ENT 127984:2021 PG 1 of 131
ANDREA ALLEN
UTAH COUNTY RECORDER
2021 Jul 20 4:24 pm FEE 0.00 BY SW
RECORDED FOR AMERICAN FORK CITY

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

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

This Notice is recorded to bind the attached Geotechnical Study dated MARCH 29, 2021 along with the site grading plan to the property generally located at 6203. 900W. AMERICAN FORK (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 19th day of July, 2021.

OWNER(S):

(Signature) _____ (Signature) _____

Scott Smithson (Printed Name) _____ (Printed Name)

Owner (Title) _____ (Title)

STATE OF UTAH)
§
COUNTY OF Utah)

On the 19 day of July, 2021, personally appeared before me Scott Smithson 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
SCOTT M ROBERTS
COMM. # 711750
MY COMMISSION EXPIRES
APRIL 30, 2024
STATE OF UTAH

Notary Public
My Commission Expires: 4/30/24

Approved as to form: American Fork City Attorney

Rev. 12/4/18

Plat A

BEGINNING AT A POINT LOCATED N89°52'20"E 2170.18 FEET AND S00°26'22"E 620.17 FEET FROM THE SOUTHEAST CORNER OF SECTION 22, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 00°40'12" WEST 454.19 FEET; THENCE WEST 5.62 FEET; THENCE SOUTH 01°10'00" WEST 650.91 FEET; THENCE NORTH 88°34'45" EAST 11.27 FEET; THENCE SOUTH 01°33'05" WEST 1260.43 FEET; THENCE ALONG THE ARC OF A 662.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 364.42 FEET (CURVE HAVING A CENTRAL ANGLE OF 31°32'27" AND LONG CHORD BEARS N48°13'47"W 359.84 FEET); THENCE NORTH 57°32'26" EAST 20.00 FEET; THENCE ALONG THE ARC OF A 642.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 381.09 FEET (CURVE HAVING A CENTRAL ANGLE OF 34°00'38" AND LONG CHORD BEARS N15°27'15"W 375.52 FEET); THENCE NORTH 01°33'05" EAST 891.95 FEET; THENCE ALONG THE ARC OF A 792.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 322.29 FEET (CURVE HAVING A CENTRAL ANGLE OF 23°18'56" AND LONG CHORD BEARS N13°12'32"E 320.07 FEET); THENCE NORTH 24°52'00" EAST 20.8259 FEET; THENCE NORTH 65°08'00" WEST 1247.80 FEET; THENCE NORTH 01°01'26" EAST 481.06 FEET; THENCE SOUTH 65°08'00" EAST 128.08 FEET; THENCE ALONG THE ARC OF A 564.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 151.36 FEET (CURVE HAVING A CENTRAL ANGLE OF 15°22'34" AND LONG CHORD BEARS N15°43'12"E 150.90 FEET); THENCE SOUTH 89°37'30" EAST 80.63 FEET; THENCE ALONG THE ARC OF 15.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 18.90 FEET (CURVE HAVING A CENTRAL ANGLE OF 72°12'35" AND LONG CHORD BEARS S29°01'43"E 17.68 FEET); THENCE SOUTH 65°08'00" EAST 73.40 FEET; THENCE NORTH 25°49'32" EAST 111.15 FEET; THENCE SOUTH 84°19'13" EAST 111.29 FEET; THENCE ALONG THE ARC OF 243.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 28.63 FEET (CURVE HAVING A CENTRAL ANGLE OF 06°45'04" AND LONG CHORD BEARS N04°20'18"E 28.62 FEET); THENCE NORTH 00°57'46" EAST 191.44 FEET; THENCE SOUTH 89°59'55" WEST 102.20 FEET; THENCE NORTH 01°00'15" EAST 426.91 FEET; THENCE SOUTH 89°01'56" EAST 278.69 FEET; THENCE SOUTH 00°58'07" WEST 728.75 FEET; THENCE NORTH 89°49'39" EAST 47.33 FEET; THENCE SOUTH 00°27'39" WEST 179.69 FEET; THENCE SOUTH 24°52'00" WEST 64.00 FEET; THENCE NORTH 65°08'00" WEST 32.98 FEET; THENCE SOUTH 24°52'00" WEST 108.00 FEET; THENCE SOUTH 65°08'00" EAST 420.00 FEET; THENCE NORTH 24°52'00" EAST 164.01 FEET; THENCE SOUTH 65°08'00" EAST 411.52 FEET TO THE POINT OF BEGINNING. AREA = 1,651,214 SF OR 37.91 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 B

BEGINNING AT A POINT LOCATED S89°52'20"W 2552.50 FEET AND SOUTH 1813.11 FEET FROM THE SOUTHEAST CORNER OF SECTION 22, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 01°33'05" WEST 558.65 FEET; THENCE ALONG THE ARC OF A 642.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 381.09 FEET (CURVE HAVING A CENTRAL ANGLE OF 34°00'38" AND LONG CHORD BEARS S15°27'15"E 275.52 FEET); THENCE SOUTH 57°32'26" WEST 20.00 FEET; THENCE ALONG THE ARC OF A 662.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 61.16 FEET (CURVE HAVING A CENTRAL ANGLE OF 05°17'37" AND LONG CHORD BEARS S35°06'23"E 61.14 FEET); THENCE ALONG THE ARC OF A NON-TANGENT 10.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 14.78 FEET (CURVE HAVING A CENTRAL ANGLE OF 84°42'23" AND LONG CHORD BEARS N80°06'23"W 13.47 FEET); THENCE SOUTH 57°32'26" WEST 31.45 FEET; THENCE ALONG THE ARC OF A 527.00 FOOT

RADIUS CURVE TO THE RIGHT A DISTANCE OF 292.95 FEET (CURVE HAVING A CENTRAL ANGLE OF 31°50'58" AND LONG CHORD BEARS S73°27'55"W 289.19 FEET); THENCE SOUTH 89°23'24" WEST 550.03 FEET; THENCE ALONG THE ARC OF 750.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 407.03 FEET (CURVE HAVING A CENTRAL ANGLE OF 31°05'41" AND LONG CHORD BEARS N75°03'46"W 402.05 FEET); THENCE NORTH 27°34'34" EAST 486.75 FEET; THENCE ALONG THE ARC OF 464.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 224.39 FEET (CURVE HAVING A CENTRAL ANGLE OF 27°42'28" AND LONG CHORD BEARS N13°43'20"E 222.21 FEET); THENCE NORTH 00°07'53" WEST 1043.06 FEET; THENCE ALONG THE ARC OF 364.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 140.87 FEET (CURVE HAVING A CENTRAL ANGLE OF 22°10'27" AND LONG CHORD BEARS N11°13'07"W 139.99 FEET); THENCE NORTH 22°18'20" WEST 210.72 FEET; THENCE ALONG THE ARC OF 436.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 137.87 FEET (CURVE HAVING A CENTRAL ANGLE OF 18°07'05" AND LONG CHORD BEARS N13°14'48"W 137.30 FEET); THENCE SOUTH 65°08'00" EAST 94.95 FEET; THENCE ALONG THE ARC OF 356.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 66.33 FEET (CURVE HAVING A CENTRAL ANGLE OF 10°40'34" AND LONG CHORD BEARS S16°58'03"E 66.24 FEET); THENCE SOUTH 22°18'20" EAST 210.72 FEET; THENCE ALONG THE ARC OF 444.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 171.83 FEET (CURVE HAVING A CENTRAL ANGLE OF 22°10'27" AND LONG CHORD BEARS S11°13'07"E 170.76 FEET); THENCE SOUTH 00°07'53" EAST 694.85 FEET; THENCE ALONG THE ARC OF 25.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 38.54 FEET (CURVE HAVING A CENTRAL ANGLE OF 88°19'02" AND LONG CHORD BEARS S44°17'24"E 34.83 FEET); THENCE SOUTH 88°26'55" EAST 740.19 FEET; THENCE ALONG THE ARC OF 30.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 47.12 FEET (CURVE HAVING A CENTRAL ANGLE OF 90°00'00" AND LONG CHORD BEARS N46°33'05"E 42.43 FEET) TO THE POINT OF BEGINNING. AREA = 1,120,576 SF OR 25.72 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.

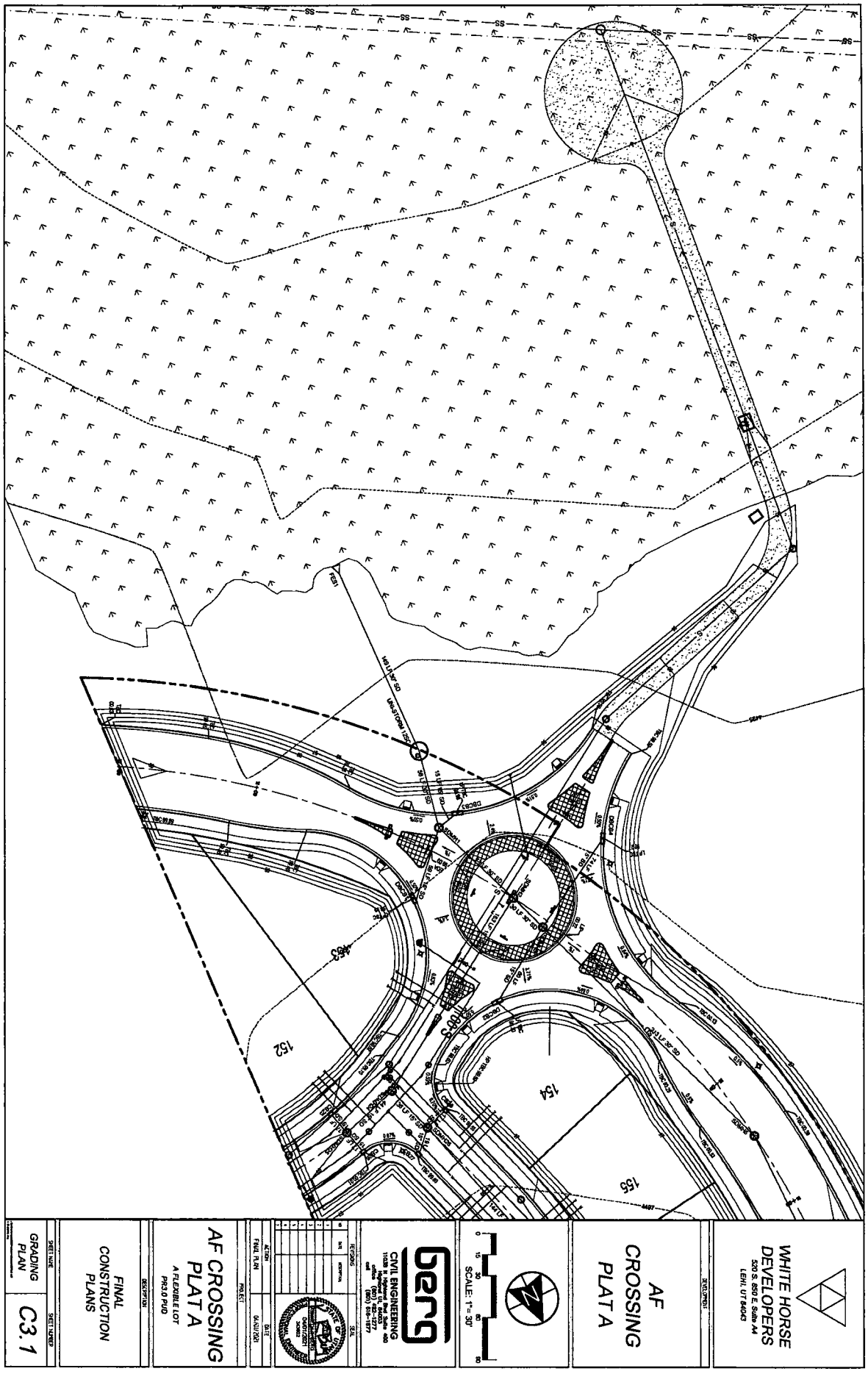
Plat G

BEGINNING AT A POINT LOCATED S89°52'20"W 2542.39 FEET AND SOUTH 446.29 FEET FROM THE NORTHEAST CORNER OF SECTION 27, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 24°52'00" WEST 164.01 FEET; THENCE NORTH 65°08'00" WEST 420.00 FEET; THENCE NORTH 24°52'00" EAST 108.00 FEET; THENCE SOUTH 65°08'00" EAST 32.98 FEET; THENCE NORTH 24°52'00" EAST 56.00 FEET; THENCE SOUTH 65°08'00" EAST 387.02 FEET TO THE POINT OF BEGINNING. AREA = 67,036 SF OR 1.54 ACRES BASIS OF BEARING IS NORTH 89°52'20" EAST ALONG SECTION LINE FROM THE NORTH QUARTER CORNER OF SECTION 27, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE AND MERIDIAN, TO THE NORTHEAST CORNER OF SAID SECTION 22. (NAD 27) NUMBER OF LOTS 6

AF 10

BEGINNING AT A POINT LOCATED SOUTH 96.23 FEET FROM THE SOUTH QUARTER CORNER OF SECTION 22, TOWNSHIP 5 SOUTH,RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE NORTH 89°31'53" WEST 236.86 FEET; THENCE SOUTH 00°27'39" WEST 4.12 FEET; THENCE NORTH 89°31'53" WEST 47.72 FEET; THENCE NORTH 00°58'19" EAST 502.92 FEET; THENCE SOUTH 89°19'23" EAST 250.00 FEET; THENCE NORTH 00°58'19" EAST 173.62 FEET; THENCE SOUTH 89°01'53" EAST 98.71 FEET;

THENCE ALONG THE ARC OF A 1500.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 48.73 FEET (CURVE HAVING A CENTRAL ANGLE OF 01°51'41" AND LONG CHORD BEARS S89°57'44"E 48.73 FEET); THENCE NORTH 89°06'26" EAST 29.21 FEET; THENCE ALONG THE ARC OF A 15.00 FOOT RADIUS NON-TANGENT CURVE TO THE LEFT A DISTANCE OF 23.07 FEET (CURVE HAVING A CENTRAL ANGLE OF 88°08'07" AND LONG CHORD BEARS S45°02'22"W 20.87 FEET); THENCE SOUTH 00°58'19" WEST 330.76 FEET; THENCE ALONG THE ARC OF A 119.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 124.98 FEET (CURVE HAVING A CENTRAL ANGLE OF 60°10'28" AND LONG CHORD BEARS S29°06'55"E 119.31 FEET); THENCE SOUTH 59°12'09" EAST 37.31 FEET; THENCE ALONG THE ARC OF A 15.00 FOOT RADIUS CURVE TO THE LEFT A DISTANCE OF 14.10 FEET (CURVE HAVING A CENTRAL ANGLE OF 53°51'40" AND LONG CHORD BEARS S86°07'59"E 13.59 FEET); THENCE ALONG THE ARC OF A 63.00 FOOT RADIUS CURVE TO THE RIGHT A DISTANCE OF 156.16 FEET (CURVE HAVING A CENTRAL ANGLE OF 142°01'01" AND LONG CHORD BEARS S42°03'18"E 119.14 FEET); THENCE SOUTH 01°13'01" WEST 114.86 FEET; THENCE NORTH 89°31'53" WEST 314.15 FEET TO THE POINT OF BEGINNING. AREA = 274,917 SF OR 6.31 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 83) NUMBER OF LOTS 27 NUMBER OF PARCELS 1


WHITE HORSE DEVELOPERS
520 S. 850 E. Suite A4
LEHI, UT 84043
DEVELOPER
AF CROSSING PLAT A
SCALE: 1" = 30'
CIVIL ENGINEERING
AF CROSSING PLAT A
A FLEXIBLE LOT PRUD PUD
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FINAL CONSTRUCTION PLANS
GRADING PLAN
C3.1
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SHEET NUMBER
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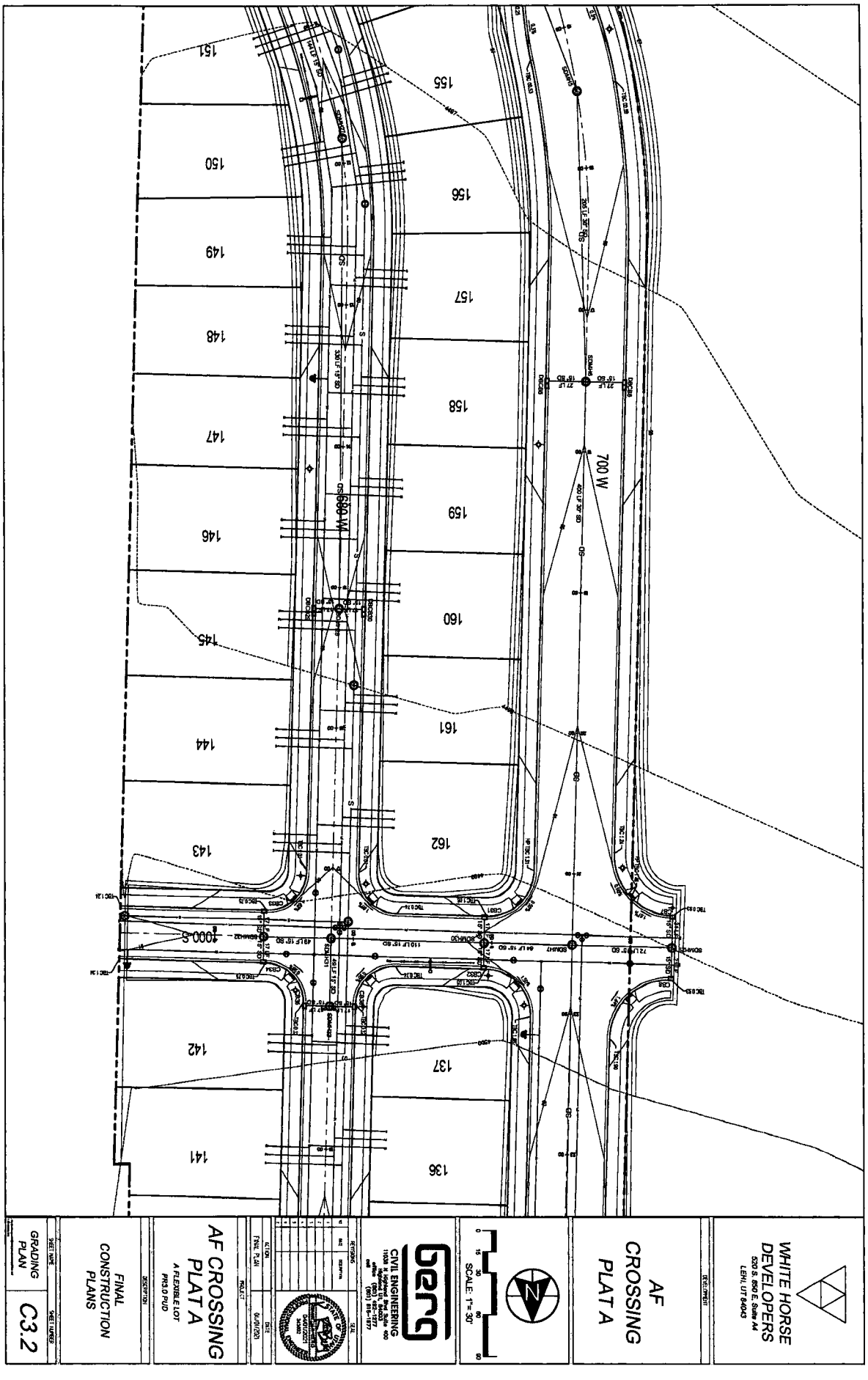
155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700 W
690 W
1000 S
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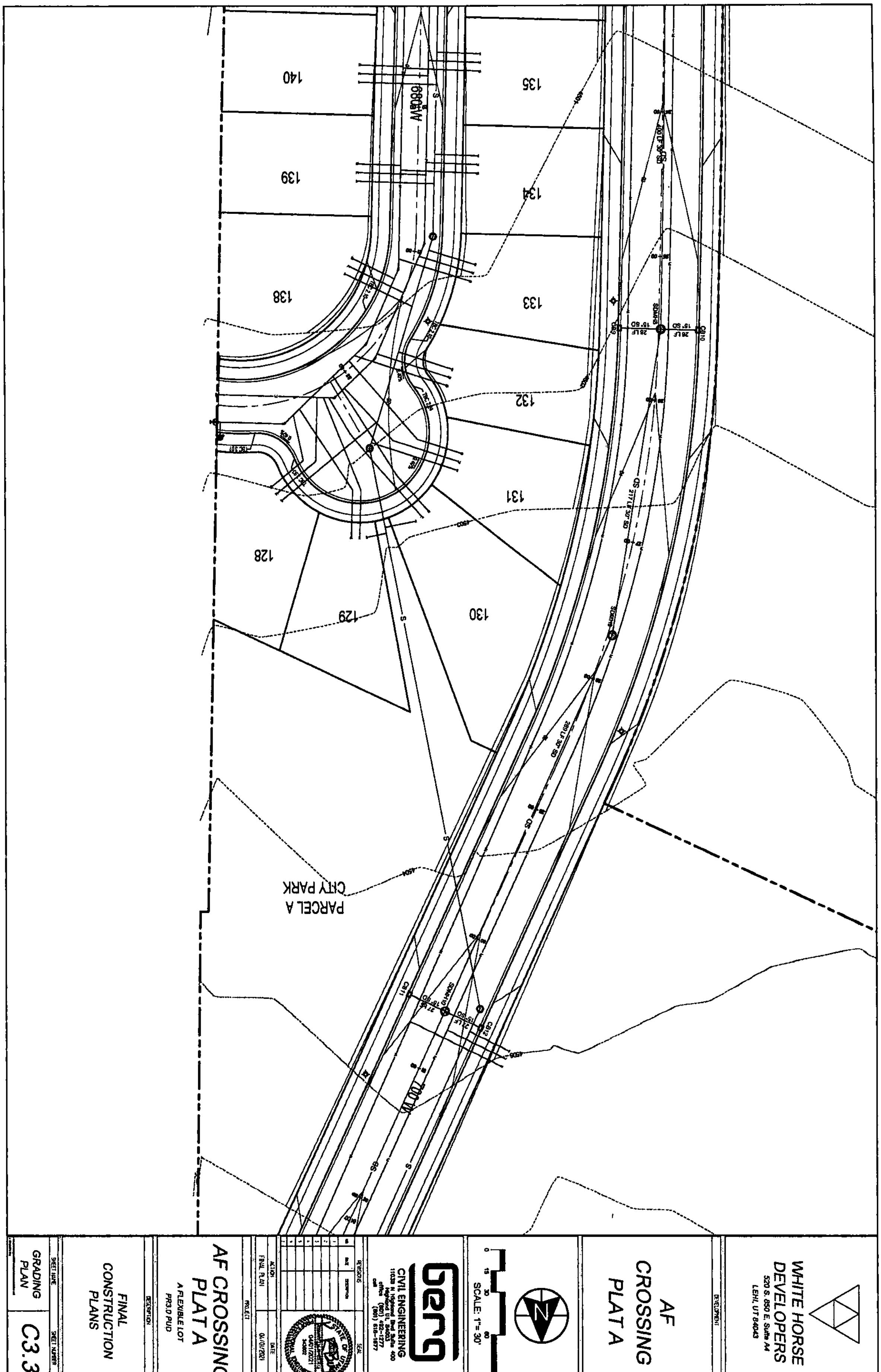
136
WHITE HORSE DEVELOPERS
5200 S. 850 E. Suite A4
LEHI, UT 84043
DEVELOPER
AF CROSSING PLAT A
SCALE: 1"= 30'
CIVIL ENGINEERING
AF CROSSING PLAT A
A FLEXIBLE LOT PRD PUD
FINAL PLAN
06/01/2021
DESCRIPTION
FINAL CONSTRUCTION PLANS
GRADING PLAN
C3.2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138
133
132
131
128
129
130
PARCEL A
CITY PARK
700 W
WHITE HORSE DEVELOPERS
520 S. 850 E. Suite A4
LEHI, UT 84043
AF CROSSING PLAT A
SCALE: 1"=30'
Berg
CIVIL ENGINEERING
AF CROSSING PLAT A
A FLEXIBLE LOT
PR3.0 PUD
FINAL CONSTRUCTION PLANS
GRADING PLAN
C3.3

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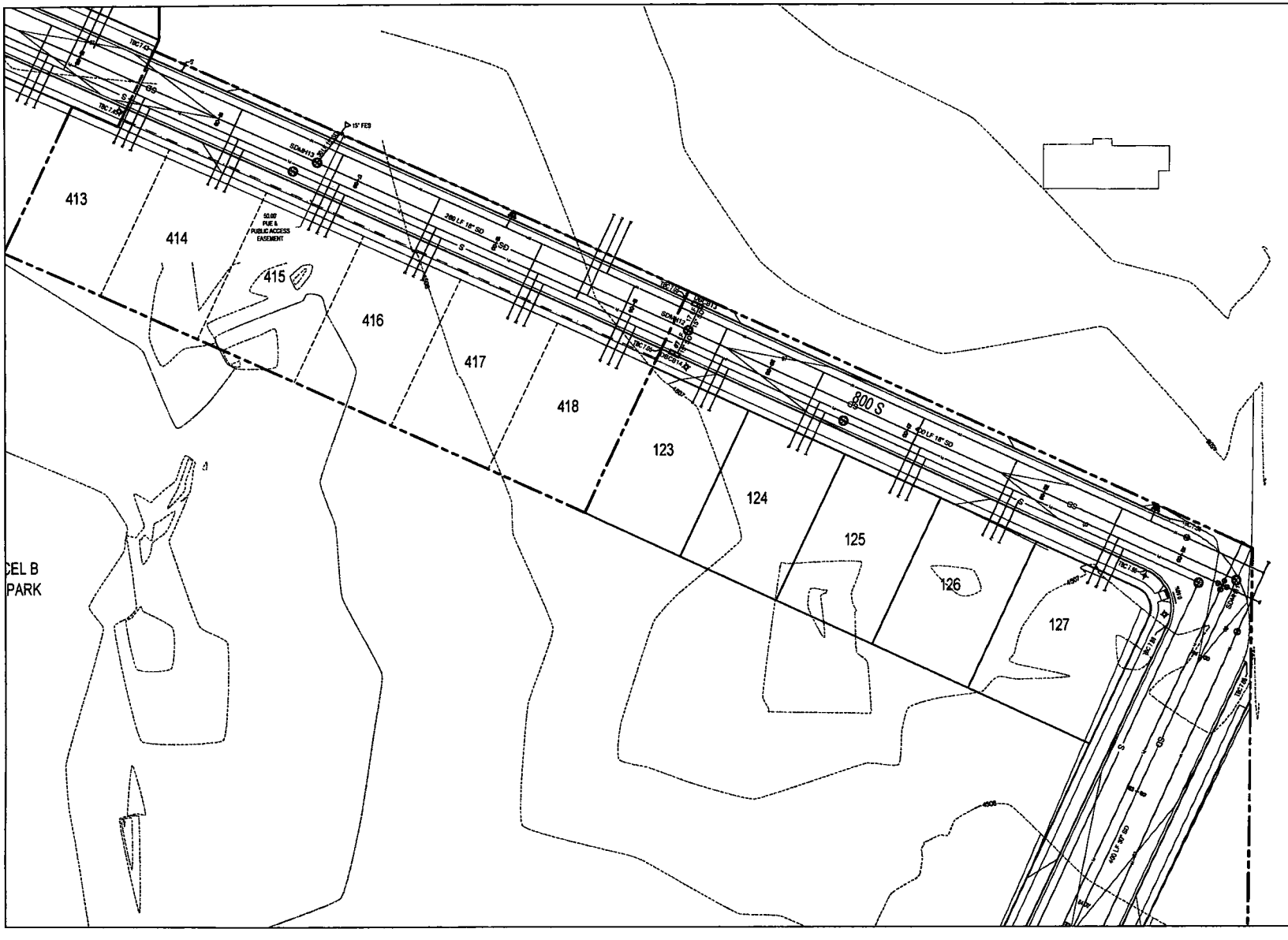


WHITE HORSE DEVELOPERS
520 S. 850 E, Suite A4
LEHI, UT 84043

DEVELOPMENT

AF CROSSING PLAT A

SCALE: 1"= 30'

berg
CIVIL ENGINEERING
11038 N Highland Blvd Suite 400
Highland UT, 84003
office (801) 492-1277
cell (801) 818-1877

REVISIONS

NO	DATE	DESCRIPTION
1		
2		
3		
4		
5		
6		

SEAL

STATE OF UTAH — REGISTERED — 04/01/2021 — 343602

ACTION	DATE
FINAL PLAN	04/01/2021

PROJECT

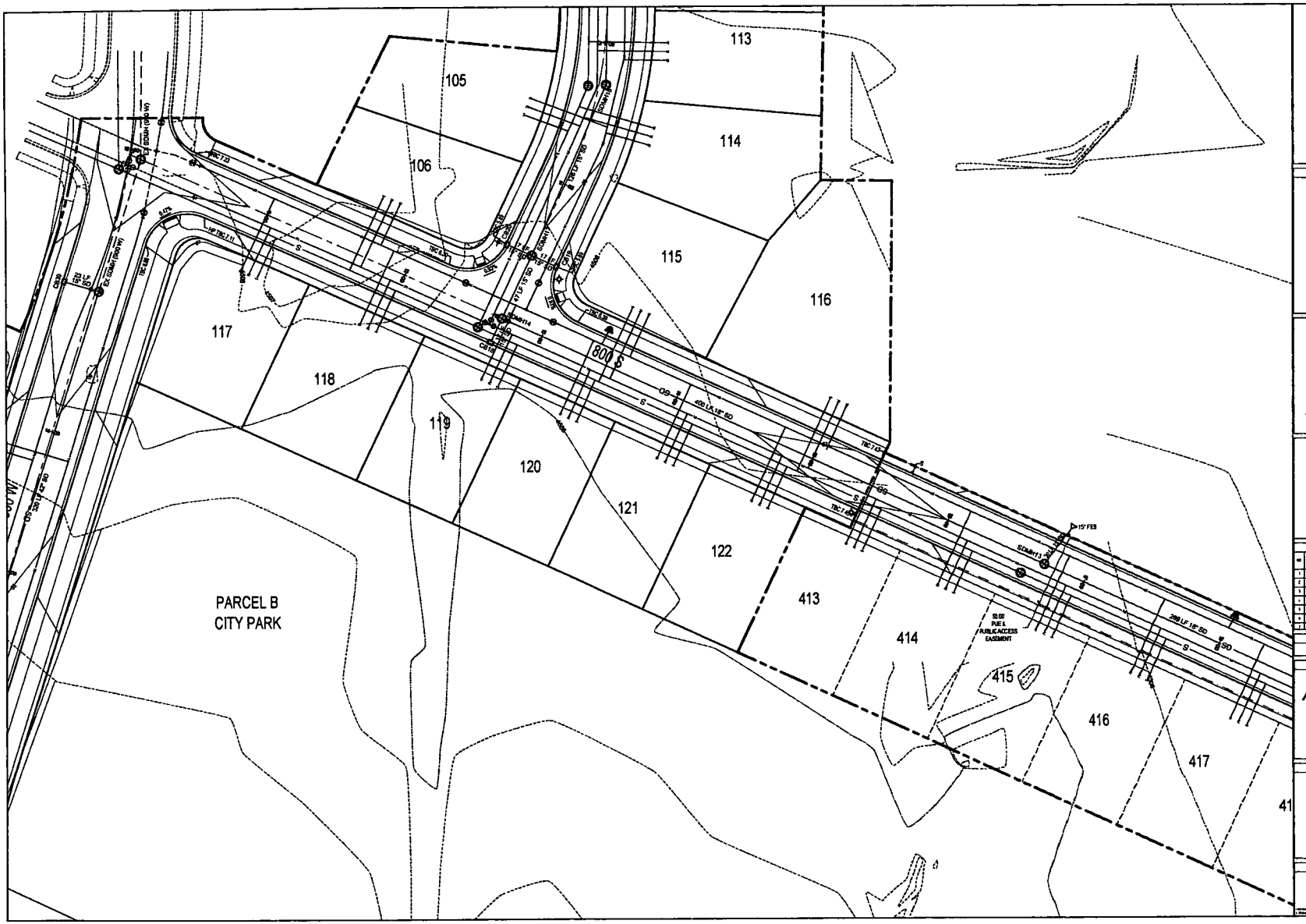
AF CROSSING PLAT A
A FLEXIBLE LOT
PR3.0 PUD

DESCRIPTION

FINAL CONSTRUCTION PLANS

SHEET NAME	SHEET NUMBER
GRADING PLAN	C3.4

ENT 127984:2021 PG 9 of 131



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

DEVELOPMENT

AF
CROSSING
PLAT A

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

Berg
CIVIL ENGINEERING
11838 N. Highland Blvd. Suite 400
Highland Ut, 84003
office (801) 492-1277
cell (801) 819-1877

REVISIONS

NO	DATE	DESCRIPTION
1		
2		
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7		

SEAL

ACTION	DATE
FINAL PLAN	06/01/2021

PROJECT

AF CROSSING
PLAT A
A FLEXIBLE LOT
PR3.0 PUD

DESCRIPTION

FINAL
CONSTRUCTION
PLANS

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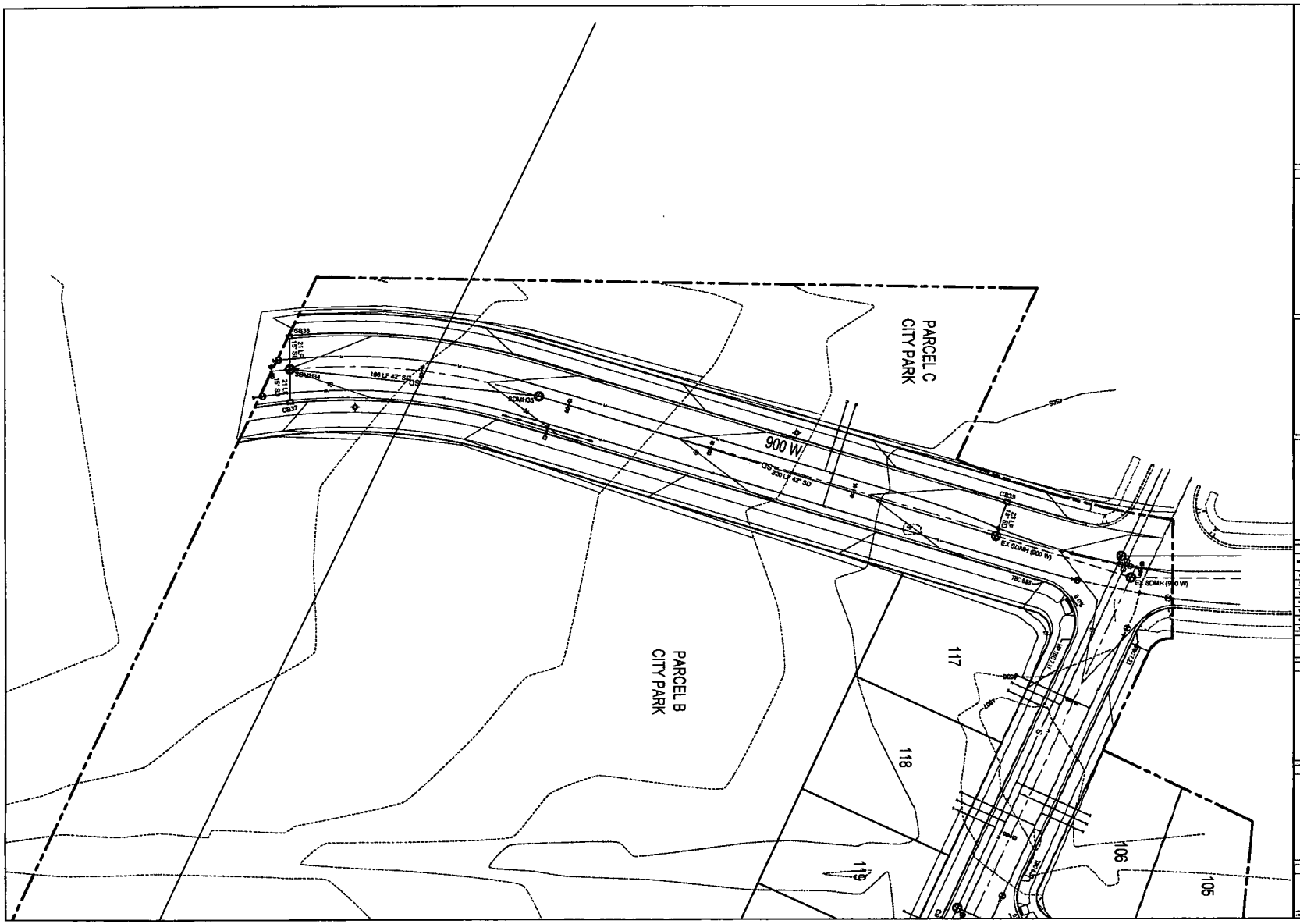
GRADING PLAN	C3.5



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

DEVELOPMENT

AF CROSSING PLAT A

berg
CIVIL ENGINEERING
11038 W Highland Blvd Suite 400
Highland UT, 84003
office (801) 492-1277
cell (801) 818-1677

