Geotechnical Engineering Report

Civic Center Promenade, Amphitheater, and Tract One
Lake Charles Civic Center Grounds
Lake Charles, Louisiana

for

D.W. Jessen & Associates, LLC
440 Kirby Street
Lake Charles, LA 70601

Attn: Mr. D.W. Jessen, Jr., C.E.

prepared by

Daniel J. Holder, P.E., Inc.
Consulting Civil / Geotechnical Engineer
2767 Scarborough Drive
Lake Charles, LA 70615

DJH File 08-067
13 January 2009

Daniel J. Holder, P.E., Inc.
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13 January 2009

D.W. Jessen & Associates, L.L.C.
440 Kirby Street
Lake Charles, LA 70601

Attn: Mr. D.W. Jessen, Jr., C.E.

RE: Geotechnical Engineering Report
Lakerfront Promenade, Amphitheater, and Tract 1
Lake Charles Civic Center Grounds
Lake Charles, Louisiana
DJH File 08-067

Dear Mr. Jessen:

I have completed the Geotechnical Engineering Report for the referenced project, and am submitting the same herewith. This work was performed in general accordance with my written scope of work dated 30 November 2008, and authorized by your letter dated 08 December 2008.

Please advise if you have any questions regarding this information, or if I may be of any additional assistance. It has been a pleasure working with you on this project.

Sincerely,

Daniel J. Holder, P.E.
Louisiana P.E. Reg. No. 26532

Report Distribution:

Mr.D.W. Jessen, Jr., C.E.: 2 copies, 1 electronic file (.pdf)
Mr. Patrick Moore, Moore Planning Group: 1 copy, 1 electronic file (.pdf)

Geotechnical Engineering Report

Civic Center Promenade, Amphitheater, and Tract One
Lake Charles Civic Center Grounds
Lake Charles, Louisiana

DJH File 08-067; 13 January 2009

PROJECT INFORMATION

1. Description of Project. Based on the information provided, I understand that this project will consist of several improvements to the Lake Charles Civic Center grounds, including a new Lakefront Promenade (Area A), a new Amphitheater and Multi-Use Fields (Area B), an area of Mixed-Use, 2 to 3 story buildings (Area C), and an area of Mixed-Use, 5 to 6 story building(s) (Hotel) (Area D).

The Promenade (Area A) will include Sidewalks, Entry Gateways, Overhead Arbors, and a 26 foot diameter Fountain Pool. Area B will include Multi-Use Fields, Playground Equipment, and an Amphitheater and Restroom. All of these structures (Areas A and B) will be supported by lightly loaded, shallow foundations if possible. Significant earthwork and grading is anticipated for the new Amphitheater structure.

Areas C and D (the Mixed-Use, Multi Story Buildings and/or Hotel) will be developed at a later date; additional study is anticipated in these areas when additional design details are available.

The site is located at the existing Civic Center Grounds at 900 Lakeshore Drive, in Lake Charles, Louisiana. Refer to the Site Vicinity Map (Figure 1) and the Boring Location Plan (Figure 2) in the Appendix.

RESULTS OF INVESTIGATION

2. General. This investigation included the following work activities.

- a review of available geologic information,
- a site reconnaissance by the project engineer,
- eight (8) soil borings ranging from the 20 to 80 foot depth in the building areas,
- laboratory testing of selected soil samples,
- engineering analyses and evaluations, and,
- the preparation of this report by the Geotechnical Engineer.

3. Site Conditions. The site consisted of the existing Lake Charles Civic Center grounds. Most of the soil borings were made in grassy park areas (e.g., A-1, A-2, A-3, B-1, and B-2); the others (C-1, C-2, and D-1) were made in grass covered parking islands within paved parking areas.

Historically, the Civic Center grounds was once the eastern edge of the adjacent Lake Charles. In the late 1960s and early 1970s, about 50 acres of lake was reclaimed using sand fill dredged from from the middle of the lake and the adjoining Calcasieu River. The sand fill was hydraulically placed and is retained by the seawall, a tied-back bulkhead structure forming the border of the Civic Center grounds with the lake. The depth of the hydraulically placed sand fill is estimated to range from 25 to 35 feet below existing site grades, which are typically at an elevation of about +10 MSL (grading down to +8 MSL at the seawall). The tie-backs reportedly consist of 2 foot square reinforced concrete beams located 5'6" below grade on 7'6" centers anchored on precast concrete piles some 55 feet behind the face of the seawall. An untreated 20 foot deep timber pile is reportedly located at the midpoint of the tie-backs.

According to the Geologic Map of Louisiana (*Pope, et al, 1984*), the site is underlain by the Prairie Formation of Pleistocene Age. These soils are described as *"Light gray to light brown clay, sandy clay, silt, sand, and some gravel."* Recent alluvial (water deposited) soils are often found bordering the waterways of Southwestern Louisiana. These deposits are often relatively weak and compressible compared to the Prairie Formation.

A portable GPS unit indicated that the site is located at an approximate latitude and longitude of N 30^{o} 13' 34.7" and W 93^{o} 13' 17.0", respectively. The appropriate U.S.G.S. Topographic Map indicates that the site is at an elevation of about +5 to +10 MSL. Refer to Figures 1 and 2 in the Appendix.

4. Soil and Ground Water Conditions. The soils encountered in the borings made for this project may be described as medium dense tan silty fine sands, becoming light gray at about the 6 to 8 foot depth, to the limit of the exploration at about the 80 foot depth. In Borings B-2 and C-1, which were the easternmost of the borings made for this project, soft dark clay was encountered from about the 32 to 42 foot depth in B-2, and very stiff to stiff clays from about the 32 to 57 foot depth in C-1. Refer to Soil Boring Logs and the Generalized Soil Profile (Figure 3) in the Appendix.

The borings were initially advanced using dry augering methods to determine the presence of and the hydrostatic conditions of ground water in the boreholes. Ground water was generally first encountered in the borings at a depth of about 6 to 9 feet, and was observed to rise about ½ to 1½ feet during a brief (about 15 minute) observation period. The depth to ground water can fluctuate with seasonal variations in rainfall and evaporation, etc. The actual depth to ground water should be determined more accurately at the time of construction, but should be at a depth of about 6 to 8 feet at this site, or just about the level of the adjacent Lake Charles.

The information contained in this section has been generalized from the data obtained from the soil boring made for this investigation, and is meant to provide the reader with a general overview of the soil and ground water conditions. For more specific information, refer to the Boring Logs in the Appendix.

GEOTECHNICAL RECOMMENDATIONS

5. General Considerations. The amphitheater structure planned for Area B is expected to involve significant earthwork and grading operations to provide a raised, sloped surface to establish site lines for spectators. As much as 6 to 8 feet or more of fill is anticipated for this structure. The shallow sandy soils at this site should be suitable for the support of this fill with only nominal settlements. Recommendations for site preparation and earthwork for the amphitheater structure and other incidental earthwork operations are provided in Section 6.

The shallow sandy soils at this site should be suitable for the support of lightly loaded, shallow foundations for the structures and other improvements planned in Areas A and B (i.e., Sidewalks, Entry Gateways, Overhead Arbors, a Fountain pool, Playground Equipment, and an Amphitheater and Restroom Building). In areas adjacent to the seawall, caution should be exercised to avoid damaging the existing tie-back structures. Preliminary plans indicate isolated (square, round, or similar) footings some 5 to 7 feet in plan located about 2 feet below existing grades. The bottoms of these footings will be located some 3½ feet above the tops of the seawall tie-back beams, which will exert some pressure on the beams (about 50 to 70 percent of the applied bearing pressure) for 5 and 7 foot wide footings founded at the 2 foot depth, respectively. It is not expected that this will cause undue stress to the tie-backs; however, the project designers should verify this before finalizing the design of shallow foundations overlying the tie-backs. Recommendations for shallow footings are provided in Section 7.

The larger structures planned for Areas C and D (Mixed-Use, Multi Story Buildings and/or Hotel) will likely have to be supported by deep foundations. Driven piles, drilled cast-in-place concrete shafts, and augered cast-in-place grout piles (augercast piles) have been considered for these structures. Preliminary considerations for these types of deep foundations are provided in Section 8.

6. Site Preparation and Earthwork Activities. All vegetation, organic matter (e.g., roots), and any manmade objects should be removed from the building areas to expose the firm natural soils. Undercuts of ½ to 1 foot or so should be anticipated over most of the site. The exposed subgrade surface should be inspected to ensure that a suitable surface exists upon which to place select fill. This inspection may include proofrolling the subgrade with a loaded, tandem-axle dump truck or other means as determined by the inspector. Any areas that are determined to be unsuitable for fill placement should be undercut or stabilized to achieve a stable subgrade surface. Proper subgrade preparation and inspection is essential for the development of this project.

Once a firm subgrade exists upon which to conduct fill operations, select fill may be placed to achieve the desired building pad elevation. Select fill should consist of a silty or sandy clay with a Liquid Limit of 30 to 42 and a Plasticity Index of 12 to 22. The fill should be placed in 6 inch thick loose lifts or less and compacted to 95% of the

Standard Proctor Maximum Dry Density (ASTM D 698). Each lift should be tested to ensure compliance with these recommendations prior to placing subsequent lifts. A minimum testing frequency of one test per 2,500 square feet, but not less than 3 tests, per lift is recommended. All subgrade preparation and earthwork activities should be observed and tested by qualified personnel experienced in earthwork inspection.

Good surface drainage should be established prior to and during the earthwork activities. Standing water on the subgrade should be promptly drained or pumped off.

Without knowing the details of the proposed Amphitheater (i.e., plan dimensions, height, slope, etc.), it is not possible to estimate the amount of settlement that might occur under the loads of the new fill. Preliminary estimates of 2 to 4 inches have been made assuming a 10 foot high fill over an area some 300 feet in diameter. Of course, this is probably a conservative estimate for the highest part of the fill, and lower settlement movements would be expected for portions of the fill that are of less height.

7. Shallow Foundations for Areas A and B. Shallow foundations should be suitable for the support of the lightly loaded, shallow foundations for the structures and other improvements planned in Areas A and B (i.e., Sidewalks, Entry Gateways, Overhead Arbors, a Fountain pool, Playground Equipment, and an Amphitheater and Restroom Building). It is expected that isolated (square, round, or similar) footings will be utilized for most of these individual structures. These footings may be designed using the recommendations contained in this section. For shallow footings overlying the existing seawall tie-backs, it is estimated that 50 to 70 percent of the applied foundation load will be transmitted to the tops of the tie-backs. It is not expected that this will cause undue stress to the tie-backs; however, the project designers should verify this before finalizing the design of shallow foundations overlying the tie-backs.

