Appendix B
Preliminary LEED Project Checklist

LEED 2009 for New Construction and Major Renovations

Project Checklist

Key West Public Transportation Facility

Draft: 10-21-2010

Sustainable Sites — Possible Points: 26

Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
	1		Credit 1	Site Selection	1
		5	Credit 2	Development Density and Community Connectivity	5
		1	Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
	1		Credit 5.2	Site Development—Maximize Open Space	1
	1		Credit 6.1	Stormwater Design—Quantity Control	1
	1		Credit 6.2	Stormwater Design—Quality Control	1
	1		Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
1			Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

Y			Prereq 1	Water Use Reduction—20% Reduction	
4			Credit 1	Water Efficient Landscaping	2 to 4
	2		Credit 2	Innovative Wastewater Technologies	2
4			Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 35

Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
10	5	4	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
		2	Credit 3	Enhanced Commissioning	2
	2		Credit 4	Enhanced Refrigerant Management	2
3			Credit 5	Measurement and Verification	3
		2	Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
1	1		Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

Y	?	N			
1	1		Credit 4	Recycled Content	1 to 2
1	1		Credit 5	Regional Materials	1 to 2
		1	Credit 6	Rapidly Renewable Materials	1
		1	Credit 7	Certified Wood	1

Indoor Environmental Quality — Possible Points: 15

Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
		1	Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
	1		Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
	1		Credit 8.1	Daylight and Views—Daylight	1
	1		Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

1			Credit 1.1	Innovation in Design: Specific Title: Green Cleaning	1
	1		Credit 1.2	Innovation in Design: Specific Title: XP/WE3 (45%)	1
			Credit 1.3	Innovation in Design: Specific Title	1
			Credit 1.4	Innovation in Design: Specific Title	1
			Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1

Total — Possible Points: 110

51	21	31	Total

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Appendix C

Geotechnical Report

REPORT OF
GEOTECHNICAL EXPLORATION

CITY OF KET WEST
TRANSIT STATION FACILITY
5701 COLLEGE ROAD
KEY WEST, FLORIDA

FOR

CHEN AND ASSOCIATES
420 LINCOLN ROAD
SUITE 420
MIAMI BEACH, FLORIDA 33139

PREPARED BY

NUTTING ENGINEERS OF FLORIDA, INC.
1310 NEPTUNE DRIVE
BOYNTON BEACH, FLORIDA 33426

ORDER NO. 786.3

MAY 2008

Nutting Engineers
of Florida Inc. | Established 1967
Your Project is Our Commitment

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May 12, 2008

Mr. Oscar R. Bello, P.E.
Chen and Associates, Inc.
420 Lincoln Road, Suite 420
Miami Beach, Florida 33139
Phone: 786-497-1500 ext. 104 Fax: 786-497-2300

Subject: Report of Geotechnical Exploration
City of Key West – Transit Station Facility
5701 College Road
Key West, Florida

Dear Mr. Bello, P.E.,

Nutting Engineers of Florida, Inc. (NE), has performed a Geotechnical Exploration for the proposed Transit Station Facility at the above referenced site in Key West, Florida. This exploration was performed in accordance with the written authorization to proceed provided by Chen and Associates. This evaluation was performed to develop information regarding subsurface conditions at specific test locations which along with proposed construction information provided was used to develop opinions regarding potential remedial earthwork procedures and foundations for support of the proposed construction. This report presents our findings and recommendations based upon the information examined at the time of this evaluation.

PROJECT INFORMATION

We understand that plans include the demolition of the existing buildings for the construction of a new two-story transit station facility. The facility will consist of a two-story office/administration building with an adjacent bus service bay area. The office portion of the building will consist of concrete block construction, while the service bay area will consist of concrete block and pre-fabricated metal and steel type construction. Besides the main building, a bus-wash station and a fuel island area will be constructed. We understand that the fuel will be house within above-ground storage tanks and that both the fuel island and bus-wash station are to be supported upon a mat type foundation system. Along with the proposed structures associated asphalt paved parking lots, roadways, and a retention pond will be constructed. Our office was provided a plan indicating the proposed building locations.

We understand that presently the site is being used as a waste transfer station. Because of this portions of the proposed building currently reside within the existing building footprints. Therefore at this time our subsurface exploration was limited. Further discussions also indicate that historically the placement of compost and/or debris within the building areas may have occurred. The size, location, and amount of debris were not known at the time of the exploration. We understand that due to potential environmental concerns it was determined to not perform any demucking or removal of this material, which may result in the necessity of constructing the buildings upon a deep foundation system (piles).

Discussions with Mr. Bello does indicate that the structures may be required to have 16-inch diameter augercast piles installed in order to provide the necessary lateral and uplift forces exerted on the structures due to heavy wave action. Finish floor elevations have not been fully finalized at this time; however discussions indicate that two to three feet of fill may be added to achieve finish floor elevations. This needs to be verified by others prior to final construction.

NE should be notified in writing by the client of any changes in the proposed construction along with a request to amend our foundation analysis and/or recommendations within this report as appropriate.

GENERAL SUBSURFACE CONDITIONS

Soil Survey Maps

As part of the geotechnical exploration, we have reviewed available Soil Conservation Service (SCS) survey maps for Monroe County. These SCS maps provide qualitative information about potential general shallow soil conditions in the project vicinity. This information was derived from approximately 6 ft. deep manual auger borings, aerial photo and surface feature interpretation at some point in the past (mid 1980's to early 1970's). The SCS data may or may not reflect actual current site conditions. As indicated in the Monroe County Soil Survey Map the series under exploration is Urban land. The Urban land consists of unconsolidated or heterogeneous overburden material generally consisting of crushed coralline limestone and coarse sand used for land leveling as fill. Beneath the fill layer natural silt deposits may exist or the natural limestone formation. We note that the maximum depth of the survey is approximately six feet.

Subsurface Exploration

NUTTING ENGINEERS OF FLORIDA, INC. was requested to perform six Standard Penetration Test (SPT) borings (ASTM D-1586) to depths of thirty feet below land surface. The soil boring locations may have been altered by the geotechnical engineer through site access limitations, lithologic conditions and other considerations from that originally proposed. The location of the test borings are indicated on the individual test boring reports presented in the Appendix of this report. The boring locations were identified in the field using approximate methods; namely, a measuring wheel and available surface controls. As such the soil boring locations should be considered to be approximate.

In addition, two 'Usual Open-Hole' exfiltration tests were performed, at locations established by the project civil engineer, in accordance with South Florida Water Management District specifications. The exfiltration tests were completed to depths of fifteen feet.

