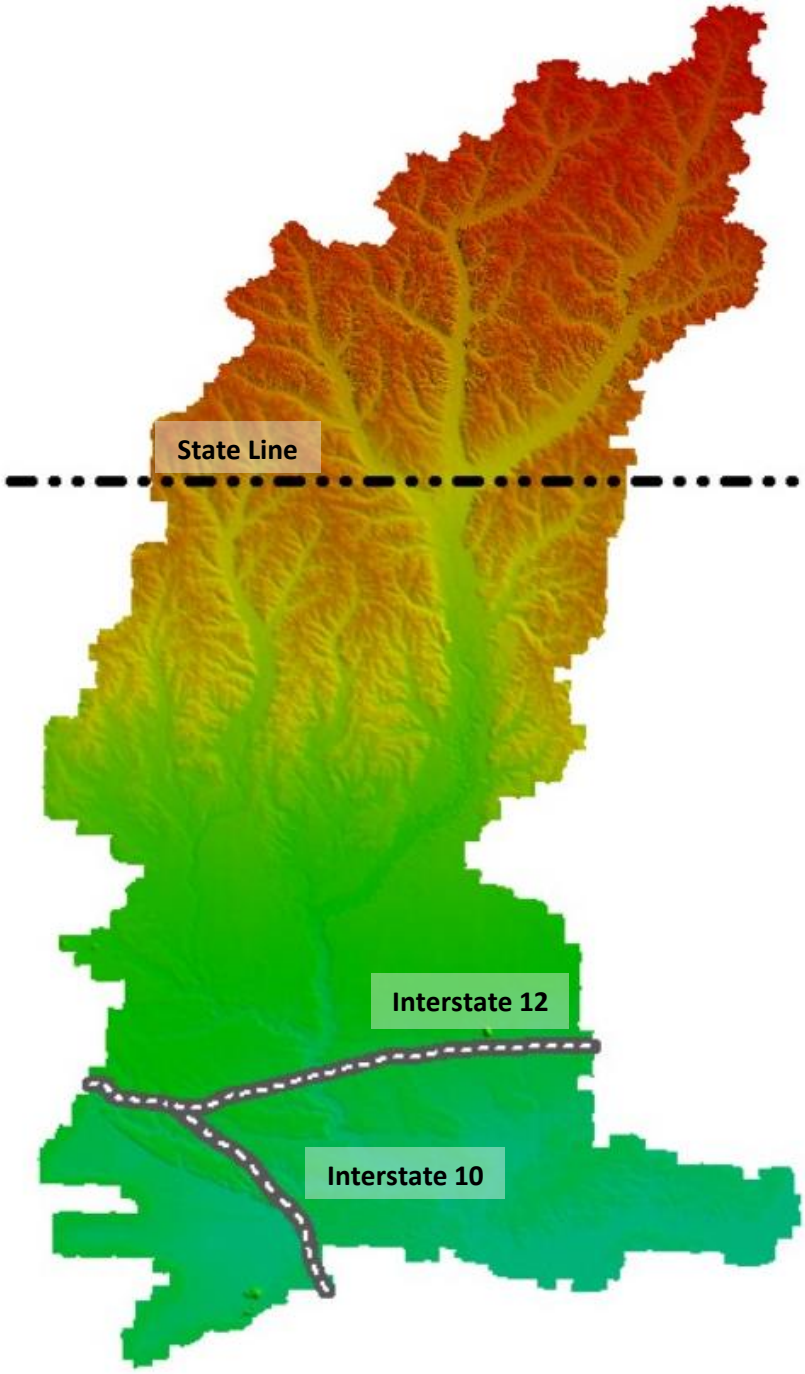
Evaluation of Potential Areas for Stormwater Storage in the Upper Amite River Basin

(Report in Response to 2023 House Resolution 290)



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Purpose

To analyze potential stormwater storage locations in the Upper Amite Basin Watershed as part of House Resolution 290 in the 2023 Regular Session. Goals will be to reduce flooding downstream, look at potential for aquifer recharge, water supply, and recreational facilities.

Introduction

This report is written in response to House Resolution 290 (HR 290) of the 2023 Regular Session. HR 290 urges and requests the Department of Transportation and Development (DOTD) to evaluate all potential areas in the upper Amite River Basin on the potential to detain or retain stormwater runoff through a system of structures. The resolution further states that the study shall consist of the upper Amite River Basin North of the I-12 corridor where detention or retention of stormwater runoff could have a positive and meaningful impact on the volume and timing of stormwater reaching the middle and lower Amite River Basin. The study shall determine if water supply sources and recreational facilities are able to be incorporated into the detention or retention structures and shall consider, at a minimum, the following:

(1) The development of a plan of managed storage or retention in sufficient volumes to reduce flood impact to downstream areas for multiple storm sizes and durations, including the development of conceptual designs and potential system operation guidance to minimize flows downstream.
(2) The evaluation of impacts by incorporating existing and proposed drainage improvements to quantify effects on the entire watershed.
(3) An evaluation of how benefits of detention and retention in the upper Amite River Basin could support further efforts to improve drainage or flood control efforts in the lower Amite River Basin.
(4) A determination of the viability of water supply and recreational facilities at each detention and retention structure.
(5) A determination of the social and economic impacts and benefits both upstream and downstream of each structure.
(6) An evaluation of the environmental impacts and benefits upstream and downstream from each structure and an evaluation of the potential impacts and benefits to the aquifers.
(7) The development of the feasibility of design and construction with cost estimates of the detention or retention structures, in compliance R.S. 38:21.

The Department of Transportation and Development shall provide a written report detailing the completion timeline and the associated costs for the evaluation of the upper Amite River Basin to the chairman of the House Committee on Transportation, Highways and Public Works and the chairman of the Senate Committee on Transportation, Highways, and Public Works by January 1, 2024.

To fully answer the seven questions posed in HR 290 requires significant technical effort and man-hours' that could not be applied in the limited response time allowed by HR 290. Examples of the effort required are hydrologic and hydraulic analyses, conceptual designs, geologic study, and cost estimate development. Proper analysis of any alternatives provided herein will require significant resources, either in staffing or through consultant contracts. While we were unable to identify sufficient funding sources for a thorough study by a consultant, DOTD staff were utilized to identify the possible locations in the Upper Amite Basin that have the physical properties to detain water. This is an effort to take one step in

the process and provide visibility of the scope of the requests of HR 290. It is important to understand the locations identified were selected based strictly on their ability to detain large volumes of water with no other considerations. It should be clear that this is a very preliminary step in a feasibility study process to identify all potential locations and that some location are obviously not viable. It is a small step in an extensive and methodical process. It is also important to understand the any identified location can and should be adjusted to identify all possible surface water uses benefit and negative impacts.

In furtherance of the seven specific considerations listed in the resolution, staff focused on identifying locations that warrant further investigation. By providing specific watershed characteristics, such as inundation areas, volumetric potential, and contributing watershed areas, it will make future studies more efficient by providing more refined project suites for evaluation.

Circumstances

Extreme rain events are increasing in frequency and intensity resulting in flooding all across Louisiana. The Amite River Basin experienced an extreme rain event in August 2016 that caused wide scale flooding. The Amite River crested at 46.20 feet during this historic flooding event. The flows generated by the August 2016 event that impacted the Amite River Basin were extreme, with an annual exceedance probability (AEP) below 0.2%. While serving as the flood of record for the majority of the Amite River Basin, the August 2016 event is only one example of flooding in the basin.

The Amite River Basin (ARB) has limited capacity for increased flow rates in its lower reaches due to its very flat topography and coastal influences through Lake Pontchartrain and Lake Maurepas. Historically, efforts to reduce flooding have focused on increasing the efficiency of the streams, bayous and rivers to move natural flows downstream. These efforts included a variety of potential solutions including but not limited to dredging, clearing and cleaning of drainage systems. While improving drainage may effectively reduce upstream risk, it can ultimately overwhelm the downstream conveyance capacity. As such, it is important to understand the value of upstream storage to be able to manage the timing of peak flows of the Amite River and its tributaries and the benefits in the Lower Amite River Basin.

The upper Amite Basin has the capacity to detain significant volumes of storm water runoff. There has been numerous studies done in the ARB by The United States Army Corps of Engineers (USACE) and DOTD. In fact, DOTD completed a basin wide numerical model of the ARB in 2019. Detention in the upper Amite Basin is not a new concept but previous analyses all focused on a dry reservoir. While unpopular with the public, the dry Darlington Reservoir showed sufficient storm water detention in the upper ARB to make a significant reduction of flood water levels downstream in East Baton Rouge (EBR), Livingston (LP) and Ascension Parishes (AP).

Referencing the DOTD proof of concept study for the initial ARB Model (Dewberry, 2018), “Investigation into the Darlington Reservoir Concept”, the impact of the 2016 rain event would be reduced by 6.1 feet just South of HWY 190 and by 5.4 feet just South of Interstate 12. The takeaway is that far fewer people and businesses would have flooded in 1983 and 2016 if a large scale detention system had been in place in the upper ARB. In smaller rainfall events the results are nothing less than remarkable. The results of the 2019 Dewberry Study revealed what approximately 1 million acre-feet of storage can do in a single location to mitigate flooding.

In addition to providing a surface water source for municipalities, industry, and agriculture, the proposed stormwater storage areas are within the recharge area of the Southern Hills Aquifer System. This cumulative positive effect would be extremely beneficial Capital Area's groundwater system. The major drought of 2023 has demonstrated the value of reliable freshwater sources in a state where water is often overly abundant. While we believe the Darlington Reservoir warrants further evaluation, there are other locations in the upper Amite River Basin that should be studied as well in an effort to achieve sufficient storage volumes while utilizing wet reservoirs.

Due to jurisdictional limitations, the effort was focused on locations within Louisiana. However, nearly 1/3 of the Amite River Basin lies within Mississippi. In particular, the upper portion of the watershed provides significant topographic relief, providing additional storage capacity. As such, the State of Mississippi is an important stakeholder. Their input and partnership is essential for maximizing regional benefits.

Results

Initial conversations identified a technical path to provide a list of potential storm water control structure locations. Utilizing the most recent LiDAR data available on the USGS National Map, DOTD engineers used Global Mapper® to identify and evaluate potential locations within Louisiana. From an initial desktop

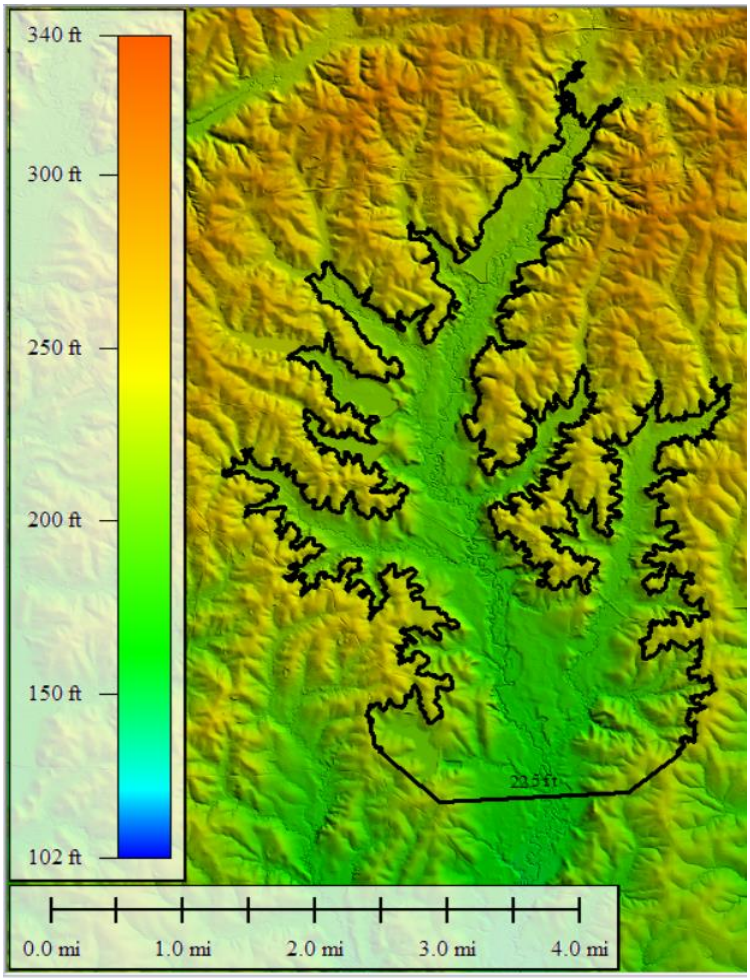

Figure 1: Example of a Potential Stormwater Storage Location

investigation, potential structure locations were determined by viewing the digital terrain data in Global Mapper. Areas with substantial stormwater storage potential were identified for further evaluation and preliminary alignments were developed. For example, a reasonable assumption for a structure location would be across a stream that has a large upstream area of low or similar elevation that is bounded on both sides by higher terrain (see Figure 1).

Through the initial desktop evaluation of the terrain, twenty-one (21) locations were identified. One potential location was found to run directly through the Town of Clinton upon review and removed from consideration. The remaining twenty (20) locations (Figure 2) were further evaluated. For each location, elevation contours were drawn and used to create polygons representing the potential reservoir surface areas at specified base elevations. Storage volumes were then calculated using Global Mapper®. Finally, the watershed for each study area was delineated to determine the contributing watershed area for the potential alignment.

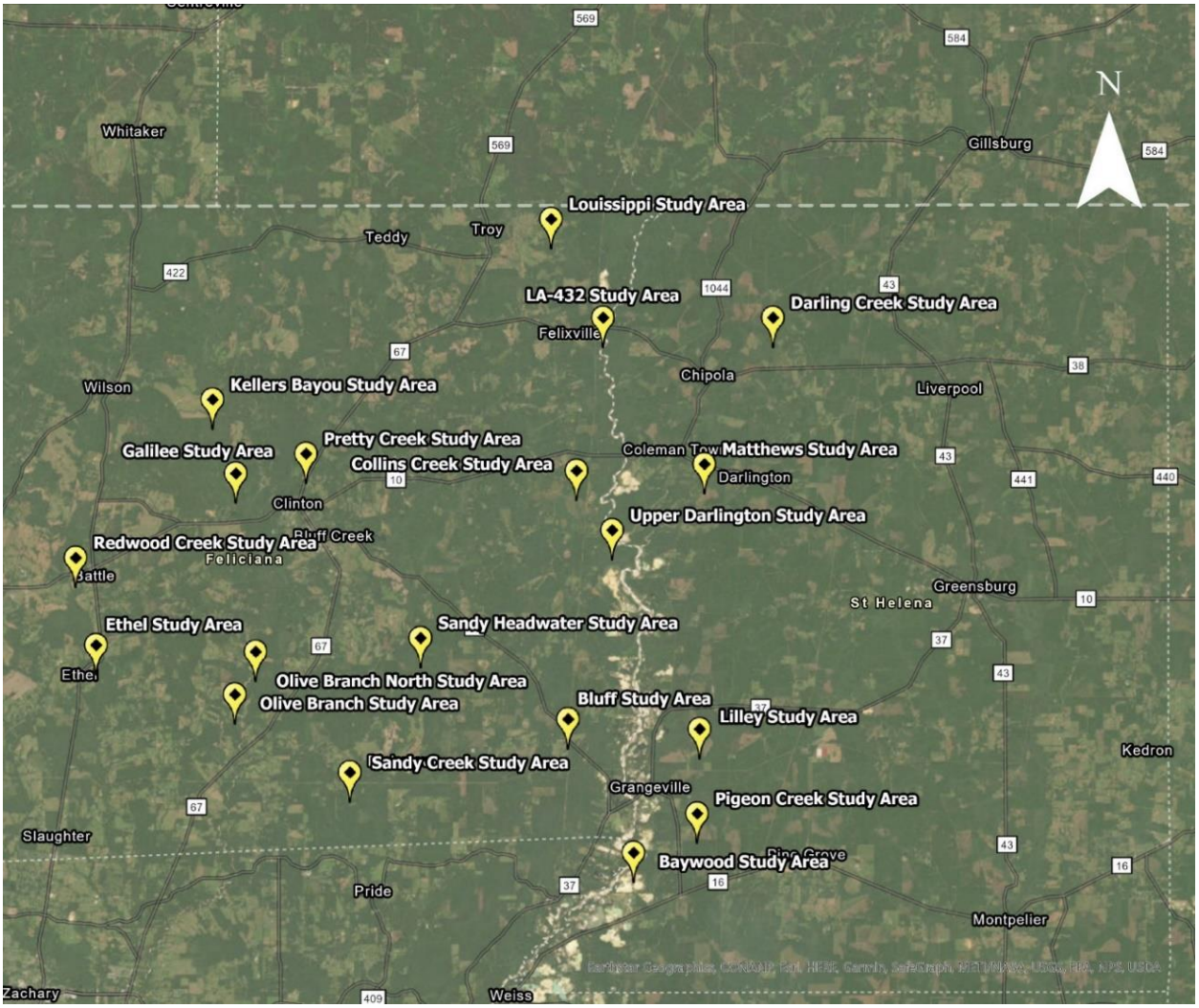

Figure 2: Evaluated Locations

Upon further evaluation of each potential structure location, several alignments were adjusted to maximize stormwater storage potential. In some cases, several alignments were evaluated. All elevations are provided in statute feet above mean sea level. It is important to remember that the storage-volumes provided within this report are near absolute maximums for the bounding terrain. If these elevations are exceeded, the reservoir could potentially spill over into adjacent watersheds. As such, the actual pool stage of any reservoirs at these potential locations would be lower than the maximum pool elevation.

Detailed results for the evaluated locations are included in Appendix A: Potential Study Areas.

Recommendations

This response was limited by the available man-hours of qualified personnel within the Department. While the data provided is extremely valuable, it is only the first step in very deliberate and methodical process to determine feasibility. A complete feasibility study and vigorous debate should precede any attempt to design projects that would provide meaningful stormwater storage within the Amite River Basin. A significant financial investment is necessary to provide the thorough engineering analysis necessary for informed decision-making. A responsible solution includes a thorough evaluation of the entire Amite River Basin.

In order to develop a viable plan of managed storage or retention within the basin, viable study areas should be evaluated using the Amite River HUC8 Watershed Model that is currently under development through the Louisiana Watershed Initiative (LWI). This model can be used to determine flow accumulations associated with each annual exceedance probability rainfall event. It also allows for the storage concentrations to be moved. This is very important to develop storage and release time tables to maximized benefits downstream. This models provides a hydraulic baseline to quantify the potential effects across the entire Amite River Basin watershed as a result of each alternative, particularly the impacts to drainage and flood control in the Lower Amite River. In addition to flood reduction benefits, some projects may have the potential to produce significant benefits to regional water resources and recreation.

In order to capture all potential benefits, the study should include both wet and dry detention to capture these benefits. The Amite River HUC8 Watershed Model can be used to determine the viability of each location as a potential source of surface water. In addition to using the Amite River HUC8 Watershed Model to evaluate surface water impacts, the evaluation should also consider the impact on the Southern Hills Aquifer by evaluating the groundwater recharge potential of all viable wet reservoir locations. The study should include evaluation of groundwater models of the Southern Hills Aquifer System to better understand the complex surface water-groundwater interaction of each respective location. Another simple measure may be to determine the number of users that can be taken off of ground water. In order to improve the accuracy of these interactions, the state should partner with United States Geological Survey to perform Airborne Electromagnetic (AEM) mapping of the study area.

It is also important to quantify the social, economic, and environmental impacts of each study area. In addition to the potential social and economic benefits of an alternative freshwater supply, there are many substantial recreational benefits of potential reservoirs that should be evaluated. It is, however, important to give due consideration to the environmental impact of water control structures on the entire basin.

With sufficient time and funding, the Department will hire a qualified engineering firm to perform an in-depth quantitative analysis of the benefits and constraints of each study location and develop suites of projects to provide greater benefits distributed across the watershed. The analysis should focus on flood reduction benefits, potable water supply potential, recreational opportunities, conflicts and relocations, environmental impacts, and geotechnical constraints of potential projects.

If funded, a preliminary feasibility study of the areas identified in this report can be completed in 12 months at a cost of approximately $850,000. Further costs and timelines would be irresponsible at this point in time given the number of variables to consider. The design of large scale detention or reservoirs is slow and can take decades. However, by moving methodically through the feasibility study process, providing multiple decisions points to eliminate alternatives can minimize sunk costs and ease the design process. This will allow for available funding to be focused on the most effective projects. As remaining alternatives are refined through modeling, preliminary designs can be developed on which to base cost estimates.

While DOTD is the correct agency to lead any effort to further these evaluations, we recognize that it is important to seek guidance from partnering federal, state, and local agencies. The State of Mississippi should also be included in the feasibility process. There are locations that can provide significant benefit to Louisiana that require the cooperation of Mississippi. Additional potential locations that can benefit both states were excluded from this report. In addition to coordinating with regional stakeholders like the Capital Area Groundwater Commission, the results of any study should be provided to the Amite River Basin Commission for their consideration for incorporation in their regional watershed master plan.

Appendix A: Potential Study Areas

Louissippi Study Area

The Louissippi Study Area is located near the state line between Louisiana and Mississippi in the upper Amite Basin near coordinates 30.98943, -90.88658. The proposed embankment alignment runs from Southwest to Northeast across East Feliciana Parish Roads 8-116 and 8-113. Initial contouring efforts identified a maximum potential pool elevation of approximately 255 feet at a dam height of 63 feet. At this maximum pool elevation, at least 80% of the potential reservoir area is in Mississippi. From a desktop analysis, there are a small number of structures in resulting reservoir area.

