4.7.4.3 Septic Systems

Figure 4-96 presented the locations of septic systems within the Lake Overstreet basin. **Figure 4-31** presented a map showing the septic tank densities by subbasin for the full Lake Jackson basin. The septic tank densities in the immediate Lake Overstreet basin and within the Lake Overstreet Drain basin downstream are in the middle to lower range, compared to other subbasins within the overall Lake Jackson basin. This increases their potential as a source of pollutants to the lake and drain but, based on the existing water quality and recent trends along with the low *E. coli* levels, the potential appears low.

4.7.4.4 Internal Recycling and Seepage

Internal Recycling

To date, no studies or data collection efforts have been undertaken to assess the potential for loading from sediments in Lake Overstreet. Given the good water quality, healthy biological conditions, and general pristine nature of the direct drainage areas to the lake, internal recycling is not a significant source for loading to the lake.

A method for identifying the presence of benthic flux is the analysis of vertical profile data for field parameters such as DO, temperature, ORP, and specific conductance. This was described in **Section 4.4.5.5** for Lake Jackson. Evaluation of the available water quality data did not identify any vertical profile data collected. As such, this method could not be utilized for independent evaluation of the potential for internal recycling. Based on the determinations described above, no additional data collection/studies are recommended to quantify the internal nutrient flux for Lake Overstreet.

Seepage

As outlined in **Section 4.7.3.7**, no surficial aquifer data in the immediate vicinity of the lake and drain were identified. As with the internal recycling assessment, the existing water quality and recent trends, along with the low *E. coli* levels, would indicate low potential.

4.7.4.5 Wastewater

Within the Lake Overstreet basin, there currently are no direct wastewater discharges. Additionally, no areas in the Lake Jackson basin presently have reuse discharges. **Figure 4-32** presented a map of the Lake Jackson basin boundaries and subbasins in relation to sewer service areas and sewer infrastructure. There is no sewer infrastructure located in the immediate drainage basin for Lake Overstreet. There is limited sewer infrastructure located along the drain upstream of Lake Jackson. Therefore, wastewater infrastructure is not a potential significant source of pollutant loads to Lake Overstreet.

4.7.4.6 Atmospheric Deposition

For the immediate Lake Overstreet basin, the ratio of the watershed area to lake area is around 8:1. With this ratio, and the potential attenuation of rainfall runoff, direct atmospheric deposition to the lake can play a role in overall loading, especially for nitrogen. **Section 4.6.3.10** identified the nearest atmospheric deposition station as the Quincy station (FL14) (**Figure 4-15**).

4.7.4.7 Interconnected Flows

No lakes are located upstream of Lake Overstreet, therefore, interconnected loads are not a source for the lake.

4.7.4.8 Summary of Findings

At present, nutrient levels and biological conditions in Lake Overstreet are very good and are not exhibiting significant declining trends. *E. coli* levels are low for all recent measurements. Based on these analyses, and that the immediate drainage basin to the lake is mostly undeveloped and restrictions are in place for future development, the qualitative assessment indicates limited sources of pollutant loading to Lake Overstreet now and under future conditions. Septic densities are somewhat elevated over more pristine areas of the Lake Jackson basin.

Though these sources do not appear significant, stormwater runoff contributing to tributary inflow, septic, and atmospheric deposition are quantified for comparative purposes as part of this study based on available data. Internal recycling, seepage, and wastewater also do not appear to be significant sources and were not quantified as part of this study based on limited data. As no upstream waterbodies drain into Lake Overstreet, interconnected flow is not identified as a source.

4.7.5 Calculation of Potential Nutrient Loads

This section presents calculations of potential nutrient (TN and TP) loads to Lake Overstreet for the sources identified for calculation in **Section 4.7.4.8**. These include stormwater runoff, septic systems, and atmospheric deposition. Where loads were not calculated the sections below provide brief discussions. The load calculations are for the purpose of comparing the potential magnitudes of each source relative to one another to support determination of sources to target for load reduction.

4.7.5.1 Stormwater Pollutant Load

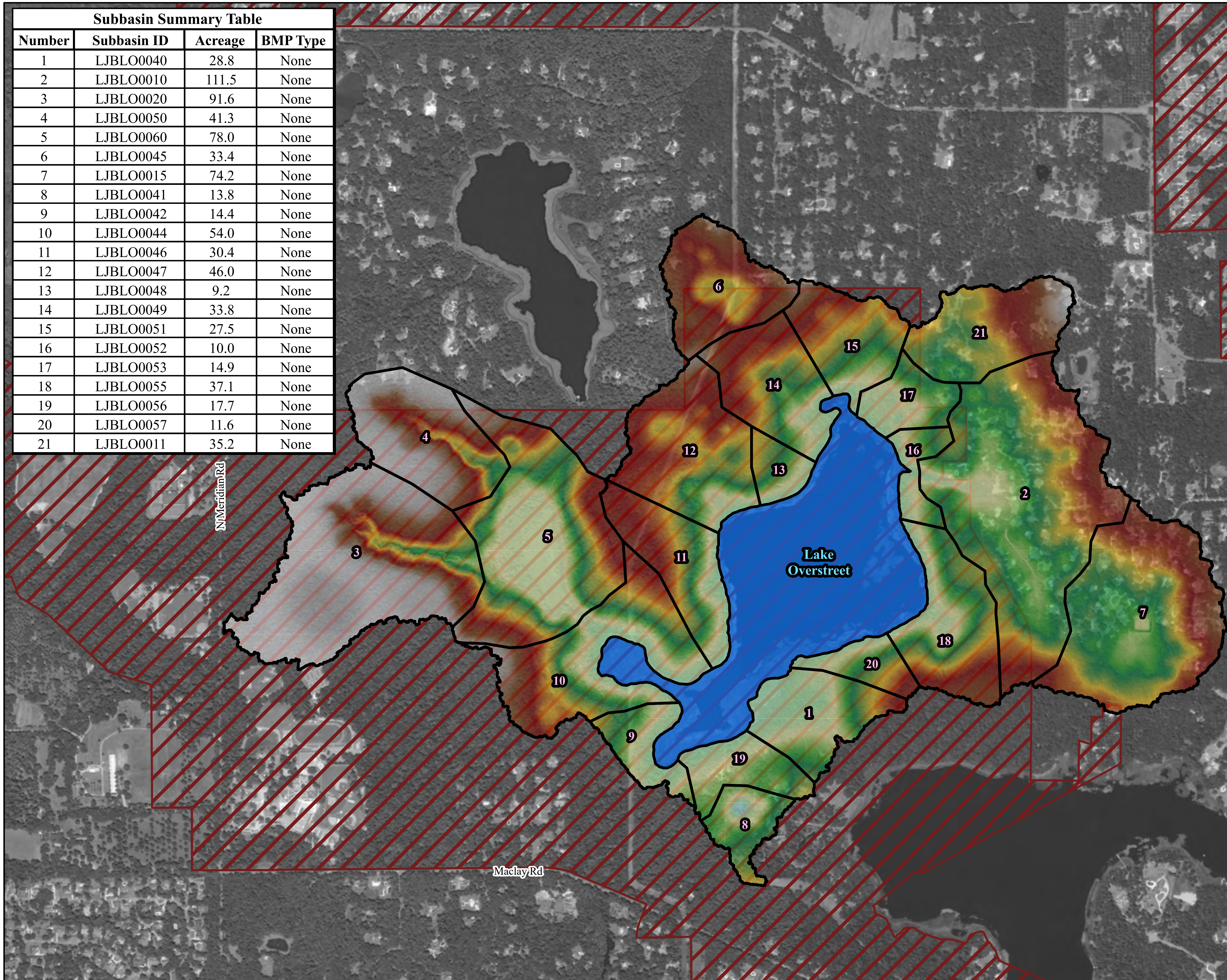
To calculate the stormwater TN and TP loads to Lake Overstreet, average annual pollutant load modeling was performed. The goal was to identify outfalls that are contributing higher TN and TP loads relative to one another and to quantify the total TN and TP loads to Lake Overstreet. TN and TP loads were calculated using the SIMPLE-Seasonal model. The model methodology was described in detail in **Section 4.4.5.1** for the stormwater loads to Lake Jackson.

Figure 4-115 presents the subbasins and the DEM utilized in the SIMPLE model calculations for Lake Overstreet. **Figure 4-116** presents the aggregated land use. Finally, **Figure 4-117** presents the CDAs for the Lake Overstreet stormwater loading to define total and per acre TN and TP loads, as well as the ranking of CDAs around the lake.

<u>Stormwater Nutrient Loads to Lake Overstreet</u>

Figure 4-118 presents the distribution of the ranking of the CDAs for TN along with the total load and per acre loads (see the table on **Figure 4-118**). The rankings are color coded with the highest ranked CDAs in dark green moving down to the lowest ranked in pale yellow. The calculated total stormwater TN loads from the CDAs ranged from as low as 6.6 lb/yr up to 64.8 lb/yr. The per acre loads ranged from 0.6 lb/acre/yr up to 3.9 lb/acre/yr.

Subbasin Summary Table			
Number	Subbasin ID	Acreage	BMP Type
1	LJBLO0040	28.8	None
2	LJBLO0010	111.5	None
3	LJBLO0020	91.6	None
4	LJBLO0050	41.3	None
5	LJBLO0060	78.0	None
6	LJBLO0045	33.4	None
7	LJBLO0015	74.2	None
8	LJBLO0041	13.8	None
9	LJBLO0042	14.4	None
10	LJBLO0044	54.0	None
11	LJBLO0046	30.4	None
12	LJBLO0047	46.0	None
13	LJBLO0048	9.2	None
14	LJBLO0049	33.8	None
15	LJBLO0051	27.5	None
16	LJBLO0052	10.0	None
17	LJBLO0053	14.9	None
18	LJBLO0055	37.1	None
19	LJBLO0056	17.7	None
20	LJBLO0057	11.6	None
21	LJBLO0011	35.2	None



CITY OF TALLAHASSEE

N

0 0.2
Miles

Legend

Lake Overstreet

Subbasins

Tallahassee Corporate Limits

Topographic Elevations

ft NAVD88

237

131

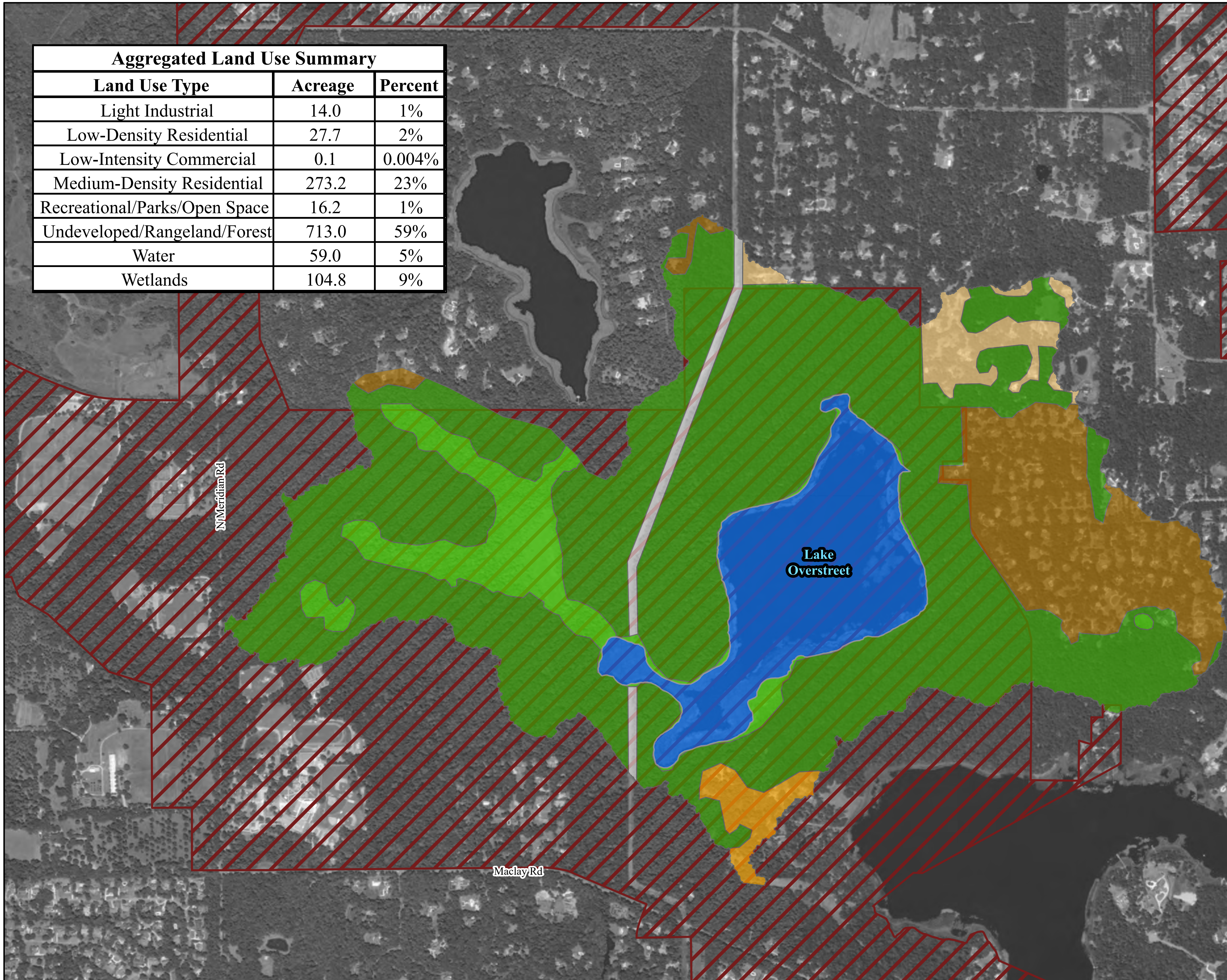
Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
Subbasins: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-115:
Lake Overstreet Subbasin Delineation and BMPs

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Aggregated Land Use Summary		
Land Use Type	**Acreage**	**Percent**
Light Industrial	14.0	1%
Low-Density Residential	27.7	2%
Low-Intensity Commercial	0.1	0.004%
Medium-Density Residential	273.2	23%
Recreational/Parks/Open Space	16.2	1%
Undeveloped/Rangeland/Forest	713.0	59%
Water	59.0	5%
Wetlands	104.8	9%



CITY OF TALLAHASSEE

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Miles

Legend

- Lake Overstreet
- Tallahassee Corporate Limits

Aggregated Land Use

Land Use Type

- Light Industrial
- Low-Density Residential
- Low-Intensity Commercial
- Medium-Density Residential
- Recreational/Parks/Open Space
- Undeveloped/Rangeland/Forest
- Water
- Wetlands

Sources:
Waterbodies: COT, 2020
Land Use: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

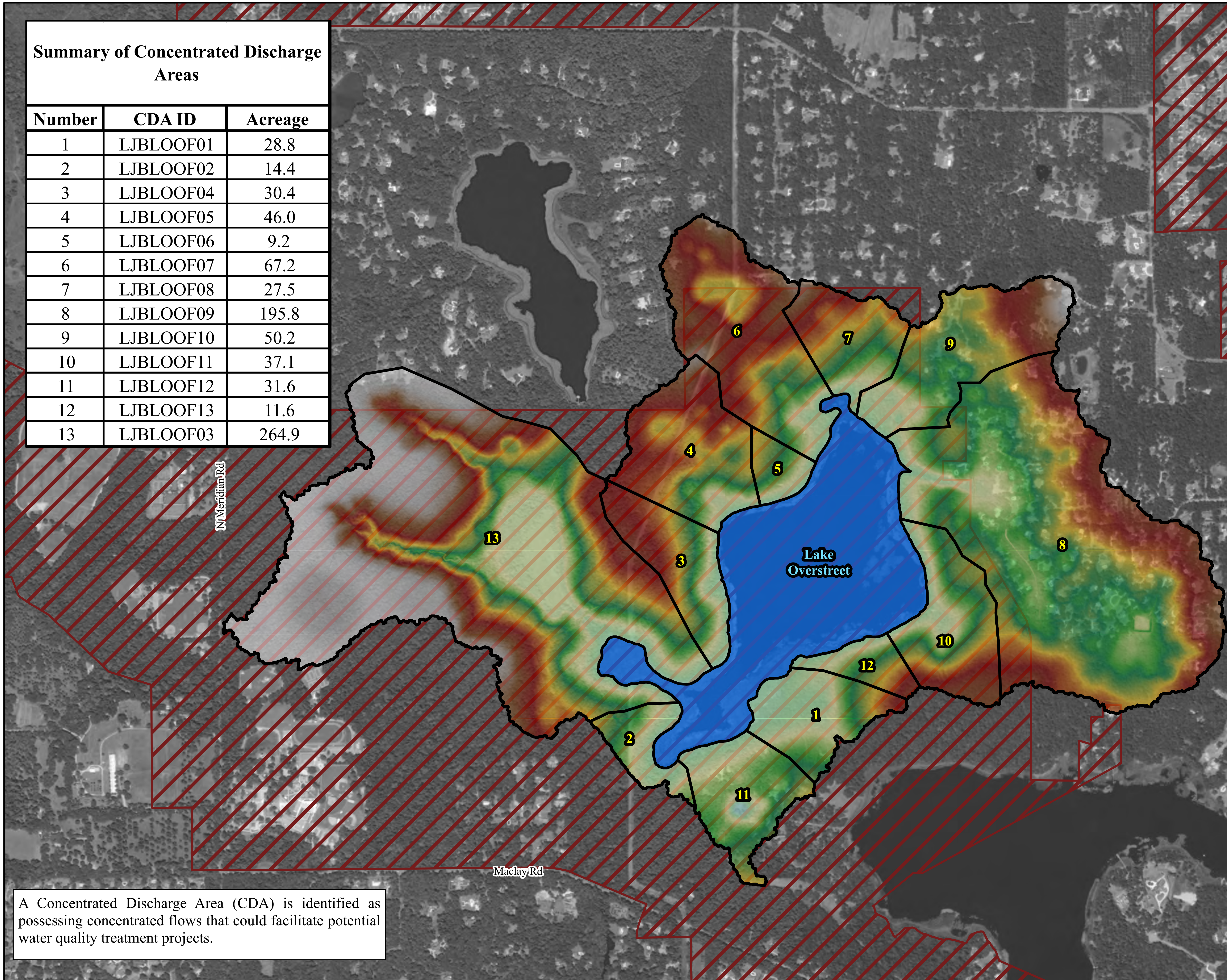
Figure 4-116:
Lake Overstreet Aggregated Land Use

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Summary of Concentrated Discharge Areas

Number	CDA ID	Acreage
1	LJBLOOF01	28.8
2	LJBLOOF02	14.4
3	LJBLOOF04	30.4
4	LJBLOOF05	46.0
5	LJBLOOF06	9.2
6	LJBLOOF07	67.2
7	LJBLOOF08	27.5
8	LJBLOOF09	195.8
9	LJBLOOF10	50.2
10	LJBLOOF11	37.1
11	LJBLOOF12	31.6
12	LJBLOOF13	11.6
13	LJBLOOF03	264.9



A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.

CITY OF TALLAHASSEE

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Miles

Legend

- Lake Overstreet
- Tallahassee Corporate Limits
- Major Roads
- Concentrated Discharge Areas

Topographic Elevations
ft NAVD88

237

131

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

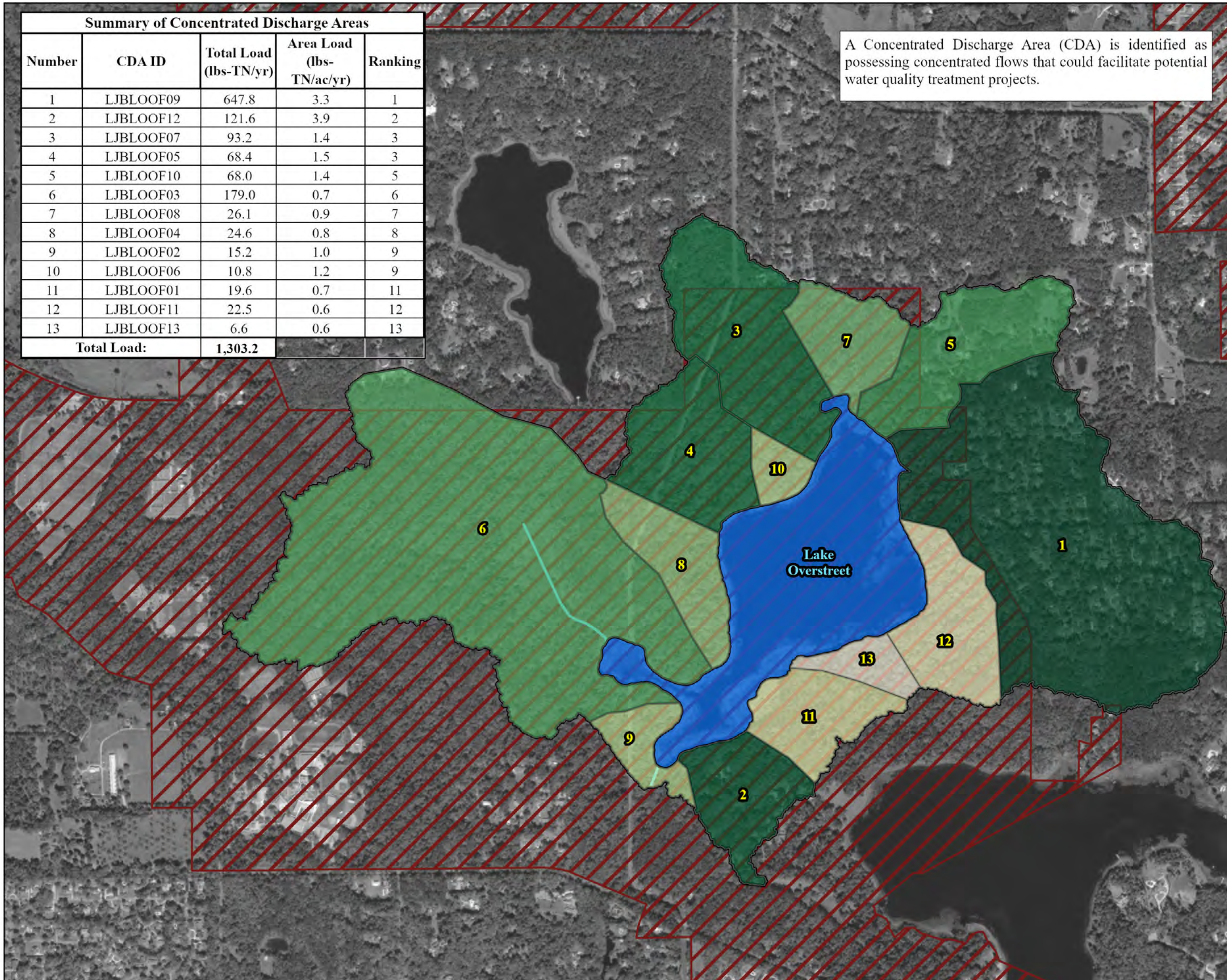
Figure 4-117:
Lake Overstreet Concentrated Discharge Areas

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBLOOF09	647.8	3.3	1
2	LJBLOOF12	121.6	3.9	2
3	LJBLOOF07	93.2	1.4	3
4	LJBLOOF05	68.4	1.5	3
5	LJBLOOF10	68.0	1.4	5
6	LJBLOOF03	179.0	0.7	6
7	LJBLOOF08	26.1	0.9	7
8	LJBLOOF04	24.6	0.8	8
9	LJBLOOF02	15.2	1.0	9
10	LJBLOOF06	10.8	1.2	9
11	LJBLOOF01	19.6	0.7	11
12	LJBLOOF11	22.5	0.6	12
13	LJBLOOF13	6.6	0.6	13
Total Load:		1,303.2		

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



CITY OF TALLAHASSEE

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Miles

Legend

- Lake Overstreet
- Concentrated Discharge Areas
- Flowlines
- Tallahassee Corporate Limits

Ranking

High (1)

Low (13)

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-118: Lake Overstreet Concentrated Discharge Areas Total Nitrogen

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

The map identifies two CDAs as ranking highest. These are on the southern side of the lake and the CDA that covers the High Grove neighborhood. The per acre loads are highest for these two and are well above those seen for the other CDA areas. The total potential stormwater runoff load for TN for Lake Overstreet is 1,303 lb/yr.

Figure 4-119 presents the distribution of the ranking of the CDAs for TP along with the total load and per acre loads (see the table on **Figure 4-119**). The calculated total stormwater TP loads from the CDAs ranged from as low as 0.9 lb/yr up to 165 lb/yr. The per acre loads ranged from 0.1 lb/acre/yr up to 1.7 lb/acre/yr. As was seen for TN, the CDA at the southern end and the CDA covering the High Grove neighborhood have the highest per acre load, well above the remaining CDAs. The total potential stormwater runoff load for TP for Lake Overstreet is 301 lb/yr.

4.7.5.2 Septic Load

To analyze the potential impacts from septic tank units to Lake Overstreet, the SPIL method adopted by FDEP was utilized to quantify the potential septic load. The approach and calculations were described earlier in **Section 4.4.5.2** which presented the septic loading to Lake Jackson. As outlined earlier, the calculations were only done for nitrogen (TN) and, based on literature on transport and assimilation, may represent a conservative potential load.

There were 45 septic tank units identified within 200 meters of a primary tributary that drains to Lake Overstreet. **Figure 4-120** shows the septic systems utilized in the analyses with those associated with loading to a tributary upstream of the lake (pink). A table provided on the figure summarizes the calculated TN load from septic units. The load to the tributary is 487 lb/yr, with no septic units within 200 meters of the shoreline of the lake. The septic units are within the High Grove neighborhood.

4.7.5.3 Point Source Load

No active point sources were identified within the Lake Jackson basin. Therefore, the point source loads for TN and TP are set to 0 lb/yr for Lake Overstreet.

4.7.5.4 Lake Inflow Load

There are no identified lakes upstream of Lake Overstreet. Therefore, the inter-lake TN and TP loads are set to 0 lb/yr.

4.7.5.5 Internal Lake Load

The source assessment determined that, given the good water quality, healthy biological conditions, and general pristine nature of the direct drainage areas to the lake, internal loading was not likely to be a significant source of loading to the lake. Given the assessment and lack of data available for evaluation, no loading estimates were developed.

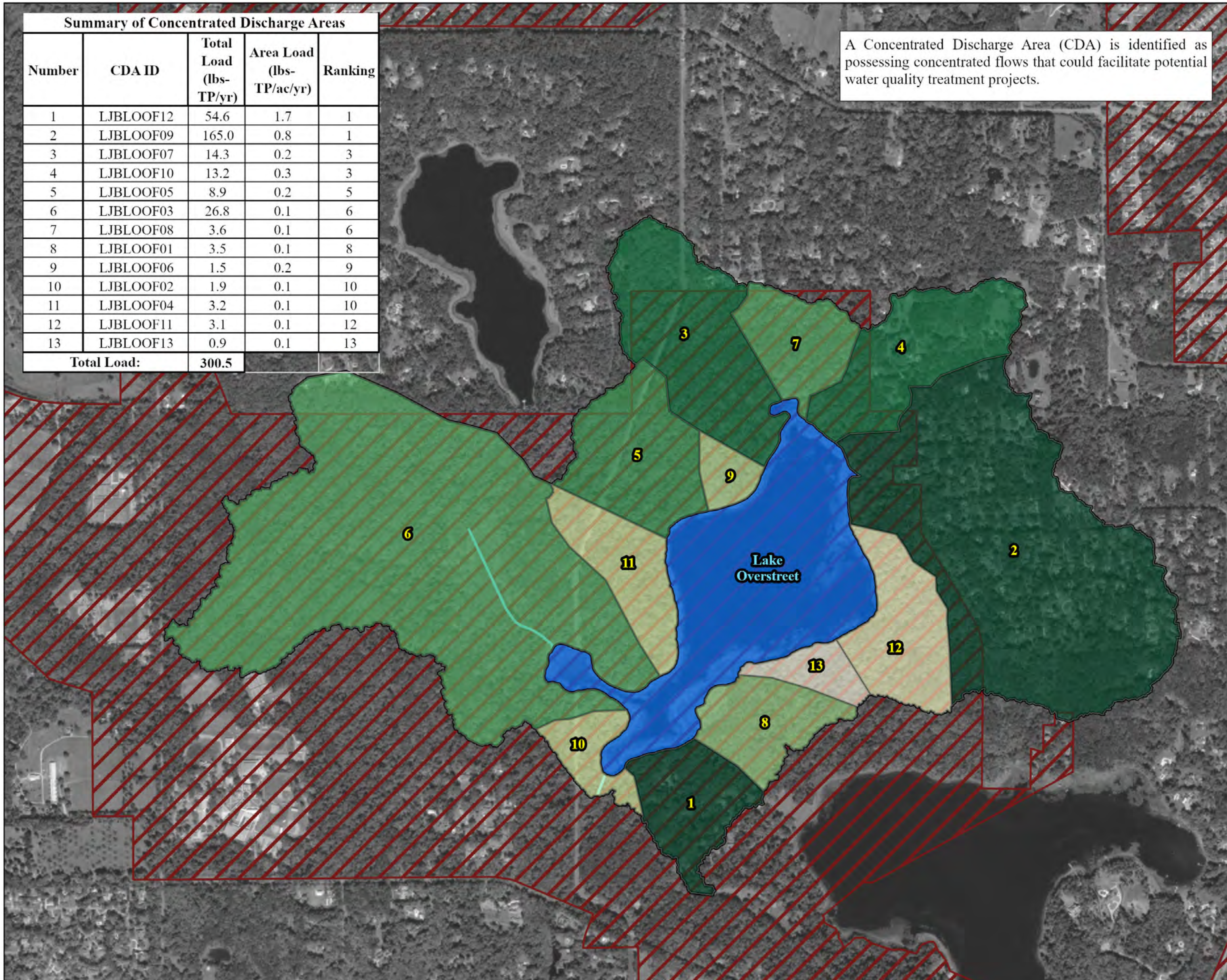
4.7.5.6 Atmospheric Deposition

As presented and discussed in **Section 4.4.5.6**, the annual average atmospheric TN load per acre was calculated from the Quincy NADP station (F14) at 2.56 lb/acre/yr. Multiplying this by the acreage of Lake Overstreet (144 acres) gives a total TN load of 369 lb/yr. No data are available for TP therefore only the nitrogen load is provided.

Summary of Concentrated Discharge Areas

Number	CDA ID	Total Load (lbs-TP/yr)	Area Load (lbs-TP/ac/yr)	Ranking
1	LJBLOOF12	54.6	1.7	1
2	LJBLOOF09	165.0	0.8	1
3	LJBLOOF07	14.3	0.2	3
4	LJBLOOF10	13.2	0.3	3
5	LJBLOOF05	8.9	0.2	5
6	LJBLOOF03	26.8	0.1	6
7	LJBLOOF08	3.6	0.1	6
8	LJBLOOF01	3.5	0.1	8
9	LJBLOOF06	1.5	0.2	9
10	LJBLOOF02	1.9	0.1	10
11	LJBLOOF04	3.2	0.1	10
12	LJBLOOF11	3.1	0.1	12
13	LJBLOOF13	0.9	0.1	13
Total Load:		300.5		

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



CITY OF TALLAHASSEE

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Miles

Legend

- Lake Overstreet
- Concentrated Discharge Areas
- Flowlines
- Tallahassee Corporate Limits

Ranking

High (1)

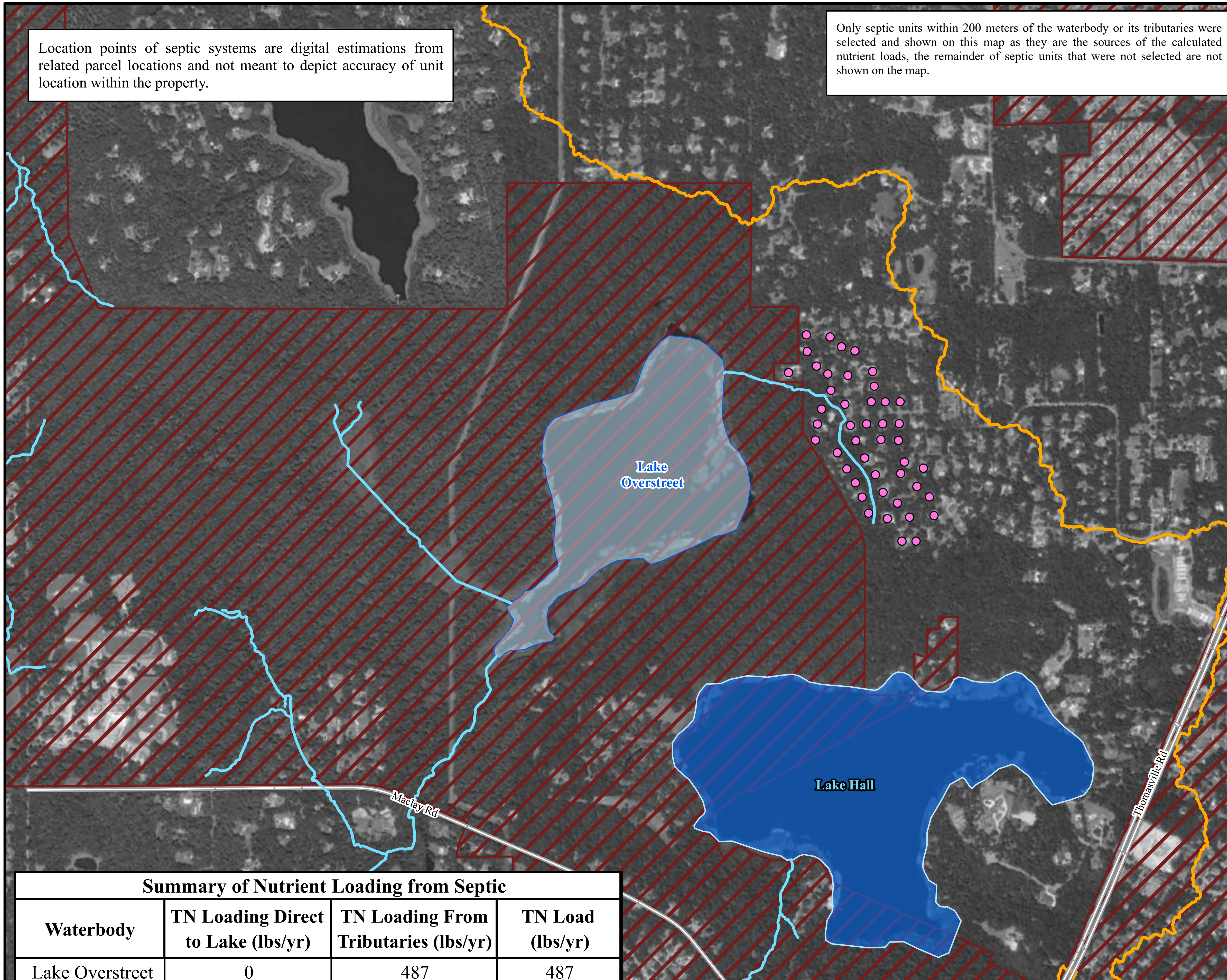
Low (13)

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-119:
Lake Overstreet Concentrated Discharge Areas Total Phosphorus

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants



Location points of septic systems are digital estimations from related parcel locations and not meant to depict accuracy of unit location within the property.

Only septic units within 200 meters of the waterbody or its tributaries were selected and shown on this map as they are the sources of the calculated nutrient loads, the remainder of septic units that were not selected are not shown on the map.

CITY OF TALLAHASSEE

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Miles

Legend

- Lake Jackson Drainage Basin
- Lake Overstreet
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits

Relevant Septic Sites

- Tributaries

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023

Figure 4-120:
Septic Loading to Lake Overstreet

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Summary of Nutrient Loading from Septic

Waterbody	TN Loading Direct to Lake (lbs/yr)	TN Loading From Tributaries (lbs/yr)	TN Load (lbs/yr)
Lake Overstreet	0	487	487

4.7.5.7 Summary of Calculated Loads

Nutrient loads to Lake Overstreet were calculated for stormwater runoff, septic systems, and atmospheric deposition. **Table 4-20** presents the calculated total loads to the lake for TN and TP. For septic systems and atmospheric deposition, only TN loads were calculated (see **Section 4.7.5.2** and **Section 4.7.5.6** respectively for explanation).

Table 4-20: Summary of Calculated Loads to Lake Overstreet

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	1,303	301
Septic Systems	487	NC
Atmospheric Deposition	369	NC

NC – Not calculated.

4.8 Lake Hall

This section presents the results from Tasks 1 through 3 for Lake Hall. This includes an overview and history of the lake and basin, present impairment status, an overview of available data, a qualitative assessment of potential pollutant sources, and calculation of potential pollutant loads.

4.8.1 Overview and History

Lake Hall is a 172-acre closed basin lake **(Figure 4-121**). A closed basin lake is one that does not have a direct surface outflow. The lake has been designated as an OFW (Leon County, 2020). Portions of the western side of the lake are within the incorporated areas of the City (**Figure 4-121**), while the eastern side is within Leon County. The portion within the City's incorporated area is primarily within Maclay Gardens State Park. The lake is used for boating, waterskiing, fishing and swimming. The lake is the home of the Capital City Rowers and hosts the swimming portion of the Redhills Sprint triathlon (City, 2020).

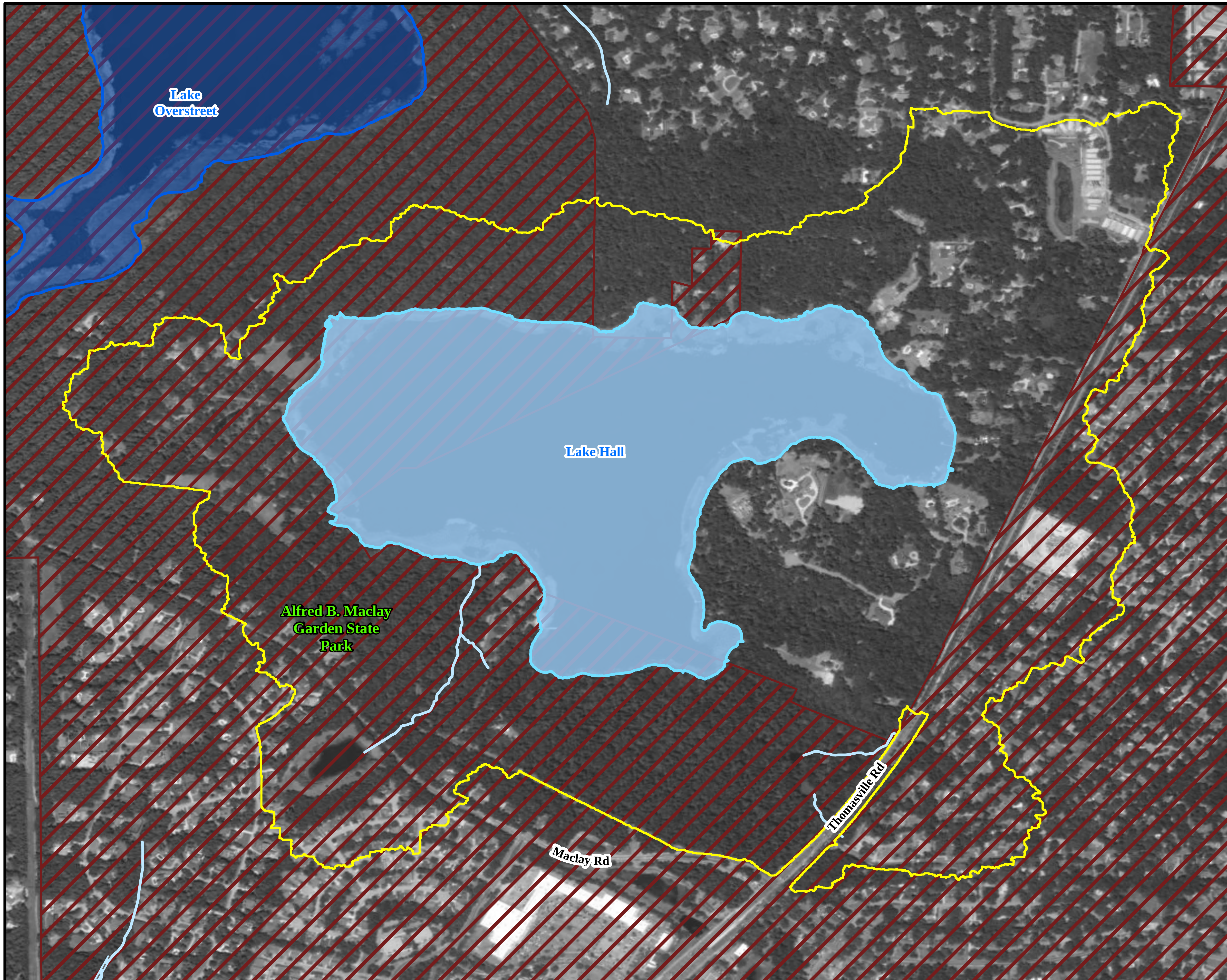
Lake Hall has been identified as one of the most pristine waterbodies in the area. **Photo 4-50** and **Photo 4-51** were taken from the Maclay Gardens boat dock, located in the southern lobe of the lake looking north. The photos show the open water nature of the lake and the general shoreline conditions.

The drainage basin for Lake Hall covers an area of 723 acres (**(Figure 4-121**). There is relatively limited development around the lake, with Maclay Gardens State Park along the western shoreline and some smaller neighborhoods along portions of the eastern lobe. Residences around the lake generally have vegetative buffer zones to the water's edge that limit nutrient inputs (Lake Ecosummary). Portions of the Lake Hall basin include neighborhoods east of Thomasville Road, south of Maclay Road, and a portion of the High Grove neighborhood to the northeast.

Lake Hall is a deep lake for the area, with maximum depths around 30 ft. **Photo 4-52** through **Photo 4-59** present aerial views of the lake from 1937 through the present. As was seen for Lake Overstreet, the aerial photos show that the lake has generally remained the same over this period of time and, due to the depths, maintains open water throughout much of its area. Prior to 1970, much of the land north of the lake was cleared and was reforested over the years. Lands to the south of the lake have not changed significantly. The residential developments within the closed basin appear over time after around 1970.

4.8.2 Regulatory Status

Exhibit 4-2 presented the verified impaired waters within the overall Lake Jackson basin. Presently, Lake Hall is not verified impaired for any parameters. As stated earlier, Lake Hall was designated an OFW (62-302.700 F.A.C.) and is afforded the highest protection by FDEP.



CITY OF TALLAHASSEE

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Miles

Legend

- Lake Hall Drainage Basin
- Lake Hall
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-121:
Lake Hall Drainage Basin Overview

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Photo 4-50: Lake Hall Photo 1

Photo 4-51: Lake Hall Photo 2

Geosyntec consultants

Photo 4-52: Lake Hall Aerial (1937)

Photo 4-53: Lake Hall Aerial (1949)

Photo 4-54: Lake Hall Aerial (1954)

Photo 4-55: Lake Hall Aerial (1970)

Photo 4-56: Lake Hall Aerial (1983)

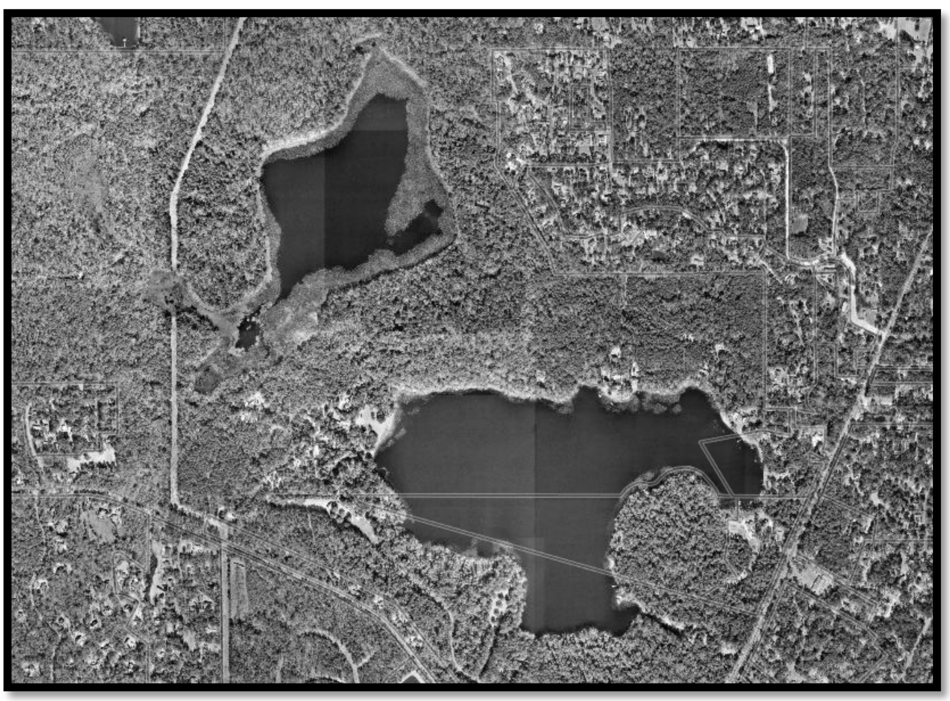


Photo 4-57: Lake Hall Aerial (1996)

Photo 4-58: Lake Hall Aerial (2007)

Photo 4-59: Lake Hall Aerial (2020)

4.8.3 Waterbody Data Review and Summary

This section presents an overview of available data and data sources for Lake Hall and the Lake Hall basin including bathymetry, land use, soils, septic systems, hydrologic measurements, surface water quality, groundwater quality, biological, stormwater treatment facilities, and atmospheric deposition.

