EXHIBIT 11A - GEOTECHNICAL STUDY - NORTH 110 ACRES

PRELIMINARY
SUBSURFACE INVESTIGATION
PROPOSED PROJECT TANGO SITE
SHREVEPORT, LOUISIANA

PREPARED FOR:

DUKE REALTY LIMITED PARTNERSHIP
C/O DUKE REALTY CORPORATION
14241 N. DALLAS PKWY., STE. 1000
DALLAS, TEXAS 75254

PREPARED BY:

ARDAMAN & ASSOCIATES, INC.
7222 GREENWOOD ROAD
SHREVEPORT, LOUISIANA 71119

ARDAMAN PROJECT NO.: 113-11-94-8781
AAI SHREVEPORT FILE NO.: 12.94.009

DECEMBER 1, 2011

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Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

December 1, 2011

Duke Realty Limited Partnership
c/o Duke Realty Corporation
South/West Region
14241 N. Dallas Pkwy., Suite 10000
Dallas, Texas 75254

Attention: Mr. Luke Peters, P.E.
Development Services Manager

Reference: Preliminary Subsurface Investigation
Proposed Project Tango Site
Shreveport, Louisiana
Ardaman Project No.: 113-11-94-8781
AAI Shreveport File No.: 12.94.009

Gentlemen:

Attached is our Subsurface Investigation Report for the above referenced project. Ardaman & Associates, Inc. (AAI) will be happy to assist you further on this project by furnishing any Construction Materials Testing Services you or your contractor may require. We are a full service laboratory with certified engineering technicians and can provide the full range of testing services including soils, concrete, and asphalt.

It has been a pleasure to perform this work for you. If we can be of any further assistance, please do not hesitate to call on us.

Very truly yours,

ARDAMAN & ASSOCIATES, INC.

James M. Belt, P.E.
Branch Manager

Lloyd G. Hoover, P.E.
Principal Engineer

cc) (2) Client

PRELIMINARY
SUBSURFACE INVESTIGATION
PROPOSED PROJECT TANGO SITE
SHREVEPORT, LOUISIANA

GENERAL

This study was authorized on October 31, 2011 via email correspondence with Mr. Luke Peters, P.E., Development Services Manager for Duke Realty Corporation South/West Region. The purposes of the study were to (1) explore the subsurface conditions present at the proposed site, (2) determine the pertinent engineering properties of the materials encountered, and (3) develop recommendations of soil parameters for preliminary design and cost estimation of foundation, slab and pavement systems compatible with the soil conditions at this site.

PROJECT DESCRIPTION

AAI understands the proposed project will be a large warehouse type facility. The project includes a 1,015,740 SF warehouse/office building and about 30 acres of paved parking with access drives associated with the proposed facility. The building construction is anticipated to be reinforced concrete tilt-panel exterior walls with interior steel columns supporting a steel bar-joist and girder roof system. Structural loads are anticipated to be light to moderate. Finished floor elevation is anticipated to be at an approximate elevation of 251. Vehicular traffic is anticipated to include a significant volume of tractor trailer trucks and privately owned vehicles on a daily basis. Access and egress to the facility will be from US HWY 80/Greenwood Road via about 12,000 feet of new roadway.

The proposed site for the facility is on an approximate 120 acre parcel of undeveloped land situated some distance north of US HWY 80/Greenwood Road near its intersection with Bert Kouns Industrial Loop in Flournoy community on the west side of Shreveport, Louisiana. The property appeared to be reforested farm land with the entire site heavily wooded at the time of this investigation. Topography of the property is dominated by a low hill with a topographic high near the area proposed for south central side of the building, sloping towards all 4 corner locations. Maximum elevation differential across the building site appears to be in the order of 40 to 45 feet. Extensive cut and fill operations will be required to grade the site for a proposed finished floor elevation of 251. Natural site drainage appears to be generally towards the east, south, and northwest. Two small ponds were observed on the property, one northwest and one south of the proposed building's location. These ponds were very low but contained some water at the time of this investigation.

FIELD OPERATIONS

The subsurface exploration for this facility consisted of taking a total of 30 test borings within the proposed footprint of the building. The boring plan was designed to sample the surface material a minimum of 15 feet below the proposed finished floor elevation. Boring depths subsequently varied from 15 to 35 feet. Test boring locations were selected and staked in the field by the AAI utilizing the site plan provided, Google™earth Maps, and a good quality hand held GPS unit. Surface elevations were estimated from topographic information available on the site plan, Google™earth, and GPS data. Our field investigation was conducted between November 7th and 15th, 2011. Access to the boring locations was achieved by clearing underbrush and small trees with a bulldozer to create a pathway for our ATV mounted drilling equipment and 4 wheel drive support vehicles.

The test borings were advanced utilizing continuous-flight, solid stem augers and our CME 550X drilling machine. Samples were obtained for laboratory evaluation in general accordance with provisions of ASTM D1586 and D1587. Standard, thin-walled, seamless Shelby tube samplers were used to obtain specimens of cohesive materials. These specimens were taken continuously to a depth of 10 feet below the existing ground surface or 10 feet below finished floor elevation. Below 10 feet or where overburden existed above finished floor elevation, samples were obtained at intervals not exceeding 5 feet as the borings were advanced.

Soils which contained enough cohesionless material or were sufficiently dense to prevent recovery of undisturbed specimens with Shelby Tube samplers were evaluated by means of the Standard Penetration test. This test consists of determining the number of blows required by a 140 pound hammer dropped 30 inches to achieve one foot penetration of the soil. This number is then related to "in situ" density of the material.

All samples obtained were logged, sealed and packaged in the field to protect them from disturbance and maintain their in situ moisture content during transportation to our laboratory. The results of our boring program (Logs of Boring) are included as Appendix "A" of this report.

LABORATORY TESTING

Upon return to our laboratory selected samples were subjected to standard laboratory tests under the supervision of a soils engineer. Atterberg Limits (ASTM D4318), percent of material passing a U.S. Standard No. 200 sieve (ASTM D1140), and moisture content (ASTM D2216) of the different subsurface soils were determined. These soil properties were used to classify the soils and evaluate their potential for volumetric change. Unconfined compression tests (ASTM D2166) were performed on selected samples of cohesive soils to estimate shear strength of the materials at various depths. The results of our laboratory testing program are included on the Logs of Boring in Appendix "A".

SOIL CONDITIONS

Soil conditions described in this section are of a generalized nature and intended to emphasize key features and characteristics. For a more detailed description of the subsurface materials encountered refer to the soil profiles on each Log of Boring in Appendix "A" of this report. Strata contacts indicated on our Logs are approximate. Actual transitions may be gradual in nature.

The entire site has a well-developed top soil layer. This layer is composed of surficial organics over sandy loam that varied in thickness from about 4 to 10 inches. Below the top soil layer hard, dry, highly plastic silty clay was generally encountered. This material generally classifies (CH) *fat clay,* per the Unified Soils Classification System (USCS). This stratum becomes thinly laminated below the weathered zone (5 to 10 feet) and contains firm to dense silty sand seams in some areas. Sand and silt content varies to the extent some samples classified (CL) *lean clay with sand.* These were generally found within 2 to 4 feet of the ground surface.

Fat clay (CH) soils are volumetrically unstable with high potential to shrink and swell with variations in moisture content. Soil moisture contents were generally very low within the upper 8 to 10 feet across this site, with insitu moisture contents well below Plastic Limits. This condition indicates a desiccated state exists and the CH soils will have a high tendency for swell when exposed to moisture.

GROUNDWATER

Shallow groundwater was not encountered to the depths explored at this site. However, cohesive soils of the type encountered at this site will frequently retain "perched" water near the ground

surface during the wetter seasons of the year or after significant rain events. This condition is temporary but can significantly impact earthwork activities. If construction activities are to be initiated during the wetter seasons of the year we recommend water levels at the site be verified prior to any construction activity.

