

# Stormwater Management Report

**GLC 22<sup>nd</sup>**  
31 NE 22<sup>nd</sup> Avenue  
Pompano Beach, FL 33062

November 27, 2023

TEC Project No. 23-015

Prepared For:

**GLC 22<sup>nd</sup>**  
31 NE 22<sup>nd</sup> Avenue  
Pompano Beach, FL 33062

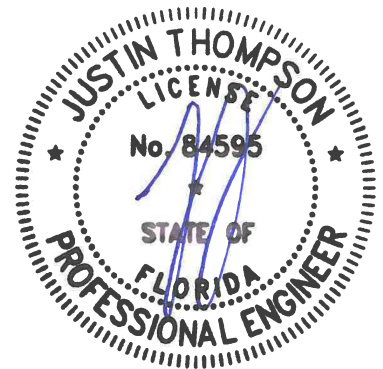
Prepared By:

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## **PROJECT DESCRIPTION**

The GLC 22<sup>nd</sup> project is located on a 0.45-acre tract of land at 31 NE 22nd Avenue in the city of Pompano Beach, Florida. The property is identified as Lots 5, 8, and 9 of Block 14 of Pinehurst, Section 31, Township 48 South, Range 43 East, and recorded as Folio number 484236011830.

The project site consists of vacant land with existing ground cover of grass and sand. The project site contains 0.45 acres of pervious area. The site is relatively flat with the grade sloping from south to northeast from approximately 8.26 feet to 6.74 feet (NAVD 1988).

The proposed development will include the construction of a 70-unit, 8-story, multi-family apartment building, with associated 3-story parking garage constructed on the first three floors of the building.

## **STORMWATER MANAGEMENT CRITERIA**

The proposed storm drainage system has been developed following the standard methods of the City of Pompano Beach, Broward County Environmental Permitting Division (BCEPD) and South Florida Water Management District (SFWMD). The most stringent design requirements were followed in the design of the proposed stormwater improvements. The design criteria are as follows:

### Flood Elevation Criteria – Buildings

The lowest first-floor elevations of all habitable spaces shall be set at, or above, the peak stage of the 100-year, 3-day storm event (DFE), or should be elevated to, or above, the elevation required in the Florida Building Code, or the base flood elevation (BFE) plus one (1) foot, whichever is higher.

### Flood Elevation Criteria – On-site Roadways

The proposed on-site roadway crown elevations shall be set at, or above, the peak stage of the 5-year, 1-day storm event. These elevations are minimum on-site roadway crown elevations, and may be exceeded if desired. When an inverted crown section is used, the lowest inlet grate elevation shall be set at, or above, the 5-year, 1-day storm event stage.

### FEMA Flood Elevation Criteria

The proposed development is located in Community Panel Number 12011C0376H of the Flood Insurance Rate Map (FIRM), revised August 18, 2014. According to the National Flood Insurance Program the project is located in Flood Zone AH, base flood elevation of 8.5 feet NAVD 1988 (see Appendix A-10).

Updated preliminary Broward County FEMA Flood Maps were released on 8/11/2023. The Preliminary FEMA FIRM panel shows the proposed project area within Flood Zone AH, with a base flood elevation of 8.5 feet NAVD 1988.



### Broward County 100-Year Flood Elevation Criteria

The Future Conditions 100-Year Flood Elevation Map adopted by Broward County establishes the lowest habitable Finished Floor Elevation based on predictions for the years 2060 - 2069. The proposed development has a flood elevation of 8.5 feet NAVD 1988 (see Appendix A-7).

### City of Pompano Beach Finished Flood Elevation Criteria

Based on the minimum finished floor elevation requirements for commercial space within the city of Pompano Beach, the finished floor elevation shall be set to 6-inches above the highest crown of road elevation of the adjacent roadway.

The proposed Finished Floor Elevation (FFE) for the project is designed to be **8.5 feet (NAVD 1988)**.

Thompson Engineering has discussed the proposed finished floor elevation with the City of Pompano Beach Floodplain Manager (Vesa 'Peter' Karttunen, CFM). A Letter of Map Revision (LOMR) will be submitted to FEMA and the local floodplain administrator for review in order to revise the floodplain line which is currently encroaching on the northeast corner of the property.

### Water Quality Criteria

#### **Volumetric Requirements**

Retention, detention, or both retention and detention in the overall system, including swales, lakes, canals, greenways, etc., shall be provided for one of the three (3) following criteria or equivalent combinations thereof:

1. Wet detention volume shall be provided for the first inch of runoff from the developed project, or the total runoff of 2.5-inches times the percentage of imperviousness, whichever is greater.
2. Dry detention volume shall be provided equal to 75 percent of the above amounts computed for wet detention.
3. Retention volume shall be provided equal to 50 percent of the above amounts computed for wet detention. Retention volume included in flood protection calculations requires a guarantee of long-term operation and maintenance of system bleed-down ability.

### Groundwater Table Elevation

The groundwater table elevation of 1.5 feet NAVD 1988 was obtained from the Broward County Future Conditions Average Wet Season Groundwater Level map (see Appendix A-8).

### **PROPOSED STORMWATER MANAGEMENT SYSTEM**

The stormwater runoff from the project will be treated and managed through the use of exfiltration trench and drainage wells. The proposed stormwater system will consist of interconnected drainage pipes, catch basins, exfiltration trench, and drainage wells. The stormwater system will not contain a proposed off-site outfall, and is designed for zero discharge.

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### Drainage Well Capacity

The stormwater management system for the proposed development will include two (2) drainage wells, with associated pumps (as required). The drainage well design is based on the FDOT Drainage Handbook, Exfiltration Systems, Chapter 4.

The proposed drainage well design has been based on an expected capacity of **200 GPM/ft head per well**. All underground piping, catch basins, concrete and asphalt pavement shall be designed and constructed to conform to the Broward County and City of Pompano Beach Engineering Design Standards.

### SUMMARY TABLES

The stormwater management analysis provided the following results:

RAINFALL DATA FOR STORMWATER ANALYSIS	
Design Storm Event	Rainfall Depth (inches)
5-Year, 1-Day	8.0
25-Year, 3-Day	15.0
100-Year, 3-Day	20.0

STORMWATER QUALITY CRITERIA			
Criteria	Water Quality Volume	Dry Pretreatment	Total Volume
REQUIRED	0.019 ac-ft	(N/A)	0.019 ac-ft
PROPOSED	0.019 ac-ft	(N/A)	0.019 ac-ft **

\*\* Water quality volume provided as dry retention within the proposed landscaped areas on the south, east, and north sides of the property. Water quality treatment is also being provided within the gravel sub-base underneath the proposed pervious paver areas on the north and south sides of property.



STORMWATER ANALYSIS AND PEAK STAGES			
Design Storm	Peak Stage Elev. (feet, NAVD 1988)	Design Element	Proposed Elev. (feet, NAVD 1988)
5-Year – 1-Day	5.12	Lowest Inlet RIM Elevation	8.00
25-Year – 3-Day	5.49	Minimum Perim. Berm Elevation	7.00
100-Year – 3-Day	5.89	Finished Floor Elevation	8.50

The stormwater management calculations provided in the Appendix B, Drainage Calculations, indicate that the proposed stormwater improvements will provide sufficient capacity to satisfy the stormwater quality and stormwater quantity requirements of SFWMD.



## **APPENDIX A - MAPS**

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## **APPENDIX A-1**

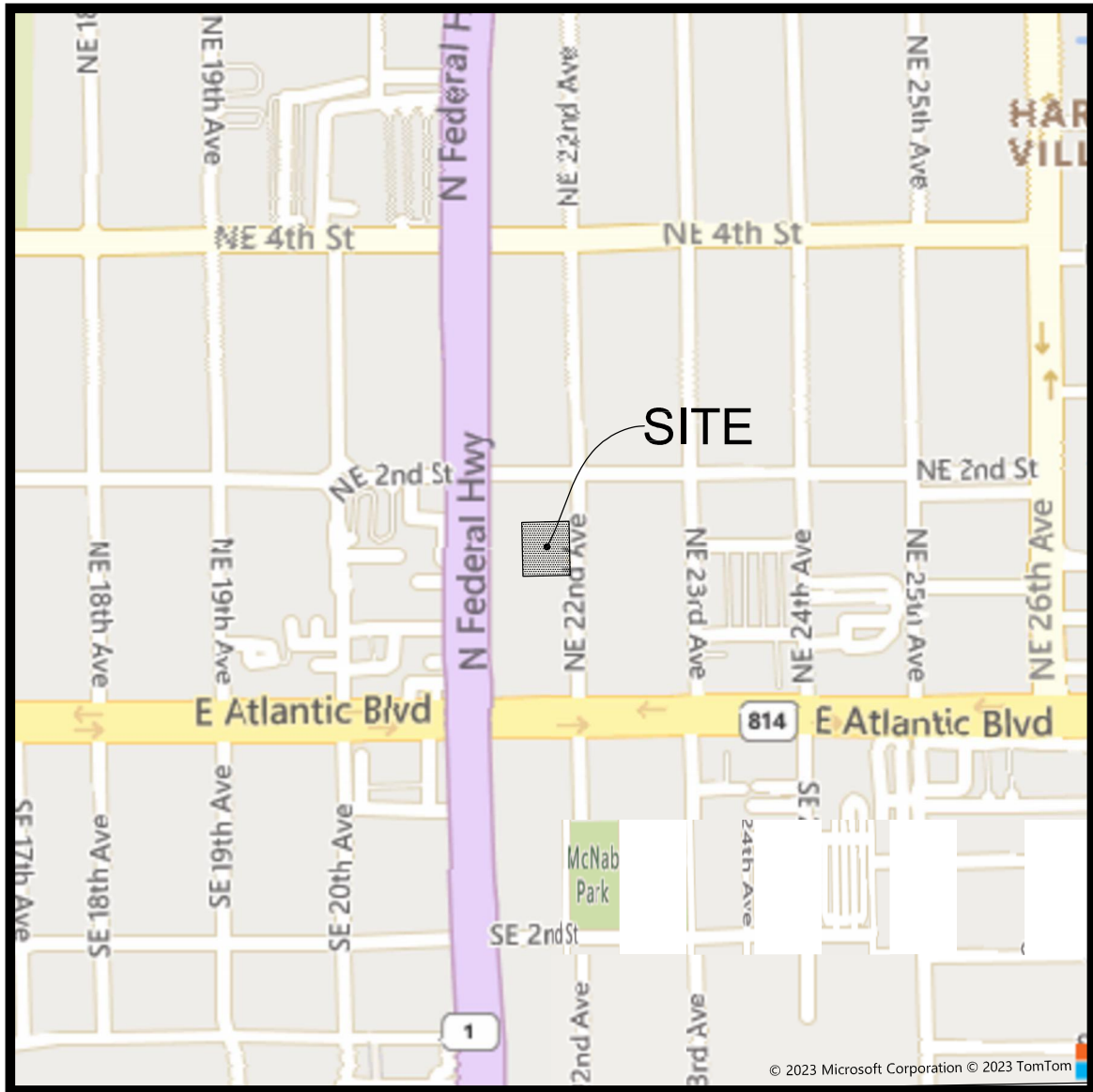
### **PROJECT LOCATION MAP**

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## LOCATION MAP

SCALE: 1" = 500'

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## **APPENDIX A-2**

### **LAND USE MAP**

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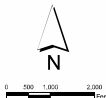
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**Map Updated: August 11, 2021**

**Map Updated: August 11, 2021**



Note: This Land Use Plan also includes by reference, R/W provisions in the Traffic Circulation Element which shall be consistent with the Broward County Trafficways Plan as amended from time to time.

This is to certify that this is The Official Land Use Map of the City of Pompano Beach, Broward County, Florida, referred to in Section 154.20 of The City of Pompano Beach Code of Ordinances adopted by Ordinance 2011 - 43 on May 10, 2011 and as amended as shown below.

This product has been compiled from various source data from the City of Pompano Beach. However, this product is for reference purposes only and is not to be construed as a legal document or warranty of any kind. Any reliance on the information contained herein is at the user's own risk. The City of Pompano Beach assumes no responsibility for any use of the information contained herein or any resulting damages or claims.

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## **APPENDIX A-3**

### **AERIAL MAP**

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AERIAL MAP

 Project Location

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BCPA, BCGIS, State of Florida, Maxar, Microsoft  
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## **APPENDIX A-4**

### **SFWMD RAINFALL MAP 5-YEAR – 1-DAY**

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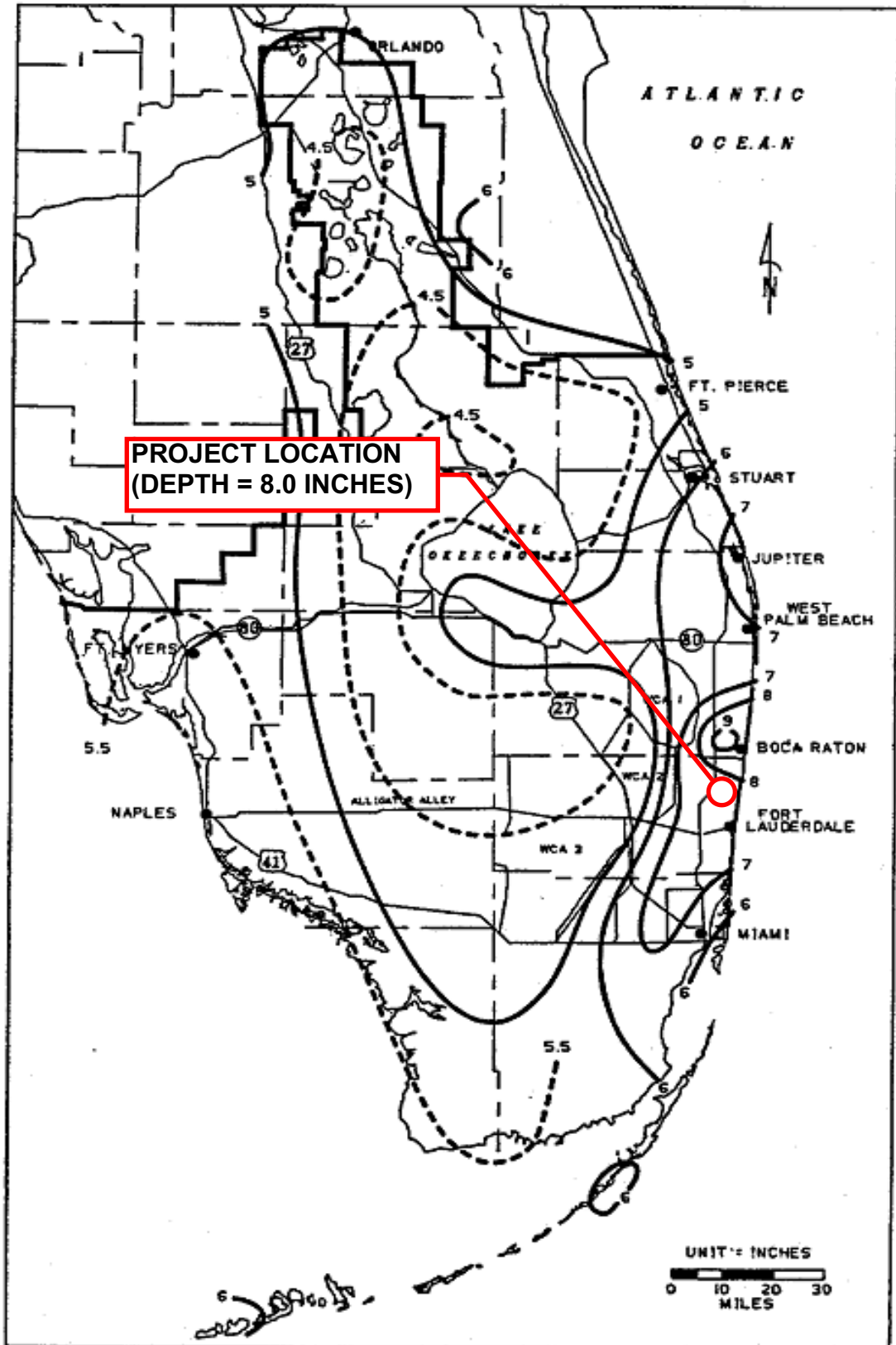