4.8.3.1 Bathymetry

Figure 4-122 presents a map of the lake bathymetry from 2007 (ReMetrix, 2007). The lake conditions have not changed significantly over the years, so this map is a good representation of the present bathymetric conditions. The maximum depths within the lake, 26 to 29 ft, are located within the central, western, and southern areas. There are some shallower banks (9 to 14 ft) along the western shoreline, with relatively steep dropoffs into the deeper waters. The maximum depths within the northeastern lobe of the lake are on the order of 15 ft.

4.8.3.2 Land Use

Figure 4-123 presents a map of the Level 2 land uses within the Lake Hall basin. A table is provided to show the overall acreages and percent cover for the various levels. Tables are provided for both the Level 2 and grouped Level 1 land uses. The largest land use within the Lake Hall basin per the grouped Level 1 categories is Upland Forest (41 percent). The Upland Forest areas surround most of the lake. The second largest land use in the overall basin is Urban and Built Up (Low Density Residential, 30 percent). The bulk of the Residential land use areas are along the eastern side of the lake bordering Thomasville Road.

4.8.3.3 Soils

The most prevalent soil group in the Lake Hall basin is Group B (**Figure 4-124**) (59 percent). Group B soils are considered to have a moderate rate of infiltration. There is an area of Group C soils in the northeast corner of the basin (10 percent). Group C soils are considered to have slow rates of infiltration.

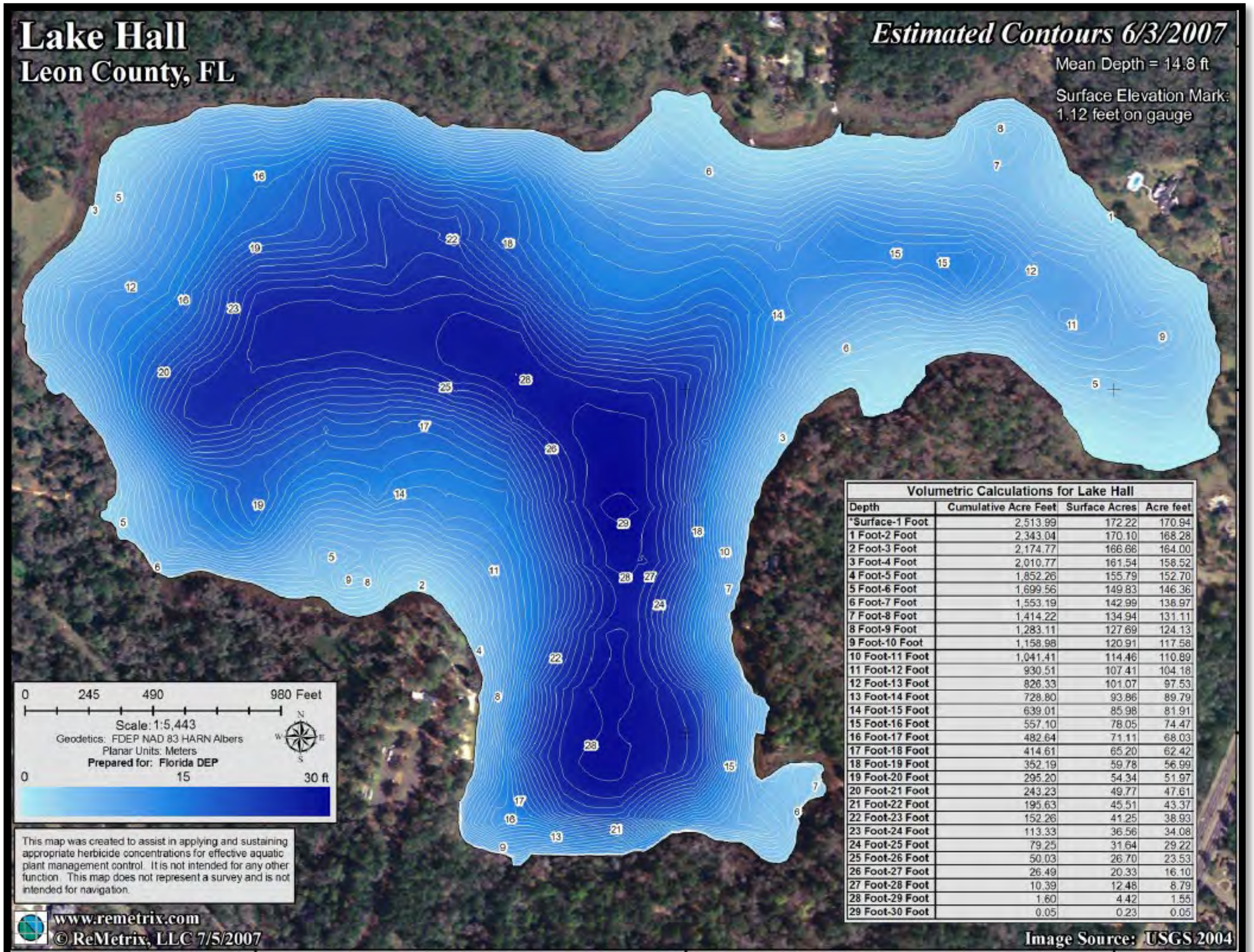
4.8.3.4 Septic Systems

An estimated 75 septic systems are within the boundaries of the Lake Hall basin, based on the FDOH septic tank layer (**Figure 4-125**). The septic systems are predominantly located on the eastern lobe of the lake in the limited residences along the shoreline and within the Thomasville Road neighborhoods.

For recent TMDL analyses, FDEP used a radius of 200 meters to analyze direct contribution of nutrient loads from septic systems to a waterbody. There are presently 10 septic systems within 200 meters of the shoreline of Lake Hall. All the remaining septic systems are within a half-mile radius of Lake Hall.

4.8.3.5 Hydrologic Data

No recent historical or present hydrologic monitoring stations are located within the Lake Hall basin.



Volumetric Calculations for Lake Hall

Depth	Cumulative Acre Feet	Surface Acres	Acre feet
*Surface-1 Foot	2,513.99	172.22	170.94
1 Foot-2 Foot	2,343.04	170.10	168.28
2 Foot-3 Foot	2,174.77	166.66	164.00
3 Foot-4 Foot	2,010.77	161.54	158.52
4 Foot-5 Foot	1,852.26	155.79	152.70
5 Foot-6 Foot	1,699.56	149.83	146.36
6 Foot-7 Foot	1,553.19	142.99	138.97
7 Foot-8 Foot	1,414.22	134.94	131.11
8 Foot-9 Foot	1,283.11	127.69	124.13
9 Foot-10 Foot	1,158.98	120.91	117.58
10 Foot-11 Foot	1,041.41	114.46	110.89
11 Foot-12 Foot	930.51	107.41	104.18
12 Foot-13 Foot	826.33	101.07	97.53
13 Foot-14 Foot	728.80	93.86	89.79
14 Foot-15 Foot	639.01	85.98	81.91
15 Foot-16 Foot	557.10	78.05	74.47
16 Foot-17 Foot	482.64	71.11	68.03
17 Foot-18 Foot	414.61	65.20	62.42
18 Foot-19 Foot	352.19	59.78	56.99
19 Foot-20 Foot	295.20	54.34	51.97
20 Foot-21 Foot	243.23	49.77	47.61
21 Foot-22 Foot	195.63	45.51	43.37
22 Foot-23 Foot	152.26	41.25	38.93
23 Foot-24 Foot	113.33	36.56	34.08
24 Foot-25 Foot	79.25	31.64	29.22
25 Foot-26 Foot	50.03	26.70	23.53
26 Foot-27 Foot	26.49	20.33	16.10
27 Foot-28 Foot	10.39	12.48	8.79
28 Foot-29 Foot	1.60	4.42	1.55
29 Foot-30 Foot	0.05	0.23	0.05

Figure 4-122: Bathymetry in Lake Hall

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1100	Residential Low Density	100	14%
1200	Residential Medium Density	57	8%
1300	Residential High Density	9	1%
1400	Commercial and Services	0	< 1%
1700	Institutional	5	1%
1800	Recreational	47	6%
4100	Upland Coniferous Forests	93	13%
4200	Upland Hardwood Forests	11	1%
4300	Upland Mixed Forests	196	27%
5200	Lakes	164	23%
6400	Vegetated Non-Forested Wetlands	20	3%
8100	Transportation	12	2%
8300	Utilities	10	1%

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1000	Urban and Built-Up	218	30%
4000	Upland Forest	299	41%
5000	Water	164	23%
6000	Wetlands	20	3%
8000	Transportation, Communication, and Utilities	22	3%

CITY OF TALLAHASSEE

N

0 0.15

Miles

Legend

Lake Hall Drainage Basin

Land Use Type

1100: Residential Low Density

1200: Residential Medium Density

1300: Residential High Density

1400: Commercial and Services

1700: Institutional

1800: Recreational

4100: Upland Coniferous Forests

4200: Upland Hardwood Forests

4300: Upland Mixed Forests

5200: Lakes

6400: Vegetated Non-Forested Wetlands

8100: Transportation

8300: Utilities

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Land Use: NWFWMD, 2019

Figure 4-123:
Lake Hall Basin Land Use

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Hydrologic Soil Group	Acres	Perecentage of Total Area
A/D	38	5%
B	429	59%
B/D	11	1%
C	75	10%
Water	171	24%

CITY OF TALLAHASSEE

N

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Legend

- Lake Hall Drainage Basin
- Waterbodies in Study
- Tallahassee Corporate Limits

Hydrologic Soil Group

- A/D
- B
- B/D
- C
- Water

Sources:
Waterbodies: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Soils: NRCS, 2020

Figure 4-124:
Lake Hall Basin Soils

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

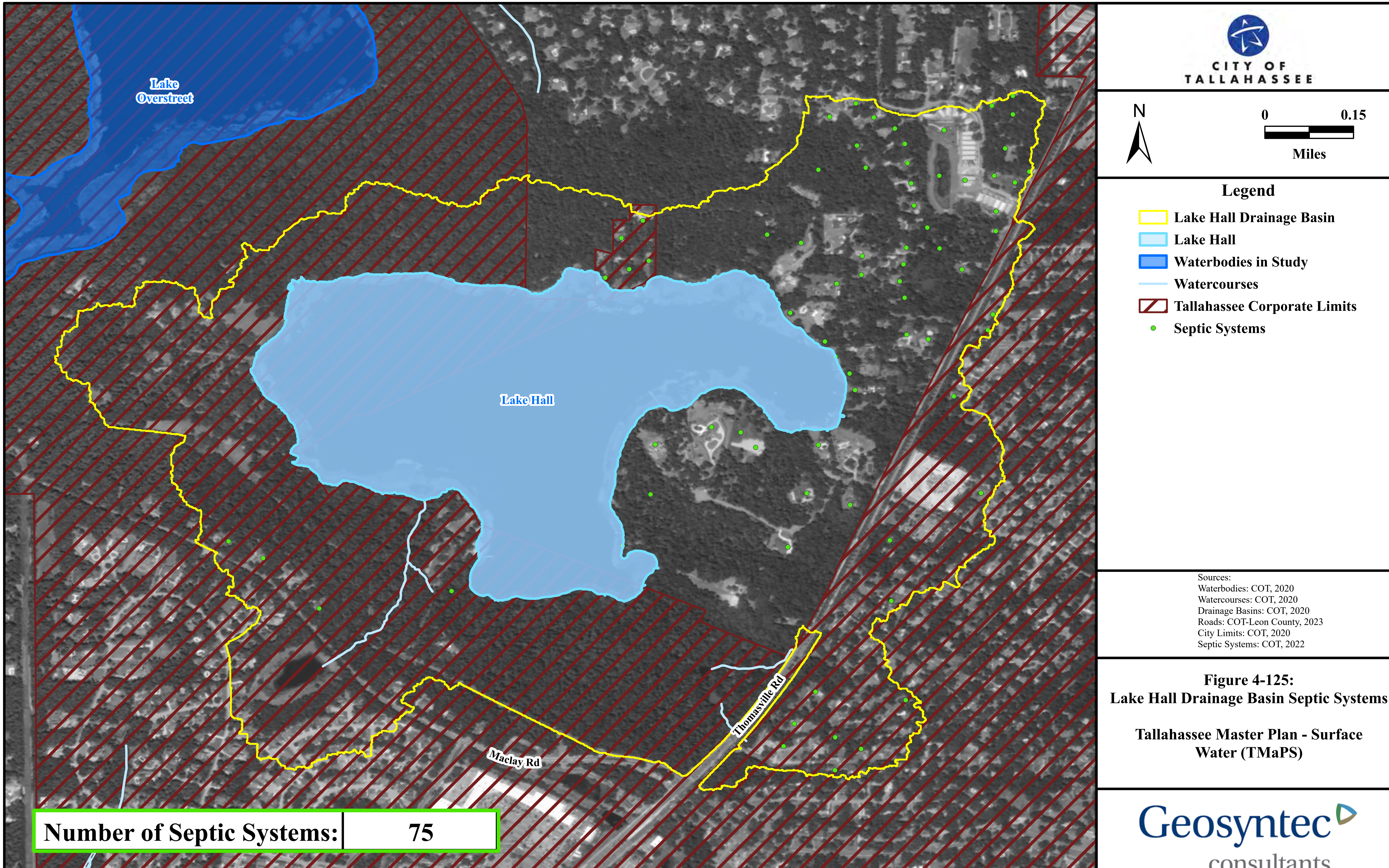


Figure 4-125:
Lake Hall Drainage Basin Septic Systems

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

4.8.3.6 Surface Water Quality Data

The IWR dataset for Lake Hall (WBID 689B) spans from 1990 to 2020 and includes contributions from local and state agencies (City, Leon County, FDEP, and Florida LAKEWATCH), as well as a private sector firm (McGlynn Lab).

Figure 4-126 presents the locations of in-lake water quality monitoring stations for Lake Hall (yellow). No data are available for tributaries flowing into Lake Hall. A table is provided in **Figure 4-126** that shows the station ID, station name, period of record, sample count, data source, and if the station represents in-lake or tributary data. Based on the number of stations and the length of the station IDs, station IDs were not included on the figure, rather each of the stations is given a number and the numbers correspond to stations in the table.

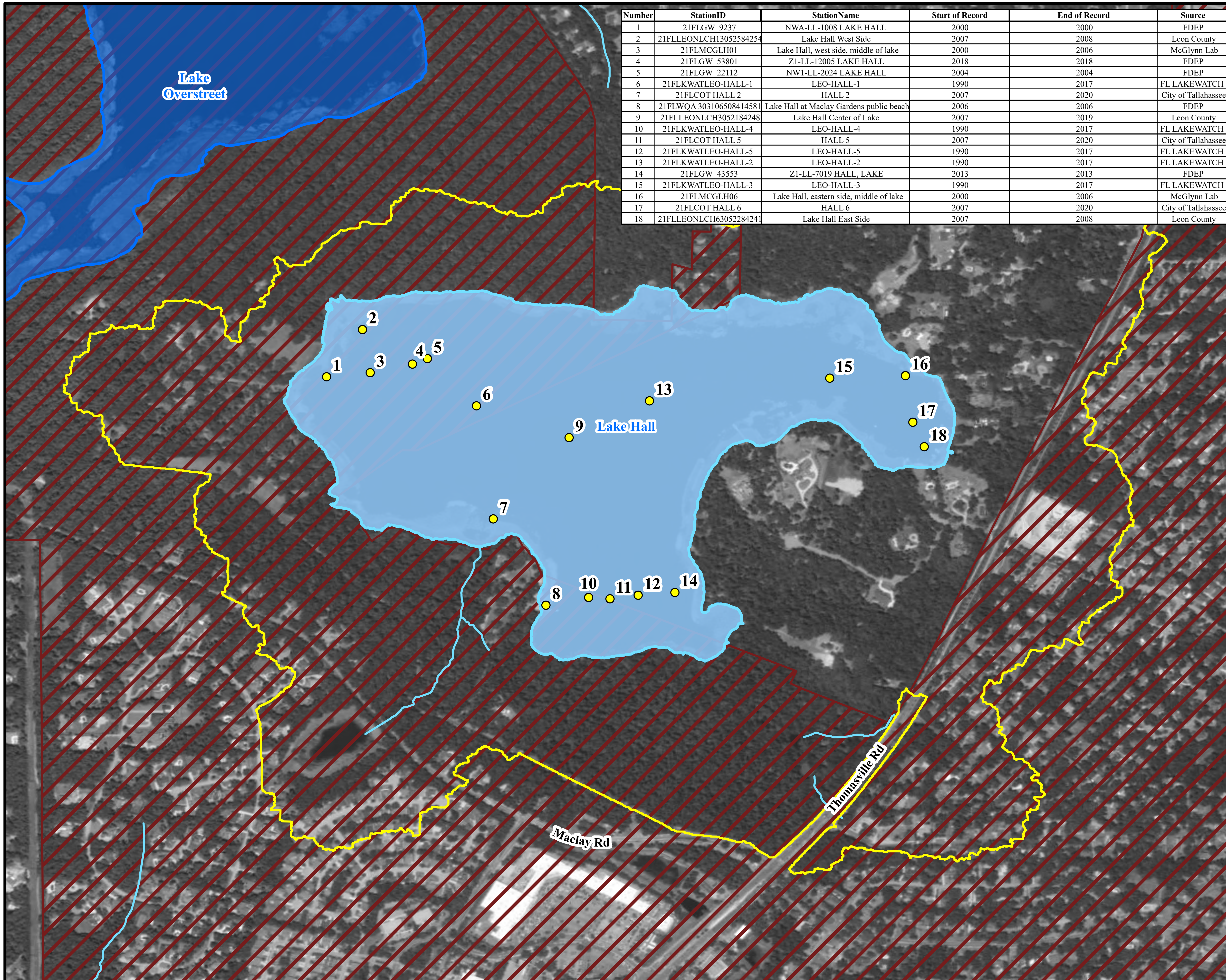
Figure 4-126 shows that in-lake water quality monitoring data have been collected at multiple locations throughout the lake, with long-term monitoring stations within the southern lobe, the eastern lobe and the western lobe. These data provide an extensive data set for evaluation of temporal and spatial conditions in Lake Hall.

Some initial plots of the full data set in the lake are provided in this section. This includes plots of the raw data and AGM comparisons to NNC thresholds. As nutrients are the primary constituent of interest relative to water quality conditions in Lake Hall, plots are provided for the key parameters related to potential nutrient impairment. These include TN, TP, Chl-a, and TSI. Additionally, based on interest in the area relative to septic systems and other sources, FIB, specifically *E. coli*, are included. Additional data plots and analyses are provided as part of the qualitative assessment of sources (**Section 4.8.4.1**).

Figure 4-127 through **Figure 4-129** present plots of the measured TN, TP, and Chl-a from 2010 to 2020. TN, TP and Chl-a data show no significant trends between 2010 and 2020, with low concentrations of all three. Examination of historical data showed that overall, conditions have not changed significantly over the period of the available data.

Under FDEP's NNC, Lake Hall is defined as a low color, low alkalinity system. Based on this designation, the AGM threshold for Chl-a is 6 μg/L. For TN and TP, a range of concentrations are allowable, based on maintaining Chl-a levels in the lake below 6 μg/L. For TN, the range is 0.51 mg/L to 0.93 mg/L. For TP, the range is 0.01 mg/L to 0.03 mg/L. For *E. coli*, the criteria are monthly geometric means below 126 colonies per 100 mL of water and less than 10 percent of samples above 410 colonies per 100 mL of water in any 30-day period.

TN, TP, and Chl-a, AGMs are plotted in **Figure 4-130** through **Figure 4-132** from 2010 to 2020, and these define the status of the lake relative to nutrient impairments. The Chl-a threshold and the minimum and maximum thresholds for TN and TP relative to the NNC are on each of the graphs as pink dashed lines. **Figure 4-133** presents a plot of calculated TSI values in the lake. Although TSI is no longer utilized for the determination of impairment, it does serve as an indicator of lake health. Based on TSI definitions, levels below 60 are deemed good condition, levels between 60 and 70 indicate fair condition, and levels above 70 indicate poor condition. **Figure 4-134** presents plots of *E. coli* data for the available period of record.



Number	StationID	StationName	Start of Record	End of Record	Source
1	21FLGW 9237	NWA-LL-1008 LAKE HALL	2000	2000	FDEP
2	21FLLEONLCH13052584254	Lake Hall West Side	2007	2008	Leon County
3	21FLMCGLH01	Lake Hall, west side, middle of lake	2000	2006	McGlynn Lab
4	21FLGW 53801	Z1-LL-12005 LAKE HALL	2018	2018	FDEP
5	21FLGW 22112	NW1-LL-2024 LAKE HALL	2004	2004	FDEP
6	21FLKWATLEO-HALL-1	LEO-HALL-1	1990	2017	FL LAKEWATCH
7	21FLCOT HALL 2	HALL 2	2007	2020	City of Tallahassee
8	21FLWQA 303106508414581	Lake Hall at Maclay Gardens public beach	2006	2006	FDEP
9	21FLLEONLCH3052184248	Lake Hall Center of Lake	2007	2019	Leon County
10	21FLKWATLEO-HALL-4	LEO-HALL-4	1990	2017	FL LAKEWATCH
11	21FLCOT HALL 5	HALL 5	2007	2020	City of Tallahassee
12	21FLKWATLEO-HALL-5	LEO-HALL-5	1990	2017	FL LAKEWATCH
13	21FLKWATLEO-HALL-2	LEO-HALL-2	1990	2017	FL LAKEWATCH
14	21FLGW 43553	Z1-LL-7019 HALL, LAKE	2013	2013	FDEP
15	21FLKWATLEO-HALL-3	LEO-HALL-3	1990	2017	FL LAKEWATCH
16	21FLMCGLH06	Lake Hall, eastern side, middle of lake	2000	2006	McGlynn Lab
17	21FLCOT HALL 6	HALL 6	2007	2020	City of Tallahassee
18	21FLLEONLCH63052284241	Lake Hall East Side	2007	2008	Leon County

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N

0 0.15

Miles

Legend

- Lake Hall Drainage Basin
- Lake Hall
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits

Water Quality Stations

- In-Lake Water Quality Sampling Stations

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
WQ Stations: FDEP, 2022

Figure 4-126:
Lake Hall Water Quality Station Locations

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

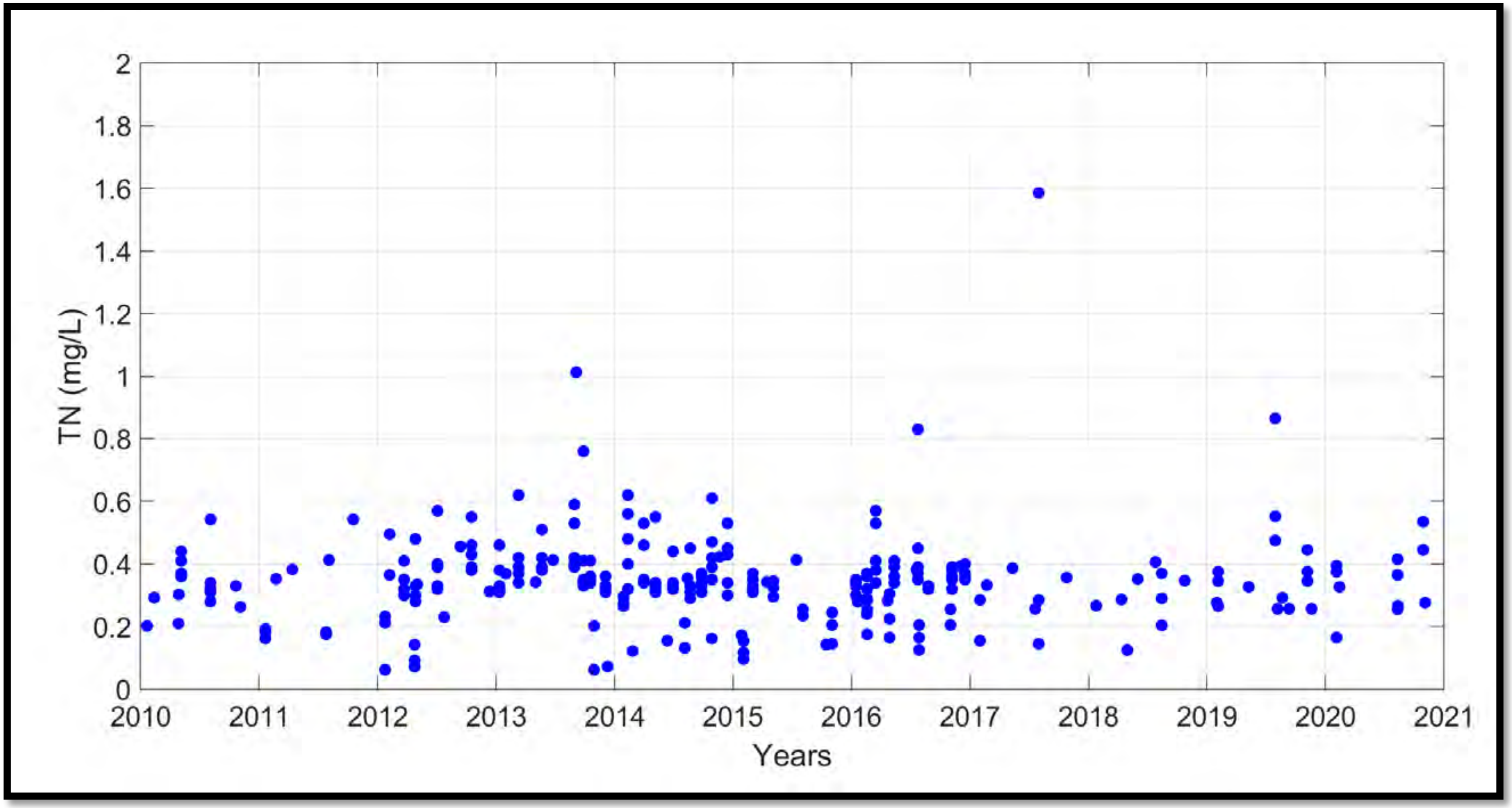


Figure 4-127: Plot of Measured TN

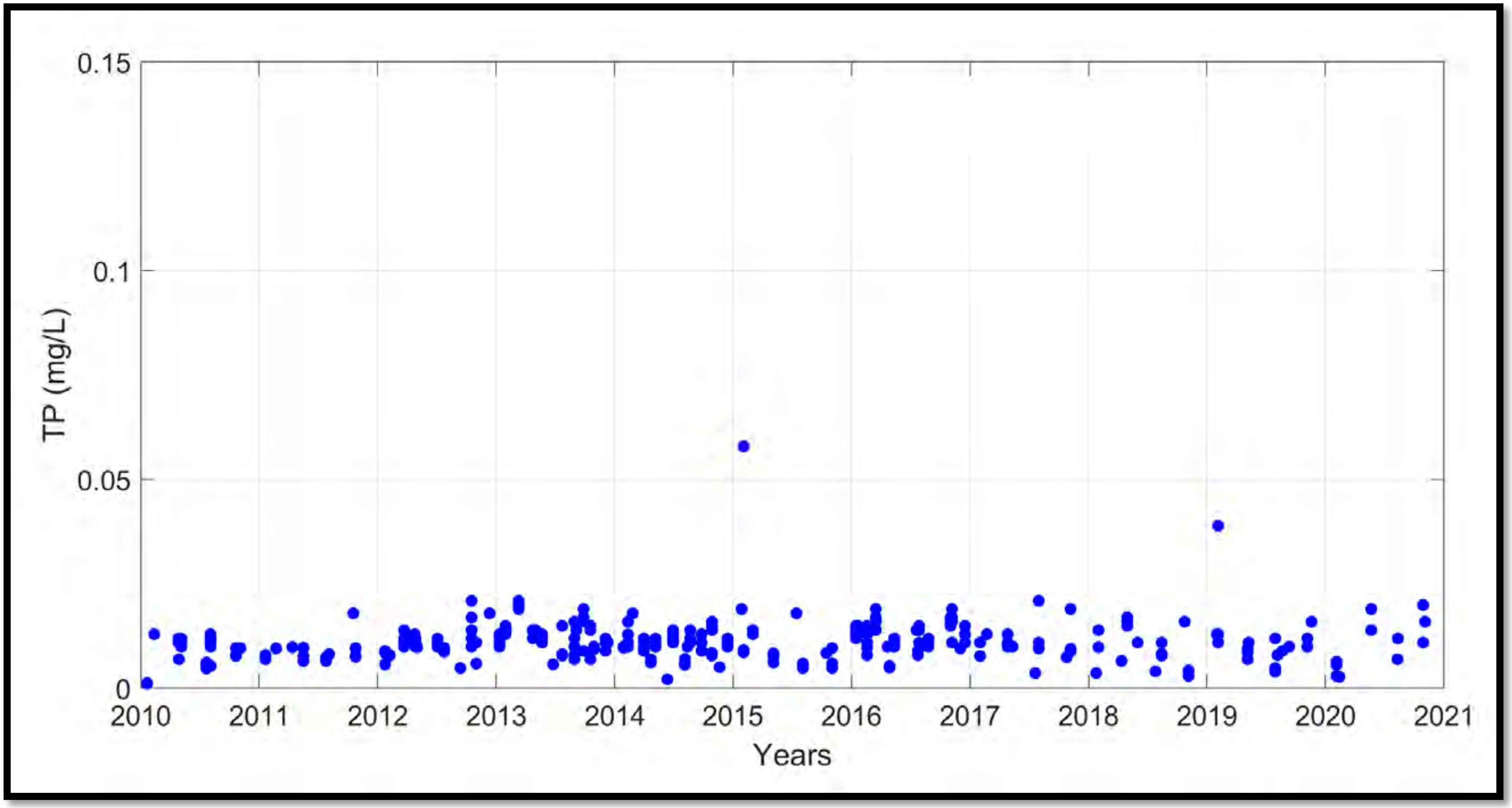


Figure 4-128: Plot of Measured TP

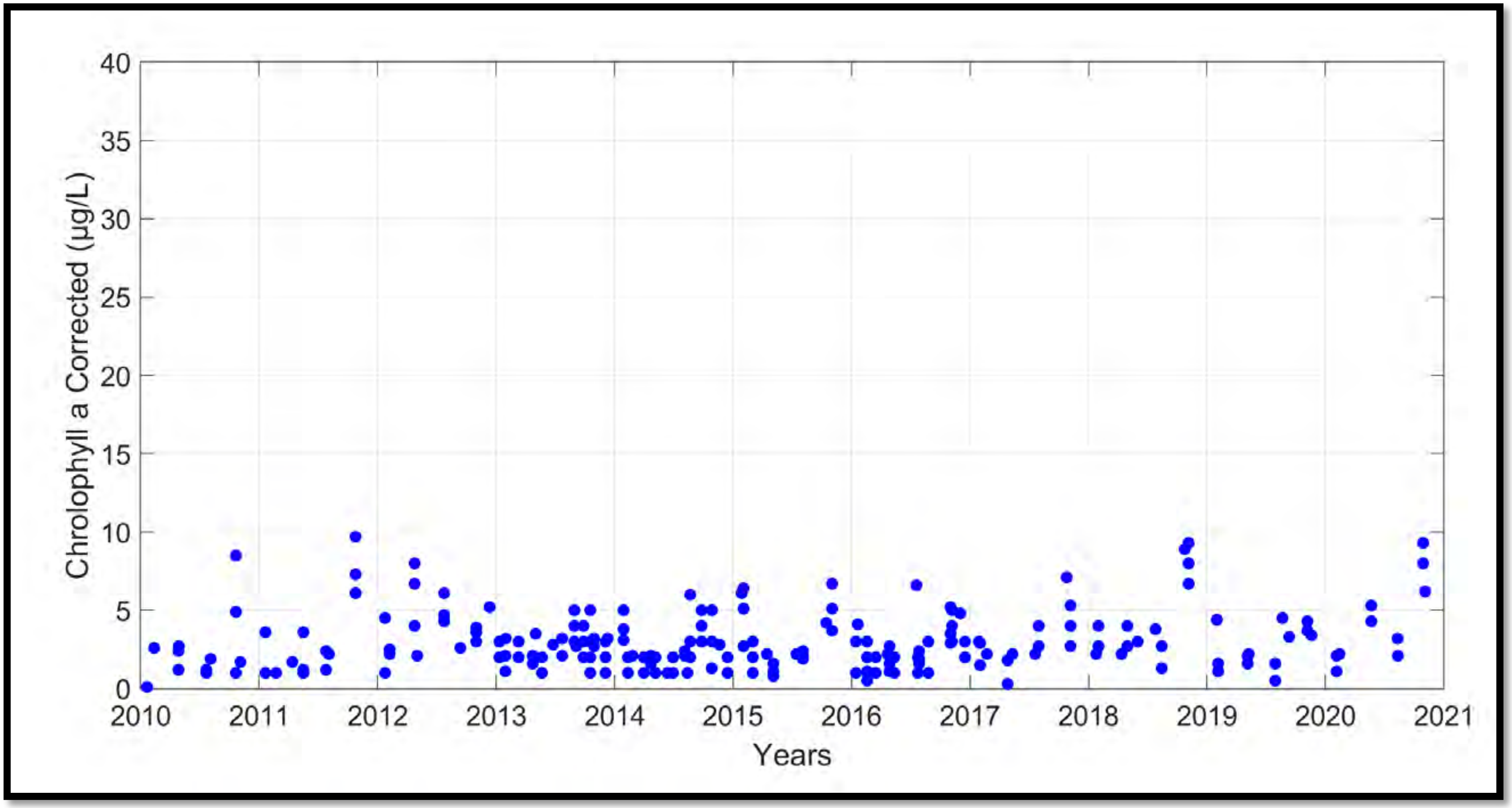


Figure 4-129: Plot of Measured Chl-a

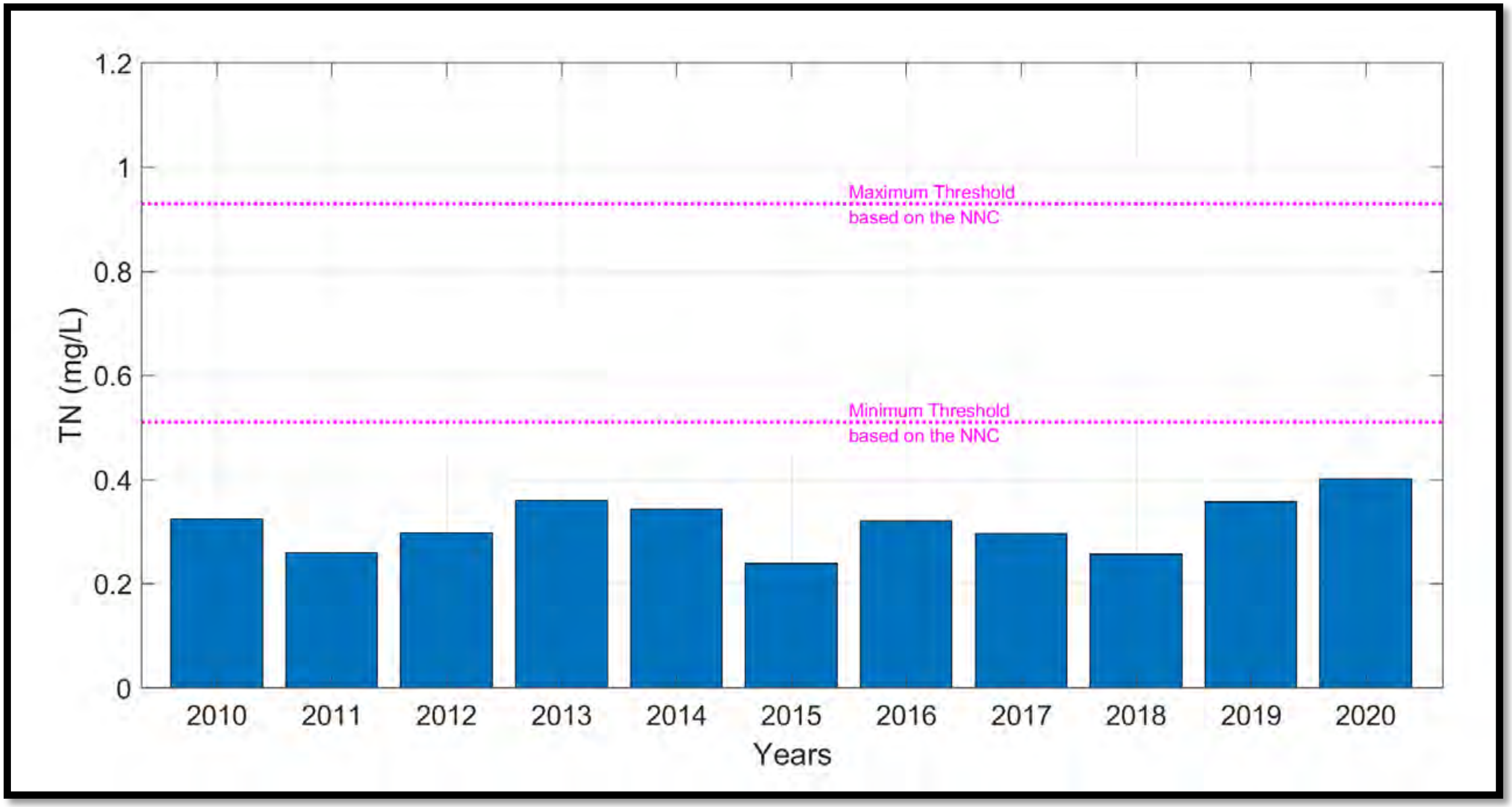


Figure 4-130: Plot of Annual Geometric Means for TN with NNC Criteria for Lake Hall

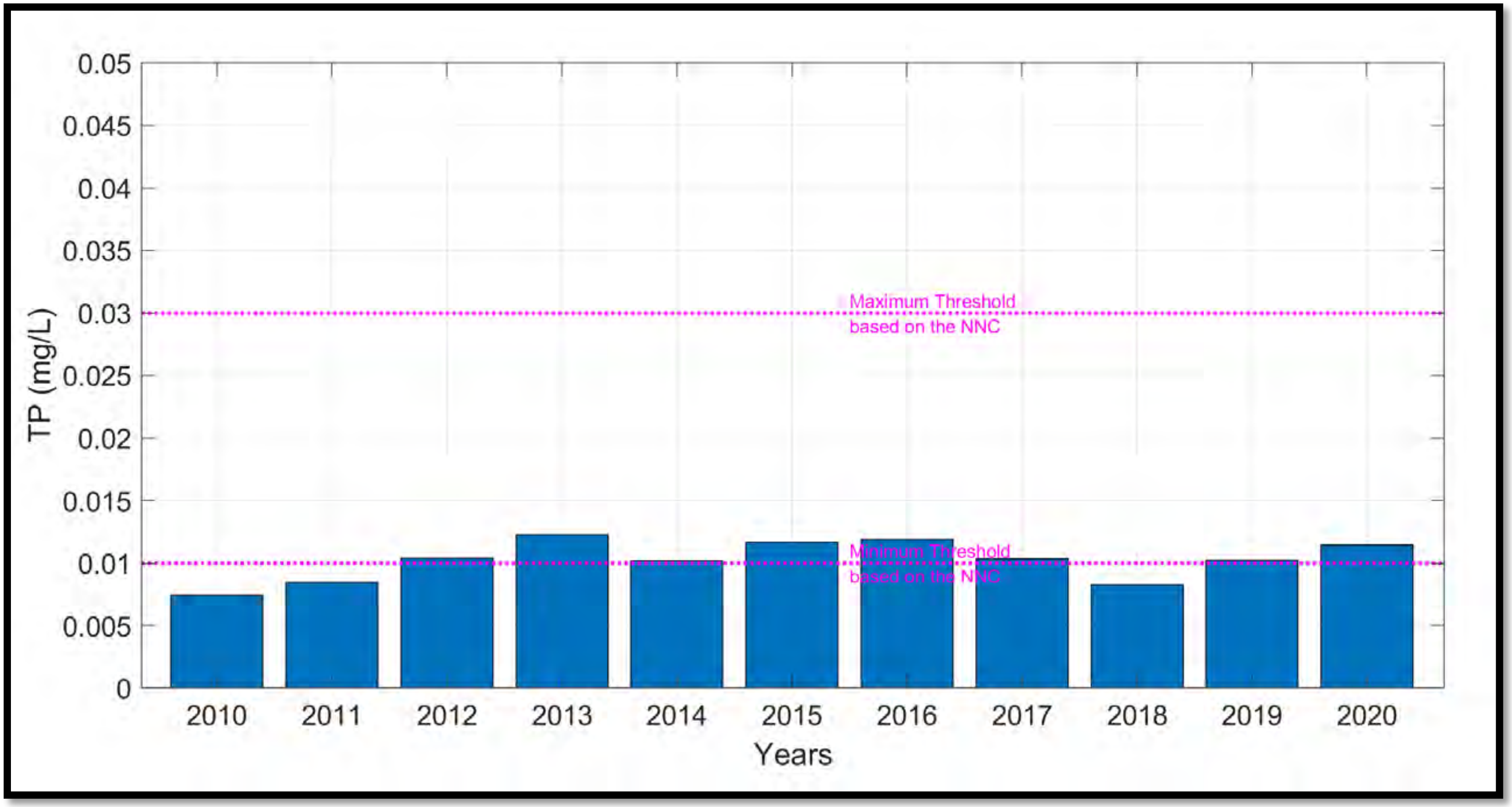


Figure 4-131: Plot of Annual Geometric Means for TP with NNC Criteria for Lake Hall

