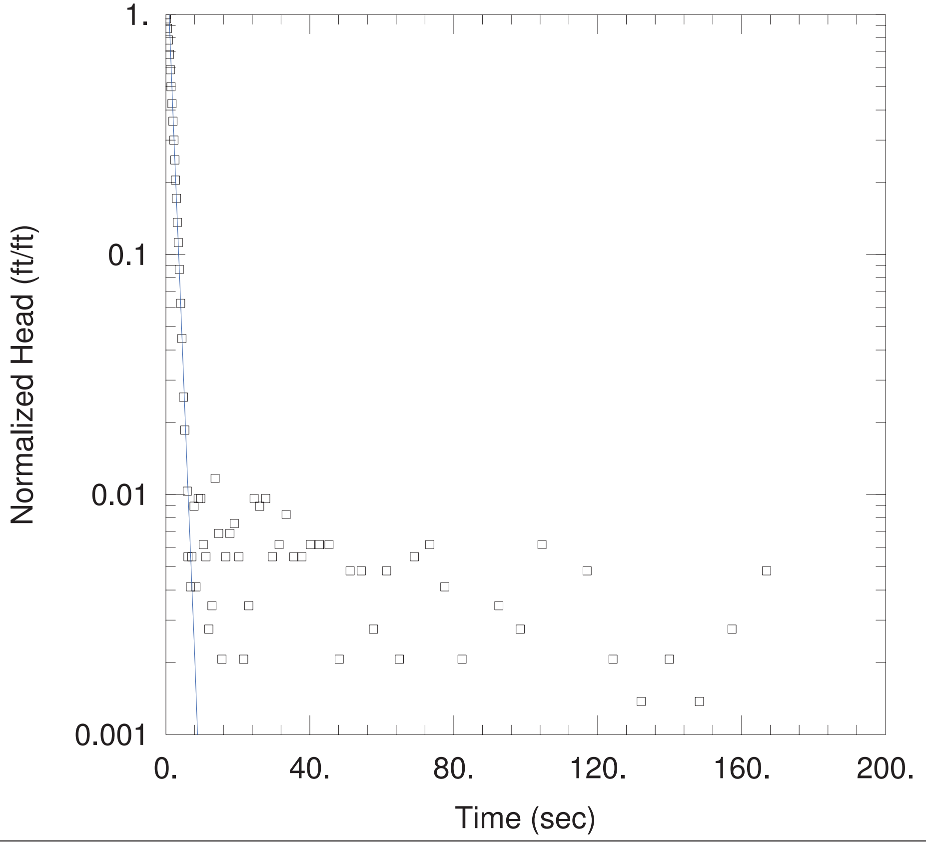
K = 0.02421 cm/sec
y0 = 1.958 ft

AQUIFER DATA

Saturated Thickness: 6.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G203 SO1)

Initial Displacement: 1.418 ft
Total Well Penetration Depth: 3.9 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.9 ft
Screen Length: 3.9 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G203 SO2.aqt
Date: 10/10/17 Time: 10:30:34

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G203
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

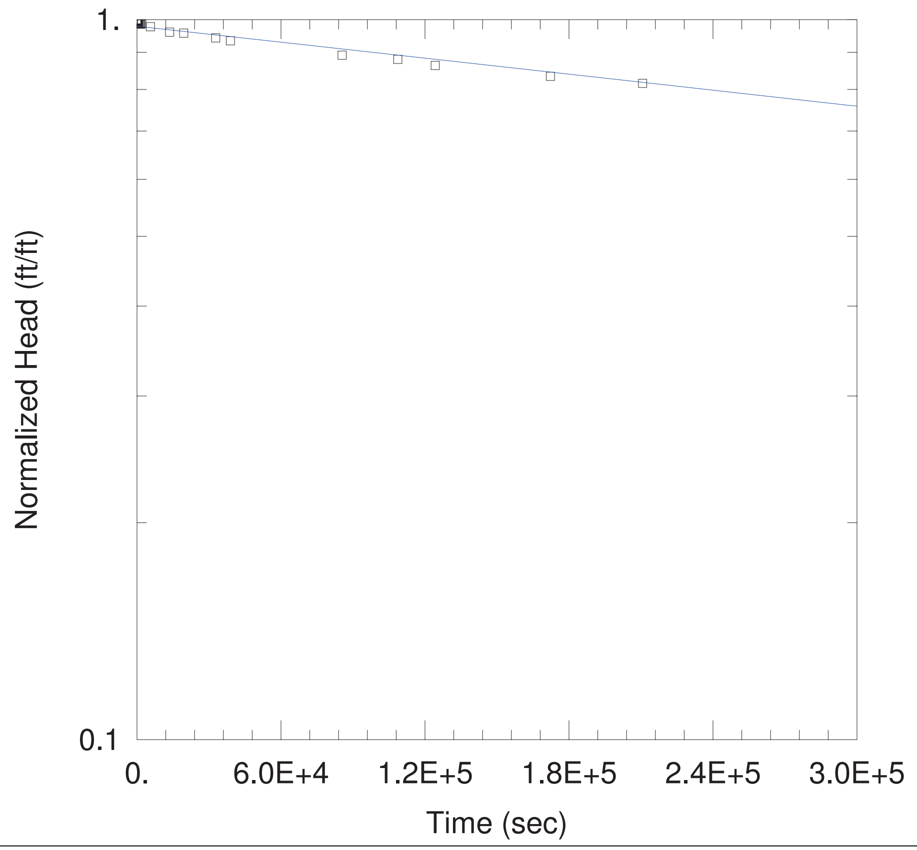
K = 0.03469 cm/sec
y0 = 3.185 ft

AQUIFER DATA

Saturated Thickness: 6.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G203 SO2)

Initial Displacement: 1.454 ft
Total Well Penetration Depth: 3.9 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.9 ft
Screen Length: 3.9 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G208 SO1.aqt
Date: 10/10/17 Time: 10:33:25

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G208
Test Date: 4/4/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

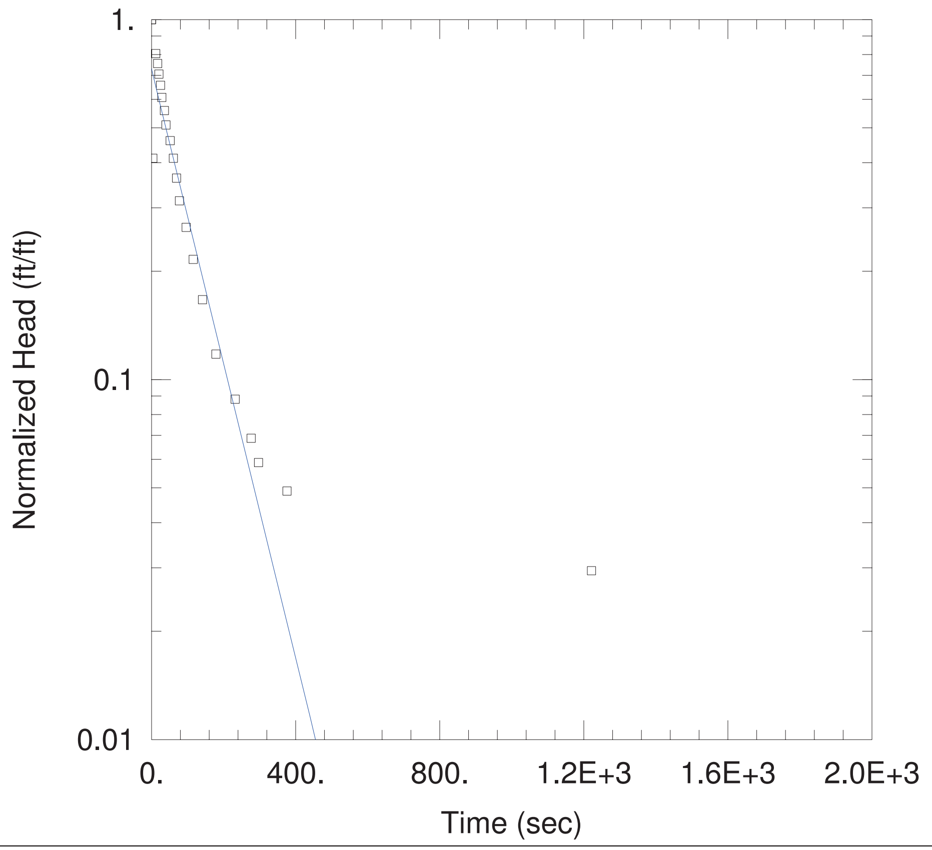
K = 1.315E-8 cm/sec
y0 = 10.16 ft

AQUIFER DATA

Saturated Thickness: 22.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G208 SO1)

Initial Displacement: 10.38 ft
Total Well Penetration Depth: 19.8 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 22.1 ft
Screen Length: 19.8 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G217D SI1.aqt
Date: 10/10/17 Time: 10:35:45

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G217D
Test Date: 4/4/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

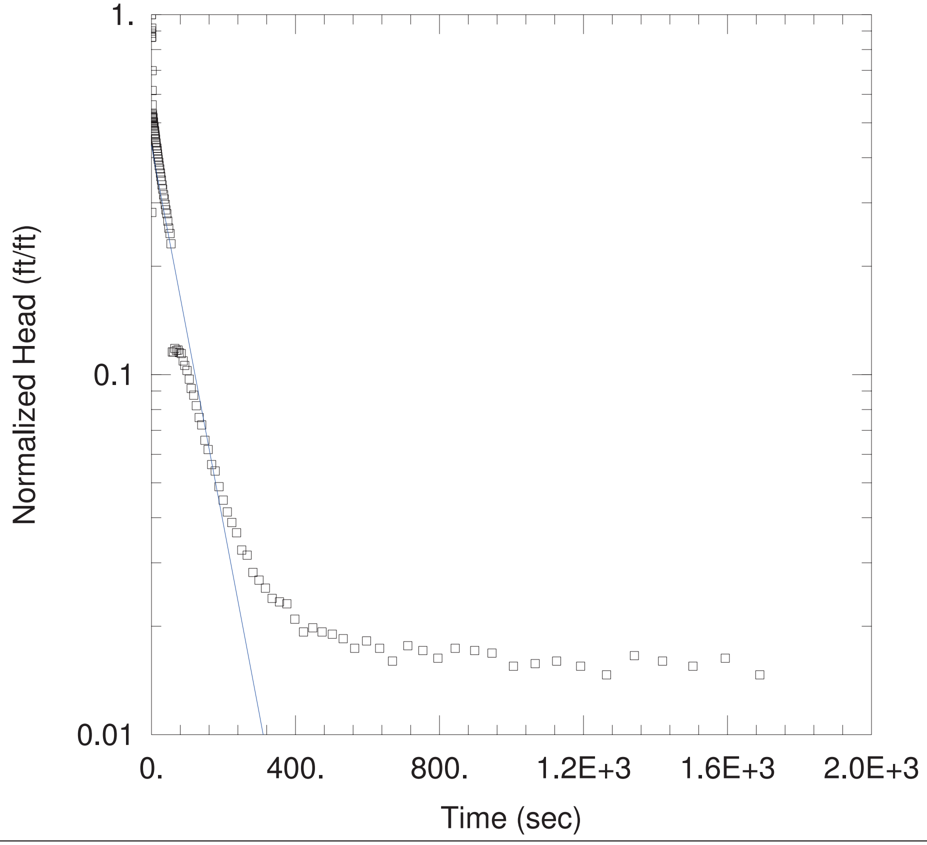
K = 0.0002266 cm/sec
y0 = 0.743 ft

AQUIFER DATA

Saturated Thickness: 13. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G217D SI1)

Initial Displacement: 1.02 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G217D SI2.aqt
Date: 10/10/17 Time: 10:38:05

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G217D
Test Date: 4/4/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

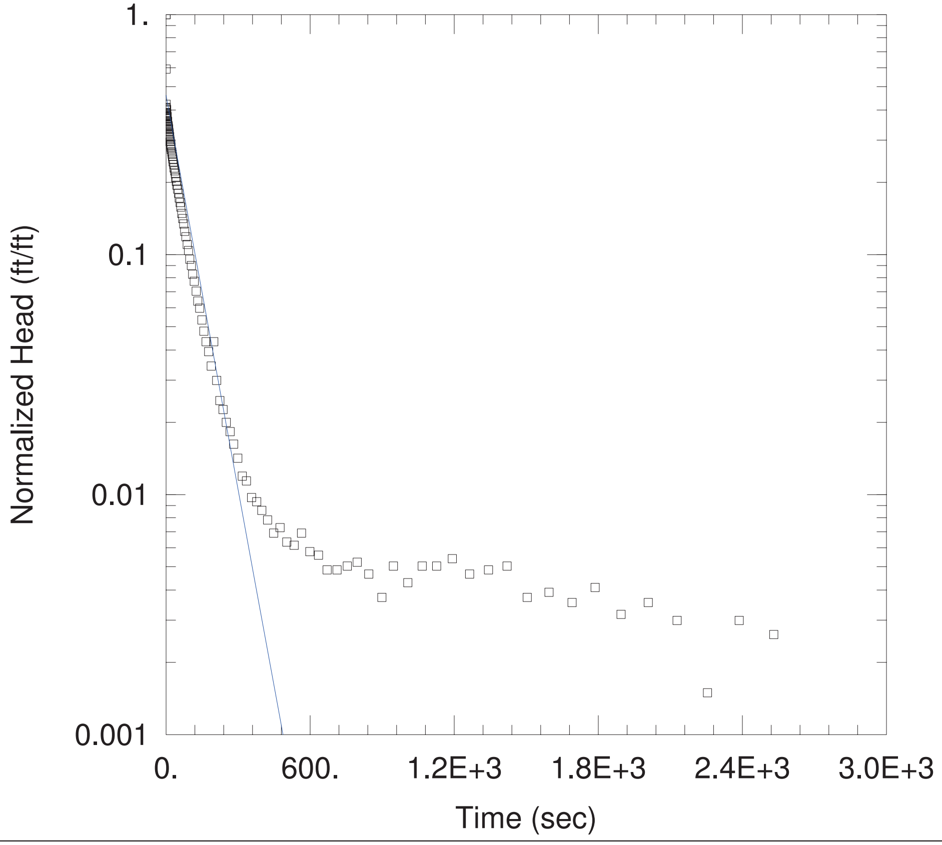
K = 0.0002919 cm/sec
y0 = 1.598 ft

AQUIFER DATA

Saturated Thickness: 13. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G217D SI2)

Initial Displacement: 3.685 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G217D SO3.aqt
Date: 10/10/17 Time: 10:40:18