FIGURE C-3. 1-DAY RAINFALL: 5-YEAR RETURN PERIOD



## **APPENDIX A-5**

### **SFWMD RAINFALL MAP 25-YEAR – 3-DAY**

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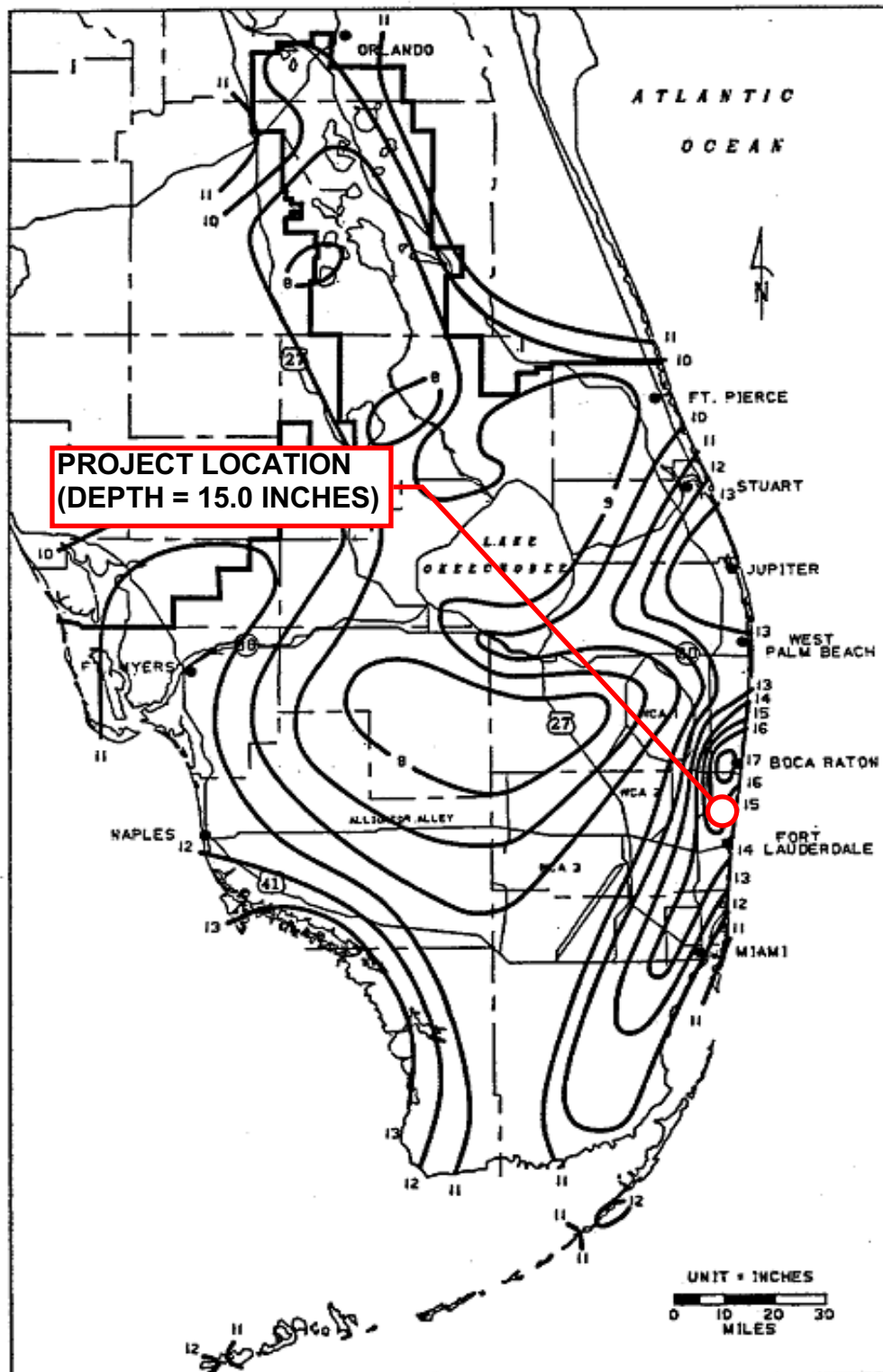


FIGURE C-8. 3-DAY RAINFALL: 25-YEAR RETURN PERIOD



## **APPENDIX A-6**

### **SFWMD RAINFALL MAP 100-YEAR – 3-DAY**

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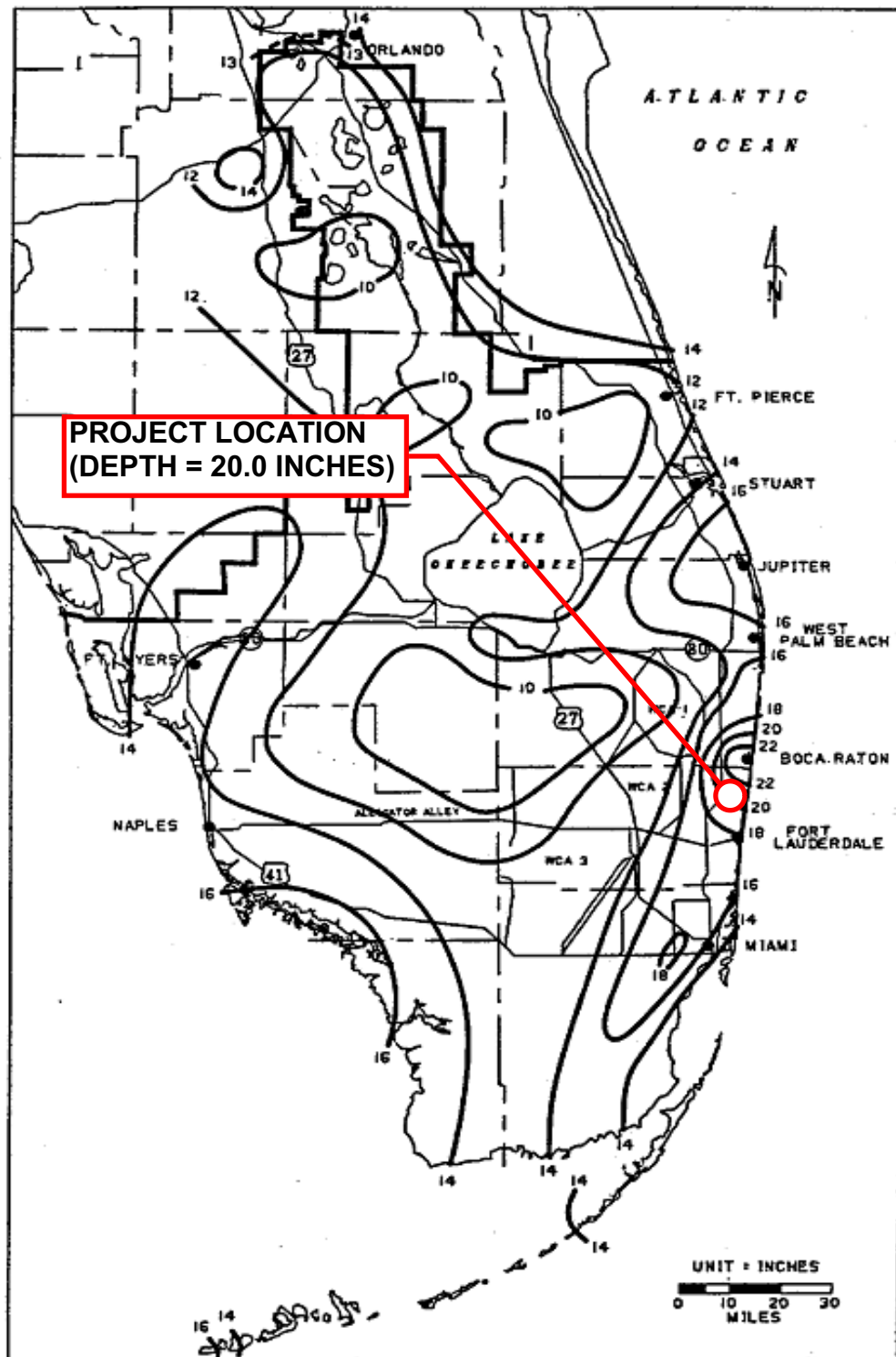


FIGURE C-9. 3-DAY RAINFALL: 100-YEAR RETURN PERIOD

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## **APPENDIX A-7**

# **BROWARD COUNTY FUTURE CONDITIONS 100-YEAR FLOOD MAP (2060)**

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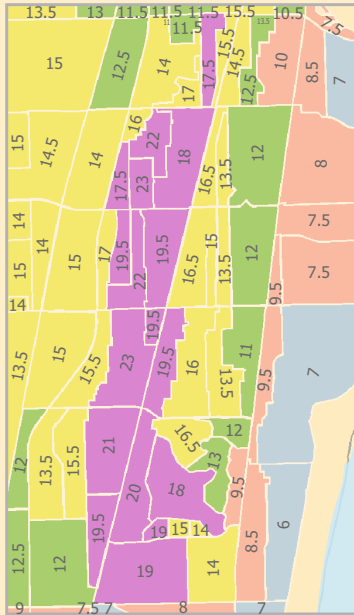
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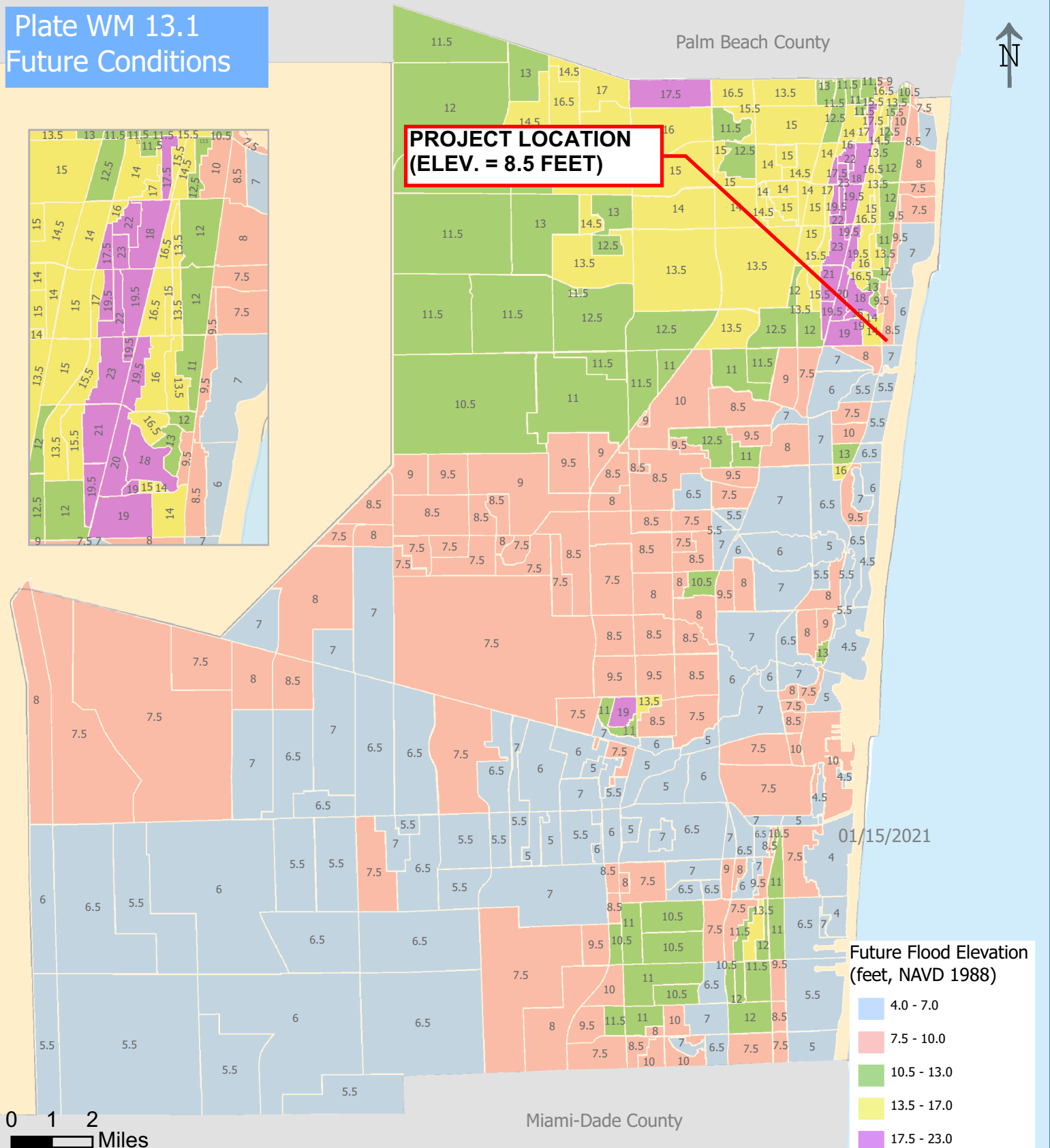
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## Plate WM 13.1 Future Conditions



**PROJECT LOCATION  
(ELEV. = 8.5 FEET)**



**Future Flood Elevation  
(feet, NAVD 1988)**

- 4.0 - 7.0
- 7.5 - 10.0
- 10.5 - 13.0
- 13.5 - 17.0
- 17.5 - 23.0

The Future Conditions 100-Year Flood Elevation Map is intended to advance the resiliency efforts in Broward County by setting the foundation to improve standards for flood protection. The flood elevation mapping results (representing a 1% annual chance during years 2060-2069) are intended to serve as the basis for establishing future finished floor elevations for new buildings and major developments in the County. The map was developed through integrated hydrologic modeling of surface and groundwater, incorporating future land use changes, projected sea level rise, rainfall intensification, and seasonal high tide to predict future flood conditions.



## **APPENDIX A-8**

# **BROWARD COUNTY WET SEASON GROUNDWATER ELEVATION MAP**

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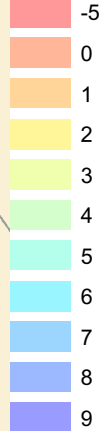
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05/05/2017

## Groundwater Table Elevation (feet, NAVD 1988)



**PROJECT LOCATION  
(GW ELEV. = 1.5 FEET)**

Water  
Conservation  
Area

0 1 2  
Miles

Division Name: Environmental Planning and Community Resilience  
Department Name: Environmental Protection and Growth Management

Miami-Dade County

USGS - United States Geological Survey  
COAPS - Center for Ocean-Atmospheric Prediction Studies  
CCSM - Community Climate System Model  
USACE - United States Army Corps of Engineers  
NRC3 - National Research Council Curve 3  
NAVD 88 - 1988 North American Vertical Datum

The map represents the expected future average wet season groundwater elevations for Broward County. The average is based on model outputs for the months of May through October over the period of 2060-2069. The models used are The Broward County Inundation Model and the Broward County Northern Variable Density model, both developed by the USGS and MODFLOW based. The future conditions that are modified in the models are both precipitation and sea level rise. The future precipitation pattern is based on the COAPS downscaled CCSM global model and represents an increase of 1% rainfall from the base case of 1990-1999 (53.4 in/yr to 58.2 in/yr). Sea level rise was based on the USACE NRC3 curve which equates to an increase of 26.6 to 33.9 inches to the future period from 1992 levels. Final results are presented in NAVD 88.

This map is for planning purposes and should not be used for legal boundary determinations.

