When Recorded Mail To:
American Fork City
51 East Main
American Fork UT 84003

ENT 82017:2022 PG 1 of 99
ANDREA ALLEN
UTAH COUNTY RECORDER
2022 Jul 19 12:17 pm FEE 0.00 BY MC
RECORDED FOR AMERICAN FORK CITY

NOTICE OF INTEREST, BUILDING REQUIREMENTS, AND ESTABLISHMENT OF RESTRICTIVE COVENANTS

This Notice is recorded to bind the attached Geotechnical Study dated JUNE 7, 2019 along with the site grading plan to the property generally located at 7306 N. 7000 W. (address), American Fork, UT 84003 and therefore mandating that all construction be in compliance with said Geotechnical Study and site grading plan per the requirements of American Fork City ordinances and standards and specification including specifically Ordinance 07-10-47, Section 6-5, Restrictive Covenant Required and 6-2-4, Liquefiable Soils. Said Sections require establishment of a restrictive covenant and notice to property owners of liquefiable soils or other unique soil conditions and construction methods associated with the property.

Exhibit A – Legal Description of Property
Exhibit B – Geotechnical Study
Exhibit C – Site Grading Plan

Dated this 12 day of APRIL, 2022.

OWNER(S):

(Signature) _____ (Signature) _____

JACOB M HORAN (Printed Name) _____ (Printed Name)

MANAGER (Title) _____ (Title)

STATE OF UTAH)
§
COUNTY OF Utah)

On the 12 day of April, 2022, personally appeared before me Jacob M Horan and _____, Owner(s) of said Property, as (individuals and/or authorized representatives of a company), and acknowledged to me that such individuals or company executed the within instrument freely of their own volition and pursuant to the articles of organization where applicable.

NOTARY PUBLIC
TIFFANIE S. MACE
704022
COMMISSION EXPIRES
JANUARY 13, 2023
STATE OF UTAH

Notary Public
My Commission Expires: January 13, 2023

Approved as to form: American Fork City Attorney

Rev. 12/4/18

EXHIBIT A

Plat E1

BEGINNING AT A POINT LOCATED S89°52'20"W 3593.71 FEET AND SOUTH 622.41 FEET FROM THE SOUTHEAST CORNER OF SECTION 22, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 65°08'00" EAST 28.53 FEET; THENCE ALONG THE ARC OF A 441.70 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 137.86 FEET (CURVE HAVING A CENTRAL ANGLE OF 17°52'56" AND LONG CHORD BEARS S13°14'48"E 137.30 FEET); THENCE SOUTH 22°18'20" EAST 210.72 FEET; THENCE ALONG THE ARC OF A 364.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 140.87 FEET (CURVE HAVING A CENTRAL ANGLE OF 22°10'27" AND LONG CHORD BEARS S11°13'07"E 139.99 FEET); THENCE SOUTH 00°07'53" EAST 691.03 FEET; THENCE ALONG THE ARC OF A 25.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 40.00 FEET (CURVE HAVING A CENTRAL ANGLE OF 91°40'58" AND LONG CHORD BEARS S45°42'36"W 35.87 FEET); THENCE NORTH 88°26'55" WEST 121.46 FEET; THENCE NORTH 04°56'17" WEST 127.39 FEET; THENCE ALONG THE ARC OF A 63.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 48.67 FEET (CURVE HAVING A CENTRAL ANGLE OF 44°16'49" AND LONG CHORD BEARS N73°13'34"W 47.49 FEET); THENCE ALONG THE ARC OF A 15.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 14.48 FEET (CURVE HAVING A CENTRAL ANGLE OF 54°33'13" AND LONG CHORD BEARS N78°21'46"W 13.75 FEET); THENCE NORTH 10°19'08" WEST 64.54 FEET; THENCE ALONG THE ARC OF A 68.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 82.42 FEET (CURVE HAVING A CENTRAL ANGLE OF 69°26'34" AND LONG CHORD BEARS N34°35'23"E 77.46 FEET); THENCE NORTH 00°07'53" EAST 270.52 FEET; THENCE ALONG THE ARC OF A 15.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 42.49 FEET (CURVE HAVING A CENTRAL ANGLE OF 162°18'44" AND LONG CHORD BEARS S81°01'29"W 29.64 FEET); THENCE ALONG THE ARC OF A 63.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 88.21 FEET (CURVE HAVING A CENTRAL ANGLE OF 80°13'27" AND LONG CHORD BEARS N57°55'53"W 81.18 FEET); THENCE NORTH 29°57'13" WEST 124.72 FEET; THENCE NORTH 19°28'44" EAST 94.33 FEET; THENCE NORTH 13°25'43" WEST 136.56 FEET; THENCE SOUTH 89°54'00" EAST 42.70 FEET; THENCE SOUTH 89°03'36" EAST 189.37 FEET; THENCE NORTH 01°01'26" EAST 265.691 FEET TO THE POINT OF BEGINNING. AREA = 245,027 SF OR 5.63 ACRES BASIS OF BEARING IS NORTH 89°52'20" EAST ALONG SECTION LINE FROM THE SOUTH QUARTER CORNER OF SECTION 22, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE AND MERIDIAN, TO THE SOUTHEAST CORNER OF SAID SECTION 22. (NAD 27)

Plat E2

BEGINNING AT A POINT LOCATED S89°52'20"W 3830.50 FEET AND SOUTH 884.27 FEET FROM THE SOUTHEAST CORNER OF SECTION 22, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 13°25'43" EAST 136.56 FEET; THENCE SOUTH 19°28'44" WEST 94.33 FEET; THENCE SOUTH 71°44'43" EAST 60.17 FEET; THENCE SOUTH 29°57'13" EAST 124.72' FEET; THENCE ALONG THE ARC OF A 63.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 88.21 FEET (CURVE HAVING A CENTRAL ANGLE OF 80°13'27" AND LONG CHORD BEARS S57°55'53"E 81.18 FEET); THENCE ALONG THE ARC OF A 15.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 42.49 FEET (CURVE HAVING A CENTRAL ANGLE OF 162°18'44" AND LONG CHORD BEARS N81°01'29"E 29.64 FEET); THENCE SOUTH 00°07'53" WEST 270.52 FEET; THENCE ALONG THE ARC OF A 68.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 82.42 FEET (CURVE HAVING A CENTRAL ANGLE OF 69°26'34" AND LONG CHORD BEARS S34°35'23"W 77.46 FEET); THENCE SOUTH 10°19'08" EAST 64.54 FEET; THENCE ALONG THE ARC OF A 15.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 14.48 FEET (CURVE HAVING A CENTRAL ANGLE OF 54°33'13" AND LONG CHORD BEARS S78°21'46"E 13.75 FEET); THENCE ALONG THE ARC OF A 63.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 48.67 FEET (CURVE HAVING A CENTRAL ANGLE OF 44°16'49" AND LONG CHORD BEARS S73°13'34"E 47.49 FEET); THENCE NORTH 88°26'55" WEST 302.68 FEET; THENCE NORTH 05°06'36" WEST 125.80 FEET; THENCE NORTH 07°10'09" WEST 64.046 FEET; THENCE NORTH 09°52'59" WEST 112.76 FEET; THENCE SOUTH 71°44'36" WEST 102.25 FEET; THENCE NORTH 84°46'30" WEST 70.106 FEET; THENCE SOUTH 70°32'58" WEST 101.79 FEET; THENCE NORTH 19°51'06" WEST 13.73 FEET; THENCE NORTH 22°04'57" WEST 91.22 FEET; THENCE NORTH 26°41'54" WEST 75.07 FEET; THENCE NORTH 20°51'38" WEST 90.00 FEET; THENCE NORTH 32°06'23" WEST 49.78 FEET; THENCE NORTH 36°32'59" WEST 73.21 FEET; THENCE NORTH 38°55'54" WEST 75.61 FEET; THENCE NORTH 43°14'59" WEST 86.77 FEET; THENCE NORTH 43°38'15" WEST 64.02 FEET; THENCE NORTH 47°45'12" WEST 156.22 FEET; THENCE NORTH 10°58'14" WEST 68.58 FEET; THENCE SOUTH 89°53'59" EAST 281.13 FEET; THENCE SOUTH 89°54'00" EAST 413.00 FEET TO THE POINT OF BEGINNING. AREA = 414,018 SF OR 9.50 ACRES BASIS OF BEARING IS NORTH 89°52'20" EAST ALONG SECTION LINE FROM THE SOUTH QUARTER CORNER OF SECTION 22, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE AND MERIDIAN, TO THE SOUTHEAST CORNER OF SAID SECTION 22. (NAD 27)

TAYLOR GEOTECHNICAL

2650 North 180 East
Lehi, Utah 84043
P. 801-766-3246

April 5, 2022

Mr. Ben Hunter
Project Engineer
City of American Fork
51 East Main Street
American Fork, Utah 84003

Subject: **Geotechnical Engineering Review No. 1**
AF Crossing
6885 West 7300 North
American Fork Utah
American Fork Application No. 2018-106
TG Project No. 22032

Submittal Status: **GEOTECHNICAL ENGINEERING SUBMITTAL INCOMPLETE**

Dear Mr. Hunter:

At your request, Taylor Geotechnical (TG) reviewed the following documents provided to TG for review on March 21, 2022.

Earthtec Engineering, Geotechnical Study, Fenn-Willard Property, 7300 North 6800 West, American Fork, Utah, Earthtec Project No. 179072, prepared for Mr. Shane Morris, P.O. Box 1344, American Fork, Utah 84003, dated October 4, 2017.

CMT Engineering Laboratories, Geotechnical Review, Dixie Farms Development, 7300 North 6800 West, American Fork, Utah, CMT Project No. 12566, prepared for Mr. Scott Sensanbaugher, City of American Fork, 275 East 200 North, American Fork, Utah 84003, dated April 5, 2019.

Earthtec Engineering, Geotechnical Study, AF 191, 7300 North 7000 West, American Fork, Utah, Earthtec Project No. 198337, prepared for Ardero, Attention: Ms. Ginger Romriell, 520 South 850 East, Suite 100, Lehi, Utah 84043, dated June 7, 2019.

CMT Engineering Laboratories, Geotechnical Review, Dixie Farms Development, 7300 North 6800 West, American Fork, Utah, CMT Project No. 12566, prepared for Mr. Scott Sensanbaugher, City of American Fork, 275 East 200 North, American Fork, Utah 84003, dated July 26, 2019.

Earthtec Engineering, Pavement Consultation, Approximately 700 to 1100 West 200 to 1000 South, American Fork, Utah, Earthtec Project No. 218261, prepared for Red Pine Construction, Attention: Mr. Mike Demke, dated March 5, 2021.

Earthtec Engineering, Structural Fill Requirements, American Fork Property, 6885 West 7300 North, American Fork, Utah, Earthtec Project No. 22061, prepared for Red Pine, 520 South 850 East, a4, Lehi, Utah 84043, dated March 14, 2022.

The purpose of TG's review is to evaluate whether or not the Earthtec Engineering (EE) reports adequately address geotechnical engineering parameters at the site, consistent with concerns for public health, safety, welfare, reasonable professional standards-of-care and the American Fork City Sensitive Lands Ordinance 07-10-47. Section 4-2-2 of the of the American Fork City Sensitive Land Ordinance sub-item (10), states the report must be in accordance with the guidelines and recommendations of the "American Fork Sensitive Lands Geologic Hazards Study," Chapter 5 titled "Conclusions and Recommendations" prepared by RB&G Engineering, Inc., dated December 2006.

TG Conclusion

Based substantially in and on reliance of the technical documentation and assurances provided by EE, including their opinions and conclusions, it is TG's opinion the October 4, 2012, June 7, 2019, March 5, 2021, and the March 14, 2022, documents do not fulfill the requirements of the American Fork City Sensitive Lands Ordinance 07-10-47.

TG Recommendations

Based on the requirements of the American Fork City Sensitive Land Ordinance and the technical documentation provided by EE, TG recommends the City of American Fork (the City) not consider the EE submittals incomplete from a geotechnical perspective until the following items are adequately addressed.

1. *TG recommends the City request EE to provide a site plan indicating the area the recommendations provided in the March 114, 2022, letter are applicable.*

2. Section 10.3 Estimated Settlements (page 12) of the June 7, 2019, EE document states, "If the proposed foundations are properly designed and constructed using the parameters provided above, we estimate the total settlements should not exceed on inch and differential settlements should be one-half of the total settlement over a 25-foot length of continuous foundation, for non-earthquake conditions. Additional settlement could occur during a seismic event due to ground shaking if more than 3 feet of grading fill is placed above the existing ground surface, if loading conditions are greater than anticipated in Section 2, and/or if foundation soils are allowed to become wetted."

   TG recommends the City request EE to provide the calculations that substantiate the recommended bearing capacity and settlement analysis as provided in the June 7, 2019,

EE report. Due to the presence of soft clay layers, EE should also address secondary settlement in addition to primary settlement in order to provide a quantitative value for the total long term settlement. Variables used in the calculations should be substantiated.

3. The RB&G, 2006, report specifies for facilities designed according to the IBC seismic provisions and located within the moderate or high liquefaction hazard zones identified on Figure 6 of the RB&G report, that the recommended Site Class be based on a site-specific subsurface investigation to a depth of at least 30 feet, supplemented by at least one investigation to a depth of at least 70 feet and located within 2,000 feet of the site (see page 17, RGB 2006).

   The June 7, 2019, EE report referenced a 70-foot boring within 2000 feet of the site but did not provide the location for the boring, the boring log, and did not show how the boring data was used to identify the Site Class.

   TG recommends the City request EE provide the recommended Site Class in accordance the American Fork City Sensitive Land Ordinance with:

   a) *The referenced 70 foot boring shown on a site map;*

   b) *The log of the 70 foot boring provided for review; and,*

   c) *Substantiation of their respective site class recommendation.*

4. The subject site is below elevation 4593 feet. For sites below elevation 4593 feet, the Sensitive Land Ordinance requires the geotechnical report address artesian conditions at the site. The EE documents did not address artesian conditions at the property.

   TG recommends the City request EE address artesian conditions for the proposed development.

5. In the March 14, 2022, EE report, EE recommends ". . . that conventional strip and spread foundations be constructed entirely on a minimum of 12 inches of properly placed, compacted and testing structural fill extending to undisturbed native soils for structural loads up to 2,500 pound per linear footing of wall loads." EE also provided table for depth of structural fill for column loads.

   TG recommends the City request EE provide calculations that substantiate their allowable bearing capacity recommendations as provided in the March 14, 2022, document for strip and spot footings. EE should also address secondary settlement in addition to primary settlement in order to provide a quantitative value for the total long term settlement. Variable used in the calculations should be substantiated.

6. In the March 14, 2022, EE report, EE recommends floor slabs be supported on 6 inches of compacted structural fill in place of the 12 inches of compacted structural fill as recommended in the June 7, 2019, EE report.

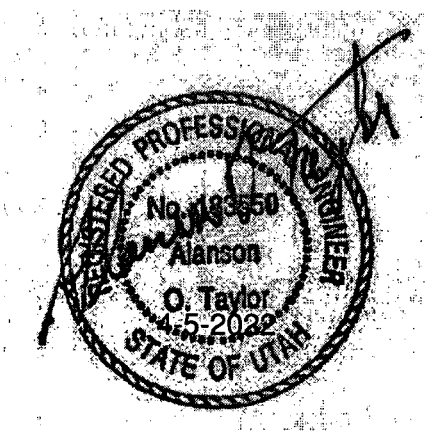
   TG recommends the City request EE to substantiate and provide an explanation for the change in recommendations.

Closure

All services performed by Taylor Geotechnical for this review were provided for the exclusive use and benefit of the City. No other person or entity is entitled to use or rely upon any of the information or reports generated by Taylor Geotechnical as a result of this review.

If you have any questions, please feel free to contact the undersigned. The opportunity to be of continued service to the City of American Fork is appreciated.

Respectfully submitted,
Taylor Geotechnical



Alanson O. Taylor, P.E.
Principal

1497 West 40 South
Lindon, Utah - 84042
Phone (801) 225-5711

840 West 1700 South #10
Salt Lake City, Utah - 84104
Phone (801) 787-9138

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516

May 20, 2022

Red Pine
520 South 850 East, A4
Lehi, UT 84043

Re: Response to Review
American Fork Crossing
6885 West 7300 North
American Fork, Utah
Job No: 220061

Gentlemen:

This letter is a response to the review by Taylor Geotechnical, dated April 5, 2022, of our geotechnical reports[1],[2] completed in 2017 and 2019. In addition, an addendum[3] was completed on March 14, 2022.

1. *TG recommends the City request EE to provide a site plan indicating the area the recommendations provided in the March 14, 2022, letter are applicable.*

Site Plan is provided at the end of this letter.

2. Section 10.3 Estimated Settlements (page 12) of the June 7, 2019, EE document states, "If the proposed foundations are properly designed and constructed using the parameters provided above, we estimate the total settlements should not exceed on inch and differential settlements should be one-half of the total settlement over a 25-foot length of continuous foundation, for non-earthquake conditions. Additional settlement could occur during a seismic event due to ground shaking if more than 3 feet of grading fill is placed above the existing ground surface, if loading conditions are greater than anticipated in Section 2, and/or if foundation soils are allowed to become wetted."

TG recommends the City request EE to provide the calculations that substantiate the recommended bearing capacity and settlement analysis as provided in the June 7, 2019, EE report. Due to the presence of soft clay layers, EE should also address secondary settlement in addition to primary settlement in order to provide a quantitative value for the total long term settlement. Variables used in the calculations should be substantiated.

The bearing capacity calculations and settlement calculations for the area labeled Area A in the 2017 and 2019 report are provided at the end of the letter. The areas labeled Area B and Area C are addressed in the 2022 Addendum and will be addressed in item number 5. Secondary settlement

[1] Geotechnical Study, Fenn-Willard Property, 7300 North 6800 West, American Fork, Utah, Earthtec Engineering, Project No. 179072, October 4, 2017.
[2] Geotechnical Study, AF 191, 7300 North 7000 West, American Fork, Utah, Earthtec Engineering, Project No. 198337, June 7, 2019.
[3] Structural Fill Requirements, American Fork Property, 6885 West 7300 North, American Fork, Utah, Earthtec Engineering, Project No. 220061, March 14, 2022.

calculations are provided at the end of the letter. The value of C_v used is a typical value for clay.

3. The RB&G, 2006, report specifies for facilities designed according to the IBC seismic provisions and located within the moderate or high liquefaction hazard zones identified on Figure 6 of the RB&G report, that the recommended Site Class be based on a site specific subsurface investigation to a depth of at least 30 feet, supplemented by at least one investigation to a depth of at least 70 feet and located within 2,000 feet of the site (see page 17, RGB 2006).

The June 7, 2019, EE report referenced a 70-foot boring within 2000 feet of the site but did not provide the location for the boring, the boring log, and did not show how the boring data was used to identify the Site Class.

TG recommends the City request EE provide the recommended Site Class in accordance the American Fork City Sensitive Land Ordinance with:

a) The referenced 70 foot boring shown on a site map;

An aerial photograph showing the location of Boring AF-06-3 in relation to the subject site is provided at the end of this letter.

b) The log of the 70 foot boring provided for review; and,

The log for Boring AF-06-3 is provided at the end of this letter.

c) Substantiation of their respective site class recommendation.

From the logs for Boring AF-06-3, the site is borderline D/E but based on the 30-foot boring from Job No. 179072, the site should be classified as Site Class E.

4. The subject site is below elevation 4593 feet. For sites below elevation 4593 feet, the Sensitive Land Ordinance requires the geotechnical report address artesian conditions at the site. The EE documents did not address artesian conditions at the property.

TG recommends the City request EE address artesian conditions for the proposed development.

Groundwater was encountered at depths of 1 to 10 feet in the explorations. No evidence of higher groundwater was encountered. No artesian conditions were encountered during our explorations.

5. In the March 14, 2022, EE report, EE recommends ". . . that conventional strip and spread foundations be constructed entirely on a minimum of 12 inches of properly placed, compacted and testing structural fill extending to undisturbed native soils for structural loads up to 2,500 pound per linear footing of wall loads." EE also provided table for depth of structural fill for column loads.

TG recommends the City request EE provide calculations that substantiate their allowable bearing capacity recommendations as provided in the March 14, 2022, document for strip and spot footings. EE should also address secondary settlement in addition to primary settlement in order to provide a quantitative value for the total long term settlement. Variables used in the calculations should be substantiated.

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Calculations are provided as 2019 settlement calculations at the end of the letter. A Coefficient of Consolidation was assumed using the NAVFAC Design Manual and the average liquid limit of the clay soils found on the site of 50. This indicates that 96% of settlement will occur within 1 year, therefore long term settlement is negligible. See attached documentation.

6. In the March 14, 2022, EE report, EE recommends floor slabs be supported on 6 inches of compacted structural fill in place of the 12 inches of compacted structural fill as recommended in the June 7, 2019, EE report.

TG recommends the City request EE to substantiate and provide an explanation for the change in recommendations.

The structural loads for the floor slabs were changed from 100 psf to 50 psf.

General Conditions

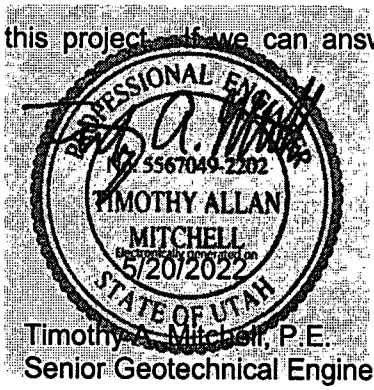
The information presented in this letter applies only to the soils encountered during the field investigation on the subject site. It should be noted that Earthtec Engineering was not involved with the selection of the foundation system being used, surface drainage control, floor slab design and construction, backfill compaction requirements against foundation walls, mass grading of the site, or any other aspect of the building construction. Site grading activities completed in other areas such as driveways, sidewalks, or detached structures, were not observed during this site visit, are outside of the scope of our work and are not addressed in this letter. The observations and recommendations presented in this letter were conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in this area at this time. No warranty or representation is intended in our proposals, contracts, reports, or letters.

