REPORT

Groundwater Monitoring System Certification Addendum No. 1

Martin Lake Steam Electric Station - A1 Area Landfill
Panola County, Texas

Submitted to:

Luminant Generation Company LLC

Submitted by:

WSP GOLDER

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Austin, Texas, USA 78746
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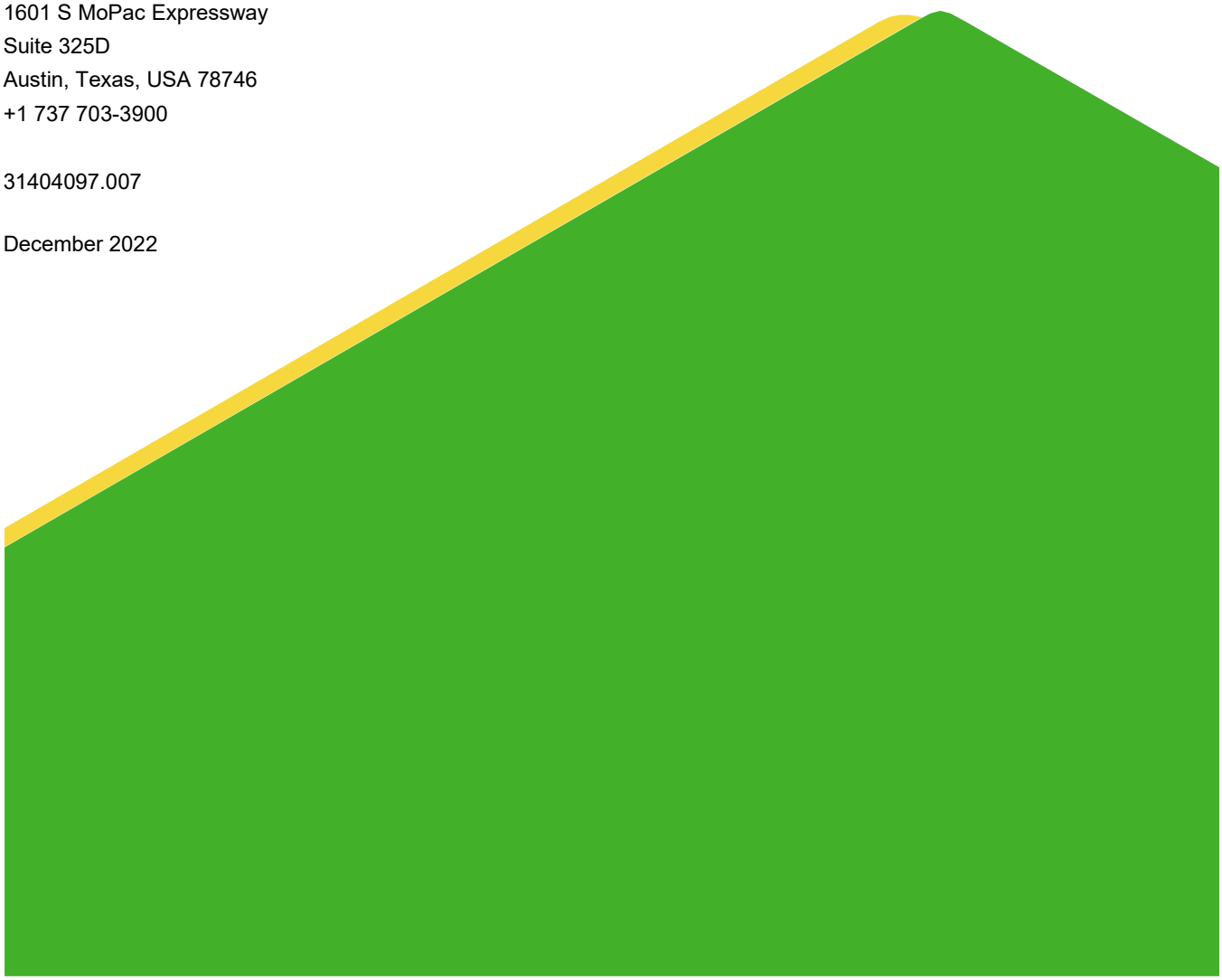
31404097.007

December 2022



PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by WSP Golder 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 Addendum No.1 to the Groundwater Monitoring System Certification for the A1 Area Landfill associated with the Martin Lake Steam Electric Station has been prepared in accordance with the requirements of 40 C.F.R. §257.91.

