WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz City/County: Polk Sampling Date: 24 APR 24

Applicant/Owner: City of Lakeland State: _____ Sampling Point: WDS-SEW4

Investigator(s): M. Brewer, T. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes _____ No _____	

Remarks:
Forested wtlnd W of Bonnet Springs Park fence & S of OK Carz Lakeland. Primarily Acer rubrum, Liquidamba styraciflua, Sabal palmetto, & Quercus laurifolia

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): N/A
Water Table Present?	Yes X	No _____	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No _____	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WOS-SW4

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: _____

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	60		FAC
2. Liquidambar styraciflua	25		FAC
3. Quercus laurifolia	15		FAC
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: _____)			
1. Quercus laurifolia	20		FAC
2. Sambucus can.	20		FACW
3. Quercus nigra	15		FAC
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: _____)			
1. Telmatoblechnum serrulatum	60		FACW
2. Apios americana	35		FACW
3. Cyclosorus interruptus	15		FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	_____ = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: W08-~~W4~~

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/2	100					Muck w/ fine sand	
4-18	10YR 2/1	40					muck w/mineral fine sand	
"			7.5YR 4/1	60	D	M	Fine sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

4-18" M

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Hood Haz Mt City/County: Polk Sampling Date: 25 APR 24

Applicant/Owner: City of Lakeland State: FC Sampling Point: W09-W

Investigator(s): M. Brelner, I. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:
Wetland W09 within Bonnet Springs Park. This wetland is a seepage area at head of one of the springs this park is named for. Reportedly 7 springs input into this wetland

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): 1-2 (in areas)

Water Table Present? Yes _____ No _____ Depth (inches): 3

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Seepage area w/ saturated soils (to surface) Parts of the wetland has 1-2" inundation. Most of wetland area has soils saturated to surface

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: _____

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. No trees			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: _____)			
1. No shrubs			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: _____)			
1. Bacopa monnieri	65		OBL
2. Hydrocotyle sp.	30		OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below).

Veg in wetland closely cropped (apparently). A few Xanthosoma are present in wetland (apparently planted)

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3	10YR 5/3	100					medium sand	
3-18	10YR 5/1	100					11	11

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Soils in area somewhat disturbed in public park

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz Mit City/County: Polk Sampling Date: 25 APR 24

Applicant/Owner: City of Lakeland State: FL Sampling Point: W09-U

Investigator(s): M. Breier, T. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:
Wetland area receives hydrologic input from reported 7 springs. Area is w/i Bonnet Springs Park

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No indicators of wetland hydrology observed

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W09U

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1. Liquidambar styraciflua	40		FAC
2. Quercus laurifolia	25		FAC
3. Melia azederach	20		UPL
4.			
5.			
6.			
7.			
8.			
	85 = Total Cover		
50% of total cover: 42.5	20% of total cover: 17		
Sapling/Shrub Stratum (Plot size:)			
1. Liquidambar styraciflua	20	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		
Herb Stratum (Plot size:)			
1. Paspalum notatum	40	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40 = Total Cover		
50% of total cover: 20	20% of total cover: 8		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (If observed, list morphological adaptations below).

Although dominance test indicates that 75% of dominant spp = FAC, not a wetland

SOIL

Sampling Point: WO9-U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/3	100					fine sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

No hydric soil indicators observed

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz. Mit. City/County: Polk Sampling Date: 26 APR 24

Applicant/Owner: City of Lakeland State: FL Sampling Point: W18-W

Investigator(s): M. Brennan, I. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): LRR U Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil _____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	Is the Sampled Area within a Wetland? Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks: Seepage area that is regularly mowed (mowers sometimes get stuck) Scattered individuals of Acer rubrum and Magnolia virginiana Data point within Bonnet Springs Park.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) (LRR U)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): _____
Water Table Present?	Yes ___	No ___	Depth (inches): 11
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Free water in soil pit. Saturated to surface

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W10-W

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: _____)			
1. Bacopa monnieri	20	Y	OBL
2. Hydrocotyle sp	25	Y	OBL
3. Ptilimnium capillaceum	10	N	OBL
4. Ludwigia peruviana	5	N	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60 = Total Cover		

50% of total cover: 30 20% of total cover: 12

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below).

>50% of dominant species are OBL

Scattered Acer rubrum & Magnolia virginiana trees present w/1 seepage area.

SOIL

Sampling Point: W10-W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1	100					muck	
16-18	10YR 6/1	100					medium sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- X Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

Data point soil pit in upslope area adj. to upland

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz Mit City/County: Polk Sampling Date: 26 APR 24

Applicant/Owner: City of Lakeland State: FL Sampling Point: W10-U

Investigator(s): M. Breiner, I. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): _____ Slope (%): 3

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	Is the Sampled Area within a Wetland? Yes _____ No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Remarks:
Upland area with Q. laurifolia, Q. nigra, Liquidambar, and Melia azedarach

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes	No X	Depth (inches): _____
Water Table Present?	Yes	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No indicators of hydrology observed

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: _____

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus nigra	15	N	FAC
2. Liquidambar styraciflua	30	Y	FAC
3. Quercus laurifolia	30	Y	FAC
4. Melia azederach	15	N	
5.			
6.			
7.			
8.			
	90	= Total Cover	
50% of total cover: 45	20% of total cover: _____		

Sapling/Shrub Stratum (Plot size: _____)			
1. Quercus laurifolia	15	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	15	= Total Cover	
50% of total cover: _____	20% of total cover: _____		

Herb Stratum (Plot size: _____)			
1. Richardia grandiflora	5		N/I
2. Emilia sonchifolia	5	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10	= Total Cover	
50% of total cover: 5	20% of total cover: _____		

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
50% of total cover: _____	20% of total cover: _____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (If observed, list morphological adaptations below).

Greater than 50% of dominant species are FAC

SOIL

Sampling Point: W10-U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/2	100					fine sand	
4->18	10YR 4/1	100					fine sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

SW of school

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz Mit City/County: Polk Sampling Date: 26 APR 24

Applicant/Owner: City of Lakeland State: FL Sampling Point: W11-W

Investigator(s): M. Breiner, I. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): LRR U Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:
Forested wetland, separated from inundated ditch by berm

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 13
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 2

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W11-W

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	65	Y	FAC
2. Triadica sebifera	30	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	95 = Total Cover		
50% of total cover: 47.5	20% of total cover: 19		

Sapling/Shrub Stratum (Plot size:)			
1. Sambucus canadensis	25	Y	FACW
2. Acer rubrum	20	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	45 = Total Cover		
50% of total cover: 22.5	20% of total cover: 9		

Herb Stratum (Plot size:)			
1. Saururus cernuus	65	Y	OBL
2. Cyclosorus interruptus	40	N	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	105 = Total Cover		
50% of total cover: 52.5	20% of total cover: 21		

Woody Vine Stratum (Plot size:)			
1. Vitis rotundifolia	15		FAC
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (If observed, list morphological adaptations below).

>50% of dominant spp are OBL, FACW, or FAC

SOIL

Sampling Point: W11-W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR2/1	100%					muck	
3-15	10YR5/1	80	10YR 2/1	20	C	M	sand, fine w/organic bodies	
15->18	7.5YR6/2	100					fine sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz Mit City/County: Polk Sampling Date: 26 APR 24

Applicant/Owner: City of Lakeland State: FL Sampling Point: W11-U

Investigator(s): M. Breiner, T. Masley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): _____

Subregion (LRR or MLRA): LRR U Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No _____	Depth (inches): _____
Water Table Present?	Yes _____	No _____	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No _____	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wetland hydrology indicators observed

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WL-U

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus nigra	50		FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1. Sabal palmetto	25		FAC
2. Prunus caroliniana	10		FACU
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size:)			
1. Lepidium	5		
2. Parthenocissus quinquefolius	5		
3. Dioscorea bulbifera	5		
4. Quercus nigra	5		FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size:)			
1. Vitis rotundifolia	15		FAC
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: W11-U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-6	10YR 4/1	100					fine sand	
6-12	10YR 3/1	100					fine sand	
12->18	10YR 6/2	100					fine sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

No hydric soil indicators observed

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz Mit City/County: Polk Sampling Date: 26 APR 24

Applicant/Owner: City of Lakeland State: FL Sampling Point: W12-W

Investigator(s): M. Breiner, T. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): _____
Water Table Present?	Yes X	No ___	Depth (inches): 17
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 6

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Saturation @ 6" BGL

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W12-W

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus laurifolia	35	Y	FAC
2. Acer rubrum	35	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	70 = Total Cover		
50% of total cover: 35	20% of total cover: 14		

Sapling/Shrub Stratum (Plot size:)			
1. Sambucus canadensis	50	Y	FACW
2. Acer rubrum	20		FAC
3. Quercus laurifolia	15		FAC
4.			
5.			
6.			
7.			
8.			
	85 = Total Cover		
50% of total cover: 42.5	20% of total cover: 17		

Herb Stratum (Plot size:)			
1. Hydrocotyle sp.	20	Y	OBL
2. Sagittaria lancifolia	20	Y	OBL
3. Sambucus canadensis	15	Y	FACW
4. Acer rubrum	15		FAC
5. Cyclosorus interruptus	10		FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		
50% of total cover: 40	20% of total cover: 16		

Woody Vine Stratum (Plot size:)			
1. None			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks: (If observed, list morphological adaptations below).

100% of dominant spp = OBL, FACW, or FAC

SOIL

Sampling Point: W12-W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1	100%					organic	loamy soil w/ mineral sand
4->18	10YR 2/1	100%					organic loamy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- X Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

10YR 2/1 soil to >18"

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz Mit City/County: Polk Sampling Date: 26 APR 24

Applicant/Owner: City of Lakeland State: _____ Sampling Point: W12-U

Investigator(s): M. Brewer, I: Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): LRR U Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of wtlnd hydrology indicators observed

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W12-U

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus laurifolia	45	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1. Schinus terebinthifolia	40	Y	
2. Sambucus canadensis	15		FACW
3.			
4.			
5.			
6.			
7.			
8.			
	55 = Total Cover		

50% of total cover: 27.5 20% of total cover: 11

Herb Stratum (Plot size:)			
1. Parietaria floridana	15	Y	FAC
2. Pouzolzia zeylandica	15		FAC
3. Parthenocissus quinquefolius	5		
4. Hydrocotyle sp.	5		
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40 = Total Cover		

50% of total cover: 20 20% of total cover: 8

Woody Vine Stratum (Plot size:)			
1. Nekemia arborea	5		
2.			
3.			
4.			
5.			
	5 = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (If observed, list morphological adaptations below).

>50% of dominant species are FAC

SOIL

Sampling Point: W12-U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-8	10YR3/1	100					fine sandy loam	
8->18	10YR2/1	100					fine sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- X Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

Soils appear to be fill material deposited when the May Manor mobile home park was established

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz Mit City/County: Polk Sampling Date: 27 APR 24

Applicant/Owner: City of Lakeland State: FL Sampling Point: W13-W

Investigator(s): M. Breiler, I. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): convex Slope (%): 0

Subregion (LRR or MLRA): LRRU Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No _____ Hydric Soil Present? Yes _____ No _____ Wetland Hydrology Present? Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): —

Water Table Present? Yes X No ___ Depth (inches): 18

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): 12

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W13-W

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	25	Y	FAC
2. Quercus laurifolia	20		FAC
3.			
4.			
5.			
6.			
7.			
8.			
	45 = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1. Quercus laurifolia	15	Y	FAC
2. Acer rubrum	10		FAC
3.			
4.			
5.			
6.			
7.			
8.			
	25 = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size:)			
1. Ptilimnium capillaceum	50	Y	OBL
2. Hydrocotyle sp	25	Y	OBL
3. Ampelopsis arborea	20		FAC
4. Mikania scandens	15		FACW
5. Polygonum punctatum	5		OBL
6. Pluchea odorata	10		FACW
7.			
8.			
9.			
10.			
11.			
12.			
	125 = Total Cover		

50% of total cover: 62.5 20% of total cover: 25

Woody Vine Stratum (Plot size:)			
1. Ampelopsis arborea	10	Y	FAC
2.			
3.			
4.			
5.			
	10 = Total Cover		

50% of total cover: 5 20% of total cover: 2

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No _____

Polygonum = Persicaria Ampelopsis = Nekemias

Remarks: (If observed, list morphological adaptations below).

100% of dominant spp = OBL, FACW, or FAC

SOIL

Sampling Point: W13-W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0->18	10YR 2/1	100					organic rich loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: _____ City/County: Polk Sampling Date: 27 APR 24

Applicant/Owner: City of Lakeland State: _____ Sampling Point: W13-U

Investigator(s): M. Breiner, I. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Upland data point on berm separating wetland from creek channel.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No _____	Depth (inches): _____
Water Table Present?	Yes _____	No _____	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No _____	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of Wetland Hydrology observed

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: _____

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus laurifolia	25		FAC
2. Sabal palmetto	15		FAC
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Sapling/Shrub Stratum (Plot size: _____)			
1. Quercus laurifolia			FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Herb Stratum (Plot size: _____)			
1. Eustachys petraea	45		
2. Ambrosia artem	25		
3. Eupatorium cap.	10		
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Woody Vine Stratum (Plot size: _____)			
1. —			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: W13-U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/2	100					medium sand	
4-8	10YR 3/1	100					loamy sand	
8-13	10YR 6/2	70	10YR 2/1	30	C	M	loamy clay sand w/organic sand	
13->18	10YR 4/2	100					medium sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

No hydric soil indicators observed

Various size limerock fragments observed throughout the soil profile

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: _____ City/County: _____ Sampling Date: 27 APR 24

Applicant/Owner: _____ State: _____ Sampling Point: WP14-W

Investigator(s): _____ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

Photo 171 : sample pit
172 : veg

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 2
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WL4-W

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	65		FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1. Sambucus canadensis	50		FACW
2. Acer rubrum	15		FAC
3. Ludwigia peruviana	15		OBL
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size:)			
1. Colocasia	15		FACW
2. Apios	15		FACW
3. Sambucus	15		FACW
4. Cyclosorus	25		FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

__ 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (If observed, list morphological adaptations below).

Acer. rub., Sambucus, Cyclosorus int., Apios

SOIL

Sampling Point: WIH-W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1	100					muck	
4-9	10YR 4/1						medium to fine sand	
9-18	10YR 3/1						sandy fibrist peat	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- X Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

173+174

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: _____ City/County: Polk Sampling Date: 27 APR 24

Applicant/Owner: _____ State: FL Sampling Point: W14-U

Investigator(s): M. Breiner, I. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____ No _____	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) (LRR U)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of wetland hydrology observed

W14-U

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: _____

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Broussonettia papyrifera	45		FACU
2. Schinus terebinthifolia	20		FAC
3. Quercus laurifolia	15		FAC
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: _____)			
1. Brossonettia papyrifera	20		FACU
2. Schinus terebinthifolia	20		FAC
3. Sambucus canadensis	10		FACW
4. Prunus carolinana	10		FACU
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: _____)			
1. Bidens alba	35		FAC
2. Ambrosia artemisiifolia	15		
3. Cyclosorus int.	10		FAC
4. Broussonettia papyrifera	10		
5. Clematis	5		
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: W14-U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3	10YR4/1	100					medium fine sand	
3->15	10YR5/2	50					medium sand w/ lithic fragments	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rocks & gravel

Depth (inches): 15

Hydric Soil Present? Yes ___ No X

Remarks:

Medium to fine sand w/ numerous rock fragments of various sizes prevented further excavation @ 15". This is on slope of road (N. Bronnel Pkwy)

NW side of L. Bonnet, adj. to W

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz City/County: Polk Sampling Date: 25 MAR 24

Applicant/Owner: City of Lakeland State: FL Sampling Point: ~~WDS~~ W

Investigator(s): M. Breina, J. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- X Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 1"
Water Table Present?	Yes X	No _____	Depth (inches): 2
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

15

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WA9-W

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	25		FAC
2. Salix caroliniana	40		OBL
3. Quercus laurifolia	15		FAC
4.			
5.			
6.			
7.			
8.			
	80 = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: _____)			
1. Salix caroliniana	20		OBL
2. Sambucus canadensis	15		FACW
3.			
4.			
5.			
6.			
7.			
8.			
	35 = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: _____)			
1. Cyclosorus interruptus	30		FACW
2. Colocasia esculentus	20		FACW
3. Hydrocotyle sp.	15		FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	65 = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (If observed, list morphological adaptations below).

>50% of dominant spp. = OBL, FACW, or FAC

SOIL

Sampling Point: 15 WP-W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-8	10YR2/2	100					fibrist	muck
8->18	10YR2/1	100					muck	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- X Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

organic soil present

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Lake Bonnet Flood Haz City/County: Polk Sampling Date: 25 APR 24

Applicant/Owner: City of Lakeland State: FL Sampling Point: W09-U

Investigator(s): M. Breiner, I. Mosley Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Upland data point between wetland W09-W and paved road on shoulder

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wtlnd hydro indicators obsrvd

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 15 WDF-U

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Schinus terebinthifolia	30	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		
Sapling/Shrub Stratum (Plot size:)			
1. Schinus terebinthifolia	15	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	15 = Total Cover		
50% of total cover:	20% of total cover: 3		
Herb Stratum (Plot size:)			
1. Bidens alba	10	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (If observed, list morphological adaptations below).

100% of dominant spp are FAC

15

SOIL

Sampling Point: WP-U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0->18	10YR 4/4	100					medium sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

No hydric soil indicators observed

Photo 1 of 26	
Description / Comments: Wetland 01 (W01) wetland soil sample pit.	
Photo 2 of 26 **Description / Comments:** Wetland 01 (W01) upland soil sample pit.	

Photo 3 of 26 **Description / Comments:** Wetland 02 (W02) wetland soil sample pit.	
Photo 4 of 26 **Description / Comments:** Wetland 02 (W02) upland soil sample pit.	

Photo 5 of 26 **Description / Comments:** Wetland 03 (W03) wetland soil sample pit.	
Photo 6 of 26 **Description / Comments:** Wetland 03 (W03) upland soil sample pit.	

Photo 7 of 26 **Description / Comments:** Wetland 04 (W04) wetland soil sample pit.	
Photo 8 of 26 **Description / Comments:** Wetland 04 (W04) upland soil sample pit.	

Photo 9 of 26 **Description / Comments:** Wetland 05 (W05) wetland soil sample pit.	
Photo 10 of 26 **Description / Comments:** Wetland 05 (W05) upland soil sample pit.	

Photo 11 of 26 **Description / Comments:** Wetland 07 (W07) wetland soil sample pit.	
Photo 12 of 26 **Description / Comments:** Wetland 07 (W07) upland soil sample pit.	

Photo 13 of 26 **Description / Comments:** Wetland 08 (W08) upland soil sample pit.	
Photo 14 of 26 **Description / Comments:** Wetland 08 (W08) additional wetland soil sample pit.	

Photo 15 of 26 **Description / Comments:** Wetland 09 (W09) wetland soil sample pit.	
Photo 16 of 26 **Description / Comments:** Wetland 09 (W09) upland soil sample pit.	

Photo 17 of 26 **Description / Comments:** Wetland 10 (W10) wetland soil sample pit.	
Photo 18 of 26 **Description / Comments:** Wetland 10 (W10) upland soil sample pit.	

Photo 19 of 26 **Description / Comments:** Wetland 11 (W11) wetland soil sample pit.	
Photo 20 of 26 **Description / Comments:** Wetland 11 (W11) upland soil sample pit.	

Photo 21 of 26 **Description / Comments:** Wetland 12 (W12) wetland soil sample pit.	
Photo 22 of 26 **Description / Comments:** Wetland 12 (W12) upland soil sample pit.	

Photo 23 of 26 **Description / Comments:** Wetland 13 (W13) wetland soil sample pit.	
Photo 24 of 26 **Description / Comments:** Wetland 13 (W13) upland soil sample pit.	

Photo 25 of 26 **Description / Comments:** Wetland 14 (W14) wetland soil sample pit.	
Photo 26 of 26 **Description / Comments:** Wetland 14 (W14) upland soil sample pit.	

APPENDIX C: PHOTOGRAPHIC LOG

Appendix C – Photographic Log

Photo 1 of 24 **Description / Comments:** Facing west, view of Wetland 01 (W01) adjacent to soil sample pit location.	
Photo 2 of 24 **Description / Comments:** Facing northwest, view of Wetland 02 (W02) adjacent to soil sample pit location.	

Photo 3 of 24 **Description / Comments:** Facing east, view of Wetland 03 (W03) adjacent to soil sample pit location.	
Photo 4 of 24 **Description / Comments:** Facing west, view of Wetland 04 (W04) adjacent to soil sample pit location.	

Photo 5 of 24 **Description / Comments:** Facing south, view of Wetland 05 (W05) adjacent to soil sample pit location.	
Photo 6 of 24 **Description / Comments:** Facing east, view of Wetland 06 (W06) adjacent to soil sample pit location.	

Photo 7 of 24 **Description / Comments:** Facing east, view of Wetland 07 (W07) adjacent to soil sample pit location.	
Photo 8 of 24 **Description / Comments:** Facing south, view of Wetland 08 (W08) adjacent to soil sample pit location.	

Photo 9 of 24 **Description / Comments:** Facing south, view of Wetland 08 (W08) adjacent to soil sample pit location.	
Photo 10 of 24 **Description / Comments:** Facing east, view of Wetland 12 (W12) adjacent to soil sample pit location.	

Photo 11 of 24 **Description / Comments:** Facing east, view of Wetland 13 (W13) adjacent to soil sample pit location.	
Photo 12 of 24 **Description / Comments:** Facing east, view of Wetland 14 (W14) adjacent to soil sample pit location.	

Photo 13 of 24 **Description / Comments:** View of channelized watercourse C02	
Photo 14 of 24 **Description / Comments:** View of channelized watercourse C02.	

Photo 15 of 24 **Description / Comments:** View of Lake 01 at Lone Palm Golf Club.	
Photo 16 of 24 **Description / Comments:** View of weir separating Lake 01 from Lake 02 at Lone Palm Golf Club.	

Photo 17 of 24 **Description / Comments:** Stormwater retention pond within Publix property adjacent to C02.	
Photo 18 of 24 **Description / Comments:** Stormwater retention pond within Publix property.	

Photo 19 of 24 **Description / Comments:** Stormwater conveyance feature within Publix property.	
Photo 20 of 24 **Description / Comments:** Stormwater retention pond within Publix property.	

Photo 21 of 24

Description / Comments:

Bald eagle (left) roseate spoonbill (right) at Lone Palm Golf Club.

Photo 22 of 24

Description / Comments:

Great blue heron at Lone Palm Golf Club.

Photo 23 of 24 **Description / Comments:** Aerial view of Island 02 (wood stork, ibis, and roseate spoonbill rookery).	
Photo 24 of 24 **Description / Comments:** Ground view of Island 02 (wood stork, ibis, and roseate spoonbill rookery).	

APPENDIX D: FNAI REPORT

Florida
Natural Areas
Inventory

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
850-224-8207
fax 850-681-9364
www.fnai.org

February 22, 2024

Michael Breiner
AECOM Technical Services, Inc.
2 Alhambra Plaza, Suite 900
Coral Gables, FL 33134

Dear Mr. Breiner,

Thank you for requesting information from the Florida Natural Areas Inventory (FNAI). At your request we have produced the following report for your project area.

The purpose of this Standard Data Report is to provide objective scientific information on natural resources located in the vicinity of a site of interest, in order to inform those involved in project planning and evaluation. This Report makes no determination of the suitability of a proposed project for this location, or the potential impacts of the project on natural resources in the area.

Project: Lake Bonnet MT047 Project

Date Received: 2/19/2024

Location: Polk County

Element Occurrences

A search of our maps and database indicates that we currently have several element occurrences mapped in the vicinity of the study area (see enclosed map and element occurrence table). Please be advised that a lack of element occurrences in the FNAI database is not a sufficient indication of the absence of rare or endangered species on a site.

The element occurrences data layer includes occurrences of rare species and natural communities. The map legend indicates that some element occurrences occur in the general vicinity of the label point. This may be due to lack of precision of the source data, or an element that occurs over an extended area (such as a wide ranging species or large natural community). For animals and plants, element occurrences generally refer to more than a casual sighting; they usually indicate a viable population of the species. Note that some element occurrences represent historically documented observations which may no longer be extant. Extirpated element occurrences will be marked with an 'X' following the occurrence label on the enclosed map.

Likely and Potential Rare Species

In addition to documented occurrences, other rare species and natural communities may be identified on or near the site based on habitat models and species range models (see enclosed Biodiversity Matrix Report). These species should be taken into consideration in field surveys, land management, and impact avoidance and mitigation.

FNAI habitat models indicate areas, which based on land cover type, offer suitable habitat for one or more rare species that is known to occur in the vicinity. Habitat models have been developed for approximately 300 of the rarest species tracked by the Inventory, including all federally listed species.

Florida Resources
and Environmental
Analysis Center

Institute of Science
and Public Affairs

The Florida State University

FNAI species range models indicate areas that are within the known or predicted range of a species, based on climate variables, soils, vegetation, and/or slope. Species range models have been developed for approximately 340 species, including all federally listed species.

The FNAI Biodiversity Matrix Geodatabase compiles Documented, Likely, and Potential species and natural communities for each square mile Matrix Unit statewide.

CLIP

The enclosed map shows natural resource conservation priorities based on the Critical Lands and Waters Identification Project. CLIP is based on many of the same natural resource data developed for the Florida Forever Conservation Needs Assessment, but provides an overall picture of conservation priorities across different resource categories, including biodiversity, landscapes, surface waters, and aggregated CLIP priorities (that combine the individual resource categories). CLIP is also based primarily on remote sensed data and is not intended to be the definitive authority on natural resources on a site.

For more information on CLIP, visit https://www.fnai.org/services/clip.

The Inventory always recommends that professionals familiar with Florida's flora and fauna conduct a site-specific survey to determine the current presence or absence of rare, threatened, or endangered species.

Please visit www.fnai.org/species-communities/tracking-main for county or statewide element occurrence distributions and links to more element information.

The database maintained by the Florida Natural Areas Inventory is the single most comprehensive source of information available on the locations of rare species and other significant ecological resources. However, the data are not always based on comprehensive or site-specific field surveys. Therefore this information should not be regarded as a final statement on the biological resources of the site being considered, nor should it be substituted for on-site surveys. Inventory data are designed for the purposes of conservation planning and scientific research, and are not intended for use as the primary criteria for regulatory decisions.

Information provided by this database may not be published without prior written notification to the Florida Natural Areas Inventory, and the Inventory must be credited as an information source in these publications. **The maps contain sensitive environmental information, please do not distribute or publish without prior consent from FNAI.** FNAI data may not be resold for profit.

Thank you for your use of FNAI services. An invoice will be mailed separately. If I can be of further assistance, please contact me at (850) 224-8207 or at kbrinegar@fnai.fsu.edu.

Sincerely,

Kerri Brinegar

Kerri Brinegar
GIS / Data Services

Encl

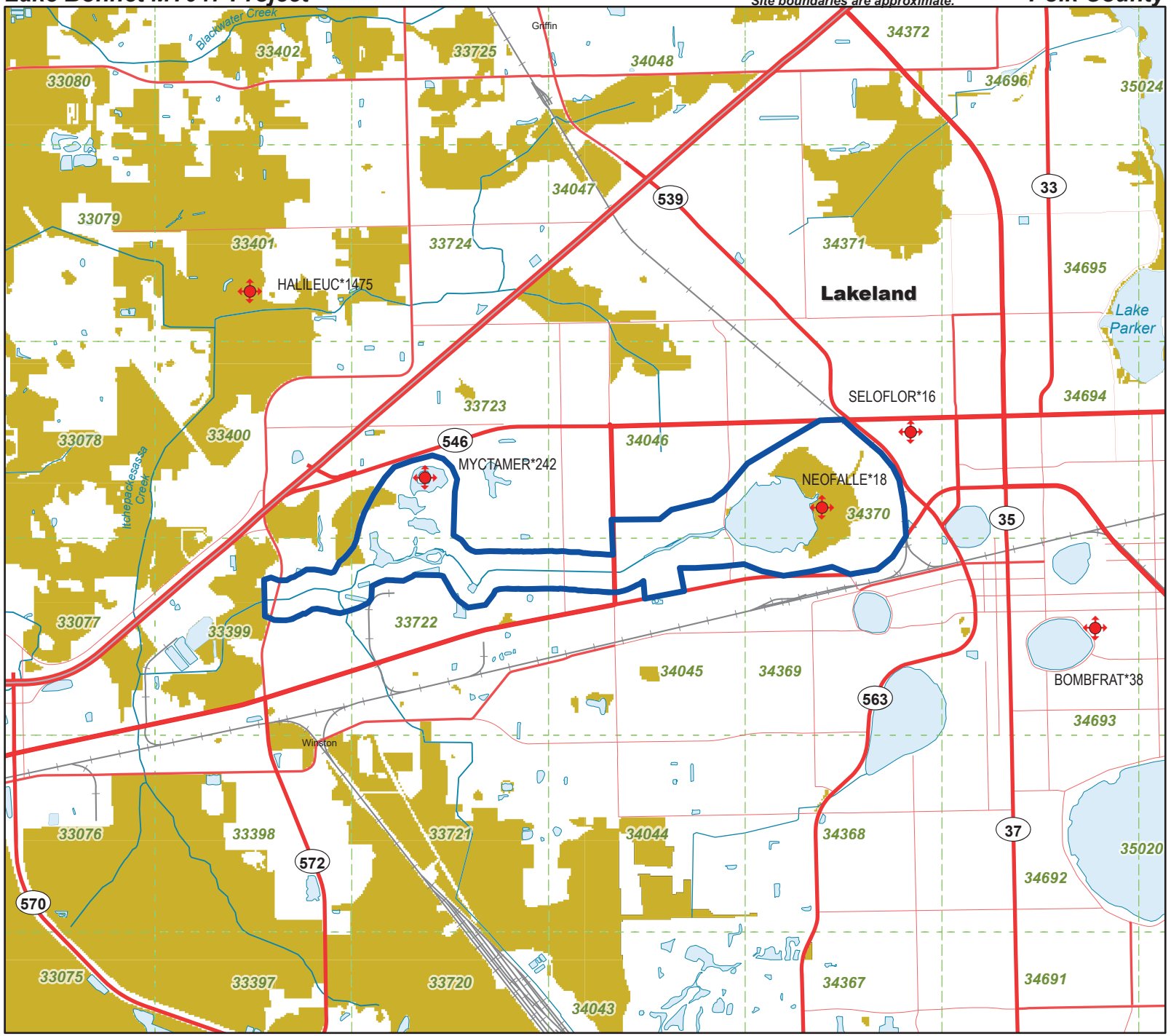
Lake Bonnet MT047 Project

Site boundaries are approximate.

Polk County

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
(850) 224-8207
www.fnai.org

Florida Natural Areas Inventory



Element Occurrences

- Animals
- Plants
- Communities
- Other
- Data Sensitive

Point Indicates General Vicinity of Element

Conservation Lands

- Federal
- State
- Local
- Private
- State Aquatic Preserves

N

Land Acquisition Projects

- Florida Forever Board of Trustees Projects

- FNAI Rare Species Habitat
- FNAI Biodiversity Matrix Square Mile Units

- County Boundary
- Roads
- Water

NOTE

This map contains environmentally sensitive information. Please do not distribute or publish without prior consent from FNAI. Map should not be interpreted without accompanying documents.

Map produced by KAB
2/22/2024

Lake Bonnet MT047 Project

Site boundaries are approximate.

Polk County

Florida Natural Areas Inventory

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
(850) 224-8207
www.fnai.org

CLIP v4.0 Resource Priorities

Biodiversity Resource Category

- Priority 1 - highest
- Priority 2
- Priority 3
- Priority 4
- Priority 5

Landscape Resource Category

- Priority 1 - highest
- Priority 2
- Priority 3
- Priority 4
- Priority 5

Surface Water Resource Category

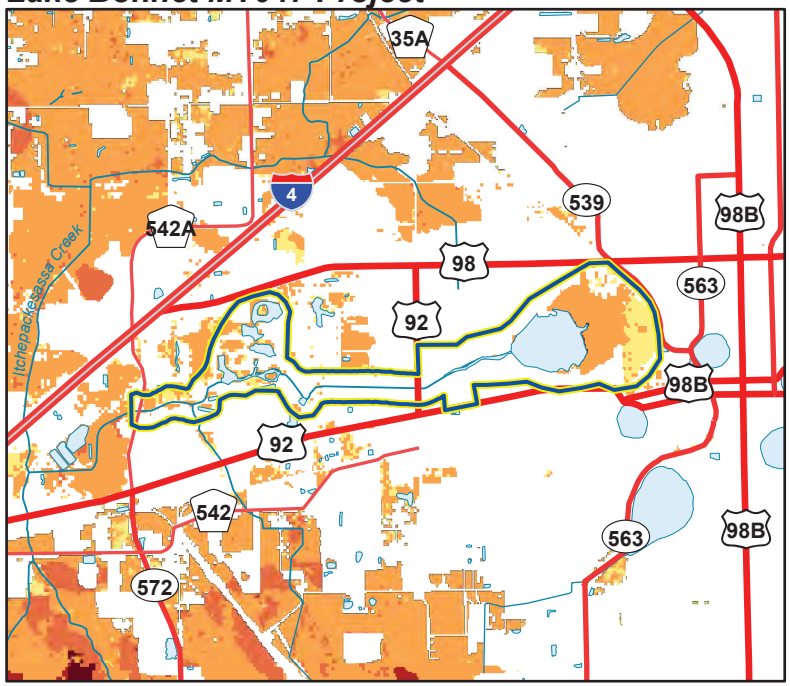
- Priority 1 - highest
- Priority 2
- Priority 3
- Priority 4
- Priority 5

Aggregated CLIP Priorities

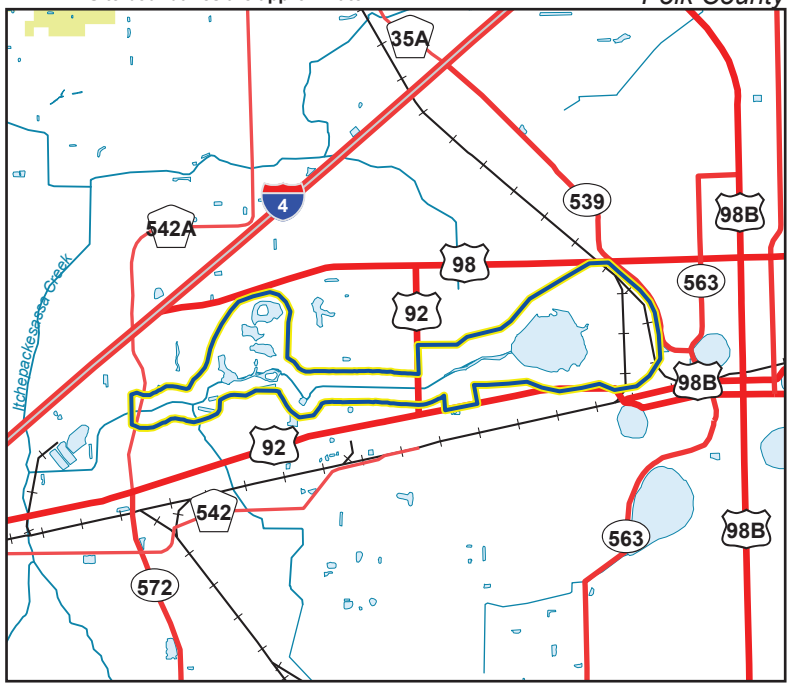
- Priority 1 - highest
- Priority 2
- Priority 3
- Priority 4
- Priority 5
- Site Boundary

Map should not be interpreted without accompanying documents.