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G217D
Test Date: 4/4/17

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

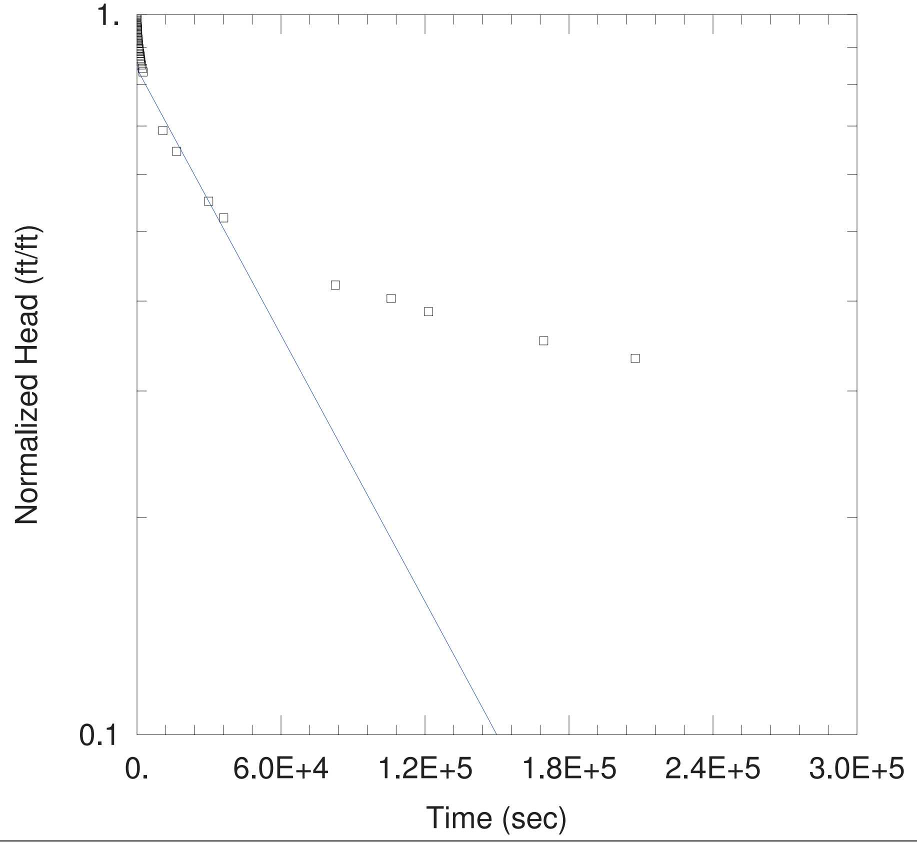
K = 0.0003032 cm/sec
y0 = 2.469 ft

AQUIFER DATA

Saturated Thickness: 13. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G217D SO3)

Initial Displacement: 5.362 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G220 SO1.aqt
Date: 10/10/17 Time: 10:42:50

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G220
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

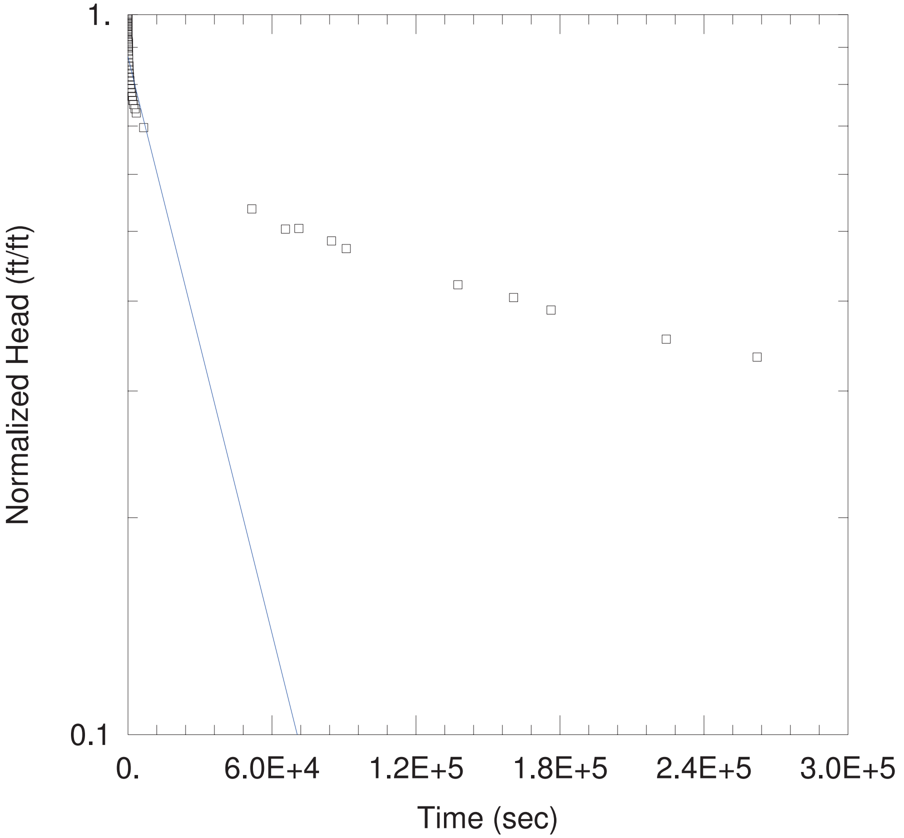
K = 3.513E-7 cm/sec
y0 = 9.098 ft

AQUIFER DATA

Saturated Thickness: 12. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G220 SO1)

Initial Displacement: 10.81 ft
Total Well Penetration Depth: 9.7 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 12. ft
Screen Length: 9.7 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G222 SO1.aqt
Date: 10/10/17 Time: 10:49:55

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G222
Test Date: 4/4/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

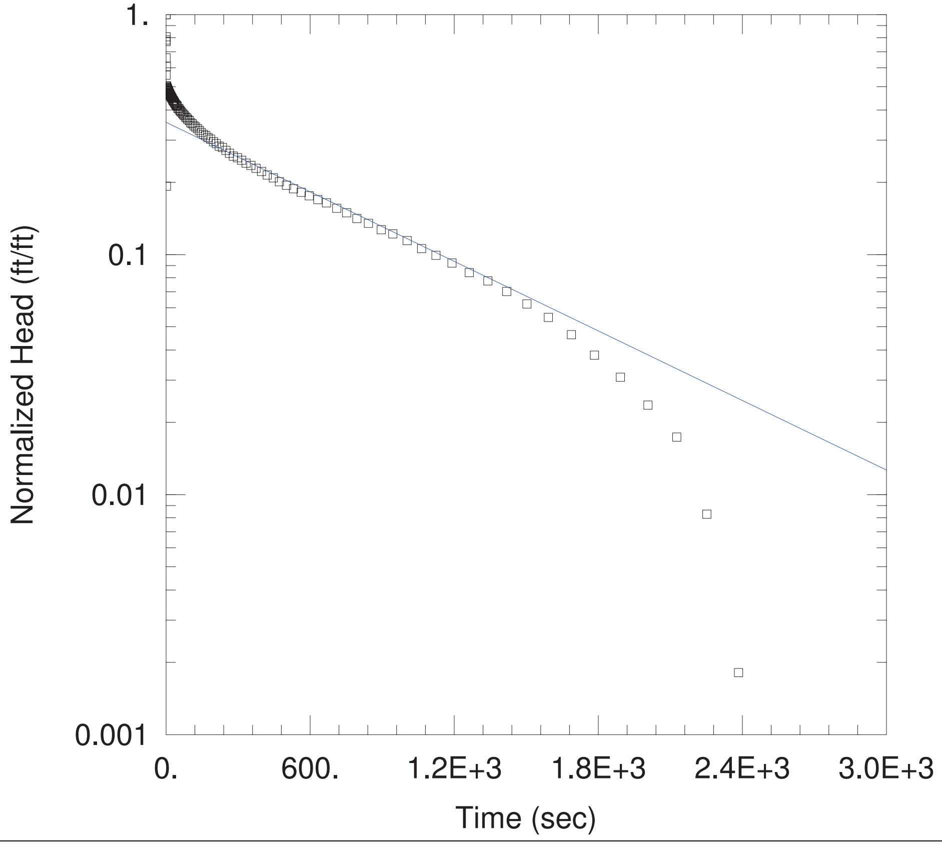
K = 1.541E-6 cm/sec
y0 = 8.832 ft

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G222 SO1)

Initial Displacement: 10.11 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 3.5 ft
Screen Length: 3.5 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G223 SI1.aqt
Date: 10/10/17 Time: 10:55:09

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G223
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

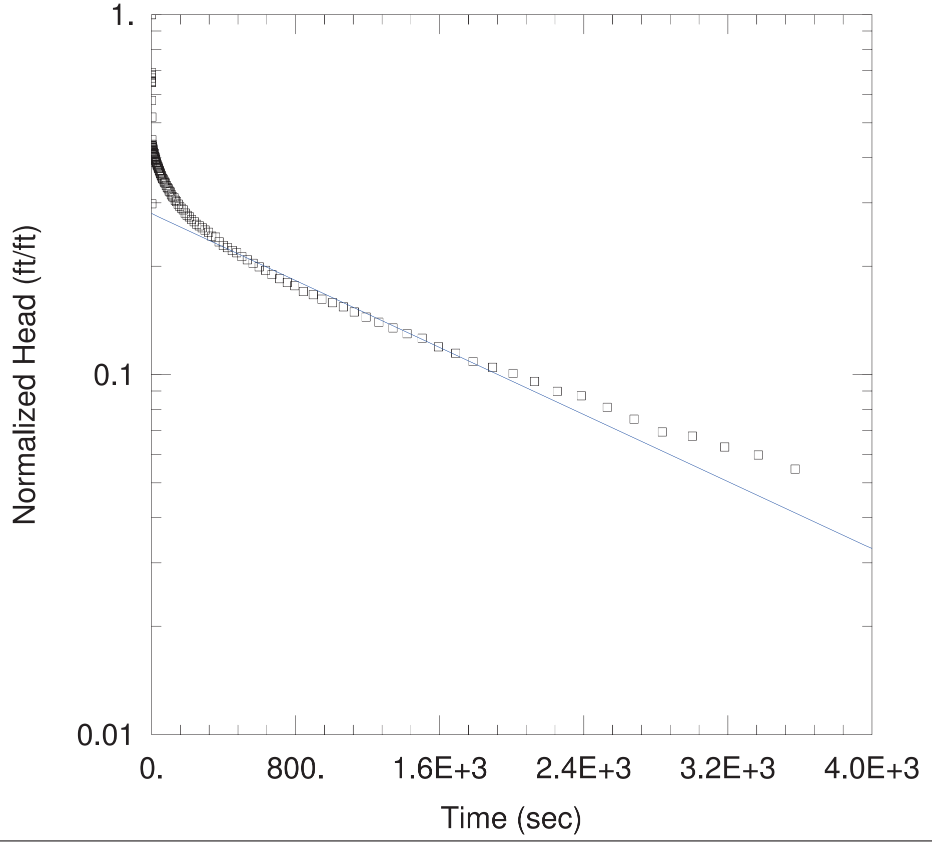
K = 5.19E-5 cm/sec
y0 = 1.374 ft

AQUIFER DATA

Saturated Thickness: 4. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G223 SI1)

Initial Displacement: 3.86 ft
Total Well Penetration Depth: 4. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 4. ft
Screen Length: 4. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G223 SI2.aqt
Date: 10/10/17 Time: 10:57:35

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G223
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

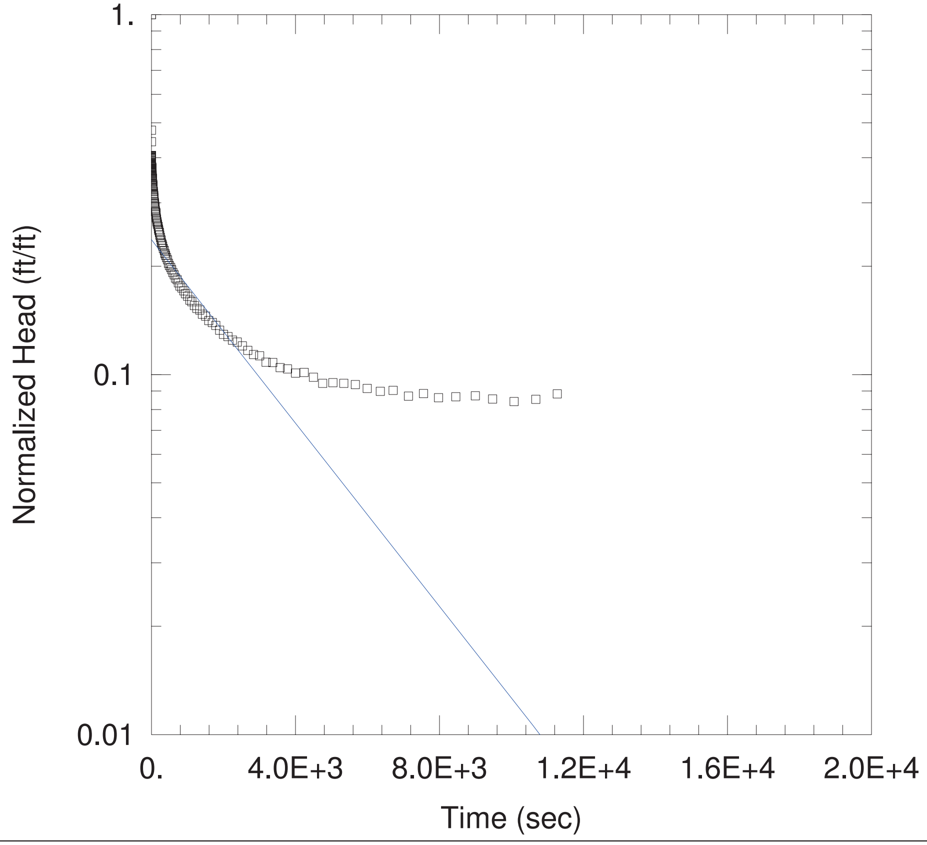
K = 2.5E-5 cm/sec
y0 = 1.251 ft

AQUIFER DATA

Saturated Thickness: 4. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G223 SI2)

Initial Displacement: 4.466 ft
Total Well Penetration Depth: 4. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 4. ft
Screen Length: 4. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G223 SO1.aqt
Date: 10/10/17 Time: 11:00:37

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G223
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