For the new restroom building (or any other similar, one story, lightly loaded buildings), a reinforced slab foundation is recommended to accommodate normal soil movements. A reinforced slab foundation consists of a monolithic slab-on-grade with turned-down edges (perimeter grade beams); interior grade beams may be included if required by the building loads and/or stiffness considerations. The perimeter grade beams function as shallow foundations to carry the exterior wall loads and serve to cutoff moisture fluctuations in the soils supporting the slab from the surrounding environment. Interior grade beams serve to stiffen the slab system, allowing it to better accommodate movements in the supporting soils. Interior grade beams should be located beneath any load bearing interior walls and/or columns, in which case they should be designed as a shallow foundation. In general, interior grade beams should be spaced at distances of 15 feet or less (each way). Adequate reinforcement, as determined by the structural engineer, should be provided in the slab-on-grade foundation and grade beams. The entire slab system should be placed monolithically (in one pour), or dowelled to provide equivalent rigidity.

The slab foundation may be reinforced with conventional reinforcing steel (rebar) or post tensioned steel tendons (i.e., a post-tensioned slab). The grade beam dimensions and reinforcement of either foundation system should be determined by a qualified design professional knowledgeable in the design of slabs-on-grade. The following soils-related design information is provided for the use of the design professional.

7.1 Bearing Capacity and Soil Movements. Individual shallow foundations and load bearing grade beams for reinforced slab foundations should bear within the medium dense sandy soils at a depth of 2 feet. Individual shallow footings may be designed for a maximum net allowable soil bearing capacity of 3,000 pounds per square foot (psf); capacities for continuous, load bearing grade beams should be decreased to 2,500 psf. Lower bearing values may be utilized if determined to be necessary by the project designers to reduce the loads applied to the seawall tie-backs. The exterior grade beams should extend to a depth of at least 2 feet below finished exterior grades to help minimize moisture fluctuations in the foundation soils. Interior grade beams in reinforced slabs may be placed at any convenient depth.

Net allowable soil capacities take into account the weight of the concrete and backfill below grade; thus, no adjustments to the design loads are necessary. The bearing capacities provided in this section include a factor of safety of at least 2 against shear failure of the bearing soils. A minimum grade beam width of 18 inches (24 inches for column footings) is recommended to minimize the possibility of shear "punch" failure of the bearing soils.

Post-construction soil movements from normal foundation settlements are expected to be on the order of one inch or less. Differential movements should be about one-half to two-thirds of the total observed movement.

7.2 Overturning. Resistance to overturning loads should only consider the ***effective*** footing area, i.e., the portion of the footing centered beneath and effective in carrying the load. The equivalent footing dimensions B' and L' of the effective footing area are defined as:

$$B' = B - 2e_B \qquad \text{and} \qquad L' = L - 2e_L$$

where e_B and e_L are the eccentricity in each direction. Eccentricity is defined as the moment (M) divided by the axial load (P), or

$$e_B = M_B / P_B \qquad \text{and} \qquad e_L = M_L / P_L$$

7.3 Lateral Loads. Lateral loads on the foundation will be resisted by sliding resistance between the base of the foundation and the underlying soil and by lateral earth pressure against the side of the foundation; the latter should be

neglected for shallow foundations for this project. The allowable sliding resistance, $f_{s,\ all}$, may be taken as 0.2 x the applied bearing pressure. This is an allowable value; a safety factor of about 2 against sliding resistance has already been included.

7.4 Uplift Loads. Foundations placed to depths of about 4 feet or less should be designed for uplift by taking into account the dead weight of the concrete and any overlying backfill. A typical unit weight of 120 pounds per cubic foot (pcf) should be utilized for the soil backfill if properly placed and compacted (refer to Section 6). Granular soils should not be used for backfill over foundations subject to uplift because the soils could become saturated if poor drainage exists. Buoyant unit weights (i.e., subtract the unit weight of water, 62.4 pcf) should be used for uplift calculations if proper drainage cannot be assured.

7.5 Construction Considerations. Shallow excavations (i.e., 4 to 6 feet deep or less) for the shallow footings and/or reinforced slab foundations in the sandy soils at this site may not remain stable (i.e., will probably cave) for short periods of time, particularly in the presence of surface or ground water. The reinforcing steel and concrete for the foundations should be placed expeditiously following the completion of the excavation. The excavations should not be permitted to stand open any longer than necessary. Any water that may accumulate in the excavations should be pumped out immediately.

The foundation excavations should be inspected by the geotechnical engineer's representative to ensure that the bearing surface is properly prepared prior to placing the reinforcing steel or concrete for the foundation. The soils at this site can become significantly weaker if wetted or disturbed during the construction operations. Traffic in the excavations should be prohibited, and drainage should be provided to direct surface and ground water (if any) away from the excavations. If the concrete for the foundation will not be placed on the same day as the excavation, a "mud mat" of lean concrete should be placed to protect the bearing surface.

According to OSHA regulations (CFR 1926.650 through 1926.652, and Appendix A to Subpart P), the contractor is responsible for developing and maintaining the appropriate safety systems for excavations on the project. The soils should be classified as Type C for this purpose. Recommendations for temporary slopes and/or shoring are beyond the scope of this investigation, but can be provided upon request once more specific design details are available.

8. Preliminary Recommendations for Deep Foundations in Areas C and D. The details of the multi-use, multiple structures planned for Areas C and D are not known at this time; however, it is expected that these structures will have to be supported by deep foundations. A general discussion of the types of deep foundations that may be

considered is provided in this section. It is anticipated that additional design details will be provided, and additional site investigation will be conducted, before specific recommendations for deep foundations for the support of these structures can be formulated.

8.1 Driven Piles. Driven piles are commonly used in this area to provide deep foundation support. At this site, however, pile driving operations will likely cause considerable vibrations in the sandy soils that may be detrimental to nearby, existing structures. Of course, this should be evaluated more accurately once more specific design details are available.

8.2 Drilled Shafts. Drilled, cast-in-place concrete shafts are also commonly used in this area to provide deep foundation support. The sandy soils and the relatively high ground water level at this site, however, will cause significant constructability issues for drilled shafts. Full depth drilling slurry and a comprehensive quality assurance program will be essential for the successful installation of drilled shafts at this site. That being said, however, drilled shafts are capable of providing very large axial and shear load capacities and resistance to overturning moments.

8.3 Auger Cast Piles. Augered, cast-in-place, grout piles will be especially suitable for this site. Auger cast piles are installed by means of a continuous flight, hollow stem auger drilled down to the desired tip elevation. Then, as the auger is slowly withdrawn, the pile is formed by pumping a high strength cement grout under pressure through the tip of the lead auger. Auger cast piles are installed by a number of contractors in the region, and can be quite economical if the number of piles justifies the relatively high mobilization and setup costs.

However, auger cast piles have relatively limited lateral and overturning capacities, and may require the use of pile groups for larger loads. In addition, it is possible that the relatively low-torque rigs used by many subcontractors could encounter potential difficulties in installing these units through the very stiff clays encountered in some locations at this site. If this foundation type will be seriously considered, it is recommended that the owners retain one of the larger and more experienced national subcontractors who have demonstrated the capability to install these piles in this geology.

OTHER GEOTECHNICAL CONSIDERATIONS

9. Drainage and Landscaping. Proper long term drainage should be provided to direct surface water away from the completed foundations. Positive site grading and gutters and downspouts, if applicable, should be utilized for this purpose as required. Landscaping near the building foundations should be avoided to minimize fluctuations in the moisture contents of the surrounding soils, or a suitable drainage barrier (e.g., geosynthetic liner) should be utilized. Trees should be located no closer to the building foundations than the drip line of the mature tree canopy.

10. Additional Consulting Services. The Geotechnical Engineer should be kept informed of and permitted to address all aspects of the soils-related aspects of the project. Often, concerns may arise that are not specifically addressed by the Geotechnical Engineering Report. A brief conference can often address any such concerns, and can identify any other issues not anticipated by the design team.

Upon completion of design, and prior to the start of construction, the Geotechnical Engineer should be provided with the opportunity to review the design drawings and specifications to assure compliance with the Geotechnical Engineering Report. Such review is considered to be an integral part of the recommendations of this report.

11. Construction Inspection Services. Construction inspection services for this project are essential to assure that the soil conditions do not vary from that assumed in this report and to ensure that the recommendations in this report are followed. These services should be retained by the owner to assure that unbiased reporting is provided. The Geotechnical Engineer should be provided with timely copies of all test results.

12. Limitations. This report is based upon the information provided by the owner's representative, as well as the soil and ground water conditions encountered during the field investigation. Variations may occur away from or between the borehole locations. If such variations become apparent, or if the nature of the project changes significantly, the Geotechnical Engineer should be consulted for additional recommendations.

The recommendations in this report pertain only to the soils-related aspects of the project. The structural design of the building foundations is beyond the scope of these services. Likewise, this report does not address the environmental aspects of the project. We would be pleased to assist with these additional services if requested.

APPENDIX

Site Vicinity Map (Figure 1)