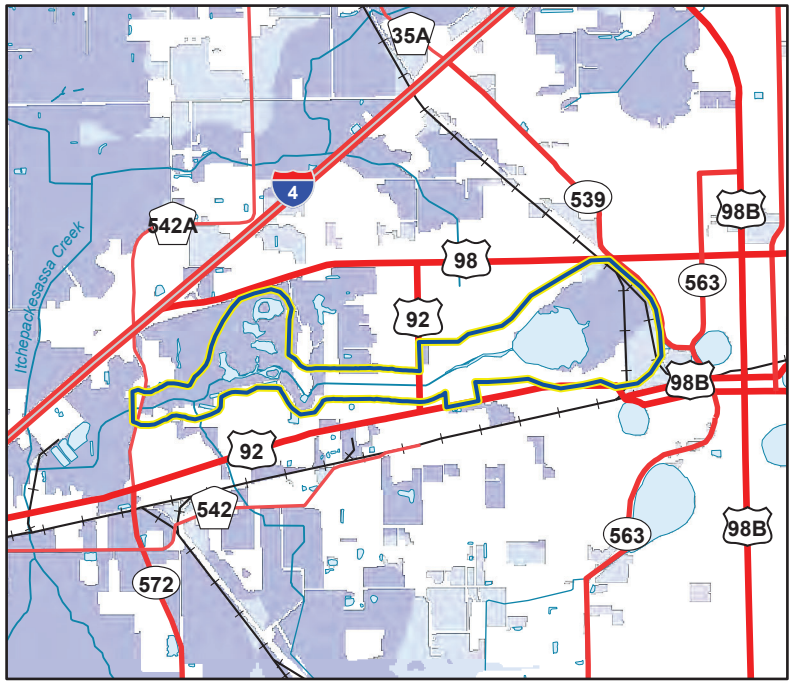
Critical Lands and Waters Identification Project (CLIP) is a cooperative effort between the FSU Florida Natural Areas Inventory, UF Center for Landscape Conservation Planning, and FL Fish & Wildlife Conservation Commission, with additional funding from FL Dept of Environmental Protection and US Fish & Wildlife Service.



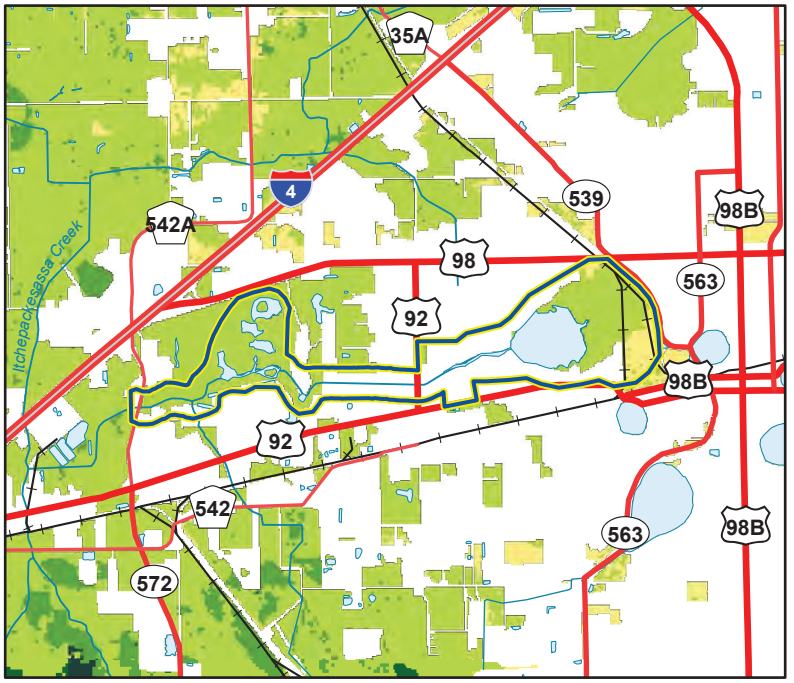
CLIP Biodiversity Resource Priorities



CLIP Landscape Resource Priorities



CLIP Surface Water Resource Priorities



CLIP Aggregated Resource Priorities

0 0.5 1 2 3 4 Miles

Map produced by KAB
2/22/2024

Florida Natural Areas Inventory
1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
(850) 224-8207
www.fnai.org

FNAI ELEMENT OCCURRENCE REPORT on or near

Lake Bonnet MT047 Project

Map Label	Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Listing	Observation Date	Description	EO Comments
BOMBFRAT*38	*Bombus fraternus*	Southern Plains Bumble Bee	G3G4	S3	N	N	1912-03-28	none given	specimen collected
HALILEUC*1475	*Haliaeetus leucocephalus*	Bald Eagle	G5	S3	N	N	2003	2005-07-12: Source does not provide a description.	Nest status: Active, 2003, 2002, 2001, 2000, 1999;(U03FWC01FLUS)
MYCTAMER*242	*Mycteria americana*	Wood Stork	G4	S2	DL	FT	2010	No general description given	Colony active for 6 years (2003-2006 and 2009-2010) with a maximum of 175 nests in 2003 (U11TSA01FLUS). Spreadsheet in U11TSA01FLUS gives number of nests by year.
NEOFALLE*18	*Neofiber alleni*	Round-tailed Muskrat	G2	S2	N	N	1970-11-09	None given	One specimen (UF #10188) collected (S70LEESMFLUS)
SELOFLOR*16	*Selonodon floridensis*	Florida Cebrionid Beetle	G2G4	S2S4	N	N	1942-05-30	1942-05-30: No description given (B99GAL01FLUS).	1942-05-30: Five specimens were collected on this date. There in an undated record for two more specimens (B99GAL01FLUS).

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
(850) 224-8207
www.fnai.org

Florida Natural Areas Inventory

Florida Natural Areas Inventory

Biodiversity Matrix Report

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Listing
Matrix Unit ID: 33399					
Likely					
Antigone canadensis pratensis	Florida Sandhill Crane	G5T2	S2	N	ST
Mustela frenata peninsulae	Florida Long-tailed Weasel	G5T3?	S3?	N	N
Mycteria americana	Wood Stork	G4	S2	DL	FT
Potential					
Athene cunicularia floridana	Florida Burrowing Owl	G4T3	S3	N	ST
Bombus fraternus	Southern Plains Bumble Bee	G3G4	S3	N	N
Bonamia grandiflora	Florida bonamia	G3	S3	T	E
Calopogon multiflorus	many-flowered grass-pink	G2G3	S2S3	N	T
Carex chapmanii	Chapman's sedge	G3	S3	N	T
Centrosema arenicola	sand butterfly pea	G2Q	S2	N	E
Clinopodium ashei	Ashe's savory	G3	S3	N	T
Coleataenia abscissa	cutthroatgrass	G3	S3	N	E
Drymarchon couperi	Eastern Indigo Snake	G3	S2?	T	FT
Dryobates borealis	Red-cockaded Woodpecker	G3	S2	E, PT	FE
Eriogonum floridanum	scrub buckwheat	G4T3	S3	T	E
Gopherus polyphemus	Gopher Tortoise	G3	S3	N	ST
Gymnopogon chapmanianus	Chapman's skeletongrass	G3	S3	N	N
Lechea cernua	nodding pinweed	G3	S3	N	T
Lithobates capito	Gopher Frog	G2G3	S3	UR	N
Matelea floridana	Florida spiny-pod	G2	S2	N	E
Nemastylis floridana	celestial lily	G3	S3	N	E
Neofiber alleni	Round-tailed Muskrat	G2	S2	N	N
Nolina brittoniana	Britton's beargrass	G3	S3	E	E
Paronychia chartacea	paper nailwort	G3	S3	T	E
Peucaea aestivalis	Bachman's Sparrow	G3	S3	N	N
Podomys floridanus	Florida Mouse	G3	S3	N	N
Polygala lewtonii	Lewton's polygala	G2	S2	E	E
Rostrhamus sociabilis	Snail Kite	G4G5	S2	E	FE
Salix floridana	Florida willow	G2G3	S2S3	UR	E
Sciurus niger niger	Southeastern Fox Squirrel	G5T5	S3	N	N
Selonodon floridensis	Florida Cebrionid Beetle	G2G4	S2S4	N	N
Zephyranthes simpsonii	redmargin zephyrlily	G2G3	S2S3	N	T
Matrix Unit ID: 33722					
Likely					
Antigone canadensis pratensis	Florida Sandhill Crane	G5T2	S2	N	ST
Mustela frenata peninsulae	Florida Long-tailed Weasel	G5T3?	S3?	N	N
Mycteria americana	Wood Stork	G4	S2	DL	FT
Potential					
Athene cunicularia floridana	Florida Burrowing Owl	G4T3	S3	N	ST
Bombus fraternus	Southern Plains Bumble Bee	G3G4	S3	N	N
Bonamia grandiflora	Florida bonamia	G3	S3	T	E
Calopogon multiflorus	many-flowered grass-pink	G2G3	S2S3	N	T
Carex chapmanii	Chapman's sedge	G3	S3	N	T

Definitions: *Documented - Rare species and natural communities documented on or near this site.*
Documented-Historic - Rare species and natural communities documented, but not observed/reported within the last twenty years.
Likely - Rare species and natural communities likely to occur on this site based on suitable habitat and/or known occurrences in the vicinity.
Potential - This site lies within the known or predicted range of the species listed.

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
(850) 224-8207
www.fnai.org

Florida Natural Areas Inventory

Florida Natural Areas Inventory

Biodiversity Matrix Report

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Listing
Centrosema arenicola	sand butterfly pea	G2Q	S2	N	E
Clinopodium ashei	Ashe's savory	G3	S3	N	T
Coleataenia abscissa	cutthroatgrass	G3	S3	N	E
Drymarchon couperi	Eastern Indigo Snake	G3	S2?	T	FT
Dryobates borealis	Red-cockaded Woodpecker	G3	S2	E, PT	FE
Eriogonum floridanum	scrub buckwheat	G4T3	S3	T	E
Gopherus polyphemus	Gopher Tortoise	G3	S3	N	ST
Gymnopogon chapmanianus	Chapman's skeletongrass	G3	S3	N	N
Lechea cernua	nodding pinweed	G3	S3	N	T
Lithobates capito	Gopher Frog	G2G3	S3	UR	N
Matelea floridana	Florida spiny-pod	G2	S2	N	E
Nemastylis floridana	celestial lily	G3	S3	N	E
Neofiber alleni	Round-tailed Muskrat	G2	S2	N	N
Nolina brittoniana	Britton's beargrass	G3	S3	E	E
Paronychia chartacea	paper nailwort	G3	S3	T	E
Peucaea aestivalis	Bachman's Sparrow	G3	S3	N	N
Plestiodon egregius lividus	Blue-tailed Mole Skink	G5T2	S2	T	FT
Podomys floridanus	Florida Mouse	G3	S3	N	N
Polygala lewtonii	Lewton's polygala	G2	S2	E	E
Rostrhamus sociabilis	Snail Kite	G4G5	S2	E	FE
Salix floridana	Florida willow	G2G3	S2S3	UR	E
Sciurus niger niger	Southeastern Fox Squirrel	G5T5	S3	N	N
Selonodon floridensis	Florida Cebrionid Beetle	G2G4	S2S4	N	N
Ursus americanus floridanus	Florida Black Bear	G5T4	S4	N	N
Zephyranthes simpsonii	redmargin zephyrlily	G2G3	S2S3	N	T

Matrix Unit ID: 33723

Documented

Mycteria americana	Wood Stork	G4	S2	DL	FT

Likely

Mustela frenata peninsulae	Florida Long-tailed Weasel	G5T3?	S3?	N	N

Potential

Antigone canadensis pratensis	Florida Sandhill Crane	G5T2	S2	N	ST
Athene cunicularia floridana	Florida Burrowing Owl	G4T3	S3	N	ST
Bombus fraternus	Southern Plains Bumble Bee	G3G4	S3	N	N
Bonamia grandiflora	Florida bonamia	G3	S3	T	E
Calopogon multiflorus	many-flowered grass-pink	G2G3	S2S3	N	T
Carex chapmanii	Chapman's sedge	G3	S3	N	T
Centrosema arenicola	sand butterfly pea	G2Q	S2	N	E
Chionanthus pygmaeus	pygmy fringe tree	G2G3	S2S3	E	E
Clinopodium ashei	Ashe's savory	G3	S3	N	T
Coleataenia abscissa	cutthroatgrass	G3	S3	N	E
Drymarchon couperi	Eastern Indigo Snake	G3	S2?	T	FT
Dryobates borealis	Red-cockaded Woodpecker	G3	S2	E, PT	FE
Eriogonum floridanum	scrub buckwheat	G4T3	S3	T	E
Gopherus polyphemus	Gopher Tortoise	G3	S3	N	ST
Gymnopogon chapmanianus	Chapman's skeletongrass	G3	S3	N	N

Definitions: *Documented - Rare species and natural communities documented on or near this site.*
Documented-Historic - Rare species and natural communities documented, but not observed/reported within the last twenty years.
Likely - Rare species and natural communities likely to occur on this site based on suitable habitat and/or known occurrences in the vicinity.
Potential - This site lies within the known or predicted range of the species listed.

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
(850) 224-8207
www.fnai.org

Florida Natural Areas Inventory

Florida Natural Areas Inventory

Biodiversity Matrix Report

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Listing
Lechea cernua	nodding pinweed	G3	S3	N	T
Lithobates capito	Gopher Frog	G2G3	S3	UR	N
Matelea floridana	Florida spiny-pod	G2	S2	N	E
Nemastylis floridana	celestial lily	G3	S3	N	E
Neofiber alleni	Round-tailed Muskrat	G2	S2	N	N
Nolina atopocarpa	Florida beargrass	G3	S3	N	T
Nolina brittoniana	Britton's beargrass	G3	S3	E	E
Paronychia chartacea	paper nailwort	G3	S3	T	E
Plestiodon egregius lividus	Blue-tailed Mole Skink	G5T2	S2	T	FT
Podomys floridanus	Florida Mouse	G3	S3	N	N
Polygala lewtonii	Lewton's polygala	G2	S2	E	E
Polygonella basiramia	Florida jointweed	G3	S3	E	E
Rostrhamus sociabilis	Snail Kite	G4G5	S2	E	FE
Salix floridana	Florida willow	G2G3	S2S3	UR	E
Sciurus niger niger	Southeastern Fox Squirrel	G5T5	S3	N	N
Selonodon floridensis	Florida Cebrionid Beetle	G2G4	S2S4	N	N
Ursus americanus floridanus	Florida Black Bear	G5T4	S4	N	N
Warea carteri	Carter's warea	G1	S1	E	E
Zephyranthes simpsonii	redmargin zephyrlily	G2G3	S2S3	N	T

Matrix Unit ID: 34045

Likely

Antigone canadensis pratensis	Florida Sandhill Crane	G5T2	S2	N	ST
Mycteria americana	Wood Stork	G4	S2	DL	FT
Sandhill upland lake		G3	S2	N	N

Potential

Athene cunicularia floridana	Florida Burrowing Owl	G4T3	S3	N	ST
Bombus fraternus	Southern Plains Bumble Bee	G3G4	S3	N	N
Bonamia grandiflora	Florida bonamia	G3	S3	T	E
Calopogon multiflorus	many-flowered grass-pink	G2G3	S2S3	N	T
Carex chapmanii	Chapman's sedge	G3	S3	N	T
Centrosema arenicola	sand butterfly pea	G2Q	S2	N	E
Chionanthus pygmaeus	pygmy fringe tree	G2G3	S2S3	E	E
Clinopodium ashei	Ashe's savory	G3	S3	N	T
Coleataenia abscissa	cutthroatgrass	G3	S3	N	E
Drymarchon couperi	Eastern Indigo Snake	G3	S2?	T	FT
Dryobates borealis	Red-cockaded Woodpecker	G3	S2	E, PT	FE
Eriogonum floridanum	scrub buckwheat	G4T3	S3	T	E
Gopherus polyphemus	Gopher Tortoise	G3	S3	N	ST
Gymnopogon chapmanianus	Chapman's skeletongrass	G3	S3	N	N
Lechea cernua	nodding pinweed	G3	S3	N	T
Lithobates capito	Gopher Frog	G2G3	S3	UR	N
Matelea floridana	Florida spiny-pod	G2	S2	N	E
Mustela frenata peninsulae	Florida Long-tailed Weasel	G5T3?	S3?	N	N
Nemastylis floridana	celestial lily	G3	S3	N	E
Neofiber alleni	Round-tailed Muskrat	G2	S2	N	N
Nolina atopocarpa	Florida beargrass	G3	S3	N	T
Nolina brittoniana	Britton's beargrass	G3	S3	E	E

Definitions: *Documented - Rare species and natural communities documented on or near this site.*
Documented-Historic - Rare species and natural communities documented, but not observed/reported within the last twenty years.
Likely - Rare species and natural communities likely to occur on this site based on suitable habitat and/or known occurrences in the vicinity.
Potential - This site lies within the known or predicted range of the species listed.

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
(850) 224-8207
www.fnai.org

Florida Natural Areas Inventory

Florida Natural Areas Inventory

Biodiversity Matrix Report

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Listing
Paronychia chartacea	paper nailwort	G3	S3	T	E
Peucaea aestivalis	Bachman's Sparrow	G3	S3	N	N
Plestiodon egregius lividus	Blue-tailed Mole Skink	G5T2	S2	T	FT
Podomys floridanus	Florida Mouse	G3	S3	N	N
Polygala lewtonii	Lewton's polygala	G2	S2	E	E
Polygonella basiramia	Florida jointweed	G3	S3	E	E
Rostrhamus sociabilis	Snail Kite	G4G5	S2	E	FE
Salix floridana	Florida willow	G2G3	S2S3	UR	E
Sciurus niger niger	Southeastern Fox Squirrel	G5T5	S3	N	N
Selonodon floridensis	Florida Cebrionid Beetle	G2G4	S2S4	N	N
Ursus americanus floridanus	Florida Black Bear	G5T4	S4	N	N
Warea carteri	Carter's warea	G1	S1	E	E
Zephyranthes simpsonii	redmargin zephyrlily	G2G3	S2S3	N	T
Matrix Unit ID: 34046					
Likely					
Antigone canadensis pratensis	Florida Sandhill Crane	G5T2	S2	N	ST
Mustela frenata peninsulae	Florida Long-tailed Weasel	G5T3?	S3?	N	N
Mycteria americana	Wood Stork	G4	S2	DL	FT
Sandhill upland lake		G3	S2	N	N
Potential					
Athene cunicularia floridana	Florida Burrowing Owl	G4T3	S3	N	ST
Bombus fraternus	Southern Plains Bumble Bee	G3G4	S3	N	N
Bonamia grandiflora	Florida bonamia	G3	S3	T	E
Calopogon multiflorus	many-flowered grass-pink	G2G3	S2S3	N	T
Carex chapmanii	Chapman's sedge	G3	S3	N	T
Centrosema arenicola	sand butterfly pea	G2Q	S2	N	E
Chionanthus pygmaeus	pygmy fringe tree	G2G3	S2S3	E	E
Clinopodium ashei	Ashe's savory	G3	S3	N	T
Coleataenia abscissa	cutthroatgrass	G3	S3	N	E
Drymarchon couperi	Eastern Indigo Snake	G3	S2?	T	FT
Dryobates borealis	Red-cockaded Woodpecker	G3	S2	E, PT	FE
Eriogonum floridanum	scrub buckwheat	G4T3	S3	T	E
Gopherus polyphemus	Gopher Tortoise	G3	S3	N	ST
Gymnopogon chapmanianus	Chapman's skeletongrass	G3	S3	N	N
Heterodon simus	Southern Hognose Snake	G2	S2S3	N	N
Lechea cernua	nodding pinweed	G3	S3	N	T
Lithobates capito	Gopher Frog	G2G3	S3	UR	N
Matelea floridana	Florida spiny-pod	G2	S2	N	E
Nemastylis floridana	celestial lily	G3	S3	N	E
Neofiber alleni	Round-tailed Muskrat	G2	S2	N	N
Nolina atopocarpa	Florida beargrass	G3	S3	N	T
Nolina brittoniana	Britton's beargrass	G3	S3	E	E
Paronychia chartacea	paper nailwort	G3	S3	T	E
Peucaea aestivalis	Bachman's Sparrow	G3	S3	N	N
Plestiodon egregius lividus	Blue-tailed Mole Skink	G5T2	S2	T	FT
Podomys floridanus	Florida Mouse	G3	S3	N	N
Polygala lewtonii	Lewton's polygala	G2	S2	E	E

Definitions: *Documented - Rare species and natural communities documented on or near this site.*
Documented-Historic - Rare species and natural communities documented, but not observed/reported within the last twenty years.
Likely - Rare species and natural communities likely to occur on this site based on suitable habitat and/or known occurrences in the vicinity.
Potential - This site lies within the known or predicted range of the species listed.

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
(850) 224-8207
www.fnai.org

Florida Natural Areas Inventory

Florida Natural Areas Inventory

Biodiversity Matrix Report

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Listing
Polygonella basiramia	Florida jointweed	G3	S3	E	E
Rostrhamus sociabilis	Snail Kite	G4G5	S2	E	FE
Salix floridana	Florida willow	G2G3	S2S3	UR	E
Sciurus niger niger	Southeastern Fox Squirrel	G5T5	S3	N	N
Selonodon floridensis	Florida Cebrionid Beetle	G2G4	S2S4	N	N
Ursus americanus floridanus	Florida Black Bear	G5T4	S4	N	N
Warea carteri	Carter's warea	G1	S1	E	E

Matrix Unit ID: 34369

Likely

Mustela frenata peninsulae	Florida Long-tailed Weasel	G5T3?	S3?	N	N
Mycteria americana	Wood Stork	G4	S2	DL	FT
Sandhill upland lake		G3	S2	N	N

Potential

Antigone canadensis pratensis	Florida Sandhill Crane	G5T2	S2	N	ST
Athene cunicularia floridana	Florida Burrowing Owl	G4T3	S3	N	ST
Bombus fraternus	Southern Plains Bumble Bee	G3G4	S3	N	N
Bonamia grandiflora	Florida bonamia	G3	S3	T	E
Calopogon multiflorus	many-flowered grass-pink	G2G3	S2S3	N	T
Carex chapmanii	Chapman's sedge	G3	S3	N	T
Centrosema arenicola	sand butterfly pea	G2Q	S2	N	E
Chionanthus pygmaeus	pygmy fringe tree	G2G3	S2S3	E	E
Clinopodium ashei	Ashe's savory	G3	S3	N	T
Coleataenia abscissa	cutthroatgrass	G3	S3	N	E
Drymarchon couperi	Eastern Indigo Snake	G3	S2?	T	FT
Dryobates borealis	Red-cockaded Woodpecker	G3	S2	E, PT	FE
Eriogonum floridanum	scrub buckwheat	G4T3	S3	T	E
Gopherus polyphemus	Gopher Tortoise	G3	S3	N	ST
Gymnopogon chapmanianus	Chapman's skeletongrass	G3	S3	N	N
Lechea cernua	nodding pinweed	G3	S3	N	T
Lithobates capito	Gopher Frog	G2G3	S3	UR	N
Matelea floridana	Florida spiny-pod	G2	S2	N	E
Nemastylis floridana	celestial lily	G3	S3	N	E
Neofiber alleni	Round-tailed Muskrat	G2	S2	N	N
Nolina atopocarpa	Florida beargrass	G3	S3	N	T
Nolina brittoniana	Britton's beargrass	G3	S3	E	E
Paronychia chartacea	paper nailwort	G3	S3	T	E
Peucaea aestivalis	Bachman's Sparrow	G3	S3	N	N
Plestiodon egregius lividus	Blue-tailed Mole Skink	G5T2	S2	T	FT
Podomys floridanus	Florida Mouse	G3	S3	N	N
Polygala lewtonii	Lewton's polygala	G2	S2	E	E
Polygonella basiramia	Florida jointweed	G3	S3	E	E
Rostrhamus sociabilis	Snail Kite	G4G5	S2	E	FE
Salix floridana	Florida willow	G2G3	S2S3	UR	E
Sciurus niger niger	Southeastern Fox Squirrel	G5T5	S3	N	N
Selonodon floridensis	Florida Cebrionid Beetle	G2G4	S2S4	N	N
Ursus americanus floridanus	Florida Black Bear	G5T4	S4	N	N
Warea carteri	Carter's warea	G1	S1	E	E

Definitions: *Documented - Rare species and natural communities documented on or near this site.*
Documented-Historic - Rare species and natural communities documented, but not observed/reported within the last twenty years.
Likely - Rare species and natural communities likely to occur on this site based on suitable habitat and/or known occurrences in the vicinity.
Potential - This site lies within the known or predicted range of the species listed.

1018 Thomasville Road
Suite 200-C
Tallahassee, FL 32303
(850) 224-8207
www.fnai.org

Florida Natural Areas Inventory

Florida Natural Areas Inventory

Biodiversity Matrix Report

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Listing
Matrix Unit ID: 34370					
Likely					
Mustela frenata peninsulae	Florida Long-tailed Weasel	G5T3?	S3?	N	N
Mycteria americana	Wood Stork	G4	S2	DL	FT
Sandhill upland lake		G3	S2	N	N
Potential					
Antigone canadensis pratensis	Florida Sandhill Crane	G5T2	S2	N	ST
Athene cunicularia floridana	Florida Burrowing Owl	G4T3	S3	N	ST
Bombus fraternus	Southern Plains Bumble Bee	G3G4	S3	N	N
Bonamia grandiflora	Florida bonamia	G3	S3	T	E
Calopogon multiflorus	many-flowered grass-pink	G2G3	S2S3	N	T
Centrosema arenicola	sand butterfly pea	G2Q	S2	N	E
Chionanthus pygmaeus	pygmy fringe tree	G2G3	S2S3	E	E
Clinopodium ashei	Ashe's savory	G3	S3	N	T
Coleataenia abscissa	cutthroatgrass	G3	S3	N	E
Drymarchon couperi	Eastern Indigo Snake	G3	S2?	T	FT
Dryobates borealis	Red-cockaded Woodpecker	G3	S2	E, PT	FE
Eriogonum floridanum	scrub buckwheat	G4T3	S3	T	E
Gopherus polyphemus	Gopher Tortoise	G3	S3	N	ST
Gymnopogon chapmanianus	Chapman's skeletongrass	G3	S3	N	N
Lechea cernua	nodding pinweed	G3	S3	N	T
Lithobates capito	Gopher Frog	G2G3	S3	UR	N
Nemastylis floridana	celestial lily	G3	S3	N	E
Neofiber alleni	Round-tailed Muskrat	G2	S2	N	N
Nolina brittoniana	Britton's beargrass	G3	S3	E	E
Paronychia chartacea	paper nailwort	G3	S3	T	E
Peucaea aestivalis	Bachman's Sparrow	G3	S3	N	N
Plestiodon egregius lividus	Blue-tailed Mole Skink	G5T2	S2	T	FT
Podomys floridanus	Florida Mouse	G3	S3	N	N
Polygala lewtonii	Lewton's polygala	G2	S2	E	E
Polygonella basiramia	Florida jointweed	G3	S3	E	E
Rostrhamus sociabilis	Snail Kite	G4G5	S2	E	FE
Sciurus niger niger	Southeastern Fox Squirrel	G5T5	S3	N	N
Selonodon floridensis	Florida Cebrionid Beetle	G2G4	S2S4	N	N
Ursus americanus floridanus	Florida Black Bear	G5T4	S4	N	N
Warea carteri	Carter's warea	G1	S1	E	E

Definitions: *Documented - Rare species and natural communities documented on or near this site.*
Documented-Historic - Rare species and natural communities documented, but not observed/reported within the last twenty years.
Likely - Rare species and natural communities likely to occur on this site based on suitable habitat and/or known occurrences in the vicinity.
Potential - This site lies within the known or predicted range of the species listed.

Elements and Element Occurrences

An **element** is any exemplary or rare component of the natural environment, such as a species, natural community, bird rookery, spring, sinkhole, cave, or other ecological feature.

An **element occurrence (EO)** is an area of land and/or water in which a species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location.

Element Ranking and Legal Status

Using a ranking system developed by NatureServe and the Natural Heritage Program Network, the Florida Natural Areas Inventory assigns two ranks for each element. The global rank is based on an element's worldwide status; the state rank is based on the status of the element in Florida. Element ranks are based on many factors, the most important ones being estimated number of Element Occurrences (EOs), estimated abundance (number of individuals for species; area for natural communities), geographic range, estimated number of adequately protected EOs, relative threat of destruction, and ecological fragility.

FNAI GLOBAL ELEMENT RANK

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
G2 = Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.
G4 = Apparently secure globally (may be rare in parts of range).
G5 = Demonstrably secure globally.
GH = Of historical occurrence throughout its range, may be rediscovered (e.g., ivory-billed woodpecker).
GX = Believed to be extinct throughout range.
GXC = Extirpated from the wild but still known from captivity or cultivation.
G#? = Tentative rank (e.g., G2?).
G#G# = Range of rank; insufficient data to assign specific global rank (e.g., G2G3).
G#T# = Rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1).
G#Q = Rank of questionable species - ranked as species but questionable whether it is species or subspecies; numbers have same definition as above (e.g., G2Q).
G#T#Q = Same as above, but validity as subspecies or variety is questioned.
GU = Unrankable; due to a lack of information no rank or range can be assigned (e.g., GUT2).
GNA = Ranking is not applicable because the element is not a suitable target for conservation (e.g. a hybrid species).
GNR = Element not yet ranked (temporary).
GNRTNR = Neither the element nor the taxonomic subgroup has yet been ranked.

FNAI STATE ELEMENT RANK

S1 = Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
S2 = Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
S3 = Either very rare and local in Florida (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.
S4 = Apparently secure in Florida (may be rare in parts of range).
S5 = Demonstrably secure in Florida.
SH = Of historical occurrence in Florida, possibly extirpated, but may be rediscovered (e.g., ivory-billed woodpecker).
SX = Believed to be extirpated throughout Florida.
SU = Unrankable; due to a lack of information no rank or range can be assigned.
SNA = State ranking is not applicable because the element is not a suitable target for conservation (e.g. a hybrid species).
SNR = Element not yet ranked (temporary).

FEDERAL LEGAL STATUS

Legal status information provided by FNAI for information only. For official definitions and lists of protected species, consult the relevant federal agency.

Definitions derived from U.S. Endangered Species Act of 1973, Sec. 3. Note that the federal status given by FNAI refers only to Florida populations and that federal status may differ elsewhere.

C = Candidate species for which federal listing agencies have sufficient information on biological vulnerability and threats to support proposing to list the species as Endangered or Threatened.
E = Endangered: species in danger of extinction throughout all or a significant portion of its range.
E, T = Species currently listed endangered in a portion of its range but only listed as threatened in other areas
E, PDL = Species currently listed endangered but has been proposed for delisting.
E, PT = Species currently listed endangered but has been proposed for listing as threatened.
E, XN = Species currently listed endangered but tracked population is a non-essential experimental population.
T = Threatened: species likely to become Endangered within the foreseeable future throughout all or a significant portion of its range.
PE = Species proposed for listing as endangered.
PS = - An infraspecific taxon or population has federal status but the entire species does not - status is in only a portion of the species range.
PT = Species proposed for listing as threatened.
SAT = Treated as threatened due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.
SC = Not currently listed, but considered a "species of concern" to USFWS.
DL = Delisted.
UR = Under review.

STATE LEGAL STATUS

Provided by FNAI for information only. For official definitions and lists of protected species, consult the relevant state agency.

Animals: Definitions derived from "Florida's Endangered Species and Species of Special Concern, Official Lists" published by Florida Fish and Wildlife Conservation Commission, 1 August 1997, and subsequent updates.

C = Candidate for listing at the Federal level by the U. S. Fish and Wildlife Service
FE = Listed as Endangered Species at the Federal level by the U. S. Fish and Wildlife Service
FT = Listed as Threatened Species at the Federal level by the U. S. Fish and Wildlife Service
FXN = Federal listed as an experimental population in Florida
FT(S/A) = Federal Threatened due to similarity of appearance
ST = State population listed as Threatened by the FFWCC. Defined as a species, subspecies, or isolated population which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat is decreasing in area at a rapid rate and as a consequence is destined or very likely to become an endangered species within the foreseeable future.
SSC = Listed as Species of Special Concern by the FFWCC. Defined as a population which warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable future, may result in its becoming a threatened species. (SSC* for Pandion haliaetus (Osprey) indicates that this status applies in Monroe county only.)
N = Not currently listed, nor currently being considered for listing.

Plants: Definitions derived from Sections 581.011, 581.185 and 581.185(2), Florida Statutes, and the Preservation of Native Flora of Florida Act, 5B-40.001. FNAI does not track all state-regulated plant species; for a complete list of state-regulated plant species, call Florida Division of Plant Industry, 352-372-3505 or see: https://www.flrules.org/gateway/ChapterHome.asp?Chapter=5B-40.

E = Endangered: species of plants native to Florida that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue; includes all species determined to be endangered or threatened pursuant to the U.S. Endangered Species Act.
T = Threatened: species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in number as to cause them to be Endangered.
CE = Commercially exploited: species native to the state which are subject to being removed in significant numbers from native habitats in the state and sold or transported for sale.
N = Not currently listed, nor currently being considered for listing.

Element Occurrence Ranking

FNAI ranks of quality of the element occurrence in terms of its viability (EORANK). Viability is estimated using a combination of factors that contribute to continued survival of the element at the location. Among these are the size of the EO, general condition of the EO at the site, and the conditions of the landscape surrounding the EO (e.g. an immediate threat to an EO by local development pressure could lower an EO rank).

A = Excellent estimated viability
A? = Possibly excellent estimated viability
AB = Excellent or good estimated viability
AC = Excellent, good, or fair estimated viability
B = Good estimated viability
B? = Possibly good estimated viability
BC = Good or fair estimated viability
BD = Good, fair, or poor estimated viability
C = Fair estimated viability
C? = Possibly fair estimated viability
CD = Fair or poor estimated viability
D = Poor estimated viability
D? = Possibly poor estimated viability
E = Verified extant (viability not assessed)
F = Failed to find
H = Historical
NR = Not ranked, a placeholder when an EO is not (yet) ranked.
U = Unrankable
X = Extirpated

*For additional detail on the above ranks see: http://www.natureserve.org/explorer/eorankguide.htm

FNAI also uses the following EO ranks:

H? = Possibly historical
F? = Possibly failed to find
X? = Possibly extirpated

The following offers further explanation of the H and X ranks as they are used by FNAI:

The rank of H is used when there is a lack of recent field information verifying the continued existence of an EO, such as (a) when an EO is based only on historical collections data; or (b) when an EO was ranked A, B, C, D, or E at one time and is later, without field survey work, considered to be possibly extirpated due to general habitat loss or degradation of the environment in the area. This definition of the H rank is dependent on an interpretation of what constitutes "recent" field information. Generally, if there is no known survey of an EO within the last 20 to 40 years, it should be assigned an H rank. While these time frames represent suggested maximum limits, the actual time period for historical EOs may vary according to the biology of the element and the specific landscape context of each occurrence (including anthropogenic alteration of the environment). Thus, an H rank may be assigned to an EO before the maximum time frames have lapsed. Occurrences that have not been surveyed for periods exceeding these time frames should not be ranked A, B, C, or D. The higher maximum limit for plants and communities (i.e., ranging from 20 to 40 years) is based upon the assumption that occurrences of these elements generally have the potential to persist at a given location for longer periods of time. This greater potential is a reflection of plant biology and community dynamics. However, landscape factors must also be considered. Thus, areas with more anthropogenic impacts on the environment (e.g., development) will be at the lower end of the range, and less-impacted areas will be at the higher end.

