REPORT OF
GEOTECHNICAL EXPLORATION

FOUNDER'S PARK BASEBALL FIELD
87000 OVERSEAS HWY
ISLAMORADA, FLORIDA 33036

FOR

MONROE COUNTY SCHOOL DISTRICT
5330 2ND AVENUE
STOCK ISLAND, FLORIDA 33040

PREPARED BY

NUTTING ENGINEERS OF FLORIDA, INC.
24478 OVERSEAS HIGHWAY
SUMMERLAND KEY, FLORIDA 33042

ORDER NO. 938.6

APRIL 2023

April 12, 2023

Mr. Douglas Pryor
Monroe County School District
5330 2nd Avenue
Stock Island, Florida 33040
Phone: 305-407-6251 Email: douglas.pryor@keysschools.com

Re: Report of Geotechnical Exploration Services
Founder's Park Baseball Field
87000 Overseas Highway
Islamorada, FL 33036

Dear Mr. Pryor:

Nutting Engineers of Florida, Inc. (NE), has performed a Geotechnical Exploration at the referenced site in Islamorada, Florida. The purpose of this exploration was to obtain information concerning the site and subsurface conditions at specific locations in order to provide site preparation and foundation design recommendations for support of the planned construction. The following presents our findings and recommendations.

PROJECT INFORMATION

Per your email dated March 7, 2023 and review of the aerial photos and rendering provided, we understand that plans for this project include the following at the referenced site:

1. Competition athletic field:
    a. Baseball – Artificial turf field to include batting cages and dugouts
2. Bleachers
    a. Baseball – Install new elevated bleachers on concrete pad with storage underneath
3. Fences
    a. Dismantle existing backstop fence and reinstall in new location closer to home plate
    b. Dismantle existing side fences and align to reinstalled back stop fences
    c. Dismantle and reinstall protective netting to align with reinstalled backstop fence and side fences
4. Dugouts
    a.Demolish existing dugouts and replace with newly constructed dugouts for home and visitors closer to the field of play and home plate
5. Batting Cage
    a. Construct new batting cage with turf

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6. Include a multi-use building to consist of the following:
    a. Concession stand, locker rooms, press box, bathrooms, weight/training room, room with AV equipment, athletic equipment storage, IT IDF room, electrical and mechanical rooms and coach's office.
7. Ensure adequate elevation and drainage throughout the facility (survey needed)
8. Include public address system, conduit and fiber cabling for connection to MCSD Network, WiFi Antenna's, drinking fountains, picnic table seating, and horizontal netting over baseball bleachers.

We note that the focus of this exploration was to provide recommendations for support of structures that will be part of the improvements. 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

Subsurface Soil Exploration

The exploration of subsurface conditions included site observation, review of available data such as the Soil Survey of Monroe County and five (5) Standard Penetration Test borings (ASTM D-1586) to a depth of thirty feet below the existing ground surface. In addition, two (2) 'Usual Open-Hole' exfiltration tests were performed to a depth of fifteen feet, in accordance with South Florida Water Management District specifications.

The locations of the tests are indicated on the attached site plan presented in the Appendix of this report. The locations were established in the field using approximate methods; namely, a measuring wheel and available surface controls. As such the locations should be considered to be approximate.

The appended boring logs present information and descriptions of the subsurface conditions at the specific test boring locations. Representative samples collected from the SPT borings were visually reviewed in the laboratory by a geotechnical engineer in order to confirm the field classifications. The Standard Penetration Test N-values (the number of successive blows required to drive the sampler into the soil one foot) are presented on the individual boring logs. The SPT N value has been empirically correlated with various soil properties and is considered to be indicative of the relative density of cohesionless soils and the consistency of cohesive soils. The correlation of penetration resistance with relative density is presented in the Soil Classification Criteria attached in the Appendix.

Soil Survey Maps

A review of the Soil Survey for Monroe County indicates that at the time the survey was conducted, the soils at the site were described as Urban Land 0 to 2 percent slopes, frequently flooded. This map unit is in upland areas adjacent to areas of water throughout the keys. Individual areas are subject to flooding from hurricanes and other tropical storms. We note that the maximum depth of the soil survey was approximately six feet.