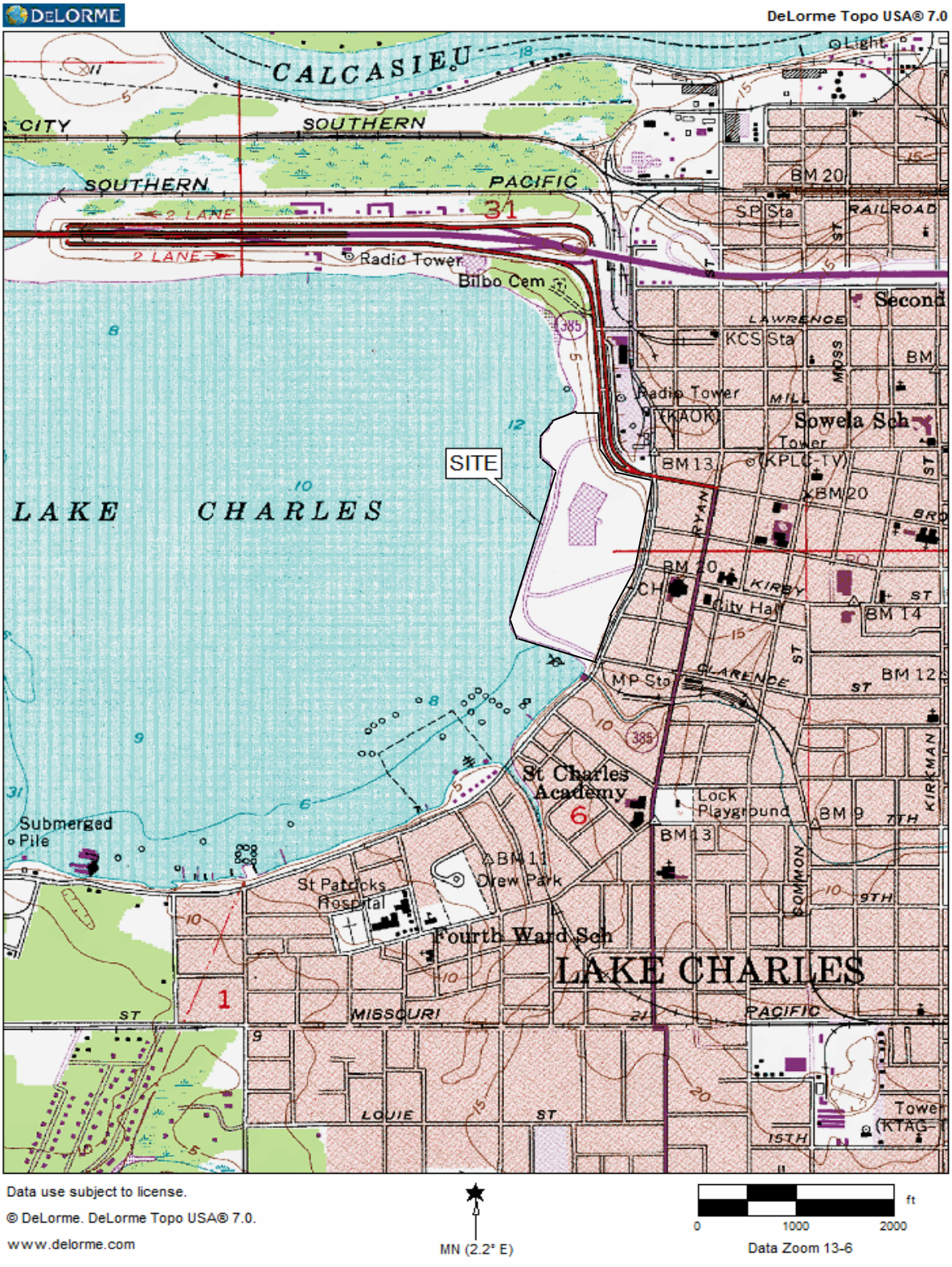
Boring Location Plan (Figure 2)

Generalized Soil Profile (Figure 3)

Soil Boring Logs (8)

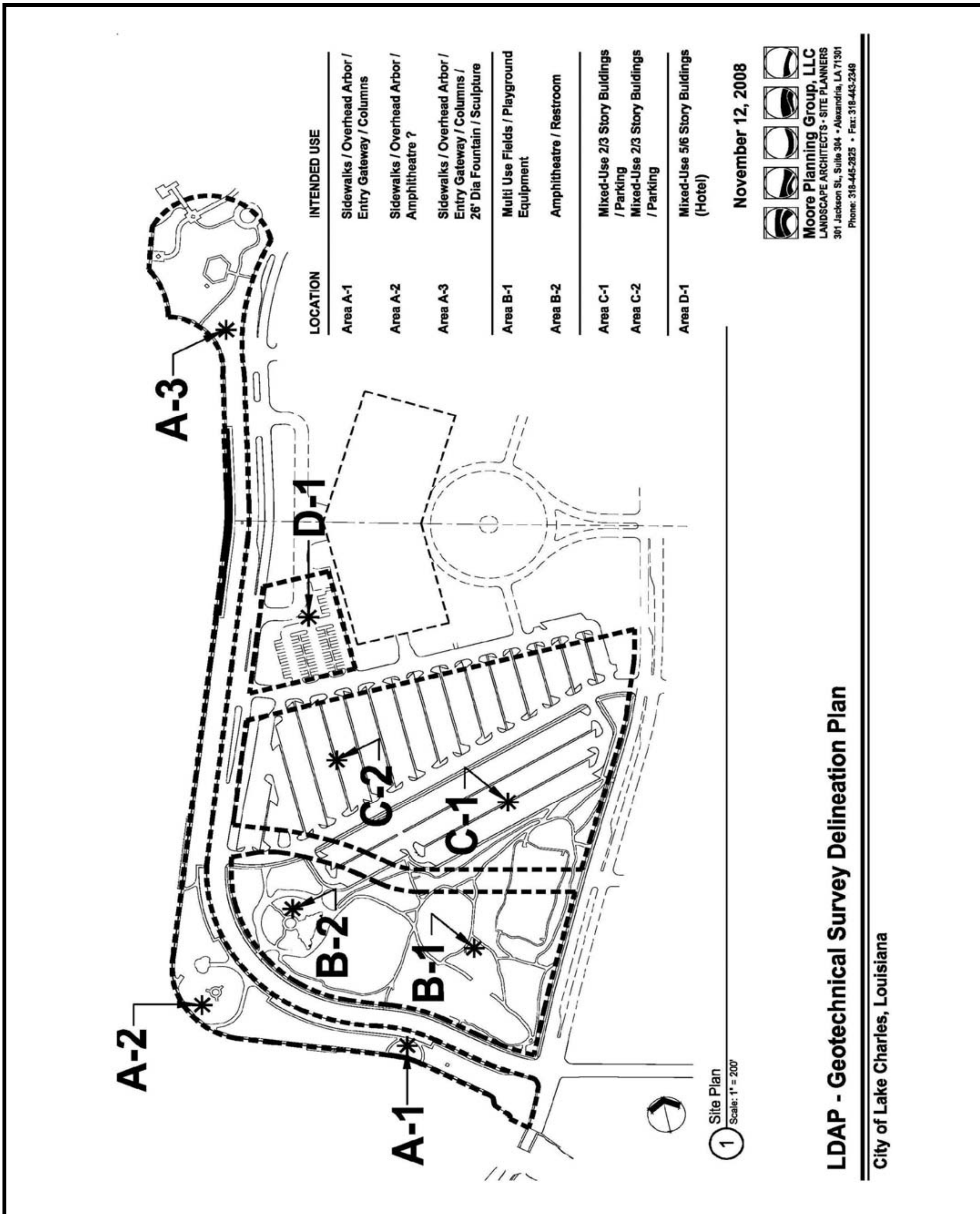
Particle Size Analyses (11)

Description of Field and Laboratory Testing Procedures



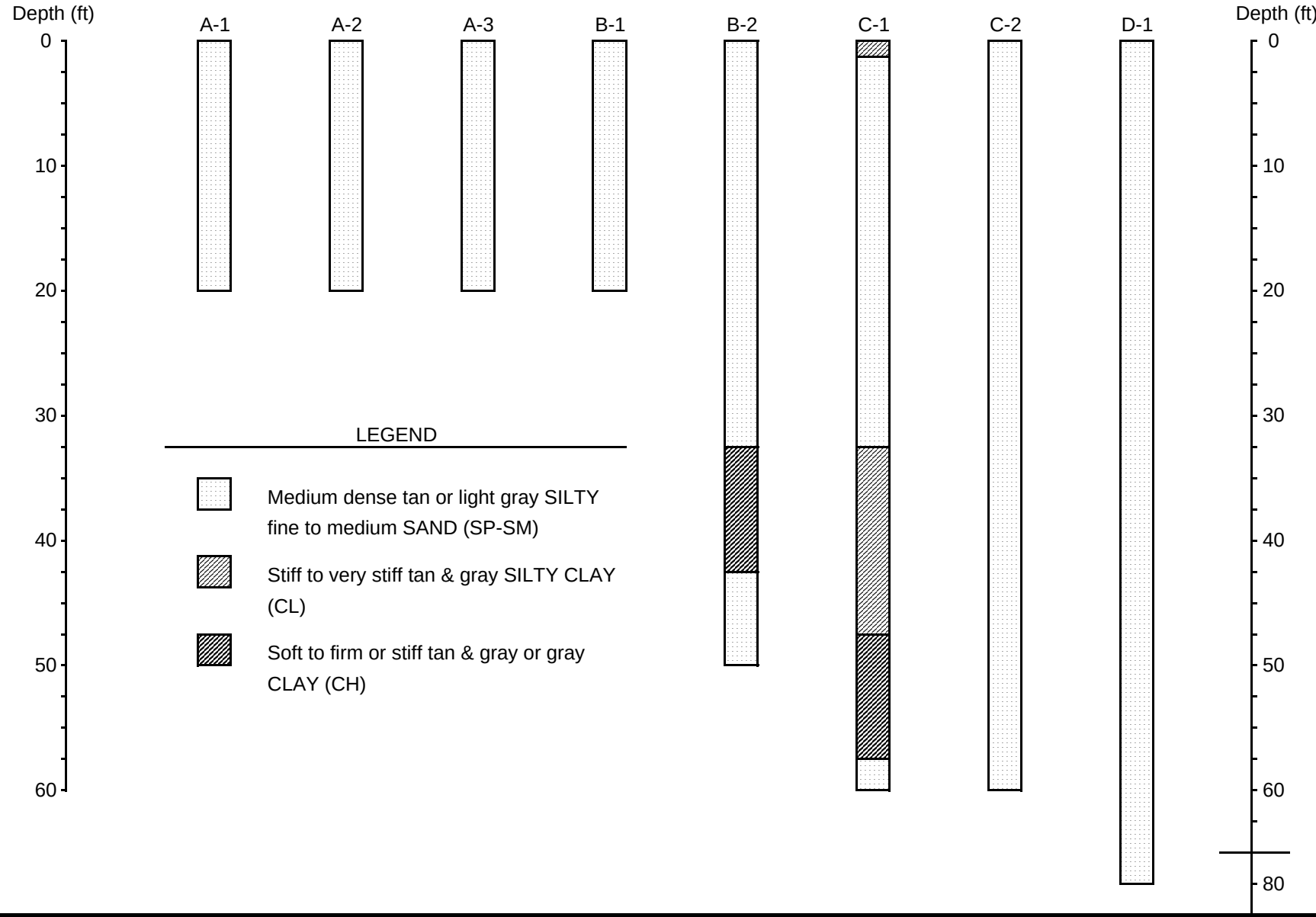
Daniel J. Holder, P.E., Inc. Consulting Civil / Geotechnical Engineer 2767 Scarborough Drive Lake Charles, LA 70615 (337) 274-4125 dan@danholderpe.com	Civic Center Promenade, etc. Lake Charles, Louisiana for D.W. Jessen & Associates, LLC Lake Charles, Louisiana	Project Engineer: DJH Drawn By: dan Checked By:	DJH File No. 08-067 Date: 13 Jan 09 Figure No. 1
		Site Vicinity Map	

Source: U.S.G.S. 7.5 Minute Topographic Map, 1999 (3-D TopoQuads, DeLorme)



Daniel J. Holder, P.E., Inc.	Civic Center Promenade, etc.	Project Engineer: DJH	DJH File No. 08-067
Consulting Civil / Geotechnical Engineer	Lake Charles, Louisiana	Drawn By: dan	Date: 13 Jan 09
2767 Scarborough Drive	for	Checked By: DJH	Figure No. 2
Lake Charles, LA 70615	D.W. Jessen & Associates, LLC		
(337) 274-4125 dan@danholderpe.com	Lake Charles, Louisiana	Boring Location Plan	