Closure

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC ENGINEERING

Jeremy A. Balleck, E.I.T.
Staff Engineer



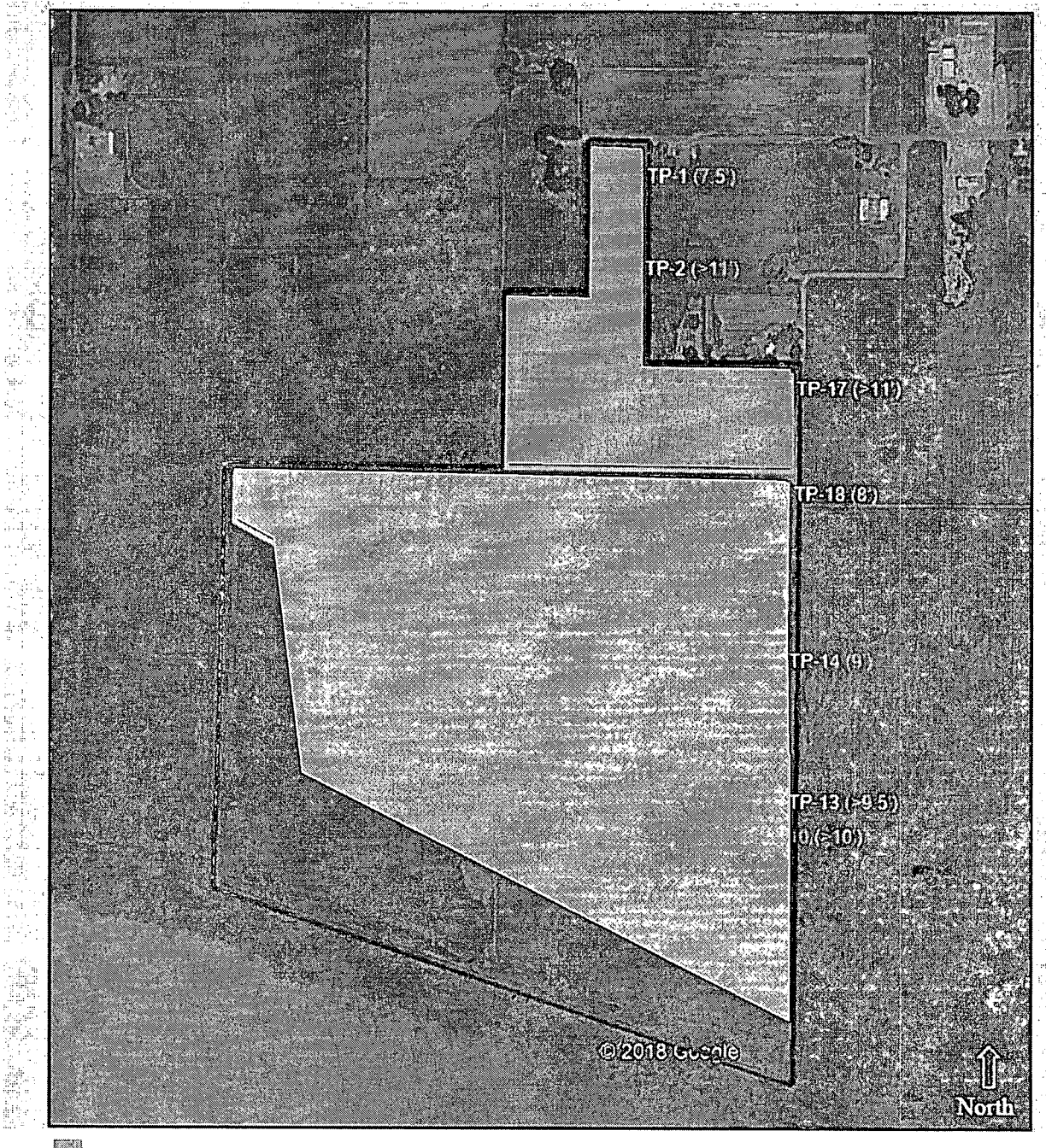
Timothy A. Mitchell, P.E.
Senior Geotechnical Engineer

JB/tm

Attachments:
Site Plan Showing Location of Updated Fill Requirements
Bearing Capacity Calculations
2017 Settlement Calculations
Secondary Settlement Calculations
Aerial Photograph Showing Location of Boring AF-06-3 in relation to subject site
Log Information for AF-06-3
2019 Settlement Calculations

SITE PLAN SHOWING LOCATION FOR UPDATED MARCH 14, 2022 RECOMMENDATIONS

AF 191
7300 NORTH 7000 WEST
AMERICAN FORK, UTAH



Unchanged – build on native soils

March 14, 2022 Letter – build on 12" of structural fill for loads up to 2,500 psf

PROJECT NO.: 198337	EARTHTEC ENGINEERING	FIGURE NO.:

Project: Fenn-Willard Area A
Job No. 179072

5/17/2022

Bearing Capacity after Meyerhoff[1]

Allowable Bearing Pressure, $q_{all} = (cN_cs_cd_c + \gamma DN_qs_qd_q + 0.5\gamma BN_\gamma s_\gamma d_\gamma r_\gamma)/(F.S.) \leq q_l$

Friction Angle, ϕ =	28	degrees				N_q =	14.7	$= e^{(\pi\tan\phi)}\tan^2(45+\phi/2)$
Cohesion, c =	0	psf				N_c =	25.8	$= (N_q - 1)\cot\phi$
Effective Unit Weight, γ =	110	pcf	=	17.3	kN/m2	N_g =	11.2	$= (N_q - 1)\tan(1.4\phi)$
Longest Wall Footing Length, L =	25	ft	=	7.6	m	K_p =	2.8	$= \tan^2(45+\phi/2)$
Bearing Pressure Limit, q_l =	1.5	ksf	=	0.1	mPa			
F.S. =	3.0					shaded areas indicate input values		

SUMMARY TABLES

Allowable Wall Footing Bearing Capacity, q_{all} - ksf

Footing Depth, D - ft	Structural Fill Depth, D_f - ft	Width - ft									
		1.50	1.67	1.83	2.00	2.50	3.00	3.50	4.00	4.50	5.00
1.00	0.00	0.96	0.99	1.02	1.05	1.15	1.26	1.37	1.48	1.50	1.50
2.50	0.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
1.00	1.50	2.03	1.99	1.96	1.95	1.96	2.00	2.07	2.16	2.12	2.07
2.50	1.50	3.18	3.02	2.89	2.78	2.54	2.39	2.27	2.19	2.12	2.07

Allowable Square Column Footing Bearing Capacity, q_{all} - ksf

Footing Depth, D - ft	Structural Fill Depth, D_f - ft	Width - ft									
		2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
1.00	0.00	1.43	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
2.50	0.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
1.00	1.50	3.67	3.38	3.06	2.84	2.67	2.54	2.43	2.34	2.27	2.21
2.50	1.50	3.84	3.38	3.06	2.84	2.67	2.54	2.43	2.34	2.27	2.21

1Bowles, Joseph E.; Foundation Analyses and Design; McGraw-Hill; 1988; pgs: 187-196
using Bowles bearing capacity reduction method (r_γ = 1- 0.25 log (B/6), B≥6 ft.).

Wall (Strip) Footing

Width, B =	1.50	1.67	1.83	2.00	2.50	3.00	3.50	4.00	4.50	5.00
s_c =	1.03	1.04	1.04	1.04	1.06	1.07	1.08	1.09	1.10	1.11
$s_n = s_\gamma$ =	1.02	1.02	1.02	1.02	1.03	1.03	1.04	1.04	1.05	1.06
Depth, D =	1									
d_c =	1.22	1.20	1.18	1.17	1.13	1.11	1.10	1.08	1.07	1.07
$d_n = d_\gamma$ =	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.04	1.03
r_γ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
q_{ult} =	2.9	3.0	3.1	3.2	3.5	3.8	4.1	4.4	4.8	5.1
q_{all} =	1.0	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Depth, D =	2.5									
d_c =	1.55	1.50	1.45	1.42	1.33	1.28	1.24	1.21	1.18	1.17
$d_n = d_\gamma$ =	1.28	1.25	1.23	1.21	1.17	1.14	1.12	1.10	1.09	1.08
r_γ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
q_{ult} =	6.5	6.5	6.5	6.5	6.7	6.9	7.2	7.5	7.8	8.1
q_{all} =	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.5	2.6	2.7

Square Column Footing

Width, B =	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
Depth, D =	1.00									
d_c =	1.13	1.11	1.10	1.08	1.07	1.07	1.06	1.06	1.05	1.05
$d_n = d_\gamma$ =	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.03	1.03	1.02
r_γ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98
q_{ult} =	4.3	4.7	5.0	5.4	5.8	6.2	6.6	7.0	7.3	7.7
q_{all} =	1.4	1.6	1.7	1.8	1.9	2.1	2.2	2.3	2.4	2.6
Depth, D =	2.5									
d_c =	1.33	1.28	1.24	1.21	1.18	1.17	1.15	1.14	1.13	1.12
$d_n = d_\gamma$ =	1.17	1.14	1.12	1.10	1.09	1.08	1.08	1.07	1.06	1.06
r_γ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98
q_{ult} =	8.3	8.6	8.9	9.2	9.5	9.9	10.2	10.6	10.9	11.2
q_{all} =	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7

Project: AF 191 Area B and C
Job No. 198337

5/17/2022

Bearing Capacity after Meyerhoff[1]

Allowable Bearing Pressure, $q_{all} = (cN_cs_cd_c + \gamma DN_qs_qd_q + 0.5\gamma BN_\gamma s_\gamma d_\gamma r_\gamma)/(F.S.) \leq q_l$

Friction Angle, ϕ =	28	degrees			N_q =	14.7	$= e^{(\pi \tan\phi)}\tan^2(45+\phi/2)$
Cohesion, c =	0	psf			N_c =	25.8	$= (N_q - 1)\cot\phi$
Effective Unit Weight, γ =	110	pcf	= 17.3	kN/m2	N_g =	11.2	$= (N_q - 1)\tan(1.4\phi)$
Longest Wall Footing Length, L =	25	ft	= 7.6	m	K_p =	2.8	$= \tan^2(45+\phi/2)$
Bearing Pressure Limit, q_l =	1.5	ksf	= 0.1	mPa			
F.S. =	3.0				shaded areas indicate input values		

SUMMARY TABLES

Allowable Wall Footing Bearing Capacity, q_{all} - ksf

Footing	Structural Fill	Width - ft									
Depth, D - ft	Depth, D_f - ft	1.50	1.67	1.83	2.00	2.50	3.00	3.50	4.00	4.50	5.00
1.00	0.00	0.96	0.99	1.02	1.05	1.15	1.26	1.37	1.48	1.50	1.50
2.50	0.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
1.00	1.00	1.66	1.64	1.64	1.64	1.68	1.75	1.83	1.92	1.91	1.87
2.50	1.00	2.60	2.49	2.41	2.34	2.18	2.08	2.01	1.95	1.91	1.87

Allowable Square Column Footing Bearing Capacity, q_{all} - ksf

Footing	Structural Fill	Width - ft									
Depth, D - ft	Depth, D_f - ft	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
1.00	0.00	1.43	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
2.50	0.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
1.00	4.00	9.69	8.17	6.89	6.00	5.35	4.86	4.48	4.17	3.91	3.70
2.50	4.00	10.14	8.17	6.89	6.00	5.35	4.86	4.48	4.17	3.91	3.70

1Bowles, Joseph E.; Foundation Analyses and Design; McGraw-Hill; 1988; pgs: 187-196

using Bowles bearing capacity reduction method (r_γ = 1- 0.25 log (B/6), B≥6 ft.).

Wall (Strip) Footing

Width, B =	1.50	1.67	1.83	2.00	2.50	3.00	3.50	4.00	4.50	5.00
s_c =	1.03	1.04	1.04	1.04	1.06	1.07	1.08	1.09	1.10	1.11
$s_n = s_\gamma$ =	1.02	1.02	1.02	1.02	1.03	1.03	1.04	1.04	1.05	1.06
Depth, D =	1									
d_c =	1.22	1.20	1.18	1.17	1.13	1.11	1.10	1.08	1.07	1.07
$d_n = d_\gamma$ =	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.04	1.03
r_γ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
q_{ult} =	2.9	3.0	3.1	3.2	3.5	3.8	4.1	4.4	4.8	5.1
q_{all} =	1.0	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Depth, D =	2.5									
d_c =	1.55	1.50	1.45	1.42	1.33	1.28	1.24	1.21	1.18	1.17
$d_n = d_\gamma$ =	1.28	1.25	1.23	1.21	1.17	1.14	1.12	1.10	1.09	1.08
r_γ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
q_{ult} =	6.5	6.5	6.5	6.5	6.7	6.9	7.2	7.5	7.8	8.1
q_{all} =	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.5	2.6	2.7

Square Column Footing

Width, B =	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
Depth, D =	1.00									
d_c =	1.13	1.11	1.10	1.08	1.07	1.07	1.06	1.06	1.05	1.05
$d_n = d_\gamma$ =	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.03	1.03	1.02
r_γ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98
q_{ult} =	4.3	4.7	5.0	5.4	5.8	6.2	6.6	7.0	7.3	7.7
q_{all} =	1.4	1.6	1.7	1.8	1.9	2.1	2.2	2.3	2.4	2.6
Depth, D =	2.5									
d_c =	1.33	1.28	1.24	1.21	1.18	1.17	1.15	1.14	1.13	1.12
$d_n = d_\gamma$ =	1.17	1.14	1.12	1.10	1.09	1.08	1.08	1.07	1.06	1.06
r_γ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98
q_{ult} =	8.3	8.6	8.9	9.2	9.5	9.9	10.2	10.6	10.9	11.2
q_{all} =	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7

2017 Settlement--Footings

SETTLEMENT OF FOOTINGS								
Project:	Fenn-Willard		B1					
B:	4.47214	feet (width or diameter)			b =	2.236068	ft (1/2 width/dia)	
L:	4.47214	feet (length)			l =	2.236068	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	30
unit weight:	120	pcf (above footing depth)					Strip Load,k:	5
allowable q:	1500	psf						
footing type:	3	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	6	feet						

DEFINE SOIL PROFILE:			preconsol		Density	Collapse	Below ftg.	Avg.
Soil type	C_c'	C_r'	press.,σ_c'(psf)	OCR	(pcf)	(%)	depth (ft)	OCR
Fill	0.001	0.000125			135		0.0	1.00
CH	0.069	0.024	2500		120	-0.5	17.5	2.36

	SQUARE/RECTANGULAR FOOTINGS (Westergard Method)...							
	Below ftg.		Increased	avg. ovrbn.	Incremnt.	Collapse	Total	
Soil Type	depth (ft)	Influence	Stress (psf)	press.(psf)	Sett. (in.)	Sett. (in.)	Set. (in.)	
Fill	0	0.000	0.0	300.0	0.000	0.000	0.00	
CH	1	0.838	1256.8	420.0	0.173	-0.060	0.11	
CH	2	0.688	1032.1	540.0	0.134	-0.060	0.19	
CH	3	0.559	838.1	660.0	0.103	-0.060	0.23	
CH	4	0.452	678.4	748.8	0.081	-0.060	0.25	
CH	5	0.367	550.9	806.4	0.065	-0.060	0.26	
CH	6	0.300	450.6	864.0	0.052	-0.060	0.25	
CH	7	0.248	372.0	921.6	0.042	-0.060	0.23	
CH	8	0.207	310.2	979.2	0.034	-0.060	0.20	
CH	9	0.174	261.3	1036.8	0.028	-0.060	0.17	<---2B
CH	10	0.148	222.4	1094.4	0.023	-0.060	0.14	
CH	11	0.127	191.0	1152.0	0.019	-0.060	0.09	
CH	12	0.110	165.5	1209.6	0.016	-0.060	0.05	
CH	13	0.096	144.5	1267.2	0.014	-0.060	0.00	
CH	14	0.085	127.1	1324.8	0.011	-0.060	-0.04	
CH	15	0.075	112.6	1382.4	0.010	-0.060	-0.09	
CH	16	0.067	100.4	1440.0	0.008	-0.060	-0.15	
CH	17	0.060	89.9	1497.6	0.007	-0.060	-0.20	
CH	17.5	0.057	85.3	1526.4	0.003	-0.030	-0.23	

2017 Settlement--Footings

SETTLEMENT OF FOOTINGS								
Project:	Fenn-Willard		TP2					
B:	4.47214	feet (width or diameter)			b =	2.236068	ft (1/2 width/dia)	
L:	4.47214	feet (length)			l =	2.236068	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	30
unit weight:	124	pcf (above footing depth)					Strip Load,k:	5
allowable q:	1500	psf						
footing type:	3	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	10	feet						

DEFINE SOIL PROFILE:			preconsol		Density	Collapse	Below ftg.	Avg.
Soil type	C_c'	C_r'	press.,σ_c'(psf)	OCR	(pcf)	(%)	depth (ft)	OCR
Fill	0.001	0.000125			135		0.0	1.00
CL	0.072	0.009	2000		124	0.8	7.5	2.49
GM	0.02	0.0025			130		17.5	1.00

SQUARE/RECTANGULAR FOOTINGS (Westergard Method)...

Soil Type	Below ftg. depth (ft)	Influence	Increased Stress (psf)	avg. ovrbn. press.(psf)	Incremnt. Sett. (in.)	Collapse Sett. (in.)	Total Set. (in.)	
Fill	0	0.000	0.0	310.0	0.000	0.000	0.00	
CL	1	0.838	1256.8	434.0	0.064	0.096	0.16	
CL	2	0.688	1032.1	558.0	0.049	0.096	0.30	
CL	3	0.559	838.1	682.0	0.038	0.096	0.44	
CL	4	0.452	678.4	806.0	0.029	0.096	0.56	
CL	5	0.367	550.9	930.0	0.022	0.096	0.68	
CL	6	0.300	450.6	1054.0	0.017	0.096	0.79	
CL	7	0.248	372.0	1178.0	0.013	0.096	0.90	
CL	7.5	0.226	339.2	1240.0	0.006	0.048	0.96	
GM	8.5	0.110	165.0	1307.6	0.012	0.000	0.97	
GM	9.5	0.091	136.6	1375.2	0.010	0.000	0.98	<---2B
GM	10.5	0.076	114.6	1442.8	0.008	0.000	0.99	
GM	11.5	0.065	97.4	1510.4	0.007	0.000	0.99	
GM	12.5	0.056	83.8	1578.0	0.005	0.000	1.00	
GM	13.5	0.048	72.7	1645.6	0.005	0.000	1.00	
GM	14.5	0.042	63.6	1713.2	0.004	0.000	1.01	
GM	15.5	0.037	56.1	1780.8	0.003	0.000	1.01	
GM	16.5	0.033	49.9	1848.4	0.003	0.000	1.01	
GM	17.5	0.030	44.6	1916.0	0.002	0.000	1.02	

2017 Settlement--Footings

SETTLEMENT OF FOOTINGS								
Project:	Fenn-Willard		B1					
B:	3.33333	feet (width or diameter)			b =	1.666667	ft (1/2 width/dia)	
L:	25	feet (length)			l =	12.5	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	30
unit weight:	120	pcf (above footing depth)					Strip Load,k:	5
allowable q:	1500	psf						
footing type:	1	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	6	feet						

DEFINE SOIL PROFILE:			preconsol		Density	Collapse	Below ftg.	Avg.
Soil type	C_c'	C_r'	press.,σ_c'(psf)	OCR	(pcf)	(%)	depth (ft)	OCR
Fill	0.001	0.000125			135		0.0	1.00
CH	0.069	0.024	2500		120	-0.5	17.5	2.36

	STRIP FOOTINGS...							
	Below ftg.		Increased	avg. ovrbn.	Incremnt.	Collapse	Total	
Soil Type	depth (ft)	Influence	Stress (psf)	press.(psf)	Sett. (in.)	Sett. (in.)	Set. (in.)	
Fill	0	0.000	0.0	300.0	0.000	0.000	0.00	
CH	1	0.937	1405.2	420.0	0.184	-0.060	0.12	
CH	2	0.755	1133.1	540.0	0.141	-0.060	0.21	
CH	3	0.593	889.6	660.0	0.107	-0.060	0.25	
CH	4	0.477	716.0	748.8	0.084	-0.060	0.28	
CH	5	0.396	593.7	806.4	0.069	-0.060	0.28	
CH	6	0.337	505.0	864.0	0.058	-0.060	0.28	
CH	7	0.292	438.4	921.6	0.049	-0.060	0.27	<---2B
CH	8	0.258	386.8	979.2	0.042	-0.060	0.25	
CH	9	0.231	345.8	1036.8	0.036	-0.060	0.23	
CH	10	0.208	312.6	1094.4	0.031	-0.060	0.20	
CH	11	0.190	285.0	1152.0	0.028	-0.060	0.17	
CH	12	0.175	261.9	1209.6	0.025	-0.060	0.13	
CH	13	0.161	242.2	1267.2	0.022	-0.060	0.09	
CH	14	0.150	225.2	1324.8	0.020	-0.060	0.05	
CH	15	0.140	210.5	1382.4	0.018	-0.060	0.01	
CH	16	0.132	197.5	1440.0	0.016	-0.060	-0.03	
CH	17	0.124	186.1	1497.6	0.015	-0.060	-0.08	
CH	17.5	0.121	180.8	1526.4	0.007	-0.030	-0.10	

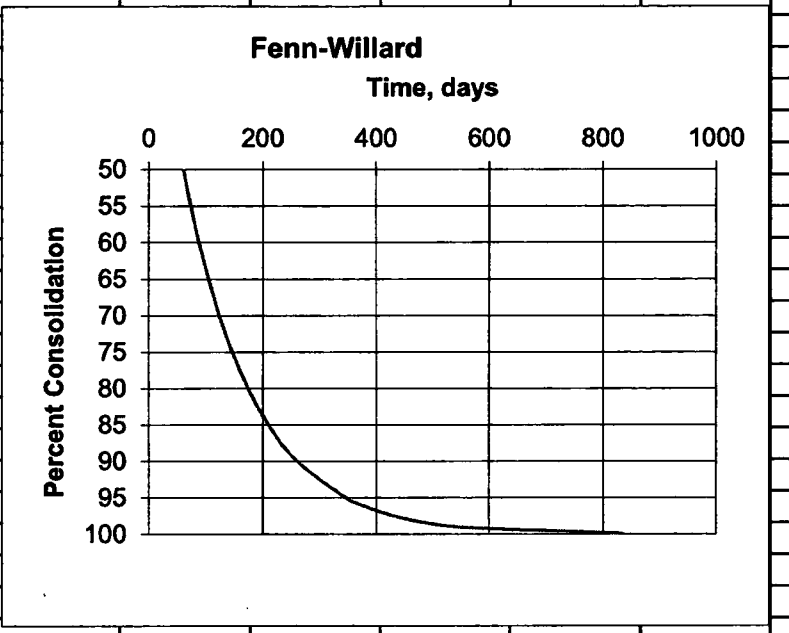
2017 Settlement--Footings

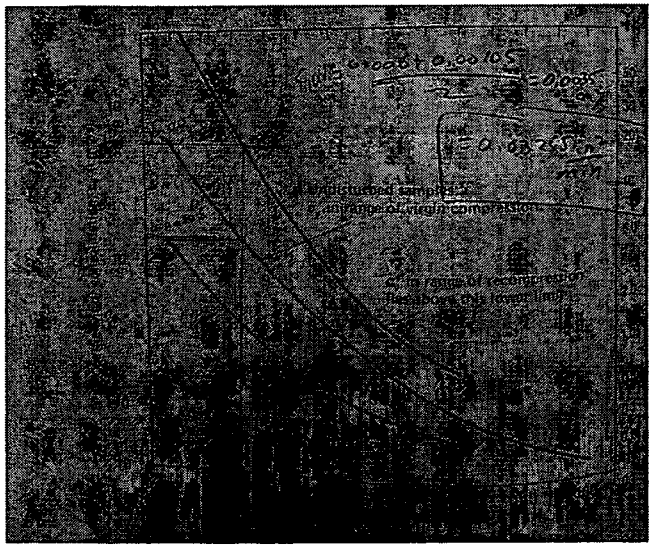
SETTLEMENT OF FOOTINGS								
Project:	Fenn-Willard		TP2					
B:	3.33333	feet (width or diameter)			b =	1.666667	ft (1/2 width/dia)	
L:	25	feet (length)			l =	12.5	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	30
unit weight:	124	pcf (above footing depth)					Strip Load,k:	5
allowable q:	1500	psf						
footing type:	1	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	10	feet						