SUBGRADE PREPARATION

Prior to subsequent construction activity, surficial vegetation should be removed and wasted. Top soil stripping on the order of 6 to 10 inches is anticipated to remove roots, stubble and brushy debris left after clearing operations. Stump holes should be completely filled to prevent ponding of water on the site. Additional excavation and backfill may be required if previously undetected weak spots are encountered during the stripping operation. Provide drainage of exposed subgrade by sloping grades and ditching away from the construction site.

Pavement Subgrade. After clearing and striping, it is recommended the upper twelve (12) inches of exposed pavement subgrade, at or below finished grade elevation, be scarified, moisture conditioned and recompacted to a minimum of 95 percent of the laboratory maximum density as determined by ASTM D698 (standard proctor) at 1 to 3 percent *above* optimum moisture content prior to subsequent construction. Subgrade soils classifying (CH) and within 1 foot of finished subgrade or subbase elevation should be undercut and replaced with select fill or treated in-place with hydrated lime. Lime treatment should decrease the in-situ plasticity index to 15 or less. For bid purposes 15% hydrated lime by volume can be used to estimate treatment costs. The actual quantity should be verified by the geotechnical engineer during the construction phase of the project in accordance with Louisiana Department of Transportation and Development Test Method TR 433. General recommended procedures for lime treatment are included in Appendix "B" of this report. The lime treated subgrade should be compacted to a minimum of 98 percent of the laboratory maximum as determined by ASTM D698 at moisture content of 1 to 3 percent *above* optimum moisture.

Building Subgrade. After clearing and striping, it is recommended the upper twelve (12) inches of building subgrade to receive fill be scarified, moisture conditioned and recompacted to a minimum of 95 percent of the laboratory maximum density as determined by ASTM D698 at 1 to 3 percent *above* optimum moisture content prior to subsequent construction. Subgrade soils classifying (CH) and within 4 feet of the base of any footing (6 feet below bottom of slab elevation) should be undercut and replaced with select fill or treated in-place with hydrated lime as specified above.

FILL RECOMMENDATIONS

Where fill will be required to achieve the desired finished grade elevation, the material should be placed and compacted in a controlled manner. Lifts should be placed in thin horizontal layers not exceeding 8 inches in compacted thickness. Each lift should be moisture conditioned to within 2 percentage points of optimum moisture and compacted to a minimum of 98 percent of the laboratory maximum as determined by ASTM D698. All imported fill material should be "select". Select materials classify as clayey sand (SC) or sandy lean clay (CL) in accordance with the USCS and will have liquid limits no greater than 38 and plasticity indices between 8 and 18 with no more than 80 percent passing the No. 200 sieve. Onsite soils classifying CH are not suitable for re-use as fill beneath buildings or pavements unless subjected to lime treatment. Specifications for compaction of sandy clay and clayey sand soils are included in Appendix "B" of this report.

FOUNDATION RECOMMENDATIONS

Due to its susceptibility to volumetric change, the soil type encountered at this site is poorly suited for support of a shallow foundation system without considerable site modifications. We estimate the free swell potential of the fat clay soils at this site could be in the order of 4 to 5 inches. Therefore most positive means of supporting the structure is on a deep foundation system with voided grade beams and a structurally suspended slab. This type system must be used if the facility cannot tolerate any differential movement between the interior and periphery of the building. AAI recognizes this type system is expensive and probably not economically feasible for a facility of this size.

If seasonal movement in the order of an inch can be tolerated, a shallow support system could be utilized with certain site modifications, the use of specialized design procedures, and a full understanding of the risks involved with an alternative support system. Often used alternatives to a deep support with suspended slab system are site modifications that isolate the slab and foundation from the active soils with a considerable thickness of inactive material and/or a specifically designed shallow support system, such as post-tension cable or conventional steel reinforced "waffle" or "ribbed" stiffened slab-on-grade designs. Properly designed and constructed, these type support systems allow the building slab (or fill) to accommodate stresses induced by normal seasonal soil movements without structural damage to the slab. With the

placement of 4 feet of inactive fill, a stiffened ribbed or waffle type slab, specifically designed for the existing site conditions, can be utilized. To utilize a conventionally reinforced shallow foundation with ground supported slab more extensive site modifications will be required. A minimum of 6 feet of inactive fill is required below the floor slab.

It should be emphasized these designs minimize, but do not eliminate, differential movements within the structure. Some cracking can still develop, but is generally cosmetic in nature. To eliminate the potential for seasonal soil movement in the structure, a deep foundation with a structurally suspended floor system must be used. We estimate differential movement due to normal moisture induced volumetric changes would be in the order of one inch or less with either shallow support system options described herein.

Deep Support System - The most positive means of supporting this structure is on drilled and poured in place straight-sided concrete caissons (drilled shafts). Ardaman recommends drilled shafts are installed to a minimum depth of twenty-five (25) feet below the proposed finished floor elevation This depth is recommended in order for the shafts to develop adequate friction at the soil/pile interface to resist the uplift forces that can be generated in the active moisture zone at this site and to minimize sand heave into the borehole bottom during installation operations.

Shaft stems need to be reinforced to resist tensile forces that may develop in this active zone. The active zone should be considered to extend from the ground surface to a depth of approximately ten (10) feet for purposes of steel reinforcement design. This typically requires reinforcement for the entire shaft lengths. Casing of the borehole during shaft installation is not anticipated but could be required if sloughing of the side walls occur in the slickensided clays. If water is present in the borehole, concrete should to be placed by tremie, displacing water from the bottom to the surface as the caisson is constructed. It is recommended test shafts be drilled prior to installation of the foundation to establish an installation procedure.

Allowable loads for various diameter straight-sided shafts are outlined below in Table 1. The compressive capacities provided contain a minimum factor of safety in the order of two (2). The Uplift capacities provided include a minimum factor of safety in the order of three (3).

TABLE 1.

ALLOWABLE LOADS FOR STRAIGHT SIDED DRILLED SHAFTS

Shaft Diameter (inches)	Tip Depth (feet)	Compressive Capacity (kips)	Uplift Resistance (kips)
18	25	53.4	28.5
24	25	75.9	38.0
30	25	81.1	47.5
36	25	128.0	57.0

A minimum void of six (6) inches should be provided between the bottom of all grade beams and the underlying expansive soils. These voids can be provided by cardboard forms or any other suitable material manufactured for this purpose. Rigid protection should be installed along the outer edge of the grade beams to prevent backfill from infiltrating the void.

The most positive means of preventing distress in the non-load bearing floor slabs due to expansion and contraction of the clay soils is to structurally suspend the floor system. A six (6) inch void should be provided between the bottom of the structure slab and underlying soil.

Ribbed Slab System – A less expensive alternative to the deep support system is to utilize a stiffened (rib) slab design either conventionally reinforced and/or post-tension reinforced. With 4 feet of density controlled inactive soil (select or lime treated onsite soil), a properly designed ribbed slab system should perform satisfactorily for a light to moderately loaded structure on this site. It should be emphasized, though, some minor cracking of slabs may occur. The cracks should not be structurally detrimental to the performance of the building. Our estimation of soil support parameters, per the PTI Method, for a slab design is outlined below. These values do not consider effects of lawn irrigation, flower beds or tree drying.

All fill materials should meet requirements and be placed in accordance with the Subgrade Preparation section of this report. A modulus of subgrade reaction (k) of 200 PCI can be used for either density controlled select fill or lime treated onsite soils.

TABLE 2.

SOIL PARAMETERS FOR SLAB DESIGN

Parameter	Center Lift	Edge Lift
e_m	8.0 feet	4.5
y_m	1.0 inch	1.0 inch

Allowable bearing pressure to proportion perimeter and interior beams placed in the density controlled fill is 3,000 PSF. This value can be increased to 3,500 PSF for any isolated spread footings. These values contain a minimum factor of safety of two (2) against shear failure of the bearing stratum. Minimum beam widths as recommended by PTI should be adhered too. Use of a polyethylene sheeting to reduce subgrade friction and to serve as a moisture vapor barrier is recommended.

