COAL COMBUSTION RESIDUAL RULE
GROUNDWATER MONITORING SYSTEM CERTIFICATION

MARTIN LAKE STEAM ELECTRIC STATION
A1 AREA LANDFILL
RUSK COUNTY, TEXAS

OCTOBER 16, 2017

Prepared For:

Luminant Generation Company, LLC
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Prepared By:

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October 16, 2017

PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Pastor, Behling & Wheeler, LLC under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the groundwater monitoring system installed at the referenced facility has been designed and constructed to meet the requirements of Section 257.91 of the CCR Rule.

Patrick J. Behling, P.E.
Principal Engineer
PASTOR, BEHLING & WHEELER, LLC

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1.0 INTRODUCTION

Luminant Power (Luminant) operates the Martin Lake Steam Electric Station (MLSES) located approximately 5 miles southeast of Tatum, Rusk County, Texas (Figure 1). The MLSES consists of three coal/lignite-fired power generation units. Coal Combustion Residuals (CCRs) including fly ash, bottom ash and gypsum are generated as part of the MLSES unit operations. Currently, CCRs generated at the MLSES are transported off-site for beneficial use by third-parties or are managed by Luminant in surface impoundments located on the MLSES property or the A1 Area Landfill located approximately 2.5 miles east of the MLSES. Three CCR Units have been identified within the MLSES operations, the Ash Pond Area (the West Ash Pond (WAP) East Ash Pond (EAP), and the New Scrubber Pond), Permanent Disposal Pond 5 (PDP 5), and A1 Area Landfill. This report discusses the A1 Area Landfill (the Site).

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. The final CCR Rule was published in the Federal Register on April 17, 2015. The effective date of the CCR Rule was October 19, 2015.

The CCR Rule establishes national minimum criteria for existing and new CCR landfills, existing and new CCR surface impoundments, and lateral expansions to landfills/impoundments. Pastor, Behling & Wheeler, LLC (PBW) was retained by Luminant to evaluate and certify the groundwater monitoring system at the Site in accordance with Section 257.91 of the CCR Rule.

1.1 Description of A1 Area Landfill

The A1 Area Landfill and adjacent A1 Area Landfill Expansion (collectively referred to as the A1 Area Landfill) are located at the Beckville Lignite Mine, approximately 2.5 miles southeast of the MLSES power units, on the opposite side of Martin Lake from the MLSES (Figure 2). CCRs generated at the MLSES, including fly ash and bottom ash, are transported and managed/disposed of by Luminant in the A1 Area Landfill. The A1 Area Landfill was constructed within a mined-out area of the Beckville Lignite Mine, and is surrounded and underlain by spoil material that was previously excavated during lignite mining operations. The A1 Area Landfill is considered an existing CCR unit under the CCR Rule.

1.2 CCR Unit Groundwater Monitoring System Requirements

Section 257.91 of the CCR Rule indicates that existing CCR landfills and surface impoundments be provided with a groundwater monitoring system that consists of sufficient wells, installed at appropriate location and depths, to yield groundwater samples from the uppermost aquifer that meet the following criteria:

- Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit; and
- Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary to ensure detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.

The specific configuration of the groundwater monitoring system must be determined based on site-specific technical information that must include aquifer thickness, groundwater flow rate, groundwater flow direction (including seasonal and temporal fluctuation in groundwater flow), saturated and unsaturated geologic units and fill materials that overly the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the upmost aquifer, including, but not limited to, thickness, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities.

At a minimum, the monitoring system must consist of at least one upgradient and three downgradient monitoring wells, and any additional monitoring wells necessary to accurately represent the quality of the background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit. Multi-unit groundwater monitoring systems are allowed but must be equally as capable of detecting monitored constituents at the waste boundary of a CCR unit as individual groundwater monitoring wells.

Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space above the sampling depth must be sealed to prevent contamination of samples and the groundwater. There must be documentation in the operating record of the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified engineer must have access to and must review this documentation as part of the groundwater monitoring system certification.

2.0 GROUNDWATER MONITORING SYSTEM EVALUATION

2.1 A1 Area Landfill Groundwater Monitoring System

The CCR groundwater monitoring well system at the Site consists of eleven monitoring wells (BMW-11AR, BMW-18, BMW-19, BMW-20, BMW-21, BMW-22, BMW-23, BMW-24, BMW-26, BMW-27, and BMW-28) that are each screened in the uppermost aquifer at the Site. The locations of the CCR monitoring wells are shown on Figure 2. Well construction information and survey data for the CCR wells are summarized in Table 1, CCR monitoring well logs are presented in Appendix A, and photographs of the CCR wells are presented in Appendix B.

2.2 Local Geology and Hydrogeology

The Site is located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1965). PBW reviewed current and historical soil boring logs, monitoring well completion documentation, and historical reports to describe the geologic and hydrogeologic conditions at the A1 Area Landfill. Geologic cross sections were constructed through this area using this data. Cross section locations are presented on Figure 3 and the cross sections are presented on Figures 4, 5, 6, and 7.

The A1 Area Landfill is constructed within spoil material that was excavated during lignite mining operations at the Beckville Lignite Mine. Available lithologic descriptions of the spoil material indicate that it primarily consists of a heterogenous mixture of clay and sand with trace imbedded fragments of lignite. The spoil depth generally increases to the northwest. The spoil/native contact in the southeastern portion of the A1 Area Landfill was encountered at depths ranging from 9 feet bgs to 70 feet bgs (BMW-, while the spoil/native contact in the northwestern portion of the A1 Area Landfill was encountered at depths ranging from 90 feet bgs to 150 feet bgs. Native material encountered below the spoil zone consisted of lignite or native, silty clay. The A1 Area Landfill groundwater monitoring wells are all completed within the spoil zone.

2.3 Groundwater Potentiometric Surface Elevations

Eight background groundwater monitoring events were performed using the A1 Area Landfill CCR monitoring well system. Static water levels measured during the background monitoring period indicated water elevations ranging from 318.19 feet above mean sea level (amsl) to 386.98 feet amsl, and depths to water ranging from 1.77 feet bgs to 55.02 feet bgs (Table 2). Groundwater potentiometric surface maps

based on data collected during the background monitoring period are presented in Appendix C.

Groundwater elevations were generally highest on the north side of the landfill, with an inferred groundwater flow direction radially outward from the north side of the landfill. Based on the inferred groundwater flow direction, the location of each CCR monitoring well relative to the A1 Area Landfill is as follows:

Upgradient Wells	Downgradient Wells
BMW-11A-R	BMW-18
	BMW-19
	BMW-20
	BMW-21
	BMW-22
	BMW-23
	BMW-24
	BMW-26
	BMW-27
	BMW-28

2.4 Uppermost Aquifer Hydraulic Conductivity Testing

PBW performed slug tests at monitoring wells BMW-21, BMW-23, and BMW-24 on October 7, 2015 to evaluate groundwater linear flow velocities at the uppermost aquifer at the Site. Slug test data and time-head change plots used to calculate hydraulic conductivities and transmissivities of the uppermost aquifer are provided in Appendix D. A summary of these hydraulic properties is presented in Table 3. The average hydraulic conductivities for the wells ranged from 9.55×10^{-5} cm/sec (well BMW-24) to 1.53×10^{-3} cm/sec (well BMW-23), with a geometric mean for the test wells of 3.05×10^{-4} cm/sec.

2.5 Conclusions

The CCR groundwater monitoring well system at the A1 Landfill complies with Section 257.91 of the CCR Rule. This conclusion is supported by the following as described in detail in previous sections of this report:

- Eleven monitoring wells are included in the CCR groundwater monitoring system – one upgradient monitoring well and ten downgradient monitoring wells.

- Each monitoring well is screened in the uppermost aquifer at the Site. Samples collected from upgradient monitoring wells will be representative of the quality of background groundwater that has not been affected by leakage from the CCR unit and samples collected from downgradient wells will ensure detection of groundwater contamination in the uppermost aquifer from the CCR unit.

- The monitoring wells are constructed with appropriate well casing to maintain the integrity of the monitoring well borehole and with slotted well screens to enable collection of groundwater samples. In addition, the annular space above the well screen is appropriately sealed to prevent contamination of groundwater samples from surface sources.

- Appropriate documentation exists concerning the design, installation, and development of the monitoring wells.

3.0 REFERENCES

Barnes, Virgil E., 1965. Geologic Atlas of Texas, Tyler Sheet. Texas Bureau of Economic Geology.

Tables

TABLE 1
WELL CONSTRUCTION SUMMARY
A1 AREA LANDFILL

Well ID	Date Installed	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Screen Length (ft)	Total Design Depth (ft bgs)	Casing Diameter (in)
BMW-11AR	2012	221220	2919014	423.37	426.05	119	139	20	139	4
BMW-18	9/29/15	216951	2915600	355.50	357.83	100	120	20	120	2
BMW-19	10/7/15	219535	2918071	397.47	400.69	25	45	20	45	2
BMW-20	10/8/15	219167	2923996	354.67	357.51	10	30	20	30	2
BMW-21	9/27/15	217793	2923479	347.87	350.98	20	40	20	40	2
BMW-22	9/27/15	216298	2924360	329.53	332.30	20	40	20	40	2
BMW-23	9/28/15	215105	2923180	339.43	341.90	15	35	20	35	2
BMW-24	9/28/15	213874	2921447	344.70	347.07	20	40	20	40	2
BMW-26	8/31/16	221187	2921307	365.96	369.44	20	30	10	30	4
BMW-27	9/1/16	220024	2922347	373.46	376.25	20	30	10	30	4
BMW-28	10/27/16	215307	2917356	371.27	373.21	40	60	20	60	2

Notes:
1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface.

TABLE 2
GROUNDWATER ELEVATION SUMMARY
A1 AREA LANDFILL

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft btoc)	Water Elevation (ft amsl)
BMW-11AR	426.05	10/30/15	43.79	382.26
		12/30/15	43.11	382.94
		02/24/16	41.77	384.28
		04/07/16	40.49	385.56
		06/08/16	39.26	386.79
		08/11/16	39.24	386.81
		10/25/16	39.07	386.98
		12/13/16	40.57	385.48
BMW-18	357.83	10/30/15	33.40	324.43
		12/30/15	32.16	325.67
		02/24/16	29.49	328.34
		04/07/16	28.98	328.85
		06/08/16	28.04	329.79
		08/11/16	28.19	329.64
		10/25/16	28.31	329.52
		12/13/16	29.88	327.95
BMW-19	400.69	10/30/15	21.42	379.27
		12/30/15	20.14	380.55
		02/24/16	20.41	380.28
		04/07/16	19.56	381.13
		06/08/16	19.22	381.47
		08/11/16	20.84	379.85
		10/25/16	20.33	380.36
		12/13/16	24.11	376.58
BMW-20	357.51	10/30/15	8.56	348.95
		12/30/15	8.81	348.70
		02/24/16	8.96	348.55
		04/07/16	9.24	348.27
		06/08/16	8.81	348.70
		08/11/16	8.52	348.99
		10/25/16	8.36	349.15
		12/13/16	10.21	347.30
BMW-21	350.98	10/30/15	5.23	345.75
		12/30/15	4.09	346.89
		02/24/16	3.83	347.15
		04/07/16	3.93	347.05
		06/08/16	3.34	347.64
		08/11/16	4.56	346.42
		10/25/16	3.84	347.14
		12/13/16	6.89	344.09
BMW-22	332.30	10/30/15	7.11	325.19
		12/30/15	6.17	326.13
		02/24/16	5.74	326.56
		04/07/16	7.33	324.97
		06/08/16	6.91	325.39
		08/11/16	5.96	326.34
		10/25/16	6.07	326.23
		12/13/16	7.86	324.44

TABLE 2
GROUNDWATER ELEVATION SUMMARY
A1 AREA LANDFILL

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft btoc)	Water Elevation (ft amsl)
BMW-23	341.90	10/30/15	16.47	325.43
		12/30/15	15.34	326.56
		02/24/16	14.78	327.12
		04/07/16	13.98	327.92
		06/08/16	11.72	330.18
		08/11/16	15.21	326.69
		10/25/16	15.51	326.39
		12/13/16	17.56	324.34
BMW-24	347.07	10/30/15	14.26	332.81
		12/30/15	12.09	334.98
		02/24/16	12.11	334.96
		04/07/16	12.03	335.04
		06/08/16	11.22	335.85
		08/11/16	12.73	334.34
		10/25/16	12.72	334.35
		12/13/16	14.27	332.80
BMW-26	369.44	9/13/16	1.77	367.67
		10/25/16	2.39	367.05
		12/13/16	4.02	365.42
		1/23/17	2.21	367.23
		2/23/17	2.67	366.77
		3/24/17	2.46	366.98
		4/24/17	2.24	367.20
		5/25/17	2.13	367.31
		6/29/17	2.12	367.32
BMW-27	376.25	9/13/16	2.12	374.13
		10/25/16	2.46	373.79
		12/13/16	4.11	372.14
		1/23/17	2.51	373.74
		2/23/17	2.84	373.41
		3/24/17	2.67	373.58
		4/24/17	3.07	373.18
		5/25/17	2.67	373.58
		6/29/17	2.24	374.01
BMW-28	373.21	12/13/16	55.02	318.19
		1/23/17	45.94	327.27
		2/23/17	39.97	333.24
		3/24/17	39.82	333.39
		4/24/17	36.81	336.40
		5/25/17	34.91	338.30
		6/29/17	33.85	339.36
		8/1/17	41.96	331.25

Notes:
1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface; toc - top of casing; btoc - below top of casing.

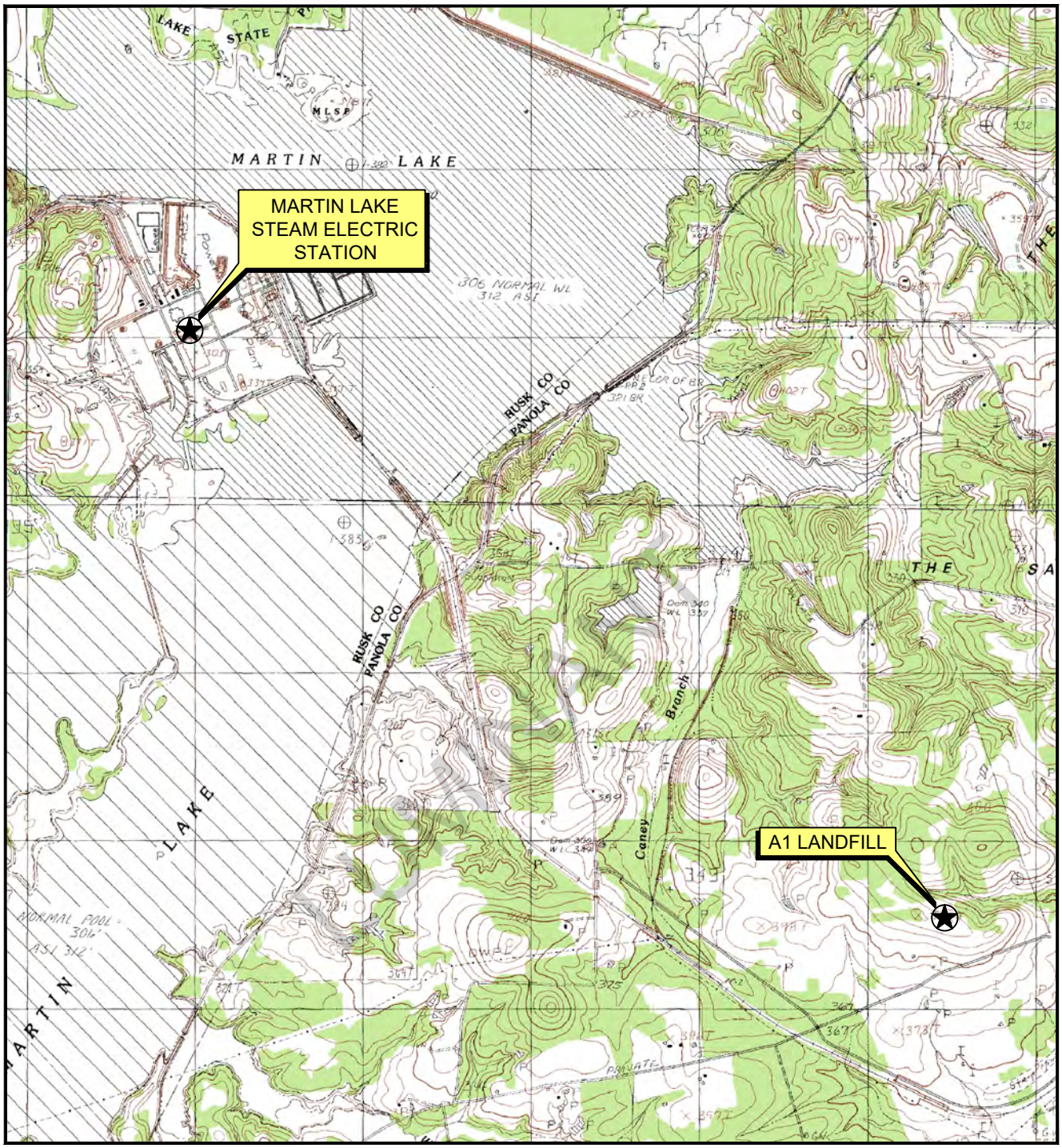
TABLE 3
SUMMARY OF AQUIFER TEST RESULTS
A1 AREA LANDFILL

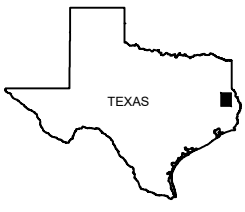
Well ID	Test Type	Aquifer Type	Analysis Method	Saturated Thickness (feet)	Results	
					T (cm^2/sec)	K (cm/sec)
PDP 5						
A1 Area Landfill						
BMW-21	Slug-In	Confined	Bouwer-Rice	10	6.24E-02	2.05E-04
BMW-21	Slug-Out	Confined	Bouwer-Rice	10	5.64E-02	1.85E-04
				Mean	**5.94E-02**	**1.95E-04**
BMW-23	Slug-In	Semi-Confined to Confined	Bouwer-Rice	15	8.00E-01	1.75E-03
BMW-23	Slug-Out	Semi-Confined to Confined	Bouwer-Rice	15	5.97E-01	1.31E-03
				Mean	**6.98E-01**	**1.53E-03**
BMW-24	Slug-In	Confined	Bouwer-Rice	5	1.30E-02	8.52E-05
BMW-24	Slug-Out	Confined	Bouwer-Rice	5	1.61E-02	1.06E-04
				Mean	**1.46E-02**	**9.55E-05**
				Geometric Mean for All A1 Area Landfill Tests	**8.45E-02**	**3.05E-04**

Notes:

1. Abbreviations: T - transmissivity; K - hydraulic conductivity.

Figures





QUADRANGLE LOCATION

N

Scale in Feet

0 1500 3000

SOURCE:
Base map from www.tnris.gov, Tatum, TX 7.5 min. USGS quadrangle dated 1983.

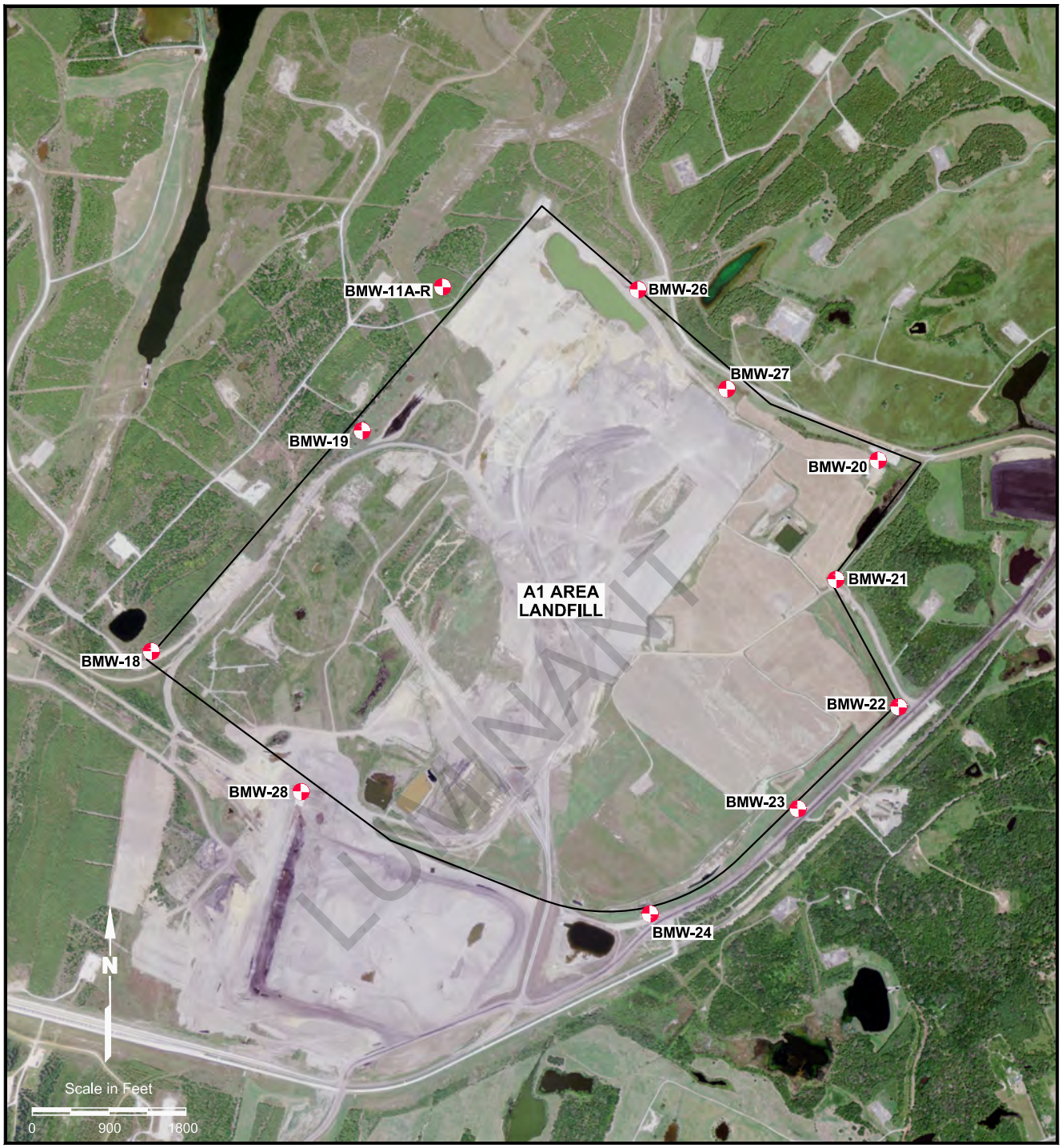
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 1

A1 AREA LANDFILL SITE LOCATION MAP

PROJECT: 5123B	BY: AJD	REVISIONS
DATE: JUNE, 2015	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