Test Boring Results

In general, the borings revealed two to six foot surface layer of medium dense to dense tan silty sand and limestone fragments fill material underlain by a two to five foot stratum of dark gray to brown silty sand with some organic silt and varying amounts of garbage debris to a depth of nine feet. Some debris was observed to consist of trace wood, plastic, glass, tile and other unknown materials. Below the debris zone hard to refusal light tan limestone with trace sand was encountered to a depth of thirty feet, the maximum depth explored. Please see the enclosed soil classification sheet in the Appendix of this report for additional important information regarding these descriptions, the field evaluation and other related information.

We note that the silty sand and debris was observed to be thicker in the area of the bus-wash and fuel island area averaging four to five feet in thickness, while in the approximate office/service bay area the debris was only two to three feet in thickness.

Note: Substantially different subsurface conditions may exist at intervening locations between soil borings. Buried debris may or may not be identified or adequately delineated by soil borings. Test pit excavation can provide more insight into such conditions and rock lithology if present. Such conditions may be revealed during site development activities (e.g. proof rolling, utility & foundation excavation activities) or other related activities. Should additional assurance be desired by the client, further subsurface investigation could be performed.

Exfiltration Results

Two 'Usual Open-Hole' exfiltration tests were performed in accordance with South Florida Water Management District (SFWMD) specifications to depths of fifteen feet below the existing ground surface. The tests were performed in order to determine the hydraulic conductivity of the in situ subsurface soils to evaluate drainage requirements for the project. The hydraulic conductivity value was determined to range from 1.77×10^{-5} to 5.58×10^{-2} cubic feet per second, per square foot, per foot of head. Detailed soil descriptions and flow rates are presented in the Appendix.

Groundwater Information

The immediate groundwater level was measured at the boring location at the time of drilling. The groundwater level was encountered at approximately five feet below the existing ground surface. Please review the paragraphs presented below regarding water table information and accuracy.

The immediate depth to groundwater measurements presented in this report may not provide a reliable indication of stabilized or more long term depth to groundwater at this site. Water table elevations can vary dramatically with time through rainfall, droughts, storm events, flood control activities, nearby surface water bodies, tidal activity, pumping and many other factors. For these reasons, this immediate depth to water data **should not** be relied upon alone for project design considerations.

Further information regarding stabilized groundwater elevations at the site could be developed upon specific request. Additional evaluation might include monitoring of peizomenters, survey of the project area for evidence of current groundwater elevation influences such as wellfields, obvious construction dewatering, tidal activity, flood control canals and other surface water bodies.

ANALYSIS AND RECOMMENDATIONS

Proposed Office/Service Building

The borings performed within the office building location for this project revealed a surficial sand and limestone fill material in the upper four to six feet underlain by a silty debris stratum to depths of approximately eight feet. Below the debris stratum the natural limestone formation was encountered. Construction of the proposed building over the existing soil profile could result in settlements exceeding one-inch. We understand that demucking of this material is not desired; therefore the main office building and service bay building will need to be supported upon a piling foundation. The foundation design and construction must be in accordance with the local building codes.

Due to the subsurface soil conditions that are common within the keys, two types of piling methods are typically used for foundation support. The one method consisting of conventional augercast piles, while the other method consisting of open-hole low-capacity drilled pile. We understand that the City of Key West does not accept the open-hole low-capacity pile, therefore at this time provided below are augercast pile recommendations. If this information is incorrect and low-capacity piles are desired for the project, our office should be notified in writing in order to provide recommendations for this piles type. **It is imperative that discussions with local city officials be performed prior to any final design or implementation to ensure that all codes are effectively being satisfied.**

Additional Testing

We recommend that once the existing buildings have been removed, and final construction information has been developed, our office be notified in writing in order to perform additional test borings. The purpose of this is to ensure that effective building specific subsurface information has been attained throughout the buildings in order to provide the best effective foundation recommendations for the project. The analysis and recommendations provided below are based on the present findings and project information provided to us at the time of the report. These recommendations may change due to final project and subsurface information.

Augercast Pile Analysis

Due to its high load carrying capacity, high installation rate, low noise and vibration level, and economic cost, the augercast pile has in recent years dominated the pile foundation for structures in Southeast Florida. Augercast piles are cylindrical drilled-in-place piles, generally 12 to 24 inches in diameter and are constructed of a cementatious grout. Reinforcement can be placed in the core of the pile. The pile is constructed with a special hollow-stem auger. The auger is advanced to the design depth and high strength grout is pumped through the auger while the auger is being extracted from the soil. After the auger is fully extracted, a reinforcing cage is inserted to complete the pile.

The augercast pile has the advantage of filing voids in the adjacent soil/rock with grout, providing mechanical interlock with the surrounding foundation material developing higher compressive and uplift capacities than a prestressed concrete pile. Some disadvantages associated with augercast piles are that these piles are susceptible to problems such as necking (small pipe diameter at some locations along its length), and grout contamination by soil or bore hole collapse. These problems can be avoided by maintaining positive pressure and providing a full-length reinforcing bar with centralizers to provide some assurance that the piles have been constructed with a continuous cross section and need to be closely monitored by experienced inspection personnel. It has been noted that due to the hard to very hard coralline limestone formation that exists abundantly within the Florida Keys piling contractors have been known to have extreme difficulty drilling to the recommended pile tip elevation provided by the project geotechnical engineer. Because of this conventional augercast piles are not fully used within the Florida Keys as abundantly as the rest of South Florida.

We understand that the proposed structures including the floor slab are to be supported on 16-inch diameter augercast piles, having a design compressive capacity of 30 tons. It is our opinion that 16-inch diameter augercast piles installed to a depth approximately twelve feet below the existing ground surface will support a design compressive capacity of 30 tons. The actual depths should be expected to vary depending on the drilling conditions encountered during the installation of these piles. We recommend at a minimum 3,000 psi grout be used for the piles. This analysis is based on the existing site elevation where the borings were performed and our understanding of the subsurface conditions within the subject site. If the site elevation changes at the time of installation, the pile depth may also change accordingly.

The piling contractor shall submit the proposed pile design to Nutting Engineers of Florida, Inc. for their review and comment prior to proceeding with pile installation. Due to the possible soft conditions within the soil profile the piling contractor should anticipate the addition of more grout than the actual theoretical volume of the pile.

The Florida Building Code (FBC) in high velocity hurricane zones requires that any piles designed for greater than 36 tons should be load tested in order to verify the pile capacity. Therefore, a pile load test will not be required for this project as described in the FBC.

AUGERCAST PILE CAPACITY TABLE

Pile Diameter (Inches)	Depth Below Exist. Ground (Ft)	All. Compr. Capacity (Tons)	All. Tension Capacity (Tons)	All. Lateral Capacity (Tons)	Minimum Grout Strength (psi) (0.25 f '$_c$)
16	12	30	10	5	3000

Pile Observations

We recommend that at least two production piles within the structure area be installed in the presence of the Nutting project geotechnical engineer. Final pile installation criteria will be provided at that time. It is important that the installation of all piles be under the full time observation of a representative of Nutting Engineers to verify the piles will support the structural loading.