Conventional Shallow Support System – Modifying the site to accommodate a conventional shallow foundation system will likely be the most economical choice for this site. To utilize a conventionally reinforced, shallow foundation system with slab-on-grade, considerable site modifications will be required. A minimum of 4 feet of inactive soil is recommended beneath the bottom of any footing or gradebeam and the underlying active clay. A minimum of 6 feet below the non-load bearing floor slab is required. To meet this criterion, the floor elevation can be raised; the existing fat clay soils can be removed; or a combination of both methods can be utilized that achieves the necessary thicknesses. All fill or backfill should be placed in accordance with the Subgrade Preparation Section of this report. It should be noted this alternative minimizes but does not eliminate the effects of normal seasonally induced volumetric changes in the underlying clay soils. Some minor cracking of masonry and drywall can still occur. Significant movement is almost certain if water is allowed to saturate the fill beneath the building. This can occur through undetected plumbing leaks or failure to direct runoff water away from the building.

With the site modified as described above and consideration given to the risks, a shallow foundation system can be utilized to support the building. An allowable bearing value of 3,000 PSF can be utilized to proportion continuous footings placed no more than two (2) feet into the density controlled fill. This bearing value contains a factor of safety in the order of two (2) against shear failure of the bearing stratum. A minimum footing width of eighteen (18) inches should be maintained for all continuous footings as protection against potential isolated shear failure.

Interior columns or other areas of concentrated load can be supported by isolated spread footings. The base of the footings should be placed in the previously described stratum. An allowable bearing value of 3,500 PSF can be used to proportion all spread footings. The bearing value contains a factor of safety on the order of two (2). A minimum footing width of twenty-four (24) inches should be maintained for all spread footings.

The non-load bearing floor slab for the proposed structure can be placed directly on the density controlled fill. It is recommended the slab be structurally tied to the foundation. Load bearing floor slabs should be placed over 4 to 6 inches of density controlled crushed aggregate base material. Use of a polyethylene moisture (vapor) barrier is recommended under all climate controlled areas.

PAVEMENT INFORMATION

Pavement section recommendations for this site are based upon our assumption subsurface conditions in the pavement areas are similar to those inferred by the test borings taken in the building area, our experience with facilities of a similar nature, and our the traffic loading provided. Properly moisture conditioned and compacted, the existing untreated CL and CH surface soils will have a soaked California Bearing Ratio (CBR) value in the order of 2 to 4 or Modulus of Subgrade Reaction (k) in the order of 100 PSI per inch. Select fill materials of the type specified and lime treated subgrade soils properly compacted will have CBR values in the range of 10 to 15 with "k" values of 200 to 225 PSI per inch.

It is entirely possible soil conditions differ significantly along the access road alignments. Additional work should be done to characterize these soils prior to final design of the pavement section.

Rigid Pavement - Concrete pavement sections suggested for this site are shown below. We anticipate, at a minimum, heavy duty rigid pavement will be needed in the truck docking/parking area where loaded vehicle will be making sharp turns and dropping trailers. Minimum flexural strength of the concrete should be 650 pounds per square inch (PSI) or have compressive strength of 4,000 PSI at twenty-eight (28) days of age. Ardaman recommends the use of chemical air entrainment additives in the concrete mix to enhance workability of the fresh

concrete mixture and to improve long term durability of the pavement surface. Control joint spacing should not exceed twelve (12) feet for un-reinforced pavement of the thicknesses outlined below. All concrete paving should include provisions to mechanically control temperature induced shrinkage cracking and provide for load transfer across construction joints. Although not required under the rigid auto sections, the use of a 4 inch aggregate base layer over the subgrade will increase "k" values approximately 15%, will reduce pumping of fines at the joints, and reduce maintenance costs over the life of the pavement.

Automobile Parking Section

5.0 Inches Portland Cement Concrete
over
12.0 Inches Density Controlled Lime Treated Subgrade and/or Select Fill

Automobile Drive Section

6.0 Inches Portland Cement Concrete
over
12.0 Inches Density Controlled Lime Treated Subgrade and/or Select Fill

Access Road and Truck Parking Section

8.0 Inches Portland Cement Concrete
over
6.0 Inches Crushed Aggregate Base Material
(or 6.0 inches Portland Cement Stabilized Base Material)
over
12.0 Inches Density Controlled Lime Treated Subgrade and/or Select Fill

Flexible Pavement – Flexible paving structurally similar to the above rigid sections are provided for your cost comparison. Hot mixed asphaltic concrete (HMAC) mixtures should meet applicable requirements for materials, production, placement and acceptance as outlined in the *Louisiana Standard Specifications for Roads and Bridges, 2000 Edition*, Section 501 for Marshall mixtures or *LSSRB, 2006,* Section 502 for Level 1 Superpave mixtures. For parking lot and light duty drive applications we recommend utilizing the ½ inch Nominal HMAC mix of either type. This mix produces a more aesthetic surface finish and generally holds up well under automobile parking lot use. Heavy duty applications should use the ¾" inch Nominal Mix of Either Type. AAI does not recommend a flexible paving section be utilized in the truck dock/parking area. The following flexible pavement sections are suggested for site:

Automobile Parking Section

2.5 Inches HMAC Pavement
over
6.0 Inches Crushed Aggregate Base Material on Geotechnical Fabric
over
12.0 Inches Density Controlled Lime Treated Subgrade or Select Fill

OR

2.5 Inches HMAC Pavement
over
8.0 Inches Soil/Cement Base Material
over
12.0 Inches Density Controlled Lime Treated Subgrade or Select Fill

Automobile Drive Section

3.5 Inches HMAC Pavement
over
6.0 Inches Crushed Aggregate Base Material on Geotechnical Fabric
over
12.0 Inches Density Controlled Lime Treated Subgrade or Select Fill

OR

3.5 Inches HMAC Pavement
over
8.0 Inches Soil/Cement Base Material
over
12.0 Inches Density Controlled Lime Treated Subgrade or Select Fill

Access Road Section

5.0 Inches HMAC Pavement
over
10.0 Inches Crushed Aggregate Base Material on Geotechnical Fabric
over
12.0 Inches Density Controlled Lime Treated Subgrade or Select Fill

OR

5.0 Inches HMAC Pavement
over
12.0 Inches Soil/Cement Base Material
over
12.0 Inches Density Controlled Lime Treated Subgrade or Select Fill

Specifications for recommended crushed aggregate base materials and approved geotextile fabrics are included in Appendix "B" of this report. Aggregate base course layers in excess of 4 inches in thickness should be compacted to not less than 98 percent of the laboratory maximum as determined by ASTM D698.

For cost estimating purposes, 8 percent Portland cement by volume can be used to evaluate soil cement stabilization costs. It should be emphasized that soil/cement materials are susceptible to shrinkage cracking especially at higher cement contents required to achieve 350 PSI unconfined compressive strength. This phenomenon is normally unavoidable and is eventually reflected through the wearing course if a separation medium is not utilized. The cracking is not structurally detrimental to the pavement but does require maintenance to keep moisture sealed out. An aggregate separation layer or geotextile material manufactured specifically for the purpose can minimize reflective cracking but add significantly to the section cost.

Soil/Cement materials and construction procedures should be in accordance with applicable portions of Section 303 of *Louisiana Standard Specifications for Roads and Bridges, 2006 Edition* with the exception that we recommend compaction of the base layer to a minimum of 98% of the laboratory maximum as determined by ASTM D698 or AASHTO T99.