DEFINE SOIL PROFILE:			preconsol		Density	Collapse	Below ftg.	Avg.
Soil type	C_c'	C_r'	press.,σ_c'(psf)	OCR	(pcf)	(%)	depth (ft)	OCR
Fill	0.001	0.000125			135		0.0	1.00
CL	0.072	0.009	2000		124	0.8	7.5	2.49
GM	0.02	0.0025			130		17.5	1.00

	STRIP FOOTINGS...							
	Below ftg.		Increased	avg. ovrbn.	Incremnt.	Collapse	Total	
Soil Type	depth (ft)	Influence	Stress (psf)	press.(psf)	Sett. (in.)	Sett. (in.)	Set. (in.)	
Fill	0	0.000	0.0	310.0	0.000	0.000	0.00	
CL	1	0.937	1405.2	434.0	0.068	0.096	0.16	
CL	2	0.755	1133.1	558.0	0.052	0.096	0.31	
CL	3	0.593	889.6	682.0	0.039	0.096	0.45	
CL	4	0.477	716.0	806.0	0.030	0.096	0.57	
CL	5	0.396	593.7	930.0	0.023	0.096	0.69	
CL	6	0.337	505.0	1054.0	0.018	0.096	0.81	
CL	7	0.292	438.4	1178.0	0.015	0.096	0.92	<---2B
CL	7.5	0.274	411.0	1240.0	0.007	0.048	0.97	<---2B
GM	8.5	0.243	365.2	1307.6	0.026	0.000	1.00	
GM	9.5	0.219	328.4	1375.2	0.022	0.000	1.02	
GM	10.5	0.199	298.2	1442.8	0.020	0.000	1.04	
GM	11.5	0.182	273.0	1510.4	0.017	0.000	1.06	
GM	12.5	0.168	251.7	1578.0	0.015	0.000	1.07	
GM	13.5	0.156	233.4	1645.6	0.014	0.000	1.09	
GM	14.5	0.145	217.6	1713.2	0.012	0.000	1.10	
GM	15.5	0.136	203.8	1780.8	0.011	0.000	1.11	
GM	16.5	0.128	191.6	1848.4	0.010	0.000	1.12	
GM	17.5	0.121	180.8	1916.0	0.009	0.000	1.13	

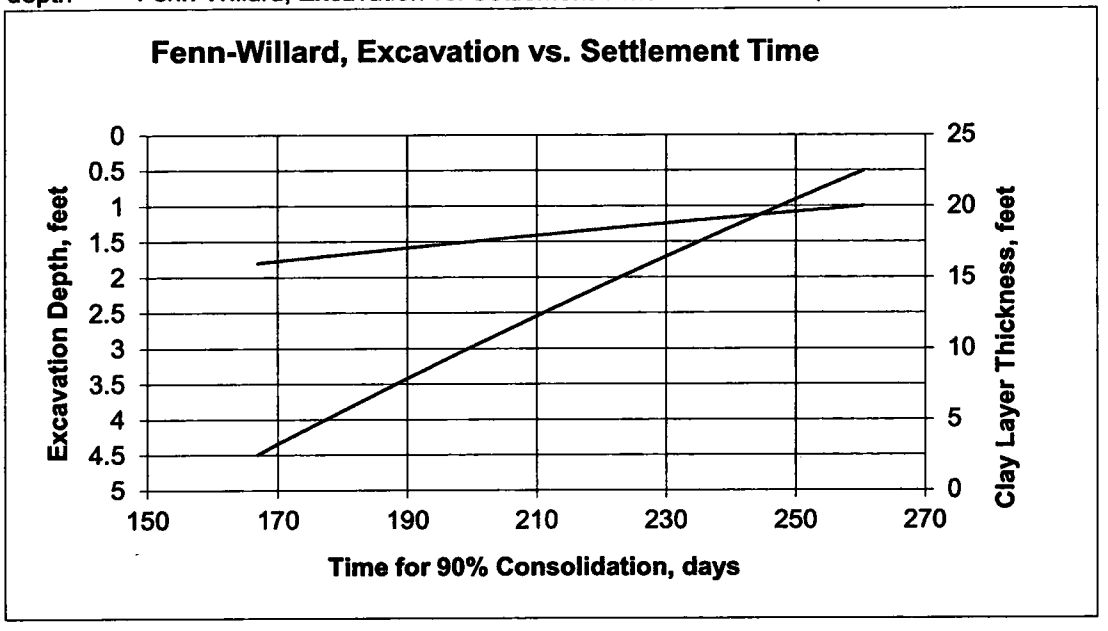
TIME RATE OF SETTLEMENT						
Project # & sample:	Fenn-Willard					
Coef. of consol.,Cv:	0.03255	in^2/min.				
Actual layer height:	20	ft				
Height for calcs, H:	10	ft				
		consol. time				
Deg. of Consol, %	Tv	days	weeks	months	years	
50	0.197	61	8.6	2.0	0.2	
55	0.238	73	10.4	2.4	0.2	
60	0.287	88	12.6	2.9	0.2	
65	0.342	105	15.0	3.5	0.3	
70	0.403	124	17.7	4.1	0.3	
75	0.478	147	21.0	4.8	0.4	
80	0.567	174	24.9	5.7	0.5	
85	0.684	210	30.0	6.9	0.6	
90	**0.848**	**261**	**37.2**	**8.6**	**0.7**	
95	1.127	346	49.5	11.4	0.9	
96	1.219	375	53.5	12.3	1.0	
97	1.335	410	58.6	13.5	1.1	
98	1.500	461	65.8	15.2	1.3	
99	1.781	547	78.2	18.0	1.5	
99.9	2.714	834	119.1	27.4	2.3	





Clay thick	days @ 90	Excavation depth
20	261	0.5
19.5	248	1
19	235	1.5
18.5	223	2
18	211	2.5
17.5	199	3
17	188	3.5
16.5	177	4
16	167	4.5

Fenn-Willard, Excavation vs. Settlement Time



AERIAL PHOTOGRAPH SHOWING LOCATION OF BORING AF-06-3 IN RELATION TO SITE

AF 191
7300 NORTH 7000 WEST
AMERICAN FORK, UTAH

Boring AF-06-3

N

Not to Scale

PROJECT NO.: 198337	EARTHTEC ENGINEERING	FIGURE NO.:

DRILL HOLE LOG

BORING NO. 06-03

SHEET 1 OF 2

PROJECT: AMERICAN FORK SENSITIVE LAND STUDY

CLIENT: HORROCKS ENGINEERS

LOCATION: SOUTH END OF 6650 WEST

DRILLING METHOD: CME-55 NO. 1 / N.W. CASING

DRILLER: T. KERN

DEPTH TO WATER - INITIAL: ▽ N.M. AFTER 24 HOURS: ▼ N.M.

PROJECT NUMBER: 200601.022

DATE STARTED: 8/16/06

DATE COMPLETED: 8/17/06

GROUND ELEVATION: NOT MEASURED

LOGGED BY: M. HANSEN, J.H.B.

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
				9	3,11,14,(51)	CL	gray-brown, dry, stiff								
	5			12	0,1/12",(2) *0.03*	CL	brown, moist, very soft								
	10			12	Pushed *0.16*	CL	lt. brown, moist, soft — LEAN CLAY W/SAND & SILTY SAND LENSES & LAYERS TO 3" THICK								
	15			18	3,2,3,(8) *0.60*	CL	gray, moist, stiff								
	20			12	Pushed *0.56*	CL-1	gray, moist, stiff		19.1	31	12	0	17	83	UC
	25			18	6,4,6,(13) *0.56*	SM	gray, wet, loose — SILTY SAND								
						CL-ML	brown-gray, moist, stiff — SILTY CLAY								
	30			15	Pushed *0.56*	CL-ML	gray, moist, stiff								
	35			18	0/18",(0) *0.55*	CL	gray, moist, stiff								
	40			18	Pushed *0.61*	CL-2	gray, moist, stiff — LEAN CLAY distorted bedding		32.8	42	12	0	1	99	UC
	45			18	0/18",(0) *0.38* *0.21*	CL	gray, moist, soft to firm								
				14	Pushed *0.32*	CL	gray, moist, firm								

LOGV1_COLOR AFSENSLAND_COLOR.GPJ US EVAL.GDT 12/11/06

RB&G ENGINEERING INC.
PROVO, UTAH

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear

= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

DRILL HOLE LOG

BORING NO. 06-03

SHEET 2 OF 2

PROJECT: AMERICAN FORK SENSITIVE LAND STUDY
CLIENT: HORROCKS ENGINEERS
LOCATION: SOUTH END OF 6650 WEST
DRILLING METHOD: CME-55 NO. 1 / N.W. CASING
DRILLER: T. KERN
DEPTH TO WATER - INITIAL: ▽ N.M. AFTER 24 HOURS: ▽ N.M.

PROJECT NUMBER: 200601.022
DATE STARTED: 8/16/06
DATE COMPLETED: 8/17/06
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J.H.B.

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter: Liquid Limit	Atter: Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
	55			18	1,3,5,(8) 0.24 0.49	CL	gray, moist, soft to firm LEAN CLAY								
	60			10	Pushed 0.48	CL-1	gray, moist, firm		22.1	32	14	0	2	98	UC
	65			13	3,7,9,(14) 0.30	CL-ML	gray, moist, firm SANDY SILTY CLAY		23.5	25	6	0	20	80	
	70			16	34,38,33,(61)	GP-GM	dk. gray, wet, dense GRAVEL W/SILT & SAND								
	75			14	7,5,6,(9) 0.56	CL	gray, moist, stiff LEAN CLAY W/SILTY SAND LENSES & LAYERS TO 5" THICK								
	80			17	Pushed 0.45	CL-2	gray, moist, stiff		23.4	39	17	0	16	84	UC
	85			8	45,25,48,(58)	GP-GM	gray, wet, dense GRAVEL W/SILT & SAND								
	90			12	Pushed 0.89	CL	brown-gray, moist, stiff LEAN CLAY								
	95			18	30,11,2,(10) 0.40	GC CL	gray, wet, med. dense CLAYEY GRAVEL gray, moist, firm SANDY LEAN CLAY								
				12	Pushed	CL-2	gray, moist		22.6	35	17	0	18	82	UC

LOGV1 COLOR AFSENSLAND COLOR.GPJ US EVAL.GDT 12/1/06

RB&G ENGINEERING INC.
PROVO, UTAH

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) — Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 — Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; 0.45 — Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear

= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

2019 Settlement--Footings

SETTLEMENT OF FOOTINGS								
Project:	AF191		TP9					
B:	1.66667	feet (width or diameter)			b =	0.833333	ft (1/2 width/dia)	
L:	25	feet (length)			l =	12.5	ft (1/2 length)	
foot. depth:	3.5	feet					Spread Load,k:	20
unit weight:	96	pcf (above footing depth)					Strip Load,k:	2.5
allowable q:	1500	psf						
footing type:	1	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	10	feet						

DEFINE SOIL PROFILE:			preconsol		Density	Collapse	Below ftg.	Avg.
Soil type	C_c'	C_r'	press.,σ_c'(psf)	OCR	(pcf)	(%)	depth (ft)	OCR
Fill	0.001	0.000125			135		1.0	1.00
SM	0.107	0.007	1600		96	1.5	16.5	1.32

	STRIP FOOTINGS...							
	Below ftg.		Increased	avg. ovrbn.	Incremnt.	Collapse	Total	
Soil Type	depth (ft)	Influence	Stress (psf)	press.(psf)	Sett. (in.)	Sett. (in.)	Set. (in.)	
Fill	1	0.755	1133.1	471.0	0.006	0.000	0.01	
SM	2	0.477	716.0	567.0	0.030	0.180	0.22	
SM	3	0.337	505.0	663.0	0.021	0.180	0.42	
SM	4	0.258	386.8	759.0	0.015	0.180	0.61	<---2B
SM	5	0.208	312.6	855.0	0.011	0.180	0.80	
SM	6	0.175	261.9	951.0	0.009	0.180	0.99	
SM	7	0.150	225.2	1015.8	0.007	0.180	1.18	
SM	8	0.132	197.5	1049.4	0.006	0.180	1.37	
SM	9	0.117	175.8	1083.0	0.005	0.180	1.55	
SM	10	0.106	158.4	1116.6	0.005	0.180	1.74	
SM	11	0.096	144.1	1150.2	0.004	0.180	1.92	
SM	12	0.088	132.2	1183.8	0.004	0.180	2.10	
SM	13	0.081	122.1	1217.4	0.003	0.180	2.29	
SM	14	0.076	113.4	1251.0	0.003	0.180	2.47	
SM	15	0.071	105.9	1284.6	0.003	0.180	2.65	
SM	16	0.066	99.3	1318.2	0.003	0.180	2.84	
SM	16.5	0.064	96.3	1335.0	0.001	0.090	2.93	

2019 Settlement--Footings

SETTLEMENT OF FOOTINGS								
Project:	AF191		TP9					
B:	3.16228	feet (width or diameter)			b =	1.581139	ft (1/2 width/dia)	
L:	3.16228	feet (length)			l =	1.581139	ft (1/2 length)	
foot. depth:	3.5	feet					Spread Load,k:	20
unit weight:	96	pcf (above footing depth)					Strip Load,k:	2.5
allowable q:	2000	psf						
footing type:	2	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	10	feet						

DEFINE SOIL PROFILE:			preconsol		Density	Collapse	Below ftg.	Avg.
Soil type	C_c'	C_r'	press.,σ_c'(psf)	OCR	(pcf)	(%)	depth (ft)	OCR
Fill	0.001	0.000125			135		4.0	1.00
SM	0.107	0.007	1600		96	1.5	16.5	1.16

	SQUARE/RECTANGULAR FOOTINGS (Boussinesq Method)...							
	Below ftg.		Increased	avg. ovrbn.	Incremnt.	Collapse	Total	
Soil Type	depth (ft)	Influence	Stress (psf)	press.(psf)	Sett. (in.)	Sett. (in.)	Set. (in.)	
Fill	1	0.878	1755.6	471.0	0.008	0.000	0.01	
Fill	2	0.578	1155.6	606.0	0.006	0.000	0.01	
Fill	3	0.361	722.9	741.0	0.004	0.000	0.02	
Fill	4	0.236	473.0	876.0	0.002	0.000	0.02	
SM	5	0.164	327.2	972.0	0.011	0.180	0.21	
SM	6	0.119	237.7	1068.0	0.007	0.180	0.40	
SM	7	0.090	179.6	1132.8	0.005	0.180	0.58	<--2B
SM	8	0.070	140.1	1166.4	0.004	0.180	0.77	
SM	9	0.056	112.1	1200.0	0.003	0.180	0.95	
SM	10	0.046	91.7	1233.6	0.003	0.180	1.13	
SM	11	0.038	76.3	1267.2	0.002	0.180	1.31	
SM	12	0.032	64.4	1300.8	0.002	0.180	1.50	
SM	13	0.028	55.1	1334.4	0.001	0.180	1.68	
SM	14	0.024	47.7	1368.0	0.001	0.180	1.86	
SM	15	0.021	41.7	1401.6	0.001	0.180	2.04	
SM	16	0.018	36.7	1435.2	0.001	0.180	2.22	
SM	16.5	0.017	34.5	1452.0	0.000	0.090	2.31	

TAYLOR GEOTECHNICAL

2650 North 180 East
Lehi, Utah 84043
P. 801-766-3246

June 9, 2022

Mr. Jeff Mortimer
Project Engineer
City of American Fork
51 East Main Street
American Fork, Utah 84003

Subject: **Geotechnical Engineering Review No. 2**
AF Crossing
6885 West 7300 North
American Fork Utah
American Fork Application No. 2018-106
TG Project No. 22032

Submittal Status: **GEOTECHNICAL ENGINEERING SUBMITTAL COMPLETE**

Dear Mr. Hunter:

At your request, Taylor Geotechnical (TG) reviewed the following documents provided to TG for review on June 7, 2022.

> Earthtec Engineering, Response to Review, American Fork Crossing, 6885 West 7300 North, American Fork, Utah, Earthtec Project No. 22061, prepared for Red Pine, 520 South 850 East, a4, Lehi, Utah 84043, dated May 20, 2022.

The May 20, 2022, Earthtec Engineering (EE) letter was prepared in response to the following TG review letter by TG:

> TG Geotechnical Engineering Review No. 1, AF Crossing 6885 West 7300 North, American Fork, Utah, American Fork Application No. 2018-106, TG Project No: 22032, prepared for Mr. Ben Hunter, Project Engineer, American Fork City, 51 East Main Street, American Fork, Utah 84003, dated April 5, 2022.

The April 5, 2022, TG letter was prepared after a review of the following EE and CMT Engineering Laboratories documents:

> Earthtec Engineering, Geotechnical Study, Fenn-Willard Property, 7300 North 6800 West, American Fork, Utah, Earthtec Project No. 179072, prepared for Mr. Shane Morris, P.O. Box 1344, American Fork, Utah 84003, dated October 4, 2017.

CMT Engineering Laboratories, Geotechnical Review, Dixie Farms Development, 7300 North 6800 West, American Fork, Utah, CMT Project No. 12566, prepared for Mr. Scott Sensanbaugher, City of American Fork, 275 East 200 North, American Fork, Utah 84003, dated April 5, 2019.

Earthtec Engineering, Geotechnical Study, AF 191, 7300 North 7000 West, American Fork, Utah, Earthtec Project No. 198337, prepared for Ardero, Attention: Ms. Ginger Romriell, 520 South 850 East, Suite 100, Lehi, Utah 84043, dated June 7, 2019.

CMT Engineering Laboratories, Geotechnical Review, Dixie Farms Development, 7300 North 6800 West, American Fork, Utah, CMT Project No. 12566, prepared for Mr. Scott Sensanbaugher, City of American Fork, 275 East 200 North, American Fork, Utah 84003, dated July 26, 2019.

Earthtec Engineering, Pavement Consultation, Approximately 700 to 1100 West 200 to 1000 South, American Fork, Utah, Earthtec Project No. 218261, prepared for Red Pine Construction, Attention: Mr. Mike Demke, dated March 5, 2021.

Earthtec Engineering, Structural Fill Requirements, American Fork Property, 6885 West 7300 North, American Fork, Utah, Earthtec Project No. 22061, prepared for Red Pine, 520 South 850 East, a4, Lehi, Utah 84043, dated March 14, 2022.

Purpose of TG Review

The purpose of TG's review is to evaluate whether:

1. The May 20, 2022, EE letter adequately responded to the April 5, 2022, TG geotechnical engineering review letter; and,

2. The Earthtec Engineering (EE) reports adequately address revised geotechnical engineering parameters for footing and floor slab support at the site, consistent with concerns for public health, safety, welfare, reasonable professional standards-of-care and the American Fork City Sensitive Lands Ordinance 07-10-47.

TG Conclusion

Based substantially on and on the reliance of the technical documentation and assurances provided by EE, including their opinions and conclusions, it is TG's opinion the May 20, 2022, EE report adequately responded to the April 5, 2022, TG review comments and combined with the October 4, 2017, June 7, 2019, March 5, 2021, and the March 14, 2022, documents, EE submittals do fulfill the requirements of the American Fork City Sensitive Lands Ordinance 07-10-47.

Liquefaction

EE determined that the subject site is not susceptible to liquefaction.

Public Right-of-Way

Public right-of-way improvements were complete at the time of this review.

TG Recommendations

Based on the requirements of the American Fork City Sensitive Land Ordinance and the technical documentation provided by EE, TG recommends the City of American Fork (the City) consider the EE submittals complete from a geotechnical perspective.

Geotechnical Report Summary for Plan Review

1. All organics, topsoil, existing fill and other deleterious material should be removed from below proposed building areas.

2. Footings may be supported on a minimum of 12 inches of properly placed and compacted structural fill extending to suitable undisturbed native soils.

3. Strip footings for the structures may be designed using an allowable bearing capacity of 1,500 pounds per square foot for strip footings and spot footings. The bearing capacity may be increased to 2,000 psf for spot footings underlain by 4 feet of compacted structural fill for column loads up to 20 kips and 5 feet of compacted structural fill for column loads between 20 and 30 kips.

4. Footings should have a minimum width of 20 inches for strip footings and 30 inches for spot footings.

5. Footings susceptible to frost should be located a minimum depth of 30 inches. Footings not susceptible to frost should have a minimum embedment of 18 inches.

6. Basement construction is not anticipated due to shallow groundwater.

7. Seismic analysis of proposed structures at the site should be based on a spectral response design acceleration of 0.2 sec (short period) S_{DS} = 0.791g. The spectral response design acceleration value was based on factored spectral response accelerations using Site Class D.

8. Prior to the placement of concrete for footings, a letter from the geotechnical engineer should be obtained that indicates subgrade for footing and floor slab support was prepared in accordance with the EE geotechnical recommendations and ready for the placement of concrete.

9. Floor slabs should be underlain by at least 4-inches of free-draining gravel over 6 inches of compacted structural fill.

10. Gutters should discharge beyond the limits of backfill or at least 10 feet from the buildings, whichever is greater.

11. Surface drainage should slope away from the structure in all directions with a 7 percent grade for the first 10 feet.

12. All import materials should be approved by Geotechnical Engineer.

13. All compaction for interior and exterior backfills adjacent to the building should be verified by the geotechnical engineer.