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## **APPENDIX A-9**

### **BROWARD COUNTY SOILS MAP**

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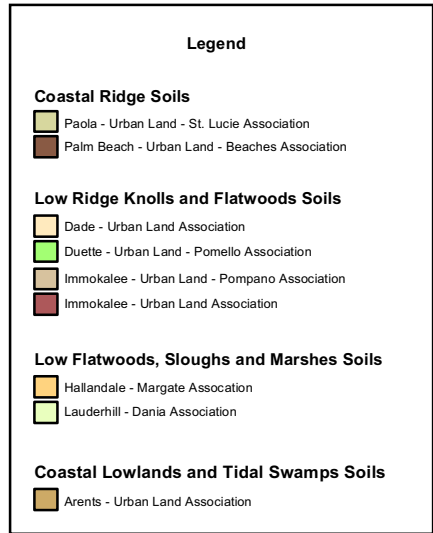
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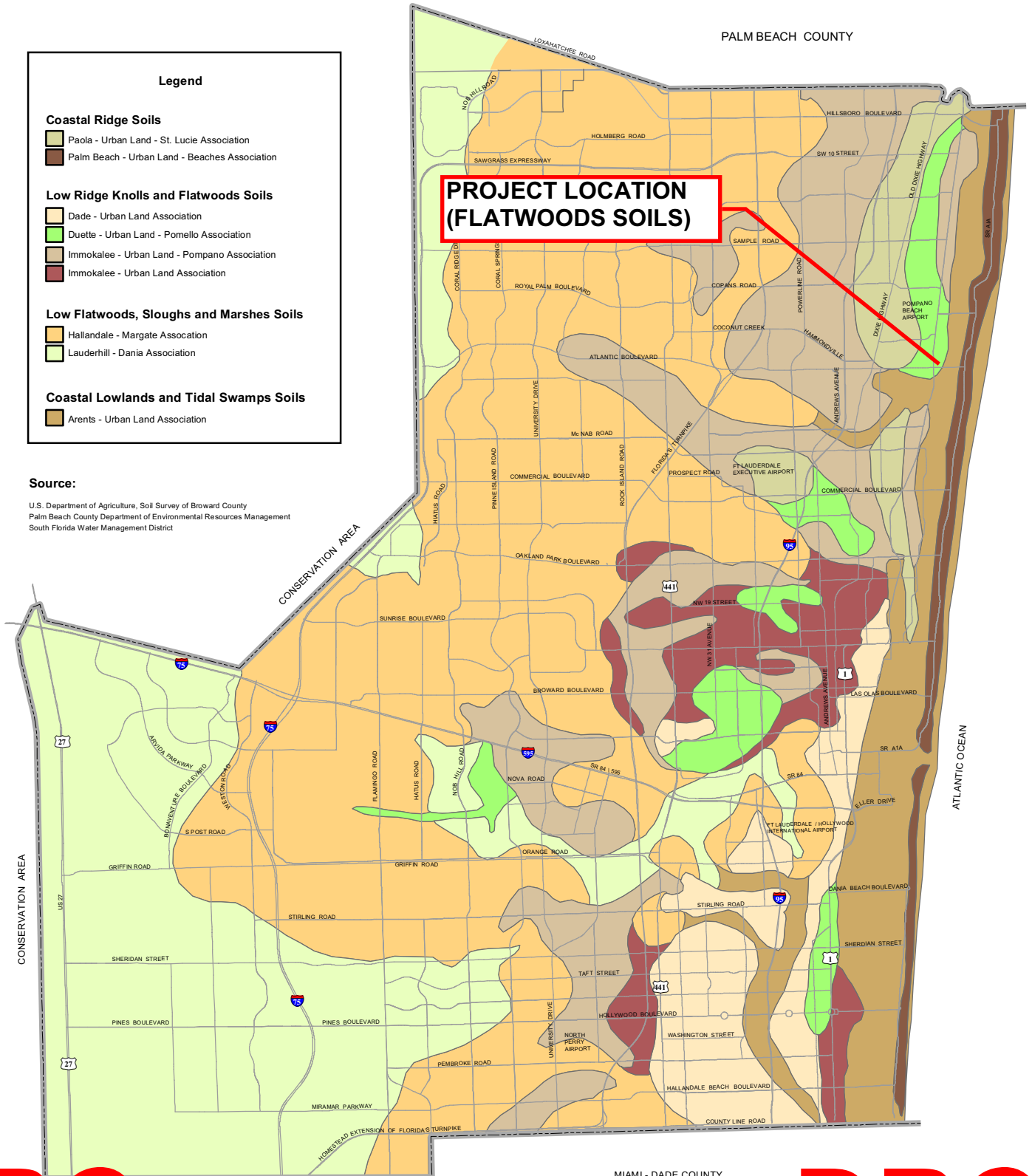
# BROWARD COUNTY LAND USE PLAN

## Natural Resource Map Series- Eastern Broward County: Soils



**Source:**

U.S. Department of Agriculture, Soil Survey of Broward County  
Palm Beach County Department of Environmental Resources Management  
South Florida Water Management District



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MIAMI - DADE COUNTY

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This is a generalized map. This map should not be used to determine parcel boundaries or limits of depicted items. Please contact the Broward County Planning and Development Office regarding questions pertaining to parcel boundaries or limits.

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## **APPENDIX A-10**

### **FEMA FLOOD MAP**

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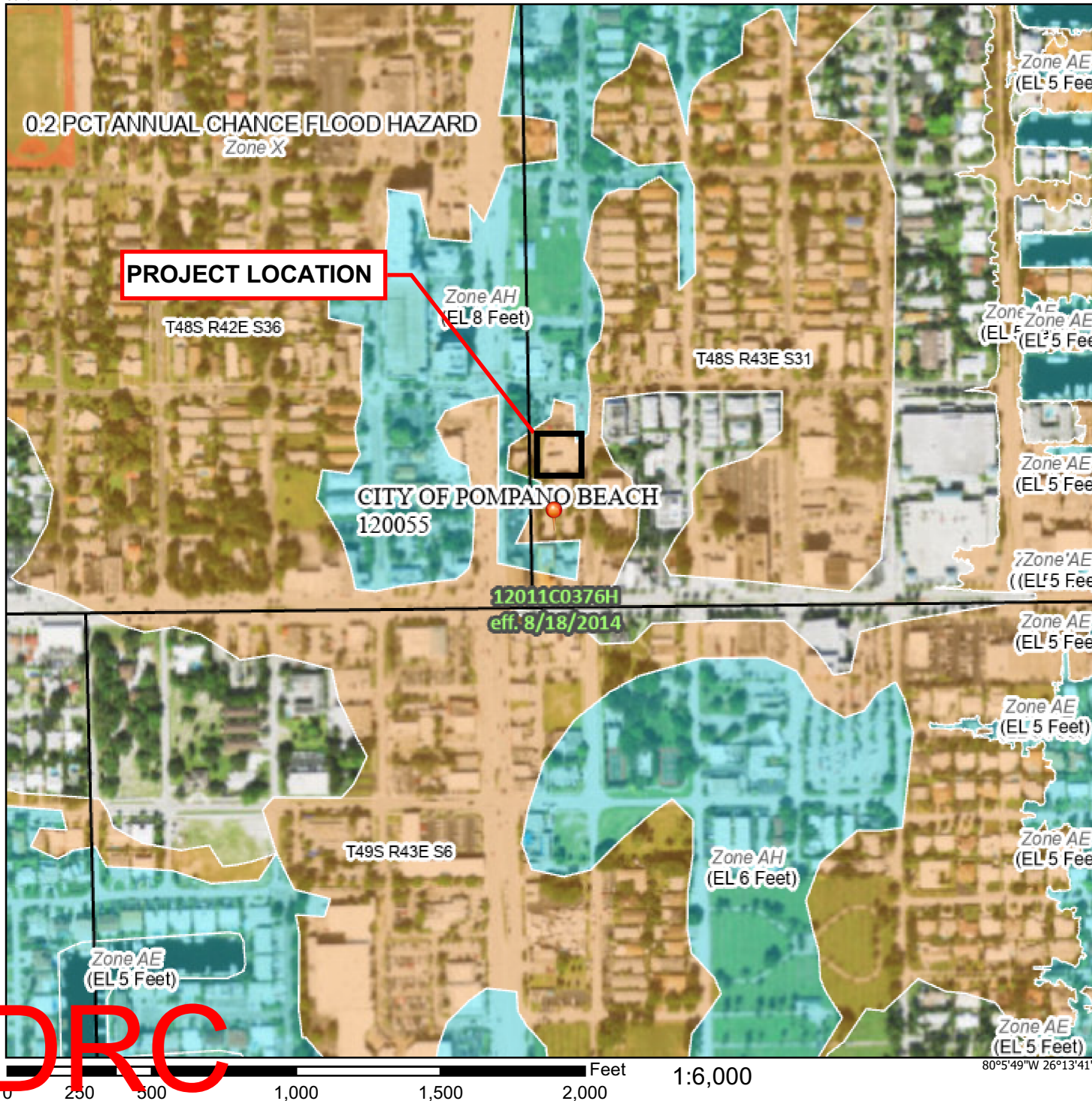
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# National Flood Hazard Layer FIRMette



80°6'27"W 26°14'13"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped
		Project Location

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **11/25/2023 at 8:29 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map is not to be used for one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, north arrow, community identifiers, FIRM panel number and NFHL effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

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Basemap Imagery Source: USGS National Map 2023

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**APPENDIX B**  
**DRAINAGE CALCULATIONS**





## **APPENDIX B-1**

# **STORMWATER QUALITY CALCULATIONS**

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## STORMWATER QUALITY CALCULATIONS

### I. GIVEN:

#### A. ACREAGE:

1. Buildings = 0.400 ac.
2. Impervious = 0.009 ac.
3. Pervious = 0.041 ac.
4. Water / Retention Area = 0.000 ac.
  
4. Total Site Area = 0.450 ac.

#### B. ZONING:

1. Multi-family Residential

### II. DESIGN CRITERIA:

#### A. WATER QUALITY CRITERIA:

1. If a wet detention system, then whichever is the greater of the following:
  - a. The first inch of runoff from the entire project site.
  - b. The amount of 2.5 inches times the percent impervious for the project site.
2. If a dry detention system, then 75% of the volume required for the detention system.
3. If a retention system, then 50% of the volume required.
4. If the property is zoned "Commercial", at least 1/2 inch of retention or dry detention pre-treatment will be required.
5. Any detention system shall be designed to discharge no more than 0.5 inches of the detained volume per day.

#### B. WATER QUANTITY CRITERIA:

1. DESIGN EVENTS AND RAINFALL AMOUNTS:

Frequency	Duration	Rainfall Amount	Design Element
5 year	1 day	8.0 inches	Lowest Inlet RIM Elevation
25 year	3 day	15.0 inches	Minimum Perim. Berm Elevation
100 year	3 day	20.0 inches	Finished Floor Elevation

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## 2. ADDITIONAL DESIGN INFORMATION:

- a. Design Water / Control Elevation: 1.50 NVAD 88  
(Note: Proposed minimum road elevation must be at least 2 feet above the wet season water table or control elevation)
- b. Drainage Basin / Canal Number: N/A
- c. Receiving Body Regulated Stage Elevation: 1.50 NVAD 88
- d. Design Storm Allowable Discharge: N/A cfs
- e. Time of Concentration: 0.167 hours
- f. Minimum Discharge: N/A
- (Note: Residential projects shall have systems with the calculated ability to discharge by surface flow or subsurface percolation at least 3/8 inch per day.)

## III. COMPUTATIONS

### A. WATER QUALITY COMPUTATIONS:

1. Compute the first inch of runoff from the entire developed project site:  
= 1.00 inch X 0.450 acres X ( 1 foot / 12 inches )  
= **0.038 ac-ft for the first inch of runoff**
2. Compute 2.5 inches times the percent impervious for the developed project site:
- a. Site area for water quality pervious / impervious calculations only:  
= Total Project Area - ( Water / Retention Area + Buildings )  
= 0.450 acres - ( 0.000 acres + 0.400 acres )  
= **0.050 acres of site area for water quality calculations**
- b. Impervious area for water quality pervious / impervious calculations only:  
= Site area for water quality - Pervious area  
= 0.050 acres - 0.041 acres  
= **0.009 acres of impervious area for water quality calculations**
- c. Percentage of impervious area for water quality:  
= Impervious area for water quality / Site area for water quality X 100%  
= 0.009 acres / 0.050 acres X 100%  
= **18.0% Impervious**
- d. For 2.5 inches times the percentage of impervious area:  
= 2.5 inches X 18.0%  
= **0.450 inches to be treated**
- e. Compute volume required for quality:  
= Inches to be treated X ( Total Site Area - Water / Retention Area )  
= 0.450 inches X ( 0.450 acres - 0.000 acres ) X ( 1 foot / 12 inches )  
= **0.017 ac-ft required for detention storage**

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3. → The first inch of runoff from the entire developed site = **0.038** ac-ft  
→ 2.5 inches times the percentage of impervious area = **0.017** ac-ft

→ Volume of **0.038** ac-ft controls Total required detention volume

4. If the project is zoned "Commercial" or if the project were discharging directly to a sensitive receiving body and is more than 40% impervious, 0.5 inches of dry detention pre-treatment must be provided:  
= 0.5 inches X ( Total Site Area - Water / Retention Area )  
= 0.5 inches X ( **0.450** acres - **0.000** acres ) X (1 foot / 12 inches)  
= **0.000** ac-ft required for pre-treatment N/A
5. Compute total volume required plus pre-treatment:  
= Total required detention + Pre-treatment  
= **0.038** ac-ft + **0.000** ac-ft  
= **0.038** ac-ft of total volume required
6. Compute credit for using one of the following systems:
- a. Wet detention volume to be provided:  
= Total required detention - Pre-treatment  
= **0.038** ac-ft - **0.000** ac-ft  
= **0.038** ac-ft of volume required for wet detention
- b. Dry detention volume to be provided ( 75% of the total required detention volume ):  
= Total required detention volume X 75%  
= **0.038** ac-ft X 0.75 %  
= **0.028** ac-ft of volume required for dry detention
- c. Dry retention volume to be provided ( 50% of the total required detention volume ):  
= Total required detention volume X 50%  
= **0.038** ac-ft X 0.50 %  
= **0.019** ac-ft of volume required for dry retention

## B. SUMMARY OF WATER QUALITY COMPUTATIONS:

Item	Description	Quantity
A.1	First inch of runoff from the entire developed project site	0.038 ac-ft
A.2	2.5 inches times percent impervious for the developed project site	0.017 ac-ft
A.3	Detention volume to be treated	0.038 ac-ft
A.4	Pre-treatment (Required for Commercial Site Only) - N/A	0.000 ac-ft
A.5	Total volume to be treated	0.038 ac-ft
A.6.a	Wet detention volume required	0.038 ac-ft
A.6.b	Dry detention volume required (75% of total)	0.028 ac-ft
A.6.c	Dry retention volume required (50% of total)	0.019 ac-ft

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## **APPENDIX B-2**

### **ICPR MODELING**

**5-YEAR – 1-DAY**

**25-YEAR – 3-DAY**

**100-YEAR – 3-DAY**

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## Manual Basin: BASIN

Scenario: GLC  
 Node: SITE  
 Hydrograph Method: NRCS Unit Hydrograph  
 Infiltration Method: Curve Number  
 Time of Concentration: 10.0000 min  
 Max Allowable Q: 999999.00 cfs  
 Time Shift: 0.0000 hr  
 Unit Hydrograph: Uh256  
 Peaking Factor: 256.0  
 Area: 0.4500 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
0.4500	BASIN	BASIN	

Comment:

## Manual Basin Runoff Summary [GLC]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
BASIN	100YR-72HR	3.98	60.0167	20.00	19.73	0.4500	98.0	0.00	0.00
BASIN	25YR-72HR	2.98	60.0167	15.00	14.74	0.4500	98.0	0.00	0.00
BASIN	5YR-24HR	2.15	12.0500	8.00	7.75	0.4500	98.0	0.00	0.00

## Manual Basin Mass Balance Summary [GLC]

Basin Name	Sim Name	Total Rainfall	Total Irrigation	Total Runoff	Total ET	Total Initial Abst	Total Recharge	Change Soil Storage
BASIN [in]	100YR-72HR	20.00	0.00	19.73	0.00	0.00	0.00	0.27
BASIN [ft3]	100YR-72HR	32670	0	32236	0	0	0	434
BASIN [ac-ft]	100YR-72HR	0.75	0.00	0.74	0.00	0.00	0.00	0.01
BASIN [in]	25YR-72HR	15.00	0.00	14.74	0.00	0.00	0.00	0.26
BASIN [ft3]	25YR-72HR	24502	0	24079	0	0	0	423
BASIN [ac-ft]	25YR-72HR	0.56	0.00	0.55	0.00	0.00	0.00	0.01
BASIN [in]	5YR-24HR	8.00	0.00	7.75	0.00	0.00	0.00	0.25
BASIN [ft3]	5YR-24HR	13068	0	12662	0	0	0	406
BASIN [ac-ft]	5YR-24HR	0.30	0.00	0.29	0.00	0.00	0.00	0.01