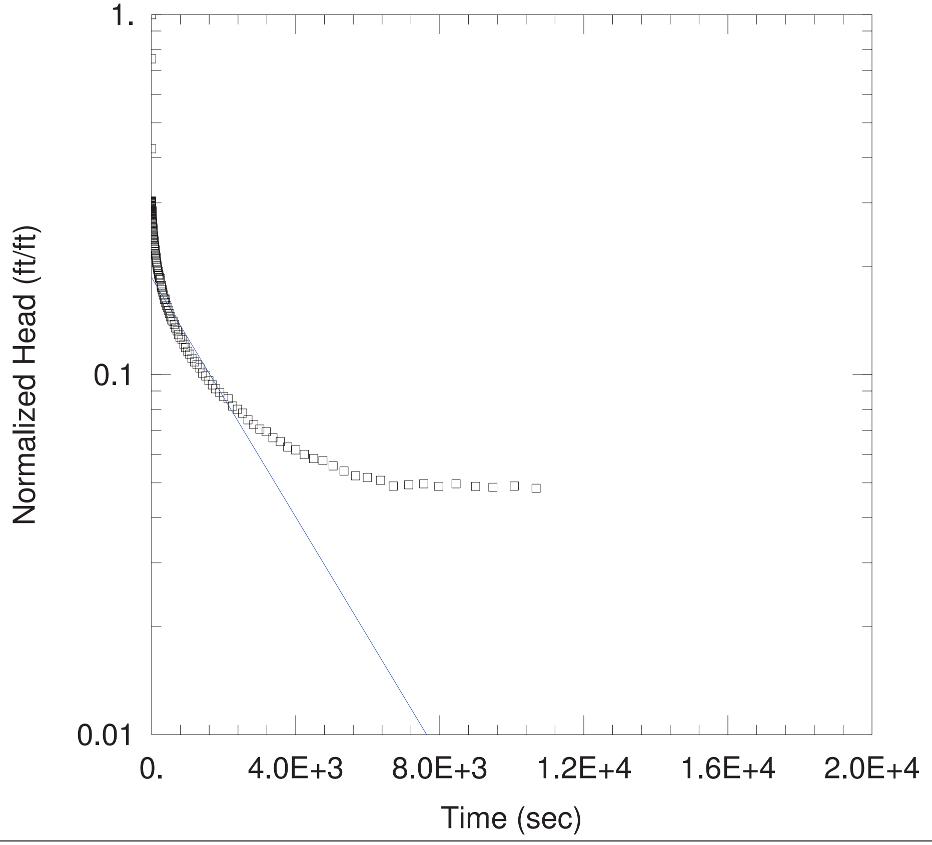
K = 1.368E-5 cm/sec
y0 = 1.281 ft

AQUIFER DATA

Saturated Thickness: 4. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G223 SO1)

Initial Displacement: 5.412 ft
Total Well Penetration Depth: 4. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 4. ft
Screen Length: 4. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G223 SO2.aqt
Date: 10/10/17 Time: 11:01:58

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G223
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

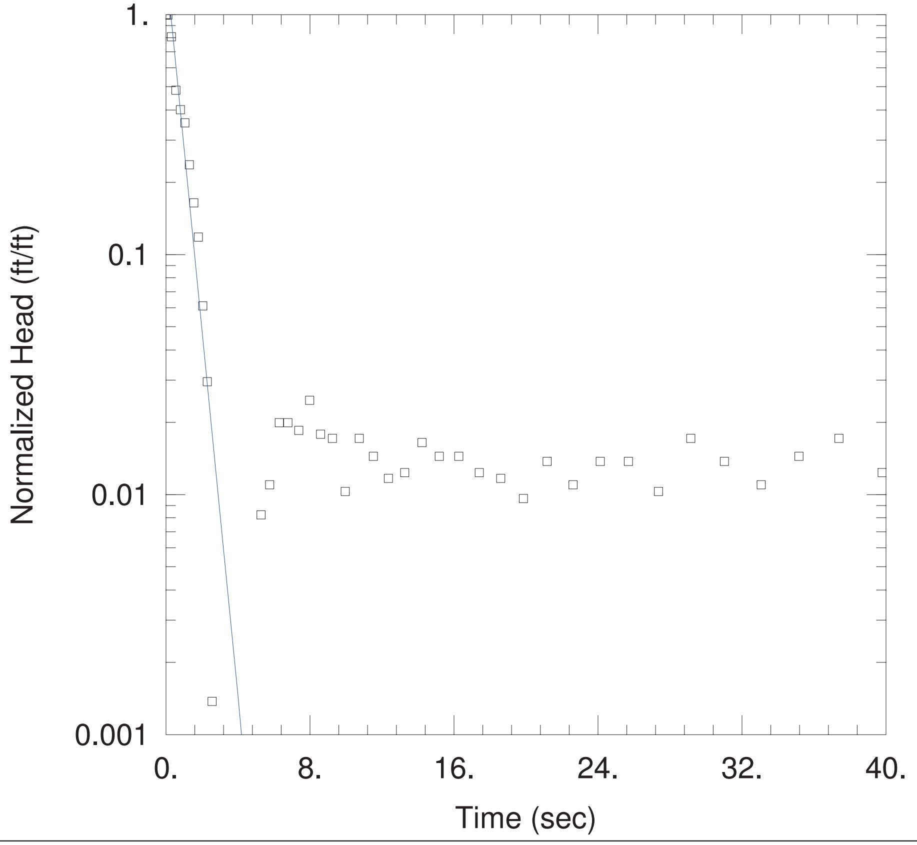
K = 1.786E-5 cm/sec
y0 = 1.359 ft

AQUIFER DATA

Saturated Thickness: 4. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G223 SO2)

Initial Displacement: 7.304 ft
Total Well Penetration Depth: 4. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 4. ft
Screen Length: 4. ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SI1.aqt
Date: 10/10/17 Time: 11:04:28

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.05146 cm/sec
y0 = 2.38 ft

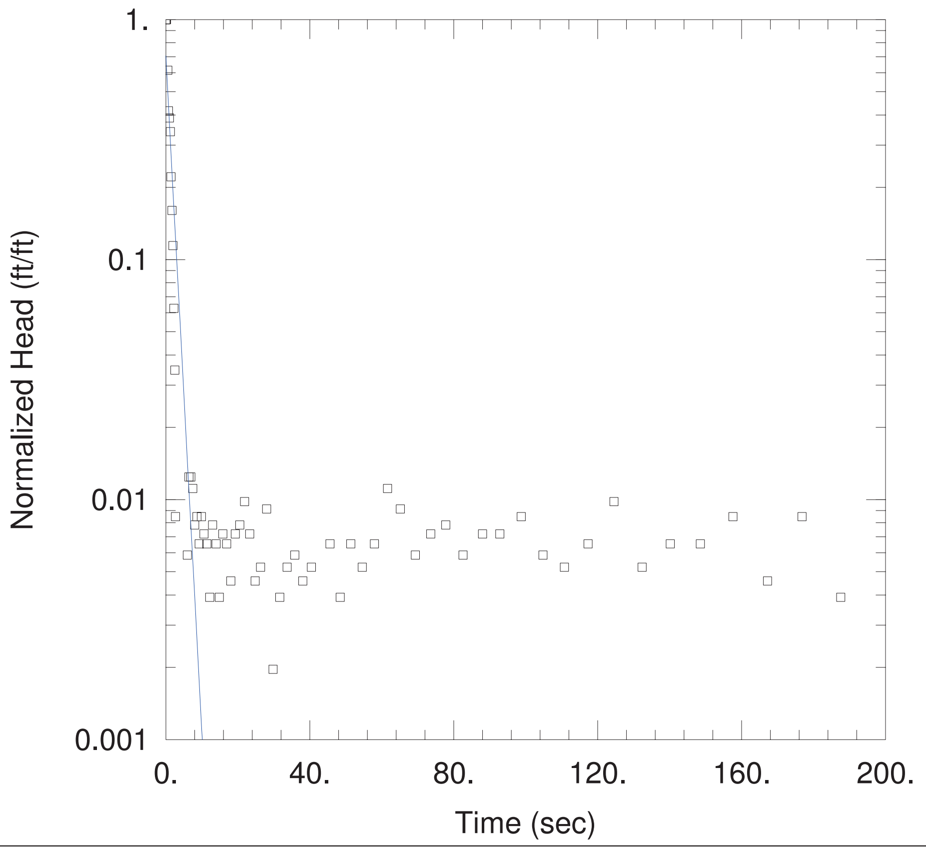
AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SI1)

Initial Displacement: 1.457 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SI2.aqt
Date: 10/10/17 Time: 11:06:55

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.01897 cm/sec
y0 = 1.081 ft

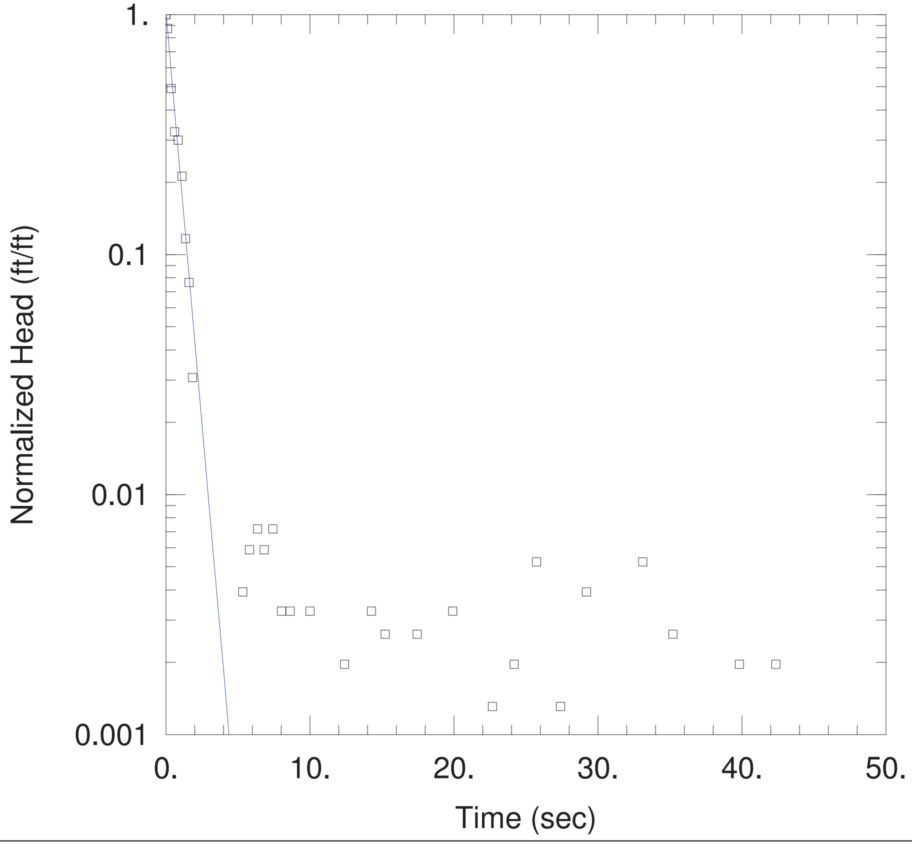
AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SI2)

Initial Displacement: 1.531 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SI3.aqt
Date: 10/10/17 Time: 11:08:48

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

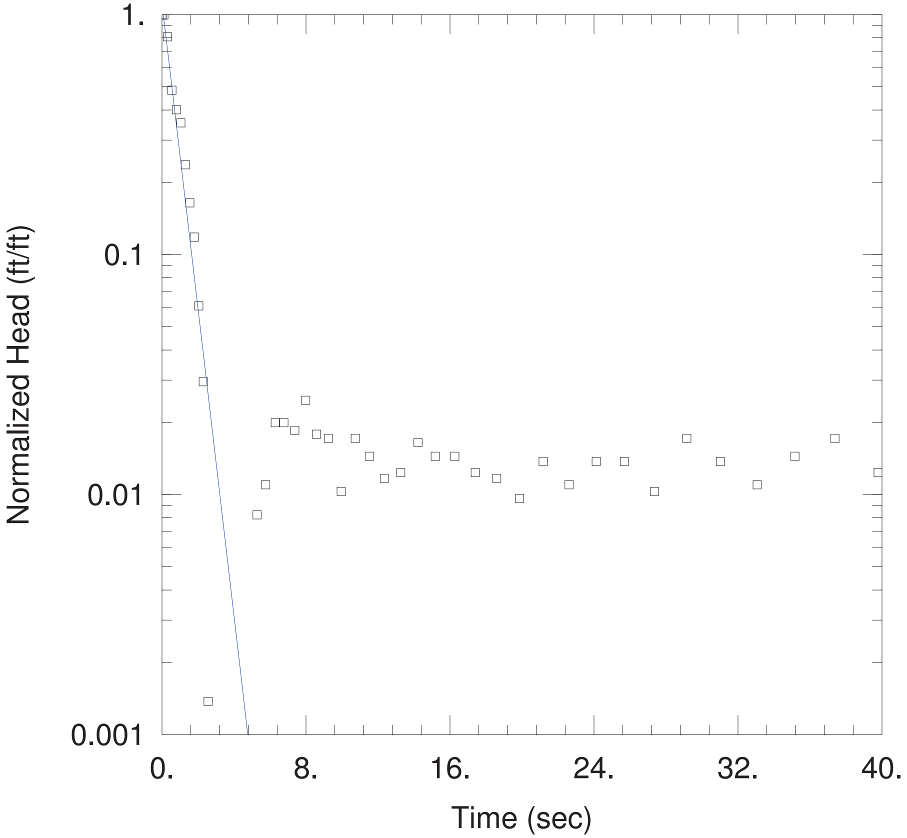
K = 0.04637 cm/sec
y0 = 1.586 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SI3)

Initial Displacement: 1.529 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SO1.aqt
Date: 10/10/17 Time: 11:10:44

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

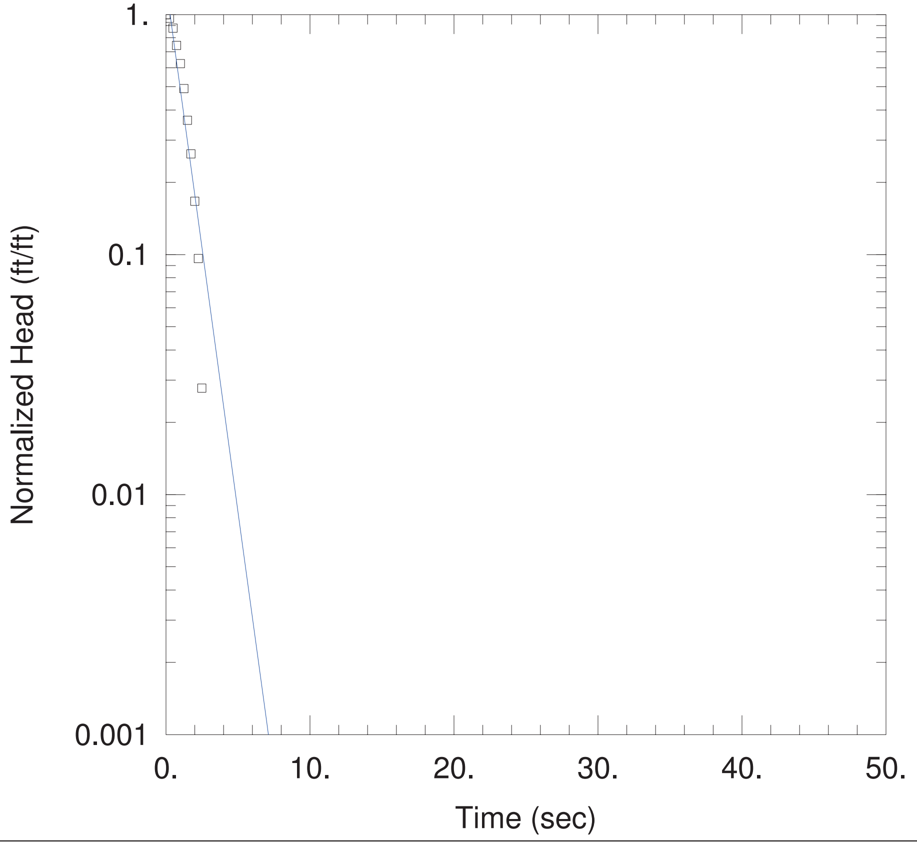
K = 0.04312 cm/sec
y0 = 1.657 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SI1)