Test Boring Results

In general, the test borings recorded a very hard light brown limestone with varying amounts of fine sand throughout the soil profile to thirty feet, the maximum depth explored. A detailed description of the soil/rock interlayering is given on the test boring logs in the Appendix.

Rock Formation Note:

Generally, rock in the Florida Keys area may include limestone or sandstone which have irregularities and discontinuities including vertical and horizontal solution features, varying surface and bottom elevations, and varying degrees of hardness. The rock features may also contain intervening sand and other material filled lenses. Solution features can be very common in rock strata in Southeast Florida and the Florida Keys. Also given the brittle nature of some rock strata, rocks may readily shatter when hit by the split spoon. Despite this, these strata may present significant resistance to excavation.

Exfiltration Results

Two (2) 'Usual Open-Hole' exfiltration tests were performed in accordance with South Florida Water Management District (SFWMD) specifications to a depth 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, by others.

The hydraulic conductivity values ranged from 1.34×10^{-4} to 8.64×10^{-3} 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 locations at the time of drilling. The groundwater level was encountered at a depth of approximately seven and a half to nine and a half feet below the existing ground surface. The immediate depth to groundwater measurements presented in this report may not provide a reliable indication of stabilized or longer-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 depth to water data should not be relied upon alone for project design considerations.

ANALYSIS AND RECOMMENDATIONS

The test borings performed for this project generally revealed soft to very hard limestone and sand throughout the soil profile. Therefore, it is our opinion that shallow foundations should provide sufficient support for the proposed construction, provided foundation criteria and site preparations are followed as discussed in this report.

Additionally, per Monroe County Code section 122-3(c) which states: "All building foundations shall rest directly on natural rock, on concrete piling driven to rock or on friction piling (concrete or wood) and shall be anchored to such rock support by holes, 16 inches in minimum diameter, augured into such rock a minimum depth of three feet and reinforced by a minimum of four #5 vertical rods extending up into the piers above a minimum of 18 inches and tied to the vertical steel of the pier".

Based on the above information, new footings will need to be installed to a below existing ground depth of at least two feet and anchor piles (if needed) should be installed to a depth of approximately four feet below the bottom of the footings to comply with the building code requirements. Discussions should be held with all interested parties to determine details concerning structural loading conditions and other factors that may be needed as part of the design.

Foundation Design – Shallow Foundations

Once the site preparation recommendations have been implemented as described in this report, the site may be developed with the proposed improvements using a shallow foundation designed for an allowable bearing pressure of 2,500 pounds per square foot.

We recommend a minimum width of 12 inches for continuous footings and 24 inches for individual footings, even though the soil bearing pressure may not be fully developed in all cases. The shallow foundations should be sized, and reinforcement must be provided in accordance with the structural engineer's requirements, the current Florida Building Code and other applicable standards. The foundations should be constructed in accordance with the local building codes and good standard practice.

Foundation Settlement

Shallow foundations designed and constructed in accordance with the recommendations of this report are estimated to sustain total settlements of less than one inch. Settlement of the foundations will occur as an elastic response of the soil to the loads applied. In this case, nearly all of the settlement of the foundations due to dead loads is expected to take place during construction. The portion of the settlement due to the live load of the structure will generally take place soon after the first application of this load.

Differential settlement between adjacent foundations should be approximately half of an inch. Distortions that occur along the wall footings due to differential settlement should not be more than 1 in 500.

Site Preparation

The debris from the clearing operations, surficial topsoil/roots, and any unsuitable soils as determined by the Geotechnical Engineer will need to be removed within the construction area and to a lateral distance of at least 5 feet beyond the footprint limits, where practical. The soils within the construction area should be compacted to achieve a minimum density of 98 percent of the modified Proctor maximum dry density to at least 12 inches below the compacted surface.

Structural fill needed to bring the site to construction grade may be placed in lifts not exceeding twelve inches in loose thickness. Each lift should be thoroughly compacted until densities equivalent to at least 98 percent of the modified Proctor maximum dry density are uniformly obtained. Fill should consist of granular soil, with less than 10% passing the No. 200 sieve, free of rubble, organics (5% or less) clay, debris, and other unsuitable material. The fill should have ASTM designation (D-2487) of GP, GW, SP, or SW, with a maximum particle size of no more than 3 inches or as otherwise approved by Nutting Engineers.