ADDITIONAL RECOMMENDATIONS

If this project moves forward and after clearing of the site, AAI recommends additional soil borings be taken along the 2 access road alignments and in the areas proposed for parking. Depth of these borings will depend upon the finalized grading plan but 5 to 10 foot depths would be anticipated. No test borings were taken in these areas for this preliminary investigation. Doing so would have required a substantial amount of additional clearing and added time and costs to the work. These borings will be necessary to ensure the most cost effective design for the pavement has been selected. It is our understanding the building's location has been shifted a hundred feet or so to the West since the time of this investigation. AAI does not feel this minor shift warrants any additional test borings at this time. However, if the building is reoriented or a major shift is anticipated, additional soil borings for the building are recommended.

CONSTRUCTION CONCERNS

The upper soils at the site are fine-grained materials composed of a significant silt and clay fractions. Silt and/or clay soils are subject to extreme changes in shear strength with varying moisture conditions and, if construction is initiated during wetter seasons of the year, it may be very difficult to move equipment about the site. Once the silt or clay becomes saturated, compaction operations can be seriously hampered by a tendency of the silt to "pump" or the clay to shear. Consequently, it is recommended adequate site drainage be established prior to and continued during and following

construction operations to prevent water ponding on or adjacent to the construction area and resulting in subsequent saturation of the soil. Compaction operations may be expedited by using light compaction equipment and thin lifts of soil. Rolling only as necessary to obtain compaction is advisable because further repetitive loading may cause the subgrade to "pump" or fail.

Compaction operations and installation of the foundations should be supervised by a qualified inspector. All foundation excavations should be inspected to verify cleaning and bearing stratum. Concrete should be placed in foundation excavations as soon as practical after forming and final clean-up have been approved, to avoid prolonged exposure of the bearing stratum and possible disturbance due to standing water, desiccation or construction operations.

Care should be taken to shape the site such that water does not pond around any structure during construction and thus weakening the subgrade and causing the clay soils to swell. When structures are complete, the ground surface should slope away from buildings and downspouts should carry runoff water several feet away from the structure, preferably into paved areas or sewers, before discharging.

Earthwork performed during wet periods of the climatic cycle may warrant special considerations. The use of hydrated lime, fly ash or Portland cement stabilization may need to be considered to provide a working platform. The need for such techniques is dependent upon earthwork scheduling with respect to weather patterns and good site management of drainage during the construction phase.

LIMITATIONS

This study has been prepared in accordance with generally accepted geotechnical engineering principles and practices in this area at this time. We make no other warranty either express or implied.

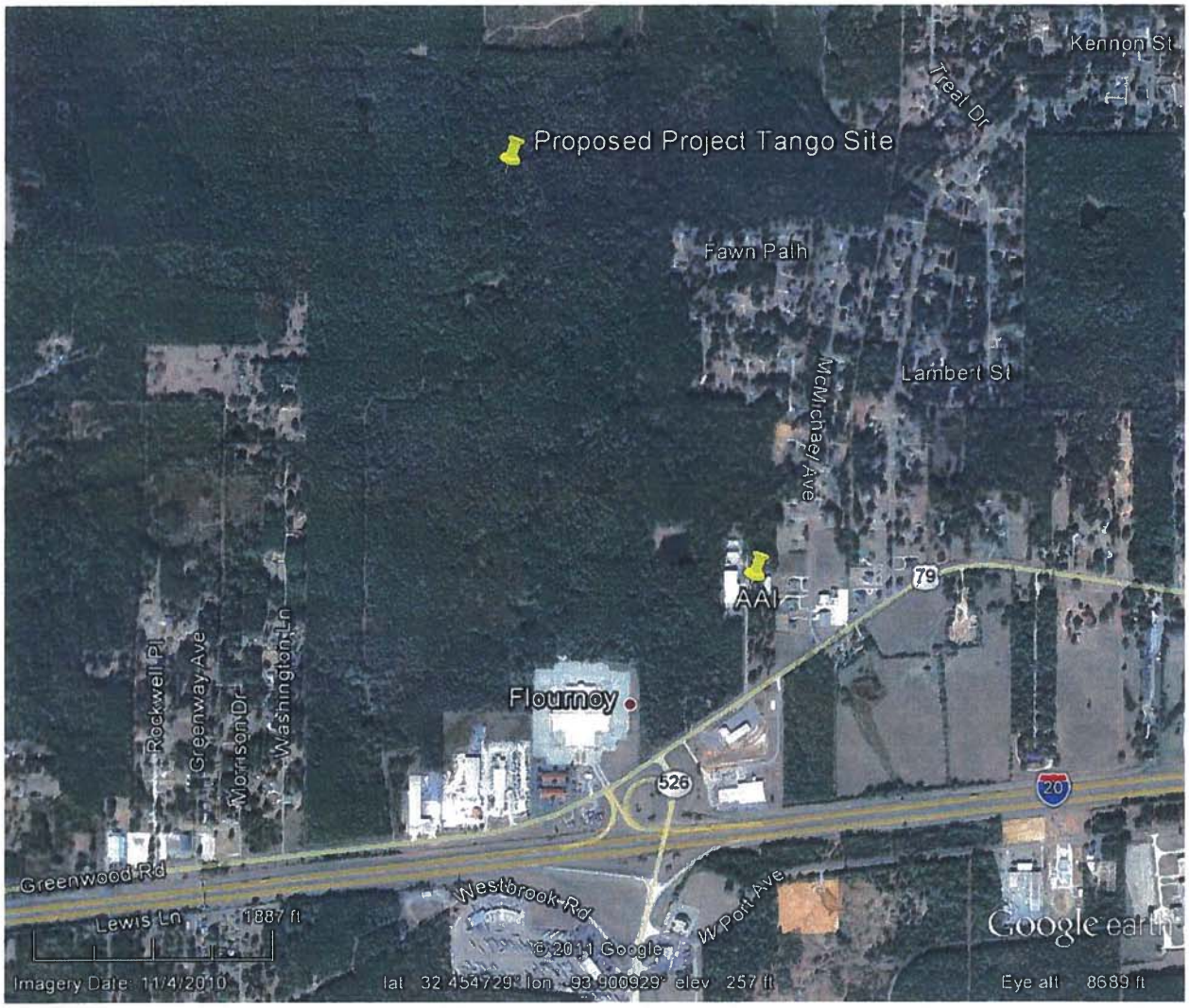
The conclusions and recommendations submitted in this report are based upon the data obtained from the exploratory borings drilled at the locations indicated in Appendix A, the proposed type of construction and our experience in the area. Our findings include interpolation and extrapolation of the subsurface conditions identified at the exploratory borings and variations in the subsurface conditions may not become evident until excavations are performed. If conditions encountered during construction appear to be different from those described in this report, we should be notified at once so that supplemental recommendations can be made if required.

This study has been prepared for the exclusive use by our client for design purposes. We are not responsible for technical interpretations by others of our exploratory information, which has not been described or documented in this report. As the project evolves, we should provide continued consultation and field services during design and construction to review and monitor the implementation of our recommendations, and to verify that the recommendations have been appropriately interpreted. Significant design changes may require additional analysis or modifications of the recommendations presented herein. We recommend on-site observation of excavations and foundation bearing strata by a representative of the geotechnical engineer.

Analysis by: James M. Belt, P.E.

