GEOTECHNICAL STUDY
Houston Ship Channel Expansion Channel Improvement Project
Harris and Chambers Counties, Texas

SUBMITTED TO

HDR Engineering, Inc.

4828 Loop Central Drive, Suite 800

Houston, Texas 77081

BY

HVJ ASSOCIATES, INC.

HOUSTON, TEXAS

DECEMBER 4, 2020

REPORT NO. HG1910092.2.1 - DATA

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December 4, 2020

Mr. Neil McLellan, PE
HDR Engineering, Inc.
4828 Loop Central Drive
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Houston, Texas 77081

Re: Geotechnical Study
Houston Ship Channel Expansion Channel Improvement Project
Harris and Chambers Counties, Texas
Owner: Port of Houston Authority
HVJ Report No. HG1910092.2.1 – DATA

Dear Mr. McLellan:

Submitted herein is the data report of our geotechnical study for the above referenced project. This report presents the summary of our field and laboratory investigations performed for the referenced project above. The study was conducted in general accordance with our proposal number HG1910092.2.1 dated September 12, 2019 (revised October 25, 2019) and is subject to the limitations presented in this report. We appreciate the opportunity of working with you on this project. Please read the entire report and notify us if there are questions concerning this report or if we may be of further assistance.

Sincerely,

HVJ ASSOCIATES, INC.
Firm License No. F-000646

DRAFT
Michael Hasen, PE
Executive Vice President

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Senior Project Manager

MH/AR/ DA:pc

Copies submitted: 1 (electronic)

This document was released under the authority of Michael Hasen, PE 57498 on December 4, 2020 for interim review. This document is not to be used for the purposes of bidding, design, or construction.

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1 EXECUTIVE SUMMARY

HVJ Associates, Inc. was retained by HDR Engineering, Inc. to perform a geotechnical study for the Houston Ship Channel Expansion Channel Improvement Project in Harris and Chambers Counties, Texas. The overall project involves widening and deepening (where applicable) to the Houston Ship Channel (HSC) and its two tributaries, Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC). The dredge material will be used to construct placement areas and beneficial use sites. A site vicinity map showing the ship channel alignment is presented on Plate 1. The work is separated into eleven sections and the description of work at each location is provided Section 2.1.

This data report presents the summary of our field and laboratory findings. A separate design report includes slope stability and consolidation settlement analyses of the E2-Clinton, Beltway 8, and Cell M12 placement area dike slopes, stability evaluation of the HSC (Segment 4), BCC and BSC channels side slopes and global stability evaluation of the bulkhead at the Barbours Cut terminal. In addition, the report also includes axial capacity of the driven piles that will support the spillboxes at the E2 Clinton placement area. Site capacity of the placement areas is also included in the design report.

A total of 74 soil borings were drilled with depths ranging between 40 and 170 feet below the existing grade. A very generalized summary of the subsurface conditions observed in our borings is presented below.

BSC Widening – San Jacinto College: Borings ECP-207 and ECP-208 were drilled adjacent to the proposed bulkhead to a depth of 110 feet below the existing grade. The depth of water at the boring locations varied between 16 and 20 feet. In addition, marine borings ECP-205A and ECP-206A were performed by JV at this location. The borings were drilled to a depth of about 60 to 64 feet below the mudline. The following table presents the summary of soil conditions observed at the site.

BSC Widening – San Jacinto College

Borings	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-205A, ECP-206A, ECP-207 & ECP-208	+11 to +5	-38 to -55	Firm to very stiff clays*
	-38 to -55	-72 to -102	Medium dense to very dense sands or silt
	-72 to -102	-98	Firm to very stiff clays
	-98	-105	Loose sand

*Boring ECP-208 has medium dense sand layer between El. -11 and El. -21 feet.

BSC Widening – East of San Jacinto College to HSC: Borings ECP-209 thru ECP-222 were drilled on the north bank of BSC to a depth of 90 feet below the existing grade. The depth of water varied between 9 and 28 feet. The following table presents the summary of soil conditions observed along BSC.

BSC Widening – East of San Jacinto College

Borings	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-209 thru ECP-222	+16 to +7	2 to -14	Firm to hard clays
	2 to -14	-9 to -20	Loose to very dense sands or silt*
	-9 to -20	-40 to -59	Firm to very stiff clays
	-40 to -59	-64 to -72	Medium dense to very dense sands**
	-64 to -72	-74 to -82	Stiff to hard clays***

*Sand or silt layer was not encountered in borings ECP-217, ECP, 219, ECP-220 and ECP-222 at these depths.
**Sand layer was not encountered in boring ECP-212 at these depths.
***A dense sand layer was observed in boring ECP-215 between El. -74 and El. -81 feet.

BCC Widening – Spilmans Island: Borings ECP-309 thru ECP-316 were performed at this site to depths ranging between 130 and 170 feet below the existing grade. Borings ECP-309, ECP-313, ECP-314 and ECP-315 were drilled on top of the existing dike whereas borings ECP-310, ECP-311 and ECP-312 were drilled in the interior part of the placement area. Boring ECP-316 was performed adjacent to the BCC shore line. The depth of water at the boring locations varied between 5 and 15 feet. In addition, three Piezocone Penetrometer tests and three Vane Shear tests were performed along Spilmans Island south dike.

In general, very soft to very stiff clays were predominantly encountered at the surface underlain by loose to very dense sands and silts at deeper depths in all the borings. Intermittent very loose to loose sand or silt layers of thickness 2 to 8 feet were observed in the top 20 feet in borings ECP-309 thru ECP-315.

BCC – Site 1: Borings ECP-317, ECP-318 and ECP-319 were drilled adjacent to the proposed bulkhead to a depth of 100 feet below the existing grade. Water was observed at the surface at boring ECP-317 and it varied between 3 and 8 feet at the remaining locations. In addition, marine borings ECP-307A and ECP-308A were performed in the vicinity by JV. The following table presents the summary of soil conditions observed at the site.

BCC – Site 1

Borings	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-307A, ECP-308A, ECP-317, ECP-318 & ECP-319	+9 to +4	-8 to -11	Soft to stiff clays*
	-8 to -11	-19 to -23	Very loose to medium dense sands or silt**
	-19 to -23	-91 to -96	Soft to hard clays***

* Fill material comprised of clayey sand, crushed concrete and gravel was observed in boring ECP-318 from surface to 12 feet (El. -7 feet).
**Sand layer was not encountered in boring ECP-319.
*** Boring ECP-318 has medium dense sand layer between El. -53 and El. -58 feet.

BCC – Site 2: Borings ECP-320 and ECP-321 were drilled at this location to a depth of 100 feet below the existing grade. The depth of water at the boring locations varied between 6 and 8 feet. Also, marine boring ECP-304B was performed to a depth of 52 feet below the mudline. The following table presents the summary of soil conditions observed at the site.

BCC – Site 2

Borings	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-304B, ECP-320 & ECP-321	+8 to +6	0 to +2	Fill material comprised of sandy lean clay with shells, asphalt and glass fragments
	0 to +2	-20 to -23	Very loose to loose silt or sand*
	-20 to -23	-53 to -65	Very soft to stiff clays
	-53 to -65	-85 to -87	Very loose to dense sands*
	-85 to -87	-92 to -94	Stiff to very stiff clay

* Boring ECP-320 has firm clay layer between El. 0 and El. -4 feet and from El. -70 to El. -75 feet.

HSC Bayou Reach: Boring ECP-426D was drilled near HSC Centerline Station 803+27 to a depth of 60 feet below the existing grade. Water was encountered at a depth of 8 feet. Firm to very stiff clays were observed in the top 24 feet with very loose to loose sand layer between 6 and 12 feet. Very loose to very dense sands were encountered between 24 and 60 feet with 10-foot thick very stiff to hard clay layer below 40 feet.

E2 Clinton Placement Area: Borings ECP-2001 thru ECP-2013 were drilled at this location to a depth of 40 to 70 feet below the existing grade. Borings ECP-2002, ECP-2009 and ECP-2012 were performed in the site interior and the remaining borings were drilled along the proposed dike alignment. The depth of water at the boring locations varied between 6 and 8 feet below the existing grade. In order to investigate the extent of hydraulically placed interior fill at the dike location a program of 31 piezocone penetrometer (PCPT) were performed to depths ranging from 15 to 40 feet. Three of these tests were also used to confirm the soil conditions in the northwest corner of the site.

Very soft to very stiff clays were predominantly observed from the surface to the boring termination depths at most of the locations. Very loose to medium dense sands were encountered in borings, ECP-2007, ECP-2008, ECP-2010, ECP-2011, ECP-2012 and in several PCPT's at various depths and thicknesses as shown in the table below.

Elevation and Location of Cohesionless Soils

Boring	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-2007	+30	+22	Very loose to medium dense sand
ECP-2008	+30	+24	Loose sand
ECP-2010	+32	+24	Very loose sand
ECP-2011	+15	+13	Sand
ECP-2012	+22	+12	Medium dense sand
ECP-EC-C01	0.4	-4.2	Silt
ECP-EC-C02	+13.3	+10.9	Silt
ECP-EC-C03	-0.6	-2.6	Silt
	-4.2	-8	Silt
ECP-EC-C11	+28.8	+26.5	Sand/Silt
	+17.2	+14	Sand
ECP-EC-C12	+16	+14	Sand
ECP-EC-C13	+29.7	+27.4	Sand/Silt
	+17.4	+15	Sand/Silt
ECP-EC-C14	+27.6	+25.5	Sand/Silt
	+14.9	+13.6	Sand/Silt
ECP-EC-C16	+28.1	+26.2	Sand/Silt
ECP-EC-C17	+27.4	+24.8	Sand/Silt
ECP-EC-C18	+26.6	+24.7	Sand/Silt
ECP-EC-C19	+34.6	+24.7	Sand/Silt
ECP-EC-C20	+30.5	+23.5	Sand/Silt
ECP-EC-C21	+26	+21.5	Sand/Silt
ECP-EC-C23	+26.3	+23.5	Sand/Silt
ECP-EC-C24	+26	+24.2	Sand/Silt
ECP-EC-C26	+17.8	+15.3	Sand/Silt
ECP-EC-C27	+27.7	+22.7	Sand/Silt
	+16.5	+13.3	Sand/Silt

Boring	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-EC-C29	+16.6	+13.8	Sand/Silt
ECP-EC-C30	+16.6	+13.5	Sand/Silt
ECP-EC-C31	+16	+13.3	Sand/Silt

We note that samples obtained at boring ECP-2005 between 6 and 10, ECP-2011 between 6 and 8, and at ECP-2010 between 6 and 10 contain gasoline odor.

Beltway 8 Placement Area: Borings ECP-2014 thru ECP-2044 were drilled at this location to a depth of 40 below the existing grade. In general, firm to hard cohesive soils were observed throughout the boring depths with occasional loose to medium dense silt below 28 feet. At most locations the groundwater depth varied between 18 and 39 feet. As borings ECP-2023 and ECP-2024 drilled at northwest corner of the site groundwater was encountered at 11 to 12 feet. We note that groundwater was not observed in borings ECP-2027, ECP-2028, ECP-2033 and ECP-2038.

Borings ECP-2014 and ECP-2044 performed in the southwestern corner of the site are in an area where the ground surface elevation is at or near El. +30. These borings generally encountered very loose to loose silty sand or silt in the upper 10 to 12 feet with groundwater encountered at 6 to 8 feet. A surficial layer of 2 feet thick very loose silt or sand was observed in borings ECP-2015, ECP-2017, ECP-2021, ECP-2019 and ECP-2039 and a layer 4 feet thick was encountered at ECP-2031. At ECP-2015 a layer of loose to medium dense sandy silt and silty sand was encountered between 6 and 12 feet.

Please note that this executive summary does not fully relate our findings. These findings are only presented through our full report.

2 INTRODUCTION

2.1 Project Description

HVJ Associates, Inc. was retained by HDR Engineering, Inc (HDR) to perform a geotechnical study for the Houston Ship Channel Expansion Channel Improvement Project in Harris and Chambers Counties, Texas. The overall project involves widening and deepening (where applicable) to the Houston Ship Channel (HSC) and its two tributaries, Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC). The dredge material will be used to construct placement areas and beneficial use sites.

The design responsibility has been divided between HDR, and Turner, Collie, and Braden, Inc. and Gahagan & Bryant Associates, Inc. Joint Venture (JV). All marine geotechnical borings were performed under the JV and land geotechnical borings were performed under HDR. Where the design is the responsibility of the JV our scope of work is limited to performing landside field investigation, laboratory testing and preparing a data report presenting the results of our investigation. Where the design is the responsibility of HDR our scope of work involves geotechnical engineering analyses and recommendations in addition to obtaining the land field and laboratory data. The geotechnical design is presented in a separate design report. The work is separated into eleven sections and the description of work at each location is provided below.

1. **Houston Ship Channel Widening - Bay Reach** – We note that engineering design for the Bay Reach is by others. There are no land borings needed to support the geotechnical design, therefore no work is performed related to the Bay Reach.

2. **Houston Ship Channel Widening - Bayou Reach** – The Bayou Reach of the HSC extends from Station 00+05 near Morgans Point to Station 1266+48 at the Turning Basin. The Turning Basin stations range from 00+00 to 30+95. Planned modifications to the channel in the Bayou reach are described below.

    - No widening or deepening is planned from Morgans Point (Station 00+05) to Boggy Bayou (Station 684+03).
    - Between Boggy Bayou to Greens Bayou (Station 833+05) the channel will be deepened from -41.5 to -49.5 feet MLLW plus 1 foot overdredge allowance for a total project depth of -50.5 feet MLLW. The channel will be widened from 300 feet to 530 feet from Station 684+03 to 823+35.
    - Between Greens Bayou and Sims Bayou (Station 1110+78) the channel will not be widened but will be deepened to a total project depth of -49.5 feet as discussed above, the deepening will extend to Hunting Bayou at Station 930+00 which is not the full length. No widening or deepening will occur between Stations 930+00 to 1110+78.

    We note that marine borings and laboratory testing needed to support the design were performed by the JV and a data report was provided to us. We performed one land boring near HSC Centerline Sta. 803+27.

3. **Bayport Ship Channel Widening** – The 4.1-mile long BSC will be widened generally to 455 feet, the land cut by 105 feet to the north and the bay cut by 55 feet to the north. Based on the recent information provided to us, we understand that the channel will be tapered down as it approaches the Bayport Turning Basin to avoid impacts to the San Jacinto College Maritime Campus (SJC) school site.

   We performed two land borings and laboratory testing at the SJC site. In addition, we performed fourteen soil borings along the BSC north shore to support the design by JV.

4. **Barbours Cut Ship Channel Widening** – The BCC is 300 feet wide and 1.6-mile long. The channel mouth will be widened and the channel will be widened to the north by 155 feet towards Spilmans Island Placement Area. A bulkhead will be required to provide adequate global stability for the north slope of the channel and the adjacent Spilmans Island Placement Area. In addition, this will require relocation of the Spilmans Island dike at the southeast corner towards the north. A bulkhead may be required at the eastern end at Morgan's Point due to the BCC flare dredging encroaching on the existing container terminal.

   We note that 8 marine borings and laboratory testing needed to support the design were performed by the JV and a data report was provided to us. We performed five land borings at the eastern end near Morgan's Point. In addition, eight borings, three Piezocone Penetrometer tests and three Vane Shear tests were performed at Spilmans Island.

5. **Lower Bay Bird Islands** – We note that engineering design for Lower Bay Bird Islands is by others. There are no land borings needed to support the geotechnical design, therefore no work is performed under this study.

6. **Bird Island Marsh** – We note that engineering design for the Bird Island Marsh is by others. There are no land borings needed to support the geotechnical design, therefore no work is performed under this study.

7. **Atkinson Island Cell, M11** – We note that engineering design for M11 is by others. There are no land borings needed to support the geotechnical design, therefore no work is performed under this study.

8. **Atkinson Island Cell, M12** – M12 has about 11,600 feet of new dike with 20-foot wide crest at an elevation of about +8.00 feet MLLW. The exterior slope will be 2.5H:1V with stone riprap and the interior slope will be 3H:1V earthen slope. We note that marine borings and laboratory testing needed to support the design were performed by the JV and a data report was provided to us.

9. **Oyster Reef** – We note that engineering design for the Oyster Reef is by others. There are no land borings needed to support the geotechnical design, therefore no work is performed under this study.

10. **BSC Shoaling Attenuation Feature** – We note that engineering design for the BSC Shoaling Attenuation Feature is by others. There are no land borings needed to support the geotechnical design, therefore no work is performed under this study.

11. **Bayou Reach Placement Areas** – The placement areas E2 Clinton and Beltway 8 tracts are currently undeveloped parcels. The E2 Clinton tract has about 8,000 feet of new dike with 15-foot wide crest at an elevation of about +55.00 feet MLLW. Beltway 8 tract has about 16,800 feet of new dike with 10 to 15-foot wide crest at an elevation of about +32 feet MLLW.

    We performed thirteen land borings and laboratory testing at the E2 Clinton site. In addition, thirty one Piezocone Penetrometer tests were performed along the proposed dike alignment. At the Beltway 8 Placement Area, we performed thirty one land borings and laboratory testing.

2.2 Geotechnical Investigation Program

The objectives of this study were to gather information on subsurface conditions at the site and to develop design recommendations to construct the placement areas, retaining walls and to perform stability analyses of the channel slopes. The objectives were accomplished by:

1. Drilling 74 soil borings to depths ranging between 40 and 170 feet below the existing grade to determine soil stratigraphy and obtained samples for laboratory testing;

2. Performing laboratory tests to determine physical and engineering characteristics of the soils;

3. Performing 3 Piezocone Penetrometer Tests and 3 Vane Shear Tests along the Spilmans Island dike to a depth of 60 feet below the existing grade;

4. Performing 31 Piezocone Penetrometer Tests along the E2 Clinton dike to depths ranging between 16 and 41 feet below the existing grade.

Subsequent sections of this report contain descriptions of the field exploration, laboratory-testing program and general subsurface conditions.

3 FIELD INVESTIGATION

3.1 Field Exploration

For this study, 74 soil borings were drilled with depths ranging between 40 and 170 feet below the existing grade. Approximate locations of the borings, PCPT and VST performed during this study are presented on the Plan of Borings, Plate 2. Drilling equipment mounted on all terrain vehicle and marsh buggy were utilized to perform the field investigation.

In general, the samples were obtained at two-foot intervals to 20 feet and at five-foot intervals below 20 feet. We note that samples were obtained continuously to the termination depth of boring ECP-426D. Cohesive soils were sampled using thin-walled tube and cohesionless soils were sampled with the Standard Penetration Test (SPT) sampler. Each sample was extruded in the field, visually classified, and strength estimate obtained with a pocket penetrometer or torvane. Representative portions of the samples were wrapped and sealed for transport to our laboratory. Detailed descriptions of the soils encountered in the borings are given on the boring logs presented in

Appendix A. A key to the soils classification and symbols used in the boring logs is also presented in Appendix A.

3.2 Water Level Measurements

Water level in the borings was recorded during the drilling operations and the water level measurements are presented on the boring logs presented in Appendix A.

3.3 Piezocone Penetrometer Testing (PCPT)

Thirty five PCPT soundings were performed in general accordance with ASTM D5778-12 using a 20-ton track mounted CPT unit. The in-situ soil data was obtained by hydraulically advancing a cylindrical steel rod, with an instrumented probe at the base, vertically into the subsurface materials at a constant rate of 2 centimeters per second. The instrumented probe consists of a cone-shaped tip element, a cylindrical shaped side friction and pore pressure element mounted between the tip and friction sleeve. Further details can be found in the reports provided as Appendices E and F.

3.4 Vane Shear Testing (VST)

Three VST borings were performed along Spilmans Island dike in general accordance with ASTM D2583-08 using a 20-ton track mounted CPT unit. The tests were conducted at selected depths at locations close to the PCPT locations. The depth of field vane shear tests were determined based on the PCPT test results. The equipment utilized in this investigation for the vane shear testing was a Geotech EVT 2000 Vane System. This system included Eurocode model downhole equipment which provides protection for the 65 x 130 mm rectangular vane blade when pushing the tool to the desired test depth. Further details can be found in the report provided as Appendix E.

3.5 Survey Information

We obtained GPS coordinates of the boring and PCPT locations during drilling. Fugro USA Land, Inc. and HDR provided the Northing, Easting and Elevation of the boring locations. Table 3-1 presents the borehole survey data.

Table 3-1 – Borehole Survey Data

Boring	Northing, Feet	Easting, Feet	Elevation, Feet (MLLW)
Bayport Ship Channel – San Jacinto College			
ECP-207	13,792,461.34	3,232,5,65.42	5.18
ECP-208	13,792,508.38	3,233,056.59	11.05
Bayport Ship Channel – East of San Jacinto College			
ECP-209	13,792,610.83	3,233,612.46	12.71
ECP-210	13,792,629.06	3,234,053.45	14.09
ECP-211	13,792,651.82	3,234,544.89	13.87
ECP-212	13,792,686.99	3,235,020.65	13.18
ECP-213	13,792,577.10	3,235,548.62	15.55
ECP-214	13,792,680.85	3,235,968.78	8.35
ECP-215	13,792,748.10	3,236,415.28	8.74
ECP-216	13,792,765.31	3,236,908.54	8.61

Boring	Northing, Feet	Easting, Feet	Elevation, Feet (MLLW)
ECP-217	13,792,792.57	3,237,347.99	9.21
ECP-218	13,792,807.26	3,237,848.45	9.31
ECP-219	13,792,858.15	3,238,351.67	14.47
ECP-220	13,792,880.24	3,238,857.33	9.49
ECP-221	13,792,894.48	3,239,310.42	7.55
ECP-222	13,792,918.96	3,239,740.89	10.86
Barbours Cut Channel – Spilmans Island			
ECP-309	13,818,082.34	3,238,312.07	31.54
ECP-310	13,818,238.53	3,238,942.13	34.42
ECP-311	13,818,366.68	3,240,208.53	31.28
ECP-312	13,818,508.34	3,241,156.78	30.23
ECP-313	13,817,955.11	3,238,634.13	39.44
ECP-314	13,818,145.06	3,239,580.73	39.08
ECP-315	13,818,279.41	3,240,846.93	39.61
ECP-316	13,817,700.71	3,238,642.83	9.17
ECP-C1	13,818,393.68	3,241,169.53	36.5
ECP-C2	13,818,018.03	3,239,243.26	34.7
ECP-C3	13,818,276.45	3,240,462.26	35.85
Barbours Cut Channel – Site 1			
ECP-317	13,817,284.46	3,243,480.96	4.55
ECP-318	13,817,229.71	3,243,652.29	4.99
ECP-319	13,817,084.89	3,243,673.15	9.07
Barbours Cut Channel – Site 2			
ECP-320	13,815,636.21	3,244,220.69	7.97
ECP-321	13,815,493.21	3,244,294.45	5.92
HSC Bayou Reach – Segment 4			
ECP-426D	13,839,266.69	3,184,503.26	7.41
E2 Clinton Placement Area			
ECP-2001	13,841,411.43	3,163,472.28	29.79
ECP-2002	13,841,147.95	3,163,951.67	29.44
ECP-2003	13,841,589.29	3,163,910.99	26.35
ECP-2004	13,841,359.77	3,164,315.21	29.61
ECP-2005	13,840,476.58	3,164,380.72	29.63
ECP-2006	13,839,650.04	3,164,322.71	27.35
ECP-2007	13,838,781.18	3,164,456.55	34.36
ECP-2008	13,838,432.35	3,163,980.99	30.08

Boring	Northing, Feet	Easting, Feet	Elevation, Feet (MLLW)
ECP-2009	13,839,217.33	3,164,066.81	26.92
ECP-2010	13,838,730.37	3,163,632.74	32.18
ECP-2011	13,839,559.39	3,163,579.57	30.55
ECP-2012	13,840,239.16	3,163,975.67	30.36
ECP-2013	13,840,558.01	3,163,520.94	30.56
ECP-EC-C01	13,842,007.50	3,163,829.78	28.94
ECP-EC-C02	13,842,036.40	3,164,162.18	29.11
ECP-EC-C03	13,841,677.10	3,164,189.63	29.75
ECP-EC-C04	13,841,617.69	3,163,813.77	25.94
ECP-EC-C05	13,841,235.09	3,163,908.64	28.70
ECP-EC-C06	13,841,277.75	3,163,539.02	30.20
ECP-EC-C07	13,840,925.50	3,163,785.29	29.86
ECP-EC-C08	13,840,867.67	3,163,571.28	29.47
ECP-EC-C09	13,840,475.15	3,163,583.92	30.49
ECP-EC-C10	13,840,272.13	3,163,606.34	30.07
ECP-EC-C11	13,840,076.08	3,163,619.01	29.78
ECP-EC-C12	13,839,865.38	3,163,628.97	29.76
ECP-EC-C13	13,839,672.96	3,163,641.52	30.77
ECP-EC-C14	13,839,346.16	3,163,661.57	29.45
ECP-EC-C15	13,839,001.61	3,163,694.90	30.14
ECP-EC-C16	13,838,724.06	3,163,662.57	29.79
ECP-EC-C17	13,838,643.22	3,163,750.90	28.34
ECP-EC-C18	13,838,562.09	3,163,829.71	29.62
ECP-EC-C19	13,838,499.27	3,164,025.40	34.60
ECP-EC-C20	13,838,577.32	3,164,302.27	34.42
ECP-EC-C21	13,838,984.22	3,164,397.09	27.55
ECP-EC-C22	13,839,143.83	3,164,382.42	25.31
ECP-EC-C23	13,839,364.92	3,164,356.24	27.59
ECP-EC-C24	13,839,542.80	3,164,344.16	28.30
ECP-EC-C25	13,839,753.19	3,164,324.68	28.45
ECP-EC-C26	13,840,127.54	3,164,312.61	30.39
ECP-EC-C27	13,840,449.01	3,164,353.04	29.12
ECP-EC-C28	13,840,548.42	3,164,276.82	29.15
ECP-EC-C29	13,840,755.58	3,164,270.14	29.31
ECP-EC-C30	13,840,969.71	3,164,253.71	29.34
ECP-EC-C31	13,841,169.91	3,164,256.78	29.16

Boring	Northing, Feet	Easting, Feet	Elevation, Feet (MLLW)
Beltway 8 Placement Area			
ECP-2014	13,836,977.07	3,191,747.97	28.49
ECP-2015	13,837,755.28	3,191,620.51	21.46
ECP-2016	13,838,288.24	3,192,754.92	24.61
ECP-2017	13,838,211.73	3,191,612.43	25.00
ECP-2018	13,838,845.48	3,191,584.46	24.94
ECP-2019	13,839,359.17	3,191,552.86	25.61
ECP-2020	13,839,877.84	3,191,540.15	24.05
ECP-2021	13,839,603.85	3,192,221.43	25.21
ECP-2022	13,840,465.93	3,191,537.93	24.15
ECP-2023	13,841,108.34	3,191,496.25	23.20
ECP-2024	13,841,700.43	3,191,556.44	23.21
ECP-2025	13,841,605.45	3,192,117.00	24.62
ECP-2026	13,841,486.46	3,192,656.24	23.13
ECP-2027	13,840,474.15	3,192,891.38	24.37
ECP-2028	13,841,319.93	3,193,296.53	22.68
ECP-2029	13,841,122.26	3,193,909.75	22.63
ECP-2030	13,840,965.69	3,194,568.79	21.97
ECP-2031	13,840,819.93	3,195,100.41	23.59
ECP-2032	13,840,322.78	3,195,299.53	23.42
ECP-2033	13,839,829.05	3,194,508.61	23.76
ECP-2034	13,839,688.34	3,195,091.98	23.76
ECP-2035	13,839,048.44	3,194,925.94	23.37
ECP-2036	13,838,274.31	3,194,701.76	24.22
ECP-2037	13,838,154.43	3,193,967.07	24.38
ECP-2038	13,839,496.51	3,193,531.34	24.62
ECP-2039	13,837,516.14	3,193,792.84	24.88
ECP-2040	13,837,042.31	3,193,502.60	15.65
ECP-2041	13,836,914.45	3,193,062.68	16.65
ECP-2042	13,837,439.82	3,192,549.76	24.08
ECP-2043	13,836,660.32	3,192,689.27	17.40
ECP-2044	13,836,629.40	3,192,173.45	30.85

Coordinates shown are referenced to U.S. State Plane Texas South Central Zone 4204, North American Datum 83. Elevations are referenced to Mean Lower Low Water (MLLW).

4 LABORATORY TESTING

4.1 General

Selected soil samples were tested in the field and laboratory to estimate physical and engineering properties applicable to the site. All tests were performed according to the relevant ASTM Standards. These tests consisted of moisture content measurements, Atterberg limits, pocket penetrometer, torvane, percent finer than No. 200 sieve, unconsolidated undrained (UU) compression, unconfined compression (UC), unit dry weight, consolidated undrained (CU) triaxial compression with pore pressure measurements and consolidation tests.

The Atterberg limits and percent passing No. 200 sieve tests were utilized to verify field classification by the Unified Soils Classification System. The compression tests were performed to obtain the undrained and drained shear strength parameters of the soil. The type and number of tests performed for this investigation are summarized in Table 4-1.

Table 4-1 – Type and Number of Laboratory Tests

Laboratory Test Name	Number of Tests
Moisture Content (ASTM D2216)	1174
Atterberg Limits (ASTM D4318)	688
Percent Finer than No. 200 Sieve (ASTM D1140)	680
UC- Compression (ASTM D 2166)	121
UU- Compression (ASTM D2850)	279
CU- Compression (ASTM D 4767) – multi stage	18
Consolidation (ASTM D2435)	7
Sieve Analysis (ASTM D6913)	4

The laboratory test results are presented on the boring logs presented in Appendix A. A summary of lab tests results are presented in Appendix B. Test results from UU Triaxial nd UC Compression tests are presented in Appendix G. Consolidated undrained triaxial compression, consolidation and sieve analysis test results are discussed further in the following sections.

4.2 Consolidated Undrained Triaxial Test

Consolidated undrained (CU) triaxial tests were performed in accordance with ASTM D4767. A soil specimen is fully saturated in a triaxial cell and isotropically consolidated while allowing drainage to occur. Once the sample is consolidated, the drainage valve is closed and the sample is sheared in compression at a constant rate of axial deformation. This testing provides shear strength parameters for total stress and effective stress global stability analysis. The test results are summarized in Table 4-2 and the laboratory data is presented in Appendix C.

Table 4-2 – Consolidated Undrained Test Results

Boring No.	Depth, Feet	Soil Type (USCS)	c', psf	ϕ', degrees	c_{cu}, psf	ϕ_{cu}, degrees
BSC – Bay Cut & SJC Site						
ECP-207	28-30	Fat Clay (CH)	360	21.9	475	15.1
ECP-208	12-14	Lean Clay (CL)	201	26.7	273	24.2
ECP-210	14-16	Lean Clay (CL)	271	22.7	500	14.8
ECP-214	28-30	Lean Clay (CL)	268	26.2	418	18.4
ECP-217	28-30	Fat Clay (CH)	359	17.8	586	8.8
Barbours Cut Channel – Spilmans Island						
ECP-314	10-12	Lean Clay w/ Sand (CL)	245	18.6	346	12.5
ECP-315	8-10	Fat Clay w/ Sand (CH)	93	29.2	218	20.1
Barbours Cut Channel – Site 1						
ECP-317	6-8	Lean Clay (CL)	187	25.8	317	16.0
ECP-317	28-30	Fat Clay (CH)	158	22.6	115	17.7
ECP-319	16-18	Fat Clay (CH)	317	23.6	288	15.1
Barbours Cut Channel – Site 2						
ECP-321	33-35	Fat Clay (CH)	86	23.2	259	10.8
HSC Bayou Reach						
ECP-426D	16-18	Lean Clay (CL)	247	21.4	264	17.8
E2 Clinton Placement Area						
ECP-2003	10-12	Lean Clay w/ Sand (CL)	806	16.2	720	16.4
ECP-2004	6-8	Fat Clay (CH)	187	23.4	302	14.1
ECP-2006	8-10	Lean Clay (CL)	230	27.6	432	21.4
Beltway 8 Placement Area						
ECP-2020	6-8	Lean Clay	370	17.7	510	16.6
ECP-2031	12-14	Fat Clay	190	16.7	310	13.1
ECP-2043	6-8	Fat Clay	740	16.3	630	16.5

Where:
c': Consolidated Drained Cohesion
c_{cu}: Consolidated Undrained Cohesion
ϕ': Consolidated Drained Friction Angle
ϕ_{cu}: Consolidated Undrained Friction Angle

Note that we performed CU triaxial tests using a multi-stage test on single samples. The ASTM Test Method is based on shearing three separate samples each consolidated to a different overburden pressure. In the multi-stage test, a single sample will be consolidated to three different consolidation

pressures and sheared at the end of each consolidation step. The initial two shear steps were to a low strain approaching a peak failure stress at that level. Shearing after the final step proceeded to failure per the ASTM method. We used multi-stage method due to the limited availability of multiple test specimens in an individual boring.

4.3 Consolidation Test Results

One-dimensional consolidation tests were performed in accordance with ASTM D2435. In the test, a cylindrical soil specimen is restrained laterally and axially drained while subjected to applied vertical loadings. Seating stress is applied to the sample, then inundated. Once the sample stabilizes (does not change in height), the sample is loaded incrementally to obtain the virgin compression and rebound curves. The stress where the sample changes from rebound compression to virgin compression is referred to as the preconsolidation pressure, which represents the stress at which the soil has previously been subject to loading and unloading increments, measurements are made of the change in the specimen height and the data is used to determine the relationship between applied stress and void ratio. The actual laboratory test data is presented in in Appendix D. Table 4-3 presents the consolidation test results:

Table 4-3 – Consolidation Test Results

Boring	Depth, Feet	Soil Description	e_0	C_c	Cr	σ_p, psf	OCR
E2 Clinton Placement Area							
ECP-2003	6-8	Lean Clay w/ Sand (CL)	0.556	0.103	0.018	3,800	4.68
ECP-2005	28-30	Lean Clay w/ Sand (CL)	0.460	0.100	0.013	6,650	3.22
ECP-2006	14-16	Lean Clay (CL)	0.559	0.102	0.028	6,000	4.36
ECP-2008	14-16	Fat Clay w/ Sand (CH)	0.774	0.170	0.096	20,000	16.52
Beltway 8 Placement Area							
ECP-2018	6-8	Sandy Lean Clay (CL)	0.524	0.118	0.037	6,600	7.50
ECP-2026	18-20	Fat Clay (CH)	0.993	0.250	0.126	10,200	4.25
ECP-2037	14-16	Fat Clay (CH)	0.894	0.207	0.126	11,600	6.17

Where:
e_0: Initial Void Ratio
C_c: Compression Index
σ_p: Preconsolidation Pressure, psf
C_r: Recompression Index
OCR: Overconsolidation Ratio with effective overburden pressure at the sample depth.

4.4 Sieve Analysis Test Results

The sieve analysis tests were performed primarily at locations requested by HDR. The test results are presented in Appendix H and are summarized in the following table.

Table 4-4 – Sieve Analysis Test Results

Boring	Depth, Feet	Soil Description
ECP-315	103 – 105	Silty Sand
	113 – 115	Silty Sand

Boring	Depth, Feet	Soil Description
ECP-317	14 – 16	Silty Sand with Gravel
ECP-318	16 – 18	Silty Sand

5 SITE CHARACTERIZATION

5.1 Soil Stratigraphy

BSC Widening – San Jacinto College: Borings ECP-207 and ECP-208 were drilled adjacent to the proposed bulkhead to a depth of 110 feet below the existing grade. The depth of water at the boring locations varied between 16 and 20 feet. In addition, marine borings ECP-205A and ECP-206A were performed by JV at this location. The borings were drilled to a depth of about 60 to 64 feet below the mudline. Table 5-1 presents the summary of soil conditions observed at the site. Approximate boring locations are shown on the Plan of Borings, Plate 2A.

Table 5-1 – BSC Widening – San Jacinto College

Borings	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-205A, ECP-206A, ECP-207 & ECP-208	+11 to +5	-38 to -55	Firm to very stiff clays*
	-38 to -55	-72 to -102	Medium dense to very dense sands or silt
	-72 to -102	-98	Firm to very stiff clays
	-98	-105	Loose sand

*Boring ECP-208 has medium dense sand layer between El. -11 and El. -21 feet.

BSC Widening – East of San Jacinto College to HSC: Borings ECP-209 thru ECP-222 were drilled on the north bank of BSC to a depth of 90 feet below the existing grade. The depth of water varied between 9 and 28 feet. Approximate boring locations are shown on the Plates 2B thru 2D .The following table presents the summary of soil conditions observed along BSC.

Table 5-2 – BSC Widening – San Jacinto College

Borings	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-209 thru ECP-222	+16 to +7	2 to -14	Firm to hard clays
	-14	-9 to -20	Loose to very dense sands or silt*
	-9 to -20	-40 to -59	Firm to very stiff clays
	-40 to -59	-64 to -72	Medium dense to very dense sands**
	-64 to -72	-74 to -82	Stiff to hard clays***

*Sand or silt layer was not encountered in borings ECP-217, ECP, 219, ECP-220 and ECP-222 at these depths.
**Sand layer was not encountered in boring ECP-212 at these depths.
***A dense sand layer was observed in boring ECP-215 between El. -74 and El. -81 feet.

BCC Widening – Spilmans Island: Borings ECP-309 thru ECP-316 were performed at this site to depths ranging between 130 and 170 feet below the existing grade. Borings ECP-309, ECP-313, ECP-314 and ECP-315 were drilled on top of the existing dike whereas borings ECP-310, ECP-311 and ECP-312 were drilled in the interior part of the placement area. Boring ECP-316 was performed adjacent to the BCC shore line. In addition, three Piezocone Penetrometer tests and three Vane Shear tests were performed along Spilmans Island south dike. Approximate boring and PCPT/VST locations are shown on the Plan of Borings, Plate 2E. The depth of water at the boring locations varied between 5 and 15 feet.

In general, very soft to very stiff clays were predominantly encountered at the surface underlain by loose to very dense sands and silts at deeper depths in all the borings. Intermittent very loose to loose sand or silt layers of thickness 2 to 8 feet were observed in the top 20 feet in borings ECP-309 thru ECP-315. Table 5-3 presents the summary of sand layers observed in the borings.

Table 5-3 – Elevation and Location of Cohesionless Soils

Boring	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-309	+21.5	+13.5	Very loose to loose sand
	-66.5	-81.5	Medium dense to dense sand
ECP-310	+30.4	+24.4	Very loose sand
	-43.6	-78.6	Medium dense to very dense sand
ECP-311	+27.3	+23.3	Very loose silt
	-51.7	-66.7	Very dense sand
ECP-312	+20.2	+16.2	Very loose sand
	-62.8	-82.8	Dense to very dense silt and sand
ECP-313	+25.4	+23.4	Loose sand
	-63.6	-78.6	Loose to dense sand
ECP-314	-64	-74	Loose sand
	-89	-94	Dense sand
ECP-315	+25.6	+16.6	Very loose to medium dense sand
	+6.6	-3.4	Loose sand
	-58.4	-68.4	Dense sand
	-73.4	-88.4	Medium dense to dense sand
ECP-316	-58.8	-63.8	Sand

Boring	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-C-01	+30	+28	Sand/Silt
	+20	+17.4	Sand/Silt
	+5.6	-0.3	Sand/Silt
ECP-C-03	+22.4	+20.6	Sand/Silt

BCC – Site 1: Borings ECP-317, ECP-318 and ECP-319 were drilled adjacent to the proposed bulkhead to a depth of 100 feet below the existing grade. Water was observed at the surface at boring ECP-317 and it varied between 3 and 8 feet at the remaining locations. In addition, marine borings ECP-307A and ECP-308A were performed in the vicinity by JV. Table 5-4 presents the summary of soil conditions observed at the site. Approximate boring locations are shown on the Plan of Borings, Plate 2F.

Table 5-4 – BCC – Site 1

Borings	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-307A, ECP-308A, ECP-317, ECP-318 & ECP-319	+9 to +4	-8 to -11	Soft to stiff clays*
	-8 to -11	-19 to -23	Very loose to medium dense sands or silt**
	-19 to -23	-91 to -96	Soft to hard clays***

* Fill material comprised of clayey sand, crushed concrete and gravel was observed in boring ECP-318 from surface to 12 feet (El. -7 feet).
**Sand layer was not encountered in boring ECP-319.
*** Boring ECP-318 has medium dense sand layer between El. -53 and El. -58 feet.

BCC – Site 2: Borings ECP-320 and ECP-321 were drilled at this location to a depth of 100 feet below the existing grade. The depth of water at the boring locations varied between 6 and 8 feet. Also, marine boring ECP-304B was performed to a depth of 52 feet below the mudline. Approximate boring locations are shown on the Plan of Borings, Plate 2G. Table 5-5 presents the summary of soil conditions observed at the site.

Table 5-5 – BCC – Site 2

Borings	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-304B, ECP-320 & ECP-321	+8 to +6	0 to +2	Fill material comprised of sandy lean clay with shells, asphalt and glass fragments

Borings	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-304B, ECP-320 & ECP-321	0 to +2	-20 to -23	Very loose to loose silt or sand*
	-20 to -23	-53 to -65	Very soft to stiff clays
	-53 to -65	-85 to -87	Very loose to dense sands*
	-85 to -87	-92 to -94	Stiff to very stiff clay

* Boring ECP-320 has firm clay layer between El. 0 and El. -4 feet and from El. -70 to El. -75 feet.

HSC Bayou Reach: Boring ECP-426D was drilled near HSC Centerline Station 803+27 to a depth of 60 feet below the existing grade. Water was encountered at a depth of 8 feet. Firm to very stiff clays were observed in the top 24 feet with very loose to loose sand layer between 6 and 12 feet. Very loose to very dense sands were encountered between 24 and 60 feet with 10-foot thick very stiff to hard clay layer below 40 feet.

E2 Clinton Placement Area: Borings ECP-2001 thru ECP-2013 were drilled at this location to a depth of 40 to 70 feet below the existing grade. Borings ECP-2002, ECP-2009 and ECP-2012 were performed in the site interior and the remaining borings were drilled along the proposed dike alignment. The depth of water at the boring locations varied between 6 and 8 feet below the existing grade. In order to investigate the extent of hydraulically placed interior fill at the dike location a program of 31 piezocone penetrometers were performed to depths ranging from 15 to 40 feet. Three of these tests were also used to confirm the soil conditions in the northwest corner of the site. Approximate boring and PCPT locations are shown on the Plan of Borings, Plate 2H.

Very soft to very stiff clays were predominantly observed from the surface to the boring termination depths at most of the locations. Very loose to medium dense sands were encountered in borings, ECP-2007, ECP-2008, ECP-2010, ECP-2011, ECP-2012 and in several PCPT's at various depths and thicknesses as shown in Table 5-6.

Table 5-6 – Elevation and Location of Cohesionless Soils

Boring	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-2007	+30	+22	Very loose to medium dense sand
ECP-2008	+30	+24	Loose sand
ECP-2010	+32	+24	Very loose sand
ECP-2011	+15	+13	Sand
ECP-2012	+22	+12	Medium dense sand
ECP-EC-C01	0.4	-4.2	Silt
ECP-EC-C02	+13.3	+10.9	Silt

Boring	Approximate Elevation, Feet (MLLW)		Material
	From	To	
ECP-EC-C03	-0.6	-2.6	Silt
	-4.2	-8	Silt
ECP-EC-C11	+28.8	+26.5	Sand/Silt
	+17.2	+14	Sand
ECP-EC-C12	+16	+14	Sand
ECP-EC-C13	+29.7	+27.4	Sand/Silt
	+17.4	+15	Sand/Silt
ECP-EC-C14	+27.6	+25.5	Sand/Silt
	+14.9	+13.6	Sand/Silt
ECP-EC-C16	+28.1	+26.2	Sand/Silt
ECP-EC-C17	+27.4	+24.8	Sand/Silt
ECP-EC-C18	+26.6	+24.7	Sand/Silt
ECP-EC-C19	+34.6	+24.7	Sand/Silt
ECP-EC-C20	+30.5	+23.5	Sand/Silt
ECP-EC-C21	+26	+21.5	Sand/Silt
ECP-EC-C23	+26.3	+23.5	Sand/Silt
ECP-EC-C24	+26	+24.2	Sand/Silt
ECP-EC-C26	+17.8	+15.3	Sand/Silt
ECP-EC-C27	+27.7	+22.7	Sand/Silt
	+16.5	+13.3	Sand/Silt
ECP-EC-C29	+16.6	+13.8	Sand/Silt
ECP-EC-C30	+16.6	+13.5	Sand/Silt
ECP-EC-C31	+16	+13.3	Sand/Silt

We note that samples obtained at boring ECP-2005 between 6 and 10, ECP-2011 between 6 and 8, and at ECP-2010 between 6 and 10 contain gasoline odor.

Beltway 8 Placement Area: Borings ECP-2014 thru ECP-2044 were drilled at this location to a depth of 40 below the existing grade. Approximate boring locations are shown on the Plan of Borings, Plate 2I. In general, firm to hard cohesive soils were observed throughout the boring depths with

occasional loose to medium dense silt below 28 feet. At most locations the groundwater depth varied between 18 and 39 feet. As borings ECP-2023 and ECP-2024 drilled at northwest corner of the site groundwater was encountered at 11 to 12 feet. We note that groundwater was not observed in borings ECP-2027, ECP-2028, ECP-2033 and ECP-2038.

Borings ECP-2014 and ECP-2044 performed in the southwestern corner of the site are in an area where the ground surface elevation is at or near El. +30. These borings generally encountered very loose to loose silty sand or silt in the upper 10 to 12 feet with groundwater encountered at 6 to 8 feet. A surficial layer of 2 feet thick very loose silt or sand was observed in borings ECP-2015, ECP-2017, ECP-2021, ECP-2019 and ECP-2039 and a layer 4 feet thick was encountered at ECP-2031. At ECP-2015 a layer of loose to medium dense sandy silt and silty sand was encountered between 6 and 12 feet.

6 LIMITATIONS

This investigation was performed for the exclusive use of HDR Engineering, Inc. for specific application to Houston Ship Channel Expansion Channel Improvement Project in Harris, Chambers and Galveston Counties, Texas. HVJ Associates, Inc. has endeavored to comply with generally accepted geotechnical engineering practice common in the local area. HVJ Associates, Inc. makes no warranty, express or implied. The analyses and recommendations contained in this report are based on data obtained from subsurface exploration, laboratory testing, the project information provided to us and our experience with similar soils and site conditions. The methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. Should any subsurface conditions other than those described in our boring logs be encountered, HVJ Associates should be immediately notified so that further investigation and supplemental recommendations can be provided.

ILLUSTRATIONS

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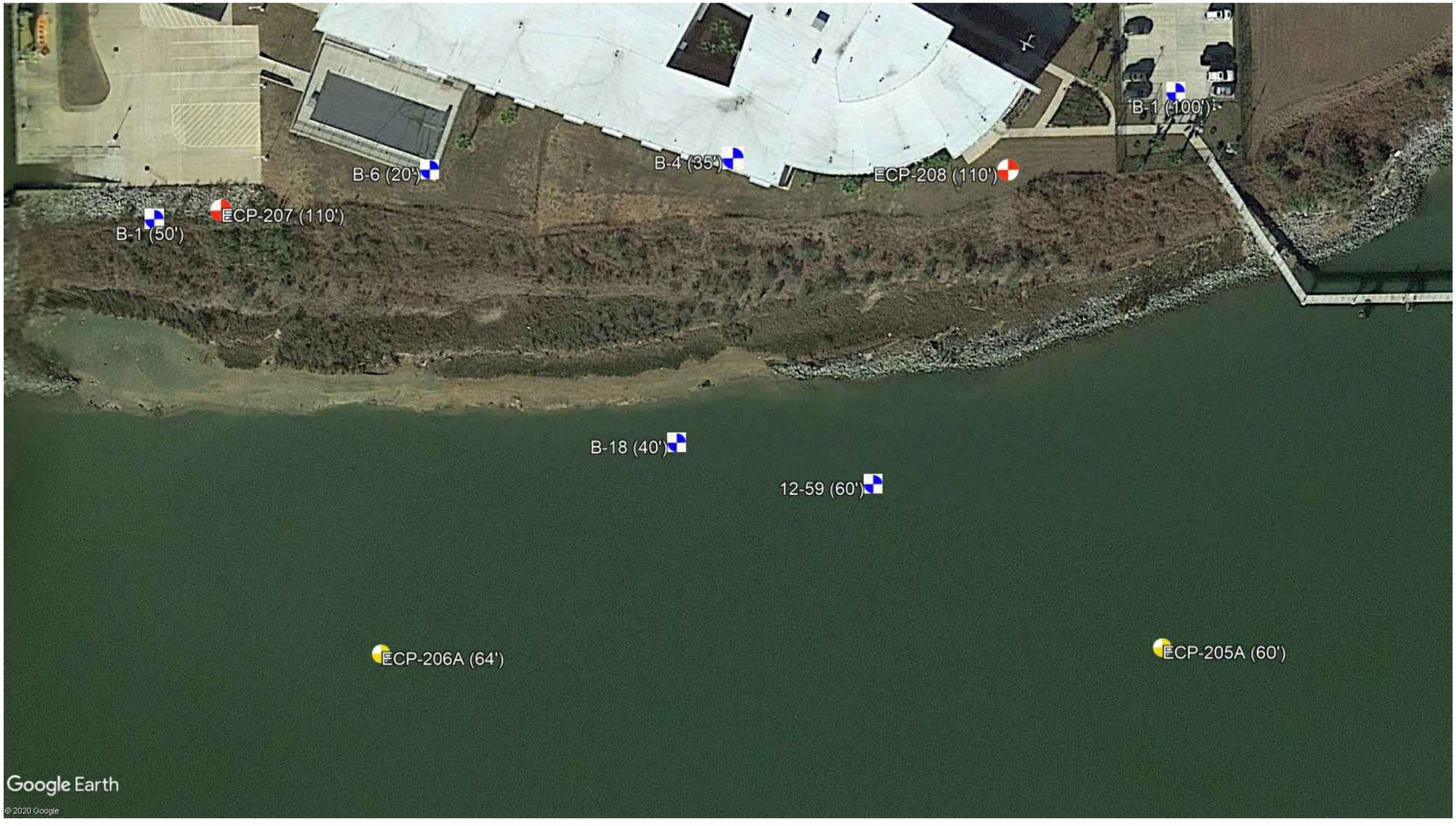
281.933.7293 Fax

DATE: 03/02/2020	APPROVED BY: AR	PREPARED BY: DA

SITE VICINITY MAP
HOUSTON SHIP CHANNEL
EXPANSION CHANNEL IMPROVEMENT PROJECT

PROJECT NO.:	DRAWING NO.:
HG1910092.2.1	PLATE 1



Approximate Boring Location (By Others for the Current Study)

Approximate Boring Location for the Current Study

Approximate Boring Location (From the Previous Studies)

MAP LOCATION

HVJ ASSOCIATES
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PH: 281-933-7388
FAX: 281-933-7293
TEXAS FIRM NO. F-000646

SCALE: 1" = 60'

DATE: 5/4/2020

DRAWN BY:	PROJ. CHK:	APPRV. BY:
AR	NK	MH

BOREHOLE LAYOUT
HOUSTON SHIP CHANNEL EXPANSION CHANNEL IMPROVEMENT
BAYPORT SHIP CHANNEL - SJC SITE

PROJECT NO.:	FILENAME:	
HG1910092.2.1	POB	PLATE 2A

12/19/2017
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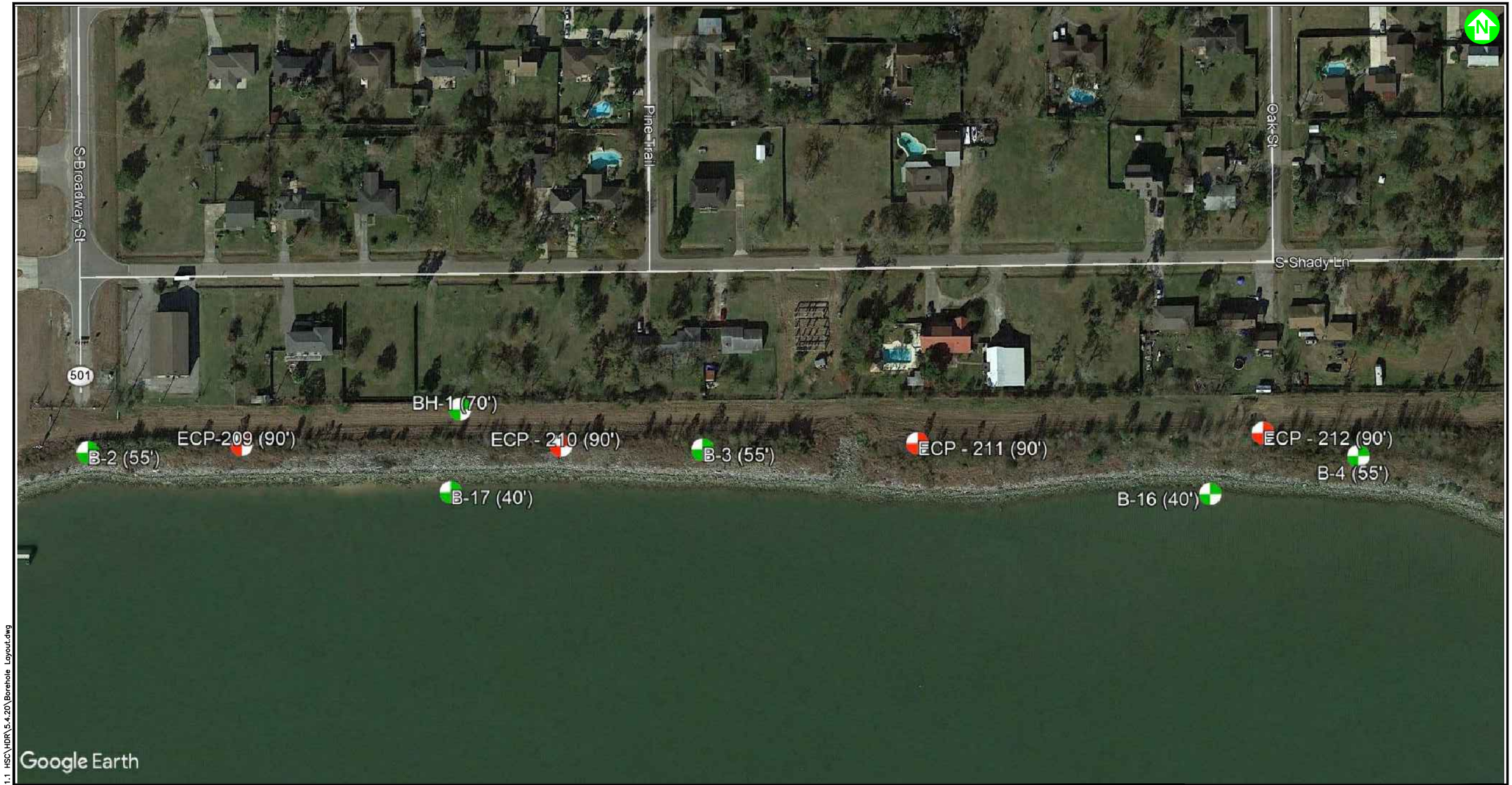

Approximate Boring Location for the Current Study

Approximate Boring Location (From the Previous Studies)

MAP LOCATION

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SCALE: 1" = 125'

DATE: 5/4/2020

DRAWN BY:	PROJ. CHK:	APPRV. BY:
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BOREHOLE LAYOUT
HOUSTON SHIP CHANNEL EXPANSION
CHANNEL IMPROVEMENT
BAYPORT SHIP CHANNEL - EAST OF SJC

PROJECT NO.:	FILENAME:	
HG1910092.2.1	POB	PLATE 2B

12/19/2017
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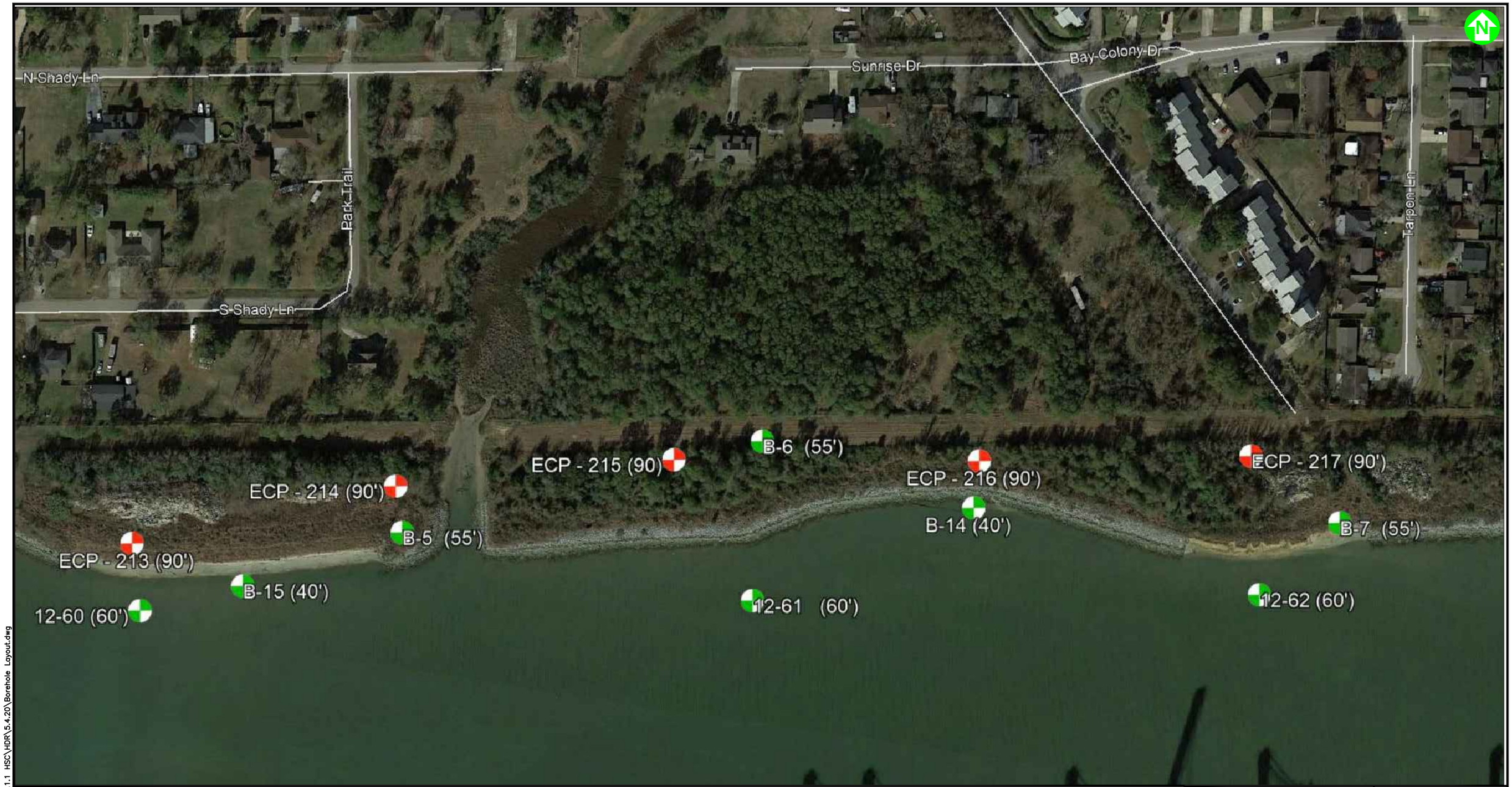

Approximate Boring Location for the Current Study

Approximate Boring Location (From the Previous Studies)

TEXAS

MAP LOCATION

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TEXAS FIRM NO. F-000646

SCALE: 1" = 150'

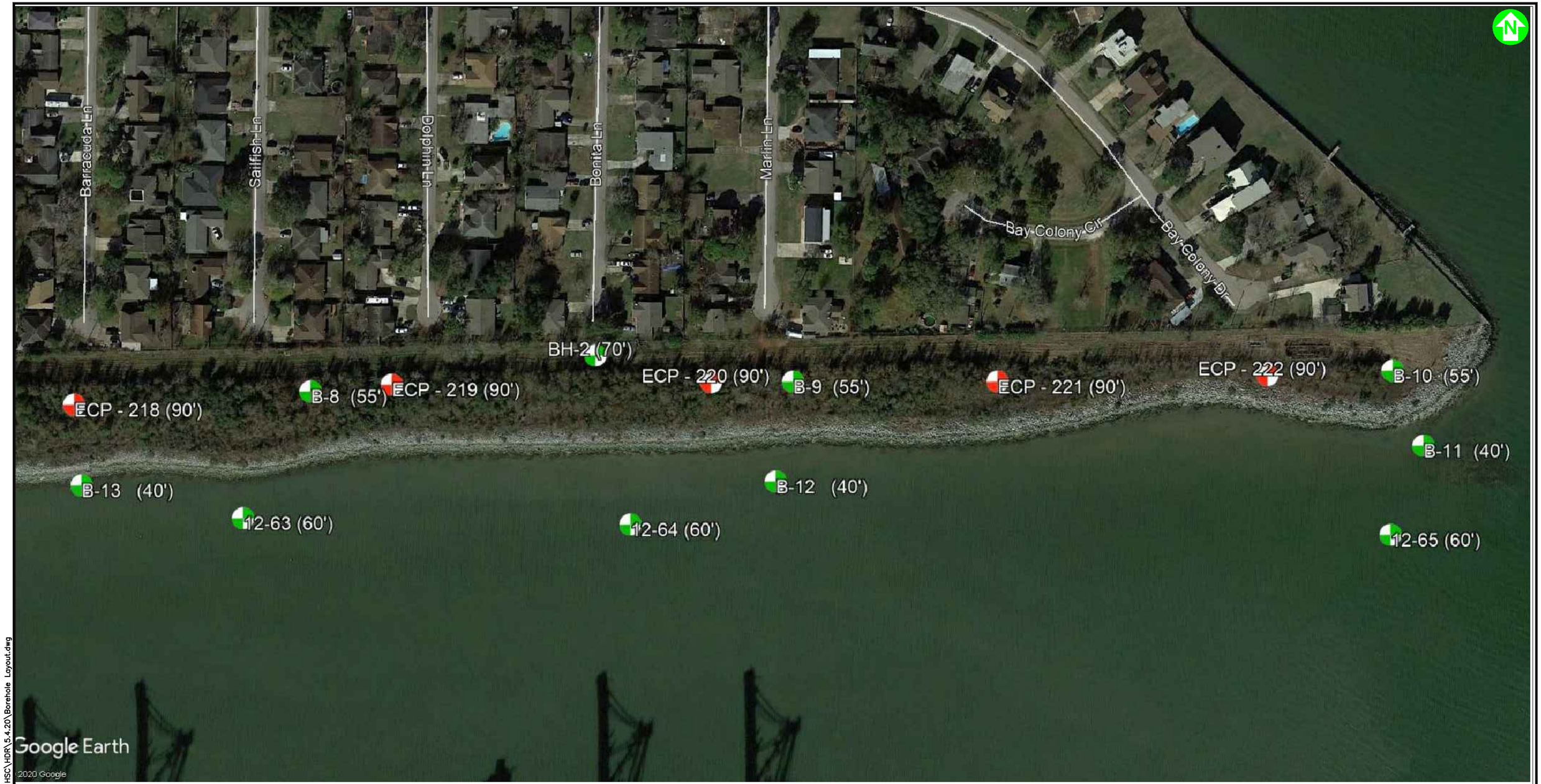
DATE: 5/4/2020

DRAWN BY:	PROJ. CHK:	APPRV. BY:
AR	NK	MH

BOREHOLE LAYOUT
HOUSTON SHIP CHANNEL EXPANSION
CHANNEL IMPROVEMENT
BAYPORT SHIP CHANNEL - EAST OF SJC

PROJECT NO.:	FILENAME:	
HG1910092.2.1	POB	PLATE 2C

12/19/2017
C:\Project Data\2019\HG1910092.1.1 HSC\HDR\5.4.20\Borehole Layout.dwg



Approximate Boring Location for the Current Study

Approximate Boring Location (From the Previous Studies)

MAP LOCATION

HVJ ASSOCIATES
6201 S. DAIRY ASHFORD RD.
HOUSTON, TX 77072
PH: 281-933-7388
FAX: 281-933-7293
TEXAS FIRM NO. F-000646

SCALE: 1" = 150'

DATE: 5/4/2020

DRAWN BY:	PROJ. CHK:	APPRV. BY:
AR	NK	MH

BOREHOLE LAYOUT
HOUSTON SHIP CHANNEL EXPANSION
CHANNEL IMPROVEMENT
BAYPORT SHIP CHANNEL - EAST OF SJC

PROJECT NO.:	FILENAME:	
HG1910092.2.1	POB	PLATE 2D

12/19/2017
C:\Project Data\2019\HG1910092.1.1 HSC\HDR\5.4.20\Borehole Layout.dwg

Approximate Boring Location for the Current Study

Approximate PCPT/VST Location for the Current Study

Approximate Boring Location (From the Previous Studies)

MAP LOCATION

HVJ ASSOCIATES
6201 S. DAIRY ASHFORD RD.
HOUSTON, TX 77072
PH: 281-933-7388
FAX: 281-933-7293
TEXAS FIRM NO. F-000646

SCALE: 1" = 250'