Initial Displacement: 1.457 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft



WELL TEST ANALYSIS

Data Set: P:\...\G224 SO3.aqt
Date: 10/10/17 Time: 11:12:56

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Dynegy
Project: 2285
Location: Newton Landfill
Test Well: G224
Test Date: 4/5/17

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0297 cm/sec
y0 = 1.264 ft

AQUIFER DATA

Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G224 SO2)

Initial Displacement: 0.936 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 8.5 ft
Screen Length: 8.2 ft
Well Radius: 0.3458 ft

INFORMATION AND DATA PROVIDED IN THE NEWTON POWER STATION LANDFILL, APPLICATION FOR LANDFILL PERMIT

SUBMITTED BY RAPPS TO IEPA IN 1997

Electronic Filing: Received, Clerk's Office 03/26/2024

from: Rapps, 1997. “Newton Power Station Landfill, Application for Landfill Permit”, Rapps Engineering and Applied Sciences, Springfield, IL

VOLUME III

APPENDIX 5.0

HYDROGEOLOGIC INVESTIGATION AND GROUNDWATER MONITORING PROGRAM CIPS - NEWTON POWER STATION LANDFILL JASPER COUNTY, ILLINOIS

TABLE OF CONTENTS

RAPPS ENGINEERING & APPLIED SCIENCE C:\FILES\SA96083\FIGURES\XSECKEY

RAPPS

ENGINEERING & APPLIED SCIENCE
821 S. DURKIN DR. SPRINGFIELD, IL 62704 (217) 787-2118
1601 BROADWAY MT. VERNON, IL 62864 (618) 244-2611

FIGURE 3-2
CROSS SECTION KEY

NEWTON POWER STATION LANDFILL
CENTRAL ILLINOIS PUBLIC SERVICE
NEWTON, ILLINOIS

TABLE 3-1

LABORATORY AND IN-SITU HYDRAULIC CONDUCTIVITY TESTS

WELL BORING	TESTED INTERVAL	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC UNIT MONITORED
G105	11-26 ft	2.39 x 10^{-6} (F)	Upper Drift
G106	21-36 ft	7.53 x 10^{-6} (F)	Upper Drift
G115	8-18 ft	1.42 x 10^{-5} (F)	Upper Drift
G116	10-20 ft	3.09 x 10^{-5} (F)	Upper Drift
G119	10-20 ft	6.10 x 10^{-5} (F)	Upper Drift
G139	10-20 ft	5.14 x 10^{-5} (F)	Upper Drift
G201	57-67 ft	1.58 x 10^{-4} (F)	Uppermost Aquifer
G203	60-70 ft	5.14 x 10^{-3} (F)	Uppermost Aquifer
G204	55.5-64.5 ft	5.99 x 10^{-3} (F)	Uppermost Aquifer
G205	67-80 ft	2.54 x 10^{-6} (F)	Uppermost Aquifer
G207	57-70 ft	7.19 x 10^{-5} (F)	Uppermost Aquifer
B-141 (R)	20-25 ft	1.69 x 10^{-8} (L)	Vandalia Till Aquitard
B-141	27-28.5 ft	6.34 x 10^{-9} (L)	Vandalia Till Aquitard
B-142	27.5-30 ft	9.25 x 10^{-9} (L)	Vandalia Till Aquitard
B-142 (R)	28-32 ft	2.11 x 10^{-8} (L)	Vandalia Till Aquitard
B-143	21-22.5 ft	9.55 x 10^{-9} (L)	Vandalia Till Aquitard
G104D	79-87 ft	1.4 x 10^{-7} (F)	Lower Drift Aquitard

(F) From in-situ field test
(L) From laboratory analysis of site boring samples
(R) Re-molded Sample

Table 3-2 lists the number of tests, range of hydraulic conductivities (K), and the mean K for each hydrostratigraphic unit.

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PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION LANDFILL

DATE: November 22, 1996

PROJECT NO.: 66398

CLIENT: RAPPS

REPORT NO: 66398-1

Sheet 1 of 5

SAMPLE IDENTIFICATION: B-141

DEPTH/ELEV: 20' - 25'

CLASSIFICATION; USCS:

DESCRIPTION: Gray, medium plasticity, SILTY CLAY, trace sand, trace gravel

SOIL PARTICLE SIZES

GRAVEL %: SAND %: SILT %: CLAY %: *

NATURAL MOISTURE %: 12.2

LIQUID LIMIT :

PLASTICITY INDEX :

DENSITY;lb/ft3 NATURAL: 0.0

MAX. DRY;lb/ft3: 126.3 REMOLDED: 120.1

PROCTOR;DEG OF COMPACTION (D698): 95.1

PERMEABILITY (k), cm/sec: 1.69E-8 **

= = = = = = = = = = = = PERMEABILITY TEST DETAILS = = = = = = = = = = = =

SAMPLES OBTAINED BY: CLIENT

TYPE OF SAMPLE: REMOLDED

SPECIMEN DATA

DIAMETER;cm: 7.264

LENGTH;cm: 7.442

AREA;cm2: 41.45

VOLUME;cm3: 308.5

INITIAL SATURATION; %: 23.46

TEST APPARATUS: GEOTEST

INITIAL DENSITY;pcf: 134.8

DRY UNIT DENSITY;pcf: 120.1

INITIAL MOISTURE; %: 12.2

FINAL MOISTURE; %:

FLOW ORIENTATION: -V

TEST PRESSURES

CELL/CONFINING; psi: 30.0

SAMPLE BACK PRESSURE;psi: 25.0

DRIVING PRESSURE; psi: 2.0

HYDRAULIC GRADIENT: 18.9

PERMEANT LIQUID: 0.005 N CaSO4

TIME OF TEST; SATURATION: 40.5 Hrs PERMEABILITY: 170.0 Hrs

FLOW THRU SPECIMEN; TOTAL: 13.41 ml PERMEABILITY TEST: 8.23 ml

TEMPERATURE CORRECTION; TEMPERATURE: 20.6 C FACTOR: 0.986

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

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PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION
LANDFILL
CLIENT: RAPPS

DATE: November 22, 1996
PROJECT NO.: 66398
REPORT NO: 66398-1
Sheet 1 of 5

SAMPLE IDENTIFICATION: B-142 DEPTH/ELEV: 28' - 32'

CLASSIFICATION; USCS:

DESCRIPTION: Gray, medium plasticity, SILTY CLAY, trace sand, trace gravel

SOIL PARTICLE SIZES
GRAVEL %: SAND %: SILT %: CLAY %: *

NATURAL MOISTURE %: 12.5
LIQUID LIMIT :
PLASTICITY INDEX :

DENSITY;lb/ft3 NATURAL: 0.0
MAX. DRY;lb/ft3: 126.3 REMOLDED: 118.6
PROCTOR;DEG OF COMPACTION (D698): 93.9

PERMEABILITY (k), cm/sec: 2.11E-8 **

PERMEABILITY TEST DETAILS

SAMPLES OBTAINED BY: CLIENT TYPE OF SAMPLE: REMOLDED

SPECIMEN DATA
DIAMETER;cm: 7.264
LENGTH;cm: 7.595
AREA;cm2: 41.45
VOLUME;cm3: 314.8
INITIAL SATURATION; %: 23.79
TEST APPARATUS: GEOTEST

INITIAL DENSITY;pcf: 133.4
DRY UNIT DENSITY;pcf: 118.6
INITIAL MOISTURE; %: 12.5
FINAL MOISTURE; %: 12.7
FLOW ORIENTATION: -V

TEST PRESSURES
CELL/CONFINING; psi: 30.0
SAMPLE BACK PRESSURE;psi: 25.0
DRIVING PRESSURE; psi: 2.0 HYDRAULIC GRADIENT: 18.5
PERMEANT LIQUID: 0.005 N CaSO4

TIME OF TEST; SATURATION: 19.7 Hrs PERMEABILITY: 167.5 Hrs
FLOW THRU SPECIMEN; TOTAL: 10.81 ml PERMEABILITY TEST: 10.10 ml
TEMPERATURE CORRECTION; TEMPERATURE: 21.46 C FACTOR: 0.966

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

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PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION
LANDFILL
CLIENT: RAPPS

DATE: November 10, 1996
PROJECT NO.: 66398
REPORT NO: 66398-1
Sheet 1 of 3

SAMPLE IDENTIFICATION: B-141 DEPTH/ELEV: 27' - 28.5

CLASSIFICATION; USCS:

DESCRIPTION: Gray, medium plasticity, SILTY CLAY, trace sand, trace gravel

SOIL PARTICLE SIZES
GRAVEL %: SAND %: SILT %: CLAY %: *

NATURAL MOISTURE %: 13.0 DENSITY;lb/ft3 NATURAL: 124.6
LIQUID LIMIT : MAX. DRY;lb/ft3: REMOLDED: 0.0
PLASTICITY INDEX : PROCTOR;DEG OF COMPACTION (D698):

PERMEABILITY (k), cm/sec: 6.34E-9 **

PERMEABILITY TEST DETAILS

SAMPLES OBTAINED BY: CLIENT TYPE OF SAMPLE: 3" THIN-WALL TUBE

SPECIMEN DATA
DIAMETER;cm: 7.264 INITIAL DENSITY;pcf: 140.8
LENGTH;cm: 7.188 DRY UNIT DENSITY;pcf: 124.6
AREA;cm2: 41.45 INITIAL MOISTURE; %: 13.0
VOLUME;cm3: 297.9 FINAL MOISTURE; %: 13.8
INITIAL SATURATION; %: 26.01 FLOW ORIENTATION: -V
TEST APPARATUS: GEOTEST

TEST PRESSURES
CELL/CONFINING; psi: 30.0
SAMPLE BACK PRESSURE;psi: 25.0
DRIVING PRESSURE; psi: 2.0 HYDRAULIC GRADIENT: 19.6
PERMEANT LIQUID: 0.005 N CaSO4

TIME OF TEST; SATURATION: 115.2 Hrs PERMEABILITY: 167.0 Hrs
FLOW THRU SPECIMEN; TOTAL: 6.98 ml PERMEABILITY TEST: 3.24 ml
TEMPERATURE CORRECTION; TEMPERATURE: 22.06 C FACTOR: 0.953

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

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PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION
LANDFILL
CLIENT: RAPPS

DATE: November 10, 1996
PROJECT NO.: 66398
REPORT NO: 66398-1
Sheet 2 of 3

SAMPLE IDENTIFICATION: B-142 **DEPTH/ELEV:** 27.5' - 30

CLASSIFICATION; USCS:

DESCRIPTION: Gray, medium plasticity, SILTY CLAY, trace sand, trace gravel

SOIL PARTICLE SIZES
GRAVEL %: SAND %: SILT %: CLAY %: *

NATURAL MOISTURE %: 11.9 DENSITY;lb/ft3 NATURAL: 124.1
LIQUID LIMIT : MAX. DRY;lb/ft3: REMOLDED: 0.0
PLASTICITY INDEX : PROCTOR;DEG OF COMPACTION (D698):

PERMEABILITY (k), cm/sec: 9.25E-9 **

= = = = = = = = = = = = PERMEABILITY TEST DETAILS = = = = = = = = = = = =

SAMPLES OBTAINED BY: CLIENT TYPE OF SAMPLE: 3" THIN-WALL TUBE

SPECIMEN DATA
DIAMETER;cm: 7.264
LENGTH;cm: 7.696
AREA;cm2: 41.45
VOLUME;cm3: 319.0
INITIAL SATURATION; %: 23.69
TEST APPARATUS: GEOTEST

INITIAL DENSITY;pcf: 138.9
DRY UNIT DENSITY;pcf: 124.1
INITIAL MOISTURE; %: 11.9
FINAL MOISTURE; %: 12.9
FLOW ORIENTATION: -V

TEST PRESSURES
CELL/CONFINING; psi: 30.0
SAMPLE BACK PRESSURE;psi: 25.0
DRIVING PRESSURE; psi: 2.0 HYDRAULIC GRADIENT: 18.3
PERMEANT LIQUID: 0.005 N CaSO4

TIME OF TEST; SATURATION: 115.2 Hrs PERMEABILITY: 167.0 Hrs
FLOW THRU SPECIMEN; TOTAL: 9.41 ml PERMEABILITY TEST: 4.42 ml
TEMPERATURE CORRECTION; TEMPERATURE: 22.06 C FACTOR: 0.953

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

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PERMEABILITY & CLASSIFICATION TEST RESULTS

PROJECT: NEWTON POWER STATION
LANDFILL
CLIENT: RAPP

DATE: November 10, 1996
PROJECT NO.: 66398
REPORT NO: 66398-1
Sheet 3 of 3

===

SAMPLE IDENTIFICATION: B-143 DEPTH/ELEV: 21' - 22.5
CLASSIFICATION; USCS:
DESCRIPTION: Gray, Silty Clay, trace sand, trace gravel

SOIL PARTICLE SIZES
GRAVEL %: SAND %: SILT %: CLAY %: *

NATURAL MOISTURE %: 11.4
LIQUID LIMIT :
PLASTICITY INDEX :

DENSITY;lb/ft3 NATURAL: 125.4
MAX. DRY;lb/ft3: REMOLDED: 0.0
PROCTOR;DEG OF COMPACTION (D698):

PERMEABILITY (k), cm/sec: 9.55E-9 **

= = = = = = = = = = = PERMEABILITY TEST DETAILS = = = = = = = = = = =

SAMPLES OBTAINED BY: CLIENT TYPE OF SAMPLE: 3" THIN-WALL TUBE

SPECIMEN DATA
DIAMETER;cm: 7.264
LENGTH;cm: 7.595
AREA;cm2: 41.45
VOLUME;cm3: 314.8
INITIAL SATURATION; %: 22.89
TEST APPARATUS: GEOTEST

INITIAL DENSITY;pcf: 139.7
DRY UNIT DENSITY;pcf: 125.4
INITIAL MOISTURE; %: 11.4
FINAL MOISTURE; %: 14.3
FLOW ORIENTATION: -V

TEST PRESSURES
CELL/CONFINING; psi: 30.0
SAMPLE BACK PRESSURE;psi: 25.0
DRIVING PRESSURE; psi: 2.0
PERMEANT LIQUID: 0.005 N CaSO4

HYDRAULIC GRADIENT: 18.5

TIME OF TEST; SATURATION: 73.4 Hrs PERMEABILITY: 117.0 Hrs
FLOW THRU SPECIMEN; TOTAL: 6.40 ml PERMEABILITY TEST: 3.27 ml
TEMPERATURE CORRECTION; TEMPERATURE: 22.4 C FACTOR: 0.944

REMARKS:

* Percentage of silt and clay fractions is based on 0.002mm as the division between the fractions (Unified Soil Classification System)

** Hydraulic conductivity test conducted in accordance with ASTM D 5084-90 unless noted otherwise. E-8 equals 10 to the minus 8 (exponent); cm3 equals cubic centimeters; The 2 in H2O is a subscript.