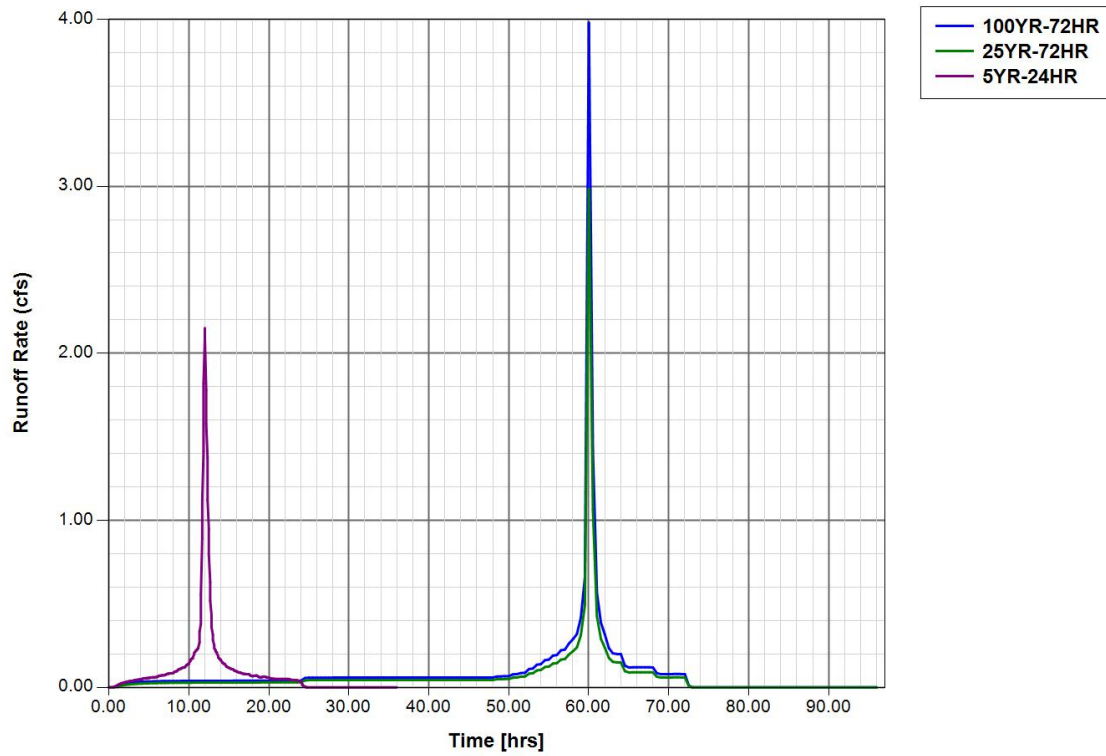
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Manual Basin Runoff Rate: BASIN [GLC]



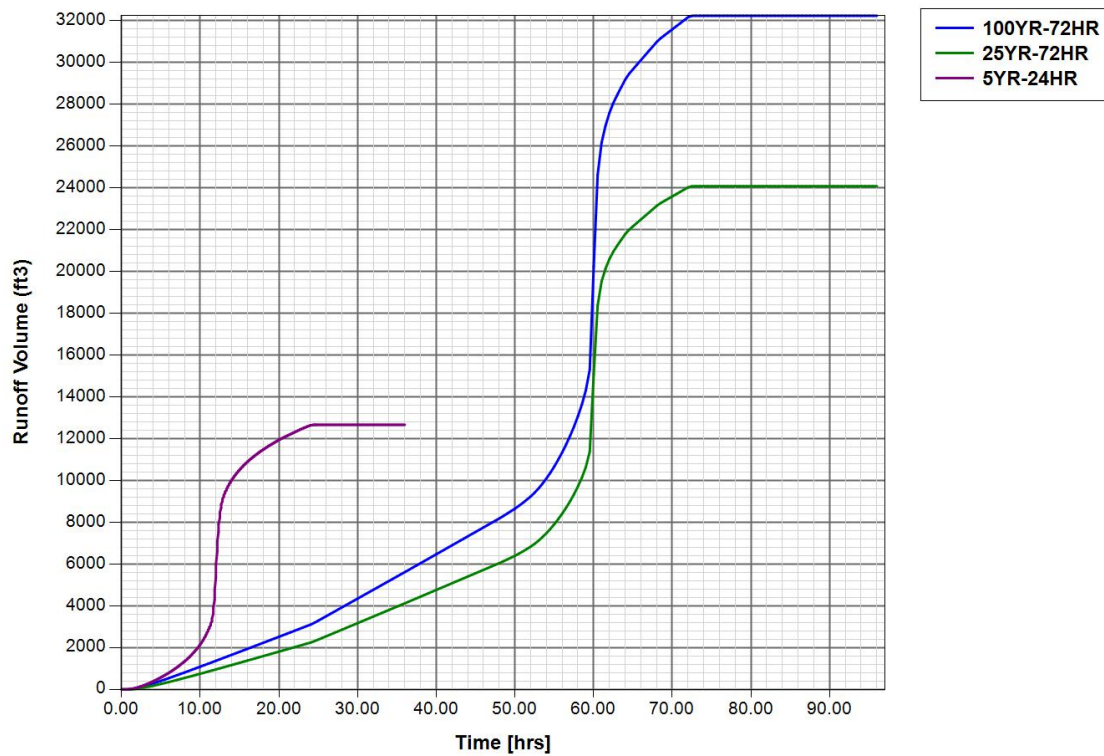
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## Manual Basin Runoff Volume: BASIN



Node: SITE

Scenario: GLC  
 Type: Stage/Volume  
 Base Flow: 0.00 cfs  
 Initial Stage: 1.50 ft  
 Warning Stage: 8.50 ft

Stage [ft]	Volume [ac-ft]	Volume [ft³]
1.50	0.00	0
2.00	0.01	436
4.00	0.05	2178
6.00	0.10	4356
8.00	0.45	19602
10.00	1.35	58806

Comment:

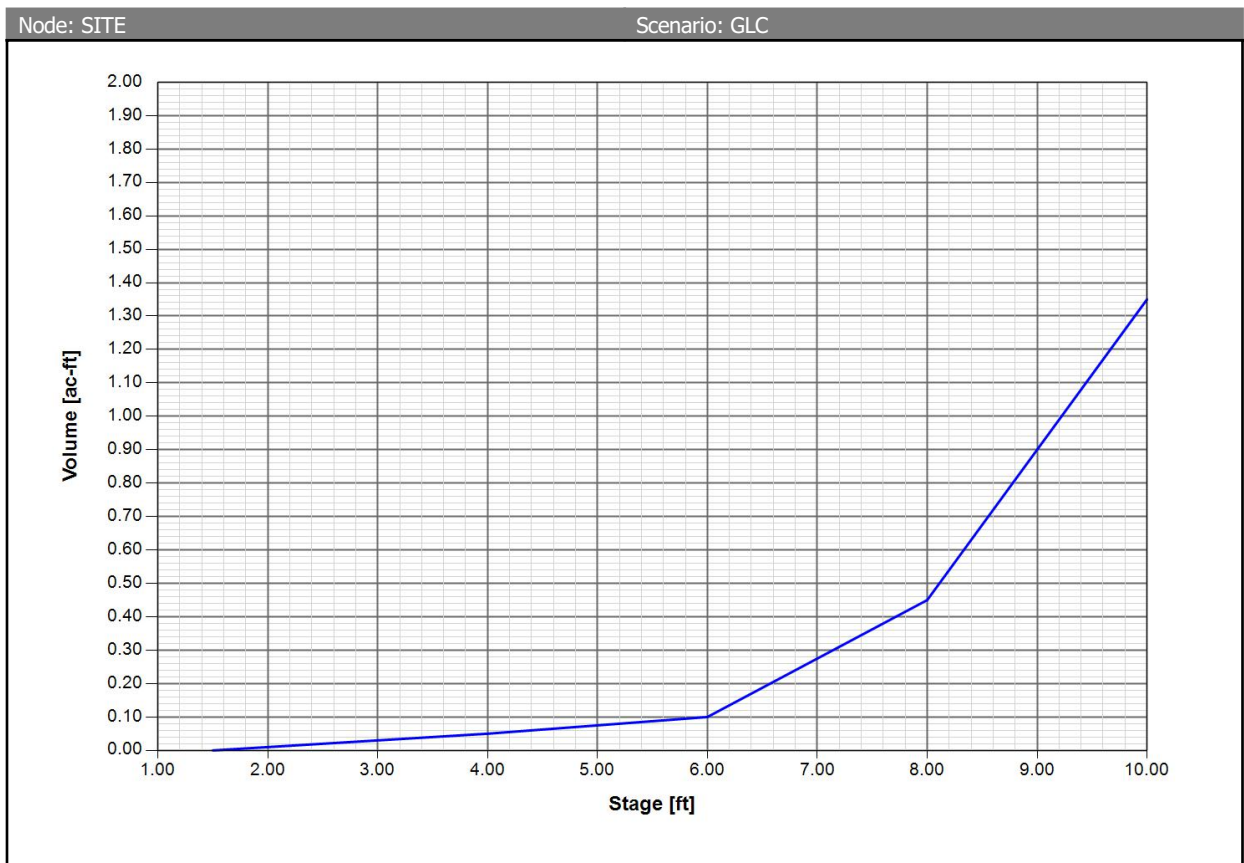
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Node Max Conditions w/ Times [GLC]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft <sup>2</sup> ]	Time to Max Stage [hr]	Time to Min/Max Delta Stage [hr]	Time to Max Total Inflow [hr]	Time to Max Total Outflow [hr]
SITE	100YR-72HR	8.50	5.89	-0.0010	3.98	1.88	4169	60.3451	61.1088	60.0167	60.3451
SITE	25YR-72HR	8.50	5.49	0.0010	2.98	1.52	3499	60.3048	3.4068	60.0164	60.3048
SITE	5YR-24HR	8.50	5.12	0.0010	2.15	1.19	2879	12.3906	9.7405	12.0497	12.3940

Node Mass Balance Detailed [GLC]

Node Name	Sim Name	Total Base [ft <sup>3</sup> ]	Total Basin [ft <sup>3</sup> ]	Total External [ft <sup>3</sup> ]	Total Seepage [ft <sup>3</sup> ]	Total Irrigation [ft <sup>3</sup> ]	Total Link [ft <sup>3</sup> ]	Stored (Flow Based)	Stored (Geo Based)	% Error Inflow

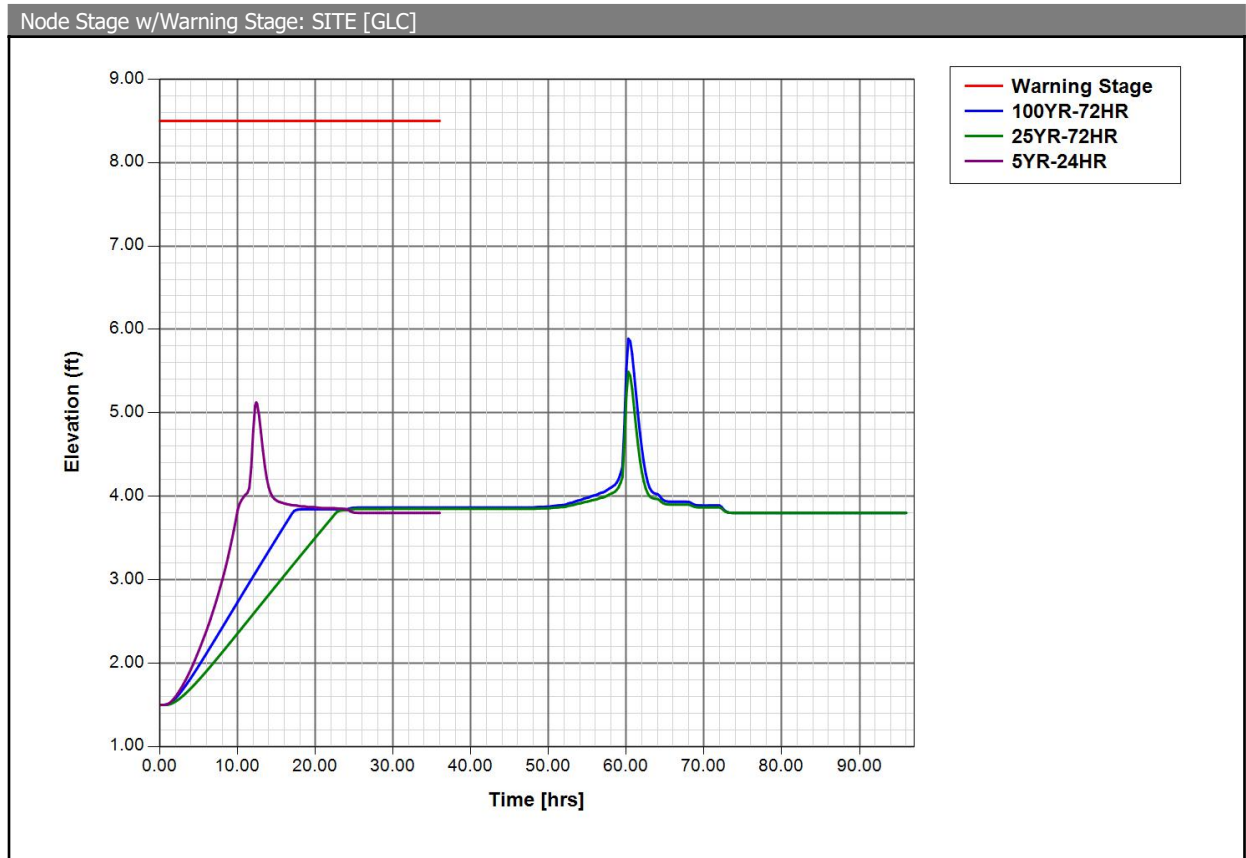
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Node Name	Sim Name	Total Base [ft3]	Total Basin [ft3]	Total External [ft3]	Total Seepage [ft3]	Total Irrigation [ft3]	Total Link [ft3]	Stored (Flow Based) [ft3]	Stored (Geo Based) [ft3]	% Error Inflow
SITE : In	100YR-72HR	0	32236	0	0	0	0	2090	2092	-0.01
SITE : Out		0	0	0	0	0	30146			
SITE : In	25YR-72HR	0	24079	0	0	0	0	2091	2092	-0.01
SITE : Out		0	0	0	0	0	21989			
SITE : In	5YR-24HR	0	12662	0	0	0	0	2092	2092	0.00
SITE : Out		0	0	0	0	0	10570			



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## Rating Curve Link: DW (2 Wells)

Scenario: GLC  
 From Node: SITE  
 To Node: GW  
 Link Count: 1  
 Flow Direction: Both

Table	Elev On [ft]	Elev On Node	Elev Off [ft]	Elev Off Node
Well_400gpm	3.80		3.79	

Comment:

## Link Min/Max Conditions with Times [GLC]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Time to Max Flow [hrs]	Time to Min Flow [hrs]	Time to Min/Max Delta Flow [hrs]	Time to Max Us Velocity [hrs]	Time to Max Ds Velocity [hrs]
DW (2 Wells)	100YR-7 2HR	1.88	0.00	0.00	0.00	0.00	60.3451	0.0000	61.1088	0.0000	0.0000
DW (2 Wells)	25YR-72 HR	1.52	0.00	0.00	0.00	0.00	60.3048	0.0000	59.6751	0.0000	0.0000
DW (2 Wells)	5YR-24 HR	1.19	0.00	0.00	0.00	0.00	12.3940	0.0000	12.8910	0.0000	0.0000

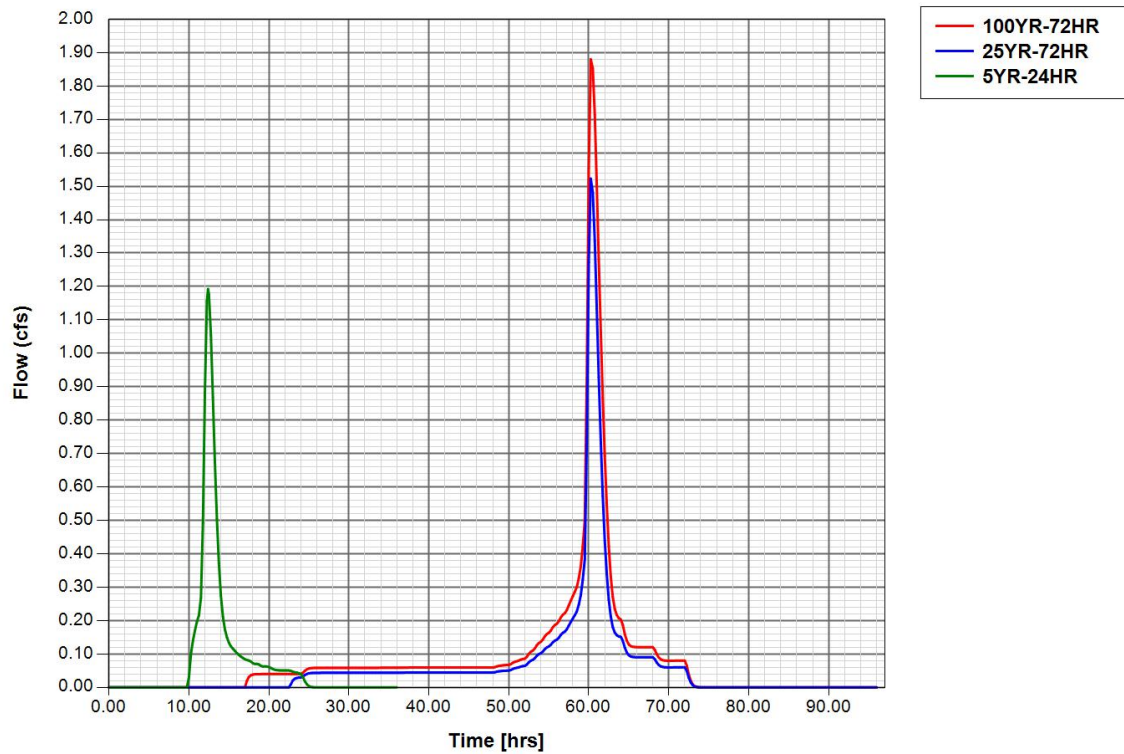
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Link Flow: DW (2 Wells) [GLC]