Patrick J. Behling, P.E.
Principal Engineer
WSP Golder
Texas Firm Registration No. 22771

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DOCUMENT REVISION RECORD

Issue No.	Date	Details of Revisions
Revision 0	October 2017	Original Document
Addendum 1	December 2022	Updated site plan to indicate extent of final waste boundary and extent of historical mining near the A1 Area Landfill, updated cross sections to show mine spoil thickness and additional geological information below the spoil zone, revised designation of uppermost groundwater-bearing unit to indicate it is an unconfined unit, and added professional seal to figures where applicable

1.0 INTRODUCTION

On behalf of Luminant Generation Company LLC (Luminant), WSP Golder (Golder) has prepared this Addendum No. 1 to the Groundwater Monitoring System Certification for the A1 Area Landfill located in Panola County, Texas (Figure 1). Coal Combustion Residuals (CCRs) including fly ash, bottom ash and gypsum, which are generated as part of the power unit operations at the Martin Lake Steam Electric Station (MLSES), are currently transported off-site for beneficial reuse 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. This report discusses the A1 Area Landfill (the Site), which is currently active and considered an Existing CCR Landfill under 40 C.F.R. Part 257, Subpart D (the CCR Rule). The original Groundwater Monitoring System Certification for the A1 Area Landfill was prepared in October 2017 in accordance with 40 C.F.R. §257.91 and placed in the MLSES operating record in accordance with 40 C.F.R. §257.105 (PBW, 2017).

2.0 LOCAL GEOLOGY AND HYDROGEOLOGY

The A1 Area Landfill is located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1965). The Wilcox Group near the Site primarily consists of unconsolidated silt and clay with varying amounts of interbedded sand and lignite. The A1 Area Landfill is constructed on top of a formerly mined area of the Wilcox Group at the Beckville Lignite Mine. The mine areas consist of an overburden interval (the interval above the lowest mined lignite seam that was disturbed during mining operations) and an underburden interval (the interval below the lowest mined lignite seam that was not disturbed during mining operations). The overburden material that was excavated and backfilled during mining is called “mine spoil.” The A1 Area Landfill is underlain by a compacted clay liner that sits on top of the mine spoil zone. It is surrounded by constructed berms that generally extend about 10 feet above grade.

The extent of mining near the A1 Area Landfill is shown on Figure 2. Lithologic descriptions of the spoil material indicate that it consists of a heterogeneous mixture of clay, silt, and sand with trace embedded fragments of lignite. Spoil depths are greatest near the center and northwest portions of the A1 Area Landfill and shallowest to the southeast. Spoil depths near the center and northwest portions of the A1 Area Landfill generally range from about 100 to 200 feet below ground surface (bgs). The spoil zone in the southeastern portion of the A1 Area Landfill decreases in thickness toward the southeastern boundary of the landfill, where the spoil depths are generally about 25 to 50 feet bgs. Native clay is encountered below the spoil zone throughout the A1 Area Landfill. A geologic cross section location map and geologic cross sections of the Site are presented on Figures 3 through 7.

As shown on the cross sections, groundwater is first encountered in the mine spoil zone, which sits below the A1 Area Landfill. The uppermost aquifer at the Site is the saturated portion of the mine spoil interval. It extends from the water table (generally about 1 to 55 feet bgs) to the base of the mine spoil interval, which is marked by remnant native lignite (where left in place) and a clay confining unit. The uppermost aquifer occurs under unconfined/water table conditions. Aquifer testing and total dissolved solids (TDS) data from wells completed within the mine spoil indicate that it is a Class 2 groundwater resource (i.e., it produces greater than 150 gallons per day and has TDS concentrations less than 10,000 mg/L).

2.1 CCR Groundwater Monitoring Network

All of the groundwater monitoring wells in the CCR groundwater monitoring network are completed in the mine spoil zone and are located outside the constructed berms that surround the A1 Area Landfill waste boundary. The CCR groundwater monitoring system at the A1 Area Landfill consists of the following twelve monitoring wells:

Upgradient Wells	Downgradient Wells
BMW-11A-R	BMW-18
BMW-33	BMW-19
	BMW-20
	BMW-21
	BMW-22
	BMW-23
	BMW-24
	BMW-26
	BMW-27
	BMW-28

A detailed Site Plan of the A1 Area Landfill showing the CCR monitoring well locations is presented on Figure 2.