The rank of X is assigned to EOs for which there is documented destruction of habitat or environment, or persuasive evidence of eradication based on adequate survey (i.e., thorough or repeated survey efforts by one or more experienced observers at times and under conditions appropriate for the Element at that location).

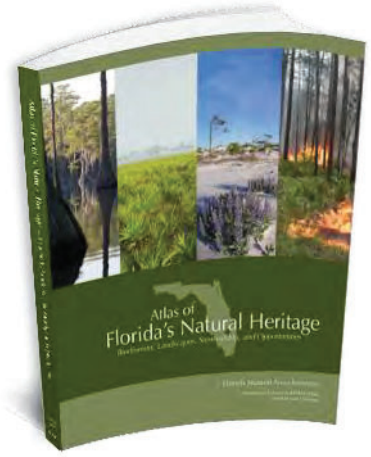
ON SALE NOW

Atlas of

Florida's Natural Heritage

Biodiversity, Landscapes, Stewardship, and Opportunities

The Florida Natural Areas Inventory is pleased to announce the publication of the ***Atlas of Florida's Natural Heritage: Biodiversity, Landscapes, Stewardship, and Opportunities***. This high-quality, full-color *Atlas* is sure to become a standard reference for anyone involved in the conservation, management, study, or enjoyment of Florida's rich natural resources. We hope the *Atlas* will inspire, educate, and raise awareness of and interest in biodiversity and conservation issues.



Learn more about the Atlas, view sample pages and order your copy today at:
https://www.fnai.org/publications/atlas-natural-heritage

Check out our various web maps and GIS data options here:

https://geodata.fnai.org/

and

FOLLOW US ON facebook

APPENDIX E: IPAC REPORT

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Polk County, Florida

Local office

Florida Ecological Services Field Office

(352) 448-9151
(772) 562-4288
fw4flesregs@fws.gov

777 37th St
Suite D-101
Vero Beach, FL 32960-3559

https://www.fws.gov/office/florida-ecological-services

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can**only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Florida Panther Puma (=Felis) concolor coryi Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1763	Endangered
Puma (=mountain Lion) Puma (=Felis) concolor (all subsp. except coryi) No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6049	SAT

Birds

NAME	STATUS
Crested Caracara (audubon''''s) [fl Dps] Caracara plancus audubonii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8250	Threatened
Eastern Black Rail Laterallus jamaicensis ssp. jamaicensis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10477	Threatened
Everglade Snail Kite Rostrhamus sociabilis plumbeus Wherever found There is **final** critical habitat for this species.Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/7713	Endangered
Whooping Crane Grus americana No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/758	EXPN

Wood Stork Mycteria americana — Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/8477

Reptiles

NAME	STATUS

American Alligator Alligator mississippiensis — SAT
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/776

Blue-tailed Mole Skink Eumeces egregius lividus — Threatened
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/2203

Eastern Indigo Snake Drymarchon couperi — Threatened
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/646

Sand Skink Neoseps reynoldsi — Threatened
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4094

Insects

NAME	STATUS

Monarch Butterfly Danaus plexippus — Candidate
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9743

Flowering Plants

NAME	STATUS

Avon Park Harebells Crotalaria avonensis — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/7093

Carter's Mustard Warea carteri — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/5583

Florida Ziziphus Ziziphus celata — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/2950

Highlands Scrub Hypericum Hypericum cumulicola — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/2940

Lewton's Polygala Polygala lewtonii — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6688

Papery Whitlow-wort Paronychia chartacea — Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1465

Pigeon Wings Clitoria fragrans — Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/991

Pygmy Fringe-tree Chionanthus pygmaeus — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1084

Sandlace Polygonella myriophylla — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/5745

Scrub Blazingstar Liatris ohlingerae — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/864

Scrub Mint Dicerandra frutescens — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/799

Short-leaved Rosemary Conradina brevifolia No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2929	Endangered
Wireweed Polygonella basiramia No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1718	Endangered

Lichens

NAME	STATUS
Florida Perforate Cladonia Cladonia perforata No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7516	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the"Supplemental Information on Migratory Birds and Eagles"

Additional information can be found using the following links:

- Eagle Managementhttps://www.fws.gov/program/eagle-management

- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles"specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence(■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

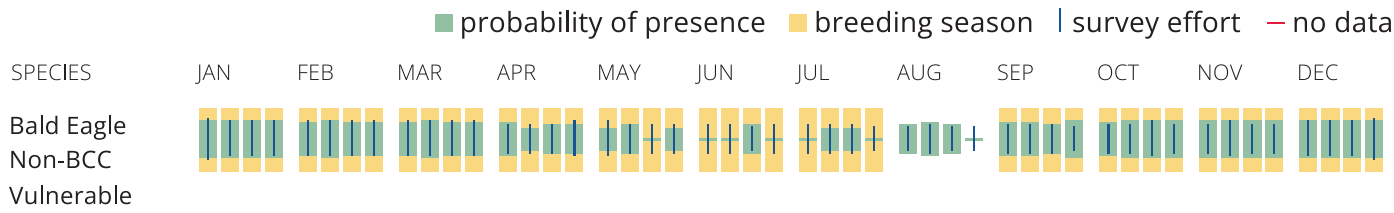
Breeding Season ( )
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles"

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management

- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Kestrel *Falco sparverius paulus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9587	Breeds Apr 1 to Aug 31
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15

Chimney Swift Chaetura pelagica — Breeds Mar 15 to Aug 25
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Great Blue Heron Ardea herodias occidentalis — Breeds Jan 1 to Dec 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

King Rail Rallus elegans — Breeds May 1 to Sep 5
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8936

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Magnificent Frigatebird Fregata magnificens — Breeds Oct 1 to Apr 30
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Painted Bunting Passerina ciris — Breeds Apr 25 to Aug 15
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Swallow-tailed Kite Elanoides forficatus — Breeds Mar 10 to Jun 30
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8938

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles"specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence(■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

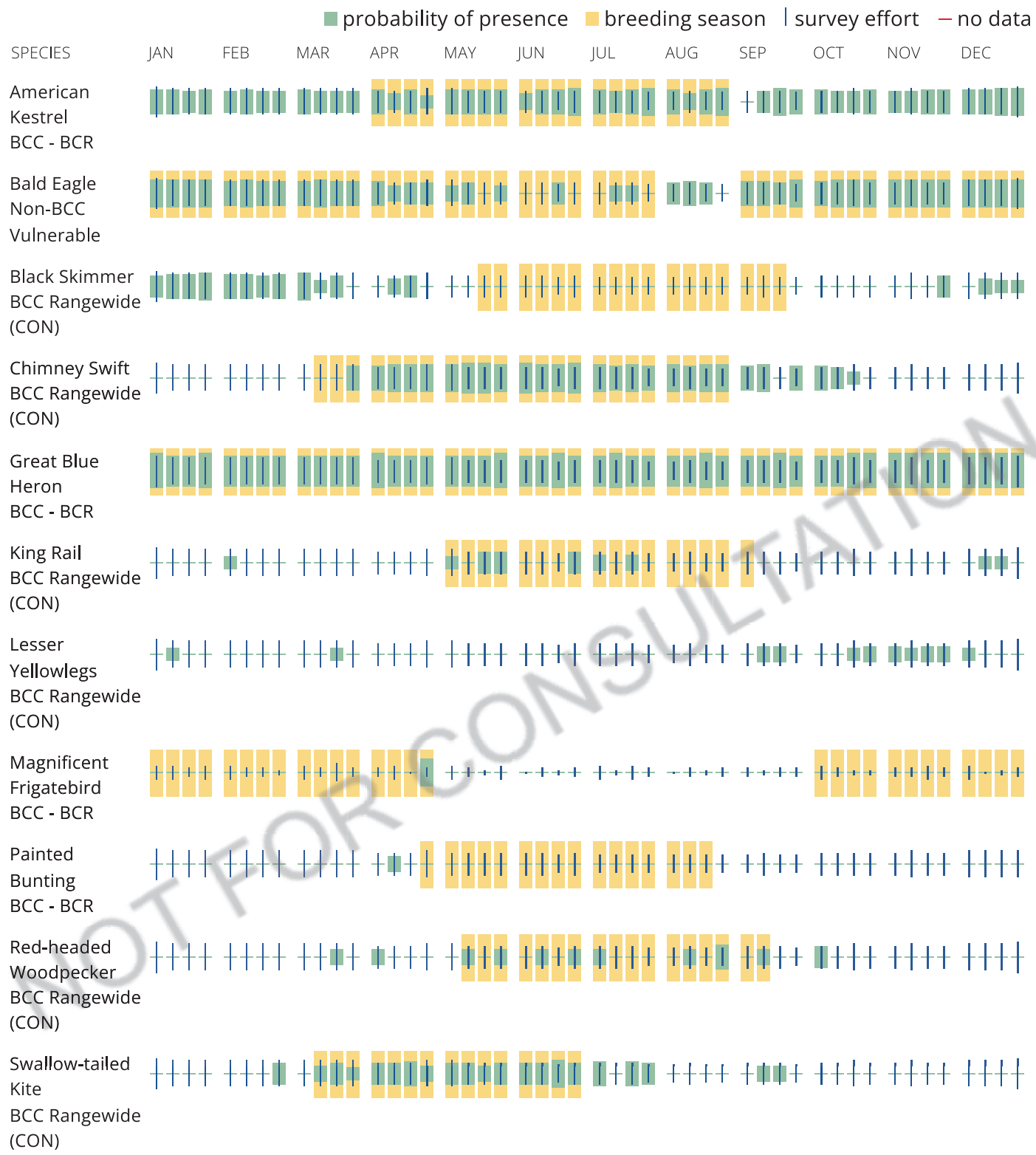
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort(|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure.

To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in

offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1Fx
- PEM1F
- PEM1C
- PEM5F
- PEM1/SS1Cx
- PEM1Cx

FRESHWATER FORESTED/SHRUB WETLAND

- PSS1F
- PFO1/EM1Cd
- PFO1Cd
- PFO1/3C
- PFO1/4C
- PFO1C
- PFO2F
- PSS1C
- PFO3C

FRESHWATER POND

- PUBHx
- PABHx
- PABH

LAKE

- L1UBH

RIVERINE

- R2UBHx
- R4SBC
- R2ABHx
- R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX F: WETLAND DESCRIPTIONS

Wetland 1 (W01)
NWI Classification: PFO1/3Cd (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded Partly Drained/Ditch)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland was located adjacent to the southwest portion of a golf course (Lone Palm Golf Club) between two channelized watercourses. Common components species of the canopy included laurel oak (*Quercus laurifolia*), red maple (*Acer rubrum*), sugarberry (*Celtis laevigata*), and American elm (*Ulmus americana*). Common understory species consisted of elderberry (*Sambucus nigra* ssp. *canadensis*) and individuals of common canopy species. Sword fern (*Nephrolepis* sp.), wild taro (*Colocasia esculenta*), Willdenow's maiden fern (*Thelypteris interrupta*), John Charles (*Hyptis verticillata*), lizard's tail (*Saururus cernuus*), and muscadine (*Vitis rotundifolia*) were common ground cover species. Soils were mapped by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) as Kaliga Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 2 (W02)
NWI Classification: PFO1/3Cd (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded Partly Drained/Ditch)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland was located adjacent to the southwest portion of a golf course (Lone Palm Golf club) on the north side of a channelized watercourse. Common components species of the canopy included laurel oak (*Quercus laurifolia*), red maple (*Acer rubrum*), sugarberry (*Celtis laevigata*), American elm (*Ulmus americana*), and cabbage palm (*Sabal palmetto*). Young individuals of species comprising the canopy were common understory species. Common ground cover species included wild taro (*Colocasia esculenta*), sword fern (*Nephrolepis* sp.), poison ivy (*Toxicodendron radicans*), peppervine (*Nekemias arborea*), and lizard's tail (*Saururus cernuus*). Soils were mapped by the NRCS as Kaliga Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 3 (W03)
NWI Classification: PFO1/3Cd (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded Partly Drained/Ditch)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland was located adjacent to the south shore of Lake Glen (L01) in the Lone Palm Golf Club. Dominant canopy specie laurel oak (*Quercus laurifolia*) and sugarberry (*Celtis laevigata*). Oher common species included red maple (*Acer rubrum*) and sweetbay (*Magnolia virginiana*). Common understory species included young individuals of canopy species, cabbage palm (*Sabal palmetto*), elderberry (*Sambucus nigra* ssp. *canadensis*), and Senegal date palm (*Phoenix reclinata*). Common ground cover species included Willdenow's maiden fern (*Thelypteris interrupta*) and wild taro (*Colocasia esculenta*). Soils were mapped by the NRCS as Kaliga Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 4 (W04)
NWI Classification: PFO1/3C (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland was surrounded by a maintained golf course within the Lone Palm Golf Club and appeared to be connected to Lake Glen (L01) by culvert. Dominant canopy species were red maple (*Acer rubrum*), laurel oak (*Quercus laurifolia*), sweetbay (*Magnolia virginiana*), and sugarberry (*Celtis laevigata*). Other common vegetation observed included Carolina willow (*Salix caroliniana*), common buttonbush (*Cephalanthus occidentalis*), American elm (*Ulmus americana*), cabbage palm (*Sabal*

palmetto), Willdenow's maiden fern (*Thelypteris interrupta*), lizard's tail (*Saururus cernuus*), wild taro (*Colocasia esculenta*), Mexican primrosewillow (*Ludwigia octovalvis*), Peruvian primrosewillow (*Ludwigia peruviana*), false nettle (*Boehmeria cylindrica*), and dotted smartweed (*Persicaria punctata*). Soils were mapped by the NRCS as Kaliga Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 5 (W05)
NWI Classification: PFO1/3C (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland is located northwest of Wetland 4 (W04) and is adjacent to the golf course (Lone Palm Golf Club). This area is part of a larger forested wetland system that extends to the south and northeast and is separated from Wetland 6 by an elevated unpaved roadbed with a culvert connection. The dominant species in the canopy of this wetland were laurel oak (*Quercus laurifolia*) and red maple (*Acer rubrum*). Sugarberry (*Celtis laevigata*) was also a common canopy component. The understory was comprised of those species that were common in the canopy as well as cabbage palm (*Sabal palmetto*). Common ground cover vegetation included lizard's tail (*Saururus cernuus*). Willdenow's maiden fern (*Thelypteris interrupta*), wild taro (*Colocasia esculenta*), and common dayflower (*Commelina diffusa*). Soils were mapped by the NRCS as Kaliga Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 6 (W06)
NWI Classification: PFO1/3C (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland is located north of Wetland 4 (W04) and is separated from Wetland 5 (W05) by an elevated unpaved roadbed with a culvert connection. This area is part of a larger forested wetland system that extends to the southwest. This wetland is partially bounded by a maintained golf course. Common canopy species included (*Quercus laurifolia*), red maple (*Acer rubrum*), and sugarberry (*Celtis laevigata*), Common understory species included those that were prevalent in the canopy as well as cabbage palm (*Sabal palmetto*) and elderberry (*Sambucus nigra* ssp. *canadensis*). Other common vegetation observed included Carolina willow (*Salix caroliniana*), common buttonbush (*Cephalanthus occidentalis*), Senegal date palm (*Phoenix reclinata*), Willdenow's maiden fern (*Thelypteris interrupta*), lizard's tail (*Saururus cernuus*), wild taro (*Colocasia esculenta*), eastern poison ivy (*Toxicodendron radicans*), Peruvian primrosewillow (*Ludwigia peruviana*), and peppervine (*Nekemias arborea*). Soils were mapped by the NRCS as Kaliga Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 7 (W07)
NWI Classification: PFO1/3E (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded/Saturated)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland is a somewhat disturbed area south of the Lone Palm Golf Club maintenance facility and extending eastward from Lake Ernest (L04). The canopy was dominated by (*Quercus laurifolia*) and red maple (*Acer rubrum*). Invasive golden rain tree (*Koelreuteria elegans*) was common in the canopy and understory. Other common understory species included those that were prevalent in the canopy as well as elderberry (*Sambucus nigra* ssp. *canadensis*) and invasive Senegal date palm (*Phoenix reclinata*). Common ground cover vegetation included wild taro (*Colocasia esculenta*), lizard's tail (*Saururus cernuus*), Willdenow's maiden fern (*Thelypteris interrupta*), and American evergreen (*Syngonium podophyllum*). Soils were mapped by the NRCS as Arents-Urban Land Complex, 0 to 5 Percent slopes

Wetland 8 (W08)
NWI Classification: PFO1/3E (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded/Saturated)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland is a large wetland area located between the open water of Lake Bonnet and Bonnet Springs Park on the east. The relatively short-stature Carolina willow (*Salix caroliniana*)/ red maple (*Acer rubrum*) community adjacent to Lake Bonnet transitions eastward to a more mature and diverse community in which the canopy, in addition to Carolina willow and red maple, is comprised of sweetbay (*Magnolia virginiana*) and sweetgum (*Liquidambar styraciflua*). Laurel oak (*Quercus laurifolia*) and cabbage palm (*Sabal palmetto*) are common along the northern and northeastern fringe of this system. Common understory species, in addition to red maple and Carolina willow, include swamp dogwood (*Cornus foemina*), elderberry (*Sambucus nigra* ssp. *canadensis*), wax myrtle (*Morella cerifera*), and Peruvian primrosewillow (*Ludwigia peruviana*). Groundnut (*Apios americana*) was in important vine component in the understory. Common ground cover species included Willdenow's maiden fern (*Thelypteris interrupta*), green arrow arum (*Peltandra virginica*), lizard's tail (*Saururus cernuus*), swamp fern (*Telmatoblechnum serrulatum*), bulltongue arrowhead (*Sagittaria lancifolia*), royal fern (*Osmunda regalis* var. *spectabilis*), Peruvian primrosewillow (*Ludwigia peruviana*), wild taro (*Colocasia esculenta*), marshpennywort (*Hydrocotyle* sp.), peppervine (*Nekemias arborea*), and eastern poison ivy (*Toxicodendron radicans*). Soils were mapped by the NRCS as Hontoon Muck, Frequently Ponded, 0 to 1 Percent Slopes and Samsula Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 9 (W09)
NWI Classification: PEM1D (Palustrine Emergent Persistent Continuously Saturated)
FLUCFCS Classification: 640 (Vegetated Non-Forested Wetlands)
This herbaceous wetland area is located within Bonnet Spring Park and consisted of seeps and springs emanating from mucky sand ground coalescing into a small stream channel with a sandy bed that traversed the seepage area. Vegetation consisted of regularly mowed forbs and graminoids typical of saturated soil conditions. The dominant species observed were marshpennywort (*Hydrocotyle* sp.) and herb-of-grace (*Bacopa monnieri*). Soils were mapped by the NRCS as Sparr Sand, 0 to 5 Percent Slopes.

Wetland 10 (W10)
NWI Classification: PEM1D (Palustrine Emergent Persistent Continuously Saturated)
FLUCFCS Classification: 640 (Vegetated Non-Forested Wetlands)
This herbaceous wetland area is located within Bonnet Spring Park and consisted of seeps and mucky sand. Vegetation consisted of regularly mowed forbs and graminoids typical of saturated soil conditions. The dominant species observed were marshpennywort (*Hydrocotyle* sp.), herb-of-grace (*Bacopa monnieri*), spadeleaf (*Centella asiatica*), and mock bishopweed (*Ptilimnium capillaceum*). Soils were mapped by the NRCS as Sparr Sand, 0 to 5 Percent Slopes.

Wetland 11 (W11)
NWI Classification: PFO1E (Palustrine Forested Broad-Leaved Deciduous Seasonally Flooded/Saturated)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This small, forested wetland is located west of Lake Bonnet and north of the stream drainageway emanating from Lake Bonnet. The downslope (southern) extremity of this wetland is separated from an eastward draining ditch by a berm. The canopy is comprised primarily of red maple (*Acer rubrum*) with a lesser amount of sweetbay (*Magnolia virginiana*). The dominant vegetation in the understory elderberry (*Sambucus nigra* ssp. *canadensis*) as well as young individuals of canopy species. Willdenow's maiden

fern (*Thelypteris interrupta*), lizard's tail (*Saururus cernuus*), and wild taro (*Colocasia esculenta*) were dominant ground cover species. Other common species observed were peppervine (*Nekemias arborea*), muscadine (*Vitis rotundifolia*), air-potato (*Dioscorea bulbifera*), and Chinese tallowtree (*Triadica sebifera*). Soils were mapped by the NRCS as Samsula Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 12 (W12)
NWI Classification: PFO1/3C (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland is located on the south side of the unnamed channelized stream drainageway emanating from Lake Bonnet. Dominant canopy species were laurel oak (*Quercus laurifolia*) and red maple (*Acer rubrum*). The dominant understory was elderberry (*Sambucus nigra* ssp. *canadensis*) as well as those species that were common in the canopy. Common ground cover species were Willdenow's maiden fern (*Thelypteris interrupta*), wild taro (*Colocasia esculenta*), marshpennywort (*Hydrocotyle* sp.), bulltongue arrowhead (*Sagittaria lancifolia*), sweetscent (*Pluchea odorata*), and false nettle (*Boehmeria cylindrica*). Other common species observed in this wetland included Carolina willow (*Salix caroliniana*), cabbage palm (*Sabal palmetto*), and sugarberry (*Celtis laevigata*). Soils were mapped by the NRCS as Samsula Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 13 (W13)
NWI Classification: PFO1/3Ch (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded Dikes/Impounded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland is located on the north side of the unnamed channelized stream drainageway emanating from Lake Bonnet and separated from said stream drainageway by a berm. The dominant tree and understory species were laurel oak (*Quercus laurifolia*) and red maple (*Acer rubrum*). Common ground cover vegetation was wild taro (*Colocasia esculenta*), peppervine (*Nekemias arborea*), climbing hempvine (*Mikania scandens*), marshpennywort (*Hydrocotyle* sp.), dotted smartweed (*Persicaria punctata*), sweetscent (*Pluchea odorata*), mock bishopweed (*Ptilimnium capillaceum*), Peruvian primrosewillow (*Ludwigia peruviana*), dogfennel (*Eupatorium capillifolium*), American burnweed (*Erechtites hieraciifolius*), and a sedge (*Carex* sp.). Soils were mapped by the NRCS as Samsula Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 14 (W14)
NWI Classification: PFO1/3C (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This forested wetland is located west of Lake Bonnet between N. Brunnell Parkway and May Manor Mobile Home Park. The dominant tree species was red maple (*Acer rubrum*) while elderberry (*Sambucus nigra* ssp. *canadensis*), red maple, and Peruvian primrosewillow (*Ludwigia peruviana*) were dominant in the understory. Other common woody species observed were laurel oak (*Quercus laurifolia*), sugarberry (*Celtis laevigata*), Brazilian-pepper (*Schinus terebinthifolia*), Carolina willow (*Salix caroliniana*), camphortree (*Camphora officinarum*), eastern poison ivy (*Toxicodendron radicans*), greenbrier (*Smilax* sp.), muscadine (*Vitis rotundifolia*) and cabbage palm (*Sabal palmetto*). Wild taro (*Colocasia esculenta*), groundnut (*Apios americana*), Willdenow's maiden fern (*Thelypteris interrupta*), sword fern (*Nephrolepis* sp.), climbing hempvine (*Mikania scandens*), and marshpennywort (*Hydrocotyle* sp.) were common ground cover species. Soils were mapped by the NRCS as Samsula Muck, Frequently Ponded, 0 to 1 Percent slopes.

Wetland 15 (W15)
NWI Classification: PFO1/3C (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This wetland is a small, forested area at the western extent of Lake Bonnet (between Lake Bonnet and N. Brunnell Parkway). The canopy was comprised primarily of Carolina willow (*Salix caroliniana*) and red maple (*Acer rubrum*). Laurel oak (*Quercus laurifolia*) was also present in the canopy. Carolina willow and elderberry (*Sambucus nigra* ssp. *canadensis*) dominant in the understory. Common ground cover species included wild taro (*Colocasia esculenta*), Willdenow's maiden fern (*Thelypteris interrupta*), and marshpennywort (*Hydrocotyle* sp.). This wetland habitat transitions to cattail (*Typha* sp.) on the lake side of the wetland. Soils were mapped by the NRCS as Arents, organic substratum-Urban land complex.

Island 1 (I01)
NWI Classification: PFO1/3C (Palustrine Forested Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This wetland occupies an island in Lake Charles, a small lake (L02) near the southern boundary of the Lone Palm Golf Club. Dominant canopy trees were sweetbay (*Magnolia virginiana*) and red maple (*Acer rubrum*) over a dense understory comprised smaller individuals of canopy species as well as elderberry (*Sambucus nigra* ssp. *canadensis*), Brazilian-pepper (*Schinus terebinthifolia*), and Carolina willow (*Salix caroliniana*). This island was serving as a rookery for several great blue heron (*Ardea herodias*) as well as anhinga (*Anhinga anhinga*) and double-crested cormorant (*Nannopterum auritum*). Potentially nesting little blue heron (*Egretta caerulea*) and tricolored heron (*Egretta tricolor*) were also observed at this island. Adequate wetland hydrology at this island may enhanced or impaired by an adjustable weir separating this lake from a downstream lake to the west.

Island 2 (I02)
NWI Classification: PSS1/3C (Palustrine Scrub-Shrub Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This wetland occupies an island in Lake George, a small lake (L03) in the northern portion of the Lone Palm Golf Club. Primarily a scrub/shrub wetland with several tree-size sweetbay (*Magnolia virginiana*) and bald-cypress (*Taxodium distichum*) present. Common vegetation included elderberry (*Sambucus nigra* ssp. *canadensis*), Carolina willow (*Salix caroliniana*), red maple (*Acer rubrum*), Peruvian primrosewillow (*Ludwigia peruviana*), and peppervine (*Nekemias arborea*). This island was serving as a rookery for a large colony of wood stork (*Mycteria americana*). Pairs of roseate spoonbill (*Platalea ajaja*) were also observed nesting here.

Island 3 (I03)
NWI Classification: PSS1/3C (Palustrine Scrub-Shrub Broad-Leaved Deciduous/Broad-leaved Evergreen Seasonally Flooded)
FLUCFCS Classification: 615 (Stream and Lake Swamps (Bottomland))
This wetland occupies an island in a lagoon (L08) located between the large wetland (W08) on the east side of Lake Bonnet and the Bonnet Springs Park uplands. The vegetation on this island was comprised primarily of elderberry (*Sambucus nigra* ssp. *canadensis*), Carolina willow (*Salix caroliniana*), and Peruvian primrosewillow (*Ludwigia peruviana*) scrub-shrub wetland with scattered tree-size sweetbay (*Magnolia virginiana*), red maple (*Acer rubrum*), and sweetgum (*Liquidambar styraciflua*). Adequate

wetland hydrology at this island may enhanced or impaired by an adjustable weir at the Lake bonnet outlet.

APPENDIX G: SURFACE WATER DESCRIPTIONS

Channelized Watercourse 1 (C01)
NWI Classification: R2UBHx (Riverine Lower Perennial Unconsolidated Bottom Permanently Flooded Excavated)
FLUCFCS Classification: 510 (Streams and Waterways)
This channelized stream emanates from Lake Bonnet and flows westward from N. Brunnell Parkway, exiting the study area just west of N. Galloway Road. Between Lake Bonnet and N. Wabash Avenue, this watercourse is wide and shallow with a silt substate and relatively low banks where it passes between mobile home parks. Downstream of N. Wabash Avenue to the Lone Palm Golf Club, the stream channel is narrow with high, steep side slopes. The side slopes are vegetated with regularly suppressed invasive and opportunistic herbaceous and woody species typical of the area. Within the golf course, this drainageway generally exhibits extensively maintained banks. Three surface waters, i.e., an unnamed lake, Lake Charles, and Lake Glen are traversed by the flow path. Weirs that artificially adjust water levels are located downstream of the unnamed lake and between Lake Charles and Lake Glen. Downstream of the golf course this channelized stream passes between forested wetland and mesic forest areas on the north and industrial development to the south before exiting the study area west of N. Galloway Road.

Channelized Watercourse 2 (C02)
NWI Classification: R2UBFx (Riverine Lower Perennial Unconsolidated Bottom Semipermanently Flooded Excavated)
FLUCFCS Classification: 510 (Streams and Waterways)
This unnamed channelized drainageway begins at the edge of maintained golf course fairway and extends southwest, traversing mesic forested areas and forested wetlands before joining Channelized Watercourse 1 (C01) east of N. Galloway Road. This drainageway generally consisted of intermittent pools and runs of shallow depth with silt/sand substrate. The high, steep side slopes were vegetated with woody species such as oaks (*Quercus laurifolia*, *Q. virginiana*, and *Q. nigra*), American elm (*Ulmus americana*), sugarberry (*Celtis laevigata*), red maple (*Acer rubrum*), and cabbage palm (*Sabal palmetto*). The flow path is culverted in two areas: the southwestern-most fairway of the Lone Palm Golf Club and an unnamed private road.

Channelized Watercourse 3 (C03)
NWI Classification: R2UBHx (Riverine Lower Perennial Unconsolidated Bottom Permanently Flooded Excavated)
FLUCFCS Classification: 510 (Streams and Waterways)
This channelized watercourse consists of a small meandering flow within a wide area with little or no vegetation between relatively high side slopes. There was minimal vegetation present on the side slopes apparently due to frequent herbicide application.

Channelized Watercourse 4 (C04)
NWI Classification: R2UBFx (Riverine Lower Perennial Unconsolidated Bottom Semipermanently Flooded Excavated)
FLUCFCS Classification: 510 (Streams and Waterways)
This small watercourse is located within Bonnet Springs Park and conveys water emanating from seepages and springs within Wetland 9 (W09) to a lagoon (L08) constructed by the park. The meandering flow way is in an engineered channel with a constructed waterfall immediately upstream of the park's lagoon. The banks of the channel were planted with landscape shrubs and regularly mowed.

Golf Course Lakes (L01, L02, L03, L04, L05, L06, L07, L08, L10, L11, L12)
NWI Classification: PUBHx (Palustrine Unconsolidated Bottom Permanently Flooded Excavated)
FLUCFCS Classification: 530 (Reservoirs)
These water bodies are small, excavated lakes embedded within the Lone Palm Golf Club (L01, L02, L03, L04, L05, L06, L07) and YMCA Par 3 (L10, L11, L12) golf courses. As such there was very little herbaceous emergent

vegetation present in the littoral areas. These systems served as sources of irrigation and as stormwater capacity. The Lone Palm Golf Club lakes are interconnected either by culvert, by stream drainage C01, are by direct connection. Hydrology is driven primarily by ground water. L11 overflows by way of a culverted connection to a southward flowing ditch D04) which ultimately connected with C01. L10 and L12 had overflow outlet weir structures in their respective northwest corners and may have connected to L11. Hydrology is driven by ground water and stormwater runoff.

Lake 9 (L09) (Bonnet Lake)
NWI Classification: L1UBH (Lacustrine Limnetic Unconsolidated Bottom Permanently Flooded)
FLUCFCS Classification: 520 (Lakes)
Lake Bonnet is a natural water body in which the water levels are anthropogenically modified by an adjustable water control structure at the outlet to a channelized watercourse (C04). Lake Bonnet is bounded by residential development on the northwest and south sides and on the east side by a forested wetland (W08) dominated by Carolina willow (*Salix caroliniana*) and red maple (*Acer rubrum*). Cattail (*Typha* sp.) stands occurred sporadically on the periphery of the lake, more commonly in the northern and southern extents. Hydrology is driven by, in addition to stormwater runoff, by contributions from springs and seepages in Bonnet Springs Park and ground water.

Lake 10 (L10)
NWI Classification: PUBHx (Palustrine Unconsolidated Bottom Permanently Flooded Excavated)
FLUCFCS Classification: 520 (Lakes)
The water body is an excavated lagoon located in Bonneted Springs Park. This system is bordered on west by wetland herbaceous emergent and woody vegetation associated with Wetland 08. The bonnet springs Park uplands form the eastern boundary. An island (with herbaceous and woody wetland vegetation), Island 3, occupies the southern portion of the lagoon. Hydrology is driven by contributions from springs and seepages in Bonnet Springs Park, ground water, and storm water runoff from adjacent uplands.

Stormwater Detention/Retention Features 1-33 (DP01-33)
NWI Classification: PUB/AB/EM/SS/FO x/h (Palustrine Unconsolidated Bottom/Aquatic Bed/Emergent/Scrub-Shrub/Forested Excavated/Diked)
FLUCFCS Classification: 530 (Reservoirs)
These features are engineered systems designed to detain or retain storm water runoff that have been excavated, diked, or a combination of both. All these features were characterized by overflow outlet structures that discharged to water bodies, uplands, or other stormwater detention/retention systems. Vegetation classes within these features varied and included open water with minimal submerged or emergent herbaceous vegetation; emergent herbaceous vegetation such as cattail (*Typha* sp.), bulrush (*Schoenoplectus* sp.), and primrosewillow (*Ludwigia* sp.); scrub-shrub vegetation, primarily smaller individuals of tree species such as Carolina willow (*Salix caroliniana*) and red maple (*Acer rubrum*); and forested, also primarily Carolina willow and red maple. A common component of the scrub-shrub and forested systems was Brazilian-pepper (*Schinus terebinthifolia*). Water regimes in normal circumstances ranged from saturated soils to permanently flooded. Per the description of these features, hydrology is driven primarily by stormwater events.

Wet Stormwater Conveyance Ditches 1-4 (D01-04)
NWI Classification: PUB/EMx (Palustrine Unconsolidated Bottom/Emergent Excavated)
FLUCFCS Classification: 510 (Streams and Waterways)
These features are linear engineered systems designed to convey stormwater runoff. Vegetation varied and ranged from areas with minimal emergent herbaceous vegetation to dense occurrences of herbaceous vegetation, often infested with primrosewillow (*Ludwigia* sp.) or in combination with other opportunistic and invasive species. Hydrology appeared to be driven by groundwater and stormwater events.

APPENDIX I

GEOTECHNICAL ENGINEERING REPORT

Madrid CPWG

Geotechnical Engineering Report

Lake Bonnet Drain Channel
Lakeland, Florida

Prepared for:

AECOM

Prepared by:

MADRID ENGINEERING GROUP, INC., dba MADRID CPWG
2030 State Road 60 East
Bartow, FL 33830
863-533-9007

Project No. 15425
April 2024

MADRID CPWG
2030 State Road 60 E
Bartow FL 33830-4268
Ph: (863) 533-9007
Fax: (863) 533-8997

April 12, 2024

Mr. Joseph M. Ruperto, P.E.
AECOM
7650 West Courtney Campbell Causeway
Tampa, Florida 33607

Re: Geotechnical Engineering Report
Lake Bonnet Drain Channel
Lakeland, Florida
Madrid Project No. 15425

Dear Mr. Ruperto,

Madrid Engineering Group, Inc., dba Madrid CPWG, (Madrid) is pleased to submit this Geotechnical Engineering Report summarizing the results of our geotechnical subsurface exploration and engineering evaluation services completed for the above referenced project. The work was completed in general accordance with the authorized scope of work in our cost estimate proposal dated January 15, 2024. This report briefly discusses our understanding of the project at the time of the subsurface exploration, describes the geotechnical consulting services provided by Madrid, and presents our findings, conclusions, and recommendations.

We appreciate the opportunity to be of service to you on this project and look forward to working with you on future projects. If you have any questions, please do not hesitate to contact us.

Sincerely,
Madrid Engineering Group, Inc.

