US Army Corps of Engineers ®
New Orleans District

HSDRRS – Lake Pontchartrain and Vicinity (LPV) Mitigation

65% - Design Document Report (DDR)

Turtle Bayou Protected-Side Intermediate Marsh Restoration Project

Orleans Parish, Louisiana

Draft Design Document Report
ED 14-036

Prepared by:

US Army Corps of Engineers
New Orleans District - Engineering Division (CEMVN-ED-E)
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INTRODUCTION:

This document outlines the information required IAW ER 1110-2-1150, August 31, 1999, Appendix D, Content and Format of Design Documentation Report. The DDR is an implementation document that provides the technical basis for the plans and specifications. It serves mainly as a summary of the design to be used by the PDT during development of the P&S. The DDR is primarily an engineering document developed by the lead design engineer in cooperation with the PDT. It shall be sufficiently detailed for each technical specialty so that the criteria which were used, the critical assumptions which were made, and the analytical methods which were used will be evident for purposes of review and historical documentation. It should contain a summary of important calculation results. It should be sufficient to support the execution of the ITR process without reference to other design records. DDR is not finalized until the project construction is completed. Design decisions made in connection with contract modifications during construction shall be added to the DDR. It should contain the Statement of Technical and Legal Review and the resolution of critical changes during construction.

1. Summary

Turtle Bayou Protected Side Intermediate Marsh is a 172 acre protected-side intermediate marsh restoration project, located north of Turtle Bayou and within the Bayou Sauvage National Wildlife Refuge (BSNWR).

2. Project Description

The Turtle Bayou Protected Side Intermediate Marsh project is located on the Bayou Sauvage National Wildlife Refuge NWR and in eastern New Orleans adjacent to Turtle Bayou, and east of I-10. As proposed, the project would consist of creating approximately 172 acres of intermediate marsh within an open water area immediately north of Turtle Bayou.

Based upon data obtained during a site visit on January 22, 2014, the average water depth within the restoration area was approximately 1.7-foot. The gage at the boat launch, located off of LA Hwy 11 and north of the restoration feature, read -0.6-foot, placing the average elevation of water bottoms within the restoration area at approximately -2.3-foot NAVD88.

The proposed mitigation feature is within the northeast portion of the Mississippi River deltaic plain. Depositional environments in the area are related to the St. Bernard Delta, which was active in this area approximately 3,000 years ago. Dominant physiographic features in the area include Bayou Sauvage and its associated natural levee, Chef Menteur Pass, Lake Pontchartrain, and marsh. Natural elevations are highest on the levees of Bayou Sauvage and decrease away from these levees to the marshes near Lake Pontchartrain.

Boring and map data in the vicinity of the proposed mitigation feature shows that the surface and shallow subsurface contains approximately 3 to 10 feet of marsh deposits characterized by very soft organic clays and peat with high water content. Interdistributary deposits underlie marsh deposits and are composed of very soft to medium clays and silty clay approximately 20 feet thick. Pleistocene deposits composed of very stiff clays, silt, and sand underlie interdistributary

deposits. There are buried beach deposits at approximately elevation -15 feet immediately north and south of Bayou Chevee. Beach deposits are composed mainly of fine sand and shell.

Restoration would be accomplished through dedicated dredging of material to be borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. This work would be coupled with the restoration work proposed under the HSDRRS LPV Mitigation – Bayou Sauvage Floodside brackish marsh (BSFBM) project, located just east of LA Hwy 11 and Irish Bayou. The dredge material would be obtained from a borrow site in east Lake Pontchartrain with access from the lake to the restoration feature to follow the location depicted in figure 1. To minimize marsh impacts, the pipeline and equipment would follow open water and canals as much as possible. The pipeline would cross under LA Hwy 11 via one of three (3) existing 36 inch CMP culverts, which the Bayou Sauvage National Wildlife Refuge has indicated may be used for the dredge pipeline to access the site. For offloading pipeline and equipment to the restoration feature, a 150-foot access corridor, commencing west of the centerline of LA Hwy11, would be used. This corridor is existing marsh and will be filled prior to construction with approximately 1 foot of earthen fill material and mats in order to prevent permanent damage to the wetlands. The actual footprint of required fill and mats will be determined by the Contractor. Excavation within all designated access corridors/ routes will not be allowed.

Disposal within the restoration feature will be confined, with dredge effluent waters allowed to be returned to the adjacent open waters for nourishment of adjacent marsh and for enhancement of submerged aquatic habitat. The dredge material would be placed confined to a maximum slurry elevation of +0.5-feet NAVD88 (2009.55) (excluding effluent waters). A vertical working tolerance of +/- 0.25 feet will be permitted. Spill box weirs may be constructed to control the pool level within the restoration area and the earthen dikes and closures may be gapped and/or degraded as necessary to facilitate development of the restoration feature. It is anticipated that all retention features for this project would be earthen and constructed from adjacent borrow to be obtained from within the marsh restoration feature, except for borrow for the two (2) earthen closure locations where borrow may be taken from outside of the restoration area. Approximately 13,000 feet of earthen retention dikes and approximately 2,700 feet of earthen closures shall be constructed prior to the placement of dredged material and maintained at all times during pumping operations. The earthen retention dikes and weirs shall be constructed to a minimum 5-foot crown width and slopes no steeper than 1V on 3H. The dikes and closures shall be constructed to approximate elevation +3.5-foot NAVD88 (2009.55). Upon completion of the project, the dikes and weirs may either be left in place to naturally degrade, or be degraded at a later date, after the dredged material has had time to settle out within the restoration feature. In the event the dikes and closures are to be degraded, the degraded material shall be put back into the borrow pits that were used to construct these retention features. Excess material would be placed on adjacent open water areas at an elevation conducive to marsh creation.

TBN IM has a mitigation potential of 0.39 AAHU per acre and provides the 41.29 AAHU required for refuge impacts to intermediate marsh through the creation of approximately 160 acres of protected side intermediate marsh within the proposed 172-acre project area. A subsequent WVA analysis utilizing more refined construction plans will be conducted prior to awarding the construction contract. Final project sizing will be determined by the inter-agency PDT upon the completion of this analysis, and will ensure the creation of 41.29 AAHU of Refuge protected-side intermediate marsh habitat.

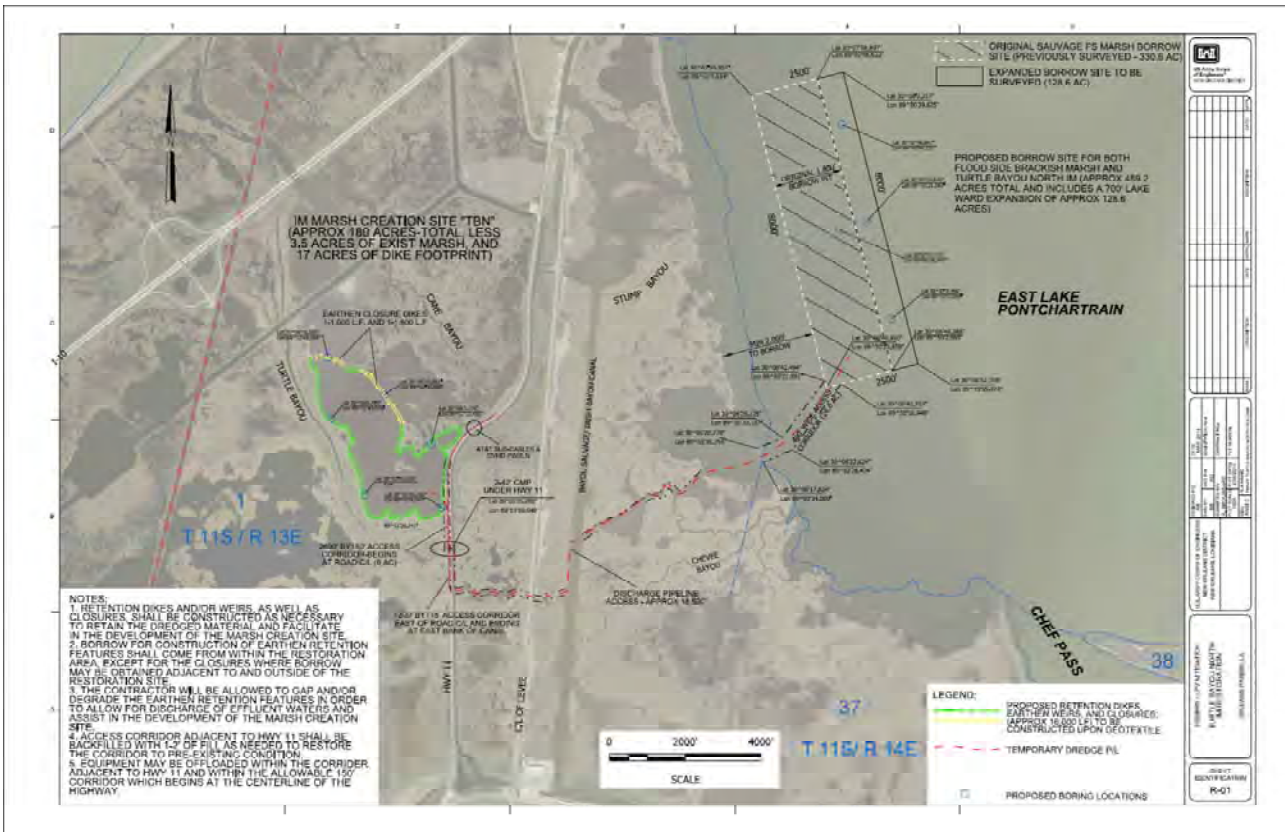


Figure 1: Turtle Bayou Protected Side Intermediate Marsh Restoration Project Overview

3. PDT Team Members

The PDT members for the HSDRRS-LPV Mitigation Turtle Bayou Protected Side Intermediate Marsh Restoration project are listed below in Table 1.

Project Delivery Team					
Name	Professional Registration	Discipline	Office	Area of Responsibility	Years of Experience
Soheila Holley	P.E.	PM	PRO	Sr. Project Manager	20
Patrick Erwin	E.I.	PM	PRO	Project Manager	4
Wayne Duplantier	E.I.	Civil	ED-E	Project Engineer	9
Rick Broussard	E.I.	Civil	ED-L	Lead Engineer/ Designer	37
Mike Danielson	-	Civil	ED-SC	Cost	15
Bich Quach	E.I.	Civil	ED-F	Geotechnical	7
Kelly Danton	-	Civil	ED-F	Geotechnical	10
Louis Britsch	P.G.	Geology	ED-F	Geology/Geomorphology	27
Cameron Alexander	-	Hydrology	ED-H	H&H	4
Sean Mickal	-	Civil	PD-P	Plan Formulation	-
Matt Mallard	-	Biology	PDR-RS	Environmental	12

Daniel Sumerall	-	Biology	PDR-RS	Environmental	5
	-	Geography	ED-SE	GIS	4
Gaynell Morrison	-	Civil	ED-SR	Relocations	10
Ulysses Hester	-	Civil	ED-SC	Specifications	25
Robert Culberson		Civil	ED-SC	Specifications	
Anthony Lauto	-	Civil	CD-Q	Construction	8
Stephen Pfeffer	-	Biology	OD-S	Operations	8
Anedra Baldwin	-	-	RE-A	Real Estate	-
Aven Bruser	-	-	OC	Counsel	-
Sandra Stiles	-	-	CT-W	Contracting	8
Andrea Baldwin			RE-E	Real Estate	4
Laura Wilkinson	-	Biology	HPO	Environmental	11
Maurya Kilroy	LSBA	Legal	OC	Asst. District Counsel	21

PE: Professional Engineer, PG: Professional Geologist, EI: Engineering Intern, --: Indicates no data or not registered

Table 1: Turtle Bayou Protected Side Intermediate Marsh Restoration Project Delivery Team.

4. References & Criteria Wavier Approvals

There were no criteria waivers for the contracts included herein. All standard regulations and design principles apply, many of which are listed below.

- EC 1165-2-209, Civil Works Review Policy (31 Jan 2010)
- ER 11-1-321, Army Programs Value Engineering (28 Feb 2005)
- ER 1110-1-12, Quality Management (21 July 90)
- ER 1110-1-1300, Engineering and Design Cost Engineering Policy and General Requirements (26 Mar 93)
- ER 1110-2-1302, Civil Works Cost Engineering
- EM 1110-2-1902, Slope Stability, (Oct 03)
- EM 1110-2-1913, Design and Construction of Levees (Apr 03)
- EM 1110-2-5027. Confined Disposal of Dredged Material
- ER 1110-2-1150, Engineering and Design for Civil Works Projects (31 August 1999)
- ER 1110-1-12, Quality Management (21 July 2006)
- EM 1110-2-5025, Dredging and Dredged Material Disposal (25 March 1983)

- EM 1110-2-5026, Beneficial Uses of Dredged Material (30Jun1987)

Vertical Datums

- The establishment and use of vertical datums in the design work will follow the guidance provided in EC 1110-2-6070, Guidance for a Comprehensive Evaluation of Vertical Datums on Flood Control, Shore Protection, Hurricane Protection and Navigation Projects (01 July 2009).

- All surveys shall be conducted in accordance with CEMVN-ED-SS-06-01

- "USACE New Orleans District Minimum Survey Standards, Edition 4.1" The guidance is available at http://www.mvn.usace.army.mil/Missions/Engineering/SurveySection/SurveyingGuidelines.aspx

- All geospatial data shall contain metadata which defines the relationship between NAVD88 and the local tidal datum (LMSL, MLLW, etc.) using the latest epochs.

- Each construction contract prepared for execution in this project shall reference a minimum of three (3) Permanent Bench Marks (PBM). Ideally these PBMs shall be located in the middle and at the end of the project. All surveys shall tie into a minimum of three benchmarks to determine the reliability of the project's control.

- Information relating to the location and determination of elevations of all vertical datums used in the project design will be provided to the Corps of Engineers, in the form of a Survey Documentation Report, for review and validation.

5. Engineering Studies, Investigations, and Design

5.1 Project Features. Location and site plan.

The Turtle Bayou Intermediate Marsh (IM) Restoration project is located on the Bayou Sauvage National Wildlife Refuge (BSNWR) and in eastern Orleans Parish, LA. The site is located immediately west of LA Hwy 11, north of and adjacent to Turtle Bayou, and east of the I-10 in New Orleans East. The project location is shown in Figure 2.

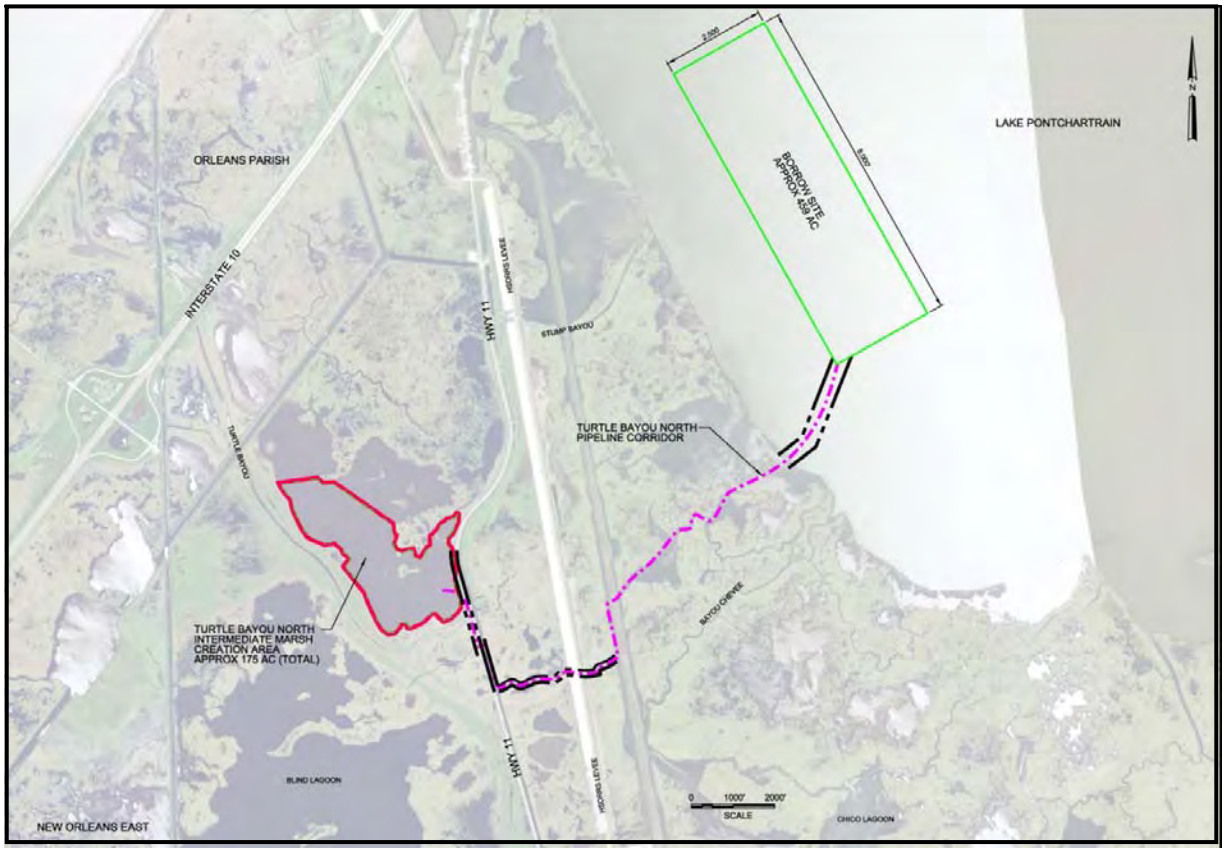


Figure 2: Turtle Bayou Location Map

5.2 Hydrology

The Turtle Bayou Protected Side Intermediate Marsh Project used the results from the CRMS 4107 gage. Based upon the period of record of November 2007 to December 2014, the minimum stage is -1.16 feet, the average stage is +0.6 feet, and the maximum stage is +2.36 feet.

Tidal data to be used for Turtle Bayou was calculated from the CRMS 4107 hourly adjusted gage readings, located in the protected area of the protection system around New Orleans, LA south of HWY 90 in Bayou Sauvage. Since this is nearest the mitigation site is in the protected area, this gage is an ideal choice to be used for this project.

Salinity. The salinity ranges from 1.07 to 4.08 ppt at CRMS4107, based for the period of Nov 2013 to Nov 2014. The mean value was 2.51. Low salinity levels can be attributed to the location being in the protected area of the HSDRRS south of Turtle Bayou.

5.3 Placement of Dredged Material

Excavation and placement of dredged material will be performed with a hydraulic cutterhead dredge. It is anticipated that dredge size for completion of this work could range from a 20 inch to a 30 inch dredge. Throttling down of a larger dredge with greater horse power may be

required in order to maintain the required freeboard elevations, maximize solids placed within the restoration area, and assure retention of dredged material. The material will be moved through a combination of floating and shore discharge pipeline between the borrow area and the Turtle Bayou marsh creation area. The removal of approximately 1,200,000 cubic yards of dredged material from Lake Pontchartrain could be required to fill the marsh creation area to the specified elevation and tolerance.

5.4 Geotechnical Investigations

The geotechnical appendix, Appendix A, addresses the subsurface exploration, soil testing, settlement calculations of the Turtle Bayou marsh creation area, and slope stability analyses of the retention dikes. The appendix also addresses the four (4) additional general type borings that were taken within the Lake Pontchartrain borrow area when the borrow area was expanded to accommodate the addition of the Turtle Bayou intermediate marsh creation feature to the Bayou Sauvage Floodside brackish marsh restoration project. These four (4) borings supplement the original six (6) general borings taken within borrow site as originally proposed for the HSDRRS LPV Mitigation - Bayou Sauvage Floodside brackish marsh project and may be found in the DDR for that project.

5.5 Civil Design

5.5.1 SURVEYS – RESTORATION SITES, ACCESS AND LAKE BORROW AREAS

General. Collection of survey data was required to develop design of the Turtle Bayou marsh creation project and was performed in July 2014 by CHUSTZ SURVEYING, INC under USACE job number 14-108C. The entire survey report, prepared by CHUSTZ SURVEYING, INC, may be found under Appendix “B”. The surveys performed under this contract included cross sections of the Turtle Bayou marsh creation site, as well as surveys of the dredge pipeline access route from Lake Pontchartrain and the staging area west of and adjacent to La Hwy 11. This survey consisted of:

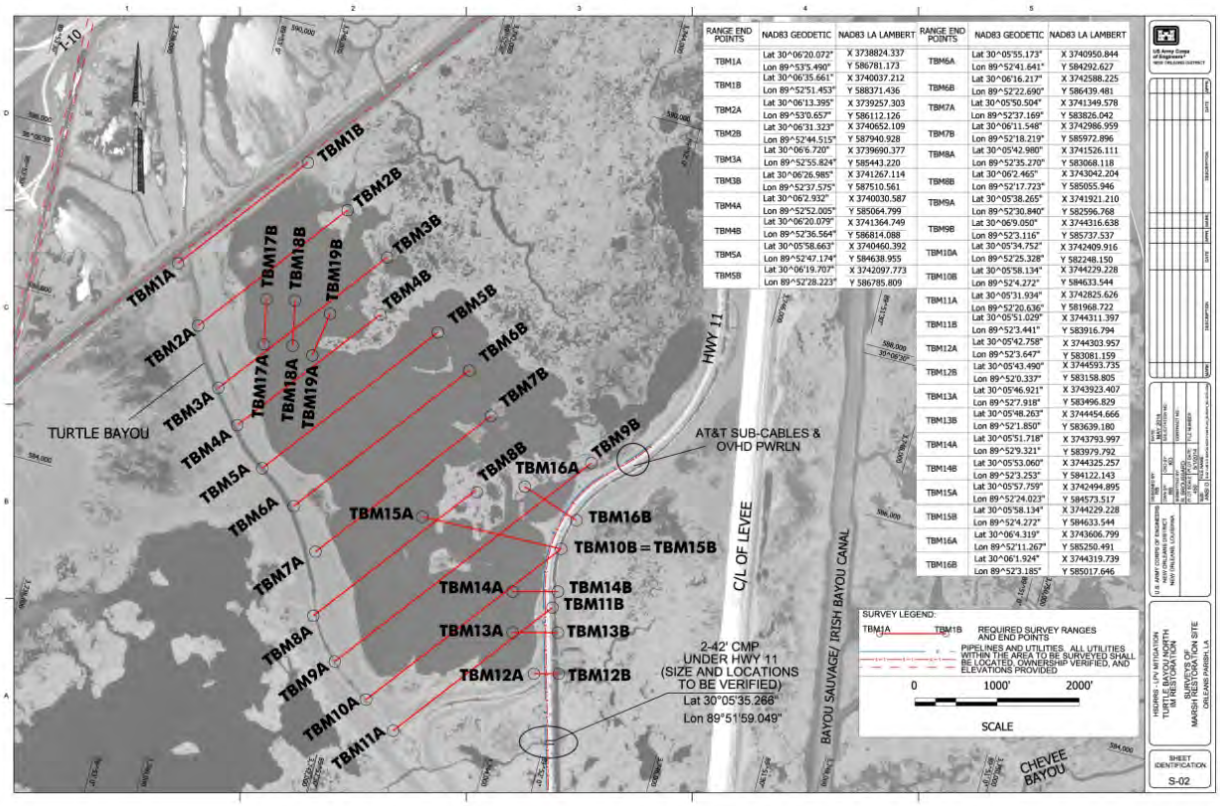
- Sixteen (16) cross section ranges (TBN 1 through TBN16) taken within the proposed restoration site, extending over variable lengths, with elevations provided at 50' intervals along the designated ranges, while also capturing all "top-of-bank" shots, "waters edge” shots, and all abrupt breaks in grade.

- Twenty-three (23) cross section ranges (AC 1 through AC23) taken along the proposed dredge discharge pipeline access corridor, including ranges and a centerline profile of the existing foreshore dike along Lake Pontchartrain, located at an existing gap in the rock dike. Elevations were provided at 25' intervals along the designated ranges and profile, while also capturing all "top-of-bank" shots, "waters edge” shots, and all abrupt breaks in grade.

- Topographic surveys of all utilities within the project area, including the Entergy

overhead power lines (including pole locations and line clearances) and AT&T sub cables, running along the west side of La Hwy 11.

The survey layout is depicted below in Figures 3A and 3B.



RANGE END POINTS	NAD83 GEODETIC	NAD83 LA LAMBERT
TBM1A	Lat 30^06'20.072" Lon 89^53'5.490"	X 3738824.337 Y 586781.173
TBM1B	Lat 30^06'35.661" Lon 89^52'51.453"	X 3740037.212 Y 588371.436
TBM2A	Lat 30^06'13.395" Lon 89^53'0.657"	X 3739257.303 Y 586112.126
TBM2B	Lat 30^06'31.323" Lon 89^52'44.515"	X 3740652.109 Y 587940.928
TBM3A	Lat 30^06'6.720" Lon 89^52'55.824"	X 3739690.377 Y 585443.220
TBM3B	Lat 30^06'26.985" Lon 89^52'37.575"	X 3741267.114 Y 587510.561
TBM4A	Lat 30^06'2.932" Lon 89^52'52.005"	X 3740030.587 Y 585064.799
TBM4B	Lat 30^06'20.079" Lon 89^52'36.564"	X 3741364.749 Y 586814.088
TBM5A	Lat 30^05'58.663" Lon 89^52'47.174"	X 3740460.392 Y 584638.955
TBM5B	Lat 30^06'19.707" Lon 89^52'28.223"	X 3742097.773 Y 586785.809

RANGE END POINTS	NAD83 GEODETIC	NAD83 LA LAMBERT
TBM6A	Lat 30^05'55.173" Lon 89^52'41.641"	X 3740950.844 Y 584292.627
TBM6B	Lat 30^06'16.217" Lon 89^52'22.690"	X 3742588.225 Y 586439.481
TBM7A	Lat 30^05'50.504" Lon 89^52'37.169"	X 3741349.578 Y 583826.042
TBM7B	Lat 30^06'11.548" Lon 89^52'18.219"	X 3742986.959 Y 585972.896
TBM8A	Lat 30^05'42.980" Lon 89^52'35.270"	X 3741526.111 Y 583068.118
TBM8B	Lat 30^06'2.465" Lon 89^52'17.723"	X 3743042.204 Y 585055.946
TBM9A	Lat 30^05'38.265" Lon 89^52'30.840"	X 3741921.210 Y 582596.768
TBM9B	Lat 30^06'9.050" Lon 89^52'3.116"	X 3744316.638 Y 585737.537
TBM10A	Lat 30^05'34.752" Lon 89^52'25.328"	X 3742409.916 Y 582248.150
TBM10B	Lat 30^05'58.134" Lon 89^52'4.272"	X 3744229.228 Y 584633.544
TBM11A	Lat 30^05'31.934" Lon 89^52'20.636"	X 3742825.626 Y 581968.722
TBM11B	Lat 30^05'51.029" Lon 89^52'3.441"	X 3744311.397 Y 583916.794
TBM12A	Lat 30^05'42.758" Lon 89^52'3.647"	X 3744303.957 Y 583081.159
TBM12B	Lat 30^05'43.490" Lon 89^52'0.337"	X 3744593.735 Y 583158.805
TBM13A	Lat 30^05'46.921" Lon 89^52'7.918"	X 3743923.407 Y 583496.829
TBM13B	Lat 30^05'48.263" Lon 89^52'1.850"	X 3744454.666 Y 583639.180
TBM14A	Lat 30^05'51.718" Lon 89^52'9.321"	X 3743793.997 Y 583979.792
TBM14B	Lat 30^05'53.060" Lon 89^52'3.253"	X 3744325.257 Y 584122.143
TBM15A	Lat 30^05'57.759" Lon 89^52'24.023"	X 3742494.895 Y 584573.517
TBM15B	Lat 30^05'58.134" Lon 89^52'4.272"	X 3744229.228 Y 584633.544
TBM16A	Lat 30^06'4.319" Lon 89^52'11.267"	X 3743606.799 Y 585250.491
TBM16B	Lat 30^06'1.924" Lon 89^52'3.185"	X 3744319.739 Y 585017.646

Figure 3A – Turtle Bayou Marsh Creation Survey Layout

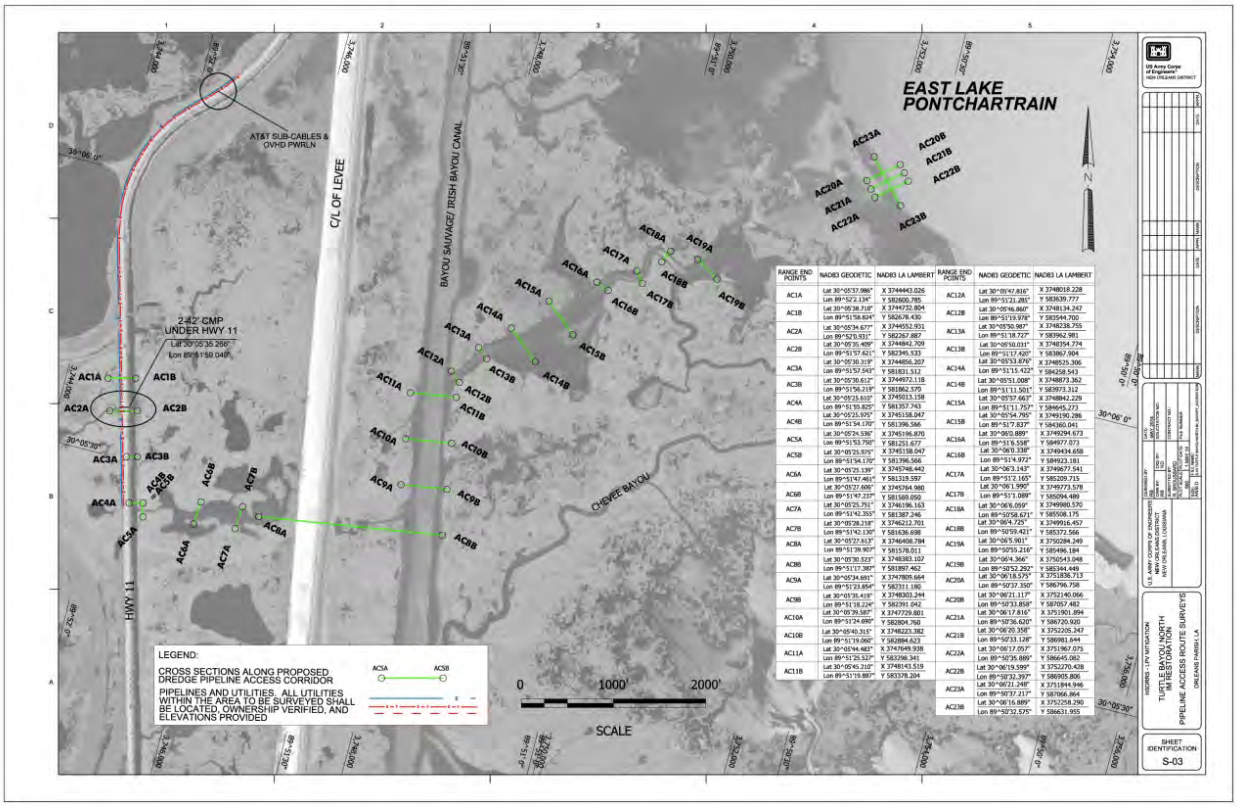


Figure 3B – Turtle Bayou Access Survey Layout

BORROW AREA SURVEYS

Eleven (11) hydrographic cross sections of the borrow area in Lake Pontchartrain were previously performed in July 2012 by EMC, INC under USACE job number 12-054C. The entire survey report is available in Appendix B. These surveys were requested as part of the 65% design effort for the HSDRRS LPV Mitigation - Bayou Sauvage Floodside brackish marsh restoration project. These cross sections, included in the 65% plans, indicated that the elevations within the Lake Pontchartrain borrow area are relatively uniform at an average elevation of -7.5' NAVD88 (2006.81).

As conditions within the lake are expected to remain relatively the same, it was determined that these surveys would suffice for determining available borrow for the Turtle Bayou project. The borrow area surveys are depicted in Figure 4.

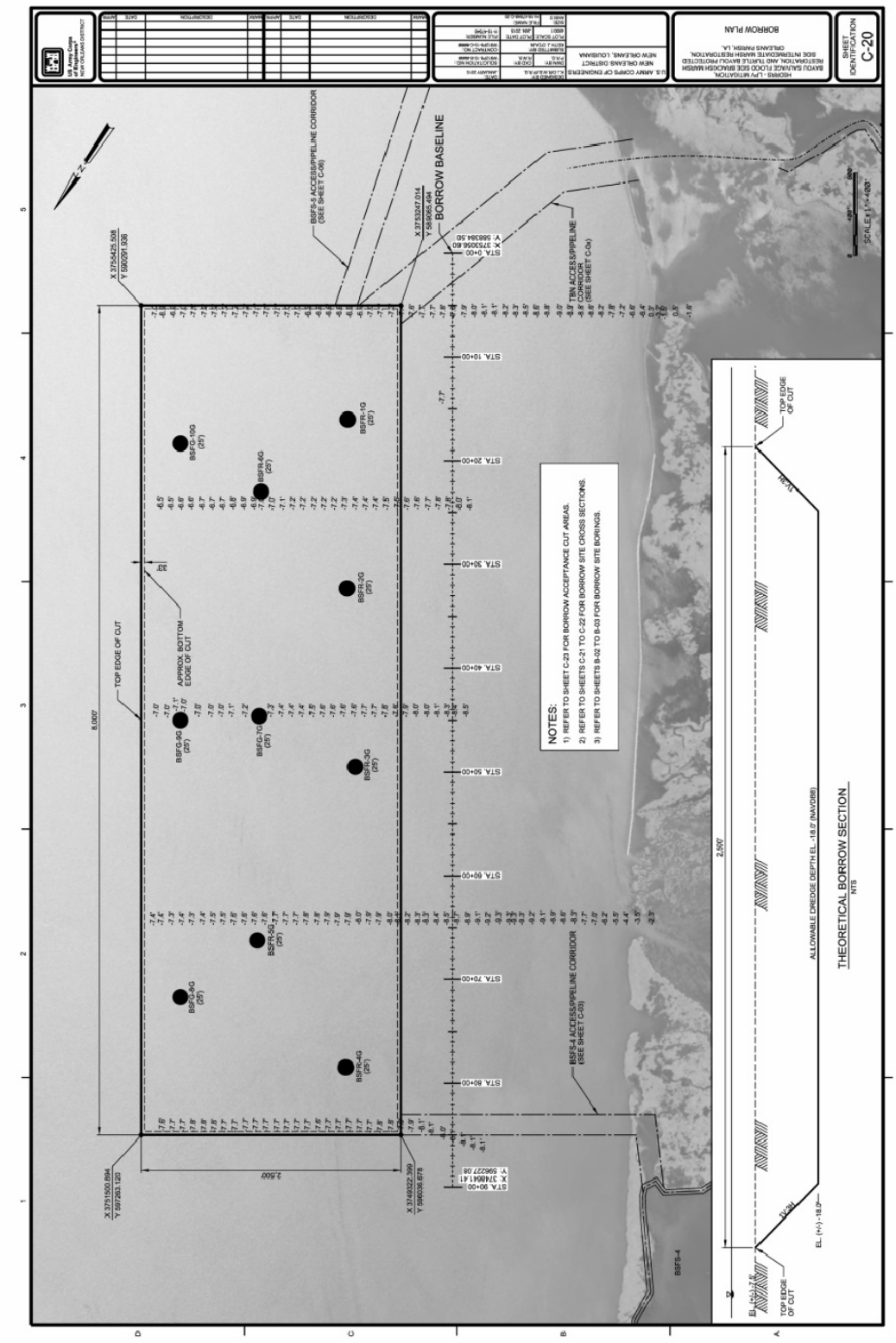


Figure 4 - Borrow Area Surveys

ACCESS CORRIDOR SURVEYS

The twenty-three (23) cross section ranges taken along the proposed dredge discharge pipeline access route are depicted on drawing Sheet C-11 of the 65% plans. The access route leads from Lake Pontchartrain, crosses Irish Bayou Canal and the Corps' HSDRRS levee, as well as under LA Hwy 11 through one of two existing corrugated metal pipes (CMPs), and then west of and adjacent to the highway and leading to Turtle Bayou. Cross sections ranges of the existing foreshore dike along Lake Pontchartrain were also taken and were strategically located through an existing gap in the rock dike, along with a profile along the existing centerline of the rock dike.

TOPOGRAPHIC SURVEYS

This consisted of locating and identifying all pipeline and utility crossings and markers, along with minimum clearances under all aerial crossings and bridges within the designated access, borrow and fill limits. Topographic surveys of all utilities within the project area, including the Entergy overhead power lines (including pole locations and line clearances) and AT&T sub-cables, running along the west side of La Hwy 11.

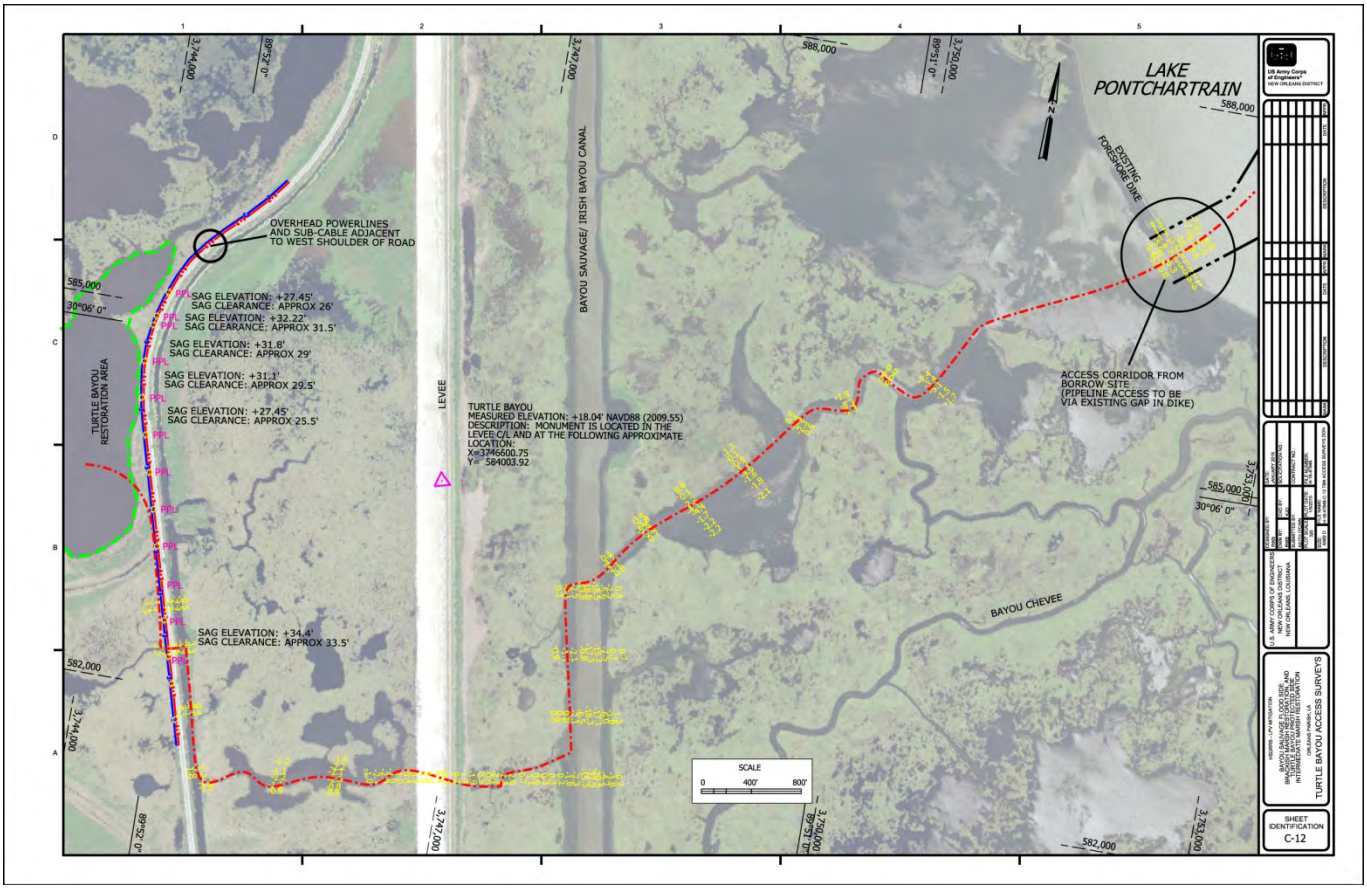


Figure 5 – Access Corridor and Topographic Surveys

HORIZONTAL AND VERTICAL CONTROL

The New Orleans District COE provided CHUSTZ SURVEYING, INC the control monuments to use. Monuments E 3146, 52 V 075 RESET, and H 375 were recovered, and TBM TURTLE BAYOU was set at the work site. They then conducted a five hour Static GPS survey session on each monument. The crew returned the next day and conducted another five hour Static GPS survey session on each monument to complete the GPS Survey.

The survey crew then located MVN-16 and made a tie utilizing VRS tied to GULFNet. The crew then made three ties to TBM TURTLE BAYOU and tied back to establish temporary control. RTK was based on TBM TURTLE BAYOU, as well as iron rods IR-1005 and IR-1006 which were also set for control and tied back to TBM TURTLE BAYOU for verification.

The elevations used for design and included in these plans and specifications are based off of the following monumentation utilized by CHUSTZ SURVEYING, INC for performing surveys of both the Turtle Bayou marsh creation site and the dredge pipeline access route and staging area.

TURTLE BAYOU NORTH (TBN) - TABULATION OF BENCHMARKS		
BENCHMARK	ELEVATION	DESCRIPTION
E 3146 (PRIMARY BM)	LAT: 30^04'14.05567 LONG: 89^48'05.39106 NORTHING: 574395.08 EASTING: 3765350.72 EL. 5.18' NAVD88 (2009.55)	THE MONUMENT IS LOCATED IN ORLEANS PARISH, LA, 15.0 MILES SOUTH OF SLIDELL, LA, 19.0 MILES EAST OF NEW ORLEANS, LA, AND 19.0 MILES NORTHEAST OF BELLE CHASSE, LA. TO REACH THE STATION FROM THE INTERSECTION OF HWY 11 AND HWY 90 IN ORLEANS PARISH, LA, GO EAST ON HWY 90 4.1 MILES TO THE STATION ON THE RIGHT. THE STATION IS A SURVEY DISK FOUND FLUSH WITH THE TOP OF CONCRETE, 106 FEET NORTHWEST OF A POWER POLE MARKED #461, 37.0 FEET SOUTHEAST OF THE CENTERLINE OF HWY 90, AND 23.0 FEET SOUTHWEST OF THE CENTERLINE OF DRIVEWAY.
H 375	LAT: 30^01'41.85873 N LONG: 89^59'14.36299 W NORTHING: 558283.46 EASTING: 3706757.86 EL. -6.43' NAVD88 (2009.55)	THE MONUMENT IS LOCATED IN ORLEANS PARISH, LA, 5.2 MILES NORTH OF ARABI, LA, 6.1 MILES NORTHWEST OF CHALMETTE, LA, AND 7.3 MILES NORTHEAST OF NEW ORLEANS, LA. TO REACH THE STATION FROM THE INTERSECTION OF I-10 EAST AND HWY 90 IN NEW ORLEANS EAST, HEAD EAST ON HWY 90 FOR 1.6 MILES TO THE INTERSECTION OF CROWDER BLVD., HEAD NORTH ON CROWDER BLVD. FOR 0.9 MILES TO THE INTERSECTION OF LAKE FOREST BLVD., TURN RIGHT ONTO LAKE FOREST BLVD AND HEAD EAST FOR 0.3 MILES TO THE STATION ON THE LEFT. THE STATION IS A STEEL ROD FOUND IN GOOD CONDITION IN THE MEDIAN OF LAKE FOREST BLVD. THE ROD IS 60.0 FEET WEST OF A 28 INCH LIVE OAK IN THE MEDIAN OF LAKE FOREST BLVD., 19.0 FEET NORTH OF THE CENTERLINE OF THE EAST BOUND LANE OF LAKE FOREST BLVD., AND 25.5 FEET SOUTH OF THE CENTERLINE OF THE WEST BOUND LANE OF LAKE FOREST BLVD.
TURTLE BAYOU	LAT: 30^05'51.60058 N LONG: 89^51'37.36701 W NORTHING: 584003.92 EASTING: 3746600.75 EL. 18.04' NAVD88 (2009.55)	THE MONUMENT IS LOCATED IN ORLEANS PARISH, LA, 9.8 MILES SOUTH OF EDEN ISLE, LA, 12.2 MILES NORTH OF MERAUX, LA, AND 12.9 MILES NORTHEAST OF ARABI, LA. TO REACH THE STATION FROM THE INTERSECTION OF I-10 AT IRISH BAYOU EXIT AND HWY 11 AT EXIT 254, PROCEED SOUTH ON HWY 11 FOR 1.7 MILES, PASS THROUGH A FLOOD GATE, TURN LEFT AND FOLLOW THE LEVEE EAST THEN SOUTH FOR 1.8 MILES. THE BENCHMARK IS LOCATED IN THE CENTERLINE OF THE LEVEE. THE STATION IS AN ALUMINUM CAP SET ON A 2.0 FOOT REBAR, LOCATED IN THE CENTERLINE OF LEVEE, 5.8 FEET LANDSIDE OF THE FLOOD SIDE CROWN, 5.5 FEET FLOOD SIDE OF THE PROTECTED SIDE CROWN, LOCATED APPROX. 6260 FEET SOUTH OF THE SOUTH PROTECTED SIDE ON THE LEVEE
52 V 075 RESET	LAT: 30^17'07.26229 LONG: 89^46'15.52853 NORTHING: 652627.73 EASTING: 3773937.79 EL. 10.47' NAVD88 (2009.55)	THE MONUMENT IS LOCATED IN ST. TAMMANY PARISH, LA, 1.7 MILES NORTHEAST OF SLIDELL, LA, 7.6 MILES SOUTH OF PEARL RIVER, LA, AND 11.1 MILES EAST OF LACOMBE, LA. TO REACH THE STATION FROM THE INTERSECTION OF I-10 (EXIT 266) AND U.S. HWY 190 (CAUSE BLVD) IN SLIDELL, LA, GO WEST 1.3 MILES ON CAUSE BLVD. TO ROBERT BLVD., TURN RIGHT AND PROCEED 200 FEET NORTH TO THE MONUMENT ON THE RIGHT BETWEEN ROBERT BLVD. AND THE SIDEWALK. THE STATION IS A BRASS CAP RECESSED IN CONCRETE, LOCATED 97.5 FEET NORTH OF A POWER POLE (#49312-59174), 32.0 FEET EAST OF THE CENTERLINE OF ROBERT BLVD., 3.0 FEET NORTHWEST OF A STREET SIGN (LA 1091), AND 9.5 FEET WEST OF A 6.0 FOOT CHAIN LINK FENCE AND AN ORANGE CARSONITE WITNESS POST.

Figure 6 – Vertical Control/ Benchmarks

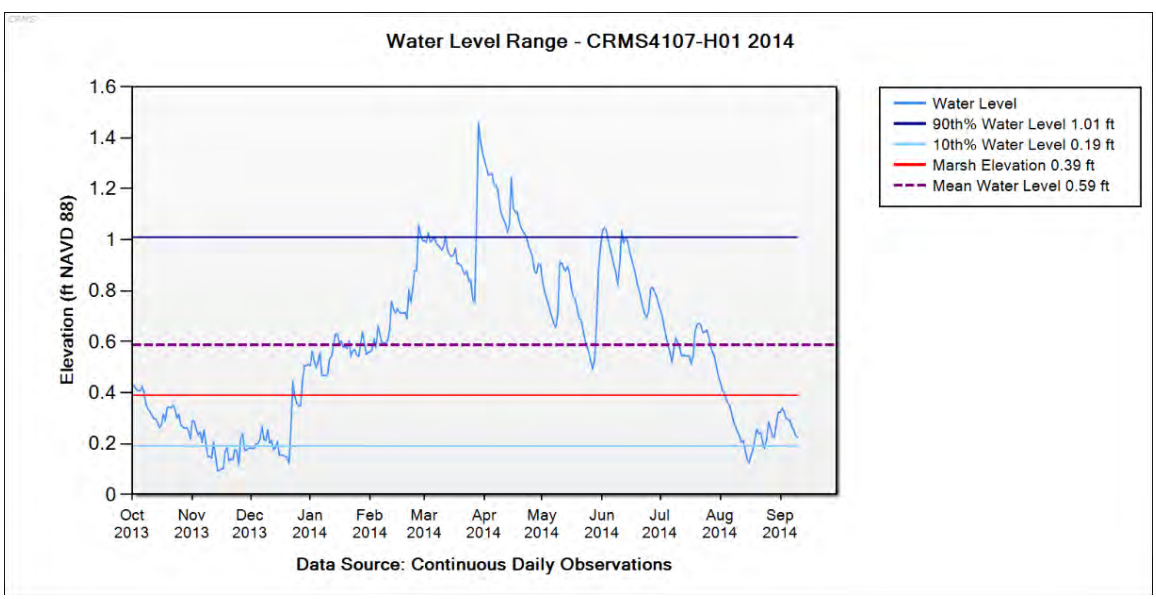
5.5.2 MARSH CREATION

MARSH ELEVATION DETERMINATIONS

Probably the most important determination in the design of marsh creation projects is the desired height of the final marsh platform. This target elevation is required to subsequently determine dredge quantities, retention dike heights, anticipated settlement, contract durations, and multiple other design parameters. To determine the target elevation, six considerations are taken into account. The considerations are as follows:

- Preliminary Site Investigation: Available LIDAR data was used to evaluate existing marsh elevations in the proximity of the project site. In general, the data indicated a range of marsh elevations from approximately +0.2 feet to -0.2 feet NAVD88.

- Water Elevations:
  Data from the Rigolets gage is provided under the Hydrology paragraph of this DDR. For the purposes of determining the target marsh elevation, data provided by the Coastwide Reference Monitoring System (CRMS) is more suited for this project. CRMS station 4107 is approximately 2.5 miles from the marsh creation site and within the HSDRRS protection system. Data for the water level range provided by CRMS4107 provides water levels from Sep. 2013 to Sep. 2014. The mean water elevation for this time period is 0.56'. The 90th % water level is +1.01', and the 10th % water level is 0.19'.



Graph 1: Water Level Range – CRMS4107-H01 2014

- Project Surveys: Based off of surveys taken for 65% design of the Turtle Bayou intermediate marsh creation project, existing marsh elevations within the project footprint per USACE surveys taken in July 2014 are in the range of 0.0' to -1.0' NAVD88 (2009.55). Although the elevations stated are representative of the current marsh elevations within the project footprint, it is understood that these elevation are not necessarily healthy marsh elevations.

- Environmental Input: The 65% design for this project will be reviewed by the USF&WL, with whom the project scope and design were coordinated, as well as other agencies for input on verification of the final marsh target elevation.

At a 65% level of design, an elevation of +0.15' NAVD88 (2009.55) was determined to be the maximum acceptable long term target marsh elevation. An elevation of +0.15' NAVD88 (2009.55) would, for the most part, provide a slightly higher marsh elevation than the existing healthy marsh elevations captured within the project surveys which ranged for the most part from +0.2' to -0.4' NAVD88 (2009.55) . Settlement calculations presented in the geotech report indicate that an initial dewatered fill elevation of +0.5' NAVD88 (2009.55) would provide a marsh elevation of 0.0'NAVD88 (2009.55) at the end of the 50 year project life. Providing an allowable construction fill tolerance range of 0.25', both above and below the desired elevation of +0.5' NAVD88 (2009.55), would provide a marsh platform within the range of +0.15' and -0.15' NAVD88 (2009.55) between project years 10 and 50.

Furthermore, consideration should be given to assessing the potential difference between the epoch of the data used in the CRMS' database, and the epoch of the data obtained in the project design surveys (2009.55). Prior to completion of final design, an assessment of potential epoch differences should be performed and used in determining the final target marsh elevation for the Turtle Bayou marsh creation project.

FILL MATERIAL INVESTIGATIONS AND ANALYSIS

The HSDRRS Lake Pontchartrain and Vicinity Mitigation project at Turtle Bayou is immediately west of and adjacent to the Bayou Sauvage Floodside brackish marsh HSDRRS Lake Pontchartrain and Vicinity Mitigation project. Turtle Bayou was added to the Sauvage floodside project in 2014 and both projects will be constructed under the same contract and utilize the same borrow site. In order to determine the physical characteristics and behavior of the soils associated with these HSDRRS Lake Pontchartrain and Vicinity Mitigation projects, additional geotechnical investigations were required as the borrow site, originally proposed for the Sauvage floodside project, had to be expanded in order to provide adequate borrow for both the Sauvage floodside and Turtle Bayou projects.

In order to determine the physical characteristics and behavior of the soils associated with this HSDRRS Lake Pontchartrain and Vicinity Mitigation project, geotechnical investigations and analyses were performed. Initially, six (6) probes (BSFR-1G to BSFR-6G) were taken in August 2012 for the LPV HSDRRS Mitigation – Bayou Sauvage Floodside brackish marsh project. In 2014, the Turtle Bayou intermediate marsh restoration feature was approved and added to the Bayou Sauvage floodside project. In order to accommodate both project features, the Lake Pontchartrain borrow site was expanded an additional 800' into the lake and across the entire 8,000' length of the borrow site. In order to determine the physical characteristics and behavior

of the soils associated with the expanded portion of the borrow site, four (4) additional geoprobes were taken. The USACE New Orleans District's drill crew was tasked to collect these additional soil borings. Laboratory testing was performed by the New Orleans District soils lab and FFEBJV, LLC to determine soil characteristics. Geoprobes (BSFG-7G to BSFG-10G) were taken within the expanded northeast portion of the proposed Lake Pontchartrain borrow area, and to a depth of 25' below the lake bottom, in order to properly define the material characteristics to be borrowed and utilized for marsh creation. Information relative to these additional borings may be found on the drawings and in the Geotech Appendix.

IN SITU FOUNDATION MATERIALS INVESTIGATION AND ANALYSIS

In order to determine the physical characteristics and behavior of the soils associated with the Turtle Bayou marsh creation feature, geotechnical investigations and analyses were performed. FFEBJV, LLC was tasked to collect the soil borings within the Turtle Bayou marsh creation site. Three (3) 5-inch undisturbed soil borings TB-1U, B-2U, and TB-3U were advanced to forty foot depths. Soil samples were laboratory tested for classification, strength, and compressibility. These borings of the project area were drilled in July 2014. The locations of these undisturbed borings can be found on plan sheet C-10.

Laboratory testing was performed by the New Orleans District soils lab and FFEBJV, LLC to determine soil characteristics. The following tests were performed: 3-point unconsolidated undrained triaxial shear, unconfined compression, consolidation, liquid and plastic limits, sieve analysis, classification, water content, and specific Gravity. Detailed results of this testing can be found on soil boring log plates 2 to 4 in the Geotech Appendix.

SUBSURFACE EVALUATION

The marsh creation area is situated east of Turtle Bayou and west of Highway 11. This is an area of low relief averaging near sea level. The surface is composed of swamp/marsh deposits that are found from approximately -2' to -6' NAVD88 in elevation. Swamp/marsh deposits are composed of predominantly organic clays, fat clays, peat and wood. Natural levee deposits underlie the swamp/marsh and are found from -3' to -7' NAVD88 in elevation. Natural levee deposits consist of predominantly fat and lean clays and silts with some sand layers. Interdistributary deposits underlie the natural levee and are found from -5' to -24' NAVD88 in elevation. These interdistributary deposits consist of soft and medium, fat clay interbedded with occasional lenses of silt and lean clay. Nearshore gulf deposits underlie interdistributary deposits and are found from -18' to -36' NAVD88 in elevation. Nearshore gulf deposits are composed predominantly Of sand and silty sand with numerous shell fragments. Pleistocene deposits underlie nearshore gulf deposits. The top of the Pleistocene is approximately -30' NAVD88 in elevation & these deposits extend to an unknown depth. The Pleistocene deposits are stiff to very stiff oxidized clays with some interbedded layers and
lenses of silts and sands. The Geologic Profile can be found on plate 5 in the Geotech Appendix. Groundwater is at or near the surface within the project area.

SETTLEMENT ANALYSIS

Due to the inherent uncertainties associated with estimating settlement, it is important to point out that settlement calculations are only an estimate of future settlement. Settlement for Primary consolidation of the foundation due to the weight of the marsh was analyzed based on Das' 6th edition of Principles of Geotechnical Engineering and with the Settle3D program. Settle3D was developed by Rocscience Inc., and is a 3-dimensional program for the analysis of vertical consolidation and settlement under foundations, embankments and surface loads. Settlement parameters were developed using actual consolidation test results and correlations were developed based on the document "Strength and Compressibility Correlations for N.O. Area Soil", soil mechanics formulas and curves. The primary purpose of the settlement analysis was to develop an estimated settlement curve showing the anticipated settlement over time. The settlement estimates depend on the soil thickness, compression index, initial void ratio, coefficient of consolidation, initial and increase in overburden stress. Besides primary consolidation of the foundation, settlement of the dredged material was also estimated. The settlement consists of shrinkage of the dredged material above the water line and consolidation of the entire thickness of the dredged material. Shrinkage was estimated as 25% and consolidation 10% of the corresponding fill height. The time rate for shrinkage
and consolidation was developed based on a standard curve that is based upon experience with similar projects.

Material from Lake Pontchartrain will be dredged to restore the Turtle Bayou project area. The marsh creation site is approximately 172 acres and the desired long term marsh target elevation range is between +0.15' to -0.15' feet NAVD88 (2009.55). For stability, the dike was analyzed to an elevation of +4' NAVD88 (2009.55) with dredged fill to elevation +2' NAVD88 (2009.55). The unit weight of
the borrow material from Lake Pontchartrain was conservatively assumed to be 100 pcf. (See Appendix A of the Geotech Appendix for more details)

Settlement curves with initial dewatered slurry elevations at +2, +1.5, +1, +0.5, and +0 feet NAVD88 (2009.55) were developed and are shown below.

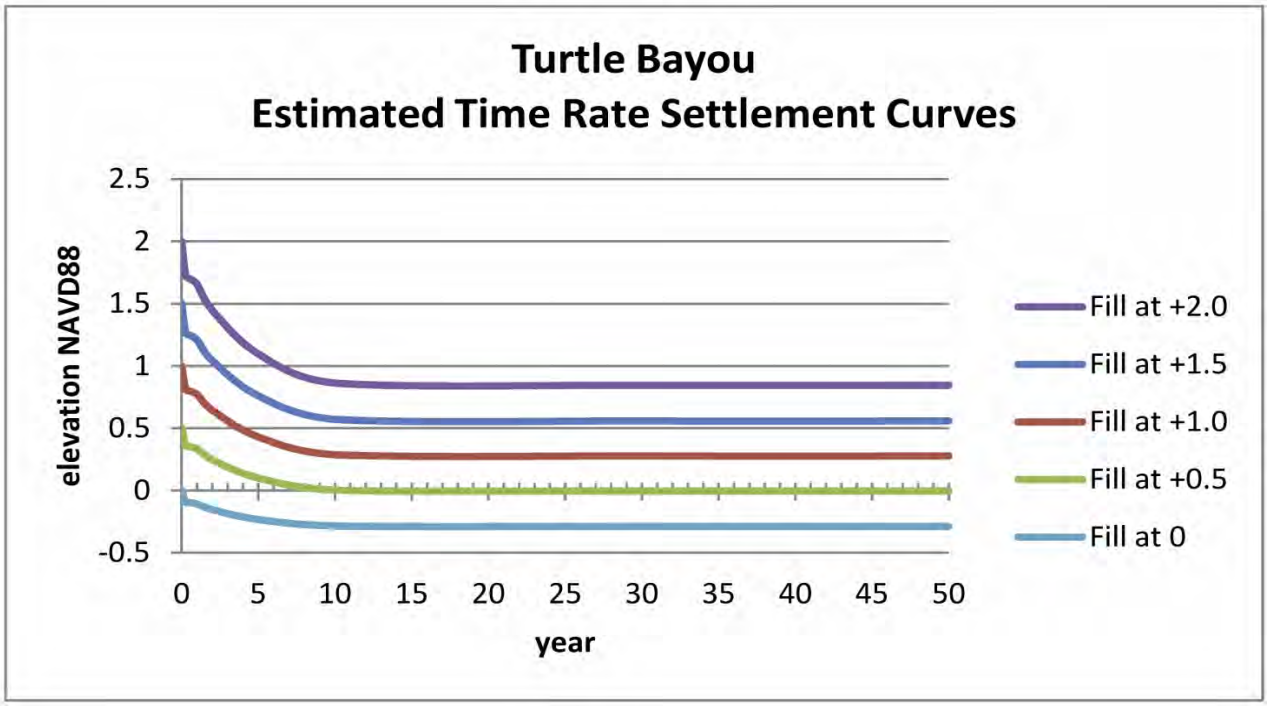


Figure 8: Marsh Settlement Curve

FILL ELEVATIONS

Based on the desired marsh target elevation of 0.0' NAVD88 (2009.55) and the settlement curves, the final dredge fill elevation (after dewatering) was established at +0.5' NAVD88 (2009.55).

RETENTION DIKES

An earthen retention dike will be constructed around the perimeter of the Turtle Bayou marsh creation area for containment of dredged material hydraulically borrowed from Lake Pontchartrain and transported via pipeline to the marsh creation area. The dredge material will be placed within the Turtle Bayou marsh creation site to an elevation of +0.5' NAVD88 (2009.55), excluding effluent waters. A tolerance of +/-0.25' will be allowed and at no time will the dredged material, excluding effluent waters, exceed +0.75' NAVD88 (2009.55). The dike will have a crown width of 5' and side slopes of 1V on 3H. To account for fill settlement and assure containment of the dredge fill, the retention dike will be constructed and maintained to elevation +3.5' NAVD88 (2009.55). This will also provide 1.5' to 2' of freeboard which will be maintained throughout dredge disposal operations.
The earthen dike material is assumed to have a unit weight of 100 pcf and cohesion of 200 psf.

Theoretical sections of the retention dikes are shown on the plans, and are based on slope stability analysis conducted and provided in the geotech report. Borrow for the retention dike

will come from adjacent borrow within the marsh creation areas. The top of cut for borrow will be no closer than 40' from the inside toe of the retention dike and no deeper than -8' NAVD88 (2009.55). This is within -10' NAVD88 (2009.55) which was used in the geotech analysis for stability.

QUANTITIES

Lake Pontchartrain Borrow: Cross sections were developed in InRoads using the survey data of the borrow site. The borrow site is approximately 459 acres in size, 2500' in depth and 8000' in width at the allowable top of cut. A natural angle of repose of 1V on 3H was estimated. The average ground elevation within the borrow pit is approx -7.5' NAVD88 (2006.81) and borrow will be allowed to -18' NAVD88 (2006.81) with a 1' vertical working tolerance down to elevation -19' NAVD88 (2006.81). The total amount of fill material from the borrow site (above elevation -18' NAVD88 (2006.81)) is approximately 7,650,000 cubic yards, with an additional 720,000 cubic yards available within the allowable 1' tolerance between elevation -18' and elevation -19' NAVD88 (2006.81).

Retention Dike Borrow: In order to create the Turtle Bayou marsh creation project, approximately 15,700 linear feet of perimeter retention dikes will need to be constructed. Of this 15,700', approximately 2,700' of closures will need to be constructed along the northen end of the restoration site. The closures will be constructed between dike C/L points PT 1 and PT 2, and PT 4 and PT 5. In order to accommodate the dredge, and provide a freeboard of 1.5' to 2' which will be maintained at all times during construction, a required dike grade of +3.5' NAVD88 (2009.55) was used. The dikes will have a minimum crown width of 5' and side slopes no steeper than 1V on 3H. Based off of the boring and test data, documented in the Geotech Appendix, stability berms were not warranted. An additional 50% was added to the neatline quantity of the dikes in order to account for settlement during construction. Approximately 93,000 gross cubic yards of adjacent borrow material are estimated to be required for construction of the earthen retention dikes, including the 2 closures previously mentioned.

Marsh Creation Area: The fill quantities for the Turtle Bayou marsh creation area were calculated using the average end method. Cross sections were developed in InRoads using the survey data of the existing marsh, retention dikes in place, and the proposed marsh fill elevation of +0.5' NAVD88 (2009.55), as well as +0.25' and +0.75' NAVD88 (2009.55) which would account for the allowable half-foot tolerance range. Below are the neat line fill quantities for these various elevations.

Triangle Volume Report

Report Created: 11/24/2014
Time: 9:12am

Mode: Entire Surface
Input Grid Factor: 1.000000

Original Surface: **TURTLE BAYOU EXISTING 2014**
Description:
Preference: Default
Type: Existing
Design Surface: **TURTLE BAYOU EL 0.5**
Description:
Preference: Default
Type: Existing
Cut Factor: 1.0000
Fill Factor: 1.0000

Cut:	100989.2 cu ft
Fill:	22619896.2 cu ft
Net:	-22518907.1 cu ft

Cut:	3740.3 cu yd
Fill:	837773.9 cu yd
Net:	-834033.6 cu yd

Original Surface: **TURTLE BAYOU EXISTING 2014**
Description:
Preference: Default
Type: Existing
Design Surface: **TURTLE BAYOU EL 0.75**
Description:
Preference: Default
Type: Existing
Cut Factor: 1.0000
Fill Factor: 1.0000

Cut:	84861.0 cu ft
Fill:	24842791.3 cu ft
Net:	-24757930.3 cu ft

Cut:	3143.0 cu yd
Fill:	920103.4 cu yd
Net:	-916960.4 cu yd

Figure 9: Theoretical Neat-Line Fill Quantities

Triangle Volume Report

Report Created: 1/26/2015
Time: 2:06pm

Mode: Entire Surface
Input Grid Factor: 1.000000

Original Surface: **TURTLE BAYOU EXISTING 2014**
Description:
Preference: Default
Type: Existing
Design Surface: **Turtle Bayou El. .25**
Description:
Preference: Default
Type: Existing
Cut Factor: 1.0000
Fill Factor: 1.0000

Cut:	29468.3 cu ft
Fill:	18625946.1 cu ft
Net:	-18596477.8 cu ft
Cut:	1091.4 cu yd
Fill:	689849.9 cu yd
Net:	-688758.4 cu yd

Figure 9: Theoretical Neat-Line Fill Quantities

Since the target fill elevation and required borrow also have to account for other factors such as base foundation and fill material consolidation and shrinkage of dredge fill, displacement of the soft organics atop the clay foundation, and refilling of interior borrow pits required for construction of retentions dikes, as well as potential losses in the borrow pit due to agitation while dredging within the borrow pit, the required borrow quantity was adjusted to account for these various loss factors. In order to achieve the target grade of +0.5' NAVD88 (2009.55) (after initial dewatering) it is estimated that approximately 1,200,000 cubic yards of borrow from Lake Pontchartrain will be required. See the Figures 10, 11 and 12 describing the assumptions used in developing the required borrow for elevations of +0.5', +0.75' and +0.25' NAVD88 (2009.55).

	Sauvage PS - TBN	Sauvage PS - TBN	1st Lift (Open Water)
0.50	Design fill elevation (immediately after pumping)		1st Lift - Dredge Quantity (Open Water)
-2.3	Average Bottom Elevation		
0.5	Displaced Foundation		
0.24	Anticipated foundation settlement (from Geotech analysis for +0.5' fill doubled)	172.00	acres
-3.04	Ultimate Bottom Elevation	7,492,320	square feet
3.54	Target Fill Face (immediately after pumping)	3.95	fill face (Bulked and less excess water from slurry)
4.95	Bulked Fill Face - excludes foundation settlement (1.5 Bulking Factor)		
1.00	Assumed Excess Water from slurry that will drain		
3.95	Bulked Fill Face less excess water (Fill Unconsolidated)	1,100,000	Required cubic yards
0.99	Consolidation and Shrinkage of Fill (from Geotech report for shrinkage and consolidation for hydraulic fill; assumes 25%)	110,000	Losses due to agitation in pit (10%)
2.96	Consolidated fill face		
-0.08	Final Fill Elevation	**1,200,000**	**Required Borrow**

Figure 10: Required Borrow/Fill Computations for Design Grade of +0.5' NAVD88 (2009.55)

	Sauvage PS - TBN	Sauvage PS - TBN	1st Lift (Open Water)
0.75	Design fill elevation (immediately after pumping)	1st Lift - Dredge Quantity (Open Water)	
-2.3	Average Bottom Elevation		
0.5	Displaced Foundation		
0.24	Anticipated foundation settlement (from Geotech analysis for +0.5' fill doubled)	172.00	acres
-3.04	Ultimate Bottom Elevation	7,492,320	square feet
3.79	Target Fill Face (immediately after pumping)	4.33	fill face (Bulked and less excess water from slurry)
5.33	Bulked Fill Face - excludes foundation settlement (1.5 Bulking Factor)		
1.00	Assumed Excess Water from slurry that will drain		
4.33	Bulked Fill Face less excess water (Fill Unconsolidated)	1,200,000	Required cubic yards
1.08	Consolidation and Shrinkage of Fill (from Geotech report for shrinkage and consol-dation for hydraulic fill; assumes 25%)	120,000	Losses due to agitation in pit (10%)
3.24	Consolidated fill face		
0.20	Final Fill Elevation	**1,300,000**	**Required Borrow**

Figure 11: Required Borrow/Fill Computations for Allowable +0.25' Tolerance (+0.75' NAVD88 (2009.55))

	Sauvage PS - TBN	Sauvage PS - TBN	1st Lift (Open Water)
0.25	Design fill elevation (immediately after pumping)	1st Lift - Dredge Quantity (Open Water)	
-2.3	Average Bottom Elevation		
0.5	Displaced Foundation		
0.24	Anticipated foundation settlement (from Geotech analysis for +0.5' fill doubled)	172.00	acres
-3.04	Ultimate Bottom Elevation	7,492,320	square feet
		3.58	fill face (Bulked and less excess water from slurry)
3.29	Target Fill Face (immediately after pumping)		
4.58	Bulked Fill Face - excludes foundation settlement (1.5 Bulking Factor)		
1.00	Assumed Excess Water from slurry that will drain		
3.58	Bulked Fill Face less excess water (Fill Unconsolidated)		
		990,000	Required cubic yards
0.89	Consolidation and Shrinkage of Fill (from Geotech report for shrinkage and consol-dation for hydraulic fill; assumes 25%)	99,000	Losses due to agitation in pit (10%)
2.68	Consolidated fill face		
-0.36	Final Fill Elevation		
		1,100,000	**Required Borrow**

Figure 12: Required Borrow/Fill Computations for Allowable -0.25' Tolerance (+0.25' NAVD88 (2009.55))

FUTURE REQUIREMENTS

Future requirements will be provided in the 95% review.

5.6 Real Estate Determination and Acquisitions

To be provided at 95% design.

5.7 Relocations

A field investigation was executed for each of the New Zydeco Ridge project sites. No relocations were found. However, there is an AT&T fiber optic line buried along the access corridor adjacent to old Spanish Trial Road. The cable may require relocation for a small reach, but has not been determined at this time. The owner has been contacted and made aware of the proposed plan and coordination in the process.

The databases used to identify potential pipelines, power lines and transmission lines within the area of the projects were HTSI, DNR SONRIS GIS, NPMS-LA, USDOT, Homeland Security Infrastructures Program 2012 and NOAA. The lines were visually confirmed, as well as a confirmation from owner. The owner located within the project is as follows:

Owner	Type	Number of Lines	POC
Entergy Power Line	Power lines and poles	2 line and associated poles	James Sholar jsholar@entergy.com Office: 504-219-4204 Cell: 504-390-9414
AT&T	Underground Fiber optic cable	1	Steve Bergeron sb0708@att.com Office: 985-327-6432

Table 8: List of Facilities

Entergy will be notified of when the Corps is within the project area only for the purpose of awareness. There's no intention to impact the power lines or poles.

6. Implementation of Lessons Learned

The Lessons Learned Memo will be included at the final submittal.

7. Cost Estimates

7.1 Independent Government Estimate (IGE)

The IGE was prepared using the following criteria,

- The cost estimates for the mitigation sites were prepared utilizing MII Software, the Cost Engineering Dredge Estimating Program (CEDEP) dredge estimating program, and unit pricing. The estimated costs were based upon an analysis of each line item evaluating quantity, production rate, and time, together with the appropriate equipment, labor and material costs. All of the construction work is common to the CEMVN. In addition, all labor, equipment and materials are typical of this type of construction and are currently available.

- Lands and damages were calculated by CEMVN Real Estate Division. The real estate costs also include administrative and acquisitions costs for building the mitigation features.

- Assumes there are no relocations required for this project.

- Quantities were provided by CEMVN Engineering Division (Civil Branch).

- This estimate assumes that the contractor will be working 10 hours days for land work and 24 hours a day for dredging work, seven (7) days a week. Equipment rates were taken from the USACE EP-1110-1-8, Region III, 2009.

- Labor rates were based on historical rates taken from contractor payrolls for local jobs. All material prices were based on quotes received from suppliers with local sales tax applied.

- The Engineering and Design (E&D) percentage rate includes such costs as project management, engineering, planning, designs, investigations, studies, reviews, value engineering and engineering during construction (EDC). A percentage of 6% was used in most cases because the type of work is typical to the New Orleans District for this type of work.

- The Supervisory and Administration (S&A) rates for USACE civil works districts historically range between 7.5% and 10%. A percentage of 8% within the historical range was selected.

- Field office overhead is included in the operating cost of the dredge.

- Home office overhead was based on 15% which is within the historical range used by New Orleans District.

- Profit was calculated by the Weighted Guidelines Method.

- Bond was assumed to be 1%. A contingency rate of 25% was developed by first looking at the recommended rate of 20% for feasibility level studies over $10,000,000 as shown in ER 1110-2-1302 and then looking at the various high risk issues.

- Contingencies for the mitigation projects include problems higher than expected settlement or erosion, damaging weather events during the construction phase of the project, dredge market conditions and fuel prices.

- The operations and maintenance estimates were developed using unit costs from historical bid data and information provided by the Environmental office.

7.2 MCACES Updates

At this time MCACES updates will be provided for review under separate cover. After award of the project the MCACES updates will be included in Appendix E.

8. Technical Review Documentation

Technical review documentation shall be included as an appendix in the DDR. A copy of the Statement of Technical and Legal Review for the design and P&S shall be included in the DDR. The documentation from the ATR team required by the QCP may be either included or referenced in the DDR.

Review Type	**Key Decision Point**	**Date of Review**	**Documentation Available**
Project Delivery Team (PDT) Review		14 Nov 2014	
District Quality Control (DQC) Review		14 Nov 2014	
Agency Technical Review (ATR)		14 Nov 2014	
Bid ability, Constructability, Operability & Environmental Review (BCOE) Certification Letter		TBD	
Statement of Technical & Legal Review		TBD	

Table 10: Review Documentation

9. APPENDICES

APPENDIX A

Geotechnical Investigations

LAKE PONTCHARTRAIN AND VICINITY MITIGATION

Turtle Bayou Intermediate Marsh Restoration

Retention Dike Design

Orleans Parish, Louisiana

September 2014

Design By: Bich Quach and Kelly Danton

Reviewed By: Brian Bonanno and Rick Broussard

ITR By: Anthony Scairono

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SLOPE STABILITY ANALYSIS 5

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3	Boring Log of TB-2U
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7	Top of Dike Case – Circular – Stability Analysis
8	Top of Dike Case – Non Circular –Stability Analysis
9	Construction Case – Circular – Stability Analysis
10	Construction Case – Non Circular – Stability Analysis
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APPENDIX D	Reviews – ITR and Waterways Section

* All elevations are in N.A.V.D. 88

Lake Pontchartrain and Vicinity Mitigation

Turtle Bayou North Intermediate Marsh Restoration

Orleans Parish, Louisiana

September 2014

INTRODUCTION

The Turtle Bayou North Intermediate Marsh Restoration project is located in the Bayou Sauvage National Wildlife Refuge, which is in New Orleans East. Bayou Savage is the largest urban national wildlife refuge and is located about 15 minutes away from the French Quarter. It was established in 1990 and consists of over 24,000 acres of fresh and brackish marshes and coastal hardwood forests. The majority of this refuge is contained within the Hurricane and Storm Damage Risk Reduction System.

PROJECT BORDERS

To the east of the Turtle Bayou North Intermediate Marsh Restoration site is Highway 11, and just beyond hwy 11 is the HSDRRS Levee – LPV-109. Turtle Bayou is to the west of the project site. Blind Lagoon is to the south. Interstate 10 is to the west.

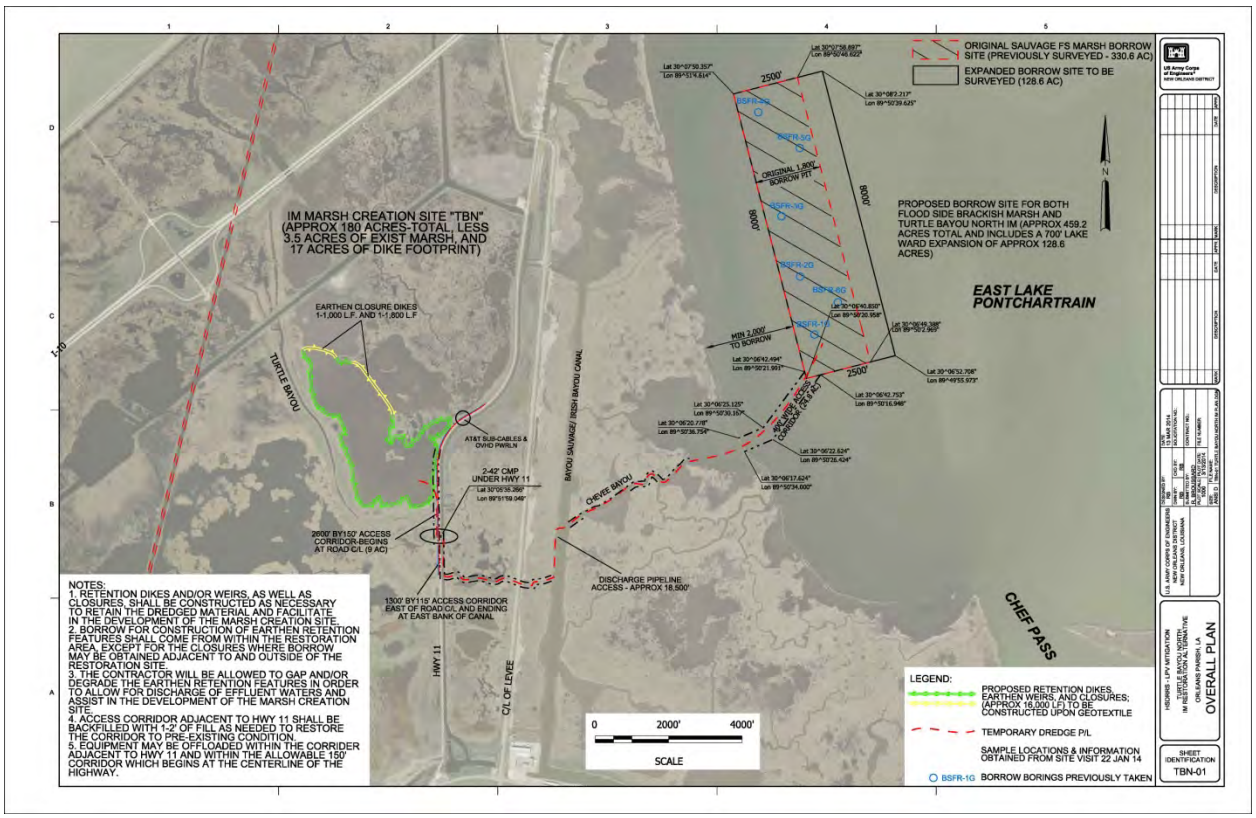


Figure 1

* All elevations are in N.A.V.D. 88

GEOTECHNICAL INVESTIGATIONS AND ANALYSIS

In order to determine the physical characteristics and behavior of the soils associated with Lake Pontchartrain and Vicinity Mitigation at Turtle Bayou, geotechnical investigations and analyses were performed. The USACE New Orleans District drill crew was tasked to collect soil borings. Laboratory testing was performed by the New Orleans District soils lab and FFEBJV, LLCs to determine soil characteristics. The geotechnical branch of the New Orleans district analyzed stability of the retention dikes, and calculated settlement of the restoration areas.