Pile Reinforcement

We recommend that at a minimum, one full length #6 reinforcing steel bar utilizing centralizers be installed, plus a steel cage extending below the point of fixity in each pile. Additional reinforcing may be required depending on the structural engineer's requirements.

We recommend that a structural engineer be retained to determine the spacing and locations of the piles, and discussions should be initiated between the owners, structural engineer, contractor, and Nutting Engineers to provide detailed specifications for the foundation installation work.

Proposed Bus-Wash and Fuel Island

The borings performed in the area of the bus-wash and fuel island revealed a surficial two to four foot layer of sand and limestone fill material underlain by a four to six feet stratum of debris material with silty sand. Below depths of nine feet the natural limestone formation was encountered. It is our understanding that these structures are to be constructed upon a mat foundation system. Based on the proposed construction a settlement analysis was performed. Based on mat foundation type system, height of wall, and subsurface soils information it was determined that settlements approaching one to one and a quarter inches may occur based upon a design soil bearing pressure of 2,000 pounds per square foot at the toe of footing. If this information is suitable for the project, once the site is prepared in accordance with the recommendations presented in this report, the site may be developed with the proposed bus wash mat foundation system designed for an allowable soil bearing pressure of 2,000 pounds per square foot at the toe of footing. Once plans are more finalized for the proposed construction, we should review the plans to determine whether additional details or changes to our recommendations are warranted. All work should be completed in accordance with applicable building codes, other regulations as appropriate, and good standard local practice.

If footings are constructed, we recommend a minimum width of 24 inches for continuous footings, even though the soil bearing pressure may not be fully developed in all cases. We recommend that the bottom of footings be at least 12 inches below the lowest adjacent finished grade.

It is our opinion that the floor slab system may be constructed as a slab on grade. We recommend that a vapor barrier be placed between the soil and concrete. We also recommend that the reinforcing top and bottom steel be placed within the slab for tensile support due to the nature of the subsurface soils.

Site Fill Concerns

At this time it is not known how much fill will be needed to brings these areas up to construction grade. Our initial settlement analysis above is based upon the structures being constructed at existing grades. If fill amounts ranging from one to three feet is required within these areas, the additional fill brought to the site will cause additional immediate settlements of approximately one to three inches to the entire site. In order to reduce the amount subsidence of the ground surface during and after construction, we recommend that fill be brought to the building pad areas as soon as possible so that the consolidation process will begin before construction starts. We estimate that approximately one to two inches of settlement will occur after approximately three months of the fill being on site.

Site Preparation

The surficial organic soils, debris from the clearing operations, remnants of the existing construction, any unsuitable soils as determined by the Geotechnical Engineer will need to be completely removed within the construction area and to a lateral distance of at least 2 feet beyond the footprint limits, where practical. A Nutting Engineer's representative should be present to observe that the stripping operations are performed as we have discussed herein.

Following site clearing as discussed above, the foundation area should be excavated and the footings formed.

The bottom of foundation excavations should be compacted after excavation to develop a minimum density requirement of 98 percent of the maximum modified Proctor dry density, for a minimum depth of one (1) foot below the bottom of the footing depth, as determined by field density compaction tests.

If required by local or county codes any anchor piles that area needed for the structure should be installed to similar depths as recommended above within the main building augercast pile analysis section of this report.

Pavement Areas

The results of the soil borings indicate that the silty debris zone may exist within the new parking and roadway areas. Based on the relative loads for the parking lot, it is our opinion that it is not necessary to excavate these organic soils and replace them with clean backfill. We note that some increased frequency of maintenance should be anticipated if the organic soils are left in place. The decision as to what should be done within the parking areas will depend on costs, tolerance to settlements, additional fill that may be required and other factors. Discussions should be held with us, the owners and other interested parties to determine the best alternative concerning the pavement areas.

If the existing silty debris material is to remain, pavement areas after site clearance should be compacted to a minimum of 98 percent of the modified Proctor maximum dry density to a depth of at least 24 inches below the subgrade level. We recommend that stabilized subgrade having a minimum Limerock Bearing Ratio (LBR) of 40 be placed to a depth of approximately one foot below the base course. The base course will range from approximately 6 to 8 inches, and should have a minimum LBR of 100. We can provide more detailed pavement design recommendations including material types and thickness. However, it would be necessary to provide us with the anticipated traffic loading characteristics and pavement design life.

GENERAL INFORMATION

Our client for this geotechnical evaluation was:

Mr. Oscar R. Bello, P.E.
Chen and Associates, Inc.
420 Lincoln Road, Suite 420
Miami Beach, Florida 33139

The contents of this report are for the exclusive use of the client, the client's design & construction team and governmental authorities for this specific project exclusively. Information conveyed in this report shall not be used or relied upon by other parties or for other projects without the expressed written consent of Nutting Engineers of Florida, Inc. This report discusses geotechnical considerations for this site based upon observed conditions and our understanding of proposed construction for foundation support. Environmental issues including (but not limited to), soil and/or groundwater contamination, methane are beyond our scope of service for this project. As such, this report should not be used or relied upon for evaluation of environmental issues.

Benefit may be realized by the performance of exploratory test pits on the site to develop additional subsurface information. The client may wish to consider performance of test pits on this project to supplement information already developed.

Prior to initiating compaction operations, we recommend that representative samples of the structural fill material to be used and acceptable in-place soils be collected and tested to determine their compaction and classification characteristics. The maximum dry density, optimum moisture content, gradation and plasticity characteristics should be determined. These tests are needed for compaction quality control of the structural fill and existing soils, and to determine if the fill material is acceptable.

If conditions are encountered which are not consistent with the findings presented in this report, or if proposed construction is moved from the location investigated, this office shall be notified immediately so that the condition or change can be evaluated and appropriate action taken.

No pile shall have a tip elevation higher than the recommended elevation without first contacting Nutting Engineers of Florida, Inc. in writing so that they may analyze any proposed changes. If Nutting Engineers of Florida, Inc. is not contacted regarding a change in pile tip elevations (or pile diameters) as indicated in this report, the geotechnical engineer /piling contractor initiating this change will be responsible for the redesigned pile capacity and performance. Furthermore, if the tip elevation is raised, a pile load test shall be performed at that location where the test borings indicate the least favorable conditions. If the pile design is changed without our knowledge, Nutting Engineers of Florida, Inc. is no longer the geotechnical engineer of record.