ANDRE KNIAZEFF LICENSE No 81315 STATE OF FLORIDA PROFESSIONAL ENGINEER

Andre Kniazeff, P.E.
Geotechnical Engineering Division Leader
Florida P.E. No. 81315

Paul Passe, P.E.
Chief Engineer
Florida Registration No. 34750

Attachment: Geotechnical Engineering Report

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION AND PROJECT DESCRIPTION

1.1 General

Madrid Engineering Group, Inc., dba Madrid CPWG, (Madrid) is pleased to submit this report summarizing the results from our subsurface soil exploration and geotechnical engineering evaluation for the Lake Bonnet Drain Channel project in Lakeland, Florida. Our conclusions and recommendations are based on the results of our field exploration, laboratory testing, and appropriate engineering analyses.

Based on the provided information, we understand that a chronic flooding effects immediately downstream of Lake Bonnet. Madrid Engineering Group, Inc. dba Madrid CPWG (Madrid) has been requested to provide an estimate for a geotechnical exploration and evaluation to support the design of improvements to an existing downstream drain channel. These improvements will include the reconfiguration/reshaping of 3,210 linear feet of the existing open-channel section, and replacement of existing culverts.

The purpose of this exploration was to collect subsurface soil and groundwater information to provide an evaluation of the existing subsurface conditions at the boring locations and to identify constraints or limitations (to the extent possible) that the subsurface conditions may impose on the planned improvements.

The scope of work for this investigation included review of existing geological data, a field exploration and laboratory testing program, evaluation of soil testing results, and providing general geotechnical recommendations for the proposed improvements.

1.2 Site Location and Description

The subject channel generally runs west-east through existing mobile home park developments located north of West Chase Street and between North Wabash Avenue on the west and North Brunnell Parkway on the east in Lakeland, Florida as shown on **Figure 1**, **Site Location Map**.

The topographic survey map published by the United States Geological Survey (USGS) was reviewed. Based on this review, the natural ground surface elevation at the project site varies between approximately +140 feet to +145 feet North American Datum (NAD, 1983), which generally agrees with the topographic information/survey data provided by the Client. GIS topographic information is provided on **Figure 2**, **USGS Topographic Map**.

1.3 Soil Survey Review

The Natural Resources Conservation Services (NRCS) Soil Survey reports provide a general description of the typical shallow soil strata (about 6 feet) encountered within each particular soil mapping unit and reports typical depth to seasonal high-water levels. The NRCS defines seasonal high water as "a zone of saturation at the highest average depth during the wettest season that is at least six inches thick, persists for more than a few weeks, and is within six feet of the soil surface." The Soil Survey for Polk County indicates the predominant shallow soils at the site are comprised of **Samsula muck** (map unit 13), **Myakka-Immokalee-Urban land complex** (map unit 53), and **Arents, organic substratum-Urban land complex** (map unit 61), as shown on **Figure 3, NRCS/USDA Soils Map.**

Table 1.3 below summarizes the soil survey review.

Table 1.3: Summary of Soil Map Unit

Map Unit Name	Slope (%)	Depth (inches)	Soil Description	USDA - Seasonal High Groundwater Table Depth (inches)
13 - Samsula muck, frequently ponded	0 - 1	0 – 32 32 – 80	Muck Sand	0
53 - Myakka-Immokalee-Urban land complex		0 – 80	Fine sand	6 - 18
61 - Arents, organic substratum-Urban land complex		0 – 30 30 – 65 65 – 80	Sand Muck Sand	24 - 36

2.0 FIELD EXPLORATION

2.1 Standard Penetration Test Borings

Madrid explored subsurface conditions at the site by drilling four (4) 25-foot-deep Standard Penetration Test (SPT) borings (B-1, B-2, B-6, and B-7) within potential new culvert structure areas and nine (9) 15-foot-deep SPT borings along the existing drain channel alignment. A GPS hand unit (typical accuracy of +/- 10 feet) was utilized in conjunction with existing site features in the field for location purposes. Boring locations are shown at the bottom of the boring logs in **Appendix A**. The boring locations are plotted on Figure 4, Boring Location Plan, and should be considered approximate.

Disturbed samples from the SPT borings were obtained using a split-spoon sampler in general accordance with ASTM Specification D 1586, using a 1.4-inch I.D. split-spoon sampler driven with a 140-pound auto-hammer falling a distance of 30 inches. An engineering technician familiar with soil classification and field evaluations logged the borings in the field and placed samples in sealed containers and returned them to Madrid's laboratory for further classification. Upon completion, the boreholes were backfilled in general accordance with industry standards. The soil boring logs have been included with this report in **Appendix A**. Soil samples will be retained for a period of 3 months unless otherwise notified.

3.0 SUBSURFACE CONDITIONS AND LABORATORY TESTING

3.1 Subsurface Soil Conditions

The subsurface soils encountered in the test borings generally consisted of mixed strata of very loose to very dense sands to clayey sands (USCS classifications SP, SP-SM, SM, and SC) from the existing ground surface elevation to the maximum depth explored of 25 feet below existing grade (beg). As exceptions, very soft to stiff lean clay (CL) was encountered in the test borings B-9 and B-13 at depths of 4 feet to 6 feet beg and 12 feet to 15 feet beg, respectively, and stiff plastic clay (CH) was encountered in the test borings B-11 and B-12 at depths from 12 feet to 15 feet beg and 6 feet to 15 feet beg, respectively. Organic soils were encountered in borings B-8 from 4 to 6 feet at 29% and B-9 from 0 to 4 feet at 12%.

The general soil profiles described above and as presented on the boring logs are based on our interpretation of subsurface conditions encountered at the boring locations only. Boundaries between soil layers are approximate and for illustration purposes only. Variations in soil conditions in both horizontal and vertical directions different from those presented are likely to exist between boring locations.

3.2 Groundwater Conditions

Groundwater was encountered in the test borings B-2 through B-13 at depths ranging from about 1 foot to 9 feet beg and was not encountered in the upper 10 feet in the test boring B-1 at the time of our subsurface exploration.

3.3 Laboratory Testing

Laboratory tests for natural water content (ASTM D2216), percent passing the No. 200 sieve (ASTM D1140), organic content (ASTM D2974), soil particle size analysis (AASHTO T-88/M145, and Atterberg Limits Determination (AASHTO T89/90) were performed on selected samples retrieved during the field exploration from the soil borings to verify the visual and tactile soil classifications. **Table 3.3a** on the next page shows a summary of some laboratory tests. In addition, laboratory test reports are included in **Appendix B**.

Table 3.3a

Lab Summary	
<#200 Sieve	5.1% - 67.6%
% Moisture	6.0% - 196.4%
Organic Content	3.1% - 29.4%
Liquid Limit	64 – 104
Plastic Limit	25 - 29
Plasticity Index	39 - 77

4.0 EVALUATION AND GENERAL RECOMMENDATIONS

4.1 Culvert Foundations

Madrid understands that the subject project may include the installation of two (2) box culvert structures. We have assumed that the proposed box culvert structures will be designed to withstand HS-20 loading conditions and have also assumed that structures will bear between 2 feet to 10 feet beg.

Shallow foundation systems bearing on densified existing soils and/or compacted structural fill may be designed for a maximum allowable bearing pressure of **1,500 psf**.

We recommend minimum conventional shallow foundation footing widths of 24 inches for ease of construction and to reduce the possibility of localized shear failures; however, we anticipate wider footing widths will be provided in the manufacturer's design.

Scour was not evaluated as part of our scope of services. However, scour should be considered during design of the foundation system. Head/wing wall foundation elements should be placed below the anticipated scour depth.

Foundation excavations should be level and free of debris, ponded water, mud, loose, or water-softened soils. Concrete should be placed as soon as is practical after the foundation is excavated and the subgrade evaluated. Foundation concrete should not be placed on saturated soil. If a foundation excavation remains open overnight, or if precipitation is imminent, a 3 to 4-inch thick "mud mat" of lean concrete should be placed in the bottom of the footing to protect the bearing soils until reinforcing steel and concrete can be placed.

Settlement: Settlement of the culvert and head/wing wall structures will be influenced by several interrelated factors, such as (1) subsurface stratification and strength/compressibility characteristics of the bearing soils, (2) footing size, bearing level, applied loads, and resulting bearing pressured beneath the culverts and foundations; (3) site preparation and earthwork construction techniques used by the contractor.

Differential settlement results from differences in applied bearing pressures (e.g., at the edges versus center of the culvert structure and head walls) and the variations in the compressibility characteristics of the subsurface soils. Due to the nature of the encountered subsurface soils, following the compaction operations we expect a significant portion of settlement to be elastic in nature and occur relatively quickly, upon application of the loads, during and immediately following construction. Provided the foundation soils are prepared are recommended in this report and for soil improvement to a minimum depth of 2 feet below the box culvert and headwall foundation elevations (through densification or removal/replacement), the estimated total and differential settlements should be on the order of 1 inch and ½ inch or less, respectively.

4.2 Below Grade Walls

The magnitude and distribution of earth pressures against below grade walls depends on the deformation condition (rotation) of the wall, soil properties and water conditions. When the soil behind the wall is prevented from lateral strain, the resulting force is known as the at-rest earth pressure (K_O). If the retaining structure moves away from the soil mass, the earth pressure decreases with the increasing lateral expansion until a minimum pressure, known as the active earth pressure ($K_{A)}$, is reached. If the wall is forced into the soil mass, the earth pressure increases until a maximum pressure, known as the passive earth pressure (K_P), is obtained.

Free-standing retaining walls are usually designed for active earth pressures. However, the earth pressures must be compatible with the wall rotation, which is limited by the wall rigidity, foundation support conditions and connections to adjoining structures. If active earth pressure development requires horizontal wall movements that cannot occur, or which are architecturally undesirable, walls should be designed for an intermediate pressure based on restraint conditions.

Laboratory analysis to determine actual soil shear strength properties was beyond the authorized scope of the services. With the bearing level subgrade soils prepared as recommended in this report and as required by applicable local and/or FDOT indices, based on our experience with similar soils and construction, the following ultimate soil parameters below may be used in the proposed design:

- Backfill soil internal angle of friction = 30°
- Ka (Coefficient of active earth pressure) = 0.33
- Kp (Coefficient of passive earth pressure) = 3.00
- Ko (Coefficient of earth pressure at rest) = 0.50
- Unit weight of soil (Moist) = 115 pounds per cubic foot
- Unit weight of soil (Buoyant) = 55 pounds per cubic foot

4.3 Site Preparation

We recommend removing existing structures, all surficial vegetation and topsoil, as well as any other deleterious non-soil materials that are found to be present. The soils exposed at the structure bottom grade elevation should be compacted to a minimum soil density of 98 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D-1557).

A geotechnical engineer should carefully evaluate all subgrades prior to foundation construction to confirm compliance with this report; evaluate geotechnical sections of the plans and specifications for the overall project; and provide additional recommendations that may be required.

4.4 Fill Suitability

Foundation fill materials should be relatively clean sands with less than 12 percent soil fines (i.e., material passing the No. 200 sieve), and free of non-soil materials and rock fragments larger than 3 inches in diameter. Based on visual examination, the near-surface existing soils encountered during this exploration appear suitable for reuse as general structural site or foundation fill. Fill materials that contain organic debris (organic contents greater than 4 percent) or construction debris/rubble are not suitable for reuse as structural fill. Prior to construction, bulk samples of the proposed fill materials should be laboratory tested to confirm their suitability.

Open graded stone backfill materials may be used as a construction convenience for foundation fill materials. Stone materials (such as No. 57 stone, having a granitic matrix) may be used as structural fill when backfilling adjacent to, or below, the groundwater level. Open-graded stone will provide uniform support and a stable working surface to place reinforcing steel as well as allow drainage when working near the water level. The minimum stone layer thickness should be 12 inches. Following “choking” a thin layer of stone materials into the exposed subgrade soils, the stone materials should be placed in relatively thin lifts of 6 inches or less and densified with vibratory compaction equipment, such as a plate compactor. Compaction should continue until the stone is well seated. The stone materials should be entirely wrapped with geosynthetic filter fabric to prohibit the migration of soil fines.

Organic and/or debris-laden material is not suitable for re-use as structural fill. Topsoil, mulch, and similar organic materials can be wasted in architectural areas. Debris-laden materials should be excavated, transported, and disposed of off-site in accordance with appropriate solid waste rules and regulations. Procedures and criteria for fill/backfill materials adjacent to and above the culvert structure should be in accordance with the manufacturer's recommendations.

4.5 Soil Compaction

Foundation area fill should be placed in thin, horizontal loose lifts (maximum 12-inch) and compacted to a minimum soil density of at least 98 percent of the Modified Proctor maximum dry density (ASTM D-1557). Footing excavations should be also compacted to a minimum soil density of at least 98 percent of the Modified Proctor maximum dry density (ASTM D-1557). Fill materials used in structural areas should have a target maximum dry density of at least 100 pounds per cubic foot (pcf). If lighter weight fill materials are used, the NOVA geotechnical engineer should be consulted to assess the impact on design recommendations.

Soil moisture content should be maintained within 3 percent of the optimum moisture content. We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. Moisture control may be difficult during rainy weather. Soils excavated from below the groundwater table will likely require significant efforts to achieve acceptable moisture contents prior to re-use as fill.

4.6 Shallow Excavations and Dewatering

Open-cut methods appear suitable for shallow excavations, but very loose sand may slough at shallow slopes. Temporary side slopes for the open-cut excavations should be stable in the short term at slopes of one and one-half feet horizontal to one foot vertical (1.5:1 H:V). All excavations should conform to the Occupational Safety and Health Act (OSHA) requirements for Type C soils as described Federal Register 29 CFR Part 1926. The design of a shoring system is the responsibility of the selected contractor. A number of variable factors, such as nature and strength of excavated soils, depth of excavation and groundwater, proximity of adjacent structures, and economics of construction method, etc., will affect the choice of support method.

All vertical shoring or prefabricated trench lining systems should be continuous and maintained in place to assure adequate temporary stability during backfilling of the trench as recommended subsequently. Excavated soils should not be stockpiled within 15 feet (horizontally) of the shored excavations, unless specific provisions for surcharge loading have been included in the design of the shoring system. The final decision on appropriate excavation methods and design of shoring systems is the responsibility of the contractor.

Based upon results of our subsurface investigation and depending upon the time of year, groundwater and surface water will impact the planned near surface construction. Contractors should be prepared to utilize a dewatering system during construction to maintain separation between the groundwater levels and working platform. Surface water within the existing drainage feature should be re-routed or dammed and pumped around the construction area. We recommend that a dewatering system be designed and installed to draw the groundwater table down to a depth sufficient to achieve compaction for the foundation; this typically requires lowering the water to 2 to 3 feet below the foundation subgrade level. The dewatering system may be used in conjunction with a cut-off system to control inflow of groundwater into excavations. The contractor should employ a registered professional engineer to design all shoring and dewatering systems.

4.7 Existing Slopes and Stabilization

The existing channel slopes at the boring locations range from as steep as approximately 1.4:1 (horizontal to vertical) to about 4:1. Steep slopes are not stable in the long term without installation of stabilization mechanisms. Although the banks currently stand steeper, soils at the site can support slopes on the order of 2:1 in the long term but surface erosion may still occur along the slope if the surface is not protected with grass or other erosion resistant material. However, for maintenance and constructability, Madrid recommends general slopes of 3:1 for rehabilitation methods and some type of ground cover to help minimize surface erosion along slopes.

We performed slope stability analyses assuming that due to limitation for lateral expansion in some areas the existing channel will be deepened, and under the rapid drawdown condition (condition occurring when the water level adjacent to the slope is lowered rapidly and it is assumed that drawdown is very fast, and no drainage occurs). The table below summarizes the results of these analyses.

Conditions	Slope, H:V	Channel Depth, ft beg	Factor of Safety
Existing Slope*	1.4:1	7	1.1
Existing Slope*	1.4:1	3	1.1
Flatter Slope*	2:1	3	1.5

Sheet Pile**		3	2.1

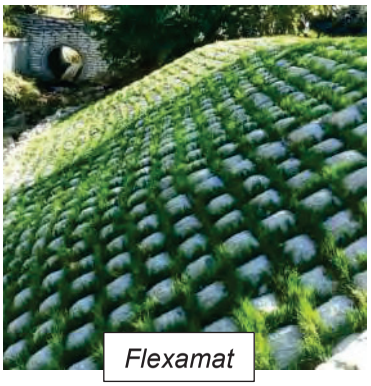
* Based on the boring B-4 results
** Based on the boring B-6 results

The results of slope stability analyses have been included with this report in **Appendix C**.

Where there is not enough room to reduce slope angles, retaining walls (gravity or sheet pile) or other methods, such as regrading with slope armoring, may be needed to improve resistance to erosion and slope failure. Slope armoring alternatives for consideration may include an armored slope revetment such as Flexamat or Hydrotex Articulating Block Mat. Armored slope revetments are erosion control mats that consist of embedded concrete for added protection against periodic high flow velocities, as expected on this project. For this option, the existing slopes would need to be regraded and the channel may need to be widened to meet slope stability requirements while maintaining the current cross-sectional area.

Another alternative to consider for this project is Mechanically Stabilized Earth (MSE) walls. MSE walls use reinforced soil to create a composite retaining wall system. The reinforced soil consists of tensile reinforcements (generally geotextiles) added to the retained soil to form a stronger composite material mass. In general, reinforcement lengths need to be at least 0.7 times the wall height (or some minimum dimension on the order of 4 to 8 feet) to satisfy stability requirements. The reinforcement length can be reduced as necessary by using a permeable concrete backfill such as Draincrete (FDOT Specification 446). Space is limited, particularly on the west bank so something like this would be required where horizontal clearance between the top of wall to the edge of the pavement is limited.

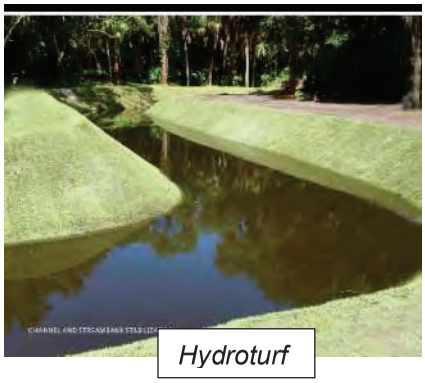
A gabion wall system could be another consideration, but space limitations also make constructability a potential issue. It is possible that a stacked Geo-Cell wall or other MSE systems could work and may require less encroachment into adjacent properties if designed as a gravity system. Other gravity systems such as Redi Rock provide aesthetically pleasing alternatives that typically do not encroach as far back as MSE wall systems. Hard armoring using articulated block systems vary from robust systems such as Shore Block to moderate systems such as ShoreFlex/Flexamat. Hydroturf is a more aesthetically pleasing erosion control mat that can be used in applications where seepage behind the system is not a concern.
Below are photos of the examples discussed.

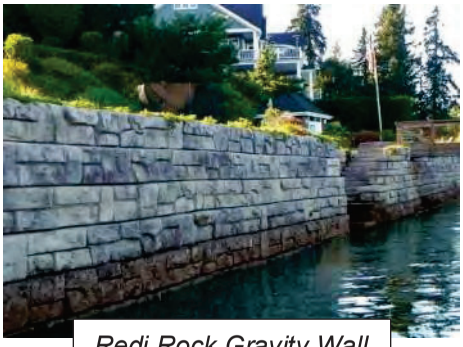

Flexamat


Hydrotex


MSE Wall


Geo-Cell Wall


Hydroturf


Redi Rock Gravity Wall

4.3 Drainage

If retaining structures are installed for rehabilitation of this drain channel, drainage behind the structures will be critical to their performance as it significantly reduces the risk of hydrostatic pressures building up and increasing the lateral stresses on the system. Specific and more detailed recommendations for drainage design are impractical at this time without knowing the final method of stabilization proposed. Depending on the stabilization method selected and its ability to release water through it, it is possible that a drainage medium such as coarse sand gravel or prefabricated drainage systems should also be employed.

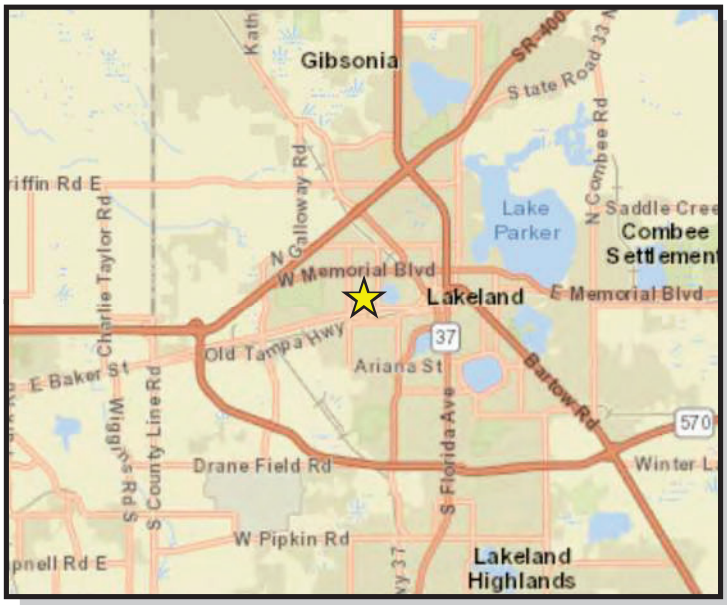
4.4 Preliminary Recommendation for Sheet Pile Embedment

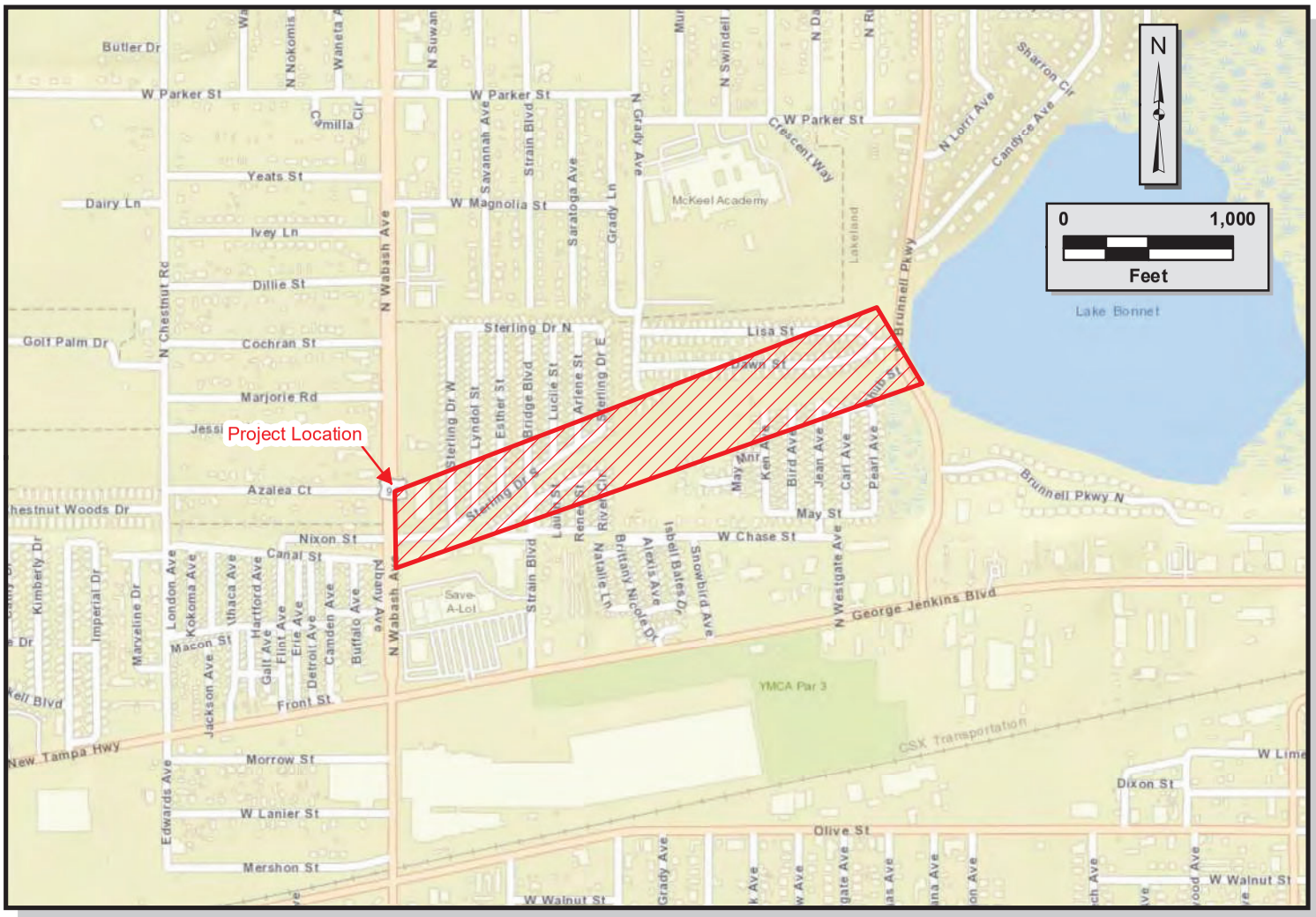
The advantage of a driven sheet pile system is that it is not restricted by the limited space; all other wall systems require excavation to the base of the wall and associated excavation support. The soils encountered were mostly loose to medium dense. Generally, ideal embedment of the sheet pile would penetrate into the medium dense (more competent) soil. However, depth of embedment of sheet pile walls depends on soil conditions, geometry, and the type of wall, such as whether cantilever or anchored. As an initial estimate for a cantilever type wall, the designer can assume the embedded depth between 1.5 to 2.0 times the retained height with a minimum recommended

embedment of 5 feet for very short (2 feet or less) retained heights. A detailed analysis of the wall system will be required for the final design of sheet pile systems, including the possibility of more and deeper borings along the channel to better establish the profile of soil along different sections of the channel.

5.0 LIMITATIONS

This preliminary report has been prepared for AECOM for the proposed Lake Bonnet Drain Channel project in Lakeland, Florida. The information in this report is intended for the sole use of the addressees and their assigns/agents and may not be relied upon or used by any third party without expressed written consent. The evaluations and recommendations presented herein are based on Madrid's interpretation and understanding of site conditions and information provided by the Client. This report is not a specification document and is not intended for use as a part of the specifications. Varying degrees of non-uniformity of the horizontal and vertical soil conditions may exist at the site. This study is not intended to be an evaluation of sinkhole risk. This study does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface. The study reported herein has been conducted in accordance with the generally accepted standards, principles and practices in the geotechnical engineering profession. No other warranty, expressed or implied, is made. Madrid is not responsible for the independent conclusions, opinions, and/or recommendations made by others based on the field investigation and laboratory testing data presented in this report. Soil samples will be stored at our Bartow Office for a period of 3 months from the date of this report unless other arrangements are made.





Sources: GIS Information (ESRI)

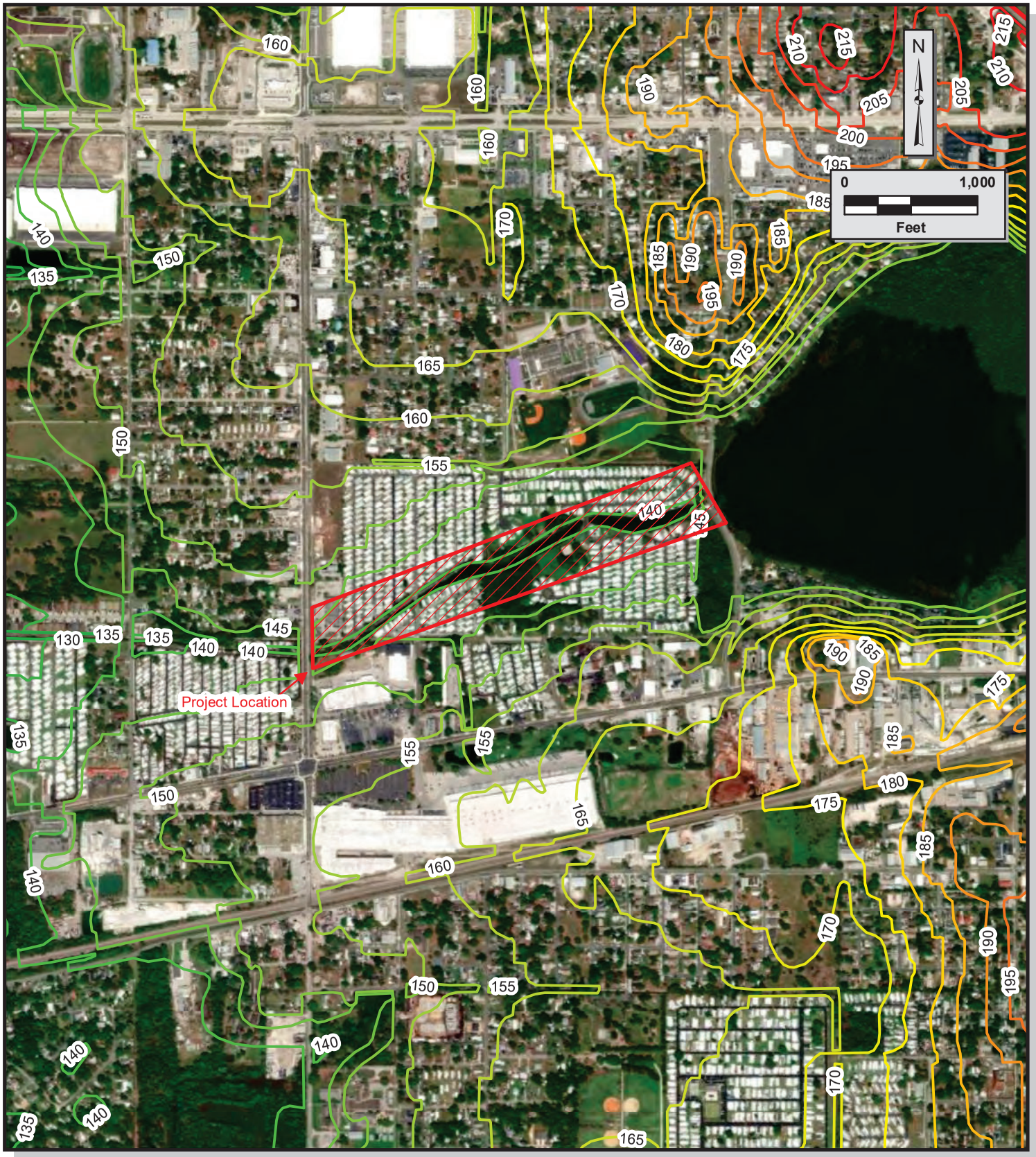
MADRID CPWG
2030 State Road 60 East
Bartow, Florida 33830
863 533-9007 Fax: 863 533-8997
EB-0006509

AECOM

FIGURE 1
Site Location Map
Lake Bonnet Drain Channel
Lakeland, Florida

Project Number:
15425

Notes:	Drawn By: CJ	Checked By: AK



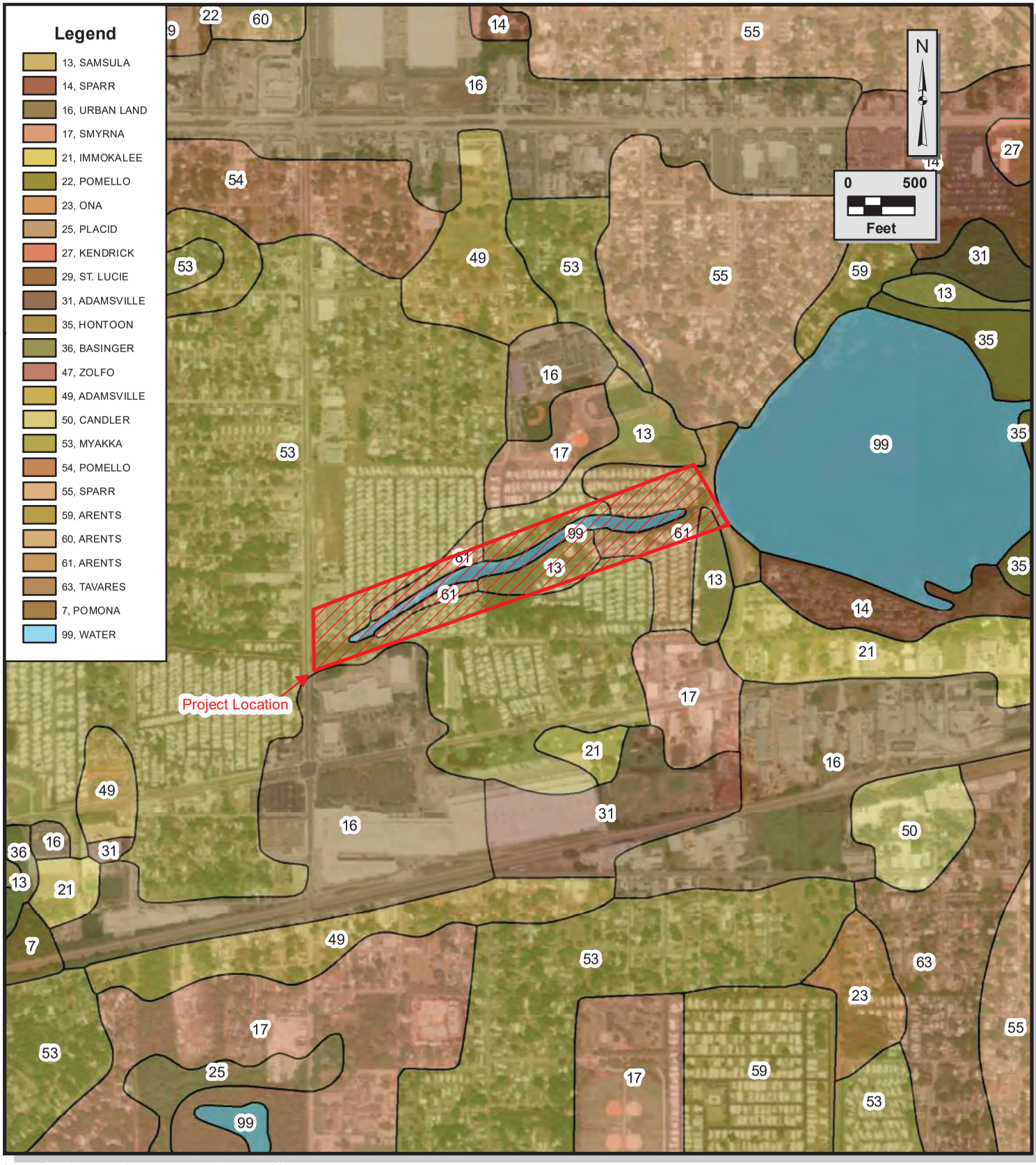
Source: GIS Information (ESRI), Topographic Information (USGS)

MADRID CPWG
2030 State Road 60 East
Bartow, Florida 33830
863 533-9007 Fax: 863 533-8997
EB-0006509

AECOM

FIGURE 2
USGS Topographic Map
Lake Bonnet Drain Channel
Lakeland, Florida

Drawn By: CJ	Checked By: AK	Project Number: 15425



Source: GIS Information (ESRI), Topographic Information (USGS)

MADRID CPWG
2030 State Road 60 East
Bartow, Florida 33830
863 533-9007 Fax: 863 533-8997
EB-0006509

AECOM

FIGURE 3
NRCS/USDA Soils Map
Lake Bonnet Drain Channel
Lakeland, Florida

Drawn By: CJ | Checked By: AK

Project Number:
15425

Aerial Data Source – 2021 Microsoft Corporation, 2021 CNES Distribution Airbus DS.

MADRID CPWG
2030 State Road 60 East
Bartow, Florida 33830
863 533-9007 Fax: 863 533-8997
EB-0006509

AECOM

FIGURE 4
Boring Location Plan
Lake Bonnet Drain Channel
Lakeland, Florida

Project Number:
15425

Notes: Base map provided by Client.