APW15 BORING LOG

SOIL BORING LOG INFORMATION

Page 1 of 6

Facility/Project Name: Newton Power Station

License/Permit/Monitoring Number:

Boring Number: APW15

Boring Drilled By: Name of crew chief (first, last) and Firm: Adam Jochimsen
Cascade Drilling

Date Drilling Started: 1/21/2021

Date Drilling Completed: 1/22/2021

Drilling Method: Mini Sonic

Common Well Name: APW15

Final Static Water Level: Feet (NAVD88)

Surface Elevation: 522.06 Feet (NAVD88)

Borehole Diameter: 6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 821,107.90 N, 997,938.87 E [✓ E]/ W

1/4 of 1/4 of Section 26, T 6 N, R 8 E

Lat 38° 55' 17.71"

Long -88° 17' 6.79"

Local Grid Location: Feet ☐ N ☐ S Feet ☐ E ☐ W

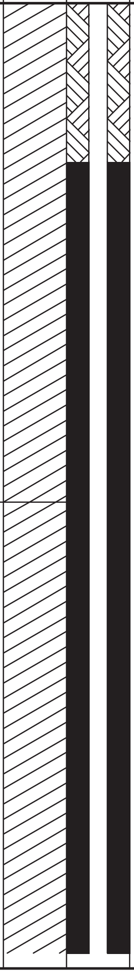
Facility ID:

County: Jasper

State: IL

Civil Town/City/ or Village: Newton

Sample: Number and Type	Sample: 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 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
1 CS	60 54		1 2 3 4	0 - 6.3' **FILL, LEAN CLAY:** CL, brown (10YR 5/3), silt (15-25%) sand (0-5%), stiff, no dilatancy, low toughness, medium plasticity, moist.	(FILL) CL				1.75 1.75					CS= Core Sample
2 CS	60 40		5 6											
			7 8 9	6.3 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%) sand (0-5%), gravel (0-5%), organic material (0-5%), very stiff to stiff, no dilatancy, medium toughness, medium plasticity, moist.	CL				2.25 4					
3 CS	60 50		10 11 12						1					



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

Signature

Firm Ramboll
234 W. Florida Street, Milwaukee, WI 53204

Tel: (414) 837-3607
Fax: (414) 837-3608

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	6.3 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%) sand (0-5%), gravel (0-5%), organic material (0-5%), very stiff to stiff, no dilatancy, medium toughness, medium plasticity, moist. *(continued)*					2.5					
4 CS	60 54		15						1.5					
			16		CL									
			17						2.25					
			19	19.2' brown (10YR 4/3), yellowish brown (10YR 5/6) mottling (10-15%), stiff.					2.5					
5 SH	24 23		20	20 - 22' **LEAN CLAY:** CL.	CL					18.5	33	23	59.2	SH= Shelby Tube
6 CS	96 96		22	22 - 23.5' **LEAN CLAY:** CL, brown (10YR 4/3), yellowish brown (10YR 5/6) mottling (10-15%), stiff, no dilatancy, medium toughness, medium plasticity, moist.	CL				1.25 1					
			24	23.5 - 26.7' **SANDY LEAN CLAY:** s(CL), brown (10YR 5/3), gray (10YR 5/1) mottling (5-10%), stiff, slow dilatancy, low toughness, medium plasticity, moist.	s(CL)				3.75					
			27	26.7 - 39.2' **LEAN CLAY:** CL, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling (10-15%), gray (10YR 5/1) mottling (5-10%), sand (5-10%), gravel (0-5%), cobbles (0-5%), very stiff to hard, no dilatancy, medium toughness, medium plasticity, dry to moist.					4.5					
			29		CL				4.5					
6 CS	60 49		30	30' hard, dry.										
			31						4.5					
			32											

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	26.7 - 39.2' **LEAN CLAY:** CL, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling (10-15%), gray (10YR 5/1) mottling (5-10%), sand (5-10%), gravel (0-5%), cobbles (0-5%), very stiff to hard, no dilatancy, medium toughness, medium plasticity, dry to moist. *(continued)*					4.5					
			34											
7 CS	60 49		35						4.5					
			36		CL									
			37						4.5					
			38											
			39						4.5					
				39.2 - 52.5' **LEAN CLAY:** CL, dark gray (10YR 4/1), no mottling, organic material (0-5%), sand (5-10%), gravel (0-5%), cobbles (0-5%), hard, no dilatancy, medium toughness, medium plasticity, dry, silt stringers 1mm to 3mm diameter fracture planes.										
8 CS	60 60		40											
			41						4.5					
			42											
			43						4.5					
			44											
9 CS	60 60		45						4.5					
			46		CL									
			47						4.5					
			48											
			49						4.5					
10 CS	60 60		50											
			51						4.5					
			52											

SOIL BORING LOG INFORMATION SUPPLEMENT

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			53	52.5 - 61.4' **SILT:** ML, dark gray (10YR 4/1), clay (15-25%), hard, no dilatancy, medium toughness, non-plastic, dry.					4.5					
			54											
11 CS	60 57		55						4.5					
			56											
			57		ML				4.5					
			58											
			59						4.5					
12 CS	60 52		60											
			61						4.5					
			62	61.4 - 97.2' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%), sand (0-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist to dry.										
			63						2.75					
			64											
13 CS	60 60		65						2.75					
			66											
			67		CL				2.25					
			68											
			69						2					
14 CS	60 60		70											
			71						2.5					
			72											

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			73	61.4 - 97.2' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%), sand (0-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist to dry. *(continued)*					2.5					
			74											
15 CS	60 53		75						2					
			76											
			77						2.5					
			78											
			79						2.25					
16 CS	60 60		80											
			81						2.25					
			82		CL									
			83						4.5					
			84	83.8' - 83.9' layer of silty sand, moist.										
17 CS	60 60		85	85' - 85.4' later of silty sand, moist.					2.75					
			86											
			87						2.5					
			88											
			89						2.75					
18 CS	60 60		90											
			91						2.5					
			92											

Boring Number APW15

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 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
19 CS	60 60		93 94 95 96 97	61.4 - 97.2' **LEAN CLAY:** CL, dark gray (10YR 4/1), silt (15-25%), sand (0-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist to dry. *(continued)*	CL				2.75					
			98 99	97.2 - 100' **POORLY-GRADED SAND WITH SILT:** SP-SM, dark gray (10YR 4/1), subrounded to rounded, medium to fine sand, loose, wet.	SP-SM									
20 SH	24 24		100 101	100 - 102' **SILTY SAND:** SM.	SM					12.1	15	3	45.8	
21 CS	36 36		102 103 104	102 - 104.3' **SANDY SILT:** s(ML), gray (10YR 5/1), firm, slow dilatancy, low toughness, non-plastic, wet.	s(ML)				1					
				104.3 - 105' **LEAN CLAY:** CL, dark gray (10YR 4/1), sand (5-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, medium toughness, medium plasticity, moist.	CL									
22 MC	24 24		105 106	105 - 107' **LEAN CLAY:** CL.	CL					19.1	29	16	76.2	MC= Modified California Sample
23 CS	36 36		107 108 109	107 - 110' **LEAN CLAY:** CL, dark gray (10YR 4/1), sand (5-10%), gravel (0-5%), organic material (0-5%), stiff to very stiff, no dilatancy, medium toughness, medium plasticity, moist.	CL				2.25 2.5					
			110	110' End of Boring.										

ATTACHMENT 2

RAMBOLL RESPONSE LETTER DATED NOVEMBER 3, 2023

RAMBOLL

ENVIRONMENT
& HEALTH

November 3, 2023

VIA E-MAIL
heather.mullenax@illinois.gov
EPA.CCR.PART845.COORDINATOR@ILLINOIS.GOV
EPA.CCR.Part845.Notify@Illinois.gov

Re: Newton Power Plant Primary Ash Pond Alternative Source Demonstration Response to IEPA Comments

To Whom It May Concern:

This letter addresses the following requests for information from the Illinois Environmental Protection Agency (IEPA) provided on October 26, 2023 via email from Lauren Hunt regarding the Newton Power Plant Primary Ash Pond alternative source demonstration (ASD) submitted on October 6, 2023:

1. Source characterization of the CCR at the Primary Ash Pond must include total solids sampling, analysis and reporting in accordance with SW846.
2. Hydraulic conductivities from laboratory or insitu testing must be collected, analyzed and presented with hydrogeologic characterization of all units including aquifers and confining units. Hydraulic conductivity data must include field and software analysis.
3. Characterization to include sample and analysis in accordance with 35 IAC 845.640 of alternative source must be provided with the ASD.

Background

Alternative source demonstrations use a multiple lines of evidence approach to support the conclusions that 1) the coal combustion residuals (CCR) unit is not the source of an exceedance, and 2) there is an alternative source of the exceedance. The multiple lines of evidence approach is consistent with the approach used in many areas of environmental analysis such as ecological risk assessment, monitored natural attenuation (MNA), and vapor intrusion (USEPA, 2016; USEPA, 1999; ITRC, 2007). The goal of a multiple lines of evidence approach is to provide robust support for a causal relationship based on many smaller individual qualitative or quantitative pieces of evidence (USEPA, 2016). Critically, no individual line of evidence will be completely conclusive, and each will have varying degrees of certainty. The final determination of a conclusion is based on the totality of the evidence provided.

ASDs based on a multiple lines of evidence approach are routinely prepared by environmental consultants to comply with federal CCR rules (Title 40 of the Code of Federal Regulations [40 C.F.R.] § 257) and State CCR rules (Title 35 of the Illinois Administrative Code [35 I.A.C.] § 845). In Georgia, where the CCR permitting authority has been delegated to the State, the Georgia Environmental Protection Division has approved ASDs using multiple lines of evidence to satisfy the requirements of federal CCR rule. An example of such approval is documented in the summary section (page 3) of the 2023 Annual Groundwater Monitoring and Corrective Action Report found in the publicly accessible files linked here: https://www.georgiapower.com/content/dam/georgia-power/pdfs/company-pdfs/plant-mcmanus/20230731_2023agwmcar_mcm_ap-1.pdf.

The Primary Ash Pond ASD was completed in conformance with the Electric Power Research Institute (EPRI) guidance for development of ASDs at CCR sites (EPRI, 2017). The EPRI document presents an approach for developing ASD lines of evidence that relies, where possible, on leachate samples collected from leachate wells, lysimeters, and/or leachate collection systems to provide samples that are representative of interstitial porewater. This direct approach for evaluating the potential for the Primary Ash Pond to impact groundwater is in contrast to the indirect approach implied by the IEPA request to characterize the CCR at the Primary Ash Pond using methods in accordance with SW-846 (specifically those used for waste characterization [*e.g.,* EP, TCLP, SPLP, LEAF[1]]), as discussed below.

Additionally, the lines of evidence as presented as section headings in the Primary Ash Pond ASD commonly contain multiple qualitative and quantitative pieces of information that contribute to the body of evidence that support the conclusion that the CCR surface impoundment (SI) is not the source of an exceedance.

Response to Request Number 1: SW-846 Characterization of CCR Material

The CCR porewater most accurately represents the mobile constituents associated with the waste management activity within the CCR SI (EPRI, 2017). The composition of CCR porewater accumulated at the base of the CCR unit, which is derived from, and represents contact with, CCR material above and around the well screen, is the truest representation of mobile constituents throughout the CCR SI. Leach tests presented in SW-846 (*e.g.*, TCLP, SPLP, LEAF 1313 - 1316) are inconsistent predictors or surrogates of *in situ* porewater chemical concentrations (EPRI, 2020; EPRI, 2021; and EPRI, 2022). Indeed, laboratory leach test effectiveness is determined by comparing results to porewater data (USEPA, 2014; EPRI, 2020; EPRI, 2021; and EPRI, 2022). These laboratory leach tests most accurately predict porewater concentrations when conditions in the test closely reflect conditions present in the field (USEPA, 2019). In many cases, the pH and/or redox potential of porewater is poorly represented by any laboratory leach test conditions. For these reasons, analysis of actual CCR porewater is more representative of potential contributions to groundwater observed in compliance monitoring wells than laboratory leach testing. The uncertainty in comparing the laboratory leach test results with the actual porewater concentrations means that the contribution of laboratory leach test data as a line of evidence to an ASD would be minimal.

Prior to performing hydrogeologic investigations in 2021, Ramboll completed a review of existing data to determine whether sufficient information existed to meet the requirements of 35 I.A.C. § 845. Based on the review, Ramboll developed an approach to fully characterize the CCR material as part of the 2021 investigation. Five locations for porewater wells were selected by evaluating the extent of ash through time on aerial photographs (**Figure 1**), identifying visible differences (color) in surficial materials, and capturing a representative spatial distribution. Porewater was encountered at an elevation of approximately 540 feet in 2021 (Ramboll, 2021). For the purpose of visualization, **Figure 2** shows the areas within the SI that were not accessible for potential sampling and testing as illustrated by different colored portions of the Primary Ash Pond. Of the 404 acre unit only about 12% was accessible. A total of four porewater wells were installed in 2021, because the fifth location was not able to be accessed safely after evaluation with contractors in the field.

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[1] Extraction Procedure, Toxic Characteristic Leaching Procedure, Synthetic Precipitation Leaching Procedure, Leaching Environmental Assessment Framework

During installation of the porewater wells, the borings were logged, and solid samples were collected from eight intervals for geotechnical and chemical analysis. Samples were analyzed for total metal concentrations via EPA Method 6010B and 6020A (SW-846) and results were summarized in the Hydrogeologic Site Characterization Report (Ramboll, 2021) and submitted in the 2021 Operating Permit (Burns and McDonnell, 2021).