DATE: 5/4/2020

DRAWN BY:	PROJ. CHK:	APPRV. BY:
AR	NK	MH

BOREHOLE LAYOUT
HOUSTON SHIP CHANNEL EXPANSION CHANNEL IMPROVEMENT
BARBOURS CUT SHIP CHANNEL- SPILMANS ISLAND

PROJECT NO.:	FILENAME:	
HG1910092.2.1	POB	PLATE 2E

12/19/2017
C:\Project Data\2019\HSC\HDR\HDR 5.4.20\Borehole Layout.dwg

Approximate Boring Location (By Others for the Current Study)

Approximate Boring Location for the Current Study

Approximate Boring Location (From the Previous Studies)

TEXAS

MAP LOCATION

HVJ ASSOCIATES
6201 S. DAIRY ASHFORD RD.
HOUSTON, TX 77072
PH: 281-933-7388
FAX: 281-933-7293
TEXAS FIRM NO. F-000646

SCALE: 1" = 100'

DATE: 5/4/2020

DRAWN BY:	PROJ. CHK:	APPRV. BY:
AR	NK	MH

BOREHOLE LAYOUT
HOUSTON SHIP CHANNEL EXPANSION
CHANNEL IMPROVEMENT
BARBOURS CUT CHANNEL – SITE 1

PROJECT NO.:	FILENAME:	
HG1910092.2.1	POB	PLATE 2F

12/19/2017
C:\Project Data\2019\HG1910092.1.1 HSC\HDR\5.4.20\Borehole Layout.dwg

Approximate Boring Location (By Others for the Current Study)

Approximate Boring Location for the Current Study

MAP LOCATION

HVJ ASSOCIATES
6201 S. DAIRY ASHFORD RD.
HOUSTON, TX 77072
PH: 281-933-7388
FAX: 281-933-7293
TEXAS FIRM NO. F-000646

SCALE: 1" = 100'

DATE: 5/4/2020

DRAWN BY:	PROJ. CHK:	APPRV. BY:
AR	NK	MH

BOREHOLE LAYOUT
HOUSTON SHIP CHANNEL EXPANSION
CHANNEL IMPROVEMENT
BARBOURS CUT CHANNEL – SITE 2

PROJECT NO.:	FILENAME:	
HG1910092.2.1	POB	PLATE 2G

12/19/2017
C:\Project Data\2019\HG1910092.1.1 HSC\HDR\5.4.20\Borehole Layout.dwg

NOTE:

1. UNDERGROUND UTILITY LINES IN UTILITY LINE CORRIDOR INCLUDE HIGH PRESSURE GAS PIPELINES.

E2 CLINTON PLACEMENT AREA BORINGS

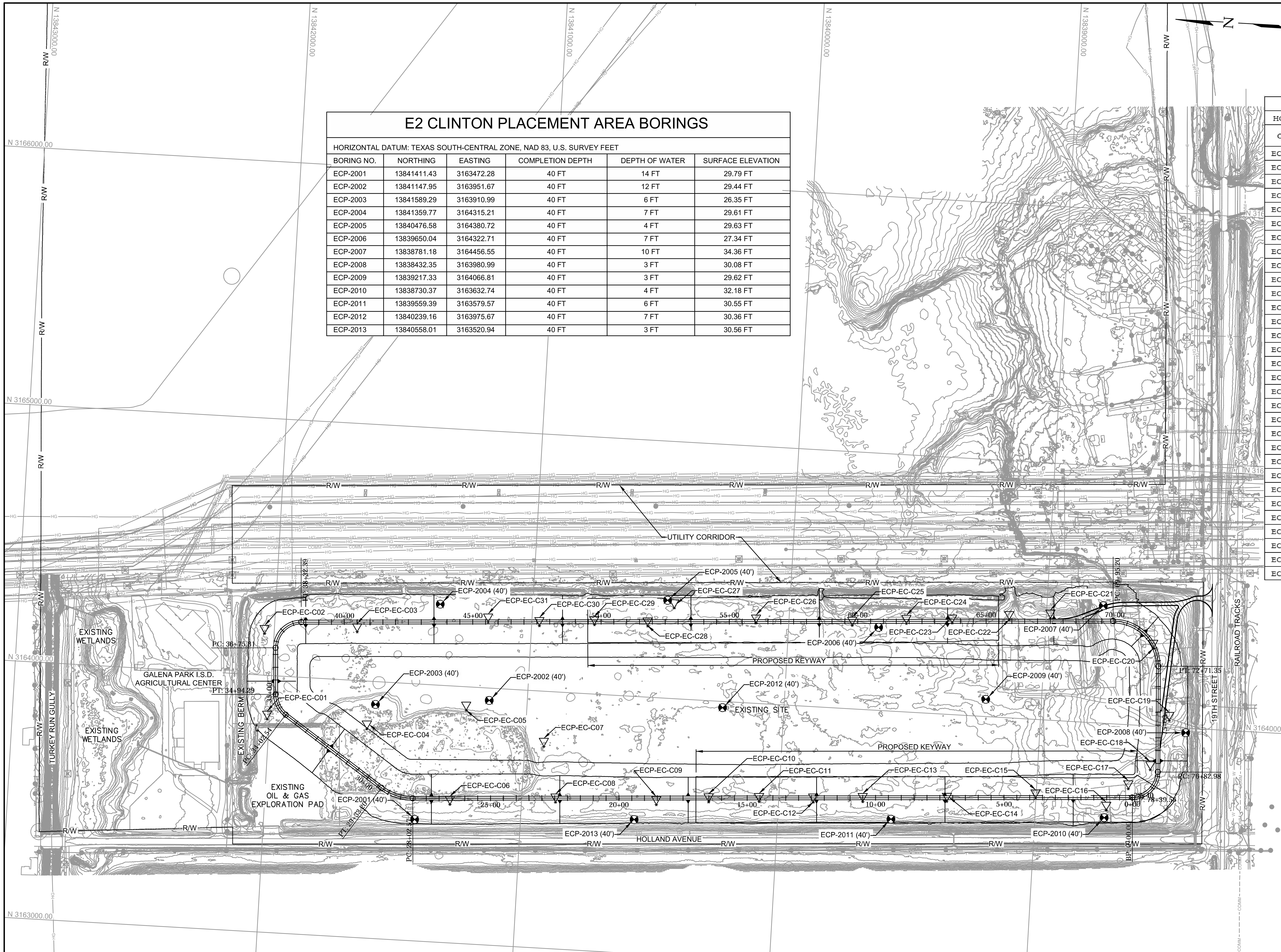
HORIZONTAL DATUM: TEXAS SOUTH-CENTRAL ZONE, NAD 83, U.S. SURVEY FEET

BORING NO.	NORTHING	EASTING	COMPLETION DEPTH	DEPTH OF WATER	SURFACE ELEVATION
ECP-2001	13841411.43	3163472.28	40 FT	14 FT	29.79 FT
ECP-2002	13841147.95	3163951.67	40 FT	12 FT	29.44 FT
ECP-2003	13841589.29	3163910.99	40 FT	6 FT	26.35 FT
ECP-2004	13841359.77	3164315.21	40 FT	7 FT	29.61 FT
ECP-2005	13840476.58	3164380.72	40 FT	4 FT	29.63 FT
ECP-2006	13839650.04	3164322.71	40 FT	7 FT	27.34 FT
ECP-2007	13838781.18	3164456.55	40 FT	10 FT	34.36 FT
ECP-2008	13838432.35	3163980.99	40 FT	3 FT	30.08 FT
ECP-2009	13839217.33	3164066.81	40 FT	3 FT	29.62 FT
ECP-2010	13838730.37	3163632.74	40 FT	4 FT	32.18 FT
ECP-2011	13839559.39	3163579.57	40 FT	6 FT	30.55 FT
ECP-2012	13840239.16	3163975.67	40 FT	7 FT	30.36 FT
ECP-2013	13840558.01	3163520.94	40 FT	3 FT	30.56 FT

CPT CONE PENETRATIONS

HORZONTAL DATUM: TEXAS SOUTH-CENTRAL ZONE, NAD83, U. S. SURVEY FEET

CPT NO	NORTHING	EASTING	SURFACE ELEVATION	COMPLETION DEPTH
ECP-EC-C01	13,842,007.50	3,163,829.78	28.94	41
ECP-EC-C02	13,842,036.40	3,164,162.18	29.11	41
ECP-EC-C03	13,841,677.10	3,164,189.63	29.75	41
ECP-EC-C04	13,841,617.69	3,163,813.77	25.94	16
ECP-EC-C05	13,841,235.09	3,163,908.64	28.70	16
ECP-EC-C06	13,841,277.75	3,163,539.02	30.20	16
ECP-EC-C07	13,840,925.50	3,163,785.29	29.86	16
ECP-EC-C08	13,840,867.67	3,163,571.28	29.47	16
ECP-EC-C09	13,840,475.15	3,163,583.92	30.49	16
ECP-EC-C10	13,840,272.13	3,163,606.34	30.07	16
ECP-EC-C11	13,840,076.08	3,163,619.01	29.78	16
ECP-EC-C12	13,839,865.38	3,163,628.97	29.76	16
ECP-EC-C13	13,839,672.96	3,163,641.52	30.77	16
ECP-EC-C14	13,839,346.16	3,163,661.57	29.45	16
ECP-EC-C15	13,839,001.61	3,163,694.90	30.14	16
ECP-EC-C16	13,838,724.06	3,163,662.57	29.79	16
ECP-EC-C17	13,838,643.22	3,163,750.90	28.34	16
ECP-EC-C18	13,838,562.09	3,163,829.71	29.62	16
ECP-EC-C19	13,838,499.27	3,164,025.40	34.60	16
ECP-EC-C20	13,838,577.32	3,164,302.27	34.42	16
ECP-EC-C21	13,838,984.22	3,164,397.09	27.55	16
ECP-EC-C22	13,839,143.83	3,164,382.42	25.31	16
ECP-EC-C23	13,839,364.92	3,164,356.24	27.59	16
ECP-EC-C24	13,839,542.80	3,164,344.16	28.30	16
ECP-EC-C25	13,839,753.19	3,164,324.68	28.45	16
ECP-EC-C26	13,840,127.54	3,164,312.61	30.39	16
ECP-EC-C27	13,840,449.01	3,164,353.04	29.12	16
ECP-EC-C28	13,840,548.42	3,164,276.82	29.15	16
ECP-EC-C29	13,840,755.58	3,164,270.14	29.31	16
ECP-EC-C30	13,840,969.71	3,164,253.71	29.34	16
ECP-EC-C31	13,841,169.91	3,164,256.78	29.16	16



A OVERALL SITE PLAN, BORING AND CPT LAYOUT

SCALE: 1" = 200'

0 200' 400'

PORT OF HOUSTON AUTHORITY

CONSULTANT:

SEAL:

This document is released for the purpose of interim review under the authority of GARLAND PENNISON, P.E., ****** 08/15/20. It is not to be used for construction, bidding, or permit purposes.

65% REVIEW

PROJECT TITLE:

HOUSTON SHIP CHANNEL (HSC)

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

SHEET TITLE:

SEGMENT 4 BOGGY BAYOU TO HUNTING BAYOU TURNING BASIN E2 CLINTON DMPA

OVERALL SITE PLAN, BORING AND CPT LAYOUT

REV	DATE	DESCRIPTION
A	8/15/20	65% SUBMITTAL

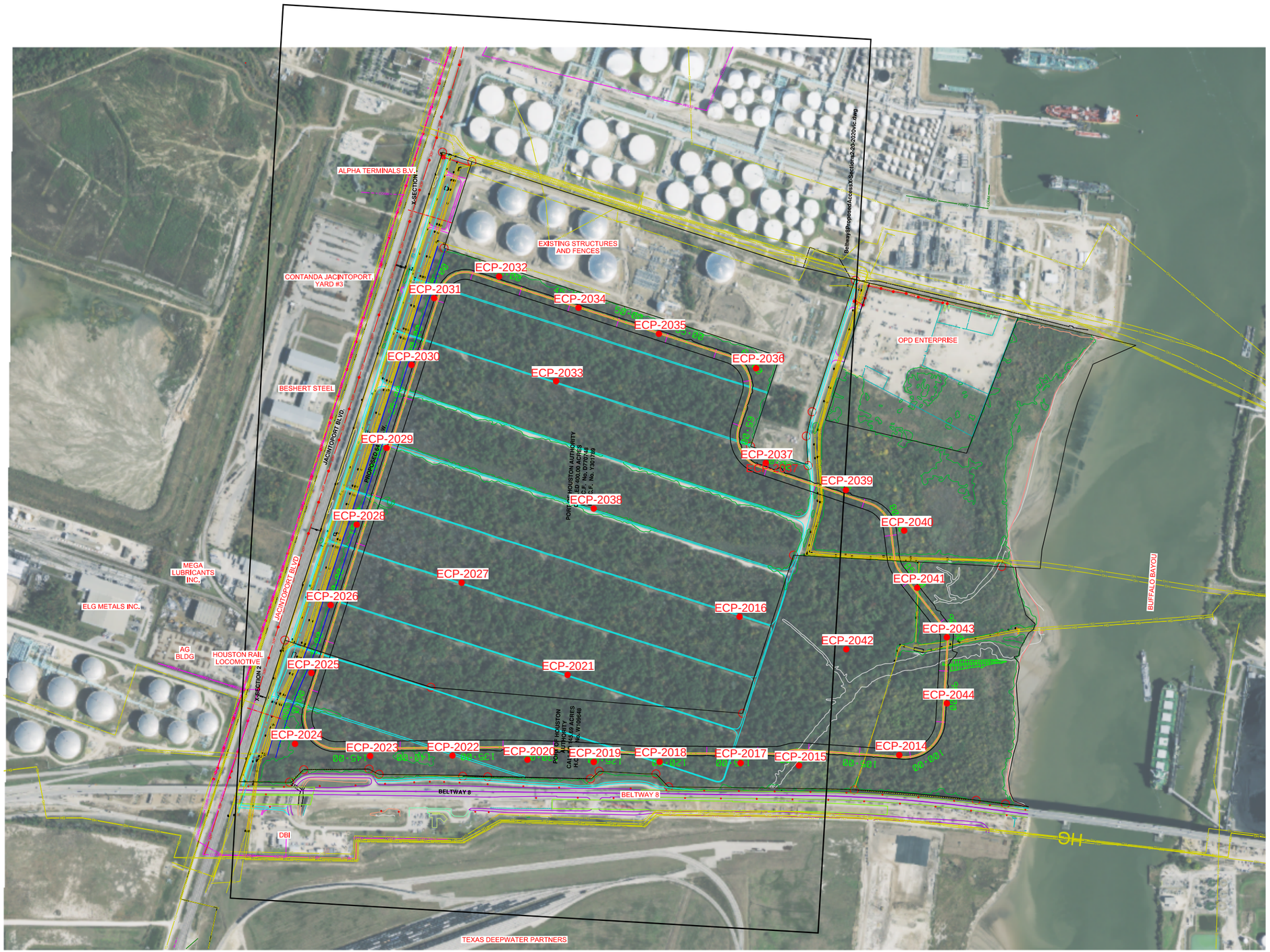
DESIGNER:	G.PENNISON
CADD:	J.DELEON
CHECKER:	G.PENNISON
DATE:	08/15/2020
SCALE:	AS NOTED

DRAWING NO. C90-D13-P11-008

SHEET NO. C-100 REV. NO. A

PLATE 2H

65% REVIEW



OVERALL SITE PLAN

SCALE: 1" = 400'

PRELIMINARY

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW AND IS NOT INTENDED TO BE USED FOR CONSTRUCTION, BIDDING OR PERMIT PURPOSES.

ENGINEER: **********

LICENSE NUMBER: **********

DATE: 03 /**/ 2020

SOLICITATION NO.: W912HYXXXXX

U.S. Army Corps of Engineers
Galveston District

MARK	DESCRIPTION	DATE

DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY:
SIZE:
ISSUE DATE:
SOLICITATION NO.:
CONTRACT NO.:

U.S. ARMY CORPS OF ENGINEERS
GALVESTON DISTRICT
2000 FORT POINT RD.
GALVESTON, TX 77550

HDR
Texas Firm Registration No. F754

PORT OF HOUSTON, TEXAS
PROJECT 11 CHANNEL DEVELOPMENT
SEGMENT 4 BOGGY BAYOU TO SIMS BAYOU
BELTWAY 8 DMPA

SHEET ID

%PRODUCTION DATA 1%
%PRODUCTION DATA 2% %PRODUCTION DATA 3% %PRODUCTION DATA 4%

PLATE 2I

35% MAR 2020

APPENDIX A

BORING LOG AND KEY TO TERMS & SYMBOLS

BAYPORT SHIP CHANNEL-
SAN JACINTO COLLEGE

LOG OF BORING ECP- 205A

PROJECT: HSC Expansion-BSC- San Jacinto College
PROJECT NO.: HG1910092.1.1
LOCATION: N: 13792269.87; E: 3233162.81
DEPTH OF WATER:43.0 FT
COMPLETION DEPTH: 60 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: -41.04 FT
DATE: 12/15/2019

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: N/A TO N/A FT
WET ROTARY: 0 TO 60 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
▽	0								
-45	5	Firm to very stiff, reddish brown and gray, SANDY LEAN CLAY (CL) -w/ sand seams at 2'-4'	20	51.2	83	21 40	31	16	15
-50	10					17	29	15	14
-55	15				103	23			
-60	20	Loose to medium dense, brown, SAND WITH SILT (SP-SM)	7 8 15	5.2		24 24			
-65	25		13			21			
-70	30	Loose to medium dense, brown, SAND (SP)	14	0.9		21			
-75	35	-w/ shells at 33'-35'	7			36			
-80	40	Firm to very stiff, gray and brown, SANDY LEAN CLAY (CL)							
-85	45	-w/ sand pockets at 43'-45'			113	19	32	22	10
-90	50	-w/ sand pockets at 48'-50'							
-95	55	-w/ sand seams at 53'-55'			117	16			
-100	60	-w/ sand seams at 58'-60'				20			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.2 0.4 0.6 0.8 1.0

1.5
1.5
1.4
1.5
1.7
1.2
1.5

COH HG1910092.1.1 - HSC SEGMENT 2.GPJ 11/12/20

Remarks: Mudline was encountered at 43.0' below the water level during drilling operations.

Drilled By: Fugro Logged By: EE

HVJ Associates, Inc.

PLATE A-1

LOG OF BORING ECP- 206A

PROJECT: HSC Expansion-BSC- San Jacinto College
PROJECT NO.: HG1910092.1.1
LOCATION: N: 13792248.52; E: 3232700.13
DEPTH OF WATER:38.6 FT
COMPLETION DEPTH: 64 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: -38.29 FT
DATE: 12/16/2019

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: N/A TO N/A FT
WET ROTARY: 0 TO 64 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0								
-40		Firm to stiff, reddish brown, LEAN CLAY WITH SAND (CL)				27	28	15	13
	5	-w/ calcareous nodules at 2'-4'		73.1		22	47	19	28
-45			13			20			
	10				120	18			
-50		-w/ calcareous nodules at 10'-12'		77.6		24	27	14	13
	15				109	21			
-55		Very loose to loose, brown, SILTY SAND (SM)	WOH	14.1		25			
	20	Medium dense, brown, SAND (SP)	7						
-60			17			20			
	25		25			23			
-65									
	30		15	2.9		22			
-70									
	35	Loose to medium dense, brown, SAND WITH SILT (SP-SM)	4			19			
-75									
	40		17	10.7		19			
-80									
	45		15			23			
-85									
	50		16	6.6		21			
-90									
	55		18			23			
-95									
	60	Medium dense, brown, SILTY SAND (SM)	22	19.7		19			
-100		-w/ gravel at 62'-64'	11			12			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.2 0.4 0.6 0.8 1.0

COH HG1910092.1.1 - HSC SEGMENT 2.GPJ 11/12/20

Remarks: Mudline was encountered at 38.6' below the water level during drilling operations.

LOG OF BORING ECP-207

PROJECT: HSC Expansion-BSC- San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792461.34; E: 3232565.42
DEPTH OF WATER: 16 FT
COMPLETION DEPTH: 110 FT
OFFSET: N/A
SURFACE ELEVATION: 5.18 FT
DATE: 1/24/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 110 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
5	0	Stiff to very stiff, dark gray and brown, FAT CLAY (CH)				29			
0	5			94.2		26	73	28	45
		-w/ calcareous nodules at 6'-8'			94	30			
-5	10					23			
-10	15			86.5	100	25	79	33	46
		Stiff, reddish brown, SILTY CLAY (CL-ML)		98.0		29	28	23	5
-15	20		10						
		Firm to very stiff, reddish brown, FAT CLAY (CH)		98.7	96	29	82	35	47
-20	25								
-25	30			99.4		25	71	31	40
-30	35					27			
-35	40	Very stiff, reddish brown, SANDY LEAN CLAY (CL) -w/ calcareous nodules at 38'-40'		53.6		19	33	20	13
-40	45	Medium dense to dense, reddish brown, SILTY CLAYEY SAND (SC-SM)	11	33.3		21	26	21	5
-45	50		22			23			
-50	55		26	16.8		25			
	60		36			21			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 16 feet below ground surface during the field operations.

Drilled By: CH Logged By: MB

HVJ Associates, Inc.

PLATE A-3

LOG OF BORING ECP-207

PROJECT: HSC Expansion-BSC- San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792461.34; E: 3232565.42
DEPTH OF WATER: 16 FT
COMPLETION DEPTH: 110 FT
OFFSET: N/A
SURFACE ELEVATION: 5.18 FT
DATE: 1/24/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 110 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-55	60	Medium dense to dense, reddish brown, SILTY CLAYEY SAND (SC-SM) [Continued...]							
-60	65	Medium dense to very dense, gray and brown, SAND WITH SILT (SP-SM)	22	11.9		24			
-65	70		37			26			
-70	75		50	5.6		20			
-75	80		96			19			
-80	85		42	7.2		21			
-85	90	Dense to very dense, SILT WITH SAND (ML)	38	71.5		26			
-90	95	-w/ gravel and shells at 93'-95'	78						
-95	100	Very stiff, gray, FAT CLAY (CH)		84.5	105	24	50	23	27
-100	105	Loose, gray, SILTY SAND (SM)		45.0		19	24	20	4
	110		7	44.0		22	22	20	2

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 16 feet below ground surface during the field operations.

Drilled By: CH Logged By: MB

HVJ Associates, Inc.

PLATE A-3

COH HG1910092.2.1 - BSC SAN JACINTO SITE -NEW AND OLD.GPJ 4/16/20

LOG OF BORING ECP-208

PROJECT: HSC Expansion-BSC- San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792508.38; E: 3233056.59
DEPTH OF WATER:20 FT
COMPLETION DEPTH: 110 FT
OFFSET: N/A
SURFACE ELEVATION: 11.05 FT
DATE: 1/23/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 110 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
10	0	Stiff to very stiff, reddish brown, LEAN CLAY (CL)				19			
		-w/ calcareous nodules at 10'-20'		95.7		20	35	20	15
5	5				92	30			
	10					31			
0					101	27			
	15								
-5						24			
▽	20				107	20	45	26	19
-10		Medium dense, reddish brown, SILTY SAND (SM)				27			
	25								
-15									
	30		20	47.6		21			
-20		Very stiff, reddish brown, FAT CLAY (CH)		99.1	96	30	67	30	37
	35								
-25		Firm, reddish brown, LEAN CLAY (CL)		98.9		31	35	24	11
	40								
-30		Stiff to very stiff, reddish brown, FAT CLAY (CH)		89.4	98	27	58	28	30
	45								
-35		-w/ calcareous nodules at 48'-50'				20			
	50								
-40									
	55	Medium dense to very dense, brown, SILTY SAND (SM)	28	20.9		27			
-45									
	60		57			25			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 20 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC SAN JACINTO SITE -NEW AND OLD.GPJ 4/16/20

Drilled By: CH Logged By: MB

HVJ Associates, Inc.

PLATE A-4

LOG OF BORING ECP-208

PROJECT: HSC Expansion-BSC- San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792508.38; E: 3233056.59
DEPTH OF WATER:20 FT
COMPLETION DEPTH: 110 FT
OFFSET: N/A
SURFACE ELEVATION: 11.05 FT
DATE: 1/23/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 110 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-50	60	Medium dense to very dense, brown, SILTY SAND (SM) [Continued...]							
	65	Very dense, brown, SAND WITH SILT (SP-SM)	68	7.6		21			
-55									
	70		58			22			
-60		Dense, gray, SANDY SILT (ML) -w/ shells at 78'-80'							
	75		58			20			
-65									
	80		48	67.7		25			
-70									
	85	Firm to very stiff, bluish gray, SANDY LEAN CLAY (CL)		55.0	107	19	27	19	8
-75									
	90					17			
-80									
	95	-w/ sand seams at 93'-95'			110	18	36	21	15
-85									
	100			56.1		19	26	18	8
-90									
	105					20			
-95									
	110		14	57.7		19	33	19	14

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 20 feet below ground surface during the field operations.

Drilled By: CH Logged By: MB

HVJ Associates, Inc.

PLATE A-4

BAYPORT SHIP CHANNEL-
EAST OF SAN JACINTO COLLEGE

LOG OF BORING ECP-209

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792610.83; E: 3233612.46
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 12.71 FT
DATE: 3/27/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, dark gray and reddish brown, FAT CLAY (CH) -w/ roots and calcareous nodules at 0'-2'		88.7		19	58	20	38
10	5				103	23			
						22			
5	10			96.5		33	79	25	54
0	15			95.5	95	28	70	29	41
▽ -5		Stiff, reddish brown and gray, LEAN CLAY (CL) -w/ silt pockets at 16'-18'		94.9		25	48	24	24
	20		10	88.4					
-10	25	Medium dense, reddish brown, SANDY SILT (ML)		68.2		23	NP	NP	NP
-15			22			25			
-20	30								
	35	Stiff, reddish brown, FAT CLAY (CH)		96.1	92	31	70	32	38
-25									
	40	Stiff to very stiff, reddish brown, LEAN CLAY (CL)		91.3		24	32	17	15
-30									
	45					28			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-209

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792610.83; E: 3233612.46
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 12.71 FT
DATE: 3/27/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45	Stiff to very stiff, reddish brown, LEAN CLAY (CL) [Continued...]							
-35	50	Stiff to very stiff, reddish brown, FAT CLAY (CH)		94.2	91	31	74	33	41
-40	55	Reddish brown, CLAYEY SAND (SC) -w/ sand pockets at 53'-55'		39.3		19	23	14	9
-45	60	Medium dense to very dense, brown, SILTY SAND (SM)	20	16.9			NP	NP	NP
-50	65		29			26			
-55	70		48	15.6		18	NP	NP	NP
-60	75		57			20			
-65	80	Dense, brown, SAND WITH SILT (SP-SM)	50	11.7		18	NP	NP	NP
-70	85	Stiff to very stiff, gray, LEAN CLAY WITH SAND (CL) -w/ oots and woods at 83'-85'		77.9		21	44	17	27
-75	90	-w/ sand pockets at 88'-90'				16			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-210

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792629.06; E: 3234053.45
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 14.09 FT
DATE: 3/27/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to hard, brown and dark gray, LEAN CLAY (CL) -w/ roots and calcareous nodules at 0'-2'		86.9		18	49	22	27
					105	22			
10	5					18			
		Stiff to very stiff, reddish brown and dark gray, SANDY FAT CLAY (CH)		66.1		21	61	26	35
5	10								
					97	27			
		Stiff, reddish brown and gray, FAT CLAY (CH) -w/ ferrous stains at 12'-14'		86.5		24	62	24	38
0	15	Very stiff, reddish brown and gray, LEAN CLAY (CL) -w/ ferrous stains at 14'-18' -w/ calcareous nodules at 14'-16' -w/ silt seams at 16'-18'		92.5		22	44	24	20
▽						21			
-5	20	Stiff, reddish brown, SILTY CLAY (CL-ML)		90.2		24	27	21	6
-10	25	Reddish brown, SANDY SILT (ML) -w/ clay seams at 23'-25'		51.5		25	NP	NP	NP
-15	30	-w/ clay seams at 28'-30'				22			
-20	35	Stiff to very stiff, reddish brown, FAT CLAY (CH)		95.8	92	32	77	34	43
-25	40					26			
-30	45	Stiff, reddish brown, LEAN CLAY (CL)		96.1		25	38	25	13

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

PLATE A-6

LOG OF BORING ECP-210

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792629.06; E: 3234053.45
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 14.09 FT
DATE: 3/27/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45			Stiff, reddish brown, LEAN CLAY (CL) [Continued...]							
-35	50			Stiff to very stiff, reddish brown, FAT CLAY WITH SAND (CH)		81.4	97	26	67	31	36
-40	55			Very stiff, reddish brown and gray, FAT CLAY (CH)		98.7		33	82	35	47
-45	60			-w/ sand seams at 58'-60'			100	25			
-50	65			Gray and brown, CLAYEY SAND (SC) -w/ ferrous stains and calcareous nodules at 63'-65'		47.6		18	50	19	31
-55	70			-w/ roots at 68'-70'		45.3		36	37	22	15
-60	75			-w/ wood at 73'-75'							
-65	80			Light brown, SILT WITH SAND (ML)		80.0		26	NP	NP	NP
-70	85			Dense, brown and gray, SILTY CLAYEY SAND (SC-SM)	31	45.0		15	25	20	5
-75	90			Stiff to very stiff, gray, LEAN CLAY WITH SAND (CL)		81.3	105	22	45	23	22

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-211

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792651.82; E: 3234544.89
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 13.87 FT
DATE: 3/28/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0			Stiff to very stiff, dark gray and reddish brown, FAT CLAY (CH) -w/ roots at 0'-2'		92.8		26	70	25	45
10	5						103	26			
				-w/ sand seams at 4'-6' and 8'-10'		94.2		24	60	25	35
5	10					95.1		29	68	28	40
							98	28			
0				-w/ sand seams at 12'-14'							
	15			Stiff to very stiff, reddish brown, LEAN CLAY (CL) -w/ silt stones at 14'-18'		86.7		18	37	21	16
-5	20			Loose, reddish brown, SILT (ML)		88.1		22	NP	NP	NP
-10	25				9	85.5		23	NP	NP	NP
-15	30			Stiff to very stiff, reddish brown, FAT CLAY (CH) -w/ silt seams at 28'-30'				23			
-20	35					99.5	92	32	73	33	40
-25	40							31			
-30	45			Stiff, reddish brown, SILTY CLAY (CL-ML)		98.8		26	29	22	7

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

PLATE A-7

LOG OF BORING ECP-211

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792651.82; E: 3234544.89
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 13.87 FT
DATE: 3/28/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45	Stiff, reddish brown, SILTY CLAY (CL-ML) [Continued...]							
-35	50	Very stiff, reddish brown, FAT CLAY (CH)		99.6	95	31	67	30	37
-40	55	Stiff to very stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL)		82.4		24	44	21	23
-45	60				115	17			
-50	65	Medium dense to dense, brown, SILTY SAND (SM)	44						
-55	70		48	25.7		21	NP	NP	NP
-60	75	-w/ clay seams at 73'-75'	24			18			
-65	80	Stiff, brown and gray, LEAN CLAY (CL)		95.1		29	44	26	18
-70	85	Stiff, gray, FAT CLAY (CH)		98.7	79	45	90	29	61
-75	90					51			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-212

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792686.99; E: 3235020.65
DEPTH OF WATER:17 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 13.18 FT
DATE: 3/30/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, gray and reddish brown, FAT CLAY (CH) -w/ roots and calcareous nodules at 0'-2'		89.9		20	56	22	34
10	5	-w/ ferrous stains at 4'-6'			103	23			
						24			
5	10			95.5		31	80	30	50
					91	31			
0	15	Firm to stiff, reddish brown and gray, LEAN CLAY (CL) -w/ sand seams at 12'-14'		88.4		20	33	18	15
		Very stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL)		72.3			24	16	8
▽		Reddish brown, SILTY SAND (SM)		48.9		18	NP	NP	NP
-5	20	-w/ clay seams at 16'-18'							
-10	25	Reddish brown, SILT WITH SAND (ML)		84.0		26	NP	NP	NP
-15	30					20			
-20	35	Very stiff, reddish brown, FAT CLAY (CH)		99.7	94	29	73	34	39
-25	40					29			
-30	45	Stiff to very stiff, reddish brown, LEAN CLAY (CL)		99.8	99	27	45	20	25

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 17 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-212

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792686.99; E: 3235020.65
DEPTH OF WATER:17 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 13.18 FT
DATE: 3/30/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45	Stiff to very stiff, reddish brown, LEAN CLAY (CL) [Continued...]							
-35	50					31			
-40	55	Very stiff, reddish brown, FAT CLAY (CH)		98.2	90	32	78	35	43
-45	60	Firm to stiff, gray, SANDY FAT CLAY (CH)		59.5		20	63	14	49
-50	65	Very stiff, gray and brown, FAT CLAY (CH) -w/ sand seams at 63'-65'		98.5		29	60	25	35
-55	70	-w/ silt seams at 68'-70'			94	30			
-60	75	Stiff to very stiff, gray and brown, SANDY LEAN CLAY (CL)		69.9		22	37	21	16
-65	80				98	26			
-70	85	Very stiff to hard, brown and gray, LEAN CLAY WITH SAND (CL) -w/ calcareous nodules at 83'-85'		71.8	110	20	47	21	26
-75	90		42			20			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 17 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-213

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792577.1; E: 3235548.62
DEPTH OF WATER:28 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 15.55 FT
DATE: 3/30/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
15	0	Firm to very stiff, dark gray and reddish brown, FAT CLAY (CH) -w/ roots at 0'-2' -w/ sand seams at 2'-12'				25			
				94.3		25	60	25	35
10	5					29			
				90.4		26	65	27	38
5	10								
				89.9			69	27	42
0	15					28			
				96.5	103	26	65	27	38
-5	20								
		Very stiff, reddish brown, LEAN CLAY (CL) -w/ silt seams at 23'-25'		97.2	114	19	40	22	18
-10	25								
▽		Brown, SANDY SILT (ML)		69.0		24	NP	NP	NP
-15	30								
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ silt seams at 33'-35'		99.0			64	34	30
-20	35								
					96	29			
-25	40								
				99.1		26	37	26	11
	45								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 28 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-213

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792577.1; E: 3235548.62
DEPTH OF WATER:28 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 15.55 FT
DATE: 3/30/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-30	45	Very stiff, reddish brown, LEAN CLAY (CL) -w/ silt seams at 43'-45' [Continued...]							
	50	Stiff to very stiff, reddish brown, FAT CLAY (CH) -w/ silt seams at 48'-50'		99.5	95	30	59	30	29
-35									
	55			100		32	73	30	43
-40									
	60	Stiff to very stiff, gray and brown, SANDY LEAN CLAY (CL)		69.3		19	41	23	18
-45		-w/ calcareous nodules at 63'-65'							
	65					18			
-50									
	70	Very dense, gray, SILTY SAND (SM)	51	17.0		20	NP	NP	NP
-55									
	75		51			21			
-60									
	80	Stiff, gray, SILTY CLAY WITH SAND (CL-ML)	9	82.0		24	26	21	5
-65									
	85	Stiff, dark gray, FAT CLAY WITH SAND (CH)	14	78.5		42	76	33	43
-70									
	90	Very stiff, gray and brown, FAT CLAY (CH)		85.3	105	23			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 28 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-214

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792680.85; E: 3235968.78
DEPTH OF WATER: 13 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 8.35 FT
DATE: 3/31/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 14 FT
WET ROTARY: 14 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Very stiff, reddish brown and gray, FAT CLAY WITH SAND (CH) -w/ roots at 0'-2'		75.4		25	62	30	32
5	5				113	17			
		Reddish brown and gray, CLAYEY SAND (SC)		46.8		17	31	19	12
0	10	Stiff to very stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL) -w/ sand seams at 10'-12'			107	21			
-5	15	-w/ ferrous stains and calcareous nodules at 14'-16'	23	84.0	112	21	45	25	20
		Medium dense, reddish brown, SANDY SILT (ML)				18			
-10	20		14	67.7		23			
-15	25		29	52.9		21	22	20	2
-20	30	Firm to very stiff, reddish brown, LEAN CLAY (CL)		99.2		25	NP	NP	NP
-25	35						35	20	15
-30	40	-w/ silt seams at 38'-40'		98.4		23			
-35	45				91	23	36	23	13
						32			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 13 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-214

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792680.85; E: 3235968.78
DEPTH OF WATER:13 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 8.35 FT
DATE: 3/31/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 14 FT
WET ROTARY: 14 TO 90 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45			Firm to very stiff, reddish brown, LEAN CLAY (CL) [Continued...]							
-40	50			Very stiff, reddish brown, FAT CLAY (CH)		96.6		33	79	30	49
-45	55			Very stiff, gray and reddish brown, SANDY FAT CLAY (CH)		65.0	105	24	59	28	31
-50	60			-w/ sand seams at 58'-60'				16			
-55	65			Dense to very dense, brown and gray, SILTY SAND (SM)	43	12.6		19	NP	NP	NP
-60	70				57			21			
-65	75				80	14.7			NP	NP	NP
-70	80			Very stiff to hard, brown and gray, LEAN CLAY WITH SAND (CL)		73.1	114	17	35	10	25
-75	85				33			19			
-80	90			Very stiff, brown and gray, LEAN CLAY (CL)		86.0	105	24	45	10	35

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 13 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-215

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792748.1; E: 3236415.28
DEPTH OF WATER:9 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 8.74 FT
DATE: 4/1/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 10 FT
WET ROTARY: 10 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH) -w/ roots at 0'-2'		76.3		21	57	23	34
5	5				104	23			
		Dense to very dense, brown, SILTY SAND (SM)	32	16.3		24	NP	NP	NP
▽ 0	10		81						
			79			22			
-5			50						
	15		49	24.0		24	NP	NP	NP
		-w/ clay seams at 16'-18'	47						
-10	20	Stiff to very stiff, brown, SANDY LEAN CLAY (CL)	16	57.5		23	31	18	13
-15	25	Very stiff, gray, brown and reddish brown, FAT CLAY (CH) -w/ sand seams at 23'-25'		97.0		26	59	20	39
-20	30	-w/ calcareous nodules at 28'-30'			98	27			
-25	35	Stiff, reddish brown, LEAN CLAY (CL)		96.6		26	32	12	20
-30	40	Very stiff, reddish brown, SILTY CLAY (CL-ML)	19	86.0		23	23	17	6
-35	45	Stiff to very stiff, reddish brown, FAT CLAY (CH)		95.5	96	29	68	33	35

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 9 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-215

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792748.1; E: 3236415.28
DEPTH OF WATER:9 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 8.74 FT
DATE: 4/1/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 10 FT
WET ROTARY: 10 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45	Stiff to very stiff, reddish brown, FAT CLAY (CH) [Continued...]							
-40	50					35			
-45	55	Stiff to very stiff, gray, brown and reddish brown. SANDY LEAN CLAY (CL)		59.9	107	20	37	19	18
-50	60					22			
-55	65	Dense, brown and gray, SAND WITH SILT (SP-SM)	41	11.7		19	NP	NP	NP
-60	70	Dense to very dense, brown and gray, SILTY SAND (SM)	66			21			
-65	75		50	13.8		21	NP	NP	NP
-70	80	Very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL) -w/ sand pockets and calcareous nodules at 78'-80'		75.5	110	19	38	22	16
-75	85	Dense, gray and brown, CLAYEY SAND (SC)	31	48.4		19	29	19	10
-80	90	-w/ clay seams at 88'-90'				17			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 9 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-216

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792765.31; E: 3236908.54
DEPTH OF WATER: 14 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 8.61 FT
DATE: 4/1/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 16 FT
WET ROTARY: 16 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL) -w/ roots at 0'-2'		74.7		15	42	20	22
5	5				109	21			
		-w/ ferrous stains at 6'-8'		71.0		15	35	19	16
0	10	Very stiff, reddish brown and gray, SANDY LEAN CLAY (CL) -w/ calcareous nodules at 8'-10'		69.8		32	20	12	
		Firm to very stiff, reddish brown, LEAN CLAY (CL)			100	22			
▽ -5	15			92.2		23	34	21	13
				89.9					
			22						
-10	20			99.5		22	31	23	8
-15	25	Medium dense, reddishbrown, SILT (ML)	14	97.9		26			
-20	30	Very stiff, reddish brown, FAT CLAY (CH)		99.4		27	76	33	43
-25	35				100	29			
-30	40	Very stiff, brown, SILTY CLAY (CL-ML)	23	89.4		27	27	21	6
-35	45			98.9		26	51	23	28

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 14 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

PLATE A-12

LOG OF BORING ECP-216

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792765.31; E: 3236908.54
DEPTH OF WATER:14 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 8.61 FT
DATE: 4/1/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 16 FT
WET ROTARY: 16 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45	Very stiff, reddish brown, FAT CLAY (CH) -w/ silt seams at 43'-45' [Continued...]							
-40	50			99.4	89	35	61	30	31
-45	55	Very stiff, reddish brown, FAT CLAY WITH SAND (CH)		79.8		26	64	29	35
-50	60				108	21			
-55	65	Dense, brown, SAND WITH SILT (SP-SM)	43	9.8		22	NP	NP	NP
-60	70		31			20			
-65	75	Stiff to very stiff, gray and reddish brown, SANDY LEAN CLAY (CL)		65.7	110	21	37	20	17
-70	80					18			
-75	85	Very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)		77.0	116	17	31	21	10
-80	90					21			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 14 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-217

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792792.57; E: 3237347.99
DEPTH OF WATER: 13 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 9.21 FT
DATE: 4/3/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 14 FT
WET ROTARY: 14 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, gray and brown, LEAN CLAY WITH SAND (CL) -w/ roots at 0'-4'		84.5		18	49	23	26
5	5				101	25			
		Stiff, brown and gray, LEAN CLAY (CL) -w/ ferrous stains and calcareous nodules at 6'-8'		89.1		18	42	19	23
0	10	Very stiff, reddish brown and gray, FAT CLAY (CH) -w/ ferrous stains at 8'-10'		98.5		20	50	22	28
▽		Firm to stiff, reddish brown and gray, LEAN CLAY (CL)		95.2		23			
-5	15	-w/ silt seams at 16'-18'			105	23			
				99.3		22	28	18	10
-10	20	Stiff to hard, brown and reddish brown, SANDY SILTY CLAY (CL-ML)	33	64.6			25	19	6
-15	25		12			28			
-20	30	Stiff to very stiff, brown and reddish brown, FAT CLAY (CH)		99.1			70	27	43
-25	35				93	31			
-30	40	Reddish brown, SILT (ML)		92.1		25	23	20	3
-35	45			94.6		26	50	24	26

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 13 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

PLATE A-13

LOG OF BORING ECP-217

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792792.57; E: 3237347.99
DEPTH OF WATER:13 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 9.21 FT
DATE: 4/3/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 14 FT
WET ROTARY: 14 TO 90 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45			Stiff to very stiff, reddish brown, FAT CLAY (CH) -w/ silt seams at 43'-45' [Continued...]							
-40	50					96.2	92	31	73	30	43
-45	55						105	21			
-50	60			Firm to stiff, reddish brown and gray, SANDY LEAN CLAY (CL) -w/ calcareous nodules at 58'-60'		65.5		20	25	16	9
-55	65			Medium dense to dense, brown and gray, SILTY SAND (SM)	38	12.4			NP	NP	NP
-60	70				29			21			
-65	75			Dense, brown, SAND WITH SILT (SP-SM)	43	7.9		22	NP	NP	NP
-70	80			Very stiff to hard, brown and gray, LEAN CLAY WITH SAND (CL) -w/ calcareous nodules at 78'-80'		80.5	118	16	40	18	22
-75	85			Very stiff to hard, brown and gray, FAT CLAY (CH) -w/ calcareous nodules at 83'-85'		97.9		27	74	35	39
-80	90			-w/ calcareous nodules and ferrous stains at 88'-90'			116	16			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 13 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-218

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792807.26; E: 3237848.45
DEPTH OF WATER: 15 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 9.31 FT
DATE: 4/3/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 16 FT
WET ROTARY: 16 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, reddish brown and gray, FAT CLAY WITH SAND (CH)		76.0		22	62	27	35
5	5				97	29			
0	10	Vey stiff, reddish brown and gray, FAT CLAY (CH) -w/ ferrous stains at 8'-10'		97.2		32	63	32	31
		Stiff to very stiff, reddish brown and gray, FAT CLAY WITH SAND (CH)		79.5			53	29	24
-5 ▽	15				10	22			
						21			
		Medium dense, reddish brown, SANDY SILT (ML)	14						
-10	20		21	62.9		19	NP	NP	NP
-15	25	Stiff to very stiff, reddish brown, LEAN CLAY (CL)	16	92.7		30	30	22	8
-20	30	Very stiff, reddish brown, FAT CLAY (CH)	19	89.2		31	67	25	42
-25	35				98	27			
-30	40	Reddish brown, SILT WITH SAND (ML) -w/ clay seams at 38'-40'		71.8		22	22	20	2
-35	45	Very stiff, reddish brown, FAT CLAY (CH)		95.7	94	26	71	31	40

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 15 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

PLATE A-14

LOG OF BORING ECP-218

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792807.26; E: 3237848.45
DEPTH OF WATER: 15 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 9.31 FT
DATE: 4/3/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 16 FT
WET ROTARY: 16 TO 90 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45			Very stiff, reddish brown, FAT CLAY (CH) [Continued...]							
-40	50							31			
-45	55						88	35			
-50	60			Stiff, brown and gray, SANDY LEAN CLAY (CL) -w/ calcareous nodules at 58'-60'		60.3		19	34	20	14
-55	65							16			
-60	70			Very dense, gray and brown, SAND WITH SILT (SP-SM)	52	9.8		18	NP	NP	NP
-65	75				60			16			
-70	80			Very dense, brown, SILTY SAND (SM)	93	17.9		16	NP	NP	NP
-75	85				69			20			
-80	90			Very stiff, gray, SANDY LEAN CLAY (CL)		69.2	110	19	43	22	21

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 15 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

PLATE A-14

LOG OF BORING ECP-219

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792858.15; E: 3238351.67
DEPTH OF WATER:17 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 14.47 FT
DATE: 4/6/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, gray and reddish brown, FAT CLAY (CH)		94.2		33	72	30	42
					97	27			
10	5								
						27			
5	10	-w/ sand seams at 10'-12'		99.2	99	28	72	29	43
		Firm to very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH)		83.0		19	51	22	29
0	15								
▽		Stiff to very stiff, reddish brown, SILTY CLAY (CL-ML)		89.7		25	26	22	4
-5	20								
		Stiff, reddish brown, LEAN CLAY (CL)		94.8		23	38	24	14
-10	25	-w/ sand seams at 23'-25'							
		Stiff to very stiff, reddish brown, FAT CLAY (CH)	12	98.2		31	72	31	41
-15	30								
					96	29			
-20	35								
		Firm to stiff, reddish brown, LEAN CLAY (CL)		94.8		25	44	24	20
-25	40	-w/ silt seams at 38'-40'							
		Very stiff, reddish brown, FAT CLAY (CH)		99.2	94	30	78	30	48
-30	45								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 17 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

PLATE A-15

LOG OF BORING ECP-219

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792858.15; E: 3238351.67
DEPTH OF WATER:17 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 14.47 FT
DATE: 4/6/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 90 FT

ELEVATION, FT	DEPTH, FT	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45		Very stiff, reddish brown, FAT CLAY (CH) [Continued...]							
-35	50						35			
			Stiff to very stiff, reddish brown and gray, SANDY LEAN CLAY (CL)		55.9	115	19	37	19	18
-40	55									
			-w/ calcareous nodules at 58'-60'				18			
-45	60									
			Medium dense to very dense, brown and gray, SAND WITH SILT (SP-SM)	21	9.0		23	NP	NP	NP
-50	65									
				70			21			
-55	70									
			Dense to very dense, gray and brown, SILTY SAND (SM)	67	14.1		22	NP	NP	NP
-60	75									
				41			16			
-65	80									
			Stiff to hard, reddish brown and gray, FAT CLAY (CH) -w/ sand seams at 83'-85'		93.4		27	52	27	25
-70	85									
						113	19			
-75	90									

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 17 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

PLATE A-15

LOG OF BORING ECP-220

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792880.24; E: 3238857.33
DEPTH OF WATER:17 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 9.49 FT
DATE: 4/7/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, gray and reddish brown, FAT CLAY (CH) -w/ roots at 0'-2' -w/ sand seams at 0'-2'		98.5	88	33	90	32	58
5	5	-w/ sand seams at 6'-12'		98.8		32	89	26	63
0	10			89.0			53	23	30
				94.4	102	25	58	18	40
-5	15	-w/ calcareous nodules at 14'-16'							
▽		Firm to stiff, reddish brown, SILTY CLAY (CL-ML)		93.0		24	25	20	5
		Firm to stiff, reddish brown, LEAN CLAY (CL)		89.4			25	17	8
-10	20								
				99.9		25	27	19	8
-15	25								
-20	30	-w/ silt seams at 28'-30'				26			
		Stiff to very stiff, reddish brown, FAT CLAY (CH) -w/ silt seams at 33'-35'		100	92	31	81	31	50
-25	35								
-30	40					27			
		-w/ silt pockets at 43'-45'		99.7		26	67	24	43
-35	45								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 17 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-220

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792880.24; E: 3238857.33
DEPTH OF WATER:17 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 9.49 FT
DATE: 4/7/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45	Stiff to very stiff, reddish brown, FAT CLAY (CH) -w/ silt seams at 33'-35' [Continued...]							
-40	50				93	28			
-45	55			100	83	39	92	32	60
-50	60	Stiff, reddish brown, SANDY LEAN CLAY (CL) -w/ calcareous nodules at 58'-60'		62.7		19	27	15	12
-55	65	Dense, brown, CLAYEY SAND (SC)	39	12.4		14	27	14	13
-60	70	Very dense, brown, SILTY SAND (SM)	83	21.3			NP	NP	NP
-65	75		94						
-70	80	Stiff to very stiff, gray and brown, FAT CLAY (CH)		98.2	78	42	100	33	67
-75	85	-w/ calcareous nodules at 83'-85'				27	76	28	48
-80	90			89.9					

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 17 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-221

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792894.48; E: 3239310.42
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 7.55 FT
DATE: 4/7/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, gray and reddish brown, FAT CLAY (CH) -w/ sand seams at 0'-2'		95.8		32	74	26	48
5	5	-w/ sand seams at 6'-8'		95.9	86	36	90	30	60
0	10	-w/ silt seams at 10'-12'		100		27	73	28	45
					98	25			
-5	15			92.7		20	55	23	32
-10		Very stiff, reddish brown, LEAN CLAY WITH SAND (CL) -w/ silt seams at 16'-18'		82.4		19	27	16	11
	20	Medium dense, reddish brown, SILT WITH SAND (ML) -w/ clay seams at 18'-20'	17						
-15	25		20	73.7		23			
-20	30	Firm to stiff, reddish brown, LEAN CLAY (CL) -w/ silt seams at 28'-30'	8	99.1			31	20	11
-25	35	Stiff to very stiff, reddish brown, FAT CLAY (CH)	16	100		29	71	30	41
-30	40	-w/ silt seams at 38'-40'							
-35	45			99.6		28	73	33	40

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-221

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792894.48; E: 3239310.42
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 7.55 FT
DATE: 4/7/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 90 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	45			Stiff to very stiff, reddish brown, FAT CLAY (CH) [Continued...]							
-40	50						93	30			
-45	55					99.2		38	86	32	54
-50	60			Dense to very dense, gray and brown, SILTY SAND (SM) -w/ calcareous nodules at 58'-60'				17			
-55	65				36	15.0		18	NP	NP	NP
-60	70				53			20			
-65	75				71			19			
-70	80			Very stiff to hard, reddish brown and gray, FAT CLAY (CH)		99.3	93	31	77	29	48
-75	85			Stiff to very stiff, gray, SANDY SILTY CLAY (CL-ML)		69.9		21	22	17	5
-80	90						110	19			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-222

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792918.96; E: 3239740.89
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 10.86 FT
DATE: 4/8/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
10	0	Firm to stiff, gray and reddish brown, FAT CLAY WITH SAND (CH) -w/ roots at 0'-2'		83.6		32	77	28	49
5	5				87	36			
0	10	Firm to very stiff, gray and reddish brown, FAT CLAY (CH)		98.6		30	72	26	46
-5	15	-w/ silt seams at 12'-14' -w/ calcareous nodules at 12'-14'			102	24			
-10	20			95.1		24	61	26	35
-15	25	Firm to stiff, reddish brown, LEAN CLAY (CL)	13	86.1		27	27	19	8
-20	30		10			30			
-25	35		7			29			
-30	40	Stiff to very stiff, reddish brown, FAT CLAY (CH) -w/ silt seams at 38'-40'		97.8	92	32	69	20	49
	45					29			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

Drilled By: CH Logged By: Edgar

LOG OF BORING ECP-222

PROJECT: HSC Expansion-BSC-East of San Jacinto College
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13792918.96; E: 3239740.89
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 90 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 10.86 FT
DATE: 4/8/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 20 FT
WET ROTARY: 20 TO 90 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-35	45	Stiff to very stiff, reddish brown, FAT CLAY (CH) -w/ silt seams at 38'-40' [Continued...]							
	50			97.4	90	32	81	29	52
-40									
		-w/ silt seams at 53'-55'							
	55					38			
-45									
	60	Gray, CLAYEY SAND (SC)		40.8		19	26	15	11
-50									
	65	Very stiff, gray, FAT CLAY WITH SAND (CH)		83.7	107	19	51	23	28
-55									
	70	Very dense, brown, SAND WITH SILT (SP-SM)	73	10.0		19	NP	NP	NP
-60									
	75	NO RECOVERY	86						
-65									
	80		72	9.4		18	NP	NP	NP
-70									
	85	Very stiff, gray and brown, LEAN CLAY WITH SAND (CL) -w/ calcareous nodules at 83'-85'		84.8	106	19	48	22	26
-75									
	90	-w/ sand seams at 88'-90'				20			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18 feet below ground surface during the field operations.

COH HG1910092.2.1 - BSC LAND CUT.GPJ 6/8/20

Drilled By: CH Logged By: Edgar

PLATE A-18

BARBOURS CUT CHANNEL-
SPILMANS ISLAND

LOG OF BORING ECP-309

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818082.34; E: 3238312.07
DEPTH OF WATER:9 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 31.54 FT
DATE: 2/04/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
30	0	Soft to very stiff, gray and brown, FAT CLAY WITH SAND (CH) -w/ shells at 0'-4' -w/ gravel at 0'-8' -w/ ferrous stains at 0'-10'		73.4	104	23	50	18	32
	5					24			
25					108	21			
▽	10	-w/ shells at 8'-10' -w/ calcareous nodules at 8'-10'				19			
20		Very loose to loose, gray, CLAYEY SAND (SC) -w/ ferrous stains at 10'-12' -w/ calcareous nodules at 10'-12'		48.2		15	47	19	28
	15	-w/ shells at 10'-16'	9	21.8		16	28	14	14
15		-w/ ferrous stains at 16'-18'	3			16			
			5			24			
	20	Very soft to firm, gray and brown, SANDY FAT CLAY (CH) -w/ ferrous stains at 18'-20'		68.4		29	55	21	34
10						30			
	25				91	32			
5									
	30	Soft to stiff, gray and brown, LEAN CLAY WITH SAND (CL)		75.8		32	43	18	25
0									
	35				101	25	39	21	18
-5									
	40					36			
-10									
	45	Firm to stiff, gray and brown, FAT CLAY (CH)			71	51	113	32	81
-15									
	50	-w/ sand pockets at 48'-50'		94.8		40	80	28	52

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 9' during drilling operations.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-19

LOG OF BORING ECP-309

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818082.34; E: 3238312.07
DEPTH OF WATER:9 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 31.54 FT
DATE: 2/04/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-20	50	Firm to stiff, gray and brown, FAT CLAY (CH) [Continued...]							
	55	Firm to stiff, gray, LEAN CLAY (CL) -w/ shells at 53'-55'			105	18	47	20	27
-25									
	60	Stiff to very stiff, brown and reddish brown, FAT CLAY (CH)		91.8		30	74	29	45
-30									
	65				87	36			
-35									
	70					26			
-40									
	75	-w/ shells at 73'-75'	13			25	64	22	42
-45									
	80	-w/ claystones at 78'-80'			109	20			
-50									
	85	Stiff to very stiff, gray and brown, LEAN CLAY (CL) -w/ ferrous stains at 83'-85'		87.6	110	18	39	18	21
-55									
	90	-w/ ferrous stains at 88'-90'				20			
-60									
	95				107	23	32	19	13
-65									
	100	Medium dense to dense, brown and gray, SILTY CLAYEY SAND (SC-SM)		45.5		20			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 9' during drilling operations.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-19

LOG OF BORING ECP-309

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818082.34; E: 3238312.07
DEPTH OF WATER:9 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 31.54 FT
DATE: 2/04/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	100			Medium dense to dense, brown and gray, SILTY CLAYEY SAND (SC-SM) [Continued...]	44	43.7		22	23	16	7
-70											
	105				11			23			
-75											
	110										
-80				Stiff, gray, SANDY LEAN CLAY (CL)		54.6		19	38	18	20
	115										
-85				Very stiff, reddish brown and gray, FAT CLAY (CH)		99.2	107	25	57	24	33
	120										
-90								25			
	125										
-95								28			
	130										

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 9' during drilling operations.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

LOG OF BORING ECP-310

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818238.53; E: 3238942.13
DEPTH OF WATER: 5 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 34.42 FT
DATE: 2/14/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 6 FT
WET ROTARY: 6 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Soft, brown, SANDY LEAN CLAY (CL)				34			
				50.9		26	34	22	12
30	5	Very loose, gray and brown, SILTY SAND (SM)				23			
			WOH	47.8		34	NP	NP	NP
			2						
25	10					75			
		Very soft to firm, gray and reddish brown, FAT CLAY (CH)			53	80			
		-w/ sand seams at 12'-14'							
20	15			96.6	48	99	130	35	95
						62			
15	20			87.6	82	42	66	3	63
10	25					46			
		Soft to firm, gray, LEAN CLAY WITH SAND (CL)		77.0	86		47	25	22
5	30								
			5						
0	35					28			
		-w/ sand pockets at 38'-40'							
-5	40					25	41	24	17
-10	45				88	28			
		Stiff to very stiff, gray and brown, FAT CLAY (CH)		97.7		29	72	29	43
-15	50								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 5' during drilling operations.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-20

LOG OF BORING ECP-310

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818238.53; E: 3238942.13
DEPTH OF WATER: 5 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 34.42 FT
DATE: 2/14/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 6 FT
WET ROTARY: 6 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	50	Stiff to very stiff, gray and brown, FAT CLAY (CH) [Continued...]							
-20	55				92	31			
-25	60	-w/ sand seams at 58'-60'		99.4		30	73	38	35
-30	65	-w/ gravel at 63'-65'			108	22			
-35	70	-w/ gravel at 68'-70'				25			
-40	75	Very stiff, gray and brown, LEAN CLAY (CL) -w/ sand seams at 73'-75'			115	16	37	21	16
-45	80	Dense to very dense, gray and brown, SILTY CLAYEY SAND (SC-SM)	78	35.6		20	25	19	6
-50	85		38			20			
-55	90	Medium dense to dense, gray and brown, SILTY SAND (SM)		38.2		21	NP	NP	NP
-60	95		26			33			
-65	100	Dense to very dense, gray and brown, CLAYEY SAND (SC)	32	47.6		23	32	20	12

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 5' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-20

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

LOG OF BORING ECP-310

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818238.53; E: 3238942.13
DEPTH OF WATER:5 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 34.42 FT
DATE: 2/14/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 6 FT
WET ROTARY: 6 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	100	Dense to very dense, gray and brown, CLAYEY SAND (SC) [Continued...]							
			44			22			
-70	105								
			74			20			
-75	110								
		Very stiff, gray, LEAN CLAY WITH SAND (CL)		77.4		18	33	21	12
-80	115	-w/ sand pockets at 113'-115'							
		Very dense, gray, SANDY SILT (ML)	50/2	55.8		26	NP	NP	NP
-85	120	-w/ clay seams at 118'-120'							
		-no recovery at 123'-125'	50/1						
-90	125								
		Very stiff, gray, LEAN CLAY (CL)	32	100		31	49	30	19
-95	130	-w/ sand seams at 128'-130'							

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 5' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-20

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

LOG OF BORING ECP-311

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818366.68; E: 3240208.53
DEPTH OF WATER:6 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 31.28 FT
DATE: 2/19/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 130 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0										
30				Soft to firm, reddish brown and gray, FAT CLAY (CH) -w/ roots and sand seams at 0'-2'		94.7		58	97	32	65
	5			Very loose, brown and gray, SILT (ML)	WOH	80.2		45	NP	NP	NP
25					2						
	10			Very soft to soft, gray, FAT CLAY (CH)		96.0		56	78	29	49
20								85			
						89.6	66	67	75	27	48
	15			Soft to firm, reddish brown and gray, FAT CLAY WITH SAND (CH)		84.3			66	30	36
15							92	32			
	20							33			
10											
	25			Very soft to firm, reddish brown and gray, LEAN CLAY WITH SAND (CL)		76.6		24	42	19	23
5											
	30						80	41	46	24	22
0											
	35			Firm, gray, FAT CLAY (CH)		95.5	82	40	80	35	45
-5											
	40			Soft, gray, SANDY LEAN CLAY (CL)		63.3		34	36	26	10
-10											
	45			Very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH) -w/ calcareous nodules at 43'-45'	17	78.8		24	53	29	24
-15											
	50			Stiff to very stiff, gray and reddish brown, FAT CLAY (CH)		99.9	86	37	94	25	69

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 6' during drilling operations.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-21

LOG OF BORING ECP-311

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818366.68; E: 3240208.53
DEPTH OF WATER:6 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 31.28 FT
DATE: 2/19/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-20	50	Stiff to very stiff, gray and reddish brown, FAT CLAY (CH) [Continued...]							
	55				87	36			
-25									
	60			99.8		36	88	33	55
-30									
	65				89	31			
-35									
	70	-w/ sand seams at 68'-70'		97.4		24	65	25	40
-40									
	75				94	29			
-45									
	80	Very stiff, gray and reddish brown, LEAN CLAY (CL)		99.2		20	43	21	22
-50									
	85	Very dense, gray, SILTY SAND (SM)	65			18			
-55									
	90		70	31.2		18	NP	NP	NP
-60									
	95		75			22			
-65									
	100	Hard, gray, SANDY LEAN CLAY (CL) -w/ sand pockets at 98'-100'	39	67.0		22	37	19	18

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 6' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-21

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

LOG OF BORING ECP-311

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818366.68; E: 3240208.53
DEPTH OF WATER:6 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 31.28 FT
DATE: 2/19/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 130 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	100			Hard, gray, SANDY LEAN CLAY (CL) -w/ sand pockets at 98'-100' [Continued...]							
-70					52	76.7		22	26	19	7
	105			Hard, gray, SILTY CLAY WITH SAND (CL-ML)							
-75					48			25			
	110										
-80					50/2.5			17			
	115										
-85					25	77.9		25	44	20	24
	120			Very stiff to hard, gray, LEAN CLAY WITH SAND (CL)							
-90					50			27			
	125										
-95					34			40			
	130			w/ woods at 128'-130'							

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 6' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-21

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

LOG OF BORING ECP-312

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818508.34; E: 3241156.78
DEPTH OF WATER: N/A FT
COMPLETION DEPTH: 170 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 30.23 FT
DATE: 2/22/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 12 FT
WET ROTARY: 12 TO 170 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
30	0			Very soft to soft, gray and brown, SANDY LEAN CLAY (CL)	1			44			
	5					63.4		64	32	17	15
25								47			
				Very soft to soft, gray and brown, FAT CLAY WITH SAND (CH)	3	72.1		47	54	16	38
	10				WOH			81			
20				Very loose, gray and brown, SILTY CLAYEY SAND (SC-SM)	WOH	48.5		39	24	18	6
					4			42			
	15			Soft to stiff, reddish brown and gray, FAT CLAY (CH)		99.1		42	94	26	68
15				-w/ sand seams at 14'-16'							
				-w/ gravel at 16'-18'							
				-w/ sand seams at 18'-20'							
	20										
10											
				-w/ sand seams at 23'-25'							
	25					90.8		35	67	20	47
5											
				-w/ ferrous stains at 28'-30'							
	30					86.9		27	62	16	46
0											
					13						
	35							38			
-5											
				Firm, gray and reddish brown, LEAN CLAY WITH SAND (CL)		73.3		39	49	15	34
-10	40			-w/ shells at 38'-40'							
				Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		99.7		37	105	27	78
	45			-w/ shells and calcareous nodules 43'-45'							
-15											
				-w/ silt seams at 48'-50'							
	50							33			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Wet rotary was initiated at about 12 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 7/8/20

Drilled By: CH Logged By: George

HVJ Associates, Inc.