REVISIONS

NO	DATE	DESCRIPTION
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SEAL

STATE OF UTAH
REGISTERED
04/01/2021
343852
PROFESSIONAL ENGINEER

ACTION	DATE
FINAL PLAN	04/01/2021

PROJECT

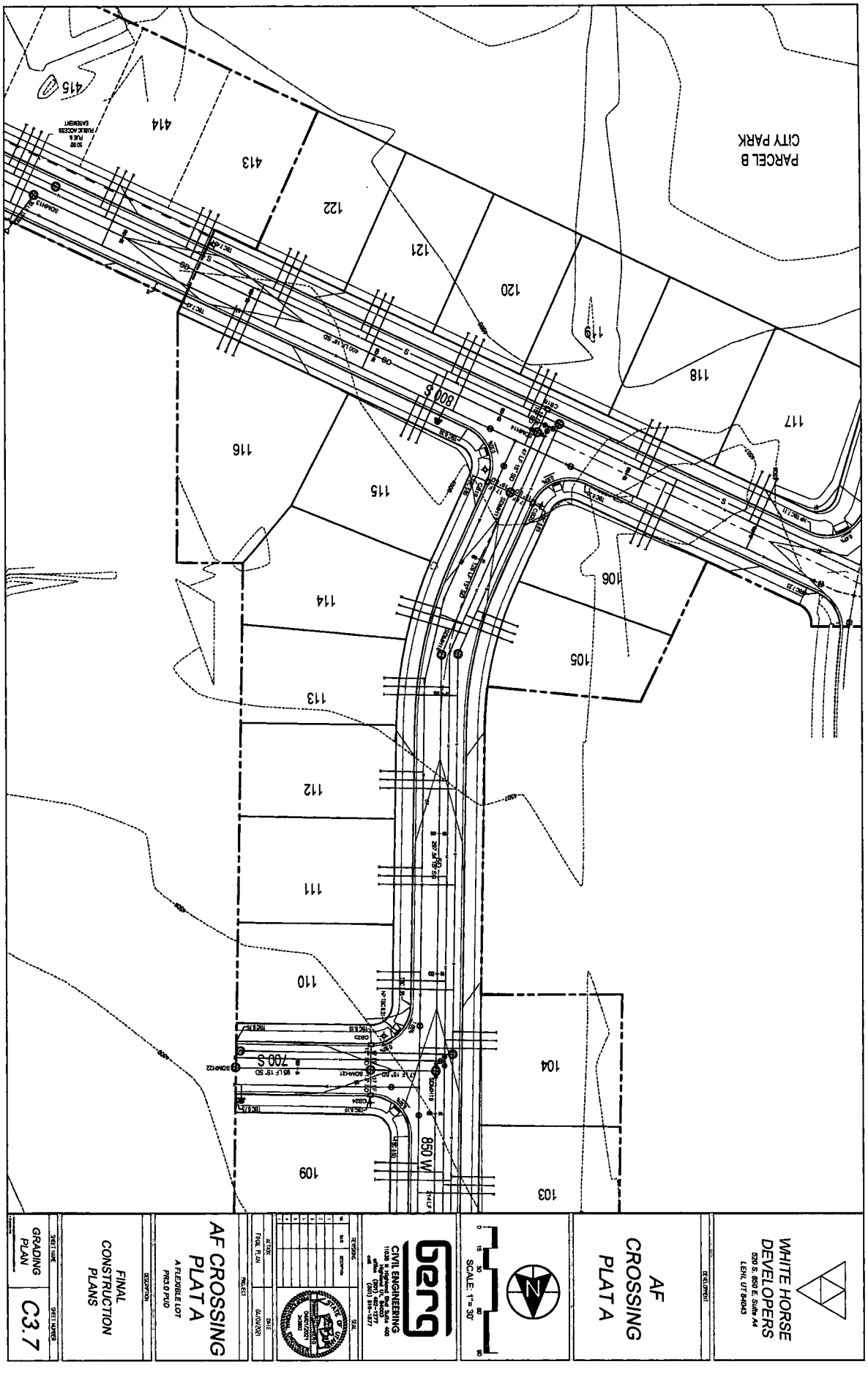
AF CROSSING PLAT A

A FLEXIBLE LOT
PR3.0 PUD

DESCRIPTION

FINAL CONSTRUCTION PLANS

SHEET NAME	SHEET NUMBER
GRADING PLAN	C3.6


PARCEL B
CITY PARK
415
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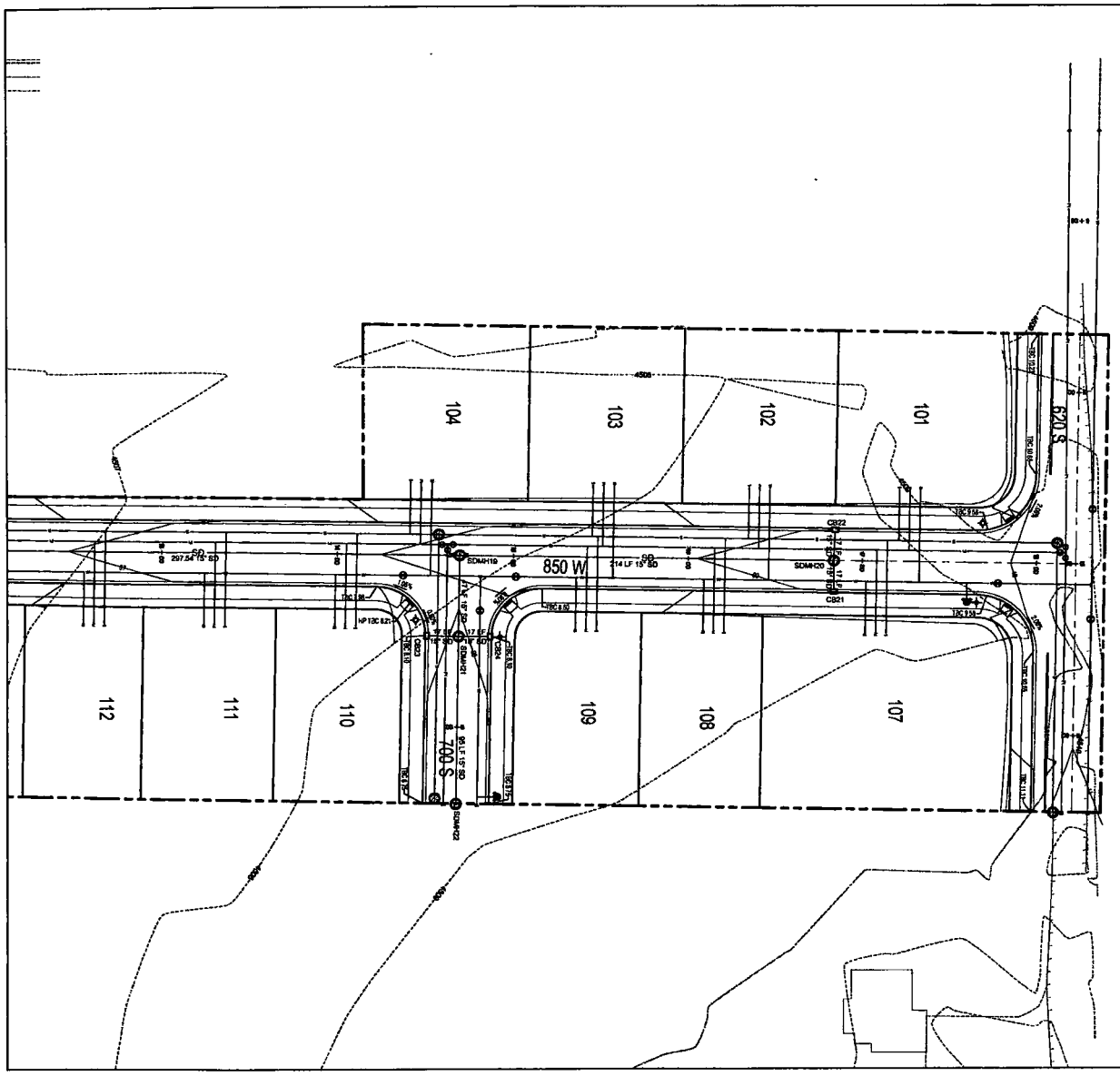
106
105
104
103
800 S
700 S
850 W
WHITE HORSE DEVELOPERS
520 S. 850 E. Suite A4
LEHI, UT 84043
AF CROSSING PLAT A
SCALE: 1" = 30'
CIVIL ENGINEERING
AF CROSSING PLAT A
A FLEXIBLE LOT PRD PUD
FINAL CONSTRUCTION PLANS
GRADING PLAN
C3.7

ENT 127984:2021 PG 12 of 131



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

DEVELOPMENT

AF CROSSING PLAT A

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

berg
CIVIL ENGINEERING
11038 N Highland Blvd, Suite 400
Highland Ut, 84003
office (801) 492-1777
cell (801) 616-1677

REVISIONS

NO.	DATE	DESCRIPTION
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SEAL

ACTION	DATE
FINAL PLAN	06/01/2021

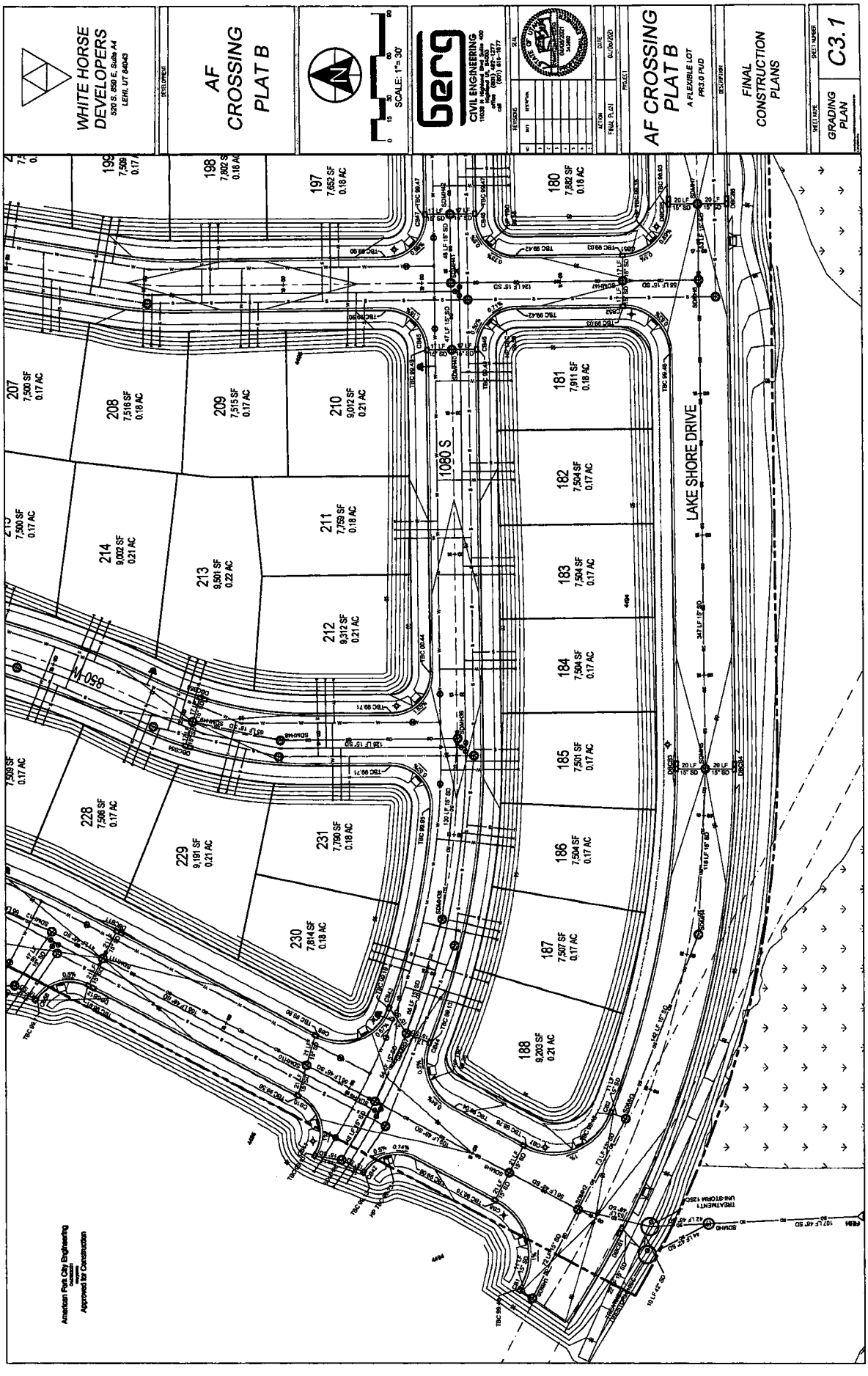
PROJECT

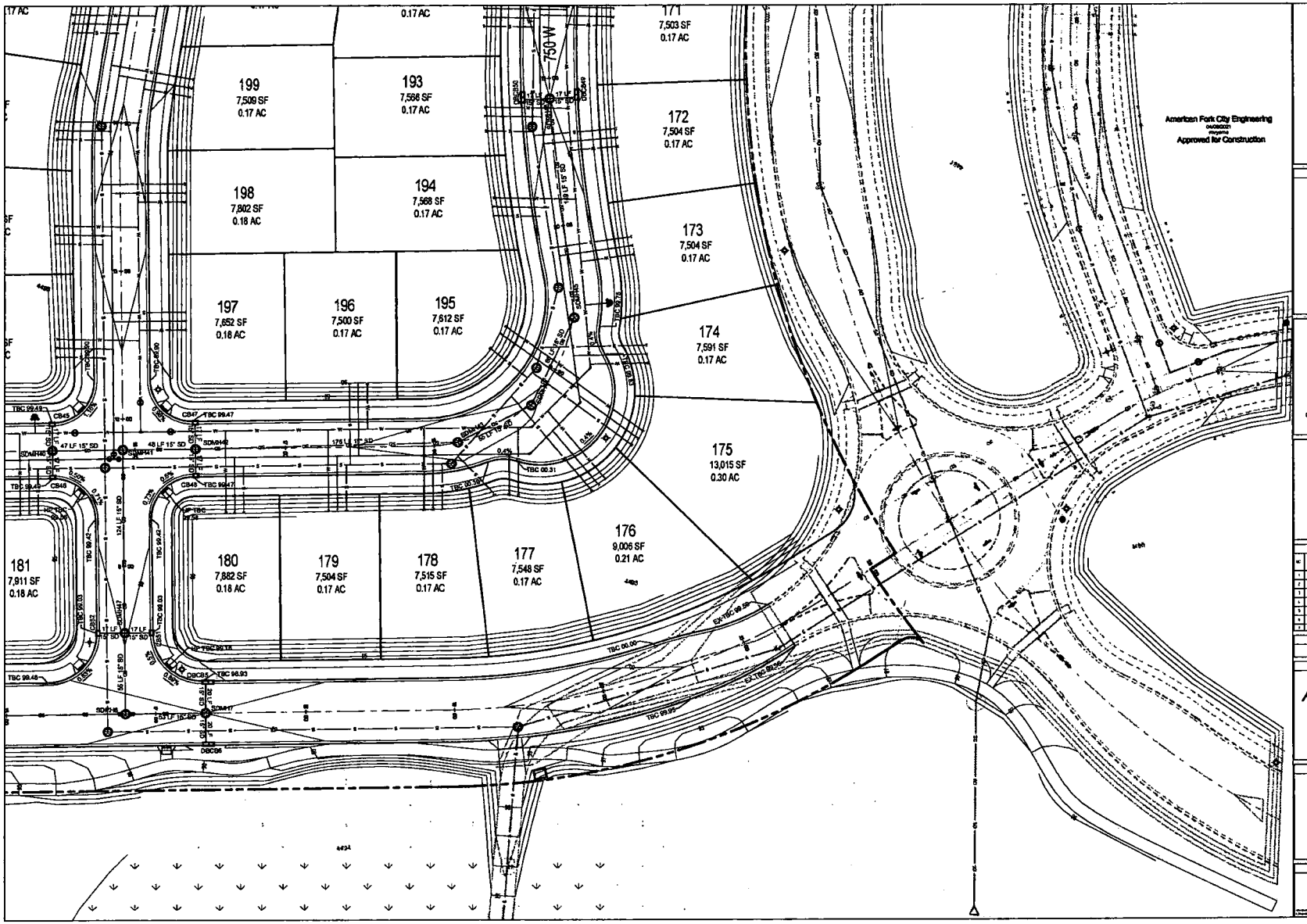
AF CROSSING PLAT A
A FLEXIBLE LOT
PR3.0 PUD

DESCRIPTION

FINAL CONSTRUCTION PLANS

SHEET NAME	SHEET NUMBER
GRADING PLAN	C3.8


WHITE HORSE DEVELOPERS
520 S. 850 E. Suite A4
LEHI, UT 84043
AF CROSSING PLAT B
SCALE: 1"= 30'
CIVIL ENGINEERING
AF CROSSING PLAT B
A FLEXIBLE LOT PRD PUD
FINAL CONSTRUCTION PLANS
GRADING PLAN
C3.1
LAKE SHORE DRIVE
1080 S
American Fork City Engineering
Approved for Construction



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

DEVELOPMENT

AF CROSSING PLAT B

SCALE: 1"= 30'

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

REVISIONS

NO	DATE	DESCRIPTION
1		
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4		
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6		

SEAL

STATE OF UTAH
04/06/2021
343662

ACTION	DATE
FINAL PLAN	04/06/2021

PROJECT

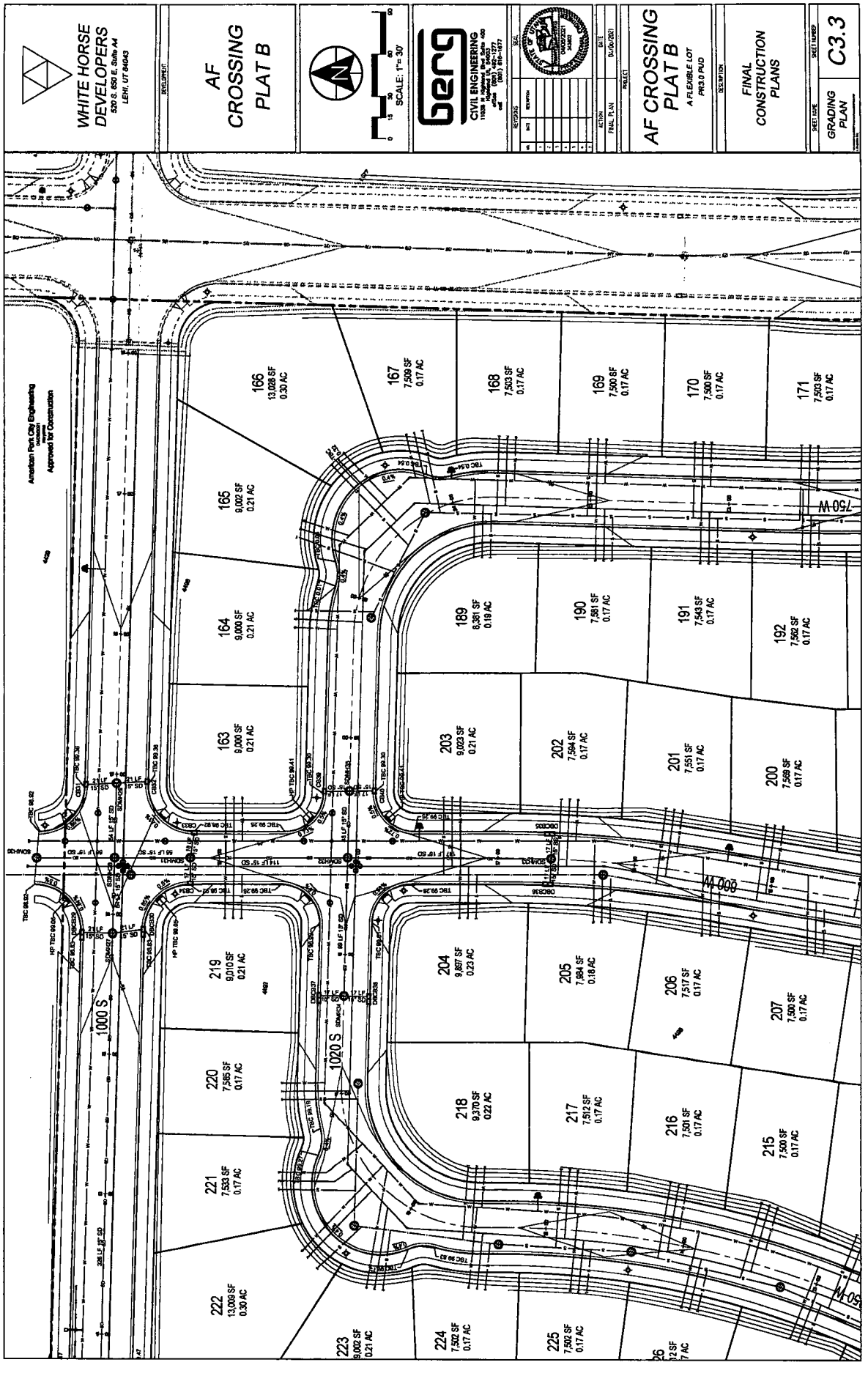
AF CROSSING PLAT B
A FLEXIBLE LOT
PR3.0 PUD

DESCRIPTION

FINAL CONSTRUCTION PLANS

SHEET NAME	SHEET NUMBER
GRADING PLAN	C3.2

ENT 127984:2021 PG 14 of 131


WHITE HORSE DEVELOPERS
520 S. 850 E. Suite A4
LEHI, UT 84043
AF CROSSING PLAT B
SCALE: 1"= 30'
CIVIL ENGINEERING
AF CROSSING PLAT B
A FLEXIBLE LOT
PR3.0 PUD
FINAL CONSTRUCTION PLANS
GRADING PLAN
C3.3
American Fork City Engineering
Approved for Construction
1000 S
1020 S
M-009
M-05
166 13,028 SF 0.30 AC
167 7,509 SF 0.17 AC
168 7,503 SF 0.17 AC
169 7,500 SF 0.17 AC
170 7,500 SF 0.17 AC
171 7,503 SF 0.17 AC
165 9,002 SF 0.21 AC
164 9,000 SF 0.21 AC
163 9,000 SF 0.21 AC
189 8,381 SF 0.19 AC
190 7,581 SF 0.17 AC
191 7,543 SF 0.17 AC
192 7,562 SF 0.17 AC
203 9,023 SF 0.21 AC
202 7,594 SF 0.17 AC
201 7,551 SF 0.17 AC
200 7,569 SF 0.17 AC
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220 7,565 SF 0.17 AC
221 7,533 SF 0.17 AC
222 13,009 SF 0.30 AC
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205 7,884 SF 0.18 AC
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207 7,500 SF 0.17 AC
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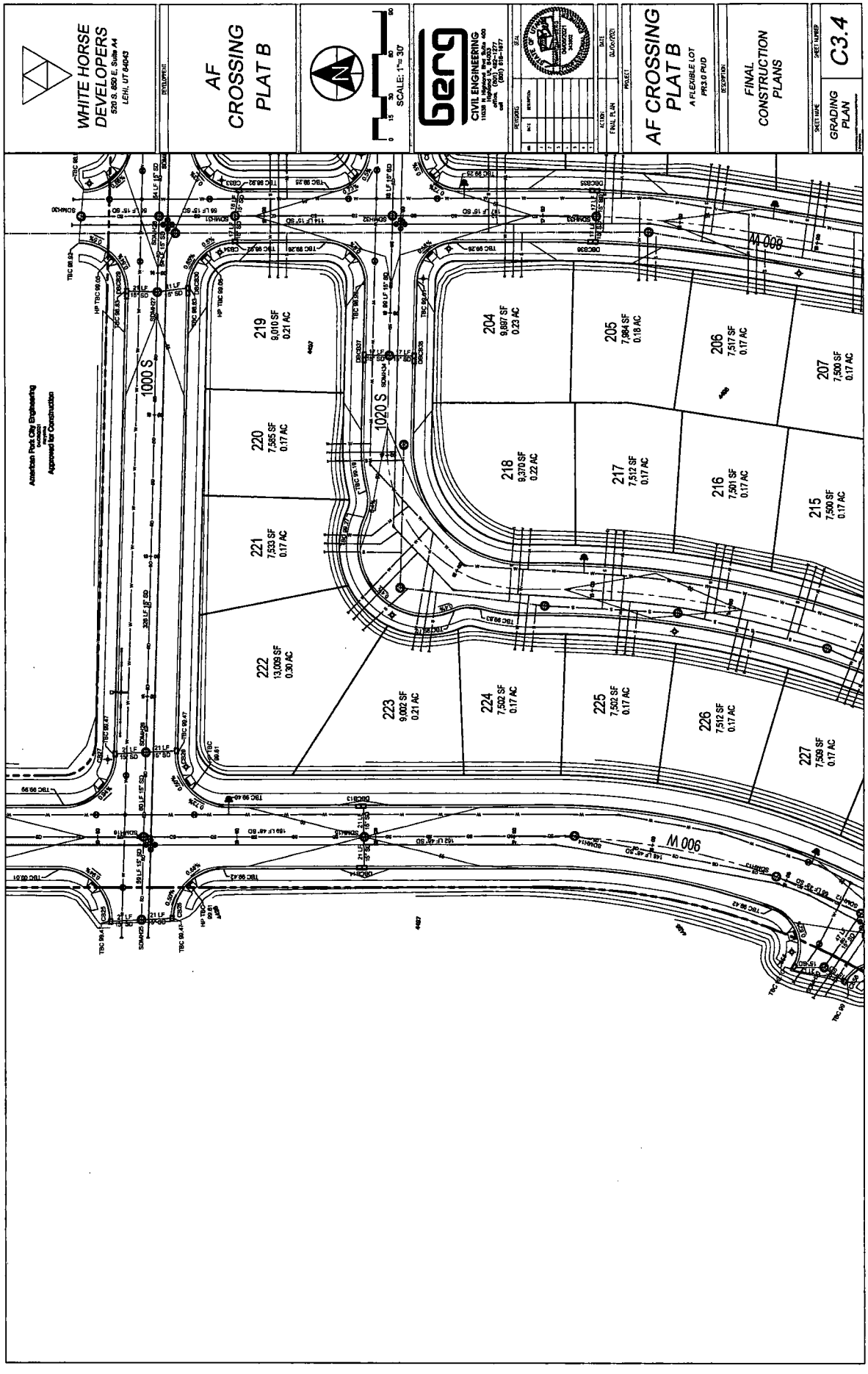
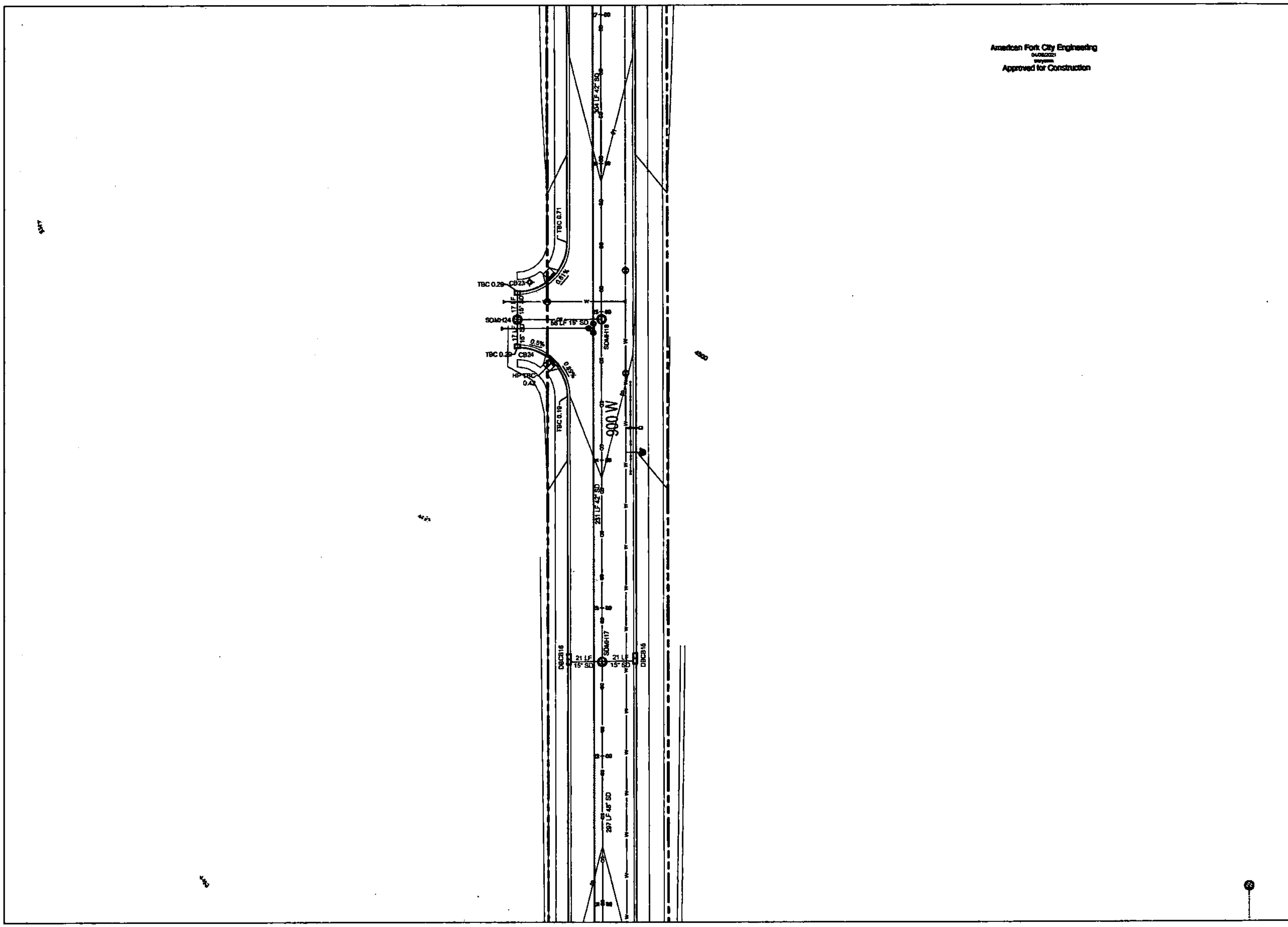

WHITE HORSE DEVELOPERS
520 S. 850 E. Suite A4
LEHI, UT 84043
AF CROSSING PLAT B
SCALE: 1"= 30'
CIVIL ENGINEERING
AF CROSSING PLAT B
A FLEXIBLE LOT
PRD 3.0 PUD
FINAL CONSTRUCTION PLANS
GRADING PLAN
C3.4
1000 S
1020 S
M.006
219 9,010 SF 0.21 AC
220 7,585 SF 0.17 AC
221 7,533 SF 0.17 AC
222 13,009 SF 0.30 AC
223 9,002 SF 0.21 AC
224 7,502 SF 0.17 AC
225 7,502 SF 0.17 AC
226 7,512 SF 0.17 AC
227 7,509 SF 0.17 AC
204 9,887 SF 0.23 AC
205 7,984 SF 0.18 AC
206 7,517 SF 0.17 AC
207 7,500 SF 0.17 AC
218 9,370 SF 0.22 AC
217 7,512 SF 0.17 AC
216 7,501 SF 0.17 AC
215 7,500 SF 0.17 AC



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

DEVELOPMENT

AF CROSSING PLAT B

SCALE: 1"= 30'

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

REVISIONS		
NO.	DATE	DESCRIPTION

SEAL

ACTION	DATE
FINAL PLAN	04/06/2021

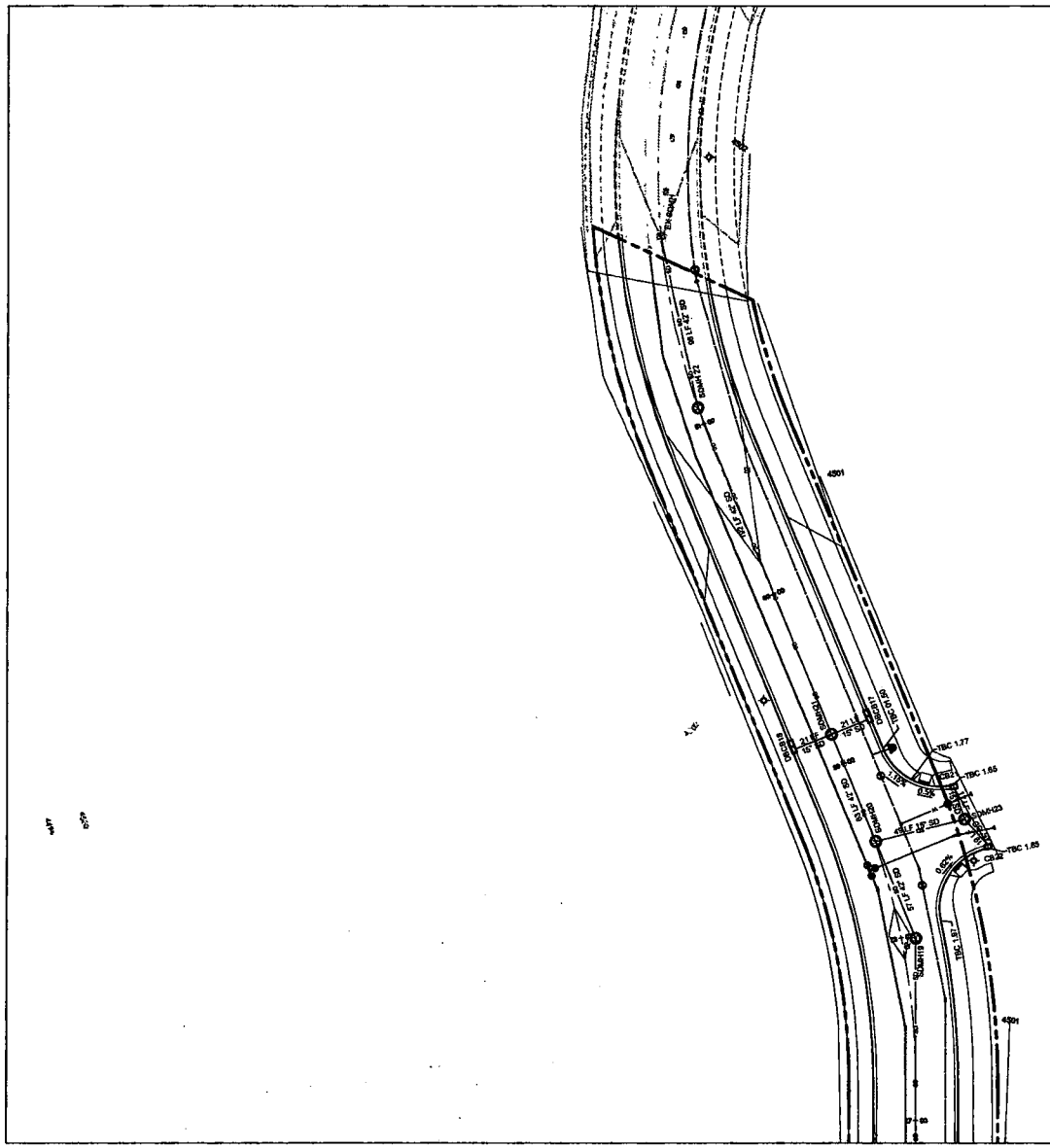
PROJECT

AF CROSSING PLAT B
A FLEXIBLE LOT
PR3.0 PUD

DESCRIPTION

FINAL CONSTRUCTION PLANS

SHEET NAME	SHEET NUMBER
GRADING PLAN	C3.5



American Fork City Engineering
Approved for Construction

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

DEVELOPMENT

AF CROSSING PLAT B

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) 518-1877

REVISIONS			SEAL
NO	DATE	DESCRIPTION	
1			
2			
3			
4			
5			
6			

ACTION	DATE
FINAL PLAN	01/06/2021

PROJECT

AF CROSSING PLAT B
A FLEXIBLE LOT
PR3.0 PUD

DESCRIPTION

FINAL CONSTRUCTION PLANS

SHEET NAME	SHEET NUMBER
GRADING PLAN	C3.6

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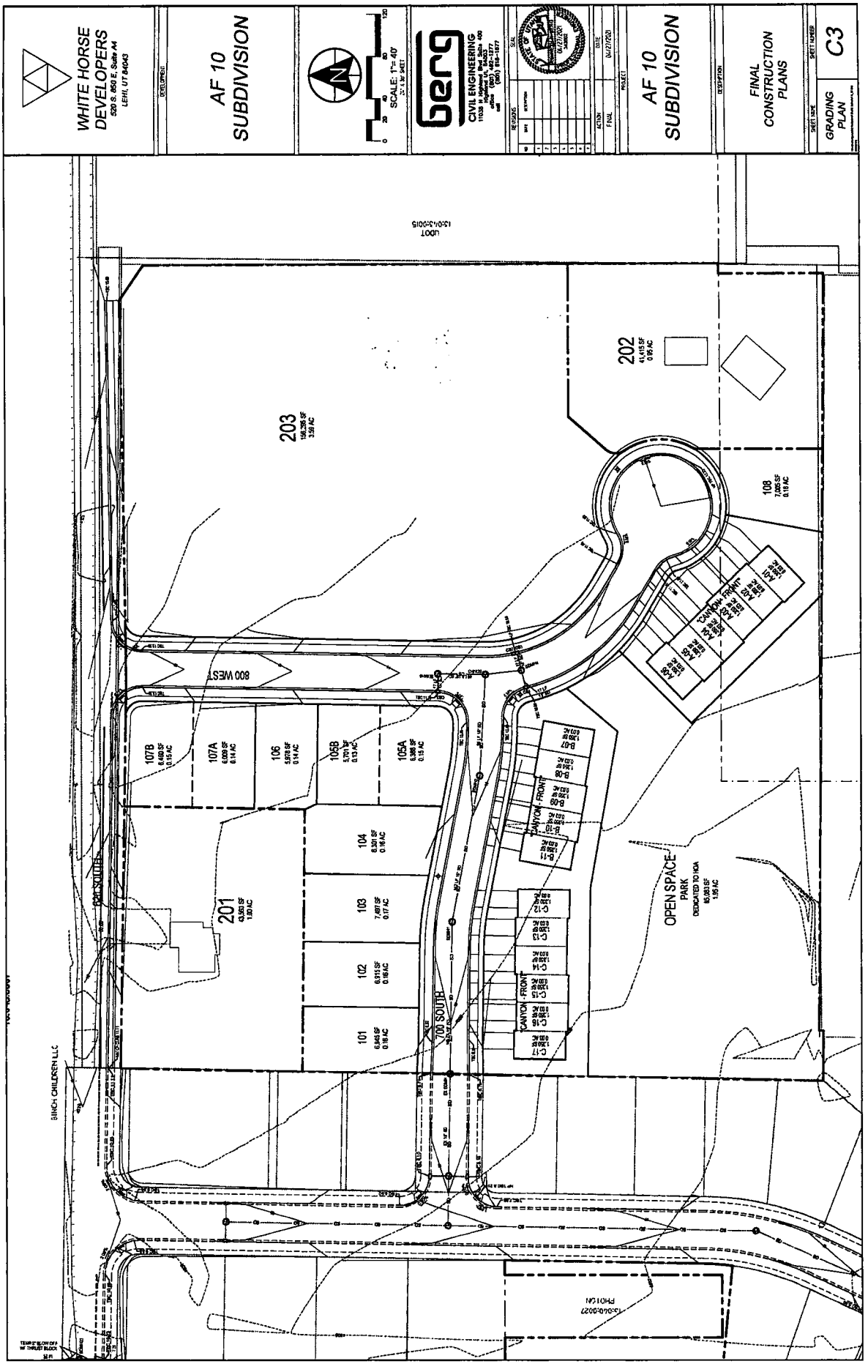
WHITE HORSE DEVELOPERS
520 S. 850 E, Suite A4
LEHI, UT 84043
AF 10 SUBDIVISION
SCALE: 1"= 40'
CIVIL ENGINEERING
AF 10 SUBDIVISION
FINAL CONSTRUCTION PLANS
GRADING PLAN
C3
203
156,255 SF
3.59 AC
202
41,415 SF
0.95 AC
108
7,205 SF
0.18 AC
107B
8,469 SF
0.19 AC
107A
6,009 SF
0.14 AC
106
5,870 SF
0.14 AC
105B
5,701 SF
0.13 AC
105A
6,366 SF
0.15 AC
104
8,301 SF
0.19 AC
103
7,497 SF
0.17 AC
102
8,015 SF
0.18 AC
101
8,045 SF
0.18 AC
201
43,561 SF
1.00 AC
800 WEST
700 SOUTH
CANYON - FRONT
OPEN SPACE
PARK
DEDICATED TO HOA
85,583 SF
1.95 AC
BIRCH CHILDREN LLC

CMT ENGINEERING LABORATORIES

ENGINEERING •GEOTECHNICAL •ENVIRONMENTAL (ESA I & II) •
MATERIALS TESTING •SPECIAL INSPECTIONS •
ORGANIC CHEMISTRY • PAVEMENT
DESIGN •GEOLOGY

GEOTECHNICAL ENGINEERING STUDY

Lakeshoring Landing/Ardero Property

6885 West 7300 North
American Fork, Utah
CMT Project No. 16111

Prepared For:
White Horse Developers
520 South 850 East
Lehi, Utah 84043

March 29, 2021

CMT ENGINEERING LABORATORIES

March 29, 2021

Mr. Jake Horan
White Horse Developers
520 South 850 East
Lehi, Utah 84043

Subject: Geotechnical Engineering Study
Lakeshoring Landing/Ardero Property
6885 West 7300 North
American Fork, Utah
CMT Project Number: 16111

Mr. Horan:

Submitted herewith is the report of our geotechnical engineering study for the subject site. This report contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics. It also contains recommendations to aid in the design and construction of the earth related phases of this project.