Simulation: 100YR-72HR

Scenario: GLC

Run Date/Time: 11/28/2023 5:18:56 PM

Program Version: ICPR4 4.07.08

## General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	96.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	60.0000	0.1000
Max Calculation Time:		60.0000

## Output Time Increments

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## Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000

## Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

## Restart File

Save Restart: False

## Resources &amp; Lookup Tables

## Resources

Rainfall Folder: Icp3

Unit Hydrograph Folder: Icp3

## Lookup Tables

Boundary Stage Set:

Extern Hydrograph Set:

Curve Number Set:

Green-Ampt Set:

Vertical Layers Set:

Impervious Set:

## Tolerances &amp; Options

Time Marching: SAOR

Max Iterations: 6

Over-Relax Weight: 0.5 dec

Fact:

dZ Tolerance: 0.0010 ft

Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft

Edge Length Option: Automatic

IA Recovery Time: 24.0000 hr

Smp/Man Basin Rain Opt: Global

Rainfall Name: Sfwmd72

Rainfall Amount: 20.00 in

Storm Duration: 72.0000 hr

Dflt Damping (1D): 0.0050 ft

Min Node Srf Area (1D): 113 ft2

Energy Switch (1D): Energy

Comment:

Simulation: 25YR-72HR

Scenario: GLC

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01/03/2024

Run Date/Time: 11/28/2023 5:18:58 PM  
 Program Version: ICPR4 4.07.08

### General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	96.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	60.0000	0.1000
Max Calculation Time:		60.0000

### Output Time Increments

#### Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000

#### Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

#### Restart File

Save Restart: False

### Resources & Lookup Tables

#### Resources

Rainfall Folder: Icp3

Unit Hydrograph Folder: Icp3

#### Lookup Tables

Boundary Stage Set:  
 Extern Hydrograph Set:  
 Curve Number Set:

Green-Ampt Set:  
 Vertical Layers Set:  
 Impervious Set:

### Tolerances & Options

Time Marching: SAOR  
 Max Iterations: 6  
 Over-Relax Weight: 0.5 dec  
 Fact:  
 dZ Tolerance: 0.0010 ft  
 Max dZ: 1.0000 ft

IA Recovery Time: 24.0000 hr

Smp/Man Basin Rain Global  
 Opt:

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Link Optimizer Tol: 0.0001 ft  
Edge Length Option: Automatic

Rainfall Name: Sfwmd72  
Rainfall Amount: 15.00 in  
Storm Duration: 72.0000 hr

Dflt Damping (1D): 0.0050 ft  
Min Node Srf Area (1D): 113 ft2  
Energy Switch (1D): Energy

Comment:

Simulation: 5YR-24HR

Scenario: GLC  
Run Date/Time: 11/28/2023 5:18:59 PM  
Program Version: ICPR4 4.07.08

#### General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	36.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	60.0000	0.1000
Max Calculation Time:		60.0000

#### Output Time Increments

##### Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	5.0000

##### Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

##### Restart File

Save Restart: False

#### Resources & Lookup Tables

##### Resources

##### Lookup Tables



Rainfall Folder: Icp3

Unit Hydrograph Folder:  
Icp3

Boundary Stage Set:

Extern Hydrograph Set:

Curve Number Set:

Green-Ampt Set:

Vertical Layers Set:

Impervious Set:

## Tolerances &amp; Options

Time Marching: SAOR

Max Iterations: 6

Over-Relax Weight: 0.5 dec

Fact:

dZ Tolerance: 0.0010 ft

Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft

Edge Length Option: Automatic

IA Recovery Time: 24.0000 hr

Smp/Man Basin Rain Opt: Global

Rainfall Name: Flmod

Rainfall Amount: 8.00 in

Storm Duration: 24.0000 hr

Dflt Damping (1D): 0.0050 ft

Min Node Srf Area: 113 ft2

(1D):

Energy Switch (1D): Energy

Comment:

## Rating Curve: Well\_400gpm

Scenario: GLC

Type: Upstream Stage

Upstream Stage [ft]	Discharge [cfs]
3.80	0.00
4.80	0.90
5.80	1.80
6.80	2.70
7.80	3.60
8.80	4.50
9.80	5.40
10.80	6.30

Comment: 2 Wells @ 200 GPM each

Discharge at 2.30' above water table (Elevation 3.80)

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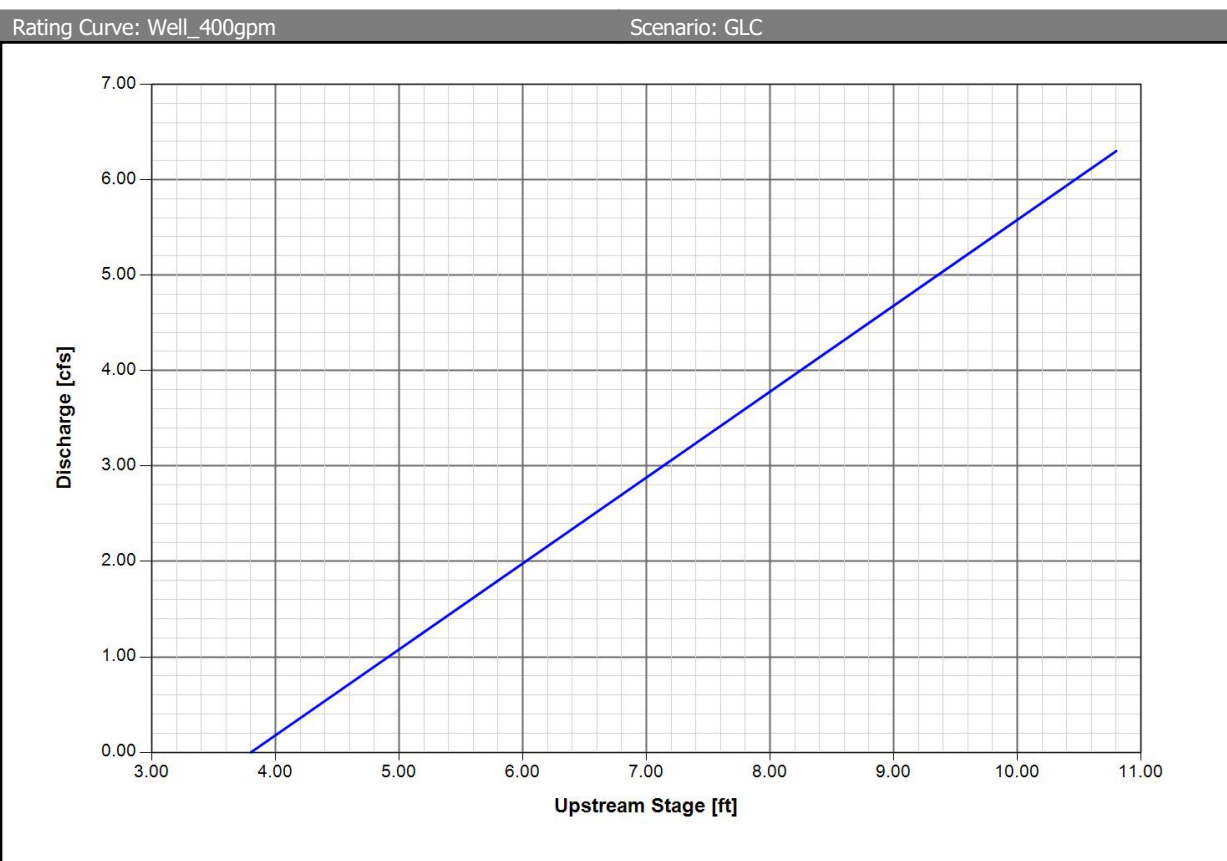
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**APPENDIX C**  
**GEOTECHNICAL REPORT**



*Florida's Leading Engineering Source*

**Geotechnical Exploration Report**  
**Eight-Story Building at NE 22nd Ave.**  
Pompano Beach, Florida

June 23, 2023  
UES Project No.: 0630.2300114.0000

Prepared for: BVR Group Asia

**DRC**

PZ23-12000046

02/21/2024

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01/03/2024



June 23, 2023

Mr. Jim Wrightsman  
**BVR Group Asia**  
114 Antelope Hill  
Boerne, TX 78006  
Email: Jim@bvrgroupasia.com

**RE: Geotechnical Exploration  
Eight-Story Building at NE 22<sup>nd</sup> Ave.  
Parcel ID: 4842-36-01-1830  
Pompano Beach, FL 33062  
UES Project No.: 0630.2300114.0000**

Dear Mr. Wrightsman,

In accordance with your authorization, UES has completed the subsurface exploration for the above referenced project in accordance with the signed geotechnical service agreement for this project dated June 5, 2023.

The purpose of UES's subsurface exploration was to classify the nature of the subsurface soils and general geomorphic conditions and to evaluate their impact upon the proposed construction. A determination of sinkhole potential at the site was outside the scope of this investigation. If a determination is requested, UES can propose and perform this service utilizing the appropriate geophysical methods. This report contains the results and UES's engineering interpretation of subsurface conditions of the site with respect to the project characteristics as described to UES, including recommendations for foundation design and site preparation procedures.

### EXECUTIVE SUMMARY

The subject property is located at NE 22nd Avenue in Pompano Beach, Florida (Parcel ID: 4842-36-01-1830). It is UES's understanding that this project is to consist of the construction of an eight-story building, noting that the first three floors will be a parking garage. The client provided an undated floor plan prepared by Austin Fox Architecture. UES assumes that the proposed construction will be constructed using reinforced concrete, masonry, and steel-frame construction. For the purpose of this report and analysis, UES has estimated foundation loading at **800 kips** for any isolated column footings and **10 kips per linear foot** for continuous footings.

If conditions vary from those indicated above, UES should be requested to review the data to see if the recommendations contained herein are still valid.

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The subsurface conditions consisted of medium-dense to very dense, fine to medium-grained sand with varying amounts of limestone fragments from the ground surface to the approximate depth of 2 feet below the ground surface (BGS). The following layer consisted of loose to dense, fine to medium-grained sand to the approximate depth of 13 feet BGS. The following layer consisted of loose to dense, fine to medium-grained sand with varying amounts of cemented sand and shell fragments to the termination depth of the deepest boring at 50 feet BGS. The standard penetration test yielded N-values ranging from 2 to 41 blows per foot.

Groundwater at the time of testing (June 2023) was encountered at the approximate depths of 4' to 4'3" BGS in the test borings.

Based on the nature of the soils and the expected magnitude of the design loads, it is UES's professional opinion that the soils will require special consideration in order to safely support the shallow foundations as well as to control foundation settlements within tolerable limits. The soil improvement option considered was **Vibro-Replacement** for the proposed structures. A net allowable soil bearing pressure of **6,000 pounds per square foot (psf)** may be used for the design of shallow isolated spread footings and/or continuous strip footings. Recommendations for the soil improvement method are contained herein.

UES appreciates the opportunity to be of service to you on this project and looks forward to a continued association with **BVR Group Asia**. Please, contact the undersigned if you have any questions or comments, or if UES may further assist you as your plans proceed.

Respectfully Submitted,

**UES**

**Registry No. 4930**



Johana Alejandra Conde  
Staff Engineer

Alberto J. Mercado, P.E.  
Geotechnical Department Manager  
Professional Engineer #95703  
State of Florida

This item has been digitally signed and sealed by [Alberto J. Mercado] 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.

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Appendix A	Record of Test Borings
Appendix B	Notes related to Test Borings Discussion of Soil Groups
Appendix C	Discussion of Soil Groups
Appendix D	Exfiltration Test Results



## 1.0 INTRODUCTION

### 1.1 Project Description

The site is located at Parcel ID: 4842-36-01-1830 in Pompano Beach, Florida, as shown in **Figure 1**. It is UES's understanding that this project to consist of the construction of an eight-story building, noting that the first three floors will be a parking garage. The client provided an undated floor plan prepared by Austin Fox Architecture. **Figure 2** displays the proposed floor plan. Structural details were not available at this time. However, UES assumes that the proposed construction will be constructed using reinforced concrete, masonry, and steel-frame construction. For the purpose of this report and analysis, UES has estimated foundation loading at **800 kips** for any isolated column footings and **10 kips per linear foot** for continuous footings, if any. If conditions vary from those indicated above, UES should be requested to review the data to see if the recommendations contained herein are still valid.

The recommendations provided in this report are based upon the information noted above. If project information differs significantly, please inform UES so that UES may review and revise the recommendations, if necessary, with respect to any modifications.

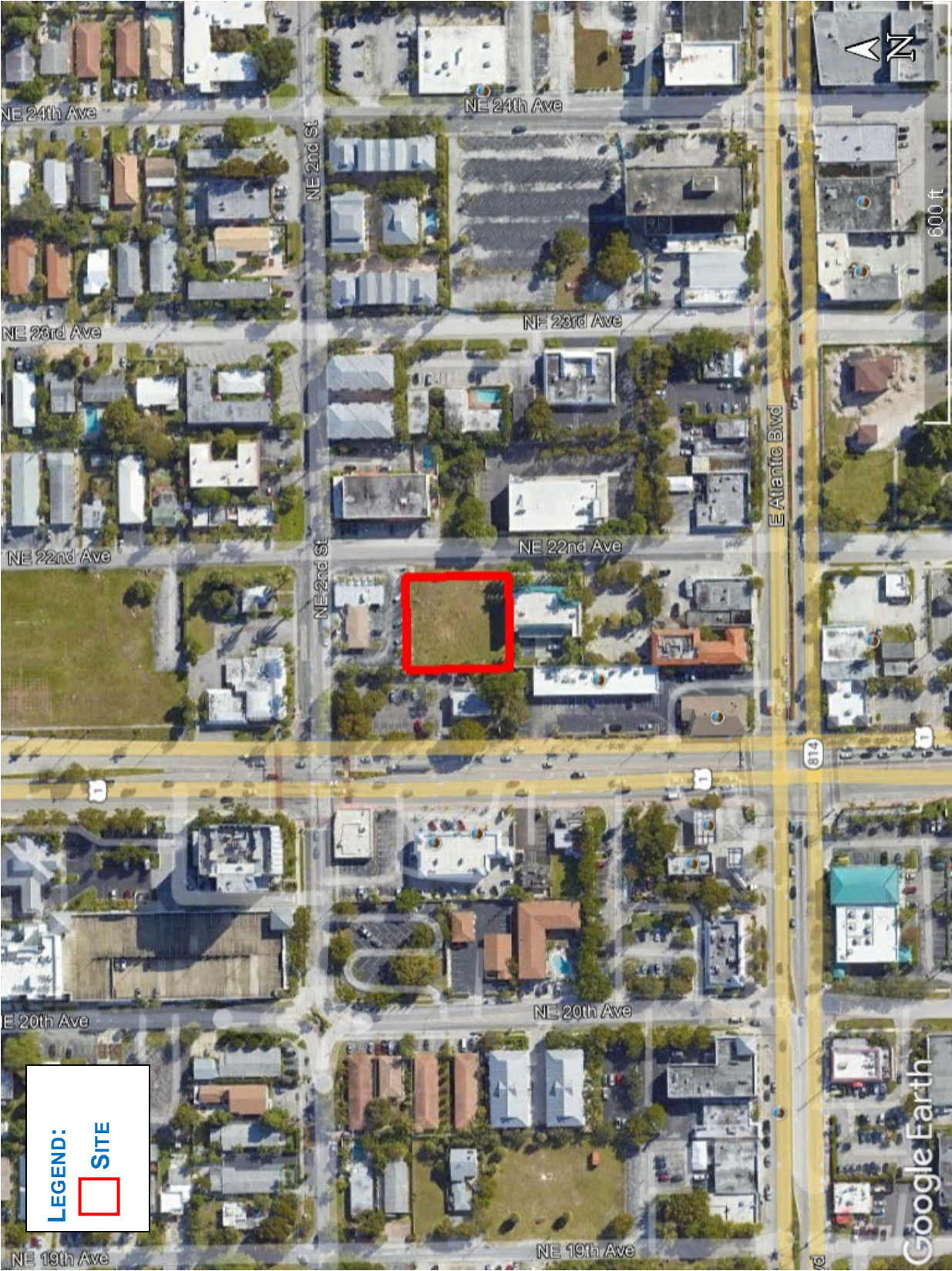
### 1.2 Purpose

The primary purpose of the geotechnical exploration was to evaluate the general type and condition of the subsurface soil materials underlying the project site, to provide professional opinions with respect to site preparation, and recommend foundation design parameters for the proposed structure.