Drawn By: CJ

Checked By: AK

Appendix A

BORING NO. B-01

DATE DRILLED 3/11/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not encountered. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Dark grayish brown sand (SP)	0				
2	Dark grayish brown slightly silty sand (SP-SM)		145			
4	Medium dense pale brown sand (SP)					
		5		5-8-9-11	17	
6	Medium dense dark gray slightly silty sand (SP-SM) <#200 = 5.4%		140	7-8-8-11	16	
	Grayish brown			9-9-7-8	16	
		10				
12	Medium dense grayish brown clayey sand (SC)		135			
				6-6-4	10	
		15				
	Light gray <#200 = 19.1%		130			
				8-12-8	20	
		20				
	White with limestone		125			
				4-9-7	16	
		25				

BORING LOCATION: 28.046917°,-81.980800°

BORING NO. B-02

DATE DRILLED 3/11/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 9' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Dark grayish brown slightly silty sand (SP-SM)	0				
	Grayish brown <#200 = 7.0%		145			
6	Very dense brown sand (SP)	5		4-4-50/6	Refusal	●
	Dense gray		140			
		10		5-28-16-14	44	●
	Very dense very pale brown		135			
		15		18-30-39	69	●
17	Dense pale brown slightly silty sand (SP-SM)		130			
		20		13-17-16	33	●
22	Medium dense light grayish olive clayey sand (SC) <#200 = 28.6% LL= 42 PL = 18 PI = 24		125			
		25		7-7-11	18	●

BORING LOCATION: 28.046740°,-81.980721°

BORING NO. B-03

DATE DRILLED 3/11/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 0.92' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
0	Loose gray slightly silty sand (SP-SM) <#200 = 5.1%	0	140	2-3-4-7	7
2	Medium dense pale brown sand (SP)			7-8-7-8	15
	Loose	5		3-3-3-3	6
	Medium dense		135	3-5-11-13	16
				7-10-11-7	21
		10	130		
	Brown			8-8-8	16
		15			

● STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 28.046484°,-81.981402°

BORING NO. B-04

DATE DRILLED 3/11/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 3.75' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Loose gray slightly silty sand (SP-SM) <#200 = 7.3%	0		2-2-2-3	4
	Medium dense dark gray		140	3-8-6-10	14
4	Medium dense very pale brown sand (SP)	5		2-4-5-5	9
6	Medium dense very pale brown slightly silty sand (SP-SM)			4-7-10-11	17
			135		
8	Medium dense very pale brown sand (SP)			4-7-10-11	17
		10			
12	Medium dense very pale brown clayey sand (SC) <#200 = 17.4%		130		
				7-8-9	17
		15			

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 28.046304°,-81.982228°

BORING NO. B-05

DATE DRILLED 3/8/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 2.5' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Very loose dark gray slightly silty sand (SP-SM)	0	140	1-1-1-2	2
	Medium dense			WOH-4-6-6	10
4	Medium dense light gray sand (SP)	5	135	4-6-8-9	14
				6-12-11-11	23
	Very pale brown			4-5-12-11	17
		10	130		
12	Medium dense clayey sand (SC) <#200 = 27.9% LL= 28 PL = 17 PI = 11				
				9-7-7	14
		15			

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 28.046340°,-81.982978°

BORING NO. B-06

DATE DRILLED 3/8/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 2.66' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Blows	N-Value
0	Dark gray slightly silty sand (SP-SM)		
2	Gray sand (SP)		
4	Loose dark grayish brown silty sand (SM) <#200 = 16.1%	2-2-2-4	4
6	Medium dense very pale brown sand (SP)	7-7-8-9	15
		7-10-8-10	18
	Loose brown	4-4-2	6
17	Medium dense very pale brown clayey sand (SC) <#200 = 21.5%	6-6-9	15
		6-8-8	16
25			

Depth (ft) | Elev. (ft): 0 / 140, 5 / 135, 10 / 130, 15 / 125, 20 / 120, 25

● STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 28.046664°,-81.983518°

BORING NO. B-07

DATE DRILLED 3/7/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 3' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
0	Brownish yellow sand (SP)	0			
2	Pale brown slightly silty sand (SP-SM)		140		
	Loose dark gray <#200 = 10.9%	5		2-2-2-2	4
	Brown		135	WOH-WOH-3-2	5
8	Medium dense pale brown sand (SP)			5-8-12-19	20
		10			
12	Medium dense very pale brown		130		
				4-7-5	12
		15			
17	Medium dense very pale brown clayey sand (SC) <#200 = 28.9% LL= 37 PL = 16 PI = 21		125		
				3-4-5	9
		20			
	Loose		120		
				2-4-4	8
		25			

● STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 28.046395°,-81.983700°

BORING NO. B-08

DATE DRILLED 3/7/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 2.5' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Medium dense very dark gray slightly silty sand (SP-SM)	0	140	2-4-6-5	10
2	Loose very dark gray clayey sand (SC)			4-4-4-4	8
4	Loose very dark gray organic silty sand (SM) <#200 = 42.0% organic content = 29.4%	5		WOH-3-1-1	4
6	Medium dense grayish brown slightly silty sand (SP-SM)		135	1-5-6-5	11
	Dense <#200 = 9.0%			5-17-22-18	39
		10	130		
12	Dense very pale brown sand (SP)				
		15		10-13-18	31

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 28.046233°,-81.984545°

BORING NO. B-09

DATE DRILLED 3/7/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 0.83' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Loose dark gray organic silty sand (SM)	0		1-2-1-2	3	
	<#200 = 33.0% organic content = 12.1%			1-3-2-1	5	
4	Very soft grayish brown clay (CL) <#200 = 60.4%		135			
		5		WOH/12"-1-1	2	
6	Loose grayish brown silty sand (SM)					
				WOH/12"-3-3	6	
				2-4-3-20	7	
		10	130			
12	Very dense very pale brown sand (SP)					
			125	13-21-23	44	
		15				

BORING LOCATION: 28.045666°,-81.984926°

BORING NO. B-10

DATE DRILLED 3/7/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 3.17' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Loose dark gray slightly silty sand (SP-SM)	0		1-2-3-2	5	
	Dark brown <#200 = 7.0%		140	2-3-2-8	5	
	Dense	5		8-14-11-9	25	
	Medium dense pale brown		135	6-8-10-11	18	
8	Medium dense very pale brown sand (SP)			8-8-8-10	16	
		10				
12	Very loose pale brown clayey sand (SC) <#200 = 23.1%		130			
				1-1-1	2	
		15				

BORING LOCATION: 28.045692°,-81.986259°

BORING NO. B-11

DATE DRILLED 3/7/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 4.5' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION
0	Dark gray slightly silty sand (SP-SM)
2	Dark gray slightly organic silty sand (SM) <#200 = 25.2% organic content = 3.1%
4	Gray slightly silty sand (SP-SM)
6	Medium dense dark gray silty sand (SM)
8	Medium dense pale brown sand (SP)
12	Stiff very pale brown highly plastic clay (CH) <#200 = 67.6% LL= 177 PL = 60 PI = 117

Depth (ft)	Elev. (ft)	Blows	N-Value
0	140		
5	135	2-3-7-10	10
10	130	8-6-6-7	12
15		4-5-5	10

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 28.045063°,-81.987513°

BORING NO. B-12

DATE DRILLED 3/7/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 8' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Dark brown slightly silty sand (SP-SM)	0	140			
4	Light gray clayey sand (SC) <#200 = 33.8%	5				
6	Stiff very pale brown highly plastic clay (CH)			4-3-3-2	6	●
	Pale olive <#200 = 66.8% LL= 80 PL = 25 PI = 55		135	4-4-4-4	8	●
		10				
	Very pale brown with limestone		130			
				2-4-7	11	●
		15				

BORING LOCATION: 28.044219°,-81.988569°

BORING NO. B-13

DATE DRILLED 3/7/2024
PROJECT NUMBER 15425
PROJECT Lake Bonnet Drain Channel

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 9' bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION
	Grayish brown slightly silty sand (SP-SM)
2	Grayish brown slightly clayey sand (SP-SC)
4	Dark brown slightly silty sand (SP-SM)
6	Medium dense light gray clayey sand (SC)
	Pale olive <#200 = 23.8%
12	Stiff pale olive clay (CL)

Depth (ft)	Elev. (ft)	Blows	N-Value
0			
	140		
5			
		4-6-7-7	13
	135	7-7-6-7	13
10			
	130	4-4-7	11
15			

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 28.043874°,-81.989718°

USCS SOIL CLASSIFICATION GUIDANCE & MEG SOIL DESCRIPTION INFORMATION

PARTICLE SIZES

Coarse Grained ← → *Fine Grained*

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

12"	3"	3/4"	4.76mm	2.0mm	0.42mm	0.074mm	*(Particle Diameter)*
			No. 4	*No. 10*	*No. 40*	*No. 200*	*(US Standard Sieve Size)*

Greater than 50% material (by weight) passing the US No. 200 Sieve = Fine Grained Soil (silt or clay)
Greater than 50% material (by weight) retained on the US No. 200 Sieve = Coarse Grained Soil (sand or gravel)

MODIFIERS

Based on Visual & Tactile Estimates (unless specific lab testing data is provided)

Estimates of Fines Content (Percent Passing US No. 200 Sieve)

FINES CONTENT	MODIFIERS	USCS SYMBOLS
0 to 5%	No Modifiers Used	SP, SW, GP, GW
5 to 12%	SLIGHTLY SILTY or SLIGHTLY CLAYEY	SP-SM, SP-SC
12 to 35%	SILTY or CLAYEY	SM, SC
35 to 45%	VERY SILTY or VERY CLAYEY	SM, SC
45 to 55%	Use Dual (e.g. CLAYEY SAND/SANDY CLAY)	SC/CL or SM/ML

Estimates of Organic Content (by weight)

ORGANIC CONTENT	MODIFIERS
1 to 3%	Trace Organics
3 to 10%	Slightly Organic
10 to 30%	Organic
> 30%	Highly Organic or Peat

Estimates of Other Materials
(e.g. shell, rock, phosphate, etc.)

OTHER MATERIALS	MODIFIERS
1 to 5%	Trace
5 to 12%	Some
> 12%	Abundant
> 15% sand or gravel	With sand or With gravel

CORRELATION OF "SPT N" WITH RELATIVE DENSITY AND CONSISTENCY

COARSE GRAINED SOILS		
SPT N		
Auto*	Safety	RELATIVE DENSITY
< 3	< 4	VERY LOOSE
3 - 8	4 - 10	LOOSE
9 - 24	11 - 30	MEDIUM DENSE
25 - 40	31 - 50	DENSE
41 +	51 +	VERY DENSE

*Based on 75% efficiency

FINE GRAINED SOILS		
SPT N		
Auto*	Safety	CONSISTENCY
< 1	< 2	VERY SOFT
1 - 3	2 - 4	SOFT
4 - 6	5 - 8	FIRM
7 - 12	9 - 15	STIFF
13 - 24	16 - 30	VERY STIFF
25 +	31 +	HARD

Madrid CPWG
PO Box 2506 Bartow, FL 33831 863-533-9007 Fax 863-533-8997

Appendix B

2030 State Road 60 East
Bartow, FL 33830
(863) 533-9007

ASTM D1140 MOISTURE / PERCENT < No. 200 SIEVE

Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Tested By: BJN

Sample	Cont. Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moisture Content (%)	W_C+S_R (g)	<#200 (%)
B-1 6-8'	20	108.77	92.36	8.24	83.7%	19.5%	87.85	5.4%
B-1 18.5-20'	21	106.61	92.73	8.19	85.9%	16.4%	76.56	19.1%
B-2 2-4'	22	103.96	98.55	8.19	94.4%	6.0%	92.20	7.0%
B-2 23.5-25'	23	103.66	86.61	8.15	82.1%	21.7%	64.20	28.6%
B-3 0-2'	24	101.73	92.25	8.17	89.9%	11.3%	87.99	5.1%
B-4 0-2'	25	109.74	103.30	8.15	93.7%	6.8%	96.32	7.3%
B-4 13.5-15'	26	110.11	97.30	8.25	87.4%	14.4%	81.84	17.4%
B-5 13.5-15'	27	102.53	88.94	8.21	85.6%	16.8%	66.44	27.9%
B-6 4-6'	28	108.60	91.34	8.12	82.8%	20.7%	77.95	16.1%
B-6 23.5-25'	29	113.17	99.81	8.15	87.3%	14.6%	80.13	21.5%
B-7 4-6'	30	101.11	85.30	8.15	83.0%	20.5%	76.88	10.9%
B-7 18.5-20'	31	103.52	87.97	8.15	83.7%	19.5%	64.92	28.9%
B-8 4-6'	32	79.92	34.29	8.25	36.3%	175.2%	23.36	42.0%
B-8 8-10'	33	109.04	94.91	8.27	86.0%	16.3%	87.08	9.0%
B-9 2-4'	34	58.76	25.30	8.26	33.7%	196.4%	19.68	33.0%
B-9 4-6'	35	114.87	78.93	8.23	66.3%	50.8%	36.2	60.4%
B-10 2-4'	36	109.56	95.77	8.25	86.4%	15.8%	89.60	7.0%
B-10 13.5-15'	37	119.63	103.30	8.13	85.4%	17.2%	81.30	23.1%
B-11 2-4'	38	109.60	88.65	8.11	79.4%	26.0%	68.34	25.2%
B-11 13.5-15'	39	82.03	45.33	8.09	50.4%	98.5%	20.14	67.6%
B-12 4-6'	40	101.10	81.69	8.09	79.1%	26.4%	56.79	33.8%
B-12 8-10'	41	69.21	53.20	8.09	73.8%	35.5%	23.08	66.8%
B-13 8-10'	42	105.93	92.54	8.08	86.3%	15.9%	72.43	23.8%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
S_R = Weight of Sample Retained

$$\text{Solids Content } (\%) = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content } (\%) = \frac{W_{H_2O}}{S_D} * 100$$

$$< \#200 \text{ Sieve } (\%) = \frac{(S_D - S_R)}{S_D} * 100$$

2030 State Road 60 East
Bartow, Florida 33830
(863)533-9007

AASHTO T267 ORGANIC CONTENT

Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM
Date Tested: 3/21/2024
Technician: BJN

Sample	Container Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moist-ure Content (%)	Furnace Container Name	$W_{fC}+S_D$ (g)	$W_{fC}+S_{FD}$ (g)	W_{fC} (g)	Organic Content (%)
B-8 4-6'	53	56.50	21.64	8.19	27.8%	259.2%	2	68.76	64.78	55.23	29.4%
B-9 2-4'	54	68.28	43.62	8.16	59.0%	69.5%	4	91.48	87.20	55.99	12.1%
B-11 2-4'	55	94.98	79.00	8.15	81.6%	22.6%	6	127.95	125.75	57.16	3.1%

Average Organic Content (%): 14.9%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
W_{fC} = Weight of Furnace Container
S_{FD} = Weight of Furnace Dried Sample

$$\text{Solids Content (\%)} = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content (\%)} = \frac{(S_W - S_D)}{S_D} * 100$$

$$\text{Organic Content (\%)} = \frac{(S_D - S_{FD})}{S_D} * 100$$

2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-1
Soil Description: clayey sand

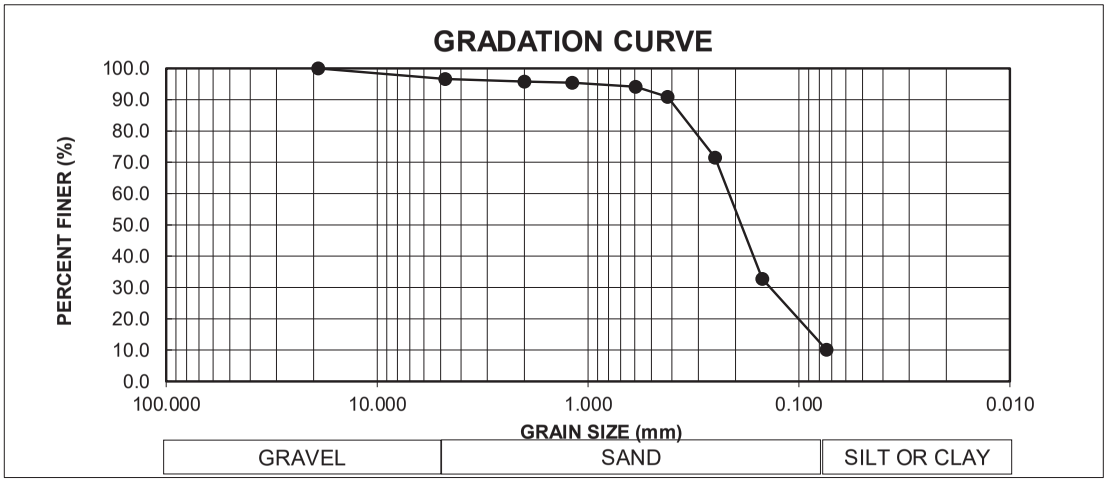
Sample Location: 0 TO 2'
Soil Classification: SC

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
87	205.41	194.33	15.66	**94.2%**	**6.2%**	177.6	**16.73**

Weight of dry soil before wash: 178.67 Weight of dry soil after wash: 161.94

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	6.1	**96.6**
10	2.000	7.5	**95.8**
16	1.190	8.2	**95.4**
30	0.595	10.4	**94.2**
40	0.420	16.3	**90.9**
60	0.250	50.9	**71.5**
100	0.149	120.1	**32.8**
200	0.074	160.6	**10.1**
Pan		161.9	9.4

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-2
Soil Description: clayey sand

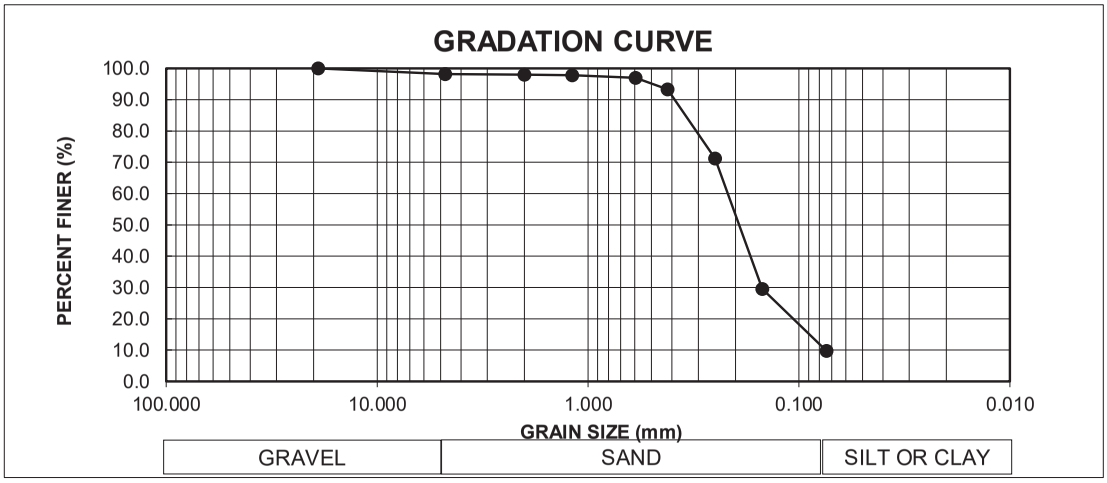
Sample Location: 6 TO 8'
Soil Classification: SC

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
88	184.00	168.46	15.83	**90.8%**	**10.2%**	153.96	**14.5**

Weight of dry soil before wash: 152.63 Weight of dry soil after wash: 138.13

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	2.8	**98.1**
10	2.000	3.0	**98.0**
16	1.190	3.4	**97.8**
30	0.595	4.6	**97.0**
40	0.420	10.2	**93.3**
60	0.250	44.0	**71.2**
100	0.149	107.6	**29.5**
200	0.074	137.8	**9.7**
Pan		138.1	9.5

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-3
Soil Description: sand

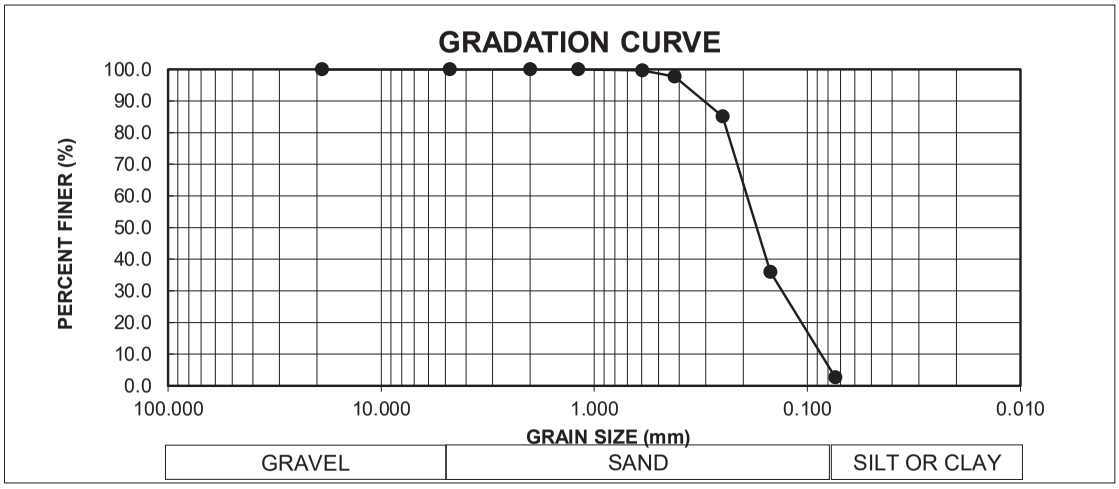
Sample Location: 4 TO 6'
Soil Classification: SP

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
89	215.39	179.26	15.66	**81.9%**	**22.1%**	177.28	**1.98**

Weight of dry soil before wash: 163.60 Weight of dry soil after wash: 161.62

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.0	**100.0**
16	1.190	0.0	**100.0**
30	0.595	0.5	**99.7**
40	0.420	3.7	**97.7**
60	0.250	24.3	**85.2**
100	0.149	104.7	**36.0**
200	0.074	159.2	**2.7**
Pan		161.6	1.2

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-4
Soil Description: sand

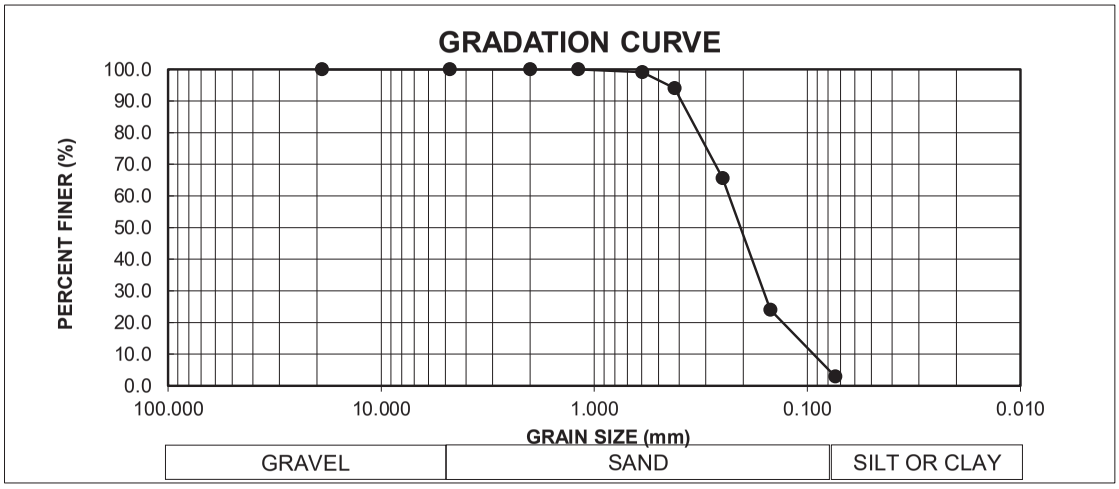
Sample Location: 4 TO 6'
Soil Classification: SP

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
90	209.83	178.90	15.69	**84.1%**	**19.0%**	174.12	**4.78**

Weight of dry soil before wash: 163.21 Weight of dry soil after wash: 158.43

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.0	**100.0**
16	1.190	0.0	**100.0**
30	0.595	1.4	**99.1**
40	0.420	9.8	**94.0**
60	0.250	56.1	**65.6**
100	0.149	123.9	**24.1**
200	0.074	158.4	**2.9**
Pan		158.4	2.9

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-5
Soil Description: clayey sand

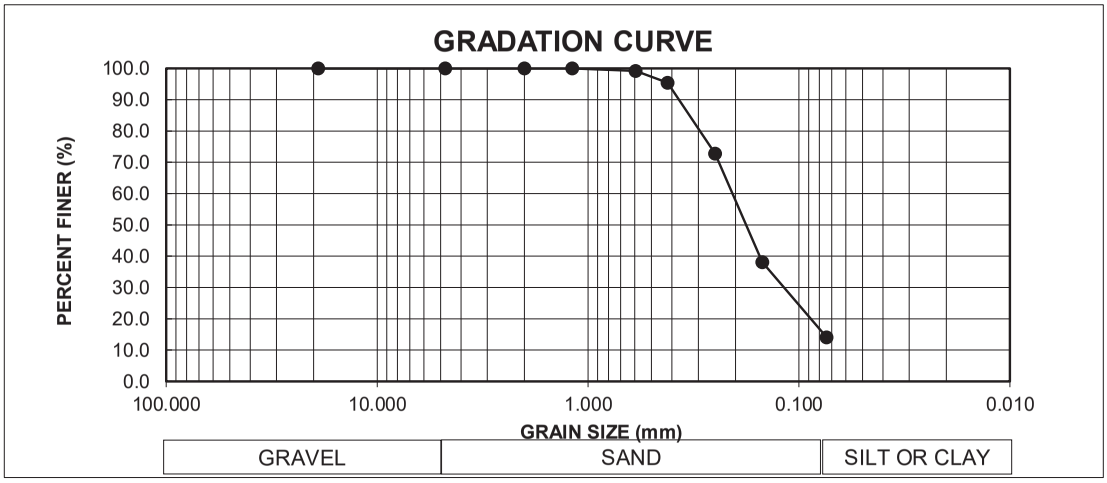
Sample Location: 2 TO 4'
Soil Classification: SC

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
101	199.51	173.16	15.63	**85.7%**	**16.7%**	152.04	**21.12**

Weight of dry soil before wash: 157.53 Weight of dry soil after wash: 136.41

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.0	**100.0**
16	1.190	0.0	**100.0**
30	0.595	1.2	**99.2**
40	0.420	7.2	**95.4**
60	0.250	42.9	**72.8**
100	0.149	97.5	**38.1**
200	0.074	135.3	**14.1**
Pan		136.4	13.4

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-6
Soil Description: sand

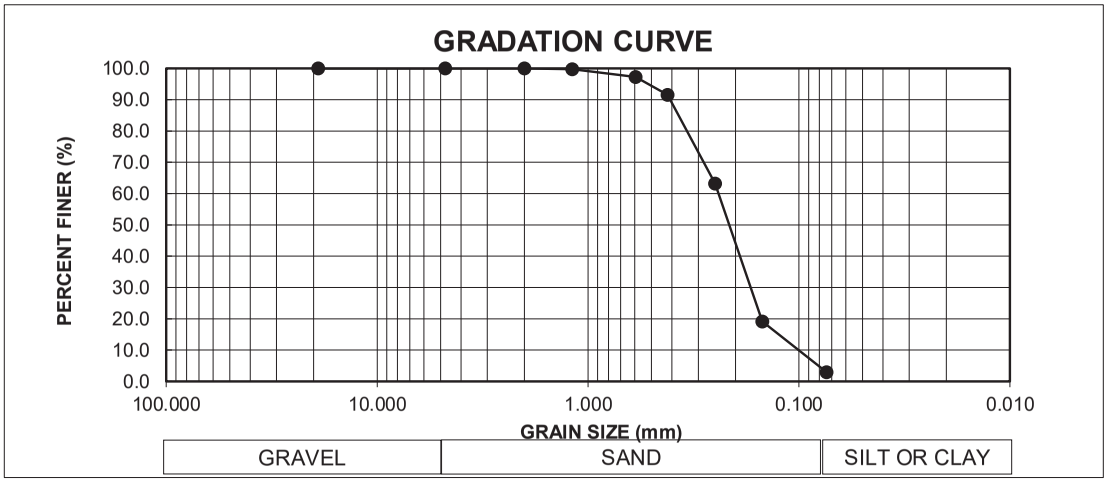
Sample Location: 2 TO 4'
Soil Classification: SP

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
106	228.36	187.84	15.66	**80.9%**	**23.5%**	183.26	**4.58**

Weight of dry soil before wash: 172.18 Weight of dry soil after wash: 167.60

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.0	**100.0**
16	1.190	0.4	**99.8**
30	0.595	4.6	**97.3**
40	0.420	14.6	**91.5**
60	0.250	63.3	**63.2**
100	0.149	139.3	**19.1**
200	0.074	167.1	**3.0**
Pan		167.6	2.7

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-7
Soil Description: clayey sand

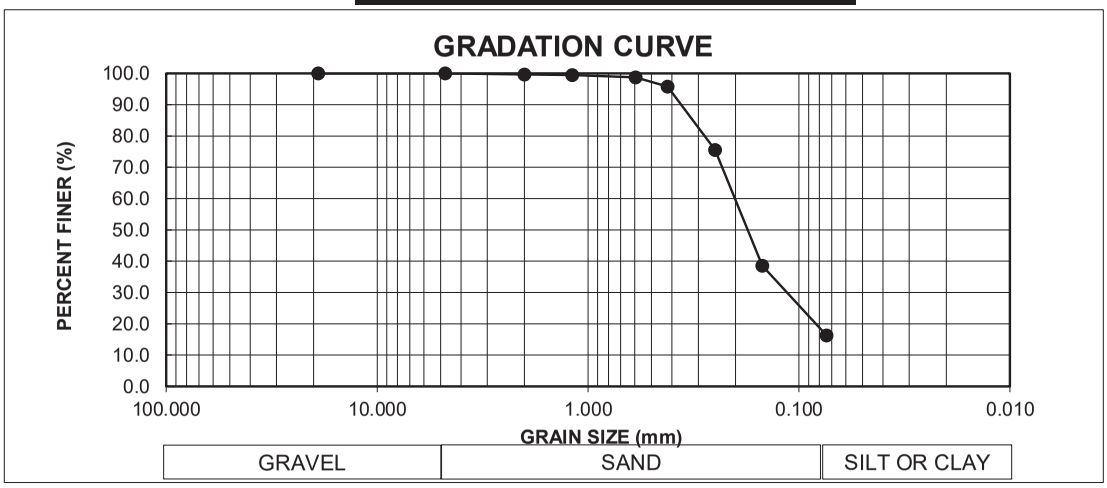
Sample Location: 0 TO 2'
Soil Classification: SC

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
103	221.97	201.49	15.86	**90.1%**	**11.0%**	173.79	**27.7**

Weight of dry soil before wash: 185.63 Weight of dry soil after wash: 157.93

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.7	**99.6**
16	1.190	1.0	**99.5**
30	0.595	2.4	**98.7**
40	0.420	7.8	**95.8**
60	0.250	45.3	**75.6**
100	0.149	114.1	**38.6**
200	0.074	155.4	**16.3**
Pan		156.2	15.9

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-8
Soil Description: clayey sand/sandy clay

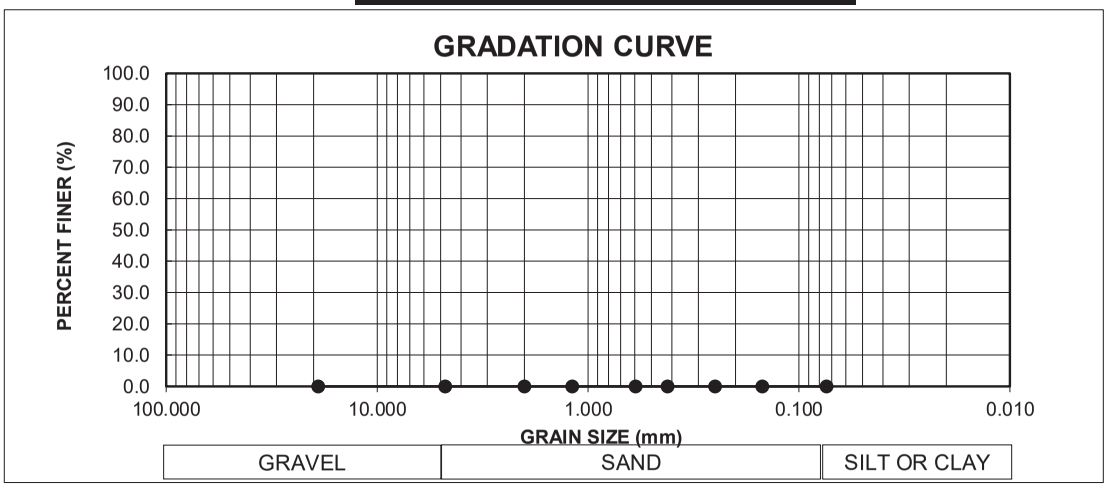
Sample Location: 0 TO 2'
Soil Classification: SC/CL

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
84	174.84	133.38	15.63	**74.0%**	**35.2%**	78.9	**54.48**

Weight of dry soil before wash: 117.75 Weight of dry soil after wash: 63.27

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000		
4	4.760		
10	2.000		
16	1.190		
30	0.595		
40	0.420		
60	0.250		
100	0.149		
200	0.074		
Pan			

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-9
Soil Description: clayey sand

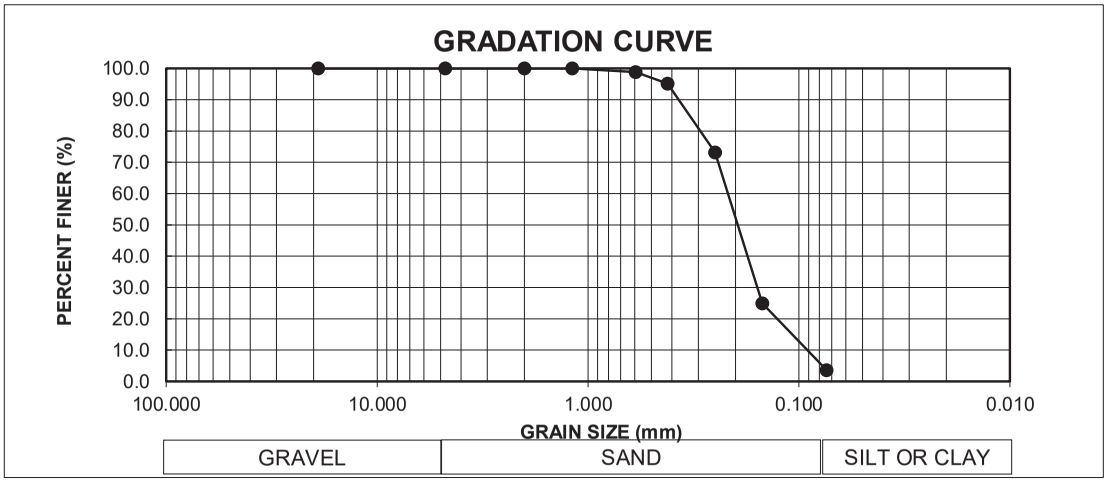
Sample Location: 13.5 TO 15'
Soil Classification: SP-SC

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
85	206.19	174.40	15.71	**83.3%**	**20.0%**	168.7	**5.7**

Weight of dry soil before wash: 158.69 Weight of dry soil after wash: 152.99

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.0	**100.0**
16	1.190	0.0	**100.0**
30	0.595	1.8	**98.9**
40	0.420	7.7	**95.1**
60	0.250	42.6	**73.2**
100	0.149	119.1	**24.9**
200	0.074	152.9	**3.6**
Pan		153.0	3.6