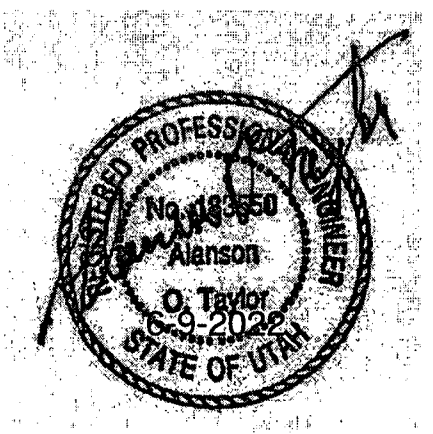
Closure

This letter is issued solely in response to the Consultants' evaluation of the referenced site. Comments and recommendations in this review are based on data presented in the referenced reports. Taylor Geotechnical accordingly provides no warranty that the data in the referenced reports are correct or accurate and has not performed an independent site evaluation. Comments and recommendations presented herein are provided to aid the City in reducing risks from geotechnical hazards and to protect public health and safety.

All services performed by Taylor Geotechnical for this review were provided for the exclusive use and benefit of the City. No other person or entity is entitled to use or rely upon any of the information or reports generated by Taylor Geotechnical as a result of this review.

If you have any questions, please feel free to contact the undersigned. The opportunity to be of continued service to American Fork City is appreciated.

Respectfully submitted,
Taylor Geotechnical



Alanson O. Taylor, P.E.
Principal

1497 West 40 South
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1596 W. 2650 S. #108
Ogden, Utah - 84401
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Geotechnical Study
AF 191
7300 North 7000 West
American Fork, Utah

Project No. 198337

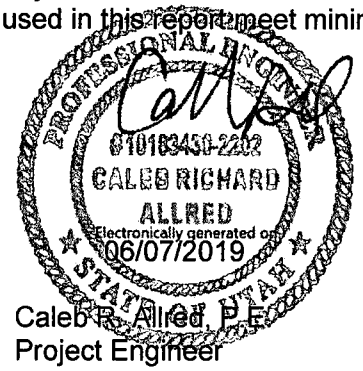
June 7, 2019

Prepared For:

Ardero
Attention: Ms. Ginger Romriell
520 South 850 East, Suite 100
Lehi, Utah 84043

CERTIFICATE

I hereby certify that I am a licensed professional engineer, as defined in the "Sensitive Lands Ordinance" Section of American Fork City Ordinances. I have examined this report to which this certificate is attached and the information and conclusions contained therein are, without any reasonable reservation not stated therein, accurate and complete. Procedures and tests used in this report meet minimum applicable professional standards.



Caleb R. Allred, P.E.
Project Engineer

TABLE OF CONTENTS

ATTACHED FIGURES

APPENDIX A

1.0 SUMMARY

This entire report presents the results of Earthtec Engineering's completed geotechnical study for the AF 191 in American Fork, Utah. This includes Areas A, B and C as shown on Figure 18, *Area Locations for Area A, Area B, and Area C*. This summary provides a general synopsis of our recommendations and findings. Details of our findings, conclusions, and recommendations are provided within the body of this report.

- The native clay soils have a negligible to moderate potential for collapse (settlement) or expansion (heave) and a slight to moderate potential for compressibility under increased moisture contents and anticipated load conditions. (see Section 6)
- Conventional strip and spread footings may be used to support the structures, with foundations placed entirely on firm, undisturbed, non-porous, non-organic, uniform soils (i.e. completely on clay soils, or completely on sand soils, etc.), or entirely on a minimum of 18 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils for Area A. See Section 10 for structural fill requirements for Area B and Area C.

Based on the results of our field exploration, laboratory testing, and engineering analyses, it is our opinion that the subject site may be suitable for the proposed development, provided the recommendations presented in this report are followed and implemented during design and construction.

Failure to consult with Earthtec Engineering (Earthtec) regarding any changes made during design and/or construction of the project from those discussed herein relieves Earthtec from any liability arising from changed conditions at the site. We also strongly recommend that Earthtec observes the building excavations to verify the adequacy of our recommendations presented herein, and that Earthtec performs materials testing and special inspections for this project to provide continuity during construction.

2.0 INTRODUCTION

The project is located at approximately 7300 North 7000 West in American Fork, Utah. The general location of the site is shown on Figure No. 1, *Vicinity Map* and Figure No. 2, *Aerial Photograph Showing Location of Test Pits*, at the end of this report. The purposes of this study are to evaluate the subsurface soil conditions at the site, assess the engineering characteristics of the subsurface soils, and provide geotechnical recommendations for general site grading and the design and construction of foundations, concrete floor slabs, miscellaneous concrete flatwork, and asphalt paved residential streets.

A previous geotechnical report was completed for Areas A and B by Earthtec Engineering in 2017[1]. The information from the 2017 report was used in the preparation of this geotechnical

[1] Geotechnical Study, Fenn-Willard Property, 7300 North 6800 West, American Fork Utah, Earthtec Engineering, Job

report and the locations of the 2017 explorations are also included on Figure 2 and the 2017 logs for those explorations can be found in the Appendix A.

The scope of work completed for this study included field reconnaissance, subsurface exploration, field and laboratory soil testing, geotechnical engineering analysis, and the preparation of this report.

3.0 PROPOSED CONSTRUCTION

We understand that the proposed project, as described to us by Ms. Ginger Romriell, consists of developing the most of the 191-acre existing parcel with residential subdivisions. The proposed structures will consist of conventionally framed and two- to three-story, slab-on-grade buildings. We have based our recommendations in this report on the assumption that foundation loads for the proposed structures will not exceed 5,000 pounds per linear foot for bearing walls, 30,000 pounds for column loads, and 100 pounds per square foot for floor slabs. If structural loads will be greater Earthtec should be notified so that we may review our recommendations and make modifications, if necessary.

In addition to the construction described above, we anticipate that utilities will be installed to service the proposed buildings, exterior concrete flatwork will be placed in the form of curb, gutter, and sidewalks, and asphalt paved residential streets will be constructed.

4.0 GENERAL SITE DESCRIPTION

4.1 Site Description

At the time of our subsurface exploration the site was an undeveloped lot vegetated with alfalfa, grass, trees, and weeds. The property was used for crop farming and grazing fields. The ground surface appears to be relatively flat, we anticipate less than 3 feet of cut and fill may be required for site grading. The lot was bounded on the north, east, south, and west by empty or agricultural fields.

4.2 Geologic Setting

The subject property is located in the northern portion of Utah Valley near the northern shore of Utah Lake. Utah Valley is a deep, sediment-filled basin that is part of the Basin and Range Physiographic Province. The valley was formed by extensional tectonic processes during the Tertiary and Quaternary geologic time periods. The valley is bordered by the Wasatch Mountain Range on the east and the Lake Mountains on the west. Much of northwestern Utah, including Utah Valley, was previously covered by the Pleistocene age Lake Bonneville. Utah Lake, which currently covers much of the western portion of the valley, is a remnant of this ancient fresh water

No. 179072, October 4, 2017.

lake. The surficial geology of much of the eastern margin of the valley has been mapped by Constenius, 2011[2]. The surficial geology at the location of the subject site and adjacent properties is mapped as:

- "Fine-grained lacustrine deposits" (Map Unit Qlf) dated to upper Pleistocene. These soil or deposits are generally described in the referenced mapping as "silt and clay with some fine-grained sand,"
- "Younger alluvial fan deposits" (Map Unit Qafy) dated to Holocene and upper Pleistocene. These soil or deposits are generally described in the referenced mapping as "mostly sand, silt, and gravel,"
- "Spring and marsh deposits" (Map Unit Qsm) dated to Holocene and upper Pleistocene. These soil or deposits are generally described in the referenced mapping as "fine, organic-rich sediment," and
- "Young lacustrine deposits" (Map Unit Qly) dated to Holocene and upper Pleistocene. These soil or deposits are generally described in the referenced mapping as "silt, clay and sand,"

5.0 SUBSURFACE EXPLORATION

5.1 Soil Exploration

Under the direction of a qualified member of our geotechnical staff, subsurface explorations for Area C were conducted at the site on May 16, 2019 by the excavation of ten (10) test pits to depths of 7 to 10 feet below the existing ground surface using a a track-mounted mini excavator. The approximate locations of the test pits are shown on Figure No. 2, *Aerial Photograph Showing Location of Test Pits.* Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 12, *Test Pit Log* at the end of this report. The stratification lines shown on the logs represent the approximate boundary between soil units; the actual transition may be gradual. Due to potential natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points. A key to the symbols and terms on the logs is presented on Figure No. 13, *Legend.*

As required by the American Fork Sensitive Lands Ordinance a 70-foot boring is required to have been performed within 2,000 feet of the site. The boring labeled AF-06-3 is within 2,000 feet of the site.

Disturbed bag samples and relatively undisturbed block samples were collected at various depths in each test pit. The soil samples collected were classified by visual examination in the field following the guidelines of the Unified Soil Classification System (USCS). The samples were transported to our Lindon, Utah laboratory where they will be retained for 30 days following the date of this report and then discarded, unless a written request for additional holding time is

[2] Constenius, K.N., Clark, D.L., King, J.K., Ehler, J.B., 2011, Interim Geologic Map of the Provo Quadrangle, *Utah, Wasatch and Salt Lake Counties, Utah*; U.S. Geological Survey, Open-File 586DM, Scale 1: 62,500.

received prior to the 30-day limit.

6.0 LABORATORY TESTING

Representative soil samples collected during our field exploration were tested in the laboratory to assess pertinent engineering properties and to aid in refining field classifications, if needed. Tests performed included natural moisture content, dry density tests, liquid and plastic limits determinations, mechanical (partial) gradation analyses, and one-dimensional consolidation tests. The laboratory test results are also included on the attached *Test Pit Logs* at the respective sample depths, and on Figure Nos. 14 through 17, *Consolidation-Swell Test.*

As part of the consolidation test procedure, water was added to the samples to assess moisture sensitivity when the samples were loaded to an equivalent pressure of approximately 1,000 psf. The native clay soils have a negligible to moderate potential for collapse (settlement) or expansion (heave) and a slight to moderate potential for compressibility under increased moisture contents and anticipated load conditions.

Water soluble sulfate tests were performed on a representative sample obtained during our field exploration. Water soluble sulfate testing from samples indicated a value of 74 to 194 parts per million, respectively. Based on this result, the risk of sulfate attack to concrete appears to be "moderate" according to American Concrete Institute standards. Therefore, we recommend that Type II Portland cement be used for concrete in contact with on-site soils. The results can be found in Appendix A.

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

On the surface of the site, we encountered topsoil which is estimated to extend about ½ to 2½ feet in depth at the test pit locations. Below the topsoil we encountered layers of clay, silt and sand extending to depths of 7 to 10 feet below the existing ground surface. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 12, *Test Pit Log* at the end of this report. Based on our experience and observations during field exploration, the clay and silt soils visually ranged soft to stiff in consistency and the sand soils visually had a relative density varying from loose to medium dense.

It should be considered that a limited number of test pits were used during the course of our subsurface exploration. Topsoil and fill material composition and contacts are difficult to determine from test pit sampling. Variation in topsoil depths may occur at the site.

7.2 Collapsible Soils

Collapsible soils are typically characterized by a pinhole structure and relatively low unit weights. Foundations, floor slabs, and roadways supported on these soils may be susceptible to large

settlements and structural distress when wetted. Measures to limit surface water from wetting supporting soils beneath foundations and floor slabs shall be implemented. These measures include maintaining positive surface drainage away from the structures, downspouts should discharge away from foundations or be conveyed to suitable locations down gradient from the structures, minimizing landscape irrigation adjacent to structures, and ensuring proper and adequate compaction of foundation wall backfill.

7.3 Groundwater Conditions

Groundwater was encountered at depths of approximately 1 to 10 feet below the existing ground surface. Groundwater was not encountered within the excavations at the depths explored. Note that groundwater levels will fluctuate in response to the season, precipitation, snow melt, irrigation, and other on and off-site influences. Quantifying these fluctuations would require long term monitoring, which is beyond the scope of this study. The contractor should be prepared to dewater excavations as needed.

8.0 SITE GRADING

8.1 General Site Grading

All surface vegetation and unsuitable soils (such as topsoil, organic soils, undocumented fill, soft, loose, or disturbed native soils, collapsible, and any other inapt materials) should be removed from below foundations, floor slabs, exterior concrete flatwork, and pavement areas. We encountered topsoil on the surface of the site. The topsoil (including soil with roots larger than about ¼ inch in diameter) should be completely removed, even if found to extend deeper, along with any other unsuitable soils that may be encountered. Over-excavations below footings and slabs also may be needed, as discussed in Section 10.0.

Fill placed over large areas, even if only a few feet in depth, can cause consolidation in the underlying native soils resulting in settlement of the fill. Because the site is relatively flat, we anticipate that less than 3 feet of grading fill will be placed. If more than 3 feet of grading fill will be placed above the existing surface (to raise site grades), Earthtec should be notified so that we may provide additional recommendations, if required. Such recommendations will likely include placing the fill several weeks (or possibly more) prior to construction to allow settlement to occur.

8.2 Temporary Excavations

Temporary excavations that are less than 4 feet in depth and above groundwater should have side slopes no steeper than ½H:1V (Horizontal:Vertical). Temporary excavations where water is encountered in the upper 4 feet or that extend deeper than 4 feet below site grades should be sloped or braced in accordance with OSHA[3] requirements for Type C soils.

[3] OSHA Health and Safety Standards, Final Rule, CFR 29, part 1926.

8.3 Fill Material Composition

The native soils are not suitable for use as placed and compacted structural fill. Excavated soils, including clay and silt, may be stockpiled for use as fill in landscape areas.

Structural fill is defined as imported fill material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavements, etc. Gradation requirements stated above shall be verified in intervals not exceeding 1,000 tons. We recommend that imported structural fill consist of sandy/gravelly soils meeting the following requirements in the table below:

Table 1: Imported Structural Fill Recommendations

Sieve Size/Other	Percent Passing (by weight)
4 inches	100
3/4 inches	70 – 100
No. 4	40 – 80
No. 40	15 – 50
No. 200	0 – 20
Liquid Limit	35 maximum
Plasticity Index	15 maximum

Engineered fill is defined as reworked native material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavements. We recommend that a professional engineer or geologist verify that the structural fill to be used on this project meets the requirements. Engineered fill should be clear of all organics, have a maximum particle size of 4 inches, less than 70 percent retained on the ¾-seive, a maximum Liquid Limit of 35, and a maximum Plasticity Index of 15.

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel may be acceptable but would likely make compaction more difficult and/or significantly reduce the possibility of successful compaction testing. Consequently, stricter quality control measures than normally used may be required, such as using thinner lifts and increased or full-time observation of fill placement.

We recommend that utility trenches below any structural load be backfilled using structural fill or engineered fill. Local governments or utility companies required specification for backfill should be followed unless our recommendations stricter.

If native soil is used as fill material, the contractor should be aware that native clay and silt soils (as observed in the explorations) may be time consuming to compact due to potential difficulties in controlling the moisture content needed to obtain optimum compaction and changes proctor values.

If required (i.e. fill in submerged areas), we recommend that free draining granular material (clean sand and/or gravel) meet the following requirements in the table below:

Table 2: Free-Draining Fill Recommendations

Sieve Size/Other	Percent Passing (by weight)
3 inches	100
No. 10	0 – 25
No. 40	0 – 15
No. 200	0 – 5
Plasticity Index	Non-plastic

Three-inch minus washed rock (sometimes called river rock or drain rock) and pea gravel materials usually meet these requirements and may be used as free draining fill. If free draining fill will be placed adjacent to soil containing a significant amount of sand or silt/clay, precautions should be taken to prevent the migration of fine soil into the free draining fill. Such precautions should include either placing a filter fabric between the free draining fill and the adjacent soil material, or using a well-graded, clean filtering material approved by the geotechnical engineer.

8.4 Fill Placement and Compaction

The thickness of each lift should be appropriate for the compaction equipment that is used. We recommend a maximum lift thickness prior to compaction of 4 inches for hand operated equipment, 6 inches for most "trench compactors" and 8 inches for larger rollers, unless it can be demonstrated by in-place density tests that the required compaction can be obtained throughout a thicker lift. The full thickness of each lift of structural fill placed should be compacted to at least the following percentages of the maximum dry density, as determined by ASTM D-1557:

- In landscape and other areas not below structurally loaded areas: 90%
- Less than 5 feet of fill below structurally loaded areas: 95%
- 5 feet or greater of fill below structurally loaded areas: 98%

Generally, placing and compacting fill at moisture contents within ±2 percent of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. Typically, the further the moisture content deviates from optimum the more difficult it will be to achieve the required compaction.

Fill should be tested frequently during placement and we recommend early testing to demonstrate that placement and compaction methods are achieving the required compaction. The contractor is responsible to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

8.5 Stabilization Recommendations

Near surface layers of clay, silt, and silty sand soils may rut and pump during grading and construction. The likelihood of rutting and/or pumping, and the depth of disturbance, is proportional to the moisture content in the soil, the load applied to the ground surface, and the frequency of the load. Consequently, rutting and pumping can be minimized by avoiding concentrated traffic, minimizing the load applied to the ground surface by using lighter equipment, partially loaded equipment, tracked equipment, by working in dry times of the year, and/or by

providing a working surface for equipment. However, because of the relatively shallow depth of groundwater, it is likely that rutting and pumping may not be avoidable.

During grading the soil in any obvious soft spots should be removed and replaced with granular material. If rutting or pumping occurs traffic should be stopped in the area of concern. The soil in rutted areas should be removed and replaced with granular material. In areas where pumping occurs the soil should either be allowed to sit until pore pressures dissipate (several hours to several days) and the soil firms up or be removed and replaced with granular material. Typically, we recommend removal to a minimum depth of 24 inches.

For granular material, we recommend using angular well-graded gravel, such as pit run, or crushed rock with a maximum particle size of four inches. We suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor. A finer granular material such as sand, gravelly sand, sandy gravel or road base may also be used. Materials which are more angular and coarse may require thinner lifts in order to achieve compaction. We recommend that the fines content (percent passing the No. 200 sieve) be less than 15%, the liquid limit be less than 35, and the plasticity index be less than 15.

Using a geosynthetic fabric, such as Mirafi 600X or equivalent, may also reduce the amount of material required and avoid mixing of the granular material and the subgrade. If a fabric is used, following removal of disturbed soils and water, the fabric should be placed over the bottom and up the sides of the excavation a minimum of 24 inches. The fabric should be placed in accordance with the manufacturer's recommendations, including proper overlaps. The granular material should then be placed over the fabric in compacted lifts. Again, we suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor.

9.0 SEISMIC AND GEOLOGIC CONSIDERATIONS

9.1 Seismic Design

The residential structures should be designed in accordance with the 2015 International Residential Code (IRC). The IRC designates this area as a seismic design class D_1.

The site is located at approximately 40.359 degrees latitude and -111.822 degrees longitude from the approximate center of the site. The IRC site value for this property is 0.791g. The design spectral response acceleration parameters are given below.

Table 3: Design Acceleration for Short Period

S_S	F_a	Site Value (S_{DS})
[redacted]	[redacted]	2/3 S_S*F_a
1.133	1.047	0.791g

S_S = Mapped spectral acceleration for short periods
F_a = Site coefficient from Table 1613.3.3(1)
S_{DS} = ⅔S_{MS}= ⅔ (F_a·S_s) = 5% damped design spectral response acceleration for short periods

9.2 Faulting

The subject property is located within the Intermountain Seismic Belt where the potential for active faulting and related earthquakes is present. Based upon published geologic maps[4], no active faults traverse through or immediately adjacent to the site and the site is not located within local fault study zones. The nearest mapped fault trace is part of a group of fault beneath Utah Lake located approximately 2 miles southwest of the site.

9.3 Liquefaction Potential

According to current liquefaction maps[5] for Utah County, the site is located within an area designated as "High" in liquefaction potential. Liquefaction can occur when saturated subsurface soils below groundwater lose their inter-granular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. Loose, saturated sands are most susceptible to liquefaction, but some loose, saturated gravels and relatively sensitive silt to low-plasticity silty clay soils can also liquefy during a seismic event. Subsurface soils were composed of saturated clay and sand soils.

The soils encountered at this project do not appear liquefiable, but the liquefaction susceptibility of underlying soils (deeper than our explorations) is not known and would require deeper explorations to quantify.

10.0 FOUNDATIONS

10.1 General

The foundation recommendations presented in this report are based on the soil conditions encountered during our field exploration, the results of laboratory testing of samples of the native soils, the site grading recommendations presented in this report, and the foundation loading conditions presented in Section 3.0, *Proposed Construction*, of this report. If loading conditions and assumptions related to foundations are significantly different, Earthtec should be notified so that we can re-evaluate our design parameters and estimates (higher loads may cause more

[4] U.S. Geological Survey, Quaternary Fault and Fold Database of the United States, November 3, 2010
[5] Utah Geological Survey, Liquefaction-Potential Map for a Part of Utah County, Utah, Public Information Series 28, August 1994.

settlement), and to provide additional recommendations if necessary.

Conventional strip and spread footings may be used to support the proposed structures after appropriate removals as outlined in Section 8.1. Foundations should not be installed on topsoil, undocumented fill, debris, combination soils, organic soils, frozen soil, or in ponded water. If foundation soils become disturbed during construction, they should be removed or compacted.

10.2 Strip/Spread Footings

For Area A, we recommend that conventional strip and spread foundations be constructed entirely on firm, undisturbed, non-porous, non-organic, uniform soils (i.e. completely on clay soils, or completely on sand soils, etc.), or entirely on a minimum of 18 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils.

For Area B, we recommend that conventional strip and spread foundations be constructed entirely structural fill on according to proposed structural loads given in the table below.

Table 4: Area B Foundation Recommendations

Anticipated Foundation Loads	Minimum Structural Fill Thickness (in)
Up to 3 klf	18
Up to 5 klf	36
Up to 20 kips	48
Up to 30 kips	60

For Area C, we recommend that conventional strip and spread foundations be constructed entirely structural fill on according to proposed structural loads given in the table below.

Table 5: Area C Foundation Recommendations

Anticipated Foundation Loads	Minimum Structural Fill Thickness (in)
Up to 5 klf	24
Up to 30 kips	36

See Figure No. 18, *Area Location* for Area A, Area B and Area C. For foundation design we recommend the following:

- Area A – Footings founded on native soils may be designed using a maximum allowable bearing capacity of 1,500 pounds per square foot. Footings founded on a minimum of 18 inches of structural fill may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot.