Four geoprobes (BSFG-7G to BSFG-10G) were taken in Lake Pontchartrain to define the material planned for dredging. Information about these borings can be found on plate 13. This area will not be dredged deeper than elevation -18' N.A.V.D. 88.

FIELD INVESTIGATION

Three 5 inch undisturbed soil borings TB-1U, B-2U, and TB-3U were advanced to forty foot depths (Plates 2 to 4). Soil samples were laboratory tested for classification, strength, and compressibility. Borings in the project area were drilled during the period of July 10, 2014 through July 12, 2014. A map showing the locations of undisturbed and borrow borings can be found on Plate 1.

LABORATORY TESTING

The following tests were performed: 3-point unconsolidated undrained triaxial shear, unconfined compression, consolidation, liquid and plastic limits, sieve analysis, classification, water content, and specific Gravity. Detailed results of this testing can be found on soil boring logs plates 2 to 4, and Appendix B on the enclosed disc.

SUBSURFACE EVALUATION

The project area is situated east of Turtle Bayou and west of Highway 11. This is an area of low relief averaging near sea level*. The surface is composed of swamp/marsh deposits that are found from approximately -2 to -6 feet in elevation. Swamp/marsh deposits are composed of predominantly organic clays, fat clays, peat and wood. Natural levee deposits underlie the swamp/marsh and are found from -3 feet to -7 feet in elevation. Natural levee deposits consist of predominantly fat and lean clays and silts with some sand layers. Interdistributary deposits underlie the natural levee and are found from -5 to -24 feet in elevation. Interdistributary deposits consist of soft and medium, fat clay interbedded with occasional lenses of silt and lean clay. Nearshore gulf deposits underlie interdistributary deposits and are found from -18 feet to -36 feet in elevation. Nearshore gulf deposits are composed predominantly of sand and silty sand with numerous shell fragments. Pleistocene deposits underlie nearshore gulf deposits. The top of the Pleistocene is approximately -30 feet in elevation and these deposits extend to an unknown depth. The Pleistocene deposits are stiff to very stiff oxidized clays with some interbedded layers and lenses of silts and sands. The Geologic Profile can be found on plate 5.

Groundwater is at or near the surface in the project area.

* All elevations are in N.A.V.D. 88

* All elevations are NAVD 88

SETTLEMENT ESTIMATE ANALYSIS

Due to the inherent uncertainties associated with estimating settlement, it is important to point out that settlement calculations are only an estimate of future settlement.

Settlement for Primary consolidation of the foundation due to the weight of the marsh was analyzed based on Das' 6th edition of Principles of Geotechnical Engineering and with the Settle3D program. Settle3D was developed by Rocscience Inc., and is a 3-dimensional program for the analysis of vertical consolidation and settlement under foundations, embankments and surface loads. Settlement parameters were developed using actual consolidation test results and correlations were developed based on the document "Strength and Compressibility Correlations for N.O. Area Soil", soil mechanics formulas and curves. The primary purpose of the settlement analysis was to develop an estimated settlement curve showing the anticipated settlement over time. The settlement estimates depend on the soil thickness, compression index, initial void ratio, coefficient of consolidation, initial and increase in overburden stress. Besides primary consolidation of the foundation, settlement of the dredged material was also estimated. The settlement consists of shrinkage of the dredged material above the water line and consolidation of the entire thickness of the dredged material. Shrinkage was estimated as 25% and consolidation 10%. The time rate for shrinkage and consolidation was developed based on a standard curve that is based upon experience with similar projects.

Material from Lake Pontchartrain shall be dredged to restore the Turtle Bayou project area, figure 1 on page 3 shows this site. The marsh is approximately 180 acres and the desired long term marsh target elevation ranges from +0.5 feet to -0.5 feet NAVD 88. The dike was analyzed to an elevation of 4 feet with dredged fill to elevation +2 feet. The unit weight of the borrow material from Lake Pontchartrain was conservatively assumed to be 100 pcf. The water surface elevation is 0'. (See Appendix A)

Settlement curves with initial slurry elevations at +2, +1.5, +1, +0.5, and +0 feet NAVD88 were developed these can be found on page 7 of this report and in Appendix A.

STRENGTH LINE

The foundation stratification and soil design parameters were created from soil borings TB-1U to TB-3U and are shown on Plate 6.

SLOPE STABILITY ANALYSIS

Slope stability analysis was performed on the earthen retention dikes for the marsh using Slope/w of the Geostudio suite of geotechnical software. The slope stability of the dike has the driving force induced by the soil weight. In response to the driving force, the subsurface soils have a resistant force in the form of shear strength, which attempts to keep the slope from sliding. Both the driving forces and the resisting forces are dependent on the geometry of the situation. The computer program Slope/W developed by GeoStudio is a software product that computes factors of safety against potential failure by the Spencer method which analyzes slices of various slip surfaces with the limit equilibrium of the forces and moments. Both Block and Entry/Exit analyses were performed. Stability analyses of the

* All elevations are in N.A.V.D. 88

extreme, operation, and construction cases were performed. The extreme case has the dredged material to the top of the dikes; it assumes that the dredged material does not have any cohesion as it is being pumped into the marsh creation area. The operation case analyzes the dredged material on one side of the dike. The construction case analyzes stability for the temporary case where in-situ material is excavated to construct the retention dike. The required minimum factor of safety is 1.3 for the operation case, and 1.2 for the construction and extreme cases.

DIKE DESIGN

The dike has a crown width of 5' and side slopes of 1V on 3H. To account for the fill settlement and the desired freeboard, the crown elevation is +4 feet. The water surface elevation is 0 feet and the average existing ground surface is at -2 feet. A minimum composite section made up of surveyed cross sections, which can be found in Appendix C was used to determine the existing ground surface elevations. The earthen dike material is assumed to have a unit weight of 100 pcf and cohesion of 200 psf.

For the extreme construction case, the slurry is to the top of the dike. The slurry has a unit weight of 100 pcf and zero strength during initial pumping.

The excavation slopes for the borrow are 1V on 3H, with a bottom elevation of -10 feet. Interior borrow pits for retention dikes will need to be located a minimum of forty feet away from the toe of the toe of the retention dike. The deepest borrow pit anticipated is to elevation -10' N.A.V.D. 88. This bottom elevation was analyzed for stability.

For the operation case, the fill is to +2 feet for the marsh, the fill properties are assumed to have a unit weight of 100 pcf and cohesion of 100 psf.

The foundation stratification was developed from borings TB-1U, TB-2U and TB-3U which consist of strata of clay, silty sand and silt (Plate 6).

Side	Slip Surface Type	Plate Number	Factor of Safety
Top of Dike Extreme Case – Required Factor of Safety = 1.2			
Inside to Outside of BU	Block (Non Circular)	8	2.23
	Entry Exit (Circular)	7	2.25
Construction Case – Required Factor of Safety = 1.2			
Dike failing towards borrow pit	Block (Non Circular)	10	2.68
	Entry Exit (Circular)	9	2.57
Operation Case – Required Factor of Safety = 1.3			
Marsh Creation side to outside of BU Area	Block (Non Circular)	12	2.46
	Entry Exit (Circular)	11	2.54

RECOMMENDATIONS

Stability analyses show that no berms are required for any dike that has an elevation of +4 feet or lower which has 1 vertical on 3 horizontal side slopes. Past construction practices show that dikes should be

* All elevations are in N.A.V.D. 88

built two feet higher than the marsh creation level, one foot of slurry while pumping and an additional foot of freeboard.

FUTURE CONSIDERATIONS

Dikes used for retention of future dredging events must be maintained prior to dredging. For future dredging events, the dikes will need to be lifted or the fill will be sloped down to the settled elevation of the dike. Future dredging events are not considered in this report.

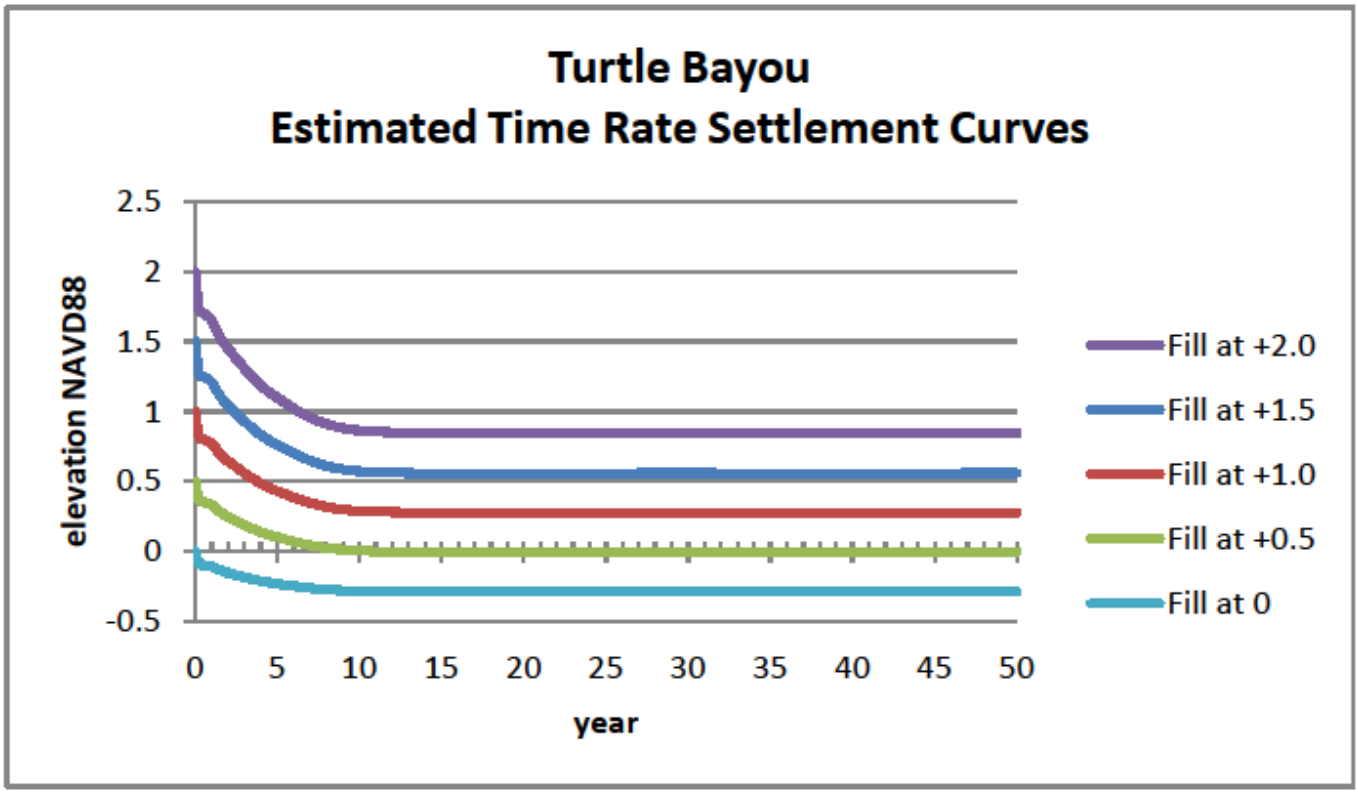


Figure 2

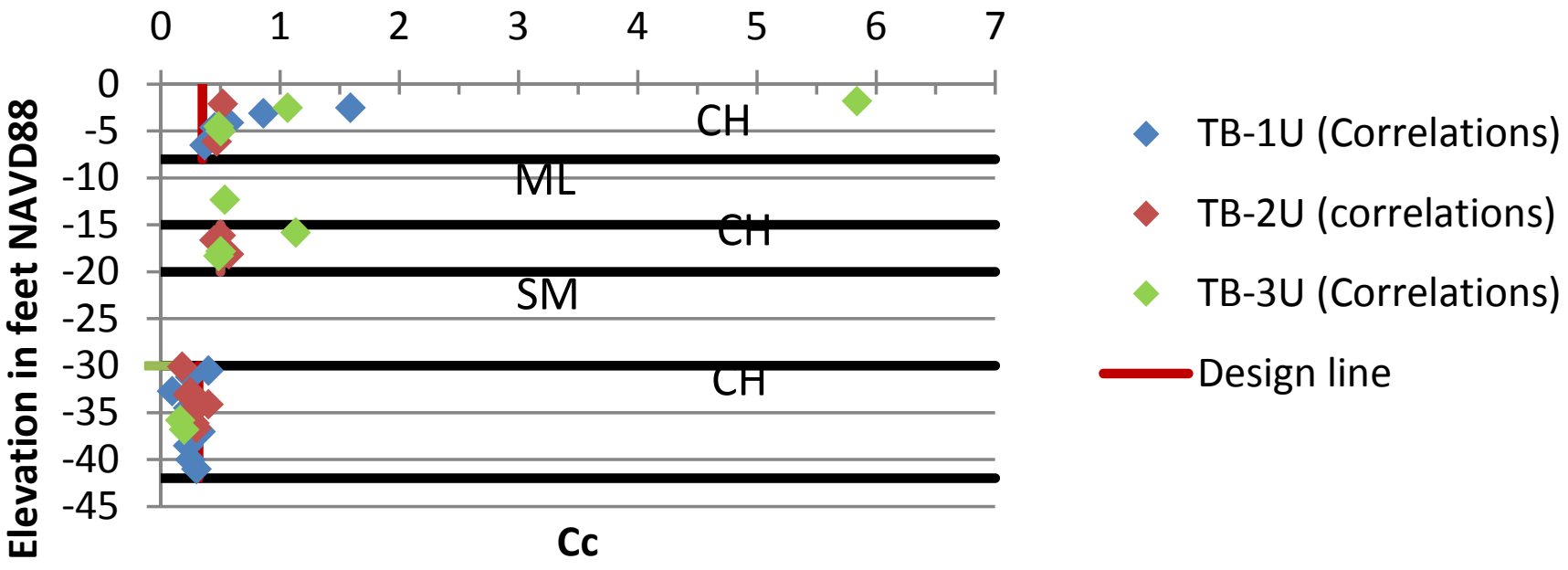
* All elevations are in N.A.V.D. 88

Appendix A

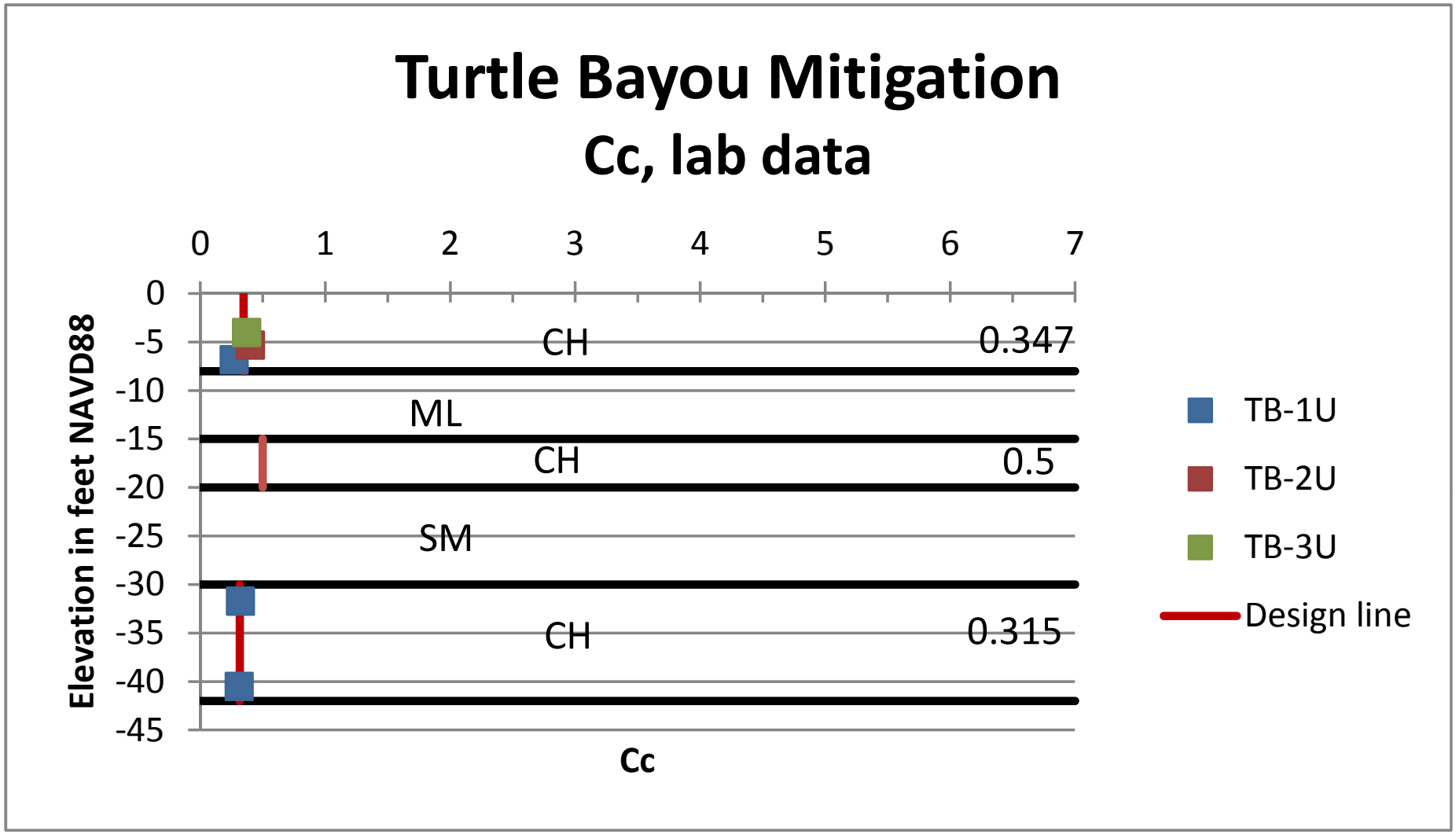
Settlement Estimate

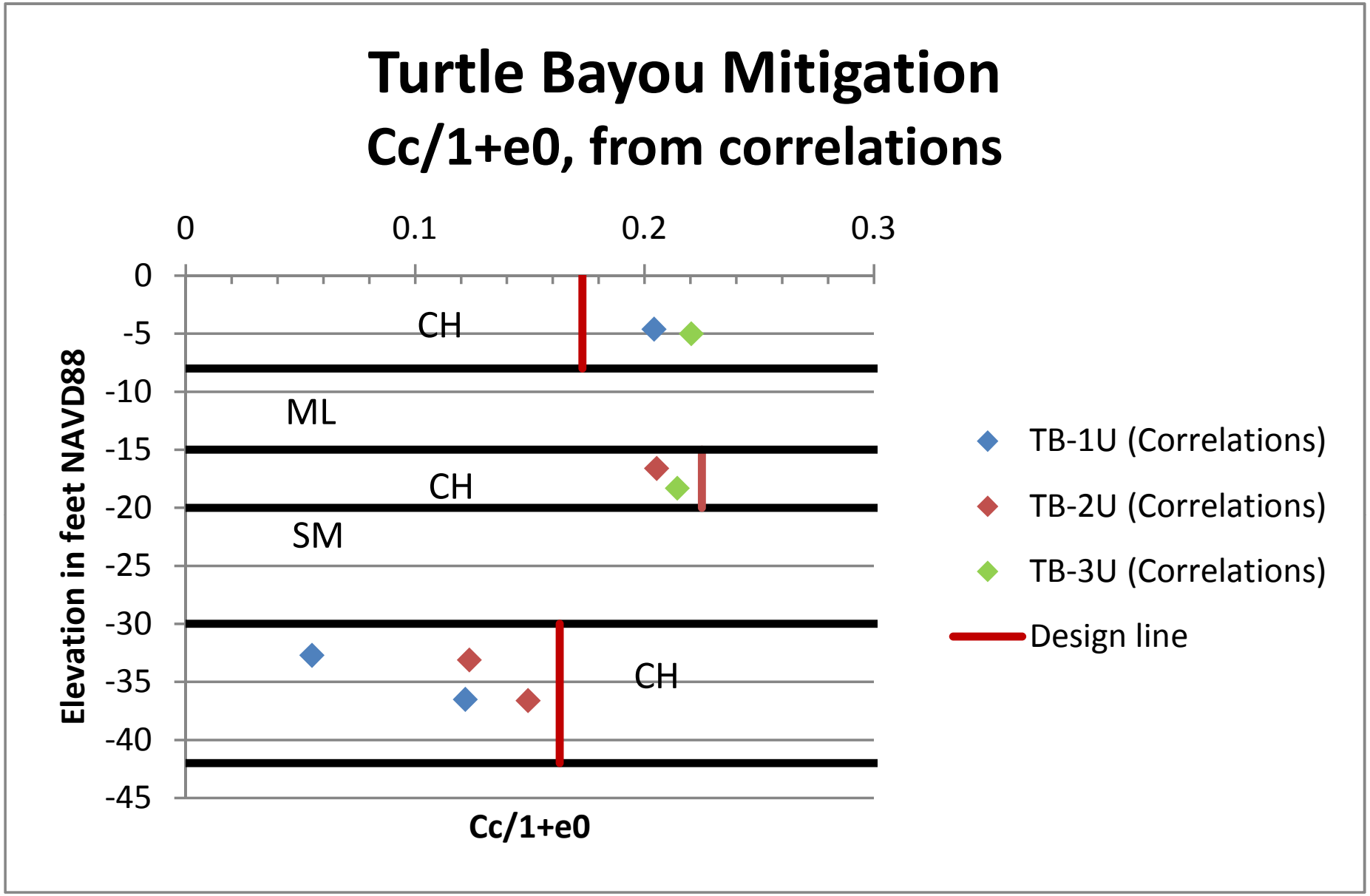
Turtle Bayou Mitigation

Cc, Correlations using Water Contents

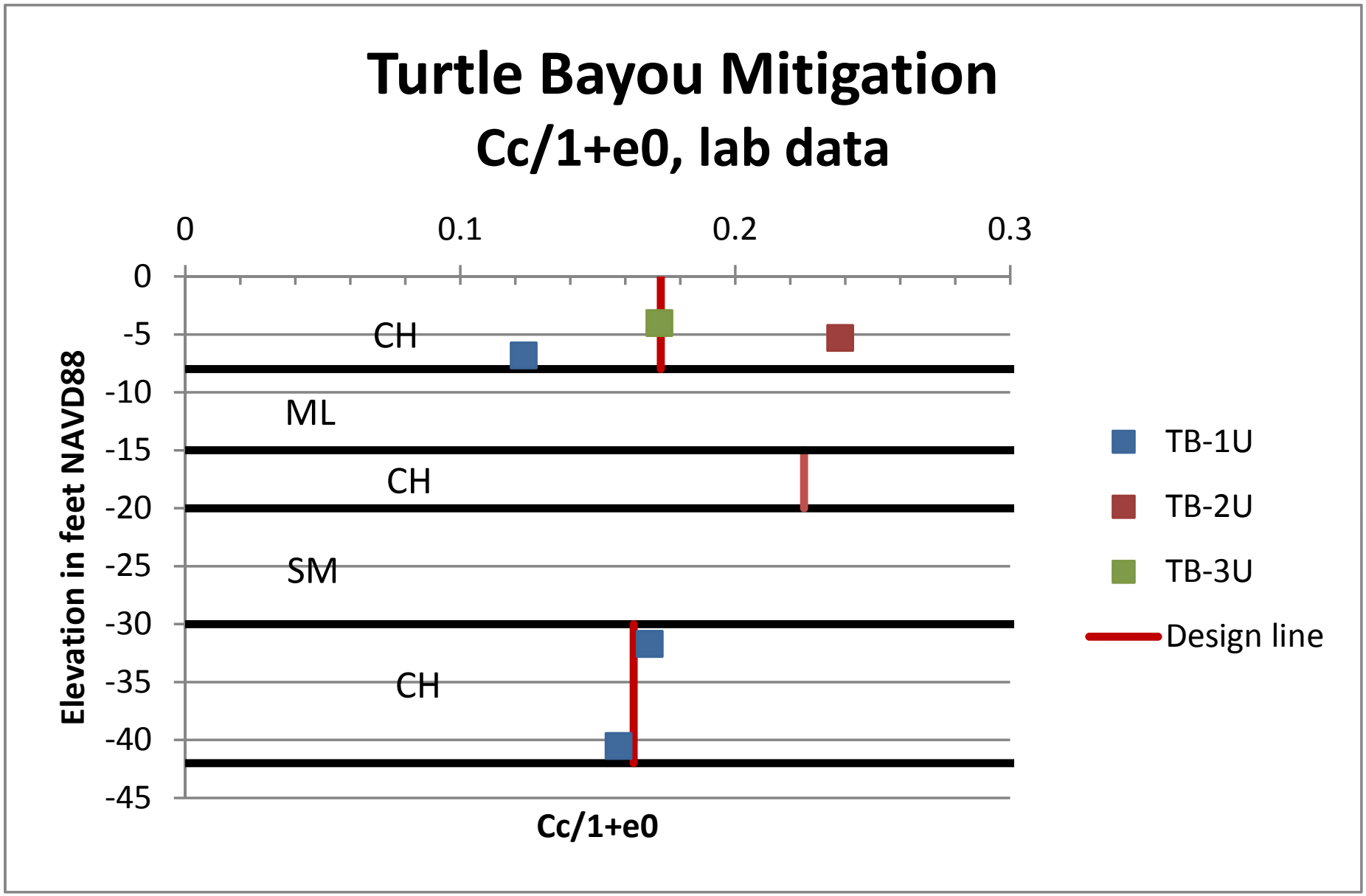


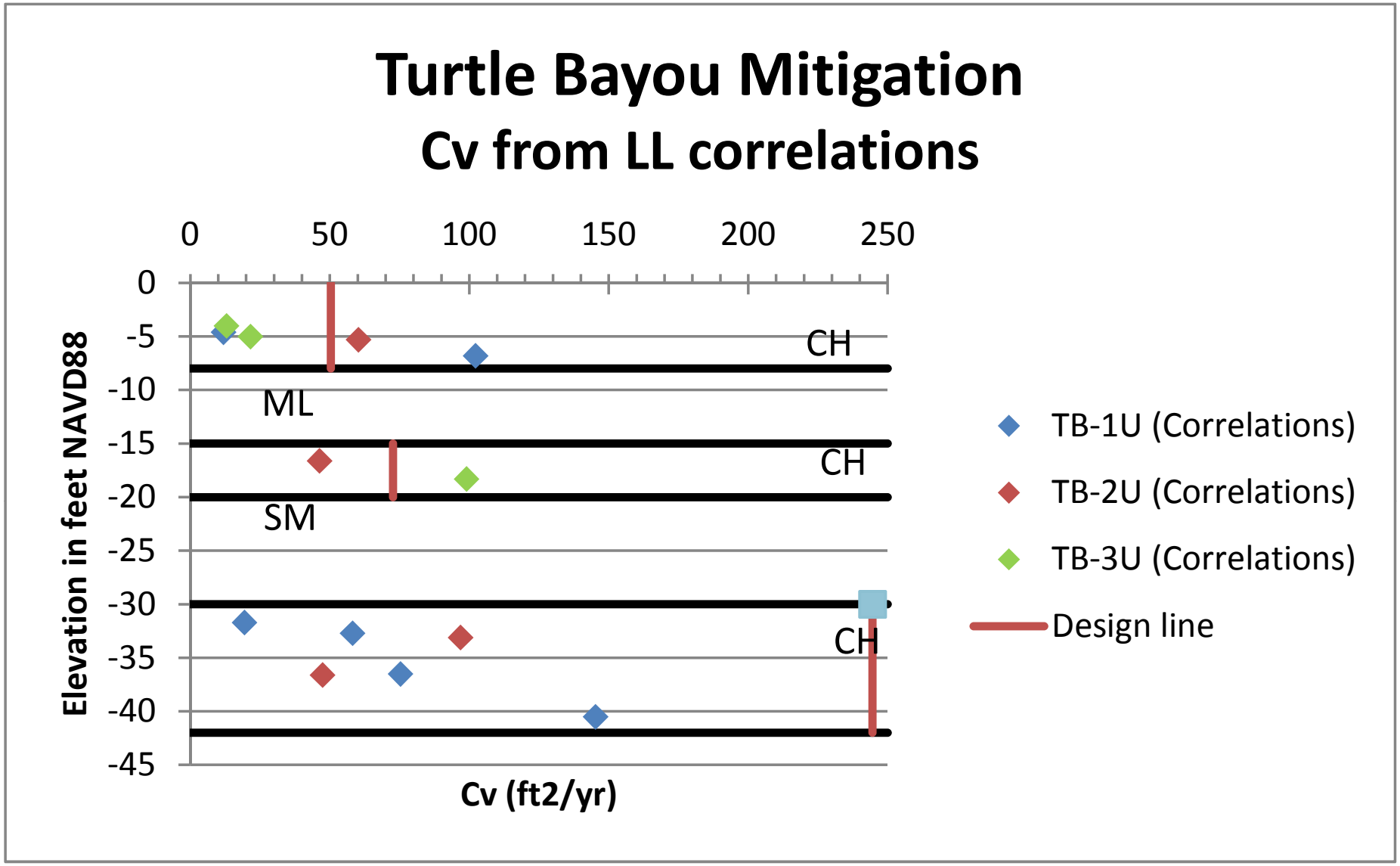
Cc=(0.017*w)-0.299


Turtle Bayou Mitigation
Cc, lab data
0
1
2
3
4
5
6
7
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
Elevation in feet NAVD88
CH
0.347
ML
CH
0.5
SM
CH
0.315
Cc
TB-1U
TB-2U
TB-3U
Design line

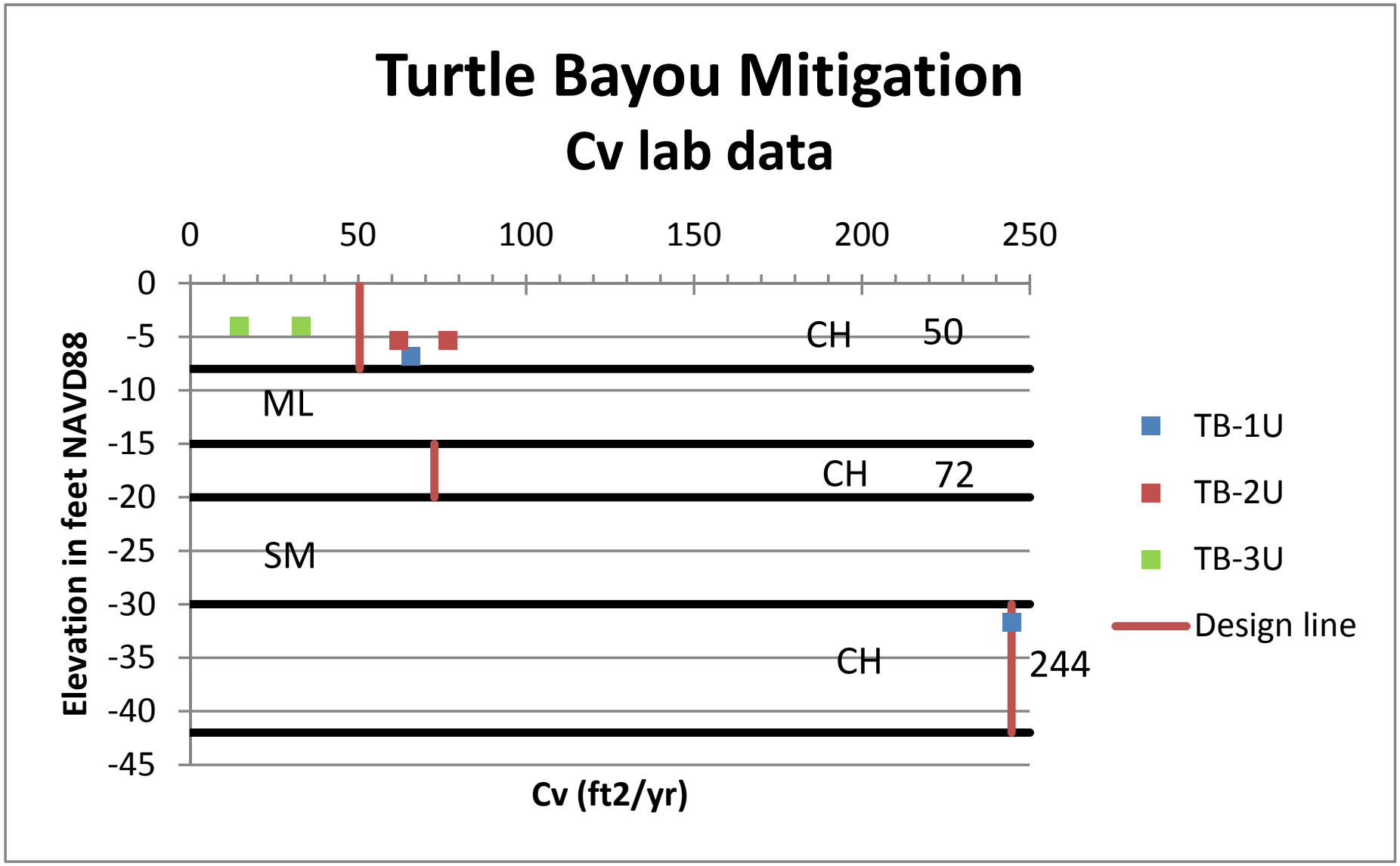


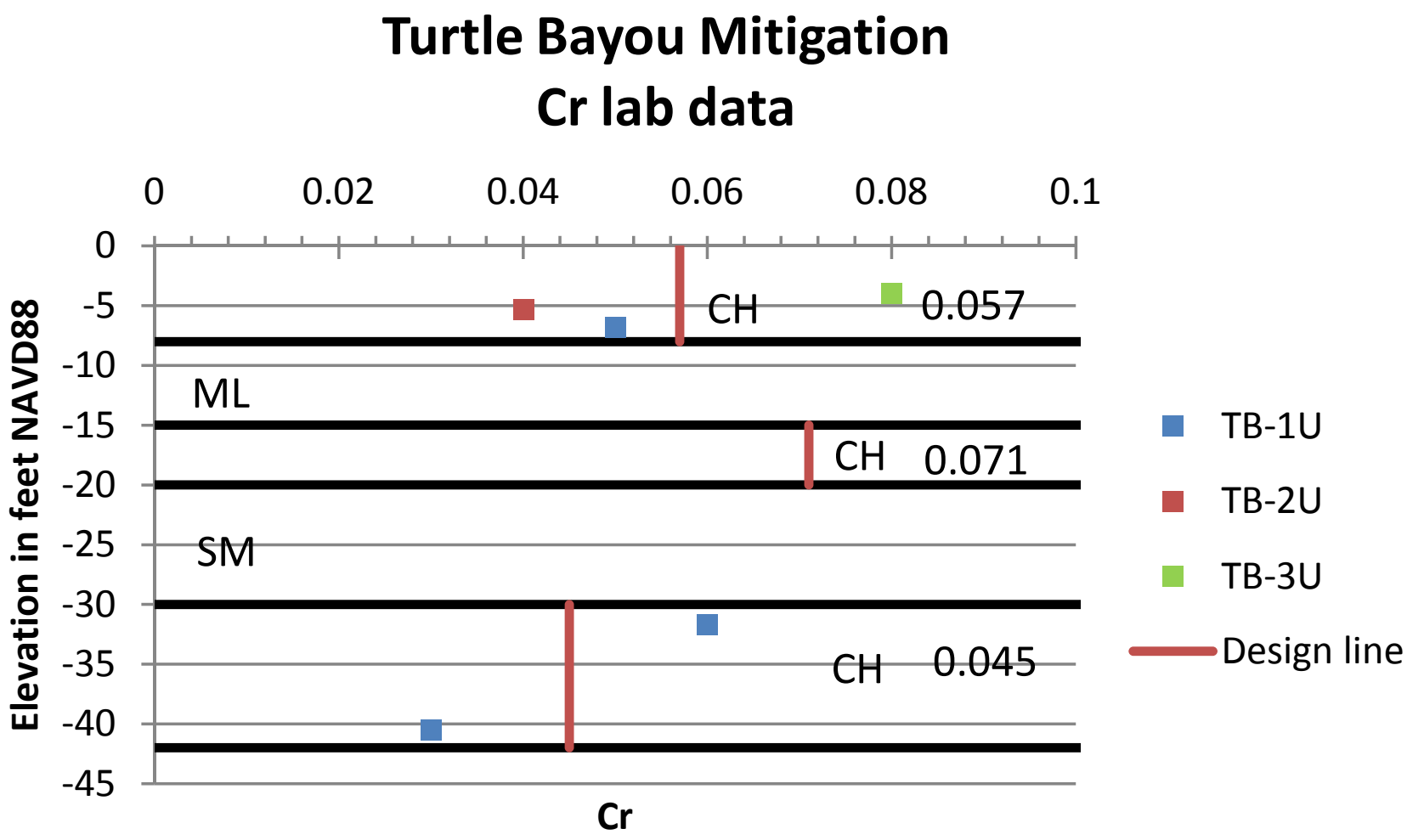
Cc=(0.017*w)-0.299
eo=(w*GS)/S


Turtle Bayou Mitigation
Cc/1+e0, lab data
0
0.1
0.2
0.3
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
CH
ML
CH
SM
CH
Elevation in feet NAVD88
Cc/1+e0
TB-1U
TB-2U
TB-3U
Design line

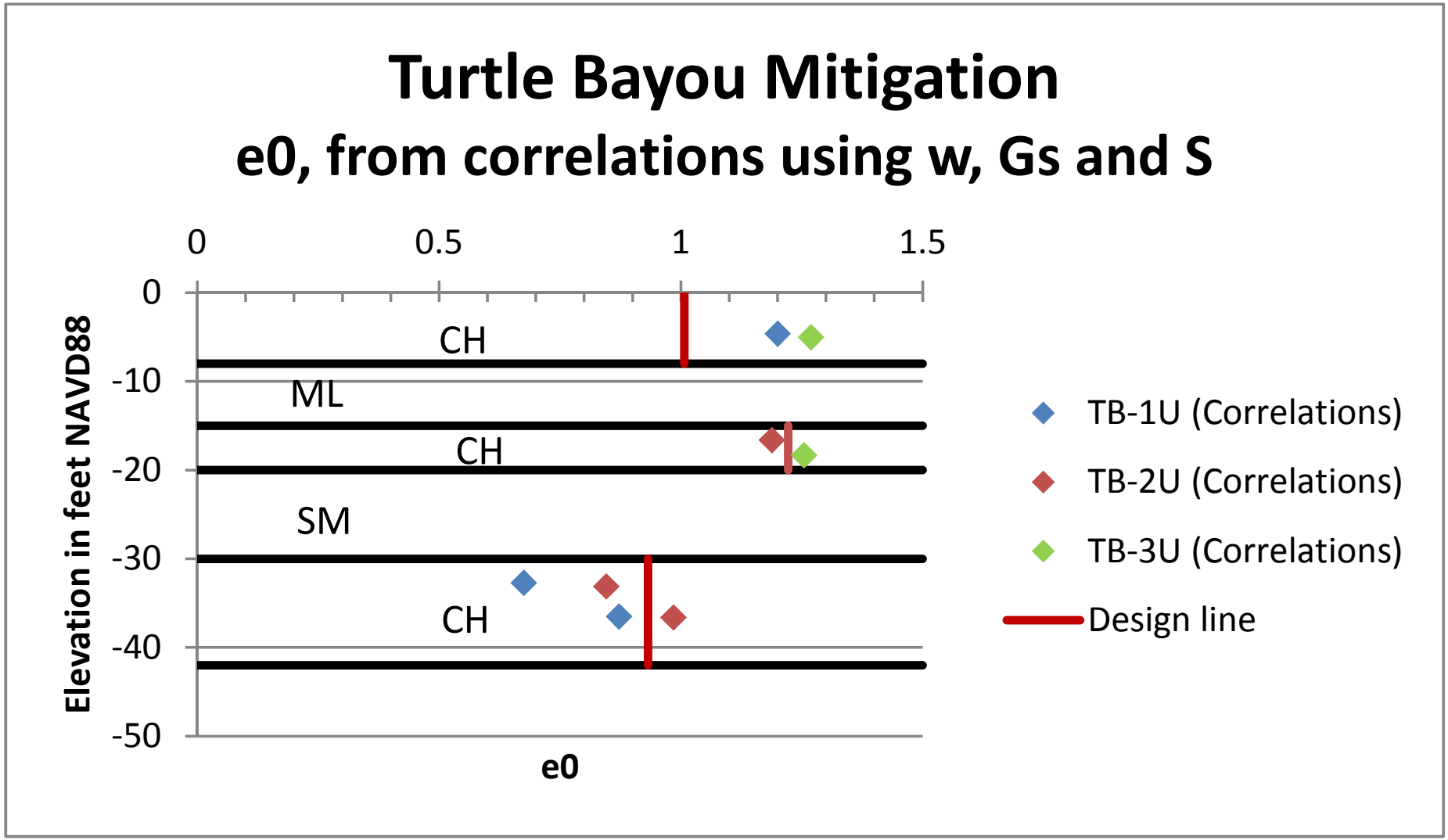


Cv values were derived from Figure 9.10 on page 404 of An Introduction to Geotechnical Engineering by Robert D. Holts PHD, P.E. and William D. Kovacs PHD, P.E.
This figure can be found on page A-30 at the end of this Appendix.

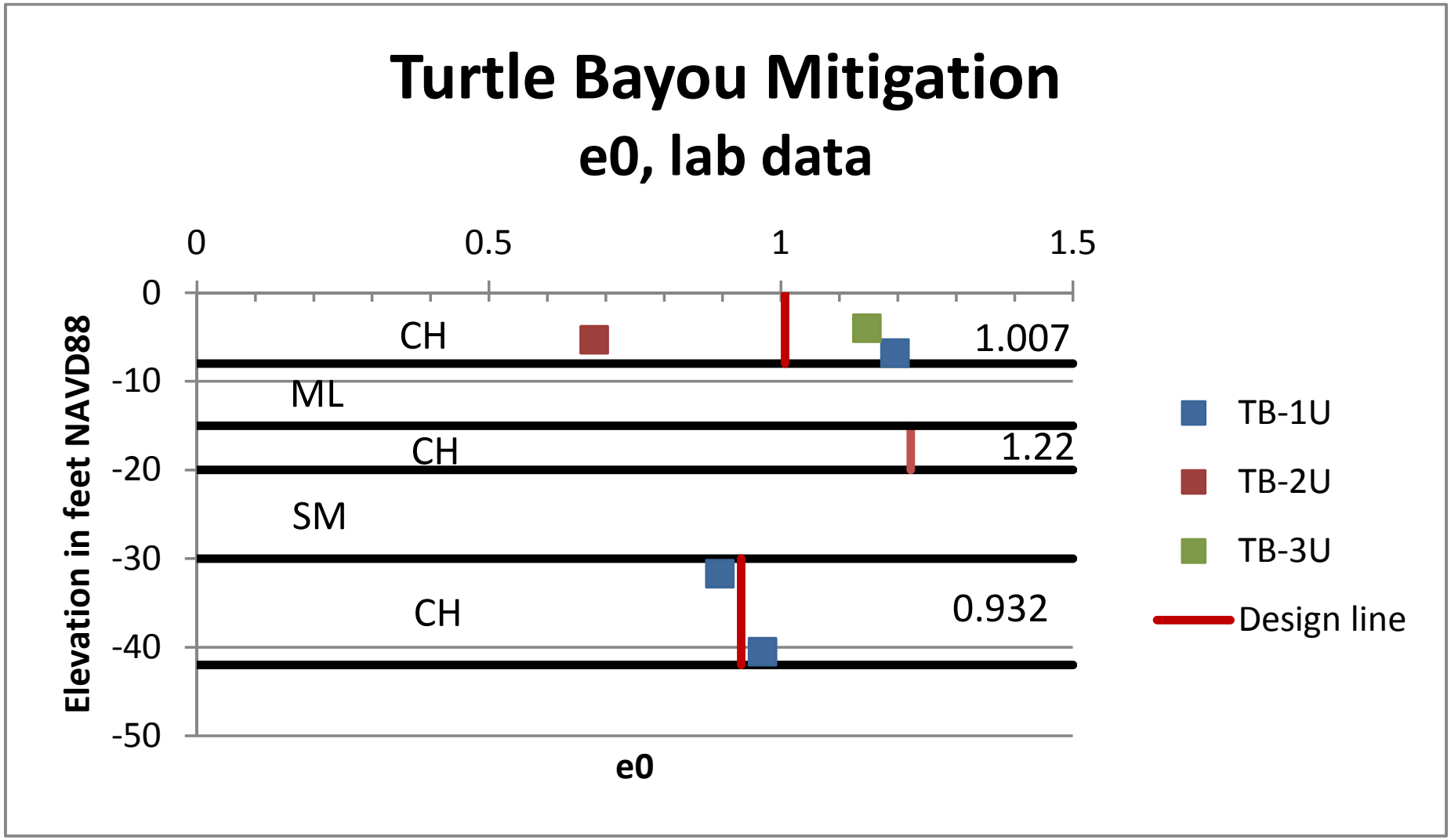

Turtle Bayou Mitigation
Cv lab data
0
50
100
150
200
250
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
Elevation in feet NAVD88
Cv (ft2/yr)
CH
50
ML
CH
72
SM
CH
244
TB-1U
TB-2U
TB-3U
Design line

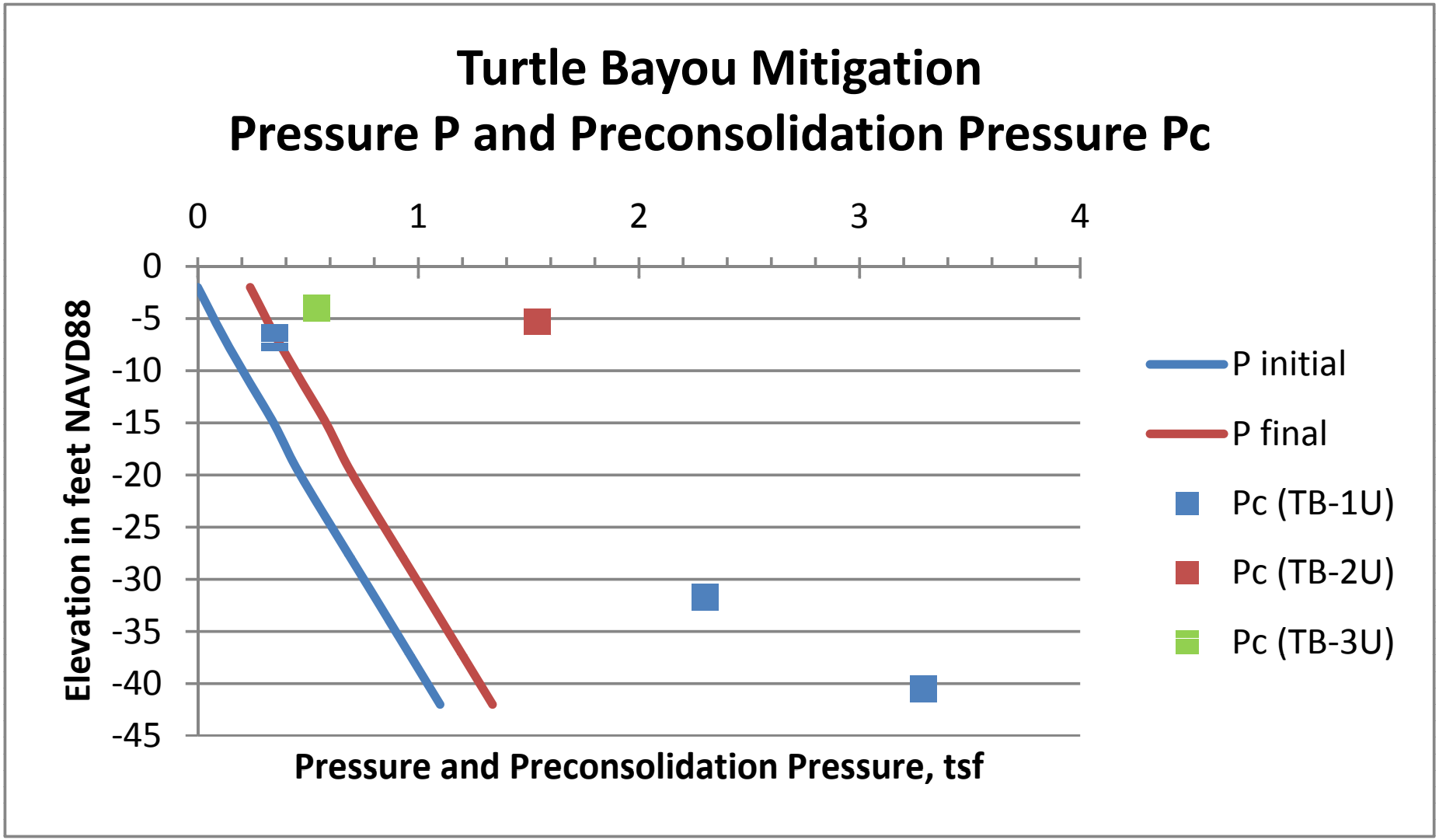


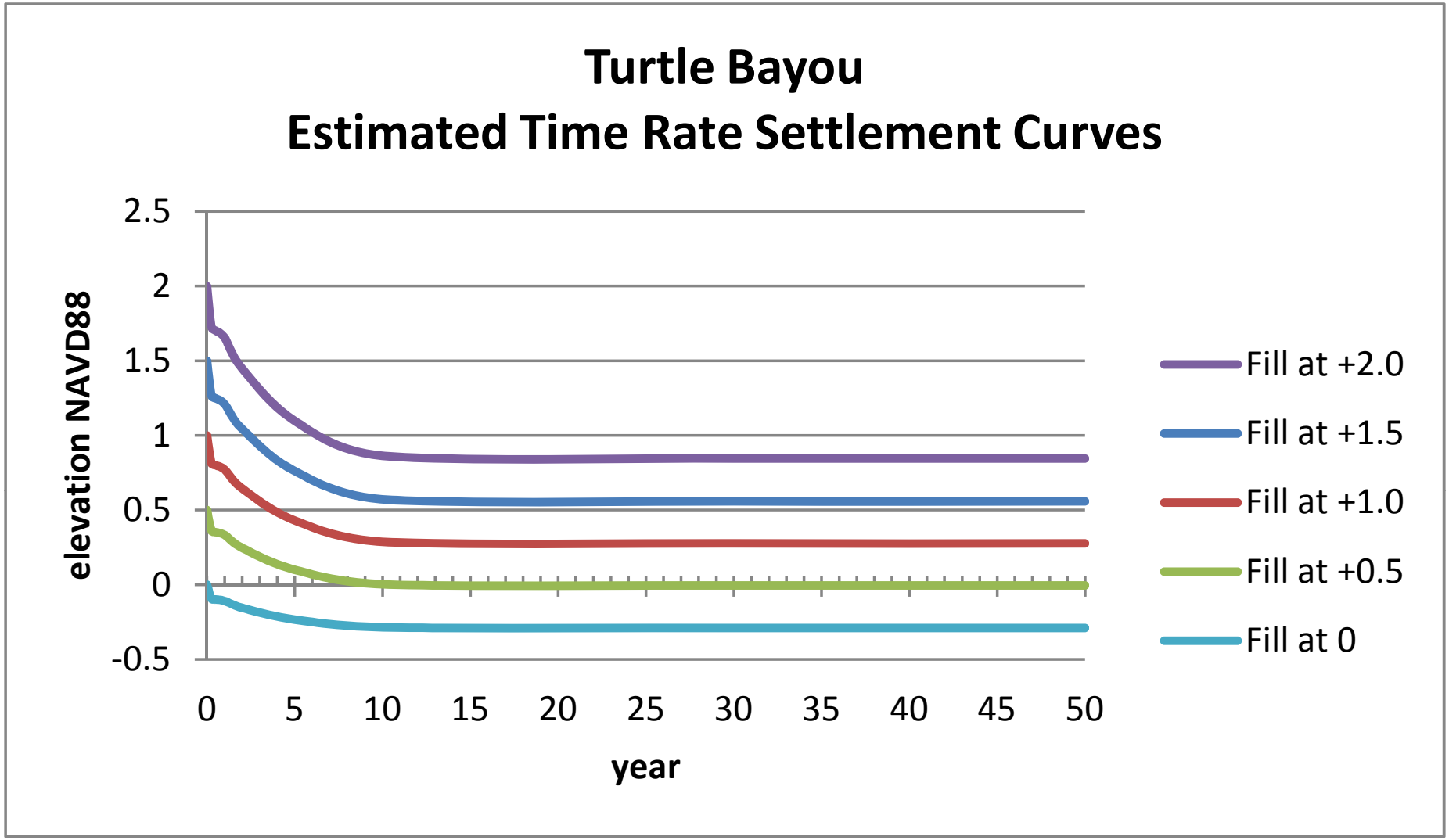
Note: Cr=Cc/7 for stratum -15 to -20 due to no lab data


Turtle Bayou Mitigation
e0, from correlations using w, Gs and S
0
0.5
1
1.5
0
-10
-20
-30
-40
-50
Elevation in feet NAVD88
CH
ML
CH
SM
CH
e0
TB-1U (Correlations)
TB-2U (Correlations)
TB-3U (Correlations)
Design line

eo=(w*GS)/S


Turtle Bayou Mitigation
e0, lab data
0
0.5
1
1.5
0
-10
-20
-30
-40
-50
Elevation in feet NAVD88
CH
1.007
ML
CH
1.22
SM
CH
0.932
e0
TB-1U
TB-2U
TB-3U
Design line


Turtle Bayou Mitigation
Pressure P and Preconsolidation Pressure Pc
0
1
2
3
4
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
Elevation in feet NAVD88
Pressure and Preconsolidation Pressure, tsf
P initial
P final
Pc (TB-1U)
Pc (TB-2U)
Pc (TB-3U)


Turtle Bayou
Estimated Time Rate Settlement Curves
elevation NAVD88
2.5
2
1.5
1
0.5
0
-0.5
0
5
10
15
20
25
30
35
40
45
50
year
Fill at +2.0
Fill at +1.5
Fill at +1.0
Fill at +0.5
Fill at 0

Fill +1.5				
Year	Foundation consolidation from Settle 3D, ft	Fill shrinkage above the water line, ft	Fill consolidation, ft	Elevation
0	0.00	0.00	0.00	1.50
0.25	0.21	0.01	0.01	1.27
0.5	0.22	0.02	0.02	1.25
1	0.22	0.04	0.04	1.21
2	0.22	0.12	0.12	1.04
5	0.22	0.27	0.25	0.76
10	0.22	0.37	0.34	0.57
30	0.22	0.38	0.35	0.56
50	0.22	0.38	0.35	0.56

Fill +1.5 - Dredged Fill Time Percent Used Shrinkage and Consolidation

25% Fill shrinkage - above the water line

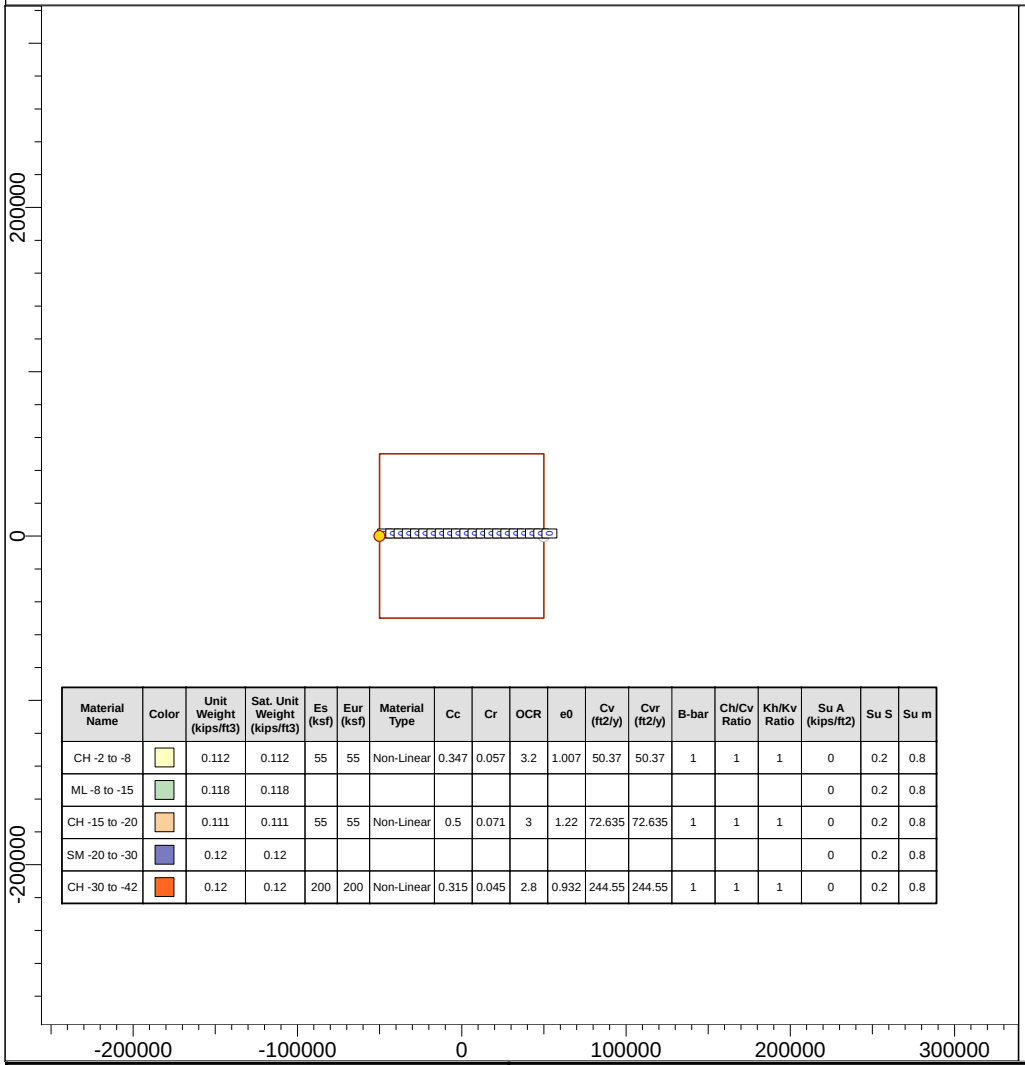
Rate	10%	33%	72%	98%	100%	100%
Time	year 1	year 2	year 5	year 10	year 30	year 50
Amount	0.25*1.5*0.1	0.25*1.5*0.33	0.25*1.5*0.72	0.25*1.5*0.98	0.25*1.5	0.25*1.5
(in feet NAVD88)	0.0375	0.12375	0.27	0.3675	0.375	0.375

10% Fill consolidation

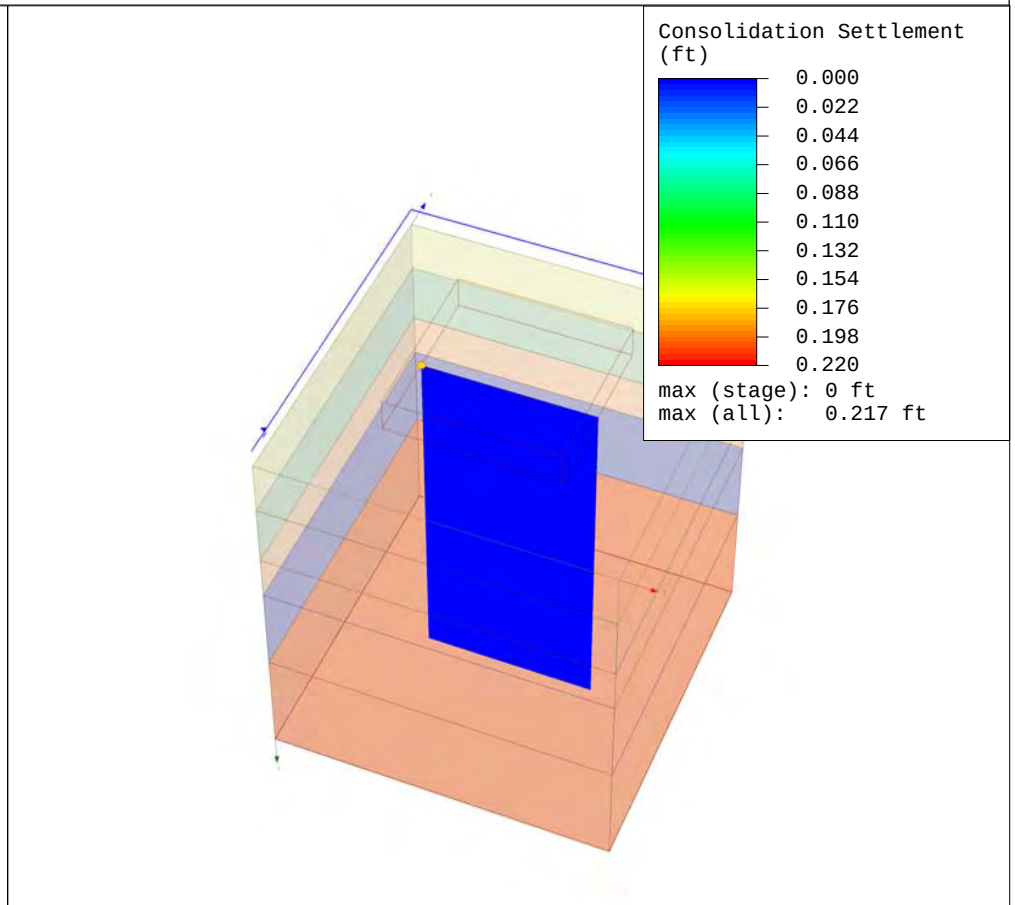
Rate	10%	33%	72%	98%	100%	100%
Time	year 1	year 2	year 5	year 10	year 30	year 50
Amount	0.1*3.5*0.1	0.1*3.5*0.33	0.1*3.5*0.72	0.1*3.5*0.98	0.1*3.5	0.1*3.5
(in feet NAVD88)	0.035	0.1155	0.252	0.343	0.35	0.35

Stage 1 = 0 y

Consolidation Settlement



Material Name	Color	Unit Weight (kips/ft3)	Sat. Unit Weight (kips/ft3)	Es (ksf)	Eur (ksf)	Material Type	Cc	Cr	OCR	e0	Cv (ft2/y)	Cvr (ft2/y)	B-bar	Ch/Cv Ratio	Kh/Kv Ratio	Su A (kips/ft2)	Su S	Su m
CH -2 to -8		0.112	0.112	55	55	Non-Linear	0.347	0.057	3.2	1.007	50.37	50.37	1	1	1	0	0.2	0.8
ML -8 to -15		0.118	0.118													0	0.2	0.8
CH -15 to -20		0.111	0.111	55	55	Non-Linear	0.5	0.071	3	1.22	72.635	72.635	1	1	1	0	0.2	0.8
SM -20 to -30		0.12	0.12													0	0.2	0.8
CH -30 to -42		0.12	0.12	200	200	Non-Linear	0.315	0.045	2.8	0.932	244.55	244.55	1	1	1	0	0.2	0.8



SETTLE3D 3.005

Project	LPV Mitigation - Turtle Bayou Intermediate Marsh Restoration
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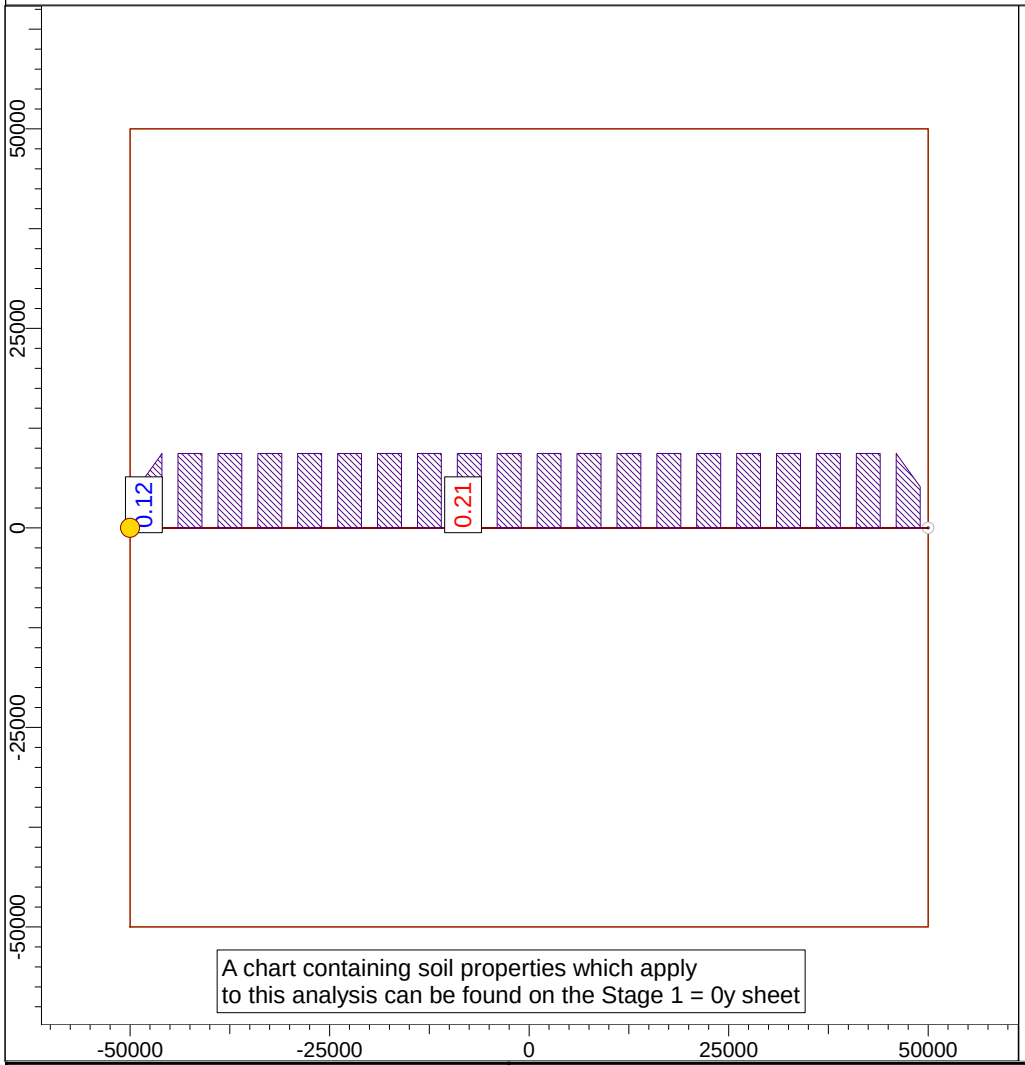
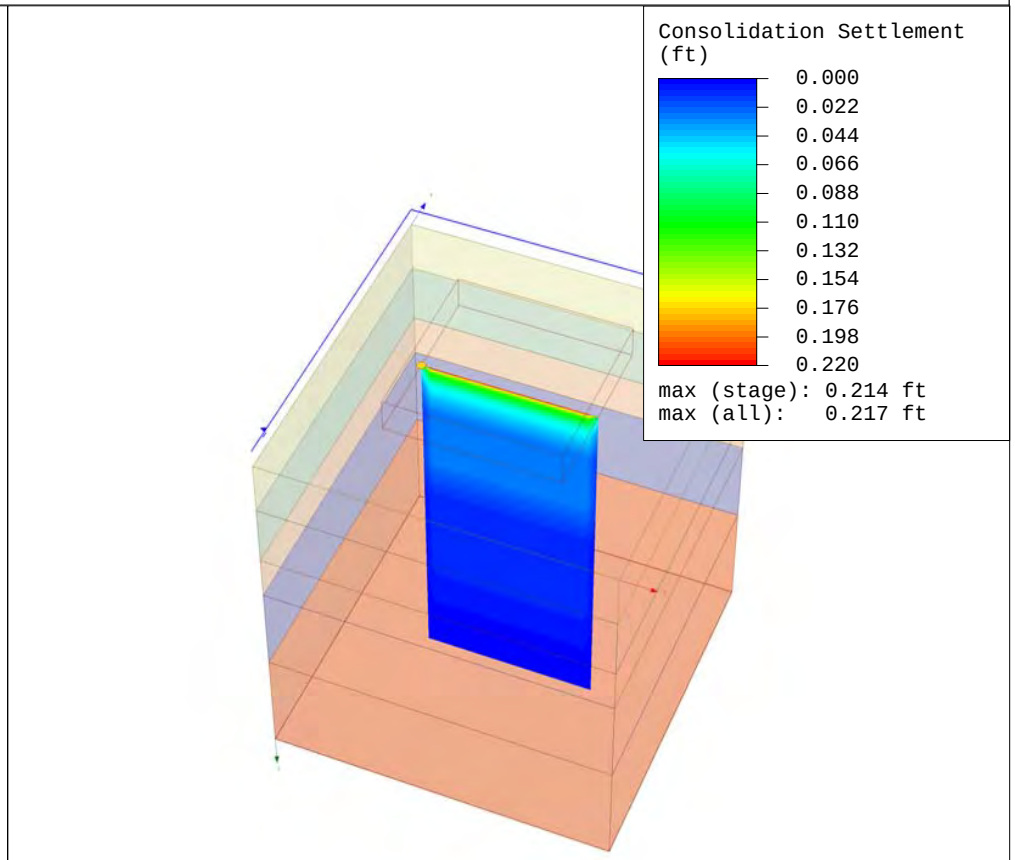
Drawn By	Bich Quach
Company	U.S. Army Corps of Engineers
Date	9/12/2014, 10:00:30 AM
File Name	Consolidation at +1.5.s3z

Stage 2 = 0.25 y

Consolidation Settlement



A chart containing soil properties which apply
to this analysis can be found on the Stage 1 = 0y sheet



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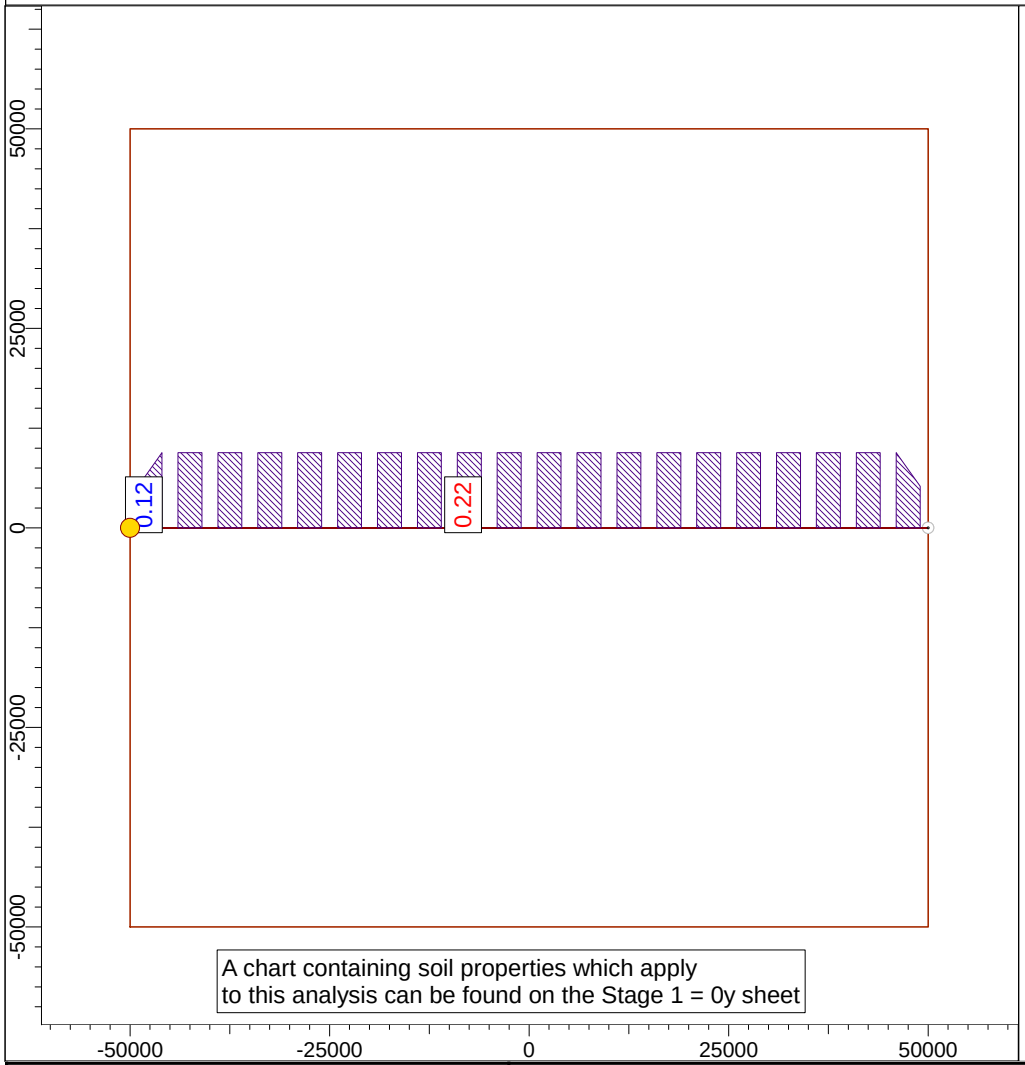
	Analysis Description	Marsh placed to elevation +1.5 feet NAVD88	
	Drawn By	Bich Quach	*Company* U.S. Army Corps of Engineers
	Date	9/12/2014, 10:00:30 AM	*File Name* Consolidation at +1.5.s3z

Stage 3 = 0.5 y

Consolidation Settlement



A chart containing soil properties which apply
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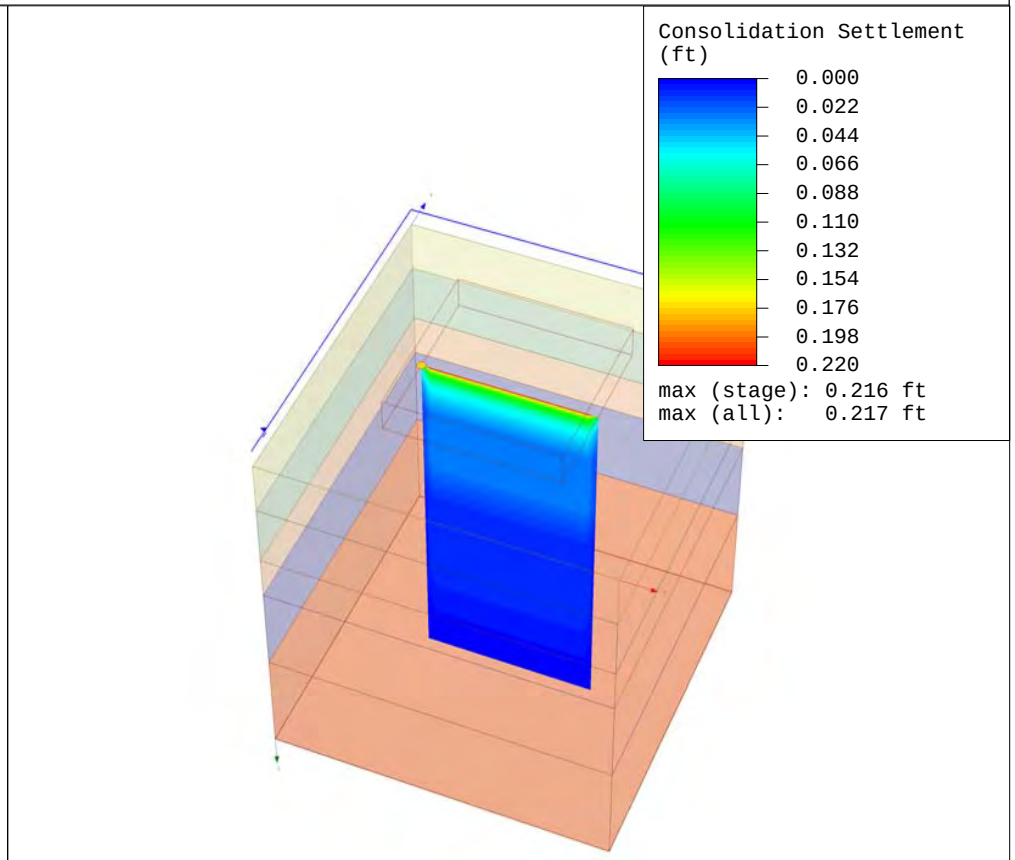

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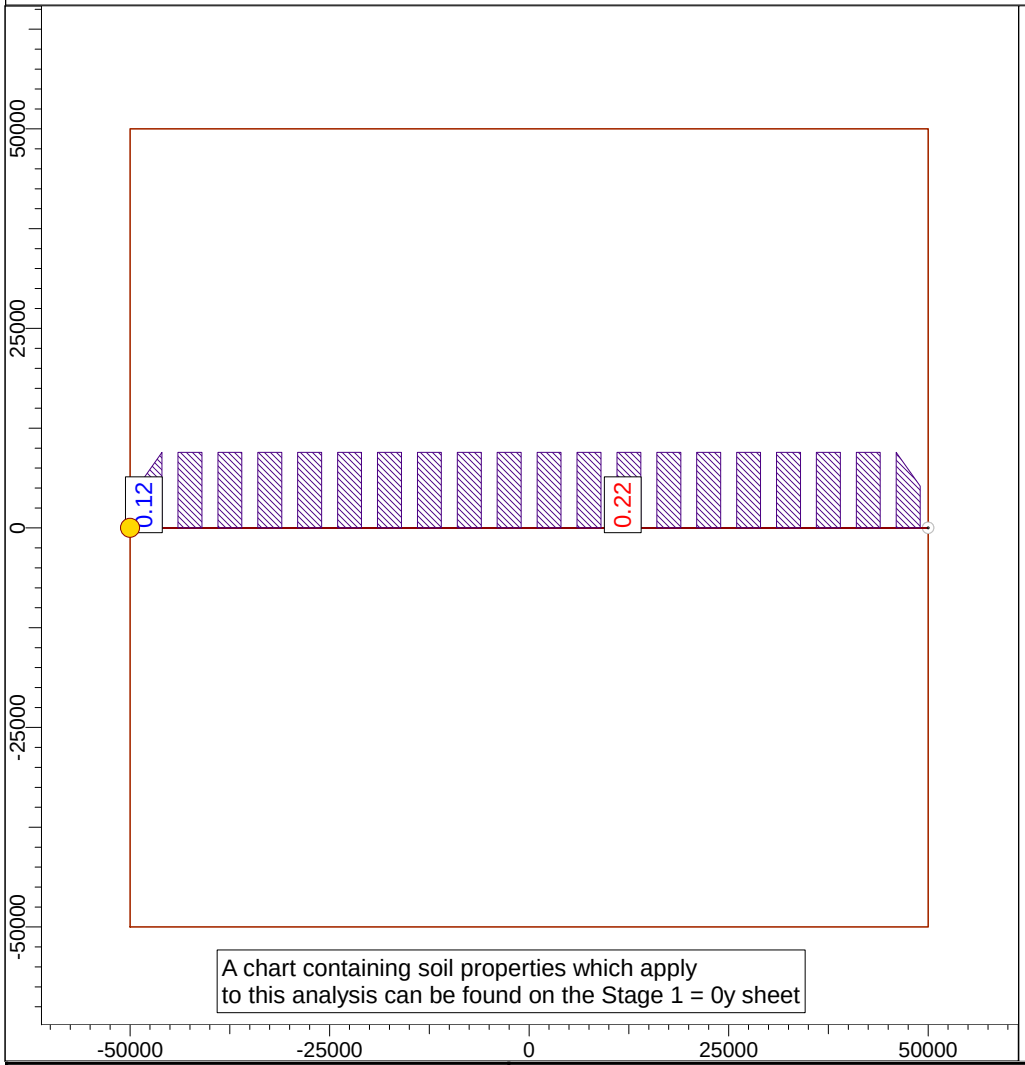
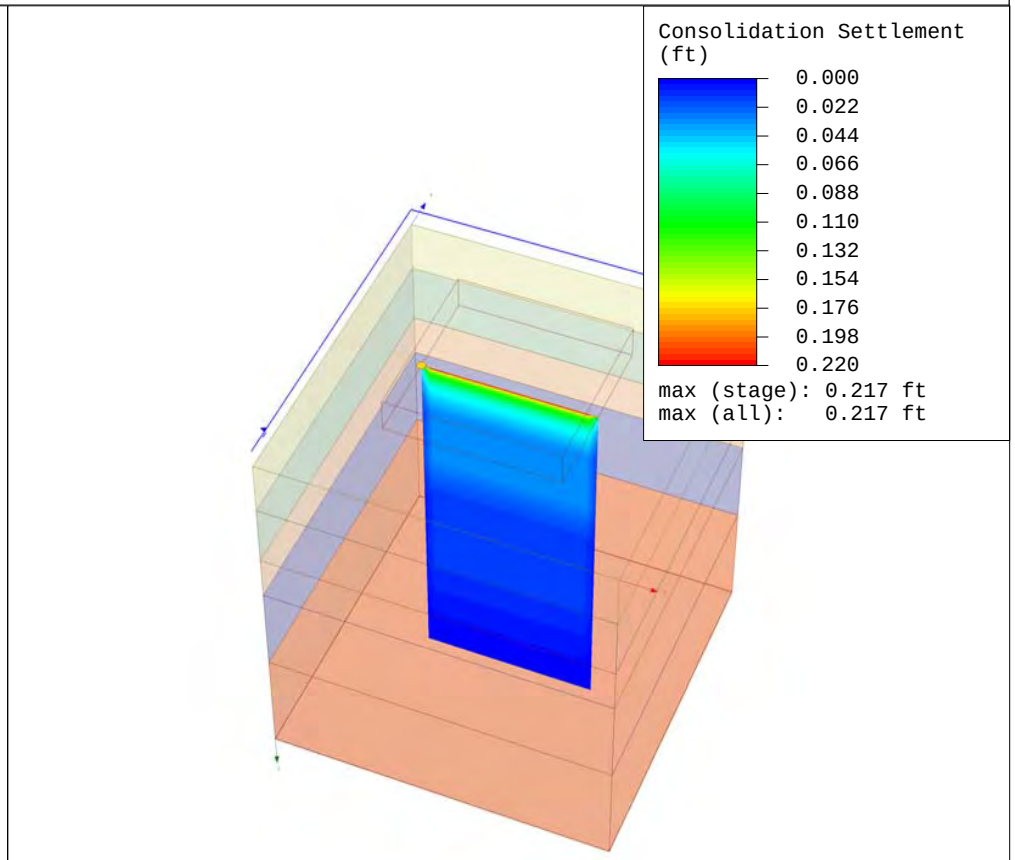
	Analysis Description	Marsh placed to elevation +1.5 feet NAVD88	
	Drawn By	Bich Quach	*Company* U.S. Army Corps of Engineers
	Date	9/12/2014, 10:00:30 AM	*File Name* Consolidation at +1.5.s3z