On March 4 and 5, 2021, CMT Engineering Laboratories (CMT) staff professionals were on-site and supervised the drilling of 10 bore holes to depths of about 16.5 to 41.5 feet and the excavation of 40 test pits extending to depths of about 7 to 15 feet below the existing ground surface. Soil samples were obtained during the field operations and subsequently transported to our laboratory for further testing and observation.

Conventional spread and/or continuous footings may be utilized to support the proposed structures, provided the recommendations in this report are followed. A detailed discussion of design and construction criteria is presented in this report.

We appreciate the opportunity to work with you at this stage of the project. CMT offers a full range of Geotechnical Engineering, Geological, Material Testing, Special Inspection services, and Phase I and II Environmental Site Assessments. With offices throughout Utah, Idaho and Arizona, our staff is capable of efficiently serving your project needs. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at 801-492-4132.

CERTIFICATE: I hereby certify that I am a licensed professional engineer, as defined in the "Sensitive Lands Ordinance" Section of the American Fork City Ordinances. I have examined the 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. The procedures and tests used in said report meet minimum applicable professional standards.

Sincerely,
CMT Engineering Laboratories

LICENSED PROFESSIONAL ENGINEER
171715
WILLIAM G. TURNER
3/29/21
STATE OF UTAH

William G. Turner, P.E., M.ASCE
Senior Geotechnical Engineer

Reviewed by:

Jeffrey J. Egbert, P.E., LEED A.P., M. ASCE
Senior Geotechnical Engineer

CMT ENGINEERING LABORATORIES

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APPENDIX

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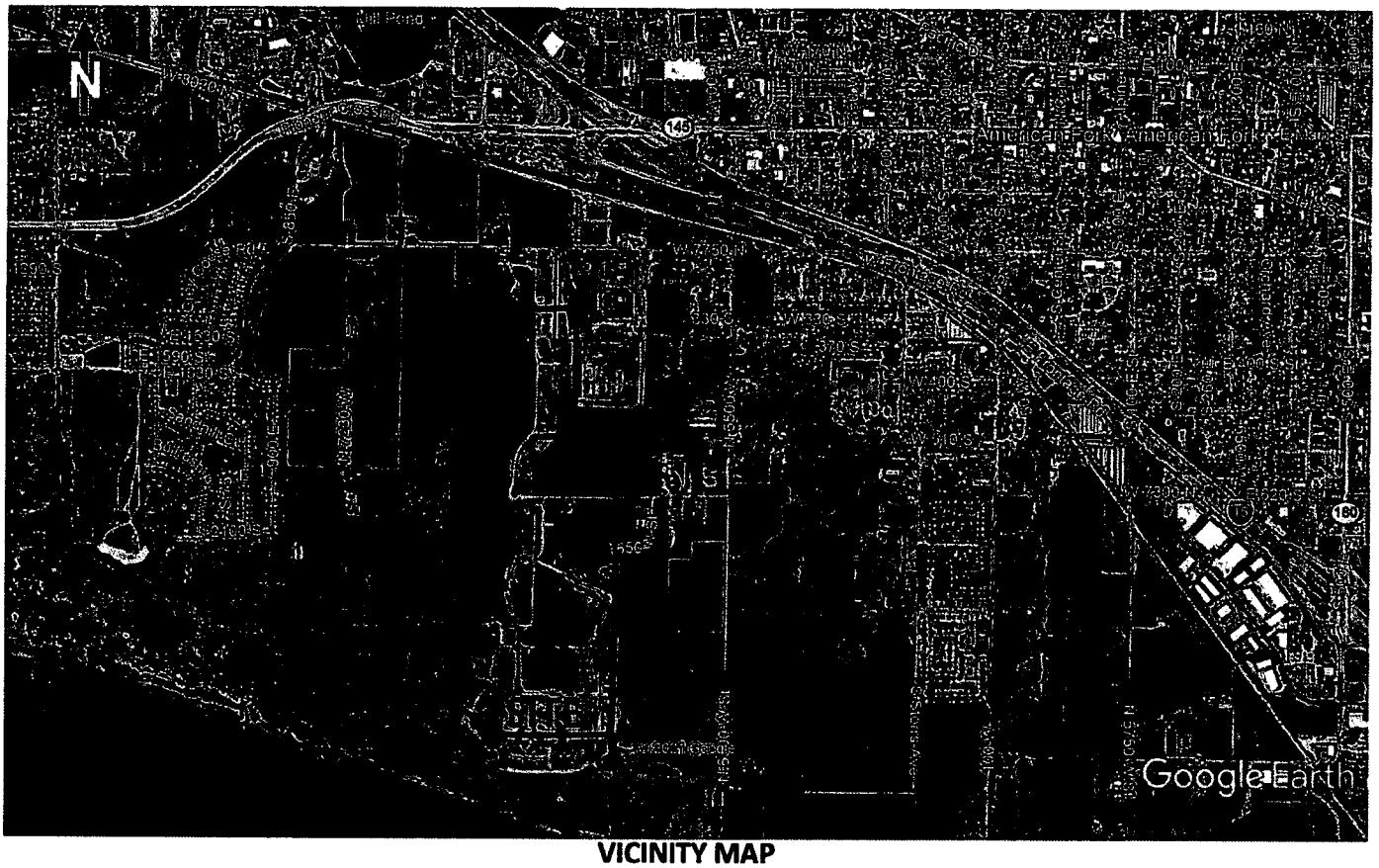
1.0 INTRODUCTION

1.1 General

CMT Engineering Laboratories (CMT) was retained to conduct a geotechnical subsurface study for the proposed development of approximately 164 acres as a mixed-residential development. The site is situated south of 200 South at about 6885 West 7300 North (Utah County coordinates) in American Fork, Utah as shown in the **Vicinity Map** below.



VICINITY MAP

1.2 Objectives, Scope and Authorization

The objectives and scope of our study were planned in discussions between Mr. Tyler Horan of White Horse Developers, and Mr. Bill Turner of CMT Engineering Laboratories (CMT). In general, the objectives of this study were to define and evaluate the subsurface soil and groundwater conditions at the site, and provide appropriate foundation, earthwork, pavement and seismic recommendations to be utilized in the design and construction of the proposed development.

In accomplishing these objectives, our scope of work has included performing a field exploration, which consisted of the drilling/logging/ sampling of 10 bore holes and the excavating/logging/sampling of 40 test pits, performing laboratory testing on representative samples of the subsurface soils collected in the explorations,

and conducting an office program, which consisted of correlating available data, performing engineering analyses, and preparing this summary report. This scope of work was authorized by returning a signed copy of our proposal dated February 19, 2021 and executed the same day.

1.3 Description of Proposed Construction

We understand that the project will consist of developing approximately 164 acres for the construction of multi-family and single-family residential structures at the site. We anticipate that the multi-family buildings will be constructed 2 to 3 stories in height above existing grade with slabs on grade, and that single-family residences will be 1 to 2 stories in height, possibly with partial to full basements. We also project that maximum structural loads will be 6,000 pounds per lineal foot for walls, 120,000 pounds for columns, and 150 pounds per square foot for floors. If the loading conditions are different than we have projected, please notify us so that any appropriate modifications to our conclusions and recommendations contained herein can be made.

We project that construction will include streets and access drives to provide access to the residential buildings and homes, which we expect will utilize asphalt surfacing. Long term traffic is projected to consist of a moderate volume of automobiles and pickup trucks, a light volume of medium-weight delivery trucks, a weekly garbage truck and an occasional fire truck.

Site development will require some earthwork in the form of minor cutting and filling. A site grading plan was not available at the time of this report, but we project that maximum cuts and fills may be on the order of 2 to 3 feet. If deeper cuts or fills are planned, CMT should be notified to provide additional recommendations, if needed.

1.4 Executive Summary

Proposed residences can be supported upon conventional spread and continuous wall foundations. The most significant geotechnical aspects regarding site development include the following:

1. Up to approximately 2.5 feet of topsoil blankets most of the site, with some areas of up to about 3 feet of undocumented fill, both of which will require removal beneath structures;
2. The soils encountered predominantly consisted of CLAY (CL, CH), with layers of SILT (ML, OL), Silty SAND (SM) and GRAVEL (GP);
3. Liquefaction could occur in the vicinity of bore hole B-1 that will likely require mitigation due to significant liquefaction-induced settlements/movements;
4. Foundations may be placed on suitable, undisturbed natural soils or on properly placed and compacted structural fill extending to suitable, undisturbed natural soils; and
5. Floor slabs should be placed on a minimum 6 inches of compacted structural fill extending to suitable, undisturbed natural soils.

CMT must assess that topsoil, undocumented fills, debris, disturbed or unsuitable soils have been appropriately removed and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements.

In the following sections, detailed discussions pertaining to the site are provided, including subsurface descriptions, geologic/seismic setting, earthwork, foundations, lateral resistance, lateral pressure, floor slabs, and pavements.

2.0 FIELD EXPLORATION

2.1 General

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 10 bore holes were drilled with hollow stem augers to depths of about 16.5 to 41.5 feet, and 40 test pits were excavated to depths of about 7 to 15 feet, below the existing ground surface. Locations of the explorations are presented on **Figure 1, Site Map**. The field exploration was performed under the supervision of experienced members of our geotechnical staff.

Representative soil samples within each test pit were collected by obtaining disturbed "grab" samples and cutting relatively undisturbed "block" samples. The samples were placed in sealed plastic bags and containers prior to transport to the laboratory.

Samples of the subsurface soils encountered in the bore holes were collected at varying depths through hollow stem drill augers. Relatively undisturbed samples were obtained by hydraulically pushing a 3-inch diameter (Shelby) tube and driving a 2.5-inch outside diameter "Dames and Moore" sampler with rings. Disturbed samples were collected utilizing a standard split spoon (SPT) sampler. The ring and SPT samplers were driven 18 inches into the soils below the drill augers using a 140-pound hammer free-falling a distance of 30 inches. The number of hammer blows needed for each 6-inch interval was recorded. The sum of the hammer blows for the final 12 inches of the standard split-spoon sampler penetration is known as a standard penetration test and this 'blow count' was recorded on the bore hole logs. The samples were placed in sealed plastic bags and containers prior to transport to the laboratory.

The subsurface soils encountered in the explorations were logged and described in general accordance with ASTM[1] D-2488. Soil samples were collected as described above, and were classified in the field based upon visual and textural examination. These field classifications were supplemented by subsequent examination and testing of select samples in our laboratory. Graphical representations of the subsurface conditions encountered are presented on each individual test pit log, **Figures 2 through 37**, and each individual bore hole log, **Figures 38 to 47**, included in the Appendix. A Key to Symbols defining the terms and symbols used on the logs, is provided as **Figure 48** in the Appendix.

The test pits were backfilled with excavated soils. The backfill was not placed in uniform lifts and compacted to a specific density and therefore must be considered as undocumented backfill. Settlement of the backfill with time is likely to occur.

[1]American Society for Testing and Materials

2.2 Infiltration Testing

Infiltration tests were also performed as part of our field exploration within test pits TP-11 and TP-35, at the depths indicated on the logs. The testing consisted of digging a small hole with a shovel, filling the hole with water, and measuring the rate of water drop over a certain time period (i.e. 10 minutes). This process was repeated multiple times until subsequent readings were the same. The results of this test indicate that the soils at this site have an infiltration rate ranging from 8 to 120 minutes per inch for silty sand and clay soils, respectively.

3.0 LABORATORY TESTING

Selected samples of the subsurface soils were subjected to various laboratory tests to assess pertinent engineering properties, as follows:

1. Moisture Content, ASTM D-2216, Percent moisture representative of field conditions
2. Dry Density, ASTM D-2937, Dry unit weight representing field conditions
3. Atterberg Limits, ASTM D-4318, Plasticity and workability
4. Gradation Analysis, ASTM D-1140/C-117/D-422, Grain Size/Hydrometer Analysis
5. One Dimensional Consolidation, ASTM D-2435, Consolidation properties

To provide data for our settlement analyses, consolidation testing was performed on 8 representative samples of the subsurface silt/clay soils encountered across the site. Based upon data obtained from the consolidation testing, the silt/clay soils at this site are mostly moderately over-consolidated and moderately to highly compressible under additional loading. Each sample was wetted at either a load of about 250 psf or 1,000 psf, which indicated a slight potential for swelling (0.1 to 0.9%). Detailed results of the consolidation tests are maintained within our files and interpretive graphs are attached as part of our settlement calculations.

Laboratory test results are presented on the exploration logs (**Figures 2 through 47**), on **Grain Size Distribution, Figures 49 and 50**, and in the following **Lab Summary Table**:

Geotechnical Engineering Study
Lakeshoring Landing/Ardero Property, American Fork, Utah
CMT Project No. 16111

LAB SUMMARY TABLE

EXPLORATION	DEPTH (feet)	SOIL CLASS	SAMPLE TYPE	MOISTURE CONTENT(%)	DRY DENSITY (pcf)	GRADATION			ATTERBERG LIMITS			COLLAPSE (-)/ EXPANSION(+)
						GRAV.	SAND	FINES	LL	PL	PI	
TP-5	3	CL	Block	21	97				32	21	11	+0.1%
TP-9	3	CL	Block	41	77				47	21	26	-0.0%
TP-11	4	SM	Bag	16				14				
TP-19	6	SM	Bag	32				27				
TP-22	9	SM	Bag	28				43				
TP-24	6	CL	Bag	35				79				
TP-32	3	CL	Block	32	90				39	21	18	-0.0%
TP-36	8	OL	Block	54	66					NP	NP	-0.0%
TP-39	3	CL	Bag	32	86				36	22	14	-0.0%
B-1	7.5	SM	SPT	25				37				
	10	SM	SPT	23				26				
	15	CH	SPT	35		0	3	97				
B-2	15	CL	SPT	21				85				
B-3	10	CH	Shelby Tube	25	99				51	19	32	+0.9%
	15	CH	SPT	25		0	4	96				
B-4	7.5	CL	SPT	28		11	9	80				
	15	CL	SPT	23				76	26	15	11	
	25	CL	SPT	40		0	3	97	40	20	20	
	35	CL	Rings	19		0	25	75				
B-7	7.5	ML	Shelby Tube	29	94					NP	NP	+0.0%
	10	CL	SPT	30		1	32	67				
B-9	2.5	CL	SPT	20								
B-10	10	CL	Shelby Tube	26	95				29	18	11	+0.2%
	15	CL	SPT	26				95				

4.0 GEOLOGIC & SEISMIC CONDITIONS

4.1 Geologic Setting

The subject site is located in the north-central portion of Utah Valley in north-central Utah. The site sits at an elevation between approximately 4,495 and 4,515 feet above sea level. The 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, and is bordered by the Wasatch Mountain Range on the east and Lake Mountain and West Mountain on the west. Utah Valley is located within the Intermountain Seismic Belt, a zone of ongoing tectonism and seismic activity extending from southwestern Montana to southwestern Utah. The active (evidence of movement in the last 10,000 years) Wasatch Fault Zone is part of the Intermountain Seismic Belt and extends from southeastern Idaho to central Utah along the western base of the Wasatch Mountain Range.

Much of northwestern Utah, including Utah Valley, was also previously covered by the Pleistocene age Lake Bonneville. Utah Lake, which currently occupies much of the western portion of the valley, is a remnant of this

ancient fresh water lake. Lake Bonneville reached a high-stand elevation of between approximately 5,160 and 5,200 feet above sea level at between 18,500 and 17,400 years ago. Approximately 17,400 years ago, the lake breached its basin in southeastern Idaho and dropped relatively fast, by almost 300 feet, as water drained into the Snake River. Following this catastrophic release, the lake level continued to drop slowly over time, primarily driven by drier climatic conditions, until reaching the current levels of Utah Lake and the larger Great Salt Lake to the north. Shoreline terraces formed at the high-stand elevation of the lake and several subsequent lower lake levels are visible in places on the mountain slopes surrounding the valley. Much of the sediment within Utah Valley was deposited as lacustrine sediments during both the transgressive (rise) and regressive (fall) phases of Lake Bonneville and in older, pre-Bonneville lakes that previously occupied the basin.

The geology of the USGS "Pelican Point, Utah" 7.5 Minute Quadrangle, which includes the location of the subject site, has been mapped by Solomon, Biek and Ritter[2]. The mapped surficial geology primarily consists of lacustrine silt and clay, but includes several geologic units, in chronological order (from youngest to oldest) as follows:

Qsm - Spring and marsh deposits (Holocene to upper Pleistocene) – Fine, organic-rich sediment associated with springs, ponds, seeps, and wetlands; commonly wet, but seasonally dry; may locally contain peat deposits as thick as 3 feet (1 m); overlies lacustrine silt and clay (Qlmp and Qlmy) and grades laterally into young lacustrine silt and clay (Qlmy); present where water table is high on the margins of Utah Lake. Thickness commonly less than 10 feet (3 m).

Qla - Lacustrine and alluvial deposits, undivided (Holocene to upper Pleistocene) – Sand, silt, and clay in areas of mixed alluvial and lacustrine deposits that are undifferentiated because the units grade imperceptibly into one another; mapped near Lindon. Thickness less than 10 feet (3 m).

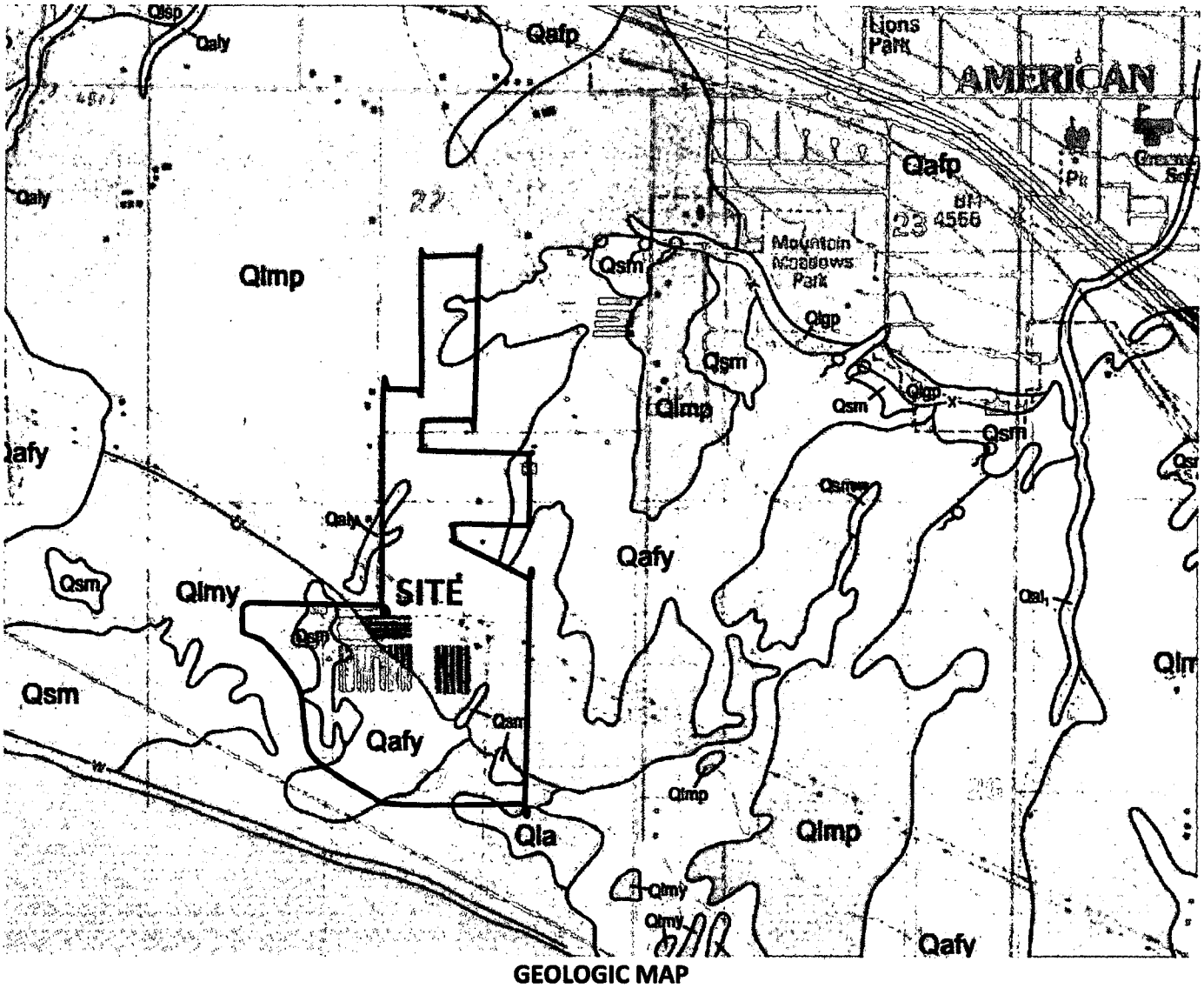
Qafy - Young alluvial-fan deposits, undivided (Holocene to upper Pleistocene) – Poorly to moderately sorted, pebble to cobble gravel with boulders near bedrock sources, with a matrix of sand, silt, and clay, grading to mixtures of sand, silt, and clay on gentler slopes; deposited by debris flows, debris floods, and streams at the mouths of mountain canyons near the base of the Lake Mountains near Pelican Point and at the mouths of American Fork, Dry Creek, and Spring Creek as they flowed toward the north shore of Utah Lake, where they may include undifferentiated deltaic sediment deposited by streams flowing into the lake; includes level-1 and level-2 alluvial-fan deposits (Qaf1 and Qaf2) that postdate the regression of Lake Bonneville from the Provo shoreline and lower levels that cannot be differentiated because of map scale or are in areas where the specific age of Holocene deposits cannot be determined; no Lake Bonneville shorelines are found on these alluvial fans. Thickness variable, probably less than 30 feet (10 m).

Qlmy - Young lacustrine silt and clay (Holocene to upper Pleistocene) – Silt, clay, and minor fine-grained sand mapped along the margin of Utah Lake; locally organic rich and locally includes pebbly beach gravel; overlies sediments of the Bonneville lake cycle. Brimhall and others (1976) reported that Holocene gray clayey silt composed mostly of calcite forms the upper 15 to 30 feet (5–10 m) of the lake sediment in Utah Lake.

[2] Solomon, B.J., Biek, R.F., and Ritter, S.M., 2009, Geologic Map of the Pelican Point Quadrangle, Utah County, Utah; Utah Geological Survey Map 244, Scale 1:24,000.

Qlmp - Lacustrine silt and clay (upper Pleistocene) – Calcareous silt (marl) and clay with minor fine sand; typically laminated or thin bedded; ostracodes locally common; deposited in quiet water in moderately deep parts of the Bonneville basin and in sheltered bays; overlies lacustrine silt and clay of the transgressive phase and grades upslope into lacustrine sand and silt (Qlsp); locally buried by loess veneer; regressive lacustrine shorelines typically poorly developed; extensive exposure within two miles (3 km) of the Utah Lake shore incised by young alluvial fans (Qafy), and small remnants south of Pelican Point. ... Exposed thickness less than 15 feet (5 m), but total thickness may exceed several tens of feet."

No fill has been mapped at the location of the site on the geologic map. Refer to the **Geologic Map** shown below.



GEOLOGIC MAP

4.2 Faulting

No surface fault traces are shown on the referenced geologic map crossing, adjacent to, or projecting toward the subject site. The nearest active (Holocene) faulting is a segment of the Utah Lake faults, located approximately 1.7 miles to the southeast. Note that the site will likely experience significant shaking if an earthquake were to occur on that fault or the nearby Wasatch fault. Seismic design issues are addressed in **Section 4.3** below.

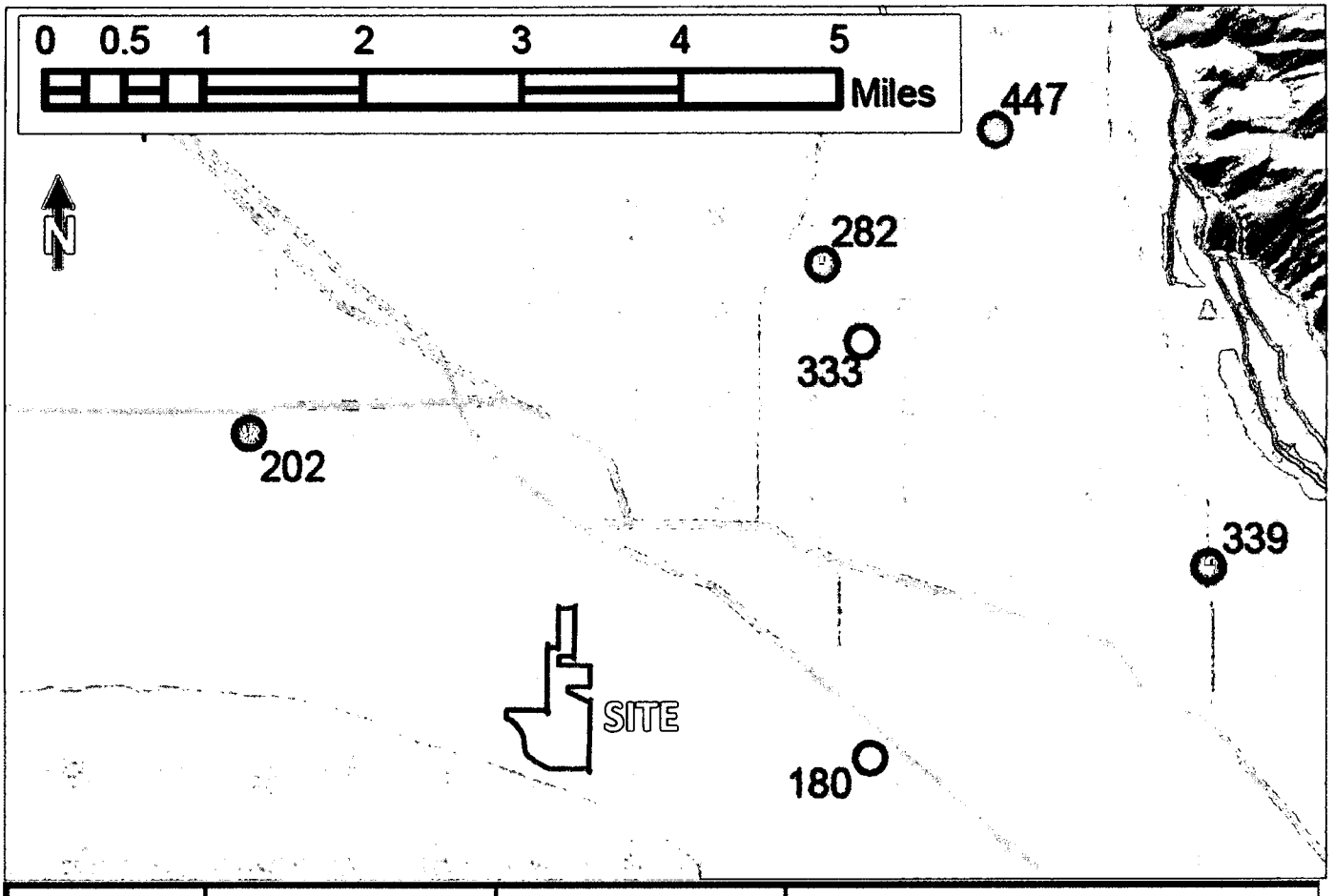
4.3 Seismicity

4.3.1 Site Class

Utah has adopted the International Building Code (IBC) 2018, which determines the seismic hazard for a site based upon 2014 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points). For site class definitions, IBC 2018 Section 1613.2.2 refers to Chapter 20, Site Classification Procedure for Seismic Design, of ASCE[3] 7-16, which stipulates that the average values of shear wave velocity, blow count and/or shear strength within the upper 100 feet (30 meters) be utilized to determine seismic site class. Based on average shear wave velocity data within the upper 30 meters ($V_{S,30}$) published by McDonald and Ashland[4], the subject site is located within unit description Q01U, which has a log-mean $V_{S,30}$ of 174 meters per second (571 feet per second), as shown in the **$V_{S,30}$ Map** below. This agrees with a nearby $V_{S,30}$ measured point which indicated a value of 180 meters per second.

[3]American Society of Civil Engineers

[4] McDonald, G.N. and Ashland, F.X., 2008, "Earthquake Site-Conditions Map for the Wasatch Front Urban Corridor, Utah," Utah Geological Survey Special Study 125, 41 pp.



Unit		Vs30 (m/s)			IBC Site Class			Description
		Minimum	Log Mean	Maximum	Minimum	Log Mean	Maximum	
Q01	All data	151	194	325	E	D	D	Lacustrine and alluvial silt, clay, and fine sand; alluvial, lateral-spread, or marsh deposits typically overlie lacustrine deposits
	Q01WD	154	188	244	E	D	D	
	Q01WDe	154	166	179	E	E	E	
	Q01WDd	189	207	244	D	D	D	
	Q01S	151	198	325	E	D	D	
	Q01U	157	174	202	E	E	D	

$V_{S,30}$ MAP

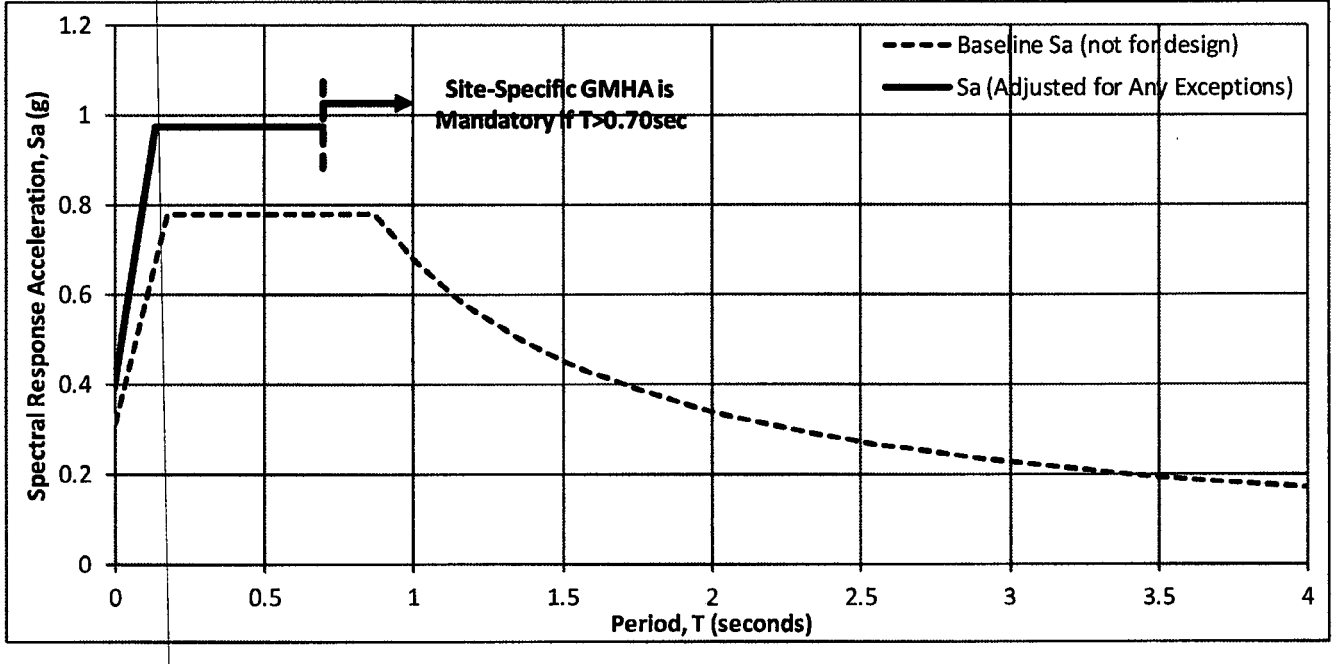
In addition, the blow counts in bore hole B-4, which extended to a depth of 41.5 feet, were 15 blows per foot or less. Thus, it is our opinion the site best fits Site Class E – Soft Clay Profile, which we recommend for seismic structural design. A small portion of the site (in the vicinity of bore hole B-1) could experience significant settlements/movements, and thus could be classified as Site Class F unless the building period will be less than 0.5 seconds, in which case Site Class E would apply.