CCR Monitoring Well

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 2

A1 AREA LANDFILL
DETAILED SITE MAP

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

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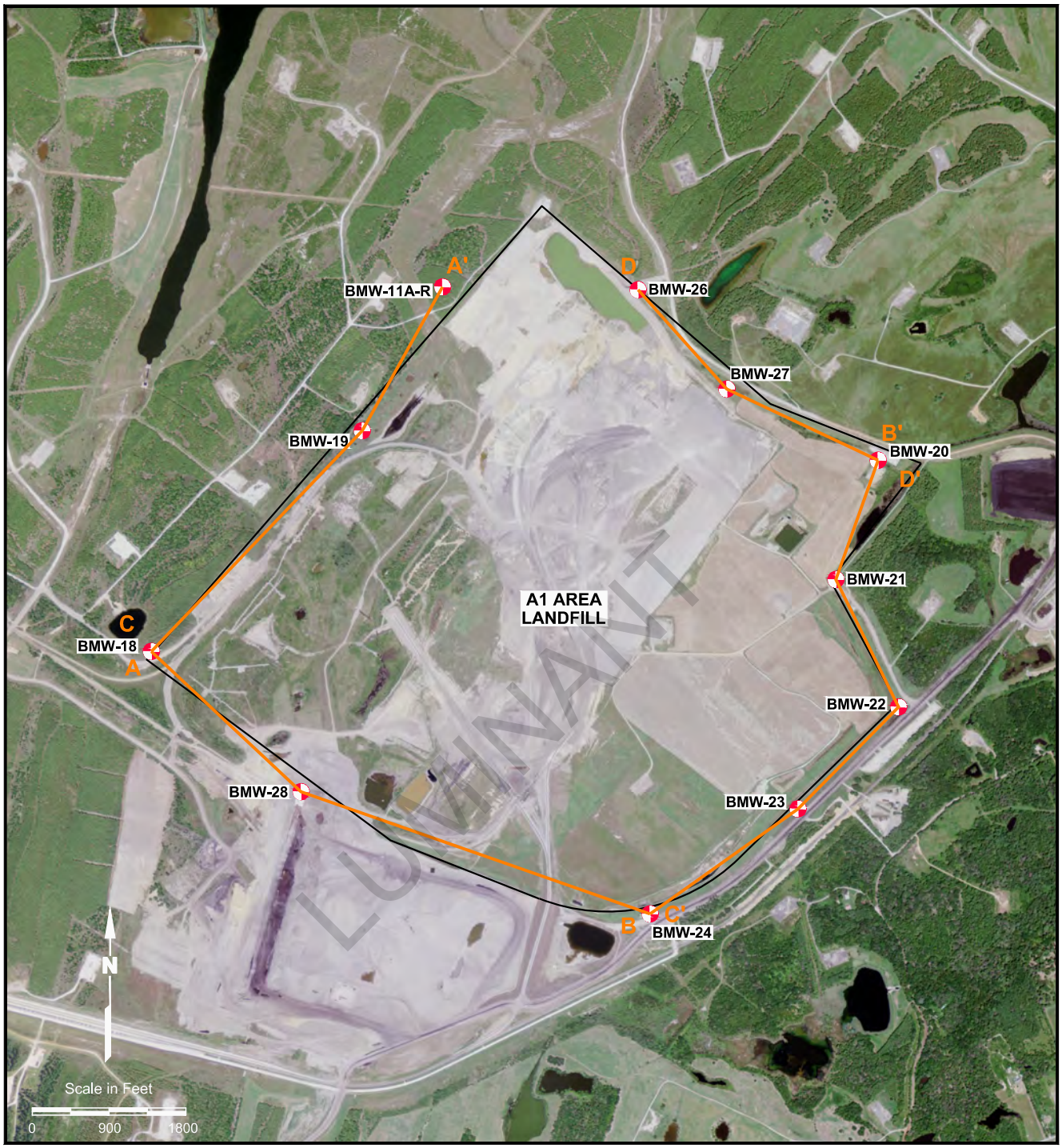

EXPLANATION

CCR Monitoring Well

A____A' Geologic Cross Section Location Lines

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 3

A1 AREA LANDFILL CROSS SECTION LOCATION MAP

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DATE: SEPT., 2017	CHECKED: PJB	

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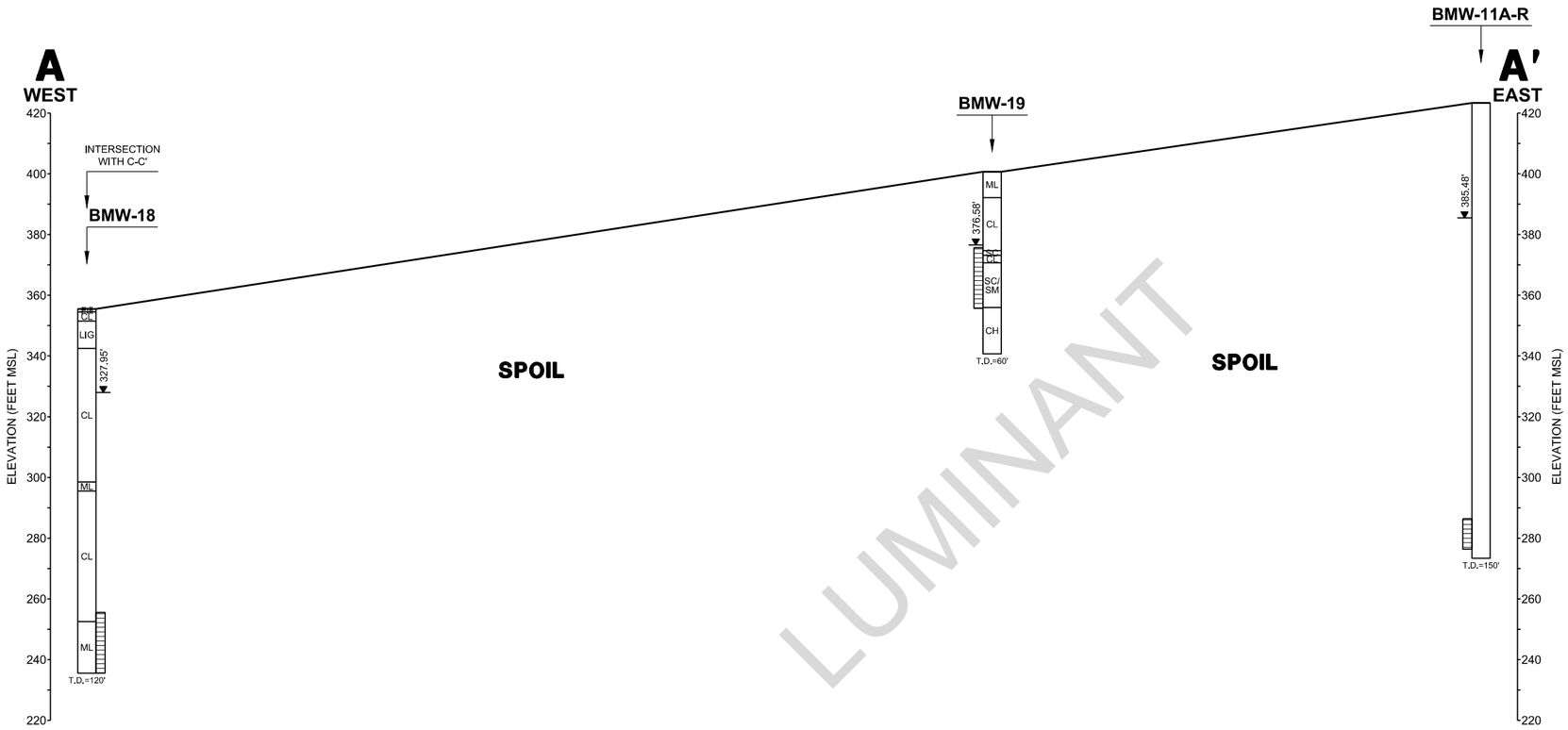

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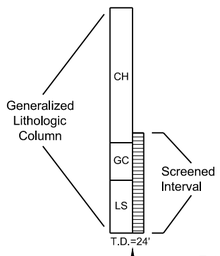
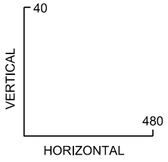


Water Level (Ft MSL) Measured 12/13/16

SCALE IN FEET



12x Vertical Exaggeration

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 4

A1 AREA LANDFILL
GEOLOGIC CROSS SECTION A-A'
NORTH SIDE OF A1 EXPANSION AREA

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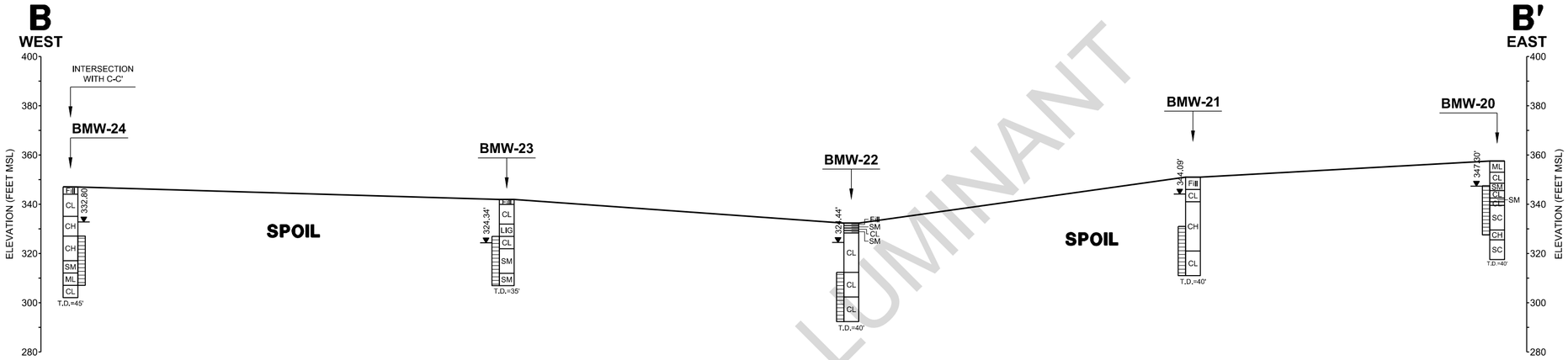
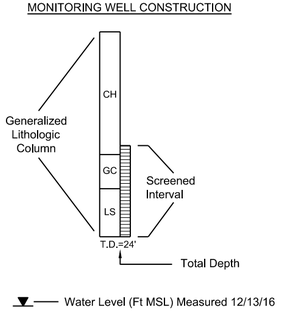
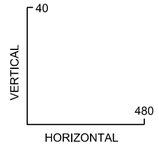
DATE: OCT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS







12x Vertical Exaggeration

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 5

A1 AREA LANDFILL
GEOLOGIC CROSS SECTION B-B'
SOUTH SIDE OF A1 LANDFILL

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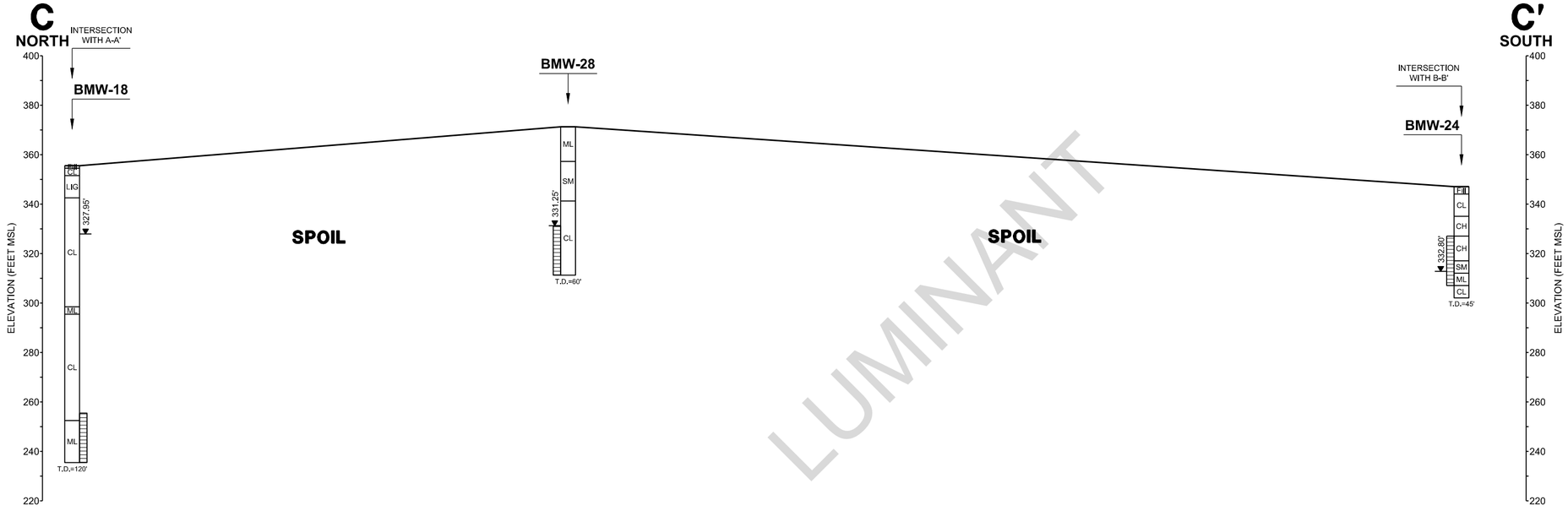
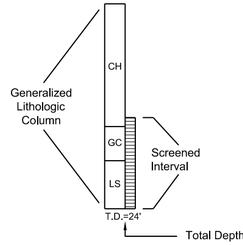
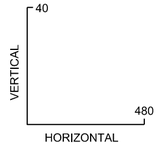


MONITORING WELL CONSTRUCTION



Water Level (Ft MSL) Measured 12/13/16

SCALE IN FEET



12x Vertical Exaggeration

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 6

A1 AREA LANDFILL
GEOLOGIC CROSS SECTION C-C'
WEST SIDE OF A1 LANDFILL

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DATE: OCT., 2017	CHECKED: PJB	

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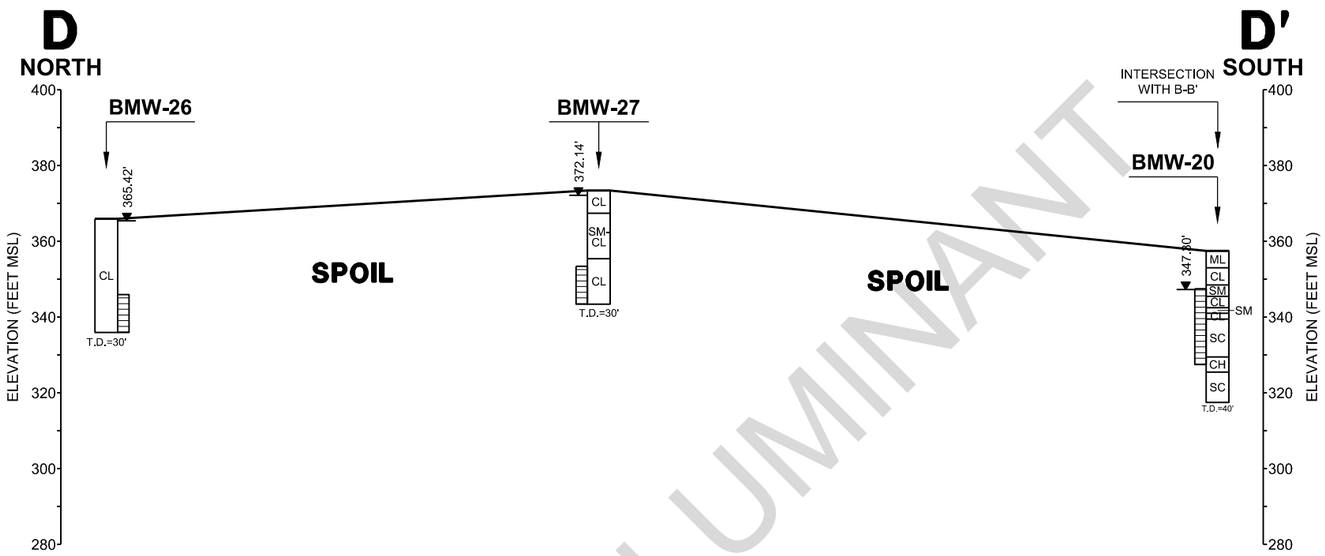
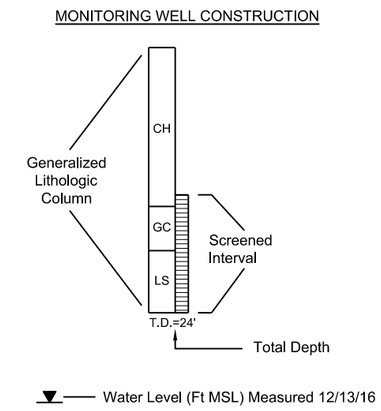
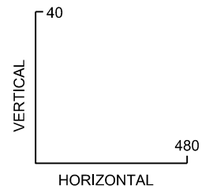
CONSULTING ENGINEERS AND SCIENTISTS





SCALE IN FEET



12x Vertical Exaggeration

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 7

A1 AREA LANDFILL
GEOLOGIC CROSS SECTION D-D'
EAST SIDE OF A1 LANDFILL

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: OCT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Appendix A

CCR Monitoring Well Logs

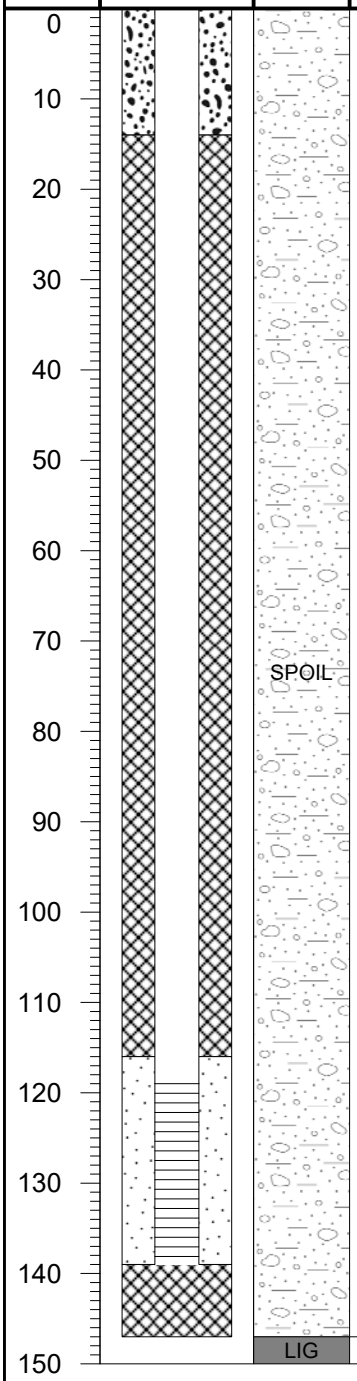
Luminant

Log of Boring: BMW-11AR

Beckville Mine
Beckville, TX

PBW Project No. 1793

Completion Date:	5/24/12	Drilling Method:	Mud Rotary
Drilling Company:	Diversified	Borehole Diameter (in.):	10
Driller:	Ed Noble	Total Depth (ft):	147
Driller's License:	5031M	Northing:	
Field Supervisor:	R. McClure/S. Berry	Easting:	
Sampling Method:	Cuttings	Ground Elev. (ft AMSL):	



Lithologic Description

(0.0 - 147.0) MINE SPOIL, clay/silty clay, dark brownish gray, abundant red and orange clay/silty clay fragments from 0.0-10.0', abundant lignite fragments from 0.0-147.0', soft, medium plasticity.

Trace red and orange clay/silty clay fragments from 10.0-147.0'.

(147.0 - 150.0) LIGNITE, black.

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Notes:
Centralizers located at 124.0' and 137.0'. Lithology taken at 150.0' pilot hole.

TOC Elevation (ft AMSL):

Annular Materials
(0.0 - 14.0) Concrete
(14.0 - 116.0) Bentonite Grout
(116.0 - 139.0) 20/40 Silica Sand
(139.0 -147.0) Cuttings

Well Materials
(+3.0 - 119.0) Casing, 4" Sch 40 FJT PVC
(119.0 - 139.0) Screen, 4" Sch 40 FJT PVC, 0.01 slot

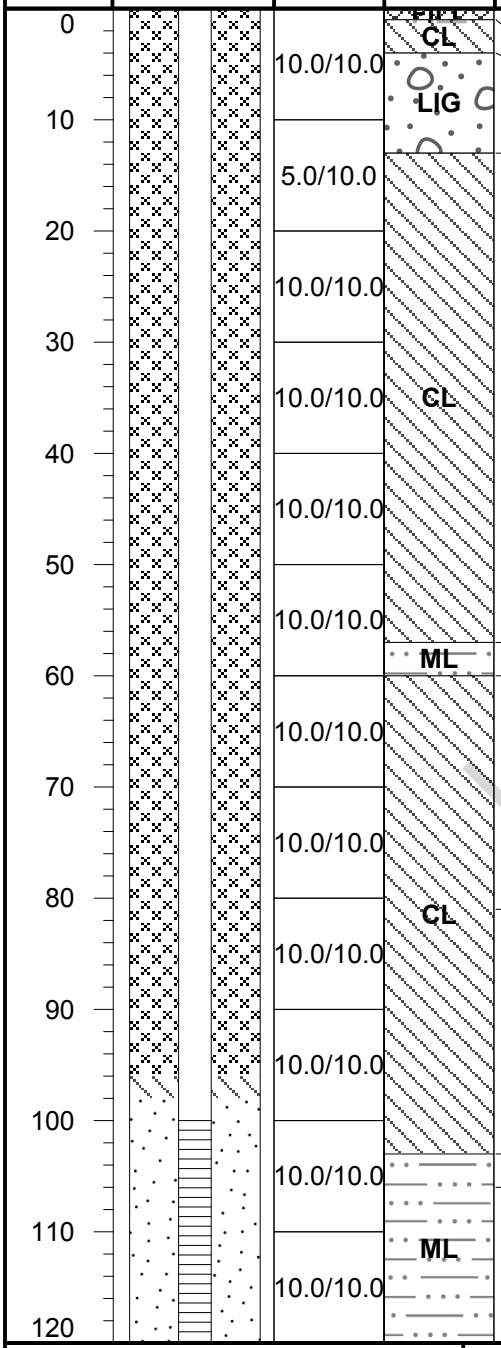
Luminant

Log of Boring: BMW-18

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/29/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	120
Driller's License:	5814M	TOC Elevation (ft. AMSL):	357.833
Logged By:	Jeremiah Bihl	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



Lithologic Description
(0 - 1) Top soil, light brown, rocks (1-3 cm) present
(1 - 4) CLAY, dark gray to black with pale tan mottling, dry, firm, brittle
(4 - 13) LIGNITE with clay, dark grey to black, dry to moist, soft, brittle, angular, low plasticity
(13 - 57) Silty CLAY, dark gray to dark brown with red and yellow mottling, dry, soft to firm, crumbly, medium plasticity, color change to tan at 30', coal seam at 32' (black, dry to moist, soft), pieces of lignite present, color change to gray to dark gray at 35'
(57 - 60) Clayey SILT, light brown to tan, moist, soft, low plasticity, lignite seam at 59'
(60 - 81) Silty CLAY, black to gray, dry, soft to firm, low plasticity, crumbly, 6" dry white gravel layer at 69', 4" light brown silty sand layer at 81'
(81 - 103) Silty CLAY, light gray, dry to moist, soft, low to medium plasticity, crumbly, rubber tire pieces at 89', hard lignite seam at 90' (hard, dry, black, firm), streaks of black (91'- 94'), becomes hard at 94', light to dark gray (94'-103')
(103 - 106) Clayey SILT, gray, very moist, soft, medium plasticity
(106 - 120) Clayey SILT, gray to dark gray, dry, firm, low plasticity

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Notes:
1. This log should not be used separately from the report to which it is attached.
2. All logged material is mine spoil.