Stage 4 = 1 y

Consolidation Settlement



A chart containing soil properties which apply
to this analysis can be found on the Stage 1 = 0y sheet



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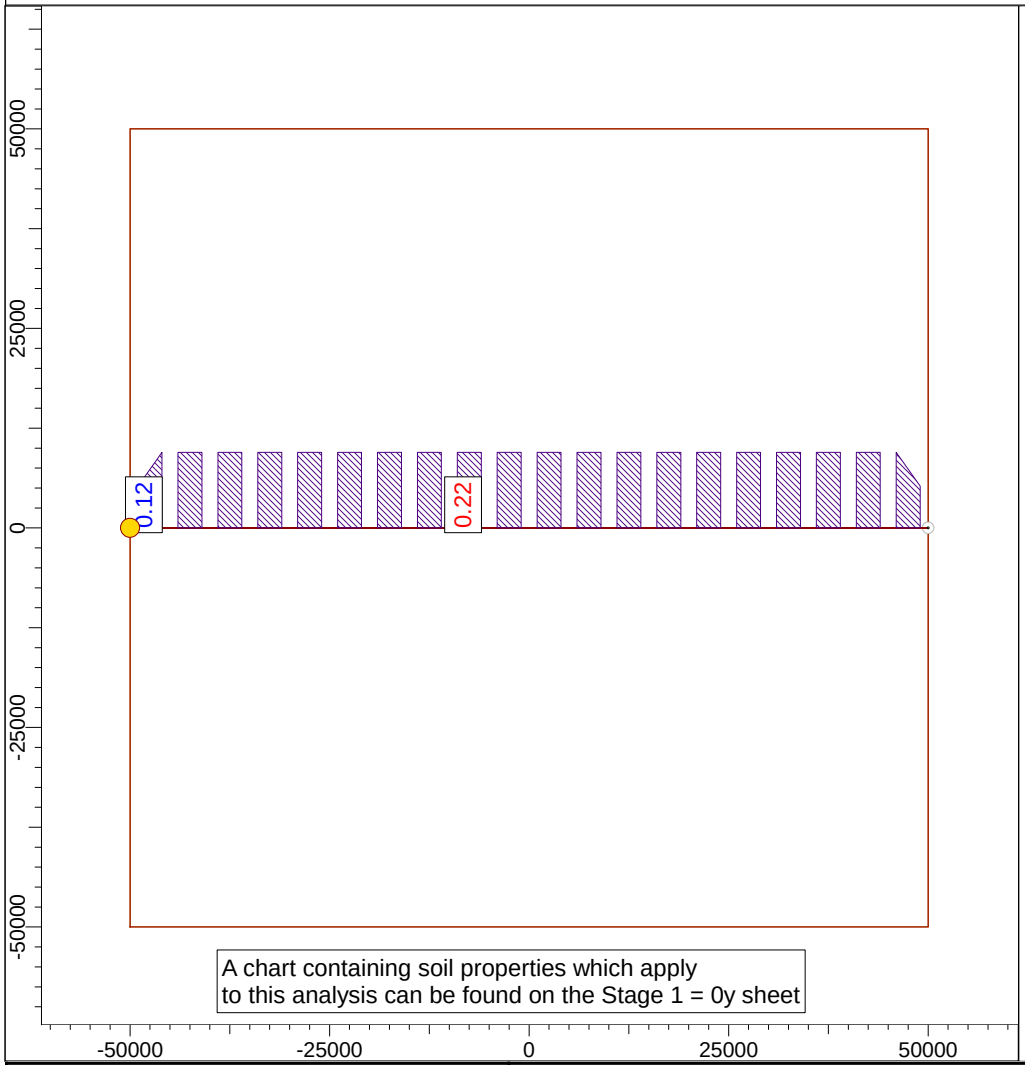
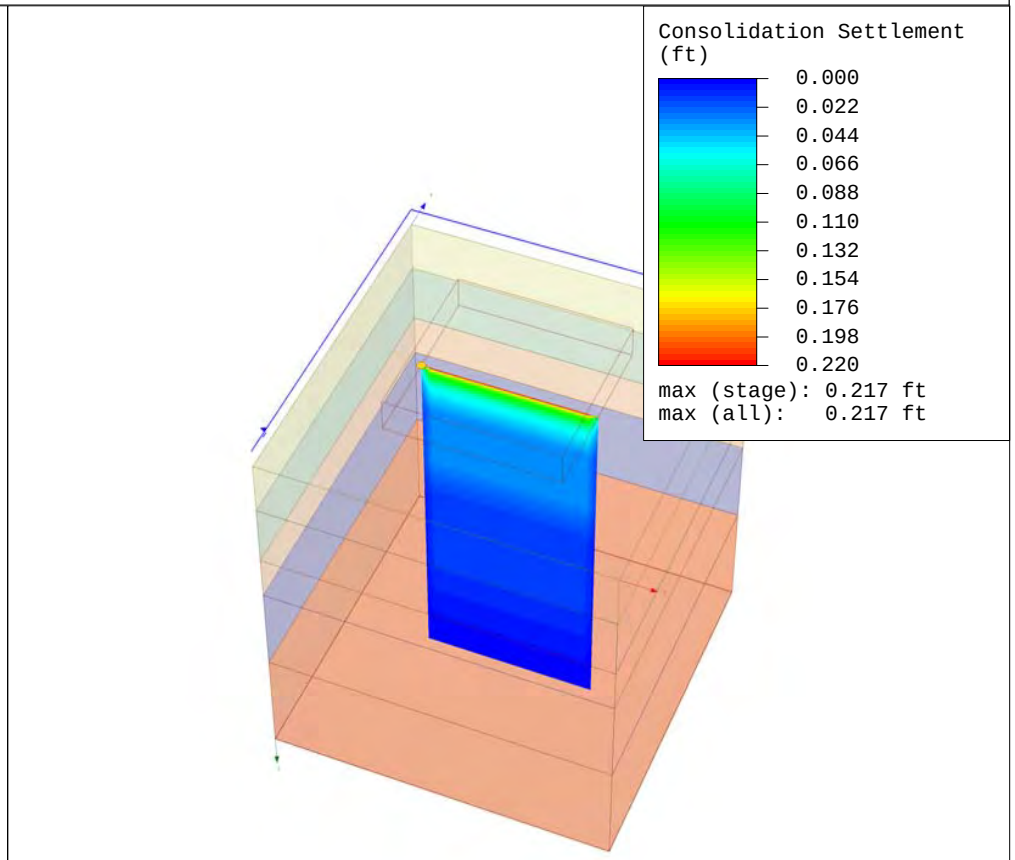
	Analysis Description	Marsh placed to elevation +1.5 feet NAVD88	
	Drawn By	Bich Quach	*Company* U.S. Army Corps of Engineers
	Date	9/12/2014, 10:00:30 AM	*File Name* Consolidation at +1.5.s3z

Stage 5 = 2 y

Consolidation Settlement



A chart containing soil properties which apply
to this analysis can be found on the Stage 1 = 0y sheet



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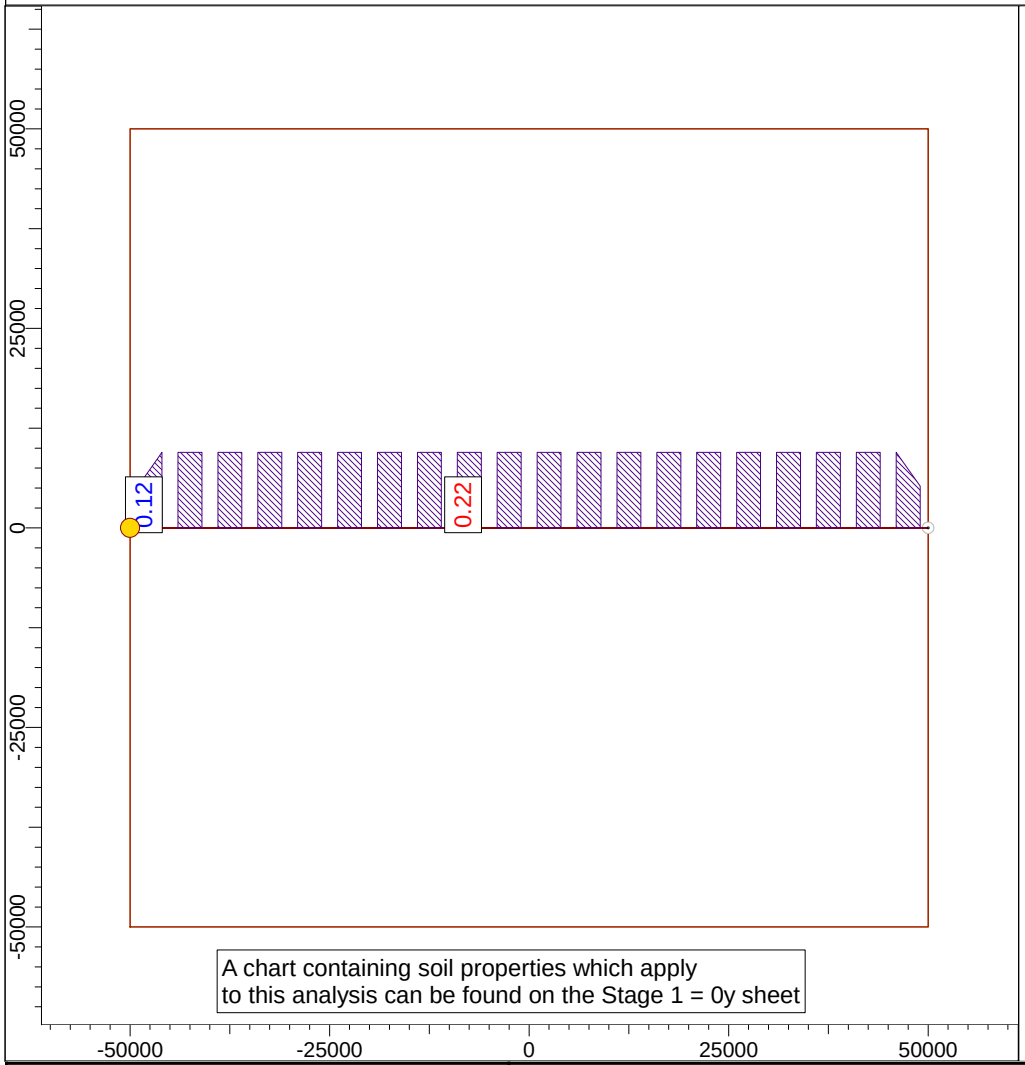
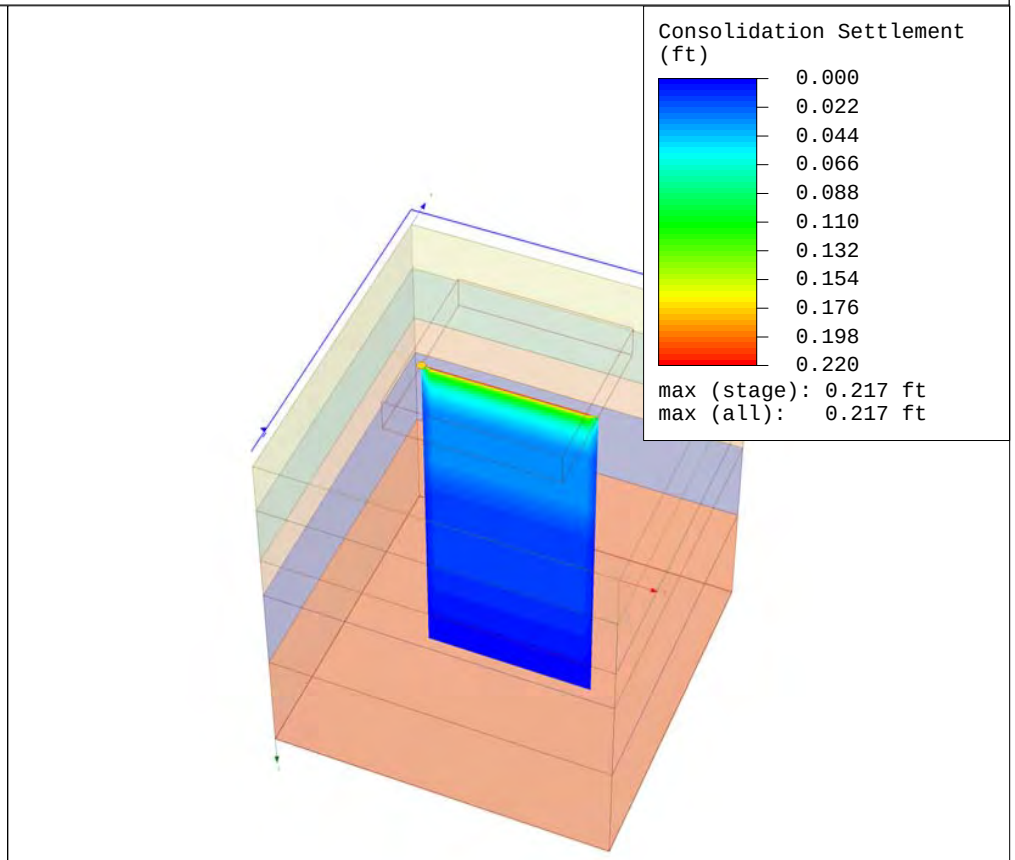
	Analysis Description	Marsh placed to elevation +1.5 feet NAVD88	
	Drawn By	Bich Quach	*Company* U.S. Army Corps of Engineers
	Date	9/12/2014, 10:00:30 AM	*File Name* Consolidation at +1.5.s3z

Stage 6 = 5 y

Consolidation Settlement

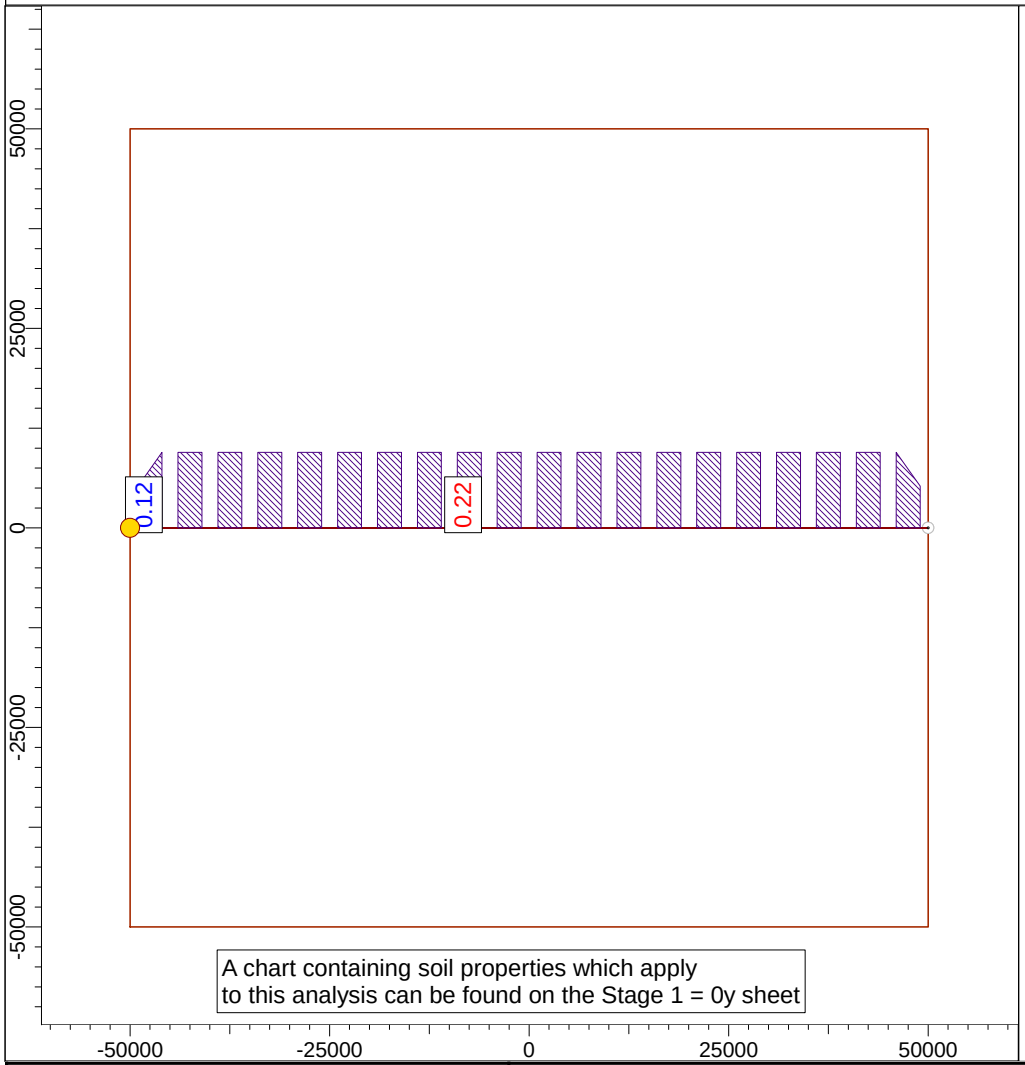




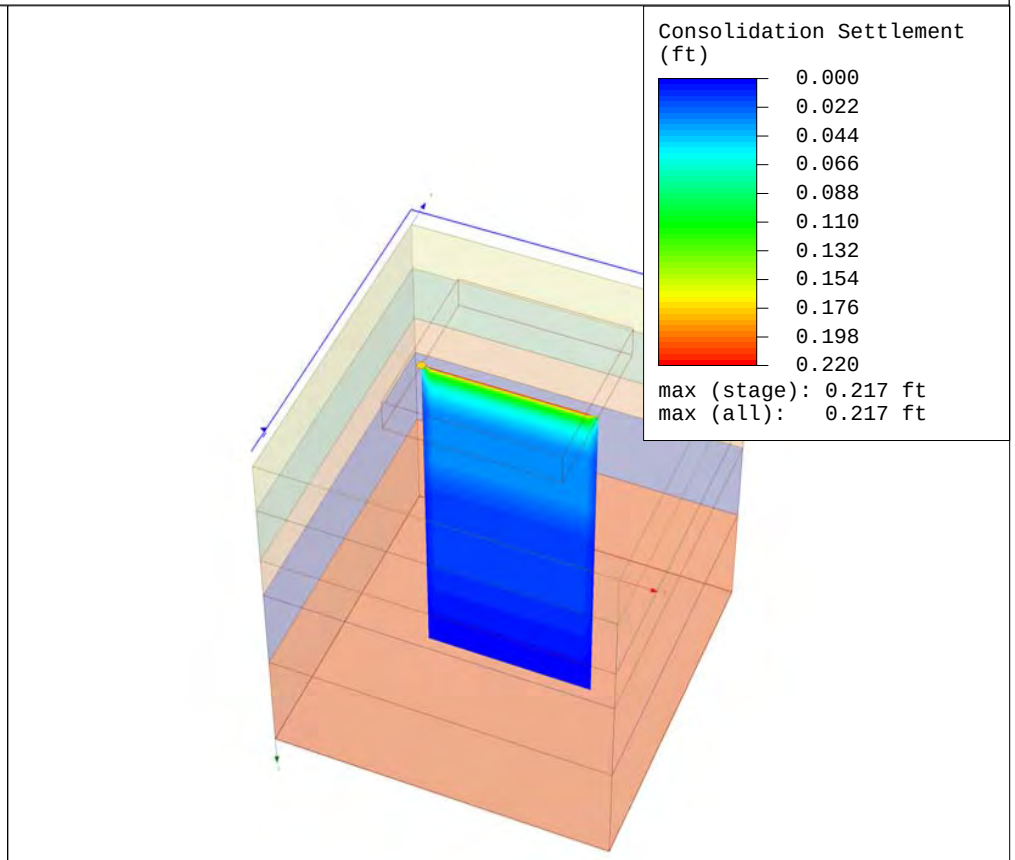
SETTLE3D 3.005	*Project*	LPV Mitigation - Turtle Bayou Intermediate Marsh Restoration	
	Analysis Description	Marsh placed to elevation +1.5 feet NAVD88	
	Drawn By	Bich Quach	*Company* U.S. Army Corps of Engineers
	Date	9/12/2014, 10:00:30 AM	*File Name* Consolidation at +1.5.s3z

Stage 7 = 10 y

Consolidation Settlement



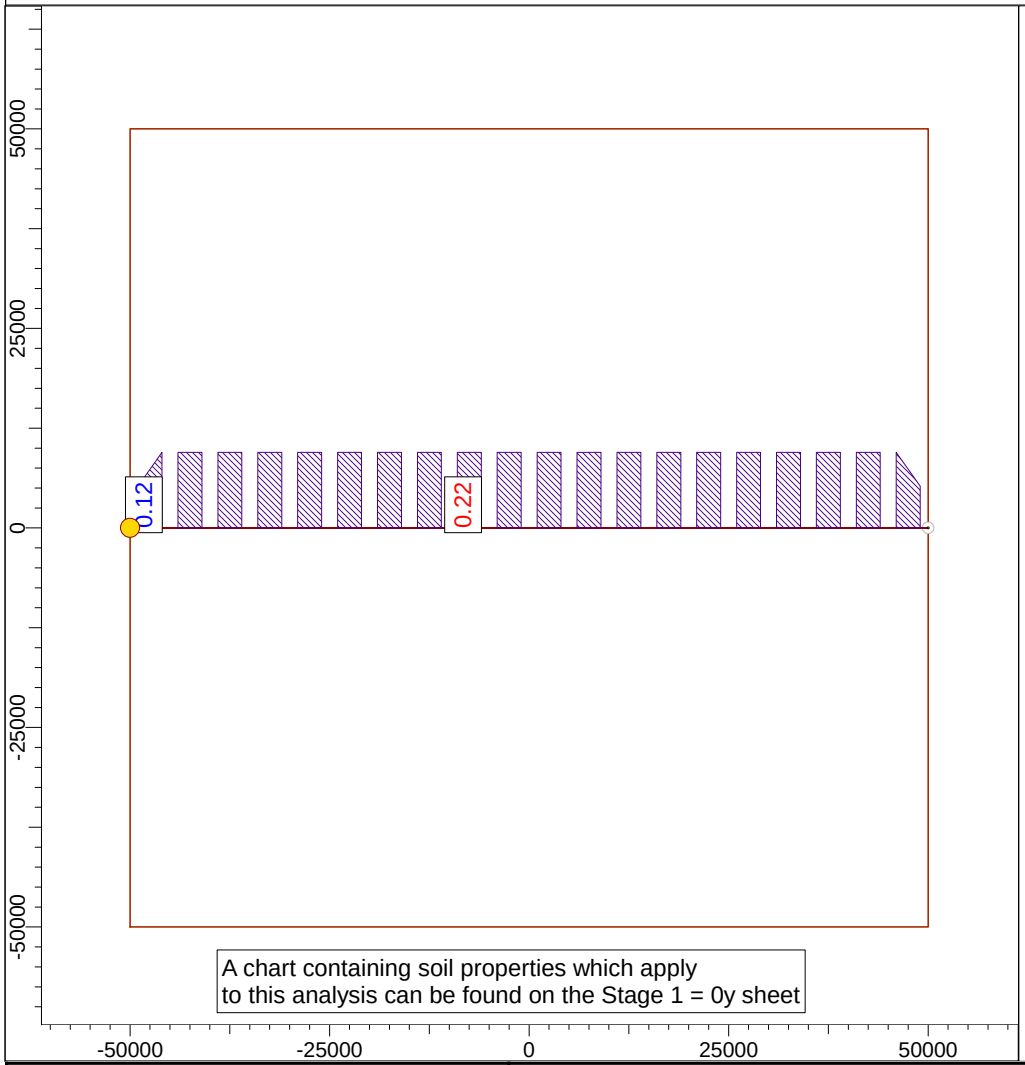
A chart containing soil properties which apply
to this analysis can be found on the Stage 1 = 0y sheet



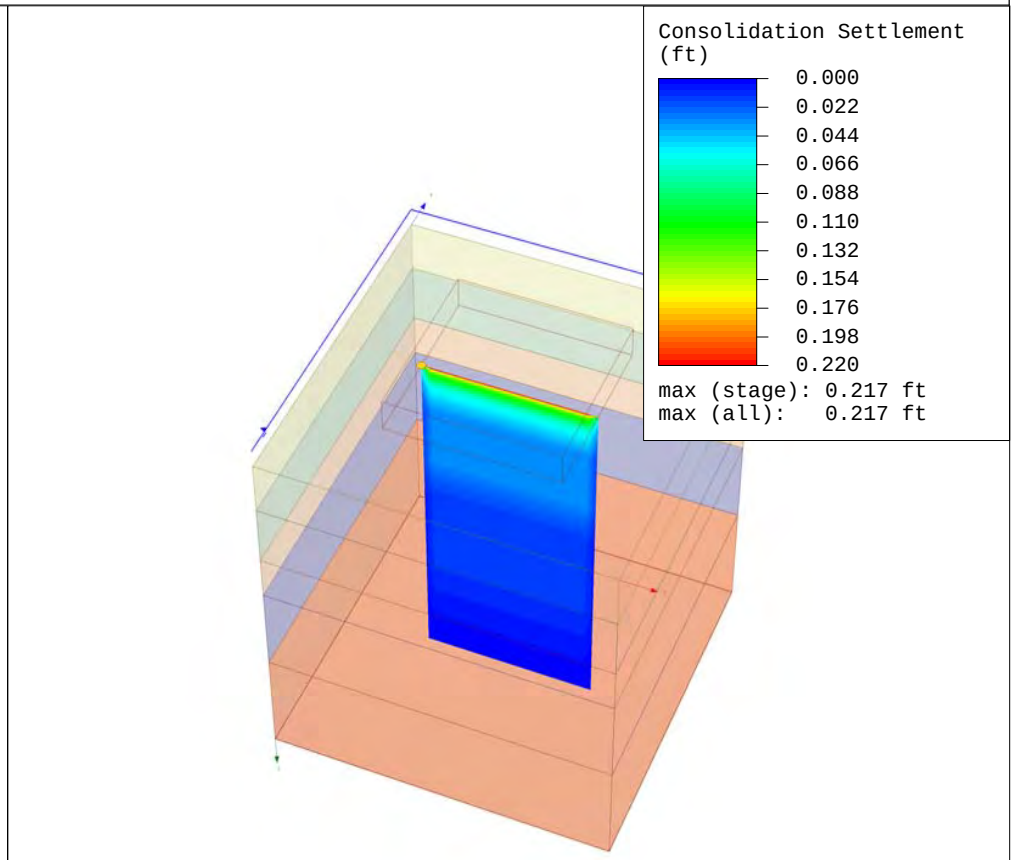
SETTLE3D 3.005	*Project*	LPV Mitigation - Turtle Bayou Intermediate Marsh Restoration	
	Analysis Description	Marsh placed to elevation +1.5 feet NAVD88	
	Drawn By	Bich Quach	*Company* U.S. Army Corps of Engineers
	Date	9/12/2014, 10:00:30 AM	*File Name* Consolidation at +1.5.s3z

Stage 8 = 30 y

Consolidation Settlement



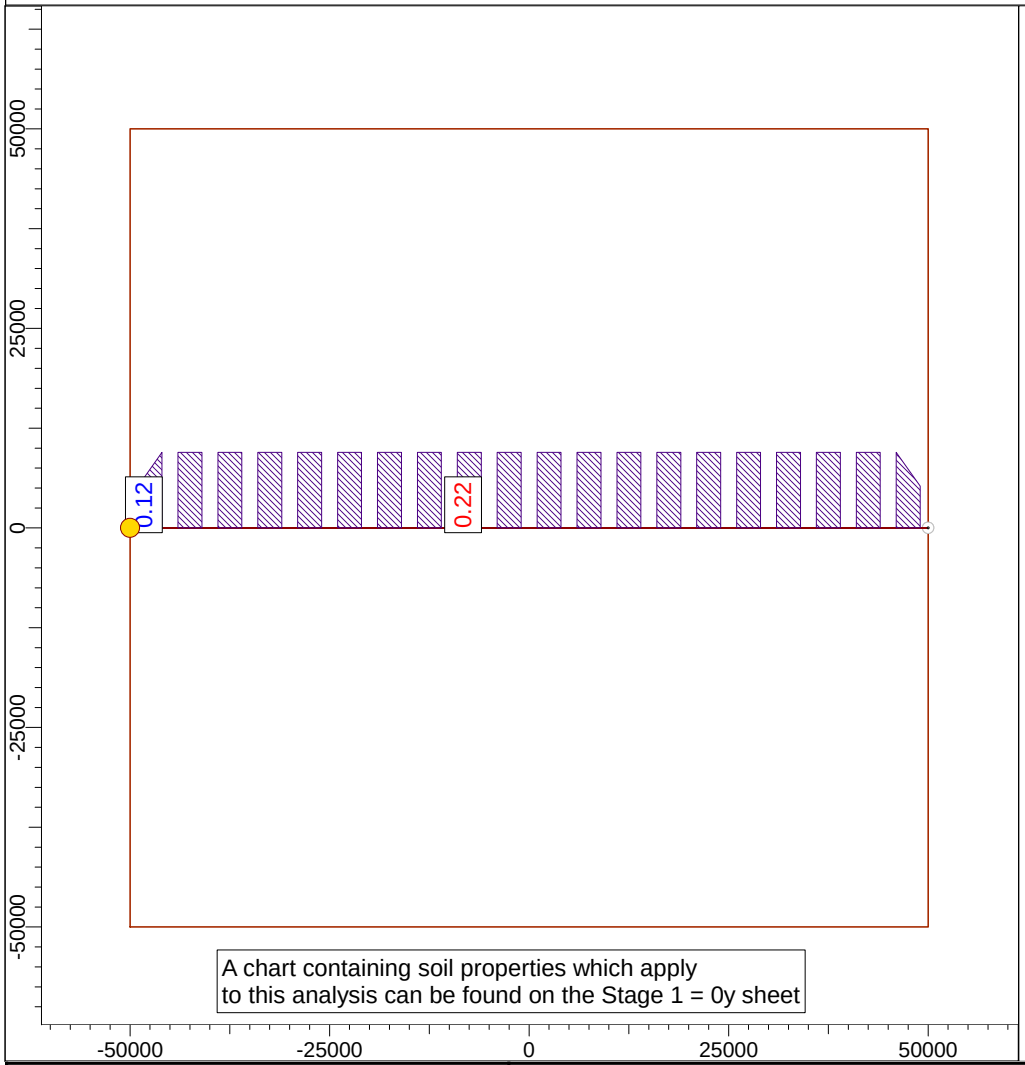
A chart containing soil properties which apply
to this analysis can be found on the Stage 1 = 0y sheet



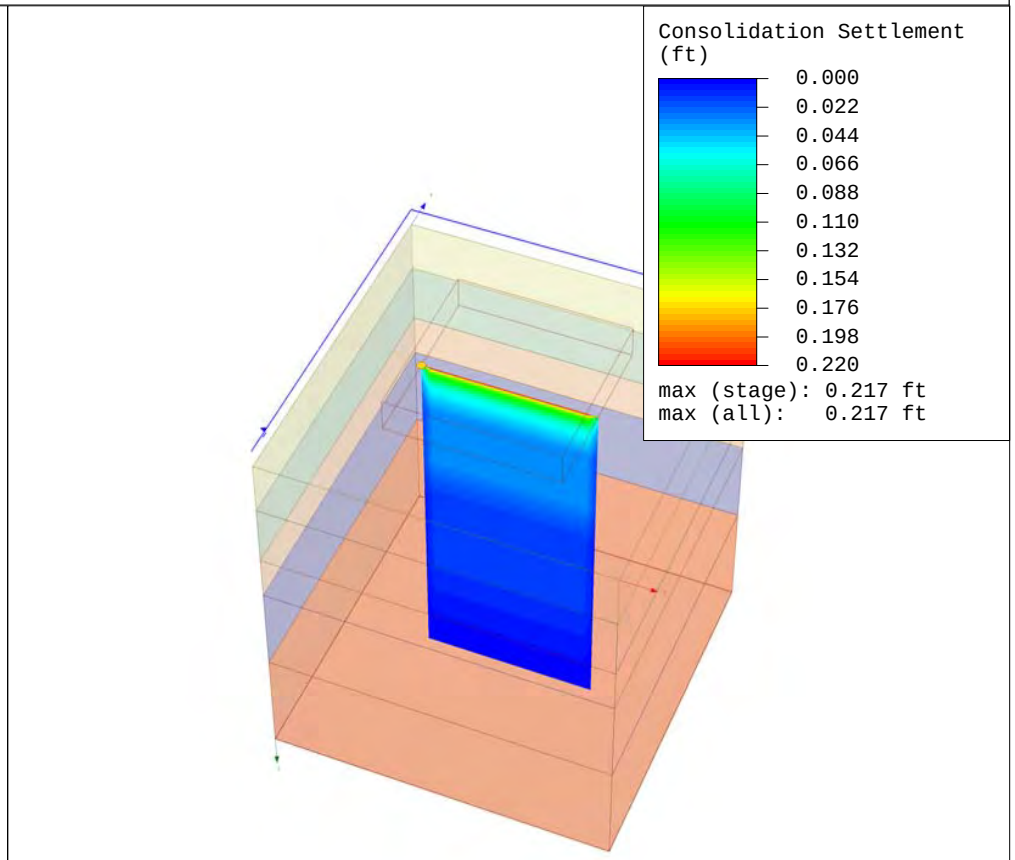
SETTLE3D 3.005	*Project*	LPV Mitigation - Turtle Bayou Intermediate Marsh Restoration	
	Analysis Description	Marsh placed to elevation +1.5 feet NAVD88	
	Drawn By	Bich Quach	*Company* U.S. Army Corps of Engineers
	Date	9/12/2014, 10:00:30 AM	*File Name* Consolidation at +1.5.s3z

Stage 9 = 50 y

Consolidation Settlement



A chart containing soil properties which apply
to this analysis can be found on the Stage 1 = 0y sheet



SETTLE3D 3.005	*Project*	LPV Mitigation - Turtle Bayou Intermediate Marsh Restoration	
	Analysis Description	Marsh placed to elevation +1.5 feet NAVD88	
	Drawn By	Bich Quach	*Company* U.S. Army Corps of Engineers
	Date	9/12/2014, 10:00:30 AM	*File Name* Consolidation at +1.5.s3z

Settle3D Analysis Information
LPV Mitigation - Turtle Bayou Intermediate Marsh Restoration

Project Settings

Document Name	Consolidation at +1.5.s3z
Project Title	LPV Mitigation - Turtle Bayou Intermediate Marsh Restoration
Analysis	Marsh placed to elevation +1.5 feet NAVD88
Author	Bich Quach
Company	U.S. Army Corps of Engineers
Date Created	9/12/2014, 10:00:30 AM
Stress Computation Method	Boussinesq
Time-dependent Consolidation Analysis	
Time Units	years
Permeability Units	feet/year
Use average properties to calculate layered stresses	

Stage Settings

Stage #	Name	Time [years]
1	Stage 1	0
2	Stage 2	0.25
3	Stage 3	0.5
4	Stage 4	1
5	Stage 5	2
6	Stage 6	5
7	Stage 7	10
8	Stage 8	30
9	Stage 9	50

Results

Time taken to compute: 0 seconds

Stage: Stage 1 = 0 y

Data Type	Minimum	Maximum
Total Settlement [ft]	0	0.058552
Consolidation Settlement [ft]	0	0
Immediate Settlement [ft]	0	0.058552
Secondary Settlement [ft]	0	0
Loading Stress [ksf]	0.175	0.35
Effective Stress [ksf]	0	2.197
Total Stress [ksf]	0.2374	5.043
Total Strain	0	0.00409455
Pore Water Pressure [ksf]	0.2374	2.846
Excess Pore Water Pressure [ksf]	0.1126	0.2252
Degree of Consolidation [%]	0	0
Pre-consolidation Stress [ksf]	0.0095232	6.14966
Over-consolidation Ratio	1	3.2
Void Ratio	0	1.21546
Permeability [ft/y]	0	79.3922
Coefficient of Consolidation [ft^2/y]	0	244.55
Hydroconsolidation Settlement [ft]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.0314

Stage: Stage 2 = 0.25 y

Data Type	Minimum	Maximum
Total Settlement [ft]	0	0.272332
Consolidation Settlement [ft]	0	0.21378
Immediate Settlement [ft]	0	0.058552
Secondary Settlement [ft]	0	0
Loading Stress [ksf]	0.175	0.35
Effective Stress [ksf]	0.1126	2.33361
Total Stress [ksf]	0.2374	5.043
Total Strain	0	0.256947
Pore Water Pressure [ksf]	0.1248	2.70939
Excess Pore Water Pressure [ksf]	0	0.0885911
Degree of Consolidation [%]	0	98.5333
Pre-consolidation Stress [ksf]	0.115576	6.14966
Over-consolidation Ratio	1	2.71555
Void Ratio	0	1.21192
Permeability [ft/y]	0	79.3922
Coefficient of Consolidation [ft^2/y]	0	244.55
Hydroconsolidation Settlement [ft]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.0314

Stage: Stage 3 = 0.5 y

Data Type	Minimum	Maximum
Total Settlement [ft]	0	0.274592
Consolidation Settlement [ft]	0	0.21604
Immediate Settlement [ft]	0	0.058552
Secondary Settlement [ft]	0	0
Loading Stress [ksf]	0.175	0.35
Effective Stress [ksf]	0.1126	2.39563
Total Stress [ksf]	0.2374	5.043
Total Strain	0	0.256947
Pore Water Pressure [ksf]	0.1248	2.64737
Excess Pore Water Pressure [ksf]	0	0.0265708
Degree of Consolidation [%]	0	99.5948
Pre-consolidation Stress [ksf]	0.115576	6.14966
Over-consolidation Ratio	1	2.67886
Void Ratio	0	1.21192
Permeability [ft/y]	0	79.3922
Coefficient of Consolidation [ft^2/y]	0	244.55
Hydroconsolidation Settlement [ft]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.0314

Stage: Stage 4 = 1 y

Data Type	Minimum	Maximum
Total Settlement [ft]	0	0.275432
Consolidation Settlement [ft]	0	0.21688
Immediate Settlement [ft]	0	0.058552
Secondary Settlement [ft]	0	0
Loading Stress [ksf]	0.175	0.35
Effective Stress [ksf]	0.1126	2.41981
Total Stress [ksf]	0.2374	5.043
Total Strain	0	0.256947
Pore Water Pressure [ksf]	0.1248	2.62319
Excess Pore Water Pressure [ksf]	0	0.00238831
Degree of Consolidation [%]	0	99.9638
Pre-consolidation Stress [ksf]	0.115576	6.14966
Over-consolidation Ratio	1	2.67423
Void Ratio	0	1.21192
Permeability [ft/y]	0	79.3922
Coefficient of Consolidation [ft^2/y]	0	244.55
Hydroconsolidation Settlement [ft]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.0314

Stage: Stage 5 = 2 y

Data Type	Minimum	Maximum
Total Settlement [ft]	0	0.275514
Consolidation Settlement [ft]	0	0.216962
Immediate Settlement [ft]	0	0.058552
Secondary Settlement [ft]	0	0
Loading Stress [ksf]	0.175	0.35
Effective Stress [ksf]	0.1126	2.42218
Total Stress [ksf]	0.2374	5.043
Total Strain	0	0.256947
Pore Water Pressure [ksf]	0.1248	2.62082
Excess Pore Water Pressure [ksf]	-7.38777e-023	1.92247e-005
Degree of Consolidation [%]	0	99.9997
Pre-consolidation Stress [ksf]	0.115576	6.14966
Over-consolidation Ratio	1	2.67423
Void Ratio	0	1.21192
Permeability [ft/y]	0	79.3922
Coefficient of Consolidation [ft^2/y]	0	244.55
Hydroconsolidation Settlement [ft]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.0314

Stage: Stage 6 = 5 y

Data Type	Minimum	Maximum
Total Settlement [ft]	0	0.275515
Consolidation Settlement [ft]	0	0.216963
Immediate Settlement [ft]	0	0.058552
Secondary Settlement [ft]	0	0
Loading Stress [ksf]	0.175	0.35
Effective Stress [ksf]	0.1126	2.4222
Total Stress [ksf]	0.2374	5.043
Total Strain	0	0.256947
Pore Water Pressure [ksf]	0.1248	2.6208
Excess Pore Water Pressure [ksf]	-4.2981e-023	9.238e-012
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.115576	6.14966
Over-consolidation Ratio	1	2.67423
Void Ratio	0	1.21192
Permeability [ft/y]	0	79.3922
Coefficient of Consolidation [ft^2/y]	0	244.55
Hydroconsolidation Settlement [ft]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.0314

Stage: Stage 7 = 10 y

Data Type	Minimum	Maximum
Total Settlement [ft]	0	0.275515
Consolidation Settlement [ft]	0	0.216963
Immediate Settlement [ft]	0	0.058552
Secondary Settlement [ft]	0	0
Loading Stress [ksf]	0.175	0.35
Effective Stress [ksf]	0.1126	2.4222
Total Stress [ksf]	0.2374	5.043
Total Strain	0	0.256947
Pore Water Pressure [ksf]	0.1248	2.6208
Excess Pore Water Pressure [ksf]	-2.33486e-016	3.38488e-016
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.115576	6.14966
Over-consolidation Ratio	1	2.67423
Void Ratio	0	1.21192
Permeability [ft/y]	0	79.3922
Coefficient of Consolidation [ft^2/y]	0	244.55
Hydroconsolidation Settlement [ft]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.0314

Stage: Stage 8 = 30 y

Data Type	Minimum	Maximum
Total Settlement [ft]	0	0.275515
Consolidation Settlement [ft]	0	0.216963
Immediate Settlement [ft]	0	0.058552
Secondary Settlement [ft]	0	0
Loading Stress [ksf]	0.175	0.35
Effective Stress [ksf]	0.1126	2.4222
Total Stress [ksf]	0.2374	5.043
Total Strain	0	0.256947
Pore Water Pressure [ksf]	0.1248	2.6208
Excess Pore Water Pressure [ksf]	-2.32488e-016	3.36474e-016
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.115576	6.14966
Over-consolidation Ratio	1	2.67423
Void Ratio	0	1.21192
Permeability [ft/y]	0	79.3922
Coefficient of Consolidation [ft^2/y]	0	244.55
Hydroconsolidation Settlement [ft]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.0314

Stage: Stage 9 = 50 y

Data Type	Minimum	Maximum
Total Settlement [ft]	0	0.275515
Consolidation Settlement [ft]	0	0.216963
Immediate Settlement [ft]	0	0.058552
Secondary Settlement [ft]	0	0
Loading Stress [ksf]	0.175	0.35
Effective Stress [ksf]	0.1126	2.4222
Total Stress [ksf]	0.2374	5.043
Total Strain	0	0.256947
Pore Water Pressure [ksf]	0.1248	2.6208
Excess Pore Water Pressure [ksf]	-3.36182e-016	2.32344e-016
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.115576	6.14966
Over-consolidation Ratio	1	2.67423
Void Ratio	0	1.21192
Permeability [ft/y]	0	79.3922
Coefficient of Consolidation [ft^2/y]	0	244.55
Hydroconsolidation Settlement [ft]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.0314

Embankments

1. Embankment

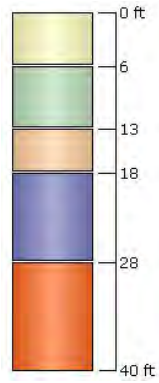
Center Line	(-50000, 0) to (50000, 0)
Number of Layers	1
Near End Angle	90 degrees
Far End Angle	90 degrees
Base Width	100000

Layer	Stage	Left Bench Width (ft)	Left Angle (deg)	Height (ft)	Unit Weight (kips/ft^3)	Right Angle (deg)	Right Bench Width (ft)
1	Stage 1 = 0 y	0	90	3.5	0.1	90	0

Soil Layers

Ground Surface Drained: Yes

Layer #	Type	Thickness [ft]	Depth [ft]	Drained at Bottom
1	CH -2 to -8	6	0	No
2	ML -8 to -15	7	6	Yes
3	CH -15 to -20	5	13	No
4	SM -20 to -30	10	18	Yes
5	CH -30 to -42	12	28	No



Soil Properties

Property	CH -2 to -8	ML -8 to -15	CH -15 to -20	SM -20 to -30	CH -30 to -42
Color					
Unit Weight [kips/ft^3]	0.112	0.118	0.111	0.12	0.12
Saturated Unit Weight [kips/ft^3]	0.112	0.118	0.111	0.12	0.12
Immediate Settlement	Enabled	Disabled	Enabled	Disabled	Enabled
Es [ksf]	55		55		200
Esur [ksf]	55		55		200
Primary Consolidation	Enabled	Disabled	Enabled	Disabled	Enabled
Material Type	Non-Linear		Non-Linear		Non-Linear
Cc	0.347		0.5		0.315
Cr	0.057		0.071		0.045
e0	1.007		1.22		0.932
OCR	3.2	1	3	1	2.8
Cv [ft^2/y]	50.37		72.635		244.55
B-bar	1		1		1
Undrained Su A [kips/ft2]	0	0	0	0	0
Undrained Su S	0.2	0.2	0.2	0.2	0.2
Undrained Su m	0.8	0.8	0.8	0.8	0.8
Piezo Line ID	1	1	1	1	1

Groundwater

Groundwater method	Piezometric Lines
Water Unit Weight	0.0624 kips/ft^3

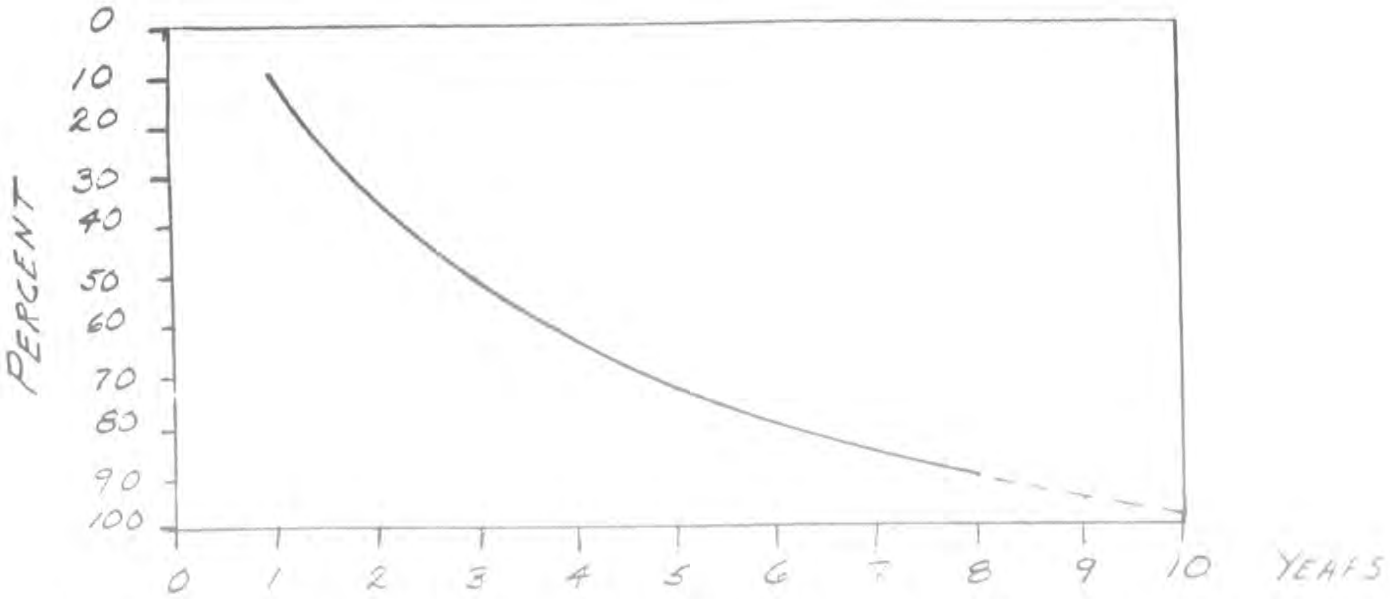
Piezometric Line Entities

ID	Depth (ft)
1	-2 ft

Query Lines

Line #	Start Location	End Location	Horizontal Divisions	Vertical Divisions
1	-50000, 0	50000, 0	20	Auto: 67

SEMI-COMPACTED FILL SHRINKAGE ESTIMATED



Precent of h = 10% 33% 50% 63% 72% 80% 86% 91% 95% 98% (Shrink)

10-15% NEW FILL = SHRINK & CONSOLIDATI
OF FILL ONLY.

HYDRAULIC FILL

-10% FOR CONSOLIDATION
-25% FOR SHRINKAGE

TABLE 9-3 Typical Values of the Coefficient of Consolidation c_v

Soil	c_v cm²/s, $\times 10^{-4}$	c_v m²/yr
Boston blue clay (CL) (Ladd and Luscher, 1965)	40 ± 20	12 ± 6
Organic silt (OH) (Lowe, Zaccheo, and Feldman, 1964)	2–10	0.6–3
Glacial lake clays (CL) (Wallace and Otto, 1964)	6.5–8.7	2.0–2.7
Chicago silty clay (CL) (Terzaghi and Peck, 1967)	8.5	2.7
Swedish medium sensitive clays (CL-CH) (Holtz and Broms, 1972)		
1. laboratory	0.4–0.7	0.1–0.2
2. field	0.7–3.0	0.2–1.0
San Francisco Bay Mud (CL)	2–4	0.6–1.2
Mexico City clay (MH) (Leonards and Girault, 1961)	0.9–1.5	0.3–0.5

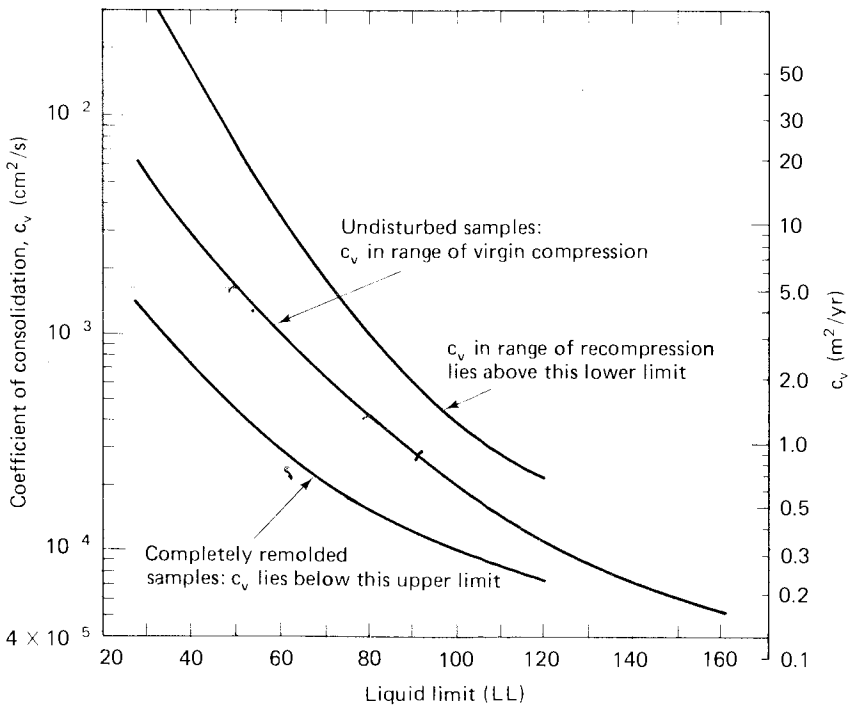


Fig. 9.10 Approximate correlations of the coefficient of consolidation c_v with the liquid limit (after U.S. Navy, 1971).

9.6 TYPICAL V

Typical values of
soils are listed in Table
limit are presented in Fi

9.7 EVALUATI SETTLEMENT

Thus far we hav
primary settlement s_c,
nents of total settlemen
s_i and secondary settl
elastic theory, and it i
and Poisson's ratio of t
distribution in the soi
estimation of immedia
textbooks and will not

Secondary compr
started during primar
slower rate. Secondary
tion in that it takes
essentially all the exce
settlement seems to res
ual clay particles and
which are not yet clea
in the field it is difficu
dation settlement, esp
thick. Parts of the lay
dated, and therefore u
near the center of the l
contribute to the tota
order to predict the
However, in this secti
acceptable for enginee
and we shall show you
some simple cases.

There is, unfortu
ture as to the best wa
compression. In this s

Appendix B

Laboratory Test Data

SUMMARY OF LABORATORY TEST RESULTS

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Assigned By: _____

Project Number: 10-017200
Boring: TB-1U

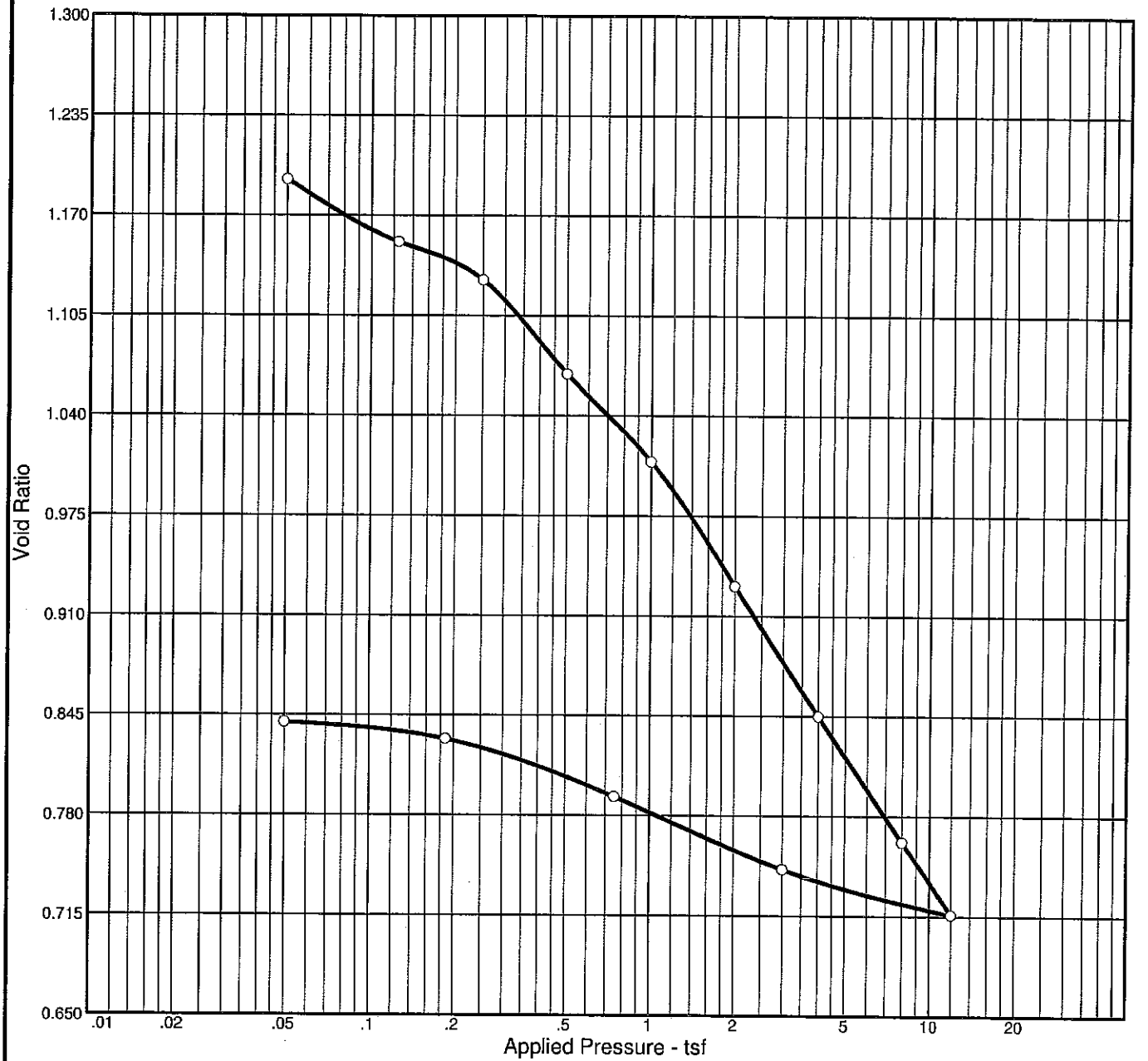
Current Date: 8/19/2014

Sample Number	Depth	Visual Classification	USCS	E(f)	W%	Dry Dens (pcf)	Wet Dens (pcf)	Sat %	Shear Test Type	Angle	Cohesion (psf)	Unconf. Comp. Str.	LL	PL	PI	TORVANE (tsf)	Other Tests
1C	2.1	M GNG CH4 W/ ARS ML, TR-O	CH4		44	78	112	99	UU	0	640		85	29	56	0.41	
2A	4.3	VSO GR CL4 W/ ARS ML, O	CH2		46	77	112	100					38	20	18		GS=2.60, CONS
11B	29.2	M GNG & T CH4 W/ ARS SM	CH3		34	85	114	97					73	20	53		GS=2.57, CONS
11C	30.2	ST GR CH2 W/ ARS SM	CH2		23	101	124	92	UU	0	1610		50	16	34	0.70	
12C	34.0	ST GR CL6 W/ ARS ML	CL6		31	90	118	96	UU	0	1273		45	21	24	0.35	
13C	38.0	SO GR CL4 W/ ARS ML, WD	CH3		34	86	115	95					33	20	13		GS=2.71, CONS

Remarks:
FFEBJV, LLC.

Checked by: _____
File Name: 075561418

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
99.9 %	45.9 %	74.0	38	18	2.60		0.35	0.27	0.05			1.195

MATERIAL DESCRIPTION	USCS	AASHTO
VSO GR CL4 W/ ARS ML, O	CH	

Project No. 10-017200 **Client:** USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA

Source: TB-1U **Sample No.:** 2A **Elev./Depth:** 4.3

Remarks:

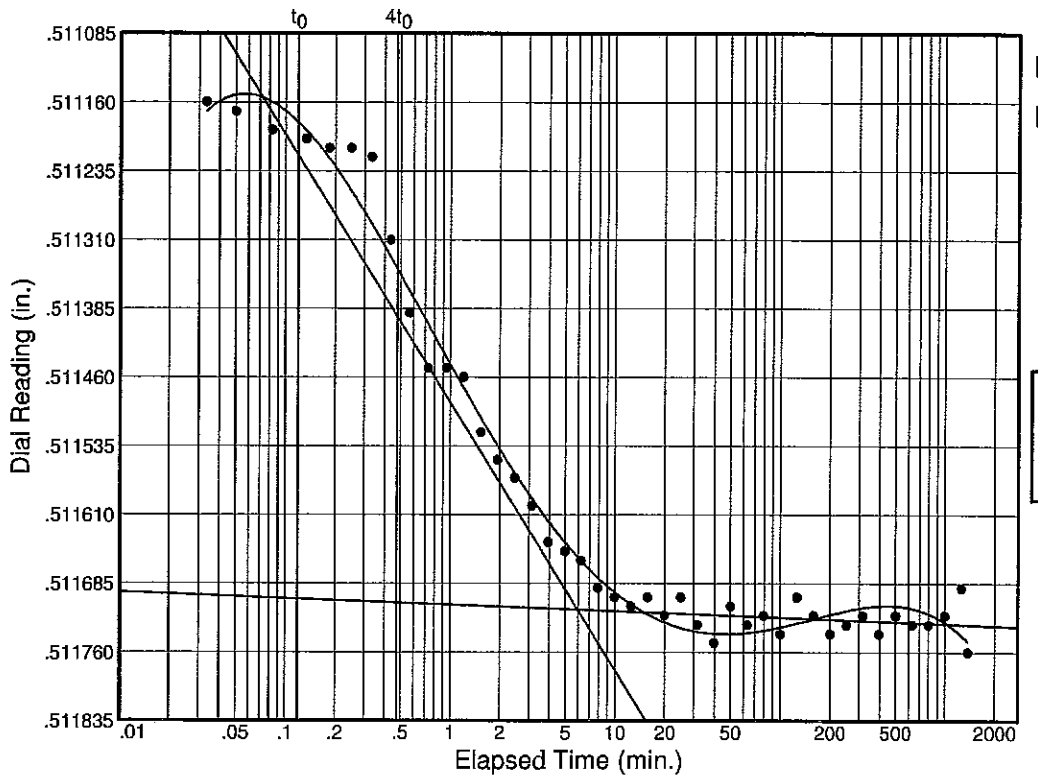
Stantec

Saint Rose, Louisiana

Figure

Dial Reading vs. Time

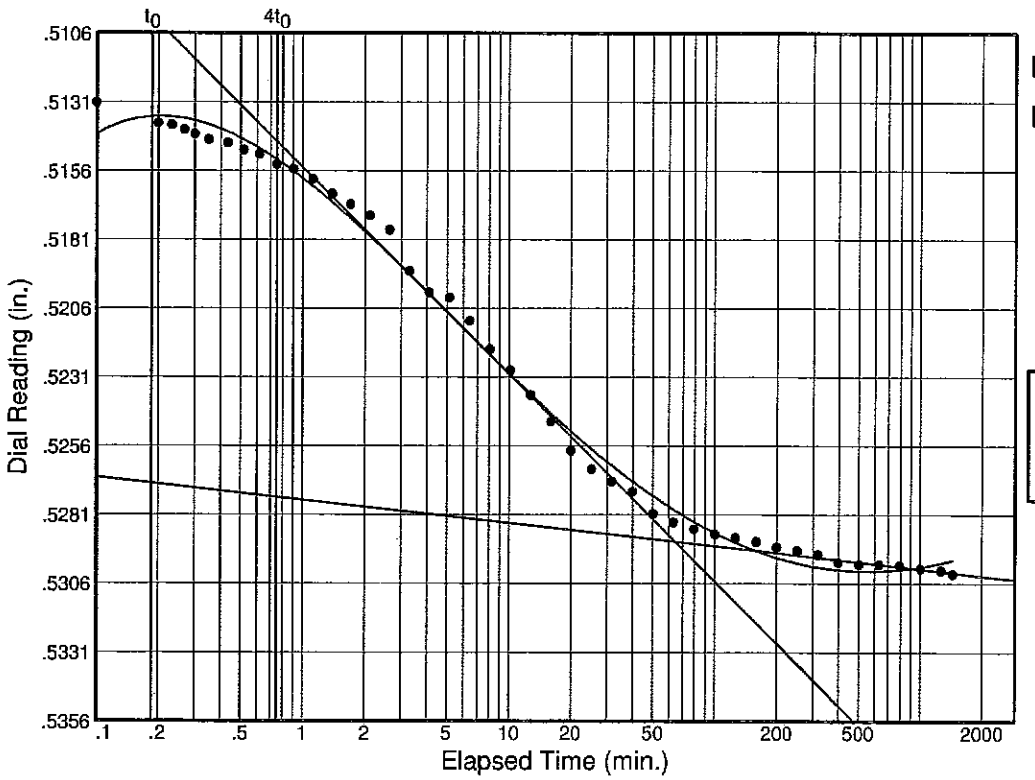
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 2A Elev./Depth: 4.3



Load No.= 1
Load= 0.05 tsf
D_0 = 0.51102
D_{50} = 0.51137
D_{100} = 0.51171
T_{50} = 0.58 min.

C_v @ T_{50}
0.86 ft.^{2}/day

C_α = 0.000



Load No.= 2
Load= 0.13 tsf
D_0 = 0.51209
D_{50} = 0.52058
D_{100} = 0.52908
T_{50} = 4.77 min.

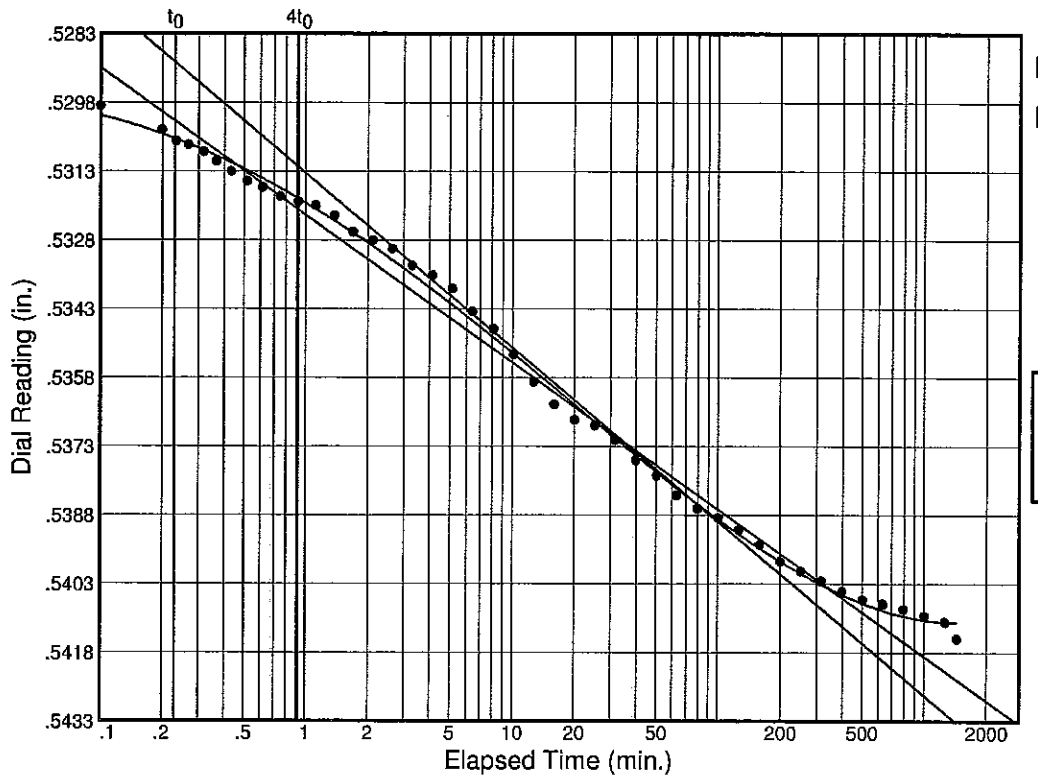
C_v @ T_{50}
0.10 ft.^{2}/day

C_α = 0.001

Figure

Dial Reading vs. Time

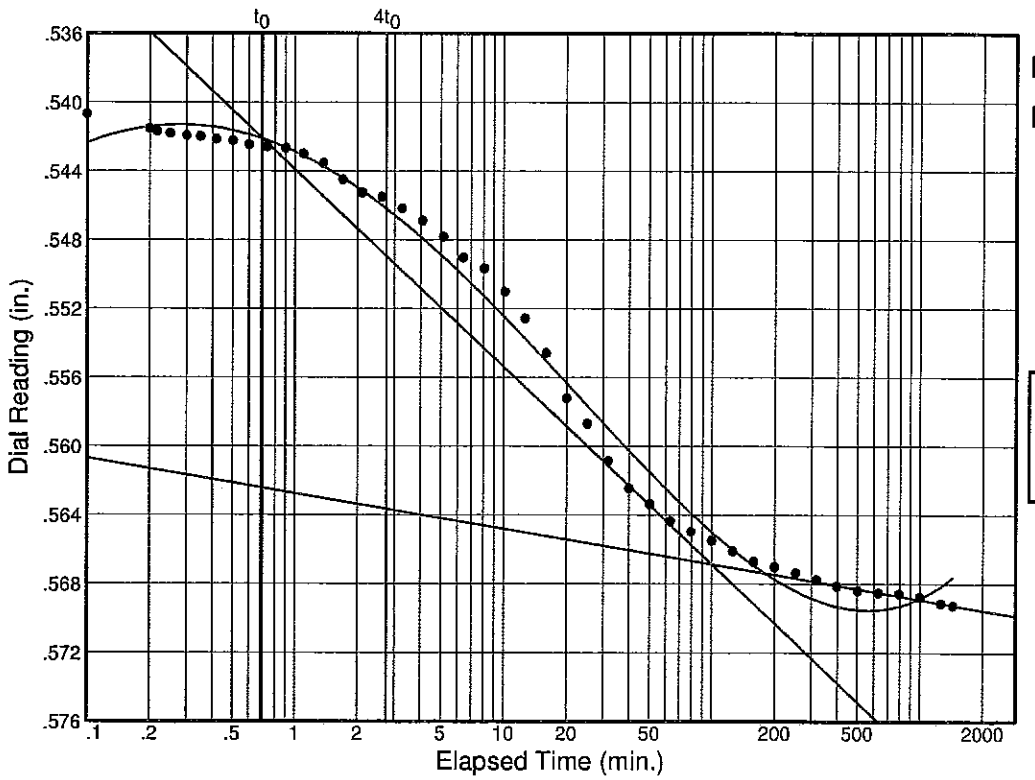
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 2A Elev./Depth: 4.3



Load No.= 3
Load= 0.25 tsf
D_0 = 0.52928
D_{50} = 0.53326
D_{100} = 0.53723
T_{50} = 2.67 min.

C_v @ T_{50}
0.18 ft.^{2}/day

C_α = 0.003



Load No.= 4
Load= 0.50 tsf
D_0 = 0.53800
D_{50} = 0.55244
D_{100} = 0.56687
T_{50} = 9.98 min.

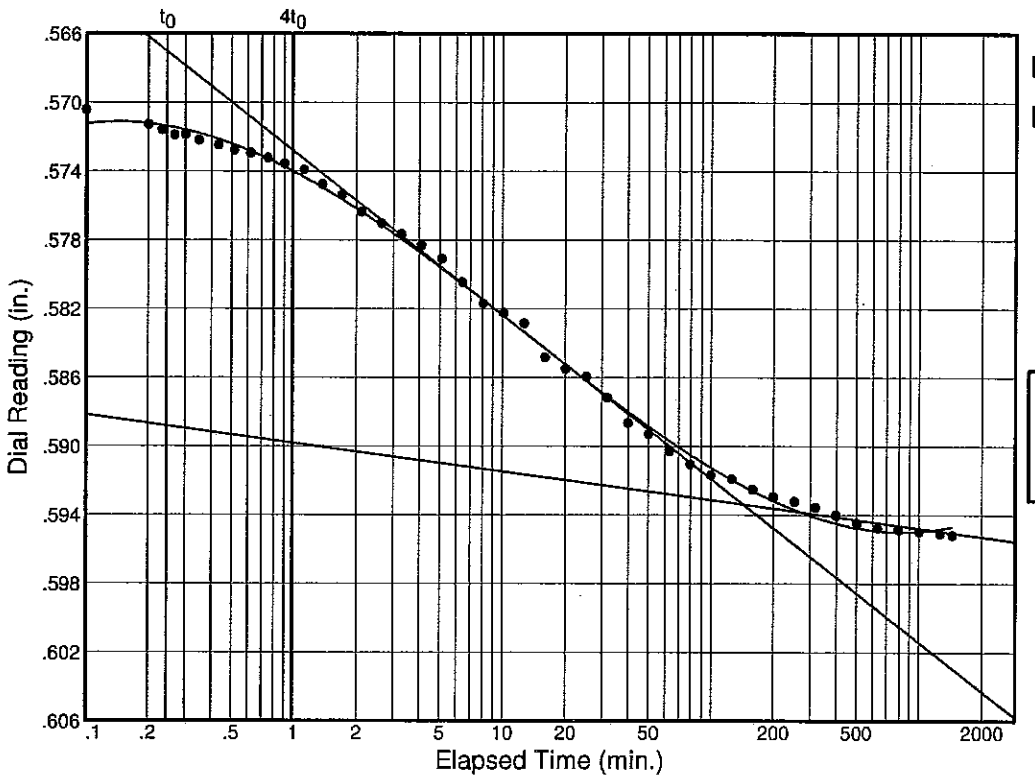
C_v @ T_{50}
0.05 ft.^{2}/day

C_α = 0.002

Figure

Dial Reading vs. Time

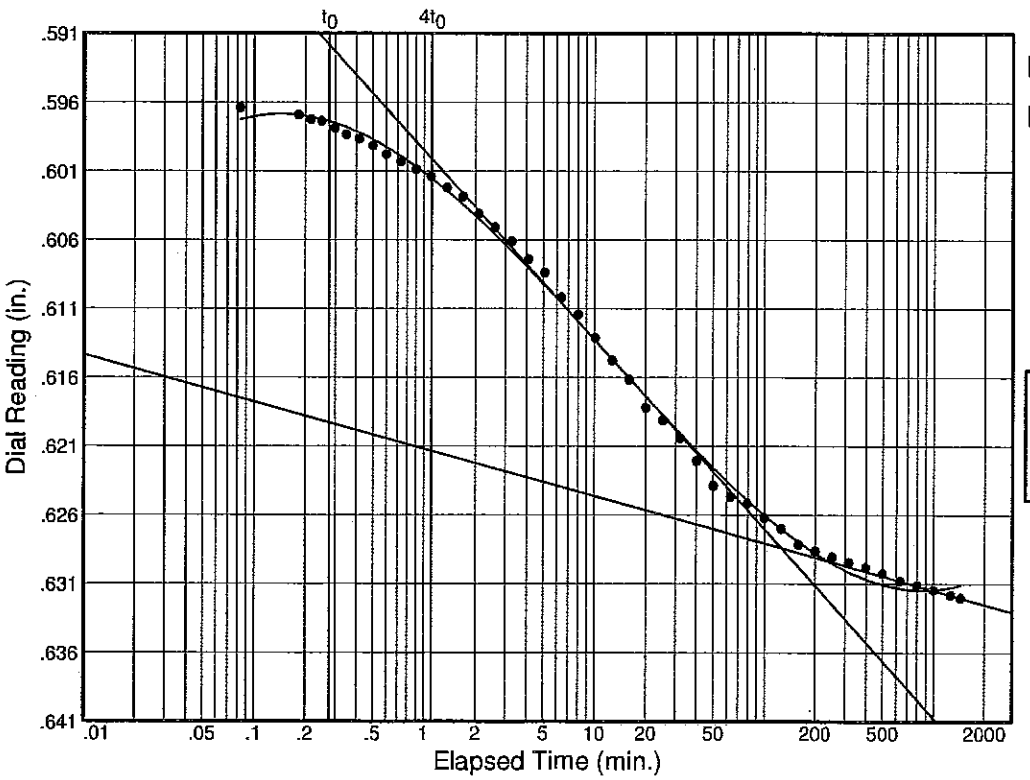
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 2A Elev./Depth: 4.3



Load No.= 5
Load= 1.00 tsf
D_0 = 0.56879
D_{50} = 0.58108
D_{100} = 0.59337
T_{50} = 7.29 min.

C_v @ T_{50}
0.06 ft.^{2}/day

C_α = 0.002



Load No.= 6
Load= 2.00 tsf
D_0 = 0.59324
D_{50} = 0.61080
D_{100} = 0.62837
T_{50} = 6.60 min.

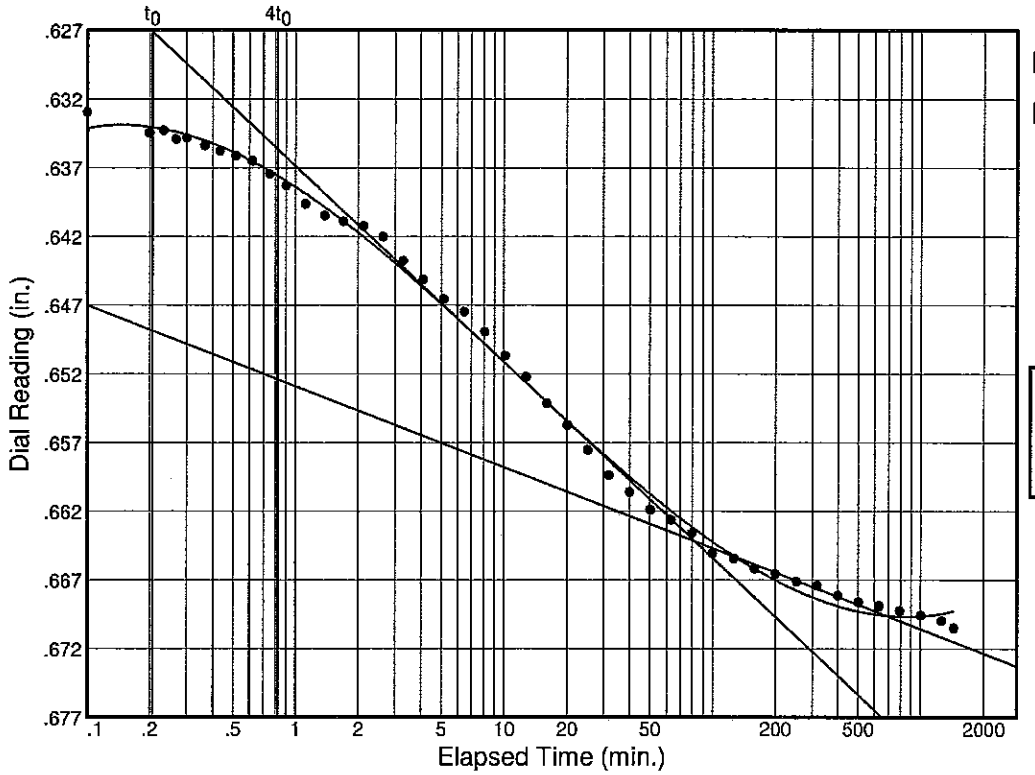
C_v @ T_{50}
0.06 ft.^{2}/day

C_α = 0.004

Figure

Dial Reading vs. Time

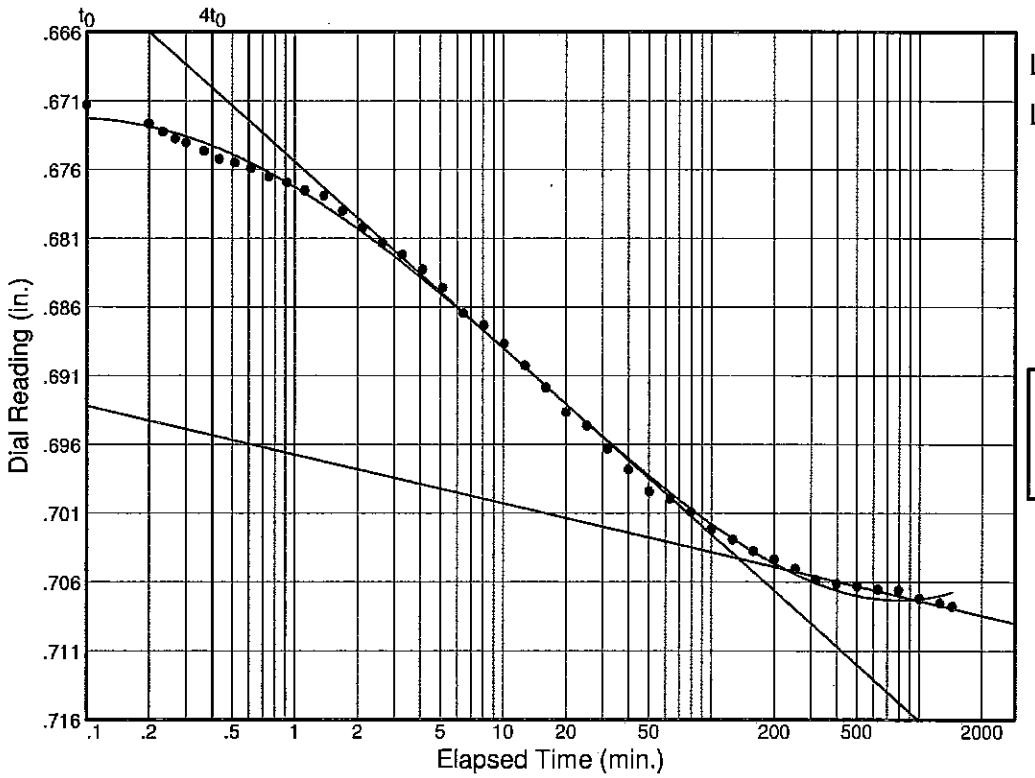
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 2A Elev./Depth: 4.3



Load No.= 7
Load= 4.00 tsf
D_0 = 0.63053
D_{50} = 0.64736
D_{100} = 0.66419
T_{50} = 5.40 min.