PLATE A-22

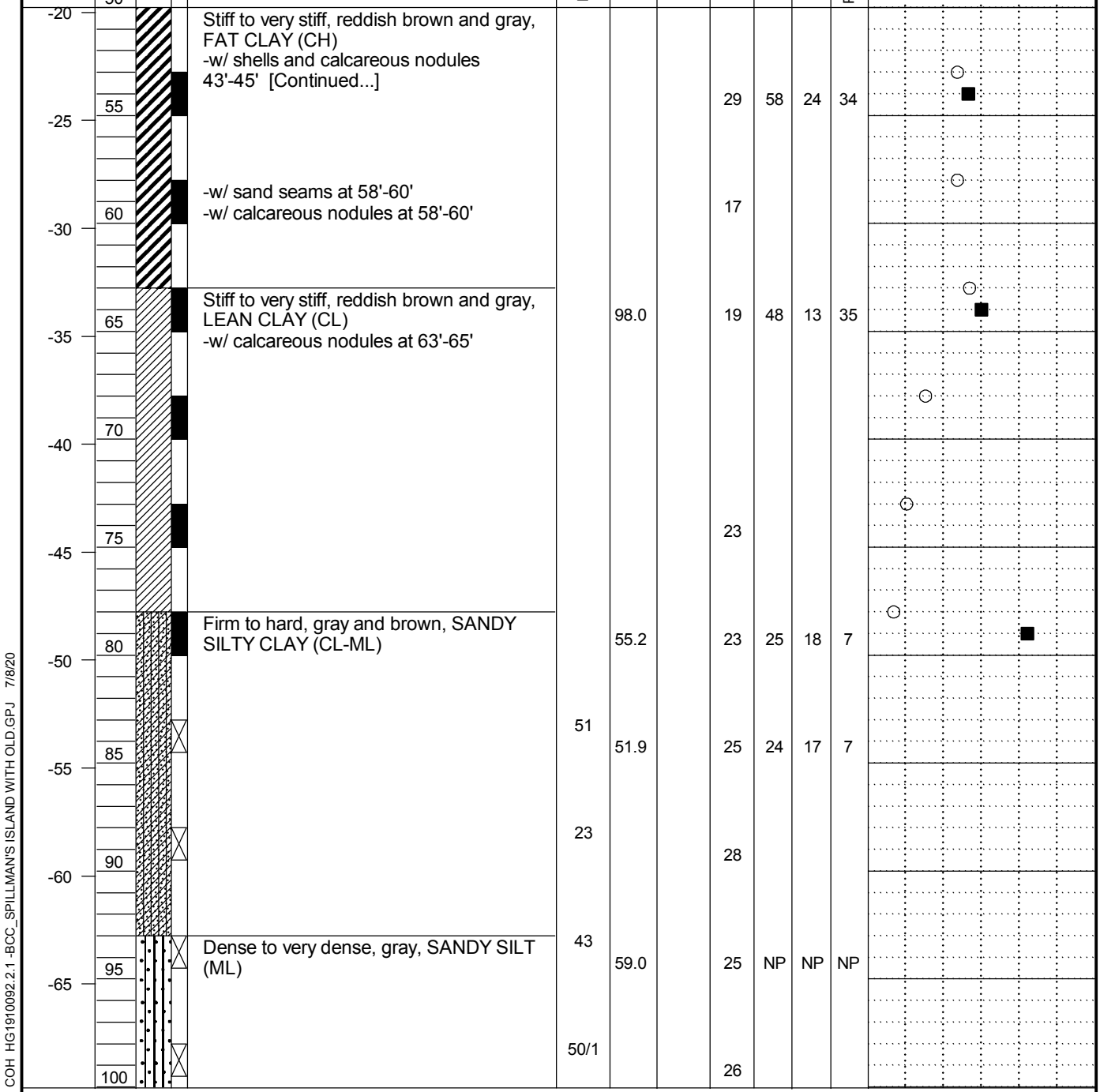
LOG OF BORING ECP-312

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818508.34; E: 3241156.78
DEPTH OF WATER: N/A FT
COMPLETION DEPTH: 170 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 30.23 FT
DATE: 2/22/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 12 FT
WET ROTARY: 12 TO 170 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-20	50	Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ shells and calcareous nodules 43'-45' [Continued...]				29	58	24	34
-25	55								
-30	60	-w/ sand seams at 58'-60' -w/ calcareous nodules at 58'-60'				17			
-35	65	Stiff to very stiff, reddish brown and gray, LEAN CLAY (CL) -w/ calcareous nodules at 63'-65'		98.0		19	48	13	35
-40	70								
-45	75					23			
-50	80	Firm to hard, gray and brown, SANDY SILTY CLAY (CL-ML)		55.2		23	25	18	7
-55	85		51	51.9		25	24	17	7
-60	90		23			28			
-65	95	Dense to very dense, gray, SANDY SILT (ML)	43	59.0		25	NP	NP	NP
	100		50/1			26			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 7/8/20

Remarks: Wet rotary was initiated at about 12 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

Drilled By: CH Logged By: George

HVJ Associates, Inc.

PLATE A-22

LOG OF BORING ECP-312

PROJECT: HSC Expansion -BCC-Spilmans Island
LOCATION: N: 13818508.34; E: 3241156.78
DEPTH OF WATER: N/A FT
STATION: N/A
SURFACE ELEVATION: 30.23 FT

PROJECT NO.: HG1910092.2.1
COMPLETION DEPTH: 170 FT
OFFSET: N/A
DATE: 2/22/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 12 FT
WET ROTARY: 12 TO 170 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-70	100	Dense to very dense, gray, SANDY SILT (ML) [Continued...]	50/1.5			25			
-75	105								
	110	Very dense, gray, SILTY SAND (SM)	61	21.2		20	NP	NP	NP
-80									
	115	Stiff to very stiff, gray, FAT CLAY (CH)	24	97.9		32	52	17	35
-85									
	120		21			43			
-90									
	125	-w/ ferrous stains at 123'-125'	20	98.6		42	69	21	48
-95									
	130					39			
-100									
	135	Very stiff, gray, LEAN CLAY (CL)	27	99.8		32	44	17	27
-105									
	140	Very stiff, gray, FAT CLAY (CH) -w/ ferrous stains and calcareous nodules at 138'-140'				46	75	28	47
-110									
	145								
-115									
	150	-w/ ferrous stains at 148'-150'		99.3		34	98	23	75

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Wet rotary was initiated at about 12 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 7/8/20

Drilled By: CH Logged By: George

HVJ Associates, Inc.

PLATE A-22

LOG OF BORING ECP-312

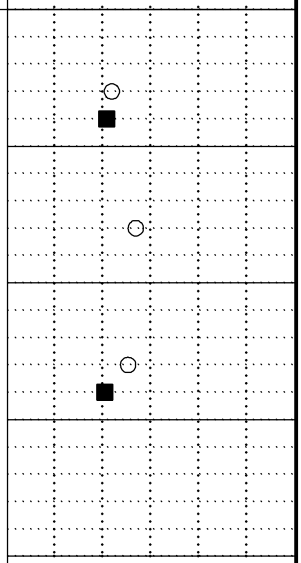
PROJECT: HSC Expansion -BCC-Spilmans Island
LOCATION: N: 13818508.34; E: 3241156.78
DEPTH OF WATER: N/A FT
STATION: N/A
SURFACE ELEVATION: 30.23 FT

PROJECT NO.: HG1910092.2.1
COMPLETION DEPTH: 170 FT
OFFSET: N/A
DATE: 2/22/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 12 FT
WET ROTARY: 12 TO 170 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-120	150			Very stiff, gray, FAT CLAY (CH) -w/ ferrous stains and calcareous nodules at 138'-140' [Continued...]							
-125	155										
	160							32	77	21	56
-130				-w/ sand seams at 163'-165'							
-135	165										
	170			Hard, gray, SILTY CLAY WITH SAND (CL-ML)	50/4.5	75.5		26	23	19	4

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



Remarks: Wet rotary was initiated at about 12 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

Drilled By: CH Logged By: George

HVJ Associates, Inc.

PLATE A-22

LOG OF BORING ECP-313

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817955.11; E: 3238634.13
DEPTH OF WATER: 14 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 39.44 FT
DATE: 2/03/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Very soft to firm, brown, LEAN CLAY WITH SAND (CL) -w/ shells at 0'-6'		76.6	93	29	46	20	26
35	5					30			
		Firm to stiff, reddish brown, FAT CLAY (CH)			97	41	54	23	31
30	10	-w/ gravel at 8'-10' -w/ sand seams at 10'-14' -w/ calcareous nodules at 12'-14'							
25	15	Loose, brown and gray, SILTY SAND (SM)	8	16.7		20	NP	NP	NP
		Very soft to stiff, gray and brown, FAT CLAY WITH SAND (CH)	3						
20	20			84.4	103	24	57	22	35
15	25				86	35			
10	30	Firm to stiff, reddish brown and gray, LEAN CLAY (CL)		90.9	98	26	49	22	27
5	35	-w/ calcareous nodules at 33'-35'				28			
0	40	-w/ calcareous nodules at 38'-40'			94	35			
-5	45	Firm, gray, FAT CLAY (CH)		99.1	71	48	93	32	61
-10	50	Firm, brown, SANDY LEAN CLAY (CL)		60.3		32	41	21	20

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 14' during drilling operations.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-23

LOG OF BORING ECP-313

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817955.11; E: 3238634.13
DEPTH OF WATER: 14 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 39.44 FT
DATE: 2/03/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	50	Firm, brown, SANDY LEAN CLAY (CL) [Continued...]							
-15	55	Firm, gray, FAT CLAY WITH SAND (CH) -w/ shells at 53'-55'		83.5	92	33	56	23	33
-20	60	Stiff, reddish brown, FAT CLAY (CH)		100	87	37	99	35	64
-25	65			100		33	87	34	53
-30	70	Very stiff, brown, SANDY FAT CLAY (CH)		69.8		19	53	23	30
-35	75	-w/ ferrous stains at 73'-75'			103	24			
-40	80	Very stiff, reddish brown, FAT CLAY (CH) -w/ ferrous stains at 78'-80'		86.7		31	69	26	43
-45	85	-w/ sand seams at 83'-85'		100		31	71	30	41
-50	90	-w/ sand seams at 88'-90'				27			
-55	95	Firm, gray and brown, SANDY LEAN CLAY (CL)		50.8		20	32	20	12
-60	100			62.9		21	28	20	8

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 14' during drilling operations.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-23

LOG OF BORING ECP-313

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817955.11; E: 3238634.13
DEPTH OF WATER: 14 FT
COMPLETION DEPTH: 130 FT
OFFSET: N/A
SURFACE ELEVATION: 39.44 FT
DATE: 2/03/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	100	Firm, gray and brown, SANDY LEAN CLAY (CL) [Continued...]							
-65	105	Loose to dense, gray, SILTY SAND (SM)	9						
-70	110		45	34.5		19	NP	NP	NP
-75	115	Medium dense, gray, SAND WITH SILT (SP-SM) -w/ woods at 113'-115'	15	7.0		27			
-80	120	Very stiff, gray and brown, FAT CLAY (CH) -w/ shells at 118'-120'	18	94.5		29	64	27	37
-85	125			98.5		26	65	30	35
-90	130	-w/ sand seams at 128'-130'				27			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 14' during drilling operations.

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-23

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

LOG OF BORING ECP-314

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818145.06; E: 3239580.73
DEPTH OF WATER:N/A FT
COMPLETION DEPTH: 170 FT
OFFSET: N/A
SURFACE ELEVATION: 39.08 FT
DATE: 2/10/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Soft to firm, brown, FAT CLAY WITH SAND (CH)		79.0		26	54	16	38
35	5			83.4		31	57	18	39
30	10	Soft to stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL) -w/ calcareous nodules at 8'-16'		79.1		21	39	13	26
25	15					24			
		Very soft to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ sand seams at 16'-18' -w/ shells at 18'-20'		90.3		41	54	17	37
20	20					32			
15	25	-w/ sand seams at 23'-25'		94.6		28	52	15	37
10	30								
5	35			93.8		44	53	18	35
0	40	-w/ shells at 38'-40'							
-5	45			94.2		30	68	20	48
-10	50					35			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Wet rotary was initiated at about 30 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By:CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-24

LOG OF BORING ECP-314

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818145.06; E: 3239580.73
DEPTH OF WATER: N/A FT
COMPLETION DEPTH: 170 FT
OFFSET: N/A
SURFACE ELEVATION: 39.08 FT
DATE: 2/10/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	50	Very soft to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ sand seams at 16'-18' [Continued...]							
-15	55	-w/ shells and sand seams at 53'-55'		95.4		49	72	22	50
-20	60								
-25	65			100.0		37	94	27	67
-30	70	-w/ ferrous stains at 68'-70'				34			
-35	75	Very stiff to hard, reddish brown and gray, LEAN CLAY WITH SAND (CL)		81.6		18	24	14	10
-40	80	-w/ ferrous stains and calcareous nodules at 78'-80'							
-45	85	Very stiff, gray, LEAN CLAY (CL)		93.6		22	45	14	31
-50	90		28			30			
-55	95	Stiff, gray, SANDY LEAN CLAY (CL)	13	68.9		26	32	12	20
-60	100	Firm to stiff, gray, FAT CLAY (CH) -w/ sand seams at 98'-100'		90.8		28	53	14	39

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Wet rotary was initiated at about 30 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-24

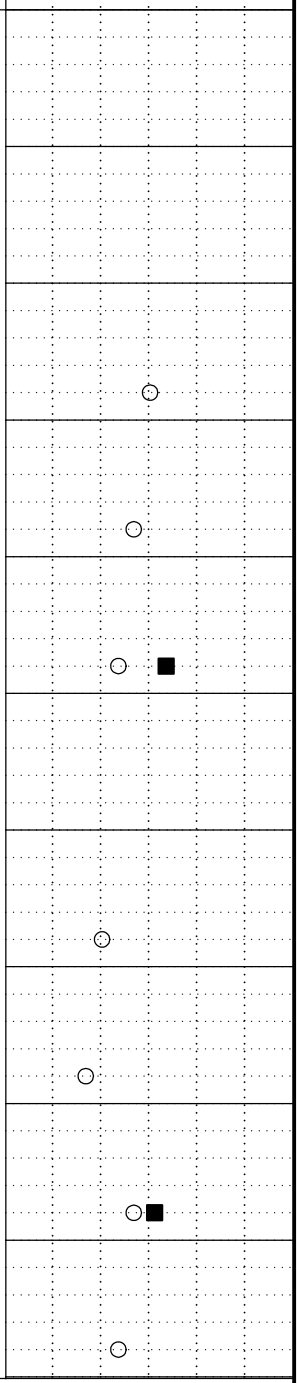
LOG OF BORING ECP-314

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818145.06; E: 3239580.73
DEPTH OF WATER: N/A FT
COMPLETION DEPTH: 170 FT
OFFSET: N/A
SURFACE ELEVATION: 39.08 FT
DATE: 2/10/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	100	Firm to stiff, gray, FAT CLAY (CH) -w/ sand seams at 98'-100' [Continued...]							
-65	105	Loose, gray, SAND WITH SILT (SP-SM)	8	7.5		21	NP	NP	NP
-70	110	-w/ shells at 108'-110'							
-75	115	Very stiff, reddish brown and gray, FAT CLAY (CH)		99.3		30	81	27	54
-80	120	-w/ sand seams at 118'-120'				21			
-85	125			98.7		32	77	23	54
-90	130	Dense, gray and brown, SAND WITH SILT (SP-SM)	42	11.7		21	NP	NP	NP
-95	135	Stiff to very stiff, gray, LEAN CLAY WITH SAND (CL)				30			
-100	140	-w/ sand seams at 133'-160'							
-105	145								
-110	150			82.0		24	36	16	20

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



Remarks: Wet rotary was initiated at about 30 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-24

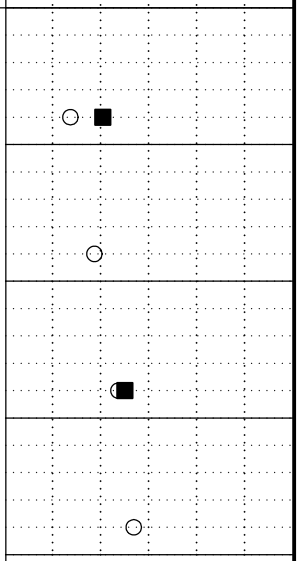
LOG OF BORING ECP-314

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818145.06; E: 3239580.73
DEPTH OF WATER:N/A FT
COMPLETION DEPTH: 170 FT
OFFSET: N/A
SURFACE ELEVATION: 39.08 FT
DATE: 2/10/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 130 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	150			Stiff to very stiff, gray, LEAN CLAY WITH SAND (CL) [Continued...]							
-115	155							30			
-120	160			Stiff to very stiff, gray, FAT CLAY (CH) -w/ shells and woods at 158'-160'				28	55	18	37
-125	165			-w/ roots at 163'-165'		97.9		30	85	21	64
-130	170			-w/ calcareous nodules at 168'-170'				29			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



Remarks: Wet rotary was initiated at about 30 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

Drilled By:CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-24

LOG OF BORING ECP-315

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818279.41; E: 3240846.93
DEPTH OF WATER: 15 FT
COMPLETION DEPTH: 170 FT
OFFSET: N/A
SURFACE ELEVATION: 39.61 FT
DATE: 2/07/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 170 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0										
35	5			Firm, reddish brown, LEAN CLAY WITH SAND (CL) -w/ gravel at 0'-8' -w/ shells at 0'-8'		72.9		21	40	19	21
							107	23			
								21			
30	10			Firm to stiff, reddishbrown and gray, FAT CLAY WITH SAND (CH)		83.4		25	53	28	25
							110	20			
25	15			Very loose to medium dense, gray, SILTY SAND (SM)	11	18.3		23	NP	NP	NP
					3						
20	20			Brown and gray, CLAYEY SAND (SC)		31.6		24	34	19	15
15	25			Soft, gray, SANDY LEAN CLAY (CL)		54.1		26	31	21	10
10	30			Very soft, gray, SANDY SILTY CLAY (CL-ML)	WOP	55.2		29	27	20	7
5	35			Loose, gray, SILTY SAND (SM)		19.0		21			
					7						
0	40							47			
-5	45			Stiff, brown, SANDY LEAN CLAY (CL)		59.0		16	34	18	16
-10	50						97	29			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 15' during drilling operations.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-25

LOG OF BORING ECP-315

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818279.41; E: 3240846.93
DEPTH OF WATER: 15 FT
COMPLETION DEPTH: 170 FT
OFFSET: N/A
SURFACE ELEVATION: 39.61 FT
DATE: 2/07/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 170 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	50			Stiff, brown, SANDY LEAN CLAY (CL) [Continued...]							
-15	55			Firm to stiff, gray, FAT CLAY WITH SAND (CH)		81.1	85	37	57	25	32
-20	60			Stiff to very stiff, brown, FAT CLAY (CH)		97.2		37	95	34	61
-25	65						94	30			
-30	70							30			
-35	75			-w/ ferrous stains at 73'-75'			102	26	65	27	38
-40	80			Very stiff, brown and gray, LEAN CLAY (CL)		95.7	108	21	47	21	26
-45	85							22			
-50	90							25	64	26	38
-55	95			Very stiff, gray, LEAN CLAY WITH SAND (CL)		73.3	111	21	34	17	17
-60	100			Dense, gray, SILTY SAND (SM)	39	19.6		21			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 15' during drilling operations.

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-25

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

LOG OF BORING ECP-315

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818279.41; E: 3240846.93
DEPTH OF WATER: 15 FT
COMPLETION DEPTH: 170 FT
OFFSET: N/A
SURFACE ELEVATION: 39.61 FT
DATE: 2/07/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 170 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	100	Dense, gray, SILTY SAND (SM) [Continued...]	37			23			
-65	105								
-70	110	Very stiff, gray, SANDY LEAN CLAY (CL)	20	67.5		24	33	19	14
-75	115	Medium dense to dense, gray, SILTY SAND (SM)	16	28.9		19	NP	NP	NP
-80	120		37			21			
-85	125		46	28.2		20			
-90	130	Very stiff, gray and brown, FAT CLAY (CH)		95.3	95	29	63	28	35
-95	135	-w/ sand seams at 133'-135'				30			
-100	140	Stiff, brown and gray, LEAN CLAY (CL)		88.2	96	27	40	23	17
-105	145	-w/ sand seams at 143'-155'		89.2		26			
-110	150				93	29			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 15' during drilling operations.

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-25

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

LOG OF BORING ECP-315

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13818279.41; E: 3240846.93
DEPTH OF WATER: 15 FT
COMPLETION DEPTH: 170 FT
OFFSET: N/A
SURFACE ELEVATION: 39.61 FT
DATE: 2/07/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 170 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	150			Stiff, brown and gray, LEAN CLAY (CL) [Continued...]							
-115	155							38	42	25	17
-120	160			Very stiff, gray, brown and bluish green, FAT CLAY (CH)			70	33	111	39	72
-125	165					93.5		28	73	33	40
-130	170						86	37			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 15' during drilling operations.

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-25

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

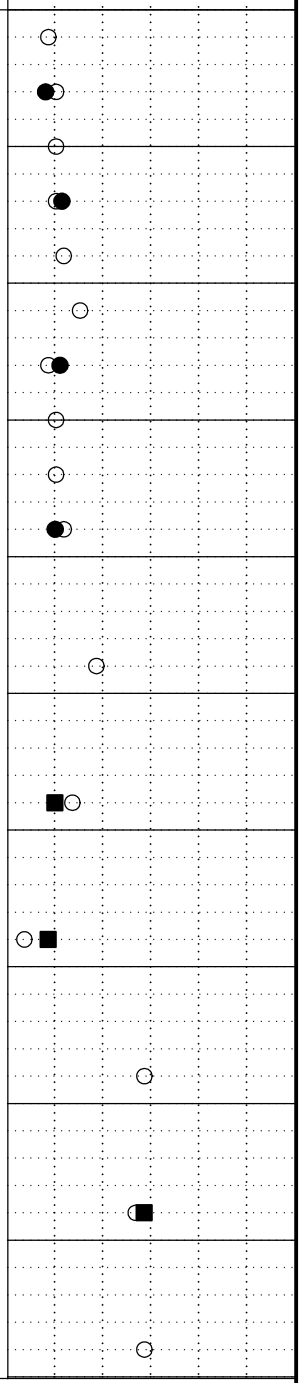
LOG OF BORING ECP-316

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817700.71; E: 3238642.83
DEPTH OF WATER:N/A FT
COMPLETION DEPTH: 150 FT
OFFSET: N/A
SURFACE ELEVATION: 9.17 FT
DATE: 2/06/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 150 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0			Firm to very stiff, brown and reddish brown, FAT CLAY (CH)							
						92.9	102	26	56	25	31
5	5							27			
							101	26	58	27	31
0	10										
								27	55	24	31
							102	27			
-5	15										
						85.2		33	57	24	33
-10	20						97	29			
				-w/ calcareous nodules at 23'-25'							
-15	25					95.8		28	63	29	34
				-w/ shells at 28'-30'							
-20	30						85	39			
-25	35						88	35	77	30	47
-30	40					99.0		24	55	23	32
-35	45						104	23			
-40	50			-w/ ferrous stains at 48'-50'		90.7		25	65	27	38

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



Remarks: Wet rotary was initiated at about 35 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By:CH Logged By: NL

HVJ Associates, Inc.

PLATE A-26

LOG OF BORING ECP-316

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817700.71; E: 3238642.83
DEPTH OF WATER: N/A FT
COMPLETION DEPTH: 150 FT
OFFSET: N/A
SURFACE ELEVATION: 9.17 FT
DATE: 2/06/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 150 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	50	Firm to very stiff, brown and reddish brown, FAT CLAY (CH) [Continued...]							
-45	55				100	26	61	29	32
-50	60					28			
-55	65	Stiff, gray, LEAN CLAY (CL) -w/ sand seams at 63'-65'	14	92.1		21	46	19	27
-60	70	Gray, SILTY SAND (SM) -w/ wood at 68'-70'		44.3		21	NP	NP	NP
-65	75	Very stiff to hard, gray and reddish brown, FAT CLAY (CH) -w/ calcareous nodules at 73'-75'			115	17			
-70	80			100		23	52	26	26
-75	85	-w/ sand seams at 83'-85'			112	18			
-80	90					23	56	22	34
-85	95				97	27	63	22	41
-90	100			99.0		24	48	21	27

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Wet rotary was initiated at about 35 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-26

LOG OF BORING ECP-316

PROJECT: HSC Expansion -BCC-Spilmans Island
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817700.71; E: 3238642.83
DEPTH OF WATER:N/A FT
COMPLETION DEPTH: 150 FT
OFFSET: N/A
SURFACE ELEVATION: 9.17 FT
DATE: 2/06/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 150 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	100			Firm to very stiff, brown and gray, LEAN CLAY (CL) -w/ sand seams at 98'-100' [Continued...]							
-95	105			-w/ sand seams at 103'-105'		98.2		26	43	22	21
-100	110						96	28			
-105	115					96.5		29	48	25	23
-110	120			-w/ sand seams at 118'-120'			97	29			
-115	125				9	99.7		28	43	23	20
-120	130					97.8		31	33	20	13
-125	135							39			
-130	140			-w/ shells at 138'-140'				34			
-135	145			Stiff to very stiff, gray, FAT CLAY (CH)		88.5		41	62	27	35
-140	150							20			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Wet rotary was initiated at about 35 feet to facilitate drilling. Ground water was not encountered to the wet rotary depth.

COH HG1910092.2.1 -BCC_SPILLMAN'S ISLAND WITH OLD.GPJ 4/16/20

Drilled By: CH Logged By: NL

HVJ Associates, Inc.

PLATE A-26

BARBOURS CUT CHANNEL - SITE 1

LOG OF BORING ECP-307A

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.1.1
LOCATION: N: 13817621.32; E: 3243747.99
DEPTH OF WATER: 15.90 FT
COMPLETION DEPTH: 46 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: -15.15 FT
DATE: 01/03/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: N/A TO N/A FT
WET ROTARY: 0 TO 46 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
▽	0								
		Very loose to soft, brown and gray, SILT (ML) -w/ shells at 0'-2'	WOH			28			
-20	5		3	98.5		22	NP	NP	NP
		Firm to very stiff, gray and reddish brown, FAT CLAY (CH)	5	99.0		26	65	18	47
-25	10		8		102				
				96.7		32	69	21	48
-30	15		7						
		Stiff to very stiff, gray and reddish brown, LEAN CLAY (CL)		98.5	109	21	37	15	22
-35	20		10						
				94.3	106	21	49	19	30
-40	25		14						
		Stiff, gray and reddish brown, SANDY LEAN CLAY (CL)	14			19	39	17	22
-45	30				106	22			
		Very stiff to hard, gray and reddish brown, SANDY FAT CLAY (CH) -sandy at 30'-32'	19	63.2		16	50	18	32
-50	35	-w/ calcareous nodules at 36'-38'	17		120	14			
-55	40	Very stiff, gray and reddish brown, FAT CLAY (CH)	25	96.5		23	65	25	40
-60	45	-slickensided at 44'-46'	21			26			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.2 0.4 0.6 0.8 1.0

Remarks: Mudline was encountered at 15.9' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 3.GPJ 11/12/20

Drilled By: Fugro Logged By: EE

HVJ Associates, Inc.

PLATE A-27

LOG OF BORING ECP-308A

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.1.1
LOCATION: N: 13817237.59; E: 3243951.24
DEPTH OF WATER: 29.40 FT
COMPLETION DEPTH: 32 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: -28.4 FT
DATE: 01/03/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: N/A TO N/A FT
WET ROTARY: 0 TO 32 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to stiff, gray and tan, LEAN CLAY (CL) -w/ shells at 0'-6'	4	96.8		41			
-30						37	35	16	19
	5		7						
-35									
	10		7						
-40					85	37			
	15	Stiff, gray and tan, FAT CLAY (CH)	8	96.2		41	85	32	53
-45		-w/ ferrous stains at 14'-16'			80	41			
	20		9			39			
-50		Stiff, gray and tan, SANDY LEAN CLAY (CL)			116	19			
			9	62.8		27	49	19	30
	25	Stiff to very stiff, gray and tan, FAT CLAY WITH SAND (CH)		70.6		30	50	17	33
-55			11			20			
	30								
-60			11			19			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.2 0.4 0.6 0.8 1.0

Remarks: Mudline was encountered at 29.4' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 3.GPJ 11/12/20

LOG OF BORING ECP-317

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817284.46; E: 3243480.96
DEPTH OF WATER:0 FT
COMPLETION DEPTH: 150 FT
OFFSET: N/A
SURFACE ELEVATION: 4.55 FT
DATE: 1/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 4 TO 100 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
▽	0										
				Stiff, dark gray, LEAN CLAY WITH SAND (CL) -w/ shells at 0'-4' -w/ roots and gravel at 0'-6'		81.7		24	47	13	34
0	5							23			
				Soft to stiff, dark gray and brown, LEAN CLAY (CL)		87.6		35	36	22	14
-5	10			-w/ shells at 10'-12' -w/ gravel at 11'-12'			92	28			
				Medium dense, gray, SAND WITH SILT (SP-SM)	19	10.6		15	NP	NP	NP
-10	15			-w/ gravel and shells at 12'-14'	13						
				Very loose to loose, gray SILTY SAND (SM)	2	47.2		23	NP	NP	NP
				-w/ gravel and shells at 18'-20'							
-15	20				6			12			
				Soft to stiff, reddish brown and gray, FAT CLAY (CH)	4	88.7		41	73	18	55
-20	25										
						99.9		23	62	16	46
-25	30										
							89	35			
-30	35										
							97	35			
-35	40										
				Very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)							
						76.4	113	21	34	13	21
-40	45										
				Stiff to very stiff, reddish brown and gray, SANDY LEAN CLAY (CL)		68.3		22	25	17	8
-45	50										

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Surface water was encountered during drilling operations.

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-29

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 4/17/20

LOG OF BORING ECP-317

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817284.46; E: 3243480.96
DEPTH OF WATER: 0 FT
COMPLETION DEPTH: 150 FT
OFFSET: N/A
SURFACE ELEVATION: 4.55 FT
DATE: 1/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 4 TO 100 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	50	Stiff to very stiff, reddish brown and gray, SANDY LEAN CLAY (CL) [Continued...]							
-50	55		12			19			
-55	60	-w/ calcareous nodules and wood pieces at 58'-60'		63.1	110	20	40	22	18
-60	65					19			
-65	70	Very stiff, reddish brown, brown and gray, LEAN CLAY WITH SAND (CL)				29			
-70	75	-w/ ferrous stains at 73'-75'		83.8	114	17	35	21	14
-75	80				112	19			
-80	85					16			
-85	90	Very stiff to hard, reddish brown, brown and gray, LEAN CLAY (CL) -w/ sand seams at 88'-90'		85.1	107	23	47	25	22
-90	95				109	25			
-95	100					27			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Surface water was encountered during drilling operations.

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 4/17/20

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-29

LOG OF BORING ECP-317

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817284.46; E: 3243480.96
DEPTH OF WATER:0 FT
COMPLETION DEPTH: 150 FT
OFFSET: N/A
SURFACE ELEVATION: 4.55 FT
DATE: 1/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 4 TO 100 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	100	Stiff to very stiff, gray, FAT CLAY (CH)							
-100	105	-w/ ferrous stains and calcareous nodules at 103'-105'		99.4		30	73	32	41
-105	110	-w/ calcareous nodules at 108'-110'				28			
-110	115	-w/ ferrous stains and shells at 113'-115'			89	33			
-115	120	-w/ ferrous stains at 118'-120'		97.3		28	50	28	22
		Gray, SILT (ML)							
-120	125	-w/ ferrous stains at 123'-125'		95.2	86	38	24	21	3
		Stiff to very stiff, gray, LEAN CLAY (CL)							
-125	130	-w/ ferrous stains at 128'-130'	15	99.6			33	25	8
-130	135				89	29			
-135	140	Stiff to very stiff, gray, FAT CLAY (CH)				46			
-140	145	-w/ ferrous stains at 143'-145'		99.7	97	29			
-145	150	-w/ ferrous stains at 148'-150'				33			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Surface water was encountered during drilling operations.

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-29

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 4/17/20

LOG OF BORING ECP-318

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817229.71; E: 3243652.29
DEPTH OF WATER:3 FT
COMPLETION DEPTH: 150 FT
OFFSET: N/A
SURFACE ELEVATION: 4.99 FT
DATE: 1/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 4 TO 100 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Fill: Brown and gray clayey sand	33			6			
		-w/ crushed concrete at 0'-2'							
		-w/ gravel at 0'-4'	5	35.6		16	24	15	9
0	5	-w/ shells at 4'-12'	5						
		-w/ gravel at 6'-12'				25			
-5	10			33.6		14	32	14	18
		Very soft to soft, gray and reddish brown, LEAN CLAY WITH SAND (CL)		77.2		24	30	17	13
-10	15								
		Very loose, gray, SILTY SAND (SM)	2			30			
-15	20		3	23.8		19	NP	NP	NP
-20	25		2			30			
		Firm to stiff, gray and reddish brown, FAT CLAY (CH)	7	94.4		25	78	16	62
-25	30								
				99.1	90	32	84	31	53
-30	35								
		Gray, SILTY CLAY (CL-ML)		85.5		20	24	18	6
-35	40								
		Very soft to very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)	12	75.0		20	35	13	22
-40	45								
		-w/ gravel at 48'-50'	6			21			
	50								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 3' during drilling operations.

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 4/17/20

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-30

LOG OF BORING ECP-318

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1 PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817229.71; E: 3243652.29
DEPTH OF WATER:3 FT COMPLETION DEPTH: 150 FT
OFFSET: N/A
SURFACE ELEVATION: 4.99 FT DATE: 1/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 4 TO 100 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	50	Very soft to very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL) [Continued...]							
-50	55	-w/ sand pockets at 53'-55'		81.7	105	22	31	20	11
-55	60	Medium dense to dense, gray and reddish brown, CLAYEY SAND (SC) -w/ gravel at 58'-60'	30	41.7		17	34	13	21
-60	65	Very stiff to hard, reddish brown and gray, LEAN CLAY (CL) -w/ sand at 63'-65'		77.6	109	19	37	21	16
-65	70					22			
-70	75			87.7		16	39	12	27
-75	80	-w/ calcareous nodules at 78'-80'			117	16			
-80	85			98.8		18	37	15	22
-85	90					19			
-90	95	Very stiff, reddish brown and gray, FAT CLAY (CH)		95.7	109	27	65	19	46
	100					28			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 3' during drilling operations.

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 4/17/20

Drilled By:CH Logged By: EE

HVJ Associates, Inc.

PLATE A-30

LOG OF BORING ECP-318

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817229.71; E: 3243652.29
DEPTH OF WATER:3 FT
COMPLETION DEPTH: 150 FT
OFFSET: N/A
SURFACE ELEVATION: 4.99 FT
DATE: 1/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 4 TO 100 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	100	Stiff to very stiff, gray and tan, LEAN CLAY (CL)							
-100	105			96.2		26	33	21	12
-105	110	Firm to stiff, gray and brown, FAT CLAY (CH)			89	34			
-110	115			98.5			53	25	28
		-w/ ferrous stains at 118'-120'			99	28			
-115	120	Gray, SILT WITH SAND (ML)							
		-w/ ferrous stains at 123'-125'		81.4		22	21	19	2
-120	125	Stiff to very stiff, gray, LEAN CLAY (CL)	9						
-125	130			99.2			38	23	15
		-w/ shells at 133'-135'			83	35			
-130	135								
		-w/ ferrous stains at 138'-140'							
-135	140	Very stiff, gray and reddish brown, FAT CLAY (CH)							
		-w/ ferrous stains at 143'-145'		100	92	32	69	28	41
-140	145								
		-w/ ferrous stains and calcareous nodules at 148'-150'				32			
	150								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 3' during drilling operations.

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 4/17/20

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-30

LOG OF BORING ECP-319

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1 PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817084.89; E: 3243673.15
DEPTH OF WATER:8 FT COMPLETION DEPTH: 100 FT
OFFSET: N/A
SURFACE ELEVATION: 9.07 FT DATE: 1/16/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 100 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0										
				Firm, gray and reddish brown, LEAN CLAY WITH SAND (CL) -w/ gravel and asphalt at 0'-2'	7	84.7		29	48	11	37
5	5										
				Very soft to soft, gray and reddish brown, SANDY LEAN CLAY (CL)			84	37			
▽ 0	10				WOH	57.4		41	25	16	9
					2						
				Firm to stiff, brown and gray, LEAN CLAY (CL) -w/ shells at 14'-16'		93.4	107	22	43	19	24
-5	15										
				Soft, brown and gray, FAT CLAY (CH) -w/ ferrous stains at 16'-18' -w/ sand seams at 18'-20'		95.3		33	62	16	46
-10	20							26			
				Very soft, gray, LEAN CLAY WITH SAND (CL) -w/ shells at 23'-25'	WOH	73.6		32	26	16	10
-15	25										
				Very soft, gray, SANDY LEAN CLAY (CL) -w/ shells at 28'-30'		61.0		20	27	15	12
-20	30										
				Firm to stiff, reddish brown and gray, FAT CLAY (CH)			96	28			
-25	35										
						94.0		32	87	20	67
-30	40										
				Very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL) -w/ calcareous nodules and ferrous stains at 53'-55'			109	20			
-35	45										
				-w/ calcareous nodules at 48'-50'				27			
-40	50										

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 8' during drilling operations.

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 4/17/20

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-31

LOG OF BORING ECP-319

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13817084.89; E: 3243673.15
DEPTH OF WATER:8 FT
COMPLETION DEPTH: 100 FT
OFFSET: N/A
SURFACE ELEVATION: 9.07 FT
DATE: 1/16/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 100 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	50	Very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL) -w/ calcareous nodules and ferrous stains at 53'-55' [Continued...]							
-45	55			74.6		14	49	13	36
-50	60				122	15			
-55	65				111	20			
-60	70	-w/ sandstone at 68'-70'				15			
-65	75	Very stiff, reddish brown, brown and gray, FAT CLAY (CH)		99.6		20	55	16	39
-70	80	-w/ ferrous stains at 78'-80'			115	18			
-75	85					14			
-80	90	Very stiff, reddish brown and gray, LEAN CLAY (CL) -w/ sand pockets at 88'-90'		90.5	118	18	46	20	26
-85	95	-w/ sand seams at 93'-95'				18			
-90	100	-w/ sand seams at 98'-100'			115	22			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

3.06

Remarks: Groundwater was encountered at 8' during drilling operations.

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 4/17/20

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-31

BARBOURS CUT CHANNEL - SITE 2

LOG OF BORING ECP- 304B

PROJECT: HSC Expansion-Barbours Cut Channel-Site 2
PROJECT NO.: HG1910092.1.1
LOCATION: N: 13815732.01; E: 3244430.59
DEPTH OF WATER:9.10 FT
COMPLETION DEPTH: 52 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: -9.44 FT
DATE: 01/04/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: N/A TO N/A FT
WET ROTARY: 0 TO 52 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-10	0	Very loosse to loose, gray, CLAYEY SAND (SC) -w/ shells at 0'-6'	1						
			4	46.4		23			
	5		5						
-15		Very soft to firm, gray, SANDY LEAN CLAY (CL)	3	67.2		27	31	16	15
	10		4						
-20			5			28			
		-w/ shells at 12'-14'							
	15		4	68.3		30	37	15	22
-25		Very soft, gray, FAT CLAY WITH SAND (CH)	2			35			
	20			83.9		45	64	24	40
-30		-w/ wood pieces at 22'-24'	2						
	25	Firm to very stiff, gray and reddish brown, SANDY LEAN CLAY (CL)			100	27			
-35			7	55.9		22	36	18	18
	30								
-40			5			21			
					109	20			
	35	Loose, gray and reddish brown, CLAYEY SAND (SC)	7	46.3		23	25	15	10
-45		-w/ sand layer at 34'-36'							
		Very soft to firm, brown, SANDY LEAN CLAY (CL)							
	40		2						
-50				63.2		25	32	17	15
			6						
	45	Loose, brown, SAND WITH SILT (SP-SM)	9	7.7		20			
-55			9						
		Loose to medium dense, brown, SILTY SAND (SM)							
	50		10	20.2		20			
-60						20			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.2 0.4 0.6 0.8 1.0

COH HG1910092.1.1 - HSC SEGMENT 3.GPJ 11/12/20

Remarks: Mudline was encountered at 9.1' below the water level during drilling operations.

Drilled By: Fugro Logged By: EE

HVJ Associates, Inc.

PLATE A-32

LOG OF BORING ECP-320

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13815636.21; E: 3244220.69
DEPTH OF WATER:8 FT
COMPLETION DEPTH: 100 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 7.97 FT
DATE: 1/14/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 10 FT
WET ROTARY: 10 TO 100 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0										
5	5			FILL: Gray and reddish brown lean clay with sand at 0'-4' -w/ wood pieces at 0'-2' -w/ gravel and shells at 0'-4' -w/ calcareous nodules at 2'-4'		74.0		17	39	13	26
				Gray sand with silt at 4'-8' -w/ shells and glass fragments at 4'-6'	19	8.6		19	NP	NP	NP
0					WOH						
	10			Firm, brown and gray, FAT CLAY WITH SAND (CH) -w/ shells at 8'-10'		82.2		37	63	17	46
-5				Very loose to loose, gray, SILT (ML)				25			
	15				5	87.0		29	NP	NP	NP
					4						
-10											
	20				5			29			
-15				-no recovery at 23'-25'							
	25				WOH						
-20				Very soft, gray, LEAN CLAY WITH SAND (CL) -w/ shells at 28'-30'	WOH	76.1		30	35	13	22
	30										
-25				Very soft, gray, LEAN CLAY (CL)		86.2		33	40	13	27
	35										
-30								29			
	40										
-35				Firm, gray, FAT CLAY (CH)		99.8	75	47	64	25	39
	45										
-40				Firm to stiff, gray, SANDY LEAN CLAY (CL)				21			
	50										

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 11/16/20

Remarks: Groundwater was encountered at 8' during drilling operations.

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-33

LOG OF BORING ECP-320

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13815636.21; E: 3244220.69
DEPTH OF WATER:8 FT
COMPLETION DEPTH: 100 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 7.97 FT
DATE: 1/14/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 10 FT
WET ROTARY: 10 TO 100 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	50	Firm to stiff, gray, SANDY LEAN CLAY (CL) [Continued...]							
-45	55		9			23			
-50	60			62.9	106	22	31	17	14
-55	65	Medium dense, light brown, SAND WITH SILT (SP-SM)	30	7.3		19			
-60	70		18			20			
-65	75	Dense, gray, SILTY SAND (SM)	33	39.4		20			
-70	80	Firm, gray, SANDY LEAN CLAY (CL)	8	62.6		23	23	15	8
-75	85	Loose to medium dense, gray, SILTY CLAYEY SAND (SC-SM)	6	40.5		26	20	16	4
-80	90		24			19			
-85	95	Very stiff, reddish brown and gray, LEAN CLAY (CL) -w/ shells at 93'-95'		98.2	107	23	42	22	20
-90	100	-w/ sand pockets at 98'-100'				20			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 8' during drilling operations.

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 11/16/20

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-33

LOG OF BORING ECP-321

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13815493.21; E: 3244294.45
DEPTH OF WATER:6 FT
COMPLETION DEPTH: 100 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 5.92 FT
DATE: 1/13/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 10 FT
WET ROTARY: 10 TO 100 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
5	0	Fill: Brown and gray sandy lean clay -w/ roots and calcareous nodules at 0'-2' -w/ shells and asphalt at 2'-4'	16	59.1		22	40	19	21
0	5	Medium dense, gray, SILT WITH SAND (ML)	15 18	75.9		20	24	21	3
-5	10	Very loose to loose, gray, SANDY SILT (ML) -w/ shells at 8'-10' -w/ shells at 12'-14'	8 4 6			24			
-10	15		3 3	64.3		23	NP	NP	NP
-15	20		3			23			
-20	25	-w/ shells at 23'-25'	WOH			26			
-25	30	Very soft, gray, LEAN CLAY WITH SAND (CL)	WOH	76.1		34	34	13	21
-30	35	Very soft to stiff, gray, FAT CLAY (CH) -w/ shells at 33'-35'		97.0		40	54	15	39
-35	40			96.6	81	43	62	24	38
-40	45			99.0		53	92	23	69
	50				78	46			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 6' during drilling operations.

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-34

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 11/16/20

LOG OF BORING ECP-321

PROJECT: HSC Expansion-Barbours Cut Channel-Site 1
LOCATION: N: 13815493.21; E: 3244294.45
DEPTH OF WATER:6 FT
STATION: N/A
SURFACE ELEVATION: 5.92 FT

PROJECT NO.: HG1910092.2.1
COMPLETION DEPTH: 100 FT
OFFSET: N/A
DATE: 1/13/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 10 FT
WET ROTARY: 10 TO 100 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
-45	50	Very soft to stiff, gray, FAT CLAY (CH) -w/ shells at 33'-35' [Continued...]							
	55					31			
-50									
	60	Medium dense to dense, gray and light brown, SAND WITH SILT (SP-SM)	31	10.0		19	NP	NP	NP
-55									
	65		27	5.6		21	NP	NP	NP
-60		-w/ gravel at 68'-70'							
	70		23			19			
-65									
	75	Very loose to loose, gray, SILTY CLAYEY SAND (SC-SM)	5	33.9		23	20	14	6
-70									
	80		4			31			
-75									
	85	Medium dense, gray, SILTY SAND (SM)	27	19.3		20	NP	NP	NP
-80									
	90		19			28			
-85									
	95	Stiff to very stiff, reddish brown and gray, LEAN CLAY (CL)			104	26	44	21	23
-90									
	100	-w/ claystone at 98'-100'				35			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 6' during drilling operations.

COH HG1910092.2.1 - SITE 3 BARBOURS CUT.GPJ 11/16/20

Drilled By: CH Logged By: EE

HVJ Associates, Inc.

PLATE A-34

HSC BAYOU REACH BORING LOGS
SEGMENT 4

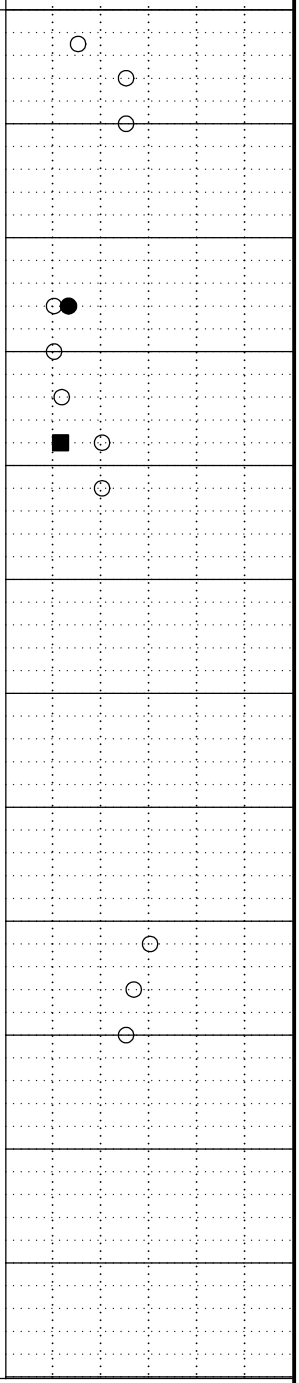
LOG OF BORING ECP-426D

PROJECT: Houston Ship Channel Expansion - Segment 4
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839266.69; E: 3184503.26
DEPTH OF WATER:7 FT
COMPLETION DEPTH: 60 FT
STATION: 803+27.24
OFFSET: 456.07' R
SURFACE ELEVATION: 7.413 FT
DATE: 8/18/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 60 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, reddish brown and gray, SANDY FAT CLAY (CH) -w/ limestone fragments at 0-1'				20			
5	5			64.6		17	51	24	27
						18			
0 ▽		Very loose to loose, brown and gray, SILTY CLAYEY SAND (SC-SM)	WOH	19.5		21	17	12	5
	10		2						
			5			22			
-5		Firm to very stiff, dark gray, LEAN CLAY WITH SAND (CL)		83.5	92	35	47	19	28
	15					26			
-10									
	20				107	21	47	16	31
-15									
						18			
	25	Very loose to medium dense, gray and brown, SILTY SAND (SM)		19.0		25	NP	NP	NP
-20			2						
	30		5	14.5		23	NP	NP	NP
-25			11						
			10			16			
	35		15						
-30		Medium dense, greenish, gray and brown, CLAYEY SAND (SC)	14	35.1		20	24	15	9
	40		20			18			
		Very stiff to hard, greenish, gray and brown, SANDY LEAN CLAY (CL) -w/ calcareous nodules at 42'-44'							
-35						17			
	45			63.6		15	26	12	14
-40			31						
	50		35	65.5		15	26	12	14
		Dense to very dense, brown, SILTY SAND (SM)				26			
-45			30	16.7		21	NP	NP	NP
	55		45						
-50			31			21			
	60		64						

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



Remarks: Groundwater was encountered at 7' below the ground level during drilling operations.

Drilled By: Soltek Logged By: Edgar

HVJ Associates, Inc.

PLATE A-35

COH HG1910092.1.1 - HSC SEGMENT 4.GPJ 11/16/20

E2 CLINTON PLACEMENT AREA

LOG OF BORING ECP-2001

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841411.43; E: 3163472.28
DEPTH OF WATER: 14 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 29.79 FT
DATE: 1/27/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 25 FT
WET ROTARY: 25 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ sand pockets at 0'-2' -w/ sand seams at 0'-10'		96.4		29	53	17	36
25	5				88	26			
		-w/ ferrous stains at 8'-10' -w/ calcareous nodules at 8'-14'			104	22			
20	10					23			
					100	24			
▽ 15	15					22			
					105	23			
10	20	Stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL)		74.5		16	27	16	11
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ sand seams at 23'-25' -w/ ferrous stains and calcareous nodules at 23'-25'		89.7	101	27	70	35	35
5	25								
						15			
0	30								
		-w/ calcareous nodules at 33'-35'			109	20			
-5	35								
		-w/ calcareous nodules at 38'-40'				20			
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 14' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-36

LOG OF BORING ECP-2002

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841147.95; E: 3163951.67
DEPTH OF WATER:12 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 29.44 FT
DATE: 1/27/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to stiff, gray and brown, FAT CLAY WITH SAND (CH) -w/ roots at 0'-2'		83.6		26	55	15	40
25	5				104	22			
20	10					20			
		Stiff to very stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL) -w/ ferrous stains at 10'-12' -w/ calcareous nodules at 10'-14'		71.6	112	20	42	22	20
15	15	-w/ sand pockets at 14'-16'		77.7		21	32	12	20
10	20	-w/ calcareous nodules at 18'-20'			119	15			
5	25				106	22	38	17	21
0	30			84.2	116	16	39	13	26
-5	35					17	47	19	28
-10	40					19			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 12' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-37

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

LOG OF BORING ECP-2003

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841589.29; E: 3163910.99
DEPTH OF WATER:6 FT
COMPLETION DEPTH: 70 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 26.35 FT
DATE: 1/27/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: N/A TO N/A FT
WET ROTARY: 0 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
25	0	Firm to stiff, gray and dark gray, FAT CLAY (CH) -w/ roots at 0'-2'		87.7	99	23	60	16	44
					103	22			
	5	-w/ calcareous nodules at 4'-6'							
20 ▽		Stiff to very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)		71.5	102	26	36	13	23
		-w/ calcareous nodules at 8'-20'							
	10								
15									
	15				119	15			
10									
					115	17			
	20	Very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH)		76.2		23	53	14	39
5									
	25	Very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)		79.6		17	35	11	24
0									
		-w/ ferrous stains at 28'-30'			113	17			
	30								
-5									
	35	Stiff to very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH)		83.4		18	50	14	36
-10									
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 6' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-38

LOG OF BORING ECP-2003

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841589.29; E: 3163910.99
DEPTH OF WATER:6 FT
COMPLETION DEPTH: 70 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 26.35 FT
DATE: 1/27/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: N/A TO N/A FT
WET ROTARY: 0 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	40	Stiff to very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH) [Continued...]							
-15		-w/ sandstones at 43'-45'		83.9		16	57	33	24
	45								
-20					113	21			
	50								
-25									
	55	Very dense, reddish brown, SANDY SILT (ML)	76	50.0		23	NP	NP	NP
-30									
	60	Very stiff to hard, reddish brown, FAT CLAY (CH)		94.9	111	21	66	34	32
-35									
	65	Stiff to hard, reddish brown, SILTY CLAY (CL-ML)	13	96.9		10	27	20	7
-40									
	70	-w/ sand seams at 69'-70'	48						

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 6' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-38

LOG OF BORING ECP-2004

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841359.77; E: 3164315.21
DEPTH OF WATER:7 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 29.61 FT
DATE: 1/27/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0								
25	5	Firm to stiff, gray, reddish brown and brown, LEAN CLAY WITH SAND (CL)		76.8		23	44	13	31
					86	35			
		Firm to stiff, gray and reddish brown, FAT CLAY (CH)		99.1		36	72	18	54
20	10	-w/ ferrous stains at 10'-14' -w/ calcareous nodules at 10'-16'			106	20			
15	15	Stiff to hard, gray and reddish brown, LEAN CLAY WITH SAND (CL) -w/ calcareous nodules at 16'-18'		76.7	109	19	49	23	26
10	20								
5	25	-w/ calcareous nodules at 23'-25'				18	38	17	21
0	30				115	15			
-5	35			79.7		16	47	19	28
-10	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 7' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-39

LOG OF BORING ECP-2005

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13840476.58; E: 3164380.72
DEPTH OF WATER:4 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 29.63 FT
DATE: 1/28/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 6 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm, dark gray and brown, FAT CLAY (CH)		95.3		31	74	21	53
		-w/ roots at 0'-2'	WOH						
		Very soft, brown, LEAN CLAY WITH SAND (CL)							
25	5		WOH	83.5		31	33	16	17
		Very soft to very stiff, brown and gray, FAT CLAY (CH)							
		-w/ gasoline odor at 6'-10'							
		-w/ silt seams at 8'-10'		97.8		38	74	16	58
20	10	-w/ calcareous nodules at 10'-12'			110	19			
		-w/ sand pockets at 12'-14'							
15	15	Very stiff, gray and reddish brown, SANDY LEAN CLAY (CL)		57.7		20	24	16	8
		-w/ calcareous nodules at 16'-18'		65.4	113	17	35	18	17
10	20	Very stiff to hard, gray, brown and reddish brown, LEAN CLAY WITH SAND (CL)							
		-w/ calcareous nodules at 18'-20'							
		-w/ calcareous nodules at 23'-25'							
5	25				118	15			
0	30				117	16			
				83.0		16	41	12	29
-5	35								
		-w/ calcareous nodules at 38'-40'							
-10	40					19			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 4' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-40

LOG OF BORING ECP-2006

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839650.04; E: 3164322.71
DEPTH OF WATER:7 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 27.34 FT
DATE: 1/28/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
25	0	Soft to stiff, brown and dark gray, LEAN CLAY (CL) -w/ roots at 0'-2' -w/ silt seams at 2'-6'				21			
				99.5		28	32	20	12
	5				94	32			
20						36			
	10					18	48	14	34
15		Stiff to very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH) -w/ calcareous nodules at 10'-12' -w/ sand pockets at 12'-14'		82.0	112	18	54	14	40
	15	Firm to very stiff, gray and reddish brown, LEAN CLAY (CL) -w/ calcareous nodules at 14'-18' -w/ sand seams at 16'-18'		86.7		19	45	13	32
10		-w/ sand pockets at 18'-20'							
	20					15			
5		Very stiff to hard, gray and reddish brown, LEAN CLAY WITH SAND (CL) -w/ sand seams at 23'-25'							
	25					14			
0				78.1		14	33	12	21
	30				115	16			
-5									
	35				112	19			
-10									
	40	-w/ calcareous nodules at 38'-40'				26			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 7' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-41

LOG OF BORING ECP-2007

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13838781.18; E: 3164456.55
DEPTH OF WATER: 10 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 34.36 FT
DATE: 1/29/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 12 FT
WET ROTARY: 12 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, brown, SANDY LEAN CLAY (CL) -w/ roots at 0'-2' -w/ gravel at 2'-4'							
30	5	Very loose to medium dense, brown and gray, SILTY CLAYEY SAND (SC-SM)	20	34.3		11	20	13	7
			8			20			
25 ▽	10		2			17			
		Firm to very stiff, gray and reddish brown, LEAN CLAY (CL) -w/ sand seam at 12'-14'		92.2		22	40	13	27
20	15				106	23			
15	20	-w/ calcareous nodules at 18'-20'				18			
		Very soft to very stiff, reddish brown and gray, SANDY LEAN CLAY (CL) -w/ calcareous nodules at 23'-25'		68.6		18	41	13	28
10	25								
5	30					18			
		Very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)		79.6	107	21	45	23	22
0	35								
-5	40					13			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 10' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-42

LOG OF BORING ECP-2008

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13838432.35; E: 3163980.99
DEPTH OF WATER:3 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 30.08 FT
DATE: 1/29/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 4 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
30	0	Loose, dark gray and brown, SILTY SAND (SM) -w/ gravel and shells at 0'-6'	6	32.1		13 23	18	16	2
25	5	Soft to stiff, brown and gray, FAT CLAY WITH SAND (CH) -w/ shells at 6'-8'		71.0		36	54	17	37
20	10	-w/ ferrous stains at 12'-14' -w/ calcareous nodules at 12'-14'			105	23			
15	15	Stiff to very stiff, gray and reddish brown, FAT CLAY (CH) -w/ ferrous stains at 14'-20' -w/ calcareous nodules at 14'-20'		90.8	112 104	29 17 22	76	21	55
10	20	Soft to very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)		79.6		18	24	12	12
5	25				112	19			
0	30	-w/ sand pockets at 33'-35'		78.8			40	18	22
-5	35	-w/ ferrous stains at 38'-40' -w/ calcareous nodules at 38'-40'				16			
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 3' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-43

LOG OF BORING ECP-2009

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839217.33; E: 3164066.81
DEPTH OF WATER:3 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 26.92 FT
DATE: 1/28/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 4 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
25	0	Very soft to very stiff, gray and brown, SANDY LEAN CLAY (CL)	WOH	68.6		21	25	17	8
	5			69.8		23	26	12	14
20		-w/ sand pockets at 6'-8'			110	20			
	10	Stiff to very stiff, gray and brown, LEAN CLAY WITH SAND (CL)		74.6	110	19	44	15	29
15	15				112	17			
10		Stiff to very stiff, gray and reddish brown, SANDY LEAN CLAY (CL)		62.3			25	17	8
	20	Soft to stiff, gray and reddish brown, SILTY CLAY WITH SAND (CL-ML)		70.1		16	18	12	6
5									
	25	Stiff to hard, gray and reddish brown, LEAN CLAY WITH SAND (CL) -w/ ferrous stains at 23'-25'		79.2		18	28	11	17
0									
	30				114	19			
-5									
	35								
-10		-w/ calcareous nodules at 38'-40'				19			
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 3' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-44

LOG OF BORING ECP-2010

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13838730.37; E: 3163632.74
DEPTH OF WATER:4 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 32.18 FT
DATE: 1/29/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 6 FT
WET ROTARY: 6 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
30	0	Very loose, brown, SILTY SAND (SM) -w/ roots at 0'-2'	WOH			13			
			WOH	20.1		20	NP	NP	NP
25	5		WOH						
		-w/ clay seams at 6'-8' -w/ gasoline odor at 6'-8'				37			
20	10	Very soft to very stiff, gray and reddish brown, FAT CLAY (CH) -w/ gasoline odor at 8'-10' -w/ roots at 10'-12' -w/ ferrous stains at 10'-12'			68	56			
				92.7		33	83	20	63
15	15	-w/ ferrous stains at 14'-18'			96	29			
10	20			94.0		25	69	20	49
5	25	-w/ sand seams at 23'-40'		98.9		23	60	18	42
0	30				118	16			
-5	35				115	17			
	40					16			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 4' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-45

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

LOG OF BORING ECP-2011

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839559.39; E: 3163579.57
DEPTH OF WATER:6 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 30.55 FT
DATE: 1/29/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
30	0	Very soft to firm, dark gray and brown, FAT CLAY (CH) -w/ roots at 0'-4'		87.4		33	65	20	45
				51.3		22			
25	5					29			
		Soft to very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH) -w/ gasoline odor at 6'-8'		80.2		36	100	22	78
20	10				113	17			
		-w/ sand pockets at 14'-16'				14			
15	15	Brown and gray, CLAYEY SAND (SC)		48.3		20	24	16	8
		Very stiff, reddish brown, FAT CLAY (CH)	24	95.4		24	58	16	42
10	20								
		Soft to very stiff, gray and reddish brown, SANDY LEAN CLAY (CL)		68.9		20	28	11	17
5	25								
	30					12			
0									
	35					16			
-5									
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 6' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-46

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

LOG OF BORING ECP-2012

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13840239.16; E: 3163975.67
DEPTH OF WATER:7 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 30.36 FT
DATE: 1/28/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
30	0	Soft to firm, gray and brown, FAT CLAY (CH)		96.1		38	74	26	48
25	5	Soft to very stiff, gray and brown, FAT CLAY WITH SAND (CH) -w/ silt seams at 4'-6'		84.5	74	48	83	29	54
20	10				103	22	51	17	34
15	15	Medium dense, gray and reddish brown, CLAYEY SAND (SC)	16	44.2		16	44	13	31
10	20	Very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)		86.3	111	18	42	15	27
5	25				116	16			
0	30	-w/ ferrous stains at 28'-30' -w/ calcareous nodules at 28'-30'				15			
-5	35	Very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)		84.0		16	44	13	31
	40	-w/ calcareous nodules at 38'-40'				17			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 7' during drilling operations.

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-47

LOG OF BORING ECP-2013

PROJECT: HSC Expansion-E2 Clinton Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13840558.01; E: 3163520.94
DEPTH OF WATER:3 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 30.56 FT
DATE: 1/29/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 4 FT
WET ROTARY: 4 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
30	0	Firm, dark gray and reddish brown, FAT CLAY WITH SAND (CH)		84.6		32	67	22	45
		Firm to stiff, gray and brown, SANDY SILTY CLAY (CL-ML)		60.6		26	23	17	6
25	5				103	24			
		Stiff to very stiff, gray and reddish brown, FAT CLAY (CH) -w/ sand seams at 8'-10' -w/ ferrous stains at 10'-16' -w/ calcareous nodules at 12'-20'		88.8		25	61	15	46
20	10								
	15				102	24			
15				97.3		22	60	18	42
	20								
10		Stiff to very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)		73.7		17	34	11	23
	25								
5					112	19			
	30								
0						16			
	35								
-5		-w/ calcareous nodules at 38'-40'				17			
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 3' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates

PLATE A-48

COH HG1910092.2.1 - E. CLINTON DRIVE.GPJ 11/16/20

BELTWAY 8 PLACEMENT AREA

LOG OF BORING ECP-2014

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13836977.07; E: 3191747.97
DEPTH OF WATER:6 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 28.49 FT
DATE: 4/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 8 FT
WET ROTARY: 8 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Very loose to loose, gray and brown, SILTY SAND (SM) -w/ roots at 0'-2' -w/ clay seams at 2'-4'	2	26		14	NP	NP	NP
25	5		3						
			5	20		23	NP	NP	NP
20	10		1						
		Firm to very stiff, gray and reddish brown, FAT CLAY (CH) -w/ sand seams at 12'-14'	4	99		45	76	25	51
15			5			29			
	15	-w/ calcareous nodules at 14'-16'				33			
				99	91	33	81	23	58
10	20								
5		-w/ ferrous stains at 23'-25'		100	87	36	80	30	50
	25								
0						33			
	30								
-5					105	24			
	35								
-10		Stiff, reddish brown and gray, LEAN CLAY (CL) -w/ sand seams at 38'-40'		89		20	28	14	14
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 6' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-49

LOG OF BORING ECP-2015

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13837755.28; E: 3191620.51
DEPTH OF WATER: 13 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 21.46 FT
DATE: 4/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 14 FT
WET ROTARY: 14 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
20	0	Dark gray, SAND (SP) -w/ roots at 0'-2'							
	5	Stiff, gray and reddish brown, FAT CLAY WITH SAND (CH)		82		31	83	22	61
15		Gray and brown, SILT WITH SAND (ML)		81		19	NP	NP	NP
	10	Loose to medium dense, brown, SANDY SILT (ML)	10	52			NP	NP	NP
10			8						
	15	Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)	9	99		29	86	24	62
5					97	27			
	20					29			
0									
	25			100	101	27	76	22	54
-5									
	30					34			
-10									
	35					31			
-15									
	40	Very stiff, brown, LEAN CLAY (CL) -w/ sand seams at 38'-40'	22	91		31	29	17	12

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 13' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-50

LOG OF BORING ECP-2016

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13838288.24; E: 3192754.92
DEPTH OF WATER:33 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.61 FT
DATE: 4/20/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, dark gray and brown, FAT CLAY (CH)				22			
		-w/ shells and roots at 0'-2'		97		24	62	18	44
		-w/ sand seams at 2'-4'							
20	5	-w/ ferrous stains at 4'-8'		91	100	24	76	17	59
						20			
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)							
15	10	-w/ sand pockets at 8'-10'		98		27	80	24	56
		-w/ calcareous nodules at 10'-12'							
		-w/ ferrous stains at 10'-20'			98	27			
10	15								
				98		35	104	30	74
					91	33			
5	20								
		-w/ ferrous stains at 23'-25'							
0	25			95		33	98	30	68
					96	28			
-5	30								
▽		-w/ sand seams at 33'-35'	14						
				96		20	65	20	45
-10	35								
		Stiff to very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)							
-15	40			84	117	16	43	12	31

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 33' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar/Vijay

HVJ Associates, Inc.