- Area B - Footings founded on a minimum of 18 inches of structural fill may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot.
- Area C - Footings founded on a minimum of 24 inches of structural fill may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot.
- All excavations should have a test pit excavated to at least 3 feet below the lowest footing elevation to verify that porous and organic soils and groundwater do not exist within 3 feet below the base of the foundations.
- The values for vertical foundation pressure can be increased by one-third for wind and seismic conditions per Section 1806.1 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2015 International Building Code.
- Continuous and spot footings should be uniformly loaded and should have a minimum width of 20 and 30 inches, respectively.
- Exterior footings should be placed below frost depth which is determined by local building codes. In general, 30 inches of cover is adequate for most sites; however local code should be verified by the end design professional. Interior footings, not subject to frost (heated structures), should extend at least 18 inches below the lowest adjacent grade.
- Foundation walls and footings should be properly reinforced to resist all vertical and lateral loads and differential settlement.
- The bottom of footing excavations should be compacted with at least 4 passes of an approved non-vibratory roller prior to erection of forms or placement of structural fill to densify soils that may have been loosened during excavation and to identify soft spots. If soft areas are encountered, they should be stabilized as recommended in Section 8.5.
- Footing excavations should be observed by the geotechnical engineer prior to beginning footing construction to evaluate whether suitable bearing soils have been exposed and whether excavation bottoms are free of loose or disturbed soils.
- Because of shallow groundwater conditions encountered at the site, we anticipate that up to 60 inches of structural fill may be required below the proposed structure to provide a firm surface upon which to construct the proposed structure. In lieu of traditional structural fill, clean 3/8- to 2-inch clean gravel may be used in conjunction with a stabilization fabric, such as Mirafi 600X or equivalent, which should be placed between the native non-porous soils and the clean gravel (additional recommendations for placing clean gravel and stabilization fabric are given in Section 8.5 of this report).
- Due to shallow groundwater encountered at the site, lowest floor slab depths should be at the existing ground surface or a minimum of three (3) feet above the observed groundwater elevation. This is intended to provide a separation between the observed groundwater condition and the bottom of the floor slab.
- Structural fill used below foundations should extend laterally a minimum of 6 inches for every

12 vertical inches of structural fill placed. For example, if 18 inches of structural fill is required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 9 inches beyond the edge of the footings on both sides.

10.3 Estimated Settlements

If the proposed foundations are properly designed and constructed using the parameters provided above, we estimate that total settlements should not exceed one inch and differential settlements should be one-half of the total settlement over a 25-foot length of continuous foundation, for non-earthquake conditions. Additional settlement could occur during a seismic event due to ground shaking, if more than 3 feet of grading fill is placed above the existing ground surface, if loading conditions are greater than anticipated in Section 2, and/or if foundation soils are allowed to become wetted.

10.4 Lateral Earth Pressures

Below grade walls act as soil retaining structures and should be designed to resist pressures induced by the backfill soils. The lateral pressures imposed on a retaining structure are dependent on the rigidity of the structure and its ability to resist rotation. Most retaining walls that can rotate or move slightly will develop an active lateral earth pressure condition. Structures that are not allowed to rotate or move laterally, such as subgrade basement walls, will develop an at-rest lateral earth pressure condition. Lateral pressures applied to structures may be computed by multiplying the vertical depth of backfill material by the appropriate equivalent fluid density. Any surcharge loads in excess of the soil weight applied to the backfill should be multiplied by the appropriate lateral pressure coefficient and added to the soil pressure. For static conditions the resultant forces are applied at about one-third the wall height (measured from bottom of wall). For seismic conditions, the resultant forces are applied at about two-third times the height of the wall both measured from the bottom of the wall. The lateral pressures presented in the table below are based on drained, horizontally placed native soils as backfill material using a 28° friction angle and a dry unit weight of 120 pcf.

Table 6: Lateral Earth Pressures (Static and Dynamic)

Condition	Case	Lateral Pressure Coefficient	Equivalent Fluid Pressure (pcf)
Active	Static	0.36	43
	Seismic	0.53	63
At-Rest	Static	0.53	64
	Seismic	0.73	88
Passive	Static	2.77	332
	Seismic	3.40	408

*Seismic values combine the static and dynamic values

These pressure values do not include any surcharge, and are based on a relatively level ground surface at the top of the wall and drained conditions behind the wall. It is important that water is not allowed to build up (hydrostatic pressures) behind retaining structures. Retaining walls should

incorporate drainage behind the walls as appropriate, and surface water should be directed away from the top and bottom of the walls.

Lateral loads are typically resisted by friction between the underlying soil and footing bottoms. Resistance to sliding may incorporate the friction acting along the base of foundations, which may be computed using a coefficient of friction of soils against concrete of 0.30 for native clay and silts, 0.40 for native sands, and 0.55 for native gravels or structural fill meeting the recommendations presented herein. Concrete or masonry walls shall be selected and constructed in accordance to the provision of Section R404 of the 2015 International Residential Code or sections referenced therein. Retaining wall lateral resistance design should further reference Section R404.4 for reference of Safety Factors.

The pressure and coefficient values presented above are ultimate; therefore, an appropriate factor of safety may need to be applied to these values for design purposes. The appropriate factor of safety will depend on the design condition and should be determined by the project structural engineer.

11.0 FLOOR SLABS AND FLATWORK

Due to shallow groundwater encountered at the site, lowest floor slab depths should be limited to existing site grades. This is intended to provide a minimum of 2 feet of separation between the observed groundwater condition and the bottom of the floor slab.

Concrete floor slabs and exterior flatwork may be supported on 12 inches of properly placed and compacted structural fill after appropriate removals and grading as outlined in Section 8.1 are completed. We recommend placing a minimum 4 inches of free-draining fill material (see Section 8.3) beneath floor slabs to facilitate construction, act as a capillary break, and aid in distributing floor loads. For exterior flatwork, we recommend placing a minimum 4 inches of road-base material. Prior to placing the free-draining fill or road-base materials, the native sub-grade should be proof-rolled to identify soft spots, which should be stabilized as discussed above in Section 8.5.

For slab design, we recommend using a modulus of sub-grade reaction of 120 pounds per cubic inch. The thickness of slabs supported directly on the ground shall not be less than 3½ inches. A 6-mil polyethylene vapor retarder with joints lapped not less than 6 inches shall be placed between the ground surface and the concrete, as per Section R506 of the 2015 International Residential Code.

To help control normal shrinkage and stress cracking, we recommend that floor slabs have adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints, frequent crack control joints, and non-rigid attachment of the slabs to foundation and bearing walls. Special precautions should be taken during placement and curing of all concrete slabs and flatwork. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures used during hot or cold weather conditions may

lead to excessive shrinkage, cracking, spalling, or curling of slabs. We recommend all concrete placement and curing operations be performed in accordance with American Concrete Institute (ACI) codes and practices.

12.0 DRAINAGE

12.1 Surface Drainage

As part of good construction practice, precautions should be taken during and after construction to reduce the potential for water to collect near foundation walls. Accordingly, we recommend the following:

- The contractor should take precautions to prevent significant wetting of the soil at the base of the excavation. Such precautions may include: grading to prevent runoff from entering the excavation, excavating during normally dry times of the year, covering the base of the excavation if significant rain or snow is forecast, backfill at the earliest possible date, frame floors and/or the roof at the earliest possible date, other precautions that might become evident during construction.
- Adequate compaction of foundation wall backfill must be provided i.e. a minimum of 90% of ASTM D-1557. Water consolidation methods should not be used.
- The ground surface should be graded to drain away from the building in all directions. We recommend a minimum fall of 8 inches in the first 10 feet.
- Roof runoff should be collected in rain gutters with down spouts designed to discharge well outside of the backfill limits, or at least 10 feet from foundations, whichever is greater.
- Sprinkler nozzles should be aimed away, and all sprinkler components kept at least 5 feet, from foundation walls. A drip irrigation system may be utilized in landscaping areas within 10 feet of foundation walls to minimize water intrusion at foundation backfill. Also, sprinklers should not be placed at the top or on the face of slopes. Sprinkler systems should be designed with proper drainage and well maintained. Over-watering should be avoided.
- Any additional precautions which may become evident during construction.

12.2 Subsurface Drainage

Groundwater or indicators of past groundwater levels were encountered/observed at depths of 1 to 10 feet below the existing ground surface. Section R405.1 of the 2015 International Residential Code states, "Drains shall be provided around all concrete and masonry foundations that retain earth and enclose habitable or usable spaces located below grade." Section R310.2.3.2 of the 2015 International Residential Code states, "Window wells shall be designed for proper drainage by connecting to the building's foundation drainage system." An exception is allowed when the foundation is installed on well drained ground consisting of Group 1 soils, which include those

defined by the Unified Soil Classification System as GW, GP, SW, SP, GM, and SM. The soils observed in the explorations at the depth of foundation consisted primarily of clay (CL) which is not a Group 1 soil.

13.0 PAVEMENT RECOMMENDATIONS

We understand that asphalt paved residential streets will be constructed as part of the project. The native soils encountered beneath the topsoil during our field exploration were predominantly composed of soft clays. We estimate that a California Bearing Ratio (CBR) value of 1.5 is appropriate for these soils. If the topsoil is left beneath concrete flatwork and pavement areas, increased maintenance costs over time should be anticipated.

We anticipate that the traffic volume for the collector streets will be 1,600 vehicles a day (163 ESAL/day) or less, consisting of construction traffic then normal use of cars, pickup trucks, and buses. We understand construction traffic will include side-dump trucks for importing soils, concrete trucks and semi-trucks to deliver construction materials. Based on a design of 1,189,000 ESAL's, the estimated CBR of 1.5, a 20-year life expectancy, and the procedures and typical design inputs outlined in the UDOT Pavement Design Manual (2008), we recommend the minimum asphalt pavement section presented below.

Table 7: Pavement Section Recommendations for Collector Streets

Asphalt Thickness (in)	Compacted Roadbase Thickness (in)	Compacted Subbase Thickness (in)
4	12	34*
4½	18	24*
4½	12	30*

* Stabilization may be required

For arterial streets, we anticipate that the traffic volume will be 1,500 vehicles a day (17.8 ESAL/day) or less, consisting of cars, pickup trucks, and buses. Based on the estimated CBR of 1.5, a 20-year life expectancy, and the procedures and typical design inputs outlined in the UDOT Pavement Design Manual (2008), we recommend the minimum asphalt pavement section presented below.

Table 8: Pavement Section Recommendations for Residential Streets

Asphalt Thickness (in)	Compacted Roadbase Thickness (in)	Compacted Subbase Thickness (in)
3	12	24*
4	12	18*

* Stabilization may be required

If the pavement will be required to support excessive construction traffic (such as dump trucks hauling soil to raise or lower the site), more than an occasional semi-tractor or fire truck, or more traffic than listed above, our office should be notified so that we can re-evaluate the pavement

section recommendations. The following also apply:

- The subgrade should be prepared by proof rolling to a firm, non-yielding surface, with any identified soft areas stabilized as discussed above in Section 8.5.
- Site grading fills below the pavements should meet structural fill composition and placement recommendations per Sections 8.3 and 8.4 herein.
- Asphaltic concrete, aggregate base and sub-base material composition should meet local, APWA, or UDOT requirements. Gradation requirements and frequency shall be followed as required by local, APWA, or UDOT requirements, but not to exceed 500 tons.
- Aggregate base and sub-base is compacted to local, APWA, or UDOT requirements, or to at least 95 percent of maximum dry density (ASTM D 1557).
- Asphaltic concrete is compacted to local or UDOT requirements, or to at least 96 percent of the laboratory Marshall density (ASTM D 6927).

14.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The explorations may not be indicative of subsurface conditions outside the study area or between points explored and thus have a limited value in depicting subsurface conditions for contractor bidding. Variations from the conditions portrayed in the explorations may occur and which may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, Earthtec should be advised immediately so that the appropriate modifications can be made.

The findings and recommendations presented in this geotechnical report were prepared in accordance with generally accepted geotechnical engineering principles and practice in this area of Utah at this time. No warranty or representation is intended in our proposals, contracts, letters, or reports. Failure to consult with Earthtec regarding any changes made during design and/or construction of the project from those discussed herein relieves Earthtec from any liability arising from changed conditions at the site.

This geotechnical report is based on relatively limited subsurface explorations and laboratory testing. Subsurface conditions may differ in some locations of the site from those described herein, which may require additional analyses and possibly modified recommendations. Thus, we strongly recommend consulting with Earthtec regarding any changes made during design and construction of the project from those discussed herein. Failure to consult with Earthtec regarding any such changes relieves Earthtec from any liability arising from changed conditions at the site.

To maintain continuity, Earthtec should also perform materials testing and special inspections for this project. The recommendations presented herein are based on the assumption that an adequate program of tests and observations will be followed during construction to verify compliance with our recommendations. We also assume that we will review the project plans and

specifications to verify that our conclusions and recommendations are incorporated and remain appropriate (based on the actual design). Earthtec should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Earthtec also should be retained to provide observation and testing services during grading, excavation, foundation construction, and other earth-related construction phases of the project.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please contact Earthtec at your convenience.

Respectfully;

EARTHTEC ENGINEERING

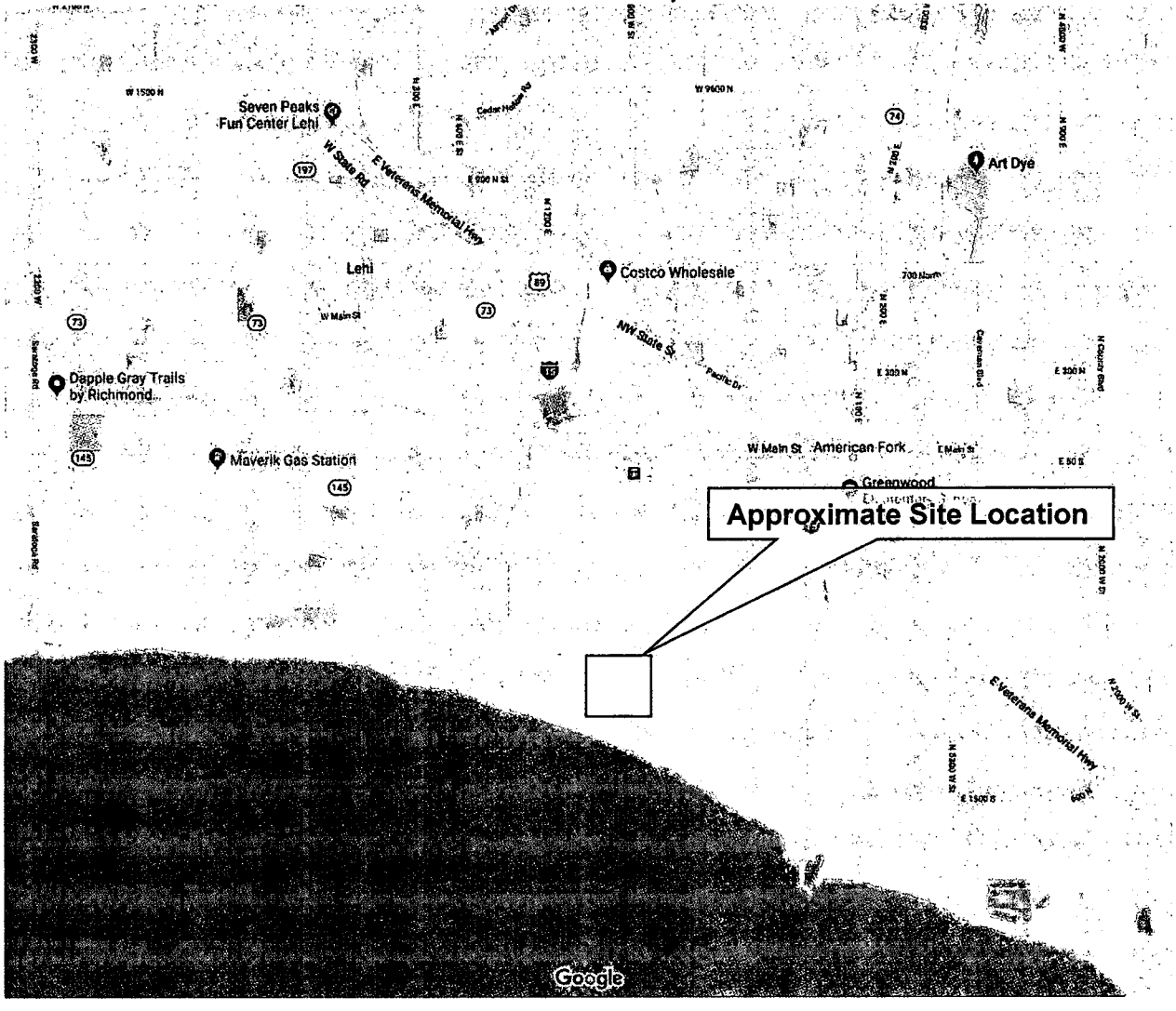
Jeremy A. Balleck, E.I.T.
Staff Engineer

PROFESSIONAL ENGINEER
#10163439-2202
CALEB RICHARD
ALLRED
Electronically generated on
06/07/2019
STATE OF UTAH

Caleb R. Allred, P.E.
Project Engineer

VICINITY MAP

AF 191
7300 NORTH 7000 WEST
AMERICAN FORK, UTAH



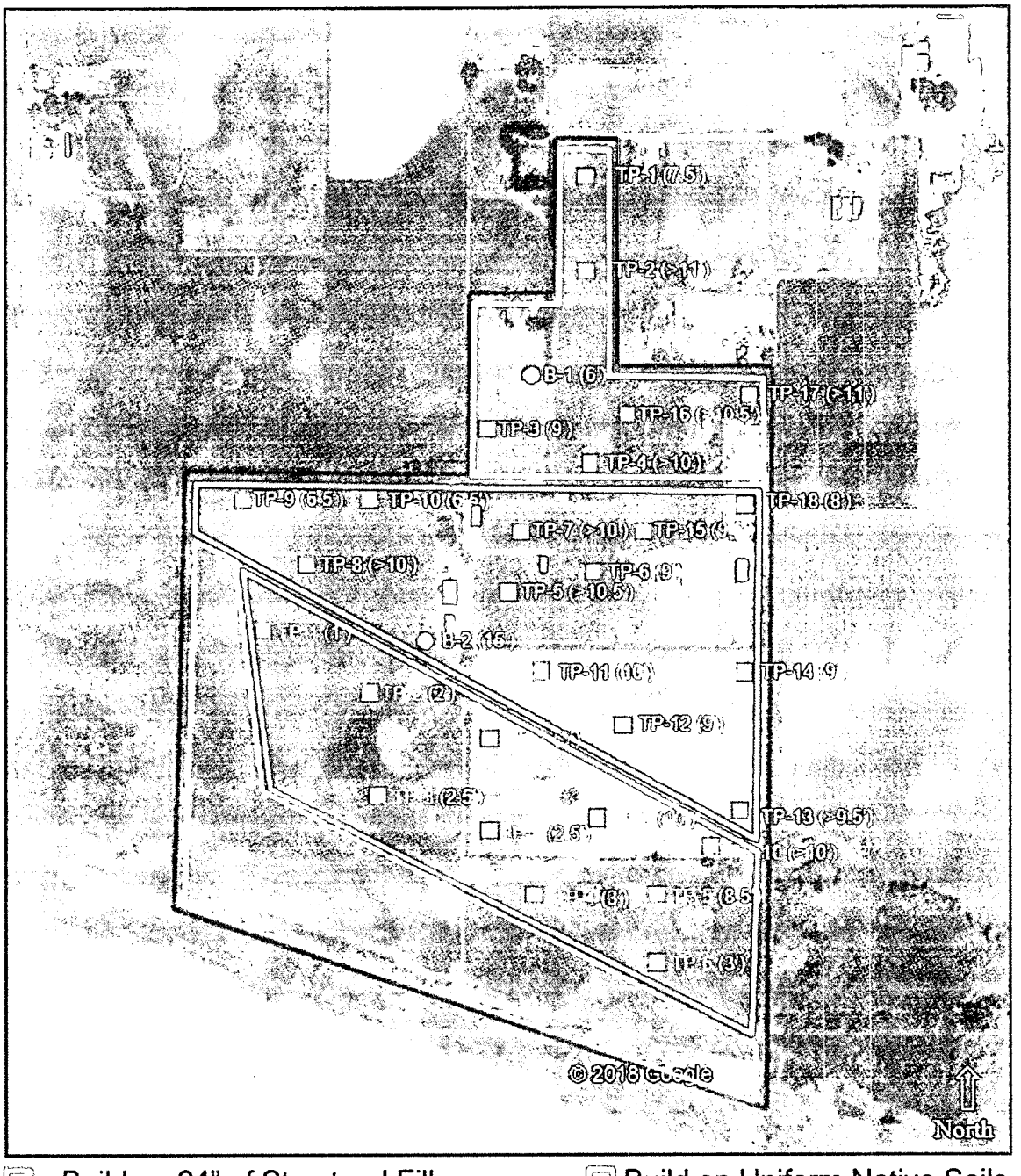
N

Not to Scale

PROJECT NO.: 188000	EARTHTEC ENGINEERING	FIGURE NO.: 1

AERIAL PHOTOGRAPH SHOWING LOCATION OF TEST PITS

AF 191
7300 NORTH 7000 WEST
AMERICAN FORK, UTAH



~ Build on 24" of Structural Fill
~ Borings (~ Groundwater Depth)
~ Test Pits (/ 2019) (~ GW Depth)
Build on Uniform Native Soils
Build on 18" Structural Fill
Unbuildable Land

PROJECT NO.: 188000	EARTHTEC ENGINEERING	FIGURE NO.: 2

TEST PIT LOG
NO.: TP-01

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 1 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, moist, brown									
1			▼ Lean CLAY, medium stiff to soft (estimated), moist to wet, gray									
2												
3												
4		CL										
5												
6												
7					35	88	45	20	2	9	89	C
8												
9			Maximum depth explored approximately 8 feet due to cave-ins									
10												
11												
12												
13												
14												
15												

Notes: Groundwater encountered at approximately 1 feet

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 3

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

TEST PIT LOG
NO.: TP-02

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 2 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, moist, brown									
2			Lean CLAY, medium stiff (estimated), moist to wet, brown to gray, roots									
3												
4		CL										
5												
6					31		34	12	1	4	95	
7												
8			Maximum depth explored approximately 7 feet due to cave-ins									
9												
10												
11												
12												
13												
14												
15												