3.0 UPPERMOST AQUIFER HYDRAULIC CONDUCTIVITY TESTING

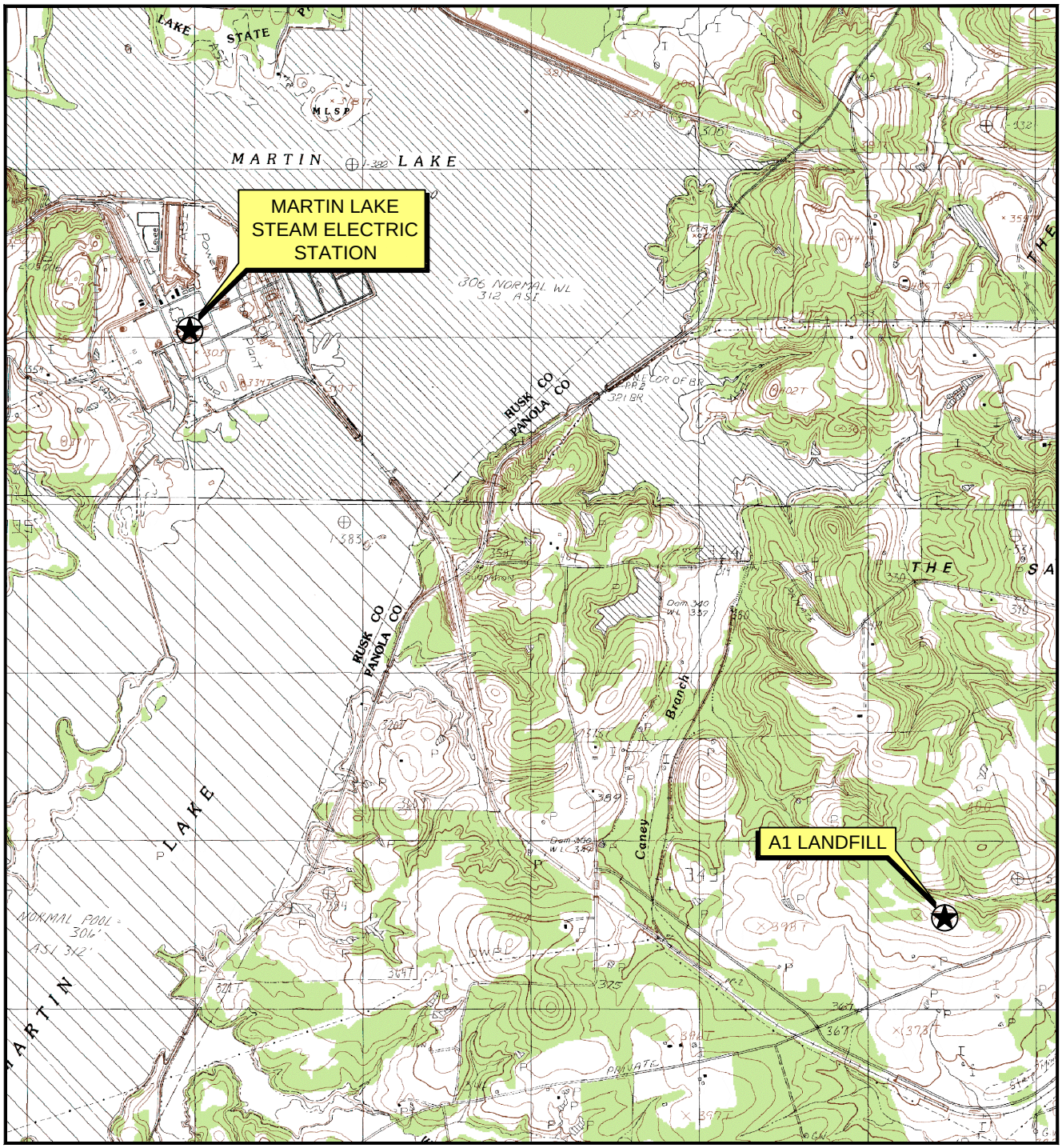
Slug tests were performed at monitoring wells BMW-21, BMW-23, and BMW-24 on October 7, 2015 to evaluate hydraulic properties of the uppermost aquifer at the Site. A summary of the hydraulic properties calculated from the slug test data are presented in Table 1. The average hydraulic conductivities for 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.

4.0 REFERENCES

Barnes, Virgil E., 1974. Geologic Atlas of Texas, Tyler Sheet. Texas Bureau of Economic Geology.

Pastor, Behling & Wheeler, LLC (PBW), 2017. CCR Groundwater Monitoring System Certification – A1 Area Landfill, Martin Lake Steam Electric Station, Panola County, Texas.