Source: Site Plan provided by Moore Planning Group, LLC (dated November 12, 2008)



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Civic Center Promenade, etc.
Lake Charles, Louisiana
for
D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:	DJH	Figure No.	3

Generalized
Soil Profile

SOIL BORING LOG

Boring No. A-1

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/9/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
1	SS	8 bpf 3-4-4				18				PSA 1		Dark brown SILTY fine SAND (SM), w/ roots & organic matter
2												
3	SS	14 bpf 5-7-7										Medium dense tan SILTY fine SAND (SM)
4												
5	SS	7 bpf 3-4-3	▽									-ditto, w/ occasional clay balls, wet
6												
7	SS	16 bpf 7-9-7										-brownish gray
8												
9	SS	18 bpf 9-11-7										-ditto
10												
11	SS	17 bpf 11-10-7										-light gray, fine to medium (SP)
12												
13												
14	SS	20 bpf 7-9-11				20				PSA 2		-ditto
15												
16												
17												
18												
19	SS	21 bpf 10-10-11										-ditto
20												
21												Boring Completed at 19½' Depth
22												
23												
24												
25												

Boring Data

Boring Advancement:
Dry Auger: 0 - 6'
Rotary Wash: 6' - 19½'

Boring Abandonment:
Boring Backfilled w/ Soil Cuttings Upon Completion

Ground Water Data

▽ First Encountered: 6'
▽ After 15 Minutes: 5½'
Boring Did Not Cave After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. A-2

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/9/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
1	SS	8 bpf 2-3-5										Loose brown SILTY fine SAND (SM), w/ roots & organic matter & clay balls
2												
3	SS	12 bpf 3-5-7										Medium dense tan SILTY fine SAND (SM)
4												
5	SS	14 bpf 4-6-8				11				PSA 3		-ditto
6			▽									
7	SS	7 bpf 3-3-4	▽									-tan to light gray, w/ clay balls
8												
9	SS	18 bpf 7-9-9										-brown, w/ clay balls
10												
11	SS	25 bpf 12-13-12										-light gray, fine to medium
12												
13												
14	SS	16 bpf 5-7-9										-ditto
15												
16												
17												
18												
19	SS	21 bpf 8-9-12										-ditto
20												
21												Boring Completed at 19½' Depth
22												
23												
24												
25												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 19½'

Boring Abandonment:
Boring Backfilled w/ Soil Cuttings Upon Completion

Ground Water Data

▽ First Encountered: 7'
▽ After 15 Minutes: 6'
Boring Did Not Cave After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. A-3

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/8/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
1	SS	12 bpf 2-5-7										Medium dense brown SILTY fine SAND (SM), w/ roots & organic matter
2												
3	SS	16 bpf 10-8-8										Medium dense tan SILTY fine SAND (SM)
4												
5	SS	17 bpf 8-9-8										-ditto
6												
7	SS	15 bpf 8-7-8	▽			15				PSA 4		-light gray, fine to medium (SP-SM)
8												
9	SS	17 bpf 9-7-10	▽									-ditto
10												
11	SS	26 bpf 6-7-19										-ditto
12												
13												
14	SS	20 bpf 9-11-9										-ditto
15												
16												
17												
18												
19	SS	23 bpf 11-13-10										-ditto
20												
21												Boring Completed at 19½' Depth
22												
23												
24												
25												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 19½'

Boring Abandonment:
Boring Backfilled w/ Soil Cuttings Upon Completion

Ground Water Data

▽ First Encountered: 9'
▽ After 15 Minutes: 7½'
Boring Caved at 8' After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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Consulting Civil / Geotechnical Engineer
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SOIL BORING LOG

Boring No. B-1

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/9/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
1	SS	17 bpf 4-8-9										Medium dense tan SILTY fine SAND (SM), w/ brown clay balls & roots
2												
3	SS	15 bpf 8-8-7				10				PSA 5		Medium dense tan SILTY fine SAND (SM-SP)
4												
5	SS	18 bpf 7-9-9										-ditto
6												
7	SS	14 bpf 9-8-6	▽									-ditto
8												
9	SS	24 bpf 9-11-13	▽									-ditto
10												
11	SS	27 bpf 7-14-13										-light gray
12												
13												
14	SS	16 bpf 11-9-7										-light gray, fine to medium
15												
16												
17												
18												
19	SS	16 bpf 7-9-7										-ditto
20												
21												Boring Completed at 19½' Depth
22												
23												
24												
25												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 19½'
Boring Abandonment:
Boring Backfilled w/ Soil Cuttings Upon Completion

Ground Water Data

▽ First Encountered: 9'
▽ After 15 Minutes: 7½'
Boring Caved at 8' After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. B-2

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/9/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
1	SS	10 bpf 4-4-6										Loose brown SILTY fine SAND (SM), w/ clay balls & roots
2												
3	SS	50+ bpf 27-28-22/5"										Loose tan SILTY fine SAND (SM)
4												-ditto, very dense
5	SS	50+ bpf 21-26-24/4"										-ditto, very dense
6												
7	SS	49 bpf 22-26-23				7				PSA 6		-ditto, very dense (SM-SP)
8												
9	SS	50+ bpf 21-28-22/3"										-ditto, light gray, very dense
10			★									
11	SS	24 bpf 10-11-13										-ditto, light gray, fine to medium, medium dense
12												
13												
14	SS	13 bpf 9-7-6										-ditto
15												
16												
17												
18												
19	SS	19 bpf 9-8-11										-ditto
20												
21												
22												
23												
24	SS	22 bpf 9-9-13										-ditto
25												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 49½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

★ No Ground Water Encountered to 10' Depth, Then Rotary Wash Drilling Methods Used

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. B-2

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/9/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
26												Medium dense light gray SILTY fine to medium SAND (SM)
27												
28	SS	26 bpf 9-11-15										-ditto
29												
30												
31												
32												Soft to firm dark gray CLAY (CH)
33	SS	13 bpf 5-7-6				51	56	24	32			
34												
35												
36												
37												
38	SS	9 bpf 4-3-6				24	44	19	25			-ditto, gray, silty (CL)
39												
40												
41												
42												Medium dense bluish gray CLAYEY fine SAND (SC)
43												
44	ST	½ tsf										
45												
46												
47												
48	SS	16 bpf 8-7-9										-ditto, gray
49												
50												Boring Completed at 49½' Depth

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 49½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

★ No Ground Water Encountered to 10' Depth, Then Rotary Wash Drilling Methods Used

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. C-1

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/11/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
1	SS	8 bpf 3-4-4										Firm dark brown SANDY CLAY (CL), w/ roots
2												
3	SS	9 bpf 5-4-5										Loose tan SILTY fine SAND (SM)
4												
5	SS	19 bpf 9-7-12										-ditto, light gray, medium dense
6												
7	SS	14 bpf 6-7-7										-ditto, w/ silty clay layer
8			▽									
9	SS	18 bpf 7-9-9	▽									-gray SILTY fine SAND, w/ large gravel
10												
11	SS	16 bpf 9-8-8										-ditto, light gray, fine to medium
12												
13												
14	SS	18 bpf 7-8-10										-ditto
15												
16												
17												
18												
19	SS	17 bpf 9-9-8										-ditto
20												
21												
22												
23												
24	SS	20 bpf 7-11-9										-ditto
25												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 59½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 9'
▽ After 15 Minutes: 8'
Boring Caved at 9' After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. C-1

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/11/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
26												Medium dense light gray SILTY fine to medium SAND (SM)
27												
28												
29	SS	18 bpf 9-11-7										-ditto
30												
31												
32												
33												Very stiff tan & gray SILTY CLAY (CL)
34	ST	1¼ tsf		3.0	108	20				ε_f = 10%		
35												
36												
37												
38												
39	ST	1½ tsf		2.9	109	19				ε_f = 10%		-ditto
40												
41												
42												
43												
44	ST	2 tsf		2.7	110	19				ε_f = 10%		-ditto
45												
46												
47												
48												Stiff tan & gray CLAY (CH), w/ black oxides & slickensides
49	ST	2 tsf		1.1	82	41				ε_f = 4.3%		
50												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 59½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 9'
▽ After 15 Minutes: 8'
Boring Caved at 9' After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

ε_f = Failure Strain

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. C-1

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/11/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γ_d (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
51												Stiff tan & gray CLAY (CH), w/ black oxides & slickensides
52												
53												
54	ST	3 tsf		1.3	93	26				ε_f = 2.5%		-ditto
55												
56												
57												
58												Dense light gray SILTY fine to medium SAND (SM)
59	SS	36 bpf 18-14-22										
60												Boring Completed at 59½' Depth
61												
62												
63												
64												
65												
66												
67												
68												
69												
70												
71												
72												
73												
74												
75												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 59½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 9'
▽ After 15 Minutes: 8'
Boring Caved at 9' After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

ε_f = Failure Strain

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. C-2

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/8/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
1	SS	10 bpf 3-5-5										Loose tan SILTY fine SAND (SM)
2												
3	SS	16 bpf 7-8-8				8				PSA 7		-ditto (SP-SM)
4												
5	SS	16 bpf 8-8-8										-ditto
6												
7	SS	17 bpf 7-9-8	▽									-ditto
8			▽									
9	SS	No Test										-ditto, light gray
10												
11	SS	14 bpf 9-7-7										-ditto, light gray, fine to medium
12												
13												
14	SS	18 bpf 7-9-9										-ditto
15												
16												
17												
18												
19	SS	21 bpf 11-9-12										-ditto
20												
21												
22												
23												
24	SS	22 bpf 6-13-9										-ditto
25												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 59½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 8'
▽ After 15 Minutes: 7½'
Boring Did Not Cave After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. C-2

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/8/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
26												Medium dense light gray SILTY fine to medium SAND (SM)
27												
28	SS	20 bpf 7-9-11										-ditto
29												
30												
31												
32												
33	SS	28 bpf 5-11-17										-ditto
34												
35												
36												
37												
38	SS	19 bpf 7-8-11				24				PSA 8		-ditto (SP)
39												
40												
41												
42												
43	SS	22 bpf 8-9-13										-ditto
44												
45												
46												
47												
48	SS	28 bpf 11-13-15										-ditto
49												
50												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 59½'
Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 8'
▽ After 15 Minutes: 7½'
Boring Did Not Cave After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. C-2

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/8/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
51												Medium dense light gray SILTY fine to medium SAND (SM)
52												
53												
54	SS	16 bpf 9-8-8										-ditto
55												
56												
57												
58												
59	SS	29 bpf 7-11-18										-ditto
60												Boring Completed at 59½' Depth
61												
62												
63												
64												
65												
66												
67												
68												
69												
70												
71												
72												
73												
74												
75												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 59½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 8'
▽ After 15 Minutes: 7½'
Boring Did Not Cave After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. D-1