### 1.3 Scope of Services

The primary objectives of the geotechnical exploration were to collect subsurface data at the proposed project site, summarize test results, and discuss any apparent site conditions that may have geotechnical significance for building construction. The following are provided within this report:

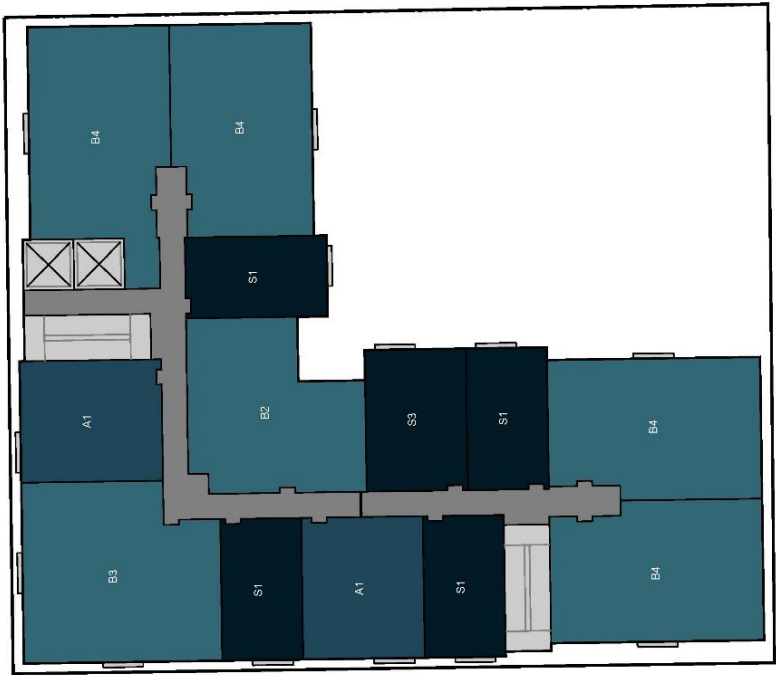
1. Soil boring logs depicting the subsurface soil conditions encountered during the field exploration.
2. A review of each soil sample obtained during the field exploration by the geotechnical engineer.



EIGHT STORY BUILDING AT NE 22ND AVENUE  
POMAPANO BEACH, FL  
UES PROJECT No.: 0630.2300114.0000

FIGURE 1 – SITE LOCATION PLAN





Site	Multifamily				Parking			Master Plan	
	Acreage	0.45 Units	66 1 Beds	10 15% Efficiency	85.9% Stalls	96 Stalls	96		
FAR	3.16 Beds	95 2 Beds	30 46% Height	84.0 Average	451				
DUI/AC	144.6 Baths	95.0 Stalls	25 38% Average	817 Ratio	1.48 Ratio				
		Stalls Req. 86				Parking Req. 86			

FIGURE 2 – PROPOSED FLOOR PLAN

3. Analysis of the existing soil conditions found during the exploration with the respect to foundation support.
4. Evaluation and recommendations with respect to foundation support of the structure, including allowable soil bearing pressures, recommended bearing elevations, and other foundation design considerations.
5. Provide soil criteria and site preparation procedures for construction of the proposed structure.

A determination of sinkhole potential at the site was outside the scope of this investigation. If a determination is requested, UES can propose and perform this service utilizing the appropriate geophysical methods.

## 2.0 OBSERVATIONS

### 2.1 Site Observation and Historical Data

The subject property is located at NE 22nd Avenue in Pompano Beach, Florida (Parcel ID: 4842-36-01-1830). The site is currently a vacant parcel of land. No soil staining or visual evidence of chemical or petroleum spillage was apparent. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. UES would be pleased to perform these services if required.

UES reviewed historical data from 1957 to 2022. The 1957 aerial depicts the site as a moderately vegetated parcel. The site has remained relatively unchanged since then.

### 2.2 Laboratory Testing and Procedures

Soil samples recovered from UES's field exploration were returned to the laboratory. A geotechnical engineer visually examined and reviewed the field descriptions of the recovered soils in general accordance with ASTM D-2488. Samples were visually examined to accurately evaluate the subsurface soil properties and site geomorphic conditions. Based on UES's analysis of the recovered samples, additional testing was deemed unnecessary.

Representative samples of the soils encountered during the field exploration will be held in the laboratory for your inspection for 30 days unless UES is notified otherwise.

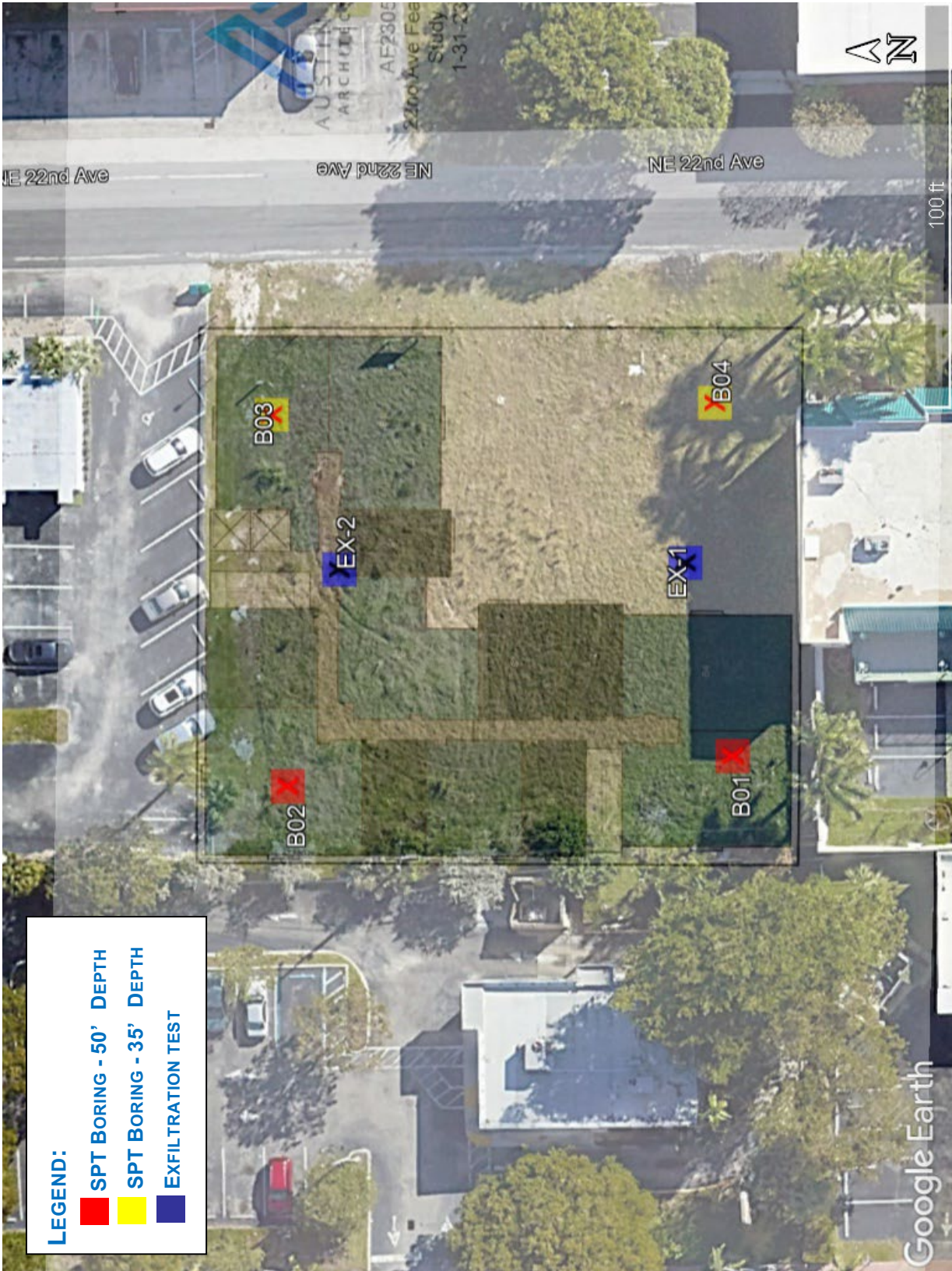


FIGURE 3 – BORING LOCATION PLAN



## 2.3 Field Exploration

For purposes of this study, the following was performed:

- Two (2) standard penetration test (SPT) borings (ASTM D-1586) to depths of 50 feet below existing grade.
- Two (2) standard penetration test (SPT) borings (ASTM D-1586) to depths of 35 feet below existing grade.
- Two (2) exfiltration tests to a depth of 10 feet below existing grade in accordance with the South Florida Water Management District method for open-hole constant head field testing.

**Figure 3** shows the approximate test locations performed at the site. The SPT boring method was used as the investigative tool within the borings. Penetration tests were performed in substantial accordance with ASTM Procedure D-1586, "Penetration Test and Split-Barrel Sampling of Soils". This test procedure consists of driving a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound manual hammer falling 30 inches. The number of blows per foot for the second and third 6-inch increments is an indication of soil strength. The SPT borings were performed using a CME-45 truck-mounted drill rig equipped with an automatic hammer.

The results of the classification and stratification are encountered during UES's exploration are presented in **Appendix A** "Record of Test Boring". It should be noted that soil conditions might vary between what is depicted on the attached log and other areas of the site. The soil boring data reflect information from a specific test location only. Site specific survey staking for the test location was not provided for UES's field exploration. The boring location was determined in the field by a project engineer by measuring distances and estimating right angles from existing site features. The latitude, longitude, and elevation noted in UES's boring logs were taken from Google Earth. Google Earth uses WGS-84 or Local Mean Sea Level (MSL) as datum. It should be noted that elevations may not always be correct if fill is added or site grades change to a site after Google captures the image. The boring location and elevations noted should, therefore, be considered approximate. The boring depths were confined to the zone of soil likely to be stressed by the proposed construction.

The boring log depicts the observed soils in graphic detail. The Standard Penetration Test boring indicates the penetration resistance, or N-values logged during the drilling and sampling activities. Please refer to **Appendix B** "Notes Related to the Test Borings" for further clarification of UES's field exploration. The classifications and descriptions shown on the log are generally based upon visual characterizations of the recovered soil samples. All soil samples reviewed have been depicted and classified in accordance with the Unified Soil Classification System symbols (i.e. SP, SP-SM, SC, etc.). See in **Appendix C** "Discussion of Soil Groups", for a detailed description of various soil groups.

### 3.0 SUBSURFACE CONDITIONS

The subsurface conditions consisted of medium dense to very dense, fine to medium grained sand with varying amounts of limestone fragments from the ground surface to the approximate depth of 2 feet below the ground surface (BGS). The following layer consisted of loose to dense, fine to medium grained sand to the approximate depth of 13 feet BGS. The following layer consisted of loose to dense, fine to medium grained sand with varying amounts of cemented sand and shell fragments to the termination depth of the deepest boring at 50 feet BGS. The standard penetration test yielded N-values ranging from 2 to 41 blows per foot.

For a more precise description of the conditions encountered within the soil test borings, refer to the "Record of Test Boring" logs included in **Appendix A**.

#### 3.1 Hydrogeological Conditions

On the date of UES's field exploration (June 2023), groundwater was encountered at the approximate depths of 4' to 4'3" BGS during drilling operations, depending on the location. The groundwater table will fluctuate seasonally depending upon local rainfall and other local influences. Higher temporary water levels may be possible at this site after extended periods of rain. This is based upon the existing static groundwater levels at the time of the exploration and anticipating groundwater table rise through the type of soils encountered during the exploration

As part of UES's field exploration, UES performed two (2) exfiltration tests to a depth of 10 feet below the existing grade in accordance with the South Florida Water Management District method for open-hole constant head field testing. The tests were conducted in the areas presented in **Figure 3**. The calculated hydraulic conductivity coefficients for the exfiltration tests are presented in **Appendix D**.

Exfiltration Test	Hydraulic Conductivity Result
EX-1	$1.1 \times 10^{-4} \text{ ft}^3/\text{sec}/\text{ft}^2\text{-ft}$
EX-2	$1.2 \times 10^{-4} \text{ ft}^3/\text{sec}/\text{ft}^2\text{-ft}$

No additional investigation was conducted in relation to any existing well field in the vicinity. Well fields may influence water table levels and cause significant fluctuations. If a more comprehensive water table analysis is necessary, UES recommends contacting a registered professional specialized in hydrogeology.

### 4.0 FOUNDATION RECOMMENDATION

#### 4.1 General

A foundation system for any structure must be designed to resist bearing capacity failures, have settlements, which are tolerable, and can resist environmental forces, which th



foundation may be subjected to over the life of the structure. Environmental forces consist of sinkholes, freeze thaw damage, shrinking and swelling soils, and hurricane scour. It is UES's opinion that these specific environmental forces have a low risk (on a scale of low, moderate, high) of detrimentally affecting shallow foundation performance at this site. The soil bearing capacity is the soil's ability to support loads without plunging into the soil profile. Bearing capacity failures are analogous to shear failures in structural design and are usually sudden and catastrophic. The allowable amount of settlement that a structure may tolerate is dependent on several factors including uniformity of settlement, time rate of settlement, structural dimensions and properties of the structural materials. Generally, total or uniform settlement does not damage a structure but may affect drainage and utility connections. These can generally tolerate movements of several inches for building construction. In contrast, differential settlement affects a structure's frame and is limited by the structural flexibility.

Based on anticipated loads and heterogeneity of the site that might trigger potential detrimental differential settlements, it is UES's professional opinion that the soils will require special consideration in order to safely support the shallow foundations as well as to control foundation settlements within tolerable limits.

Due to the presence of cemented sand fragments in the soil profile, UES recommends the use of vibro-replacement (vibro-improvement using crushed stone) for this site. Vibro-Replacement recommendations are presented herein.

#### 4.2 Vibro Replacement (Stone)

Vibro-replacement techniques are well suited for the soil conditions encountered at this site. In this case, vibro-replacement would only be performed under all column and continuous wall foundations. Vibro-replacement beneath the floor slab is not required.

The vibro-improvement process involves inserting a large vibrating metal probe into the soil by water jetting techniques. The vibration of the probe device densifies the surrounding soil.

Crushed stone (vibro-replacement), placed on the ground surface around the device migrates downward and fills the void space created by the vibrating probe. Thus, as the probe is withdrawn from the soil, a zone of dense sand or a column of stone is formed.

Vibro-improvement should be performed to depths of at least **twice the width of isolated column footings and four times the width of continuous footings** with a minimum improvement depth of fifteen (15) feet below existing site grade. UES recommends that vibro-improvement be performed beneath all loaded foundation elements. Vibro-improvement will not be required beneath the ground-level slab.

The vibro-improvement process is a highly specialized ground modification technique and its successful completion depends on the experience of the specialty contractor, the size and energy of the equipment used, and the spacing of the probe locations. A vibro-improvement plan including the methods and equipment to be used, and a probe location

plan should be submitted by the vibro-improvement specialty contractor and approved by UES prior to initiation of vibro-improvement operation. **The approval of the vibro-improvement plan by UES is in no way a warranty or guarantee that the intended improvements will be achieved. The responsibility for achieving the required improvement is solely the responsibility of the vibro-improvement contractor.**

In general, there are limitations on the extent of soil improvement. The vibro-replacement technique and acceptance-testing program can achieve an allowable bearing capacity of up to **6,000 psf** when the soils have been improved to a high percent of relative density for the full depth of the treatment. UES recommends that the soils be improved in a way to achieve an allowable bearing capacity of at least **6,000 psf** for this project.

The vibro-replacement method does not generally densify soils in the upper 3 to 4 feet of the subsurface profile due to lack of overburden pressure and confinement. For this reason, heavy surface vibratory compaction using a steel drum roller is generally performed following the completion of vibro-replacement and acceptance testing. This technique is an applicable method for soil improvement on this site. Specific details concerning probe spacing will depend on the foundation size and desired degree of soil improvement. The required depth of improvement will vary based on foundation size for the proposed structure.

Following the soil improvement and verification as recommended above, a net allowable soil bearing pressure of **6,000 pounds per square foot (psf)** may be used for the design of isolated spread footings and continuous strip footings.