FIGURES



TEXAS

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

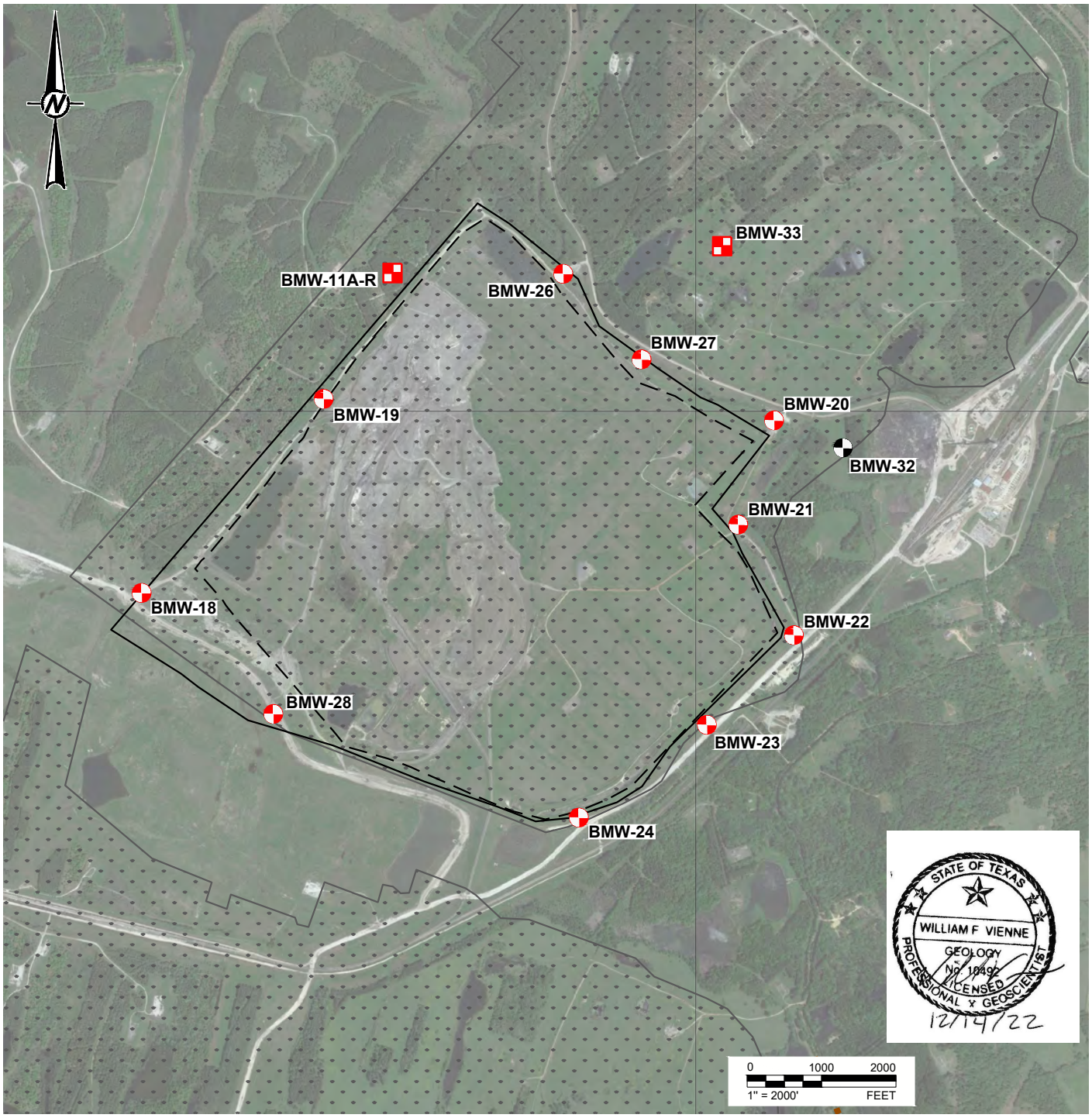
TATUM, TEXAS

Figure 1

SITE LOCATION MAP

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

WSP GOLDER



STATE OF TEXAS
WILLIAM F VIENNE
GEOLOGY
No. 10496
LICENSED
PROFESSIONAL GEOSCIENTIST
12/14/22

LEGEND

- MINED OUT AREA
- DEED RESTRICTION BOUNDARY
- WASTE BOUNDARY
- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL
- CCR DELINEATION MONITORING WELL

NOTE(S)

1. EXTENT OF MINED OUT AREAS WAS TAKEN FROM THE 1993 MINING PERMIT FOR THE BECKVILLE MINE AND SHOULD BE CONSIDERED APPROXIMATE.

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/6/17.