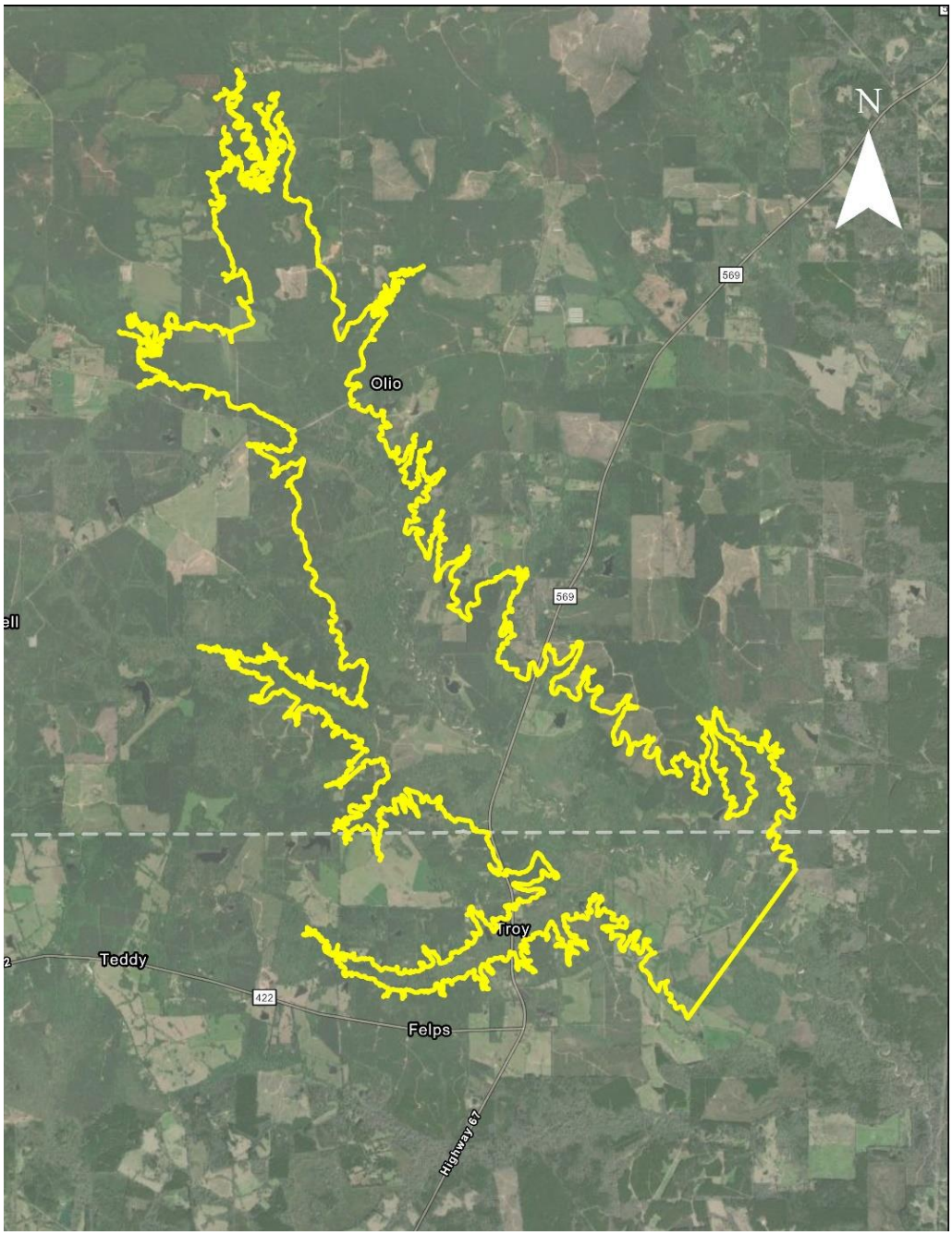

Figure 1: 255' Pool Boundary for Louissippi Study Area

The most effective alignment evaluated provided a maximum storage volume of 128,000 acre-feet at the maximum pool elevation of 255 feet. This alignment has a contributing watershed area of 69,945 acres. Potential reservoir characteristics for the Louissippi Study Area are presented in Table 1.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet-1)
200	92.97	29.01	752.36
205	404.11	136.87	173.08
210	1,847.91	444.25	37.85
215	4,925.64	806.63	14.20
220	10,032.81	1,246.50	6.97
225	17,417.18	1,709.80	4.02
230	27,365.45	2,290.90	2.56
235	40,400.79	2,933.70	1.73
240	56,775.92	3,627.80	1.23
245	76,543.55	4,321.30	0.914
250	100,396.11	5,235.50	0.697
255	128,952.15	6,200.10	0.542

Table 1: Louissippi Study Area Stormwater Storage Potential

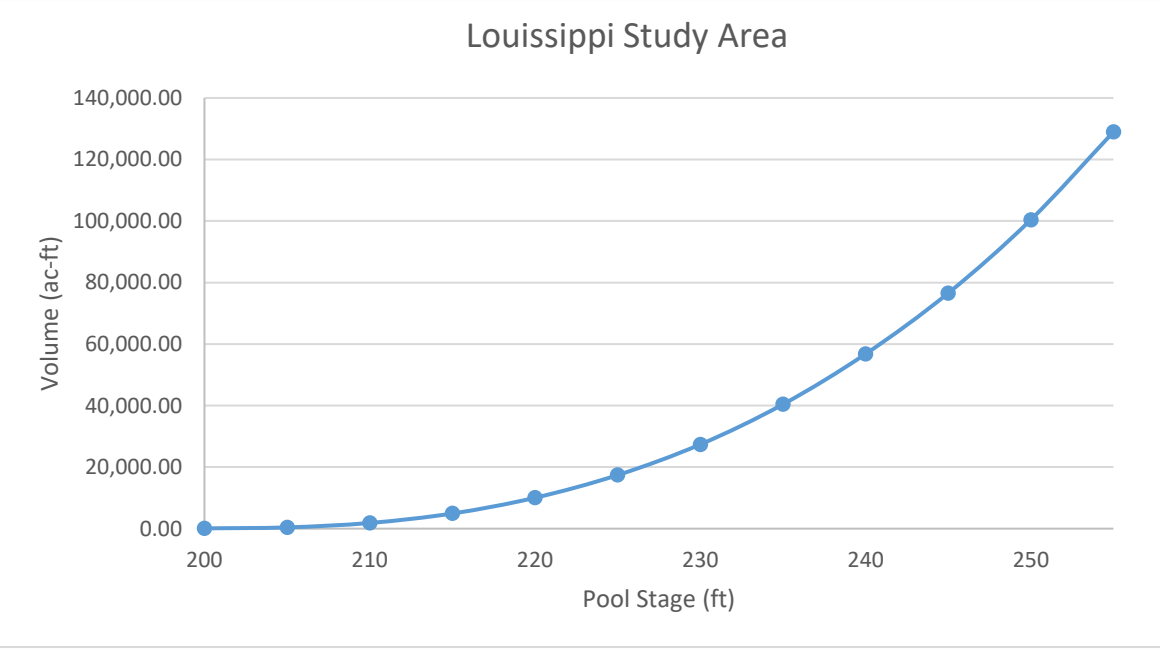

Figure 2: Stage-Storage Curve for Louissippi Study Area

Matthews Study Area

The Matthews Study Area is located on Darling Creek, a direct tributary of the Amite River, south of Chipola in St. Helena Parish near coordinates 30.88074, -90.80735. It was determined that 2 separate alignments warrant investigation in this area. The first alignment is limited to a max elevation of around 195 feet and dam height of 50 feet. Bringing the dam farther northeast could allow for an elevation of 220 feet and dam height of 73 feet, but would require a significantly longer embankment. An estimated 4-5 roads, including Louisiana Highway 10, cross the reservoir area as well as structures in the western portion near the potential embankment. From a desktop analysis, there are a small number of structures in resulting reservoir area.

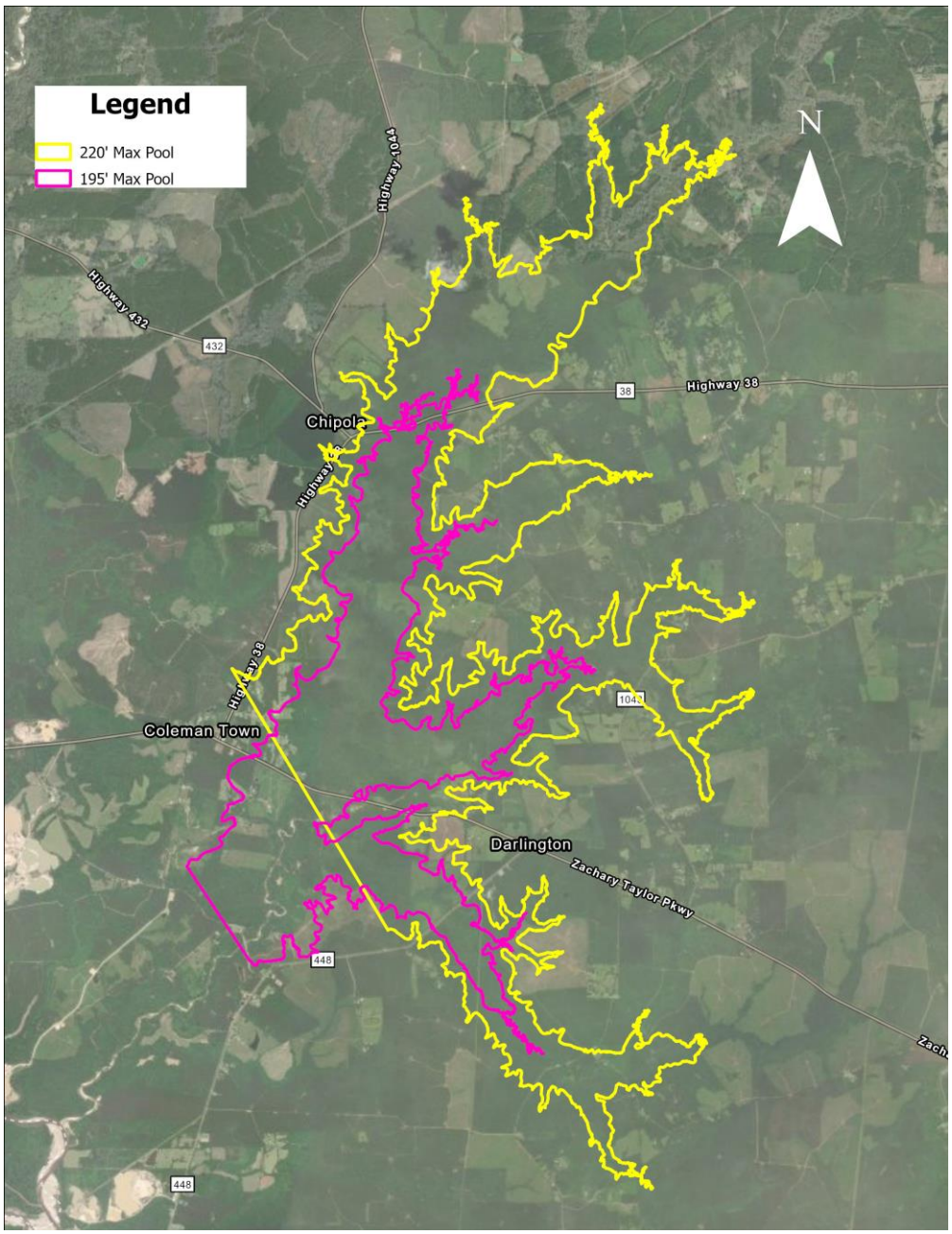

Figure 3: Max Pool Boundaries for Matthews Study Area

The most effective alignment evaluated provided a maximum storage volume 129,524 acre-feet at the maximum pool elevation of 220 feet. This alignment has a contributing watershed area of 41,900 acres. Potential reservoir characteristics for the Matthews Study Area are presented in Table 2.

Pool Stage (ft)	Fill Volume (ac-ft)		Fill Area (acres)		DA/NC (feet-1)	
	Alignment 1	Alignment 2	Alignment 1	Alignment 2	Alignment 1	Alignment 2
160	228.90	173.15505	48.46	39.21556	368.58	241.980
165	605.56	469.5816	116.40	90.46514	129.12	89.228
170	1,698.48	1296.1607	351.06	274.5337	46.08	32.326
175	4,144.61	3323.712	645.18	557.4689	17.11	12.606
180	8,332.08	7062.4511	1,047.00	955.3079	7.40	5.933
185	14,636.04	12899.895	1,494.00	1398.861	3.83	3.248
190	23,287.70	21064.682	1,964.30	1864.407	2.26	1.989
195	34,448.12	31704.472	2,513.60	2404.826	1.47	1.322
200	48,591.73		3,176.50		1.01	
205	66,318.55		3,918.30		0.737	
210	87,964.84		4,735.10		0.540	
215	113,763.51		5,623.50		0.412	
220	144,166.19		6,517.70		0.321	

Table 2: Matthews Study Area Stormwater Storage Potential

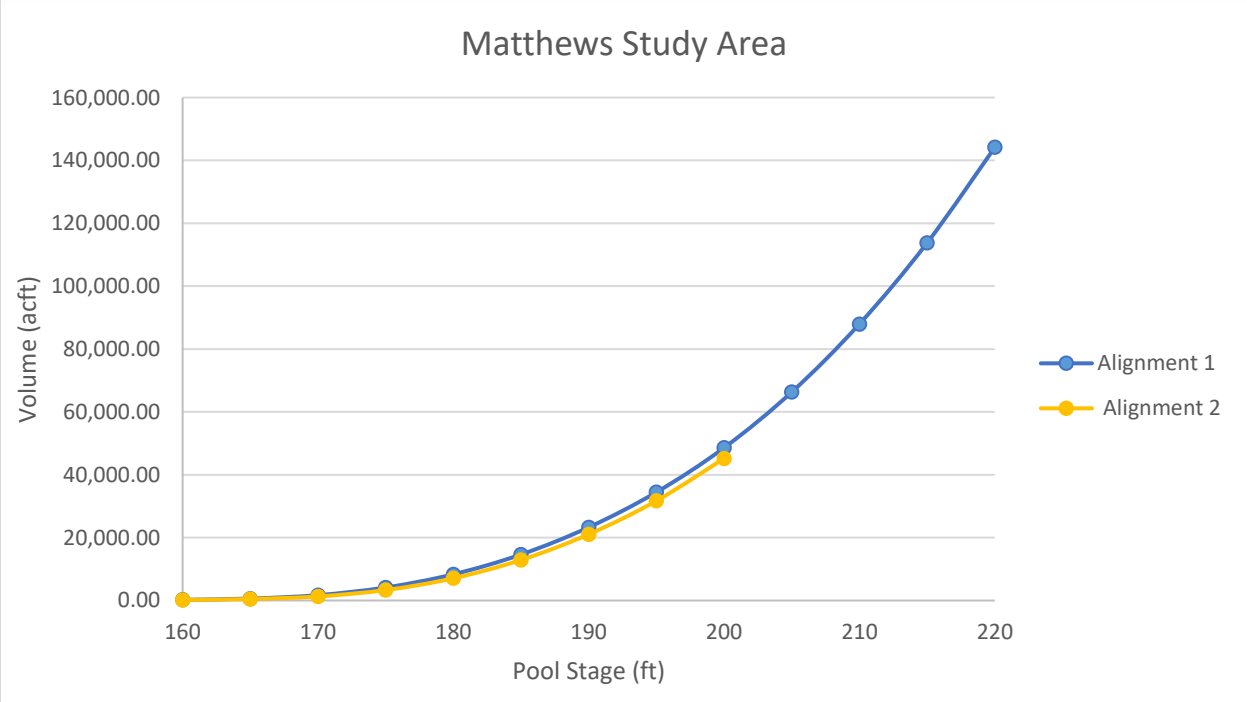

Figure 4: Stage-Storage Curve for Matthews Study Area

Sandy Study Area

The Sandy Study Area is located on Sandy Creek in East Feliciana Parish, approximately 3 miles north of Pride near coordinates 30.74363, -90.99095. Initial contouring efforts identified a maximum potential pool elevation of approximately 165 feet at a dam height of 48 feet. At this elevation, the reservoir would extend into Sandy Headwater Dam to the north. There are a handful of structures in reservoir area, and LA 959 crosses the potential reservoir. There is currently a utility corridor at the evaluated alignment location.

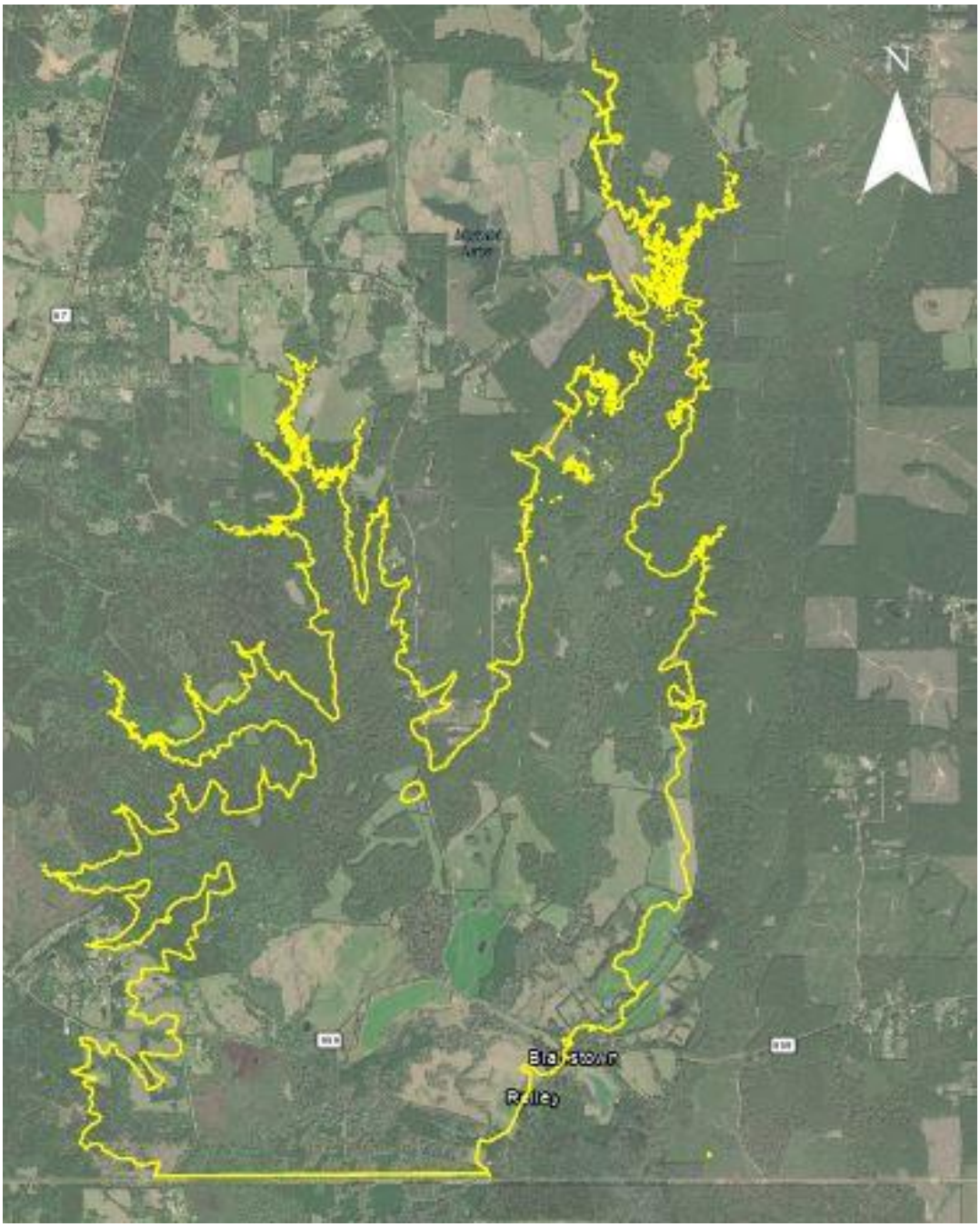

Figure 5: Max Pool Boundary for Sandy Study Area

The most effective alignment evaluated provided a maximum storage volume 75,864 acre-feet at the maximum pool elevation of 165 feet. This alignment has a contributing watershed area of 27,528 acres. Potential reservoir characteristics for the Sandy Study Area are presented in Table 3.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet-1)
130	651.44004	238.33	42.26
135	2,802.9444	652.03	9.82
140	7,282.2571	1,194.5	3.78
145	14,589.341	1,757.1	1.89
150	24,923.233	2,410.6	1.10
155	38,730.397	3,111	0.711
160	55,735.28	3,715.6	0.494
165	75,864.151	4,374.3	0.363

Table 3: Sandy Study Area Stormwater Storage Potential

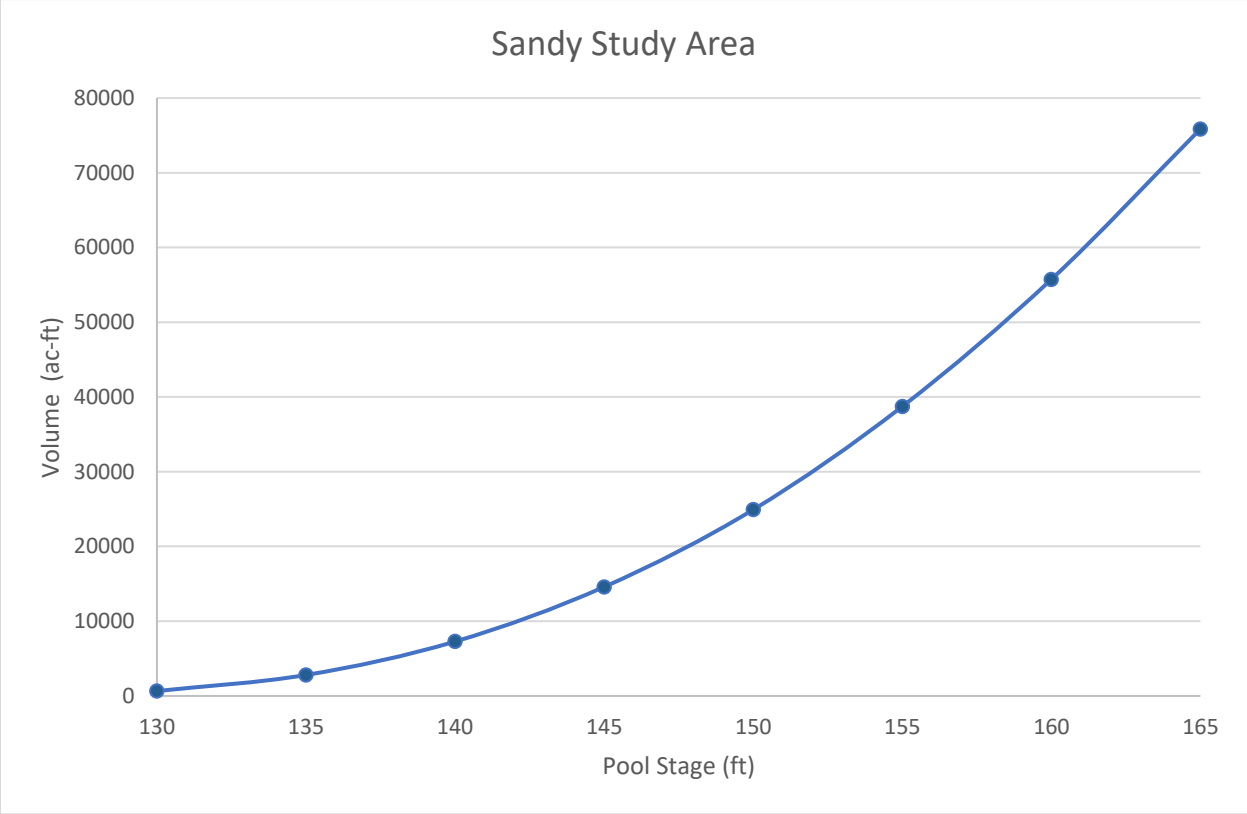

Figure 6: Stage-Storage Curves for Sandy Study Area

Sandy Headwater Study Area

The Sandy Headwater Study Area is located on Sandy Creek in East Feliciana Parish, immediately upstream of the Sandy Study Area. The evaluated alignment is approximately 3 miles southeast of Clinton near coordinates 30.80351, -90.95424. Initial contouring efforts identified a maximum potential pool elevation of approximately 225 feet at a dam height of 70 feet. At this elevation, there are a small number of homes within the potential reservoir area. In addition, Louisiana Highways 10 and 63 cross the max pool area.