Notes: Groundwater encountered at approximately 2 feet

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 4

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

TEST PIT LOG
NO.: TP-03

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 2.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, moist, brown									
1												
2			Lean CLAY, medium stiff to soft (estimated), moist to wet, gray to dark gray, roots									
3												
4												
5		CL		■	33		43	19	1	2	97	
6												
7												
8												
9												
10												
11			Maximum depth explored approximately 10 feet									
12												
13												
14												
15												

Notes: Groundwater encountered at approximately 2½ feet

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 5

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

TEST PIT LOG
NO.: TP-04

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 3 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, moist, brown									
1												
2			SILT with sand, soft (estimated), very moist to wet, gray to black, roots									
3			▼	■	55	65	41	11	1	19	80	C
4												
5												
6		ML										
7												
8												
9				⊠								
10												
11			Maximum depth explored approximately 10 feet									
12												
13												
14												
15												

Notes: Groundwater encountered at approximately 3 feet

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 6

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

TEST PIT LOG
NO.: TP-05

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 8.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, moist, brown									
1												
2			Sandy Lean CLAY, medium stiff (estimated), dry to moist, gray to black, roots									
3												
4		CL										
5												
6												
7												
8			Fat CLAY, medium stiff (estimated), moist to wet, gray, mottled, roots		36	86	50	28	0	1	99	C
9		CH ▼										
10												
11			Maximum depth explored approximately 10 feet									
12												
13												
14												
15												

Notes: Groundwater encountered at approximately 8½ feet

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 7

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

TEST PIT LOG
NO.: TP-06

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 3 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, moist, brown									
1												
2			Fat CLAY, medium stiff to stiff (estimated), moist to wet, gray to black, mottled, roots									
3			▼									
4				X								
5		CH										
6												
7												
8												
9				X	43		57	32	0	3	97	
			Maximum depth explored approximately 9 feet due to cave-ins									
10												
11												
12												
13												
14												
15												

Notes: Groundwater encountered at approximately 3 feet

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 8

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

TEST PIT LOG
NO.: TP-07

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 3 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, moist, brown									
2		CL	Lean CLAY, medium stiff to stiff (estimated), moist to wet, gray to brown									
3			▼									
4												
5												
6												
7												
8			Maximum depth explored approximately 8 feet due to cave-ins									
9												
10												
11												
12												
13												
14												
15												

Notes: Groundwater encountered at approximately 3 feet

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 9

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

TEST PIT LOG
NO.: TP-08

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 2.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, moist, brown									
2			Lean CLAY, soft to medium stiff (estimated), moist to wet, gray to brown, roots									
3												
4		CL										
5												
6												
7			Maximum depth explored approximately 7 feet due to cave-ins									
8												
9												
10												
11												
12												
13												
14												
15												

Notes: Groundwater encountered at approximately 2½ feet

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 10

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

TEST PIT LOG
NO.: TP-09

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 10 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, moist, brown									
2		CL	Lean CLAY, medium stiff (estimated), dry to moist, gray, roots									
3												
4		SM	Silty SAND, medium dense (estimated), moist, brown, roots, porous		11	87	22	NP	5	65	30	C
5												
6												
7												
8												
9		CL	Lean CLAY, medium stiff to stiff (estimated), moist to wet, brown, roots									
10			▼									
11			Maximum depth explored approximately 10 feet									
12												
13												
14												
15												

Notes: Groundwater encountered at approximately 10 feet

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 11

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

TEST PIT LOG
NO.: TP-10

PROJECT: AF 191
CLIENT: Ardero
LOCATION: See Figure 2
OPERATOR: D. Judd
EQUIPMENT: Mini Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 198337
DATE: 05/16/19
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, moist, brown									
4		CL	Lean CLAY, medium stiff (estimated), dry, gray, mottled, roots									
5					14		39	16	3	3	94	
8		SM	Silty SAND, medium dense (estimated), dry, light brown, roots									
10		CL	Lean CLAY, medium stiff (estimated), moist, gray									
10			Maximum depth explored approximately 10 feet									

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 198337

EARTHTEC ENGINEERING

FIGURE NO.: 12

LOG OF TESTPIT 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

LEGEND

PROJECT: AF 191 **DATE:** 05/16/19
CLIENT: Ardero **LOGGED BY:** J. Balleck

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS			USCS SYMBOL	TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)	GW	Well Graded Gravel, May Contain Sand, Very Little Fines
			GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)	GM	Silty Gravel, May Contain Sand
			GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No. 4 Sieve)	CLEAN SANDS (Less than 5% fines)	SW	Well Graded Sand, May Contain Gravel, Very Little Fines
			SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)	SM	Silty Sand, May Contain Gravel
			SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand
			ML	Silt, Inorganic, May Contain Gravel and/or Sand
			OL	Organic Silt or Clay, May Contain Gravel and/or Sand
	SILTS AND CLAYS (Liquid Limit Greater than 50)		CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand
			MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand
			OH	Organic Clay or Silt, May Contain Gravel and/or Sand
HIGHLY ORGANIC SOILS			PT	Peat, Primarily Organic Matter

SAMPLER DESCRIPTIONS

- SPLIT SPOON SAMPLER (1 3/8 inch inside diameter)
- MODIFIED CALIFORNIA SAMPLER (2 inch outside diameter)
- SHELBY TUBE (3 inch outside diameter)
- BLOCK SAMPLE
- BAG/BULK SAMPLE

WATER SYMBOLS

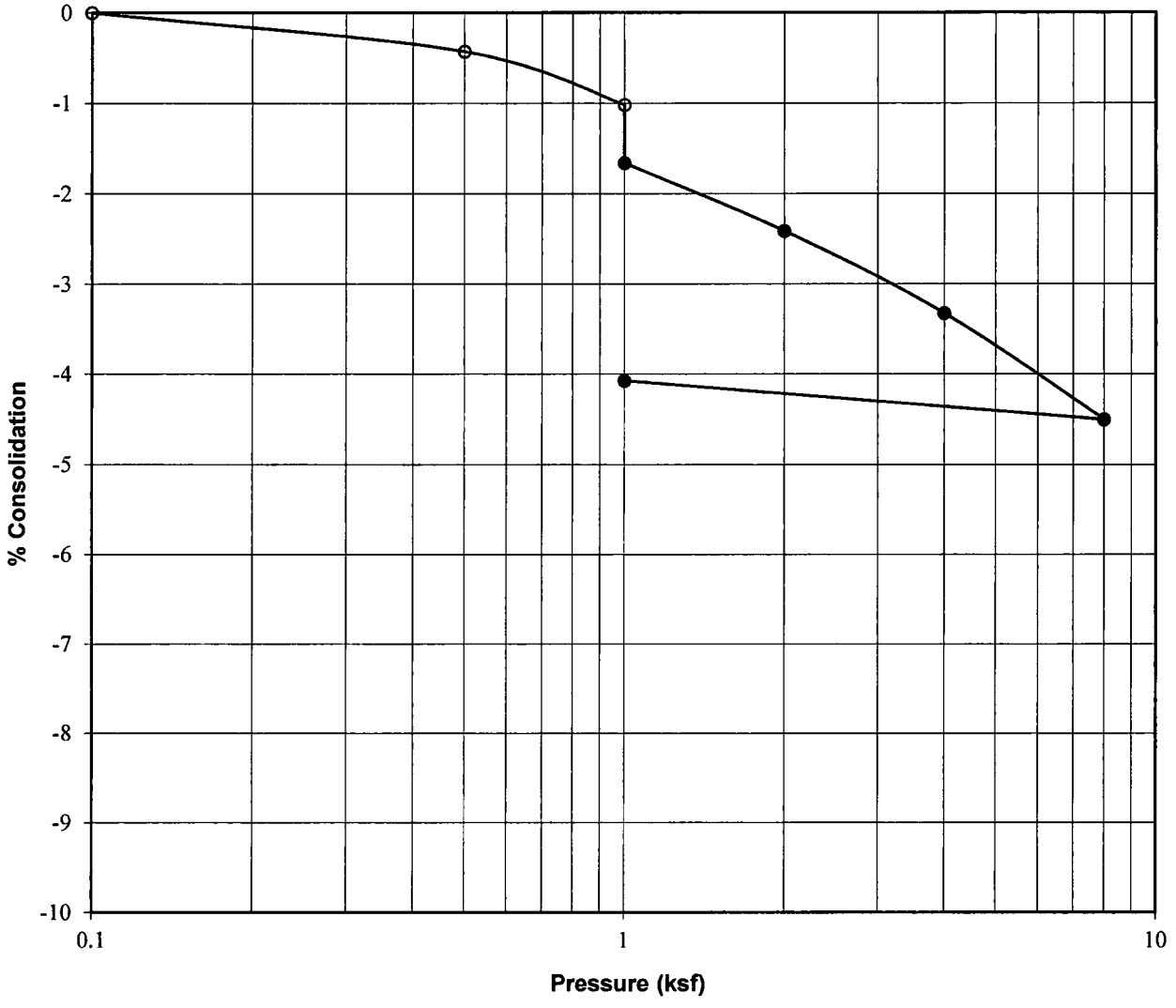
- ▽ Water level encountered during field exploration
- ▼ Water level encountered at completion of field exploration

NOTES:
1. The logs are subject to the limitations, conclusions, and recommendations in this report.
2. Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
3. Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
4. In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

PROJECT NO.: 198337 | EARTHTEC ENGINEERING | **FIGURE NO.:** 13

LEGEND 198337 LOGS.GPJ EARTHTEC.GDT 6/7/19

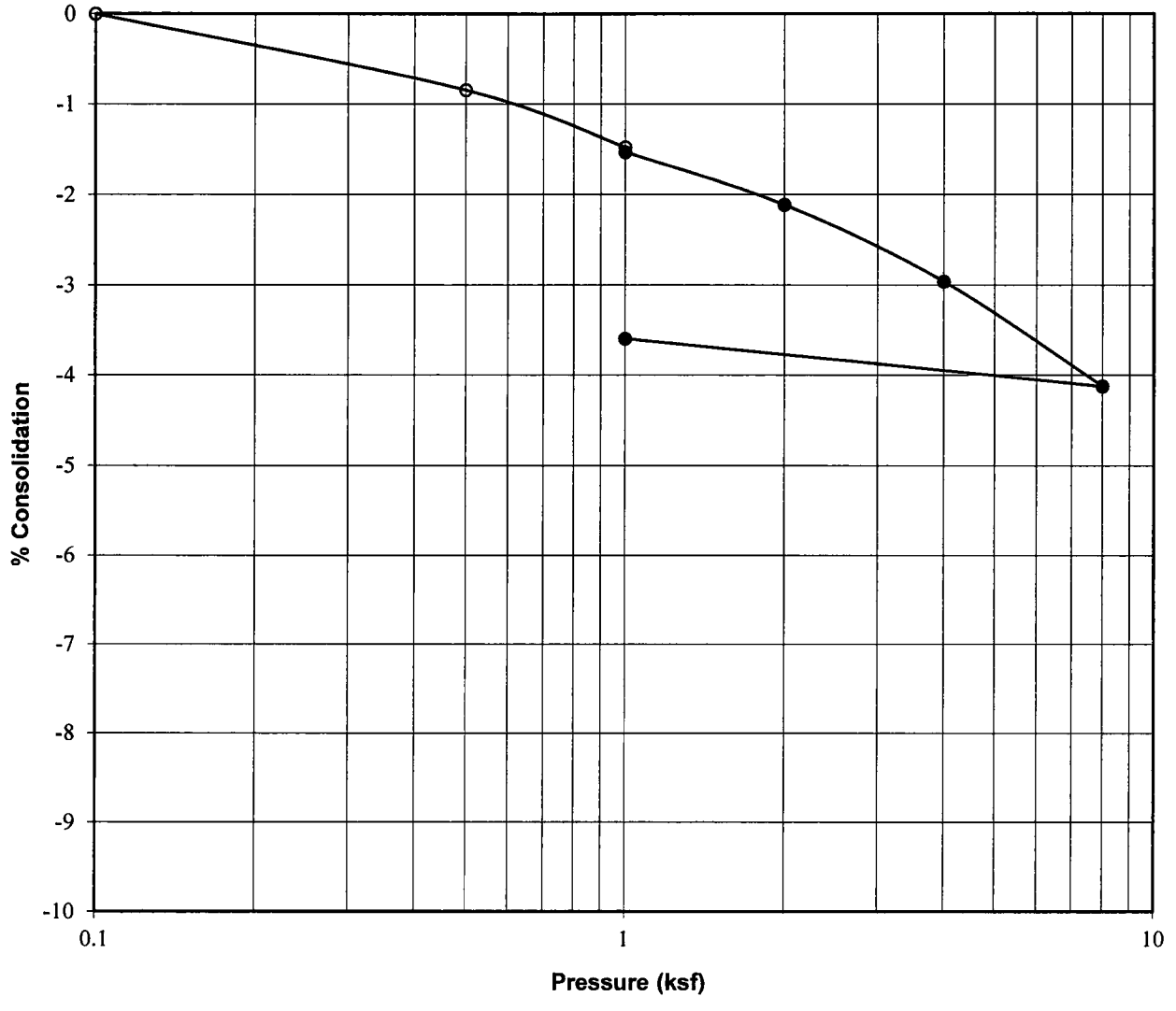
CONSOLIDATION - SWELL TEST



Project:	AF 191
Location:	TP-1
Sample Depth, ft:	6
Description:	Block
Soil Type:	Lean CLAY (CL)
Natural Moisture, %:	35
Dry Density, pcf:	88
Liquid Limit:	45
Plasticity Index:	20
Water Added at:	1 ksf
Percent Collapse:	0.6

PROJECT NO.: 198337	EARTHTEC ENGINEERING	**FIGURE NO.:** 14

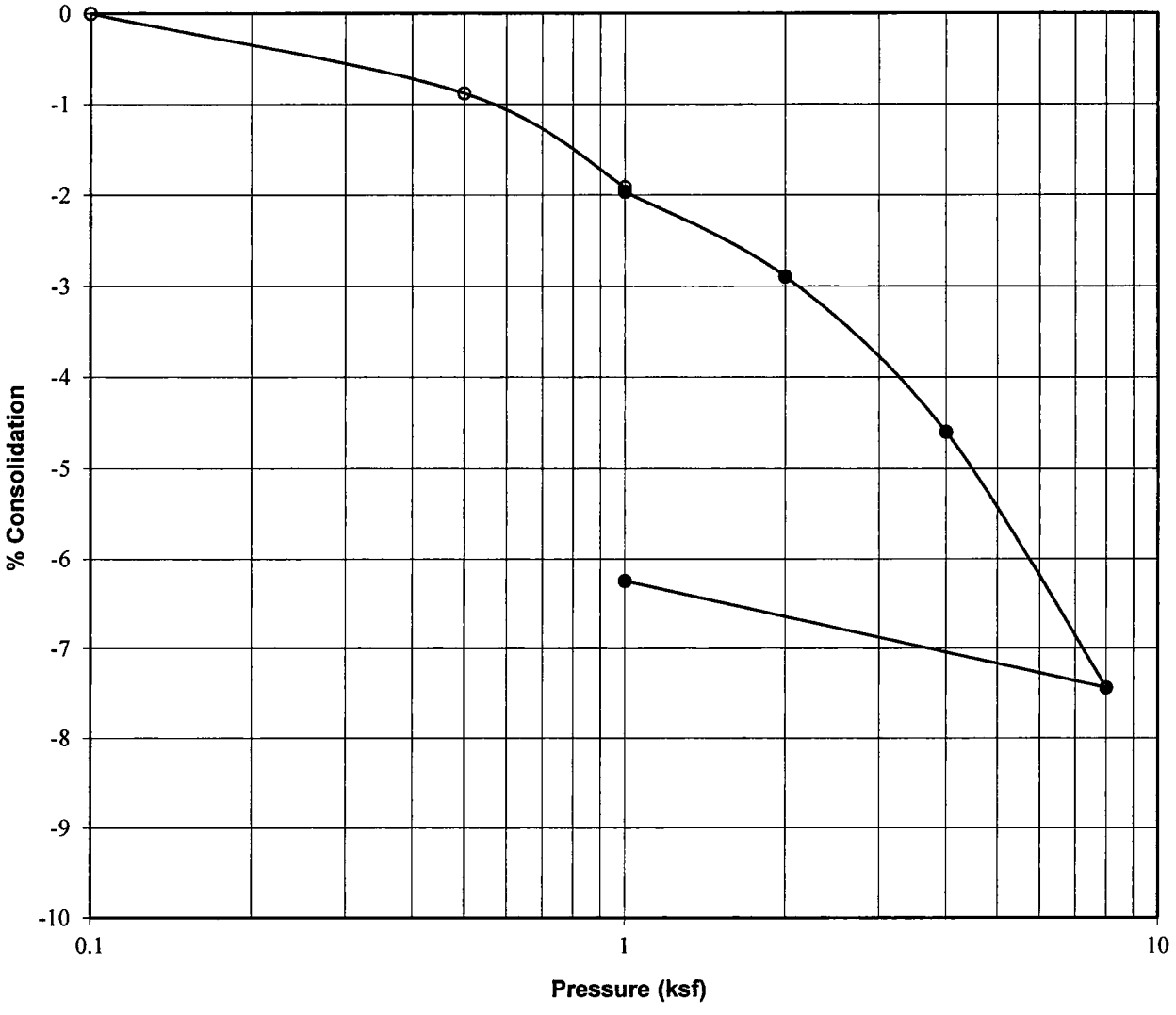
CONSOLIDATION - SWELL TEST



Project:	AF 191
Location:	TP-4
Sample Depth, ft:	2½
Description:	Block
Soil Type:	SILT with sand (CL)
Natural Moisture, %:	55
Dry Density, pcf:	65
Liquid Limit:	41
Plasticity Index:	11
Water Added at:	1 ksf
Percent Collapse:	0.1

PROJECT NO.: 198337	EARTHTEC ENGINEERING	**FIGURE NO.:** 15

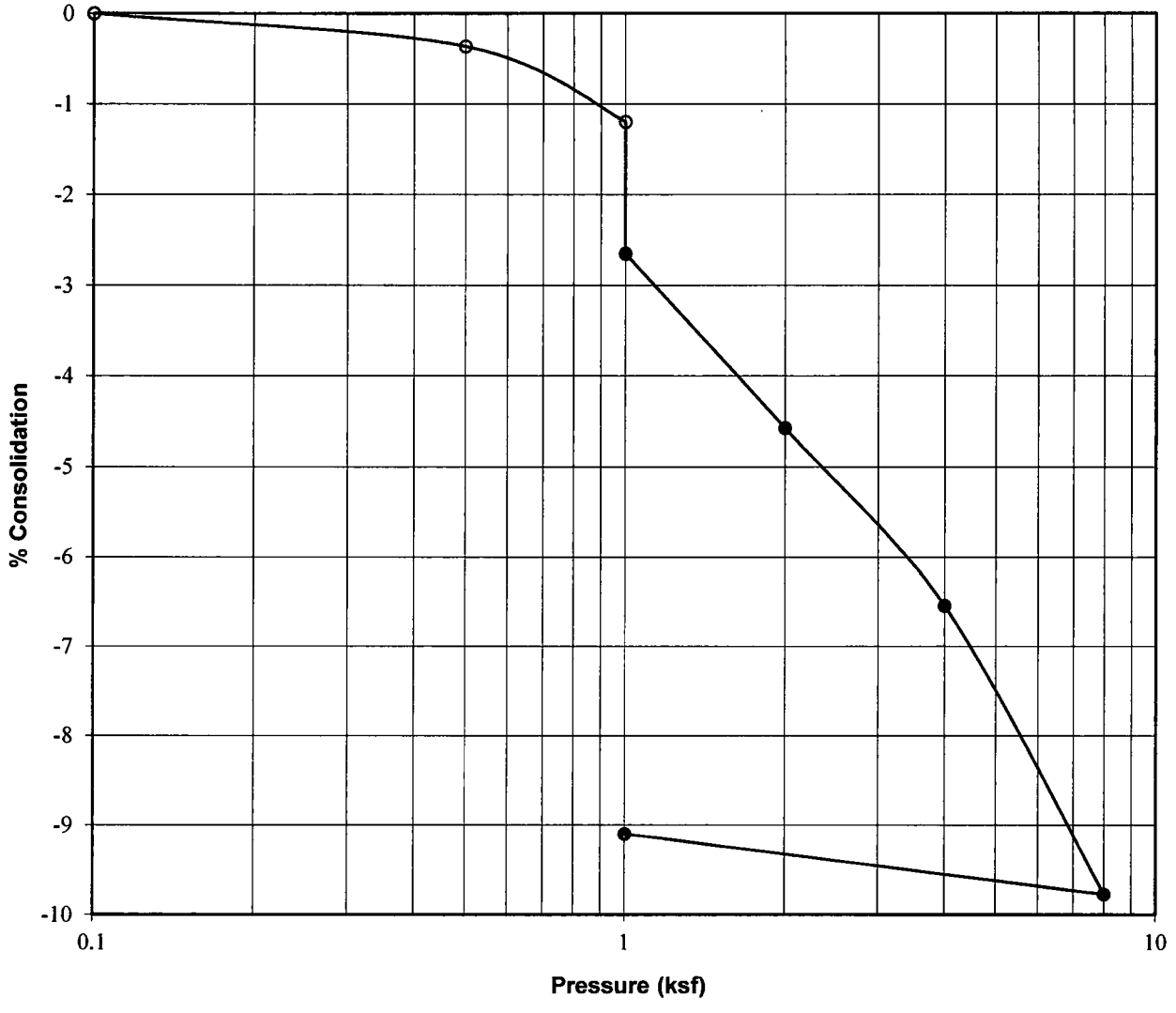
CONSOLIDATION - SWELL TEST



Project:	AF 191
Location:	TP-5
Sample Depth, ft:	7
Description:	Block
Soil Type:	Fat CLAY (CH)
Natural Moisture, %:	36
Dry Density, pcf:	86
Liquid Limit:	50
Plasticity Index:	28
Water Added at:	1 ksf
Percent Collapse:	0.1