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

TITLE
DETAILED SITE PLAN - A1 AREA LANDFILL

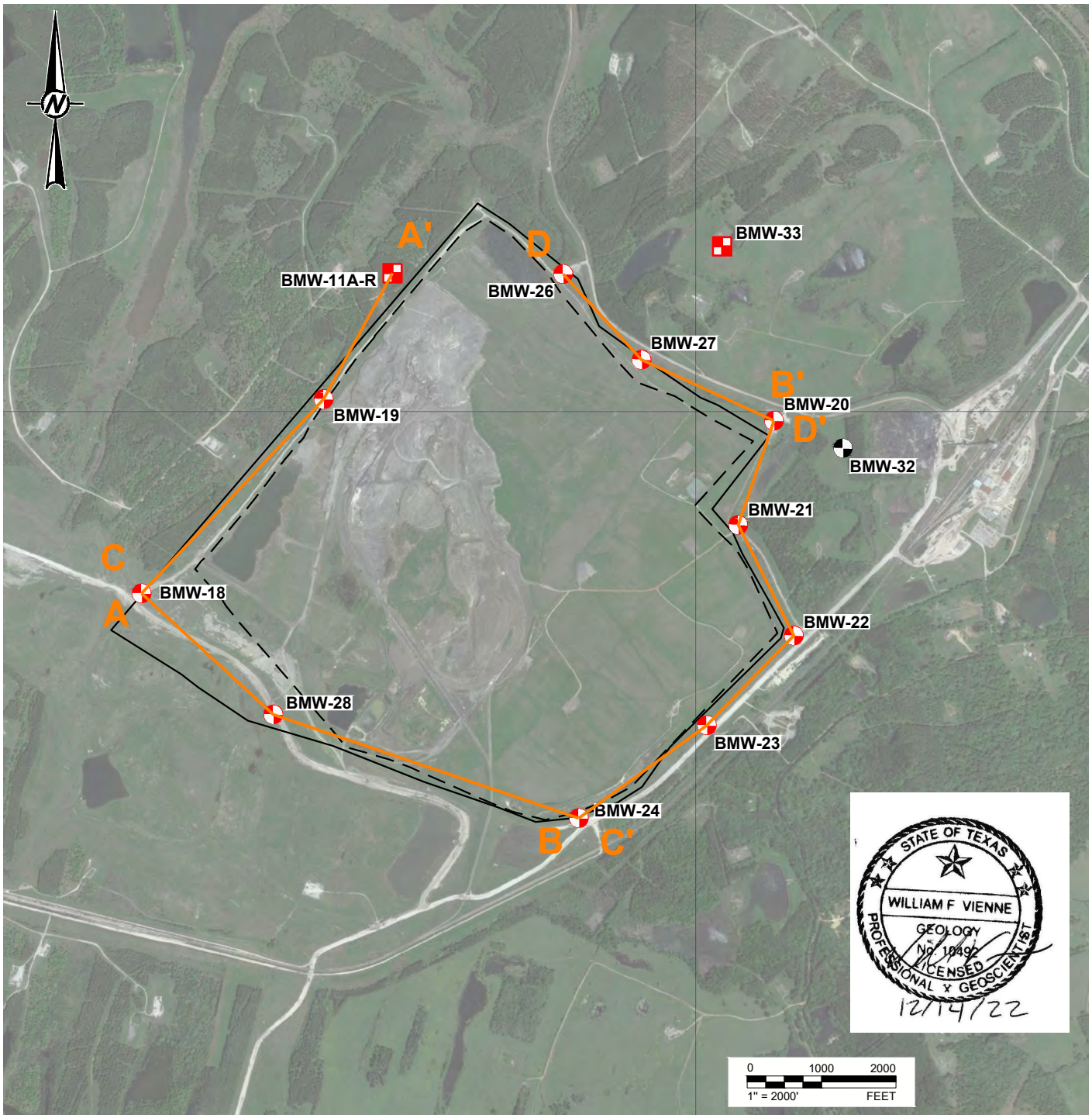
CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-12-06
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.	CONTROL	REV.	FIGURE
		0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in



LEGEND

- DEED RESTRICTION BOUNDARY
- WASTE BOUNDARY
- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL
- CCR DELINEATION MONITORING WELL
- A — A' GEOLOGIC CROSS SECTION LOCATION LINES

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/6/17.

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

TITLE
A1 AREA LANDFILL CROSS SECTION LOCATION MAP

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-12-06
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.	CONTROL	REV.	FIGURE
		0	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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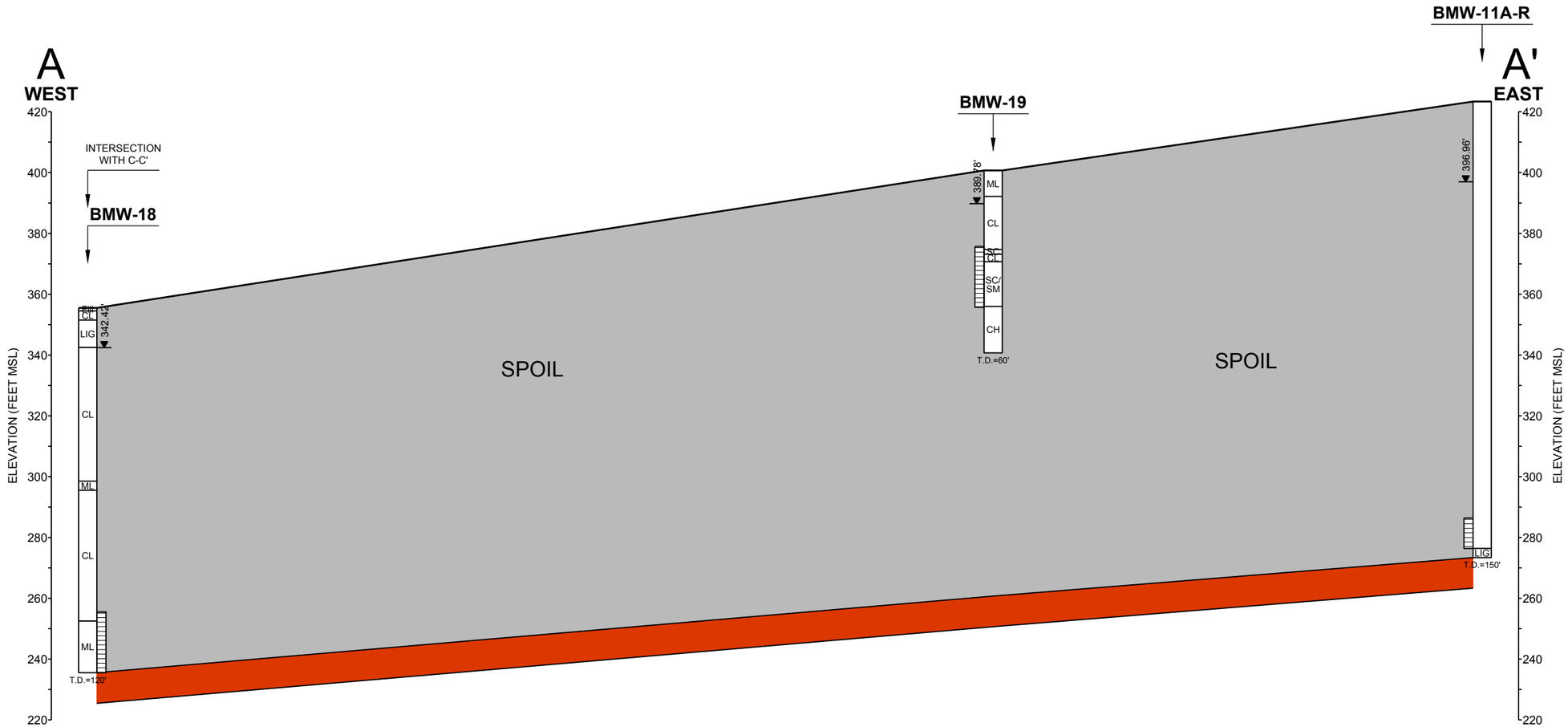
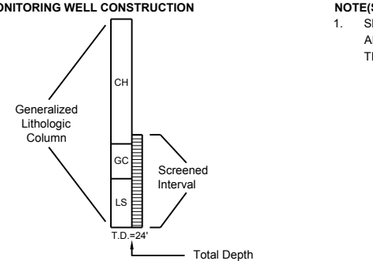