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-10
Soil Description: clayey sand

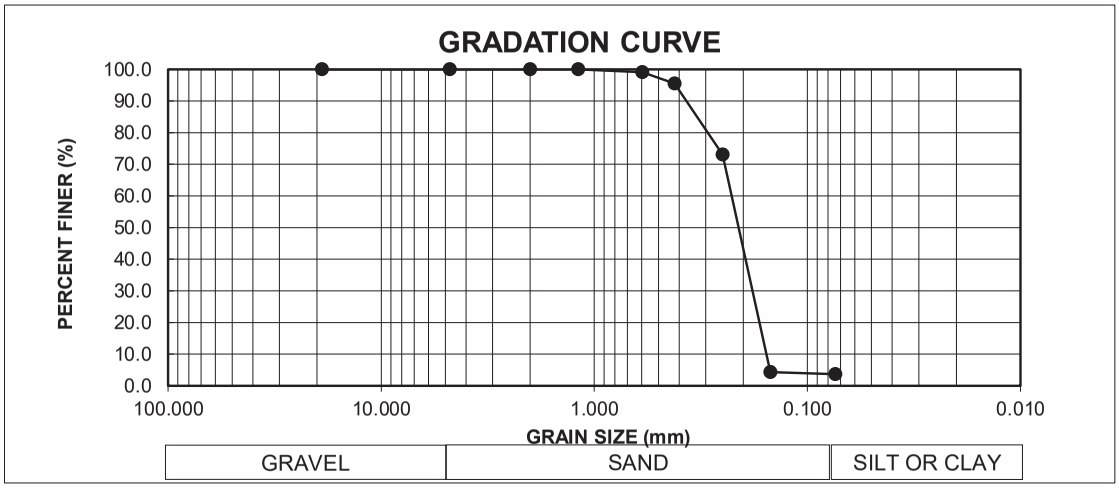
Sample Location: 8 TO 10'
Soil Classification: SC

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
86	201.22	173.89	15.58	**85.3%**	**17.3%**	168.06	**5.83**

Weight of dry soil before wash: 158.31 Weight of dry soil after wash: 152.48

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.0	**100.0**
16	1.190	0.0	**100.0**
30	0.595	1.3	**99.2**
40	0.420	7.0	**95.6**
60	0.250	42.6	**73.1**
100	0.149	151.5	**4.3**
200	0.074	152.5	**3.7**
Pan			

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-11
Soil Description: clayey sand

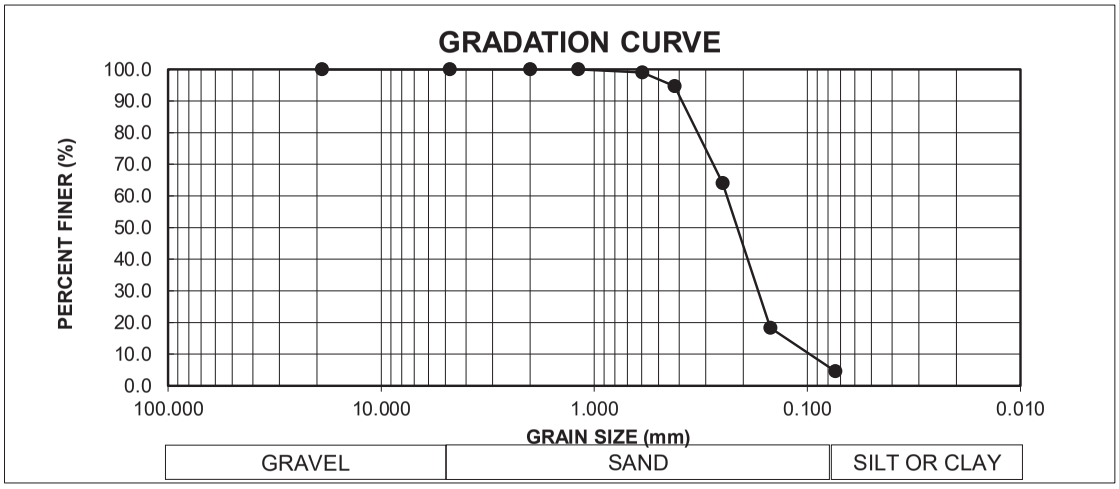
Sample Location: 8 TO 10'
Soil Classification: SC

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
110	196.34	171.97	15.59	**86.5%**	**15.6%**	166.04	**5.93**

Weight of dry soil before wash: 156.38 Weight of dry soil after wash: 150.45

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.0	**100.0**
16	1.190	0.0	**100.0**
30	0.595	1.5	**99.1**
40	0.420	8.3	**94.7**
60	0.250	56.3	**64.0**
100	0.149	127.8	**18.3**
200	0.074	149.2	**4.6**
Pan		150.5	3.8

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-12
Soil Description: clayey sand

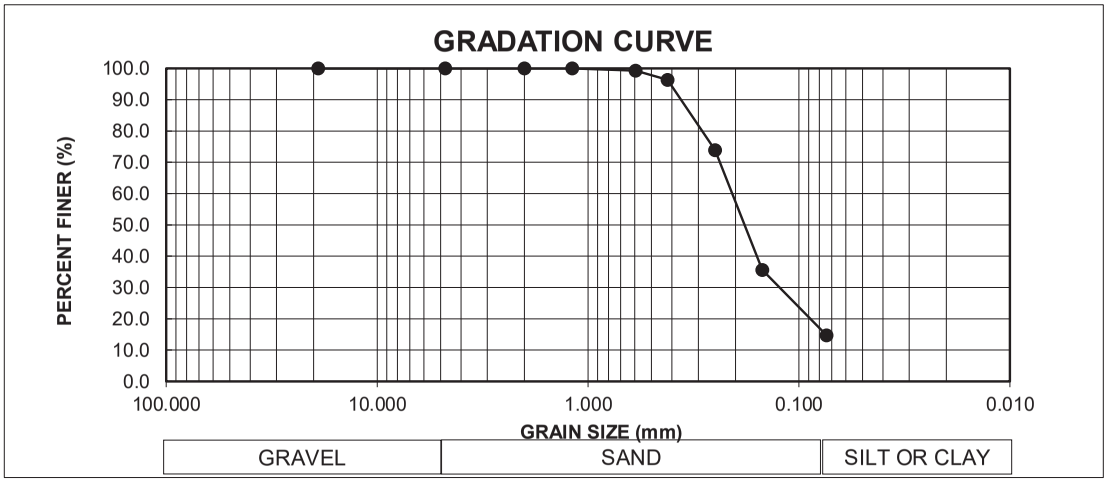
Sample Location: 2 TO 4'
Soil Classification: SC

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
111	204.96	179.09	15.63	**86.3%**	**15.8%**	154.61	**24.48**

Weight of dry soil before wash: 163.46 Weight of dry soil after wash: 138.98

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.0	**100.0**
16	1.190	0.0	**100.0**
30	0.595	1.1	**99.3**
40	0.420	6.0	**96.3**
60	0.250	42.6	**73.9**
100	0.149	105.2	**35.6**
200	0.074	139.4	**14.7**
Pan		140.0	14.4

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

AASHTO T88/M145 PARTICLE SIZE ANALYSIS & SOIL CLASSIFICATION

FPID:
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

Date Tested: 3/21/2024
Technician: BJN

Sample Number: B-13
Soil Description: clayey sand

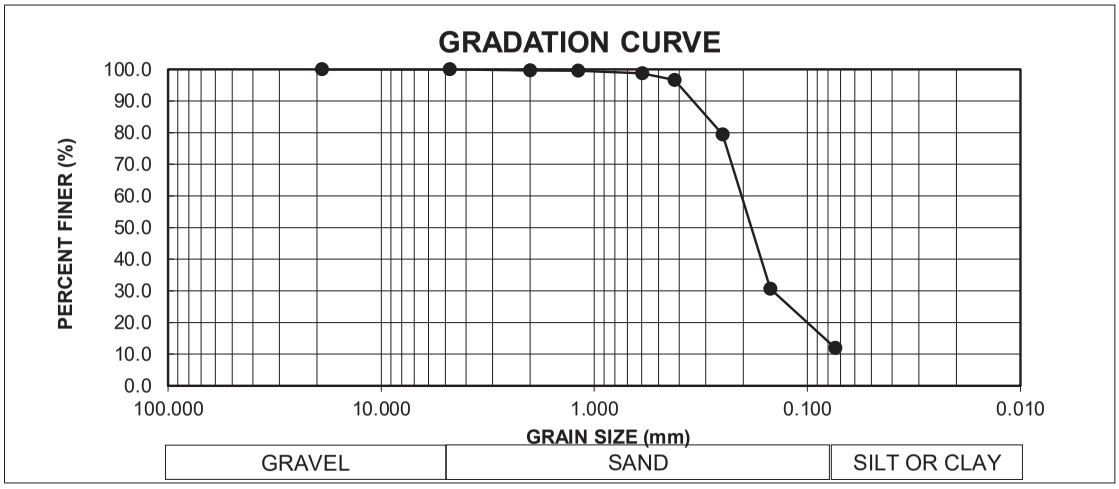
Sample Location: 0 TO 2'
Soil Classification: SC

Moisture / Minus No. 200 Sieve Wet Wash							
Container ID	Container + Wet Soil (g)	Container + Dry Soil (g)	Container (g)	Solids Content (%)	Moisture Content (%)	Container + Washed Soil (g)	Fines Lost in Wash (g)
112	204.55	190.17	15.61	**92.4%**	**8.2%**	169.48	**20.69**

Weight of dry soil before wash: 174.56 Weight of dry soil after wash: 153.87

Sieve Number	Opening (mm)	Accum S_D (g)	Percent Finer
3/4"	19.000	0.0	**100.0**
4	4.760	0.0	**100.0**
10	2.000	0.6	**99.7**
16	1.190	0.8	**99.6**
30	0.595	2.1	**98.8**
40	0.420	5.9	**96.6**
60	0.250	35.8	**79.5**
100	0.149	121.0	**30.7**
200	0.074	153.7	**11.9**
Pan		153.9	11.9

$$\text{Percent Finer (\%)} = 100\left(\frac{Accumulated\ SD}{Total\ Weight\ of\ Dry\ Soil}\right)$$



MADRID ENGINEERING GROUP, INC.
2030 State Road 60 East
Bartow, Florida 33830
863/533-9007 FAX: 863/533-8997

ATTERBERG LIMITS DETERMINATION AASHTO T89/90

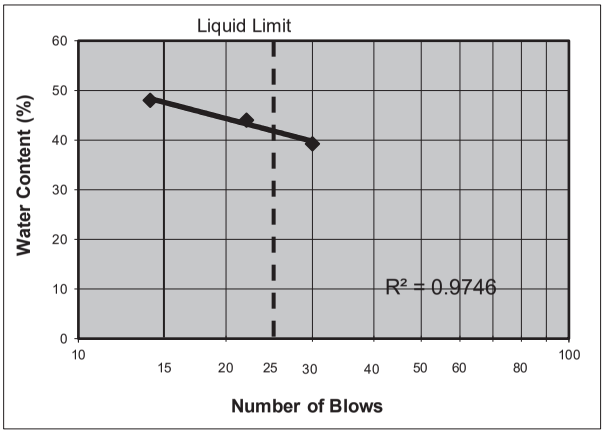
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

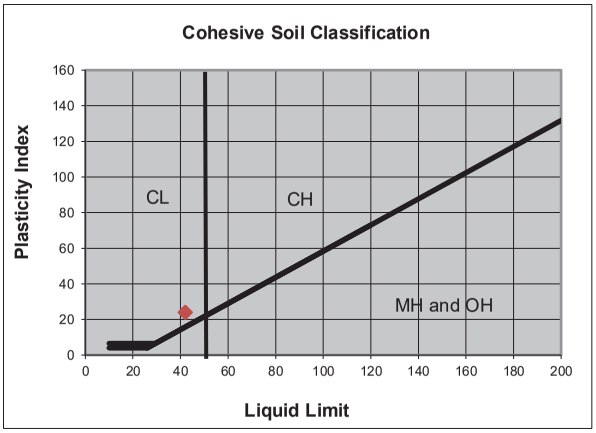
Date Tested: 3/26/2024
Technician: BJN

Sample Number: B-2
Soil Description: clayey sand

Sample Location: 23.5 TO 25'
USCS Code: SC

Liquid Limit					
Sample Number	22	29	37		
W_C+S_W (g)	23.16	22.96	22.65		
W_C+S_D (g)	20.54	20.22	19.86		
W_C (g)	13.87	14.00	14.05		
S_D (g)	6.67	6.22	5.81		
W_{H2O} (g)	2.62	2.74	2.79		
Number of Blows	30	22	14		
Moisture Content (%)	39.28	44.05	48.02		





Plastic Limit				
Sample Number	5	16	21	
W_C+S_W (g)	17.41	17.61	17.52	
W_C+S_D (g)	16.84	17.07	17.00	
W_C (g)	13.78	13.97	14.05	
S_D (g)	3.06	3.10	2.95	
W_{H2O} (g)	0.57	0.54	0.52	
Moisture Content (%)	18.63	17.42	17.63	

Summary	
% < #200 =	**28.6**
Liquid Limit =	**42**
Plastic Limit =	**18**
Plasticity Index =	**24**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.53

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 East
Bartow, Florida 33830
863/533-9007 FAX: 863/533-8997

ATTERBERG LIMITS DETERMINATION AASHTO T89/90

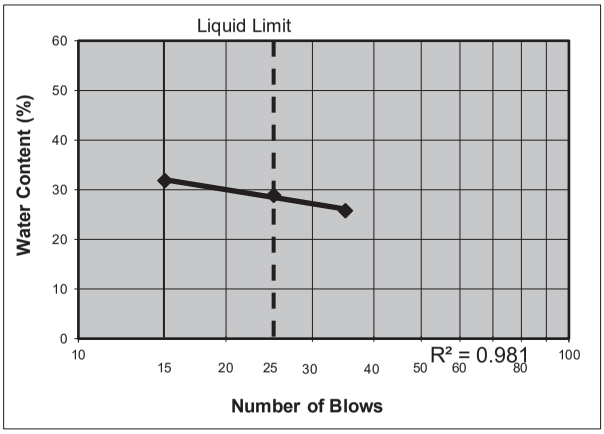
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

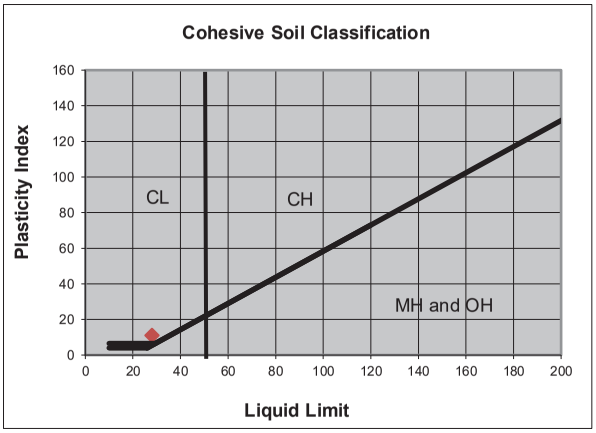
Date Tested: 3/26/2024
Technician: BJN

Sample Number: B-5
Soil Description: clayey sand

Sample Location: 13.5 TO 15'
USCS Code: SC

Liquid Limit					
Sample Number	34	35	36		
W_C+S_W (g)	22.44	24.36	23.70		
W_C+S_D (g)	20.74	22.02	21.35		
W_C (g)	14.15	13.93	13.97		
S_D (g)	6.59	8.09	7.38		
W_{H2O} (g)	1.70	2.34	2.35		
Number of Blows	35	25	15		
Moisture Content (%)	25.80	28.92	31.84		





Plastic Limit				
Sample Number	3	24	32	
W_C+S_W (g)	17.49	17.56	17.61	
W_C+S_D (g)	16.98	17.06	17.12	
W_C (g)	13.90	14.10	14.07	
S_D (g)	3.08	2.96	3.05	
W_{H2O} (g)	0.51	0.50	0.49	
Moisture Content (%)	16.56	16.89	16.07	

Summary	
% < #200 =	**27.9**
Liquid Limit =	**28**
Plastic Limit =	**17**
Plasticity Index =	**11**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.34

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 East
Bartow, Florida 33830
863/533-9007 FAX: 863/533-8997

ATTERBERG LIMITS DETERMINATION AASHTO T89/90

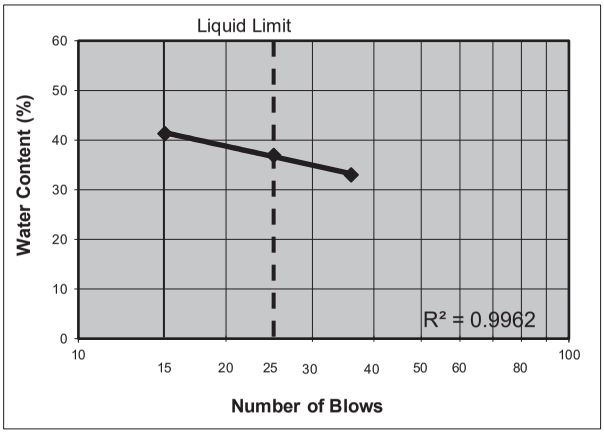
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

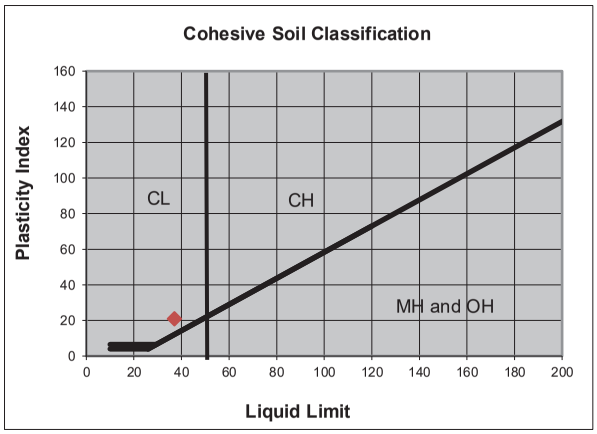
Date Tested: 3/26/2024
Technician: BJN

Sample Number: B-7
Soil Description: clayey sand

Sample Location: 18.5 TO 20'
USCS Code: SC

Liquid Limit					
Sample Number	26	27	28		
W_C+S_W (g)	23.09	22.49	22.02		
W_C+S_D (g)	20.80	20.21	19.65		
W_C (g)	13.87	14.04	13.92		
S_D (g)	6.93	6.17	5.73		
W_{H2O} (g)	2.29	2.28	2.37		
Number of Blows	36	25	15		
Moisture Content (%)	33.04	36.95	41.36		





Plastic Limit				
Sample Number	11	13	30	
W_C+S_W (g)	17.34	17.36	17.35	
W_C+S_D (g)	16.88	16.92	16.90	
W_C (g)	14.09	14.04	13.98	
S_D (g)	2.79	2.88	2.92	
W_{H2O} (g)	0.46	0.44	0.45	
Moisture Content (%)	16.49	15.28	15.41	

Summary	
% < #200 =	**28.9**
Liquid Limit =	**37**
Plastic Limit =	**16**
Plasticity Index =	**21**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.54

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 East
Bartow, Florida 33830
863/533-9007 FAX: 863/533-8997

ATTERBERG LIMITS DETERMINATION AASHTO T89/90

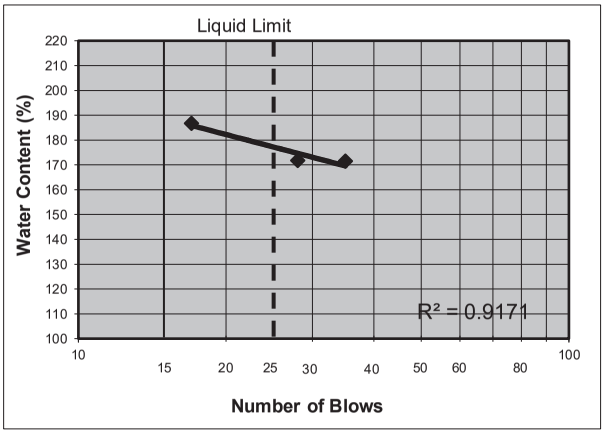
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

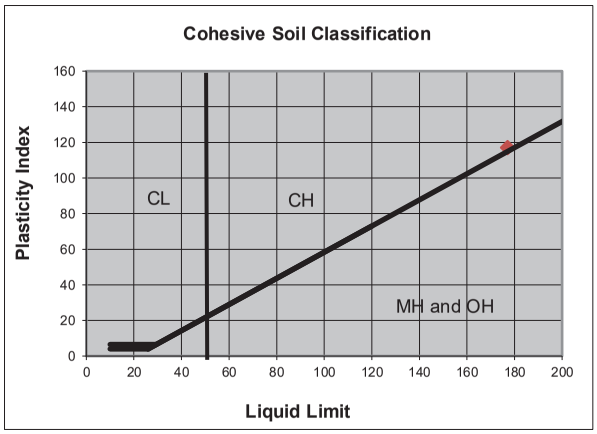
Date Tested: 3/22/2024
Technician: DP

Sample Number: B-11
Soil Description: highly plastic very sandy clay

Sample Location: 13.5 TO 15'
USCS Code: CH

Liquid Limit					
Sample Number	28	29	30		
W_C+S_W (g)	20.20	21.20	22.20		
W_C+S_D (g)	16.22	16.63	16.84		
W_C (g)	13.90	13.97	13.97		
S_D (g)	2.32	2.66	2.87		
W_{H2O} (g)	3.98	4.57	5.36		
Number of Blows	35	28	17		
Moisture Content (%)	171.55	171.80	186.76		





Plastic Limit				
Sample Number	25	26	27	
W_C+S_W (g)	18.24	18.05	18.20	
W_C+S_D (g)	16.67	16.50	16.64	
W_C (g)	14.11	13.88	14.05	
S_D (g)	2.56	2.62	2.59	
W_{H2O} (g)	1.57	1.55	1.56	
Moisture Content (%)	61.33	59.16	60.23	

Summary	
% < #200 =	**67.6**
Liquid Limit =	**177**
Plastic Limit =	**60**
Plasticity Index =	**117**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.89

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 East
Bartow, Florida 33830
863/533-9007 FAX: 863/533-8997

ATTERBERG LIMITS DETERMINATION AASHTO T89/90

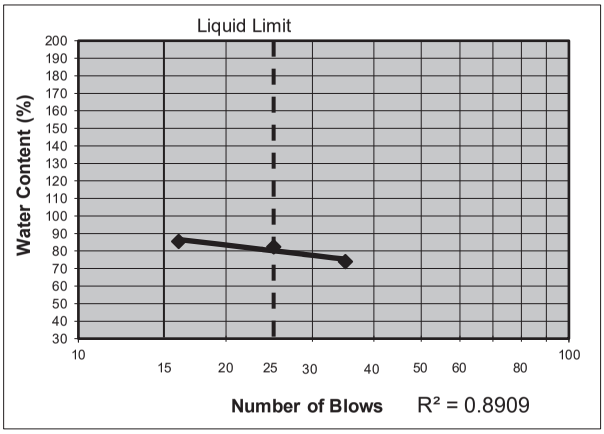
Project Number: 15425
Project Name: Lake Bonnet Drain Channel
Project Location: Lakeland, Fl
Client: AECOM

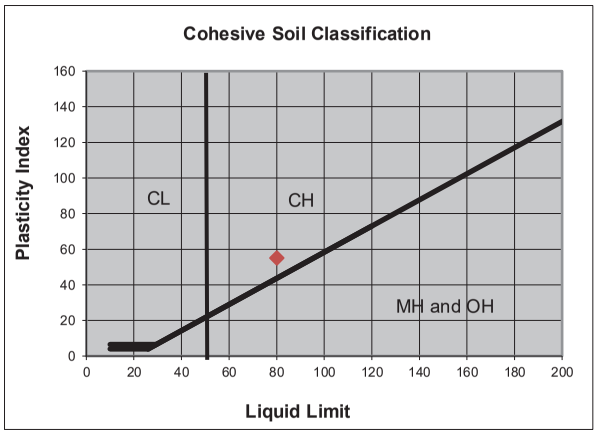
Date Tested: 3/22/2024
Technician: DP

Sample Number: B-12
Soil Description: highly plastic very sandy clay

Sample Location: 8 TO 10'
USCS Code: CH

Liquid Limit					
Sample Number	6	7	8		
W_C+S_W (g)	20.20	21.43	22.53		
W_C+S_D (g)	17.58	18.09	18.59		
W_C (g)	14.04	14.04	13.99		
S_D (g)	3.54	4.05	4.60		
W_{H2O} (g)	2.62	3.34	3.94		
Number of Blows	35	25	16		
Moisture Content (%)	74.01	82.47	85.65		





Plastic Limit				
Sample Number	3	4	5	
W_C+S_W (g)	19.16	19.37	19.04	
W_C+S_D (g)	18.12	18.31	17.96	
W_C (g)	13.90	14.15	13.77	
S_D (g)	4.22	4.16	4.19	
W_{H2O} (g)	1.04	1.06	1.08	
Moisture Content (%)	24.64	25.48	25.78	

Summary	
% < #200 =	**66.8**
Liquid Limit =	**80**
Plastic Limit =	**25**
Plasticity Index =	**55**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

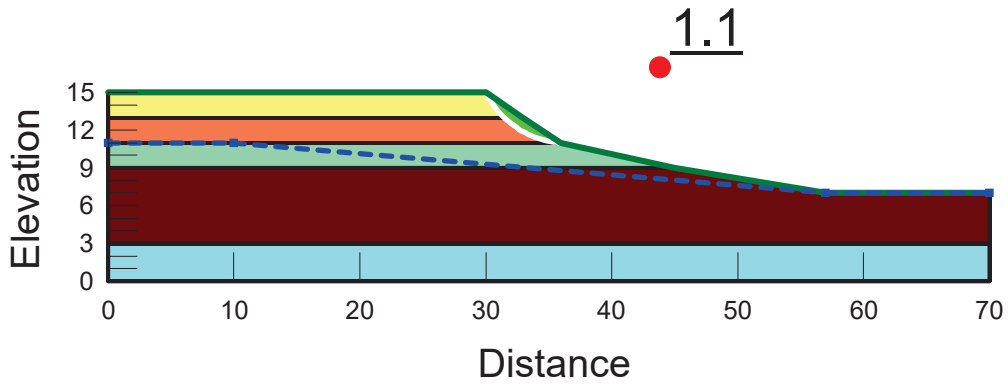
$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.48

Appendix C

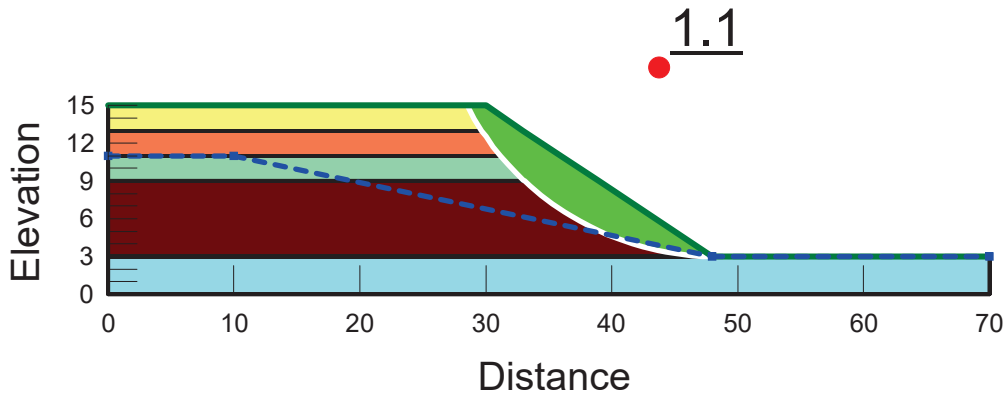
B-4 Existing Slope

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Loose SP-SM -1	100	0	29
	Medium dense SC-5	125	20	32
	Medium dense SP -3	105	0	30
	Medium dense SP-SM -2	120	0	32
	Medium dense SP-SM/SP - 4	125	0	32



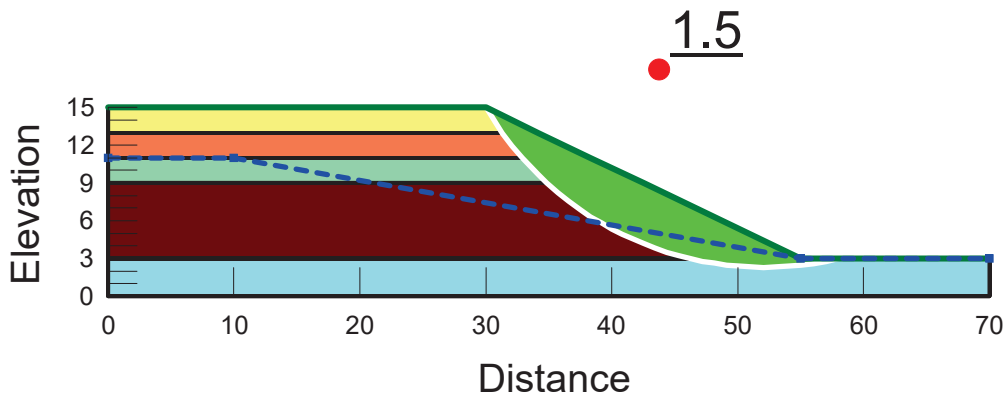
B-4 Deep Existing Slope

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Loose SP-SM -1	100	0	29
	Medium dense SC-5	125	20	32
	Medium dense SP -3	105	0	30
	Medium dense SP-SM -2	120	0	32
	Medium dense SP-SM/SP - 4	125	0	32



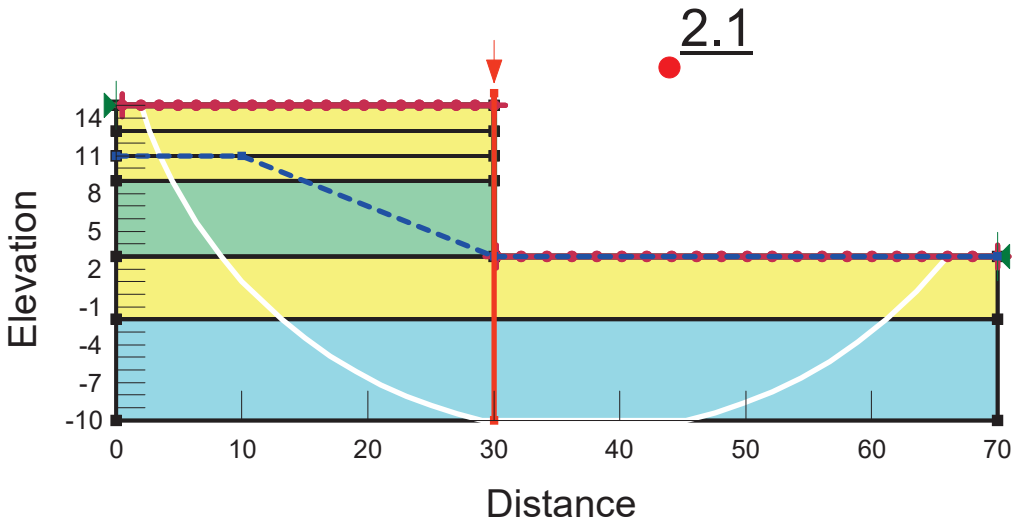
B-4 Deep 2 to 1 Slope

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Loose SP-SM -1	100	0	29
	Medium dense SC-5	125	20	32
	Medium dense SP -3	105	0	30
	Medium dense SP-SM -2	120	0	32
	Medium dense SP-SM/SP - 4	125	0	32



B-6 Sheet Pile

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Loose SP-SM -1	100	0	29
	Medium dense SC-5	125	20	32
	Medium dense SP -3	105	0	30



APPENDIX J

DREDGING AND DEWATERING ALTERNATIVES ANALYSIS

AECOM Delivering a better world

Attachment J
Dredging and Dewatering Alternatives Analysis

Lake Bonnet Dredging and Restoration

City of Lakeland, Polk County, Florida

Project number: 60721840

aecom.com

Quality information

Prepared by	Checked by	Verified by	Approved by
Reece Frederick Environmental Engineer	Josh Loomis, PE Civil Engineer	Brian Mastin, PhD Sediments Technical Lead	TBD Title

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	06/28/2024	Draft	-	-	-

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

City of Lakeland, Polk County, Florida

Prepared by:

AECOM Technical Services, Inc.
110 East Broward Blvd, Suite 700
Fort Lauderdale, FL 33301
aecom.com

Table of Contents

Tables

Figures

Appendices

1. Introduction

The overall restoration strategy for Lake Bonnet consists of three major project elements: (1) Flood Mitigation and Conveyance; (2) Sediment Dredging; and (3) Wetland Restoration. Based on hydrologic and hydraulic (H&H) modeling of the watershed, additional retention capacity within Lake Bonnet (Lake) may help mitigate downstream flooding and improve conveyance control by expanding the storage volume of the Lake (Alternative 3) for the Lake Bonnet Drainage Basin Flood Hazard and Debris Mitigation Project (Project) as previously described. In support of watershed management alternative(s) that include dropping the current water level elevation and increasing the storage volume of Lake Bonnet (Lakeland, Polk County, Florida), AECOM performed a Dredging and Dewatering Alternatives Analysis to recommend a cost-effective design to remove and subsequently manage sediments in an ex-situ sediment management area (SMA) for in-situ/ex-situ beneficial reuse opportunities.

The AECOM team evaluated alternatives and recommended the alternative(s) that best achieved project objectives and assisted the City of Lakeland with their overall restoration goals for Lake Bonnet. The purpose of the present analysis is to incorporate a sediment management strategy into the overarching flood hazard mitigation program, as necessary, and provide analysis of alternatives with respect to dropping the Lake Bonnet water surface to EL 143.0-ft and removing approximately 143,000 CY of sediment from Lake Bonnet to increase the water column to greater than four feet (**Figure 1**). Opportunities to beneficially reuse “clean” sediment onsite for wetlands and littoral zone restoration or offsite (e.g., landfill cap material) within the watershed or other applications will be evaluated. Note that only preliminary sediment characterization, chemistry and lithology (e.g., thickness of organic layer) has been investigated to date, and that a more thorough investigation is scheduled for Winter 2025 to delineate the quantity/quality of sediment within the dredge prism. This effort is being performed in concurrence with the most recent City of Lakeland Water Quality Management Plan (2019).

The following alternatives were selected for definitive evaluation utilizing previous project experience:

- Alternative 1 – No Action
- Alternative 2A – Mechanical Dredging with Amended Sediment Stacking
- Alternative 2B – Mechanical Dredging with Mechanical Dewatering
- Alternative 2C – Mechanical Dredging with Passive Dewatering (stacking)
- Alternative 3A – Hydraulic Dredging with a Confined Disposal Facility (CDF)
- Alternative 3B - Hydraulic Dredging with Geotextile Tube Dewatering
- Alternative 3C – Hydraulic Dredging with Mechanical Dewatering

The alternatives analysis will focus on dredging and dewatering Lake sediments as part of the proposed Flood Hazard and Debris Mitigation Project strategies. This alternatives analysis is outlined as follows:

- Section 1: Introduction
- Section 2: Site Background and Previous Studies
- Section 3: Data Gaps
- Section 4: Dredging Methods
- Section 5: Dewatering Methods
- Section 6: Alternatives Analysis Criteria
- Section 7: Sediment Removal Alternatives
- Section 8: Scoring of Alternatives
- Section 9: Process Flow for Recommended Alternative
- Section 10: Conclusions and Recommendations

2. Site Background and Previous Studies

Lake Bonnet is a 79-acre Lake located in the City of Lakeland, FL that has experienced nuisance algal blooms for many years. The Lake is relatively shallow (mean depth < 4 feet). There are several isolated deep 6- to 12-foot areas around the eastern and southern shorelines. Forested wetland (62 acres) occupies the eastern shoreline, with the remaining northern and southern shorelines occupied by residential homes. The western shoreline abuts a paved road. There are no public boat access locations on the Lake.

