

October 7, 2022
Revised May 15, 2023



ENTECH
ENGINEERING, INC.

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COLORADO SPRINGS, CO 80907
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Classic SRJ
2138 Flying Horse Club Drive
Colorado Springs, Colorado 80921

Attn: Loren Moreland

Re: Response to Colorado Geological Survey Review
Soil, Geology, & Geology Hazard Study
Sterling Ranch East – Preliminary Plan No. 1
Parcel Nos. 17, 18, 22, 23, 24, 26, 37, & 38
El Paso County, Colorado
Entech Job No. 220571

Ref: Entech Engineering, Inc., dated April 19, 2022, Geologic Hazard Investigation,
Soil, Geology, & Geology Hazard Study, Sterling Ranch East – Preliminary Plan
No. 1, Parcel Nos. 17, 18, 22, 23, 24, 26, 37, & 38, El Paso County, Colorado.
Entech Job No. 212176

Colorado Geological Survey, August 1, 2022. *Sterling Ranch East, Phase I,
PUDSP224. El Paso County, Colorado;* CGS Unique No. EP22-0074.

Colorado Geological Survey, December 29, 2022. *Sterling Ranch East, Phase I,
PUDSP224. El Paso County, Colorado;* CGS Unique No. EP22-0074.

Dear Mr. Moreland:

This letter is written in response to the second Colorado Geological Survey (CGS), August 24, 2022, review letter concerning the revised Geologic Hazard Investigation for the above referenced site, dated August 10, 2022. The attached Geologic Hazard Investigation includes responses to the comments, figures, and associated appendices as referenced below. The 2nd CGS review letter is included in Appendix A.

CGS COMMENTS AND ENTECH ENGINEERING, INC. RESPONSES

CGS Comment: *“In the test borings drilled, groundwater was encountered at 3 to 19 feet below grade during drilling, and Entech observed areas on ponded water in some locations. According to Entech (page 2), “The proposed housing will potentially utilize crawlspaces, garden level basements, or full basements.” Monitoring/observations of groundwater fluctuations have not been conducted. If basements are planned **CGS recommends the county require a groundwater monitoring/observation program prior to the preliminary plan’s approval to determine if basements are feasible and if an underdrain system could be employed for this site.**”*

Entech Response: Three additional test borings were drilled in the areas where groundwater was previously encountered at 3 to 3.5 feet below the surface grade, and near an area which previously had standing water. The Test Boring Location Map, and Test Boring Logs are included with this letter. Soils encountered in the test borings consisted of 3 to 9 feet of silty sand overlying slightly silty to silty sandstone and sandy claystone. Groundwater was encountered in Test Boring No. 1A at 13 feet during drilling, and at 11.5 feet the following day. Test Borings Nos. 2A and 3A

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did not encounter groundwater during or subsequent to drilling. The test borings were drilled to 20 feet. It is anticipated that these areas will be raised during future site grading of the development.

While the test borings were drilled in October (not typically high water), they do show a significant drop in water levels. The water levels in the area will be affected by development. Drainage improvements along roads and utility underdrains will intercept water. In our opinion, the site can be developed based on the preliminary plan. Adjustments to grades and/or type of construction (basement/crawlspace) should be evaluated as plans are developed.

CGS Comment: *“Entech’s response to CGS’s review indicated that three additional test holes were drilled, and groundwater was encountered in one of the test holes at 13 feet below grade during drilling and at 11.5 feet the following day, but also indicated that these additional test borings were drilled in October (when water levels are lower). CGS recommends that these test holes continue to be monitored through winter and spring”.*

Entech Response: Additional water measurements were taken on the borings in January and May 2023, and are included on Table No. 1 of this letter. Ground water levels were measured at depths ranging from 5 to 16 feet below the existing surface grade. Test Boring No. 2A was damaged between the January and May readings.

Interceptor drains will likely be needed in areas of cuts where shallow groundwater is encountered. The groundwater depth at 3A is not expected to affect the proposed structures. Additional site investigation will need to be conducted as development plans are finalized. Basement feasibility should be determined on a block by block basis pending the results of additional site investigation and approved grading plans. Currently cuts of up to 7 feet are proposed in the general area of Test Boring No. 1A.

We trust this has provided you with the information you required. In summary, based on the analysis of this site, the proposed development meets stability requirements. If you have any questions or need additional information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.