C_v @ T_{50}
0.07 ft.^{2}/day

C_α = 0.007



Load No.= 8
Load= 8.00 tsf
D_0 = 0.67032
D_{50} = 0.68730
D_{100} = 0.70428
T_{50} = 7.46 min.

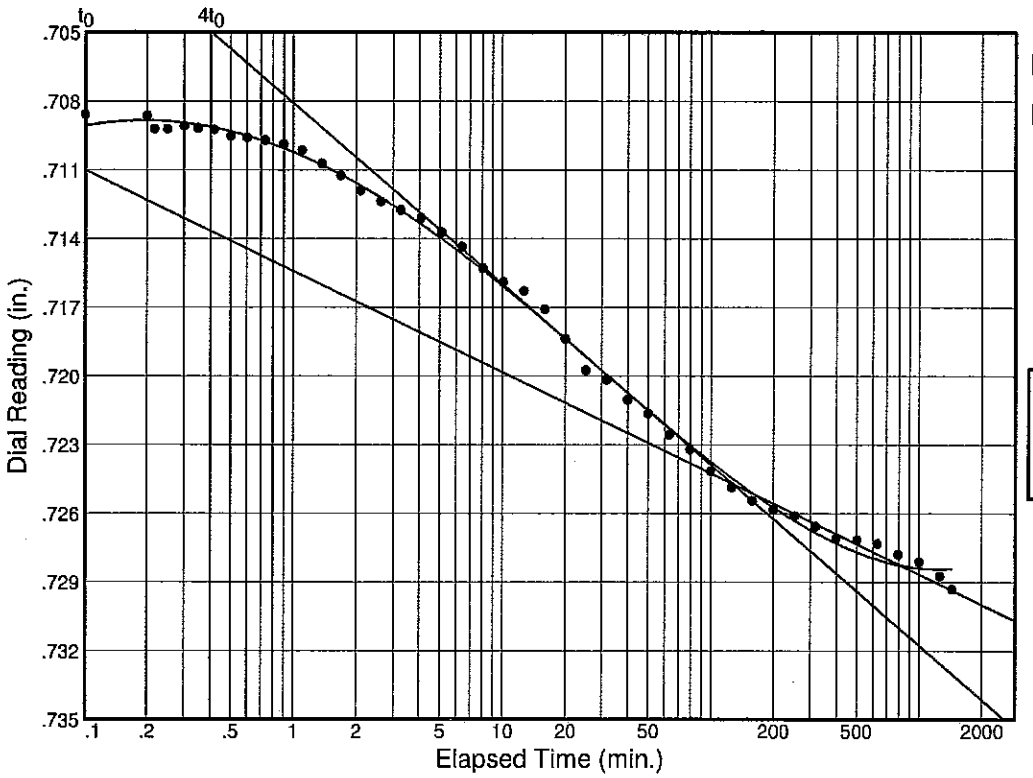
C_v @ T_{50}
0.05 ft.^{2}/day

C_α = 0.004

Figure

Dial Reading vs. Time

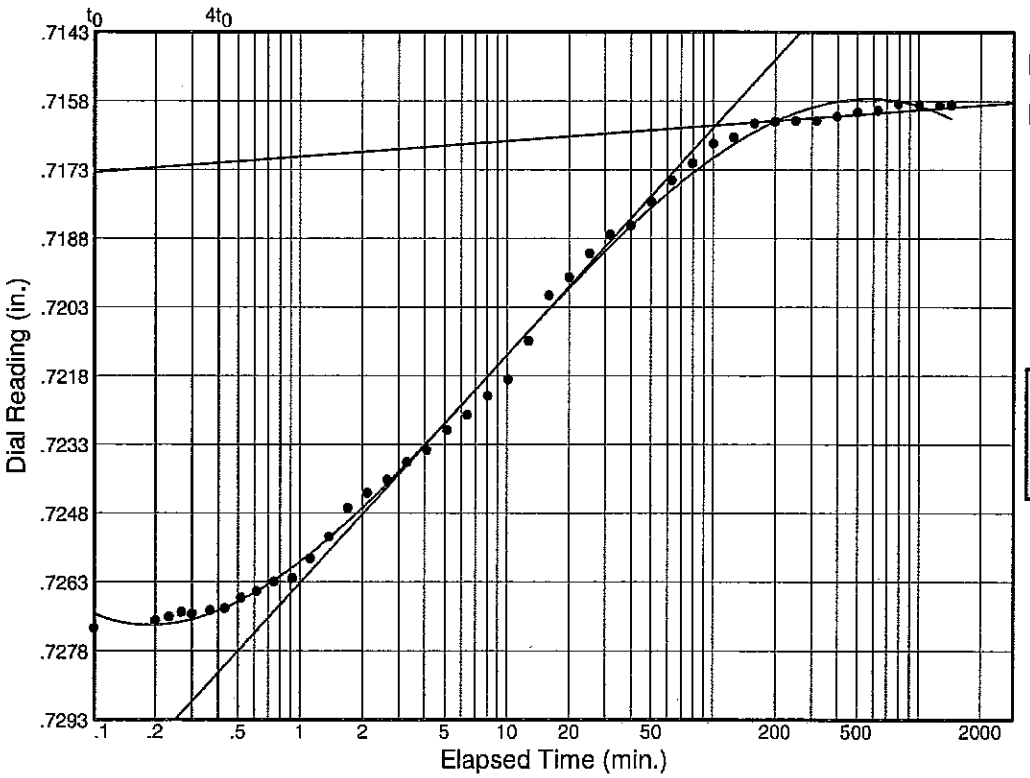
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 2A Elev./Depth: 4.3



Load No.= 9
Load= 12.00 tsf
D_0 = 0.70902
D_{50} = 0.71687
D_{100} = 0.72471
T_{50} = 12.81 min.

C_v @ T_{50}
0.02 ft.^{2}/day

C_α = 0.005



Load No.= 10
Load= 3.00 tsf
D_0 = 0.72705
D_{50} = 0.72169
D_{100} = 0.71633
T_{50} = 8.53 min.

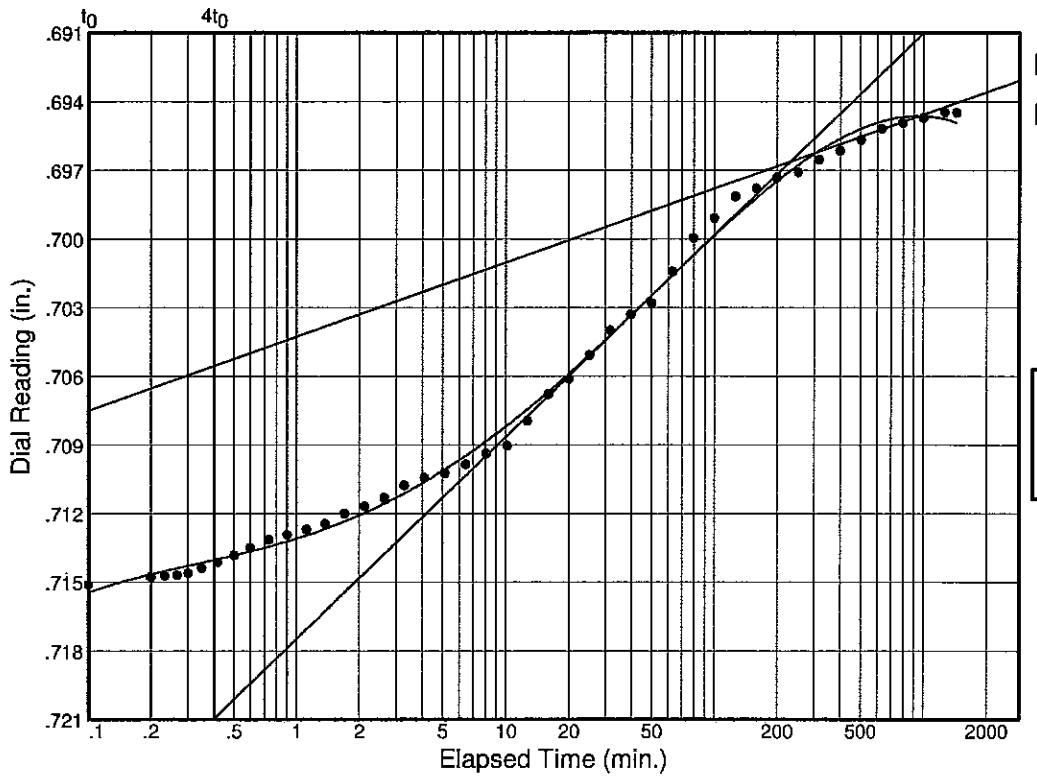
C_v @ T_{50}
0.04 ft.^{2}/day

Figure

Stantec, Inc.

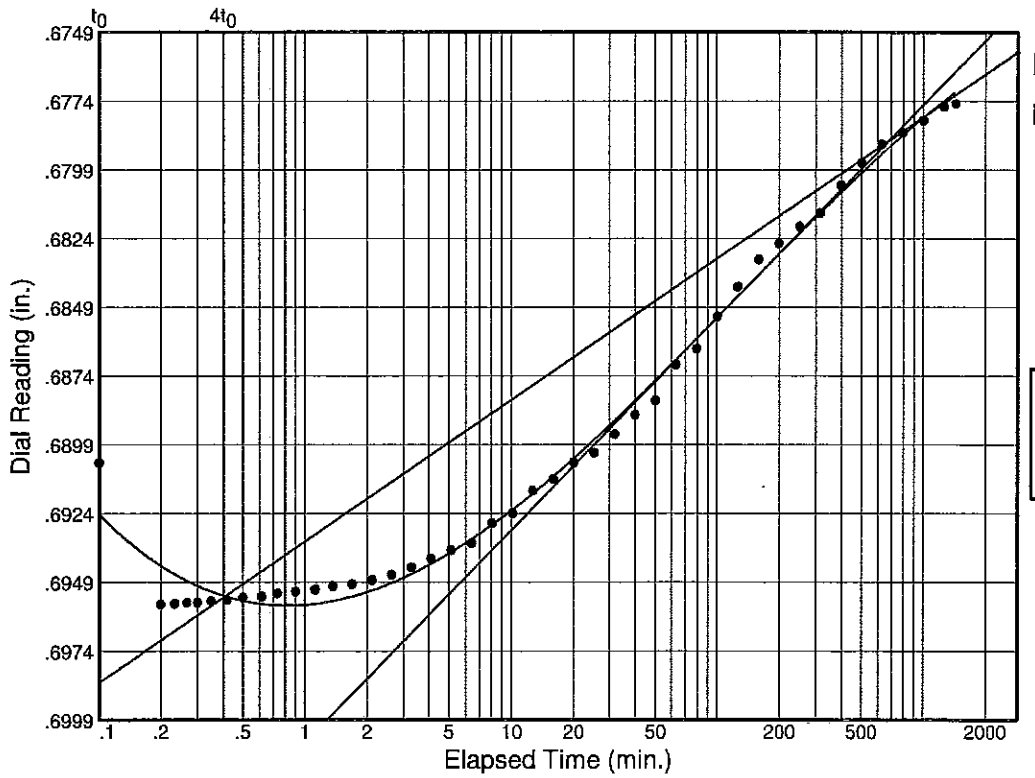
Dial Reading vs. Time

Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 2A Elev./Depth: 4.3



Load No.= 11
Load= 0.75 tsf
D_0 = 0.71687
D_{50} = 0.70676
D_{100} = 0.69664
T_{50} = 15.58 min.

C_v @ T_{50}
0.02 ft.^{2}/day



Load No.= 12
Load= 0.19 tsf
D_0 = 0.68949
D_{50} = 0.68417
D_{100} = 0.67886
T_{50} = 138.81 min.

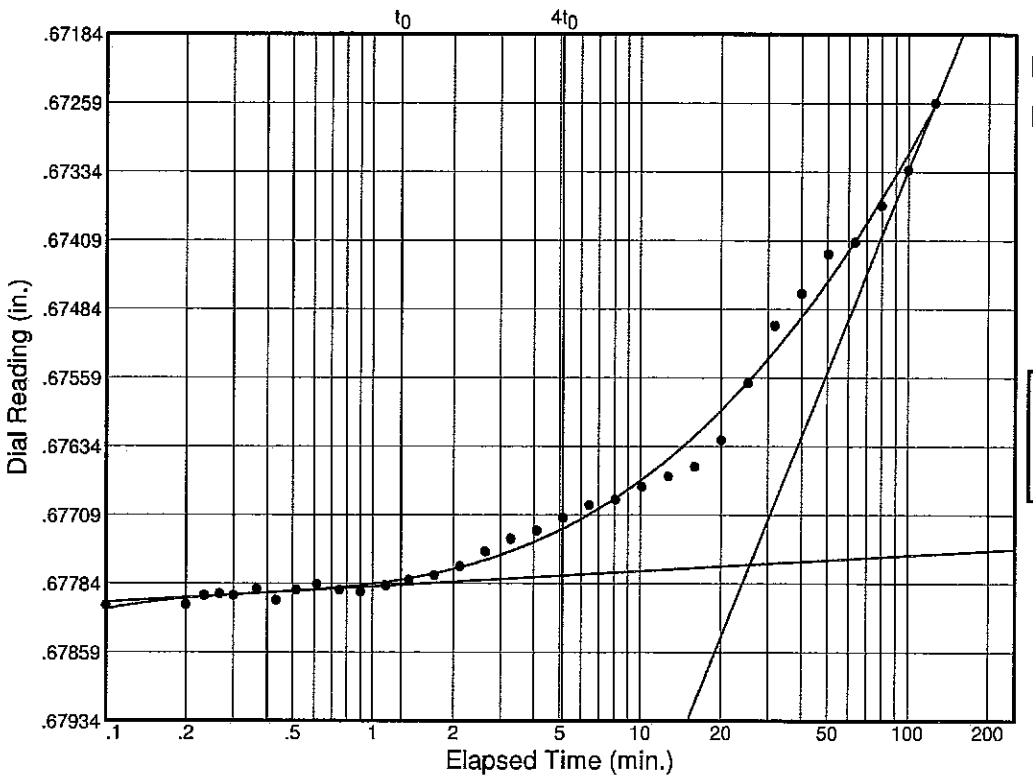
C_v @ T_{50}
0.00 ft.^{2}/day

Figure

Stantec, Inc.

Dial Reading vs. Time

Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 2A Elev./Depth: 4.3



Load No.= 13
Load= 0.05 tsf
D_0 = 0.67836
D_{50} = 0.67799
D_{100} = 0.67763
T_{50} = 0.21 min.

C_v @ T_{50}
1.64 ft.^{2}/day

Figure

CONSOLIDATION TEST DATA

Client: USACE
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Project Number: 10-017200

Sample Data

Source: TB-1U
Sample No.: 2A
Depth: 4.3 **Sample Length(in./cm.):**
Location:
Description: VSO GR CL4 W/ ARS ML, O
Liquid Limit: 38 **Plasticity Index:** 18
USCS: CH **AASHTO:** **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 314.40 g.	**Consolidometer #** = 2	**Wet w+t** = 344.19 g.
Dry w+t = 218.06 g.		**Dry w+t** = 264.68 g.
Tare Wt. = 8.20 g.	**Spec. Gravity** = 2.60	**Tare Wt.** = 8.32 g.
Height = 1.00 in.	**Height** = 1.00 in.	
Diameter = 4.07 in.	**Diameter** = 4.07 in.	
Weight = 369.06 g.	**Defl. Table** = n/a	
Moisture = 45.9 %	**Ht. Solids** = 0.4556 in.	**Moisture** = 31.0 %
Wet Den. = 107.9 pcf	**Dry Wt.** = 252.94 g.*	**Dry Wt.** = 256.36 g.
Dry Den. = 74.0 pcf	**Void Ratio** = 1.195	**Void Ratio** = 0.840
	Saturation = 99.9 %	

*** Initial dry weight used in calculations**

End-of-Load Summary

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	0.51114				1.195	
0.05	0.51176	0.00000	0.86	0.000	1.193	0.1 Comprs.
0.13	0.53025	0.00000	0.10	0.001	1.153	1.9 Comprs.
0.25	0.54150	0.00000	0.18	0.003	1.128	3.0 Comprs.
0.50	0.56925	0.00000	0.05	0.002	1.067	5.8 Comprs.
1.00	0.59516	0.00000	0.06	0.002	1.010	8.4 Comprs.
2.00	0.63200	0.00000	0.06	0.004	0.929	12.1 Comprs.
4.00	0.67050	0.00000	0.07	0.007	0.845	15.9 Comprs.
8.00	0.70776	0.00000	0.05	0.004	0.763	19.7 Comprs.
12.00	0.72929	0.00000	0.02	0.005	0.716	21.8 Comprs.
3.00	0.71589	0.00000	0.04		0.745	20.5 Comprs.
0.75	0.69449	0.00000	0.02		0.792	18.3 Comprs.
0.19	0.67749	0.00000	0.00		0.830	16.6 Comprs.
0.05	0.67259	0.00000	1.64		0.840	16.1 Comprs.

C_c = 0.27 P_c = 0.35 tsf C_r = 0.05

Pressure: 0.05 tsf **TEST READINGS** **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.51114	16	2.45	0.51157	31	79.38	0.51172
2	0.03	0.51116	17	3.12	0.51160	32	99.95	0.51174
3	0.05	0.51117	18	3.93	0.51164	33	125.85	0.51170
4	0.08	0.51119	19	4.97	0.51165	34	158.45	0.51172
5	0.13	0.51120	20	6.25	0.51166	35	199.48	0.51174
6	0.18	0.51121	21	7.90	0.51169	36	251.15	0.51173
7	0.25	0.51121	22	9.95	0.51170	37	316.20	0.51172
8	0.33	0.51122	23	12.53	0.51171	38	398.07	0.51174
9	0.43	0.51131	24	15.80	0.51170	39	501.15	0.51172
10	0.57	0.51139	25	19.90	0.51172	40	630.92	0.51173
11	0.73	0.51145	26	25.07	0.51170	41	794.30	0.51173
12	0.95	0.51145	27	31.58	0.51173	42	999.97	0.51172
13	1.20	0.51146	28	39.77	0.51175	43	1258.90	0.51169
14	1.53	0.51152	29	50.07	0.51171	44	1383.97	0.51176
15	1.93	0.51155	30	63.05	0.51173			

Void Ratio = 1.193 **Compression** = 0.1 %
D_0 = 0.51102 D_{50} = 0.51137 D_{100} = 0.51171
C_v **at 0.6 min.** = 0.86 ft.^{2}/day C_α = 0.000

Pressure: 0.13 tsf **TEST READINGS** **Load No. 2**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.51016	16	2.12	0.51723	31	63.23	0.52838
2	0.10	0.51314	17	2.63	0.51776	32	79.58	0.52861
3	0.20	0.51388	18	3.28	0.51925	33	100.15	0.52881
4	0.23	0.51394	19	4.10	0.52003	34	126.03	0.52894
5	0.27	0.51412	20	5.13	0.52022	35	158.63	0.52908
6	0.30	0.51427	21	6.43	0.52107	36	199.67	0.52927
7	0.35	0.51447	22	8.07	0.52210	37	251.33	0.52941
8	0.43	0.51459	23	10.13	0.52286	38	316.38	0.52956
9	0.52	0.51485	24	12.72	0.52376	39	398.25	0.52982
10	0.62	0.51501	25	15.98	0.52472	40	501.33	0.52990
11	0.75	0.51538	26	20.08	0.52577	41	631.12	0.52991
12	0.90	0.51554	27	25.25	0.52645	42	794.48	0.52994
13	1.12	0.51592	28	31.75	0.52691	43	1000.15	0.53005
14	1.38	0.51645	29	39.95	0.52727	44	1259.08	0.53012
15	1.70	0.51683	30	50.27	0.52807	45	1440.17	0.53025

Void Ratio = 1.153 **Compression** = 1.9 %
D_0 = 0.51209 D_{50} = 0.52058 D_{100} = 0.52908
C_v **at 4.8 min.** = 0.10 ft.^{2}/day C_α = 0.001

Pressure: 0.25 tsf **TEST READINGS** **Load No. 3**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.52869	16	2.12	0.53281	31	63.25	0.53837
2	0.10	0.52988	17	2.63	0.53299	32	79.58	0.53866
3	0.20	0.53040	18	3.28	0.53336	33	100.15	0.53885
4	0.23	0.53064	19	4.12	0.53357	34	126.05	0.53912
5	0.27	0.53072	20	5.13	0.53386	35	158.65	0.53944
6	0.32	0.53088	21	6.43	0.53436	36	199.68	0.53981
7	0.37	0.53108	22	8.08	0.53474	37	251.35	0.54002
8	0.43	0.53131	23	10.13	0.53530	38	316.38	0.54024
9	0.52	0.53152	24	12.72	0.53589	39	398.27	0.54046
10	0.62	0.53165	25	15.98	0.53638	40	501.35	0.54064
11	0.75	0.53185	26	20.10	0.53672	41	631.12	0.54074
12	0.92	0.53196	27	25.27	0.53685	42	794.50	0.54085
13	1.12	0.53205	28	31.77	0.53716	43	1000.17	0.54100
14	1.38	0.53227	29	39.95	0.53760	44	1259.10	0.54113
15	1.70	0.53262	30	50.27	0.53794	45	1440.18	0.54150

Void Ratio = 1.128 **Compression** = 3.0 %
D_0 = 0.52928 D_{50} = 0.53326 D_{100} = 0.53723
C_v **at 2.7 min.** = 0.18 ft.^{2}/day C_α = 0.003

Pressure: 0.50 tsf **TEST READINGS** **Load No. 4**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.53849	16	2.10	0.54526	31	63.22	0.56435
2	0.10	0.54071	17	2.62	0.54551	32	79.57	0.56496
3	0.20	0.54152	18	3.27	0.54618	33	100.13	0.56549
4	0.22	0.54169	19	4.10	0.54690	34	126.02	0.56610
5	0.25	0.54181	20	5.13	0.54782	35	158.62	0.56670
6	0.30	0.54194	21	6.42	0.54904	36	199.67	0.56702
7	0.35	0.54200	22	8.07	0.54967	37	251.33	0.56737
8	0.42	0.54215	23	10.12	0.55102	38	316.37	0.56776
9	0.50	0.54225	24	12.70	0.55259	39	398.25	0.56812
10	0.60	0.54246	25	15.97	0.55460	40	501.33	0.56839
11	0.73	0.54260	26	20.07	0.55721	41	631.10	0.56852
12	0.90	0.54268	27	25.23	0.55870	42	794.47	0.56858
13	1.10	0.54300	28	31.75	0.56086	43	1000.15	0.56876
14	1.37	0.54356	29	39.93	0.56245	44	1259.07	0.56913
15	1.70	0.54450	30	50.25	0.56337	45	1440.13	0.56925

Void Ratio = 1.067 **Compression** = 5.8 %
D_0 = 0.53800 D_{50} = 0.55244 D_{100} = 0.56687
C_v **at 10.0 min.** = 0.05 ft.^{2}/day C_α = 0.002

Pressure: 1.00 tsf **TEST READINGS** **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.56692	16	2.12	0.57638	31	63.23	0.59028
2	0.10	0.57046	17	2.63	0.57703	32	79.58	0.59106
3	0.20	0.57130	18	3.28	0.57766	33	100.15	0.59167
4	0.23	0.57162	19	4.10	0.57832	34	126.03	0.59192
5	0.27	0.57191	20	5.13	0.57910	35	158.63	0.59250
6	0.30	0.57188	21	6.43	0.58046	36	199.67	0.59293
7	0.35	0.57221	22	8.07	0.58170	37	251.33	0.59323
8	0.43	0.57248	23	10.13	0.58225	38	316.38	0.59355
9	0.52	0.57278	24	12.72	0.58285	39	398.25	0.59401
10	0.62	0.57295	25	15.98	0.58482	40	501.33	0.59447
11	0.75	0.57324	26	20.08	0.58551	41	631.12	0.59473
12	0.90	0.57358	27	25.25	0.58595	42	794.48	0.59484
13	1.12	0.57394	28	31.77	0.58717	43	1000.15	0.59496
14	1.37	0.57476	29	39.95	0.58865	44	1259.08	0.59509
15	1.70	0.57541	30	50.27	0.58930	45	1440.18	0.59516

Void Ratio = 1.010 **Compression** = 8.4 %
D_0 = 0.56879 D_{50} = 0.58108 D_{100} = 0.59337
C_v **at 7.3 min.** = 0.06 ft.^{2}/day C_α = 0.002

Pressure: 2.00 tsf **TEST READINGS** **Load No. 6**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.59138	16	2.10	0.60412	31	63.22	0.62466
2	0.08	0.59641	17	2.62	0.60512	32	79.57	0.62516
3	0.18	0.59692	18	3.27	0.60614	33	100.13	0.62621
4	0.22	0.59726	19	4.10	0.60742	34	126.03	0.62701
5	0.25	0.59738	20	5.12	0.60839	35	158.62	0.62815
6	0.30	0.59788	21	6.42	0.61021	36	199.67	0.62861
7	0.35	0.59836	22	8.07	0.61144	37	251.33	0.62906
8	0.42	0.59868	23	10.12	0.61311	38	316.37	0.62945
9	0.50	0.59916	24	12.72	0.61478	39	398.25	0.62980
10	0.60	0.59980	25	15.97	0.61617	40	501.33	0.63025
11	0.73	0.60034	26	20.08	0.61821	41	631.10	0.63080
12	0.90	0.60090	27	25.25	0.61913	42	794.47	0.63111
13	1.10	0.60138	28	31.75	0.62041	43	1000.15	0.63142
14	1.37	0.60221	29	39.93	0.62208	44	1259.07	0.63180
15	1.70	0.60287	30	50.25	0.62389	45	1440.20	0.63200

Void Ratio = 0.929 **Compression** = 12.1 %
D_0 = 0.59324 D_{50} = 0.61080 D_{100} = 0.62837
C_v **at 6.6 min.** = 0.06 ft.^{2}/day C_α = 0.004

Pressure: 4.00 tsf **TEST READINGS** **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.62662	16	2.12	0.64125	31	63.25	0.66261
2	0.10	0.63296	17	2.63	0.64203	32	79.58	0.66358
3	0.20	0.63447	18	3.28	0.64377	33	100.15	0.66507
4	0.23	0.63430	19	4.12	0.64512	34	126.05	0.66543
5	0.27	0.63493	20	5.15	0.64657	35	158.63	0.66616
6	0.30	0.63486	21	6.45	0.64748	36	199.68	0.66654
7	0.37	0.63538	22	8.08	0.64893	37	251.35	0.66710
8	0.43	0.63579	23	10.13	0.65066	38	316.38	0.66740
9	0.52	0.63613	24	12.73	0.65222	39	398.27	0.66812
10	0.62	0.63652	25	16.00	0.65414	40	501.35	0.66858
11	0.75	0.63745	26	20.10	0.65571	41	631.12	0.66887
12	0.90	0.63831	27	25.27	0.65754	42	794.48	0.66923
13	1.12	0.63962	28	31.77	0.65937	43	1000.17	0.66955
14	1.38	0.64048	29	39.95	0.66061	44	1259.08	0.66996
15	1.70	0.64090	30	50.27	0.66188	45	1440.07	0.67050

Void Ratio = 0.845 **Compression** = 15.9 %
D_0 = 0.63053 D_{50} = 0.64736 D_{100} = 0.66419
C_v **at 5.4 min.** = 0.07 ft.^{2}/day C_α = 0.007

Pressure: 8.00 tsf **TEST READINGS** **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.66106	16	2.12	0.68023	31	63.23	0.69997
2	0.10	0.67131	17	2.63	0.68135	32	79.58	0.70091
3	0.20	0.67268	18	3.28	0.68219	33	100.15	0.70216
4	0.23	0.67327	19	4.12	0.68328	34	126.05	0.70292
5	0.27	0.67376	20	5.13	0.68462	35	158.63	0.70375
6	0.30	0.67406	21	6.43	0.68646	36	199.68	0.70437
7	0.37	0.67466	22	8.08	0.68733	37	251.35	0.70503
8	0.43	0.67525	23	10.13	0.68867	38	316.38	0.70585
9	0.52	0.67552	24	12.73	0.69028	39	398.27	0.70613
10	0.62	0.67592	25	15.98	0.69186	40	501.35	0.70630
11	0.75	0.67655	26	20.08	0.69365	41	631.12	0.70654
12	0.92	0.67694	27	25.25	0.69463	42	794.48	0.70661
13	1.12	0.67752	28	31.77	0.69630	43	1000.17	0.70720
14	1.38	0.67791	29	39.95	0.69783	44	1259.08	0.70752
15	1.70	0.67902	30	50.27	0.69942	45	1440.37	0.70776

Void Ratio = 0.763 **Compression** = 19.7 %
D_0 = 0.67032 D_{50} = 0.68730 D_{100} = 0.70428
C_v **at 7.5 min.** = 0.05 ft.^{2}/day C_α = 0.004

Pressure: 12.00 tsf **TEST READINGS** **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.69959	16	2.10	0.71190	31	63.23	0.72257
2	0.10	0.70860	17	2.62	0.71239	32	79.57	0.72321
3	0.20	0.70865	18	3.27	0.71276	33	100.13	0.72415
4	0.22	0.70923	19	4.08	0.71311	34	126.03	0.72485
5	0.25	0.70923	20	5.12	0.71374	35	158.62	0.72545
6	0.30	0.70909	21	6.42	0.71435	36	199.67	0.72584
7	0.35	0.70918	22	8.05	0.71529	37	251.33	0.72610
8	0.42	0.70925	23	10.12	0.71590	38	316.37	0.72656
9	0.50	0.70953	24	12.70	0.71629	39	398.25	0.72709
10	0.60	0.70961	25	15.97	0.71709	40	501.33	0.72716
11	0.73	0.70971	26	20.07	0.71838	41	631.10	0.72732
12	0.90	0.70989	27	25.23	0.71975	42	794.47	0.72778
13	1.10	0.71016	28	31.75	0.72015	43	1000.15	0.72811
14	1.37	0.71073	29	39.93	0.72104	44	1259.07	0.72873
15	1.68	0.71124	30	50.25	0.72163	45	1440.05	0.72929

Void Ratio = 0.716 **Compression** = 21.8 %
D_0 = 0.70902 D_{50} = 0.71687 D_{100} = 0.72471
C_v **at 12.8 min.** = 0.02 ft.^{2}/day C_α = 0.005

Pressure: 3.00 tsf **TEST READINGS** **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.74694	16	2.12	0.72436	31	63.23	0.71754
2	0.10	0.72731	17	2.63	0.72407	32	79.57	0.71716
3	0.20	0.72714	18	3.28	0.72368	33	100.13	0.71673
4	0.23	0.72706	19	4.10	0.72342	34	126.03	0.71660
5	0.27	0.72696	20	5.13	0.72298	35	158.63	0.71630
6	0.30	0.72699	21	6.43	0.72265	36	199.67	0.71625
7	0.37	0.72692	22	8.07	0.72224	37	251.33	0.71623
8	0.43	0.72687	23	10.13	0.72188	38	316.37	0.71624
9	0.52	0.72664	24	12.72	0.72104	39	398.25	0.71614
10	0.62	0.72650	25	15.98	0.72005	40	501.33	0.71604
11	0.75	0.72629	26	20.08	0.71965	41	631.10	0.71600
12	0.92	0.72622	27	25.25	0.71913	42	794.48	0.71586
13	1.12	0.72578	28	31.75	0.71872	43	1000.15	0.71589
14	1.38	0.72531	29	39.95	0.71852	44	1259.08	0.71590
15	1.70	0.72469	30	50.25	0.71800	45	1440.03	0.71589

Void Ratio = 0.745 **Compression** = 20.5 %
D_0 = 0.72705 D_{50} = 0.72169 D_{100} = 0.71633
C_v **at 8.5 min.** = 0.04 ft.^{2}/day

Pressure: 0.75 tsf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.72223	16	2.12	0.71169	31	63.23	0.70143
2	0.10	0.71510	17	2.63	0.71131	32	79.57	0.69997
3	0.20	0.71477	18	3.28	0.71077	33	100.13	0.69910
4	0.23	0.71471	19	4.10	0.71044	34	126.03	0.69815
5	0.27	0.71469	20	5.13	0.71023	35	158.63	0.69780
6	0.30	0.71459	21	6.43	0.70984	36	199.67	0.69732
7	0.35	0.71437	22	8.07	0.70938	37	251.33	0.69710
8	0.42	0.71412	23	10.12	0.70903	38	316.37	0.69653
9	0.50	0.71383	24	12.72	0.70796	39	398.25	0.69616
10	0.60	0.71351	25	15.97	0.70679	40	501.33	0.69569
11	0.73	0.71314	26	20.08	0.70612	41	631.10	0.69519
12	0.90	0.71292	27	25.25	0.70508	42	794.47	0.69494
13	1.12	0.71270	28	31.75	0.70400	43	1000.15	0.69471
14	1.37	0.71246	29	39.93	0.70331	44	1259.08	0.69447
15	1.70	0.71200	30	50.25	0.70282	45	1440.47	0.69449

Void Ratio = 0.792 **Compression** = 18.3 %
D_0 = 0.71687 D_{50} = 0.70676 D_{100} = 0.69664
C_v **at 15.6 min.** = 0.02 ft.^{2}/day

Pressure: 0.19 tsf **TEST READINGS** **Load No. 12**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.69824	16	2.12	0.69482	31	63.23	0.68698
2	0.10	0.69057	17	2.63	0.69463	32	79.57	0.68641
3	0.20	0.69571	18	3.28	0.69436	33	100.13	0.68524
4	0.23	0.69568	19	4.10	0.69404	34	126.03	0.68416
5	0.27	0.69565	20	5.13	0.69373	35	158.63	0.68317
6	0.30	0.69564	21	6.43	0.69347	36	199.67	0.68258
7	0.35	0.69558	22	8.07	0.69276	37	251.33	0.68197
8	0.42	0.69554	23	10.13	0.69240	38	316.37	0.68147
9	0.50	0.69545	24	12.72	0.69158	39	398.25	0.68047
10	0.62	0.69541	25	15.98	0.69115	40	501.33	0.67966
11	0.73	0.69530	26	20.08	0.69055	41	631.10	0.67897
12	0.90	0.69523	27	25.25	0.69020	42	794.48	0.67854
13	1.12	0.69517	28	31.75	0.68952	43	1000.15	0.67811
14	1.37	0.69505	29	39.95	0.68881	44	1259.08	0.67761
15	1.70	0.69497	30	50.25	0.68829	45	1440.15	0.67749

Void Ratio = 0.830 **Compression** = 16.6 %
D_0 = 0.68949 D_{50} = 0.68417 D_{100} = 0.67886
C_v **at 138.8 min.** = 0.00 ft.^{2}/day

Pressure: 0.05 tsf **TEST READINGS** **Load No. 13**

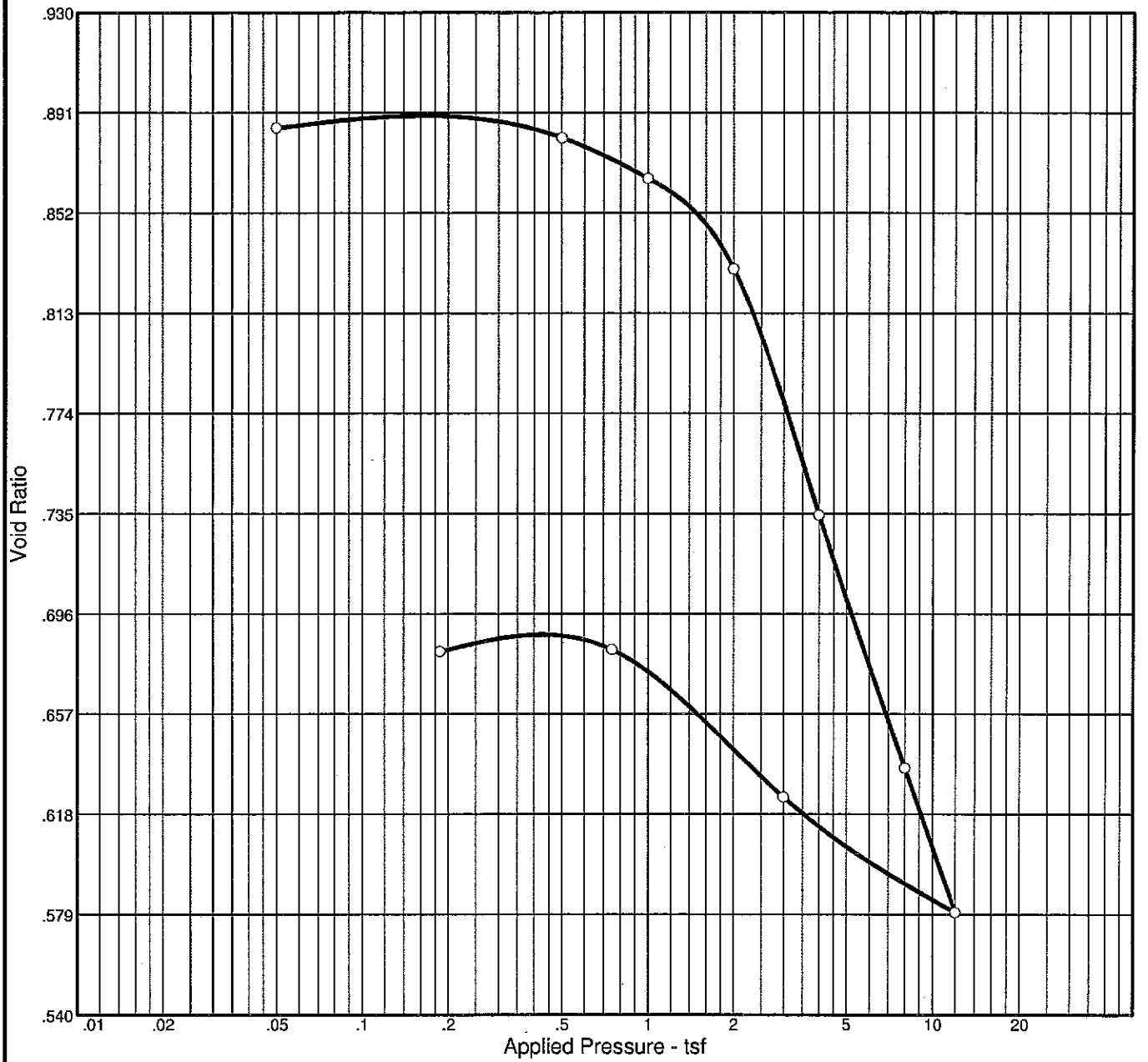
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.67879	13	1.12	0.67786	25	15.98	0.67656
2	0.10	0.67808	14	1.37	0.67780	26	20.08	0.67627
3	0.20	0.67807	15	1.70	0.67775	27	25.25	0.67565
4	0.23	0.67797	16	2.12	0.67765	28	31.75	0.67502
5	0.27	0.67795	17	2.63	0.67749	29	39.95	0.67467
6	0.30	0.67797	18	3.28	0.67735	30	50.25	0.67424
7	0.37	0.67790	19	4.10	0.67726	31	63.23	0.67411
8	0.43	0.67802	20	5.13	0.67712	32	79.57	0.67371
9	0.52	0.67791	21	6.43	0.67698	33	100.13	0.67332
10	0.62	0.67785	22	8.07	0.67692	34	126.03	0.67259
11	0.75	0.67791	23	10.13	0.67678			
12	0.90	0.67793	24	12.72	0.67667			

Void Ratio = 0.840 **Compression** = 16.1 %

D_0 = 0.67836 D_{50} = 0.67799 D_{100} = 0.67763

C_v **at 0.2 min.** = 1.64 ft.^{2}/day

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
96.8 %	33.7 %	84.7	73	20	2.57		2.30	0.32	0.06			0.895

MATERIAL DESCRIPTION	USCS	AASHTO
M GNG & T CH4 W/ ARS SM	CH	

Project No. 10-017200 **Client:** USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA

Source: TB-1U **Sample No.:** 11B **Elev./Depth:** 29.2

Remarks:

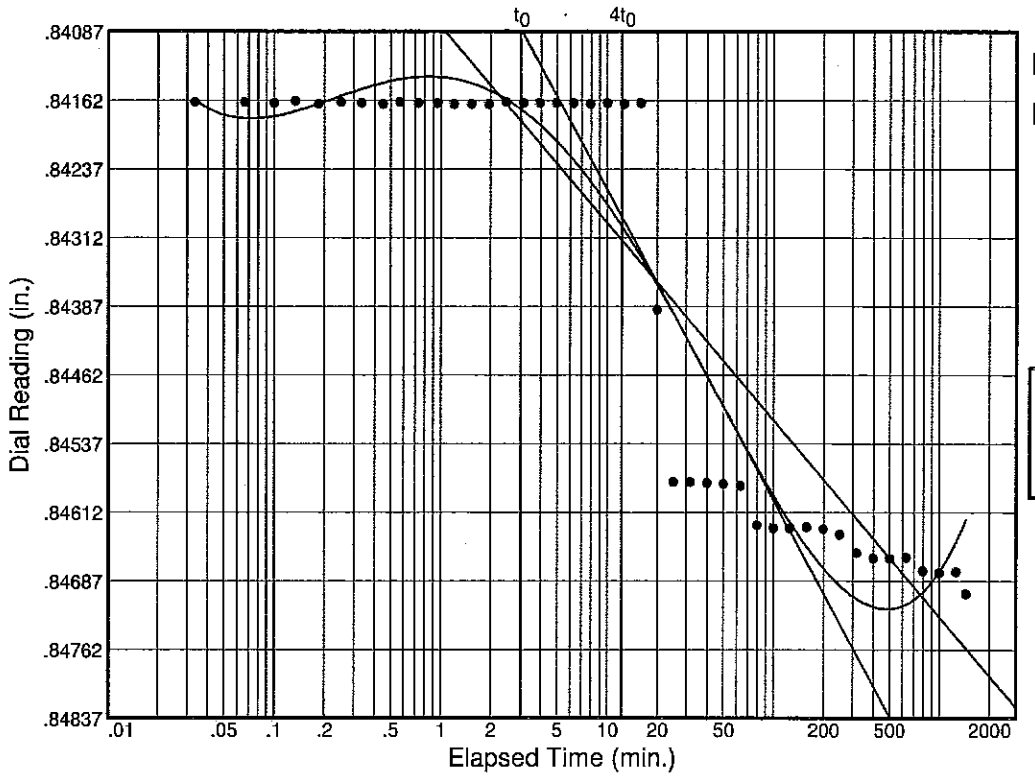
Stantec

Saint Rose, Louisiana

Figure

Dial Reading vs. Time

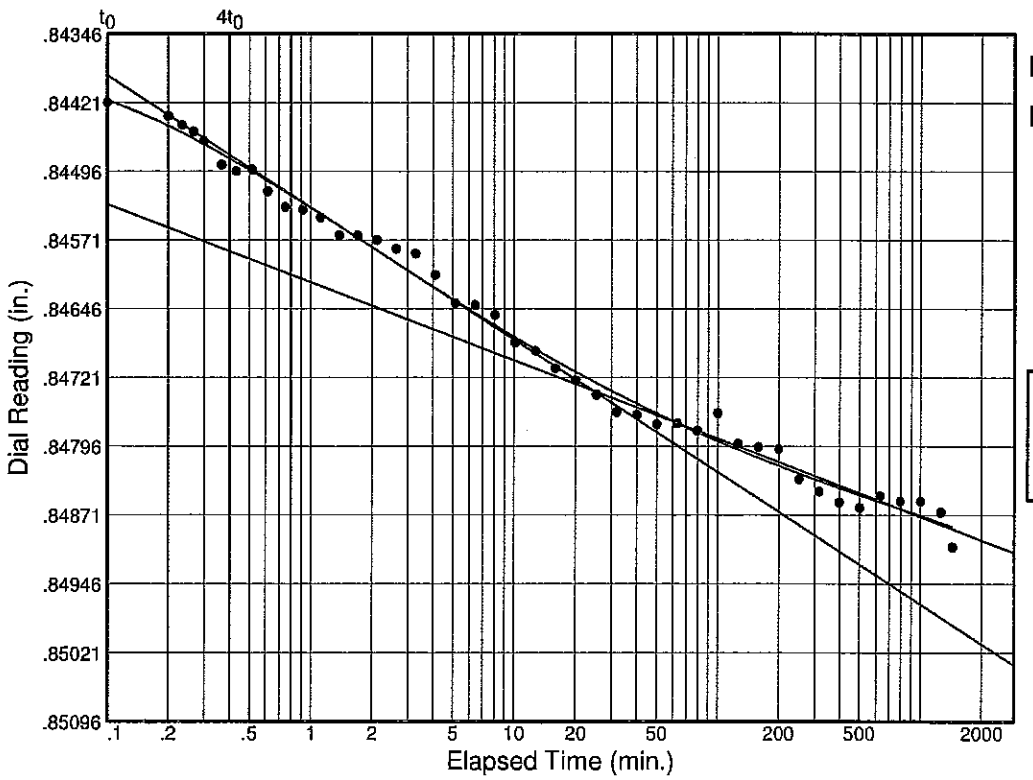
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 11B Elev./Depth: 29.2



Load No.= 1
Load= 0.05 tsf
D_0 = 0.84045
D_{50} = 0.84202
D_{100} = 0.84359
T_{50} = 4.68 min.

C_v @ T_{50}
0.10 ft.^{2}/day

C_α = 0.002



Load No.= 2
Load= 0.50 tsf
D_0 = 0.84355
D_{50} = 0.84545
D_{100} = 0.84735
T_{50} = 1.17 min.

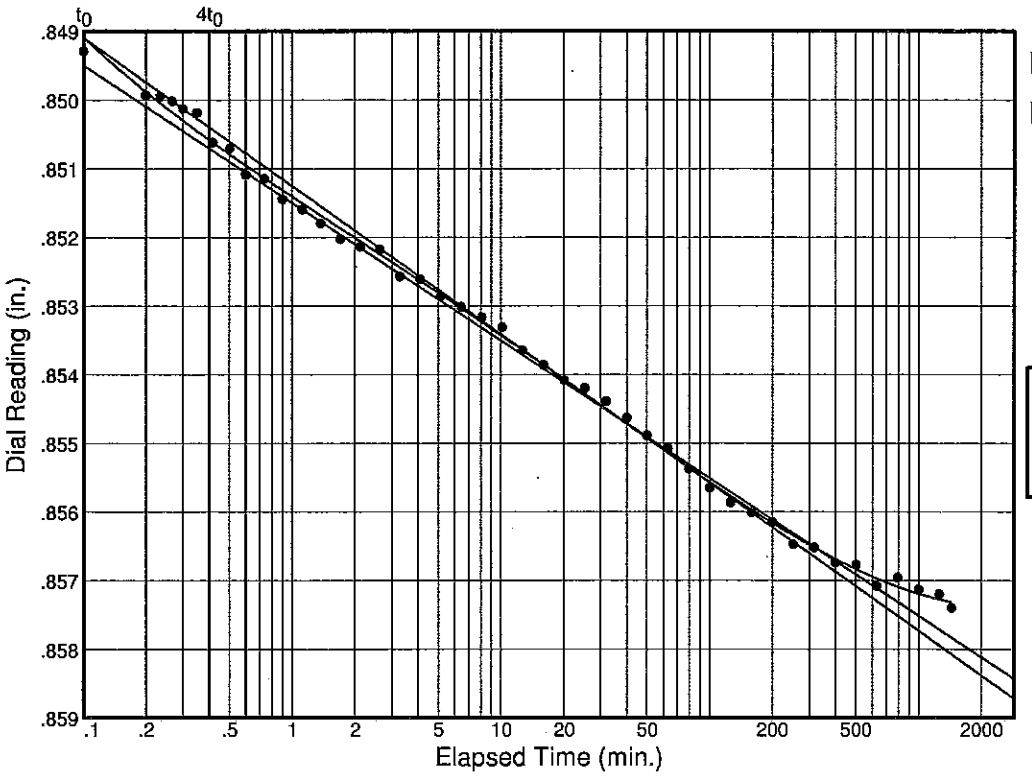
C_v @ T_{50}
0.42 ft.^{2}/day

C_α = 0.001

Figure

Dial Reading vs. Time

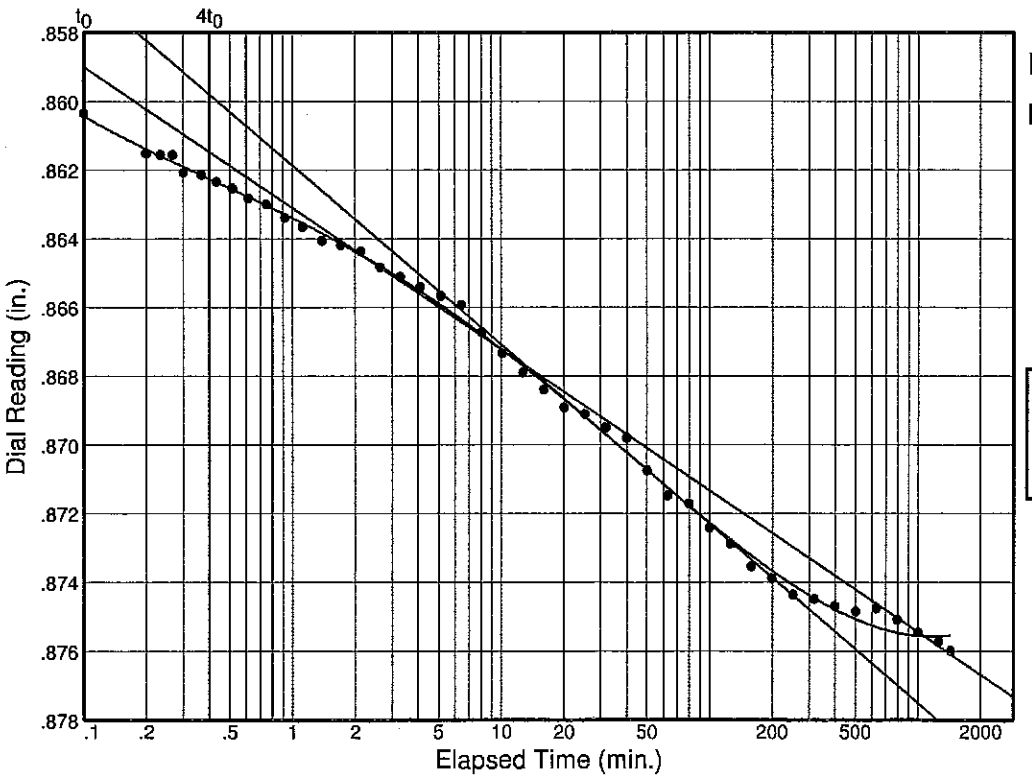
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 11B Elev./Depth: 29.2



Load No.= 3
Load= 1.00 tsf
D_0 = 0.84760
D_{50} = 0.85112
D_{100} = 0.85464
T_{50} = 0.72 min.

C_v @ T_{50}
0.67 ft.^{2}/day

C_α = 0.002



Load No.= 4
Load= 2.00 tsf
D_0 = 0.85860
D_{50} = 0.86316
D_{100} = 0.86773
T_{50} = 0.83 min.

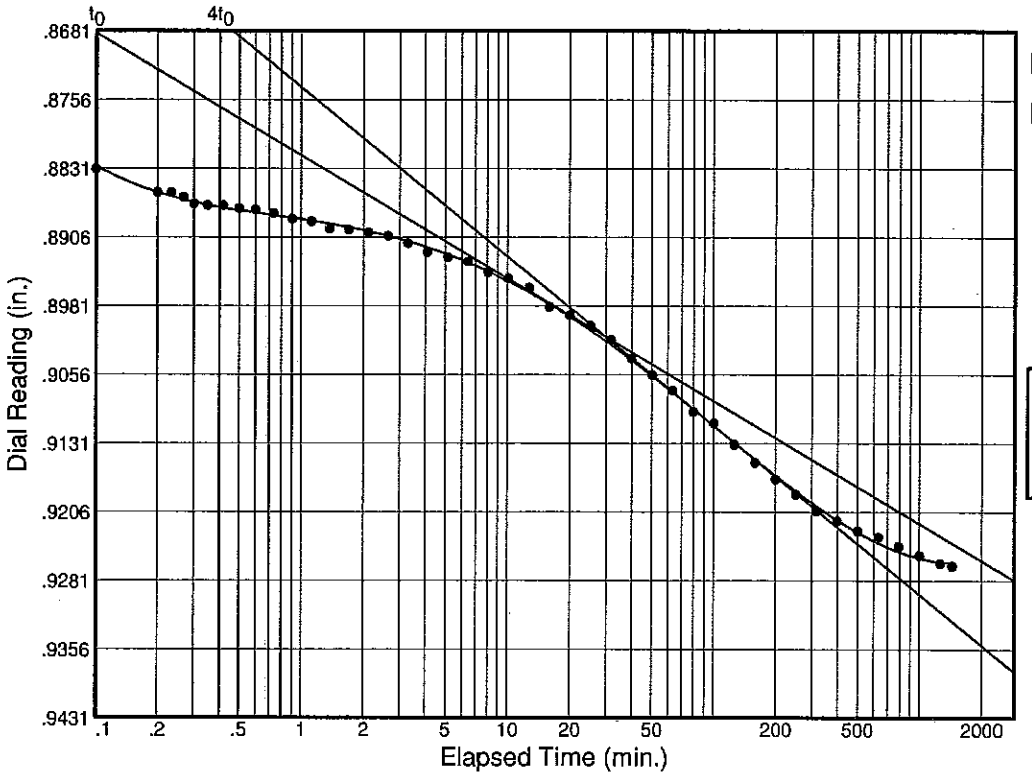
C_v @ T_{50}
0.56 ft.^{2}/day

C_α = 0.004

Figure

Dial Reading vs. Time

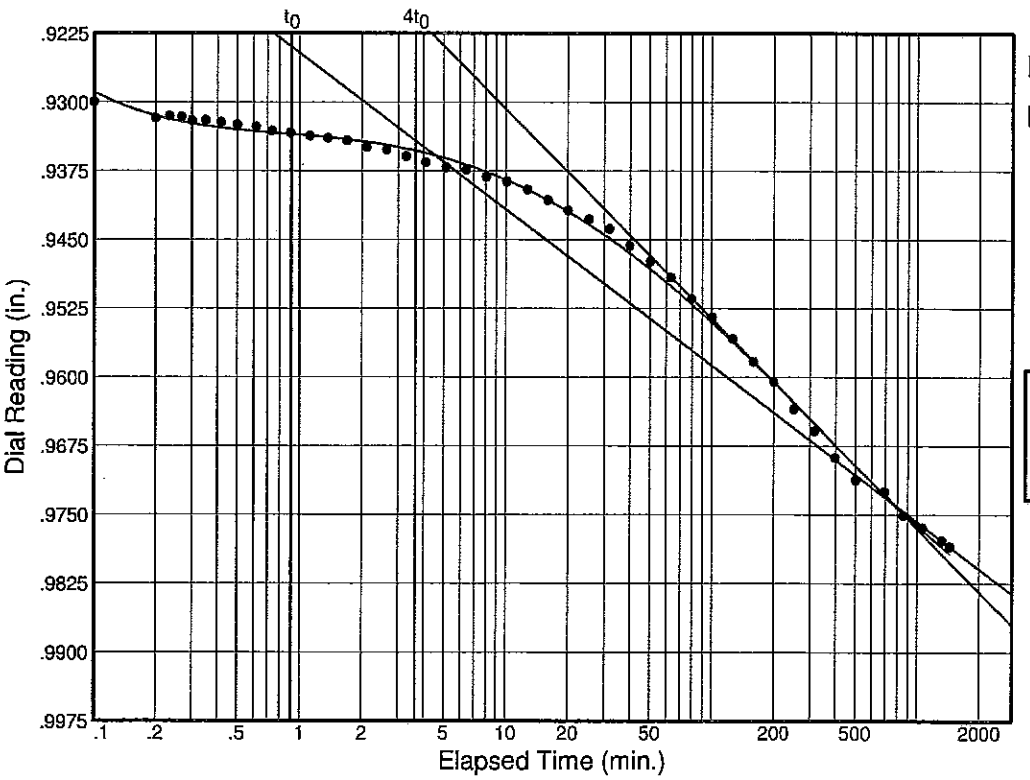
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 11B Elev./Depth: 29.2



Load No.= 5
Load= 4.00 tsf
D_0 = 0.87832
D_{50} = 0.88983
D_{100} = 0.90134
T_{50} = 1.98 min.

C_v @ T_{50}
0.22 ft.^{2}/day

C_α = 0.014



Load No.= 6
Load= 8.00 tsf
D_0 = 0.93172
D_{50} = 0.95264
D_{100} = 0.97356
T_{50} = 85.59 min.

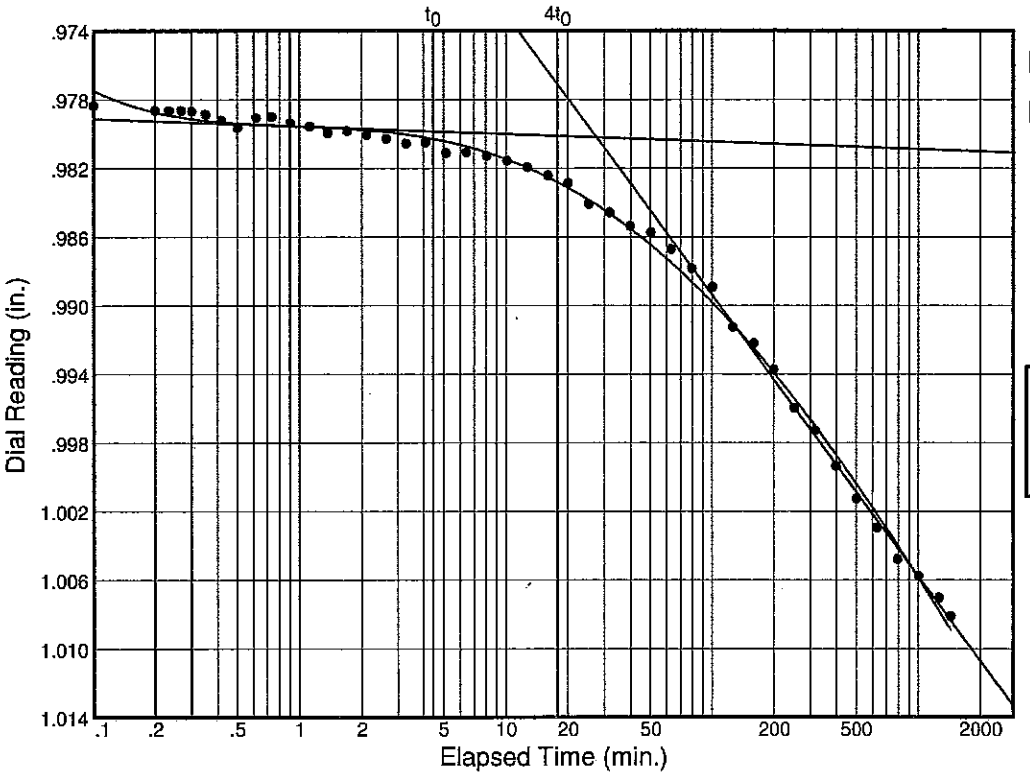
C_v @ T_{50}
0.00 ft.^{2}/day

C_α = 0.019

Figure

Dial Reading vs. Time

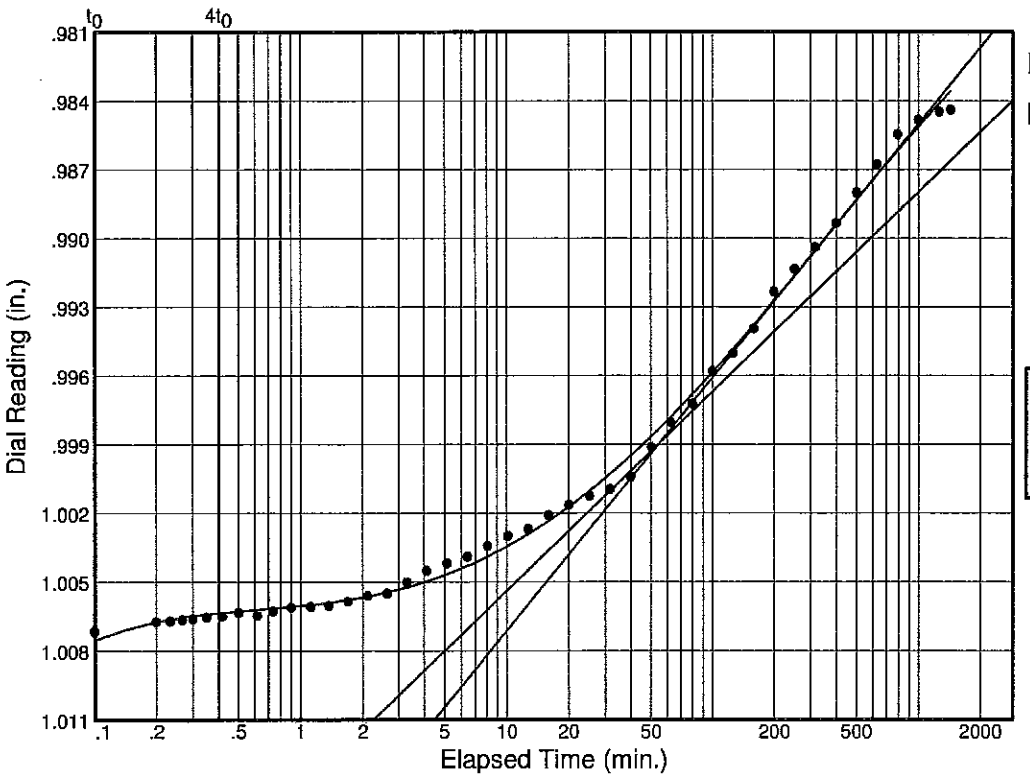
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 11B Elev./Depth: 29.2



Load No.= 7
Load= 12.00 tsf
D_0 = 0.97777
D_{50} = 0.97899
D_{100} = 0.98020
T_{50} = 0.25 min.

C_v @ T_{50}
1.42 ft.^{2}/day

C_α = 0.019



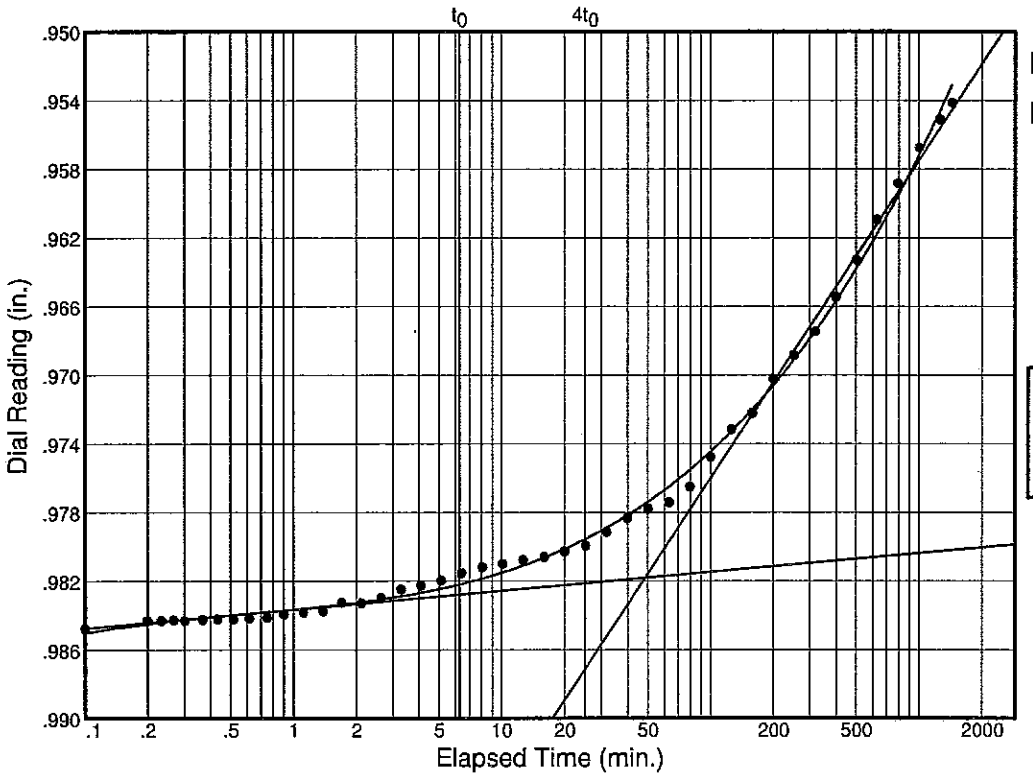
Load No.= 8
Load= 3.00 tsf
D_0 = 1.00876
D_{50} = 1.00387
D_{100} = 0.99898
T_{50} = 8.14 min.

C_v @ T_{50}
0.04 ft.^{2}/day

Figure

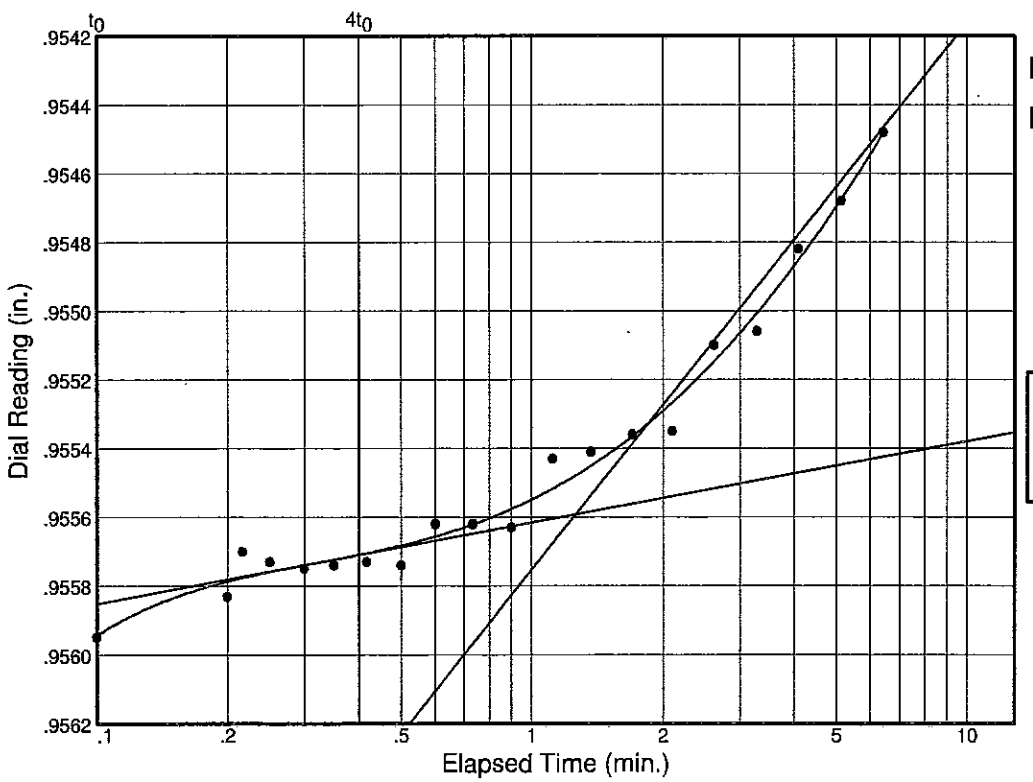
Dial Reading vs. Time

Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 11B Elev./Depth: 29.2



Load No.= 9
Load= 0.75 tsf
D_0 = 0.98483
D_{50} = 0.98332
D_{100} = 0.98180
T_{50} = 1.82 min.

C_v @ T_{50}
0.20 ft.^{2}/day



Load No.= 10
Load= 0.19 tsf
D_0 = 0.95618
D_{50} = 0.95588
D_{100} = 0.95559
T_{50} = 0.12 min.

C_v @ T_{50}
3.19 ft.^{2}/day

Figure

Stantec, Inc.

CONSOLIDATION TEST DATA

Client: USACE
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Project Number: 10-017200

Sample Data

Source: TB-1U
Sample No.: 11B
Depth: 29.2 **Sample Length(in./cm.):**
Location:
Description: M GNG & T CH4 W/ ARS SM
Liquid Limit: 73 **Plasticity Index:** 20
USCS: CH **AASHTO:** **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 204.02 g.	**Consolidometer #** = 4	**Wet w+t** = 367.70 g.
Dry w+t = 154.70 g.		**Dry w+t** = 288.22 g.
Tare Wt. = 8.46 g.	**Spec. Gravity** = 2.57	**Tare Wt.** = 8.33 g.
Height = 1.00 in.	**Height** = 1.00 in.	
Diameter = 4.00 in.	**Diameter** = 4.00 in.	
Weight = 373.42 g.	**Defl. Table** = n/a	
Moisture = 33.7 %	**Ht. Solids** = 0.5276 in.	**Moisture** = 28.4 %
Wet Den. = 113.2 pcf	**Dry Wt.** = 279.24 g.*	**Dry Wt.** = 279.89 g.
Dry Den. = 84.7 pcf	**Void Ratio** = 0.895	**Void Ratio** = 0.681
	Saturation = 96.8 %	

*** Initial dry weight used in calculations**

End-of-Load Summary

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	0.84165				0.895	
0.05	0.84701	0.00000	0.10	0.002	0.885	0.5 Comprs.
0.50	0.84906	0.00000	0.42	0.001	0.881	0.7 Comprs.
1.00	0.85740	0.00000	0.67	0.002	0.865	1.6 Comprs.
2.00	0.87599	0.00000	0.56	0.004	0.830	3.4 Comprs.
4.00	0.92649	0.00000	0.22	0.014	0.734	8.5 Comprs.
8.00	0.97847	0.00000	0.00	0.019	0.636	13.7 Comprs.
12.00	1.00811	0.00000	1.42	0.019	0.580	16.6 Comprs.
3.00	0.98440	0.00000	0.04		0.625	14.3 Comprs.
0.75	0.95414	0.00000	0.20		0.682	11.2 Comprs.
0.19	0.95448	0.00000	3.19		0.681	11.3 Comprs.