Table 1. General Subsurface Soil Parameters

Approx. Depth (feet)	Soil Description	Soil Unit Weight (pcf)		Internal Friction Angle, ϕ (degrees)	Earth Pressure Coefficients (Rankine)	
		Saturated	Submerged		Active (Ka)	Passive (Kp)
0-10	Fine SAND, LIMESTONE	135	73	34	0.28	3.54

Note: Values based on visual classification of samples and prior experience with similar materials. If more exact values are needed, specific testing should be performed.

Excavations for Underground Utilities

Based upon the depth to ground water encountered in our exploration, if an excavation needs to remain dry, we anticipate that dewatering will be necessary for open-cut areas where the depth of the excavation is below about seven feet. If dewatering is to be performed, it is recommended that such work be designed, permitted and executed by qualified knowledgeable parties thoroughly experienced with similar local dewatering operations. We note that the exfiltration tests resulted in very high exfiltration rates which could cause significant difficulty in dewatering operations. Also, hard excavation conditions should be anticipated and planned for. We are available to discuss excavation issues and to provide input concerning implementation.

Piping laid through areas of limestone should be bedded in a granular material, or as specified by the civil engineer, in order to account for the associated stress concentrations on the pipe. Piping laid through these areas should be over-excavated approximately six inches below the anticipated pipe bedding elevation and backfilled using a granular fill.

Although deleterious materials were not encountered within the study area, in the case peat, silt or other unsuitable materials are encountered within the pipe bedding area, the bedding should be over-excavated to at least 6 inches below the proposed pipe. Backfill should be performed in accordance with the recommendations presented herein or as specified by the civil engineer. Sand and/or limestone fragments encountered during the excavation operations may be used for backfill.

GENERAL INFORMATION

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, environmental issues related to fill, methane, and other environmental considerations 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.

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.

Nutting Engineers of Florida, Inc. (NE), recommends that we be contracted to provide input to the design team and owner during the foundation and earthwork design process and that we review final foundation drawings and specifications to verify that our report recommendations and design intent have been properly implemented. NE shall also perform testing and inspections during the earthwork and foundation construction as recommended in this report. If NE is not engaged to perform these services as detailed herein, the Client agrees that NE shall bear no liability for the interpretation, implementation of our report, its recommendations and/or inspection and testing services as described in this report if implemented by others.

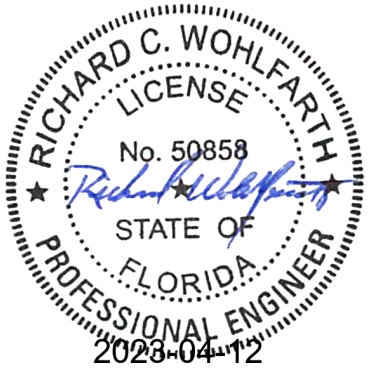
The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein, have been presented after being prepared in accordance with general accepted professional practice in the field of foundation engineering, soil mechanics and engineering geology. 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.