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/7/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
1	SS	11 bpf 4-4-7										Medium dense dark brown SILTY fine SAND (SM), w/ clay balls & roots
2												
3	SS	17 bpf 15-7-10										Medium dense tan SILTY fine SAND (SM)
4												
5	SS	21 bpf 9-10-11										-ditto
6												
7	SS	25 bpf 10-14-11	▽									-ditto
8												
9	SS	14 bpf 7-6-8	▽			23				PSA 9		-light gray (SM-SP), wet
10												
11	SS	12 bpf 9-4-8										-ditto, w/ dark gray clay balls
12												
13												
14	SS	22 bpf 8-9-13										-ditto
15												
16												
17												
18												
19	SS	7 bpf 3-4-3										-ditto
20												
21												
22												
23												
24	SS	11 bpf 4-6-5										-ditto
25												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 79½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 9'
▽ After 15 Minutes: 7'
Boring Caved to 8' After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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Consulting Civil / Geotechnical Engineer
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Lake Charles, LA 70615
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SOIL BORING LOG

Boring No. D-1

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/7/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
26												Medium dense light gray SILTY fine SAND (SM)
27												
28	SS	17 bpf 5-9-8										-ditto, w/ clay balls
29												
30												
31												
32												
33	SS	17 bpf 9-8-9										-ditto, w/ clay balls
34												
35												
36												
37												
38	SS	20 bpf 7-11-9										-ditto, w/ clay balls
39												
40												
41												
42												
43	SS	25 bpf 8-11-14				17				PSA 10		-ditto, fine to medium, no clay balls
44												
45												
46												
47												
48	SS	23 bpf 11-13-10										-ditto
49												
50												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 79½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 9'
▽ After 15 Minutes: 7'
Boring Caved to 8' After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. D-1

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/7/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
51												Medium dense light gray SILTY fine to medium SAND (SM)
52												
53	SS	28 bpf 7-15-13										-ditto
54												
55												
56												
57												
58	SS	36 bpf 11-15-21										-ditto, dense
59												
60												
61												
62												
63	SS	25 bpf 9-11-14										-ditto
64												
65												
66												
67												
68	SS	31 bpf 8-14-17										-ditto, dense
69												
70												
71												
72												
73	SS	39 bpf 11-18-21										-ditto, dense
74												
75												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 79½'

Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 9'
▽ After 15 Minutes: 7'
Boring Caved to 8' After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

Soil Stratification is Approximate

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SOIL BORING LOG

Boring No. D-1

Project: Civic Center Promenade, Ampitheater & Tract One
Location: Lake Charles Civic Center Grounds
Lake Charles, Louisiana
Client: D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

DJH File No: 08-067
Date Drilled: 1/7/2009
Logged By: Rob Morgan
Drilled By: DJH, PE, Inc.
Equipment: Carey Top Drive (Tractor)

Depth (ft)	Field Tests: Sample Type	Field Tests: Penetrometer (tsf) or SPT (bpf)	Field Tests: Ground Water	Laboratory Tests: Qu / UU (tsf)	Laboratory Tests: Dry Density, γd (pcf)	Laboratory Tests: Moisture Content, w (%)	Laboratory Tests: Atterberg Limits: Liquid Limit, %	Laboratory Tests: Atterberg Limits: Plastic Limit, %	Laboratory Tests: Atterberg Limits: Plasticity Index, %	Laboratory Tests: Notes / Other Tests	Symbol	Description
76												Medium dense light gray SILTY fine to medium SAND (SM)
77												
78												
79	SS	20 bpf 10-9-11				22				PSA 11		-ditto (SP)
80												Boring Completed at 79½' Depth
81												
82												
83												
84												
85												
86												
87												
88												
89												
90												
91												
92												
93												
94												
95												
96												
97												
98												
99												
100												

Boring Data

Boring Advancement:
Dry Auger: 0 - 8'
Rotary Wash: 8' - 79½'
Boring Abandonment:
Boring Grouted w/ Bentonite-Cement Upon Completion

Ground Water Data

▽ First Encountered: 9'
▽ After 15 Minutes: 7'
Boring Caved to 8' After 15 Mins

Sample Type:
ST: Shelby Tube (ASTM D 1587)
SS: Split Spoon (ASTM D 1586)

Notes / Other Tests

PSA = Particle Size Analysis (ASTM D 422)

Soil Stratification is Approximate

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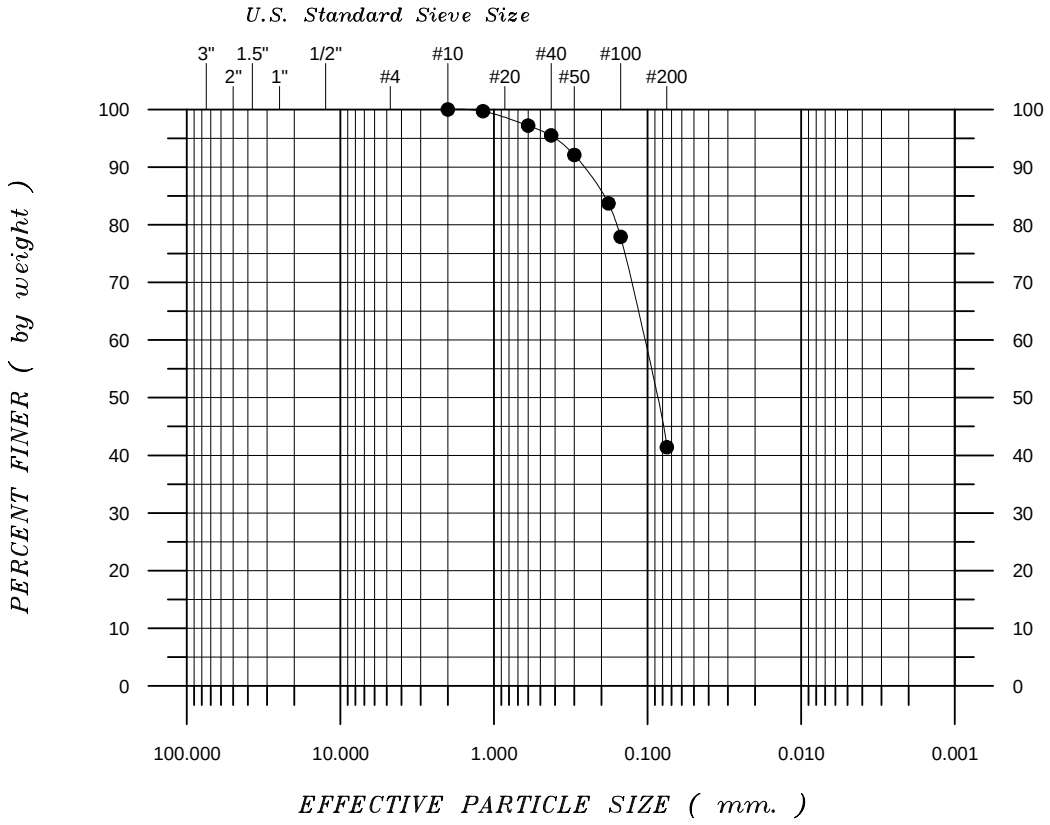
Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. A-1, 0 to 1½' depth

Sample Description: Dark brown SILTY fine SAND (SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	99.7
#30	0.600	97.2
#40	0.425	95.5
#50	0.300	92.1
#80	0.180	83.7
#100	0.150	77.9
#200	0.075	41.4



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Lake Charles, Louisiana
for
D.W. Jessen & Associates, LLC
Lake Charles, Louisiana

Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:	DJH	Figure No.	PSA 1

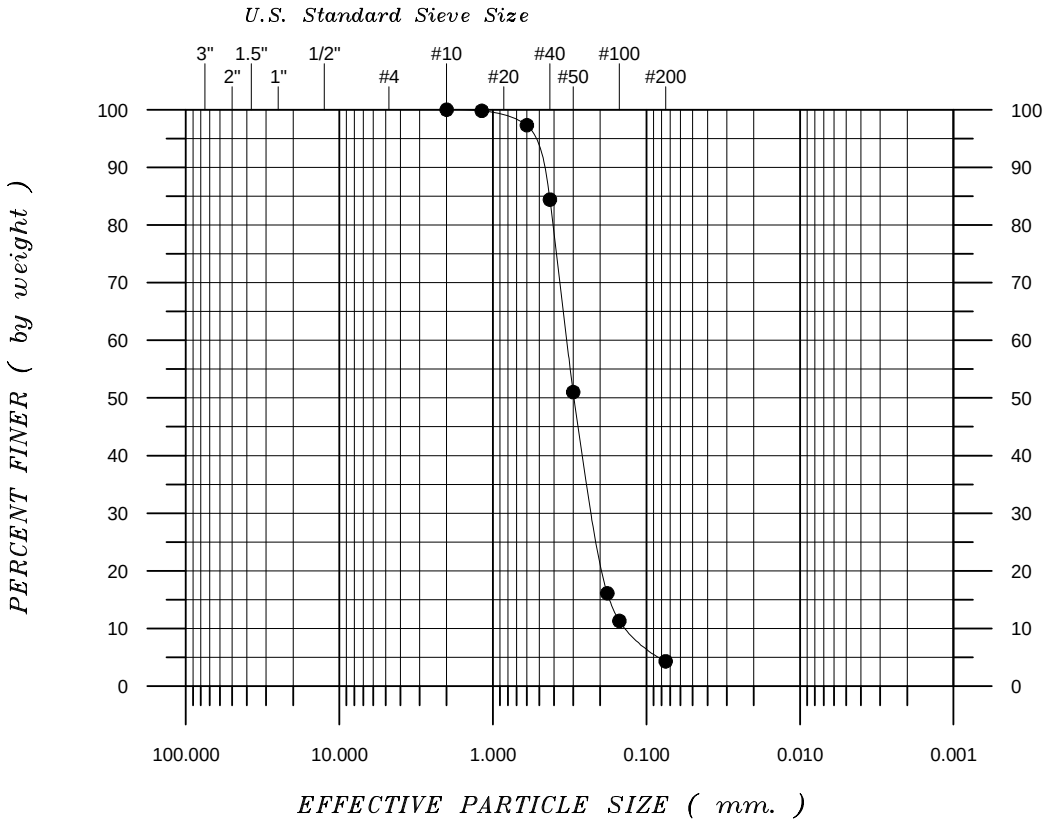
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. A-1, 13 to 14½' depth

Sample Description: Medium dense light gray SILTY fine to medium SAND (SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	99.8
#30	0.600	97.3
#40	0.425	84.4
#50	0.300	51.0
#80	0.180	16.1
#100	0.150	11.3
#200	0.075	4.3