C_c = 0.32 P_c = 2.30 tsf C_r = 0.06

Pressure: 0.05 tsf — **TEST READINGS** — **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.84165	16	2.47	0.84164	31	79.40	0.84626
2	0.03	0.84164	17	3.12	0.84165	32	99.97	0.84629
3	0.07	0.84164	18	3.93	0.84165	33	125.87	0.84629
4	0.10	0.84165	19	4.97	0.84165	34	158.47	0.84628
5	0.13	0.84163	20	6.27	0.84165	35	199.50	0.84630
6	0.18	0.84166	21	7.90	0.84166	36	251.17	0.84636
7	0.25	0.84164	22	9.97	0.84165	37	316.22	0.84656
8	0.33	0.84165	23	12.55	0.84166	38	398.08	0.84662
9	0.45	0.84166	24	15.82	0.84165	39	501.17	0.84662
10	0.57	0.84164	25	19.92	0.84391	40	630.93	0.84661
11	0.73	0.84165	26	25.08	0.84579	41	794.32	0.84676
12	0.95	0.84165	27	31.58	0.84579	42	999.98	0.84678
13	1.20	0.84166	28	39.78	0.84580	43	1258.92	0.84677
14	1.53	0.84166	29	50.08	0.84581	44	1440.07	0.84701
15	1.95	0.84166	30	63.07	0.84583			

Void Ratio = 0.885 **Compression** = 0.5 %
D_0 = 0.84045 D_{50} = 0.84202 D_{100} = 0.84359
C_v **at 4.7 min.** = 0.10 ft.^{2}/day C_α = 0.002

Pressure: 0.50 tsf — **TEST READINGS** — **Load No. 2**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.84167	16	2.12	0.84571	31	63.25	0.84771
2	0.10	0.84421	17	2.63	0.84581	32	79.58	0.84779
3	0.20	0.84436	18	3.28	0.84586	33	100.15	0.84760
4	0.23	0.84446	19	4.10	0.84609	34	126.05	0.84793
5	0.27	0.84453	20	5.13	0.84640	35	158.65	0.84797
6	0.30	0.84463	21	6.43	0.84642	36	199.68	0.84799
7	0.37	0.84489	22	8.07	0.84653	37	251.35	0.84832
8	0.43	0.84496	23	10.13	0.84683	38	316.38	0.84845
9	0.52	0.84494	24	12.72	0.84692	39	398.27	0.84857
10	0.62	0.84518	25	15.98	0.84711	40	501.35	0.84863
11	0.75	0.84535	26	20.08	0.84724	41	631.12	0.84850
12	0.92	0.84538	27	25.27	0.84740	42	794.48	0.84856
13	1.12	0.84547	28	31.77	0.84759	43	1000.17	0.84856
14	1.38	0.84566	29	39.95	0.84762	44	1259.08	0.84868
15	1.70	0.84566	30	50.27	0.84772	45	1440.08	0.84906

Void Ratio = 0.881 **Compression** = 0.7 %
D_0 = 0.84355 D_{50} = 0.84545 D_{100} = 0.84735
C_v **at 1.2 min.** = 0.42 ft.^{2}/day C_α = 0.001

Pressure: 1.00 tsf **TEST READINGS** **Load No. 3**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.84590	16	2.12	0.85214	31	63.23	0.85507
2	0.10	0.84929	17	2.63	0.85218	32	79.57	0.85537
3	0.20	0.84994	18	3.28	0.85257	33	100.13	0.85565
4	0.23	0.84995	19	4.10	0.85261	34	126.03	0.85586
5	0.27	0.85002	20	5.13	0.85286	35	158.63	0.85601
6	0.30	0.85013	21	6.43	0.85301	36	199.67	0.85615
7	0.35	0.85019	22	8.07	0.85317	37	251.33	0.85647
8	0.42	0.85062	23	10.13	0.85331	38	316.37	0.85652
9	0.50	0.85071	24	12.72	0.85365	39	398.25	0.85674
10	0.60	0.85109	25	15.98	0.85386	40	501.33	0.85677
11	0.73	0.85115	26	20.08	0.85408	41	631.10	0.85708
12	0.90	0.85145	27	25.25	0.85420	42	794.48	0.85696
13	1.12	0.85160	28	31.75	0.85439	43	1000.15	0.85713
14	1.37	0.85180	29	39.95	0.85463	44	1259.08	0.85720
15	1.70	0.85203	30	50.25	0.85489	45	1440.47	0.85740

Void Ratio = 0.865 **Compression** = 1.6 %
D_0 = 0.84760 D_{50} = 0.85112 D_{100} = 0.85464
C_v **at 0.7 min.** = 0.67 ft.^{2}/day C_α = 0.002

Pressure: 2.00 tsf **TEST READINGS** **Load No. 4**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.85453	16	2.12	0.86437	31	63.23	0.87148
2	0.10	0.86035	17	2.63	0.86484	32	79.58	0.87171
3	0.20	0.86152	18	3.28	0.86512	33	100.15	0.87241
4	0.23	0.86156	19	4.10	0.86540	34	126.03	0.87288
5	0.27	0.86156	20	5.13	0.86567	35	158.63	0.87354
6	0.30	0.86207	21	6.43	0.86593	36	199.67	0.87387
7	0.37	0.86214	22	8.07	0.86672	37	251.33	0.87436
8	0.43	0.86234	23	10.13	0.86734	38	316.38	0.87448
9	0.52	0.86254	24	12.72	0.86791	39	398.25	0.87469
10	0.62	0.86282	25	15.98	0.86840	40	501.33	0.87485
11	0.75	0.86300	26	20.08	0.86892	41	631.12	0.87475
12	0.92	0.86339	27	25.25	0.86911	42	794.48	0.87509
13	1.12	0.86366	28	31.75	0.86949	43	1000.15	0.87544
14	1.38	0.86407	29	39.95	0.86981	44	1259.08	0.87573
15	1.70	0.86419	30	50.27	0.87075	45	1440.25	0.87599

Void Ratio = 0.830 **Compression** = 3.4 %
D_0 = 0.85860 D_{50} = 0.86316 D_{100} = 0.86773
C_v **at 0.8 min.** = 0.56 ft.^{2}/day C_α = 0.004

Pressure: 4.00 tsf **TEST READINGS** **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.87197	16	2.12	0.89011	31	63.23	0.90735
2	0.10	0.88320	17	2.63	0.89047	32	79.57	0.90965
3	0.20	0.88575	18	3.28	0.89124	33	100.13	0.91090
4	0.23	0.88576	19	4.10	0.89221	34	126.03	0.91324
5	0.27	0.88627	20	5.13	0.89281	35	158.63	0.91520
6	0.30	0.88697	21	6.43	0.89328	36	199.67	0.91703
7	0.35	0.88714	22	8.07	0.89445	37	251.33	0.91868
8	0.42	0.88716	23	10.12	0.89513	38	316.37	0.92048
9	0.50	0.88748	24	12.72	0.89612	39	398.25	0.92156
10	0.60	0.88764	25	15.97	0.89823	40	501.33	0.92267
11	0.73	0.88803	26	20.08	0.89909	41	631.10	0.92334
12	0.90	0.88864	27	25.25	0.90027	42	794.48	0.92436
13	1.12	0.88889	28	31.75	0.90179	43	1000.15	0.92533
14	1.37	0.88968	29	39.93	0.90385	44	1259.08	0.92620
15	1.70	0.88980	30	50.25	0.90561	45	1440.28	0.92649

Void Ratio = 0.734 **Compression** = 8.5 %
D_0 = 0.87832 D_{50} = 0.88983 D_{100} = 0.90134
C_v **at 2.0 min.** = 0.22 ft.^{2}/day C_α = 0.014

Pressure: 8.00 tsf **TEST READINGS** **Load No. 6**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.92092	16	2.12	0.93493	31	63.23	0.94911
2	0.10	0.93002	17	2.63	0.93518	32	79.57	0.95145
3	0.20	0.93177	18	3.28	0.93592	33	100.13	0.95346
4	0.23	0.93156	19	4.10	0.93658	34	126.03	0.95582
5	0.27	0.93164	20	5.13	0.93713	35	158.63	0.95829
6	0.30	0.93201	21	6.43	0.93740	36	199.67	0.96051
7	0.35	0.93199	22	8.07	0.93816	37	251.33	0.96348
8	0.42	0.93221	23	10.13	0.93868	38	316.37	0.96587
9	0.50	0.93251	24	12.72	0.93956	39	398.25	0.96877
10	0.62	0.93270	25	15.98	0.94066	40	501.33	0.97122
11	0.73	0.93315	26	20.08	0.94184	41	691.10	0.97251
12	0.90	0.93338	27	25.25	0.94279	42	854.48	0.97510
13	1.12	0.93366	28	31.77	0.94383	43	1060.15	0.97644
14	1.37	0.93395	29	39.95	0.94566	44	1319.08	0.97782
15	1.70	0.93420	30	50.25	0.94738	45	1440.22	0.97847

Void Ratio = 0.636 **Compression** = 13.7 %
D_0 = 0.93172 D_{50} = 0.95264 D_{100} = 0.97356
C_v **at 85.6 min.** = 0.00 ft.^{2}/day C_α = 0.019

Pressure: 12.00 tsf **TEST READINGS** **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.97437	16	2.12	0.98007	31	63.23	0.98672
2	0.10	0.97837	17	2.63	0.98030	32	79.57	0.98784
3	0.20	0.97864	18	3.28	0.98057	33	100.13	0.98894
4	0.23	0.97866	19	4.10	0.98049	34	126.03	0.99127
5	0.27	0.97865	20	5.13	0.98113	35	158.62	0.99222
6	0.30	0.97868	21	6.43	0.98109	36	199.67	0.99372
7	0.35	0.97888	22	8.07	0.98129	37	251.33	0.99597
8	0.42	0.97920	23	10.13	0.98158	38	316.37	0.99727
9	0.50	0.97965	24	12.72	0.98195	39	398.25	0.99936
10	0.62	0.97908	25	15.98	0.98243	40	501.33	1.00126
11	0.73	0.97901	26	20.08	0.98289	41	631.10	1.00294
12	0.90	0.97936	27	25.25	0.98411	42	794.47	1.00478
13	1.12	0.97957	28	31.75	0.98458	43	1000.15	1.00575
14	1.37	0.97994	29	39.93	0.98538	44	1259.08	1.00703
15	1.70	0.97984	30	50.25	0.98575	45	1440.05	1.00811

Void Ratio = 0.580 **Compression** = 16.6 %
D_0 = 0.97777 D_{50} = 0.97899 D_{100} = 0.98020
C_v **at 0.3 min.** = 1.42 ft.^{2}/day C_α = 0.019

Pressure: 3.00 tsf **TEST READINGS** **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	1.01767	16	2.12	1.00560	31	63.23	0.99805
2	0.10	1.00716	17	2.63	1.00551	32	79.57	0.99723
3	0.20	1.00674	18	3.28	1.00501	33	100.13	0.99580
4	0.23	1.00671	19	4.10	1.00452	34	126.03	0.99502
5	0.27	1.00665	20	5.13	1.00419	35	158.63	0.99395
6	0.30	1.00662	21	6.43	1.00390	36	199.67	0.99234
7	0.35	1.00654	22	8.07	1.00344	37	251.33	0.99135
8	0.42	1.00650	23	10.13	1.00299	38	316.37	0.99039
9	0.50	1.00635	24	12.72	1.00269	39	398.25	0.98934
10	0.62	1.00647	25	15.98	1.00209	40	501.33	0.98802
11	0.73	1.00627	26	20.08	1.00163	41	631.10	0.98679
12	0.90	1.00610	27	25.25	1.00126	42	794.48	0.98547
13	1.12	1.00608	28	31.75	1.00095	43	1000.15	0.98484
14	1.37	1.00603	29	39.95	1.00042	44	1259.08	0.98448
15	1.70	1.00585	30	50.25	0.99911	45	1440.37	0.98440

Void Ratio = 0.625 **Compression** = 14.3 %
D_0 = 1.00876 D_{50} = 1.00387 D_{100} = 0.99898
C_v **at 8.1 min.** = 0.04 ft.^{2}/day

Pressure: 0.75 tsf **TEST READINGS** **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.98803	16	2.12	0.98329	31	63.23	0.97742
2	0.10	0.98477	17	2.63	0.98298	32	79.57	0.97651
3	0.20	0.98431	18	3.28	0.98249	33	100.13	0.97477
4	0.23	0.98431	19	4.10	0.98227	34	126.03	0.97316
5	0.27	0.98428	20	5.13	0.98197	35	158.62	0.97222
6	0.30	0.98431	21	6.43	0.98153	36	199.67	0.97021
7	0.37	0.98426	22	8.07	0.98119	37	251.32	0.96884
8	0.43	0.98423	23	10.13	0.98099	38	316.37	0.96746
9	0.52	0.98422	24	12.72	0.98078	39	398.25	0.96545
10	0.62	0.98417	25	15.98	0.98059	40	501.33	0.96332
11	0.75	0.98413	26	20.08	0.98028	41	631.10	0.96095
12	0.90	0.98394	27	25.25	0.97995	42	794.47	0.95884
13	1.12	0.98383	28	31.75	0.97914	43	1000.15	0.95676
14	1.38	0.98376	29	39.93	0.97833	44	1259.07	0.95512
15	1.70	0.98325	30	50.25	0.97779	45	1440.35	0.95414

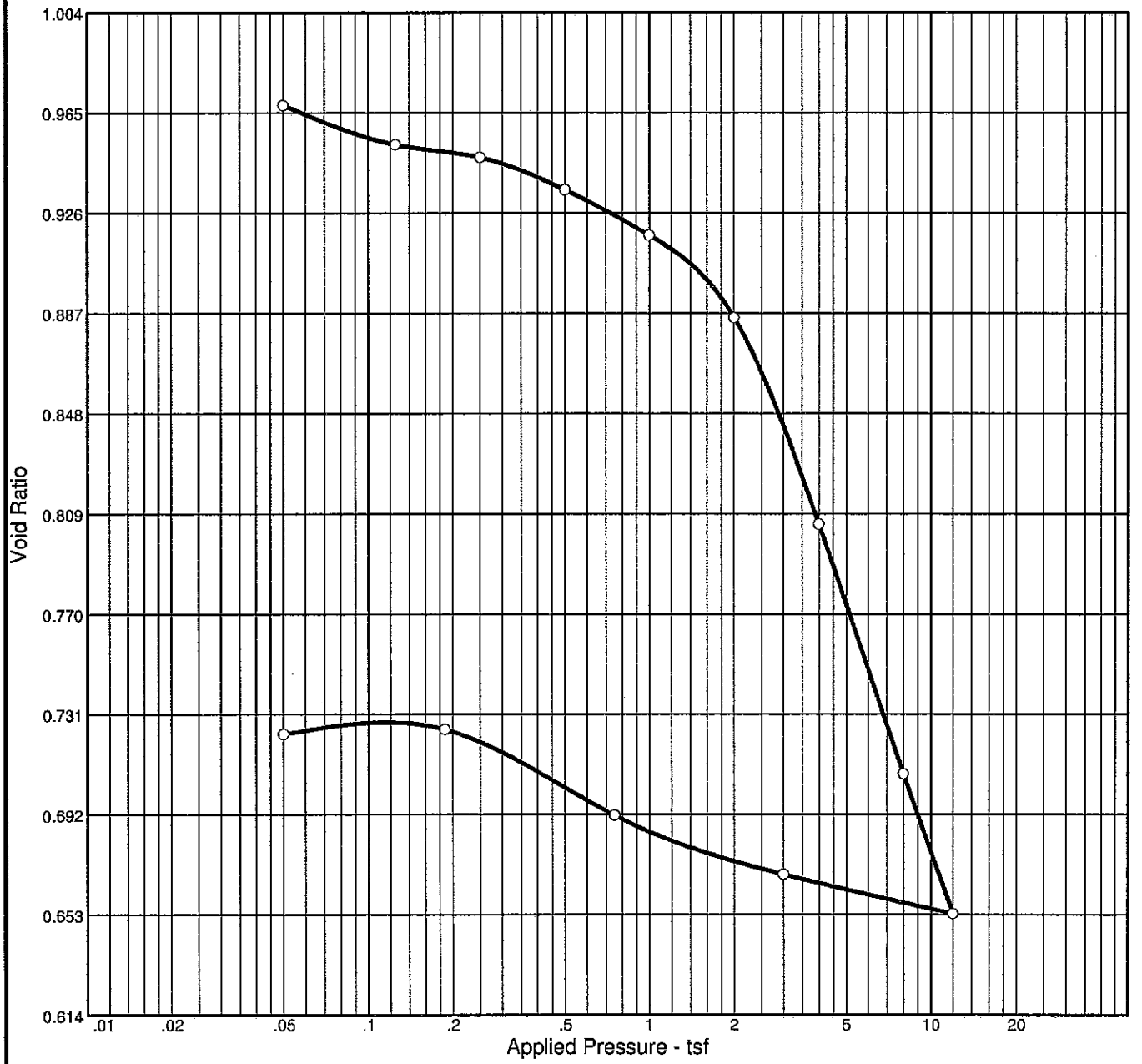
Void Ratio = 0.682 **Compression** = 11.2 %
D_0 = 0.98483 D_{50} = 0.98332 D_{100} = 0.98180
C_v **at 1.8 min.** = 0.20 ft.^{2}/day

Pressure: 0.19 tsf **TEST READINGS** **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.95753	8	0.42	0.95573	15	1.70	0.95536
2	0.10	0.95595	9	0.50	0.95574	16	2.10	0.95535
3	0.20	0.95583	10	0.60	0.95562	17	2.62	0.95510
4	0.22	0.95570	11	0.73	0.95562	18	3.28	0.95506
5	0.25	0.95573	12	0.90	0.95563	19	4.10	0.95482
6	0.30	0.95575	13	1.12	0.95543	20	5.13	0.95468
7	0.35	0.95574	14	1.37	0.95541	21	6.43	0.95448

Void Ratio = 0.681 **Compression** = 11.3 %
D_0 = 0.95618 D_{50} = 0.95588 D_{100} = 0.95559
C_v **at 0.1 min.** = 3.19 ft.^{2}/day

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
95.2 %	34.0 %	85.9	33	13	2.71		3.29	0.31	0.03			0.968

MATERIAL DESCRIPTION	USCS	AASHTO
SO GR CL4 W/ ARS ML, WD	CH	

Project No. 10-017200 **Client:** USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA

Source: TB-1U **Sample No.:** 13C **Elev./Depth:** 38.0

Remarks:

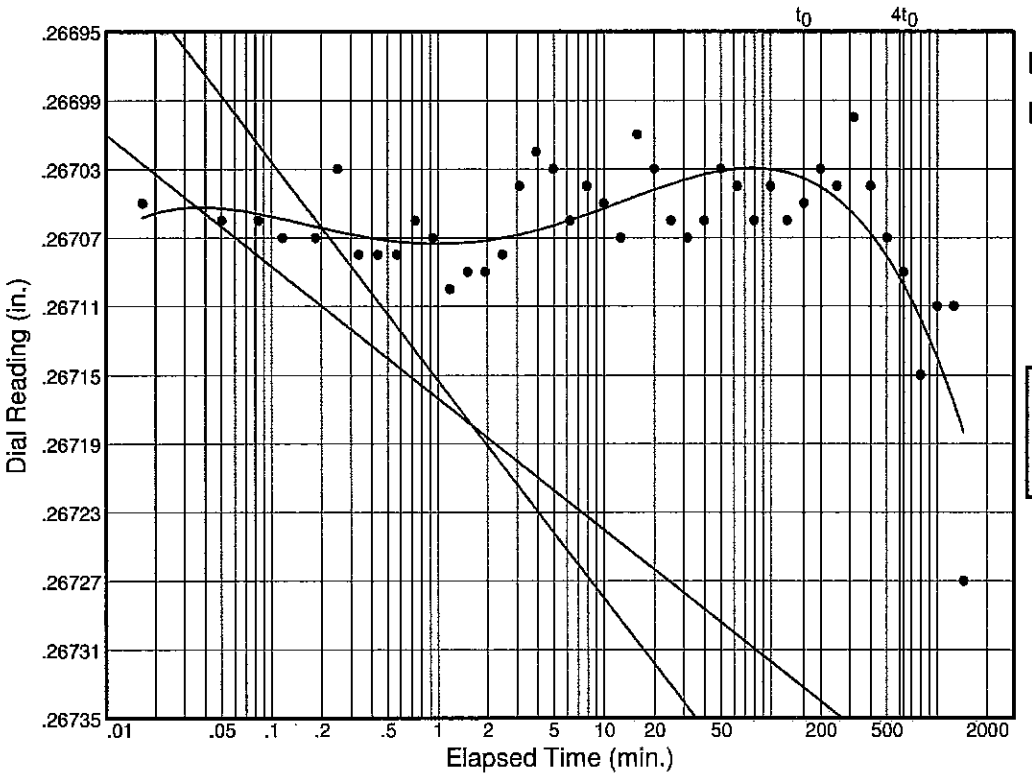
Stantec

Saint Rose, Louisiana

Figure

Dial Reading vs. Time

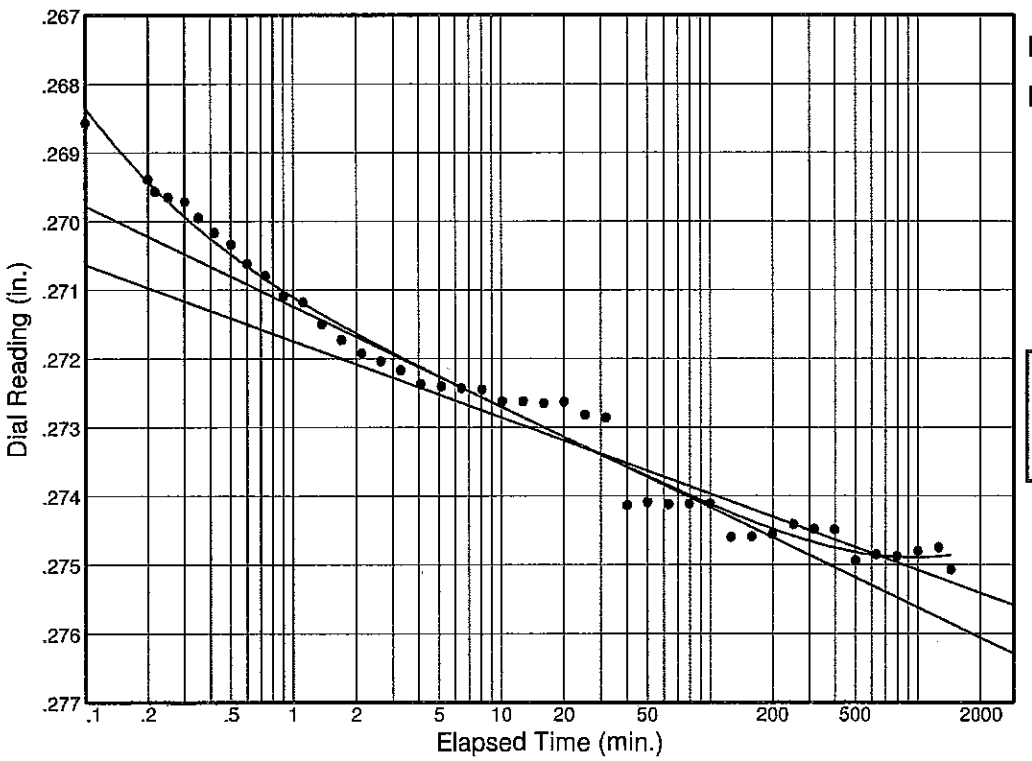
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 13C Elev./Depth: 38.0



Load No.= 1
Load= 0.05 tsf
D_0 = 0.26697
D_{50} = 0.26708
D_{100} = 0.26718
T_{50} = 463.95 min.

C_v @ T_{50}
0.00 ft.^{2}/day

C_α = 0.000



Load No.= 2
Load= 0.13 tsf
D_0 = 0.26514
D_{50} = 0.26924
D_{100} = 0.27335
T_{50} = 0.18 min.

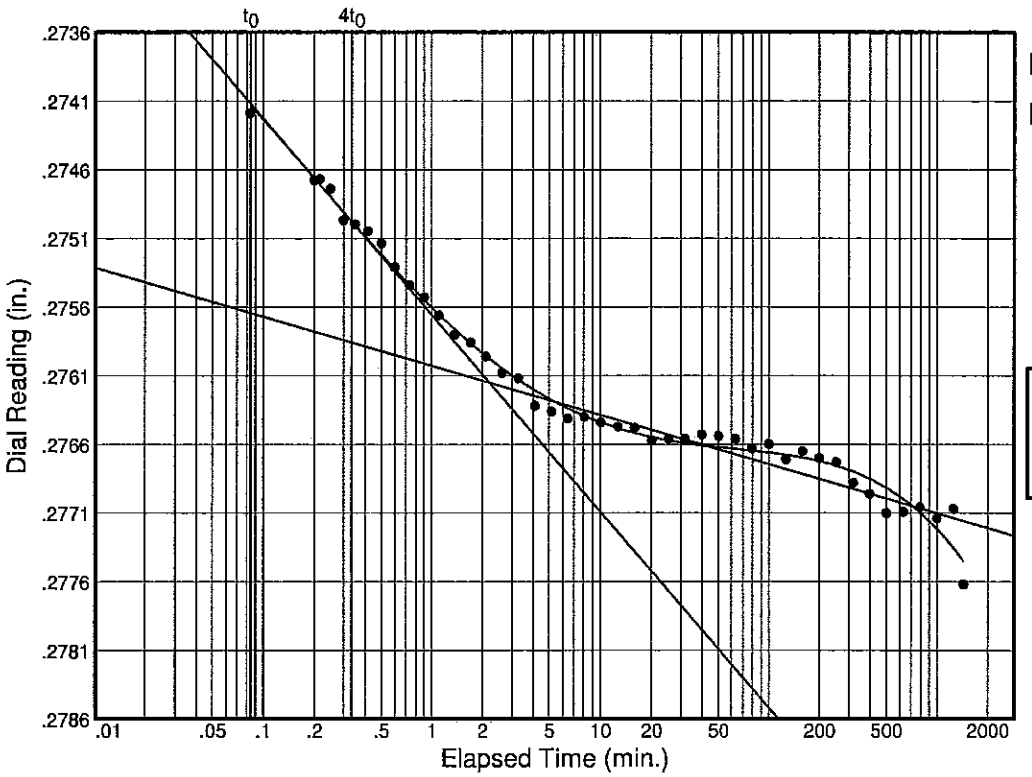
C_v @ T_{50}
2.79 ft.^{2}/day

C_α = 0.001

Figure

Dial Reading vs. Time

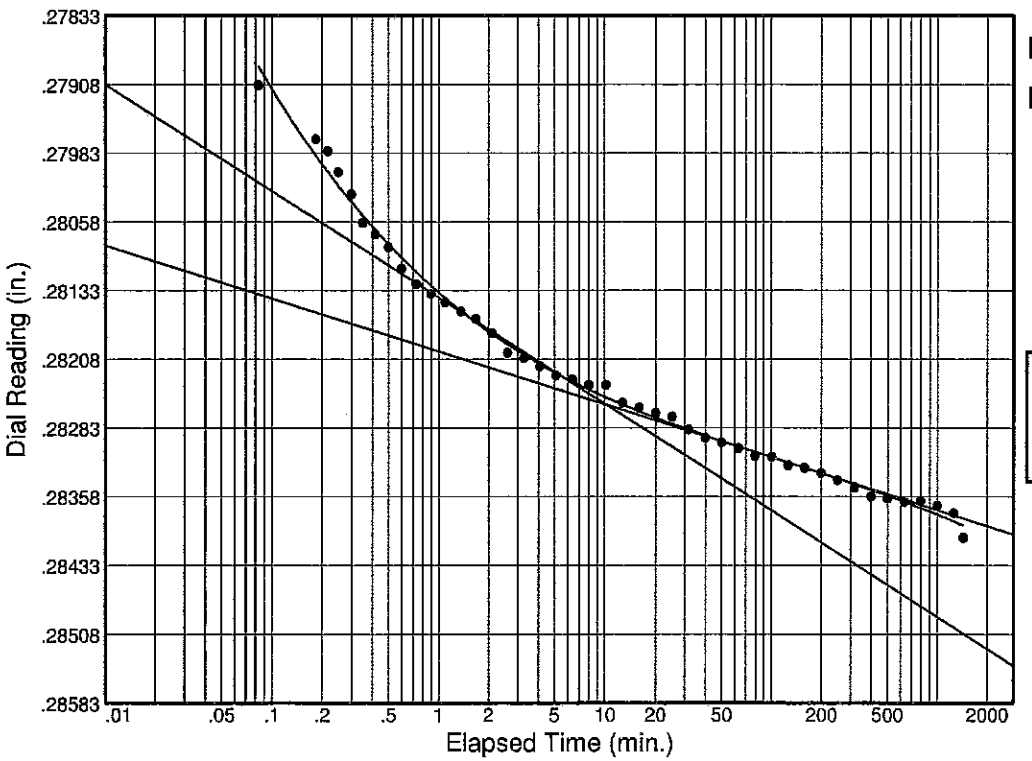
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 13C Elev./Depth: 38.0



Load No.= 3
Load= 0.25 tsf
D_0 = 0.27329
D_{50} = 0.27472
D_{100} = 0.27615
T_{50} = 0.21 min.

C_v @ T_{50}
2.33 ft.^{2}/day

C_α = 0.000



Load No.= 4
Load= 0.50 tsf
D_0 = 0.27537
D_{50} = 0.27898
D_{100} = 0.28258
T_{50} = 0.09 min.

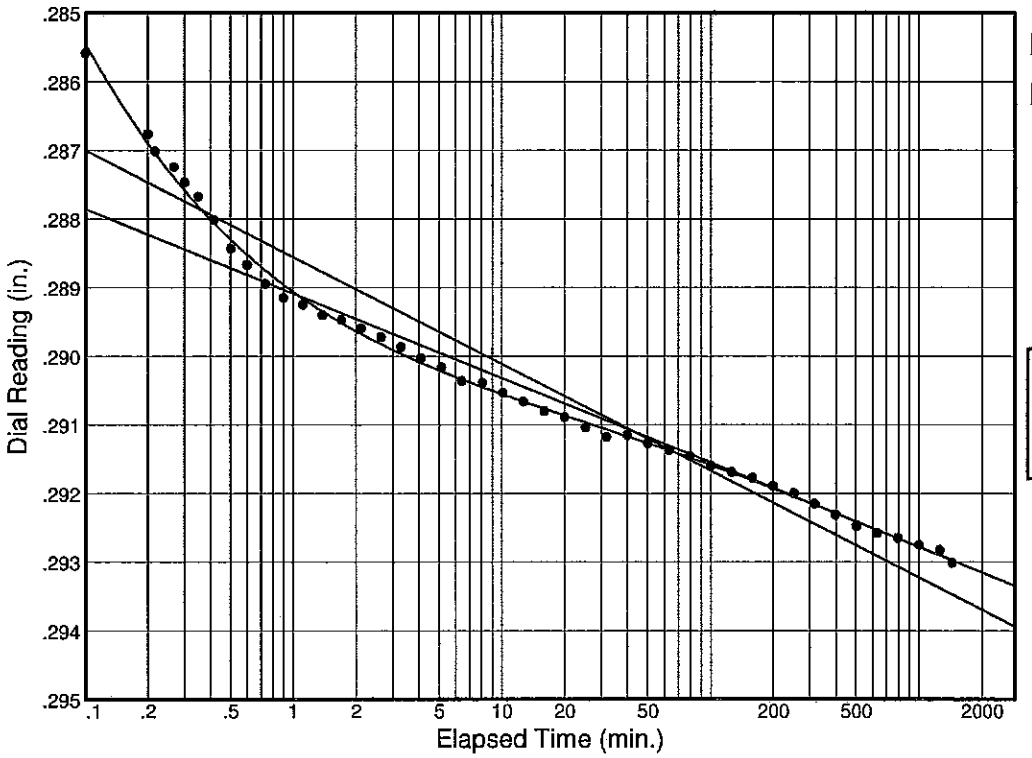
C_v @ T_{50}
5.39 ft.^{2}/day

C_α = 0.001

Figure

Dial Reading vs. Time

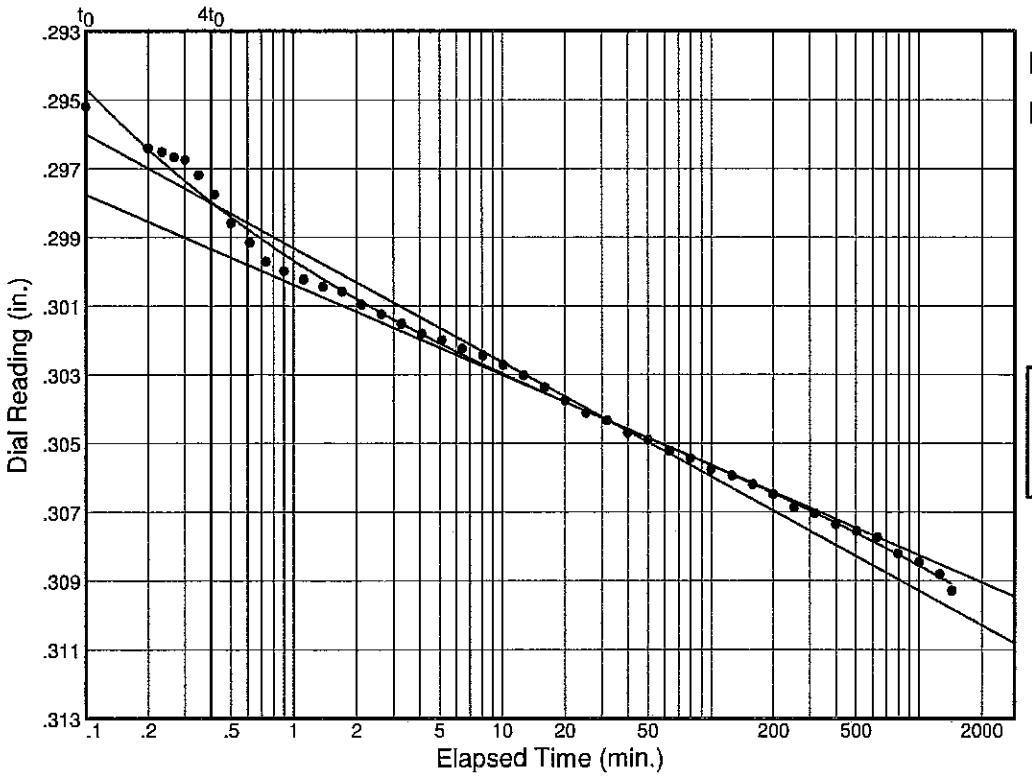
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 13C Elev./Depth: 38.0



Load No.= 5
Load= 1.00 tsf
D_0 = 0.28010
D_{50} = 0.28560
D_{100} = 0.29110
T_{50} = 0.11 min.

C_v @ T_{50}
4.44 ft.^{2}/day

C_α = 0.002



Load No.= 6
Load= 2.00 tsf
D_0 = 0.29137
D_{50} = 0.29788
D_{100} = 0.30438
T_{50} = 0.38 min.

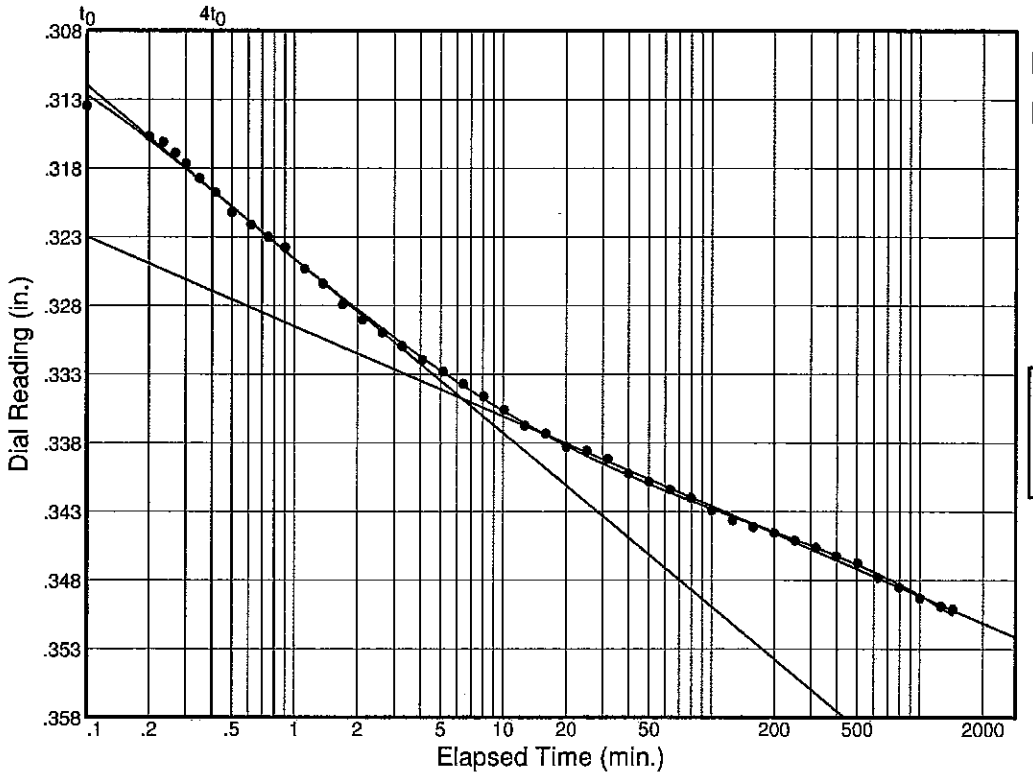
C_v @ T_{50}
1.20 ft.^{2}/day

C_α = 0.003

Figure

Dial Reading vs. Time

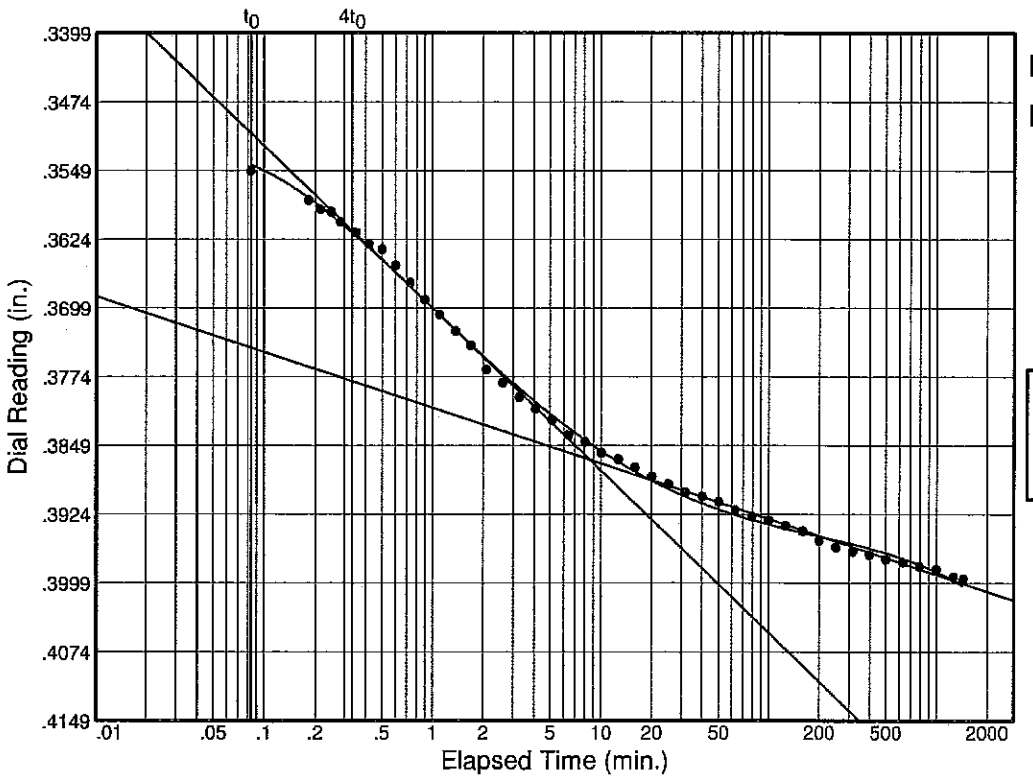
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 13C Elev./Depth: 38.0



Load No.= 7
Load= 4.00 tsf
D_0 = 0.30578
D_{50} = 0.32027
D_{100} = 0.33477
T_{50} = 0.45 min.

C_v @ T_{50}
0.96 ft.^{2}/day

C_α = 0.007



Load No.= 8
Load= 8.00 tsf
D_0 = 0.34689
D_{50} = 0.36667
D_{100} = 0.38644
T_{50} = 0.65 min.

C_v @ T_{50}
0.61 ft.^{2}/day

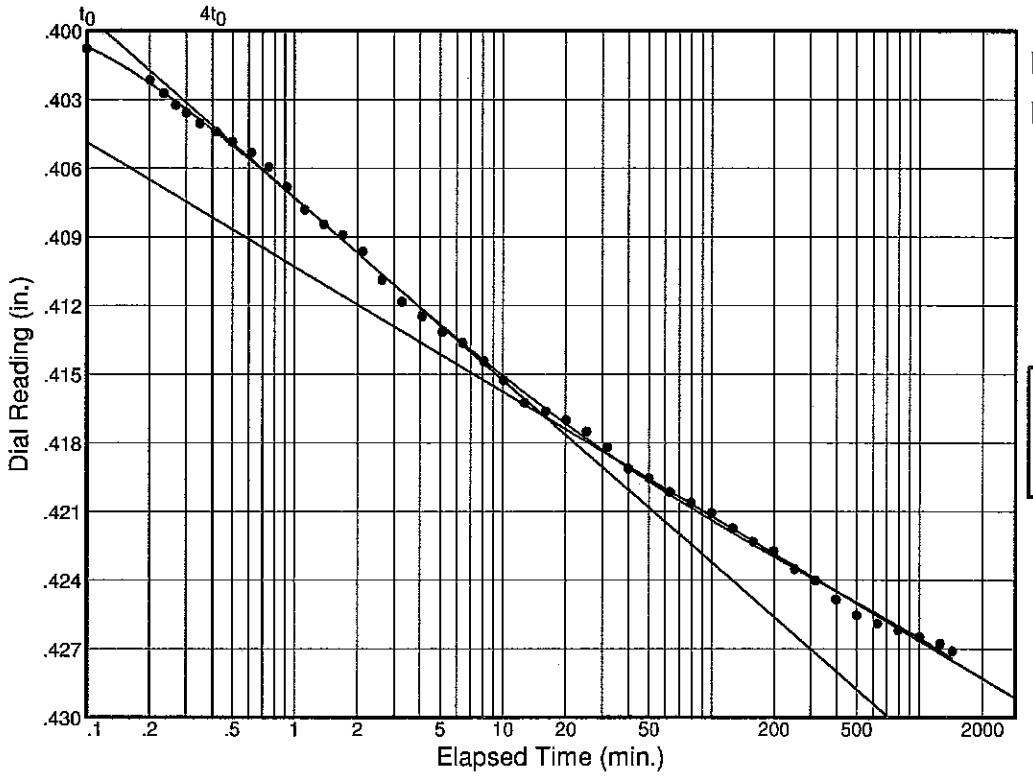
C_α = 0.007

Figure

Stantec, Inc.

Dial Reading vs. Time

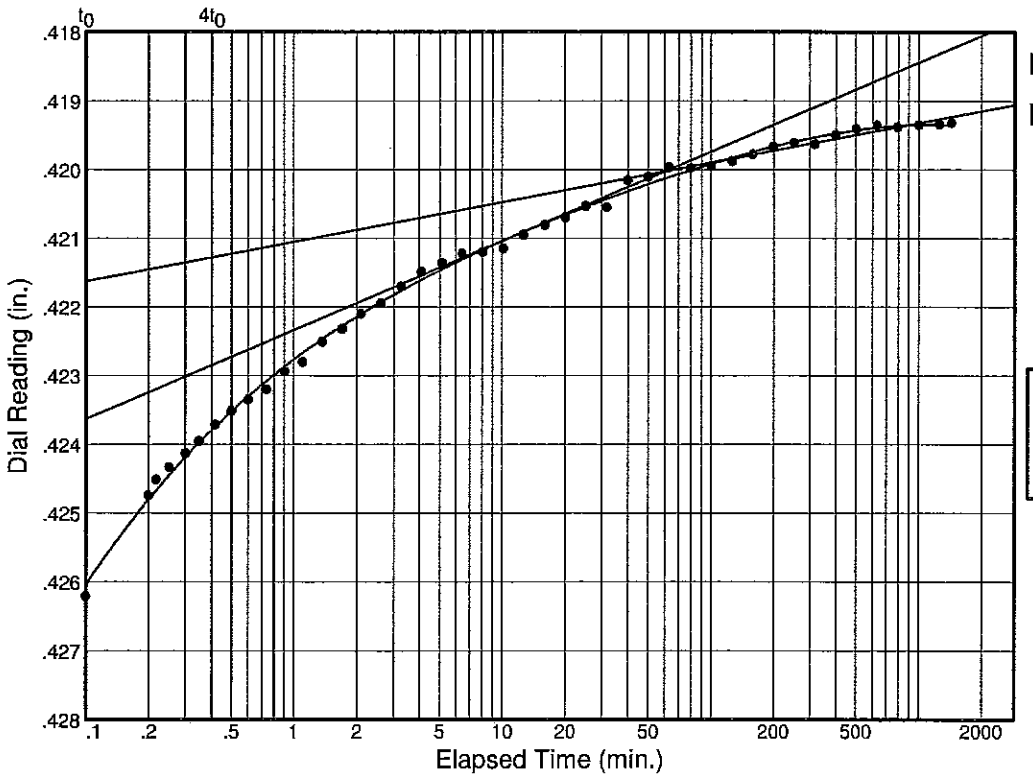
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 13C Elev./Depth: 38.0



Load No.= 9
Load= 12.00 tsf
D_0 = 0.39707
D_{50} = 0.40696
D_{100} = 0.41685
T_{50} = 0.90 min.

C_v @ T_{50}
0.40 ft.^{2}/day

C_α = 0.006



Load No.= 10
Load= 3.00 tsf
D_0 = 0.42829
D_{50} = 0.42416
D_{100} = 0.42002
T_{50} = 0.31 min.

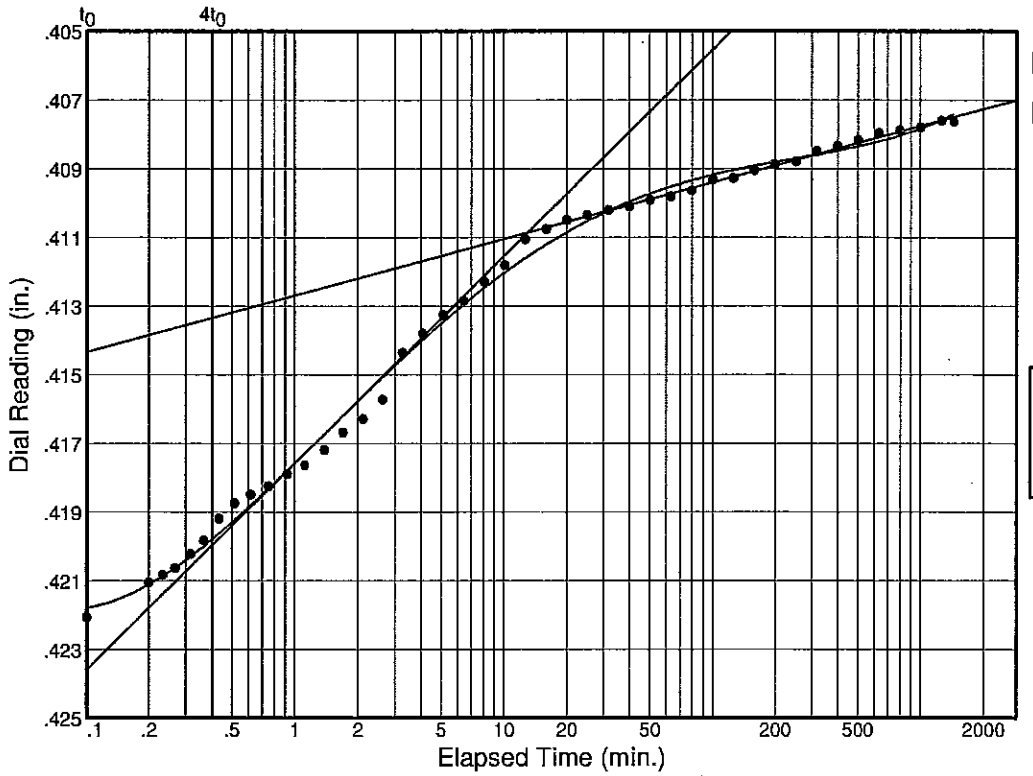
C_v @ T_{50}
1.12 ft.^{2}/day

Figure

Stantec, Inc.

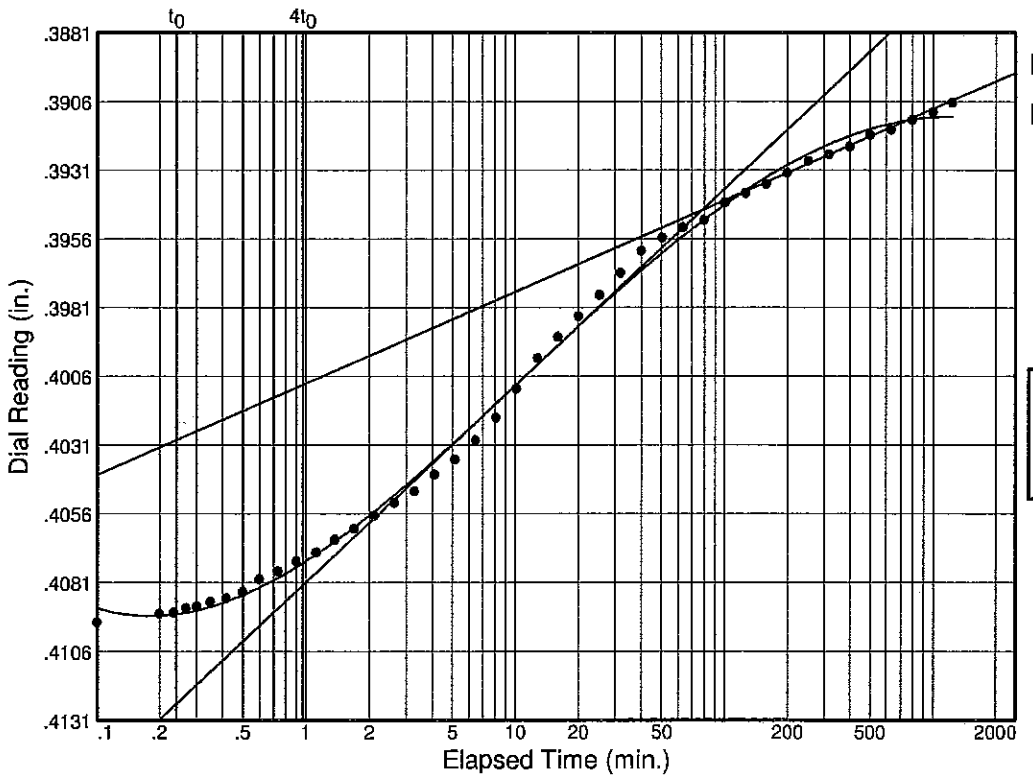
Dial Reading vs. Time

Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 13C Elev./Depth: 38.0



Load No.= 11
Load= 0.75 tsf
D_0 = 0.42378
D_{50} = 0.41732
D_{100} = 0.41085
T_{50} = 1.10 min.

C_v @ T_{50}
0.32 ft.^{2}/day



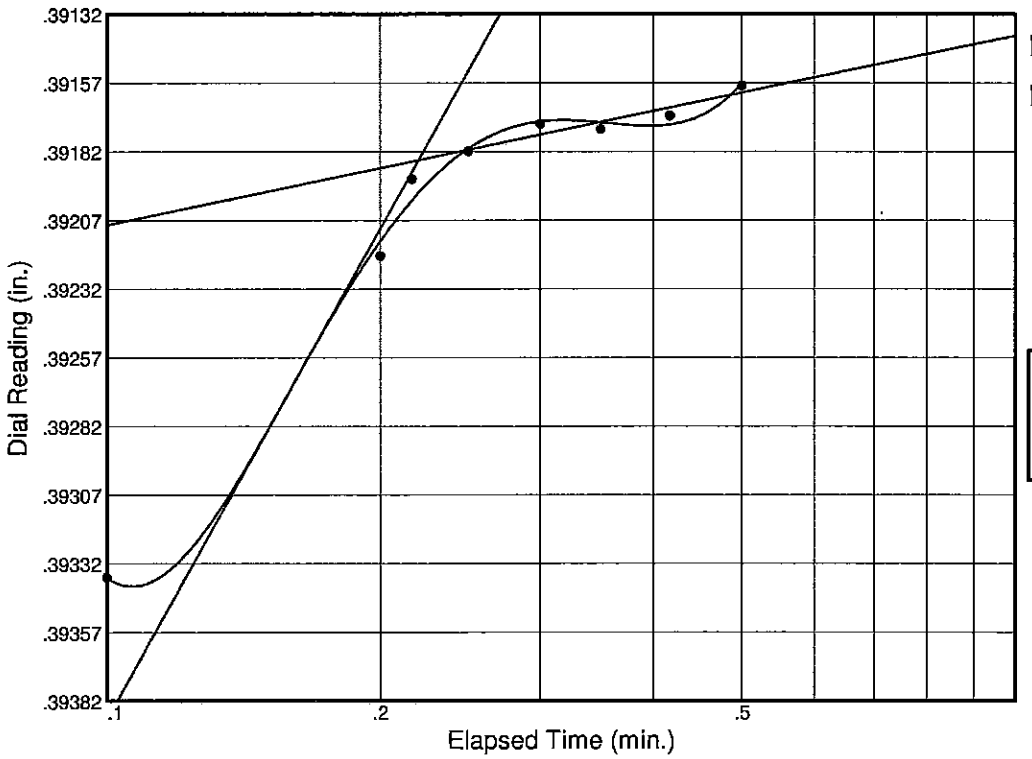
Load No.= 12
Load= 0.19 tsf
D_0 = 0.41110
D_{50} = 0.40284
D_{100} = 0.39457
T_{50} = 5.38 min.

C_v @ T_{50}
0.07 ft.^{2}/day

Figure

Dial Reading vs. Time

Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-1U Sample No.: 13C Elev./Depth: 38.0



Load No.= 13
Load= 0.05 tsf
D_0 = 0.39336
D_{50} = 0.39261
D_{100} = 0.39185
T_{50} = 0.16 min.

C_v @ T_{50}
2.29 ft.^{2}/day

Figure

CONSOLIDATION TEST DATA

Client: USACE
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Project Number: 10-017200

Sample Data

Source: TB-1U
Sample No.: 13C
Depth: 38.0 **Sample Length(in./cm.):**
Location:
Description: SO GR CL4 W/ ARS ML, WD
Liquid Limit: 33 **Plasticity Index:** 13
USCS: CH **AASHTO:** **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 247.96 g.	**Consolidometer #** = 3	**Wet w+t** = 375.06 g.
Dry w+t = 187.10 g.		**Dry w+t** = 293.23 g.
Tare Wt. = 8.21 g.	**Spec. Gravity** = 2.71	**Tare Wt.** = 15.95 g.
Height = 1.00 in.	**Height** = 1.00 in.	
Diameter = 4.00 in.	**Diameter** = 4.00 in.	
Weight = 379.95 g.	**Defl. Table** = n/a	
Moisture = 34.0 %	**Ht. Solids** = 0.5080 in.	**Moisture** = 29.5 %
Wet Den. = 115.2 pcf	**Dry Wt.** = 283.50 g.*	**Dry Wt.** = 277.28 g.
Dry Den. = 85.9 pcf	**Void Ratio** = 0.968	**Void Ratio** = 0.723
	Saturation = 95.2 %	

*** Initial dry weight used in calculations**

End-of-Load Summary

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	0.26704				0.968	
0.05	0.26727	0.00000	0.00	0.000	0.968	0.0 Comprs.
0.13	0.27507	0.00000	2.79	0.001	0.953	0.8 Comprs.
0.25	0.27762	0.00000	2.33	0.000	0.948	1.1 Comprs.
0.50	0.28403	0.00000	5.39	0.001	0.935	1.7 Comprs.
1.00	0.29301	0.00000	4.44	0.002	0.917	2.6 Comprs.
2.00	0.30929	0.00000	1.20	0.003	0.885	4.2 Comprs.
4.00	0.35011	0.00000	0.96	0.007	0.805	8.3 Comprs.
8.00	0.39949	0.00000	0.61	0.007	0.708	13.2 Comprs.
12.00	0.42709	0.00000	0.40	0.006	0.653	16.0 Comprs.
3.00	0.41932	0.00000	1.12		0.669	15.2 Comprs.
0.75	0.40764	0.00000	0.32		0.692	14.1 Comprs.
0.19	0.39065	0.00000	0.07		0.725	12.4 Comprs.
0.05	0.39158	0.00000	2.29		0.723	12.5 Comprs.

C_c = 0.31 P_c = 3.29 tsf C_r = 0.03

Pressure: 0.05 tsf — **TEST READINGS** — **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.26704	16	2.45	0.26708	31	79.38	0.26706
2	0.02	0.26705	17	3.10	0.26704	32	99.95	0.26704
3	0.05	0.26706	18	3.92	0.26702	33	125.85	0.26706
4	0.08	0.26706	19	4.95	0.26703	34	158.45	0.26705
5	0.12	0.26707	20	6.25	0.26706	35	199.48	0.26703
6	0.18	0.26707	21	7.88	0.26704	36	251.15	0.26704
7	0.25	0.26703	22	9.95	0.26705	37	316.18	0.26700
8	0.33	0.26708	23	12.53	0.26707	38	398.07	0.26704
9	0.43	0.26708	24	15.80	0.26701	39	501.15	0.26707
10	0.57	0.26708	25	19.90	0.26703	40	630.92	0.26709
11	0.73	0.26706	26	25.07	0.26706	41	794.30	0.26715
12	0.93	0.26707	27	31.57	0.26707	42	999.97	0.26711
13	1.18	0.26710	28	39.77	0.26706	43	1258.90	0.26711
14	1.52	0.26709	29	50.07	0.26703	44	1440.13	0.26727
15	1.93	0.26709	30	63.05	0.26704			

Void Ratio = 0.968 **Compression** = 0.0 %
D_0 = 0.26697 D_{50} = 0.26708 D_{100} = 0.26718
C_v **at 464.0 min.** = 0.00 ft.^{2}/day C_α = 0.000

Pressure: 0.13 tsf — **TEST READINGS** — **Load No. 2**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.26514	16	2.12	0.27192	31	63.23	0.27412
2	0.10	0.26857	17	2.63	0.27204	32	79.57	0.27411
3	0.20	0.26939	18	3.28	0.27217	33	100.13	0.27411
4	0.22	0.26957	19	4.10	0.27237	34	126.03	0.27460
5	0.25	0.26965	20	5.13	0.27240	35	158.63	0.27459
6	0.30	0.26972	21	6.43	0.27243	36	199.67	0.27455
7	0.35	0.26995	22	8.07	0.27245	37	251.33	0.27441
8	0.42	0.27017	23	10.12	0.27262	38	316.37	0.27448
9	0.50	0.27034	24	12.72	0.27262	39	398.25	0.27449
10	0.60	0.27062	25	15.97	0.27265	40	501.33	0.27494
11	0.73	0.27079	26	20.08	0.27263	41	631.12	0.27485
12	0.90	0.27109	27	25.25	0.27282	42	794.48	0.27488
13	1.12	0.27118	28	31.75	0.27286	43	1000.15	0.27480
14	1.37	0.27150	29	39.93	0.27414	44	1259.08	0.27475
15	1.70	0.27173	30	50.25	0.27409	45	1440.08	0.27507

Void Ratio = 0.953 **Compression** = 0.8 %
D_0 = 0.26514 D_{50} = 0.26924 D_{100} = 0.27335
C_v **at 0.2 min.** = 2.79 ft.^{2}/day C_α = 0.001

Pressure: 0.25 tsf **TEST READINGS** **Load No. 3**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.27321	16	2.10	0.27596	31	63.23	0.27656
2	0.08	0.27419	17	2.62	0.27608	32	79.57	0.27663
3	0.20	0.27468	18	3.27	0.27612	33	100.13	0.27660
4	0.22	0.27467	19	4.10	0.27632	34	126.02	0.27671
5	0.25	0.27474	20	5.13	0.27636	35	158.62	0.27665
6	0.30	0.27497	21	6.43	0.27641	36	199.67	0.27670
7	0.35	0.27500	22	8.07	0.27640	37	251.33	0.27673
8	0.42	0.27505	23	10.12	0.27644	38	316.37	0.27688
9	0.50	0.27514	24	12.72	0.27647	39	398.25	0.27696
10	0.60	0.27531	25	15.97	0.27648	40	501.33	0.27710
11	0.73	0.27544	26	20.08	0.27657	41	631.10	0.27709
12	0.90	0.27553	27	25.25	0.27656	42	794.47	0.27706
13	1.10	0.27566	28	31.75	0.27656	43	1000.15	0.27714
14	1.37	0.27580	29	39.93	0.27653	44	1259.07	0.27707
15	1.70	0.27586	30	50.25	0.27654	45	1440.03	0.27762

Void Ratio = 0.948 **Compression** = 1.1 %
D_0 = 0.27329 D_{50} = 0.27472 D_{100} = 0.27615
C_v **at 0.2 min.** = 2.33 ft.^{2}/day C_α = 0.000

Pressure: 0.50 tsf **TEST READINGS** **Load No. 4**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.27537	16	2.10	0.28180	31	63.22	0.28305
2	0.08	0.27909	17	2.62	0.28201	32	79.55	0.28314
3	0.18	0.27968	18	3.27	0.28207	33	100.12	0.28315
4	0.22	0.27981	19	4.08	0.28216	34	126.02	0.28324
5	0.25	0.28004	20	5.12	0.28226	35	158.62	0.28327
6	0.30	0.28028	21	6.42	0.28230	36	199.65	0.28332
7	0.35	0.28059	22	8.05	0.28236	37	251.32	0.28340
8	0.42	0.28072	23	10.12	0.28236	38	316.35	0.28348
9	0.50	0.28086	24	12.70	0.28256	39	398.23	0.28358
10	0.60	0.28109	25	15.97	0.28261	40	501.32	0.28360
11	0.73	0.28126	26	20.07	0.28267	41	631.08	0.28364
12	0.90	0.28137	27	25.23	0.28271	42	794.47	0.28363
13	1.10	0.28146	28	31.73	0.28285	43	1000.13	0.28368
14	1.37	0.28156	29	39.93	0.28294	44	1259.07	0.28376
15	1.68	0.28164	30	50.23	0.28299	45	1440.07	0.28403

Void Ratio = 0.935 **Compression** = 1.7 %
D_0 = 0.27537 D_{50} = 0.27898 D_{100} = 0.28258
C_v **at 0.1 min.** = 5.39 ft.^{2}/day C_α = 0.001

Pressure: 1.00 tsf **TEST READINGS** **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.28010	16	2.12	0.28959	31	63.23	0.29137
2	0.10	0.28559	17	2.63	0.28972	32	79.57	0.29146
3	0.20	0.28677	18	3.28	0.28987	33	100.13	0.29160
4	0.22	0.28702	19	4.10	0.29003	34	126.03	0.29169
5	0.27	0.28725	20	5.13	0.29016	35	158.63	0.29177
6	0.30	0.28747	21	6.43	0.29036	36	199.67	0.29189
7	0.35	0.28768	22	8.07	0.29039	37	251.33	0.29200
8	0.42	0.28802	23	10.13	0.29053	38	316.37	0.29215
9	0.50	0.28843	24	12.72	0.29066	39	398.25	0.29231
10	0.60	0.28867	25	15.98	0.29080	40	501.33	0.29248
11	0.73	0.28895	26	20.08	0.29089	41	631.10	0.29258
12	0.90	0.28915	27	25.25	0.29104	42	794.48	0.29265
13	1.12	0.28925	28	31.75	0.29118	43	1000.15	0.29275
14	1.38	0.28940	29	39.95	0.29115	44	1259.08	0.29283
15	1.70	0.28947	30	50.25	0.29127	45	1440.05	0.29301

Void Ratio = 0.917 **Compression** = 2.6 %
D_0 = 0.28010 D_{50} = 0.28560 D_{100} = 0.29110
C_v **at 0.1 min.** = 4.44 ft.^{2}/day C_α = 0.002

Pressure: 2.00 tsf **TEST READINGS** **Load No. 6**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.28762	16	2.12	0.30097	31	63.23	0.30522
2	0.10	0.29520	17	2.63	0.30125	32	79.57	0.30544
3	0.20	0.29641	18	3.28	0.30152	33	100.13	0.30576
4	0.23	0.29652	19	4.10	0.30181	34	126.03	0.30594
5	0.27	0.29667	20	5.13	0.30200	35	158.63	0.30619
6	0.30	0.29674	21	6.43	0.30224	36	199.67	0.30648
7	0.35	0.29719	22	8.07	0.30244	37	251.33	0.30687
8	0.42	0.29776	23	10.13	0.30273	38	316.38	0.30704
9	0.50	0.29859	24	12.72	0.30302	39	398.25	0.30736
10	0.62	0.29916	25	15.98	0.30337	40	501.33	0.30755
11	0.73	0.29971	26	20.08	0.30376	41	631.12	0.30773
12	0.90	0.29999	27	25.25	0.30412	42	794.48	0.30821
13	1.12	0.30023	28	31.75	0.30433	43	1000.15	0.30845
14	1.38	0.30044	29	39.95	0.30469	44	1259.08	0.30880
15	1.70	0.30058	30	50.25	0.30490	45	1440.33	0.30929

Void Ratio = 0.885 **Compression** = 4.2 %
D_0 = 0.29137 D_{50} = 0.29788 D_{100} = 0.30438
C_v **at 0.4 min.** = 1.20 ft.^{2}/day C_α = 0.003

Pressure: 4.00 tsf **TEST READINGS** **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.30232	16	2.12	0.32905	31	63.23	0.34141
2	0.10	0.31348	17	2.63	0.32998	32	79.57	0.34200
3	0.20	0.31570	18	3.28	0.33096	33	100.13	0.34291
4	0.23	0.31612	19	4.10	0.33195	34	126.03	0.34365
5	0.27	0.31691	20	5.13	0.33280	35	158.63	0.34412
6	0.30	0.31767	21	6.43	0.33371	36	199.67	0.34454
7	0.35	0.31874	22	8.07	0.33462	37	251.33	0.34511
8	0.42	0.31978	23	10.12	0.33560	38	316.37	0.34561
9	0.50	0.32121	24	12.72	0.33674	39	398.25	0.34625
10	0.62	0.32213	25	15.97	0.33732	40	501.33	0.34674
11	0.75	0.32302	26	20.08	0.33828	41	631.10	0.34782
12	0.90	0.32377	27	25.25	0.33857	42	794.47	0.34850
13	1.12	0.32535	28	31.75	0.33918	43	1000.15	0.34930
14	1.37	0.32642	29	39.93	0.34024	44	1259.08	0.34988
15	1.70	0.32793	30	50.25	0.34083	45	1440.03	0.35011

Void Ratio = 0.805 **Compression** = 8.3 %
D_0 = 0.30578 D_{50} = 0.32027 D_{100} = 0.33477
C_v **at 0.5 min.** = 0.96 ft.^{2}/day C_α = 0.007

Pressure: 8.00 tsf **TEST READINGS** **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.33989	16	2.10	0.37662	31	63.22	0.39194
2	0.08	0.35494	17	2.62	0.37806	32	79.55	0.39265
3	0.18	0.35815	18	3.27	0.37963	33	100.12	0.39308
4	0.22	0.35913	19	4.08	0.38087	34	126.02	0.39368
5	0.25	0.35942	20	5.12	0.38211	35	158.62	0.39423
6	0.28	0.36049	21	6.42	0.38373	36	199.65	0.39527
7	0.35	0.36165	22	8.05	0.38451	37	251.32	0.39600
8	0.42	0.36287	23	10.12	0.38574	38	316.37	0.39646
9	0.50	0.36352	24	12.70	0.38640	39	398.25	0.39684
10	0.60	0.36528	25	15.97	0.38730	40	501.33	0.39732
11	0.73	0.36713	26	20.07	0.38828	41	631.10	0.39765
12	0.90	0.36902	27	25.23	0.38913	42	794.47	0.39807
13	1.10	0.37061	28	31.75	0.39004	43	1000.13	0.39840
14	1.37	0.37242	29	39.93	0.39046	44	1259.07	0.39927
15	1.68	0.37400	30	50.23	0.39104	45	1440.08	0.39949

Void Ratio = 0.708 **Compression** = 13.2 %
D_0 = 0.34689 D_{50} = 0.36667 D_{100} = 0.38644
C_v **at 0.7 min.** = 0.61 ft.^{2}/day C_α = 0.007

Pressure: 12.00 tsf **TEST READINGS** **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.39137	16	2.12	0.40964	31	63.25	0.42015
2	0.10	0.40080	17	2.63	0.41089	32	79.58	0.42061
3	0.20	0.40216	18	3.28	0.41184	33	100.15	0.42107
4	0.23	0.40274	19	4.10	0.41248	34	126.05	0.42174
5	0.27	0.40326	20	5.13	0.41317	35	158.65	0.42232
6	0.30	0.40360	21	6.43	0.41364	36	199.68	0.42273
7	0.35	0.40405	22	8.08	0.41442	37	251.35	0.42353
8	0.42	0.40441	23	10.13	0.41528	38	316.38	0.42401
9	0.50	0.40486	24	12.73	0.41624	39	398.27	0.42485
10	0.62	0.40534	25	15.98	0.41664	40	501.35	0.42553
11	0.75	0.40596	26	20.10	0.41701	41	631.12	0.42590
12	0.92	0.40682	27	25.27	0.41751	42	794.48	0.42618
13	1.12	0.40782	28	31.77	0.41818	43	1000.17	0.42647
14	1.38	0.40847	29	39.95	0.41912	44	1259.08	0.42677
15	1.70	0.40892	30	50.27	0.41954	45	1440.47	0.42709

Void Ratio = 0.653 **Compression =** 16.0 %
D_0 = 0.39707 D_{50} = 0.40696 D_{100} = 0.41685
C_v **at 0.9 min.** = 0.40 ft.^{2}/day C_α = 0.006

Pressure: 3.00 tsf **TEST READINGS** **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.44522	16	2.10	0.42210	31	63.23	0.41997
2	0.10	0.42621	17	2.62	0.42195	32	79.57	0.41998
3	0.20	0.42474	18	3.27	0.42170	33	100.13	0.41995
4	0.22	0.42451	19	4.10	0.42149	34	126.03	0.41988
5	0.25	0.42433	20	5.13	0.42136	35	158.63	0.41978
6	0.30	0.42413	21	6.43	0.42122	36	199.67	0.41967
7	0.35	0.42395	22	8.07	0.42120	37	251.33	0.41961
8	0.42	0.42371	23	10.12	0.42115	38	316.37	0.41963
9	0.50	0.42351	24	12.72	0.42095	39	398.25	0.41950
10	0.60	0.42335	25	15.97	0.42081	40	501.33	0.41941
11	0.73	0.42320	26	20.08	0.42070	41	631.10	0.41936
12	0.90	0.42294	27	25.25	0.42053	42	794.48	0.41938
13	1.10	0.42280	28	31.75	0.42055	43	1000.15	0.41935
14	1.37	0.42251	29	39.93	0.42016	44	1259.08	0.41934
15	1.70	0.42232	30	50.25	0.42011	45	1440.03	0.41932

Void Ratio = 0.669 **Compression =** 15.2 %
D_0 = 0.42829 D_{50} = 0.42416 D_{100} = 0.42002
C_v **at 0.3 min.** = 1.12 ft.^{2}/day

Pressure: 0.75 tsf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.42957	16	2.12	0.41629	31	63.23	0.40982
2	0.10	0.42207	17	2.63	0.41572	32	79.57	0.40964
3	0.20	0.42105	18	3.28	0.41436	33	100.13	0.40932
4	0.23	0.42083	19	4.10	0.41380	34	126.03	0.40928
5	0.27	0.42063	20	5.13	0.41326	35	158.63	0.40905
6	0.32	0.42022	21	6.43	0.41285	36	199.67	0.40887
7	0.37	0.41982	22	8.07	0.41229	37	251.33	0.40880
8	0.43	0.41919	23	10.13	0.41181	38	316.37	0.40849
9	0.52	0.41874	24	12.72	0.41107	39	398.25	0.40835
10	0.62	0.41849	25	15.98	0.41076	40	501.33	0.40818
11	0.75	0.41824	26	20.08	0.41050	41	631.10	0.40797
12	0.92	0.41789	27	25.25	0.41036	42	794.48	0.40789
13	1.12	0.41763	28	31.75	0.41021	43	1000.15	0.40780
14	1.38	0.41719	29	39.95	0.41011	44	1259.08	0.40761
15	1.70	0.41668	30	50.25	0.40992	45	1440.23	0.40764

Void Ratio = 0.692 **Compression** = 14.1 %
D_0 = 0.42378 D_{50} = 0.41732 D_{100} = 0.41085
C_v **at 1.1 min.** = 0.32 ft.^{2}/day

Pressure: 0.19 tsf **TEST READINGS** **Load No. 12**

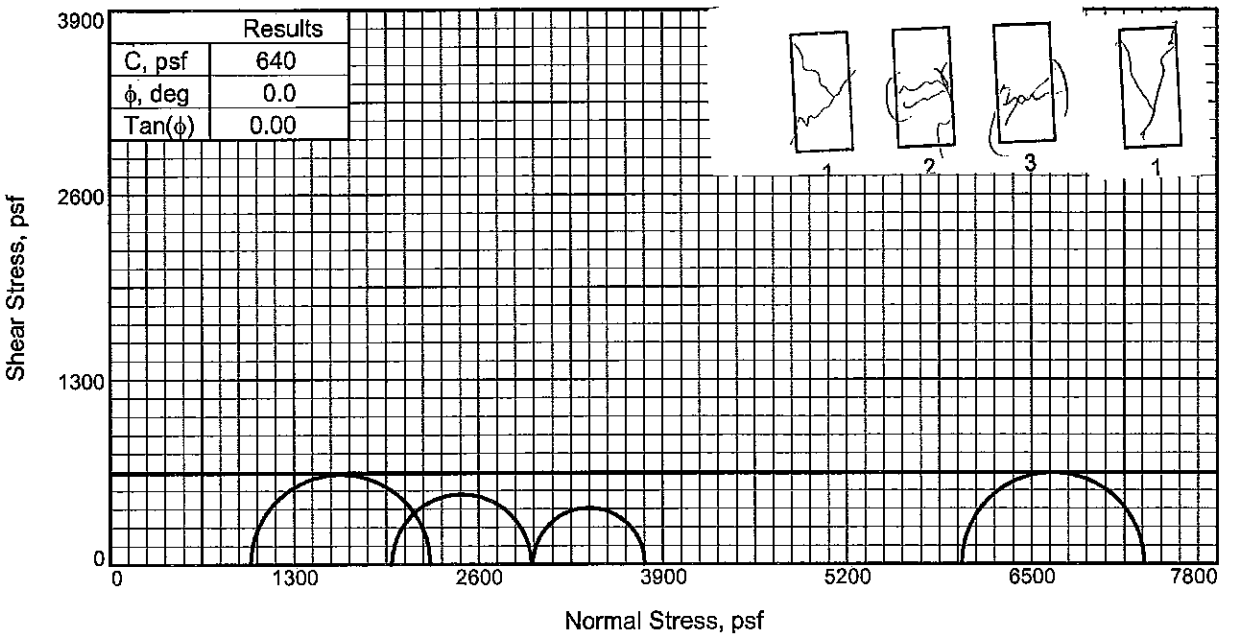
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.41298	16	2.12	0.40567	31	63.23	0.39519
2	0.10	0.40954	17	2.63	0.40521	32	79.57	0.39492
3	0.20	0.40923	18	3.28	0.40478	33	100.13	0.39429
4	0.23	0.40920	19	4.10	0.40417	34	126.03	0.39396
5	0.27	0.40903	20	5.13	0.40362	35	158.63	0.39361
6	0.30	0.40896	21	6.43	0.40293	36	199.67	0.39319
7	0.35	0.40881	22	8.07	0.40211	37	251.33	0.39277
8	0.42	0.40867	23	10.12	0.40105	38	316.38	0.39253
9	0.50	0.40843	24	12.72	0.39993	39	398.25	0.39225
10	0.60	0.40797	25	15.98	0.39917	40	501.33	0.39181
11	0.73	0.40770	26	20.08	0.39842	41	631.12	0.39163
12	0.90	0.40732	27	25.25	0.39766	42	794.48	0.39127
13	1.12	0.40700	28	31.75	0.39685	43	1000.15	0.39099
14	1.37	0.40654	29	39.95	0.39604	44	1242.37	0.39065
15	1.70	0.40614	30	50.25	0.39556			

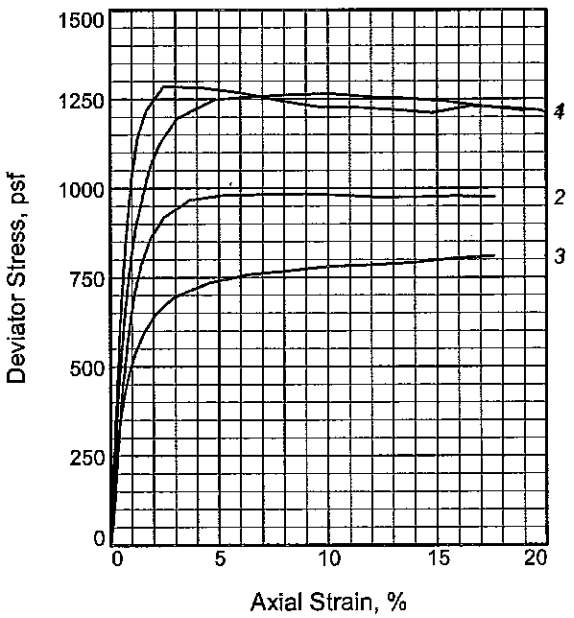
Void Ratio = 0.725 **Compression** = 12.4 %
D_0 = 0.41110 D_{50} = 0.40284 D_{100} = 0.39457
C_v **at 5.4 min.** = 0.07 ft.^{2}/day

Pressure: 0.05 tsf **TEST READINGS** **Load No. 13**

No.	Elapsed Time	Dial Reading
1	0.00	0.39336
2	0.10	0.39337
3	0.20	0.39220
4	0.22	0.39192
5	0.25	0.39182
6	0.30	0.39172
7	0.35	0.39174
8	0.42	0.39169
9	0.50	0.39158

Void Ratio = 0.723 **Compression** = 12.5 %
D_0 = 0.39336 D_{50} = 0.39261 D_{100} = 0.39185
C_v **at 0.2 min.** = 2.29 ft.^{2}/day





Sample No.		1	2	3	4
Initial	Water Content, %	43.5	47.4	49.5	45.5
	Dry Density, pcf	77.5	73.1	71.7	75.1
	Saturation, %	99.4	97.6	98.2	98.0
	Void Ratio	1.1898	1.3216	1.3698	1.2612
	Diameter, in.	1.399	1.407	1.407	1.427
	Height, in.	2.994	2.995	2.979	3.007
At Test	Water Content, %	43.5	47.4	49.5	45.5
	Dry Density, pcf	77.5	73.1	71.7	75.1
	Saturation, %	99.4	97.6	98.2	98.0
	Void Ratio	1.1898	1.3216	1.3698	1.2612
	Diameter, in.	1.399	1.407	1.407	1.427
	Height, in.	2.994	2.995	2.979	3.007
Strain rate, %/min.		1.00	1.00	1.00	1.00
Back Pressure, psi		0.00	0.00	0.00	0.00
Cell Pressure, psi		6.90	13.80	20.70	41.71
Fail. Stress, psf		1265	984	791	1285
Strain, %		10.1	8.8	13.9	2.4
Ult. Stress, psf		1252	975	791	1211
Strain, %		13.6	14.1	13.9	14.8
σ_1 Failure, psf		2259	2971	3772	7291
σ_3 Failure, psf		994	1987	2981	6006

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: M GNG CH4 W/ ARS ML, TR-O

LL= 85 **PL=** 29 **PI=** 56
Assumed Specific Gravity= 2.72
Remarks: Torvane=0.41 tsf

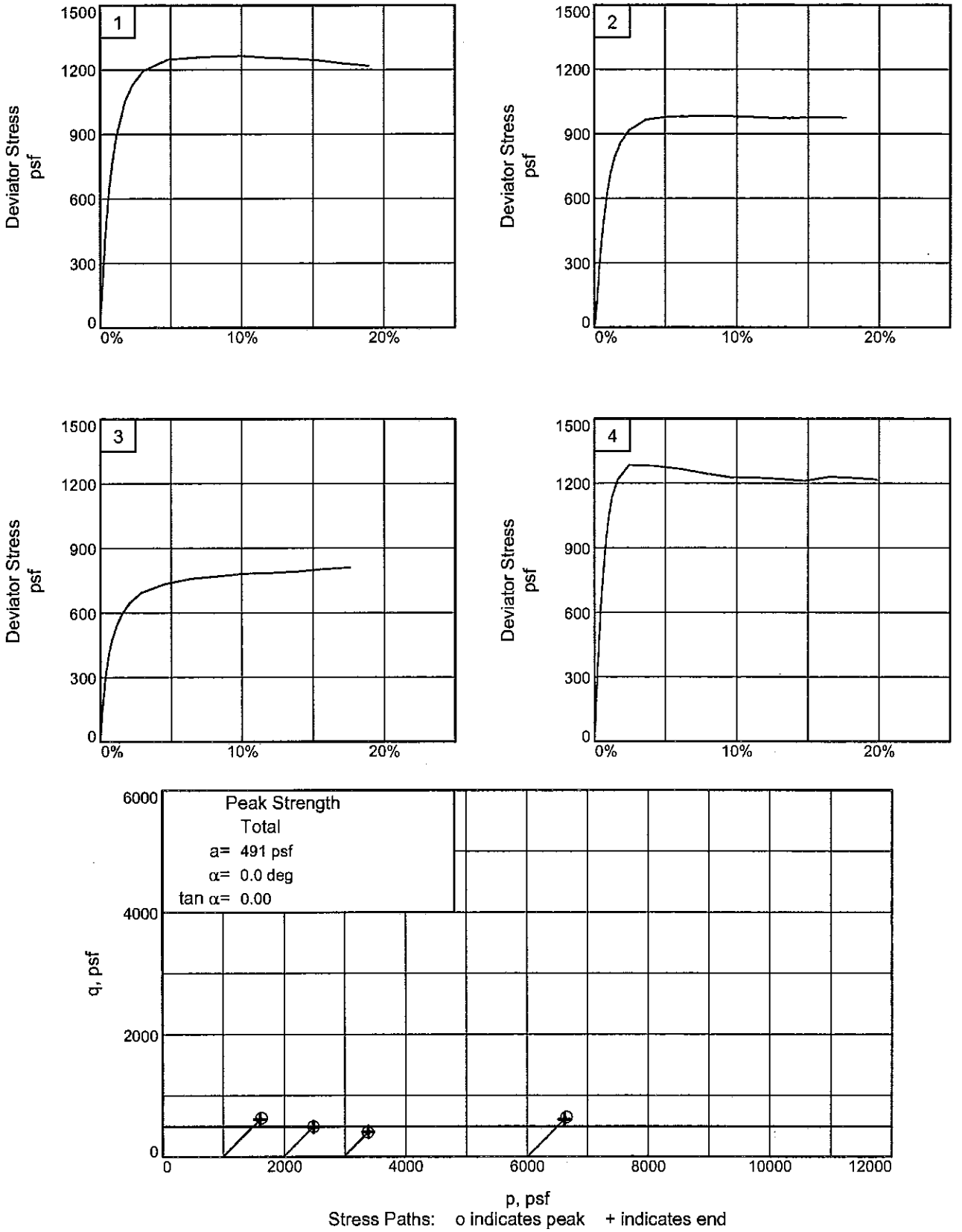
Client: USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source of Sample: TB-1U **Depth:** 2.1
Sample Number: 1C
Proj. No.: 10-017200 **Date Sampled:** 8-4-14

TRIAXIAL SHEAR TEST REPORT
Stantec
Saint Rose, Louisiana

Figure _____

Tested By: JC **Checked By:** MJB/JS



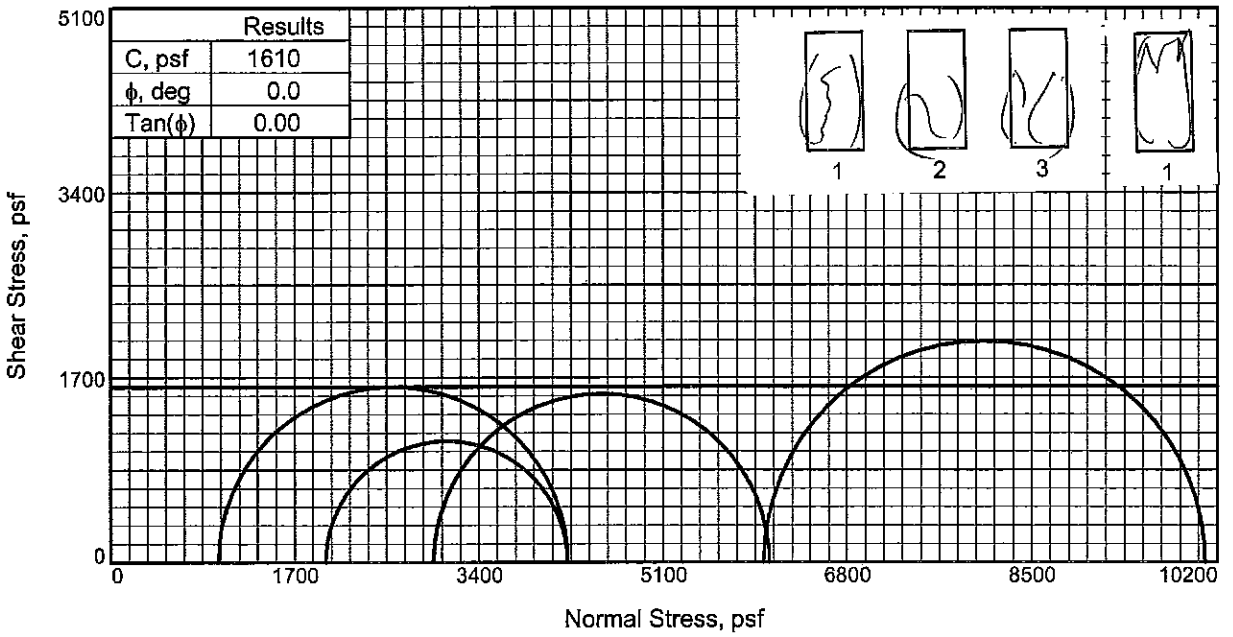
Client: USACE

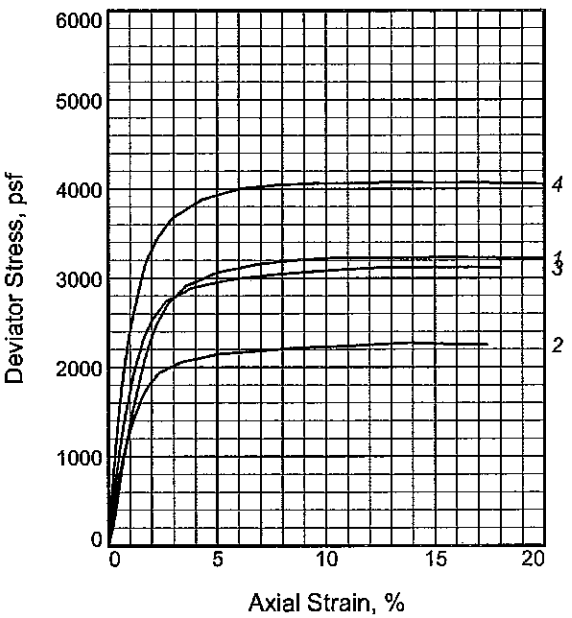
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Pari