PROJECT NO.: 198337	EARTHTEC ENGINEERING	**FIGURE NO.:** 16

CONSOLIDATION - SWELL TEST

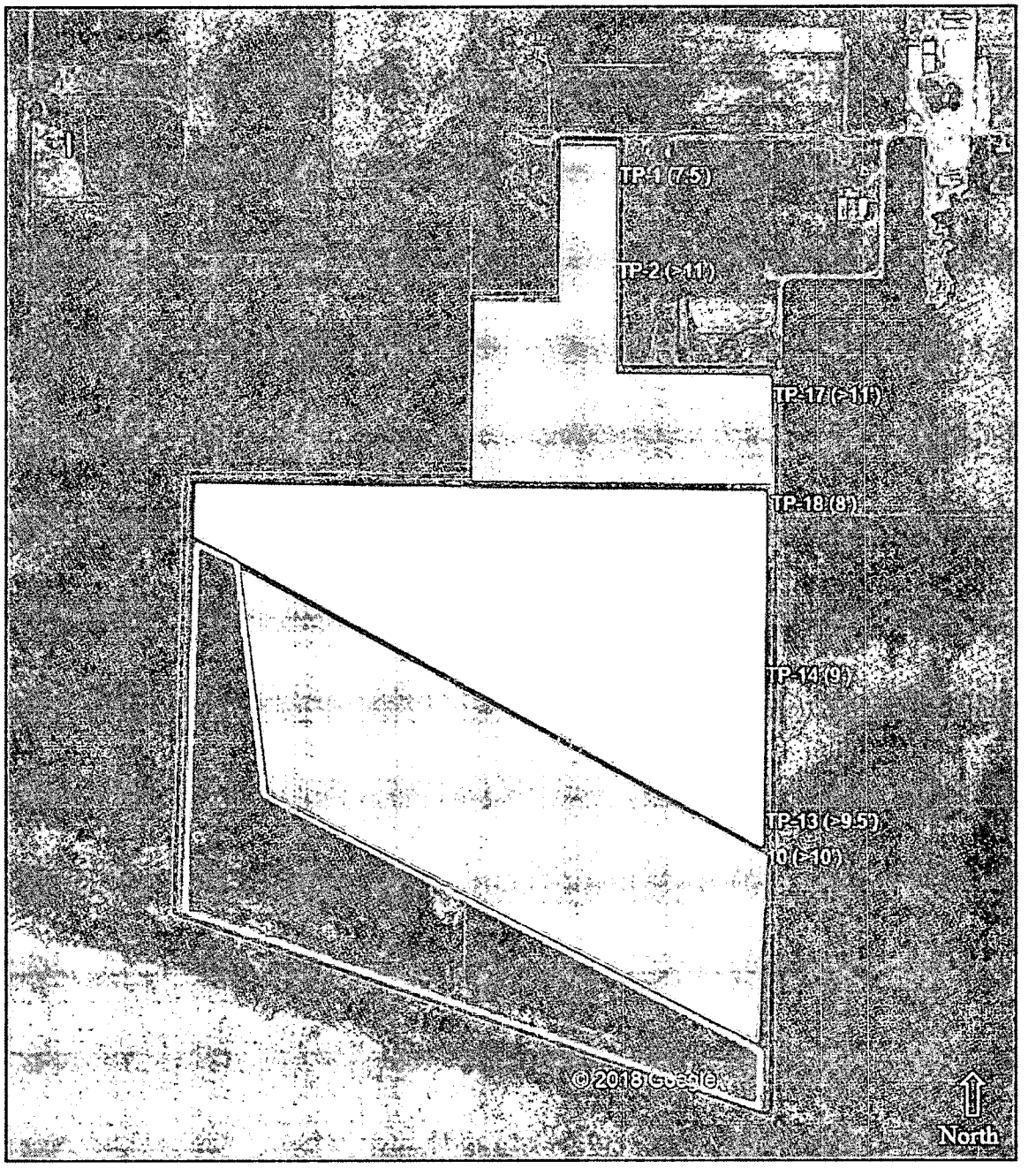


Project:	AF 191
Location:	TP-9
Sample Depth, ft:	3½
Description:	Block
Soil Type:	Silty SAND (SM)
Natural Moisture, %:	11
Dry Density, pcf:	87
Liquid Limit:	22
Plasticity Index:	NP
Water Added at:	1 ksf
Percent Collapse:	1.5

PROJECT NO.: 198337	EARTHTEC ENGINEERING	**FIGURE NO.:** 17

AREA LOCATION FOR AREA A, AREA B AND AREA C

AF 191
7300 NORTH 7000 WEST
AMERICAN FORK, UTAH



☐ Area A

Area B

☐ Area C

PROJECT NO.: 188000	EARTHTEC ENGINEERING	FIGURE NO.: 18

APPENDIX A

Timpview Analytical Laboratories
A Chemtech-Ford, Inc. Affiliate
1384 West 130 South Orem, UT 84058 (801) 229-2282

Certificate of Analysis

Earthtec Testing & Engineering
Caleb Allred
1497 W 40 S
Lindon, UT 84042
DW System # :

Work Order #: 19E1081
PO# / Project Name: 198337
Receipt: 5/20/19 11:39
Batch Temp °C: 19.3
Date Reported: 5/24/2019

Sample Name: 198337 TP-8 @ 5
Collected: 5/16/19 15:00 **Matrix:** Solid **Collected By:** Client

Parameter	Lab ID #	Method	Analysis Date / Time	Result	Units	MRL	Flags
Sulfate, Soluble (IC)	19E1081-01	EPA 300.0	5/21/19	74	mg/kg dry	14	
Total Solids	19E1081-01	SM 2540G	5/23/19	73.3	%	0.1	

Comment:

Reviewed by: Joyce Applegate

Joyce Applegate, Project Manager

BORING LOG

NO.: B-1

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: All-Terrain Hydraulic Drill Rig
DEPTH TO WATER; INITIAL ▽ : 6 ft.

PROJECT NO.: 179072
DATE: 09/08/17
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, dry, brown										
			Fat CLAY, soft to medium stiff, moist, brown										
3					3								
			...very moist										
6			▽		2								
			...moist, mottled, gray to brown										
9		CH			6								SS
			...medium stiff (estimated), black to gray			31	92	55	33	6	8	86	C
12													
15			...wet, gray, thin interbedded sand layers		6								

Notes: Groundwater encountered at 6 feet.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity/Nitrates/PH
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 3a

LOG OF TESTHOLE 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

BORING LOG

NO.: B-1

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: All-Terrain Hydraulic Drill Rig
DEPTH TO WATER; INITIAL ▽ : 6 ft.

PROJECT NO.: 179072
DATE: 09/08/17
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
			Fat CLAY, soft to medium stiff, moist, brown										
18													
			...dark gray, some organics		2	41				1	8	91	
21													
		CH											
24													
			...sand layers up to 2 inches thick		3								
27													
30													
		SM	Silty SAND, medium dense, wet, dark gray		27								
			Maximum depth explored 31.5 feet										

Notes: Groundwater encountered at 6 feet.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity/Nitrates/PH
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 3b

LOG OF TESTHOLE 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

BORING LOG

NO.: B-2

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: All-Terrain Hydraulic Drill Rig
DEPTH TO WATER; INITIAL ▽ : 15 ft.

PROJECT NO.: 179072
DATE: 09/08/17
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, lean clay, dry, brown										
			Sandy Lean CLAY with gravel, medium stiff, dry to moist, gray										
3					5								
		CL											
			...oxide stains										
6			...wet, organics		5								SS
			Sandy Lean CLAY with gravel, stiff, wet, gray, oxide stains, organics			23	101	39	21	15	27	58	C
9													
			...brown to gray, some gravel		9								
		CL											
12													
15			▽										
		CL	Lean CLAY, stiff to soft, wet, gray, oxide stains, organics		11	23		32	10	1	2	97	

Notes: Groundwater encountered at 15 feet.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity/Nitrates/PH
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 4a

LOG OF TESTHOLE 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

BORING LOG

NO.: B-2

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: All-Terrain Hydraulic Drill Rig
DEPTH TO WATER; INITIAL ▽ : 15 ft.

PROJECT NO.: 179072
DATE: 09/08/17
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
			Lean CLAY, stiff to soft, wet, gray, oxide stains, organics										
18													
			...gray, thin sand layers		7								
21													
24		CL			4								
27													
30					3								
			Maximum depth explored 31½ feet										

Notes: Groundwater encountered at 15 feet.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity/Nitrates/PH
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 4b

LOG OF TESTHOLE 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-1

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ : 7.5 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, dry, brown									
2		CL	Lean CLAY, medium stiff (estimated), slightly moist to moist, light brown, rootholes									
3												
4			...brown									
5												
6												
7												
8		ML	SILT with sand, stiff (estimated), wet, brown ▽	X	34		26	1	6	9	85	
9			Maximum depth explored 8 feet due to cave-ins									
10												
11												
12												

Notes: Groundwater encountered at 7½ feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 5

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-2

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, dry, brown, roots									
2		CL	Lean CLAY with sand, medium stiff (estimated), dry, brown, roots									
3												
4			...some oxidation	X								
5												
6			...thin sand layers									
7												
8												
9												
10		CL	Lean CLAY, stiff (estimated), moist, gray		28	98	34	11	0	6	94	C
11		GM	Silty GRAVEL with sand, dense (estimated), very moist, gray	X								
12			Maximum depth explored 11 feet									

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 6

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-3

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ : 9 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, dry, brown, roots									
1			Lean CLAY, medium stiff (estimated), dry, brown, rootholes									
2												
3												
4			...soft (estimated), moist, no rootholes									
5		CL		■	31		35	12	6	8	86	
6			...stiff (estimated), wet, gray, oxidation									
7												
8												
9			▽									
10		CL	Sandy Lean CLAY, very stiff (estimated), wet, gray, some rootholes	■								
11			Maximum depth explored 10 feet due to cave ins									
12												

Notes: Groundwater encountered at 9 feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 7

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-4

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, dry, brown, roots									
2			Sandy Lean CLAY, stiff (estimated), dry, brown, some oxidation, roots									
5		CL	...moist ...oxidation, mottled									
7			...gray									
9		CH	Fat CLAY, very stiff (estimated), moist, dark gray to black, organics		28		51	25	0	4	96	
12			Maximum depth explored 10 feet									

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 8

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-5

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, dry, brown, roots									
2			Sandy Lean CLAY, stiff (estimated), dry, brown, roots									
3		CL										
4					12		35	15	1	36	63	
5												
6			Lean CLAY, stiff (estimated), grayish brown, oxidation									
7												
8		CL										
9												
10												
11			Maximum depth explored 10½ feet									
12												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 9

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-6

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ : 9 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, dry, brown, roots									
2			Lean CLAY, medium stiff (estimated), light brown, roots, rootholes									
3												
4				X								
5												
6		CL										
7			...very stiff (estimated), moist		31	88	45	23	1	7	92	C
8												
9			...mottled grayish yellow									
10				X								
11			Maximum depth explored 10½ feet									
12												

Notes: Groundwater encountered at 9 feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 10

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-7

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, dry, brown, roots									
1												
2		CL	Sandy Lean CLAY, medium stiff (estimated), dry, brown, roots, rootholes									
3												
4												
5				X								
6		CL	Lean CLAY with sand, stiff (estimated), moist, brown									
7												
8												
9												
10		CL	Lean CLAY with gravel, stiff (estimated), moist, brown		28	100	45	22	13	5	82	C
11			Maximum depth explored 10 feet									
12												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 11

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-8

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, silty sand, dry, brown, roots									
1												
2		CL	Sandy Lean CLAY, medium stiff (estimated), dry, brown, roots, rootholes									
3												
4												
5		CL	Lean CLAY, stiff (estimated), moist, brown, roots, some oxidation									
6												
7												
8				X								
9			...very stiff (estimated), organics		22	104	38	17	1	4	95	C
10												
11			Maximum depth explored 10 feet									
12												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 12

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-9

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽: 6.5 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼:

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, silty sand, dry, brown, roots									
1												
2		CL	Sandy Lean CLAY, medium stiff (estimated), dry, brown, roots, rootholes									
3												
4												
5			Lean CLAY, medium stiff (estimated), moist to wet, gray									
					27	91	41	18	1	11	88	C
6			...mottled grayish yellow ▽									
7												
8		CL										
9												
10			...organics									
11												
12			Maximum depth explored 11 feet									

Notes: Groundwater encountered at 6½ feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 13

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-10

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ : 6.5 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, dry, brown, roots									
2			Silty CLAY, medium stiff to stiff (estimated), moist, brown, roots									
3												
4												
5				X	22		25	5	0	8	92	
6		CL-ML	...very stiff (estimated), wet, gray									
7												
8												
9				X								
10												
11			Maximum depth explored 10½ feet									
12												

Notes: Groundwater encountered at 6½ feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 14

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-11

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ : 10 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, dry, brown, roots									
1												
2			Sandy Lean CLAY, medium stiff (estimated), dry, light brown, roots, rootholes									
3												
4		CL		X								
5												
6			Lean CLAY with sand, stiff (estimated), moist, light brown, roots, oxidation									
7												
8		CL	...very stiff (estimated)									
9				■	32	91	40	19	8	8	84	C
10		▽										
11			Maximum depth explored 10½ feet									
12												

Notes: Groundwater encountered at 10 feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 15

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-12

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ : 9 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, dry, brown, roots									
1												
2												
3		CL	Sandy Lean CLAY, stiff (estimated), dry, dark brown, roots, rootholes									
4												
5			Lean CLAY, stiff (estimated), slightly moist, brown to dark brown, roots									
6					30	93	45	24	0	6	94	C
7		CL										
8			...very stiff (estimated), mottled grayish yellow									
9			▽									
10												
11			Maximum depth explored 10½ feet									
12												

Notes: Groundwater encountered at 9 feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 16

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-13

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, dry, brown, roots									
2		CL	Lean CLAY with sand, stiff (estimated), dry, light brown, pinholes, roots									
3				■								
4												
5												
6				X								
7		GP-GM	Poorly Graded GRAVEL with silt and sand, very dense (estimated), dry, light brown									
8				X	1				72	23	5	
9												
10			Maximum depth explored 9½ feet due to equipment refusal									
11												
12												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 17

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-14

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ : 9 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▽ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, dry, brown, roots									
2		SM	Silty SAND, medium dense (estimated), slightly moist, light brown									
3												
4												
5				X								
6		CL	Sandy Lean CLAY, medium stiff (estimated), slightly moist, brown, roots									
7				X								
8		CL ▽	Lean CLAY with sand, stiff (estimated), moist to wet, brown, roots									
9												
10					26	100	35	19	0	20	80	C
11												
12			Maximum depth explored 11 feet									

Notes: Groundwater encountered at 9 feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 18

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-15

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ : 9.5 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, dry, brown, roots									
2		SM	Silty SAND, medium dense (estimated), slightly moist, light brown, roots									
3												
4				X								
5												
6												
7		CL	Lean CLAY, medium stiff (estimated), moist, brown, roots									
8					35	83	47	26	1	7	92	C
9			▽									
10												
11				X								
12			Maximum depth explored 11 feet									

Notes: Groundwater encountered at 9½ feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 19

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-16

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, dry, brown, roots									
3		ML	Sandy SILT, medium stiff (estimated), slightly moist, light brown, rootholes									
4				X	12		22	NP	3	43	54	
5		CL	Sandy Lean CLAY, medium stiff (estimated), moist, brown, rootholes									
8				X								
9			...Interbedded organics									
10				X								
11			Maximum depth explored 10½ feet									
12												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 20

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-17

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0												
1			TOPSOIL, sandy lean clay, dry, brown, roots									
2		ML	Sandy SILT, stiff (estimated), moist, brown									
3												
4												
5				X	14				3	32	65	
6												
7												
8												
9		ML	SILT with sand, stiff (estimated), moist, brown	X	36		23	2	1	19	80	
10												
11												
12			Maximum depth explored 11 feet									

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 21

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

TEST PIT LOG
NO.: TP-18

PROJECT: Fenn-Willard Property
CLIENT: Mr. Shane Morris
LOCATION: See Figure 2
OPERATOR: Blaine Hone Excavating
EQUIPMENT: Mini Track-Mounted Excavator
DEPTH TO WATER; INITIAL ▽ : 8 ft.

PROJECT NO.: 179072
DATE: 09/11/17
ELEVATION: Not Measured
LOGGED BY: H. Peterson
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, sandy lean clay, dry, brown									
1												
2			Lean CLAY with gravel, stiff (estimated), moist, light brown									
3												
4												
5				X								
6		CL	...light brown to gray									
7												
					28	92	36	13	18	7	75	C
8			▽									
9												
10				X								
11			Maximum depth explored 10½ feet									
12												

Notes: Groundwater encountered at 8 feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 179072

EARTHTEC ENGINEERING

FIGURE NO.: 22

LOG OF TESTPIT 179072 LOGS.GPJ EARTHTEC.GDT 10/6/17

EARTHTEC ENGINEERING

1497 West 40 South
Lindon, Utah - 84042
Phone (801) 225-5711

840 West 1700 South #10
Salt Lake City, Utah - 84104
Phone (801) 787-9138

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516

March 14, 2022

Red Pine
520 South 850 East, a4
Lehi, UT 84043

Re: **Structural Fill Requirements**
American Fork Property
6885 West 7300 North
American Fork, Utah
Job No: 220061

Gentlemen:

This letter is a response to a meeting with Red Pine Construction about structural fill depths. A geotechnical study[1] was previously completed by Earthtec Engineering on June 7, 2019.

Strip/Spread Footings
We recommend that conventional strip and spread foundations be constructed entirely on a minimum of 12 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils for structural loads up to 2,500 pounds per linear foot for wall loads. For column loads, the specified structural fill depths are below.

Depth of Structural Fill

Structural Loads	Depth of Structural Fill (in)	Maximum Allowable Bearing Capacity (psf)
Up to 2.5 klf	12	1500
Up to 20 kips	48	2000
20 – 30 kips	60	2000

Concrete floor slabs may be supported on 6 inches of properly placed and compacted structural fill after appropriate removals and grading as outlined in Section 8.1 of the referenced report

The information presented in this letter applies to the same general conditions in the geotechnical report. The information and recommendations presented in this letter were conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in this area at this time. No warranty or representation is intended in our proposals, contracts, reports, or letters. All other recommendations in the referenced report should be followed.

[1] Geotechnical Study, AF 191, 7300 North 7000 West, American Fork, Utah, Earthtec Engineering, Project No. 198337, June 7, 198337.

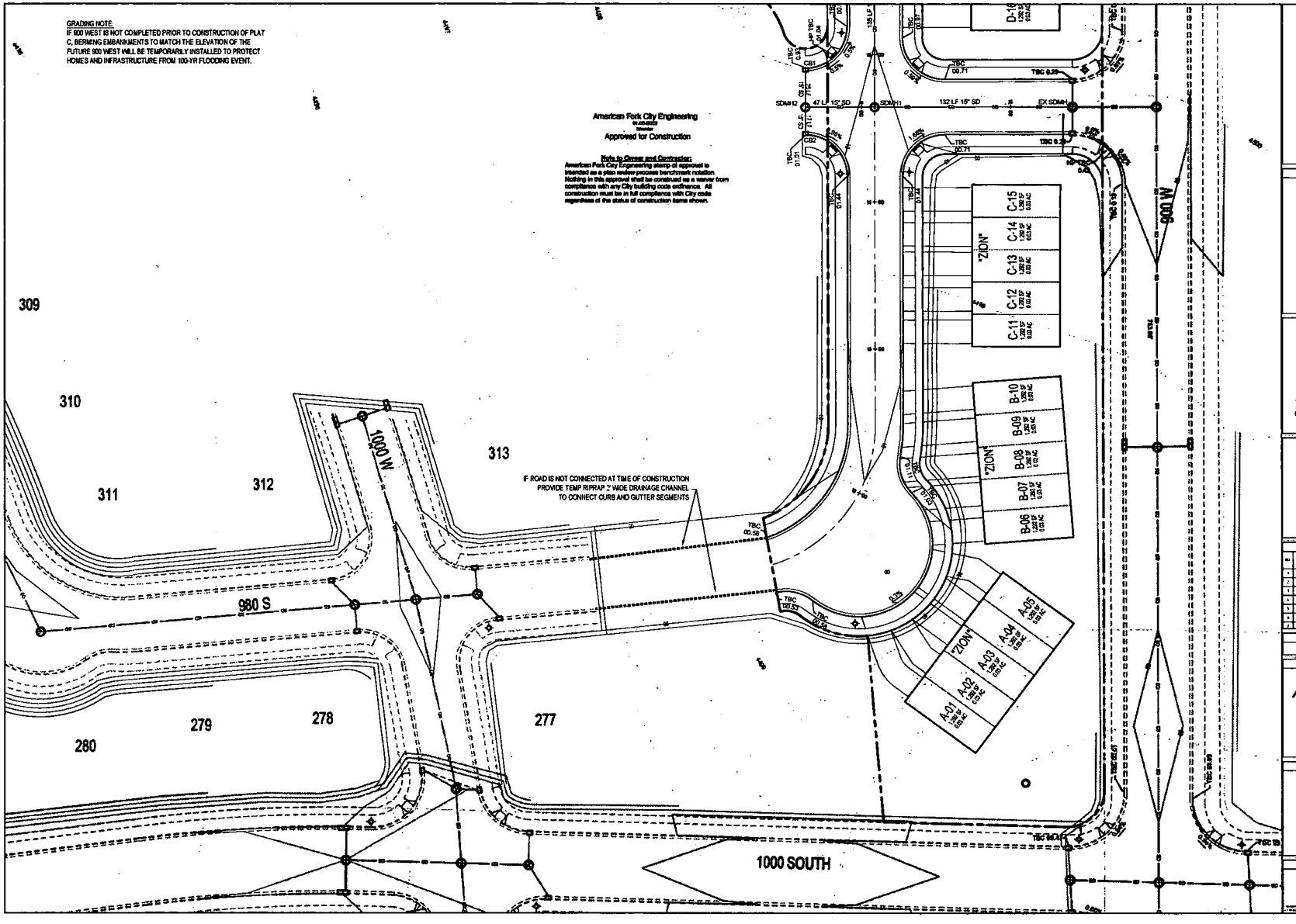
We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC ENGINEERING

PROFESSIONAL ENGINEER
No. 5567049-2202
TIMOTHY ALLAN MITCHELL
Electronically generated on
3/14/2022
STATE OF UTAH

Jeremy Balleck, E.I.T.
Project Engineer

Timothy A. Mitchell, P.E.
Vice President



WHITE HORSE DEVELOPERS
520 S. 850 E, Suite A4
LEHI, UT 84043

DEVELOPMENT

AF CROSSING PLAT E-1

A LOW DENSITY ATTACHED HOUSING PROJECT

0 15 30 60 90
SCALE: 1"= 30'

Gerg
CIVIL ENGINEERING
11038 N. Highland Blvd Suite 400
Highland, UT. 84003
office (801) 492-1277
cell (801) 616-1677