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Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:	DJH	Figure No.	PSA 2

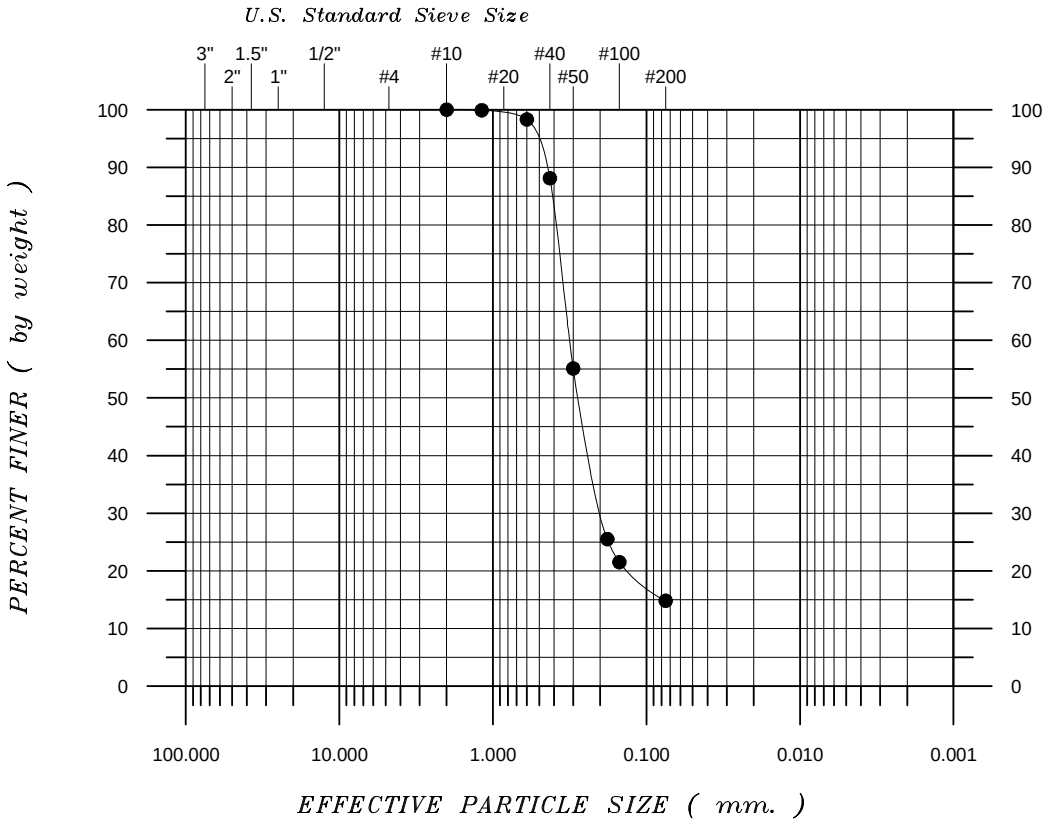
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. A-2, 4 to 5½' depth

Sample Description: Medium dense tan SILTY fine SAND (SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	99.9
#30	0.600	98.3
#40	0.425	88.1
#50	0.300	55.1
#80	0.180	25.5
#100	0.150	21.5
#200	0.075	14.8



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Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:	DJH	Figure No.	PSA 3

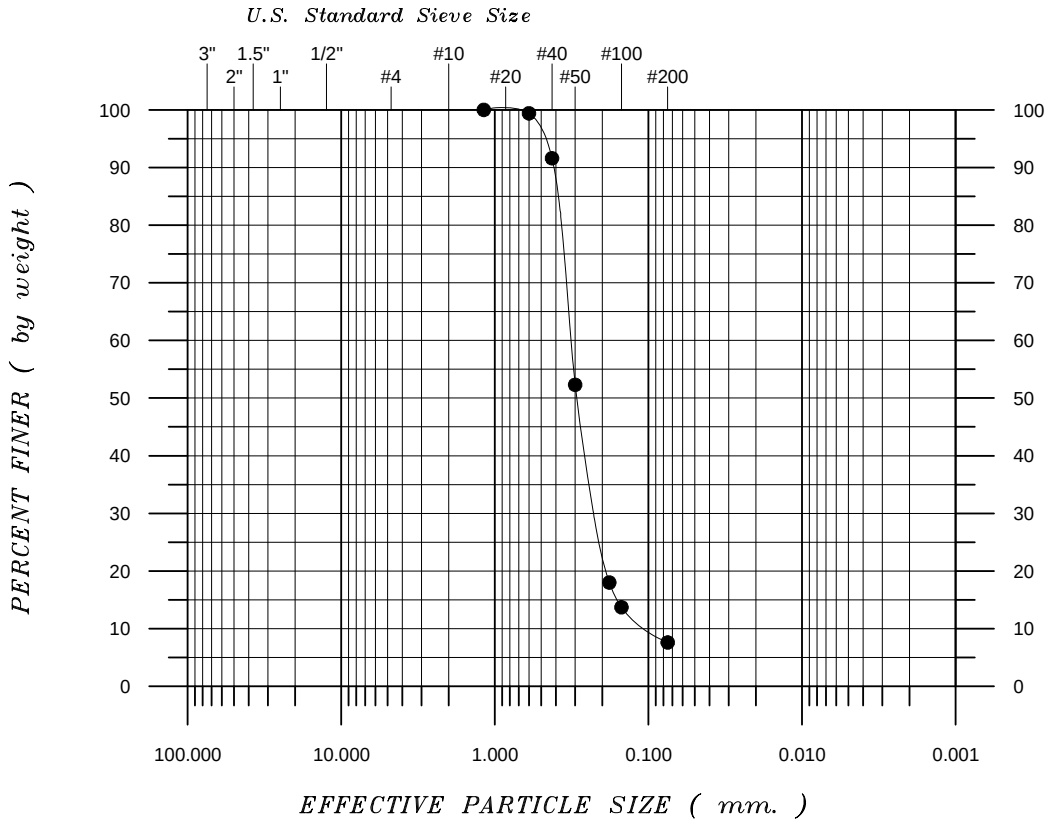
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. A-3, 6 to 7½' depth

Sample Description: Medium dense light gray SILTY fine to medium SAND (SP-SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#16	1.18	100.0
#30	0.600	99.4
#40	0.425	91.6
#50	0.300	52.3
#80	0.180	18.0
#100	0.150	13.7
#200	0.075	7.6



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Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:	DJH	Figure No.	PSA 4

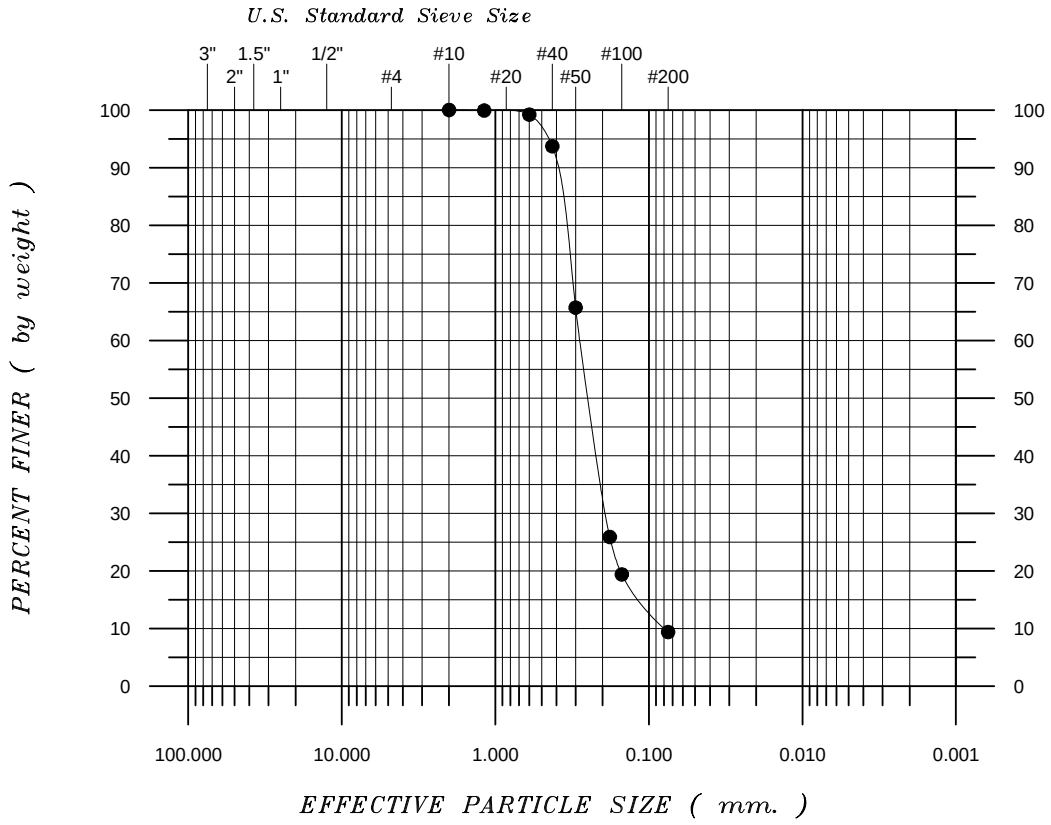
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. B-1, 2 to 3½' depth

Sample Description: Medium dense tan SILTY fine SAND (SP-SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	99.9
#30	0.600	99.2
#40	0.425	93.7
#50	0.300	65.7
#80	0.180	25.9
#100	0.150	19.4
#200	0.075	9.4



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Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:	DJH	Figure No.	PSA 5