The vibratory compaction equipment may cause vibrations that could be felt by persons within nearby buildings and could potentially induce structural settlements. Additionally, preexisting settlements may exist within these structures that could be construed to have been caused or worsened by the proposed vibratory compaction after the fact. Pre- and post conditions surveys of these structures along with the vibration monitoring during vibratory compaction could be performed to better evaluate this concern. The contractor should exercise due care during the performance of the vibratory compaction work with due consideration of potential impacts on existing structures. If potential vibrations and impacts are not considered tolerable, then alternate foundation modification techniques should be considered.

Nutting Engineers of Florida, Inc. shall bear no liability for the implementation of recommended inspection and testing services as described in this report if implemented by others. Nutting has no ability to verify the completeness, accuracy or proper technique of such procedures if performed by others.

Excavations of five feet or more in depth should be sloped or shored in accordance with OSHA and State of Florida requirements.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein, have been presented after being prepared in accordance with general accepted professional practice in the field of foundation engineering, soil mechanics and engineering geology. No other warranties are implied or expressed.

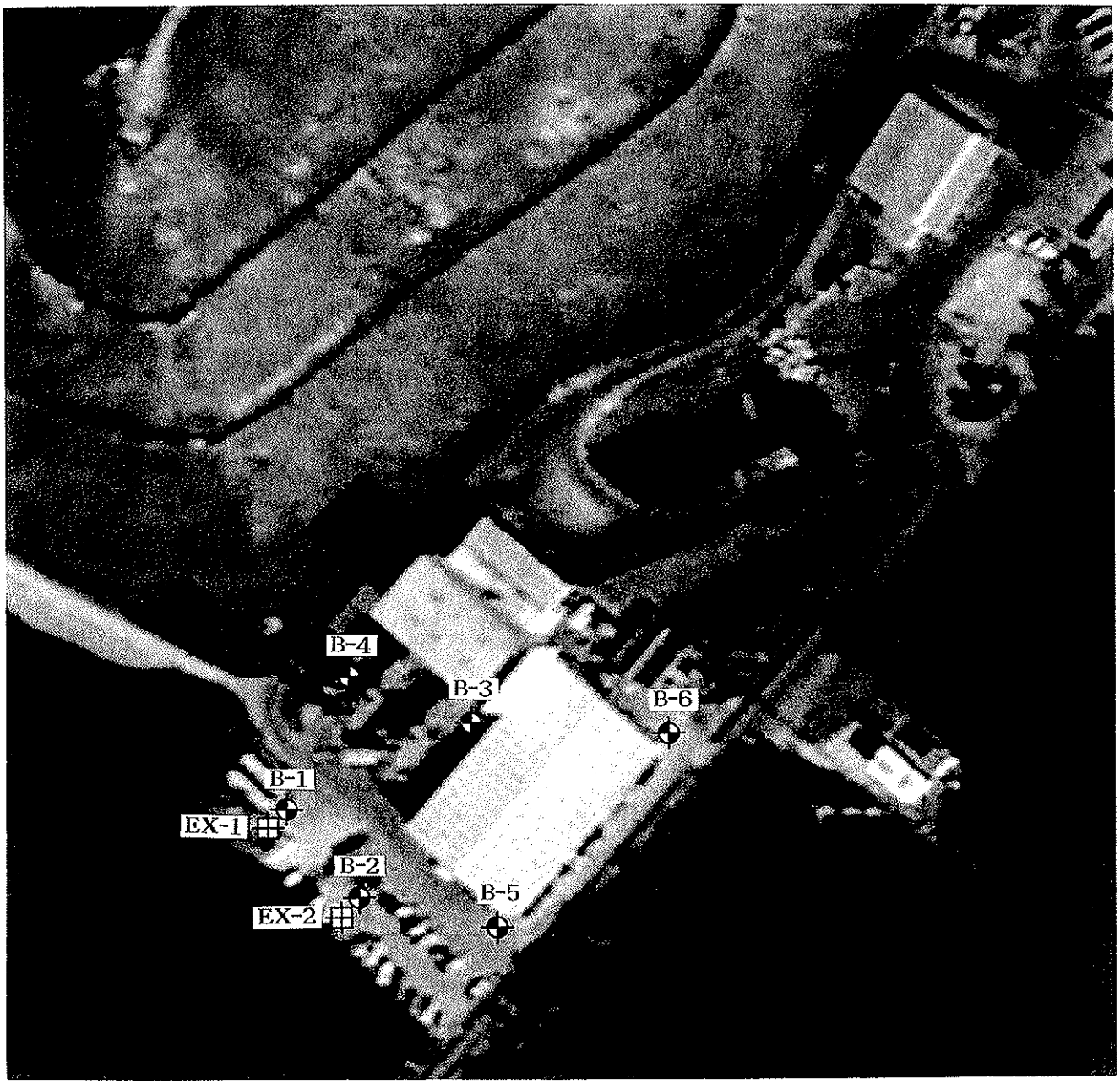
We appreciate the opportunity to provide these services for you. If we can be of any further assistance, or if you need additional information, please feel free to contact us.

Sincerely,
NUTTING ENGINEERS OF FLORIDA, INC.

Christopher E. Gworek, E.I.
Project Engineer

5/15/08
Reza Javidan, P.E. #60223
Senior Geotechnical Engineer

Appendix: Boring Location Plan
Test Boring Results
Exfiltration Test Results
Limitations of Liability
Soil Classification Criteria



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CHEN & ASSOCIATES
CITY OF KEY WEST
TRANSIT STATION FACILITY
5701 COLLEGE RD., KEY WEST, FL
PROJECT NO. 786.3

- GEOTECHNICAL EXPLORATION -

FIG. 1

Nutting Engineers of Florida Inc. | Established 1967
Your Project is Our Commitment
1310 Neptune Drive
Boynton Beach, 33426
Telephone: 561-736-4900
Fax: 561-737-9975

BORING NUMBER B-1

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/15/08 COMPLETED 4/15/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		LIMESTONE, some tan quartz fine sand (fill material)	SS 1	30-31-22-15	53	>>
		Dark gray silty SAND and debris (fill material)	SS 2	10-7-9-9	16	▲
5	▽		SS 3	12-13-15-5	28	▲
			SS 4	3-50/4"		>>
		Light tan LIMESTONE, trace sand	SS 5	32-30-33-36	63	>>
10						
			SS 6	49-50	99	>>
15						
			SS 7	43-41-46	84	>>
20						
			SS 8	45-50	95	>>
25						
			SS 9	29-27-31	56	>>
30		Bottom of hole at 30.0 feet.				