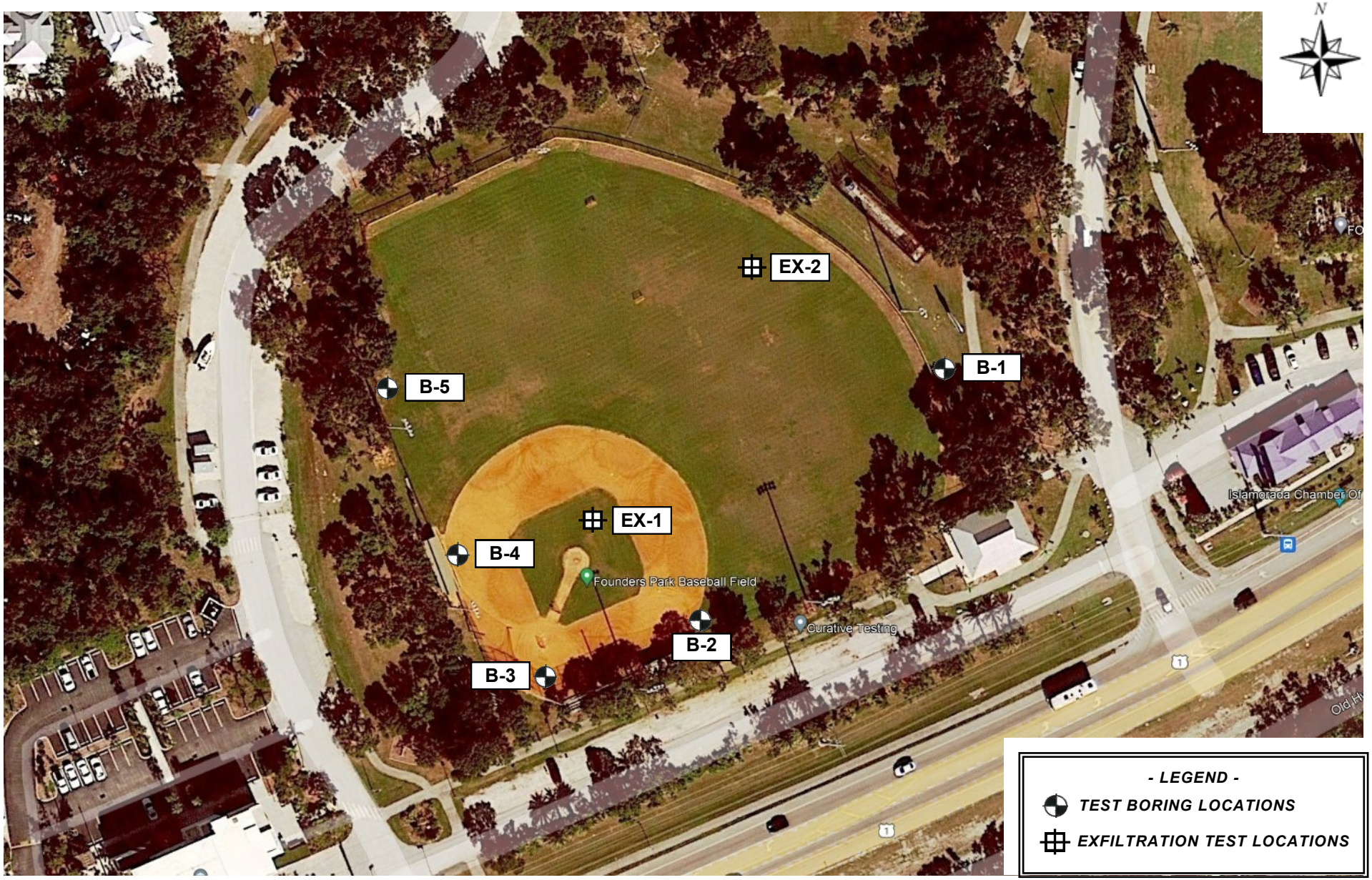
This item has been digitally signed and sealed by Richard C. Wohlfarth on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.



Richard C. Wohlfarth, P.E. #50858
Director of Engineering

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



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Monroe County School District
Founder's Park Baseball Field
87000 Overseas Hwy
Islamorada, Florida 33036
PROJECT NO. 938.6

APPROXIMATE TEST LOCATION PLAN

GEOTECHNICAL EXPLORATION

FIG. 1

Nutting Engineers of Florida

BORING NUMBER B-1

PROJECT NUMBER 938.6

CLIENT Monroe County School District **PROJECT NAME** Founder's Park Baseball Field

PROJECT LOCATION 87000 Overseas Highway, Islamorada, FL 33036

DATE STARTED 3/29/23 COMPLETED 3/29/23 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY Dancor CHECKED BY C. Acevedo ▽ AT TIME OF DRILLING 7.9 ft

APPROXIMATE LOCATION OF BORING **As located 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		Brown fine SAND, trace limestone fragments	SS 1	13-50/5"	100+	>>
		Lt. brown LIMESTONE FRAGMENTS	SS 2	7-13-17-16	30	
5		Lt. brown LIMESTONE	SS 3	13-12-10-8	22	
		▽	SS 4	16-18-15-20	33	
10			SS 5	12-24-37-42	61	>>
			SS 6	25-50/3"	100+	>>
15						
20			SS 7	19-18-17-16	35	
			SS 8	7-6-6-6	12	
25						
30			SS 9	7-5-4-5	9	
		Bottom of hole at 30.0 feet.				