Well Materials
(0-100) Casing, 2" Sch 40 FJT PVC
(100-120) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-96') Grout
(96'-98') Bentonite pellets
(98'-110') 20/40 sand

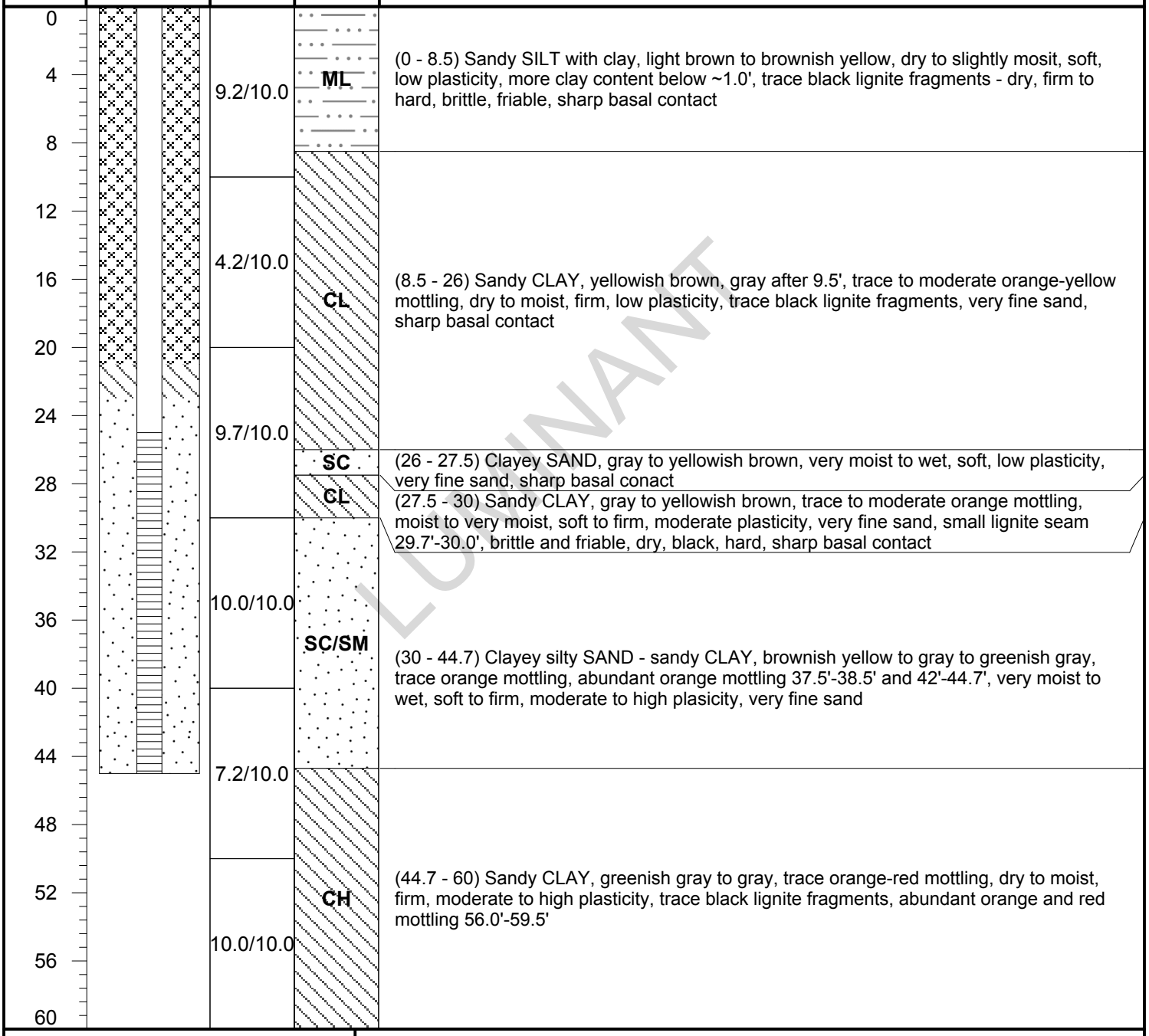
Luminant

Log of Boring: BMW-19

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	10/7/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	60
Driller's License:	5814M	TOC Elevation (ft. AMSL):	400.685
Logged By:	Nolan Townsend	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



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Notes:
1. This log should not be used separately from the report to which it is attached.
2. Hole collapsed - drilled back down to 45' with 6" casing to set well.
3. All logged material is mine spoil.

Well Materials
(0-25) Casing, 2" Sch 40 FJT PVC
(25-45) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-21') Grout
(21'-23') Bentonite pellets
(23'-45') 20/40 sand

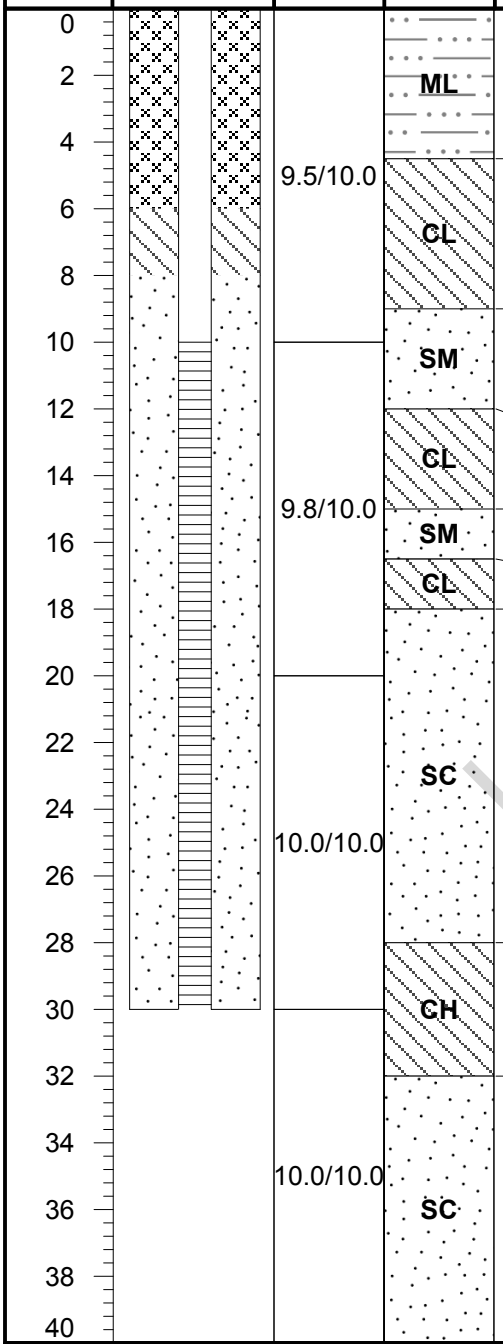
Luminant

Log of Boring: BMW-20

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	10/8/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	40
Driller's License:	5814M	TOC Elevation (ft. AMSL):	357.512
Logged By:	Nolan Townsend	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



Lithologic Description
(0 - 4.5) Sandy SILT with clay, brownish yellow to gray, trace to moderate orange mottling near 4.0', dry, soft, low plasticity, very fine sand
(4.5 - 9) CLAY with trace sand lenses, gray with trace to moderate orange/yellow mottling, dry to slightly moist, firm to hard, low to moderate plasticity, trace calcareous precipitates, sharp basal contact
(9 - 12) Slightly silty SAND, yellowish orange to tan, moist to very moist, slightly unconsolidated, moderate to high plasticity, very fine sand, moderately to well sorted, mostly quarts with ~5-10% lithic fragments, clay content present 10'-12', dark gray, sharp basal contact
(12 - 15) CLAY, slightly sandy, gray to dark gray, dry to slihgtly moist, firm to hard, low to moderate plasticity, trace black lignite fragments, sandy lenses, trace orange mottling
(15 - 16.5) Silty SAND with clay, tan to yellowish orange, moist to very moist, moderately consolidated, medium to high plasticity, very fine sand
(16.5 - 18) CLAY as above, dry to moist, firm to hard, moderate plasticity
(18 - 28) Clayey SAND, reddish orange and gray, very moist, wet at 20.0', moderately consolidated, moderate to high plasticity, clay composition increases and decreases throughout, very fine sand, becomes gray at 28.0' and more clay content
(28 - 32) Sandy CLAY, gray, trace orange mottling, moist to very moist, firm, moderate to high plasticity, locally sandy lenses/interbeds, trace lignitic fragments (black)
(32 - 40) Clayey SAND, reddish orange with gray clay, very moist to wet, moderately consolidated, moderate to high plasticity, very fine sand, localized small sandy clay seams, trace lignite fragments

PBW

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Notes:
1. This log should not be used separately from the report to which it is attached.
2. All logged material is mine spoil.

Well Materials
(0-10) Casing, 2" Sch 40 FJT PVC
(10-30) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-6') Grout
(6'-8') Bentonite pellets
(8'-30') 20/40 sand

Luminant

Log of Boring: BMW-21

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/27/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	40
Driller's License:	5814M	TOC Elevation (ft. AMSL):	350.976
Logged By:	Jeremiah Bihl	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Lithologic Description
0 – 5		10.0/10.1	FILL	(0 - 5) Top soil, sandy with small amounts of clay, tan/brown, moist, soft, low plasticity
5 – 10			CL	(5 - 10) Sandy CLAY, dark gray to black, moist, soft, low to medium plasticity, trace amounts of lignite, clay content increases with depth
10 – 20		10.0/10.0	CH	(10 - 30) CLAY with angular lignite, light gray, moist, soft, high plasticity, 1'-thick lignite layer at 25', hardness increases from 26' to 30'
20 – 30		10.0/10.0	CH	
30 – 40		10.0/10.0	CL	(30 - 40) CLAY with angular lignite pieces, wet, soft with increasing hardness with depth, medium plasticity, water present at 30', moisture decreases at 35'

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Notes:
1. This log should not be used separately from the report to which it is attached.
2. All logged material is mine spoil.

Well Materials
(0-20) Casing, 2" Sch 40 FJT PVC
(20-40) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-16') Grout
(16'-18') Bentonite pellets
(18'-40') 20/40 sand

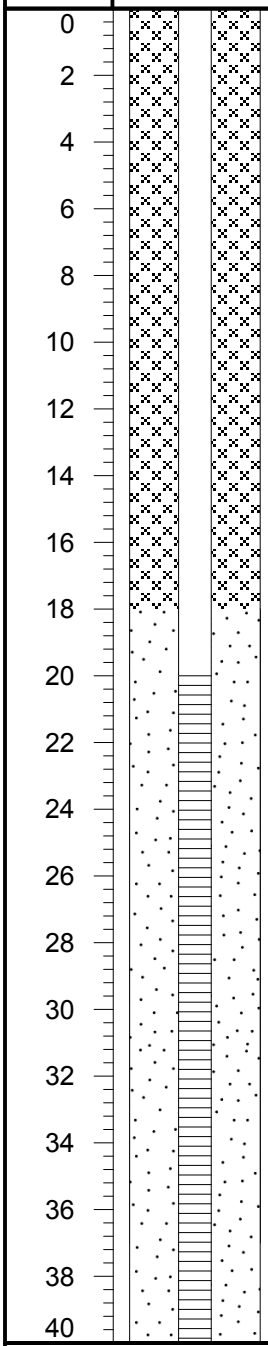
Luminant

Log of Boring: BMW-22

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/27/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	40
Driller's License:	5814M	TOC Elevation (ft. AMSL):	332.304
Logged By:	Jeremiah Bihl	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



Depth (ft)	Recovery (ft/ft)	USCS	Lithologic Description
0		FILL	(0 - 1) Top soil, light brown
2		SM	(1 - 2) Sandy silty soil with pieces of rock, light brown, abundant organics
		CL	(2 - 3) CLAY, yellow-reddish
4		SM	(3 - 4) Sandy silty soil with pieces of rock, light brown/tan, abundant organics
6	10.0/10.0		
8			
10			(4 - 20) CLAY, dark gray, lignite present (angular), color change to light gray to yellow clay with some red mottling at 6', firm, moist, medium plasticity, color change to tan at 10', moist and soft lignite layer (12'-13'), hard and lignite layer (angular pieces) at 13'
12			
14	10.0/10.0		
16			
18			
20			
22		CL	
24			
26	10.0/10.0		(20 - 30) Sandy CLAY, light gray, moist, soft, medium plasticity, moisture content decreases with depth, hardness increases with depth, plasticity decreases with depth
28			
30			
32			
34	10.0/10.0		(30 - 40) Sandy CLAY, light gray, wet, soft, hardness increases with depth
36			
38			
40			

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Notes:
1. This log should not be used separately from the report to which it is attached.
2. All logged material is mine spoil.

Well Materials
(0-20) Casing, 2" Sch 40 FJT PVC
(20-40) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-16') Grout
(16'-18') Bentonite pellets
(18'-40') 20/40 sand

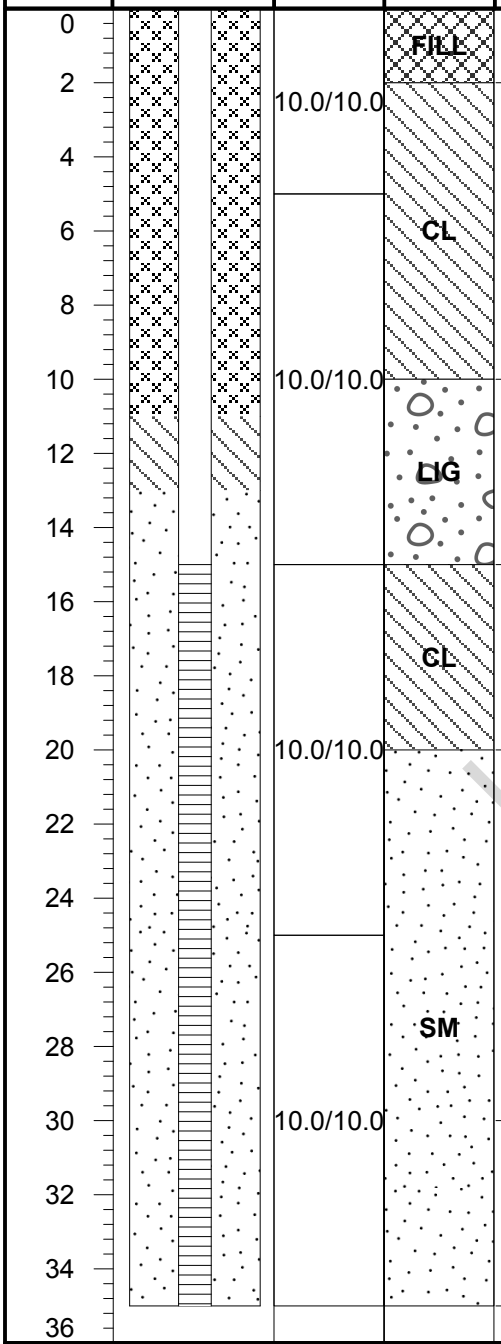
Luminant

Log of Boring: BMW-23

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/28/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	35
Driller's License:	5814M	TOC Elevation (ft. AMSL):	341.903
Logged By:	Jeremiah Bihl	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



Lithologic Description

(0 - 2) Top soil, sandy silty CLAY, moist, soft, light brown

(2 - 10) CLAY, light gray to pale yellow, some sand present, soft, moist, low plasticity, color change to brown at 5'

(10 - 15) LIGNITE, black, soft, moist, crumbly, sharp contact

(15 - 20) CLAY, dark gray and light tan, dry, hard, medium plasticity

(20 - 30) Silty SAND with small amounts of clay, moist, soft, low plasticity, small seams of lignite, clay content increases with depth (20'-30')

(30 - 35) Silty SAND, light gray, wet, very soft, low plasticity, some clay content at 32', sand lenses present

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Notes:
1. This log should not be used separately from the report to which it is attached.
2. All logged material is mine spoil.

Well Materials
(0-15) Casing, 2" Sch 40 FJT PVC
(15-35) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-11') Grout
(11'-13') Bentonite pellets
(13'-35') 20/40 sand

Luminant

Log of Boring: BMW-24

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/28/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	45
Driller's License:	5814M	TOC Elevation (ft. AMSL):	347.074
Logged By:	Jeremiah Bihl	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Lithologic Description
0			FILL	(0 - 3) Top soil, brown, moist, roots present
4		10.0/10.0	CL	(3 - 4) CLAY, light brown with yellow and orange mottling, dry, soft, low plasticity (4 - 6) CLAY with some silt, tan to yellow/gray, moist, firm, medium plasticity
8				(6 - 12) CLAY, black with lignite pieces (0.2-1 cm), dry, soft, low plasticity, sharp contact
12		10.0/10.0		(12 - 20) CLAY, dark gray with yellow and red mottling, dry, hard, medium to high plasticity
16				
20		10.0/10.0	CH	(20 - 30) Silty CLAY, light gray to gray, yellow and red mottling, moist, very soft, high plasticity, pieces of lignite present, decreasing silt content with depth and becomes harder, more brittle, and dry (28'-30'), increase in red, yellow, and black mottling at 28'
24				
28				
32		10.0/10.0	SM	(30 - 35) Silty SAND, gray, wet, soft, low plasticity, subangular to rounded
36			ML	(35 - 40) Clayey SILT, dry, firm, low plasticity, silt content decreases with depth
40		10.0/10.0	CL	(40 - 45) Silty CLAY, light gray, dry, firm, low plasticity
44				
48				

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Notes:
1. This log should not be used separately from the report to which it is attached.
2. All logged material is mine spoil.

Well Materials
(0-20) Casing, 2" Sch 40 FJT PVC
(20-40) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-16') Grout
(16'-18') Bentonite pellets
(18'-40') 20/40 sand

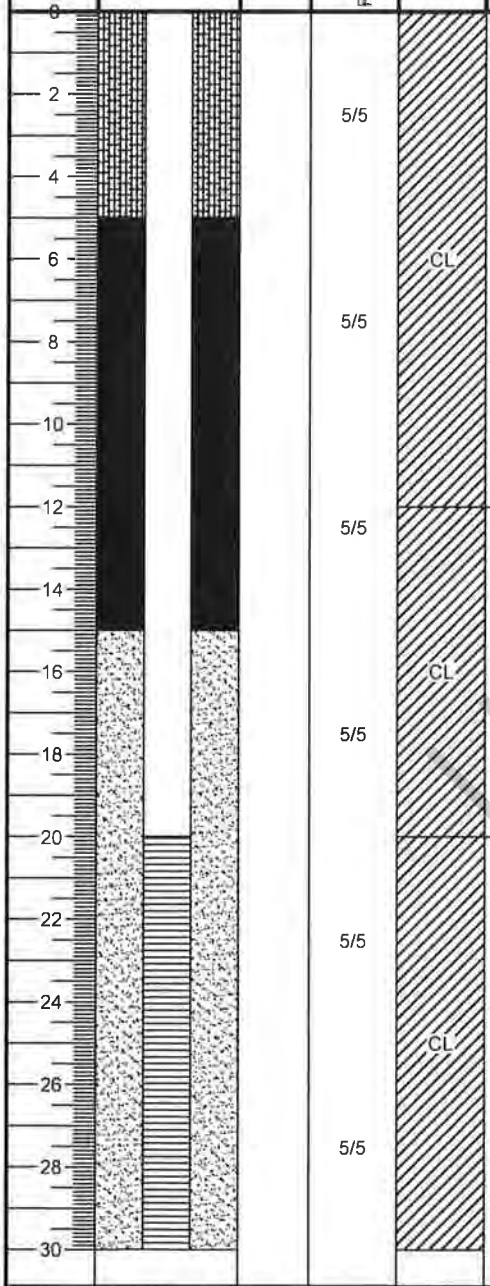
LUMINANT

Log of Boring: BMW-26

A-1 AREA LANDFILL
TATUM, TEXAS

PBW PROJECT No.: 5164-F

Completion Date:	8-31-16	Drilling Method:	HS Auger
Drilling Company:	Walker-Hill Env.	Borehole Diameter (in.):	10.25"
Driller:	Jeremy Thornhill	Total Depth (ft):	30.0'
Driller's License:	NA	Northing:	221187.022
Field Supervisor:	RKS	Easting:	2921306.755
Sampling Method:	5'Macrocore Sampler	Ground Elev. (ft AMSL):	365.958



Lithologic Description

0.0-12.0 - Clay with silt and lignite fragments, dark gray-black, soft, moist, low plasticity

Wet at 4.0'

12.0-20.0 - Silty clay, dark brown, saturated, low plasticity

20.0-30.0 - Silty clay, fine grained, dark brown, saturated, low plasticity

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Notes:

1. All logged material is mine spoil.

Depth (bgs)	Well Materials	Depth (bgs)	Annular Materials
0' - 20'	Casing, 4" Sch 40 PVC, FJT	0' - 5'	Grout
20' - 30'	Screen, 4" Sch 40 PVC, .010 Slot	5' - 15'	Bentonite Pellet Seal
		15' - 30'	20/40 Sand

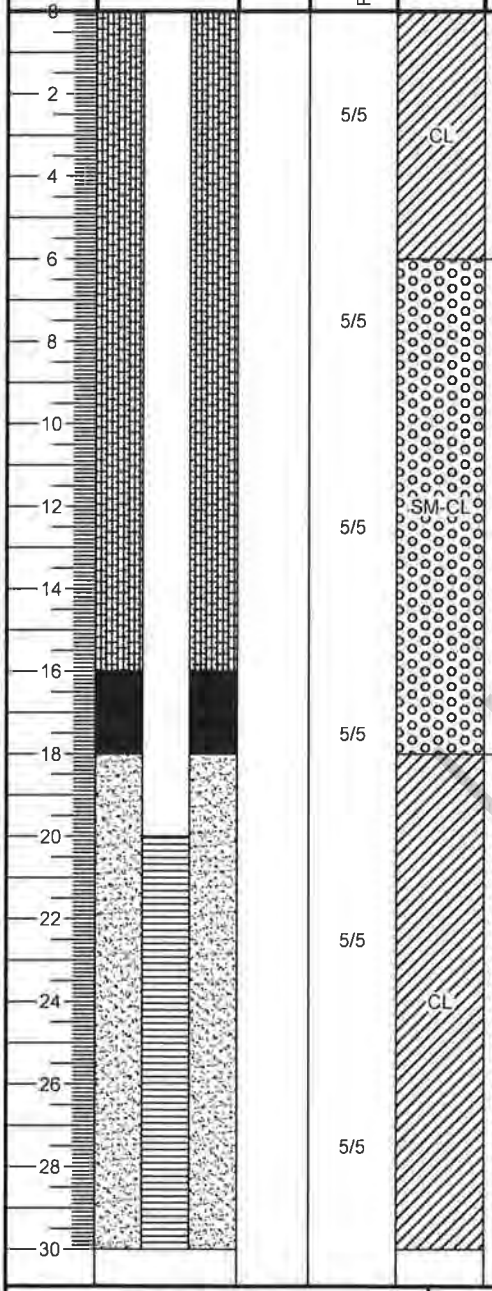
LUMINANT

Log of Boring: BMW-27

A-1 AREA LANDFILL
TATUM, TEXAS

PBW PROJECT No.: 5164-F

Completion Date:	9-1-16	Drilling Method:	HS Auger
Drilling Company:	Walker-Hill Env	Borehole Diameter (in.):	10 25"
Driller:	Jeremy Thornhill	Total Depth (ft):	30 0'
Driller's License:	NA	Northing	220024 389
Field Supervisor:	RKS	Easting	2922347 297
Sampling Method:	5'Macrocore Sampler	Ground Elev (ft AMSL):	373 463



Lithologic Description

0.0-6.0 - Clay with silt and fine sand, dark gray, soft, moist, low plasticity

Wet at 5 0'

6 0-18 0 - Silty sand with clay, brown, soft, moist

18.0-30.0 - Silty clay with lignite, dark brown-gray, wet, low plasticity

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Notes:
1. All logged material is mine spoil.