TEST NUTTING BOREHOLE 786.3 CHEN & ASSOCIATES- CITY OF KEY WEST TRANSIT STATION FACILITY.GPJ GINT US.GDT 4/21/08

Disclaimer Nutting Engineers of Florida, Inc. accepts no liability for the consequences of the independent interpretation of drilling logs by others.

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BORING NUMBER B-2

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0		ASPHALT				
		LIMESTONE and tan quartz fine sand (fill material)	SS 1	88-52-16-8	68	>>
		Black silty dark brown SAND and debris (fill material)				
		LIMESTONE and tan quartz fine sand (fill material)	SS 2	10-10-7-5	17	
5		Silty brown quartz fine SAND and debris (fill material) ▽	SS 3	3-8-9-3	17	
			SS 4	3-3-3-4	6	
		Light tan LIMESTONE, trace sand	SS 5	3-31-44-50/3"	75	>>
10						
			SS 6	41-44-56	85	>>
15						
			SS 7	52-50-48	102	>>
20						
			SS 8	56-50	106	>>
25						
			SS 9	50-50	100	>>
30		Bottom of hole at 30.0 feet.				

TEST NUTTING BOREHOLE 786.3 CHEN & ASSOCIATES- CITY OF KEY WEST TRANSIT STATION FACILITY.GPJ GINT US.GDT 4/21/08

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Boynton Beach, 33426
Telephone: 561-736-4900
Fax: 561-737-9975

BORING NUMBER B-3

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.3 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0		ASPHALT and basecourse				
		Tan quartz fine SAND, slight trace of debris (fill material)	SS 1	43-20-19-30	39	▲
			SS 2	20-16-11-8	27	▲
5		Brown LIMESTONE, some quartz fine sand (fill material) ▽	SS 3	5-4-8-5	12	▲
		Dark gray quartz fine SAND and debris (fill material)	SS 4	3-2-3-35	5	▲
		Light tan LIMESTONE, trace sand	SS 5	26-33-39-41	72	>>▲
10						
			SS 6	38-43-51	81	>>▲
15						
			SS 7	37-38-42	75	>>▲
20						
			SS 8	25-24-29	49	▲
25						
			SS 9	29-36-40	65	>>▲
30		Bottom of hole at 30.0 feet.				

TEST NUTTING BOREHOLE 786.3 CHEN & ASSOCIATES- CITY OF KEY WEST TRANSIT STATION FACILITY.GPJ GINT US.GDT 4/21/08

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BORING NUMBER B-4

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0		CONCRETE				
		LIMESTONE and light tan quartz fine sand (fill material)	SS 1	71-56-43-39	99	>>
			SS 2	22-39-50-50	89	>>
5		▽	SS 3	42-25-19-19	44	
		LIMESTONE, little light tan quartz fine sand				
		LIMESTONE and dark gray quartz fine sand, some debris (fill material)	SS 4	13-10-18-22	28	
		Light tan LIMESTONE, trace sand	SS 5	21-28-27-31	55	>>
10						
			SS 6	31-36-36	67	>>
15						
			SS 7	65-41-48	106	>>
20						
			SS 8	42-45-46	87	>>
25						
			SS 9	25-25-21	50	
30						
		Bottom of hole at 30.0 feet.				

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BORING NUMBER B-5

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		ASPHALT				
		Tan SAND and limestone fragments (fill material)	SS 1	36-25-21-29	46	▲
			SS 2	38-50-27-19	77	>>
5		▽	SS 3	10-16-18-23	34	▲
		Dark gray quartz fine SAND and debris (fill material)	SS 4	15-13-9-21	22	▲
		Light tan LIMESTONE, trace sand	SS 5	19-26-33-40	59	>>
10						
			SS 6	39-52-48	91	>>
15						
			SS 7	50-53-50	103	>>
20						
			SS 8	54-36-40	90	>>
25						
			SS 9	30-28-23	58	>>
30		Bottom of hole at 30.0 feet.				

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BORING NUMBER B-6

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		ASPHALT				
		LIMESTONE and light tan quartz fine sand (fill material)	SS 1	66-48-30-34	78	>>
			SS 2	31-29-30-25	59	>>
5		▽	SS 3	8-6-5-4	11	
		Silty dark gray quartz fine SAND, some debris and peat (fill material)	SS 4	3-5-4-14	9	
		Light tan LIMESTONE, trace sand	SS 5	19-21-36-41	57	>>
10						
			SS 6	35-41-40	76	>>
15						
			SS 7	43-51-59	94	>>
20						
			SS 8	38-30-29	68	>>
25						
			SS 9	30-27-22	57	>>
30		Bottom of hole at 30.0 feet.				

TEST NUTTING BOREHOLE 786.3 CHEN & ASSOCIATES- CITY OF KEY WEST TRANSIT STATION FACILITY.GPJ GINT US.GDT 4/21/08

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St. Lucie 772-408-1050
Miami-Dade 305-557-3083
www.nuttingengineers.com

Exfiltration Test

Client: Chen & Associates
Project: City of Key West Transit Station Facility
Location: 5701 College Road, Key West, Florida
Test: Usual Tpy Open Hole Exfiltration Test
Surface Elevation: Approx. @ Road Crown
Water table from ground surface: 4.7'

Order No 786.3
Report No 1
Date: 4/18/08

Casing Diameter: 6"
Tube Depth: 15'

One Minute Increme	Pump Rate in Gal/Min
1	1.0
2	1.0
3	1.0
4	1.0
5	1.0
6	0.5
7	0.5
8	0.5
9	0.5
10	0.5

Sample Location: Approx. As Indicated on Site Plan

Material:
0'-2' LIMESTONE and tan quartz fine sand
2'-6.8' Silty dark gray quartz fine SAND and debris (fill)
6.8'-15' LIMESTONE and light tan quartz fine sand

$K = 1.77 \times 10^{-5}$ cfs/ft^{2}ft.head

5/14/08
Reza Javidan, P.E. #60223

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Exfiltration Test

Client: Chen & Associates — Order No 786.3
Project: City of Key West Transit Station Facility — Report No 2
Location: 5701 College Road, Key West, Florida — Date: 4/18/08
Test: Usual Tpy Open Hole Exfiltration Test
Surface Elevation: Approx. @ Road Crown — Water table from ground surface: 5'

Casing Diameter: 6"
Tube Depth: 15'

One Minute Increme	Pump Rate in Gal/Min
1	40.0
2	40.0
3	40.0
4	40.0
5	40.0
6	40.0
7	40.0
8	40.0
9	40.0
10	40.0

Sample Location: Approx. As Indicated on Site Plan

Material:
0'-4' LIMESTONE and tan quartz fine sand
4'-8.5' Silty brown quartz fine SANd and debris (fill)
8.5'-15' LIMESTONE and light tan quartz fine sand

$K = 5.58 \times 10^{-2}$ cfs/ft^{2}ft.head

*** NOTE:** Driller could only raise water table one foot above initial location, while pumping maximum flow (40 gpm) with testing equipment. Calculation Based upon this condition.