Prior to development, Lake Bonnet likely only received water from springs, groundwater flow, precipitation, and minimal surface water runoff. Since residential and commercial development of the area began, there has been additional water entering the Lake via surface runoff of untreated stormwater. The Lake acts like a sink for nutrients and other constituents from the untreated stormwater. The nutrient rich Lake has encouraged algal production and subsequently led to a nutrient rich, fluidized sediment layer (via algal decay) which may become resuspended during wind events or heavy stormwater runoff.

These studies have identified three primary sources of pollutants in Lake Bonnet. These include untreated stormwater runoff, groundwater seepage, and resuspension of Lake sediments. Four studies, the *Lake Bonnet Diagnostic Study* (Environmental Consulting & Technology et al., 2002), the *Lakes Report* (City of Lakeland, 2010), the *Lake System Hydraulic Management Plan* (Amec Foster Wheeler, 2017), and the *Lake Bonnet Pollutant Source Reduction Feasibility Study* (Wood, 2018) have found that excessive nutrients have impacted Lake Bonnet's water quality and created nuisance algal conditions.

The *Lake Bonnet Diagnostic Study* (EC&T et al., 2002) estimated approximately 970,000 CY of organic sediments in the Lake with particularly high concentrations of total phosphorous (TP) compared to other Florida lakes. It was also found that the Lake volume was only 28% of its original volume. Sediment polycyclic aromatic hydrocarbon (PAH) concentrations near a storm sewer outfall were elevated compared to the FDEP Sediment Quality Assessment Guidelines (i.e., greater than the total PAH probable effects concentration (PEC) of 22.8 mg/kg). It was estimated that TP movement from the sediments into the water column due to diffusion and resuspension might reach 2,100 pounds TP/year, while bioturbation might reach 14,000 pounds TP/year.

The *Lakes Report* (City of Lakeland, 2010) further documented that TP of the sediments could potentially become available to surface algae via diffusion, resuspension, and/or bioturbation by benthic invertebrates and fish. The report also suggested that the source of Lake Bonnet's excess nutrients is likely due to stormwater inputs entering the Lake prior to implementation of stormwater regulations. Such sources include past/present agricultural, commercial, and residential inputs. The report also recorded the maximum measured chlorophyll *a*, total nitrogen and TP concentrations in the water were 133 µg/L, 9.7 mg/L, and 0.73 mg/L, respectively.

Analysis of more recent data from the Polk County Water Atlas (2017-2023) indicates that nutrients and chlorophyll *a* continue to exceed the Florida DEP guidance and qualify the Lake as an impaired waterbody, which are based on the annual geometric mean:

- TN: 1.05 mg/L (2017-2023) with a range of 2.01-3.47 mg/L
- TP: 0.03 mg/L (2017-2023) with a range of 0.18-0.24 mg/L
- Chlorophyll a: 20 ug/L (2017-2023) with a range of 49-139 ug/L

A review of all Lake Bonnet water quality data (https://polk.wateratlas.usf.edu/waterbodies/lakes/160542/) indicated that sampling over time has only been comprised of surface water. It is likely that the Lake is polymictic (i.e., it continually circulates due to wind/wave action), and bottom waters never go anoxic.

The *Lake System Hydraulic Management Plan Report* (Amec Foster Wheeler, 2017) found that chlorophyll-*a* and Lake water levels were inversely correlated. This suggests that an increase in Lake water depth may improve water quality. This could be a function of several factors such as dilution and/or the potential to reduce groundwater inflows via seepage from a contaminated surficial groundwater aquifer. A deeper Lake could also create a zone near the lake bottom where wind action cannot affect the transfer of P from the sediments into the phototrophic zone at the lake surface, significantly reducing the impact of internal P loading.

The *Lake Bonnet Pollutant Source Reduction Feasibility Study* performed by Wood (2018) determined lake/watershed conditions and recommended sediment mitigation alternatives. Wood performed preliminary measurements of the sediments, estimating the thickness of different sediment layers across the Lake. They also sampled 11 locations for chemical analysis, identifying three locations (southeast part of the Lake) with arsenic and chromium concentrations greater than beneficial use, groundwater and residential direct contact criteria.

3. Data Gaps

There are several data gaps that will be addressed in future Lake investigations to refine operational assumptions and improve the alternatives recommendations including but not limited to:

- Updated survey and a geotechnical investigation to evaluate, select and design a CDF or SMA for sediment management. The current conceptual design places the CDF or SMA in the wetlands to the southeast of the Lake (Section 5).
- Sediment collection within the proposed dredge prism for waste characterization and beneficial use evaluation.
- Treatability testing will be used to measure dewatering efficacy of both mechanical and hydraulic dredging of in situ sediment. Stack testing and solidification/stabilization (s/s) testing will be used to measure dewatering efficacy of mechanically dredged sediment. Settling tests and chemical conditioning polymers will be identified and subsequently used to evaluate passive dewatering alternatives (e.g., CDF and geotextile tubes) to measure dewatering efficacy of hydraulically dredged sediment. Filter cake generated from passive dewatering and consolidation during bench-testing can be used to evaluate dewatered sediment against criteria for beneficial use, transportation and disposal as well as for testing of additional s/s additives for improving dewatering efficacy and strength, as necessary. Filtrate water from the dewatering processes will be evaluated to design any water treatment before returning to the Lake.

4. Dredging Methods

4.1 Mechanical Dredging

Mechanical dredges excavate material at almost in-situ densities using some form of bucket to carry dredged material up through the water column and place it into a temporary staging area, transport container (e.g. barge, scow, etc.) for off-site processing and/or disposal. Mechanical dredges in the form of a backhoe, bucket (e.g., clamshell, orange-peel, and dragline), bucket ladder, bucket wheel, and dipper dredges are engineered to remove loose to hard, compacted materials. Dredges may be used to excavate most types of materials except for the most cohesive consolidated sediments and solid rock. Mechanical dredges are typically used in areas where hydraulic dredges cannot work because of the proximity of the dredge cut to piers, docks, and other structures, where sediment contains excessive debris, or where the disposal area is too far from the dredge site for it to be feasible for a hydraulic dredge to pump the dredged material.

Clamshell Dredges are the most common type of bucket dredges, consisting of a clamshell bucket operated from a crane or derrick mounted on a barge or other floating structure. The clamshell dredge usually leaves an irregular, cratered bottom. Because of production efficiency and accuracy, clamshell dredges are usually used in water not deeper than 100 feet. This style of dredge results in sediment removal at nearly in-situ density. The dredged material is placed in a SMA, on land, in a confined disposal facility (CDF), or in barges or scows for transportation to a SMA. Due to longer turn times for moving the bucket up and down through deep water and multiple material re-handling steps, production rates of mechanical dredging can be relatively low compared to comparable hydraulic dredges.

Excavator dredges are typically barge-mounted and not self-propelled. Excavator dredges employ an articulated excavation bucket mounted on an articulated boom or fixed arm. They use hydraulically operated rams for movement, positioning and excavating. The material is excavated, brought to the surface, and placed in a SMA, on land, in a CDF, or in barges or scows for transportation to the SMA. Excavator dredges have radius and depth limitations, but some newer models excavate to over 90 feet. These dredges are generally stationary and require spuds, or occasionally anchors to fix them at the dredging location.

Mechanical dredging/removal of sediments “in the wet”, meaning overlying water is present, includes use of a barge-mounted clamshell (e.g., crane or derrick) or excavator dredge (e.g., articulated, long-reach excavator). The dredge excavates sediment from the dredge prism using Geographic Positioning System (GPS) guidance (e.g., DREDGEPACK®) and transfers the material to a temporary containment area for subsequent transfer to a SMA or disposal location. If material is not transferred directly to a final disposal area, a lined SMA is designed to accommodate and manage all excavated material and contains a sump to manage filtrate and precipitation during the project duration. Excavated sediments are mechanically stacked to facilitate gravity drainage. Methods such as turning, mechanical augers, windrowing, and/or addition of s/s reagents may be used to enhance the dewatering process. A temporary cover system may also be used over the dried sediments prior to storm events to limit re-saturation until the material is transloaded for disposal.

4.2 Hydraulic Dredging

Hydraulic dredges are typically used for unconsolidated sediment, such as those typically found in waterway maintenance removal projects. Some types of hydraulic dredges are modified to be used to excavate more consolidated sediments. Hydraulic dredges use diesel or electric-powered centrifugal pumps with discharge pipes ranging in diameter from 6 inches to 4 feet. The pump produces a vacuum on its intake side, which forces water and sediment through the suction pipe. In a hydraulic dredge the material to be removed is first loosened and mixed with water by cutterheads or by agitation with water jets and then pumped as a slurry. Loosened sediments are pulled into the suction end of a hydraulic pipeline by vacuum forces, transported to the waterbody surface inside a floating pipeline, and then to a selected discharge point for containment and consolidation of solids.

Hydraulically operated dredges can be classified into four main categories: pipeline (e.g., plain suction, cutterhead, auger, dustpan), hopper (e.g., trailing suction), bucket wheel, and side casting. Hydraulic dredges are self-contained units that handle both the dredge and disposal phases of dredging operations. They not only dig the material up but also convey the sediment slurry to a SMA by pumping it through a pipeline or storing it in hoppers that can be emptied at the SMA.

Cutterhead Suction Dredges are the most common hydraulic dredge used in North America and are generally the most efficient and versatile. With this type of dredge, a rotating cutter at the end of a ladder excavates the bottom sediment and guides it into the suction end of the pump. This rotating cutter can be used to screen out larger material and debris from entering the suction line. The excavated material is lifted and pumped by a centrifugal pump to a designated disposal area through a pipeline as slurry with a typical solids content of 10 to 20 percent by weight. The typical

cutterhead dredge is swung in an arc from side to side by alternately pulling on port and starboard swing wires connected to anchors through pulleys mounted on the ladder just behind the cutter. Pivoting on one of two spuds at the stern, the dredge "steps" or "sets" forward.

Jet-Suction Dredges are hydraulic suction dredges that use a widely flared dredge head or ring around the intake pipe along which water jets are mounted. The jets loosen and agitate sediment particles, which are then captured in the dredge head as the dredge moves forward. This type of dredge works best in free-flowing granular material and is not generally used to dredge fine-grained sediment. Like cutter suction dredges, jet-suction dredges agitate and slurry the sediment with fine water jets at the end of the ladder and then suction the slurry into the pipeline for conveyance and discharge at the SMA, temporary storage area, or disposal site.

Auger Dredges are like Cutterhead Suction Dredges in that a rotating cutter loosens material before pulling into the dredge pipeline. Auger Dredges utilize a head ranging from 5-ft to 45-ft wide that is designed to remove thin layers ranging from a few inches to 3-ft of the top-most sediment. This type of dredge works best with smooth, shallow (< 30-ft) sediment beds made of soft soils, sludges, sand, and silt. Auger Dredges have a turbidity shroud which produces both a stronger suction force and much less turbidity than other types of dredges. Because of this reduced turbidity, Auger Dredges are often used to remove contaminated sediments or coastal marine applications that require reduced turbidity. Wheels can be mounted to the auger head, which makes this type of dredge advantageous when liner protection is a priority.

5. Dewatering Methods

Typically, some form of sediment dewatering is required prior to final management and disposal. The objective of dewatering is to increase the solids content (by decreasing water content) which has the following benefits:

- Reduces the volume and weight of sediments
- Improves the handling properties
- Reduces the cost of many treatment processes
- Meets disposal requirements (e.g., land disposal)
- Reduces transportation and disposal (T&D) costs

The nature and extent of dewatering depends on the sediment characteristics, type of dredging, and T&D methods and criteria of the receiving site for the removed material.

5.1 Passive Dewatering

Passive (gravity) dewatering is commonly used on sediment management sites where land area is available, and ex-situ treatment is the practical/cost effective remedial strategy. Passive dewatering separates water by gravity and requires space to spread out or stack dredged sediments. Staging for dewatering operations varies depending on sediment characteristics, on the sediment's ability to release water, and on the resources available near the dredging site.

For hydraulically dredged material, geotextile tubes are another form of gravity dewatering. Geotextile tubes are manufactured from a woven, high-strength polypropylene geotextile. With the aid of a chemical conditioning agent(s), sediment in the tubes consolidates releasing water (filtrate) through the geotextile tube while retaining solids within it. Excavation of the dried materials from opened tubes and subsequent disposal can occur when retained solids meet dryness goals (e.g., pass a paint filter test). SMAs with geotextile tube dewatering generally includes construction of a lined laydown area, chemical storage and feed systems, and power and fuel systems.

Confined Disposal Facilities (CDFs) can be used with hydraulic or mechanical dredging techniques to simultaneously dispose and dewater dredged material. Typically, existing low areas near a dredge prism are filled with dredged material to dewater gradually over time and capped with clean material to prevent migration, if necessary. Alternatively, berms can be built to surround a particular area. This bermed area is then filled and capped as described previously. Multiple CDFs can be built adjacent to each other, separated by a berm, and are called "cells". Because CDFs store material near the site, CDFs are often used to dewater and store clean material for later uses, such as agriculture, watershed restoration and future construction projects.

Typical advantages of passive dewatering techniques compared to mechanical dewatering (Section 5.2) include:

- Lower capital/operating cost compared to mechanical dewatering methods;
- Less infrastructure required (structures, utilities, power use, etc.);
- Limited operation and maintenance; and
- No separation of sand required prior to dewatering.

Typical disadvantages of passive dewatering techniques compared to mechanical dewatering include:

- Requires a larger footprint to manage sediment;
- Higher T&D costs due to lower percent solids in resulting filter cake;
- Potential need for additional s/s reagents to meet transportation and disposal criteria; and
- Dewatering typically takes a longer duration

5.2 Mechanical Dewatering

Mechanical dewatering techniques are commonly used at water, wastewater, and industrial facilities, including sediment management sites, to remove water from liquid residuals (sludges) and dredged slurries using a combination of applied pressure and filters to produce a solid-like material (i.e., filter cake). Some of the most common technologies include presses (e.g., plate-and-frame and belt filter), centrifuges, and thickeners. Mechanical dewatering options generally include construction of an enclosure, (canopy/tent, sprung structure, or building), conveyance system, chemical storage and feed system(s), power and fuel, material set down and loading area, and facility for attending staff/operators.

During active mechanical dewatering, equipment or materials are used to apply external pressure and can sometimes achieve a solids content of up to 70% by weight. Typical equipment used includes plate-and-frame presses, which are effective but operate in batch mode, and belt filter presses and centrifuges, which may be less effective but can be operated continuously. Water removed during mechanical dewatering will be treated, discharged, or disposed of depending on contaminant concentrations and regulatory requirements.

Typical advantages of mechanical dewatering techniques compared to passive dewatering methods include:

- Reduced mass and volume of filter cake to be loaded, transported, and disposed;
- Shorter dewatering duration;
- More uniform solids for T&D;
- Smaller footprint required for equipment;
- Minimizes need for air drying and/or other solidification processes; and
- Lower T&D costs due to decreased mass and volume of the filter cake and reduction in drying s/s reagent quantities.

Typical disadvantages of mechanical dewatering techniques compared to passive dewatering include:

- Slurry quality, consistency and removal rate can affect equipment operation and production;
- Dependent upon operator knowledge and experience;
- High capital and sustaining (operation and maintenance) labor/costs; and
- Infrastructure and environmental controls are required to manage daily operations in addition to potential nuisance conditions, including noise and odors.

5.3 Solidification/Stabilization

Solidification/Stabilization (S/S) includes processes that mix inorganic cementitious/pozzolanic reagents into dewatered dredged material to transform it into a durable, solid, low–hydraulic conductivity material. Although solidification and stabilization can be used independently, they are often implemented simultaneously through a single treatment process. Ex-situ solidification and stabilization are each defined as follows:

- Solidification encapsulates dredged material to form a solid material and restricts contaminant migration by decreasing the surface area exposed to leaching and/or by coating the contaminated material with low-permeability materials. Solidification entraps the material within a granular or monolithic matrix. Solidification can be accomplished by mechanical processes that mix the material with one or more reagents.
- Stabilization occurs when reactions between the reagents and dredged material to reduce the leachability of contaminated material into a stable insoluble form. Stabilization chemically binds free liquids and immobilizes contaminated materials or reduces their solubility through a chemical reaction. The physical nature of the contaminated material may or may not be changed significantly by this process.

Dredge material is usually stabilized and/or dewatered with a reactive pozzolanic reagent. Cementitious reagents are the most common commercially employed S/S process options due, in part, to low cost and availability. Cementitious and/or pozzolanic reagents include Portland cement, Calciment™, fly ash, ground granulated blast furnace slag, silica fume, cement kiln dust, various forms of lime, and lime kiln dust. These reagents may be used individually or in various combinations. In low admixture concentrations, cement (and other pozzolanic reagents) is used for dewatering, consolidation, and geotechnical stability of the sediment. Most soil stabilization treatment ranges from 5 to 10% admixture, however higher concentrations (up to 20%) may be needed depending on the percent moisture of the sediment matrix.

Implementation costs vary widely based on reagent availability, delivery cost, and mixing technique (in-situ or ex-situ). The S/S process typically involves either the addition of reagents to water (to form a grout or paste) or the addition of dry reagents to the dredge material and using the in-situ water for activation. The selection of the type of reagent is influenced by sediment characteristics and site conditions such as depth of mixing and moisture content. in-situ dry addition is typically feasible for only relatively shallow dredge prisms or ex-situ mixing operations; however, the generation of fugitive dust may be a concern unless it is mitigated by use of suitable equipment and controls.

6. Alternatives Analysis Criteria

While identifying sediment dredging and management options, multiple alternatives were discussed and screened. The alternatives were initially evaluated against criteria including technical feasibility (i.e., constructability, effectiveness, sustainability), economic feasibility and other considerations (e.g., regulatory and community acceptance). Alternatives are described and evaluated in Section 7 of this report.

6.1 Constructability

This criterion addresses the technical and administrative feasibility of constructing an alternative and the availability of various services and materials required during its implementation. Assessment of this criterion relies heavily on previous evaluations of methods described in Sections 4 and 5. Specific considerations include the following:

- The ability to construct and operate the alternative, mitigating the difficulties and uncertainties that may be encountered during construction, and the likelihood of technical problems that may lead to schedule delays;
- Available capacity for treatment, storage, and/or disposal services, and the measures required to ensure that capacity is available;
- The availability of necessary equipment and specialists, and whether a lack of equipment and specialists prevents construction;
- Availability of technologies sufficiently demonstrated as effective for the specific full-scale application; and
- Level of effort that would be required to fully restore construction area(s).

6.2 Effectiveness

The evaluation of long-term effectiveness options assesses the risk to workers and the environment during construction and the time to recovery after the alternative has been implemented. The adequacy and reliability of best management practices and engineering controls used during construction is evaluated in terms of the long-term effectiveness and considers the following:

- The likelihood that the alternative would meet required process efficiencies and performance specifications;
- The type and degree of construction management, best management practices (BMPs) and monitoring;
- Operation and maintenance (O&M) functions required to maintain process efficiencies or performance specifications; and
- Difficulties of long-term maintenance, including the potential need for replacement of technical components and the degree of confidence that controls can adequately handle potential problems.

Short-term effectiveness addresses the effects of the alternative during the construction and implementation phases until objectives are met and considers the following:

- The risks to project workers and the methods used to mitigate the implementation risks, which could not be readily controlled during the project;
- The risks to the community during construction and how the risks would be mitigated; and
- Environmental impacts, which can be expected during construction and implementation, the mitigation measures and their reliability, and the impacts which cannot be avoided or controlled.

The duration of time until project objectives are met

6.3 Regulatory and Community Acceptance

This criterion is used to evaluate the technical and administrative concerns of the state and citizens of the state regarding alternatives, which can include an assessment of the state's position and key concerns regarding the alternative. Regulatory permitting and compliance requirements are considerable when dealing with disturbance of wetlands and freshwater resources. Multiple federal, state, and local permitting agencies typically need to be engaged to perform this work.

This criterion also involves evaluation of the concerns of the public regarding the proposed alternatives and determines which component of the alternatives interested persons in the community support or oppose. Odor, noise, and traffic caused by project execution present the potential to cause a public disturbance and/or impact quality of life for nearby residents. Public perception, potential for interference in traffic and quality of life present a risk as public complaints may cause project delays. This project also involves several public stakeholders including local government and non-government organizations which have a vested interest in keeping the wellbeing of the residents in mind. A

comprehensive public communication strategy will be developed to mitigate many of the questions and concerns about the project plan and schedule.

6.4 Sustainability

This criterion addresses the durability of each alternative. The criterion is used to evaluate the resiliency of each alternative to various changes in condition, both acute and chronic changes. Acute, or short term, conditional changes include storms, hurricanes, flash flooding, dredge/SMA construction errors, large future construction projects, large volume waste dumps, etc. Chronic, or long term, conditional changes include droughts, climate change, habitual waste dumping, sediment migration, etc. Evaluation of this criterion relies heavily on past project experiences. This criterion addresses the concerns of stakeholders and inherent risk that is a factor in any project. It should be noted that BMP's and long-term maintenance strategies will be applied to mitigate the risk of any alternative. Scores represent the level of effort required for BMPs and risk mitigation.

6.5 Cost

Cost may play a significant role in comparing options, which are similar in long-term effectiveness or when treatment methods provide a similar performance. The options with high costs compared to the remedial option's overall effectiveness will not be selected as the final remedy. Similarly, non-treatment options that have low initial capital costs may be more costly overall than a treatment option when long-term O&M costs are considered. The Engineers' Opinion of Probable Cost estimates (-30% to +50%) are provided for each alternative may vary based on a variety of factors such as, project timeline, contractor, dredging conditions, material assumptions, etc. (**Appendix A**). Improved performance or greater long-term risk reduction may justify higher costs. For alternatives 2A, 2B, 2C, 3B and 3C, it was assumed that 50% of the dewatered sediment would remain onsite for beneficial use opportunities and 50% would be transported and disposed of at a local Subtitle D municipal landfill for nonhazardous waste. For alternative 3A, it was assumed that 100% of the dewatered sediment would remain onsite for beneficial use opportunities.

7. Sediment Removal Alternatives

Flood hazard mitigation of Lake Bonnet and its surrounding wetland ecosystem is the City of Lakeland's highest priority. Rehabilitation of the ecosystem requires removal of sediments from Lake Bonnet and beneficially using the nutrient rich, noncontaminated sediments in the watershed, if possible. Because of this, alternatives selected for evaluation focus on removal and dewatering, which inherently creates some overlap of advantages, disadvantages, and assumptions. Below are notes that apply to all alternatives:

- Dredging, CDF or SMA construction, water discharge, and stacking require local, regional, state and federal permitting.
- CDF or SMA construction within a wetland area proposes challenges including flooding, biological hazards, ingress/egress, and foundation stability.
- All berms may require fill material to be purchased and imported.
- Sediments of 20% solids or less can be difficult or impossible to dredge via mechanical methods.
- Large amounts of debris such as cobble, tires, wire and branches can make hydraulic dredging difficult.
- Seasonal construction windows may exist due to local and regional environmental resources.
- BMPs will be developed and installed to mitigate environmental impacts (e.g., bubble or turbidity curtains to deter alligators and fish from entering the work zone).
- Assumed adequate water depth for necessary barges and boats used in alternative implementation.
- Quality of life impacts can be mitigated through work hour restrictions, construction season selection, barge/dredge sizing, etc.

7.1 Alternative 1 – No Action

This alternative is used for baseline comparison as a no action alternative would not accomplish any of the project objectives.

7.2 Alternative 2A – Mechanical Dredging with Amended Sediment Stacking

This alternative consists of mechanical dredging via long reach bucket excavator or articulated arm and dewatering via stacking with ex-situ addition of S/S amendments to facilitate dewatering. Methods such as bucket mixing and/or mechanical augers will be used to enhance the dewatering process.

Constructability: An SMA can be constructed to handle mechanically dredged and stacked sediment from Lake Bonnet. The dredge prism will be accessible with an appropriately sized dredge. Stacking alone is not expected to be sufficient for the dredged material to pass a PFT and s/s reagent addition will be required to meet off-site T&D requirements. However, amended material is expected to dewater and pass a PFT within 96-h cure time.

Impacts and/or challenges to constructability include:

- Suitable water depths to accommodate full hopper barges and/or scows;
- Anchoring barges in barge staging area(s); and
- Amendment must be stored in an area that can be kept dry.

Effectiveness: Mechanical dredging with a long-reach bucket excavator, articulated arm, or cable arm bucket would not be effective in removing sediment from this 1-2 ft surficial sediment dredge prism as the in-situ material is consists of less than 30% solids. Treatability tests are recommended to evaluate the time for amended sediment to pass a paint filter test (PFT) and be suitable for T&D. S/S reagents will allow for mechanically dredged sediment to dewater up to 90% solids concentration. S/S reagents will decrease the overall mass and volume for T&D and can provide treatment and/or reduce mobility of constituents.

Impacts and/or challenges to effectiveness include:

- Re-handling of the dredge material 1-2 times will be required to stack and mix s/s reagent in a nearshore SMA; and
- Spill and fall may occur using mechanical dredging methods that may resuspend and/or mobilize sediment outside excavation area compared to other alternatives

Regulatory and Community Acceptance: Mechanical dredging with amended sediment stacking will produce a relatively small quantity of water to be treated and discharged. Discharge permitting is expected to be accepted with minimal constraints. Dust from amendment addition is not expected to be excessive but operators and contractors

should be mindful of wind direction and surroundings. It should be noted that some amendments (i.e., lime) have an inherent odor.

Sustainability: Adverse weather, particularly rain, will halt s/s amendment addition in outdoor areas. Wetting pozzolanic reagents prior to mixing can cause reactions to occur early and decrease/remove any effects once mixed with sediments. Strong winds can also halt amendment mixing in outdoor areas as dust from these amendments can be difficult to remove from cars and homes of nearby residents. Spring structures, tarps and other mitigation measures can decrease the sensitivity of this alternative. Gravity Stacking and amendment mixing will require a significant SMA footprint. All disturbed areas will be recovered by vegetating, grading, and other restoration actions, as necessary.

Cost: $8,560,000. S/S amendment is typically very successful in reducing water content (reducing weight) and adding strength to the material. An assumed reduction in moisture content of over 30% will offset any initial material costs by decreasing mass and subsequently lowering transportation and disposal costs.

7.3 Alternative 2B – Mechanical Dredging with Mechanical Dewatering

This alternative consists of mechanical dredging via long reach bucket excavator or articulated arm into hopper barges, slurring sediment to less than 10% solids for polymer addition and pumping via a high solids pump to mechanical dewatering equipment for dewatering. Stabilizing reagent can be added to dewatered and staged filter cake, if necessary, to meet disposal site criteria. The addition of stabilizing reagent was not included in the scoring of this alternative.

Constructability: Mechanical dredging and mechanical dewatering of these sediments in a nearshore SMA can be implemented in a nearby SMA. The dredge prism will be accessible with an appropriately sized dredge(s) and hopper barge(s). The slurried dredge material will dewater via mechanical dewatering operations.

Impacts and/or challenges to constructability include:

- Management and treatment of a large volume of filtrate water required as a 10% solids dredge slurry will be required for sediment conveyance and polymer addition;
- Spring structure construction and maintenance;
- Heavy dewatering equipment on soft wetland foundation. Geotechnical evaluation of the SMA site will be required; and
- Access to utilities and non-potable fresh water.

Effectiveness: Similar to Alternative 2A, mechanical dredging will be moderately effective in removing 30% in situ sediment from the dredge prism. During active mechanical dewatering, equipment or materials are used to apply external pressure and can achieve a solids content of up to 70% by weight. It is assumed dewatered sediment produced from mechanical dewatering operations will pass a PFT within a few hours and be suitable for T&D or beneficial reuse.

Impacts and/or challenges to effectiveness include:

- Stacking and rehandling of the dredge material 1-2 times will be required in the lined SMA;
- Operator knowledge and experience for mechanical dewatering equipment;
- O&M of mechanical dewatering equipment can affect dredge productivity;
- Onsite utilities (water and electric); and
- Slurry quality, consistency and removal rate that can affect equipment operation and production.

Regulatory and Community Acceptance: Mechanical dewatering typically produces filtrate with a higher TSS concentration compared to passive dewatering strategies. Discharge permits will likely have a TSS concentration threshold and potential site-specific constituents needing water treatment prior to discharge to Lake Bonnet. Excessive noise from mechanical dewatering equipment may limit available working hours.

Sustainability: Mechanical dewatering equipment requires fuel and/or power sources for operation. Any interference with the supply of fuel and/or power can cease any further dewatering until fuel and utilities are resupplied. It is also important that equipment remains dry. Like Alternative 2A, structures can be erected to control weather. Mechanical dewatering will require significantly less square footage than passive dewatering alternatives. All disturbed areas will be recovered by vegetating, grading, and other restoration actions, however, it is assumed less restoration effort will be needed.

Cost: $14,860,000. Mechanical dewatering strategies typically include high operation and maintenance costs, structure costs, utilities, and water treatment.

7.4 Alternative 2C – Mechanical Dredging with Passive Dewatering

This alternative consists of mechanical dredging via long reach bucket excavator or articulated arm into hopper barges and pumping sediment with a high solids pump into geotextile tubes until it meets all requirements for transportation and disposal, potentially weeks to months. Adding S/S reagents to the staged material, if necessary, is viable but is not considered part of this evaluation.

Constructability: Mechanical dredging and passive dewatering of these sediments in geotextile tubes in a nearshore SMA can be readily implemented. The dredge prism will be accessible with an appropriately sized dredge and hopper barge(s). Berms and spring structures will need to be built to keep rain and high water from Lake Bonnet out of SMA.

Impacts and/or challenges to constructability include:

- Filtrate water collection, conveyance, treatment and monitoring. Large water volume management and treatment still required as slurry required for polymer addition and loading equipment.
- Spring structure construction and maintenance.

Effectiveness: Like Alternatives 2A and 2B, mechanical dredging will be moderately effective in removing high moisture content sediment from this dredge prism. During passive dewatering, sediment from barges is stacked and left to dewater. It is assumed dewatered sediment produced from geotextile tubes will pass a PFT and reach approximately 70% solids, however a higher volume and mass of material for disposal would be produced and it would be less stable than material dewatered using other alternatives.

Impacts and/or challenges to effectiveness include:

- Rehandling of the dredged material 1-2 times will be required to transport material to geotextile tubes;
- Very large volume of water required to slurry dredged material at in-situ solids concentrations for chemical conditioning;
- Filter cake from geotextile tubes may pass a PFT in a few days or weeks but typically requires stabilization to meet disposal criteria; and
- Operator knowledge and experience for chemical conditioning of the slurry.

Regulatory and Community Acceptance: Mechanical dredging with geotextile tube dewatering will produce a relatively large quantity of filtrate water to be treated and discharged due to chemical conditioning requirements. Water treatment and temporary water discharge permits are expected to be required. It is expected that community members will accept this approach if the strategy does not disrupt daily routines and occasional events. Odors and dust will be mitigated as necessary to prevent unnecessary conflicts.

Sustainability: Sediments with high organic material concentrations can be difficult to dewater and may not release water under their own weight. It is expected that material dredged from shallow parts of the Lake (i.e., the littoral zone) will contain roots, rhizomes, algae, invasive plants, and other organics that will not allow for efficient passive dewatering without screening and/or polymer use. Amendment addition may be needed if high organic concentrations are encountered. Geotextile tube dewatering will require a significant SMA footprint. All disturbed areas will be recovered by vegetating, grading, and other restoration actions, as necessary.

Cost: $12,090,000. Passive dewatering can be a cheaper dewatering alternative given adequate time for material to release moisture. This cost assumes passively dewatered sediment will be removed upon passing a PFT, approximately 53% solids.

7.5 Alternative 3A – Hydraulic Dredging with a CDF

This alternative consists of hydraulic dredging via one of the methods described in Section 3.2 and passive dewatering via CDF (Section 5.1).

Constructability: Hydraulic dredging or pumping to a CDF for containment, dewatering and consolidation of sediments can be implemented. Dredge slurries will readily dewater in a CDF with the use of properly introduced chemical conditioning agents using polymer make-down units (with proper make-up water quality and quantity) at inline solids concentrations less than 15%. Sufficiently sized containment with sufficient hydraulic retention time and a weir system will be required to collect and manage a large volume of filtrate water and any additional precipitation prior to discharge to Lake Bonnet.

Impacts and/or challenges to constructability include:

- Access to and movement within the dredge prism.
- Surficial sediment dredging across a large footprint.
- Filtrate water collection, retention, conveyance, and monitoring. Large water volume management still required, and polymer added to the dredge slurry to expedite consolidation and settling.
- Exclusion of cobble and debris from the dredge intake and slurry while meeting the target removal depths. If present, rock boxes, screens or cyclones may be required to remove coarse-grain material prior to the CDF.
- Large debris could be removed from the dredge prism with a mechanical excavator or comparable ahead of the dredge.
- Passive dewatering in a CDF requires sufficient hydraulic retention time to allow suspended solids to settle sufficiently prior to water discharge to Lake Bonnet. Dewatered sediment in the CDF has sufficient time to consolidate in the CDF for beneficial use in the watershed for littoral zone and wetlands rehabilitation.
- Settling in a CDF typically requires a larger footprint and 7 to14-d dewatering time to efficiently operate. However, smaller CDFs can be used in combination with polymer to shorten the time and space required to reach dewatering goals.
- Coarse grain material and debris can block conveyance pipelines.

Effectiveness: Hydraulic dredging with a self-propelled, horizontal auger or cutter suction dredge or high-solids pumping with a Heavy slurry pump from a flexi-barge will be effective in removing sediment from the dredge prism(s). If necessary, the contractor could screen larger cobble and debris (greater than 6” in diameter) from being dredged and passed through the discharge line to the CDF(s). Sediments with large amounts of cobble and debris are difficult to remove hydraulically as the dredge will frequently need to shutdown to remove wedged debris. Slurried sediment can be chemically conditioned in the dredge discharge line to expedite settling and consolidation in the CDF. The dewatered and consolidated material will pass a PFT within a few days and be suitable for beneficial use in the watershed or closure in place. It is expected that sediments will reach greater than 70% solids using CDF dewatering, but the timeframe for reaching this goal is difficult to predict without treatability testing.

Impacts and/or challenges to effectiveness include:

- Accuracy to target surficial sediments
- Filtrate collection, suspended solids settling and discharge
- Access to and movement within a 1 to 3-foot dredge prism
- Filter cake from CDF may pass a PFT in a few days or weeks Operator knowledge and experience for chemical conditioning of the slurry
- Very large volume of filtrate water generated in hydraulic dredging processes

Regulatory and Community Acceptance: Hydraulic dredging will produce a large quantity of filtrate water to be managed and treated prior to discharge to Lake Bonnet. Water treatment and temporary water discharge permits are expected to be required. A large hydraulic dredge and/or booster pump(s) can cause excessive noise and may limit working hours. Noise from hydraulic dredges and/or pumps may disturb surrounding citizens, but can be mitigated through institutional controls and BMPs, such as limiting working hours, scheduling, and implementing interim noise barriers.