Depth (bgs)	Well Materials
0' - 20'	Casing, 4" Sch 40 PVC, FJT
20' - 30'	Screen, 4" Sch 40 PVC, 010 Slot

Depth (bgs)	Annular Materials
0' - 16'	Grout
16' - 18'	Bentonite Pellet Seal
18' - 30'	20/40 Sand

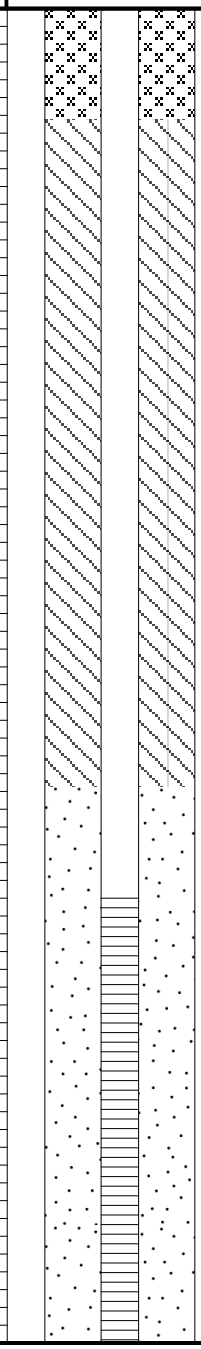
Luminant

Log of Boring: BMW-28

A-1 Area Landfill
Tatum, TX

PBW Project No. 5164F

Completion Date:	10/27/2016	Drilling Method:	HSA
Drilling Company:	ETTL	Borehole Diameter (in.):	10.25
Driller:	Tommy Cook	Total Depth (ft):	60
Driller's License:	2853	TOC Elevation (ft. AMSL):	373.208
Logged By:	Jeremiah Bihl	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	

Depth (ft)	Well Materials	USCS	Lithologic Description
0 – 14		ML	(0 - 14) Clayey SILT (spoil), black to brown, some pieces of coal, moist, low plasticity.
14 – 30		SM	(14 - 30) SAND with silt and small amounts of clay (spoil), some coal pieces, black, soft, dry, low plasticity.
30 – 60		CL	(30 - 60) CLAY with some silt (spoil), pieces of coal, soft, black to dark gray, dry, low plasticity, possible sandstone/siltstone boulder at 40'.

PBW

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Notes:
1. This log should not be used separately from the report to which it is attached.
2. All logged material is mine spoil.

Well Materials
(0-40) Casing, 2" Sch 40 FJT PVC
(40-60) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-5') Grout
(5'-35') Bentonite pellets
(35'-60') 20/40 sand

Appendix B

Photographs of CCR Groundwater Monitoring Wells

Appendix B – Photographs of CCR Groundwater Monitoring Wells
A1 Area Landfill

Photograph 1: BMW-18

Photograph 2: BMW-19

Appendix B – Photographs of CCR Groundwater Monitoring Wells
A1 Area Landfill

Photograph 3: BMW-20

Photograph 4: BMW-21

Appendix B – Photographs of CCR Groundwater Monitoring Wells
A1 Area Landfill

Photograph 5: BMW-22

Photograph 6: BMW-23

Appendix B – Photographs of CCR Groundwater Monitoring Wells
A1 Area Landfill

Photograph 7: BMW-24

Photograph 8: BMW-26

Appendix B – Photographs of CCR Groundwater Monitoring Wells
A1 Area Landfill

Photograph 9: BMW-27

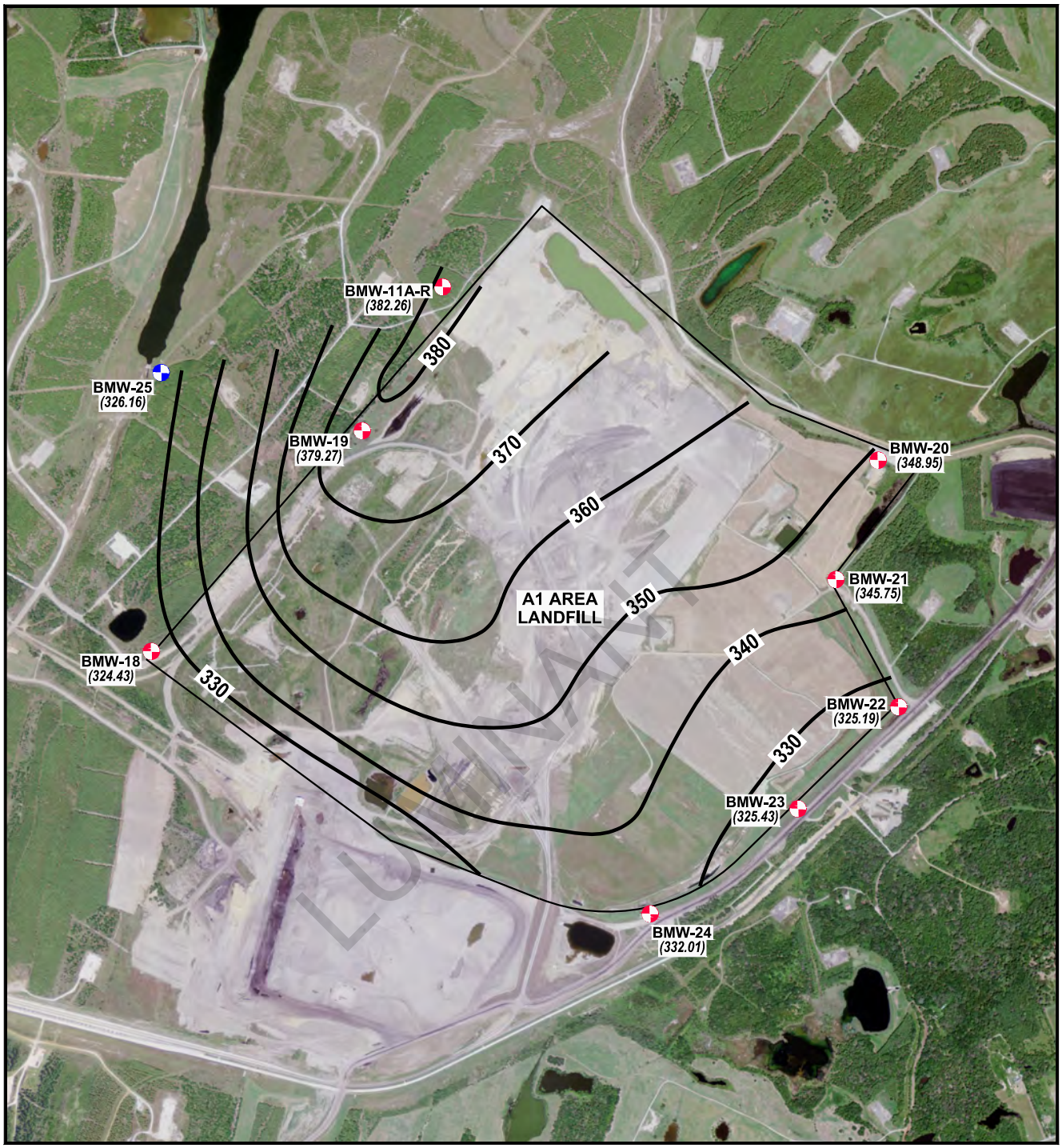
Photograph 10: BMW-28

Appendix B – Photographs of CCR Groundwater Monitoring Wells
A1 Area Landfill

Photograph 11: BMW-11-AR

Appendix C

Groundwater Potentiometric Surface Maps



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- *(358.02)* Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 10 ft.)

N

Scale in Feet

0 900 1800

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

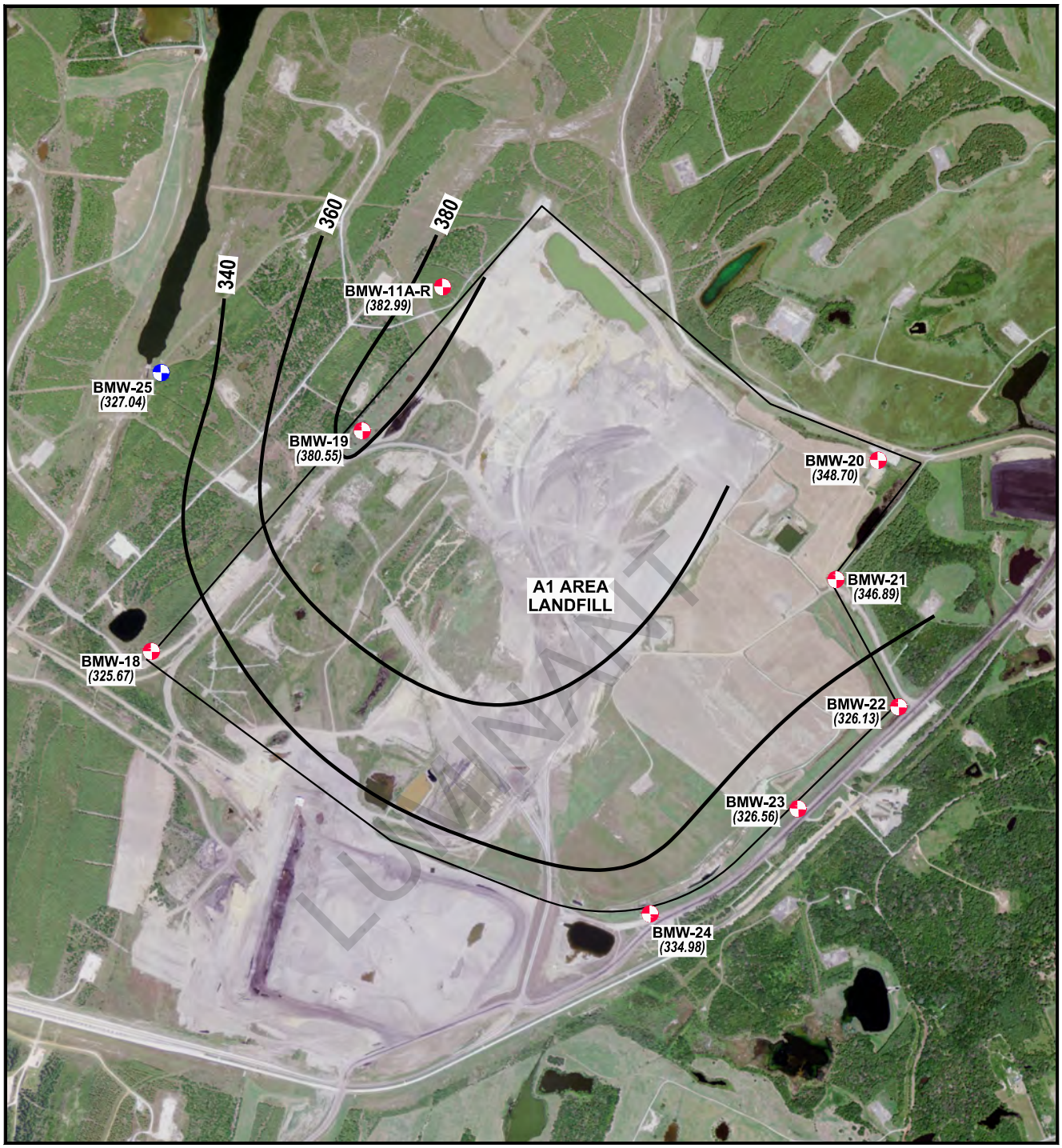
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 1

A1 AREA LANDFILL GROUNDWATER POTENTIOMETRIC SURFACE MAP OCTOBER 30, 2015

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (358.02) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 20 ft.)

N

Scale in Feet

0 900 1800

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

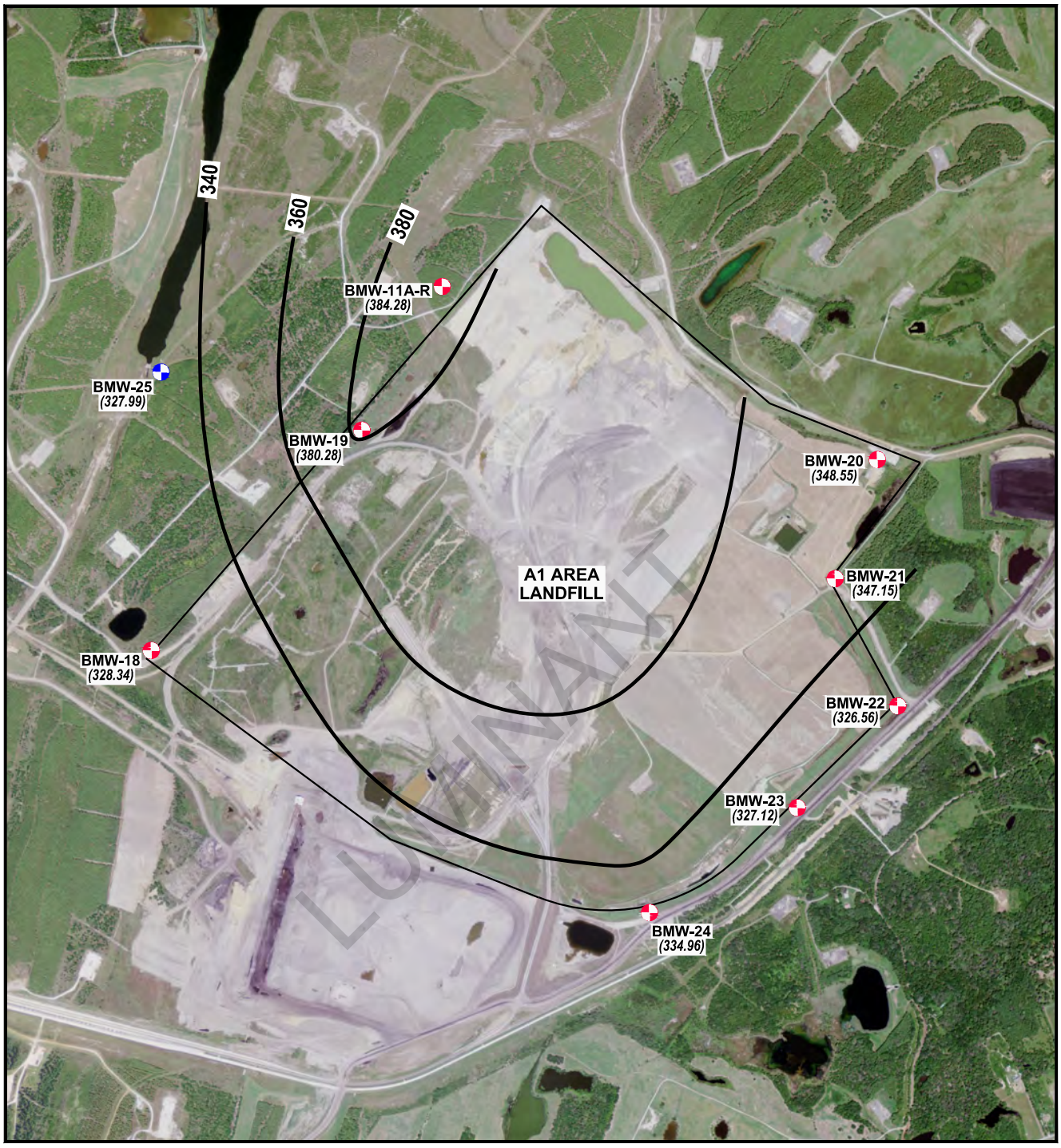
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 2

A1 AREA LANDFILL GROUNDWATER POTENTIOMETRIC SURFACE MAP DEC. 30, 2015

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (358.02) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 20 ft.)

N

Scale in Feet

0 900 1800

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

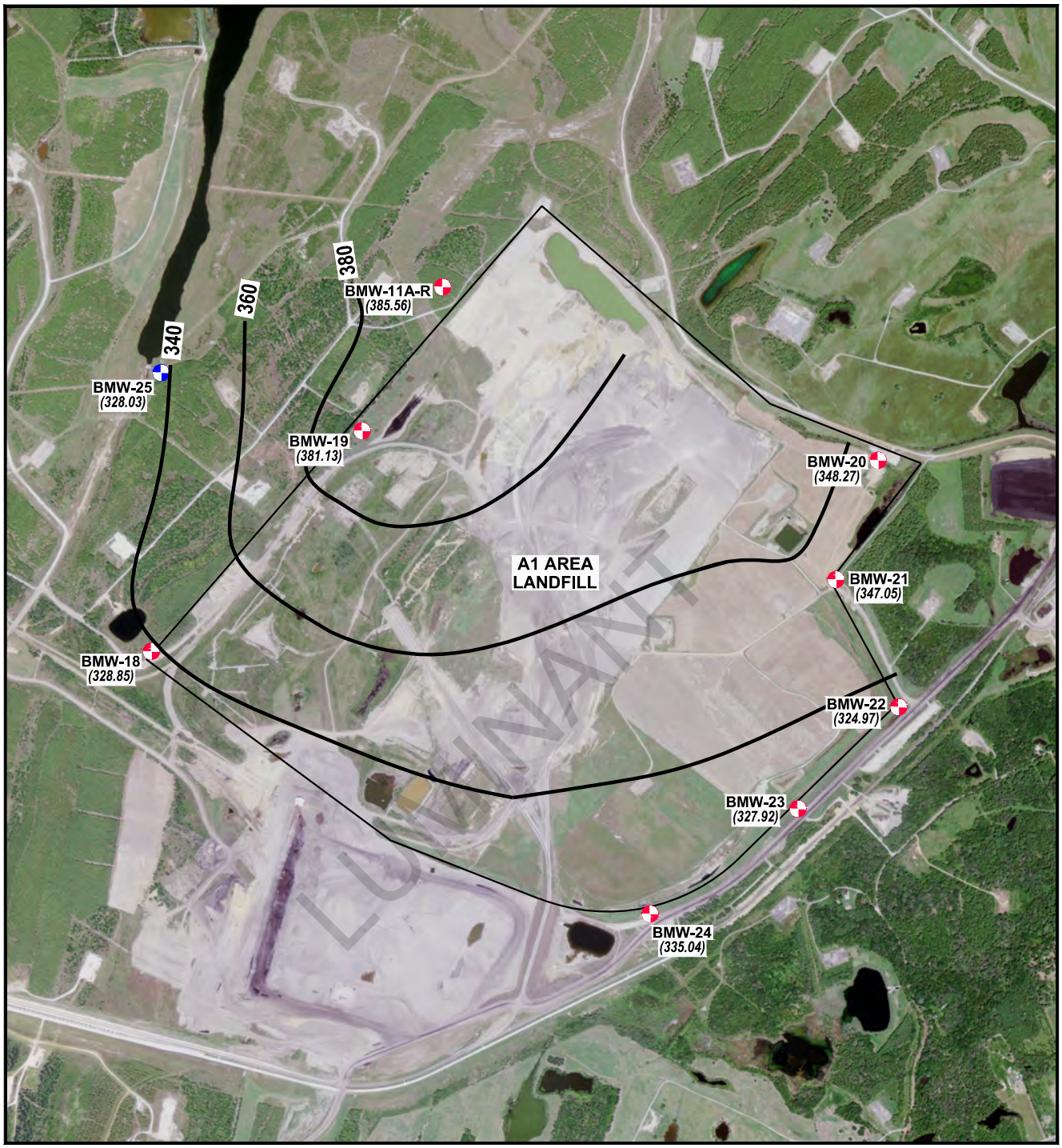
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 3

A1 AREA LANDFILL GROUNDWATER POTENTIOMETRIC SURFACE MAP FEB. 24, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (358.02) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 20 ft.)

N

Scale in Feet

0 900 1800

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

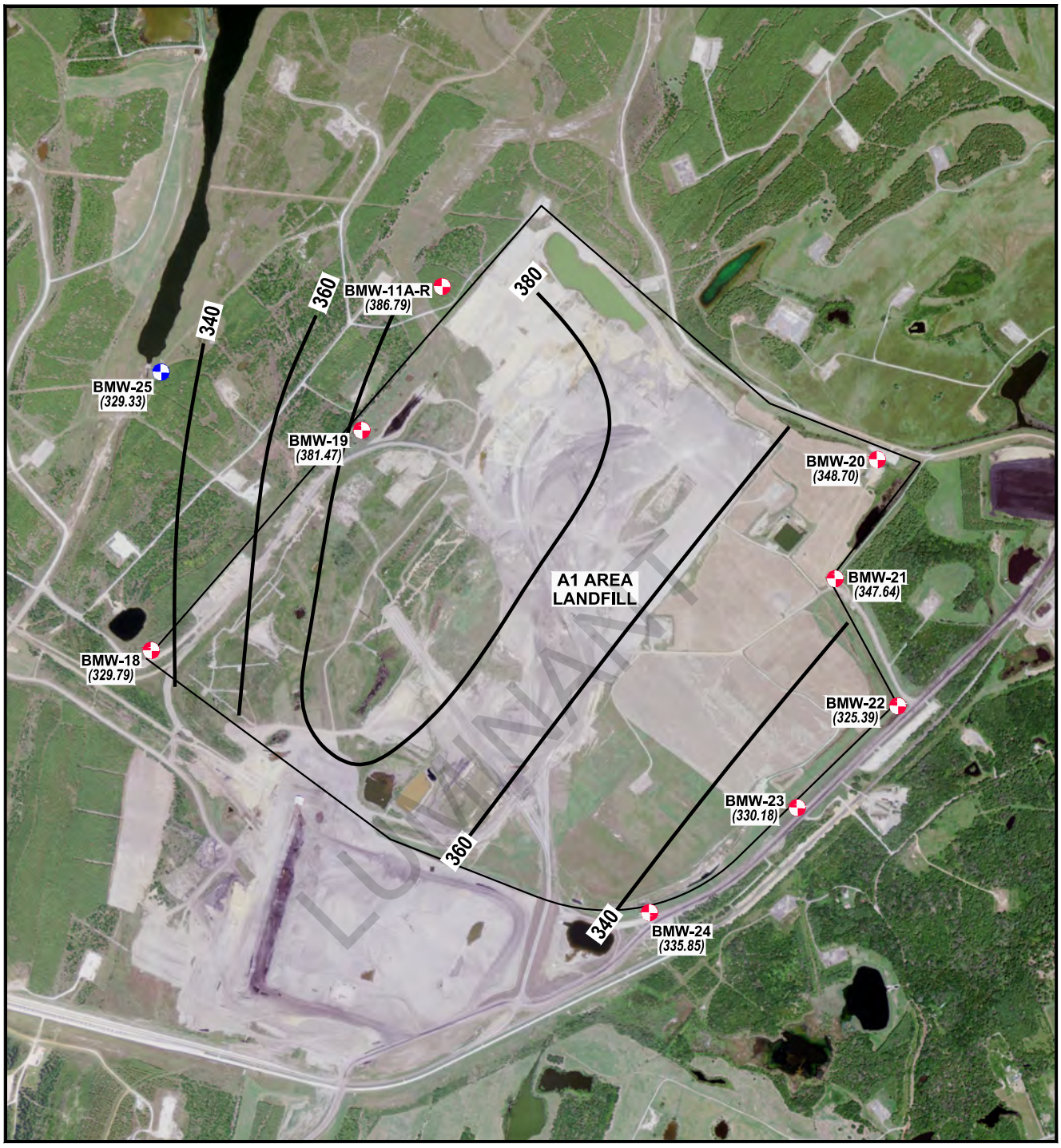
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 4

A1 AREA LANDFILL GROUNDWATER POTENTIOMETRIC SURFACE MAP APRIL 7, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (358.02) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 20 ft.)