PLATE A-51

LOG OF BORING ECP-2017

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13838211.73; E: 3191612.43
DEPTH OF WATER: 34 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 25.0 FT
DATE: 4/14/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
25	0	Dark gray and brown, SAND (SP) -w/ roots at 0'-2'							
		Stiff to very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH)		83		18	59	18	41
20	5	-w/ ferrous stains at 4'-8'			123	16			
		-w/ calcareous nodules at 6'-8'							
		Firm to very stiff, reddish brown and gray, FAT CLAY (CH)		98	98	28	81	25	56
15	10								
				100		29	85	26	59
10	15				96	29			
				98		34	96	30	66
5	20								
				93	87	36	102	33	69
0	25								
						28			
-5	30								
▽		-w/ silt seams at 33'-35'		91	102	25	70	21	49
-10	35								
		Very stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL)		84		14	40	14	26
-15	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 34' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-52

LOG OF BORING ECP-2018

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13838845.48; E: 3191584.46
DEPTH OF WATER:38 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.94 FT
DATE: 4/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, gray and brown, FAT CLAY WITH SAND (CH) -w/ roots at 0'-2'		74		18	52	16	36
20	5	-w/ calcareous nodules and ferrous stains at 4'-6'			113	20			
		Very stiff, reddish brown and gray, SANDY LEAN CLAY (CL)		69		15	42	14	28
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		96		23	70	21	49
15	10	-w/ calcareous noodules at 8'-10'			102	23			
				100		25	76	23	53
10	15								
					89	34			
				94		32	93	31	62
5	20								
		-w/ calcareous nodules at 23'-25'		91	90		92	34	58
0	25								
						26			
-5	30								
				100	99	27	68	23	45
-10	35								
▽		Very stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL)		81		12	38	13	25
-15	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 38' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

LOG OF BORING ECP-2019

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839359.17; E: 3191552.86
DEPTH OF WATER:38 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 25.61 FT
DATE: 4/17/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
25	0	Brown, SAND (SP) -w/ roots at 0'-2'							
		Stiff to very stiff, brown and reddish brown, FAT CLAY WITH SAND (CH)	10	74		19	50	17	33
	5		28						
20		Stiff to very stiff, reddish brown and brown, SANDY LEAN CLAY (CL)	26	55		8	26	17	9
	10		9						
15		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		98	107	21	70	19	51
	15				96	29			
10				99		31	80	28	52
	20								
5									
	25			98	87		84	28	56
0									
	30					27			
-5									
	35			100	103	24	68	20	48
-10									
▽		Very stiff, reddish brown, LEAN CLAY WITH SAND (CL)		73		15	38	14	24
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 38' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar/Vijay

HVJ Associates, Inc.

PLATE A-54

LOG OF BORING ECP-2020

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839877.84; E: 3191540.15
DEPTH OF WATER:38 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.05 FT
DATE: 4/16/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ sand seams at 0'-2' and 4'-10' -w/ organics at 0'-2'	6	87	110	18	71	20	51
20	5	-w/ ferrous stains at 4'-10'							
		-w/ calcareous nodules at 6'-10'							
15	10				110	20			
				96		23	73	22	51
		-w/ ferrous stains at 12'-20'							
10	15				96	29			
				100		32	94	34	60
5	20								
		-w/ calcareous nodules and ferrous stains at 23'-25'		98		33	90	32	58
0	25								
-5	30				98	26			
		-w/ calcareous nodules at 33'-35'							
-10	35					27			
▽		Soft to firm, reddish brown and gray, LEAN CLAY WITH SAND (CL)							
-15	40			81		18	30	13	17

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 38' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar/Vijay

HVJ Associates, Inc.

PLATE A-55

LOG OF BORING ECP-2021

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839603.85; E: 3192221.43
DEPTH OF WATER:38 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 25.21 FT
DATE: 4/20/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
25	0	Stiff, dark gray and brown, SANDY LEAN CLAY (CL)		53		11	38	13	25
		-w/ organics at 0'-2'							
		Firm to stiff, brown and gray, FAT CLAY WITH SAND (CH)			107	20			
20	5	-w/ ferrous stains at 4'-10'		83		21	54	15	39
		-w/ calcareous nodules at 6'-10'							
	10				108	25			
15		Stiff to very stiff, gray and reddish brown, FAT CLAY (CH)		88		25	60	19	41
	15				94	31			
10		-w/ calcareous nodules at 16'-20'		99		26	78	27	51
	20				92	32			
5									
	25				92	31			
0		-w/ ferrous stains at 28'-30'		100		26	72	24	48
-5	30								
		-w/ ferrous stains at 33'-35'			99	25			
-10	35								
				87		20	58	18	40
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

▽

Remarks: Groundwater was encountered at 38' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar/Vijay

HVJ Associates, Inc.

PLATE A-56

LOG OF BORING ECP-2022

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13840465.93; E: 3191537.93
DEPTH OF WATER:38 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.15 FT
DATE: 4/16/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, dark gray, gray and brown, FAT CLAY (CH)		91		26	54	17	37
20	5	-w/ ferrous stains at 6'-10'			118	19			
15	10	Stiff to very stiff, reddish brown and gray, LEAN CLAY (CL) -w/ calcareous nodules at 8'-10'		92	106	23	46	19	27
10	15	Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ ferrous stains and calcareous nodules at 12'-16'		90		23	67	18	49
					97	28			
				98		31			
5	20				91	32	82	31	51
0	25	Very stiff, reddish brown and gray, FAT CLAY WITH SAND (CH) -w/ calcareous nodules at 23'-25'		82		32	85	29	56
-5	30				97	28			
-10	35					26			
▽ -15	40	Stiff, reddish brown, LEAN CLAY (CL) -w/ silt seams at 38'-40'		99		20	34	15	19

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 38' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-57

LOG OF BORING ECP-2023

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841108.34; E: 3191496.25
DEPTH OF WATER: 12 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 23.2 FT
DATE: 4/16/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 12 FT
WET ROTARY: 12 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
20	0	Stiff to very stiff, gray and brown, FAT CLAY (CH)		93		24	52	26	26
	5				112	17			
						18			
15		Stiff to very stiff, reddish brown and gray, LEAN CLAY (CL) -w/ sand pockets at 8'-12' -w/ calcareous nodules at 10'-12'		91			29	15	14
	10								
10		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		99	95	28	74	21	53
	15								
						31			
5		-w/ calcareous nodules at 18'-20'		93		30	78	24	54
	20								
0		-w/ calcareous nodules at 23'-25'		85	94	29	79	22	57
	25								
-5						30			
	30								
-10				100		26	66	19	47
	35								
-15					96	28			
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 12' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

LOG OF BORING ECP-2024

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841700.43; E: 3191556.44
DEPTH OF WATER:11 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 23.21 FT
DATE: 4/16/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 12 FT
WET ROTARY: 12 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, dark gray and brown, LEAN CLAY (CL) -w/ roots at 0'-2'		90		23	43	14	29
20	5				114	19			
		-w/ calcareous nodules at 6'-8'							
15		Stiff, brown, LEAN CLAY WITH SAND (CL)		71		20	27	18	9
	10		9						
10		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ calcareous nodules at 12'-16'		91		23	56	19	37
	15				103	21			
						31			
5				96		30	80	27	53
	20								
0		-w/ calcareous nodules and ferrous stains at 23'-25'		93		25	66	23	43
	25								
-5					96	28			
	30								
-10				99		19	88	28	60
	35								
-15					93	31			
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 11' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-59

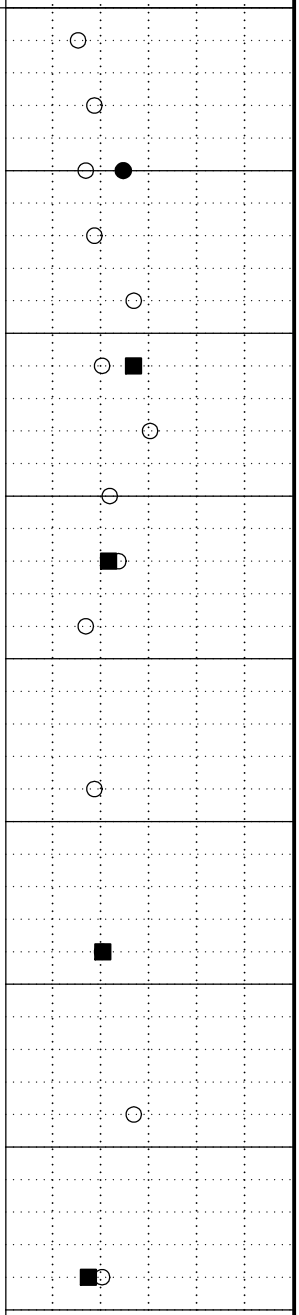
LOG OF BORING ECP-2025

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841605.45; E: 3192117
DEPTH OF WATER:38 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.62 FT
DATE: 4/16/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, gray and reddish brown, LEAN CLAY (CL) -w/ roots at 0'-4'		90		18	43	16	27
20	5				113	17			
		-w/ ferrous stains at 6'-8'							
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ calcareous nodules and ferrous stains at 8'-12'		87		18	53	18	35
15	10				114	22			
				99		21	56	19	37
10	15								
					90	35			
5	20			100		31	92	31	61
		-w/ calcareous nodules and ferrous stains at 23'-25'		91		37	101	33	68
0	25								
					95	29			
-5	30								
				100		23	50	19	31
-10	35								
▽									
					90	30			
-15	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



COH HG1910092.2.1 -BW8.GPJ 11/16/20

Remarks: Groundwater was encountered at 38' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-60

LOG OF BORING ECP-2026

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841486.46; E: 3192656.24
DEPTH OF WATER:38 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 23.13 FT
DATE: 4/16/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, gray and reddish brown, FAT CLAY (CH) -w/ organics at 0'-2'				29			
20				92		30	80	21	59
	5	-w/ roots at 4'-6'			105	24			
		-w/ calcareous nodules and ferrous stains at 6'-8'							
15		-w/ ferrous stains at 8'-40'							
	10			95		21	56	19	37
					100	24			
10						27			
	15								
		-w/ calcareous nodules at 16'-18'							
					87	35			
5									
	20			96		20	62	20	42
0									
	25			100	97	25	75	24	51
-5						30			
	30								
-10									
	35			100	98	29	76	26	50
▽ -15									
	40					28			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 38' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar/Vijay

HVJ Associates, Inc.

PLATE A-61

LOG OF BORING ECP-2027

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13840474.15; E: 3192891.38
DEPTH OF WATER: Dry FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.37 FT
DATE: 4/20/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to stiff, gray and brown, LEAN CLAY WITH SAND (CL) -w/ organics at 0'-2'				19			
				82		20	39	11	28
20	5				113	20			
				73		17	42	12	30
15	10								
		Stiff to very stiff, gray and reddish brown, FAT CLAY (CH) -w/ ferrous stains at 6'-20' -w/ calcareous nodules at 6'-10'			102	24			
						27			
10	15			98		26	82	21	61
					99	29			
		-w/ calcareous nodules at 18'-20'				35			
5	20								
		-w/ ferrous stains and calcareous nodules at 23'-25'			87	35			
0	25								
		-w/ ferrous stains at 28'-30'		99		28	78	24	54
-5	30								
		-w/ ferrous stains at 33'-35'				22			
-10	35								
		-w/ ferrous stains 38'-40'		99	95	30	81	24	57
-15	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was not encountered during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar/Vijay

HVJ Associates, Inc.

PLATE A-62

LOG OF BORING ECP-2028

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841319.93; E: 3193296.53
DEPTH OF WATER: Dry FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 22.68 FT
DATE: 4/21/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, gray and reddish brown, FAT CLAY (CH)		94		27	63	21	42
20					102	22			
	5	-w/ calcareous nodules 4'-8'							
15				89		21	58	17	41
	10				115	22			
				98		25	81	22	59
10									
	15			100	93	26	79	21	58
5						36			
	20								
0		-w/ calcareous nodules at 23'-25'			90	34	95	28	67
	25								
-5						29			
	30								
-10				100	94	29	86	21	65
	35								
-15		-w/ sand seams and calcareous nodules at 38'-40'		97		22	50	15	35
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was not encountered during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-63

LOG OF BORING ECP-2029

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13841122.26; E: 3193909.75
DEPTH OF WATER:33 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 22.63 FT
DATE: 4/21/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
20	0	Firm to stiff, gray and reddish brown, FAT CLAY WITH SAND (CH) -w/ roots at 0'-2'		85		26	64	22	42
15	5	Stiff to very stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL) -w/ calcareous nodules and ferrous stains at 6'-8'		82	106	26	48	16	32
10	10					19			
10	15	Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		100		30	82	30	52
5	20				95	29			
0	25	-w/ calcareous nodules and ferrous stains at 23'-25'		99		34	92	31	61
-5	30	Very stiff, reddish brown and gray, LEAN CLAY (CL) -w/ silt seams at 28'-30'		93	91	33			
▽ -10	35	Medium dense to dense, brown, SANDY SILT (ML) -w/ clay seams at 33'-35'	12			18	27	13	14
-15	40		34	66		29			
						23	NP	NP	NP

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 33' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-64

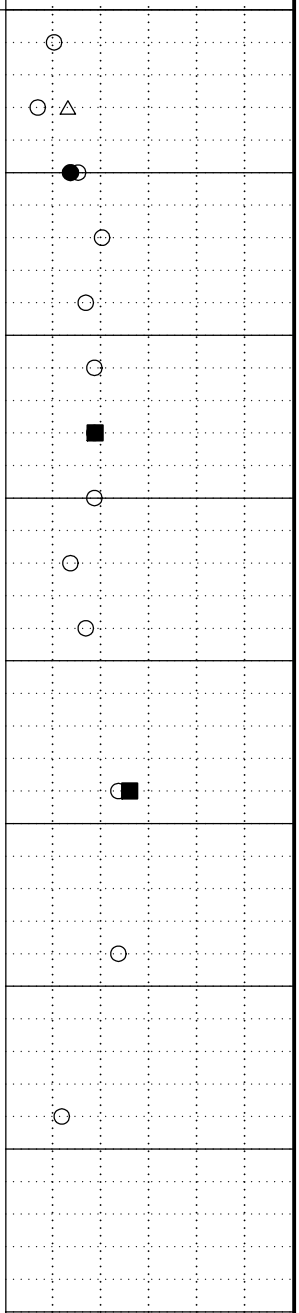
LOG OF BORING ECP-2030

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13840965.69; E: 3194568.79
DEPTH OF WATER:34 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 21.97 FT
DATE: 4/21/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
20	0	Firm to very stiff, reddish brown and gray, FAT CLAY WITH SAND (CH)		79		27	62	20	42
15	5	-w/ calcareous nodules and ferrous stains at 6'-10'			103	22			
10	10			99		21			
5	15	Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ calcareous nodules and ferrous stains at 10'-12' and 16'-20'			93	27 30	76	25	51
0	20			99		36	86	33	53
-5	25			99	95	28	80	27	53
-10	30					27			
-15	35	Stiff, reddish brown and gray, LEAN CLAY (CL)		97		22	28	18	10
	40	Very stiff, brown, LEAN CLAY WITH SAND (CL)	19	78		22	25	17	8

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



COH HG1910092.2.1 -BW8.GPJ 11/16/20

Remarks: Groundwater was encountered at 34' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-65

LOG OF BORING ECP-2031

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13840819.93; E: 3195100.41
DEPTH OF WATER: 39 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 23.59 FT
DATE: 4/23/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Very loose to loose, brown, SANDY SILT (ML)	4	70		10	NP	NP	NP
			8						
20	5	Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ calcareous nodules at 4'-10' -w/ ferrous stains at 4'-18'		89		18	58	17	41
					115	19			
15	10								
				99		21	64	22	42
10	15				92	32			
				100	91	36	90	30	60
5	20	-w/ calcareous nodules at 18'-20'							
				96		35	90	33	57
0	25								
				100	96	27	68	23	45
-5	30								
				90		26	66	23	43
-10	35								
▽ -15	40	Firm, brown, LEAN CLAY (CL)	6	87		25	24	16	8

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 39' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-66

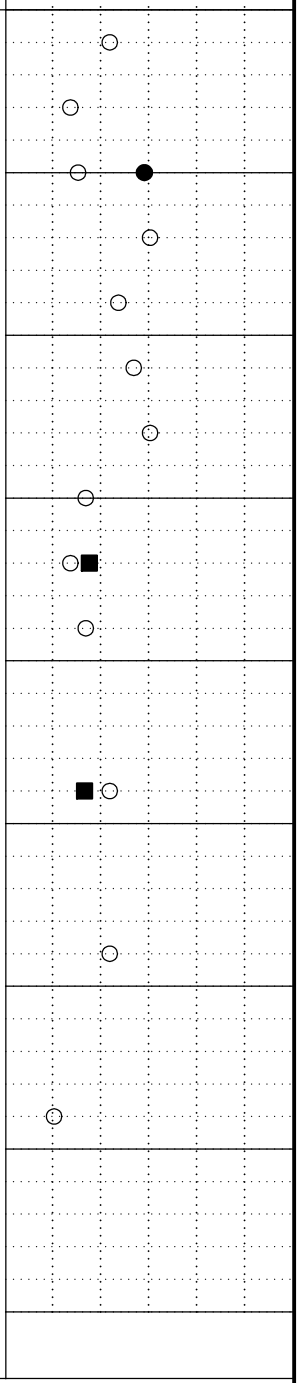
LOG OF BORING ECP-2032

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13840322.78; E: 3195299.53
DEPTH OF WATER:38 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 23.42 FT
DATE: 4/23/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, reddish brown and gray, FAT CLAY WITH SAND (CH)							
20	5			83		21	57	13	44
					117	17			
		-w/ calcareous nodules at 6'-8'							
15		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		95		21	68	17	51
	10	-w/ calcareous nodules at 8'-10'							
10						26			
	15			100		31	90	21	69
					87	26			
5									
	20								
0		-w/ ferrous stains at 23'-25'		95	90	25	93	30	63
	25								
-5						27			
	30								
-10		Firm to stiff, brown and gray, LEAN CLAY (CL)		91		20	32	15	17
	35								
▽ -15		-w/ sand layers at 38'-40'	18			26			
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



COH HG1910092.2.1 -BW8.GPJ 11/16/20

Remarks: Groundwater was encountered at 38' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-67

LOG OF BORING ECP-2033

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839829.05; E: 3194508.61
DEPTH OF WATER: Dry FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 23.76 FT
DATE: 4/21/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, reddish brown and gray, FAT CLAY WITH SAND (CH) -w/ roots at 0'-4'		80		21	62	18	44
20	5	-w/ sand seams at 4'-8'			110	18			
15	10	-w/ calcareous nodules and ferrous stains at 8'-12'		73		19	56	18	38
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		98		30	80	27	53
10	15				96	34			
5	20			98		37	94	35	59
0	25	-w/ calcareous nodules and ferrous stains at 23'-25'			86	36			
-5	30			100		28	78	26	52
-10	35				95	29			
-15	40			96		29	82	28	54

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was not encountered during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-68

COH HG1910092.2.1 -BW8.GPJ 11/16/20

LOG OF BORING ECP-2034

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839688.34; E: 3195091.98
DEPTH OF WATER:33 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 23.76 FT
DATE: 4/22/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to stiff, dark gray and brown, LEAN CLAY WITH SAND (CL)		78		21	44	15	29
20	5	Very stiff, reddish brown and gray, SANDY LEAN CLAY (CL) -w/ ferrous stains at 4'-6'		65		15	36	15	21
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)			112	28			
15	10	-w/ calcareous nodules at 6'-10' -w/ ferrous stains at 8'-10'		96		23	68	22	46
						30			
10	15				94	33			
5	20	-w/ ferrous stains and calcareous nodules at 18'-20'		99		36	96	33	63
0	25	-w/ ferrous stains and calcareous nodules at 23'-25'			89	36			
-5	30			98		30	77	28	49
-10	35				99	27			
-15	40					27			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

▽

Remarks: Groundwater was encountered at 33' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-69

LOG OF BORING ECP-2035

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839048.44; E: 3194925.94
DEPTH OF WATER:33 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 23.37 FT
DATE: 4/22/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Stiff to very stiff, reddish brown and gray, FAT CLAY WITH SAND (CH)		85		23	53	17	36
		-w/ roots at 2'-4'							
20									
	5	-w/ sand seams at 4'-6'							
		-w/ calcareous nodules at 4'-8'				17			
					119	17			
15		Firm to very stiff, reddish brown and gray, FAT CLAY (CH)		92		28	70	21	49
	10	-w/ calcareous nodules at 8'-10'							
						30			
10									
	15			99	92	35	90	26	64
5		-w/ calcareous nodules and ferrous stains at 18'-20'		93		34	90	26	64
	20								
0		-w/ calcareous nodules at 23'-25'			90	32			
	25								
-5						27			
	30								
▽ -10		Stiff to very stiff, reddish brown and gray, LEAN CLAY (CL)		98	108	20	40	17	23
	35								
-15		Medium dense, brown, SILT WITH SAND (ML)	21	84		20	NP	NP	NP
	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Remarks: Groundwater was encountered at 33' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-70

LOG OF BORING ECP-2036

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13838274.31; E: 3194701.76
DEPTH OF WATER:28 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.22 FT
DATE: 4/22/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, gray and reddish brown, LEAN CLAY (CL)		91		16	38	14	24
20	5	-w/ sand seams at 4'-8'							
		-w/ ferrous stains at 6'-8'				16			
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		94		31	68	21	47
15	10				92	29			
		-w/ sand seams at 12'-14'				30			
10	15	-w/ calcareous nodules at 14'-16' and 18'-20'							
				94	97	27	50	16	34
5	20								
				87		27	51	19	32
0	25								
▽		-w/ sand seams at 28'-30'							
-5	30			94	109	21	54	18	36
		Loose to medium dense, brown, SILT (ML)	16	92		26	NP	NP	NP
-10	35								
			6			20			
-15	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 28' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-71

LOG OF BORING ECP-2037

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13838154.43; E: 3193967.07
DEPTH OF WATER:33 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.38 FT
DATE: 4/22/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, reddish brown and gray, FAT CLAY (CH)		89		35	80	22	58
					109	20			
20	5								
		-w/ calcareous nodules at 6'-10'		91		36	72	30	42
15	10				92	31			
						30			
					96	28			
10	15			99		31	82	26	56
5	20				92	32			
		-w/ calcareous nodules and ferrous stains at 23'-25'		95	95	29	78	25	53
0	25								
						28			
-5	30								
		Stiff to very stiff, reddish brown and gray, LEAN CLAY (CL)		97		23	43	15	28
-10	35	-w/ sand at 33'-35'							
		-w/ sand at 38'-40'	27			21			
-15	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 33' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-72

LOG OF BORING ECP-2038

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13839496.51; E: 3193531.34
DEPTH OF WATER: Dry FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.62 FT
DATE: 4/20/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 40 FT
WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Firm to very stiff, brown, reddish brown and gray, FAT CLAY (CH) -w/ shells at 0'-2'		91		27	66	21	45
				92		31	70	17	53
20	5				93	25			
		-w/ ferrous stains at 6'-10'		93		27	70	19	51
15	10					27			
		-w/ ferrous stains at 10'-20'		100	95	28	86	23	63
10	15								
				99		35	86	28	58
5	20								
		-w/ ferrous stains at 23'-25'		93	87	33	93	32	61
0	25								
						28			
-5	30								
				100	96	29	74	25	49
-10	35								
						29			
-15	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was not encountered during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar/Vijay

HVJ Associates, Inc.

PLATE A-73

LOG OF BORING ECP-2039

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13837516.14; E: 3193792.84
DEPTH OF WATER:35 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.88 FT
DATE: 4/14/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	Brown, SAND (SP) -w/ roots at 0'-2'							
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		90		23	65	19	46
20	5								
		-w/ calcareous nodules at 6'-8'			106	22			
		Stiff, reddish brown and gray, LEAN CLAY WITH SAND (CL)		76		17	44	15	29
15	10								
		Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)			94	27			
				94		28	88	24	64
10	15								
					102	27			
				95		23	64	20	44
5	20								
		-w/ calcareous nodules and ferrous stains at 23'-25'		96		34	88	27	61
0	25								
					96	28			
-5	30								
		Stiff, reddish brown and gray, LEAN CLAY (CL) -w/ sand seams at 33'-35'		98		21	30	14	16
▽ -10	35								
		-w/ silt seams at 38'-40'	15			24			
-15	40								

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Remarks: Groundwater was encountered at 35' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-74

LOG OF BORING ECP-2040

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13837042.31; E: 3193502.6
DEPTH OF WATER: 18 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 15.65 FT
DATE: 4/13/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 18 FT
WET ROTARY: 18 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
15	0	Firm to very stiff, dark gray and brown, FAT CLAY (CH) -w/ roots at 0'-4' -w/ calcareous nodules at 0'-6'		100		38	98	28	70
					93	29			
10	5	-w/ sand and silt seams at 6'-12'		94		25	73	22	51
						29			
5	10				95	24			
0	15	Firm to very stiff, reddish brown, LEAN CLAY (CL)		89		19	32	15	17
						18			
▽	20			90		21	34	16	18
					113	20			
-5	25			87		31	28	17	11
-10	30		15			27			
-15	35	Medium dense, brown, SANDY SILT (ML)	27	58		24	NP	NP	NP
-20	40	Very stiff, reddish brown and gray, FAT CLAY (CH) -w/ sand seams at 38'-40'		93			62	23	39
					101	27			

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 18' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-75

LOG OF BORING ECP-2041

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13836914.45; E: 3193062.68
DEPTH OF WATER:28 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 16.65 FT
DATE: 4/13/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
15	0	Stiff, gray and brown, FAT CLAY WITH SAND (CH)							
		-w/ calcareous nodules at 2'-6'		84		20	57	13	44
10	5	Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)			98	28			
		-w/ sand seams at 8'-14'		93		28	68	26	42
5	10				88	36			
	15	-w/ calcareous nodules at 14'-16'		95		30	90	33	57
0		-w/ ferrous stains at 14'-18'		92		21	76	23	53
	20				99	26			
-5	25			100	108	20	54	18	36
-10		Medium dense, brown and gray, SILT (ML)		93		23	NP	NP	NP
	30								
-15	35		24			24			
-20		Stiff, reddish brown and gray, FAT CLAY (CH)		86		24	57	18	39
	40	-w/ sand seams at 38'-40'							

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 28' during drilling operations.

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-76

COH HG1910092.2.1 -BW8.GPJ 11/16/20

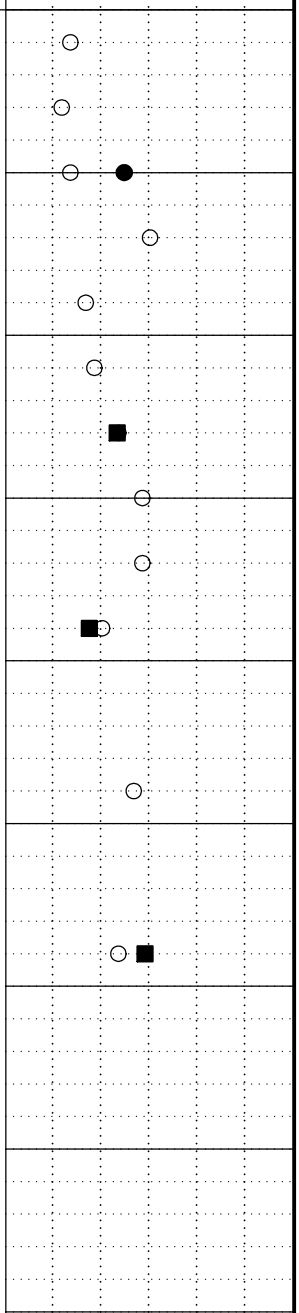
LOG OF BORING ECP-2042

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13837439.82; E: 3192549.76
DEPTH OF WATER: 35 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 24.08 FT
DATE: 4/14/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 35 FT
WET ROTARY: 35 TO 40 FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0			Stiff to very stiff, dark gray and reddish brown, LEAN CLAY (CL)		88		18	43	15	28
20	5			-w/ calcareous nodules and ferrous stains at 4'-6'			119	16			
				Stiff to very stiff, reddish brown and gray, FAT CLAY (CH)		97		30	84	24	60
15	10										
							101	27			
10	15			-w/ calcareous nodules at 14'-18'		89		19	56	16	40
5	20					95	93	27	70	24	46
0	25					95		28	85	24	61
-5	30						92	27			
-10	35			-w/ silt pockets at 33'-35'	10	97		28	64	19	45
-15	40			Medium dense, brown, SILT (ML) -w/ clay seams at 38'-40'	24	91		22	NP	NP	NP

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5



Remarks: Groundwater was encountered at 35' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-77

LOG OF BORING ECP-2043

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13836660.32; E: 3192689.27
DEPTH OF WATER:28 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 17.4 FT
DATE: 4/13/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 30 FT
WET ROTARY: 30 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
15	0	Firm to hard, gray and reddish brown, FAT CLAY (CH) -w/ roots at 0'-2' -w/ calcareous nodules at 0'-6'		94		27	78	23	55
	5				95	28			
10		-w/ calcareous nodules at 6'-18'		93		25	62	21	41
	10				111	18			
5				92		20	66	21	45
	15		95				98	31	67
0					92	32			
	20			99		28	61	22	39
-5									
	25			100	103	26	79	26	53
-10 ▽		Firm, brown, SILTY CLAY (CL-ML)	7	96		26	26	20	6
	30								
-15		Medium dense, brown, SILT (ML)	19	90			NP	NP	NP
	35								
-20									
	40	Very stiff, reddish brown and gray, FAT CLAY (CH)		100		28	76	24	52

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 28' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-78

LOG OF BORING ECP-2044

PROJECT: HSC Expansion - Beltway 8 Placement Area
PROJECT NO.: HG1910092.2.1
LOCATION: N: 13836629.4; E: 3192173.45
DEPTH OF WATER:8 FT
COMPLETION DEPTH: 40 FT
STATION: N/A
OFFSET: N/A
SURFACE ELEVATION: 30.85 FT
DATE: 4/15/2020

SAMPLER: Shelby Tube/Split Spoon
DRY AUGER: 0 TO 10 FT
WET ROTARY: 10 TO 40 FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
30	0	Loose to medium dense, brown, CLAYEY SAND (SC) -w/ roots at 0'-4'	5						
			9	39		15	32	11	21
	5		22						
25		Very loose to loose, brown, SILTY SAND (SM)	7	29		21	NP	NP	NP
			3						
	10		4						
20		Very soft, dark gray and brown, SANDY LEAN CLAY (CL)	1	57		25	34	14	20
	15	Firm to very stiff, reddish brown and gray, FAT CLAY (CH)		88		37	86	23	63
15		-w/ sand seams at 14'-16'	6	97		36	86	26	60
	20				91	32			
10									
	25			95	89	33	90	27	63
5		-w/ calcareous nodules at 28'-30'							
	30					35			
0									
	35				98	28			
-5									
	40	Firm to stiff, reddish brown and gray, LEAN CLAY (CL)		94		21	32	20	12

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

Remarks: Groundwater was encountered at 8' during drilling operations.

COH HG1910092.2.1 -BW8.GPJ 11/16/20

Drilled By: CH Logged By: Edgar

HVJ Associates, Inc.

PLATE A-79

SOIL SYMBOLS

Soil Types


Clay


Silt


Sand


Gravel

Modifiers


Clayey


Silty


Sandy


Cemented

Construction Materials


Asphaltic Concrete


Stabilized Base


Fill or Debris


Portland Cement Concrete

SAMPLER TYPES


Thin Walled Shelby Tube


No Recovery


Split Barrel


Core


Liner Tube


Jar Sample

WATER LEVEL SYMBOLS


Groundwater level after drilling in open borehole or piezometer


Groundwater level determined during drilling operations

SOIL GRAIN SIZE

Classification	Particle Size	Particle Size or Sieve No. (U.S. Standard)
Clay	< 0.002 mm	< 0.002 mm
Silt	0.002 - 0.075 mm	0.002 mm - #200 sieve
Sand	0.075 - 4.75 mm	#200 sieve - #4 sieve
Gravel	4.75 - 75 mm	#4 sieve - 3 in.
Cobble	75 - 200 mm	3 in. - 8 in.
Boulder	> 200 mm	> 8 in.

DENSITY OF COHESIONLESS SOILS

Descriptive Term	Penetration Resistance "N" * Blows/Foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

CONSISTENCY OF COHESIVE SOILS

Consistency	Undrained Shear Strength (tsf)	Penetration Resistance "N" * Blows/Foot
Very Soft	0 - 0.125	0 - 2
Soft	0.125 - 0.25	2 - 4
Firm	0.25 - 0.5	4 - 8
Stiff	0.5 - 1.0	8 - 16
Very Stiff	1.0 - 2.0	16 - 32
Hard	> 2.0	> 32

PENETRATION RESISTANCE

3/6	Blows required to penetrate each of three consecutive 6-inch increments per ASTM D-1586 *
50/4"	If more than 50 blows are required, driving is discontinued and penetration at 50 blows is noted
0/18"	Sampler penetrated full depth under weight of drill rods and hammer

* The N value is taken as the blows required to penetrate the final 12 inches

TERMS DESCRIBING SOIL STRUCTURE

Slickensided	Fracture planes appear polished or glossy, sometimes striated
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Inclusion	Small pockets of different soils, such as small lenses of sand scattered through a mass of clay
Parting	Inclusion less than 1/4 inch thick extending through the sample
Seam	Inclusion 1/4 inch to 3 inches thick extending through the sample
Layer	Inclusion greater than 3 inches thick extending through the sample
Laminated	Soil sample composed of alternating partings of different soil type
Stratified	Soil sample composed of alternating seams or layers of different soil type
Intermixed	Soil sample composed of pockets of different soil type and laminated or stratified structure is not evident
Calcareous	Having appreciable quantities of calcium carbonate
Ferrous	Having appreciable quantities of iron
Nodule	A small mass of irregular shape

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KEY TO TERMS AND SYMBOLS
USED ON BORING LOGS
Houston Ship Channel Expansion Channel Improvement Project

PROJECT NO.: HG1910092.2.1

DRAWING NO.: PLATE A-80

APPENDIX B

SUMMARY OF LABORATORY TEST RESULTS

Company Name: HVJ Associates, Inc
Project: Houston Ship Channel Expansion Channel Improvement Project
Location: Houston, Texas
Project Number: HG1910092.2.1

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
BAYPORT SHIP CHANNEL-SAN JACINTO COLLEGE										
ECP-207	1					29				0.67
ECP-207	3									0.67
ECP-207	5	73	28	45	94.2	26				0.92
ECP-207	7					30	122		0.59	0.58
ECP-207	9									0.83
ECP-207	11					23				1.17
ECP-207	13									1.33
ECP-207	15	79	33	46	86.5	25	125	1.09		1.17
ECP-207	17	28	23	5	98.0	29				
ECP-207	24	82	35	47	98.7	29	124	1.40		1.33
ECP-207	29	71	31	40	99.4	25				1.33
ECP-207	34					27				0.33
ECP-207	39	33	20	13	53.6	19				1.17
ECP-207	44	26	21	5	33.3	21				
ECP-207	49					23				
ECP-207	54				16.8	25				
ECP-207	59					21				
ECP-207	64				11.9	24				
ECP-207	69					26				
ECP-207	74				5.6	20				
ECP-207	79					19				
ECP-207	84				7.2	21				
ECP-207	89				71.5	26				
ECP-207	99	50	23	27	84.5	24	130	1.44		1.25
ECP-207	104	24	20	4	45.0	19				1.00
ECP-207	109	22	20	2	44.0	22				
ECP-208	1					19				0.75
ECP-208	3	35	20	15	95.7	20				0.58
ECP-208	5					30	120		0.73	0.67
ECP-208	7									0.67
ECP-208	9					31				0.67
ECP-208	11					27	128		0.80	0.58
ECP-208	13									0.75
ECP-208	15									1.50
ECP-208	17					24				1.50
ECP-208	19	45	26	19		20	128	0.87		0.83
ECP-208	24					27				1.17
ECP-208	29				47.6	21				
ECP-208	34	67	30	37	99.1	30	125	1.20		1.42
ECP-208	39	35	24	11	98.9	31				0.33
ECP-208	44	58	28	30	89.4	27	125	1.09		1.50
ECP-208	49					20				0.75
ECP-208	54				20.9	27				

Company Name: HVJ Associates, Inc
Project: Houston Ship Channel Expansion Channel Improvement Project
Location: Houston, Texas
Project Number: HG1910092.2.1

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-208	59					25				
ECP-208	64				7.6	21				
ECP-208	69					22				
ECP-208	74					20				
ECP-208	79				67.7	25				
ECP-208	84	27	19	8	55.0	19	127	0.55		0.50
ECP-208	89					17				1.50
ECP-208	94	36	21	15		18	130	1.75		1.50
ECP-208	99	26	18	8	56.1	19				0.50
ECP-208	104					20				0.25
ECP-208	109	33	19	14	57.7	19				
Total		**19**	**19**	**19**	**26**	**48**	**11**	**8**	**3**	**34**
BAYPORT SHIP CHANNEL-EAST OF SAN JACINTO COLLEGE										
ECP-209	1	58	20	38	88.7	19				1.50
ECP-209	3					23	127		1.80	1.00
ECP-209	5					22				1.30
ECP-209	7									1.30
ECP-209	9	79	25	54	96.5	33				0.80
ECP-209	11									0.50
ECP-209	13	70	29	41	95.5	28	122		1.00	0.60
ECP-209	15									1.00
ECP-209	17	48	24	24	94.9	25				0.80
ECP-209	19				88.4					
ECP-209	24	NP	NP	NP	68.2	23				
ECP-209	29					25				
ECP-209	34	70	32	38	96.1	31	121	0.80		0.90
ECP-209	39	32	17	15	91.3	24				0.50
ECP-209	44					28				1.00
ECP-209	49	74	33	41	94.2	31	119	1.50		0.90
ECP-209	54	23	14	9	39.3	19				0.70
ECP-209	59	NP	NP	NP	16.9					
ECP-209	64					26				
ECP-209	69	NP	NP	NP	15.6	18				
ECP-209	74					20				
ECP-209	79	NP	NP	NP	11.7	18				
ECP-209	84	44	17	27	77.9	21				0.70
ECP-209	89					16				1.50
ECP-210	1	49	22	27	86.9	18				1.10
ECP-210	3					22	128		2.20	1.00
ECP-210	5					18				1.50
ECP-210	7	61	26	35	66.1	21				1.50
ECP-210	9									1.00
ECP-210	11					27	123		1.00	0.90
ECP-210	13	62	24	38	86.5	24				0.80

Company Name: HVJ Associates, Inc
Project: Houston Ship Channel Expansion Channel Improvement Project
Location: Houston, Texas
Project Number: HG1910092.2.1

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-210	15	44	24	20	92.5	22				1.20
ECP-210	17					21				1.50
ECP-210	19	27	21	6	90.2	24				0.60
ECP-210	24	NP	NP	NP	51.5	25				
ECP-210	29					22				1.00
ECP-210	34	77	34	43	95.8	32	121	1.20		1.00
ECP-210	39					26				0.80
ECP-210	44	38	25	13	96.1	25				0.80
ECP-210	49	67	31	36	81.4	26	122	1.10		1.00
ECP-210	54	82	35	47	98.7	33				1.20
ECP-210	59					25	125	1.60		1.30
ECP-210	64	50	19	31	47.6	18				1.50
ECP-210	69	37	22	15	45.3	36				
ECP-210	79	NP	NP	NP	80.0	26				
ECP-210	84	25	20	5	45.0	15				
ECP-210	89	45	23	22	81.3	22	128	1.30		1.00
ECP-211	1	70	25	45	92.8	26				1.20
ECP-211	3					26	130		1.00	0.60
ECP-211	5	60	25	35	94.2	24				0.70
ECP-211	7									0.80
ECP-211	9	68	28	40	95.1	29				0.50
ECP-211	11					28	125		0.60	0.60
ECP-211	13									0.80
ECP-211	15	37	21	16	86.7	18				1.00
ECP-211	17									0.50
ECP-211	19	NP	NP	NP	88.1	22				
ECP-211	24	NP	NP	NP	85.5	23				
ECP-211	29					23				1.10
ECP-211	34	73	33	40	99.5	32	121	1.20		1.20
ECP-211	39					31				0.90
ECP-211	44	29	22	7	98.8	26				0.70
ECP-211	49	67	30	37	99.6	31	124	1.20		1.10
ECP-211	54	44	21	23	82.4	24				1.20
ECP-211	59					17	135	1.50		1.00
ECP-211	69	NP	NP	NP	25.7	21				
ECP-211	74					18				
ECP-211	79	44	26	18	95.1	29				0.80
ECP-211	84	90	29	61	98.7	45	115	1.00		0.90
ECP-211	89					51				0.70
ECP-212	1	56	22	34	89.9	20				1.50
ECP-212	3					23	127		1.30	1.30
ECP-212	5									1.50
ECP-212	7					24				1.30
ECP-212	9	80	30	50	95.5	31				1.00
ECP-212	11					31	119		0.70	0.70

Company Name: HVJ Associates, Inc
Project: Houston Ship Channel Expansion Channel Improvement Project
Location: Houston, Texas
Project Number: HG1910092.2.1

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-212	13	33	18	15	88.4	20				0.30
ECP-212	15	24	16	8	72.3					1.50
ECP-212	17	NP	NP	NP	48.9	18				
ECP-212	24	NP	NP	NP	84.0	26				
ECP-212	29					20				
ECP-212	34	73	34	39	99.7	29	121	1.10		1.10
ECP-212	39					29				1.10
ECP-212	44	45	20	25	99.8	27	126	0.70		0.70
ECP-212	49					31				1.00
ECP-212	54	78	35	43	98.2	32	119	1.50		1.20
ECP-212	59	63	14	49	59.5	20				0.30
ECP-212	64	60	25	35	98.5	29				1.50
ECP-212	69					30	122	1.10		1.00
ECP-212	74	37	21	16	69.9	22				0.80
ECP-212	79					26	123	1.50		1.20
ECP-212	84	47	21	26	71.8	20	132	2.00		1.10
ECP-212	89					20				
ECP-213	1					25				0.90
ECP-213	3	60	25	35	94.3	25				0.50
ECP-213	5					29				0.50
ECP-213	7									0.30
ECP-213	9	65	27	38	90.4	26				0.80
ECP-213	11									0.80
ECP-213	13	69	27	42	89.9					0.70
ECP-213	15					28				0.80
ECP-213	17									1.00
ECP-213	19	65	27	38	96.5	26	130	1.20		1.20
ECP-213	24	40	22	18	97.2	19	136	1.10		1.30
ECP-213	29	NP	NP	NP	69.0	24				
ECP-213	34	64	34	33	99.0					1.10
ECP-213	39					29	124	0.90		1.20
ECP-213	44	37	26	11	99.1	26				1.20
ECP-213	49	59	30	29	99.5	30	124	1.00		0.70
ECP-213	54	73	30	43	100.0	32				1.00
ECP-213	59	41	23	18	69.3	19				0.70
ECP-213	64					18				1.30
ECP-213	69	NP	NP	NP	17.0	20				
ECP-213	74					21				
ECP-213	79	26	21	5	82.0	24				
ECP-213	84	76	33	43	78.5	42				
ECP-213	89				85.3	23	129	1.50		1.20
ECP-214	1									1.50
ECP-214	3	62	30	32	75.4	25				1.20
ECP-214	5					17	132		1.90	1.50
ECP-214	7	31	19	12	46.8	17				1.30

Company Name: HVJ Associates, Inc
Project: Houston Ship Channel Expansion Channel Improvement Project
Location: Houston, Texas
Project Number: HG1910092.2.1

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-214	9					21	129		0.50	0.60
ECP-214	11									0.80
ECP-214	13	45	25	20	84.0	21				
ECP-214	15					18	132		0.70	1.50
ECP-214	17					23				0.20
ECP-214	19	22	20	2	67.7	21				
ECP-214	24	NP	NP	NP	52.9	25				
ECP-214	29	35	20	15	99.2					1.00
ECP-214	34					23				0.50
ECP-214	39	36	23	13	98.4	23				0.80
ECP-214	44					32	120	1.30		1.10
ECP-214	49	79	30	49	96.6	33				1.20
ECP-214	54	59	28	31	65.0	24	130	1.50		1.10
ECP-214	59					16				1.30
ECP-214	64	NP	NP	NP	12.6	19				
ECP-214	69					21				
ECP-214	74	NP	NP	NP	14.7					
ECP-214	79	35	10	25	73.1	17	133	1.80		1.40
ECP-214	84					19				
ECP-214	89	45	10	35	86.0	24	130	1.80		1.30
ECP-215	1	57	23	34	76.3	21				1.50
ECP-215	3									0.90
ECP-215	5					23	128		1.20	0.70
ECP-215	7	NP	NP	NP	16.3	24				
ECP-215	11					22				
ECP-215	15	NP	NP	NP	24.0	24				
ECP-215	19	31	18	13	57.5	23				
ECP-215	24	59	20	39	97.0	26				1.10
ECP-215	29					27	124	1.20		1.20
ECP-215	34	32	12	20	96.6	26				0.70
ECP-215	39	23	17	6	86.0	23				
ECP-215	44	68	33	35	95.5	29	124	1.30		0.80
ECP-215	49					35				1.10
ECP-215	54	37	19	18	59.9	20	128	0.70		1.00
ECP-215	59					22				0.60
ECP-215	64	NP	NP	NP	11.7	19				
ECP-215	69					21				
ECP-215	74	NP	NP	NP	13.8	21				
ECP-215	79	38	22	16	75.5	19	131	1.60		1.20
ECP-215	84	29	19	10	48.4	19				
ECP-215	89					17				1.30
ECP-216	1	42	20	22	74.7	15				1.50
ECP-216	3									0.50
ECP-216	5					21	132		1.00	0.70
ECP-216	7	35	19	16	71.0	15				0.60

Company Name: HVJ Associates, Inc
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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-216	9	32	20	12	69.8					1.30
ECP-216	11					22	122		0.90	0.80
ECP-216	13	34	21	13	92.2	23				0.30
ECP-216	15				89.9					
ECP-216	19	31	23	7	99.5	22				0.70
ECP-216	24				97.9	26				
ECP-216	29	76	33	43	99.4	27				1.30
ECP-216	34					29	129	1.30		1.20
ECP-216	39	27	21	6	89.4	27				
ECP-216	44	51	23	28	98.9	26				1.20
ECP-216	49	61	30	31	99.4	35	120	1.20		1.10
ECP-216	54	64	29	35	79.8	26				1.20
ECP-216	59					21	131	1.60		1.30
ECP-216	64	NP	NP	NP	9.8	22				
ECP-216	69					20				
ECP-216	74	37	20	17	65.7	21	133	1.00		0.80
ECP-216	79					18				1.50
ECP-216	84	31	21	10	77.0	17	136	1.70		1.10
ECP-216	89					21				1.30
ECP-217	1	49	23	26	84.5	18				1.40
ECP-217	3									0.60
ECP-217	5					25	126		0.90	0.80
ECP-217	7	42	19	23	89.1	18				0.90
ECP-217	9	50	22	28	98.5	20				1.50
ECP-217	11									1.50
ECP-217	13				95.2	23				0.50
ECP-217	15					23	129		0.40	0.50
ECP-217	17	28	18	10	99.3	22				0.90
ECP-217	19	25	19	6	64.6					
ECP-217	24					28				
ECP-217	29	70	27	43	99.1					1.00
ECP-217	34					31	122	1.20		0.80
ECP-217	39	23	20	3	92.1	25				0.60
ECP-217	44	50	24	26	94.6	26				1.00
ECP-217	49	73	30	43	96.2	31	121	1.40		0.80
ECP-217	54					21	127	1.70		1.10
ECP-217	59	25	16	9	65.5	20				0.50
ECP-217	64	NP	NP	NP	12.4					
ECP-217	69					21				
ECP-217	74	NP	NP	NP	7.9	22				
ECP-217	79	40	18	22	80.5	16	137	2.70		1.50
ECP-217	84	74	35	39	97.9	27				1.30
ECP-217	89					16	135	2.30		1.50
ECP-218	1									1.50
ECP-218	3	62	27	35	76.0	22				1.50

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-218	5									1.50
ECP-218	7					29	125		0.80	0.80
ECP-218	9	63	32	31	97.2	32				1.10
ECP-218	11	53	29	24	79.5					1.00
ECP-218	13					22	116		0.90	0.70
ECP-218	15					21				1.20
ECP-218	19	NP	NP	NP	62.9	19				
ECP-218	24	30	22	8	92.7	30				
ECP-218	29	67	25	42	89.2	31				
ECP-218	34					27	124	1.10		1.30
ECP-218	39	22	20	2	71.8	22				
ECP-218	44	71	31	40	95.7	26	118	1.10		1.10
ECP-218	49					31				1.30
ECP-218	54					35	119	1.30		1.20
ECP-218	59	34	20	14	60.3	19				0.80
ECP-218	64					16				0.80
ECP-218	69	NP	NP	NP	9.8	18				
ECP-218	74					16				
ECP-218	79	NP	NP	NP	17.9	16				
ECP-218	84					20				
ECP-218	89	43	22	21	69.2	19	131	1.90		1.10
ECP-219	1	72	30	42	94.2	33				0.50
ECP-219	3					27	123		1.60	1.20
ECP-219	5									1.30
ECP-219	7					27				1.00
ECP-219	9	72	29	43	99.2	28	127		1.00	0.70
ECP-219	11									1.00
ECP-219	13	51	22	29	83.0	19				1.40
ECP-219	15									0.50
ECP-219	17	26	22	4	89.7	25				1.00
ECP-219	24	38	24	14	94.8	23				0.70
ECP-219	29	72	31	41	98.2	31				
ECP-219	34					29	124	1.50		1.20
ECP-219	39	44	24	20	94.8	25				1.00
ECP-219	44	78	30	48	99.2	30	122	1.40		1.10
ECP-219	49					35				1.10
ECP-219	54	37	19	18	55.9	19	137	1.30		1.00
ECP-219	59					18				0.90
ECP-219	64	NP	NP	NP	9.0	23				
ECP-219	69					21				
ECP-219	74	NP	NP	NP	14.1	22				
ECP-219	79					16				
ECP-219	84	52	27	25	93.4	27				0.70
ECP-219	89					19	134	2.00		1.20
ECP-220	1									0.40

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-220	3	90	32	58	98.5	33	117		1.10	0.60
ECP-220	5									1.20
ECP-220	7	89	26	63	98.8	32				0.70
ECP-220	9									1.00
ECP-220	11	53	23	30	89.0					1.00
ECP-220	13	58	18	40	94.4	25	128		1.20	1.30
ECP-220	15									0.60
ECP-220	17	25	20	5	93.0	24				0.50
ECP-220	19	25	17	8	89.4					0.40
ECP-220	24	27	19	8	99.9	25				0.60
ECP-220	29					26				0.50
ECP-220	34	81	31	50	100.0	31	121	0.90		0.70
ECP-220	39					27				0.90
ECP-220	44	67	24	43	99.7	26				1.30
ECP-220	49					28	119	1.30		1.00
ECP-220	54	92	32	60	100.0	39	115	1.00		1.10
ECP-220	59	27	15	12	62.7	19				0.70
ECP-220	64	27	14	13	12.4	14				
ECP-220	69	NP	NP	NP	21.3					
ECP-220	79	100	33	67	98.2	42	111	1.00		0.70
ECP-220	84	76	28	48		27				1.50
ECP-220	89				89.9					1.50
ECP-221	1	74	26	48	95.8	32				0.50
ECP-221	3									0.50
ECP-221	5	90	30	60	95.9	36	117		0.60	0.50
ECP-221	7									0.40
ECP-221	9	73	28	45	100.0	27				1.00
ECP-221	11					25	123		1.10	1.10
ECP-221	13	55	23	32	92.7	20				1.30
ECP-221	15									1.20
ECP-221	17	27	16	11	82.4	19				1.20
ECP-221	24				73.7	23				
ECP-221	29	31	20	11	99.1					
ECP-221	34	71	30	41	100.0	29				
ECP-221	39									1.30
ECP-221	44	73	33	40	99.6	28				1.20
ECP-221	49					30	121	1.40		1.20
ECP-221	54	86	32	54	99.2	38				0.90
ECP-221	59					17				1.20
ECP-221	64	NP	NP	NP	15.0	18				
ECP-221	69					20				
ECP-221	74					19				
ECP-221	79	77	29	48	99.3	31	122	2.10		1.50
ECP-221	84	22	17	5	69.9	21				0.50
ECP-221	89					19	131	1.60		1.00

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-222	1									0.40
ECP-222	3	77	28	49	83.6	32				0.80
ECP-222	5									0.50
ECP-222	7					36	118		0.60	0.60
ECP-222	9	72	26	46	98.6	30				0.80
ECP-222	11									1.50
ECP-222	13					24	126		1.50	1.00
ECP-222	15									1.30
ECP-222	17	61	26	35	95.1	24				0.70
ECP-222	19									0.40
ECP-222	24	27	19	8	86.1	27				
ECP-222	29					30				
ECP-222	34					29				
ECP-222	39	69	20	49	97.8	32	121	1.50		1.00
ECP-222	44					29				1.30
ECP-222	49	81	29	52	97.4	32	119	1.40		1.30
ECP-222	54					38				1.40
ECP-222	59	26	15	11	40.8	19				0.80
ECP-222	64	51	23	28	83.7	19	127	2.00		1.50
ECP-222	69	NP	NP	NP	10.0	19				
ECP-222	79	NP	NP	NP	9.4	18				
ECP-222	84	48	22	26	84.8	19	126	1.90		1.50
ECP-222	89					20				1.50
Total		**183**	**183**	**183**	**189**	**271**	**84**	**58**	**26**	**247**
BARBOURS CUT CHANNEL-SPILMANS ISLAND										
ECP-309	1									0.50
ECP-309	3	50	18	32	73.4	23	128		0.39	0.17
ECP-309	5					24				0.33
ECP-309	7					21	131		0.50	0.58
ECP-309	9					19				1.17
ECP-309	11	47	19	28	48.2	15				
ECP-309	13	28	14	14	21.8	16				
ECP-309	15					16				
ECP-309	17					24				
ECP-309	19	55	21	34	68.4	29				
ECP-309	20									0.25
ECP-309	21					30				
ECP-309	24					32	120	0.27		
ECP-309	29	43	18	25	75.8	32				0.25
ECP-309	34	39	21	18		25	126	0.53		0.50
ECP-309	39					36				0.67
ECP-309	44	113	32	81		51	107	0.49		0.33
ECP-309	49	80	28	52	94.8	40				0.50
ECP-309	54	47	20	27		18	124	0.37		0.50

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-309	59	74	29	45	91.8	30				0.75
ECP-309	64					36	118	0.80		1.08
ECP-309	69					26				1.50
ECP-309	74	64	22	42		25				
ECP-309	79					20	131	1.92		1.17
ECP-309	84	39	18	21	87.6	18	130	1.48		0.83
ECP-309	89					20				1.50
ECP-309	94	32	19	13		23	132	1.85		1.50
ECP-309	99				45.5	20				
ECP-309	104	23	16	7	43.7	22				
ECP-309	109					23				
ECP-309	114	38	18	20	54.6	19				0.67
ECP-309	119	57	24	33	99.2	25	134	1.27		1.50
ECP-309	124					25				1.50
ECP-309	129					28				1.50
ECP-310	1					34				0.17
ECP-310	3	34	22	12	50.9	26				
ECP-310	5					23				
ECP-310	7	NP	NP	NP	47.8	34				
ECP-310	9					75				
ECP-310	10									
ECP-310	11					80	95		0.13	
ECP-310	14									0.25
ECP-310	15	130	35	95	96.6	99	96		0.12	
ECP-310	17					62				0.25
ECP-310	19	66	3	32	87.6	42	116		0.19	0.08
ECP-310	24					46				0.33
ECP-310	29	47	25	22	77.0		86	0.17		0.25
ECP-310	38									0.50
ECP-310	39	41	24	17		25				
ECP-310	44					28	113	0.29		0.17
ECP-310	49	72	29	43	97.7	29				0.83
ECP-310	54					31	121	0.91		0.75
ECP-310	59	73	38	35	99.4	30				1.00
ECP-310	64					22	132	1.54		1.00
ECP-310	69					25				1.25
ECP-310	74	37	21	16		16	133	1.33		1.25
ECP-310	79	25	19	6	35.6	20				
ECP-310	84					20				
ECP-310	89	NP	NP	NP	38.2	21				0.25
ECP-310	94					33				
ECP-310	99	32	20	12	47.6	23				
ECP-310	104					22				
ECP-310	109					20				
ECP-310	114	33	21	12	77.4	18				1.33

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-310	119	NP	NP	NP	55.8	26				
ECP-310	129	49	30	19	100.0	31				
ECP-311	1	97	32	65	94.7	58				0.25
ECP-311	5	NP	NP	NP	80.2	45				
ECP-311	9	78	29	49	96.0	56				
ECP-311	11					85				
ECP-311	13	75	27	48	89.6	67	110		0.09	
ECP-311	15	66	30	36	84.3					0.33
ECP-311	17					32	121		0.41	0.25
ECP-311	19					33				0.17
ECP-311	24	42	19	23	76.6	24				0.50
ECP-311	29	46	24	22		41	113	0.30		0.08
ECP-311	34	80	35	45	95.5	40	115	0.45		0.33
ECP-311	39	36	26	10	63.3	34				0.17
ECP-311	44	53	29	24	78.8	24				
ECP-311	49	94	25	69	99.9	37	118	0.97		1.00
ECP-311	54					36	118	0.97		0.83
ECP-311	59	88	33	55	99.8	36				0.92
ECP-311	64					31	117	0.81		0.83
ECP-311	69	65	25	40	97.4	24				1.33
ECP-311	74					29	121	0.81		1.00
ECP-311	79	43	21	22	99.2	20				1.50
ECP-311	84					18				
ECP-311	89	NP	NP	NP	31.2	18				
ECP-311	94					22				
ECP-311	99	37	19	18	67.0	22				
ECP-311	104	26	19	7	76.7	22				
ECP-311	109					25				
ECP-311	114					17				
ECP-311	119	44	20	24	77.9	25				
ECP-311	124					27				
ECP-311	129					40				
ECP-312	1					44				
ECP-312	2									0.25
ECP-312	3	32	17	15	63.4	64				
ECP-312	4									0.17
ECP-312	5					47				
ECP-312	7	54	16	38	72.1	47				
ECP-312	9					81				
ECP-312	11	24	18	6	48.5	39				
ECP-312	13					42				
ECP-312	15	94	26	68	99.1	42			0.17	0.25
ECP-312	17									0.58
ECP-312	19								0.15	0.42
ECP-312	23									0.50

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-312	24	67	20	47	90.8	35		0.31		
ECP-312	29	62	16	46	86.9	27				0.58
ECP-312	34					38				
ECP-312	39	49	15	34	73.3	39				0.42
ECP-312	44	105	27	78	99.7	37		0.69		0.83
ECP-312	49					33				1.00
ECP-312	54	58	24	34		29		1.32		1.17
ECP-312	59					17				1.17
ECP-312	64	48	13	35	98.0	19		1.49		1.33
ECP-312	69									0.75
ECP-312	74					23				0.50
ECP-312	79	25	18	7	55.2	23		2.10		0.33
ECP-312	84	24	17	7	51.9	25				
ECP-312	89					28				
ECP-312	94	NP	NP	NP	59.0	25				
ECP-312	99					26				
ECP-312	104					25				
ECP-312	109	NP	NP	NP	21.2	20				
ECP-312	114	52	17	35	97.9	32				
ECP-312	119					43				
ECP-312	124	69	21	48	98.6	42				
ECP-312	129					39				0.83
ECP-312	134	44	17	27	99.8	32				
ECP-312	139	75	28	47		46		1.39		
ECP-312	144							1.07		1.00
ECP-312	149	98	23	75	99.3	34				1.17
ECP-312	154							1.03		1.08
ECP-312	159	77	21	56		32				1.33
ECP-312	164							1.01		1.25
ECP-312	169	23	19	4	75.5	26				
ECP-313	1									0.25
ECP-313	3	46	20	26	76.6	29	120		0.22	
ECP-313	5					30				0.08
ECP-313	7	54	23	31		41	137		0.47	0.25
ECP-313	9									0.67
ECP-313	11									0.83
ECP-313	13									0.25
ECP-313	15	NP	NP	NP	16.7	20				
ECP-313	19	57	22	34	84.4	24	128		0.58	0.58
ECP-313	24					35	116		0.11	
ECP-313	29	49	22	27	90.9	26	123		0.32	1.00
ECP-313	34					28				0.58
ECP-313	39					35	127		0.4	0.33
ECP-313	44	93	32	61	99.1	48	105		0.48	0.33
ECP-313	49	41	21	20	60.3	32				0.42

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-313	54	56	23	33	83.5	33	122		0.44	0.25
ECP-313	59	99	35	64	100.0	37	119		0.72	1.00
ECP-313	64	87	34	53	100.0	33				0.92
ECP-313	69	53	23	30	69.8	19				1.50
ECP-313	74					24	128		1.44	1.42
ECP-313	79	69	26	39	86.7	31				1.00
ECP-313	84	71	30	41	100	31				1.50
ECP-313	89					27				1.50
ECP-313	94	32	20	12	50.8	20				0.50
ECP-313	99	28	20	8	62.9	21				0.50
ECP-313	109	NP	NP	NP	34.5	19				
ECP-313	114				7.0	27				
ECP-313	119	64	27	37	94.5	29				
ECP-313	124	65	30	35	98.5	26				1.50
ECP-313	129					27				1.17
ECP-314	1	54	16	38	79.0	26				0.33
ECP-314	3									0.42
ECP-314	5	57	18	39	83.4	31			0.16	0.17
ECP-314	7									0.17
ECP-314	9	39	13	26	79.1	21		0.97		0.58
ECP-314	11									0.50
ECP-314	13					24				0.33
ECP-314	15								0.18	0.17
ECP-314	17	54	17	37	90.3	41				0.17
ECP-314	19					32				0.08
ECP-314	24	52	15	37	94.6	28				0.25
ECP-314	29							0.18		0.58
ECP-314	34	53	18	35	93.8	44				0.17
ECP-314	39							0.46		0.25
ECP-314	44	68	20	48	94.2	30				0.50
ECP-314	49					35				0.50
ECP-314	54	72	22	50	95.4	49		0.63		0.25
ECP-314	59									0.83
ECP-314	64	94	27	67	100.0	37		1.18		0.92
ECP-314	69					34				0.83
ECP-314	74	24	14	10	81.6	18				1.25
ECP-314	79							2.39		1.33
ECP-314	84	45	14	31	93.6	22				1.50
ECP-314	89					30				
ECP-314	94	32	12	20	68.9	26				
ECP-314	99	53	14	39	90.8	28				0.50
ECP-314	104	NP	NP	NP	7.5	21				
ECP-314	114	81	27	54	99.3	30				1.50
ECP-314	119					21				1.33
ECP-314	124	77	23	54	98.7	32		1.67		1.17

Company Name: HVJ Associates, Inc
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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-314	129	NP	NP	NP	11.7	21				
ECP-314	134					30				1.00
ECP-314	139									0.83
ECP-314	144							1.55		1.33
ECP-314	149	36	16	20	82.0	24				1.17
ECP-314	154					30		1.01		0.67
ECP-314	159	55	18	37		28				0.92
ECP-314	164	85	21	64	97.9	30		1.24		1.17
ECP-314	169					29				1.33
ECP-315	1									0.33
ECP-315	3	40	19	21	72.9	21				0.42
ECP-315	5					23	132		0.37	0.25
ECP-315	7					21				0.50
ECP-315	9	53	28	25	83.4	25				0.83
ECP-315	11									1.00
ECP-315	13					20	132		0.35	0.83
ECP-315	15	NP	NP	NP	18.3	23				
ECP-315	19	34	19	15	31.6	24				0.17
ECP-315	24	31	21	10	54.1	26				
ECP-315	29	27	20	7	55.2	29				
ECP-315	34				19.0	21				
ECP-315	39					47				
ECP-315	44	34	18	16	59.0	16				0.83
ECP-315	49					29	125	0.70		0.92
ECP-315	54	57	25	32	81.1	37	116	0.62		0.42
ECP-315	59	95	34	61	97.2	37				1.17
ECP-315	64					30	122	1.29		1.17
ECP-315	69					30				1.17
ECP-315	74	65	27	38		26	129	0.99		1.50
ECP-315	79	47	21	26	95.7	21	131	1.51		1.33
ECP-315	84					22				1.50
ECP-315	89	64	26	38		25				1.42
ECP-315	94	34	17	17	73.3	21	134	1.24		1.17
ECP-315	99				19.6	21				
ECP-315	104					23				
ECP-315	109	33	19	14	67.5	24				
ECP-315	114	NP	NP	NP	28.9	19				
ECP-315	119					21				
ECP-315	124				28.2	20				
ECP-315	129	63	28	35	95.3	29	123	1.9		1.50
ECP-315	134					30				1.50
ECP-315	139	40	23	17	88.2	27	122	1.31		0.83
ECP-315	144				89.2	26				1.00
ECP-315	149					29	120	0.89		1.00
ECP-315	154	42	25	17		38				1.00

Company Name: HVJ Associates, Inc
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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-315	159	111	39	72		33	93	2.00		1.33
ECP-315	164	73	33	40	93.5	28				1.50
ECP-315	169					37	118	1.35		1.50
ECP-316	1									0.42
ECP-316	3	56	25	31	92.9	26	129		0.40	0.50
ECP-316	5					27				0.50
ECP-316	7	58	27	31		26	127		0.57	0.50
ECP-316	9									0.58
ECP-316	11	55	24	31		27				0.75
ECP-316	13					27	130		0.55	0.42
ECP-316	15									0.50
ECP-316	17	57	24	33	85.2	33				0.50
ECP-316	19					29	125		0.50	0.58
ECP-316	24	63	29	34	95.8	28				0.92
ECP-316	29					39	118	0.49		0.67
ECP-316	34	77	30	47		35	119	0.42		0.17
ECP-316	39	55	23	32	99.0	24				1.42
ECP-316	44					23	128	1.42		1.33
ECP-316	49	65	27	38	90.7	25				1.42
ECP-316	54	61	29	32		26	126	1.68		1.50
ECP-316	59					28				1.50
ECP-316	64	46	19	27	92.1	21				
ECP-316	69	NP	NP	NP	44.3	21				0.33
ECP-316	74					17	135	1.41		1.50
ECP-316	79	52	26	26	100.0	23				1.50
ECP-316	84					18	132	1.04		1.50
ECP-316	89	56	22	34		23				1.50
ECP-316	94	63	22	41		27	123	2.21		1.50
ECP-316	99	48	21	27	99.0	24				1.50
ECP-316	104	43	22	21	98.2	26				1.17
ECP-316	109					28	123	1.16		0.83
ECP-316	114	48	25	23	96.5	29				0.83
ECP-316	119					29	125	0.93		0.67
ECP-316	124	43	23	20	99.7	28				
ECP-316	129	33	20	13	97.8	31				0.33
ECP-316	134					39				0.83
ECP-316	139					34				0.67
ECP-316	144	62	27	35	88.5	41				0.83
ECP-316	149					20				1.50
TOTAL		**148**	**148**	**148**	**131**	**249**	**63**	**59**	**27**	**197**
BARBOURS CUT CHANNEL-SITE 1										
ECP-317	1	47	13	34	81.7	24				0.67
ECP-317	5					23				0.83