TEST NUTTING BOREHOLE 2-938.6 MONROE COUNTY SCHOOL DISTRICT - FOUNDER'S PARK BASEBALL FIELD.GPJ GINT US.GDT 4/3/23

Nutting Engineers of Florida

BORING NUMBER B-2

PROJECT NUMBER 938.6

CLIENT Monroe County School District **PROJECT NAME** Founder's Park Baseball Field

PROJECT LOCATION 87000 Overseas Highway, Islamorada, FL 33036

DATE STARTED 3/28/23 COMPLETED 3/28/23 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY Dancor CHECKED BY C. Acevedo ▽ AT TIME OF DRILLING 9.1 ft

APPROXIMATE LOCATION OF BORING **As located 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		Brown fine SAND, trace shell and roots				
		Lt. brown LIMESTONE FRAGMENTS	SS 1	6-12-10-8	22	▲
		Lt. brown LIMESTONE FRAGMENTS, trace fine sand	SS 2	6-10-50/5"	100+	>>
5		Lt. brown LIMESTONE	SS 3	15-50/5"	100+	>>
			SS 4	15-37-50/3"	100+	>>
10		▽	SS 5	38-35-25-27	60	>>
			SS 6	23-20-32-50/3"	100+	>>
15						
			SS 7	11-14-49-25	63	>>
20						
		Lt. brown to lt. gray LIMESTONE	SS 8	41-35-16-14	51	>>
25						
		Lt. brown LIMESTONE	SS 9	18-10-10-12	20	▲
30		Bottom of hole at 30.0 feet.				

Nutting Engineers of Florida

BORING NUMBER B-3

PROJECT NUMBER 938.6

CLIENT Monroe County School District **PROJECT NAME** Founder's Park Baseball Field

PROJECT LOCATION 87000 Overseas Highway, Islamorada, FL 33036

DATE STARTED 3/28/23 COMPLETED 3/28/23 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY Dancor CHECKED BY C. Acevedo ▽ AT TIME OF DRILLING 9.5 ft

APPROXIMATE LOCATION OF BORING **As located 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		Brown fine SAND, trace limestone fragments and roots				
		Lt. brown to brown LIMESTONE FRAGMENTS	SS 1	6-13-14-8	27	▲
		Lt. brown LIMESTONE FRAGMENTS	SS 2	14-18-26-19	44	▲
5		Lt. brown LIMESTONE	SS 3	46-50/4"	100+	>>▲
		Lt. brown to gray LIMESTONE	SS 4	21-50/4"	100+	>>▲
10		Lt. brown LIMESTONE ▽	SS 5	17-18-16-18	34	▲
15			SS 6	21-16-20-25	36	▲
20			SS 7	28-25-28-31	53	>>▲
25			SS 8	9-13-25-26	38	▲
30			SS 9	6-10-10-18	20	▲
		Bottom of hole at 30.0 feet.				

Nutting Engineers of Florida

BORING NUMBER B-4

PROJECT NUMBER 938.6

CLIENT Monroe County School District **PROJECT NAME** Founder's Park Baseball Field

PROJECT LOCATION 87000 Overseas Highway, Islamorada, FL 33036

DATE STARTED 3/28/23 COMPLETED 3/28/23 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY Dancor CHECKED BY C. Acevedo ▽ AT TIME OF DRILLING 8.9 ft

APPROXIMATE LOCATION OF BORING **As located 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		Brown fine SAND, trace limestone fragments and roots				
		Lt. brown LIMESTONE FRAGMENTS	SS 1	9-25-21-17	46	
		Brown fine SAND and LIMESTONE	SS 2	36-27-16-15	43	
5			SS 3	11-5-1-2	6	
		Brown fine SAND, trace limestone	SS 4	2-1-3-3	4	
		▽ Lt. brown LIMESTONE, trace brown fine sand	SS 5	7-41-50/1"	100+	>>
10						
		Lt. brown LIMESTONE	SS 6	14-14-14-22	28	
15						
			SS 7	20-16-21-26	37	
20						
			SS 8	6-4-3-1	7	
25						
			SS 9	16-11-13-20	24	
30		Bottom of hole at 30.0 feet.				