Reza Javidan 5114-8
Reza Javidan, P.E. #60223

Geotechnical and Construction Materials | Engineering, Testing and Inspections | Environmental Services

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LIMITATIONS OF LIABLILITY

WARRANTY

We warranty that the services performed by Nutting Engineers of Florida, Inc. are conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions. ***No other warranties, expressed or implied, are made.*** While the services of Nutting Engineers of Florida, Inc. are a valuable and integral part of the design and construction teams, we do not warrant, guarantee or insure the quality, completeness, or satisfactory performance of construction plans and specifications which we have not prepared, nor the ultimate performance of building site materials.

SUBSURFACE EXPLORATION

Subsurface exploration is normally accomplished by test borings; test pits are sometimes employed. The method of determining the boring location and the surface elevation at the boring is noted in the report. This information is represented on a drawing or on the boring log. The location and elevation of the borings should be considered accurate only to the degree inherent with the method used.

The soil boring log includes sampling information, description of the materials recovered, approximate depths of boundaries between soil and rock strata and groundwater data. The log represents conditions specifically at the location where the boring was made. The boundaries between different soil strata are indicated at specific depths; however, these depths are in fact approximate and dependent upon the frequency of sampling. The transition between soil strata is often gradual. Water level readings are made at the time and under conditions stated on the boring logs. Water levels change with time, precipitation, canal level, local well drawdown and other factors.

LABORATORY AND FIELD TESTS

Tests are performed in accordance with specific ASTM Standards unless otherwise indicated. All criteria included in a given ASTM Standard are not always required and performed. Each test report indicates the measurement and determination actually made.

ANALYSIS AND RECOMMENDATIONS

The geotechnical report is prepared primarily to aid in the design of site work and structural foundations. Although the information in the report is expected to be sufficient for these purposes, it is not intended to determine the cost of construction or to stand alone as a construction specification.

Report recommendations are based primarily on data from test borings made at the locations shown on the test boring reports. Soil variations may exist between borings and may not become evident until construction. If variations are then noted, the geotechnical engineer should be contacted so that field conditions can be examined and recommendations revised if necessary.

The geotechnical report states our understanding as to the location, dimensions and structural features proposed for the site. ***Any significant changes in the nature, design, or location of the site improvements must be communicated to the geotechnical engineer*** so that the geotechnical analysis, conclusions, and recommendations can be appropriately adjusted.

CONSTRUCTION OBSERVATION

Construction observation and testing is an important element of geotechnical services. The geotechnical engineer's field representative (G.E.F.R.) is the "owner's representative" observing the work of the contractor, performing tests and reporting data from such tests and observations. ***The geotechnical engineer's field representative does not direct the contractor's construction means, methods, operations or personnel.*** The G.E.F.R. does not interfere with the relationship between the owner and the contractor and, except as an observer, does not become a substitute owner on site. The G.E.F.R. is responsible for his/her safety, but has no responsibility for the safety of other personnel at the site. The G.E.F.R. is an important member of a team whose responsibility is to observe and test the work being done and report to the owner whether that work is being carried out in general conformance with the plans and specifications.

SOIL CLASSIFICATION CRITERIA

RELATIVE DENSITY SAND

SPT N-VALUE (blows/ft.)	RELATIVE DENSITY
0 - 4	Very Loose
5 - 10	Loose
11 - 29	Medium
30 - 49	Dense
>50	Very Dense
100/6"	Refusal

SHEAR STRENGTH CLAY

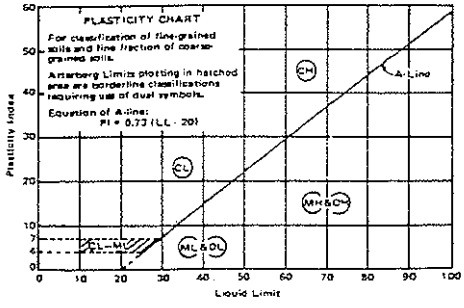
SPT N-Value (blows/ft.)	UNCONFINED COMP. STRENGTH (tons/ft.2)	CONSISTENCY
<2	<0.25	Very soft
2 - 4	0.25-0.50	Soft
5 - 8	0.50-1.00	Medium
9 - 15	1.00-2.00	Stiff
16 - 30	2.00-4.00	Very Stiff
>30	>4.00	Hard

PARTICLE SIZE

Boulder	>12 in.
Cobble	3 to 12 in.
Gravel	4.76mm to 3 in.
Sand	0.074mm to 4.76mm
Silt	0.005mm to 0.074mm
Clay	<0.005mm

DESCRIPTION MODIFIERS

0 - 5%	Slight trace
6 - 10%	Trace
11 - 20%	Little
21 - 35%	Some
>35%	And

Major Divisions			Group Symbols	Typical Names	Classification Criteria
Coarse-Grained Soils More than 50% retained on No. 200 sieve*	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% pass No. 200 sieve: GW, GP, SW, SP; More than 12% pass No. 200 sieve: GM, GC, SM, SC; 5% to 12% pass No. 200 sieve: Borderline classification requiring use of dual symbols. $C_u = D_{60}/D_{10}$ Greater than 4; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines	Not meeting both criteria for GW
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4 / Atterberg limits plot above "A" line and plasticity index greater than 7 — Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines	$C_u = D_{60}/D_{10}$ Greater than 6; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			SP	Poorly graded sands and gravelly sands, little or no fines	Not meeting both criteria for SW
		Sands with Fines	SM	Silty sands, sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4 / Atterberg limits plot above "A" line and plasticity index greater than 7 — Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	
Fine-Grained Soils 50% or more passes No. 200 sieve*	Silts and Clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL	Organic silts and organic silty clays of low plasticity	
	Silts and Clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
			CH	Inorganic clays of high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity	
Highly Organic Soils			PT	Peat, muck, and other highly organic soils	Visual-Manual Identification, see ASTM Designation D 2488.

*Based on the material passing the 3-in. (75-mm.)sieve.

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BORING NUMBER B-1

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/15/08 COMPLETED 4/15/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		LIMESTONE, some tan quartz fine sand (fill material)	SS 1	30-31-22-15	53	>>
		Dark gray silty SAND and debris (fill material)	SS 2	10-7-9-9	16	▲
5		▽	SS 3	12-13-15-5	28	▲
			SS 4	3-50/4"		>>
		Light tan LIMESTONE, trace sand	SS 5	32-30-33-36	63	>>
10						
			SS 6	49-50	99	>>
15						
			SS 7	43-41-46	84	>>
20						
			SS 8	45-50	95	>>
25						
			SS 9	29-27-31	56	>>
30		Bottom of hole at 30.0 feet.				