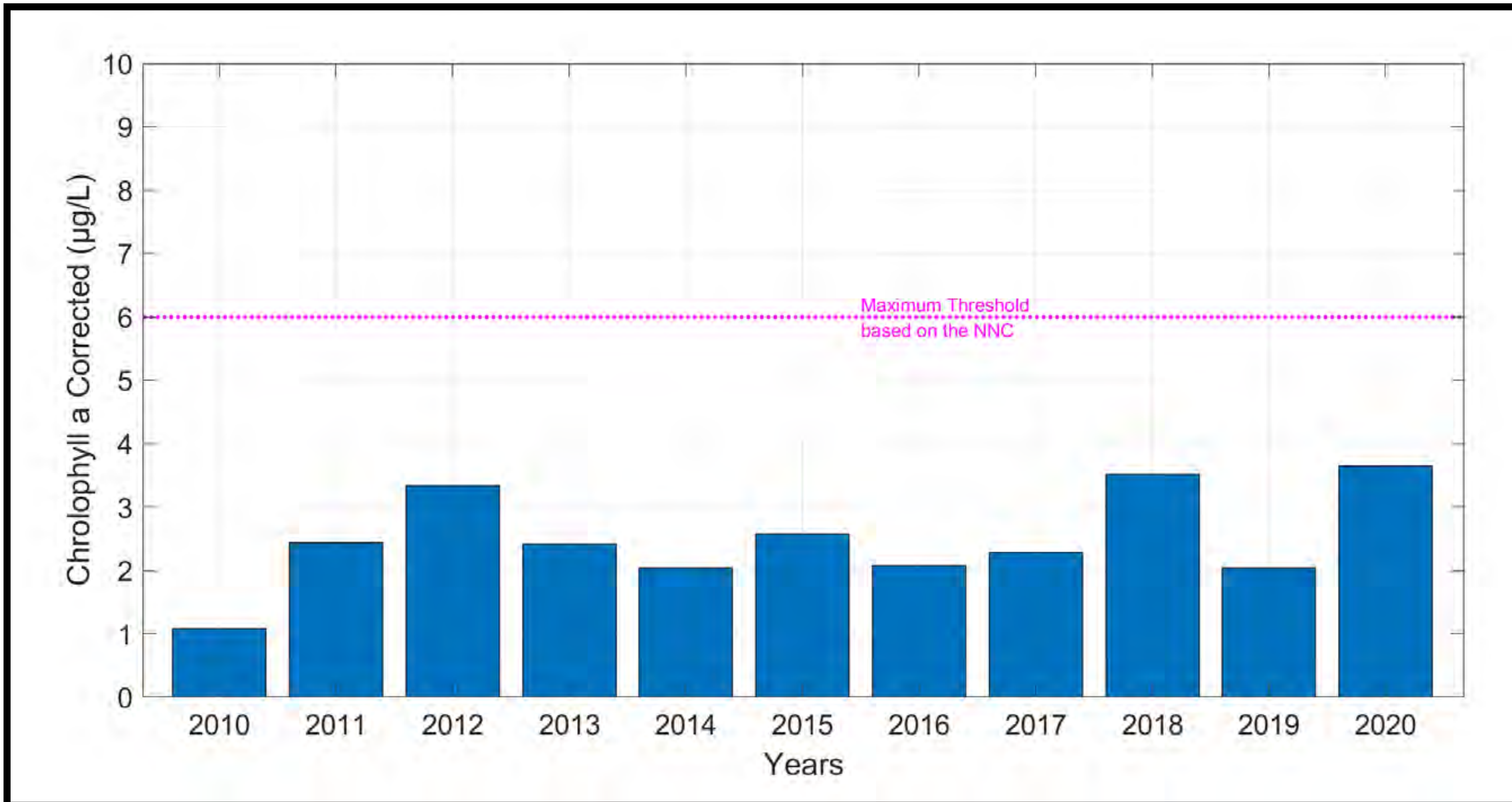


Figure 4-132: Plot of Annual Geometric Means for Chl-a with NNC Criteria for Lake Hall

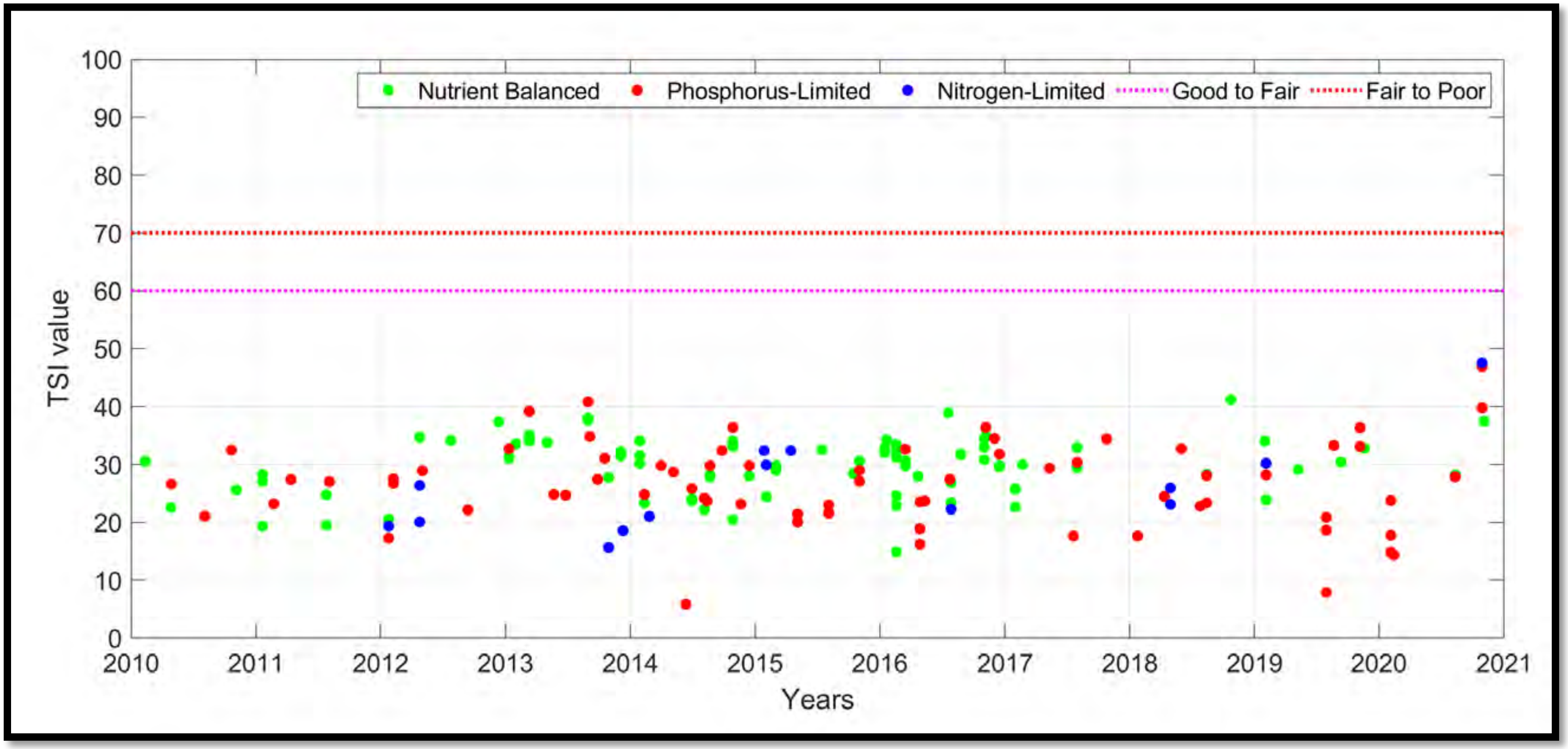


Figure 4-133: Plot of Trophic State Index for Lake Hall

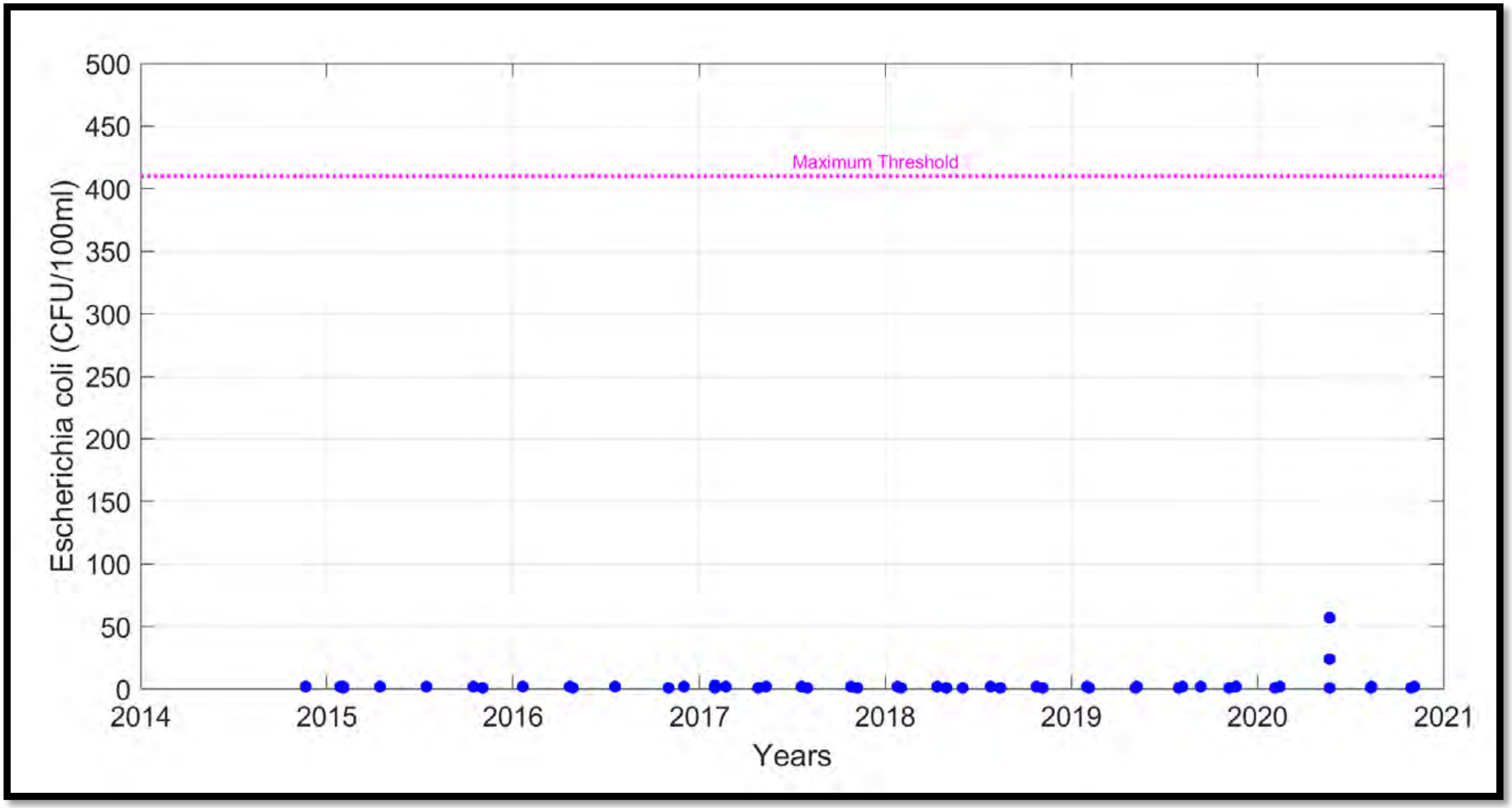


Figure 4-134: Plot of *E. coli* for Lake Hall

The data show why Lake Hall is considered to have some of the best water quality in the area. Examination of the TN plot (**Figure 4-130**) shows that from 2010 to 2020, TN AGM levels remained well below the minimum NNC threshold. The TP AGM levels (**Figure 4-131**) range from just above to below the minimum threshold from 2010 to 2020. Chl-a measurements (**Figure 4-132**) are well below the threshold of 6 µg/L, with all the years showing values below 4 µg/L. The TSI values (**Figure 4-133**) are almost entirely at or below 40, which represents oligotrophic conditions. Finally, the *E. coli* data **(Figure 4-134**) are nearly all below 5 colony-forming units MPN/100 mL, indicating no bacterial issues within the lake.

4.8.3.7 Groundwater Data

There are no identified surficial groundwater monitoring wells currently within the Lake Hall basin.

4.8.3.8 Biological Data

Table 4-21 presents LVI data collected by the City and Leon County between 2010 and 2018. The data show a range of from 66 up to 86, reflecting healthy to exceptionally healthy conditions in the lake.

Table 4-21: Summary of LVI Results from Lake Hall

Date	Station ID	LVI	Aquatic Life Use Category
6/21/2010	21FLCOTCOTLVI002	84	Exceptional
8/4/2010	21FLLEONLVI004	76	Healthy
7/26/2011	21FLCOTCOTLVI002	76	Healthy
9/12/2012	21FLLEONLVI004	67	Healthy
10/3/2012	21FLCOTCOTLVI002	77	Healthy
6/5/2013	21FLGW43553	76	Healthy
9/4/2013	21FLLEONLVI004	66	Healthy
10/29/2013	21FLCOTCOTLVI002	82	Exceptional
8/13/2014	21FLLEONLVI004	71	Healthy
7/27/2015	21FLLEONLVI004	67	Healthy
10/21/2015	21FLCOTCOTLVI002	86	Exceptional
7/21/2016	21FLLEONLVI004	70	Healthy
7/25/2018	21FLLEONLVI004	81	Exceptional

4.8.3.9 Stormwater Treatment Facilities

Figure 4-135 presents a map showing the locations of stormwater treatment facilities throughout the Lake Hall basin. There are relatively few facilities throughout the basin, and these are located within the neighborhoods along Thomasville Road and Maclay Road. The facilities are maintained by the City, Leon County, and Maclay Gardens. No facilities are located within the portion of the basin within neighborhoods east of Thomasville Road.

CITY OF TALLAHASSEE

N

0 0.14

Miles

Legend

- Lake Hall Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- City of Tallahassee Stormwater Ponds
- Leon County Stormwater Ponds
- Stormwater Ponds (Other)

Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Roads: FDOT, 2020
BMPs: Geosyntec, 2022
City Limits: COT, 2022

Figure 4-135:
Lake Hall Basin BMP Locations

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

4.8.3.10 Atmospheric Deposition Data

Section 4.4.3.11 presented the location of the nearest atmospheric deposition station to the Lake Jackson basin. The data from this station will be utilized to calculate atmospheric deposition to Lake Hall.

4.8.3.11 Data Summary

For the purposes of the qualitative analysis of sources of pollutants to Lake Hall (**Section 4.8.4**), the available data are reasonable. There are sufficient active surface water quality stations within the lake to support the qualitative assessment. The water quality conditions in the lake limit the need for additional data. Based on the pristine water quality, it is assumed anthropogenic loads are minimal. No noteworthy limitations were identified.

4.8.4 Qualitative Assessment of Sources

As outlined in previous sections, prior to performing loading calculations and other analyses to quantify existing pollutant sources to Lake Hall, it is important to analyze available data and summarize findings from historical studies to support identification of likely sources.

For Lake Hall, the sources to be evaluated include the following:

- Stormwater runoff
- Septic systems
- Internal recycling and seepage
- Wastewater
- Atmospheric deposition
- Interconnected flows

An overview of analyses and findings for each source listed above is provided in the following sections. Prior to the discussions of each of the potential sources, an in-lake analysis is provided to build on the information presented in **Section 4.8.3**. Following the discussions for each source type, a summary of findings for the qualitative assessment is provided.

4.8.4.1 In-Lake Water Quality

Following the methodology utilized for other lakes, analyses were conducted on the available in-lake data from 2010 to the present. This provides an evaluation of the baseline water quality conditions and the spatial differences within the lake. The parameters analyzed for Lake Hall include color, alkalinity, TP, TN, Chl-a, TSI, and *E. coli*.

As was done for the other lakes, stations were clustered where they represent conditions within a specific area. The clustered data from 2010 to the present were analyzed to provide the average of the annual geomeans or the 90th percentile, depending upon the parameter. The results are presented on a map, with colors representing the results. The levels associated with the colors are reflective of water quality thresholds as outlined in 62-302 F.A.C. and were discussed and presented in **Section 4.4.4.1**. The Lake Hall analyses use the same ranges as the Lake Jackson analyses.

Figure 4-136 presents the data clustering used for the analyses and associated stations. For Lake Hall, data since 2010 were available within five clusters around the lake. There are two along the western side of the lake (W and NW), a group in the center of the lake (C), one in the northeast lobe (NE), and one in the southern lobe (S). The NW cluster is primarily from LAKEWATCH data, therefore, the parameters measured were more limited.

Figure 4-137 and **Figure 4-138** present the color and alkalinity. Both parameters show low values, with limited discernible spatial variation in the data. For alkalinity, the data show slightly higher values at the W and C clusters. These results support the determination of the lake as a clear, low alkaline system with the associated criteria.

Figure 4-139 and **Figure 4-140** present the TN and TP results. The TN clusters show levels below the minimum throughout the lake with no discernable spatial pattern. TP levels at all the clusters are low, with the W, S, and NE clusters showing values below the minimum. The C and NW clusters have slightly higher values but still near the minimum levels.

Figure 4-141 and **Figure 4-142** present maps of the Chl-a and TSI. Chl-a levels are low at all clusters between 1.5 and 3.0 µg/L. TSI levels are all below 30, with the W, S, and NE clusters below 15 and the C and NW clusters between 15 and 30, indicating oligotrophic conditions.

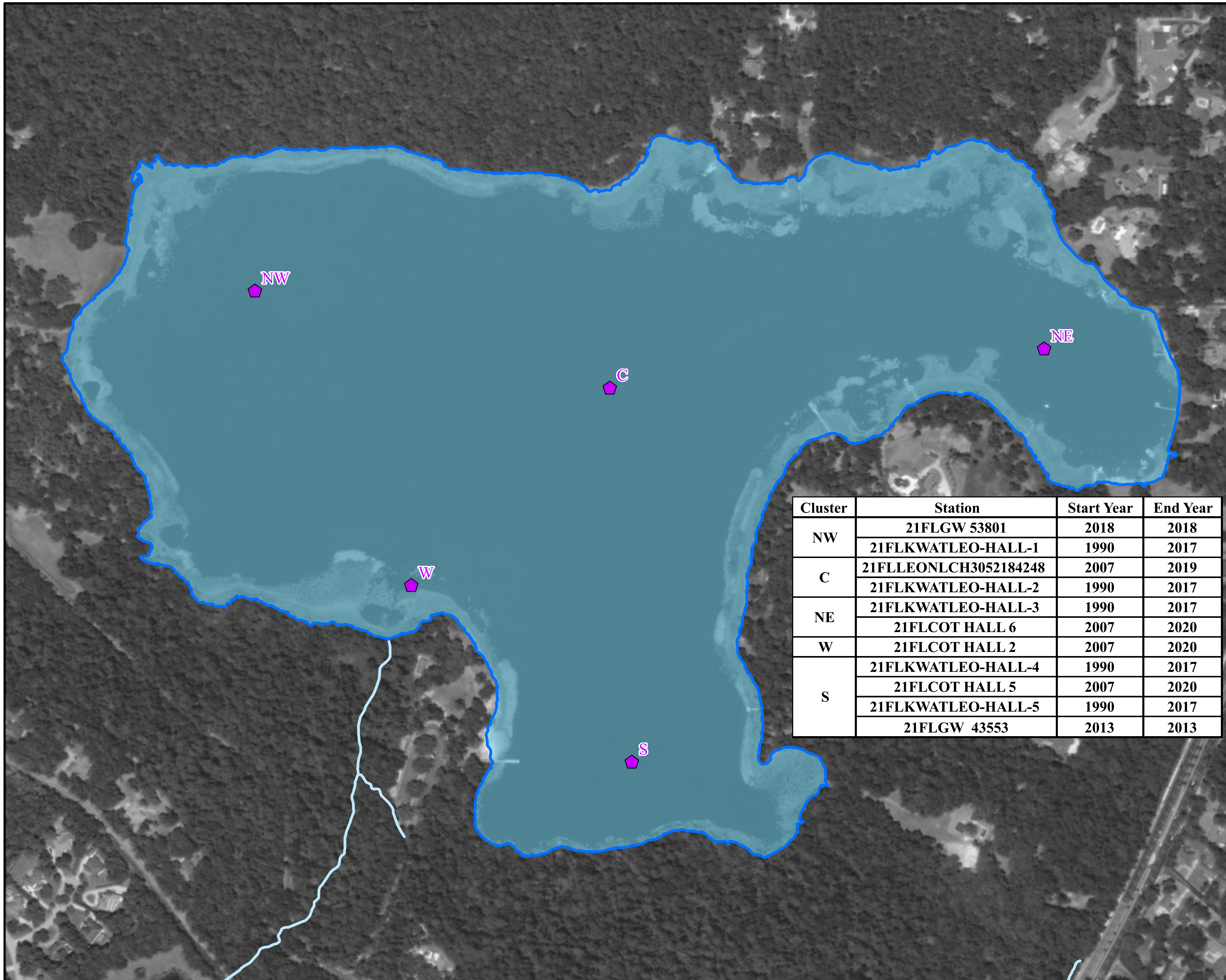
Figure 4-143 presents a map of the *E. coli* levels. The data analyzed are from 2014 through 2020, and the data were analyzed to provide the 90^{th} percentile to compare against the 410 MPN/100 mL criteria per the FDEP approach in the IWR analyses. The results show that for the stations with *E. coli* data, the 90^{th} percentile are well within the criteria, in the lowest blue range (less than 100 MPN/100 mL).

4.8.4.2 Stormwater Runoff

To assess stormwater runoff as a potential source of pollutant loads to Lake Hall, the first step was to evaluate the LDI levels within the subbasins draining to the lake. In **Section 4.4.4.2**, LDI values were presented by subbasin in **Figure 4-24**. The map shows that in the immediate watershed area surrounding Lake Hall, LDI levels were good. This would indicate that this area has limited potential for anthropogenic pollutant loads from stormwater runoff. No data were available on tributaries flowing into Lake Hall.

4.8.4.3 Septic Systems

Figure 4-125 presented the locations of septic systems within the Lake Hall basin. **Figure 4-31** presented a map showing the septic tank densities by subbasin for the full Lake Jackson basin. The septic tank densities in the Lake Hall closed basin are in the middle to lower range compared to other subbasins within the overall Lake Jackson basin. This would increase their potential as a source of pollutants to the lake but, based on the existing water quality and recent trends along with the low *E. coli* levels, the potential appears low.



Cluster	Station	Start Year	End Year
NW	21FLGW 53801	2018	2018
	21FLKWATLEO-HALL-1	1990	2017
C	21FLLEONLCH3052184248	2007	2019
	21FLKWATLEO-HALL-2	1990	2017
NE	21FLKWATLEO-HALL-3	1990	2017
	21FLCOT HALL 6	2007	2020
W	21FLCOT HALL 2	2007	2020
S	21FLKWATLEO-HALL-4	1990	2017
	21FLCOT HALL 5	2007	2020
	21FLKWATLEO-HALL-5	1990	2017
	21FLGW 43553	2013	2013

CITY OF TALLAHASSEE

N

0 0.08
Miles

Legend

- Watercourses
- Lake Hall
- In-Lake Station Clusters

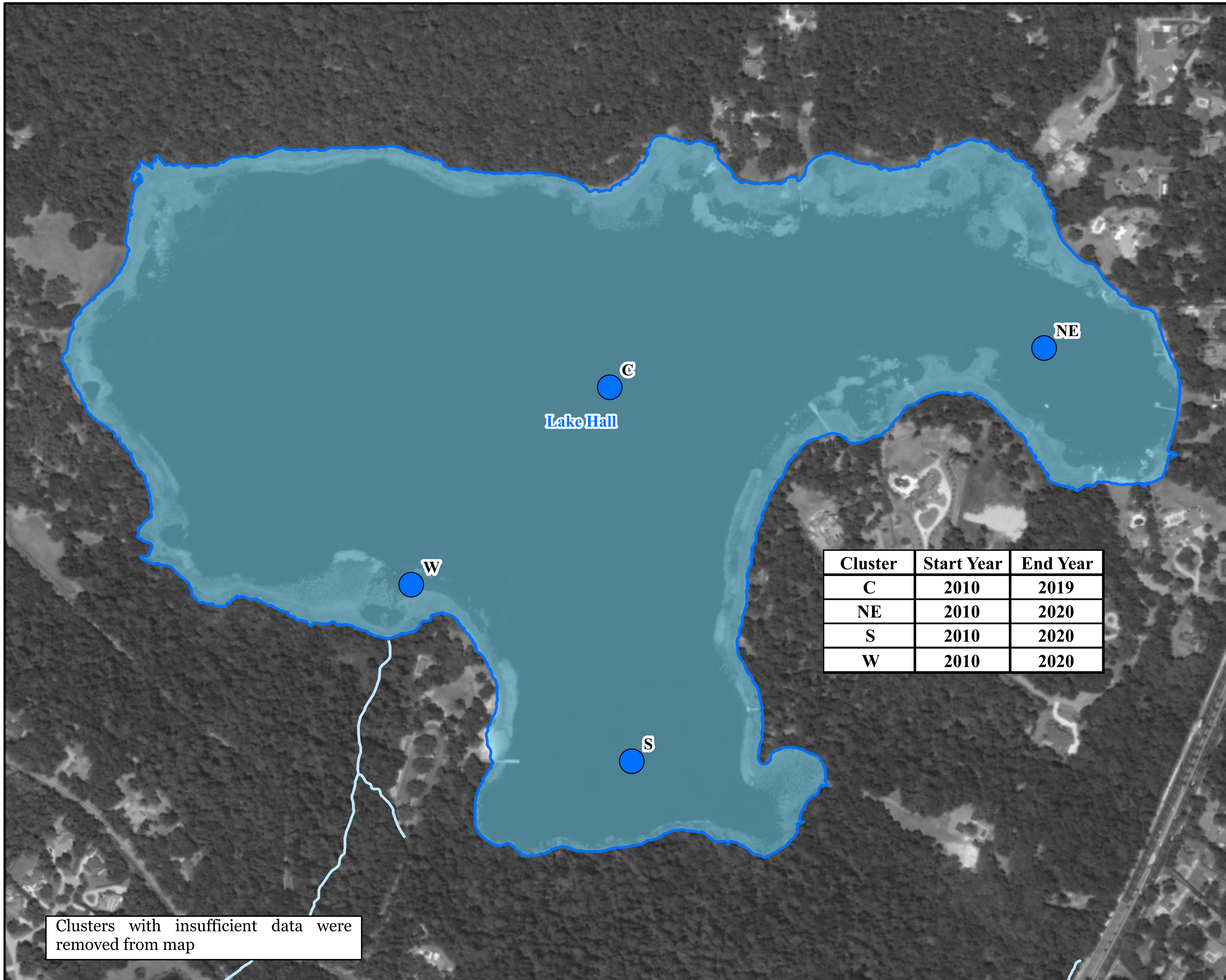
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-136:
Station Clustering for In-Lake Analyses for Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

CITY OF TALLAHASSEE



Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
S	2010	2020
W	2010	2020

Legend

- Lake Hall
- Watercourses

Color Average 2010-2020

PCU

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- > 40

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-137:
Spatial Assessment of Color in Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

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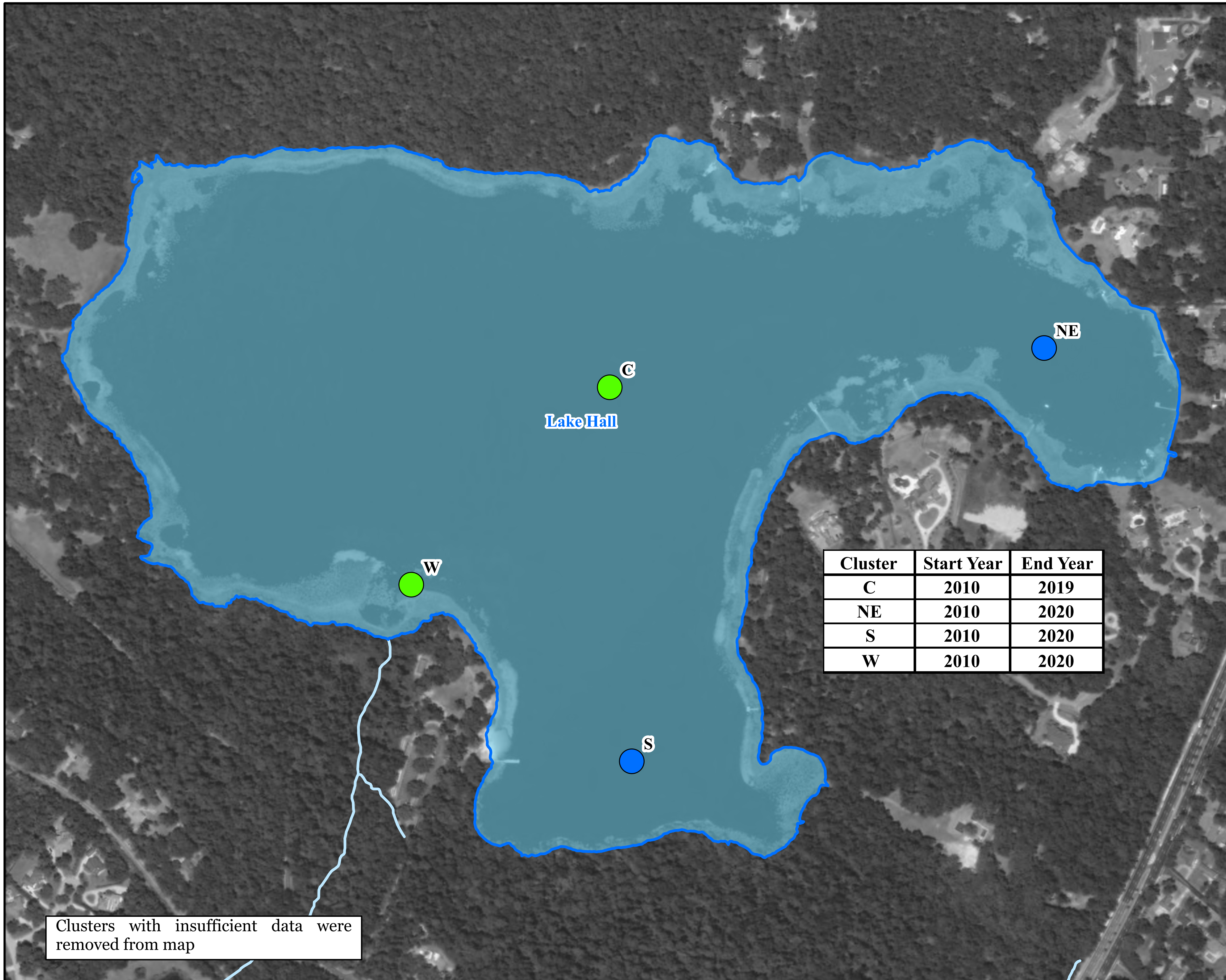


Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
S	2010	2020
W	2010	2020

CITY OF TALLAHASSEE

N

0 0.08

Miles

Legend

Lake Hall

Watercourses

Alkalinity Average 2010-2020 mg/L

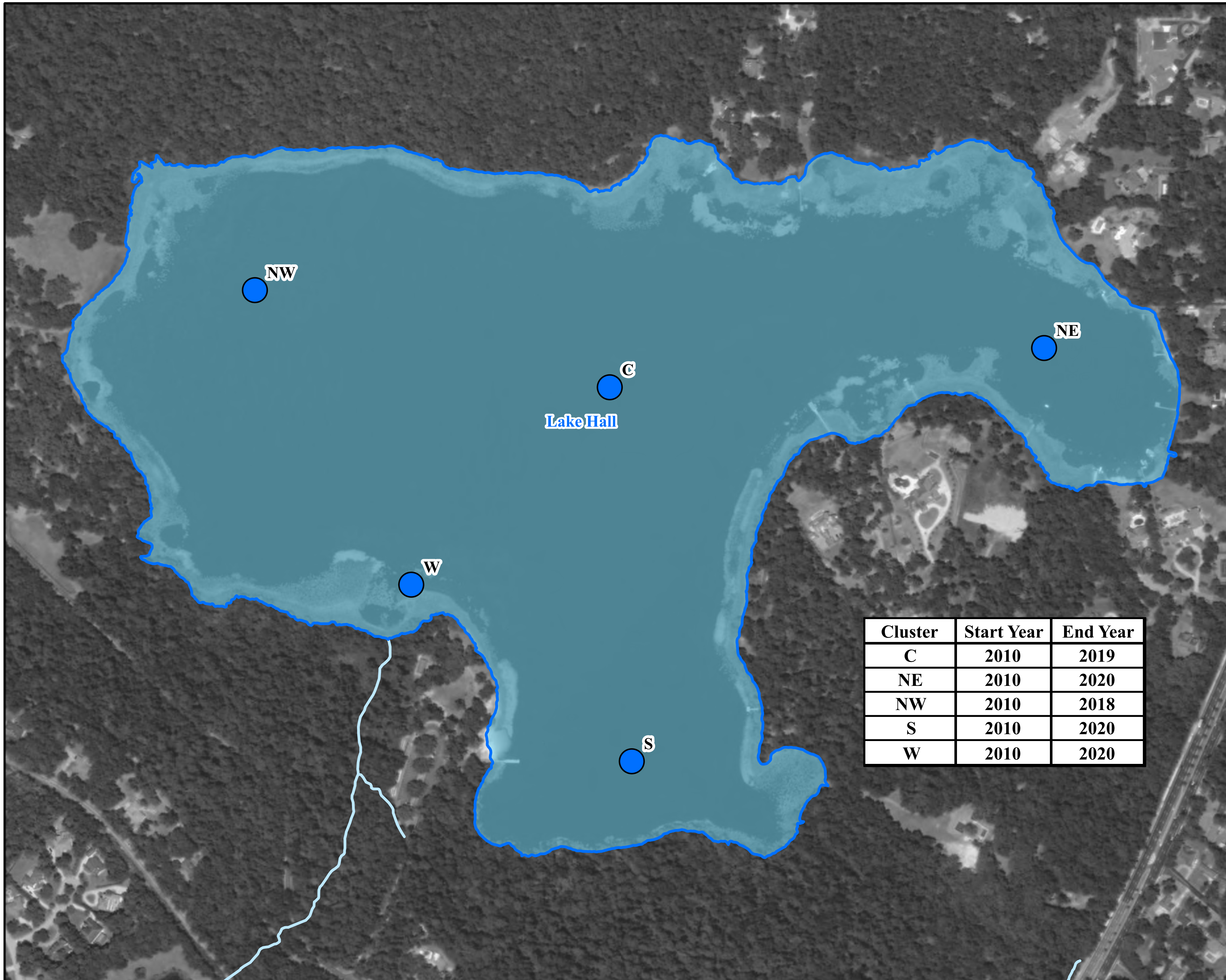
- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- > 20

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-138: Spatial Assessment of Alkalinity in Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants



Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
NW	2010	2018
S	2010	2020
W	2010	2020

CITY OF TALLAHASSEE

N

0 0.08

Miles

Legend

Lake Hall

Watercourses

TN Average 2010-2020

mg/L

0 - 0.53

0.53 - 0.66

0.66 - 0.79

0.79 - 0.93

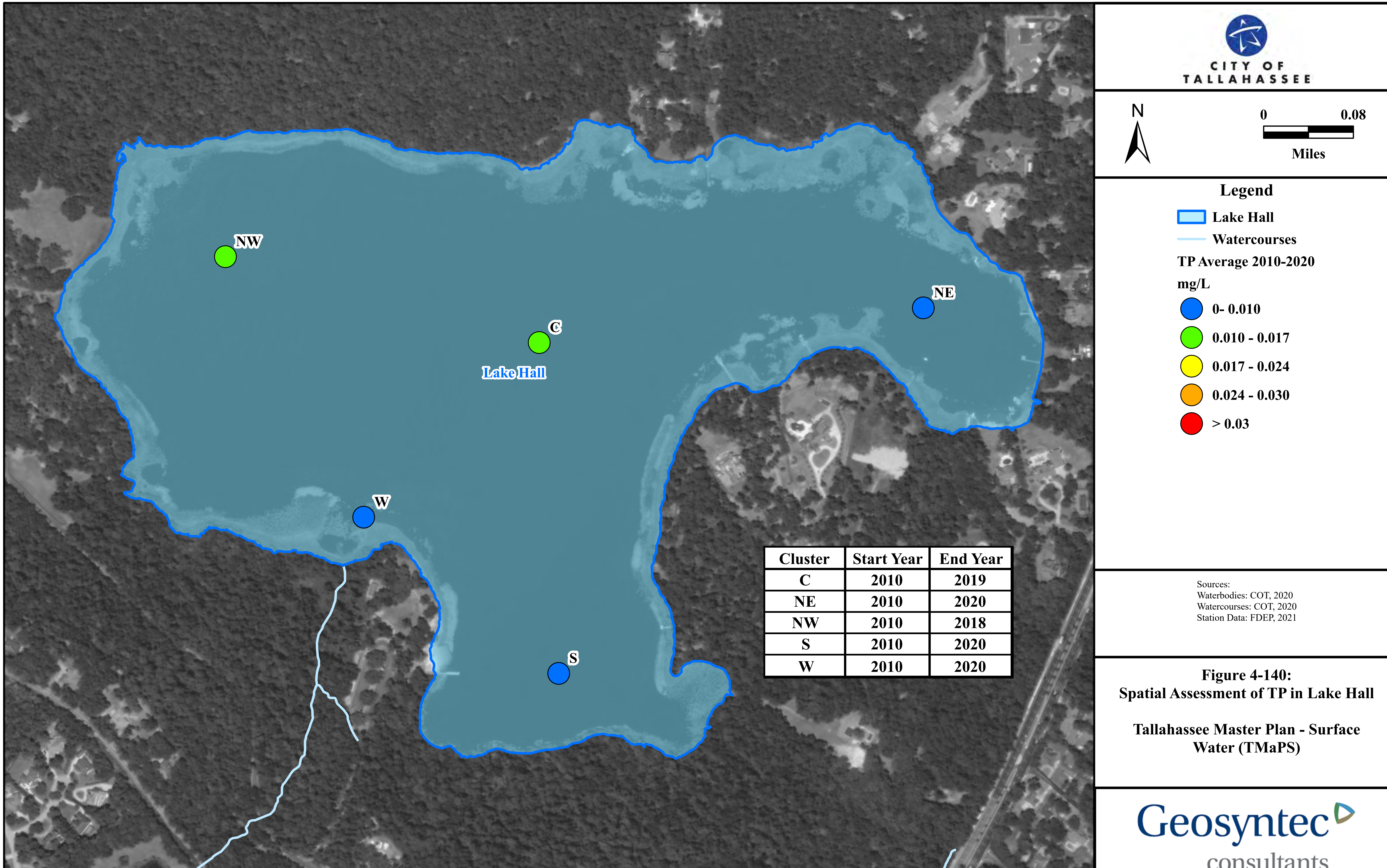
> 0.93

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-139:
Spatial Assessment of TN in Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

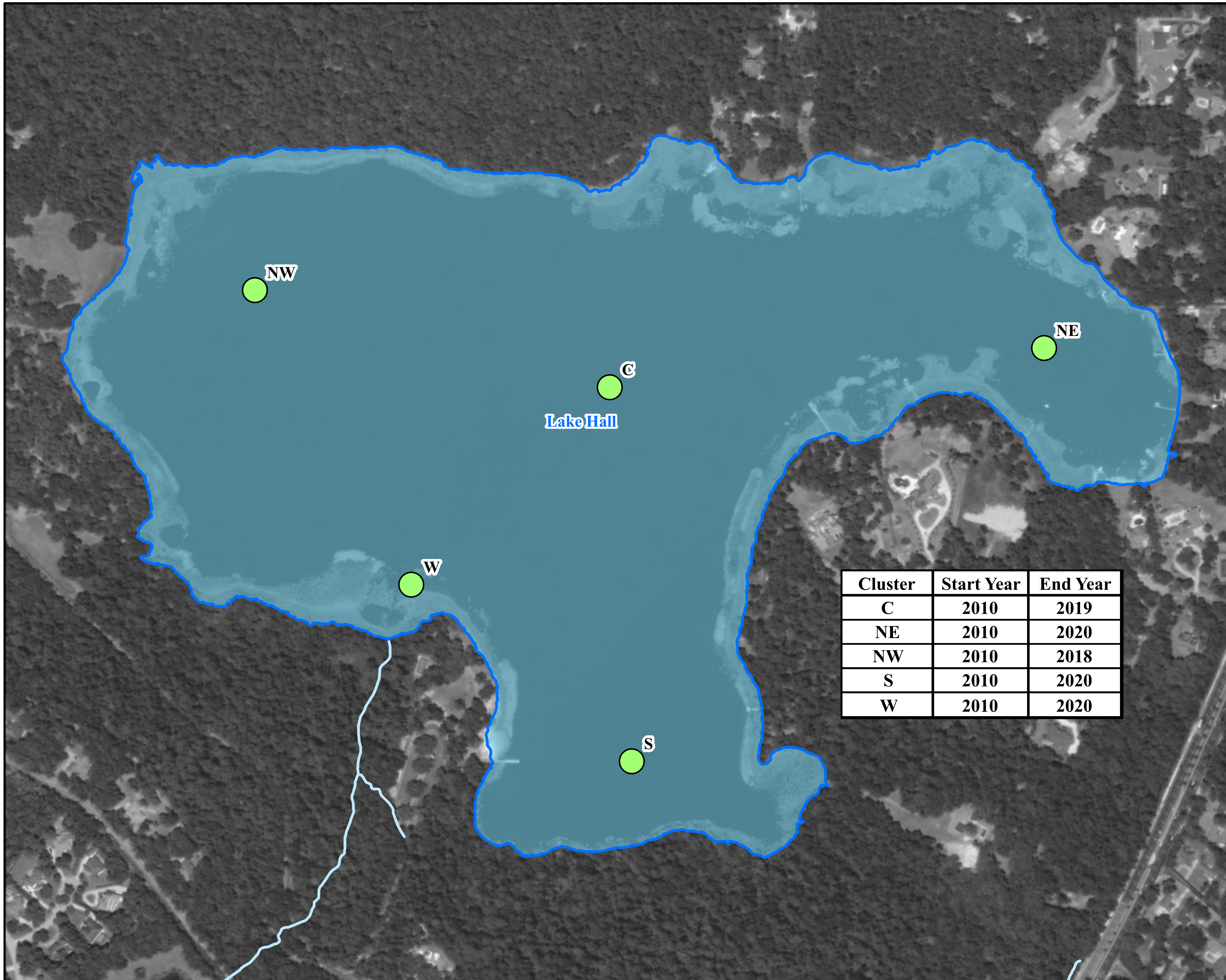


Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
NW	2010	2018
S	2010	2020
W	2010	2020

Figure 4-140:
Spatial Assessment of TP in Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

CITY OF TALLAHASSEE



Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
NW	2010	2018
S	2010	2020
W	2010	2020

N

0 0.08

Miles

Legend

- Lake Hall
- Watercourses

Chl a Average 2010-2020

µg/L

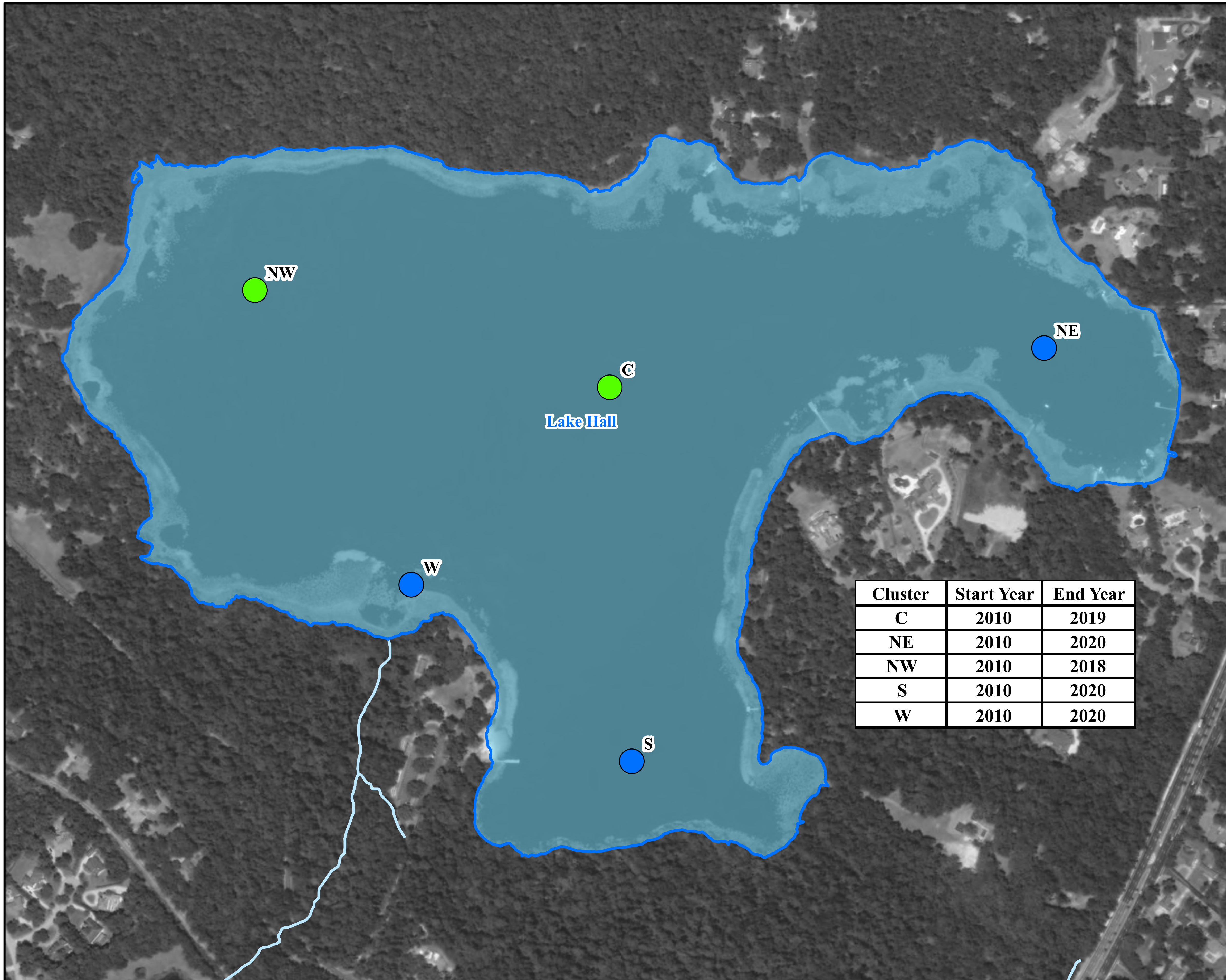
- 0.0 - 1.5
- 1.5 - 3.0
- 3.0 - 4.5
- 4.5 - 6.0
- > 6

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-141:
Spatial Assessment of Chl a in Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec
consultants



Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
NW	2010	2018
S	2010	2020
W	2010	2020

CITY OF TALLAHASSEE

N

0 0.08

Miles

Legend

Lake Hall

Watercourses

TSI Average 2010-2020

TSI Score

- 0 - 15
- 15 - 30
- 30 - 45
- 45 - 60
- > 60

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-142:
Spatial Assessment of TSI in Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

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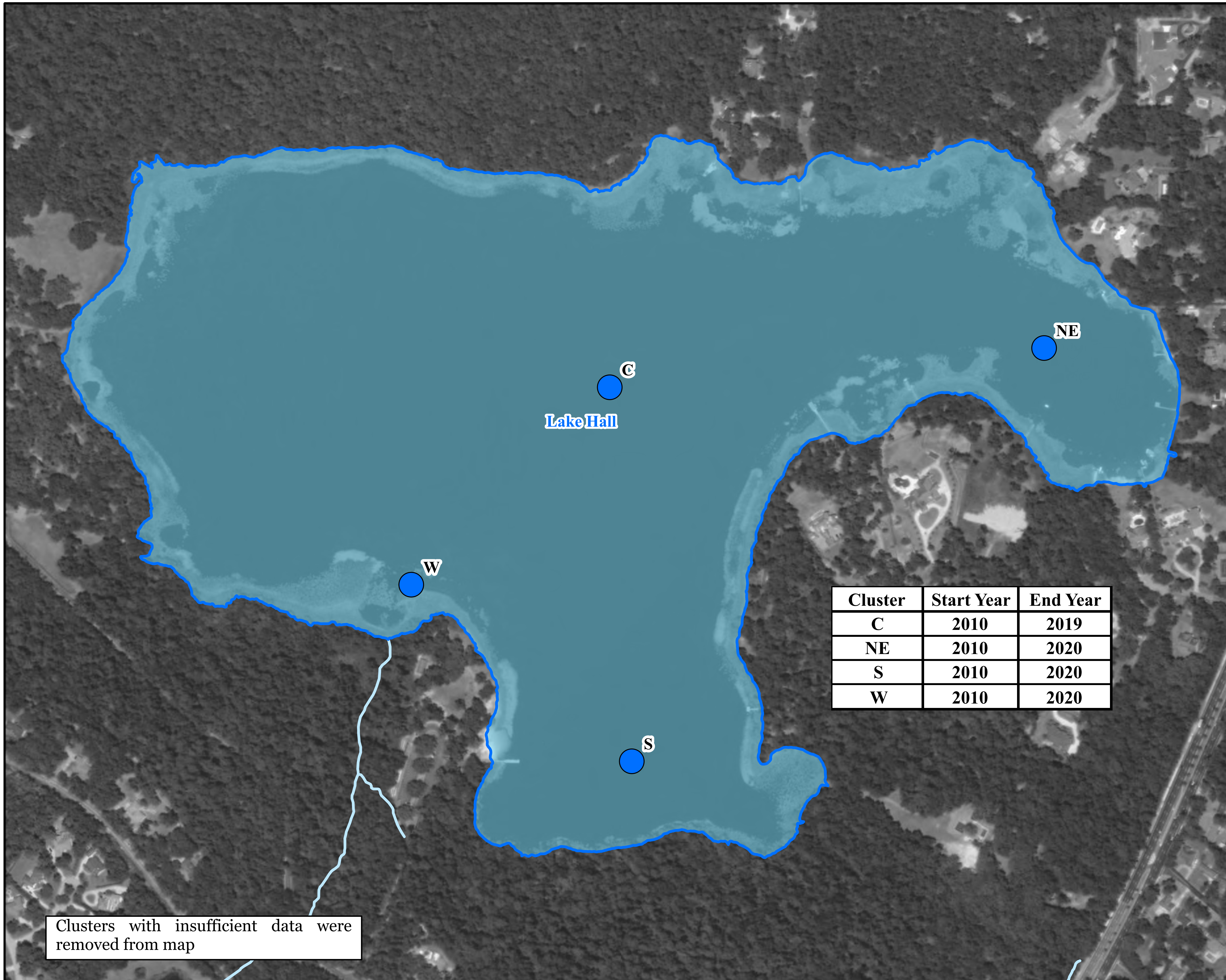


Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
S	2010	2020
W	2010	2020

CITY OF TALLAHASSEE

N

0 0.08
Miles

Legend

Lake Hall

Watercourses

E. coli 90th Percentile 2010-2020 MPN/100mL

- < 100
- 100 - 200
- 200 - 300
- 300 - 410
- > 410

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-143:
Spatial Assessment of E. coli in Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

4.8.4.4 Internal Recycling and Seepage

Internal Recycling

To date no studies or data collection efforts have been undertaken to assess the potential for loading from sediments in Lake Hall. Given the good water quality, healthy biological conditions, and general pristine nature of the direct drainage areas to the lake and the lake depths, internal recycling is not identified as a significant source for loading to the lake.