TEST NUTTING BOREHOLE 2-938.6 MONROE COUNTY SCHOOL DISTRICT - FOUNDER'S PARK BASEBALL FIELD.GPJ GINT US.GDT 4/3/23

Nutting Engineers of Florida

BORING NUMBER B-5

PROJECT NUMBER 938.6

CLIENT Monroe County School District **PROJECT NAME** Founder's Park Baseball Field

PROJECT LOCATION 87000 Overseas Highway, Islamorada, FL 33036

DATE STARTED 3/28/23 COMPLETED 3/28/23 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY Dancor CHECKED BY C. Acevedo ▽ AT TIME OF DRILLING 7.9 ft

APPROXIMATE LOCATION OF BORING **As located 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		Brown fine SAND, trace roots and limestone fragments Brown fine SAND and LIMESTONE FRAGMENTS Lt. brown fine SAND and LIMESTONE FRAGMENTS	SS 1	5-5-4-10	9	▲
			SS 2	17-49-50/3"	100+	>>
5		Brown to lt. brown LIMESTONE	SS 3	22-50/1"	100+	>>
		Lt. brown LIMESTONE, trace fine sand	SS 4	13-14-26-33	40	▲
10		▽ Lt. brown LIMESTONE	SS 5	24-18-16-21	34	▲
15			SS 6	16-50/3"	100+	>>
20			SS 7	12-16-18-18	34	▲
25			SS 8	10-21-17-25	38	▲
30			SS 9	4-5-5-7	10	▲
		Bottom of hole at 30.0 feet.				

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Report of Exfiltration Test

Client:	Monroe County School District	Order No	938.6
Project:	Founder's Park Baseball Field	Report No	1
Location:	87000 Overseas Highway	Date:	3/28/23
	Islamorada, FL 33036		
Test:	Usual Open Hole Exfiltration Test		
Surface Elevation:	Approx. Same as Road Crown	Water table from ground surface:	8.17'
Casing Diameter:	6"		
Tube Depth:	15'		

Hydraulic Conductivity (K) = 1.34×10^{-4} cfs/ft^{2}ft.head

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EXFIL NO. 1

Sample Location: Approx. as located on site plan.

Material:		
	0'- 0.5'	Dk. brown fine SAND, trace roots
	0.5'- 1'	Brown LIMESTONE FRAGMENTS
	1'- 4'	Lt. brown LIMESTONE FRAGMENTS
	4'- 15'	Lt. brown to lt. gray LIMESTONE

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

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Report of Exfiltration Test

Client:	Monroe County School District	Order No	938.6
Project:	Founder's Park Baseball Field	Report No	2
Location:	87000 Overseas Highway	Date:	3/28/23
	Islamorada, FL 33036		
Test:	Usual Open Hole Exfiltration Test		
Surface Elevation:	Approx. Same as Road Crown	Water table from ground surface:	7.4'
Casing Diameter:	6"		
Tube Depth:	15'		

Hydraulic Conductivity (K) = 8.64×10^{-3} cfs/ft^{2}ft.head

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EXFIL NO. 2	One Minute Increme	Pump Rate in Gal/Min
	1	50
	2	50
Sample Location: Approx. as located on site plan.	3	50
	4	50
	5	50
Material: 0'- 0.5' Brown fine SAND and ROOTS	6	50
0.5'- 4' Brown to lt. brown LIMESTONE FRAGMENTS	7	50
4'- 15' Lt. gray LIMESTONE		

Note: Water table only raised 1' during test

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 in our area currently practicing under similar conditions at the time our services were performed. ***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 designs, construction plans, specifications we have not prepared, nor the ultimate performance of building site materials or assembly/construction.

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 in the soil boring logs and/or a drawing. The location and elevation of the borings should be considered accurate only to the degree inherent with the method used and may be approximate.

The soil boring log includes sampling information, description of the materials recovered, approximate depths of boundaries between soil and rock strata as encountered and immediate depth to water data. The log represents conditions recorded specifically at the location where and when the boring was made. Site conditions may vary through time as will subsurface conditions. The boundaries between different soil strata as encountered are indicated at specific depths; however, these depths are in fact approximate and dependent upon the frequency of sampling, nature and consistency of the respective strata. Substantial variation between soil borings may commonly exist in subsurface conditions. 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. Water level data provided on soil boring logs shall not be relied upon for groundwater based design or construction considerations.