Logan L. Langford, P.G.
Geologist

LLL

Entech Job No. 220571
AAprojects/2022/220571 cgs response 5.15.23

Reviewed by



Joseph C. Goode, Jr., P.E.
President

Table 1: Summary of Depth to Bedrock and Groundwater

Test Boring No.	Depth of Bedrock (ft.)	Depth of Groundwater (ft.) (Date Measured)		
		10/15/2022	1/12/2023	5/15/2023
1A	9	11.5	16	8.7
2A	8	>18	5	Removed
3A	3	>19	>19	16.1

The available referral documents include the Response to Colorado Geological Survey Review (Entech Engineering, Job No. 220571, October 7, 2022), Soil, Geology, and Geologic Hazard Study, Sterling Ranch East – Preliminary Plan No. 1 (Entech Engineering, Job No. 220571, April 19, 2022), Preliminary Plan (N.E.S. Inc., December 8, 2022), Letter of Intent (N.E.S., Inc., December 2022), and other documents.

Entech's response to CGS's comments and preliminary recommendations for mitigating the site's hazards are valid. We offer the following comments and recommendations.

1. In the test borings Entech previously drilled, groundwater was encountered at 3 to 19 feet below grade during drilling, and Entech observed areas of ponded water in some locations. According to Entech (page 2 of their report), "The proposed housing has will (sic) potentially utilize crawlspaces, garden level basements, or full basements." Entech's response to CGS's review indicated that three additional test holes were drilled, and groundwater was encountered in one of the test holes at 13 feet below grade during drilling and 11.5 feet the following day, but also indicated that these additional test borings were drilled in October (when water levels are lower). CGS recommends that these test holes continue to be monitored through winter and spring.

We agree with Entech (page 12 of their report), "A minimum separation of 3 feet between foundation components and groundwater levels are recommended." Proposed floor levels should be at least three feet (preferably five feet) above maximum anticipated groundwater levels and maintained year-round. CGS recommends no below-grade construction in areas with seasonal shallow groundwater levels within three feet of proposed floor levels.

2. Page 12 of Entech's report states, "In areas where high subsurface moisture conditions are anticipated periodically, subsurface perimeter drains will be necessary to help prevent the intrusion of water into areas located below grade." According to the preliminary plans, an underdrain will be installed beneath the sanitary sewer for all residential streets. An underdrain system should be allowed ONLY if it can gravity discharge to a daylight outfall or is connected to an existing underdrain system that gravity discharges to a daylight outfall. CGS recommends the underground drainage system with connections to individual underdrains for each lot are shown in the plans. Individual foundation perimeter drains are intended to handle small amounts of intermittent, perched water and may NOT be used as the sole mitigation of persistent shallow groundwater conditions. Similar to other Sterling Ranch developments, if shallow groundwater conditions exist and mitigation measures are not possible, then NO basements should be permitted within the Sterling Ranch East development.

3. Entech identified areas containing potentially unstable slopes but states on page 11, "these areas are to be avoided" and provides a setback distance of 20 feet from the crest of these slopes unless stabilized. Once final grading is complete, Entech should review the grades to verify these areas will be avoided or regraded and that the appropriate setbacks from unstable slopes are adhered to.

Reviewed on 12.29.2022 by Amy Crandall, Engineering Geologist (acrandall@mines.edu, 303-384-2632)

EP-22-0102_1 Sterling Ranch East Phase I PUDSP224

Location: Sections 27, 28, 33 & 34, T12S, R65W, 6th P.M.
38.9616, -104.6693

761 SF lots on 321 acres for future residential development

The available referral documents include a Soil, Geology, and Geologic Hazard Study, Sterling Ranch East – Preliminary Plan No. 1 (Entech Engineering, Job No. 220571, April 19, 2022), Preliminary Plan (N.E.S. Inc., June 10, 2022), Letter of Intent (N.E.S., Inc., June 2022), Grading and Erosion Control Plans (Classic Consulting, April 1, 2022), and other documents.

As noted on page 1 of Entech's Soil, Geology, and Geologic Hazard Study (Entech Engineering, Inc., April 19, 2022), the hazards and constraints identified on this site include artificial fill, expansive soils, erosion, hydrocompaction, potentially unstable slopes, seasonal and potential seasonally shallow groundwater areas, floodplains, flowing/ponded water, and radon. Additionally, Entech's Engineering Geology/Geology Map (figure 7) separates the site into the following: floodplain (fp), potentially seasonal shallow groundwater areas (psw), seasonal groundwater area (sw), areas of ponded water (w), and potentially unstable slope (pu). Hydrocompaction (h) is also a hazard shown on the map but not listed in the legend. Entech makes appropriate preliminary recommendations for mitigating the site's hazards. We offer the following comments and recommendations.