Source of Sample: TB-1U **Depth:** 2.1 **Sample Number:** 1C

Project No.: 10-017200 **Figure** _____ **Stantec, Inc.**

Tested By: JC **Checked By:** MJB/JS





Sample No.		1	2	3	4
Initial	Water Content, %	23.0	23.5	22.9	22.4
	Dry Density, pcf	101.3	99.7	97.3	102.0
	Saturation, %	91.5	90.0	82.7	90.5
	Void Ratio	0.6894	0.7163	0.7579	0.6777
	Diameter, in.	1.431	1.399	1.417	1.401
	Height, in.	3.003	3.004	3.003	2.994
At Test	Water Content, %	23.0	23.5	22.9	22.4
	Dry Density, pcf	101.3	99.7	97.3	102.0
	Saturation, %	91.5	90.0	82.7	90.5
	Void Ratio	0.6894	0.7163	0.7579	0.6777
	Diameter, in.	1.431	1.399	1.417	1.401
	Height, in.	3.003	3.004	3.003	2.994
Strain rate, %/min.		1.00	1.00	1.00	1.00
Back Pressure, psi		0.00	0.00	0.00	0.00
Cell Pressure, psi		6.90	13.80	20.70	41.85
Fail. Stress, psf		3226	2228	3097	4064
Strain, %		10.3	10.3	10.9	9.6
Ult. Stress, psf		3226	2228	3097	4064
Strain, %		10.3	10.3	10.9	9.6
σ_1 Failure, psf		4220	4216	6078	10090
σ_3 Failure, psf		994	1987	2981	6026

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: ST GR CH2 W/ ARS SM

LL= 50 **PL=** 16 **PI=** 34
Assumed Specific Gravity= 2.74
Remarks: Torvane=0.70 tsf

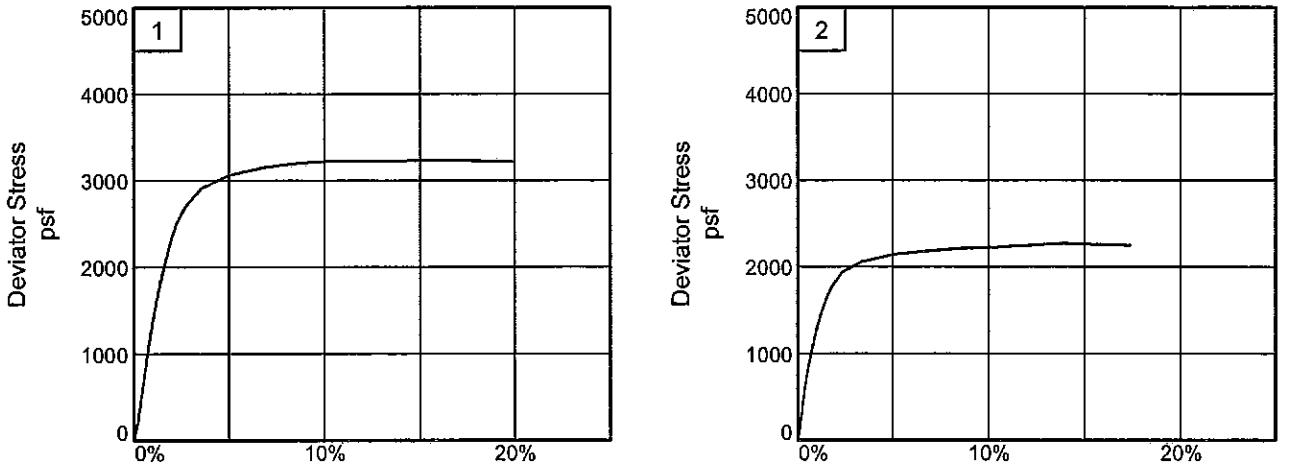
Client: USACE

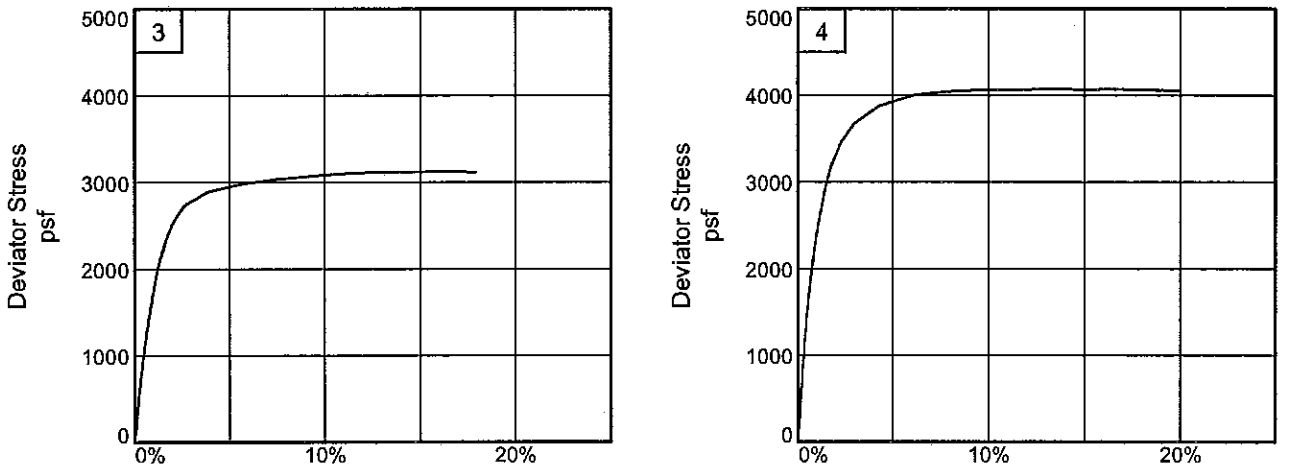
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source of Sample: TB-1U **Depth:** 30.2
Sample Number: 11C
Proj. No.: 10-017200 **Date Sampled:** 8-4-14

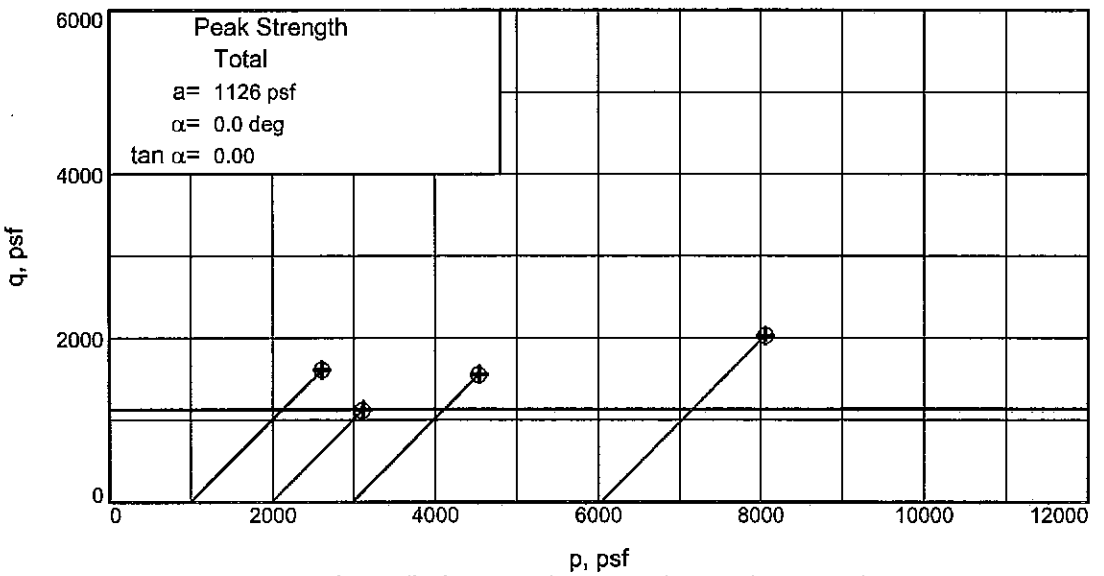
TRIAXIAL SHEAR TEST REPORT
Stantec
Saint Rose, Louisiana

Figure _____

Tested By: JC **Checked By:** MJB/JS







Stress Paths: o indicates peak + indicates end

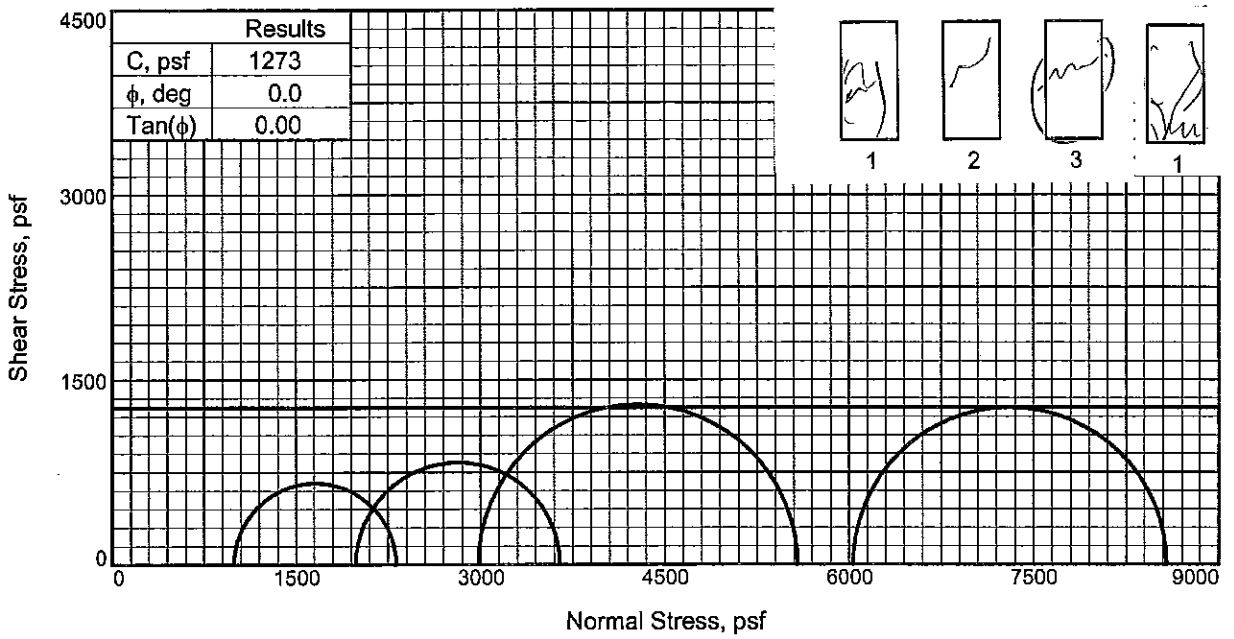
Client: USACE

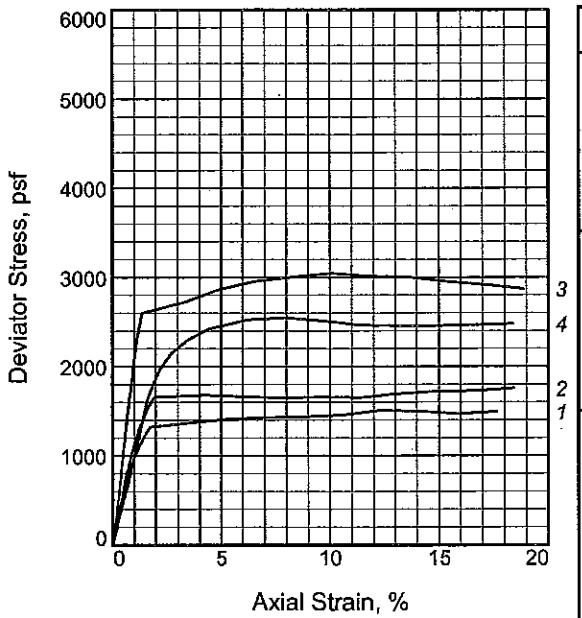
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Pari

Source of Sample: TB-1U **Depth:** 30.2 **Sample Number:** 11C

Project No.: 10-017200 **Figure** _____ **Stantec, Inc.**

Tested By: JC **Checked By:** MJB/JS





Sample No.		1	2	3	4
Initial	Water Content, %	31.1	32.4	30.6	31.7
	Dry Density, pcf	89.9	88.0	91.7	90.0
	Saturation, %	96.0	95.5	98.4	98.0
	Void Ratio	0.8744	0.9148	0.8385	0.8734
	Diameter, in.	1.409	1.406	1.404	1.407
	Height, in.	2.998	3.005	3.005	2.997
At Test	Water Content, %	31.1	32.4	30.6	31.7
	Dry Density, pcf	89.9	88.0	91.7	90.0
	Saturation, %	96.0	95.5	98.4	98.0
	Void Ratio	0.8744	0.9148	0.8385	0.8734
	Diameter, in.	1.409	1.406	1.404	1.407
	Height, in.	2.998	3.005	3.005	2.997
Strain rate, %/min.		1.00	1.00	1.00	1.00
Back Pressure, psi		0.00	0.00	0.00	0.00
Cell Pressure, psi		6.90	13.80	20.70	41.89
Fail. Stress, psf		1322	1658	2597	2546
Strain, %		1.7	1.9	1.3	8.0
Ult. Stress, psf		1322	1658	2597	2455
Strain, %		1.7	1.9	1.3	14.9
σ_1 Failure, psf		2315	3645	5578	8578
σ_3 Failure, psf		994	1987	2981	6032

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: ST GR CL6 W/ ARS ML

LL= 45 **PL=** 21 **PI=** 24
Assumed Specific Gravity= 2.70
Remarks: Torvane=0.35 tsf

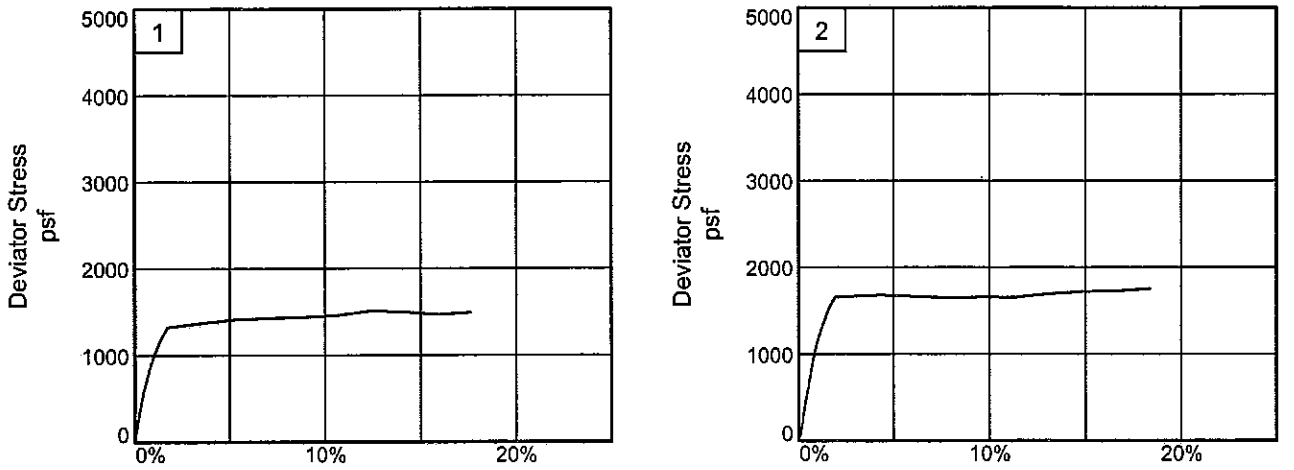
Client: USACE

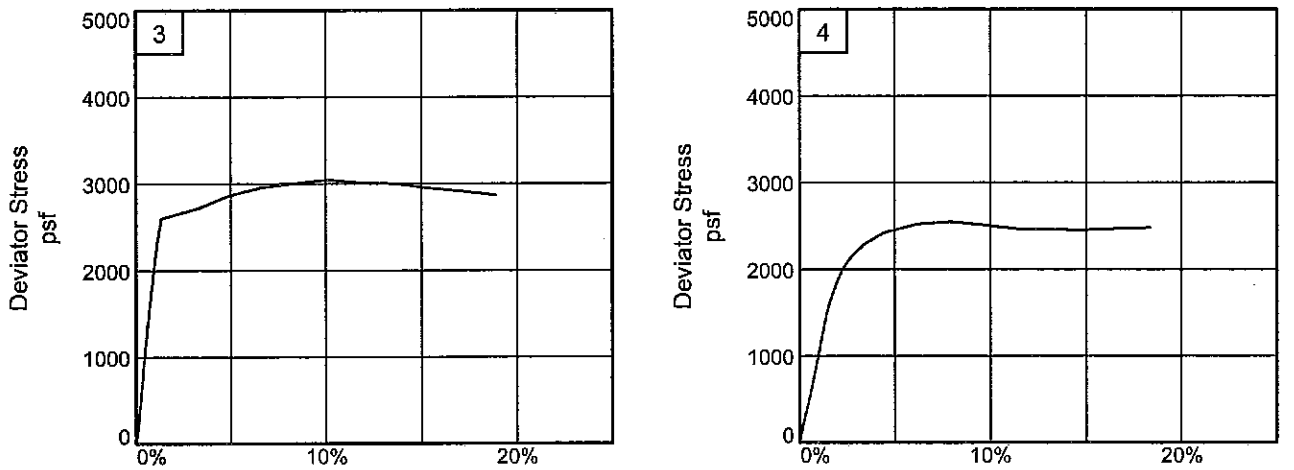
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source of Sample: TB-1U **Depth:** 34.0
Sample Number: 12C
Proj. No.: 10-017200 **Date Sampled:** 8-4-14

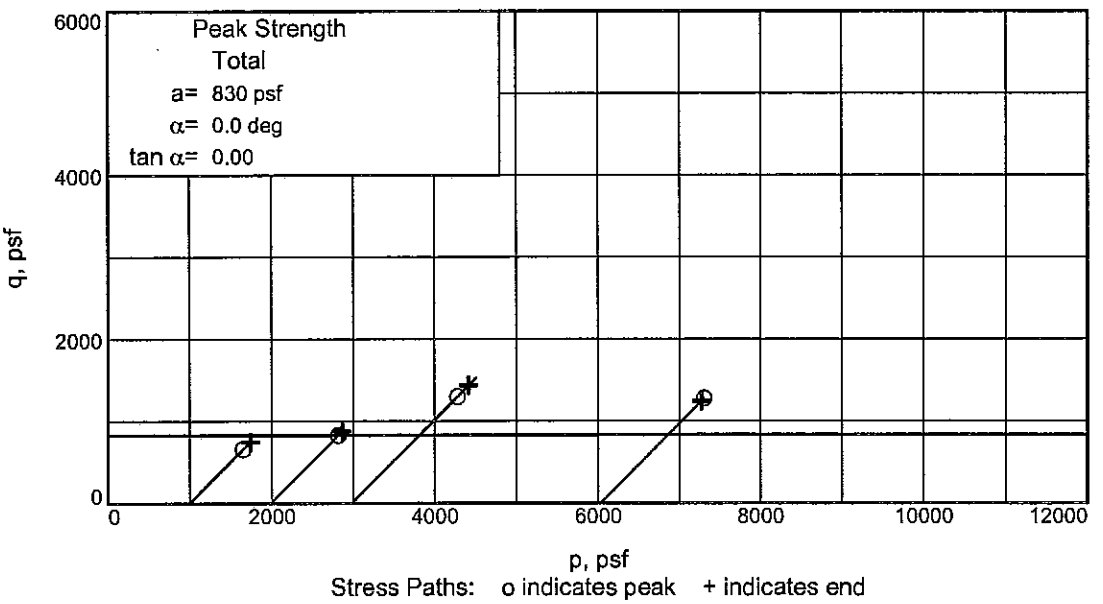
TRIAXIAL SHEAR TEST REPORT
Stantec
Saint Rose, Louisiana

Figure _____

Tested By: JC **Checked By:** MJB/JS







Client: USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Pari

Source of Sample: TB-1U **Depth:** 34.0 **Sample Number:** 12C

Project No.: 10-017200 **Figure** _____ **Stantec, Inc.**

Tested By: JC **Checked By:** MJB/JS

SUMMARY OF LABORATORY TEST RESULTS

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Assigned By: _____

Project Number: 10-017200
Boring: TB-2U Final

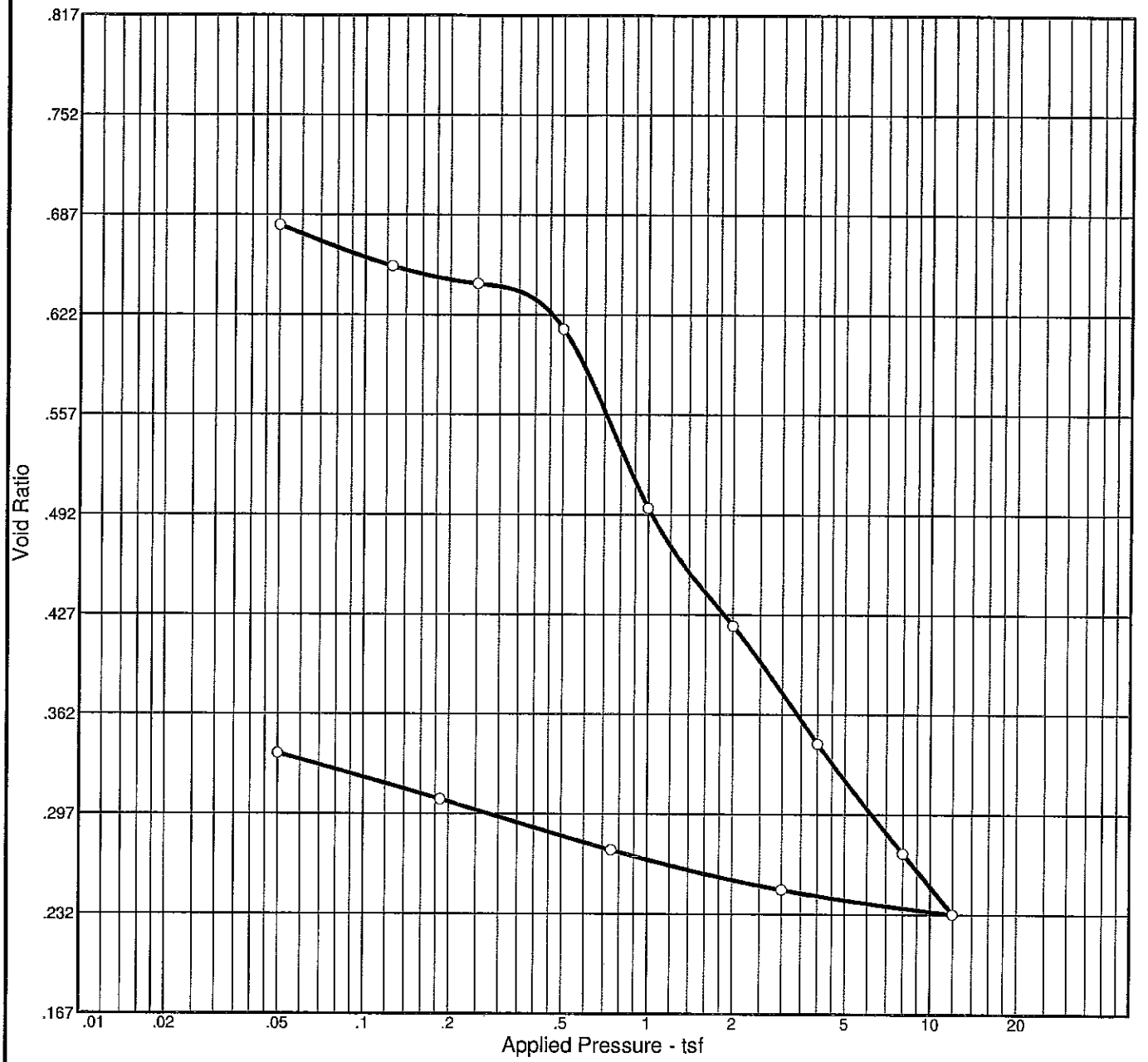
Current Date: 8/26/2014

Sample Number	Depth	Visual Classification	USCS	E(f)	W%	Dry Dens (pcf)	Wet Dens (pcf)	Sat %	Shear Test Type	Angle	Cohesion (psf)	Unconf. Comp. Str.	LL	PL	PI	TORVANE (tsf)	Other Tests
1D	3.2	SO GR & T CL6 W/ ARS ML	CL6		11	98	109	44					48	18	30		GS=2.64, CONS
4C	14.5	SO GR CH3 W/ ARS ML & SM	CH3		44	78	112	100	UU	0	318		55	19	36	0.20	
8D	31.0	M LGR & T CL4 W/ ARS SM	CL4		31	92	121	100	UU	0	669		41	19	22	0.30	
9C	34.5	ST GR CH2 W/ ARS ML	CH2		35	87	117	100	UU	0	1196		54	17	37	0.70	

Remarks: _____
FFEBJV, LLC.

Checked by: _____
File Name: 175561418

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
44.1 %	11.4 %	98.1	48	30	2.64		1.54	0.40	0.04			0.680

MATERIAL DESCRIPTION	USCS	AASHTO
SO GR & T CL6 W/ ARS ML	CL	

Project No. 10-017200 **Client:** USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA

Source: TB-2U **Sample No.:** 1D **Elev./Depth:** 3.2

Remarks:

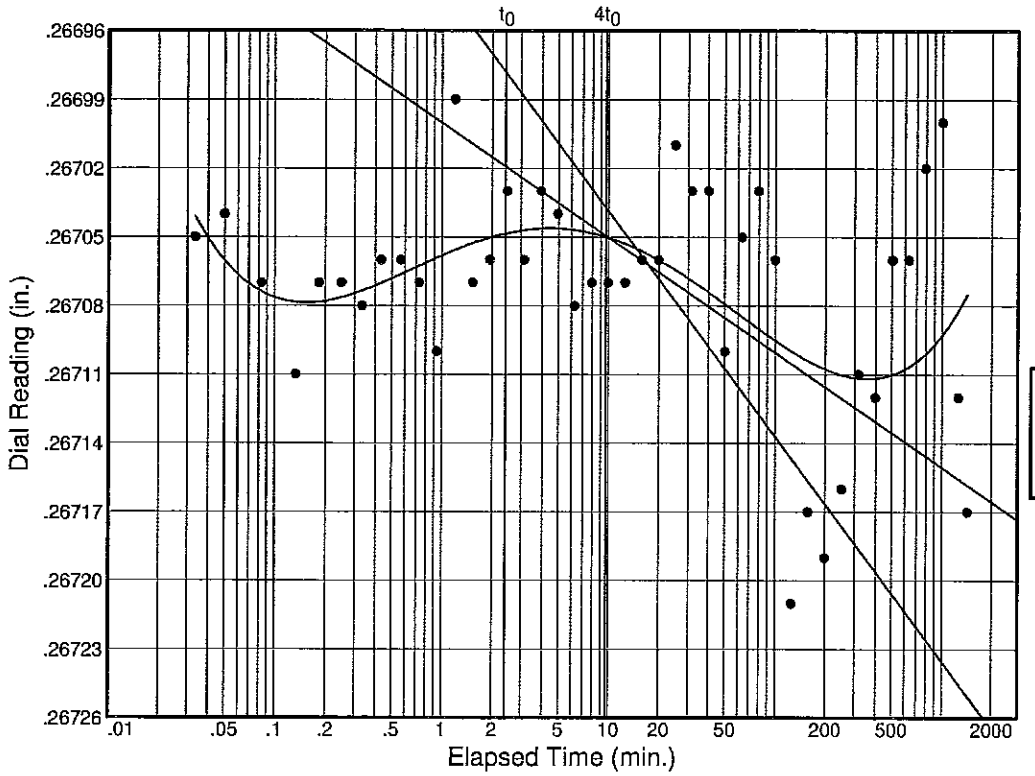
Stantec

Saint Rose, Louisiana

Figure

Dial Reading vs. Time

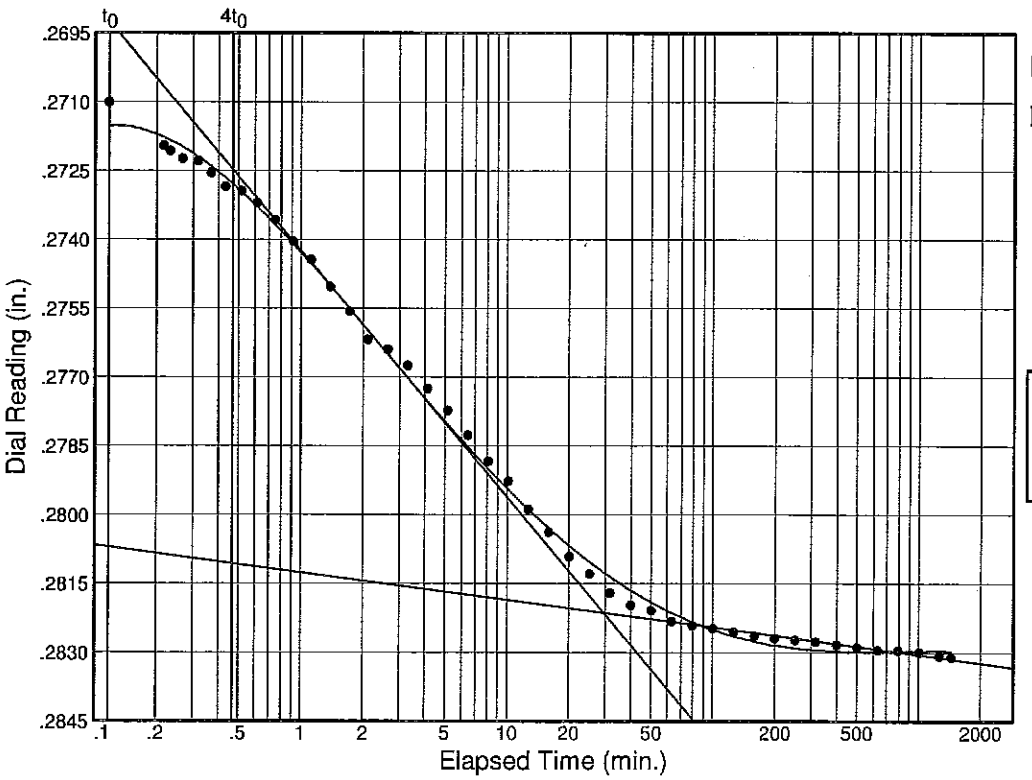
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-2U Sample No.: 1D Elev./Depth: 3.2



Load No.= 1
Load= 0.05 tsf
D_0 = 0.26705
D_{50} = 0.26705
D_{100} = 0.26706
T_{50} = 14.21 min.

C_v @ T_{50}
0.03 ft.^{2}/day

C_α = 0.000



Load No.= 2
Load= 0.13 tsf
D_0 = 0.27026
D_{50} = 0.27620
D_{100} = 0.28214
T_{50} = 2.32 min.

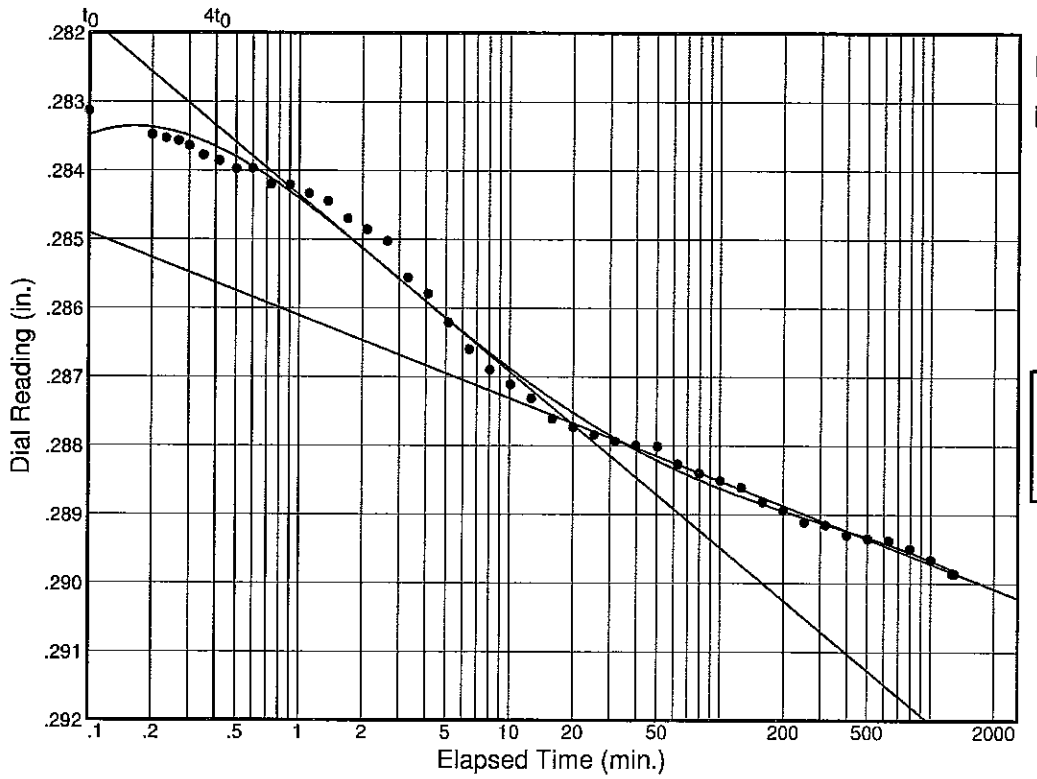
C_v @ T_{50}
0.21 ft.^{2}/day

C_α = 0.001

Figure

Dial Reading vs. Time

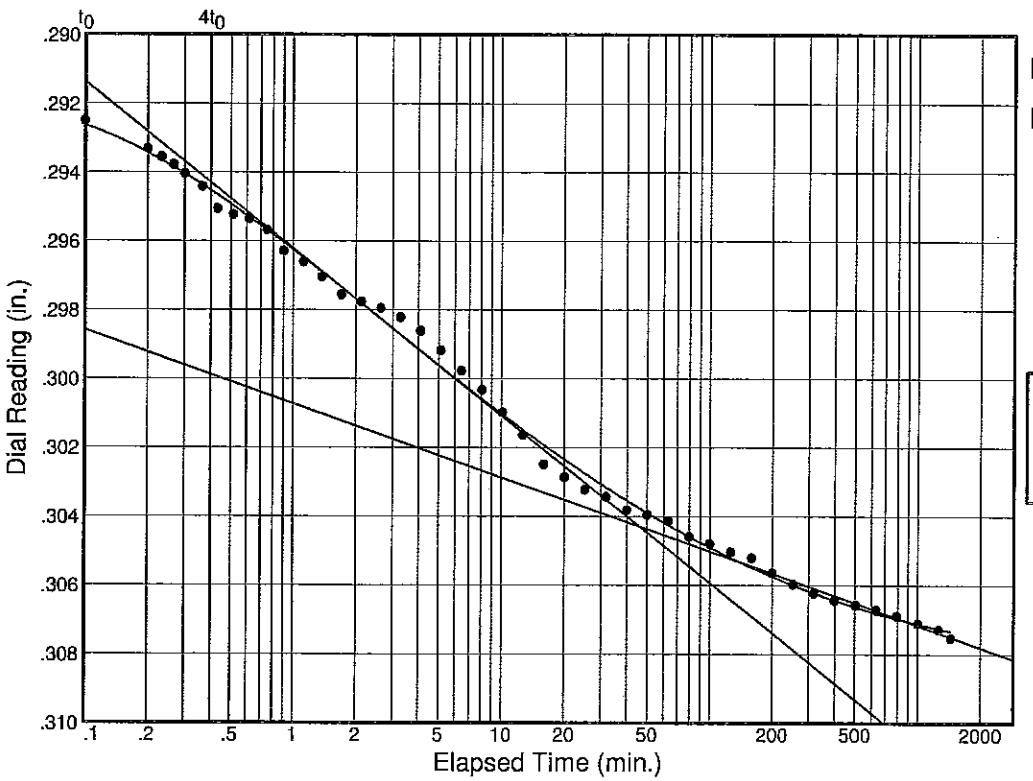
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-2U Sample No.: 1D Elev./Depth: 3.2



Load No.= 3
Load= 0.25 tsf
D_0 = 0.28332
D_{50} = 0.28548
D_{100} = 0.28765
T_{50} = 2.74 min.

C_v @ T_{50}
0.17 ft.^{2}/day

C_α = 0.001



Load No.= 4
Load= 0.50 tsf
D_0 = 0.29074
D_{50} = 0.29752
D_{100} = 0.30429
T_{50} = 1.85 min.

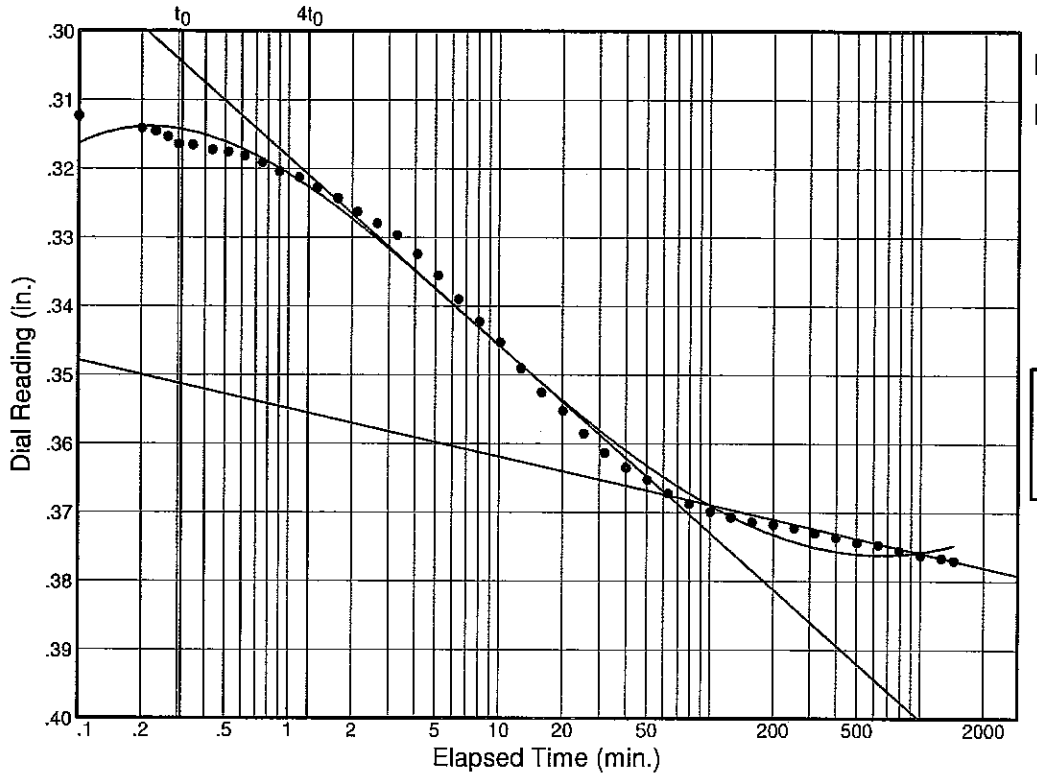
C_v @ T_{50}
0.25 ft.^{2}/day

C_α = 0.002

Figure

Dial Reading vs. Time

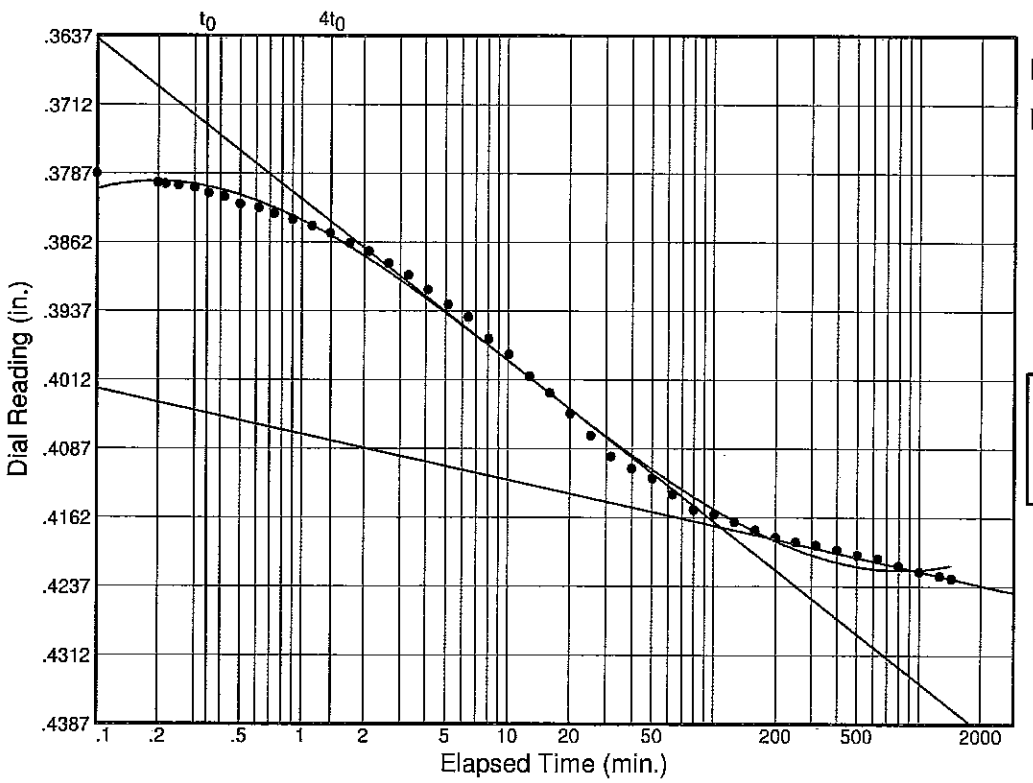
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-2U Sample No.: 1D Elev./Depth: 3.2



Load No.= 5
Load= 1.00 tsf
D_0 = 0.30595
D_{50} = 0.33673
D_{100} = 0.36750
T_{50} = 4.67 min.

C_v @ T_{50}
0.09 ft.^{2}/day

C_α = 0.007



Load No.= 6
Load= 2.00 tsf
D_0 = 0.37472
D_{50} = 0.39598
D_{100} = 0.41724
T_{50} = 6.62 min.

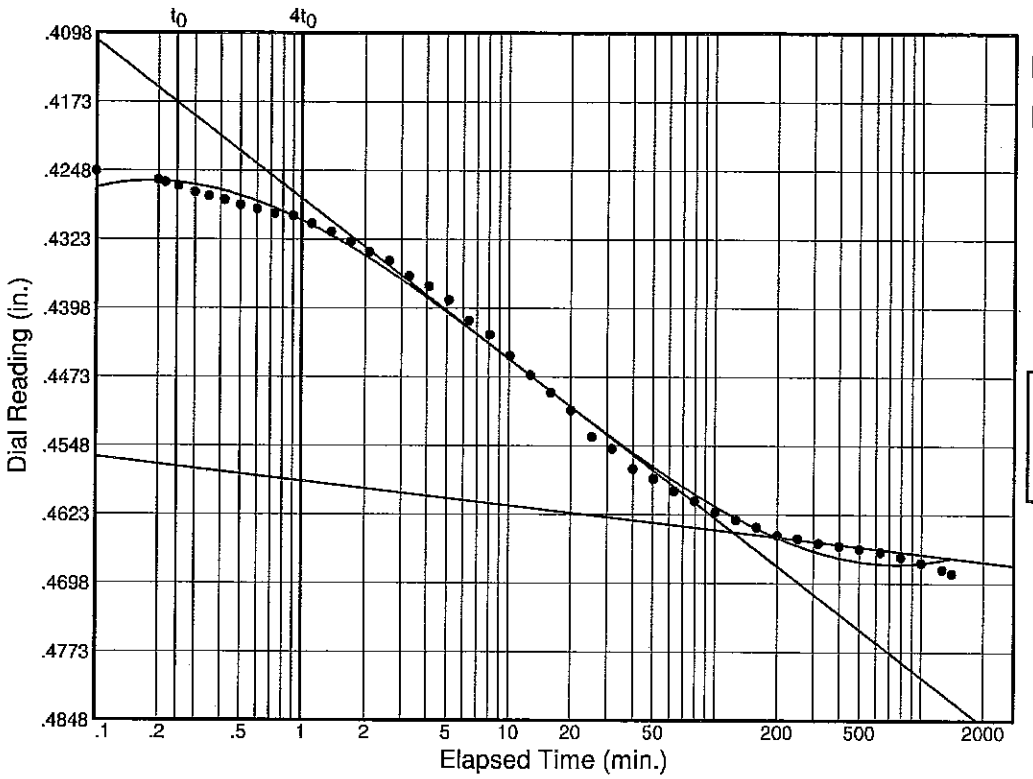
C_v @ T_{50}
0.06 ft.^{2}/day

C_α = 0.006

Figure

Dial Reading vs. Time

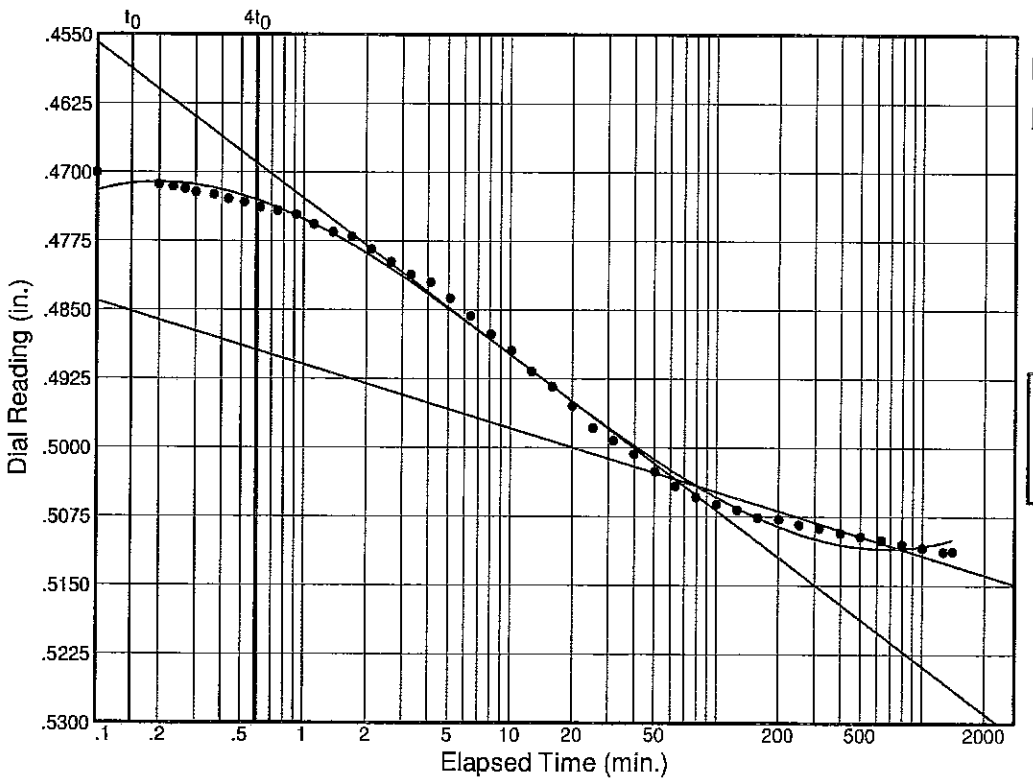
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-2U Sample No.: 1D Elev./Depth: 3.2



Load No.= 7
Load= 4.00 tsf
D_0 = 0.42195
D_{50} = 0.44307
D_{100} = 0.46419
T_{50} = 7.39 min.

C_v @ T_{50}
0.05 ft.^{2}/day

C_α = 0.003



Load No.= 8
Load= 8.00 tsf
D_0 = 0.46955
D_{50} = 0.48649
D_{100} = 0.50343
T_{50} = 6.31 min.

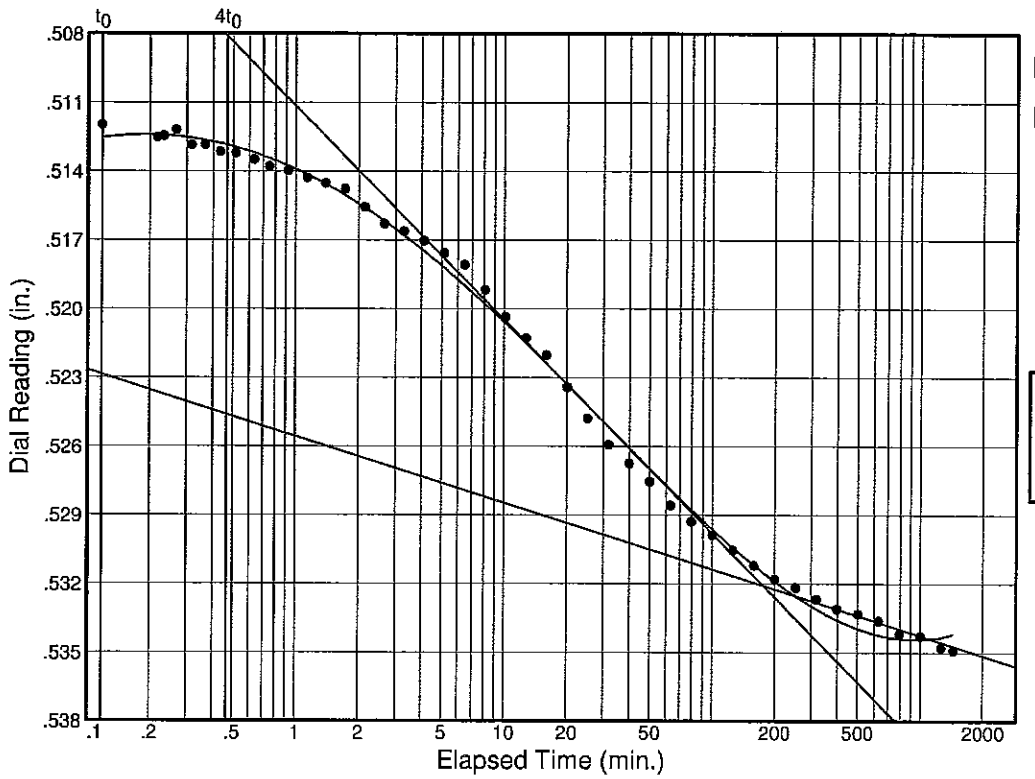
C_v @ T_{50}
0.05 ft.^{2}/day

C_α = 0.009

Figure

Dial Reading vs. Time

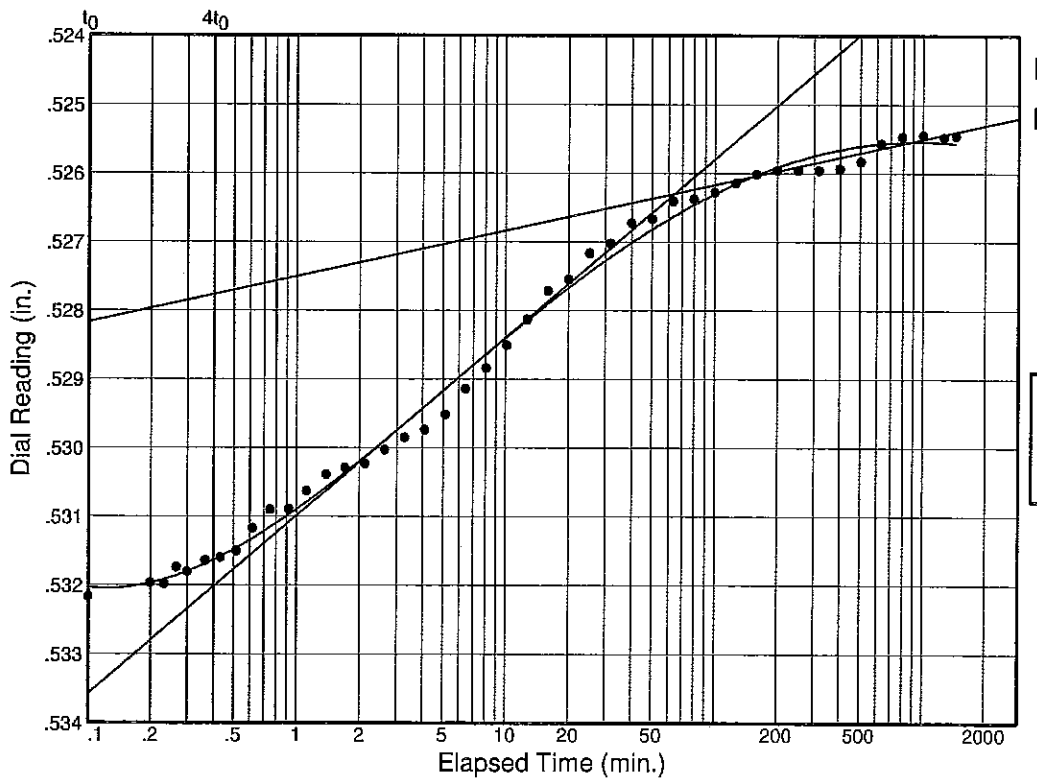
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-2U Sample No.: 1D Elev./Depth: 3.2



Load No.= 9
Load= 12.00 tsf
D_0 = 0.51224
D_{50} = 0.52215
D_{100} = 0.53207
T_{50} = 15.03 min.

C_v @ T_{50}
0.02 ft.^{2}/day

C_α = 0.004



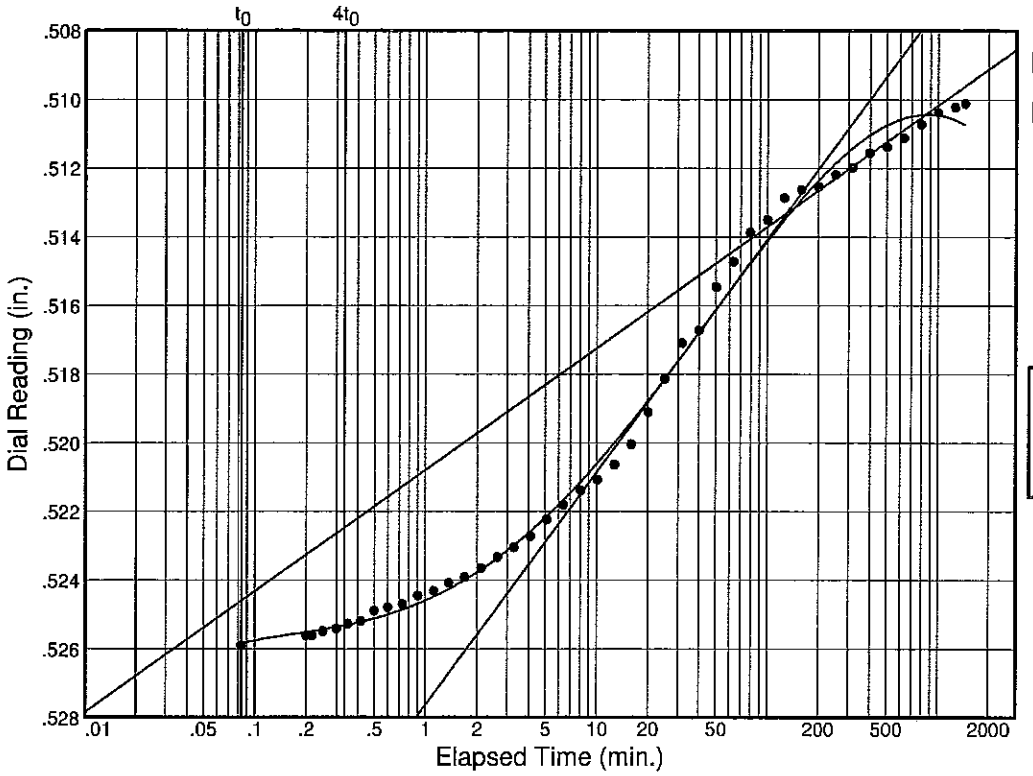
Load No.= 10
Load= 3.00 tsf
D_0 = 0.53243
D_{50} = 0.52936
D_{100} = 0.52630
T_{50} = 4.22 min.

C_v @ T_{50}
0.06 ft.^{2}/day

Figure

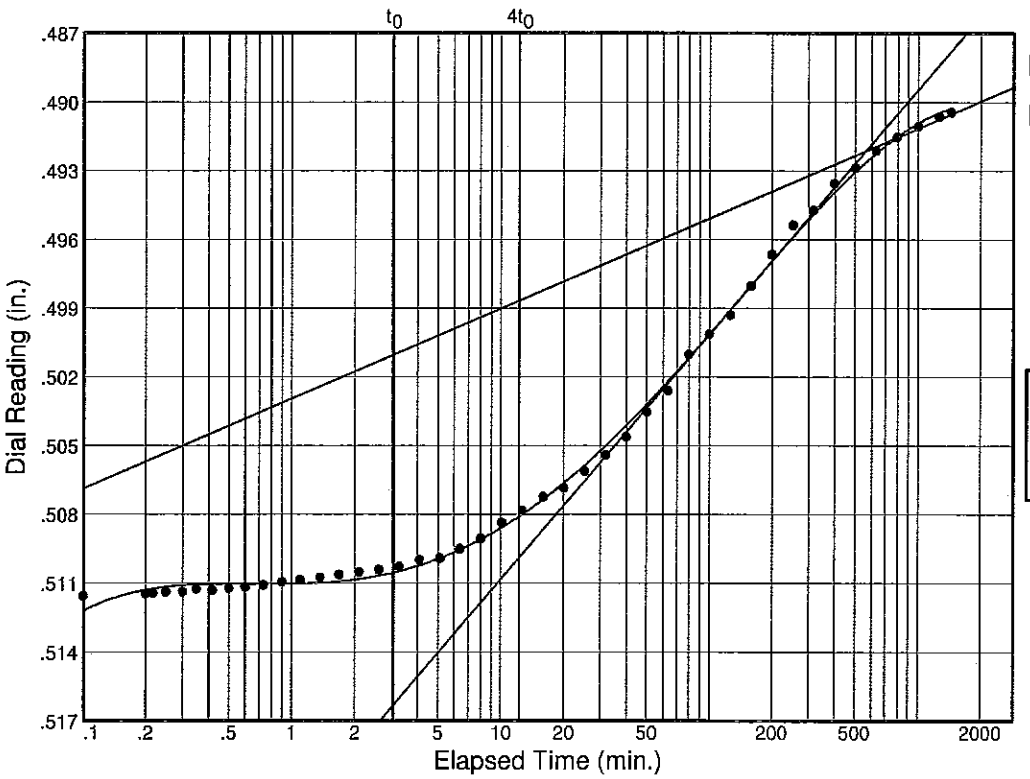
Dial Reading vs. Time

Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-2U Sample No.: 1D Elev./Depth: 3.2



Load No.= 11
Load= 0.75 tsf
D_0 = 0.52634
D_{50} = 0.51982
D_{100} = 0.51331
T_{50} = 13.57 min.

C_v @ T_{50}
0.02 ft.^{2}/day



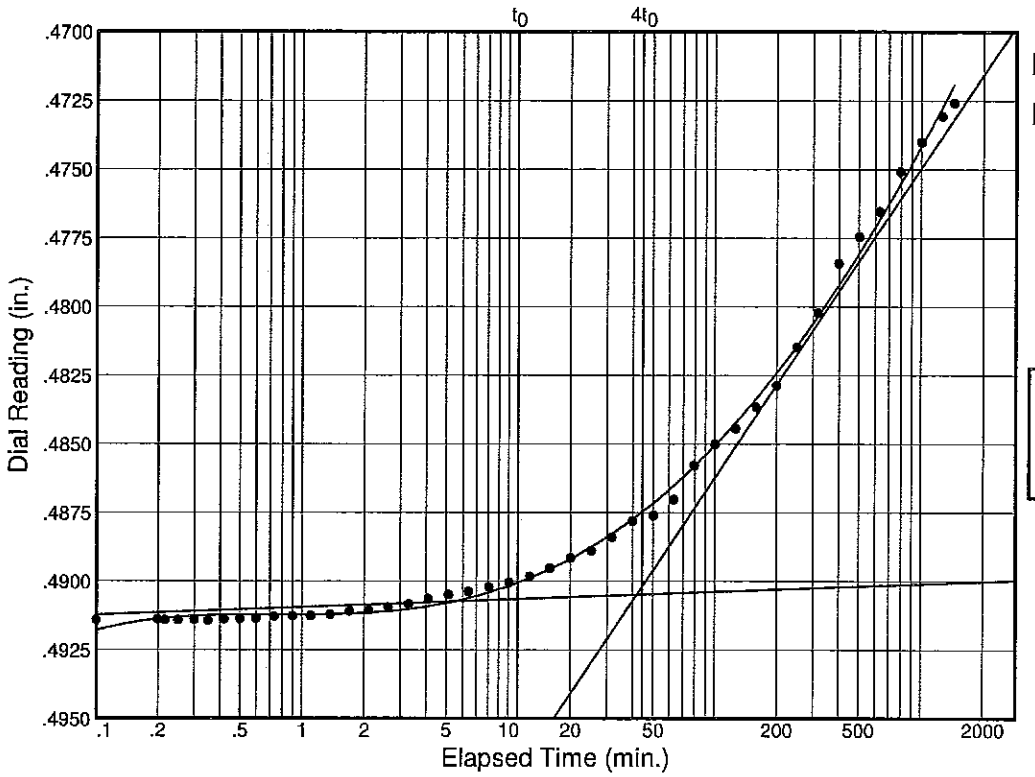
Load No.= 12
Load= 0.19 tsf
D_0 = 0.51298
D_{50} = 0.50257
D_{100} = 0.49216
T_{50} = 57.95 min.

C_v @ T_{50}
0.01 ft.^{2}/day

Figure

Dial Reading vs. Time

Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-2U Sample No.: 1D Elev./Depth: 3.2



Load No.= 13
Load= 0.05 tsf
D_0 = 0.49264
D_{50} = 0.49156
D_{100} = 0.49049
T_{50} = 0.14 min.

C_v @ T_{50}
2.26 ft.^{2}/day

CONSOLIDATION TEST DATA

Client: USACE
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Project Number: 10-017200

Sample Data

Source: TB-2U
Sample No.: 1D
Depth: 3.2 **Sample Length(in./cm.):**
Location:
Description: SO GR & T CL6 W/ ARS ML
Liquid Limit: 48 **Plasticity Index:** 30
USCS: CL **AASHTO:** **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 161.12 g.	**Consolidometer #** = 1	**Wet w+t** = 340.48 g.
Dry w+t = 147.90 g.		**Dry w+t** = 267.77 g.
Tare Wt. = 31.62 g.	**Spec. Gravity** = 2.64	**Tare Wt.** = 15.70 g.
Height = 1.00 in.	**Height** = 1.00 in.	
Diameter = 4.00 in.	**Diameter** = 4.00 in.	
Weight = 361.00 g.	**Defl. Table** = n/a	
Moisture = 11.4 %	**Ht. Solids** = 0.5974 in.	**Moisture** = 28.8 %
Wet Den. = 109.2 pcf	**Dry Wt.** = 324.15 g.*	**Dry Wt.** = 252.07 g.
Dry Den. = 98.1 pcf	**Void Ratio** = 0.680	**Void Ratio** = 0.336
	Saturation = 44.1 %	

*** Initial dry weight used in calculations**

End-of-Load Summary

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	0.26701				0.680	
0.05	0.26717	0.00000	0.03	0.000	0.680	0.0 Comprs.
0.13	0.28311	0.00000	0.21	0.001	0.654	1.6 Comprs.
0.25	0.28986	0.00000	0.17	0.001	0.642	2.3 Comprs.
0.50	0.30753	0.00000	0.25	0.002	0.613	4.0 Comprs.
1.00	0.37705	0.00000	0.09	0.007	0.496	11.0 Comprs.
2.00	0.42283	0.00000	0.06	0.006	0.420	15.5 Comprs.
4.00	0.46872	0.00000	0.05	0.003	0.343	20.1 Comprs.
8.00	0.51129	0.00000	0.05	0.009	0.272	24.3 Comprs.
12.00	0.53492	0.00000	0.02	0.004	0.232	26.7 Comprs.
3.00	0.52546	0.00000	0.06		0.248	25.7 Comprs.
0.75	0.51012	0.00000	0.02		0.274	24.2 Comprs.
0.19	0.49044	0.00000	0.01		0.307	22.3 Comprs.
0.05	0.47259	0.00000	2.26		0.336	20.5 Comprs.

C_c = 0.40 P_c = 1.54 tsf C_r = 0.04

Pressure: 0.05 tsf — **TEST READINGS** — **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.26701	16	2.47	0.26703	31	79.40	0.26703
2	0.03	0.26705	17	3.12	0.26706	32	99.97	0.26706
3	0.05	0.26704	18	3.93	0.26703	33	125.85	0.26721
4	0.08	0.26707	19	4.97	0.26704	34	158.45	0.26717
5	0.13	0.26711	20	6.27	0.26708	35	199.50	0.26719
6	0.18	0.26707	21	7.90	0.26707	36	251.15	0.26716
7	0.25	0.26707	22	9.95	0.26707	37	316.20	0.26711
8	0.33	0.26708	23	12.55	0.26707	38	398.08	0.26712
9	0.43	0.26706	24	15.80	0.26706	39	501.15	0.26706
10	0.57	0.26706	25	19.92	0.26706	40	630.93	0.26706
11	0.73	0.26707	26	25.08	0.26701	41	794.30	0.26702
12	0.93	0.26710	27	31.58	0.26703	42	999.98	0.26700
13	1.20	0.26699	28	39.77	0.26703	43	1258.90	0.26712
14	1.53	0.26707	29	50.08	0.26710	44	1429.10	0.26717
15	1.93	0.26706	30	63.05	0.26705			

Void Ratio = 0.680 **Compression** = 0.0 %
D_0 = 0.26705 D_{50} = 0.26705 D_{100} = 0.26706
C_v **at 14.2 min.** = 0.03 ft.^{2}/day C_α = 0.000

Pressure: 0.13 tsf — **TEST READINGS** — **Load No. 2**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.26578	16	2.12	0.27618	31	63.23	0.28233
2	0.12	0.27101	17	2.63	0.27640	32	79.58	0.28242
3	0.22	0.27196	18	3.28	0.27675	33	100.15	0.28248
4	0.23	0.27207	19	4.12	0.27725	34	126.05	0.28256
5	0.27	0.27224	20	5.15	0.27773	35	158.65	0.28265
6	0.32	0.27229	21	6.45	0.27827	36	199.68	0.28270
7	0.37	0.27255	22	8.08	0.27884	37	251.35	0.28273
8	0.43	0.27285	23	10.13	0.27927	38	316.38	0.28277
9	0.52	0.27294	24	12.73	0.27989	39	398.27	0.28284
10	0.62	0.27321	25	15.98	0.28038	40	501.35	0.28289
11	0.75	0.27358	26	20.10	0.28092	41	631.12	0.28295
12	0.92	0.27405	27	25.27	0.28130	42	794.48	0.28296
13	1.12	0.27444	28	31.77	0.28171	43	1000.17	0.28300
14	1.38	0.27503	29	39.95	0.28198	44	1259.08	0.28308
15	1.72	0.27557	30	50.27	0.28209	45	1440.10	0.28311

Void Ratio = 0.654 **Compression** = 1.6 %
D_0 = 0.27026 D_{50} = 0.27620 D_{100} = 0.28214
C_v **at 2.3 min.** = 0.21 ft.^{2}/day C_α = 0.001

Pressure: 0.25 tsf **TEST READINGS** **Load No. 3**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.28052	16	2.10	0.28486	31	63.23	0.28827
2	0.10	0.28313	17	2.62	0.28503	32	79.57	0.28840
3	0.20	0.28348	18	3.28	0.28556	33	100.13	0.28851
4	0.23	0.28353	19	4.10	0.28579	34	126.03	0.28861
5	0.27	0.28357	20	5.13	0.28621	35	158.63	0.28882
6	0.30	0.28364	21	6.43	0.28660	36	199.67	0.28894
7	0.35	0.28378	22	8.07	0.28690	37	251.33	0.28911
8	0.42	0.28386	23	10.12	0.28711	38	316.38	0.28915
9	0.50	0.28398	24	12.72	0.28731	39	398.25	0.28930
10	0.60	0.28397	25	15.98	0.28761	40	501.33	0.28935
11	0.73	0.28420	26	20.08	0.28773	41	631.12	0.28938
12	0.90	0.28421	27	25.25	0.28784	42	794.48	0.28950
13	1.12	0.28434	28	31.77	0.28794	43	1000.15	0.28966
14	1.37	0.28445	29	39.95	0.28800	44	1259.08	0.28985
15	1.70	0.28470	30	50.25	0.28801	45	1294.65	0.28986

Void Ratio = 0.642 **Compression** = 2.3 %
D_0 = 0.28332 D_{50} = 0.28548 D_{100} = 0.28765
C_v **at 2.7 min.** = 0.17 ft.^{2}/day C_α = 0.001

Pressure: 0.50 tsf **TEST READINGS** **Load No. 4**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.28791	16	2.12	0.29776	31	63.25	0.30414
2	0.10	0.29251	17	2.63	0.29795	32	79.58	0.30459
3	0.20	0.29332	18	3.28	0.29822	33	100.15	0.30480
4	0.23	0.29356	19	4.10	0.29861	34	126.05	0.30504
5	0.27	0.29379	20	5.13	0.29918	35	158.65	0.30521
6	0.30	0.29405	21	6.43	0.29977	36	199.68	0.30564
7	0.37	0.29442	22	8.07	0.30033	37	251.35	0.30597
8	0.43	0.29506	23	10.13	0.30097	38	316.38	0.30623
9	0.52	0.29523	24	12.72	0.30164	39	398.27	0.30644
10	0.62	0.29537	25	15.98	0.30249	40	501.35	0.30657
11	0.75	0.29568	26	20.08	0.30287	41	631.12	0.30671
12	0.90	0.29629	27	25.25	0.30323	42	794.50	0.30689
13	1.12	0.29661	28	31.77	0.30343	43	1000.17	0.30710
14	1.37	0.29704	29	39.95	0.30382	44	1259.10	0.30728
15	1.70	0.29756	30	50.27	0.30395	45	1440.35	0.30753

Void Ratio = 0.613 **Compression** = 4.0 %
D_0 = 0.29074 D_{50} = 0.29752 D_{100} = 0.30429
C_v **at 1.8 min.** = 0.25 ft.^{2}/day C_α = 0.002

Pressure: 1.00 tsf **TEST READINGS** **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.30447	16	2.12	0.32629	31	63.23	0.36722
2	0.10	0.31235	17	2.63	0.32798	32	79.57	0.36873
3	0.20	0.31418	18	3.28	0.32970	33	100.13	0.36990
4	0.23	0.31459	19	4.10	0.33244	34	126.03	0.37069
5	0.27	0.31541	20	5.13	0.33553	35	158.63	0.37138
6	0.30	0.31647	21	6.43	0.33900	36	199.67	0.37177
7	0.35	0.31658	22	8.07	0.34227	37	251.33	0.37227
8	0.43	0.31726	23	10.13	0.34526	38	316.37	0.37299
9	0.52	0.31761	24	12.72	0.34906	39	398.25	0.37360
10	0.62	0.31823	25	15.98	0.35254	40	501.33	0.37436
11	0.75	0.31915	26	20.08	0.35523	41	631.10	0.37471
12	0.90	0.32041	27	25.25	0.35856	42	794.48	0.37560
13	1.12	0.32133	28	31.75	0.36138	43	1000.15	0.37623
14	1.37	0.32277	29	39.95	0.36347	44	1259.08	0.37664
15	1.70	0.32431	30	50.25	0.36527	45	1440.32	0.37705

Void Ratio = 0.496 **Compression** = 11.0 %
D_0 = 0.30595 D_{50} = 0.33673 D_{100} = 0.36750
C_v **at 4.7 min.** = 0.09 ft.^{2}/day C_α = 0.007

Pressure: 2.00 tsf **TEST READINGS** **Load No. 6**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.37304	16	2.12	0.38721	31	63.23	0.41368
2	0.10	0.37872	17	2.63	0.38852	32	79.57	0.41535
3	0.20	0.37973	18	3.28	0.38980	33	100.15	0.41584
4	0.22	0.37984	19	4.10	0.39139	34	126.03	0.41671
5	0.25	0.37998	20	5.13	0.39302	35	158.63	0.41757
6	0.30	0.38024	21	6.43	0.39435	36	199.67	0.41835
7	0.35	0.38085	22	8.07	0.39676	37	251.33	0.41887
8	0.42	0.38126	23	10.13	0.39843	38	316.38	0.41921
9	0.50	0.38208	24	12.72	0.40080	39	398.25	0.41974
10	0.62	0.38244	25	15.98	0.40263	40	501.33	0.42029
11	0.73	0.38310	26	20.08	0.40490	41	631.12	0.42067
12	0.90	0.38374	27	25.25	0.40726	42	794.48	0.42145
13	1.12	0.38444	28	31.75	0.40956	43	1000.15	0.42208
14	1.37	0.38520	29	39.95	0.41089	44	1259.08	0.42254
15	1.70	0.38631	30	50.25	0.41194	45	1440.00	0.42283

Void Ratio = 0.420 **Compression** = 15.5 %
D_0 = 0.37472 D_{50} = 0.39598 D_{100} = 0.41724
C_v **at 6.6 min.** = 0.06 ft.^{2}/day C_α = 0.006

Pressure: 4.00 tsf **TEST READINGS** **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.41737	16	2.10	0.43368	31	63.23	0.45973
2	0.10	0.42487	17	2.62	0.43466	32	79.57	0.46083
3	0.20	0.42586	18	3.27	0.43631	33	100.13	0.46198
4	0.22	0.42608	19	4.10	0.43744	34	126.03	0.46291
5	0.25	0.42650	20	5.12	0.43893	35	158.63	0.46368
6	0.30	0.42717	21	6.42	0.44118	36	199.67	0.46457
7	0.35	0.42760	22	8.07	0.44270	37	251.33	0.46495
8	0.42	0.42802	23	10.12	0.44500	38	316.37	0.46541
9	0.50	0.42858	24	12.72	0.44712	39	398.25	0.46574
10	0.60	0.42900	25	15.97	0.44900	40	501.33	0.46607
11	0.73	0.42951	26	20.08	0.45095	41	631.10	0.46638
12	0.90	0.42976	27	25.25	0.45383	42	794.47	0.46695
13	1.10	0.43061	28	31.75	0.45511	43	1000.15	0.46757
14	1.37	0.43151	29	39.93	0.45736	44	1259.07	0.46828
15	1.70	0.43261	30	50.25	0.45838	45	1402.55	0.46872

Void Ratio = 0.343 **Compression** = 20.1 %
D_0 = 0.42195 D_{50} = 0.44307 D_{100} = 0.46419
C_v **at 7.4 min.** = 0.05 ft.^{2}/day C_α = 0.003

Pressure: 8.00 tsf **TEST READINGS** **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.46022	16	2.12	0.47841	31	63.23	0.50421
2	0.10	0.47009	17	2.63	0.47980	32	79.58	0.50542
3	0.20	0.47134	18	3.28	0.48117	33	100.15	0.50619
4	0.23	0.47158	19	4.12	0.48201	34	126.03	0.50680
5	0.27	0.47184	20	5.13	0.48378	35	158.63	0.50762
6	0.30	0.47221	21	6.43	0.48569	36	199.68	0.50780
7	0.37	0.47247	22	8.07	0.48767	37	251.33	0.50838
8	0.43	0.47293	23	10.13	0.48944	38	316.38	0.50877
9	0.52	0.47329	24	12.72	0.49170	39	398.27	0.50927
10	0.62	0.47386	25	15.98	0.49335	40	501.35	0.50968
11	0.75	0.47423	26	20.08	0.49547	41	631.12	0.51005
12	0.92	0.47464	27	25.25	0.49788	42	794.48	0.51051
13	1.12	0.47571	28	31.77	0.49926	43	1000.17	0.51090
14	1.38	0.47653	29	39.95	0.50073	44	1259.08	0.51132
15	1.70	0.47703	30	50.27	0.50262	45	1397.98	0.51129

Void Ratio = 0.272 **Compression** = 24.3 %
D_0 = 0.46955 D_{50} = 0.48649 D_{100} = 0.50343
C_v **at 6.3 min.** = 0.05 ft.^{2}/day C_α = 0.009

Pressure: 12.00 tsf **TEST READINGS** **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.50403	16	2.13	0.51556	31	63.25	0.52858
2	0.12	0.51198	17	2.65	0.51631	32	79.58	0.52928
3	0.22	0.51252	18	3.30	0.51663	33	100.17	0.52987
4	0.23	0.51247	19	4.12	0.51704	34	126.05	0.53055
5	0.27	0.51221	20	5.15	0.51758	35	158.65	0.53121
6	0.32	0.51286	21	6.45	0.51809	36	199.68	0.53180
7	0.37	0.51284	22	8.08	0.51919	37	251.35	0.53217
8	0.43	0.51316	23	10.15	0.52035	38	316.40	0.53268
9	0.52	0.51321	24	12.73	0.52128	39	398.27	0.53310
10	0.63	0.51349	25	16.00	0.52203	40	501.35	0.53332
11	0.75	0.51380	26	20.10	0.52343	41	631.13	0.53362
12	0.92	0.51399	27	25.27	0.52478	42	794.50	0.53419
13	1.13	0.51430	28	31.78	0.52593	43	1000.17	0.53429
14	1.38	0.51453	29	39.97	0.52675	44	1259.10	0.53479
15	1.72	0.51478	30	50.27	0.52754	45	1440.33	0.53492

Void Ratio = 0.232 **Compression** = 26.7 %
D_0 = 0.51224 D_{50} = 0.52215 D_{100} = 0.53207
C_v **at 15.0 min.** = 0.02 ft.^{2}/day C_α = 0.004

Pressure: 3.00 tsf **TEST READINGS** **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.55069	16	2.12	0.53023	31	63.23	0.52641
2	0.10	0.53217	17	2.63	0.53003	32	79.57	0.52638
3	0.20	0.53197	18	3.28	0.52985	33	100.13	0.52628
4	0.23	0.53198	19	4.10	0.52974	34	126.03	0.52615
5	0.27	0.53174	20	5.13	0.52952	35	158.63	0.52602
6	0.30	0.53180	21	6.43	0.52914	36	199.67	0.52596
7	0.37	0.53164	22	8.07	0.52884	37	251.33	0.52596
8	0.43	0.53160	23	10.13	0.52851	38	316.37	0.52596
9	0.52	0.53150	24	12.72	0.52813	39	398.25	0.52594
10	0.62	0.53117	25	15.98	0.52772	40	501.33	0.52583
11	0.75	0.53090	26	20.08	0.52755	41	631.10	0.52557
12	0.92	0.53089	27	25.25	0.52717	42	794.48	0.52547
13	1.12	0.53063	28	31.75	0.52703	43	1000.15	0.52545
14	1.38	0.53039	29	39.95	0.52673	44	1259.08	0.52548
15	1.70	0.53029	30	50.25	0.52667	45	1440.12	0.52546

Void Ratio = 0.248 **Compression** = 25.7 %
D_0 = 0.53243 D_{50} = 0.52936 D_{100} = 0.52630
C_v **at 4.2 min.** = 0.06 ft.^{2}/day

Pressure: 0.75 tsf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.53159	16	2.12	0.52365	31	63.23	0.51473
2	0.08	0.52590	17	2.63	0.52333	32	79.57	0.51388
3	0.20	0.52561	18	3.28	0.52305	33	100.13	0.51351
4	0.22	0.52561	19	4.10	0.52272	34	126.03	0.51287
5	0.25	0.52550	20	5.13	0.52223	35	158.63	0.51263
6	0.30	0.52542	21	6.43	0.52181	36	199.67	0.51254
7	0.35	0.52527	22	8.07	0.52139	37	251.33	0.51219
8	0.42	0.52519	23	10.13	0.52107	38	316.37	0.51199
9	0.50	0.52490	24	12.72	0.52063	39	398.25	0.51156
10	0.60	0.52480	25	15.98	0.52004	40	501.33	0.51138
11	0.73	0.52470	26	20.08	0.51911	41	631.10	0.51112
12	0.90	0.52446	27	25.25	0.51814	42	794.48	0.51073
13	1.12	0.52431	28	31.75	0.51710	43	1000.15	0.51038
14	1.37	0.52408	29	39.95	0.51672	44	1259.08	0.51023
15	1.70	0.52392	30	50.25	0.51547	45	1440.07	0.51012