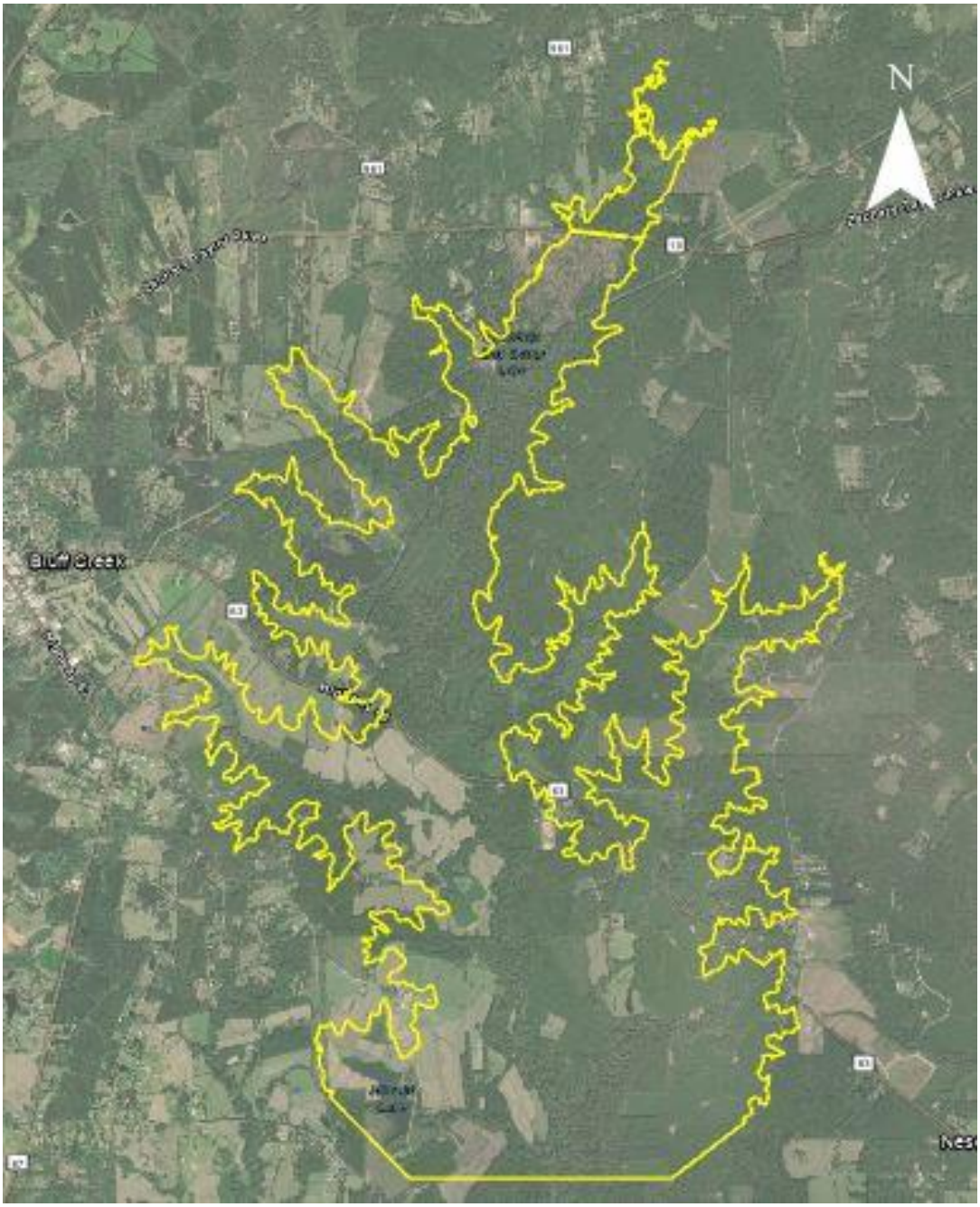

Figure 7: 225' Pool Boundaries for Sandy Headwater Study Area

The evaluated alignment would provide a maximum storage volume of 121,086 acre-feet at the maximum pool elevation of 225 feet. This alignment has a contributing watershed of 27,528 acres. Potential reservoir characteristics for the Sandy Headwater Study Area are presented in Table 4.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet-1)
170	807.30	214.90	21.10251
175	2,449.11	454.45	6.956006
180	5,414.01	728.81	3.146651
185	9,789.43	1,044.50	1.740245
190	15,845.67	1,380.70	1.07512
195	23,605.49	1,725.60	0.721697
200	33,154.93	2,104.90	0.51383
205	44,856.19	2,586.10	0.379791
210	58,998.33	3,083.60	0.288754
215	76,150.86	3,765.90	0.223714
220	96,774.24	4,494.00	0.176039
225	121,086.20	5,229.50	0.140693

Table 4: Sandy Headwater Study Area Stormwater Storage Potential

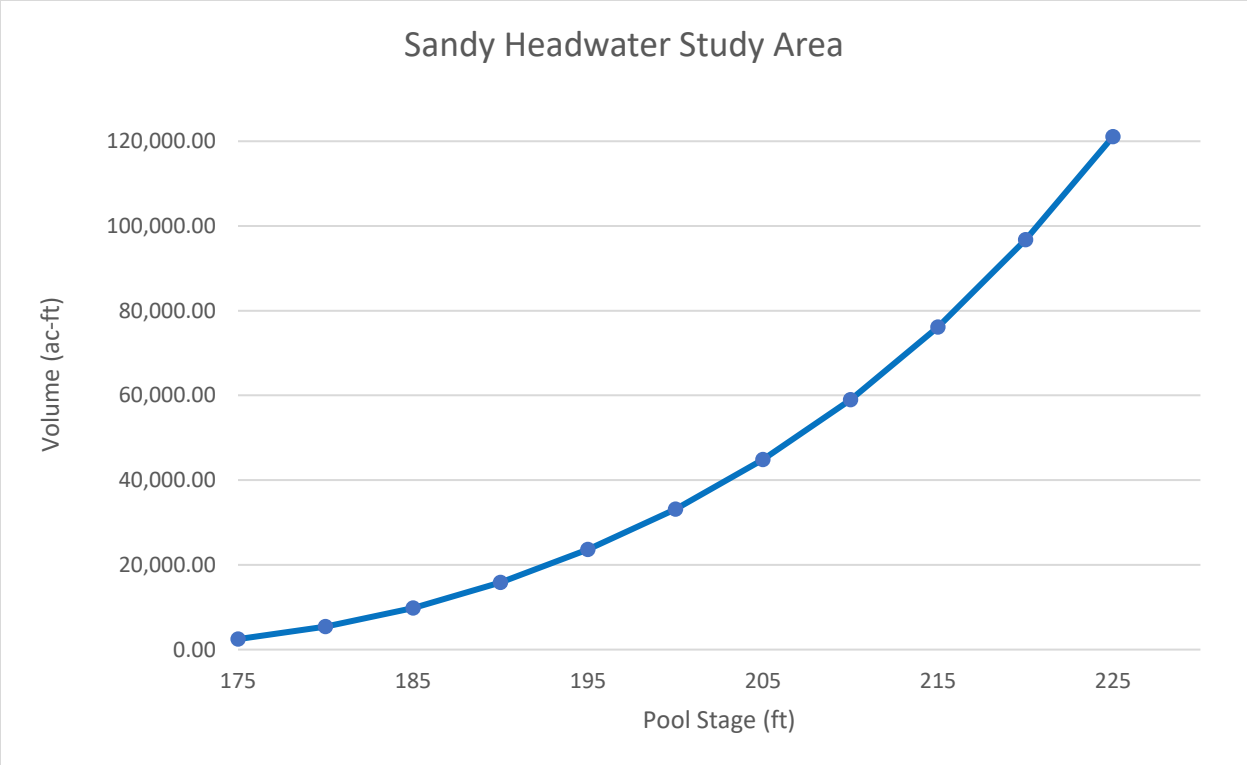

Figure 8: Stage-Storage Curves for Sandy Headwater Study Area

Ethel Study Area

The Ethel Study Area is located on Redwood Creek in East Feliciana Parish. The evaluated alignment is immediately upstream of the unincorporated community of Ethel and 5 miles north of Slaughter near coordinates 30.80033, -91.12245. Initial contouring efforts identified a maximum potential pool elevation of approximately 220 feet at a dam height of 77 feet. At this elevation, there are a substantial number of structures within the potential reservoir area. In addition to Louisiana Highways 10 and 19, Gloster Southern Railroad runs through the potential reservoir area.

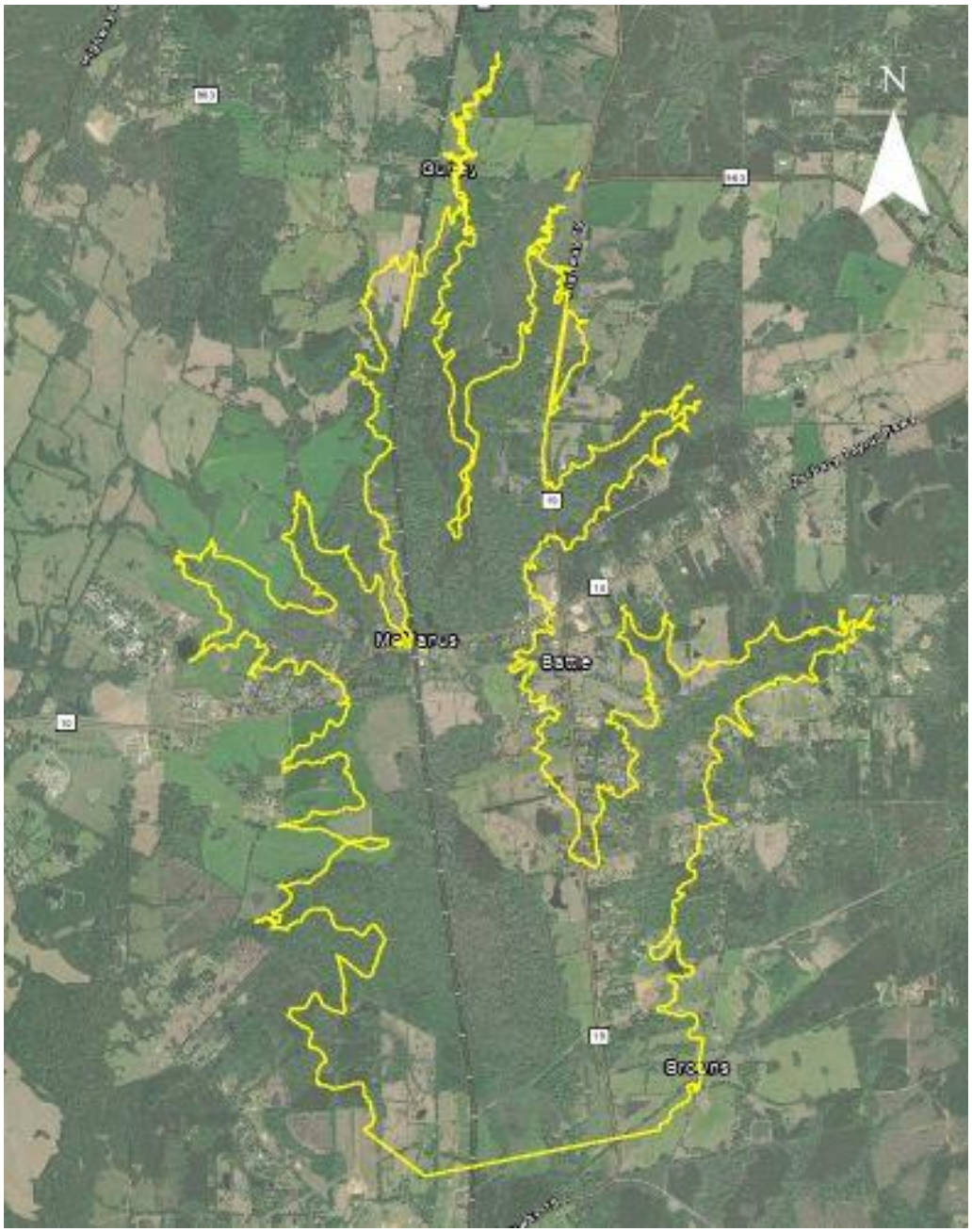

Figure 9: 220' Pool Boundaries for Ethel Study Area

The most effective alignment evaluated provided a maximum storage volume 70,029 acre-feet at the maximum pool elevation of 200 feet. This alignment has a contributing watershed area of 17,783 acres. Potential reservoir characteristics for the Ethel Study Area are presented in Table 5.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
160	562.82	164.64	31.60
165	2,123.08	464.16	8.38
170	5,268.00	799.53	3.38
175	10,214.52	1,190.90	1.74
180	17,235.04	1,624.80	1.03
185	26,528.18	2,102.80	0.670
190	38,295.40	2,603.90	0.464
195	52,712.09	3,172.20	0.337
200	70,029.05	3,772.10	0.254

Table 5: Ethel Study Area Stormwater Storage Potential

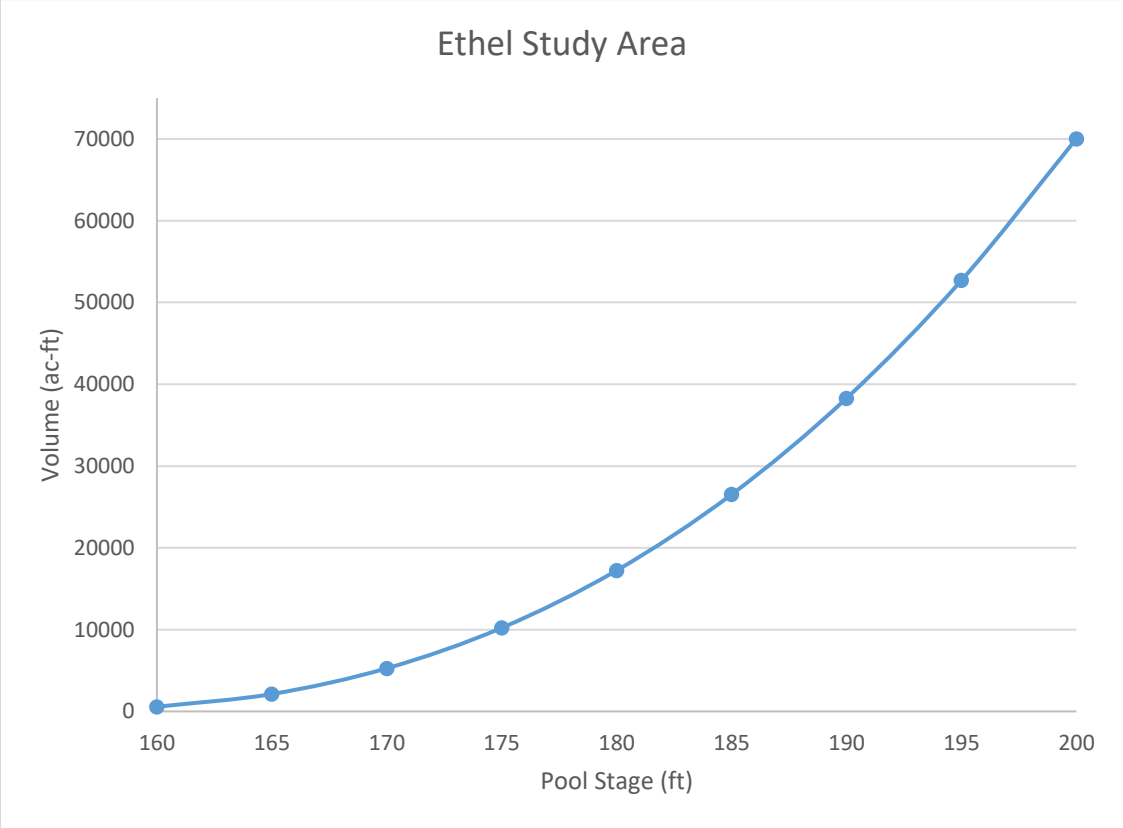

Figure 10: Stage-Storage Curves for Ethel Study Area

Redwood Creek Study Area

The Redwood Creek Study Area is located on Redwood Creek in East Feliciana Parish, 3.5 miles northwest of Clinton near coordinates 30.83911, -91.13296. The study area is approximately 3 miles upstream of the Ethel Study Area. Initial contouring efforts identified a maximum potential pool elevation of approximately 230 feet at a dam height of 62 feet. At this elevation, there are many roads and structures within the potential reservoir area. In addition to Louisiana Highways 10 and 19, Gloster Southern Railroad runs through the potential reservoir area.

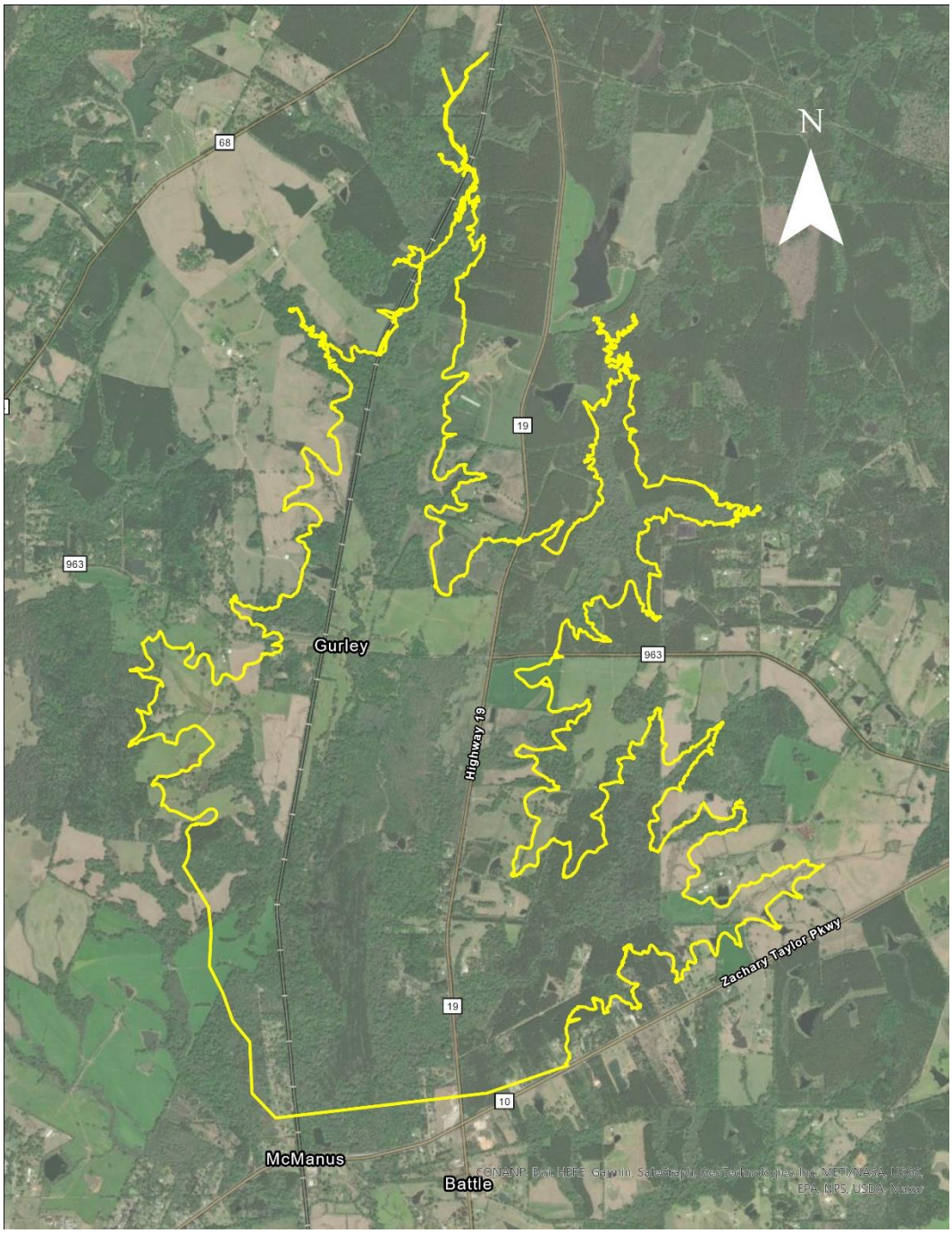

Figure 11: 230' Pool Boundary for Redwood Creek Study Area

The evaluated alignment can provide a maximum storage volume of 67,057 acre-feet at the maximum pool elevation of 230 feet. This alignment has a contributing watershed area of 11,084 acres. Potential reservoir characteristics for the Redwood Creek Study Area are presented in Table 22.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
185	522.49	150.42	21.21
190	1,726.49	341.73	6.42
195	4,046.18	584.54	2.74
200	7,607.19	853.94	1.46
205	12,674.13	1,181.60	0.875
210	19,456.35	1,533.20	0.570
215	28,109.68	1,930.90	0.394
220	38,773.49	2,341.70	0.286
225	51,663.98	2,826.70	0.215
230	67,056.90	3,323.30	0.165

Table 6: Redwood Creek Study Area Stormwater Storage Potential

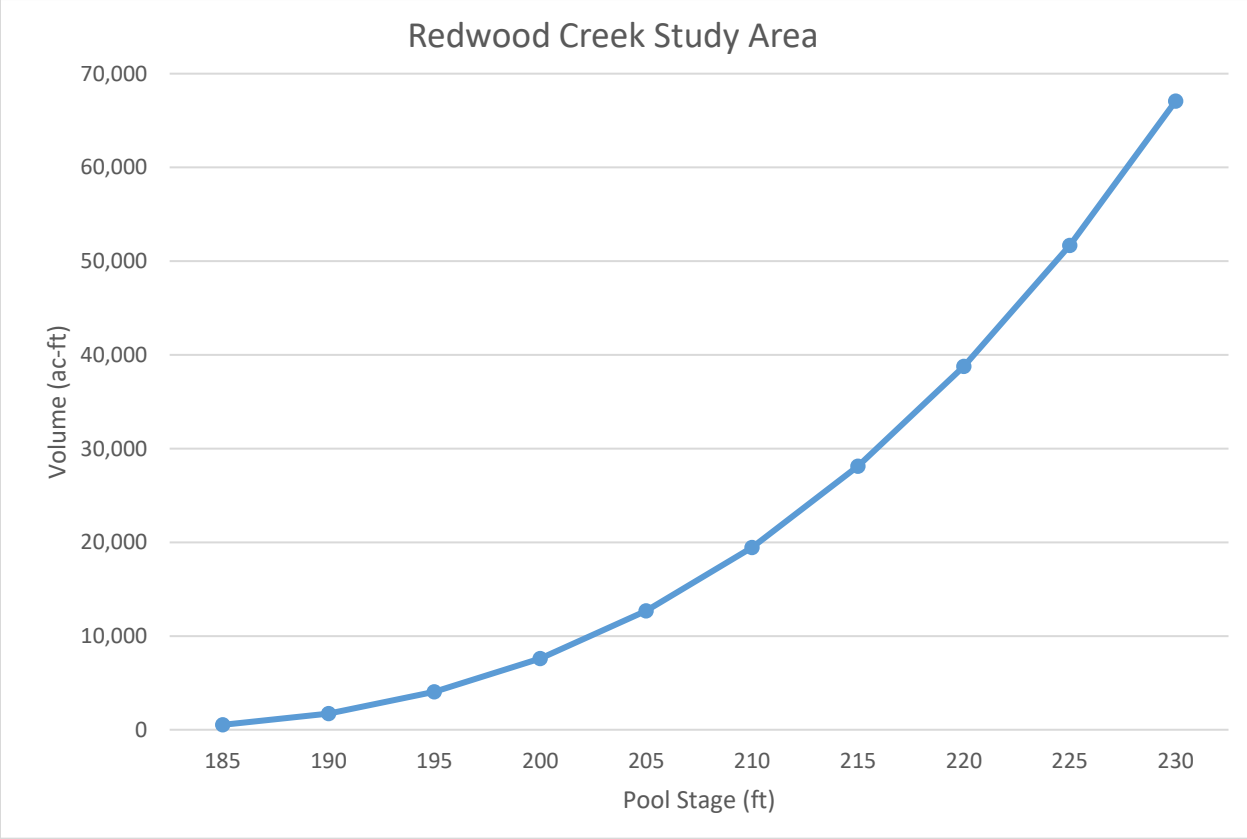

Figure 12: Stage-Storage Curve for Redwood Creek Study Area

Bluff Study Area

The Bluff Study Area is located on Bluff Creek in East Feliciana Parish. The evaluated alignment is upstream of the unincorporated Bluff Creek community near coordinates 30.76736, -90.87796. Initial contouring efforts identified a maximum potential pool elevation of approximately 185 feet with a dam height of 65 feet. At this elevation, there are several structures within the potential reservoir area. In addition to Louisiana Highway 63, a small number of local roads run through the potential reservoir area. This area has been previously evaluated as a dry reservoir by the United States Army Corps of Engineers.