A method for identifying the presence of benthic flux is the analysis of vertical profile data for field parameters such as DO, temperature, ORP, and specific conductance. This was described in **Section 4.4.5.5** for Lake Jackson. Evaluation of the available water quality data did not identify any vertical profile data collected. As such, this method could not be utilized for independent evaluation of the potential for internal recycling. Based on the determinations described above, no additional data collection/studies are recommended to quantify the internal nutrient flux for Lake Hall.

Seepage

As outlined in **Section 4.8.3.7**, no surficial aquifer data in the immediate vicinity of the lake and drain were identified. As such, no direct determination of seepage as a potential source can be made. As with the internal recycling assessment, the existing water quality and recent trends, along with the low *E. coli* levels, would indicate low potential.

4.8.4.5 Wastewater

Within the Lake Hall basin, there currently are no direct wastewater discharges. Additionally, no areas in the Lake Jackson basin presently have reuse discharges. **Figure 4-32** presented a map of the Lake Jackson basin boundaries and subbasins in relation to sewer service areas and sewer infrastructure. There is limited sewer infrastructure located in the drainage basin for Lake Hall, covering approximately 22 percent of the basin. Based on the limited sewer service area, along with the existing and trending water quality, wastewater infrastructure is not identified as a potential significant source of pollutant loads to Lake Hall.

4.8.4.6 Atmospheric Deposition

For Lake Hall, the ratio of the watershed area to lake area is around 4:1. With this low ratio, and the potential attenuation of rainfall runoff, direct atmospheric deposition to the lake would likely play a significant role in overall loading, especially for nitrogen. Atmospheric deposition will be accounted for both indirectly within stormwater runoff and directly as a load to the lake surface. **Section 4.4.3.11** identified the nearest atmospheric deposition station as the Quincy station (FL14) **(Figure 4-15**).

4.8.4.7 Interconnected Flows

No lakes are located upstream of Lake Hall, therefore, interconnected loads are not a source for the lake.

4.8.4.8 Summary of Findings

At present, nutrient levels and biological conditions in Lake Hall are excellent and are not exhibiting significant declining trends. *E. coli* levels are low for all recent measurements. Based on these analyses, and that the immediate drainage basin to the lake is mostly undeveloped and restrictions are in place for future development, the qualitative assessment indicates limited sources of pollutant loading to Lake Hall now and under future conditions. Septic densities are generally low, but some systems are found in the immediate vicinity of the lake.

Though these sources do not appear significant, stormwater runoff contributing to tributary inflow, septic, and atmospheric deposition are quantified for comparative purposes as part of this study based on available data. Internal recycling, seepage, and wastewater also do not appear to be significant sources and were not quantified as part of this study based on limited data. As no upstream waterbodies drain into Lake Hall, interconnected flow is not identified as a source.

4.8.5 Calculation of Potential Nutrient Loads

This section presents calculations of potential nutrient (TN and TP) loads to Lake Hall for the sources identified for calculation in **Section 4.8.4.8**. These include stormwater runoff, septic systems, and atmospheric deposition. Where loads were not calculated, the sections below provide brief discussions. The load calculations are for the purpose of comparing the potential magnitudes of each source relative to one another to support determination of sources to target for load reduction.

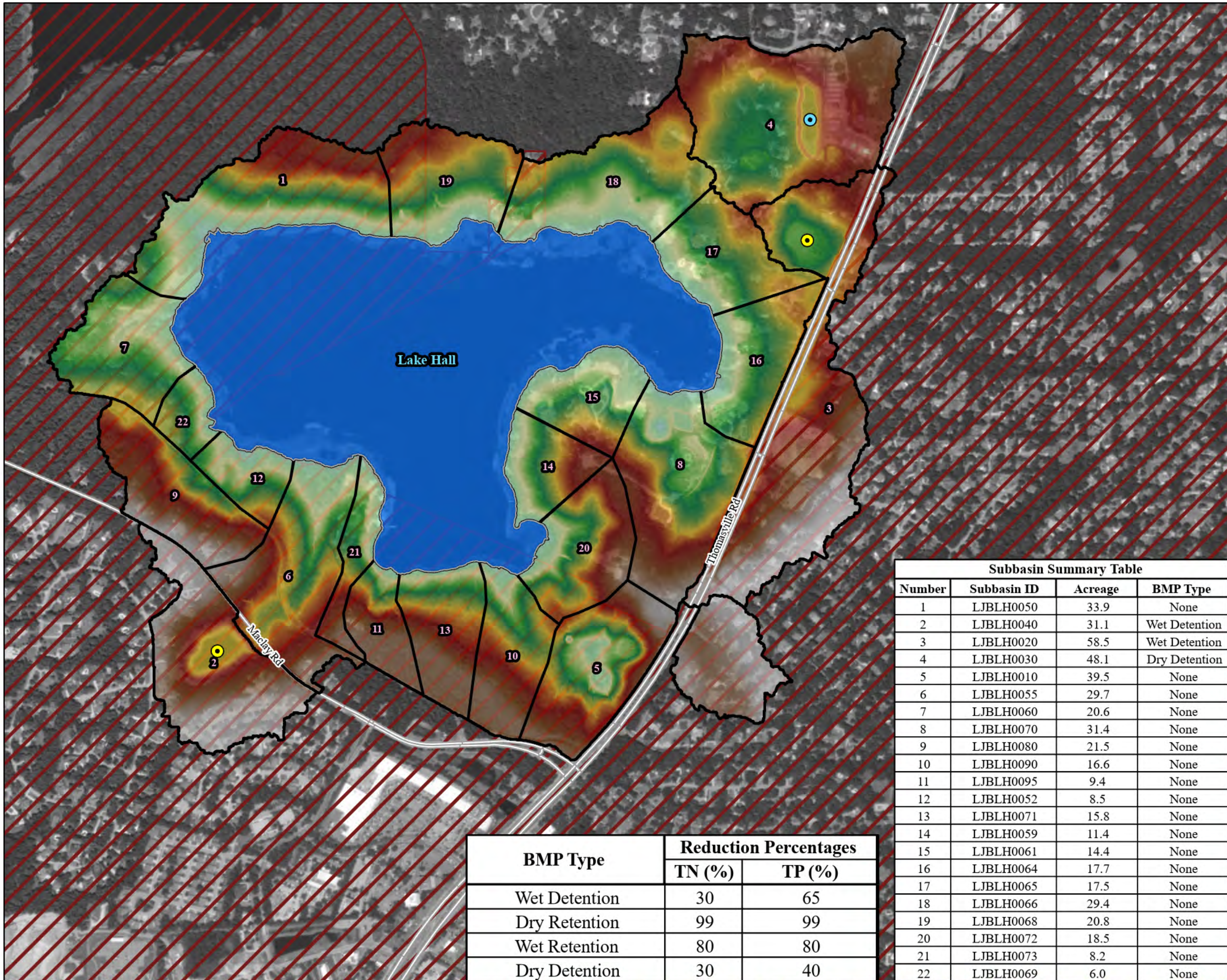
4.8.5.1 Stormwater Pollutant Load

To calculate the stormwater TN and TP loads to Lake Hall, average annual pollutant load modeling was performed. The goal was to identify outfalls that are contributing higher TN and TP loads relative to one another and to quantify the total TN and TP loads to Lake Hall. TN and TP loads were calculated using the SIMPLE-Seasonal model. The model methodology was described in detail in **Section 4.4.5.1** for the stormwater loads to Lake Jackson.

Figure 4-144 presents the subbasins and the DEM utilized in the SIMPLE model calculations for Lake Hall. **Figure 4-145** presents the aggregated land use. Finally, **Figure 4-146** presents the CDAs for the Lake Hall stormwater loading to define total and per acre TN and TP loads, as well as the ranking of CDAs around the Lake.

<u>Stormwater Nutrient Loads to Lake Hall</u>

Figure 4-147 presents the distribution of the ranking of the CDAs for TN along with the total load and per acre loads (see the table on **Figure 4-147).** The rankings are color coded, with the highest ranked CDAs in dark green moving down to the lowest ranked in pale yellow. The calculated total stormwater TN loads from the CDAs ranged from as low as 7.3 lb/yr up to 243.3 lb/yr. The per acre loads ranged from 0.6 lb/acre/yr up to 6.0 lb/acre/yr. The highest ranked CDA (LJBLHOF05) was located within what is identified as a recreational land use area that has a high EMC value. This may not be fully reflective of conditions from this area. The other high ranked CDAs were located along the eastern side within areas of medium density land use. The higher ranked CDAs showed significantly higher per acre loads than those seen for the other more natural areas. The total potential stormwater runoff load for TN for Lake Hall is 1,049 lb/yr.



CITY OF TALLAHASSEE

N

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Miles

Legend

- Lake Hall
- Subbasins
- Tallahassee Corporate Limits

BMP Type

- Dry Detention
- Wet Detention

Topographic Elevations

ft NAVD88

235

141

BMP Type	Reduction Percentages	
	TN (%)	TP (%)
Wet Detention	30	65
Dry Retention	99	99
Wet Retention	80	80
Dry Detention	30	40

Subbasin Summary Table

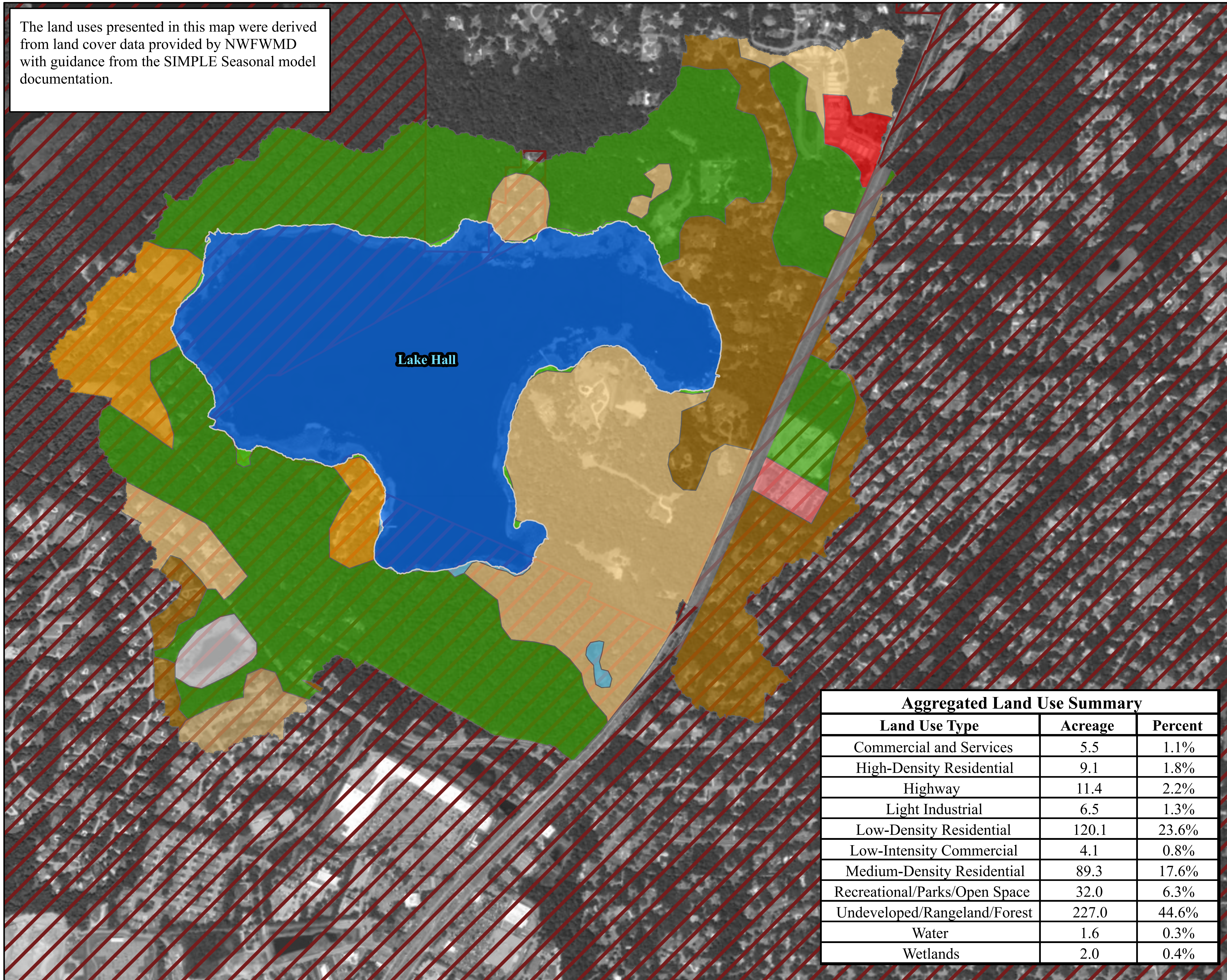
Number	Subbasin ID	Acreage	BMP Type
1	LJBLH0050	33.9	None
2	LJBLH0040	31.1	Wet Detention
3	LJBLH0020	58.5	Wet Detention
4	LJBLH0030	48.1	Dry Detention
5	LJBLH0010	39.5	None
6	LJBLH0055	29.7	None
7	LJBLH0060	20.6	None
8	LJBLH0070	31.4	None
9	LJBLH0080	21.5	None
10	LJBLH0090	16.6	None
11	LJBLH0095	9.4	None
12	LJBLH0052	8.5	None
13	LJBLH0071	15.8	None
14	LJBLH0059	11.4	None
15	LJBLH0061	14.4	None
16	LJBLH0064	17.7	None
17	LJBLH0065	17.5	None
18	LJBLH0066	29.4	None
19	LJBLH0068	20.8	None
20	LJBLH0072	18.5	None
21	LJBLH0073	8.2	None
22	LJBLH0069	6.0	None

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
Subbasins: Geosyntec, 2023
Roads: COT-Leon County, 2023
BMPs: Geosyntec, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-144:
Lake Hall Subbasin Delineation and BMPs

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants



Aggregated Land Use Summary		
Land Use Type	**Acreage**	**Percent**
Commercial and Services	5.5	1.1%
High-Density Residential	9.1	1.8%
Highway	11.4	2.2%
Light Industrial	6.5	1.3%
Low-Density Residential	120.1	23.6%
Low-Intensity Commercial	4.1	0.8%
Medium-Density Residential	89.3	17.6%
Recreational/Parks/Open Space	32.0	6.3%
Undeveloped/Rangeland/Forest	227.0	44.6%
Water	1.6	0.3%
Wetlands	2.0	0.4%

CITY OF TALLAHASSEE

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Miles

Legend

- Lake Hall
- Tallahassee Corporate Limits

Aggregated Land Use

Land Use Type

- Commercial and Services
- High-Density Residential
- Highway
- Light Industrial
- Low-Density Residential
- Low-Intensity Commercial
- Medium-Density Residential
- Recreational/Parks/Open Space
- Undeveloped/Rangeland/Forest
- Water
- Wetlands

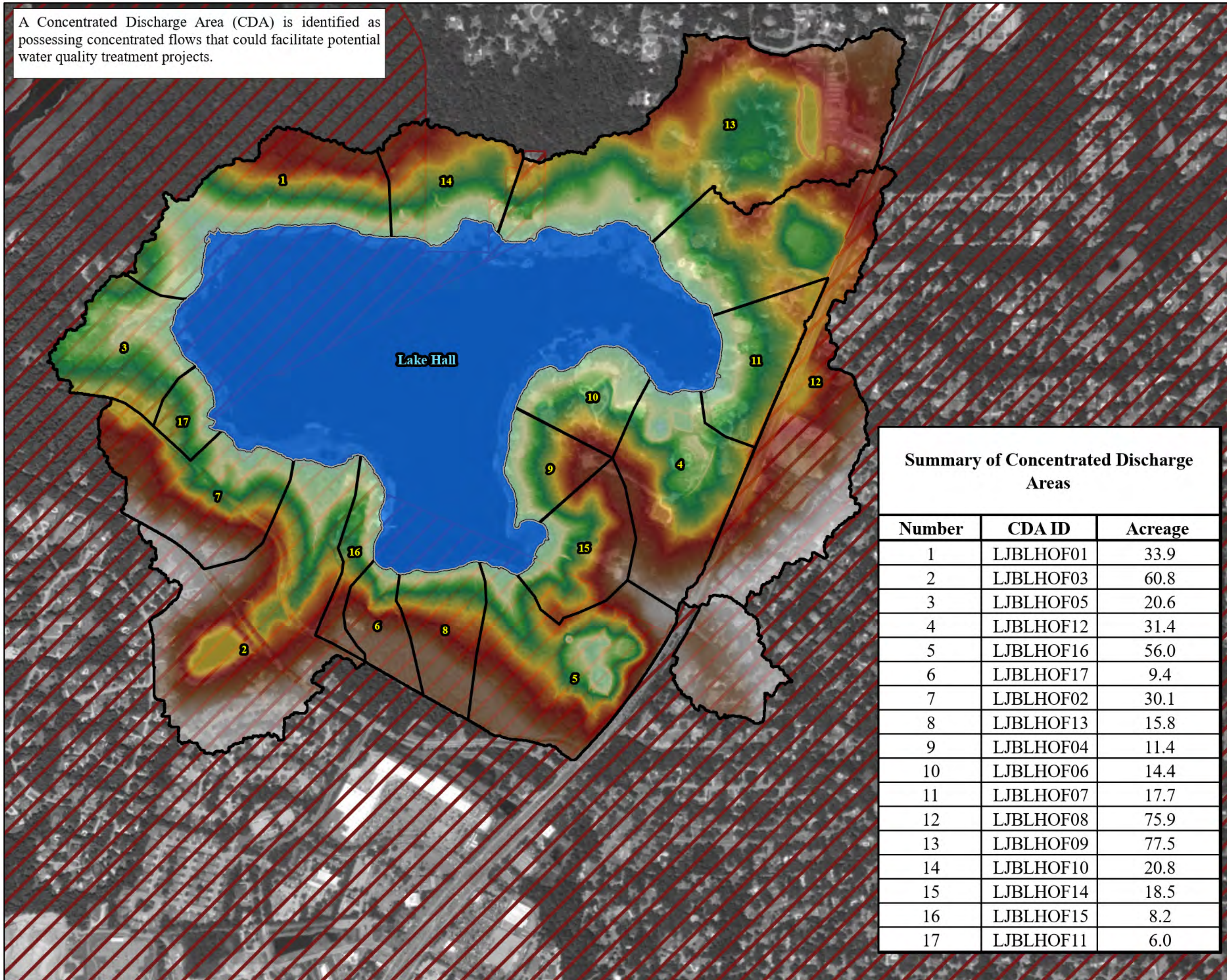
Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2022
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-145: Lake Hall Aggregated Land Use

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



Summary of Concentrated Discharge Areas

Number	CDA ID	Acreage
1	LJBLHOF01	33.9
2	LJBLHOF03	60.8
3	LJBLHOF05	20.6
4	LJBLHOF12	31.4
5	LJBLHOF16	56.0
6	LJBLHOF17	9.4
7	LJBLHOF02	30.1
8	LJBLHOF13	15.8
9	LJBLHOF04	11.4
10	LJBLHOF06	14.4
11	LJBLHOF07	17.7
12	LJBLHOF08	75.9
13	LJBLHOF09	77.5
14	LJBLHOF10	20.8
15	LJBLHOF14	18.5
16	LJBLHOF15	8.2
17	LJBLHOF11	6.0

CITY OF TALLAHASSEE

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Miles

Legend

Lake Hall

Concentrated Discharge Areas

Tallahassee Corporate Limits

Topographic Elevations

ft NAVD88

235

141

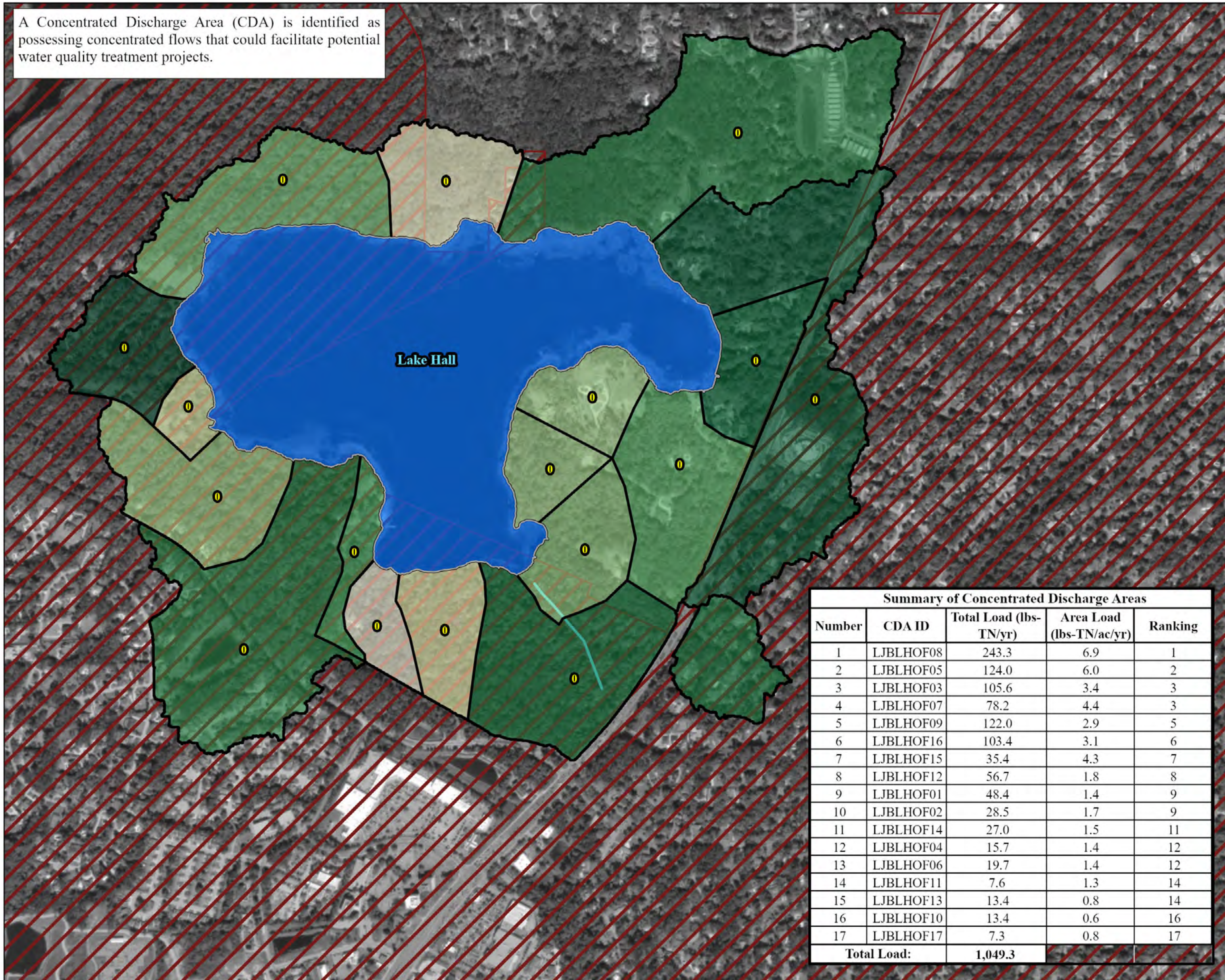
Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2022
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-146:
Lake Hall Concentrated Discharge Areas

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBLHOF08	243.3	6.9	1
2	LJBLHOF05	124.0	6.0	2
3	LJBLHOF03	105.6	3.4	3
4	LJBLHOF07	78.2	4.4	3
5	LJBLHOF09	122.0	2.9	5
6	LJBLHOF16	103.4	3.1	6
7	LJBLHOF15	35.4	4.3	7
8	LJBLHOF12	56.7	1.8	8
9	LJBLHOF01	48.4	1.4	9
10	LJBLHOF02	28.5	1.7	9
11	LJBLHOF14	27.0	1.5	11
12	LJBLHOF04	15.7	1.4	12
13	LJBLHOF06	19.7	1.4	12
14	LJBLHOF11	7.6	1.3	14
15	LJBLHOF13	13.4	0.8	14
16	LJBLHOF10	13.4	0.6	16
17	LJBLHOF17	7.3	0.8	17
Total Load:		1,049.3		

CITY OF TALLAHASSEE

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Miles

Legend

- Lake Hall
- Concentrated Discharge Areas
- Flowlines
- Tallahassee Corporate Limits

CDAs_TP

Ranking

- High (1)
- Low (17)

Sources:
Waterbodies: COT, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-147:
Lake Hall Concentrated Discharge Areas
Total Nitrogen

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Figure 4-148 presents the distribution of the ranking of the CDAs for TP along with the total load and per acre loads (see the table on **Figure 4-148**). The calculated total stormwater TP loads from the CDAs ranged from as low as 1.0 lb/yr up to 59.7 lb/yr. The per acre loads ranged from 0.1 lb/acre/yr up to 2.9 lb/acre/yr. The results for the TP looked similar in distribution and degree of per acre load as was seen for TN, with the recreational area again showing as highest ranked along with the medium density residential areas on the eastern side. The total potential stormwater runoff load for TP for Lake Hall is 259 lb/yr.

4.8.5.2 Septic Load

To analyze the potential impacts from septic tank units to Lake Hall, the SPIL method adopted by FDEP was utilized to quantify the potential septic load. The approach and calculations were described earlier in **Section 4.4.5.2**, which presented the septic loading to Lake Jackson. As outlined earlier, the calculations were only done for nitrogen (TN) and, based on literature on transport and assimilation, may represent a conservative potential load.

An estimated 24 septic tank units were identified within 200 meters of Lake Hall. **Figure 4-149** shows the septic systems utilized in the analyses with those associated with direct loading to the waterbody green and those associated with tributaries pink. Only one unit was identified as loading to tributaries. A table provided on the figure summarizes the calculated TN load from septic units. The total load is 270 lb/yr, with nearly all of this load from septic systems along the lake boundary.

4.8.5.3 Point Source Load

No active point sources were identified within the Lake Jackson basin. Therefore, the point source loads for TN and TP are set to 0 lb/yr for Lake Hall.

4.8.5.4 Lake Inflow Load

There are no identified lakes upstream of Lake Hall. Therefore, the inter-lake TN and TP loads are set to 0 lb/yr.

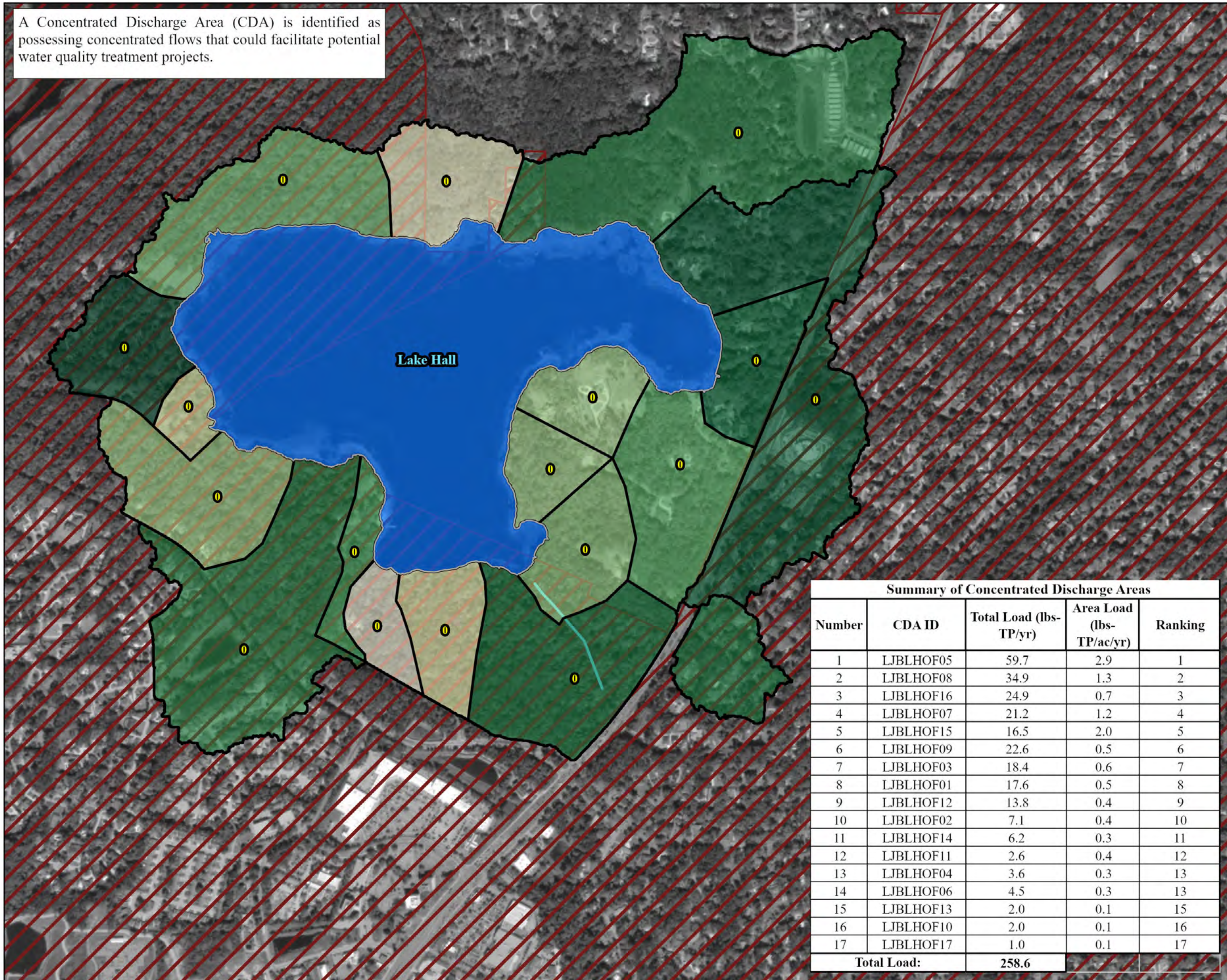
4.8.5.5 Internal Lake Load

The source assessment determined that, given the good water quality, healthy biological conditions, and general pristine nature of the direct drainage areas to the lake, internal loading was not likely to be a significant source of loading to the lake. Given the assessment and lack of data available for evaluation, no loading estimates were developed.

4.8.5.6 Atmospheric Deposition

As presented and discussed in **Section 4.4.5.6** the annual average atmospheric TN load per acre was calculated from the Quincy NADP station (F14) at 2.56 lb/acre/yr. Multiplying this by the acreage of Lake Hall (172 acres) gives a total TN load of 440 lb/yr. No data are available for TP, therefore only the nitrogen load is provided.

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



CITY OF TALLAHASSEE

Summary of Concentrated Discharge Areas

Number	CDA ID	Total Load (lbs-TP/yr)	Area Load (lbs-TP/ac/yr)	Ranking
1	LJBLHOF05	59.7	2.9	1
2	LJBLHOF08	34.9	1.3	2
3	LJBLHOF16	24.9	0.7	3
4	LJBLHOF07	21.2	1.2	4
5	LJBLHOF15	16.5	2.0	5
6	LJBLHOF09	22.6	0.5	6
7	LJBLHOF03	18.4	0.6	7
8	LJBLHOF01	17.6	0.5	8
9	LJBLHOF12	13.8	0.4	9
10	LJBLHOF02	7.1	0.4	10
11	LJBLHOF14	6.2	0.3	11
12	LJBLHOF11	2.6	0.4	12
13	LJBLHOF04	3.6	0.3	13
14	LJBLHOF06	4.5	0.3	13
15	LJBLHOF13	2.0	0.1	15
16	LJBLHOF10	2.0	0.1	16
17	LJBLHOF17	1.0	0.1	17
Total Load:		258.6		

Sources:
Waterbodies: COT, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-148:
Lake Hall Concentrated Discharge Areas
Total Phosphorus

Tallahassee Master Plan - Surface Water (TMaPS)

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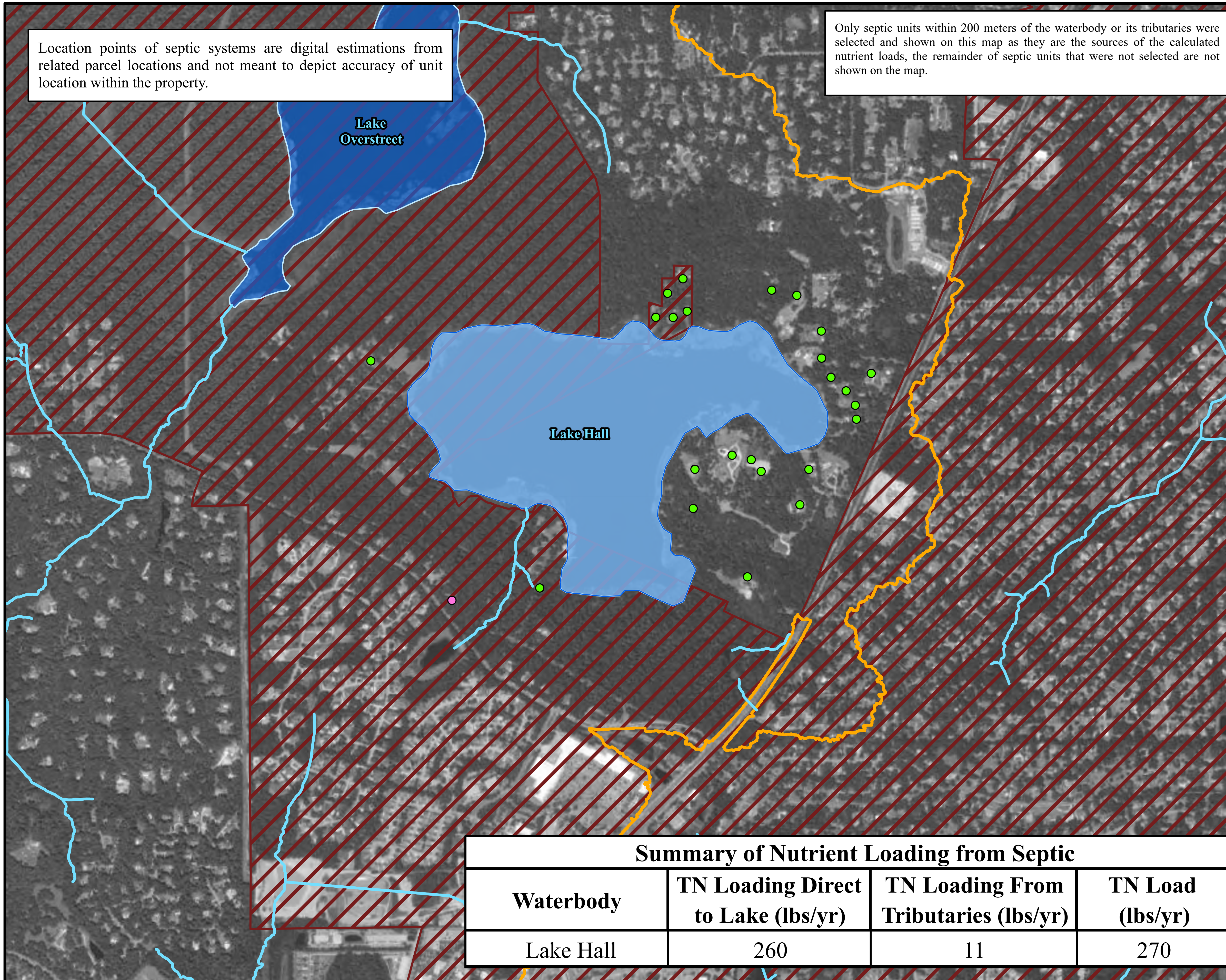
Location points of septic systems are digital estimations from related parcel locations and not meant to depict accuracy of unit location within the property.

Only septic units within 200 meters of the waterbody or its tributaries were selected and shown on this map as they are the sources of the calculated nutrient loads, the remainder of septic units that were not selected are not shown on the map.



CITY OF TALLAHASSEE

Legend

- Lake Jackson Drainage Basin
- Lake Hall
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits

Relevant Septic Sites

- Lake
- Tributaries

Summary of Nutrient Loading from Septic			
Waterbody	TN Loading Direct to Lake (lbs/yr)	TN Loading From Tributaries (lbs/yr)	TN Load (lbs/yr)
Lake Hall	260	11	270

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023

Figure 4-149: Septic Loading to Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

4.8.5.7 Summary of Calculated Loads

Nutrient loads to Lake Hall were calculated for stormwater runoff, septic systems, and atmospheric deposition. **Table 4-22** presents the calculated total loads to the lake for TN and TP. For septic systems and atmospheric deposition, only TN loads were calculated (see **Section 4.8.5.2** and **Section 4.8.5.6** respectively for explanation).

Table 4-22: Summary of Calculated Loads to Lake Hall

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	1,049	259
Septic Systems	270	NC
Atmospheric Deposition	440	NC

NC – Not calculated.

4.9 Lexington Creek

This section presents the results from Tasks 1 through 3 for Lexington Creek. This includes an overview and history of the basin, present impairment status, an overview of available data, a qualitative assessment of potential pollutant sources, and calculation of potential pollutant loads.

4.9.1 Overview and History

Lexington Creek is an urban stream that flows from its headwaters in commercial areas off Timberlane Road, through wooded areas between Timberlane Road and I-10, crosses Meridian Road through the Lakeshore neighborhood, and eventually drains into Fords Arm and Lake Jackson (**Figure 4-150**). The creek is intermittent in nature, which at times has limited the ability to collect water quality samples. The southern side of the basin drains a considerable length of I-10. Lexington Creek basin **(Figure 4-150**) covers an area of 1,827 acres.

Leon County has identified potential water quality related issues on Lexington Creek. Those include increased erosion/sedimentation and higher nutrient concentrations associated with sampling during significant rain events. In 2012, a sampling event caught one of the larger rainfall events. Water quality measurements associated with this event showed elevated levels of turbidity, TSS, copper, and lead (Leon County, 2020). Additionally, Leon County staff identified that excessive erosion and sedimentation along the creek is a common event. In recent years, Leon County has noted higher TP levels in the creek, which have exceeded the NNC threshold for freshwater streams.