Void Ratio = 0.274 **Compression =** 24.2 %
D_0 = 0.52634 D_{50} = 0.51982 D_{100} = 0.51331
C_v **at 13.6 min.** = 0.02 ft.^{2}/day

Pressure: 0.19 tsf **TEST READINGS** **Load No. 12**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.51397	16	2.10	0.51052	31	63.22	0.50260
2	0.10	0.51157	17	2.62	0.51041	32	79.55	0.50103
3	0.20	0.51147	18	3.27	0.51027	33	100.13	0.50014
4	0.22	0.51143	19	4.08	0.50999	34	126.02	0.49930
5	0.25	0.51139	20	5.12	0.50991	35	158.62	0.49803
6	0.30	0.51137	21	6.42	0.50950	36	199.67	0.49667
7	0.35	0.51126	22	8.05	0.50904	37	251.32	0.49538
8	0.42	0.51131	23	10.12	0.50836	38	316.37	0.49473
9	0.50	0.51122	24	12.70	0.50783	39	398.25	0.49356
10	0.60	0.51116	25	15.97	0.50723	40	501.32	0.49287
11	0.73	0.51108	26	20.07	0.50684	41	631.10	0.49212
12	0.90	0.51096	27	25.23	0.50613	42	794.47	0.49153
13	1.10	0.51086	28	31.75	0.50541	43	1000.13	0.49106
14	1.37	0.51075	29	39.93	0.50462	44	1259.07	0.49065
15	1.68	0.51064	30	50.23	0.50353	45	1440.45	0.49044

Void Ratio = 0.307 **Compression =** 22.3 %
D_0 = 0.51298 D_{50} = 0.50257 D_{100} = 0.49216
C_v **at 58.0 min.** = 0.01 ft.^{2}/day

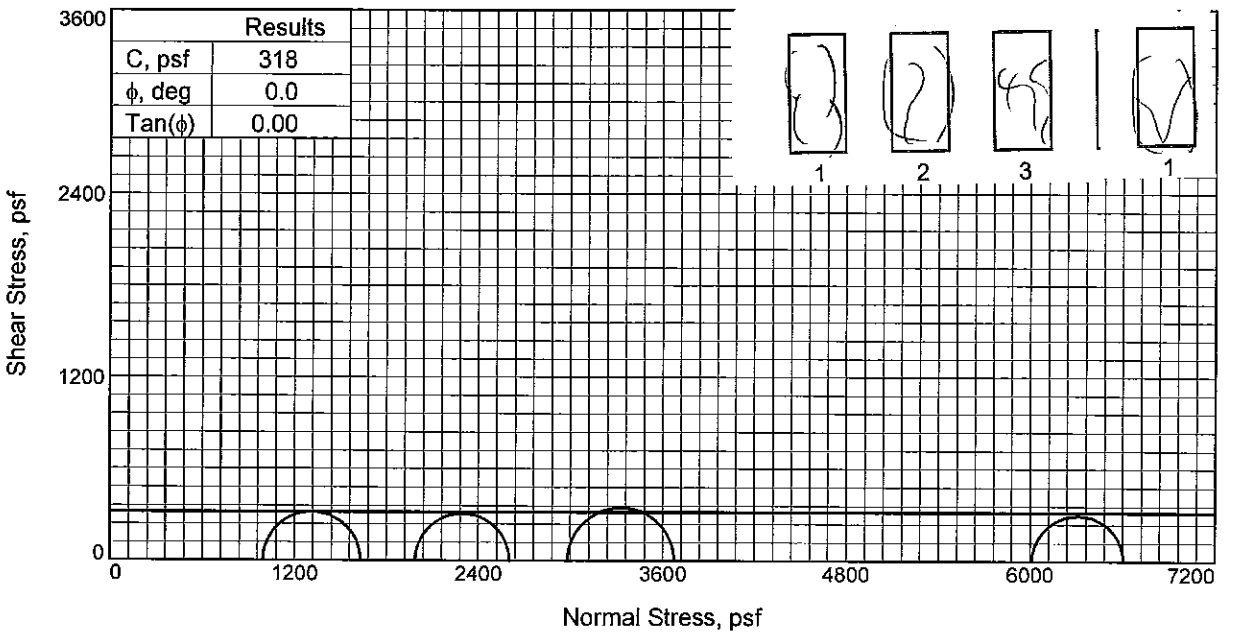
Pressure: 0.05 tsf **TEST READINGS** **Load No. 13**

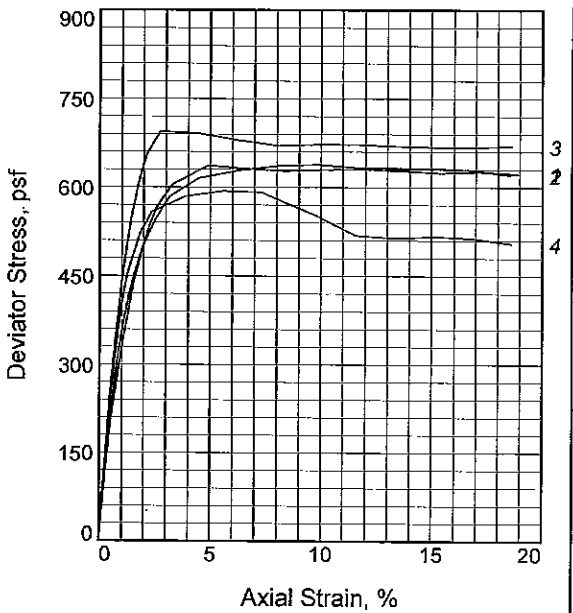
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.49243	16	2.10	0.49105	31	63.22	0.48703
2	0.10	0.49141	17	2.62	0.49095	32	79.57	0.48578
3	0.20	0.49139	18	3.28	0.49084	33	100.13	0.48501
4	0.22	0.49141	19	4.10	0.49064	34	126.03	0.48444
5	0.25	0.49141	20	5.13	0.49049	35	158.63	0.48366
6	0.30	0.49140	21	6.43	0.49038	36	199.67	0.48288
7	0.35	0.49143	22	8.07	0.49021	37	251.33	0.48147
8	0.42	0.49138	23	10.12	0.49004	38	316.37	0.48023
9	0.50	0.49138	24	12.72	0.48983	39	398.25	0.47843
10	0.60	0.49135	25	15.97	0.48953	40	501.33	0.47746
11	0.73	0.49129	26	20.08	0.48915	41	631.10	0.47654
12	0.90	0.49127	27	25.25	0.48889	42	794.48	0.47509
13	1.10	0.49126	28	31.75	0.48840	43	1000.15	0.47402
14	1.37	0.49121	29	39.93	0.48781	44	1259.08	0.47307
15	1.70	0.49109	30	50.25	0.48761	45	1440.10	0.47259

Void Ratio = 0.336 **Compression** = 20.5 %

D_0 = 0.49264 D_{50} = 0.49156 D_{100} = 0.49049

C_v **at 0.1 min.** = 2.26 ft.^{2}/day





Sample No.		1	2	3	4
Initial	Water Content, %	44.0	48.7	50.0	48.4
	Dry Density, pcf	77.5	73.5	71.5	73.0
	Saturation, %	100.4	101.0	98.9	99.4
	Void Ratio	1.1913	1.3110	1.3761	1.3250
	Diameter, in.	1.406	1.408	1.413	1.406
	Height, in.	2.989	3.004	3.006	2.999
At Test	Water Content, %	44.0	48.7	50.0	48.4
	Dry Density, pcf	77.5	73.5	71.5	73.0
	Saturation, %	100.4	101.0	98.9	99.4
	Void Ratio	1.1913	1.3110	1.3761	1.3250
	Diameter, in.	1.406	1.408	1.413	1.406
	Height, in.	2.989	3.004	3.006	2.999
Strain rate, %/min.		1.00	1.00	1.00	1.00
Back Pressure, psi		0.00	0.00	0.00	0.00
Cell Pressure, psi		6.90	13.80	20.70	41.75
Fail. Stress, psf		636	615	694	593
Strain, %		4.9	4.5	2.7	5.6
Ult. Stress, psf		624	615	668	517
Strain, %		15.4	4.5	15.1	15.1
σ_1 Failure, psf		1630	2602	3675	6605
σ_3 Failure, psf		994	1987	2981	6012

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: SO GR CH3 W/ ARS ML & SM

LL= 55 **PL=** 19 **PI=** 36
Assumed Specific Gravity= 2.72
Remarks: Torvane=0.20 tsf

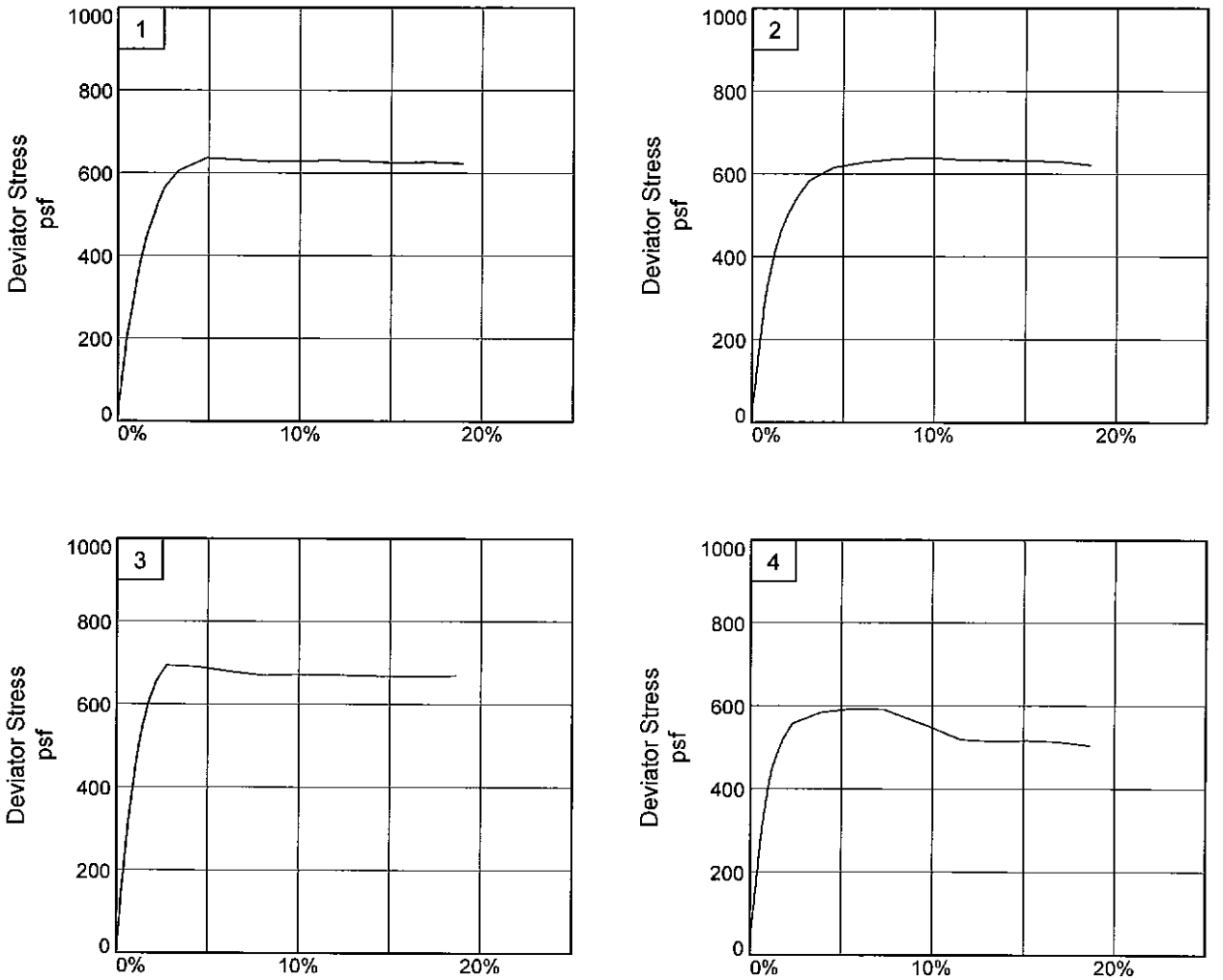
Client: USACE

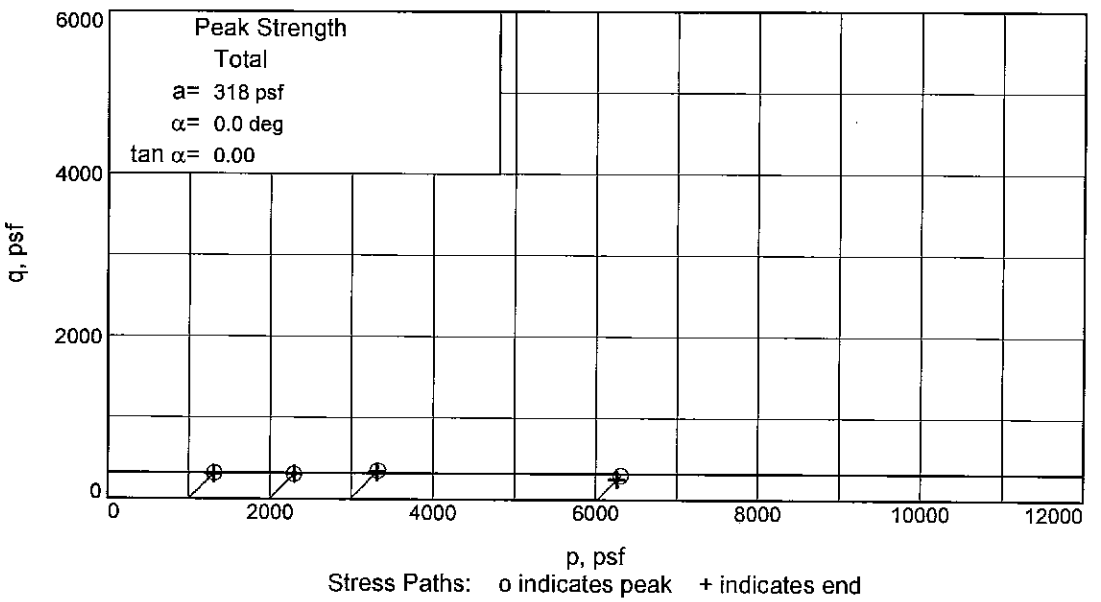
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source of Sample: TB-2U **Depth:** 14.5
Sample Number: 4C
Proj. No.: 10-017200 **Date Sampled:** 8-4-14

TRIAXIAL SHEAR TEST REPORT
Stantec
Saint Rose, Louisiana

Figure _____

Tested By: JC **Checked By:** MJB/JS





Client: USACE

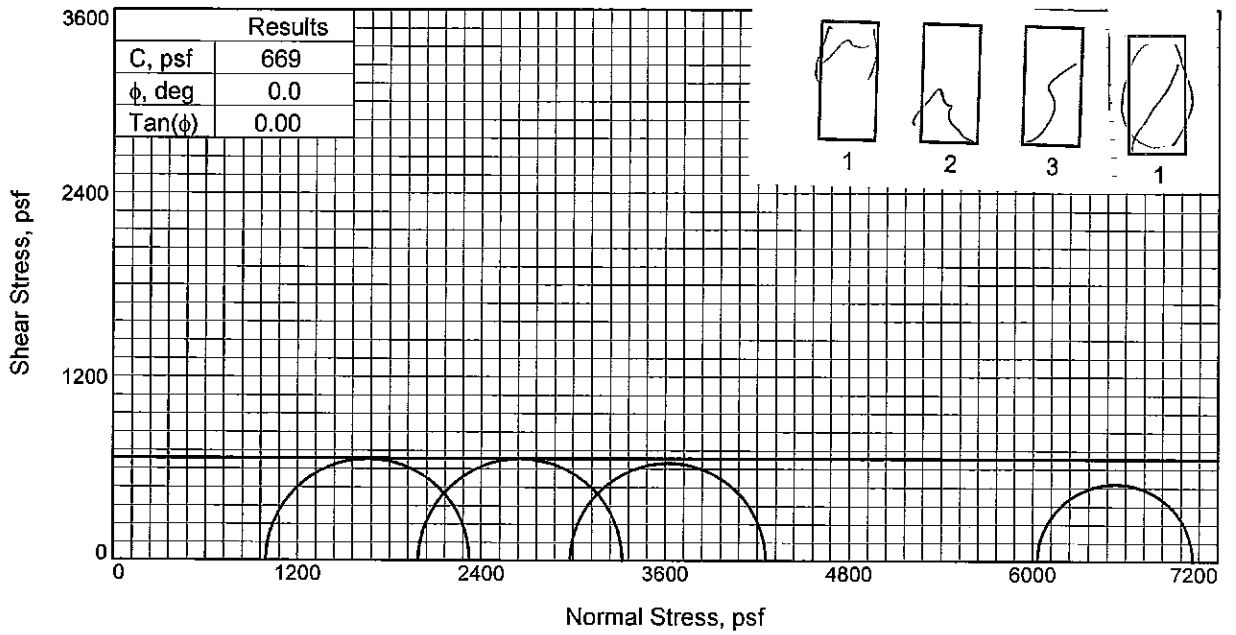
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Pa

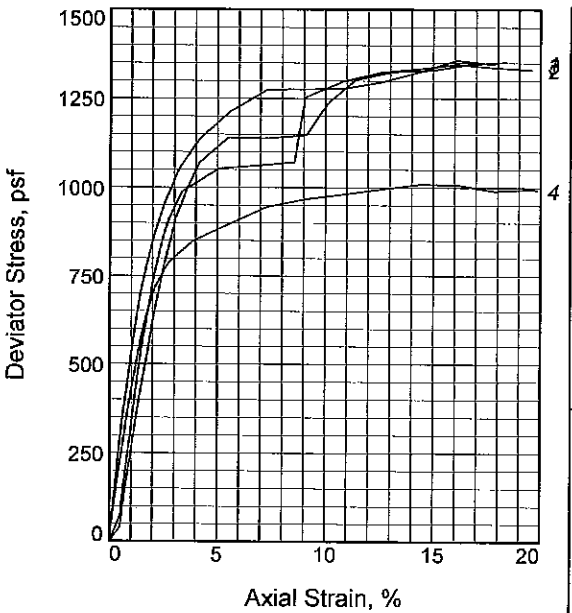
Source of Sample: TB-2U **Depth:** 14.5 **Sample Number:** 4C

Project No.: 10-017200 **Figure** _____

Stantec, Inc.

Tested By: JC **Checked By:** MJB/JS





Sample No.		1	2	3	4
Initial	Water Content, %	30.9	32.6	33.0	33.3
	Dry Density, pcf	91.8	88.9	89.0	88.5
	Saturation, %	99.9	98.4	99.7	99.5
	Void Ratio	0.8357	0.8950	0.8941	0.9039
	Diameter, in.	1.399	1.406	1.409	1.393
	Height, in.	2.995	2.999	2.999	2.993
At Test	Water Content, %	30.9	32.6	33.0	33.3
	Dry Density, pcf	91.8	88.9	89.0	88.5
	Saturation, %	99.9	98.4	99.7	99.5
	Void Ratio	0.8357	0.8950	0.8941	0.9039
	Diameter, in.	1.399	1.406	1.409	1.393
	Height, in.	2.995	2.999	2.999	2.993
Strain rate, %/min.		1.00	1.00	1.00	1.00
Back Pressure, psi		0.00	0.00	0.00	0.00
Cell Pressure, psi		6.90	13.80	20.70	41.88
Fail. Stress, psf		1329	1333	1275	1008
Strain, %		14.9	14.3	7.3	14.3
Ult. Stress, psf		1329	1333	1324	1008
Strain, %		14.9	14.3	14.3	14.3
σ_1 Failure, psf		2323	3320	4256	7039
σ_3 Failure, psf		994	1987	2981	6031

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: M LGR & T CL4 W/ ARS SM

LL= 41 **PL=** 19 **PI=** 22
Assumed Specific Gravity= 2.70
Remarks: Torvane=0.30 tsf

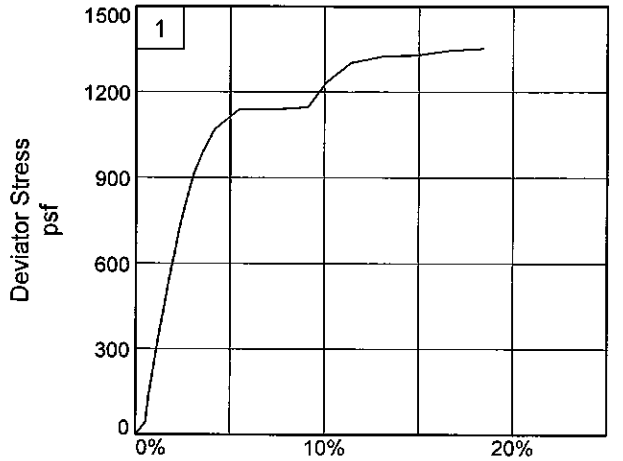
Client: USACE

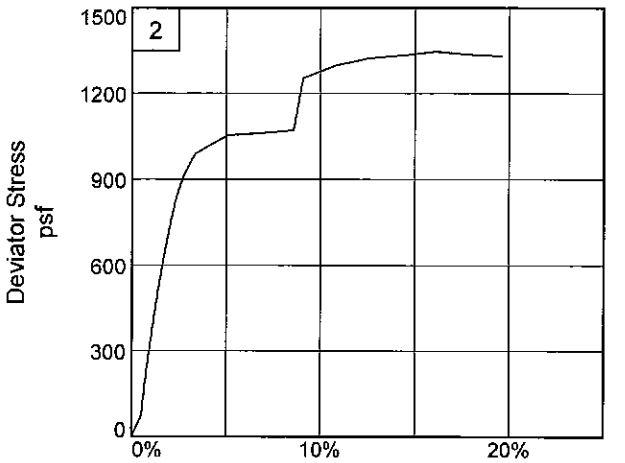
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source of Sample: TB-2U **Depth:** 31.0
Sample Number: 8D
Proj. No.: 10-017200 **Date Sampled:** 8-4-14

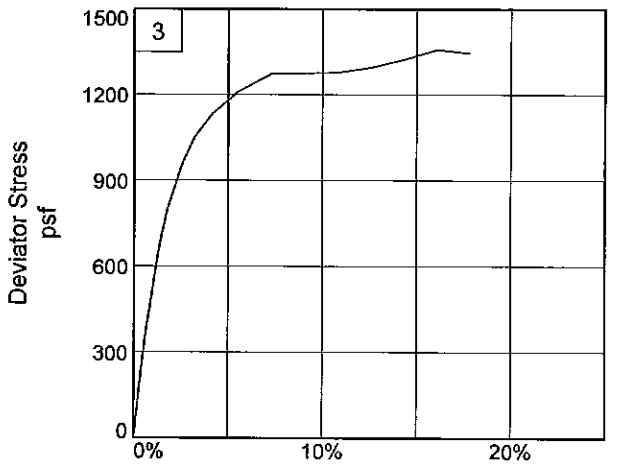
TRIAXIAL SHEAR TEST REPORT
Stantec
Saint Rose, Louisiana

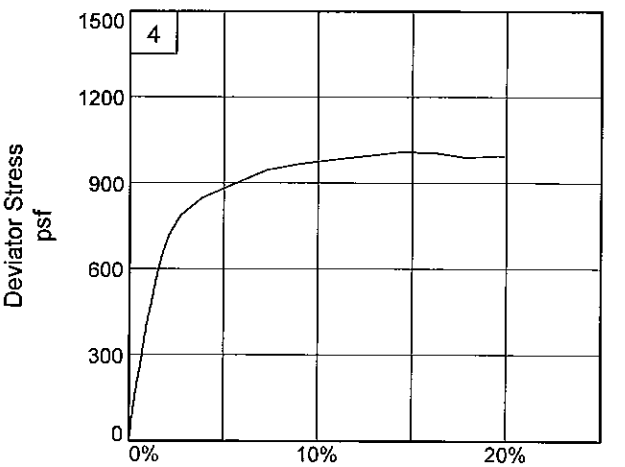
Figure _____

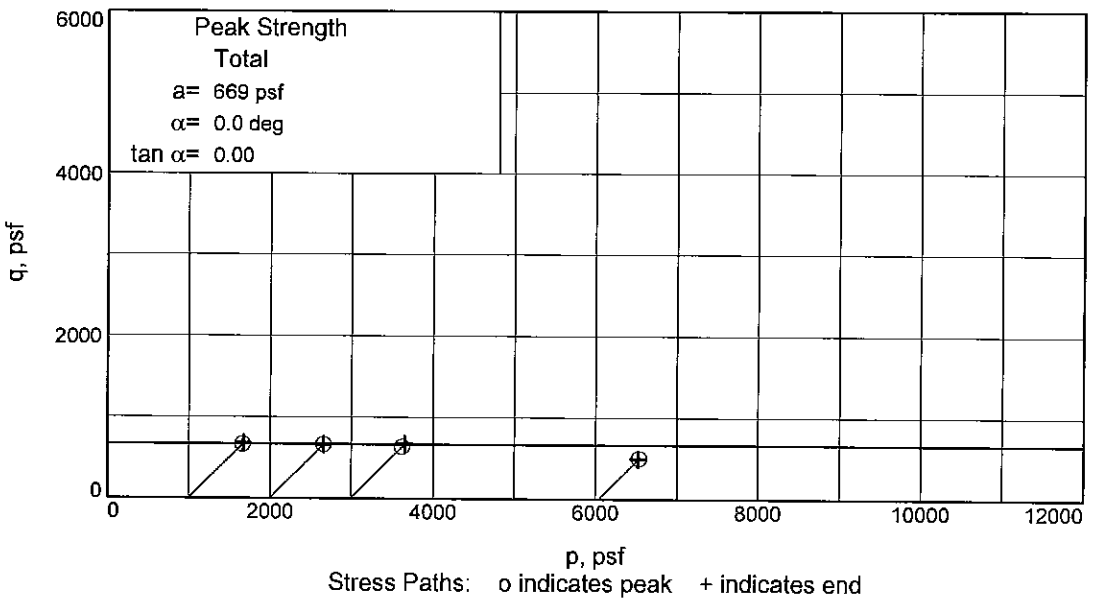
Tested By: JC **Checked By:** MJB/JS











Client: USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Pa

Source of Sample: TB-2U **Depth:** 31.0 **Sample Number:** 8D

Project No.: 10-017200 **Figure** _____

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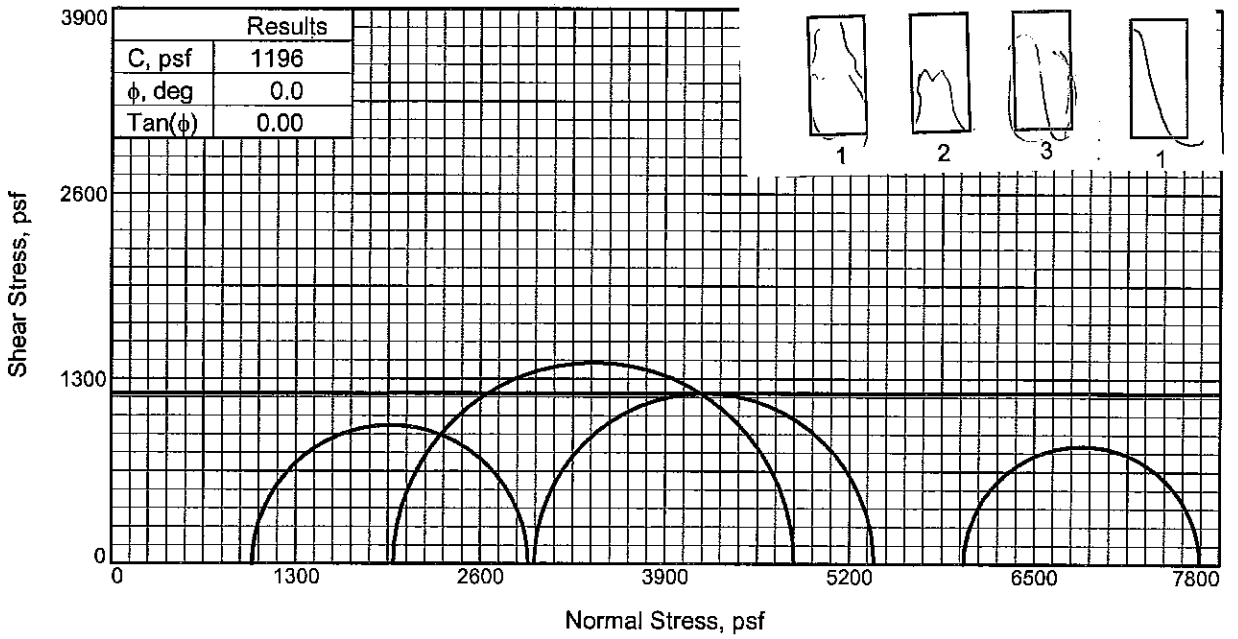
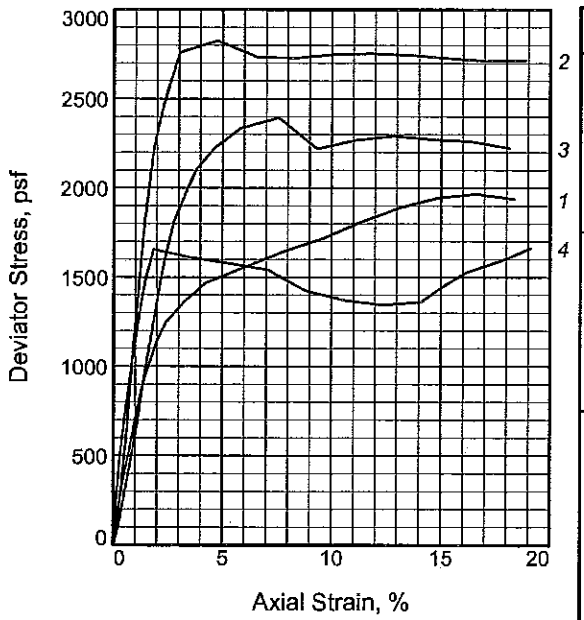
Tested By: JC **Checked By:** MJB/JS





Sample No.		1	2	3	4
Initial	Water Content, %	35.3	35.6	34.6	35.6
	Dry Density, pcf	86.8	86.6	87.8	85.7
	Saturation, %	100.4	100.7	100.7	98.7
	Void Ratio	0.9572	0.9615	0.9339	0.9816
	Diameter, in.	1.400	1.422	1.411	1.408
	Height, in.	3.009	2.995	2.993	2.992
At Test	Water Content, %	35.3	35.6	34.6	35.6
	Dry Density, pcf	86.8	86.6	87.8	85.7
	Saturation, %	100.4	100.7	100.7	98.7
	Void Ratio	0.9572	0.9615	0.9339	0.9816
	Diameter, in.	1.400	1.422	1.411	1.408
	Height, in.	3.009	2.995	2.993	2.992
Strain rate, %/min.		1.00	1.00	1.00	1.00
Back Pressure, psi		0.00	0.00	0.00	0.00
Cell Pressure, psi		6.90	13.80	20.70	41.70
Fail. Stress, psf		1944	2825	2393	1655
Strain, %		14.8	4.8	7.6	1.8
Ult. Stress, psf		1944	2745	2272	1344
Strain, %		14.8	13.6	14.6	12.3
σ_1 Failure, psf		2938	4812	5374	7660
σ_3 Failure, psf		994	1987	2981	6005

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: ST GR CH2 W/ ARS ML

LL= 54 **PL=** 17 **PI=** 37
Assumed Specific Gravity= 2.72
Remarks: Torvane=0.70 tsf

Figure _____

Client: USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source of Sample: TB-2U **Depth:** 34.5
Sample Number: 9C
Proj. No.: 10-017200 **Date Sampled:** 8-4-14

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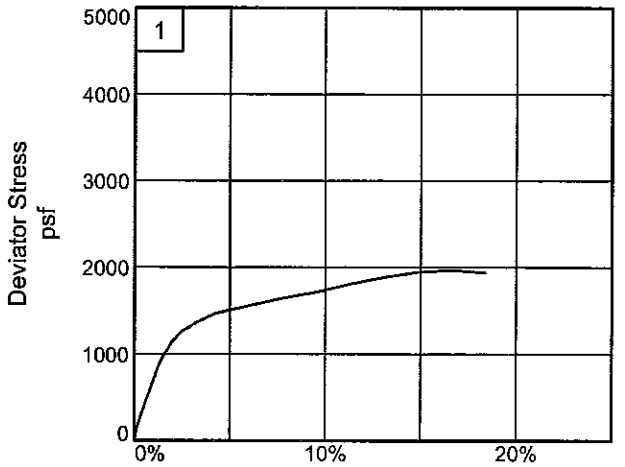
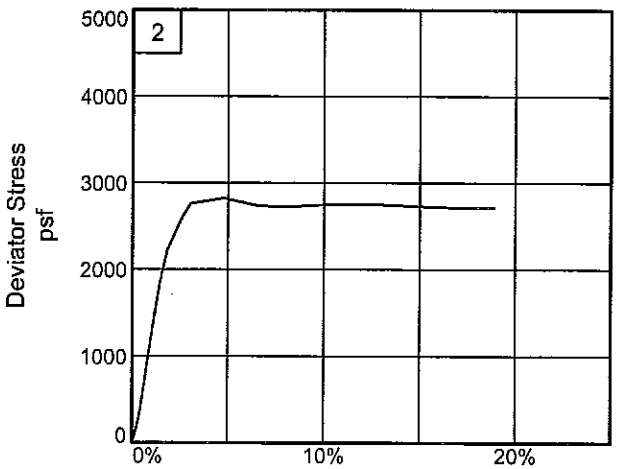
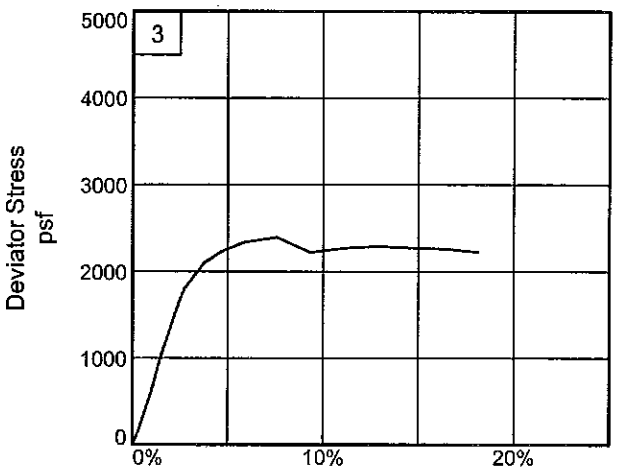
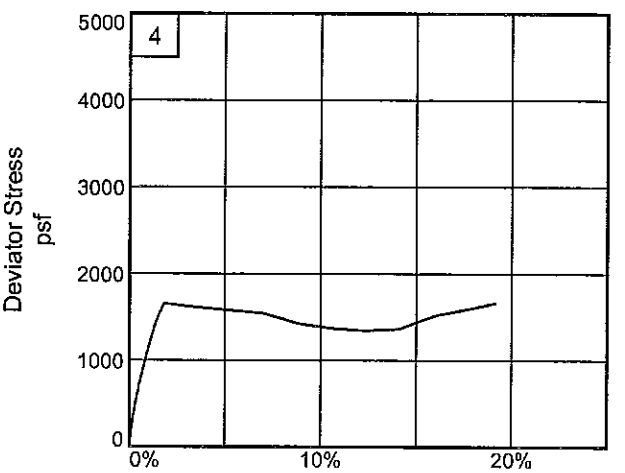
Saint Rose, Louisiana

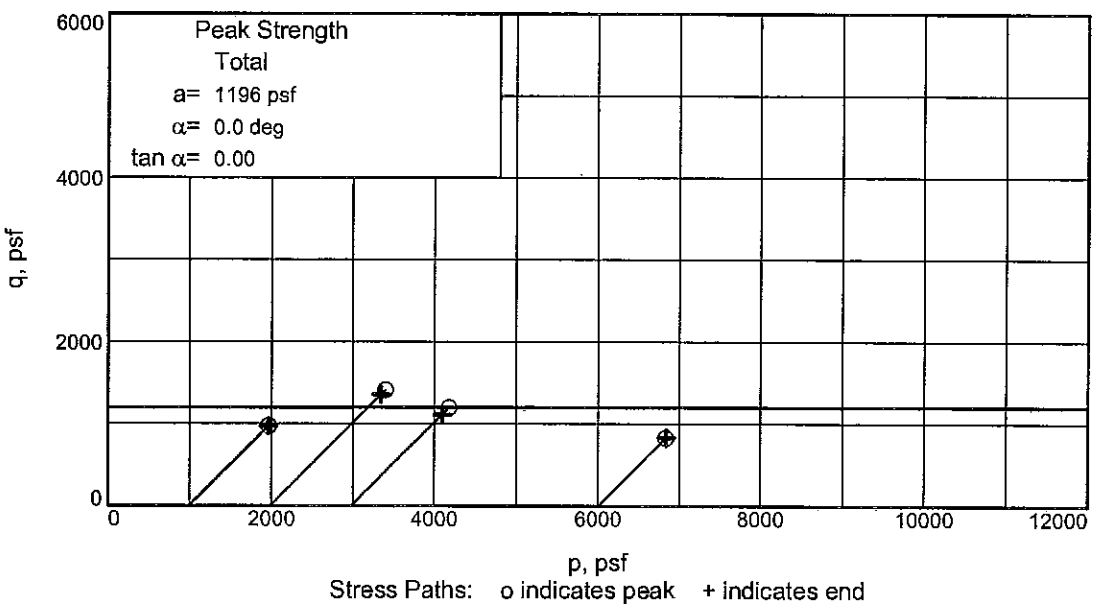
Tested By: JC **Checked By:** MJB/JS











Client: USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Pari

Source of Sample: TB-2U **Depth:** 34.5 **Sample Number:** 9C

Project No.: 10-017200 **Figure** _____ **Stantec, Inc.**

Tested By: JC **Checked By:** MJB/JS

SUMMARY OF LABORATORY TEST RESULTS

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Assigned By: _____

Project Number: 10-017200
Boring: TB-3U Final

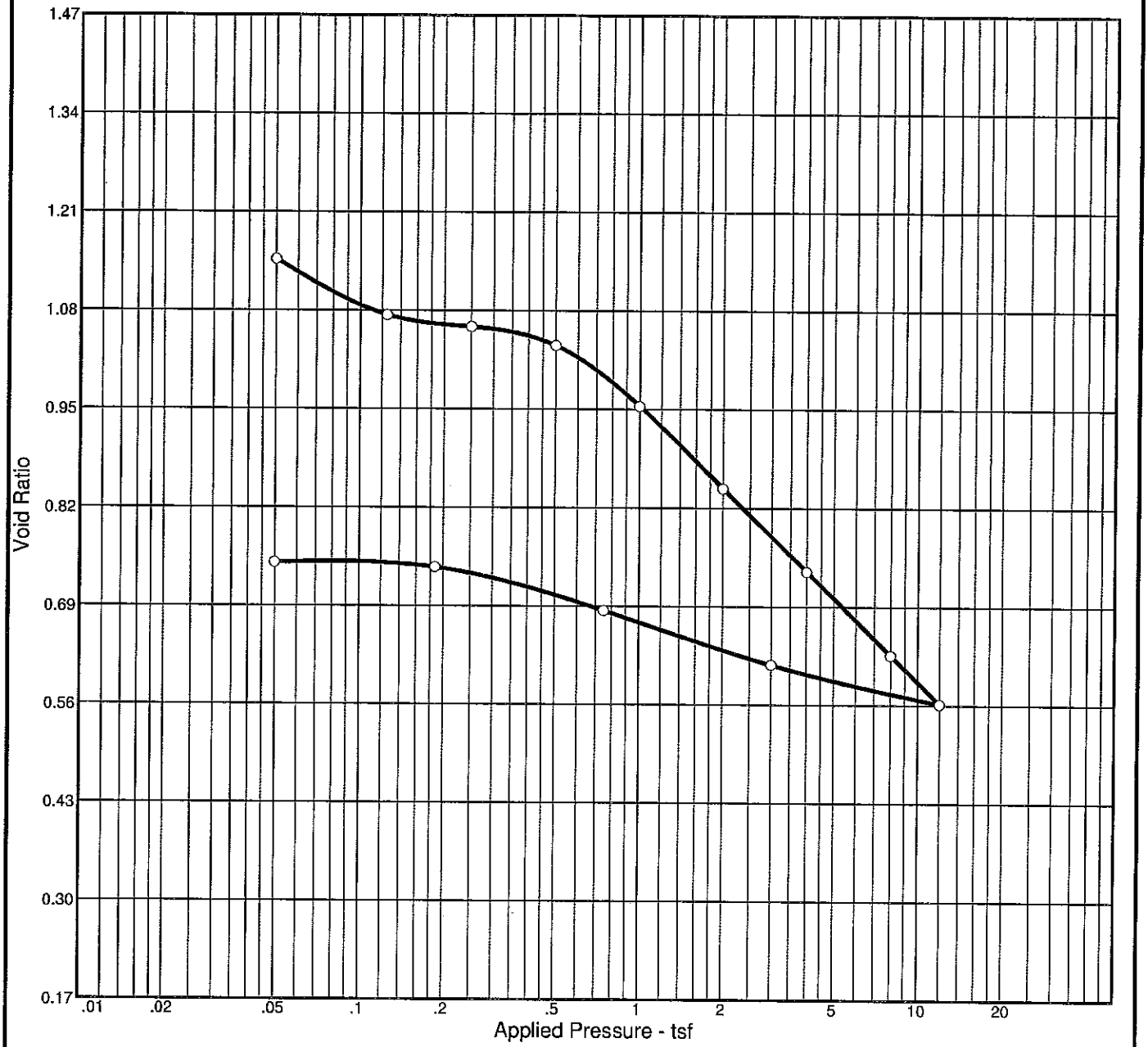
Current Date: 8/26/2014

Sample Number	Depth	Visual Classification	USCS	E(f)	W%	Dry Dens (pcf)	Wet Dens (pcf)	Sat %	Shear Test Type	Angle	Cohesion (psf)	Unconf. Comp. Str.	LL	PL	PI	TORVANE (tsf)	Other Tests
1C	2.2	SO GR CH4 W/ ARS ML	CH4		45	75	108	100					79	21	58		GS=2.58, CONS
1D	3.2	SO GR CH3 W/ ARS ML, TR-O	CH3		47	75	110	100	UU	0	262		70	25	45	0.22	
5A	16.5	VSO GR CL4 W/ ARS SP	CL4		46	74	108	99	UU	0	202		39	13	26	0.17	

Remarks:
FFEBJV, LLC.

Checked by: _____
File Name: 176561418

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
100.0 %	44.5 %	75.0	79	58	2.58		0.54	0.37	0.08			1.147

MATERIAL DESCRIPTION	USCS	AASHTO
SO GR CH4 W/ ARS ML	CH	

Project No. 10-017200 **Client:** USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA

Source: TB-3U **Sample No.:** 1C **Elev./Depth:** 2.2

Remarks:

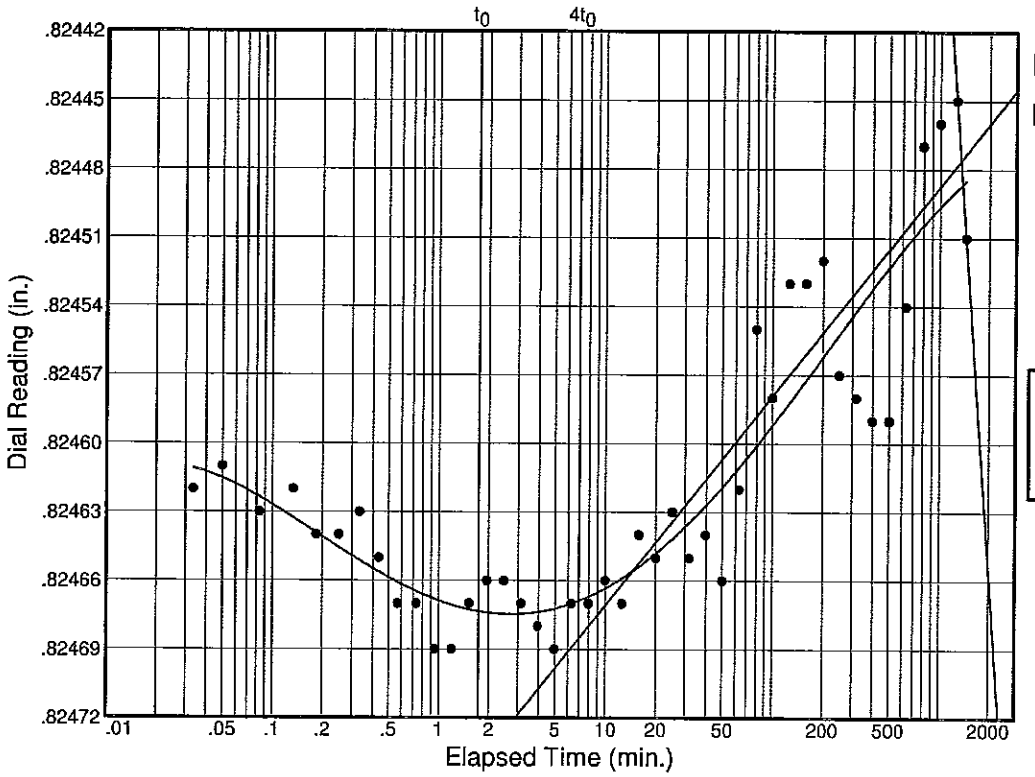
Stantec

Saint Rose, Louisiana

Figure

Dial Reading vs. Time

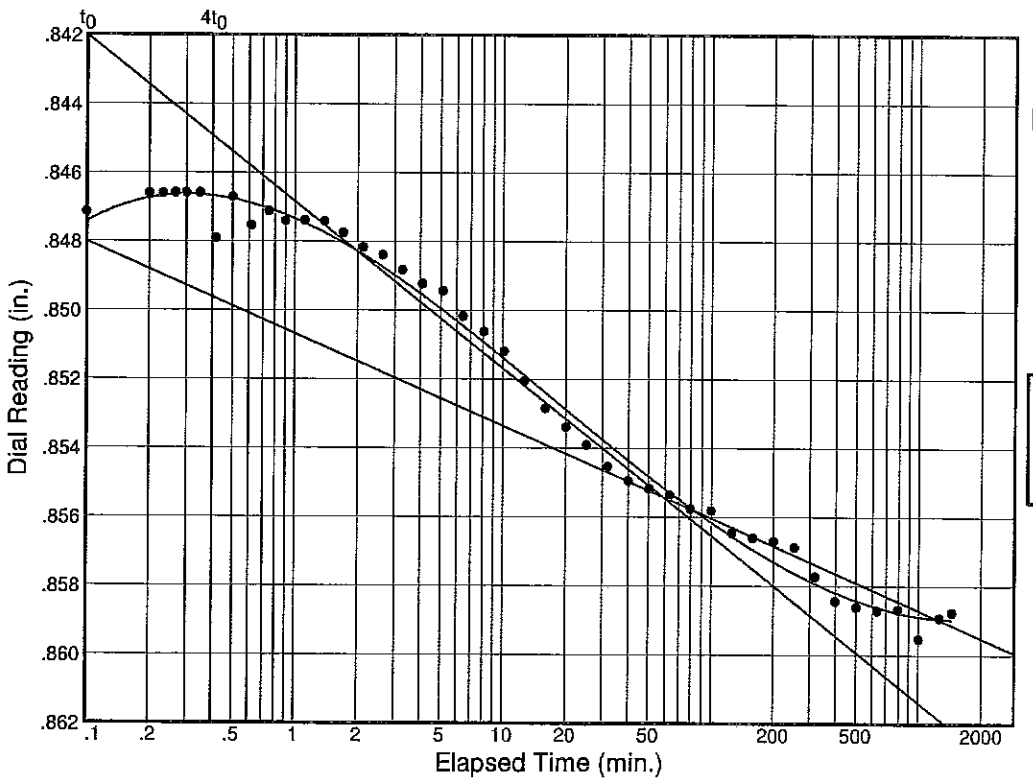
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-3U Sample No.: 1C Elev./Depth: 2.2



Load No.= 1
Load= 0.05 tsf
D_0 = 0.82468
D_{50} = 0.82458
D_{100} = 0.82448
T_{50} = 6.93 min.

C_v @ T_{50}
0.07 ft.^{2}/day

C_α = 0.001



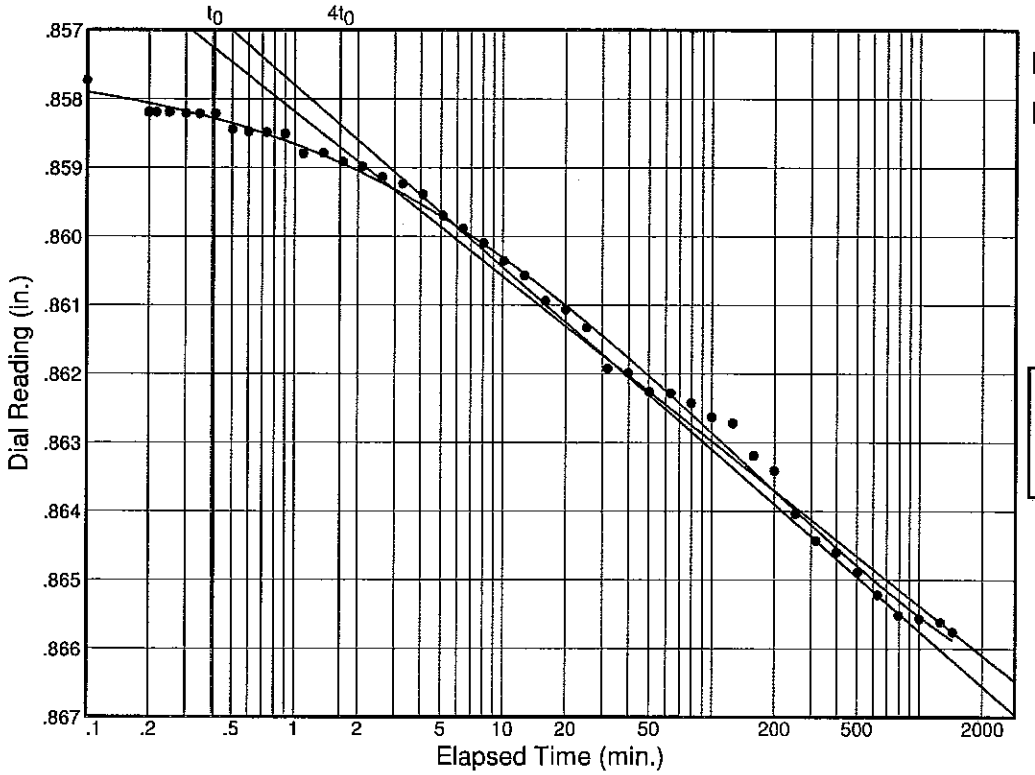
Load No.= 2
Load= 0.13 tsf
D_0 = 0.84818
D_{50} = 0.85179
D_{100} = 0.85540
T_{50} = 12.09 min.

C_v @ T_{50}
0.04 ft.^{2}/day

C_α = 0.003

Dial Reading vs. Time

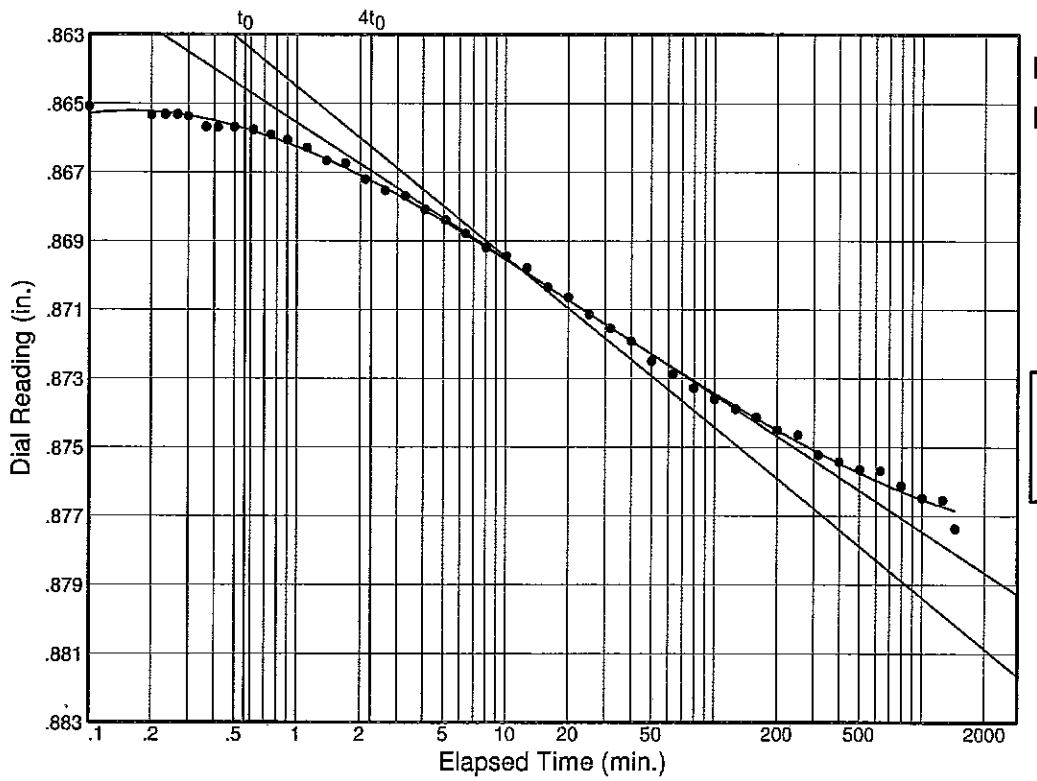
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-3U Sample No.: 1C Elev./Depth: 2.2



Load No.= 3
Load= 0.25 tsf
D_0 = 0.85764
D_{50} = 0.85975
D_{100} = 0.86186
T_{50} = 5.28 min.

C_v @ T_{50}
0.09 ft.^{2}/day

C_α = 0.002



Load No.= 4
Load= 0.50 tsf
D_0 = 0.86422
D_{50} = 0.86701
D_{100} = 0.86980
T_{50} = 1.87 min.

C_v @ T_{50}
0.24 ft.^{2}/day

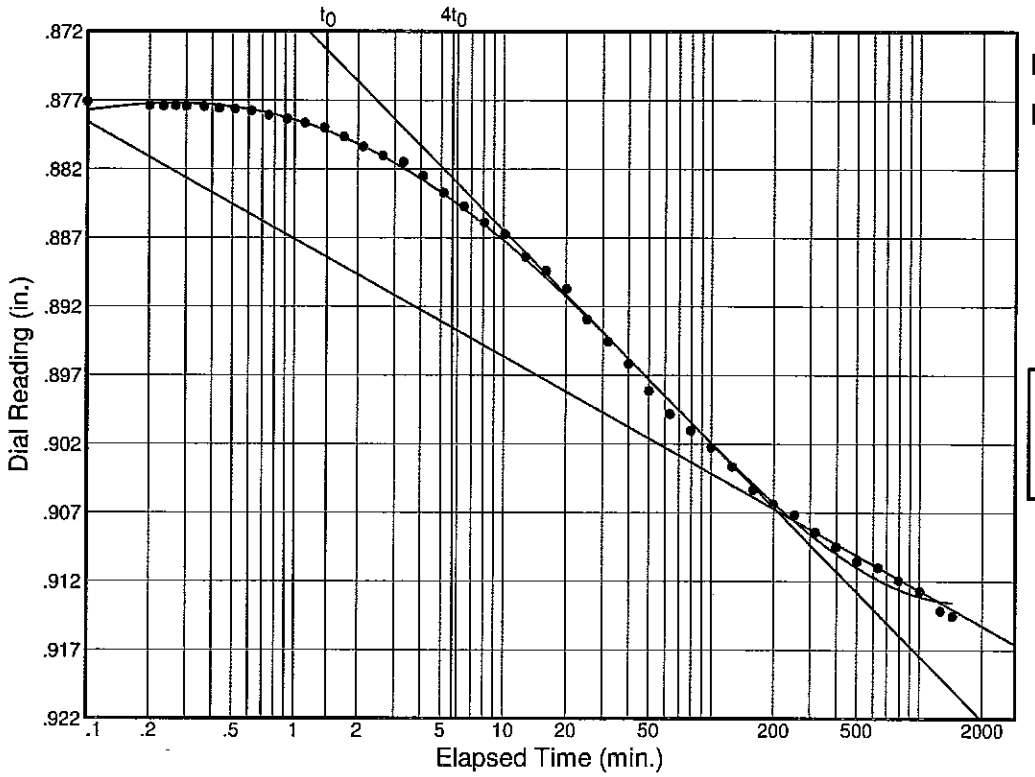
C_α = 0.005

Figure

Stantec, Inc.

Dial Reading vs. Time

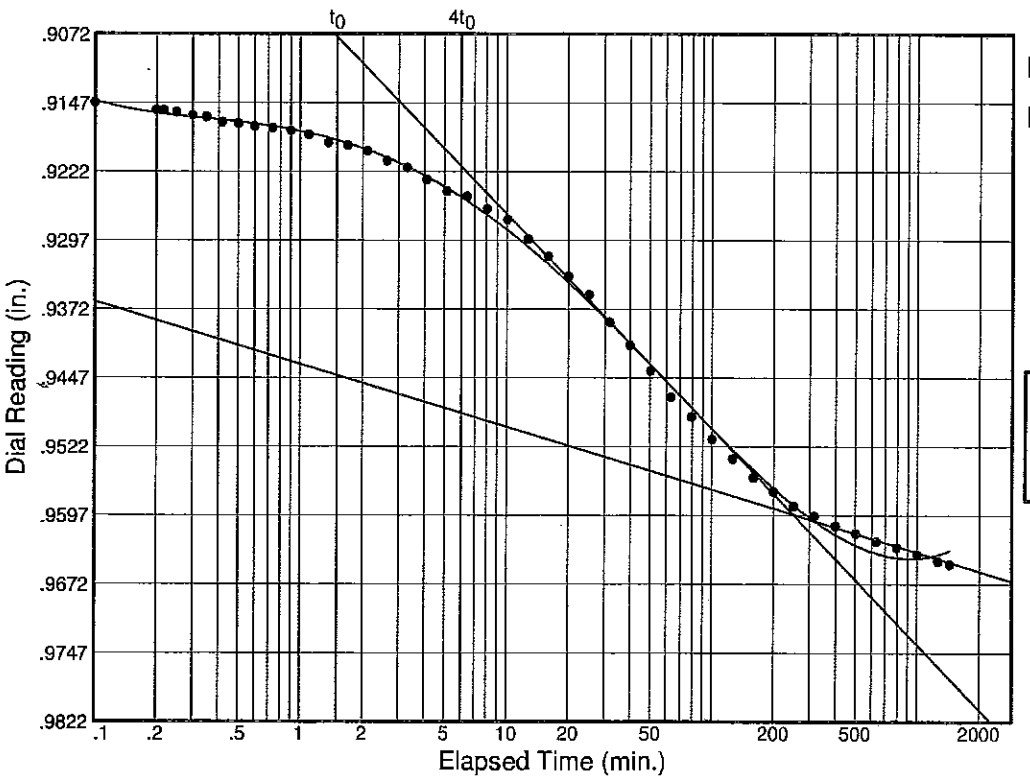
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-3U Sample No.: 1C Elev./Depth: 2.2



Load No.= 5
Load= 1.00 tsf
D_0 = 0.87415
D_{50} = 0.89050
D_{100} = 0.90685
T_{50} = 17.57 min.

C_v @ T_{50}
0.02 ft.^{2}/day

C_α = 0.009



Load No.= 6
Load= 2.00 tsf
D_0 = 0.91257
D_{50} = 0.93607
D_{100} = 0.95957
T_{50} = 24.15 min.

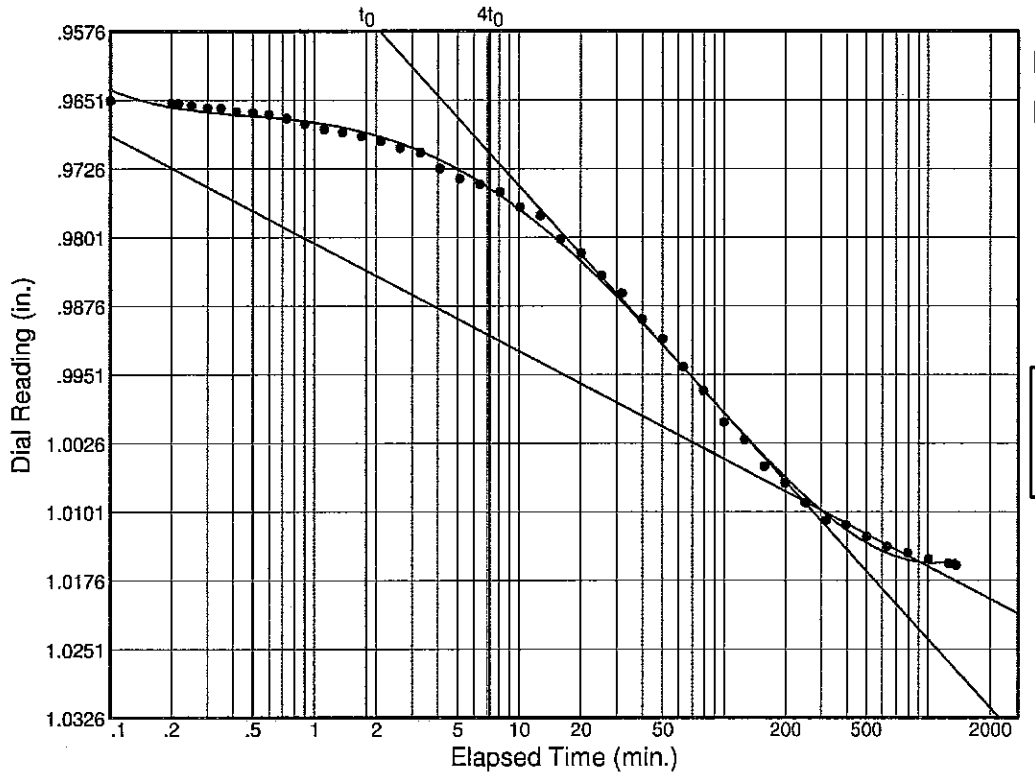
C_v @ T_{50}
0.02 ft.^{2}/day

C_α = 0.007

Figure

Dial Reading vs. Time

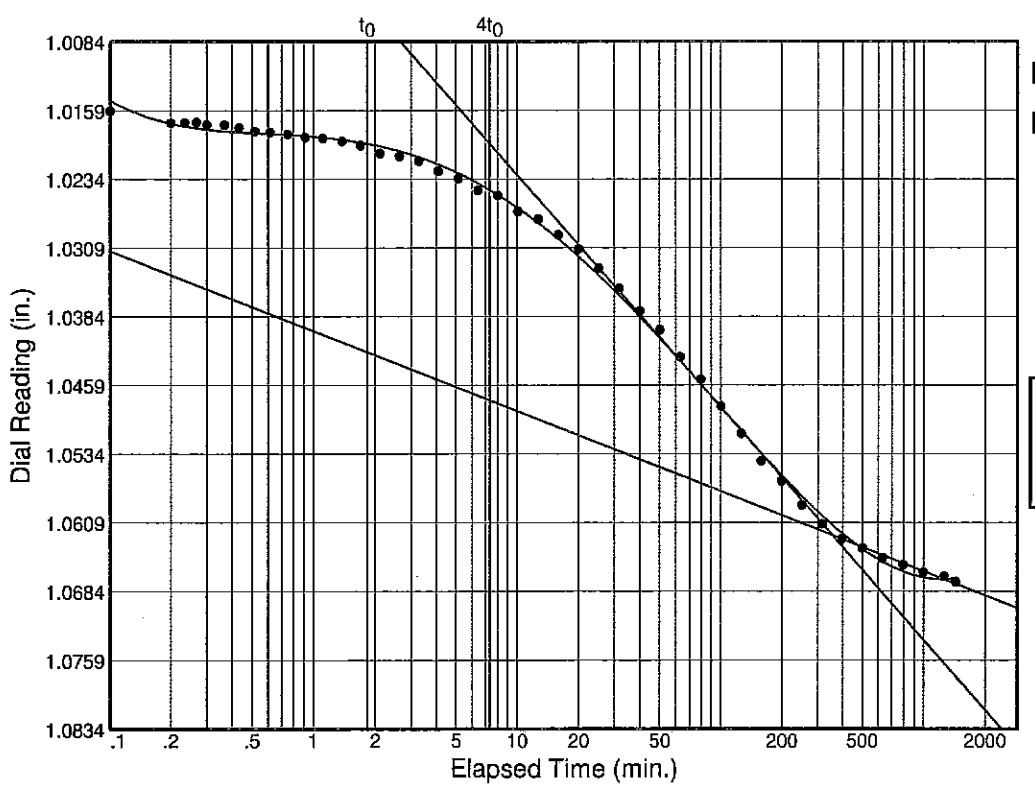
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-3U Sample No.: 1C Elev./Depth: 2.2



Load No.= 7
Load= 4.00 tsf
D_0 = 0.96266
D_{50} = 0.98575
D_{100} = 1.00884
T_{50} = 27.58 min.

C_v @ T_{50}
0.01 ft.^{2}/day

C_α = 0.014



Load No.= 8
Load= 8.00 tsf
D_0 = 1.01450
D_{50} = 1.03839
D_{100} = 1.06228
T_{50} = 39.81 min.

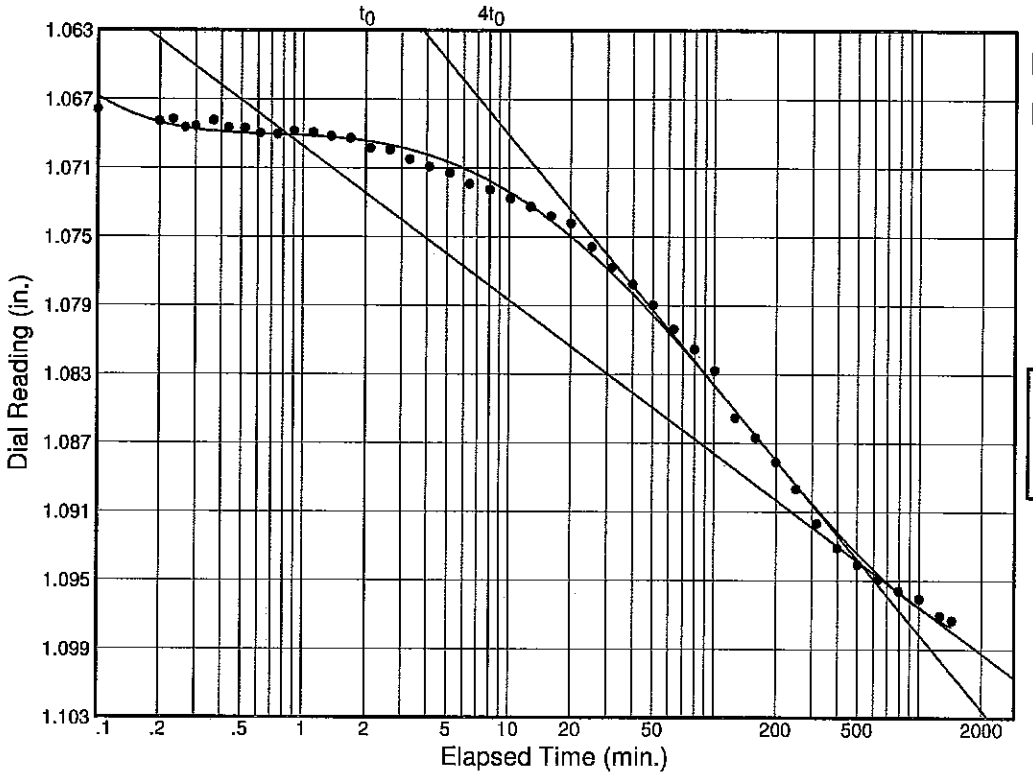
C_v @ T_{50}
0.01 ft.^{2}/day

C_α = 0.011

Figure

Dial Reading vs. Time

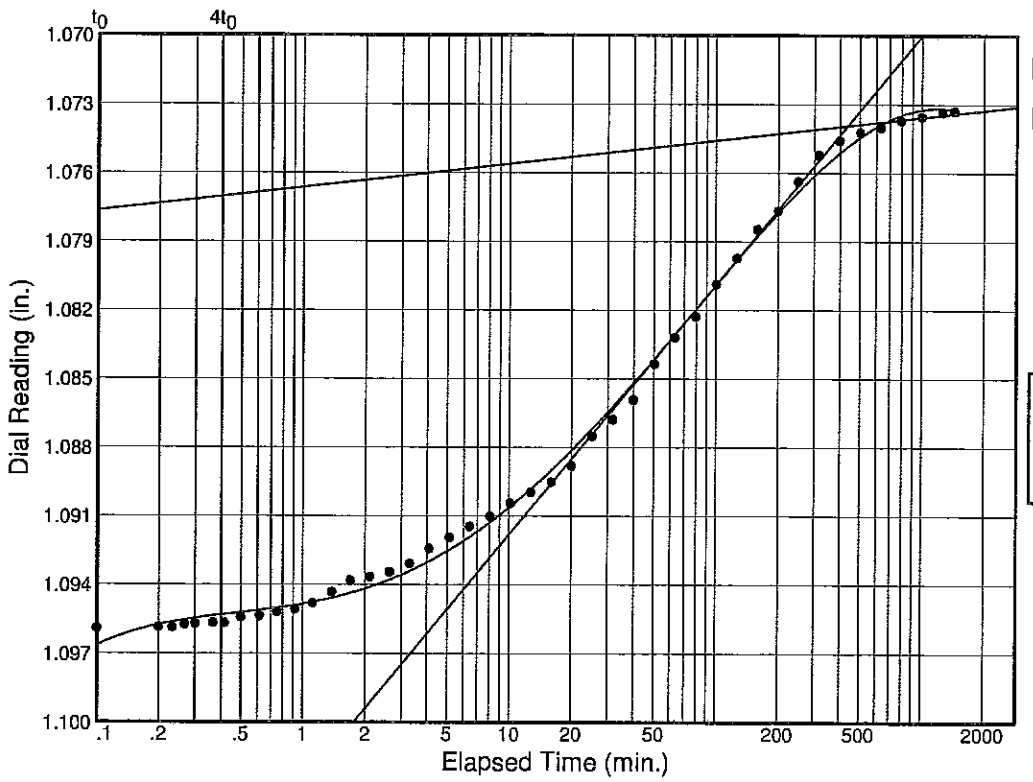
Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-3U Sample No.: 1C Elev./Depth: 2.2



Load No.= 9
Load= 12.00 tsf
D_0 = 1.06710
D_{50} = 1.08055
D_{100} = 1.09400
T_{50} = 59.72 min.

C_v @ T_{50}
0.00 ft.^{2}/day

C_α = 0.012

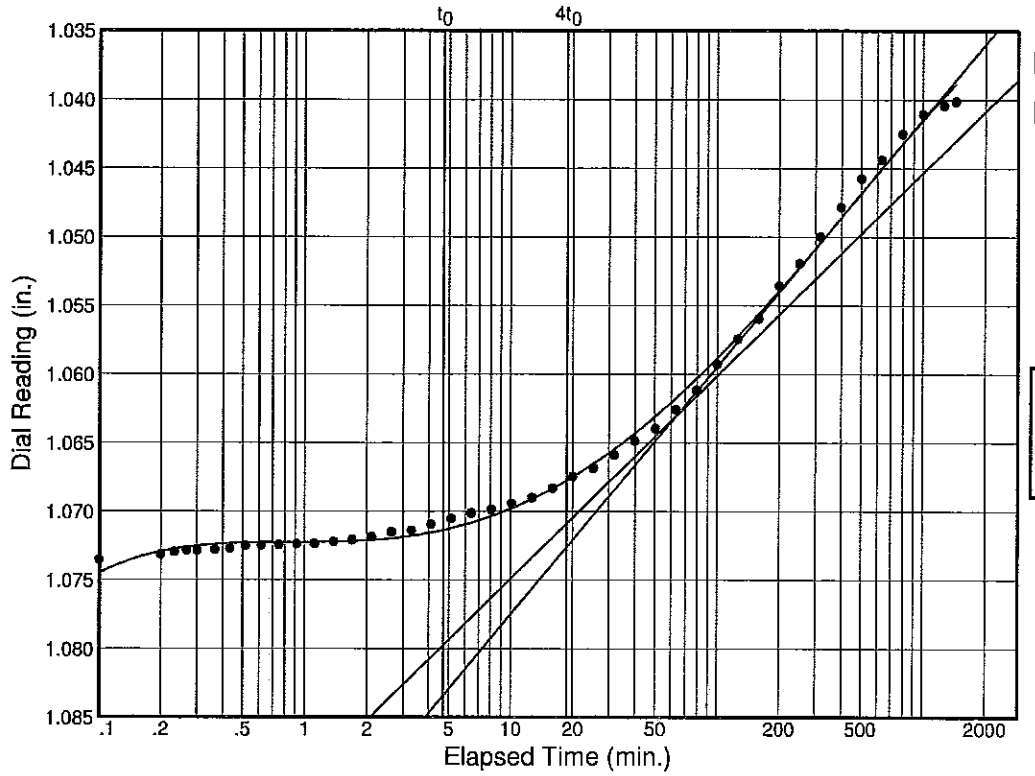


Load No.= 10
Load= 3.00 tsf
D_0 = 1.09799
D_{50} = 1.08596
D_{100} = 1.07394
T_{50} = 33.61 min.

C_v @ T_{50}
0.01 ft.^{2}/day

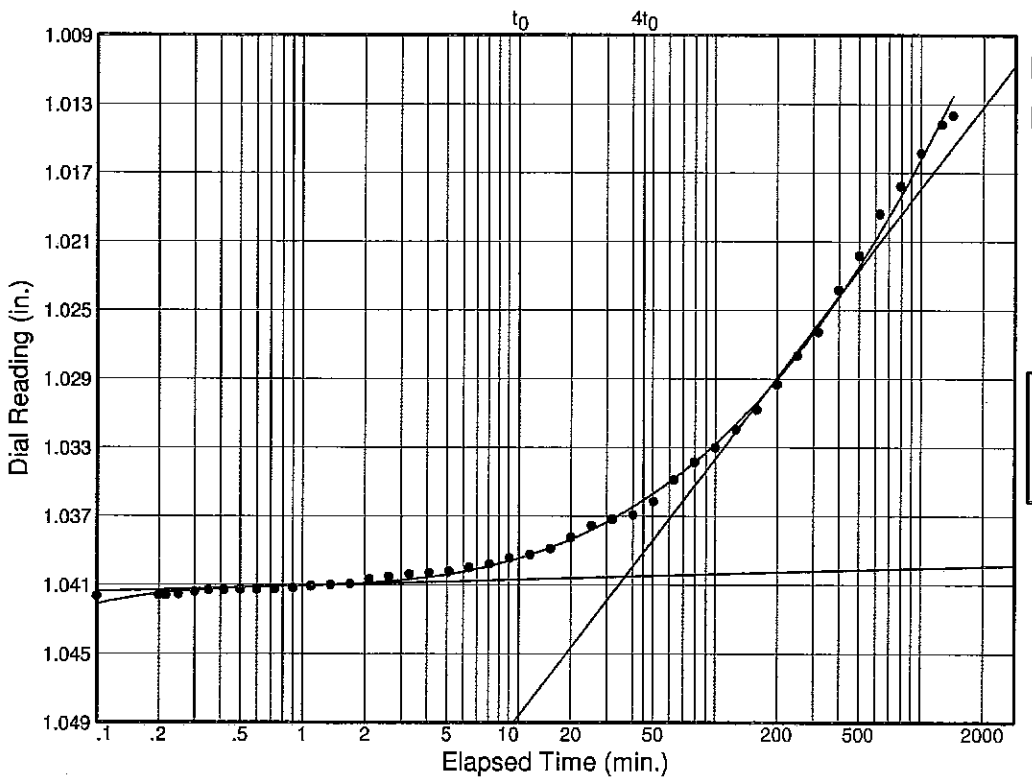
Dial Reading vs. Time

Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-3U Sample No.: 1C Elev./Depth: 2.2



Load No.= 11
Load= 0.75 tsf
D_0 = 1.07495
D_{50} = 1.06907
D_{100} = 1.06319
T_{50} = 12.79 min.

C_v @ T_{50}
0.02 ft.^{2}/day



Load No.= 12
Load= 0.19 tsf
D_0 = 1.04281
D_{50} = 1.04166
D_{100} = 1.04051
T_{50} = 0.16 min.

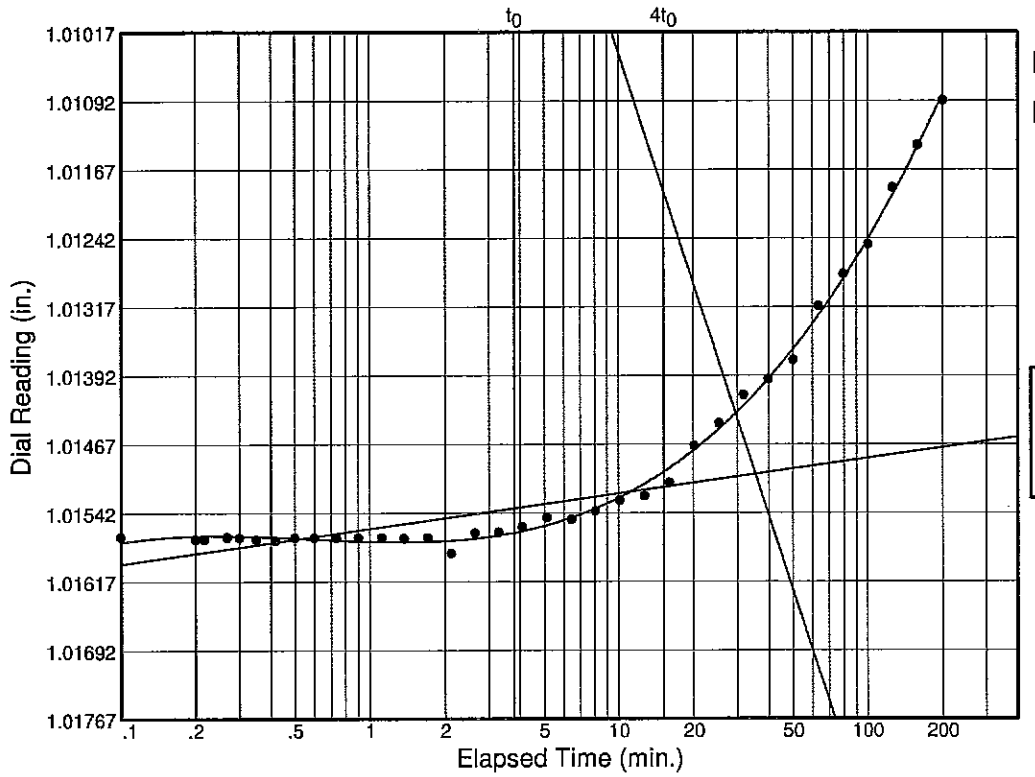
C_v @ T_{50}
1.97 ft.^{2}/day

Figure

Stantec, Inc.

Dial Reading vs. Time

Project No.: 10-017200
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source: TB-3U Sample No.: 1C Elev./Depth: 2.2



Load No.= 13
Load= 0.05 tsf
D_0 = 1.01630
D_{50} = 1.01565
D_{100} = 1.01499
T_{50} = 3.58 min.