1. Sheet 1 of the preliminary plan shows Filing 3 to the north of Sterling Ranch Rd. and north of Briargate Pkwy. Our review of the grading plans indicates that the parcel north of Sterling Ranch Rd. is Filing 1.
2. In the test borings drilled, groundwater was encountered at 3 to 19 feet below grade during drilling, and Entech observed areas of ponded water in some locations. According to Entech (page 2), "The proposed housing has will (sic) potentially utilize crawlspaces, garden level basements, or full basements." Monitoring/observations of groundwater fluctuations have not been conducted. If basements are planned, **CGS recommends the county require a groundwater monitoring/observation program** prior to the preliminary plan's approval to determine if basements are feasible and if an underdrain system could be employed for this site. To be effective, however, this monitoring should include measurements/observations through fall, winter, and spring and not merely during site-specific building investigations.

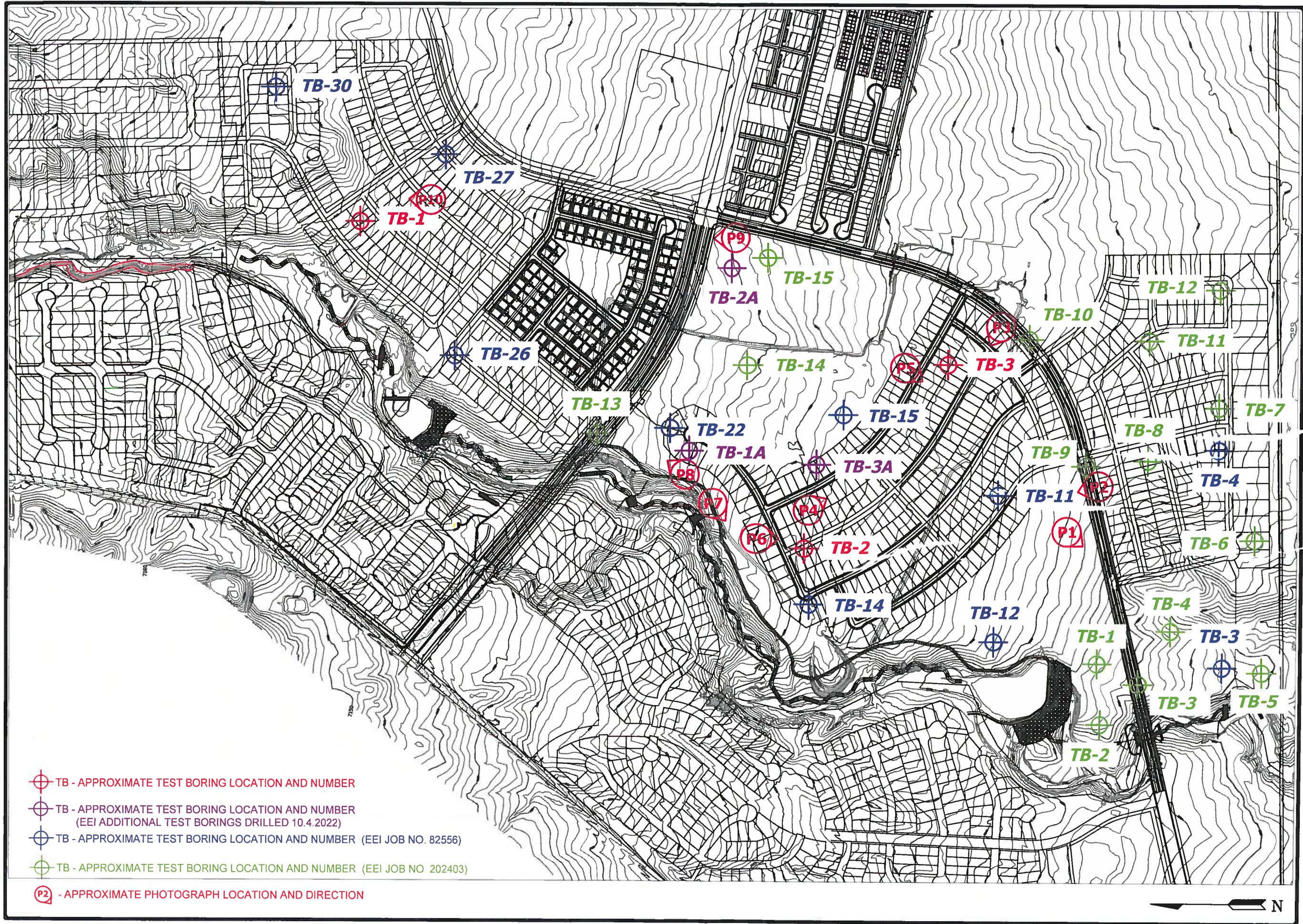
We agree with Entech (page 12), "A minimum separation of 3 feet between foundation components and groundwater levels are recommended." Proposed floor levels should be *at least three feet* (preferably five feet) above maximum anticipated groundwater levels and maintained year-round. CGS recommends no below-grade construction in areas with seasonal shallow groundwater levels within three feet of proposed floor levels.