N

Scale in Feet

0 900 1800

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

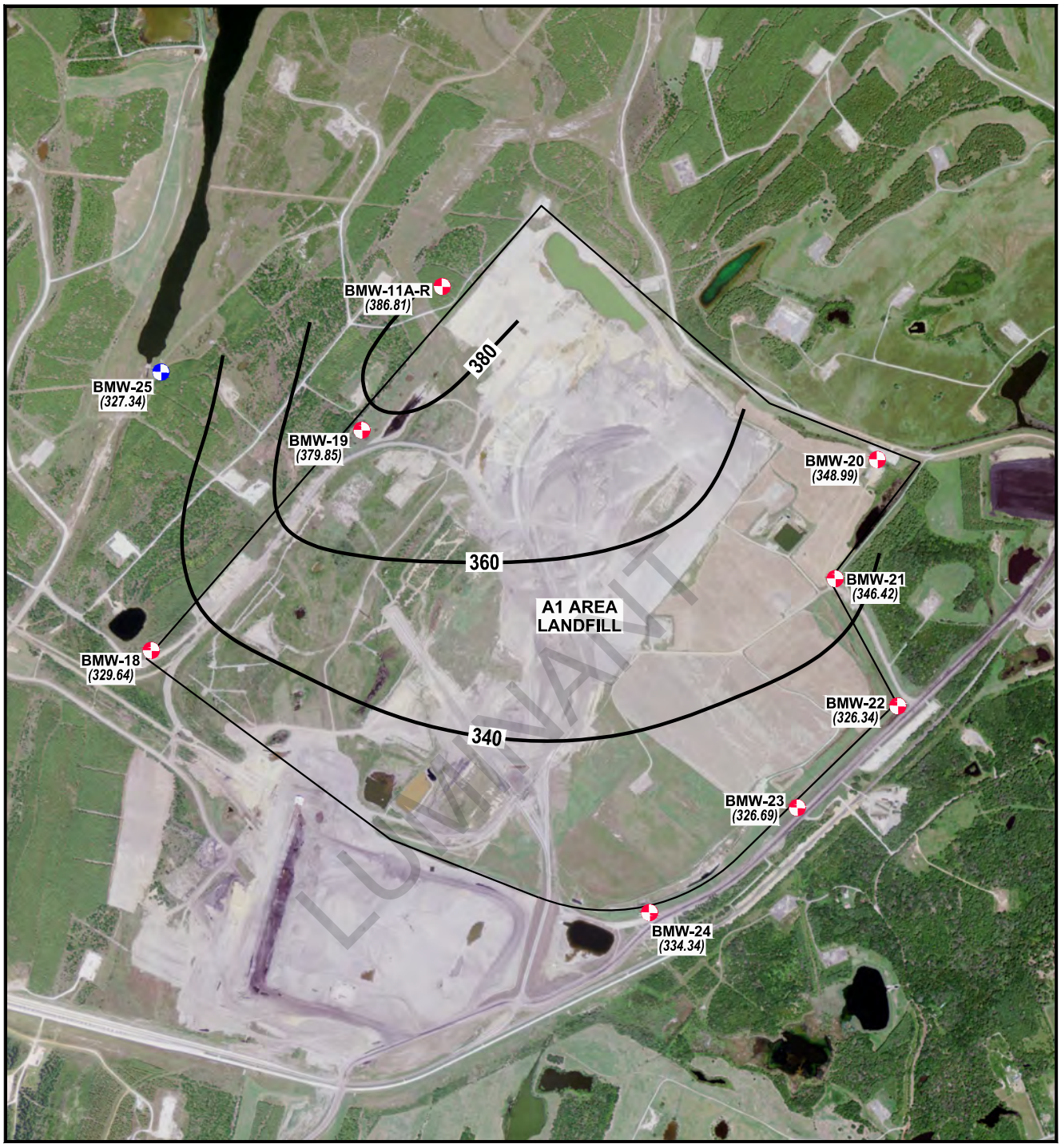
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 5

A1 AREA LANDFILL GROUNDWATER POTENTIOMETRIC SURFACE MAP JUNE 6, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- *(358.02)* Groundwater Potentiometric Surface (ft. MSL)
- 360 Groundwater Potentiometric Surface Contour (C.I. = 20 ft.)

N

Scale in Feet

0 900 1800

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

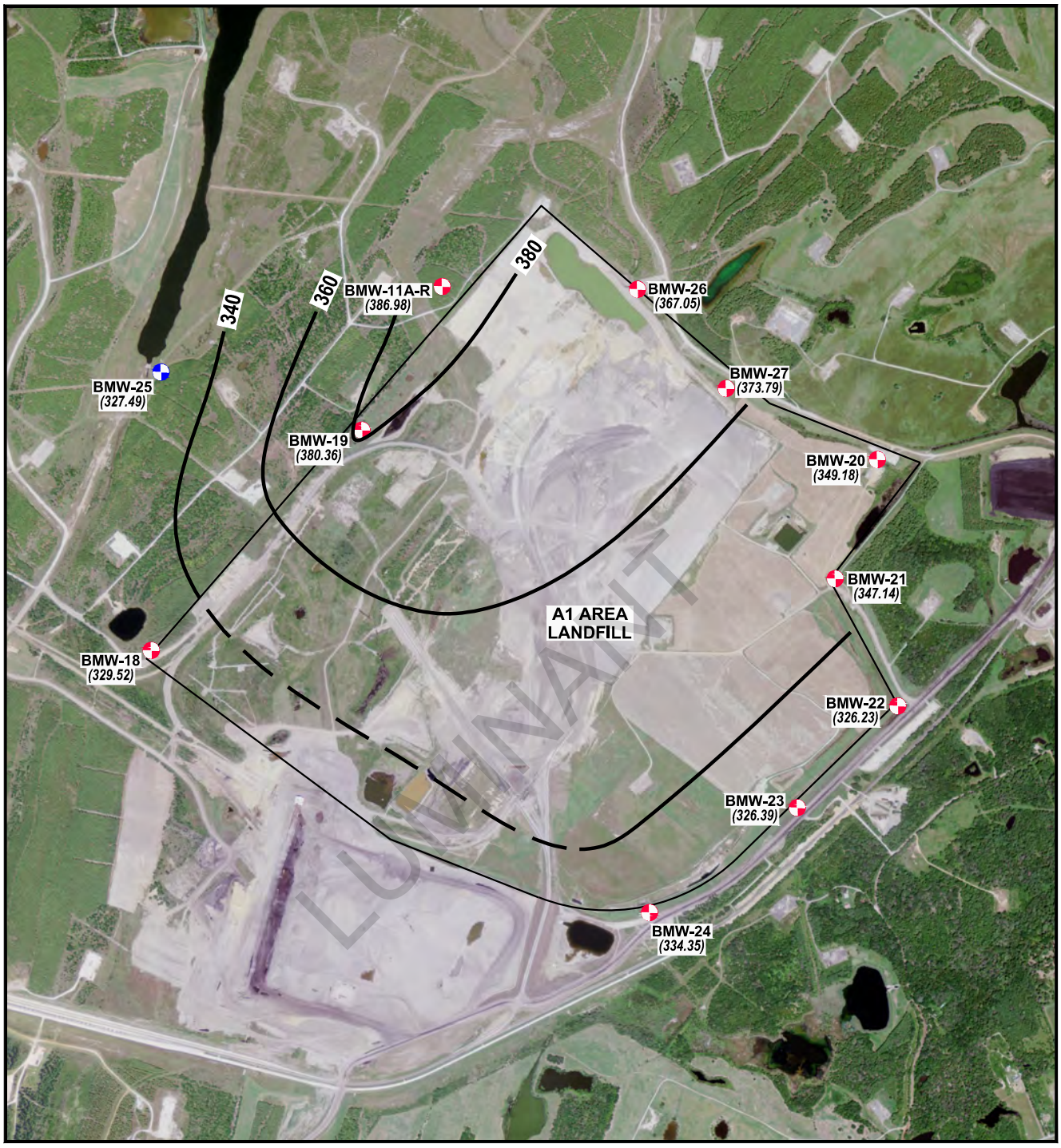
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 6

A1 AREA LANDFILL GROUNDWATER POTENTIOMETRIC SURFACE MAP AUGUST 11, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (358.02) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 20 ft.)

N

Scale in Feet

0 900 1800

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

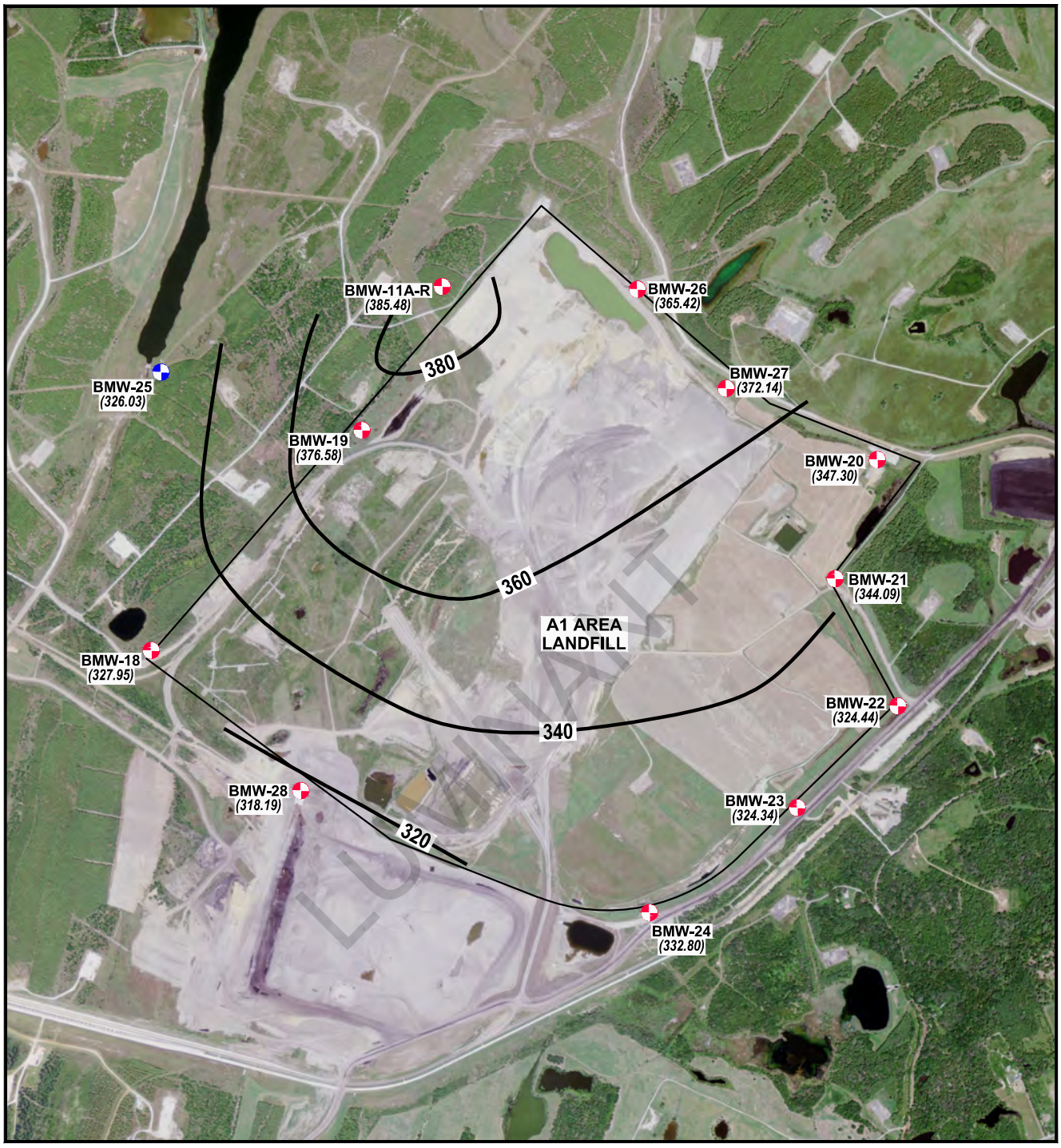
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 7

A1 AREA LANDFILL GROUNDWATER POTENTIOMETRIC SURFACE MAP OCTOBER 25, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (358.02) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 20 ft.)

N

Scale in Feet

0 900 1800

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 8

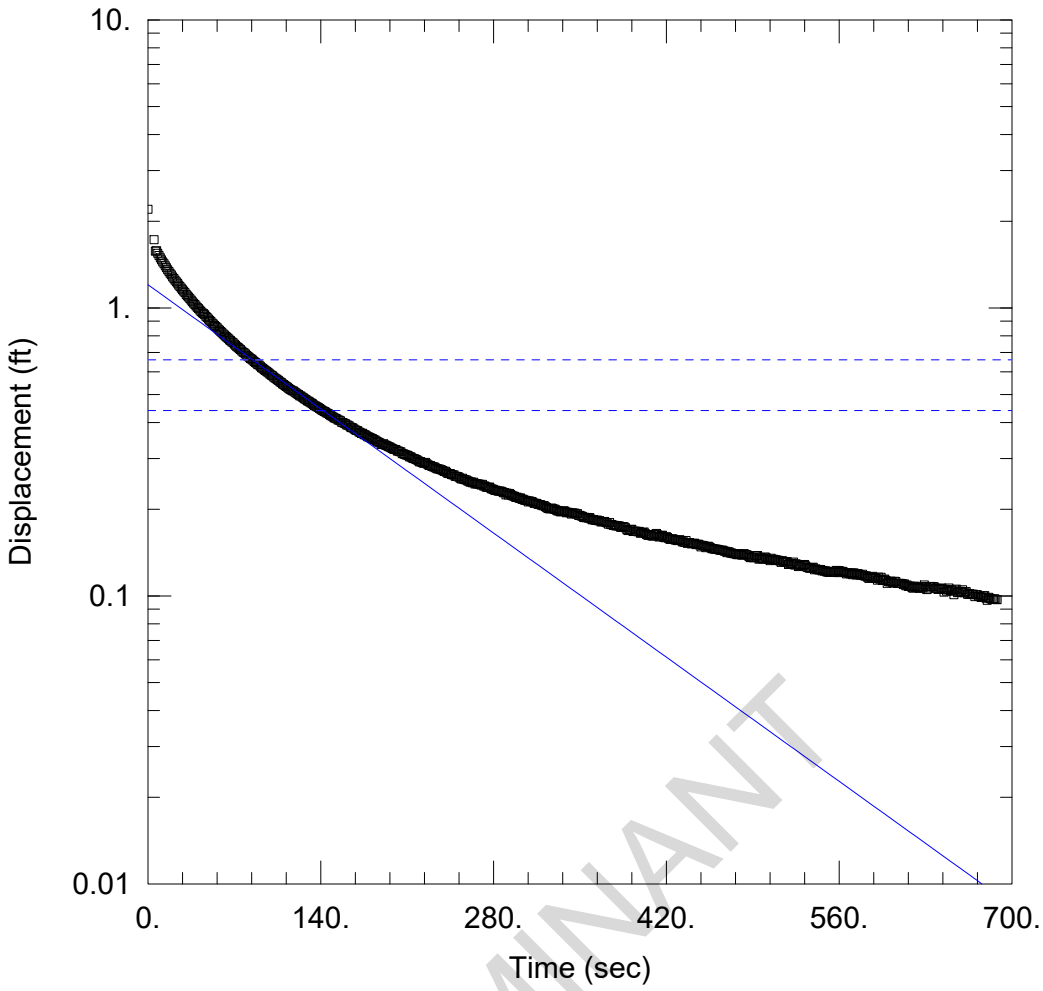
A1 AREA LANDFILL GROUNDWATER POTENTIOMETRIC SURFACE MAP DECEMBER 13, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Appendix D

Aquifer Test Data



WELL TEST ANALYSIS

Data Set: J:\...\BMW-21 Slug IN.aqt
Date: 12/16/15 Time: 10:22:24

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Well: BMW-21
Test Date: 9-22-2015

AQUIFER DATA

Saturated Thickness: 10. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BMW-21)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.083 ft
Static Water Column Height: 38.08 ft
Screen Length: 10. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0002046 cm/sec
y0 = 1.204 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\A1 LF\Aqtes
Date: 12/16/15
Time: 10:24:36

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Date: 9-22-2015
Test Well: BMW-21

AQUIFER DATA

Saturated Thickness: 10. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BMW-21

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 38.08 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 10. ft
Total Well Penetration Depth: 10. ft

No. of Observations: 685

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	347.	0.1923
5.	1.725	348.	0.193
6.	1.573	349.	0.1901
7.	1.58	350.	0.1904
8.	1.547	351.	0.1894
9.	1.52	352.	0.1889
10.	1.493	353.	0.187
11.	1.468	354.	0.1876
12.	1.444	355.	0.1868
13.	1.424	356.	0.1872
14.	1.401	357.	0.186
15.	1.38	358.	0.1871
16.	1.356	359.	0.1848
17.	1.338	360.	0.1838
18.	1.319	361.	0.1843
19.	1.302	362.	0.1833
20.	1.282	363.	0.1829
21.	1.265	364.	0.1835
22.	1.249	365.	0.1823
23.	1.233	366.	0.1825
24.	1.218	367.	0.1806
25.	1.201	368.	0.1809
26.	1.187	369.	0.1811
27.	1.172	370.	0.1813
28.	1.156	371.	0.1799
29.	1.143	372.	0.1792
30.	1.129	373.	0.1775
31.	1.114	374.	0.1798
32.	1.101	375.	0.1769
33.	1.09	376.	0.1771

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
34.	1.076	377.	0.1757
35.	1.064	378.	0.1758
36.	1.05	379.	0.1751
37.	1.039	380.	0.1753
38.	1.028	381.	0.175
39.	1.016	382.	0.1749
40.	1.005	383.	0.1729
41.	0.994	384.	0.1729
42.	0.9826	385.	0.1741
43.	0.9714	386.	0.1736
44.	0.962	387.	0.1724
45.	0.9552	388.	0.1698
46.	0.9466	389.	0.1687
47.	0.9345	390.	0.1699
48.	0.9261	391.	0.1701
49.	0.9153	392.	0.1704
50.	0.9058	393.	0.1674
51.	0.8976	394.	0.1678
52.	0.8867	395.	0.1678
53.	0.8794	396.	0.1675
54.	0.8698	397.	0.167
55.	0.8616	398.	0.1676
56.	0.8539	399.	0.165
57.	0.844	400.	0.1657
58.	0.8371	401.	0.166
59.	0.8284	402.	0.1667
60.	0.8203	403.	0.1646
61.	0.8126	404.	0.1633
62.	0.8052	405.	0.1623
63.	0.7972	406.	0.163
64.	0.7909	407.	0.1624
65.	0.7837	408.	0.1617
66.	0.7748	409.	0.1612
67.	0.7694	410.	0.1632
68.	0.7622	411.	0.1637
69.	0.7567	412.	0.1648
70.	0.7481	413.	0.1629
71.	0.7415	414.	0.1602
72.	0.7337	415.	0.1607
73.	0.7293	416.	0.162
74.	0.7219	417.	0.1624
75.	0.7163	418.	0.1597
76.	0.7086	419.	0.1591
77.	0.7023	420.	0.1607
78.	0.6981	421.	0.1597
79.	0.6922	422.	0.1579
80.	0.6841	423.	0.1572
81.	0.6792	424.	0.1574
82.	0.6738	425.	0.158
83.	0.6673	426.	0.1573
84.	0.6634	427.	0.1563
85.	0.6582	428.	0.1563
86.	0.6521	429.	0.1556
87.	0.6465	430.	0.1561
88.	0.6426	431.	0.1568
89.	0.6351	432.	0.1555
90.	0.6336	433.	0.1539
91.	0.6276	434.	0.154
92.	0.6202	435.	0.1535
93.	0.617	436.	0.1557
94.	0.6114	437.	0.1522
95.	0.6065	438.	0.1533
96.	0.603	439.	0.1532
97.	0.5984	440.	0.1516
98.	0.5934	441.	0.1518
99.	0.5885	442.	0.1522

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
100.	0.5843	443.	0.1524
101.	0.5809	444.	0.1507
102.	0.5748	445.	0.151
103.	0.5707	446.	0.1512
104.	0.5673	447.	0.1502
105.	0.5629	448.	0.1481
106.	0.5594	449.	0.15
107.	0.5537	450.	0.1496
108.	0.5511	451.	0.1489
109.	0.5452	452.	0.147
110.	0.5423	453.	0.1484
111.	0.5374	454.	0.1488
112.	0.5339	455.	0.1478
113.	0.5305	456.	0.1469
114.	0.5259	457.	0.1458
115.	0.5217	458.	0.146
116.	0.5192	459.	0.1454
117.	0.5159	460.	0.1454
118.	0.5144	461.	0.1451
119.	0.5101	462.	0.145
120.	0.5068	463.	0.1442
121.	0.503	464.	0.144
122.	0.5	465.	0.144
123.	0.4949	466.	0.144
124.	0.4944	467.	0.143
125.	0.4898	468.	0.1429
126.	0.4869	469.	0.1414
127.	0.4834	470.	0.1425
128.	0.4805	471.	0.142
129.	0.4759	472.	0.1408
130.	0.4748	473.	0.141
131.	0.4715	474.	0.1402
132.	0.4679	475.	0.1401
133.	0.4662	476.	0.1403
134.	0.4616	477.	0.1392
135.	0.4576	478.	0.1391
136.	0.4561	479.	0.1395
137.	0.4535	480.	0.1396
138.	0.4516	481.	0.1386
139.	0.4476	482.	0.1387
140.	0.4445	483.	0.1402
141.	0.4411	484.	0.1393
142.	0.4393	485.	0.1391
143.	0.4368	486.	0.1385
144.	0.4348	487.	0.1369
145.	0.4315	488.	0.1359
146.	0.4303	489.	0.1361
147.	0.4265	490.	0.1357
148.	0.4235	491.	0.1358
149.	0.421	492.	0.138
150.	0.4181	493.	0.1374
151.	0.4152	494.	0.1381
152.	0.414	495.	0.1341
153.	0.4116	496.	0.135
154.	0.4083	497.	0.1356
155.	0.4074	498.	0.1343
156.	0.4054	499.	0.1347
157.	0.4006	500.	0.1365
158.	0.4	501.	0.1356
159.	0.3979	502.	0.1339
160.	0.3965	503.	0.1339
161.	0.3925	504.	0.1326
162.	0.3916	505.	0.1351
163.	0.3898	506.	0.1338
164.	0.386	507.	0.1342
165.	0.384	508.	0.1327