TEST NUTTING BOREHOLE 786.3 CHEN & ASSOCIATES- CITY OF KEY WEST TRANSIT STATION FACILITY.GPJ GINT US.GDT 4/21/08

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BORING NUMBER B-2

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		ASPHALT				
		LIMESTONE and tan quartz fine sand (fill material)	SS 1	88-52-16-8	68	>>
		Black silty dark brown SAND and debris (fill material)				
		LIMESTONE and tan quartz fine sand (fill material)	SS 2	10-10-7-5	17	
5		Silty brown quartz fine SAND and debris (fill material) ▽	SS 3	3-8-9-3	17	
			SS 4	3-3-3-4	6	
		Light tan LIMESTONE, trace sand	SS 5	3-31-44-50/3"	75	>>
10						
			SS 6	41-44-56	85	>>
15						
			SS 7	52-50-48	102	>>
20						
			SS 8	56-50	106	>>
25						
			SS 9	50-50	100	>>
30		Bottom of hole at 30.0 feet.				

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BORING NUMBER B-3

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.3 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0		ASPHALT and basecourse				
		Tan quartz fine SAND, slight trace of debris (fill material)	SS 1	43-20-19-30	39	▲ at 80
			SS 2	20-16-11-8	27	▲ at 60
5		Brown LIMESTONE, some quartz fine sand (fill material) ▽	SS 3	5-4-8-5	12	▲ at 20
		Dark gray quartz fine SAND and debris (fill material)	SS 4	3-2-3-35	5	▲ at 10
		Light tan LIMESTONE, trace sand	SS 5	26-33-39-41	72	>>
10						
			SS 6	38-43-51	81	>>
15						
			SS 7	37-38-42	75	>>
20						
			SS 8	25-24-29	49	▲ at 40
25						
			SS 9	29-36-40	65	>>
30		Bottom of hole at 30.0 feet.				

TEST NUTTING BOREHOLE 786.3 CHEN & ASSOCIATES- CITY OF KEY WEST TRANSIT STATION FACILITY.GPJ GINT US.GDT 4/21/08

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BORING NUMBER B-4

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		CONCRETE				
		LIMESTONE and light tan quartz fine sand (fill material)	SS 1	71-56-43-39	99	>>
			SS 2	22-39-50-50	89	>>
5		▽	SS 3	42-25-19-19	44	
		LIMESTONE, little light tan quartz fine sand				
		LIMESTONE and dark gray quartz fine sand, some debris (fill material)	SS 4	13-10-18-22	28	
		Light tan LIMESTONE, trace sand	SS 5	21-28-27-31	55	>>
10						
			SS 6	31-36-36	67	>>
15						
			SS 7	65-41-48	106	>>
20						
			SS 8	42-45-46	87	>>
25						
			SS 9	25-25-21	50	
30		Bottom of hole at 30.0 feet.				

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BORING NUMBER B-5

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5'-2' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		ASPHALT				
		Tan SAND and limestone fragments (fill material)	SS 1	36-25-21-29	46	▲
			SS 2	38-50-27-19	77	>>▲
5	▽		SS 3	10-16-18-23	34	▲
		Dark gray quartz fine SAND and debris (fill material)	SS 4	15-13-9-21	22	▲
		Light tan LIMESTONE, trace sand	SS 5	19-26-33-40	59	>>▲
10						
			SS 6	39-52-48	91	>>▲
15						
			SS 7	50-53-50	103	>>▲
20						
			SS 8	54-36-40	90	>>▲
25						
			SS 9	30-28-23	58	>>▲
30		Bottom of hole at 30.0 feet.				

TEST NUTTING BOREHOLE 786.3 CHEN & ASSOCIATES- CITY OF KEY WEST TRANSIT STATION FACILITY.GPJ GINT US.GDT 4/21/08

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Boynton Beach, 33426
Telephone: 561-736-4900
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BORING NUMBER B-6

PROJECT NUMBER 786.3

CLIENT Chen & Associates

PROJECT NAME City of Key West Transit Station Facility

PROJECT LOCATION 5701 College Road, Key West, Florida

DATE STARTED 4/16/08 COMPLETED 4/16/08

SURFACE ELEVATION REFERENCE 1.5' Above Road Crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons CHECKED BY C. Gworek

▽ AT TIME OF DRILLING 5.0 ft

APPROXIMATE LOCATION OF BORING Approx. As Indicated on Site Plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0		ASPHALT				
		LIMESTONE and light tan quartz fine sand (fill material)	SS 1	66-48-30-34	78	>>
			SS 2	31-29-30-25	59	>>
5		▽	SS 3	8-6-5-4	11	
		Silty dark gray quartz fine SAND, some debris and peat (fill material)	SS 4	3-5-4-14	9	
		Light tan LIMESTONE, trace sand	SS 5	19-21-36-41	57	>>
10						
			SS 6	35-41-40	76	>>
15						
			SS 7	43-51-59	94	>>
20						
			SS 8	38-30-29	68	>>
25						
			SS 9	30-27-22	57	>>
30		Bottom of hole at 30.0 feet.				

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St. Lucie 772-408-1050
Miami-Dade 305-557-3083
www.nuttingengineers.com

Exfiltration Test

Client: Chen & Associates
Project: City of Key West Transit Station Facility
Location: 5701 College Road, Key West, Florida
Test: Usual Tpy Open Hole Exfiltration Test
Surface Elevation: Approx. @ Road Crown
Water table from ground surface: 4.7'
Casing Diameter: 6"
Tube Depth: 15'

Order No 786.3
Report No 1
Date: 4/18/08

One Minute Increme	Pump Rate in Gal/Min
1	1.0
2	1.0
3	1.0
4	1.0
5	1.0
6	0.5
7	0.5
8	0.5
9	0.5
10	0.5

Sample Location: Approx. As Indicated on Site Plan

Material:
0'-2' LIMESTONE and tan quartz fine sand
2'-6.8' Silty dark gray quartz fine SAND and debris (fill)
6.8'-15' LIMESTONE and light tan quartz fine sand

$K = 1.77 \times 10^{-5}$ cfs/ft^{2}ft.head

Reza Javidan 5/14/08
Reza Javidan, P.E. #60223

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Exfiltration Test

Client: Chen & Associates — Order No 786.3
Project: City of Key West Transit Station Facility — Report No 2
Location: 5701 College Road, Key West, Florida — Date: 4/18/08
Test: Usual Tpy Open Hole Exfiltration Test
Surface Elevation: Approx. @ Road Crown — Water table from ground surface: 5'

Casing Diameter: 6"
Tube Depth: 15'

One Minute Increme	Pump Rate in Gal/Min
1	40.0
2	40.0
3	40.0
4	40.0
5	40.0
6	40.0
7	40.0
8	40.0
9	40.0
10	40.0

Sample Location: Approx. As Indicated on Site Plan

Material:		
	0'-4'	LIMESTONE and tan quartz fine sand
	4'-8.5'	Silty brown quartz fine SANd and debris (fill)
	8.5'-15'	LIMESTONE and light tan quartz fine sand

$K = 5.58 \times 10^{-2}$ cfs/ft^{2}ft.head

* **NOTE:** Driller could only raise water table one foot above initial location, while pumping maximum flow (40 gpm) with testing equipment. Calculation Based upon this condition.