4.3.2 Ground Motions

The 2014 USGS mapping utilized by the IBC provides values of peak ground, short period and long period spectral accelerations for the Site Class B/C boundary and the Risk-Targeted Maximum Considered Earthquake (MCE_R). This Site Class B/C boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions at site grid coordinates of 40.3597 degrees north latitude and -111.823 degrees west longitude (the approximate center of the site). The following table and response spectra summarizes the peak ground, short period and long period accelerations for the MCE_R event, and incorporates appropriate soil correction factors for a Site Class E soil profile:

SPECTRAL ACCELERATION PERIOD, T	SITE CLASS B/C BOUNDARY [mapped values] (g)	SITE COEFFICIENT	SITE CLASS E [adjusted for site class effects] (g)	MULTI-PLIER	DESIGN VALUES (g)
Peak Ground Acceleration	PGA = **0.543**	F_{pga} = 1.157	PGA_M = 0.628	1.000	PGA_M = 0.628
0.2 Seconds (Long Period Acceleration)	S_S = **1.218**	F_a = N/A	S_{MS} = N/A	0.667	S_{DS} = N/A
	(Exception 1:)	F_a = (1.200)	S_{MS} = (1.462)	0.667	S_{DS} = (0.974)
1.0 Second (Long Period Acceleration)	S_1 = **0.439**	F_v = N/A	S_{M1} = N/A	0.667	S_{D1} = N/A
	(Exception 3:)	F_v = (2.322)	S_{M1} = (1.019)	0.667	S_{D1} = (0.680)

NOTES: 1. TL (seconds): **8**
2. Site Class: **E**
3. Have data to verify? **Yes**
4. ASCE 7-16 Requires Site-Specific Ground Motion Hazard Analysis (Since Ss≥1.0 & S1≥0.2 sec) - OR Can Use Exceptions 1 & 3 up to T=0.70sec (per §11.4.8)



As shown in the response spectrum above, if the period of the proposed building is greater than 0.70 seconds, a site-specific ground motion hazard analysis (GMHA) is required. If this situation applies, please contact CMT for a proposal to perform the GMHA.

4.3.3 Liquefaction

The site is located within an area designated by the Utah Geologic Survey[5] as having "High" liquefaction potential. Liquefaction is defined as the condition when saturated, loose, sandy soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

We evaluated the liquefaction potential of the site using the procedures described in Youd et al[6] and Idriss & Boulanger[7] (calculations are attached). We also performed several hydrometer tests (see **Figures 49 and 50**), which indicated the clayey soils at the site have more than 20% clay fines and, thus, do not appear susceptible to liquefaction. Our evaluation indicates the saturated sandy soils within bore hole B-1 between depths of 7.5 and 13 feet could liquefy during a major seismic event. Maximum anticipated settlement resulting from the liquefaction is estimated to range from 3 to 4 inches, but lateral spreading due to liquefaction is anticipated to cause up to 3.5 feet of lateral movements.

In addition, the geologic hazards study[8] for the American Fork Sensitive Lands Ordinance recommended supplementing on-site field explorations with at least one boring extending to a minimum depth of 70 feet. As shown on Figure 1, Site Map, boring AF-06-03 (attached in the **Appendix**) from that study is located within site boundaries and extended to a depth of 100 feet, thus we evaluated the potential liquefaction for that boring as well, which indicated a couple of isolated layers could liquefy at that boring location. Maximum anticipated settlement resulting from liquefaction is estimated to range from 2 to 6 inches, and lateral spreading due to liquefaction is anticipated to cause only about 0.1 foot of lateral movement.

The amounts of settlement/movement in the vicinity of B-1 are not considered tolerable for structures, thus we recommend mitigation strategies, such as aggregate columns or other soil densification methods, to treat susceptible soils in the vicinity of B-1. Note that liquefaction is not anticipated at the other bore hole locations, with the exception of boring 06-03 from the referenced geologic study where up to 6 inches of liquefaction-induced settlement and about 1 inch of lateral movement could occur. That particular area is where single-family homes are planned; thus, it is our opinion that one mitigation measure besides soil densification methods that could be utilized is to tie the footings together to limit structural damage due to liquefaction in the vicinity of 06-03.

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[5] Utah Geological Survey, "Liquefaction-Potential Map for a Part of Utah County, Utah," Utah Geological Survey Public Information Series 28, August 1994. https://ugspub.nr.utah.gov/publications/public_information/pi-28.pdf

[6] Youd, T.L.; Idriss, I.M.; Andrus, R.D.; Arango, I.; Castro, G.; Christian, J.T.; Dobry, R.; Finn, W.D.L.; Harder, L.F. Jr.; Hynes, M.E.; Ishihara, K.; Koester, J.P.; Liao, S.C.; Marcuson, W.F. III; Martin, G.R.; Mitchell, J.K.; Moriwaki, Y.; Power, M.S.; Robertson, P.K.; Seed, R.B.; and Stokoe, K.H. II; October 2001, "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils," ASCE Journal of Geotechnical and Geoenvironmental Engineering, p 817-833.

[7] Idriss, I.M. and Boulanger, R.W., December 2010, "SPT-Based Liquefaction Triggering Procedures," Department of Civil & Environmental Engineering, University of California at Davis, Report No. UCD/CGM 10/02, 259 p.

[8] "American Fork Sensitive Lands Geologic Hazards Study, American Fork, Utah" Prepared by RB&G Engineering, December 9, 2006.

4.4 Other Geologic Hazards

No landslide deposits or features, including lateral spread deposits, are mapped on or adjacent to the site. The site is not located within a known debris flow, stream flooding[9], or rock-fall hazard area.

5.0 SITE CONDITIONS

5.1 Surface Conditions

At the time of our field explorations, development at the site had begun, with several streets roughed in and/or graded with roadbase. The overall area comprised primarily vacant, agricultural/pasture land, with a couple of residences and related out-buildings. Vegetation consisted of grasses and weeds, with some scattered trees throughout the site. Based upon aerial photos readily available online dating back to 1993, the site appears relatively unchanged since then and has been consistently used for agriculture/pasture land; the street grading appeared by mid-summer 2019. The site grade generally sloped downward to the southwest, with an overall gradient of about 20 feet across the site. The site property is surrounded by scattered residences and similar agricultural/pasture land (see **Vicinity Map** in **Section 1.1** above).

5.2 Subsurface Soils

At the locations of the explorations, we typically encountered approximately 0.5 to 2.5 feet of topsoil at the surface, but occasionally encountered 0.5 to 3 feet of fill. The fill soils, which consisted of silty clay to gravel, are considered undocumented/untested. Natural soils were observed at the surface in some bore holes or beneath the topsoil/fill soils, consisting of layers of CLAY with varying amounts of silt and sand (CL, CH), SILT with some sand (ML), ORGANIC SILT (OL), Silty SAND (SM) and GRAVEL (GP), extending to the maximum depths explored of 7 to 41.5 feet.

The silt/clay soils were moist to wet, brown to light brown to gray/bluish gray to black in color, and estimated to be very soft to stiff in consistency. They also exhibited moderate over consolidation and high compressibility characteristics, with a slight expansive potential.

The natural sand soils were moist to wet, brown to gray in color, and were loose to medium dense based on SPT blow counts. They will also exhibit moderately high strength and low compressibility characteristics.

For a more descriptive interpretation of subsurface conditions, please refer to the exploration logs, **Figures 2 through 47**, which graphically represent the subsurface conditions encountered. The lines designating the interface between soil types on the logs generally represent approximate boundaries; in situ, the transition between soil types may be gradual. A key to the symbols and terms on the logs is included as **Figure 48**.

[9] https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd&extent=-111.36752238312305,40.474000783564726,-111.34675135651116,40.48216171946493

5.3 Groundwater

Groundwater was encountered in the explorations at depths of about 2 to 15 feet below existing grade at the time of our field exploration. These depths to groundwater will affect excavations and basement depths. Dewatering may be required during utility installations.

Historic groundwater levels at the site were difficult to ascertain, but we noted in the Google Earth photo history that water levels came to or encroached on the southwest portion of the site in 2011 to 2013. The ground elevation in that particular area is about 4,495 feet, which in our opinion is the highest historic groundwater level for the site.

Groundwater levels can fluctuate seasonally. Numerous other factors such as heavy precipitation, irrigation of neighboring land, and other unforeseen factors, may also influence ground water elevations at the site. The detailed evaluation of these and other factors, which may be responsible for ground water fluctuations, is beyond the scope of this study.

5.4 Site Subsurface Variations

Based on the results of the subsurface explorations and our experience, variations in the continuity and nature of subsurface conditions should be anticipated. Due to the heterogeneous characteristics of natural soils, care should be taken in interpolating or extrapolating subsurface conditions between or beyond the exploratory locations.

In addition, once the subsurface explorations were completed the test pits were backfilled with the excavated soils but little effort was made to compact these soils. Therefore, the backfill must be considered as undocumented fill and settlement of the backfill in the test pits over time should be anticipated. Caution must be exercised when constructing over these locations.

6.0 SITE PREPARATION AND GRADING

6.1 General

All deleterious materials should be stripped from the site prior to commencement of construction activities. This includes loose and disturbed soils, topsoil, vegetation, etc. Based upon the conditions observed in many test pits, there is topsoil on the surface of the site which we estimated to be about 6 to 30 inches in thickness. When stripping and grubbing, topsoil should be distinguished by the apparent organic content and not solely by color; thus we estimate that topsoil stripping will need to include the upper 6 inches. However, given the past agricultural uses of the site, the upper 12 to 15 inches may have been disturbed during farming.

In addition, up to approximately 3 feet of undocumented fill was encountered in various explorations throughout the site. All undocumented fill shall be removed from beneath structures, but may remain beneath flatwork and pavements, provided they are properly prepared and the owner understands that additional maintenance may be required. Outside of building footprints, proper preparation of undocumented fill and

disturbed soils shall consist of removing the upper 12 inches, scarifying to a minimum depth of 8 inches and re-compacting the soils in place. The exposed subgrade must then be proofrolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or loose soils are encountered, they must be removed (up to a maximum depth of 2 feet) and replaced with structural fill.

The site should be observed by a CMT geotechnical engineer to assess that suitable natural soils have been exposed and any deleterious materials, loose and/or disturbed soils have been removed, prior to placing site grading fills, footings, slabs, and pavements.

Fill placed over large areas to raise overall site grades can induce settlements in the underlying natural soils. If more than 3 feet of site grading fill is anticipated over the natural ground surface, we should be notified to assess potential settlements and provide additional recommendations as needed. These recommendations may include placement of the site grading fill far in advance to allow potential settlements to occur prior to construction.

6.2 Temporary Excavations

Groundwater was observed within the explorations at depths of about 2 to 15 feet below the existing ground surface. We anticipate that excavations extending close to the encountered groundwater depths will likely require dewatering.

The natural soils encountered at this site predominantly consisted of silt/clay. In clayey (cohesive) soils, temporary construction excavations not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary excavations up to 8 feet deep, above or below groundwater, may be constructed with side slopes no steeper than one-half horizontal to one vertical (0.5H:1V).

For sandy and non-plastic silt (cohesionless) soils, construction excavations above the water table, not exceeding 4 feet, should be no steeper than one-half horizontal to one vertical (0.5H:1V). For cohesionless soils, temporary construction excavations not exceeding 4 feet in depth should be no steeper than one-half horizontal to one vertical (0.5H:1V). For excavations up to 8 feet and above groundwater, side slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult to maintain, and will require very flat side slopes and/or shoring, bracing and dewatering.

To reduce disturbance of the natural soils during excavation, we recommend that smooth edge buckets/blades be utilized.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated. All excavations should be made following OSHA safety guidelines.

6.3 Fill Material

Following are our recommendations for the various fill types we anticipate will be used at this site:

CMT ENGINEERING LABORATORIES

ENGINEERING •GEOTECHNICAL •ENVIRONMENTAL (ESA I & II) •
MATERIALS TESTING •SPECIAL INSPECTIONS •
ORGANIC CHEMISTRY • PAVEMENT
DESIGN •GEOLOGY

GEOTECHNICAL ENGINEERING STUDY

Lakeshoring Landing/Ardero Property

6885 West 7300 North
American Fork, Utah
CMT Project No. 16111

Prepared For:
White Horse Developers
520 South 850 East
Lehi, Utah 84043

March 29, 2021

CMT ENGINEERING LABORATORIES

March 29, 2021

Mr. Jake Horan
White Horse Developers
520 South 850 East
Lehi, Utah 84043

Subject: Geotechnical Engineering Study
Lakeshoring Landing/Ardero Property
6885 West 7300 North
American Fork, Utah
CMT Project Number: 16111

Mr. Horan:

Submitted herewith is the report of our geotechnical engineering study for the subject site. This report contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics. It also contains recommendations to aid in the design and construction of the earth related phases of this project.

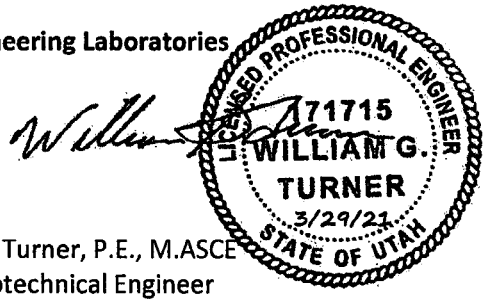
On March 4 and 5, 2021, CMT Engineering Laboratories (CMT) staff professionals were on-site and supervised the drilling of 10 bore holes to depths of about 16.5 to 41.5 feet and the excavation of 40 test pits extending to depths of about 7 to 15 feet below the existing ground surface. Soil samples were obtained during the field operations and subsequently transported to our laboratory for further testing and observation.

Conventional spread and/or continuous footings may be utilized to support the proposed structures, provided the recommendations in this report are followed. A detailed discussion of design and construction criteria is presented in this report.

We appreciate the opportunity to work with you at this stage of the project. CMT offers a full range of Geotechnical Engineering, Geological, Material Testing, Special Inspection services, and Phase I and II Environmental Site Assessments. With offices throughout Utah, Idaho and Arizona, our staff is capable of efficiently serving your project needs. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at 801-492-4132.

CERTIFICATE: I hereby certify that I am a licensed professional engineer, as defined in the "Sensitive Lands Ordinance" Section of the American Fork City Ordinances. I have examined the 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. The procedures and tests used in said report meet minimum applicable professional standards.

Sincerely,
CMT Engineering Laboratories



William G. Turner, P.E., M.ASCE
Senior Geotechnical Engineer

Reviewed by:

Jeffrey J. Egbert, P.E., LEED A.P., M. ASCE
Senior Geotechnical Engineer

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CMT ENGINEERING LABORATORIES

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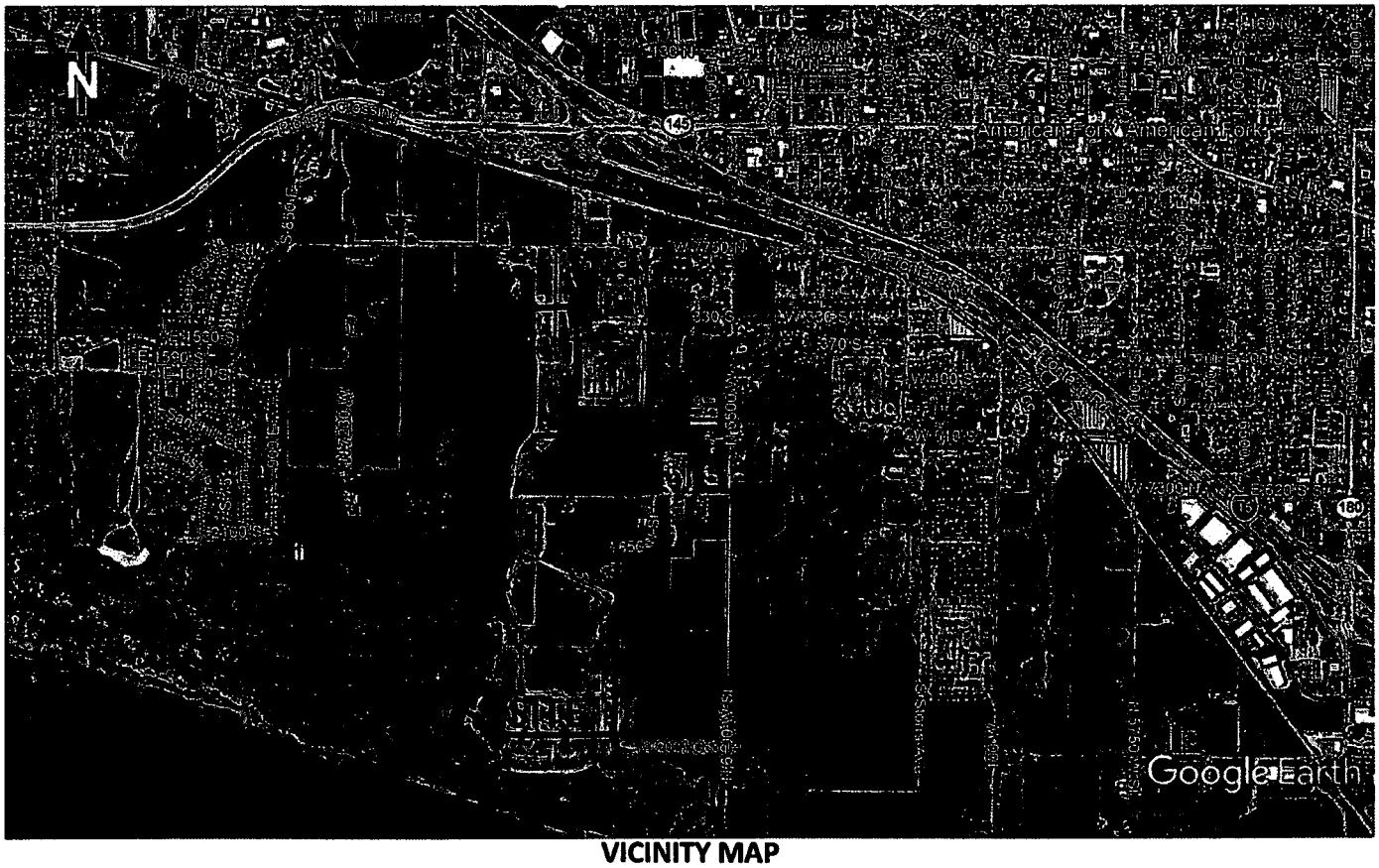
APPENDIX

1.0 INTRODUCTION

1.1 General

CMT Engineering Laboratories (CMT) was retained to conduct a geotechnical subsurface study for the proposed development of approximately 164 acres as a mixed-residential development. The site is situated south of 200 South at about 6885 West 7300 North (Utah County coordinates) in American Fork, Utah as shown in the **Vicinity Map** below.



VICINITY MAP

1.2 Objectives, Scope and Authorization

The objectives and scope of our study were planned in discussions between Mr. Tyler Horan of White Horse Developers, and Mr. Bill Turner of CMT Engineering Laboratories (CMT). In general, the objectives of this study were to define and evaluate the subsurface soil and groundwater conditions at the site, and provide appropriate foundation, earthwork, pavement and seismic recommendations to be utilized in the design and construction of the proposed development.

In accomplishing these objectives, our scope of work has included performing a field exploration, which consisted of the drilling/logging/ sampling of 10 bore holes and the excavating/logging/sampling of 40 test pits, performing laboratory testing on representative samples of the subsurface soils collected in the explorations,

and conducting an office program, which consisted of correlating available data, performing engineering analyses, and preparing this summary report. This scope of work was authorized by returning a signed copy of our proposal dated February 19, 2021 and executed the same day.

1.3 Description of Proposed Construction

We understand that the project will consist of developing approximately 164 acres for the construction of multi-family and single-family residential structures at the site. We anticipate that the multi-family buildings will be constructed 2 to 3 stories in height above existing grade with slabs on grade, and that single-family residences will be 1 to 2 stories in height, possibly with partial to full basements. We also project that maximum structural loads will be 6,000 pounds per lineal foot for walls, 120,000 pounds for columns, and 150 pounds per square foot for floors. If the loading conditions are different than we have projected, please notify us so that any appropriate modifications to our conclusions and recommendations contained herein can be made.

We project that construction will include streets and access drives to provide access to the residential buildings and homes, which we expect will utilize asphalt surfacing. Long term traffic is projected to consist of a moderate volume of automobiles and pickup trucks, a light volume of medium-weight delivery trucks, a weekly garbage truck and an occasional fire truck.

Site development will require some earthwork in the form of minor cutting and filling. A site grading plan was not available at the time of this report, but we project that maximum cuts and fills may be on the order of 2 to 3 feet. If deeper cuts or fills are planned, CMT should be notified to provide additional recommendations, if needed.

1.4 Executive Summary

Proposed residences can be supported upon conventional spread and continuous wall foundations. The most significant geotechnical aspects regarding site development include the following:

1. Up to approximately 2.5 feet of topsoil blankets most of the site, with some areas of up to about 3 feet of undocumented fill, both of which will require removal beneath structures;
2. The soils encountered predominantly consisted of CLAY (CL, CH), with layers of SILT (ML, OL), Silty SAND (SM) and GRAVEL (GP);
3. Liquefaction could occur in the vicinity of bore hole B-1 that will likely require mitigation due to significant liquefaction-induced settlements/movements;
4. Foundations may be placed on suitable, undisturbed natural soils or on properly placed and compacted structural fill extending to suitable, undisturbed natural soils; and
5. Floor slabs should be placed on a minimum 6 inches of compacted structural fill extending to suitable, undisturbed natural soils.

CMT must assess that topsoil, undocumented fills, debris, disturbed or unsuitable soils have been appropriately removed and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements.

In the following sections, detailed discussions pertaining to the site are provided, including subsurface descriptions, geologic/seismic setting, earthwork, foundations, lateral resistance, lateral pressure, floor slabs, and pavements.

2.0 FIELD EXPLORATION

2.1 General

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 10 bore holes were drilled with hollow stem augers to depths of about 16.5 to 41.5 feet, and 40 test pits were excavated to depths of about 7 to 15 feet, below the existing ground surface. Locations of the explorations are presented on **Figure 1, Site Map**. The field exploration was performed under the supervision of experienced members of our geotechnical staff.

Representative soil samples within each test pit were collected by obtaining disturbed "grab" samples and cutting relatively undisturbed "block" samples. The samples were placed in sealed plastic bags and containers prior to transport to the laboratory.

Samples of the subsurface soils encountered in the bore holes were collected at varying depths through hollow stem drill augers. Relatively undisturbed samples were obtained by hydraulically pushing a 3-inch diameter (Shelby) tube and driving a 2.5-inch outside diameter "Dames and Moore" sampler with rings. Disturbed samples were collected utilizing a standard split spoon (SPT) sampler. The ring and SPT samplers were driven 18 inches into the soils below the drill augers using a 140-pound hammer free-falling a distance of 30 inches. The number of hammer blows needed for each 6-inch interval was recorded. The sum of the hammer blows for the final 12 inches of the standard split-spoon sampler penetration is known as a standard penetration test and this 'blow count' was recorded on the bore hole logs. The samples were placed in sealed plastic bags and containers prior to transport to the laboratory.

The subsurface soils encountered in the explorations were logged and described in general accordance with ASTM[1] D-2488. Soil samples were collected as described above, and were classified in the field based upon visual and textural examination. These field classifications were supplemented by subsequent examination and testing of select samples in our laboratory. Graphical representations of the subsurface conditions encountered are presented on each individual test pit log, **Figures 2 through 37**, and each individual bore hole log, **Figures 38 to 47**, included in the Appendix. A Key to Symbols defining the terms and symbols used on the logs, is provided as **Figure 48** in the Appendix.

The test pits were backfilled with excavated soils. The backfill was not placed in uniform lifts and compacted to a specific density and therefore must be considered as undocumented backfill. Settlement of the backfill with time is likely to occur.

[1]American Society for Testing and Materials

2.2 Infiltration Testing

Infiltration tests were also performed as part of our field exploration within test pits TP-11 and TP-35, at the depths indicated on the logs. The testing consisted of digging a small hole with a shovel, filling the hole with water, and measuring the rate of water drop over a certain time period (i.e. 10 minutes). This process was repeated multiple times until subsequent readings were the same. The results of this test indicate that the soils at this site have an infiltration rate ranging from 8 to 120 minutes per inch for silty sand and clay soils, respectively.

3.0 LABORATORY TESTING

Selected samples of the subsurface soils were subjected to various laboratory tests to assess pertinent engineering properties, as follows:

1. Moisture Content, ASTM D-2216, Percent moisture representative of field conditions
2. Dry Density, ASTM D-2937, Dry unit weight representing field conditions
3. Atterberg Limits, ASTM D-4318, Plasticity and workability
4. Gradation Analysis, ASTM D-1140/C-117/D-422, Grain Size/Hydrometer Analysis
5. One Dimensional Consolidation, ASTM D-2435, Consolidation properties

To provide data for our settlement analyses, consolidation testing was performed on 8 representative samples of the subsurface silt/clay soils encountered across the site. Based upon data obtained from the consolidation testing, the silt/clay soils at this site are mostly moderately over-consolidated and moderately to highly compressible under additional loading. Each sample was wetted at either a load of about 250 psf or 1,000 psf, which indicated a slight potential for swelling (0.1 to 0.9%). Detailed results of the consolidation tests are maintained within our files and interpretive graphs are attached as part of our settlement calculations.

Laboratory test results are presented on the exploration logs (**Figures 2 through 47**), on **Grain Size Distribution, Figures 49 and 50**, and in the following **Lab Summary Table**:

LAB SUMMARY TABLE

EXPLORATION	DEPTH (feet)	SOIL CLASS	SAMPLE TYPE	MOISTURE CONTENT(%)	DRY DENSITY (pcf)	GRADATION GRAV.	SAND	FINES	ATTERBERG LIMITS LL	PL	PI	COLLAPSE(-)/ EXPANSION(+)
TP-5	3	CL	Block	21	97				32	21	11	+0.1%
TP-9	3	CL	Block	41	77				47	21	26	-0.0%
TP-11	4	SM	Bag	16				14				
TP-19	6	SM	Bag	32				27				
TP-22	9	SM	Bag	28				43				
TP-24	6	CL	Bag	35				79				
TP-32	3	CL	Block	32	90				39	21	18	-0.0%
TP-36	8	OL	Block	54	66					NP	NP	-0.0%
TP-39	3	CL	Bag	32	86				36	22	14	-0.0%
B-1	7.5	SM	SPT	25				37				
	10	SM	SPT	23				26				
	15	CH	SPT	35		0	3	97				
B-2	15	CL	SPT	21				85				
B-3	10	CH	Shelby Tube	25	99				51	19	32	+0.9%
	15	CH	SPT	25		0	4	96				
B-4	7.5	CL	SPT	28		11	9	80				
	15	CL	SPT	23				76	26	15	11	
	25	CL	SPT	40		0	3	97	40	20	20	
	35	CL	Rings	19		0	25	75				
B-7	7.5	ML	Shelby Tube	29	94					NP	NP	+0.0%
	10	CL	SPT	30		1	32	67				
B-9	2.5	CL	SPT	20								
B-10	10	CL	Shelby Tube	26	95				29	18	11	+0.2%
	15	CL	SPT	26				95				

4.0 GEOLOGIC & SEISMIC CONDITIONS

4.1 Geologic Setting

The subject site is located in the north-central portion of Utah Valley in north-central Utah. The site sits at an elevation between approximately 4,495 and 4,515 feet above sea level. The 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, and is bordered by the Wasatch Mountain Range on the east and Lake Mountain and West Mountain on the west. Utah Valley is located within the Intermountain Seismic Belt, a zone of ongoing tectonism and seismic activity extending from southwestern Montana to southwestern Utah. The active (evidence of movement in the last 10,000 years) Wasatch Fault Zone is part of the Intermountain Seismic Belt and extends from southeastern Idaho to central Utah along the western base of the Wasatch Mountain Range.

Much of northwestern Utah, including Utah Valley, was also previously covered by the Pleistocene age Lake Bonneville. Utah Lake, which currently occupies much of the western portion of the valley, is a remnant of this

ancient fresh water lake. Lake Bonneville reached a high-stand elevation of between approximately 5,160 and 5,200 feet above sea level at between 18,500 and 17,400 years ago. Approximately 17,400 years ago, the lake breached its basin in southeastern Idaho and dropped relatively fast, by almost 300 feet, as water drained into the Snake River. Following this catastrophic release, the lake level continued to drop slowly over time, primarily driven by drier climatic conditions, until reaching the current levels of Utah Lake and the larger Great Salt Lake to the north. Shoreline terraces formed at the high-stand elevation of the lake and several subsequent lower lake levels are visible in places on the mountain slopes surrounding the valley. Much of the sediment within Utah Valley was deposited as lacustrine sediments during both the transgressive (rise) and regressive (fall) phases of Lake Bonneville and in older, pre-Bonneville lakes that previously occupied the basin.

The geology of the USGS "Pelican Point, Utah" 7.5 Minute Quadrangle, which includes the location of the subject site, has been mapped by Solomon, Biek and Ritter[2]. The mapped surficial geology primarily consists of lacustrine silt and clay, but includes several geologic units, in chronological order (from youngest to oldest) as follows:

Qsm - Spring and marsh deposits (Holocene to upper Pleistocene) – Fine, organic-rich sediment associated with springs, ponds, seeps, and wetlands; commonly wet, but seasonally dry; may locally contain peat deposits as thick as 3 feet (1 m); overlies lacustrine silt and clay (Qlmp and Qlmy) and grades laterally into young lacustrine silt and clay (Qlmy); present where water table is high on the margins of Utah Lake. Thickness commonly less than 10 feet (3 m).

Qla - Lacustrine and alluvial deposits, undivided (Holocene to upper Pleistocene) – Sand, silt, and clay in areas of mixed alluvial and lacustrine deposits that are undifferentiated because the units grade imperceptibly into one another; mapped near Lindon. Thickness less than 10 feet (3 m).

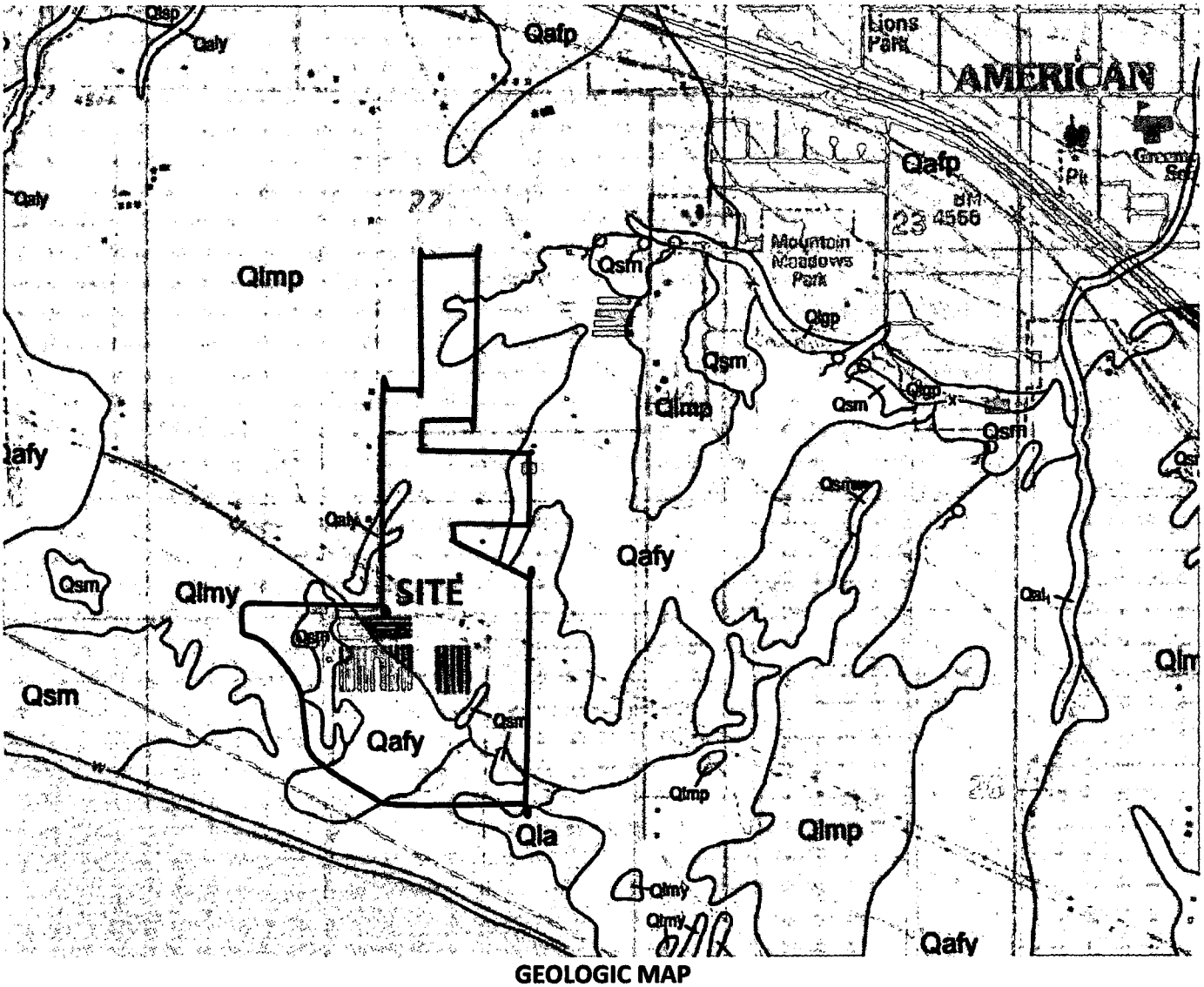
Qafy - Young alluvial-fan deposits, undivided (Holocene to upper Pleistocene) – Poorly to moderately sorted, pebble to cobble gravel with boulders near bedrock sources, with a matrix of sand, silt, and clay, grading to mixtures of sand, silt, and clay on gentler slopes; deposited by debris flows, debris floods, and streams at the mouths of mountain canyons near the base of the Lake Mountains near Pelican Point and at the mouths of American Fork, Dry Creek, and Spring Creek as they flowed toward the north shore of Utah Lake, where they may include undifferentiated deltaic sediment deposited by streams flowing into the lake; includes level-1 and level-2 alluvial-fan deposits (Qaf1 and Qaf2) that postdate the regression of Lake Bonneville from the Provo shoreline and lower levels that cannot be differentiated because of map scale or are in areas where the specific age of Holocene deposits cannot be determined; no Lake Bonneville shorelines are found on these alluvial fans. Thickness variable, probably less than 30 feet (10 m).

Qlmy - Young lacustrine silt and clay (Holocene to upper Pleistocene) – Silt, clay, and minor fine-grained sand mapped along the margin of Utah Lake; locally organic rich and locally includes pebbly beach gravel; overlies sediments of the Bonneville lake cycle. Brimhall and others (1976) reported that Holocene gray clayey silt composed mostly of calcite forms the upper 15 to 30 feet (5–10 m) of the lake sediment in Utah Lake.

[2] Solomon, B.J., Biek, R.F., and Ritter, S.M., 2009, Geologic Map of the Pelican Point Quadrangle, Utah County, Utah; Utah Geological Survey Map 244, Scale 1:24,000.

Qlmp - Lacustrine silt and clay (upper Pleistocene) – Calcareous silt (marl) and clay with minor fine sand; typically laminated or thin bedded; ostracodes locally common; deposited in quiet water in moderately deep parts of the Bonneville basin and in sheltered bays; overlies lacustrine silt and clay of the transgressive phase and grades upslope into lacustrine sand and silt (Qlsp); locally buried by loess veneer; regressive lacustrine shorelines typically poorly developed; extensive exposure within two miles (3 km) of the Utah Lake shore incised by young alluvial fans (Qafy), and small remnants south of Pelican Point. ... Exposed thickness less than 15 feet (5 m), but total thickness may exceed several tens of feet."

No fill has been mapped at the location of the site on the geologic map. Refer to the **Geologic Map** shown below.



GEOLOGIC MAP

4.2 Faulting

No surface fault traces are shown on the referenced geologic map crossing, adjacent to, or projecting toward the subject site. The nearest active (Holocene) faulting is a segment of the Utah Lake faults, located approximately 1.7 miles to the southeast. Note that the site will likely experience significant shaking if an earthquake were to occur on that fault or the nearby Wasatch fault. Seismic design issues are addressed in **Section 4.3** below.