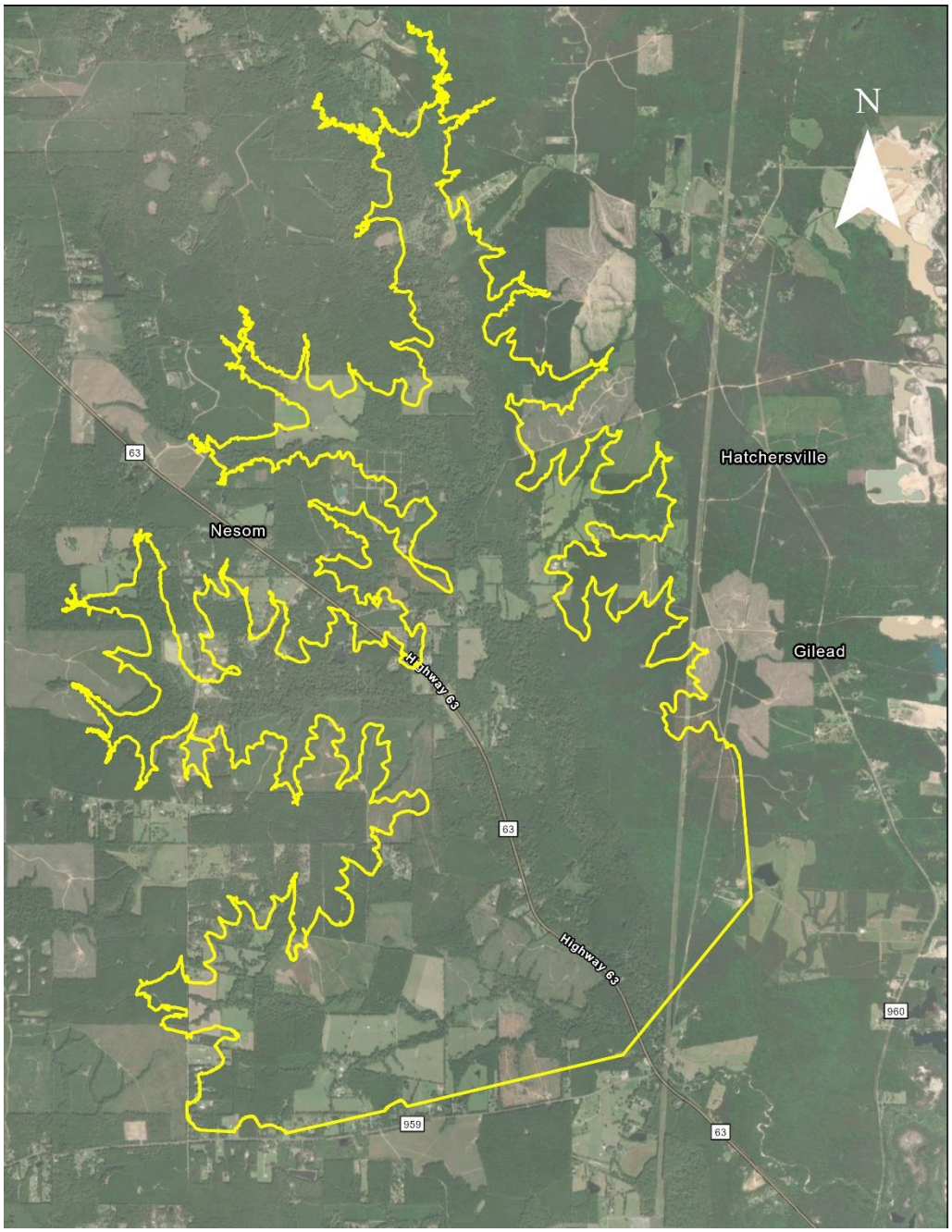

Figure 13: 185' Pool Boundary for Bluff Study Area

The evaluated alignment provided a maximum storage volume 127,713 acre-feet at the maximum pool elevation of 185 feet. This alignment has a contributing watershed area of 16,278 acres. Potential reservoir characteristics for the Bluff Study Area are presented in Table 6.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
130	62.69	16.82	259.64
135	270.74	96.72	60.12
140	1,516.83	426.62	10.73
145	4,655.07	852.64	3.50
150	9,991.13	1,279.40	1.63
155	17,661.88	1,784.60	0.922
160	27,804.93	2,289.90	0.585
165	40,719.48	2,886.20	0.400
170	56,831.46	3,580.50	0.286
175	76,536.58	4,304.90	0.213
180	100,040.97	5,112.00	0.163
185	127,712.63	5,966.10	0.127

Table 7: Bluff Study Area Stormwater Storage Potential

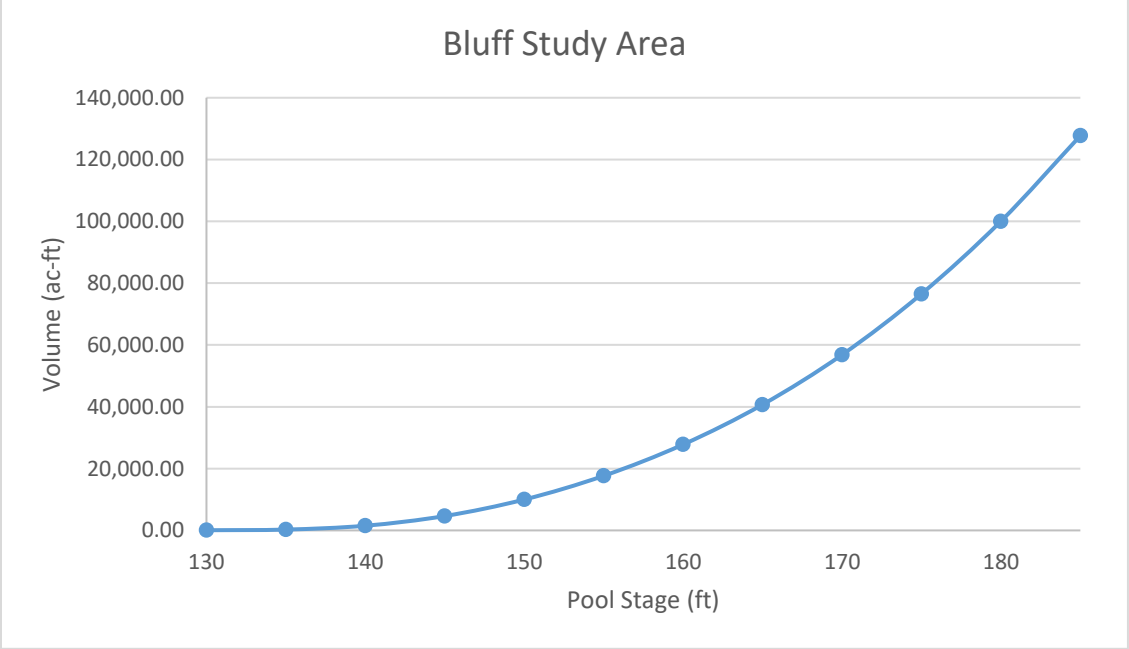

Figure 14: Stage-Storage Curves for Bluff Study Area

Galilee Study Area

The Galilee Study Area is located on the Comite River in East Feliciana Parish, approximately 1 mile northwest of Clinton near coordinates 30.87665, -91.04998. Initial contouring efforts identified a maximum potential pool elevation of approximately 260 feet with a dam height of 85 feet. At this elevation, there are a small number of structures within the potential reservoir area. Multiple roads cross the potential reservoir area including Louisiana Highway 422. The maximum pool reservoir would also extend into the extreme southern portions of Amite and Wilkinson Counties in Mississippi.

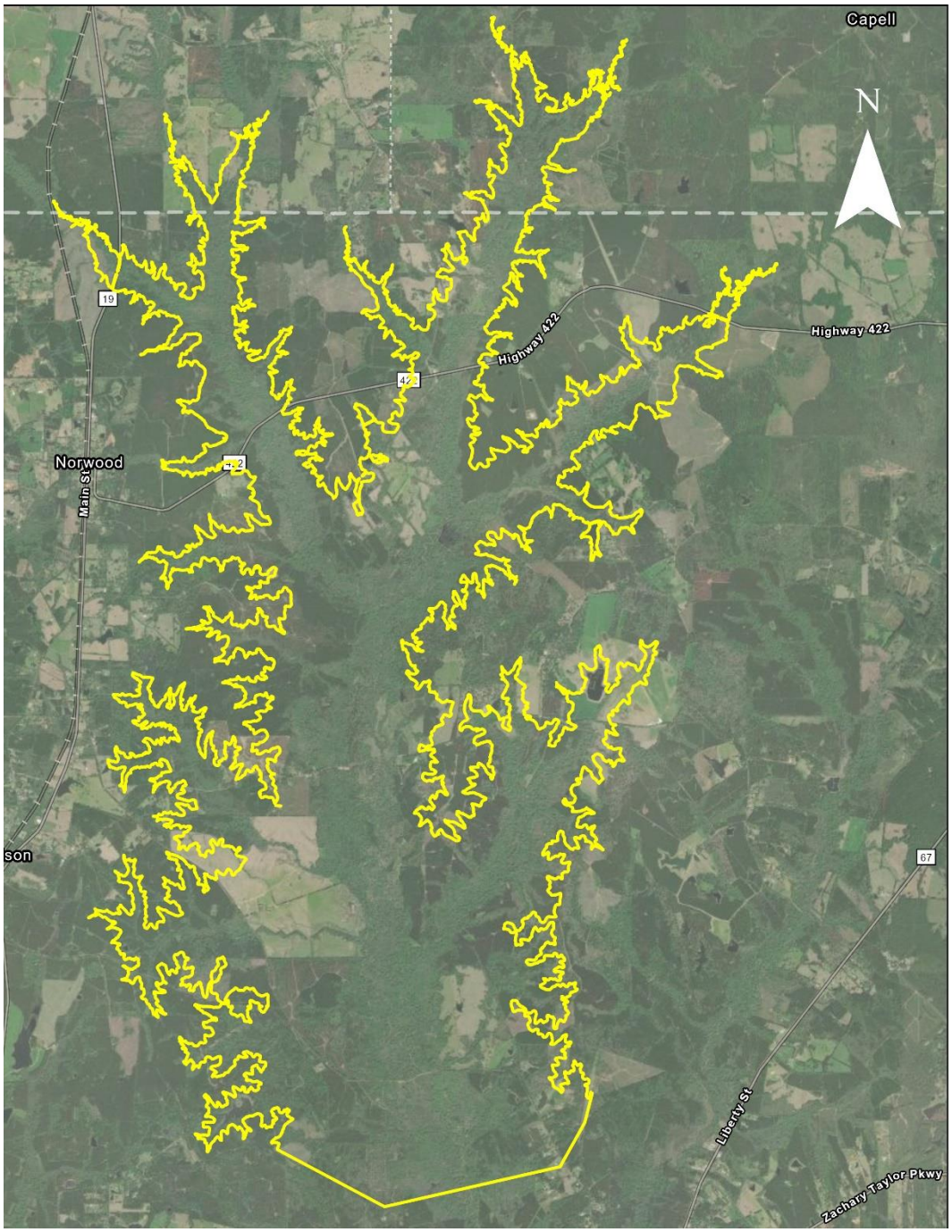

Figure 15: 260' Pool Boundary for Galilee Study Area

The evaluated alignment provided a maximum storage volume 415,184 acre-feet at the maximum pool elevation of 260 feet. This alignment has a contributing watershed area of 51,532 acres. Potential reservoir characteristics for the Galilee Study Area are presented in Table 7.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
190	2,767.41	624.33	18.62
195	6,887.06	1,035.40	7.48
200	13,231.03	1,519.10	3.89
205	22,251.75	2,104.20	2.32
210	34,284.51	2,700.20	1.50
215	49,569.50	3,438.90	1.04
220	68,926.99	4,299.40	0.748
225	92,699.64	5,249.30	0.556
230	121,407.91	6,214.60	0.424
235	154,883.53	7,201.30	0.333
240	193,624.66	8,317.60	0.266
245	238,342.50	9,595.20	0.216
250	289,743.56	10,990.00	0.178
255	348,472.00	12,535.00	0.148
260	415,184.24	14,169.00	0.124

Table 8: Galilee Study Area Stormwater Storage Potential

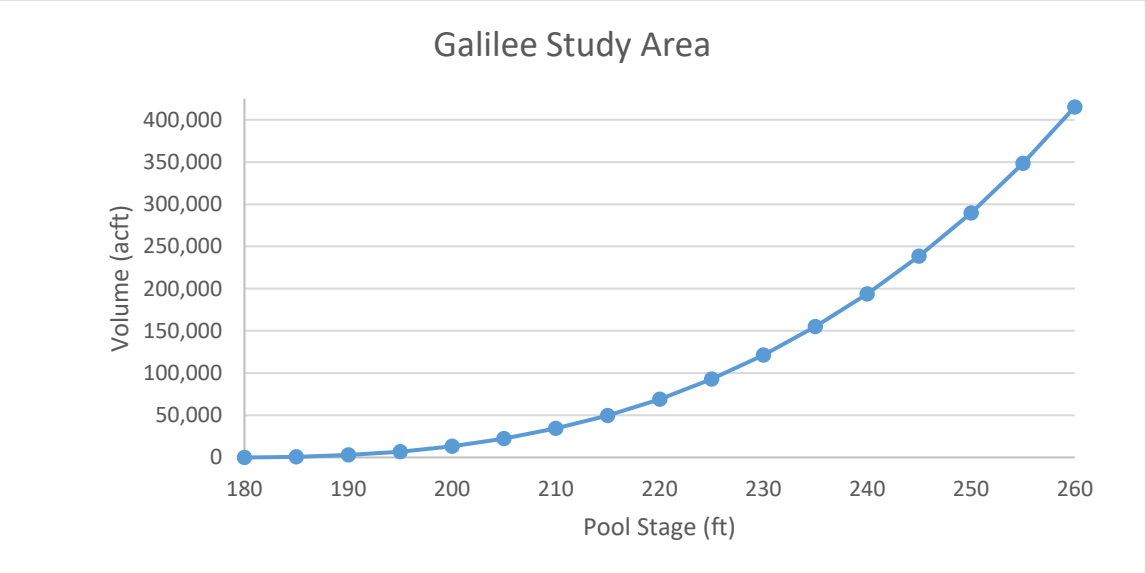

Figure 16: Stage-Storage Curve for Galilee Study Area

Lilley Study Area

The Lilley Study Area is located on Lilley Creek in St. Helena Parish, approximately 5 miles northwest of Pine Grove near coordinates 30.76297, -90.80976. This area was previously studied by the U.S. Army Corps of Engineers as a dry reservoir. Because of the available terrain, there are multiple alignments that warrant consideration for stormwater storage potential. The alignments were selected during initial contouring, providing alternatives for a range of 5 maximum pool elevations between 160 feet and 200 feet and dam heights between 29 feet and 63 feet. A desktop analysis shows several structures within the 200 foot maximum pool elevation of Alignment E, but very few within the 180 foot maximum pool of Alignment C. There are few roads in the potential reservoir area including Louisiana Highway 37.

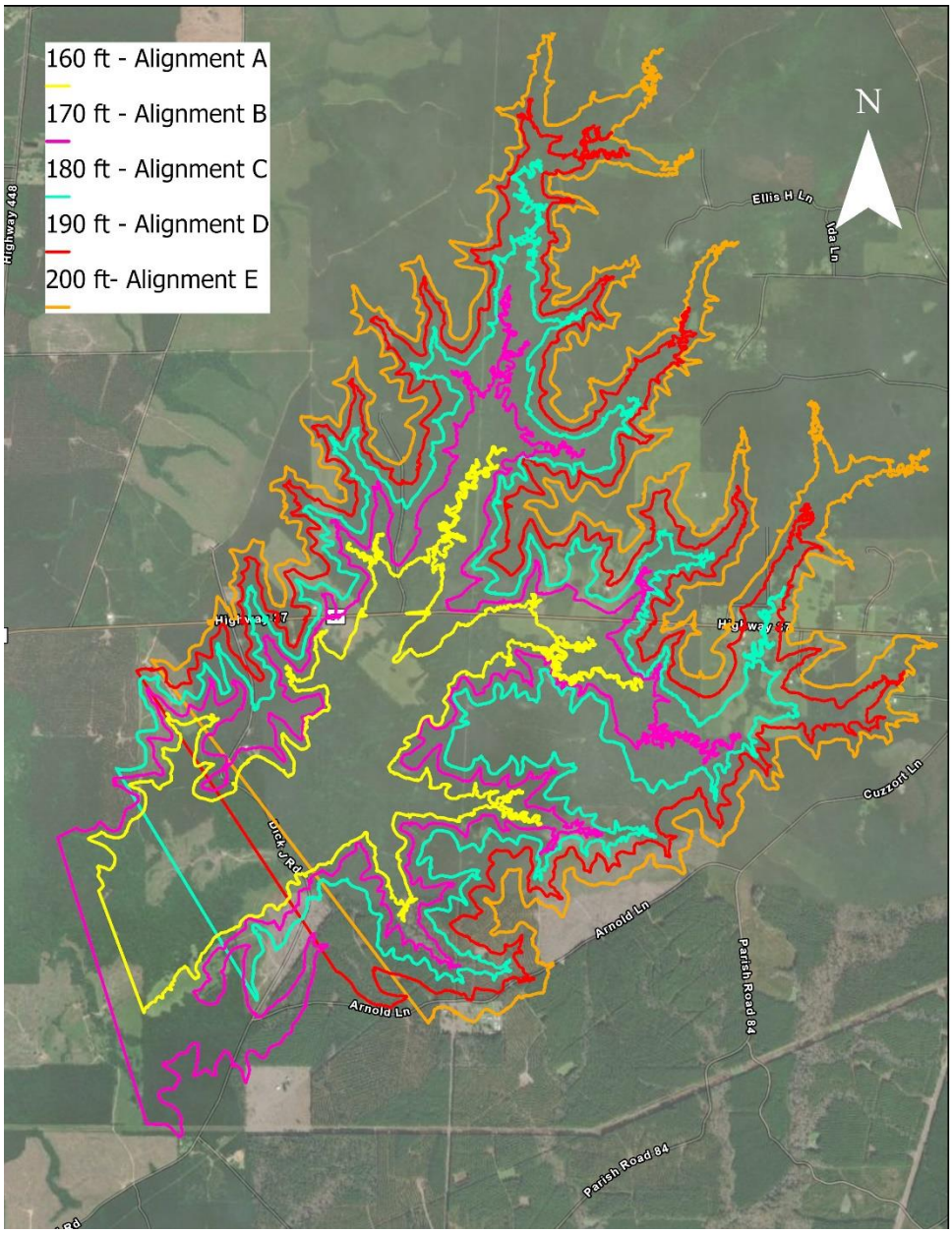

Figure 17: Max Pool Boundaries for Lilley Study Area

The evaluated alignments provide between 7,221 acre-feet of stormwater storage potential at a maximum pool elevation of 160 feet for Alignment A and 59,283 acre-feet at a maximum pool elevation of 200 feet for Alignment E.

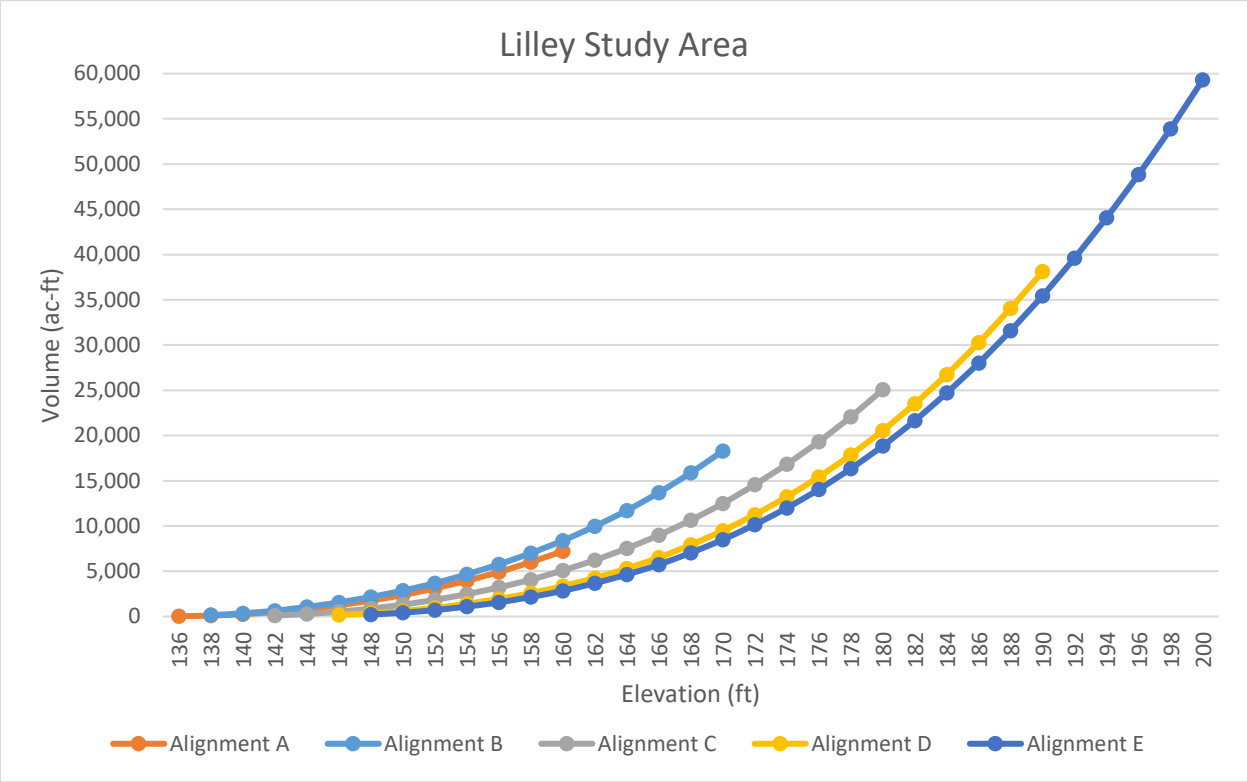

Figure 18: Stage-Storage Curves for Lilley Study Area

Alignment A provides up to 7,521 acre-feet of stormwater storage potential at maximum pool elevation of 160 feet and dam height of 29 feet. This alignment has a contributing watershed area of 6,232 acres. Potential reservoir characteristics for the Lilley Study Area Alignment A are presented in Table 8.