Company Name: HVJ Associates, Inc
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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-317	7	39	13	26	93.5	26				0.33
ECP-317	9					28	118		0.66	0.58
ECP-317	11									0.25
ECP-317	13	NP	NP	NP	10.6	15				
ECP-317	17	NP	NP	NP	47.2	23				
ECP-317	19					12				
ECP-317	24	73	18	55	88.7	41				
ECP-317	29	62	16	46	99.9	23				0.83
ECP-317	34					35	120	0.18		0.92
ECP-317	39					35	131	0.49		0.67
ECP-317	44	34	13	21	76.4	21	137	1.07		1.17
ECP-317	49	25	17	8	68.3	22				
ECP-317	54					19				
ECP-317	59	40	22	18	63.1	20	132	1.91		0.83
ECP-317	64					19				1.50
ECP-317	69					29				1.50
ECP-317	74	35	21	14	83.8	17	133	1.87		1.33
ECP-317	79					19	133	1.99		1.50
ECP-317	84					16				1.50
ECP-317	89	47	25	22	85.1	23	132	2.16		1.50
ECP-317	94					25	136	1.92		1.50
ECP-317	99					27				1.50
ECP-317	104	73	32	41	99.4	30				1.17
ECP-317	109					28				1.17
ECP-317	114					33	118	0.71		0.83
ECP-317	119	50	28	22	97.3	28				0.67
ECP-317	124	24	21	3	95.2	38	119			
ECP-317	129	33	25	8	99.6					
ECP-317	134					29	115	1.06		0.50
ECP-317	139					46				0.67
ECP-317	144				99.7	29	125	1.32		0.87
ECP-317	149					33				1.17
ECP-318	1					6				
ECP-318	3	24	15	9	35.6	16				
ECP-318	7					25				
ECP-318	9	32	14	18	33.6	14				0.33
ECP-318	11									0.17
ECP-318	13	30	17	13	77.2	24				0.17
ECP-318	15									0.17
ECP-318	17					30				
ECP-318	19	NP	NP	NP	23.8	19				
ECP-318	24					30				
ECP-318	29	78	16	62	94.4	25				
ECP-318	34	84	31	53	99.1	32	119	0.86		0.83
ECP-318	39	24	18	6	85.5	20				

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-318	44	35	13	22	75.0	20				
ECP-318	49					21				
ECP-318	54	31	20	11	81.7	22	128	0.08		1.33
ECP-318	59	34	13	21	41.7	17				
ECP-318	64	37	21	16	77.6	19	130	1.84		1.33
ECP-318	69					22				1.50
ECP-318	74	39	12	27	87.7	16				1.50
ECP-318	79					16	136	2.71		1.50
ECP-318	84	37	15	22	98.8	18				1.50
ECP-318	89					19				1.50
ECP-318	94	65	19	46	95.7	27	138	2.66		1.50
ECP-318	99					28				1.50
ECP-318	104	33	21	12	96.2	26				1.00
ECP-318	109					34	119	1.23		0.83
ECP-318	114	53	25	28	98.5					
ECP-318	119					28	127	0.80		0.33
ECP-318	124	21	19	2	81.4	22				
ECP-318	129	38	23	15	99.2					
ECP-318	134					35	109	1.04		0.75
ECP-318	139									0.68
ECP-318	144	69	28	41	100.0	32	121	1.29		1.00
ECP-318	149					32				1.33
ECP-319	3	48	11	37	84.7	29				0.33
ECP-319	5									0.42
ECP-319	7					37	115		0.27	0.08
ECP-319	9	25	16	9	57.4	41				
ECP-319	13	43	19	24	93.4	22	131		0.62	0.58
ECP-319	15									0.33
ECP-319	17	62	16	46	95.3	33				0.17
ECP-319	19					26				0.17
ECP-319	24	26	16	10	73.6	32				
ECP-319	29	27	15	12	61.0	20				0.08
ECP-319	34					28	123	0.46		0.33
ECP-319	39	87	20	67	94.0	32				0.83
ECP-319	44					20	131	1.39		1.17
ECP-319	49					27				1.25
ECP-319	54	49	13	36	74.6	14				1.50
ECP-319	59					15	140	2.91		1.50
ECP-319	64					20	133	1.93		1.50
ECP-319	69					15				1.33
ECP-319	74	55	16	39	99.6	20				1.50
ECP-319	79					18	136	1.56		1.50
ECP-319	84					14				1.50
ECP-319	89	46	20	26	90.5	18	139	3.06		1.50
ECP-319	94					18				1.50

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-319	99					23				1.17
Total		**44**	**44**	**44**	**45**	**84**	**30**	**26**	**3**	**69**
BARBOURS CUT CHANNEL-SITE 2										
ECP-320	1									0.67
ECP-320	3	39	13	36	74.0	17				0.83
ECP-320	5	NP	NP	NP	8.6	19				
ECP-320	9	63	17	46	82.2	37				0.33
ECP-320	11									0.25
ECP-320	13					25				
ECP-320	15	NP	NP	NP	87.0	29				
ECP-320	19					29				
ECP-320	29	35	13	22	76.1	30				
ECP-320	34	40	13	27	86.2	33				0.08
ECP-320	39					29				0.08
ECP-320	44	64	25	39	99.8	47	110	0.39		0.25
ECP-320	49					21				0.25
ECP-320	54					23				
ECP-320	59	31	17	14	62.9	22	129	0.65		0.67
ECP-320	64				7.3	19				
ECP-320	69					20				
ECP-320	74				39.4	20				
ECP-320	79	23	15	8	62.6	23				
ECP-320	84	20	16	4	40.5	26				
ECP-320	89					19				
ECP-320	94	42	22	20	98.2	23	132	1.36		1.17
ECP-320	99					20				1.33
ECP-321	1	40	19	21	59.1	22				1.25
ECP-321	5	24	21	3	75.9	20				
ECP-321	11					24				
ECP-321	15	NP	NP	NP	64.3	23				
ECP-321	19					23				
ECP-321	24					26				
ECP-321	29	34	13	21	76.1	34				
ECP-321	34	54	15	39	97.0	40				0.08
ECP-321	39	62	24	38	96.6	43	116	0.32		0.08
ECP-321	44	92	23	69	99.0	53				0.17
ECP-321	49					46	134	0.43		0.33
ECP-321	54					31				0.75
ECP-321	59	NP	NP	NP	10.0	19				
ECP-321	64	NP	NP	NP	5.6	21				
ECP-321	69					19				
ECP-321	74	20	14	6	33.9	23				
ECP-321	79					31				
ECP-321	84	NP	NP	NP	19.3	20				

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-321	89					28				
ECP-321	94	44	21	23		26	131	1.40		1.00
ECP-321	99					35				0.83
Total		**23**	**23**	**23**	**24**	**42**	**6**	**6**	**0**	**19**
HSC BAYOU REACH BORING LOGS-SEGMENT 4										
ECP-426D	1.5					20				0.75
ECP-426D	3	51	24	27	64.6	17				1.25
ECP-426D	5					18				1.25
ECP-426D	7	17	12	5	19.5	21				
ECP-426D	11					22				
ECP-426D	13	47	19	28	83.5	35	124		0.66	0.50
ECP-426D	17									0.58
ECP-426D	21									1.00
ECP-426D	25	NP	NP	NP	19.0	25				
ECP-426D	39					18				
ECP-426D	41									1.50
ECP-426D	43					17				1.33
ECP-426D	45	26	12	14	63.6	15				1.25
ECP-426D	49	26	12	14	65.5	15				
ECP-426D	51					26				
ECP-426D	53	NP	NP	NP	16.7	21				
ECP-426D	57					21				
Total		**7**	**7**	**7**	**7**	**14**	**1**	**0**	**1**	**9**
E2 CLINTON PLACEMENT AREA										
ECP-2001	3									0.30
ECP-2001	5					26	111		0.40	0.30
ECP-2001	7									0.50
ECP-2001	9					22	127		0.86	0.40
ECP-2001	11					23				1.20
ECP-2001	13					24	124		0.60	1.20
ECP-2001	15					22				1.50
ECP-2001	17					23	129		0.88	1.30
ECP-2001	19	27	16	11	74.5	16				0.60
ECP-2001	23									1.50
ECP-2001	24	70	35	35	89.7	27	128	0.96		
ECP-2001	29					15				1.30
ECP-2001	34					20	131	1.87		1.50
ECP-2001	39					20				1.50
ECP-2002	1	55	15	40	83.6	26				0.30
ECP-2002	3									0.30
ECP-2002	5					22	127		0.56	0.40
ECP-2002	7									0.70

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2002	9					20				0.80
ECP-2002	11	42	22	20	71.6	20	134		0.58	1.10
ECP-2002	13									1.20
ECP-2002	15	32	12	20	77.7	21				1.20
ECP-2002	17									1.20
ECP-2002	19					15	137	1.77		1.50
ECP-2002	24	38	17	21		22	129	0.90		1.30
ECP-2002	29	39	13	26	84.2	16	135	1.82		1.30
ECP-2002	34	47	19	28		17				1.50
ECP-2002	39					19				1.50
ECP-2003	1	60	16	44	87.7	23	122		0.39	0.30
ECP-2003	3					22	126		0.52	0.30
ECP-2003	5									0.80
ECP-2003	7	36	13	23	71.5	20				1.00
ECP-2003	9									1.50
ECP-2003	11									1.50
ECP-2003	13					15	137		1.40	1.20
ECP-2003	15									1.50
ECP-2003	17					17	135		1.76	1.50
ECP-2003	19	53	14	39	76.2	23				1.50
ECP-2003	24	35	11	24	79.6	17		1.68		1.20
ECP-2003	29					17	132	1.97		1.50
ECP-2003	34	50	14	36	83.4	18				1.50
ECP-2003	39									1.50
ECP-2003	44	57	33	24	83.9	16				1.50
ECP-2003	49					21	132	1.60		1.00
ECP-2003	54	NP	NP	NP	50.0	23				
ECP-2003	59	66	34	32	94.9	21	134	2.20		1.50
ECP-2003	64	27	20	7	96.9	10				
ECP-2004	1									0.40
ECP-2004	3	44	13	31	76.8	23				0.40
ECP-2004	5					35	116		0.29	0.50
ECP-2004	7	72	18	54	99.1	36				0.40
ECP-2004	9									0.70
ECP-2004	11					20	127		0.94	0.70
ECP-2004	13									0.70
ECP-2004	15									0.80
ECP-2004	17	49	23	26	76.7	19	130	1.45		1.50
ECP-2004	19									0.70
ECP-2004	24	38	17	21		18				1.50
ECP-2004	29					15	132	2.61		1.50
ECP-2004	34	47	19	28	79.7	16				1.50
ECP-2004	39									1.50
ECP-2005	1	74	21	53	95.3	31				0.50
ECP-2005	4	33	16	17	83.5	31				

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2005	7									0.10
ECP-2005	8	74	16	58	97.8	38				
ECP-2005	9									0.10
ECP-2005	11					19	131		1.10	1.20
ECP-2005	13									0.50
ECP-2005	14	24	16	8	57.7	20				
ECP-2005	17	35	18	17	65.4	17	132	1.40		1.20
ECP-2005	19									1.50
ECP-2005	24					15	136	1.50		1.50
ECP-2005	29					16	136	2.02		1.50
ECP-2005	33	41	12	29	83.0	16				
ECP-2005	34							2.94		1.50
ECP-2005	39					19				1.50
ECP-2006	1					21				0.20
ECP-2006	2	32	20	12	99.5	28				
ECP-2006	3									0.20
ECP-2006	5					32	124		0.50	0.30
ECP-2006	7					36				0.30
ECP-2006	8	54	14	40	82.0	18				
ECP-2006	9									0.60
ECP-2006	11					18	132		1.17	1.50
ECP-2006	13									0.70
ECP-2006	14	45	13	32	86.7	19				
ECP-2006	15									1.20
ECP-2006	17									1.20
ECP-2006	19					15				0.50
ECP-2006	24					14				1.50
ECP-2006	28	33	12	21	78.1	14				
ECP-2006	29					16	133	2.01		1.50
ECP-2006	34					19	133	2.01		1.50
ECP-2006	39					26				1.50
ECP-2007	1									0.60
ECP-2007	3									1.50
ECP-2007	6	20	13	7	34.3	11				
ECP-2007	9					20				
ECP-2007	11					17				
ECP-2007	12	40	13	27	92.2	22				
ECP-2007	13									0.80
ECP-2007	15									0.50
ECP-2007	17					23	130	1.30		0.80
ECP-2007	19					18				1.00
ECP-2007	23	41	13	28	68.6	18				
ECP-2007	24									1.20
ECP-2007	29					18				0.10
ECP-2007	34	45	23	22	79.6	21	129	1.40		1.10

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2007	39					13				1.50
ECP-2008	1					13				
ECP-2008	3	18	16	2	32.1	23				
ECP-2008	7	54	17	37	71.0	36				0.30
ECP-2008	9									0.70
ECP-2008	11									0.60
ECP-2008	13					23	129	0.93		0.80
ECP-2008	14	76	21	55	90.8	29				
ECP-2008	15									1.00
ECP-2008	17					17	131	0.90		1.00
ECP-2008	19					22	127	0.98		1.20
ECP-2008	23	24	12	12	79.6	18				
ECP-2008	24									0.20
ECP-2008	29					19	133	1.58		1.20
ECP-2008	34	40	18	22	78.8					1.30
ECP-2008	39					16				1.50
ECP-2009	1	25	17	8	68.6	21				0.80
ECP-2009	5	26	12	14	69.8	23				0.10
ECP-2009	7									0.40
ECP-2009	9					20	132		1.28	0.80
ECP-2009	11	44	15	29	74.6	19	131		1.10	0.70
ECP-2009	13									1.50
ECP-2009	15					17	131		0.92	0.80
ECP-2009	17	25	17	8	62.3					1.00
ECP-2009	19	18	12	6	70.1	16				0.20
ECP-2009	24	28	11	17	79.2	18				0.80
ECP-2009	29					19	136	2.01		1.50
ECP-2009	34									1.50
ECP-2009	39					19				1.50
ECP-2010	1					13				
ECP-2010	3	NP	NP	NP	20.1	20				
ECP-2010	7					37				
ECP-2010	9					56	106		0.10	0.20
ECP-2010	11	83	20	63	92.7	33				0.30
ECP-2010	13									0.60
ECP-2010	15					29	124	1.01		0.80
ECP-2010	17									1.10
ECP-2010	19	69	20	49	94.0	25				1.00
ECP-2010	24	60	18	42	98.9	23				1.50
ECP-2010	29					16	137	1.89		1.50
ECP-2010	34					17	135	1.41		1.30
ECP-2010	39					16				1.50
ECP-2011	1	65	20	45	87.4	33				0.40
ECP-2011	3				51.3	22				
ECP-2011	5					29				0.10

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2011	7	100	22	78	80.2	36				0.10
ECP-2011	9									0.70
ECP-2011	11					17	132		0.80	0.50
ECP-2011	13					14				0.90
ECP-2011	15									1.20
ECP-2011	17	24	16	8	48.3	20				
ECP-2011	19	58	16	42	95.4	24				
ECP-2011	24	28	11	17	72.9	4				0.10
ECP-2011	29					12				1.20
ECP-2011	34					16				1.50
ECP-2011	39									1.50
ECP-2012	1	74	26	48	96.1	38				0.30
ECP-2012	3									0.30
ECP-2012	5	83	29	54	84.5	48	110		0.19	0.30
ECP-2012	7									0.20
ECP-2012	9	51	17	34		22	126		0.71	0.30
ECP-2012	11									1.10
ECP-2012	13	44	13	31	44.2	16				
ECP-2012	19	42	15	27	86.3	18	131	1.73		1.50
ECP-2012	24					16	135	1.58		1.10
ECP-2012	29					15				1.20
ECP-2012	34	44	13	31	84.0	16				1.50
ECP-2012	39					17				1.50
ECP-2013	1	67	22	45	84.6	32				0.30
ECP-2013	3	23	17	6	60.6	26				
ECP-2013	5									0.40
ECP-2013	7					24	128		0.54	0.50
ECP-2013	9	61	15	46	88.8	25				0.70
ECP-2013	11									0.80
ECP-2013	13									1.20
ECP-2013	15					24	127		0.84	0.80
ECP-2013	17	60	18	42	97.3	22				1.50
ECP-2013	19									1.50
ECP-2013	24	34	11	23	73.7	17				1.20
ECP-2013	29					19	133	1.30		0.90
ECP-2013	34					16				1.50
ECP-2013	39					17				1.50
Total		**68**	**68**	**68**	**64**	**136**	**52**	**30**	**24**	**162**
BELTWAY 8 PLACEMENT AREA										
ECP-2014	1	NP	NP	NP	26.0	14				
ECP-2014	5	NP	NP	NP	20.0	23				
ECP-2014	11	76	25	51	99.0	45				
ECP-2014	13					29				
ECP-2014	15					33				0.50

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2014	17	81	23	58	99.0	33	121	0.63		0.42
ECP-2014	19									1.25
ECP-2014	24	80	30	50	100.0	36	118	0.84		0.92
ECP-2014	29					33				1.08
ECP-2014	34					24	130	1.20		1.17
ECP-2014	39	28	14	14	89.0	20				0.67
ECP-2015	3	83	22	61	82.0	31				0.58
ECP-2015	5									0.50
ECP-2015	6	NP	NP	NP	81.0	19				
ECP-2015	7									1.08
ECP-2015	8	NP	NP	NP	52.0					
ECP-2015	12	86	24	62	99.0	29				
ECP-2015	15					27	123	1.06		1.17
ECP-2015	17					29				1.00
ECP-2015	19									0.83
ECP-2015	24	76	22	54	100.0	27	128	1.28		1.00
ECP-2015	29					34				0.83
ECP-2015	34					31				1.17
ECP-2015	38	29	17	12	91.0	31				
ECP-2016	0					22				
ECP-2016	1									1.50
ECP-2016	2	62	18	44	97.0	24				
ECP-2016	3									0.58
ECP-2016	5	76	17	59	91.0	24	124		0.79	0.50
ECP-2016	7					20				1.00
ECP-2016	9									1.17
ECP-2016	10	80	24	56	98.0	27				
ECP-2016	11									1.50
ECP-2016	13					27	124	1.14		1.00
ECP-2016	15									1.00
ECP-2016	17	104	30	74	98.0	35				0.75
ECP-2016	19					33	121	0.63		0.92
ECP-2016	24	98	30	68	95.0	33				1.00
ECP-2016	29					28	123	1.35		1.00
ECP-2016	34	65	20	45	96.0	20				
ECP-2016	39	43	12	31	84.0	16	136	1.56		0.83
ECP-2017	3	59	18	41	83.0	18				1.00
ECP-2017	5					16	143		1.94	1.17
ECP-2017	7									1.00
ECP-2017	9	81	25	56	98.0	28	125	0.46		1.00
ECP-2017	11									1.08
ECP-2017	13	85	26	59	100.0	29				1.00
ECP-2017	15					29	124	0.68		1.08
ECP-2017	17	96	30	66	98.0	34				1.00
ECP-2017	19									1.00

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2017	24	102	33	69	93.0	36	118	0.87		0.92
ECP-2017	28					28				
ECP-2017	29									1.42
ECP-2017	34	70	21	49	91.0	25	128	1.20		1.17
ECP-2017	39	40	14	26	84.0	14				1.50
ECP-2018	1									0.50
ECP-2018	3	52	16	36	74.0	18				0.67
ECP-2018	5					20	136		1.28	0.75
ECP-2018	7	42	14	28	69.0	15				1.17
ECP-2018	9	70	21	49	96.0	23				0.75
ECP-2018	11					23	125	0.90		1.08
ECP-2018	13	76	23	53	100.0	25				0.75
ECP-2018	15									0.83
ECP-2018	17					34	119	0.90		0.92
ECP-2018	19	93	31	62	94.0	32				0.92
ECP-2018	24	92	34	58	91.0		90	0.95		1.00
ECP-2018	29					26				1.33
ECP-2018	34	68	23	45	100.0	27	126	0.83		1.50
ECP-2018	39	38	13	25	81.0	12				1.50
ECP-2019	2	50	17	33	74.0	19				
ECP-2019	6	26	17	9	55.0	8				
ECP-2019	11									1.50
ECP-2019	12	70	19	51	98.0	21	129	1.86		
ECP-2019	13									1.00
ECP-2019	15					29	124		1.09	1.00
ECP-2019	17	80	28	52	99.0	31				0.83
ECP-2019	19									0.83
ECP-2019	24	84	28	56	98.0		87	0.96		1.00
ECP-2019	29					27				1.17
ECP-2019	34	68	20	48	100.0	24	128	1.35		1.33
ECP-2019	39	38	14	24	73.0	15				1.50
ECP-2020	3	71	20	51	87.0	18	130		1.62	0.83
ECP-2020	5									1.00
ECP-2020	7									0.67
ECP-2020	9					20	132		1.04	1.17
ECP-2020	11	73	22	51	96.0	23				0.83
ECP-2020	13									0.83
ECP-2020	15					29	124	1.13		0.92
ECP-2020	17	94	34	60	100.0	32				0.92
ECP-2020	19									0.75
ECP-2020	24	90	32	58	98.0	33				0.92
ECP-2020	29					26	123	1.38		1.17
ECP-2020	34					27				1.17
ECP-2020	39	30	13	17	81.0	18				0.17
ECP-2021	1	38	13	25	53.0	11				0.67

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2021	3					20	128		0.58	0.58
ECP-2021	5	54	15	39	83.0	21				0.50
ECP-2021	7									0.50
ECP-2021	9					25	135		0.76	1.00
ECP-2021	11	60	19	41	88.0	25				0.75
ECP-2021	13									0.75
ECP-2021	15					31	123	0.88		0.67
ECP-2021	17	78	27	51	99.0	26				0.58
ECP-2021	19					32	121	0.85		0.92
ECP-2021	24					31	121	0.71		1.00
ECP-2021	29	72	24	48	100.0	26				1.42
ECP-2021	34					25	124	1.34		1.25
ECP-2021	39	58	18	40	87.0	20				1.17
ECP-2022	1									1.00
ECP-2022	3	54	17	37	91.0	26				0.25
ECP-2022	5					19	140		1.22	0.92
ECP-2022	7									1.00
ECP-2022	9	46	19	27	92.0	23	130		0.70	0.67
ECP-2022	11									1.17
ECP-2022	13	67	18	49	90.0	23				0.92
ECP-2022	15					28	124	1.13		1.00
ECP-2022	17					31				1.00
ECP-2022	18				98.0					
ECP-2022	19	82	31	51		32	120	0.88		0.92
ECP-2022	24	85	29	56	82.0	32				1.08
ECP-2022	29					28	124	1.08		1.17
ECP-2022	34					26				1.17
ECP-2022	39	34	15	19	99.0	20				0.83
ECP-2023	1									0.67
ECP-2023	3	52	26	26	93.0	24				0.58
ECP-2023	5					17	131		1.04	1.33
ECP-2023	7					18				1.25
ECP-2023	9	29	15	14	91.0					1.00
ECP-2023	11									1.00
ECP-2023	13	74	21	53	99.0	28	122	0.88		1.08
ECP-2023	15									1.17
ECP-2023	17					31				1.17
ECP-2023	19	78	24	54	93.0	30				1.17
ECP-2023	24	79	22	57	85.0	29	121	1.15		1.25
ECP-2023	29					30				1.50
ECP-2023	34	66	19	47	100.0	26				1.33
ECP-2023	39					28	123	0.78		1.00
ECP-2024	1									0.50
ECP-2024	3	43	14	29	90.0	23				0.42
ECP-2024	5					19	136		1.18	0.58

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2024	7									1.33
ECP-2024	8	27	18	9	71.0	20				
ECP-2024	13	56	19	37	91.0	23				1.50
ECP-2024	15					21	125		0.92	1.33
ECP-2024	17					31				1.08
ECP-2024	19	80	27	53	96.0	30				0.83
ECP-2024	24	66	23	43	93.0	25				1.42
ECP-2024	29					28	123	1.08		1.17
ECP-2024	34	88	28	60	99.0	19				1.33
ECP-2024	39					31	122	0.66		1.08
ECP-2025	1									0.75
ECP-2025	3	43	16	27	90.0	18				0.92
ECP-2025	5					17	132		1.23	0.83
ECP-2025	7									0.92
ECP-2025	9	53	18	35	87.0	18				1.33
ECP-2025	11					22	139	1.33		1.00
ECP-2025	13	56	19	37	99.0	21				1.50
ECP-2025	15									1.08
ECP-2025	17					35	122	1.07		1.17
ECP-2025	19	92	31	61	100.0	31				0.83
ECP-2025	24	101	33	68	91.0	37				0.92
ECP-2025	29					29	123	1.01		1.00
ECP-2025	34	50	19	31	100.0	23				1.33
ECP-2025	39					30	117	0.86		1.00
ECP-2026	1					29				0.33
ECP-2026	3	80	21	59	92.0	30				0.50
ECP-2026	5					24	130		0.65	0.50
ECP-2026	7									0.58
ECP-2026	9	56	19	37	95.0	21				1.00
ECP-2026	11					24	124	0.97		1.33
ECP-2026	13					27				1.42
ECP-2026	15									1.08
ECP-2026	17					35	117	0.75		0.92
ECP-2026	19	62	20	42	96.0	20				1.00
ECP-2026	24	75	24	51	100.0	25	121	1.05		1.08
ECP-2026	28					30				
ECP-2026	29									1.50
ECP-2026	34	76	26	50	100.0	29	126	1.32		1.17
ECP-2026	39					28				1.50
ECP-2027	1					19				0.83
ECP-2027	3	39	11	28	82.0	20				0.67
ECP-2027	5					20	136		0.86	0.50
ECP-2027	7	42	12	30	73.0	17				0.83
ECP-2027	9									0.58
ECP-2027	11					24	126	1.1		1.17

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2027	13					27				1.17
ECP-2027	15	82	21	61	98.0	26				0.92
ECP-2027	17					29	128	1.08		1.08
ECP-2027	19					35				0.92
ECP-2027	24					35	117	0.76		1.00
ECP-2027	29	78	24	54	99.0	28				1.08
ECP-2027	34					22				1.42
ECP-2027	39	81	24	57	99.0	30	124	0.68		0.92
ECP-2028	1	63	21	42	94.0	27				0.33
ECP-2028	3					22	124		0.73	0.5
ECP-2028	5									0.67
ECP-2028	7	58	17	41	89.0	21				0.67
ECP-2028	9					22	140.3	0.82		1.08
ECP-2028	11	81	22	59	98.0	25				1.00
ECP-2028	13									0.67
ECP-2028	15	79	21	58	100.0	26	117.18	0.92		0.83
ECP-2028	17					36				0.75
ECP-2028	19									0.83
ECP-2028	24	95	28	67		34	120.6	0.95		0.92
ECP-2028	29					29				1.00
ECP-2028	34	86	21	65	100.0	29	121	1.04		1.17
ECP-2028	39	50	15	35	97.0	22				1.08
ECP-2029	1									0.33
ECP-2029	3	64	22	42	85.0	26				0.50
ECP-2029	5									0.67
ECP-2029	7	48	16	32	82.0	26	134		1.23	0.83
ECP-2029	9									1.50
ECP-2029	11					19				1.00
ECP-2029	13	82	30	52	100.0	30				0.75
ECP-2029	15					29	123	0.92		0.67
ECP-2029	17									0.83
ECP-2029	19	92	31	61	99.0	34				0.83
ECP-2029	24					33	121	1.02		1.00
ECP-2029	29	27	13	14	93.0	18				1.25
ECP-2029	33					29				
ECP-2029	38	NP	NP	NP	66.0	23				
ECP-2030	1									0.50
ECP-2030	3	62	20	42	79.0	27				0.33
ECP-2030	5					22	126		0.68	0.75
ECP-2030	7									1.00
ECP-2030	8					21				
ECP-2030	9									0.83
ECP-2030	10				99.0					
ECP-2030	11	76	25	51		27				0.92
ECP-2030	13					30	121	0.93		0.92

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Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2030	15									0.92
ECP-2030	17	86	33	53	99.0	36				0.67
ECP-2030	19									0.83
ECP-2030	23				99.0					
ECP-2030	24	80	27	53		28	122	1.29		1.17
ECP-2030	28					27				
ECP-2030	29									1.17
ECP-2030	33	28	18	10	97.0	22				
ECP-2030	34									0.58
ECP-2030	38	25	17	8	78.0	22				
ECP-2031	1	NP	NP	NP	70.0	10				
ECP-2031	5	58	17	41	89.0	18				0.83
ECP-2031	7					19	137		1.28	1.00
ECP-2031	9									1.08
ECP-2031	11	64	22	42	99.0	21				1.33
ECP-2031	13					32	121	0.69		0.83
ECP-2031	15									0.92
ECP-2031	17	90	30	60	100.0	36	124	0.70		0.92
ECP-2031	19									1.00
ECP-2031	23	90	33	57	96.0	35				
ECP-2031	29	68	23	45	100.0	27	122	1.00		1.42
ECP-2031	34	66	23	43	90.0	26				1.17
ECP-2031	38	24	16	8	87.0	25				
ECP-2032	1									1.08
ECP-2032	3	57	13	44	83.0	21				0.67
ECP-2032	5					17	137		1.45	0.75
ECP-2032	7									1.50
ECP-2032	9	68	17	51	95.0	21				1.17
ECP-2032	11									1.33
ECP-2032	13					26				1.50
ECP-2032	15	90	21	69	100.0	31				0.83
ECP-2032	17					26	110	0.87		0.67
ECP-2032	19									0.83
ECP-2032	24	93	30	63	95.0	25	113	0.82		1.08
ECP-2032	29					27				1.08
ECP-2032	34	32	15	17	91.0	20				0.50
ECP-2032	38					26				
ECP-2033	1									0.50
ECP-2033	3	62	18	44	80.0	21				0.83
ECP-2033	5									0.92
ECP-2033	7					18	130		0.83	1.17
ECP-2033	9	56	18	38	73.0	19				1.25
ECP-2033	11									0.75
ECP-2033	13	80	27	53	98.0	30				0.92
ECP-2033	15					34	129	0.89		1.00

Company Name: HVJ Associates, Inc
Project: Houston Ship Channel Expansion Channel Improvement Project
Location: Houston, Texas
Project Number: HG1910092.2.1

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2033	17									0.67
ECP-2033	19	94	35	59	98.0	37				1.00
ECP-2033	24					36	117	0.92		0.83
ECP-2033	29	78	26	52	100.0	28				1.33
ECP-2033	34					29	123	0.82		1.33
ECP-2033	39	82	28	54	96.0	29				1.00
ECP-2034	1	44	15	29	78.0	21				0.50
ECP-2034	3									0.75
ECP-2034	5	36	15	20	65.0	15				1.50
ECP-2034	7					28	143		0.62	0.83
ECP-2034	9	68	22	46	96.0	23				0.67
ECP-2034	11									0.83
ECP-2034	12					30				
ECP-2034	13									0.92
ECP-2034	15					33	125	0.79		1.00
ECP-2034	17									1.00
ECP-2034	19	96	33	63	99.0	36				0.92
ECP-2034	24					36	121	1.05		1.08
ECP-2034	29	77	28	49	98.0	30				1.17
ECP-2034	34					27	126	1.13		1.17
ECP-2034	39					27				1.08
ECP-2035	1	53	17	36	85.0	23				0.58
ECP-2035	3									0.50
ECP-2035	5					17				1.33
ECP-2035	7					17	139		0.81	1.00
ECP-2035	9	70	21	49	92.0	28				0.50
ECP-2035	11									0.75
ECP-2035	12					30				
ECP-2035	13									0.83
ECP-2035	15	90	26	64	99.0	35	124	0.83		0.83
ECP-2035	17									0.83
ECP-2035	19	90	26	64	93.0	34				0.83
ECP-2035	24					32	119	1.13		1.08
ECP-2035	29					27				1.17
ECP-2035	34	40	17	23	98.0	20	130	0.95		1.50
ECP-2035	38	NP	NP	NP	84.0	20				
ECP-2036	1									0.33
ECP-2036	3	38	14	24	91.0	16				0.83
ECP-2036	5									1.33
ECP-2036	7					16				0.75
ECP-2036	9	68	21	47	94.0	31				1.50
ECP-2036	11					29	119		0.60	0.75
ECP-2036	13					30				0.92
ECP-2036	15									0.92
ECP-2036	17	50	16	34	94.0	27	123	0.68		0.92

Company Name: HVJ Associates, Inc
Project: Houston Ship Channel Expansion Channel Improvement Project
Location: Houston, Texas
Project Number: HG1910092.2.1

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2036	19									1.08
ECP-2036	24	51	19	32	87.0	27				1.50
ECP-2036	29	54	18	36	94.0	21	132	0.90		1.25
ECP-2036	33	NP	NP	NP	92.0	26				
ECP-2036	38					20				
ECP-2037	1	80	22	58	89.0	35				0.33
ECP-2037	3					20	131		1.22	0.83
ECP-2037	5									1.33
ECP-2037	7	72	30	42	91.0	36				0.83
ECP-2037	9					31	121		0.58	1.50
ECP-2037	11					30				0.92
ECP-2037	13					28	123	0.74		0.83
ECP-2037	15	82	26	56	99.0	31				1.00
ECP-2037	17									1.00
ECP-2037	19					32	121	0.91		1.00
ECP-2037	24	78	25	53	95.0	29	123	1.03		1.25
ECP-2037	29					28				1.25
ECP-2037	33	43	15	28	97.0	23				
ECP-2037	34									0.83
ECP-2037	38					21				
ECP-2038	1	66	21	45	91.0	27				0.58
ECP-2038	3	70	17	53	92.0	31				0.67
ECP-2038	5					25	116		0.66	0.67
ECP-2038	7	70	19	51	93.0	27				0.67
ECP-2038	9									0.50
ECP-2038	10					27				
ECP-2038	11									0.75
ECP-2038	13	86	23	63	100.0	28	122	0.98		1.08
ECP-2038	15									0.75
ECP-2038	17									0.67
ECP-2038	19	86	28	58	99.0	35				0.58
ECP-2038	24	93	32	61	93.0	33	116	0.82		1.17
ECP-2038	29					28				1.17
ECP-2038	34	74	25	49	100.0	29	124	1.24		0.75
ECP-2038	38					29				
ECP-2038	39									1.5
ECP-2039	3	65	19	46	90.0	23				0.83
ECP-2039	5									1.08
ECP-2039	7					22	129		0.8	1.17
ECP-2039	9	44	15	29	76.0	17				0.67
ECP-2039	11					27	119	0.77		0.83
ECP-2039	13	88	24	64	94.0	28				1.25
ECP-2039	15									1.33
ECP-2039	17					27	130	1.27		1.08
ECP-2039	19	64	20	44	95.0	23				1.42

Company Name: HVJ Associates, Inc
Project: Houston Ship Channel Expansion Channel Improvement Project
Location: Houston, Texas
Project Number: HG1910092.2.1

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2039	23	88	27	61	96.0	34				
ECP-2039	24									1.25
ECP-2039	29					28	123	1.41		1.17
ECP-2039	33	30	14	16	98.0	21				
ECP-2039	34									0.67
ECP-2039	38					24				
ECP-2040	1	98	28	70	100.0	38				0.83
ECP-2040	3					29	120		0.92	0.50
ECP-2040	5	73	22	51	94.0	25				1.00
ECP-2040	7					29				0.50
ECP-2040	9									0.67
ECP-2040	11					24	118		0.93	0.58
ECP-2040	13	32	15	17	89.0	19				1.33
ECP-2040	15					18				1.08
ECP-2040	17	34	16	18	90.0	21				1.33
ECP-2040	19					20	136	1.20		0.83
ECP-2040	23	28	17	11	87.0	31				
ECP-2040	24									0.33
ECP-2040	28					27				
ECP-2040	33	NP	NP	NP	58.0	24				
ECP-2040	38	62	23	39	93.0					
ECP-2040	39					27	128	1.16		1.17
ECP-2041	1									0.67
ECP-2041	3	57	13	44	84.0	20				0.83
ECP-2041	5									0.67
ECP-2041	7					28	125		0.96	0.92
ECP-2041	9	68	26	42	93.0	28				1.17
ECP-2041	11									1.17
ECP-2041	13					36	120	0.87		0.83
ECP-2041	15	90	33	57	95.0	30				0.83
ECP-2041	17	76	23	53	92.0	21				1.33
ECP-2041	19					26	125	1.01		1.42
ECP-2041	24	54	18	36	100.0	20	130	1.59		1.50
ECP-2041	28	NP	NP	NP	93.0	23				
ECP-2041	33					24				
ECP-2041	38	57	18	39	86.0	24				
ECP-2041	39									1.00
ECP-2042	1									0.67
ECP-2042	3	43	15	28	88.0	18				0.58
ECP-2042	5					16	138		1.24	0.67
ECP-2042	7									1.50
ECP-2042	9	84	24	60	97.0	30				0.83
ECP-2042	11									0.92
ECP-2042	13					27	128	1.16		1.17
ECP-2042	15	56	16	40	89.0	19				1.42

Company Name: HVJ Associates, Inc
Project: Houston Ship Channel Expansion Channel Improvement Project
Location: Houston, Texas
Project Number: HG1910092.2.1

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve	Moisture content (%)	Total Density (pcf)	Shear Strength (UU) (tsf)	Shear Strength (UC) (tsf)	Shear Strength (Pocket Pen) (tsf)
ECP-2042	17									1.42
ECP-2042	19	70	24	46	95.0	27	118	0.87		1.00
ECP-2042	24	85	24	61	95.0	28				1.33
ECP-2042	29					27	117	1.45		1.17
ECP-2042	33	64	19	45	97.0	28				
ECP-2042	38	NP	NP	NP	91.0	22				
ECP-2043	1									1.33
ECP-2043	3	78	23	55	94.0	27				0.50
ECP-2043	5					28	122		0.75	0.58
ECP-2043	7	62	21	41	93.0	25				1.50
ECP-2043	9					18	131		2.09	1.50
ECP-2043	11	66	21	45	92.0	20				1.50
ECP-2043	13									1.50
ECP-2043	15	98	31	67						1.50
ECP-2043	17					32	121	1.86		1.42
ECP-2043	19	61	22	39	99.0	28				1.50
ECP-2043	24	79	26	53	100.0	26	130	1.52		1.17
ECP-2043	28	26	20	6	96.0	26				
ECP-2043	33	NP	NP	NP	90.0					
ECP-2043	38	76	24	52	100.0	28				
ECP-2043	39									1.33
ECP-2044	2	32	11	21	39.0	15				
ECP-2044	6	NP	NP	NP	29.0	21				
ECP-2044	12	34	14	20	57.0	25				
ECP-2044	15	86	23	63	88.0	37				0.33
ECP-2044	16	86	26	60	97.0	36				
ECP-2044	19					32	120		0.75	0.75
ECP-2044	24	90	27	63	95.0	33	118	0.82		1.00
ECP-2044	29					35				0.92
ECP-2044	34					28	125	1.05		1.33
ECP-2044	39	32	20	12	94.0	21				0.50
TOTAL		**196**	**196**	**196**	**194**	**330**	**128**	**92**	**37**	**383**

APPENDIX C

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

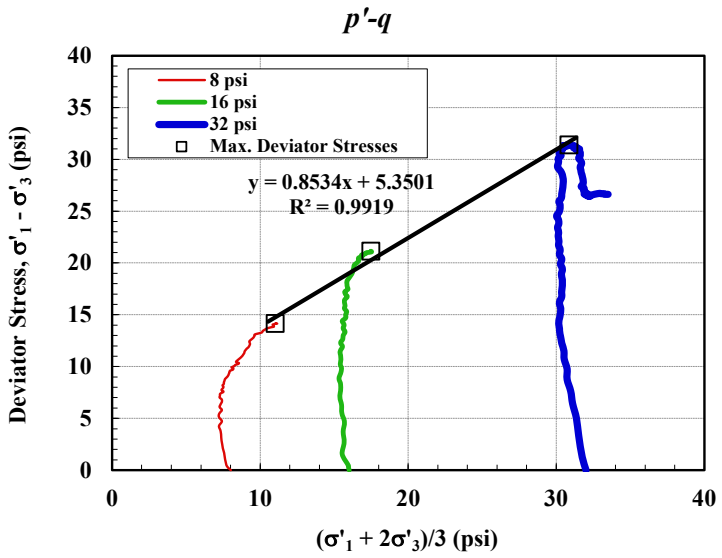
Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

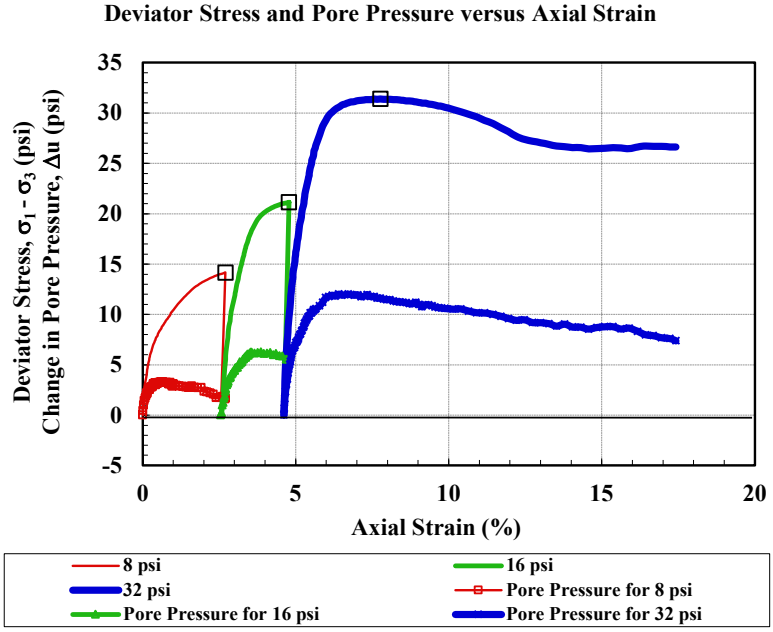
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: HSC ECIP (PN: HG1910092.2.1)
Test Method: ASTM D4767-Modified

Sample ID.: ECP-207 (28-30 ft)
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2001012
Test Date: 02/11/20

Total Stresses	
Friction Angle, ϕ (°):	**15.1**
Cohesion, c (psi):	**3.3**
Effective Stresses	
Friction Angle, ϕ' (°):	**21.9**
Cohesion, c' (psi):	**2.5**





Initial Specimen Conditions				
Specimen ID.		ECP-207		
Eff. Consolidation Stress (psi)		8	16	32
Depth (ft)		28-30	- -	- -
Avg. Diameter (in)	D_o	2.79	2.79	2.79
Avg. Height (in)	H_o	5.69	5.54	5.40
Avg. Water Content (%)	w_o	28.3	- -	- -
Total Unit Weight (pcf)	γ_{total}	121.7	124.8	128.1
Dry Unit Weight (pcf)	γ_{dry}	94.9	- -	- -
Saturation (%)	S_r	99.5	- -	- -
Void Ratio	e_o	0.76	- -	- -
Specific Gravity (assumed)	G_s	2.68	- -	- -
B-Coefficient	B	0.96	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.71
Area (in^2)	A_1	6.10	6.07	6.05
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	29.5

Peak Stresses at Failure			
Deviator Stress (psi)	14.2	21.1	31.4
Axial Strain (%)	2.7	4.8	7.8
Total Stresses at Failure			
σ_1 (psi)	22.2	37.1	63.4
σ_3 (psi)	8.0	16.0	32.0
Effective Stresses at Failure			
σ'_1 (psi)	20.5	31.5	51.8
σ'_3 (psi)	6.3	10.4	20.4

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

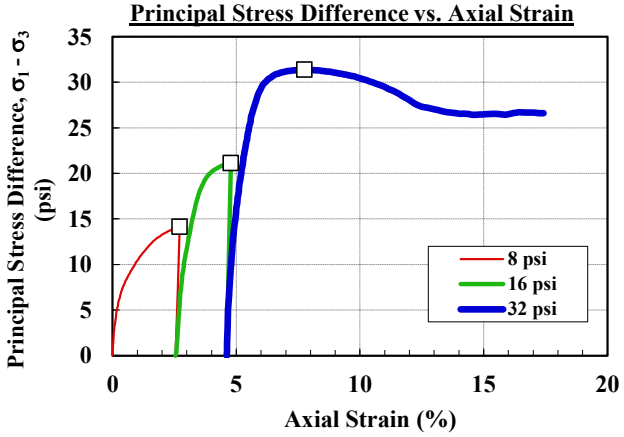
Cheng-Wei Chen, Ph.D. 02/15/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

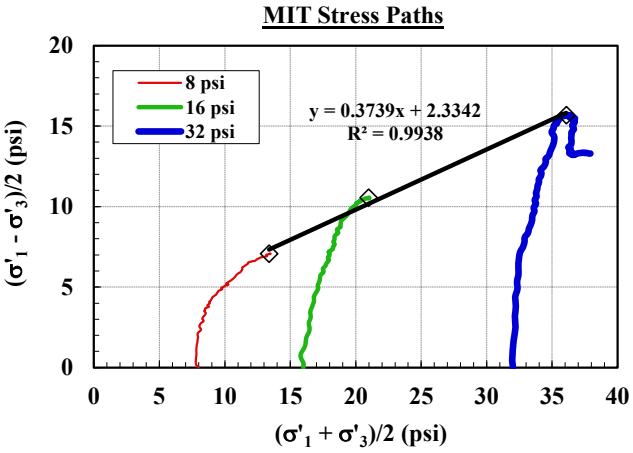
Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

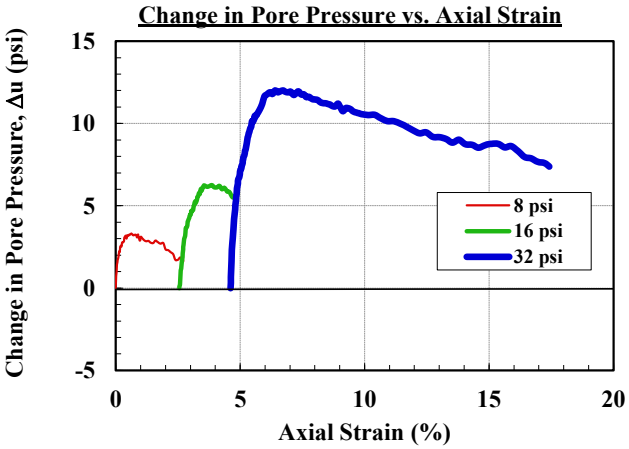
Multi-Stage CU Triaxial Compression Test Appendix

Client: HVJ Associates, Inc.
Project: HSC ECIP (PN: HG1910092.2.1)
Specimen: ECP-207 (28-30 ft)

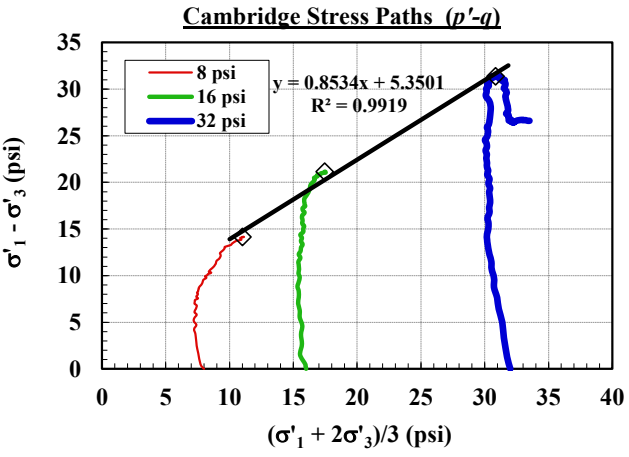
Beyond Project No.: LT2001012
Test Method: ASTM D4767-Modified
Test Date: 02/11/20







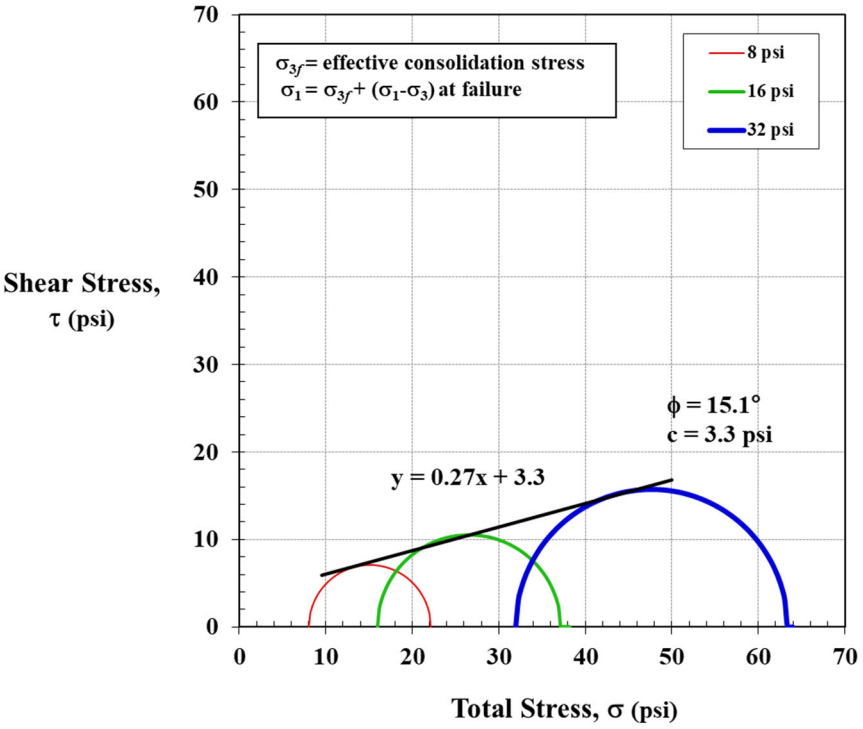
(a) Before



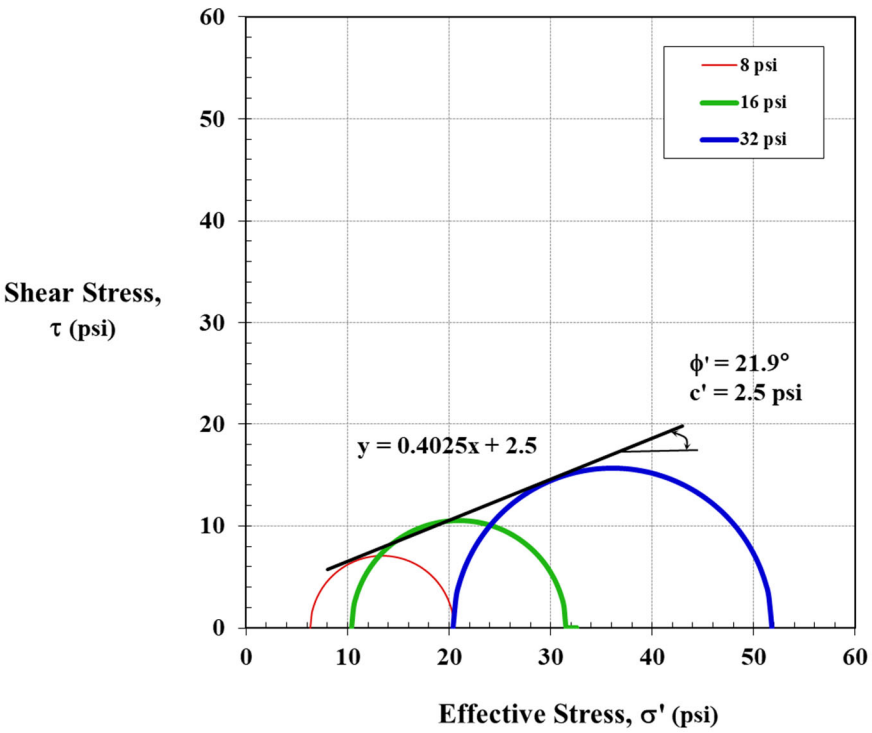
(b) Post-Test

Sample ID.: ECP-207 (28-30 ft)

Mohr Circles (Total Stress)
ECP-207 (28-30 ft) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-207 (28-30 ft) (multi-stage test on single specimen)



Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

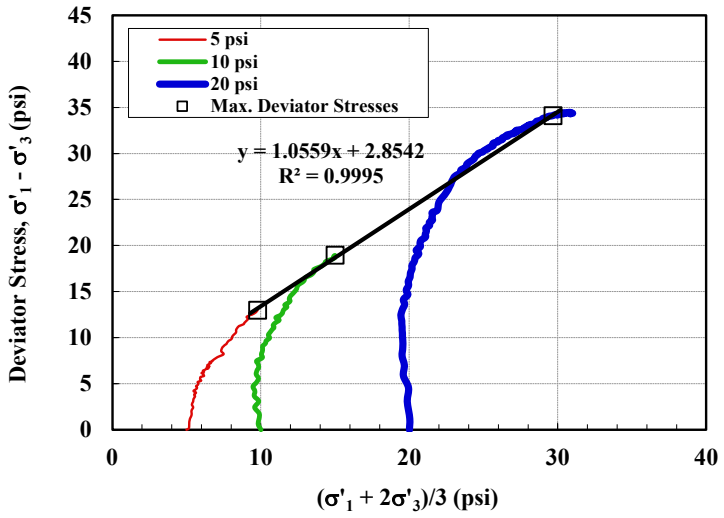
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: HSC ECIP (PN: HG1910092.2.1)
Test Method: ASTM D4767-Modified

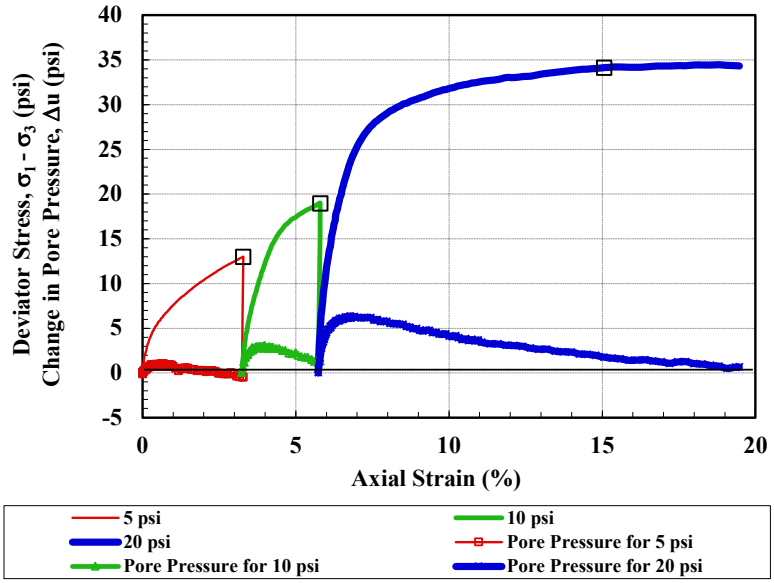
Sample ID.: ECP-208 (12-14 ft)
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2001012
Test Date: 02/07/20

Total Stresses	
Friction Angle, ϕ (°):	**24.2**
Cohesion, c (psi):	**1.9**
Effective Stresses	
Friction Angle, ϕ' (°):	**26.7**
Cohesion, c' (psi):	**1.4**

p'-q



Deviator Stress and Pore Pressure versus Axial Strain



Initial Specimen Conditions				
Specimen ID.		ECP-208		
Eff. Consolidation Stress (psi)		5	10	20
Depth (ft)		12-14	- -	- -
Avg. Diameter (in)	D_o	2.79	2.79	2.79
Avg. Height (in)	H_o	5.68	5.50	5.33
Avg. Water Content (%)	w_o	20.8	- -	- -
Total Unit Weight (pcf)	γ_{total}	128.1	132.2	136.6
Dry Unit Weight (pcf)	γ_{dry}	106.0	- -	- -
Saturation (%)	S_r	96.4	- -	- -
Void Ratio	e_o	0.58	- -	- -
Specific Gravity (assumed)	G_s	2.68	- -	- -
B-Coefficient	B	0.95	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.54
Area (in^2)	A_1	6.10	6.07	6.04
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	20.6

Peak Stresses at Failure			
Deviator Stress (psi)	13.0	19.0	34.1
Axial Strain (%)	3.3	5.8	15.1
Total Stresses at Failure			
σ_1 (psi)	18.0	29.0	54.1
σ_3 (psi)	5.0	10.0	20.0
Effective Stresses at Failure			
σ'_1 (psi)	18.4	27.7	52.4
σ'_3 (psi)	5.4	8.7	18.3

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

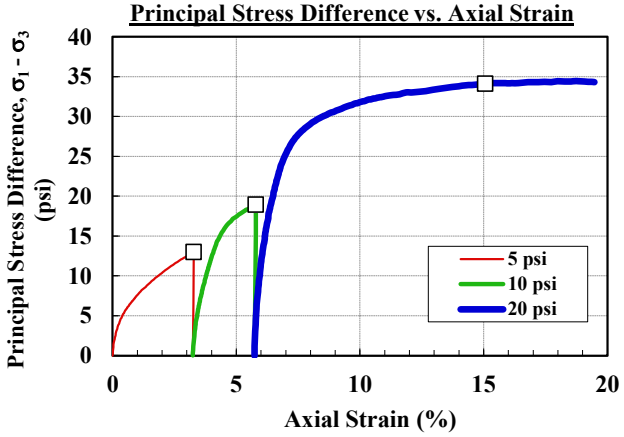
Cheng-Wei Chen, Ph.D. 02/13/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

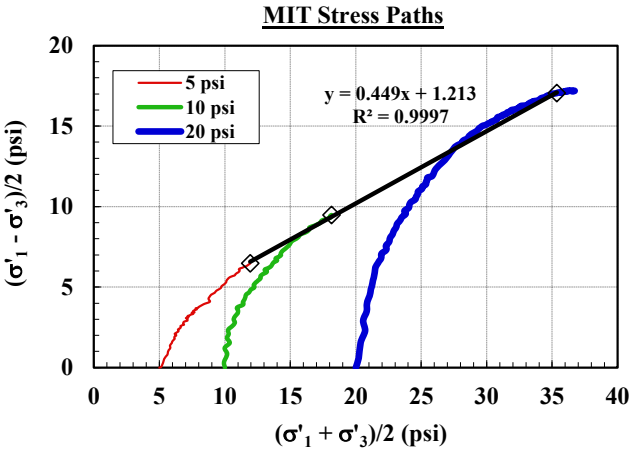
Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

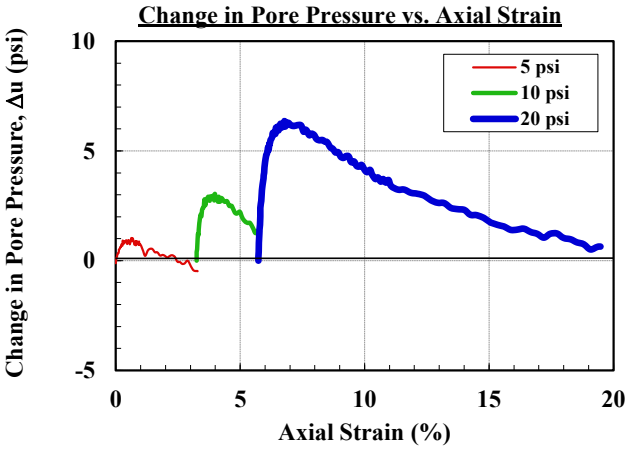
Multi-Stage CU Triaxial Compression Test Appendix

Client: HVJ Associates, Inc.
Project: HSC ECIP (PN: HG1910092.2.1)
Specimen: ECP-208 (12-14 ft)

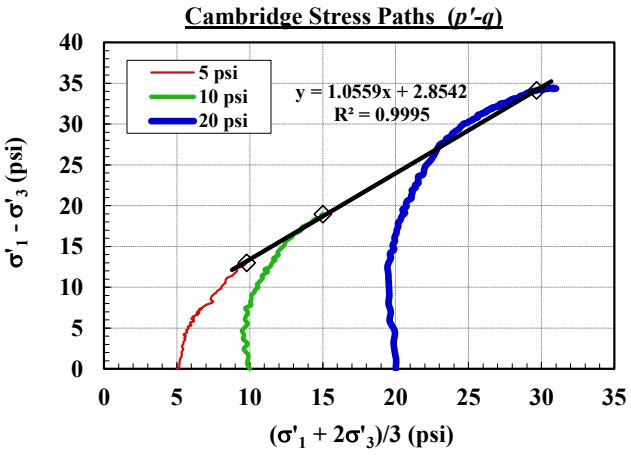
Beyond Project No.: LT2001012
Test Method: ASTM D4767-Modified
Test Date: 02/07/20







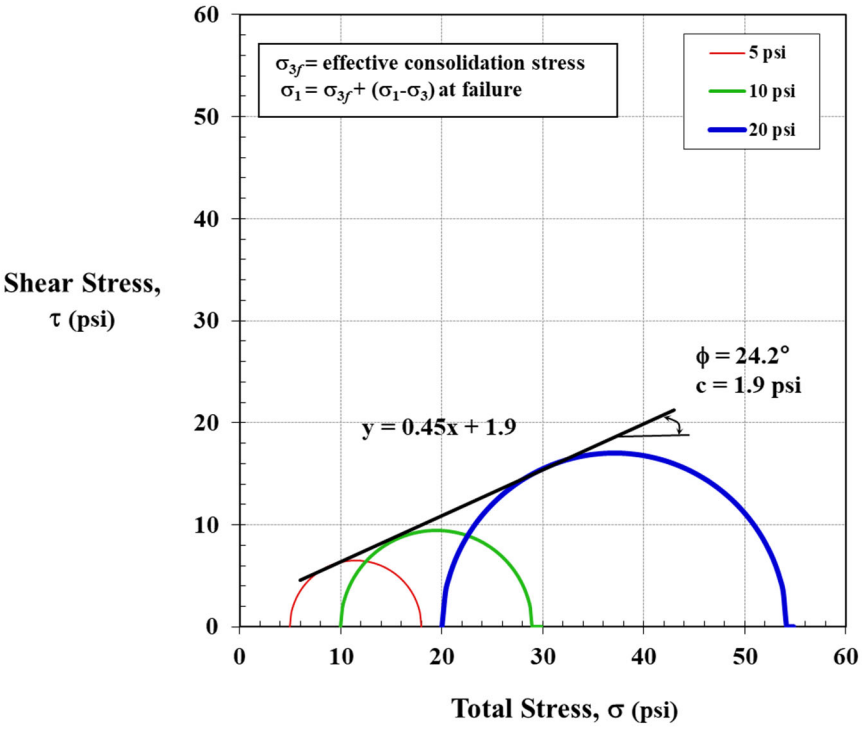
(a) Before



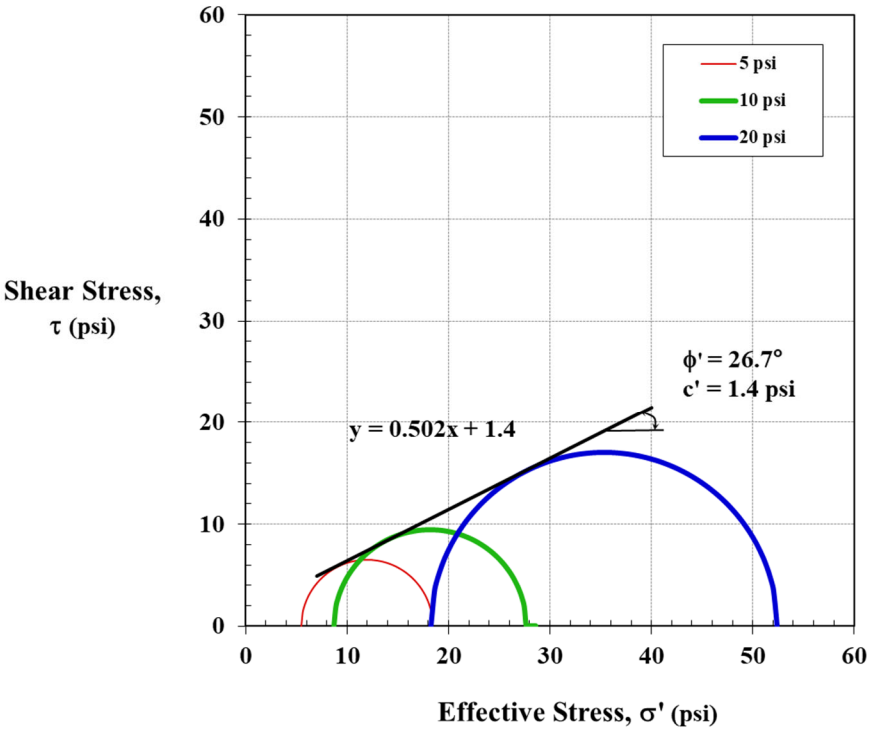
(b) Post-Test

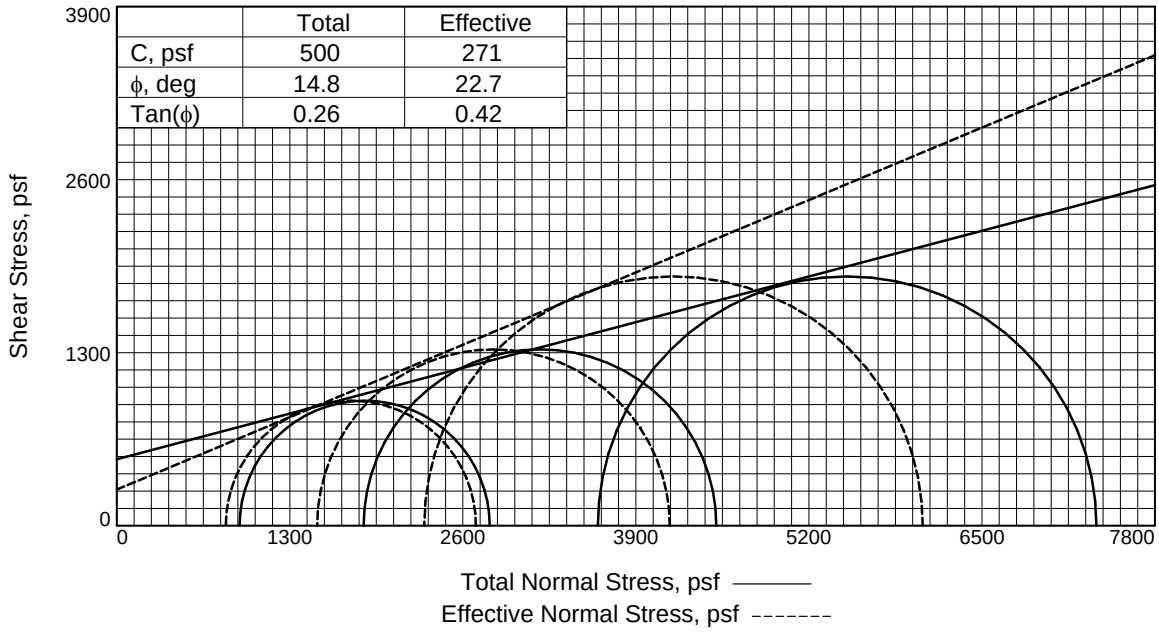
Sample ID.: ECP-208 (12-14 ft)

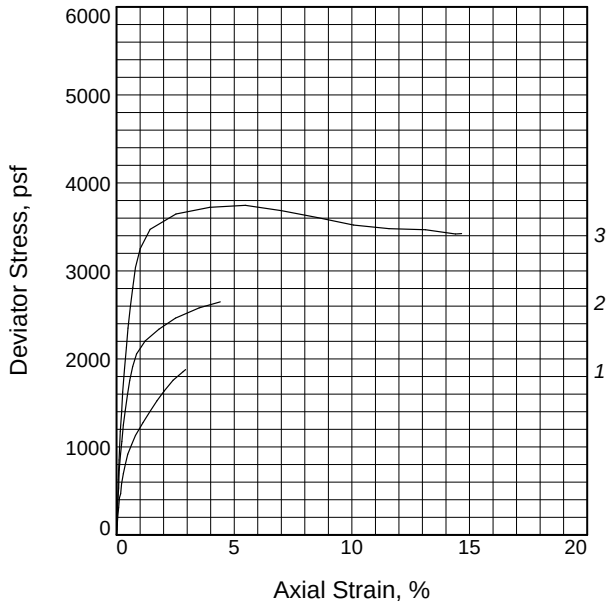
Mohr Circles (Total Stress)
ECP-208 (12-14 ft) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-208 (12-14 ft) (multi-stage test on single specimen)







Sample No.		1	2	3
Initial	Water Content, %	21.8	21.8	21.8
	Dry Density, pcf	106.8	106.8	106.8
	Saturation, %	98.9	98.9	98.9
	Void Ratio	0.6072	0.6072	0.6072
	Diameter, in.	2.00	2.00	2.00
	Height, in.	3.99	3.99	3.99
At Test	Water Content, %	24.8	24.5	23.9
	Dry Density, pcf	102.1	102.7	103.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6810	0.6724	0.6567
	Diameter, in.	2.04	2.07	2.11
	Height, in.	3.99	3.87	3.70
Strain rate, in./min.		0.01	0.01	0.01
Eff. Cell Pressure, tsf		0.462	0.927	1.807
Fail. Stress, psf		1878	2649	3745
Total Pore Pr., psf		7304	7549	8505
Strain, %		2.9	4.4	5.5
Ult. Stress, psf		1878	2649	3745
Total Pore Pr., psf		7304	7549	8505
Strain, %		2.9	4.4	5.5
$\bar{\sigma}_1$ Failure, psf		2698	4155	6055
$\bar{\sigma}_3$ Failure, psf		819	1505	2310

Type of Test:
CU with Pore Pressures
Sample Type: undisturbed
Description: Reddish brown, LEAN CLAY (CL)

LL= 44 **PL=** 24 **PI=** 20
Assumed Specific Gravity= 2.75
Remarks: % Passing #200 Sieve = 92.5

Figure 1

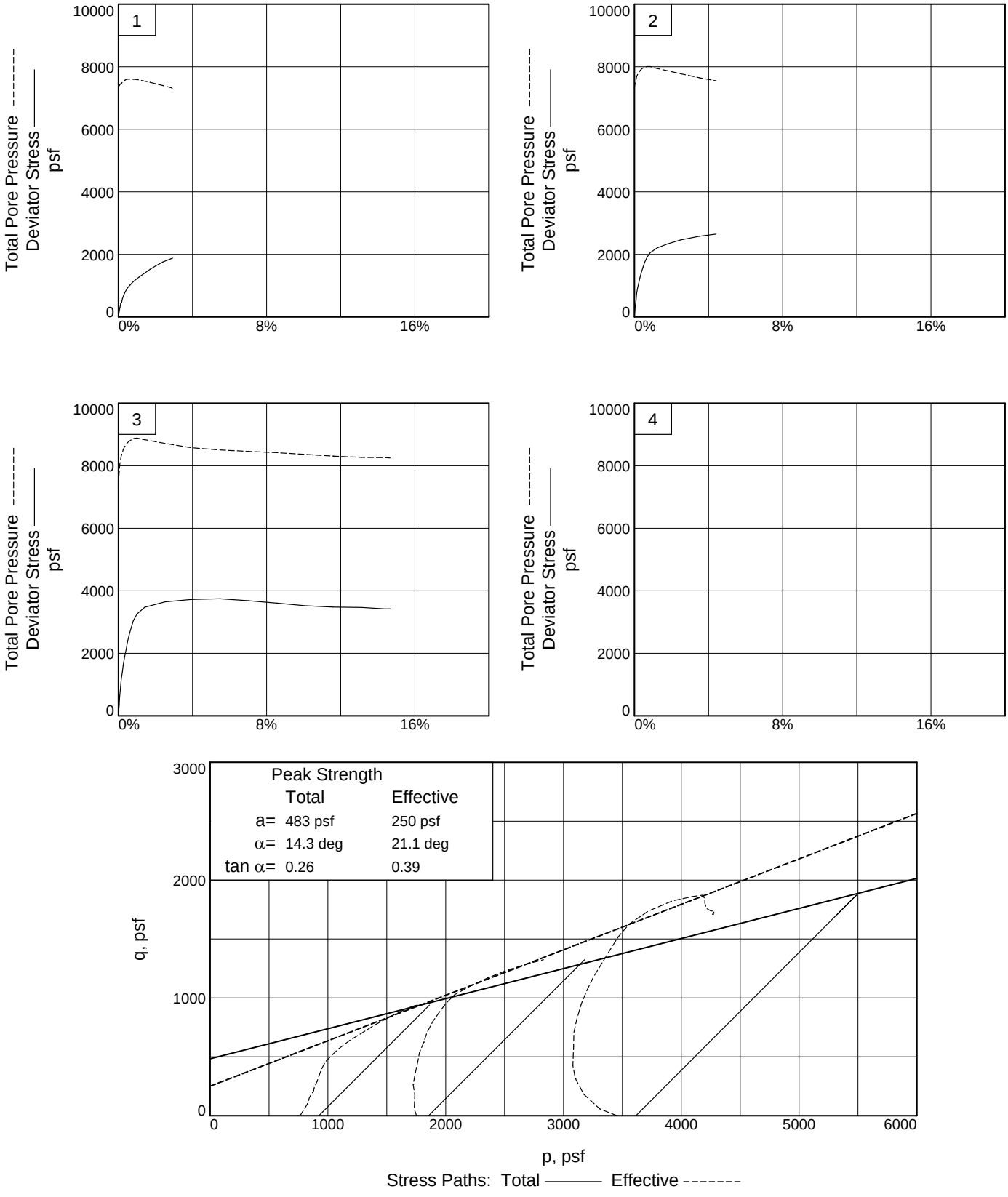
Client: HDR Engineering, Inc.