LEGEND

- SPOIL
- NATIVE CLAY

MONITORING WELL CONSTRUCTION



▼ — Water Level (Ft AMSL) Maximum Measured 2015-2022

NOTE(S)

1. SPOIL DEPTHS AND OCCURRENCE OF NATIVE CLAY BELOW SPOIL ZONE ARE APPROXIMATED BASED ON HISTORICAL DATA FROM SOIL BORINGS COMPLETED NEAR THE CCR WELLS.

STATE OF TEXAS
WILLIAM F VIENNE
GEOLOGY
No. 10490
LICENSED
PROFESSIONAL GEOSCIENTIST
12/14/22

SCALE IN FEET

40

VERTICAL

480

HORIZONTAL

12x Vertical Exaggeration

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

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

CONSULTANT
wsp GOLDER

YYYY-MM-DD	2022-12-13
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.

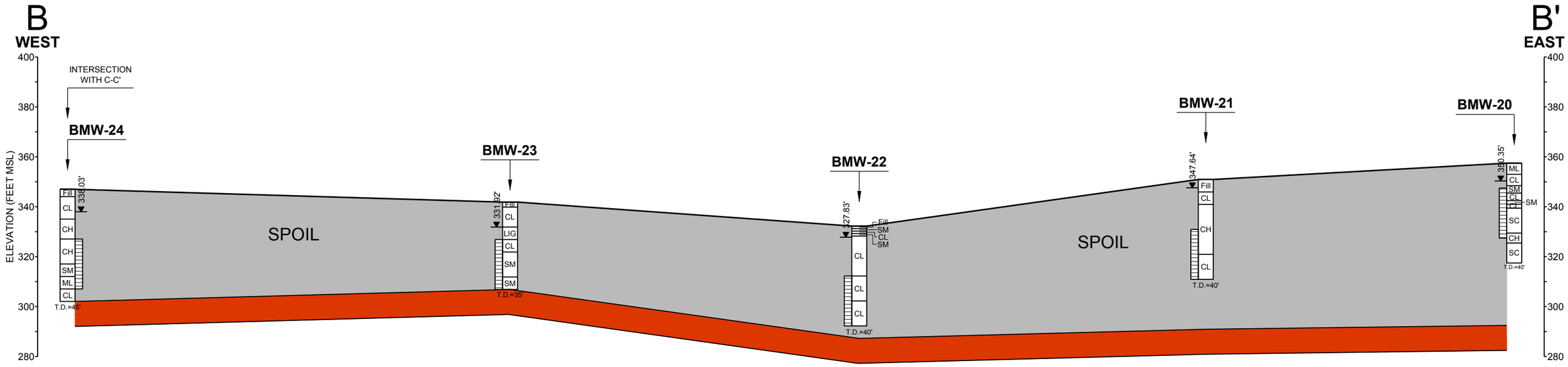
REV. 0

FIGURE 4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

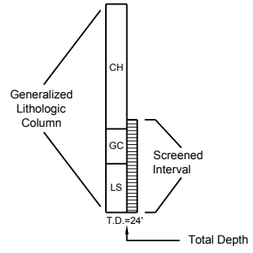
0



LEGEND

- SPOIL
- NATIVE CLAY

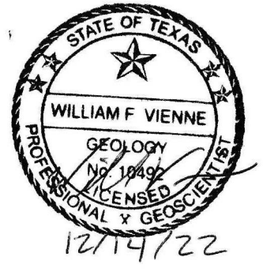
MONITORING WELL CONSTRUCTION



Water Level (Ft AMSL) Maximum Measured 2015-2022

NOTE(S)