Alignment B provides up to 18,287 acre-feet of stormwater storage potential at maximum pool elevation of 170 feet and dam height of 40 feet. This alignment has a contributing watershed area of 6,607 acres. Potential reservoir characteristics for the Lilley Study Area Alignment B are presented in Table 9.

Alignment C provides up to 25,064 acre-feet of stormwater storage potential at maximum pool elevation of 180 feet and dam height of 45 feet. This alignment has a contributing watershed area of 6,090 acres. Potential reservoir characteristics for the Lilley Study Area Alignment C are presented in Table 10.

Alignment D provides up to 38,112 acre-feet of stormwater storage potential at maximum pool elevation of 190 feet and dam height of 52 feet. This alignment has a contributing watershed area of 5,949 acres. Potential reservoir characteristics for the Lilley Study Area Alignment D are presented in Table 11.

Alignment E provides up to 59,283 acre-feet of stormwater storage potential at maximum pool elevation of 200 feet and dam height of 63 feet. This alignment has a contributing watershed area of 5,821 acres. Potential reservoir characteristics for the Lilley Study Area Alignment E are presented in Table 12.

	Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
Lilley Study Area Alignment A	140	240.29	94.58	26.06315802
	142	475.56	141.22	13.16886433
	144	807.44	188.26	7.756120023
	146	1,231.57	235.90	5.085039998
	148	1,749.80	282.44	3.5790329
	150	2,369.03	338.62	2.643524187
	152	3,102.28	393.83	2.018709601
	154	3,946.99	451.26	1.586679292
	156	4,906.80	509.38	1.276309438
	158	5,991.48	577.24	1.045250487
	160	7,221.44	650.58	0.867223338

Table 9: Lilley Study Area Alignment A Stormwater Storage Potential

	Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
Lilley Study Area Alignment B	138	155.89	75.58	42.38181013
	140	349.25	119.50	18.91806566
	142	639.11	170.54	10.33794023
	144	1,034.38	222.52	6.387491032
	146	1,531.90	275.14	4.313022376
	148	2,133.35	326.50	3.09705872
	150	2,845.91	388.04	2.321608667
	152	3,684.69	449.99	1.79312318
	154	4,648.89	514.70	1.421220246
	156	5,743.06	580.29	1.150450013
	158	6,977.61	656.62	0.946899858
	160	8,377.12	742.72	0.788708134
	162	9,949.50	831.23	0.664063234
	164	11,708.66	929.63	0.564291633
	166	13,674.58	1,037.00	0.483166753
	168	15,862.68	1,152.00	0.416518441
	170	18,287.41	1,271.00	0.361292317

Table 10: Lilley Study Area Alignment B Stormwater Storage Potential

	Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
Lilley Study Area Alignment C	150	1,289.06	241.41	4.724609558
	152	1,824.29	292.85	3.338452041
	154	2,462.87	346.05	2.4728419
	156	3,207.74	399.58	1.898627453
	158	4,068.61	463.39	1.496898255
	160	5,068.28	535.82	1.201651307
	162	6,211.71	608.84	0.980455415
	164	7,508.88	689.99	0.811079552
	166	8,977.70	779.10	0.678380968
	168	10,630.39	874.47	0.572914124
	170	12,480.80	976.96	0.487973723
	172	14,543.49	1,083.70	0.418764627
	174	16,817.78	1,191.30	0.362134663
	176	19,316.18	1,308.00	0.315295211
	178	22,058.68	1,436.20	0.276095447
	180	25,063.73	1,566.70	0.242992544

Table 11: Lilley Study Area Alignment C Stormwater Storage Potential

	Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
Lilley Study Area Alignment D	154	1,392.45	244.12	4.272311643
	156	1,927.96	292.47	3.085648451
	158	2,569.90	351.61	2.314878407
	160	3,341.53	419.47	1.780320802
	162	4,247.73	487.86	1.400512019
	164	5,298.08	564.21	1.122860662
	166	6,510.03	647.86	0.913820098
	168	7,894.79	737.55	0.753535193
	170	9,465.37	833.87	0.628501846
	172	11,236.57	935.28	0.529431836
	174	13,210.43	1,039.80	0.450326129
	176	15,403.53	1,154.30	0.386210224
	178	17,837.56	1,281.60	0.333509834
	180	20,534.38	1,416.20	0.289709258
	182	23,503.96	1,552.00	0.253106307
	184	26,741.43	1,686.10	0.222463803
	186	30,249.58	1,822.30	0.196663875
	188	34,034.79	1,964.60	0.174791725
	190	38,112.37	2,111.20	0.156091074

Table 12: Lilley Study Area Alignment D Stormwater Storage Potential

	Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
Lilley Study Area Alignment E	154	1,091.07	213.94	5.452
	156	1,564.00	259.74	3.804
	158	2,136.79	315.13	2.784
	160	2,832.31	380.02	2.100
	162	3,656.68	445.40	1.627
	164	4,619.30	518.77	1.288
	166	5,737.15	599.19	1.037
	168	7,021.13	685.53	0.847
	170	8,483.58	777.66	0.701
	172	10,137.08	873.89	0.587
	174	11,982.39	972.60	0.496
	176	14,035.59	1,081.60	0.424
	178	16,318.41	1,203.20	0.365
	180	18,852.12	1,331.40	0.316
	182	21,645.19	1,460.50	0.275
	184	24,694.22	1,589.40	0.241
	186	28,003.79	1,720.30	0.212
	188	31,579.63	1,857.30	0.188
	190	35,438.55	2,002.40	0.168
	192	39,595.23	2,155.70	0.150
	194	44,057.13	2,306.90	0.135
	196	48,824.28	2,462.20	0.122
	198	53,900.87	2,613.50	0.110
	200	59,283.35	2,766.50	0.100

Table 13: Lilley Study Area Alignment E Stormwater Storage Potential

Clinton Study Area

One of the potential Study Area locations identified would have an embankment through the town of Clinton. This location, located near coordinates 30.86691, -91.02555, was removed as an option to pursue.

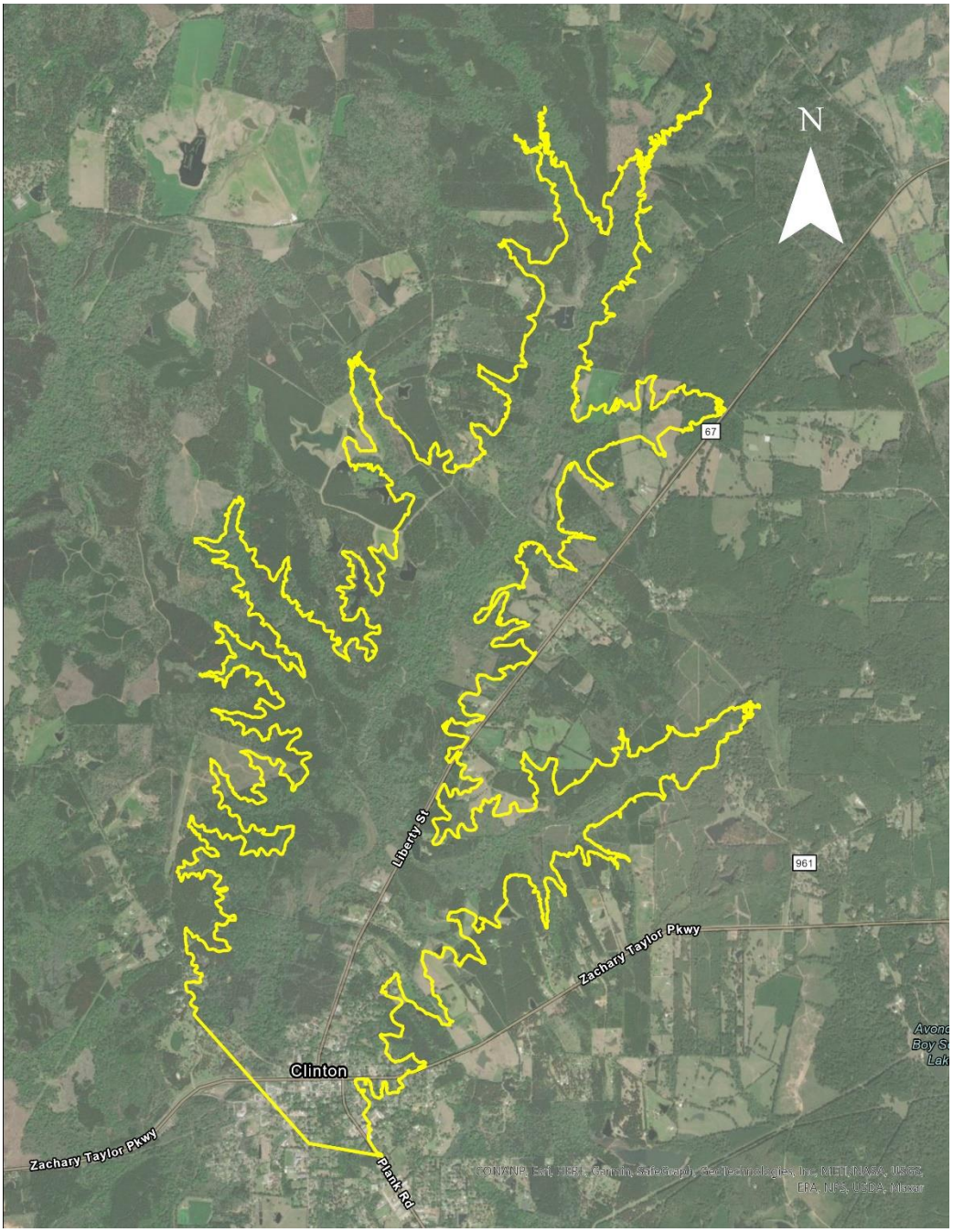

Figure 19: Max Pool Boundary for Clinton Study Area

Pretty Creek Study Area

The Pretty Creek Study Area is located on Pretty Creek in East Feliciana Parish, approximately 1 mile north of Clinton near coordinates 30.88537, -91.01362. Initial contouring efforts identified a maximum potential pool elevation of approximately 266 feet with a dam height of 78 feet. At this elevation there are a 2 public roads passing through the reservoir are, including Louisiana Highway 67, and a small number of homes within the potential reservoir area. The contributing watershed is 12,437 acres.

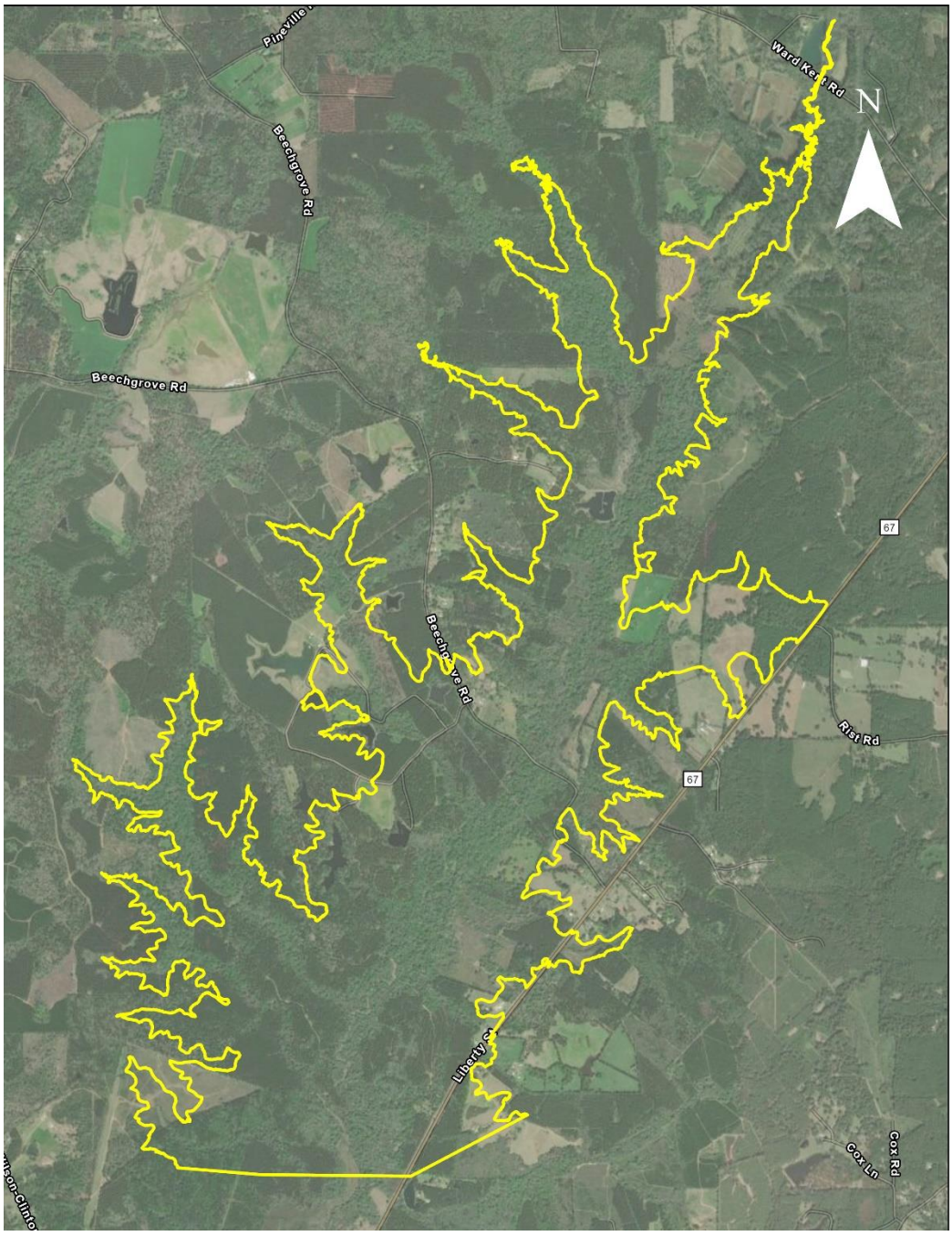

Figure 20: 266' Pool Boundaries for Pretty Creek Study Area

The evaluated alignment can provide a maximum storage volume 149,761 acre-feet at the maximum pool elevation of 266 feet. This alignment has a contributing watershed area of 12,437 acres. Potential reservoir characteristics for the Pretty Creek Study Area are presented in Table 13.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
198	663.93	183.45	18.73
202	1,653.25	308.78	7.52
206	3,144.80	440.37	3.95
210	5,180.83	577.65	2.40
214	7,823.82	746.07	1.59
218	11,208.88	942.49	1.11
222	15,367.65	1,138.90	0.809
226	20,440.22	1,397.80	0.608
230	26,581.42	1,678.00	0.468
234	33,928.32	2,000.00	0.367
238	42,617.02	2,351.70	0.292
242	52,742.32	2,716.50	0.236
246	64,396.29	3,114.30	0.193
250	77,747.08	3,555.00	0.160
254	92,830.07	3,992.80	0.134
258	109,743.81	4,466.10	0.113
262	128,686.08	5,002.20	0.097
266	149,760.69	5,535.60	0.083

Table 14: Pretty Creek Study Area Stormwater Storage Potential

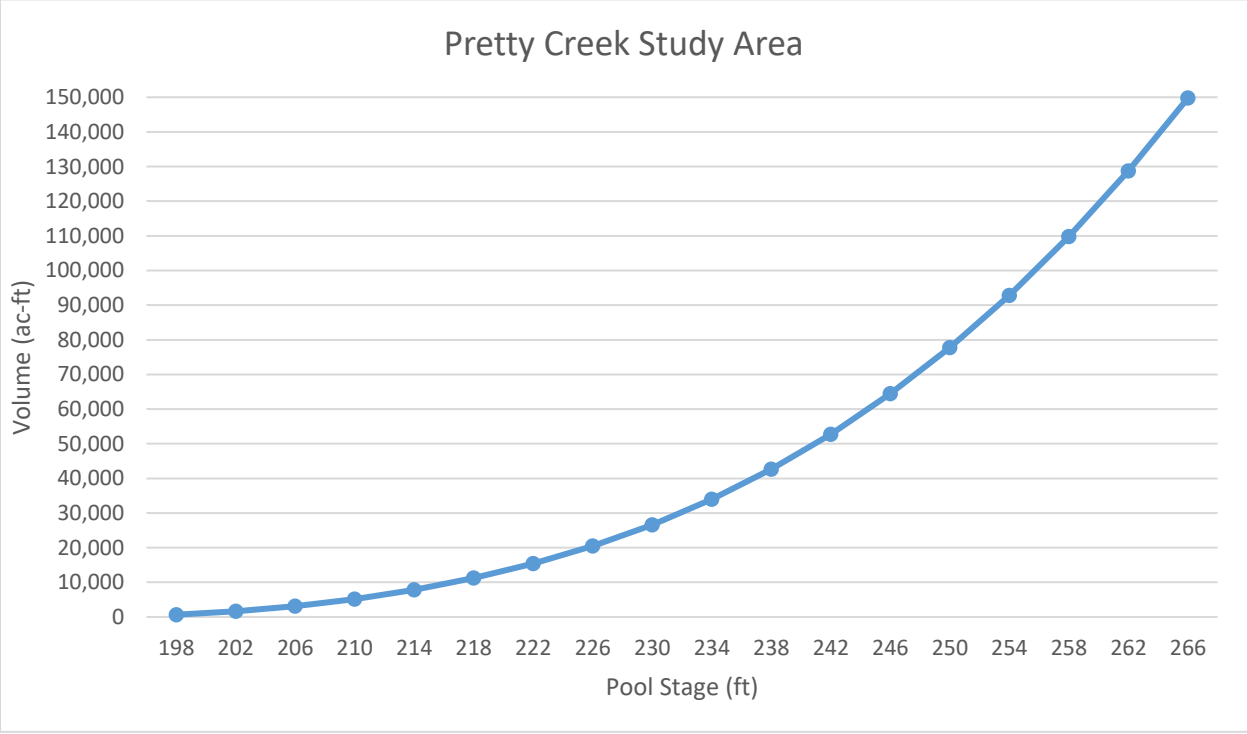

Figure 21: Stage- storage curve for Pretty Creek Study Area

Upper Darlington Study Area

The Upper Darlington Study Area is located on the main stem of the Amite River near the confluence with Darling Creek. The evaluated alignment, near coordinates 30.85109, -90.85539, is between Clinton in East Feliciana Parish and Greensburg in St. Helena Parish. Initial contouring efforts identified a maximum potential pool elevation of approximately 265 feet with a dam height of 130 feet. At this elevation, there are many roads and structures within the potential reservoir area, including Louisiana Highways 10, 38, 67, 432, 448, 961, 1043, and 1044. Additionally, 36% of the potential reservoir area is in Mississippi.

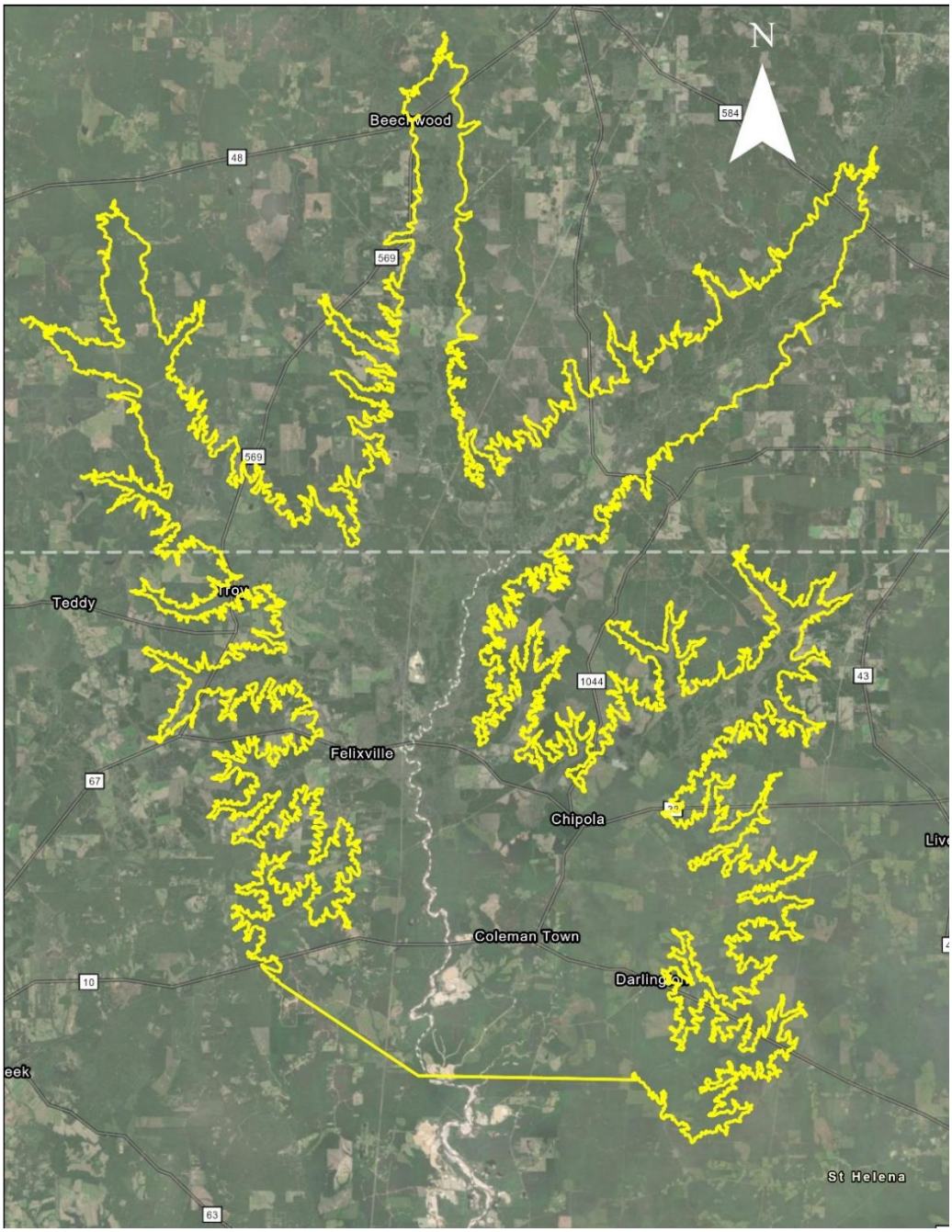

Figure 22 265' Pool Boundary for Upper Darlington Study Area

The evaluated alignment can provide a maximum storage volume of 3,041,566 acre-feet at the maximum pool elevation of 265 feet. This alignment has a contributing watershed area of 429,478 acres. Potential reservoir characteristics for the Upper Darlington Study Area are presented in Table 14.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
155	9,627.61	1,874.20	44.61
165	42,508.67	4,947.10	10.10
175	108,771.32	8,435.00	3.95
185	212,167.90	12,391.00	2.02
195	360,716.58	17,532.00	1.19
205	566,026.94	23,638.00	0.759
215	834,382.82	30,133.00	0.515
225	1,170,763.80	37,259.00	0.367
235	1,584,736.20	45,665.00	0.271
245	2,088,472.10	55,256.00	0.206
255	2,694,878.20	66,322.00	0.159
265	3,419,281.80	78,692.00	0.126