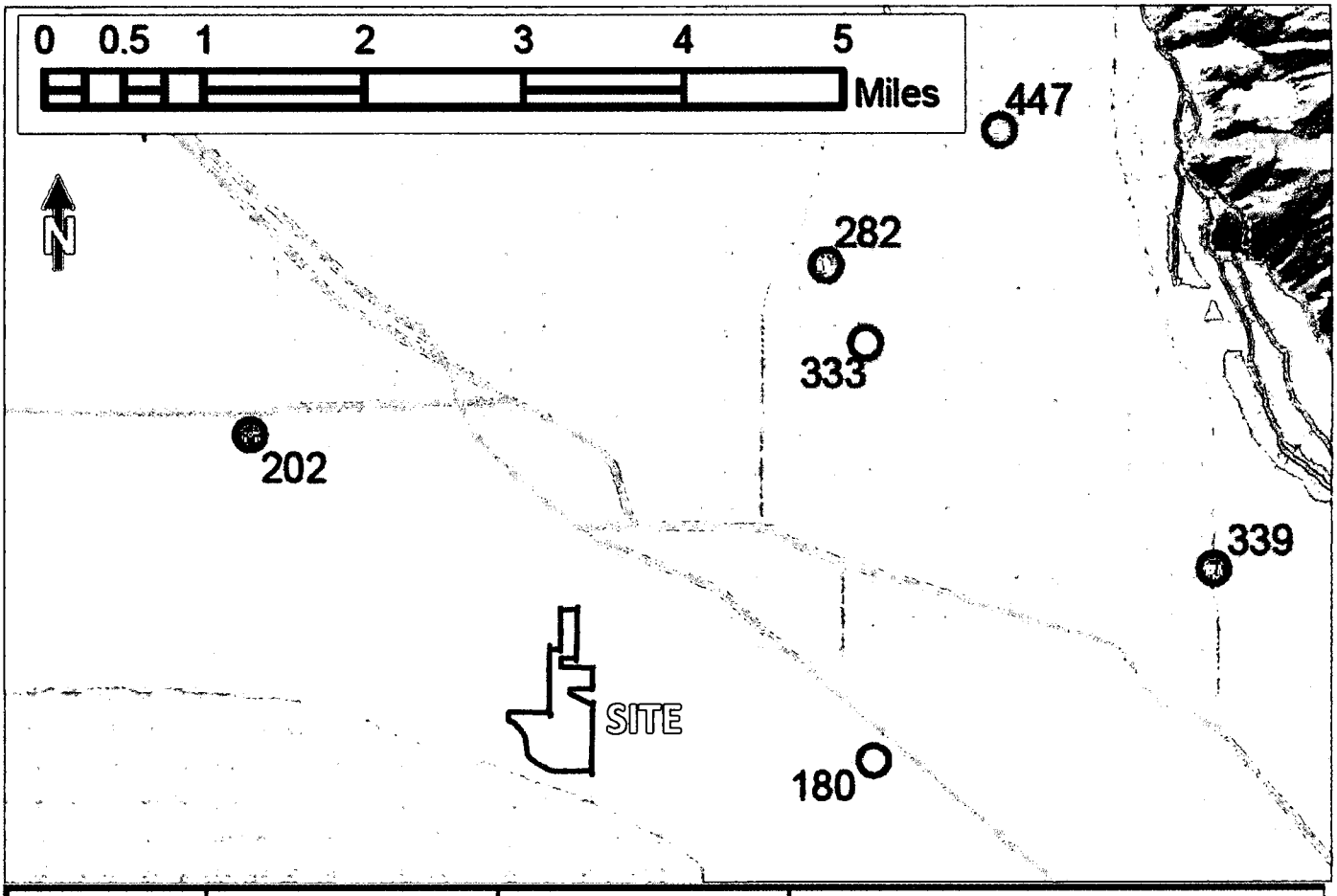
4.3 Seismicity

4.3.1 Site Class

Utah has adopted the International Building Code (IBC) 2018, which determines the seismic hazard for a site based upon 2014 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points). For site class definitions, IBC 2018 Section 1613.2.2 refers to Chapter 20, Site Classification Procedure for Seismic Design, of ASCE[3] 7-16, which stipulates that the average values of shear wave velocity, blow count and/or shear strength within the upper 100 feet (30 meters) be utilized to determine seismic site class. Based on average shear wave velocity data within the upper 30 meters ($V_{S,30}$) published by McDonald and Ashland[4], the subject site is located within unit description Q01U, which has a log-mean $V_{S,30}$ of 174 meters per second (571 feet per second), as shown in the **$V_{S,30}$ Map** below. This agrees with a nearby $V_{S,30}$ measured point which indicated a value of 180 meters per second.

[3]American Society of Civil Engineers

[4] McDonald, G.N. and Ashland, F.X., 2008, "Earthquake Site-Conditions Map for the Wasatch Front Urban Corridor, Utah," Utah Geological Survey Special Study 125, 41 pp.



Unit		Vs30 (m/s)			IBC Site Class			Description
		Minimum	Log Mean	Maximum	Minimum	Log Mean	Maximum	
Q01	All data	151	194	325	E	D	D	Lacustrine and alluvial silt, clay, and fine sand; alluvial, lateral-spread, or marsh deposits typically overlie lacustrine deposits
	Q01WD	154	188	244	E	D	D	
	Q01WDe	154	166	179	E	E	E	
	Q01WDd	189	207	244	D	D	D	
	Q01S	151	198	325	E	D	D	
	Q01U	157	174	202	E	E	D	

$V_{S,30}$ MAP

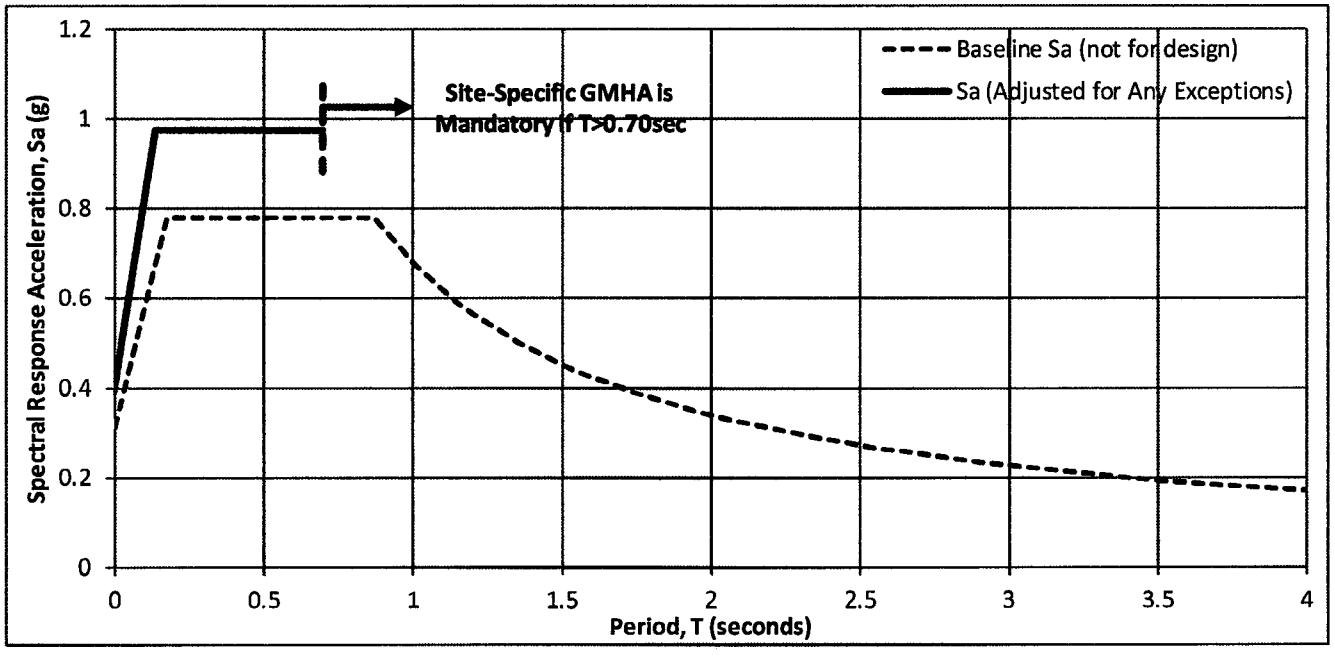
In addition, the blow counts in bore hole B-4, which extended to a depth of 41.5 feet, were 15 blows per foot or less. Thus, it is our opinion the site best fits Site Class E – Soft Clay Profile, which we recommend for seismic structural design. A small portion of the site (in the vicinity of bore hole B-1) could experience significant settlements/movements, and thus could be classified as Site Class F unless the building period will be less than 0.5 seconds, in which case Site Class E would apply.

4.3.2 Ground Motions

The 2014 USGS mapping utilized by the IBC provides values of peak ground, short period and long period spectral accelerations for the Site Class B/C boundary and the Risk-Targeted Maximum Considered Earthquake (MCE_R). This Site Class B/C boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions at site grid coordinates of 40.3597 degrees north latitude and -111.823 degrees west longitude (the approximate center of the site). The following table and response spectra summarizes the peak ground, short period and long period accelerations for the MCE_R event, and incorporates appropriate soil correction factors for a Site Class E soil profile:

SPECTRAL ACCELERATION PERIOD, T	SITE CLASS B/C BOUNDARY [mapped values] (g)	SITE COEFFICIENT	SITE CLASS E [adjusted for site class effects] (g)	MULTI-PLIER	DESIGN VALUES (g)
Peak Ground Acceleration	PGA = **0.543**	F_{pga} = 1.157	PGA_M = 0.628	1.000	PGA_M = 0.628
0.2 Seconds (Long Period Acceleration)	S_S = **1.218**	F_a = N/A	S_{MS} = N/A	0.667	S_{DS} = N/A
	(Exception 1:)	F_a = (1.200)	S_{MS} = (1.462)	0.667	S_{DS} = (0.974)
1.0 Second (Long Period Acceleration)	S_1 = **0.439**	F_v = N/A	S_{M1} = N/A	0.667	S_{D1} = N/A
	(Exception 3:)	F_v = (2.322)	S_{M1} = (1.019)	0.667	S_{D1} = (0.680)

NOTES: 1. TL (seconds): **8**
2. Site Class: **E**
3. Have data to verify? **Yes**
4. ASCE 7-16 Requires Site-Specific Ground Motion Hazard Analysis (Since Ss≥1.0 & S1≥0.2 sec) - OR Can Use Exceptions 1 & 3 up to T=0.70sec (per §11.4.8)



As shown in the response spectrum above, if the period of the proposed building is greater than 0.70 seconds, a site-specific ground motion hazard analysis (GMHA) is required. If this situation applies, please contact CMT for a proposal to perform the GMHA.

4.3.3 Liquefaction

The site is located within an area designated by the Utah Geologic Survey[5] as having "High" liquefaction potential. Liquefaction is defined as the condition when saturated, loose, sandy soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

We evaluated the liquefaction potential of the site using the procedures described in Youd et al[6] and Idriss & Boulanger[7] (calculations are attached). We also performed several hydrometer tests (see **Figures 49 and 50**), which indicated the clayey soils at the site have more than 20% clay fines and, thus, do not appear susceptible to liquefaction. Our evaluation indicates the saturated sandy soils within bore hole B-1 between depths of 7.5 and 13 feet could liquefy during a major seismic event. Maximum anticipated settlement resulting from the liquefaction is estimated to range from 3 to 4 inches, but lateral spreading due to liquefaction is anticipated to cause up to 3.5 feet of lateral movements.

In addition, the geologic hazards study[8] for the American Fork Sensitive Lands Ordinance recommended supplementing on-site field explorations with at least one boring extending to a minimum depth of 70 feet. As shown on Figure 1, Site Map, boring AF-06-03 (attached in the **Appendix**) from that study is located within site boundaries and extended to a depth of 100 feet, thus we evaluated the potential liquefaction for that boring as well, which indicated a couple of isolated layers could liquefy at that boring location. Maximum anticipated settlement resulting from liquefaction is estimated to range from 2 to 6 inches, and lateral spreading due to liquefaction is anticipated to cause only about 0.1 foot of lateral movement.

The amounts of settlement/movement in the vicinity of B-1 are not considered tolerable for structures, thus we recommend mitigation strategies, such as aggregate columns or other soil densification methods, to treat susceptible soils in the vicinity of B-1. Note that liquefaction is not anticipated at the other bore hole locations, with the exception of boring 06-03 from the referenced geologic study where up to 6 inches of liquefaction-induced settlement and about 1 inch of lateral movement could occur. That particular area is where single-family homes are planned; thus, it is our opinion that one mitigation measure besides soil densification methods that could be utilized is to tie the footings together to limit structural damage due to liquefaction in the vicinity of 06-03.

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[5] Utah Geological Survey, "Liquefaction-Potential Map for a Part of Utah County, Utah," Utah Geological Survey Public Information Series 28, August 1994. https://ugspub.nr.utah.gov/publications/public_information/pi-28.pdf

[6] Youd, T.L.; Idriss, I.M.; Andrus, R.D.; Arango, I.; Castro, G.; Christian, J.T.; Dobry, R.; Finn, W.D.L.; Harder, L.F. Jr.; Hynes, M.E.; Ishihara, K.; Koester, J.P.; Liao, S.C.; Marcuson, W.F. III; Martin, G.R.; Mitchell, J.K.; Moriwaki, Y.; Power, M.S.; Robertson, P.K.; Seed, R.B.; and Stokoe, K.H. II; October 2001, "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils," ASCE Journal of Geotechnical and Geoenvironmental Engineering, p 817-833.

[7] Idriss, I.M. and Boulanger, R.W., December 2010, "SPT-Based Liquefaction Triggering Procedures," Department of Civil & Environmental Engineering, University of California at Davis, Report No. UCD/CGM 10/02, 259 p.

[8] "American Fork Sensitive Lands Geologic Hazards Study, American Fork, Utah" Prepared by RB&G Engineering, December 9, 2006.

4.4 Other Geologic Hazards

No landslide deposits or features, including lateral spread deposits, are mapped on or adjacent to the site. The site is not located within a known debris flow, stream flooding[9], or rock-fall hazard area.

5.0 SITE CONDITIONS

5.1 Surface Conditions

At the time of our field explorations, development at the site had begun, with several streets roughed in and/or graded with roadbase. The overall area comprised primarily vacant, agricultural/pasture land, with a couple of residences and related out-buildings. Vegetation consisted of grasses and weeds, with some scattered trees throughout the site. Based upon aerial photos readily available online dating back to 1993, the site appears relatively unchanged since then and has been consistently used for agriculture/pasture land; the street grading appeared by mid-summer 2019. The site grade generally sloped downward to the southwest, with an overall gradient of about 20 feet across the site. The site property is surrounded by scattered residences and similar agricultural/pasture land (see **Vicinity Map** in **Section 1.1** above).

5.2 Subsurface Soils

At the locations of the explorations, we typically encountered approximately 0.5 to 2.5 feet of topsoil at the surface, but occasionally encountered 0.5 to 3 feet of fill. The fill soils, which consisted of silty clay to gravel, are considered undocumented/untested. Natural soils were observed at the surface in some bore holes or beneath the topsoil/fill soils, consisting of layers of CLAY with varying amounts of silt and sand (CL, CH), SILT with some sand (ML), ORGANIC SILT (OL), Silty SAND (SM) and GRAVEL (GP), extending to the maximum depths explored of 7 to 41.5 feet.

The silt/clay soils were moist to wet, brown to light brown to gray/bluish gray to black in color, and estimated to be very soft to stiff in consistency. They also exhibited moderate over consolidation and high compressibility characteristics, with a slight expansive potential.

The natural sand soils were moist to wet, brown to gray in color, and were loose to medium dense based on SPT blow counts. They will also exhibit moderately high strength and low compressibility characteristics.

For a more descriptive interpretation of subsurface conditions, please refer to the exploration logs, **Figures 2 through 47**, which graphically represent the subsurface conditions encountered. The lines designating the interface between soil types on the logs generally represent approximate boundaries; in situ, the transition between soil types may be gradual. A key to the symbols and terms on the logs is included as **Figure 48**.

[9] https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd&extent=-111.36752238312305,40.474000783564726,-111.34675135651116,40.48216171946493

5.3 Groundwater

Groundwater was encountered in the explorations at depths of about 2 to 15 feet below existing grade at the time of our field exploration. These depths to groundwater will affect excavations and basement depths. Dewatering may be required during utility installations.

Historic groundwater levels at the site were difficult to ascertain, but we noted in the Google Earth photo history that water levels came to or encroached on the southwest portion of the site in 2011 to 2013. The ground elevation in that particular area is about 4,495 feet, which in our opinion is the highest historic groundwater level for the site.

Groundwater levels can fluctuate seasonally. Numerous other factors such as heavy precipitation, irrigation of neighboring land, and other unforeseen factors, may also influence ground water elevations at the site. The detailed evaluation of these and other factors, which may be responsible for ground water fluctuations, is beyond the scope of this study.

5.4 Site Subsurface Variations

Based on the results of the subsurface explorations and our experience, variations in the continuity and nature of subsurface conditions should be anticipated. Due to the heterogeneous characteristics of natural soils, care should be taken in interpolating or extrapolating subsurface conditions between or beyond the exploratory locations.

In addition, once the subsurface explorations were completed the test pits were backfilled with the excavated soils but little effort was made to compact these soils. Therefore, the backfill must be considered as undocumented fill and settlement of the backfill in the test pits over time should be anticipated. Caution must be exercised when constructing over these locations.

6.0 SITE PREPARATION AND GRADING

6.1 General

All deleterious materials should be stripped from the site prior to commencement of construction activities. This includes loose and disturbed soils, topsoil, vegetation, etc. Based upon the conditions observed in many test pits, there is topsoil on the surface of the site which we estimated to be about 6 to 30 inches in thickness. When stripping and grubbing, topsoil should be distinguished by the apparent organic content and not solely by color; thus we estimate that topsoil stripping will need to include the upper 6 inches. However, given the past agricultural uses of the site, the upper 12 to 15 inches may have been disturbed during farming.

In addition, up to approximately 3 feet of undocumented fill was encountered in various explorations throughout the site. All undocumented fill shall be removed from beneath structures, but may remain beneath flatwork and pavements, provided they are properly prepared and the owner understands that additional maintenance may be required. Outside of building footprints, proper preparation of undocumented fill and

disturbed soils shall consist of removing the upper 12 inches, scarifying to a minimum depth of 8 inches and re-compacting the soils in place. The exposed subgrade must then be proofrolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or loose soils are encountered, they must be removed (up to a maximum depth of 2 feet) and replaced with structural fill.

The site should be observed by a CMT geotechnical engineer to assess that suitable natural soils have been exposed and any deleterious materials, loose and/or disturbed soils have been removed, prior to placing site grading fills, footings, slabs, and pavements.

Fill placed over large areas to raise overall site grades can induce settlements in the underlying natural soils. If more than 3 feet of site grading fill is anticipated over the natural ground surface, we should be notified to assess potential settlements and provide additional recommendations as needed. These recommendations may include placement of the site grading fill far in advance to allow potential settlements to occur prior to construction.

6.2 Temporary Excavations

Groundwater was observed within the explorations at depths of about 2 to 15 feet below the existing ground surface. We anticipate that excavations extending close to the encountered groundwater depths will likely require dewatering.

The natural soils encountered at this site predominantly consisted of silt/clay. In clayey (cohesive) soils, temporary construction excavations not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary excavations up to 8 feet deep, above or below groundwater, may be constructed with side slopes no steeper than one-half horizontal to one vertical (0.5H:1V).

For sandy and non-plastic silt (cohesionless) soils, construction excavations above the water table, not exceeding 4 feet, should be no steeper than one-half horizontal to one vertical (0.5H:1V). For cohesionless soils, temporary construction excavations not exceeding 4 feet in depth should be no steeper than one-half horizontal to one vertical (0.5H:1V). For excavations up to 8 feet and above groundwater, side slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult to maintain, and will require very flat side slopes and/or shoring, bracing and dewatering.

To reduce disturbance of the natural soils during excavation, we recommend that smooth edge buckets/blades be utilized.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated. All excavations should be made following OSHA safety guidelines.

6.3 Fill Material

Following are our recommendations for the various fill types we anticipate will be used at this site:

FILL MATERIAL TYPE	DESCRIPTION | RECOMMENDED SPECIFICATION
Structural Fill	Placed below structures, flatwork and pavement. Well-graded sand/gravel mixture, with maximum particle size of 4 inches, a minimum 70% passing 3/4-inch sieve, a maximum 20% passing the No. 200 sieve, and a maximum Plasticity Index of 10.
Site Grading Fill	Placed over larger areas to raise the site grade. Sandy to gravelly soil, with a maximum particle size of 6 inches, a minimum 70% passing 3/4-inch sieve, a maximum 50% passing No. 200 sieve, and a maximum Plasticity Index of 15.
Non-Structural Fill	Placed below non-structural areas, such as landscaping. On-site soils or imported soils, with a maximum particle size of 8 inches, including silt/clay soils not containing excessive amounts of degradable/organic material (see discussion below).
Stabilization Fill	Placed to stabilize soft areas prior to placing structural fill and/or site grading fill. Coarse angular gravels and cobbles 1 inch to 8 inches in size. May also use 1.5-inch to 2.0-inch gravel placed on stabilization fabric, such as Mirafi RS280i, or equivalent (see **Section 6.6**).

On-site near-surface silt/clay soils are not suitable for use as structural fill, but may be used as site grading fill and non-structural fill. Note that these silt/clay soils are moisture-sensitive, which means they are inherently more difficult to work with in proper moisture conditioning (they are very sensitive to changes in moisture content), requiring very close moisture control during placement and compaction. This will be very difficult, if not impossible, during wet and cold periods of the year. We also recommend the site grading fill thickness using on-site silt/clay soils not exceed 3 feet below structures, to minimize potential settlements.

All fill material should be approved by a CMT geotechnical engineer prior to placement.

6.4 Fill Placement and Compaction

The various types of compaction equipment available have their limitations as to the maximum lift thickness that can be compacted. For example, hand operated equipment is limited to lifts of about 4 inches and most "trench compactors" have a maximum, consistent compaction depth of about 6 inches. Large rollers, depending on soil and moisture conditions, can achieve compaction at 8 to 12 inches. The full thickness of each lift should be compacted to at least the following percentages of the maximum dry density as determined by ASTM D-1557 (or AASHTO[10] T-180) in accordance with the following recommendations:

LOCATION	TOTAL FILL THICKNESS (FEET)	MINIMUM PERCENTAGE OF MAXIMUM DRY DENSITY
Beneath an area extending at least 4 feet beyond the perimeter of structures, and below flatwork and pavement (applies to structural fill and site grading fill) extending at least 2 feet beyond the perimeter	0 to 5 5 to 8	95 98
Site grading fill outside area defined above	0 to 5 5 to 8	92 95
Utility trenches within structural areas	--	96

[10] American Association of State Highway and Transportation Officials

LOCATION	TOTAL FILL THICKNESS (FEET)	MINIMUM PERCENTAGE OF MAXIMUM DRY DENSITY
Roadbase and subbase	-	96
Non-structural fill	0 to 5 5 to 8	90 92

Structural fills greater than 8 feet thick are not anticipated at the site. For best compaction results, we recommend that the moisture content for structural fill/backfill be within 2% of optimum. Field density tests should be performed on each lift as necessary to verify that proper compaction is being achieved.

6.5 Utility Trenches

For the bedding zone around the utility, we recommend utilizing sand bedding fill material that meets current APWA[11] requirements.

Most utility companies and local governments are requiring Type A-1a or A-1b (AASHTO Designation) soils (sand/gravel soils with limited fines) be used as backfill over utilities within public rights of way, and the backfill be compacted over the full depth above the bedding zone to at least 96% of the maximum dry density as determined by AASHTO T-180 (ASTM D-1557).

Where the utility does not underlie structurally loaded facilities and public rights of way, on-site fill and natural soils may be utilized as trench backfill above the bedding layer, provided they are properly moisture conditioned and compacted to the minimum requirements stated above in **Section 6.4**.

6.6 Stabilization

The natural silt/clay soils at this site will likely be susceptible to rutting and pumping. The likelihood of disturbance or rutting and/or pumping of the existing natural soils is a function of the load applied to the surface, as well as the frequency of the load. Consequently, rutting and pumping can be minimized by avoiding concentrated traffic, minimizing the load applied to the surface by using lighter equipment and/or partial loads, by working in drier times of the year, or by providing a working surface for the equipment. Rubber-tired equipment particularly, because of high pressures, promotes instability in moist/wet, soft soils. If rutting or pumping occurs, traffic should be stopped and the disturbed soils should be removed and replaced with stabilization material. Typically, a minimum of 18 inches of the disturbed soils must be removed to be effective. However, deeper removal is sometimes required.

To stabilize soft subgrade conditions (if encountered), a mixture of coarse, clean, angular gravels and cobbles and/or 1.5- to 2.0-inch clean gravel should be utilized, as indicated above in **Section 6.3**. Often the amount of gravelly material can be reduced with the use of a geotextile fabric such as Mirafi RS280i or equivalent. Its use will also help avoid mixing of the subgrade soils with the gravelly material. After excavating the soft/disturbed soils, the fabric should be spread across the bottom of the excavation and up the sides a minimum of 18 inches.

[11] American Public Works Association

Otherwise, it should be placed in accordance with the manufacturer's recommendation, including proper overlaps. The gravel material can then be placed over the fabric in compacted lifts as described above.

7.0 FOUNDATION RECOMMENDATIONS

The following recommendations have been developed on the basis of the previously described project characteristics, the subsurface conditions observed in the field, the laboratory test data, as well as common engineering practice.

7.1 Foundation Recommendations

Based on our geotechnical engineering analyses, the proposed residences may be supported upon conventional spread and/or continuous wall foundations placed on suitable, undisturbed natural soils and/or on structural fill extending to suitable natural soils. Footings may be designed using a net bearing pressure of 1,500 psf (calculations are attached). In order to control total and differential settlements, more heavily loaded footings must be underlain by some thickness of structural fill, as outlined below in **Section 7.3**. The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade, thus the weight of the footing and backfill to lowest adjacent final grade need not be considered. The allowable bearing pressure may be increased by 1/3 for temporary loads such as wind and seismic forces.

We also recommend the following:

1. Exterior footings subject to frost should be placed at least 30 inches below final grade.
2. Interior footings not subject to frost should be placed at least 16 inches below grade.
3. Continuous footing widths should be maintained at a minimum of 18 inches.
4. Spot footings should be a minimum of 24 inches wide.

7.2 Installation

Under no circumstances shall foundations be placed on undocumented fill, topsoil with organics, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

Deep, large roots may be encountered where trees and larger bushes are located or were previously located at the site; such large roots should be removed. If other unsuitable soils are encountered, they must be completely removed and replaced with properly compacted structural fill. Excavation bottoms should be observed by a CMT geotechnical engineer to confirm that suitable bearing soils have been exposed.

All structural fill should meet the requirements for such, and should be placed and compacted in accordance with **Section 6** above. The width of structural replacement fill below footings should be equal to the width of the footing plus 1 foot for each foot of fill thickness. For instance, if the footing width is 2 feet and the structural fill depth beneath the footing is 2 feet, the fill replacement width should be 4 feet, centered beneath the footing.

The minimum thickness of structural fill below footings should be equivalent to one-third the thickness of structural fill below any other portion of the foundations. For example, if the maximum depth of structural fill is 6 feet, all footings for the new structure should be underlain by a minimum 2 feet of structural fill.

7.3 Estimated Settlement

Foundations designed and constructed in accordance with our recommendations could experience some settlement, but we anticipate that total settlements of footings founded as recommended above will not exceed 1 inch, provided more heavily loaded footings are placed on the minimum structural fill thicknesses recommended below (calculations are attached). We project that approximately 50% of the total settlement will initially take place during construction.

FOUNDATION TYPE	BEARING PRESSURE (psf)	LOADING (pounds)	MINIMUM THICKNESS OF REPLACEMENT STRUCTURAL FILL (feet)
Spread	1,500	Up to 100,000	0.0
Spread	1,500	100,000+ to 120,000	3.0
Wall	1,500	Up to 6,000 pounds per lineal foot	0.0

7.4 Lateral Resistance

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.30 for natural silt/clay soils or 0.40 for natural sand/gravel soils and structural fill, may be utilized for design. Passive resistance provided by properly placed and compacted structural fill above the water table may be considered equivalent to a fluid with a density of 300 pcf (calculations are attached). A combination of passive earth resistance and friction may be utilized if the passive earth resistance component of the total is divided by 1.5.

8.0 LATERAL EARTH PRESSURES

We project that basement walls up to 8 feet tall might be constructed at this site. The lateral earth pressure values given below anticipate that native silt/clay soils will be used as backfill material (assuming a friction angle of 26 degrees and a unit weight of 120 pcf), placed and compacted in accordance with the recommendations presented herein (calculations are attached). If other soil types will be used as backfill, we should be notified so that appropriate modifications to these values can be provided, as needed.

The lateral pressures imposed upon subgrade facilities will depend upon the relative rigidity and movement of the backfilled structure. Following are the recommended lateral pressure values, which also assume that the soil surface behind the wall is horizontal and that the backfill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

CONDITION	STATIC (pcf)*	SEISMIC (pcf)*
Active Pressure (wall is allowed to yield, i.e. move away from the soil, with a minimum 0.001H movement/rotation at the top of the wall, where "H" is the total height of the wall)	47	80
At-Rest Pressure (wall is not allowed to yield)	67	---
Passive Pressure (wall moves into the soil)	300	200

*Equivalent Fluid Pressure (applied at 1/3 Height of 8-foot High Wall)

9.0 FLOOR SLABS

Floor slabs should be established upon a minimum 6 inches of structural fill extending to suitable natural soils. Under no circumstances shall floor slabs be established directly on any topsoil, undocumented fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

The top of habitable floor slabs should not be established closer than 4 feet to groundwater without foundation subdrains, and 2 feet to groundwater with foundation subdrains.

In order to facilitate curing of the concrete, we recommend that floor slabs be directly underlain by at least 4 inches of "free-draining" fill, such as "pea" gravel or 3/4-inch to 1-inch minus, clean, gap-graded gravel (which may be part of the 6 inches recommended above). To help control normal shrinkage and stress cracking, the floor slabs should have the following features:

1. Adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints;
2. Frequent crack control joints; and
3. Non-rigid attachment of the slabs to foundation walls and bearing slabs.

10.0 DRAINAGE RECOMMENDATIONS

10.1 Surface Drainage

It is important to the long-term performance of foundations and floor slabs that water not be allowed to collect near the foundation walls and infiltrate into the underlying soils. We recommend the following:

1. All areas around each structure should be sloped to provide drainage away from the foundations. We recommend a minimum slope of 6 inches in the first 10 feet away from the structure. This slope should be maintained throughout the lifetime of the structure.

2. All roof drainage should be collected in rain gutters with downspouts designed to discharge at least 10 feet from the foundation walls or well beyond the backfill limits, whichever is greater.

3. Adequate compaction of the foundation backfill should be provided. We suggest a minimum of 90% of the maximum laboratory density as determined by ASTM D-1557. Water consolidation methods should not be used under any circumstances.

4. Landscape sprinklers should be aimed away, and maintained a distance of at least 4 feet, from the foundation walls. The sprinkling systems should be designed with proper drainage and be well-maintained. Over watering should be avoided.

5. Other precautions that may become evident during construction.

10.2 Foundation Subdrains

Groundwater at this site was encountered at depths of about 2 to 15 feet below the surface. Wherever floor slabs will be placed within 4 feet of groundwater depths, we recommend that perimeter foundation subdrains be installed. The top of habitable floor slabs should not be established closer than 2 feet to groundwater or historic groundwater (see **Section 5.3**).

Foundation subdrains should consist of a 4-inch diameter perforated or slotted plastic or PVC pipe surrounded by clean gravel. The invert of the subdrain should be at least 2 feet below the top of the lowest adjacent floor slab. The gravel portion of the drain should extend a minimum 2 inches laterally and below the perforated pipe and at least 1 foot above the top of the lowest adjacent floor slab. The gravel zone must be installed immediately adjacent to the perimeter footings and the foundation walls. To reduce the possibility of plugging, the gravel must be wrapped with a geotextile, such as Mirafi 140N or equivalent. Prior to the installation of the footing subdrain, the below-grade walls should be dampproofed. The slope of the subdrain should be at least 0.5%. The gravel placed around the drain pipe should be clean 3/4-inch to 1-inch minus gap-graded gravel and/or "pea" gravel. The foundation subdrains can be discharged into the area subdrains, storm drains, or other suitable down-gradient location.

11.0 PAVEMENTS

All pavement areas must be prepared as discussed above in **Section 6.1**. Under no circumstances shall pavements be established over topsoil, non-engineered fills (if encountered), loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

In roadway areas, subsequent to stripping and prior to the placement of pavement materials, the exposed subgrade must be proof rolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or otherwise unsuitable soils are encountered, we recommend they be removed to a minimum of 18 inches below the subgrade level and replaced with structural fill.

We anticipate the natural silt/clay soils will exhibit very poor pavement support characteristics when saturated or nearly saturated. Based on our laboratory testing experience with similar soils, our pavement design utilized a California Bearing Ratio (CBR) of 2 for the natural silt/clay soils. Given the projected traffic as discussed above in **Section 1.3**, the following pavement sections are recommended for parking/drive areas, and for the proposed residential streets having approximately 5 ESAL's (18-kip equivalent single-axle loads) per day:

MATERIAL	PARKING/DRIVE AREAS PAVEMENT SECTION THICKNESS (inches)					
	PARKING AREAS (1 ESAL per day)			DRIVE AREAS (3 ESAL'S per day)		
Asphalt	3	3	---	4	4	---
Concrete	---	--	5	---	---	6
Road-Base	12	6	8	13	6	8
Subbase	0	8	0	0	8	0
Total Thickness	15	17	13	17	18	14

MATERIAL	LOCAL STREETS PAVEMENT SECTION THICKNESS (inches)
Asphalt	3
Road-Base	8
Subbase	12
Total Thickness	23

Untreated base course (UTBC) should conform to city specifications, or to 1-inch-minus UDOT specifications for A–1-a/NP, and have a minimum CBR value of 70%. Material meeting our specification for structural fill can be used for subbase, as long as the fines content (percent passing No. 200 sieve) does not exceed 15%. Roadbase and subbase material should be compacted as recommended above in **Section 6.4**. Asphalt material generally should conform to APWA requirements, having a ½-inch maximum aggregate size, a 75-gyration Superpave mix containing no more than 15% of recycled asphalt (RAP) and a PG58-28 binder.

Concrete pavement should typically have a minimum 28-day strength of 3,000 psi, and should be saw-cut at appropriate intervals and at the proper time to control the locations of shrinkage cracking. This generally means maximum saw-cut intervals of twice the pavement thickness, in feet (i.e. a 10-foot maximum interval for 5 inches thick concrete), and performing the saw cutting within 24 hours of placement.

12.0 QUALITY CONTROL

We recommend that CMT be retained as part of a comprehensive quality control testing and observation program for which we can offer discounted rates. With CMT onsite we can help facilitate implementation of our recommendations and address, in a timely manner, any subsurface conditions encountered which vary from those described in this report. Without such a program CMT cannot be responsible for application of our recommendations to subsurface conditions which may vary from those described herein. This program may include, but not necessarily be limited to, the following:

12.1 Field Observations

Observations should be completed during all phases of construction such as site preparation, foundation excavation, structural fill placement and concrete placement.

12.2 Fill Compaction

Compaction testing by CMT is required for all structural supporting fill materials. Maximum Dry Density (Modified Proctor, ASTM D-1557) tests should be requested by the contractor immediately after delivery of any fill materials. The maximum density information should then be used for field density tests on each lift as necessary to ensure that the required compaction is being achieved.

12.3 Excavations

All excavation procedures and processes should be observed by a geotechnical engineer from CMT or their representative. In addition, for the recommendations in this report to be valid, all backfill and structural fill placed in trenches and all pavements should be density tested by CMT. We recommend that freshly mixed concrete be tested by CMT in accordance with ASTM designations.

13.0 LIMITATIONS

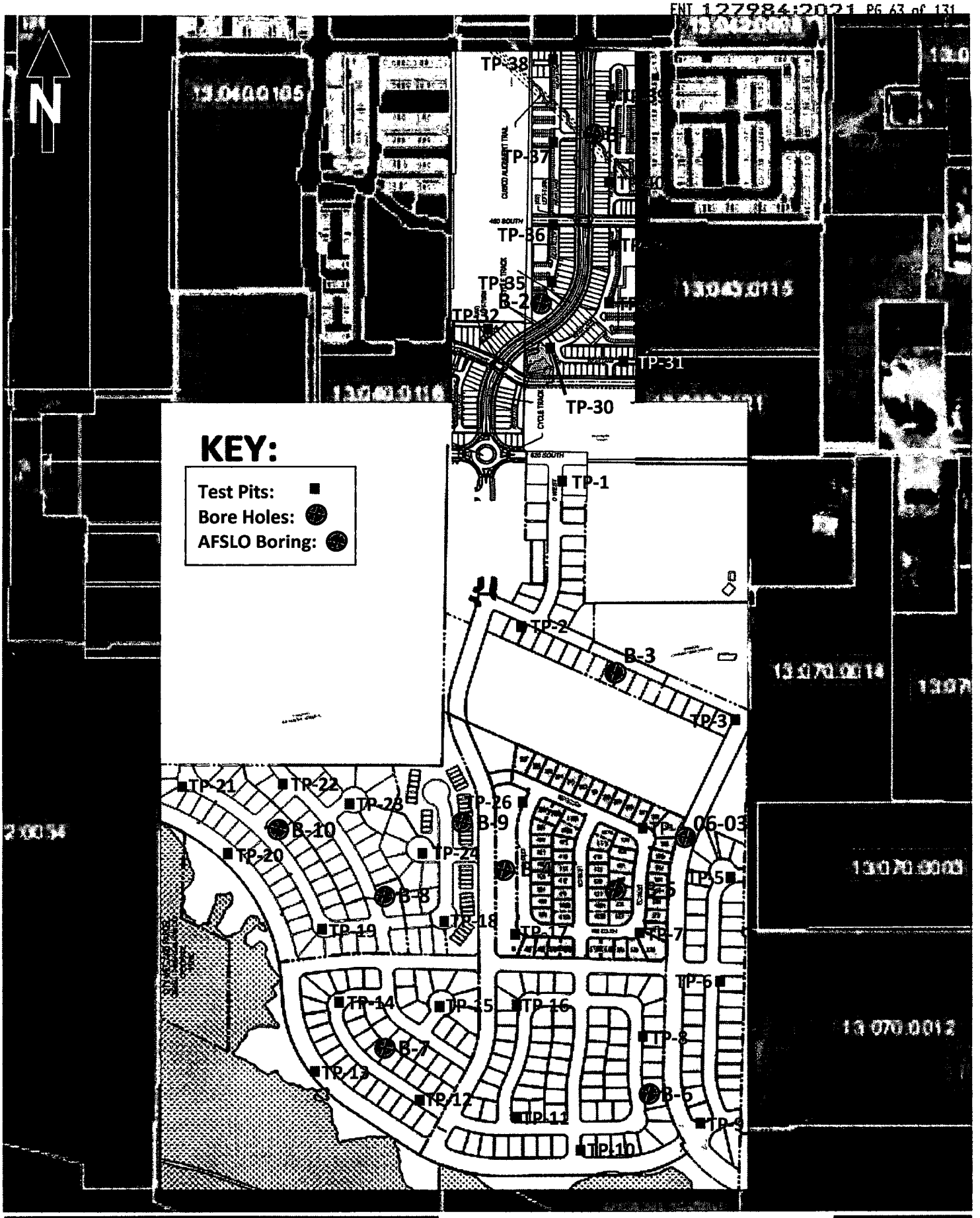
The recommendations provided herein were developed by evaluating the information obtained from the subsurface explorations and soils encountered therein. The exploration logs reflect the subsurface conditions only at the specific location at the particular time designated on the logs. Soil and groundwater conditions may differ from conditions encountered at the actual exploration locations. The nature and extent of any variation in the explorations may not become evident until during the course of construction. If variations do appear, it may become necessary to re-evaluate the recommendations of this report after we have observed the variation.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 870-6730. To schedule materials testing, please call (801) 381-5141.