Reza Javidan 5114-8

Reza Javidan, P.E. #60223

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LIMITATIONS OF LIABLILITY

WARRANTY

We warranty that the services performed by Nutting Engineers of Florida, Inc. are conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions. ***No other warranties, expressed or implied, are made.*** While the services of Nutting Engineers of Florida, Inc. are a valuable and integral part of the design and construction teams, we do not warrant, guarantee or insure the quality, completeness, or satisfactory performance of construction plans and specifications which we have not prepared, nor the ultimate performance of building site materials.

SUBSURFACE EXPLORATION

Subsurface exploration is normally accomplished by test borings; test pits are sometimes employed. The method of determining the boring location and the surface elevation at the boring is noted in the report. This information is represented on a drawing or on the boring log. The location and elevation of the borings should be considered accurate only to the degree inherent with the method used.

The soil boring log includes sampling information, description of the materials recovered, approximate depths of boundaries between soil and rock strata and groundwater data. The log represents conditions specifically at the location where the boring was made. The boundaries between different soil strata are indicated at specific depths; however, these depths are in fact approximate and dependent upon the frequency of sampling. The transition between soil strata is often gradual. Water level readings are made at the time and under conditions stated on the boring logs. Water levels change with time, precipitation, canal level, local well drawdown and other factors.

LABORATORY AND FIELD TESTS

Tests are performed in accordance with specific ASTM Standards unless otherwise indicated. All criteria included in a given ASTM Standard are not always required and performed. Each test report indicates the measurement and determination actually made.

ANALYSIS AND RECOMMENDATIONS

The geotechnical report is prepared primarily to aid in the design of site work and structural foundations. Although the information in the report is expected to be sufficient for these purposes, it is not intended to determine the cost of construction or to stand alone as a construction specification.

Report recommendations are based primarily on data from test borings made at the locations shown on the test boring reports. Soil variations may exist between borings and may not become evident until construction. If variations are then noted, the geotechnical engineer should be contacted so that field conditions can be examined and recommendations revised if necessary.

The geotechnical report states our understanding as to the location, dimensions and structural features proposed for the site. ***Any significant changes in the nature, design, or location of the site improvements must be communicated to the geotechnical engineer*** so that the geotechnical analysis, conclusions, and recommendations can be appropriately adjusted.

CONSTRUCTION OBSERVATION

Construction observation and testing is an important element of geotechnical services. The geotechnical engineer's field representative (G.E.F.R.) is the "owner's representative" observing the work of the contractor, performing tests and reporting data from such tests and observations. ***The geotechnical engineer's field representative does not direct the contractor's construction means, methods, operations or personnel.*** The G.E.F.R. does not interfere with the relationship between the owner and the contractor and, except as an observer, does not become a substitute owner on site. The G.E.F.R. is responsible for his/her safety, but has no responsibility for the safety of other personnel at the site. The G.E.F.R. is an important member of a team whose responsibility is to observe and test the work being done and report to the owner whether that work is being carried out in general conformance with the plans and specifications.

SOIL CLASSIFICATION CRITERIA

RELATIVE DENSITY SAND

SPT N-VALUE (blows/ft.)	RELATIVE DENSITY
0 - 4	Very Loose
5 - 10	Loose
11 - 29	Medium
30 - 49	Dense
>50	Very Dense
100/6"	Refusal

SHEAR STRENGTH CLAY

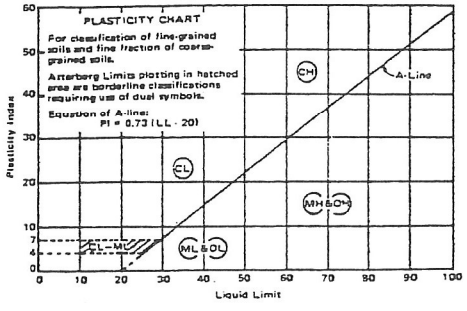
SPT N-Value (blows/ft.)	UNCONFINED COMP. STRENGTH (tons/ft.2)	CONSISTENCY
<2	<0.25	Very soft
2 - 4	0.25-0.50	Soft
5 - 8	0.50-1.00	Medium
9 - 15	1.00-2.00	Stiff
16 - 30	2.00-4.00	Very Stiff
>30	>4.00	Hard

PARTICLE SIZE

Boulder	>12 in.
Cobble	3 to 12 in.
Gravel	4.76mm to 3 in.
Sand	0.074mm to 4.76mm
Silt	0.005mm to 0.074mm
Clay	<0.005mm

DESCRIPTION MODIFIERS

0 - 5%	Slight trace
6 - 10%	Trace
11 - 20%	Little
21 - 35%	Some
>35%	And

Major Divisions			Group Symbols	Typical Names	Classification Criteria
Coarse-Grained Soils: More than 50% retained on No. 200 sieve*	Gravels: 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines: Less than 5% pass No. 200 sieve: GW, GP, SW, SP; More than 12% pass No. 200 sieve: GM, GC, SM, SC; 5% to 12% pass No. 200 sieve: Borderline classification requiring use of dual symbols. $C_u = D_{60}/D_{10}$ Greater than 4; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines	Not meeting both criteria for GW
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4; Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits plot above "A" line and plasticity index greater than 7; Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
	Sands: More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines	$C_u = D_{60}/D_{10}$ Greater than 6; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			SP	Poorly graded sands and gravelly sands, little or no fines	Not meeting both criteria for SW
		Sands with Fines	SM	Silty sands, sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4; Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Atterberg limits plot above "A" line and plasticity index greater than 7; Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
Fine-Grained Soils: 50% or more passes No. 200 sieve*	Silts and Clays: Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL	Organic silts and organic silty clays of low plasticity	
	Silts and Clays: Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
			CH	Inorganic clays of high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity	
Highly Organic Soils			PT	Peat, muck, and other highly organic soils	Visual-Manual Identification, see ASTM Designation D 2488.

*Based on the material passing the 3-in. (75-mm.) sieve.