As established above, testing porewater is a direct source term for evaluating potential influence on groundwater. SW-846 provides analytical methods for evaluating solid waste using leach tests that are designed to replicate potential *in situ* conditions (either current or future). The goal of these laboratory leach tests is to predict the potential concentration of chemicals under laboratory controlled conditions (*e.g.*, landfill leachate, synthetic precipitation, variable pH) which may or may not represent conditions observed in the field. The use of leach test results performed under variable conditions collected from any number of locations within the CCR SI to estimate a total potential for chemical leaching from CCR into groundwater under a variety of different conditions is irrelevant to an ASD. ASDs are prepared to evaluate the potential for actual porewater leaking from a CCR SI to be the cause of a detected exceedance observed in a compliance well.

Response to Request Number 2: Provide Hydraulic Conductivity Data

Responses to Request Number 2 are provided in the cover letter to this Attachment and in Attachment 1 to that cover letter.

Response to Request Number 3: Alternative Source Characterization

In the ASD, the multiple lines of evidence approach is appropriate for identifying that a source other than the Primary Ash Pond caused, and that the Primary Ash Pond did not contribute to, the chloride exceedance in APW15. Additionally, Ramboll's investigation and analysis determined bedrock is likely the source of chloride in APW15. Ramboll reviewed available power plant and public well records which did not yield any bedrock monitoring wells in the immediate vicinity to provide site-specific groundwater analytical results. However, the references provided in Section 2.3.2 of the ASD indicate chloride is present in bedrock groundwater in many locations within the Illinois Basin which underlies approximately 70% of Illinois. That and the observation of a saline spring approximately 10 miles from the site near the Clay City Anticline (a structural feature which could provide fractures that act as conduits to bring brines near the land surface) are strong indicators that the bedrock beneath the Primary Ash Pond also contains chloride.

Conclusions

The combined strength of the lines of evidence in the Primary Ash Pond ASD demonstrates that the Primary Ash Pond is not the source of the chloride exceedance at APW15 (and did not contribute to the chloride exceedance at APW15) and that the likely source is native bedrock. Ramboll does not believe that additional lines of evidence based on leach test data or testing of the alternative source would change the conclusion of the full body of evidence presented in the ASD that the Primary Ash Pond is not the source of the chloride exceedance at APW15 and did not contribute to the chloride exceedance at APW15.

References

Burns & McDonnell, 2021. Initial Operating Permit. Newton Ash Pond. October 25.

Interstate Technology Regulatory Council (ITRC), 2007. Technical and Regulatory Guidance Vapor Intrusion Pathway: A Practical Guide. January 2007.

Electric Power Research Institute (EPRI), 2022. Evaluation and Comparison of Leach Test and Porewater Variability for Multiple Coal Combustion Product Management Units. EPRI, Palo Alto, CA: 2022. 3002024214.

Electric Power Research Institute (EPRI), 2021. Leaching, Geotechnical, and Hydrologic Characterization of Coal Combustion Products from an Active Coal Ash Management Unit: Plant 42197. EPRI, Palo Alto, CA: 2021. 3002018780.

Electric Power Research Institute (EPRI), 2020. Leaching, Geotechnical, and Hydrologic Characterization of Coal Combustion Products from a Closed Coal Ash Impoundment: Capped Unit. EPRI, Palo Alto, CA: 2020. 3002017363.

Electric Power Research Institute (EPRI), 2017. Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites. EPRI, Palo Alto, CA: 2017. 3002010920.

Ramboll Americas Engineering Services (Ramboll), 2021. Hydrogeologic Site Characterization Report. Newton Power Plant Primary Ash Pond. October

United States Environmental Protection Agency (USEPA), 2019. Leaching Environmental Assessment Framework (LEAF) How-To Guide. SW-846 Update VII. Revision 1. May.

United States Environmental Protection Agency (USEPA), 2016. Weight of Evidence in Ecological Assessment. EPA/100/R-16/001. December.

United States Environmental Protection Agency (USEPA), 2014. Leaching Test Relationships, Laboratory-to-Field Comparisons and Recommendations for Leaching Evaluation using the Leaching Environmental Assessment Framework. EPA 600/R-14/061 September.

United States Environmental Protection Agency (USEPA), 1999. Use of Monitoring Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. OSWER Directive Number 9200.4-17P.

Attachments

Figure 1	CCR Characterization
Figure 2	2022 Conditions

If you have any questions about this letter, please do not hesitate to contact Brian Hennings or Frances Ackerman, as referenced below.

Sincerely,

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Project Officer, Hydrogeology
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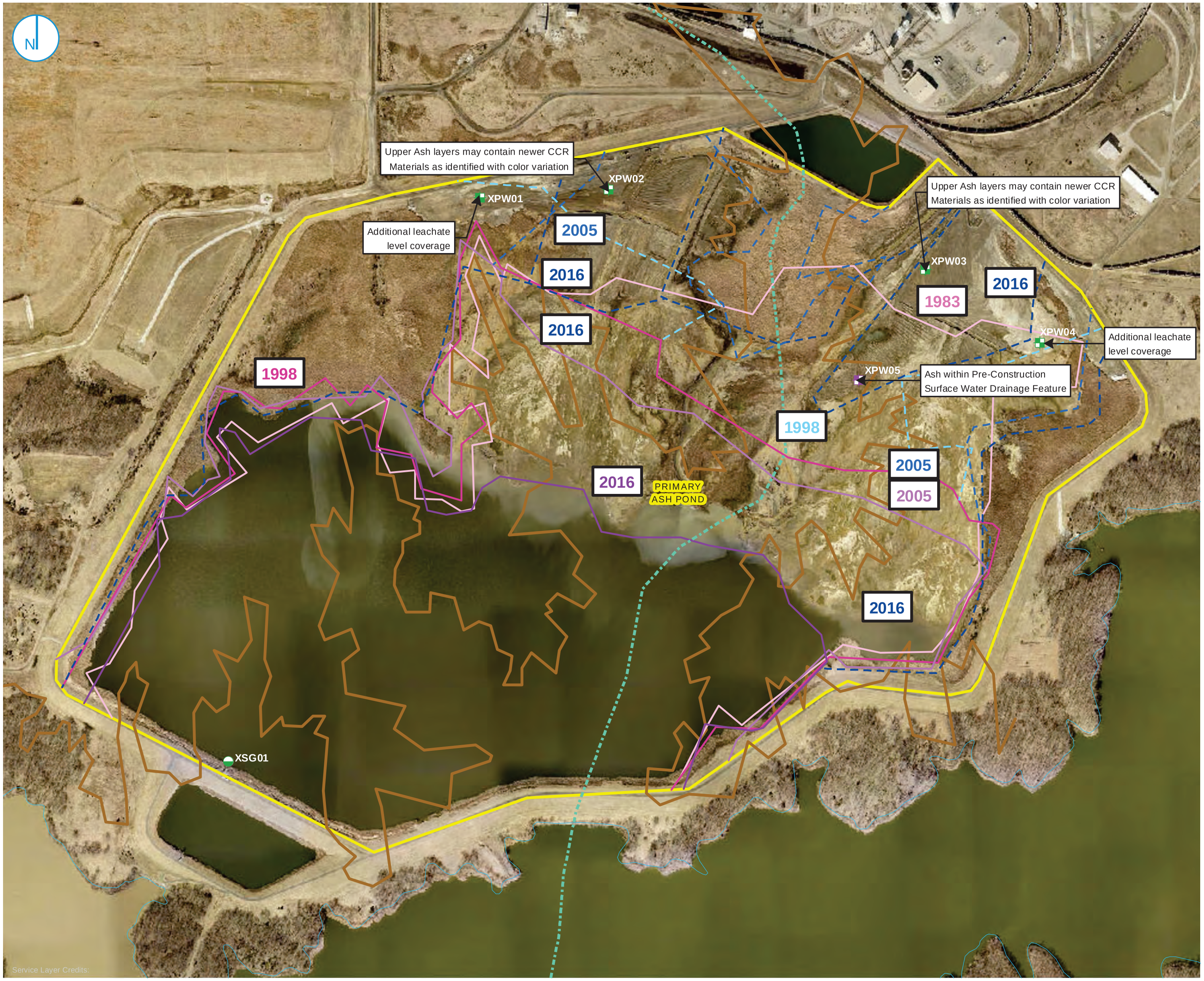
frances.ackerman@ramboll.com

ATTACHMENTS



- PORE WATER WELL
- STAFF GAGE, CCR UNIT
- PROPOSED LOCATION COULD NOT BE ACCESSED
- APPROXIMATE LOCATION OF STREAM BASED ON 1953 TOPOGRAPHIC MAP (BASE OF STREAM ELEVATION DECREASES SOUTH TOWARD NEWTON LAKE)
- APPROXIMATE LOCATION OF 530 FOOT GROUND SURFACE ELEVATION CONTOUR BASED ON 1953 TOPOGRAPHIC MAP (PRE-CONSTRUCTION SURFACE WATER DRAINAGE FEATURE)
- APPROXIMATE LIMITS OF ASH BASED ON 1983 AERIAL
- APPROXIMATE LIMITS OF ASH BASED ON 1998 AERIAL
- APPROXIMATE LIMITS OF ASH BASED ON 2005 AERIAL
- APPROXIMATE LIMITS OF ASH BASED ON 2016 AERIAL
- APPROXIMATE LIMITS OF VARIANCE IN CCR MATERIAL COLORATION AS OBSERVED IN 1998 AERIAL
- APPROXIMATE LIMITS OF VARIANCE IN CCR MATERIAL COLORATION AS OBSERVED IN 2005 AERIAL
- APPROXIMATE LIMITS OF VARIANCE IN CCR MATERIAL COLORATION AS OBSERVED IN 2016 AERIAL
- SURFACE WATER FEATURE
- CCR MONITORED UNIT, SUBJECT SITE

0 275 550 Feet

CCR CHARACTERIZATION

NEWTON PRIMARY ASH POND (UNIT ID: 501)

NEWTON POWER STATION
NEWTON, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 11/3/2023 | DESIGNER: GALARNMC

Y:\Mapping\Projects\22\2285\MXD\845\Newton\2023\INTERACTIVE_Figure 1_Newton_CCR Characterization.mxd

2022 CONDITIONS

NEWTON POWER PLANT
NEWTON, ILLINOIS

FIGURE 2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\845\Newton\2023\Figure 2_NEW 2022 Conditions.mxd

PROJECT: 169000XXXX | DATED: 11/3/2023 | DESIGNER: GALARNMC

Exhibit D

DECLARATION OF MELINDA W. HAHN, PhD

In support of Illinois Power Generation Company's (IPGC's) Petition for Review of IEPA's Non-concurrence with the Newton Alternative Source Demonstration and Request for Stay

I, Dr. Melinda W. Hahn, declare and state as follows:

1) I am an Environmental Engineer and Senior Managing Consultant with Ramboll Americas Engineering Solutions, Inc. Attached as Attachment 1 is a true and accurate copy of my Curriculum Vitae.

2) I hold a PhD in Environmental Engineering from Johns Hopkins University. The focus of my research for my PhD dissertation was contaminant transport in porous media (e.g., groundwater).

3) My practice over my 25-year career includes site investigation and remediation in multiple state and federal programs, such as voluntary remediation, Resource Conservation and Recovery Act (RCRA) corrective action, and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response action. My work in these programs includes contaminant fate

and transport modelling, site investigation and remediation, and statistics and forensic analysis of environmental contamination data. I have evaluated sites from many different industrial sectors with many different contaminants of concern, including volatile organic compounds (VOCs), which includes chlorinated volatile organic compounds (CVOCs), semivolatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), and dioxins/furans.

4) To prepare this Declaration, I reviewed the Illinois Power Generation Company (IPGC) October 6, 2023 Alternative Source Demonstration (ASD) Report for chloride concentrations observed in groundwater from well APW15 at the Newton Power Plant Primary Ash Pond (PAP), the November 3, 2023 IPGC letter to the IEPA with supplementary information on the ASD, the November 7, 2023 IEPA denial of the ASD, and supporting information for the ASD. I reviewed the documents submitted by IPGC independently and was not personally involved in their preparation.

5) The three lines of evidence (LOEs) presented in the October 3, 2023 ASD report are as follows:

a) LOE 1: The thick layer of low permeability till that separates the PAP from the screened aquifer in APW15 prevents vertical migration of coal combustion residual (CCR) constituents;

b) LOE 2: Primary CCR indicators boron and sulfate do not exceed background limits and are not increasing at APW15; and

c) LOE 3: Concentrations of chloride at APW15 are greater than source porewater concentrations.

The ASD report also noted that concentrations of chloride at APW15 are consistent with published data for regional bedrock aquifer quality and the observation of a saline spring (that establishes the presence of an upward hydraulic gradient) within ten miles of the Newton Power Plant. These LOEs and observations are sufficient to determine that coal ash in the PAP is not the source of the chloride concentrations observed in monitoring well APW15, and that those concentrations are consistent with adjacent natural groundwater quality.

6) The ASD report relies on a multiple lines of evidence (MLE) approach that is standard practice in causal determinations in environmental forensic analysis, risk assessment, and site investigation.[1,2,3,4,5] The MLE approach involves analysis of multiple independent sets of data to test whether an identified source can explain observed data. Information to consider can be site-specific,

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[1] Miller, J. Methods and Advances in the Forensic Analysis of Contaminated Rivers, E3S Web of Conferences Vol. 125, 2019, p. 3.

[2] U.S. EPA, U.S. Navy SPAWAR Systems Center, GeoChem Metrix Inc., and Battelle Memorial Institute, A Handbook for Determining the Sources of PCB Contamination in Sediments, Technical Report, TR-NAVFAC EXWC-EV-1302, October 2012, p. 13.

[3] U.S. EPA, Office of the Science Advisor, Risk Assessment Forum, Weight of Evidence in Ecological Assessment, EPA/100/R-16/001, December 2016.

[4] U.S. EPA, Office of Solid Waste and Emergency Response, OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor in Indoor Air, June 2015, pp. xv-xvii, 17-18, 38-40, 60-61, 117-123.

[5] EPRI, Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites, 2017 Technical Report, p. viii.

regional, or from the literature.[6,7] These independent lines of evidence are developed until sufficient confidence is achieved to either confirm or rule out a source.[8] For the Newton ASD, the independent lines of evidence include hydrogeological data to show that migration from the PAP to a deep well is unlikely, chemical data for key CCR indicators to show a lack of CCR impact at APW15, and the fundamental concept of contaminant migration that contaminant concentrations decrease in the downgradient direction due to the successive dilution of dispersion and diffusion (i.e., downgradient concentrations cannot be higher than source concentrations). In a CCR surface impoundment release scenario, leachate is subject to physical processes that dilute solute concentrations including mixing, dispersion and dilution.[9] Together, these lines result in sufficient confidence that a source other than the PAP is the cause of the chloride exceedance in APW15 and that the PAP is not contributing to the observed chloride concentrations.

7) The source concentrations in the PAP have been characterized through the collection of porewater samples. The source porewater data for the

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[6] U.S. EPA, Office of the Science Advisor, Risk Assessment Forum, Weight of Evidence in Ecological Assessment, EPA/100/R-16/001, December 2016, p. 20 et seq.