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
166.	0.3832	509.	0.1336
167.	0.3799	510.	0.133
168.	0.3771	511.	0.133
169.	0.3758	512.	0.132
170.	0.3748	513.	0.1307
171.	0.3709	514.	0.1326
172.	0.3695	515.	0.1317
173.	0.3668	516.	0.1309
174.	0.3671	517.	0.1315
175.	0.3628	518.	0.1314
176.	0.3628	519.	0.1286
177.	0.3599	520.	0.1293
178.	0.3569	521.	0.1294
179.	0.3563	522.	0.1299
180.	0.3544	523.	0.131
181.	0.3528	524.	0.1279
182.	0.3516	525.	0.1292
183.	0.349	526.	0.1287
184.	0.3479	527.	0.1264
185.	0.345	528.	0.1273
186.	0.3432	529.	0.1279
187.	0.3418	530.	0.1277
188.	0.3398	531.	0.1277
189.	0.3356	532.	0.1286
190.	0.3357	533.	0.1271
191.	0.3377	534.	0.1257
192.	0.3344	535.	0.1254
193.	0.3335	536.	0.1248
194.	0.3317	537.	0.1249
195.	0.3297	538.	0.1253
196.	0.3286	539.	0.1258
197.	0.3269	540.	0.1232
198.	0.3251	541.	0.1242
199.	0.3231	542.	0.1236
200.	0.3225	543.	0.1232
201.	0.3221	544.	0.1231
202.	0.3183	545.	0.1236
203.	0.3183	546.	0.1221
204.	0.3169	547.	0.1226
205.	0.3164	548.	0.1218
206.	0.3122	549.	0.1222
207.	0.3117	550.	0.1211
208.	0.31	551.	0.1211
209.	0.3088	552.	0.1206
210.	0.3082	553.	0.1219
211.	0.3068	554.	0.1207
212.	0.3036	555.	0.1206
213.	0.304	556.	0.1206
214.	0.3014	557.	0.1213
215.	0.2998	558.	0.1226
216.	0.2994	559.	0.1204
217.	0.2979	560.	0.1224
218.	0.2968	561.	0.1214
219.	0.2947	562.	0.1217
220.	0.292	563.	0.1217
221.	0.2926	564.	0.1207
222.	0.2909	565.	0.1204
223.	0.2891	566.	0.1192
224.	0.289	567.	0.1202
225.	0.2909	568.	0.12
226.	0.2874	569.	0.1192
227.	0.2852	570.	0.1201
228.	0.2839	571.	0.1184
229.	0.2833	572.	0.1203
230.	0.2818	573.	0.1193
231.	0.2804	574.	0.1181

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
232.	0.2807	575.	0.1196
233.	0.2786	576.	0.1191
234.	0.2768	577.	0.1181
235.	0.276	578.	0.118
236.	0.2761	579.	0.1189
237.	0.2744	580.	0.1176
238.	0.2737	581.	0.1171
239.	0.2724	582.	0.1174
240.	0.2702	583.	0.116
241.	0.2711	584.	0.115
242.	0.2686	585.	0.1165
243.	0.2664	586.	0.1154
244.	0.266	587.	0.117
245.	0.2658	588.	0.1157
246.	0.2638	589.	0.1152
247.	0.2633	590.	0.1151
248.	0.2632	591.	0.1134
249.	0.2601	592.	0.1162
250.	0.2602	593.	0.1143
251.	0.2596	594.	0.116
252.	0.2586	595.	0.1131
253.	0.2561	596.	0.1138
254.	0.2546	597.	0.1145
255.	0.2561	598.	0.1131
256.	0.2536	599.	0.1105
257.	0.2533	600.	0.1122
258.	0.2526	601.	0.1119
259.	0.2508	602.	0.1125
260.	0.2501	603.	0.1116
261.	0.248	604.	0.1109
262.	0.2488	605.	0.1124
263.	0.247	606.	0.1122
264.	0.2483	607.	0.1106
265.	0.2447	608.	0.1104
266.	0.2454	609.	0.1106
267.	0.245	610.	0.1105
268.	0.2444	611.	0.1104
269.	0.2441	612.	0.1094
270.	0.2424	613.	0.1102
271.	0.244	614.	0.1084
272.	0.2407	615.	0.1092
273.	0.241	616.	0.1079
274.	0.2385	617.	0.108
275.	0.2385	618.	0.1081
276.	0.2379	619.	0.1068
277.	0.2387	620.	0.1064
278.	0.2354	621.	0.1082
279.	0.2351	622.	0.107
280.	0.2342	623.	0.1077
281.	0.2325	624.	0.1072
282.	0.2329	625.	0.1063
283.	0.2318	626.	0.1065
284.	0.2311	627.	0.1075
285.	0.2313	628.	0.1067
286.	0.2309	629.	0.1092
287.	0.23	630.	0.1078
288.	0.2281	631.	0.1052
289.	0.2286	632.	0.1057
290.	0.2243	633.	0.1078
291.	0.2276	634.	0.1074
292.	0.224	635.	0.1079
293.	0.2269	636.	0.1076
294.	0.2249	637.	0.1077
295.	0.2229	638.	0.1062
296.	0.2224	639.	0.1062
297.	0.2217	640.	0.1053

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
298.	0.2197	641.	0.1061
299.	0.2203	642.	0.106
300.	0.2191	643.	0.1066
301.	0.2182	644.	0.1056
302.	0.219	645.	0.1031
303.	0.2163	646.	0.1055
304.	0.2166	647.	0.1039
305.	0.2151	648.	0.105
306.	0.2147	649.	0.1066
307.	0.2146	650.	0.1044
308.	0.2121	651.	0.1051
309.	0.2138	652.	0.1038
310.	0.2126	653.	0.1009
311.	0.2129	654.	0.1048
312.	0.2115	655.	0.1056
313.	0.2097	656.	0.1027
314.	0.2097	657.	0.1029
315.	0.2095	658.	0.1039
316.	0.208	659.	0.1032
317.	0.2078	660.	0.1051
318.	0.2074	661.	0.1025
319.	0.2063	662.	0.1035
320.	0.2055	663.	0.1034
321.	0.2059	664.	0.1013
322.	0.2041	665.	0.1012
323.	0.2031	666.	0.1019
324.	0.2013	667.	0.1011
325.	0.2008	668.	0.1014
326.	0.2006	669.	0.1013
327.	0.202	670.	0.0994
328.	0.2009	671.	0.1009
329.	0.2002	672.	0.1009
330.	0.1999	673.	0.0995
331.	0.1985	674.	0.1
332.	0.1971	675.	0.0988
333.	0.1975	676.	0.0991
334.	0.1958	677.	0.1001
335.	0.1961	678.	0.1002
336.	0.1964	679.	0.0982
337.	0.1975	680.	0.0966
338.	0.1969	681.	0.0989
339.	0.1943	682.	0.0983
340.	0.1954	683.	0.0977
341.	0.1948	684.	0.0973
342.	0.1943	685.	0.0974
343.	0.1924	686.	0.0978
344.	0.1943	687.	0.0972
345.	0.1936	688.	0.0971
346.	0.1939		

SOLUTION

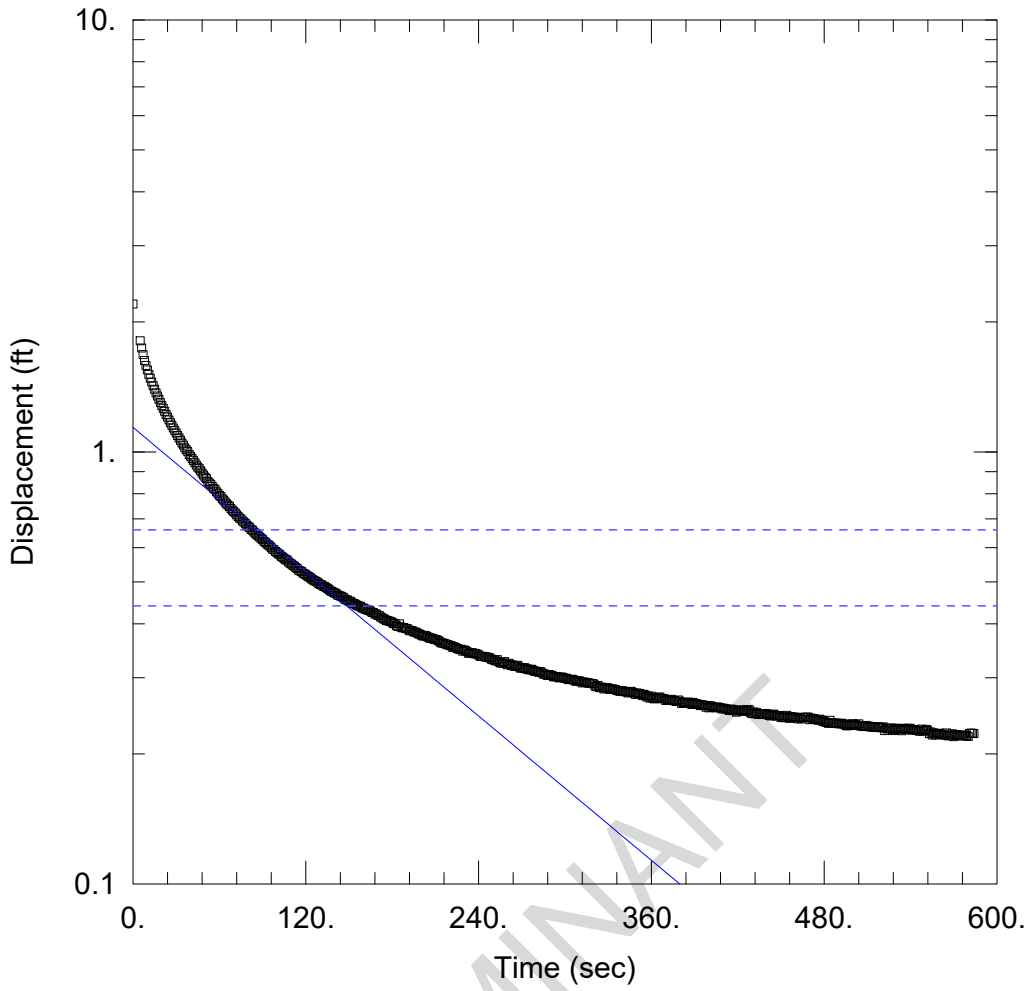
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.748

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0002046	cm/sec
y0	1.204	ft

T = K*b = 0.06235 cm²/sec



SLUG OUT

Data Set: J:\...\BMW-21 Slug OUT.aqt
Date: 12/16/15 Time: 10:22:40

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Well: BMW-21
Test Date: 9-22-2015

AQUIFER DATA

Saturated Thickness: 10. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BMW-21)

Initial Displacement: 2.2 ft Static Water Column Height: 38.08 ft
Total Well Penetration Depth: 10. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice
K = 0.0001849 cm/sec y0 = 1.14 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\A1 LF\Aqtes
Title: Slug OUT
Date: 12/16/15
Time: 10:24:27

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Date: 9-22-2015
Test Well: BMW-21

AQUIFER DATA

Saturated Thickness: 10. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BMW-21

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 38.08 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 10. ft
Total Well Penetration Depth: 10. ft

No. of Observations: 581

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	295.	0.3014
5.	1.809	296.	0.2997
6.	1.74	297.	0.3012
7.	1.68	298.	0.301
8.	1.628	299.	0.2999
9.	1.585	300.	0.2994
10.	1.548	301.	0.2992
11.	1.511	302.	0.2976
12.	1.48	303.	0.2969
13.	1.451	304.	0.2972
14.	1.423	305.	0.2978
15.	1.396	306.	0.2968
16.	1.37	307.	0.2952
17.	1.347	308.	0.2944
18.	1.325	309.	0.295
19.	1.301	310.	0.2953
20.	1.281	311.	0.2938
21.	1.262	312.	0.2919
22.	1.241	313.	0.2934
23.	1.22	314.	0.2926
24.	1.203	315.	0.2927
25.	1.185	316.	0.2918
26.	1.168	317.	0.2918
27.	1.152	318.	0.291
28.	1.136	319.	0.291
29.	1.122	320.	0.2902
30.	1.107	321.	0.2868
31.	1.091	322.	0.286
32.	1.078	323.	0.288

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
33.	1.064	324.	0.2846
34.	1.049	325.	0.2851
35.	1.037	326.	0.2854
36.	1.022	327.	0.2828
37.	1.012	328.	0.284
38.	1.002	329.	0.2846
39.	0.9864	330.	0.2842
40.	0.9767	331.	0.2819
41.	0.9654	332.	0.2829
42.	0.9543	333.	0.2827
43.	0.9438	334.	0.2821
44.	0.9317	335.	0.282
45.	0.9221	336.	0.2803
46.	0.9145	337.	0.2803
47.	0.9036	338.	0.2792
48.	0.8933	339.	0.2799
49.	0.8844	340.	0.2801
50.	0.8746	341.	0.2787
51.	0.8674	342.	0.2788
52.	0.8542	343.	0.2778
53.	0.8472	344.	0.2768
54.	0.8417	345.	0.2786
55.	0.8322	346.	0.279
56.	0.8236	347.	0.2773
57.	0.8178	348.	0.2766
58.	0.8082	349.	0.2745
59.	0.8018	350.	0.2767
60.	0.7934	351.	0.2753
61.	0.7889	352.	0.2761
62.	0.7789	353.	0.2748
63.	0.7735	354.	0.2727
64.	0.7656	355.	0.2747
65.	0.7583	356.	0.2727
66.	0.7532	357.	0.2707
67.	0.7472	358.	0.2723
68.	0.7396	359.	0.2692
69.	0.7331	360.	0.272
70.	0.7273	361.	0.2693
71.	0.7221	362.	0.2682
72.	0.7151	363.	0.2696
73.	0.7086	364.	0.2693
74.	0.7028	365.	0.2697
75.	0.6996	366.	0.2708
76.	0.6921	367.	0.2683
77.	0.6881	368.	0.2685
78.	0.6831	369.	0.2684
79.	0.6772	370.	0.2658
80.	0.6724	371.	0.267
81.	0.6679	372.	0.2668
82.	0.6617	373.	0.2666
83.	0.659	374.	0.2674
84.	0.6526	375.	0.2656
85.	0.6481	376.	0.2658
86.	0.6426	377.	0.2644
87.	0.6392	378.	0.2648
88.	0.6349	379.	0.2665
89.	0.6306	380.	0.2642
90.	0.6264	381.	0.2616
91.	0.6204	382.	0.263
92.	0.6173	383.	0.2631
93.	0.612	384.	0.2632
94.	0.6092	385.	0.2627
95.	0.6054	386.	0.2637
96.	0.6002	387.	0.2619
97.	0.5954	388.	0.2602
98.	0.5936	389.	0.2631

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
99.	0.5881	390.	0.2613
100.	0.5845	391.	0.2615
101.	0.5808	392.	0.2609
102.	0.5782	393.	0.2601
103.	0.573	394.	0.2586
104.	0.5701	395.	0.2601
105.	0.5664	396.	0.2587
106.	0.5623	397.	0.2592
107.	0.5624	398.	0.2564
108.	0.5562	399.	0.2585
109.	0.5526	400.	0.2556
110.	0.5503	401.	0.2585
111.	0.5464	402.	0.2575
112.	0.5442	403.	0.2563
113.	0.54	404.	0.2561
114.	0.5373	405.	0.2556
115.	0.5323	406.	0.257
116.	0.5303	407.	0.2561
117.	0.5287	408.	0.2557
118.	0.524	409.	0.254
119.	0.5223	410.	0.2552
120.	0.5198	411.	0.2543
121.	0.5167	412.	0.2541
122.	0.5142	413.	0.2534
123.	0.5117	414.	0.252
124.	0.5082	415.	0.2537
125.	0.5058	416.	0.2537
126.	0.5033	417.	0.253
127.	0.5019	418.	0.2524
128.	0.4999	419.	0.2499
129.	0.4957	420.	0.2513
130.	0.4934	421.	0.2522
131.	0.4923	422.	0.2525
132.	0.4891	423.	0.2513
133.	0.4882	424.	0.2529
134.	0.4856	425.	0.2509
135.	0.4834	426.	0.2527
136.	0.4805	427.	0.2522
137.	0.4773	428.	0.2531
138.	0.4753	429.	0.2487
139.	0.4736	430.	0.2481
140.	0.4714	431.	0.25
141.	0.4703	432.	0.2476
142.	0.4664	433.	0.2496
143.	0.4655	434.	0.2468
144.	0.4638	435.	0.2477
145.	0.4622	436.	0.2477
146.	0.4605	437.	0.2466
147.	0.4564	438.	0.2478
148.	0.4545	439.	0.2476
149.	0.4543	440.	0.2477
150.	0.4511	441.	0.2462
151.	0.4509	442.	0.2456
152.	0.4472	443.	0.2447
153.	0.446	444.	0.2465
154.	0.445	445.	0.2472
155.	0.4428	446.	0.2455
156.	0.4408	447.	0.2446
157.	0.4393	448.	0.2453
158.	0.4393	449.	0.2454
159.	0.4354	450.	0.2428
160.	0.4352	451.	0.2432
161.	0.4325	452.	0.2424
162.	0.4323	453.	0.2438
163.	0.4301	454.	0.2456
164.	0.4304	455.	0.2433

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
165.	0.4279	456.	0.2416
166.	0.4249	457.	0.244
167.	0.4245	458.	0.2433
168.	0.4215	459.	0.2431
169.	0.4216	460.	0.2428
170.	0.4186	461.	0.2428
171.	0.418	462.	0.241
172.	0.4146	463.	0.243
173.	0.4133	464.	0.2411
174.	0.4108	465.	0.2426
175.	0.4097	466.	0.2426
176.	0.407	467.	0.243
177.	0.4068	468.	0.243
178.	0.4058	469.	0.2432
179.	0.4044	470.	0.24
180.	0.4034	471.	0.2421
181.	0.4004	472.	0.2402
182.	0.4005	473.	0.2415
183.	0.396	474.	0.2401
184.	0.3946	475.	0.2402
185.	0.4001	476.	0.2391
186.	0.3933	477.	0.2405
187.	0.3916	478.	0.2396
188.	0.3921	479.	0.2379
189.	0.3907	480.	0.2375
190.	0.3896	481.	0.237
191.	0.3893	482.	0.2364
192.	0.3857	483.	0.2353
193.	0.386	484.	0.2392
194.	0.3857	485.	0.2357
195.	0.3831	486.	0.2362
196.	0.383	487.	0.2354
197.	0.3817	488.	0.2355
198.	0.3795	489.	0.2356
199.	0.3787	490.	0.2348
200.	0.3772	491.	0.2349
201.	0.3753	492.	0.2356
202.	0.3748	493.	0.2345
203.	0.3761	494.	0.2346
204.	0.3735	495.	0.2327
205.	0.3726	496.	0.2322
206.	0.3704	497.	0.2334
207.	0.3712	498.	0.2328
208.	0.3701	499.	0.2337
209.	0.3681	500.	0.235
210.	0.3681	501.	0.2337
211.	0.3673	502.	0.2337
212.	0.3661	503.	0.2326
213.	0.3634	504.	0.2348
214.	0.3614	505.	0.2321
215.	0.3611	506.	0.2321
216.	0.3606	507.	0.2314
217.	0.3596	508.	0.2322
218.	0.358	509.	0.2328
219.	0.3577	510.	0.2313
220.	0.3562	511.	0.232
221.	0.3559	512.	0.2309
222.	0.353	513.	0.2308
223.	0.354	514.	0.2314
224.	0.3526	515.	0.2301
225.	0.3509	516.	0.2307
226.	0.3499	517.	0.2302
227.	0.3488	518.	0.231
228.	0.3492	519.	0.2299
229.	0.3457	520.	0.2299
230.	0.3481	521.	0.2309

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
231.	0.3465	522.	0.2264
232.	0.3449	523.	0.2288
233.	0.3418	524.	0.2285
234.	0.3427	525.	0.2293
235.	0.3429	526.	0.2291
236.	0.3427	527.	0.2294
237.	0.3409	528.	0.2265
238.	0.3409	529.	0.2277
239.	0.3403	530.	0.2292
240.	0.3389	531.	0.2291
241.	0.336	532.	0.2281
242.	0.3368	533.	0.2288
243.	0.3359	534.	0.2263
244.	0.336	535.	0.2286
245.	0.3349	536.	0.2292
246.	0.3349	537.	0.2278
247.	0.3341	538.	0.2276
248.	0.3333	539.	0.2294
249.	0.3309	540.	0.2287
250.	0.3302	541.	0.2268
251.	0.3298	542.	0.2276
252.	0.3281	543.	0.2276
253.	0.3304	544.	0.2269
254.	0.3268	545.	0.2269
255.	0.3249	546.	0.2257
256.	0.3247	547.	0.2258
257.	0.3246	548.	0.2283
258.	0.3271	549.	0.2262
259.	0.3235	550.	0.2264
260.	0.3214	551.	0.2279
261.	0.3243	552.	0.2263
262.	0.3224	553.	0.2229
263.	0.3201	554.	0.2247
264.	0.3211	555.	0.2211
265.	0.3189	556.	0.2238
266.	0.319	557.	0.2211
267.	0.3207	558.	0.2224
268.	0.3181	559.	0.2229
269.	0.3159	560.	0.2233
270.	0.3166	561.	0.222
271.	0.3157	562.	0.2222
272.	0.3166	563.	0.2212
273.	0.3144	564.	0.2212
274.	0.3145	565.	0.2235
275.	0.3129	566.	0.2201
276.	0.3136	567.	0.221
277.	0.314	568.	0.2205
278.	0.3117	569.	0.2226
279.	0.3105	570.	0.2192
280.	0.3108	571.	0.2216
281.	0.3099	572.	0.2214
282.	0.309	573.	0.2208
283.	0.3099	574.	0.2206
284.	0.3081	575.	0.2212
285.	0.3061	576.	0.2199
286.	0.3059	577.	0.2211
287.	0.3046	578.	0.2203
288.	0.3038	579.	0.2204
289.	0.3052	580.	0.2194
290.	0.3041	581.	0.2231
291.	0.304	582.	0.2234
292.	0.3015	583.	0.2232
293.	0.3015	584.	0.2228
294.	0.302		