In addition to these issues, FIB concerns have been raised based on elevated concentrations of *E. coli*. Recent measurements by FDEP have shown elevated levels, although coincident measurements by Leon County did not show the same elevated concentrations. These discrepancies in the available measured data are being evaluated as part of a joint effort between FDEP and Leon County to quantify pollutant loads to Lake Jackson from the Lexington Creek watershed. The approach is outlined within the Lake Jackson Monitoring Plan prepared by FDEP (FDEP, 2021). The FIB data discrepancies are discussed later in this section.

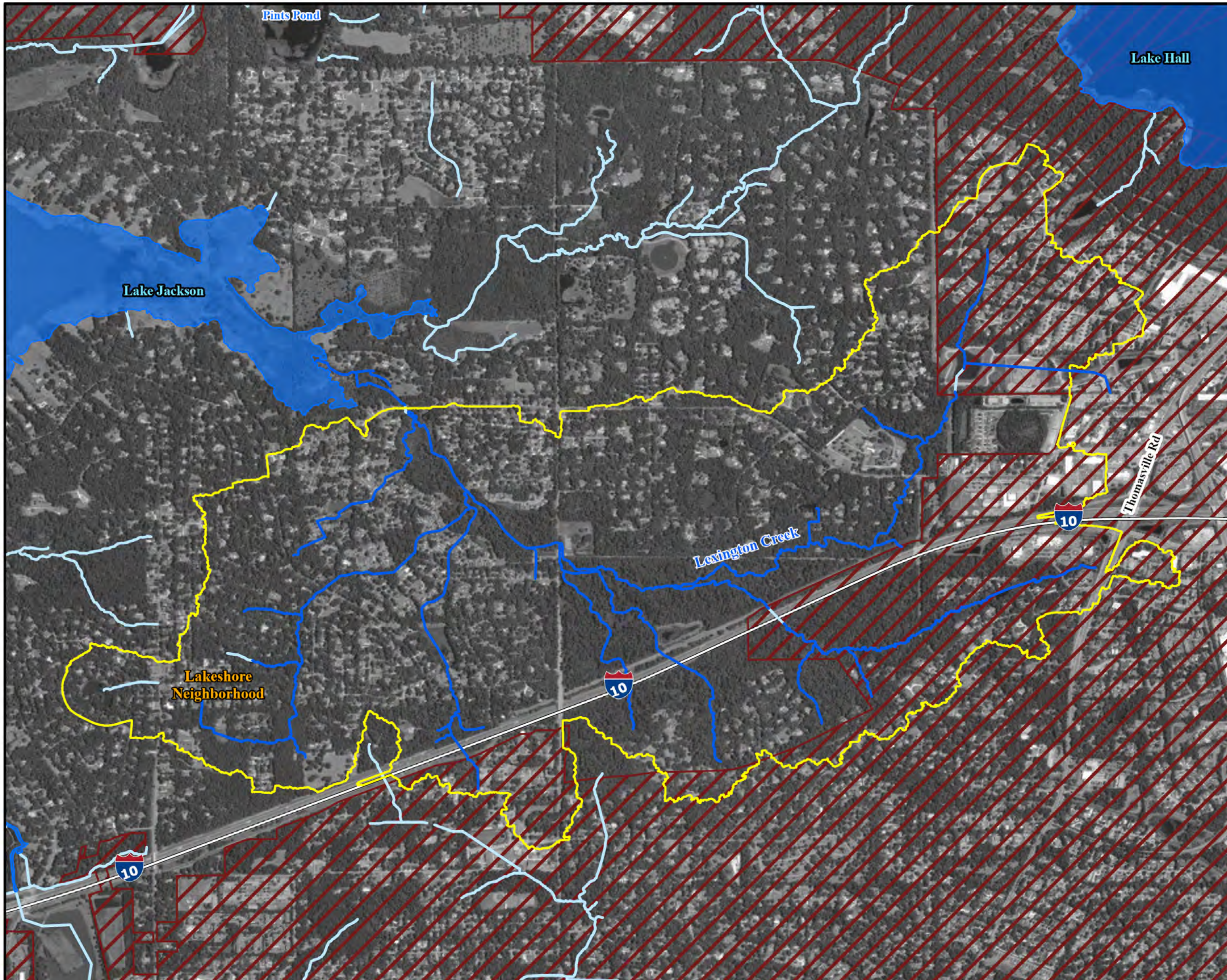
In response to concerns on FIB levels in Lexington Creek, beginning in March 2019, the City performed maintenance activities on the sanitary sewer system to alleviate concerns with inflow/infiltration in proximity to Lexington Creek. As part of this work, 156 manholes and more than 4,500 linear feet of clay pipe within the service area surrounding Lexington Creek were lined.

4.9.2 Regulatory Status

Exhibit 4-2 presented the verified impaired waters within the overall Lake Jackson basin. Presently, Lexington Creek is verified impaired for *E. coli*. This is the only verified listing for Lexington Creek.

4.9.3 Waterbody Data Review and Summary

This section presents an overview of available data and data sources for Lexington Creek and the Lexington Creek basin, including land use, soils, septic systems, hydrologic measurements, surface water quality, groundwater quality, biological, stormwater treatment facilities, and atmospheric deposition.



CITY OF TALLAHASSEE

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Miles

Legend

- Lexington Creek Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-150:
Lexington Creek Drainage Basin Overview

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

4.9.3.1 Land Use

Figure 4-151 presents a map of the Level 2 land uses within the Lexington Creek basin. A table is provided to show the overall acreages and percent cover. Tables are provided for both the Level 2 and grouped Level 1 land uses. The largest land use within the Lexington Creek basin per the grouped Level 1 categories is Urban and Built Up (69 percent). This is made up primarily of Low Density Residential with some Medium Density Residential. There is a cluster of Commercial land use in the headwaters of the drainage basin in the area where Timberlane Road and Thomasville Road meet.

4.9.3.2 Soils

The most prevalent soil group in the Lexington Creek basin is Group B (64 percent) (**Figure 4-152**). Group B soils are considered to have moderate rates of infiltration. The second highest soil group is Group A/D (18 percent), which has low rates of infiltration due to a high-water table. There is also a significant area of Group C soils, which have moderate rates of infiltration.

4.9.3.3 Septic Systems

An estimated 594 septic systems are within the boundaries of the Lexington Creek drainage basin (**Figure 4-153**). The systems are located in specific clusters, including portions of the Lakeshore neighborhood and other neighborhoods to the southwest of Lakeshore Drive, various neighborhoods north of the creek along Timberlane Road, and a small cluster south of I-10.

4.9.3.4 Hydrologic Data

There is a single stage and flow station located along Lexington Creek where it crossed Meridian Road (Station 008454). The station location is shown on **Exhibit 4-6**. The flow data from this station was presented and discussed in **Section 4.4.3.6** for Lake Jackson.

4.9.3.5 Surface Water Quality Data

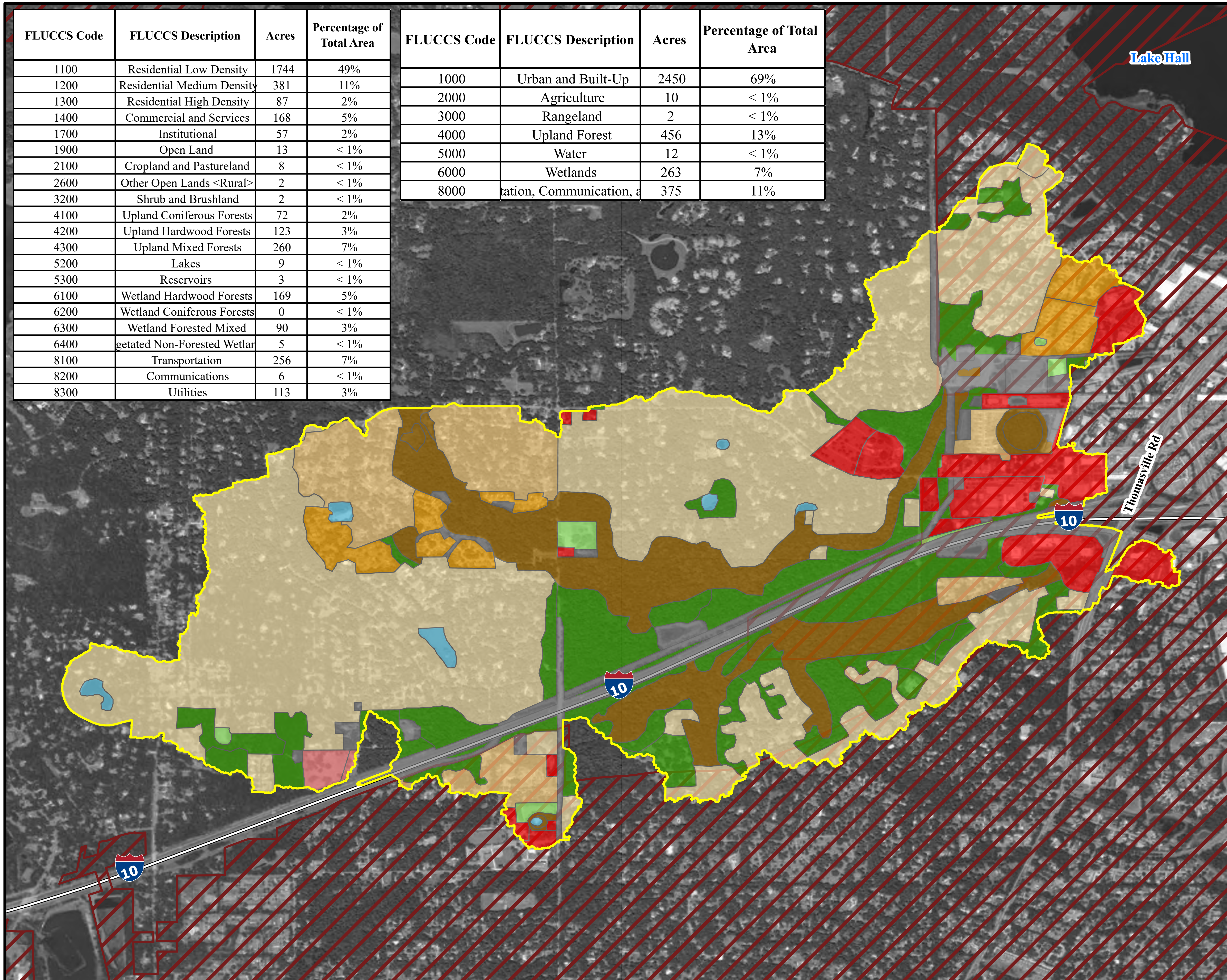
The IWR dataset for the Lexington Creek drainage basin spans from 1996 to 2020 and includes data collected by FWC, FDEP and Leon County (**Figure 4-154**). A table is provided in **Figure 4-154** that shows the ID, station name, period of record, sample count, and data source. Based on the number of stations and the length of the station IDs, station IDs were not included on the figure, rather each of the stations is given a number and the numbers correspond to stations in the table.

The data collected prior to 2001 was from a single station (#1) located in an upstream portion of the basin. The primary location with continuous measurements is just upstream of where the creek flows into Fords Arm (#5, #6, and #7). These data were collected by Leon County and FDEP. At this site, data are available from 2005 to the present. The other locations throughout the basin were sampled for short discrete periods by FDEP.

Figure 4-155 and **Figure 4-156** present plots of the TN and TP data, respectively, from 2010 to 2020. Examination of the data shows TN and TP levels slightly decreasing during that period. There was a significant outlier point in 2012 which was from an event sampled by Leon County that was described earlier.

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1100	Residential Low Density	1744	49%
1200	Residential Medium Density	381	11%
1300	Residential High Density	87	2%
1400	Commercial and Services	168	5%
1700	Institutional	57	2%
1900	Open Land	13	< 1%
2100	Cropland and Pastureland	8	< 1%
2600	Other Open Lands <Rural>	2	< 1%
3200	Shrub and Brushland	2	< 1%
4100	Upland Coniferous Forests	72	2%
4200	Upland Hardwood Forests	123	3%
4300	Upland Mixed Forests	260	7%
5200	Lakes	9	< 1%
5300	Reservoirs	3	< 1%
6100	Wetland Hardwood Forests	169	5%
6200	Wetland Coniferous Forests	0	< 1%
6300	Wetland Forested Mixed	90	3%
6400	getated Non-Forested Wetlar	5	< 1%
8100	Transportation	256	7%
8200	Communications	6	< 1%
8300	Utilities	113	3%

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1000	Urban and Built-Up	2450	69%
2000	Agriculture	10	< 1%
3000	Rangeland	2	< 1%
4000	Upland Forest	456	13%
5000	Water	12	< 1%
6000	Wetlands	263	7%
8000	tation, Communication, a	375	11%



CITY OF TALLAHASSEE

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Miles

Legend

Lexington Creek Drainage Basin

Land Use Type

- 1100: Residential Low Density
- 1200: Residential Medium Density
- 1300: Residential High Density
- 1400: Commercial and Services
- 1700: Institutional
- 1900: Open Land
- 2100: Cropland and Pastureland
- 2600: Other Open Lands <Rural>
- 3200: Shrub and Brushland
- 4100: Upland Coniferous Forests
- 4200: Upland Hardwood Forests
- 4300: Upland Mixed Forests
- 5200: Lakes
- 5300: Reservoirs
- 6100: Wetland Hardwood Forests
- 6200: Wetland Coniferous Forests
- 6300: Wetland Forested Mixed
- 6400: Vegetated Non-Forested Wetlands
- 8100: Transportation
- 8200: Communications
- 8300: Utilities

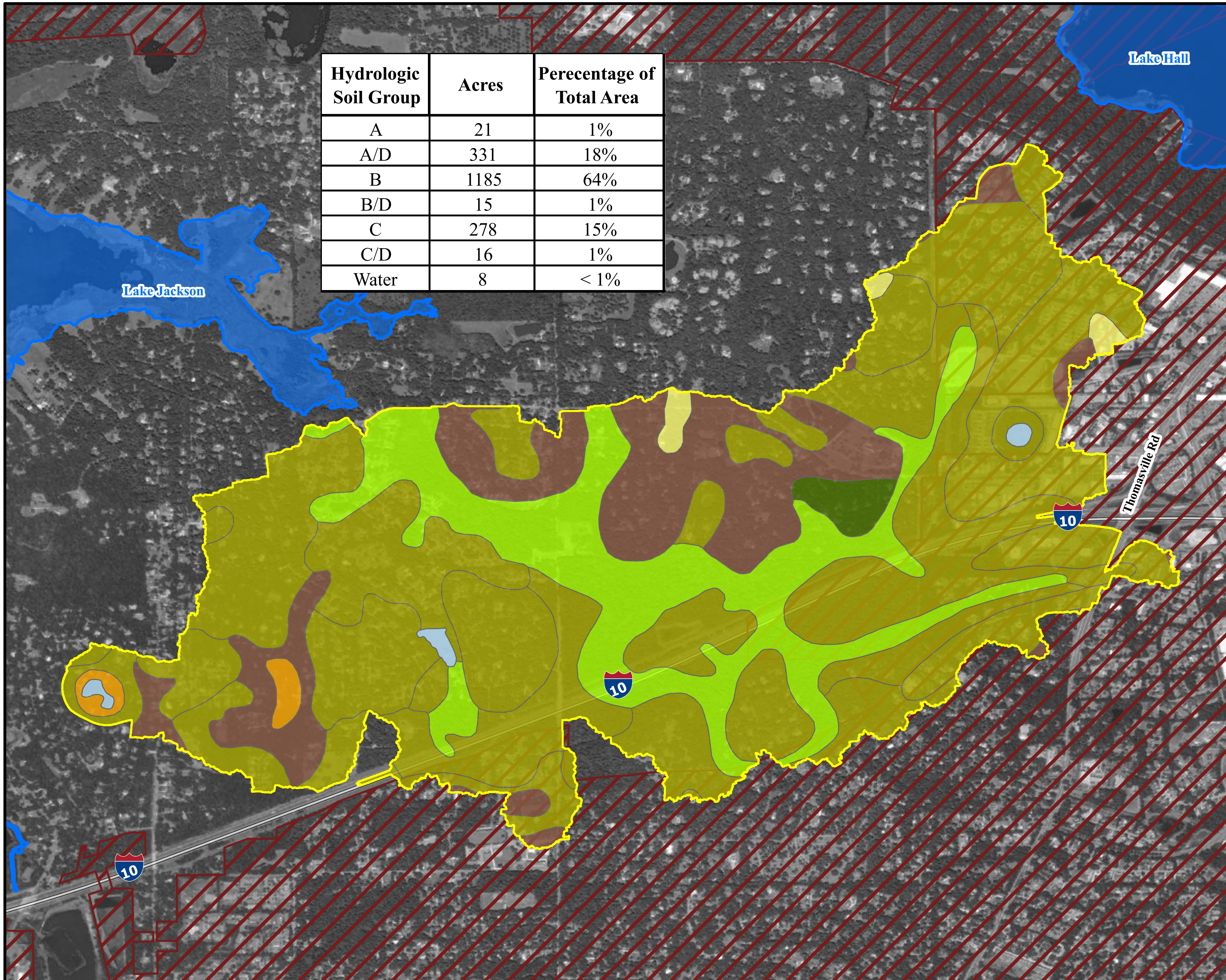
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Land Use: NWFWMD, 2019

Figure 4-151:
Lexington Creek Basin Land Use

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Hydrologic Soil Group	Acres	Perecentage of Total Area
A	21	1%
A/D	331	18%
B	1185	64%
B/D	15	1%
C	278	15%
C/D	16	1%
Water	8	< 1%



CITY OF TALLAHASSEE

N

0 0.3

Miles

Legend

- Lexington Creek Drainage Basin
- Waterbodies in Study
- Tallahassee Corporate Limits

Hydrologic Soil Group

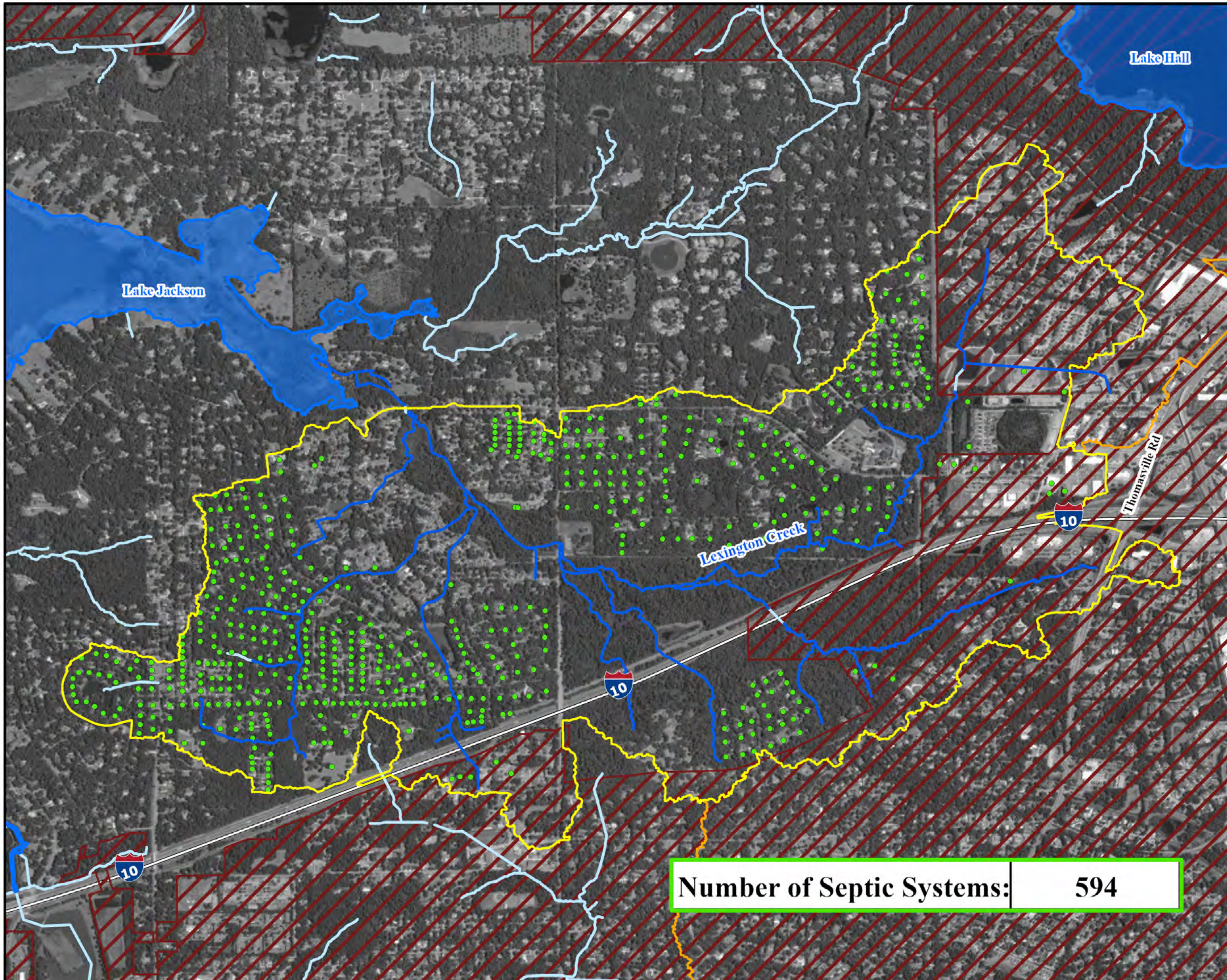
- A
- A/D
- B
- B/D
- C
- C/D
- Water

Sources:
Waterbodies: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Soils: NRCS, 2020

Figure 4-152:
Lexington Creek Basin Soils

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants



CITY OF TALLAHASSEE

N

0 0.32

Miles

Legend

- Lexington Creek Drainage Basin
- Lexington Creek
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Septic Systems

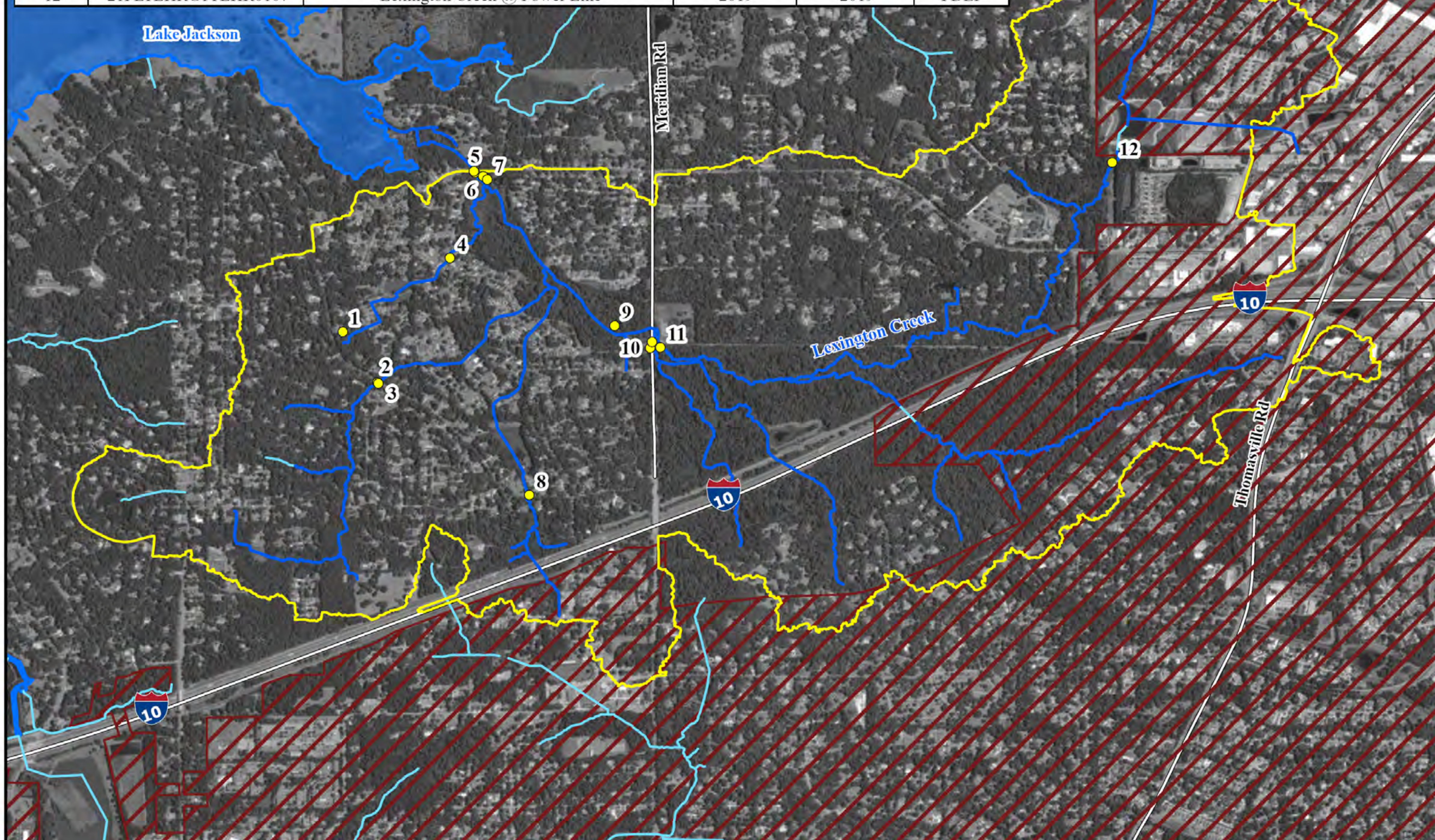
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Septic Systems: COT, 2022

Figure 4-153: Lexington Creek Drainage Basin Septic Systems

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Number	StationID	StationName	Start of Record	End of Record	Source
1	21FLGFWF03120003-LJ-02	Lake Jackson Station 2	1996	1999	FWC
2	21FLTLHRG1TLHR0108	Unnamed Branch @ Lakeshore Dr	2019	2019	FDEP
3	21FLWQA 302954908417159	Brookforest Trib at Lakeshore Dr	2001	2001	FDEP
4	21FLTLHRG1TLHR0105	Unnamed Branch @ John Hancock Dr	2019	2019	FDEP
5	21FLLEONLCLJ3050684284	Lexington Trib @ Timberlane Rd	2007	2019	Leon County
6	21FLTLHRG1TLHR0088	Lexington Creek @ Timberlane Rd	2018	2020	FDEP
7	21FLWQSPLEO122US	Lexington Trib At Timberlane Rd (WBID 758)	2005	2006	FDEP
8	21FLWQA 302939708416553	Yorktown Trib at Lakeshore Dr	2001	2001	FDEP
9	21FLTLHRG1TLHR0109	Lexington Creek 100m downstream n Meridian Rd	2019	2019	FDEP
10	21FLWQA 302959708416388	Lexington Trib at Meridian Rd (SR 155)	2001	2006	FDEP
11	21FLTLHRG1TLHR0106	Lexington Creek @ N Meridian Rd	2019	2019	FDEP
12	21FLTLHRG1TLHR0107	Lexington Creek @ Power Line	2019	2019	FDEP



CITY OF TALLAHASSEE

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
WQ Stations: FDEP, 2022

Figure 4-154: Lexington Creek Water Quality Station Locations

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

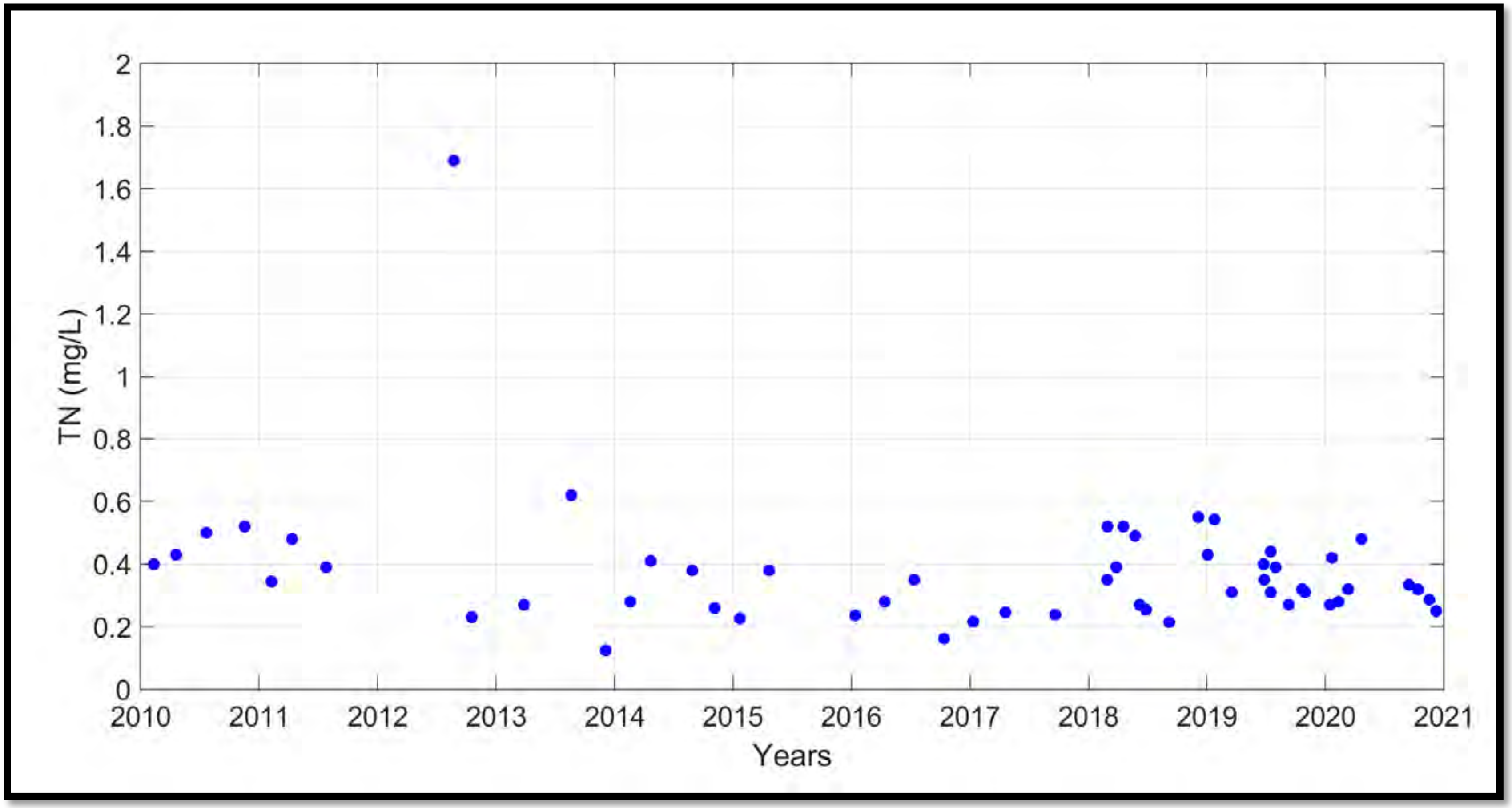


Figure 4-155: Plot of Measured TN

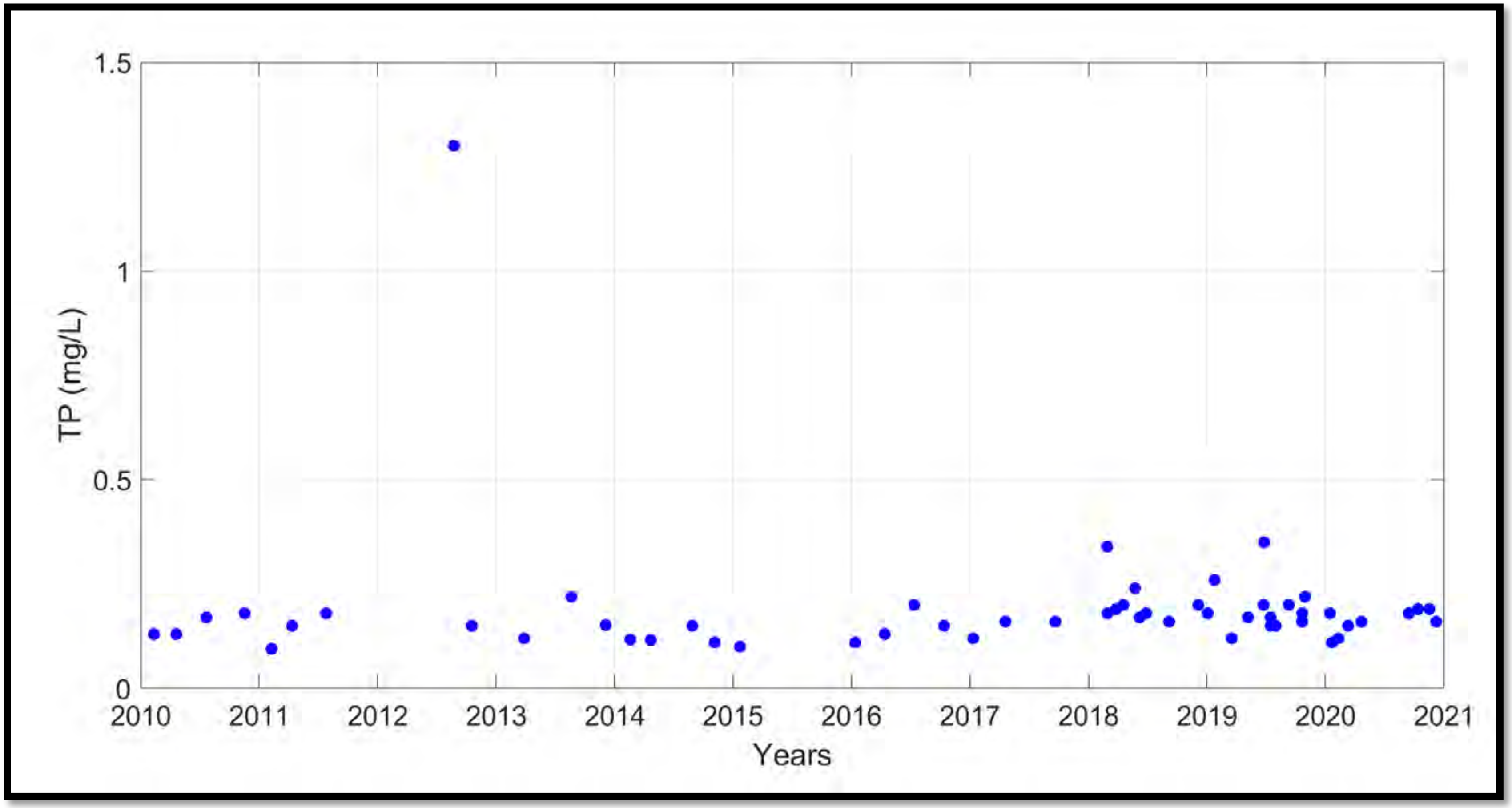


Figure 4-156: Plot of Measured TP

Under FDEP's NNC, the freshwater stream thresholds are 0.18 mg/L for TP and 1.03 mg/L for TN as AGMs. For *E. coli*, the freshwater stream criteria are monthly geometric means below 126 colonies per 100 mL of water and less than 10 percent of samples above 410 colonies per 100 mL of water in any 30-day period. For the purpose of determining FIB impairments where data are collected monthly, per 62-303 F.A.C., FDEP assesses all the samples collected through the verified period to determine the number of samples that are above the threshold. If the number of samples (based on the sample size) is greater than or equal to numbers provided in the tables within 62-303 (to provide 90 percent confidence), the waterbody is deemed impaired. The FDEP threshold for this analysis is 410 MPN/100 mL.

Figure 4-157 and **Figure 4-158** present plots of the TN and TP annual geomeans from 2010 to 2020 for all the data along the creek for years with sufficient samples. In addition to the geomeans, the NNC criteria are plotted as dashed lines on the graphs. The data show that TN geometric means are well below the NNC threshold for years with sufficient data. The TP annual geomeans are generally below the thresholds, with a number of years above the threshold. The TP annual geomeans were above the threshold for two consecutive years in 2018 and 2019. This aspect was noted by Leon County in its assessment of the waterbody (Leon County, 2019). In response to higher TP levels in the creek in recent years, concerns have been raised on sediment issues associated with the recently constructed stormwater treatment facility at the intersection of Lexington Creek and Meridian Road. This issue warrants further investigation.

Figure 4-159 presents a plot of the measured *E. coli* from all the stations from 2014 through 2020. The data are plotted with the 410 MPN/100 mL threshold (described earlier) as a dashed line. Examination of the data indicates that the 410 MPN/100 mL threshold was exceeded at times prior to 2018, but the more recent data show much greater exceedances, with measurements as high as 8,000 MPN/100 mL, with multiple samples above 1,000 MPN/100 mL.

As was noted previously, discrepancies in the measured data between FDEP and Leon County are significant and may impact the present FIB impairment status of the creek as outlined in **Section 4.9.2**. Based on review of the methodologies used in the data analyses, Leon County utilized the EPA methodology (EPA, 1603) that the water quality standards were based on. The

City notified FDEP of this issue in comments made on the Revised Draft Verified List of Impaired Waters in the Ochlockonee – St. Marks Basin (City, 2019). The differences cannot be explained based on timing of the sampling or based on sample locations (FDEP sampled a number of other locations along with the primary station) because samples collected at nearly coincident times and conditions showed distinctly different results. The City identified in its comments that the improvements to the sanitary sewer system in the area occurred in conjunction with Leon County sampling that showed improvements in the *E. coli* levels. The discrepancies can be seen in the Leon County data plotted in **Figure 4-159** in blue versus the FDEP data in red.

4.9.3.6 Groundwater Data

Presently there are no surficial groundwater monitoring wells identified within the Lexington Creek basin.

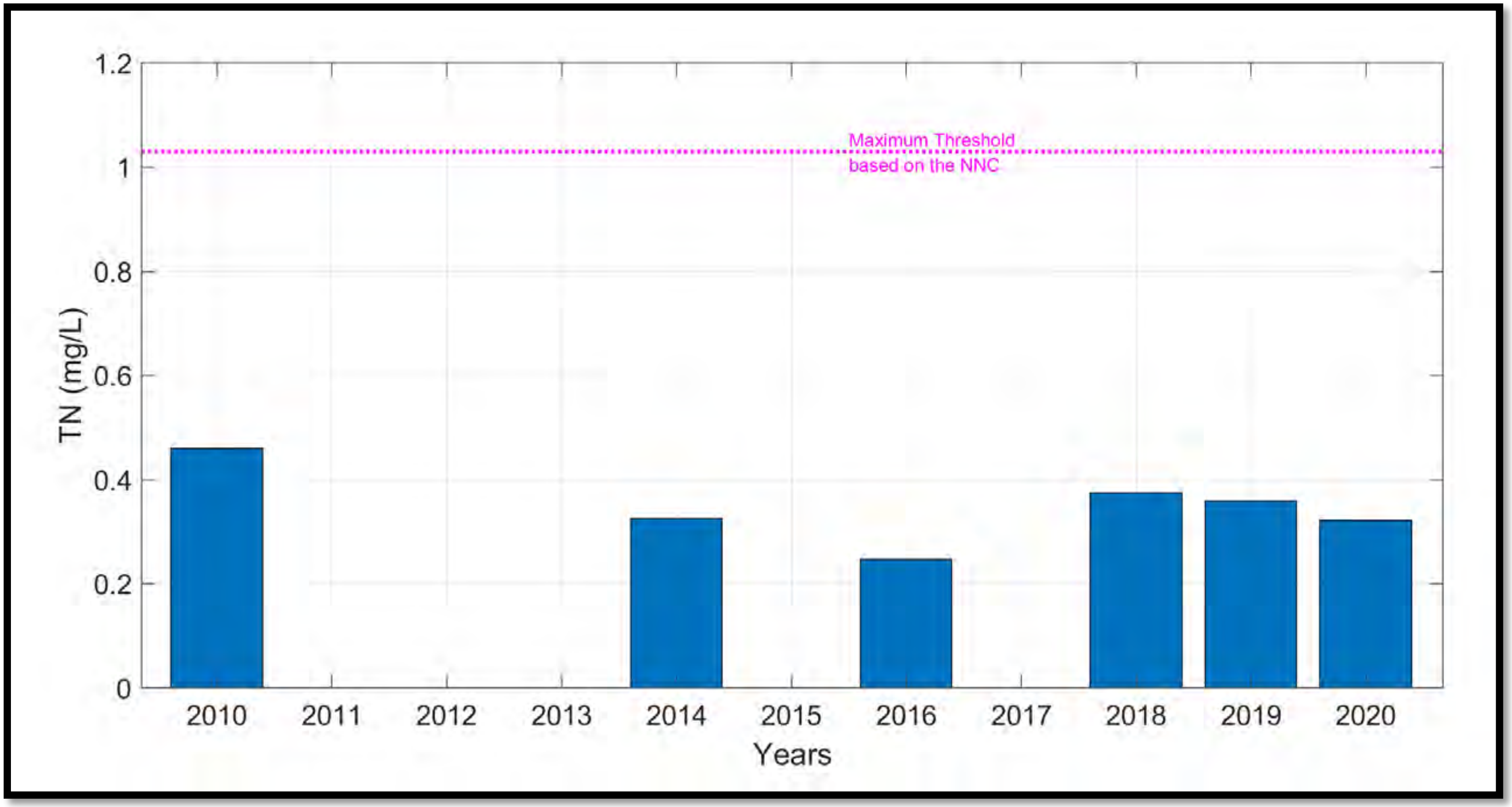


Figure 4-157: Plot of Annual Geometric Means for TN with NNC Criteria for Lexington Creek

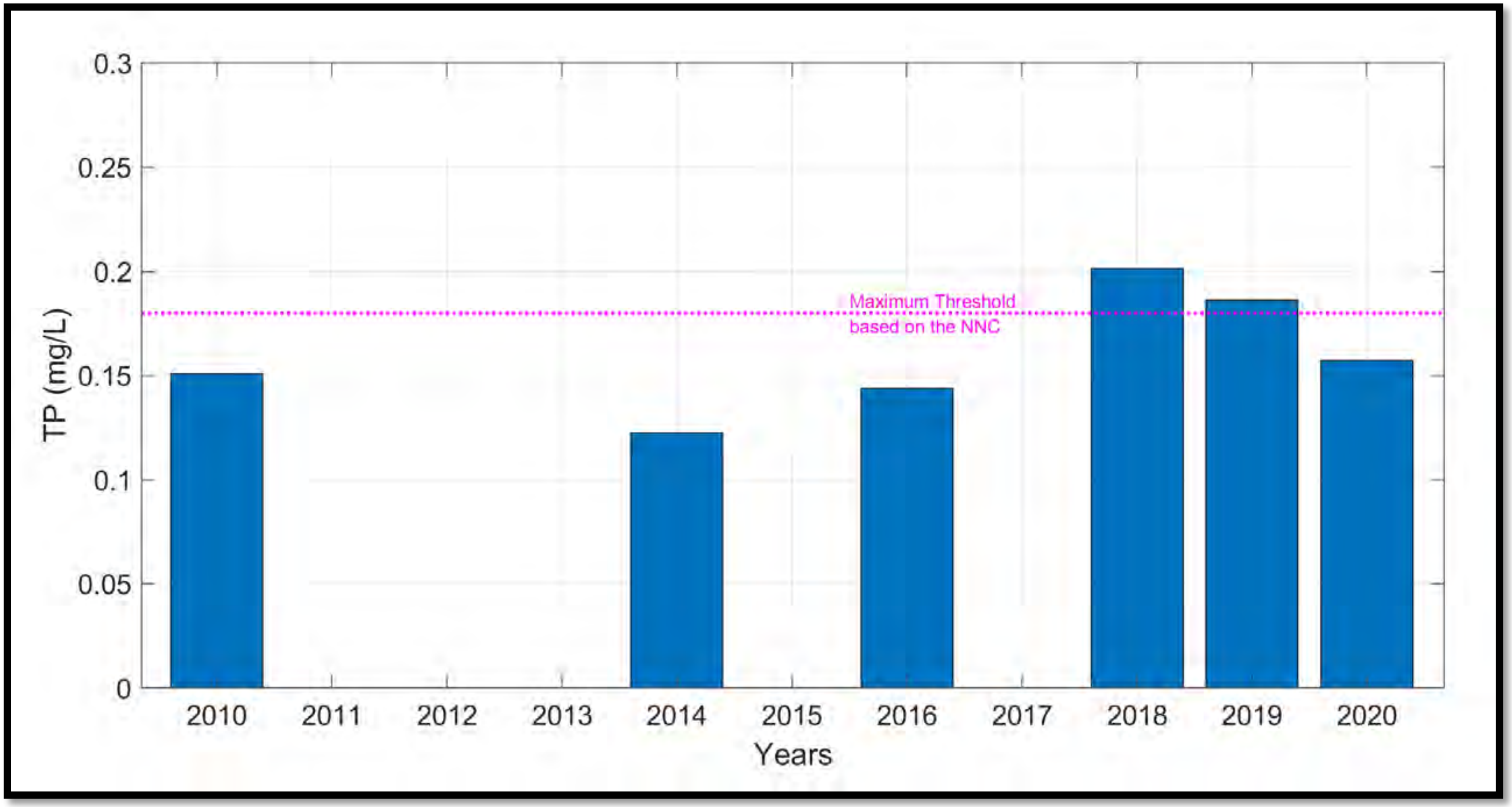


Figure 4-158: Plot of Annual Geometric Means for TP with NNC Criteria for Lexington Creek

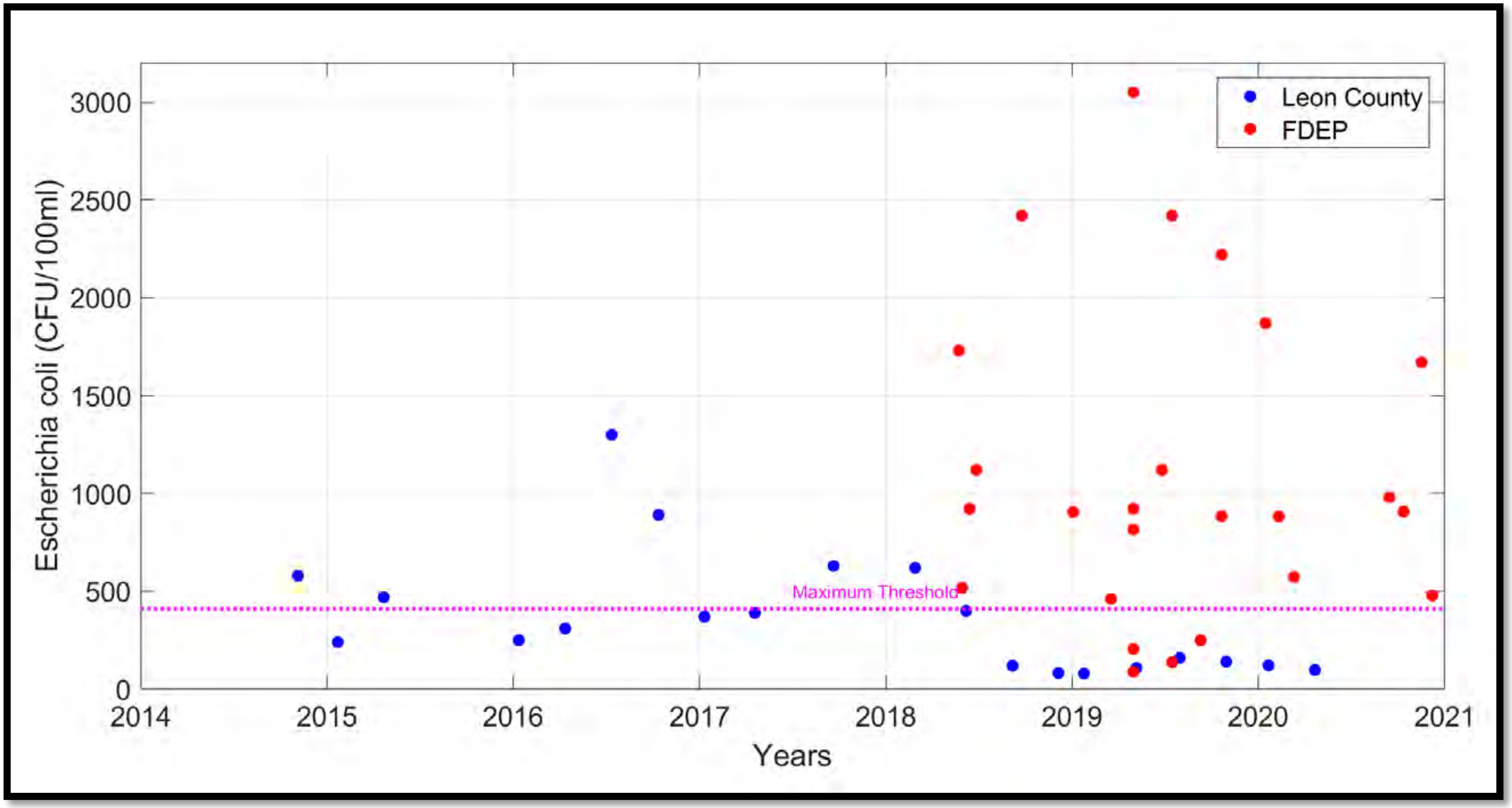


Figure 4-159: Plot of *E. coli* Measurements (2014 to 2020)(Leon County – blue, FDEP – red)

4.9.3.7 Biological Data

Biological data in Lexington Creek consists of SCI and habitat assessment (HA) conducted by Leon County and FDEP. **Table 4-23** presents SCI data collected on the creek. Data are available only from 2010 and 2018. The SCI score in 2010 was 33, whereas the two scores from 2018 were 35 and 42. A score above 39 represents healthy conditions. Therefore, the limited SCI determinations would indicate the system may not be healthy relative to taxa. The HA scores ranged from optimal to suboptimal and, based on the Leon County assessment in 2018, were identified as suboptimal overall (Leon County, 2019).