1. SPOIL DEPTHS AND OCCURRENCE OF NATIVE CLAY BELOW SPOIL ZONE ARE APPROXIMATED BASED ON HISTORICAL DATA FROM SOIL BORINGS COMPLETED NEAR THE CCR WELLS.



SCALE IN FEET

VERTICAL 40

HORIZONTAL 480

12x Vertical Exaggeration

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

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

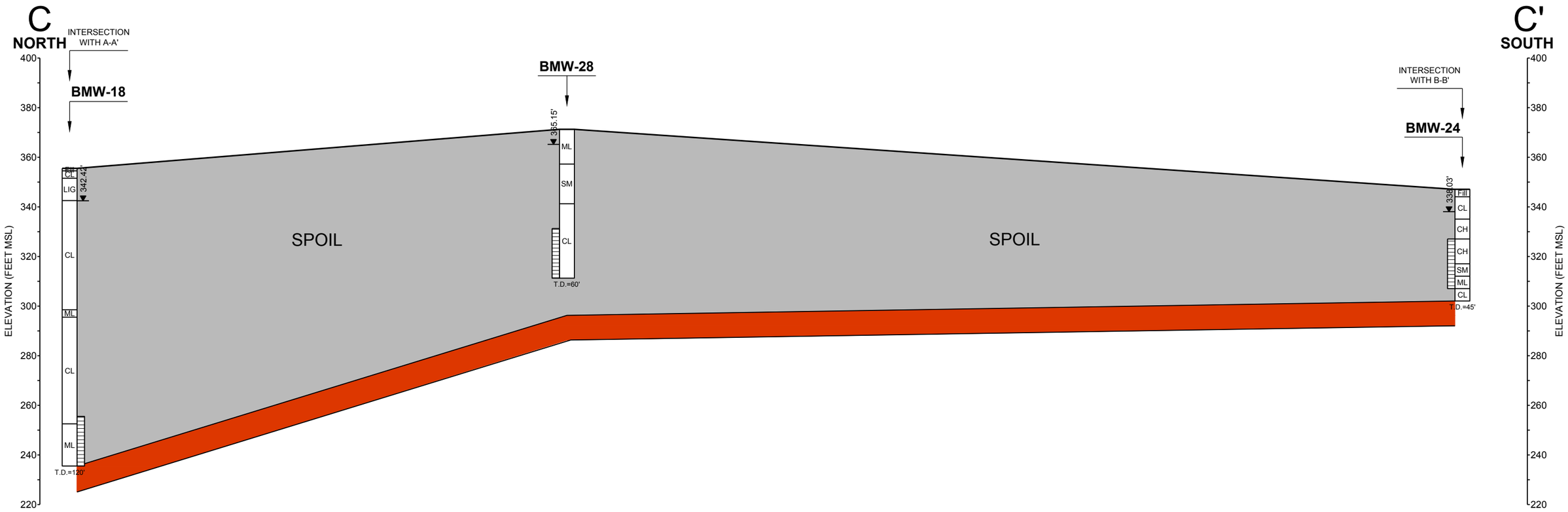
CONSULTANT
wsp GOLDER

YYYY-MM-DD	2022-12-13
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO. | REV. 0 | FIGURE 5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

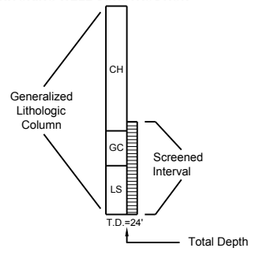
1 in



LEGEND

- SPOIL
- NATIVE CLAY

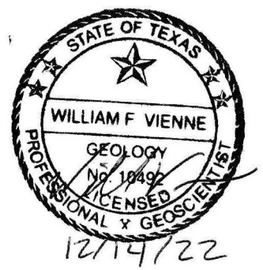
MONITORING WELL CONSTRUCTION



Water Level (Ft AMSL) Maximum Measured 2015-2022

NOTE(S)

1. SPOIL DEPTHS AND OCCURRENCE OF NATIVE CLAY BELOW SPOIL ZONE ARE APPROXIMATED BASED ON HISTORICAL DATA FROM SOIL BORINGS COMPLETED NEAR THE CCR WELLS.



SCALE IN FEET

VERTICAL 40

HORIZONTAL 480

12x Vertical Exaggeration

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

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

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-12-13
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.