APPENDIX

SUPPORTING
DOCUMENTATION



Lakeshore Landing & AF Crossings

5885 West 7300 North, American Fork, Utah

CMT ENGINEERING LABORATORIES

Site Map

Date: 19-Feb-21

Job #

Figure 1

Lakeshore Landing/Ardero Property

Test Pit Log

TP-1

6885 West 7300 North, American Fork, Utah

Total Depth: 8'
Water Depth: 6'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Gray Silty CLAY with sand (CL), slightly mottled moist, stiff (estimated)										
2												
				1								
4												
		wet		2								
		hole caving in below groundwater										
8		END AT 8'										
10												
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 2

Lakeshore Landing/Ardero Property

Test Pit Log

TP-2

6885 West 7300 North, American Fork, Utah

Total Depth: 10'
Water Depth: (see Remarks)

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		FILL, silty clay										
2		Dark Brown Silty CLAY (CL), trace roots moist, stiff (estimated)										
				3								
4		grades gray										
6				4								
8												
				5								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater not encountered during excavation.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe
Excavated By: Owner Provided
Logged By: Nate Pack

CMT ENGINEERING LABORATORIES

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Figure: 3

Lakeshore Landing/Ardero Property

Test Pit Log **TP-3**

6885 West 7300 North, American Fork, Utah

Total Depth: 12'
Water Depth: 8'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		FILL, silty clay										
		Dark Brown Silty CLAY (CL), trace roots										
2		moist, very stiff (estimated)										
				6								
4		grades brown and with sand										
6				7								
		grades mottled brown and gray, with less sand wet										
				8								
10												
12		END AT 12'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 8 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 4

Lakeshore Landing/Ardero Property

Test Pit Log **TP-4**

6885 West 7300 North, American Fork, Utah

Total Depth: 12'
Water Depth: 7'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		TOPSOIL										
		Dark Brown Silty CLAY to Clayey SILT (CL to ML), trace roots moist, stiff (estimated)										
2		Brown Silty SAND (SM), some clay moist, medium dense (estimated)										
				9								
4												
6				10								
		Mottled Brown/Gray Silty CLAY with fine sand (CL) wet stiff (estimated)										
8												
				11								
10												
12		END AT 12'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 7 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 5

Lakeshore Landing/Ardero Property

Test Pit Log

TP-5

6885 West 7300 North, American Fork, Utah

Total Depth: **10'**
Water Depth: **6'**

Date: **3/4/21**
Job #: **16111**

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Dark Brown Silty CLAY to Clayey SILT (CL to ML), trace roots moist, stiff (estimated)										
2		Mottled Brown/Gray Silty CLAY with fine sand (CL) moist, stiff (estimated)										
				12	21	97				32	21	11
4												
		wet		13								
8												
				14								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure **6**

Lakeshore Landing/Ardero Property

Test Pit Log

TP-6

6885 West 7300 North, American Fork, Utah

Total Depth: 10'
Water Depth: 6'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		Dark Brown Silty CLAY to Clayey SILT (CL to ML), trace roots slightly moist, very stiff (estimated)										
2		Mottled Brown/Gray Silty CLAY with fine sand (CL) moist, stiff (estimated)		15								
4												
		wet		16								
8												
				17								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater encountered during excavation at depth of 6 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe
Excavated By: Owner Provided
Logged By: Nate Pack

CMT ENGINEERING LABORATORIES

Figure 7

Lakeshore Landing/Ardero Property

Test Pit Log

TP-7

6885 West 7300 North, American Fork, Utah

Total Depth: 12'
Water Depth: 6'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		TOPSOIL, light brown silty clay with organics										
		Light Brown Silty CLAY (CL)										
2		slightly moist, very stiff (estimated)										
		grades gray										
		moist, stiff (estimated)		18								
4												
		wet		19								
8												
		grades mottled brown/gray		20								
10												
12		END AT 12'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 8

Lakeshore Landing/Ardero Property

Test Pit Log

TP-8

6885 West 7300 North, American Fork, Utah

Total Depth: 11'
Water Depth: 6'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		TOPSOIL										
		Dark Brown Silty CLAY (CL) slightly moist, very stiff (estimated)										
2		Mottled Brown/Gray Silty CLAY with fine sand (CL), trace roots moist, stiff (estimated)										
				21								
4												
		wet		22								
8												
				23								
10												
		END AT 11'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 9

Lakeshore Landing/Ardero Property

Test Pit Log

TP-9

6885 West 7300 North, American Fork, Utah

Total Depth: 9.5'
Water Depth: 3'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		TOPSOIL										
		Dark Brown Silty CLAY (CL) slightly moist, very stiff (estimated)										
2		Brown CLAY with fine sand (CL), trace roots moist, stiff (estimated)										
		wet		24	41	77				47	21	26
4												
6				25								
8												
		hole collapsing so stopped excavation		26								
10		END AT 9.5'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 3 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 10

Lakeshore Landing/Ardero Property

Test Pit Log **TP-10**

6885 West 7300 North, American Fork, Utah

Total Depth: 10'
Water Depth: 6'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		FILL, silty clay and gravel										
2												
		Dark Brown Silty CLAY (CL) slightly moist, very stiff (estimated)		27								
4		Brown CLAY with fine sand (CL), trace roots moist, stiff (estimated)										
		wet										
8				28								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 11

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Lakeshore Landing/Ardero Property

Test Pit Log TP-11

6885 West 7300 North, American Fork, Utah

Total Depth: 10'
Water Depth: 5.5'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Brownish Gray Silty SAND (SM), slightly cemented moist, medium dense (estimated)										
2												
4				29	16				14			
6		Mottled Brown/Gray Silty CLAY with fine sand (CL), gray sand lenses up to 3"wet stiff (estimated)										
8				30								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater encountered during excavation at depth of 5.5 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe
Excavated By: Owner Provided
Logged By: Nate Pack

CMT ENGINEERING LABORATORIES

Figure 12

Lakeshore Landing/Ardero Property

Test Pit Log **TP-12**

6885 West 7300 North, American Fork, Utah

Total Depth: **10'**
Water Depth: **5'**

Date: **3/4/21**
Job #: **16111**

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL, clay with roots, highly organic										
		Brown/Gray Silty CLAY (CL) slightly moist, very stiff (estimated)										
2		Gray Silty CLAY with fine sand (CL), trace roots slightly moist, very stiff (estimated)										
4				31								
		wet stiff										
6												
8				32								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 5 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 13

Lakeshore Landing/Ardero Property

Test Pit Log **TP-13**

6885 West 7300 North, American Fork, Utah

Total Depth: 9'
Water Depth: 5'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Brown Silty CLAY (CL), interbedded sand lenses moist, stiff (estimated)										
4				33								
		wet										
8				34								
		END AT 9'										
10												
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 5 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 14

Lakeshore Landing/Ardero Property

Test Pit Log **TP-14**

6885 West 7300 North, American Fork, Utah

Total Depth: 10'
Water Depth: 6'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Gray Silty CLAY (CL) moist, stiff (estimated)										
2												
4				35								
		cemented layer from 6' to 7' wet										
8				36								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 15

Lakeshore Landing/Ardero Property

Test Pit Log **TP-15**

6885 West 7300 North, American Fork, Utah

Total Depth: 12'
Water Depth: (see Remarks)

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		TOPSOIL										
		Gray Silty CLAY (CL), some large root-holes; slightly moist, very stiff (estimated)										
2												
				37								
4												
		grades mottled gray and brown; moist, stiff (estimated)										
6				38								
8												
		grades brown										
10				39								
12		END AT 12'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater not encountered during excavation.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe
Excavated By: Owner Provided
Logged By: Nate Pack

CMT ENGINEERING LABORATORIES

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Figure 16

Lakeshore Landing/Ardero Property

Test Pit Log **TP-16**

6885 West 7300 North, American Fork, Utah

Total Depth: 12'
Water Depth: (see Remarks)

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Gray Silty CLAY (CL), some large root-holes slightly moist, very stiff (estimated)										
2		grades mottled gray and brown moist, stiff (estimated)										
				40								
4												
6												
				41								
8												
10				42								
12		END AT 12'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater not encountered during excavation.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe
Excavated By: Owner Provided
Logged By: Nate Pack

CMT ENGINEERING LABORATORIES

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Figure 17

Lakeshore Landing/Ardero Property

Test Pit Log

TP-17

6885 West 7300 North, American Fork, Utah

Total Depth: 10'
Water Depth: 7'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Brown Silty CLAY (CL), some large root-holes										
2		moist, stiff (estimated)										
		grades mottled gray and brown										
4				43								
6												
		wet										
8				44								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 7 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

Figure 18

Lakeshore Landing/Ardero Property

Test Pit Log **TP-18**

6885 West 7300 North, American Fork, Utah

Total Depth: 12'
Water Depth: 11'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		TOPSOIL										
		Brown Silty CLAY (CL), some large root-holes moist, stiff (estimated)										
2		grades mottled gray and brown										
4				45								
6												
8				46								
10												
		Gray GRAVEL (GP) wet										
12		END AT 12'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 11 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

CMT ENGINEERING LABORATORIES

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Figure 19

Lakeshore Landing/Ardero Property

Test Pit Log **TP-19**

6885 West 7300 North, American Fork, Utah

Total Depth: 12'
Water Depth: 2'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL, dark brown silty clay with organics										
		Mottled Brown/Gray Silty CLAY with sand (CL), some cementation wet hard (estimated)		47								
4												
6		Grayish Brown Silty SAND (SM), some clay lenses wet, loose (estimated)		48	32				27			
8												
				49								
10												
12		END AT 12'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 2 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 20

Lakeshore Landing/Ardero Property

Test Pit Log **TP-20**

6885 West 7300 North, American Fork, Utah

Total Depth: **10'**
Water Depth: **2.5'**

Date: **3/4/21**
Job #: **16111**

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
2		Gray Silty CLAY with sand (CL) stiff (estimated) wet		50								
4												
6				51								
8												
10		END AT 10'		52								
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 2.5 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure **21**

Lakeshore Landing/Ardero Property

Test Pit Log **TP-21**

6885 West 7300 North, American Fork, Utah

Total Depth: **11'**
Water Depth: **3'**

Date: **3/4/21**
Job #: **16111**

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Mottled Brown/Gray Silty CLAY with sand (CL) moist, stiff (estimated)										
2												
▽		wet		53								
4												
6				54								
8												
				55								
10		END AT 11'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 3 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 22

Lakeshore Landing/Ardero Property

Test Pit Log **TP-22**

6885 West 7300 North, American Fork, Utah

Total Depth: 10'
Water Depth: 6'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Dark Brown Silty CLAY (CL) slightly moist, very stiff (estimated)										
2		Mottled Brown/Gray Silty CLAY with sand (CL) moist, stiff (estimated)										
				56								
4												
		wet		57								
8		Grayish Brown Silty SAND (SM), some clay lenses wet, medium dense (estimated)										
				58	28				43			
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater encountered during excavation at depth of 6 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe
Excavated By: Owner Provided
Logged By: Nate Pack

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Figure 23

Lakeshore Landing/Ardero Property

Test Pit Log **TP-23**

6885 West 7300 North, American Fork, Utah

Total Depth: **10'**
Water Depth: **5'**

Date: **3/4/21**
Job #: **16111**

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Dark Brown Clayey SILT (ML), some pinholes and large root-holes moist, stiff (estimated)										
2												
				59								
4												
		Mottled Brown/Gray Silty CLAY with sand (CL) wet stiff (estimated)										
6				60								
8												
				61								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 5 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 24

Lakeshore Landing/Ardero Property

Test Pit Log

TP-24

6885 West 7300 North, American Fork, Utah

Total Depth: 11'
Water Depth: 3.5'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Dark Brown Silty CLAY (CL) moist, stiff (estimated)										
2												
				62								
4		Mottled Brown/Gray Silty CLAY with sand (CL) wet stiff (estimated)										
6				63	35				79			
8												
				64								
10		END AT 11'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater encountered during excavation at depth of 3.5 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe
Excavated By: Owner Provided
Logged By: Nate Pack

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Figure 25

Lakeshore Landing/Ardero Property

Test Pit Log

TP-26

6885 West 7300 North, American Fork, Utah

Total Depth: 7'
Water Depth: 2'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		TOPSOIL, disturbed upper 12"										
		Dark Brown Silty CLAY (CL) moist, stiff (estimated) wet										
				65								
4		Mottled Brown/Gray Silty CLAY with sand (CL) wet stiff (estimated)										
6				66								
		hole collapsing so stopped excavation END AT 7'										
8												
10												
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 2 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 26

Lakeshore Landing/Ardero Property

Test Pit Log TP-30

6885 West 7300 North, American Fork, Utah

Total Depth: 7.5'
Water Depth: 2'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL, highly organic/fibrous										
		Mottled Blueish/Gray Silty CLAY with sand (CL) wet stiff (estimated)		67								
4												
6				68								
8		END AT 7.5'										
10												
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 2 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 27

Lakeshore Landing/Ardero Property

Test Pit Log **TP-31**

6885 West 7300 North, American Fork, Utah

Total Depth: **11'**
Water Depth: **7'**

Date: **3/5/21**
Job #: **16111**

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Brown Silty CLAY (CL) moist, stiff (estimated)										
2												
		Mottled Blueish/Gray Silty CLAY with sand (CL) moist, stiff (estimated)		69								
4												
6				70								
		wet										
8		grades greenish/blueish in color										
10												
		END AT 11'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 7 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 28

Lakeshore Landing/Ardero Property

Test Pit Log **TP-32**

6885 West 7300 North, American Fork, Utah

Total Depth: 11'
Water Depth: 7'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		TOPSOIL										
		Brown Silty CLAY (CL) moist, stiff (estimated)										
2												
		Mottled Blueish/Gray Silty CLAY with sand (CL) moist, stiff (estimated)	■	71	32	90				39	21	18
4												
6			■	72								
		wet										
8		grades greenish/blueish in color										
			■	73								
10												
		END AT 11'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 7 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 29

Lakeshore Landing/Ardero Property

Test Pit Log **TP-33**

6885 West 7300 North, American Fork, Utah

Total Depth: 10'
Water Depth: 4'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL										
		Mottled Brown/Gray Silty CLAY with sand (CL)										
2		moist, stiff (estimated)										
		wet		74								
6												
8				75								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater encountered during excavation at depth of 4 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe
Excavated By: Owner Provided
Logged By: Nate Pack

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Figure 30

Lakeshore Landing/Ardero Property

Test Pit Log

TP-34

6885 West 7300 North, American Fork, Utah

Total Depth: 11'
Water Depth: 6'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL, dark brown silty clay with organics										
		Mottled Brown/Gray Silty CLAY with sand (CL)										
2		moist, stiff (estimated)										
				76								
4												
		wet		77								
8		cemented layer at 7.5'										
				78								
10		END AT 11'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 31

Lakeshore Landing/Ardero Property

Test Pit Log **TP-35**

6885 West 7300 North, American Fork, Utah

Total Depth: 15'
Water Depth: 7'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		FILL: sand/gravel										
2		Mottled Brown/Gray Silty CLAY with sand (CL) moist, stiff (estimated)										
				79								
4												
6				80								
		wet										
8												
10												
12				81								
14		END AT 15'										
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 7 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Nate Pack**

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Figure 32

Lakeshore Landing/Ardero Property

Test Pit Log **TP-36**

6885 West 7300 North, American Fork, Utah

Total Depth: 12'
Water Depth: 7'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Fill										
		Brown Silty CLAY (CL) moist, medium stiff (estimated)										
2												
				82								
4												
6												
		Gray ORGANIC SILT with sand (OL), calcified nodules, some roots wet stiff (estimated)										
8				83	54	66					NP	NP
10												
12		END AT 12'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 7 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Owen Kahn**

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Figure 33

Lakeshore Landing/Ardero Property

Test Pit Log **TP-37**

6885 West 7300 North, American Fork, Utah

Total Depth: 10'
Water Depth: 6'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Fill										
		Black SILT (ML)		84								
2		Brown Silty CLAY (CL) moist, stiff (estimated)										
				85								
4												
		Gray SILT with sand (ML) wet medium stiff (estimated)										
8												
10		END AT 10'		86								
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Owen Kahn**

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Figure 34

Lakeshore Landing/Ardero Property Test Pit Log TP-38

6885 West 7300 North, American Fork, Utah

Total Depth: 8'
Water Depth: 6.5'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		Fill										
		Brown Silty CLAY (CL) moist, medium stiff (estimated)										
2												
4				87								
6		grades gray wet										
8		hole collapsing so stopped excavation END AT 8'										
10												
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6.5 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Owen Kahn**

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Figure 35

Lakeshore Landing/Ardero Property

Test Pit Log

TP-39

6885 West 7300 North, American Fork, Utah

Total Depth: 7'
Water Depth: 4'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Fill; gravel with black silt										
2		Black Silty CLAY (CL) very moist, medium stiff (estimated)		88	32	86				36	22	14
6		Gray SILT with sand (ML), calcified nodules wet		89								
		END AT 7'										
8												
10												
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 4 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Owen Kahn**

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Figure 36

Lakeshore Landing/Ardero Property

Test Pit Log

TP-40

6885 West 7300 North, American Fork, Utah

Total Depth: 9'
Water Depth: 6'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		FILL										
		Black SILT (ML) with some sand moist, medium stiff (estimated)										
2												
				90								
4		Gray Silty CLAY with sand (CL) very moist, medium stiff (estimated)										
		wet										
8												
		END AT 9'										
10												
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: **Groundwater encountered during excavation at depth of 6 feet.**

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: **Rubber Tire Backhoe**
Excavated By: **Owner Provided**
Logged By: **Owen Kahn**

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Figure 37

Lakeshore Landing/Ardero Property Bore Hole Log

B-1

6885 West 7300 North, American Fork, Utah

Total Depth: 16.5'
Water Depth: 7.5'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Topsoil												
		Reddish-Brown Silty SAND (SM) moist, very loose												
				1	2 2 2	4								
4														
		grades light brown with some clay very moist		2	1 1 0	1								
8		grades brown with some gravel wet		3	0 0 1	1	25				37			
		grades gray		4	2 3 3	6	23				26			
12														
		Gray CLAY (CH) wet, soft												
				5	0 1 2	3	35		0	3	97			
16		END AT 16.5'												
20														
24														
28														

Remarks: Groundwater encountered during drilling at depth of 7.5 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
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Figure 38

Lakeshore Landing/Ardero Property Bore Hole Log B-2

6885 West 7300 North, American Fork, Utah

Total Depth: 16.5'
Water Depth: 13'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Fill												
		Dark Brown Silty CLAY (CL), some sand moist, medium stiff		6	5 3 4	7								
4		soft		7	1 1 1	2								
8		grades gray very moist		8	0 1 1	2								
		medium stiff		9	0 2 3	5								
12		wet grades with sand and silt lenses												
		stiff		10	2 4 6	10	21				85			
16		END AT 16.5'												
20														
24														
28														

Remarks: Groundwater encountered during drilling at depth of 13 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
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Figure 39

Lakeshore Landing/Ardero Property Bore Hole Log

B-3

6885 West 7300 North, American Fork, Utah

Total Depth: 16.5'
Water Depth: 10'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Topsoil												
		Dark Brown SILTY CLAY (CL-ML), some sand, moist, soft		11	2 1 1	2								
4		Light Brown Silty CLAY (CL), trace sand, moist, soft		12	1 1 1	2								
8		grades with silt lenses, very moist, medium stiff		13	0 2 2	4								
		Gray CLAY (CH), trace sand, medium stiff, wet		14			25	99				51	19	32
12		grades brown		15	1 3 4	7	25		0	4	96			
16		END AT 16.5'												
20														
24														
28														

Remarks: Groundwater encountered during drilling at depth of 10 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
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Figure 40

Lakeshore Landing/Ardero Property Bore Hole Log

B-4

6885 West 7300 North, American Fork, Utah

Total Depth: 41.5'
Water Depth: 10'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Brown Silty CLAY with gravel (CL), some sand slightly moist, medium stiff												
				16	2 3 3	6								
4		soft		17	1 2 1	3								
8		very moist, medium stiff		18	1 1 3	4	28		11	9	80			
		grades with calcified nodules wet		19	3 6 9	15								
12														
		grades dark brown		20	2 3 3	6	23				76	26	15	11
16														
		Black CLAY (CL), trace sand wet, medium stiff												
20				21	3 3 4	7								
24		grades gray very soft		22	0 0 0	0	40		0	3	97	40	20	20
28														

Remarks: Groundwater encountered during drilling at depth of 10 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
Page: 1 of 2

CMT ENGINEERING LABORATORIES

Figure 41

Lakeshore Landing/Ardero Property Bore Hole Log

B-4

6885 West 7300 North, American Fork, Utah

Total Depth: 41.5'
Water Depth: 10'

Date: 3/4/21
Job #: 2/9/44

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
28		Gray CLAY (CL), trace sand												
				23	0 0 0	0								
32														
		Dark Brown Silty CLAY with sand (CL) wet, stiff												
36				24	1 5 7	12	19		0	25	75			
		grades gray with silty sandy lenses												
40				25	1 4 6	10								
		END AT 41.5'												
44														
48														
52														
56														

Remarks: Groundwater encountered during drilling at depth of 10 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
Page: 1 of 2

CMT ENGINEERING LABORATORIES

Figure 41

Lakeshore Landing/Ardero Property Bore Hole Log

B-5

6885 West 7300 North, American Fork, Utah

Total Depth: 16.5'
Water Depth: 15'

Date: 3/4/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Brown-Gray Silty CLAY (CL) slightly moist, medium stiff												
				26	3 3 3	6								
4														
				27	1 2 2	4								
8		moist		28	1 2 3	5								
		very moist		29	1 2 2	4								
12														
▽		grades gray with silty sandy lenses wet		30	1 2 3	5								
16		END AT 16.5'												
20														
24														
28														

Remarks: Groundwater encountered during drilling at depth of 15 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
Page: 1 of 1

CMT ENGINEERING LABORATORIES

Figure 42

Lakeshore Landing/Ardero Property Bore Hole Log

B-6

6885 West 7300 North, American Fork, Utah

Total Depth: 16.5'
Water Depth: 15'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		FILL												
		Gray Silty CLAY (CL) slightly moist, stiff		31	4 4 4	8								
4		grades with sand lenses moist, soft		32	1 1 2	3								
8		grades brown very moist		33	1 1 1	2								
		grades with silt lenses		34	1 1 1	2								
12														
		wet		35	2 1 2	3								
16		END AT 16.5'												
20														
24														
28														

Remarks: Groundwater encountered during drilling at depth of 15 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
Page: 1 of 1

CMT ENGINEERING LABORATORIES

Figure: 43

Lakeshore Landing/Ardero Property Bore Hole Log B-7

6885 West 7300 North, American Fork, Utah

Total Depth: 16.5'
Water Depth: 7.5'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Topsoil												
		Gray Silty CLAY (CL) slightly moist, medium stiff		36	1 2 3	5								
4		moist, very soft		37	0 0 1	1								
		Gray Sandy SILT (ML) very soft wet		38			29	94					NP	NP
8		Gray Coarse Sandy CLAY (CL), trace gravel wet, soft		39	0 0 2	2	30		1	32	67			
12		Gray Silty CLAY (CL) with some fine sand wet, stiff		40	4 5 6	11								
16		END AT 16.5'												
20														
24														
28														

Remarks: Groundwater encountered during drilling at depth of 7.5 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
Page: 1 of 1

CMT ENGINEERING LABORATORIES

Figure 44

Lakeshore Landing/Ardero Property Bore Hole Log

B-8

6885 West 7300 North, American Fork, Utah

Total Depth: 16.5'
Water Depth: 15'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Brown Silty CLAY (CL) moist, soft												
				41	2 1 2	3								
4														
				42	2 2 1	3								
8		Gray CLAY (CL) with some gravel (calcified nodules) moist, medium stiff		43	1 1 3	4								
		grades with some silt/sand lenses stiff		44	3 4 5	9								
12														
▽		wet		45	3 4 5	9								
16		END AT 16.5'												
20														
24														
28														

Remarks: Groundwater encountered during drilling at depth of 15 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
Page: 1 of 1

CMT ENGINEERING LABORATORIES

Figure 45

Lakeshore Landing/Ardero Property Bore Hole Log B-9

6885 West 7300 North, American Fork, Utah

Total Depth: 16.5'
Water Depth: (see Remarks)
Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		FILL: gravelly												
		Light Brown CLAY (CL) moist, soft		46	2 1 2	3	20							
4				47	1 0 1	1								
8				48	1 1 2	3								
		Gray CLAY (CL) with some gravel (calcified nodules) moist, medium stiff		49	1 2 4	6								
12		grades brown		50	2 3 4	7								
16		END AT 16.5'												
20														
24														
28														

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
Page: 1 of 1

CMT ENGINEERING LABORATORIES

Figure 46

Lakeshore Landing/Ardero Property Bore Hole Log B-10

6885 West 7300 North, American Fork, Utah

Total Depth: 16.5'
Water Depth: 10'

Date: 3/5/21
Job #: 16111

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Brown Silty CLAY to Clayey SILT (CL to ML) moist, soft												
				51	1 1 2	3								
4		Light Brown Silty CLAY (CL) moist, soft												
				52	0 1 1	2								
8														
		grades gray with some roots wet		53			26	95				29	18	11
12														
		stiff		54	3 5 7	12	26				95			
16		END AT 16.5'												
20														
24														
28														

Remarks: Groundwater encountered during drilling at depth of 10 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Owen Kahl
Page: 1 of 1

CMT ENGINEERING LABORATORIES

Figure 47

Lakeshore Landing/Ardero Property

6885 West 7300 North, American Fork, Utah

Key to Symbols

Date: 3/4/21

Job #: 16111

① Depth (ft)	② GRAPHIC LOG	③ Soil Description	④ Sample Type	⑤ Sample #	Blows(N) ⑥	Blows(N) ⑦ Total	⑧ Moisture (%)	⑨ Dry Density(pcf)	Gradation ⑩ Gravel %	Gradation ⑩ Sand %	Gradation ⑩ Fines %	Atterberg ⑪ LL	Atterberg ⑪ PL	Atterberg ⑪ PI

COLUMN DESCRIPTIONS

① **Depth (ft.):** Depth (feet) below the ground surface (including groundwater depth - see water symbol below).

② **Graphic Log:** Graphic depicting type of soil encountered (see ② below).

③ **Soil Description:** Description of soils encountered, including Unified Soil Classification Symbol (see below).

④ **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below-right

⑤ **Sample #:** Consecutive numbering of soil samples collected during field exploration.

⑥ **Blows:** Number of blows to advance sampler in 6" increments, using a 140-lb hammer with 30" drop.

⑦ **Total Blows:** Number of blows to advance sampler the 2nd and 3rd 6" increments.

⑧ **Moisture (%):** Water content of soil sample measured in laboratory (percentage of dry weight of sample).

⑨ **Dry Density (pcf):** The dry density of a soil measured in laboratory (pounds per cubic foot).

⑩ **Gradation:** Percentages of Gravel, Sand and Fines (Silt/Clay), obtained from lab test results of soil passing the No. 4 and No. 200 sieves.

⑪ **Atterberg:** Individual descriptions of Atterberg Tests are as follows:

LL = Liquid Limit (%): Water content at which a soil changes from plastic to liquid behavior.

PL = Plastic Limit (%): Water content at which a soil changes from liquid to plastic behavior.

PI = Plasticity Index (%): Range of water content at which a soil exhibits plastic properties (= Liquid Limit - Plastic Limit).

STRATIFICATION	
Description	**Thickness**
Seam	Up to ½ inch
Lense	Up to 12 inches
Layer	Greater than 12 in.
Occasional	1 or less per foot
Frequent	More than 1 per foot

MODIFIERS
Trace
<5%
Some
5-12%
With
> 12%

MOISTURE CONTENT
Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp / moist to the touch, but no visible water.
Saturated: Visible water, usually soil below groundwater.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	②	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS: More than 50% of material is larger than No. 200 sieve size.	GRAVELS: The coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS (< 5% fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		GRAVELS WITH FINES (≥ 12% fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS: The coarse fraction passing through No. 4 sieve.	CLEAN SANDS (< 5% fines)	SW		Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP		Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (≥ 12% fines)	SM		Silty Sands, Sand-Silt Mixtures
			SC		Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS: More than 50% of material is smaller than No. 200 sieve size.	SILTS AND CLAYS: Liquid Limit less than 50%		ML		Inorganic Silts and Very Fine Sands, Silty or Clayey Fine Sands or Clayey Silts with Slight
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean
			OL		Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS: Liquid Limit greater than 50%		MH		Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils with Plasticity (Elastic Silts)
			CH		Inorganic Clays of High Plasticity, Fat Clays
			OH		Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT		Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications (i.e. GP-GM, SC-SM, etc.).

SAMPLER SYMBOLS

- Block Sample
- Bulk/Bag Sample
- Modified California Sampler 3.5" OD, 2.42" ID
- D&M Sampler
- Rock Core
- Standard Penetration Split Spoon Sampler
- Thin Wall (Shelby Tube)

WATER SYMBOL

- Encountered Water Level
- Measured Water Level (see Remarks on Logs)

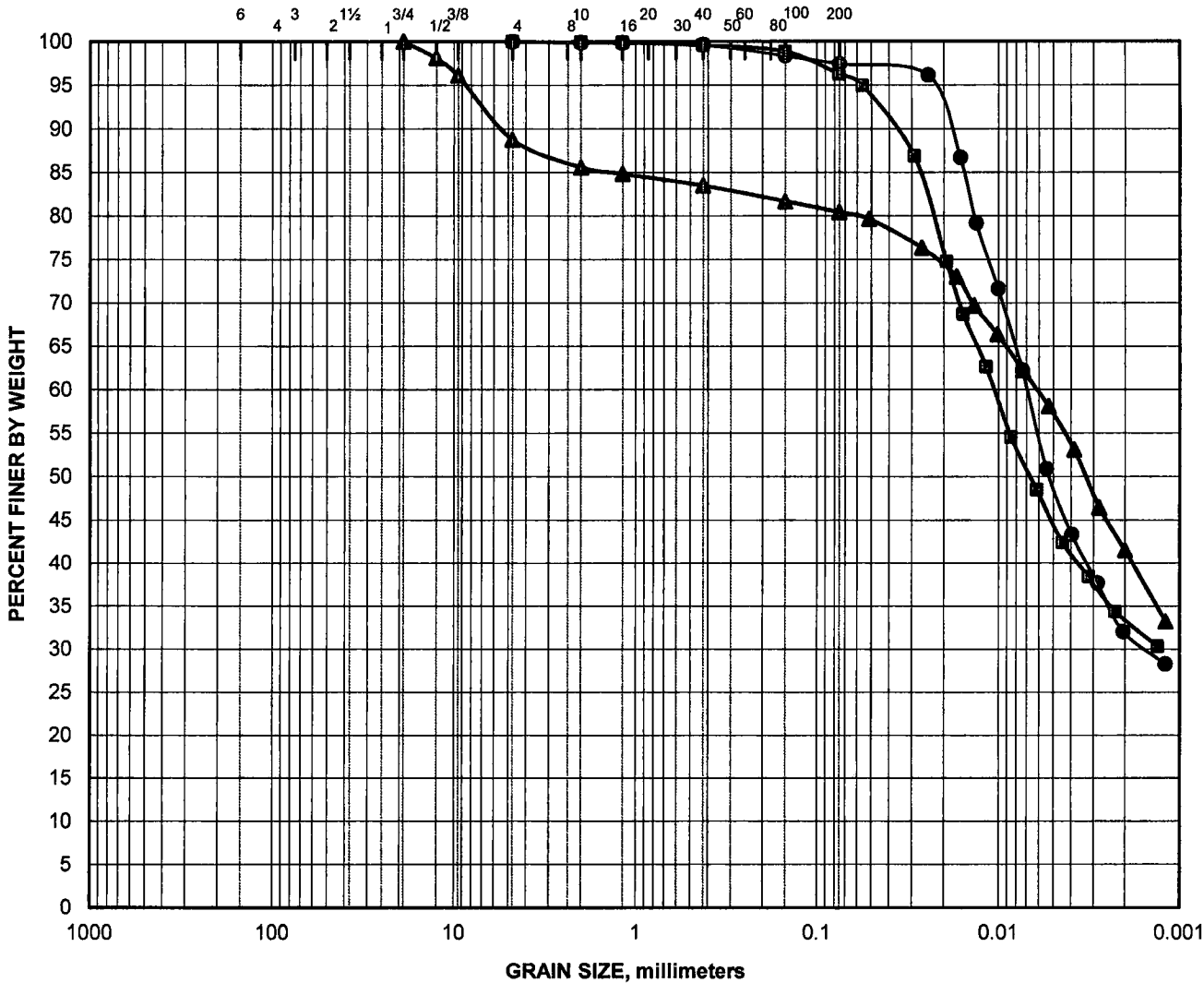
1. The results of laboratory tests on the samples collected are shown on the logs at the respective sample depths.
2. The subsurface conditions represented on the logs are for the locations specified. Caution should be exercised if interpolating between or extrapolating beyond the exploration locations.
3. The information presented on each log is subject to the limitations, conclusions, and recommendations presented in this report.