Table 4-23: Summary of SCI Results from Lexington Creek

Date	Station ID	SCI	Aquatic Life Use Category
8/20/2010	21FLLEONLCLJ3050684284	33	Impaired
4/18/2018	21FLTLHRG1TLHR0088	35	Impaired
10/30/2018	21FLLEON26	42	Healthy

4.9.3.8 Stormwater Treatment Facilities

Figure 4-160 presents a map showing the locations of stormwater treatment facilities throughout the Lexington Creek basin. Within the City incorporated areas on the eastern and southern edges of the basin, there are a number of City treatment ponds, along with some privately maintained ponds. These are a mixture of dry and wet ponds. FDOT maintains multiple wet detention facilities that provide treatment for waters draining off I-10. Leon County maintains a number of dry retention facilities (and one wet) on the edge of the riparian area of the creek to treat runoff from the adjacent neighborhoods. Leon County also maintains a large regional treatment facility (Yorktown Pond) within the basin (**Exhibit 4-1**). In 2018, Leon County constructed a stormwater facility where the creek crosses Meridian Road.

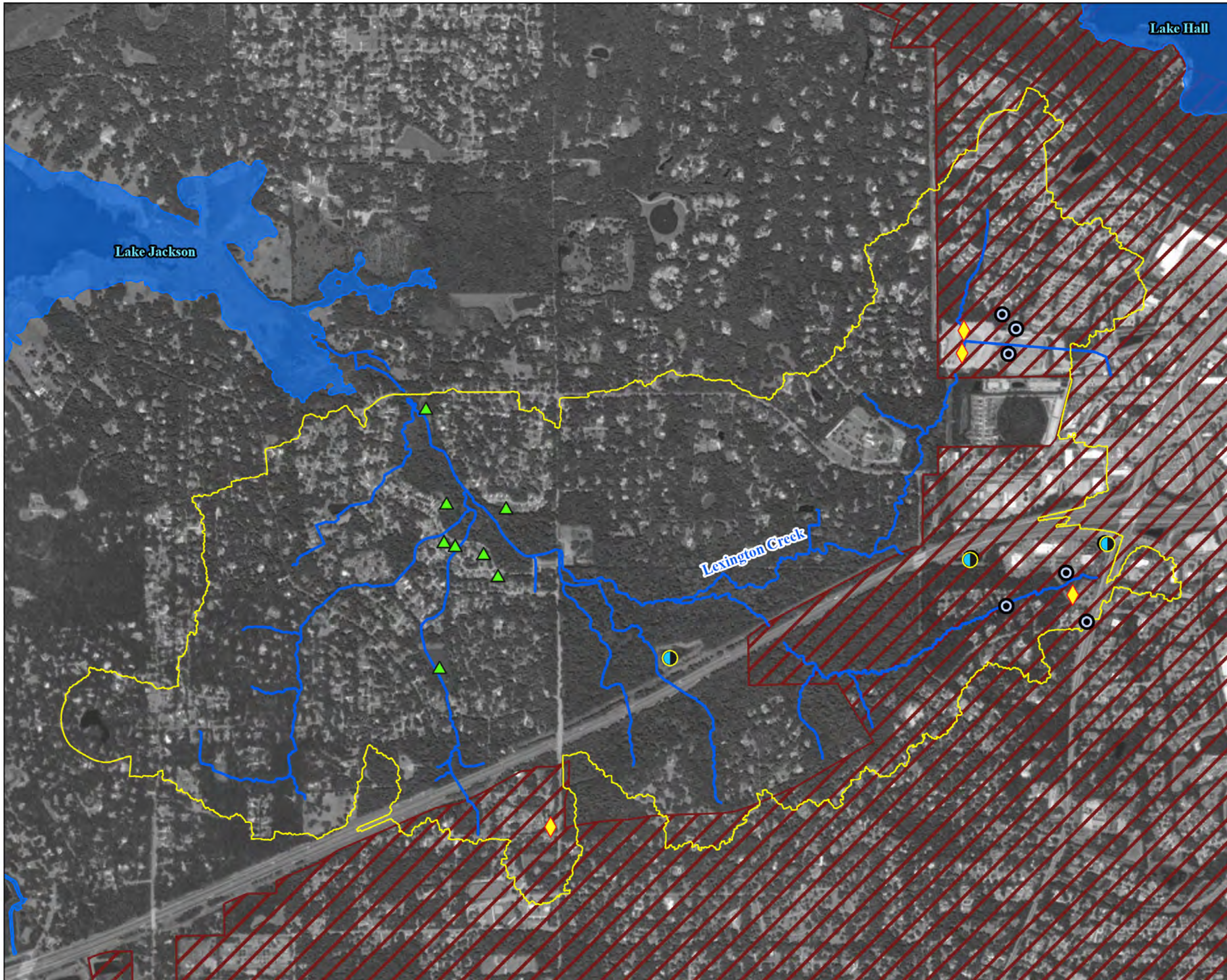
4.9.3.9 Atmospheric Deposition Data

As no lake waterbodies are included in the Lexington Creek basin, direct atmospheric deposition is not calculated but will be included in stormwater runoff calculations through land use based EMCs.

4.9.3.10 Data Summary

For the purposes of the qualitative analysis of sources of pollutants to Lexington Creek (**Section 4.9.4**), the available data are reasonable. There are sufficient active surface water quality stations at key locations within the creek to support the qualitative assessment. The following outlines a limitation in the available data. Specific recommendations on additional data collection efforts are provided in **Section 4.11**.

- A gage that was located on Lexington Creek was decommissioned in 2018, and may be beneficial to re-establish flow measurements on the creek.



CITY OF TALLAHASSEE

N

0 0.2

Miles

Legend

- Lexington Creek Drainage Basin
- Waterbodies in Study
- Tallahassee Corporate Limits
- City of Tallahassee Stormwater Ponds
- Leon County Stormwater Ponds
- FDOT Stormwater Ponds
- Stormwater Ponds (Other)

Sources:
Flowlines: USGS, 2020
Subbasins: Geosyntec, 2023
Roads: COT-Leon County, 2023
BMPs: Geosyntec, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-160:
Lexington Creek Basin BMPs

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

4.9.4 Qualitative Assessment of Sources

As outlined in previous sections, prior to performing loading calculations and other analyses to quantify existing pollutant sources to Lexington Creek, it is important to analyze available data and summarize findings from historical studies to support identification of likely sources.

For Lexington Creek, the sources to be evaluated include the following:

- Stormwater runoff
- Septic systems
- Internal recycling and seepage
- Wastewater
- Atmospheric deposition
- Interconnected flows

4.9.4.1 In-Stream Water Quality

Following the methodology utilized for the lakes, analyses were conducted on the available stream data from 2010 to the present. This provides an evaluation of the baseline water quality conditions and the spatial differences along the creek (where data support a spatial assessment). The parameters analyzed include TP, TN, TSS, and *E. coli*.

As was done for the lakes, stations were clustered where they represent conditions within a specific area. The clustered data from 2010 to the present were analyzed to provide the average of the annual geomeans or the 90th percentile, depending upon the parameter. The results are then presented on a map with colors representing the results. The levels associated with the colors are reflective of water quality thresholds as outlined in 62-302 F.A.C. for the freshwater stream criteria. For the parameters with freshwater stream criteria (TN, TP, and *E. coli*), the transition between orange and red was set at the criteria. The remaining transition levels are set at even increments from the criteria down to zero. For the parameters without a freshwater stream criteria, the ranges were set at levels that represent reasonable ratios to the total values and match ranges presented for the other stream data.

Figure 4-161 presents the data clustering used for the analyses and associated stations. For Lexington Creek, data from 2010 through 2020 were available at two locations along the main stem. One cluster is located along the main stem near where it crosses Meridian Road. The second cluster is located further downstream, where the creek crosses Timberlane Road just upstream of the discharge to Fords Arm. The upstream station only had data from 2019 whereas the downstream station had a complete data set from 2010 to 2020. As such, intercomparison between the two locations needs to take this into account. Any stations with data after 2010 were utilized in the analyses.

Cluster	Station	Start Year	End Year
C	21FLTLHRG1TLHR0106	2019	2019
	21FLTLHRG1TLHR0109	2019	2019
W	21FLLEONLCLJ3050684284	2007	2019
	21FLTLHRG1TLHR0088	2018	2020

CITY OF TALLAHASSEE

N

0 0.18

Miles

Legend

- Lexington Creek
- Waterbodies in Study
- Stream Station Clusters

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-161:
Station Clustering for Lexington Creek

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Figure 4-162 and **Figure 4-163** present the TN and TP results. Looking first at the TP shows higher average levels, with the average for the upstream station (only from 2019) showing above the threshold. This is consistent with the AGM plots presented in **Section 4.9.3.3**, where it showed 2019 as above the threshold. As such, the spatial variation between the two stations most likely is reflective of the time frames of the data rather than a true spatial difference. In contrast, TN levels are low within the creek at both stations.

Figure 4-164 presents a map of the TSS levels. The measured TSS levels are high in relation to values seen in other tributaries around the basin, with average levels above 10 mg/L at the cluster just before the discharge to Fords Arm. This location had the highest TSS levels of any of the tributaries analyzed in previous sections within the Lake Jackson basin.

Figure 4-165 presents a map of the *E. coli* levels. The data analyzed are from 2014 through 2020 and the data were analyzed to provide the 90th percentile to compare against the 410 MPN/100 mL criteria per the FDEP approach in the IWR analyses. The analyses show that both stations when analyzed using the full dataset show results above the 410 MPN/100 mL threshold. This determination needs to be qualified based on the data discrepancy between the FDEP and the Leon County monitoring that was discussed in **Section 4.9.3.3**. If the FDEP data were excluded, the conclusion would be different. This data discrepancy issue must be resolved as part of future assessment of FIB issues in Lexington Creek.

4.9.4.2 Stormwater Runoff

To assess stormwater runoff as a potential source of pollutant loads to Lexington Creek and, ultimately, to Fords Arm in Lake Jackson, the first step was to evaluate the LDI levels within the Lexington Creek basin. In **Section 4.4.4.2**, LDI values were presented by subbasin in **Figure 4-24**. The map showed that the LDI level in Lexington Creek basin is moderate, indicating potential for pollutant loading from stormwater runoff. The data, at present, indicate potential issues with TP levels in the creek (trend and threshold exceedance), as well as higher TSS levels. These conditions collectively indicate stormwater runoff for Lexington Creek should be a focus for additional quantitative assessment. It should be noted that a number of projects have been initiated in recent years to deal with stormwater runoff in Lexington Creek, including the Lexington Creek Meridian Road stormwater facility and work in the Market District in the upper reaches of the basin.

4.9.4.3 Septic Systems

Figure 4-153 presented the locations of septic systems within the Lexington Creek basin. **Figure 4-31** presented a map showing the septic tank densities by subbasin for the full Lake Jackson basin, including the Lexington Creek basin. The septic tank density in the Lexington Creek basin is above the overall median for the full Lake Jackson basin. Additionally, albeit qualified based on issues of data discrepancy, *E. coli* levels are also elevated. This indicates that septic systems may be a potential source of pollutant loading, although this may change after the data issues are resolved.

Cluster	Start Year	End Year
C	2019	2019
W	2010	2020

CITY OF TALLAHASSEE

N

0 0.18
Miles

Legend

- Lexington Creek
- Waterbodies in Study

TN Average 2010-2020 mg/L

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75- 1.03
- > 1.03

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-162:
Spatial Assessment of TN in Lexington Creek

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Cluster	Start Year	End Year
C	2019	2019
W	2010	2020

CITY OF TALLAHASSEE

N

0 0.18

Miles

Legend

Lexington Creek

Waterbodies in Study

TP Average 2010-2020

mg/L

0 - 0.045

0.045 - 0.090

0.090 - 0.135

0.135 - 0.180

> .18

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-163:
Spatial Assessment of TP in Lexington Creek

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Cluster	Start Year	End Year
C	2019	2019
W	2010	2020

CITY OF TALLAHASSEE

N

0 0.18

Miles

Legend

Lexington Creek

Waterbodies in Study

TSS Average 2010-2020

mg/L

- 0- 2.5
- 2.5 - 5.0
- 5.0 - 7.5
- 7.5- 10
- > 10

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-164: Spatial Assessment of TSS in Lexington Creek

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

Cluster	Start Year	End Year
C	2019	2019
W	2010	2020

CITY OF TALLAHASSEE

N

0 0.18

Miles

Legend

Lexington Creek

Waterbodies in Study

E. coli 90th Percentile 2010-2020

MPN/100mL

0 - 100

100 - 200

200 - 300

300 - 410

> 410

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-165:
Spatial Assessment of E. coli in Lexington Creek

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

4.9.4.4 Internal Recycling and Seepage

Internal Recycling

No lakes are included in the waterbodies evaluated in the Lexington Creek basin, so internal sediment loading is not evaluated.

Seepage

As outlined in **Section 4.9.3.6**, there are no surficial aquifer sampling sites identified within the Lexington Creek basin to provide potential for seepage to contribute to the loading to the creek. It should be noted that based on the soil types in this basin, sub-surface transmissivity levels are expected to be low, impeding transport of pollutants through seepage.

4.9.4.5 Wastewater

Within the Lexington Creek basin, there currently are no direct wastewater discharges. Additionally, no areas in the Lake Jackson basin presently have reuse discharges. **Figure 4-32** presented a map of the Lake Jackson basin boundaries and subbasins in relation to sewer service areas and sewer infrastructure. Presently, 43 percent of the Lexington Creek basin has sewer infrastructure, and some of this infrastructure is located adjacent to the creek. As noted previously, significant efforts were undertaken in 2019 to line the sewer infrastructure in the area of the creek, reducing the potential for leakage as a source. This activity coincided with a drop in *E. coli* measurements by Leon County in more recent years (although per FDEP data, levels are still high). Based on data discrepancy issues, and the resultant uncertainty created, wastewater should be considered as a potential source for this basin.

4.9.4.6 Atmospheric Deposition

No lakes are included in the waterbodies evaluated in the Lexington Creek basin, so direct atmospheric loads are not considered.

4.9.4.7 Interconnected Flows

No lakes are located upstream that discharge directly to Lexington Creek, therefore interconnected loads are not a source for the stream.

4.9.4.8 Summary of Findings

Based on these discussions and data and information presented in **Section 4.9.3**, there are various potential sources of pollutant loads to Lexington Creek and downstream into Fords Arm. These are identified based upon elevated water quality measurements for TP and FIB.

Stormwater runoff contributing to tributary inflow and septic appear significant and are quantified as part of this study. Wastewater loads due to infrastructure leakage are not quantified, due to data limitations, but may warrant further evaluation as part of future studies.

4.9.5 Calculation of Potential Nutrient Loads

This section presents calculations of potential nutrient (TN and TP) loads to Lexington Creek for the sources identified for calculation in **Section 4.6.4.8**. These include stormwater runoff and septic systems. Where loads were not calculated, the sections below provide brief discussions.

The load calculations are for the purpose of comparing the potential magnitudes of each source relative to one another to support determination of sources to target for load reduction.

4.9.5.1 Stormwater Pollutant Load

To calculate the stormwater TN and TP loads to Lexington Creek, average annual pollutant load modeling was performed. The goal was to identify outfalls that are contributing higher TN and TP loads relative to one another and to quantify the total TN and TP loads to Lexington Creek. TN and TP loads were calculated using the SIMPLE-Seasonal model. The model methodology was described in detail in **Section 4.4.5.1** for the stormwater loads to Lake Jackson.

Figure 4-166 presents the subbasins and the DEM utilized in the SIMPLE model calculations for Lexington Creek. **Figure 4-167** presents the aggregated land use. Finally, **Figure 4-168** presents the CDAs for the Lexington Creek stormwater loading to define total and per acre TN and TP loads, as well as the ranking of CDAs throughout the subbasin.

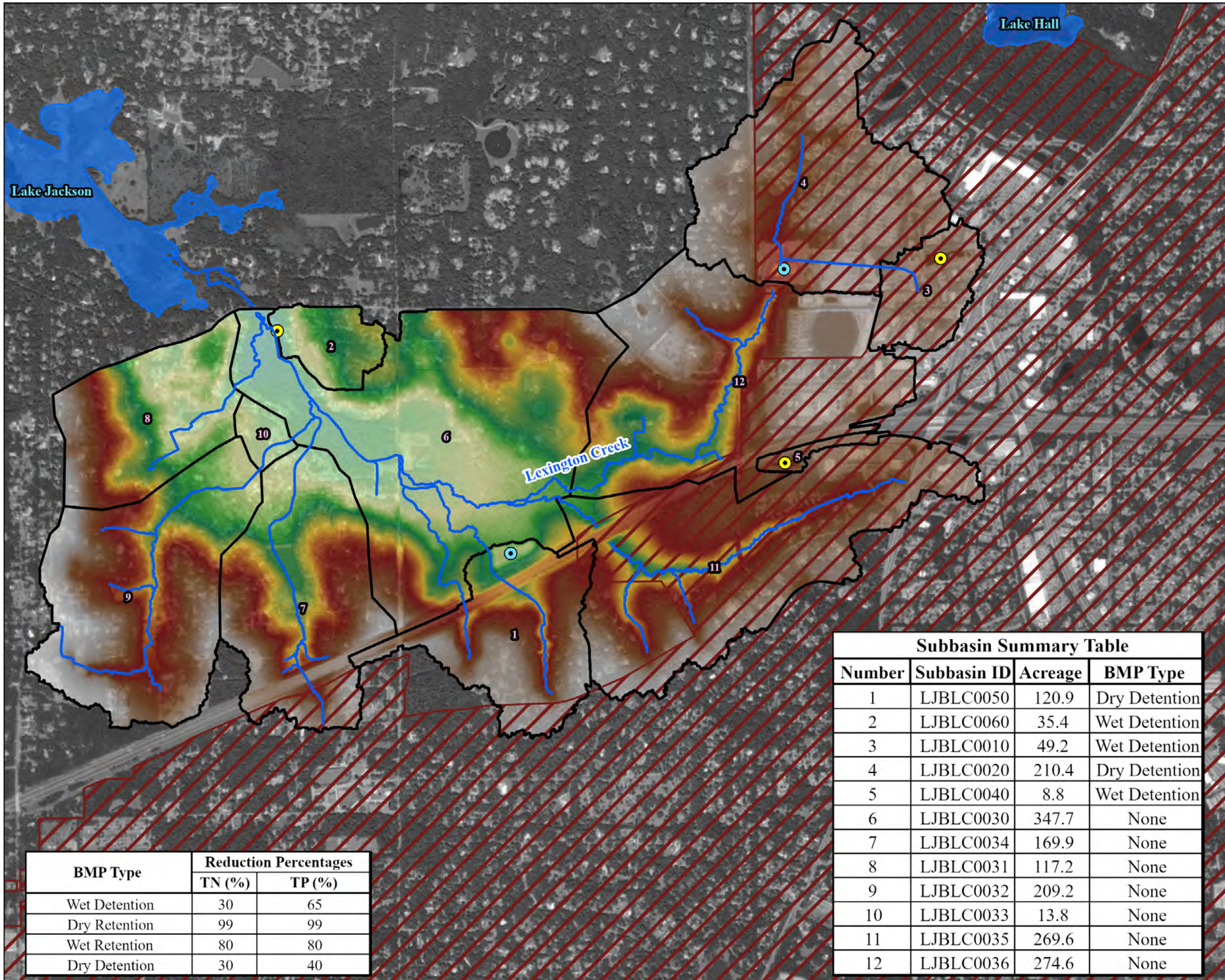
<u>Stormwater Nutrient Loads to Lexington Creek</u>

Figure 4-169 presents the distribution of the ranking of the CDAs for TN along with the total load and per acre loads (see the table on **Figure 4-169)**. The rankings are color coded with the highest ranked CDAs in dark green moving down to the lowest ranked in pale yellow. The calculated total stormwater TN loads from the CDAs ranged from as low as 112.6 lb/yr up to 1,713.4 lb/yr. The per acre loads ranged from 1.2 lb/acre/yr up to 3.2 lb/acre/yr. The highest ranked CDA is located in the upper reaches of Lexington Creek in an area with a high concentration of commercial, high density residential, and industrial land uses. Overall, the per acre loads throughout the CDAs are higher in relation to more natural areas, with the lowest in the area of low density residential on the southwestern side. The total potential stormwater runoff load for TN for Lexington Creek is 4,389 lb/yr.

Figure 4-170 presents the distribution of the ranking of the CDAs for TP along with the total load and per acre loads (see the table on **Figure 4-170**.) The calculated total stormwater TP loads from the CDAs ranged from as low as 15.3 lb/yr up to 326.3 lb/yr. The per acre loads ranged from 0.1 lb/acre/yr up to 0.6 lb/acre/yr. The TP shows similar results to those seen for TN, with the highest rank CDA in the upper reach of the creek and overall high per acre loads in most of the CDAs in comparison to natural areas in other waterbodies. The total potential stormwater runoff load for TP for Lexington Creek is 922 lb/yr.

4.9.5.2 Septic Load

To analyze the potential impacts from septic tank units to Lexington Creek, the SPIL method adopted by FDEP was utilized to quantify the potential septic load. The approach and calculations were described earlier in **Section 4.4.5.2** which presented the septic loading to Lake Jackson. As outlined earlier, the calculations were only done for nitrogen (TN), and based on literature on transport and assimilation, may represent a conservative potential load. It should be noted that the Lexington Creek load was included within the overall Lake Jackson septic loading.



Subbasin Summary Table			
Number	Subbasin ID	Acreage	BMP Type
1	LJBLC0050	120.9	Dry Detention
2	LJBLC0060	35.4	Wet Detention
3	LJBLC0010	49.2	Wet Detention
4	LJBLC0020	210.4	Dry Detention
5	LJBLC0040	8.8	Wet Detention
6	LJBLC0030	347.7	None
7	LJBLC0034	169.9	None
8	LJBLC0031	117.2	None
9	LJBLC0032	209.2	None
10	LJBLC0033	13.8	None
11	LJBLC0035	269.6	None
12	LJBLC0036	274.6	None

BMP Type	Reduction Percentages	
	TN (%)	TP (%)
Wet Detention	30	65
Dry Retention	99	99
Wet Retention	80	80
Dry Detention	30	40

CITY OF TALLAHASSEE

N

0 0.2

Miles

Legend

Lexington Creek

Waterbodies in Study

Subbasins

Tallahassee Corporate Limits

BMP Type

Dry Detention

Wet Detention

Topographic Elevations

ft NAVD88

255

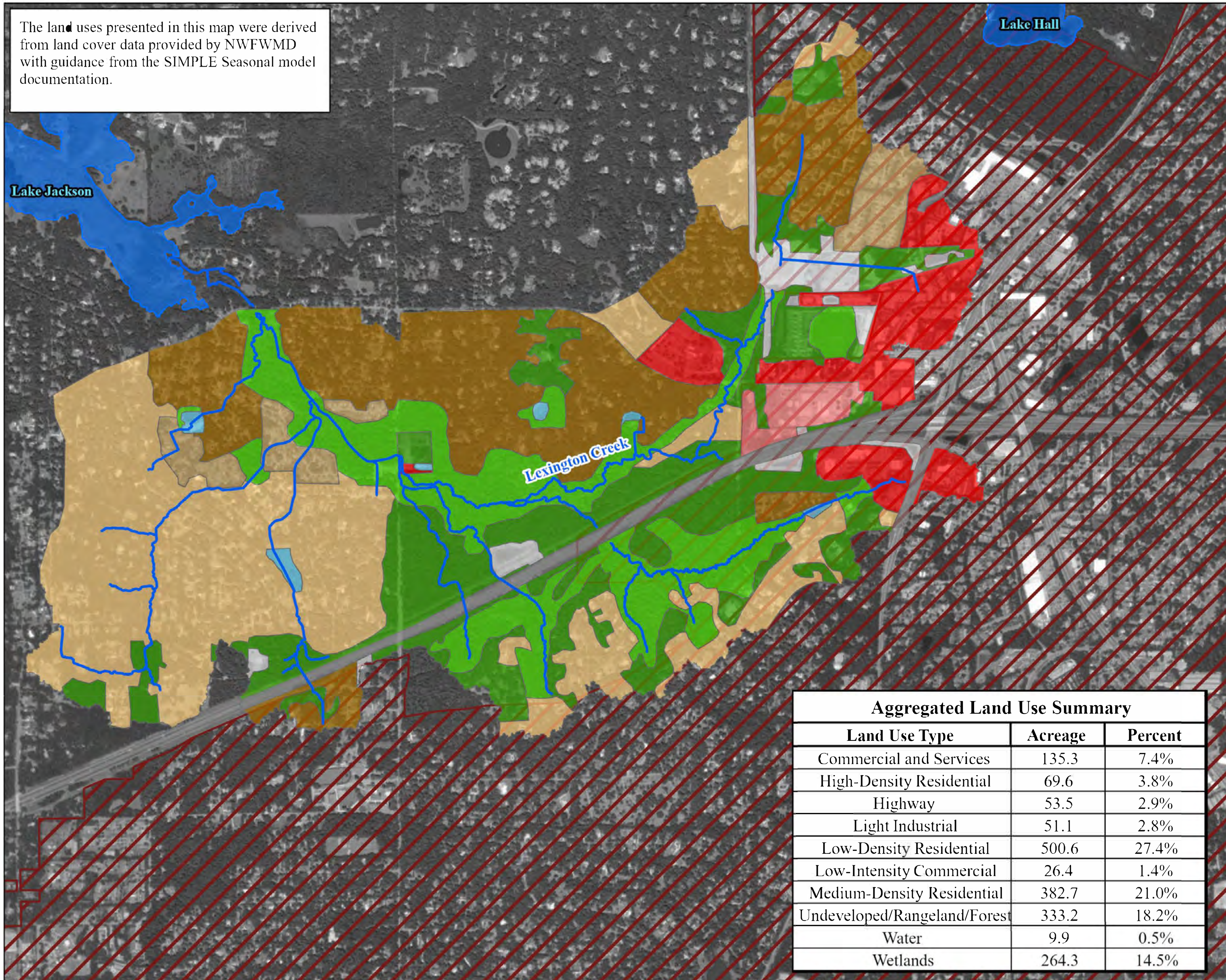
93

Sources:
Flowlines: USGS, 2020
Subbasins: Geosyntec, 2023
Roads: COT-Leon County, 2023
BMPs: Geosyntec, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

**Figure 4-166:
Lexington Creek Subbasin Delineation and BMPs**

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants



Aggregated Land Use Summary		
Land Use Type	**Acreage**	**Percent**
Commercial and Services	135.3	7.4%
High-Density Residential	69.6	3.8%
Highway	53.5	2.9%
Light Industrial	51.1	2.8%
Low-Density Residential	500.6	27.4%
Low-Intensity Commercial	26.4	1.4%
Medium-Density Residential	382.7	21.0%
Undeveloped/Rangeland/Forest	333.2	18.2%
Water	9.9	0.5%
Wetlands	264.3	14.5%

CITY OF TALLAHASSEE

N
0 0.2
Miles

Legend

- Lexington Creek
- Waterbodies in Study
- Tallahassee Corporate Limits

Aggregated Land Use

Land Use Type

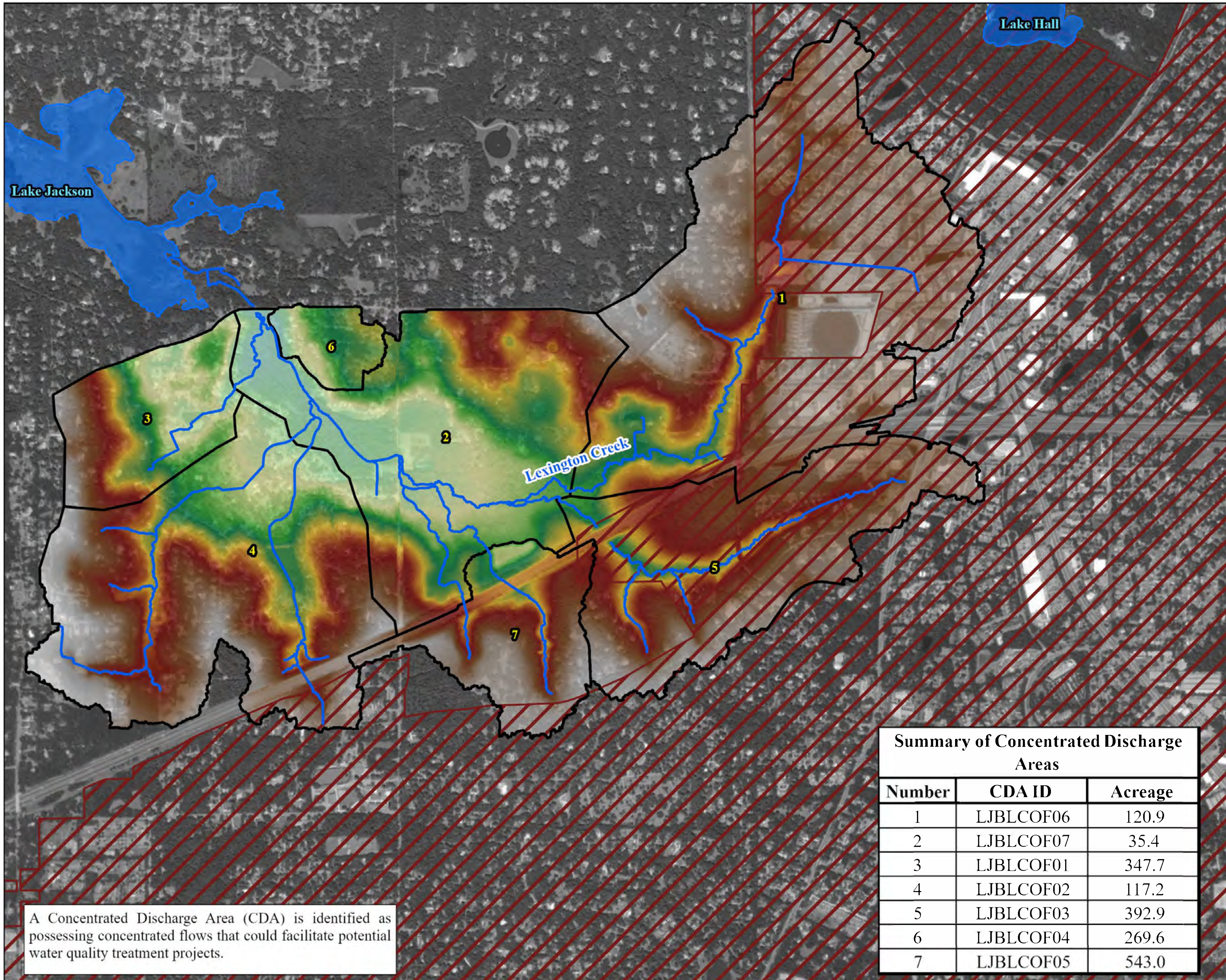
- Commercial and Services
- High-Density Residential
- Highway
- Light Industrial
- Low-Density Residential
- Low-Intensity Commercial
- Medium-Density Residential
- Undeveloped/Rangeland/Forest
- Water
- Wetlands

Sources:
Flowlines: USGS, 2020
Land Use: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-167:
Lexington Creek Aggregated Land Use

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants



A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.

Summary of Concentrated Discharge Areas

Number	CDA ID	Acreage
1	LJBLCOF06	120.9
2	LJBLCOF07	35.4
3	LJBLCOF01	347.7
4	LJBLCOF02	117.2
5	LJBLCOF03	392.9
6	LJBLCOF04	269.6
7	LJBLCOF05	543.0

CITY OF TALLAHASSEE

N

0 0.2

Miles

Legend

- Lexington Creek
- Waterbodies in Study
- Concentrated Discharge Areas
- Tallahassee Corporate Limits

Topographic Elevations
ft NAVD88
255
93

Sources:
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits. COT, 202

Figure 4-168:
Lexington Creek Concentrated Discharge Areas

Tallahassee Master Plan - Surface Water (TMaPS)

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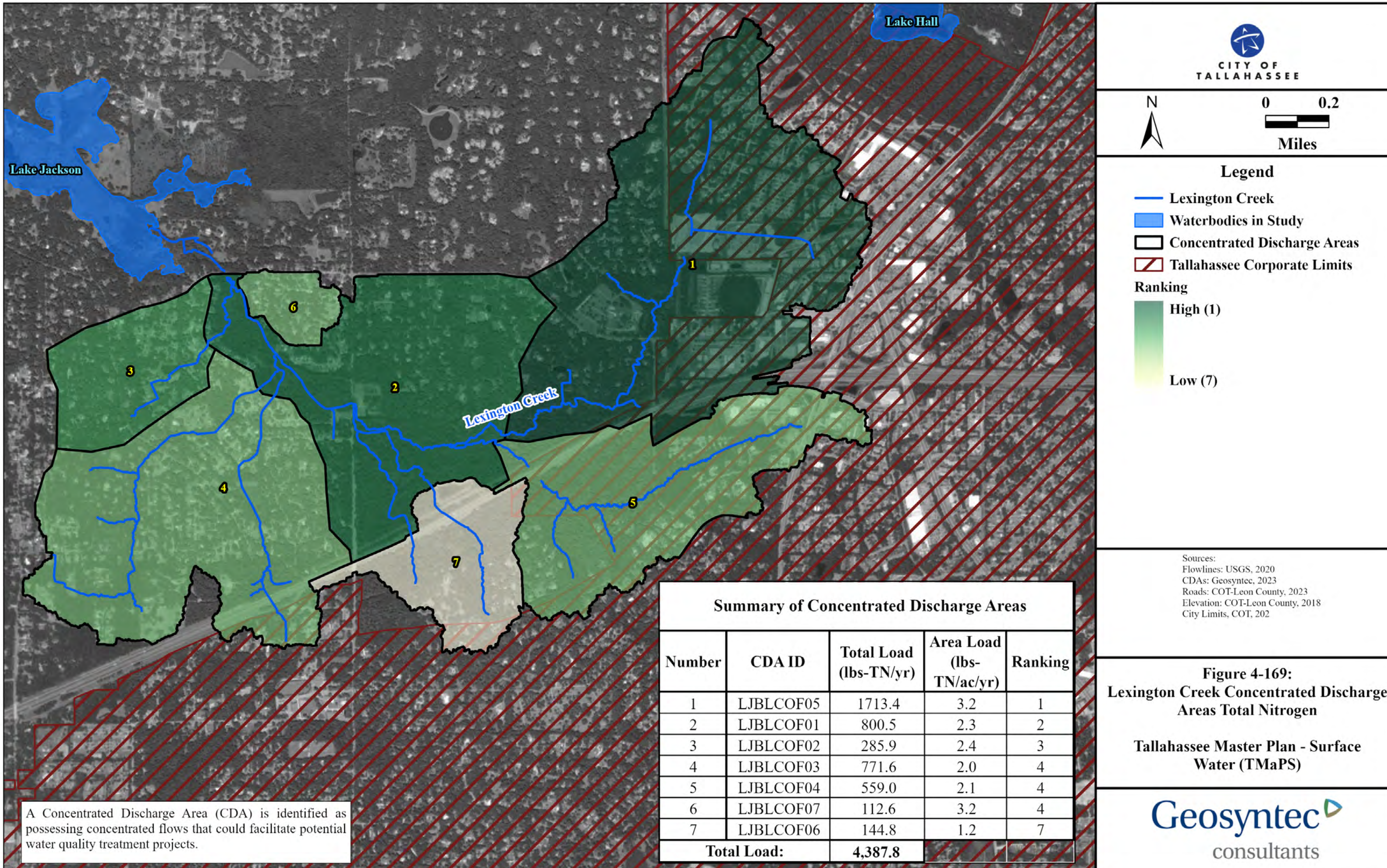

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.

Summary of Concentrated Discharge Areas

Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBLCOF05	1713.4	3.2	1
2	LJBLCOF01	800.5	2.3	2
3	LJBLCOF02	285.9	2.4	3
4	LJBLCOF03	771.6	2.0	4
5	LJBLCOF04	559.0	2.1	4
6	LJBLCOF07	112.6	3.2	4
7	LJBLCOF06	144.8	1.2	7
Total Load:		4,387.8		

Sources:
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-169: Lexington Creek Concentrated Discharge Areas Total Nitrogen

Tallahassee Master Plan - Surface Water (TMaPS)

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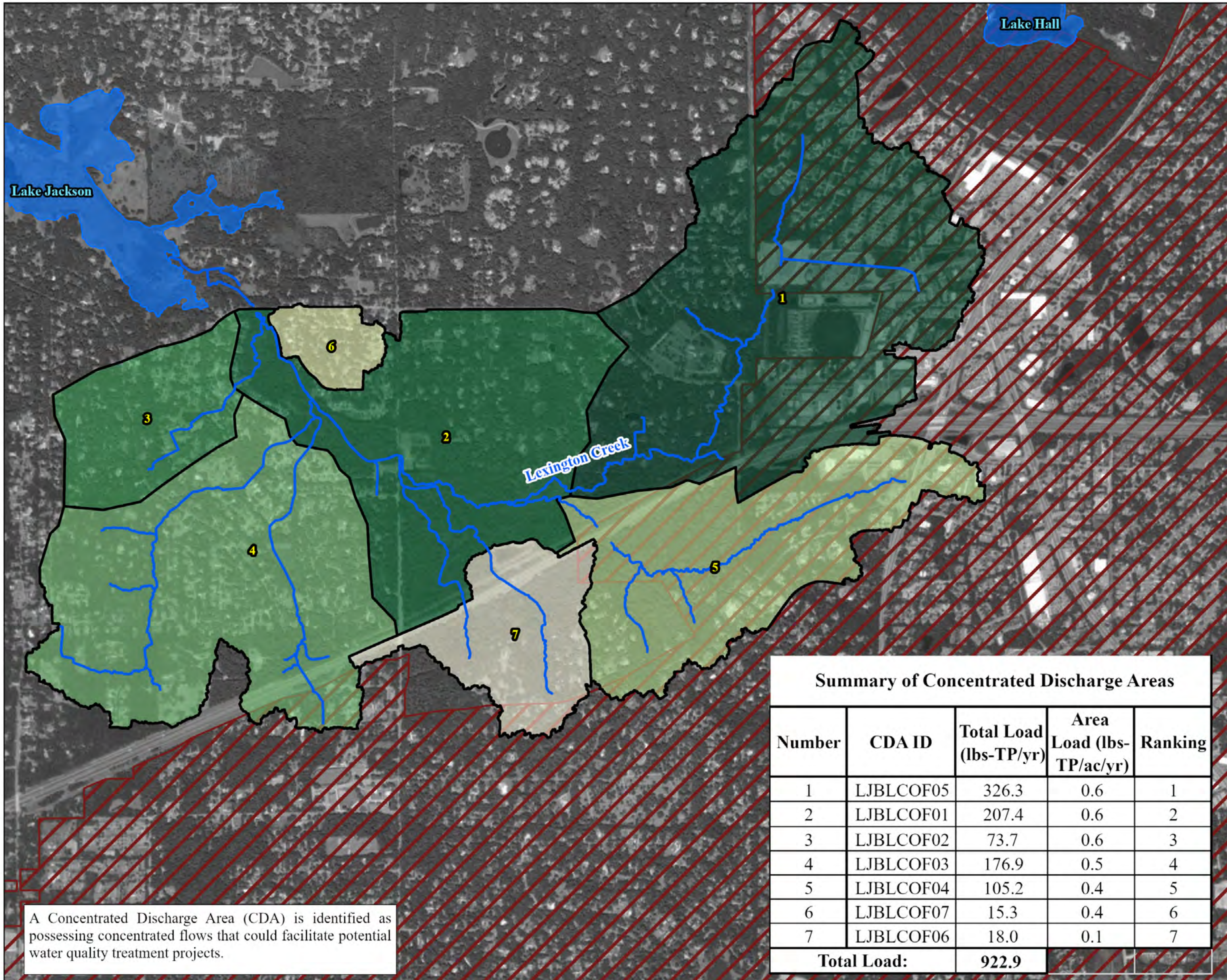

Summary of Concentrated Discharge Areas

Number	CDA ID	Total Load (lbs-TP/yr)	Area Load (lbs-TP/ac/yr)	Ranking
1	LJBLCOF05	326.3	0.6	1
2	LJBLCOF01	207.4	0.6	2
3	LJBLCOF02	73.7	0.6	3
4	LJBLCOF03	176.9	0.5	4
5	LJBLCOF04	105.2	0.4	5
6	LJBLCOF07	15.3	0.4	6
7	LJBLCOF06	18.0	0.1	7
Total Load:		922.9		

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.