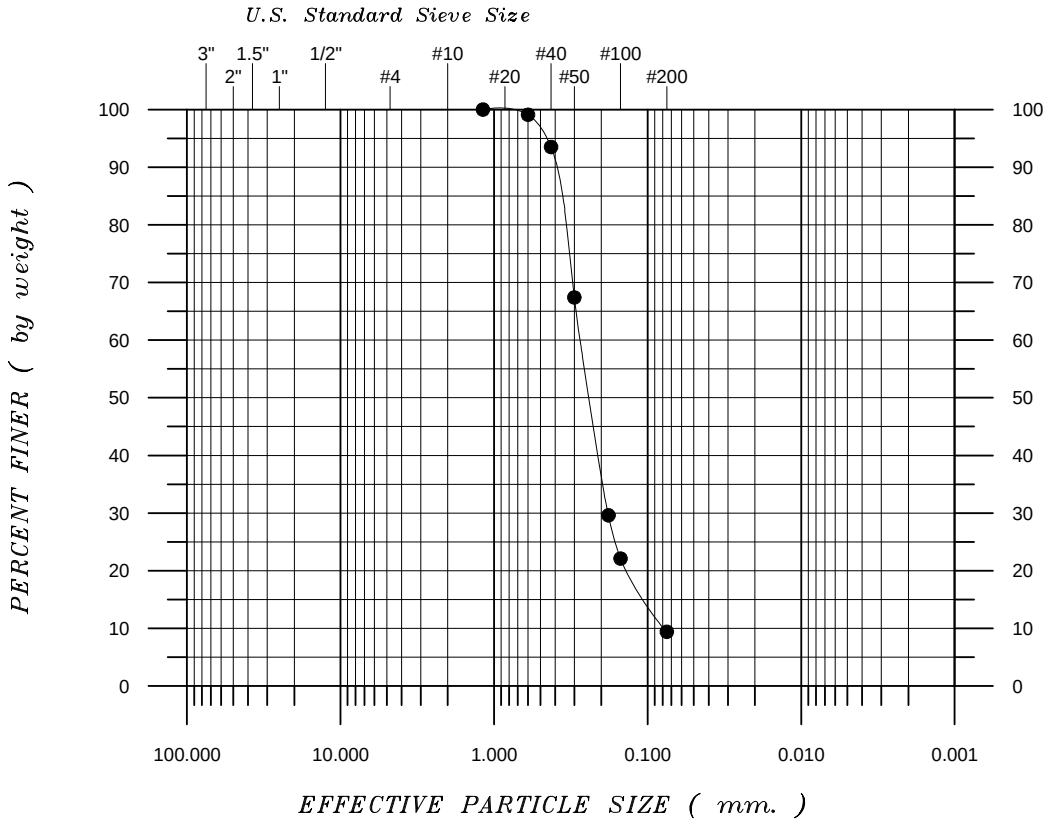
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. B-2, 6 to 7½' depth

Sample Description: Medium dense tan SILTY fine SAND (SP-SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	100.0
#30	0.600	99.1
#40	0.425	93.5
#50	0.300	67.4
#80	0.180	29.6
#100	0.150	22.1
#200	0.075	9.4



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Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:		Figure No.	PSA 6

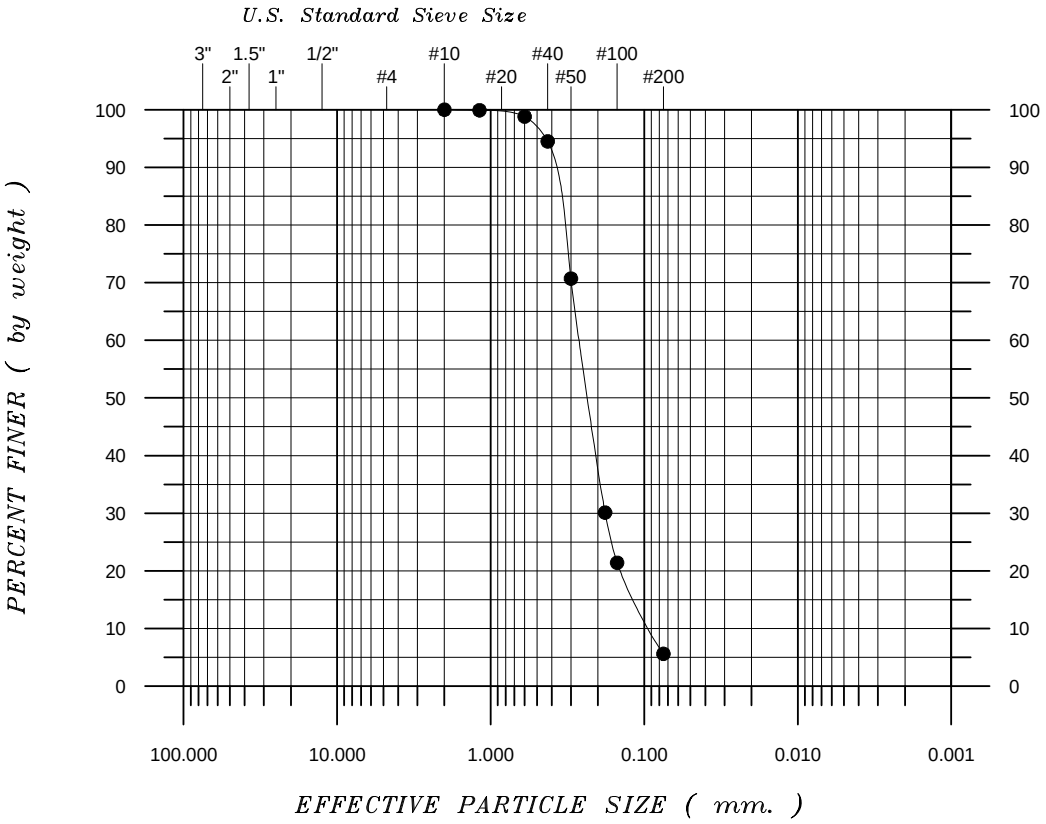
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. C-2, 2 to 3½' depth

Sample Description: Medium dense tan SILTY fine SAND (SP-SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	99.9
#30	0.600	98.8
#40	0.425	94.5
#50	0.300	70.7
#80	0.180	30.1
#100	0.150	21.4
#200	0.075	5.6



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Lake Charles, Louisiana

Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:	DJH	Figure No.	PSA 7

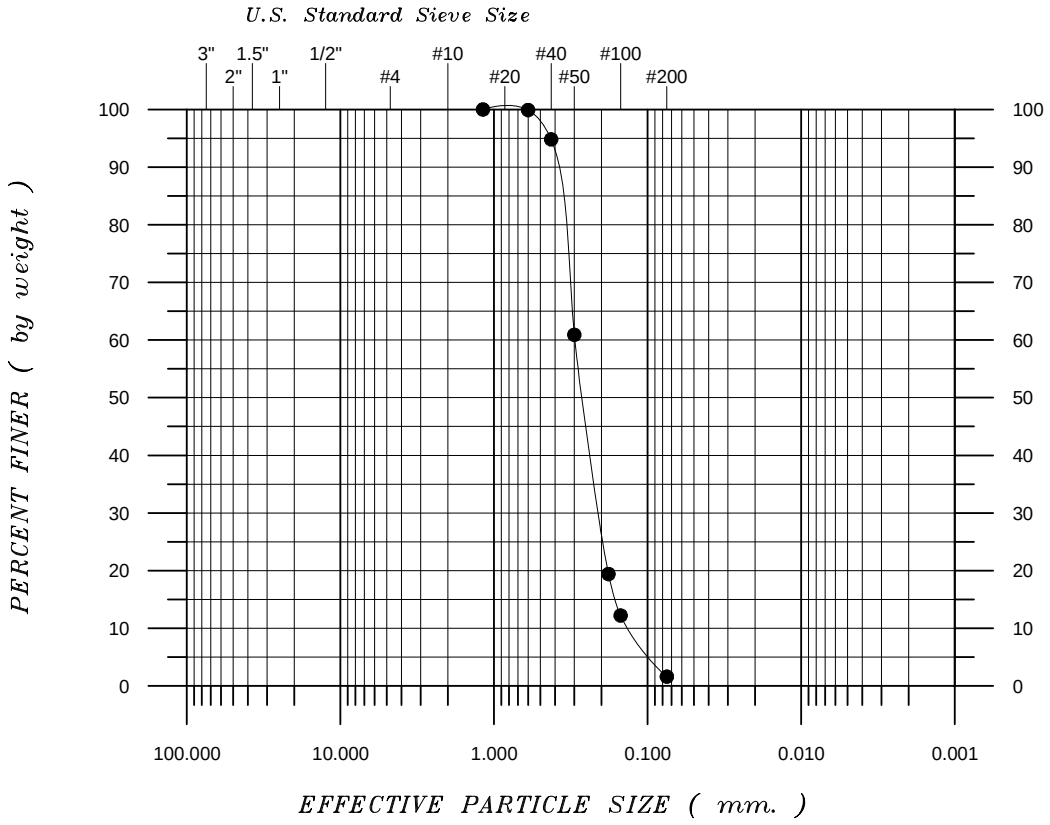
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. C-2, 38 to 39½' depth

Sample Description: Medium dense light gray SILTY fine to medium SAND (SP)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	100.0
#30	0.600	99.9
#40	0.425	94.8
#50	0.300	60.9
#80	0.180	19.4
#100	0.150	12.2
#200	0.075	1.6



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Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:	DJH	Figure No.	PSA 8

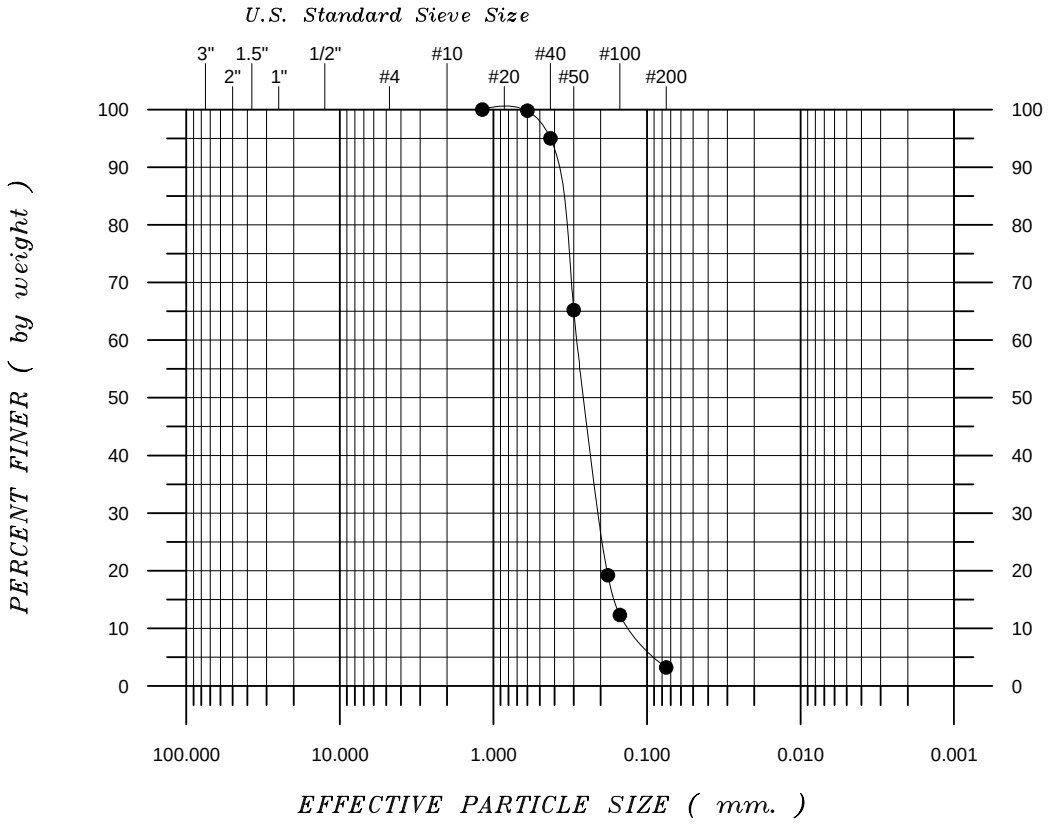
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. D-1, 8 to 9½' depth