REV. 0

FIGURE 6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

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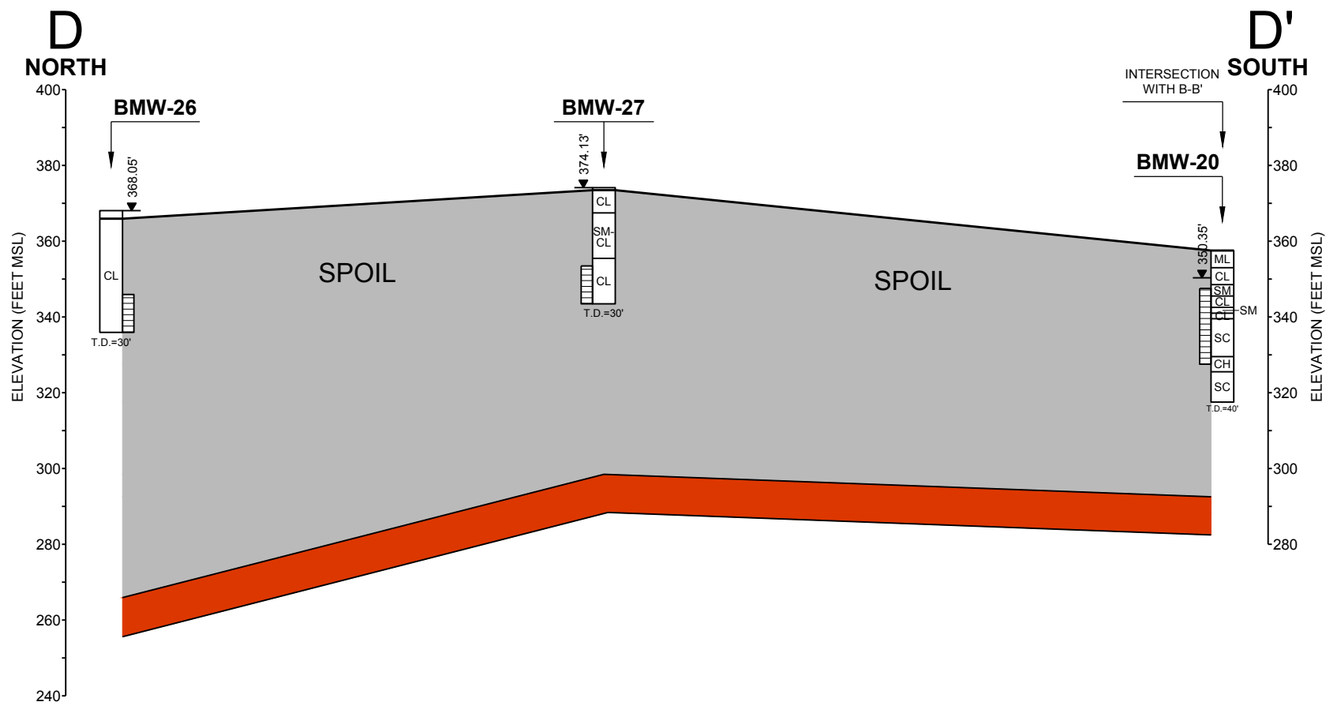
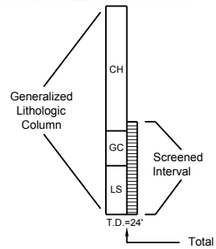


LEGEND

- SPOIL
- NATIVE CLAY

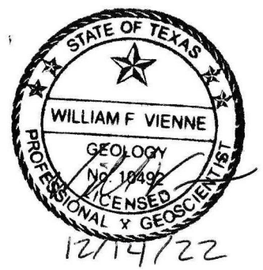
MONITORING WELL CONSTRUCTION



Water Level (Ft AMSL) Maximum Measured 2015-2022

NOTE(S)

1. SPOIL DEPTHS AND OCCURRENCE OF NATIVE CLAY BELOW SPOIL ZONE ARE APPROXIMATED BASED ON HISTORICAL DATA FROM SOIL BORINGS COMPLETED NEAR THE CCR WELLS.



SCALE IN FEET

VERTICAL 40

HORIZONTAL 480

12x Vertical Exaggeration

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

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

CONSULTANT
wsp GOLDER

YYYY-MM-DD	2022-12-13
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.

REV. 0

FIGURE 7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in
0

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TABLES

TABLE 1
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	Unconfined	Bouwer-Rice	10	6.24E-02	2.05E-04
BMW-21	Slug-Out	Unconfined	Bouwer-Rice	10	5.64E-02	1.85E-04
				Mean	**5.94E-02**	**1.95E-04**
BMW-23	Slug-In	Unconfined	Bouwer-Rice	15	8.00E-01	1.75E-03
BMW-23	Slug-Out	Unconfined	Bouwer-Rice	15	5.97E-01	1.31E-03
				Mean	**6.98E-01**	**1.53E-03**
BMW-24	Slug-In	Unconfined	Bouwer-Rice	5	1.30E-02	8.52E-05
BMW-24	Slug-Out	Unconfined	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.