[7] U.S. EPA, U.S. Navy SPAWAR Systems Center, GeoChem Metrix Inc., and Battelle Memorial Institute, A Handbook for Determining the Sources of PCB Contamination in Sediments, Technical Report, TR-NAVFAC EXWC-EV-1302, October 2012, p. 30.

[8] Miller, J. Methods and Advances in the Forensic Analysis of Contaminated Rivers, E3S Web of Conferences Vol. 125, 2019, p. 3.

[9] U.S. EPA Office of Solid Waste and Emergency Response, Solid Waste Disposal Criteria, Technical Manual, EPA530-R-93-017, p. 126.

PAP are consistent with literature values for coal ash leachate,[10,11,12] and define the maximum concentrations for groundwater impact outside of the PAP. The porewater data also provide information on the relative abundance of coal ash constituents and the variability of the observed concentrations.

8) The two lines of evidence based on groundwater chemistry (lines 2 and 3) are sufficient to eliminate the PAP as the source of chloride concentrations in APW15. PAP source concentrations as described by the porewater data show that CCR impact is characterized primarily by increases in boron and sulfate compared to the background concentrations at APW05 and APW06, whereas chloride is not similarly enriched in the source porewater. At APW15, however, boron is not enriched with respect to background, sulfate is depleted with respect to background, but chloride is dramatically enriched (by an order of magnitude) with respect to background ***and*** porewater. This chloride enrichment relative to the source concentration is an indication of an alternate source because groundwater plume strength only decreases downgradient due to the dilutive physical processes discussed above. While all three analytes are considered to be conservative (travel unretarded with groundwater), boron is considered by U.S.

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[10] U.S. EPA, Industrial Environmental Research Laboratory, Chemical and Biological Characterization of Leachates from Coal Solid Wastes, EPA-600/7-80-039, March 1980.

[11] U.S. EPA and TVA, Effects of Coal-ash Leachate on Ground Water Quality, EPA-600/7-80-066, March 1980.

[12] U.S. EPA, Office of Research and Development, Characterization of Coal Combustion Residues from Electric Utilities – Leaching and Characterization Data, EPA-600/R-09/151, December 2009.

EPA to be the indicator analyte with the fastest travel time and likely the first indicator analyte to be detected.[13] The lack of consistency of APW15 groundwater chemistry with CCR impacted groundwater or even site-specific background groundwater is clear evidence of an additional source. An additional source rich in chloride is sufficiently explained by the published literature values for regional data and observations for the local bedrock aquifer and saline spring.[14,15] The relationship between boron, sulfate and chloride in PAP porewater (XPW01, XPW02, XPW03 and XPW04), background (APW05 and APW06), and APW15 is described graphically in the following chart:

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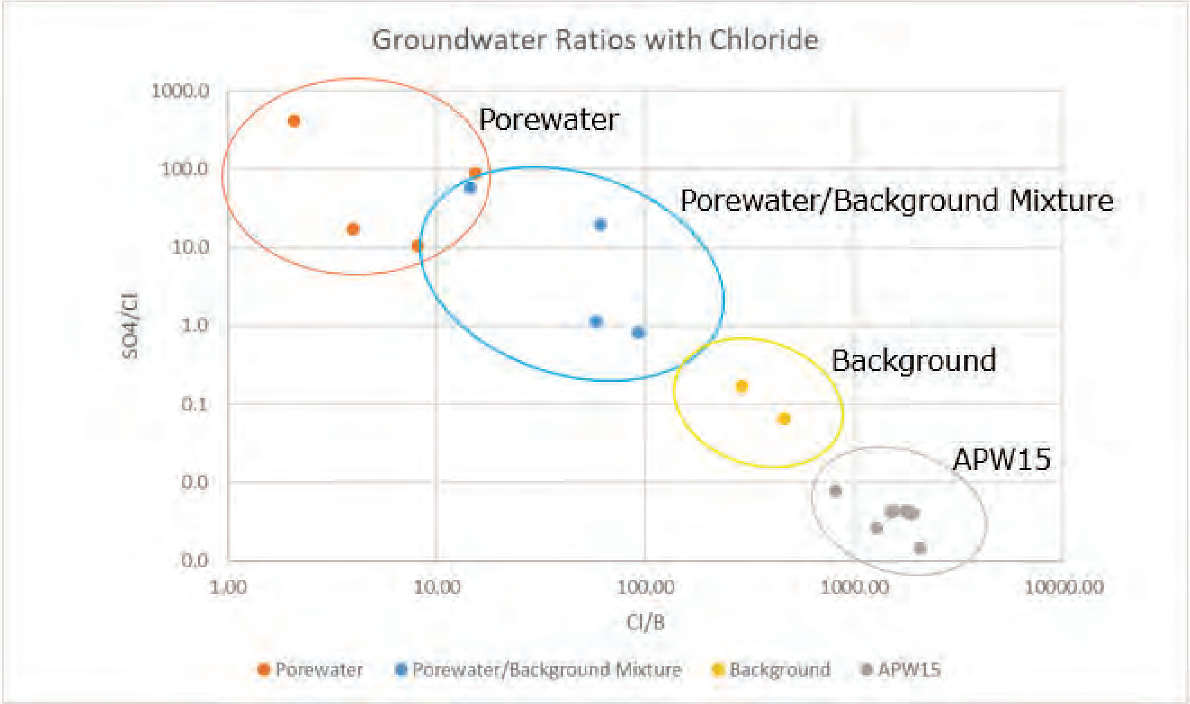
[13] EPA Proposed Rule: Amendments to the National Minimum Criteria (Phase One for Disposal of Coal Combustion Residuals from Electric Utilities, FR Vol. 83, No. 51, March 15, 2018, p. 11588.

[14] Panno, V.P. et al, Recharge and Groundwater Flow Within an Intracratonic Basis, Midwestern United States, Groundwater, Vol. 56, No. 1, pp. 32-45.

[15] Illinois State Water Survey, The Sources, Distribution, and Trends of Chloride in the Waters of Illinois, Bulletin B-74, March 2012.

Figure 1: Newton PAP Well Data – CCR Indicator Ratios with Chloride[16]



Samples from the groups "porewater", "background", and APW15 appear in distinct clusters. A theoretical mixture of porewater and background data (a 20/80 mixture is assumed) group appears in between the porewater and background data group, as one would expect. The APW15 samples, however, are separate, distinct and outside of the area that includes all other groups. This comparison confirms the findings in the ASD that the PAP is not contributing to the groundwater chemistry observed at APW15.

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[16] Porewater data are average values observed at XPW01, XPW02, XPW03, and XPW04. Background Samples are average values observed at APW05 and APW06, and mixture values are 20% average porewater and 80% global average background. Data included in this chart are provided in Attachment 2.

9) In its November 7, 2023 letter, the IEPA denied the ASD due to perceived “data gaps” that included the following:

a) Source characterization of the CCR at the Primary Ash Pond must include total solids sampling in accordance with SW846.

b) Hydraulic conductivities from laboratory or in-situ testing must be collected, analyzed and presented with hydrogeologic characterization of the bedrock unit.

c) Characterization to include sample and analysis in accordance with 35 IAC 845.640 of alternative source must be provided with the ASD.

10) The CCR source characterization request is so vague that it is not actionable. However, if the IEPA is requesting “total” constituent analysis of CCR in mg/kg (mass of constituent per mass of CCR on a dry weight basis), that information would not be more appropriate for a source impact analysis than the porewater data used for the ASD. In a land disposal scenario, groundwater would be impacted if leachate (or porewater) from the solid waste (rather than the solid waste itself) travels to and mixes with (and is diluted by) groundwater, then the impacted groundwater travels downgradient where dispersion and diffusion processes further dilute solid waste component concentrations. The most critical data needed for a groundwater impact analysis is the leachate quality, not the total amount of constituent in a solid sample of CCR, because leachate is the material that potentially mixes with groundwater. Similarly, if the IEPA is requesting

laboratory leach testing of solid CCR samples either by TCLP, SPLP, or LEAF, that information would also not be more appropriate for a source impact analysis than the actual porewater data collected from the CCR in the Newton PAP (as was used for the ASD). All of the synthetic laboratory leach tests on a solid sample aim to simulate a landfill environment in order to predict leachate quality from a solid sample. These "batch" one-day laboratory tests on a relatively small sample do not account for the long-term climatic and meteorological influences on a full-scale landfill operation.[17] These tests often yield high initial concentrations that are not typical of a full-scale operation.[18] Clearly, directly measuring CCR analytes in actual porewater samples from the actual disposal environment is a more accurate basis for an impact analysis. As stated above, the PAP CCR has been adequately characterized for performing an alternative source demonstration. Data from the 40 PAP porewater samples relied upon in the Alternative Source Demonstration Report[19] are sufficient to define the strength and variability of source water. Collection of additional CCR source characterization data referenced in IEPA's November 7 letter is not required for the ASD by Part 845 or Part 257 and would not change the conclusion of the ASD.

11) Similarly, hydraulic conductivity and hydrogeologic characterization

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[17] U.S. EPA Office of Solid Waste and Emergency Response, Solid Waste Disposal Criteria, Technical Manual, EPA530-R-93-017, p. 125.

[18] *Ibid.*

[19] Ramboll, Alternative Source Demonstration Report, October 6, 2023. Appendix C.

and the collection of alternate source samples is not required for the ASD and development of such information for the bedrock aquifer would not change the conclusion of the ASD. Parts 845 and 257 do not even require identification of the alternate source – only that a source other than the CCR is causing the chloride exceedance and that the CCR is not contributing to the chloride exceedance. At the Newton PAP, the CCR is ruled out as a source of chloride to APW15 solely on the basis of the chemistry data. The chloride concentrations in APW15 samples are an order of magnitude higher than the porewater "source" concentrations, which clearly indicates that the CCR cannot be a source, and the APW15 sample chemistry (chloride and key CCR indicator analytes boron and sulfate) cannot be explained by a mixture of PAP porewater and background groundwater (as would be the case if the CCR was the source). No information regarding the alternate source is needed to make this determination, and collecting this information would not change the ASD conclusions. The regional salinity of the underlying bedrock aquifer reported in the geologic literature as reported in the ASD, however, represents the plausible source. The regional bedrock chloride concentrations range from 100 to 5,000 mg/L[20] versus the maximum porewater concentration of 62 mg/L and the range of chloride concentrations at APW15 of 130 to 270 mg/L. The presence of a saline

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[20] Panno, V.P. et al, Recharge and Groundwater Flow Within an Intracratonic Basis, Midwestern United States, Groundwater, 2017, Vol. 56, No. 1, p. 41.

spring just ten miles from the Newton Power Plant establishes the regional upward hydraulic gradient in this unit.[21]

I declare under penalty of perjury that the foregoing is true and correct.

Dated: December 15, 2023

Melinda W Hahn

Melinda W. Hahn, PhD

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[21] Illinois State Water Survey, The Sources, Distribution, and Trends of Chloride in the Waters of Illinois, Bulletin B-74, March 2012.

ATTACHMENT 1

Curriculum Vitae of Melinda Hahn, PhD

ENVIRONMENT
& HEALTH

MELINDA W. HAHN, PH.D.

Senior Managing Consultant

Dr. Hahn’s practice areas include site investigation and remediation, contaminant fate and transport modelling, statistics of environmental data, forensic analysis, and litigation support, including primarily environmental liability and cost allocation. Regulatory areas include RCRA, CERCLA, TSCA, and Voluntary Cleanup/Risk-Based Corrective Action. Dr. Hahn has experience in the following industry categories: energy (electric utilities, petroleum dispensing, pipeline operations, former manufactured gas plant sites), industrial equipment manufacturing, metal working and metal recycling, automobile manufacturing, ink and chemical manufacturing, wood treating, mining, cement manufacturing, milling and smelting operations, secondary aluminum production, and dry cleaning.

EDUCATION

1995
PhD, Environmental Engineering
The Johns Hopkins University

1990
BS, Physics
The University of Texas at Austin

1990
BS, Mathematics
The University of Texas at Austin

CONTACT INFORMATION

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Austin, TX 78759
United States of America

ACADEMIC HONORS

1992-1995
Graduate Fellow, National Science Foundation

1995
Most Distinguished Environmental Engineering Dissertation, Association of Environmental Engineering Professors

CAREER

1998-Present
Senior Managing Consultant, ENVIRON/Ramboll

1997-1998
Consultant, Roy Ball, PC

1995-1997
Senior Project Engineer, Environmental Resources Management-North Central, Inc.

PROJECTS

- Provided technical litigation support for over 50 matters regarding extent, severity, timing, and source of soil and ground water contamination and vapor intrusion, necessity for and costs of remediation, human health risk assessment, toxic tort liability, Superfund cost allocation (including consistency with the NCP), insurance cost recovery, and the siting and monitoring of a hazardous waste landfill. The regulatory frameworks included Illinois Voluntary Cleanup Program, Illinois Leaking Underground Storage Tank Program, RCRA, CERCLA, TSCA, NCP, and California Proposition 65. Completed projects in more than twenty states, with a focus in the Midwest.
- Provided expert testimony in matters involving Superfund cost allocation, statistics of environmental data, and contaminant fate and transport.
- Retained as an expert witness and provided litigation/mediation support for a number of cost allocation cases involving remediation of contaminated soil, groundwater, and sediment.
- Provided litigation support for environmental liability/cost allocation mediation and litigation at several large sediment sites. Evaluated historical information on industrial processes and discharges, and conducted forensic/statistical analysis to estimate the relative contribution of contaminants to sediments.
- Provided litigation support for a number of insurance cost recovery projects, including a former wood treating facility, a jewelry manufacturer, metal plating facility, machine shop and dry cleaner. Tasks included the identification of likely sources and timing of contamination.
- Evaluated claims of residents living near a scrap metal facility of transport and deposition of lead-containing particles in their homes using statistical analysis of plaintiffs' chemical data. Provided expert testimony based on this analysis.
- Evaluated the hydrogeological setting of a proposed petroleum pipeline pumping station and estimated the likelihood of a release and groundwater contamination. Provided expert testimony based on this analysis.
- Provided expert testimony on proposed coal ash impoundment closure regulations and proposed new state groundwater standards in Illinois.
- Conducted environmental forensic evaluations to determine sources of observed environmental contamination in soil, groundwater, sediment and sub-slab/indoor air for sites in litigation and pre-litigation phases.
- Performed multivariate statistical analyses of data for forensic analysis, for contaminant ecological impact analysis, to determine appropriate remedial objectives, and as part of human health and ecological risk assessments.
- Lead RCRA Corrective Action at a former manufacturing facility.
- Directed and assisted in the closure of a number of sites in the Illinois Voluntary Cleanup Program and the Illinois Leaking Underground Storage Tank Program.
- Evaluated the potential contribution of urban industrial sources of heavy metals to urban soil and sediments using both simple data comparisons and multivariate statistical techniques.
- Performed ground water and contaminant fate and transport modeling using MODFLOW and MT3D for use as a Superfund cost allocation tool in support of expert testimony. Relative mass of TCE entering the Superfund Site from sources on two PRP's properties was used as a basis for cost allocation. A Monte Carlo analysis was also performed to evaluate the sensitivity of the proposed allocation to changes in key variables.