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Sources:
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-170:
Lexington Creek Concentrated Discharge Areas Total Phosphorus

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec consultants

An estimated 355 septic tank units were identified within 200 meters of Lexington Creek and its primary tributaries. **Figure 4-171** shows the septic systems utilized in the analyses. A table provided on the figure summarizes the calculated TN load from septic units. The total load is 3,839 lb/yr.

4.9.5.3 Point Source Load

No active point sources were identified within the Lake Jackson basin. Therefore, the point source loads for TN and TP are set to 0 lb/yr for Lexington Creek.

4.9.5.4 Lake Inflow Load

There are no identified lakes upstream of Lexington Creek. Therefore, the lake load for TN and TP are set to 0 lb/yr.

4.9.5.5 Internal Lake Load

There are no lakes identified for study in the Lexington Creek basin, therefore, no internal lake load is calculated.

4.9.5.6 Atmospheric Deposition

There are no lakes identified for study in the Lexington Creek basin, therefore, no direct atmospheric load is calculated.

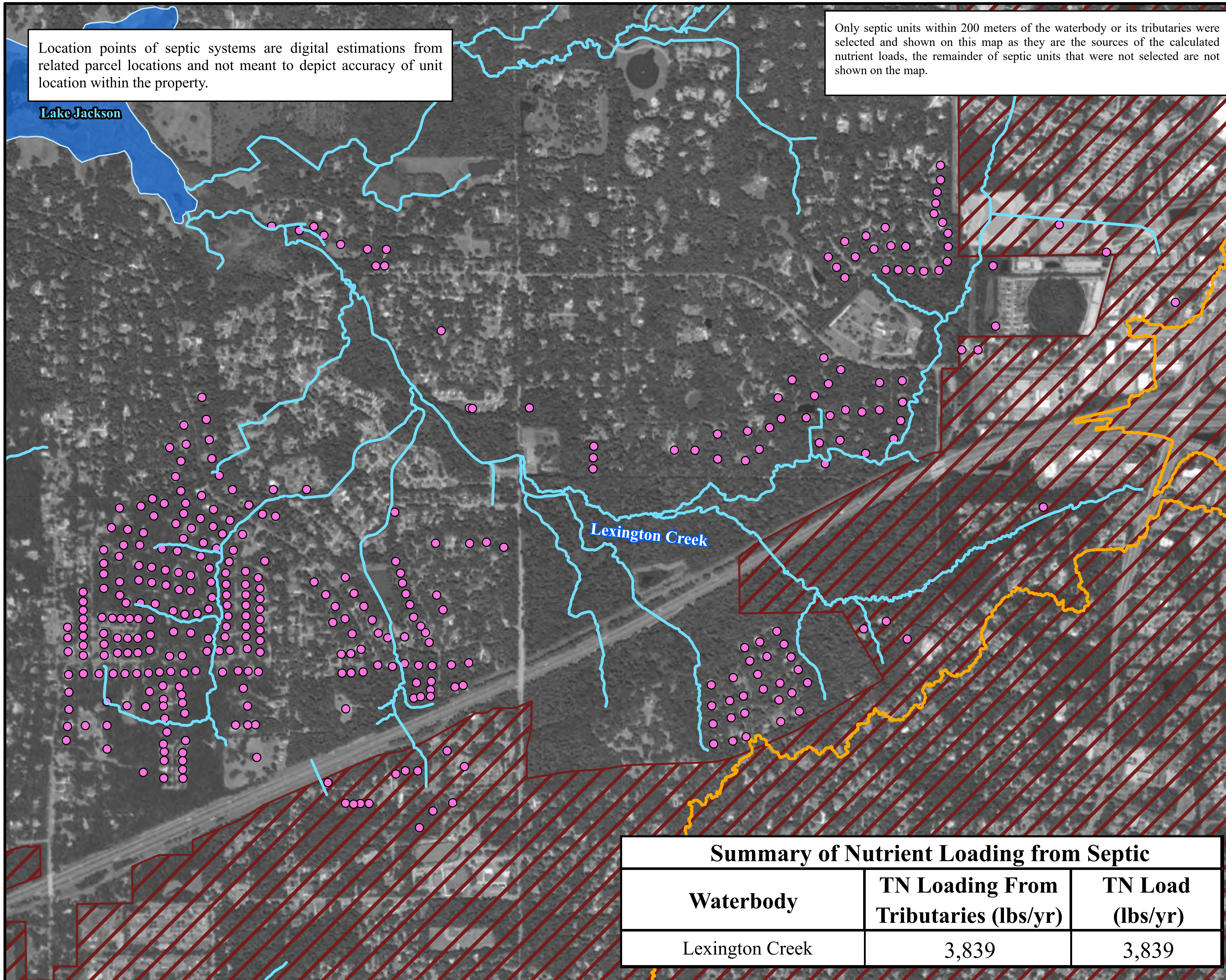
4.9.5.7 Summary of Calculated Loads

Nutrient loads to Lexington Creek were calculated for stormwater runoff and septic systems. **Table 4-24** presents the calculated total loads to the lake for TN and TP. For septic systems only TN loads were calculated (see **Section 4.9.5.2** for explanation).

Table 4-24: Summary of Calculated Loads to Lexington Creek

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	4,389	922
Septic Systems	3,839	NC

NC – Not calculated.



Summary of Nutrient Loading from Septic		
Waterbody	TN Loading From Tributaries (lbs/yr)	TN Load (lbs/yr)
Lexington Creek	3,839	3,839

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N

0 0.2

Miles

Legend

- Lake Jackson Drainage Basin
- Waterbodies in Study
- Tallahassee Corporate Limits
- Watercourses

Relevant Septic Sites

- Tributaries

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023

Figure 1-171: Septic Loading to Lexington Creek

Tallahassee Master Plan - Surface Water (TMaPS)

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4.10 Lake Jackson Basin Hot Spot Analysis

Using the information presented and discussed in **Section 4.4** through **Section 4.9**, qualitative and quantitative rankings were performed to identify target areas (hot spots) within the Lake Jackson basin for development of structural and non-structural projects to reduce loads and improve water quality.

The hot spot analysis was completed in three steps. The first step was to collate information presented for each of the waterbodies to support their ranking from highest to lowest based on need for water quality restoration. The second step was to utilize the load calculations presented for each of the waterbodies to rank the sources (by waterbody) from lowest to highest using normalized loads. The final step was to provide spatial ranking of CDAs (as defined in the TN and TP load calculations) by waterbody for use in the identification of structural and non-structural projects. The higher ranked CDAs within a highly ranked waterbody are hot spots and will be targeted for potential pollutant load reduction projects.

For the rankings, nutrients were the primary driver, with FIB data used to support some of the determinations. All rankings using actual loading data were based on nutrients. The following sections discuss the data utilized, the methodology, and the results of each step of the hot spot analysis, culminating in stormwater runoff and septic hot spot maps for the Lake Jackson basin.

4.10.1 Waterbody Ranking

The waterbodies within the Lake Jackson basin were ranked with respect to water quality or factors that could negatively affect water quality, using a qualitative approach. The ranking identified those waterbodies most in need of restoration. The waterbodies evaluated in this analysis include the following:

- Lake Jackson
- Carr Lake
- Summerbrook Creek and the Summerbrook Chain of Lakes (Lake Alyssa, Somerset Lake, Shelly Pond)
- Lake Overstreet
- Lake Hall
- Lexington Creek

While the Summerbrook Creek basin contains four waterbodies assessed for this study, due to the lack of data within the lakes (data are available along the creek connecting the lakes), the ranking is done for the Summerbrook basin as a whole using the data from Summerbrook Creek.

The information utilized in the development of the waterbody ranking included the following:

- Verified impairment status
- Waterbody and tributary water quality data analyses

- Biological data
- Land-development indices
- Septic densities

Table 4-25 presents a summary of the information by waterbody for each of these categories. For each of the five categories, the waterbodies were ranked based on the summary information provided. The rankings were qualitative for some categories and quantitative in others. The five rankings were then averaged. Using the average ranking, the waterbodies were ranked from highest to lowest based on need for water quality restoration.

For impairment status, two results were defined, verified impaired or not verified impaired for nutrients or FIB. Waterbodies that were impaired for nutrients were given the higher ranking. Based on impairment, the highest ranked waterbody was Lexington Creek due to its verified impairment for *E. coli*. The remaining waterbodies were then equally ranked second due to the lack of verified impairment.

Analyses of water quality data presented earlier, which included evaluations of the data against the NNC for the waterbodies themselves and primary inflowing tributaries, were utilized for the waterbody water quality ranking. The highest ranked waterbody was Lexington Creek due to TP levels in the creek found to be above the NNC threshold, along with FIB data that also exceeded the FIB threshold. The second ranked waterbody was Lake Jackson. The lake showed 1 year with TP levels above the NNC threshold (in 2020) and Chl-a levels that were at or just below the threshold. The spatial analyses presented in **Section 4.4.4.1** and **Section 4.4.4.2** identified that along the southeastern side of the lake, where Megginnis Arm and Fords Arm drain into the lake, the levels were above the NNC TP and Chl-a thresholds. Additionally, based on the tributary data, there were elevated levels of TP and TN coming in from various tributaries along the southeastern side of the lake. The third ranked waterbody was Summerbrook Creek. While the nutrient and FIB levels were below the stream threshold, the TP concentrations did show higher levels within the creek in recent years, and the FIB concentrations were somewhat elevated. The remaining waterbodies, Carr Lake, Lake Overstreet, and Lake Hall all had very good water quality and clearly fall below the prior waterbodies in terms of need for water quality improvement. The ultimate ranking (for these non-priority waterbodies) was based on which had the higher AGM levels for the primary nutrient parameters (TN, TP, and Chl-a) overall. This approach resulted in the next ranked waterbody being Lake Overstreet, followed by Carr Lake, and Lake Hall last.

For the biological assessment, the waterbody rankings used the Exceptional, Healthy, and Impaired determinations for the rankings. Where no data existed, the ranking was set just below the healthy. Based on this assessment (outlined in **Table 4-25**), the top ranked waterbody was Lexington Creek, followed by Lake Jackson, Summerbrook Creek, Carr Lake/Lake Overstreet (tied), and then Lake Hall.

Table 4-25: Waterbody Ranking

Waterbody	Impairment Status	Rank	Waterbody WQ Analyses	Tributary Analyses	Rank	Biological Data (LVI or SCI)	Rank	LDI	Rank	Septic Density	Rank	Average Rank	Waterbody Rank
Lake Jackson	Not Impaired	2	Overall lake is below but close, parts of the lake near Meginnis and Fords Arms are above the NNC thresholds	Lexington, Okeeheepkee, Harbinwood (higher TP, just below stream standard). TN - Lake Jackson Mounds above standard, Okeeheepkee high. *E. coli* - Lexington, Lake Jackson Mounds, Okeeheepkee above threshold	2	Mostly healthy with two years of impaired.	2	Poor - Megginnis Arm. Moderate - Fords Arm, Southwest side of lake, and Summerbrook.	1	Highest in Harbinwood, high values just around the lake (but relative). All less than 1 unit per acre	2	1.80	**2**
Carr Lake	Not Impaired	2	Nitrogen below minimum , TP between min and max some below min, Chl-a all below like 2-4. TSI all good. *E. coli* all way low	No specific trib data	5	Healthy	4	All excellent around the lake. Moderate in Summerbrook that drains in	4	Very low all around the lake, mid-level in Summerbrook (0.3 to 0.4 units per acre)	4	3.80	**5**
Summerbrook Creek	Not Impaired	2	TN trending down and well below stream threshold, TP trending up but well below stream criteria, some higher *E. coli*, one above 410.	TN trending down and well below stream threshold, TP trending up but well below stream criteria, some higher *E. coli*, one above 410.	3	ND	3	Moderate	2	Mid level (0.3 to 0.4)	3	2.60	**3**
Lake Overstreet	Not Impaired	2	Well below all water quality criteria, no issues	N/A	4	Healthy	4	Good	3	Lower level (0.16-0.20)	4	3.40	**4**
Lake Hall	Not Impaired	2	Well below all water quality criteria, no issues	N/A	6	Healthy to Exceptional	5	Good	3	Lower level (0.11-0.15)	5	4.20	**6**
Lexington Creek	Impaired (FIB)	1	TP levels above AGM stream criteria. *E. coli* levels above criteria but question on validity of the data	TP levels above AGM stream criteria. *E. coli* levels above criteria but question on validity of the data	1	Impaired and Healthy	1	Moderate	2	Upper Level (0.31-0.4)	1	1.20	**1**

Note: Merging of Summerbrook Creek

Using the LDI scores presented earlier, the individual waterbodies were ranked based upon where they fell overall in the potential for anthropogenic loading based on the watershed that drains to it **(Table 4-25**). Based on LDI, the highest ranked waterbody was Lake Jackson due to the land use conditions for the part of the watershed draining to the southeast portion of the lake, followed by Lexington Creek and Summerbrook Creek, which were tied, then Lake Overstreet and Lake Hall which were tied, and finally Carr Lake as the lowest ranked.

The final waterbody ranking criteria was septic density within the immediate drainage area. The waterbodies were ranked based on the results presented earlier and summarized in **Table 4-25**. The top ranked waterbody was Lexington Creek followed by Lake Jackson, then Summerbrook Creek, then Carr Lake and Lake Overstreet which were tied, and finally Lake Hall as the lowest ranked.

Table 4-25 provides an average ranking for each of the waterbodies and then a final ranking based on the average ranking. The final ranking by waterbody, with respect to the need for restoration activities, are presented from most pressing (1) to least pressing (6) in the order shown below.

1. Lexington Creek
2. Lake Jackson (southeastern and southern sides)
3. Summerbrook Creek
4. Lake Overstreet
5. Carr Lake
6. Lake Hall

Based on their overall water quality and potential for loading (as summarized above and in **Table 4-25**), Lake Overstreet, Carr Lake, and Lake Hall were removed from further ranking, and not considered targets for stormwater load reduction projects.

4.10.2 Pollutant Source Ranking

The pollutant source ranking utilizes load calculations presented in the **Calculation of Potential Nutrient Loads** sections for each waterbody. The specific loads quantified (where data allowed) included the following:

- Stormwater pollutant load
- Septic load
- Point source load
- Lake inflow load
- Internal lake load, and shallow groundwater seepage
- Atmospheric deposition

Using the calculated total loads for nutrients, the load sources are ranked for each individual waterbody to identify which type of loading to prioritize. The ranking (by waterbody) is based upon the total loads, with the highest rank (the top source to target) assigned to the largest load.

For the Lake Jackson basin, no data were available for internal lake loading, therefore this load category was not included in the source ranking by waterbody. Additionally, insufficient data were available to calculate the inter-lake loads in the Summerbrook basin.

Where insufficient data are available, the load sources are not considered in the ranking. Additionally, where the loads are zero, i.e., no load, these source types are not included in the ranking. This is the case for point source loads in the Lake Jackson basin as well as inter-lake loads for some of the waterbodies.

Table 4-26 presents the results of the source ranking by waterbody. As some of the load types only had TN data, TN became the driving load for the ranking. Almost across the board, stormwater loads are identified as the top ranked source on a per acre basis. The only waterbody where it was not the top ranked source was Lake Alyssa, which had a higher per acre septic load (due to the number of septic systems along primary tributaries).

The only place where data were available for inter-lake loads was for Lake Jackson, and these loads were not high in relation to others on a per acre basis. In general, the lakes that discharge directly to Lake Jackson (for which data were available to calculate load) are relatively pristine.

Finally, atmospheric loads were calculated and normalized to evaluate their potential relative to other sources. In general, atmospheric loads are small on a per acre basis relative to other sources.

Based on this analysis, the top load source to target for the waterbodies within the Lake Jackson basin would be stormwater loads. The next target would be septic loading. Other loading sources are either at zero, are low compared to the stormwater or septic, are not addressable through projects (atmospheric deposition), or have insufficient data at this time and therefore would not be targeted for structural or non-structural projects as part of this study.

4.10.3 Identification of Hot Spot Areas

Section 4.10.1 ranked the waterbodies in the Lake Jackson basin based on their need for water quality restoration. The next step in the evaluation of the waterbodies was to determine if each one should be considered for development of projects. This is a qualitative assessment that accounts for the present conditions and the potential for future degradation. For the Lake Jackson basin, it was determined that Lexington Creek, Lake Jackson, and Summerbrook Creek (and the Summerbrook Chain of Lakes) would be considered for project development.

The next step was to present the stormwater and septic load rankings for each of the chosen waterbodies presented on a basin-wide map. The stormwater load rankings were presented by waterbody drainage area in the **Calculation of Potential Nutrient Loads** sections. The highest to lowest ranked CDAs were highlighted from dark green to pale yellow, with the dark green representing the top ranked areas to target for load reduction activities.

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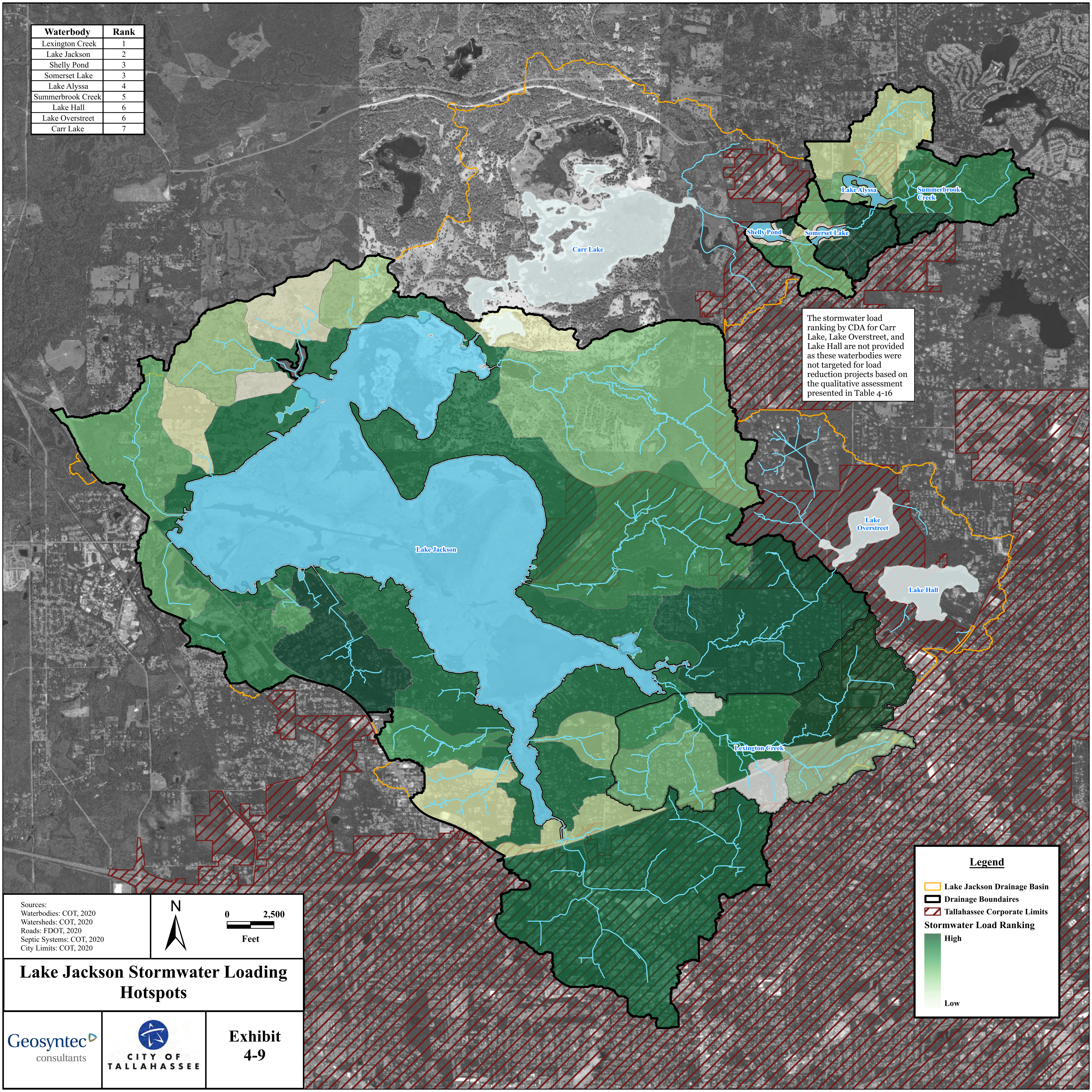
Table 4-26: Load Source Ranking

Waterbody	Stormwater Pollutant Load			Septic Load			Lake Inflow Load			Atmospheric Deposition		
	Total		Rank	Total		Rank	Total		Rank	Total		Rank
	TN (lb/yr)	TP (lb/yr)		TN (lb/yr)	TN Direct (lb/yr)		TN (lb/yr)	TP (lb/yr)		TN (lb/yr)	TP (lb/yr)	
Lake Jackson	22,162	4,374	1	14,232	3,071	2	3,524	142	4	6,906	ND	3
Carr Lake	2,804	431	1	401	22	3	ND	ND	NA	1,428	ND	2
Lake Alyssa	2,482	541	2	2,801	76	1	NA	NA	NA	74	ND	3
Somerset Lake	1,365	450	1	0	0	NR	ND	ND	NA	26	ND	2
Shelly Pond	560	149	1	141	108	2	ND	ND	NA	47	ND	3
Summerbrook Creek	4,407	1,140	1	2,942	184	2	ND	ND	NA	NA	NA	NR
Lake Overstreet	1,303	301	1	487	0	2	0	0	NR	297	ND	3
Lake Hall	1,049	259	1	0	270	3	0	0	NR	355	ND	2
Lexington Creek	4,388	923	1	3,839	0	2	0	0	NR	NA	NA	NR

For septic loads, the total loads (calculated and presented in earlier sections) were sub-divided into the CDAs based upon the location of septic systems which were determined to load the waterbodies or tributaries draining to the waterbodies. The total septic load for each of the CDAs was calculated and then ranked (by waterbody drainage area) as largest to smallest based on total load, with the highest ranked having the largest total load. The septic load CDA rankings are presented separately because their loads will be different and the potential project types also different, i.e., septic to sewer conversions.

Exhibit 4-9 and **Exhibit 4-10** present the CDA rankings for the stormwater and septic loads respectively for each of the chosen waterbodies, with the drainage areas for the waterbodies not identified for projects (Carr Lake, Lake Overstreet, and Lake Hall) greyed out. The rankings are by waterbody drainage area and are shown as green for the highest ranked areas and pale yellow for the lowest ranked areas. These two hot spot maps provide the basis for project targeting for the two primary sources identified, stormwater and septic loads. Projects are discussed in **Volume 7**.

Waterbody	Rank
Lexington Creek	1
Lake Jackson	2
Shelly Pond	3
Somerset Lake	3
Lake Alyssa	4
Summerbrook Creek	5
Lake Hall	6
Lake Overstreet	6
Carr Lake	7



Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Roads: FDOT, 2020
Septic Systems: COT, 2020
City Limits: COT, 2020

Lake Jackson Stormwater Loading Hotspots

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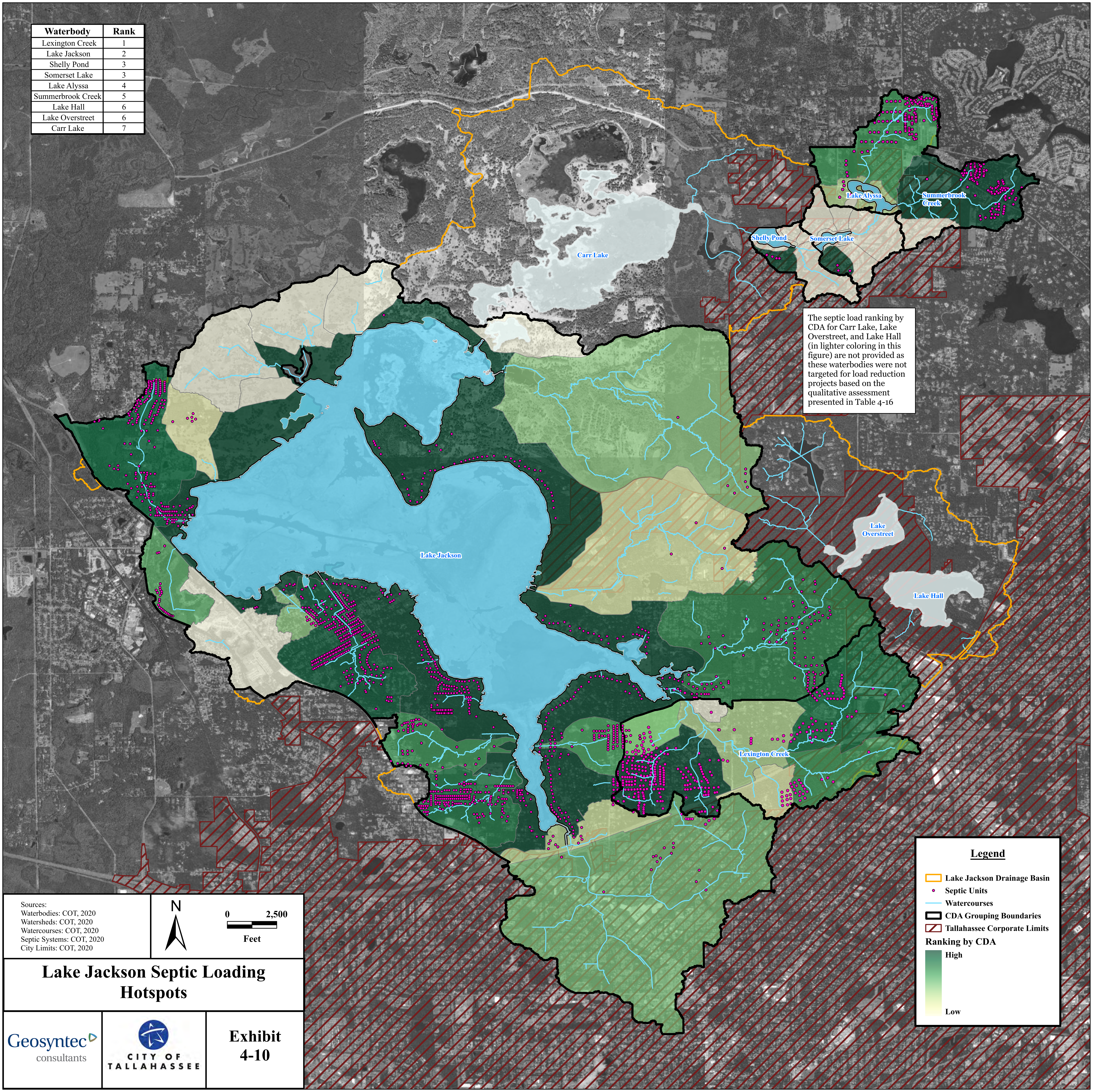
Exhibit 4-9



Waterbody	Rank
Lexington Creek	1
Lake Jackson	2
Shelly Pond	3
Somerset Lake	3
Lake Alyssa	4
Summerbrook Creek	5
Lake Hall	6
Lake Overstreet	6
Carr Lake	7

Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
City Limits: COT, 2020

Lake Jackson Septic Loading Hotspots

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Exhibit 4-10

4.11 Water Quality Study Identification and Prioritization

As part of the data review and summary provided for each of the target waterbodies (**Section 4.4** through **Section 4.9**), limitations in available hydrologic, water quality (groundwater and surface water), and benthic sediment data were identified. Additionally, as part of the qualitative assessment of sources for each waterbody, specific key stressors, i.e., significant potential sources of anthropogenic load or factors contributing to degraded water quality, were identified. Finally, **Section 4.10** presents a hot spot analysis for the Lake Jackson basin that ranked the waterbodies relative to their need for restoration and identified specific waterbodies to target for restoration projects, additional data collection, or studies.

Utilizing the information outlined above, potential water quality improvement studies needed to address data gaps and quantify key stressors were proposed and ranked. The results of the previous tasks are summarized in **Section 4.11.1**, along with an overview of key stressors for the priority waterbodies (Lexington Creek, Lake Jackson, and the Summerbrook Chain of Lakes). Studies are identified that fill in data gaps and support quantification of specific waterbody stressor(s) or support targeted waterbody restoration (**Section 4.11.2**). The proposed studies include re-establishment of hydrologic monitoring, sub-watershed-level source assessments based on key stressors, a whole-basin hydrologic evaluation, and a study on potential restoration of the MARS Facility.

4.11.1 Summary of Data Limitations, Waterbody Prioritization, and Key Stressors

Table 4-27 provides a summary of the data limitations presented at the end of the data review and summary sections for each of the waterbodies in this study (**Section 4.4** through **Section 4.9**). Data limitations were previously only identified for Lake Jackson, Lexington Creek, the Summerbrook Chain of Lakes, and Carr Lake. No data limitations were previously identified for Lake Hall and Lake Overstreet, so no studies or additional data collection are proposed for these waterbodies.

Examination of **Table 4-27** shows some common themes relative to the identified data limitations. The themes include limited continuous flow data along key tributaries, old or no water quality data, no groundwater quality data in the area of the study waterbodies to allow assessment of potential seepage load impacts, and no data to quantify internal nutrient loading in target lakes.

Section 4.10.3 and **Exhibit 4-9** present the prioritized waterbodies for restoration within the Lake Jackson basin. These included, in order of priority, Lexington Creek, Lake Jackson, and the Summerbrook Chain of Lakes. These waterbodies were targeted for development of projects to support water quality improvement. Identified projects are discussed in **Volume 7 – Non-Structural and Structural Project Development**. The prioritized waterbodies are also targeted for studies to fill data gaps to further refine restoration strategies. As such, the proposed studies will focus on these waterbodies. While Carr Lake was not identified as a priority waterbody, the Summerbrook Chain of Lakes (which is a priority waterbody) drains into Carr Lake. Currently, limited information is available on the load entering Carr Lake. Therefore, based on the desire to maintain the present water quality in Carr Lake, discussions with City staff identified quantification of the flows, concentrations, and loads going to Carr Lake from the Summerbrook Chain as a priority.

Table 4-27: Summary of Identified Data Limitations for Waterbodies in the Lake Jackson Basin

Lake Jackson	Lexington Creek	Summerbrook Chain	Carr Lake
Limited flow on key tributaries	Flow station decommissioned in 2018	No flow measurements anywhere along Summerbrook Creek	No measured flow in primary tributary flowing into the lake from the Summerbrook Chain of Lakes
Old water quality data on tributaries	Discrepancies in measured *E. coli* concentrations between FDEP and Leon County, with Leon County concentrations significantly lower than FDEP from the same locations and generally same time periods.	No water quality data provided for any of the three lakes	Water quality data on the primary tributary from the Summerbrook Chain of Lakes is old and sparse
No adjacent surficial aquifer data to assess seepage		No adjacent surficial aquifer data to assess seepage in any of the lakes.	
No recent data to quantify internal recycling of nutrients		No data to quantify internal recycling of nutrients in any of the three lakes	

A key task under the scope of work for the basin studies identification was to review and assess stressors for the priority waterbodies. The stressor sources were reviewed to confirm potential water quality impact and pathways of pollutant migration to the waterbodies. The intent is to identify where additional data collection and analysis of advanced analytic parameters might help better understand the expected load/contribution of the source. The following sections outline the key stressors identified in previous sections for each of the prioritized waterbodies within the Lake Jackson basin (Lexington Creek, Lake Jackson, and Summerbrook Chain of Lakes).

4.11.1.1 Lexington Creek Key Stressors

The stressors identified for Lexington Creek were twofold. Water quality analyses and the qualitative assessment of sources (**Section 4.9.3.5** and **Section 4.9.4**) identified phosphorus and FIB loading as key stressors. Phosphorus loading was related primarily to stormwater runoff contributing to tributary inflow, whereas FIB loads were associated primarily with septic systems and, to a limited degree, potential wastewater infrastructure leakage or spills.

In relation to phosphorus, **Figure 4-158** showed AGM TP levels exceeding the Panhandle East TP threshold of 0.18 mg/L in the creek in recent years. For some of the years with high TP levels, construction of the BMP at Meridian Road was ongoing, therefore, some TP data may be representative of those conditions. Additionally, two of the three available SCI assessments since 2010 identified the stream as impaired (**Table 4-23**).

Lexington Creek is impaired for FIB based on *E. coli* data primarily sampled at the downstream end of the creek where it crosses Timberlane Road. **Figure 4-159** presented a plot of the *E. coli* data on Lexington Creek through 2020. The plot showed numerous (greater than the 10 percent threshold) exceedances of the 410 MPN/100 mL criteria. **Figure 4-159** also highlighted an issue with the available data, which is discussed in **Section 4.9.3.5**. The issue is the discrepancy between the Leon County and FDEP results, with the Leon County results much lower and generally not showing exceedances, whereas the FDEP data are significantly higher and do show exceedances. The proposed study outlined in **Section 4.11.2.2** is scoped in part to resolve the question of the data inconsistency.

4.11.1.2 Lake Jackson Key Stressors

Lake Jackson water quality analyses and the qualitative assessment of sources (**Section 4.4.3.7** and **Section 4.4.4**) identified phosphorus, and associated Chl-a response, as the key stressor in the southern portion of the lake. Additionally, FIB was identified as a stressor for certain tributaries to the lake (not including Lexington Creek, which was discussed previously). While the lake is presently not impaired for nutrients and Chl-a, recent data had lake-wide average Chl-a AGMs slightly above the 6 µg/L threshold (**Figure 4-11**), with TP AGMs at times above the maximum, but always above the minimum threshold (**Figure 4-10**). Analyses of the spatial variation in the lake (**Section 4.4.4.1**) showed that long-term average AGM levels of TP (**Figure 4-20**) and Chl-a (**Figure 4-21**) on the south end of the lake, including Megginnis Arm (Megginnis Creek inflow) and Fords Arm (Lexington Creek inflow), are significantly higher than other areas of the lake and above the allowable thresholds per the NNC.

Analyses of tributary inflow data, other than Lexington Creek, which was discussed above, showed high FIB and nitrogen levels in two tributaries flowing into the upper western side of Megginnis Arm (**Figure 4-26** and **Figure 4-29**, Tribs 1 and 2). These are Butlers Mill Creek and Okeeheepkee Creek. **Figure 4-172** and **Figure 4-173** present the available *E. coli* data (after 2020) along Butlers Mill Creek and Okeeheepkee Creek, respectively. The plots show where the *E. coli* concentrations in both creeks exceed the 410 MPN/100 mL threshold a majority of the time, with percent exceedances of 92 percent and 71 percent for Butlers Mill Creek and Okeeheepkee Creek, respectively.

Analyses of the nitrogen constituents showed that the high TN levels on both creeks were primarily due to inorganic nitrogen, indicating a potential anthropogenic source in the area. **Figure 4-174** and **Figure 4-175** present plots of the total nitrogen and inorganic nitrogen concentrations within each of the creeks, using the available data (since 2020). The plots show the high percentage of inorganic nitrogen in each creek, with average percentages of between 55 percent and 87 percent, which is indicative of an anthropogenic source of nitrogen. While the Okeeheepkee Creek flows pass through a regional treatment facility prior to entering Megginnis Arm, the Butler Mill Creek flows discharge directly to Megginnis Arm and, therefore, are a higher priority for a study or restoration efforts.

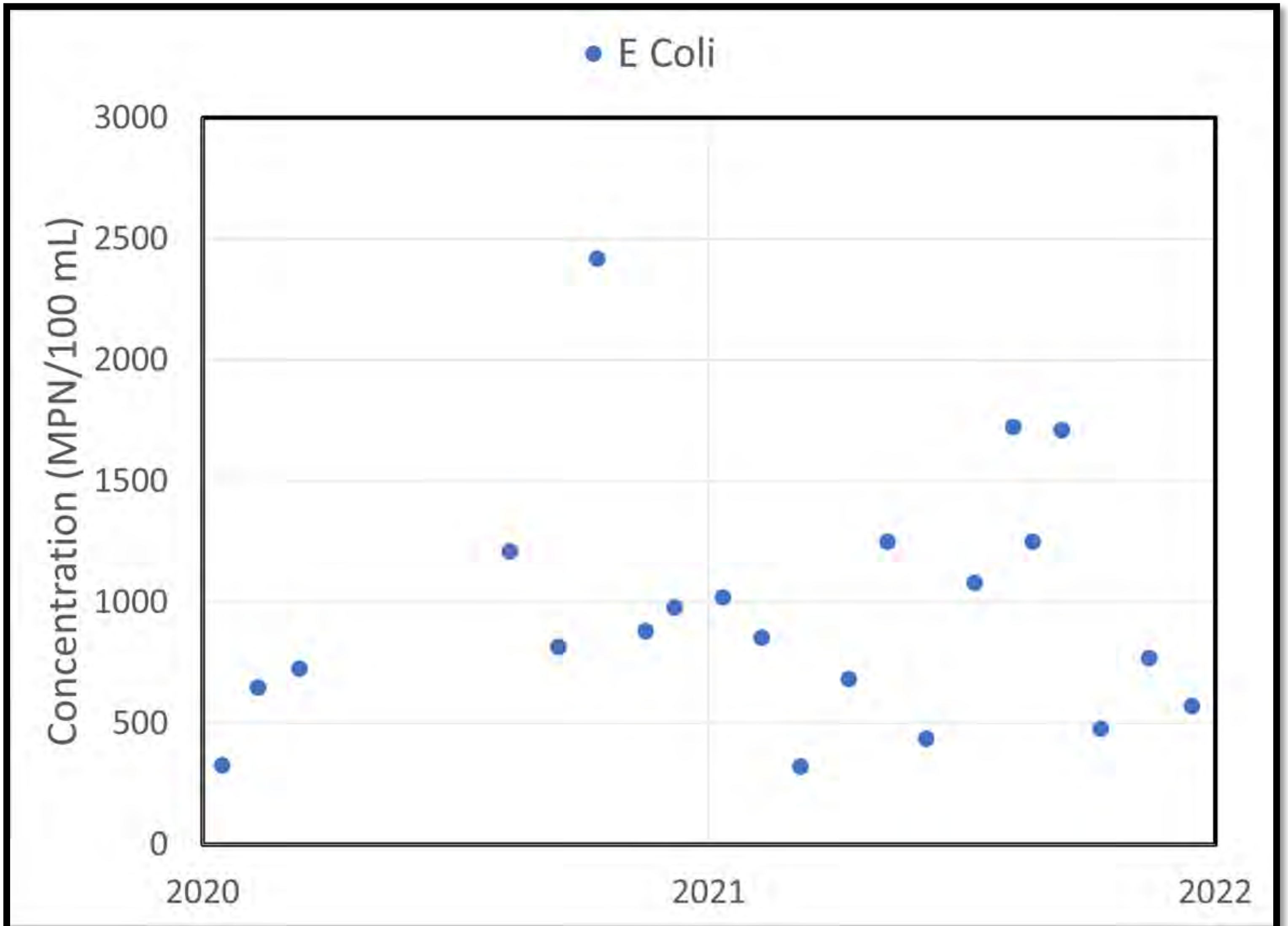


Figure 4-172: Measured *E. coli* on Butlers Mill Creek (2020 and 2021)

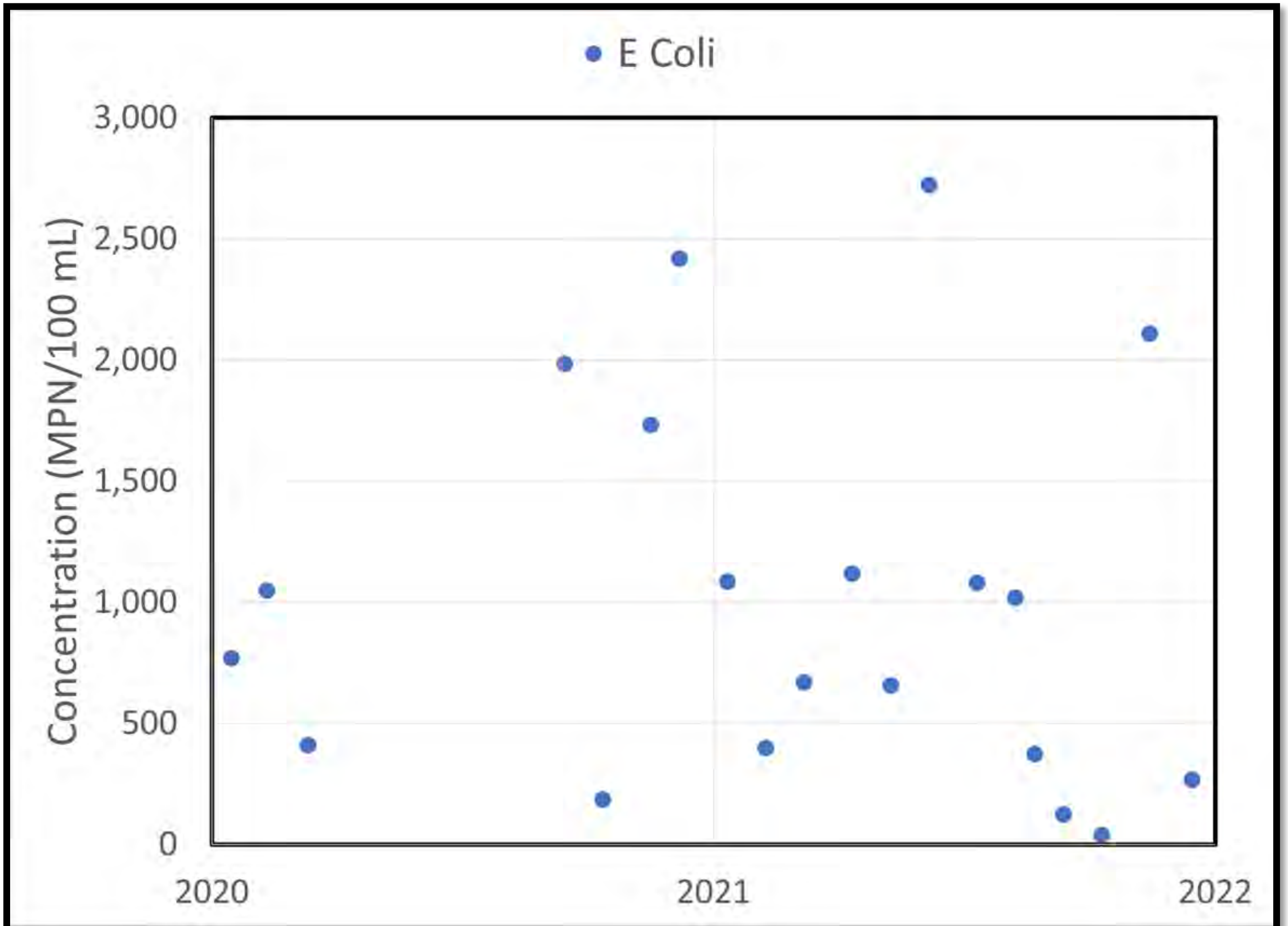


Figure 4-173: Measured *E. coli* on Okeeheepkee Creek (2020 and 2021)

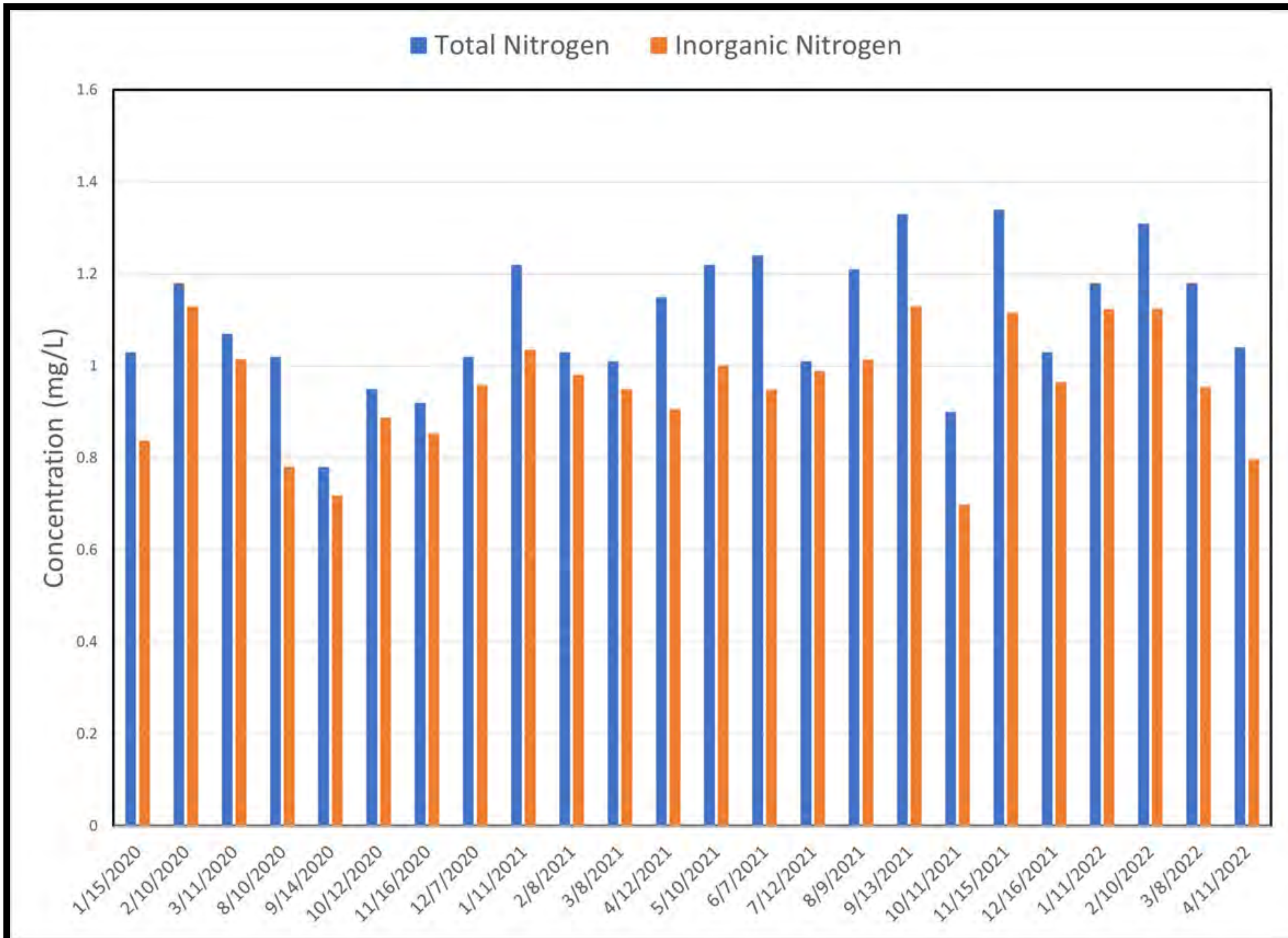


Figure 4-174: Measured TN and Inorganic Nitrogen on Butlers Mill Creek (2020 and 2021)

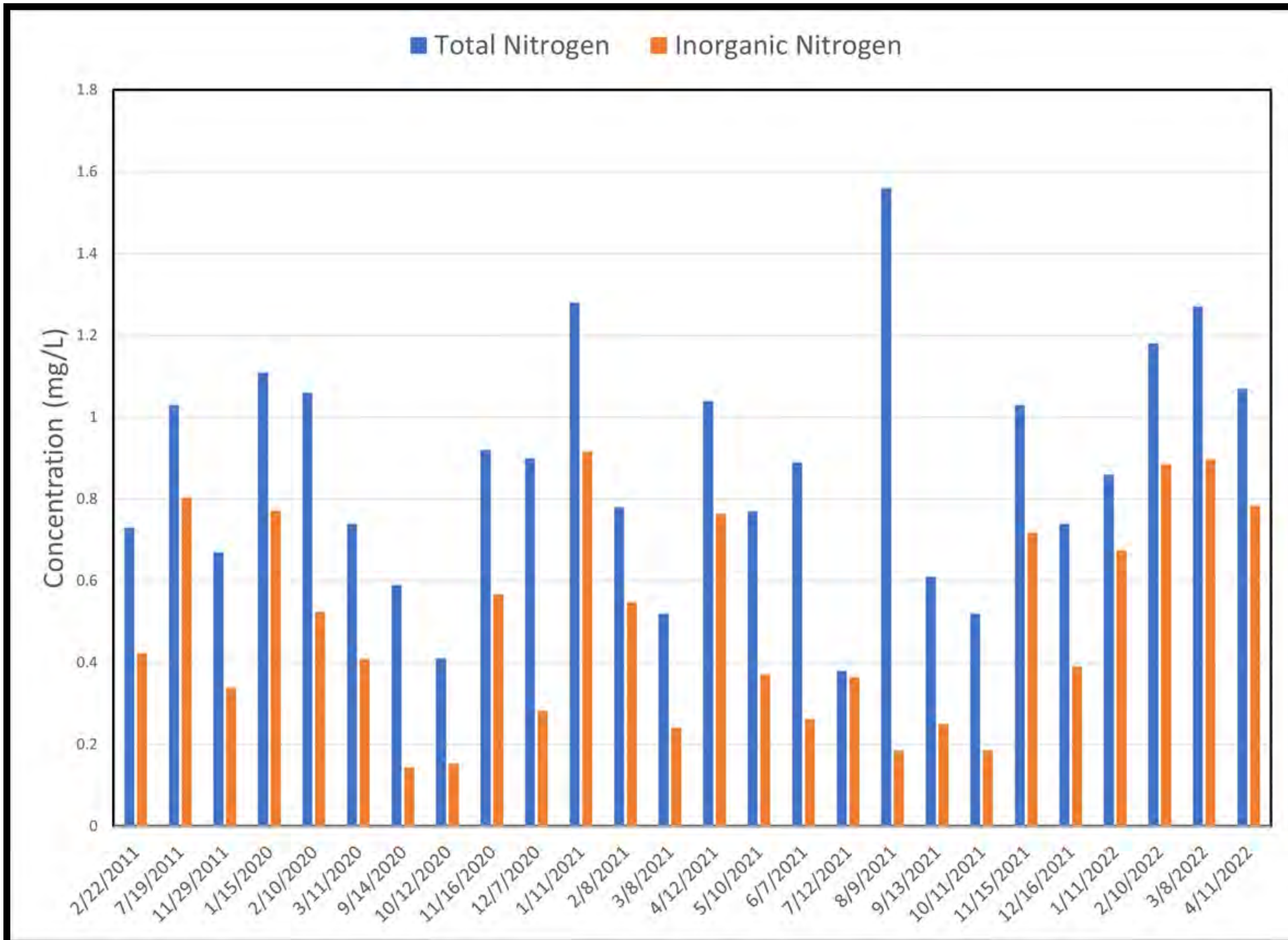


Figure 4-175: Measured TN and Inorganic Nitrogen on Okeeheepkee Creek (2020 and 2021)

Finally, septic loading was identified as a potential source of pollutant loads in **Section 4.4.4.3** and, primarily the areas along the southwestern side of the lake that include the Harbinwood, Lake Jackson Mounds, and the Okeeheepkee sub-watersheds (Lexington Creek was addressed in the previous section). **Figure 4-172** through **Figure 4-175** showed elevated FIB and inorganic nitrogen in two of the creeks draining this area.

4.11.1.3 Summerbrook Chain of Lakes Key Stressors

The Summerbrook Chain of Lakes had no available data to define water quality conditions within each of the three lakes and limited data along Summerbrook Creek. The qualitative assessment (**Section 4.6.4**) identified stormwater loading and septic loading as potential stressors, with the focus on septic loading limited to areas upstream of Lake Alyssa. The limited water quality data in the creek did not show elevated nutrient levels relative to the NNC (**Figure 4-77** and **Figure 4-78**) but did show some upward trends in recent phosphorus measurements (**Figure 4-76**). *E. coli* data, while generally below the 410 MPN/100 mL threshold, were elevated in comparison to other more natural waterbodies in the area (**Figure 4-79**).

4.11.2 Study/Data Collection Recommendations

Based on the data limitations and waterbody stressors outlined in **Section 4.11.1**, additional data collection and waterbody study recommendations were developed in conjunction with City staff. The following studies are recommended:

- Lake Jackson: Re-Establish Flow Measurements in Lexington Creek,
- Lexington Creek: FIB Source Assessment,
- Lake Jackson: MARS Facility Restoration Study,
- Lake Jackson: Butlers Creek and Okeeheepkee Creek Inorganic Nitrogen and FIB Source Assessment,
- Lake Jackson: Hydrologic Budget Assessment, and
- Carr Lake: Flow Measurement and Water Quality of the Inflow from the Summerbrook Chain of Lakes.

The following outlines the justification, what stressors or data limitations are being addressed, and a general description of the work to be performed, along with initial scope items for each of the data collection/studies listed previously. It is noted that some of these studies are outside of the City incorporated areas and the areas where the studies would occur are under the jurisdiction of Leon County.

4.11.2.1 Lake Jackson: Re-establish Flow Measurements in Lexington Creek

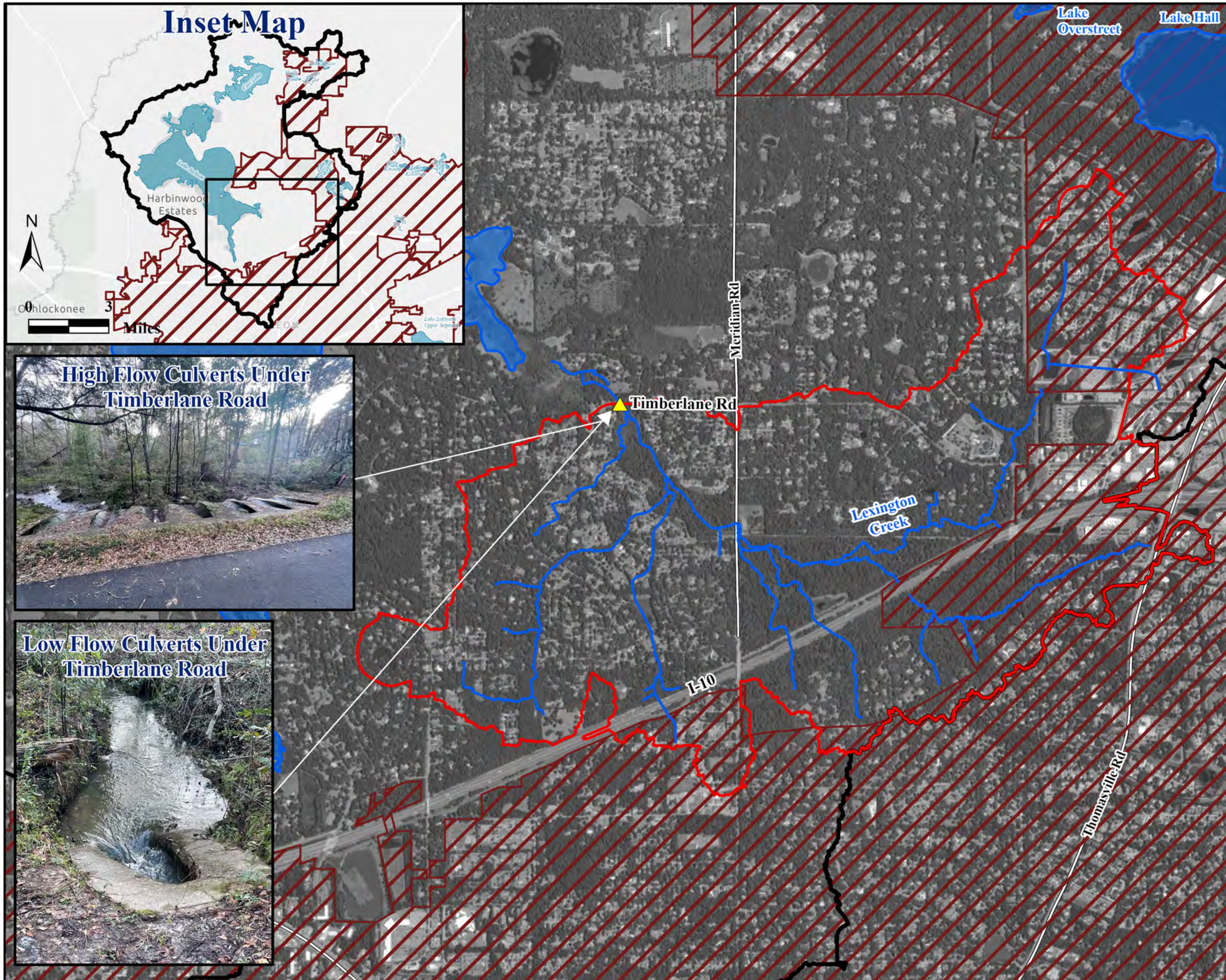
In the waterbody prioritization, Lexington Creek was the highest ranked waterbody in terms of need for restoration activities. Lexington Creek discharges to the southern end of Lake Jackson through Fords Arm. Discharges to the southern end of Lake Jackson were prioritized based on the high TP and Chl-a levels in that area (**Figure 4-20** and **Figure 4-21**). Historical flow measurements along Lexington Creek are limited, and the station that was located at Timberlane Road was discontinued in 2018. The location of the historical flow measurements, maintenance and calibration concerns, and significant discrepancies between more recent flow data and historical measurements has raised questions on the validity of the flow data. Additionally, the flow station was upstream of two additional inflows that drain significant areas of the sub-watershed. These inflows drain large neighborhoods with the potential for significant loads.

Accurate quantification of the nutrient load (especially phosphorus) coming into Lake Jackson from Lexington Creek is necessary for understanding the potential impacts to the degraded areas of the lake along the southern side. Presently, ongoing water quality monitoring is being performed along Lexington Creek where it crosses Timberlane Road (**Figure 4-176**). Based on the discontinuance of the flow measurements in 2018, calculation of loads, using the flow and water quality data, cannot be done for recent conditions. As such, it is recommended to re-establish flow measurements on Lexington Creek, but at the location where it crosses Timberlane Road to coincide with the water quality measurements. An additional benefit of providing continuous flow measurements at Timberlane (versus the previous location at Meridian) is flows will be reflective of more than 90 percent of the Lexington Creek sub-watershed. Additionally, an evaluation of the frequency of ambient sampling at Timberlane under the present data collection efforts should be evaluated to determine if an alternate frequency would better characterize conditions.

Figure 4-176 provides a map showing the location of the data collection in relation to the Lexington Creek watershed, the location of the proposed monitoring station, and photos of the culverts that cross Timberlane Road where the measurements would be taken (see photos in **Figure 4-176**). This location has a lower flow bypass culvert separate from the culverts that carry the higher flows (see photo). While the multiple culverts and the low flow bypass pose difficulties in setting up a continuous flow station, the site offers the best opportunity to quantify the full flow from the Lexington Creek sub-watershed.

The re-establishment of the flow station is recommended to be conducted in two phases, where the first phase focuses on reconnaissance of the site and development of a plan for the installation of equipment, and the second phase is the data collection. The recommended elements for the re-establishment of the flow measurements are presented below.

- Site Reconnaissance and Survey (Phase 1) to better understand the site logistics, including inflow/outflow invert elevations, as well as develop consensus with City staff on the approach for measuring the flow and development of a Quality Assurance Project Plan (QAPP).
- Equipment Installation and Data Collection (Phase 2) to facilitate and perform data collection.
- Data Reporting and Analyses (Phase 2) to prepare reports that present the data from the flow measurements.



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Legend

- Lexington Creek Watershed
- Waterbodies in Study
- Tallahassee Corporate Limits
- Lake Jackson Basin
- Flow and Water Quality Sampling Location

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Road: COT, 2020

Figure 4-176:
Lake Jackson - Re-Establish Flow Measurements on Lexington Creek Watershed

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4.11.2.2 Lexington Creek: FIB Source Assessment

FIB loading was identified as a potential stressor for the Lexington Creek sub-watershed based on available *E. coli* data and septic tank density and distribution. **Figure 4-177** shows the Lexington Creek sub-watershed with historical water quality sampling stations identified. While the bulk of the historical data were collected where the creek crosses Timberlane Road (yellow triangle on **Figure 4-177**), high *E. coli* concentrations were also found at the secondary stations (orange triangles).

Determination of the sources of the FIB is necessary to support development of a restoration plan. Additionally, concerns raised earlier around discrepancies between monitoring by FDEP and Leon County create a need for an independent assessment to determine if *E. coli* levels are actually elevated. A study is recommended to evaluate if present FIB levels on the creek are elevated (resolve the discrepancy identified earlier) and, if determined to be elevated, define the sources of the FIB.

To evaluate if the present *E. coli* concentrations on the creek are elevated, more recent data collected by the County and FDEP will be analyzed to see if those data continue to show the discrepancies seen in the data through 2020. If the analyses do not fully resolve the discrepancies, an independent sampling will be performed utilizing methods approved by the City and FDEP. The sampling is proposed to be done at the Timberlane Road location.

If needed to help determine the origin of the elevated FIB, including species of origin (i.e., human, animal, etc.) and location of input to the Lexington Creek sub-watershed, molecular source tracking (DNA analytical testing) is proposed along with an iterative sampling approach throughout the sub-watershed. The investigation will include sampling from multiple locations within and around the sub-watershed, working upstream and into the various tributaries.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- Field reconnaissance of the Lexington Creek sub-watershed to identify potential FIB sources as well as potential sampling locations.
- Development of a QAPP that details staff responsibilities, sampling procedure, methodology, equipment, and laboratory analytical requirements for the project.
- Field monitoring and sampling to verify the FIB levels and identify potential sources of FIB to Lexington Creek.
- Data analyses to test hypotheses on potential sources that were identified for this investigation.
- Develop a draft and final report summarizing the findings from the study.

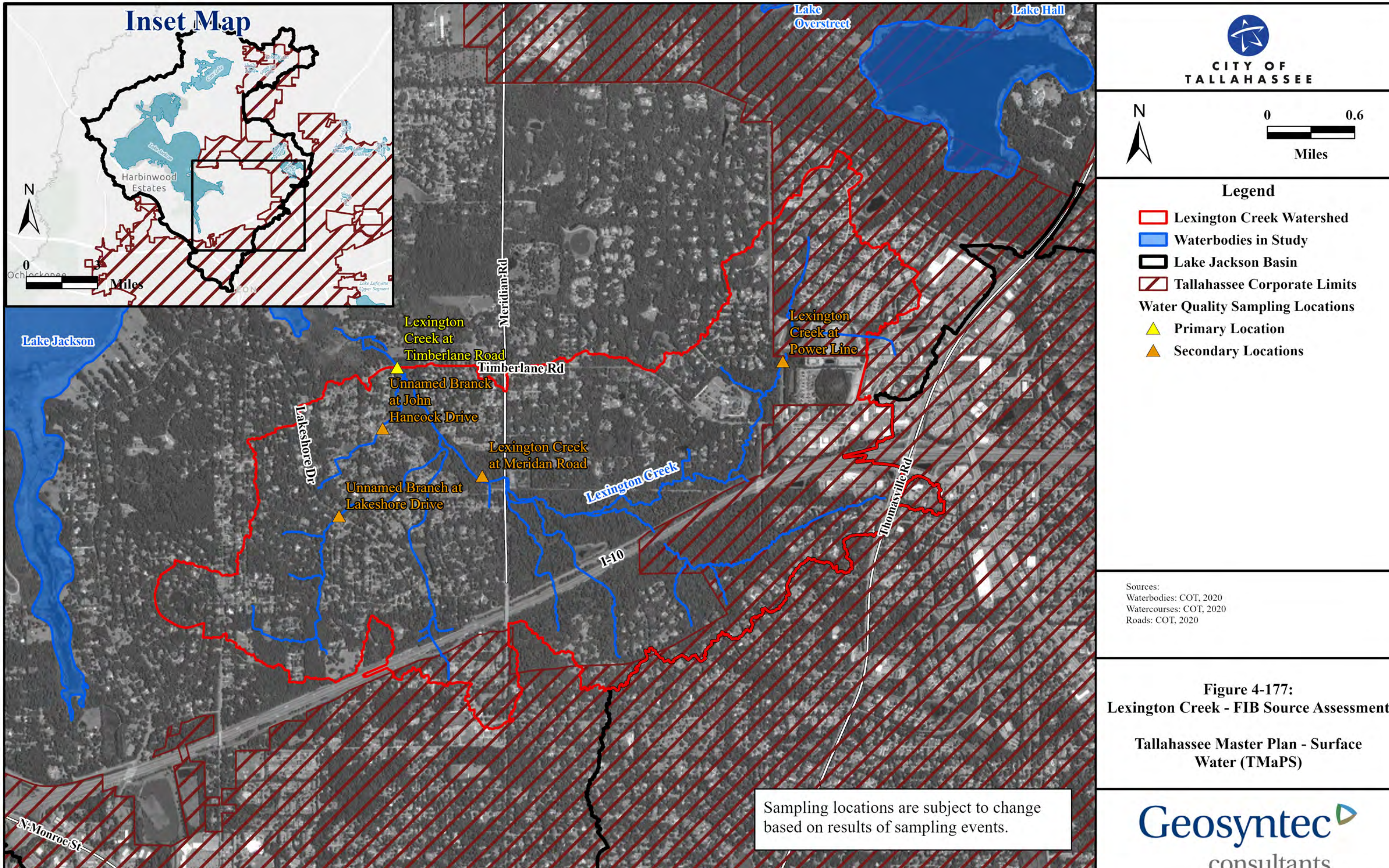

Figure 4-177:
Lexington Creek - FIB Source Assessment

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4.11.2.3 Lake Jackson: MARS Facility Restoration Study

Nutrient loading to the southern side of Lake Jackson was identified as a key stressor in **Section 4.11.1.2**. Megginnis Arm is one of the two primary discharges to the southern side of the lake and drains a highly urbanized area. The MARS Facility was constructed to treat runoff into Megginnis Creek. **Figure 4-178** provides an overview of the MARS Facility, including an aerial view of the system components, a diagram outlining the design components, and photos taken in 2021 of the overflow, the filter marsh intake, and a portion of the filter marsh.

The MARS Facility resides outside the City limits and is currently operated by NWFWMD. Additionally, an FDEP-sponsored study, completed by the City, shows the facility is effective at removing nutrients. However, as described in **Section 4.4.1**, maintenance of the MARS Facility has declined significantly over the years, potentially reducing treatment effectiveness. Based on this, a study is proposed to accomplish the following:

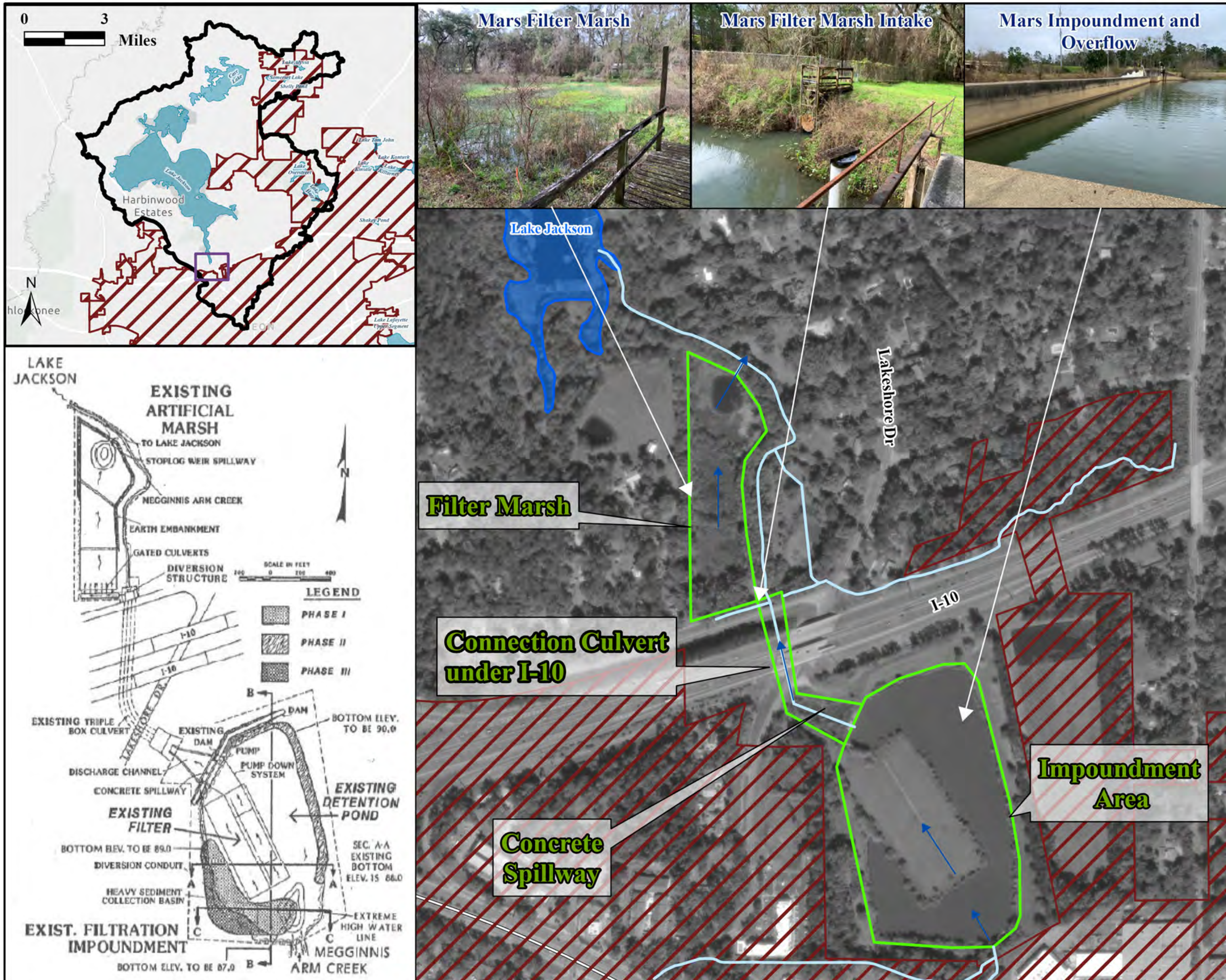
- Evaluate the present conditions of the facility against its historical design,
- Quantify the present performance of the facility based on existing and new data collected, and
- Assess options for restoration of design components to improve water quality treatment including impoundment and wetland polishing areas.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- Gather and assess all available information relevant to the MARS Facility and its overall design and performance
- Conduct a detailed engineering assessment of all components of the MARS Facility based on available information on the individual design components
- Perform a facility performance evaluation using available data and additional data gathered as needed
- Develop restoration recommendations based on the findings from previous work tasks
- Develop a draft and final report summarizing the findings of the study

4.11.2.4 Lake Jackson: Butler Creek and Okeeheepkee Creek Inorganic Nitrogen and FIB Source Assessment

High *E. coli* and inorganic nitrogen concentrations within Butlers Mill Creek and Okeeheepkee Creek were identified in **Section 4.11.1.2** as stressors to Lake Jackson (**Figure 4-172** to **Figure 4-175**). These high concentrations are indicators of anthropogenic loading sources that need to be identified and addressed. **Figure 4-179** shows the Butlers Mill Creek and Okeeheepkee Creek sub-watersheds with historical water quality sampling stations identified. As outlined previously, while Okeeheepkee Creek flows through the Okeeheepkee Creek Regional Treatment Facility, Butlers Mill Creek discharges directly to Megginnis Arm.



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Legend

- Waterbodies
- MARS Facility Components
- Tallahassee Corporate Limits
- Lake Jackson Basin
- Watercourses

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
MARS Facility Layout: COT, 2023

Figure 4-178:
Lake Jackson - MARS Facility Restoration Study

Tallahassee Master Plan - Surface Water (TMaPS)

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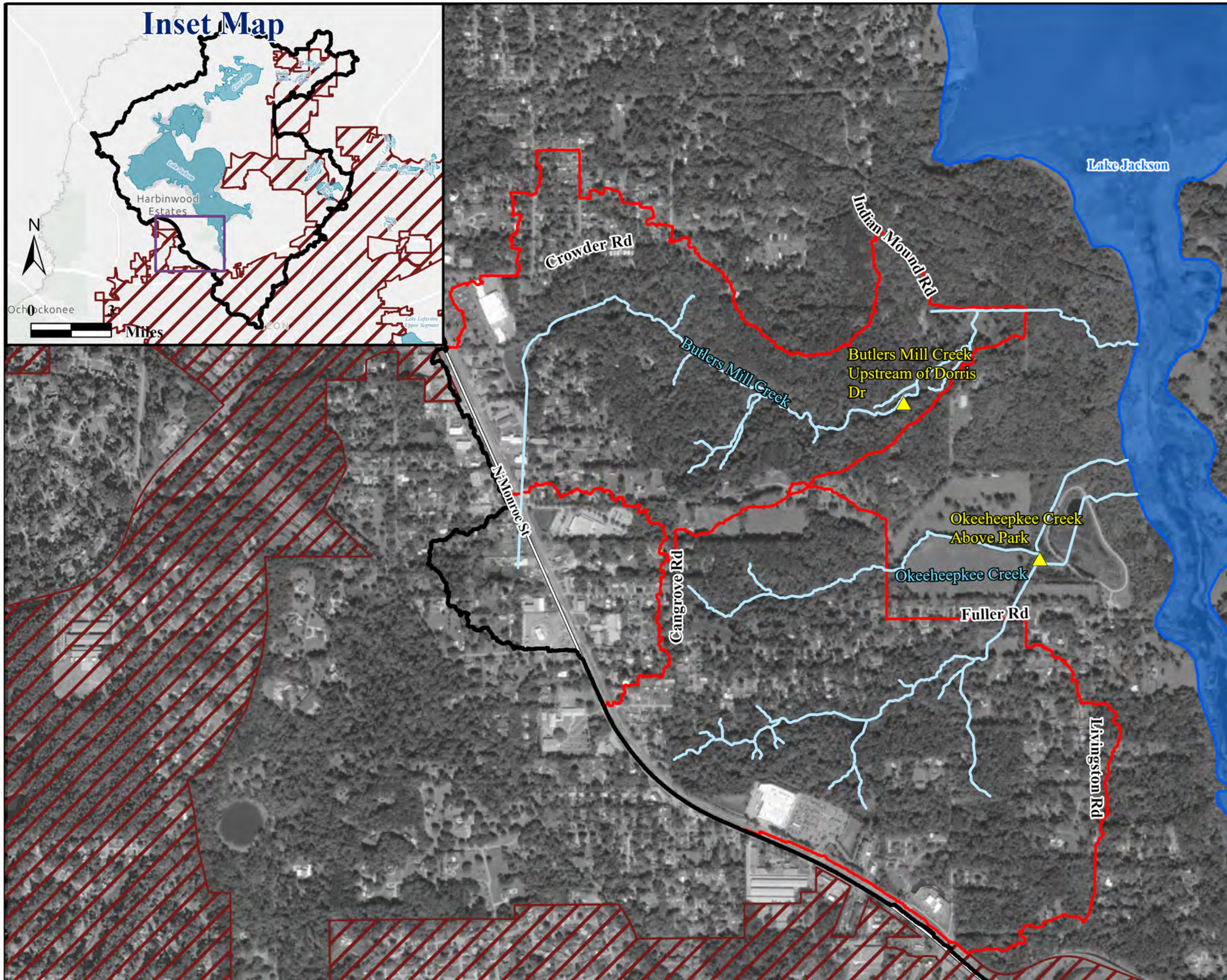

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Legend

- Subbasins
- Waterbodies in Study
- Tallahassee Corporate Limits
- Lake Jackson Basin
- Historic Water Quality Sampling Location
- Watercourses

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT, 2020

Figure 4-179:
Lake Jaskson - Butlers Mill Creek and Okeeheepkee Creek Inorganic Nitrogen and FIB Source Assessment

Tallahassee Master Plan - Surface Water (TMaPS)

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Determination of the sources of the elevated inorganic nitrogen and FIB is necessary to support development of a restoration plan. A study is recommended to identify and define the sources.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- A field and desktop reconnaissance of the Butlers Mill Creek and Okeeheepkee Creek sub-watersheds to identify potential inorganic and FIB sources, as well as potential sampling locations.
- Development of a QAPP that details staff responsibilities, sampling procedure, methodology, equipment, and laboratory analytical requirements for this project.
- Field monitoring and sampling to verify the inorganic nitrogen and FIB levels and identify potential sources to the two creeks.
- Data analyses to test hypotheses on potential sources that were identified for this investigation.
- Development of a draft and final report summarizing the findings from the study.

4.11.2.5 Lake Jackson: Hydrologic Budget Assessment

Section 4.4.3.6 presented measured flows in Lexington Creek from 1987 to 1996 and from 2016 to 2018 (**Figure 4-5**). That data indicated significant reductions in the flow from Lexington Creek in the later measurements. While some concerns were raised relative to the accuracy of the data, the significant differences raise questions. The questions include what changes occurred in the sub-watershed to result in the significant reduction in flow, and how do those reductions on this tributary and potential reductions in other tributaries impact the hydrologic and water quality response in the lake. Additionally, examination of the historical water level record in Lake Jackson (**Figure 4-4**) showed significant changes in the water level patterns since the earliest records in the 1950s and 1960s, along with an overall water level decline.

Understanding the hydrologic budget for a waterbody and its response to that budget, along with how that budget has changed over time, is important relative to impacts on water quality response. This is especially true for closed basin systems such as Lake Jackson, where water level and exchange impact the ecological response. The changes in water level patterns are likely a function of changes in the loss to groundwater through the sinkholes, but they may also be influenced by changes in the overall runoff. If the flow data are accurate, the reductions in flows from Lexington Creek may be due to increased retention from stormwater pond construction in the more urbanized sub-watershed. A similar condition potentially exists within the other significant input from the south, Megginnis Creek, due to the construction of the MARS Facility, with its extensive impoundment volume and other upstream improvements.

A Lake Jackson Hydrologic Study is proposed. The goals of the study are as follows.

- Quantify the present hydrologic budget to the lake, including rainfall, baseflow and runoff from tributaries, evaporation/transpiration, and losses to groundwater.

- Develop historical hydrologic stage and water budget based on pre-development conditions and compare with present stage and water budget.
- Provide hydrologic restoration alternatives, if needed.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- Gather and assess all available information relevant to hydrologic conditions in the Lake Jackson basin.
- Develop a data collection and modeling plan that will identify the need for additional measurements to support development of a hydrologic and hydraulic model of the basin and outline the assumptions, model(s), data, and methodologies for simulating the existing and pre-development conditions in the basin.
- Develop a hydrologic model of the Lake Jackson basin to simulate existing as well as pre-development conditions.
- Develop a draft and final report summarizing the findings of the study.

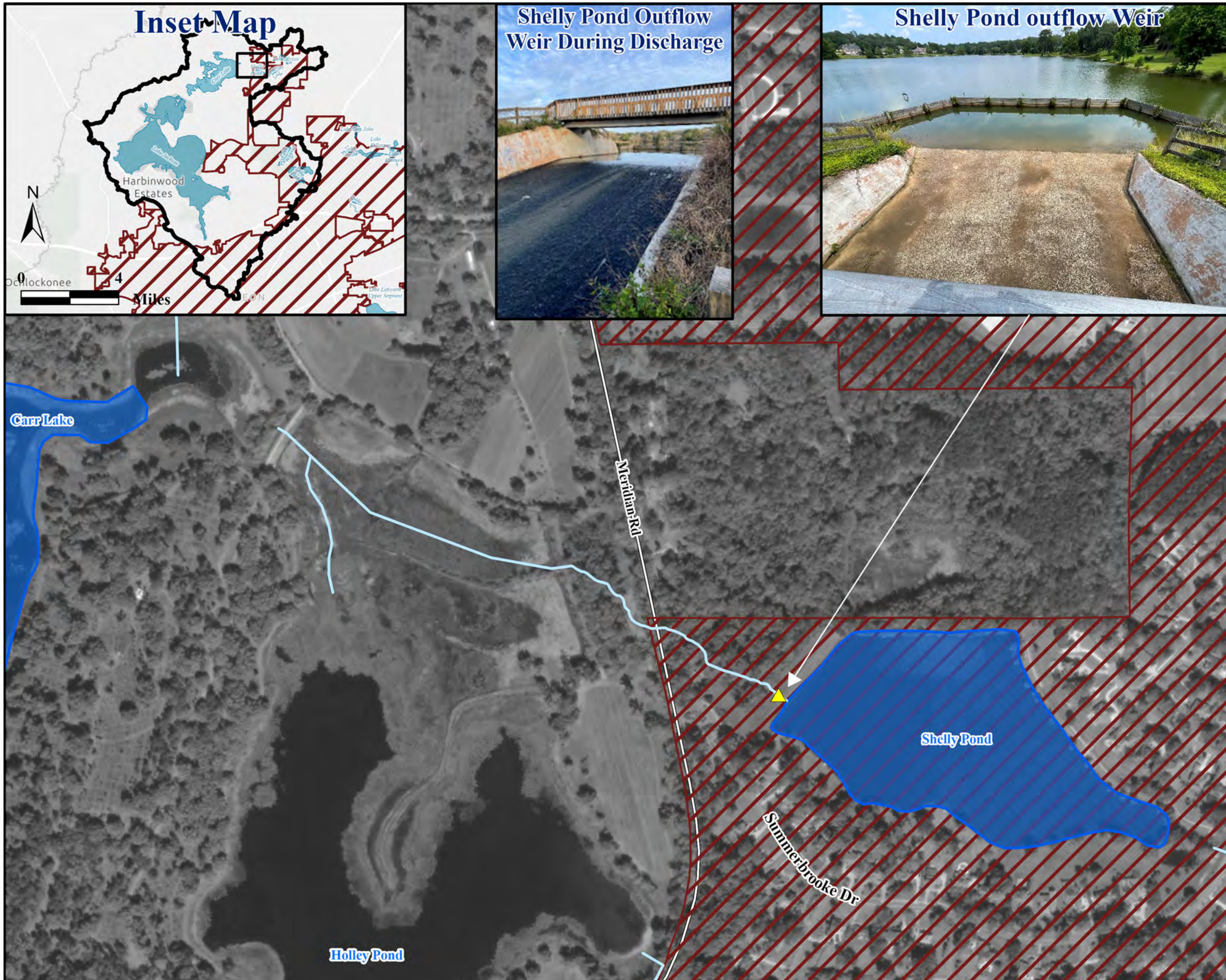
4.11.2.6 Carr Lake: Flow Measurement and Water Quality of the Inflow from the Summerbrook Chain of Lakes

As outlined earlier in the summary of data limitations, while Carr Lake was not identified as a priority waterbody, the Summerbrook Chain of Lakes (which is a priority waterbody) drains into Carr Lake. Currently, there is limited information on the load entering Carr Lake, and based on the desire to maintain the existing water quality in Carr Lake, discussions with City staff identified a need to quantify the flow, concentrations, and load coming into Carr Lake from the Summerbrook Chain.

Accurate quantification of the nutrient load coming into Carr Lake from the Summerbrook Chain of Lakes requires the collection of ambient data within Shelly Pond (the source of water flowing to Carr Lake) and flow measurements over the spillway leaving the pond. **Figure 4-180** provides a map showing the location of the proposed data collection at the outfall weir from Shelly Pond, along with photos of the weir when dry and flowing. The study would include establishment of ambient monitoring of Shelly Pond and installation of a pressure sensor to measure water levels to allow calculation of flow over the weir.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- Reconnaissance of the site with City staff to understand the site logistics and develop consensus with City staff on the approach for setting up the monitoring at the site.
- Performance of a survey of the site that includes a full survey of the weir and setting of elevations for a staff gage or water level instrument.
- Development of a QAPP that details staff responsibilities, sampling procedure, methodology, equipment, and laboratory analytical requirements for this project.



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- Waterbodies in Study
- Tallahassee Corporate Limits
- Lake Jackson Basin
- Flow and Water Quality Sampling Location
- Watercourses

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT, 2020

Figure 4-180:
Carr Lake - Flow Measurements and Water Quality Sampling of the Shelly Pond Outflow

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- Ambient sampling of Shelly Pond.
- Installation of water level monitoring equipment in Shelly Pond.
- Ongoing maintenance of the station as outlined in the QAPP.
- Data reporting and analyses that present the raw data and any analyses outlined in the QAPP, along with an overview of the sampling methodology, issues encountered, and methods of resolution.

4.11.3 Study Prioritization

To prioritize the proposed studies, a ranking table was developed that scored each of the projects in relation to the following:

- Waterbody priority ranking (**Table 4-25**),
- Source target ranking (the overall ranking of the source addressed by the study),
- Restoration benefits (qualitative assessment of the benefits of the study),
- Extent of missing data, and
- Relative estimated cost.

Table 4-28 presents the study rankings for each of the individual metrics, the average score based on the individual rankings, and the final study ranking. The studies are divided between those that are within the City's incorporated area and those within unincorporated Leon County. The locations are provided in **Table 4-28**.

Only one study is fully within the City's incorporated area, the flow measurement and water quality of the inflow from the Summerbrook Chain of Lakes. This project overall is ranked fourth.

For the studies within unincorporated Leon County, the top priority is the MARS Facility restoration project, followed by the flow and event-based water quality sampling on Lexington Creek. The third and fourth ranked projects are the FIB source assessment for Lexington Creek and the inorganic and FIB source assessment for Butlers Mill Creek and Okeeheepkee Creek, respectively. The lowest ranked project is the hydrologic budget assessment for the Lake Jackson basin, which covers incorporated and unincorporated areas found within the basin.

Table 4-28: Proposed Study Ranking

Target Waterbody	Proposed Study	Study Location	Waterbody Priority Ranking	Source Ranking	Restoration Benefits	Extent of Missing Data	Relative Cost	Average Rank	Study Ranking
Lake Jackson	Flow and Event Based Water Quality Sampling of Lexington Creek	Leon County	2	1	2	3	3	2.20	**2**
Lake Jackson	MARS Facility Restoration Study	Leon County	2	1	1	2	4	2.00	**1**
Lake Jackson	Butlers Creek and Okeeheepkee Creek Inorganic Nitrogen and FIB Source Assessment	Leon County	2	3	4	4	2	3.00	**4**
Carr Lake	Flow Measurement and Event Based Water Quality of the Inflow from the Summerbrook Chain of Lakes	City Incorporated Area	3	2	6	1	3	3.00	**4**
Lake Jackson	Hydrologic Budget Assessment	Leon County, City Incorporated Area	2	5	5	5	5	4.40	**6**
Lexington Creek	FIB Source Assessment	Leon County	1	4	3	4	1	2.60	**3**