C_v @ T_{50}
0.09 ft.^{2}/day

C_α = 0.010

Figure

SWELL/CONSOLIDATION TEST DATA

Client: USACE
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Project Number: 10-017200

Sample Data

Source: TB-3U
Sample No.: 1C
Depth: 2.2
Sample Length(in./cm.):
Location:
Description: SO GR CH4 W/ ARS ML
Liquid Limit: 79
Plasticity Index: 58
USCS: CH
AASHTO:
Figure No.:
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE		BEFORE TEST	AFTER TEST
Wet w+t	= 204.03 g.	Consolidometer # = 1	Wet w+t = 340.45 g.
Dry w+t	= 143.78 g.		Dry w+t = 255.00 g.
Tare Wt.	= 8.24 g.	Spec. Gravity = 2.58	Tare Wt. = 15.65 g.
Height	= 1.00 in.	Height = 1.00 in.	
Diameter	= 4.00 in.	Diameter = 4.00 in.	
Weight	= 357.45 g.	Defl. Table = n/a	
Moisture	= 44.5 %	Ht. Solids = 0.4658 in.	Moisture = 35.7 %
Wet Den.	= 108.4 pcf	Dry Wt. = 247.45 g.*	Dry Wt. = 239.35 g.
Dry Den.	= 75.0 pcf	Void Ratio = 1.147	Void Ratio = 0.747
		Saturation = 100.0 %	

*** Initial dry weight used in calculations**

End-of-Load Summary

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	0.82461				1.147	
0.05	0.82451	0.00000	0.07	0.001	1.147	0.0 Swell
0.13	0.85876	0.00000	0.04	0.003	1.074	3.4 Comprs.
0.25	0.86576	0.00000	0.09	0.002	1.059	4.1 Comprs.
0.50	0.87737	0.00000	0.24	0.005	1.034	5.3 Comprs.
1.00	0.91454	0.00000	0.02	0.009	0.954	9.0 Comprs.
2.00	0.96504	0.00000	0.02	0.007	0.846	14.0 Comprs.
4.00	1.01593	0.00000	0.01	0.014	0.736	19.1 Comprs.
8.00	1.06734	0.00000	0.01	0.011	0.626	24.3 Comprs.
12.00	1.09732	0.00000	0.00	0.012	0.562	27.3 Comprs.
3.00	1.07331	0.00000	0.01		0.613	24.9 Comprs.
0.75	1.04015	0.00000	0.02		0.684	21.6 Comprs.
0.19	1.01366	0.00000	1.97		0.741	18.9 Comprs.
0.05	1.01092	0.00000	0.09	0.010	0.747	18.6 Comprs.

C_c = 0.37 P_c = 0.54 tsf C_r = 0.08

Pressure: 0.05 tsf **TEST READINGS** **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.82461	16	2.47	0.82466	31	79.40	0.82455
2	0.03	0.82462	17	3.12	0.82467	32	99.97	0.82458
3	0.05	0.82461	18	3.93	0.82468	33	125.87	0.82453
4	0.08	0.82463	19	4.97	0.82469	34	158.47	0.82453
5	0.13	0.82462	20	6.27	0.82467	35	199.50	0.82452
6	0.18	0.82464	21	7.90	0.82467	36	251.17	0.82457
7	0.25	0.82464	22	9.97	0.82466	37	316.20	0.82458
8	0.33	0.82463	23	12.55	0.82467	38	398.08	0.82459
9	0.43	0.82465	24	15.82	0.82464	39	501.17	0.82459
10	0.57	0.82467	25	19.92	0.82465	40	630.93	0.82454
11	0.73	0.82467	26	25.08	0.82463	41	794.32	0.82447
12	0.95	0.82469	27	31.58	0.82465	42	999.98	0.82446
13	1.20	0.82469	28	39.78	0.82464	43	1258.92	0.82445
14	1.53	0.82467	29	50.08	0.82466	44	1440.22	0.82451
15	1.95	0.82466	30	63.07	0.82462			

Void Ratio = 1.147 **Swell** = 0.0 %
D_0 = 0.82468 D_{50} = 0.82458 D_{100} = 0.82448
C_v **at 6.9 min.** = 0.07 ft.^{2}/day C_α = 0.001

Pressure: 0.13 tsf **TEST READINGS** **Load No. 2**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.82317	16	2.12	0.84817	31	63.25	0.85537
2	0.10	0.84714	17	2.63	0.84840	32	79.58	0.85576
3	0.20	0.84660	18	3.28	0.84883	33	100.15	0.85582
4	0.23	0.84660	19	4.10	0.84923	34	126.05	0.85646
5	0.27	0.84659	20	5.13	0.84945	35	158.65	0.85661
6	0.30	0.84659	21	6.43	0.85017	36	199.68	0.85671
7	0.35	0.84659	22	8.08	0.85062	37	251.35	0.85688
8	0.42	0.84791	23	10.13	0.85119	38	316.38	0.85773
9	0.50	0.84671	24	12.73	0.85205	39	398.27	0.85844
10	0.62	0.84754	25	15.98	0.85285	40	501.35	0.85861
11	0.75	0.84712	26	20.10	0.85339	41	631.13	0.85872
12	0.90	0.84741	27	25.27	0.85391	42	794.50	0.85868
13	1.12	0.84740	28	31.77	0.85454	43	1000.17	0.85953
14	1.38	0.84742	29	39.95	0.85495	44	1259.10	0.85892
15	1.70	0.84775	30	50.27	0.85518	45	1440.07	0.85876

Void Ratio = 1.074 **Compression** = 3.4 %
D_0 = 0.84818 D_{50} = 0.85179 D_{100} = 0.85540
C_v **at 12.1 min.** = 0.04 ft.^{2}/day C_α = 0.003

Pressure: 0.25 tsf **TEST READINGS** **Load No. 3**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.85665	16	2.10	0.85899	31	63.22	0.86228
2	0.10	0.85773	17	2.62	0.85914	32	79.57	0.86243
3	0.20	0.85820	18	3.28	0.85924	33	100.13	0.86263
4	0.22	0.85820	19	4.10	0.85939	34	126.02	0.86272
5	0.25	0.85820	20	5.13	0.85970	35	158.62	0.86319
6	0.30	0.85821	21	6.43	0.85989	36	199.67	0.86341
7	0.35	0.85822	22	8.07	0.86010	37	251.32	0.86404
8	0.42	0.85822	23	10.12	0.86036	38	316.37	0.86443
9	0.50	0.85845	24	12.72	0.86057	39	398.25	0.86460
10	0.60	0.85848	25	15.97	0.86094	40	501.33	0.86489
11	0.73	0.85849	26	20.08	0.86107	41	631.10	0.86522
12	0.90	0.85851	27	25.25	0.86133	42	794.47	0.86552
13	1.10	0.85880	28	31.75	0.86192	43	1000.15	0.86557
14	1.37	0.85879	29	39.93	0.86199	44	1259.07	0.86562
15	1.70	0.85892	30	50.25	0.86226	45	1440.40	0.86576

Void Ratio = 1.059 **Compression** = 4.1 %
D_0 = 0.85764 D_{50} = 0.85975 D_{100} = 0.86186
C_v **at 5.3 min.** = 0.09 ft.^{2}/day C_α = 0.002

Pressure: 0.50 tsf **TEST READINGS** **Load No. 4**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.86387	16	2.12	0.86722	31	63.23	0.87288
2	0.10	0.86509	17	2.63	0.86754	32	79.57	0.87328
3	0.20	0.86533	18	3.28	0.86770	33	100.15	0.87361
4	0.23	0.86532	19	4.10	0.86809	34	126.03	0.87389
5	0.27	0.86532	20	5.13	0.86840	35	158.63	0.87414
6	0.30	0.86538	21	6.43	0.86879	36	199.67	0.87450
7	0.37	0.86568	22	8.07	0.86920	37	251.33	0.87465
8	0.42	0.86569	23	10.13	0.86944	38	316.38	0.87523
9	0.50	0.86569	24	12.72	0.86979	39	398.27	0.87543
10	0.62	0.86576	25	15.98	0.87035	40	501.33	0.87564
11	0.75	0.86591	26	20.08	0.87065	41	631.12	0.87569
12	0.90	0.86607	27	25.25	0.87115	42	794.48	0.87613
13	1.12	0.86629	28	31.77	0.87155	43	1000.17	0.87648
14	1.38	0.86667	29	39.95	0.87192	44	1259.08	0.87654
15	1.70	0.86674	30	50.25	0.87250	45	1440.45	0.87737

Void Ratio = 1.034 **Compression** = 5.3 %
D_0 = 0.86422 D_{50} = 0.86701 D_{100} = 0.86980
C_v **at 1.9 min.** = 0.24 ft.^{2}/day C_α = 0.005

Pressure: 1.00 tsf **TEST READINGS** **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.87421	16	2.12	0.88039	31	63.25	0.89981
2	0.10	0.87712	17	2.63	0.88105	32	79.58	0.90102
3	0.20	0.87741	18	3.30	0.88152	33	100.15	0.90227
4	0.23	0.87743	19	4.12	0.88253	34	126.05	0.90366
5	0.27	0.87740	20	5.15	0.88373	35	158.65	0.90536
6	0.30	0.87746	21	6.45	0.88475	36	199.68	0.90636
7	0.37	0.87747	22	8.08	0.88590	37	251.35	0.90716
8	0.43	0.87758	23	10.13	0.88674	38	316.38	0.90840
9	0.52	0.87766	24	12.73	0.88840	39	398.27	0.90949
10	0.62	0.87776	25	15.98	0.88944	40	501.35	0.91055
11	0.75	0.87811	26	20.10	0.89073	41	631.13	0.91098
12	0.92	0.87836	27	25.27	0.89296	42	794.50	0.91192
13	1.12	0.87866	28	31.77	0.89459	43	1000.17	0.91271
14	1.38	0.87901	29	39.95	0.89619	44	1259.10	0.91414
15	1.72	0.87967	30	50.27	0.89814	45	1440.50	0.91454

Void Ratio = 0.954 **Compression** = 9.0 %
D_0 = 0.87415 D_{50} = 0.89050 D_{100} = 0.90685
C_v **at 17.6 min.** = 0.02 ft.^{2}/day C_α = 0.009

Pressure: 2.00 tsf **TEST READINGS** **Load No. 6**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.91163	16	2.12	0.92000	31	63.23	0.94682
2	0.10	0.91472	17	2.63	0.92104	32	79.57	0.94896
3	0.20	0.91552	18	3.28	0.92177	33	100.13	0.95143
4	0.22	0.91554	19	4.10	0.92308	34	126.03	0.95353
5	0.25	0.91574	20	5.13	0.92437	35	158.63	0.95561
6	0.30	0.91610	21	6.43	0.92494	36	199.67	0.95714
7	0.35	0.91627	22	8.07	0.92629	37	251.33	0.95872
8	0.42	0.91683	23	10.12	0.92746	38	316.37	0.95976
9	0.50	0.91699	24	12.72	0.92958	39	398.25	0.96087
10	0.60	0.91731	25	15.97	0.93146	40	501.33	0.96169
11	0.73	0.91745	26	20.08	0.93365	41	631.10	0.96256
12	0.90	0.91777	27	25.25	0.93566	42	794.48	0.96320
13	1.10	0.91820	28	31.75	0.93862	43	1000.15	0.96394
14	1.37	0.91907	29	39.95	0.94119	44	1259.08	0.96469
15	1.70	0.91934	30	50.25	0.94393	45	1440.45	0.96504

Void Ratio = 0.846 **Compression** = 14.0 %
D_0 = 0.91257 D_{50} = 0.93607 D_{100} = 0.95957
C_v **at 24.1 min.** = 0.02 ft.^{2}/day C_α = 0.007

Pressure: 4.00 tsf **TEST READINGS** **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.96103	16	2.10	0.96958	31	63.22	0.99423
2	0.10	0.96519	17	2.62	0.97037	32	79.57	0.99686
3	0.20	0.96546	18	3.28	0.97086	33	100.13	1.00030
4	0.22	0.96552	19	4.10	0.97261	34	126.03	1.00222
5	0.25	0.96573	20	5.13	0.97373	35	158.63	1.00513
6	0.30	0.96602	21	6.43	0.97433	36	199.67	1.00697
7	0.35	0.96604	22	8.07	0.97517	37	251.33	1.00908
8	0.42	0.96643	23	10.12	0.97683	38	316.37	1.01103
9	0.50	0.96653	24	12.72	0.97774	39	398.25	1.01155
10	0.60	0.96672	25	15.97	0.98035	40	501.33	1.01280
11	0.73	0.96712	26	20.08	0.98184	41	631.10	1.01391
12	0.90	0.96776	27	25.23	0.98427	42	794.47	1.01461
13	1.12	0.96835	28	31.75	0.98623	43	1000.15	1.01523
14	1.37	0.96864	29	39.93	0.98906	44	1259.08	1.01575
15	1.70	0.96909	30	50.25	0.99122	45	1367.93	1.01593

Void Ratio = 0.736 **Compression** = 19.1 %
D_0 = 0.96266 D_{50} = 0.98575 D_{100} = 1.00884
C_v **at 27.6 min.** = 0.01 ft.^{2}/day C_α = 0.014

Pressure: 8.00 tsf **TEST READINGS** **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	1.01034	16	2.12	1.02059	31	63.23	1.04283
2	0.10	1.01597	17	2.63	1.02095	32	79.57	1.04529
3	0.20	1.01729	18	3.28	1.02141	33	100.15	1.04822
4	0.23	1.01726	19	4.10	1.02253	34	126.03	1.05119
5	0.27	1.01721	20	5.13	1.02336	35	158.63	1.05419
6	0.30	1.01750	21	6.43	1.02465	36	199.67	1.05638
7	0.37	1.01752	22	8.07	1.02524	37	251.33	1.05900
8	0.43	1.01781	23	10.13	1.02694	38	316.38	1.06105
9	0.52	1.01822	24	12.72	1.02782	39	398.27	1.06267
10	0.62	1.01834	25	15.98	1.02953	40	501.35	1.06367
11	0.75	1.01854	26	20.08	1.03106	41	631.12	1.06480
12	0.92	1.01887	27	25.25	1.03314	42	794.48	1.06555
13	1.12	1.01897	28	31.75	1.03537	43	1000.17	1.06634
14	1.38	1.01931	29	39.95	1.03784	44	1259.08	1.06678
15	1.70	1.01975	30	50.25	1.03988	45	1440.45	1.06734

Void Ratio = 0.626 **Compression** = 24.3 %
D_0 = 1.01450 D_{50} = 1.03839 D_{100} = 1.06228
C_v **at 39.8 min.** = 0.01 ft.^{2}/day C_α = 0.011

Pressure: 12.00 tsf **TEST READINGS** **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	1.06324	16	2.12	1.06986	31	63.23	1.08037
2	0.10	1.06760	17	2.63	1.06995	32	79.57	1.08154
3	0.20	1.06830	18	3.28	1.07050	33	100.15	1.08279
4	0.23	1.06818	19	4.10	1.07093	34	126.03	1.08552
5	0.27	1.06866	20	5.13	1.07130	35	158.63	1.08669
6	0.30	1.06858	21	6.43	1.07193	36	199.67	1.08810
7	0.37	1.06826	22	8.07	1.07228	37	251.33	1.08967
8	0.43	1.06867	23	10.13	1.07280	38	316.38	1.09167
9	0.52	1.06870	24	12.72	1.07327	39	398.27	1.09310
10	0.62	1.06898	25	15.98	1.07382	40	501.33	1.09407
11	0.75	1.06904	26	20.08	1.07424	41	631.12	1.09492
12	0.90	1.06887	27	25.25	1.07560	42	794.48	1.09559
13	1.12	1.06896	28	31.75	1.07678	43	1000.17	1.09606
14	1.37	1.06917	29	39.95	1.07776	44	1259.08	1.09706
15	1.70	1.06929	30	50.25	1.07897	45	1440.45	1.09732

Void Ratio = 0.562 **Compression** = 27.3 %
D_0 = 1.06710 D_{50} = 1.08055 D_{100} = 1.09400
C_v **at 59.7 min.** = 0.00 ft.^{2}/day C_α = 0.012

Pressure: 3.00 tsf **TEST READINGS** **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	1.10684	16	2.12	1.09366	31	63.23	1.08320
2	0.10	1.09591	17	2.63	1.09345	32	79.58	1.08229
3	0.20	1.09585	18	3.28	1.09308	33	100.15	1.08088
4	0.23	1.09587	19	4.10	1.09242	34	126.03	1.07973
5	0.27	1.09575	20	5.13	1.09194	35	158.63	1.07848
6	0.30	1.09571	21	6.43	1.09147	36	199.68	1.07767
7	0.37	1.09567	22	8.07	1.09103	37	251.33	1.07638
8	0.42	1.09568	23	10.13	1.09044	38	316.38	1.07523
9	0.50	1.09543	24	12.72	1.08996	39	398.27	1.07460
10	0.62	1.09537	25	15.98	1.08952	40	501.33	1.07423
11	0.75	1.09520	26	20.08	1.08881	41	631.12	1.07404
12	0.92	1.09507	27	25.25	1.08751	42	794.48	1.07372
13	1.12	1.09481	28	31.77	1.08679	43	1000.15	1.07355
14	1.38	1.09434	29	39.95	1.08594	44	1259.08	1.07335
15	1.70	1.09382	30	50.25	1.08436	45	1440.33	1.07331

Void Ratio = 0.613 **Compression** = 24.9 %
D_0 = 1.09799 D_{50} = 1.08596 D_{100} = 1.07394
C_v **at 33.6 min.** = 0.01 ft.^{2}/day

Pressure: 0.75 tsf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	1.07695	16	2.12	1.07186	31	63.23	1.06258
2	0.10	1.07353	17	2.63	1.07150	32	79.57	1.06117
3	0.20	1.07316	18	3.28	1.07140	33	100.13	1.05927
4	0.23	1.07295	19	4.10	1.07094	34	126.03	1.05744
5	0.27	1.07285	20	5.13	1.07052	35	158.63	1.05596
6	0.30	1.07284	21	6.43	1.07012	36	199.67	1.05358
7	0.37	1.07279	22	8.07	1.06985	37	251.33	1.05194
8	0.43	1.07270	23	10.13	1.06943	38	316.38	1.04996
9	0.52	1.07250	24	12.72	1.06901	39	398.25	1.04785
10	0.62	1.07249	25	15.98	1.06831	40	501.33	1.04577
11	0.75	1.07245	26	20.08	1.06746	41	631.12	1.04442
12	0.92	1.07238	27	25.25	1.06685	42	794.48	1.04252
13	1.12	1.07236	28	31.77	1.06587	43	1000.15	1.04109
14	1.38	1.07221	29	39.95	1.06486	44	1259.08	1.04046
15	1.70	1.07207	30	50.25	1.06397	45	1440.48	1.04015

Void Ratio = 0.684 **Compression** = 21.6 %
D_0 = 1.07495 D_{50} = 1.06907 D_{100} = 1.06319
C_v **at 12.8 min.** = 0.02 ft.^{2}/day

Pressure: 0.19 tsf **TEST READINGS** **Load No. 12**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	1.04354	16	2.10	1.04065	31	63.23	1.03489
2	0.10	1.04166	17	2.62	1.04053	32	79.57	1.03386
3	0.20	1.04159	18	3.28	1.04038	33	100.13	1.03302
4	0.22	1.04159	19	4.10	1.04030	34	126.03	1.03194
5	0.25	1.04154	20	5.13	1.04021	35	158.63	1.03080
6	0.30	1.04140	21	6.42	1.03999	36	199.67	1.02933
7	0.35	1.04131	22	8.07	1.03977	37	251.33	1.02764
8	0.42	1.04130	23	10.12	1.03945	38	316.37	1.02629
9	0.50	1.04127	24	12.72	1.03924	39	398.25	1.02385
10	0.60	1.04126	25	15.97	1.03889	40	501.33	1.02183
11	0.73	1.04124	26	20.08	1.03824	41	631.10	1.01940
12	0.90	1.04118	27	25.25	1.03756	42	794.47	1.01778
13	1.10	1.04106	28	31.75	1.03717	43	1000.15	1.01586
14	1.37	1.04100	29	39.93	1.03692	44	1259.07	1.01418
15	1.70	1.04092	30	50.25	1.03615	45	1426.67	1.01366

Void Ratio = 0.741 **Compression** = 18.9 %
D_0 = 1.04281 D_{50} = 1.04166 D_{100} = 1.04051
C_v **at 0.2 min.** = 1.97 ft.^{2}/day

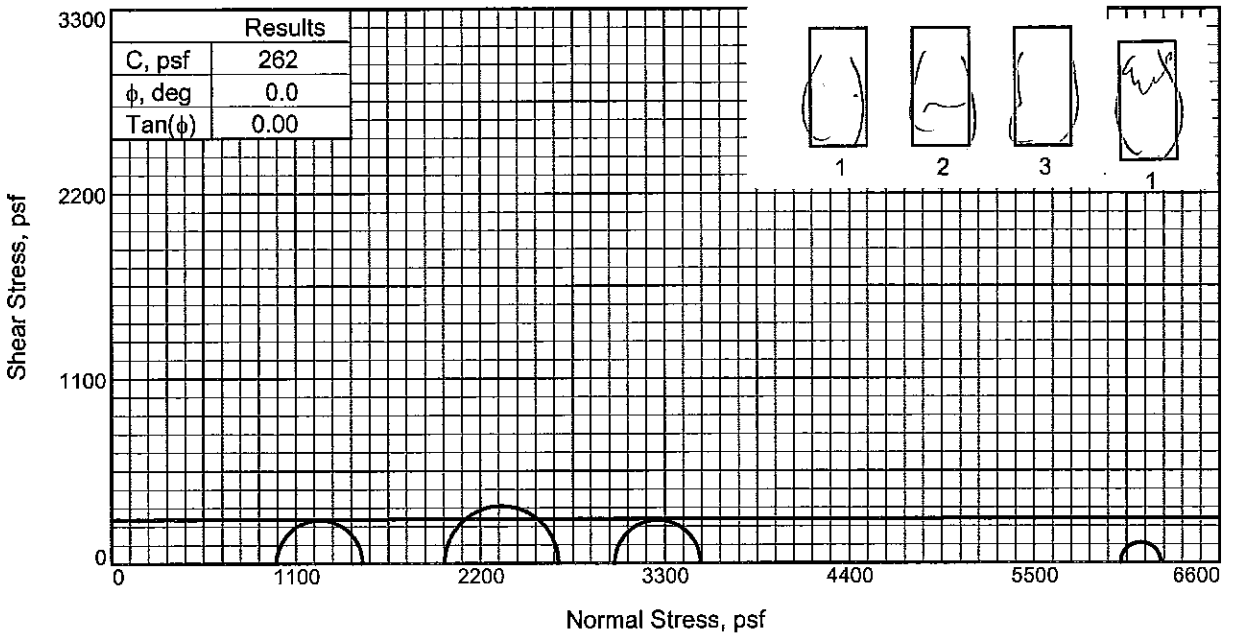
Pressure: 0.05 tsf **TEST READINGS** **Load No. 13**

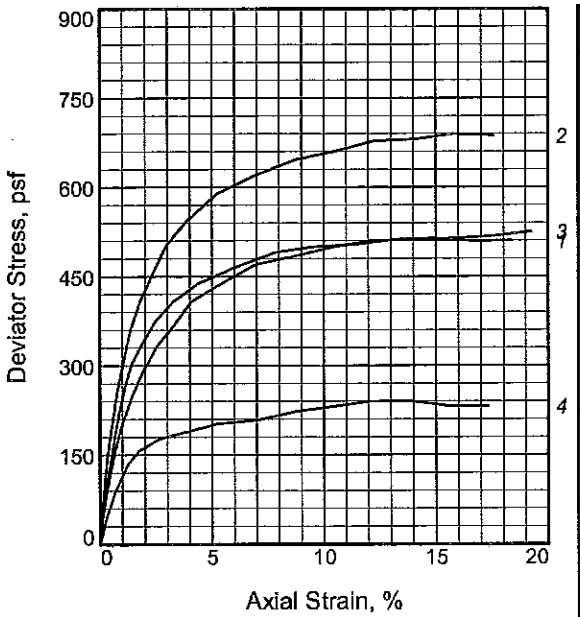
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	1.01632	13	1.12	1.01569	25	15.98	1.01509
2	0.10	1.01568	14	1.37	1.01570	26	20.08	1.01469
3	0.20	1.01571	15	1.70	1.01569	27	25.25	1.01444
4	0.22	1.01571	16	2.12	1.01586	28	31.75	1.01413
5	0.27	1.01568	17	2.63	1.01564	29	39.95	1.01396
6	0.30	1.01569	18	3.28	1.01563	30	50.25	1.01375
7	0.35	1.01571	19	4.10	1.01557	31	63.23	1.01316
8	0.42	1.01572	20	5.13	1.01547	32	79.57	1.01281
9	0.50	1.01569	21	6.43	1.01549	33	100.13	1.01249
10	0.60	1.01569	22	8.07	1.01540	34	126.03	1.01187
11	0.73	1.01569	23	10.12	1.01528	35	158.63	1.01141
12	0.90	1.01569	24	12.72	1.01523	36	199.67	1.01092

Void Ratio = 0.747 **Compression** = 18.6 %

D_0 = 1.01630 D_{50} = 1.01565 D_{100} = 1.01499

C_v **at 3.6 min.** = 0.09 ft.^{2}/day C_α = 0.010





Sample No.		1	2	3	4
Initial	Water Content, %	46.8	46.0	49.1	61.6
	Dry Density, pcf	74.6	75.3	72.5	63.3
	Saturation, %	99.8	99.7	99.7	99.7
	Void Ratio	1.2761	1.2545	1.3408	1.6822
	Diameter, in.	1.405	1.407	1.406	1.399
	Height, in.	3.012	3.005	3.004	2.994
At Test	Water Content, %	46.8	46.0	49.1	61.6
	Dry Density, pcf	74.6	75.3	72.5	63.3
	Saturation, %	99.8	99.7	99.7	99.7
	Void Ratio	1.2761	1.2545	1.3408	1.6822
	Diameter, in.	1.405	1.407	1.406	1.399
	Height, in.	3.012	3.005	3.004	2.994
Strain rate, %/min.		1.00	1.00	1.00	1.00
Back Pressure, psi		0.00	0.00	0.00	0.00
Cell Pressure, psi		6.83	13.78	20.84	41.76
Fail. Stress, psf		514	681	510	239
Strain, %		14.9	14.0	14.0	12.1
Ult. Stress, psf		514	681	510	239
Strain, %		14.9	14.0	14.0	12.1
σ_1 Failure, psf		1497	2665	3511	6253
σ_3 Failure, psf		984	1984	3001	6013

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: SO GR CH3 W/ ARS ML, TR-O

LL= 70 **PL=** 25 **PI=** 45
Assumed Specific Gravity= 2.72
Remarks: Torvane=0.22 tsf

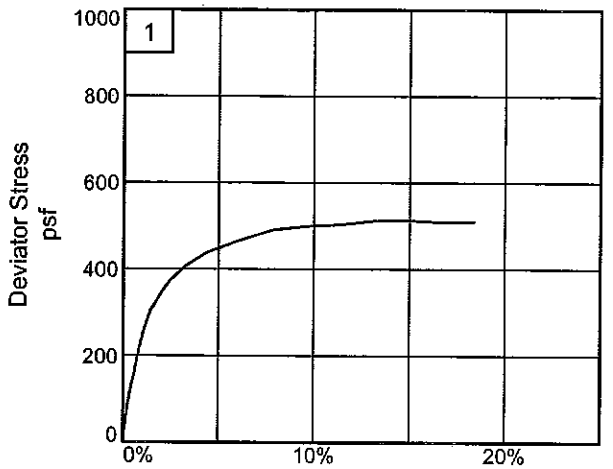
Client: USACE

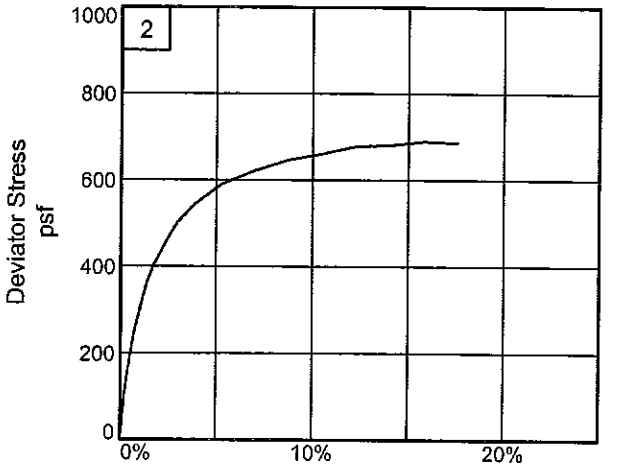
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source of Sample: TB-3U **Depth:** 3.2
Sample Number: 1D
Proj. No.: 10-017200 **Date Sampled:** 8-4-14

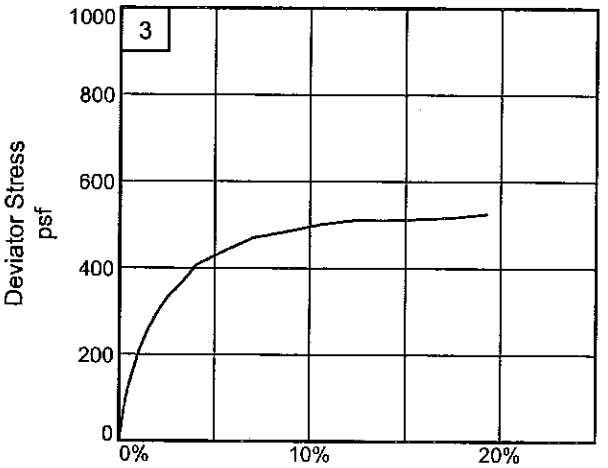
TRIAXIAL SHEAR TEST REPORT
Stantec
Saint Rose, Louisiana

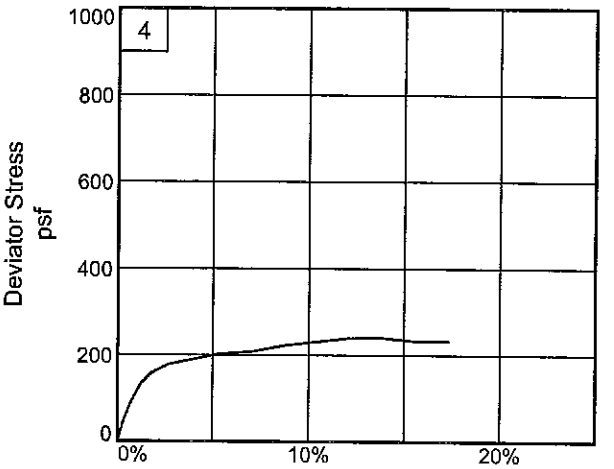
Figure _____

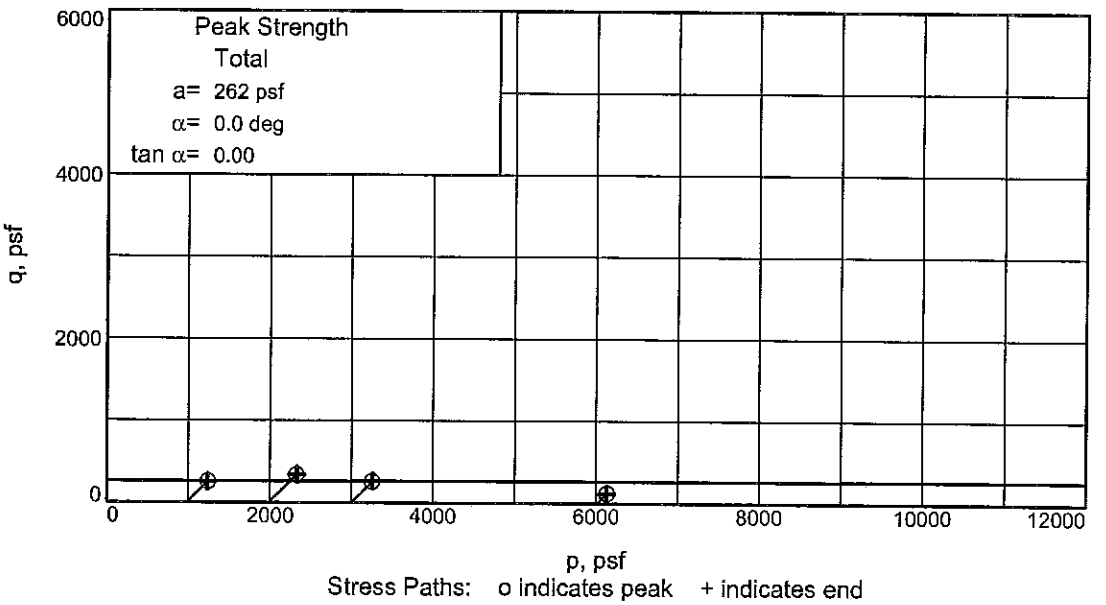
Tested By: JC **Checked By:** MJB/JS











Client: USACE

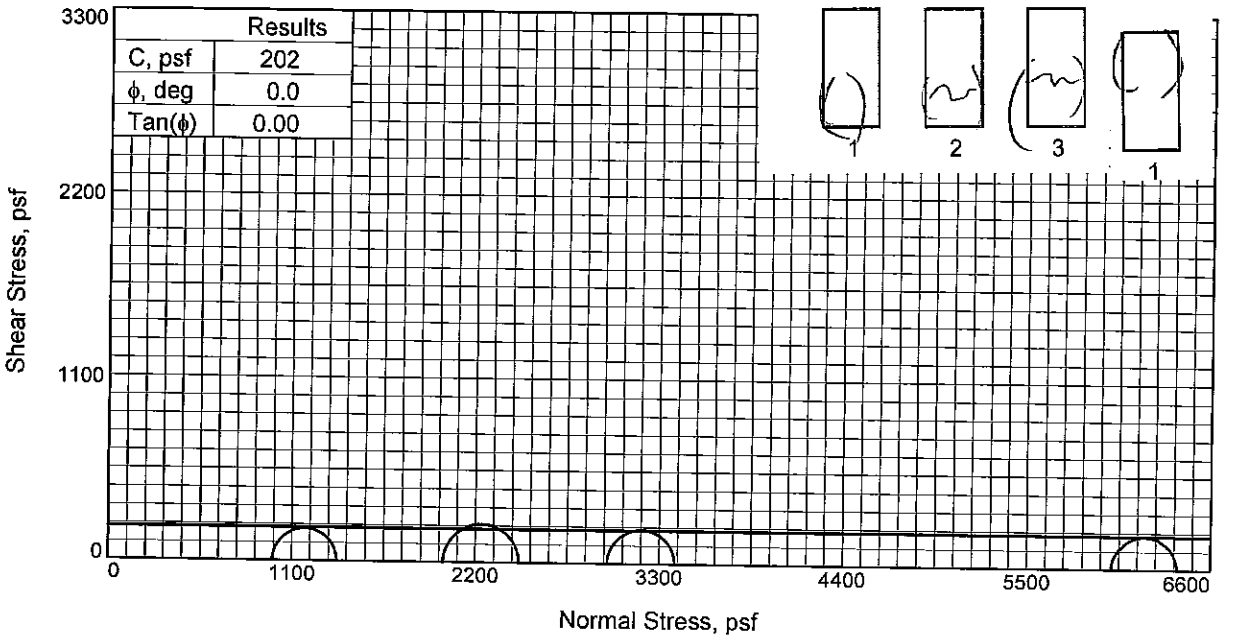
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Pari

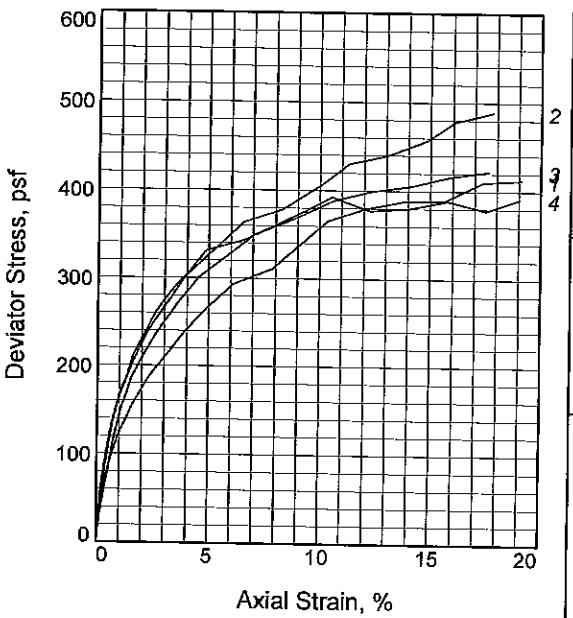
Source of Sample: TB-3U **Depth:** 3.2 **Sample Number:** 1D

Project No.: 10-017200 **Figure** _____

Stantec, Inc.

Tested By: JC **Checked By:** MJB/JS





Sample No.		1	2	3	4
Initial	Water Content, %	46.4	45.4	45.7	47.9
	Dry Density, pcf	74.4	75.7	75.2	73.5
	Saturation, %	98.9	100.0	99.5	99.9
	Void Ratio	1.2657	1.2254	1.2407	1.2939
	Diameter, in.	1.391	1.412	1.406	1.394
	Height, in.	3.003	3.003	2.994	2.999
At Test	Water Content, %	46.4	45.4	45.7	47.9
	Dry Density, pcf	74.4	75.7	75.2	73.5
	Saturation, %	98.9	100.0	99.5	99.9
	Void Ratio	1.2657	1.2254	1.2407	1.2939
	Diameter, in.	1.391	1.412	1.406	1.394
	Height, in.	3.003	3.003	2.994	2.999
Strain rate, %/min.		1.00	1.00	1.00	1.00
Back Pressure, psi		0.00	0.00	0.00	0.00
Cell Pressure, psi		6.82	13.93	20.75	41.70
Fail. Stress, psf		388	457	405	393
Strain, %		13.8	14.8	14.1	10.5
Ult. Stress, psf		388	457	405	380
Strain, %		13.8	14.8	14.1	14.0
σ_1 Failure, psf		1370	2463	3393	6397
σ_3 Failure, psf		982	2006	2988	6005

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: VSO GR CL4 W/ ARS SP

LL= 39 **PL=** 13 **PI=** 26
Assumed Specific Gravity= 2.70
Remarks: Torvane=0.17 tsf

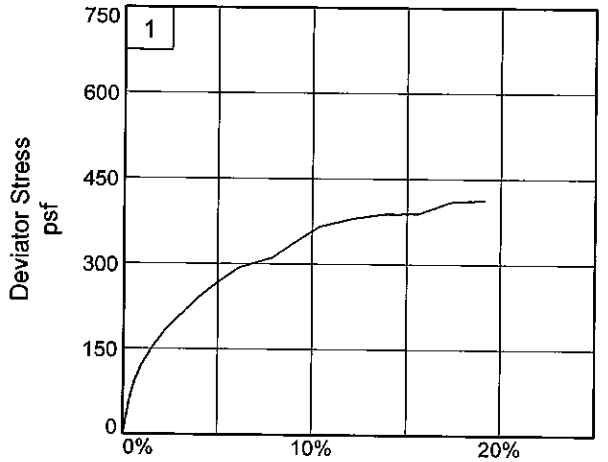
Client: USACE

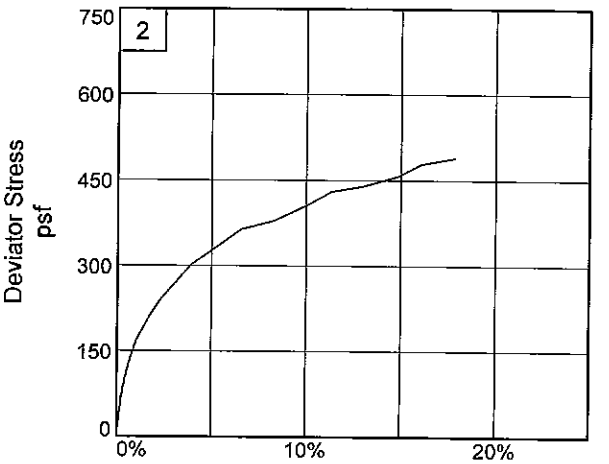
Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Parish, LA
Source of Sample: TB-3U **Depth:** 16.5
Sample Number: 5A
Proj. No.: 10-017200 **Date Sampled:** 8-4-14

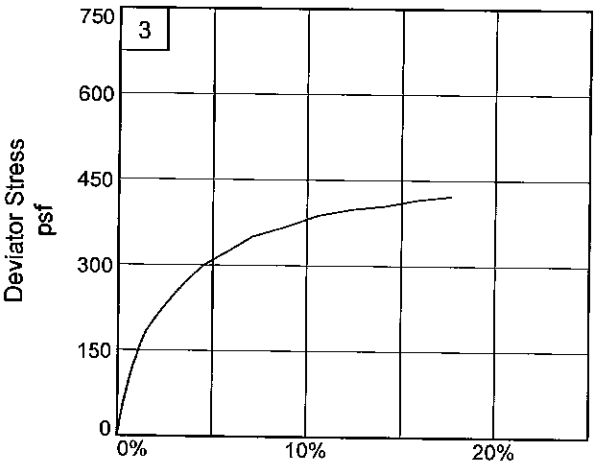
TRIAXIAL SHEAR TEST REPORT
Stantec
Saint Rose, Louisiana

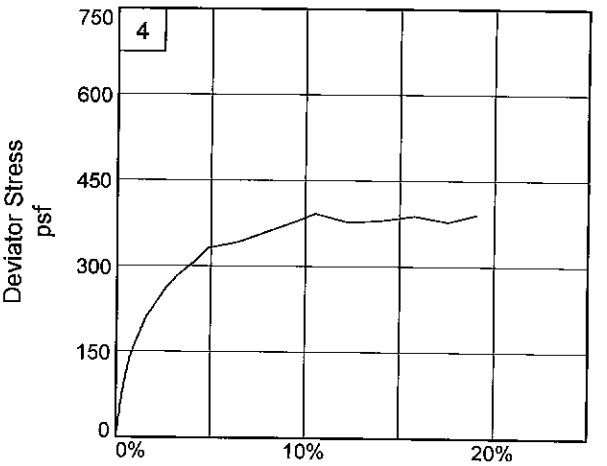
Figure _____

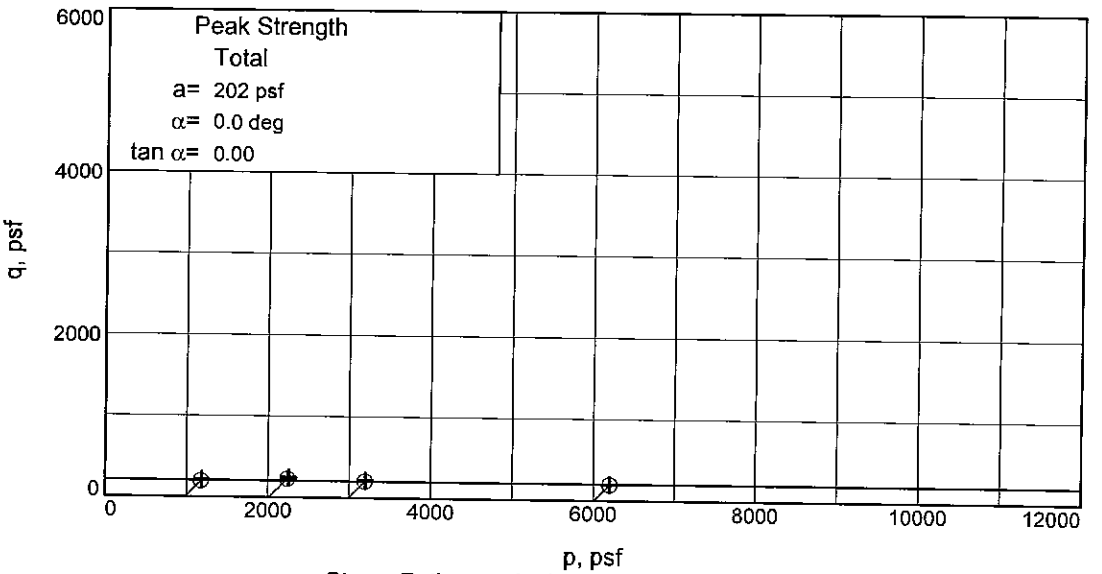
Tested By: JC **Checked By:** MJB/JS











Stress Paths: o indicates peak + indicates end

Client: USACE

Project: Undisturbed Soil Borings for LPV Mitigation, Turtle Bayou in Bayou Sauvage National Wildlife Refuge, Orleans Pa

Source of Sample: TB-3U **Depth:** 16.5 **Sample Number:** 5A

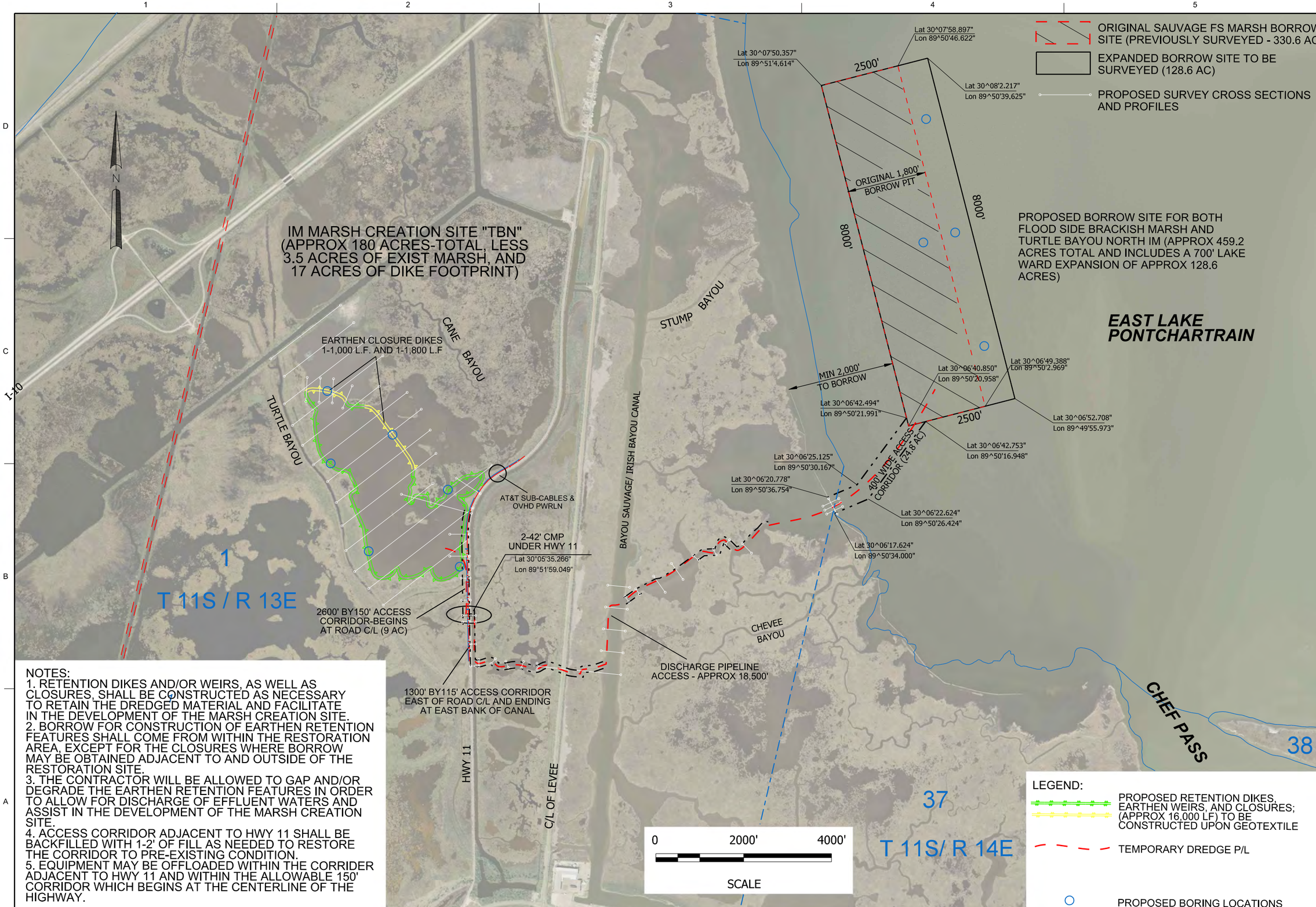
Project No.: 10-017200 **Figure** _____

Stantec, Inc.

Tested By: JC **Checked By:** MJB/JS

Appendix C

Survey Cross Sections



NOTES:
1. RETENTION DIKES AND/OR WEIRS, AS WELL AS CLOSURES, SHALL BE CONSTRUCTED AS NECESSARY TO RETAIN THE DREDGED MATERIAL AND FACILITATE IN THE DEVELOPMENT OF THE MARSH CREATION SITE.
2. BORROW FOR CONSTRUCTION OF EARTHEN RETENTION FEATURES SHALL COME FROM WITHIN THE RESTORATION AREA, EXCEPT FOR THE CLOSURES WHERE BORROW MAY BE OBTAINED ADJACENT TO AND OUTSIDE OF THE RESTORATION SITE.
3. THE CONTRACTOR WILL BE ALLOWED TO GAP AND/OR DEGRADE THE EARTHEN RETENTION FEATURES IN ORDER TO ALLOW FOR DISCHARGE OF EFFLUENT WATERS AND ASSIST IN THE DEVELOPMENT OF THE MARSH CREATION SITE.
4. ACCESS CORRIDOR ADJACENT TO HWY 11 SHALL BE BACKFILLED WITH 1-2' OF FILL AS NEEDED TO RESTORE THE CORRIDOR TO PRE-EXISTING CONDITION.
5. EQUIPMENT MAY BE OFFLOADED WITHIN THE CORRIDER ADJACENT TO HWY 11 AND WITHIN THE ALLOWABLE 150' CORRIDOR WHICH BEGINS AT THE CENTERLINE OF THE HIGHWAY.

MARK	DESCRIPTION	DATE	APPR.

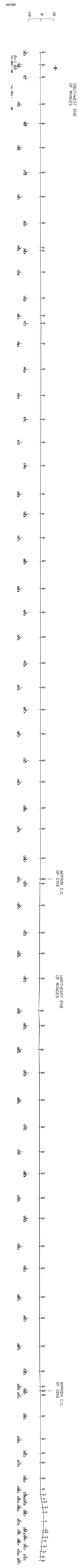
MARK	DESCRIPTION	DATE	APPR.

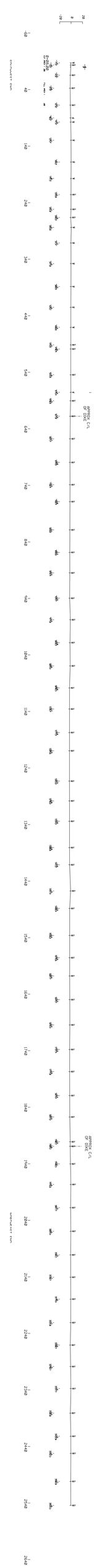
U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT
NEW ORLEANS, LOUISIANA

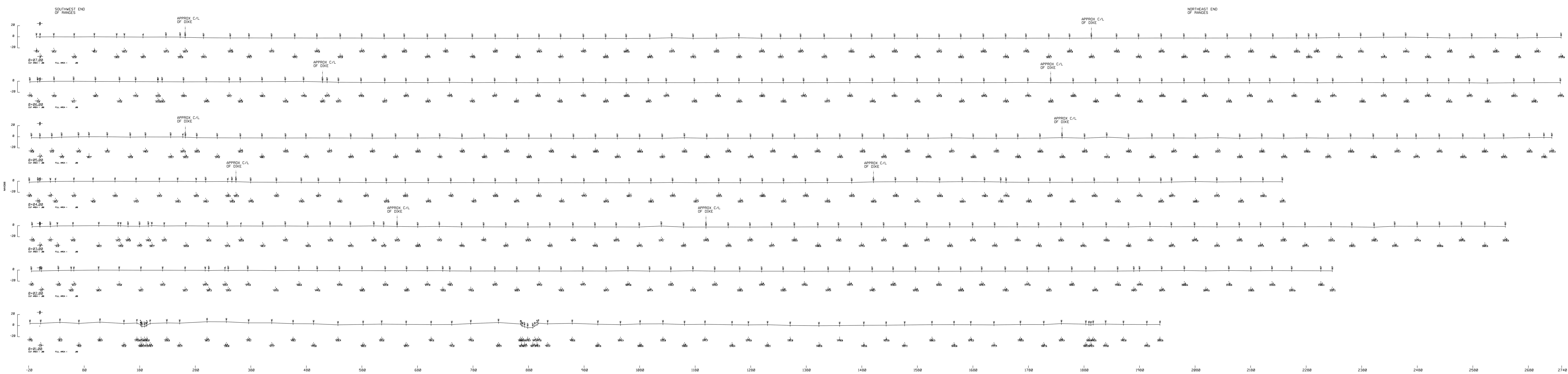
DESIGNED BY: RB
DWN BY: RB
CKD BY: KO
SUBMITTED BY: R. BROUSSARD
PLOT SCALE: 1:20,000
PLOT DATE: 3/28/2014
SIZE: ANSI D
FILE NAME: TBN-01 TURTLE BAYOU NORTH ROE.DGN
DATE: MAR 2014
SOLICITATION NO.:
CONTRACT NO.:
FILE NUMBER:

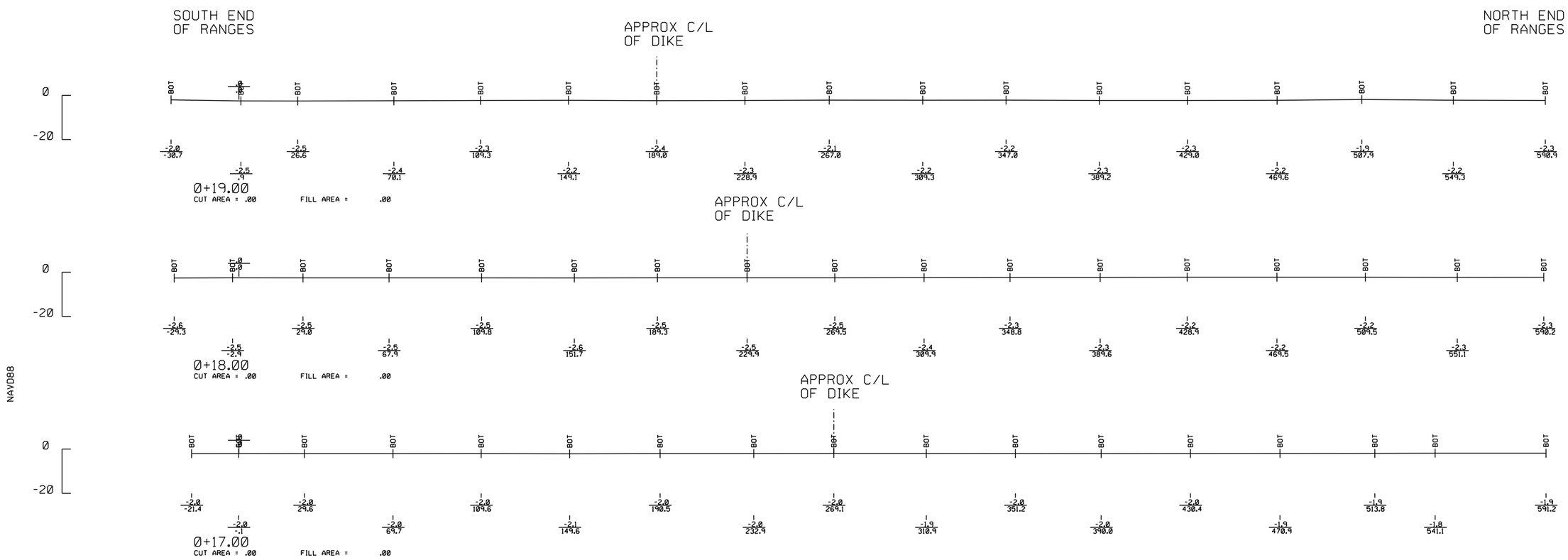
HSDRRS - LPV MITIGATION
TURTLE BAYOU NORTH IM RESTORATION
ORLEANS PARISH, LA

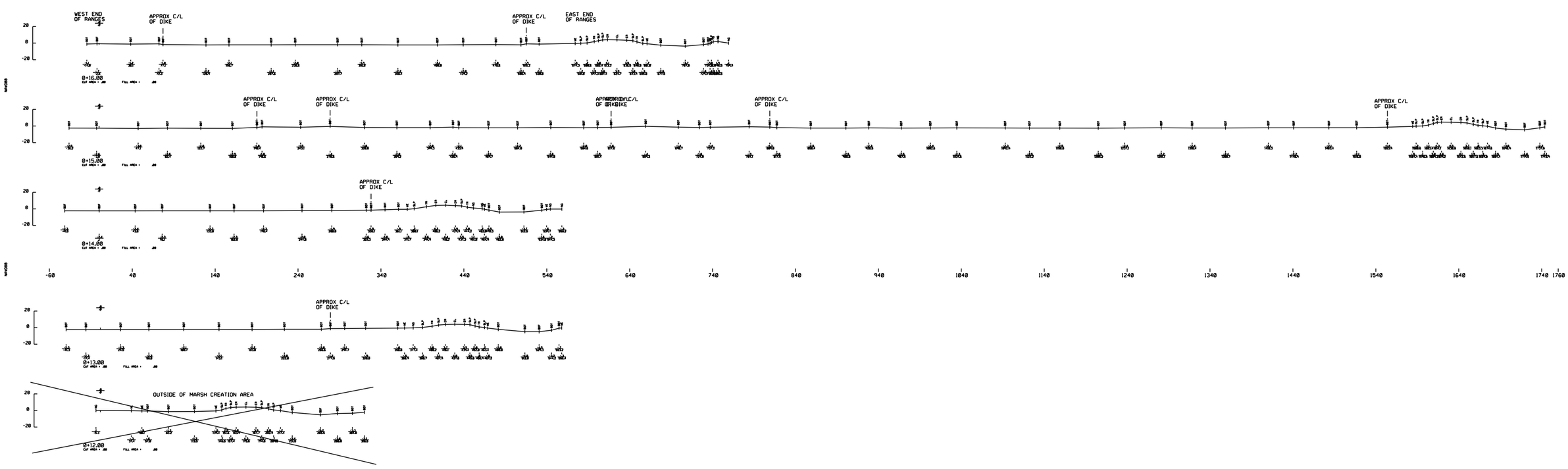
SHEET IDENTIFICATION
R-01


SOUTHWEST END OF RANGES
NORTHEAST END OF RANGES
APPROX. C.L. OF DIKE
APPROX. C.L. OF DIKE


ARMOR C/L
OF BOX
ARMOR C/L
OF BOX
CONTAINMENT FAN
CONTAINMENT FAN


SOUTHWEST END OF RANGES
NORTHEAST END OF RANGES
APPROX C/L OF DIKE
0+07.00
CUT AREA = .00 FILL AREA = .00
0+06.00
CUT AREA = .00 FILL AREA = .00
0+05.00
CUT AREA = .00 FILL AREA = .00
0+04.00
0+03.00
0+02.00
CUT AREA = .00 FILL AREA = .00
0+01.00
CUT AREA = .00 FILL AREA = .00
-20 80 180 280 380 480 580 680 780 880 980 1080 1180 1280 1380 1480 1580 1680 1780 1880 1980 2080 2180 2280 2380 2480 2580 2680 2740


SOUTH END
OF RANGES
APPROX C/L
OF DIKE
NORTH END
OF RANGES
0
-20
BOT
-2.0 -30.7
-2.5 .9
-2.5 26.6
-2.4 70.1
-2.3 109.3
-2.2 149.1
-2.4 189.0
-2.3 228.9
-2.1 267.0
-2.2 309.3
-2.2 347.0
-2.3 389.2
-2.3 429.0
-2.2 469.6
-1.9 507.9
-2.2 549.3
-2.3 590.9
0+19.00
CUT AREA = .00
FILL AREA = .00
APPROX C/L
OF DIKE
0
-20
BOT
-2.6 -24.3
-2.5 -2.9
-2.5 24.0
-2.5 67.9
-2.5 109.8
-2.6 151.7
-2.5 184.3
-2.5 224.9
-2.5 264.5
-2.4 304.9
-2.3 348.8
-2.3 389.6
-2.2 428.9
-2.2 469.5
-2.2 509.5
-2.3 551.1
-2.3 590.2
0+18.00
CUT AREA = .00
FILL AREA = .00
APPROX C/L
OF DIKE
0
-20
BOT
-2.0 -21.4
-2.0 -.1
-2.0 29.6
-2.0 64.7
-2.0 109.6
-2.1 149.6
-2.0 190.5
-2.0 232.9
-2.0 269.1
-1.9 310.9
-2.0 351.2
-2.0 390.0
-2.0 430.4
-1.9 470.9
-1.9 513.8
-1.8 541.1
-1.9 581.2
0+17.00
CUT AREA = .00
FILL AREA = .00
NAVD88


WEST END OF RANGES
APPROX C/L OF DIKE
APPROX C/L OF DIKE
EAST END OF RANGES
0+16.00
CUT AREA = JOB
FILL AREA = JOB
APPROX C/L OF DIKE
APPROX C/L OF DIKE
APPROX C/L OF DIKE
APPROX C/L OF DIKE
APPROX C/L OF DIKE
0+15.00
CUT AREA = JOB
FILL AREA = JOB
APPROX C/L OF DIKE
0+14.00
CUT AREA = JOB
FILL AREA = JOB
APPROX C/L OF DIKE
0+13.00
CUT AREA = JOB
FILL AREA = JOB
OUTSIDE OF MARSH CREATION AREA
0+12.00
CUT AREA = JOB
FILL AREA = JOB
20
0
-20
-60
40
140
240
340
440
540
640
740
840
940
1040
1140
1240
1340
1440
1540
1640
1740
1760

Appendix D

Reviews – ITR and Waterways Section

Responses to ITR comments

1. Change parameter to parameters on page 5, second sentence of the second paragraph under Settlement Estimate Analysis

Concur: This has been updated in the report.

2. On the same page, second sentence of the third paragraph under the same section, there is no value for the number of acres

Concur: this value has been added.

3. The factors of safety for plates 9 and 10 listed within the table on pages 6 and 7 do not match those on the actual plates.

Concur: The table has been updated to reflect the correct values.

Danton, Kelly L MVN

From: Scairono, Anthony J MVN
Sent: Friday, September 26, 2014 6:11 PM
To: Danton, Kelly L MVN
Cc: Quach, Bich N MVN
Subject: RE: Turtle Bayou Draft Report (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

I completed my review of Turtle Bayou Draft Report, and I only have three comments:

1. Change parameter to parameters on page 5, second sentence of the second paragraph under Settlement Estimate Analysis
2. On the same page, second sentence of the third paragraph under the same section, there is no value for the number of acres
3. The factors of safety for plates 9 and 10 listed within the table on pages 6 and 7 do not match those on the actual plates.

Anthony

-----Original Message-----
From: Danton, Kelly L MVN
Sent: Thursday, September 25, 2014 4:44 PM
To: Scairono, Anthony J MVN
Cc: Quach, Bich N MVN
Subject: RE: Turtle Bayou Draft Report (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Anthony,

How is your review coming? Do you think you will be finished by close of business tomorrow?

Thanks,
Kelly

-----Original Message-----
From: Bonanno, Brian P MVN
Sent: Monday, September 22, 2014 12:57 PM
To: Danton, Kelly L MVN
Cc: Scairono, Anthony J MVN; Woodward, Mark L MVN
Subject: RE: Turtle Bayou Draft Report (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Kelly,

Please get Bich to provide Anthony with a copy of the report ASAP and the charge number.

Thanks,

Brian

-----Original Message-----
From: Woodward, Mark L MVN
Sent: Monday, September 22, 2014 12:07 PM
To: Bonanno, Brian P MVN
Cc: Danton, Kelly L MVN; Scairono, Anthony J MVN
Subject: RE: Turtle Bayou Draft Report (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Anthony Scairono

-----Original Message-----
From: Bonanno, Brian P MVN
Sent: Monday, September 22, 2014 11:59 AM
To: Woodward, Mark L MVN
Cc: Danton, Kelly L MVN
Subject: FW: Turtle Bayou Draft Report (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Mark,

Need an engineer to conduct an ITR on Turtle Bayou (Marsh Creation LPV Mitigation Project).

Thanks,

Brian

-----Original Message-----
From: Danton, Kelly L MVN
Sent: Monday, September 22, 2014 11:31 AM
To: Bonanno, Brian P MVN
Subject: FW: Turtle Bayou Draft Report (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Brian,

Will the date for the Turtle Bayou final report stay the same (October 1st)? Who will be doing the ITR?

Thanks,
Kelly

-----Original Message-----
From: Duplantier, Wayne A MVN
Sent: Monday, September 22, 2014 11:18 AM
To: Danton, Kelly L MVN
Subject: RE: Turtle Bayou Draft Report (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Why the delay. Will the daft for the final report stay the same?

-----Original Message-----
From: Danton, Kelly L MVN
Sent: Monday, September 22, 2014 10:27 AM
To: Duplantier, Wayne A MVN
Cc: Bonanno, Brian P MVN
Subject: Turtle Bayou Draft Report (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Wayne,

I spoke to Brian, he said he will try to get it out by tomorrow.

Thanks,
Kelly Danton
USACE-MVN
Geotechnical Branch
Phone (504)862-1031
Fax (504)862-2987
Kelly.M.Lefort@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED

Comments to DRAFT LPV Mitigation Geotech Report (Sept 2014) for Turtle Bayou IM Restoration

1. Index to Plates;

   As the borrow borings are in 4 sheets, the Plate numbers for them will have to be 13 through 16 and should be shown as such under the "Plate Number" column.

   These will be put onto one plate as soon as we receive survey information from the drill crew.

2. A divider sheet for both APPENDIX B and APPENDIX C needs to be inserted into the report as was done for APPENDIX A.

   Concur: These sheets have been added.

3. Turtle Bayou Boring Location Google Earth Map;
   a. The title block in the upper left corner refers to this as Map 1 of 3. Where are maps 2 and 3?
      The map has been updated to remove Map 1 of 3. The original map was used in the Task Order to drill the borings, map 1 was a close up of the undisturbed borings and map 2 was a close up of the borrow borings. It was determined that only one map was needed to show the boring locations.
   b. The lake borrow borings are labeled "BSFR" but the boring log sheets refer to them as "BSFG". These discrepancies need to be resolved.
      The label BSFR was a typographical error and has been corrected on the updated map.
   c. This map needs to be labeled "Plate 1" to agree with the Plate index.
      Concur: this has been updated

4. The Boring Logs sheets for BOR TB-1U, TB-2U and TB-3U needs to be corrected as follows:
   a. Correct the elevation datum on each sheet from "NAVD" to "NAVD88".
      Concur: this has been updated
   b. Insert "Plate 2", "Plate 3" and "Plate 4" under "Sheet Identification Number" for each respective plate.
      Concur: this has been updated
   d. Complete title blocks on each boring log sheet/Plate
      Concur: this has been updated

5. The Geologic Profile Plate; Correct the Plate number in the bottom right hand corner to Plate 5.
   Concur: this has been updated

6. Strength Line Plate;
   a. Add the plate number "6" in the bottom right hand corner. *Concur: this has been updated*
   b. Correct the vertical datum from "NGVD" to NAVD88". *Concur: this has been updated*.

7. Plates 9 and 10;
   These plates are supposed to address Construction Case – Circular and Non-Circular for the intermediate marsh restoration site, but for some reason show the beneficial use area to be at approx elevation –18' NAVD88 and the file name is "Turtle Bayou borrow pit". Is this the lake borrow pit? Please resolve as needed.
   Analysis was changed so that the bottom of the proposed borrow pit that will be used to obtain dike material is at elevation -10' NAVD88.

8. Plate 11;
   This plate is labeled "Operation Case – Non Circular", as is Plate 12. Should this plate be labeled "Circular" as alluded to in the write-up? *Concur: this was corrected*

9. The four(4) Lake Borrow logs – Plates 13 through 16;
   a. Please be sure to include complete, full scale plates (with complete title blocks) in the final report for each boring. *These borrow borings are now shown on one plate, as is typical with general type borings.*
   b. Be sure to correct the datum to read "NAVD88" on all plates. *Concur: This has been updated.*
   c. Correct the elevations on all plates. *Concur: elevations have been updated. Elevations were not taken by the drill crew, but were inferred from surveys of the borrow pit in the lake.*
   d. Do the boring names/labels need to be corrected as they disagree with Plate 1 (Google Earth Plan map of all borings) *Boring names on these plates are correct the map was corrected.*

10. Appendix A;
    a. Add the vertical datum of "NAVD88" to all of the plots in this appendix. *Concur, this has been added.*

b. Additional comments to the settlement curves ; based off of an e-mail from Brian Bonanno, dated 18 Sep 14, requesting the "target construction grade" for the dredge fill, and my follow-up e-mail that date providing a long term marsh elevation of 0.0' NAVD88, these curves do not address the 0.0' NAVD88 long term target grade provided.

Please revise these settlement curves to show the initial dewatered elevation of the dredge full that will be required to obtain the required 0.0' NAVD88 target grade. We should also have an extra curve just below the one developed for the 0.0' nAVD88 target curve.
Concur: curves to address the 0.0' NAVD88 long term target grade have been provided.

One added and minor note; the curves for fill at +4.0, +3.5 and +3.0' can be eliminated, if desired, based off of the long term grade of 0.0'.
Concur: These curves have been deleted.

c. Consolidation and shrinkage charts/tables are provided for fill placed to +4.0'. Is there a reason for this when the long term grade is to be 0.0'? These charts/tables should be replaced with ones that pertain to the initial fill grade that will be required to achieve the long term elevation of 0.0' NAVD88 (i.e. appears to be between +1.0 and +0.5' NAVD88 at year 0 based off of curves provided) requested on 18 Sep 14.
Concur: Charts and tables have been updated to include fill placed to +1.5' NAVD88.

d. "Roc Science" Consolidation Settlement charts and graphics.

Again, all of these pertain to Settlement fill at +4.0'. They need to be replaced with those pertaining to the settlement fill grade required to obtain a long term fill elevation of 0.0' NAVD88.

Concur: These have been replaced with settlement fill to +1.5' NAVD88.

e. The Semi-compacted fill shrinkage curve really needs some clarification.
Concur: Tables on pages A-13 and A-14 of Appendix A have been updated to better explain the calculations used to determine the shrinkage curve.

11. APPENDIX C.

a. Insert a divider/ header sheet as done for Appendices A and B. *The divider has been added for this appendix.*

b. The cross sections are not legible and need to be re-plotted on larger paper (i.e. 11X17) when plotted to PDF files, and maybe on multiple sheets rather than all of them on one page. *Concur: The cross sections have been plotted on multiple sheets.*

12. GEOTECH REPORT WRITE-UP

a. Page 4, paragraph entitled "PROJECT CONSTRAINTS; BORROW". This paragraph is confusing as it first seems to be addressing lake borrow, followed by borrow for retention dikes, and then again lake borrow. Need to be sure that the report clearly states which borrow feature is being addressed. Also, the "-18' NAVD88" was the maximum depth provided to Kelley Danton for the LAKE borrow. Was this depth also used as the maximum for dike stability for the retention dikes to be constructed in the restoration area? If so, then we simply need to be sure that it is clearly spelled out in the report. <u>(FYI – (-)18' NAVD88 will not be allowed for construction of the retention dikes, unless ED-F determines that to be warranted due to soil conditions)</u>
Interior borrow pits will not be deeper than elevation -10' NAVD88. This was analyzed for stability. A sentence was added to the first paragraph in this section "This area will not be dredged deeper than elevation -18' N.A.V.D. 88".

b. "FIELD INVESTIGATIONS". This paragraph states that the 3 Turtle Bayou borings are on Plates 1 to 3. According to the Plate index on page 2, these borings are on Plates 2 to 4. Same comment applies to the next paragraph "LABORATORY TESTING". *Concur: plate numbers have been updated in these sections.*

c. "SETTLEMENT ESTIMATE ANALYSIS". In the 2nd paragraph, a blank space is left in the 2nd sentence. If this is to be the total acres of the marsh restoration area, then it should be entered as 180, as depicted in the map on page 3.
Concur: This has been added.
The remaining figures in this paragraph need to be revised to address what Geotech Branch determines the initial elevation of the fill to be in order to achieve the long term elevation of 0.0' NAVD88 that provide to Brian Bonanno on 18 Sep 14.
Figures have been updated, the stability design is thought to be conservative. The dike elevation can be reduced or the slopes may be made less steep if necessary to achieve project goals.

d. "SETTLEMENT CURVES". See previous comments addressing additional curves required and the ability to eliminate some (from +4 to +3), if desired by Geotech Branch.
Concur: Additional Curves have been provided.

e. "EARTHEN DIKE". Based off of the survey performed, and an e-mail provided to Geotech Branch on 18 Sep 14, the water surface in the Turtle Bayou IM area was -0.4'

NAVD88 at the time of the survey. Was this simply rounded by Geotech Branch as the report shows "0" as the water surface? Also, based off of a meeting with Kelly Danton, I had been informed that the slopes for the retention dikes would be 1 on 3, but the report says 1 on 4. Just need clarification as to which slope is the correct one and to be used for the P&S? *The water surface elevation was rounded to elevation 0 feet N.A.V.D. 88. An exact water level elevation was not used because the 18 Sep 2014 email also stated that this is an enclosed basin and levels will vary by rainfall events, droughts, etc. Dike slopes are 1V on 3H; the report has been corrected to reflect this.*

The 3rd paragraph again addresses a borrow depth of -18' for the retention dikes which just so happened to coincide with the maximum depth for borrow in the lake that was provide to Geotech Branch. What generated this specific borrow depth for the earthen dikes? *There was a miscommunication, it was believed that both the dredged borrow pit and the interior borrow pit were both to be excavated to no deeper than elevation -18 feet N.A.V.D. 88. This has been corrected and the report and stability analyses were updated to reflect an interior borrow pit that extends no deeper than elevation -10 feet N.A.V.D. 88 will be used.*

The last paragraph addresses +2' as the fill elevation for the operation case for the marsh. Why +2'? *The stability analysis was run with a marsh elevation of +2' N.A.V.D. 88, this is conservative and a lower elevation of marsh will be stable.*

Rick Broussard

9/29/2014 4:24 PM

APPENDIX B

Survey Report

Survey Report

HSDRRS Lake Pontchartrain and Vicinity Mitigation,
Turtle Bayou North, Intermediate Marsh Restoration
Survey,
Orleans Parish, LA

Prepared for
Department of the Army
New Orleans District, Corps of Engineers

W912P8-10-D-0051
Task Order No. 0127

Chustz Surveying Inc.
211 Richy Street
New Roads, LA 70760
225-638-5949

STATE OF LOUISIANA
JAMES H. CHUSTZ, JR.
Reg. No. 4657
REGISTERED PROFESSIONAL LAND SURVEYOR

CHUSTZ SURVEYING, INC.

I hereby certify that the information shown hereon is true and correct to the best of my knowledge and belief.

James H. Chustz Jr., PLS
LA Reg. No. 4657
Chustz Surveying, Inc.

August 2014

Section 1
General Project Description and Background

This project is for the Department of the Army, New Orleans District, Corps of Engineers for Contract No. W912P8-10-D-0051, Task Order 127, HSDRRS Lake Pontchartrain and Vicinity Mitigation, Turtle Bayou North, Intermediate Marsh Restoration Survey.

Statement of Work to be Performed

The required work consists of a topography/hydrographic survey of the proposed Turtle Bayou North marsh creation site, and the dredge access corridor leading from Lake Pontchatrain and crossing Irish Bayou Canal, the HSDRRS levee system, and LA HWY 11. Chustz Surveying shall collect sixteen cross section ranges (TBN1-TBN16) within the proposed restoration site that will extend over variable lengths. All elevations shall be provided at 50 foot intervals along designated ranges and also at all grade changes. Chustz Surveying shall collect 23 additional cross section ranges (AC-AC23) along the proposed dredge discharge pipeline access route. Elevations shall be provided at 25 feet intervals along the designated ranges, while capturing all major grade changes. All pipelines, utilities, signs, fiber optic cables and aerial power link crossings, wells and other miscellaneous structures within the vicinity of the work area shall be located and noted.

All surveys and submittals shall meet the requirements set forth in the USACE New Orleans District Guide for Minimum Survey Standards document found at: http://www.mvn.usace.army.mil/ed/edss/USACE_MVN_Min_Survey_Standards.PDF

Horizontal Control

Horizontal control shall be tied to a stable established benchmark and referenced to the State Plane Coordinate System using North American Datum of 1983 (NAD83).

Vertical Control

Vertical data will be tied to a stable benchmark and referenced to North American Vertical Datum of 1988 (NAVD88-2009.55).

Equipment

The topographic data for this job will be collected with a Trimble TSC 3, a Trimble TSC 2, two Trimble R6's, a Trimble Dini Digital Level, two Trimble 5700's, a Trimble Zephyr Geodetic Antenna, and a Trimble Trimark 3.

Section 2
Project Planning and Data Collection

On July 7, 2014, Chustz Surveying, Inc. deployed a four person Static GPS survey party to site and surrounding areas to conduct the GPS survey. The crew recovered monuments E 3146, 52 V 075 RESET, H 375, and set TBM TURTLE BAYOU at the work site. They then conducted a five hour Static GPS survey session on each monument. The crew returned the next day and conducted another five hour Static GPS survey session on each monument to complete the GPS Survey.

The crew then located MVN-16 and made a tie utilizing VRS tied to GULFNet. Next they made three ties to TBM TURTLE BAYOU and tied back to establish temporary control. The crew returned the next day, set up their RTK base on TBM TURTLE BAYOU and set iron rods IR-1005 and IR-1006 for control. Next, they moved their base to IR-1005 and tied back to TBM TURTLE BAYOU for verification. Utilizing RTK, the crew then began to collect assigned cross sections. Over the next eight days, the three person crew continued conducting the topographic survey and collected the cross section data. On July 24, 2014 a two person crew performed a level peg test to ensure that all equipment was operating within 3rd order standards. Next, they ran a level loop from IR-1005, through FP 2807, IR-1006, FP 1165, and FP 1070, and back to IR-1005 to establish vertical control throughout the work area. On July, 28, 2014, a two person crew returned to site to finish the remaining topographic survey and cross section data. The job was completed this day including all required survey work and finished the job.

Once the precise ephemerides were available for the GPS data, a Fully Constrained Station GPS Network was produced and all the topographic data was processed accordingly. The job was completed and submitted on Wednesday, July 6, 2014.

Section 3
Submitted File Index

Job 14-108C Turtle Bayou North Marsh Restoration

ED-SS_Correspondence:
SOW Q-A.pdf

ED-SS_EM_Format:
14108CAC.EM 14108CAC.EM.rep
14108CTB.EM 14108CTB.EM.rep
codes.dat

ED-SS_FieldBooks:
FBK #140046 PGS 1-54.pdf 072414PG Level Report.pdf
070814PG Level Report.pdf 072414L1 Level Report.pdf

ED-SS_GPS:
14-108C GPS TBC_2.zipr

ED-SS_KMZ_Files
14108CAC.EM.kmz 14108CTB.EM.kmz

ED-SS_LMN830:
14108CAC.830 14108CAC.rpt
14108CTB.830 14108CTB.rpt

ED-SS_Photos:
Photos.zip

ED-SS_Raw_Data:
14020JC070814VRS.csv 14020JC070814VRS.job 14020JC070914RTK.csv
14020JC070914RTK.job 14020JC071214RTK.csv 14020JC071214RTK.job
14020JC071414RTK.csv 14020JC071414RTK.job 14020JC072114RTK.csv
14020JC072114RTK.job 14020JC072414S3.csv 14020JC072414S3.job
14108CLD072814.csv 14108CLD072814.job 070814PG.DAT
072414L1.DAT 072414PG.DAT

ED-SS_SOW:
14-108C Scope of Work.pdf
TURTLE BAYOU NORTH IM_Survey Maps.pdf

ED-SS_Survey_Control:
52 V 075 RESET.pdf
E 3146.pdf
H 375.pdf
TURTLE BAYOU.pdf

ED-SS_Survey_Report:
14-108C Turtle Bayou Survey Report.pdf

ED-SS_Technical_Review:
14108CAC.EM.err
14108CTB.EM.err