SOLUTION

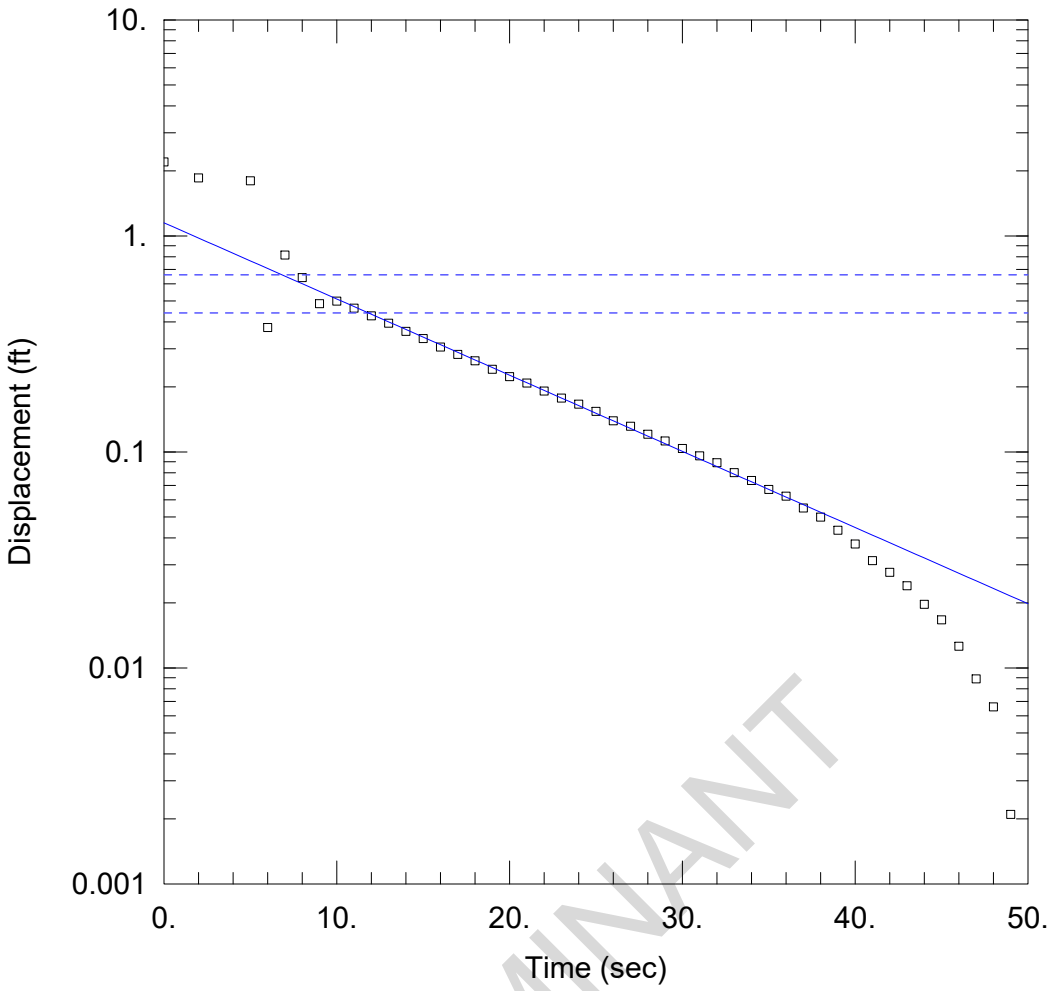
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.748

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001849	cm/sec
y0	1.14	ft

T = K*b = 0.05637 cm²/sec



WELL TEST ANALYSIS

Data Set: J:\...\BMW-23 Slug IN.aqt
Date: 12/16/15 Time: 10:22:50

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Well: BMW-23
Test Date: 9-22-2015

AQUIFER DATA

Saturated Thickness: 15. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BMW-23)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 15. ft
Casing Radius: 0.083 ft
Static Water Column Height: 21.76 ft
Screen Length: 15. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.00175 cm/sec
y0 = 1.15 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\A1 LF\Aqtes
Date: 12/16/15
Time: 10:24:14

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Date: 9-22-2015
Test Well: BMW-23

AQUIFER DATA

Saturated Thickness: 15. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BMW-23

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 21.76 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 15. ft
Total Well Penetration Depth: 15. ft

No. of Observations: 48

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	27.	0.1315
2.	1.854	28.	0.1208
5.	1.8	29.	0.1124
6.	0.3769	30.	0.1038
7.	0.8153	31.	0.0959
8.	0.6414	32.	0.0891
9.	0.4853	33.	0.0802
10.	0.4989	34.	0.0738
11.	0.4631	35.	0.067
12.	0.4267	36.	0.0624
13.	0.3941	37.	0.055
14.	0.3618	38.	0.0499
15.	0.3346	39.	0.0434
16.	0.3059	40.	0.0375
17.	0.2828	41.	0.0314
18.	0.264	42.	0.0277
19.	0.2415	43.	0.024
20.	0.2231	44.	0.0197
21.	0.2085	45.	0.0167
22.	0.1915	46.	0.0126
23.	0.1775	47.	0.0089
24.	0.1664	48.	0.0066
25.	0.1541	49.	0.0021
26.	0.1393	50.	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice

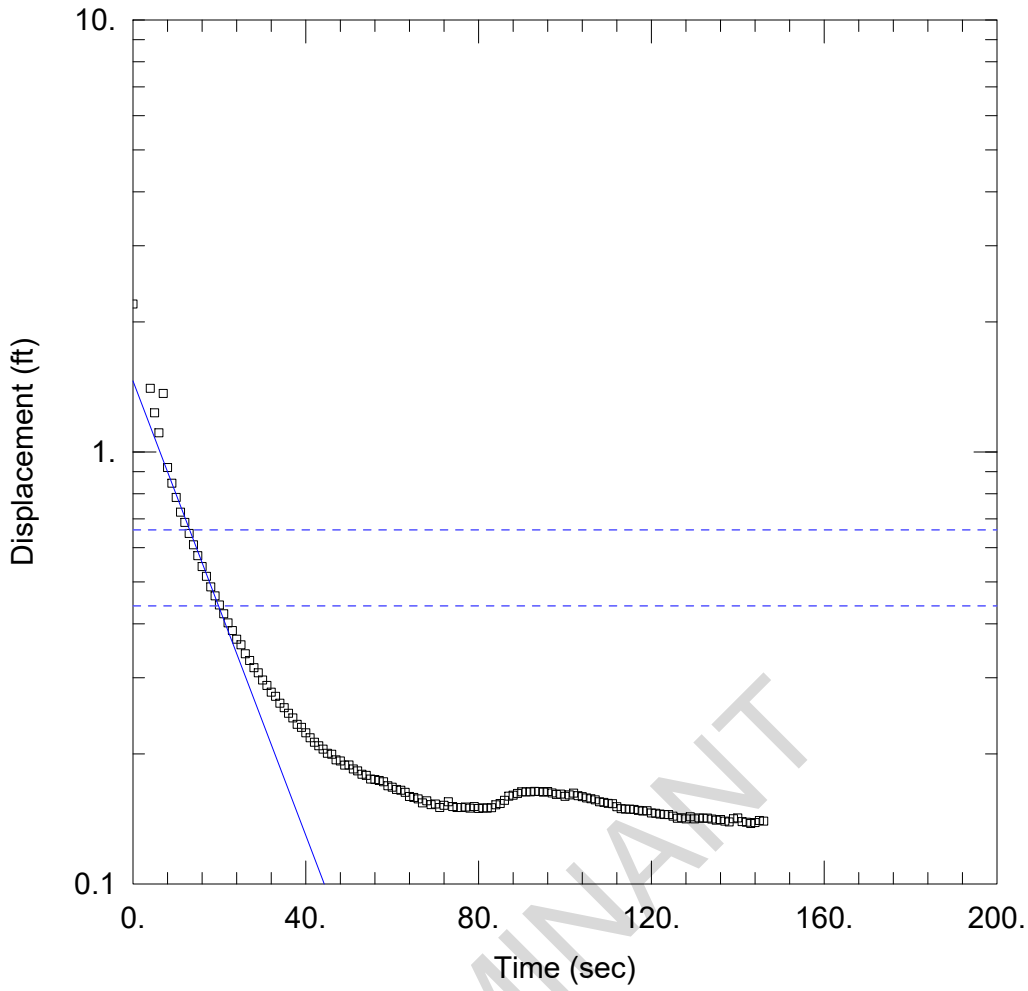
ln(Re/rw): 3.079

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00175	cm/sec
y0	1.15	ft

T = K*b = 0.8 cm²/sec



WELL TEST ANALYSIS

Data Set: J:\...\BMW-23 Slug OUT.aqt
Date: 12/16/15 Time: 10:22:59

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Well: BMW-23
Test Date: 9-22-2015

AQUIFER DATA

Saturated Thickness: 15. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 15. ft
Casing Radius: 0.083 ft
Static Water Column Height: 21.76 ft
Screen Length: 15. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.001305 cm/sec
y0 = 1.46 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\A1 LF\Aqtes
Date: 12/16/15
Time: 10:24:02

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Date: 9-22-2015
Test Well: BMW-23

AQUIFER DATA

Saturated Thickness: 15. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: New Well

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 21.76 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 15. ft
Total Well Penetration Depth: 15. ft

No. of Observations: 144

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	75.	0.1502
4.	1.404	76.	0.1502
5.	1.232	77.	0.1506
6.	1.108	78.	0.1497
7.	1.366	79.	0.151
8.	0.9205	80.	0.1495
9.	0.8461	81.	0.15
10.	0.7847	82.	0.1498
11.	0.7252	83.	0.1501
12.	0.687	84.	0.1525
13.	0.6474	85.	0.1535
14.	0.6094	86.	0.1561
15.	0.5752	87.	0.1596
16.	0.5429	88.	0.1605
17.	0.5153	89.	0.162
18.	0.487	90.	0.1634
19.	0.4645	91.	0.1633
20.	0.4424	92.	0.1634
21.	0.4221	93.	0.1638
22.	0.4021	94.	0.1637
23.	0.3858	95.	0.1631
24.	0.3684	96.	0.1637
25.	0.3576	97.	0.1624
26.	0.3409	98.	0.1611
27.	0.3289	99.	0.1614
28.	0.3165	100.	0.1595
29.	0.308	101.	0.1608
30.	0.2965	102.	0.1623
31.	0.288	103.	0.1601
32.	0.278	104.	0.1592

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
33.	0.2717	105.	0.1582
34.	0.262	106.	0.1575
35.	0.2558	107.	0.1565
36.	0.2484	108.	0.1549
37.	0.2422	109.	0.1544
38.	0.2341	110.	0.1536
39.	0.2304	111.	0.1534
40.	0.2238	112.	0.1509
41.	0.218	113.	0.1494
42.	0.2128	114.	0.149
43.	0.2089	115.	0.149
44.	0.2051	116.	0.1487
45.	0.2006	117.	0.148
46.	0.1996	118.	0.1475
47.	0.1937	119.	0.1477
48.	0.1926	120.	0.146
49.	0.1884	121.	0.1457
50.	0.1885	122.	0.1451
51.	0.1846	123.	0.1447
52.	0.1826	124.	0.1447
53.	0.1795	125.	0.1435
54.	0.1783	126.	0.1419
55.	0.1749	127.	0.1423
56.	0.1744	128.	0.1414
57.	0.1735	129.	0.143
58.	0.1724	130.	0.1414
59.	0.1688	131.	0.1422
60.	0.1675	132.	0.1419
61.	0.1655	133.	0.142
62.	0.1647	134.	0.1413
63.	0.1629	135.	0.1405
64.	0.1594	136.	0.1409
65.	0.1585	137.	0.1398
66.	0.1573	138.	0.1392
67.	0.154	139.	0.1415
68.	0.1557	140.	0.1422
69.	0.1526	141.	0.1394
70.	0.1531	142.	0.1389
71.	0.1502	143.	0.138
72.	0.1521	144.	0.1387
73.	0.1549	145.	0.1402
74.	0.151	146.	0.1398

SOLUTION

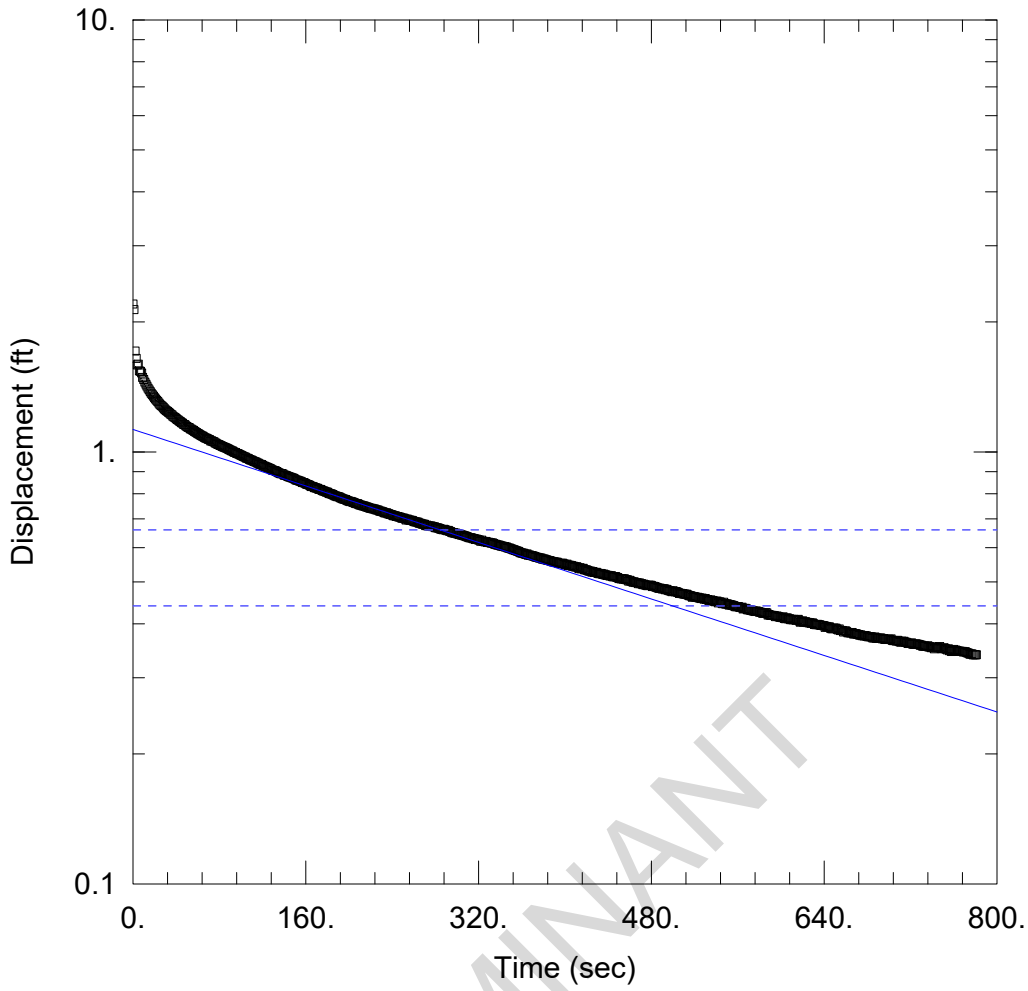
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.079

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.001305	cm/sec
y0	1.46	ft

T = K*b = 0.5966 cm²/sec



WELL TEST ANALYSIS

Data Set: J:\...\BMW-24 Slug IN.aqt
Date: 12/16/15 Time: 10:23:09

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Well: BMW-24
Test Date: 9-22-2015

AQUIFER DATA

Saturated Thickness: 5. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 2.2 ft Static Water Column Height: 23.87 ft
Total Well Penetration Depth: 5. ft Screen Length: 5. ft
Casing Radius: 0.083 ft Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice
K = 8.517E-5 cm/sec y0 = 1.127 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\A1 LF\Aqtes
Date: 12/16/15
Time: 10:23:49

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Date: 9-22-2015
Test Well: BMW-24

AQUIFER DATA

Saturated Thickness: 5. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: New Well

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 23.87 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 5. ft
Total Well Penetration Depth: 5. ft

No. of Observations: 782

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	391.	0.5552
1.	2.135	392.	0.5553
2.	1.713	393.	0.5553
3.	1.646	394.	0.5526
4.	1.59	395.	0.5518
5.	1.596	396.	0.5522
6.	1.54	397.	0.5522
7.	1.536	398.	0.5526
8.	1.523	399.	0.5501
9.	1.487	400.	0.5492
10.	1.47	401.	0.5474
11.	1.451	402.	0.5498
12.	1.435	403.	0.546
13.	1.42	404.	0.547
14.	1.405	405.	0.5451
15.	1.392	406.	0.5462
16.	1.379	407.	0.5438
17.	1.367	408.	0.5439
18.	1.357	409.	0.5421
19.	1.346	410.	0.5412
20.	1.335	411.	0.5423
21.	1.326	412.	0.5402
22.	1.317	413.	0.5369
23.	1.308	414.	0.5397
24.	1.298	415.	0.5362
25.	1.289	416.	0.537
26.	1.282	417.	0.5378
27.	1.276	418.	0.5334
28.	1.268	419.	0.5335
29.	1.258	420.	0.5332

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	1.252	421.	0.5318
31.	1.246	422.	0.5301
32.	1.241	423.	0.5296
33.	1.235	424.	0.5297
34.	1.23	425.	0.5268
35.	1.223	426.	0.5285
36.	1.218	427.	0.526
37.	1.21	428.	0.5259
38.	1.205	429.	0.5262
39.	1.201	430.	0.5248
40.	1.195	431.	0.5231
41.	1.189	432.	0.5223
42.	1.185	433.	0.5234
43.	1.178	434.	0.5223
44.	1.174	435.	0.5206
45.	1.168	436.	0.5215
46.	1.166	437.	0.5194
47.	1.158	438.	0.5192
48.	1.157	439.	0.5175
49.	1.15	440.	0.5178
50.	1.145	441.	0.517
51.	1.14	442.	0.5163
52.	1.139	443.	0.5172
53.	1.132	444.	0.5146
54.	1.129	445.	0.5139
55.	1.125	446.	0.5144
56.	1.122	447.	0.5143
57.	1.116	448.	0.5122
58.	1.112	449.	0.5116
59.	1.108	450.	0.509
60.	1.103	451.	0.5093
61.	1.1	452.	0.5082
62.	1.096	453.	0.509
63.	1.092	454.	0.5074
64.	1.089	455.	0.5089
65.	1.087	456.	0.5065
66.	1.082	457.	0.5062
67.	1.077	458.	0.5055
68.	1.076	459.	0.5023
69.	1.073	460.	0.5043
70.	1.069	461.	0.5021
71.	1.067	462.	0.5016
72.	1.06	463.	0.4994
73.	1.061	464.	0.5005
74.	1.056	465.	0.4986
75.	1.055	466.	0.4985
76.	1.05	467.	0.4982
77.	1.048	468.	0.4954
78.	1.043	469.	0.4974
79.	1.041	470.	0.4953
80.	1.038	471.	0.4956
81.	1.035	472.	0.4929
82.	1.032	473.	0.494
83.	1.029	474.	0.4924
84.	1.026	475.	0.4916
85.	1.024	476.	0.4904
86.	1.022	477.	0.4903
87.	1.019	478.	0.4915
88.	1.017	479.	0.4913
89.	1.012	480.	0.4907
90.	1.01	481.	0.488
91.	1.007	482.	0.4887
92.	1.005	483.	0.488
93.	1.002	484.	0.4865
94.	0.9982	485.	0.4857
95.	0.9974	486.	0.4846

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
96.	0.9917	487.	0.4832
97.	0.9907	488.	0.4839
98.	0.9886	489.	0.483
99.	0.9849	490.	0.4818
100.	0.9827	491.	0.482
101.	0.9804	492.	0.482
102.	0.9768	493.	0.4798
103.	0.9743	494.	0.4807
104.	0.973	495.	0.4792
105.	0.9678	496.	0.4776
106.	0.9668	497.	0.4771
107.	0.9641	498.	0.4763
108.	0.9607	499.	0.4746
109.	0.9582	500.	0.4771
110.	0.9574	501.	0.4757
111.	0.9536	502.	0.4744
112.	0.9508	503.	0.4752
113.	0.9487	504.	0.4737
114.	0.9473	505.	0.4728
115.	0.9434	506.	0.4705
116.	0.9415	507.	0.4707
117.	0.9378	508.	0.4698
118.	0.9362	509.	0.4699
119.	0.9351	510.	0.4688
120.	0.9313	511.	0.4688
121.	0.9274	512.	0.4679
122.	0.9269	513.	0.4682
123.	0.9236	514.	0.4665
124.	0.9219	515.	0.4648
125.	0.9196	516.	0.4647
126.	0.9171	517.	0.4638
127.	0.9155	518.	0.461
128.	0.9118	519.	0.4628
129.	0.9077	520.	0.462
130.	0.9065	521.	0.4611
131.	0.9058	522.	0.4603
132.	0.9041	523.	0.4609
133.	0.9008	524.	0.4594
134.	0.8978	525.	0.4593
135.	0.8947	526.	0.4576
136.	0.8924	527.	0.4587
137.	0.8902	528.	0.4578
138.	0.8906	529.	0.4562
139.	0.8887	530.	0.4575
140.	0.8833	531.	0.4555
141.	0.8834	532.	0.4552
142.	0.8817	533.	0.4539
143.	0.8786	534.	0.4523
144.	0.8768	535.	0.4544
145.	0.8751	536.	0.4524
146.	0.8732	537.	0.4529
147.	0.8714	538.	0.4514
148.	0.8696	539.	0.4501
149.	0.8685	540.	0.4512
150.	0.865	541.	0.4516
151.	0.8609	542.	0.4472
152.	0.8604	543.	0.4499
153.	0.8588	544.	0.4486
154.	0.8563	545.	0.4473
155.	0.8552	546.	0.4453
156.	0.8527	547.	0.4489
157.	0.8492	548.	0.4457
158.	0.8494	549.	0.4443
159.	0.8471	550.	0.445
160.	0.8441	551.	0.4443
161.	0.8414	552.	0.4418

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
162.	0.8407	553.	0.443
163.	0.8385	554.	0.4425
164.	0.8355	555.	0.4415
165.	0.8311	556.	0.4409
166.	0.8323	557.	0.4397
167.	0.8306	558.	0.4383
168.	0.8266	559.	0.4382
169.	0.8268	560.	0.4384
170.	0.8241	561.	0.4382
171.	0.8233	562.	0.4365
172.	0.8194	563.	0.4364
173.	0.8188	564.	0.4371
174.	0.8189	565.	0.4331
175.	0.8143	566.	0.4341
176.	0.8123	567.	0.4343
177.	0.8115	568.	0.4332
178.	0.8098	569.	0.4311
179.	0.807	570.	0.4312
180.	0.8068	571.	0.4313
181.	0.8033	572.	0.4298
182.	0.8006	573.	0.4296
183.	0.8	574.	0.4287
184.	0.7986	575.	0.4284
185.	0.7965	576.	0.4272
186.	0.7942	577.	0.4283
187.	0.791	578.	0.4278
188.	0.7909	579.	0.427
189.	0.7882	580.	0.4255
190.	0.788	581.	0.4258
191.	0.7866	582.	0.4249
192.	0.783	583.	0.4231
193.	0.7822	584.	0.4233
194.	0.7793	585.	0.4234
195.	0.778	586.	0.4245
196.	0.7764	587.	0.4238
197.	0.7756	588.	0.4192
198.	0.7725	589.	0.4203
199.	0.7709	590.	0.4188
200.	0.7696	591.	0.4186
201.	0.7672	592.	0.4186
202.	0.7677	593.	0.4182
203.	0.7659	594.	0.4176
204.	0.7641	595.	0.4158
205.	0.7625	596.	0.4171
206.	0.7602	597.	0.4162
207.	0.7587	598.	0.4153
208.	0.759	599.	0.4143
209.	0.7565	600.	0.4139
210.	0.7539	601.	0.4134
211.	0.7531	602.	0.4152
212.	0.7516	603.	0.4119
213.	0.7502	604.	0.4111
214.	0.75	605.	0.4129
215.	0.748	606.	0.4129
216.	0.7463	607.	0.4107
217.	0.7454	608.	0.4111
218.	0.7435	609.	0.409
219.	0.7418	610.	0.4098
220.	0.7402	611.	0.4086
221.	0.7402	612.	0.4098
222.	0.7382	613.	0.4094
223.	0.7381	614.	0.4074
224.	0.737	615.	0.4085
225.	0.7348	616.	0.4097
226.	0.7343	617.	0.406
227.	0.7337	618.	0.4034