Sample Description: Medium dense light gray SILTY fine to medium SAND (SP-SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	100.0
#30	0.600	99.8
#40	0.425	95.0
#50	0.300	65.2
#80	0.180	19.2
#100	0.150	12.3
#200	0.075	3.2



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Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:	DJH	Figure No.	PSA 9

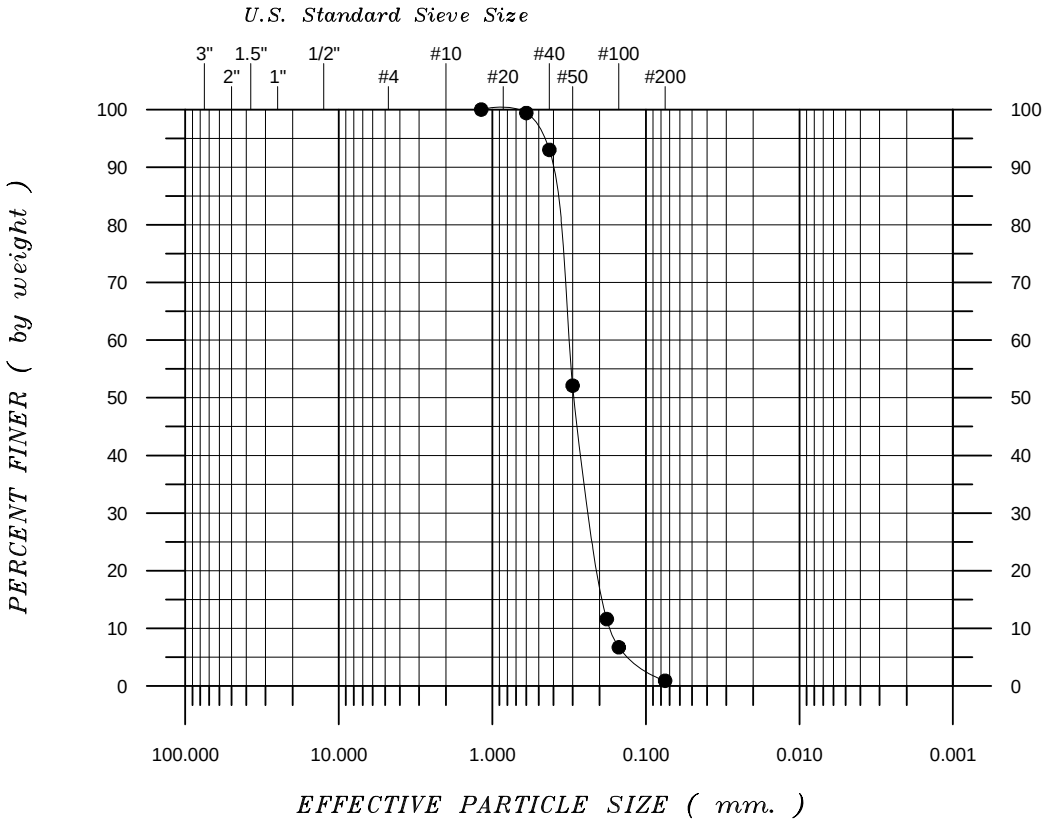
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. D-1, 43 to 44½' depth

Sample Description: Medium dense light gray SILTY fine to medium SAND (SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	100.0
#30	0.600	99.4
#40	0.425	93.0
#50	0.300	52.1
#80	0.180	11.6
#100	0.150	6.7
#200	0.075	0.9



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Lake Charles, Louisiana
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Lake Charles, Louisiana

Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:		Figure No.	PSA 10

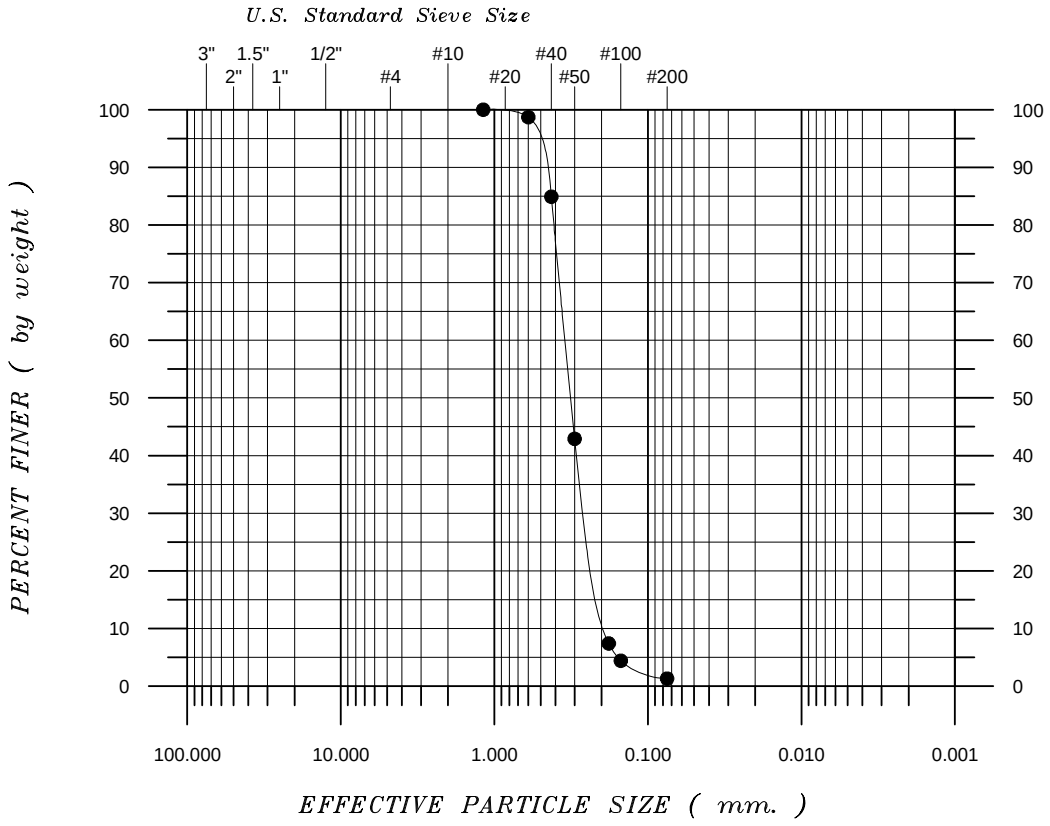
Particle Size Analysis

Particle Size / Hydrometer Analysis
(ASTM D 422)

Sample Location: Boring No. D-1, 78 to 79½' depth

Sample Description: Medium dense light gray SILTY fine to medium SAND (SM)

Particle Size		Percent Finer
(Sieve)	(mm.)	by Wt.
#10	2.00	100.0
#16	1.18	100.0
#30	0.600	98.7
#40	0.425	84.9
#50	0.300	42.9
#80	0.180	7.4
#100	0.150	4.4
#200	0.075	1.3



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Project Engineer:	DJH	DJH File No.	08-067
Drawn By:	dan	Date:	13 Jan 09
Checked By:		Figure No.	PSA 11

Particle Size Analysis

Description of Field and Laboratory Testing Procedures

Field Testing Procedures. The borings were initially advanced using dry augering methods. Soil samples were obtained continuously in the upper 10 foot and on 5 foot centers thereafter. The sample depths and types are recorded on the soil boring logs.

In general, relatively undisturbed "Shelby" tube samples (ASTM D 1587) were taken in clays and silty clays. Undisturbed soil samples are required for strength and density tests, and other properties that are dependent upon the soil being close to its natural state. In this procedure, the boring is advanced to the desired sampling depth, then a 3 inch diameter, thin-walled "Shelby" tube is inserted into the borehole. The tube is then pushed hydraulically about 2 feet into the undisturbed soil. The tube is withdrawn, and the sample extruded with a hydraulic piston. The sample is visually classified and tested with a spring loaded penetrometer, which provides a crude estimate of the unconfined compressive strength. The penetrometer test result is recorded on the soil boring log, and a representative portion of the sample is secured for transport to the laboratory.

In sands and silts, Standard Penetration Tests (ASTM D 1586) are generally made. This test provides a measure of the in-situ density or stiffness of the soil and provides a relatively disturbed sample that may be used for classification testing. In this procedure, the boring is advanced to the desired sampling depth, and a relatively heavy walled "split spoon" sampler is inserted into the borehole. The sampler is driven into the soil using a 140 pound "drop" hammer with 30 inch strokes. The number of blows required to drive each 6 inch increment is recorded. The first increment is a seating drive; the number of blows required to drive the second and third increments are added together to determine the "N-value," which has units of blows per foot (bpf). The N-value and the number of blows per increment are recorded on the soil boring log. The sample is visually classified, and a representative portion secured for transport to the laboratory.

Laboratory Testing Procedures. Representative samples from the field investigation were selected by the project engineer for laboratory testing to determine their relevant engineering characteristics. These tests generally fall into one of the following categories.

Strength Tests. Strength tests generally consist of the Unconfined Compressive Strength, or Qu Test, (ASTM D 2166), and the Unconsolidated, Undrained Triaxial Compressive Strength, or UU Test, (ASTM D 2850). In each of these tests, a cylindrical sample of undisturbed soil is subjected to an axial load until failure occurs, yielding the compressive strength of the soil. The principal difference between the two tests is that the Qu is not confined laterally, which can lead to premature failure, and thus, lower compressive strength values. The UU test is confined laterally in a triaxial cell, typically to the lateral stress that the in-situ soil sample was subject to. The compressive strength and axial strain at failure (ε_f) are recorded on the soil boring log. The confining stress of UU tests is also recorded.

Classification Tests. Common classification tests include the Atterberg Limit Tests and Particle Size Analyses. Atterberg Limit Tests (ASTM D 4318) are performed to determine the consistency (or "clayeyness") of a soil. The Atterberg limits consist of the Liquid Limit (LL) and the Plastic Limit (PL), and the Plasticity Index (PI), which is the difference between the LL and the PL. These values are recorded on the soil boring log.

The Particle Size Analysis Test (ASTM D 422) is performed to determine the distribution of the individual particle sizes of a soil sample. The test is typically performed using mechanical sieves for soils containing gravel and sands, or a "hydrometer" for clayey and silty soils. The results of the Particle Size Analysis are typically plotted on a log scale.

Physical Tests. Common physical tests include the Moisture Content Test (ASTM D 2216) and the Dry Density Test. As the names indicate, these tests determine the moisture content and dry density (or dry unit weight) of a soil sample.