- Performed Monte Carlo analysis of risk to ground water posed by a proposed petroleum pipeline in support of expert testimony. The analysis examined the likelihood of the exceedance of the Illinois Class I ground water standard for benzene per mile of proposed pipeline.
- Performed Monte Carlo cost allocation among four PRPs for a Superfund Site in support of expert testimony. Total volume, volume of hazardous substances, and volume of drummed materials were considered.
- Utilized 3-D geostatistical interpolation techniques to visualize environmental data, to estimate excavation volumes for remediation, and to identify and distinguish source areas and potential preferential pathways of migration for a number of contaminated sites.
- Performed research and analysis of remedial activities and associated costs to determine compliance with the NCP for cost recovery matters for a number of sites.

PUBLICATIONS AND PRESENTATIONS

1993

Stochastic Models of Particle Deposition in Porous Media

Paper presented at the 1993 Midwest Regional Conference on Environmental Chemistry, University of Notre Dame

Authors: Hahn, M.W., and C. F. O'Melia

1994

Deposition and Reentrainment of Particles in Porous Media

Poster presented at the 1994 Gordon Research Conference on Environmental Science, Water, New Hampshire

Authors: Hahn, M.W., D. Abadzic, and C. R. O'Melia

1994

Colloid Transport in Groundwaters: Filtration of Fine Particles at Low Filtration Rates

Presented at the 1994 ASCE National Conference, Boulder, Colorado

Authors: Hahn, M.W., D. Abadzic, and C. R. O'Melia

1995

Deposition and Reentrainment of Brownian Particles under Unfavorable Chemical Conditions

Presented at the 1995 ACE National Conference, Environmental Chemistry Division

Authors: Hahn, M.W., D. Abadzic, and C. R. O'Melia

1995

Deposition and Reentrainment of Brownian Particles under Unfavorable Chemical Conditions

Doctoral Dissertation, Johns Hopkins University

Author: Hahn, M.W.

1997

Some Effects of Particles Size in Separation Processes Involving Colloids

Wat. Sci. Tech. Vol. 36, No. 4 pp. 119–126

Authors: O'Melia, C.R., M.W. Hahn, and C. Chen

1997

Literature Review 1997: Storage, Disposal, Remediation, and Closure

Water Environment Research, Vol. 69, No. 4, pp 6389-719

Authors: Millano E.F. and M.W. Hahn

1998
The Statistics of Small Data Sets
Accepted for publication, Superfund Risk Assessment in Soil Contamination Studies: Third Volume, ASTM STP 1338, K.B. Hoddinott Ed., American Society for Testing and Materials
Authors: Ball, R.O., and M.W. Hahn

1998
RBCA Compliance for Small Data Sets
Battelle Conference Proceedings, Remediation of Chlorinated and Recalcitrant Compounds: Risk, Resource and Regulatory Issues
The First International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, California, pp. 73-78
Authors: Hahn, M.W., A.E. Sevcik, and R.O.Ball

1998
Contaminant Plume and using 3D Geostatistics
Battelle Conference Proceedings, Remediation of Chlorinated and Recalcitrant Compounds: Risk, Resource and Regulatory Issues
The First International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, California, pp. 85-90
Authors: Ball, R.O., M.W. Hahn, and A.E. Sevcik1998
RBCA Closure at DNAPL Sites
Battelle Conference Proceedings, Remediation of Chlorinated and Recalcitrant Compounds: Risk, Resource and Regulatory Issues
The First International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, California, pp.181-186
Authors: Sheahan, J.W., R.O. Ball, and M.W. Hahn

1998
RBCA Closure at DNAPL Sites, Ground Water Monitoring and Research
Authors: Sheahan, J.W., R.O. Ball, and M.W. Hahn

2004
Deposition and Reentrainment of Brownian Particles in Porous Media under Unfavorable Chemical Conditions: Some Concepts and Applications
Environmental Science & Technology, Vol. 38, pp 210-220
Authors: Hahn, M.W. and C.R. O'Melia

2010
Making the Case for Causation in Toxic Tort Cases: Superfund Rules Don't Apply
Environmental Law Reporter, News & Analysis, July 2010, pp. 10638-10641
Authors: More, J.R. and M.W. Hahn

ATTACHMENT 2

PAP Groundwater Data Supporting Figure 1

Groundwater Data Supporting Table 1
Newton Power Plant PAP

Parameter			Boron, total		Chloride, total		Sulfate, total		
Result Units			mg/L		mg/L		mg/L		
Program ID	Location	Sample Date	Result	RL	Result	RL		Result	RL
NEW-000	APW05	12/15/15	0.099	0.01	48	25		15	5
		01/20/16	0.12	0.01	50	10		15	10
		04/27/16	0.1	0.01	58	10		14	10
		08/01/16	0.1	0.01	52	10		1.8	1
		10/25/16	0.12	0.01	50	10	<	1	1
		01/23/17	0.09	0.01	50	10	<	1	1
		04/24/17	0.079	0.01	46	10		1.2	1
		06/13/17	0.082	0.01	47	10	<	1	1
		11/17/17	0.099	0.01	43	10	<	1	1
		05/18/18	0.1	0.01	48	10		2.1	1
		08/17/18			56	25		1.4	1
		11/09/18	0.098	0.01	51	10		5.1	1
		02/22/19	0.11	0.01	48	10		3.5	1
		08/22/19	0.12	0.01	50	10		2.3	1
		02/04/20	0.091	0.01	54	10		2.3	1
		07/28/20	0.1	0.01	52	10		1.8	1
		02/09/21	0.13	0.01	50	10		1.3	1
		02/17/21	0.1	0.01	52	10		3.3	1
		03/10/21	0.12	0.01	48	10		1.3	1
		03/30/21	0.092	0.01	49	10		1.3	1
		04/28/21	0.099	0.01	51	10		1.1	1
		05/25/21	0.12	0.01	48	10		1	1
		06/17/21	0.091	0.01	50	10	<	1	1
		06/30/21	0.26	0.01	51	25		1	1
		07/15/21	0.1	0.01	52	25		1.1	1
	APW06	12/15/15	0.073	0.01	26	25		9.9	5
		01/20/16	0.082	0.01	24	10		9.9	1
		04/27/16	0.16	0.01	29	5		7.4	1
		08/01/16	0.078	0.01	27	5		1.2	1
		10/25/16	0.093	0.01	26	5	<	1	1
		01/23/17	0.076	0.01	26	5	<	1	1
		04/24/17	0.074	0.01	50	10	<	1	1
		06/13/17	0.093	0.01	25	5		2.3	1
		11/17/17	0.094	0.01	23	10		1.9	1
		05/18/18	0.087	0.01	25	5		1.7	1
		08/17/18			25	5		1.7	1
		11/09/18	0.083	0.01	24	10		2.1	1
		02/22/19	0.09	0.01	24	5		1.7	1
		08/23/19	0.11	0.01	26	5		5.8	1
		02/04/20	0.08	0.015	27	10	<	1	1
		07/28/20	0.091	0.01	24	5		3.2	1
		02/09/21	0.087	0.01	24	10		1.8	1
		02/17/21	0.086	0.01	23	5		3.6	1
		03/10/21	0.086	0.01	22	10		9.2	1
		03/30/21	0.078	0.01	26	10		7.7	1
		04/29/21	0.082	0.01	23	10		8.5	1
		05/25/21	0.1	0.01	23	5		7.8	1
		06/16/21	0.11	0.01	25	5		6.2	1
		06/30/21	0.085	0.01	32	25		6.3	1
		07/15/21	0.083	0.01	27	10		7.8	1
	APW15	02/23/21	0.14	0.01	260	50	<	1	1
		03/10/21	0.13	0.01	250	50	<	1	1
		03/31/21	0.16	0.01	240	50	<	1	1

Groundwater Data Supporting Table 1

Newton Power Plant PAP

Parameter			Boron, total		Chloride, total		Sulfate, total	
Result Units			mg/L		mg/L		mg/L	
Program ID	Location	Sample Date	Result	RL	Result	RL	Result	RL
		04/28/21	0.13	0.01	230	50	< 1	1
		05/24/21	0.15	0.01	230	50	< 1	1
		06/17/21	0.13	0.01	240	25	< 1	1
		06/30/21	0.13	0.01	230	50	< 1	1
		07/14/21	0.16	0.01	130	50	< 1	1
		03/14/23	0.18	0.01	230	50	0.6	1
		04/26/23	0.13	0.01	270	50	0.4	1
	XPW01	02/17/21	9.5	0.01	49	10	19000	2500
		03/09/21	11	0.2	38	10	14000	5000
		03/30/21	9.9	0.01	32	10	19000	2500
		04/28/21	10	0.2	33	10	12000	2500
		07/14/21	12	0.4	27	10	11000	2500
		02/23/22	12	0.2	25	10	9300	2500
		06/14/22			14	10	6100	2500
		08/15/22	13	0.2	11	10	5900	1000
		02/01/23	15	0.2	9.7	5	4200	1000
		04/27/23	14	0.2	8.1	5	2900	1000
	XPW02	02/17/21	2.3	0.01	10	5	160	100
		03/09/21	2.5	0.01	9.6	1	150	50
		03/30/21	2.4	0.01	9.9	1	160	100
		04/28/21	2.6	0.02	9.7	1	190	25
		07/14/21	2.5	0.01	10	10	160	25
		02/23/22	2.4	0.01	12	10	210	100
		06/14/22			8.6	5	170	100
		08/15/22	2.4	0.01	8.9	5	160	25
		02/01/23	2.3	0.01	8.4	1	150	25
		04/27/23	2.3	0.01	8.8	1	150	25
	XPW03	02/17/21	1.3	0.01	14	10	92	25
		03/09/21	1.2	0.01	9.2	5	93	10
		03/30/21	0.84	0.01	13	10	94	10
		04/28/21	1.2	0.02	11	10	96	10
		07/14/21	1.3	0.01	11	10	120	25
		02/23/22	1.7	0.01	13	10	130	50
		06/15/22			11	5	150	50
		08/16/22	1.4	0.01	11	5	180	25
		02/02/23	1.7	0.01	9.6	1	98	25
		04/27/23	1.8	0.01	9.7	5	120	25
	XPW04	02/17/21	2.5	0.01	62	10	2200	500
		03/09/21	2.4	0.01	34	10	1400	250
		03/29/21	2.1	0.01	31	10	600	250
		04/28/21	2.8	0.02	37	10	3800	1000
		07/14/21	2.3	0.01	34	25	1600	500
		02/23/22	2.2	0.01	30	10	1800	250
		06/15/22			50	10	7500	1000
		08/16/22	3.7	0.01	54	10	4000	1000
		02/01/23	3.5	0.01	46	10	6200	1000
		04/28/23	4	0.01	59	10	9500	1000

Note: Porewater (XPW01, XPW02, XPW03, and XPW04) and APW15 data are from the October 6, 2023 ASD Report (Appendix C) and Background data APW05 and APW06 are from the October 2021 Hydrogeologic Site Characterization Report, Table 4-1.

Exhibit E

DECLARATION OF CYNTHIA VODOPIVEC
ON BEHALF OF ILLINOIS POWER GENERATING COMPANY

I, Cynthia Vodopivec, affirm and declare as follows:

1. I present this Declaration on behalf of Illinois Power Generating Company (hereinafter "IPGC"). I am Senior Vice President, Environmental Health and Safety at Vistra Corp., the indirect corporate parent of IPGC. As part of my duties, I oversee permitting, regulatory development, compliance (air, water, and waste issues), and health and safety at the Company, including IPGC's Newton Power Plant in Jasper County, Illinois. I received a Bachelor's Degree in Engineering from Dartmouth College in 1998 and an MBA from Rensselaer in 2009. I state the following in support of IPGC's Petition for Review of Illinois Environmental Protection Agency's Non-Concurrence with Alternative Source Demonstration under 35 Ill. Adm. Code Part 845 and Motion for Stay ("Petition").

2. IPGC received IEPA's November 7, 2023 letter notifying IPGC of IEPA's nonconcurrence with the Newton Primary Ash Pond Alternative Source Demonstration via U.S. Mail on November 10, 2023. This letter is attached as Exhibit A of the Petition.

3. Following IPGC's submittal of an Alternative Source Demonstration for the Newton Primary Ash Pond on October 6, 2023, IPGC Representatives communicated with IEPA multiple times between October 19 and October 31, 2023. Those communications occurred via telephone and email and included a discussion of (1) source characterization of the Primary Ash Pond using total solids sampling in accordance with SW846 methods; (2) hydraulic conductivities and hydrogeologic characterization; and (3) a complete characterization of the proposed alternative source in accordance with 35 Ill. Adm. Code § 845.640.

4. Performing source characterization of the CCR at the Newton Primary Ash Pond using total solids sampling techniques under SW846 would require drilling within the Newton Primary Ash Pond with up to 10 borings using specialized equipment to collect 20 samples. It would further require complete laboratory analyses, data evaluation and reporting for those samples. Assuming a driller is readily available, which is not always the case, this process would likely take approximately 21-42 weeks to complete, and would likely cost approximately $450,000-$800,000.

5. Conducting a characterization of the bedrock surrounding the Newton Primary Ash Pond in accordance with 35 Ill Adm. Code 845.640 would require drilling to bedrock, well installation, solids and groundwater sampling and analyses, and data evaluation and reporting. Assuming a driller is readily available, which is not always the case, this process would take approximately 20-30 weeks and would cost approximately $150,000.

6. Completing an assessment of corrective measures for a chloride exceedance at the Newton Primary Ash Pond in accordance with the requirements and deadlines of 35 Ill. Adm. Code § 845.660 would likely cost approximately $35,000. Completing the requirements of 35 Ill. Adm. Code § 845.670, including determining nature and extent, conducting a monitored natural attenuation evaluation, preparing and submitting the semi-annual reports, a construction permit application and a corrective action plan, for a chloride exceedance at the Newton Primary Ash

Pond would likely cost approximately $800,000. Undertaking the steps required in Sections 845.660 and 845.670 is a considerable undertaking that requires the dedication of many resources. For example, the corrective measures assessment may require development of groundwater models specific to chloride and could result in the development of potential engineered remedies. The Corrective Action Plan may require a 30 percent design for the selected remedy, a groundwater monitoring plan, a new Construction Permit Application, and attendance at a public meeting. Significant personnel time and resources will be necessary to dedicate specifically to this work.

FURTHER, the Declarant sayeth not.

Dated: December 15, 2023