3. According to the preliminary plan's geologic hazard disclosure statement on sheets 1 and 35, "*In Areas of High Groundwater: Due to high groundwater in the area, all foundations shall incorporate an underground drainage system. Under drains to be maintained by the District.*" **CGS recommends the underground drainage system and maintenance requirements are shown in the plans, and the "District" understands the maintenance requirements throughout the life of the development.**

Page 12 of Entech's report states, "In areas where high subsurface moisture conditions are anticipated periodically, subsurface perimeter drains will be necessary to help prevent the intrusion of water into areas located below grade." As individual underdrains are typically tied to the storm sewer system or underdrain system that gravity discharges to a daylight outfall, **CGS recommends that underdrain systems are designed early in the design stage and noted on the plans.** No drawings were included with the current referral documents showing an underdrain system. An underdrain system should be allowed ONLY if it can gravity discharge to a daylight outfall or is connected to an existing underdrain system that gravity discharges to a daylight outfall. Individual foundation perimeter drains are intended to handle small amounts of intermittent, perched water and may NOT be used as sole mitigation of persistent shallow groundwater conditions.

4. Entech identified areas containing potentially unstable slopes but states on page 11, "these areas are to be avoided" and provides a setback distance of 20 feet from the crest of these slopes unless stabilized. Once final grading is complete, Entech should review the grades to verify these areas will be avoided or regraded and that the appropriate setbacks from unstable slopes are adhered to.

Reviewed on 8.1.2022 by Amy Crandall, Engineering Geologist (acrandall@mines.edu, 303-384-2634)



- ⊕ TB - APPROXIMATE TEST BORING LOCATION AND NUMBER
- ⊕ TB - APPROXIMATE TEST BORING LOCATION AND NUMBER (EEI ADDITIONAL TEST BORINGS DRILLED 10.4.2022)
- ⊕ TB - APPROXIMATE TEST BORING LOCATION AND NUMBER (EEI JOB NO. 82556)
- ⊕ TB - APPROXIMATE TEST BORING LOCATION AND NUMBER (EEI JOB NO. 202403)
- Ⓚ - APPROXIMATE PHOTOGRAPH LOCATION AND DIRECTION

REVISION	BY

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SITE PLAN/TEST BORING LOCATION MAP
STERLING RANCH EAST
PRELIMINARY PLAN NO. 1
COLORADO SPRINGS, CO.
FOR: CLASSIC SRJ

DRAWN T.L.L. CHECKED
DATE 10/5/22
SCALE AS SHOWN
JOB NO. 220571
FIGURE NO. 1

TEST BORING NO. 1 A
 DATE DRILLED 10/4/2022
 Job # 220571

TEST BORING NO. 2 A
 DATE DRILLED 10/4/2022
 CLIENT CLASSIC SRJ
 LOCATION STERLING RANCH, PLAN 1

REMARKS

REMARKS

WATER @ 11.5', 10/5/22

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE,
 MOIST

SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST



Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		22	13.8	1
10	[Symbol]		50 8"	11.0	3
15	[Symbol]		50 8"	12.3	3
20	[Symbol]		43	18.2	3

DRY TO 18', 10/5/22

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, LOOSE, MOIST

CLAYSTONE, SANDY, GRAY
 BROWN, HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		8	24.1	1
10	[Symbol]		50 9"	7.8	4
15	[Symbol]		50 7"	13.7	4
20	[Symbol]		50 8"	13.5	4



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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	10/5/22

JOB NO.:
 220571

FIG NO.:
 2

TEST BORING NO. 3 A
 DATE DRILLED 10/4/2022
 Job # 220571

TEST BORING NO.
 DATE DRILLED
 CLIENT CLASSIC SRJ
 LOCATION STERLING RANCH, PLAN 1

REMARKS

REMARKS

DRY TO 19', 10/5/22

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, DENSE, MOIST

SANDSTONE, SLIGHTLY SILTY
 TO SILTY, FINE TO COARSE
 GRAINED, TAN, VERY DENSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0					-	0					
5			50 9"	8.3	3	5					
10			50 8"	6.2	3	10					
15			50 6"	14.5	3	15					
20			50 8"	7.2	3	20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

LLL

10/5/22

JOB NO.:
 220571

FIG NO.:
 3