Project: Houston Ship Channel Expansion Channel Improvement Project

Source of Sample: ECP-210 **Depth:** 14-16'
Sample Number: 8
Proj. No.: HG1910092.2.1 **Date Sampled:** 4/30/2020

HVJ ASSOCIATES
6120 S. Dairy Ashford Rd.
Houston, TX 77072-1010

Tested By: KC **Checked By:** SW



Client: HDR Engineering, Inc.

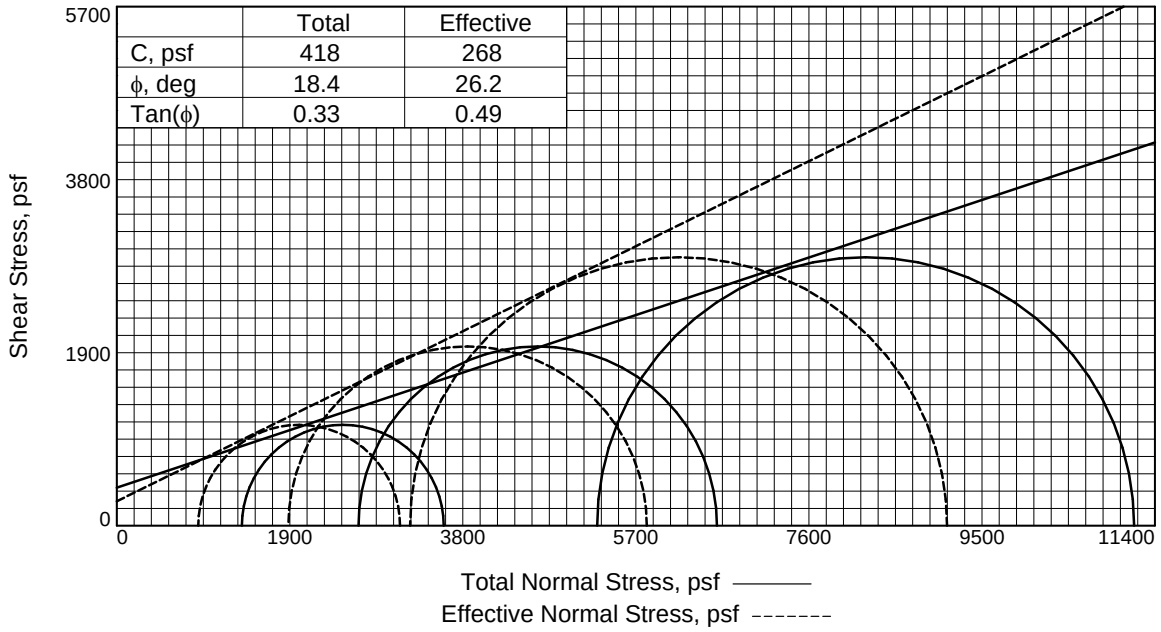
Project: Houston Ship Channel Expansion Channel Improvement Project

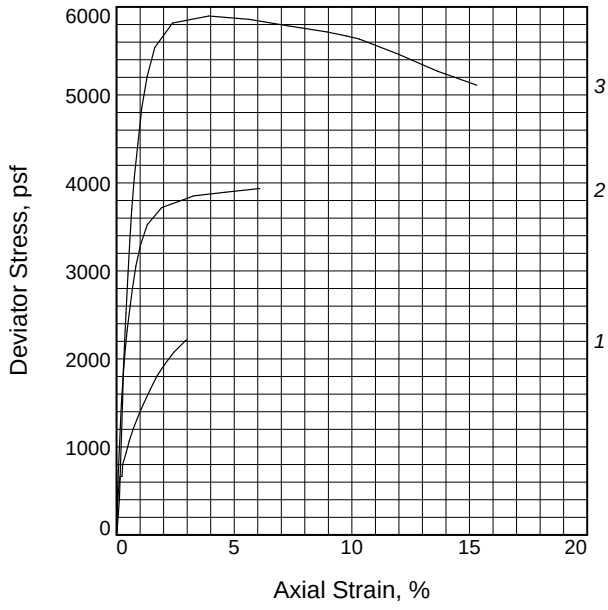
Source of Sample: ECP-210 **Depth:** 14-16' **Sample Number:** 8

Project No.: HG1910092.2.1 **Figure** 2

HVJ ASSOCIATES, INC.

Tested By: KC **Checked By:** SW





Sample No.		1	2	3
Initial	Water Content, %	25.8	25.8	25.8
	Dry Density, pcf	99.7	99.7	99.7
	Saturation, %	98.5	98.5	98.5
	Void Ratio	0.7213	0.7213	0.7213
	Diameter, in.	1.94	1.94	1.94
	Height, in.	4.03	4.03	4.03
At Test	Water Content, %	24.0	23.2	22.2
	Dry Density, pcf	103.4	104.8	106.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6606	0.6385	0.6094
	Diameter, in.	1.91	1.95	2.06
	Height, in.	4.00	3.78	3.35
Strain rate, in./min.		0.02	0.02	0.02
Eff. Cell Pressure, tsf		0.687	1.327	2.637
Fail. Stress, psf		2216	3937	5896
Total Pore Pr., psf		7679	7970	9254
Strain, %		3.0	6.1	3.9
Ult. Stress, psf		2216	3937	5896
Total Pore Pr., psf		7679	7970	9254
Strain, %		3.0	6.1	3.9
$\bar{\sigma}_1$ Failure, psf		3110	5820	9117
$\bar{\sigma}_3$ Failure, psf		895	1884	3221

Type of Test:
CU with Pore Pressures
Sample Type: undisturbed
Description: Brown, LEAN CLAY (CL)

LL= 35 **PL=** 20 **PI=** 15
Assumed Specific Gravity= 2.75
Remarks: % Passing #200 Sieve = 99.2

Figure 1

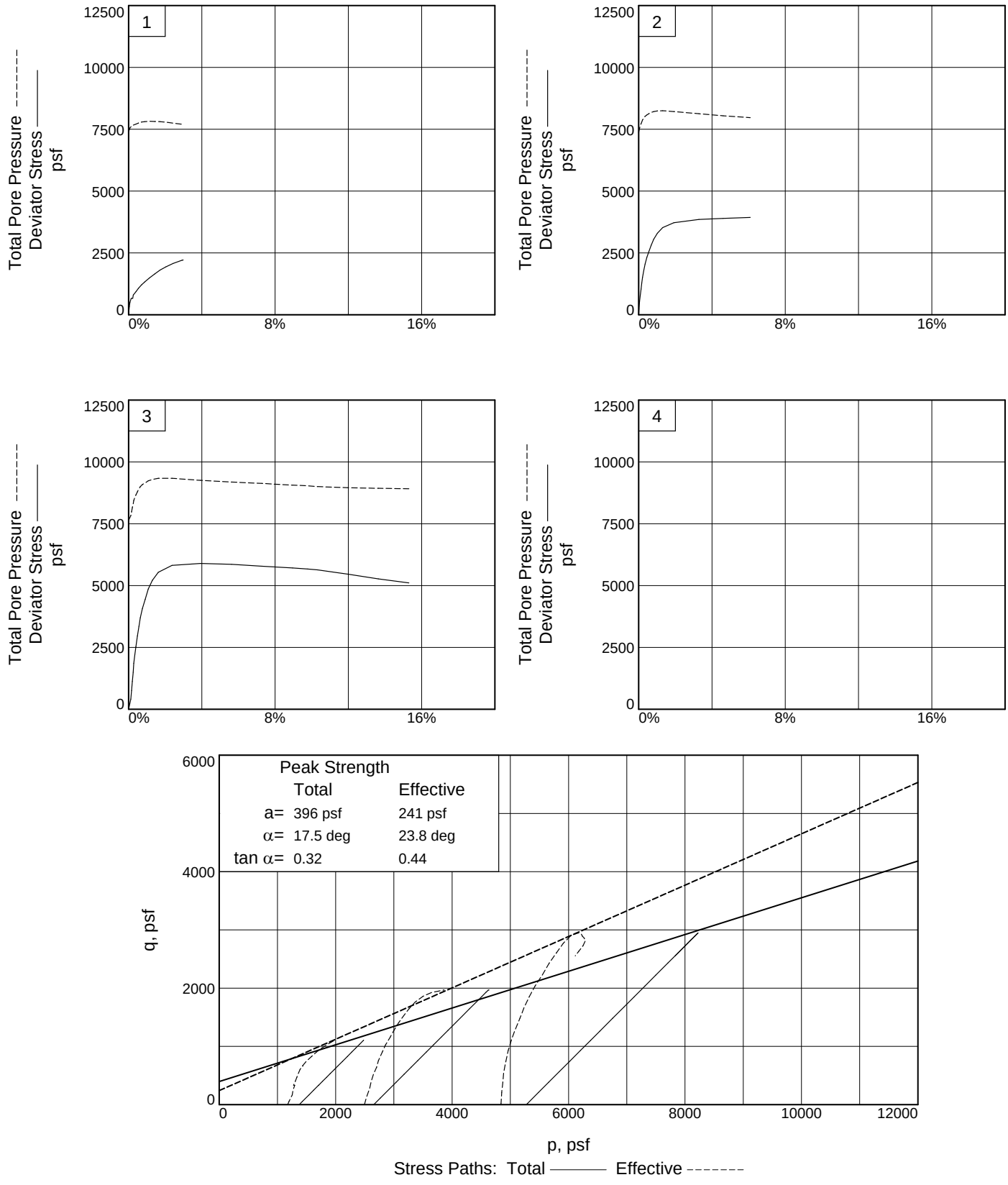
Client: HDR Engineering, Inc.

Project: Houston Ship Channel Expansion Channel Improvement Project

Source of Sample: ECP-214 **Depth:** 28-30'
Sample Number: 12
Proj. No.: HG1910092.2.1 **Date Sampled:** 5/18/2020

HVJ ASSOCIATES
6120 S. Dairy Ashford Rd.
Houston, TX 77072-1010

Tested By: KC **Checked By:** SW



Client: HDR Engineering, Inc.

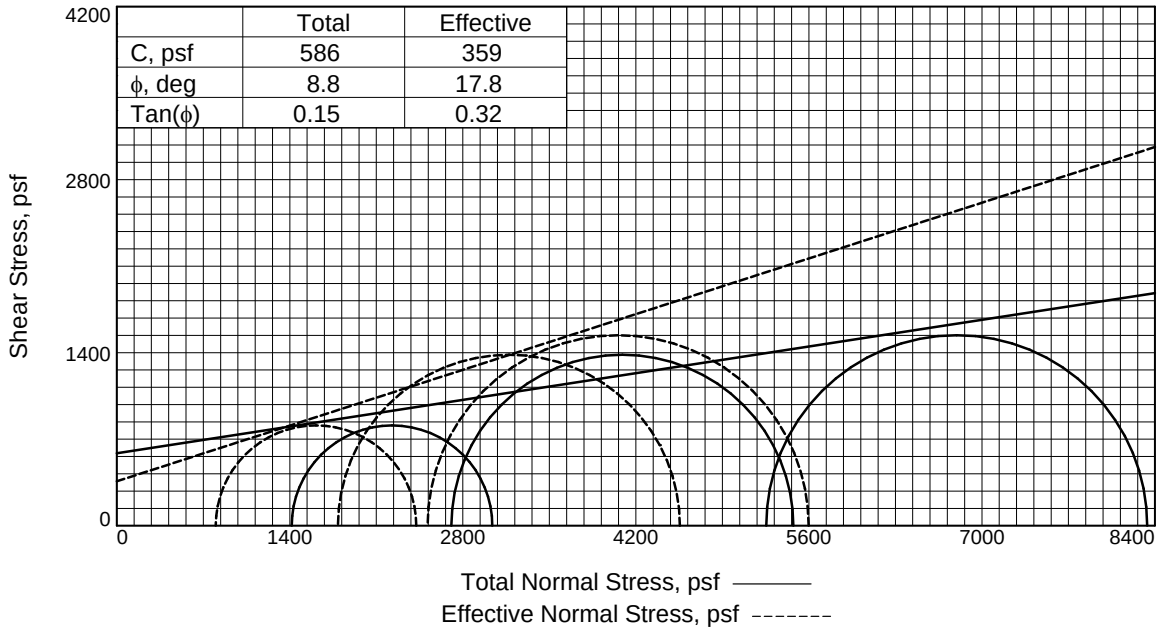
Project: Houston Ship Channel Expansion Channel Improvement Project

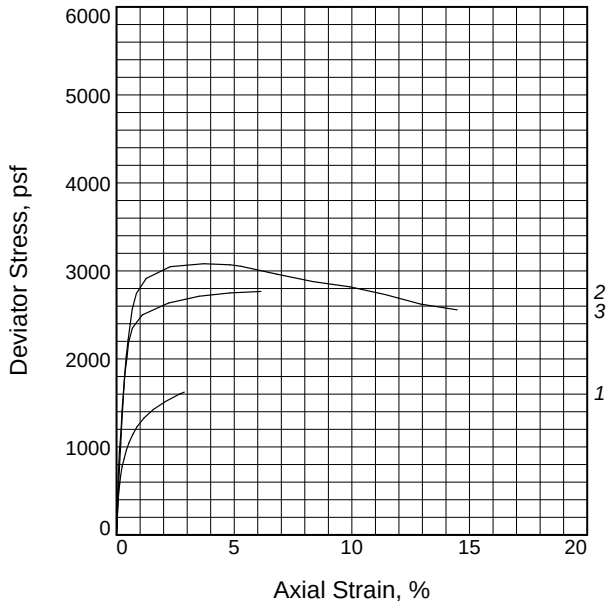
Source of Sample: ECP-214 **Depth:** 28-30' **Sample Number:** 12

Project No.: HG1910092.2.1 **Figure** 2

HVJ ASSOCIATES, INC.

Tested By: KC **Checked By:** SW





Sample No.		1	2	3
Initial	Water Content, %	30.4	30.4	30.4
	Dry Density, pcf	92.6	92.6	92.6
	Saturation, %	97.9	97.9	97.9
	Void Ratio	0.8530	0.8530	0.8530
	Diameter, in.	1.98	1.98	1.98
	Height, in.	3.99	3.99	3.99
At Test	Water Content, %	31.9	31.5	31.0
	Dry Density, pcf	91.4	92.0	92.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.8780	0.8669	0.8530
	Diameter, in.	1.99	2.01	2.07
	Height, in.	3.99	3.88	3.64
Strain rate, in./min.		0.02	0.02	0.02
Eff. Cell Pressure, tsf		0.708	1.354	2.627
Fail. Stress, psf		1623	2766	3083
Total Pore Pr., psf		7815	8117	9940
Strain, %		2.9	6.1	3.7
Ult. Stress, psf		1623	2766	3083
Total Pore Pr., psf		7815	8117	9940
Strain, %		2.9	6.1	3.7
$\bar{\sigma}_1$ Failure, psf		2424	4556	5598
$\bar{\sigma}_3$ Failure, psf		801	1790	2515

Type of Test:
CU with Pore Pressures
Sample Type: undisturbed
Description: Reddish brown, FAT CLAY (CH)

LL= 70 **PL=** 27 **PI=** 43
Assumed Specific Gravity= 2.75
Remarks: % Passing #200 Sieve = 99.1

Figure 1

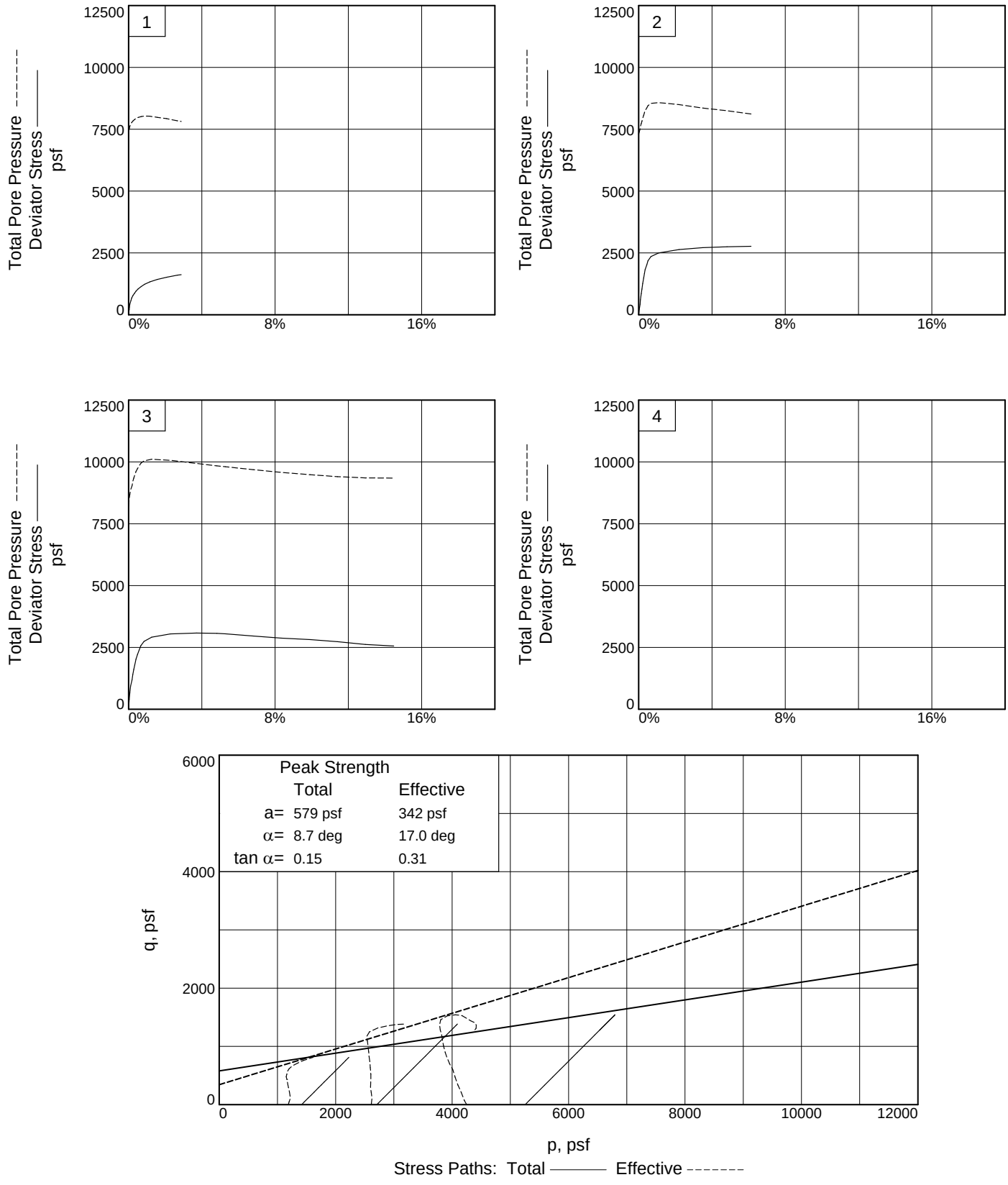
Client: HDR Engineering, Inc.

Project: Houston Ship Channel Expansion Channel Improvement Project

Source of Sample: ECP-217 **Depth:** 28-30
Sample Number: 12
Proj. No.: HG1910092.2.1 **Date Sampled:** 5/25/2020

HVJ ASSOCIATES
6120 S. Dairy Ashford Rd.
Houston, TX 77072-1010

Tested By: KC **Checked By:** SW



Client: HDR Engineering, Inc.

Project: Houston Ship Channel Expansion Channel Improvement Project

Source of Sample: ECP-217 **Depth:** 28-30 **Sample Number:** 12

Project No.: HG1910092.2.1 **Figure** 2

HVJ ASSOCIATES, INC.

Tested By: KC **Checked By:** SW

Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

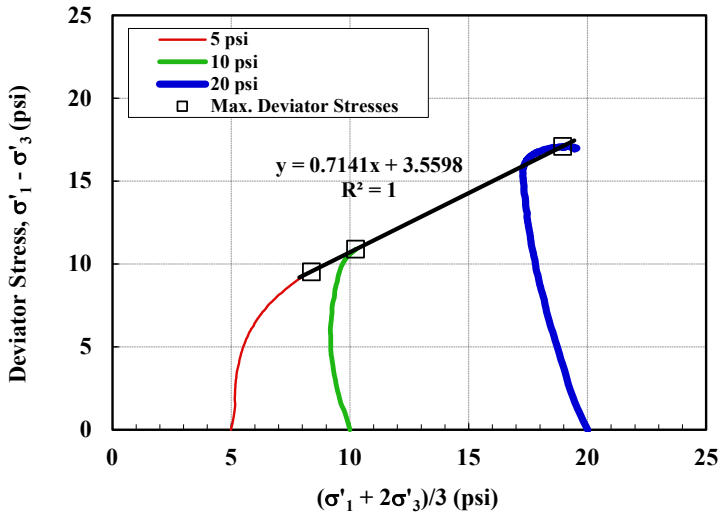
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: HSC- Spillmans Island (PN: HG1910092.2.1)
Test Method: ASTM D4767-Modified

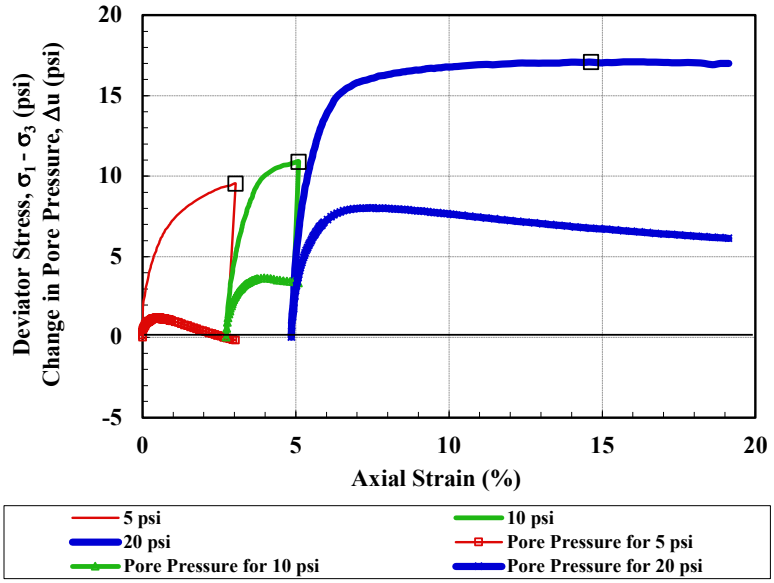
Sample ID.: ECP-314-S6 (10-12 ft)
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2001012
Test Date: 03/31/20

Total Stresses	
Friction Angle, ϕ (^{o}):	**12.5**
Cohesion, c (psi):	**2.4**
Effective Stresses	
Friction Angle, ϕ' (^{o}):	**18.6**
Cohesion, c' (psi):	**1.7**

p'-q



Deviator Stress and Pore Pressure versus Axial Strain



Initial Specimen Conditions				
Specimen ID.		ECP-314-S5		
Eff. Consolidation Stress (psi)		5	10	20
Depth (ft)		10-12	- -	- -
Avg. Diameter (in)	D_o	2.76	2.76	2.76
Avg. Height (in)	H_o	5.68	5.53	5.38
Avg. Water Content (%)	w_o	22.6	- -	- -
Total Unit Weight (pcf)	γ_{total}	126.4	129.8	133.5
Dry Unit Weight (pcf)	γ_{dry}	103.1	- -	- -
Saturation (%)	S_r	97.2	- -	- -
Void Ratio	e_o	0.62	- -	- -
Specific Gravity (assumed)	G_s	2.68	- -	- -
B-Coefficient	B	0.96	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.59
Area (in^2)	A_1	6.00	5.99	5.93
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	27.2

Peak Stresses at Failure			
Deviator Stress (psi)	9.5	10.9	17.1
Axial Strain (%)	3.0	5.1	14.6
Total Stresses at Failure			
σ_1 (psi)	14.5	20.9	37.1
σ_3 (psi)	5.0	10.0	20.0
Effective Stresses at Failure			
σ'_1 (psi)	14.7	17.5	30.4
σ'_3 (psi)	5.2	6.6	13.3

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

Cheng-Wei Chen, Ph.D. 04/07/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

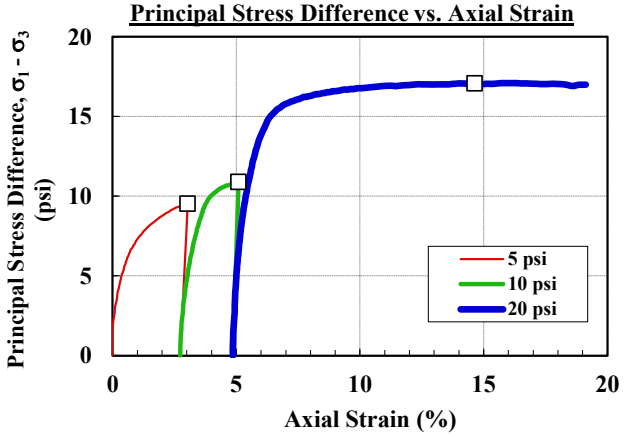
Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

Multi-Stage CU Triaxial Compression Test Appendix

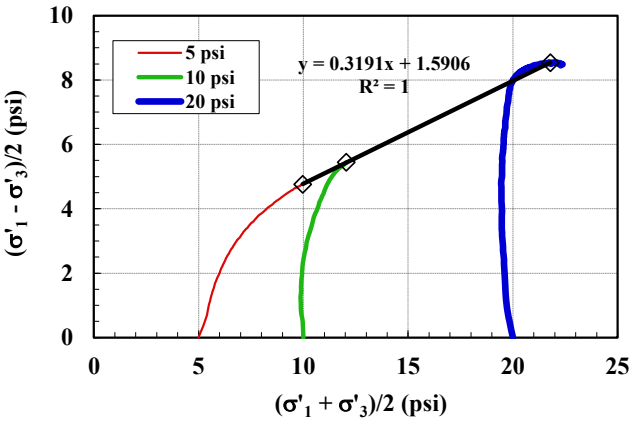
Client: HVJ Associates, Inc.
Project: HSC- Spillmans Island (PN: HG1910092.2.1)
Specimen: ECP-314-S6 (10-12 ft)

Beyond Project No.: LT2001012
Test Method: ASTM D4767-Modified
Test Date: 03/31/20

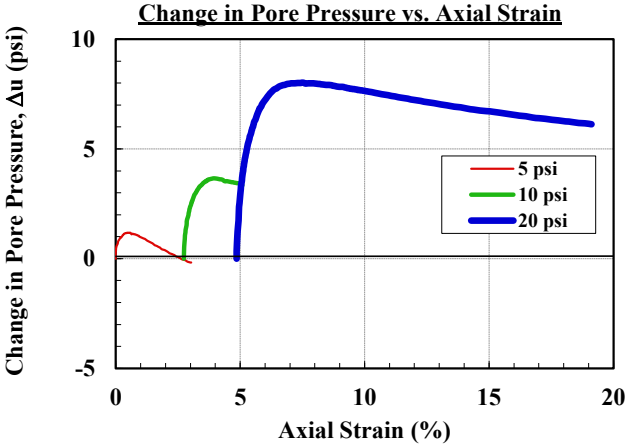
Principal Stress Difference vs. Axial Strain



MIT Stress Paths

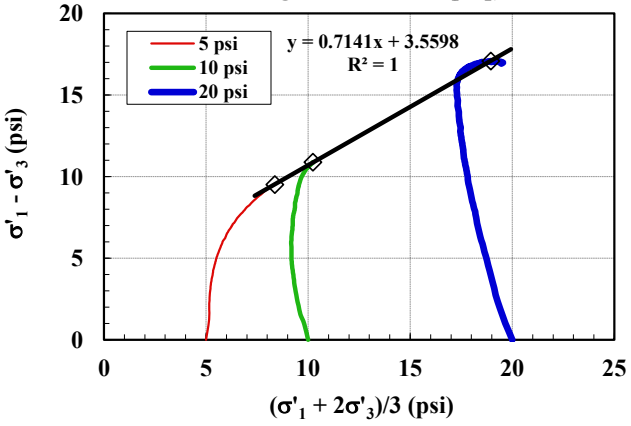


Change in Pore Pressure vs. Axial Strain



(a) Before

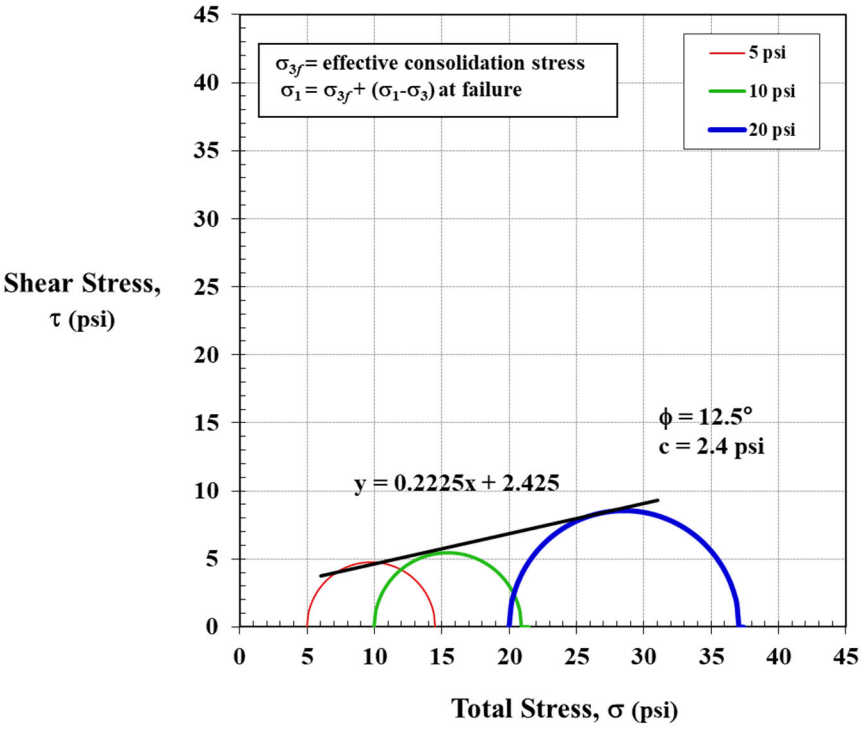
Cambridge Stress Paths (*p'-q*)



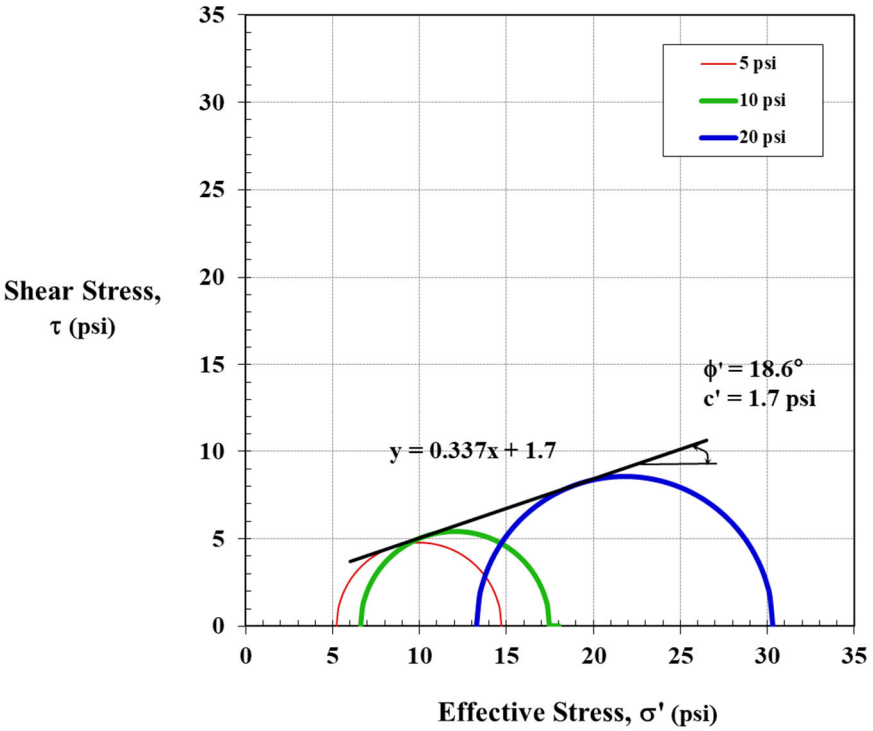
(b) Post-Test

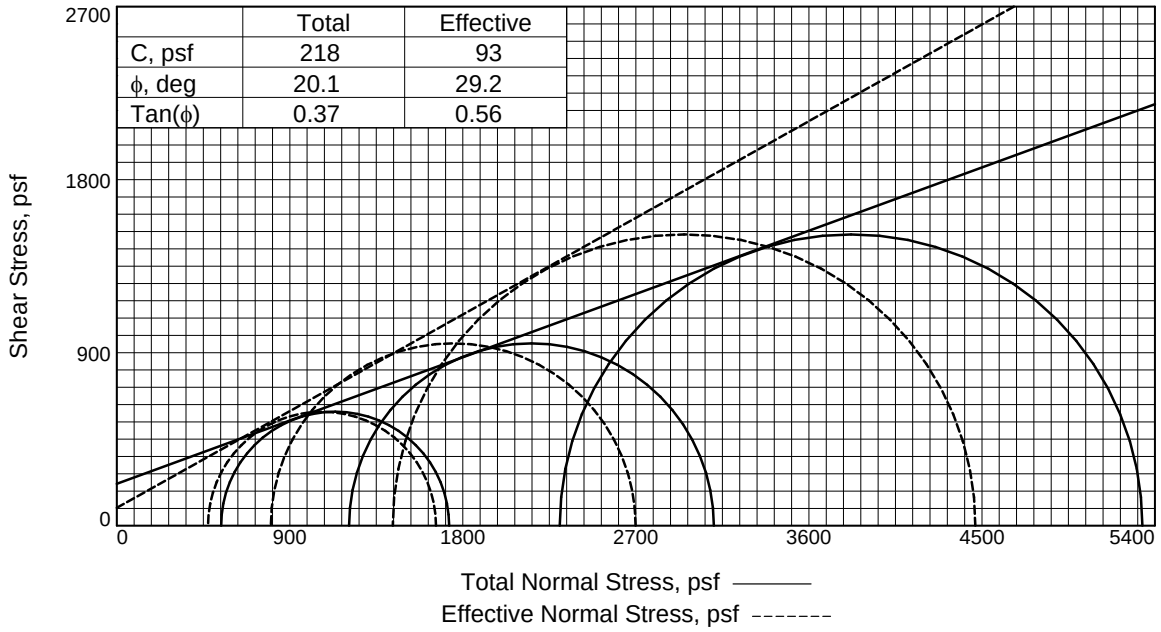
Sample ID.: ECP-314-S6 (10-12 ft)

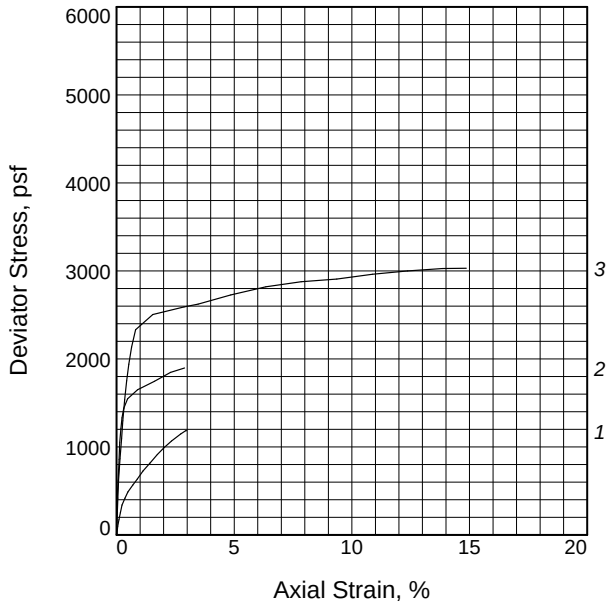
Mohr Circles (Total Stress)
ECP-314-S6 (10-12 ft) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-314-S6 (10-12 ft) (multi-stage test on single specimen)







Sample No.		1	2	3
Initial	Water Content, %	25.1	25.1	25.1
	Dry Density, pcf	99.8	99.8	99.8
	Saturation, %	96.0	96.0	96.0
	Void Ratio	0.7198	0.7198	0.7198
	Diameter, in.	2.02	2.02	2.02
	Height, in.	4.02	4.02	4.02
At Test	Water Content, %	18.4	18.0	17.7
	Dry Density, pcf	114.0	114.7	115.4
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5059	0.4961	0.4872
	Diameter, in.	1.88	1.91	1.93
	Height, in.	4.04	3.92	3.80
Strain rate, in./min.		0.01	0.01	0.01
Eff. Cell Pressure, tsf		0.271	0.604	1.152
Fail. Stress, psf		1186	1897	3030
Total Pore Pr., psf		7268	7607	8069
Strain, %		2.9	2.9	14.9
Ult. Stress, psf				
Total Pore Pr., psf				
Strain, %				
$\bar{\sigma}_1$ Failure, psf		1661	2699	4466
$\bar{\sigma}_3$ Failure, psf		475	801	1435

Type of Test:
CU with Pore Pressures
Sample Type: undisturbed
Description: Brown and gray, Fat Clay with Sand (CH)

LL= 53 **PL=** 28 **PI=** 25
Assumed Specific Gravity= 2.75
Remarks: % Passing #200 Sieve = 83.4
Multi-staged

Figure 1

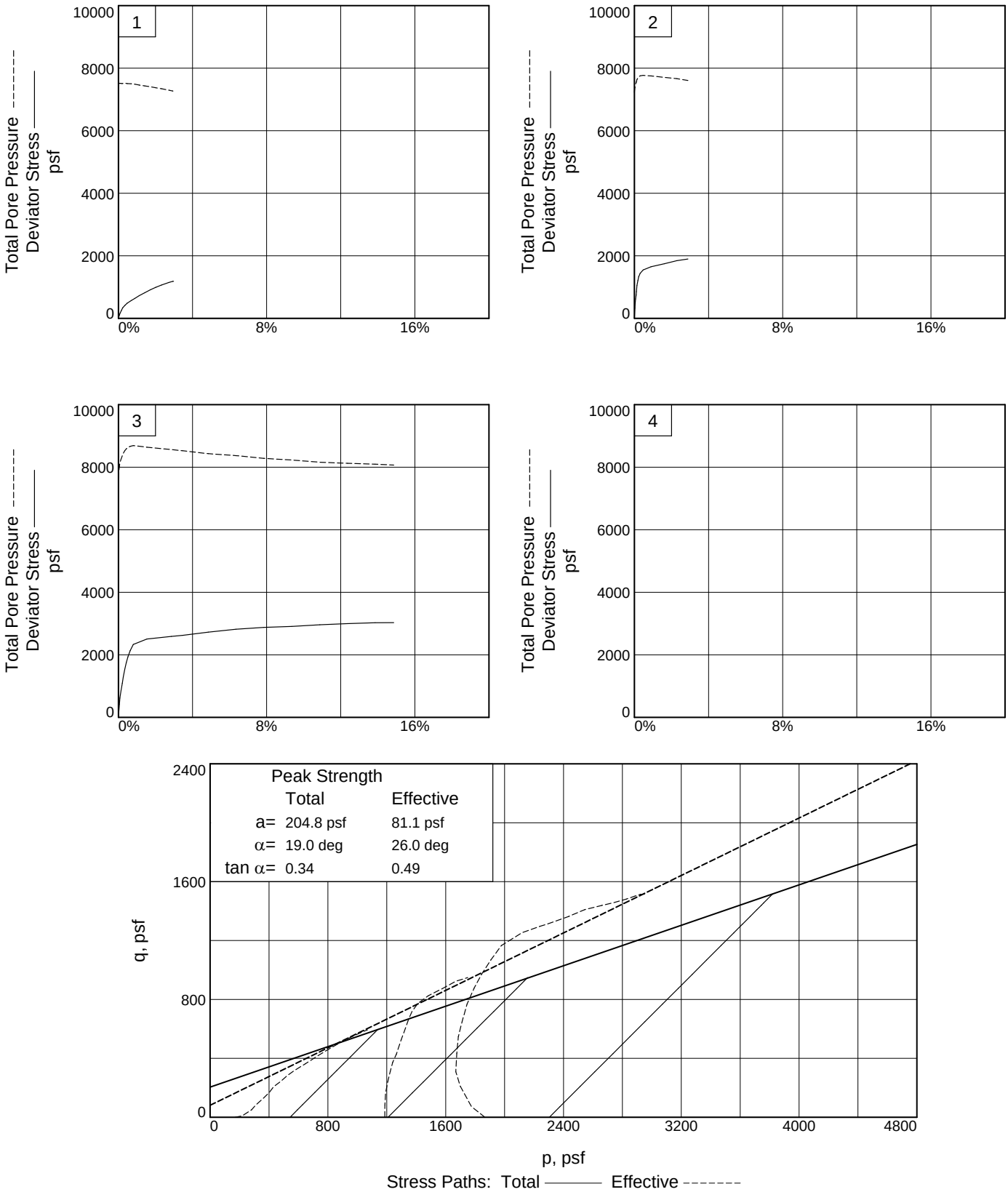
Client: HDR Engineering, Inc.

Project: Houston Ship Channel Expansion Channel Improvement Project

Source of Sample: ECP-315 **Depth:** 8-10'
Sample Number: 5
Proj. No.: HG1910092.2.1 **Date Sampled:** 2/27/2020

HVJ ASSOCIATES
6120 S. Dairy Ashford Rd.
Houston, TX 77072-1010

Tested By: KC **Checked By:** SW



Client: HDR Engineering, Inc.

Project: Houston Ship Channel Expansion Channel Improvement Project

Source of Sample: ECP-315 **Depth:** 8-10' **Sample Number:** 5

Project No.: HG1910092.2.1 **Figure** 2

HVJ ASSOCIATES, INC.

Tested By: KC **Checked By:** SW

Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

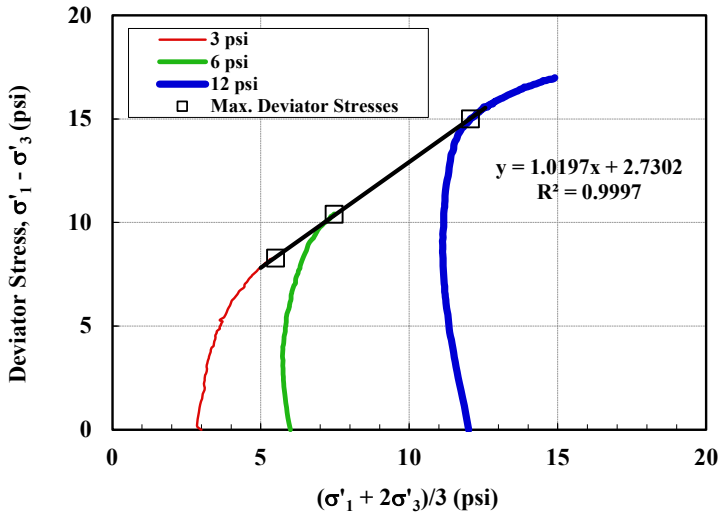
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: HSC-Site 3-BCC (PN: HG19100192.2.1)
Test Method: ASTM D4767-Modified

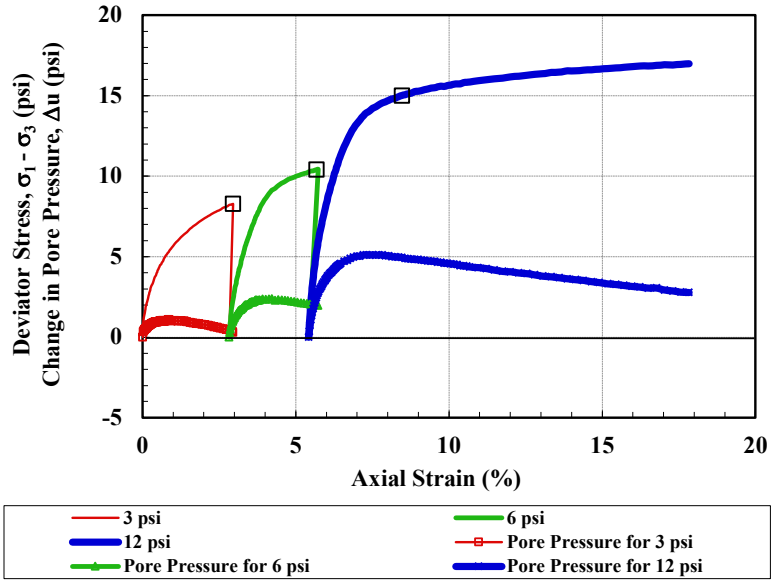
Sample ID.: ECP-317-S1 (6-8 ft) (Q/B
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2003032
Test Date: 03/31/20

Total Stresses	
Friction Angle, ϕ (°):	**16.0**
Cohesion, c (psi):	**2.2**
Effective Stresses	
Friction Angle, ϕ' (°):	**25.8**
Cohesion, c' (psi):	**1.3**

p'-q



Deviator Stress and Pore Pressure versus Axial Strain



Initial Specimen Conditions				
Specimen ID.		ECP-317		
Eff. Consolidation Stress (psi)		3	6	12
Depth (ft)		6-8 (Q/B)	- -	- -
Avg. Diameter (in)	D_o	2.75	2.75	2.75
Avg. Height (in)	H_o	5.67	5.52	5.33
Avg. Water Content (%)	w_o	26.1	- -	- -
Total Unit Weight (pcf)	γ_{total}	123.9	127.4	131.8
Dry Unit Weight (pcf)	γ_{dry}	98.3	- -	- -
Saturation (%)	S_r	99.5	- -	- -
Void Ratio	e_o	0.70	- -	- -
Specific Gravity (assumed)	G_s	2.68	- -	- -
B-Coefficient	B	0.96	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.67
Area (in^2)	A_1	5.95	5.93	5.89
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	25.8

Peak Stresses at Failure			
Deviator Stress (psi)	8.3	10.4	15.0
Axial Strain (%)	3.0	5.7	8.5
Total Stresses at Failure			
σ_1 (psi)	11.3	16.4	27.0
σ_3 (psi)	3.0	6.0	12.0
Effective Stresses at Failure			
σ'_1 (psi)	11.0	14.4	22.1
σ'_3 (psi)	2.7	4.0	7.1

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

Cheng-Wei Chen, Ph.D. 04/03/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

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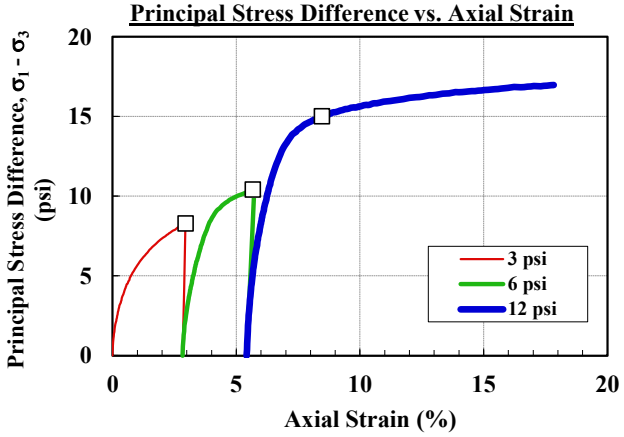
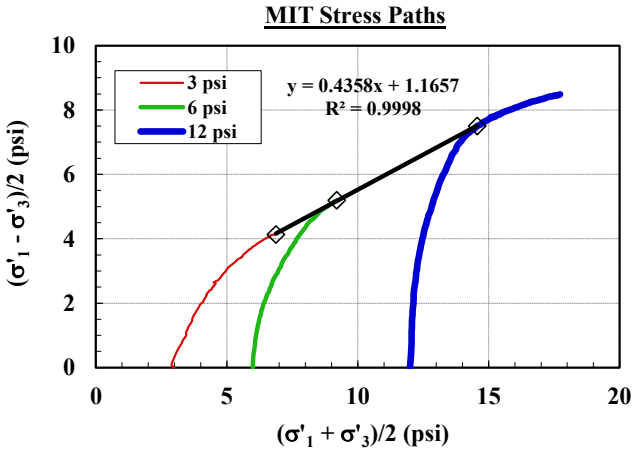
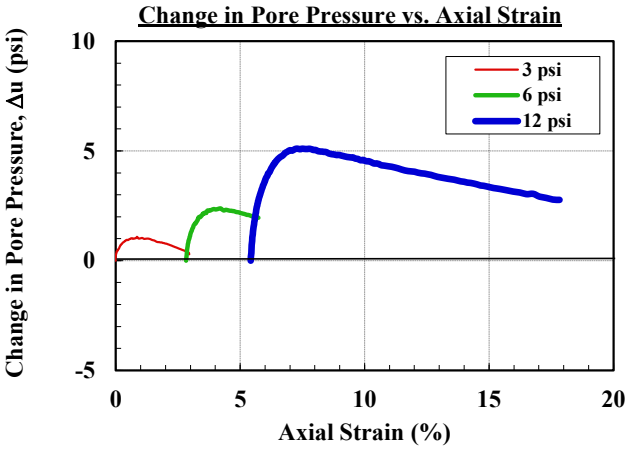
Multi-Stage CU Triaxial Compression Test Appendix

Client: HVJ Associates, Inc.
Project: HSC-Site 3-BCC (PN: HG19100192.2.1)
Specimen: ECP-317-S1 (6-8 ft) (Q/B)

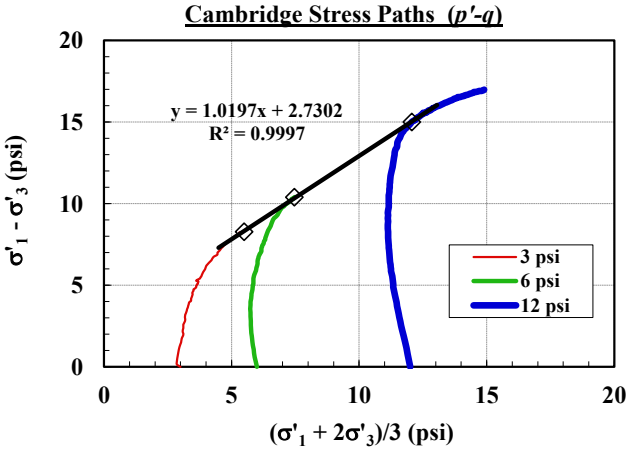
Beyond Project No.: LT2003032
Test Method: ASTM D4767-Modified
Test Date: 03/31/20







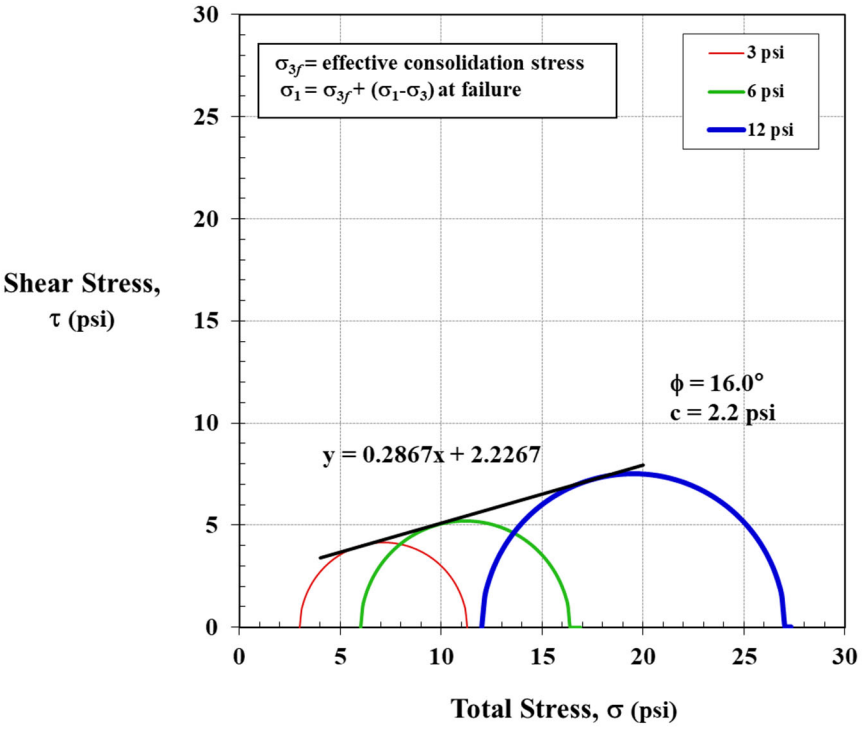
(a) Before



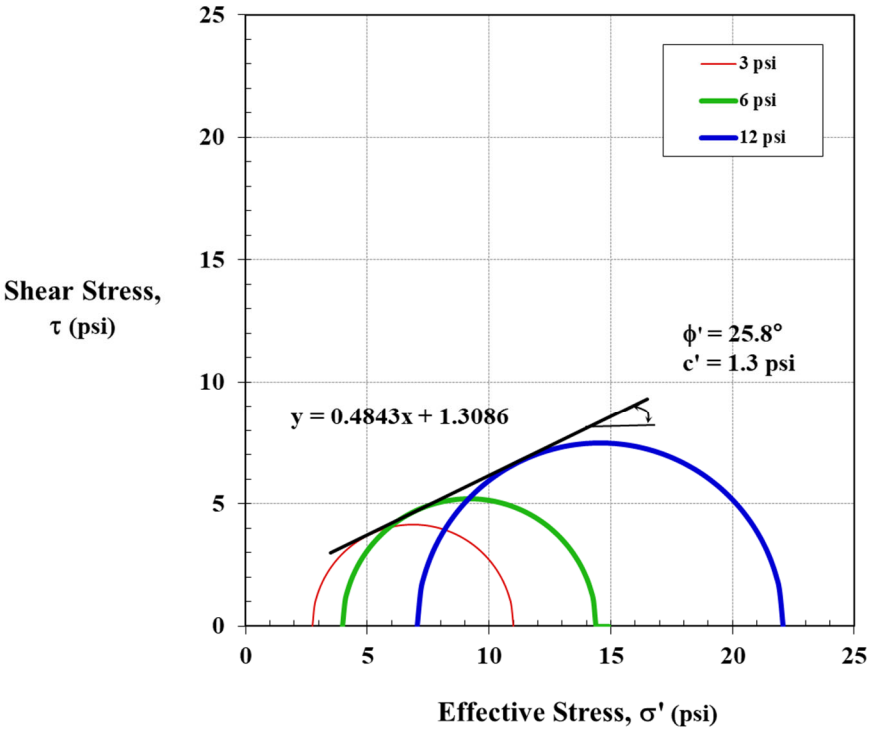
(b) Post-Test

Sample ID.: ECP-317-S1 (6-8 ft) (Q/B)

Mohr Circles (Total Stress)
ECP-317-S1 (6-8 ft) (Q/B) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-317-S1 (6-8 ft) (Q/B) (multi-stage test on single specimen)



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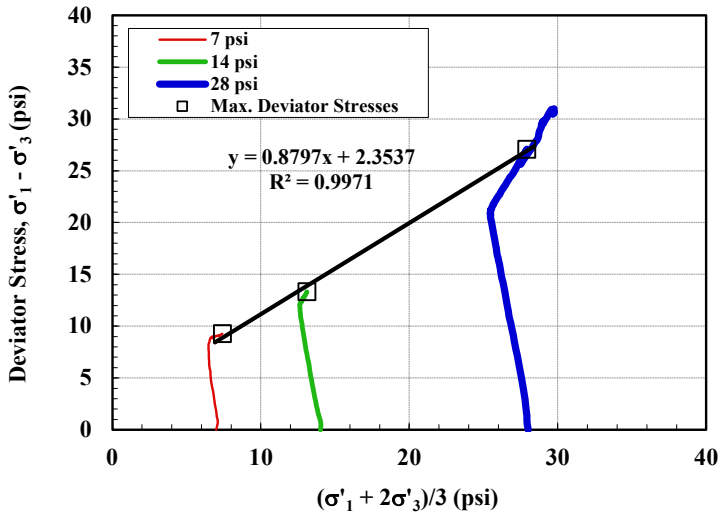
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Test Method: ASTM D4767-Modified

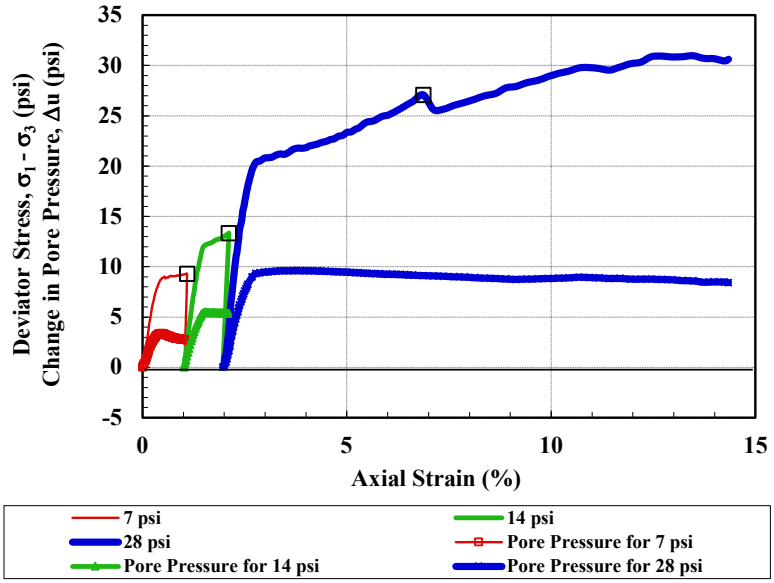
Sample ID.: ECP-317 (28-30 ft)
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2001012
Test Date: 02/10/20