Settlement analysis was performed assuming the soils are improved as outlined herein. Provided that the site is prepared in accordance as discussed in this report, foundation settlement is expected to be less than 1 inch total. UES expects differential settlement to be less than 1/2-inch differential between adjacent columns or a horizontal distance of 20 feet.

Fill required to raise the building pad to the final grade, in excess of 2 feet, will need to be completed before vibro-replacement begins to increase the confining pressure and increase the effectiveness of these techniques.

The production of the vibro-replacement points should be monitored continuously to verify depth of each probe and that the desired pressures are achieved as the probe is advanced back to ground surface.

In addition, a post-vibro-improvement verification program consisting of Standard Penetration Test (SPT) borings should be performed to the same depths as the closest vibro-improvement probes to verify the effectiveness of the vibro-improvement process. **The number and location of test borings are to be selected by UES, or by the retained geotechnical engineer that will monitor the vibro-replacement procedure.** Post improvement testing should not be initiated until a period of at least 48 hours has elapsed following the completion of the soil improvement in order to allow time for excess pore water pressure to dissipate.

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01/03/2024

Using vibratory compaction equipment at this site may disturb adjacent structures. The contractor is required to monitor nearby structures before and during compaction operations. A representative from this office can monitor the vibration disturbance of adjacent structures; a proposal for these services can be submitted to the contractor upon request.

#### 4.3 Site Preparation for Vibro-Replacement

UES's recommendations for preparation of the site for isolated or continuous footings are noted below.

1. Perform vibro-replacement operation under isolated column pads as mentioned before using a vibroflot for any range between 30-HP unit and 100-HP unit.
2. After the completion of vibro-replacement operation, level the ground surface, and recompact up to the finish grade of the building pad.
3. Perform confirmation standard penetration test borings at the completion of site densification compaction. The allowable soil bearing capacity certification will be confirmed after completion of confirmation borings.

#### 4.4 General Site Preparation

UES's recommendations for site preparation are for the site are contained herein. This approach to improving and maintaining the site soils has been found to be successful on projects with similar soil conditions.

1. The removal of any construction debris, concrete, etc., including utilities and footings, is required prior to construction. Following site stripping, clearing, and grubbing, areas of surficial sand should be compacted prior to the placement of any fill. UES recommends a steel drum vibratory roller with a minimum static weight of 20,000 lbs. and minimum vibratory impact energy of 50,000 lbs. The roller should be operated at 2 mph making at least 10 perpendicular overlapping passes. Densification should continue until no further settlement can be visually discerned at the excavated surface. No section of the subgrade should receive less than 4 passes of the roller or until at least 95% maximum density (ASTM D 1557) is achieved for a depth of at least **1 foot** below the excavated surface. Upon completion of the proof rolling, backfill shall be placed in maximum 12-inch loose lifts and compacted to a minimum density of **98 percent** of the Modified Proctor maximum dry density (ASTM D-1557).
2. Place fill material, as required. The excavated site soils that do not contain organics or other deleterious material should be suitable for use as engineered fill. The fill material should be inorganic (classified as SP, SW, GP or GW) containing not more than 5 percent (by weight) organic materials. Fill should be placed in maximum 12-inch loose lifts and compacted to a minimum density of **98 percent** of the Modified

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01/03/2024

Proctor maximum dry density (ASTM D-1557) with a vibratory roller as mentioned above.

3. Perform compliance tests within the fill at a frequency of not less than one test per 2,500 square feet per lift in the building areas, or at a minimum of 2 test locations per lift, whichever is greater.
4. The bottom of all footing excavations shall be examined by the engineer/ geologist or his representative to determine if the soil is free of all organic and/or deleterious material, and that compaction and the recommended allowable soil bearing pressures are achieved. UES recommends density tests be performed approximately every 50 lineal feet along continuous strip footings and at isolated column footings.
5. The contractor shall take into account the final contours and grades as established by the plan when executing his backfilling and compaction operations.

Using vibratory compaction equipment can disturb adjacent structures. If vibration related disturbance to nearby structures may be of concern, vibration levels should be monitored during compaction operations. A representative from this office can monitor the vibration disturbance of adjacent structures, and a proposal for these services can be provided upon your request.

#### 4.5 Floor Slabs

The ground floor slab may be supported directly on a granular fill pad following site preparation and foundation construction outlined in this report. For purposes of design, a modulus of subgrade reaction of 150 pounds per cubic inch may be used. It should be noted that excessive moisture vapor transmission through concrete floor slabs can result in damage to floor coverings, as well as other deleterious effects to slab supported equipment or stored items. An appropriate moisture vapor retarder should be placed beneath the floor slab to reduce moisture vapor from entering the building through the slab. The retarder should be installed in general accordance with applicable ASTM procedures and manufacturer's installation instructions including sealing the membrane at lapped joints, around pipe penetrations and at the edges of foundations.

#### 4.6 Vibration Monitoring

The proposed construction will be within close proximity to residential structures and roadways that may be susceptible to damage from vibration generated at the site. UES recommends that during all aspects of construction, the bordering landmarks be monitored using a seismograph to determine the extent of vibration absorption that these features will be subject to. The seismograph used to monitor this site should have the capability to measure ground velocities along vertical, transverse, and longitudinal axes. The project structural engineer should establish allowable ground velocities that the bordering facilities can safely withstand without any damage. A representative from this office can monitor the

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vibration disturbance of adjacent structures, and a proposal for these services can be provided upon your request.

## **5.0 EXCAVATION CONDITIONS**

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better ensure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the OSHA guidelines. It is UES's understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. UES is providing this information solely as a service to UES's client. UES is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not implied and should not be inferred.

## **6.0 REPORT LIMITATIONS**

This consulting report has been prepared for the exclusive use of the current project owners and other members of the design team for the proposed project. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied. The evaluation submitted in this report is based in part upon the data collected during a field exploration. However, the nature and extent of variations throughout the subsurface profile may not become evident until the time of construction. If variations then appear evident, it may be necessary to reevaluate information and professional opinions as provided in this report. In the event changes are made in the nature, design, or locations of the proposed structure, the evaluation and opinions contained in this report shall not be considered valid, unless the changes are reviewed and conclusions modified or verified in writing by UES. Lastly, in accepting this report, the client understands that the data obtained from the soil borings is intended for foundation analysis only and is not to be used for excavating or backfilling pricing estimates.

## **7.0 BASIS FOR RECOMMENDATIONS**

The analysis and recommendations submitted in this report are based on the data obtained from the tests performed at the location indicated on the attached **Figure 3**. This report

does not reflect any variations, which may occur between borings. While the borings are representative of the subsurface conditions at their respective locations and for their vertical reaches, local variations characteristic of the subsurface soils of the region are anticipated and may be encountered. The delineation between soil types shown on the soil logs is approximate and the description represents UES's interpretation of the subsurface conditions at the designated boring locations on the particular date drilled.

UES should be provided the opportunity to review the final foundation specifications and review foundation design drawings, in order to determine whether UES's recommendations have been properly interpreted, communicated, and implemented. If UES is not afforded the opportunity to participate in construction-related aspects of foundation installation as recommended in this report or any report addendum, UES will accept no responsibility for the interpretation of UES's recommendations made in this report or on a report addendum for foundation performance.

Any third-party reliance on UES's geotechnical report or parts thereof is strictly prohibited without the expressed written consent of UES. The SPT methodology (ASTM D-1586) used in performing UES's borings and for determining penetration resistance is specific to the sampling tools utilized and does not reflect the ease or difficulty of advancing other tools, equipment, or materials.

**APPENDIX A**  
Record of Test Borings

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1215 Wallace Drive  
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561-395-5805

# LOG OF BORING B01

PAGE 1 OF 2

CLIENT BVR Group Asia

PROJECT NAME Eight-Story Building at NE 22nd Ave.

PROJECT NUMBER 0630.2300114.0000

PROJECT LOCATION Parcel ID: 4842-36-01-1830, Pompano Beach, FL

DRILLING CONTRACTOR Universal Engineering Sciences

HOLE DEPTH 50 ft

HOLE DIAMETER \_\_\_\_\_

DRILLER John Holdsworth

DATE STARTED 6/19/23

COMPLETED 6/19/23

DRILL RIG CME-45

GROUND WATER LEVEL: ▽ AT TIME OF DRILLING 4.00 ft / Elev 3.00 ft

METHOD SPT

LATITUDE 26.232917

LONGITUDE -80.102323

NOTE: \_\_\_\_\_

HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	▲ SPT N VALUE ▲			
										20	40	60	80
										PL	MC	LL	
										20	40	60	80
										□ FINES CONTENT (%) □			
										20	40	60	80
5	2.0		Dense, gray, fine to medium grained SAND (SP) with some limestone fragments, trace of asphalt fragments.	1	80	8 21 11 12	32						
			Medium dense, light gray, fine to medium grained SAND (SP).	2	92	10 9 8 8	17						
5				3	92	6 5 5 4	10						
0			Loose, brown, fine to medium grained SAND (SP).	4	92	3 4 4 4	8						
				5	92	3 3 5 6	8						
10													
-5													
15			Medium dense, light brown, fine to medium grained SAND (SP) with trace of cemented sand and shell fragments.	6	30	11 3 6 9	9						
-10													
20			Dense, tan, fine to medium grained SAND (SP) with some cemented sand fragments, trace of shell fragments.	7	92	14 17 15 12	32						
-15			Medium dense, tan, fine to medium grained SAND (SP) with some cemented sand fragments, trace of shell fragments.	8	70	9 10 5 6	15						
25													
-20													
30			CEMENTED SAND fragments with trace of sand.	9	30	10 8 8 9	16						
-25													
35			Medium dense, light brown, fine to medium grained SAND (SP) with some cemented sand fragments, trace of shell fragments.	10	90	7 8 12 13	20						

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# LOG OF BORING B01

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CLIENT BVR Group Asia

PROJECT NAME Eight-Story Building at NE 22nd Ave.

PROJECT NUMBER 0630.2300114.0000

PROJECT LOCATION Parcel ID: 4842-36-01-1830, Pompano Beach, FL

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	▲ SPT N VALUE ▲ 20 40 60 80 PL MC LL 20 40 60 80 □ FINES CONTENT (%) □ 20 40 60 80
-30			Medium dense, light brown, fine to medium grained SAND (SP) with some cemented sand fragments, trace of shell fragments. (continued)							
38.0			Medium dense, light brown, fine to medium grained SAND (SP).	11	80	7 7 8 9	15			
-35			43.0	12	92	6 9 8 11	17			
45			Medium dense, tan to gray, fine to medium grained SAND (SP).							
-40			Loose, tan to gray, fine to medium grained SAND (SP).	13	60	5 4 3 2	7			
50			50.0							

Bottom of borehole at 50.0 feet.

GFA GEOTECH BH - GFA DATA TEMPLATE.GDT - 6/22/23 10:10 - S:\GINT\PROJECTS\0630.2300114.0000 - 8-STORY BUILDING AT NE 22ND AVE, POMPAHO.GPJ

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02/21/2024

DRC

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01/03/2024



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# LOG OF BORING B02

PAGE 1 OF 2

CLIENT BVR Group Asia

PROJECT NAME Eight-Story Building at NE 22nd Ave.

PROJECT NUMBER 0630.2300114.0000

PROJECT LOCATION Parcel ID: 4842-36-01-1830, Pompano Beach, FL

DRILLING CONTRACTOR Universal Engineering Sciences

HOLE DEPTH 50 ft

HOLE DIAMETER \_\_\_\_\_

DRILLER John Holdsworth

DATE STARTED 6/19/23

COMPLETED 6/19/23

DRILL RIG CME-45

GROUND WATER LEVEL: ▽ AT TIME OF DRILLING 4.00 ft / Elev 3.00 ft

METHOD SPT

LATITUDE 26.233219

LONGITUDE -80.102346

NOTE: \_\_\_\_\_

HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	▲ SPT N VALUE ▲			
										20	40	60	80
										PL	MC	LL	
										20	40	60	80
										☐ FINES CONTENT (%) ☐			
										20	40	60	80
5	2.0		Very dense, gray, fine to medium grained SAND (SP) with some limestone fragments, trace of asphalt fragments.	1	92	3 26 15 11	41						
			Medium dense, light gray, fine to medium grained SAND (SP).	2	92	10 10 9 9	19						
5			Loose, light gray, fine to medium grained SAND (SP).	3	92	8 4 4 5	8						
			Medium dense, brown, fine to medium grained SAND (SP).	4	92	3 4 6 7	10						
			Driller's Note: 80% loss of drilling fluid circulation from 10' to 20'. Hard drilling from 10' to 12.5'	5	92	7 7 8 9	15						
10													
			Medium dense, light brown, fine to medium grained SAND (SP) with some cemented sand fragments.	6	92	3 5 7 8	12						
15			Medium dense, light brown, fine to medium grained SAND (SP) with trace of cemented sand fragments.	7	90	4 5 5 5	10						
20			Medium dense, tan, fine to medium grained SAND (SP) with some cemented sand fragments, trace of shell fragments.	8	90	4 4 5 5	9						
25				9	90	14 11 3 4	14						
30			Medium dense, light brown, fine to medium grained SAND (SP) with trace of cemented sand and shell fragments.	10	90	4 5 5 6	10						

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02/21/2024

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# LOG OF BORING B02

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CLIENT BVR Group Asia

PROJECT NAME Eight-Story Building at NE 22nd Ave.

PROJECT NUMBER 0630.2300114.0000

PROJECT LOCATION Parcel ID: 4842-36-01-1830, Pompano Beach, FL

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	▲ SPT N VALUE ▲ 20 40 60 80 PL MC LL 20 40 60 80 □ FINES CONTENT (%) □ 20 40 60 80
-30			Medium dense, light brown, fine to medium grained SAND (SP) with trace of cemented sand and shell fragments. (continued)							
38.0			Loose, light brown to tan, fine to medium grained SAND (SP).	11	90	1 3 3 4	6			
40										
-35				12	90	1 1 3 3	4			
45										
-40			Medium dense, light brown to tan, fine to medium grained SAND (SP).	13	90	5 5 6 6	11			
50			50.0							

Bottom of borehole at 50.0 feet.

GFA GEOTECH BH - GFA DATA TEMPLATE.GDT - 6/22/23 10:10 - S:\GINT\PROJECTS\0630.2300114.0000 - 8-STORY BUILDING AT NE 22ND AVE, POMPAHO.GPJ

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561-395-5805

# LOG OF BORING B03

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CLIENT BVR Group Asia

PROJECT NAME Eight-Story Building at NE 22nd Ave.

PROJECT NUMBER 0630.2300114.0000

PROJECT LOCATION Parcel ID: 4842-36-01-1830, Pompano Beach, FL

DRILLING CONTRACTOR Universal Engineering Sciences

HOLE DEPTH 35 ft

HOLE DIAMETER

DRILLER John Holdsworth

DATE STARTED 6/20/23

COMPLETED 6/20/23

DRILL RIG CME-45

GROUND WATER LEVEL:  $\nabla$  AT TIME OF DRILLING 4.00 ft / Elev 3.00 ft

METHOD SPT

LATITUDE 26.23323

LONGITUDE -80.102065

NOTE:

HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	▲ SPT N VALUE ▲			
										20	40	60	80
										PL	MC	LL	
										20	40	60	80
										□ FINES CONTENT (%) □			
										20	40	60	80
5	2.0		Medium dense, gray to light gray, fine to medium grained SAND (SP) with trace of limestone fragments.	1	92	6 8 10 10	18						
			Medium dense, light gray, fine to medium grained SAND (SP).	2	92	7 9 8 9	17						
5	6.0		Medium dense, brown, fine to medium grained SAND (SP).	3	92	6 5 6 6	11						
0	8.0		Dense, brown, fine to medium grained SAND (SP) with tree root.	4	92	2 3 10 12	13						
				5	92	12 13 13 12	26						
10	13.0		Very loose, light brown, fine to medium grained SAND (SP) with some cemented sand fragments, trace of shell fragments.	6	50	1 1 1 4	2						
15	18.0		Loose, tan, fine to medium grained SAND (SP) with trace of cemented sand and shell fragments.	7	70	3 3 3 3	6						
20	23.0		Medium dense, light brown, fine to medium grained SAND (SP) with some cemented sand fragments, trace of shell fragments.	8	60	4 5 4 3	9						
25	28.0		Loose, light brown, fine to medium grained SAND (SP) with some cemented sand and shell fragments.	9	60	2 3 2 2	5						
30			Medium dense, light brown, fine to medium grained SAND (SP) with some cemented sand and shell fragments.	10	90	4 4 6 7	10						
35	35.0												

Bottom of borehole at 35.0 feet.

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# LOG OF BORING B04

PAGE 1 OF 1

CLIENT BVR Group Asia

PROJECT NAME Eight-Story Building at NE 22nd Ave.

PROJECT NUMBER 0630.2300114.0000

PROJECT LOCATION Parcel ID: 4842-36-01-1830, Pompano Beach, FL

DRILLING CONTRACTOR Universal Engineering Sciences

HOLE DEPTH 35 ft

HOLE DIAMETER

DRILLER John Holdsworth

DATE STARTED 6/20/23

COMPLETED 6/20/23

DRILL RIG CME-45

GROUND WATER LEVEL:  $\nabla$  AT TIME OF DRILLING 4.00 ft / Elev 3.00 ft

METHOD SPT

LATITUDE 26.232929

LONGITUDE -80.102056

NOTE:

HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	▲ SPT N VALUE ▲			
										20	40	60	80
										PL	MC	LL	
										20	40	60	80
										□ FINES CONTENT (%) □			
										20	40	60	80
5	2.0		Medium dense, gray, fine to medium grained SAND (SP) with trace of limestone fragments.	1	90	3 8 7 12	15						
5	4.0		Medium dense, light gray, fine to medium grained SAND (SP).	2	92	8 9 9 8	18						
5	6.0		Loose, gray to brown, fine to medium grained SAND (SP).	3	92	5 5 3 4	8						
0			Medium dense, brown, fine to medium grained SAND (SP).	4	92	3 5 5 6	10						
10			Loose, brown, fine to medium grained SAND (SP).	5	92	3 4 4 4	8						
-5													
15	13.0		Medium dense, light brown, fine to medium grained SAND (SP) with trace of shell fragments.	6	92	6 8 10 11	18						
-10													
20	18.0		Medium dense, light brown, fine to medium grained SAND (SP) with trace of cemented sand and shell fragments.	7	92	4 4 6 5	10						
-15													
25	23.0		CEMENTED SAND fragments.	8	10	36 5 5 8	10						
-20													
30	28.0		Medium dense, light brown, fine to medium grained SAND (SP) with some cemented sand fragments, trace of shell fragments.	9	90	5 6 8 10	14						
-25													
35	33.0		Dense, tan, fine to medium grained SAND (SP) with CEMENTED SAND fragments, trace of shell fragments.	10	80	7 21 8 6	29						
	35.0												

Bottom of borehole at 35.0 feet.

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**APPENDIX B**  
Notes Related to Test Borings

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# **NOTES RELATED TO RECORDS OF TEST BORING AND GENERALIZED SUBSURFACE PROFILE**

1. Groundwater level was encountered and recorded (if shown) following the completion of the soil test boring on the date indicated. Fluctuations in groundwater levels are common; consult report text for a discussion.
2. The boring location was identified and located in the field based on measured and estimated distances from existing site features.
3. The borehole was backfilled to site grade following boring completion, patched with asphalt cold patch mix when pavement was encountered.
4. The Record of Test Boring represents our interpretation of field conditions based on engineering examination of the soil samples.
5. The Record of Test Boring is subject to the limitations, conclusions, and recommendations presented in the report text.
6. The Standard Penetration Test (SPT) was performed in accordance ASTM Procedure D-1586. SPT testing procedure consists of driving a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound hammer falling 30 inches.
7. On the Record of Test Boring listed as "Blow Counts", the N-value is the sum of the SPT hammer blows required to drive the split-tube sampler through the second and third 6-inch increment of the sampling layer, and is an indication of soil strength.
8. Shown on the Record of Test Boring an SPT N-value expressed as 50/2" is descriptive of the fact that 50 hammer blows were required to drive the split-spoon sampler a distance of approximately 2 inches.
9. The soil/rock strata interfaces shown on the Records of Test Boring are approximate and may vary from those in the field. The soil/rock conditions shown on the Records of Test Boring refer to conditions at the specific location tested; soil/rock conditions may vary between test locations.

10. Relative density and consistency for sands/gravels, silts/clays, and limestone are described as follows:

Cohesionless Soils	
SPT (N-Value)	Relative Density
0 – 3	Very Loose
4 – 8	Loose
9 – 24	Medium Dense
25 – 40	Dense
Over 40	Very Dense

Silts and Clays	
SPT (N-Value)	Consistency
0 – 1	Very Soft
2 – 4	Soft
4 – 6	Firm
7 – 12	Stiff
13 – 24	Very Stiff
Over 24	Hard

Limestone	
SPT (N-Value)	Relative Density
0 – 19	Very Soft
20 – 49	Soft
50 – 100	Medium Hard
50 for 3 to 5"	Moderately Hard
50 for 0 to 2"	Hard

11. Definition of descriptive terms of modifiers for silts/clays/shells/gravels are described as follows:

Percentage of Modifier Material	First Qualifier	Second Qualifier
0 – 5	With a Trace of + Silt, Clay, Shell	With a Trace
5 – 12	Slightly + Silty, Clayey, Shelly	With Some
12 – 30	Silty, Clayey, Shelly	With
30 – 50	Very + Silty, Clayey, Shelly	And

12. Descriptive characteristics for organic content percentages are described as follows:

Percentage of Organic Material	Descriptor
0 – 5	With a Trace
5 – 20	With Organics
20 – 75	Highly Organic
75 – 100	Peat

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**APPENDIX C**  
Discussion of Soil Groups

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## **DISCUSSION OF SOIL GROUPS**

### **COARSE GRAINED SOILS**

**GW and SW GROUPS.** These groups comprise well-graded gravelly and sandy soils having little or no plastic fines (less than 5 percent passing the No. 200 sieve). The presence of the fines must not noticeably change the strength characteristics of the coarse-grained fraction and must not interface with its free-draining characteristics.

**GP and SP GROUPS.** Poorly graded gravels and sands containing little or no plastic fines (less than 5 percent passing the No. 200 sieve) are classed in GP and SP groups. The materials may be called uniform gravels, uniform sands or non-uniform mixtures of very coarse material and very fine sands, with intermediate sizes lacking (sometimes called skip-graded, gap-graded or step-graded). This last group often results from borrow pit excavation in which gravel and sand layers are mixed.

**GM and SM GROUPS.** In general, the GM and SM groups comprise gravels or sands with fines (more than 12 percent passing the No. 200 sieve) having low or no plasticity. The plasticity index and liquid limit of soils in the group should plot below the "A" line on the plasticity chart. The gradation of the material is not considered significant and both well and poorly graded materials are included.

**GC and SC GROUPS.** In general, the GC and SC groups comprise gravelly or sandy soils with fines (more than 12 percent passing the No. 200 sieve), which have a fairly high plasticity. The liquid limit and plasticity index should plot above the "A" line on the plasticity chart.

### **FINE GRAINED SOILS**

**ML and MH GROUPS.** In these groups, the symbol M has been used to designate predominantly silty material. The symbols L and H represent low and high liquid limits, respectively, and an arbitrary dividing line between the two is set at a liquid limit of 50. The soils in the ML and MH groups are sandy silts, clayey silts or inorganic silts with relatively low plasticity. Also included are loess type soils and rock flours.

**CL and CH GROUPS.** In these groups the symbol C stands for clay, with L and H denoting low or high liquid limits, with the dividing line again set at a liquid limit of 50. The soils are primarily inorganic clays. Low plasticity clays are classified as CL and are usually lean clays, sandy clays or silty clays. The medium and high plasticity clays are classified as CH. These include the fat clays, gumbo clays and some volcanic clays.

**APPENDIX D**  
Hydraulic Conductivity Results

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## HYDRAULIC CONDUCTIVITY TEST RESULTS

**Project name:** Exfiltration Tests at Eighth-Story Building at NE 22nd Ave.  
**Project number:** 0630.2300114.0000  
**Date:** 6/20/2023

**SFWMD USUAL Open Hole Formula:**

$$K = \frac{4Q}{\pi d(2H_2^2 + 4H_2D_s + H_2d)}$$

Exfiltration Number	First volume of water reading (after stabilization)	Final volume of water reading	Elapsed time	Average flow rate at constant head Q	Average flow rate at constant head Q*0.00223	Perforated casing diameter or hole diameter (d)	Water table H <sub>2</sub>	Total length of bore hole	Length of bore hole below stabilized ground water (D <sub>s</sub> )	Hydraulic Conductivity (K)
	gallon	gallon	min.	gallon/minute	ft <sup>3</sup> /sec	ft	ft	ft	ft	ft <sup>3</sup> /sec/ft <sup>2</sup> - ft of head
EX-1	2735.1	2751.50	10	1.64	0.0037	0.33	4.17	10.0	5.83	1.1E-04
EX-2	2776.7	2794.90	10	1.82	0.0041	0.33	4.25	10.0	5.75	1.2E-04

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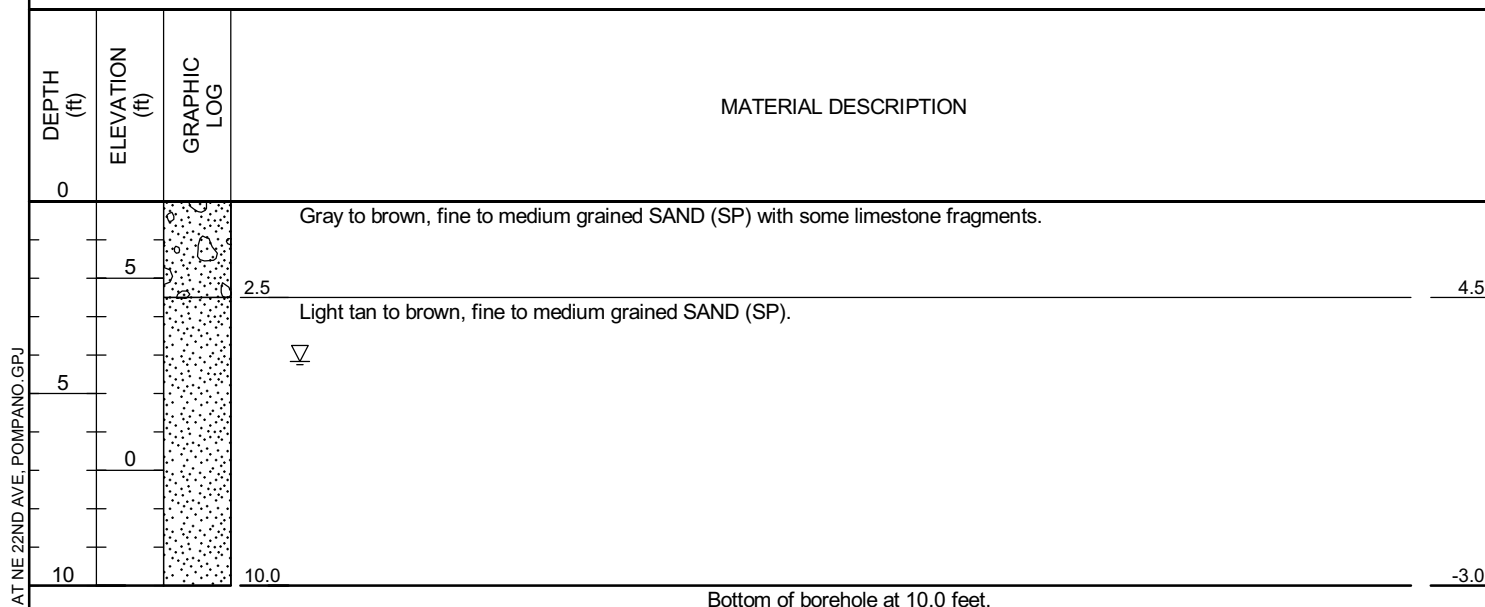


UES  
1215 Wallace Drive  
Delray Beach, FL 33444  
561-347-0070  
561-395-5805

# BORING NUMBER EX-1

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CLIENT	BVR Group Asia	PROJECT NAME	Eight-Story Building at NE 22nd Ave.
PROJECT NUMBER	0630.2300114.0000	PROJECT LOCATION	Parcel ID: 4842-36-01-1830, Pompano Beach, FL
DATE STARTED	6/20/23	COMPLETED	6/20/23
DRILLING CONTRACTOR	Universal Engineering Sciences	LATITUDE	26.232949
DRILLING METHOD	SPT	LONGITUDE	-80.102177
LOGGED BY	John Holdsworth	CHECKED BY	Johana Conde
NOTES			
		GROUND WATER LEVELS:	
		▽ AT TIME OF DRILLING	4.18 ft / Elev 2.82 ft
		AT END OF	---
		AFTER DRILLING	---



GENERAL NOTE: IP / WELL - GINT STD US.GDT - 6/22/23 10:11 - S:\GINT\PROJECTS\0630.2300114.0000 - 8-STORY BUILDING AT NE 22ND AVE, POMPAO.GPJ

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## BORING NUMBER EX-2

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**CLIENT** BVR Group Asia **PROJECT NAME** Eight-Story Building at NE 22nd Ave.  
**PROJECT NUMBER** 0630.2300114.0000 **PROJECT LOCATION** Parcel ID: 4842-36-01-1830, Pompano Beach, FL  
**DATE STARTED** 6/20/23 **COMPLETED** 6/20/23 **LATITUDE** 26.233184 **LONGITUDE** -80.102182  
**DRILLING CONTRACTOR** Universal Engineering Sciences **GROUND WATER LEVELS:**  
**DRILLING METHOD** SPT **AT TIME OF DRILLING** 4.25 ft / Elev 2.75 ft  
**LOGGED BY** John Holdsworth **CHECKED BY** Johana Conde **AT END OF** ---  
**NOTES** --- **AFTER DRILLING** ---

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION
0			
5			Brown to dark gray, fine to medium grained SAND (SP) with trace of limestone fragments.
2.5			4.5
5			Light tan to brown, fine to medium grained SAND (SP).
0			
10			10.0
			Bottom of borehole at 10.0 feet.
			-3.0

GENERAL NOTE: IP / WELL - GINT STD US.GDT - 6/22/23 10:11 - S:\GINT\PROJECTS\0630.2300114.0000 - 8-STORY BUILDING AT NE 22ND AVE, POMPAO.GPJ

DRC

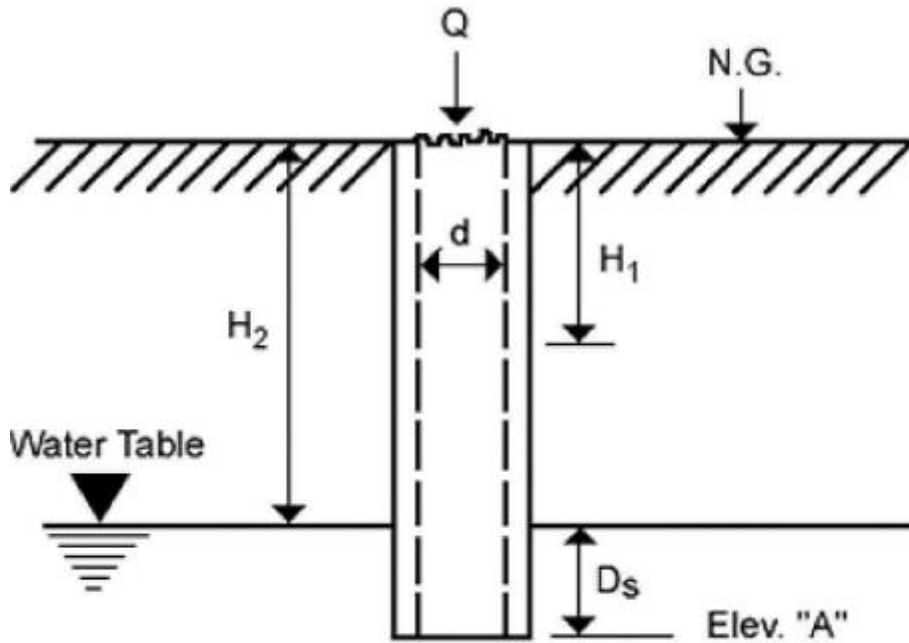
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## USUAL OPEN-HOLE TEST



$$K = \frac{4Q}{\pi d (2H_2^2 + 4H_2D_s + H_2d)}$$

**K = Hydraulic Conductivity (cfs/ft.<sup>2</sup> – ft. head)**

**Q = “Stabilized” Flow Rate (cfs)**

**d = Diameter of Test Hole (ft)**

**H<sub>2</sub> = Depth to Water Table (ft)**

**D<sub>s</sub> = Saturated Hole Depth (ft)**

**Elev. “A” = Proposed Trench Bottom Elev. (ft – NGVD)**

**H<sub>1</sub> = Average Head on Unsaturated Hole Surface (ft. head)**

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