Sustainability: CDF dewatering is more resilient to adverse conditions than other dewatering alternatives described in this report. CDFs can dewater sediment in wet or dry conditions, and, if permitted, sediment can be left in the CDF for years prior to excavation. Should the dredge rate increase substantially, CDFs typically are not the a pinch point in the sediment management strategy. If the CDF size is not adequate for the dredge rate, dredging will intermittently stop

while waiting for the CDF to settle and gain more capacity. CDF dewatering will require a significant footprint. All disturbed areas will be recovered by vegetating, grading, and other restoration actions, as necessary.

Cost: $6,702,794. Unlike mechanical dredging, a hydraulic dredge would not require the rehandling of dredged material when arriving at and placing in the CDF. This cuts down on labor and equipment rental costs. However, there are additional costs for hydraulic dredging such as pipelines, polymer, and CDF berm and weir construction.

7.6 Alternative 3B – Hydraulic Dredging with Geotextile Tubes

This alternative consists of hydraulic dredging via one of the methods described in Section 3.2 and passive dewatering via geotextile tubes (Section 5.1). See **Figures 2 and 3** for conceptual layout of this alternative.

Constructability: Hydraulic dredging or pumping to geotextile tubes for dewatering of sediments in a nearshore SMA can be implemented. Dredge slurries will readily dewater in geotextile tubes with the use of properly introduced chemical conditioning agents using polymer make-down units (with proper make-up water quality and quantity) at inline solids concentrations less than 15%. Sufficiently sized perimeter ditches and a sump will be required to collect and convey a large volume of filtrate water and any additional precipitation to a water treatment system prior to discharge to Lake Bonnet.

Impacts and/or challenges to constructability include:

- Access to and movement within the dredge prism.
- Surficial sediment dredging across a large footprint.
- Filtrate water collection, conveyance, treatment and monitoring. Large water volume management and treatment still required as slurry required for polymer addition and loading equipment.
- Exclusion of cobble and debris from the dredge intake and slurry while meeting the target removal depths. If present, rock boxes, screens or cyclones may be required to remove coarse-grain material prior to the geotextile tubes.
- Large debris could be removed from the dredge prism with a mechanical excavator or comparable ahead of the dredge.
- Geotextile tubes typically require a larger footprint and 7 to14-d dewatering time to efficiently operate. However, smaller SMAs can be used in combination with s/s to shorten the time and space required to reach dewatering goals.
- Coarse grain material and debris can block conveyance pipelines.

Effectiveness: Hydraulic dredging with a self-propelled, horizontal auger or cutter suction dredge or high-solids pumping with a Hevvy slurry pump from a flexi-barge will be effective in removing sediment from the dredge prism(s). If necessary, the contractor could screen larger cobble and debris (greater than 6” in diameter) from being dredged and passed through the discharge line to geotextile tubes located in the SMA. Sediments with large amounts of cobble and debris are difficult to remove hydraulically as the dredge will frequently need to shutdown to remove wedged debris. Slurred sediment can be chemically conditioned in the dredge discharge line and passively dewatered in geotextile tubes. The dewatered and consolidated material will pass a PFT within a few days and be suitable for T&D and/or beneficial use in the watershed. It is expected that sediments will reach greater than 70% solids using geotextile tube dewatering, but the timeframe for reaching this goal is difficult to predict without treatability testing.

Impacts and/or challenges to effectiveness include:

- Accuracy to target surficial sediments
- Filtrate collection, conveyance and treatment
- Access to and movement within a 1 to 3-foot dredge prism
- Filter cake from geotextile tubes may pass a PFT in a few days or weeks but typically requires stabilization to meet disposal criteria
- Operator knowledge and experience for chemical conditioning of the slurry
- Very large volume of filtrate water generated in hydraulic dredging processes

Regulatory and Community Acceptance: Hydraulic dredging will produce a large quantity of filtrate water to be managed and treated prior to discharge to Lake Bonnet. Water treatment and temporary water discharge permits are expected to be required. A large hydraulic dredge and/or booster pump(s) can cause excessive noise and may limit working hours. Noise from hydraulic dredges and/or pumps may disturb surrounding citizens, but can be mitigated through institutional controls and BMPs, such as limiting working hours, scheduling, and implementing interim noise barriers.

Sustainability: Geotextile tube dewatering is more resilient to adverse conditions than other dewatering alternatives described in this report. Geotextile tubes can dewater sediment in wet or dry conditions, and, if permitted, can be left in the SMA for years prior to excavation. Should the dredge rate increase substantially, geotextile tubes can be a pinch point in the remediation strategy. If geotextile quantity and/or size is not adequate for the dredge rate, dredging will intermittently stop while waiting for tubes to dewater and gain more capacity. Geotextile tube dewatering will require a significant SMA footprint. All disturbed areas will be recovered by vegetating, grading, and other restoration actions, as necessary.

Cost: $12,430,000. Unlike mechanical dredging, a hydraulic dredge would not require the rehandling of dredged material when arriving at and placing in the SMA. This cuts down on labor and equipment rental costs. However, there are additional costs for hydraulic dredging such as pipelines, polymer, and geotextile tubes.

7.7 Alternative 3C – Hydraulic Dredging with Mechanical Dewatering

This alternative consists of hydraulic dredging via one of the methods described in Section 3.2 and mechanical dewatering (Section 5.2). Adding S/S reagents to the mechanically dewatered material, if necessary, would remain viable but is not included in this evaluation.

Constructability: Hydraulic dredging or slurry pumping followed by mechanical dewatering of these sediments in a nearshore SMA can be implemented in the wetland area. The dredge prism will be accessible with an appropriately sized dredge(s). The slurred dredge material will dewater via mechanical dewatering operations.

Impacts and/or challenges to constructability include:

- Access to and movement within the dredge prism
- Filtrate water collection, conveyance, treatment and monitoring. Large water volume management and treatment still required as slurry required for polymer addition and loading equipment
- Large debris would require a mechanical excavator or comparable to remove from dredge prism ahead of the dredge
- Coarse grain material can block conveyance pipelines
- Mechanical dewatering equipment needs to be operated in dry conditions in a spring structure
- Access to utilities and non-potable fresh water
- Mechanical dewatering equipment is prone to maintenance issues and may slow dredging rates down at times

Effectiveness: Like Alternative 3A, hydraulic dredging will be effective in removing sediment from the dredge prism(s). During active mechanical dewatering, equipment or materials are used to apply external pressure and can sometimes achieve a solids content of up to 70% by weight. Because hydraulic dredging typically slurries sediments to a low solids concentration, thickening tanks may be used to prepare the slurry for mechanical dewatering strategies. It is assumed that dewatered sediment produced from mechanical dewatering operations will pass a PFT and be suitable for T&D.

Impacts and/or challenges to effectiveness include:

- Filter cake from dewatering equipment may pass a PFT in a short time period but typically requires stabilization to meet disposal criteria
- Very large volume of filtrate water generated in the hydraulic dredging process
- Operator knowledge and experience for mechanical dewatering equipment
- O&M of mechanical dewatering equipment can affect dredge productivity
- Slurry quality, consistency and removal rate that can affect equipment operation and production.

Regulatory and Community Acceptance: Mechanical dewatering typically produces filtrate with a high TSS concentration. Discharge permits will likely have a TSS concentration threshold requiring water treatment prior to discharge to Lake Bonnet. Excessive noise from mechanical dewatering equipment may limit available working hours.

Sustainability: Mechanical dewatering equipment requires fuel and/or power sources for operation. Any interference with the supply of fuel and/or power can cease any further dewatering until fuel and utilities are resupplied. It is also important that equipment remains dry. Like Alternative 2A, structures can be erected to control weather. In our experience, mechanical dewatering has greater impacts to community and environment due to the additional machinery required. Mechanical dewatering will require significantly less square footage than passive dewatering alternatives. All disturbed areas will be recovered by vegetating, grading, and other restoration actions, however, it is assumed less restoration effort will be needed.

Cost: $14,950,000. Like Alternative 2B, mechanical dewatering strategies typically include high operation and maintenance costs, structure costs, utilities, and water treatment.

8. Scoring of Alternatives

Scoring each alternative was completed by assigning a value (1-20) to each criterion for each alternative. Alternatives were scored using past engineering experience, historical data, and previous alternatives analysis workshops with the City of Lakeland, Bonnet Springs Park and other community stakeholders. Values were summed to create a total score for each alternative. Scoring for each criterion was roughly defined as follows (except cost) to subsequently select an alternative with the highest probability of success:

16-20: Strongly recommended. Values within this range indicate that this alternative is an excellent option based on the criterion. Values within this range indicate that the alternative is constructable, uses a proven strategy for risk mitigation, has been applied to similar environments, has little uncertainty, is predictable, resilient to long-term and short-term condition changes, and will stay on budget as designed and estimated. Land is available suitable for equipment staging and/or sediment processing with no additional engineering support or costs. There is a low probability of project delay as materials and equipment for this alternative are readily available and there are no long lead items. Results of the dewatering strategy will be adequate and transport to a final disposal area is achievable. Regulatory acceptance is expected.

11-15: Recommended. Values within this range indicate that this alternative is a recommended option based on the criterion. Values within this range indicate that the alternative is constructable, uses a proven strategy for risk mitigation, has been applied to similar environments, has minimal uncertainty, is predictable resilient to long term condition changes, and has low probability of change orders. Land is available suitable for equipment staging and/or sediment processing with additional engineering support and costs. There is a low probability of project delay as materials and equipment for this alternative are readily available and there are no long lead items. The results of the dewatering strategy will be adequate and transport to a final disposal area is achievable with few challenges. Regulatory acceptance is expected.

6-10: Acceptable but with several challenges. Values within this range indicate that this alternative is acceptable but has several challenges that can be mitigated with engineering and BMPs. Values within this range indicate moderate impacts to project costs are expected, a strong possibility for project delays and a need to use mitigation measures to resolve challenges. The alternative is not expected to be resilient or flexible to changing conditions over time and may require more work in the future. Values within this range indicate that the alternative is constructable, uses a blend of proven and innovative strategies for risk mitigation, has been applied to other project sites with success and has moderate uncertainty. Land is available suitable for equipment staging and/or sediment processing with major engineering and design support and costs. There is a moderate probability of project delay as materials and equipment for this alternative are available and there are no long lead items. Results of dewatering strategy will be effective with high engineering support and cost. Transport to a final disposal area is achievable with interim storage. Regulatory acceptance is achievable but challenging.

1-5: Not recommended. Values within this range indicate that this alternative has several engineering and design challenges that could be mitigated with engineering and BMPs. Values within this range indicate that impacts to project costs are expected as well as a strong possibility for project delays and a need to use mitigation measures to resolve challenges. The alternative or criterion is meant to be a temporary fix and should not be considered a permanent solution. Values within this range indicate that the alternative is constructable, uses a blend of proven and innovative strategies for risk mitigation, has been applied to a few project sites with success and has moderate uncertainty. Footprint required is not available. The space is suitable for equipment staging and/or sediment processing with major engineering and design support and costs. There is a moderate probability of project delay as materials and equipment for this alternative are available and there are no long lead items. The dewatering strategy is not effective/existent and transport to final disposal area is not accounted for. Regulatory Acceptance is questionable.

Scoring for the cost criterion is based upon the comparative cost estimates prepared for this analysis on an inverted scale ranging from a score of 20 for no additional cost to a score of 1 for $15M. Comparative cost estimates can be found in **Appendix A** for each alternative. The following are general assumptions used to develop the cost estimates and process flow calculations:

- In-situ solids concentration of 30% solids.
- There are no seasonal construction restrictions.
- Confirmation sampling will be completed within one week of dredge completion.
- Water treatment system design is capable of handling 2,000 gpm, if necessary.
- One oversite employee will be on site full-time for mobilization, dredging, dewatering, T&D, and restoration.
- Hydraulic dredge rate of 600 in-situ CY/day.
- Mechanical dredge rate of 612 in-situ CY/day.
- Dredge operates 8.5 hours/day (85% uptime).
- Construction hours are 6 days/week – 10 hours/day.
- 143,000 CY of sediment will be removed from the top 1 to 3-feet of the Lake.
- 100% of dredged and dewatered sediment will be used beneficially in the watershed for Alternative 3A and 50% for all other alternatives.
- Mechanical dewatering, dewatering in a CDF and geotextile tube dewatering achieve greater than 70% solids with adequate strength for disposal and/or beneficial reuse.
- Amended dredge material will achieve 90% solids.
- 3 ft of fill material (rock, aggregate, dirt, geotextile fabric, etc.) is required to construct the CDF or SMA in the wetland.
- Construction entrances at residential roads are acceptable.
- In-kind wetland restoration is required for areas disturbed during construction.
- Mobilization includes 2 weeks of placing and compacting backfill material to build the CDF or SMA foundation.
- Backfill and berm material will be beneficially reused for watershed and wetland restoration.
- Average density of backfill material is 1.7 ton/CY.

Based on the following **Alternatives Analysis Scoring Table**, **Alternative 3A – Hydraulic Dredging with a CDF** is recommended over mechanical dredging and other dewatering alternatives. The comparison and rationale used to perform the scoring analysis and reach this recommendation are summarized in **Tables 1 and 2**.

Table 1. Alternatives Criteria Scoring Analysis

Alternative	Constructability	Effectiveness	Sustainability	Regulatory & Community Acceptance	Cost	Total
1 - No Action	19	1	1	3	19	43
2A - Mechanical Dredging with Amended Sediment Stacking	13	13	13	13	17	69
2B - Mechanical Dredging with Mechanical Dewatering	8	12	13	11	8	52
2C - Mechanical Dredging with Passive Dewatering	13	9	10	14	13	59
3A - Hydraulic Dredging with a CDF	**15**	**17**	**18**	**16**	**18**	**84**
3B - Hydraulic Dredging with Geotextile Tube Dewatering	14	17	18	16	15	80
3C – Hydraulic Dredging with Mechanical Dewatering	14	14	16	11	8	63

Note: Each criteria is weighted equally.

Table 2. Alternatives criteria scoring rationale

1 - No Action	No implementation required.	Does not meet the project objectives.	Does not meet the project objectives.	The community initially pushed for remedial action and, therefore, would not accept the alternative.	**$0 M**
2A - Mechanical Dredging with Amended Sediment Stacking	Staging/offloading areas required for barges; however sufficient area is available. Additional handling/reworking of sediment. S/S reagent allows load out to begin < 5 days. More coordination is needed with S/S reagent suppliers. S/S reagent will need to be kept dry until it is mixed with sediment. SMA and barge unloading area construction in soft wetlands will need to be accounted for.	Mechanical dredging will meet sediment removal objectives and amended sediment is typically more than capable of reaching adequate strength requirements for disposal/reuse. Mechanical dredging in-situ sediments with <30% solids by weight can slow dredge production.	Amendment cannot be left exposed to adverse weather conditions as dust can negatively impact surrounding residents. Exposing s/s reagent to rain can severely reduce effectiveness upon mixing.	Discharge permitting is expected to be accepted with minimal constraints. Operators and contractors should be mindful of wind direction and surroundings to mitigate dust. It should be noted that some amendments (i.e., lime) have an inherent odor.	**$8.56 M**
2B - Mechanical Dredging with Mechanical Dewatering	Mechanical Dredging requires barge staging areas, barge offloading areas, rehandling of materials, and barge coordination. Pumping to mechanical dewatering equipment will require chemical conditioning via polymer additives to ensure sediments floc together and release water quickly. Mechanical dewatering will require additional coordination to ensure the equipment is running efficiently. Excess water volume will need to be managed and treated prior to discharge. SMA and barge unloading area construction in soft wetlands will need to be accounted for. Construction of spring structures should be considered.	Mechanical dredging will meet sediment removal objectives; however, mechanical dewatering results are heavily dependent on operator experience. Mechanically dewatered sediment is expected to pass PFT and strength requirements. Mechanical dewatering will not achieve the same results as s/s reagents. Mechanical dredging in-situ sediments with low solids content can slow dredge production	Utility and fuel sources are very important for mechanical dredging operations. Should supply fuel and/or power be interrupted, dewatering operations will cease.	Mechanical dewatering typically produces filtrate with a higher TSS concentrations compared to passive dewatering strategies. Discharge permits will likely have a TSS concentration threshold and potential site-specific constituents needing water treatment prior to discharge to Lake Bonnet. Noise from mechanical dewatering equipment is expected to disturb surrounding citizens but can be mitigated.	**$14.86 M**
2C - Mechanical Dredging with Passive Dewatering	Mechanical Dredging requires barge staging areas, barge offloading areas, rehandling of materials, and barge coordination. SMA will require a larger footprint than Alternatives 2A and 2B. Sediment dewatering duration should be expected to take several weeks when designing and scheduling. SMA and barge unloading area construction in soft wetlands will need to be accounted for.	Mechanical dredging will meet sediment removal objectives; however, sediments may not readily dewater adequately, nor acquire adequate strength for disposal of contaminated sediments in a timely manner. Mechanical dredging in-situ sediments with low solids content can slow dredge production	High organic material concentrations can drastically slow/stop dewatering processes. It is expected to encounter these high concentrations when dredging near the shore of Lake Bonnet or in the creeks Lake Bonnet contributes too.	Discharge permitting is expected to be accepted with minimal constraints. Gravity stacking will require a longer duration for sediment to reach solids content and/or stability goals. It is expected that community members will accept if the strategy does not disrupt daily routines and occasional events. Odors and dust will be mitigated as necessary to prevent unnecessary conflicts.	**$12.09M**
3A - Hydraulic Dredging with a CDF	Hydraulic Dredging requires a floating discharge pipe to be connected to a single vessel. The discharge pipe may cause disruptions in boat traffic as vessels should not pass over the floating pipe. Pumping to a CDF will require chemical conditioning via polymer additives to ensure sediments floc together and release water quickly. Excess water will need to be managed prior to discharge. CDF construction in soft wetlands will need to be accounted for.	Hydraulic dredging can quickly remove and dewater sediment. A CDF will allow sediment to pass a PFT and be ready for transport or closure in place in as little as 7-d. Sediment may not acquire adequate strength for beneficial use without the addition of S/S reagents. Longer durations will dewater and consolidate sediments further.	CDF containment and dewatering is very resilient when exposed to adverse conditions. CDFs are effective in wet and dry conditions. Once filled, a CDF can be left in place for further dewatering, erosion control, water management, and other uses. When not properly designed without sufficient hydraulic retention time can become a pinch point to dredging operations should the dredge have significantly higher dredge rate than expected.	Hydraulic dredging will produce a large quantity of filtrate water to be managed and possibly treated prior to discharge to Lake Bonnet. Water treatment and a temporary water discharge permit are expected to be required. Noise from hydraulic dredges and/or pumps may disturb surrounding citizens, but can be mitigated through BMPs, such as work hours and scheduling.	**$6.7M**

Hydraulic retention time

Table 3. Alternatives criteria scoring rationale

3B – Hydraulic Dredging with Geotextile Tube Dewatering	Hydraulic Dredging requires a floating discharge pipe to be connected to a single vessel. The discharge pipe may cause disruptions in boat traffic as vessels should not pass over the floating pipe. Pumping to geotextile tubes will require chemical conditioning via polymer additives to ensure sediments floc together and release water quickly. Excess water will need to be managed and treated prior to discharge. SMA construction in soft wetlands will need to be accounted for.	Hydraulic dredging can quickly remove and dewater sediment. Geotextile tubes will allow sediment to pass a PFT and be ready for transport in as little as 7-d. Sediment may not acquire adequate strength for disposal or beneficial use of dewatered sediment without the addition of S/S reagents. Longer durations will dewater sediments further.	Geotextile tube dewatering is very resilient when exposed to adverse conditions. Geotextile tubes are effective in wet and dry conditions. Once filled, tubes can be left in place for further dewatering, erosion control, water management, and other uses. When not properly designed, geotextile tubes can become a pinch point to dredging operations should the dredge have significantly higher dredge rate than expected.	Hydraulic dredging will produce a large quantity of filtrate water to be managed and possibly treated prior to discharge to Lake Bonnet. Water treatment and a temporary water discharge permit are expected to be required. Noise from hydraulic dredges and/or pumps may disturb surrounding citizens, but can be mitigated through BMPs, such as work hours and scheduling.	**$13.68 M**
3C - Hydraulic Dredging with Mechanical Dewatering	Hydraulic Dredging requires a floating discharge pipe to be connected to a single vessel. The discharge pipe may cause disruptions in boat traffic as vessels should not pass over the floating pipe. Pumping to mechanical dewatering equipment will require chemical conditioning via polymer additives to ensure sediments floc together and release water quickly. Mechanical dewatering will require additional coordination to ensure the equipment is running efficiently. Excess water volume will need to be managed and treated prior to discharge. SMA construction in soft wetlands will need to be accounted for. No barge unloading area required	Hydraulic dredging can quickly remove and dewater sediment. Mechanically dewatered sediment is expected to pass PFT and strength requirements. Mechanical dewatering is expected to achieve similar results to geotextile tubes.	Utility and fuel sources are very important for mechanical dredging operations. Should supply fuel and/or power be interrupted, dewatering operations will cease.	Mechanical dewatering typically produces filtrate with a high TSS concentration. Discharge permits will likely have a TSS concentration threshold requiring water treatment prior to discharge to Lake Bonnet. Excessive noise from mechanical dewatering equipment may limit available working hours.	**$16.45 M**

9. Mass Balance for Recommended Alternative

AECOM developed process flow and mass balance calculations for Alternative 3A based on assumptions listed in Section 8 of this alternatives analysis. **Tables 3 and 4** below, may need to be adjusted for constructability and dredging productivity as sediment volume to be dredged is subject to change.

Table 4. Mass Balance of Alternative 3A Hydraulic Dredging and CDF Dewatering of 143,000 CY of Lake Bonnet Sediment

Geotextile Tube Dewatering (average condition)	Units	
In situ volume at 30.0% solids	CY	143,000
In situ volume at 30.0% solids	US gals	28,886,000
Volume pumped @ 10% solids for chemical conditioning	US gals	86,658,000
Volume of sediment in CDF, 70.0% solids	US gals	12,379,714
Volume of sediment in CDF, 70.0% solids	CY	61,286

5

Table 64. Volume of Chemical Conditioning Polymer(s) used to Dewater 143,000 CY of Lake Bonnet Sediment

Chemical Conditioning Program (average condition)	Units	
Treatability testing (coagulant and flocculant)	ppm	**198**
Volume of emulsion polymer	US gals	**17,158**
Polymer (10 lb/gal)	lbs	**171,583**
Totes of emulsion polymer (~2,500 lb)	#	**69**

10. Conclusions and Recommendations

This alternatives analysis was prepared to present dredging and dewatering strategies for the remediation of Lake Bonnet. This report a) provides site-specific recommendations for optimization and a basis of design for full-scale operations (e.g., dredging, dewatering, and water management), b) provides a conceptual-level cost estimate, c) compares and recommends effective strategies for supporting Lake Bonnet Flood Hazard and Debris Mitigation Alternative 3.

Based on a comparative analysis of the retained alternatives using constructability, effectiveness, sustainability, regulatory and community acceptance and cost as comparison criteria, correspondence with the City of Lakeland and stakeholders, and past project experience, **Alternative 3A: Hydraulic Dredging with a CDF** was selected as the recommended alternative. The Engineers' Opinion of Probable Cost (-30% to +50%) for this dredging, dewatering and disposal/beneficial use approach for 143,000 CY of in-situ sediment (30% solids) was estimated at approximately **$6,702,794**.

A Data Gap Investigation is recommended to confirm assumptions made in this report. Additional sampling will be required to further delineate potential CoCs throughout the Lake, followed by a bench-scale treatability study to characterize and test dewatering efficacy of Lake sediments. If necessary, an SMA and/or CDF location should be determined prior to beginning any detailed designs. A complete Basis of Design Report (BODR) will be drafted once data gaps have been completed. In addition, dewatered sediment characterization and beneficial use opportunities for onsite reuse will be evaluated throughout the design process. Beneficial use alternatives such as shoreline or littoral zone placement, wetland rehabilitation and/or land creation within the Lake may provide cost/benefit to the Lake Restoration Program and simultaneously limit offsite transportation and disposal costs.

11. References

Amec Foster Wheeler. 2017. Lake System Hydraulic Management Plan. City of Lakeland, FL, USA.

City of Lakeland. 2010. *City of Lakeland 200 Lake Report*. City of Lakeland, FL, USA.

City of Lakeland. 2019. *City of Lakeland Water uality Management Plan*. City of Lakeland, FL, USA.

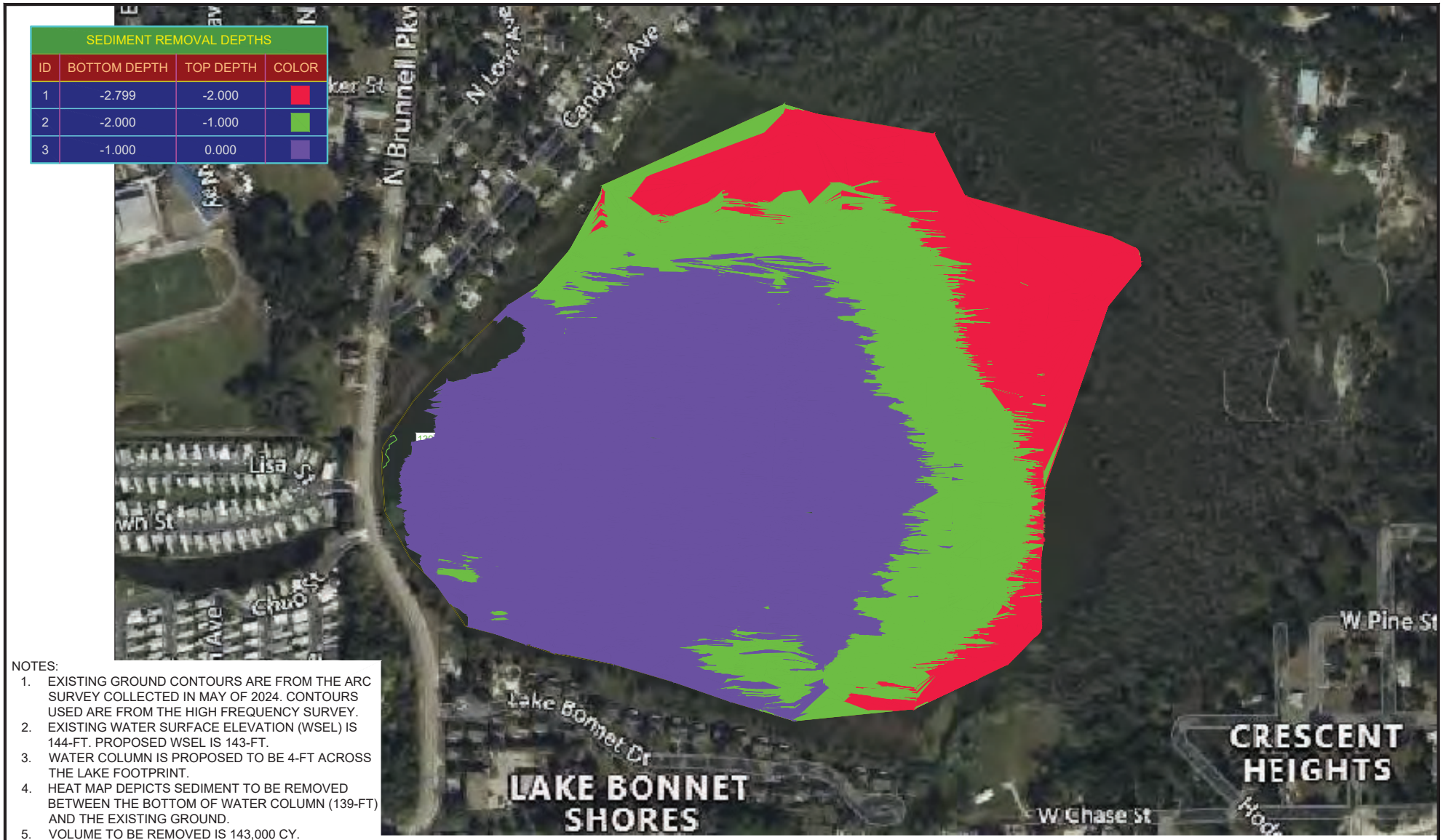
Environmental Consulting & Technology, Inc., Lowe and Battoe, Inc., Gowland, J.E., and Mehta, A.J. 2002. *Lake Bonnet Diagnostic Study*. Final report to the City of Lakeland Public Works Department, Lakes, and Stormwater Division. Lakeland, FL, USA.

Wood. 2018. *Lake Bonnet Pollutant Source Reduction Feasibility Study*. City of Lakeland, Polk County, FL, USA.

AECOM Technical Services, Inc.
110 East Broward Blvd, Suite 700
Fort Lauderdale, FL 33301

aecom.com

Figures



NOTES:

1. EXISTING GROUND CONTOURS ARE FROM THE ARC SURVEY COLLECTED IN MAY OF 2024. CONTOURS USED ARE FROM THE HIGH FREQUENCY SURVEY.
2. EXISTING WATER SURFACE ELEVATION (WSEL) IS 144-FT. PROPOSED WSEL IS 143-FT.
3. WATER COLUMN IS PROPOSED TO BE 4-FT ACROSS THE LAKE FOOTPRINT.
4. HEAT MAP DEPICTS SEDIMENT TO BE REMOVED BETWEEN THE BOTTOM OF WATER COLUMN (139-FT) AND THE EXISTING GROUND.
5. VOLUME TO BE REMOVED IS 143,000 CY.

AECOM

150 0 300

GRAPHIC SCALE IN FEET

DRAFT

LAKE BONNET DREDGING PROJECT NUMBER 60721840	**SEDIMENT VOLUME TO BE REMOVED**
DATE: 08/13/2024 DRWN: JLL	**FIGURE 1**

Project Management Initials: Designer: Checked: Approved: ANSI D 22" x 34"

AECOM

PROJECT

LAKE BONNET DRAINAGE BASIN FLOOD HAZARD AND DEBRIS MITIGATION - ELEMENTS 1C AND 3

LAKE BONNET
LAKELAND, POLK COUNTY, FLORIDA

CLIENT

CITY OF LAKELAND
www.lakelandgov.net

CONSULTANT

AECOM
3201 W. COMMERCIAL BLVD., STE. 134
FORT LAUDERDALE, FL 33309
www.aecom.com

N

30 0 60
GRAPHIC SCALE IN FEET

REGISTRATION

ISSUE/REVISION

A		CONCEPTUAL DESIGN
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60721840

SHEET TITLE

CONCEPTUAL SEDIMENT DEWATERING PLAN

SHEET NUMBER

FIGURE 2

1. DREDGE SLURRY LINE FROM HYDRAULIC DREDGE
2. CHEMICAL CONDITIONING UNIT PRIOR TO MANIFOLD
3. HEADER MANIFOLD
4. 18 60 FT CIRCUMFERENCE X 275 FT LENGTH GEOTEXTILE TUBES SPLIT INTO 2 WORKING CELLS (A & B). CELLS WILL SIMULTANEOUSLY ALTERNATE DEWATERING AND LOAD OUT OPERATIONS FOR A TOTAL OF 2 CYCLES
5. FILTRATE COLLECTION SUMP
6. WATER TREATMENT SYSTEM (WTS)
7. CONTAINMENT BERM FOR GEOTEXTILE TUBE DEWATERING PAD (ACREAGE)
8. DECONTAMINATION AREA
9. LAYDOWN AREA
10. FIELD OFFICES

AECOM

PROJECT

LAKE BONNET DRAINAGE BASIN FLOOD HAZARD AND DEBRIS MITIGATION - ELEMENTS 1C AND 3

LAKE BONNET
LAKELAND, POLK COUNTY, FLORIDA

CLIENT

CITY OF LAKELAND
www.lakelandgov.net

CONSULTANT

AECOM
3201 W. COMMERCIAL BLVD., STE. 134
FORT LAUDERDALE, FL 33309
www.aecom.com

N

30 0 60
GRAPHIC SCALE IN FEET

REGISTRATION

ISSUE/REVISION

A		CONCEPTUAL DESIGN
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60721840

SHEET TITLE

CONCEPTUAL SEDIMENT DEWATERING PLAN - BIFURCATED SDA

SHEET NUMBER

FIGURE 3

Project Management Initials: Designer: Checked: Approved: ANSI D 22" x 34"

Appendix A - Comparative Cost Estimate Summary Tables

Attachment 1: Comparative Cost Estimate Summary Table[1,2,3]

Alternative 2A - Mechanical Dredging with Amended Sediment Stacking	Cost	
Mob/Demob, Site Prep, Site Restoration, Materials	$	1,520,000
Mechanical Dredging Contractor	$	3,560,000
Transportation and Disposal (Incl. S/S Reagent)	$	2,520,000
Construction Support Services by Owner's Engineer	$	960,000
10% Contingency	$	860,000
Total	$	9,420,000

Alternative 2B - Mechanical Dredging with Mechanical Dewatering	Cost	
Mob/Demob, Site Prep, Site Restoration, Materials	$	1,710,000
Mechanical Dredging Contractor	$	9,250,000
Transportation and Disposal	$	2,790,000
Construction Support Services by Owner's Engineer	$	1,110,000
10% Contingency	$	1,490,000
Total	$	16,350,000

Alternative 2C - Mechanical Dredging with Passive Dewatering	Cost	
Mob/Demob, Site Prep, Site Restoration, Materials	$	4,250,000
Mechanical Dredging Contractor	$	3,870,000
Transportation and Disposal	$	2,830,000
Construction Support Services by Owner's Engineer	$	1,140,000
10% Contingency	$	1,210,000
Total	$	13,300,000

Alternative 3A - Hydraulic Dredging with Geotextile Tube Dewatering	Cost	
Mob/Demob, Site Prep, Site Restoration, Materials	$	4,340,000
Hydraulic Dredging Contractor	$	4,370,000
Transportation and Disposal	$	2,830,000
Construction Support Services by Owner's Engineer	$	890,000
10% Contingency	$	1,250,000
Total	$	13,680,000

Alternative 3AA - Hydraulic Dredging with a CDF Dewatering	Cost	
Mob/Demob, Site Prep, Site Restoration, Materials	$	1,538,112
Hydraulic Dredging Contractor	$	3,709,500
Transportation and Disposal	$	569,402
Construction Support Services by Owner's Engineer	$	885,780
10% Contingency	$	670,279
Total	$	7,373,073

Alternative 3B - Hydraulic Dredging with Mechanical Dewatering	Cost	
Mob/Demob, Site Prep, Site Restoration, Materials	$	1,020,000
Hydraulic Dredging Contractor	$	10,020,000
Transportation and Disposal	$	2,790,000
Construction Support Services by Owner's Engineer	$	1,120,000
10% Contingency	$	1,500,000
Total	$	16,450,000

Notes:

1 - These are Class 5 Cost Estimates (Based on AACE RP No.56R-0818R-97 Standard with an accuracy range of -35% to +65%) based on conceptual designs intended for comparative, not budgetary, purposes.

2 - These cost estimates were prepared based on 2023 dollars. Escalation has not been included for construction cost in future dollars.

3 - Statements of Probable Construction Cost prepared by AECOM represent AECOM's judgment as a design professional familiar with the construction industry. It is recognized, however, that neither AECOM nor the Owner has control over the cost of labor, materials or equipment nor over the contractor's methods of determining the bid price or other competitive bidding, market, or negotiating conditions. Accordingly, AECOM cannot and does not warrant or represent that proposals, bids or actual construction costs will not vary from any statement of Probable Construction Cost or other estimates or evaluations prepared by AECOM.

AECOM Technical Services, Inc.
110 East Broward Blvd, Suite 700
Fort Lauderdale, FL 33301
aecom.com

aecom.com