APPENDIX A

LOCATION DIAGRAM
AND
LOGS OF BORING



SITE MAP

PROPOSED SITE LOCATION
PROJECT TANGO

BORING LOCATIONS

PROJECT TANGO

LOG OF BORING NO. B-1

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/8/11

SURFACE ELEV: 238' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	0			20									Six (6) inches sandy topsoil 0.5
	5			20	103	59	23	36	98	23.27	3.3		Hard, dry tan and gray clay
	10		P=4.5+	25									
	15		P=4.5+	29									15.0 Bottom of boring at 15 feet
	20												
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.462737 degrees W93.906542 degrees

LOG OF BORING NO. B-2

PROJECT: Project Tango | **SHEET** 1 of 1

CLIENT: Duke Realty | **LOCATION:** I-20 & US Hwy 80 Shreveporet

DATE: 11/8/11 | **SURFACE ELEV:** 247' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	0		P=4.5+	22		79	30	49	95				Hard, dry red and tan mottled clay with trace sand
				22	98	69	25	44	95	11.31	2.8		--Gray and tan
	5		P=4.5+	16		80	28	52	96				
			P=4.5+	19									
			P=4.5+	17									
	10												
			P=4.5+	26									--With fine sand laminations
	15												
			P=4.5+	29									
	20												20.0
													Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.462729 degrees W93.905901 degrees

LOG OF BORING NO. B-3

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/8/11

SURFACE ELEV: 248' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	9		33	17	16	72				Six (6) inches sandy topsoil over tan sandy silty clay 2.0
	5		P=4.5+	20	103					18.81	2.1		Hard, dry red, tan and gray mottled clay with trace sand
				17		77	26	51					
				12	100					6.99	2.0		--Very stiff gray and tan
	10		P=4.5+	17									
	15		N=99/10"	11					63				--Hard with sand laminations
			P=4.5+	22									20.0
	20												Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.462721 degrees W93.905259 degrees

LOG OF BORING NO. B-4

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/8/11

SURFACE ELEV: 246' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
				11	100	36	20	16		11.42	1.8		Six (6) inches sandy topsoil over hard tan sandy silty clay
			P=4.5+	9		31	17	14					4.0
	5		P=4.5+	15									Hard, dry gray and tan clay with trace sand
			P=4.5+	21									
			P=4.5+	18									--With fine sand laminations below 8 feet
	10												
			P=4.5+	31									
	15												
			P=4.5+	28									
	20												20.0
													Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.462711 degrees W93.904616 degrees

LOG OF BORING NO. B-5

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/8/11

SURFACE ELEV: 246' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	18									Six (6) inches sandy topsoil over hard red and tan mottled clay
				22	96	74	27	47	97	13.67	1.4		
	5		P=4.5+	18									--Tan, red and gray mottled
			P=4.5+	20									
			P=4.5+	20									--Tan and gray with fine sand laminations below 8 feet
	10												
			P=4.5+	13									
	15												
			P=4.5+	24									
													20.0
	20												Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.462702 degrees W93.903973 degrees

LOG OF BORING NO. B-6

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/7/11

SURFACE ELEV: 245' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	12		40	17	23					Six (6) inches sandy topsoil over hard red and tan sandy silty clay 2.0
	5		P=4.5+	17	114	65	25	40	81	36.67	10.9		Hard, dry red, tan and gray mottled clay with sand
			P=4.5+	21									
	10		P=4.5+	19									--Gray and tan with fine sand laminations below 6 feet
			P=4.5+	22									
	15		P=4.5+	22									
			P=4.5+	24									20.0
	20												Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

REMARKS: Approximate coordinates: N32.462693 degrees W93.903333 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

12.94.009

ARDAMAN & ASSOCIATES,INC.

LOG OF BORING NO. B-7

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/7/11

SURFACE ELEV: 240' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	0		P=4.5+	19									Four (4) to six (6) inches topsoil over red and tan clay
				19	107	65	25	40		25.89	3.2		--Hard red, tan and gray mottled clay
	5		P=4.5+	18									--With fine sand laminations below 4 feet
			P=4.5+	29									
	10		P=4.5+	26									
	15												15.0 Bottom of boring at 15 feet
	20												
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.462684 degrees W93.902690 degrees

LOG OF BORING NO. B-8

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/7/11

SURFACE ELEV: 237' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	0			26									Four (4) to six (6) inches sandy topsoil over red and tan mottled clay
	5			18	104	62	24	38	100				--Hard, dry gray and tan clay with silt lamination
	10		P=4.5+	23									
	15		P=4.5+	23									15.0
	20												Bottom of boring at 15 feet
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.462675 degrees W93.902048 degrees

LOG OF BORING NO. B-9

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/7/11

SURFACE ELEV: 230′ +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	0			21									Four (4) to six (6) inches sandy topsoil over red, tan and gray mottled clay
	5		P=4.5+	17									--Hard gray and tan clay laminated below 4 feet
	10		P=4.5+	19		59	24	35	99				
	15		P=4.5+	22									15.0
	20												Bottom of boring at 15 feet
	25												
	30												
	35												
	40												

REMARKS: Approximate coordinates: N32.462666 degrees W93.904405 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

LOG OF BORING NO. B-10

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/7/11

SURFACE ELEV: 220' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	0			18									Four (4) to six (6) inches sandy topsoil over tan clay
	5			22	103	76	27	49	92	14.80	9.4		--Hard, dry red, tan and gray clay with trace sand
	10		P=4.5+	22									--Gray and tan with fine sand laminations below 8 feet
	15			24	97					2.54	6.1		
	20		P=4.5+	20									20.0
	25												Bottom of boring at 20 feet
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.462653 degrees W93.900765 degrees

LOG OF BORING NO. B-11

PROJECT: Project Tango | **SHEET** 1 of 1

CLIENT: Duke Realty | **LOCATION:** I-20 & US Hwy 80 Shreveporet

DATE: 11/10/11 | **SURFACE ELEV:** 230' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	0												Four (4) to six (6) inches sandy topsoil over red and tan clay
	5			14	113					16.17	2.6		--Hard, dry tan and gray clay with sand laminations
	10			30	96					6.80	1.8		--Very stiff
	15			23	101					6.72	6.5		15.0
	20												Bottom of boring at 15 feet
	25												
	30												
	35												
	40												

REMARKS: Approximate coordinates: N32.461861 degrees W93.900780 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

LOG OF BORING NO. B-12

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/10/11

SURFACE ELEV: 237' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	5			17	104					12.48	2.7		Four (4) to six (6) inches sandy topsoil over red and tan clay --Hard, dry gray and tan clay with fine sand laminations
	10			18	103					11.13	3.5		
	15			28	94					12.96	3.1		15.0 Bottom of boring at 15 feet
	20												
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461871 degrees W93.901424 degrees

LOG OF BORING NO. B-13

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/10/11

SURFACE ELEV: 244' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
				8	100	26	18	8		5.19	2.2		Four (4) to six (6) inches sandy topsoil over red and tan sandy silty clay
	5		P=4.5+	13		40	22	18					Hard, dry tan and red mottled sandy silty clay
			P=4.5+	14									--Gray with sand laminations
													7.0
				19	100					11.30	4.4		Hard tan and gray clay with fine sand laminations
	10												
			P=4.5+	36									
	15												
			P=4.5+	24									
													20.0
	20												Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461582 degrees W93.902066 degrees

LOG OF BORING NO. B-14

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/10/11

SURFACE ELEV: 250' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	9		27	17	10	70				Four (4) to six (6) inches sandy topsoil over red and tan sandy silty clay
			P=4.5+	16		47	23	24					4.0
	5			20	105	53	26	27		21.22	3.1		Hard, dry red and gray clay with trace sand
				16	92					11.69	2.0		--With fine sand laminations below 6 feet
				16	105					19.12	3.3		
	10												
				15	114					17.46	6.2		--Tan and gray
	15												
			P=4.5+	26									20.0
	20												Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461893 degrees W93.902707 degrees