CMT ENGINEERING LABORATORIES

Figure: 48

GRAIN SIZE DISTRIBUTION

U.S. SIEVE OPENING, inches | U.S. SIEVE NUMBERS | HYDROMETER



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
●	B-1 @ 15'	CLAY (CH)	35					
■	B-3 @ 15'	CLAY (CH)	25					
▲	B-4 @ 7.5'	CLAY with gravel (CL)	28					
◆								
X								

	Specimen Identification	D100	D85	D60	D30	D15	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1 @ 15'	4.75						0	3	48.5	48.9
■	B-3 @ 15'	4.75						0	4	51.5	44.7
▲	B-4 @ 7.5'	19.0	1.31					11	9	23.2	57.2
◆											
X											

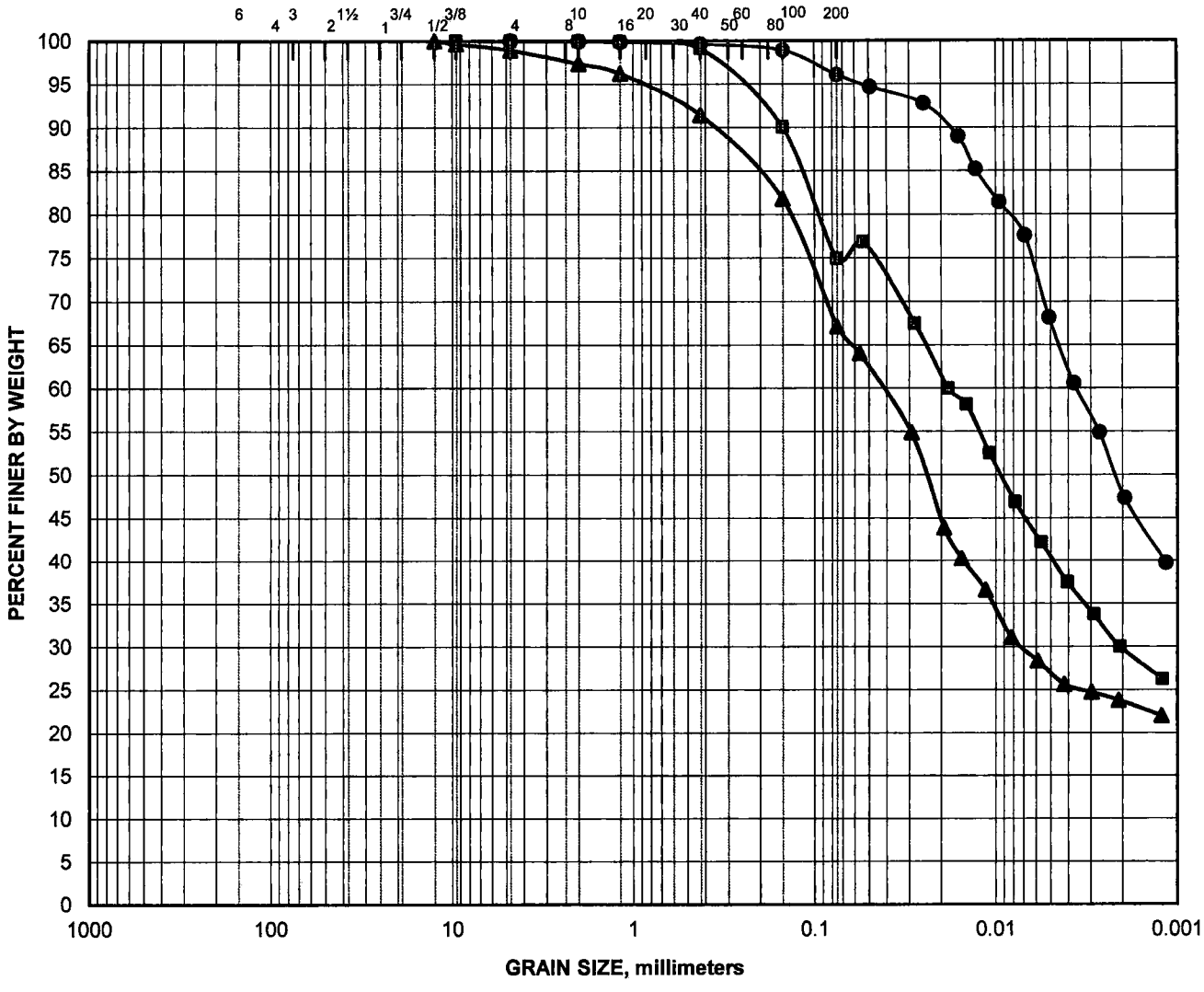
PROJECT NO.: 16111

CMT ENGINEERING LABORATORIES

FIGURE NO.: 49

GRAIN SIZE DISTRIBUTION

U.S. SIEVE OPENING, inches | U.S. SIEVE NUMBERS | HYDROMETER



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
●	B-4 @ 25'	CLAY (CL)	35					
■	B-4 @ 35'	CLAY with sand (CL)	19					
▲	B-7 @ 10'	Sandy CLAY (CL)	30					
◆								
X								

	Specimen Identification	D100	D85	D60	D30	D15	D10	%Gravel	%Sand	%Silt	%Clay
●	B-4 @ 25'	4.75						0	4	28.4	67.7
■	B-4 @ 35'	9.50	0.084					0	25	34.4	40.5
▲	B-7 @ 10'	12.5	0.212					1	32	40.1	27.1
◆											
X											

PROJECT NO.: 16111

CMT ENGINEERING LABORATORIES

FIGURE NO.: 50

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 CL-ML	gray, wet, loose — SILTY SAND 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		32.6	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								

ENT 127984:2021 PG 114 of 131

...\LOGV1 COLOR AFSENSLAND COLOR.GPJ US.EVAL.GDT 12/11/06

RB&G ENGINEERING INC.
PROVO, UTAH

LEGEND:

DISTURBED SAMPLE — 2,3,2,(8) ← 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	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								
							ENT 127984:2021 PG 115 of 131								
	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	45,26,48,(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)

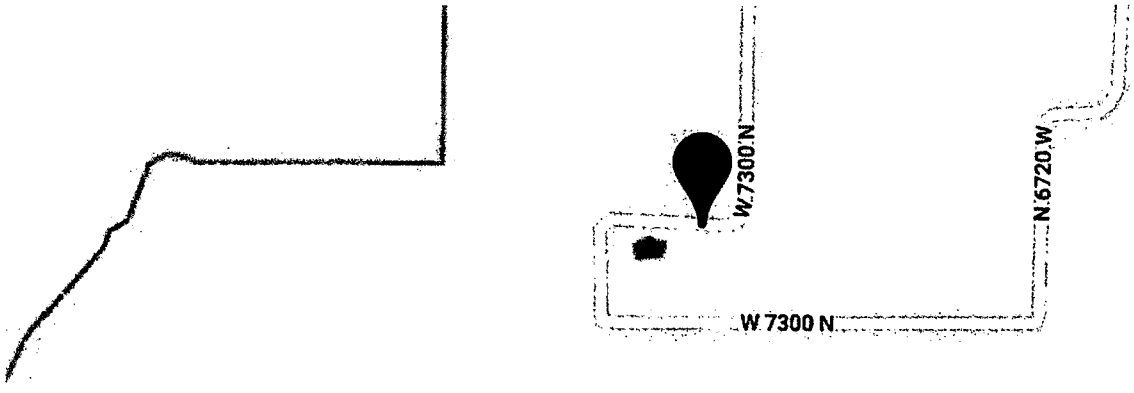
OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear

= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

OSHPD

Lakeshore Landing

Latitude, Longitude: 40.3597, -111.823



Google Map data ©2021

Date	3/27/2021, 5:20:08 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	E - Soft Clay Soil

Type	Value	Description
S_S	1.218	MCE_R ground motion. (for 0.2 second period)
S_1	0.439	MCE_R ground motion. (for 1.0s period)
S_{MS}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	null -See Section 11.4.8	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	null -See Section 11.4.8	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.543	MCE_G peak ground acceleration
F_{PGA}	1.157	Site amplification factor at PGA
PGA_M	0.629	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.218	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.389	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.993	Factored deterministic acceleration value. (0.2 second)
S1RT	0.439	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.494	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.157	Factored deterministic acceleration value. (1.0 second)
PGAd	1.16	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.877	Mapped value of the risk coefficient at short periods
C_{R1}	0.888	Mapped value of the risk coefficient at a period of 1 s

Company:	**CMT Engineering**				
Project Name:	Lakeshore Landing/Ardero Property				
Location:	American Fork, utah	**Designer:**	Bill Turner	**Checked By:**	
Project #:	16111	**Date:**	3/27/2021	**Date:**	

Units (1=SI, 2=US):	2		**Ground Slope, S:**	1	% (Enter either S or W)
PGA:	0.55		**Free-Face Ratio, W:**		% (Enter either S or W)
Vs,12:	623	ft/s	**Hammer Efficiency:**	60	%
M_w:	7.09		**Sampler Liner:**	NL	NL = Room for liners, but no liners L = Standard Split Spoon
Distance:	7.26	km	**Borehole Diameter:**	8	in
Percentile:	85		**Rod Lengths:**	5	ft

Boring No.	Top Samp. Depth (ft)	Depth to Water (ft)	Measured SPT N	γ (lb/ft^3)	Thickness (ft)	Fines (%)	D50 (mm)	$K_{(aging)}$	Soil Type	Susceptible?
B-1	7.5	7.5	1	112	2.5	37	0.1377		SM	Yes
B-1	10	7.5	6	115	3.5	26	0.2067		SM	Yes
B-1	15	7.5	3	113	5	97	0.0052		CH	No
B-2	15	13	10	117	5	85	0.0046		CL	No
B-3	15	10	7	115	5	96	0.0068		CH	No
B-4	10	10	7	115	5	76	0.0032		CL	No
B-4	15	10	6	115	5	76	0.0032		CL	No
B-4	20	10	7	115	5	97	0.0022		CL	No
B-4	25	10	1	112	5	97	0.0022		CL	No
B-4	30	10	1	112	5	97	0.0022		CL	No
B-4	35	10	5	114	5	75	0.0095		CL	No
B-4	40	10	10	116	5	75	0.0095		CL	No
B-5	15	15	5	114	5	70	0.0105		CL	No
B-6	15	15	3	113	5	70	0.0105		CL	No
B-7	10	7.5	2	112	5	67	0.0230		CL	No
B-7	15	7.5	11	118	5	75	0.0083		CL	No
B-8	15	15	9	117	5	75	0.0083		CL	No
B-10	15	10	12	119	5	83	0.0053		CL	No
06-03	15	6	5	120	5	80	0.0064		CL-ML	Yes
06-03	25	6	10	120	5	95	0.0014		CL	No
06-03	33.5	6	0	120	5	99	0.0003		CL	No
06-03	43.5	6	0	120	5	99	0.0003		CL	No
06-03	53.5	6	8	120	5	98	0.0006		CL	No
06-03	63.5	6	16	120	5	80	0.0064		CL-ML	Yes
06-03	68.5	6	71	120	5	5	0.9307		GP-GM	Yes
06-03	73.5	6	11	120	5	84	0.0049		CL	No
06-03	83.5	6	74	120	5	5	0.9307		GP-GM	Yes
06-03	93.5	6	13	120	5	82	0.0056		CL	No

Deterministic Liquefaction Triggering using Youd & Idriss et al (2001)

a_{max} = 0.5500 g
Depth to Water= 2.286 m
M_w = 7.09

comparison only)

Boring No.	Samp.Depth (ft)	Depth (m)	Thick. (m)	γ (kN/m³)	σ_v (kPa)	σ_v' (kPa)	Fines (%)	$(N_1)_{60}$	α	β	$(N_1)_{60,cs}$	r_d	MSF^{Idriss}	$SF^{Andrus+Sto}$	K_σ	$K_{(sg,mg)}$	CSR(site)	CRR	FS_{Liq}
B-1	8	2.438	0.762	17.60	42.90	41.41	37	1.38	5.000	1.200	6.66	0.981	1.154	1.155	1.196	1.00	0.2633	0.1122	0.426
B-1	10.5	3.200	1.067	18.07	57.82	48.85	26	8.44	4.388	1.123	13.86	0.976	1.154	1.155	1.157	1.00	0.3090	0.1714	0.555
B-1	15.5	4.724	1.524	17.75	83.87	59.96	97	4.43	5.000	1.200	10.31	0.964	1.154	1.155	1.111	1.00	Not Suscpt	0.1404	Not Suscp
B-2	15.5	4.724	1.524	18.38	86.84	62.92	85	15.21	5.000	1.200	23.25	0.964	1.154	1.155	1.154	1.00	Not Suscpt	0.2963	Not Suscp
B-3	15.5	4.724	1.524	18.07	85.35	61.44	96	10.27	5.000	1.200	17.32	0.964	1.154	1.155	1.105	1.00	Not Suscpt	0.2067	Not Suscp
B-4	10.5	3.200	1.524	18.07	57.82	48.85	76	9.84	5.000	1.200	16.81	0.976	1.154	1.155	1.157	1.00	Not Suscpt	0.2010	Not Suscp
B-4	15.5	4.724	1.524	18.07	85.35	61.44	76	8.78	5.000	1.200	15.54	0.964	1.154	1.155	1.105	1.00	Not Suscpt	0.1877	Not Suscp
B-4	20.5	6.248	1.524	18.07	112.89	74.03	97	9.59	5.000	1.200	16.50	0.952	1.154	1.155	1.065	1.00	Not Suscpt	0.1977	Not Suscp
B-4	25.5	7.772	1.524	17.60	136.76	82.95	97	1.31	5.000	1.200	6.57	0.941	1.154	1.155	1.041	1.00	Not Suscpt	0.1115	Not Suscp
B-4	30.5	9.296	1.524	17.60	163.57	94.82	97	1.30	5.000	1.200	6.56	0.926	1.154	1.155	1.013	1.00	Not Suscpt	0.1115	Not Suscp
B-4	35.5	10.820	1.524	17.91	193.79	110.09	75	6.09	5.000	1.200	12.30	0.885	1.154	1.155	0.984	1.00	Not Suscpt	0.1573	Not Suscp
B-4	40.5	12.344	1.524	18.22	224.96	126.32	75	11.53	5.000	1.200	18.84	0.844	1.154	1.155	0.957	1.00	Not Suscpt	0.2248	Not Suscp
B-5	15.5	4.724	1.524	17.91	84.61	60.70	70	7.35	5.000	1.200	13.82	0.964	1.154	1.155	1.108	1.00	Not Suscpt	0.1710	Not Suscp
B-6	15.5	4.724	1.524	17.75	83.87	59.96	70	4.43	5.000	1.200	10.31	0.964	1.154	1.155	1.111	1.00	Not Suscpt	0.1404	Not Suscp
B-7	10.5	3.200	1.524	17.60	56.31	47.34	67	2.84	5.000	1.200	8.41	0.976	1.154	1.155	1.164	1.00	Not Suscpt	0.1252	Not Suscp
B-7	15.5	4.724	1.524	18.54	87.58	63.67	75	16.90	5.000	1.200	25.29	0.964	1.154	1.155	1.150	1.00	Not Suscpt	0.3467	Not Suscp
B-8	15.5	4.724	1.524	18.38	86.84	62.92	75	13.48	5.000	1.200	21.18	0.964	1.154	1.155	1.100	1.00	Not Suscpt	0.2581	Not Suscp
B-10	15.5	4.724	1.524	18.69	88.32	64.41	83	18.64	5.000	1.200	27.37	0.964	1.154	1.155	1.146	1.00	Not Suscpt	0.4196	Not Suscp
06-03	15.5	4.724	1.524	18.85	89.06	65.15	80	7.17	5.000	1.200	13.61	0.964	1.154	1.155	1.092	1.00	0.3736	0.1690	0.453
06-03	25.5	7.772	1.524	18.85	146.53	92.72	95	12.82	5.000	1.200	20.38	0.941	1.154	1.155	1.018	1.00	Not Suscpt	0.2459	Not Suscp
06-03	34	10.363	1.524	18.85	195.37	116.15	99	0.00	5.000	1.200	5.00	0.897	1.154	1.155	0.973	1.00	Not Suscpt	0.1006	Not Suscp
06-03	44	13.411	1.524	18.85	252.83	143.72	99	0.00	5.000	1.200	5.00	0.816	1.154	1.155	0.932	1.00	Not Suscpt	0.1006	Not Suscp
06-03	54	16.459	1.524	18.85	310.29	171.29	98	7.70	5.000	1.200	14.24	0.735	1.154	1.155	0.900	1.00	Not Suscpt	0.1750	Not Suscp
06-03	64	19.507	1.524	18.85	367.75	198.86	80	14.68	5.000	1.200	22.61	0.653	1.154	1.155	0.817	1.00	0.4579	0.2835	0.619
06-03	69	21.031	1.524	18.85	396.48	212.65	5	70.79	0.000	1.000	70.79	0.612	1.154	1.155	0.743	1.00	0.4757	########	########
06-03	74	22.555	1.524	18.85	425.21	226.43	84	8.91	5.000	1.200	15.70	0.572	1.154	1.155	0.851	1.00	Not Suscpt	0.1893	Not Suscp
06-03	84	25.603	1.524	18.85	482.67	254.00	5	65.66	0.000	1.000	65.66	0.490	1.154	1.155	0.692	1.00	0.4168	########	########
06-03	94	28.651	1.524	18.85	540.13	281.57	82	9.09	5.000	1.200	15.91	0.409	1.154	1.155	0.815	1.00	Not Suscpt	0.1915	Not Suscp
																1.00			
																1.00			
																1.00			
																1.00			

Deterministic Liquefaction Triggering using Boulanger & Idriss (2008)

a_{max} = 0.5500 g
Depth to Water= 2.286 m
M_w = 7.09
Percentile = 85

Boring No.	Samp.Depth (ft)	Depth (m)	Thick. (m)	γ (kN/m³)	Fines (%)	$(N_1)_{60}$	$(N_1)_{60,cs}$	σ_v (kPa)	σ_v' (kPa)	α	β	r_d	MSF	C_σ	K_σ	$K_{(sg,mg)}$	CSR(site)	CRR	FS_{Liq}
B-1	8	2.438	0.762	17.60	37	1.72	7.26	42.90	41.41	-0.101	0.012	0.982	1.114	0.064	1.058	1.00	0.3088	0.1166	0.378
B-1	10.5	3.200	1.067	18.07	26	9.64	14.79	57.46	48.49	-0.146	0.017	0.973	1.114	0.091	1.067	1.00	0.3467	0.1803	0.520
B-1	15.5	4.724	1.524	17.75	97	4.96	10.46	84.08	60.17	-0.247	0.028	0.953	1.114	0.076	1.039	1.00	Not Suscpt	0.1416	Not Suscp
B-2	15.5	4.724	1.524	18.38	85	16.03	21.55	84.95	61.03	-0.247	0.028	0.953	1.114	0.115	1.058	1.00	Not Suscpt	0.2644	Not Suscp
B-3	15.5	4.724	1.524	18.07	96	11.02	16.52	84.99	61.08	-0.247	0.028	0.953	1.114	0.096	1.049	1.00	Not Suscpt	0.1978	Not Suscp
B-4	10.5	3.200	1.524	18.07	76	11.11	16.66	57.46	48.49	-0.146	0.017	0.973	1.114	0.096	1.071	1.00	Not Suscpt	0.1994	Not Suscp
B-4	15.5	4.724	1.524	18.07	76	9.51	15.07	84.99	61.08	-0.247	0.028	0.953	1.114	0.091	1.046	1.00	Not Suscpt	0.1830	Not Suscp
B-4	20.5	6.248	1.524	18.07	97	10.00	15.49	112.53	73.67	-0.360	0.041	0.930	1.114	0.092	1.029	1.00	Not Suscpt	0.1872	Not Suscp
B-4	25.5	7.772	1.524	17.60	97	1.33	6.82	141.57	87.76	-0.484	0.054	0.906	1.114	0.063	1.009	1.00	Not Suscpt	0.1134	Not Suscp
B-4	30.5	9.296	1.524	17.60	97	1.28	6.77	168.38	99.63	-0.618	0.069	0.881	1.114	0.062	1.001	1.00	Not Suscpt	0.1130	Not Suscp
B-4	35.5	10.820	1.524	17.91	75	6.01	11.57	194.19	110.50	-0.758	0.085	0.854	1.114	0.079	0.993	1.00	Not Suscpt	0.1509	Not Suscp
B-4	40.5	12.344	1.524	18.22	75	11.65	17.21	220.48	121.84	-0.902	0.100	0.827	1.114	0.098	0.982	1.00	Not Suscpt	0.2054	Not Suscp
B-5	15.5	4.724	1.524	17.91	70	7.97	13.54	85.50	61.58	-0.247	0.028	0.953	1.114	0.085	1.043	1.00	Not Suscpt	0.1685	Not Suscp
B-6	15.5	4.724	1.524	17.75	70	4.80	10.37	87.68	63.76	-0.247	0.028	0.953	1.114	0.075	1.035	1.00	Not Suscpt	0.1409	Not Suscp
B-7	10.5	3.200	1.524	17.60	67	3.22	8.80	63.28	54.31	-0.146	0.017	0.973	1.114	0.070	1.044	1.00	Not Suscpt	0.1283	Not Suscp
B-7	15.5	4.724	1.524	18.54	75	19.23	24.79	74.15	50.24	-0.247	0.028	0.953	1.114	0.130	1.091	1.00	Not Suscpt	0.3329	Not Suscp
B-8	15.5	4.724	1.524	18.38	75	15.25	20.81	77.05	53.13	-0.247	0.028	0.953	1.114	0.112	1.072	1.00	Not Suscpt	0.2524	Not Suscp
B-10	15.5	4.724	1.524	18.69	83	21.62	27.15	70.77	46.86	-0.247	0.028	0.953	1.114	0.142	1.109	1.00	Not Suscpt	0.4107	Not Suscp
06-03	15.5	4.724	1.524	18.85	80	9.54	15.09	67.40	43.48	-0.247	0.028	0.953	1.114	0.091	1.077	1.00	0.4401	0.1831	0.416
06-03	25.5	7.772	1.524	18.85	95	14.67	20.17	124.86	71.05	-0.484	0.054	0.906	1.114	0.109	1.039	1.00	Not Suscpt	0.2428	Not Suscp
06-03	34	10.363	1.524	18.85	99	0.00	5.49	173.70	94.49	-0.715	0.080	0.862	1.114	0.053	1.004	1.00	Not Suscpt	0.1039	Not Suscp
06-03	44	13.411	1.524	18.85	99	0.00	5.49	231.16	122.06	-1.004	0.112	0.808	1.114	0.053	0.990	1.00	Not Suscpt	0.1039	Not Suscp
06-03	54	16.459	1.524	18.85	98	8.12	13.61	288.62	149.62	-1.294	0.143	0.755	1.114	0.086	0.966	1.00	Not Suscpt	0.1691	Not Suscp
06-03	64	19.507	1.524	18.85	80	16.18	21.72	346.08	177.19	-1.564	0.171	0.706	1.114	0.116	0.935	1.00	0.4727	0.2673	0.565
06-03	69	21.031	1.524	18.85	5	106.80	106.80	374.81	190.98	-1.687	0.184	0.683	1.114	-0.134	1.085	1.00	0.3962	########	########
06-03	74	22.555	1.524	18.85	84	9.47	15.00	403.54	204.76	-1.798	0.195	0.661	1.114	0.090	0.936	1.00	Not Suscpt	0.1823	Not Suscp
06-03	84	25.603	1.524	18.85	5	113.98	113.98	461.00	232.33	-1.979	0.213	0.624	1.114	-0.120	1.100	1.00	0.3614	########	########
06-03	94	28.651	1.524	18.85	82	9.86	15.40	518.46	259.90	-2.095	0.222	0.595	1.114	0.092	0.914	1.00	Not Suscpt	0.1863	Not Suscp
																1.00			
																1.00			
																1.00			
																1.00			

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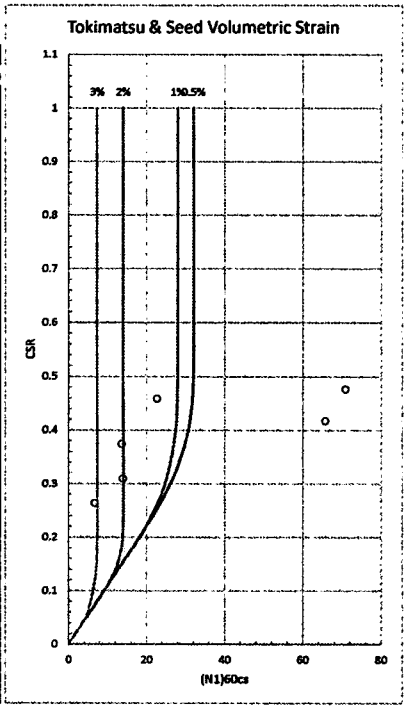
Deterministic Settlement using Tokimatsu & Seed (1987)

Boring No.	Depth (ft)	Susceptible?	Thick. (ft)	$(N_1)_{60,cs}$	CSR	CRR	FS_{Liq}	Interpolated Vol.Strain	Settlement of Layer(in)	Settlement Σ layers(in)
B-1	8.00	Yes	2.50	6.661	0.2633	0.1122	0.4261	3.262	0.98	1.83
B-1	10.50	Yes	3.50	13.860	0.3090	0.1714	0.5546	2.021	0.85	
B-1	15.50	No	5.00	10.312	Not Suscpt	0.1404	Not Suscpt	#N/A	0.00	
B-2	15.50	No	5.00	23.247	Not Suscpt	0.2963	Not Suscpt	#N/A	0.00	0.00
B-3	15.50	No	5.00	17.325	Not Suscpt	0.2067	Not Suscpt	#N/A	0.00	0.00
B-4	10.50	No	5.00	16.813	Not Suscpt	0.2010	Not Suscpt	#N/A	0.00	0.00
B-4	15.50	No	5.00	15.538	Not Suscpt	0.1877	Not Suscpt	#N/A	0.00	
B-4	20.50	No	5.00	16.503	Not Suscpt	0.1977	Not Suscpt	#N/A	0.00	
B-4	25.50	No	5.00	6.572	Not Suscpt	0.1115	Not Suscpt	#N/A	0.00	
B-4	30.50	No	5.00	6.564	Not Suscpt	0.1115	Not Suscpt	#N/A	0.00	
B-4	35.50	No	5.00	12.303	Not Suscpt	0.1573	Not Suscpt	#N/A	0.00	
B-4	40.50	No	5.00	18.840	Not Suscpt	0.2248	Not Suscpt	#N/A	0.00	
B-5	15.50	No	5.00	13.818	Not Suscpt	0.1710	Not Suscpt	#N/A	0.00	0.00
B-6	15.50	No	5.00	10.312	Not Suscpt	0.1404	Not Suscpt	#N/A	0.00	0.00
B-7	10.50	No	5.00	8.405	Not Suscpt	0.1252	Not Suscpt	#N/A	0.00	0.00
B-7	15.50	No	5.00	25.286	Not Suscpt	0.3467	Not Suscpt	#N/A	0.00	
B-8	15.50	No	5.00	21.176	Not Suscpt	0.2581	Not Suscpt	#N/A	0.00	0.00
B-10	15.50	No	5.00	27.369	Not Suscpt	0.4196	Not Suscpt	#N/A	0.00	0.00
06-03	15.50	Yes	5.00	13.607	0.3736	0.1690	0.4525	2.058	1.23	2.07
06-03	25.50	No	5.00	20.385	Not Suscpt	0.2459	Not Suscpt	#N/A	0.00	
06-03	34.00	No	5.00	5.000	Not Suscpt	0.1006	Not Suscpt	#N/A	0.00	
06-03	44.00	No	5.00	5.000	Not Suscpt	0.1006	Not Suscpt	#N/A	0.00	
06-03	54.00	No	5.00	14.243	Not Suscpt	0.1750	Not Suscpt	#N/A	0.00	
06-03	64.00	Yes	5.00	22.614	0.4579	0.2835	0.6191	1.386	0.83	
06-03	69.00	Yes	5.00	70.792	0.4757	########	########	#N/A	0.00	
06-03	74.00	No	5.00	15.695	Not Suscpt	0.1893	Not Suscpt	#N/A	0.00	
06-03	84.00	Yes	5.00	65.660	0.4168	########	########	#N/A	0.00	
06-03	94.00	No	5.00	15.911	Not Suscpt	0.1915	Not Suscpt	#N/A	0.00	
								#N/A	0.00	0.00
								#N/A	0.00	
								#N/A	0.00	
								#N/A	0.00	



Deterministic Settlement using Ishihara & Yoshimine (1992)

(Settlement limited to FS<1.2)

Boring No.	Depth (m)	Susceptible?	Thick. (m)	$(N_1)_{60,cs}$	CSR	CRR	FS_{Liq}	Compute Deterministic Vertical Strain: F_α	γ_{lim}	γ_{max}	ε_v	Compute Ground Surface Settlement: DF_i	$\varepsilon^*t^*DF_i$	$DF_i * t_i$	$\varepsilon_{v,equiv.}$	Sett.(in)
B-1	2.44	Yes	0.762	7.261	0.3088	0.1166	0.3776	0.9474	0.6450	0.6450	0.0444	0.865	0.0292	0.659	0.0356	**2.308**
B-1	3.20	Yes	1.067	14.792	0.3467	0.1803	0.5199	0.7628	0.2814	0.2814	0.0290	0.822	0.0255	0.877		
B-1	4.72	No	0.000	10.457	Not Suscpt	0.1416	Not Suscpt	0.9039	0.0000	0.0000	0.0000	0.738	0.0000	0.000		
B-2	4.72	No	0.000	21.554	Not Suscpt	0.2644	Not Suscpt	0.4334	0.0000	0.0000	0.0000	0.738	0.0000	0.000	0.0000	**0.000**
B-3	4.72	No	0.000	16.520	Not Suscpt	0.1978	Not Suscpt	0.6889	0.0000	0.0000	0.0000	0.738	0.0000	0.000	0.0000	**0.000**
B-4	3.20	No	0.000	16.663	Not Suscpt	0.1994	Not Suscpt	0.6824	0.0000	0.0000	0.0000	0.822	0.0000	0.000	0.0000	**0.000**
B-4	4.72	No	0.000	15.068	Not Suscpt	0.1830	Not Suscpt	0.7516	0.0000	0.0000	0.0000	0.738	0.0000	0.000		
B-4	6.25	No	0.000	15.491	Not Suscpt	0.1872	Not Suscpt	0.7339	0.0000	0.0000	0.0000	0.653	0.0000	0.000		
B-4	7.77	No	0.000	6.823	Not Suscpt	0.1134	Not Suscpt	0.9473	0.0000	0.0000	0.0000	0.568	0.0000	0.000		
B-4	9.30	No	0.000	6.775	Not Suscpt	0.1130	Not Suscpt	0.9472	0.0000	0.0000	0.0000	0.484	0.0000	0.000		
B-4	10.82	No	0.000	11.566	Not Suscpt	0.1509	Not Suscpt	0.8750	0.0000	0.0000	0.0000	0.399	0.0000	0.000		
B-4	12.34	No	0.000	17.209	Not Suscpt	0.2054	Not Suscpt	0.6572	0.0000	0.0000	0.0000	0.314	0.0000	0.000		
B-5	4.72	No	0.000	13.544	Not Suscpt	0.1685	Not Suscpt	0.8106	0.0000	0.0000	0.0000	0.738	0.0000	0.000	0.0000	**0.000**
B-6	4.72	No	0.000	10.370	Not Suscpt	0.1409	Not Suscpt	0.9059	0.0000	0.0000	0.0000	0.738	0.0000	0.000	0.0000	**0.000**
B-7	3.20	No	0.000	8.802	Not Suscpt	0.1283	Not Suscpt	0.9348	0.0000	0.0000	0.0000	0.822	0.0000	0.000	0.0000	**0.000**
B-7	4.72	No	0.000	24.787	Not Suscpt	0.3329	Not Suscpt	0.2450	0.0000	0.0000	0.0000	0.738	0.0000	0.000		
B-8	4.72	No	0.000	20.811	Not Suscpt	0.2524	Not Suscpt	0.4743	0.0000	0.0000	0.0000	0.738	0.0000	0.000	0.0000	**0.000**
B-10	4.72	No	0.000	27.153	Not Suscpt	0.4107	Not Suscpt	0.0976	0.0000	0.0000	0.0000	0.738	0.0000	0.000	0.0000	**0.000**
06-03	4.72	Yes	1.524	15.087	0.4401	0.1831	0.4162	0.7508	0.2726	0.2726	0.0286	0.738	0.0322	1.124	0.0286	**6.183**
06-03	7.77	No	0.000	20.166	Not Suscpt	0.2428	Not Suscpt	0.5089	0.0000	0.0000	0.0000	0.568	0.0000	0.000		
06-03	10.36	No	0.000	5.489	Not Suscpt	0.1039	Not Suscpt	0.9350	0.0000	0.0000	0.0000	0.424	0.0000	0.000		
06-03	13.41	No	0.000	5.489	Not Suscpt	0.1039	Not Suscpt	0.9350	0.0000	0.0000	0.0000	0.255	0.0000	0.000		
06-03	16.46	No	0.000	13.611	Not Suscpt	0.1691	Not Suscpt	0.8082	0.0000	0.0000	0.0000	0.086	0.0000	0.000		
06-03	19.51	Yes	1.524	21.724	0.4727	0.2673	0.5655	0.4239	0.1308	0.1308	0.0215	0.000	0.0000	0.000		
06-03	21.03	Yes	1.524	106.800	0.3962	########	########	-6.7212	0.0000	0.0000	0.0000	0.000	0.0000	0.000		
06-03	22.56	No	0.000	14.997	Not Suscpt	0.1823	Not Suscpt	0.7545	0.0000	0.0000	0.0000	0.000	0.0000	0.000		
06-03	25.60	Yes	1.524	113.979	0.3614	########	########	-7.4188	0.0000	0.0000	0.0000	0.000	0.0000	0.000		
06-03	28.65	No	0.000	15.400	Not Suscpt	0.1863	Not Suscpt	0.7377	0.0000	0.0000	0.0000	0.000	0.0000	0.000		
												#N/A		0.000		
												#N/A		0.000		
												#N/A		0.000		
												#N/A		0.000		

Deterministic Lateral Spreading using Youd, Hansen & Bartlett (2002)

Boring No.	Depth (ft)	Thick. (ft)	Susceptible'	$(N_1)_{60,cs}$	T_{15} (m)	F_{15} (%)	$D50_{15}$(mm)	D_h (ft)
B-1	8.00	2.50	Yes	6.66	1.83	31.50	0.17	**2.63**
B-1	10.50	3.50	Yes	13.86				
B-1	15.50	5.00	Not Suscpt	10.31				
B-2	15.50	5.00	Not Suscpt	23.25	0.00	0.00	0.00	**0.00**
B-3	15.50	5.00	Not Suscpt	17.32	0.00	0.00	0.00	**0.00**
B-4	10.50	5.00	Not Suscpt	16.81	0.00	0.00	0.00	**0.00**
B-4	15.50	5.00	Not Suscpt	15.54				
B-4	20.50	5.00	Not Suscpt	16.50				
B-4	25.50	5.00	Not Suscpt	6.57				
B-4	30.50	5.00	Not Suscpt	6.56				
B-4	35.50	5.00	Not Suscpt	12.30				
B-4	40.50	5.00	Not Suscpt	18.84				
B-5	15.50	5.00	Not Suscpt	13.82	0.00	0.00	0.00	**0.00**
B-6	15.50	5.00	Not Suscpt	10.31	0.00	0.00	0.00	**0.00**
B-7	10.50	5.00	Not Suscpt	8.41	0.00	0.00	0.00	**0.00**
B-7	15.50	5.00	Not Suscpt	25.29				
B-8	15.50	5.00	Not Suscpt	21.18	0.00	0.00	0.00	**0.00**
B-10	15.50	5.00	Not Suscpt	27.37	0.00	0.00	0.00	**0.00**
06-03	15.50	5.00	Yes	13.61	3.05	80.00	0.01	**0.11**
06-03	25.50	5.00	Not Suscpt	20.38				
06-03	34.00	5.00	Not Suscpt	5.00				
06-03	44.00	5.00	Not Suscpt	5.00				
06-03	54.00	5.00	Not Suscpt	14.24				
06-03	64.00	5.00	Yes	22.61				
06-03	69.00	5.00	Yes	70.79				
06-03	74.00	5.00	Not Suscpt	15.70				
06-03	84.00	5.00	Yes	65.66				
06-03	94.00	5.00	Not Suscpt	15.91				
					0.00	0.00	0.00	**0.00**

Deterministic Method

S =	1	%
W =		%
R =	7.26	km
R* =	11.93843	km
M =	7.09	
Percentile =	**50**	(assumed)

Limitations:

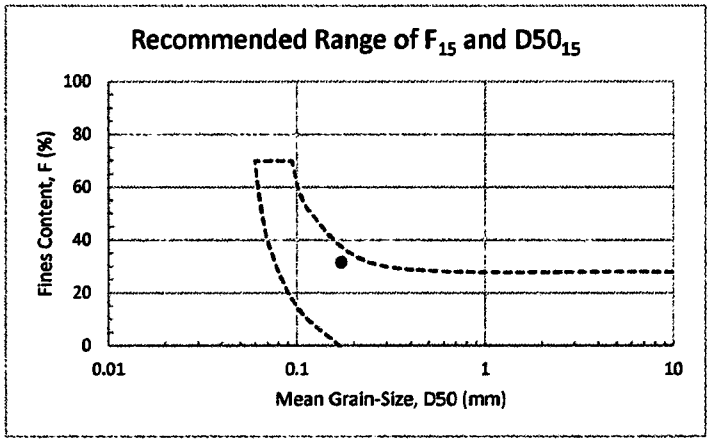
-Drainage is impeded

-Fines content up to 70%, must be non-plastic

-Lateral spreading limited to 6 meters

Regression Coefficients

	GS	FF
b_0	-16.213	-16.713
b_1	1.532	1.532
b_2	-1.406	-1.406
b_3	-0.012	-0.012
b_4	0.000	0.592
b_5	0.338	0.000
b_6	0.540	0.540
b_7	3.413	3.413
b_8	-0.795	-0.795



Settlement--Footings.xls

SETTLEMENT OF FOOTINGS								
Project:	Lakeshore Landing/Ardero Property, #16111							
B:	8.16497	feet (width or diameter)			b =	4.082483	ft (1/2 width/dia)	
L:	8.16497	feet (length)			l =	4.082483	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	100
unit weight:	114	pcf (above footing depth)					Strip Load,k:	6
allowable q:	1500	psf						
footing type:	2	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	5	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	0.01	0.00125			135		0.0	1.00
CL1	0.124	0.0149	2600		114		2.5	9.12
CL2	0.113	0.0149	1600		119		5.5	2.44
CL3	0.091	0.0256	2200		124		9.5	2.55
CL4	0.091	0.0256		2	125		21.5	2.00

SQUARE/RECTANGULAR FOOTINGS (Boussinesq 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	285.0	0.000	0.000	0.00	
CL1	1	0.990	1484.7	399.0	0.121	0.000	0.12	
CL1	2	0.933	1400.0	513.0	0.102	0.000	0.22	
CL1	2.5	0.886	1329.6	570.0	0.047	0.000	0.27	
CL2	3.5	0.771	1157.2	626.6	0.137	0.000	0.41	
CL2	4.5	0.652	977.4	683.2	0.088	0.000	0.49	
CL2	5.5	0.543	814.8	739.8	0.058	0.000	0.55	
CL3	6.5	0.452	677.8	801.4	0.082	0.000	0.63	
CL3	7.5	0.377	566.1	863.0	0.067	0.000	0.70	
CL3	8.5	0.317	476.2	924.6	0.055	0.000	0.76	
CL3	9.5	0.269	403.9	986.2	0.046	0.000	0.80	
CL4	10.5	0.230	345.5	1048.8	0.038	0.000	0.84	
CL4	11.5	0.199	298.1	1111.4	0.032	0.000	0.87	
CL4	12.5	0.173	259.3	1174.0	0.027	0.000	0.90	
CL4	13.5	0.151	227.2	1236.6	0.023	0.000	0.92	
CL4	14.5	0.134	200.5	1299.2	0.019	0.000	0.94	
CL4	15.5	0.119	178.1	1361.8	0.016	0.000	0.96	
CL4	16.5	0.106	159.1	1424.4	0.014	0.000	0.97	<---2B
CL4	17.5	0.095	142.9	1487.0	0.012	0.000	0.98	
CL4	18.5	0.086	129.0	1549.6	0.011	0.000	0.99	
CL4	19.5	0.078	117.0	1612.2	0.009	0.000	1.00	
CL4	20.5	0.071	106.6	1674.8	0.008	0.000	1.01	
CL4	21.5	0.065	97.4	1737.4	0.007	0.000	1.02	

Settlement--Footings.xls

SETTLEMENT OF FOOTINGS								
Project:	Lakeshore Landing/Ardero Property, #16111							
B:	4	feet (width or diameter)			b =	2	ft (1/2 width/dia)	
L:	25	feet (length)			I =	12.5	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	100
unit weight:	114	pcf (above footing depth)					Strip Load,k:	6
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:	5	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	0.01	0.00125			135		0.0	1.00
CL1	0.124	0.0149	2600		114		2.5	9.12
CL2	0.113	0.0149	1600		119		5.5	2.44
CL3	0.091	0.0256	2200		124		9.5	2.55
CL4	0.091	0.0256		2	125		21.5	2.00

STRIP FOOTINGS...