LABORATORY AND FIELD TESTS

Tests are performed in *general* accordance with specific ASTM Standards unless otherwise indicated. All criteria included in a given ASTM Standard are not always required and performed. Each test boring report indicates the measurements and data developed at each specific test location.

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 shall not be utilized to determine the cost of construction nor to stand alone as a construction specification. Contractors shall verify subsurface conditions as may be appropriate prior to undertaking subsurface work.

Report recommendations are based primarily on data from test borings made at the locations shown on the test boring reports. Soil variations commonly exist between boring locations. Such variations may not become evident until construction. Test pits sometimes provide valuable supplemental information that derived from soil borings. If variations are then noted, the geotechnical engineer shall be contacted in writing immediately 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 of the site improvements or site conditions must be communicated in writing to the geotechnical engineer immediately*** so that the geotechnical analysis, conclusions, and recommendations can be reviewed and appropriately adjusted as necessary.

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. The enclosed report may be relied upon solely by the named client.

SOIL AND ROCK CLASSIFICATION CRITERIA

SAND/SILT

N-VALUE (bpf)	RELATIVE DENSITY
0 – 4	Very Loose
5 – 10	Loose
11 – 29	Medium
30 – 49	Dense
>50	Very dense
100	Refusal

CLAY/SILTY CLAY

N-VALUE (bpf)	UNCONFINED COMP. STRENGTH (tsf)	CONSISTENCY
<2	<0.25	v. 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	v. Stiff
>30	>4.00	Hard

ROCK

N-VALUE (bpf)	RELATIVE HARDNESS	ROCK CHARACTERISTICS
N≥ 100	Hard to v. hard	Local rock formations vary in hardness from soft to very hard within short vertical and horizontal distances and often contain vertical solution holes of 3 to 36 inch diameter to varying depths and horizontal solution features. Rock may be brittle to split spoon impact, but more resistant to excavation.
25≤ N ≤ 100	Medium hard to hard	
5≤ N ≤ 25	Soft to medium hard	

PARTICLE SIZE

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

DESCRIPTION MODIFIERS

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

Major Divisions			Group Symbols	Typical names	Laboratory classification criteria
Coarse-grained soils (More than half of material is *larger* than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gavels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than five percent……GW, GP, SW, SP More than 12 percent……GM, GC, SM, SC 5 to 12 percent……*Borderline* cases requiring dual systems**
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	
		Gravels with fines (Appreciable amount of fines)	GW* d	Silty gravels, gravel-sand-silt mixtures	
			u		
			GC	Clayey gravels, gravel-sand-clay mixtures	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	
			SP	Poorly graded sands, gravelly sands, little or no fines	
		Sands with fines (Appreciable amount of fines)	SM* d	Silty sands, sand-silt mixtures	
			u		
			SC	Clayey sands, sand-clay mixtures	
Fine-grained soils (More than half of material is *smaller* than No. 200 sieve size)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	
			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 sandy or silty soils, elastic silts	
			CH	Inorganic clays or high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity, organic silts	
	Highly organic soils		PT	Peat and other highly organic soils	

$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_z = \frac{(D_{30})^2}{D_{10} x D_{60}}$ *between* 1 and 3

Not meeting all gradation requirements for GW

Atterberg limits below "A" line or P.I. less than 4

Atterberg limits above "A" line with P.I. greater than 7

Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols.

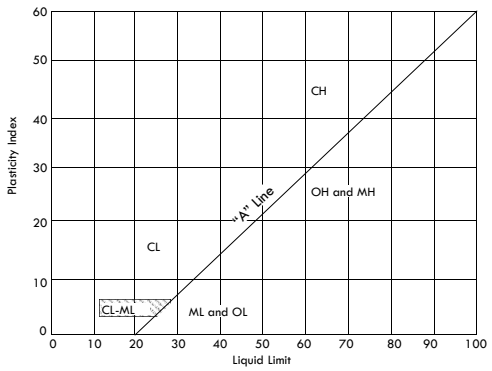
$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_z = \frac{(D_{30})^2}{D_{10} x D_{60}}$ *between* 1 and 3

Not meeting all gradation requirements for SW

Atterberg limits below "A" line or P.I. less than 4

Atterberg limits above "A" line with P.I. more than 7

Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual system.



Plasticity Chart

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