LOG OF BORING NO. B-15

PROJECT: Project Tango | **SHEET** 1 of 1

CLIENT: Duke Realty | **LOCATION:** I-20 & US Hwy 80 Shreveporet

DATE: 11/10/11 | **SURFACE ELEV:** 256' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	12		32	19	13					Four (4) to six (6) inches sandy topsoil over hard, dry red and tan sandy silty clay
													3.0
	5		P=4.5+	17		53	24	29					Hard, dry red, tan and gray mottled clay with trace sand
			P=4.5+	18		62	22	40					--With fine sand laminations below 8 feet
	10			18	92	64	23	41		6.20	2.2		--Gray and tan
			P=4.5+	22		57	23	34					
				26	94	64	26	38		12.24	5.4		
	15		P=4.5+	27	91					9.3	5.2		
				27	97					4.57	2.1		
	20												
			P=4.5+	30									
													25.0
	25												Bottom of boring at 25 feet
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461904 degrees W93.903349 degrees

LOG OF BORING NO. B-16

PROJECT: Project Tango | **SHEET** 1 of 1

CLIENT: Duke Realty | **LOCATION:** I-20 & US Hwy 80 Shreveporet

DATE: 11/10/11 | **SURFACE ELEV:** 257' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	26		74	35	39					Four (4) to six (6) inches sandy topsoil over hard red clay
	5		P=4.5+	17		57	26	31					--Hard, dry gray and tan clay with fine sand laminations below 4 feet
			P=4.5+	21		71	26	45					
	10			19	100	66	26	40		13.66	2.0		--Slicken-sided fractures
													12.0
				18	100	42	18	24		7.31	1.9		Very stiff tan and gray sandy silty clay
													14.0
	15		P=4.5+	12		32	21	11					Very dense tan clayey sand
													16.0
				21									Very stiff gray clay with sand pockets
	20			35	87					4.28	2.5		--With fine sand laminations below 18 feet
				29	95					9.86	4.5		--Hard
	25												25.0
													Bottom of boring at 25 feet
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461915 degrees W93.903991 degrees

LOG OF BORING NO. B-17

PROJECT: Project Tango | **SHEET** 1 of 1

CLIENT: Duke Realty | **LOCATION:** I-20 & US Hwy 80 Shreveporet

DATE: 11/10/11 | **SURFACE ELEV:** 254' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA										DESCRIPTION OF STRATUM
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI		
				13		36	18	18						Four (4) to six (6) inches sandy topsoil over red and tan sandy silty clay
														3.0
	5			17		61	23	38						Hard, dry red and gray mottled clay with sand
				14	114	46	19	27		15.72	2.0			--Very sandy
				17	101	55	24	31		14.93	2.1			--Hard tan and gray clay with fine sand laminations below 8 feet
	10			23	98	70	27	43		9.85	1.5			--Slicken-sided
			P=4.5+	39										
	15			23	101					11.10	2.5			
				13										
	20													
				25						4.96	5.0			--Stiff and gray
														25.0
	25													Bottom of boring at 25 feet
	30													
	35													
	40													

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461925 degrees W93.904633 degrees

LOG OF BORING NO. B-18

PROJECT: Project Tango | **SHEET** 1 of 1

CLIENT: Duke Realty | **LOCATION:** I-20 & US Hwy 80 Shreveporet

DATE: 11/10/11 | **SURFACE ELEV:** 254' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=3.5	11		33	18	15					Four (4) to six (6) inches sandy topsoil over red and gray mottled sandy silty clay
	5		P=4.5+	14		47	20	27					--Hard tan and gray silty clay with sand 6.0
				20	97	62	24	38		13.77	2.7		Hard tan clay with fine sand laminations below 6 feet
				38	86	118	39	79		5.77	1.3		--Very stiff, slicken-sided
	10		P=4.5+	23		74	27	47					--Hard red and gray, slicken-sided
				24	99					9.58	2.2		--Stiff with trace lignite, slicken-sided
	15			32	91					4.15	2.3		
			P=3.5	26									--Very stiff gray clay
	20												
			P=4.5+	27									
	25												25.0
													Bottom of boring at 25 feet
	30												
	35												
	40												

REMARKS: Approximate coordinates: N32.461936 degrees W93.905274 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

LOG OF BORING NO. B-19

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/8/11

SURFACE ELEV: 247' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	24		65	28	37	92				Four (4) to six (6) inches sandy topsoil over red and tan clay
				16	113	49	22	27		25.77	3.3		--Hard tan and gray clay with trace sand
	5		P=4.5+	16		54	21	33					
				18	103					25.10	3.7		
			P=4.5+	22									
	10												
			P=4.5+	21					86				--Tan with fine sand laminations
	15												
			P=4.5+	26									
													20.0
	20												Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

REMARKS: Approximate coordinates: N32.461946 degrees W93.905916 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

12.94.009

ARDAMAN & ASSOCIATES,INC.

LOG OF BORING NO. B-20

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/8/11

SURFACE ELEV: 245' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
				17	102	48	23	25	78				Four (4) to six (6) inches sandy topsoil over hard, dry red and tan sandy silty clay
			P=4.5+	14		47	20	27	80	13.14	5.1		
													4.0
	5			13	113								Hard, dry gray and tan clay with trace sand
			P=4.5+	19						19.63	2.4		
				21									--With fine sand laminations below 8 feet
	10												12.0
				15									Hard tan silty clay with sand laminations
	15												
				24									
	20												20.0
													Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

REMARKS: Approximate coordinates: N32.461957 degrees W93.906566 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

LOG OF BORING NO. B-21

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11

SURFACE ELEV: 257' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
				20		55	24	31					Four (4) to six (6) inches sandy topsoil over red clay
	5			20		63	24	39					--Tan and dry
				22	91	73	28	45		4.31	1.6		--Hard, dry tan clay with fine sand laminations, slicken-sided
	10			23	99	71	25	46		15.96	3.6		
				25	96	72	28	44		10.59	5.6		13.0
	15		N=31	7 20					18				Very dense dry gray silty sand --Dense, moist
				31	90					3.17	2.1		18.0 Stiff gray and tan clay with fine sand laminations, slicken-sided
	20			28									
	25												25.0 Bottom of boring at 25 feet
	30												
	35												
	40												

REMARKS: Approximate coordinates: N32.461173 degrees W93.906589 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

LOG OF BORING NO. B-22

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11

SURFACE ELEV: 248' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
				16	109	39	20	19		5.63	1.9		Four (4) to six (6) inches sandy topsoil over red and tan sandy silty clay 2.0
	5		P=4.5+	20		72	33	39					Hard, dry red, tan and gray clay with sand
				16	98	65	25	40		9.66	1.8		
				22	100					9.36	1.6		--With fine sand laminations below 6 feet, slicken-sided
	10		P=4.5+	27									
	15		P=4.5+	27									--Gray
			P=4.5+	28									20.0
	20												Bottom of boring at 20 feet
	25												
	30												
	35												
	40												

REMARKS: Approximate coordinates: N32.461162 degrees W93.905947 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

LOG OF BORING NO. B-23

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11

SURFACE ELEV: 258' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA										
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM	
				5		NP	NP	NP					Four (4) to six (6) inches sandy topsoil over tan silty sand	3.0
	5		P=4.5+	20		67	26	41	98				Hard, dry tan clay	
				25	99	76	27	49		9.87	2.1		--With fine sand laminations below 8 feet, slicken-sided	
	10			28	95					7.75	1.8			12.0
			P=4.5+	16		43	24	19					Hard, dry tan sandy silty clay	
	15		P=4.5+	23										16.0
			P=4.5+	21									Very dense silty sand with clay laminations	18.0
				25	96	48	25	23		9.83	5.8		Hard tan and gray clay with fine sand laminations	
	20			26	97					16.40	6.5			25.0
	25												Bottom of boring at 25 feet	
	30													
	35													
	40													

REMARKS: Appreoximate coordinates: N32.461153 degrees W93.905305 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