Total Stresses	
Friction Angle, ϕ (^{o}):	**17.7**
Cohesion, c (psi):	**0.8**
Effective Stresses	
Friction Angle, ϕ' (^{o}):	**22.6**
Cohesion, c' (psi):	**1.1**

p'-q



Deviator Stress and Pore Pressure versus Axial Strain



Initial Specimen Conditions				
Specimen ID.		ECP-317		
Eff. Consolidation Stress (psi)		7	14	28
Depth (ft)		28-30	- -	- -
Avg. Diameter (in)	D_o	2.83	2.83	2.83
Avg. Height (in)	H_o	5.69	5.63	5.57
Avg. Water Content (%)	w_o	23.2	- -	- -
Total Unit Weight (pcf)	γ_{total}	126.4	127.7	129.0
Dry Unit Weight (pcf)	γ_{dry}	102.6	- -	- -
Saturation (%)	S_r	98.5	- -	- -
Void Ratio	e_o	0.63	- -	- -
Specific Gravity (assumed)	G_s	2.68	- -	- -
B-Coefficient	B	0.96	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.60
Area (in^2)	A_1	6.31	6.27	6.25
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	23.9

Peak Stresses at Failure			
Deviator Stress (psi)	9.3	13.3	27.1
Axial Strain (%)	1.1	2.1	6.9
Total Stresses at Failure			
σ_1 (psi)	16.3	27.3	55.1
σ_3 (psi)	7.0	14.0	28.0
Effective Stresses at Failure			
σ'_1 (psi)	13.6	22.0	46.0
σ'_3 (psi)	4.3	8.7	18.9

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

Cheng-Wei Chen, Ph.D. 02/14/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

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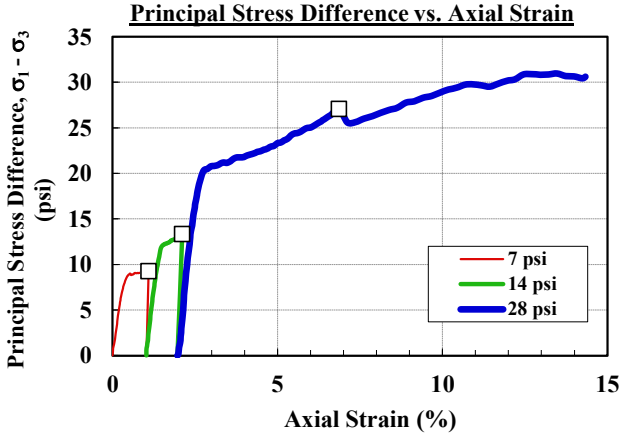
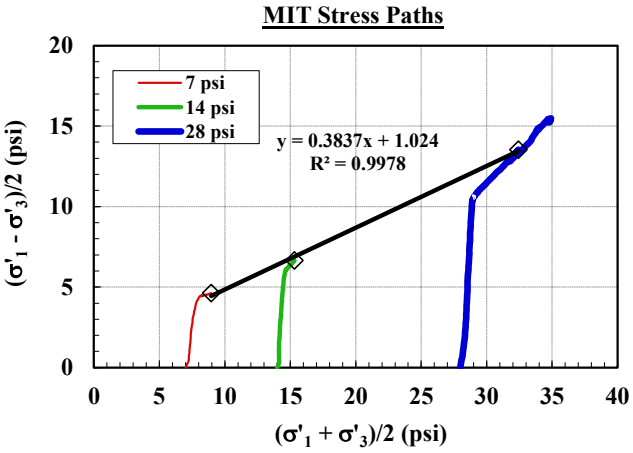
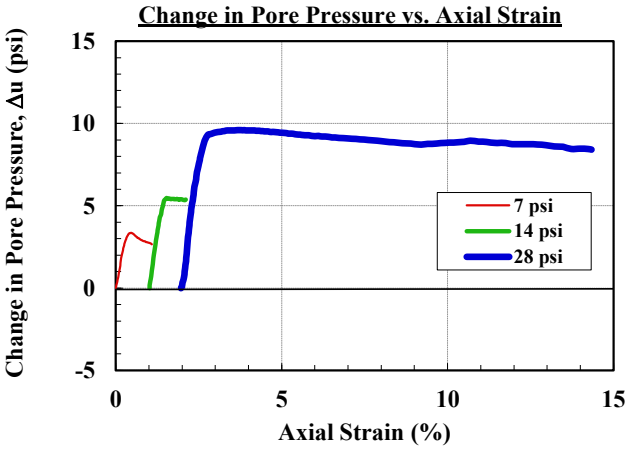
Multi-Stage CU Triaxial Compression Test Appendix

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Specimen: ECP-317 (28-30 ft)

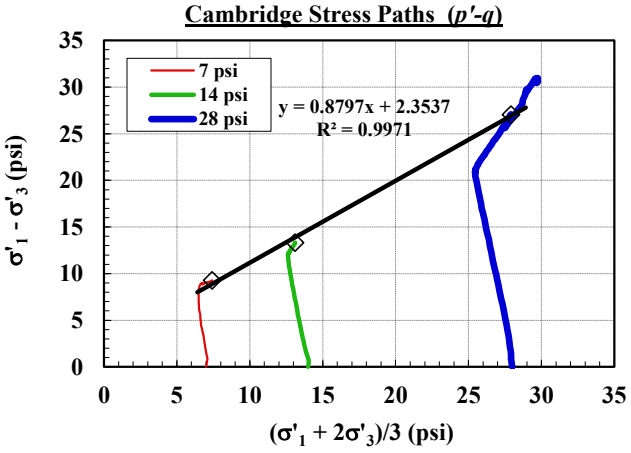
Beyond Project No.: LT2001012
Test Method: ASTM D4767-Modified
Test Date: 02/10/20







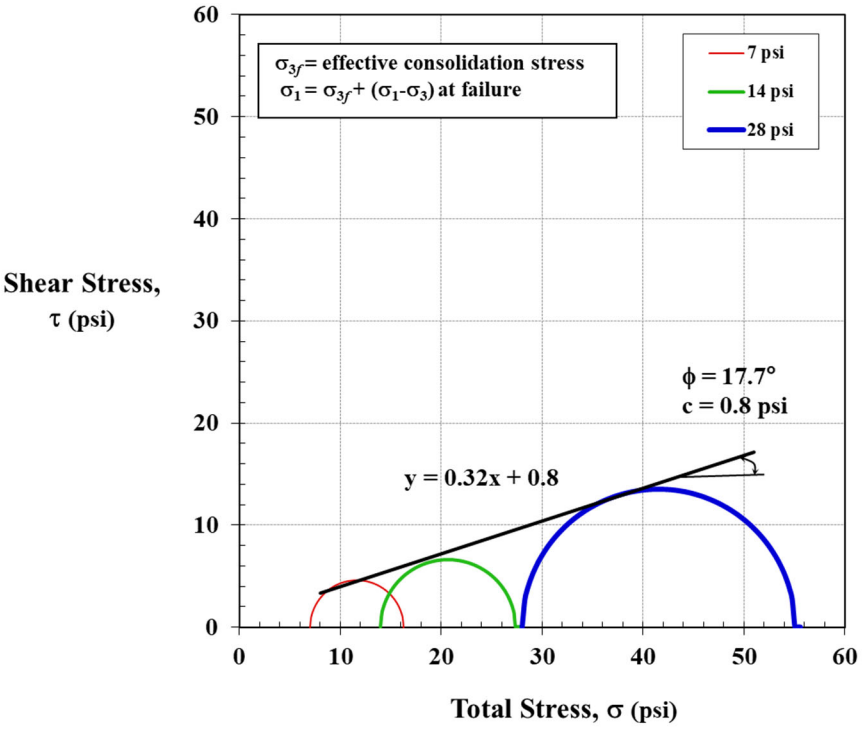
(a) Before



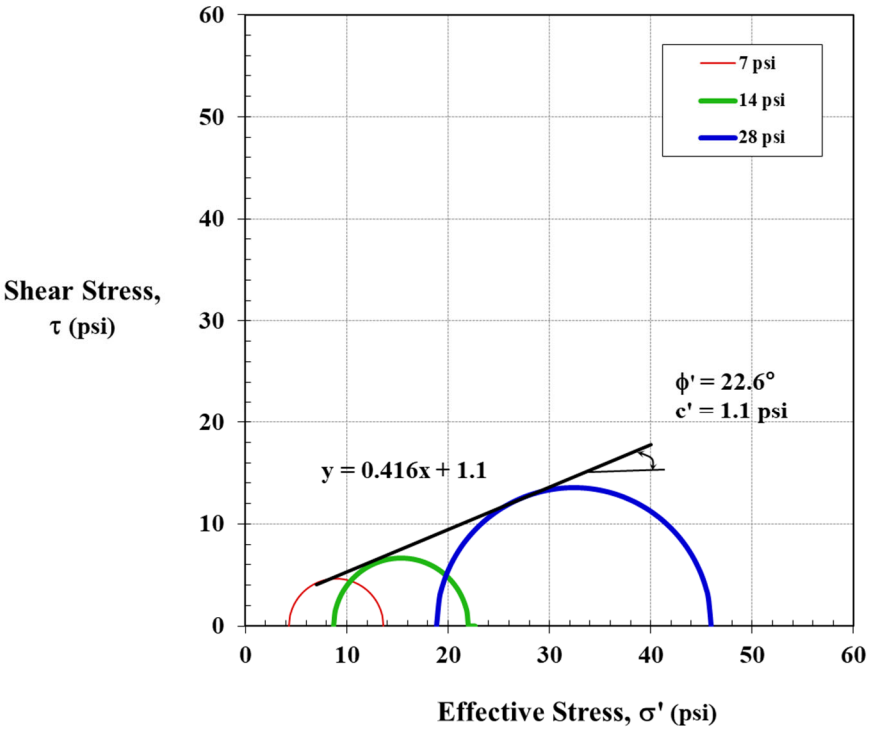
(b) Post-Test

Sample ID.: ECP-317 (28-30 ft)

Mohr Circles (Total Stress)
ECP-317 (28-30 ft) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-317 (28-30 ft) (multi-stage test on single specimen)



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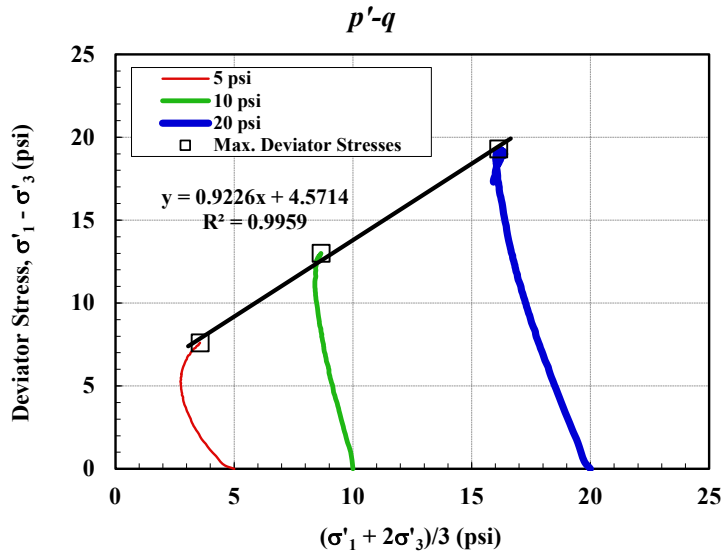
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Test Method: ASTM D4767-Modified

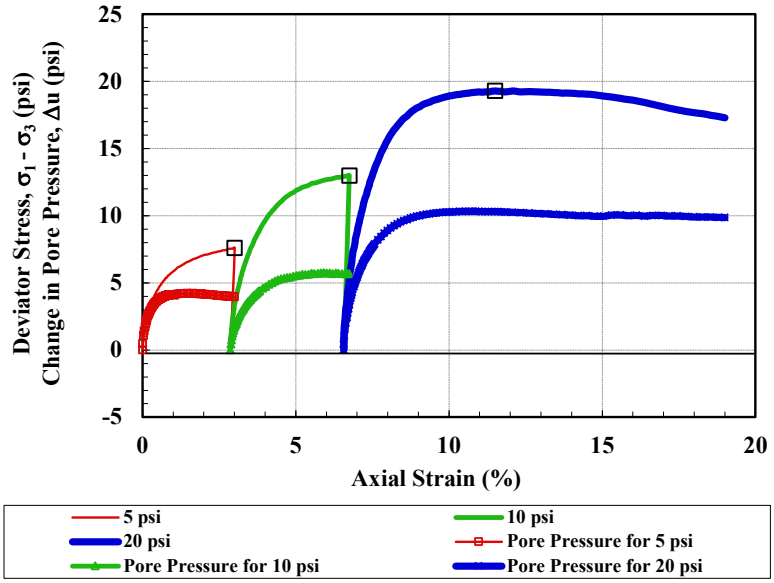
Sample ID.: ECP-319 (16-18 ft)
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2001012
Test Date: 02/14/20

Total Stresses	
Friction Angle, ϕ (°):	**15.1**
Cohesion, c (psi):	**2.0**
Effective Stresses	
Friction Angle, ϕ' (°):	**23.6**
Cohesion, c' (psi):	**2.2**



Initial Specimen Conditions				
Specimen ID.		ECP-319		
Eff. Consolidation Stress (psi)		5	10	20
Depth (ft)		16-18	- -	- -
Avg. Diameter (in)	D_o	2.83	2.83	2.83
Avg. Height (in)	H_o	5.69	5.53	5.31
Avg. Water Content (%)	w_o	34.1	- -	- -
Total Unit Weight (pcf)	γ_{total}	120.5	123.9	129.2
Dry Unit Weight (pcf)	γ_{dry}	89.9	- -	- -
Saturation (%)	S_r	99.8	- -	- -
Void Ratio	e_o	0.97	- -	- -
Specific Gravity (assumed)	G_s	2.83	- -	- -
B-Coefficient	B	0.96	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.86
Area (in^2)	A_1	6.27	6.15	6.17
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	28.0

Deviator Stress and Pore Pressure versus Axial Strain



Peak Stresses at Failure			
Deviator Stress (psi)	7.6	13.0	19.3
Axial Strain (%)	3.0	6.7	11.5
Total Stresses at Failure			
σ_1 (psi)	12.6	23.0	39.3
σ_3 (psi)	5.0	10.0	20.0
Effective Stresses at Failure			
σ'_1 (psi)	8.6	17.3	29.0
σ'_3 (psi)	1.0	4.3	9.7

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

Cheng-Wei Chen, Ph.D. 02/20/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

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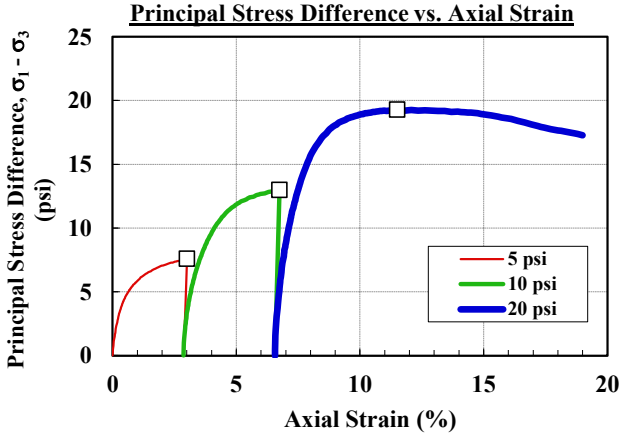
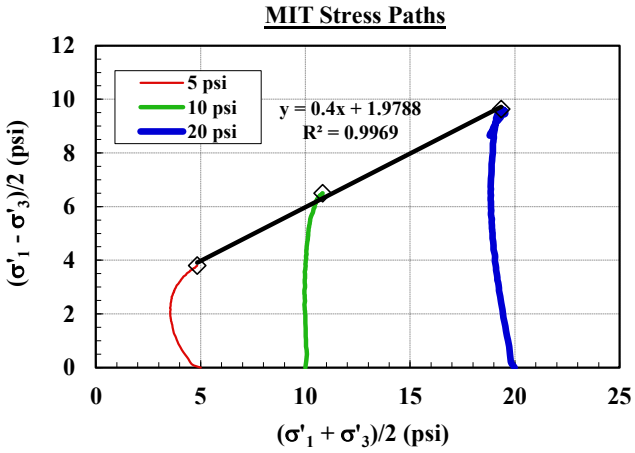
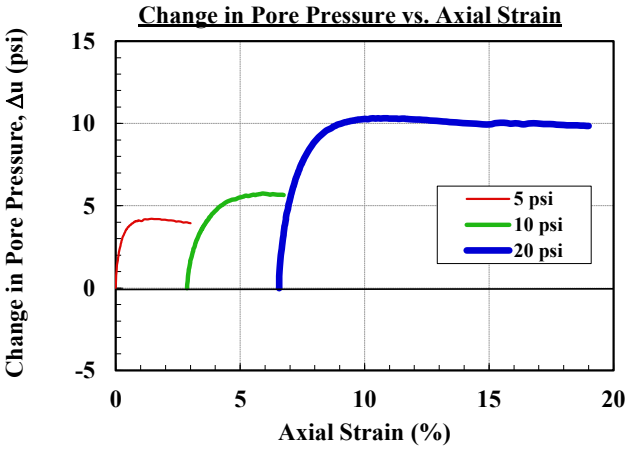
Multi-Stage CU Triaxial Compression Test Appendix

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Specimen: ECP-319 (16-18 ft)

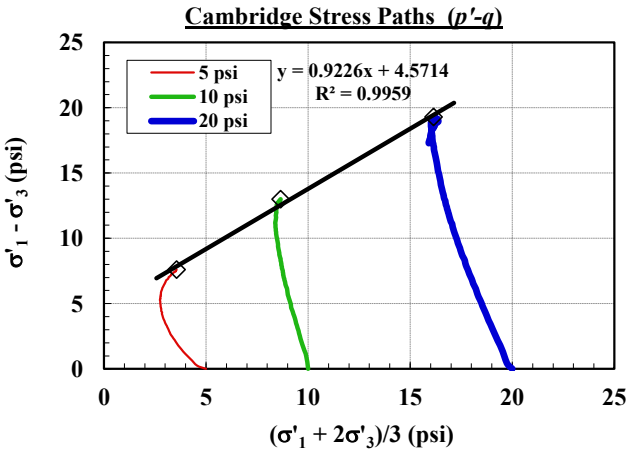
Beyond Project No.: LT2001012
Test Method: ASTM D4767-Modified
Test Date: 02/14/20







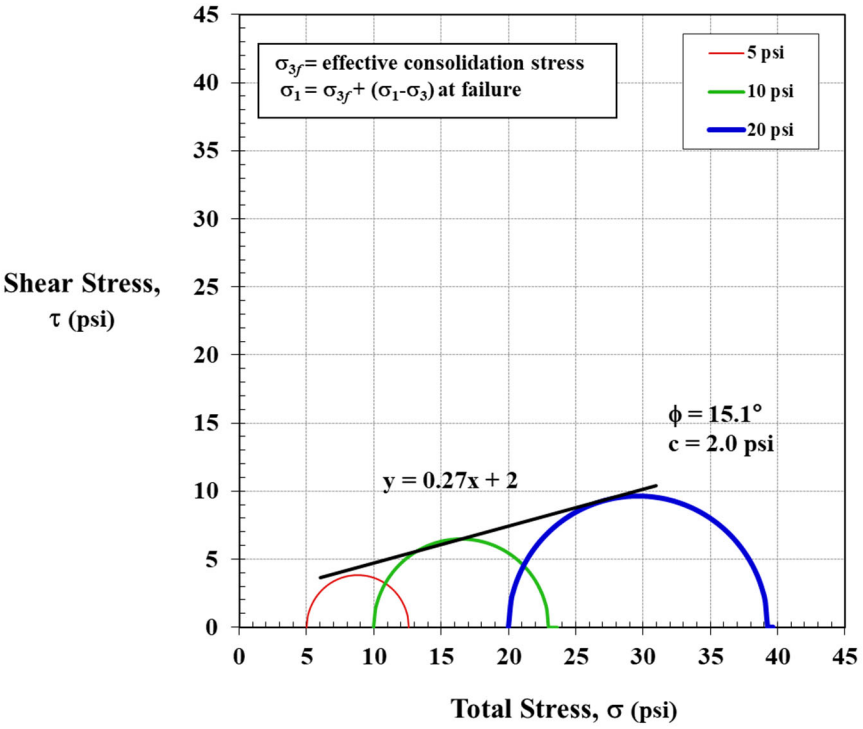
(a) Before



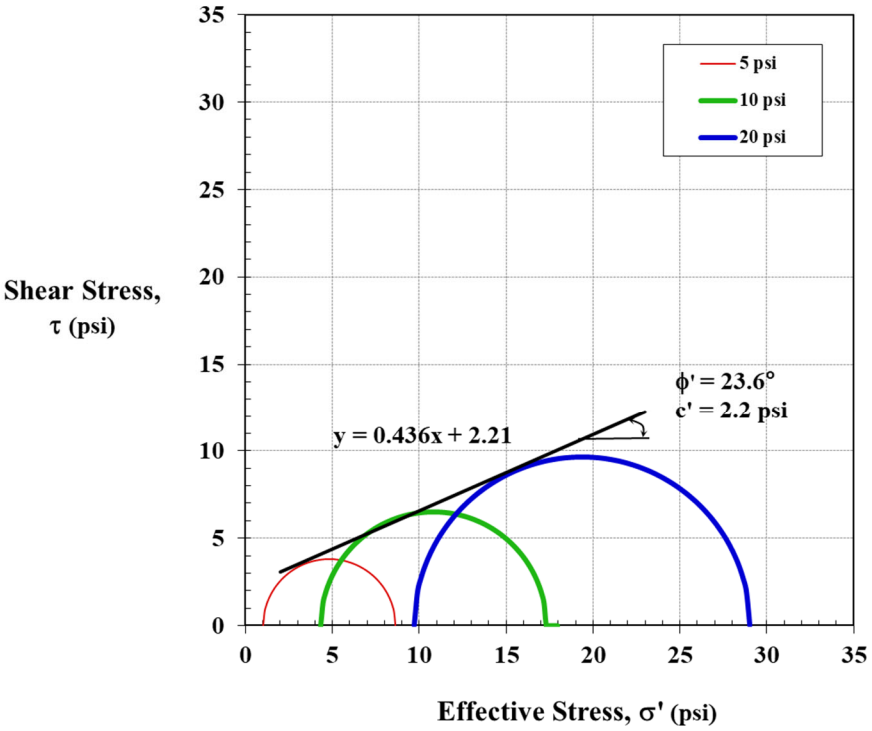
(b) Post-Test

Sample ID.: ECP-319 (16-18 ft)

Mohr Circles (Total Stress)
ECP-319 (16-18 ft) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-319 (16-18 ft) (multi-stage test on single specimen)



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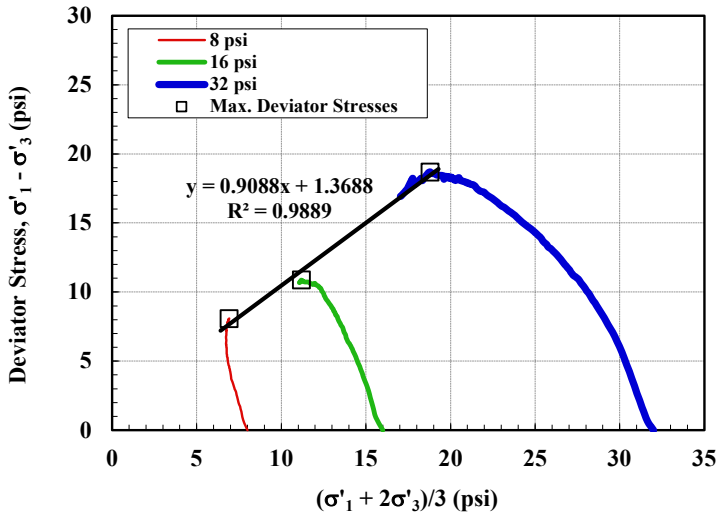
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Test Method: ASTM D4767-Modified

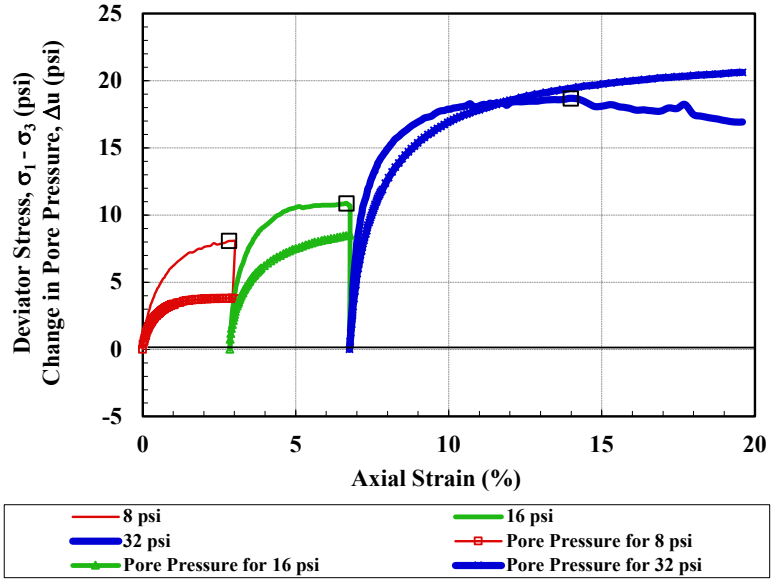
Sample ID.: ECP-321 (33-35 ft)
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2001012
Test Date: 02/10/20

Total Stresses	
Friction Angle, ϕ (°):	**10.8**
Cohesion, c (psi):	**1.8**
Effective Stresses	
Friction Angle, ϕ' (°):	**23.2**
Cohesion, c' (psi):	**0.6**

p'-q



Deviator Stress and Pore Pressure versus Axial Strain



Initial Specimen Conditions				
Specimen ID.		ECP-321		
Eff. Consolidation Stress (psi)		8	16	32
Depth (ft)		33-35	- -	- -
Avg. Diameter (in)	D_o	2.83	2.83	2.83
Avg. Height (in)	H_o	5.68	5.52	5.30
Avg. Water Content (%)	w_o	38.1	- -	- -
Total Unit Weight (pcf)	γ_{total}	113.1	116.3	121.1
Dry Unit Weight (pcf)	γ_{dry}	81.9	- -	- -
Saturation (%)	S_r	97.8	- -	- -
Void Ratio	e_o	1.04	- -	- -
Specific Gravity (assumed)	G_s	2.68	- -	- -
B-Coefficient	B	0.96	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.83
Area (in^2)	A_1	6.26	6.10	6.04
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	32.9

Peak Stresses at Failure			
Deviator Stress (psi)	8.1	10.9	18.7
Axial Strain (%)	2.8	6.7	14.0
Total Stresses at Failure			
σ_1 (psi)	16.1	26.9	50.7
σ_3 (psi)	8.0	16.0	32.0
Effective Stresses at Failure			
σ'_1 (psi)	12.3	18.5	31.3
σ'_3 (psi)	4.2	7.6	12.6

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

Cheng-Wei Chen, Ph.D. 02/20/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

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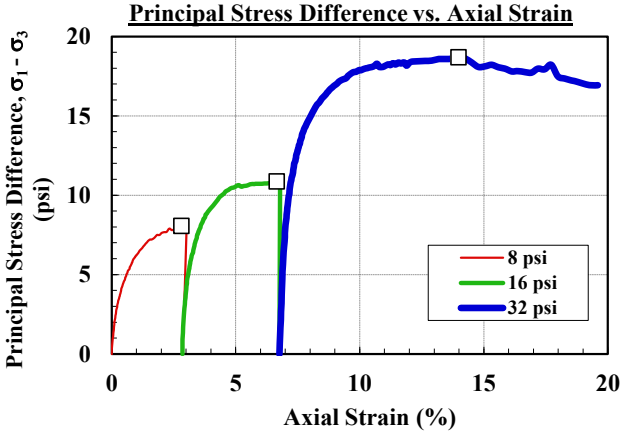
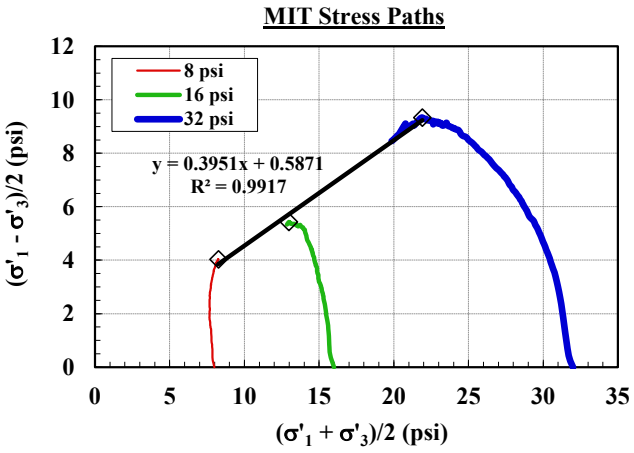
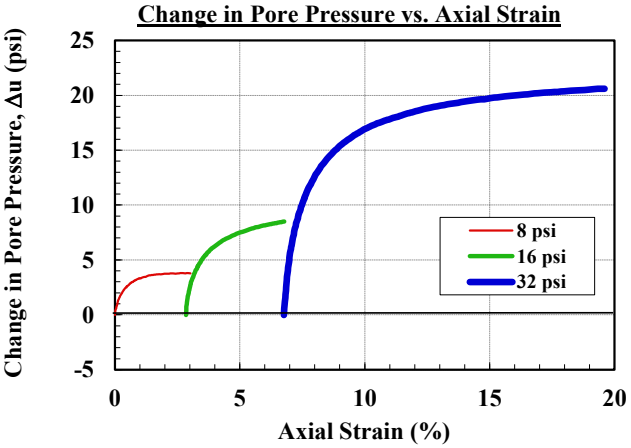
Multi-Stage CU Triaxial Compression Test Appendix

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Specimen: ECP-321 (33-35 ft)

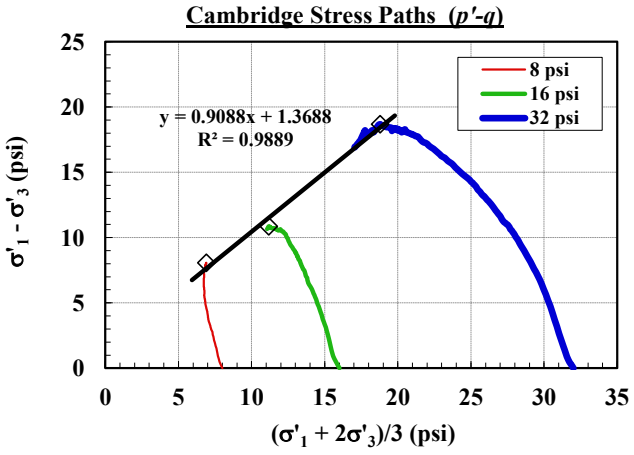
Beyond Project No.: LT2001012
Test Method: ASTM D4767-Modified
Test Date: 02/10/20







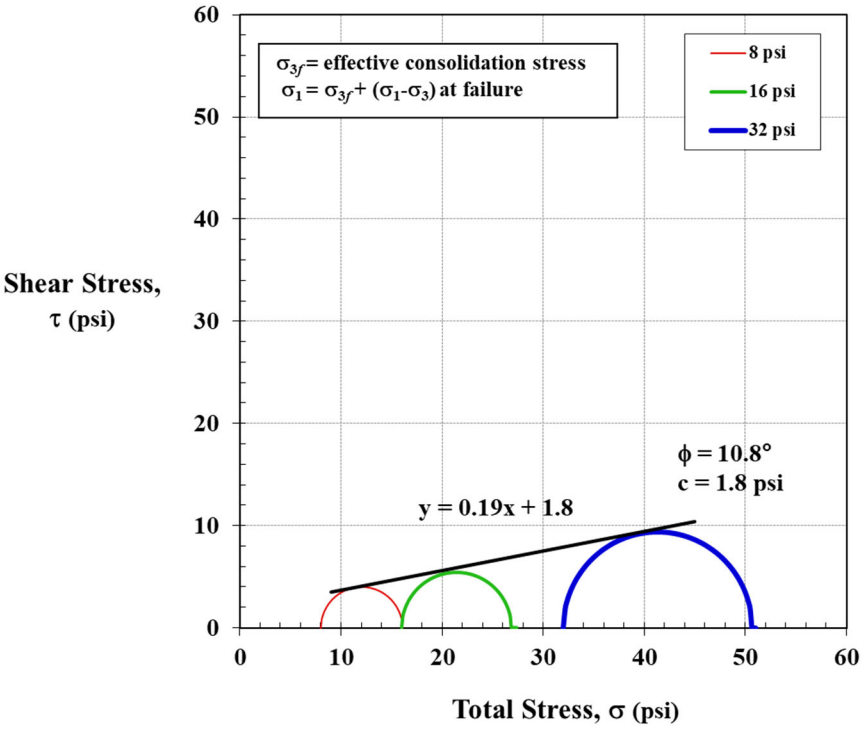
(a) Before



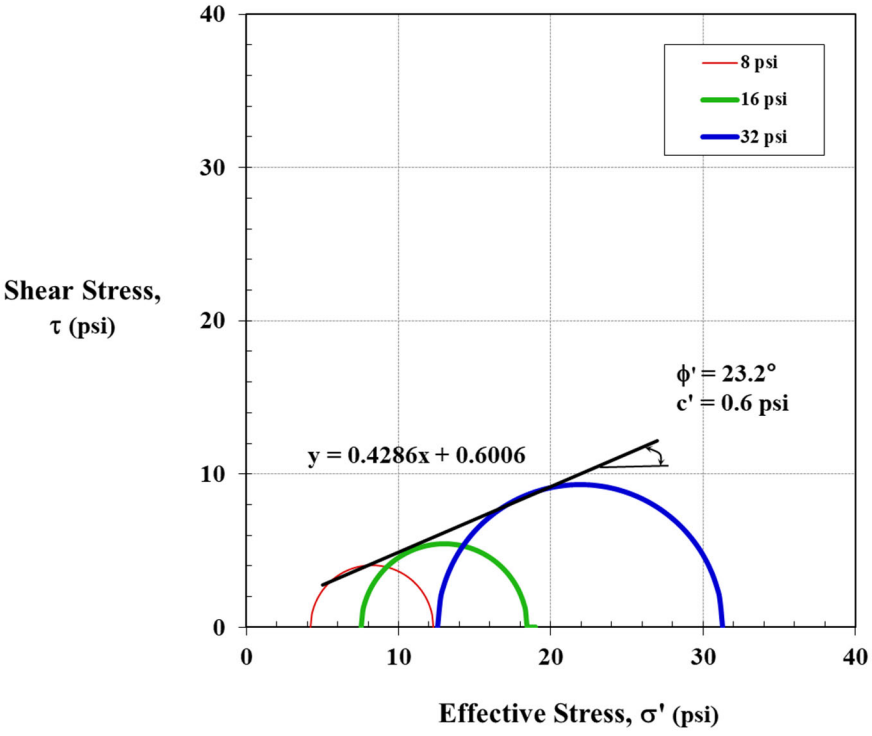
(b) Post-Test

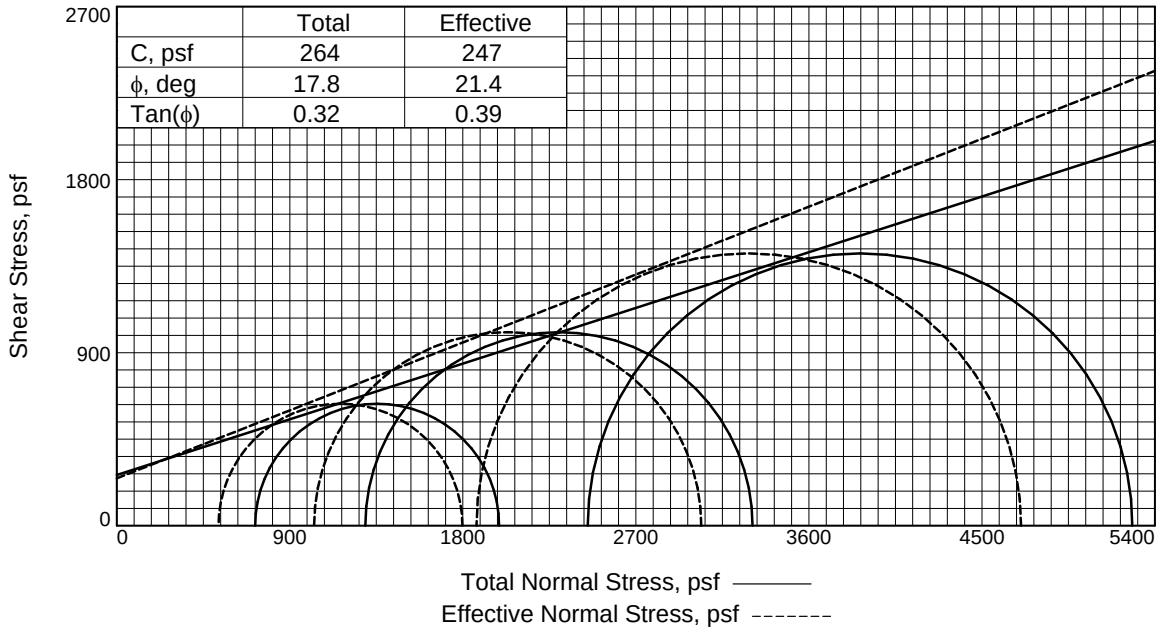
Sample ID.: ECP-321 (33-35 ft)

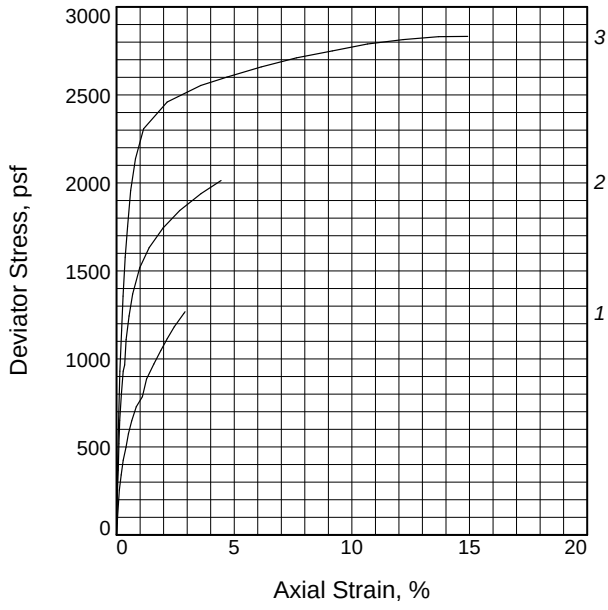
Mohr Circles (Total Stress)
ECP-321 (33-35 ft) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-321 (33-35 ft) (multi-stage test on single specimen)







Sample No.		1	2	3
Initial	Water Content, %	22.5	22.5	22.5
	Dry Density, pcf	104.8	104.8	104.8
	Saturation, %	96.9	96.9	96.9
	Void Ratio	0.6378	0.6378	0.6378
	Diameter, in.	1.99	1.99	1.99
	Height, in.	3.97	3.97	3.97
At Test	Water Content, %	23.1	22.4	21.7
	Dry Density, pcf	104.9	106.3	107.5
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6359	0.6156	0.5970
	Diameter, in.	1.99	2.01	2.04
	Height, in.	3.97	3.86	3.69
Strain rate, in./min.		0.01	0.01	0.01
Eff. Cell Pressure, tsf		0.360	0.647	1.225
Fail. Stress, psf		1269	2014	2833
Total Pore Pr., psf		7391	7467	7779
Strain, %		2.9	4.4	14.9
Ult. Stress, psf				
Total Pore Pr., psf				
Strain, %				
$\bar{\sigma}_1$ Failure, psf		1798	3040	4704
$\bar{\sigma}_3$ Failure, psf		529	1027	1871

Type of Test:
CU with Pore Pressures
Sample Type: undisturbed
Description: Dark Gray, LEAN CLAY (CL)

LL= 45 **PL=** 19 **PI=** 26
Assumed Specific Gravity= 2.75
Remarks: % Passing #200 Sieve = 85.2
Multi-Staged

Figure 1

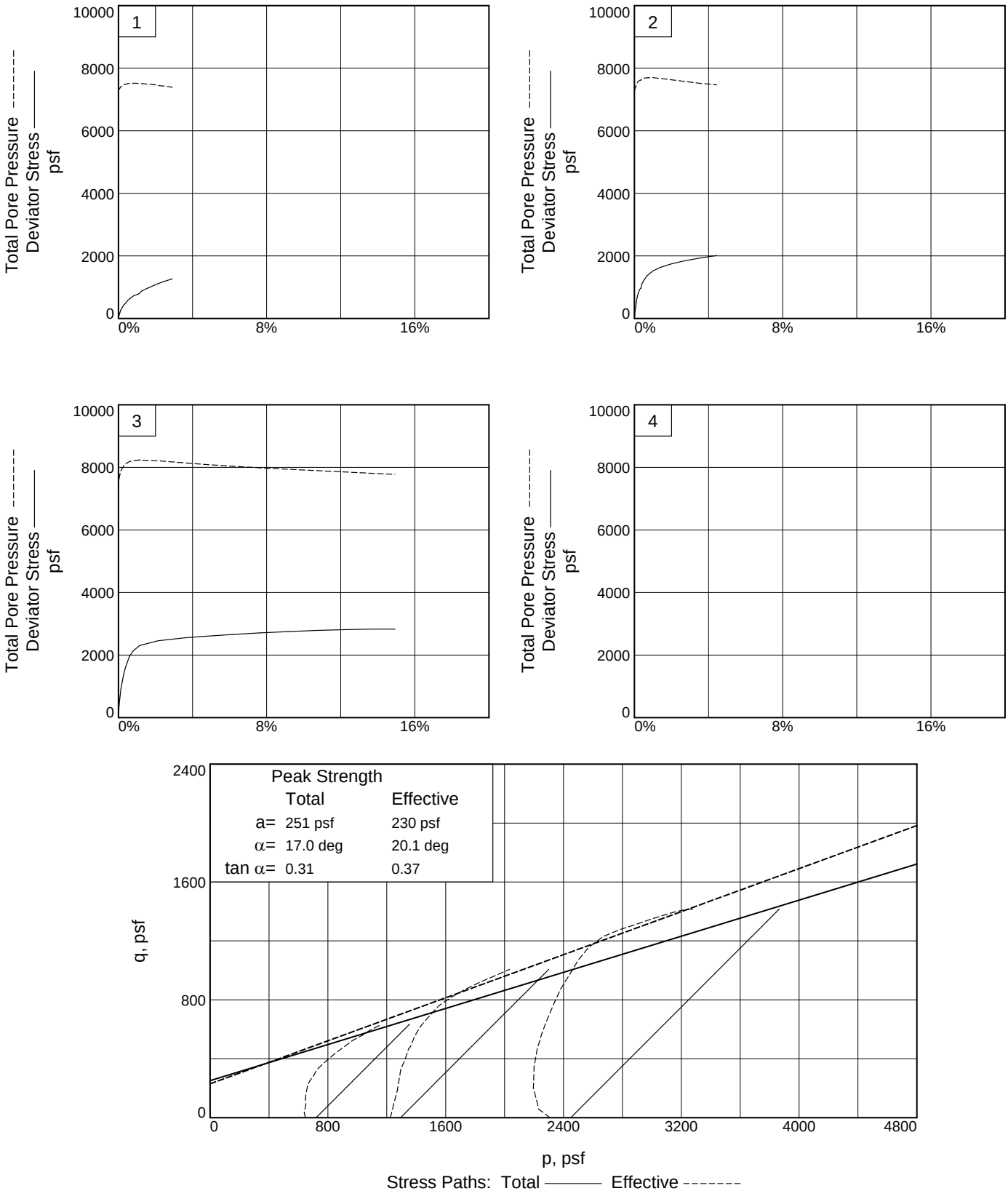
Client: HDR Engineering, Inc.

Project: Houston Ship Channel Expansion Channel Improvement Project

Source of Sample: ECP-426D **Depth:** 16-18'
Sample Number: 10
Proj. No.: HG1910092.2.1 **Date Sampled:** 9/2/2020

HVJ ASSOCIATES
6120 S. Dairy Ashford Rd.
Houston, TX 77072-1010

Tested By: KC **Checked By:** SW



Client: HDR Engineering, Inc.

Project: Houston Ship Channel Expansion Channel Improvement Project

Source of Sample: ECP-426D **Depth:** 16-18' **Sample Number:** 10

Project No.: HG1910092.2.1 **Figure** 2

HVJ ASSOCIATES, INC.

Tested By: KC **Checked By:** SW

Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

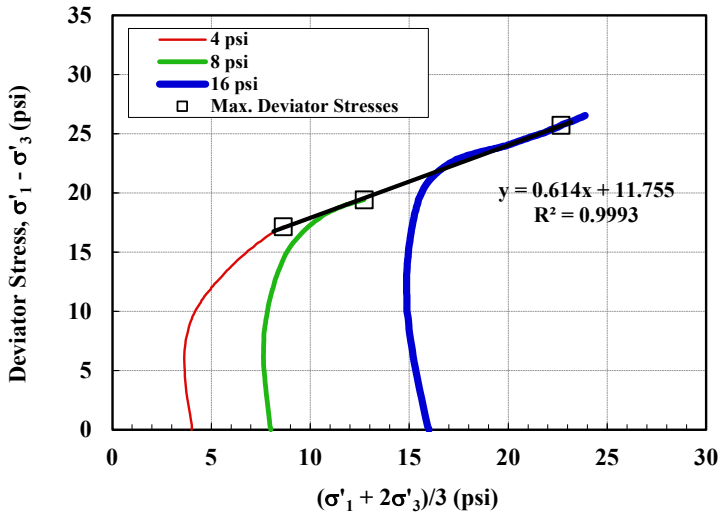
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Test Method: ASTM D4767-Modified

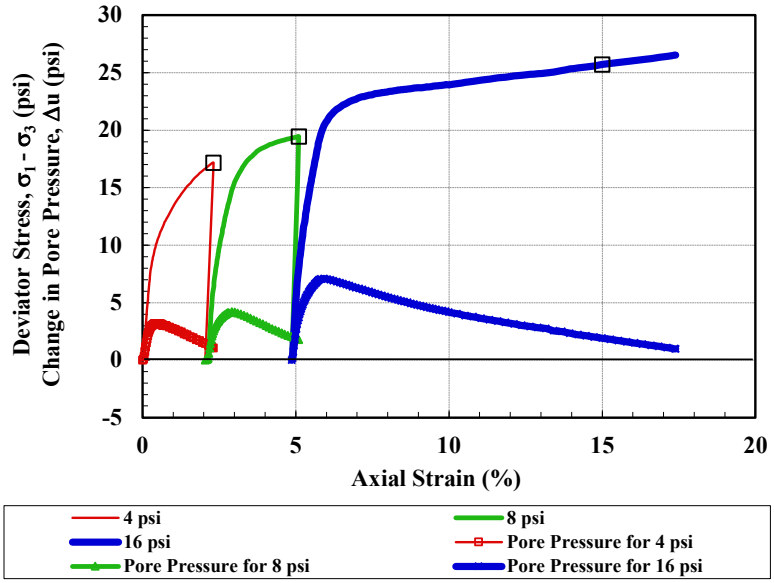
Sample ID.: ECP-2003 (10-12 ft)
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2001012
Test Date: 03/25/20

Total Stresses	
Friction Angle, ϕ (°):	**16.4**
Cohesion, c (psi):	**5.0**
Effective Stresses	
Friction Angle, ϕ' (°):	**16.2**
Cohesion, c' (psi):	**5.6**

p'-q



Deviator Stress and Pore Pressure versus Axial Strain



Initial Specimen Conditions				
Specimen ID.		ECP-2003		
Eff. Consolidation Stress (psi)		4	8	16
Depth (ft)		10-12	- -	- -
Avg. Diameter (in)	D_o	2.77	2.77	2.77
Avg. Height (in)	H_o	5.68	5.56	5.36
Avg. Water Content (%)	w_o	15.2	- -	- -
Total Unit Weight (pcf)	γ_{total}	132.0	134.7	139.8
Dry Unit Weight (pcf)	γ_{dry}	114.6	- -	- -
Saturation (%)	S_r	88.6	- -	- -
Void Ratio	e_o	0.46	- -	- -
Specific Gravity (assumed)	G_s	2.68	- -	- -
B-Coefficient	B	0.96	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.45
Area (in^2)	A_1	6.03	6.03	6.00
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	22.0

Peak Stresses at Failure			
Deviator Stress (psi)	17.2	19.4	25.7
Axial Strain (%)	2.3	5.1	15.0
Total Stresses at Failure			
σ_1 (psi)	21.2	27.5	41.7
σ_3 (psi)	4.0	8.0	16.0
Effective Stresses at Failure			
σ'_1 (psi)	20.1	25.7	39.8
σ'_3 (psi)	2.9	6.2	14.1

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

Cheng-Wei Chen, Ph.D. 04/01/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

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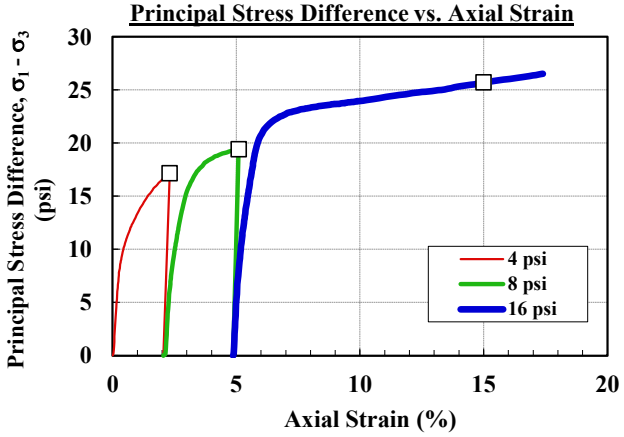
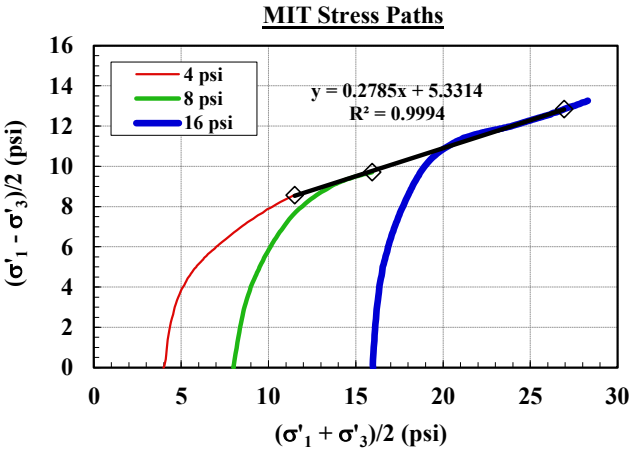
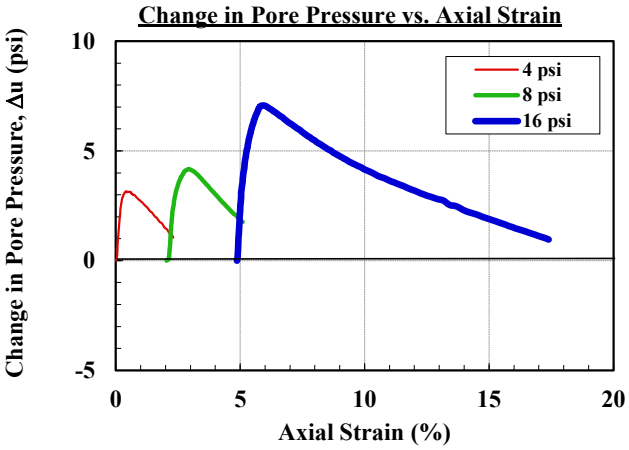
Multi-Stage CU Triaxial Compression Test Appendix

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Specimen: ECP-2003 (10-12 ft)

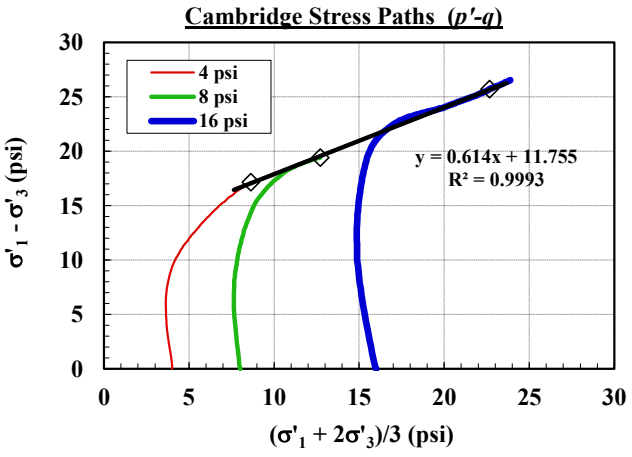
Beyond Project No.: LT2001012
Test Method: ASTM D4767-Modified
Test Date: 03/25/20

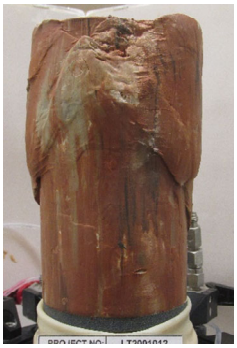






(a) Before

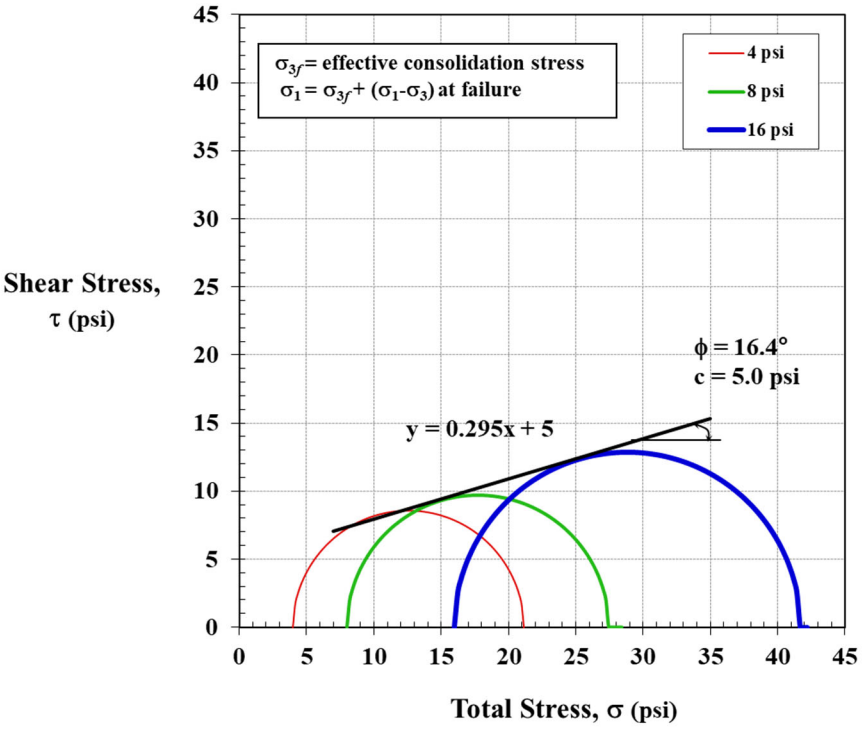




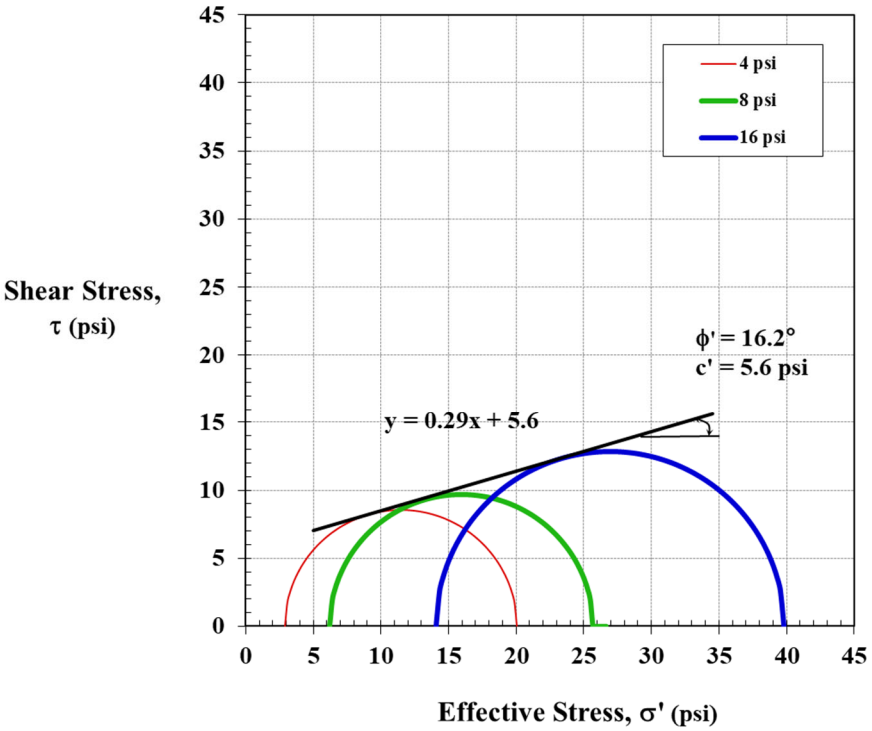
(b) Post-Test

Sample ID.: ECP-2003 (10-12 ft)

Mohr Circles (Total Stress)
ECP-2003 (10-12 ft) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-2003 (10-12 ft) (multi-stage test on single specimen)



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(512) 358-6048

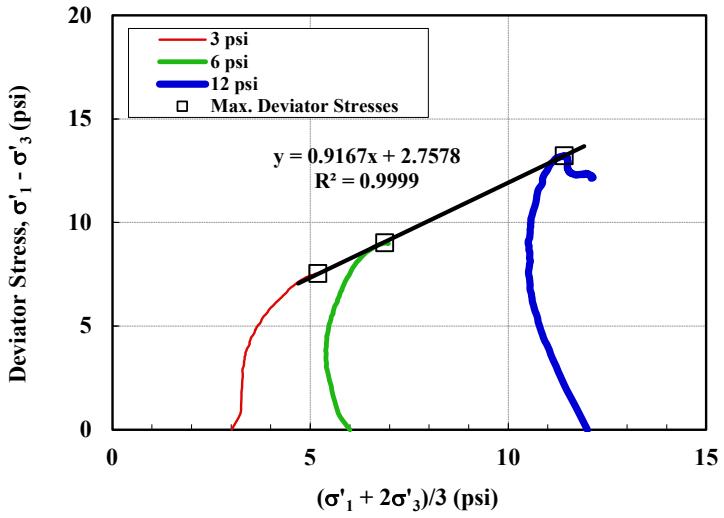
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Test Method: ASTM D4767-Modified

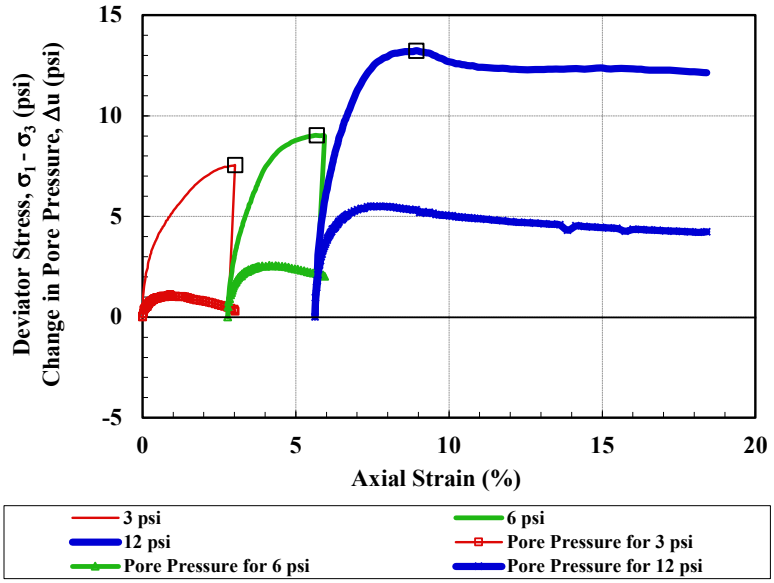
Sample ID.: ECP-2004 (6-8 ft) (4Q/B
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2001012
Test Date: 02/16/20

Total Stresses	
Friction Angle, ϕ (°):	**14.1**
Cohesion, c (psi):	**2.1**
Effective Stresses	
Friction Angle, ϕ' (°):	**23.4**
Cohesion, c' (psi):	**1.3**

p'-q



Deviator Stress and Pore Pressure versus Axial Strain



Initial Specimen Conditions				
Specimen ID.		ECP-2004		
Eff. Consolidation Stress (psi)		3	6	12
Depth (ft)		6-8 (4Q/B)	- -	- -
Avg. Diameter (in)	D_o	2.80	2.80	2.80
Avg. Height (in)	H_o	5.68	5.53	5.33
Avg. Water Content (%)	w_o	35.5	- -	- -
Total Unit Weight (pcf)	γ_{total}	115.7	118.9	123.4
Dry Unit Weight (pcf)	γ_{dry}	85.4	- -	- -
Saturation (%)	S_r	99.2	- -	- -
Void Ratio	e_o	0.96	- -	- -
Specific Gravity (assumed)	G_s	2.68	- -	- -
B-Coefficient	B	0.96	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.91
Area (in^2)	A_1	6.15	6.12	6.08
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	32.6

Peak Stresses at Failure			
Deviator Stress (psi)	7.5	9.0	13.2
Axial Strain (%)	3.0	5.7	8.9
Total Stresses at Failure			
σ_1 (psi)	10.5	15.0	25.2
σ_3 (psi)	3.0	6.0	12.0
Effective Stresses at Failure			
σ'_1 (psi)	10.2	12.9	20.2
σ'_3 (psi)	2.7	3.9	7.0

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

Cheng-Wei Chen, Ph.D. 02/24/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

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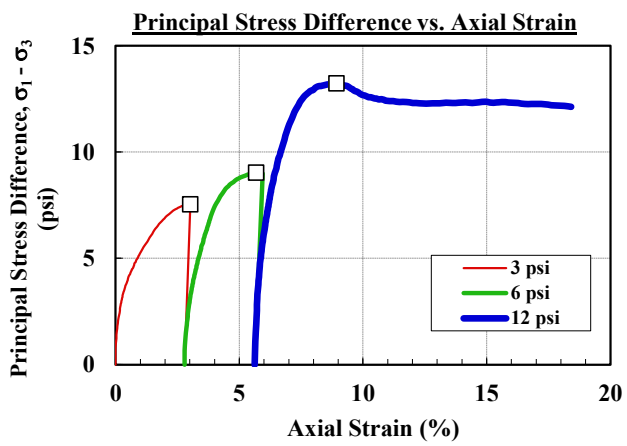
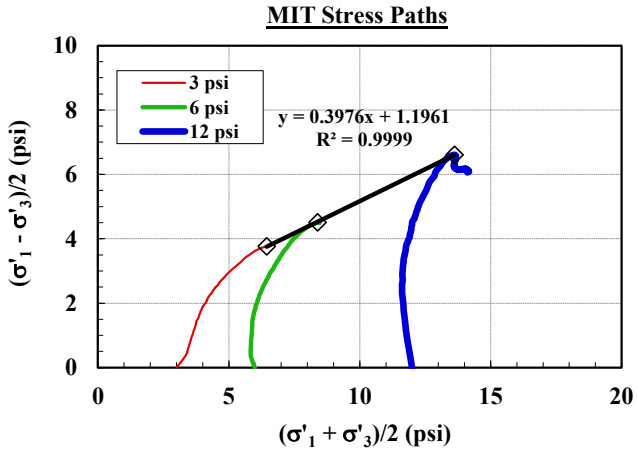
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

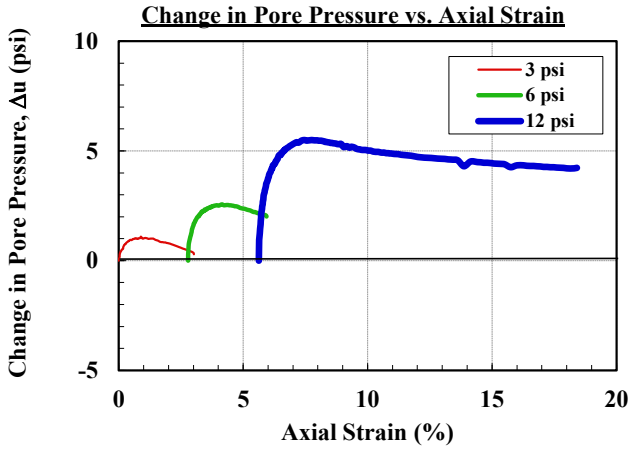
Multi-Stage CU Triaxial Compression Test Appendix

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Specimen: ECP-2004 (6-8 ft) (4Q/B)