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
228.	0.7303	619.	0.405
229.	0.7293	620.	0.4064
230.	0.7283	621.	0.4034
231.	0.727	622.	0.4046
232.	0.7251	623.	0.4044
233.	0.7232	624.	0.4027
234.	0.7221	625.	0.403
235.	0.7228	626.	0.4021
236.	0.7194	627.	0.4025
237.	0.7192	628.	0.401
238.	0.7168	629.	0.4022
239.	0.7164	630.	0.4008
240.	0.715	631.	0.3986
241.	0.7121	632.	0.3983
242.	0.7121	633.	0.3982
243.	0.711	634.	0.399
244.	0.7088	635.	0.3981
245.	0.7087	636.	0.3978
246.	0.707	637.	0.3966
247.	0.7063	638.	0.3966
248.	0.7051	639.	0.3964
249.	0.7025	640.	0.3958
250.	0.7026	641.	0.3926
251.	0.7023	642.	0.3945
252.	0.6998	643.	0.3931
253.	0.6955	644.	0.3933
254.	0.6995	645.	0.3936
255.	0.6965	646.	0.3906
256.	0.6958	647.	0.3896
257.	0.6944	648.	0.39
258.	0.6946	649.	0.3913
259.	0.6934	650.	0.3904
260.	0.6903	651.	0.391
261.	0.689	652.	0.3885
262.	0.6885	653.	0.3873
263.	0.688	654.	0.3893
264.	0.6874	655.	0.3859
265.	0.6842	656.	0.3862
266.	0.6837	657.	0.3858
267.	0.6822	658.	0.3829
268.	0.6806	659.	0.385
269.	0.6802	660.	0.3852
270.	0.6799	661.	0.3835
271.	0.6752	662.	0.3814
272.	0.6771	663.	0.3817
273.	0.6741	664.	0.3813
274.	0.674	665.	0.3811
275.	0.6736	666.	0.3821
276.	0.674	667.	0.3789
277.	0.672	668.	0.379
278.	0.6716	669.	0.3796
279.	0.6705	670.	0.3791
280.	0.6679	671.	0.378
281.	0.6675	672.	0.3778
282.	0.6673	673.	0.3764
283.	0.6662	674.	0.377
284.	0.6641	675.	0.3755
285.	0.6626	676.	0.3758
286.	0.6618	677.	0.3748
287.	0.6602	678.	0.3757
288.	0.6621	679.	0.3749
289.	0.6605	680.	0.3738
290.	0.6585	681.	0.3732
291.	0.6568	682.	0.3735
292.	0.6579	683.	0.3733
293.	0.6555	684.	0.3729

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
294.	0.654	685.	0.3711
295.	0.6514	686.	0.371
296.	0.6498	687.	0.373
297.	0.6505	688.	0.3703
298.	0.6482	689.	0.3708
299.	0.6489	690.	0.3704
300.	0.6466	691.	0.37
301.	0.6463	692.	0.3711
302.	0.644	693.	0.3704
303.	0.6441	694.	0.3693
304.	0.6419	695.	0.3699
305.	0.6422	696.	0.3681
306.	0.6405	697.	0.3683
307.	0.6395	698.	0.3678
308.	0.6383	699.	0.3683
309.	0.6368	700.	0.3684
310.	0.6358	701.	0.368
311.	0.6332	702.	0.3691
312.	0.633	703.	0.3662
313.	0.6328	704.	0.3658
314.	0.632	705.	0.3661
315.	0.6295	706.	0.3656
316.	0.6299	707.	0.3647
317.	0.6271	708.	0.3665
318.	0.6285	709.	0.3648
319.	0.627	710.	0.3635
320.	0.6253	711.	0.3627
321.	0.6246	712.	0.3648
322.	0.6213	713.	0.3636
323.	0.6248	714.	0.3646
324.	0.6208	715.	0.3626
325.	0.6208	716.	0.3625
326.	0.619	717.	0.3614
327.	0.6205	718.	0.3602
328.	0.6175	719.	0.3606
329.	0.6178	720.	0.3606
330.	0.6171	721.	0.3614
331.	0.6164	722.	0.359
332.	0.615	723.	0.3586
333.	0.6157	724.	0.359
334.	0.6138	725.	0.3594
335.	0.6113	726.	0.359
336.	0.6109	727.	0.3585
337.	0.6097	728.	0.3582
338.	0.6087	729.	0.3567
339.	0.6083	730.	0.3571
340.	0.607	731.	0.3554
341.	0.6053	732.	0.3551
342.	0.6056	733.	0.3556
343.	0.6039	734.	0.3547
344.	0.6041	735.	0.3548
345.	0.6021	736.	0.3559
346.	0.6023	737.	0.3536
347.	0.5998	738.	0.3542
348.	0.5988	739.	0.3522
349.	0.5987	740.	0.3526
350.	0.5967	741.	0.3534
351.	0.5957	742.	0.3503
352.	0.5938	743.	0.3523
353.	0.5934	744.	0.3536
354.	0.5915	745.	0.3526
355.	0.5907	746.	0.352
356.	0.5891	747.	0.3543
357.	0.5885	748.	0.3512
358.	0.5861	749.	0.3503
359.	0.5843	750.	0.3507

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
360.	0.5838	751.	0.3522
361.	0.5826	752.	0.3504
362.	0.5824	753.	0.3497
363.	0.5801	754.	0.3482
364.	0.5789	755.	0.3501
365.	0.5805	756.	0.3465
366.	0.5769	757.	0.3477
367.	0.5776	758.	0.3452
368.	0.5755	759.	0.347
369.	0.5758	760.	0.3491
370.	0.5747	761.	0.3456
371.	0.5739	762.	0.3477
372.	0.5727	763.	0.3469
373.	0.5706	764.	0.3458
374.	0.5705	765.	0.3456
375.	0.5697	766.	0.3458
376.	0.5682	767.	0.3452
377.	0.5679	768.	0.3455
378.	0.5681	769.	0.3442
379.	0.5651	770.	0.3449
380.	0.5651	771.	0.3445
381.	0.5651	772.	0.3432
382.	0.5632	773.	0.3425
383.	0.5624	774.	0.342
384.	0.561	775.	0.3402
385.	0.5607	776.	0.3408
386.	0.5602	777.	0.3407
387.	0.5588	778.	0.3391
388.	0.5578	779.	0.3396
389.	0.5562	780.	0.3391
390.	0.5569	781.	0.3394

SOLUTION

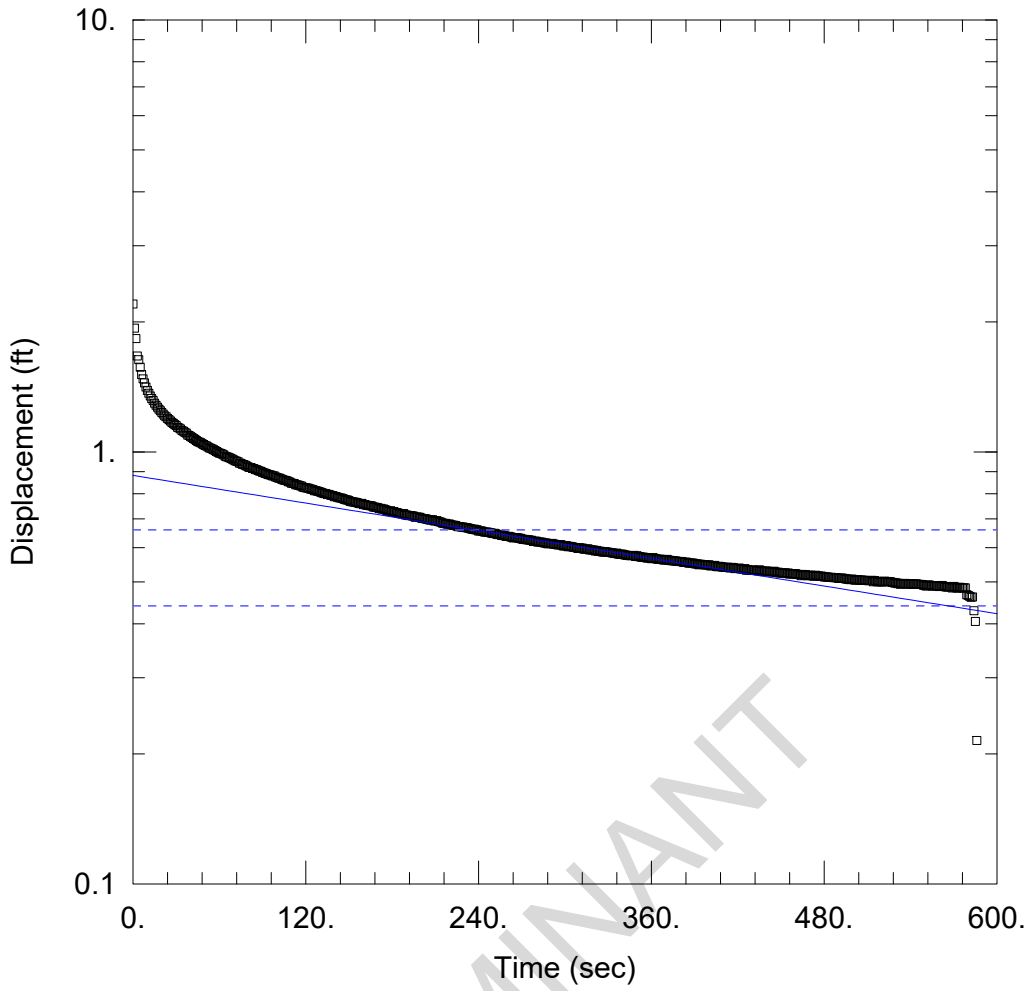
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.155

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	8.517E-5	cm/sec
y0	1.127	ft

$T = K*b = 0.01298$ cm²/sec



WELL TEST ANALYSIS

Data Set: J:\...\BMW-24 Slug OUT.aqt
Date: 10/03/17 Time: 17:25:14

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Well: BMW-24
Test Date: 9-22-2015

AQUIFER DATA

Saturated Thickness: 5. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BMW-24)

Initial Displacement: 2.2 ft Static Water Column Height: 23.87 ft
Total Well Penetration Depth: 5. ft Screen Length: 5. ft
Casing Radius: 0.083 ft Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 5.558E-5 cm/sec y0 = 0.8822 ft

Data Set: J:\5164 - Luminant CCR GW Monitoring\5164-B_Martin Lake\Slug Tests\A1 LF\Aqtesolv files\BMW-24 Sl
Date: 10/03/17
Time: 17:25:42

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-B
Location: Beckville Mine
Test Date: 9-22-2015
Test Well: BMW-24

AQUIFER DATA

Saturated Thickness: 5. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BMW-24

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 23.87 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 5. ft
Total Well Penetration Depth: 5. ft

No. of Observations: 587

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	294.	0.6108
1.	1.934	295.	0.609
2.	1.83	296.	0.6095
3.	1.668	297.	0.6098
4.	1.635	298.	0.6078
5.	1.571	299.	0.6053
6.	1.51	300.	0.6062
7.	1.476	301.	0.6068
8.	1.444	302.	0.6035
9.	1.414	303.	0.6047
10.	1.389	304.	0.6031
11.	1.367	305.	0.6035
12.	1.347	306.	0.6012
13.	1.329	307.	0.6008
14.	1.315	308.	0.6001
15.	1.297	309.	0.5979
16.	1.282	310.	0.6005
17.	1.269	311.	0.598
18.	1.256	312.	0.5994
19.	1.246	313.	0.5958
20.	1.234	314.	0.5955
21.	1.224	315.	0.5955
22.	1.212	316.	0.5966
23.	1.206	317.	0.593
24.	1.196	318.	0.5936
25.	1.188	319.	0.5928
26.	1.18	320.	0.5928
27.	1.17	321.	0.5894
28.	1.165	322.	0.5917
29.	1.156	323.	0.5886

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	1.151	324.	0.5889
31.	1.14	325.	0.5887
32.	1.136	326.	0.5868
33.	1.13	327.	0.5863
34.	1.121	328.	0.5876
35.	1.117	329.	0.5859
36.	1.11	330.	0.5863
37.	1.105	331.	0.5853
38.	1.094	332.	0.5846
39.	1.091	333.	0.5838
40.	1.084	334.	0.5827
41.	1.08	335.	0.5814
42.	1.074	336.	0.5829
43.	1.069	337.	0.5803
44.	1.063	338.	0.5796
45.	1.057	339.	0.5803
46.	1.054	340.	0.5798
47.	1.05	341.	0.5781
48.	1.045	342.	0.5772
49.	1.04	343.	0.5764
50.	1.036	344.	0.5756
51.	1.032	345.	0.5754
52.	1.027	346.	0.5752
53.	1.022	347.	0.5755
54.	1.019	348.	0.5763
55.	1.016	349.	0.5727
56.	1.011	350.	0.575
57.	1.007	351.	0.5722
58.	1.002	352.	0.5722
59.	0.9982	353.	0.5703
60.	0.9939	354.	0.5709
61.	0.9917	355.	0.5701
62.	0.9883	356.	0.5693
63.	0.9845	357.	0.568
64.	0.9776	358.	0.5684
65.	0.9747	359.	0.5686
66.	0.9727	360.	0.5661
67.	0.969	361.	0.5692
68.	0.9658	362.	0.5674
69.	0.9621	363.	0.5659
70.	0.958	364.	0.5648
71.	0.9541	365.	0.564
72.	0.9517	366.	0.5643
73.	0.9493	367.	0.5641
74.	0.9413	368.	0.5627
75.	0.9407	369.	0.5621
76.	0.9359	370.	0.562
77.	0.9342	371.	0.5641
78.	0.931	372.	0.5613
79.	0.9275	373.	0.5613
80.	0.9232	374.	0.5598
81.	0.9206	375.	0.5602
82.	0.9199	376.	0.5592
83.	0.9155	377.	0.5594
84.	0.9145	378.	0.5578
85.	0.9098	379.	0.5577
86.	0.9092	380.	0.5571
87.	0.9057	381.	0.5578
88.	0.9026	382.	0.5554
89.	0.9012	383.	0.555
90.	0.8962	384.	0.556
91.	0.8945	385.	0.5549
92.	0.8913	386.	0.5524
93.	0.8893	387.	0.5536
94.	0.8861	388.	0.5526
95.	0.8848	389.	0.5532

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
96.	0.8834	390.	0.5513
97.	0.8793	391.	0.5503
98.	0.88	392.	0.5505
99.	0.8748	393.	0.5477
100.	0.8728	394.	0.55
101.	0.8702	395.	0.5487
102.	0.8692	396.	0.5483
103.	0.8651	397.	0.5479
104.	0.8628	398.	0.5479
105.	0.8602	399.	0.5472
106.	0.8587	400.	0.5479
107.	0.8572	401.	0.5446
108.	0.8528	402.	0.5449
109.	0.8515	403.	0.546
110.	0.8466	404.	0.546
111.	0.8458	405.	0.5429
112.	0.8451	406.	0.5423
113.	0.8395	407.	0.5436
114.	0.8391	408.	0.5426
115.	0.8369	409.	0.5412
116.	0.8349	410.	0.5414
117.	0.8333	411.	0.5398
118.	0.8285	412.	0.5405
119.	0.8273	413.	0.5409
120.	0.826	414.	0.5395
121.	0.8249	415.	0.5386
122.	0.8239	416.	0.5403
123.	0.8205	417.	0.5394
124.	0.8197	418.	0.5368
125.	0.8183	419.	0.5371
126.	0.8134	420.	0.5371
127.	0.8133	421.	0.5385
128.	0.8118	422.	0.5359
129.	0.8095	423.	0.536
130.	0.8075	424.	0.5356
131.	0.8049	425.	0.5369
132.	0.8027	426.	0.5324
133.	0.8009	427.	0.5334
134.	0.801	428.	0.5324
135.	0.797	429.	0.5328
136.	0.7972	430.	0.5323
137.	0.795	431.	0.5328
138.	0.7927	432.	0.5319
139.	0.7918	433.	0.5313
140.	0.7874	434.	0.5303
141.	0.7883	435.	0.5335
142.	0.7854	436.	0.5302
143.	0.783	437.	0.5301
144.	0.7827	438.	0.5283
145.	0.7812	439.	0.5304
146.	0.7795	440.	0.5294
147.	0.7756	441.	0.529
148.	0.7747	442.	0.5283
149.	0.7737	443.	0.5277
150.	0.7715	444.	0.5271
151.	0.7683	445.	0.5295
152.	0.7667	446.	0.5278
153.	0.7659	447.	0.5255
154.	0.7649	448.	0.5267
155.	0.7639	449.	0.5245
156.	0.7624	450.	0.5247
157.	0.7595	451.	0.5245
158.	0.7591	452.	0.524
159.	0.7602	453.	0.5251
160.	0.755	454.	0.5228
161.	0.7554	455.	0.5248

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
162.	0.7528	456.	0.5214
163.	0.7516	457.	0.5229
164.	0.751	458.	0.5216
165.	0.7503	459.	0.5217
166.	0.7491	460.	0.5228
167.	0.7456	461.	0.5204
168.	0.7448	462.	0.5206
169.	0.7439	463.	0.5198
170.	0.7426	464.	0.517
171.	0.7393	465.	0.5205
172.	0.7402	466.	0.5183
173.	0.737	467.	0.5203
174.	0.7376	468.	0.5172
175.	0.7355	469.	0.5183
176.	0.733	470.	0.5172
177.	0.7305	471.	0.5185
178.	0.7291	472.	0.5167
179.	0.7312	473.	0.5158
180.	0.7271	474.	0.5185
181.	0.7278	475.	0.516
182.	0.7249	476.	0.5168
183.	0.7244	477.	0.5148
184.	0.7224	478.	0.516
185.	0.7207	479.	0.5147
186.	0.7189	480.	0.5137
187.	0.7184	481.	0.5137
188.	0.72	482.	0.5135
189.	0.7152	483.	0.5126
190.	0.7142	484.	0.5123
191.	0.7128	485.	0.5128
192.	0.7117	486.	0.5119
193.	0.7123	487.	0.5117
194.	0.7105	488.	0.5113
195.	0.7099	489.	0.5115
196.	0.7059	490.	0.5096
197.	0.7069	491.	0.5101
198.	0.7062	492.	0.5107
199.	0.7056	493.	0.5095
200.	0.7037	494.	0.5095
201.	0.7012	495.	0.5077
202.	0.7009	496.	0.508
203.	0.7005	497.	0.5068
204.	0.6987	498.	0.5062
205.	0.6977	499.	0.5078
206.	0.6958	500.	0.507
207.	0.6955	501.	0.5054
208.	0.6968	502.	0.505
209.	0.6928	503.	0.5066
210.	0.692	504.	0.505
211.	0.6936	505.	0.5048
212.	0.6903	506.	0.5051
213.	0.6886	507.	0.5046
214.	0.6876	508.	0.5042
215.	0.6841	509.	0.5038
216.	0.6835	510.	0.5041
217.	0.6832	511.	0.5032
218.	0.6807	512.	0.5039
219.	0.681	513.	0.5045
220.	0.6804	514.	0.5006
221.	0.6779	515.	0.5038
222.	0.6765	516.	0.502
223.	0.6765	517.	0.5
224.	0.6756	518.	0.5016
225.	0.673	519.	0.5004
226.	0.6711	520.	0.4998
227.	0.6718	521.	0.5008

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
228.	0.6702	522.	0.5023
229.	0.67	523.	0.5006
230.	0.6687	524.	0.5015
231.	0.6678	525.	0.5008
232.	0.6676	526.	0.5004
233.	0.6658	527.	0.4988
234.	0.6643	528.	0.4987
235.	0.6631	529.	0.4966
236.	0.6615	530.	0.4981
237.	0.6624	531.	0.4955
238.	0.6596	532.	0.4962
239.	0.6606	533.	0.4938
240.	0.6559	534.	0.4953
241.	0.6565	535.	0.4958
242.	0.6563	536.	0.4962
243.	0.6542	537.	0.4956
244.	0.6524	538.	0.494
245.	0.6519	539.	0.4947
246.	0.6523	540.	0.4949
247.	0.6507	541.	0.494
248.	0.6506	542.	0.4948
249.	0.6487	543.	0.4946
250.	0.6471	544.	0.4951
251.	0.6482	545.	0.4936
252.	0.6467	546.	0.4938
253.	0.6439	547.	0.4935
254.	0.6439	548.	0.4935
255.	0.6436	549.	0.4913
256.	0.6406	550.	0.4904
257.	0.6417	551.	0.4893
258.	0.6401	552.	0.4919
259.	0.6379	553.	0.4919
260.	0.6371	554.	0.4903
261.	0.6378	555.	0.4893
262.	0.6363	556.	0.4904
263.	0.6343	557.	0.4893
264.	0.6324	558.	0.4903
265.	0.6336	559.	0.4894
266.	0.6336	560.	0.4879
267.	0.6326	561.	0.4887
268.	0.6312	562.	0.4908
269.	0.6312	563.	0.4885
270.	0.6286	564.	0.4875
271.	0.6274	565.	0.4866
272.	0.6274	566.	0.4865
273.	0.6263	567.	0.4878
274.	0.6261	568.	0.4871
275.	0.6256	569.	0.4843
276.	0.6244	570.	0.4883
277.	0.6241	571.	0.4862
278.	0.6208	572.	0.484
279.	0.621	573.	0.4842
280.	0.6218	574.	0.4863
281.	0.6187	575.	0.485
282.	0.6191	576.	0.4841
283.	0.6187	577.	0.4845
284.	0.6181	578.	0.4845
285.	0.6163	579.	0.467
286.	0.6154	580.	0.4656
287.	0.6155	581.	0.4631
288.	0.6129	582.	0.461
289.	0.6139	583.	0.4616
290.	0.6134	584.	0.4288
291.	0.6142	585.	0.4051
292.	0.6121	586.	0.2148
293.	0.6109		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.155

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	5.558E-5	cm/sec
y0	0.8822	ft

T = K*b = 0.00847 cm²/sec