REVISIONS

#	DATE	DESCRIPTION

SEAL

STATE OF UTAH
REGISTERED
PROFESSIONAL ENGINEER
09/08/2021
343602

AUTHOR	DATE
FINAL PLAN	09/08/2021

PROJECT

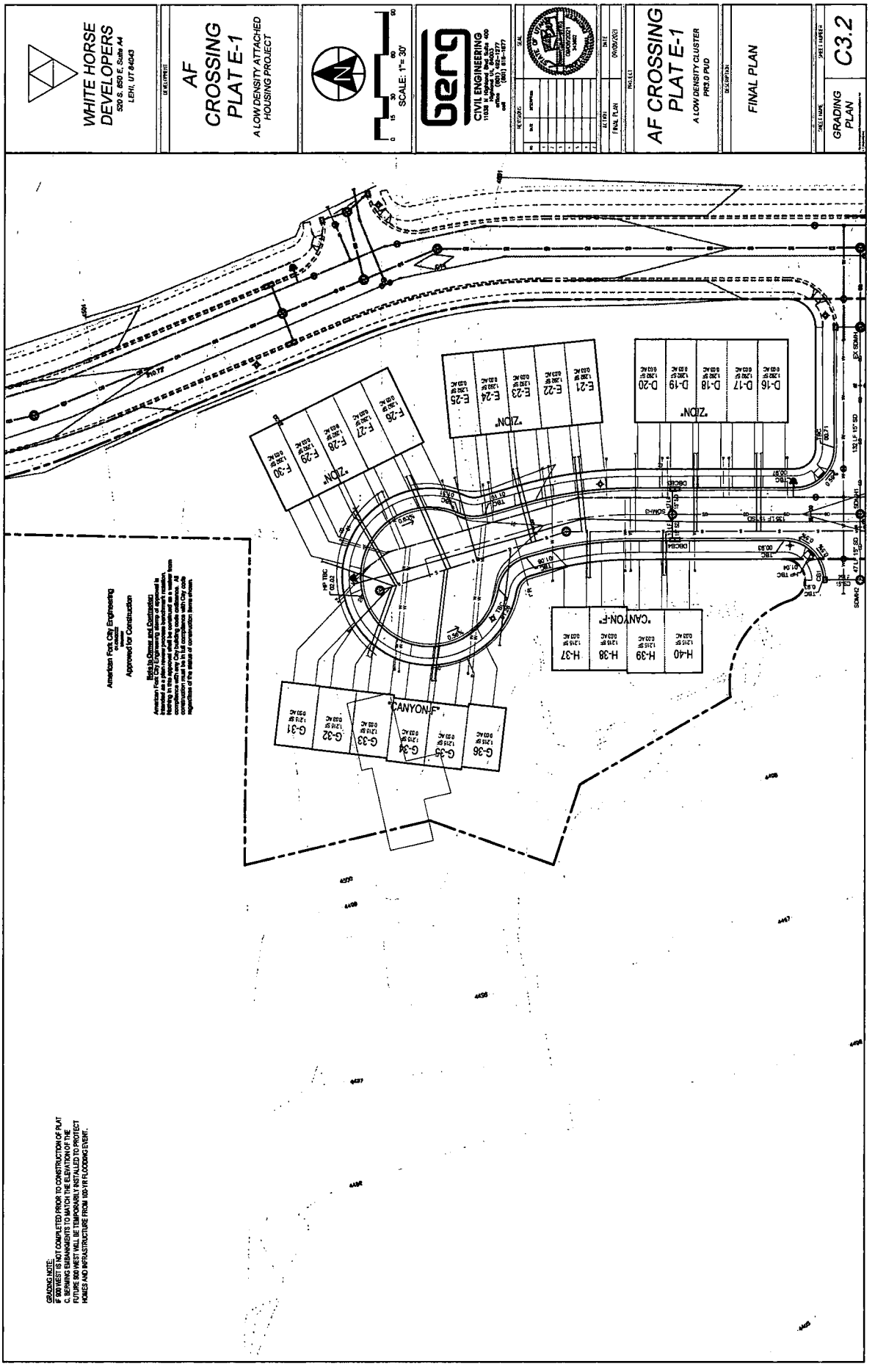
AF CROSSING PLAT E-1

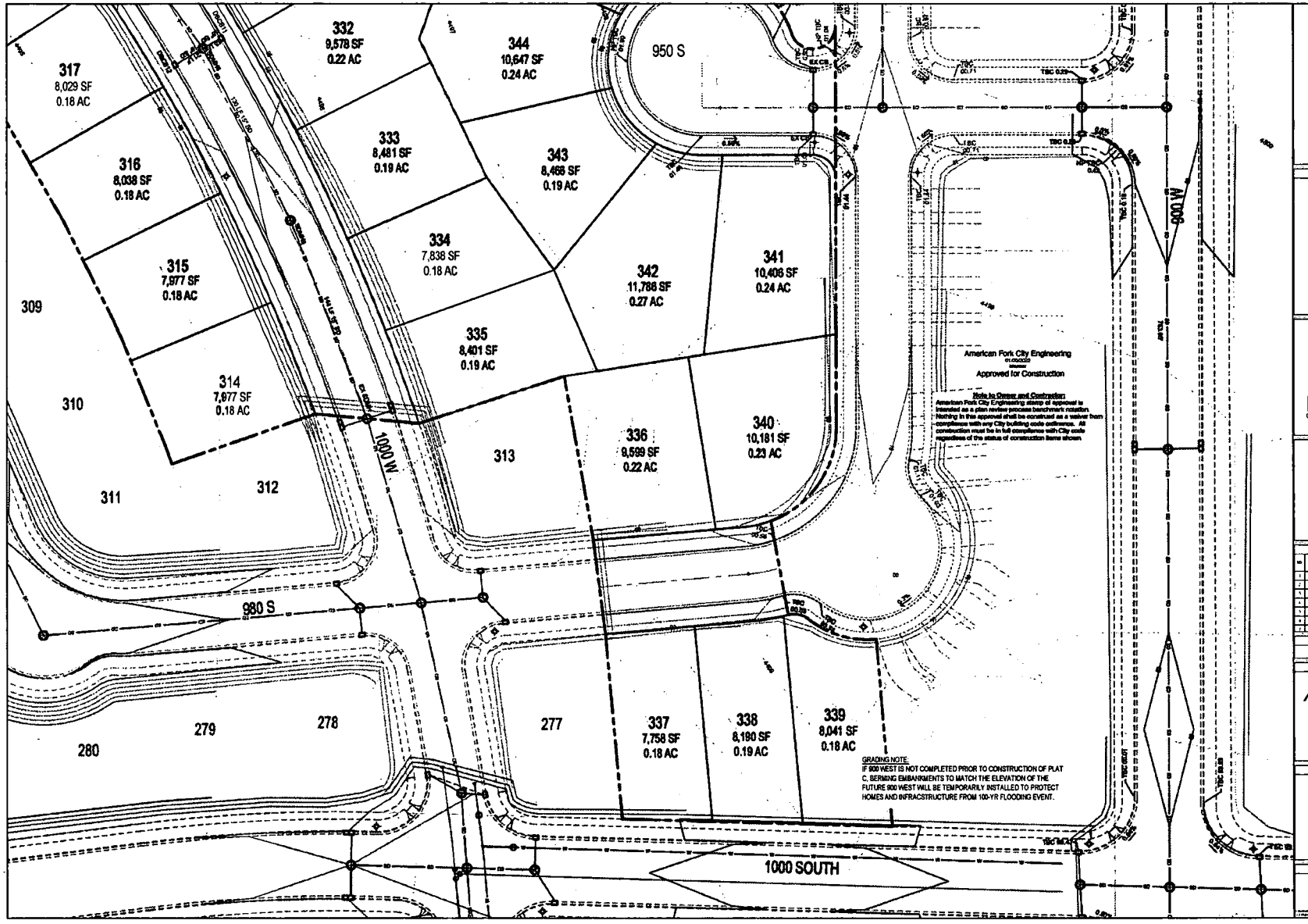
A LOW DENSITY CLUSTER
PR3.0 PUD

DESCRIPTION

FINAL PLAN

SHEET NAME	SHEET NUMBER
GRADING PLAN	C3.1


WHITE HORSE DEVELOPERS
520 S. 850 E. Suite #4
LEHI, UT 84043
AF CROSSING PLAT E-1
A LOW DENSITY ATTACHED HOUSING PROJECT
SCALE: 1"= 30'
CIVIL ENGINEERING
AF CROSSING PLAT E-1
A LOW DENSITY CLUSTER
PRD.0 PUD
FINAL PLAN
GRADING PLAN
C3.2
"ZION"
"CANYON-F"
American Fork City Engineering
Approved for Construction
GRADING NOTE:
A. 800 WEST IS NOT COMPLETED PRIOR TO CONSTRUCTION OF PLAT
C. BERMING EMBANKMENTS TO MATCH THE ELEVATION OF THE FUTURE 800 WEST WILL BE TEMPORARILY INSTALLED TO PROTECT HOMES AND INFRASTRUCTURE FROM 100-YR FLOODING EVENT.



WHITE HORSE DEVELOPERS
520 S. 850 E, Suite A4
LEHI, UT 84043

DEVELOPMENT

AF CROSSING PLAT E-2

A PR 3.0 FLEXIBLE LOT SUBDIVISION

0 15 30 60 90
SCALE: 1"= 30'

berg
CIVIL ENGINEERING
11038 N Highland Blvd Suite 400
Highland UT, 84003
office (801) 492-1277
cell (801) 616-1677

REVISIONS | SEAL

NO	DATE	DESCRIPTION
1		
2		
3		
4		
5		
6		
7		

STATE OF UTAH — 09/08/2021

ACTION	DATE
FINAL PLAN	09/08/2021

PROJECT

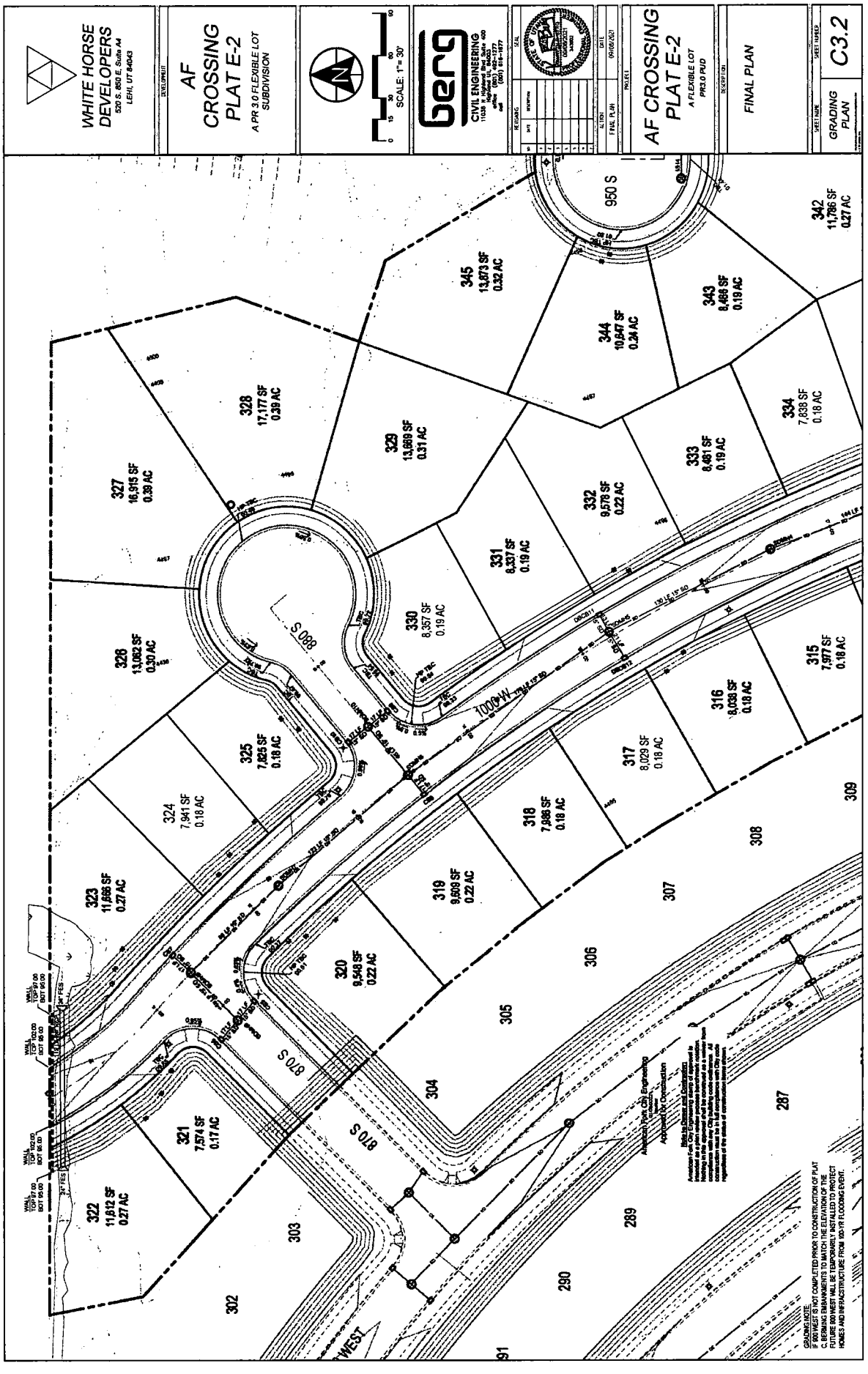
AF CROSSING PLAT E-2

A FLEXIBLE LOT
PR3.0 PUD

DESCRIPTION

FINAL PLAN

SHEET NAME	SHEET NUMBER
GRADING PLAN	C3.1


WHITE HORSE DEVELOPERS
920 S. 850 E. Suite A4
LEHI, UT 84043
AF CROSSING PLAT E-2
A PR 3.0 FLEXIBLE LOT SUBDIVISION
SCALE: 1"= 30'
berg
CIVIL ENGINEERING
AF CROSSING PLAT E-2
A FLEXIBLE LOT PRS.0 PUD
FINAL PLAN
GRADING PLAN
C3.2
950 S
S 870 S
S 008
WEST
100 YR
327 16,915 SF 0.39 AC
328 17,177 SF 0.39 AC
329 13,889 SF 0.31 AC
330 8,357 SF 0.19 AC
331 8,337 SF 0.19 AC
332 9,578 SF 0.22 AC
333 8,481 SF 0.19 AC
334 7,838 SF 0.18 AC
342 11,786 SF 0.27 AC
343 8,486 SF 0.19 AC
344 10,647 SF 0.24 AC
345 13,873 SF 0.32 AC
326 13,082 SF 0.30 AC
325 7,825 SF 0.18 AC
324 7,941 SF 0.18 AC
323 11,886 SF 0.27 AC
315 7,977 SF 0.18 AC
316 8,038 SF 0.18 AC
317 8,029 SF 0.18 AC
318 7,988 SF 0.18 AC
319 9,609 SF 0.22 AC
320 9,548 SF 0.22 AC
321 7,574 SF 0.17 AC
322 11,812 SF 0.27 AC
GRADING NOTES
IF 800 WEST IS NOT COMPLETED PRIOR TO CONSTRUCTION OF PLAT
C. BERMING EMBANKMENTS TO MATCH THE ELEVATION OF THE
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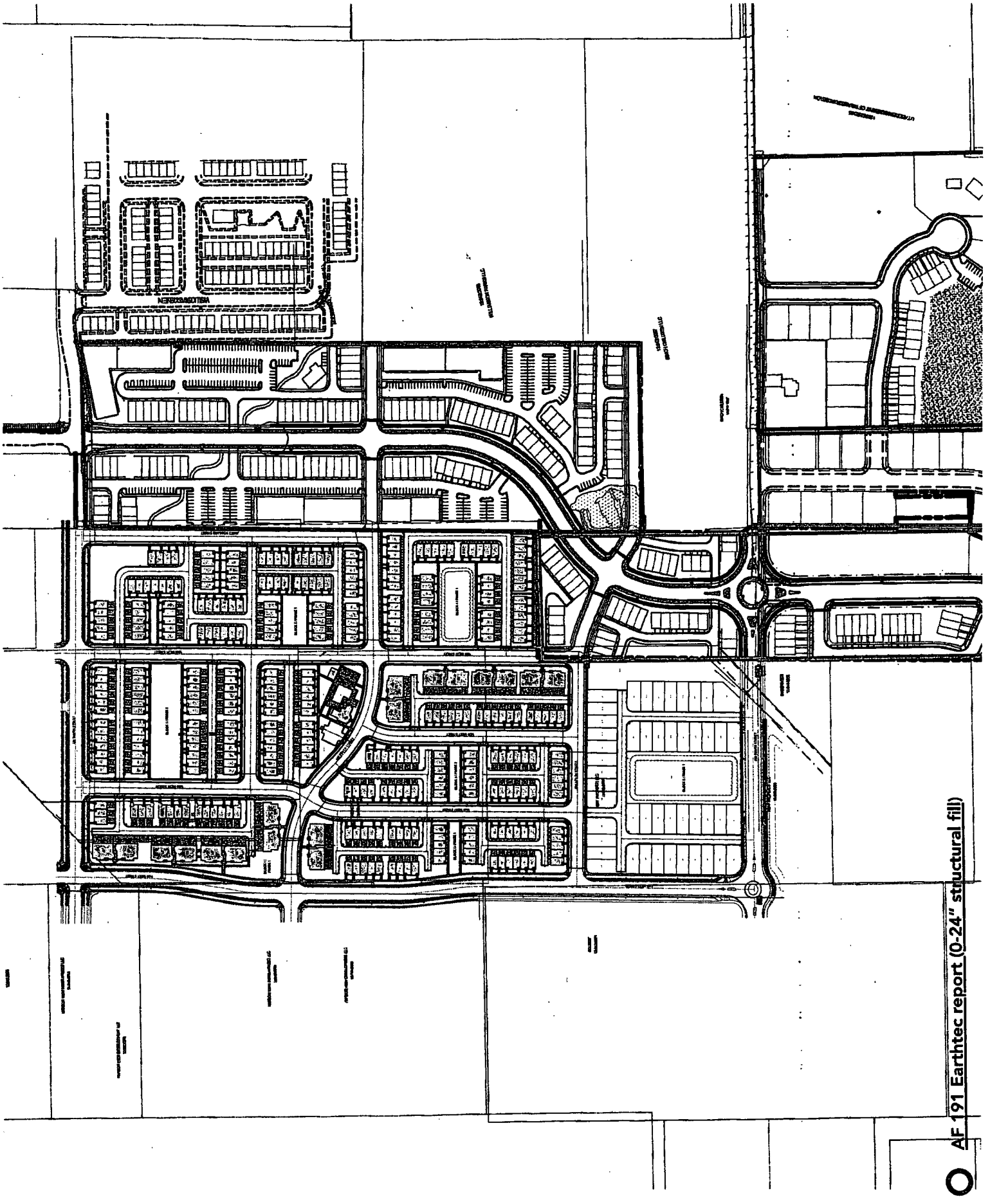
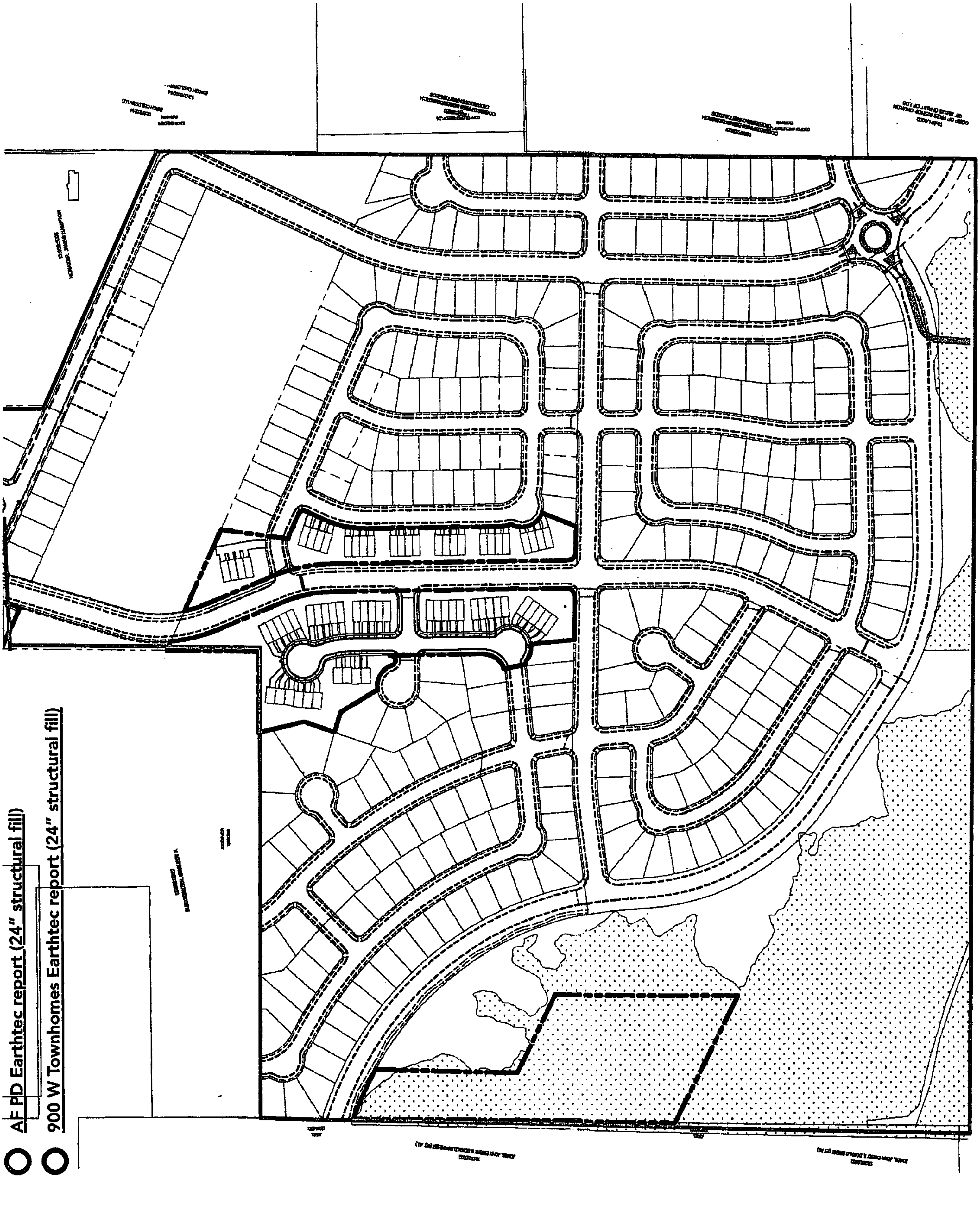


AF 191 Earthtec report (0-24" structural fill)


AF PD Earthtec report (24" structural fill)
900 W Townhomes Earthtec report (24" structural fill)