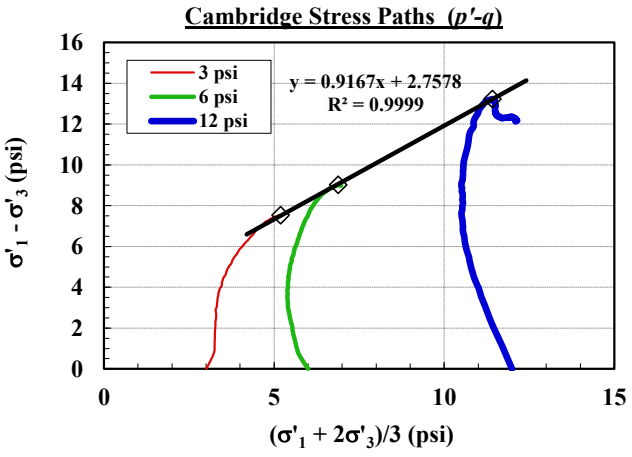
Beyond Project No.: LT2001012
Test Method: ASTM D4767-Modified
Test Date: 02/16/20

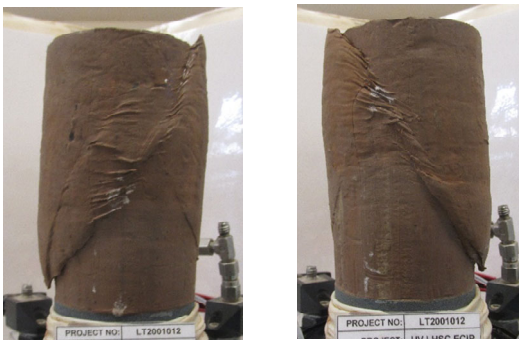






(a) Before

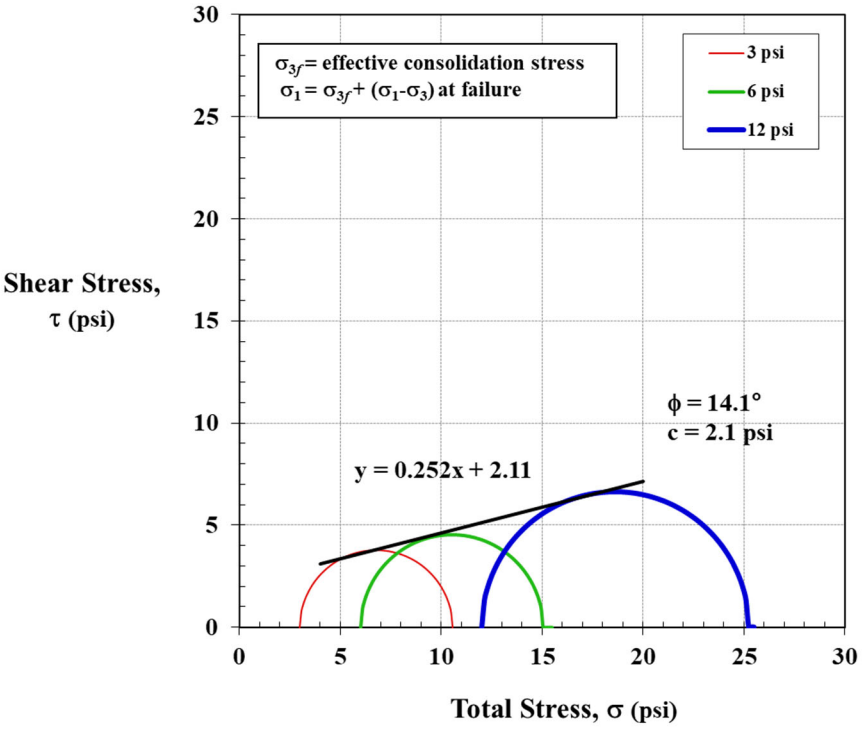




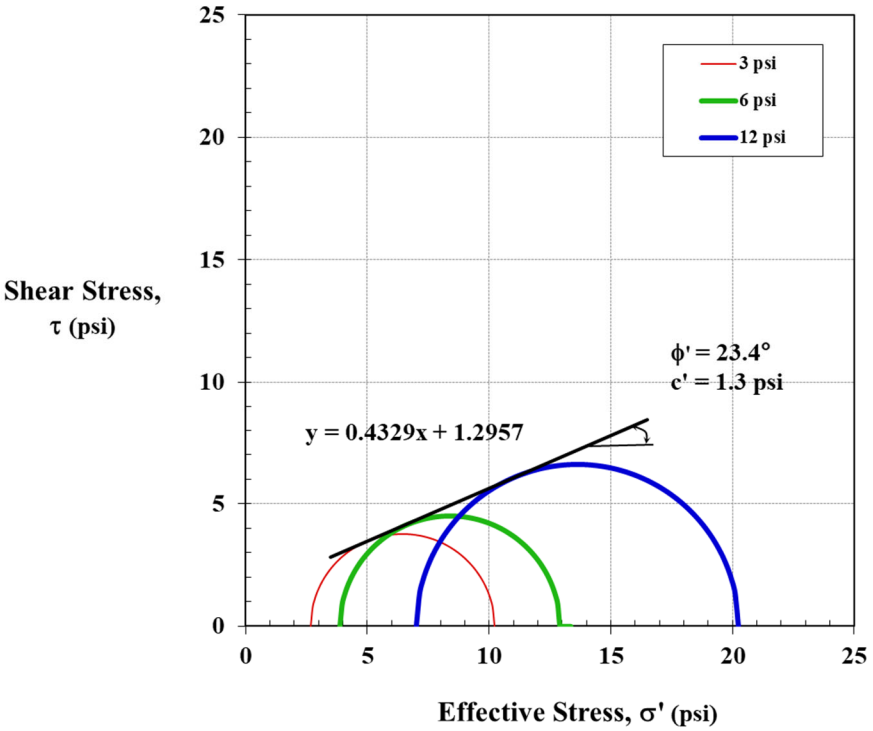
(b) Post-Test

Sample ID.: ECP-2004 (6-8 ft) (4Q/B)

Mohr Circles (Total Stress)
ECP-2004 (6-8 ft) (4Q/B) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-2004 (6-8 ft) (4Q/B) (multi-stage test on single specimen)



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(512) 358-6048

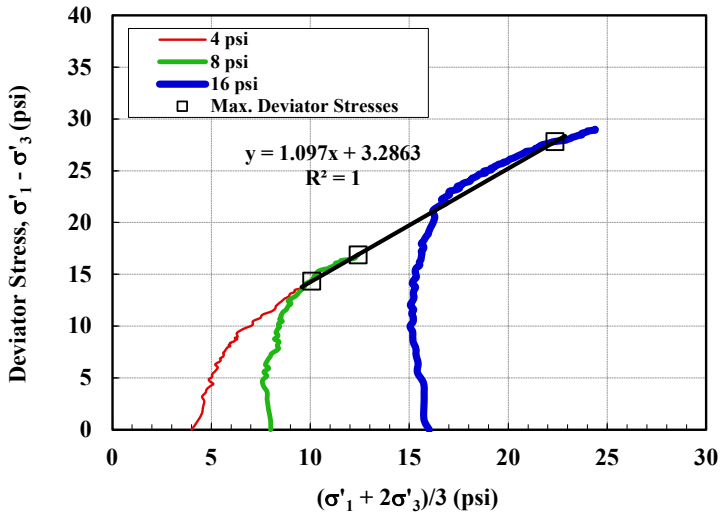
Triaxial Compression Test Report (Multi-stage test on single specimen)

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Test Method: ASTM D4767-Modified

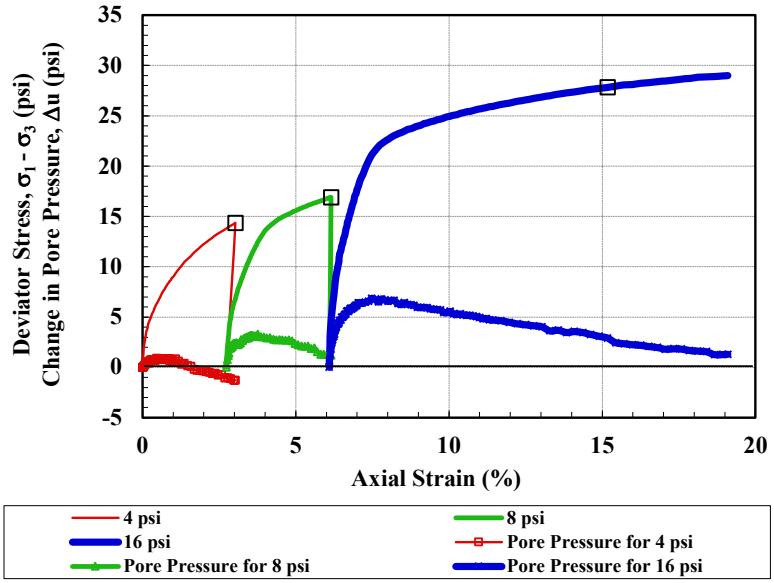
Sample ID.: ECP-2006 (8-10 ft) (5Q)
Type of Specimen: Shelby Tube
Type of Test: CU R-bar, Multi-stage
Strain Rate (%/hr): 0.5 % / hr
Beyond PN: LT2001012
Test Date: 02/14/20

Total Stresses	
Friction Angle, ϕ (^{o}):	**21.4**
Cohesion, c (psi):	**3.0**
Effective Stresses	
Friction Angle, ϕ' (^{o}):	**27.6**
Cohesion, c' (psi):	**1.6**

p'-q



Deviator Stress and Pore Pressure versus Axial Strain



Initial Specimen Conditions				
Specimen ID.		ECP-2006		
Eff. Consolidation Stress (psi)		4	8	16
Depth (ft)		8-10 (5Q)	- -	- -
Avg. Diameter (in)	D_o	2.77	2.77	2.77
Avg. Height (in)	H_o	5.62	5.47	5.24
Avg. Water Content (%)	w_o	18.1	- -	- -
Total Unit Weight (pcf)	γ_{total}	131.9	135.5	141.2
Dry Unit Weight (pcf)	γ_{dry}	111.6	- -	- -
Saturation (%)	S_r	97.3	- -	- -
Void Ratio	e_o	0.50	- -	- -
Specific Gravity (assumed)	G_s	2.68	- -	- -
B-Coefficient	B	0.96	- -	- -
Specimen Conditions after Consolidation				
Void Ratio	e_c	- -	- -	0.25
Area (in^2)	A_1	6.03	6.02	5.31
Saturation (%)	Sr	- -	- -	- -
Avg. Water Content (%)	w_f	- -	- -	20.1

Peak Stresses at Failure			
Deviator Stress (psi)	14.3	16.9	27.8
Axial Strain (%)	3.0	6.1	15.2
Total Stresses at Failure			
σ_1 (psi)	18.3	24.9	43.8
σ_3 (psi)	4.0	8.0	16.0
Effective Stresses at Failure			
σ'_1 (psi)	19.6	23.7	40.9
σ'_3 (psi)	5.3	6.8	13.1

Note: Specimen was mounted in the triaxial cells using the back-pressure saturation method. Failure was determined at the maximum deviator stress or deviator stress at 15% axial strain, which ever is obtained first.

Cheng-Wei Chen, Ph.D. 02/20/20
Analysis & Quality Review/Date
Specimen prepared by: T.D.

Beyond Engineering & Testing, LLC
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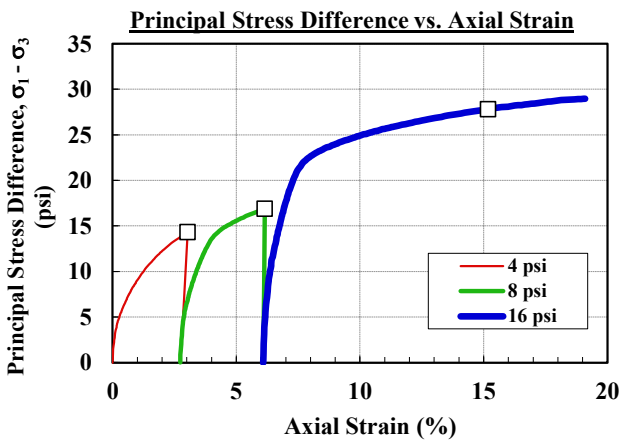
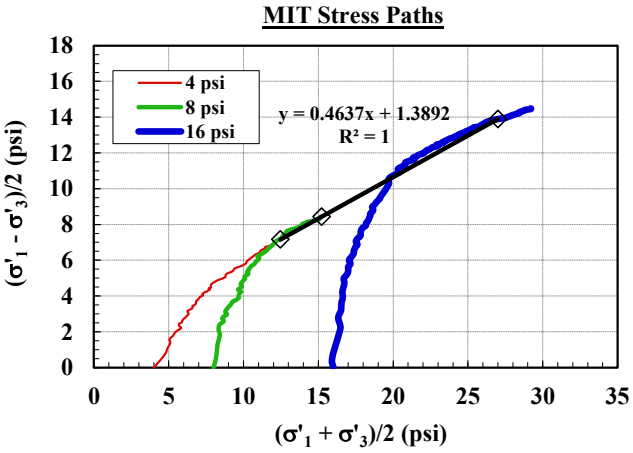
Round Rock, TX 78664
(512) 358-6048

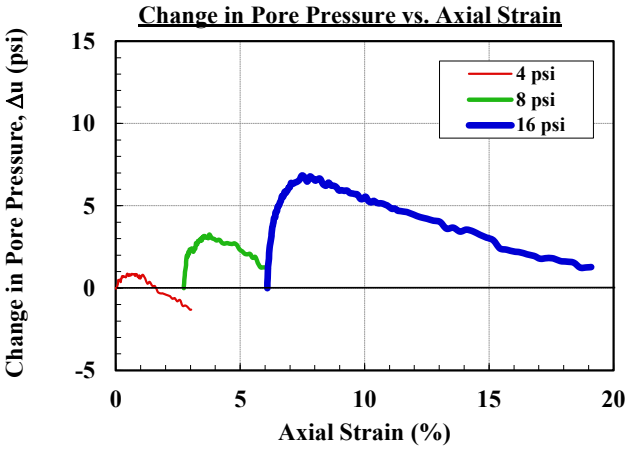
Multi-Stage CU Triaxial Compression Test Appendix

Client: HVJ Associates, Inc.
Project: IHSC ECIP (PN: HG1910092.2.1)
Specimen: ECP-2006 (8-10 ft) (5Q)

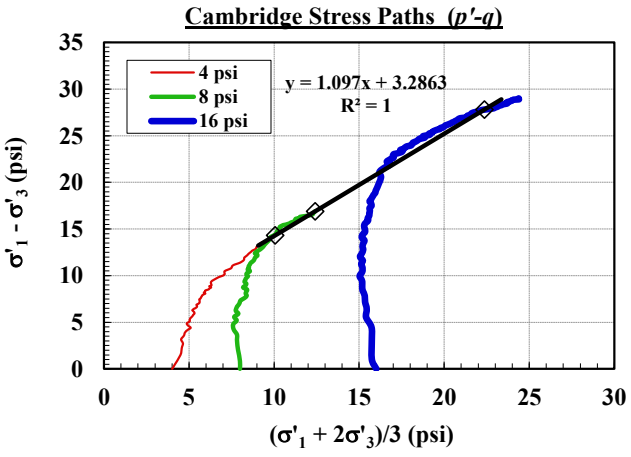
Beyond Project No.: LT2001012
Test Method: ASTM D4767-Modified
Test Date: 02/14/20







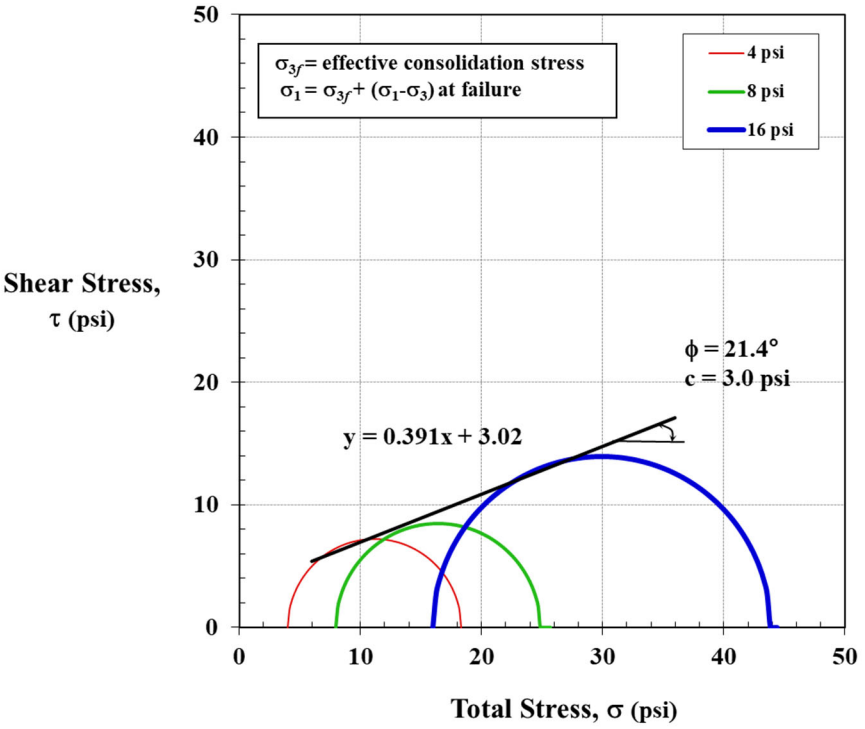
(a) Before



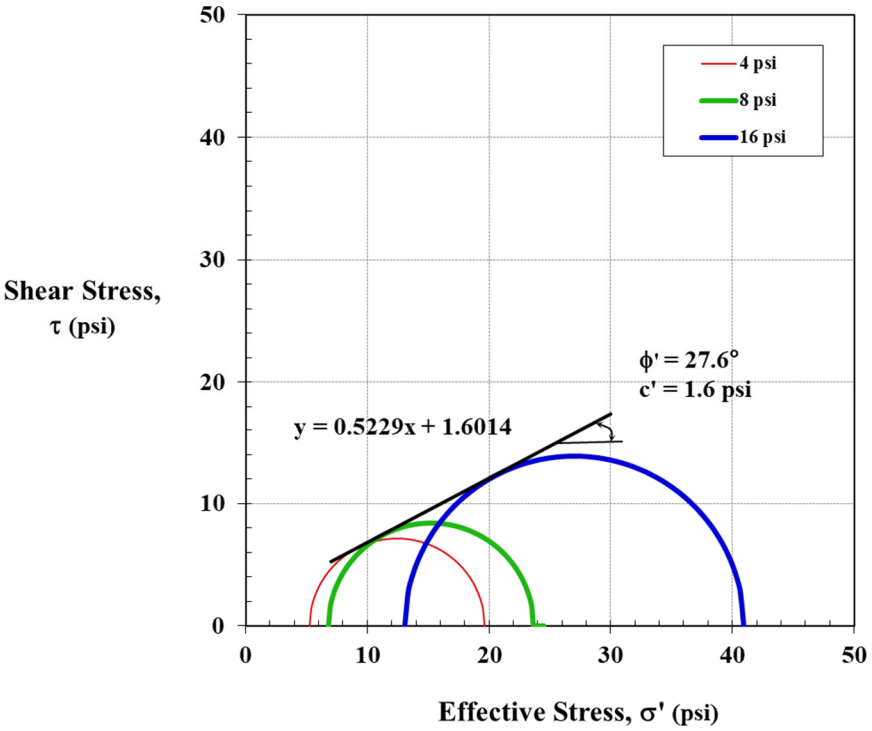
(b) Post-Test

Sample ID.: ECP-2006 (8-10 ft) (5Q)

Mohr Circles (Total Stress)
ECP-2006 (8-10 ft) (5Q) (multi-stage test on single specimen)



Mohr Circles (Effective Stress)
ECP-2006 (8-10 ft) (5Q) (multi-stage test on single specimen)



"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name: *HVJ Project 11* ***Classification:*** *Lean Clay (CL), w/ calc. nodules, Yellowish Brown*

PSI Project Number: *286-2245* ***Boring Number:*** *ECP-2020* ***Depth, feet:*** *6-8 ft* ***Sample No./ID:*** *S-4*

Liquid Limit: *44* ***Plastic Limit:*** *26* ***Plasticity Index:*** *18* ***Percent Passing No. 200:*** *95*

Specimen/Stage Data	Before Test			After Consolidation/Shear		
Specimen/Stage No.	1	2	3	1	2	3
Diameter (D),in.:	2.835	2.891	2.986	2.891	2.986	3.268
Height (H), in.:	5.572	5.349	5.002	5.349	5.002	4.144
Correc. Dia. After Consol (D_c),in.:	2.833	2.891	2.982	-	-	-
Correc. Ht. After Consol (H_c), in.:	5.572	5.337	4.978	-	-	-
Corrected Cross-Sec. Area, in^2	6.304	6.565	6.983	6.566	7.003	8.387
Volume (Vo, Vf = Vo -ΔV), cm^3:	576.4	575.4	574.0	575.6	574.1	569.6
Moisture, {Wo, Wf} %:	22.0%	22.1%	21.9%	22.1%	21.9%	21.5%
Wet Soil Wt. {Mo, Mf}, ,gm:	1204.60	1203.80	1202.50	1203.80	1202.50	1198.10
Wet Unit Weight, pcf:	130.4	130.55	130.7	130.5	130.70	131.3
Dry Unit Weight, pcf:	106.9	106.9	107.2	106.9	107.2	108.0
Specific Gravity (Assumed):	2.75	2.75	2.75	2.75	2.75	2.75
Void Ratio, eo, ef:	0.61	0.60	0.60	0.61	0.60	0.59
Degree of Saturation, So, Sf:	1.00	1.00	1.00	1.00	1.00	1.00

Description		Saturation/Consolidation		
Specimen/Stage No.		1	2	3
Method		Wet Mounting Method		
Cell Pressure, lbs/in^2		12.0	16.0	24.0
Back Pressure, lbs/in^2		8.0	8.0	8.1
B-Parameter		0.97	0.98	0.98
Consolidation Pressure, lbs/in^2		4.0	8.0	16.0
Volume Change After (ΔV), cm^3		0.8	1.3	4.4
Time for Consolidation, min.		1445	4320	3075
Failure Type:	*Stage 1*	*Bulge*		
	Stage 2		*Bulge-Fractures*	
	Stage 3			*Bulge-Fractures*

Equipment	Specimen/Stage		
	1	2	3
Oven:	B33ER01048	B33ER01048	B33ER01048
Scale:	AE444189	AE444189	AE444189
Calipers:	7174871	7174871	7174871
Digital Dial:	1849	1849	1849
Load Frame:	Load Frame	0.000	0.000
Load Cell ID:	LC05	LC06	LC06
DCDT:	DCDT-02	DCDT-03	DCDT-03
Cell Pressure Transducer:	PS-12	PS-05	PS-05
Pore Pressure Transducer:	PS01	PS-04	PS-04
Radial Drainage Fliter Strip:	Yes	Yes	Yes

Shear Data	Specimen/Stage		
	1	2	3
Total Shearing Time, min	480	719	1799
Strain Rate, %/hr	0.50	0.53	0.56
Axial Strain at Failure, %	4.00	6.27	14.23
Deviator Stress, lbs/in^2 (Δσ)	13.95	15.63	22.11
Excess Pore Pressure, lbs/in^2 (u)	-2.03	-2.04	-1.31
A-Parameter, (u/Δσ)	-0.15	-0.13	-0.06
Total Major Pincipal Stress, lbs/in^2 ($\sigma 1 = \sigma 3 + \Delta\sigma$)	17.94	23.44	38.04
Total Minor Pincipal Stress, lbs/in^2 ($\sigma 3$)	3.99	7.81	15.94
Effectivel Major Pincipal Stress, lbs/in^2 ($\bar{\sigma}\ \bar{1} = \sigma 1 - u$)	19.96	25.48	39.36
Effectivel Minor Pincipal Stress, lbs/in^2 ($\sigma\ 3 = \sigma 3 - u$)	6.02	9.85	17.25

Remarks: **Failure criteria for stages 1 and 2 selected at maximum strain for stage and failure criteria for stage 3 selected at maximum deviator stress.**

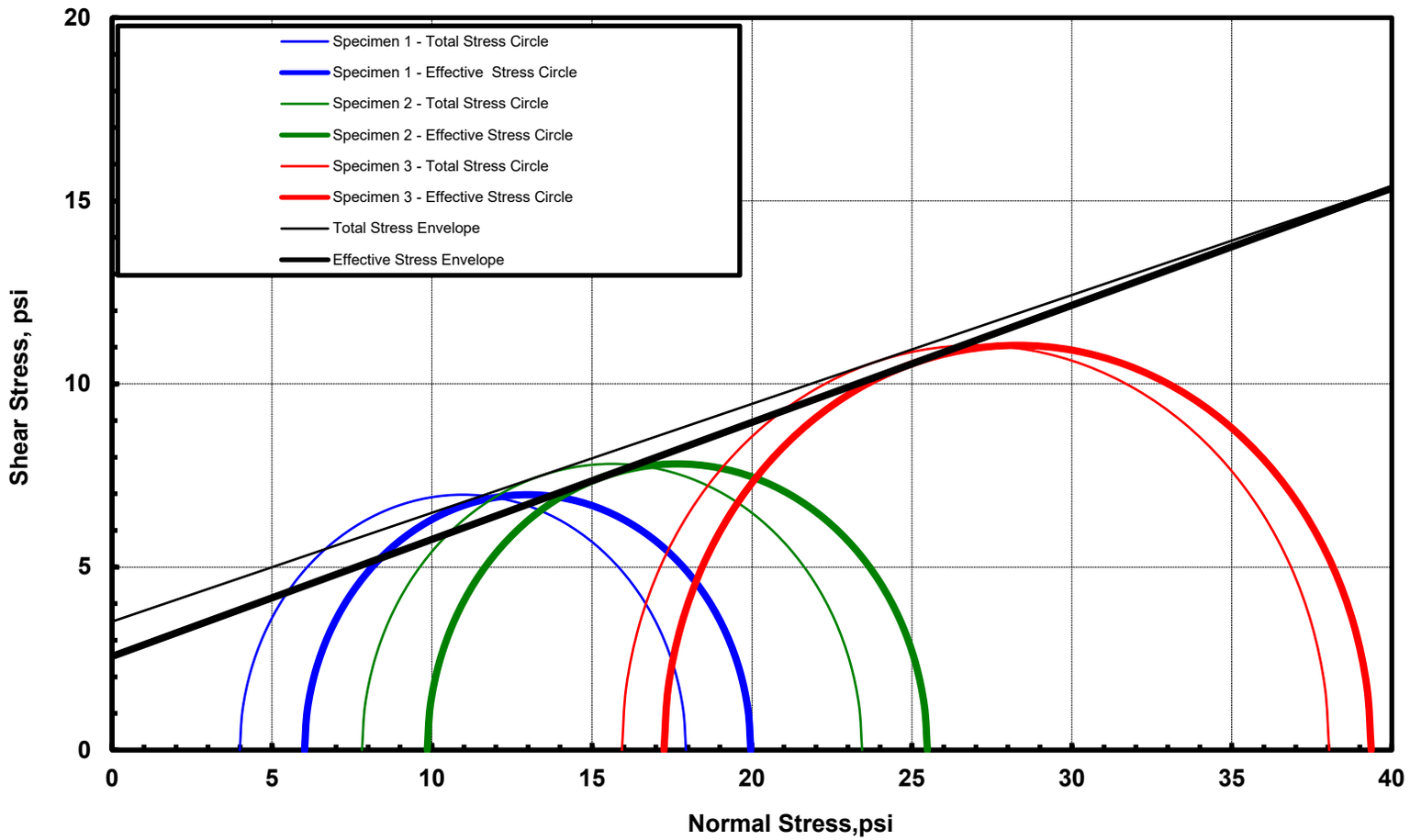
"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name: *HVJ Project 11* ***Classification:*** *Lean Clay (CL), w/ calc. nodules, Yellowish Brown*

Project Number: *286-2245* ***Boring Number:*** *ECP-2020* ***Depth, feet:*** *6-8 ft* ***Sample No./ID:*** *4*

Cohesion (C_T), ksf: *0.51* ***Friction Angle(ϕ_T), deg:*** *16.6* ***Cohesion (C_d), ksf:*** *0.37* ***Friction Angle(ϕ_d), deg:*** *17.7*

Remarks:



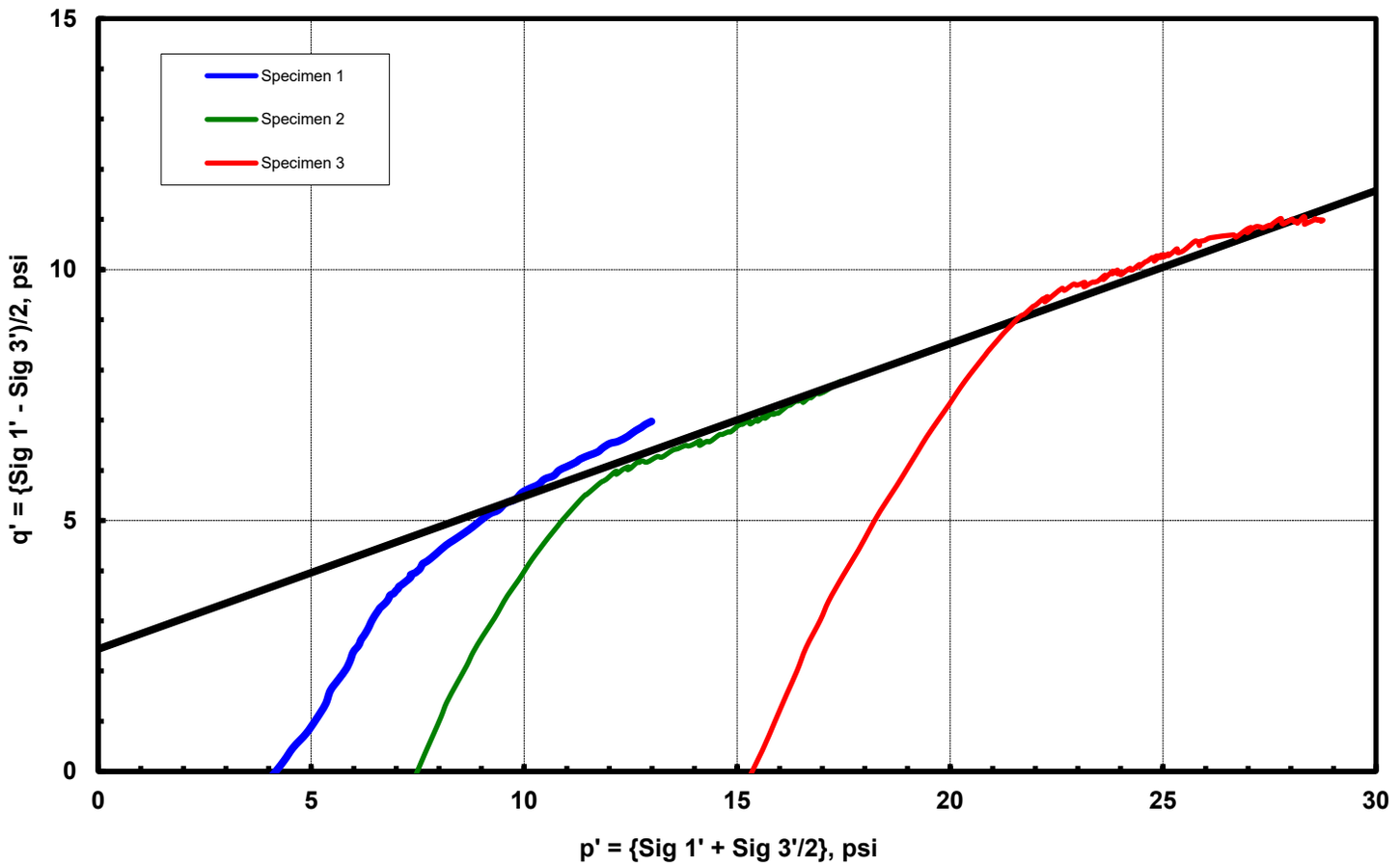
"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name: *HVJ Project 11* ***Classification:*** *Lean Clay (CL), w/ calc. nodules, Yellowish Brown*

Project Number: *286-2245* ***Boring Number:*** *ECP-2020* ***Depth, feet:*** *6-8 ft* ***Sample No./ID:*** *4*

Cohesion (C_d), ksf: *0.35* ***Friction Angle(ϕ_d), deg:*** *17.7*

Remarks:

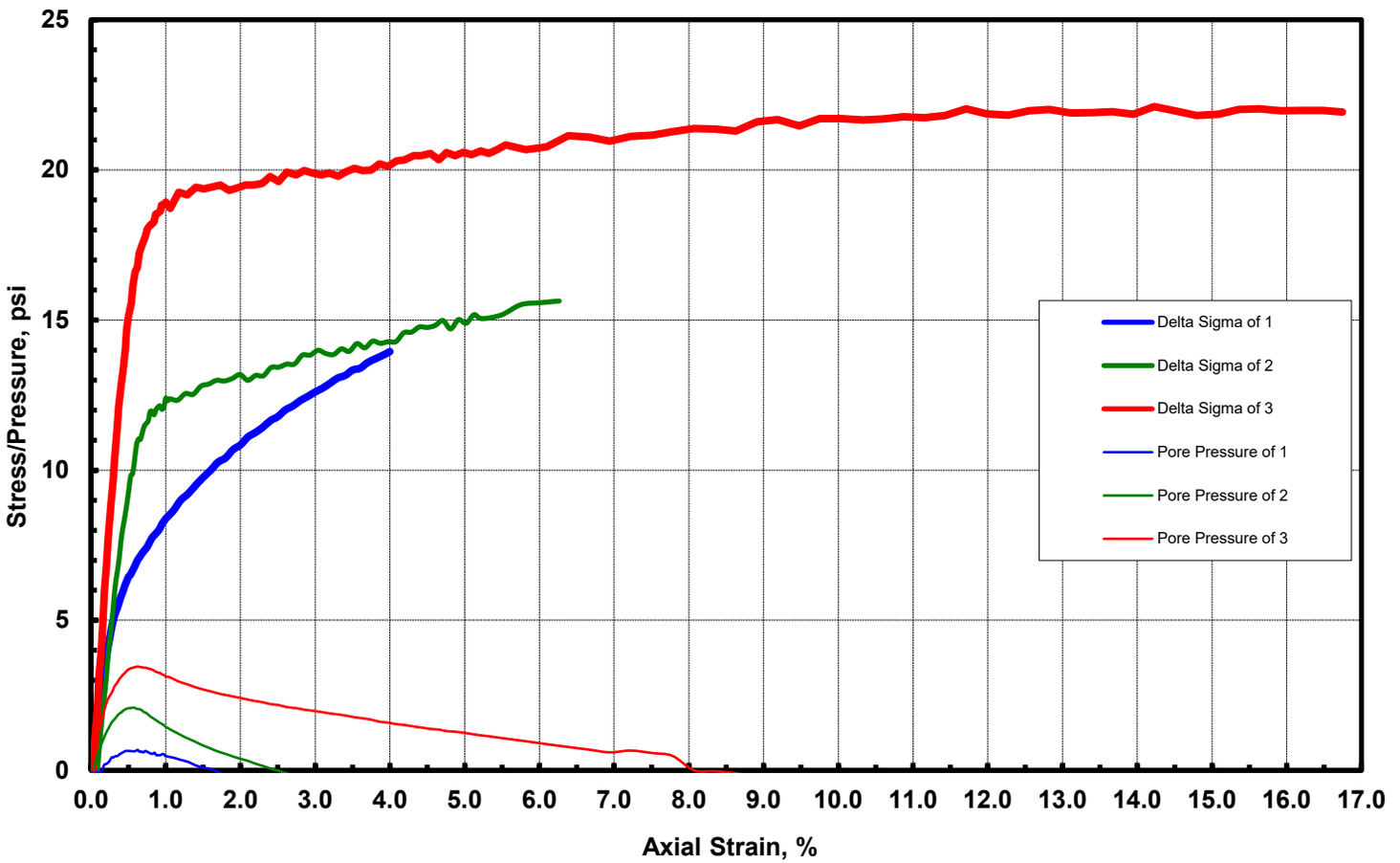


"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name: *HVJ Project 11* ***Classification:*** *Lean Clay (CL), w/ calc. nodules, Yellowish Brown*

Project Number: *286-2245* ***Boring Number:*** *ECP-2020* ***Depth, feet:*** *6-8 ft* ***Sample No./ID:*** *4*

Remarks:



"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name: *HVJ Project 11* ***Classification:*** *Fat Clay (CH), Light Brown*

Project Number: *286-2184* ***Boring Number:*** *ECP-2031* ***Depth, feet:*** *12-14 ft* ***Sample No./ID:*** *NA*

Liquid Limit: *64* ***Plastic Limit:*** *22* ***Plasticity Index:*** *42* ***Percent Passing No. 200:*** *92*

Specimen/Stage Data	Before Test			After Consolidation/Shear		
Specimen/Stage No.	1	2	3	1	2	3
Diameter (D),in.:	2.833	2.861	2.917	2.861	2.917	3.164
Height (H), in.:	5.554	5.443	5.220	5.443	5.220	4.384
Correc. Dia. After Consol (D_c),in.:	2.833	2.857	2.901	-	-	-
Correc. Ht. After Consol (H_c), in.:	5.554	5.442	5.217	-	-	-
Corrected Cross-Sec. Area, in^2	6.301	6.411	6.608	6.430	6.683	7.862
Volume (Vo, Vf = Vo -ΔV), cm^3:	573.7	573.4	571.7	573.5	571.7	564.9
Moisture, {Wo, Wf} %:	21.8%	25.8%	25.6%	25.8%	25.6%	24.8%
Wet Soil Wt. {Mo, Mf}, ,gm:	1163.00	1162.80	1161.10	1162.80	1161.10	1154.30
Wet Unit Weight, pcf:	126.5	126.54	126.7	126.5	126.73	127.5
Dry Unit Weight, pcf:	103.8	100.6	100.9	100.6	100.9	102.1
Specific Gravity (Assumed):	2.75	2.75	2.75	2.75	2.75	2.75
Void Ratio, eo, ef:	0.71	0.71	0.70	0.71	0.70	0.68
Degree of Saturation, So, Sf:	0.85	1.00	1.00	1.00	1.00	1.00

Description		Saturation/Consolidation		
Specimen/Stage No.		1	2	3
Method		Wet Mounting Method		
Cell Pressure, lbs/in^2		14.0	20.0	32.1
Back Pressure, lbs/in^2		8.0	8.1	8.1
B-Parameter		0.97	0.98	0.98
Consolidation Pressure, lbs/in^2		6.0	12.0	24.0
Volume Change After (ΔV), cm^3		0.2	1.7	6.8
Time for Consolidation, min.		480	4845	4490
Failure Type:	*Stage 1*	*Single Fracture*		
	Stage 2		*Multiple Fractures*	
	Stage 3			*Single Shear*

Equipment	Specimen/Stage		
	1	2	3
Oven:	B33ER01048	B33ER01048	B33ER01048
Scale:	AE444189	AE444189	AE444189
Calipers:	7174871	7174871	7174871
Digital Dial:	1849	1849	1849
Load Frame:	0.000	0.000	Load Frame
Load Cell ID:	LC06	LC06	LC05
DCDT:	DCDT-03	DCDT-03	DCDT-02
Cell Pressure Transducer:	PS-05	PS-05	PS-12
Pore Pressure Transducer:	PS-04	PS-04	PS01
Radial Drainage Fliter Strip:	Yes	Yes	Yes

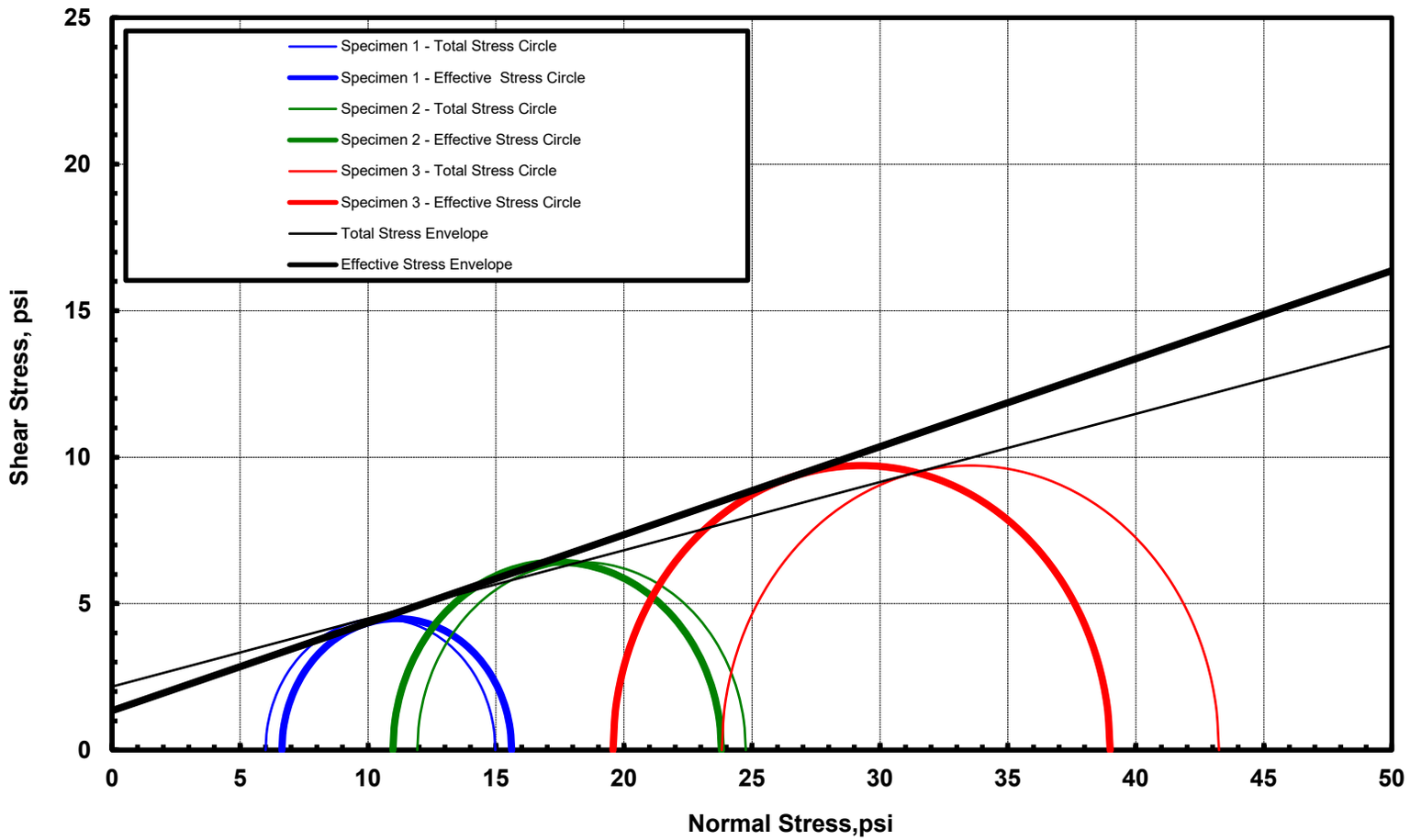
Shear Data	Specimen/Stage		
	1	2	3
Total Shearing Time, min	239	479	1800
Strain Rate, %/hr	0.50	0.51	0.53
Axial Strain at Failure, %	2.00	3.89	2.84
Deviator Stress, lbs/in^2 (Δσ)	8.98	12.84	19.43
Excess Pore Pressure, lbs/in^2 (u)	-0.64	0.95	4.25
A-Parameter, (u/Δσ)	-0.07	0.07	0.22
Total Major Pincipal Stress, lbs/in^2 ($\sigma 1 = \sigma 3 + \Delta\sigma$)	14.98	24.76	43.25
Total Minor Pincipal Stress, lbs/in^2 ($\sigma 3$)	6.00	11.92	23.82
Effectivel Major Pincipal Stress, lbs/in^2 ($\bar{\sigma}\ \bar{1} = \sigma 1 - u$)	15.61	23.81	39.00
Effectivel Minor Pincipal Stress, lbs/in^2 ($\sigma\ 3 = \sigma 3 - u$)	6.63	10.97	19.57

Remarks: **Failure criteria for stage 1 selected at maximum strain and failure criteria for stages 2 and 3 selected at maximum deviator stress.**

"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name:	***HVJ Project 11***		***Classification: Fat Clay (CH), Light Brown***
Project Number:	***286-2184***	***Boring Number: ECP-2031***	***Depth, feet: 12-14 ft***
Sample No./ID: 6			
Cohesion (C_T), ksf:	***0.31***	***Friction Angle(ϕ_T), deg: 13.1***	***Cohesion (C_d), ksf: 0.19***
Friction Angle(ϕ_d), deg: 16.7			

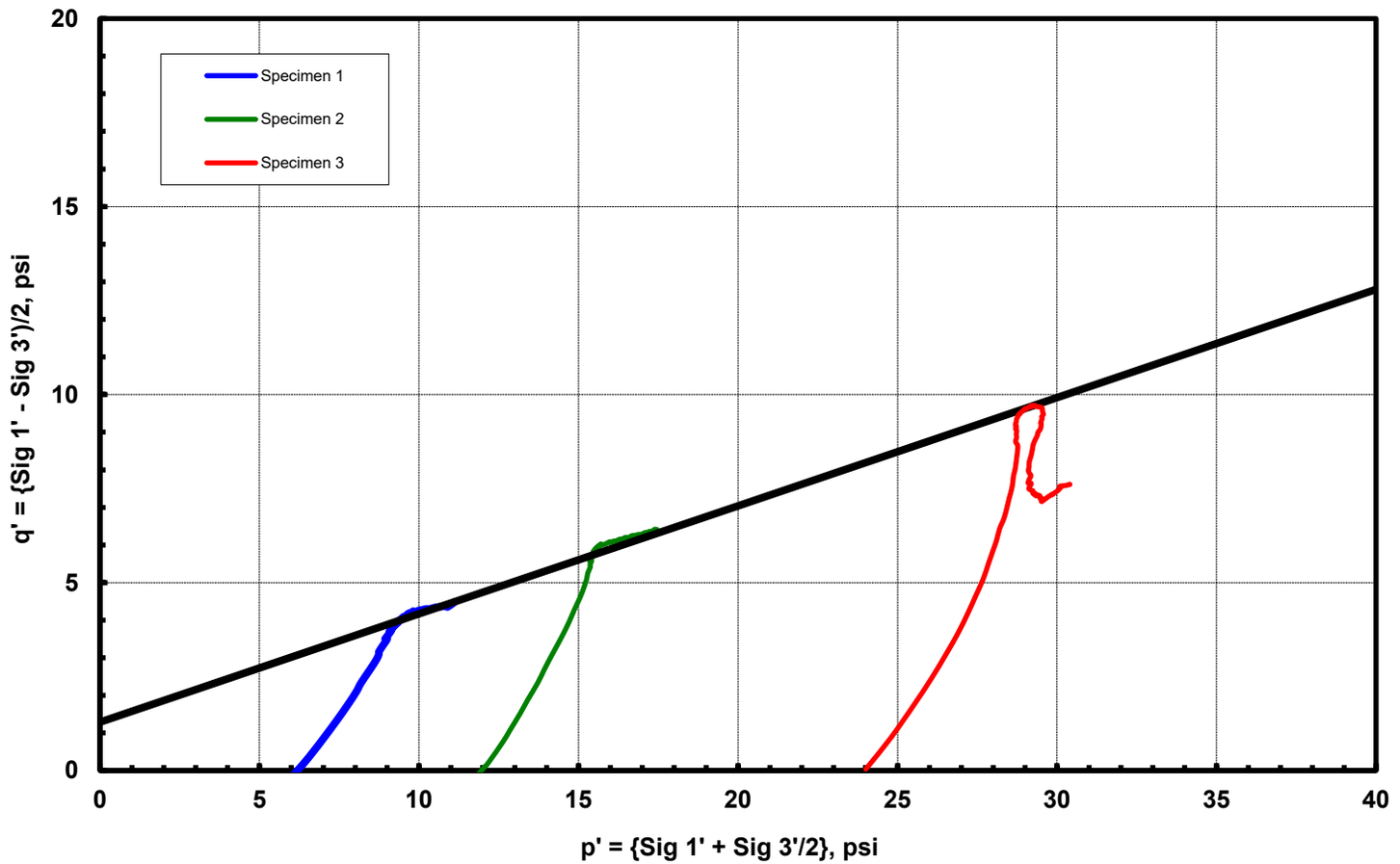
Remarks:



"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name:	***HVJ Project 11***		***Classification: Fat Clay (CH), Light Brown***	
Project Number:	***286-2184***	***Boring Number: ECP-2031***	***Depth, feet: 12-14 ft***	***Sample No./ID: 6***
		Cohesion (C_d), ksf: 0.19	***Friction Angle(ϕ_d), deg: 16.7***	

Remarks:

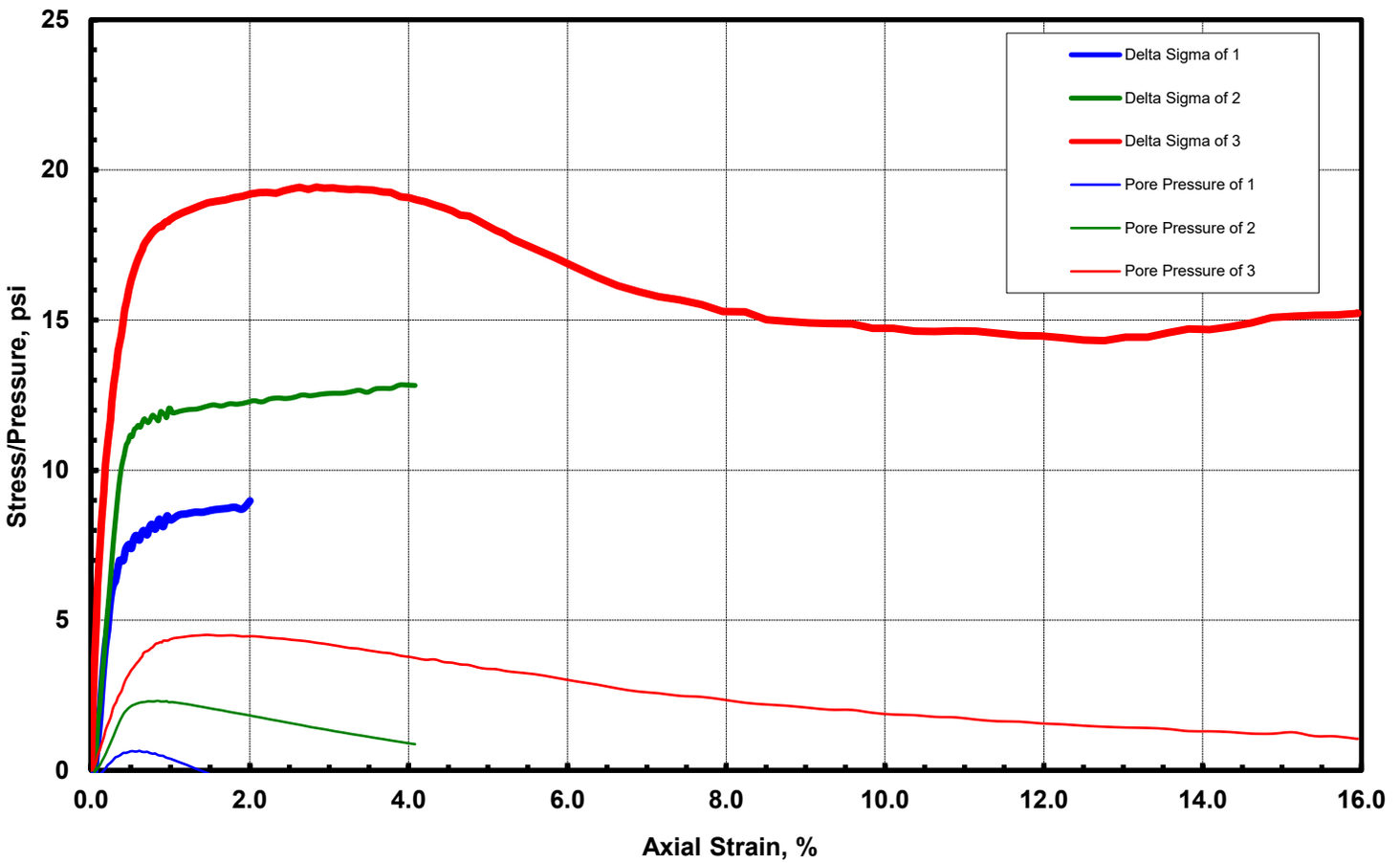


"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name: *HVJ Project 11* ***Classification:*** *Fat Clay (CH), Light Brown*

Project Number: *286-2184* ***Boring Number:*** *ECP-2031* ***Depth, feet:*** *12-14 ft* ***Sample No./ID:*** *6*

Remarks:



"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name: *HVJ Project 11* ***Classification:*** *Fat Clay (CH), w/ calc. nodules, Brown*

Project Number: *286-2245* ***Boring Number:*** *ECP-2043* ***Depth, feet:*** *6-8 ft* ***Sample No./ID:*** *S-4*

Liquid Limit: *62* ***Plastic Limit:*** *21* ***Plasticity Index:*** *41* ***Percent Passing No. 200:*** *93*

Specimen/Stage Data	Before Test			After Consolidation/Shear		
Specimen/Stage No.	1	2	3	1	2	3
Diameter (D),in.:	2.848	2.877	2.933	2.877	2.933	3.184
Height (H), in.:	5.576	5.464	5.238	5.464	5.238	4.401
Correc. Dia. After Consol (D_c),in.:	2.848	2.873	2.919	-	-	-
Correc. Ht. After Consol (H_c), in.:	5.576	5.462	5.236	-	-	-
Corrected Cross-Sec. Area, in^2	6.372	6.481	6.692	6.502	6.757	7.962
Volume (Vo, Vf = Vo -ΔV), cm^3:	582.1	582.1	579.9	582.2	580.0	574.2
Moisture, {Wo, Wf} %:	21.5%	23.5%	23.3%	23.5%	23.3%	22.7%
Wet Soil Wt. {Mo, Mf}, ,gm:	1199.21	1199.36	1197.31	1199.36	1197.31	1191.56
Wet Unit Weight, pcf:	128.6	128.57	128.8	128.5	128.81	129.5
Dry Unit Weight, pcf:	105.8	104.1	104.5	104.1	104.5	105.5
Specific Gravity (Assumed):	2.75	2.75	2.75	2.75	2.75	2.75
Void Ratio, eo, ef:	0.65	0.65	0.64	0.65	0.64	0.63
Degree of Saturation, So, Sf:	0.91	1.00	1.00	1.00	1.00	1.00

Description		Saturation/Consolidation		
Specimen/Stage No.		1	2	3
Method		Wet Mounting Method		
Cell Pressure, lbs/in^2		14.0	20.1	32.0
Back Pressure, lbs/in^2		8.1	8.1	8.1
B-Parameter		0.97	0.98	0.98
Consolidation Pressure, lbs/in^2		5.9	12.0	23.9
Volume Change After (ΔV), cm^3		-0.15	2.05	5.75
Time for Consolidation, min.		480	4836	4490
Failure Type:	*Stage 1*	*Bulge*		
	Stage 2		*Bulge*	
	Stage 3			*Bulge*

Equipment	Specimen/Stage		
	1	2	3
Oven:	B33ER01048	B33ER01048	B33ER01048
Scale:	AE444189	AE444189	AE444189
Calipers:	7174871	7174871	7174871
Digital Dial:	1849	1849	1849
Load Frame:	Load Frame	0.000	0.000
Load Cell ID:	LC05	LC02	External Load Cell
DCDT:	DCDT-02	LP-679	DCDT
Cell Pressure Transducer:	PS-12	PS-02	Cell Pressure
Pore Pressure Transducer:	PS01	PS-11	Pore Pressure
Radial Drainage Fliter Strip:	Yes	Yes	Yes

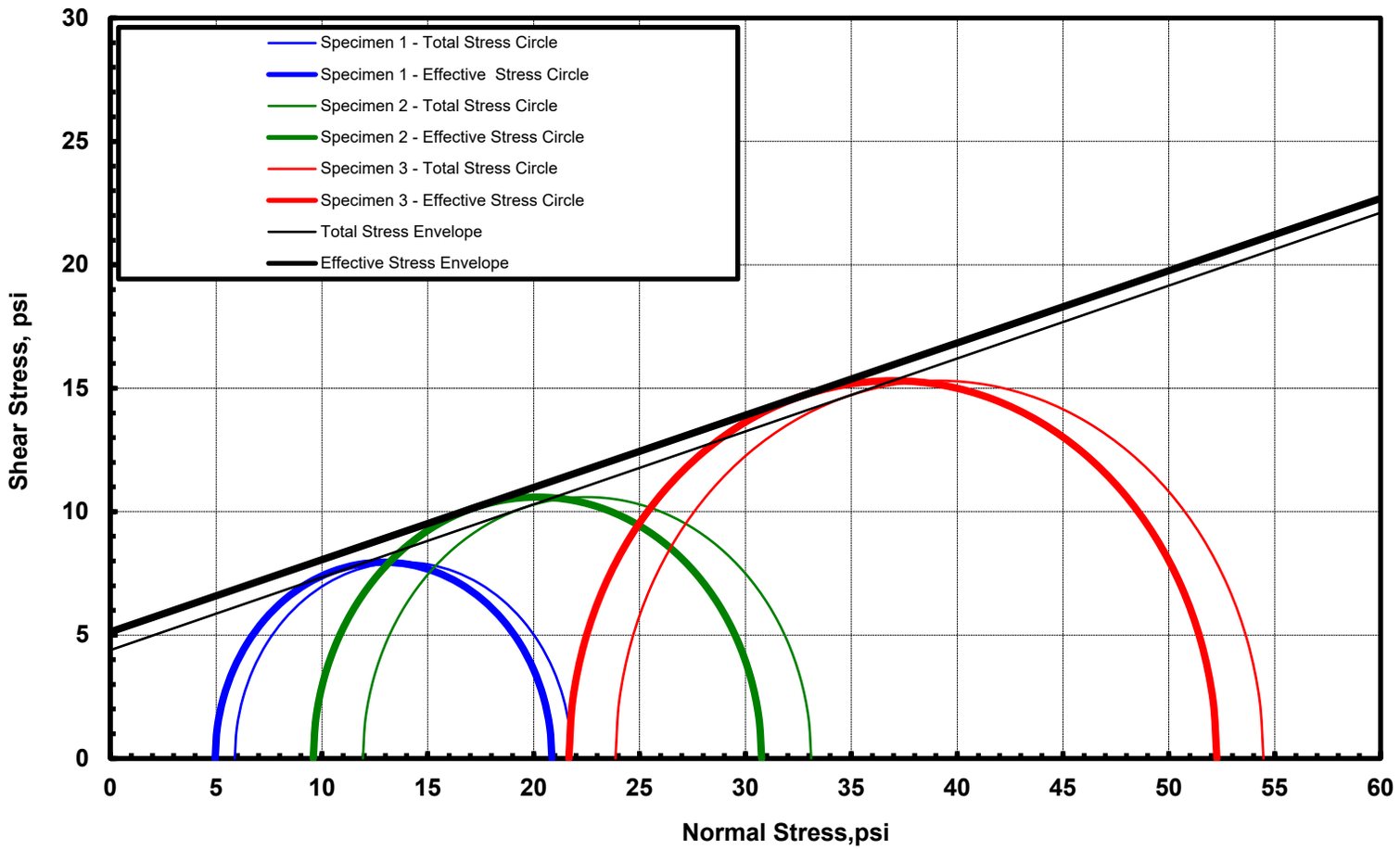
Shear Data	Specimen/Stage		
	1	2	3
Total Shearing Time, min	240	479	1800
Strain Rate, %/hr	0.50	0.50	0.50
Axial Strain at Failure, %	2.00	4.00	11.41
Deviator Stress, lbs/in^2 (Δσ)	15.90	21.18	30.61
Excess Pore Pressure, lbs/in^2 (u)	0.92	2.34	2.20
A-Parameter, (u/Δσ)	0.06	0.11	0.07
Total Major Pincipal Stress, lbs/in^2 ($\sigma 1 = \sigma 3 + \Delta\sigma$)	21.78	33.11	54.47
Total Minor Pincipal Stress, lbs/in^2 (σ3)	5.88	11.93	23.86
Effectivel Major Pincipal Stress, lbs/in^2 ($\bar{\sigma}\ \bar{1} = \sigma 1 - u$)	20.86	30.77	52.27
Effectivel Minor Pincipal Stress, lbs/in^2 ($\sigma\ 3 = \sigma 3 - u$)	4.96	9.59	21.66

Remarks: **Failure criteria for stage 1 selected at maximum strain for stage and failure criteria for stages 2 and 3 selected at maximum deviator stress.**

"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name:	***HVJ Project 11***		***Classification: Fat Clay (CH), w/ calc. nodules, Brown***
Project Number:	***286-2245***	***Boring Number: ECP-2043***	***Depth, feet: 6-8 ft***
Sample No./ID: 4			
Cohesion (C_T), ksf:	***0.63***	***Friction Angle(ϕ_T), deg: 16.5***	***Cohesion (C_d), ksf: 0.74***
Friction Angle(ϕ_d), deg: 16.3			

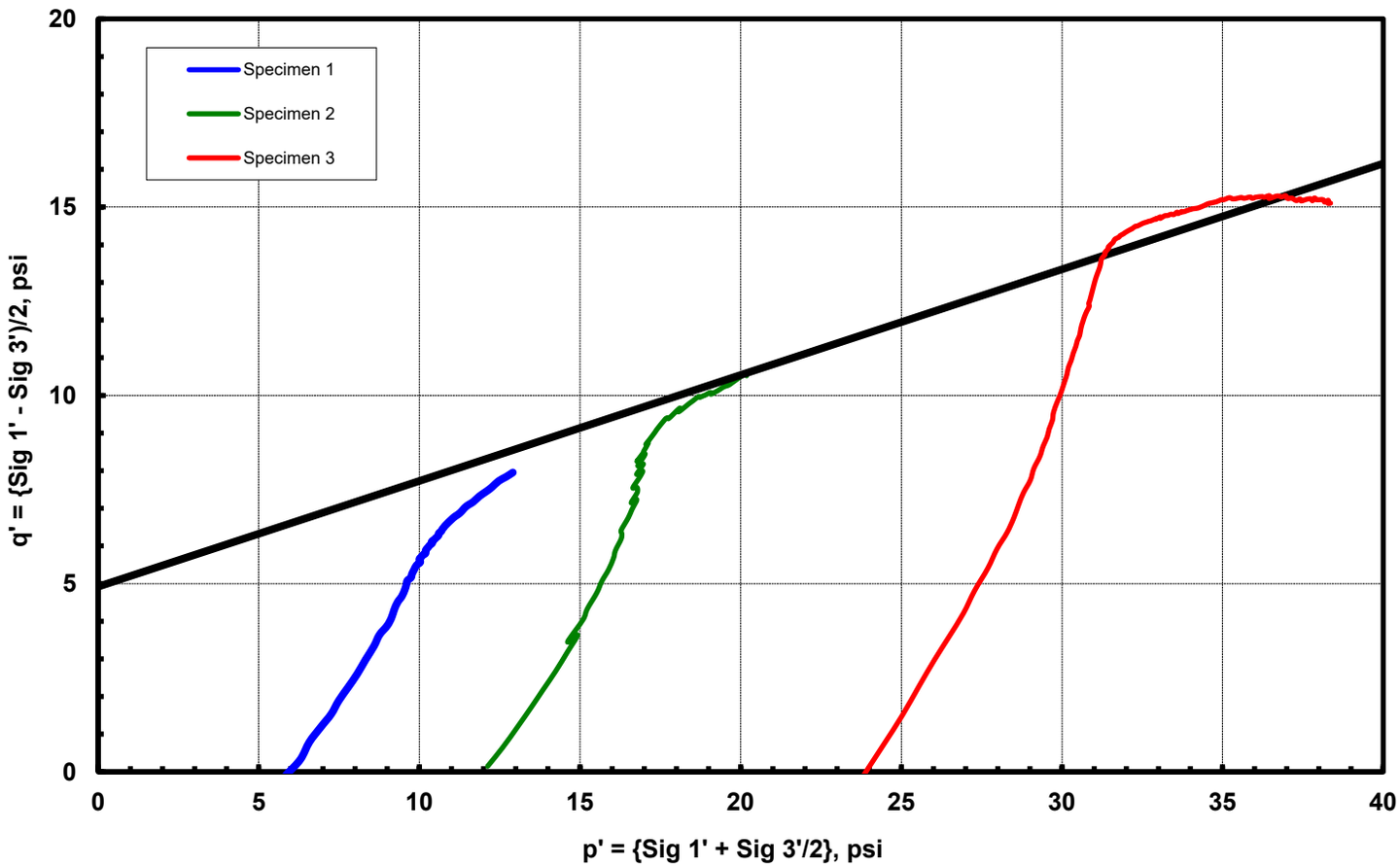
Remarks:



"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name:	*HVJ Project 11*		*Classification: Fat Clay (CH), w/ calc. nodules, Brown*	
Project Number:	*286-2245*	*Boring Number: ECP-2043*	*Depth, feet: 6-8 ft*	*Sample No./ID: 4*
		Cohesion (C_d), ksf: 0.71	*Friction Angle(ϕ_d), deg: 16.3*	

Remarks:



"Multi-Stage (Single Sample) Consolidated Undrained Triaxial Test with Pore Pressure Measurements"

Project Name: *HVJ Project 11* ***Classification:*** *Fat Clay (CH), w/ calc. nodules, Brown*

Project Number: *286-2245* ***Boring Number:*** *ECP-2043* ***Depth, feet:*** *6-8 ft* ***Sample No./ID:*** *4*

Remarks: