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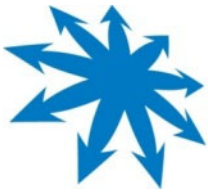
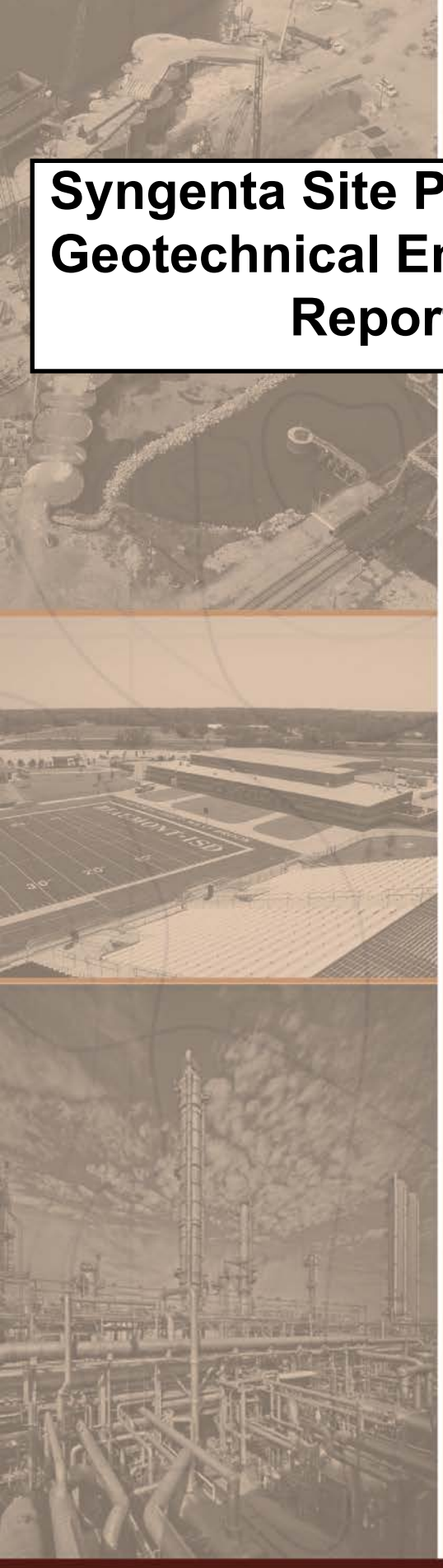
Exhibit BB.
Syngenta Site
Preliminary Geotechnical Engineering Report



Baton Rouge Area Chamber®



Tolunay-Wong Engineers, Inc.

Syngenta Site Preliminary Geotechnical Engineering Report

PRELIMINARY REPORT
RECONNAISSANCE GEOTECHNICAL STUDY
PROPOSED WANHUA CHEMICAL PROCESSING FACILITY
SYNGENTA SITE
CARVILLE, LOUISIANA

Prepared for:

Wanhua Chemical US Holdings, Inc.
Two Shell Plaza
777 Walker Street
Houston, Texas 77002

Prepared by:

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October 28, 2015

TWE Project No. 15.33.021 / TWE Report No. 16855

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October 28, 2015

Wanhua Chemical US Holdings, Inc.
Two Shell Plaza
777 Walker Street
Houston, Texas 77002

Attn: Mr. Sun Kunpeng (Sam Kupper)
kpsun@whchem.com

Ref: Reconnaissance Geotechnical Study – Preliminary Report
Proposed Wanhua Chemical Processing Facility
Syngenta Site
Carville, Louisiana
TWE Project No. 15.33.021 / Report No. 16855

Dear Mr. Kupper,

Tolunay-Wong Engineers, Inc. (TWE) is pleased to submit this preliminary report of our reconnaissance geotechnical study for the proposed chemical processing facility at the Syngenta Site in Carville, Louisiana. This report contains a detailed description of the field and laboratory program performed for this study, as well as soil boring logs with tabulated laboratory test results. Cone penetration test (CPT) sounding logs pertaining to this study are also included in this report. Our preliminary geotechnical evaluations for the Syngenta Site are also included in this report.

We appreciate the opportunity to work with you on this phase of the project and look forward to the opportunity of providing additional services as the project progresses. If you have any questions or comments regarding this report or if we can be of further assistance, please contact us.

Sincerely,

TOLUNAY-WONG ENGINEERS, INC.
Louisiana Professional Engineering and Land Surveying Board - Registration No. EF.0003024

Adam J. Milling, E.I.
Staff Professional

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Branch Manager

Patrick J. Kenney, P.E.
Senior Geotechnical Engineer

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APPENDICES

1 INTRODUCTION AND PROJECT DESCRIPTION

1.1 Introduction

This preliminary report presents results of our reconnaissance geotechnical study performed for the proposed Chemical Processing Facility at the Syngenta Site in Carville, Louisiana. Our geotechnical study was conducted in general accordance with TWE Proposal No. P15-GZL032 (Revision No. 5) dated June 17, 2015 and authorized by Jack Shi on behalf of Wanhua Chemical Corporation (Client) on June 19, 2015.

1.2 Project Description

The project consisted of performing a reconnaissance geotechnical study at the Syngenta Site to develop preliminary geotechnical recommendations to assist the Client in the cost evaluation and conceptual design of foundations for proposed structures associated with a potential chemical processing facility.

For purposes of this study, the Syngenta Site was divided into three (3) areas based on property ownership. Syngenta Area 1 consists of the western parcel owned by Bear Industries, Syngenta Area 2 consists of the northern parcel owned by Kinder Morgan, and Syngenta Area 3 consists of the eastern parcel owned by Syngenta.

We understand that various structures at the Syngenta Site for this project would include major process equipment, storage tanks, pipe racks, and other equipment. Site preparation activities at the site could consist of stripping, placement and compaction of structural fill, and excavations for underground lines, sumps, and drainage structures. We expect that major structures associated with a chemical processing facility, such as this, would likely be supported on deep foundation systems and lightly loaded structures could possibly be supported with shallow foundation systems.

This report is intended to assist the Client in evaluating the subsurface conditions at the Syngenta Site and to provide geotechnical information necessary for conceptual design of various project structures associated with the proposed chemical facility. We understand that the purpose of this study is to evaluate the feasibility of the project site for the development of the proposed facility and that the Client is considering acquisition of land at this time. Therefore, this report is not intended for final design purposes. Additional geotechnical studies are recommended if the property is purchased, and as the project progresses.

2 PURPOSE AND SCOPE OF SERVICES

The purposes of this geotechnical engineering study were to investigate the soil and groundwater conditions at the Syngenta Site to assist the Client in evaluating the suitability of this site for the potential construction of a chemical processing facility.

The scope of our geotechnical services consisted of:

1. Drilling and sampling twenty-one (21) conventional soil borings to depths ranging from 60-ft to 100-ft below existing grade at predetermined locations to evaluate subsurface stratigraphy and groundwater conditions;
2. Performing cone penetration tests (CPT) at forty (40) locations to depths of 25-ft below grade to supplement the geotechnical soil boring program;
3. Performing test pits at five (5) locations to depths up to 10-ft below grade throughout the site to supplement the field exploration program and to assist in evaluation of site stripping, subgrade preparation, earthwork requirements and pavement recommendations;
4. Performing geotechnical laboratory tests on recovered soil samples to evaluate the physical and engineering properties of the soil strata encountered;
5. Preparing a geotechnical report containing:
    a. Discussion and conclusions of our findings including:
        i. Subsurface soil and groundwater conditions;
        ii. Classification of soils encountered in accordance with the USCS;
        iii. Cross-sections of soils encountered in accordance with the USCS;
        iv. Boring logs presenting tabulated field and laboratory test results;
        v. Derivation of geotechnical design parameters, such as unit weight, cohesion, friction angle, elastic modulus, earth pressure coefficients, and consolidation parameters;
        vi. Discussion of groundwater level observations and impact of anticipated minimum and maximum levels on proposed construction;
        vii. Determination of Site Classification and coefficients per IBC;
    b. Discussions and recommendations for potential shallow foundation systems, including bearing capacity and settlement considerations, uplift and lateral resistance, and construction recommendations;
    c. Preliminary geotechnical design and construction recommendations for deep foundations, including:
        i. Ultimate axial capacities for driven piles as requested by the Client;
        ii. Recommended soil design parameters for use with lateral analyses (L-Pile Input Parameters);
        iii. General deep foundation installation guidelines;
    d. Geotechnical design and construction recommendations for storage tanks, including:
        i. Bearing capacity analysis for proposed ringwall and/or mat foundations for hydro-test and long term conditions;

ii. Discussions regarding deep foundations and/or remedial measures to improve subgrade conditions for tank support;

e. Consideration and recommendations pertaining to ground improvement methods where applicable;

f. Preliminary pavement design and construction recommendations for access roads, plant roads and area paving, where applicable;

g. Recommendations for re-use of on-site excavated materials as fill and backfill materials; and,

h. Construction considerations including site preparation, excavation, dewatering, fill and backfill placement, compaction requirements and foundation installation.

Our scope of services did not include any environmental assessments for the presence or absence of wetlands or of hazardous or toxic materials within or on the soil, air or water within this project site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the Client. A geological fault study was also beyond the scope of our services associated with this geotechnical engineering study.

3 FIELD PROGRAM

3.1 Soil Borings

Exploration of subsurface soil and groundwater conditions using conventional soil borings at the project site was performed from July 6 to July 10 and from August 26 to August 28, 2015. The quantities and depths of the performed conventional soil borings for the Syngenta site are listed in Tables 3-1, 3-2 and 3-3 below by area. Surveying of the test boring locations was performed by our subcontractor Batture Engineering.

Table 3-1 Geotechnical Field Program		
Syngenta Area 1 (West)		
Soil Borings		
Designation	**Depth (ft)**	**Elevation (ft)**
B-1	60	17.30
B-2	60	19.44
B-3	100	18.19
B-4	60	14.21
B-9	60	19.32
B-10	60	16.12
B-11	60	15.72
B-12	60	15.92
B-14	100	15.85

Table 3-2 Geotechnical Field Program		
Syngenta Area 2 (North)		
Soil Borings		
Designation	**Depth (ft)**	**Elevation (ft)**
B-5	60	14.40
B-6	100	15.05
B-7	60	15.09

Table 3-3 Geotechnical Field Program		
Syngenta Area 3 (East)		
Soil Borings		
Designation	**Depth (ft)**	**Elevation (ft)**
B-8	100	17.59
B-13	60	16.23
B-15	60	14.89
B-16	60	13.26
B-17	100	17.42
B-18	60	17.44
B-19	100	13.53
B-20	60	13.86
B-21	60	12.48

The soil boring locations are presented on Drawing No. 15.33.021-1 provided in Appendix A. Drilling, sampling and grouting of the soil borings was performed using buggy-mounted drilling equipment. Our field personnel coordinated the field activities and logged the boreholes.

3.1.1 Drilling Methods

Field operations were performed in general accordance with *Standard Practice for Soil Investigation and Sampling by Auger Borings* [American Society for Testing and Materials (ASTM) D 1452]. The soil borings were drilled using a buggy-mounted drilling rig equipped with a rotary head. The boreholes were advanced using dry-auger and wash-rotary drilling methods. Typically, borings are dry-augered using a flight auger to advance the boreholes until groundwater is encountered or until the boreholes become unstable and/or collapse. At that point, the soil borings are completed using wash-rotary drilling techniques. Samples were obtained continuously at intervals of 2-ft from existing ground surface to a depth of 12-ft, at 13-ft to 15-ft, and intervals of 5-ft thereafter until the boring completion depths were reached.

3.1.2 Soil Sampling

Fine-grained, cohesive soil samples were recovered from the soil borings by hydraulically pushing 3-in diameter, thin-walled Shelby tubes a distance of about 24-in. The field sampling procedures were conducted in general accordance with the *Standard Practice for Thin-Walled Tube Sampling of Soils* (ASTM D 1587). Our geotechnician visually classified the recovered soils and obtained field strength measurements using a pocket penetrometer or hand torvane device. A factor of 0.67 is typically applied to the penetrometer measurement to estimate the undrained shear strength of the Gulf Coast cohesive soils. The samples were extruded in the field, wrapped in foil, placed in moisture sealed containers and protected from disturbance prior to transport to the laboratory.

Coarse-grained, cohesionless and semi-cohesionless soil samples were collected with the standard penetration test (SPT) sampler driven 18-in by blows from a 140-lb hammer falling 30-in in accordance with the *Standard Test Method for Standard Penetration Test (SPT) and Spilt-Barrel Sampling of Soils* (ASTM D 1586). The number of blows required to advance the sampler three (3) consecutive 6-in depths are recorded for each corresponding sample on the boring log. The N-value, in blows per foot, is obtained from SPTs by adding the last two (2) blow count numbers. The compactness of cohesionless and semi-cohesionless samples and the consistency of cohesive samples are inferred from the N-value. The samples obtained from the split-barrel sampler were visually classified, placed in moisture sealed containers and transported to our laboratory.

The recovered soil sample depths with corresponding pocket penetrometer and hand torvane measurements are presented on the boring logs in Appendix B. SPT sampling intervals and blow counts are also presented at their respective sample depths on the boring logs in Appendix B.

3.1.3 Boring Logs

Our interpretations of general subsurface soil and groundwater conditions at the soil boring locations are included on the boring logs. Our interpretations of the soil types throughout the boring depths and the locations of strata changes were based on visual classifications during field sampling and laboratory testing in accordance with *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)* (ASTM D 2487) and *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)* (ASTM D 2488). The boring logs include the type and interval depth for each sample along with their corresponding pocket penetrometer measurements, hand torvane measurements and blow count values. The boring logs for B-1 through B-21 and a key to terms and symbols used on boring logs are presented in Appendix B.

3.1.4 Groundwater Measurements

Groundwater level measurements were attempted in open boreholes during dry-auger drilling in the open boreholes when groundwater was first encountered and at five (5) minute intervals over a fifteen (15) minute time period. The groundwater observations are summarized in Section 6.4 of this report entitled *"Groundwater Observations."*

3.2 CPT Soundings

Cone penetration tests (CPT's) were performed within Area 1 at locations CPT-1 through CPT-5, CPT-8 through CPT-21 and CPT-28. Cone penetration tests were performed in Area 2 at locations CPT-6 AND CPT-7. Cone penetration tests were performed in Area 3 at locations CPT-22 through CPT-27 and CPT-29 through CPT-40. Locations of CPT soundings are provided on Drawing No. 15.33.021-3 in Appendix A. CPT soundings extended to a depth of 25-ft below grade. The CPT obtains data at nearly continuous intervals. The data obtained is tip resistance, friction and pore pressures. These are processed through published correlations and comparisons with laboratory testing and geotechnical borings to provide cone soil properties such as soil type, undrained shear strength, density, overconsolidation ratio, relative density, soil

friction angle, and equivalent "N" values. These properties when correlated with geotechnical drilling and sampling provide a more complete understanding of the subsurface conditions. CPT sounding logs for Area 1, Area 2 and Area 3 are provided in Appendix C.

Surveying of the CPT locations was performed by our subcontractor Batture Engineering. Ground surface elevations at the test locations are presented in Table 3-4, Table 3-5 and Table 3-6 below. Elevations at locations not reported in the following tables will be obtained and provided in the final report.

Table 3-4
CPT Ground Elevations

Syngenta Area 1 (West)	
Test Location	Elevation (ft)
CPT-1	19.50
CPT-2	18.35
CPT-3	17.88
CPT-4	13.73
CPT-5	-
CPT-8	-
CPT-9	20.02
CPT-10	19.55
CPT-11	17.56
CPT-12	16.97
CPT-13	16.89
CPT-14	-
CPT-15	-
CPT-16	-
CPT-17	19.59
CPT-18	17.63
CPT-19	-
CPT-20	-

Table 3-5
CPT Ground Elevations

Syngenta Area 2 (North)	
Test Location	Elevation (ft)
CPT-6	14.67
CPT-7	15.34

Table 3-6 CPT Ground Elevations	
Syngenta Area 3 (East)	
Test Location	Elevation (ft)
CPT-22	18.41
CPT-23	16.26
CPT-24	17.60
CPT-25	14.87
CPT-26	14.28
CPT-27	13.79
CPT-29	16.84
CPT-30	16.83
CPT-31	17.43
CPT-32	16.25
CPT-33	15.68
CPT-34	13.17
CPT-35	-
CPT-36	-
CPT-37	17.31
CPT-38	-
CPT-39	-
CPT-40	-

3.3 Test Pit Excavations

Test pit excavations were performed at five (5) locations designated TP-1 through TP-5 within Areas 1 and 3. The locations of the test pits are provided on Drawing No. 15.33.021-3 in Appendix A. The test pits were performed to depths of up to 10 feet using a track mounted hoe. Visual observations of the test pits were made and bulk samples were collected for geotechnical laboratory testing, including standard Proctor and California Bearing Ratio (CBR) testing.

4 LABORATORY SERVICES

4.1 Laboratory Testing Program

A laboratory testing program was conducted on selected samples from Area 1 through 3 to assist in classification of the soils encountered and to evaluate the physical and engineering properties of the strata encountered. Laboratory tests were performed in general accordance with ASTM International standards. The types and brief descriptions of the laboratory tests performed are presented in Table 4-1 below.

Table 4-1
Laboratory Testing Program

Type of Test	Testing Method
Water (Moisture) Content of Soil	ASTM D 2216
Liquid Limit, Plastic Limit and Plasticity Index of Soils	ASTM D 4318
Amount of Materials in Soils Finer than Sieve No. 200	ASTM D 1140
Unconfined Compressive (UC) Strength of Cohesive Soil	ASTM D 2166
Undrained-Unconsolidated (UU) Triaxial Compression Test for Cohesive Soils	ASTM D 2850
Inorganic Anions by Ion Chromatography (Sulfates and Chlorides)	EPA 300.0
Soil and Waste pH	EPA 9045D
Dry Unit Weight	--

Water (Moisture) Content of Soil by Mass (ASTM D 2216)
This test method determines water (moisture) content by mass of soil where the reduction in mass by drying is due to loss of water. The water (moisture) content of soil, expressed as a percentage, is defined as the ratio of the mass of water to the mass of soil solids. Moisture content may provide an indication of cohesive soil shear strength and compressibility when compared to Atterberg Limits.

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D 4318)
This test method determines the liquid limit, plastic limit and the plasticity index of soils. These tests, also known as Atterberg limits, are used for soil classification purposes. They also provide an indication of the volume change potential of a soil when considered in conjunction with the natural moisture content. The liquid limit and plastic limit establish boundaries of consistency for plastic soils. The plasticity index is the difference between the liquid limit and plastic limit.

Amount of Materials in Soils Finer than No. 200 (75-µm) Sieve (ASTM D 1140)
This test method determines the amount of materials in soils finer than the No. 200 (75-µm) sieve by washing. The loss in weight resulting from the wash treatment is presented as a percentage of the original sample and is reported as the percentage of silt and clay particles in the sample.

Unconfined Compressive Strength of Cohesive Soil (ASTM D 2166)

This test method determines the unconfined compressive strength of cohesive soil in the undisturbed or remolded condition using strain-controlled application of an axial load. This test method provides an approximate value of the strength of cohesive materials in terms of total stresses. The undrained shear strength of a cohesive soil sample is typically one-half (1/2) the unconfined compressive strength.

Undrained-Unconsolidated Triaxial Compression (UU) Test for Cohesive Soils (ASTM D 2850)

This test method covers determination of the strength and stress-strain relationships of a cylindrical specimen of either undisturbed or remolded cohesive soil. Specimens are subjected to a confining fluid pressure in a triaxial chamber. No drainage of the specimen is permitted during the test. The specimen is sheared in compression without drainage at a constant rate of axial deformation (strain controlled).

Determination of Inorganic Anions by Ion Chromatography (EPA 300.0)

This test method determines the concentration of inorganic anions (chloride, sulfate, etc.) within a soil mass. Inorganic anion properties help indicate corrosion potential of steel and chemical attack of concrete in contact with soil or water and the reaction of soils with chemical stabilization methods.

Evaluation of Soil and Waste pH (EPA 9045D)

This test method is an electromagnetic procedure for measuring pH in soils and waste samples. Wastes may be solids, sludges or non-aqueous liquids. The sample is mixed with reagent water and the pH of the resulting aqueous solution is measured using a pH meter.

Dry Unit Weight of Soils

This test method determines the weight per unit volume of soil, excluding water. Dry unit weight is used to relate the compactness of soils to volume change and stress-strain tendencies of soils when subjected to external loadings.

Typical laboratory test results are presented on the boring logs in Appendix B. Results of consolidation tests and analytical tests are provided in Appendices E and F, respectively.

5 SITE GEOLOGY

We conducted a general assessment of site geology to assist in our determination of subsurface soil classifications and in our understanding of deposit formations, i.e. residual or alluvial deposits. Our assessment was performed by reviewing published literature pertaining to regional geology and site geology. The site is situated in the Mississippi Alluvial Plain physiographic region of Louisiana. The sediments of the Ascension Parish area were deposited during the Quaternary Period of the Cenozoic Era. The Quaternary Period is represented by two geologic epochs, the Holocene and the Pleistocene. The approximate site location is provided below on the *Louisiana Geological Survey Map, Map 5, 1984.*

The Holocene Epoch is the youngest epoch of the Quaternary Period and consists of recent sediments deposited in present day alluvial valleys and floodplains of major area drainage systems. These sedimentary units typically contain cohesionless soils (sand, silt, and their intermixture) intermixed with cohesive soils (clay, sandy clay, and silty clay).

The Holocene Epoch is the youngest epoch of the Quaternary Period and consists of recent sediments deposited in present day alluvial valleys and floodplains of major area drainage systems. These sedimentary units typically contain cohesionless soils (sand, silt, and their intermixture) intermixed with cohesive soils (clay, sandy clay, and silty clay).

The Pleistocene Epoch includes the sedimentary deposits of the Prairie Formation. The sediments which compose the Prairie Formation are similar in depositional composition in that they were deposited by systems of coalescing fluvial and deltaic systems. The soils which developed from these systems include clay, sand, and their intermixtures.

During the late Pleistocene low stand in sea level, the Mississippi River cut a major valley in central Louisiana. The valley is filled with Holocene sediments that have been deposited by recent fluvial and deltaic processes. According to the 2003 Ponchatoula 30 x 60 Minute Geology Quadrangle produced and published by the Louisiana Geological Survey, the site lies within this valley filled with Holocene sediments (Qal and Qnl) and Prairie Terraces (Qtp). The sediments are classified as Natural Levee complex (Qnl) of Mississippi River meander belt 1. The Natural Levee deposits are generally comprised of silty clay, sandy clay and silty sand deposits.

6 SITE CONDITIONS

6.1 General

Our interpretations of soil and groundwater conditions within the Syngenta Site are based on information obtained at the soil boring and CPT locations. This information has been used as the basis for our conclusions and recommendations. Subsurface conditions could vary at areas not explored. Significant variations at areas not explored by the soil borings and CPT's will require reassessment of our recommendations.

6.2 Site Description and Surface Conditions

The project site consists primarily of sparsely wooded fields, densely wooded areas, and developed areas that consist of concrete pavement and areas used for stockpiling materials. Man made ponds are present at the northwest portion of the site, to the north of Braud Bayou which traverses the site in an east to west direction. To the north of the ponds, there is an existing railroad line that runs east to west through the property. Small drainage ditches and dirt vehicle paths are located throughout the project site. Surface drainage throughout the site appeared to be relatively good.

6.3 Subsurface Soil Conditions

The generalized soil profile encountered in the project borings, CPT sounding logs and test pits consisted of cohesive lean and fat clays alternating between the ground surface and a depth of 100-ft. The variation of the clay strata generally consisted of very soft to stiff lean clays (CL) and fat clays (CH). Layers of highly plastic organic clay (OH) and peat with varying thicknesses were encountered at varying depths in areas of the site.

Detailed descriptions of the soils encountered along with the tabulated laboratory test results at the exploration locations are presented on the boring logs in Appendix B and CPT sounding logs are presented in Appendix C.

Soil design parameters were developed based on field and laboratory testing, published correlations, and our experience. Soil design parameters are presented in Appendix D.

6.4 Groundwater Observations

Groundwater measurements obtained from the project borings during dry-auger drilling are presented in Table 6-1, Table 6-2 and Table 6-3 on the following pages.

Table 6-1 Groundwater Level Measurements			
Syngenta Area 1 (West)			
Boring	**Groundwater Level Measurements**		
	Boring Completion Depth	**Encountered During Dry-Auger Drilling**	**Depth Observed after Fifteen (15) Minutes**
B-1	60-ft	12’-0”	6’-7”
B-2	60-ft	10’-0”	2’-6”
B-3	100-ft	7’-6”	6’-0”
B-4	60-ft	7’-2”	4’-9”
B-9	60-ft	10’-0”	4’-10”
B-10	60-ft	6’-0”	1’-7”
B-11	60-ft	6’-0”	1’-6”
B-12	60-ft	6’-0”	1’-10”
B-14	100-ft	8’-0”	0’-8”

Table 6-2 Groundwater Level Measurements			
Syngenta Area 2 (North)			
Boring	**Groundwater Level Measurements**		
	Boring Completion Depth	**Encountered During Dry-Auger Drilling**	**Depth Observed after Fifteen (15) Minutes**
B-5	60-ft	7’-8”	7’-0”
B-6	60-ft	6’-2”	4’-8”
B-7	100-ft	7’-8”	4’-0”

Table 6-3 Groundwater Level Measurements			
Syngenta Area 3 (East)			
Boring	**Groundwater Level Measurements**		
	Boring Completion Depth	**Encountered During Dry-Auger Drilling**	**Depth Observed after Fifteen (15) Minutes**
B-8	100-ft	10’-0”	7’-0”
B-13	60-ft	8’-0”	2’-3”
B-15	60-ft	13’-0”	1’-3”
B-16	60-ft	-	-
B-17	100-ft	12’-0”	10’-10”
B-18	60-ft	9’-0”	6’-6”
B-19	100-ft	12’-0”	6’-4”
B-20	60-ft	-	-
B-21	60-ft	-	-

Groundwater levels may fluctuate with climatic and seasonal variations and should be verified before construction.

6.5 Soil Corrosion Potential

Steel and concrete elements in contact with soil are subject to degradation from corrosion or chemical attack. Underground or buried structures should be designed to resist corrosion and degradation based on acceptable practices. Soil pH, chloride and sulfate ion concentration tests were performed on selected soil samples obtained from the project borings. Results of analytical laboratory testing performed on the recovered soil samples are summarized in Table 6-4 on the following page.

Table 6-4 Analytical Laboratory Testing Results				
Soil Boring	**Depth below Existing Grade (ft)**	**Soil pH**	**Chloride Ion Concentration (ppm)**	**Sulfate Ion Concentration (ppm)**
B-7	5-ft	5.4	167	1760
B-7	10-ft	5.3	461	7110
B-7	15-ft	7.5	67.5	689
B-12	5-ft	7.1	176	1700
B-12	10-ft	7.2	522	7200
B-12	15-ft	7.2	179	1750
B-19	5-ft	7.4	132	1300
B-19	10-ft	7.6	217	3890
B-19	15-ft	7.6	286	3870

The measurable properties that indicate corrosion potential of steel in contact with soil or water are total dissolved solids in water, soil pH, soil chloride ion concentration and soil electrical resistivity. It is generally accepted that corrosion of steel is most likely to occur in soils containing chloride ions even in low concentration, low pH and/or low electrical resistivity as presented in Table 6-5 below. The factors shown should be used independently when evaluating corrosion potential. For instance, it is not necessary to have both an electrical resistivity between 0-ohm-cm and 1,000-ohm-cm and a soil pH between 0.0 and 4.5 to indicate very high potential for corrosion.

Table 6-5 Soil Corrosion Potential			
Electrical Resistivity Measurement (ohm-cm)	**Soil pH**	**Chloride Ion Concentration (ppm)**	**Corrosion Potential**
0 - 1,000	0.0 - 4.5	-	Very High
1,000 - 2,000	4.5 - 5.5	> 500	High
2,000 - 5,000	5.5 - 6.5	< 500	Moderate
> 5,000	> 6.5	-	Mild

The degradation of concrete is caused by chemical agents in the soil or groundwater that react with concrete to either dissolve the cement paste or precipitate larger compounds which cause cracking and flaking. The concentration of water-soluble sulfates in the soils is a good indicator of the potential for chemical attack of concrete as presented in Table 6-6 on the following page.

Table 6-6 Chemical Attack Potential	
Sulfate Ion Concentration (ppm)	**Aggressiveness**
> 20,000	Very Severe
2,000 - 20,000	Severe
1,000 - 2,000	Moderate
< 1,000	Mild

Based on the above sulfate ion concentration data, the soils at the site of the soil borings listed in Table 6-4 have a mild to severe potential for attacking concrete.

7 SITE CLASS

A site class is a classification assigned to a site for seismic design based on the types of soils/rock present and their engineering properties. Site class requirements are provided by the International Building Code (IBC) and the American Society of Civil Engineers (ASCE) *Minimum Design Loads for Buildings and Other Structures*, ASCE Standard 7-10.

7.1 Site Class

Six (6) site class definitions are provided in the International Building Code (Site Classes A through F). The site class definitions are based on the average soil/rock properties to a depth of 100 ft. Soil boring data and results of shear wave velocity measurements suggest that the site is characteristic of either Site Class E.

7.2 Seismic Ground Motion Values

The interpreted 2012 IBC seismic ground motion values and seismic site coefficients for the Syngenta Grove Property are summarized in Table 7-1.

Table 7-1
Seismic Ground Motion Values
Syngenta Site

Spectral Response Acceleration	Mapped Ground Motion Values	Seismic Site Coefficients	Design Ground Motion Values
0.2 second	S_S = 0.105g	F_a = 2.5	S_{DS} = 0.174g
1 second	S_1 = 0.054g	F_v = 3.5	S_{D1} = 0.126g

8 DISCUSSION

8.1 General

The reconnaissance geotechnical engineering study at the Syngenta Site was performed to assist the Client in evaluating the suitability of the site, prior to acquisition, for the potential construction of a chemical processing facility. Therefore, the recommendations in the following sections are not intended for final design purposes. More detailed investigations should be performed at planned structure locations, if the site is to be developed, to determine specific geotechnical foundation recommendations based on actual structural loading conditions.

The proposed Chemical Processing Plant would include the construction of major process equipment, pipe racks, storage tanks, and other ancillary equipment. Site preparation activities at the site could consist of stripping, placement and compaction of structural fill, and excavations for underground lines, sumps, and drainage structures.

We expect that major structures associated with a chemical processing facility such as this, would likely be supported on deep foundation systems and lightly loaded structures could possibly be supported with shallow foundation systems.

Preliminary shallow and deep foundation recommendations for the support of various project structures, based on the subsurface conditions encountered in the soil borings and CPT's are provided in the subsequent sections.

8.2 Preliminary Foundation Considerations

The preliminary conceptual plans for this site include major process equipment, storage tanks, pipe racks, storage tanks, and other ancillary equipment. The subsurface soil conditions encountered at this site during this reconnaissance geotechnical study are suitable for a variety of foundation options. Both shallow and deep foundations are viable options at this site, and the selection of the appropriate foundation type will depend upon the size and type of structure, the design loads and sensitivity of the structure to movements due to consolidation settlement.

Suitable shallow foundations include spread footings, strip footings, drilled footings, ringwall foundations (for storage tanks), and mat foundations. Shallow foundations should be used for lightly loaded structures and those structures not sensitive to total or differential settlement.

Deep foundations are typically used for heavily loaded structures and structures sensitive to settlement. Suitable deep foundation systems for this site include driven piles, augered cast-in-place piles or straight-sided drilled shafts (installed using slurry).

9 SHALLOW FOUNDATIONS

9.1 Shallow Foundation Allowable Bearing Capacity

Subsurface conditions from soils encountered during this investigation indicate that shallow spread and strip footings should bear on undisturbed natural firm to stiff clay soils at a depth of at least 2 feet below final grade and at least 1-foot into natural soils. The allowable net bearing pressure of clay soils depends primarily on the undrained shear strength of the foundation soils, and in part, on the size, shape and depth of the footing. Based on the subsurface conditions encountered, the allowable net bearing pressure for spread or strip footings bearing on natural clay soils at the recommended depth generally varies from about 500 psf to 1,400 psf across the Syngenta Site.

The allowable net soil bearing pressures stated above include a factor of safety of 3 on the ultimate soil bearing capacity. It should be noted that the allowable bearing pressures are independent of settlement analysis. Based on the soils encountered at this site, excessive settlements could be experienced for shallow foundations using the above allowable bearing pressures. Settlement analysis should be performed as part of final design of shallow foundations considering size and loading conditions.

If plans require the site to be raised above grade with fill, footings could be placed in properly compacted structural select fill at a depth of at least 2 feet below final grade. An allowable net bearing of 1,500 psf could be considered for spread footings bearing on properly compacted structural select fill.

9.1.1 Uplift Resistance

Resistance to vertical force (uplift) is provided by the weight of the concrete footing plus the weight of the soil directly above the footing. For this site, it is recommended that the ultimate uplift resistance be based on buoyant unit weights for soil and concrete of 60-pcf and 90-pcf, respectively. The calculated ultimate uplift resistance should be reduced by a factor of safety of 1.2 to calculate the allowable uplift resistance.

9.1.2 Resistance to Overturning Loads

The contact pressure distribution of a spread footing subject to overturning moments will be trapezoidal. The design of the foundation should be such that full soil contact and positive pressure are maintained under the foundation. In addition, the maximum contact pressure should not exceed the allowable net bearing pressure for the foundation soil.

9.1.3 Lateral Resistance

Horizontal loads acting on shallow foundations below grade will be resisted by passive earth pressure acting on one side of the foundation and by base adhesion for foundations bearing on cohesive soils. An allowable passive pressure of 750-psf can be considered for the natural clays and/or properly compacted structural select fill material used as backfill around the foundation.

An allowable base adhesion of 300-psf can be considered for foundations in good contact with the natural clay soils at the recommended foundation depth. These values should provide a factor of safety of 2.0 with respect to the ultimate values.

9.2 Mat Foundations

Mat foundations could be used to support lightly-loaded structures such as small equipment pads, skid-mounted equipment or where numerous point loads or columns must be supported within a relatively confined area. Mat foundations provide uniform pressure distribution and thereby reduce the magnitude of differential settlement. Mat foundations should be supported on undisturbed natural clay soils or properly-compacted structural select fill. Maximum bearing pressures up to those values given for spread footings could be used for mat foundation design. However, mat foundation bearing pressures are typically controlled by settlement considerations. Settlement for mat foundations will depend on the dimensions of the mat and the actual bearing pressure. If mat foundations are planned to be used, TWE should be contacted once the mat foundation sizes and loading distributions are known.

9.2.1 Coefficient of Subgrade Reaction

Typical analyses for design of mat foundations require a coefficient of subgrade reaction, k, this is defined as the ratio between the pressure at any given point on the surface of contact and the deformation produced by the load application at that point. A subgrade modulus obtained from a 1-ft by 1-ft plate load test (k_1) is typically applicable to the design of pavements and lightly-loaded slabs where the stress influence from loading occurs at a relatively shallow depth. For larger slabs and mat foundations with increased loading conditions, the stress influence will be deeper whereby k_1 is adjusted to k_f based on the foundation width, bearing pressure and predicted settlement.

Typical subgrade modulus values (k_1) for various soils are presented in Table 9-1 below that can be used as a general guide. It should be noted that these values are appropriate only for lightly-loaded slabs and concrete pads where load intensities are low enough to not cause differential settlements greater than the project requirements using the allowable bearing pressures recommended.

Table 9-1
Typical Subgrade Modulus Values (k_1)

Material	Subgrade Modulus (k_1)
Existing Clay Subgrade	75-pci
Select Structural Fill	100-pci
Lime-Stabilized Clay	150-pci

Published methods, such as those presented by Karl Terzaghi (1955), are available for adjusting the coefficient of subgrade reaction for a 1-ft square plate to structural engineering mat analysis

programs. Furthermore, for design, mat settlement should be considered and a reduced coefficient of subgrade reaction should be determined to account for this settlement.

The modulus of subgrade reaction is a function of soil properties as well as the actual foundation size. For initial planning purposes and based on our experience with large concrete mats bearing on heavily overconsolidated soils, subgrade modulus values of 5-pci to 15-pci may be used for preliminary mat design. Once final foundation dimensions have been established, TWE can provide additional information regarding coefficient of subgrade reaction considering the actual foundation size.

10 DEEP FOUNDATIONS

10.1 Discussion

Although conventional spread footings are generally an economical foundation for lightly loaded structures, we expect that moderately to heavily loaded structures supported on shallow foundations at this site would experience excessive settlements beyond tolerable limits due to the potential for compressibility and consolidation of the in-situ clay soils.

Depending on the loading conditions, deep foundation depths on the order of 65 to 100-ft should be anticipated. This depth requirement could vary based upon the final design loading conditions. Driven piles consisting of timber piles, steel pipe piles, steel H-section piles, or square precast concrete piles may be suitable for use on this project. In addition, drilled shafts or augered cast-in-place piles may be appropriate. The allowable axial compression and tension capacities will be dependent upon the pile type, diameter or width, and penetration.

10.2 Axial Capacity

For estimating purposes, we developed preliminary unit friction and end bearing capacity curves for allowable pile capacities for use with driven precast concrete piles and augered-cast in place piles installed to depths of up to 100-ft below the ground surface. The allowable F & E curves and pile capacity tables are included in Appendices I through J, for areas 1 through 3, respectively.

For driven precast concrete piles, we computed tension and compression single pile capacities using the static method of analysis recommended by the American Petroleum Institute (API RP 2A-WSD, 2002) for typical driven piles. The analysis was performed using the computer code APILEplus, Version 4.0 by Ensoft, Inc. The skin friction resistance in the upper 5-ft was neglected because of potential disturbance during the pile installation and/or shallow gap formation produced by the interaction with lateral loads.

For augercast piles and drilled shafts, the side resistance for the cohesive soils was computed by using the alpha (α) method. The alpha method relates the side resistance to the average undrained shear strength of the soil, reduced by an alpha value of 0.55 to account for soil disturbances during construction. The analysis was performed using the computer code SHAFT, Version 6.0 by Ensoft, Inc.

The unit friction (F_c) and end bearing (E) curves for driven piles include a minimum factor of safety of 2.0. A factor of safety of 3.0 was applied to side friction capacity (F_t) for driven piles when computing tension capacity. The unit friction (F_c) curve for augercast piles and drilled shafts includes a factor of safety of 2.0. A factor of safety of 3.0 was applied to skin friction capacity (F_t) and end bearing (E) curves for augercast piles and drilled shafts.

The values presented are based on the assumption that the piles have a minimum center-to-center spacing of at least three (3) pile diameters. The values presented are also based on the assumption that less than 2 feet of fill will be placed above grade in the vicinity of the pile foundations. If more than 2 feet of fill above grade will be required in the vicinity of the planned pile foundations, pile capacity and settlement evaluations should include negative skin friction imposed on the piles.

10.2.1 Axial Group Effects

The overall allowable axial compression load carrying capacity of a pile group, in some cases, could be less than the sum of the individual pile allowable capacities. A reduction in the individual pile capacity, to allow for group effects, is usually not necessary for piles having a center-to-center spacing of 3 or more pile widths/diameters. The reduction in individual capacity depends on several factors including number of piles in the group, pile sizes, pile penetration, pile spacing, etc. We recommend that the piles be spaced at least 3 widths/diameters (center-to-center) to reduce substantial axial group effects. If pile groups are planned for this project, TWE should be contacted to analyze group capacities and settlements once the final pile size, depth and group configurations are selected.

10.3 Lateral Capacity

For deep foundations, lateral loads are resisted by the soil as well as the rigidity of the pile. Lateral capacity will vary with pile type and properties, degree of fixity and pile spacing. Typically, lateral loads are analyzed using the p-y method in which the soil is modeled as a series of non-linear springs. This procedure with appropriate computer codes (i.e., LPILE by Ensoft, Inc.) has the advantage that major factors influencing soil resistance are inherently included in the semi-empirical p-y design criteria. Detailed lateral analyses can be performed for the final pile type and configuration upon request.

For the subsurface conditions encountered at this site based on soil borings and CPT soundings, we developed soil parameters for use with lateral analysis of deep foundations. These design parameters are provided in Appendix I.

10.4 Driven Pile Installation

Pile driving hammers should be selected according to pile type, length, size and weight of pile, as well as potential vibrations resulting from pile driving operations. Care should be taken to assure that the hammer selected is capable of achieving the desired penetration without causing damage to the piles or causing excessive vibrations which could damage existing, nearby structures.

Each pile should be driven to the desired tip elevation and driving resistance without interruption in the driving operations. Supplemental techniques like pilot holes or jetting are not considered necessary for this project based on the soils encountered. Accurate records of the final tip elevation and driving resistances should be obtained during the pile driving operations. Monitoring of each pile driving record and hammer/cushion effects should be performed during pile installation.

The hammer type, cap and cushion block and driving energy should be planned to avoid pile damage during driving. The pile hammer should be sufficient to drive the piles to the lengths required without causing pile damage. Driving criteria should be established prior to installation based on the following criteria:

- Pile design load;
- Load test data;
- Pile type and size;
- Type of hammer, and
- Type of cap and cushion block.

The driving of displacement piles can result in vertical heave and lateral displacement of adjacent piles. The tops of the piles should be checked after driving of adjacent piles. If heave has occurred, the piles should be re-driven to the original tip elevation. Where the displacement piles are installed in groups, heave and lateral displacement will be most critical. The contractor can reduce heave and displacement within a pile group by installing the interior piles first and then proceeding to the perimeter locations.

Pile installation considerations are included in the following paragraphs.

Precast Concrete Piles. The materials for an manufacture of precast concrete piles should be in accordance with guidelines set forth by the "Recommendations for Design, Manufacture, and Installation of Concrete Piles" prepared by ACI Committee, 543, or latest revision. General recommendations constituting good driving practice include:

(1) The pile should be properly aligned prior to driving and held with fixed leads. Re-alignment, once driving has commenced, should not be allowed. The top of the pile should be square or perpendicular to the longitudinal axis of the pile to reduce damage to the pile edges during driving. It is common practice to specify a tolerance of 2% for the pile verticality, and that the top of the pile be within 3 in. or less of the specified location.

(2) The entire hammer-cushion-pile system should be compatible and capable of installing piling to design penetrations in an undamaged condition. Adequate cushion material between the pile driving cap and the pile head should be provided. For piles over 50 ft in length, a cushion of soft wood with a thickness of 6 to 12 in. is preferred.

10.5 ACIP Pile Installation

The proper installation of augercast piles is dependent on Contractor experience, construction procedure and equipment. The Contractor should have relevant experience with augering and pumping equipment, installing augercast piles in similar subsurface conditions and placing of

reinforcing steel. Key personnel including the crane operator, grout pump operator and full-time field supervisor should have a minimum of three (3) years experience with installing augercast piles of similar size and depth in the local area.

10.5.1 Installation Monitoring

We recommend pile installation monitoring be implemented and performed by a qualified representative of the Geotechnical Engineer. Several aspects to monitor during augercast pile installation are viscosity of the pumped grout mixture, initial grout placement prior to raising the augers, resulting grout head observed at pile completion, incremental grout factors computed over 5-ft intervals during auger withdrawal, uniformity of grout placement; computed grout factor along completed pile length, continuous grout placement, auger withdrawal without delays or grout pressure fluctuations and reinforcing steel placement.

10.5.2 Grout Mix

A grout mix should be furnished to meet the requirements of the project and tested by a qualified representative of the Geotechnical Engineer. A minimum of six (6) 2-in square grout cubes should be cast each day during which piles are installed. Two (2) grout cubes should be tested in compression at seven (7) days and twenty-eight (28) days after placement. The remaining grout cubes should be held for additional testing, if necessary.

10.5.3 Grout Placement

The required grout volume to obtain a uniform pile will vary depending on subsurface soil conditions. Installation of piles with inappropriate grout volumes will affect the performance of the foundation system. Therefore, the Contractor should calibrate the grout pump before augercast pile installation commences. Grout should be pumped with sufficient pressure typically ranging from 300-psi to 400-psi. The auger should be withdrawn slowly enough to keep the hole filled to prevent collapse and lateral penetration of grout into soft or porous zones surrounding the pile. The auger withdrawal rate should be constant and not exceed 10-ft per minute. Pumped grout volumes typically range from 115% to 150% of the theoretical volume of the pile.

A pressure head of at least 10-ft of grout above the injection point should be maintained at all times during auger withdrawal so that the grout exhibits a displacing action and resists the movement of loose material into the hole. The Contractor should determine the appropriate pressure head requirement during construction.

Specific criteria regarding the minimum curing time before drilling adjacent piles and the minimum distance between new and previously installed, freshly grouted piles should be established in the project specifications. These criteria are necessary to protect newly completed piles from damage during the installation of adjacent piles.

11 TANK FOUNDATIONS

11.1 Discussion

For this reconnaissance study, we have analyzed ground storage tank foundations for Area 2 based on the tank volumes provided of 800,000 gallons and 2,600,000 gallons. Tank diameters analyzed ranged from 50-ft to 120-ft with corresponding fluid heights ranging from 28-ft to 70-ft. Our evaluation of tank foundations was performed for Area 1 only. Detailed foundation analysis of tanks should be provided during a final geotechnical investigation.

Subsurface conditions in Area 2 and our settlement analyses indicate that storage tanks, as discussed above, would not be able to be supported using typical shallow foundations such as ringwalls. Based on our experience and knowledge of similar tanks in the area of this project, it likely that the ground storage tanks would need to be supported using a deep foundation system. Alternatively, ground improvement could be considered. There are a variety of ground improvement options and technologies that would be appropriate for this site, such as surcharging with vertical wick drains, controlled modulus columns, rapid impact compaction, dynamic compaction, stone columns, soil jet grouting, soil mixing, and various types of Geopiers.

During a final geotechnical study a more detailed investigation at the location of the planned tanks is recommended. Standard soil borings and CPT's should be performed in conjunction at the planned tank locations, with at least one test location extending to a depth of twice the tank diameter.

12 SLABS AND PAVEMENTS

We expect that the surrounding areas around equipment and structures within the proposed facility would be paved with flexible asphalt pavement or rigid concrete.

In the subsections below, we have provided general guidelines for pavements. A detailed pavement analyses should be performed during the final design phase of the investigation.

12.1 Pavement Design Criteria

Generalized vehicle classifications and traffic loadings are listed in Table 12-1 below.

Table 12-1
Vehicle Classification and Traffic Loading

Pavement Area	Traffic Design Index	Description
Parking Areas	DI-1	Light traffic: few vehicles heavier than passenger cars; no regular use by heavily-loaded two (2) axle trucks or larger
Light-Duty Driveways	DI-2	Light to medium traffic: similar to DI-1; less than fifty (50) loaded, two (2) axle trucks or lightly-loaded larger vehicles per day; no regular use by heavily-loaded trucks with three (3) or more axles
Heavy-Duty Driveways and Loading Areas	DI-3	Medium traffic: less than three-hundred (300) heavily-loaded, two (2) axle trucks or buses per day; no more than thirty (30) heavily-loaded trucks with more than three (3) axles per day

Listed in Table 12-2 on the following page are typical pavement component thicknesses based on the shallow subgrade conditions, which may be used as a guide for pavement systems at the site for the traffic classifications stated herein. It should be noted that these systems were derived based on general soil characterization of the subgrade. For the purpose of this preliminary report, a CBR value of 3.0 was assumed. The results of the laboratory CBR testing for this project will be included in the final report.

Table 12-2 Typical Pavement Thicknesses			
Flexible Pavement System Material Thickness			
Component	**DI-1**	**DI-2**	**DI-3**
Asphaltic Concrete	1.5-in	2.0-in	3.0-in
Crushed Limestone Base	8.0-in	10.0-in	12.0-in
Stabilized Subgrade	8.0-in	8.0-in	8.0-in
Rigid Pavement System Material Thickness			
Component	**DI-1**	**DI-2**	**DI-3**
Reinforced Concrete	5.0-in	6.0-in	8.0-in
Stabilized Subgrade	8.0-in	8.0-in	8.0-in

Reinforcing steel consisting of deformed steel rebar should be used in concrete pavement. Thickness is based on concrete flexural strength, soil modulus and traffic volume. Selection of steel is dependent on joint spacing, slab thickness and other factors as discussed in Portland Cement Association publications. The following suggested guidelines for the concrete pavement should be modified by the civil-structural engineer based upon the actual configuration of the pavement layout and published Portland Cement Association and ACI articles. Table 12-3 below presents these guidelines.

Table 12-3 Rigid Pavement Components	
Component	**Description**
Minimum Reinforcing Steel	#3 bars should be spaced at 18-in on centers in both directions.
Minimum Dowel Size	3/4-in bars, 18-in in length, with one (1) end treated to slip should be spaced at 12-in on centers at each joint.
Control Joint Spacing	Maximum control joint spacing should be 15-ft. If sawcut, control joints should be cut as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling which is usually within four (4) to twenty-four (24) hours of concrete placement.
Isolation / Expansion Joints	Expansion joints should be used in areas adjacent to structures, such as manholes and walls.

12.2 Pavement Section Materials

Reinforced Concrete

Concrete should be designed to exhibit a flexural strength [three (3) point loading] of at least 500-psi at twenty-eight (28) days. Flexural strength (M_r) may be approximated by the following formula from ACI 330R: $M_r=2.3(f_c^{2/3})$ where f_c is the compressive strength of the concrete. The actual relationship between flexural and compressive strength for the proposed mix should be evaluated in the laboratory. In general, 500-psi flexural strength can be typically achieved with a concrete mix designed for a minimum twenty-eight (28) day compressive strength of 3,000-psi.

Hot Mix Asphaltic Concrete Surface Course

The asphaltic concrete surface course should be a plant mixed, hot laid (Fine Graded Surface Course) meeting the master specification requirements in the LA DOTD Standard Specifications and specific criteria for the job mix formula. The mix should be designed for a stability of at least forty (40) and should be compacted to between 92% and 97% of the maximum theoretical density as measured by *ASTM International Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures (ASTM D 2041).*

Crushed Limestone Base

Base material should be composed of crushed limestone meeting the requirements of LA DOTD Standard Specifications. The base should be compacted in maximum 6-in compacted lifts to a minimum of 95% of the maximum density as determined by *ASTM International Standard Test Method for Laboratory Compaction Characteristics of Soil using Modified Effort (ASTM D1557),* at -2% to +3% of optimum moisture content. After final compaction, field density tests should be performed at 250-ft intervals at locations representative of the entire roadway alignment.

Stabilized Clay Subgrade

Subgrade stabilization is used to increase the modulus of subgrade reaction for weak or highly plastic soils. If subgrade stabilization is necessary, the clay subgrade shall be stabilized with hydrated lime in accordance with LA DOTD Standard Specification Section 304. It is estimated that 6% hydrated lime by dry weight of soil will be required. The stabilized soils should be compacted to at least 95% of the Standard Proctor maximum dry density (ASTM D 698). The compacted moisture content should be at above the optimum moisture content. Compaction should begin one (1) to four (4) days after mixing for road mixed lime.

The natural soils encountered near existing ground surface within the project site consist of medium to high plasticity cohesive fat clays (CH). Where pavements will be constructed on areas that have not been backfilled with compacted select fill soils, and where subgrade materials consist of high plasticity fat clays (CH), we recommend the top 8-in depth of final grade be stabilized with lime in order to provide a stable work platform during construction activities.

13 GENERAL SITE PREPARATION GUIDELINES

13.1 Discussion

Preliminary site preparation guidelines are presented herein for site evaluation purposes. Specific site preparation recommendations can be developed once more detailed information is available.

The project site consists primarily of sparsely wooded fields, densely wooded areas, and developed areas covered with concrete pavement and areas that are currently used for stockpiling materials. Man made ponds are present at the northwest portion of the site, to the north of Braud Bayou that traverses the site in an east to west direction. To the north of the ponds, there is an existing railroad line that runs east to west through the property. Small drainage ditches and dirt vehicle paths are located throughout the project site. Surface drainage throughout the site appeared to be relatively good.

Existing grade at the site ranges from approximately EL 20-ft to 12.5-ft, decreasing with distance from the Mississippi River levee.

13.2 Site Stripping and Proofrolling

Areas designated for new construction should be stripped of all existing pavement, surface vegetation, loose topsoil and fill material. The exposed soil subgrade should then be proof-rolled with at least a 15-ton pneumatic roller, loaded dump truck or equivalent to detect weak areas. Such weak areas should be removed and replaced with soils exhibiting similar classification, moisture content and density as the adjacent in-place soils. Subsequent to proof-rolling, and just prior to placement of select fill, the exposed subgrade in foundation areas should be compacted to at least 95% of the maximum dry density near optimum moisture (to+3%) in accordance with the Standard Proctor Compaction Effort (ASTM D698) procedures.

In areas of the existing drainage ditches, we recommend that the soft, wet surface soils be removed prior to the placement of structural fill. Such areas should be observed by a representative of the Geotechnical Engineer prior to the placement of structural fill or shallow foundation construction.

Proper site drainage should be maintained during construction so that ponding of surface runoff does not occur and cause construction delays or inhibit site access. If the natural subgrade becomes wet and soft, consideration can be given to either removal or replacement of the wet material with structural select fill material.

13.3 Construction Excavations

All sloped short-term construction excavations on-site should be designed in accordance with the Occupational Safety and Health Administration (OSHA) standards to protect workers from excavation hazards (29 CFR Part 1926, Subpart P). Borings from our subsurface explorations performed to date indicate that the soils within the upper 10 ft at this site could generally be

classified as Type B based on unconfined compressive strength. Depending on the depth of the excavation and the depth of the groundwater table at the time of construction, the presence of a shallow groundwater table could result in significant seepage from the walls and bottom of excavations, in which case the soils would be classified as Type C. For Type B soils, short-term construction excavations can be constructed with maximum slope of 1H:1V. For Type C soils, short-term construction excavations can be constructed with a maximum slope of 1.5H:1V.

As an alternative to sloped excavations, vertical short-term construction excavations could be used in conjunction with trench boxes or other shoring systems. Shoring systems should be properly designed to support lateral loads from the retained earth and hydrostatic pressures. Surcharge pressures at the ground surface due to dead and live loads should be added to the lateral earth pressures where they may occur.

13.4 Groundwater Control

Excavations less than about 5 ft deep below present grade are expected to terminate in cohesive soils above the water table, based on the conditions at the time of our study. Excavations deeper than 5 ft are expected to encounter groundwater. In the event that groundwater is encountered, then provisions should be made to remove any water that accumulates within the excavations to maintain a dry bottom. Provisions should be made to divert surface water runoff from open excavations.

Mechanical dewatering provisions are not expected for excavations less than about 4 ft from present grade. Deeper excavations planned will encounter groundwater seepage. Based on the subsurface conditions encountered, we believe that the seepage can be sufficiently controlled to allow sump construction by using sumps and pumps. If the quantities of water present cannot be controlled using sumps and pumps, a more rigorous method of groundwater control could be required.

13.5 Fill Soils

Fill soil types can be grouped according to their application. Fill soils that are used to support foundations and structures are typically identified as structural fill and are usually associated with engineering specifications. Fill soils that are used for general site grading and landscaping are typically indentified as general fill.

General fill can be used in areas where structures will be supported on deep foundations, and to raise site grade. Select fill should be used in areas where shallow foundations, including spread footing and mat foundations are planned. If ground improvement options will be used in ground storage tank areas, specific recommendations will be applied with regard to fill requirements in these areas.

We recommend the following material and compaction requirements for various fill applications for this project.

Fill Classification	Material and Compaction Requirements	Proposed Use
Class I – Structural Fill	Structural fill should consist of a clean, low-plasticity sandy clay or non-plastic sand material with a liquid limit of less than 40, a plasticity index less than 20, and a maximum particle size of 3 inches. Structural fill should be placed in thin lifts, not exceeding 8-in loose measure, moisture conditioned between -2% and +3% of optimum moisture content and compacted to a minimum 95% of the maximum dry density as determined by ASTM D 698 (Standard Proctor Compaction Effort).	Beneath soil supported foundations or slabs-on-grade.
Class II – General Fill	General fill should consist of a clean cohesive fat clay (CH) or lean clay (CL) material having a plasticity index equal to or greater than 25 and a maximum particle size of 1 inch. Select fill should be compacted a minimum 95% of the maximum dry density as determined by ASTM D 698 (Standard Proctor Compaction Effort). The moisture content of the cohesive fill during placement and compaction should be 2 to 3 percentage points wet of the optimum moisture content.	Containment dikes, berms and levees. Could be suitable around pile supported structures and equipment.

On-site materials are considered suitable as Class II – General Fill. Class I – Structural Fill and soils are readily available from several borrow pits located in close proximity to the project site.

Fills should be placed in uniform layers or lifts. The maximum fill lift thickness should be controlled to maintain compaction throughout the entire fill lift and will depend on the type of compaction equipment used. Typically, a maximum 8-inch lift thickness (loose measure) is appropriate for most conventional compactors. Thicker fill lifts are likely with sand fill.

The fill should be compacted to at least 95 percent of the maximum dry density and at a moisture content range within about +/-3 percentage points of the optimum moisture content, as determined by the Standard Proctor test (ASTM D 698). Vibratory rollers or tamping foot compactors should be used for compaction. We do not recommend using rubber-tired earthmoving equipment or tracked vehicles for compaction.

13.6 Fill Testing

All fill placement should be observed and tested by a geotechnical representative at the time of placement to check the fill procedures and to verify conformance with the specified compaction and moisture contents. We recommend a minimum density/moisture testing frequency of at least one test per 2,500 sq ft for each lift, with a minimum of four tests per lift.

14 LIMITATIONS AND DESIGN REVIEW

14.1 Limitations

This reconnaissance report has been prepared for the exclusive use of Wanhua Chemical US Holdings, and their design team for specific application of preliminary evaluation of the proposed site for a new chemical processing plant. Our report has been prepared in accordance with the generally accepted geotechnical engineering practice common to the local area. No other warranty, express or implied, is made. This report was prepared to assist the Client in selection of the project site. This report is not intended for final design.

The analyses and recommendations contained in this report are based on the data obtained from the referenced subsurface explorations within the project site. The soil borings indicate subsurface conditions only at the specific locations, times and depths penetrated. The soil borings do not necessarily reflect strata variations that may exist at other locations within the project site. The validity of our recommendations is based in part on assumptions about the stratigraphy made by the Geotechnical Engineer. Such assumptions may be confirmed only during construction and installation of the project structures. Our recommendations presented in this report must be reevaluated if subsurface conditions during the construction phase are different from those described in this report.

If any changes in the nature, design or location of the project are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and the conclusions modified or verified in writing by TWE. TWE is not responsible for any claims, damages or liability associated with interpretation or reuse of the subsurface data or engineering analyses without the expressed written authorization of TWE.

14.2 Design Review

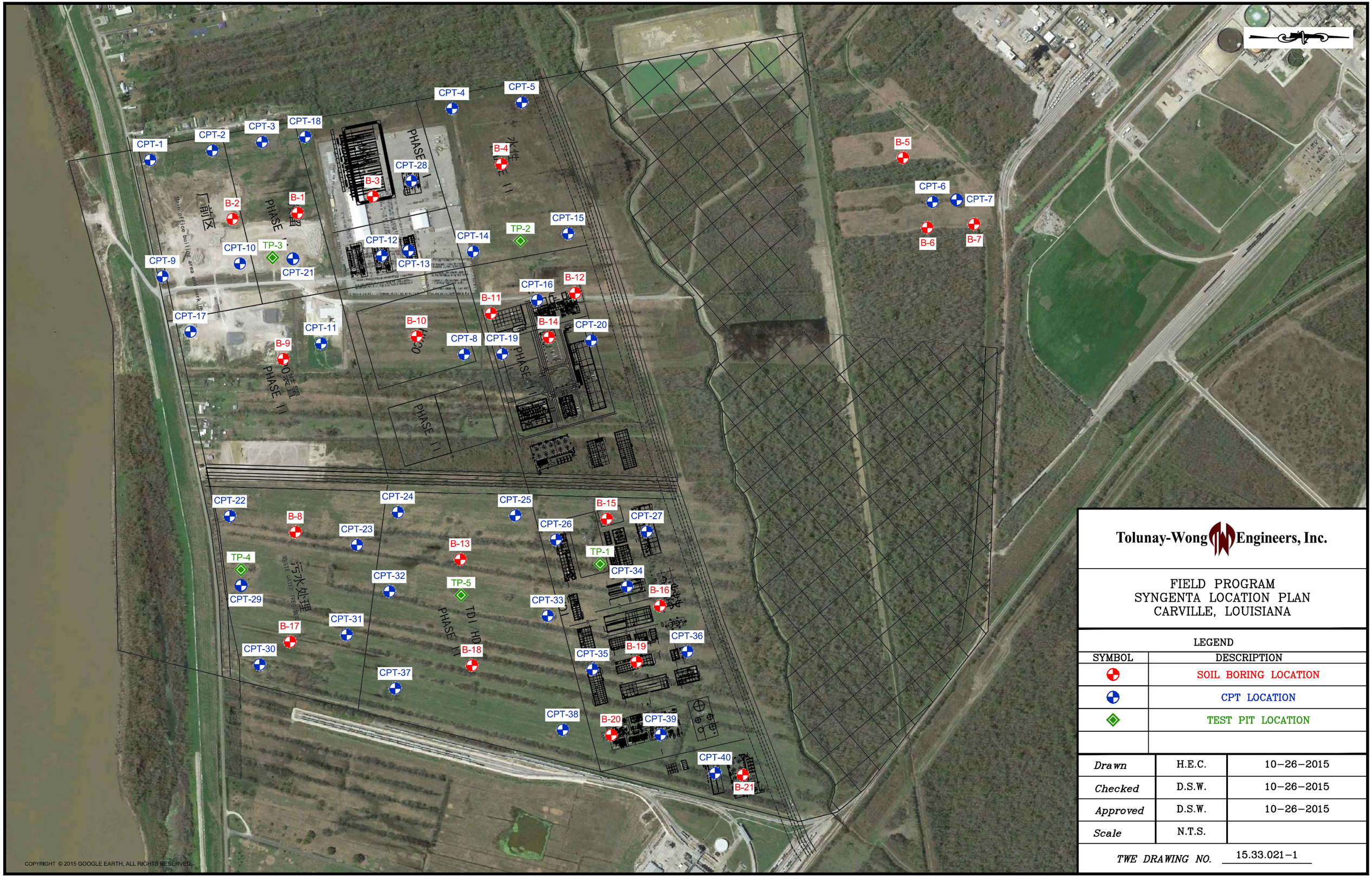
Review of the design and construction drawings as well as the specifications should be performed by TWE before release. The review is aimed at determining if the geotechnical design and construction recommendations contained in this report have been properly interpreted. Design review is not within the authorized scope of work for this study.

14.3 Construction Monitoring

Construction surveillance is recommended and has been assumed in preparing our recommendations. These field services are required to check for changes in conditions that may result in modifications to our recommendations. The quality of the construction practices will affect foundation performance and should be monitored. TWE would be pleased to provide construction monitoring, testing and inspection services for the project.

APPENDIX A

FIELD EXPLORATION LOCATION PLANS
TWE DRAWING NOS. 15.33.021-1 & 15.33.021-2



Tolunay-Wong Engineers, Inc.

FIELD PROGRAM
SYNGENTA LOCATION PLAN
CARVILLE, LOUISIANA

LEGEND

SYMBOL	DESCRIPTION
	SOIL BORING LOCATION
	CPT LOCATION
	TEST PIT LOCATION

Drawn	H.E.C.	10-26-2015
Checked	D.S.W.	10-26-2015
Approved	D.S.W.	10-26-2015
Scale	N.T.S.	

TWE DRAWING NO. 15.33.021-1

CPT LOCATION

SYNGENTA	DEPTH	LATITUDE	LONGITUDE
CPT-1	25'	30° 12' 57.89" N	91° 05' 29.06" W
CPT-2	25'	30° 13' 02.94" N	91° 05' 30.60" W
CPT-3	25'	30° 13' 06.84" N	91° 05' 31.93" W
CPT-4	25'	30° 13' 21.50" N	91° 05' 36.61" W
CPT-5	25'	30° 13' 26.62" N	91° 05' 38.33" W
CPT-6	25'	30° 13' 59.90" N	91° 05' 33.02" W
CPT-7	25'	30° 14' 01.79" N	91° 05' 33.46" W
CPT-8	25'	30° 13' 23.93" N	91° 05' 14.20" W
CPT-9	25'	30° 12' 59.78" N	91° 05' 18.57" W
CPT-10	25'	30° 13' 05.96" N	91° 05' 20.49" W
CPT-11	25'	30° 13' 12.87" N	91° 05' 13.87" W
CPT-12	25'	30° 13' 16.91" N	91° 05' 22.60" W
CPT-13	25'	30° 13' 18.97" N	91° 05' 23.30" W
CPT-14	25'	30° 13' 24.07" N	91° 05' 23.89" W
CPT-15	25'	30° 13' 31.40" N	91° 05' 26.51" W
CPT-16	25'	30° 13' 29.54" N	91° 05' 20.00" W
CPT-17	25'	30° 13' 02.98" N	91° 05' 13.06" W
CPT-18	25'	30° 13' 10.07" N	91° 05' 32.73" W
CPT-19	25'	30° 13' 27.10" N	91° 05' 14.90" W
CPT-20	25'	30° 13' 34.09" N	91° 05' 16.95" W
CPT-21	25'	30° 13' 09.85" N	91° 05' 22.11" W
CPT-22	25'	30° 13' 07.11" N	91° 04' 56.88" W
CPT-23	25'	30° 13' 17.42" N	91° 04' 55.44" W
CPT-24	25'	30° 13' 20.33" N	91° 04' 58.84" W
CPT-25	25'	30° 13' 29.70" N	91° 04' 59.68" W
CPT-26	25'	30° 13' 33.12" N	91° 04' 57.79" W
CPT-27	25'	30° 13' 40.18" N	91° 04' 59.41" W
CPT-28	25'	30° 13' 18.51" N	91° 05' 29.98" W
CPT-29	25'	30° 13' 08.30" N	91° 04' 50.50" W
CPT-30	25'	30° 13' 09.74" N	91° 04' 43.24" W
CPT-31	25'	30° 13' 17.35" N	91° 04' 46.96" W
CPT-32	25'	30° 13' 20.36" N	91° 04' 51.41" W
CPT-33	25'	30° 13' 33.04" N	91° 04' 50.70" W
CPT-34	25'	30° 13' 39.08" N	91° 04' 54.18" W
CPT-35	25'	30° 13' 37.02" N	91° 04' 46.12" W
CPT-36	25'	30° 13' 44.40" N	91° 04' 48.66" W
CPT-37	25'	30° 13' 21.65" N	91° 04' 42.42" W
CPT-38	25'	30° 13' 35.20" N	91° 04' 40.19" W
CPT-39	25'	30° 13' 43.01" N	91° 04' 40.68" W
CPT-40	25'	30° 13' 47.65" N	91° 04' 37.62" W

SOIL BORING LOCATION

SYNGENTA	DEPTH	LATITUDE	LONGITUDE
B-1	60'	30° 13' 09.93" N	91° 05' 26.25" W
B-2	60'	30° 13' 04.80" N	91° 05' 24.65" W
B-3	100'	30° 13' 15.65" N	91° 05' 28.07" W
B-4	60'	30° 13' 25.52" N	91° 05' 32.35" W
B-5	60'	30° 13' 57.22" N	91° 05' 36.77" W
B-6	60'	30° 13' 59.73" N	91° 05' 30.56" W
B-7	60'	30° 14' 03.39" N	91° 05' 31.32" W
B-8	100'	30° 13' 12.31" N	91° 04' 56.01" W
B-9	60'	30° 13' 09.98" N	91° 05' 12.00" W
B-10	60'	30° 13' 20.31" N	91° 05' 15.46" W
B-11	60'	30° 13' 26.00" N	91° 05' 18.37" W
B-12	60'	30° 13' 32.45" N	91° 05' 21.07" W
B-13	60'	30° 13' 25.59" N	91° 04' 55.17" W
B-14	100'	30° 13' 30.91" N	91° 05' 16.17" W
B-15	60'	30° 13' 36.89" N	91° 05' 00.26" W
B-16	60'	30° 13' 42.56" N	91° 04' 52.67" W
B-17	100'	30° 13' 13.33" N	91° 04' 45.69" W
B-18	60'	30° 13' 27.37" N	91° 04' 45.51" W
B-19	60'	30° 13' 40.45" N	91° 04' 47.24" W
B-20	60'	30° 13' 39.09" N	91° 04' 40.16" W
B-21	60'	30° 13' 49.82" N	91° 04' 37.70" W

TEST PIT LOCATION

SYNGENTA	DEPTH	LATITUDE	LONGITUDE
TP-1	NA	30° 13' 36.73" N	91° 04' 56.00" W
TP-2	NA	30° 13' 27.68" N	91° 05' 25.38" W
TP-3	NA	30° 13' 08.26" N	91° 05' 21.39" W
TP-4	NA	30° 13' 08.42" N	91° 04' 52.02" W
TP-5	NA	30° 13' 25.90" N	91° 04' 51.72" W

Tolunay-Wong Engineers, Inc.

FIELD PROGRAM
COORDINATES

Drawn	H.E.C.	10-26-2015
Checked	D.S.W.	10-26-2015
Approved	D.S.W.	10-26-2015
Scale	N.T.S.	

TWE DRAWING NO. 15.33.021-2

APPENDIX B

LOGS OF BORINGS AND A KEY TO
TERMS AND SYMBOLS USED ON BORING LOGS

LOG OF BORING B-1

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 09.93"
W 91° 05' 26.25"

SURFACE ELEVATION: 17.3'

DRILLING METHOD:
Dry Augered: 0 to 12
Wash Bored: 12 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Stiff brown FAT CLAY (CH)	(P)2.50										
15			-firm from 2' to 4'	(P)1.00		42		74	45					
			-becomes gray and tan at 2'											
				(P)2.00										
5														
			-firm from 6' to 8'	(P)1.50		39	81			0.91	13			
10			-with silt pockets from 6' to 8'											
			-with trace organics from 8' to 10'	(P)1.75										
10			Firm gray LEAN CLAY (CL)	(P)0.75										
5			-sickensided from 13' to 15'	(P)1.00		37	82			0.91	3			
15														
0			-becomes soft at 18'	(P)0.50		36		35	18					
			-with silt pockets from 18' to 20'											
20														
-5			-becomes very soft at 23'	(P)0.25										
25														
-10			Firm gray FAT CLAY (CH)	(P)0.50		110	42	148	102	0.51	3			
			-with trace organics from 28' to 35'											
30														
-15				(P)0.75										
35														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 8/28/15
DATE BORING COMPLETED: 8/28/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 12.0' and rose to a depth of 6.6' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-1

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 09.93"
W 91° 05' 26.25"

SURFACE ELEVATION: 17.3'

DRILLING METHOD:
Dry Augered: 0 to 12
Wash Bored: 12 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / -20			Firm gray FAT CLAY (CH)											
40 / -25			-with silt pockets from 38' to 40'	(P)0.50		54	69	87	55	0.54	7			
45 / -30			Very soft gray LEAN CLAY (CL) with wood fragments	(P)0.25		49								
50 / -35			Stiff black PEAT -with wood and shell fragments from 48' to 50'	(P)2.00		199		301	103					
55 / -40			-becomes firm at 53'	(P)0.75										
60 / -45			Soft gray FAT CLAY (CH) with silt pockets -slickensided from 58' to 60'	(P)0.50		50	75			0.49	3			
			Bottom @ 60'											
65 / -50														
70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 8/28/15
DATE BORING COMPLETED: 8/28/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 12.0' and rose to a depth of 6.6' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-2

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 04.80"
W 91° 05' 24.65"

SURFACE ELEVATION: 19.4'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 60

ELEVATION (FT)	DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
20	0			Stiff brown FAT CLAY (CH) -with calcareous nodules and silt pockets from 0' to 4'	(P)2.00		34	91	52	28	2.00	10		86	
				Stiff brown FAT CLAY with SAND (CH)	(P)2.50		31		55	29				84	
15	5			Stiff gray FAT CLAY (CH) -with silt seams from 4' to 6'	(P)1.50										
				-becomes firm at 6' -with ferrous nodules from 6' to 8' -with silt pockets from 6' to 18'	(P)1.00										
10	10			-soft from 8' to 10'	(P)1.00		34	85	62	39	0.44	15			
					(P)1.25										
5	15				(P)1.25										
0	20			Very soft gray LEAN CLAY (CL) with silt pockets	(P)0.25		35	87	37	12	0.22	9	16		
-5	25			Firm gray FAT CLAY (CH) -with silt pockets from 23' to 30'	(P)1.00										
-10	30				(P)0.75										
-15	35			-soft from 33' to 35'	(P)0.25		62	61	87	55	0.25	2	29		

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 8/27/15
DATE BORING COMPLETED: 8/27/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 10.0' and rose to a depth of 2.5' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-2

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 04.80"
W 91° 05' 24.65"

SURFACE ELEVATION: 19.4'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / 40 / 45 / 50 / 55 / 60 / 65 / 70			Firm gray FAT CLAY (CH)											
-20			-with silt pockets and calcareous nodules from 38' to 40'	(P)1.00										
-25			-with wood fragments from 43' to 45'	(P)1.00										
-30				(P)1.25										
-35			-soft from 53' to 55' -with trace organics from 53' to 55'	(P)0.75		86	51	125	76	0.43	4			
-40				(P)1.00										
-45 / -50			Bottom @ 60'											

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 8/27/15
DATE BORING COMPLETED: 8/27/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 10.0' and rose to a depth of 2.5' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-3

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 15.65"
W 91° 05' 28.07"

SURFACE ELEVATION: 18.2'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 0			Asphaltic Concrete: Approximately 6"											
			Crushed Stone: Approximately 18"											
15 / 5			Firm gray and brown FAT CLAY (CH) -with silt and trace organics from 2' to 8'	(P)1.00										
				(P)1.25		42							99	
				(P)1.00		39	82			0.81	6			
10 / 10				(P)1.00										
				(P)1.00										
5 / 15			-soft from 13' to 15' -slickensided from 13' to 15'	(P)1.25		46	75			0.37	3			
0 / 20				(P)1.00										
-5 / 25			Soft gray LEAN CLAY (CL) with silt	(T)0.10		32	89	35	11	0.32	15	7		
-10 / 30			Very soft gray FAT CLAY (CH) -with trace silt from 28' to 30'	(P)0.25		49		54	29					
-15 / 35				(P)0.25										

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/09/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 7.5' and rose to a depth of 6.0' after a period of 15 minutes.The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-3

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 15.65"
W 91° 05' 28.07"

SURFACE ELEVATION: 18.2'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Soft gray FAT CLAY (CH)											
-20 / 40				(P)0.50		60	63			0.39	3			
-25 / 45			-with roots from 43' to 45'	(P)0.75										
-30 / 50				(P)0.50										
-35 / 55			-becomes firm at 53' -with sand, silt, and trace organics from 53' to 55'	(P)0.50		50	71			0.65	9			
-40 / 60			Stiff black PEAT with charred wood fragments	(P)2.50		149		256	142					
-45 / 65			Very soft gray LEAN CLAY (CL) -with trace silt from 63' to 65'	(T)0.10		36								
-50 / 70			-becomes firm at 68' -slickensided from 68' to 70'	(P)0.75		49	72			0.72	4		100	

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/09/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 7.5' and rose to a depth of 6.0' after a period of 15 minutes.The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-3

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 15.65"
W 91° 05' 28.07"

SURFACE ELEVATION: 18.2'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
			Firm gray LEAN CLAY (CL)											
-55 / 75			Soft gray FAT CLAY (CH)	(P)0.50										
-60 / 80			-very soft from 78' to 80'		WOH									
-65 / 85			-becomes firm at 83' -with fine sand and silt seams from 83' to 85'	(P)0.50		62	65	107	75	0.79	4			
-70 / 90			-with trace silt from 88' to 90'	(P)0.50		50								
-75 / 95			-becomes soft at 93' -with silt seams from 93' to 95'	(P)1.00		51	69	79	53	0.42	6			
-80 / 100				(P)1.25										
-85 / 105			Bottom @ 100'											

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/09/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 7.5' and rose to a depth of 6.0' after a period of 15 minutes.The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-4

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 25.52"
W 91° 05' 32.35"

SURFACE ELEVATION: 14.2'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 0			Firm gray FAT CLAY (CH)	(P)0.50										
			-slickensided from 2' to 4'	(P)0.50		53	69			0.61	6			
10 / 5				(P)0.50										
				(P)0.75										
			-very soft from 8' to 10'	(T)0.15		49							99	
5 / 10			-olive gray with trace silt and roots from 8' to 15'	(P)1.00		34		55	32				99	
			-slickensided from 13' to 20'	(P)0.75		44	78			0.62	5			
0 / 15														
				(P)0.75										
-5 / 20														
			-with trace small roots from 23' to 25'	(P)0.75										
-10 / 25														
			-becomes soft at 28'	(P)0.50		65	62			0.28	2			
-15 / 30			-with silt from 28' to 30'											
			-with silt and trace organics from 33' to 35'	(P)0.50		87		104	77					
-20 / 35														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/08/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at 7.2' and rose to a depth of 4.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-4

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 25.52"
W 91° 05' 32.35"

SURFACE ELEVATION: 14.2'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / 40			Soft gray FAT CLAY (CH)	(P)0.50										
-25 / 40			-with roots from 43' to 45'	(P)0.75		40	82			0.45	6			
-30 / 45			Firm black PEAT with ORGANIC CLAY layers	(P)1.25		94		340	150					
-35 / 50			Very soft gray FAT CLAY (CH) -with trace organics from 53' to 55'	(P)0.25										
-40 / 55			-becomes soft at 58'	(P)0.50		51	70			0.41	3			
-45 / 60			Bottom @ 60'											
-50 / 65														
-55 / 70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/08/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at 7.2' and rose to a depth of 4.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-5

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 57.22"
W 91° 05' 31.77"

SURFACE ELEVATION: 14.4'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 0			Firm gray and reddish brown FAT CLAY (CH)	(P)0.75										
				(P)1.00										
10 / 5			-soft from 4' to 12'	(P)0.75		53	69	102	71	0.47	3			
				(P)1.00										
5 / 10				(P)0.75		48								
				(T)0.20										
0 / 15			-firm from 13' to 15'	(P)0.75		43	79			0.68	4			
-5 / 20			-becomes soft at 18'	(P)0.50										
-10 / 25			Very soft gray LEAN CLAY (CL)	(P)0.25		47		47	24					
-15 / 30			Very soft gray and tan FAT CLAY (CH) -slickensided from 28' to 35'	(P)0.25										
-20 / 35			-becomes soft at 33' -with roots from 33' to 35'	(P)0.50										

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/09/15
DATE BORING COMPLETED: 7/09/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 7.7' and rose to a depth of 7.0' after a period of 15 minutes. The boring was backfilled with cemen bentonite grout.

LOG OF BORING B-5

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 57.22"
W 91° 05' 31.77"

SURFACE ELEVATION: 14.4'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Soft gray and tan FAT CLAY (CH)											
			-very soft from 38' to 40' -with trace crushed shells and small roots from 38' to 40'	(P)0.25		63								
-25 / 40			-slickensided from 43' to 45'	(P)0.50		52	68			0.39	2			
-30 / 45														
				(P)1.00										
-35 / 50														
			-with silt pockets from 53' to 60'	(P)1.00		44	76			0.41	2			
-40 / 55														
				(P)0.75		46		69	48					
-45 / 60			Bottom @ 60'											
-50 / 65														
-55 / 70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/09/15
DATE BORING COMPLETED: 7/09/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 7.7' and rose to a depth of 7.0' after a period of 15 minutes. The boring was backfilled with cemen bentonite grout.

LOG OF BORING B-6

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 59.73"
W 91° 05' 30.56"

SURFACE ELEVATION: 15.1'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 100

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
15	0	Firm gray and brownish yellow FAT CLAY (CH)	(P)1.00										
			(P)1.25										
			(P)1.25		40	82	82	57	0.82	4			
10	5		(P)1.00										
		-becomes soft at 8'	(P)0.50		32	89			0.31	15			
5	10	-very soft from 10' to 12'	(T)0.10										
		-becomes gray and firm with trace silt and sand at 13'	(P)0.25		31	94			0.74	15	8		
0	15												
		Soft gray SANDY LEAN CLAY (CL) with silt	(P)0.50		28							66	
-5	20												
		Very soft gray LEAN CLAY with SAND (CL)	(P)0.25		31							83	
-10	25												
		-becomes firm at 28'	(P)1.00		40	79			0.72	8			
-15	30												
		Firm dark gray PEAT -with decayed wood fragments	(P)1.00		230		283	182					
	35												

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/10/15
DATE BORING COMPLETED: 7/10/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 6.2' and rose to a depth of 4.7' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-6

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 59.73"
W 91° 05' 30.56"

SURFACE ELEVATION: 15.1'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
-20 / 35			Firm dark gray PEAT -with decayed wood fragments											
-25 / 40			Very soft gray FAT CLAY (CH)	(P)0.25										
			-firm from 43' to 45'	(P)1.00										
-30 / 45			-soft from 48' to 50' -with trace silt from 48' to 58'	(P)0.75		44	79			0.45	5			
-35 / 50				(P)0.25										
-40 / 55														
-45 / 60			Soft gray LEAN CLAY (CL)	(P)0.50		32	93	21	8	0.48	5			
-50 / 65				(P)0.50										
70			-becomes very soft at 68.5'		WOH									

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/10/15
DATE BORING COMPLETED: 7/10/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 6.2' and rose to a depth of 4.7' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-6

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 59.73"
W 91° 05' 30.56"

SURFACE ELEVATION: 15.1'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 100

ELEVATION (FT)	DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
-55				Very soft LEAN CLAY (CL)											
-60	75			Firm gray FAT CLAY (CH) with trace silt	(P)1.00		45	75			0.59	7			
-65	80			-becomes stiff at 78'	(P)0.50		54	67			1.08	3			
-70	85				(P)1.25										
-75	90			-with shell fragments from 88' to 90'	(P)1.50		64	59	113	76	1.05	4			
-80	95				(P)1.25										
-85	100			-with silt seams from 98' to 100'	(P)1.50										
	105			Bottom @ 100'											

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/10/15
DATE BORING COMPLETED: 7/10/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 6.2' and rose to a depth of 4.7' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-7

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 14' 03.39"
W 91° 05' 31.32"

SURFACE ELEVATION: 15.1'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
15	0	Firm tan and gray FAT CLAY (CH)	(P)1.75										
		-with trace organics from 2' to 4'	(P)1.00		47	77			0.64	8			
			(P)1.00										
10	5	Soft tan and gray LEAN CLAY (CL)	(P)0.50										
		-with trace silt from 6' to 15'											
			(T)0.20		33		34	21				100	
5	10	-firm from 10' to 13'	(T)0.10		29	89			0.74	15	9		
		-becomes very soft at 13'	(T)0.10										
0	15												
		-with sand pockets from 18' to 28'	(P)0.25		37							90	
-5	20												
			(T)0.10										
-10	25												
		Soft gray FAT CLAY (CH) with sand seams	(P)0.50		48	73	55	32	0.31	15			
-15	30												
		-with wood fragments from 33' to 35'	(P)0.50										
	35												

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/09/15
DATE BORING COMPLETED: 7/09/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 7.7' and rose to a depth of 4.0' after a period of 15 minutes. The boring was backfilled with cement- bentonite grout.

LOG OF BORING B-7

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 14' 03.39"
W 91° 05' 31.32"

SURFACE ELEVATION: 15.1'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT)	DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
-20	35			Firm gray FAT CLAY (CH)											
				-slickensided from 38' to 40'	(P)0.25		53	69			0.59	3			
-25	40														
					(P)1.00										
-30	45														
				Soft gray LEAN CLAY (CL) -with trace silt from 48' to 60'	(P)0.25		35	82	38	19	0.32	9			
-35	50														
					(T)0.10										
-40	55														
					(P)0.75		34								
-45	60			Bottom @ 60'											
-50	65														
	70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/09/15
DATE BORING COMPLETED: 7/09/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 7.7' and rose to a depth of 4.0' after a period of 15 minutes. The boring was backfilled with cement- bentonite grout.

LOG OF BORING B-8

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 12.31"
W 91° 04' 56.01"

SURFACE ELEVATION: 17.6'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 15			Stiff brown LEAN CLAY (CL)	(P)1.50										
			-with silt pockets from 2' to 4'	(P)1.75		22	95	38	17	1.78	5			
5 / 10			Firm gray FAT CLAY (CH) -with silt pockets and ferrous nodules from 4' to 8'	(P)0.75 (P)1.25										
				(P)0.50		41	80	73	48	0.58	8			
10 / 5			-with ferrous nodules from 10' to 15' -with silt pockets from 10' to 12'	(P)1.25										
				(P)1.00										
15 / 0			-with silt pockets from 18' to 35'	(P)1.00										
20 / -5			-becomes soft at 23'	(P)0.75		68	60			0.39	3			
25 / -10			-with ferrous nodules from 28' to 40'	(P)0.50										
30 / -15				(P)0.50										
35														

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 8/26/15
DATE BORING COMPLETED: 8/26/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 10.0' and rose to a depth of 7.0' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-8

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 12.31"
W 91° 04' 56.01"

SURFACE ELEVATION: 17.6'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / -20			Soft gray FAT CLAY (CH) -with silt seams from 35' to 50'											
			-becomes firm at 38'	(P)0.75		47	76	74	47	0.55	5			
40 / -25				(P)1.00										
45 / -30				(P)1.00										
50 / -35			-becomes soft at 53'	(P)0.50										
55 / -40			Firm gray LEAN CLAY (CL)	(P)0.75		33		36	20	0.63	13	2	100	
60 / -45			-becomes soft at 63'	(P)0.50										
65 / -50			Soft gray FAT CLAY (CH)	(P)0.50										
70														

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 8/26/15
DATE BORING COMPLETED: 8/26/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 10.0' and rose to a depth of 7.0' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-8

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 12.31"
W 91° 04' 56.01"

SURFACE ELEVATION: 17.6'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
			Soft gray FAT CLAY (CH)											
-55 / 75			-with trace organics from 73' to 75'	(P)0.75										
-60 / 80			-becomes firm at 78'	(P)0.50		54	70	81	57	0.99	7			
-65 / 85				(P)1.00										
-70 / 90			-with calcareous nodules from 88' to 90'	(P)1.25										
-75 / 95			-with ferrous nodules from 93' to 95'	(P)1.00										
-80 / 100			-becomes soft at 98'	(P)0.50		54							100	
-85 / 105			Bottom @ 100'											

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 8/26/15
DATE BORING COMPLETED: 8/26/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 10.0' and rose to a depth of 7.0' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-9

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 09.34"
W 91° 05' 12.37"

SURFACE ELEVATION: 19.3'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 60

ELEVATION (FT)	DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
	0			Mixed Gravel: Approximately 6"											
15	5			Firm brown LEAN CLAY (CL) -with silt pockets and calcareous nodules from 2' to 6'	(P)1.00 (P)1.00		22		45	22					
				-soft with silt seams from 6' to 8'	(P)0.50 (P)0.50		28	102	39	20	0.40	15	6		
10	10			Firm brown FAT CLAY (CH) -with silt pockets from 10' to 15' -with ferrous nodules from 10' to 12'	(P)1.00 (P)1.00		37	89	69	41	0.76	15			
5	15			-stiff from 18' to 20'	(P)1.50										
0	20			-becomes gray at 23'	(P)1.00										
-5	25			-with ferrous nodules and trace organics from 28' to 30' -with wood fragments from 28' to 35'	(P)1.50		92	48	142	107	0.70	4			
-10	30				(P)1.50										
-15	35														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 8/28/15
DATE BORING COMPLETED: 8/28/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 10.0' and rose to a depth of 4.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-9

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 09.34"
W 91° 05' 12.37"

SURFACE ELEVATION: 19.3'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / 0			Firm brown FAT CLAY (CH)											
-20 / 40			-becomes soft at 38' -with trace organics from 38' to 40'	(P)0.50										
-25 / 45				(P)0.75										
-30 / 50			Firm dark gray ORGANIC CLAY (OH)	(P)1.50		146	34	243	119	0.91	4			
-35 / 55			-entire sample composed of wood fragments											
-40 / 60			Firm gray LEAN CLAY (CL)	(P)0.75										
			Bottom @ 60'											
-45 / 65														
-50 / 70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 8/28/15
DATE BORING COMPLETED: 8/28/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 10.0' and rose to a depth of 4.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-10

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 20.30"
W 91° 05' 15.40"

SURFACE ELEVATION: 16.1'

DRILLING METHOD:
Dry Augered: 0 to 6
Wash Bored: 6 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 15			Soft tan LEAN CLAY (CL)	(P)1.00										
				(P)0.50										
				(P)0.50										
5 / 10			-becomes very soft at 6'	(P)0.25		38	82	47	29	0.17	15	5		
				(P)0.25										
10 / 5			Firm gray FAT CLAY (CH)	(P)1.50										
			-slickensided from 13' to 15'	(P)1.50		51	72	96	62	0.80	4			
15 / 0														
				(P)1.00										
20 / -5														
				(P)1.50										
25 / -10														
30 / -15			Firm gray ORGANIC CLAY (OH) -slickensided from 28' to 30'	(P)0.50		102	45	155	106	0.70	2			
				(P)0.75										
35														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/06/15
DATE BORING COMPLETED: 7/06/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 6.0' and rose to a depth of 1.6' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-10

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 20.30"
W 91° 05' 15.40"

SURFACE ELEVATION: 16.1'

DRILLING METHOD:
Dry Augered: 0 to 6
Wash Bored: 6 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / -20			Firm gray ORGANIC CLAY (OH)											
40 / -25			Very soft gray FAT CLAY (CH)	(T)0.15		61	61	80	52	0.04	1	17		
			-becomes soft at 43'	(P)0.50										
45 / -30														
50 / -35			Firm dark gray ORGANIC CLAY (OH) with charred wood fragments	(P)1.00		122		192	137					
55 / -40			Soft gray FAT CLAY (CH)	(P)1.00		52	69			0.46	3			
			-with silt seams from 58' to 60'	(P)0.50										
60 / -45			Bottom @ 60'											
65 / -50														
70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/06/15
DATE BORING COMPLETED: 7/06/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 6.0' and rose to a depth of 1.6' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-11

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 26.00"
W 91° 05' 18.37"

SURFACE ELEVATION: 15.7'

DRILLING METHOD:
Dry Augered: 0 to 6
Wash Bored: 6 to 60

ELEVATION (FT)	DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
15	0			Stiff brown LEAN CLAY (CL)	(P)1.50										
				Firm tan and gray FAT CLAY (CH)	(P)1.00										
10	5			Soft tan LEAN CLAY (CL) with silt	(P)0.25		32	91	41	20	0.34	15			
					(T)0.24		32							87	
					(T)0.15		31	88	31	9	0.25	15	5		
5	10			Soft gray FAT CLAY (CH)	(P)0.50										
					(P)1.00										
0	15														
					(P)0.75		56	67			0.32	2			
-5	20														
				-becomes firm at 23'	(P)1.00										
-10	25														
					(P)0.75										
-15	30														
					(P)0.75		54	60	101	67	0.58	4	16		
	35														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/06/15
DATE BORING COMPLETED: 7/06/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 6.0' and rose to a depth of 1.5' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-11

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 26.00"
W 91° 05' 18.37"

SURFACE ELEVATION: 15.7'

DRILLING METHOD:
Dry Augered: 0 to 6
Wash Bored: 6 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
-20 / 35			Firm gray FAT CLAY (CH)											
				(P)0.50										
-25 / 40														
				(P)0.50										
-30 / 45														
				(P)0.50		73	59			0.53	3			
-35 / 50														
				(P)1.00										
-40 / 55														
				(P)1.00										
-45 / 60			Bottom @ 60'											
-50 / 65														
/ 70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/06/15
DATE BORING COMPLETED: 7/06/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 6.0' and rose to a depth of 1.5' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-12

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 32.45"
W 91° 05' 21.07"

SURFACE ELEVATION: 15.9'

DRILLING METHOD:
Dry Augered: 0 to 6
Wash Bored: 6 to 60

ELEVATION (FT) / DEPTH (FT)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
15 / 0	Soft brown SANDY SILT (ML) with clay	(P)0.50										
	Firm brown LEAN CLAY (CL) with silt	(P)0.75										
	-becomes soft at 4'	(P)0.50				36	16					
10 / 5		(P)0.25										
		(T)0.10		30	88			0.36	15	5		
5 / 10	-with sand from 10' to 12'	(P)0.25										
0 / 15	Very soft gray FAT CLAY (CH) -with silt and sand pockets from 13' to 15'	(T)0.10		37		59	30				98	
	-becomes soft at 18' -with wood fragments from 18' to 20'	(P)0.50		54	67			0.43	4			
-5 / 20												
	-becomes firm at 23'	(P)1.00										
-10 / 25												
		(P)1.50		46	77			0.79	2			
-15 / 30												
	-with organics from 33' to 35'	(P)1.00										
35												

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 6.0' and rose to a depth of 1.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-12

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 32.45"
W 91° 05' 21.07"

SURFACE ELEVATION: 15.9'

DRILLING METHOD:
Dry Augered: 0 to 6
Wash Bored: 6 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / -20			Firm gray FAT CLAY (CH)											
			-soft from 38' to 45'	(P)1.00		53	70	93	65	0.45	6			
40 / -25														
			-with trace organics from 43' to 45'	(P)1.00										
45 / -30														
				(P)1.25										
50 / -35														
			-becomes soft with trace organics and fine sand at 53'	(P)0.25		69	57			0.36	3	22	96	
55 / -40														
				(P)0.25										
60 / -45			Bottom @ 60'											
65 / -50														
70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 6.0' and rose to a depth of 1.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-13

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 25.59"
W 91° 04' 55.17"

SURFACE ELEVATION: 16.2'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 15			Firm brown LEAN CLAY (CL)	(P)1.50										
				(P)0.50										
5 / 10			-becomes gray at 4' -with silt and sand from 4' to 6'	(P)1.00		29	93	44	26	0.66	15			
			-becomes soft at 6'	(P)0.50										
				(P)0.50										
10 / 5			-with silt pockets from 10' to 12'	(P)0.50		42								
				(P)0.50										
15 / 0														
20 / -5			Soft gray FAT CLAY (CH) -slickensided with silt pockets from 18' to 20'	(P)1.00		53	67	92	63	0.32	3			
			-firm from 23' to 30'	(P)1.50										
25 / -10														
				(P)0.50		52	67			0.74	5			
30 / -15														
				(P)0.50										
35														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/09/15
DATE BORING COMPLETED: 7/09/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 8.0' and rose to a depth of 2.3' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-13

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 25.59"
W 91° 04' 55.17"

SURFACE ELEVATION: 16.2'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / -20			Soft gray FAT CLAY (CH)											
				(P)1.00		41								
40 / -25														
				(P)0.50		43	80			0.48	11			
45 / -30														
			-with silt pockets and wood fragments from 48' to 55'	(P)0.50		45		78	52					
50 / -35														
			-slickensided from 53' to 55'	(P)0.25		44	74			0.39	10			
55 / -40														
				(P)0.25		50								
60 / -45			Bottom @ 60'											
65 / -50														
70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/09/15
DATE BORING COMPLETED: 7/09/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 8.0' and rose to a depth of 2.3' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-14

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 30.91"
W 91° 05' 16.17"

SURFACE ELEVATION: 15.9'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
15 / 0			Soft tan and brown LEAN CLAY (CL) with silt and sand	(P)0.50										
			-firm from 2' to 4'	(P)1.50										
10 / 5			-becomes very soft at 4'	(P)0.25		30	90	38	17	0.19	15	4		
				(P)0.50										
			-very soft from 8' to 10'	(P)0.25		31							82	
5 / 10				(P)0.50										
0 / 15				(P)0.75		37	76	34	10	0.26	7	12		
			Firm gray FAT CLAY (CH)	(P)0.75										
-5 / 20														
				(P)0.50										
-10 / 25														
			-with silt from 28' to 30'	(P)1.00		40	78			0.53	3			
-15 / 30														
			-becomes soft at 33' -with trace organics from 33' to 35'	(P)0.50										
35														

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: P Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 8.0' and rose to a depth of 1.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-14

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 30.91"
W 91° 05' 16.17"

SURFACE ELEVATION: 15.9'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
-20 / 35			Soft gray FAT CLAY (CH)											
			-with shell fragments from 38' to 40'	(P)0.50										
-25 / 40			becomes firm at 43'	(P)0.50		46	71	71	46	0.51	7			
			-with trace organics from 43' to 45'											
-30 / 45														
				(P)0.75		54		106	74					
-35 / 50														
				(P)1.25										
-40 / 55														
			Soft gray LEAN CLAY (CL)	(T)0.15		32	90	36	13	0.38	15	27		
-45 / 60														
			-becomes firm at 63'	(P)1.00										
-50 / 65														
			Very soft gray FAT CLAY (CH)	(T)0.10		46	71			0.20	12			
			70											

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: P Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 8.0' and rose to a depth of 1.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-14

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 30.91"
W 91° 05' 16.17"

SURFACE ELEVATION: 15.9'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
-55 / 75			Very soft gray FAT CLAY (CH)											
			-becomes firm at 73'	(P)0.75										
-60 / 80			-slickensided from 78' to 80'	(P)0.75		62	64	102	68	0.75	2			
-65 / 85				(P)0.75										
-70 / 90			Firm gray LEAN CLAY (CL)	(P)1.00		43	75			0.58	2			
-75 / 95			-with sand from 93' to 95'	(P)1.00										
-80 / 100				(P)1.00		57	62			0.63	10			
-85 / 105			Bottom @ 100'											

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: P Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 8.0' and rose to a depth of 1.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-15

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 36.89"
W 91° 05' 00.26"

SURFACE ELEVATION: 14.4'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 0			Soft light gray FAT CLAY (CH)	(P)0.50										
				(P)0.50										
10 / 5			-becomes stiff at 4' -with silt, sand and trace organics from 4' to 6'	(P)0.50		33	91	59	40	1.03	15			
				(P)1.50										
5 / 10				(P)1.50										
				(P)1.50										
0 / 15			-becomes soft at 13'	(P)1.50		50	69	102	73	0.46	2			
				(P)0.50										
-5 / 20														
-10 / 25			Soft gray SILT (ML) with clay and sand	(P)0.50		43							94	
-15 / 30			Firm gray ORGANIC CLAY (OH) -slickensided from 28' to 30'	(P)0.50		130	42			0.74	5			
-20 / 35			Soft black PEAT	(P)0.50										

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/09/15
DATE BORING COMPLETED: 7/09/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 13.0' and rose to a depth of 1.3' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-15

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 36.89"
W 91° 05' 00.26"

SURFACE ELEVATION: 14.4'

DRILLING METHOD:
Dry Augered: 0 to 8
Wash Bored: 8 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Soft black PEAT											
			-with ORGANIC CLAY layers and charred wood fragments from 38 to 40'	(P)0.50		167								
-25 / 40														
			Soft gray FAT CLAY (CH)	(P)1.00		47	74			0.49	2			
-30 / 45														
			-becomes firm at 48' -with silt from 48' to 50'	(P)1.50		49		88	60					
-35 / 50														
				(P)1.50										
-40 / 55														
			-soft with silt pockets at 58'	(P)2.00		41	75			0.48	6			
-45 / 60			Bottom @ 60'											
-50 / 65														
-55 / 70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/09/15
DATE BORING COMPLETED: 7/09/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 13.0' and rose to a depth of 1.3' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-16

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 42.56"
W 91° 04' 52.67"

SURFACE ELEVATION: 13.3'

DRILLING METHOD:
Dry Augered: 0 to 15
Wash Bored: 15 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 0			Stiff gray FAT CLAY (CH)	(P)2.00										
				(P)1.50										
10 / 5			-soft with traces of silt from 4' to 6' -slickensided from 4' to 6'	(P)0.50		46	74	105	77	0.39	3			
				(P)2.00										
5 / 10				(P)2.00										
			-firm from 10' to 15'	(P)0.75		52		91	72					
0 / 15				(P)1.00										
-5 / 20			-becomes very soft at 18'	(P)0.75		46	74			0.14	14			
-10 / 25				(P)1.00										
-15 / 30				(P)0.50										
-20 / 35				(T)0.10										

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/08/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was not encountered during drilling. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-16

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 42.56"
W 91° 04' 52.67"

SURFACE ELEVATION: 13.3'

DRILLING METHOD:
Dry Augered: 0 to 15
Wash Bored: 15 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35			Very soft gray FAT CLAY (CH)											
-25 / 40			Soft gray LEAN CLAY (CL)	(P)0.50										
-30 / 45			-firm from 43' to 45'	(P)1.00		49	73			0.64	6			
-35 / 50				(T)0.25										
-40 / 55				(P)0.25		34	85			0.30	15			
-45 / 60				(T)0.15										
			Bottom @ 60'											
-50 / 65														
-55 / 70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/08/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was not encountered during drilling. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-17

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 13.33"
W 91° 04' 45.69"

SURFACE ELEVATION: 17.4'

DRILLING METHOD:
Dry Augered: 0 to 12
Wash Bored: 12 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 15			Stiff brown LEAN CLAY (CL) -with silt pockets from 0' to 2'	(P)2.00										
			-becomes soft at 2'	(P)0.75		31							96	
5 / 10			Firm gray FAT CLAY (CH)	(P)0.50										
			-with silt pockets from 6' to 8' -slickensided from 6' to 8'	(P)0.50		39	83	78	49	0.60	8			
				(P)0.75										
10 / 5				(P)1.00										
			-slickensided from 13' to 15'	(P)1.25		39	81			0.66	2			
15 / 0														
				(P)1.00										
20 / -5			Soft gray LEAN CLAY (CL)	(P)0.75										
25 / -10			Firm dark gray ORGANIC CLAY (OH)	(P)0.50		129	38	239	181	0.59	5			
30 / -15			Soft gray LEAN CLAY (CL)	(P)0.50										
35														

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 8/26/15
DATE BORING COMPLETED: 8/27/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 12.0' and rose to a depth of 10.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-17

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 13.33"
W 91° 04' 45.69"

SURFACE ELEVATION: 17.4'

DRILLING METHOD:
Dry Augered: 0 to 12
Wash Bored: 12 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
-20 / 35			Soft gray LEAN CLAY (CL)											
			-becomes firm at 38'	(P)1.00										
-25 / 40			Soft gray FAT CLAY (CH) -with silt pockets from 43' to 50'	(P)0.50										
-30 / 45			-very soft from 48' to 50' -slickensided from 48' to 50'	(P)0.50		47	77			0.24	3			
-35 / 50			-with calcareous nodules from 53' to 55'	(P)0.50		46		79	47				98	
-40 / 55			Soft gray LEAN CLAY (CL) with silt	(P)0.50										
-45 / 60			Soft gray FAT CLAY (CH) -with silt and sand seams from 63' to 65'	(P)0.50										
-50 / 65				(P)0.50										
70														

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 8/26/15
DATE BORING COMPLETED: 8/27/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 12.0' and rose to a depth of 10.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-17

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 13.33"
W 91° 04' 45.69"

SURFACE ELEVATION: 17.4'

DRILLING METHOD:
Dry Augered: 0 to 12
Wash Bored: 12 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
-55 / 75			Soft gray FAT CLAY (CH)											
			-becomes firm at 73'	(P)1.25		71	61			0.55	6			
-60 / 80			-with trace organics from 78' to 80'	(P)1.50										
-65 / 85			-with silt pockets from 83' to 85'	(P)1.00		49		95	63					
-70 / 90			Firm gray LEAN CLAY (CL)	(P)1.00										
-75 / 95			Stiff gray FAT CLAY (CH)	(P)1.25		60	65			1.27	5			
-80			-with trace organics from 98' to 100'	(P)2.25										
100 / -85 / 105			Bottom @ 100'											

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 8/26/15
DATE BORING COMPLETED: 8/27/15
LOGGER: P. Lawson
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 12.0' and rose to a depth of 10.8' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-18

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 27.37"
W 91° 04' 45.51"

SURFACE ELEVATION: 17.4'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 0			Firm tan FAT CLAY (CH) -with trace roots from 0' to 2'	(P)2.00										
15				(P)1.50										
				(P)1.00		34	86	71	42	0.76	8			
5				(P)1.00										
10			-soft from 8' to 10'	(P)1.00		37	82			0.27	15	12		
10				(P)1.00										
5				(P)1.00										
15														
0			-becomes soft and gray at 18' -slickensided from 18' to 20'	(P)1.00		51	54	98	78	0.44	3			
20														
-5				(P)1.00										
25														
-10			-firm from 28' to 30' -with silt, peat, and trace organics from 28' to 30'	(P)1.50			83	104		0.98	4	4		
30														
-15				(P)0.50										
35														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 9.0' and rose to a depth of 6.5' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-18

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 27.37"
W 91° 04' 45.51"

SURFACE ELEVATION: 17.4'

DRILLING METHOD:
Dry Augered: 0 to 10
Wash Bored: 10 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / -20			Soft gray FAT CLAY (CH)											
			-becomes stiff at 38'	(P)2.00										
40 / -25														
			Soft gray LEAN CLAY (CL)	(P)0.50		40	80	48	27	0.49	8			
45 / -30														
			-becomes firm at 48'	(P)1.50										
50 / -35														
			Soft gray FAT CLAY (CH) with silt	(P)0.50										
55 / -40														
				(P)0.50		31	87	52	30	0.47	15	4		
60 / -45			Bottom @ 60'											
65 / -50														
70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 9.0' and rose to a depth of 6.5' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-19

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 40.25"
W 91° 04' 47.24"

SURFACE ELEVATION: 13.5'

DRILLING METHOD:
Dry Augered: 0 to 12
Wash Bored: 12 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 0			Soft tan FAT CLAY (CH)	(P)1.00										
			-with silt from 2' to 4'	(P)1.00		42	75	91	63	0.40	9			
10 / 5				(P)1.50										
				(P)0.50										
5 / 10			-with silt from 8' to 10' -slickensided from 8' to 10'	(P)1.50		47	75			0.37	2			
0 / 15			-becomes gray and firm at 13'	(P)1.00										
-5 / 20			Firm gray LEAN CLAY (CL)	(P)0.50		27	87	27	12	0.59	15	16		
-10 / 25			Soft gray and tan FAT CLAY (CH)	(T)0.25										
-15 / 30				(P)1.00										
-20 / 35			-with silt pockets at 33' to 35'	(P)0.50		40	81	73	50	0.41	1			

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/08/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 12.0' and rose to a depth of 6.3' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-19

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 40.25"
W 91° 04' 47.24"

SURFACE ELEVATION: 13.5'

DRILLING METHOD:
Dry Augered: 0 to 12
Wash Bored: 12 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 /			Soft gray FAT CLAY (CH)											
-25 / 40				(P)0.50										
-30 / 45				(P)0.50										
-35 / 50				(T)0.20										
-40 / 55			Loose gray SILT (ML) with clay	(P)0.15		35	84	24	1	0.31	15	25		
-45 / 60			Loose gray SILTY SAND (SM)	(T)0.15										
-50 / 65			Soft gray FAT CLAY (CH)	(P)0.50										
-55 / 70			-slickensided from 68' to 70'	(P)0.50		59	63			0.47	3			

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/08/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 12.0' and rose to a depth of 6.3' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-19

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 40.25"
W 91° 04' 47.24"

SURFACE ELEVATION: 13.5'

DRILLING METHOD:
Dry Augered: 0 to 12
Wash Bored: 12 to 100

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
			Soft gray FAT CLAY (CH)											
-60 / 75			-becomes firm at 73'	(P)1.50										
-65 / 80				(P)1.00										
-70 / 85				(P)1.50		50	68			0.86	10			
-75 / 90			-slickensided with trace shell fragments from 88' to 90'	(P)1.50										
-80 / 95				(P)1.75										
-85 / 100			-with silt pockets from 98' to 100' -slickensided from 98' to 100'	(P)1.25		48	72			0.94	4			
-90 / 105			Bottom @ 100'											

COMPLETION DEPTH: 100 ft
DATE BORING STARTED: 7/08/15
DATE BORING COMPLETED: 7/08/15
LOGGER: T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was encountered at a depth of 12.0' and rose to a depth of 6.3' after a period of 15 minutes. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-20

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 39.09"
W 91° 08' 40.16"

SURFACE ELEVATION: 13.9'

DRILLING METHOD:
Dry Augered: 0 to 15
Wash Bored: 15 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0 / 0			Firm gray FAT CLAY (CH)	(P)1.50										
				(P)0.75		54		104	82	0.57	10			
10 / 5				(P)0.75										
				(P)1.25										
5 / 10				(P)1.50										
			-soft from 10' to 15'	(P)0.50										
0 / 15				(P)0.50		58	66	102	71	0.45	5			
-5 / 20				(P)1.25										
-10 / 25			Soft black PEAT	(P)0.50		183		257	146					
-15 / 30			Soft gray FAT CLAY (CH)	(P)1.00										
-20 / 35			-with wood fragments from 33' to 35'	(P)1.00		48	77			0.34	4			

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: T. Bell/T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was not encountered during drilling. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-20

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 39.09"
W 91° 08' 40.16"

SURFACE ELEVATION: 13.9'

DRILLING METHOD:
Dry Augered: 0 to 15
Wash Bored: 15 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / 0			Soft gray FAT CLAY (CH) with silt											
				(P)0.50										
-25 / 40														
				(P)0.50		45	76			0.45	9			
-30 / 45														
				(P)0.50										
-35 / 50														
-40 / 55			Firm gray LEAN CLAY (CL) with silt	(T)0.10		29	97	28	11	0.62	15	45		
				(P)1.50										
-45 / 60			Bottom @ 60'											
-50 / 65														
-55 / 70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: T. Bell/T. Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was not encountered during drilling. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-21

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 49.82"
W 91 °04' 37.70"

SURFACE ELEVATION: 12.5'

DRILLING METHOD:
Dry Augered: 0 to 15
Wash Bored: 15 to 60

ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0			Firm gray FAT CLAY (CH)	(P)2.00										
				(P)1.00										
10			-soft from 4' to 10'	(P)0.75		49	69	94	63	0.46	4			
			-slickensided from 4' to 6'											
5			-with calcerous nodules from 6' to 8'	(P)1.00										
			-slickensided from 8' to 10'	(P)1.50		53	69			0.28	3			
10				(P)1.00										
0			-slickensided from 13' to 15'	(P)1.25		53	71			0.64	6			
15														
-5			-becomes soft at 18'	(P)0.50										
			-with wood fragments from 18' to 20'											
20														
-10			Soft black PEAT	(P)0.50		165		337	188					
25														
-15			Soft tan FAT CLAY (CH)	(P)0.50										
30														
-20			Soft gray LEAN CLAY (CL)	(P)0.50		40	84	42	21	0.32	8			
35														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: T. Bell/T/ Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was not encountered during drilling. The boring was backfilled with cement-bentonite grout.

LOG OF BORING B-21

PROJECT: Wanhua Chemical - Syngenta Site
Carville, Louisiana

CLIENT: Wanhua Chemical US Holdings
Houston, Texas

COORDINATES: N 30° 13' 49.82"
W 91 °04' 37.70"

SURFACE ELEVATION: 12.5'

DRILLING METHOD:
Dry Augered: 0 to 15
Wash Bored: 15 to 60

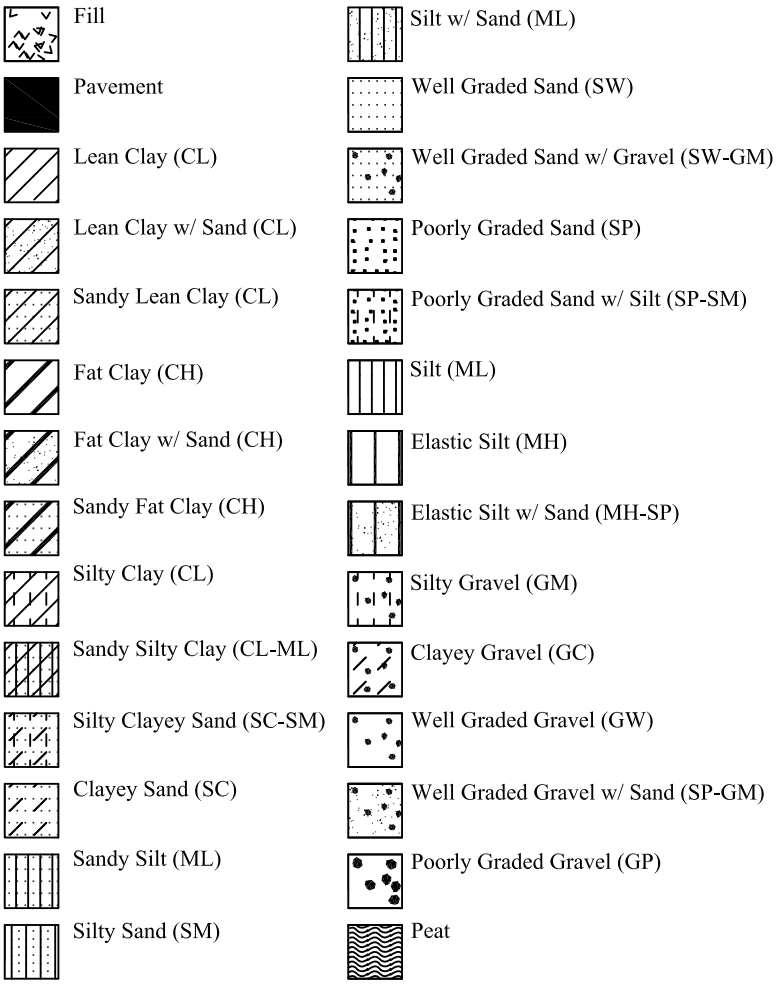
ELEVATION (FT) / DEPTH (FT)	SAMPLE TYPE	SYMBOL	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (tsf)	STD. PENETRATION TEST BLOWCOUNT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35 / -25			Soft gray LEAN CLAY (CL)											
40 / -30			Soft gray FAT CLAY (CH)	(P)0.50										
45 / -35			-becomes firm at 43'	(P)1.50		40	81			0.63	4			
50 / -40				(P)1.50										
55 / -45				(P)0.50										
60 / -50				(P)1.00		50	74	82	55	0.71	8			
65 / -55			Bottom @ 60'											
70														

COMPLETION DEPTH: 60 ft
DATE BORING STARTED: 7/07/15
DATE BORING COMPLETED: 7/07/15
LOGGER: T. Bell/T/ Cina
PROJECT NO.: 15.33.021

NOTES: Groundwater was not encountered during drilling. The boring was backfilled with cement-bentonite grout.

SYMBOLS AND TERMS USED ON BORING LOGS

Most Common Unified Soil Classifications System Symbols



Sampler Symbols	Meaning
	Pavement core
	Thin - walled tube sample
	Standard Penetration Test (SPT)
	Auger sample
	Sampling attempt with no recovery
	TxDOT Cone Penetrometer Test

Field Test Data

2.50	Pocket penetrometer reading in tons per square foot
8/6"	Blow count per 6 - in. interval of the Standard Penetration Test
	Observed free water during drilling
	Observed static water level

Laboratory Test Data

Wc (%)	Moisture content in percent
Dens. (pcf)	Dry unit weight in pounds per cubic foot
Qu (tsf)	Unconfined compressive strength in tons per square foot
UU (tsf)	Compressive strength under confining pressure in tons per square foot
Str. (%)	Strain at failure in percent
LL	Liquid Limit in percent
PI	Plasticity Index
#200 (%)	Percent passing the No. 200 mesh sieve
( )	Confining pressure in pounds per square inch
*	Slickensided failure
**	Did not fail @ 15% strain

RELATIVE DENSITY OF COHESIONLESS & SEMI-COHESIONLESS SOILS

The following descriptive terms for relative density apply to cohesionless soils such as gravels, silty sands, and sands as well as semi-cohesive and semi-cohesionless soils such as sandy silts, and clayey sands.

Relative Density	Typical N_{60} Value Range*
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Over 50

* N_{60} is the number of blows from a 140-lb weight having a free fall of 30-in. required to penetrate the final 12-in. of an 18-in. sample interval, corrected for field procedure to an average energy ratio of 60% (Terzaghi, Peck, and Mesri, 1996).

CONSISTENCY OF COHESIVE SOILS

The following descriptive terms for consistency apply to cohesive soils such as clays, sandy clays, and silty clays.

Pocket Penetrometer (tsf)	Typical Compressive Strength (tsf)	Consistency	Typical SPT "N_{60}" Value Range**
$pp < 0.50$	$qu < 0.25$	Very soft	≤ 2
$0.50 \leq pp < 0.75$	$0.25 \leq qu < 0.50$	Soft	3-4
$0.75 \leq pp < 1.50$	$0.50 \leq qu < 1.00$	Firm	5-8
$1.50 \leq pp < 3.00$	$1.00 \leq qu < 2.00$	Stiff	9-15
$3.00 \leq pp < 4.50$	$2.00 \leq qu < 4.00$	Very Stiff	16-30
$pp \geq 4.50$	$qu \geq 4.00$	Hard	≥ 31

** An "N_{60}" value of 31 or greater corresponds to a hard consistency. The correlation of consistency with a typical SPT "N_{60}" value range is approximate.

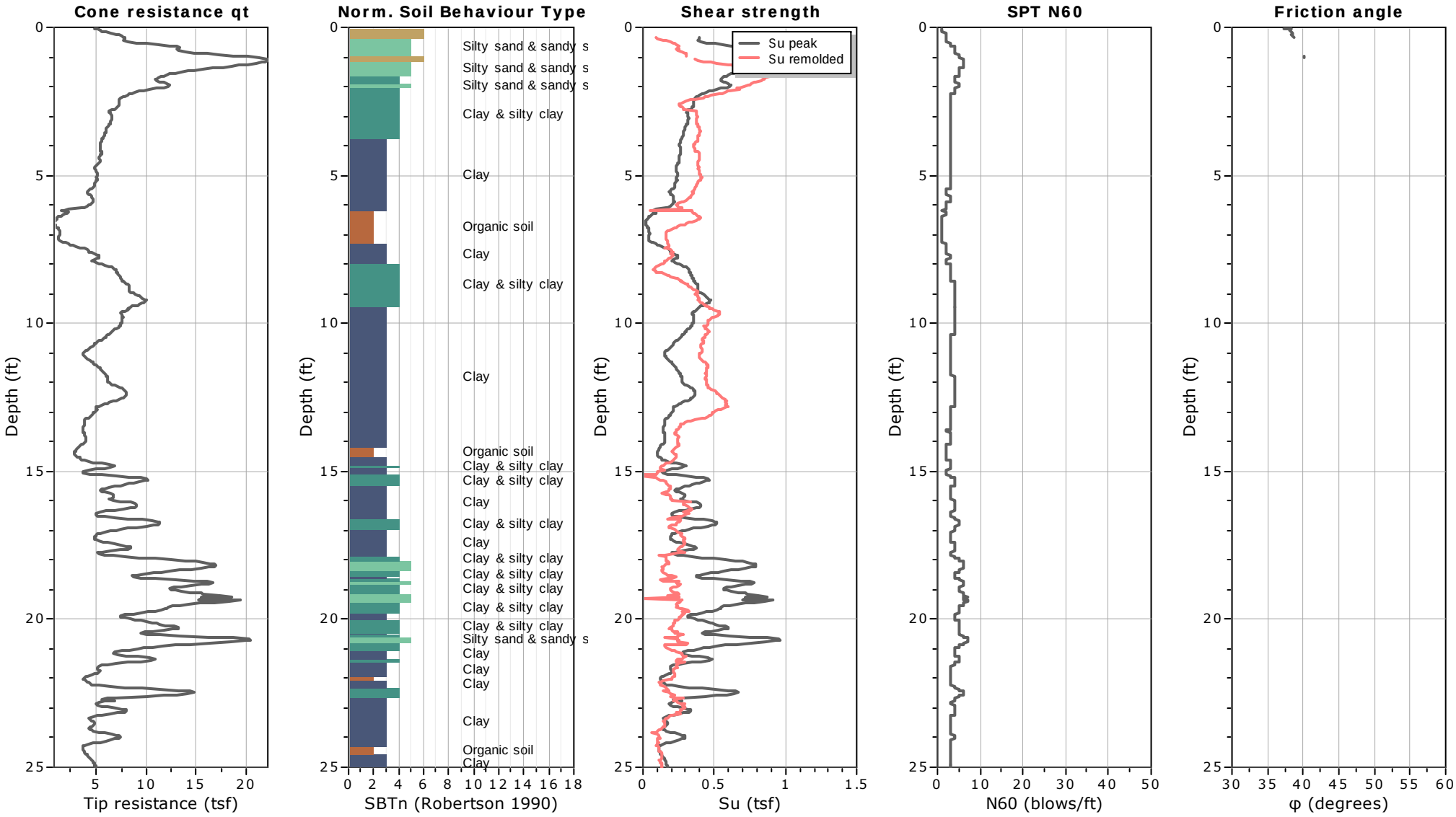
APPENDIX C

CPT SOUNDING LOGS

Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

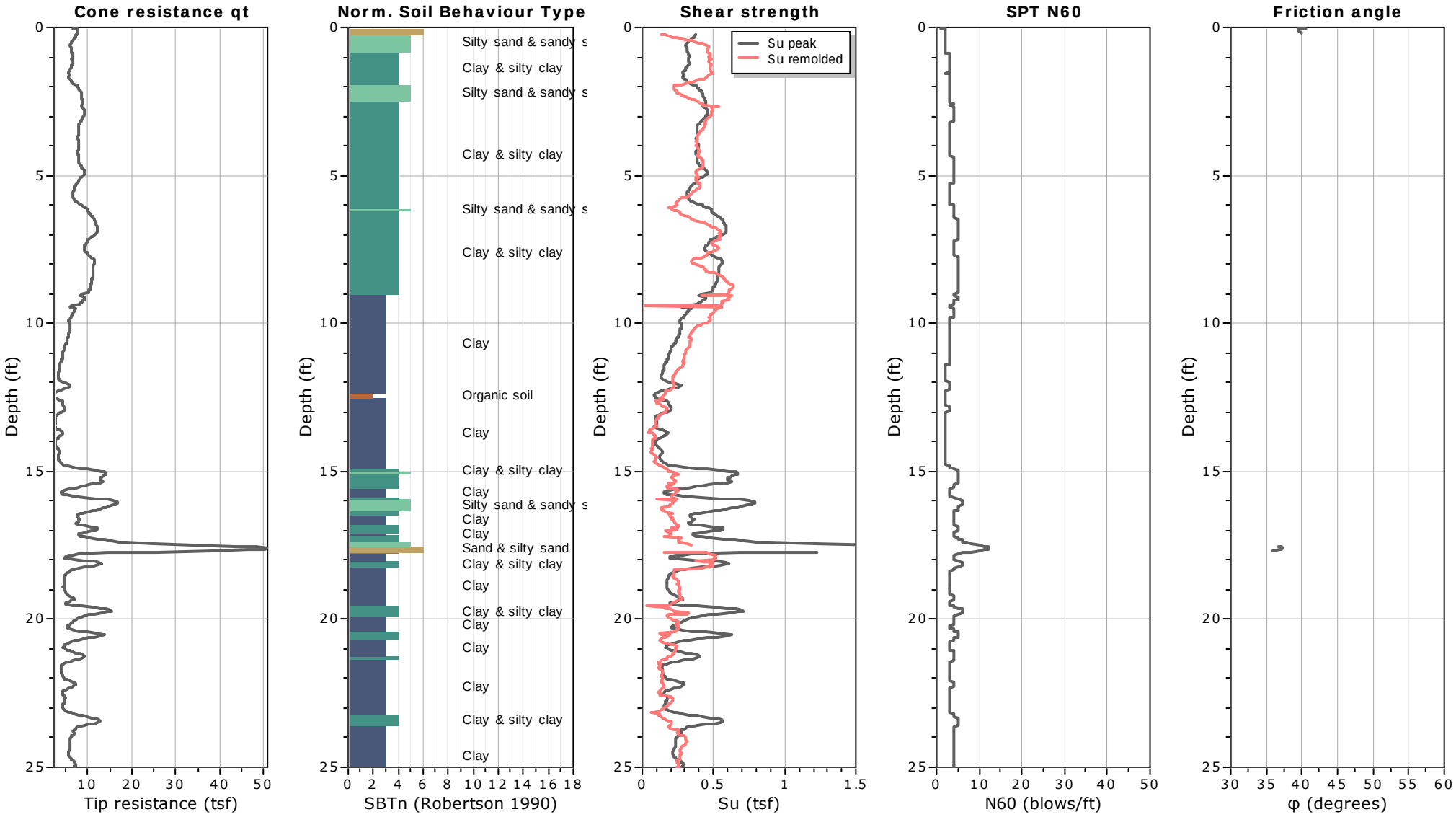
CPT: 15.33.021_CPT-1
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

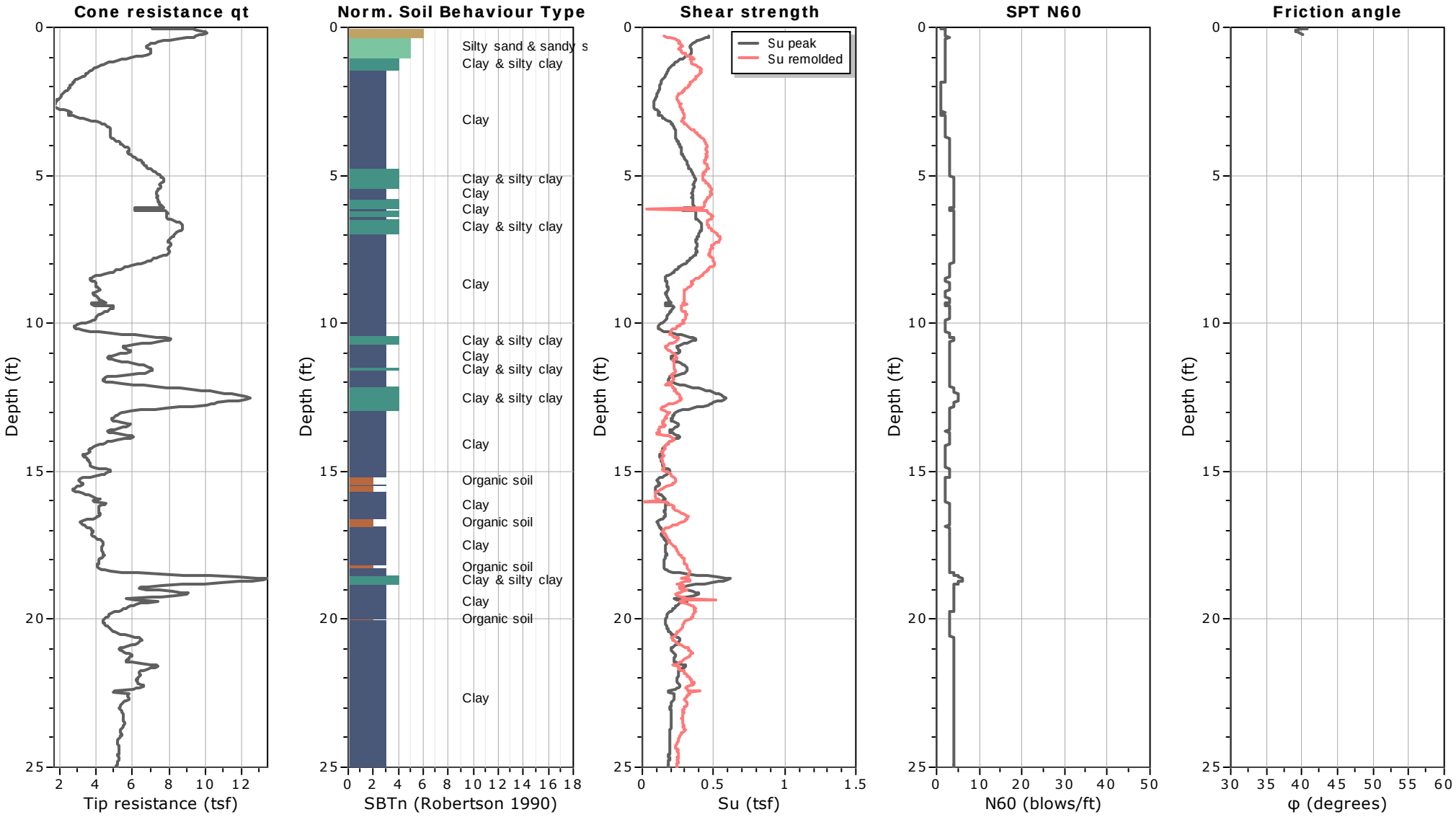
CPT: 15.33.021_CPT-2
Total depth: 25.66 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

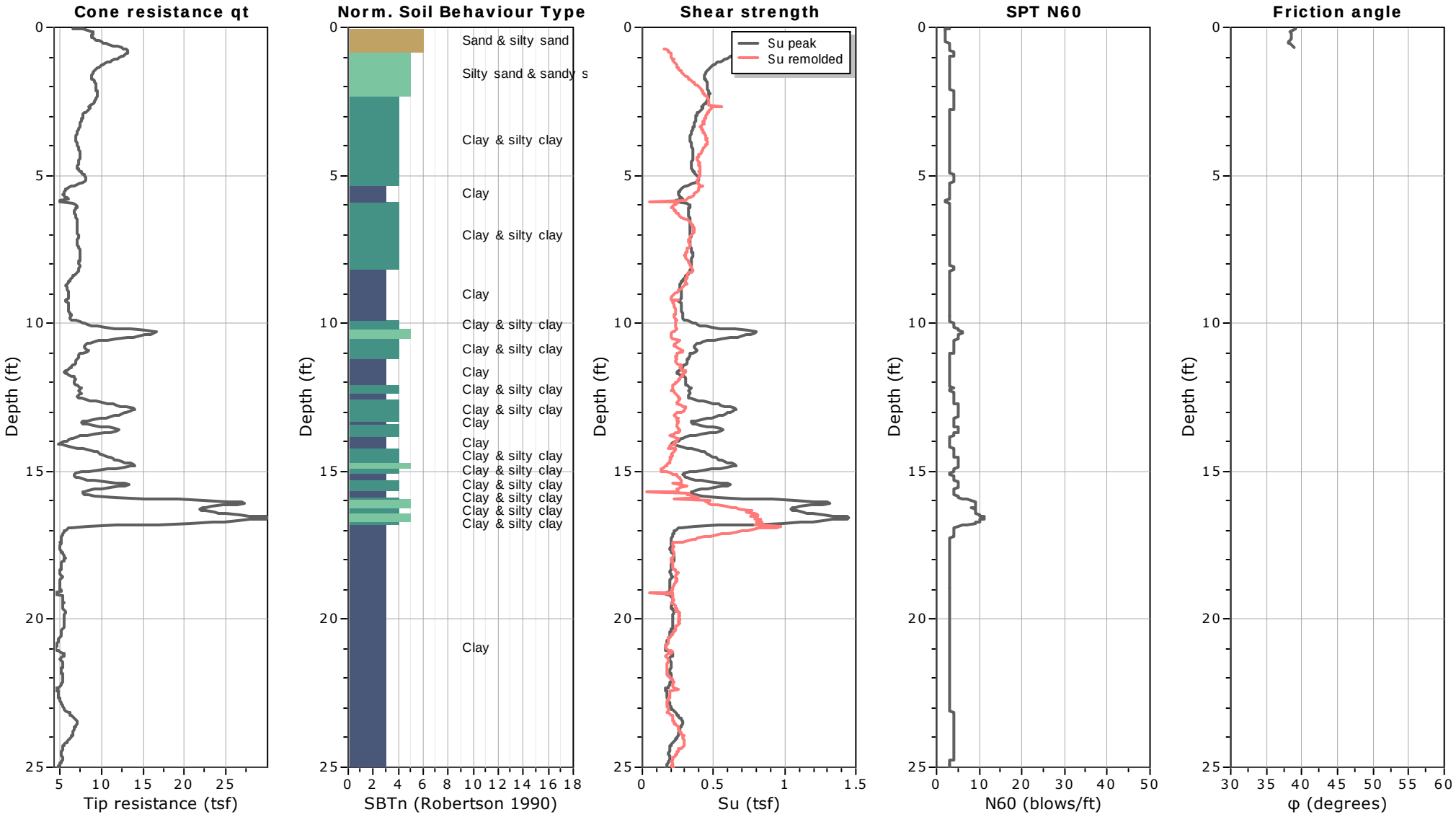
CPT: 15.33.021_CPT-3
Total depth: 25.30 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

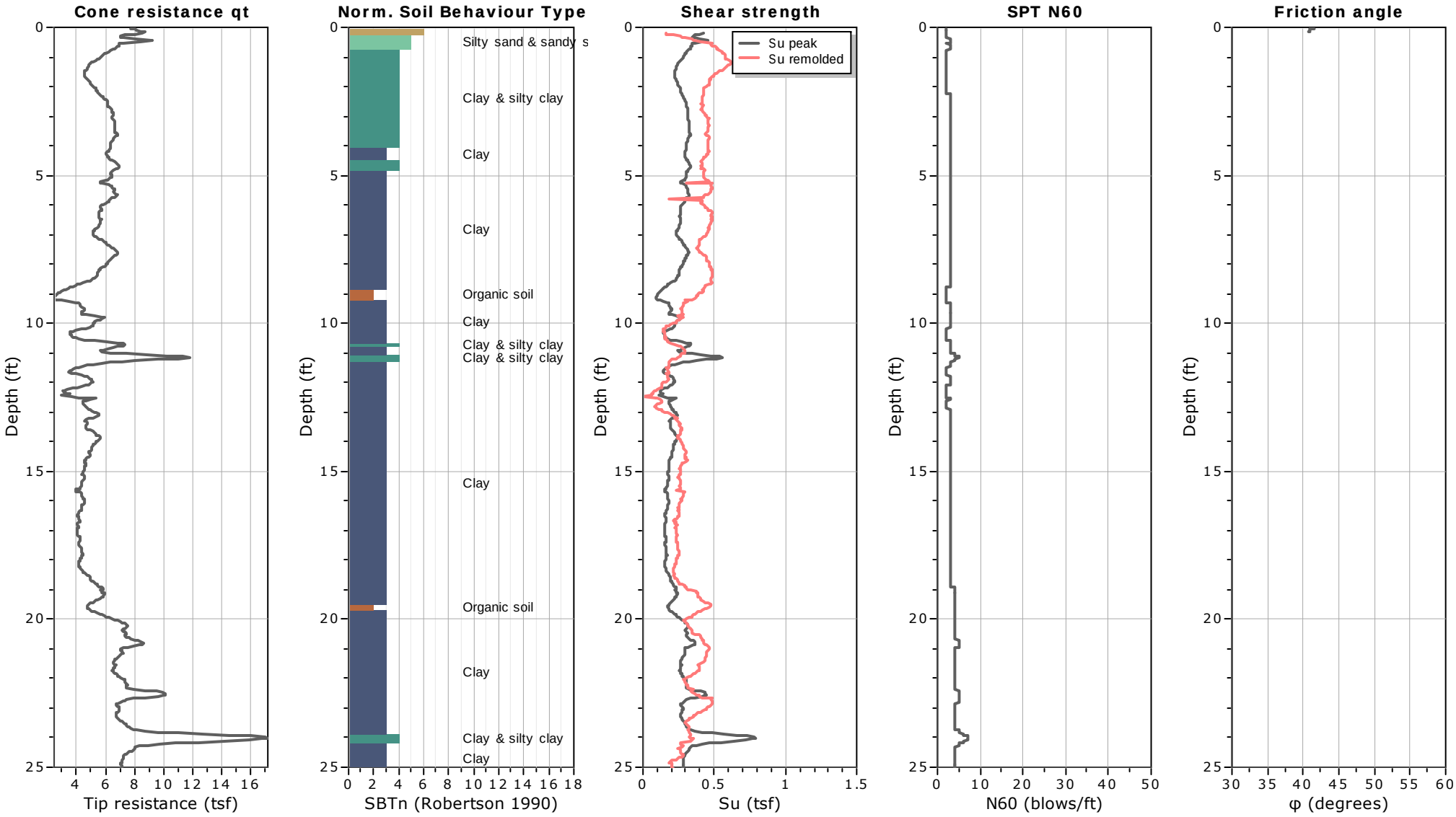
CPT: 15.33.021_CPT-4
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

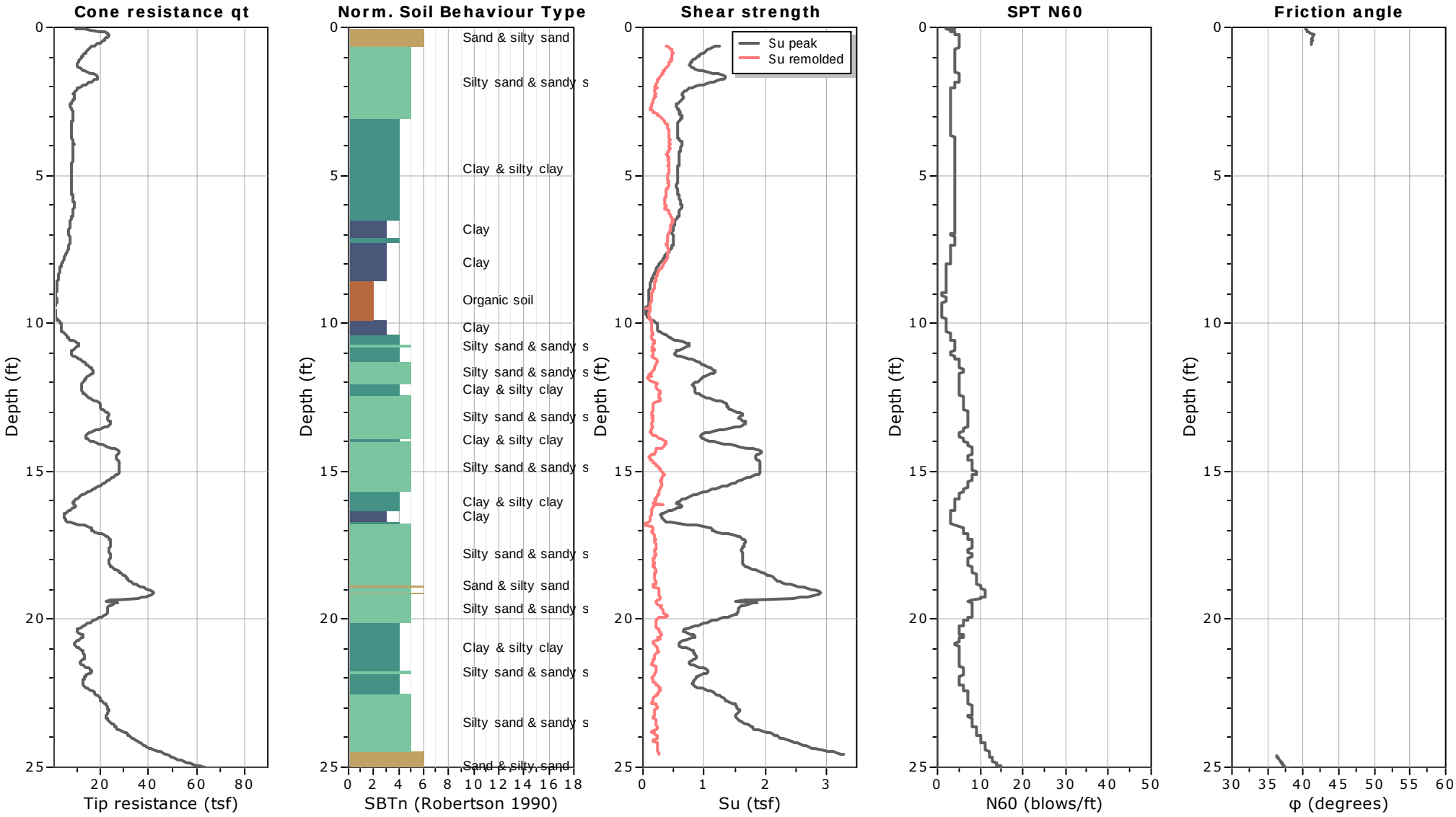
CPT: 15.33.021_CPT-5
Total depth: 25.20 ft



Tolunay-Wong Engineers, Inn.
27534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 2 (North)
Location: Wanhua Chemical

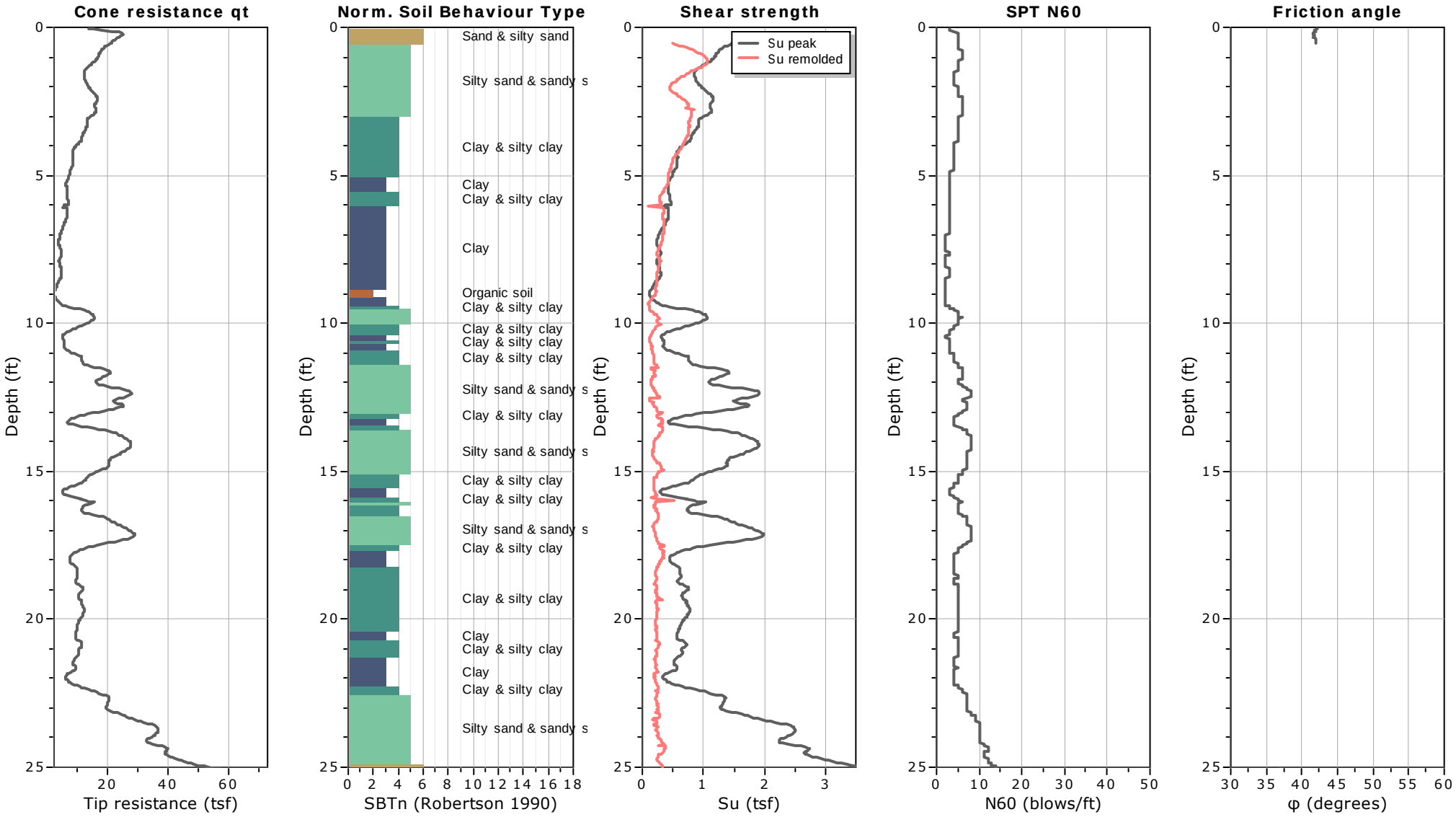
CPT: 15.33.021_CPT-6
Total depth: 25.39 ft



Tolunay-Wong Engineers, Inn.
27534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 2 (North)
Location: Wanhua Chemical

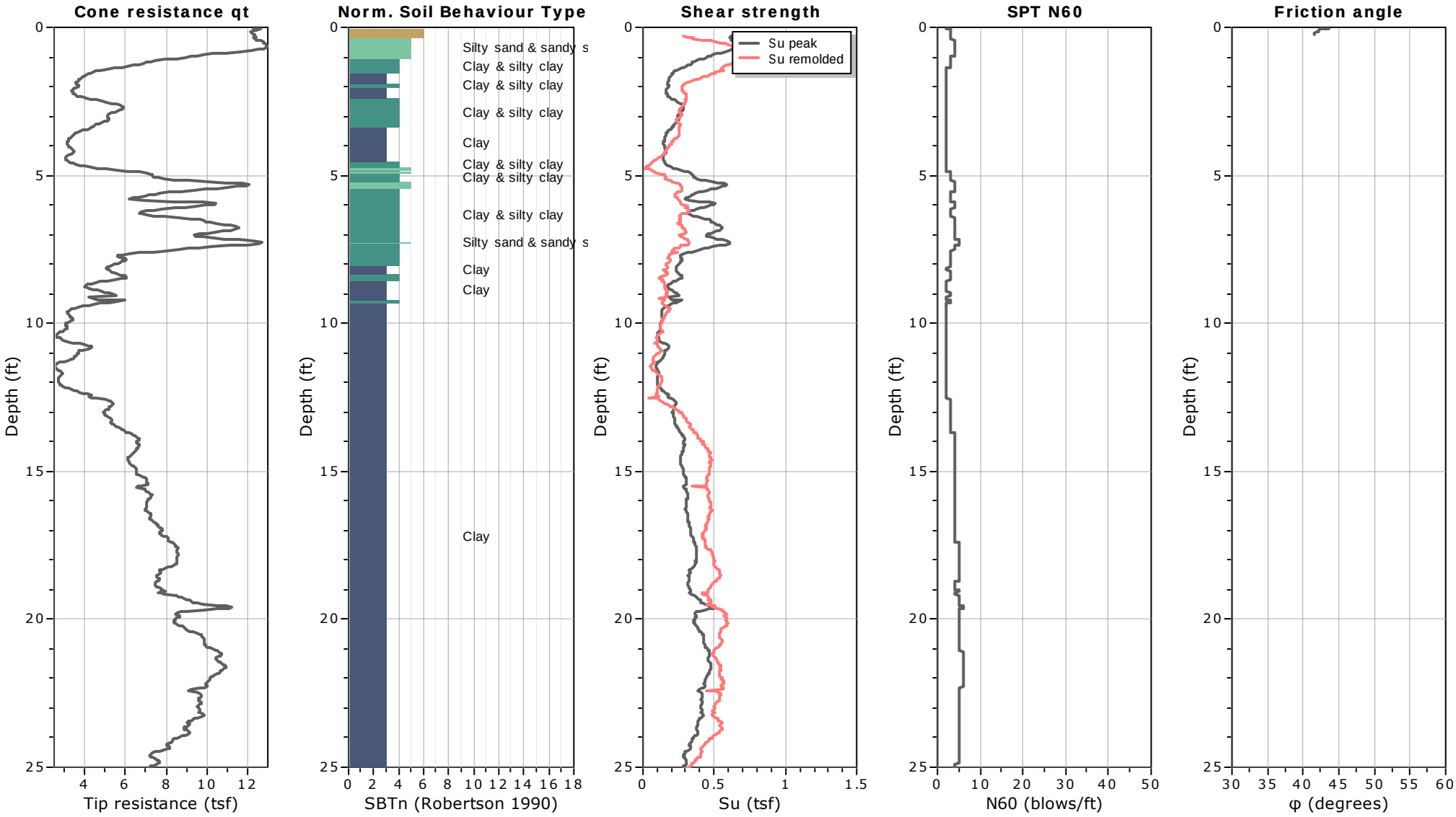
CPT: 15.33.021_CPT-7
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

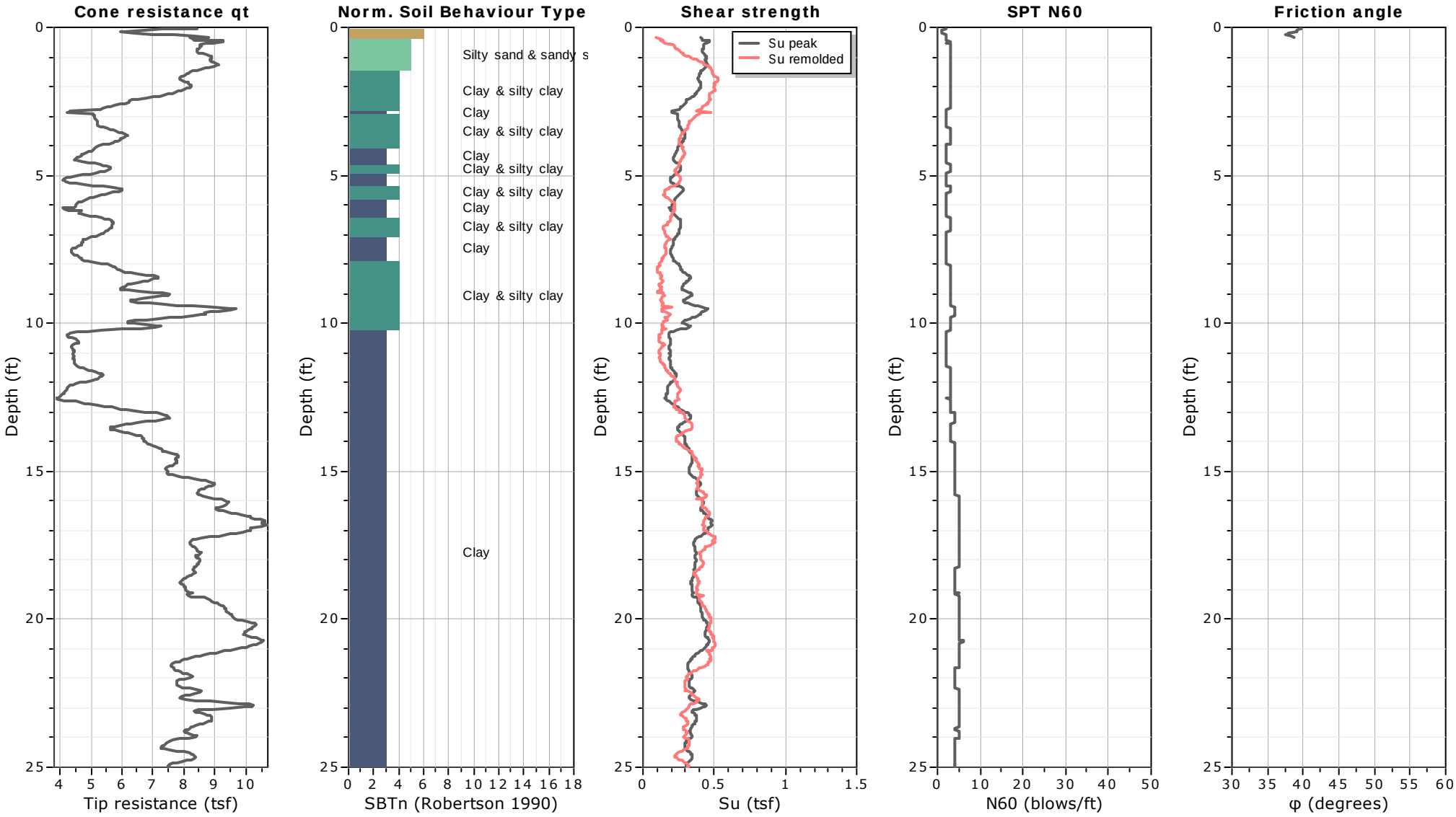
CPT: 15.33.021_CPT-8
Total depth: 25.10 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

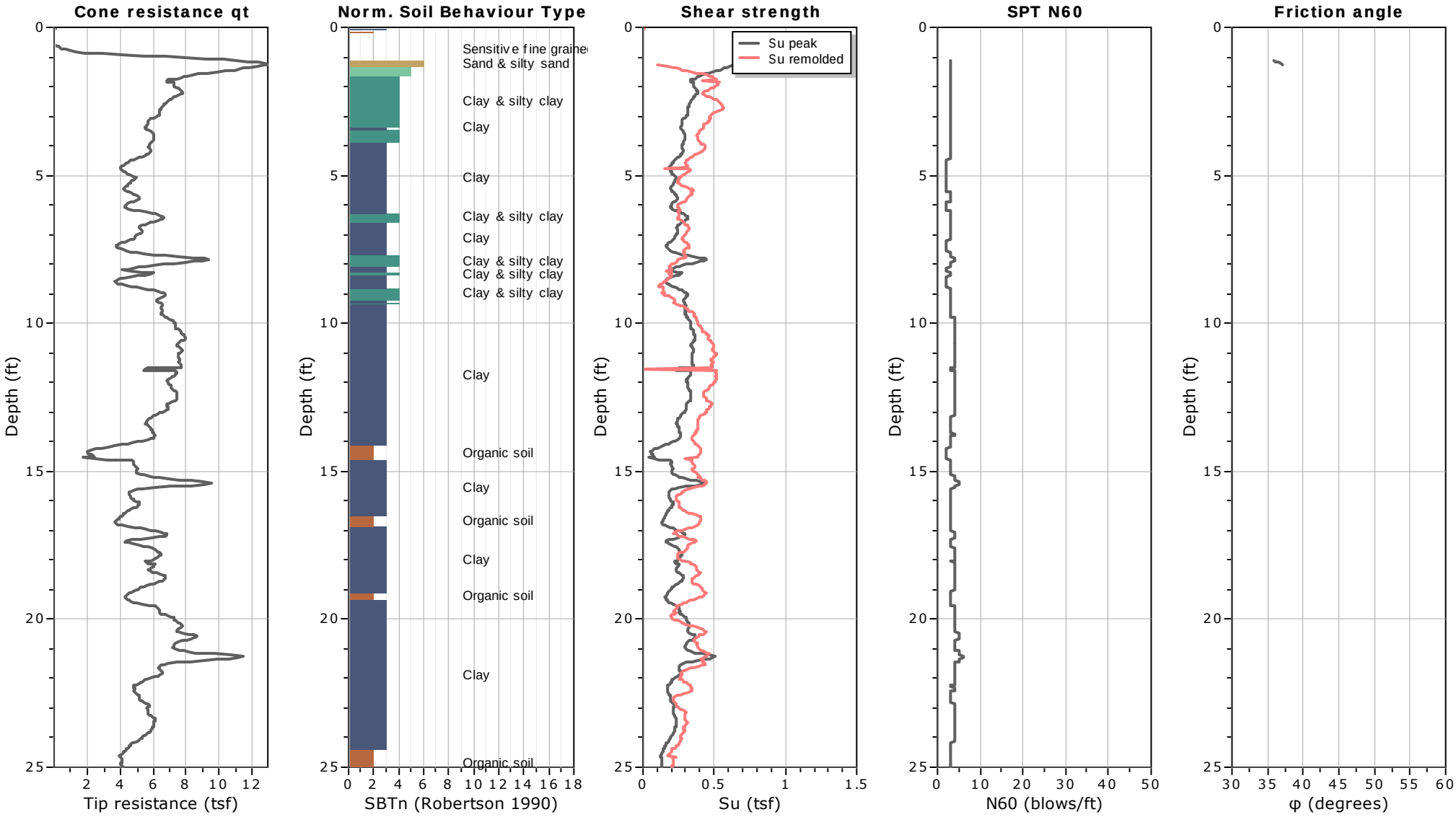
CPT: 15.33.021_CPT-9
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

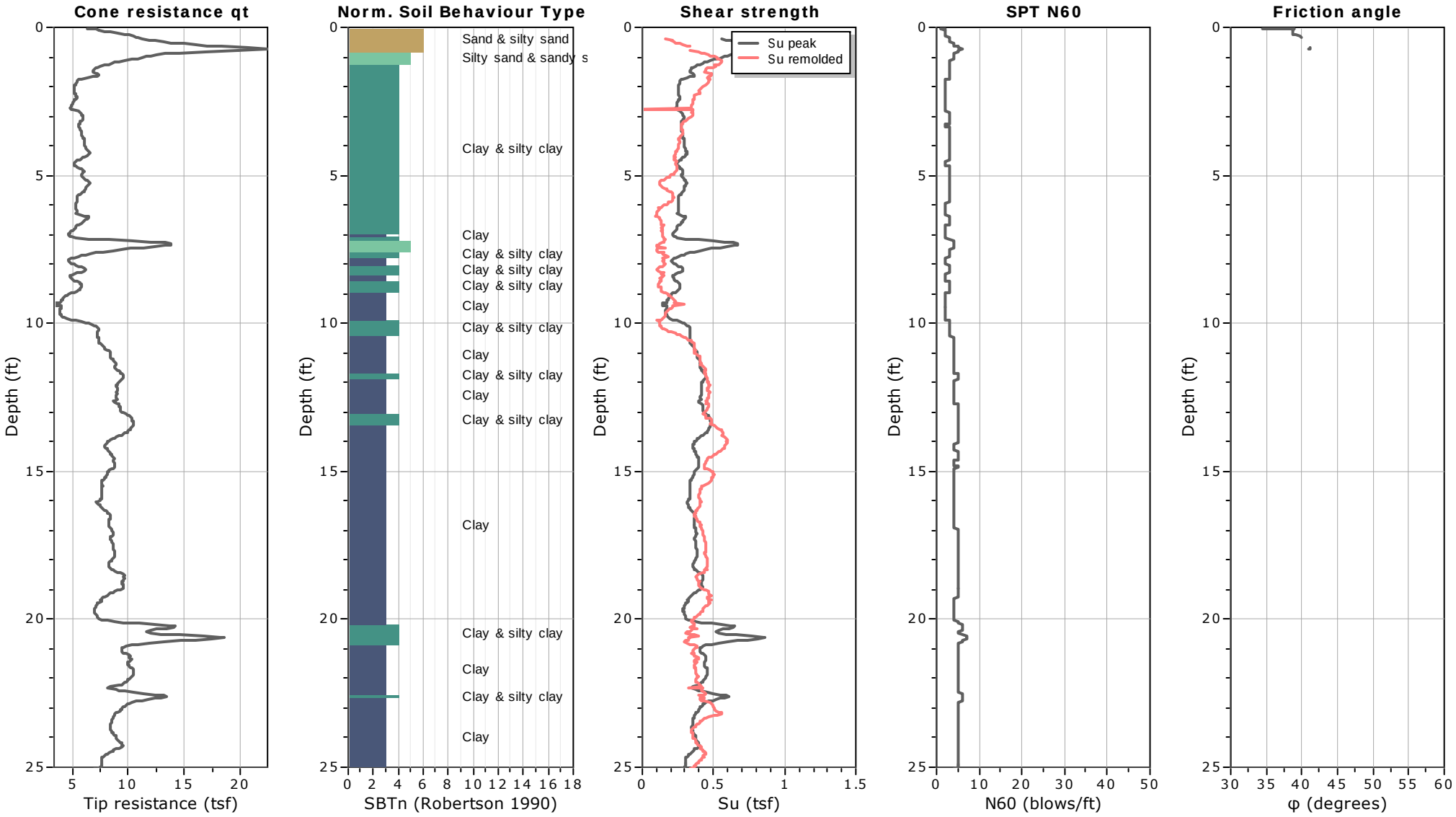
CPT: 15.33.021_CPT-10
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

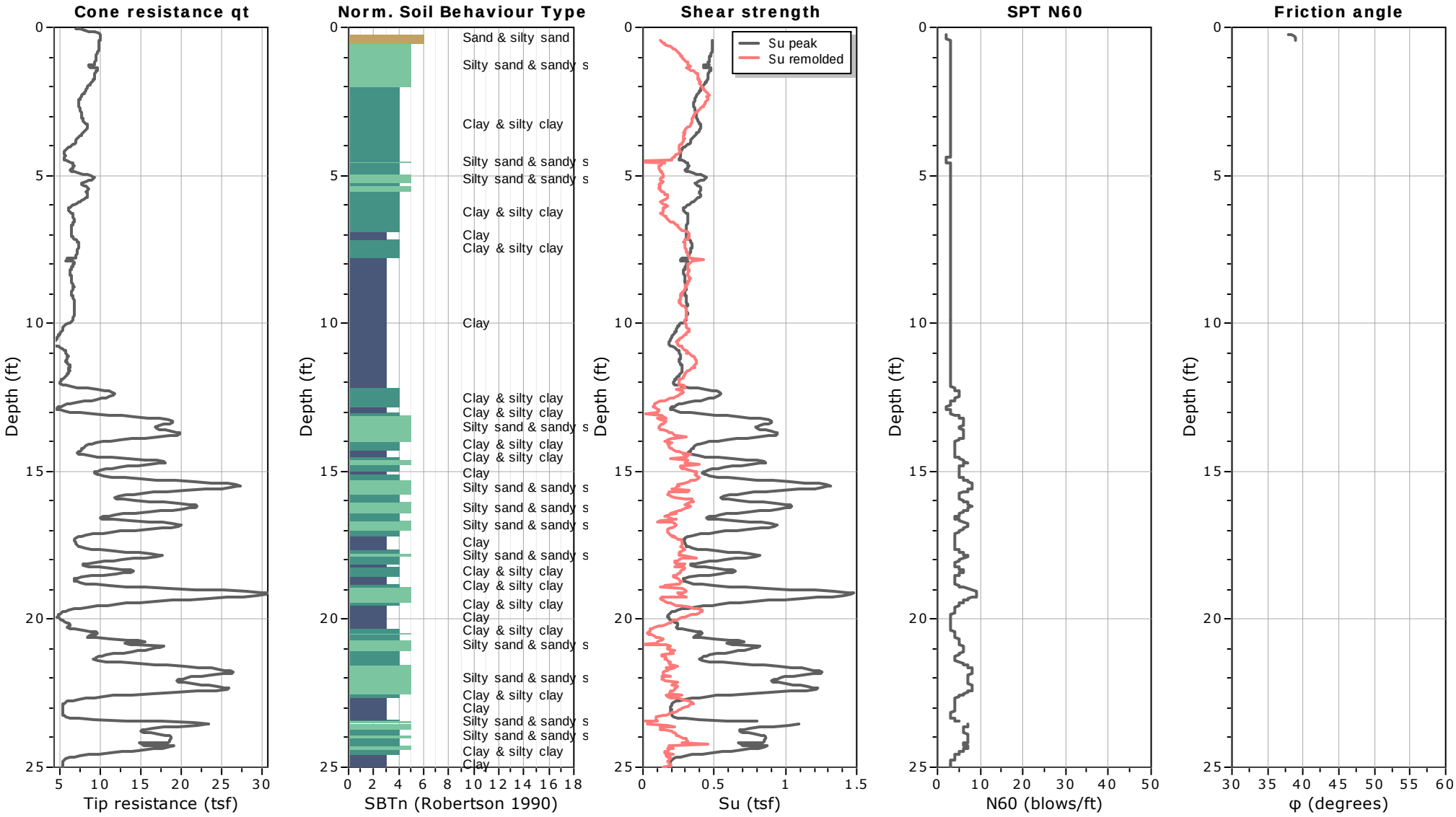
CPT: 15.33.021_CPT-11
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

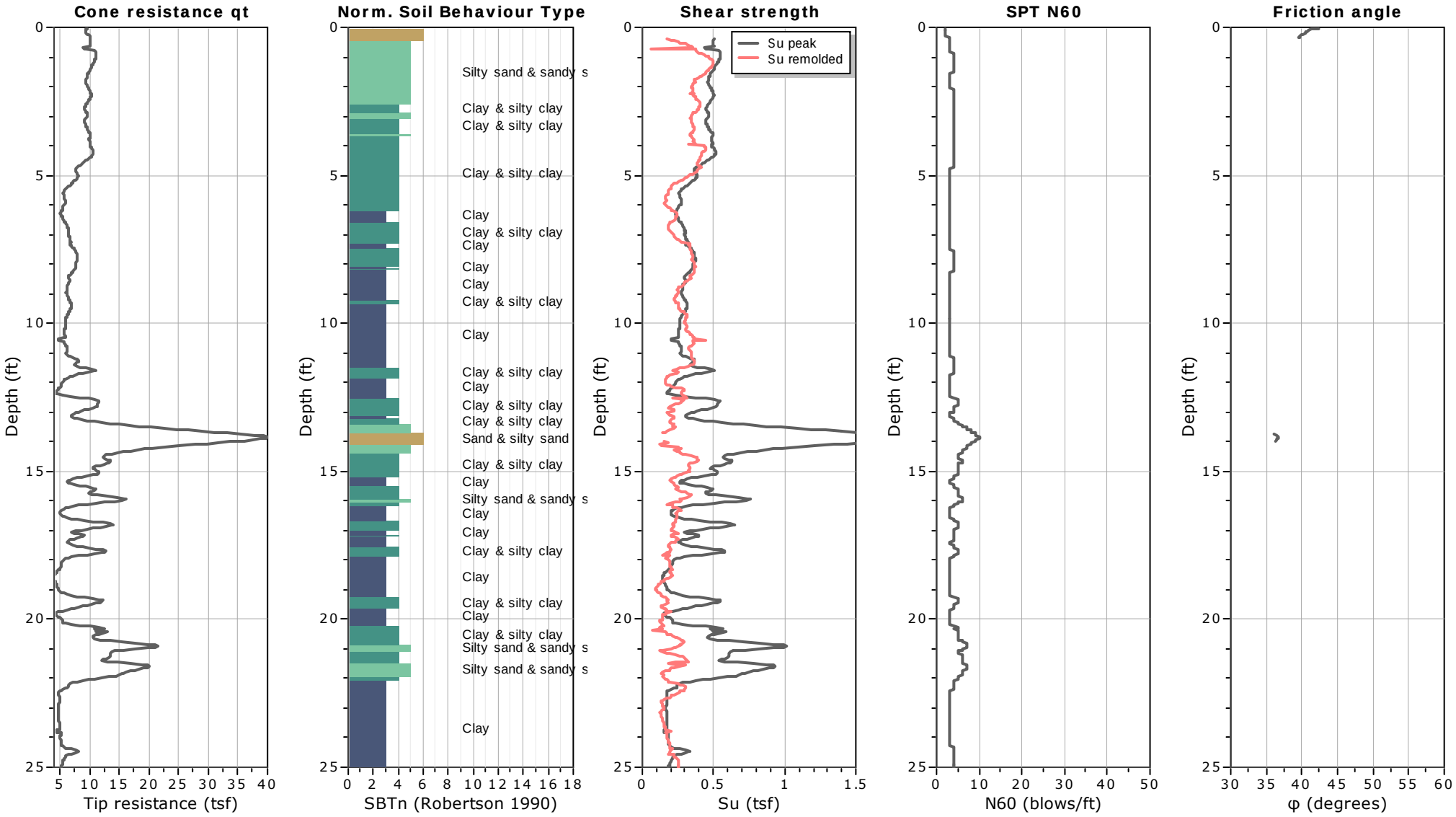
CPT: 15.33.021_CPT-12
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

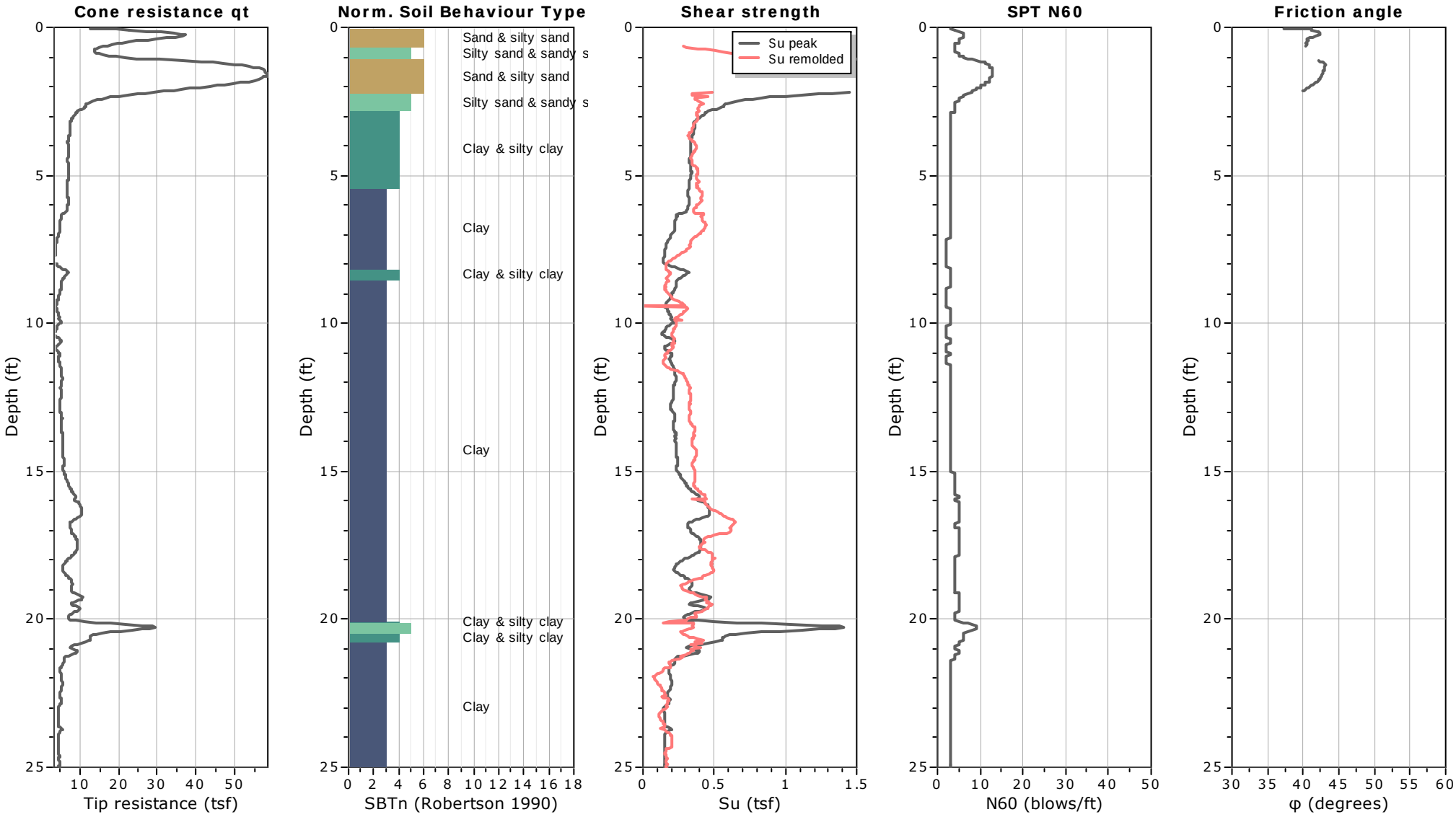
CPT: 15.33.021_CPT-13
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

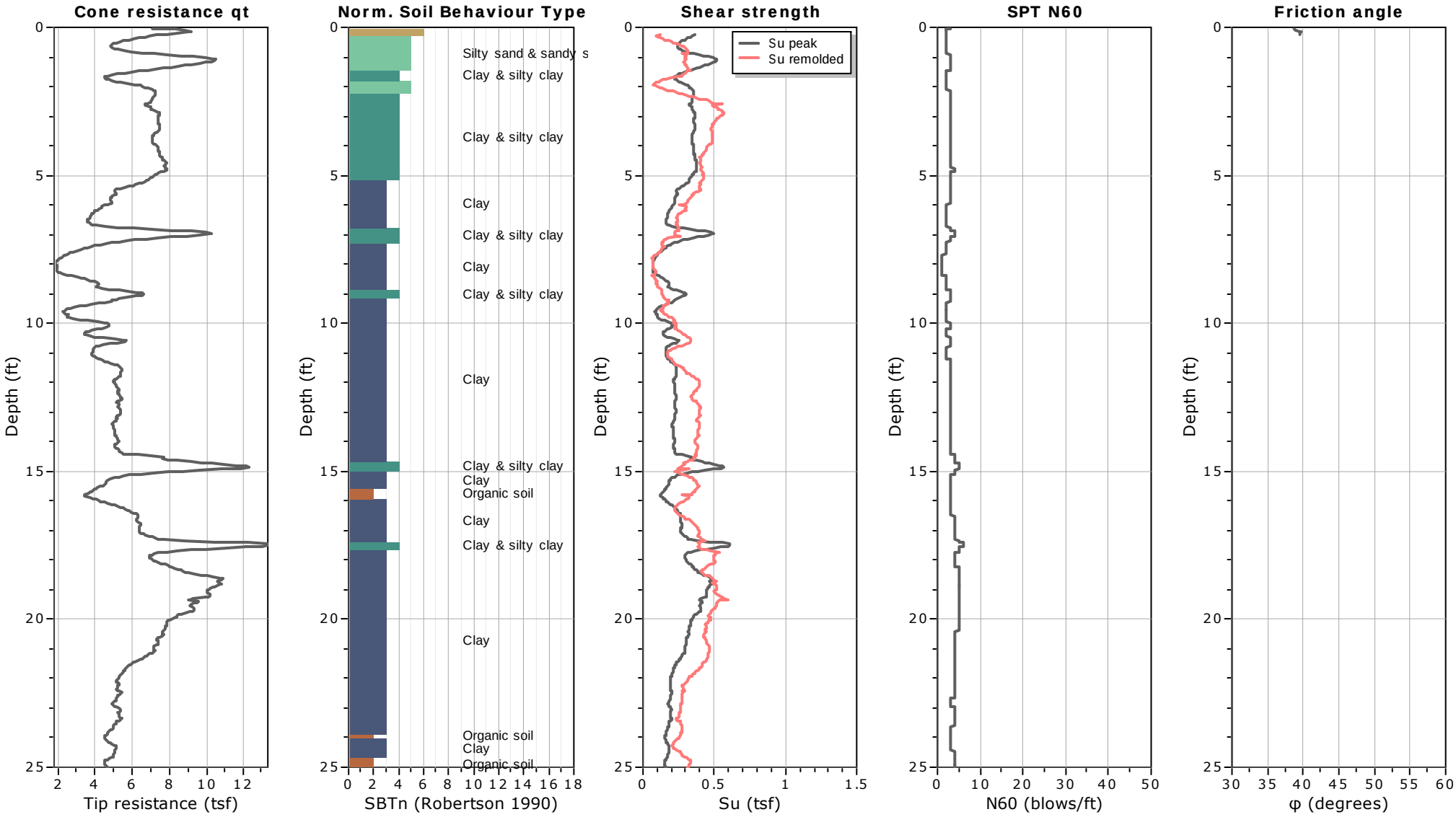
CPT: 15.33.021_CPT-14
Total depth: 25.10 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

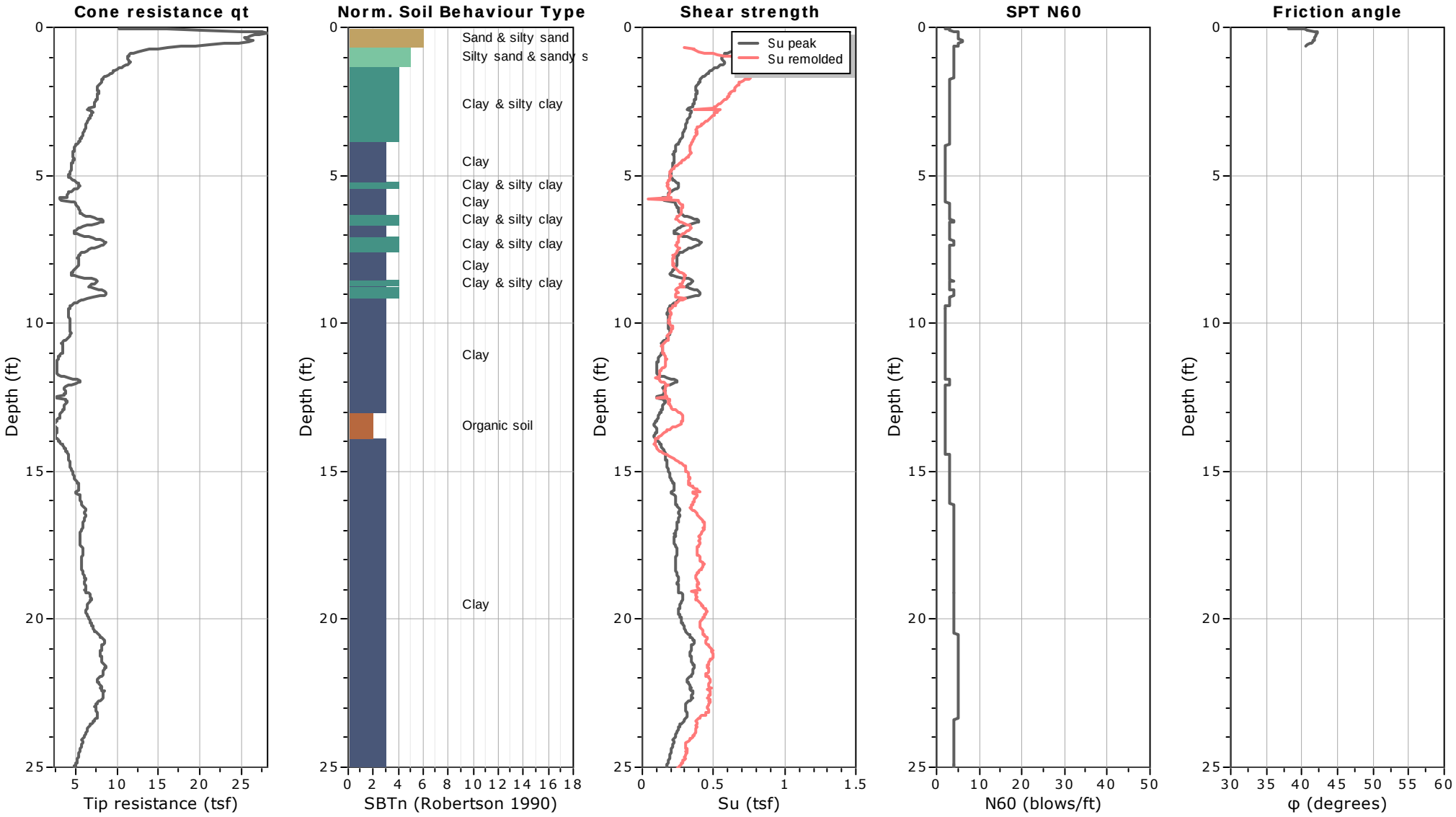
CPT: 15.33.021_CPT-15
Total depth: 25.10 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

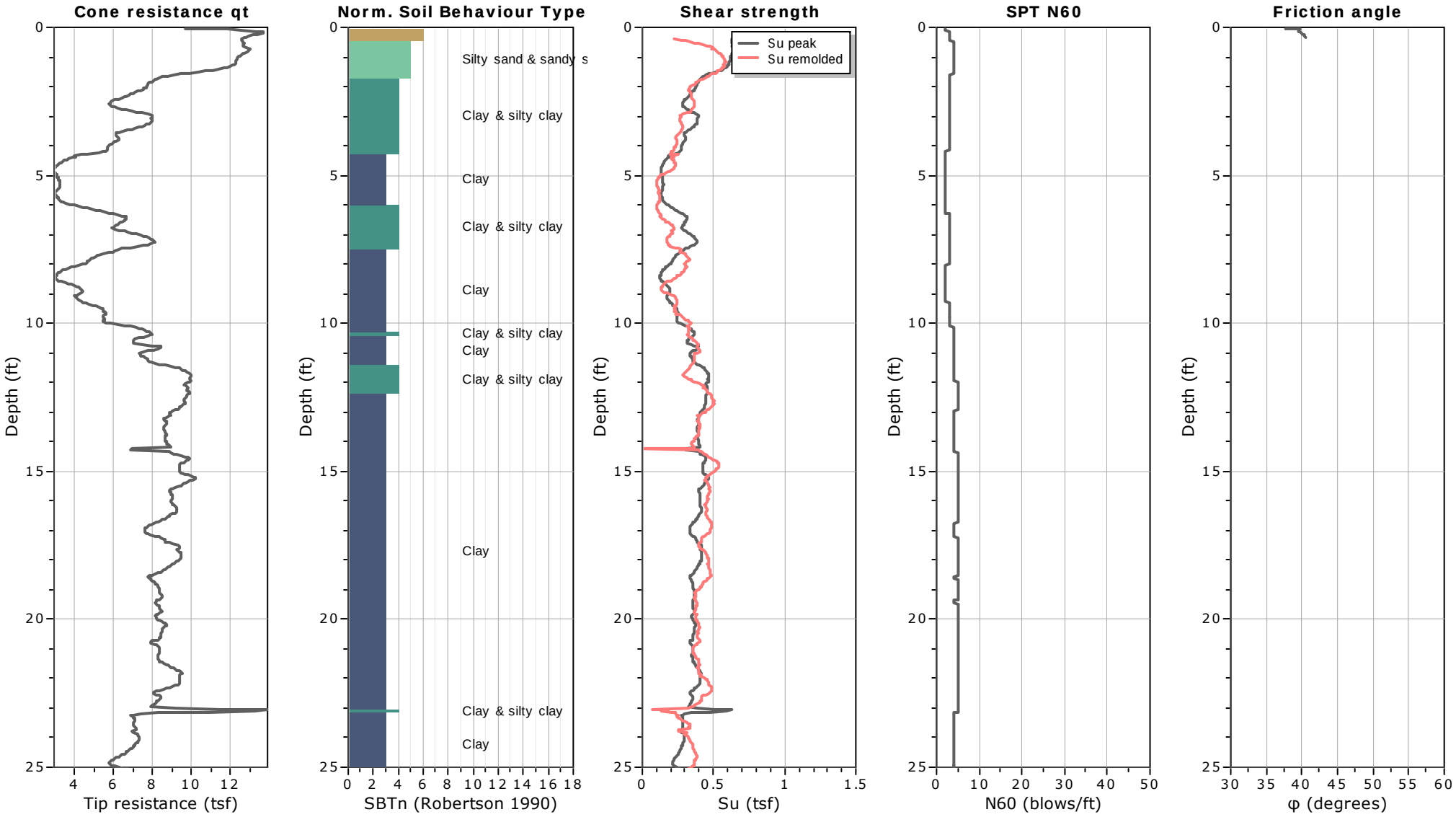
CPT: 15.33.021_CPT-16
Total depth: 25.10 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

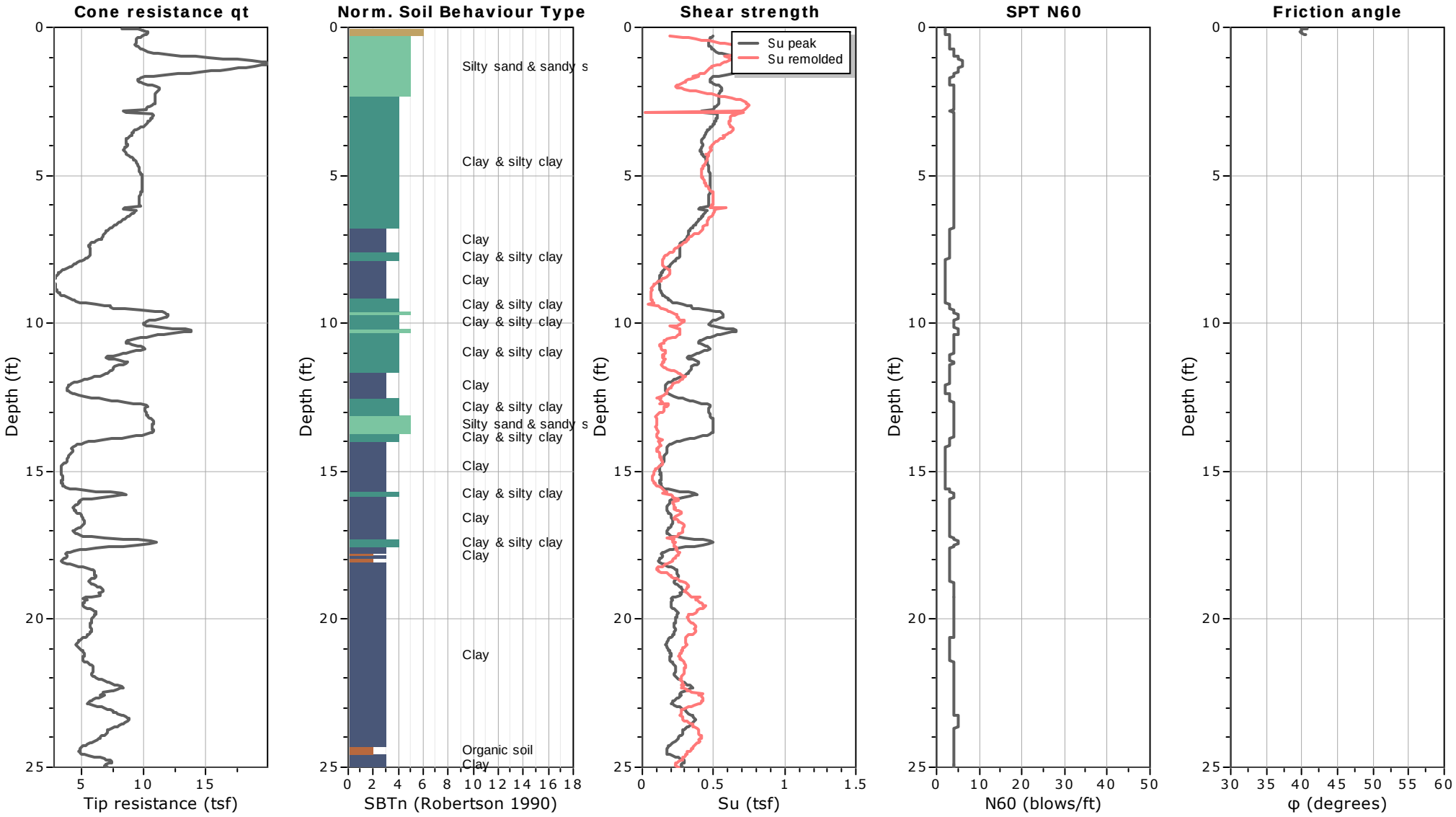
CPT: 15.33.021_CPT-17
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

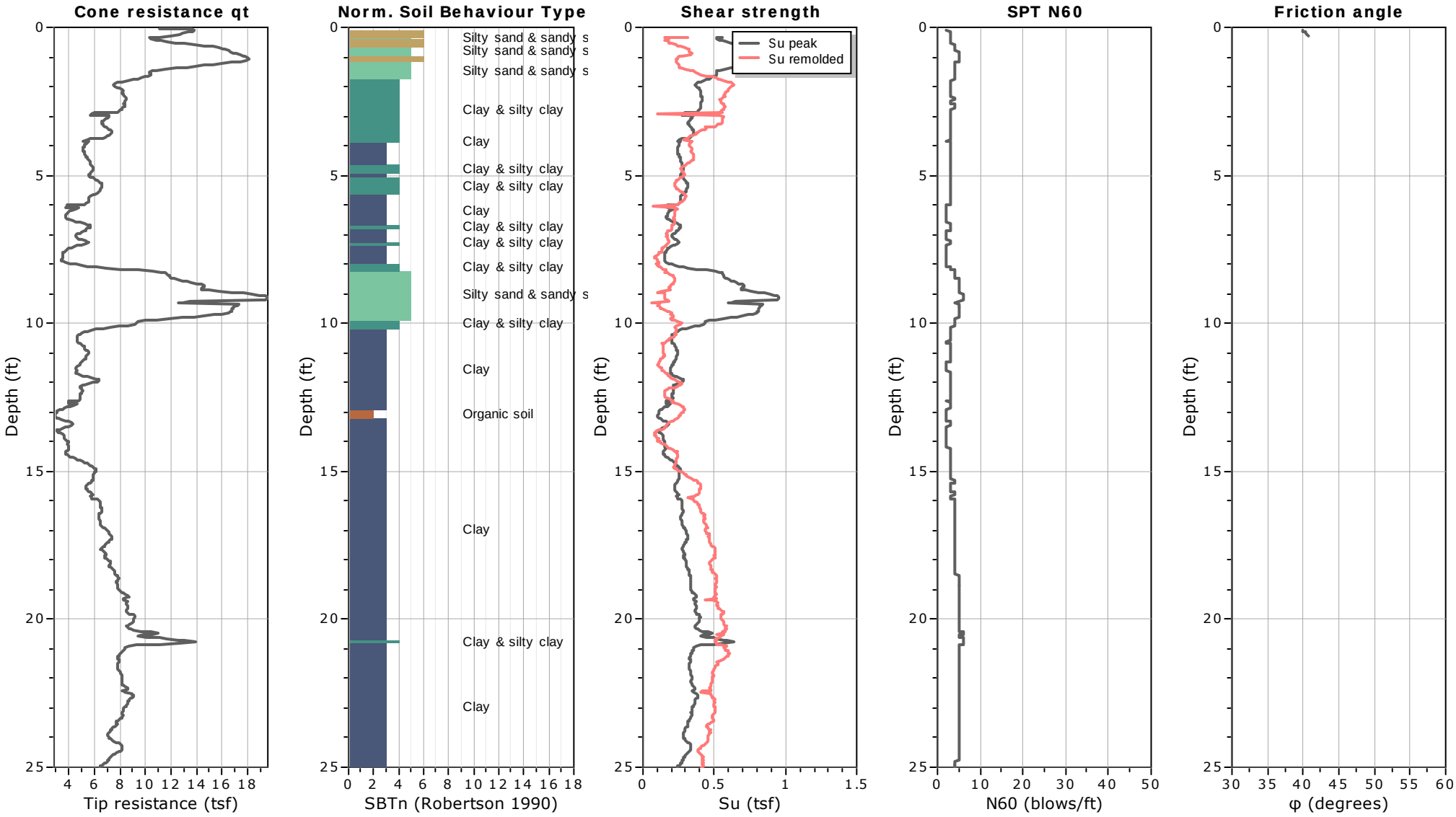
CPT: 15.33.021_CPT-18
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

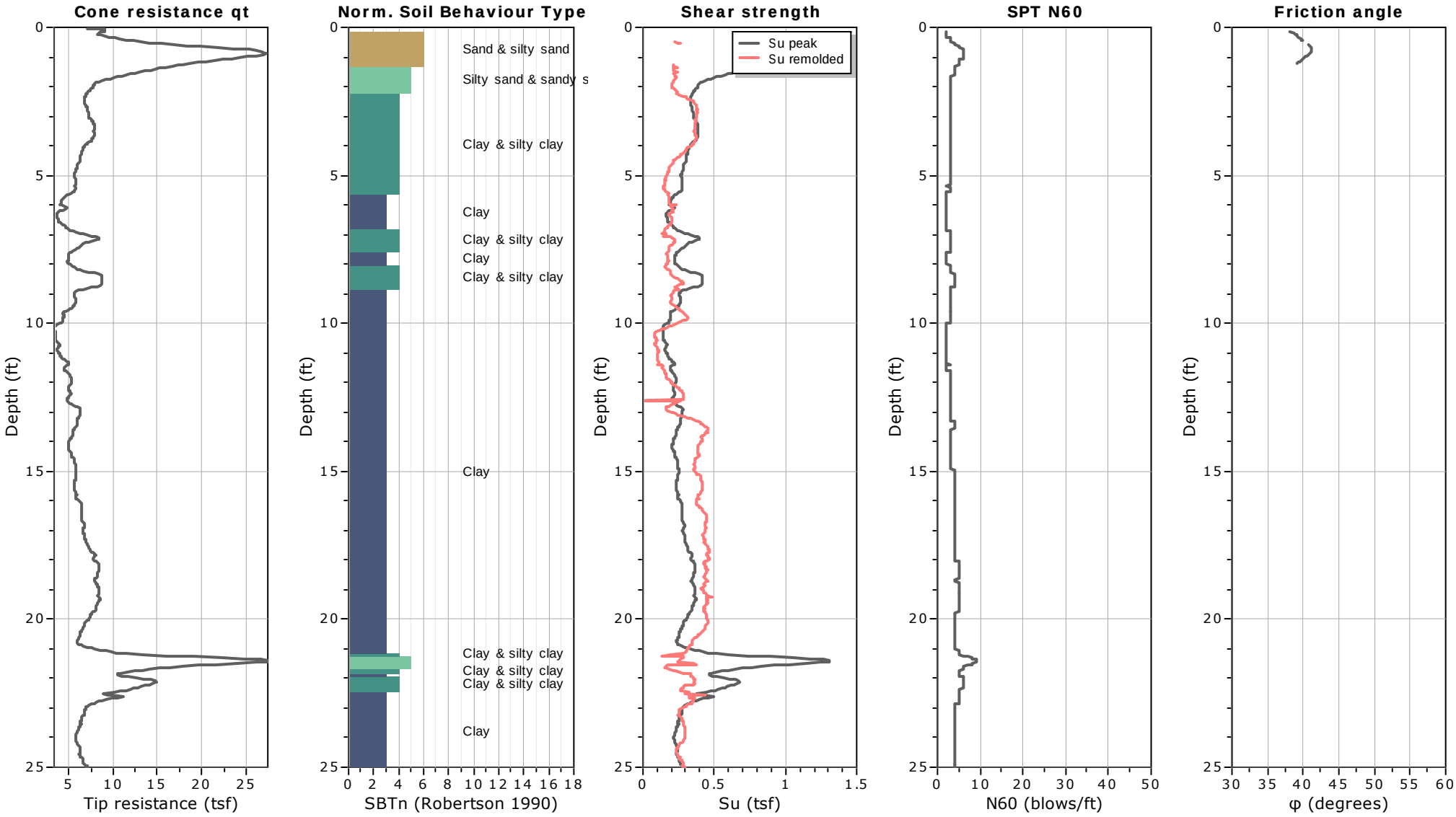
CPT: 15.33.021_CPT-19
Total depth: 25.10 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

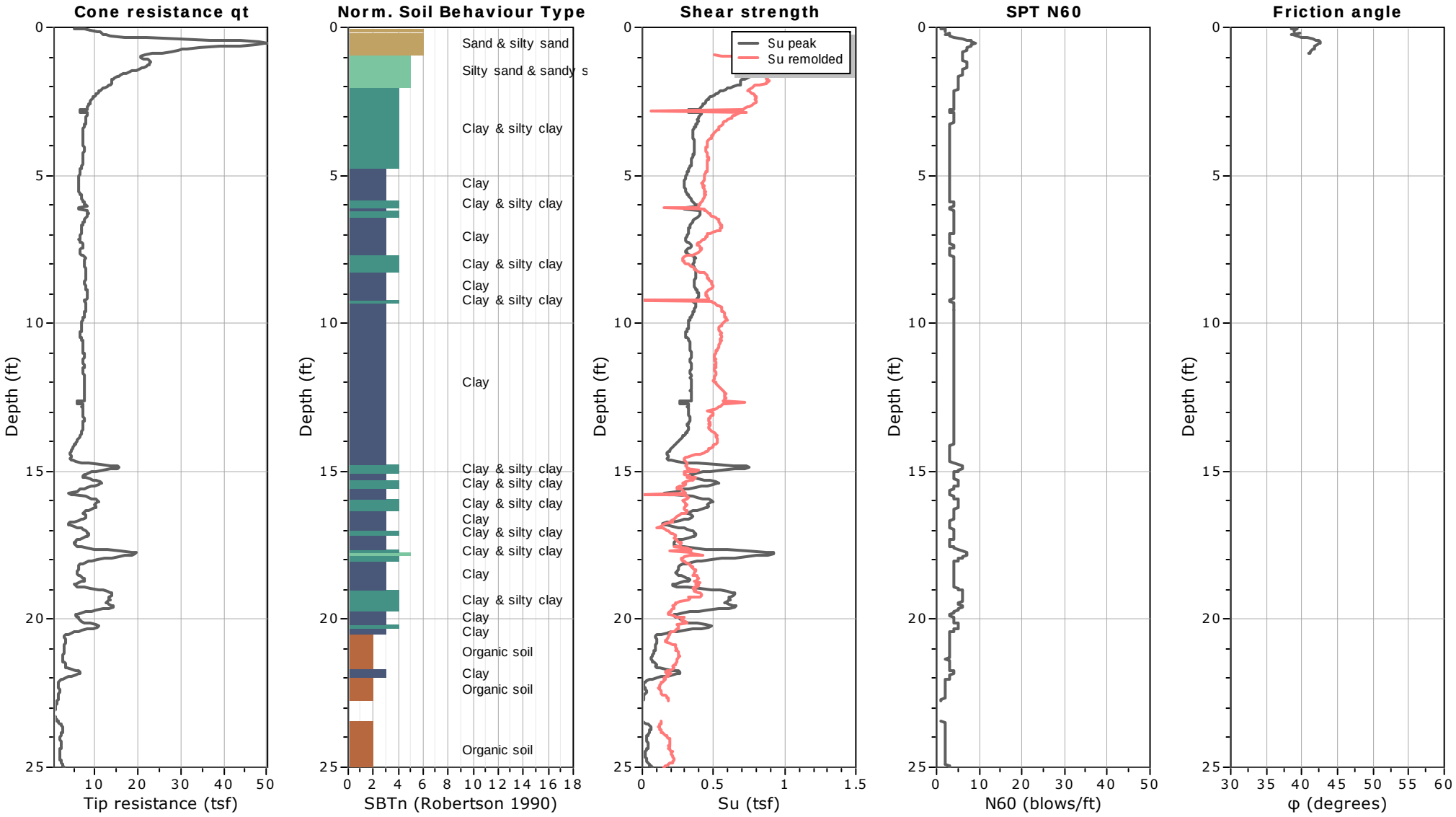
CPT: 15.33.021_CPT-20
Total depth: 25.10 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

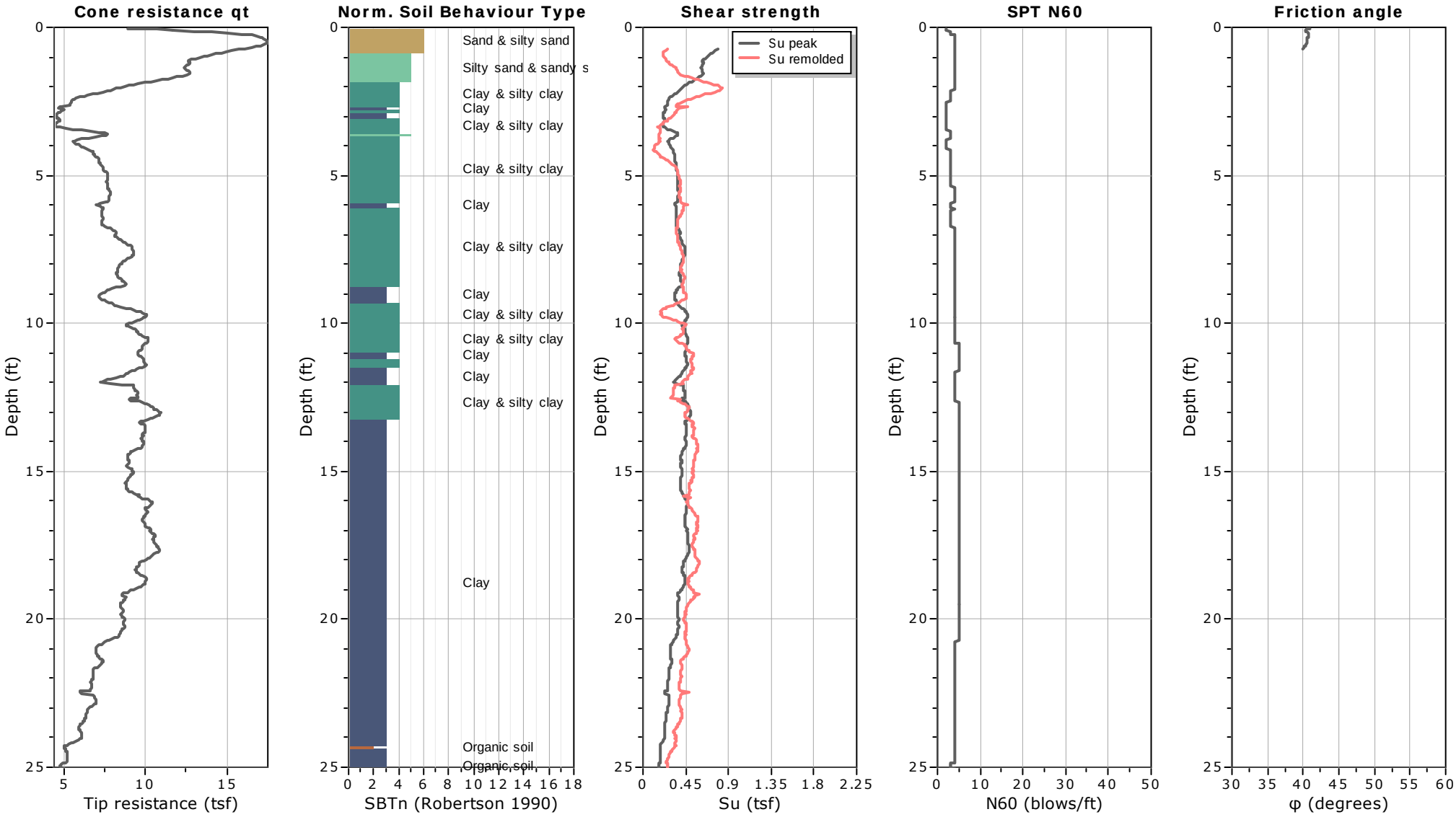
CPT: 15.33.021_CPT-21
Total depth: 25.33 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

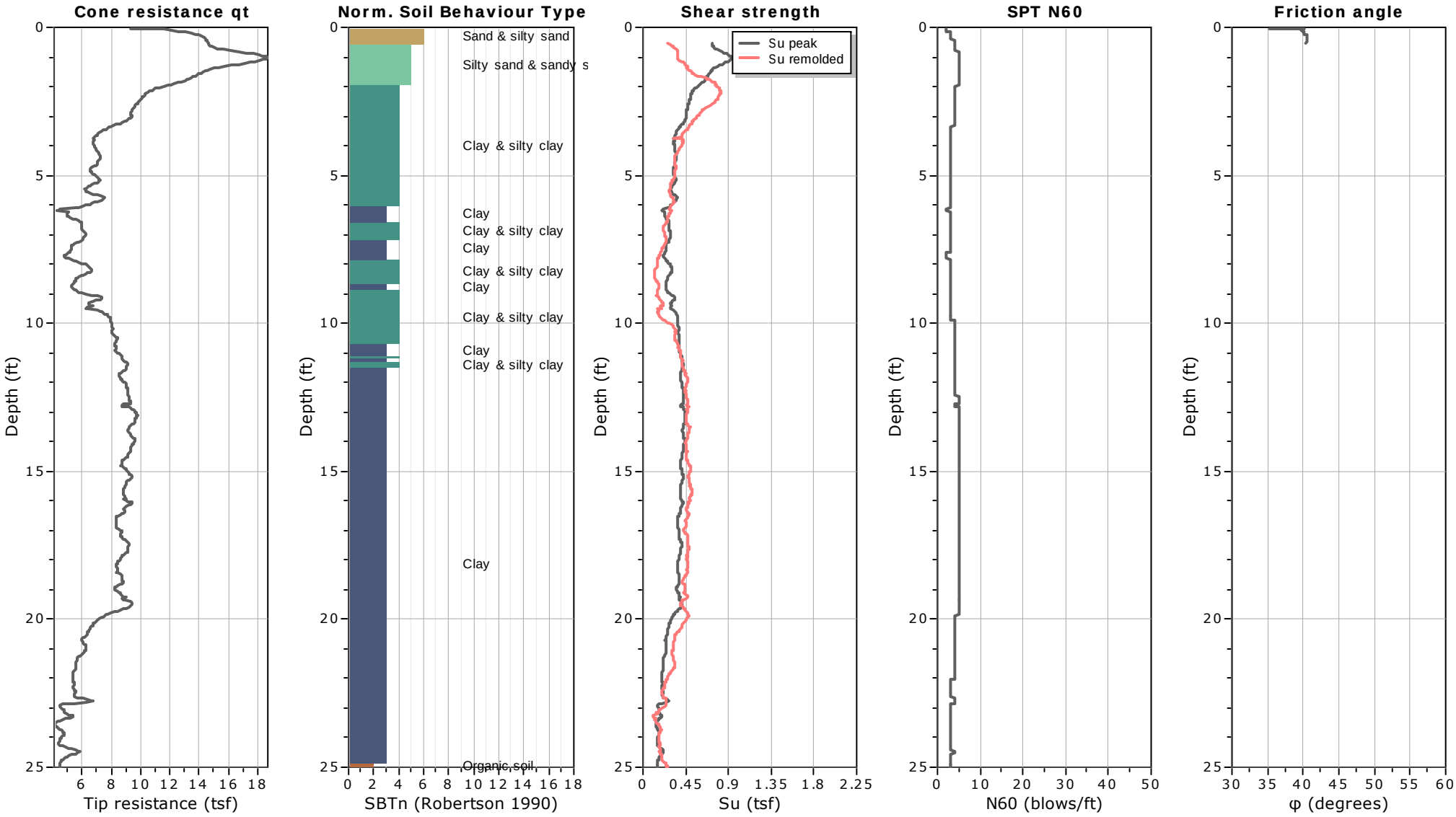
CPT: 15.33.021_CPT-22
Total depth: 25.30 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

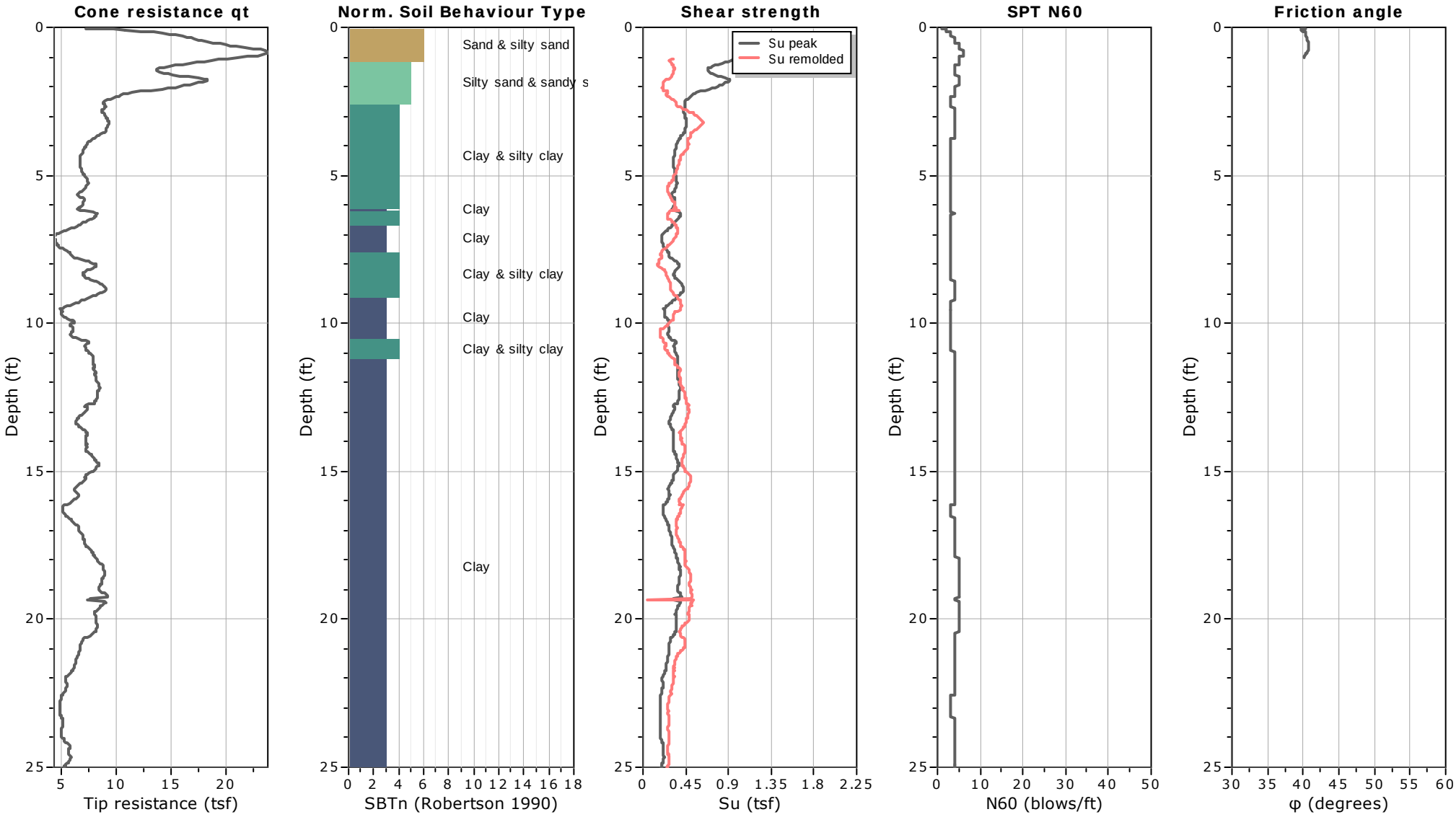
CPT: 15.33.021_CPT-23
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

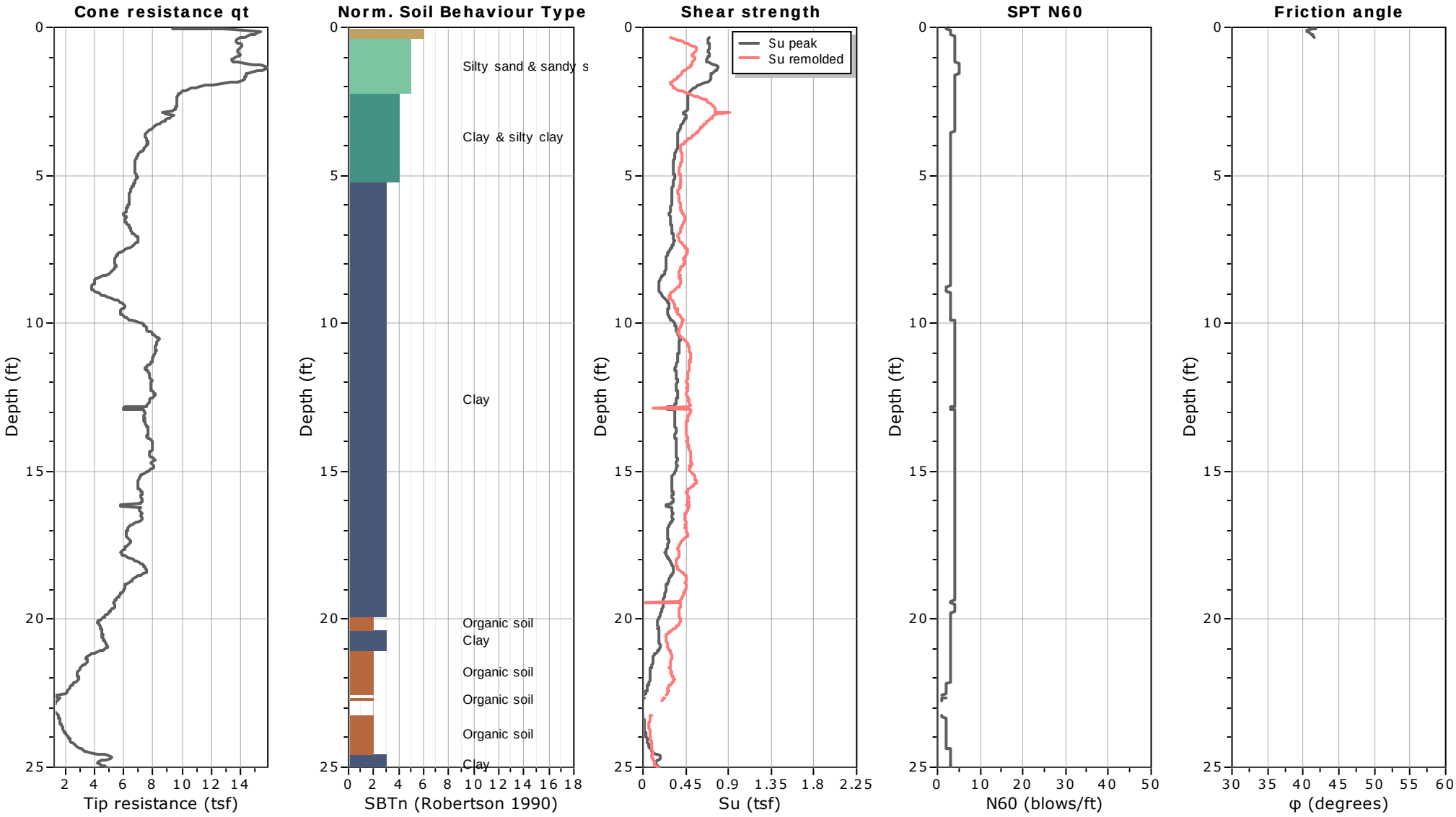
CPT: 15.33.021_CPT-24
Total depth: 25.30 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: **Syngenta - Area 3 (East)**
Location: **Wanhua Chemical**

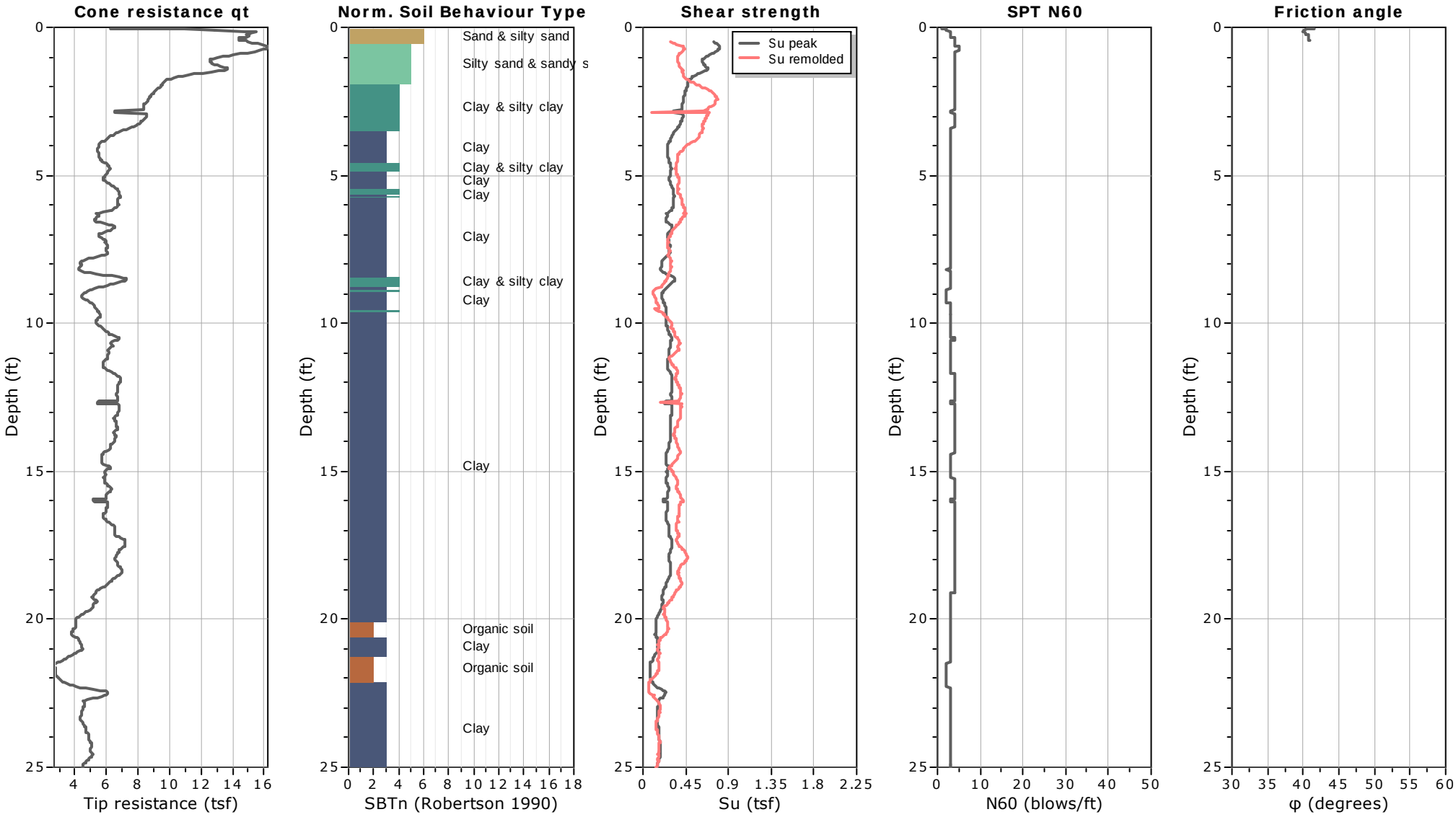
CPT: 15.33.021_CPT-25
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

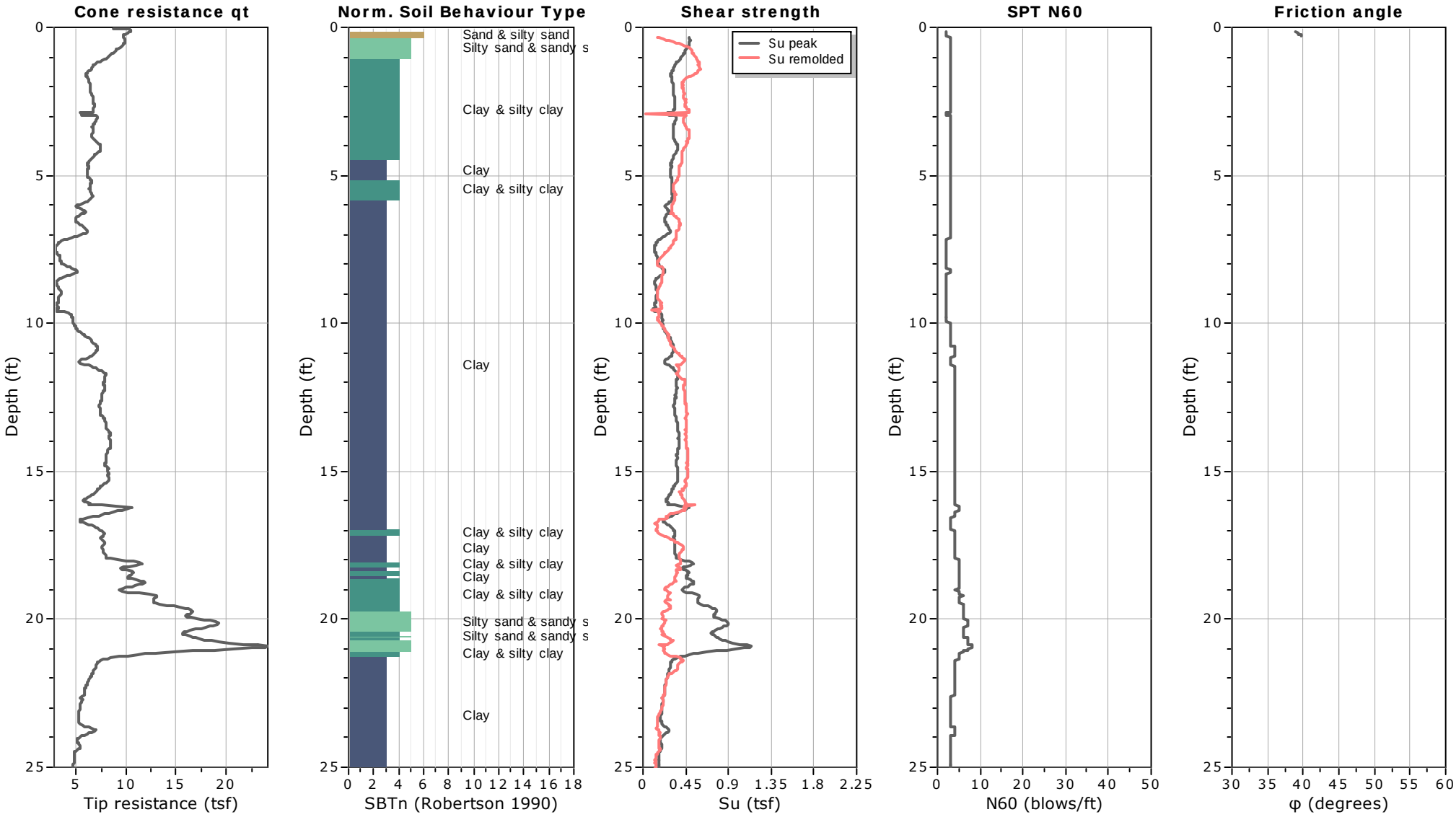
CPT: 15.33.021_CPT-26
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

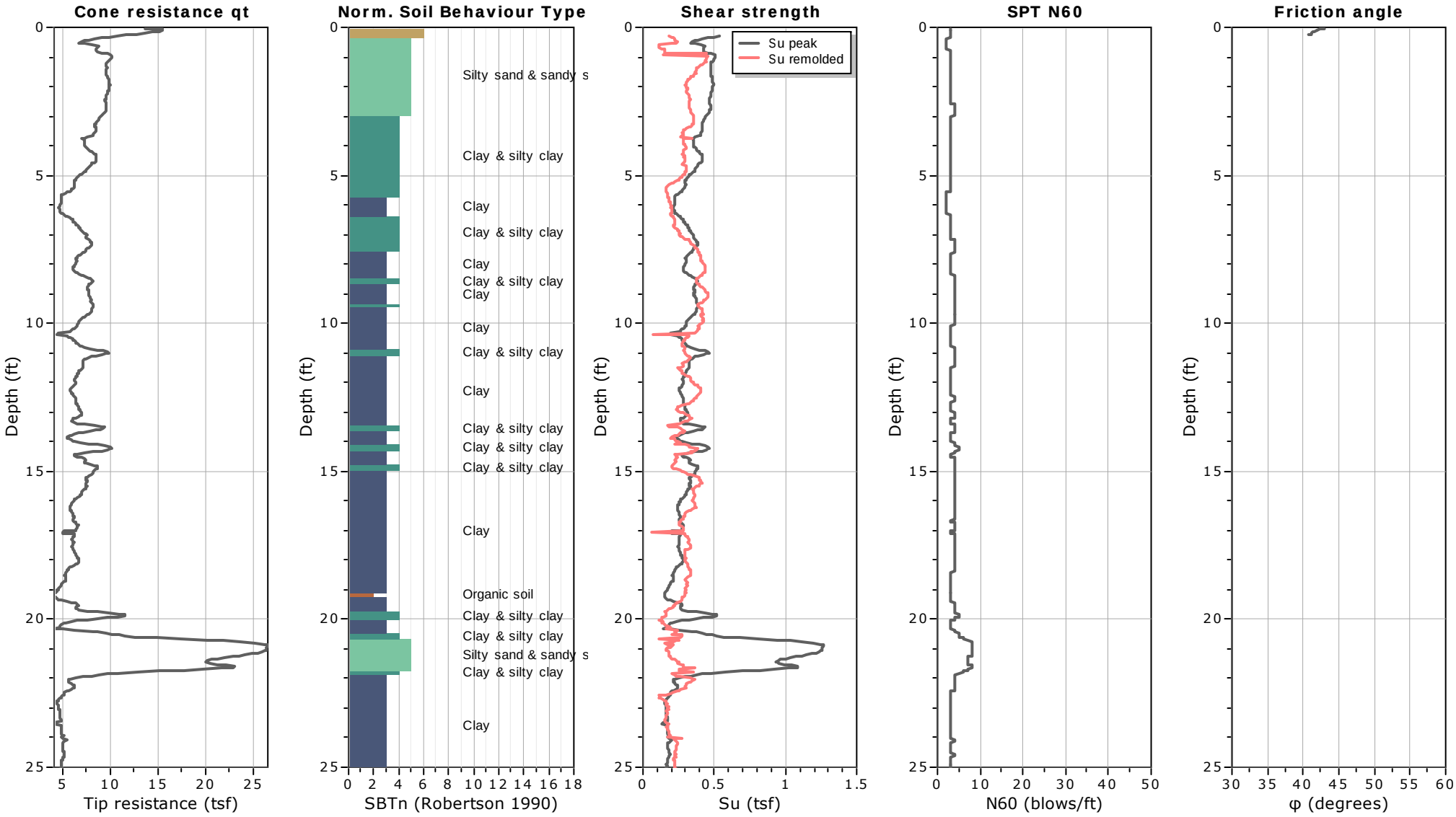
CPT: 15.33.021_CPT-27
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 1 (West)
Location: Wanhua Chemical

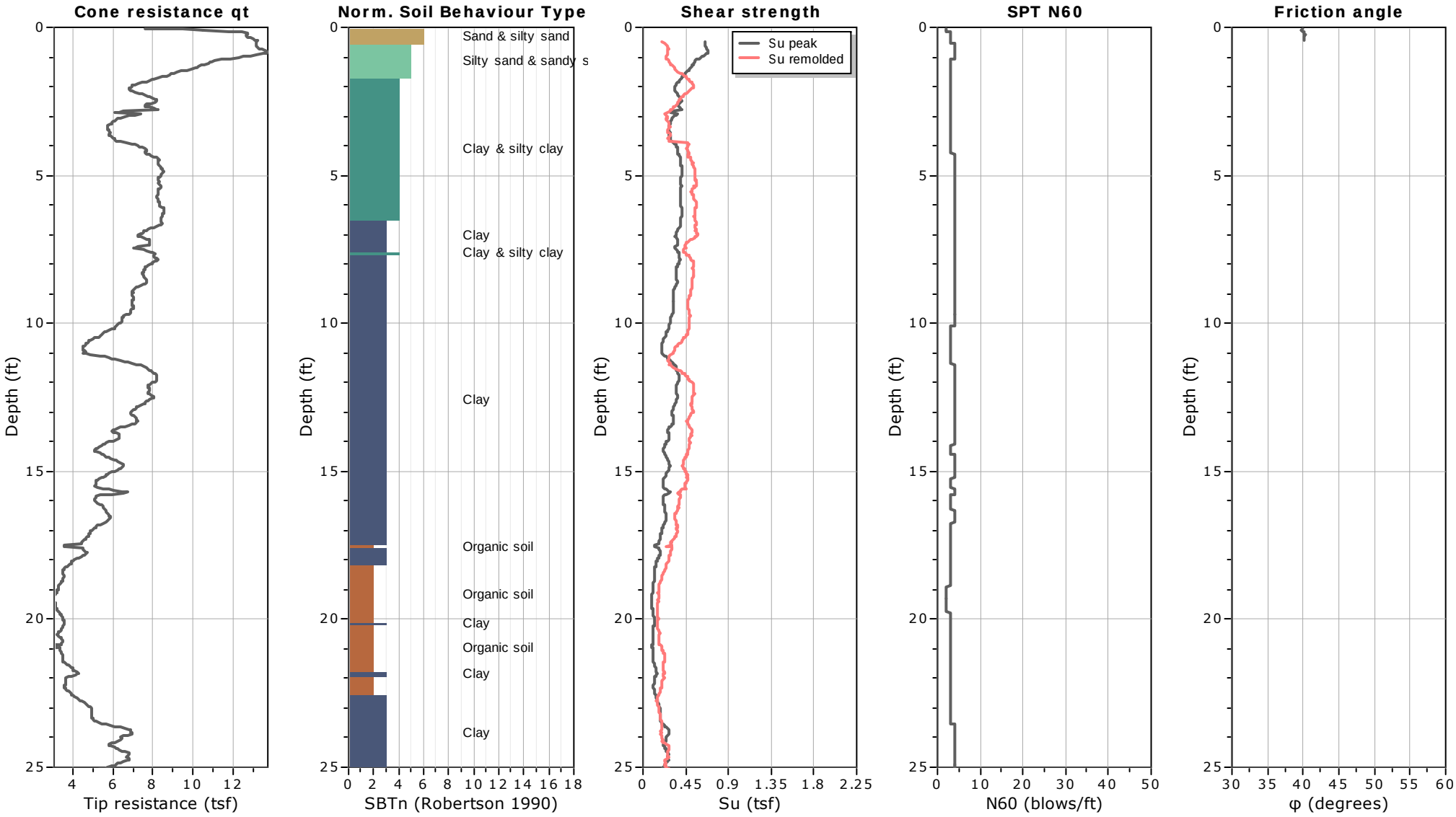
CPT: 15.33.021_CPT-28
Total depth: 25.33 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

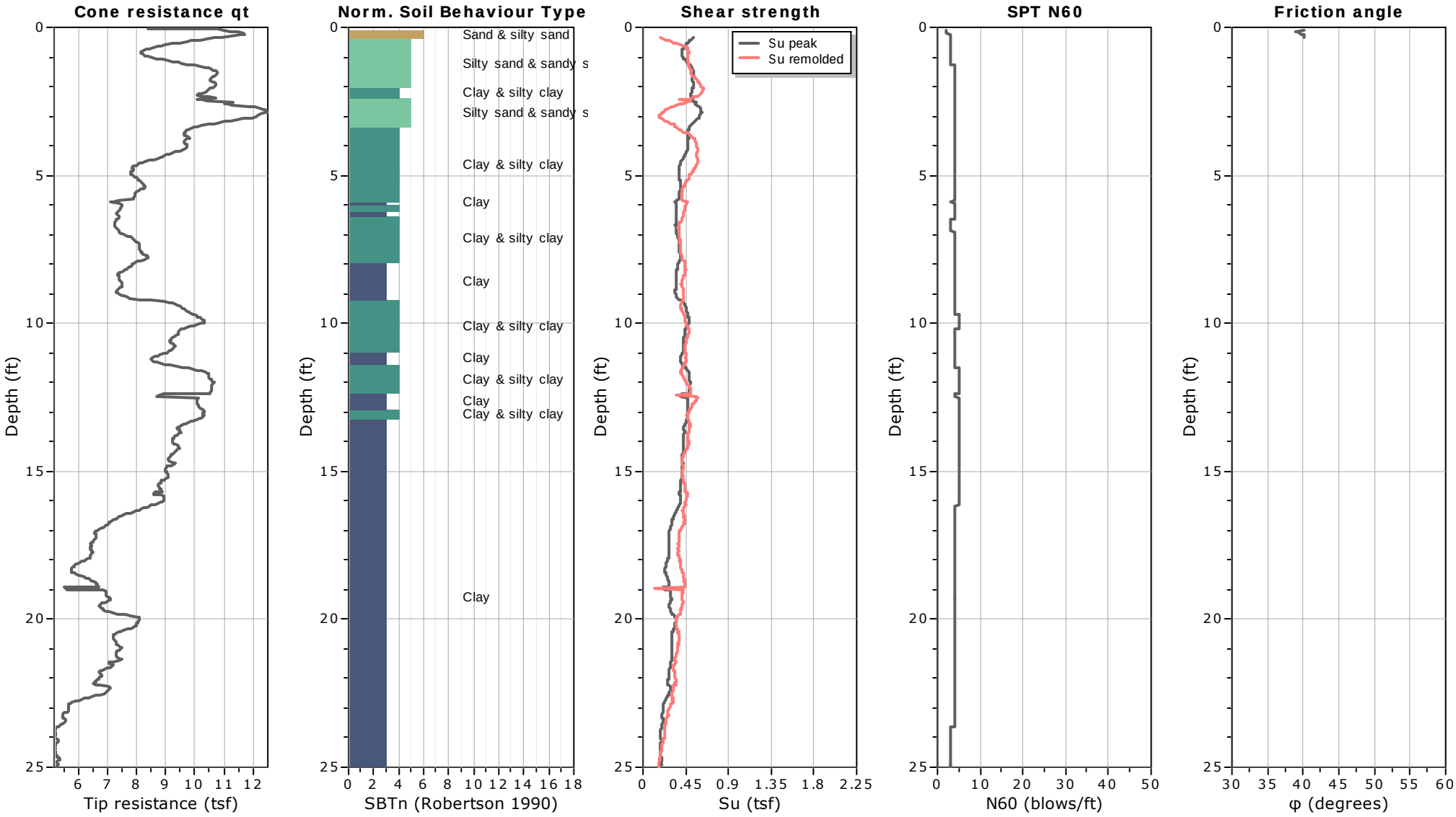
CPT: 15.33.021_CPT-29
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

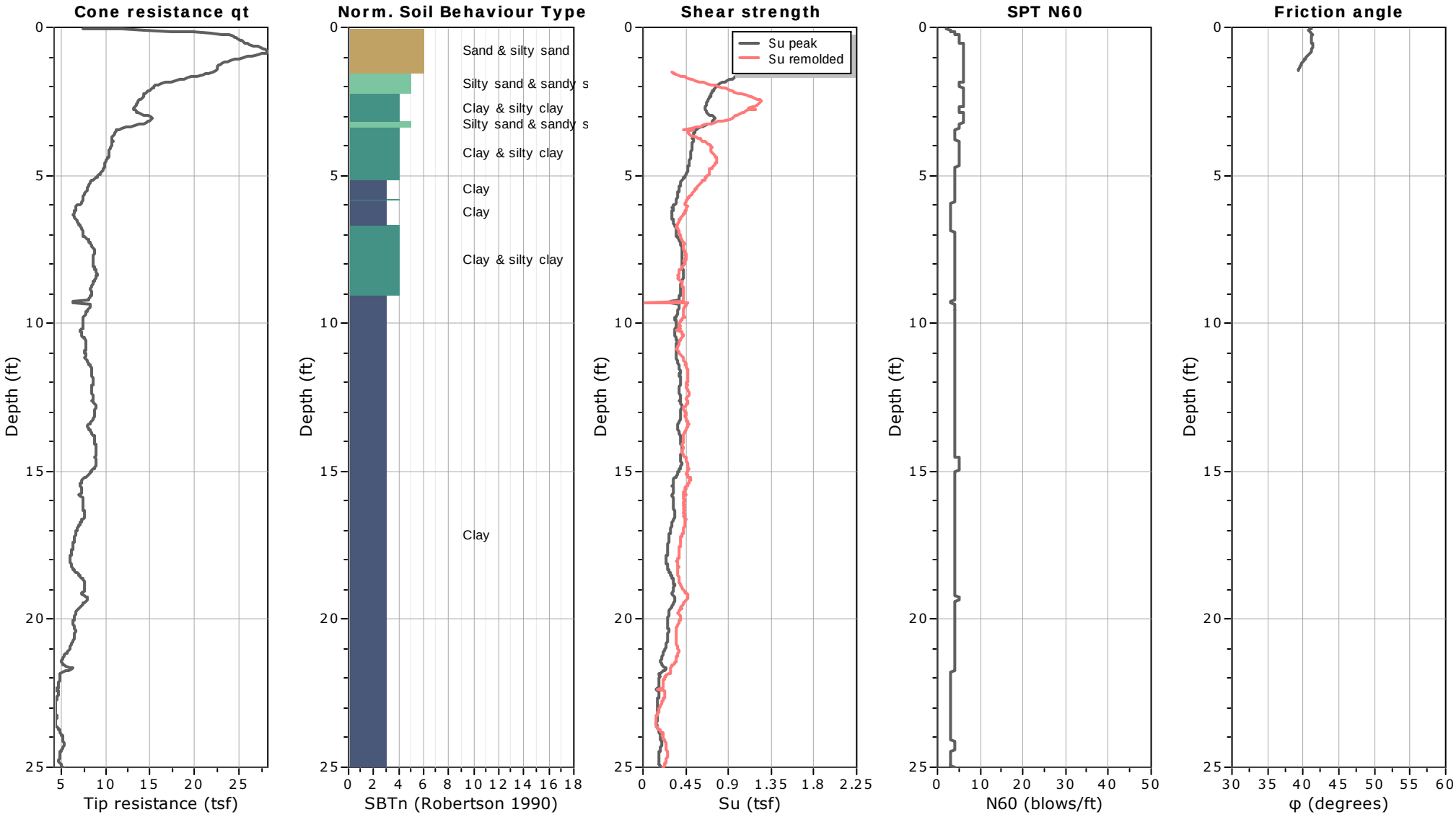
CPT: 15.33.021_CPT-30
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

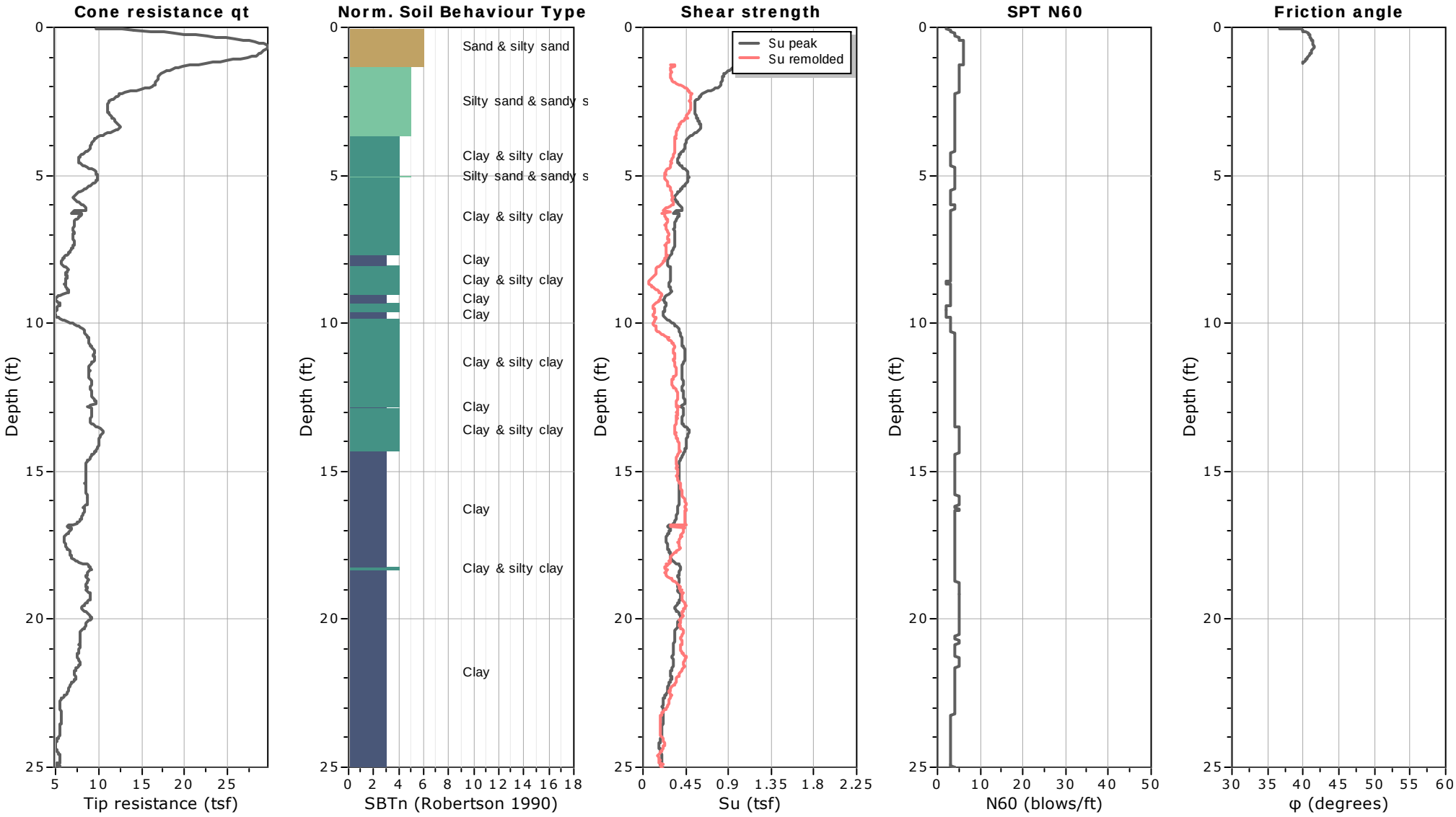
CPT: 15.33.021_CPT-31
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

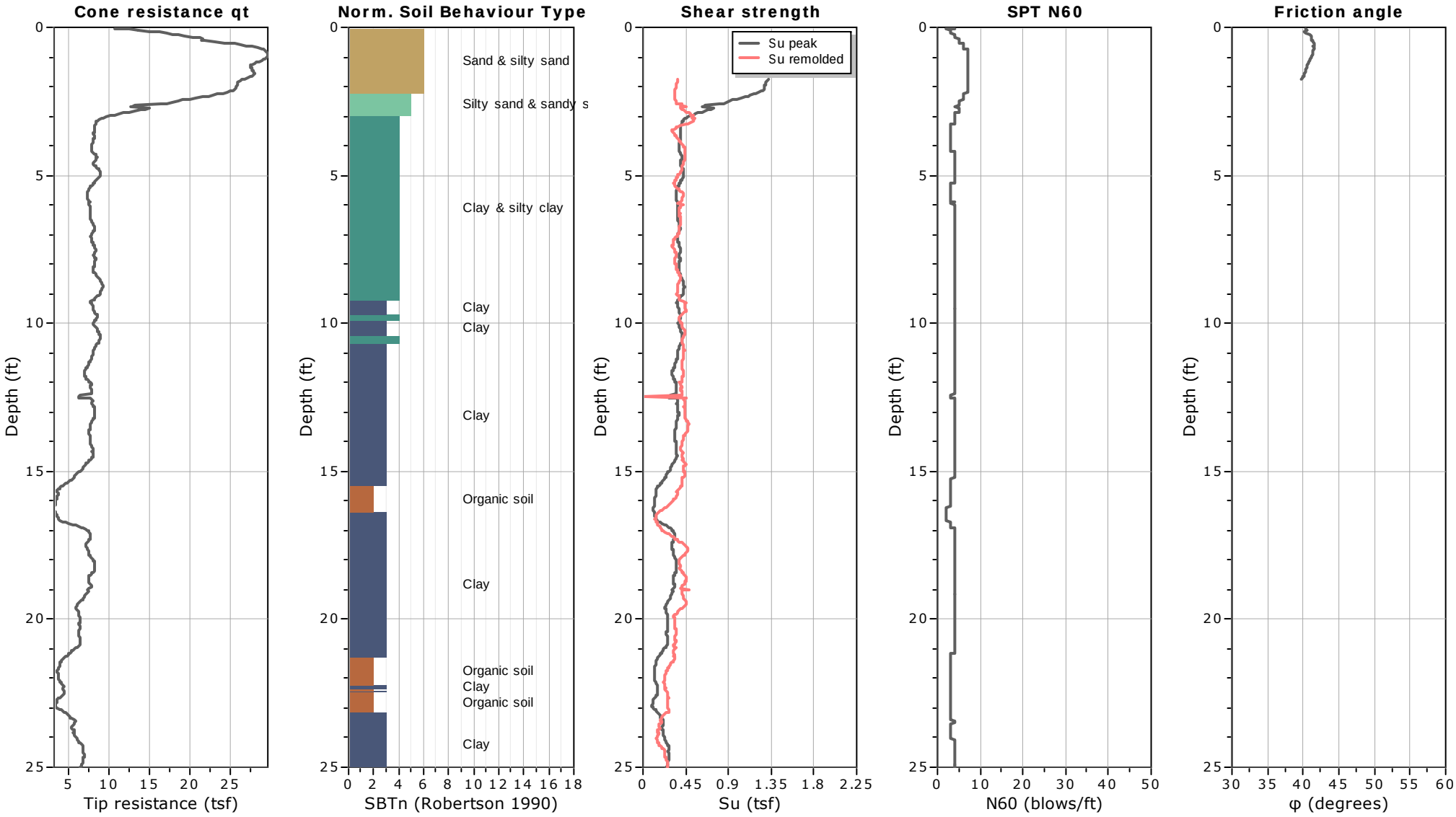
CPT: 15.33.021_CPT-32
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

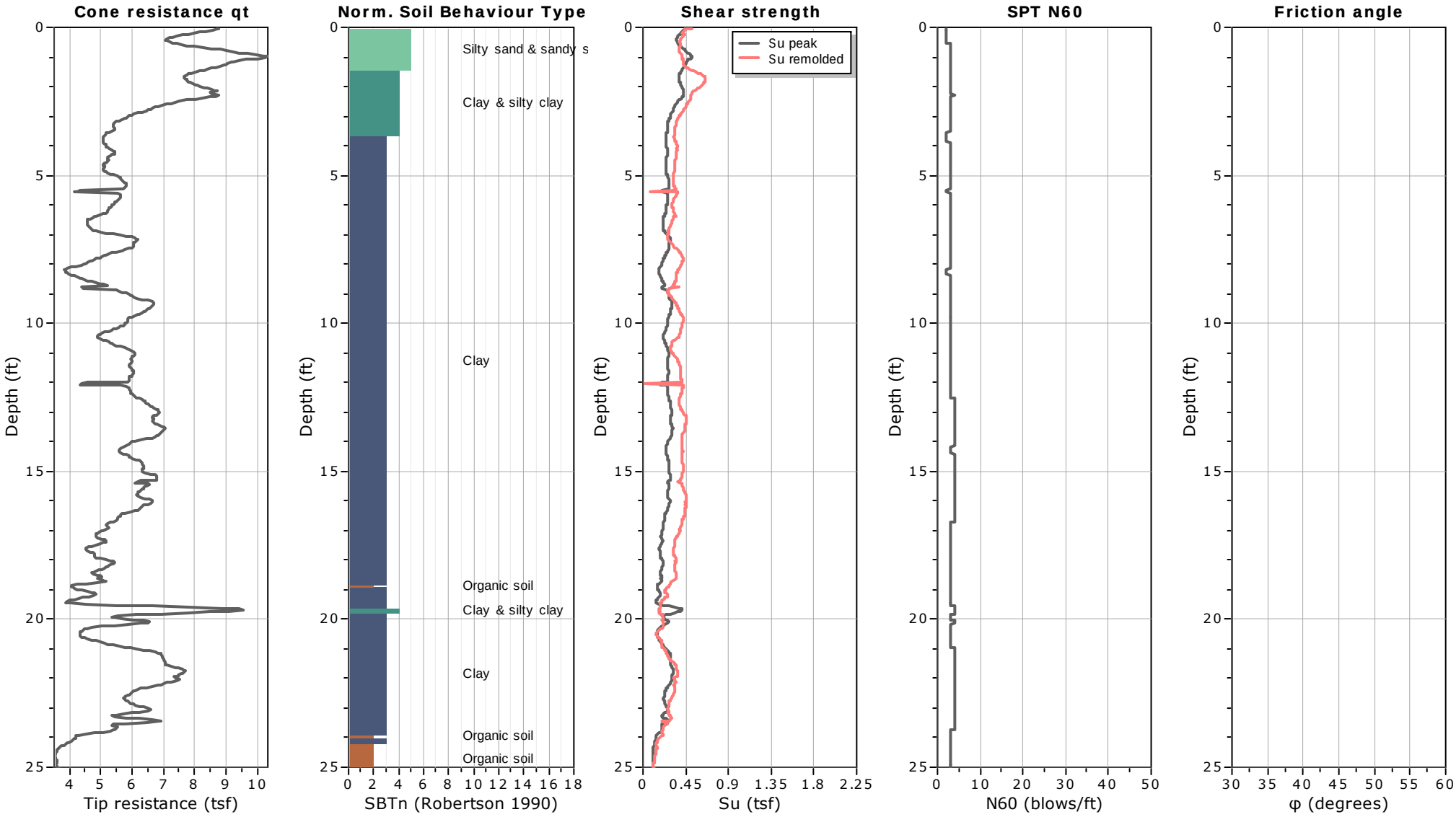
CPT: 15.33.021_CPT-33
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

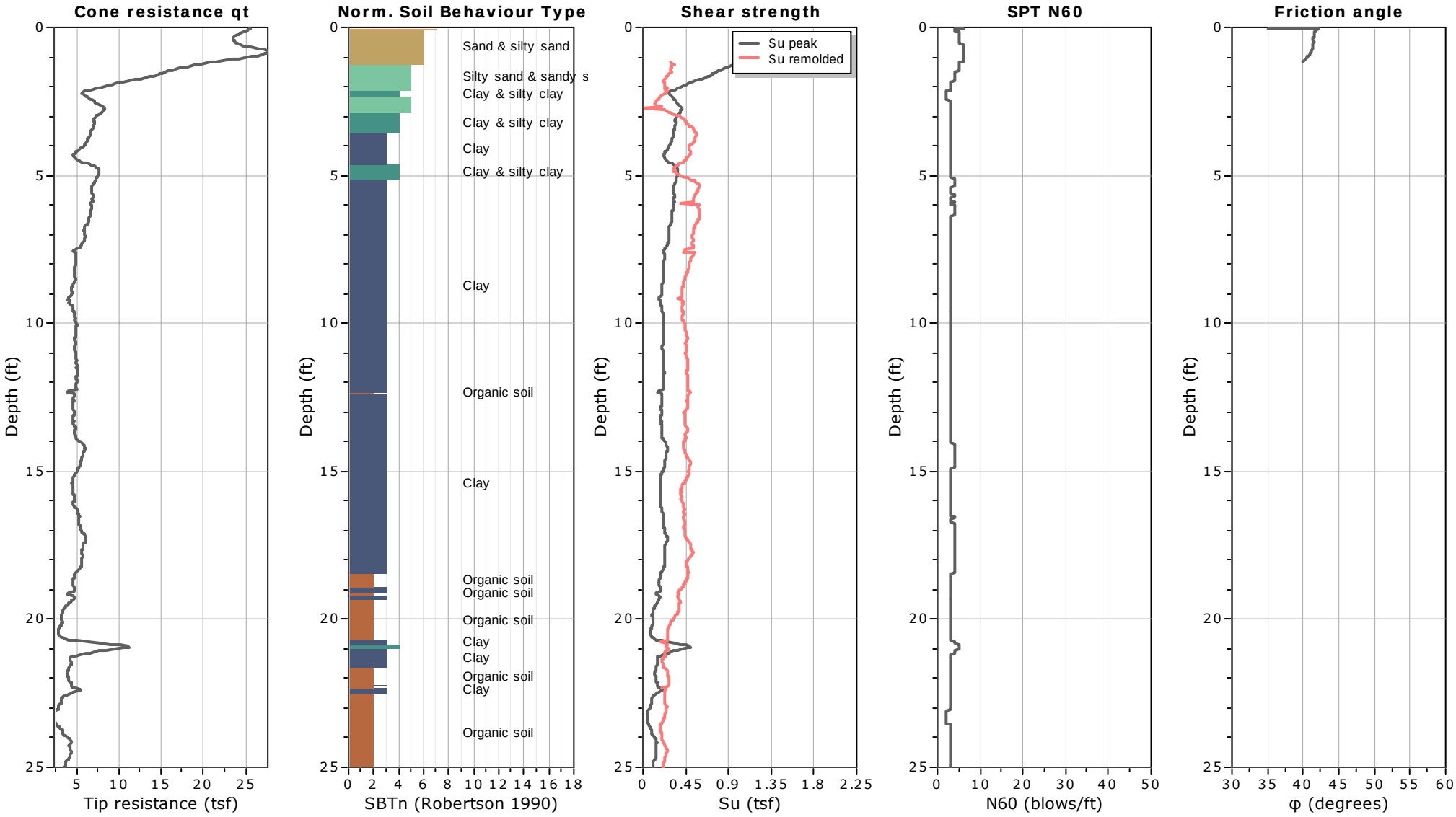
CPT: 15.33.021_CPT-34
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

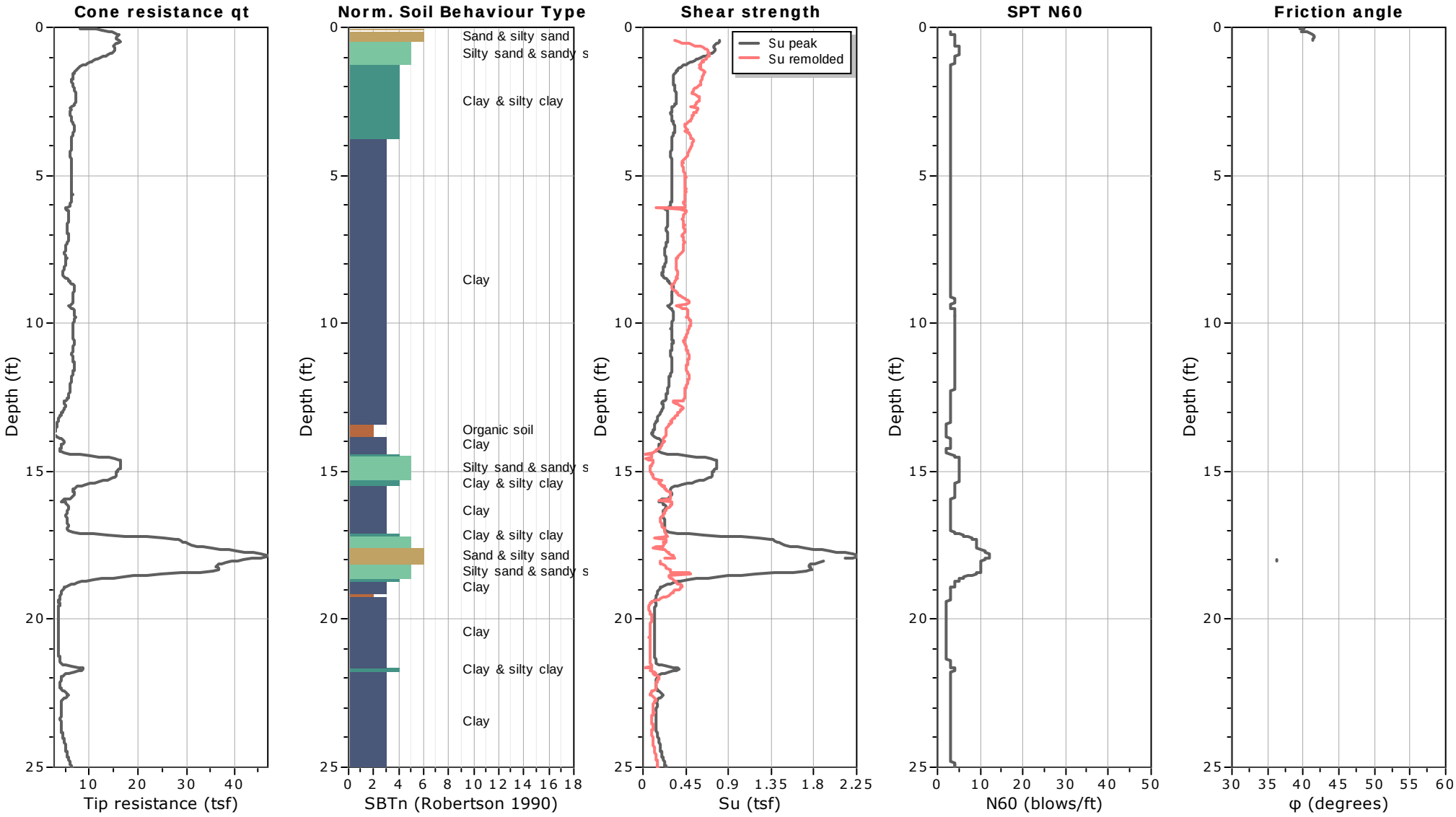
CPT: 15.33.021_CPT-35
Total depth: 25.13 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

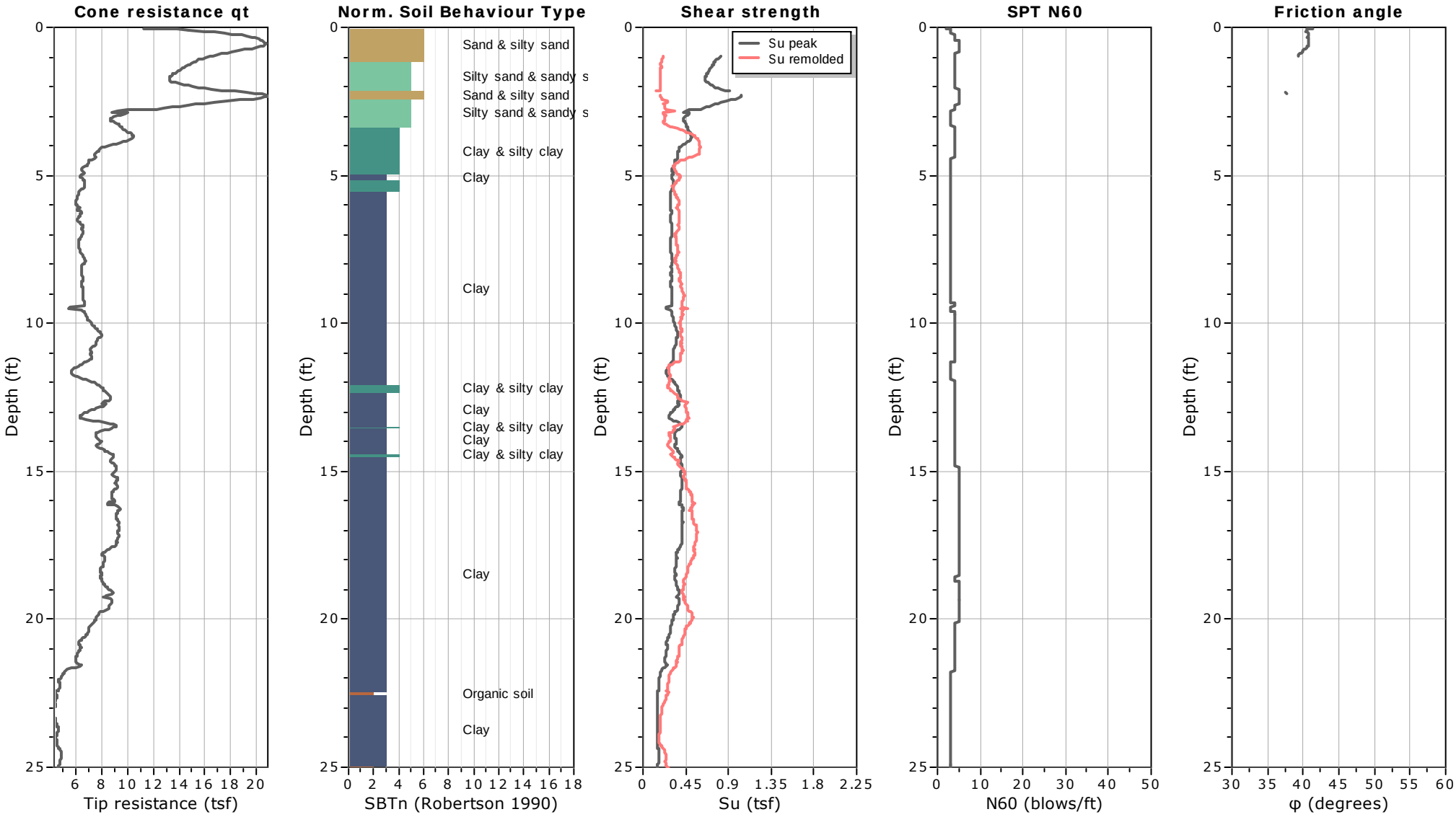
CPT: 15.33.021_CPT-36
Total depth: 25.10 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

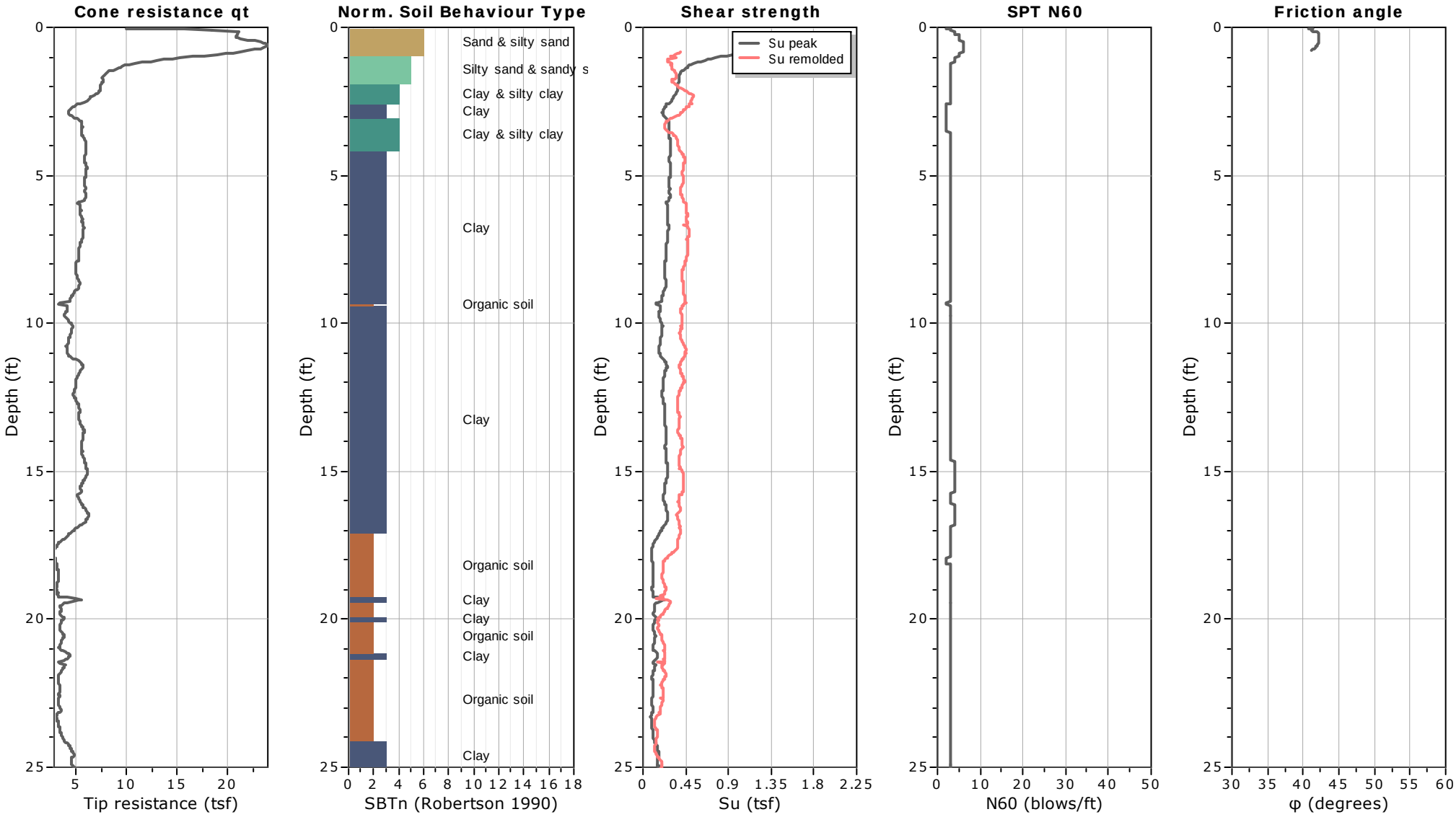
CPT: 15.33.021_CPT-37
Total depth: 25.26 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

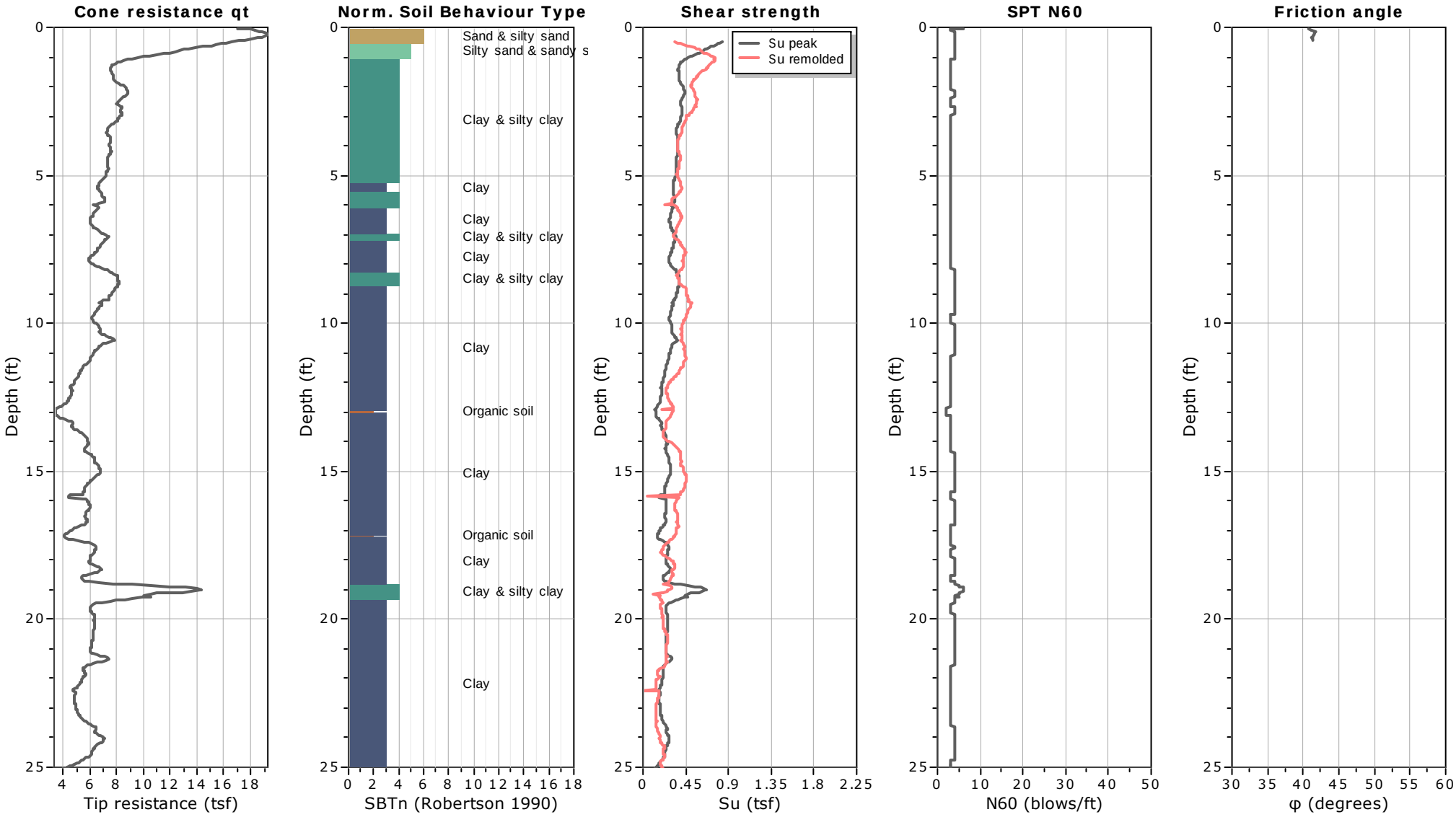
CPT: 15.33.021_CPT-38
Total depth: 25.10 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

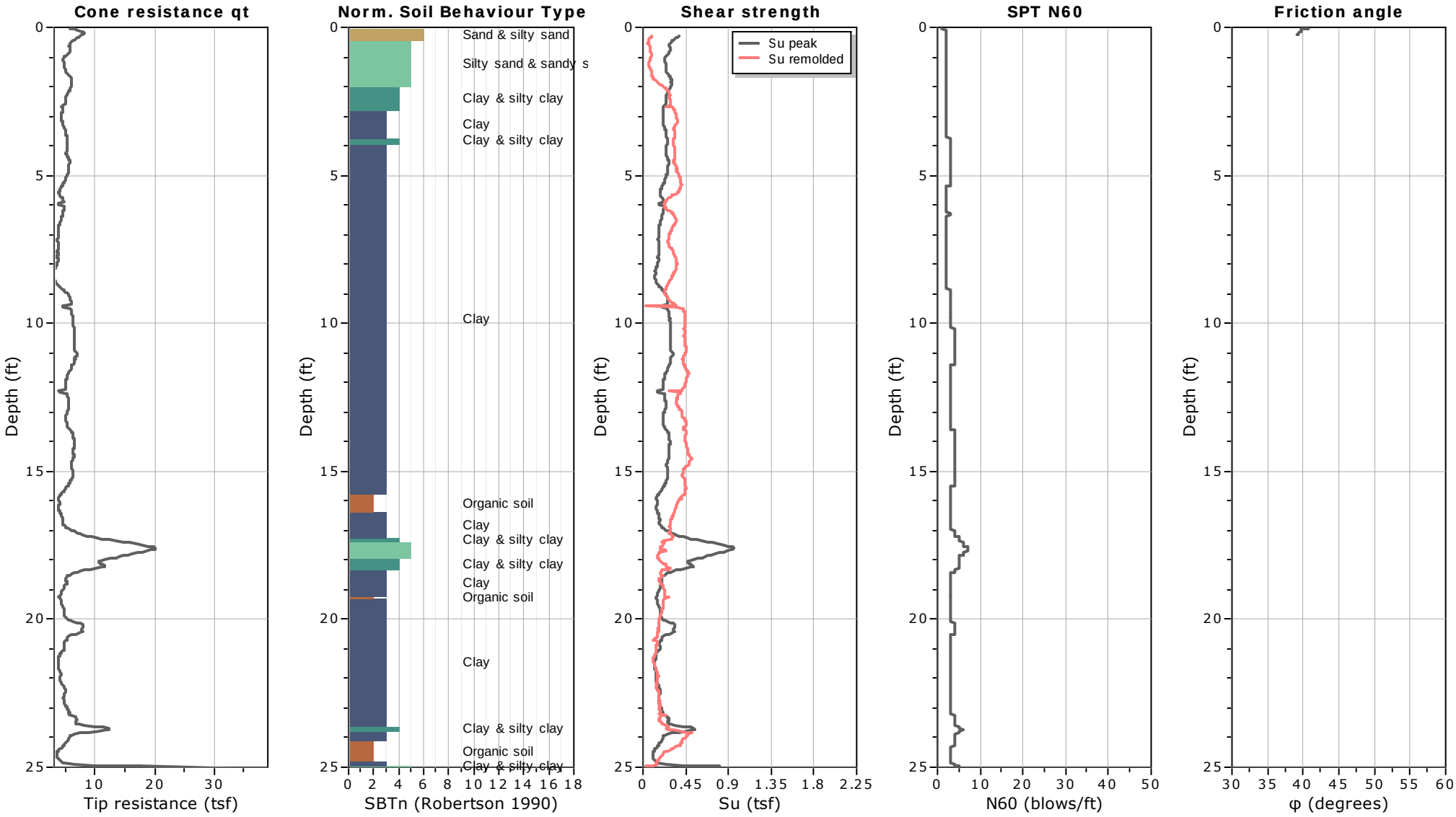
CPT: 15.33.021_CPT-39
Total depth: 25.16 ft



Tolunay-Wong Engineers, Inc.i
37534 Highway 30, Suite A
Gonzales, Louisiana

Project: Syngenta - Area 3 (East)
Location: Wanhua Chemical

CPT: 15.33.021_CPT-40
Total depth: 25.53 ft



APPENDIX D

DESIGN SOIL PARAMETERS
SYNGENTA – AREA 1

Tabulated Design Soil Parameters															
Depth Range (ft)		Thickness of Layer (ft)	Soil Type	Undrained Shear Strength, S_u (psf)		Internal Friction Angle, Φ (°)	Total Unit Weight, γ (pcf)	Effective Vertical Stress at Center of Layer, σ'_{vo} (psf)	Initial Void Ratio, e_o	Compression Index, C_c	Recompression Index, C_r	Overconsolidation Ratio, OCR		Elastic Modulus, E_{50} (ksf)	
				Top	Bottom							Top	Bottom	Top	Bottom
0	5	5	Clay	400	400	--	120	300	1.00	0.40	0.05	14.00	5.00	150	175
5	10	5	Clay	400	400	--	114	729	1.00	0.30	0.04	5.00	3.50	175	200
10	23	13	Clay	450	450	--	109	1,161	1.30	0.40	0.05	3.50	1.60	200	260
23	36	13	Clay	450	450	--	98	1,695	2.00	0.85	0.11	1.60	1.00	100	105
36	45	9	Clay	450	505	--	103	2,109	1.50	0.70	0.09	1.00	1.00	120	135
45	58	13	Clay	505	610	--	99	2,530	2.50	2.20	0.28	1.00	1.00	100	120
58	80	22	Clay	610	820	--	106	3,247	1.40	0.85	0.11	1.00	1.00	145	195
80	100	20	Clay	820	1,010	--	106	4,163	1.40	0.85	0.11	1.00	1.00	195	240

Project:
Syngenta Site Evaluation
Carville, Louisiana

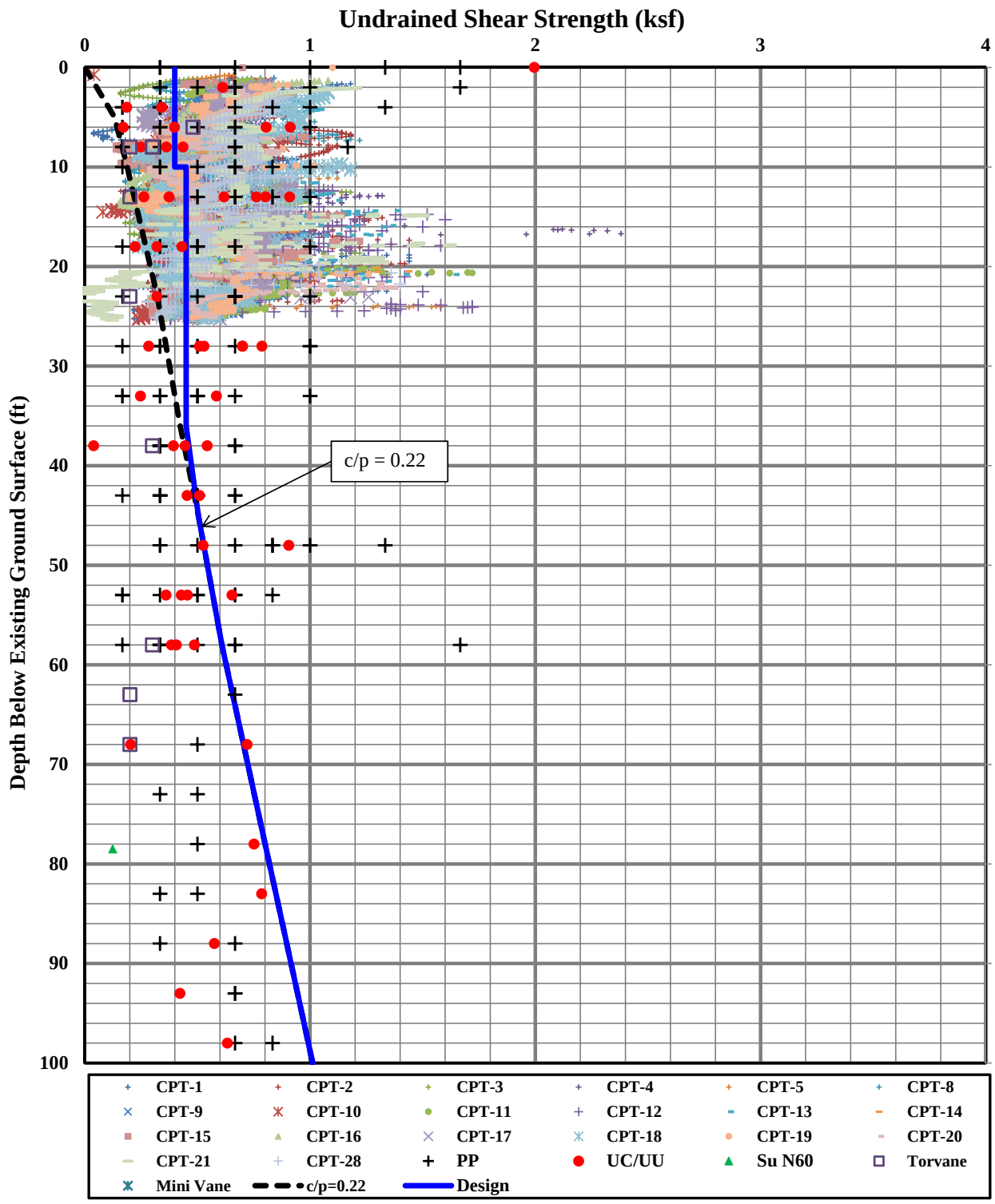
Tolunay-Wong Engineers, Inc.

Project No.: 15.33.021
Report No.: 16855

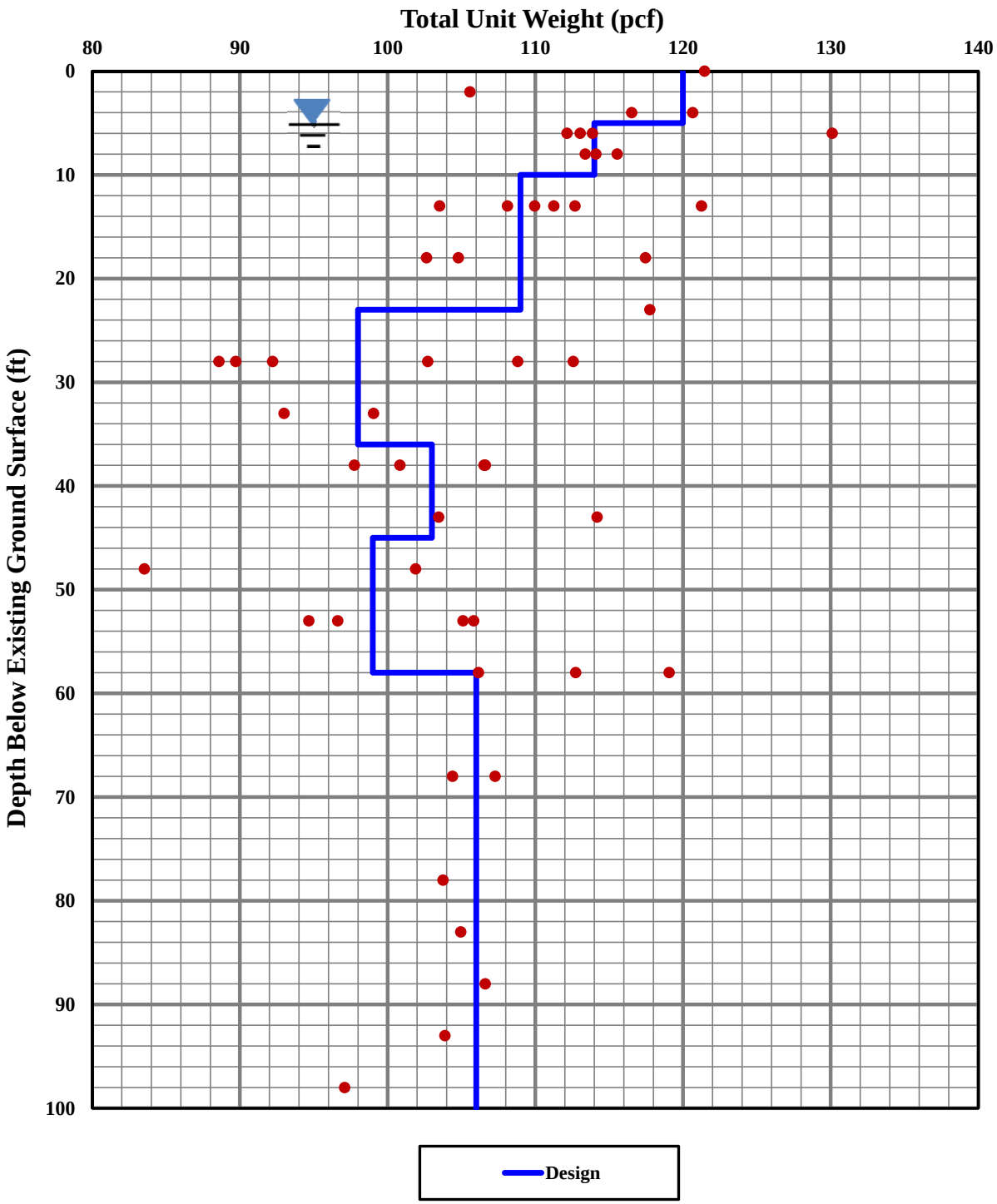
Client:
Wanhua Chemical US Holdings, Inc.
Houston, Texas

Summary of Design Soil Parameters
Syngenta - Area 1 (West)

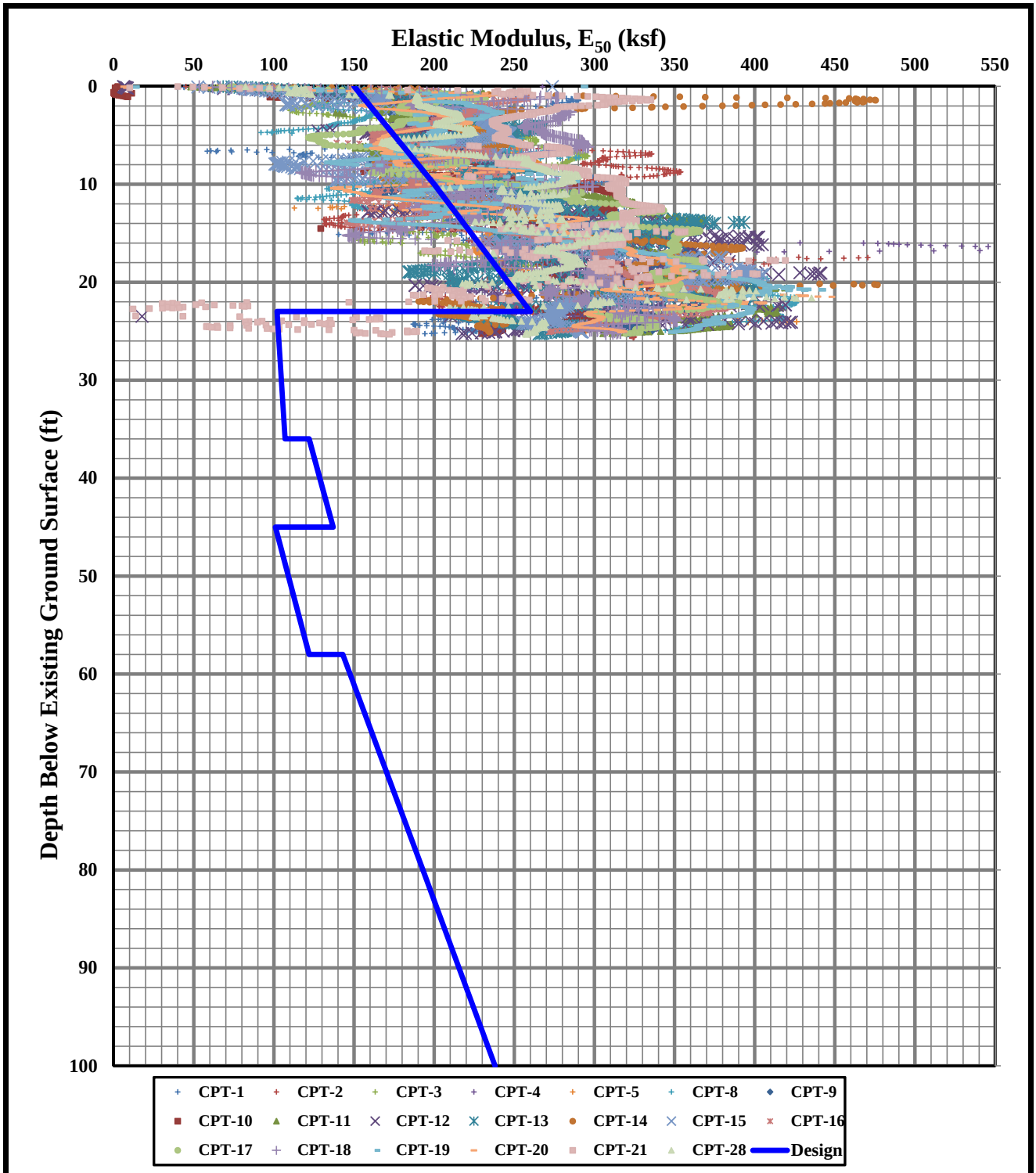
Appendix: D
Figure: 1



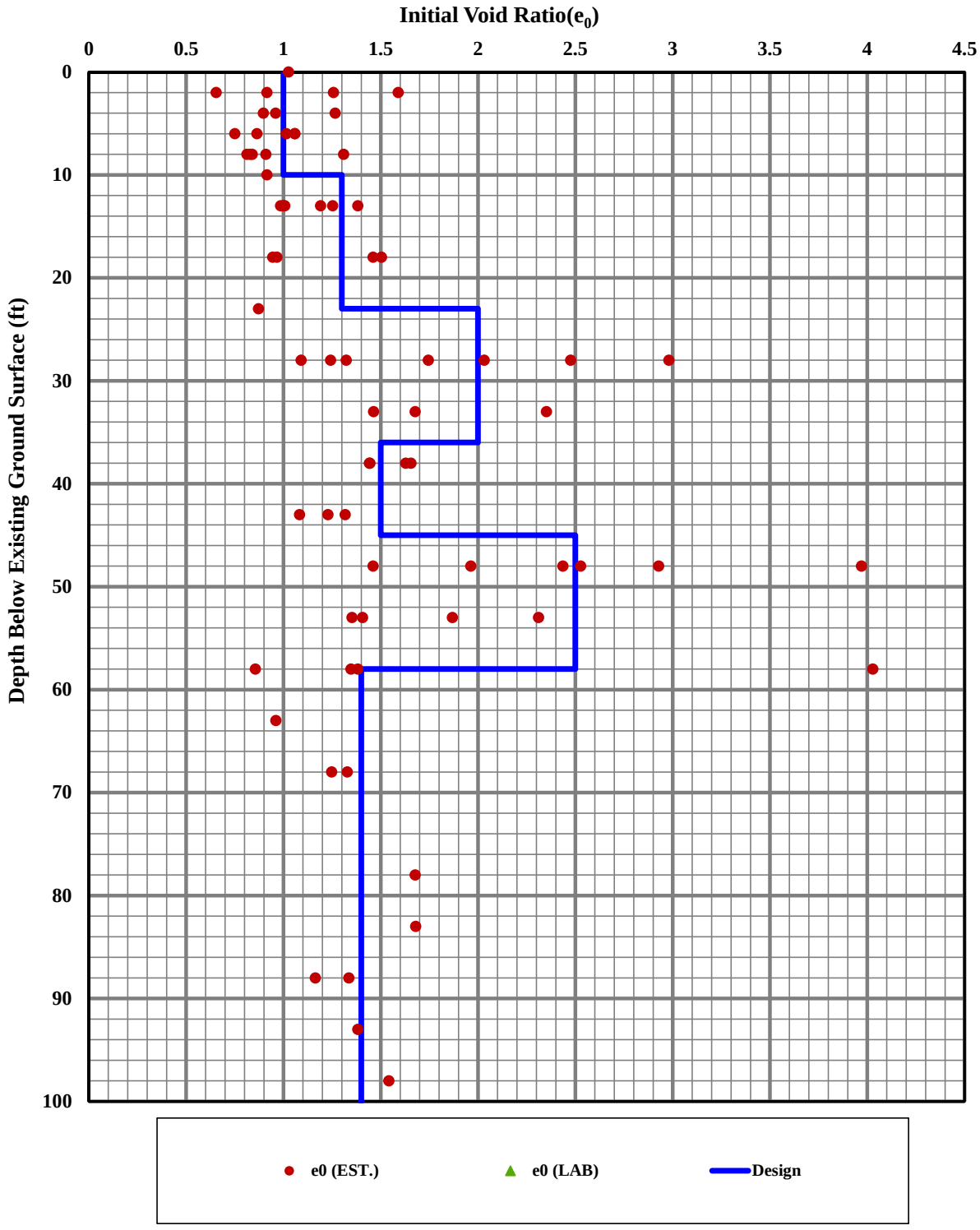
Project: Syngenta Site Evaluation Carville, Louisiana	**Tolunay-Wong Engineers, Inc.**	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Undrained Shear Strength Profile** **Syngenta - Area 1 (West)**	**Appendix:** D **Figure:** 2



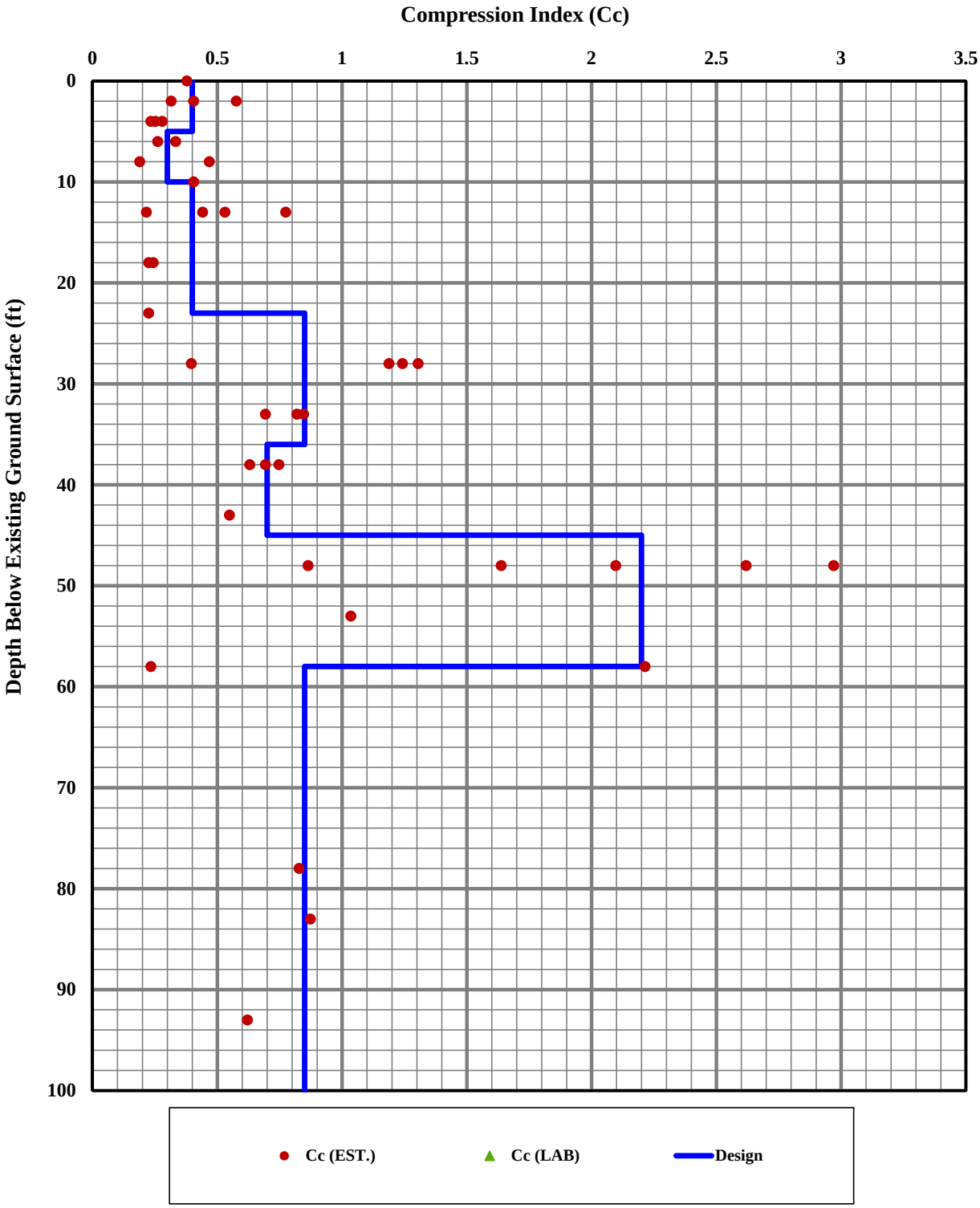
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Total Unit Weight Profile** **Syngenta - Area 1 (West)**	**Appendix:** D **Figure:** 3



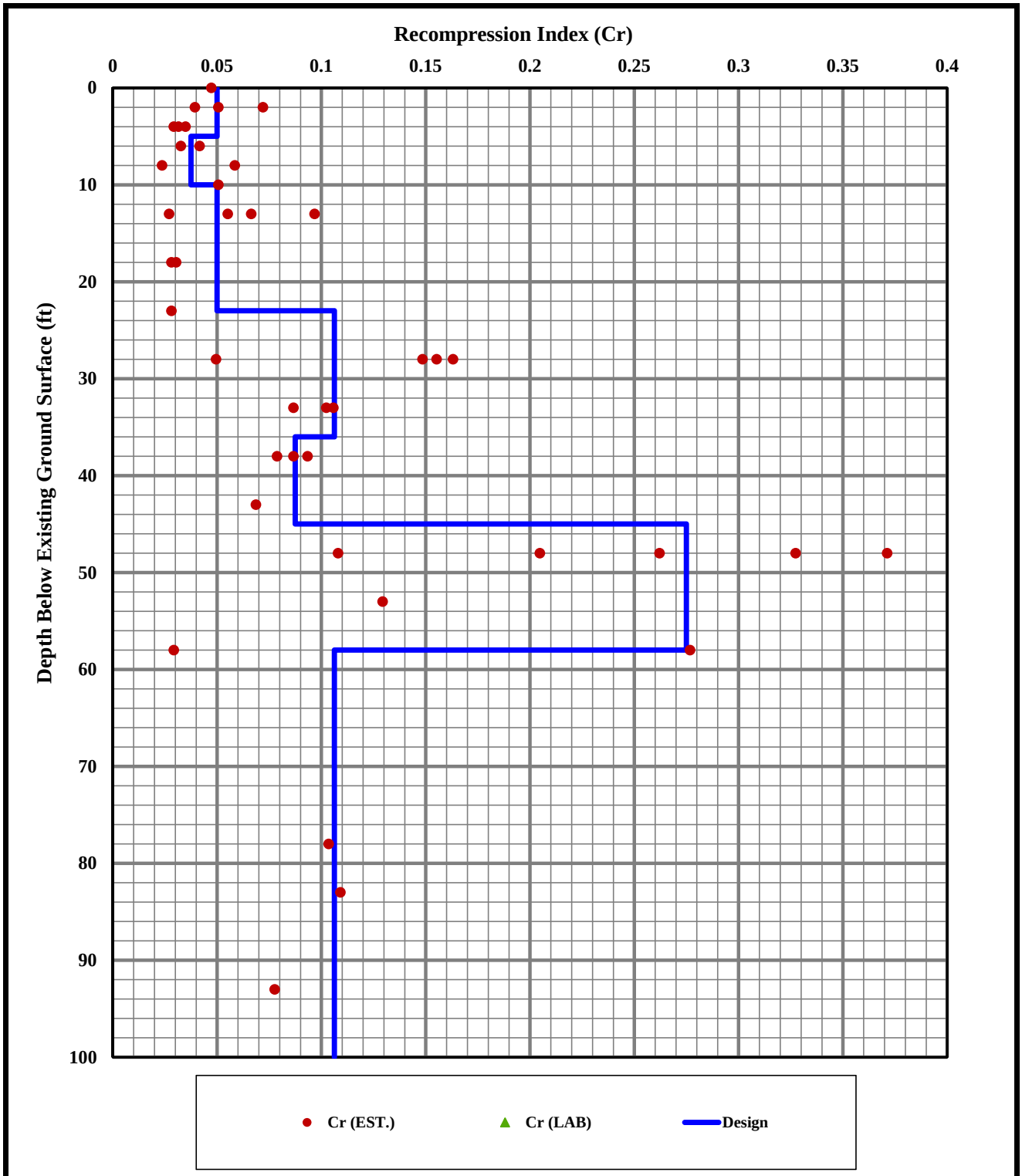
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Elastic Modulus Profile** **Syngenta - Area 1 (West)**	**Appendix:** D **Figure:** 4



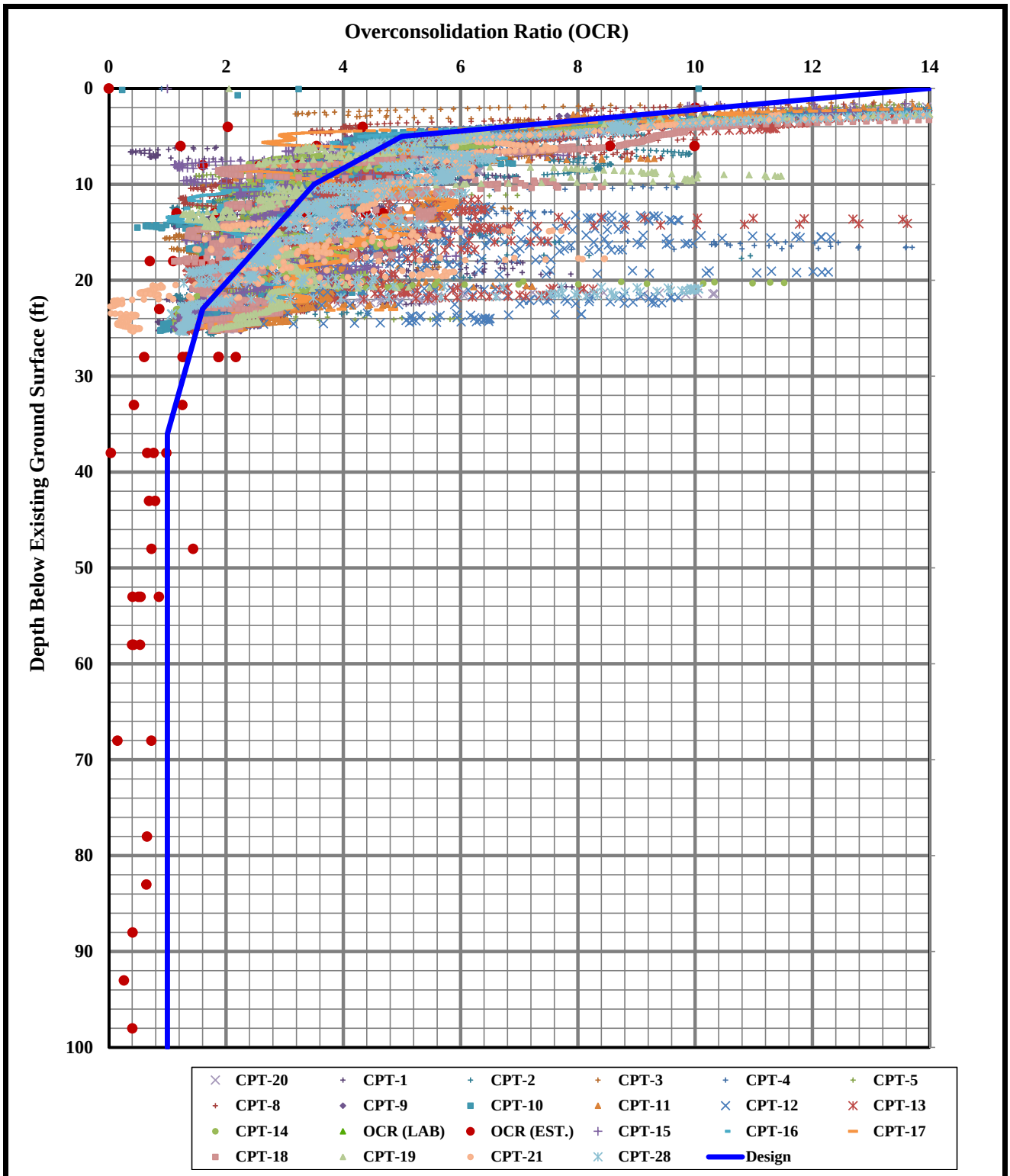
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Initial Void Ratio Profile** **Syngenta - Area 1 (West)**	**Appendix:** D **Figure:** 5



Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Compression Index Profile** **Syngenta - Area 1 (West)**	**Appendix:** D **Figure:** 6



Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Recompression Index Profile** **Syngenta - Area 1 (West)**	**Appendix:** D **Figure:** 7



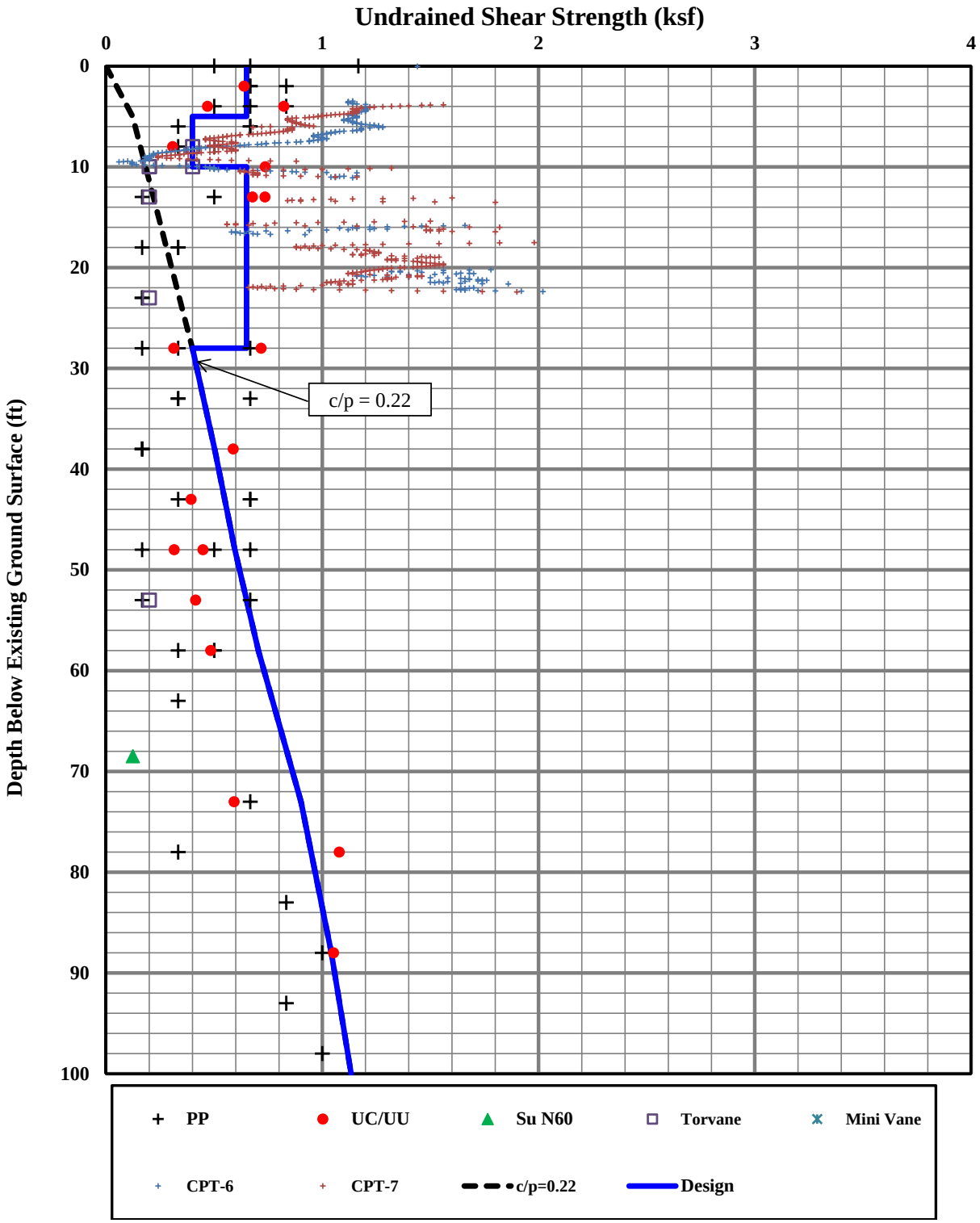
Project: Syngenta Site Evaluation Carville, Louisiana	**Tolunay-Wong Engineers, Inc.**	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Overconsolidation Ratio Profile** **Syngenta - Area 1 (West)**	**Appendix:** D **Figure:** 8

APPENDIX E

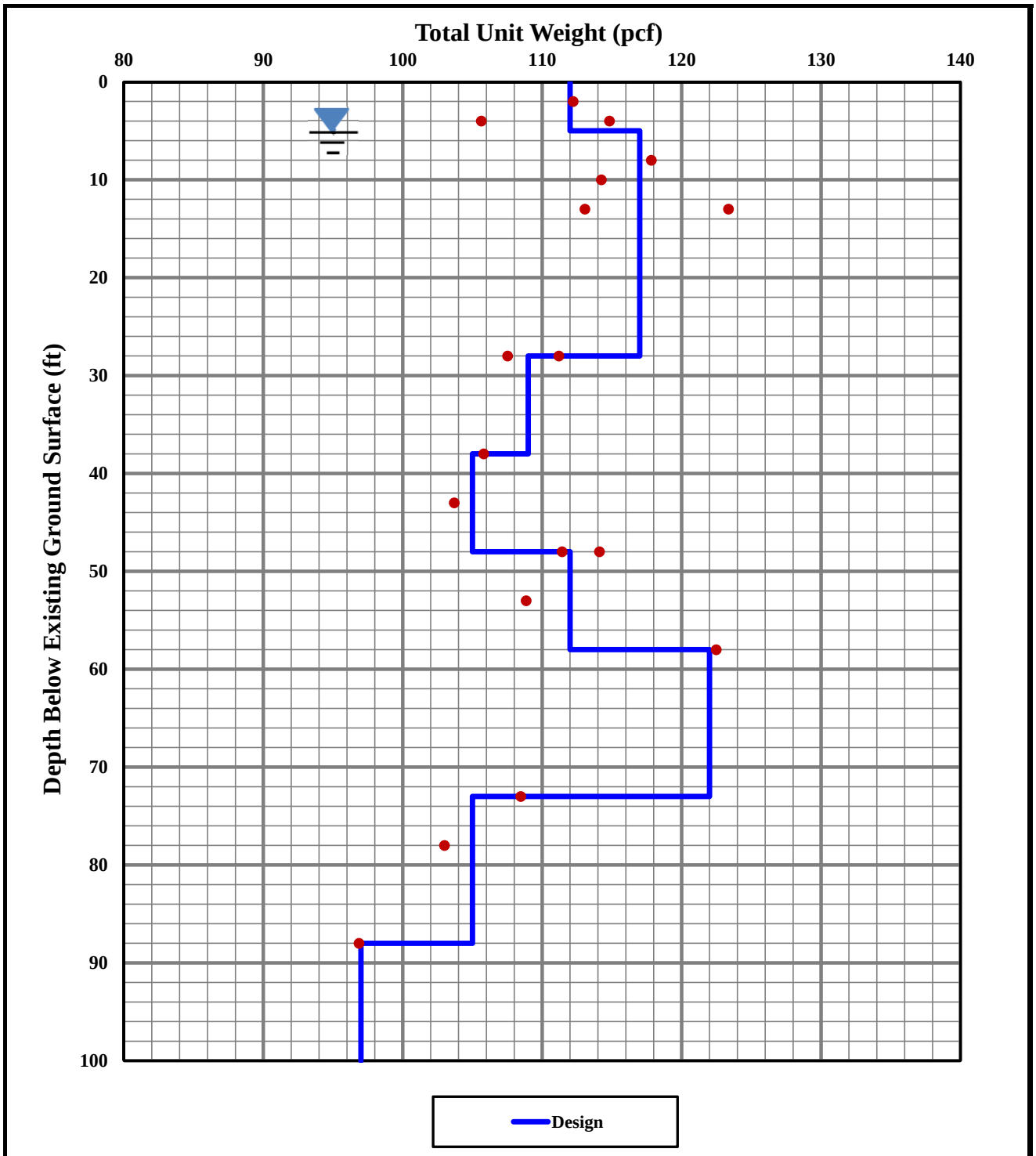
DESIGN SOIL PARAMETERS
SYNGENTA – AREA 2

Tabulated Design Soil Parameters															
Depth Range (ft)		Thickness of Layer (ft)	Soil Type	Undrained Shear Strength, S_u (psf)		Internal Friction Angle, Φ (°)	Total Unit Weight, γ (pcf)	Effective Vertical Stress at Center of Layer, σ'_{vo} (psf)	Initial Void Ratio, e_o	Compression Index, C_c	Recompression Index, C_r	Overconsolidation Ratio, OCR		Elastic Modulus, E (ksf)	
				Top	Bottom							Top	Bottom	Top	Bottom
0	5	5	Clay	650	650	--	112	280	1.40	0.75	0.09	15.00	7.50	200	200
5	10	5	Clay	400	400	--	117	697	1.00	0.30	0.04	7.50	2.80	200	200
10	28	18	Clay	650	650	--	117	1,324	1.00	0.30	0.04	2.80	1.30	200	400
28	33	5	Clay	400	450	--	109	1,932	1.20	0.40	0.05	1.30	1.10	225	255
33	38	5	Clay	450	500	--	109	2,165	6.20	2.45	0.31	1.10	1.00	45	50
38	48	10	Clay	500	595	--	105	2,495	1.50	0.25	0.03	1.00	1.00	520	615
48	58	10	Clay	595	705	--	112	2,956	1.10	0.25	0.03	1.00	1.00	615	730
58	73	15	Clay	705	900	--	122	3,651	1.10	0.25	0.03	1.00	1.00	480	610
73	88	15	Clay	900	1,040	--	105	4,417	1.50	0.25	0.03	1.00	1.00	610	705
88	100	12	Clay	1,040	1,135	--	97	4,944	1.50	0.93	0.12	1.00	1.00	215	235

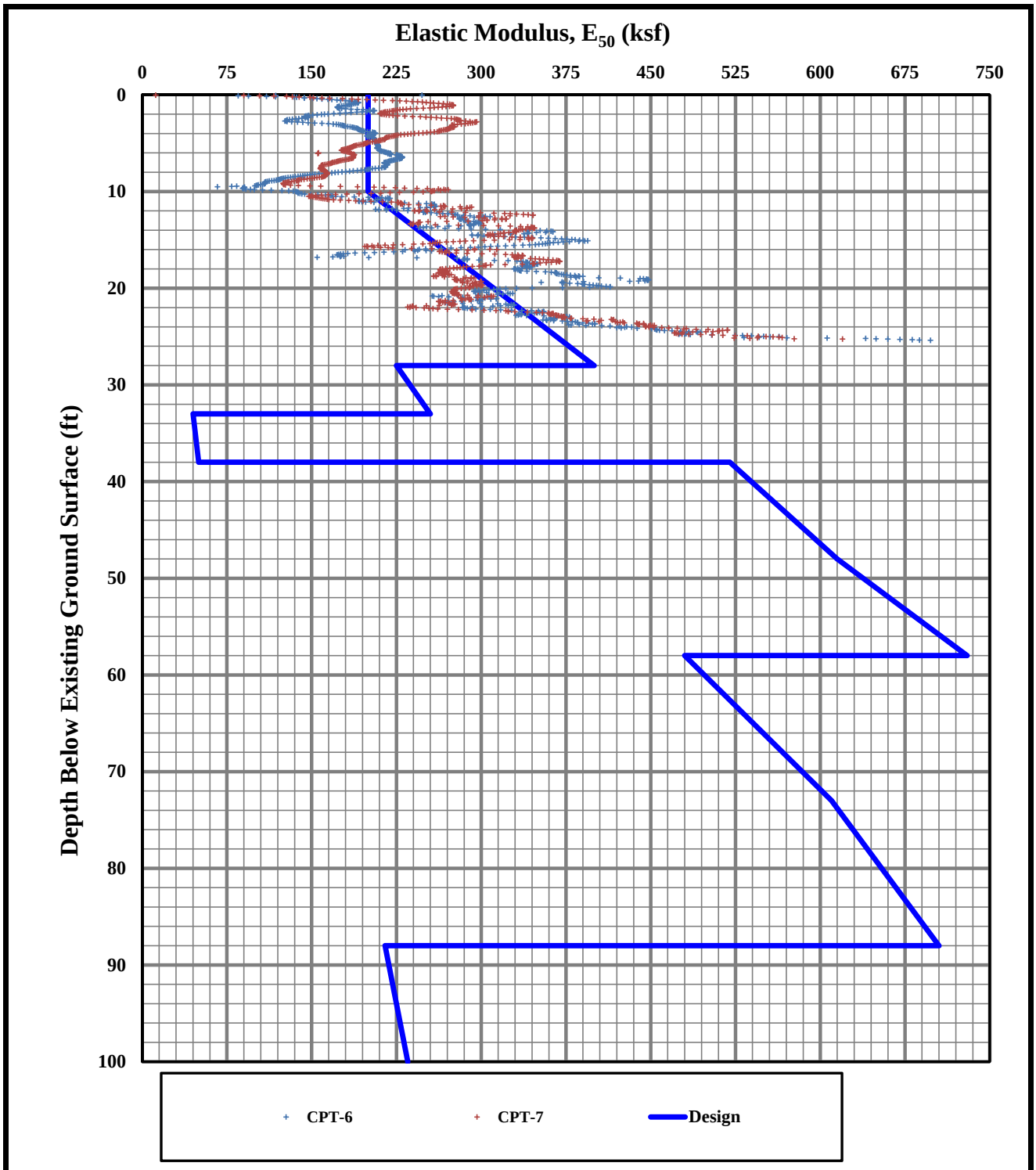
Project: Syngenta Site Evaluation Carville, Louisiana	**Tolunay-Wong Engineers, Inc.**	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Summary of Design Soil Parameters** **Syngenta - Area 2 (North)**	**Appendix:** E **Figure:** 1



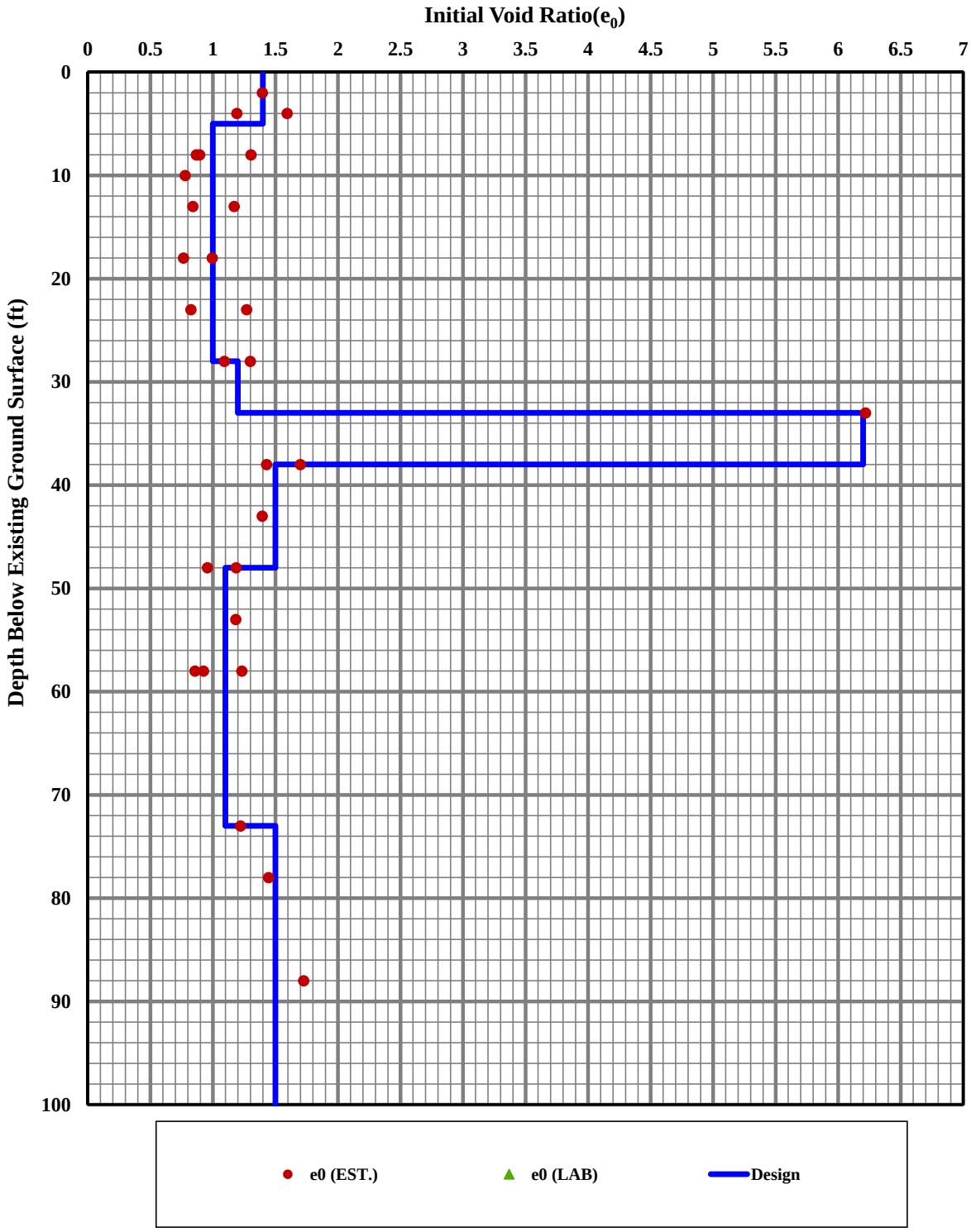
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Undrained Shear Strength Profile** **Syngenta - Area 2 (North)**	**Appendix:** E **Figure:** 2



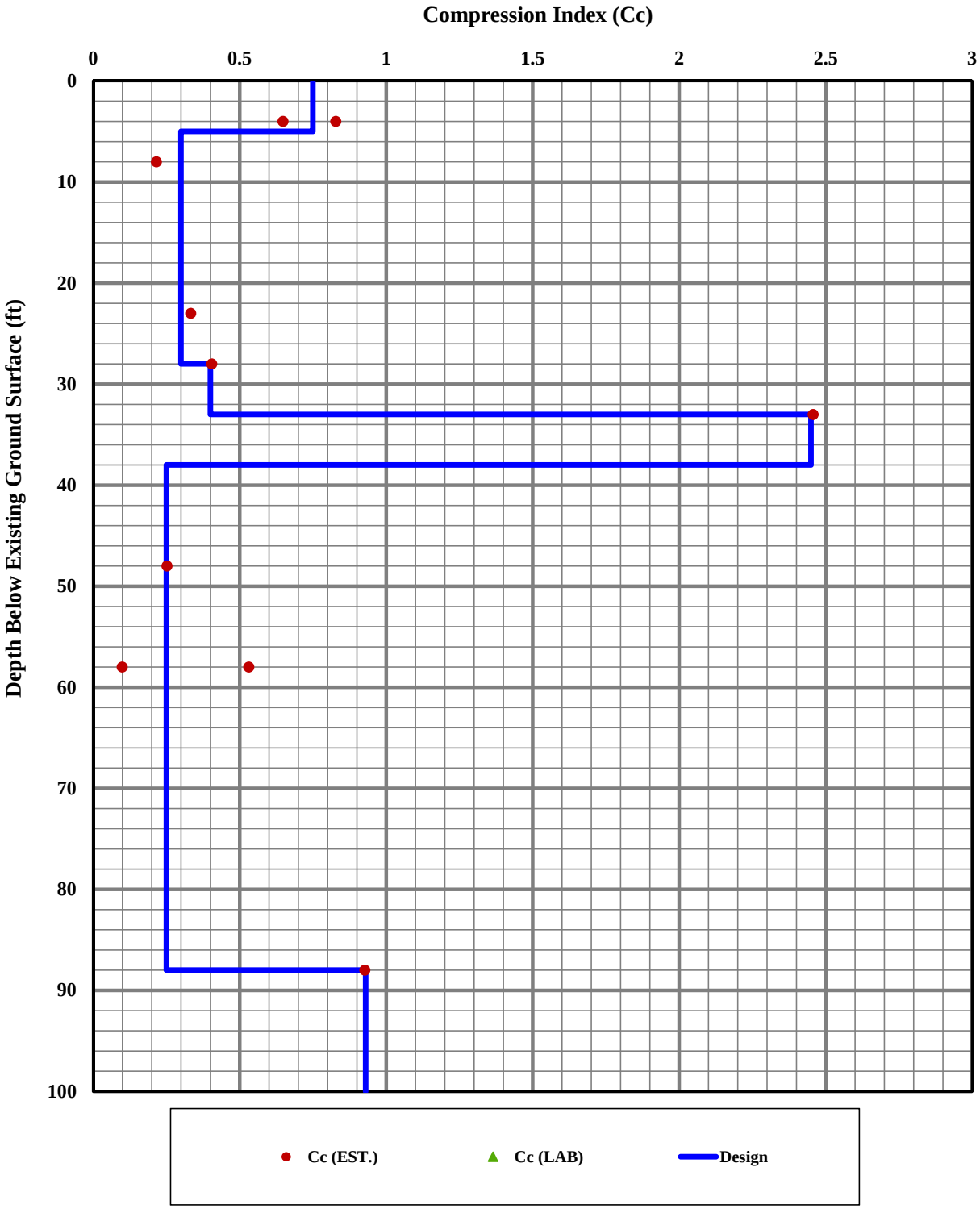
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Total Unit Weight Profile** **Syngenta - Area 2 (North)**	**Appendix:** E **Figure:** 3



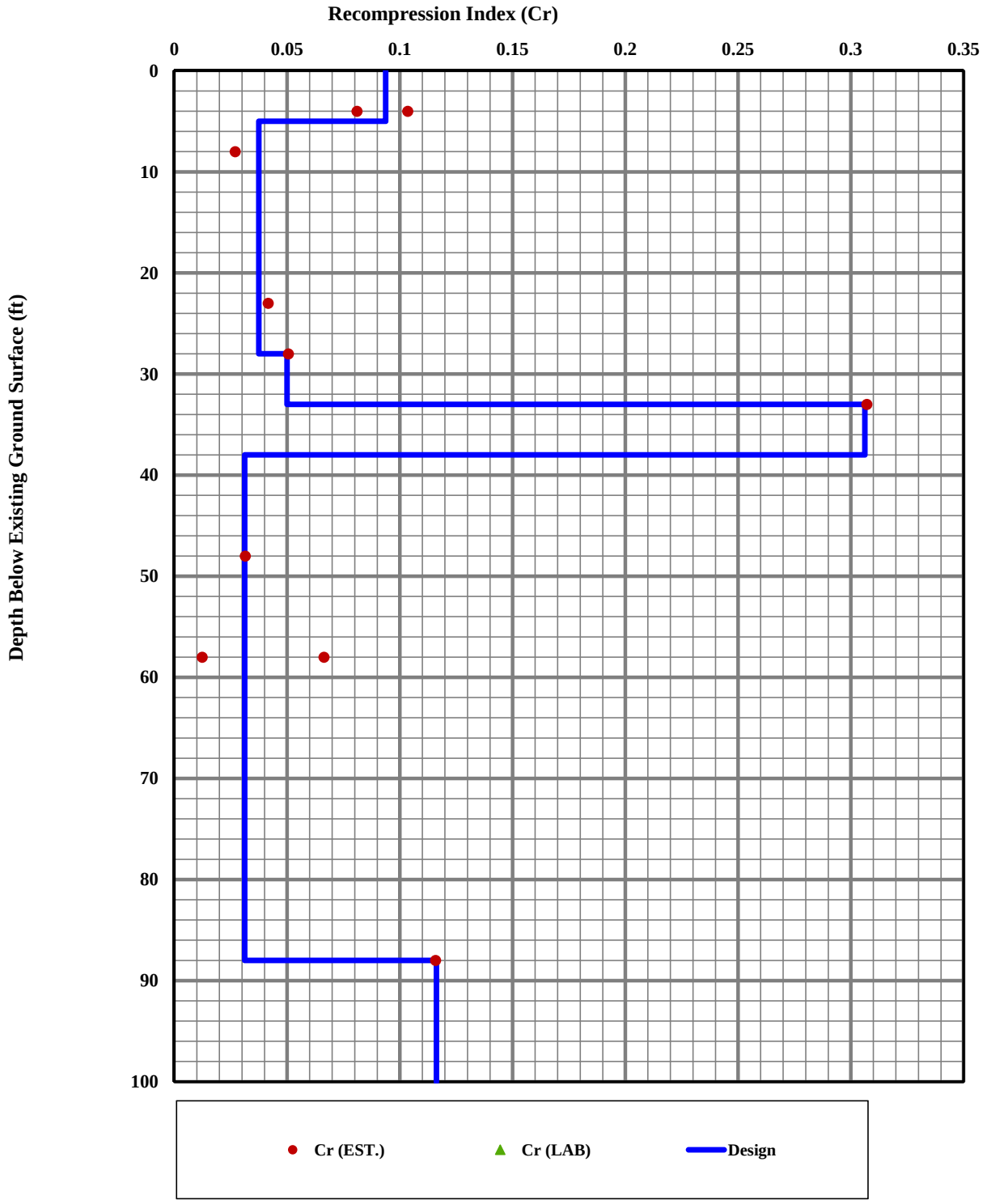
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Elastic Modulus Profile** **Syngenta - Area 2 (North)**	**Appendix:** E **Figure:** 4



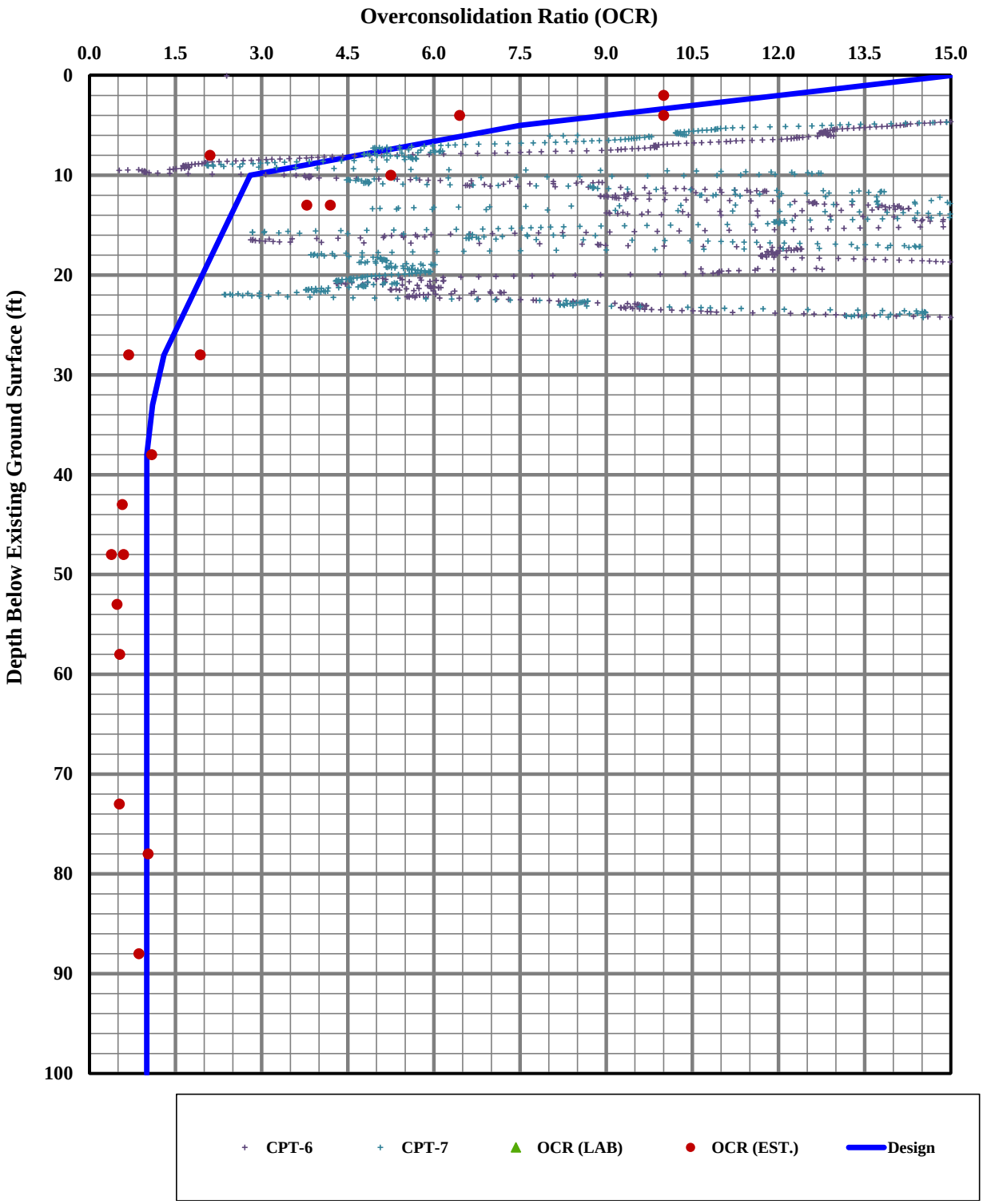
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Initial Void Ratio Profile** **Syngenta - Area 2 (North)**	**Appendix:** E **Figure:** 5



Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Compression Index Profile** **Syngenta - Area 2 (North)**	**Appendix:** E **Figure:** 6



Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Recompression Index Profile** **Syngenta - Area 2 (North)**	**Appendix:** E **Figure:** 7



Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Overconsolidation Ratio Profile** **Syngenta - Area 2 (North)**	**Appendix:** E **Figure:** 8

APPENDIX F

DESIGN SOIL PARAMETERS
SYNGENTA – AREA 3

Tabulated Design Soil Parameters

Depth Range (ft)		Thickness of Layer (ft)	Soil Type	Undrained Shear Strength, S_u (psf)		Internal Friction Angle, Φ (°)	Total Unit Weight, γ (pcf)	Effective Vertical Stress at Center of Layer, σ'_{vo} (psf)	Initial Void Ratio, e_o	Compression Index, C_c	Recompression Index, C_r	Overconsolidation Ratio, OCR		Elastic Modulus, E_{50} (ksf)	
				Top	Bottom							Top	Bottom	Top	Bottom
0	5	5	Clay	500	500	--	114	285	1.10	0.60	0.08	15.00	6.00	200	220
5	12	7	Clay	500	500	--	111	740	1.20	0.60	0.08	6.00	3.00	220	260
12	18	6	Clay	500	500	--	104	1,035	1.40	0.80	0.10	3.00	1.70	260	300
18	23	5	Clay	350	350	--	90	1,229	1.40	0.80	0.10	1.70	1.30	300	200
23	28	5	Clay	500	500	--	95	1,379	4.00	2.50	0.31	1.30	1.00	50	70
28	33	5	Clay	700	700	--	95	1,542	4.00	2.50	0.31	1.00	1.00	160	285
33	58	25	Clay	355	635	--	113	2,256	1.20	0.50	0.06	1.00	1.00	210	285
58	73	15	Clay	635	790	--	109	3,238	1.20	0.50	0.06	1.00	1.00	285	355
73	100	27	Clay	790	1,035	--	104	4,149	1.50	0.70	0.09	1.00	1.00	210	275

Project:
Syngenta Site Evaluation
Carville, Louisiana

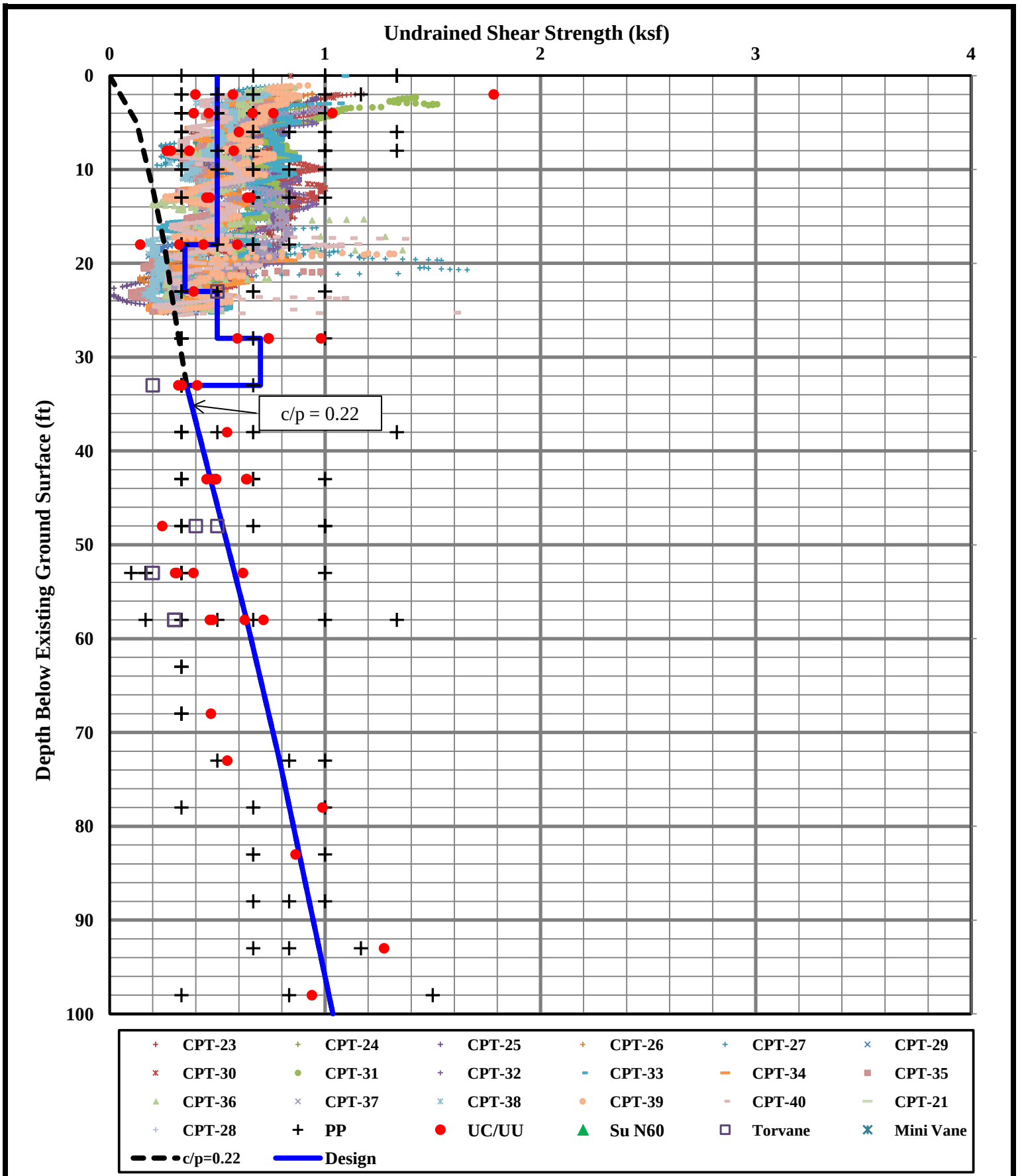
Tolunay-Wong Engineers, Inc.

Project No.: 15.33.021
Report No.: 16855

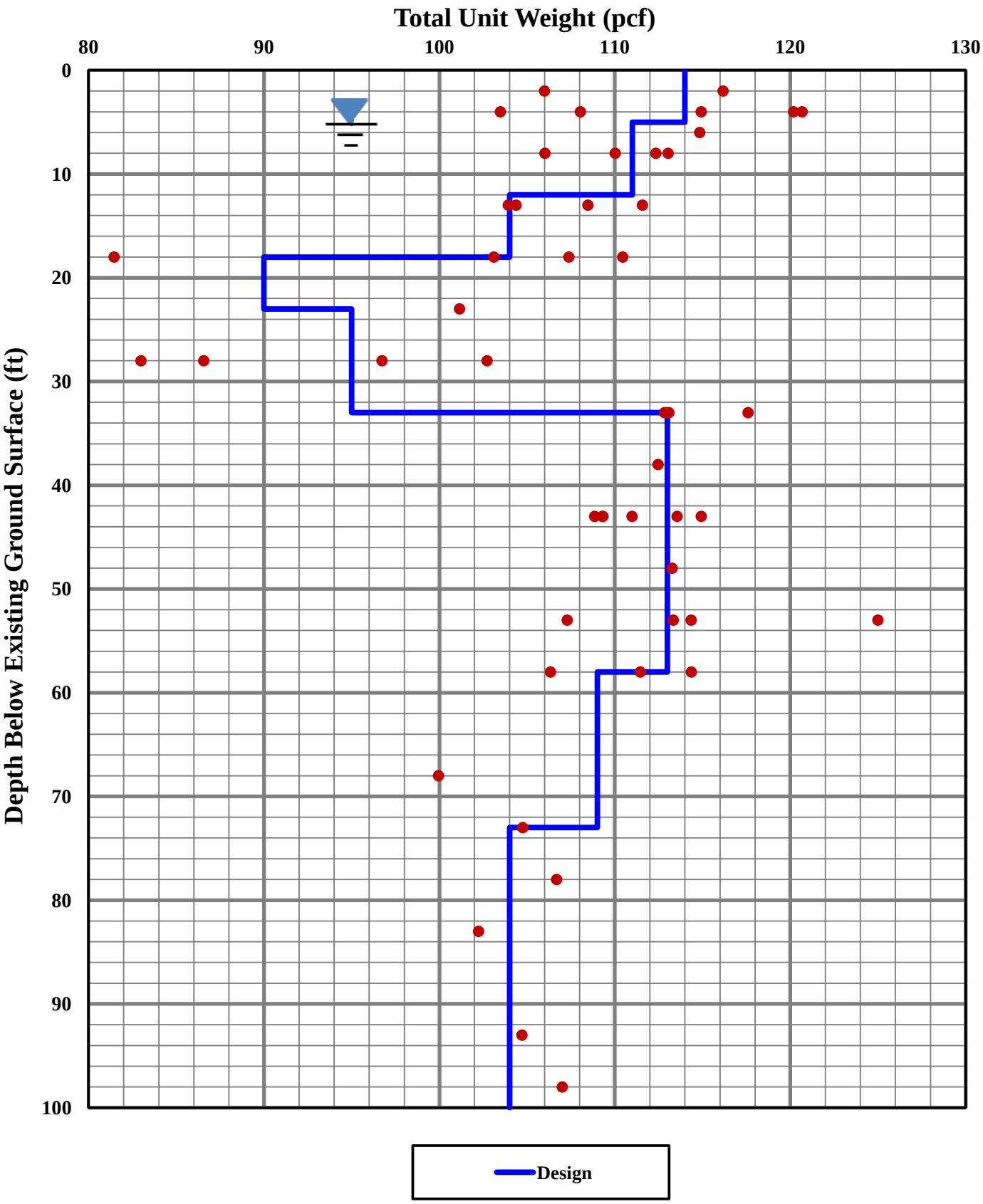
Client:
Wanhua Chemical US Holdings, Inc.
Houston, Texas

Summary of Design Soil Parameters
Syngenta - Area 3 (East)

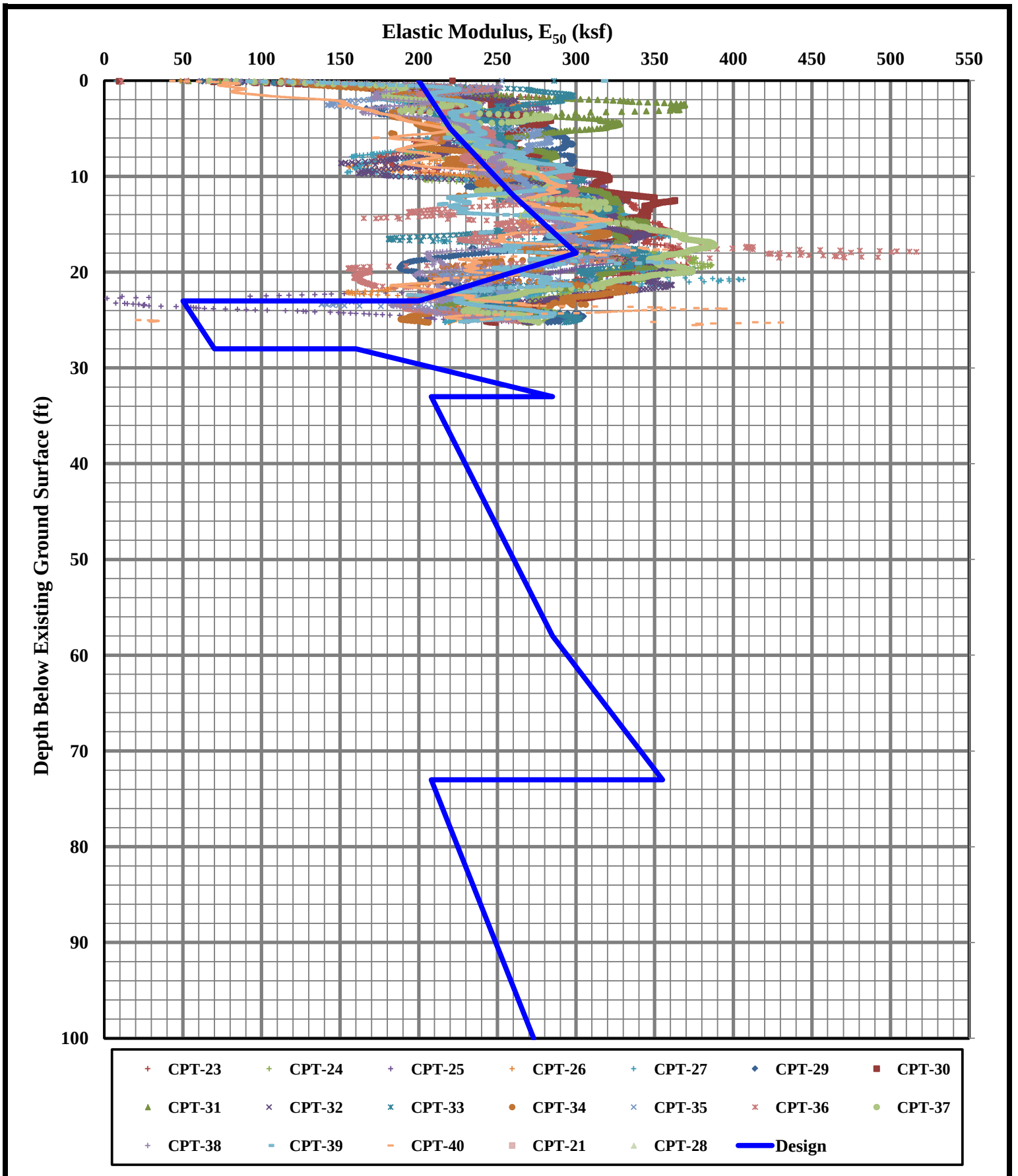
Appendix: F
Figure: 1



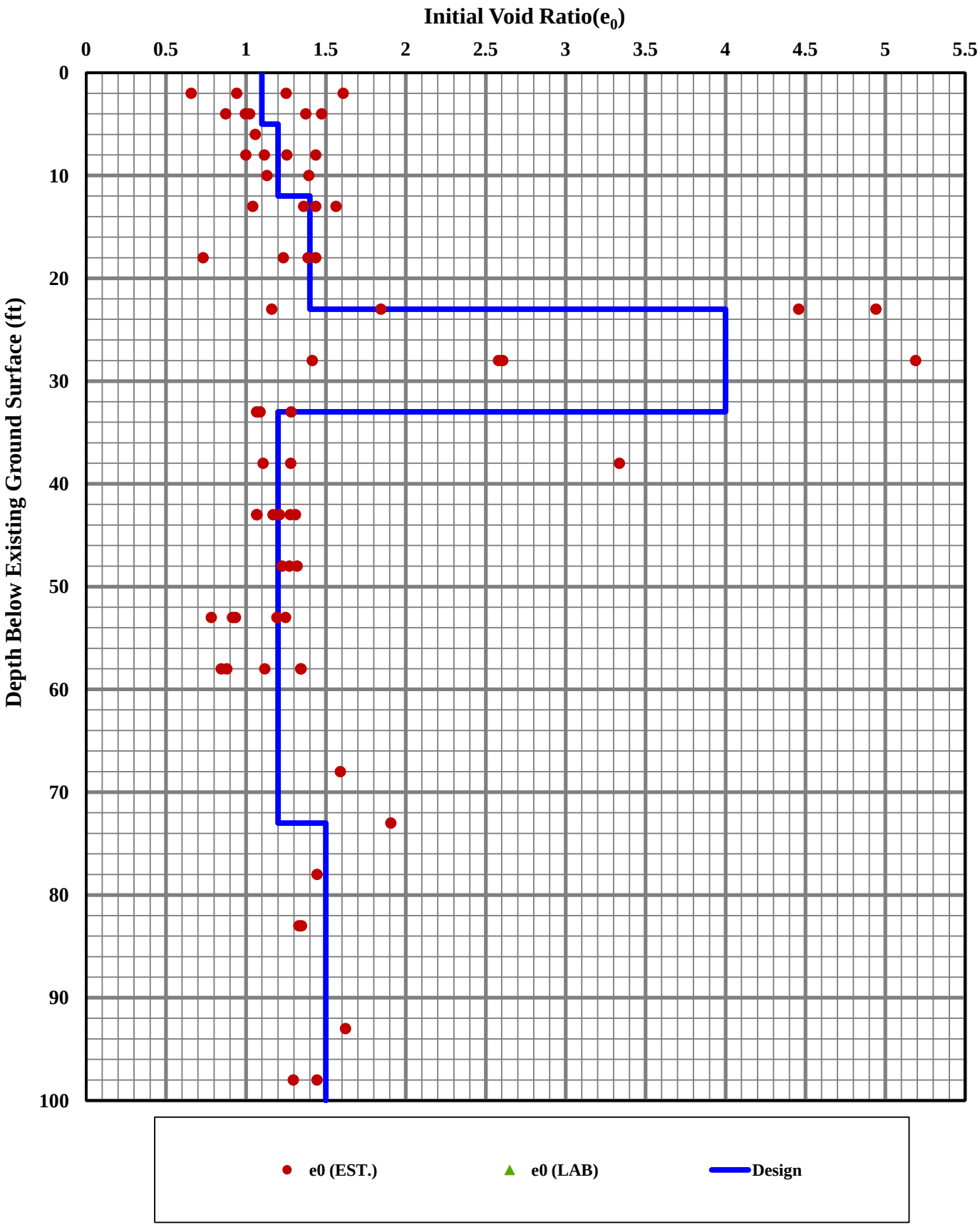
Project: Syngenta Site Evaluation Carville, Louisiana	**Tolunay-Wong Engineers, Inc.**	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Undrained Shear Strength Profile** **Syngenta - Area 3 (East)**	**Appendix:** F **Figure:** 2



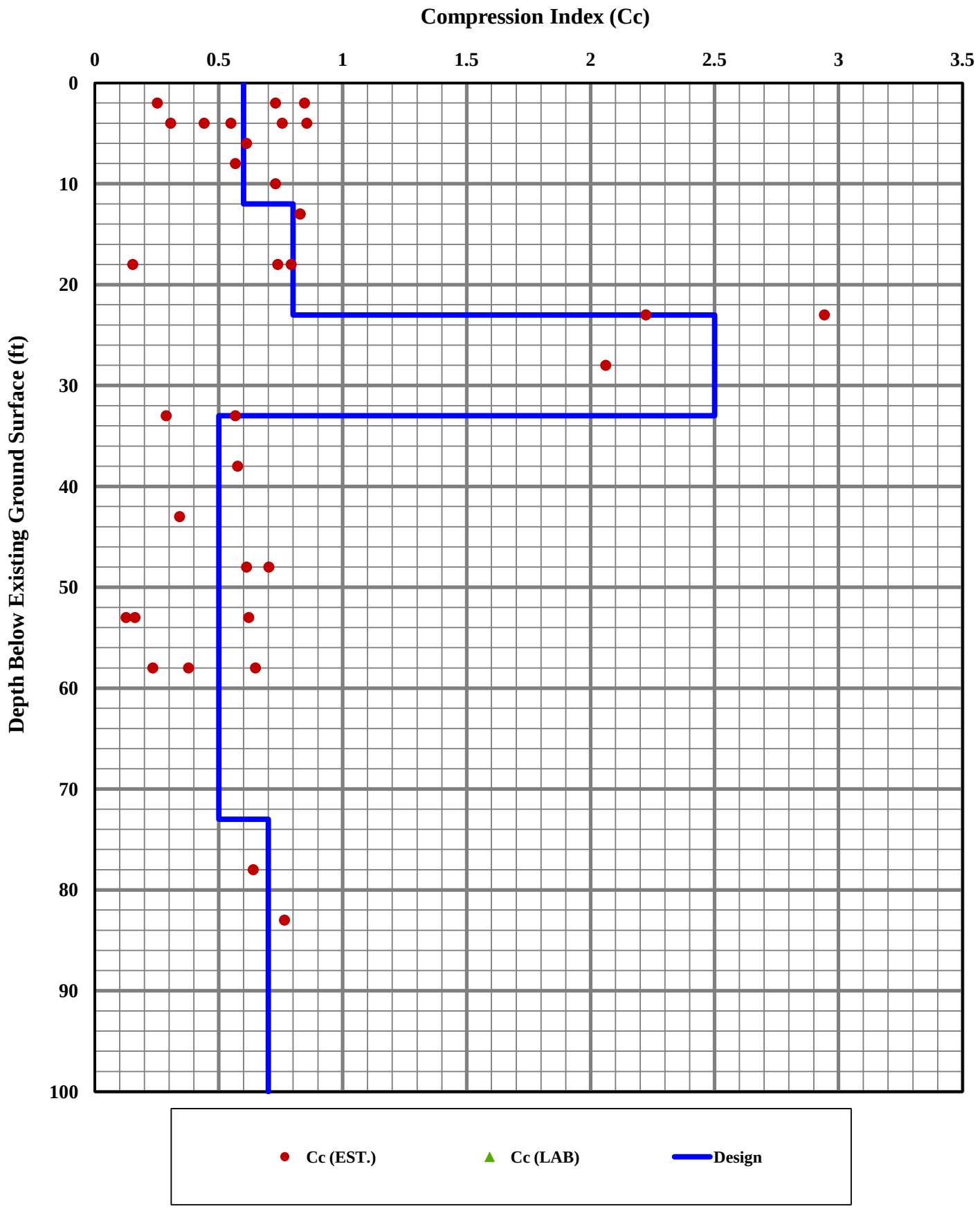
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Total Unit Weight Profile** **Syngenta - Area 3 (East)**	**Appendix:** F **Figure:** 3



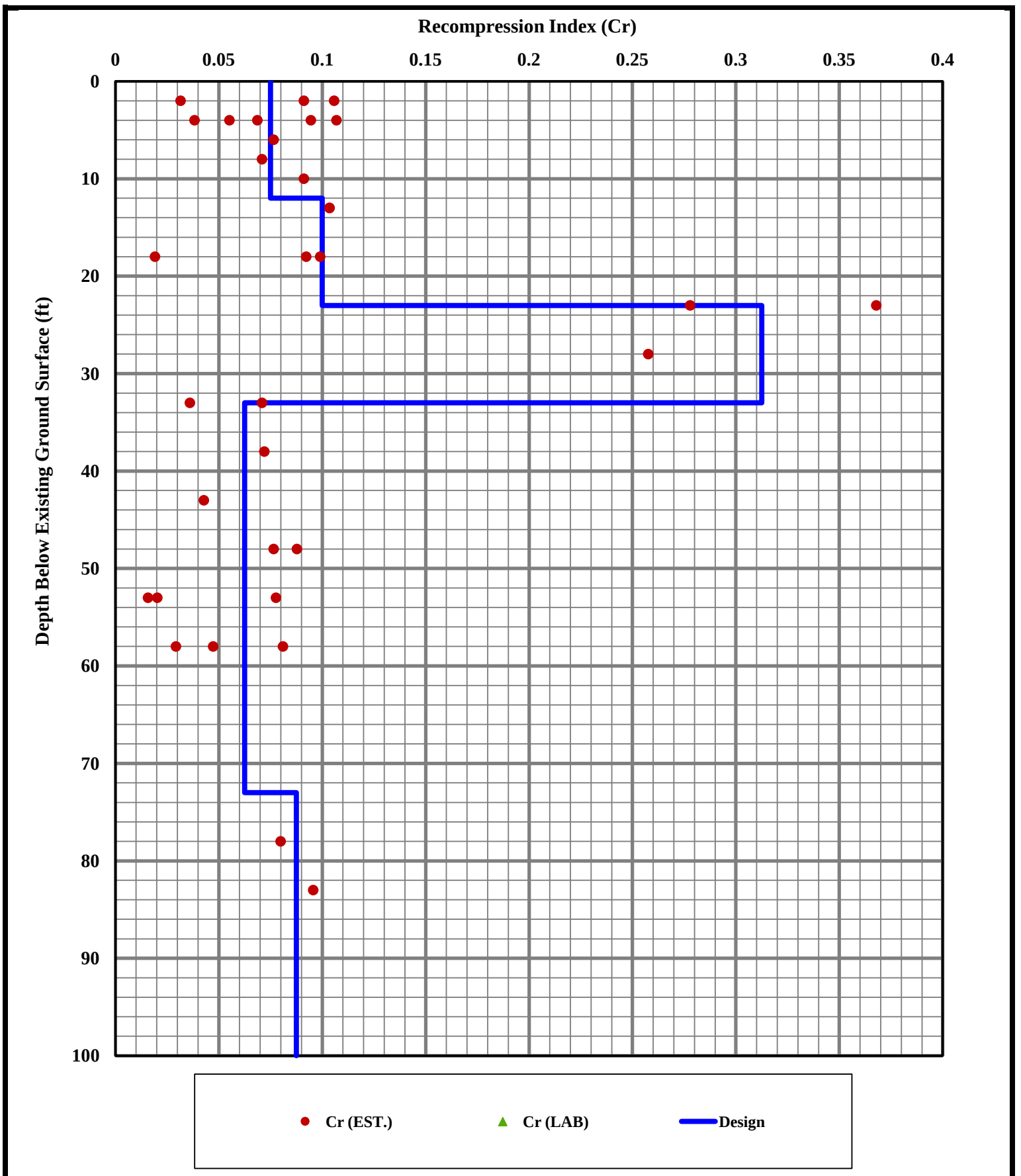
Project: Syngenta Site Evaluation Carville, Louisiana	**Tolunay-Wong Engineers, Inc.**	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Elastic Modulus Profile** **Syngenta - Area 3 (East)**	**Appendix:** F **Figure:** 4



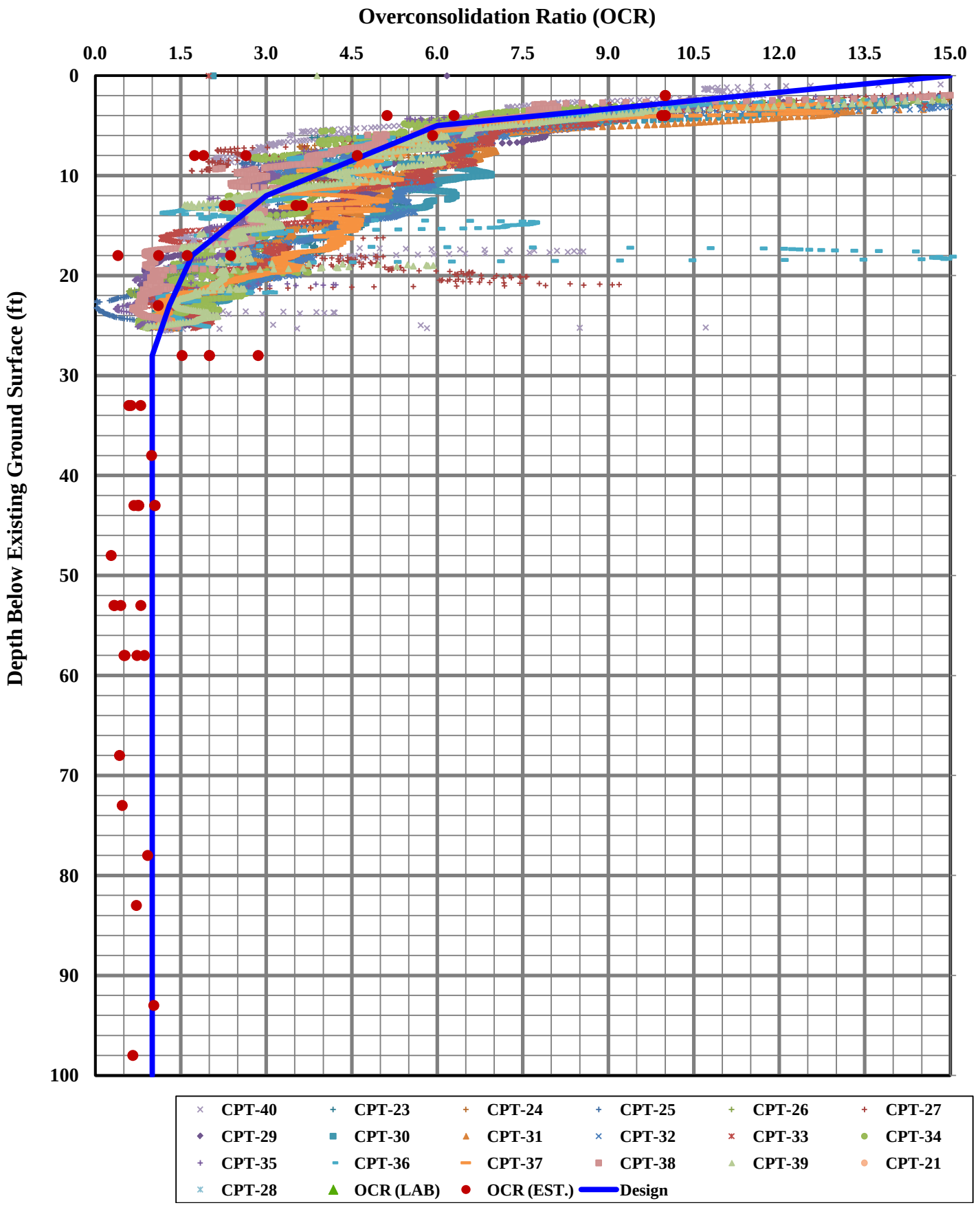
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Initial Void Ratio Profile** **Syngenta - Area 3 (East)**	**Appendix:** F **Figure:** 5



Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Compression Index Profile** **Syngenta - Area 3 (East)**	**Appendix:** F **Figure:** 6



Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Recompression Index Profile** **Syngenta - Area 3 (East)**	**Appendix:** F **Figure:** 7



Project: Syngenta Site Evaluation Carville, Louisiana	**Tolunay-Wong Engineers, Inc.**	**Project No.:** 15.33.021 **Report No.:** 16855
Client: Wanhua Chemical US Holdings, Inc. Houston, Texas	**Overconsolidation Ratio Profile** **Syngenta - Area 3 (East)**	**Appendix:** F **Figure:** 8

APPENDIX G

RESULTS OF ANALYTICAL TESTS
(PH, SULFATES AND CHLORIDES)

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

August 03, 2015

Adam Milling
Tolunay-Wong Engineers
1201 24th Street
Kenner, LA 70062

RE: Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Dear Adam Milling:
Enclosed are the analytical results for sample(s) received by the laboratory on July 29, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Karen Brown
karen.brown@pacelabs.com
Project Manager

Enclosures

cc: Dustin Walker, Tolunay-Wong Engineers

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

CERTIFICATIONS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

New Orleans Certification IDs

California Env. Lab Accreditation Program Branch: 11277CA
Florida Department of Health (NELAC): E87595
Illinois Environmental Protection Agency: 0025721
Kansas Department of Health and Environment (NELAC): E-10266
Louisiana Dept. of Environmental Quality (NELAC/LELAP): 02006
Pennsylvania Dept. of Env Protection (NELAC): 68-04202
Texas Commission on Env. Quality (NELAC): T104704405-09-TX
U.S. Dept. of Agriculture Foreign Soil Import: P330-10-00119

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

SAMPLE SUMMARY

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Lab ID	Sample ID	Matrix	Date Collected	Date Received
2023333001	**B-7 @ 5'**	Solid	07/28/15 16:12	07/29/15 16:40
2023333002	**B-7 @ 10'**	Solid	07/28/15 16:12	07/29/15 16:40
2023333003	**B-7 @ 15'**	Solid	07/28/15 16:12	07/29/15 16:40
2023333004	**B-12 @ 5'**	Solid	07/28/15 16:15	07/29/15 16:40
2023333005	**B-12 @ 10'**	Solid	07/28/15 16:15	07/29/15 16:40
2023333006	**B-12 @ 15'**	Solid	07/28/15 16:15	07/29/15 16:40
2023333007	**B-19 @ 5'**	Solid	07/28/15 16:20	07/29/15 16:40
2023333008	**B-19 @ 10'**	Solid	07/28/15 16:20	07/29/15 16:40
2023333009	**B-19 @ 15'**	Solid	07/28/15 16:20	07/29/15 16:40
2023333010	**B-23 @ 5'**	Solid	07/28/15 16:20	07/29/15 16:40
2023333011	**B-23 @ 10'**	Solid	07/28/15 16:20	07/29/15 16:40
2023333012	**B-23 @ 15'**	Solid	07/28/15 16:20	07/29/15 16:40
2023333013	**B-28 @ 5'**	Solid	07/28/15 16:20	07/29/15 16:40
2023333014	**B-28 @ 10'**	Solid	07/28/15 16:20	07/29/15 16:40
2023333015	**B-28 @ 15'**	Solid	07/28/15 16:20	07/29/15 16:40

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

SAMPLE ANALYTE COUNT

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
2023333001	**B-7 @ 5'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333002	**B-7 @ 10'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333003	**B-7 @ 15'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333004	**B-12 @ 5'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333005	**B-12 @ 10'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333006	**B-12 @ 15'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333007	**B-19 @ 5'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333008	**B-19 @ 10'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333009	**B-19 @ 15'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333010	**B-23 @ 5'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333011	**B-23 @ 10'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333012	**B-23 @ 15'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333013	**B-28 @ 5'**	EPA 9045	JMA	1	PASI-N

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SAMPLE ANALYTE COUNT

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333014	**B-28 @ 10'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N
2023333015	**B-28 @ 15'**	EPA 9045	JMA	1	PASI-N
		EPA 9038	JMA	1	PASI-N
		EPA 9251	JMA	1	PASI-N

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PROJECT NARRATIVE

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Method: **EPA 9045**
Description: 9045 pH Soil
Client: Tolunay-Wong Engineers, Inc.
Date: August 03, 2015

General Information:
15 samples were analyzed for EPA 9045. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Method: **EPA 9038**
Description: 9038 Sulfate, Turbidimetric
Client: Tolunay-Wong Engineers, Inc.
Date: August 03, 2015

General Information:
15 samples were analyzed for EPA 9038. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 9038 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Method: **EPA 9251**
Description: 9251 Chloride
Client: Tolunay-Wong Engineers, Inc.
Date: August 03, 2015

General Information:
15 samples were analyzed for EPA 9251. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 9251 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Sample: B-7 @ 5' **Lab ID: 2023333001** Collected: 07/28/15 16:12 Received: 07/29/15 16:40 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**5.4**	Std. Units	0.010	1		07/30/15 12:38		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**1760**	mg/kg	236	5	07/30/15 11:24	07/31/15 09:53	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**167**	mg/kg	9.4	1	07/30/15 11:24	07/31/15 10:23	16887-00-6	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Sample: B-7 @ 10' **Lab ID: 2023333002** Collected: 07/28/15 16:12 Received: 07/29/15 16:40 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**5.3**	Std. Units	0.010	1		07/30/15 12:39		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**7110**	mg/kg	2250	50	07/30/15 11:24	07/31/15 11:15	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**461**	mg/kg	9.0	1	07/30/15 11:24	07/31/15 10:23	16887-00-6	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Sample: B-7 @ 15' **Lab ID: 2023333003** Collected: 07/28/15 16:12 Received: 07/29/15 16:40 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**7.5**	Std. Units	0.010	1		07/30/15 12:45		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**689**	mg/kg	221	5	07/30/15 11:24	07/31/15 09:53	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**67.5**	mg/kg	8.8	1	07/30/15 11:24	07/31/15 10:20	16887-00-6	

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ANALYTICAL RESULTS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Sample: B-12 @ 5' **Lab ID: 2023333004** Collected: 07/28/15 16:15 Received: 07/29/15 16:40 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**7.1**	Std. Units	0.010	1		07/30/15 12:45		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**1700**	mg/kg	243	5	07/30/15 11:24	07/31/15 09:53	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**176**	mg/kg	9.7	1	07/30/15 11:24	07/31/15 10:20	16887-00-6	

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ANALYTICAL RESULTS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Sample: B-12 @ 10' **Lab ID: 2023333005** Collected: 07/28/15 16:15 Received: 07/29/15 16:40 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**7.2**	Std. Units	0.010	1		07/30/15 12:46		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**7200**	mg/kg	2400	50	07/30/15 11:24	07/31/15 11:15	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**522**	mg/kg	9.6	1	07/30/15 11:24	07/31/15 10:20	16887-00-6	

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ANALYTICAL RESULTS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Sample: B-12 @ 15' **Lab ID: 2023333006** Collected: 07/28/15 16:15 Received: 07/29/15 16:40 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**7.2**	Std. Units	0.010	1		07/30/15 12:48		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**1750**	mg/kg	238	5	07/30/15 11:24	07/31/15 10:00	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**179**	mg/kg	9.5	1	07/30/15 11:24	07/31/15 10:20	16887-00-6	

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ANALYTICAL RESULTS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Sample: B-19 @ 5' **Lab ID: 2023333007** Collected: 07/28/15 16:20 Received: 07/29/15 16:40 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**7.4**	Std. Units	0.010	1		07/30/15 12:49		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**1300**	mg/kg	240	5	07/30/15 11:24	07/31/15 10:00	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**132**	mg/kg	9.6	1	07/30/15 11:24	07/31/15 10:20	16887-00-6	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Sample: B-19 @ 10' **Lab ID: 2023333008** Collected: 07/28/15 16:20 Received: 07/29/15 16:40 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**7.6**	Std. Units	0.010	1		07/30/15 12:51		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**3890**	mg/kg	2290	50	07/30/15 11:24	07/31/15 11:12	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**217**	mg/kg	9.2	1	07/30/15 11:24	07/31/15 10:20	16887-00-6	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Sample: B-19 @ 15' **Lab ID: 2023333009** Collected: 07/28/15 16:20 Received: 07/29/15 16:40 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**7.6**	Std. Units	0.010	1		07/30/15 12:53		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**3870**	mg/kg	2230	50	07/30/15 11:24	07/31/15 11:12	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**286**	mg/kg	8.9	1	07/30/15 11:24	07/31/15 10:20	16887-00-6	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

QC Batch: WET/7774 Analysis Method: EPA 9045
QC Batch Method: EPA 9045 Analysis Description: 9045 pH
Associated Lab Samples: 2023333001, 2023333002, 2023333003, 2023333004, 2023333005, 2023333006, 2023333007, 2023333008, 2023333009, 2023333010, 2023333011, 2023333012, 2023333013, 2023333014, 2023333015

LABORATORY CONTROL SAMPLE: 142861

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
pH at 25 Degrees C	Std. Units	6	6.0	100	97-103	

SAMPLE DUPLICATE: 142872

Parameter	Units	2023293001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	5.6	5.8	4	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

QC Batch: WETA/6767 Analysis Method: EPA 9038
QC Batch Method: EPA 9038 Analysis Description: 9038 Sulfate, Turbidimetric
Associated Lab Samples: 2023333001, 2023333002, 2023333003, 2023333004, 2023333005, 2023333006, 2023333007, 2023333008, 2023333009, 2023333010, 2023333011, 2023333012, 2023333013, 2023333014, 2023333015

METHOD BLANK: 142863 Matrix: Solid
Associated Lab Samples: 2023333001, 2023333002, 2023333003, 2023333004, 2023333005, 2023333006, 2023333007, 2023333008, 2023333009, 2023333010, 2023333011, 2023333012, 2023333013, 2023333014, 2023333015

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/kg	ND	50.0	07/31/15 09:33	

LABORATORY CONTROL SAMPLE: 142864

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	323	322	100	90-110	

MATRIX SPIKE SAMPLE: 142866

Parameter	Units	2023333001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	1760	91.7	3720	2140	75-125	

SAMPLE DUPLICATE: 142865

Parameter	Units	2023333001 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfate	mg/kg	1760	1780	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

QC Batch: WETA/6768 Analysis Method: EPA 9251
QC Batch Method: EPA 9251 Analysis Description: 9251 Chloride
Associated Lab Samples: 2023333001, 2023333002, 2023333003, 2023333004, 2023333005, 2023333006, 2023333007, 2023333008, 2023333009, 2023333010, 2023333011, 2023333012, 2023333013, 2023333014, 2023333015

METHOD BLANK: 142867 Matrix: Solid
Associated Lab Samples: 2023333001, 2023333002, 2023333003, 2023333004, 2023333005, 2023333006, 2023333007, 2023333008, 2023333009, 2023333010, 2023333011, 2023333012, 2023333013, 2023333014, 2023333015

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/kg	ND	10.0	07/31/15 10:23	

LABORATORY CONTROL SAMPLE: 142868

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	707	643	91	90-110	

MATRIX SPIKE SAMPLE: 142870

Parameter	Units	2023333001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	167	917	1260	119	75-125	

SAMPLE DUPLICATE: 142869

Parameter	Units	2023333001 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	mg/kg	167	167	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The Nelac Institute

LABORATORIES

PASI-N Pace Analytical Services - New Orleans

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: WANHUA CHEMICAL STUDY
Pace Project No.: 2023333

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
2023333001	**B-7 @ 5'**	EPA 9045	WET/7774		
2023333002	**B-7 @ 10'**	EPA 9045	WET/7774		
2023333003	**B-7 @ 15'**	EPA 9045	WET/7774		
2023333004	**B-12 @ 5'**	EPA 9045	WET/7774		
2023333005	**B-12 @ 10'**	EPA 9045	WET/7774		
2023333006	**B-12 @ 15'**	EPA 9045	WET/7774		
2023333007	**B-19 @ 5'**	EPA 9045	WET/7774		
2023333008	**B-19 @ 10'**	EPA 9045	WET/7774		
2023333009	**B-19 @ 15'**	EPA 9045	WET/7774		
2023333010	**B-23 @ 5'**	EPA 9045	WET/7774		
2023333011	**B-23 @ 10'**	EPA 9045	WET/7774		
2023333012	**B-23 @ 15'**	EPA 9045	WET/7774		
2023333013	**B-28 @ 5'**	EPA 9045	WET/7774		
2023333014	**B-28 @ 10'**	EPA 9045	WET/7774		
2023333015	**B-28 @ 15'**	EPA 9045	WET/7774		
2023333001	**B-7 @ 5'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333002	**B-7 @ 10'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333003	**B-7 @ 15'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333004	**B-12 @ 5'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333005	**B-12 @ 10'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333006	**B-12 @ 15'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333007	**B-19 @ 5'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333008	**B-19 @ 10'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333009	**B-19 @ 15'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333010	**B-23 @ 5'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333011	**B-23 @ 10'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333012	**B-23 @ 15'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333013	**B-28 @ 5'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333014	**B-28 @ 10'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333015	**B-28 @ 15'**	EPA 9038	WETA/6767	EPA 9038	WETA/6776
2023333001	**B-7 @ 5'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333002	**B-7 @ 10'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333003	**B-7 @ 15'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333004	**B-12 @ 5'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333005	**B-12 @ 10'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333006	**B-12 @ 15'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333007	**B-19 @ 5'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333008	**B-19 @ 10'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333009	**B-19 @ 15'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333010	**B-23 @ 5'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333011	**B-23 @ 10'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333012	**B-23 @ 15'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333013	**B-28 @ 5'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333014	**B-28 @ 10'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775
2023333015	**B-28 @ 15'**	EPA 9251	WETA/6768	EPA 9251	WETA/6775

REPORT OF LABORATORY ANALYSIS

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CHAIN-OF-CUST

The Chain-of-Custody is a LEC

WO# : 2023333

2023333

Page: 1 of 2

1947360

Section A
Required Client Information:

Company: Tolunay-Wong Engineers
Address: 1201 24th St.
Kenner, LA 70062
Email To: cmilling@tweinc.com
Phone: 225-939-7901 Fax:
Requested Due Date/TAT: 8-4-15

Section B
Required Project Information:

Report To: Adam M. Illing
Copy To: Dustin Walker
dwalker@tweinc.com
Purchase Order No.: 15.33.021 Phase 1
Project Name: Wanhua Chemical Shady and Syngas
Project Number: 15.33.021

Sec
Invoice Information:

Attention:
Company Name:
Address:
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: LA

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes
MATRIX / CODE

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	pH	Sulfates	Chlorides	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	B-7 @ 5'	SL	G	7/28	4:10p	7/28	4:12p		1										X	X	X		
2	B-7 @ 10'	SL	G	7/28	4:10p	7/28	4:12p		1										X	X	X		
3	B-7 @ 15'	SL	G	7/28	4:10p	7/28	4:12p		1										X	X	X		
4	B-12 @ 5'	SL	G	7/28	4:12p	7/28	4:15p		1										X	X	X		
5	B-12 @ 10'	SL	G	7/28	4:12p	7/28	4:15p		1										X	X	X		
6	B-12 @ 15'	SL	G	7/28	4:12p	7/28	4:15p		1										X	X	X		
7	B-19 @ 5'	SL	G	7/28	4:10p	7/28	4:20p		1										X	X	X		
8	B-19 @ 10'	SL	G	7/28	4:10p	7/28	4:20p		1										X	X	X		
9	B-19 @ 15'	SL	G	7/28	4:10p	7/28	4:20p		1										X	X	X		
10	B-23 @ 5'	SL	G	7/28	4:10p	7/28	4:20p		1										X	X	X		
11	B-23 @ 10'	SL	G	7/28	4:10p	7/28	4:20p		1										X	X	X		
12	B-23 @ 15'	SL	G	7/28	4:10p	7/28	4:20p		1										X	X	X		

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
		7-29-15	16:20		7-29-15	16:20
		7/29/15	16:40		7/29/15	1640

SAMPLE CONDITIONS			
A	N	N	y

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER:
SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY):

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

ORIGINAL

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

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www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

1947361

Section A Required Client Information:

Company:	Tolunay-Wong Engineers
Address:	1201 24th street
	Kenner, LA 70062
Email To:	amilling@tweinc.com
Phone: 225-939-7901	Fax:
Requested Due Date/TAT:	8-4-15

Section B Required Project Information:

Report To:	Adam Milling
Copy To:	Dustin Walker
	dwalker@tweinc.com
Purchase Order No.:	15.33.021 Phase I
Project Name:	Wanhua Chemical Study and Synopsis
Project Number:	15.33.021

Section C Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: LA

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes MATRIX / CODE

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Y/N	Analysis Test: pH	Sulfates	Chlorides	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	B-28 @ 5'	SL	G	7/28	4:15p	7/28	4:20p												X	X	X		
2	B-28 @ 10'	SL	G	7/28	4:15p	7/28	4:20p												X	X	X		
3	B-28 @ 15'	SL	G	7/28	4:15p	7/28	4:20p												X	X	X		
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
		7-29-15	1620		7/29/15	1650	A	N	N	y
		7-29-15	1640		7/29/15	1640				

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY):

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

WO#: 2023333

Pace Analytical

1000 Riverbend. Blvd., Suite F
St. Rose, LA 70087

Sample Condition Upon F

PM: KHB Due Date: 08/07/15
CLIENT: 20-TOLUNAY Tolunay-Wong Eng:

Project #: 20

Courier: ☑ Pace Courier ☐ Hired Courier ☐ Fed X ☐ UPS ☐ DHL ☐ USPS ☐ Customer ☐ Other

Custody Seal on Cooler/Box Present: [see COC] **Custody Seals intact:** ☐Yes ☑No

Therometer Used: ☐ Therm Fisher IR 5 ☐ Therm Fisher IR 6 ☐ Therm Fisher IR 7

Type of Ice: Wet Blue (None)

Samples on ice: [see COC]

Cooler Temperature: [see COC]

Temp should be above freezing to 6°C

Date and Initials of person examining contents: 7-30-15

Temp must be measured from Temperature blank when present

		Comments:
Temperature Blank Present"?	☐Yes ☑No ☐N/A	1
Chain of Custody Present:	☑Yes ☐No ☐N/A	2
Chain of Custody Complete:	☑Yes ☐No ☐N/A	3
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	4
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	5
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	6
Sufficient Volume:	☑Yes ☐No ☐N/A	7
Correct Containers Used:	☑Yes ☐No ☐N/A	8
Filtered vol. Rec. for Diss. tests	☐Yes ☑No ☐N/A	9
Sample Labels match COC:	☑Yes ☐No ☐N/A	10
All containers received within manafacture's precautionary and/or expiration dates.	☑Yes ☐No ☐N/A	11
All containers needing chemical preservation have been checked (except VOA, coliform, & O&G).	☐Yes ☐No ☑N/A	12
All containers preservation checked found to be in compliance with EPA recommendation.	☐Yes ☐No ☑N/A	13 If No, was preserative added? ☐Yes ☐No If added record lot no.: HNO3 _____ H2SO4 _____
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	14
Trip Blank Present:	☐Yes ☑No	15

Client Notification/ Resolution:

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

APPENDIX H

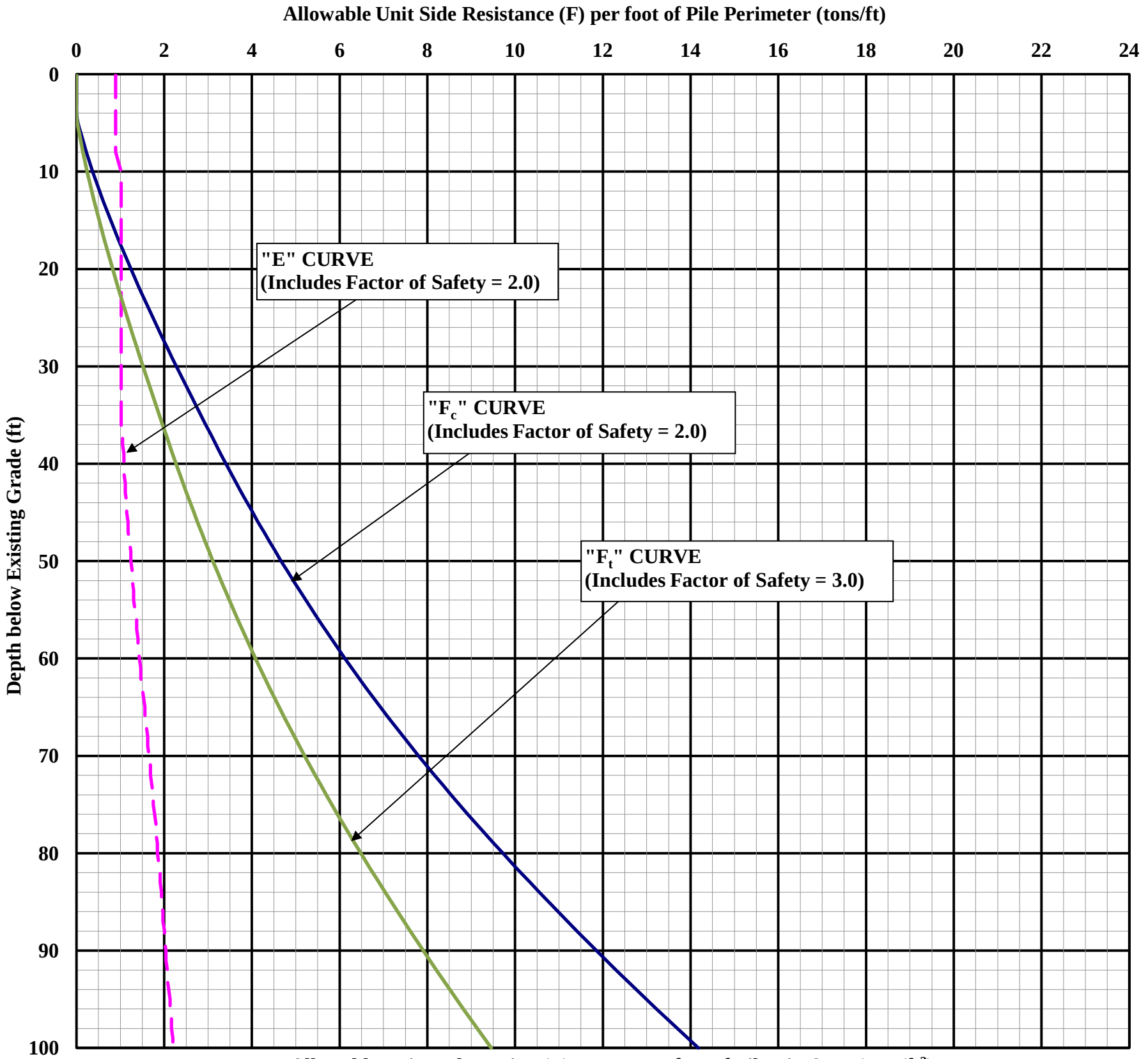
SOIL PROFILE CROSS SECTIONS
(NOT PROVIDED IN THIS PRELIMINARY REPORT)

APPENDIX I

PRELIMINARY ALLOWABLE UNIT FRICTION AND END BEARING
CAPACITY CURVES AND PILE CAPACITY TABLES
PRECAST CONCRETE PILES & AUGERCAST PILES

SYNGENTA – AREA 1

ALLOWABLE UNIT SIDE FRICTION AND END BEARING RESISTANCE
DRIVEN SYP TIMBER OR PRECAST CONCRETE PILES



DESIGN EQUATIONS:

Compression: $Q_c = PF_c + AE$

Tension: $Q_t = PF_t$

TERMS:

P = Average Pile Perimeter (ft)

A = Pile Tip Area (ft^2)

F_c, F_t & E = Allowable Unit Friction (Compression/Tension) and End Bearing Factors

$Q_{c,t}$ = Allowable Pile Capacity in Compression and Tension (tons)

(See Notes 1 thru 5 on Figure 2 of Appendix D)

EXAMPLE:

Driven Precast Concrete Pile
(14-in Width, 50-ft Length)

P = 4.67 ft

A = 1.36 ft^2

F_c = 4.66 tons/ft

F_t = 3.11 tons/ft

E = 1.24 tons/ft^2

Q_c = (4.67)(4.66) + (1.36)(1.24) = 23.45-tons

Q_t = (4.67)(3.11) = 14.52-tons

Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Unit F & E Curves** **Driven Timber and Concrete Piles** **Syngenta Area 1 (West)**	Appendix I Figure 1

ROUND DRIVEN SYP TIMBER PILES

Allowable Axial Capacity (tons)

Pile Butt Diameter (in)	Embedment Depth (ft)	Average Perimeter (ft)	Tip Area (ft^2)	Design Factors from Curves			Compression (tons)	Tension (tons)
				F_c	F_t	E		
13	45	2.79	0.38	4.02	2.68	1.15	12	7
13	50	2.75	0.35	4.66	3.11	1.24	13	9
13	55	2.70	0.32	5.37	3.58	1.34	15	10
13	60	2.66	0.29	6.12	4.08	1.43	17	11
13	65	2.62	0.27	6.93	4.62	1.56	19	12

SQUARE PRECAST CONCRETE PILES

Allowable Axial Capacity (tons)

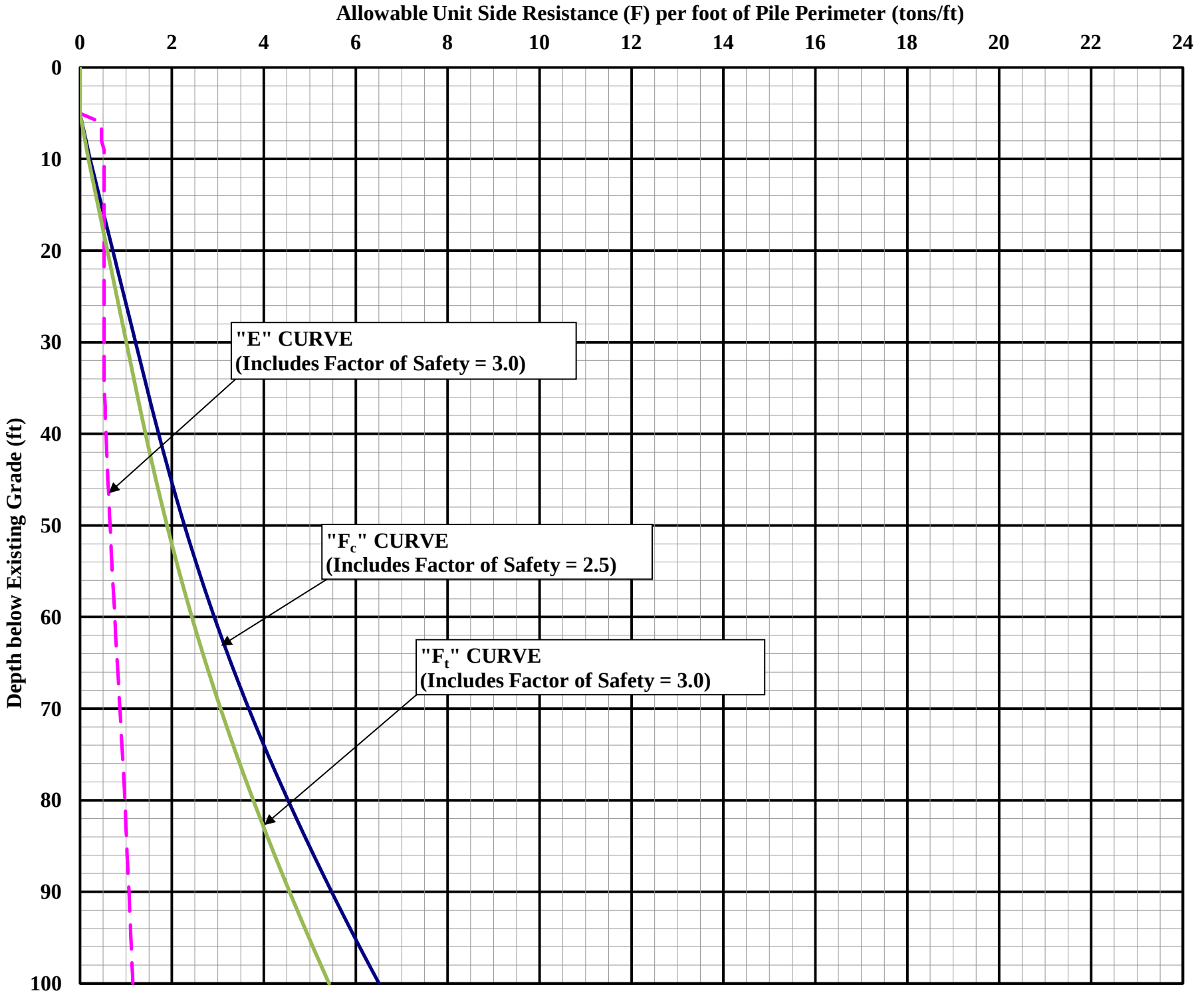
Pile Width (in) (Square)	Embedment Depth (ft)	Perimeter (ft)	Area (ft^2)	Design Factors from Curves			Compression (tons)	Tension (tons)
				F_c	F_t	E		
12	50	4.00	1.00	4.66	3.11	1.24	20	12
12	60	4.00	1.00	6.12	4.08	1.43	26	16
12	70	4.00	1.00	7.80	5.20	1.66	33	21
12	80	4.00	1.00	9.72	6.48	1.85	41	26
12	90	4.00	1.00	11.86	7.90	2.04	49	32
14	50	4.67	1.36	4.66	3.11	1.24	23	15
14	60	4.67	1.36	6.12	4.08	1.43	31	19
14	70	4.67	1.36	7.80	5.20	1.66	39	24
14	80	4.67	1.36	9.72	6.48	1.85	48	30
14	90	4.67	1.36	11.86	7.90	2.04	58	37
16	50	5.33	1.78	4.66	3.11	1.24	27	17
16	60	5.33	1.78	6.12	4.08	1.43	35	22
16	70	5.33	1.78	7.80	5.20	1.66	45	28
16	80	5.33	1.78	9.72	6.48	1.85	55	35
16	90	5.33	1.78	11.86	7.90	2.04	67	42
18	50	6.00	2.25	4.66	3.11	1.24	31	19
18	60	6.00	2.25	6.12	4.08	1.43	40	24
18	70	6.00	2.25	7.80	5.20	1.66	51	31
18	80	6.00	2.25	9.72	6.48	1.85	63	39
18	90	6.00	2.25	11.86	7.90	2.04	76	47

Notes:

1) Pile embedment depth is depth below existing ground surface.
2) Allowable axial compression values in the above table are net loads and should consist of DL + LL.
3) Allowable axial compression and tension values in the above table may be increased by 33% for transient loads including wind.
4) Allowable axial tension capacity values in the above table do not include the weight of the pile.
5) We recommend that allowable axial compression capacity values for SYP timber piles be limited to a maximum of 25 tons.

Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Axial Capacity** **Driven Timber and Concrete Piles** **Syngenta Area 1 (North)**	Appendix I Figure 2

ALLOWABLE UNIT SIDE FRICTION AND END BEARING RESISTANCE
AUGERED CAST-IN-PLACE PILES



DESIGN EQUATIONS:

Compression: $Q_c = PF_c + AE$

Tension: $Q_t = PF_t$

TERMS:

P = Average Pile Perimeter (ft)

A = Pile Tip Area (ft^2)

F_c, F_t & E = Allowable Unit Friction (Compression/Tension) and End Bearing Factors

$Q_{c,t}$ = Allowable Pile Capacity in Compression and Tension (tons)

(See Notes 1 thru 4 on Figure 4 of Appendix H)

EXAMPLE:

Augered Cast-in-Place Pile
(14-in Diameter, 50-ft Length)

P = 3.67-ft

A = 1.07-ft^2

F_c = 2.27-tons/ft

F_t = 1.90-tons/ft

E = 0.65-tons/ft^2

Q_c = (3.67)(2.27) + (1.07)(0.65) = 9.03-tons

Q_t = (3.67)(1.90) = 6.97-tons

Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Unit F & E Curves** **Augered Cast-in-Place Piles** **Syngenta Area 1 (West)**	Appendix I Figure 3

AUGERED CAST-IN-PLACE PILES
Allowable Axial Capacity (tons)

Pile Diameter (in)	Embedment Depth (ft)	Perimeter (ft)	Area (ft^2)	Design Factors from Curves			Compression (tons)	Tension (tons) (See Note 4)
				F_c	F_t	E		
14	30	3.67	1.07	1.21	1.01	0.53	5	4
14	40	3.67	1.07	1.71	1.43	0.57	7	5
14	50	3.67	1.07	2.27	1.90	0.65	9	7
14	60	3.67	1.07	2.92	2.44	0.76	12	9
14	70	3.67	1.07	3.67	3.06	0.87	14	11
14	80	3.67	1.07	4.53	3.77	0.98	18	14
14	90	3.67	1.07	5.48	4.56	1.07	21	17
16	30	4.19	1.40	1.21	1.01	0.53	6	4
16	40	4.19	1.40	1.71	1.43	0.57	8	6
16	50	4.19	1.40	2.27	1.90	0.65	10	8
16	60	4.19	1.40	2.92	2.44	0.76	13	10
16	70	4.19	1.40	3.67	3.06	0.87	17	13
16	80	4.19	1.40	4.53	3.77	0.98	20	16
16	90	4.19	1.40	5.48	4.56	1.07	24	19
18	30	4.71	1.77	1.21	1.01	0.53	7	5
18	40	4.71	1.77	1.71	1.43	0.57	9	7
18	50	4.71	1.77	2.27	1.90	0.65	12	9
18	60	4.71	1.77	2.92	2.44	0.76	15	11
18	70	4.71	1.77	3.67	3.06	0.87	19	14
18	80	4.71	1.77	4.53	3.77	0.98	23	18
18	90	4.71	1.77	5.48	4.56	1.07	28	22
24	30	6.28	3.14	1.21	1.01	0.53	9	6
24	40	6.28	3.14	1.71	1.43	0.57	13	9
24	50	6.28	3.14	2.27	1.90	0.65	16	12
24	60	6.28	3.14	2.92	2.44	0.76	21	15
24	70	6.28	3.14	3.67	3.06	0.87	26	19
24	80	6.28	3.14	4.53	3.77	0.98	32	24
24	90	6.28	3.14	5.48	4.56	1.07	38	29

Notes:

1) Pile embedment depth is depth below existing ground surface at the time borings were performed.
2) Allowable axial compression loads in the above table are net loads and should consist of DL + LL.
3) Allowable compression and tension values in the above table may be increased by 33% for transient loads including wind.
4) Allowable tension capacity provided in the above table does not include the weight of the pile.

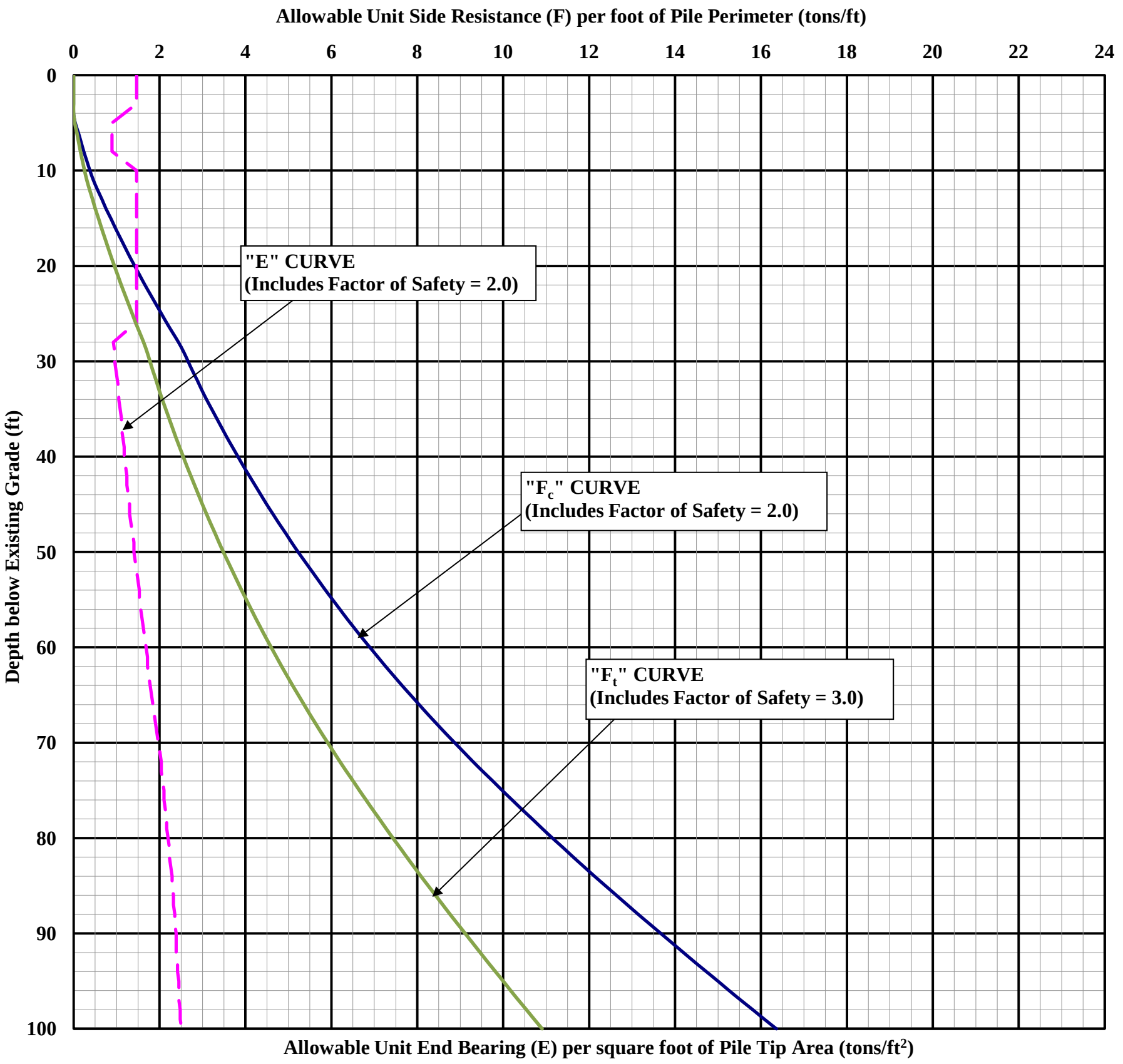
Project: Syngenta Site Evaluation, Carville, Louisiana	Tolunay-Wong Engineers, Inc.	**Project No.: 15.33.021** Report No.: 16855
Client: Wanhua Chemical US Holdings, Houston, Texas	**Allowable Axial Capacity Table Augered Cast-in-Place Piles Syngenta Area 1 (West)**	Appendix I Figure 4

APPENDIX J

PRELIMINARY ALLOWABLE UNIT FRICTION AND END BEARING
CAPACITY CURVES AND PILE CAPACITY TABLES
PRECAST CONCRETE PILES & AUGERCAST PILES

SYNGENTA – AREA 2

ALLOWABLE UNIT SIDE FRICTION AND END BEARING RESISTANCE
DRIVEN SYP TIMBER OR PRECAST CONCRETE PILES



DESIGN EQUATIONS:

Compression: $Q_c = PF_c + AE$

Tension: $Q_t = PF_t$

TERMS:

P = Average Pile Perimeter (ft)

A = Pile Tip Area (ft^2)

F_c, F_t & E = Allowable Unit Friction (Compression/Tension) and End Bearing Factors

$Q_{c,t}$ = Allowable Pile Capacity in Compression and Tension (tons)

(See Notes 1 thru 5 on Figure 2 of Appendix D)

EXAMPLE:

Driven Precast Concrete Pile
(14-in Wide, 50-ft Length)

P = 4.67 ft

A = 1.36 ft^2

F_c = 5.23 tons/ft

F_t = 3.49 tons/ft

E = 1.40 tons/ft^2

Q_c = (4.67)(5.23) + (1.36)(1.40) = 26.33-tons

Q_t = (4.67)(3.49) = 16.30-tons

Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Unit F & E Curves** **Driven Timber and Concrete Piles** **Syngenta Area 2 (North)**	Appendix J Figure 1

ROUND DRIVEN SYP TIMBER PILES

Allowable Axial Capacity (tons)

Pile Butt Diameter (in)	Embedment Depth (ft)	Average Perimeter (ft)	Tip Area (ft^2)	Design Factors from Curves			Compression (tons)	Tension (tons)
				F_c	F_t	E		
13	45	2.79	0.38	4.50	3.00	1.31	13	8
13	50	2.75	0.35	5.23	3.49	1.40	15	10
13	55	2.70	0.32	6.03	4.02	1.53	17	11
13	60	2.66	0.29	6.90	4.60	1.69	19	12
13	65	2.62	0.27	7.85	5.23	1.81	21	14

SQUARE PRECAST CONCRETE PILES

Allowable Axial Capacity (tons)

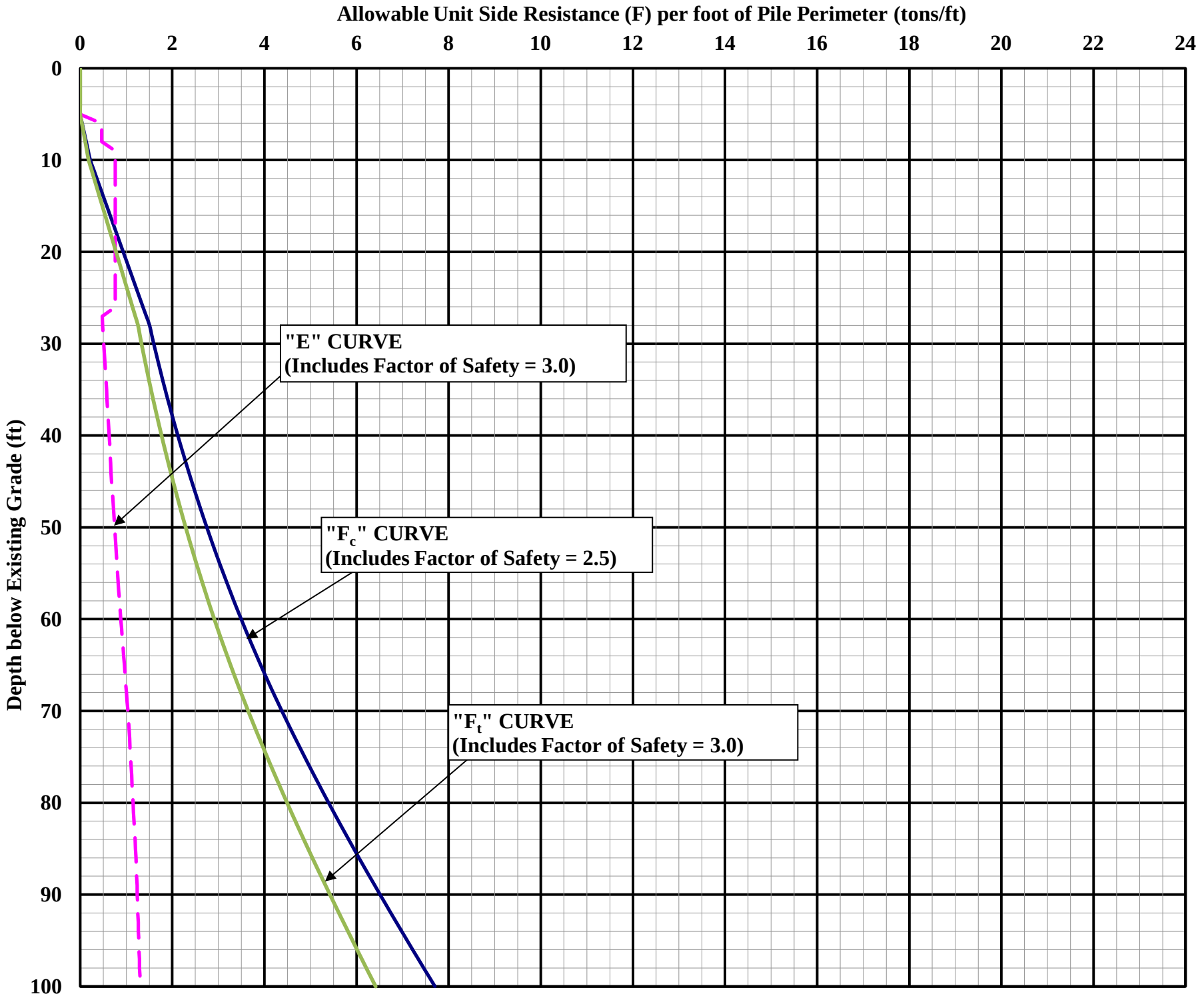
Pile Width (in) (Square)	Embedment Depth (ft)	Perimeter (ft)	Area (ft^2)	Design Factors from Curves			Compression (tons)	Tension (tons)
				F_c	F_t	E		
12	50	4.00	1.00	5.23	3.49	1.40	22	14
12	60	4.00	1.00	6.90	4.60	1.69	29	18
12	70	4.00	1.00	8.87	5.92	1.97	37	24
12	80	4.00	1.00	11.15	7.43	2.20	47	30
12	90	4.00	1.00	13.67	9.11	2.39	57	36
14	50	4.67	1.36	5.23	3.49	1.40	26	16
14	60	4.67	1.36	6.90	4.60	1.69	34	21
14	70	4.67	1.36	8.87	5.92	1.97	44	28
14	80	4.67	1.36	11.15	7.43	2.20	55	35
14	90	4.67	1.36	13.67	9.11	2.39	67	43
16	50	5.33	1.78	5.23	3.49	1.40	30	19
16	60	5.33	1.78	6.90	4.60	1.69	40	25
16	70	5.33	1.78	8.87	5.92	1.97	51	32
16	80	5.33	1.78	11.15	7.43	2.20	63	40
16	90	5.33	1.78	13.67	9.11	2.39	77	49
18	50	6.00	2.25	5.23	3.49	1.40	35	21
18	60	6.00	2.25	6.90	4.60	1.69	45	28
18	70	6.00	2.25	8.87	5.92	1.97	58	35
18	80	6.00	2.25	11.15	7.43	2.20	72	45
18	90	6.00	2.25	13.67	9.11	2.39	87	55

Notes:

1) Pile embedment depth is depth below existing ground surface.
2) Allowable axial compression values in the above table are net loads and should consist of DL + LL.
3) Allowable axial compression and tension values in the above table may be increased by 33% for transient loads including wind.
4) Allowable axial tension capacity values in the above table do not include the weight of the pile.
5) We recommend that allowable axial compression capacity values for SYP timber piles be limited to a maximum of 25 tons.

Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Axial Capacity** **Driven Timber and Concrete Piles** **Syngenta Area 2 (North)**	Appendix J Figure 2

ALLOWABLE UNIT SIDE FRICTION AND END BEARING RESISTANCE
AUGERED CAST-IN-PLACE PILES



Allowable Unit End Bearing (E) per square foot of Pile Tip Area (tons/ft^2)

DESIGN EQUATIONS:

Compression: $Q_c = PF_c + AE$

Tension: $Q_t = PF_t$

TERMS:

P = Average Pile Perimeter (ft)

A = Pile Tip Area (ft^2)

F_c, F_t & E = Allowable Unit Friction (Compression/Tension) and End Bearing Factors

$Q_{c,t}$ = Allowable Pile Capacity in Compression and Tension (tons)

(See Notes 1 thru 4 on Figure 4 of Appendix H)

EXAMPLE:

Augered Cast-in-Place Pile
(14-in Diameter, 50-ft Length)

P = 3.67-ft

A = 1.07-ft^2

F_c = 2.75-tons/ft

F_t = 2.29-tons/ft

E = 0.75-tons/ft^2

Q_c = (3.67)(2.75) + (1.07)(0.75) = 10.89-tons

Q_t = (3.67)(2.29) = 8.4-tons

Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Unit F & E Curves** **Augered Cast-in-Place Piles** **Syngenta Area 2 (North)**	Appendix J Figure 3

AUGERED CAST-IN-PLACE PILES Allowable Axial Capacity (tons)								
Pile Diameter (in)	Embedment Depth (ft)	Perimeter (ft)	Area (ft^2)	Design Factors from Curves			Compression (tons)	Tension (tons) (See Note 4)
				F_c	F_t	E		
14	30	3.67	1.07	1.60	1.33	0.51	6	5
14	40	3.67	1.07	2.12	1.77	0.63	8	6
14	50	3.67	1.07	2.75	2.29	0.75	11	8
14	60	3.67	1.07	3.50	2.91	0.88	14	11
14	70	3.67	1.07	4.38	3.65	1.04	17	13
14	80	3.67	1.07	5.39	4.49	1.15	21	16
14	90	3.67	1.07	6.51	5.43	1.24	25	20
16	30	4.19	1.40	1.60	1.33	0.51	7	6
16	40	4.19	1.40	2.12	1.77	0.63	10	7
16	50	4.19	1.40	2.75	2.29	0.75	13	10
16	60	4.19	1.40	3.50	2.91	0.88	16	12
16	70	4.19	1.40	4.38	3.65	1.04	20	15
16	80	4.19	1.40	5.39	4.49	1.15	24	19
16	90	4.19	1.40	6.51	5.43	1.24	29	23
18	30	4.71	1.77	1.60	1.33	0.51	8	6
18	40	4.71	1.77	2.12	1.77	0.63	11	8
18	50	4.71	1.77	2.75	2.29	0.75	14	11
18	60	4.71	1.77	3.50	2.91	0.88	18	14
18	70	4.71	1.77	4.38	3.65	1.04	22	17
18	80	4.71	1.77	5.39	4.49	1.15	27	21
18	90	4.71	1.77	6.51	5.43	1.24	33	26
24	30	6.28	3.14	1.60	1.33	0.51	12	8
24	40	6.28	3.14	2.12	1.77	0.63	15	11
24	50	6.28	3.14	2.75	2.29	0.75	20	14
24	60	6.28	3.14	3.50	2.91	0.88	25	18
24	70	6.28	3.14	4.38	3.65	1.04	31	23
24	80	6.28	3.14	5.39	4.49	1.15	38	28
24	90	6.28	3.14	6.51	5.43	1.24	45	34

Notes:

1) Pile embedment depth is depth below existing ground surface at the time borings were performed.
2) Allowable axial compression loads in the above table are net loads and should consist of DL + LL.
3) Allowable compression and tension values in the above table may be increased by 33% for transient loads including wind.
4) Allowable tension capacity provided in the above table does not include the weight of the pile.

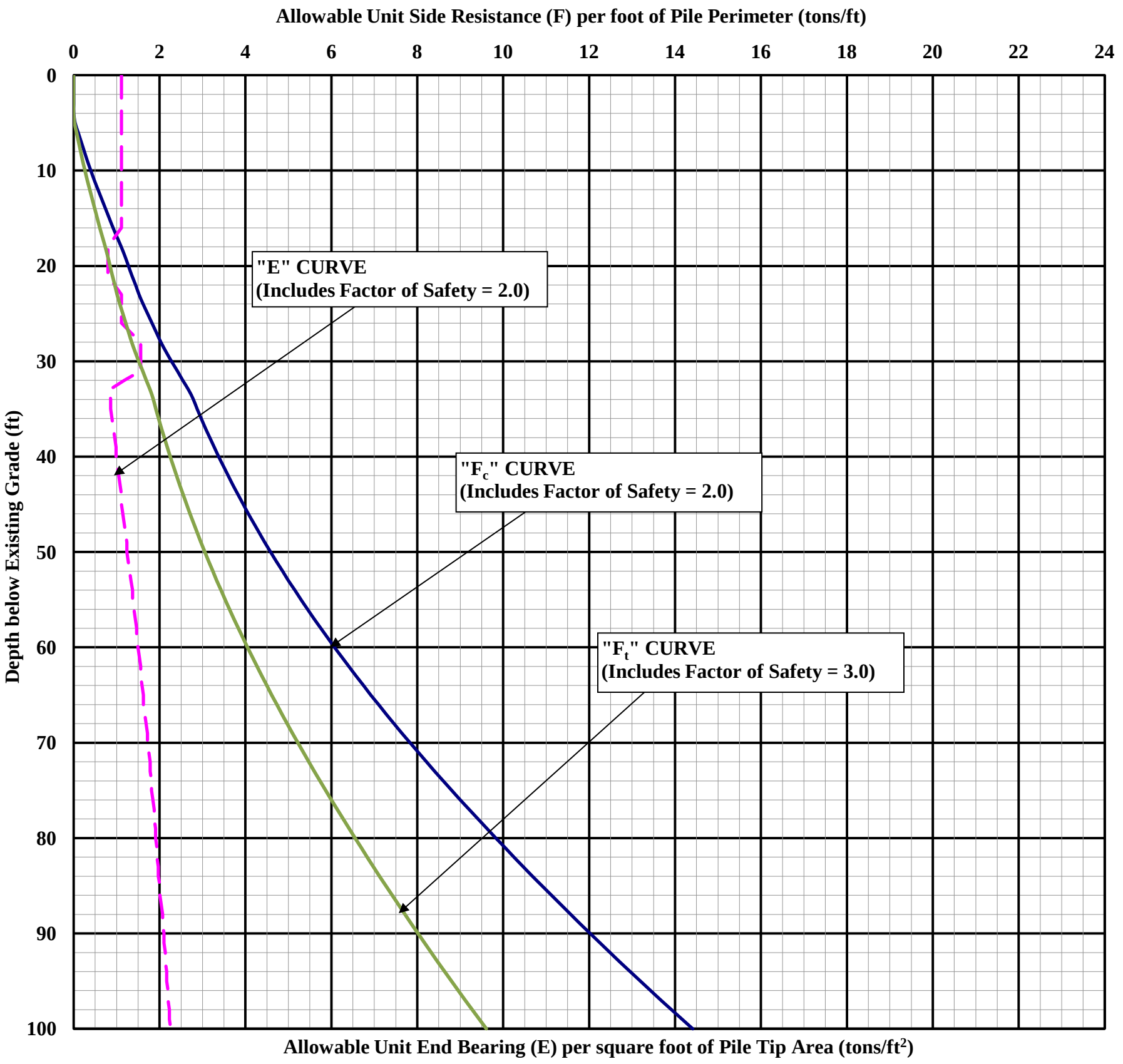
Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Axial Capacity Table** **Augered Cast-in-Place Piles** **Syngenta Area 2 (North)**	Appendix J Figure 4

APPENDIX K

PRELIMINARY ALLOWABLE UNIT FRICTION AND END BEARING
CAPACITY CURVES AND PILE CAPACITY TABLES
PRECAST CONCRETE PILES & AUGERCAST PILES

SYNGENTA – AREA 3

ALLOWABLE UNIT SIDE FRICTION AND END BEARING RESISTANCE
DRIVEN SYP TIMBER OR PRECAST CONCRETE PILES



DESIGN EQUATIONS:

Compression: $Q_c = PF_c + AE$

Tension: $Q_t = PF_t$

TERMS:

P = Average Pile Perimeter (ft)

A = Pile Tip Area (ft^2)

F_c, F_t & E = Allowable Unit Friction (Compression/Tension) and End Bearing Factors

$Q_{c,t}$ = Allowable Pile Capacity in Compression and Tension (tons)

(See Notes 1 thru 5 on Figure 2 of Appendix D)

EXAMPLE:

Driven Precast Concrete Pile
(14-in Wide, 50-ft Length)

P = 4.67 ft

A = 1.36 ft^2

F_c = 4.58 tons/ft

F_t = 3.06 tons/ft

E = 1.24 tons/ft^2

Q_c = (4.67)(4.58) + (1.36)(1.24) = 23.08-tons

Q_t = (4.67)(3.06) = 14.29-tons

Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Unit F & E Curves** **Driven Timber and Concrete Piles** **Syngenta Area 3 (East)**	Appendix K Figure 1

ROUND DRIVEN SYP TIMBER PILES

Allowable Axial Capacity (tons)

Pile Butt Diameter (in)	Embedment Depth (ft)	Average Perimeter (ft)	Tip Area (ft^2)	Design Factors from Curves			Compression (tons)	Tension (tons)
				F_c	F_t	E		
13	45	2.79	0.38	3.95	2.63	1.11	11	7
13	50	2.75	0.35	4.58	3.06	1.24	13	8
13	55	2.70	0.32	5.29	3.53	1.37	15	10
13	60	2.66	0.29	6.07	4.05	1.50	17	11
13	65	2.62	0.27	6.92	4.61	1.62	19	12

SQUARE PRECAST CONCRETE PILES

Allowable Axial Capacity (tons)

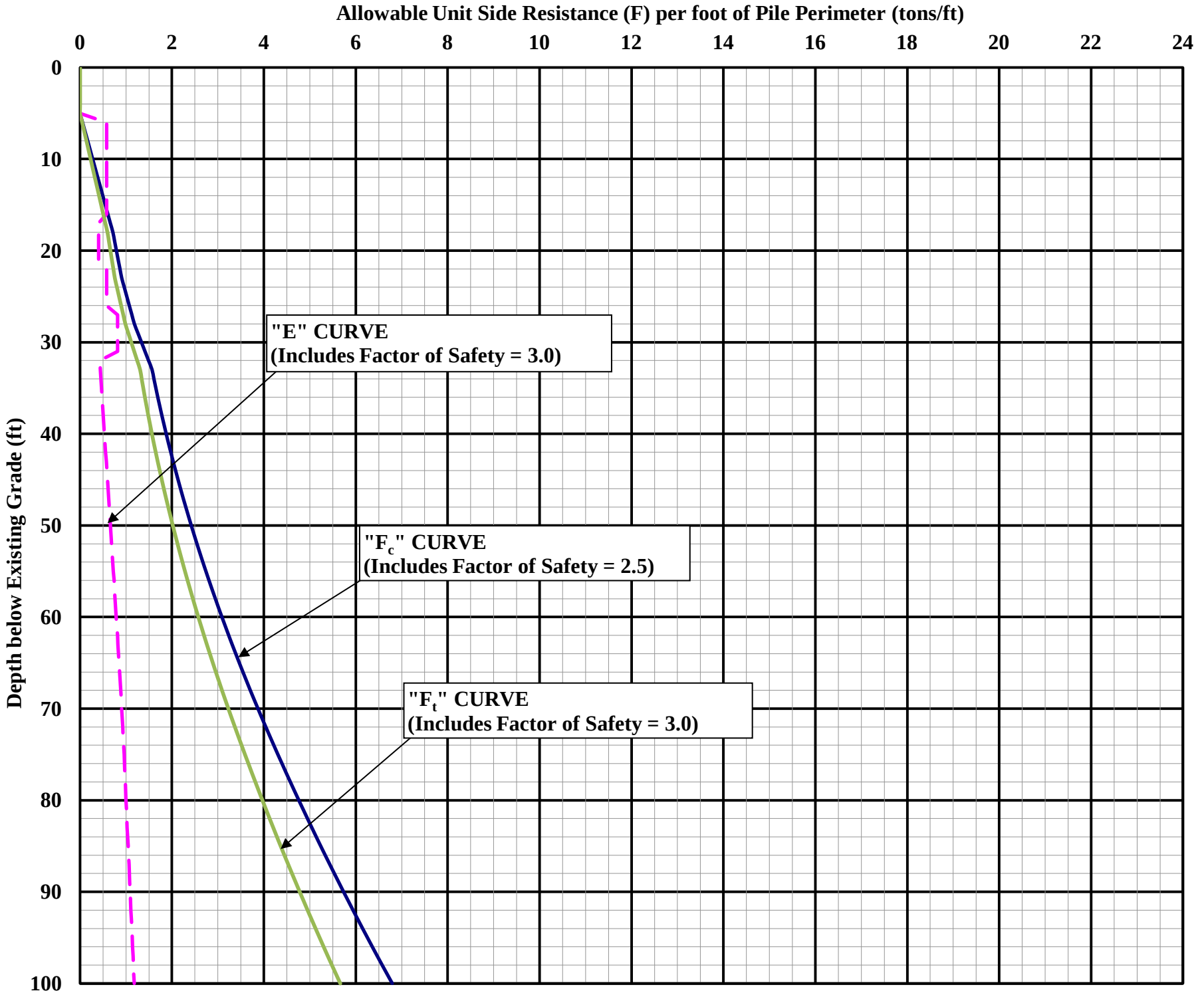
Pile Width (in) (Square)	Embedment Depth (ft)	Perimeter (ft)	Area (ft^2)	Design Factors from Curves			Compression (tons)	Tension (tons)
				F_c	F_t	E		
12	50	4.00	1.00	4.58	3.06	1.24	20	12
12	60	4.00	1.00	6.07	4.05	1.50	26	16
12	70	4.00	1.00	7.83	5.22	1.72	33	21
12	80	4.00	1.00	9.83	6.55	1.91	41	26
12	90	4.00	1.00	12.02	8.02	2.10	50	32
14	50	4.67	1.36	4.58	3.06	1.24	23	14
14	60	4.67	1.36	6.07	4.05	1.50	30	19
14	70	4.67	1.36	7.83	5.22	1.72	39	24
14	80	4.67	1.36	9.83	6.55	1.91	48	31
14	90	4.67	1.36	12.02	8.02	2.10	59	37
16	50	5.33	1.78	4.58	3.06	1.24	27	16
16	60	5.33	1.78	6.07	4.05	1.50	35	22
16	70	5.33	1.78	7.83	5.22	1.72	45	28
16	80	5.33	1.78	9.83	6.55	1.91	56	35
16	90	5.33	1.78	12.02	8.02	2.10	68	43
18	50	6.00	2.25	4.58	3.06	1.24	30	18
18	60	6.00	2.25	6.07	4.05	1.50	40	24
18	70	6.00	2.25	7.83	5.22	1.72	51	31
18	80	6.00	2.25	9.83	6.55	1.91	63	39
18	90	6.00	2.25	12.02	8.02	2.10	77	48

Notes:

1) Pile embedment depth is depth below existing ground surface.
2) Allowable axial compression values in the above table are net loads and should consist of DL + LL.
3) Allowable axial compression and tension values in the above table may be increased by 33% for transient loads including wind.
4) Allowable axial tension capacity values in the above table do not include the weight of the pile.
5) We recommend that allowable axial compression capacity values for SYP timber piles be limited to a maximum of 25 tons.

Project: Syngenta Site Evaluation Carville, LA	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Axial Capacity** **Driven Timber and Concrete Piles** **Syngenta Area 3 (East)**	Appendix K Figure 2

ALLOWABLE UNIT SIDE FRICTION AND END BEARING RESISTANCE
AUGERED CAST-IN-PLACE PILES



DESIGN EQUATIONS:

Compression: $Q_c = PF_c + AE$

Tension: $Q_t = PF_t$

TERMS:

P = Average Pile Perimeter (ft)

A = Pile Tip Area (ft^2)

F_c, F_t & E = Allowable Unit Friction (Compression/Tension) and End Bearing Factors

$Q_{c,t}$ = Allowable Pile Capacity in Compression and Tension (tons)

(See Notes 1 thru 4 on Figure 4 of Appendix H)

EXAMPLE:

Augered Cast-in-Place Pile
(14-in Diameter, 50-ft Length)

P = 3.67-ft

A = 1.07-ft^2

F_c = 2.42-tons/ft

F_t = 2.02-tons/ft

E = 0.66-tons/ft^2

Q_c = (3.67)(2.42) + (1.07)(0.66) = 9.59-tons

Q_t = (3.67)(2.02) = 7.41-tons

Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Unit F & E Curves** **Augered Cast-in-Place Piles** **Syngenta Area 3 (East)**	Appendix K Figure 3

AUGERED CAST-IN-PLACE PILES Allowable Axial Capacity (tons)								
Pile Diameter (in)	Embedment Depth (ft)	Perimeter (ft)	Area (ft^2)	Design Factors from Curves			Compression (tons)	Tension (tons) (See Note 4)
				F_c	F_t	E		
14	30	3.67	1.07	1.34	1.11	0.81	6	4
14	40	3.67	1.07	1.88	1.56	0.53	7	6
14	50	3.67	1.07	2.42	2.02	0.66	10	7
14	60	3.67	1.07	3.09	2.57	0.79	12	9
14	70	3.67	1.07	3.87	3.23	0.91	15	12
14	80	3.67	1.07	4.76	3.97	1.00	19	15
14	90	3.67	1.07	5.73	4.78	1.09	22	18
16	30	4.19	1.40	1.34	1.11	0.81	7	5
16	40	4.19	1.40	1.88	1.56	0.53	9	7
16	50	4.19	1.40	2.42	2.02	0.66	11	8
16	60	4.19	1.40	3.09	2.57	0.79	14	11
16	70	4.19	1.40	3.87	3.23	0.91	17	14
16	80	4.19	1.40	4.76	3.97	1.00	21	17
16	90	4.19	1.40	5.73	4.78	1.09	26	20
18	30	4.71	1.77	1.34	1.11	0.81	8	5
18	40	4.71	1.77	1.88	1.56	0.53	10	7
18	50	4.71	1.77	2.42	2.02	0.66	13	10
18	60	4.71	1.77	3.09	2.57	0.79	16	12
18	70	4.71	1.77	3.87	3.23	0.91	20	15
18	80	4.71	1.77	4.76	3.97	1.00	24	19
18	90	4.71	1.77	5.73	4.78	1.09	29	23
24	30	6.28	3.14	1.34	1.11	0.81	11	7
24	40	6.28	3.14	1.88	1.56	0.53	13	10
24	50	6.28	3.14	2.42	2.02	0.66	17	13
24	60	6.28	3.14	3.09	2.57	0.79	22	16
24	70	6.28	3.14	3.87	3.23	0.91	27	20
24	80	6.28	3.14	4.76	3.97	1.00	33	25
24	90	6.28	3.14	5.73	4.78	1.09	39	30

Notes:

1) Pile embedment depth is depth below existing ground surface at the time borings were performed.
2) Allowable axial compression loads in the above table are net loads and should consist of DL + LL.
3) Allowable compression and tension values in the above table may be increased by 33% for transient loads including wind.
4) Allowable tension capacity provided in the above table does not include the weight of the pile.

Project: Syngenta Site Evaluation Carville, Louisiana	Tolunay-Wong Engineers, Inc.	Project No.: 15.33.021 Report No.: 16855
Client: Wanhua Chemical US Holdings Houston, Texas	**Allowable Axial Capacity Table** **Augered Cast-in-Place Piles** **Syngenta Area 3 (East)**	Appendix K Figure 4

APPENDIX L

PRELIMINARY LATERAL ANALYSIS
SOIL DESIGN PARAMETERS

SYNGENTA – AREA 1

Syngenta Area 1 (West) Lateral Analysis Soil Design Parameters										
Soil Layer	Soil Type	Approximate Depth (ft)		Effective Unit Weight, γ' (pci)	Cohesion, c (psi)	Cohesion, c (psi)	Lateral Modulus, *k* (pci)	Lateral Modulus, *k* (pci)	Strain Factor, ε_{50}	Strain Factor, ε_{50}
		Top	Bottom		Top	Bottom	Top	Bottom	Top	Bottom
1	Soft Clay (Matlock)	0	5	0.069	2.78	2.78	30	30	0.020	0.020
2	Soft Clay (Matlock)	5	10	0.030	2.78	2.78	30	30	0.020	0.020
3	Soft Clay (Matlock)	10	23	0.027	3.13	3.13	30	30	0.020	0.020
4	Soft Clay (Matlock)	23	36	0.021	3.13	3.13	30	30	0.020	0.020
5	Soft Clay (Matlock)	36	45	0.023	3.13	3.51	30	100	0.020	0.010
6	Soft Clay (Matlock)	45	58	0.021	3.51	4.24	100	100	0.010	0.010
7	Soft Clay (Matlock)	58	80	0.025	4.24	5.69	100	100	0.010	0.010
8	Soft Clay (Matlock)	80	100	0.025	5.69	7.01	100	500	0.010	0.007

APPENDIX M

PRELIMINARY LATERAL ANALYSIS
SOIL DESIGN PARAMETERS

SYNGENTA – AREA 2

Syngenta Area 2 (North) Lateral Analysis Soil Design Parameters										
Soil Layer	Soil Type	Approximate Depth (ft)		Effective Unit Weight, γ' (pci)	Cohesion, c (psi)	Cohesion, c (psi)	Lateral Modulus, *k* (pci)	Lateral Modulus, *k* (pci)	Strain Factor, ε_{50}	Strain Factor, ε_{50}
		Top	Bottom		Top	Bottom	Top	Bottom	Top	Bottom
1	Soft Clay (Matlock)	0	5	0.065	4.51	4.51	100	100	0.010	0.010
2	Soft Clay (Matlock)	5	10	0.032	2.78	2.78	30	30	0.020	0.020
3	Soft Clay (Matlock)	10	28	0.032	4.51	4.51	100	100	0.020	0.020
4	Soft Clay (Matlock)	28	33	0.027	2.78	3.13	30	30	0.020	0.020
5	Soft Clay (Matlock)	33	38	0.027	3.13	3.47	30	30	0.020	0.020
6	Soft Clay (Matlock)	38	48	0.025	3.47	4.13	30	100	0.020	0.010
7	Soft Clay (Matlock)	48	58	0.029	4.13	4.90	100	100	0.010	0.010
8	Soft Clay (Matlock)	58	73	0.034	4.90	6.25	100	100	0.010	0.010
9	Stiff Clay without Free Water	73	88	0.025	6.25	7.22	100	500	0.010	0.007
10	Stiff Clay without Free Water	88	100	0.020	7.22	7.88	500	500	0.007	0.007

APPENDIX N

PRELIMINARY LATERAL ANALYSIS
SOIL DESIGN PARAMETERS

SYNGENTA – AREA 3

Syngenta Area 3 (East) Lateral Analysis Soil Design Parameters										
Soil Layer	Soil Type	Approximate Depth (ft)		Effective Unit Weight, γ' (pci)	Cohesion, c (psi)	Cohesion, c (psi)	Lateral Modulus, *k* (pci)	Lateral Modulus, *k* (pci)	Strain Factor, ε_{50}	Strain Factor, ε_{50}
		Top	Bottom		Top	Bottom	Top	Bottom	Top	Bottom
1	Soft Clay (Matlock)	0	5	0.066	3.47	3.47	30	30	0.020	0.020
2	Soft Clay (Matlock)	5	12	0.028	3.47	3.47	30	30	0.020	0.020
3	Soft Clay (Matlock)	12	18	0.024	3.47	3.47	30	30	0.020	0.020
4	Soft Clay (Matlock)	18	23	0.016	2.43	2.43	30	30	0.020	0.020
5	Soft Clay (Matlock)	23	28	0.019	3.47	3.47	30	30	0.020	0.020
6	Soft Clay (Matlock)	28	33	0.019	4.86	4.86	100	100	0.010	0.010
7	Soft Clay (Matlock)	33	58	0.029	2.47	4.41	30	100	0.020	0.010
8	Soft Clay (Matlock)	58	73	0.027	4.41	5.49	100	100	0.010	0.010
9	Soft Clay (Matlock)	73	100	0.024	5.49	7.19	100	500	0.010	0.007

APPENDIX O

USGS SEISMIC DESIGN MAP

USGS Design Maps Summary Report

User–Specified Input

Report Title	Syngenta Site Tue October 13, 2015 18:36:53 UTC
Building Code Reference Document	2012 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	30.221°N, 91.093°W
Site Soil Classification	Site Class E – "Soft Clay Soil"
Risk Category	I/II/III

USGS–Provided Output

S_S =	0.105 g	S_{MS} =	0.262 g	S_{DS} =	0.174 g
S_1 =	0.054 g	S_{M1} =	0.190 g	S_{D1} =	0.126 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.