LOG OF BORING NO. B-24

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11

SURFACE ELEV: 262' +/-

DRILLING METHOD(S): Augeer

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA										
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	27									Four (4) to six (6) inches sandy topsoil over hard red and tan clay
	5		P=4.5+	20		63	24	39	85				--Hard red and gray mottled clay with fine sand laminations
			P=4.5+	22		59	26	33					--Tan and gray
	10			27	99					5.96	2.0		--Very stiff tan and red clay, slicken-sided
	15			30	93	80	32	48		5.26	1.6		
				18	106					6.27	3.8		
	20		P=4.5+	22		46	23	23					--Silty and tan
			P=4.5+	23									--Tan and gray with fine sand laminations
	25		P=4.5+	26									
				27	95					11.14	5.9		
	30												30.0
													Bottom of boring at 30 feet
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461142 degrees W93.904663 degrees

LOG OF BORING NO. B-25

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11

SURFACE ELEV: 265' =/-

DRILLING METHOD(S): Augere

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	0		P=4.5+	17		51	23	28	81				Eight (8) to ten (10) inches sandy topsoil over hard red and tan clay with sand
	5		P=4.5+	17		51	21	30	97				--Hard, dry tan clay with trace sand
	10		P=4.5+	22		59	25	34	98				--With fine sand laminations
	15		P=4.5+	25		64	28	36					--Tan and red
				31	91	79	28	51		7.48	6.4		--Red and gray
	20			39	82	121	38	83		9.23	5.2		--Gray
				24	100	63	23	40		8.10	3.2		--Dark gray with trace lignite
	25		P=4.5+	26									26.0
			N=50/3"	31									Very dense dark brown lignite coal 28.0
	30		N=61	24									Very dense gray silty sand with clay laminations 32.0
				23	100					7.13	5.9		Very stiff gray clay 35.0
	35												Bottom of boring at 35 feet
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461133 degrees W93.904021 degrees

LOG OF BORING NO. B-26

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11

SURFACE ELEV: 261' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
	0		P=4.5+	16		40	22	18	61				Eight (8) to ten (10) inches sandy topsoil over red sandy silty clay
	5		P=4.5+	16		46	23	23	80				--Hard, dry red and gray sandy silty clay
													7.0
			P=4.5+	15		53	23	30	98				Hard, dry tan clay with fine sand laminations, slicken-sided
	10												
				25	94	58	30	28		10.36	5.1		
	15			27	95	65	26	39		6.41	5.2		--Slicken-sided fractures
				27	97	62	23	39		10.81	5.6		--Red and gray mottled
	20		P=4.5+	21									
				18									--Tan, very dry
			P=4.5+	26									--Gray
	25												
				23	105					6.18	13.8		--Gray with lignite partings
													30.0
	30												Bottom of boring at 30 feet
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461122 degrees W93.903380 degrees

LOG OF BORING NO. B-27

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11

SURFACE ELEV: 256' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	12		32	18	14	63				Eight (8) to ten (10) inches sandy topsoil over red sandy silty clay
	5		P=4.5+	15		45	19	26	62				--Hard red and gray mottled sandy silty clay
													7.0
			P=4.5+	10		50	22	28					Very dense, dry tan clayey sand
	10												10.0
				19	98					12.04	3.6		Hard, dry tan clay with fine sand laminations
				39	74					4.89	4.4		--Very stiff tan clay with sand seams
	15		P=4.5+	25		51	22	29					
				28	97					10.24	5.6		
	20												
				24	101					23.16	6.1		--Dark gray clay with lignite laminations, slicken-sided
	25												25.0
													Bottom of boreing at 25 feet
	30												
	35												
	40												

REMARKS: Approximate coordinates: N32.461113 degrees W93.902095 degrees

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

12.94.009

ARDAMAN & ASSOCIATES,INC.

LOG OF BORING NO. B-28

PROJECT: Project Tango | **SHEET** 1 of 1

CLIENT: Duke Realty | **LOCATION:** I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11 | **SURFACE ELEV:** 249' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
			P=4.5+	10		31	16	15	81				Twelve (12) inches sandy topsoil over red and tan sandy silty clay 2.0
	5		P=4.5+	20		73	27	46	98				Hard, dry red and gray clay
				18	96	56	23	33		13.63	2.8		--Tan with fine sand laminations
			P=4.5+	19									
	10		P=4.5+	22		58	23	35					12.0
	15		P=4.5+	15									Very dense, dry silty sand with gray clay laminations 17.0
	20		P=4.5+	18									Hard tan and gray sandy silty clay 20.0
	25												Bottom of boring at 20 feet
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461102 degrees W93.902095 degrees

LOG OF BORING NO. B-29

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11

SURFACE ELEV: 244' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
				12	119	29	17	12		15.47	2.3		Eight (8) inches sandy topsoil over red and tan sandy silty clay 2.0
	5			19	105	56	26	30		17.31	3.6		Hard red and tan clay, slicken-sided
				23	98					13.33	2.4		
	10		P=4.5+	38									--Tan
	15			23	104					5.73	1.4		--Tan and gray, slicken-sided
			P=4.5+	25									20.0
	20												Bottom of boreing at 20 feet
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

REMARKS: Approximate coordinates: N32.461092 degrees W93.901454 degrees

LOG OF BORING NO. B-30

PROJECT: Project Tango

SHEET 1 of 1

CLIENT: Duke Realty

LOCATION: I-20 & US Hwy 80 Shreveporet

DATE: 11/14/11

SURFACE ELEV: 236' +/-

DRILLING METHOD(S): Auger

GROUNDWATER INFORMATION: No water encountered

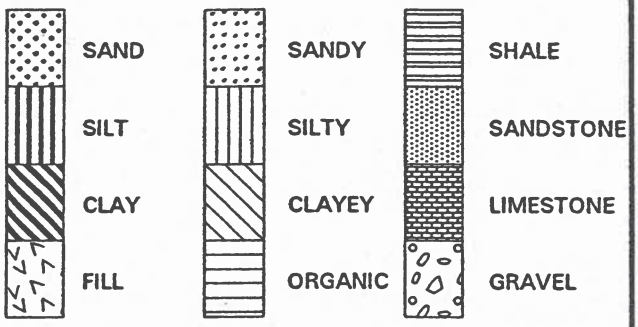
FIELD DATA				LABORATORY DATA									
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	DESCRIPTION OF STRATUM
													Eight (8) to ten (10) inches sandy topsoil over red and tan clay
	5			18	112					21.82	3.2		--Hard, dry red and tan clay, slicken-sided
	10		P=4.5+	24									--Tan with fine sand laminations
	15			38	83					6.03	2.9		--Very stiff, slicken-sided 15.0
	20												Bottom of boring at 15 feet
	25												
	30												
	35												
	40												

TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY

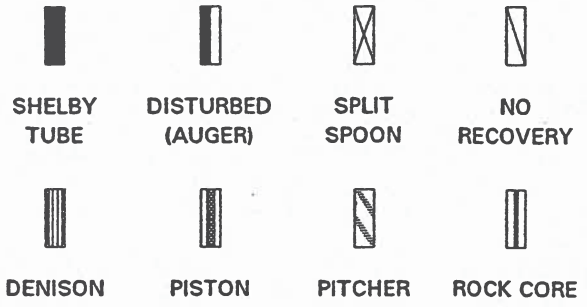
REMARKS: Approximate coordinates: N32.461082 degrees W93.900807 degrees

KEY TO SOIL CLASSIFICATION TERMS AND SYMBOLS

SOIL OR ROCK TYPES



SAMPLER TYPES



CONSISTENCY OF COHESIVE SOILS (MAJOR PORTION PASSING NO. 200 SIEVE)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH, TONS/SQ FT
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.5
FIRM	0.5 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	GREATER THAN 4.0

RELATIVE DENSITY OF GRANULAR SOILS (MAJOR PORTION RETAINED ON NO. 200 SIEVE)

DESCRIPTIVE TERM	RELATIVE DENSITY, %
VERY LOOSE	LESS THAN 15
LOOSE	15 TO 35
MEDIUM DENSE	35 TO 65
DENSE	65 TO 85
VERY DENSE	GREATER THAN 85

WATER LEVELS

▼ - DEPTH GROUNDWATER FIRST ENCOUNTERED DURING DRILLING

▽ - GROUNDWATER LEVEL AFTER 24 HOURS (UNLESS OTHERWISE NOTED)

TERMS DESCRIBING SOIL STRUCTURE

Parting: paper thin in thickness

Seam: 1/8" - 3" in thickness

Layer: greater than 3" in thickness

Calcareous: containing appreciable quanties of calcium carbonate

Ferrous: containing appreciable quantities of iron

Well-graded: having wide range in grain size & similar proportions of all intermediate sizes

Poorly graded: predominately one grain size or having a range of sizes with few or no particles of some intermediate sizes

Fissured: containing shrinkage cracks, frequently filled with fine sand or silt, usually more or less vertical

Interbedded: composed of alternate layers of different soil types

Laminated: composed of thin layers of varying color and texture

Slickensided: having inclined planes of weakness that are slick & glossy in appearance

NOTE: Clays possessing slickensided or fissured structure may exhibit lower measured shear strength than indicated by the described consistency. The consistency of such soil is interpreted using the measured shear strength along with pocket penetrometer results.