Table 15: Upper Darlington Study Area Stormwater Storage Potential

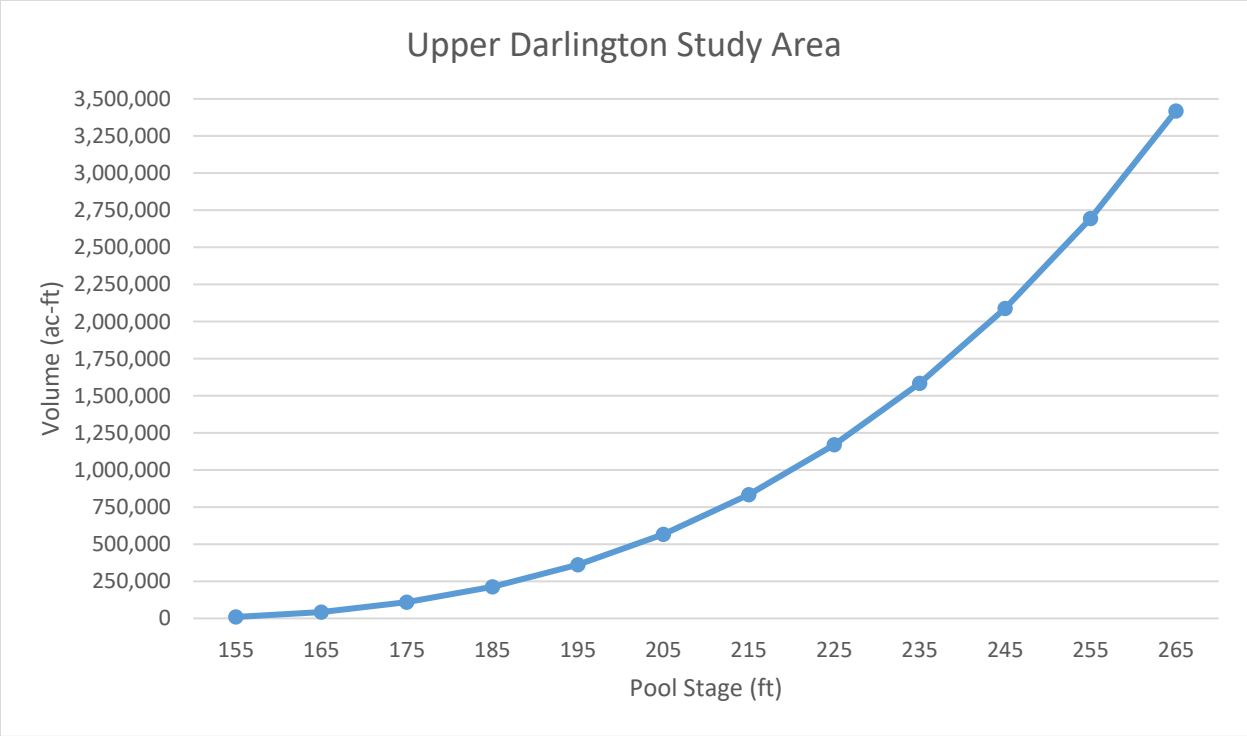

Figure 23: Stage-storage curve for Upper Darlington Study Area

Olive Branch Study Area

The Olive Branch Study Area is located on the Comite River in East Feliciana Parish, approximately 6 miles south of Clinton near coordinates 30.77825, -91.05067. Initial contouring efforts identified a maximum potential pool elevation of approximately 230 feet. However, the desktop analysis determined that the inundation area at this elevation would encompass the town of Clinton as well as numerous roads and structures near the embankment location. Analysis of developed contouring determined that 173 feet is the maximum allowable pool stage that could occur without substantial flooding of structures, which requires a dam height of 53 feet.

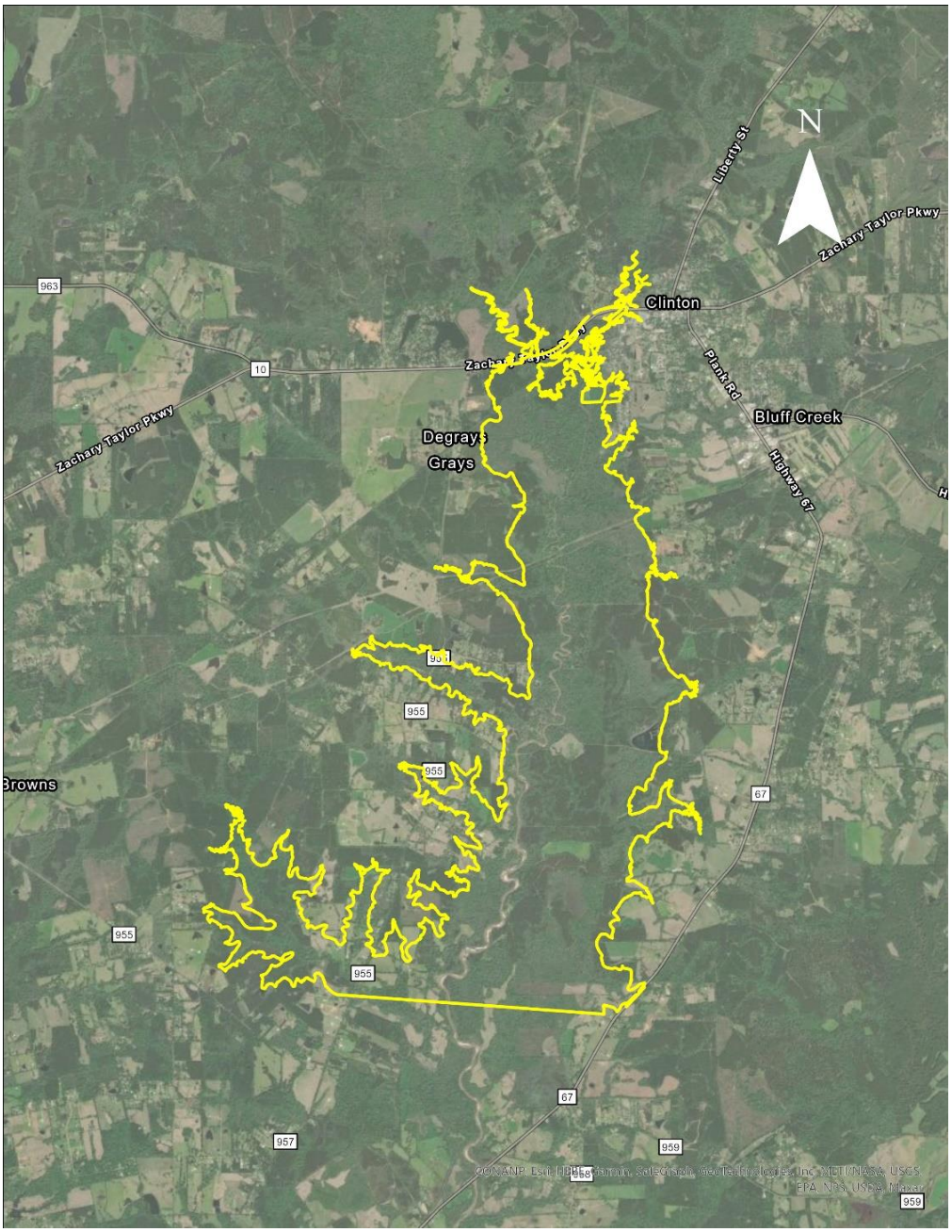

Figure 24: 173' Max Pool Boundary for Olive Branch Study Area

The evaluated alignment can provide a maximum storage volume of 40,178 acre-feet at the maximum pool elevation of 173 feet. This alignment has a contributing watershed area of 86,390 acres. Potential reservoir characteristics for the Olive Branch Study Area are presented in Table 15.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
135	333.90	73.45	275.13
140	878.54	160.24	104.57
145	2,620.63	626.86	35.05
150	7,416.88	1,310.30	12.39
155	15,774.87	2,041.30	5.82
160	28,220.44	2,920.20	3.26
165	45,354.00	3,947.50	2.03
170	68,039.36	5,141.20	1.35
173	85,259.77	5,881.12	1.08
175	96,740.04	6,374.40	0.950

Table 16: Olive Branch Study Area Stormwater Storage Potential

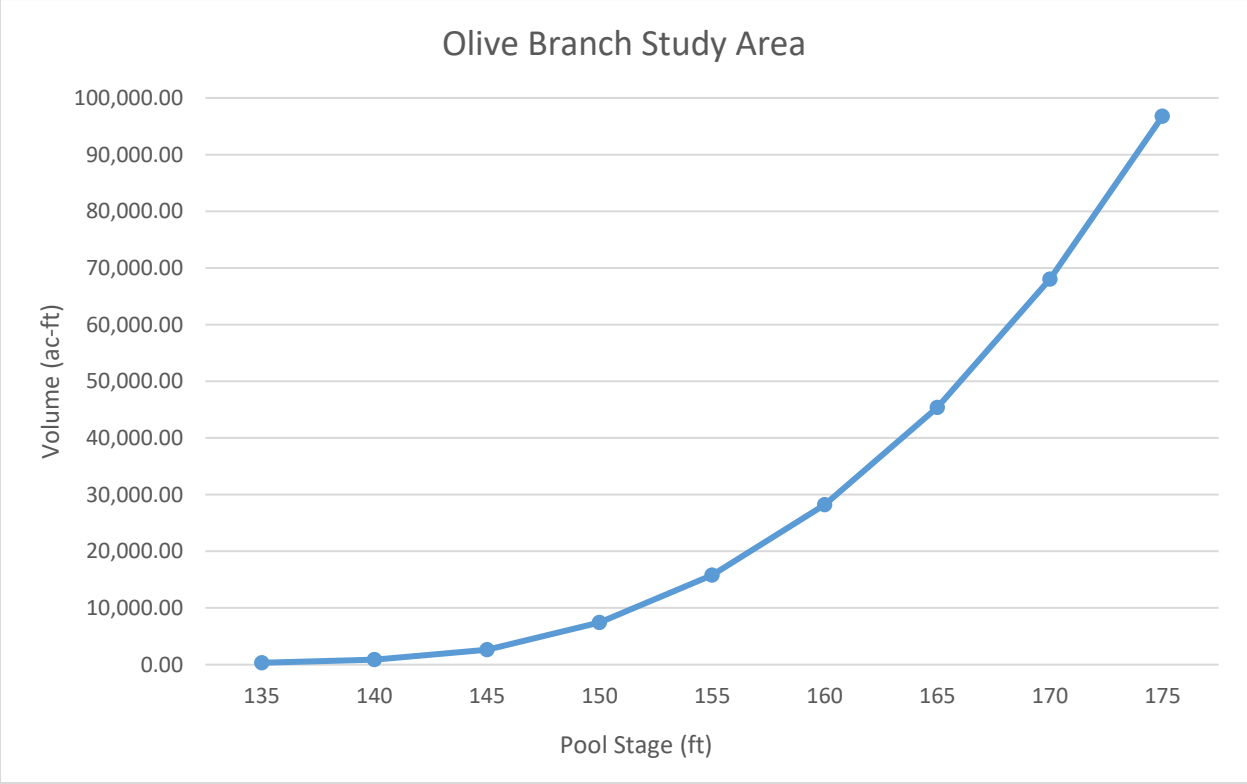

Figure 25: Stage-Storage Curve for Olive Branch Study Area

Olive Branch North Study Area

The Olive Branch North Study Area is located on the Comite River in East Feliciana Parish, immediately upstream of the Olive Branch Study Area. The evaluated alignment is approximately 4 miles south-southwest of Clinton near coordinates 30.79720, -91.03977. Initial contouring efforts identified a maximum potential pool elevation of approximately 230 feet. However, the desktop analysis determined that the inundation area at this elevation would encompass the town of Clinton as well as numerous roads and structures near the embankment location. Analysis of developed contouring determined that 173 feet is the maximum allowable pool stage that could occur without substantial flooding of structures, which requires a dam height of 40 feet.

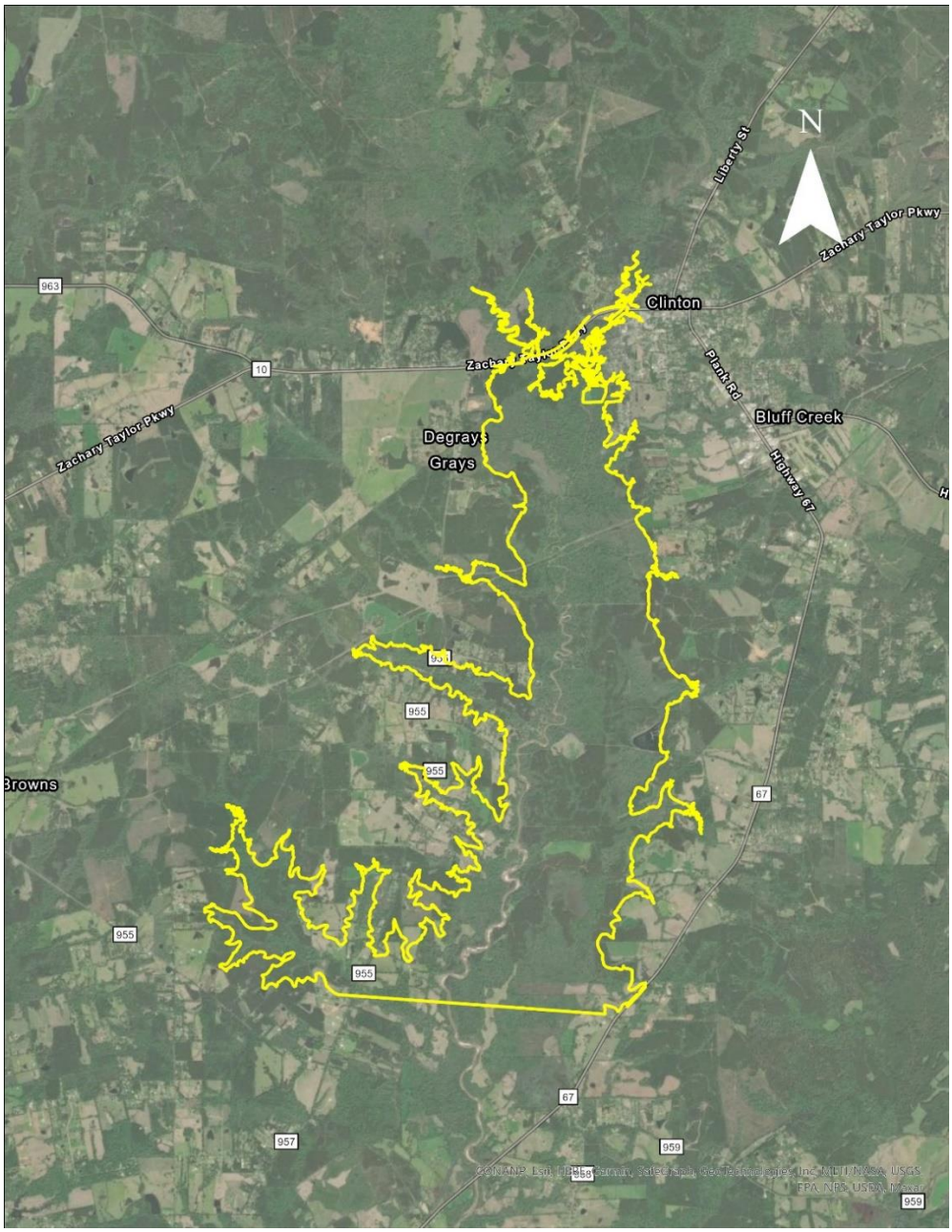

Figure 26: 173' Max Pool Boundary for Olive Branch North Study Area

The evaluated alignment can provide a maximum storage volume of 40,178 acre-feet at the maximum pool elevation of 173 feet. This alignment has a contributing watershed area of 86,390 acres. Potential reservoir characteristics for the Olive Branch North Study Area are presented in Table 16.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
151	1,237.00	258.56	69.84
153	1,911.71	424.45	45.19
155	2,992.67	658.46	28.87
157	4,612.14	952.39	18.73
159	6,790.63	1,221.10	12.72
161	9,514.97	1,515.80	9.08
163	12,868.49	1,836.90	6.71
165	16,878.66	2,172.00	5.12
167	21,573.44	2,544.10	4.00
169	27,047.69	2,925.70	3.19
171	33,264.97	3,288.60	2.60
173	40,178.04	3,619.00	2.15

Table 17: Olive Branch North Study Area Stormwater Storage Potential

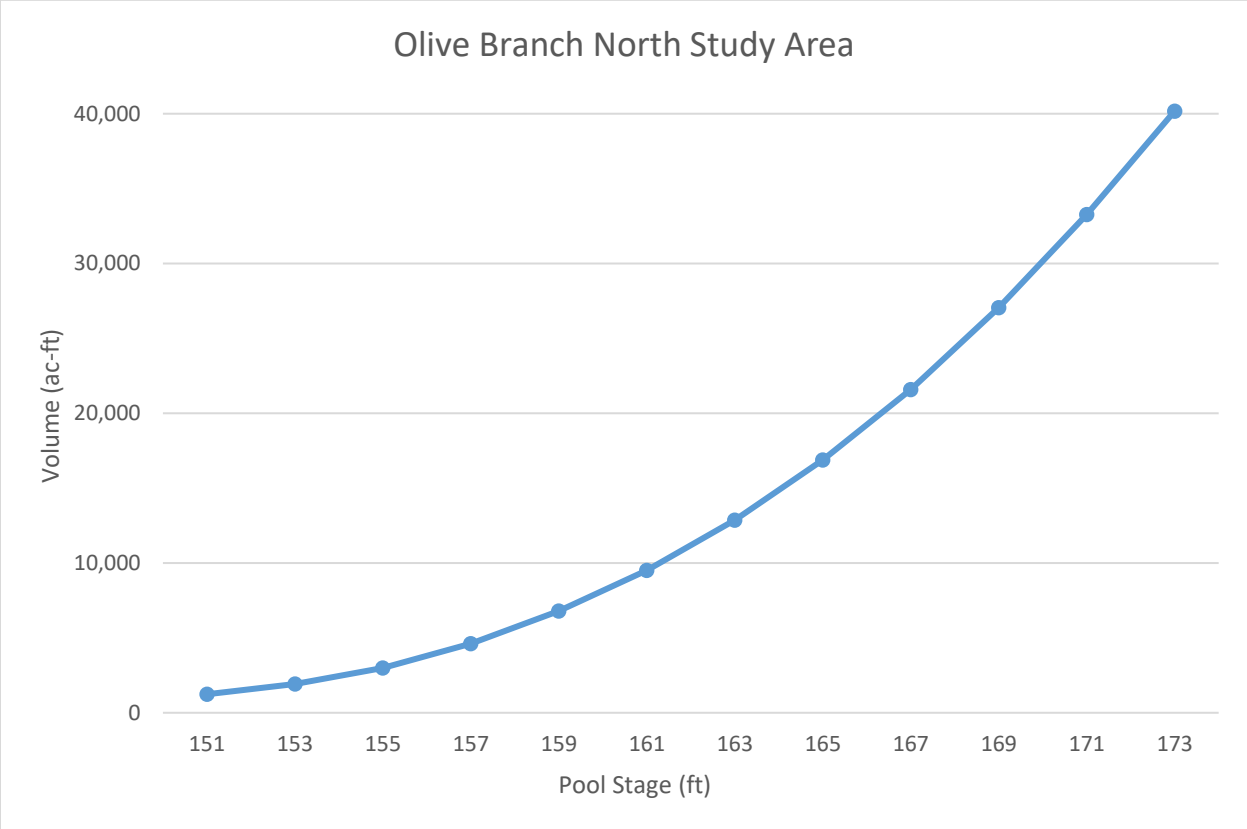

Figure 27: Stage-Storage Curves for Olive Branch North Study Area

Pigeon Creek Study Area

The Pigeon Creek Study Area is located on Pigeon Creek in St. Helena Parish, approximately 1 mile south of the Lilley Study Area. The evaluated alignment is approximately 3 miles west-northwest of Pine Grove, near coordinates 30.72524, -90.81102. Initial contouring efforts identified a maximum potential pool elevation of approximately 160 feet with a dam height of 43 feet. At this elevation, there are a small number of dirt and gravel roads but no known structures within the inundation area.

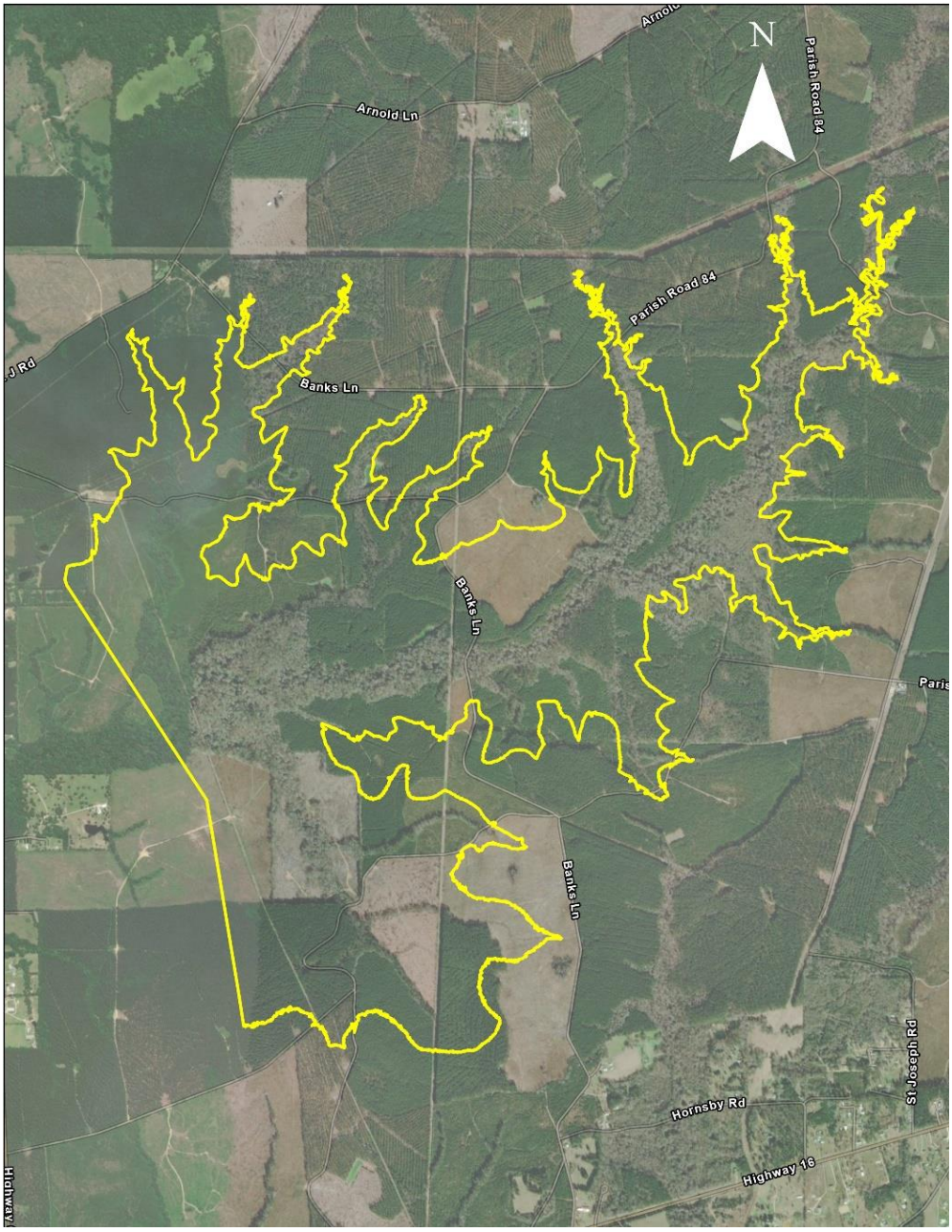

Figure 28: 160' Pool Boundaries for Pigeon Creek Study Area

The evaluated alignment can provide a maximum storage volume of 21,419 acre-feet at the maximum pool elevation of 160 feet. This alignment has a contributing watershed area of 5,884 acres. Potential reservoir characteristics for the Pigeon Creek Study Area are presented in Table 17.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
130	313.22	99.90	18.79
132	556.90	142.59	10.57
134	888.94	190.40	6.62
136	1,322.00	243.28	4.45
138	1,867.62	304.32	3.15
140	2,546.23	374.84	2.31
142	3,374.57	455.95	1.74
144	4,376.66	546.71	1.34
146	5,566.13	644.77	1.06
148	6,962.33	753.33	0.845
150	8,593.24	880.70	0.685
152	10,492.62	1,024.60	0.561
154	12,706.90	1,189.50	0.463
156	15,255.51	1,358.60	0.386
158	18,151.78	1,540.10	0.324
160	21,419.21	1,727.00	0.275

Table 18: Pigeon Creek Study Area Stormwater Storage Potential

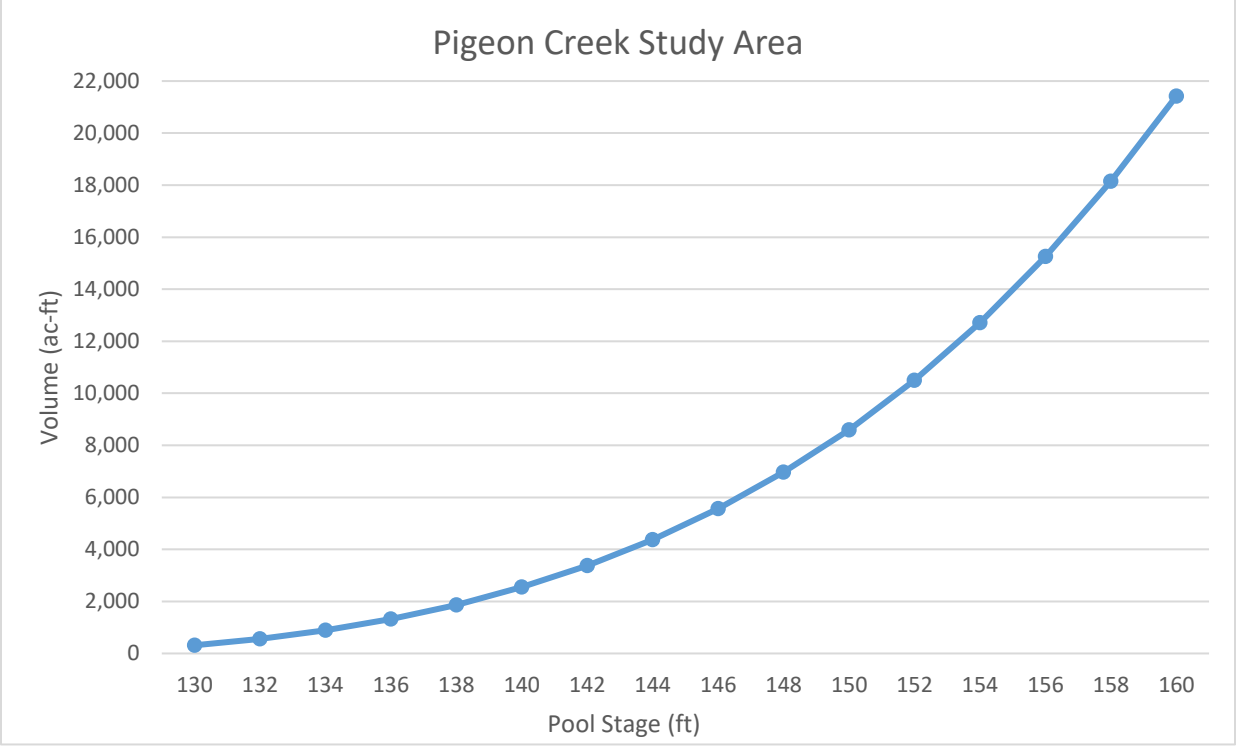

Figure 29: Stage-Storage Curves for Pigeon Creek Study Area

Baywood Study Area

The Baywood Study Area is located in East Feliciana and St. Helena Parishes on the Amite River, approximately 5 miles west-northwest of Pine Grove near coordinates 30.70785, -90.84398. The evaluated alignment is approximately 5 miles south of the Darlington Dam location that was previously studied by the U.S. Army Corps of Engineers as a dry reservoir. Initial contouring efforts identified a maximum potential pool elevation of approximately 155 feet. The 155' max reservoir extends into and/or encompasses the Pigeon Creek, Upper Darlington, Lilley, and Bluff Study Areas. From a desktop analysis, there are numerous roads and structures with the inundation area at this elevation including Louisiana Highways 37, 63, 448, 959, and 960. Analysis of developed contouring determined that 116 feet is the maximum allowable pool stage that could occur without substantial flood risk to structures. This elevation would require a dam height of 36 feet.

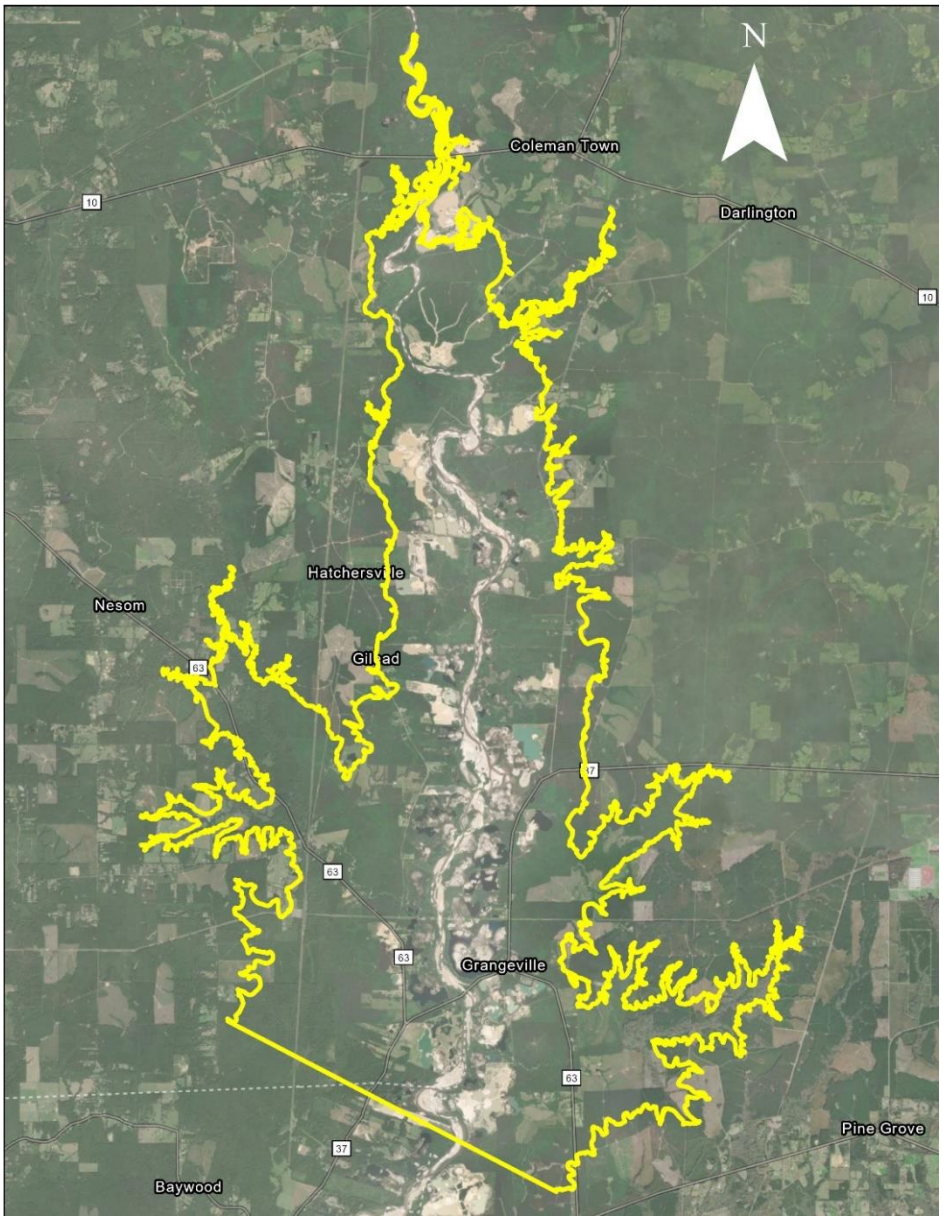

Figure 30: 155' Pool Boundaries for Baywood Study Area

The evaluated alignment can provide a maximum storage volume of 519,411 acre-feet at the maximum pool elevation of 155 feet. However, due to number of structures in the vicinity, the potential reservoir data in Table 18 is limited to a maximum elevation of 116 feet. This alignment has a contributing watershed area of 5,884 acres.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
90	562.84	134.96	864.08
92	889.26	220.55	546.90
94	1,419.52	307.13	342.61
96	2,134.96	413.36	227.80
98	3,122.66	561.25	155.75
100	4,518.27	879.51	107.64
102	6,472.05	1,075.40	75.14
104	8,938.13	1,370.90	54.41
106	11,992.62	1,719.80	40.55
108	15,780.79	2,044.40	30.82
110	20,239.23	2,426.20	24.03
112	25,503.17	2,878.30	19.07
114	31,801.12	3,410.00	15.29

Table 19: Baywood Study Area Stormwater Storage Potential

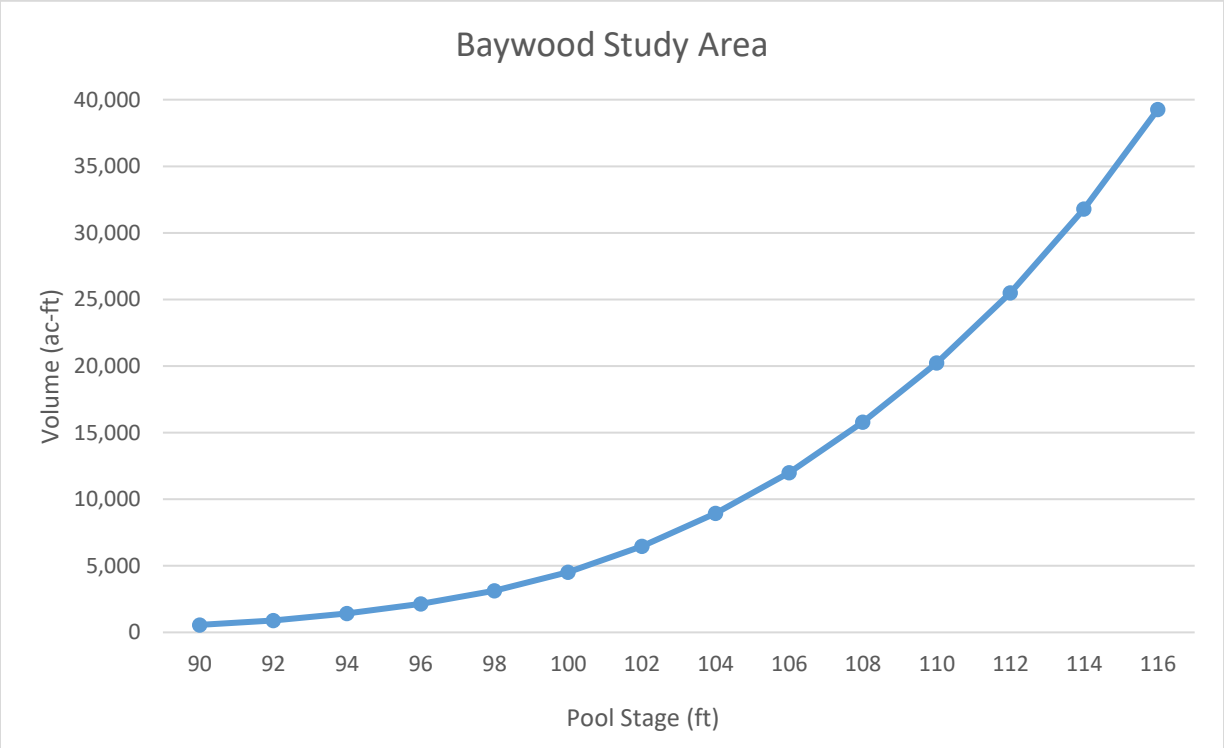

Figure 31: Stage-storage curves for Baywood Study Area

Collins Study Area

The Collins Study Area is located on Collins Creek in East Feliciana Parish, approximately 8 miles east Clinton near coordinates 30.87764, -90.87354. Initial contouring efforts identified a maximum potential pool elevation of approximately 245 feet with a dam height of 78 feet. At this elevation, there are approximately 10 structures, a utility corridor, Louisiana Highway 10, and 2 local roads in the inundation area.

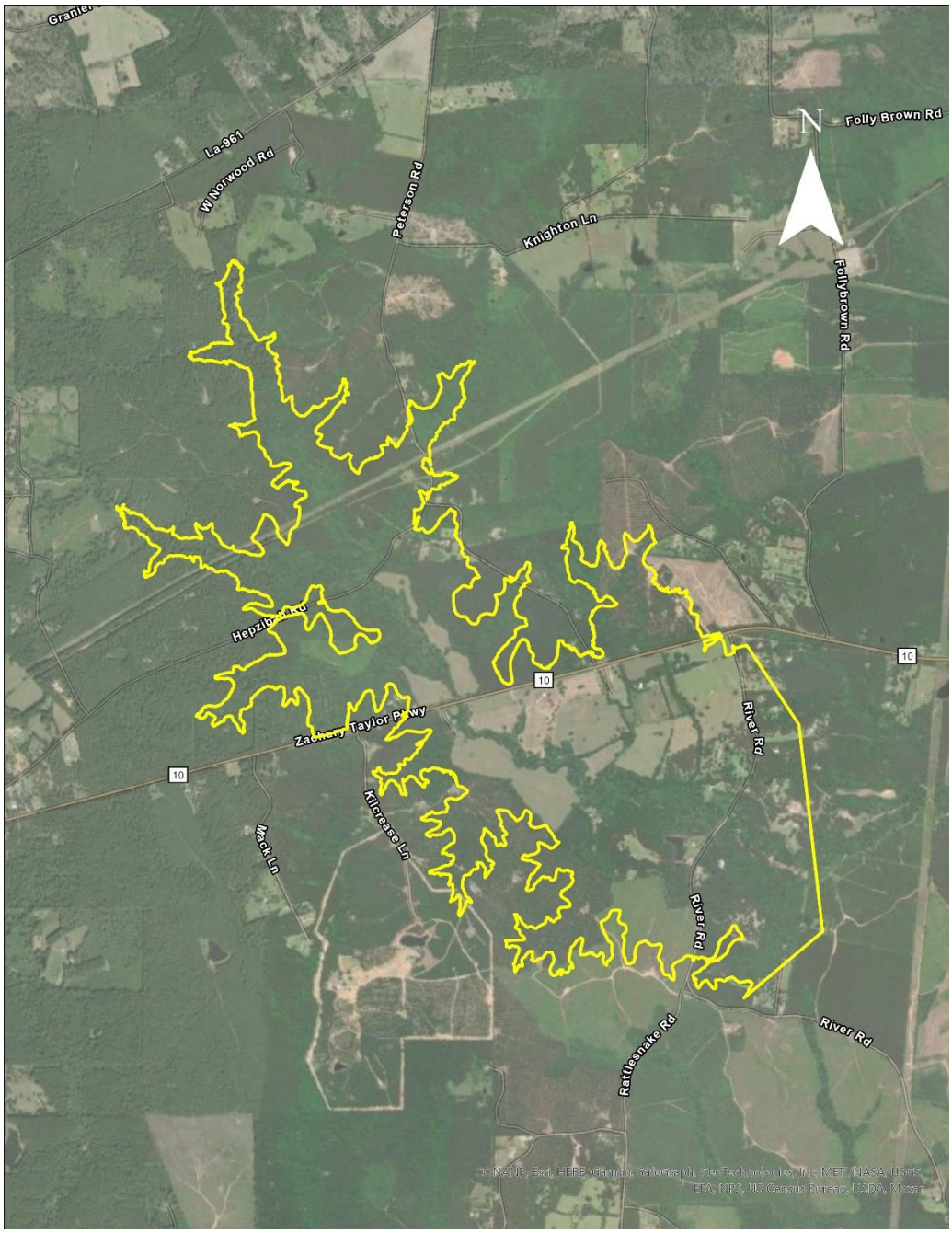

Figure 32: 245' Pool Boundary for Collins Study Area

The evaluated alignment can provide a maximum storage volume of 34,913 acre-feet at the maximum pool elevation of 245 feet. This alignment has a contributing watershed area of 3,765 acres. Potential reservoir characteristics for the Collins Study Area are presented in Table 19.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
195	1,279.13	156.94	2.94
200	2,242.73	232.85	1.68
205	3,581.70	301.83	1.05
210	5,290.03	385.50	0.712
215	7,457.74	483.19	0.505
220	10,173.27	606.71	0.370
225	13,542.26	742.39	0.278
230	17,631.95	896.29	0.214
235	22,529.84	1,062.70	0.167
240	28,271.48	1,236.50	0.133
245	34,913.39	1,422.60	0.108

Table 20: Collins Study Area Stormwater Storage Potential

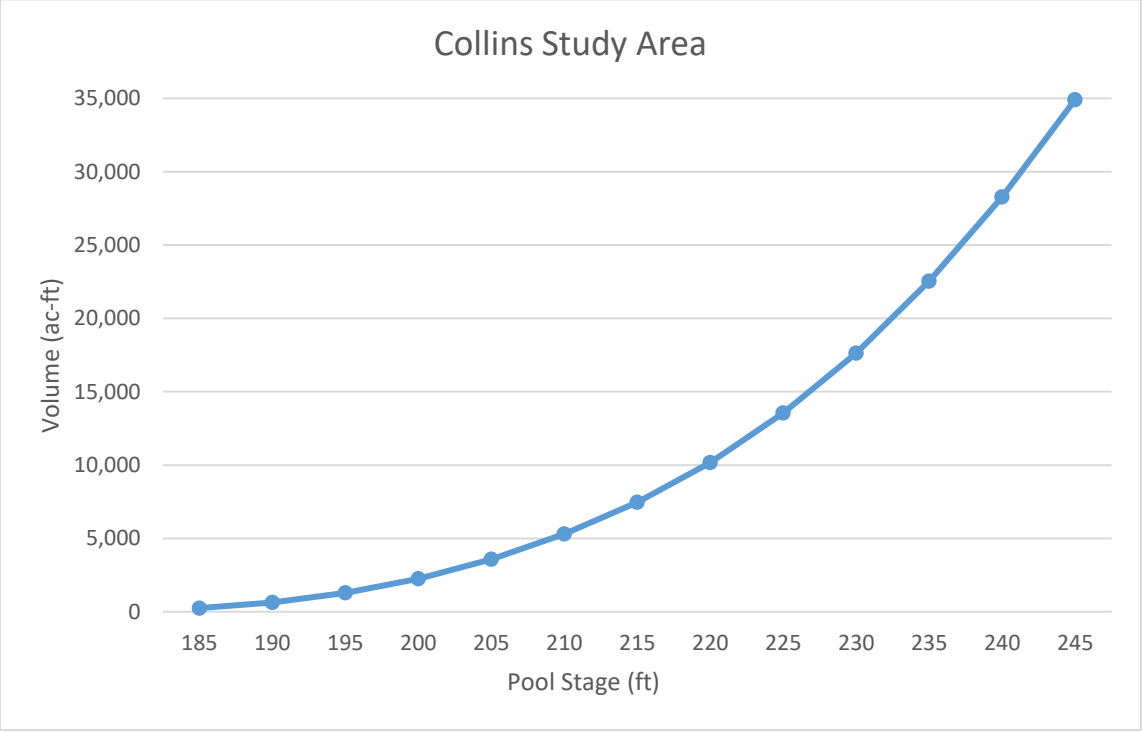

Figure 33: Stage-Storage Curve for Collins Study Area

LA-432 Study Area

The LA-432 Study Area is located on the Amite River at Louisiana Highway 432 in East Feliciana and St. Helena Parishes, approximately 3 miles northwest of Chipola near coordinates 30.94561, -90.85980. Initial contouring efforts identified a maximum potential pool elevation of approximately 280 feet with a dam height of 114 feet. Desktop analysis identified several structures throughout the large inundation area, along with several roads, including Louisiana Highway 67 which becomes Mississippi Highway 569. At this maximum pool elevation, approximately 73% of the potential reservoir area is in Mississippi.

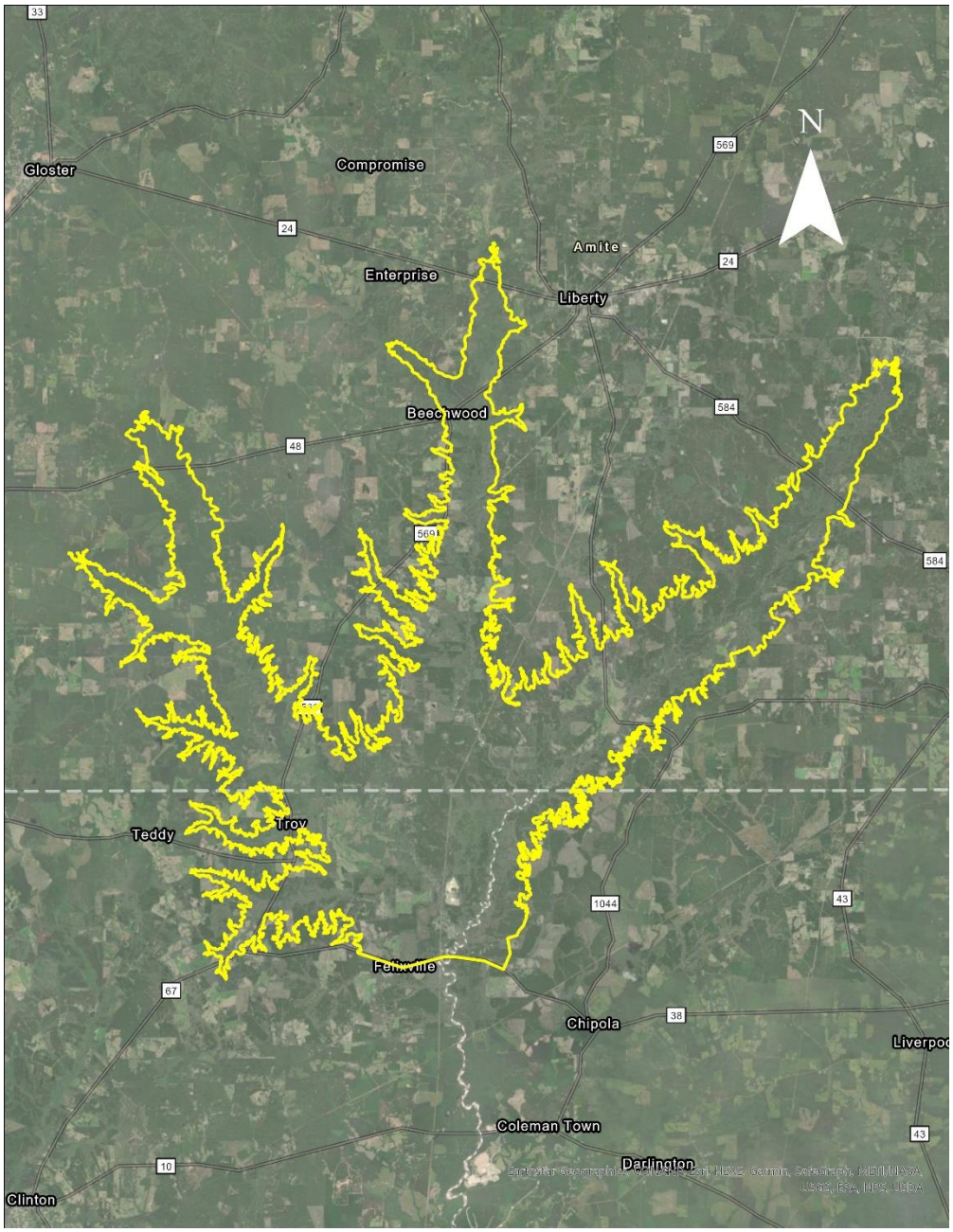

Figure 34: 280' Pool Boundary for LA-432 Study Area

The evaluated alignment can provide a maximum storage volume of 1,978,587 acre-feet at the maximum pool elevation of 280 feet. This alignment has a contributing watershed area of 358,798 acres. Potential reservoir characteristics for the LA-432 Study Area are presented in Table 20.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
180	1,624.33	400.56	220.89
190	15,003.29	2,485.30	23.91
200	54,390.03	5,545.70	6.60
210	127,589.89	9,067.40	2.81
220	235,739.73	12,706.00	1.52
230	383,424.70	17,002.00	0.94
240	577,777.62	22,028.00	0.62
250	825,753.88	27,734.00	0.43
260	1,135,420.60	34,368.00	0.32
270	1,516,920.10	42,088.00	0.24
280	1,978,586.90	50,476.00	0.18

Table 21: LA-432 Study Area Stormwater Storage Potential

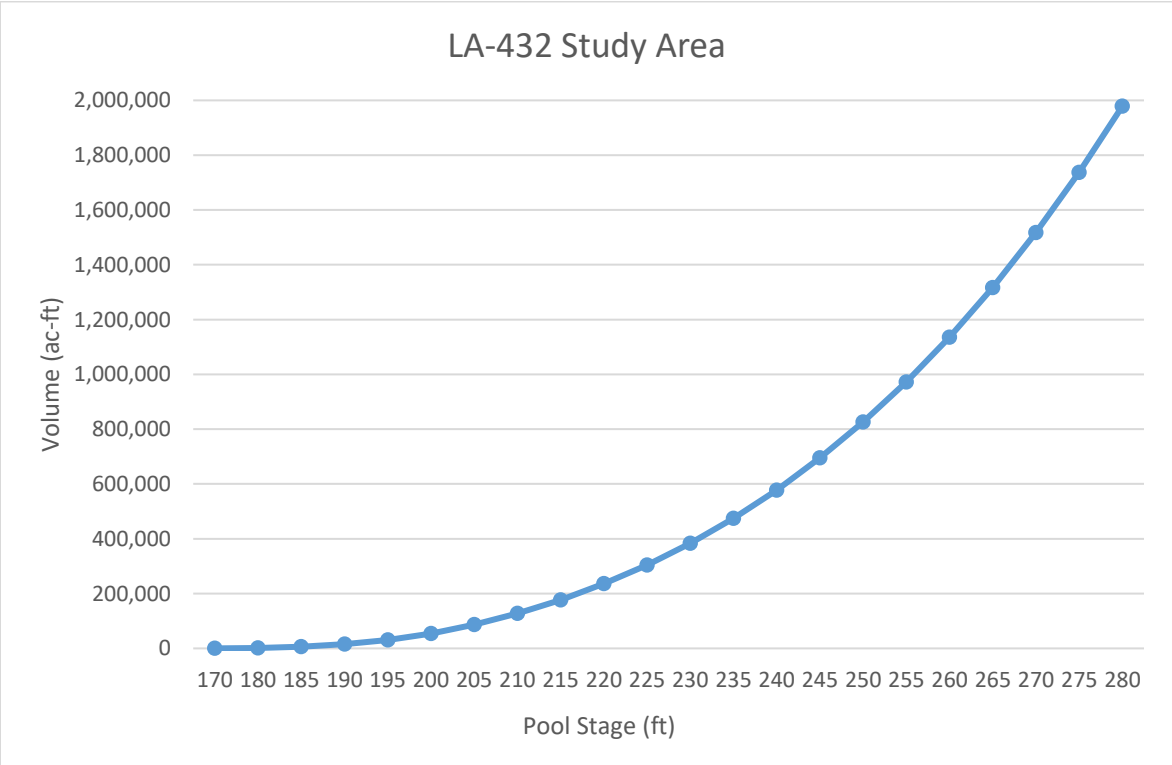

Figure 35: Stage-Storage Curve for LA-432 Study Area

Kellers Bayou Study Area

The Kellers Bayou Study Area is located on Kellers Bayou in East Feliciana Parish, 3.5 miles northwest of Clinton near coordinates 30.90927, -91.06205. Initial contouring efforts identified a maximum potential pool elevation of approximately 250 feet with a dam height of 62 feet. At this elevation, there are several structures and three roads within the inundation area, including Louisiana Highway 422.

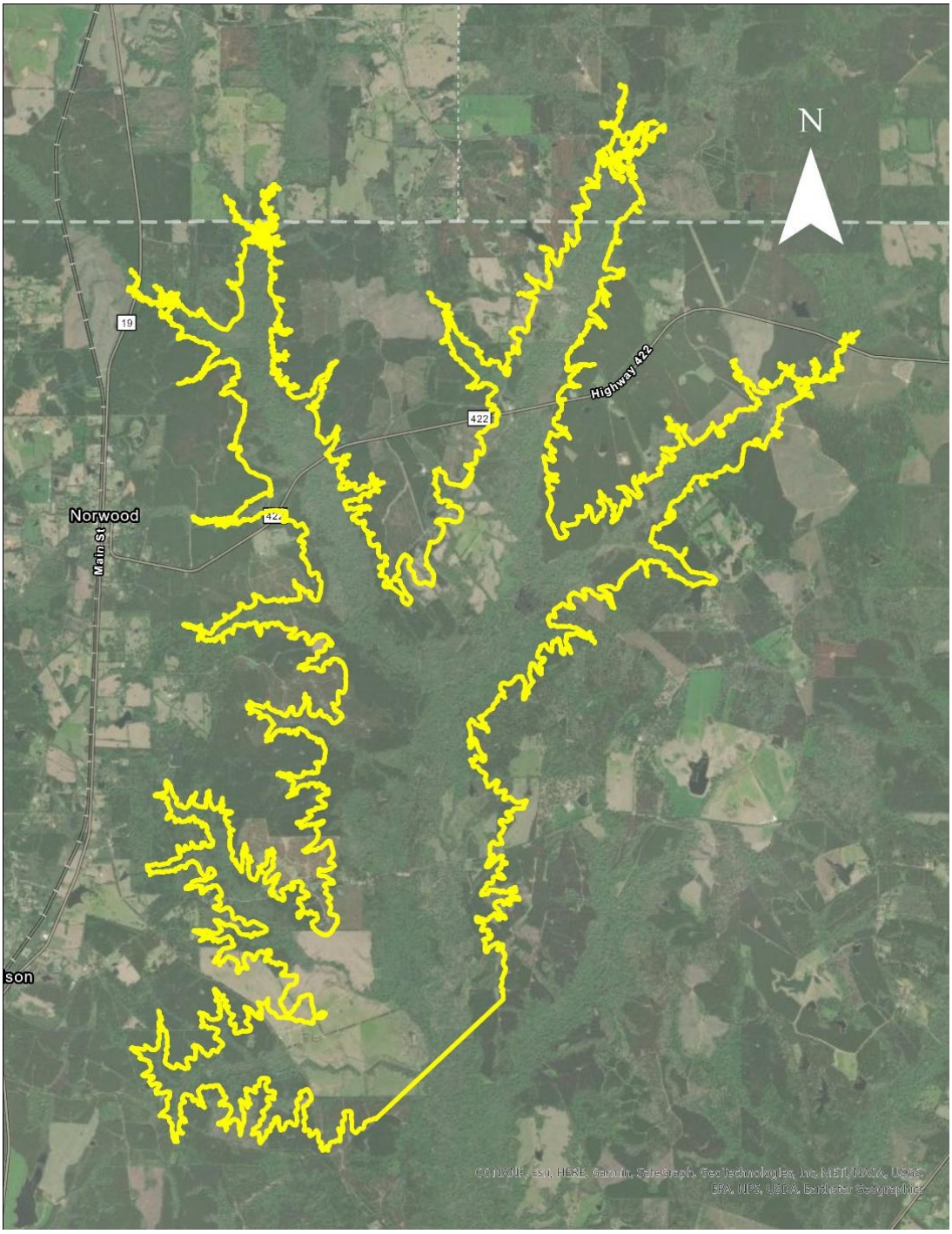

Figure 36: 250' Pool Boundary for Kellers Bayou Study Area

The evaluated alignment can provide a maximum storage volume of 150,098 acre-feet at the maximum pool elevation of 250 feet. This alignment has a contributing watershed area of 44,795 acres. Potential reservoir characteristics for the Kellers Bayou Study Area are presented in Table 21.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
200	390.96	186.56	114.58
205	2,256.84	577.48	19.85
210	6,194.05	986.69	7.23
215	12,389.30	1,515.74	3.62
220	21,557.00	2,142.15	2.08
225	33,891.49	2,828.36	1.322
230	49,789.76	3,507.16	0.900
235	68,956.66	4,178.05	0.650
240	91,731.45	4,948.28	0.488
245	118,609.25	5,818.58	0.378
250	150,097.98	6,789.70	0.298

Table 22: Kellers Bayou Study Area Stormwater Storage Potential

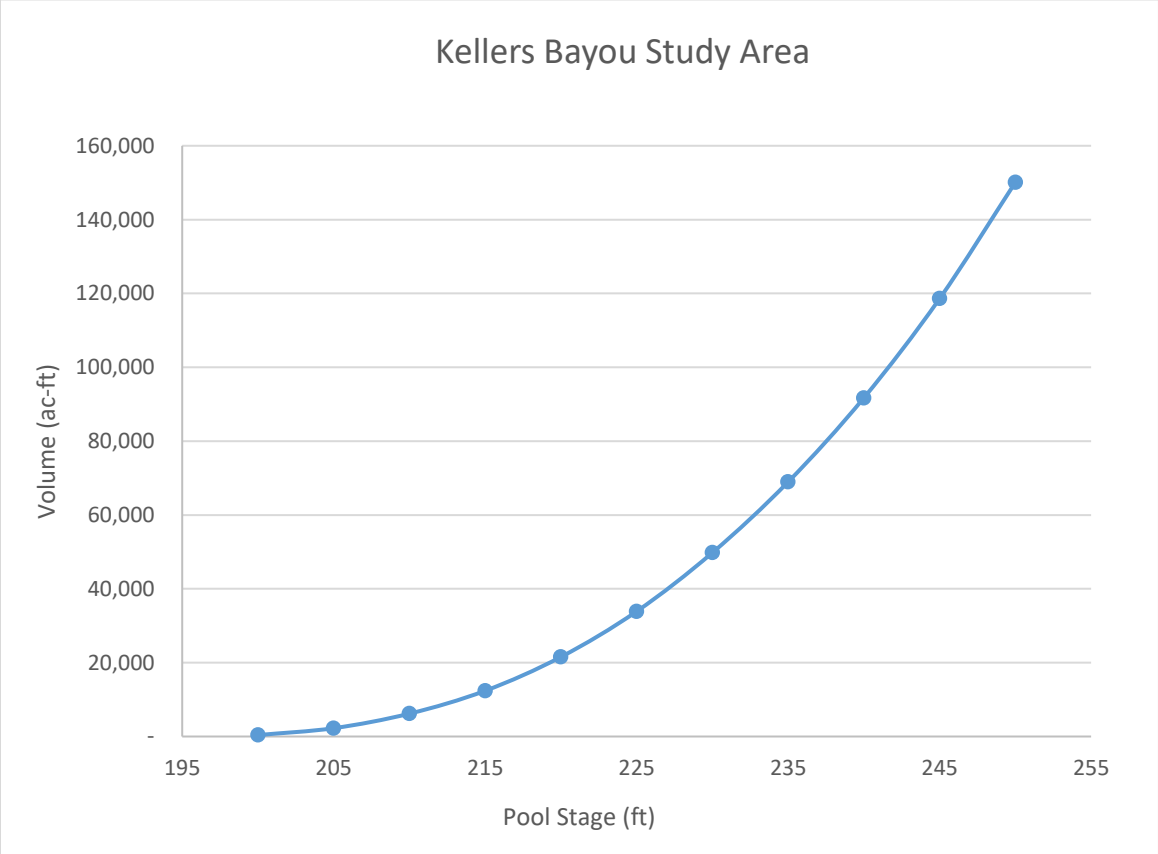

Figure 37: Stage-Storage Curve for Kellers Bayou Study Area

Darling Creek Study Area

The Darling Creek Study Area is located on Darling Creek in East Feliciana Parish, 3.5 miles northwest of Clinton near coordinates 30.94561, -90.77179. The study area is approximately 5 miles upstream of the Matthews Study Area. Initial contouring efforts identified a maximum potential pool elevation of approximately 260 feet with a dam height of 55 feet. At this elevation, there are five small structures within the inundation area.

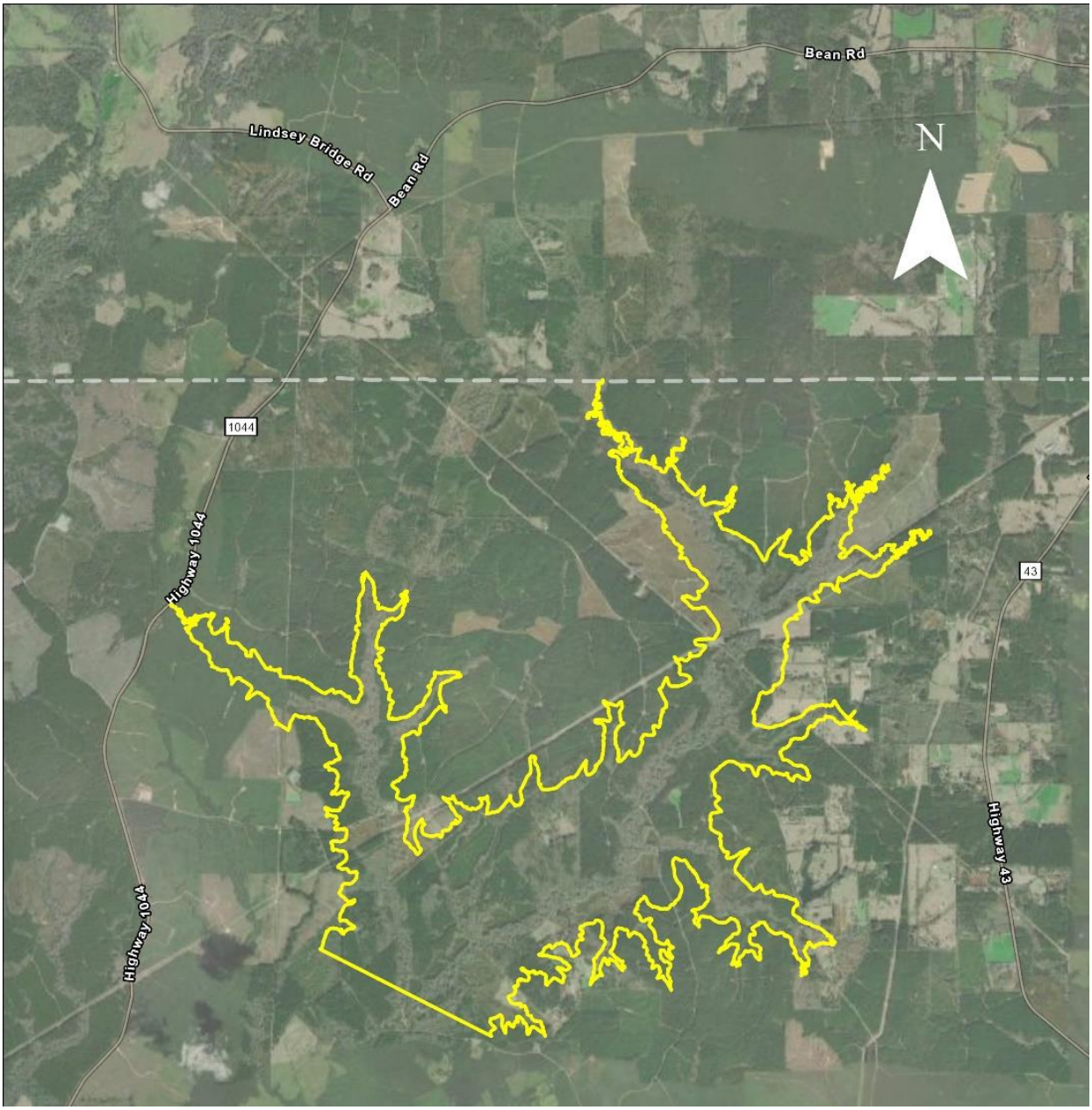

Figure 38: 260' Pool Boundary for Darling Creek Study Area

The evaluated alignment can provide a maximum storage volume of 55,071 acre-feet at the maximum pool elevation of 260 feet. This alignment has a contributing watershed area of 18,880 acres. Potential reservoir characteristics for the Darling Creek Study Area are presented in Table 22.

Pool Stage (ft)	Fill Volume (ac-ft)	Fill Area (acres)	DA/NC (feet^{-1})
215	101.69	43.71	185.66
220	684.60	201.09	27.58
225	2,158.59	400.05	8.75
230	4,826.29	677.47	3.91
235	8,930.70	961.08	2.11
240	14,503.13	1,272.80	1.30
245	21,736.35	1,612.40	0.869
250	30,709.58	1,991.40	0.615
255	41,730.71	2,427.20	0.452
260	55,071.49	2,912.80	0.343

Table 23: Darling Creek Study Area Stormwater Storage Potential

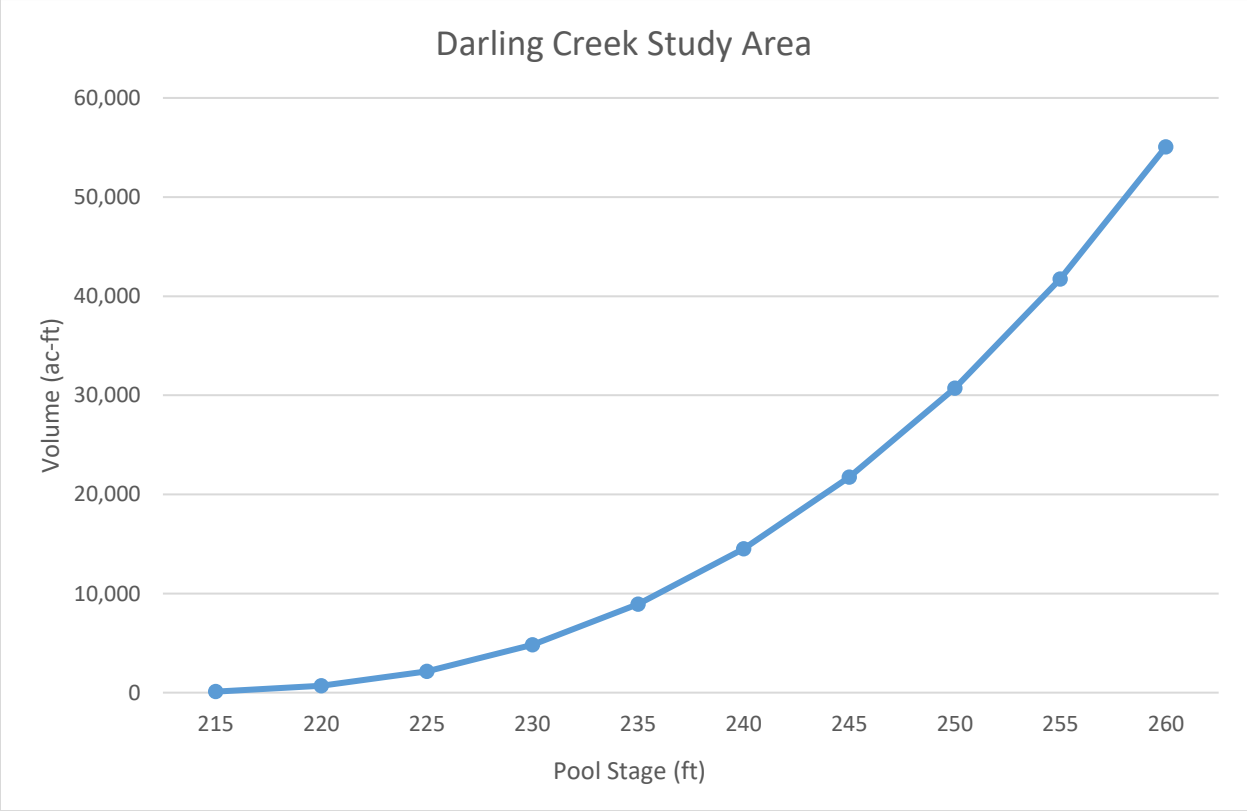

Figure 39: Stage-Storage Curve for Darling Creek Study Area