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	285.0	0.000	0.000	0.00	
CL1	1	0.959	1439.2	399.0	0.119	0.000	0.12	
CL1	2	0.818	1227.5	513.0	0.095	0.000	0.21	
CL1	2.5	0.740	1110.1	570.0	0.042	0.000	0.26	
CL2	3.5	0.605	907.1	626.6	0.070	0.000	0.32	
CL2	4.5	0.503	753.8	683.2	0.058	0.000	0.38	
CL2	5.5	0.426	639.7	739.8	0.048	0.000	0.43	
CL3	6.5	0.369	553.5	801.4	0.070	0.000	0.50	
CL3	7.5	0.324	486.6	863.0	0.060	0.000	0.56	
CL3	8.5	0.289	433.6	924.6	0.051	0.000	0.61	<---2B
CL3	9.5	0.260	390.7	986.2	0.045	0.000	0.66	
CL4	10.5	0.237	355.3	1048.8	0.039	0.000	0.70	
CL4	11.5	0.217	325.6	1111.4	0.034	0.000	0.73	
CL4	12.5	0.200	300.5	1174.0	0.030	0.000	0.76	
CL4	13.5	0.186	278.9	1236.6	0.027	0.000	0.79	
CL4	14.5	0.173	260.1	1299.2	0.024	0.000	0.81	
CL4	15.5	0.162	243.7	1361.8	0.022	0.000	0.83	
CL4	16.5	0.153	229.3	1424.4	0.020	0.000	0.85	
CL4	17.5	0.144	216.4	1487.0	0.018	0.000	0.87	
CL4	18.5	0.137	204.9	1549.6	0.017	0.000	0.89	
CL4	19.5	0.130	194.5	1612.2	0.015	0.000	0.90	
CL4	20.5	0.123	185.2	1674.8	0.014	0.000	0.92	
CL4	21.5	0.118	176.6	1737.4	0.013	0.000	0.93	

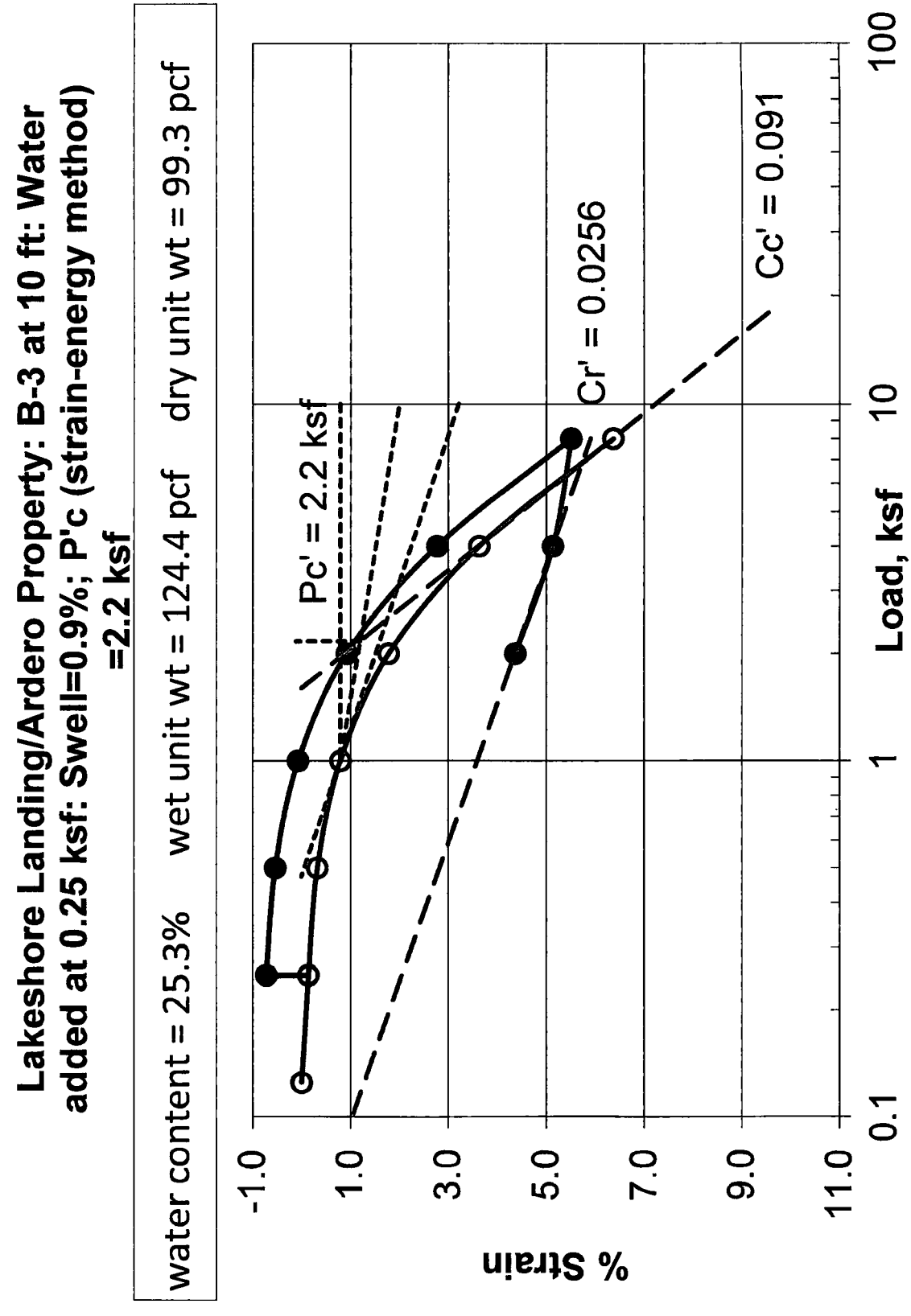
Settlement--Footings.xls

SETTLEMENT OF FOOTINGS								
Project:	Lakeshore Landing/Ardero Property, #16111							
B:	8.94427	feet (width or diameter)			b =	4.472136	ft (1/2 width/dia)	
L:	8.94427	feet (length)			l =	4.472136	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	120
unit weight:	114	pcf (above footing depth)					Strip Load,k:	6
allowable q:	1500	psf						
footing type:	2	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	5	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	0.01	0.00125			135		2.5	1.00
CL1	0.124	0.0149	2600		114		2.5	3.85
CL2	0.113	0.0149	1600		119		5.5	2.11
CL3	0.091	0.0256	2200		124		9.5	2.27
CL4	0.091	0.0256		2	125		21.5	2.00

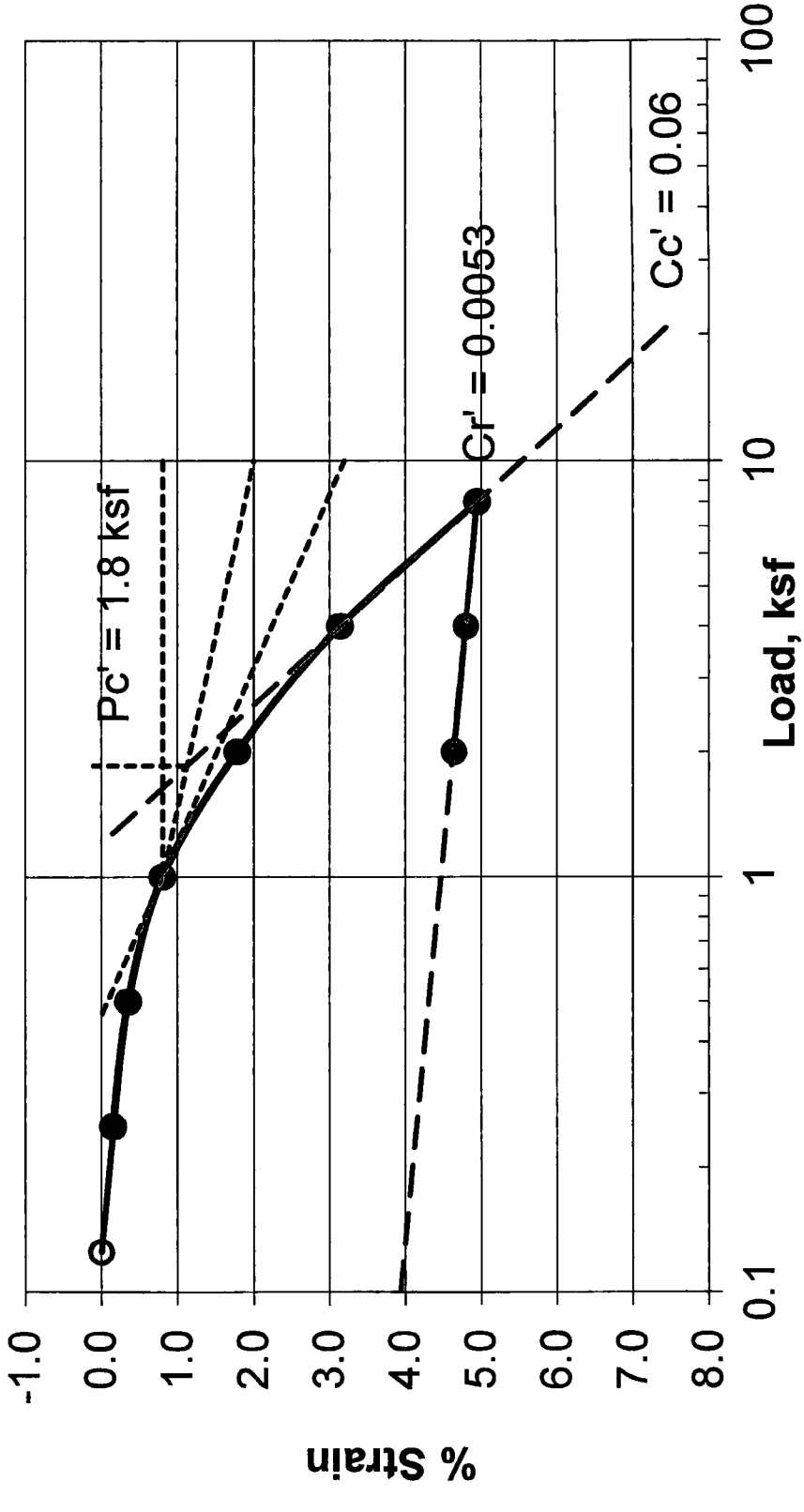
SQUARE/RECTANGULAR FOOTINGS (Boussinesq Method)...

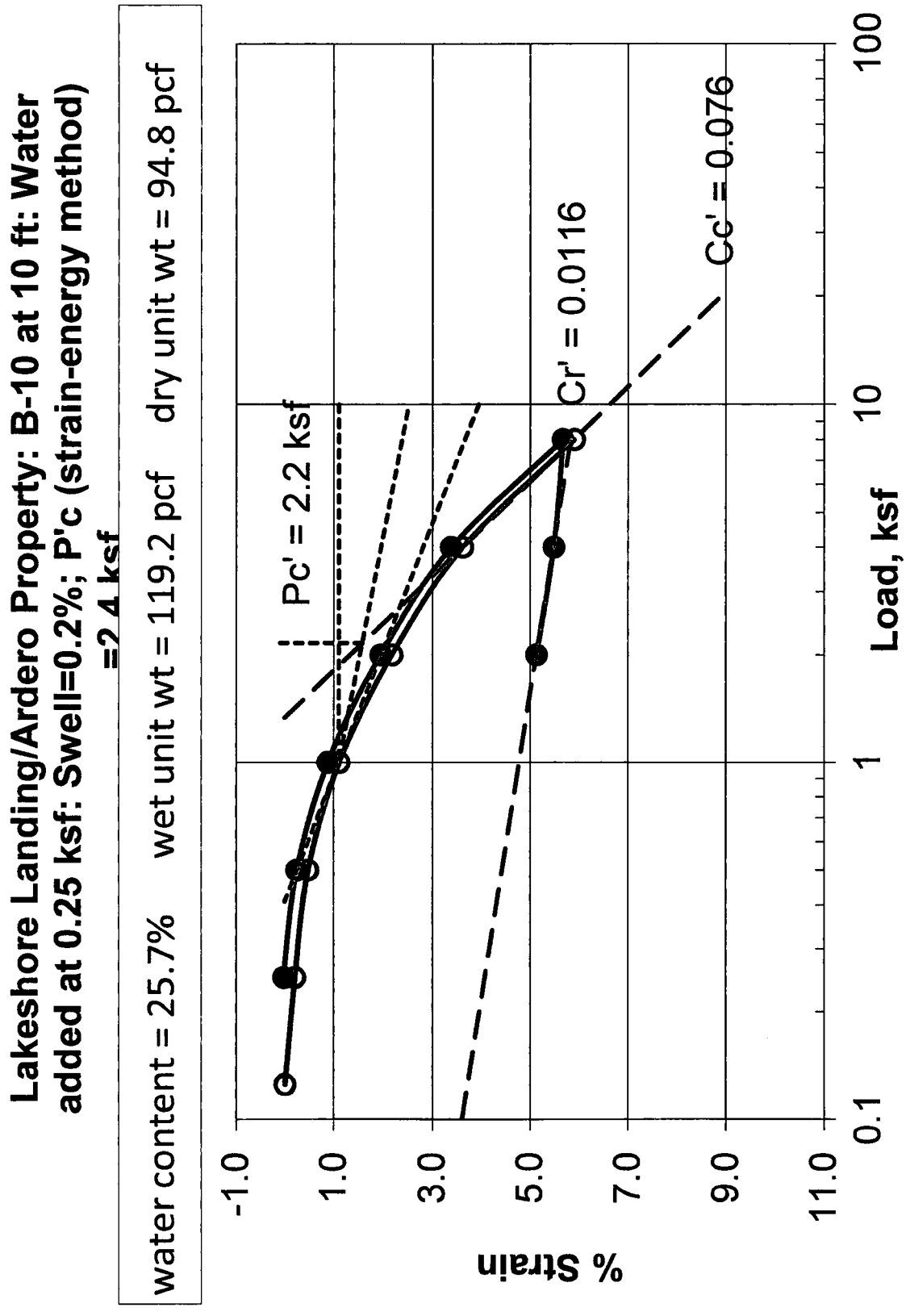
Soil Type	Below ftg. depth (ft)	Influence	Increased Stress (psf)	avg. ovrbn. press.(psf)	Incremnt. Sett. (in.)	Collapse Sett. (in.)	Total Set. (in.)	
Fill	1	0.992	1488.2	420.0	0.079	0.000	0.08	
Fill	2	0.947	1420.6	555.0	0.066	0.000	0.15	
Fill	2.5	0.908	1362.1	622.5	0.030	0.000	0.18	
CL1	2.5	0.000	0.0	622.5	0.000	0.000	0.18	
CL2	3.5	0.808	1212.3	679.1	0.165	0.000	0.34	
CL2	4.5	0.698	1046.8	735.7	0.124	0.000	0.46	
CL2	5.5	0.593	889.7	792.3	0.084	0.000	0.55	
CL3	6.5	0.501	752.1	853.9	0.084	0.000	0.63	
CL3	7.5	0.424	636.4	915.5	0.070	0.000	0.70	
CL3	8.5	0.361	540.9	977.1	0.059	0.000	0.76	
CL3	9.5	0.308	462.6	1038.7	0.049	0.000	0.81	
CL4	10.5	0.266	398.4	1101.3	0.041	0.000	0.85	
CL4	11.5	0.230	345.6	1163.9	0.035	0.000	0.89	
CL4	12.5	0.201	302.0	1226.5	0.029	0.000	0.92	
CL4	13.5	0.177	265.6	1289.1	0.025	0.000	0.94	
CL4	14.5	0.157	235.1	1351.7	0.021	0.000	0.96	
CL4	15.5	0.140	209.4	1414.3	0.018	0.000	0.98	
CL4	16.5	0.125	187.4	1476.9	0.016	0.000	1.00	
CL4	17.5	0.112	168.7	1539.5	0.014	0.000	1.01	
CL4	18.5	0.102	152.5	1602.1	0.012	0.000	1.02	<---2B
CL4	19.5	0.092	138.5	1664.7	0.011	0.000	1.03	
CL4	20.5	0.084	126.3	1727.3	0.009	0.000	1.04	
CL4	21.5	0.077	115.6	1789.9	0.008	0.000	1.05	


Lakeshore Landing/Ardero Property: B-3 at 10 ft: Water added at 0.25 ksf: Swell=0.9%; P'c (strain-energy method) =2.2 ksf
water content = 25.3% wet unit wt = 124.4 pcf dry unit wt = 99.3 pcf
Pc' = 2.2 ksf
Cr' = 0.0256
Cc' = 0.091
% Strain
-1.0
1.0
3.0
5.0
7.0
9.0
11.0
0.1
1
10
100
Load, ksf

Lakeshore Landing/Ardero Property: B-7 at 7.5 ft: Water added at 0.25 ksf: Swell=0.0%; P'c (strain-energy method) =1.9 ksf

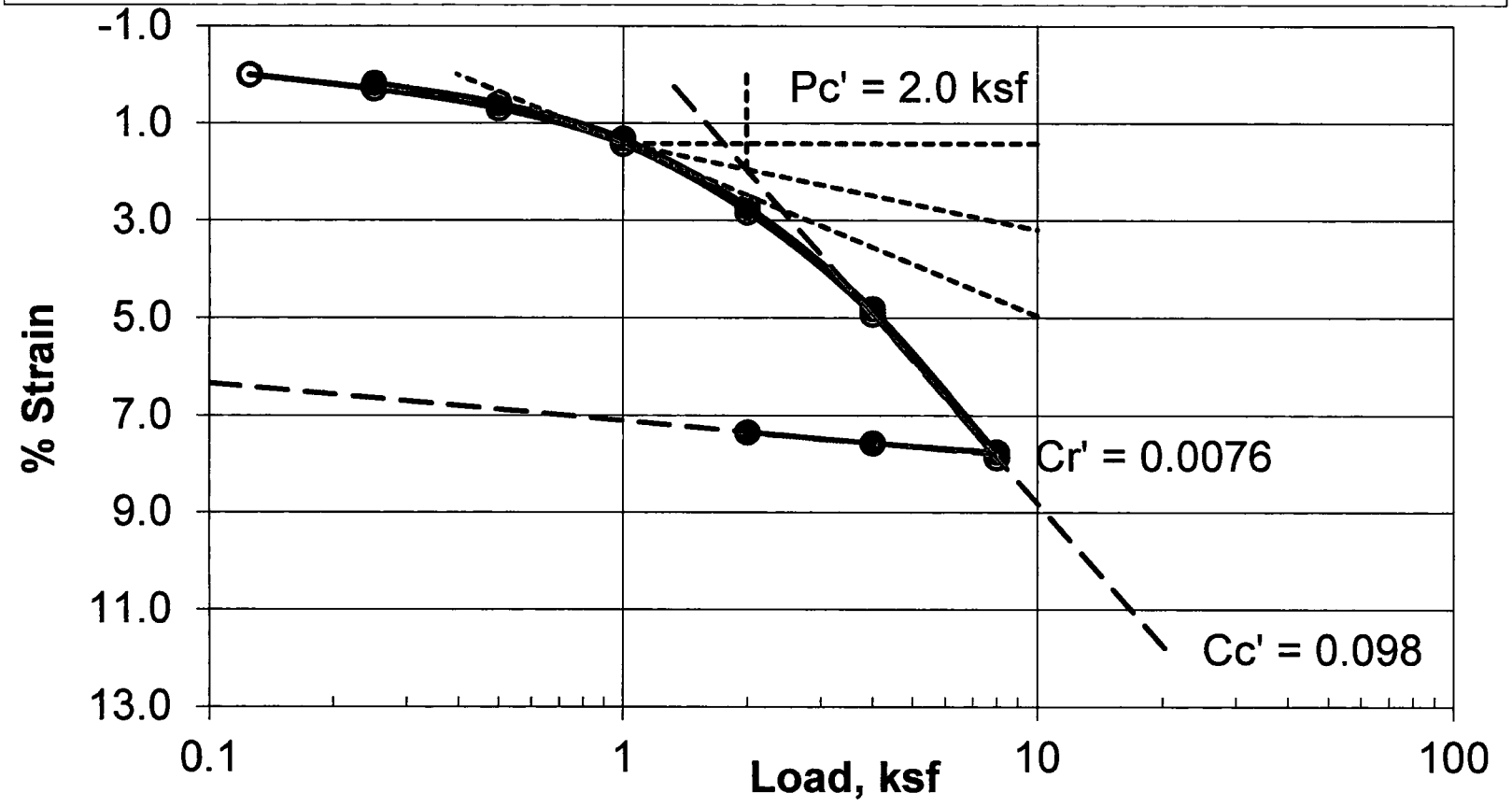
water content = 29.3% wet unit wt = 121.4 pcf dry unit wt = 93.9 pcf




Lakeshore Landing/Ardero Property: B-10 at 10 ft: Water added at 0.25 ksf: Swell=0.2%; P'c (strain-energy method) =2.4 ksf
water content = 25.7% wet unit wt = 119.2 pcf dry unit wt = 94.8 pcf
Pc' = 2.2 ksf
Cr' = 0.0116
Cc' = 0.076
% Strain
-1.0
1.0
3.0
5.0
7.0
9.0
11.0
0.1
1
10
100
Load, ksf

Lakeshore Landing/Ardero Property: TP-5 at 3 ft: Water added at 0.25 ksf: Swell=0.1%; P'c (strain-energy method) =2.1 ksf

water content = 20.9% wet unit wt = 117.8 pcf dry unit wt = 97.4 pcf



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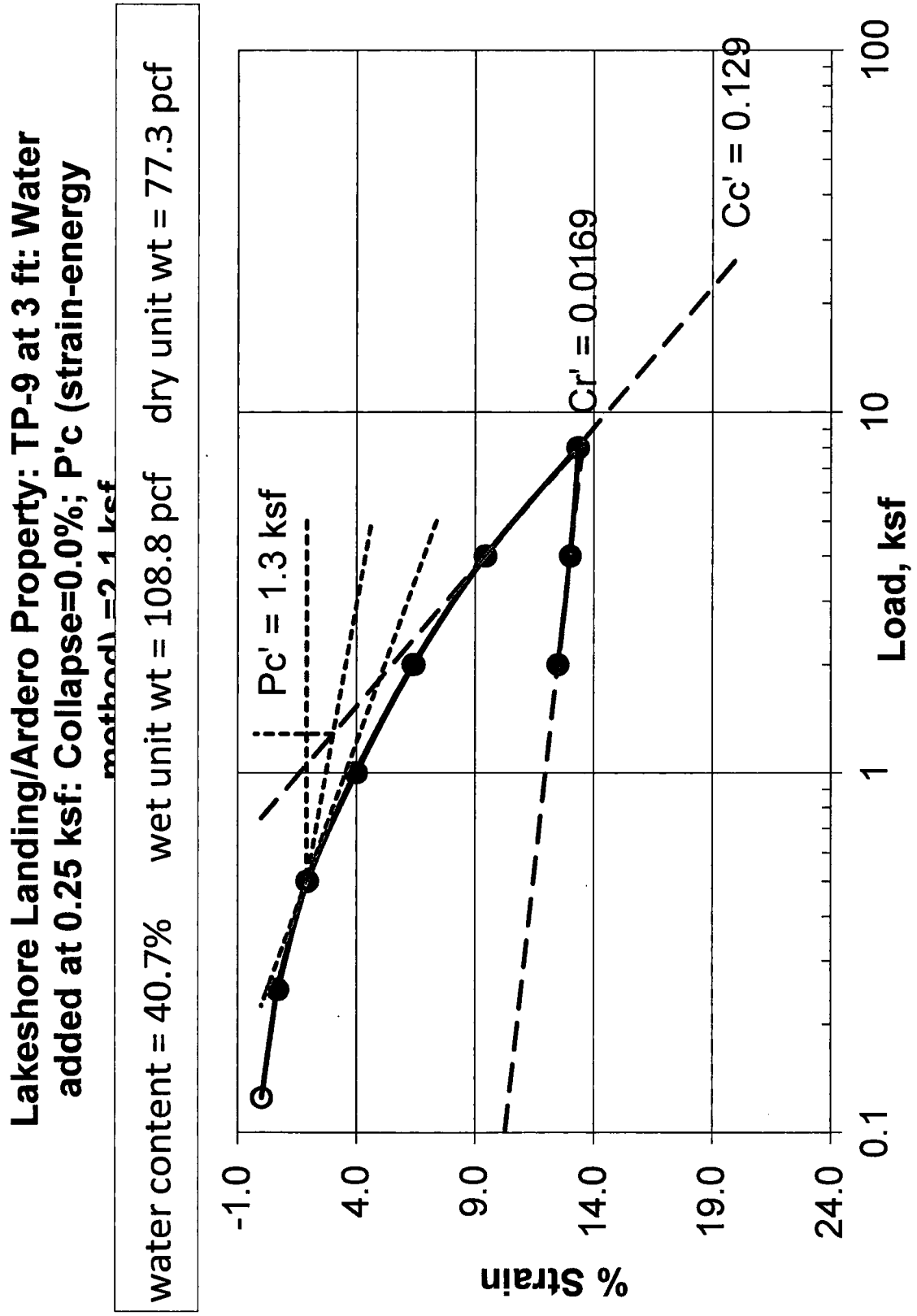
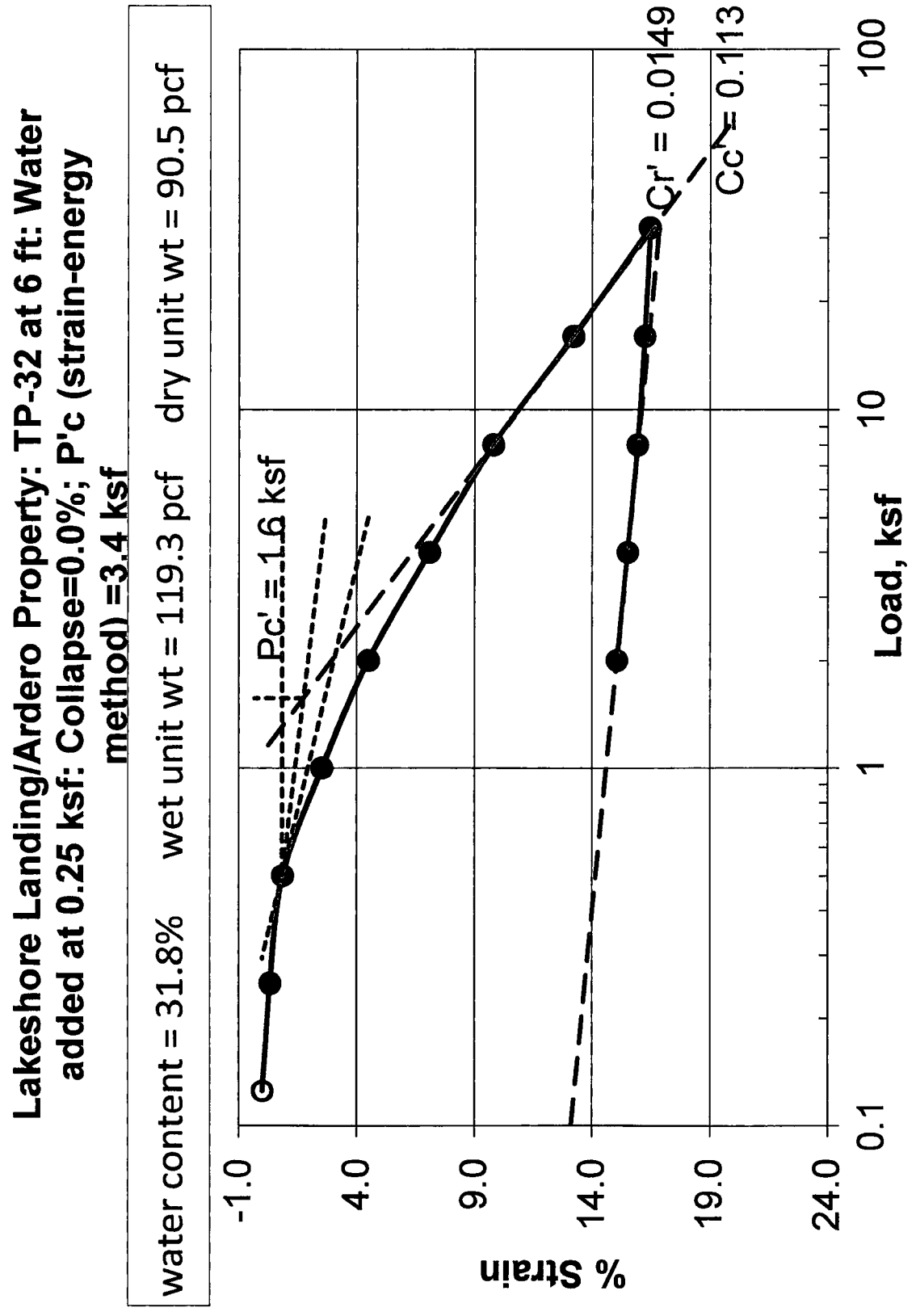
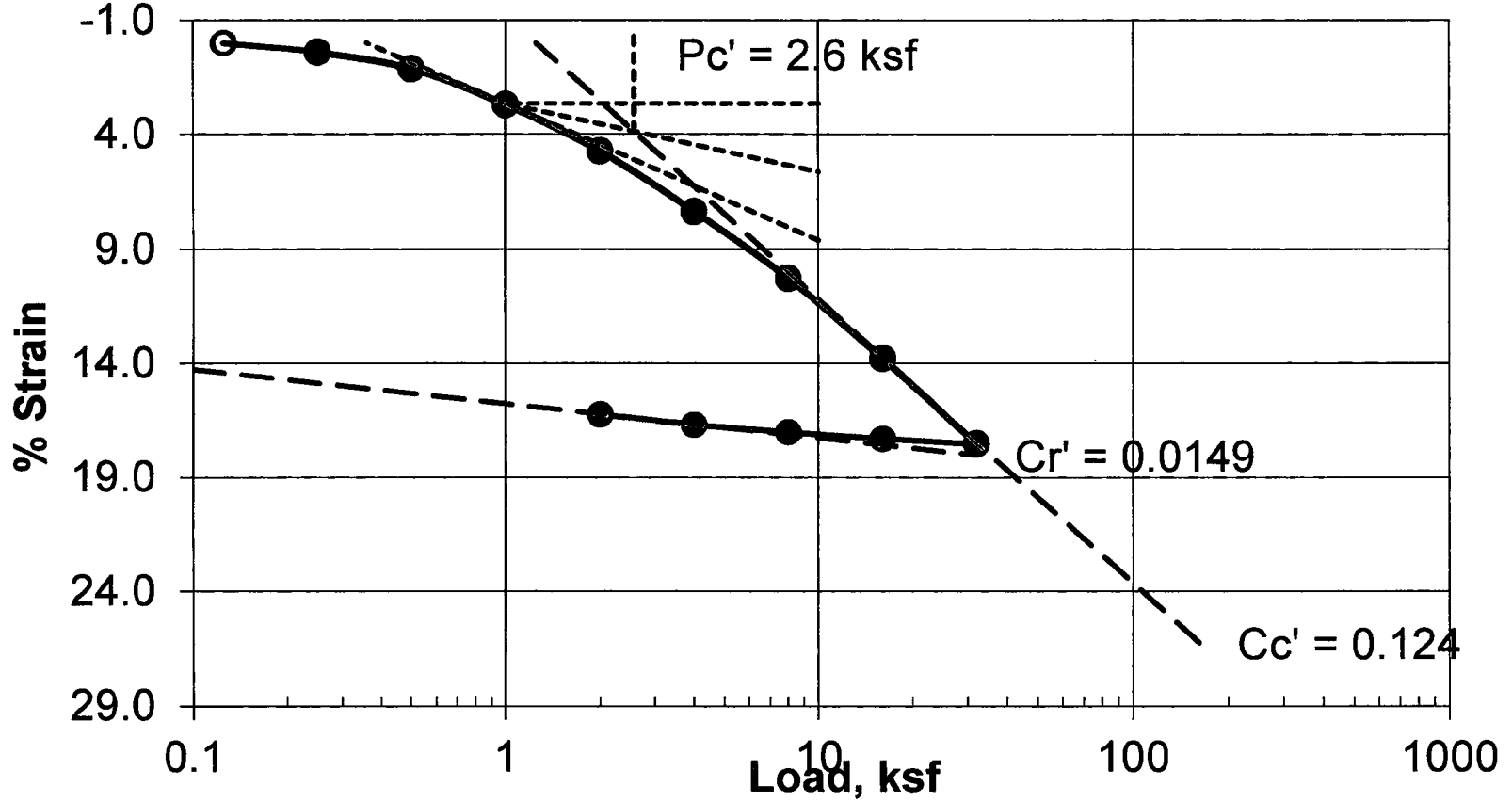

Lakeshore Landing/Ardero Property: TP-9 at 3 ft: Water added at 0.25 ksf: Collapse=0.0%; P'c (strain-energy method) =2.1 ksf
water content = 40.7%
wet unit wt = 108.8 pcf
dry unit wt = 77.3 pcf
Pc' = 1.3 ksf
Cr' = 0.0169
Cc' = 0.129
% Strain
-1.0
4.0
9.0
14.0
19.0
24.0
0.1
1
10
100
Load, ksf


Lakeshore Landing/Ardero Property: TP-32 at 6 ft: Water added at 0.25 ksf: Collapse=0.0%; P'c (strain-energy method) =3.4 ksf
water content = 31.8%
wet unit wt = 119.3 pcf
dry unit wt = 90.5 pcf
Pc' = 1.6 ksf
Cr' = 0.0149
Cc' = 0.113
% Strain
-1.0
4.0
9.0
14.0
19.0
24.0
0.1
1
10
100
Load, ksf

Lakeshore Landing/Ardero Property: TP-39 at 3 ft: Water added at 0.25 ksf: Collapse=0.0%; P'c (strain-energy method) =3.5 ksf

water content = 32.3% wet unit wt = 114.1 pcf dry unit wt = 86.3 pcf



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LATERAL EARTH PRESSURES

	ENTER				
Project:	**Lakeshore Landing/Ardero Property, #16111**				
Density of water:	**62.4**	pcf			
Internal Friction Angle of Soil:	**26**	deg.	=	0.453785606 rad.	0.325155059
Angle of Soil Backfill (from horiz.):	**0**	deg.	=	0 rad.	
Friction angle of soil/wall interface:	**13**	deg.	=	0.226892803 rad.	
Angle of back of wall (from VERT.):	**0**	deg.	=	0 rad.	1.570796327
Angle of front of wall (from VERT.):	**0**	deg.	=	0 rad.	
Density of soil (above water):	**120**	pcf			
Horizontal Acceleration:	**0.31**	g	=>	0.30060567 (theta, radians, for k_v = 0)	
Height of Wall, H:	**8**	feet			

CALCULATIONS

AT REST K_o =	0.562				
At Rest Pressure =	67	psf/ft above water	=	95	psf/ft below water
Coulomb K_a =	0.353	(Accounts for wall friction)			
Coulomb K_p =	3.787	(Accounts for wall friction)			
Coulomb Active Pressure =	42	psf/ft above water	=	83	psf/ft below water
Coulomb Passive Pressure =	454	psf/ft above water	=	281	psf/ft below water
Rankine K_a =	0.390				
Rankine K_p =	2.561				
Rankine Active Pressure =	47	psf/ft above water	=	85	psf/ft below water
Rankine Passive Pressure =	307	psf/ft above water	=	210	psf/ft below water
Mononobe-Okabe Seismic K_{ae} =	0.67				
Mononobe-Okabe Seismic K_{pe} =	2.66				
M.-O. Seismic Active Pressure =	80	psf/ft above water	=	101	psf/ft below water
M.-O. Seismic Passive Pressure=	320	psf/ft above water	=	216	psf/ft below water

Ultimate Coefficient of Friction =	0.487732589
Allowable Coefficient of Friction (FS=1.5) =	0.325155059
(Structural Fill, phi = 32°) Ultimate Coefficient of Friction =	0.624869352
Allowable Coefficient of Friction (FS=1.5) =	0.416579568