APPENDIX B

MATERIAL SPECIFICATIONS

B.1. SPECIFICATIONS FOR COMPACTION

Sandy Clay and Clayey Sand Soils

The thickness of lifts used should be no more than the height of the teeth on sheepsfoot rollers. Generally, for a forty-eight (48) inch diameter or smaller drum roller, the maximum compacted lift thickness acceptable is six (6) inches. For rollers with drums of sixty (60) inches in diameter and larger with teeth about nine (9) inches long, a nine (9) inch final compacted lift thickness will be acceptable. The sole determination of the thickness of a lift will be the capability of the contractor's equipment to obtain the required compaction.

When obtaining the average density of a lift to determine its conformance to specifications, the lift should be immediately rejected if any density is more than 2% below the required average.

Generally, sheepsfoot rollers are most suitable for compaction of sandy clay and clayey sand soils, the contractor may use spiketooth rollers, rubber tired rollers, or any fill compaction equipment that has sufficient mass to compact the soil. Generally, the drums of sheepsfoot rollers should be filled with water or for additional weight with both water and sand. Tractors or other vehicles used primarily for hauling should not be allowed as fill compaction equipment. The contractor should also have smooth wheel rollers to seal the working area at the end of the day's operations so overnight rains will not saturate the soil and delay his work. These rollers should also be used to seal the surface whenever rainfall is imminent.

The soil engineer or his representative will perform density tests and will accept or reject a lift within two (2) hours after being tested. No material will be placed on any lift that has not been accepted by the engineer.

B.2. AGGREGATE BASE MATERIAL

Crushed Stone Crushed Concrete

Crushed stone base course shall be composed of crusher-run broken stone. The material shall be crushed and consist of durable particles of stone mixed with approved soil binder material.

Gradation

The base material shall meet the following requirements:

Pass #1-1/2"	100%
Pass #1"	90 -100%
Pass #3/4"	70 -100%
Pass #4	35 - 65%
Pass #40	12 - 32%
Pass #200	5 -12%

Soil Binder

Material passing the No. 40 sieve shall be known as "soil binder" and shall meet the following requirements:

Liquid Limit < 25

Plasticity Index < 5

Compaction

Compaction shall be obtained as outlined in the Pavement Section of this report

Note

Extra binder material may be added with the approval of the geotechnical or design engineer.

Soundness and Los Angeles abrasion tests should meet Louisiana Department of Transportation and Development (LDOTD) specifications.

B.3. GEOTEXTILE FABRIC SPECIFICATIONS

The following proven woven Geotextile Fabrics are approved:

1. Amoco Pro Pex 2006
2. Beltech Style 980
3. ConTech C300
4. Mirafi 600X
5. Hanes (Terra Tex) HD

If alternate geotextile fabric from above is requested, the following qualifications should be met:

SPECIFICATIONS

Property	Test Method	Minimum Requirements
Fabric Structure	-	Woven
Polymer Composition	-	Polypropylene
Fabric Width	-	12½', 15', 17½'
Weight	ASTM D-3776C	5 oz. / yd.
Grab Strength	ASTM D-4632	300 x 300 lbs.
Elongation	ASTM D-4632	20%
Trap Tear Strength	ASTM D-4533	115 lbs. x 115 lbs.
Burst Strength	ASTM D-3786	575 psi.
Puncture	ASTM D-4833	120 lbs.
UV Resistance	ASTM D-4355	> 70%
A.O.S.	ASTM D-4751	35

NOTE:

1. Requires Mill Certification from manufacturer.

2. Minimum requirements are not minimum average values. Minimum average values per roll are not an acceptable specification.

B.4. LIME TREATMENT

The work consists of constructing one or more courses of a mixture of lime and soil and water in accordance with these specifications. The percentage of lime should be determined by the construction materials division of the geotechnical laboratories.

Lime shall be protected from moisture prior to use. Water shall be added as needed during mixing and re-mixing operations, during the curing period, and to keep the cured material uniformly moist until covered. Lime shall not be applied on a frozen foundation or when the ambient air temperature is below 35° F (2° C).

Lime shall be incorporated in the following sequence: spreading the lime; initial mixing (12 inch depth); watering; sealing and mellowing for at least 48 hours; and re-mixing until pulverization requirements are met; compacting; finishing; and maintaining as necessary. After lime treatment, the treated soil shall have a maximum PI of fifteen (15).

The percentage of lime to be incorporated shall be as specified. A unit weight of thirty-five (35) pounds per cubic foot (560 kg/cu m) will be used to compute the required application rate of hydrated lime regardless of the actual unit weight of the lime used. Lime may be furnished in bags or bulk and distributed, in powder form, granular or in slurry, and in the required proportion. Dry lime shall be prevented from blowing by adding water or by other suitable means.

Lime shall be uniformly spread and mixed with the soil to the width and depth shown on the plans or as directed. Any procedure, which results in excessive loss, or displacement of lime, shall be discontinued. Areas to which lime is applied shall be processed on the same day as application is made.

Lime exposed to air for more than six (6) hours and lime lost or damaged before incorporation due to rain, wind, or other cause will be rejected, deducted from measured quantities, and shall be replaced by contractor at no direct pay.

The pulverization mixture shall meet the gradation requirements below.

U.S. Sieve, Inches (mm)	Percent Passing By Weight (Mass)
3/4 (19.0)	95
No.4 (4.75)	50

Pulverization requirements shall be met prior to final compaction and finishing. After meeting the pulverization requirement, the mixture shall be uniformly compacted to at least ninety-eight (98) percent of maximum dry weight density determined by the Standard Proctor (ASTM D698). Compaction and finishing operations shall be completed within six (6) hours after meeting pulverization requirements.

Density test will be required per geotechnical engineer recommendations. At places inaccessible to rollers the mixture shall be compacted using devices that will obtain uniform compaction to required density without damage to adjacent structures. Any section not meeting the required density shall be reconstructed in accordance with these specifications. Reconstruction shall include the addition of the specified amount of time.

The final finish shall meet grade and cross-slope requirements and shall have a smooth, uniform, closely knit surface, free from ridges, waves, loose material or laitance.

Construction methods shall prevent contamination, segregation, soft spots, wet spots, laminations and other deficiencies. The contractor shall be responsible for taking such tests as necessary to adequately control the work. The contractor shall control the grade, cross-slope, lime spread, mixing, pulverization, thickness, width, density and curing to construct a completed course that is uniform and conforms to the acceptance requirements.

After finishing operations have been completed, the material shall be protected against rapid drying for seventy-two (72) hours by applying an asphalt curing membrane. The application shall be placed immediately following smooth rolling and shall be adequately maintained during the seventy-two (72) hour curing period.