# Alternatives Analysis

**Prepared for:**
**Carroll County Water Authority**
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Table of Contents

Appendix C:  Groundwater Assessment by William McLemore, PhD PG

Appendix D:  Evaluation of Closed Carroll County Landfill by William Hodges, PE

Appendix E:  Rating Tables

# Alternatives Analysis

## A. Introduction

Carroll County Water Authority ("CCWA") is applying for a Section 404 Permit from the U.S. Army Corps of Engineers ("USACE") for the construction of a water supply reservoir on Indian Creek. As demonstrated by prudent analyses, the proposed Indian Creek Reservoir is the least environmentally damaging, practicable alternative capable of meeting the water supply needs of Carroll County in 2065.

## B. Project History

In 2006, CCWA commenced with the evaluation of potential water supply sources capable of meeting the needs of the Tallapoosa Basin-portion of Carroll County through 2060. Based on population projections prepared by Brown & Caldwell in 2008, the 2060 unmet water supply need in the Tallapoosa Basin portion of Carroll County was computed to be 18 million gallons per day (mgd). The analysis of potential alternatives concluded that the only viable alternative was to construct a pumped-storage reservoir supplemented with diversions from the Little Tallapoosa River. Eight reservoir sites were initially screened and four were recommended for further consideration. After field evaluations and review of impacts to streams and wetlands, human environment, endangered species, infrastructure, cultural resources, stream flows and costs, the Indian Creek Reservoir was identified as the preferred alternative.

On December 28, 2008, CCWA filed a Section 404 Permit application with U.S. Army Corps of Engineers ("USACE") to construct the Indian Creek Reservoir with a normal operating pool level of 1190'msl and a yield, with supplemental pumping from the Little Tallapoosa River, of 18 mgd. The 404 Permit application included the following: Alternatives Analysis, Phase I Cultural Resource Survey, Phase I Environmental Site Assessment, Jurisdictional Waters Report, Mitigation Plan, Safe Yield Report, Water Supply Needs Assessment and Maps.

On August 9, 2009, the Georgia Environmental Protection Division ("EPD") certified the need for the Indian Creek Reservoir. The USACE issued a Joint Public Notice on January 13, 2010 and held a Public Information Meeting on March 4, 2010. From 2010 through 2015, CCWA worked diligently with the USACE, EPD, U.S. Environmental Protection Agency ("EPA"), Fish and Wildlife Service ("FWS") and the State Historic Preservation Office ("SHPO") to obtain the approvals required for issuance of a 404 Permit. Numerous meetings and site visits occurred and numerous reports were prepared. The approvals obtained include:

- Jurisdictional Verifications for Reservoir (3/16/11), Mitigation Site (3/8/12), Pipeline Route (1/27/12)
- Downstream Flow Model of ACT Basin Study showing minimal downstream impacts approved by USACE in June 2015
- Cultural Resource Phase I and II Reports approved with concurrence that no additional work is needed (October 13, 2015)
- Wetland Reference Site approved by USACE in October 2012

The State also indicated support for the project by awarding $40 million to CCWA under the Governor's Water Supply Program to construct the Indian Creek Reservoir.

Population projections are the fundamental building block of a 404 Permit application. The future demand for a water supply project is determined by future population multiplied by estimated per capita consumption. Due to the economic downturn from 2009 to 2012, as well as changes in methodologies, there have been several significant modifications to the projected population for Carroll County. Since 2008, six (6) sets of population projections for Carroll County have been released and each time the population was projected to decrease. Due to the decreasing population, , the USACE required CCWA to reevaluate the project need. Below is a summary of the population projects since 2008.

- August 19, 2009 - EPD certified the need for the Indian Creek Reservoir which was proposed as an 18 mgd project with a 2060 Carroll County population projected at 416,613.
- 2010 – The Governor's Office of Planning and Budget ("OPB") released county-level population projections which estimated the 2030 Carroll County population at 198,891.
- 2013 - OPB released projections estimating the 2030 Carroll County population at 144,699. EPD requested that CCWA update its projections for the project based on the 2013 OPB estimates.
- February 21, 2014 - EPD certified CCWA's updated projections estimating a 2060 Carroll County population of 354,743.
- 2015 - OPB released new projections estimating a 2050 Carroll County population of 172,143. CCWA once again updated its projections.
- January 28, 2016 - EPD certified a 2065 Carroll County Water Authority service area population of 184,545.

EPD issued a supplemental letter on August 10, 2017 clarifying that the certification of need was provisioned on the water supply storage required to meet CCWA's need be located in the Tallapoosa Basin portion of Carroll County.

Evolving through six sets of population projections over nine years had a significant impact on the 404-permitting process. Upon receipt of its latest need certification on January 28, 2016, CCWA requested additional time to update its 404 Permit application. On February 9, 2016, the USACE gave CCWA 15-days to revise its permit application to take into account the updated need certification or administratively withdraw its permit application. Given the change in need from 18 mgd to 6 mgd, the revisions required could not be completed in 15-days. On February 22, 2016, CCWA requested an administrative withdrawal of the application and on March 7, 2016 the USACE accepted the request for withdrawal.

Since 2016, CCWA has worked to re-evaluate its water supply options to meet a reduced need of 6 mgd. As detailed in this Alternatives Analysis, CCWA evaluated avoidance alternatives, surface water supply alternatives and minimization alternatives and determined that a pumped-diversion water supply reservoir was the least environmentally damaging, practicable alternative. CCWA identified 12 reservoir sites which were ultimately narrowed to three for detailed analysis with Indian Creek Reservoir making the final selection as the preferred alternative. The Indian Creek Reservoir proposed in this application has a normal operating pool elevation of 1161'msl

resulting in a surface area of 480 acres. The Indian Creek Reservoir site is an excellent site due to the steep topography which increases water supply storage while minimizing impacts. The analyses supporting this conclusion are presented herein.

## C. Project Purpose

The purpose of this project is to provide Carroll County with a reliable source of water within the Tallapoosa Basin capable of satisfying the projected water demand during drought conditions in its service area for projected growth through the year 2065. The projected unmet water supply demand in the service area in the year 2065, after including demand reductions through water conservation and reuse, is estimated to be 6 million gallons per day.

## D. Service Area

The Service Area for this project includes unincorporated Carroll County, as well as the cities of Villa Rica, Roopville, Whitesburg, Temple, and Mount Zion as depicted on the Water Service Delivery District Map in Figure D-1, below.

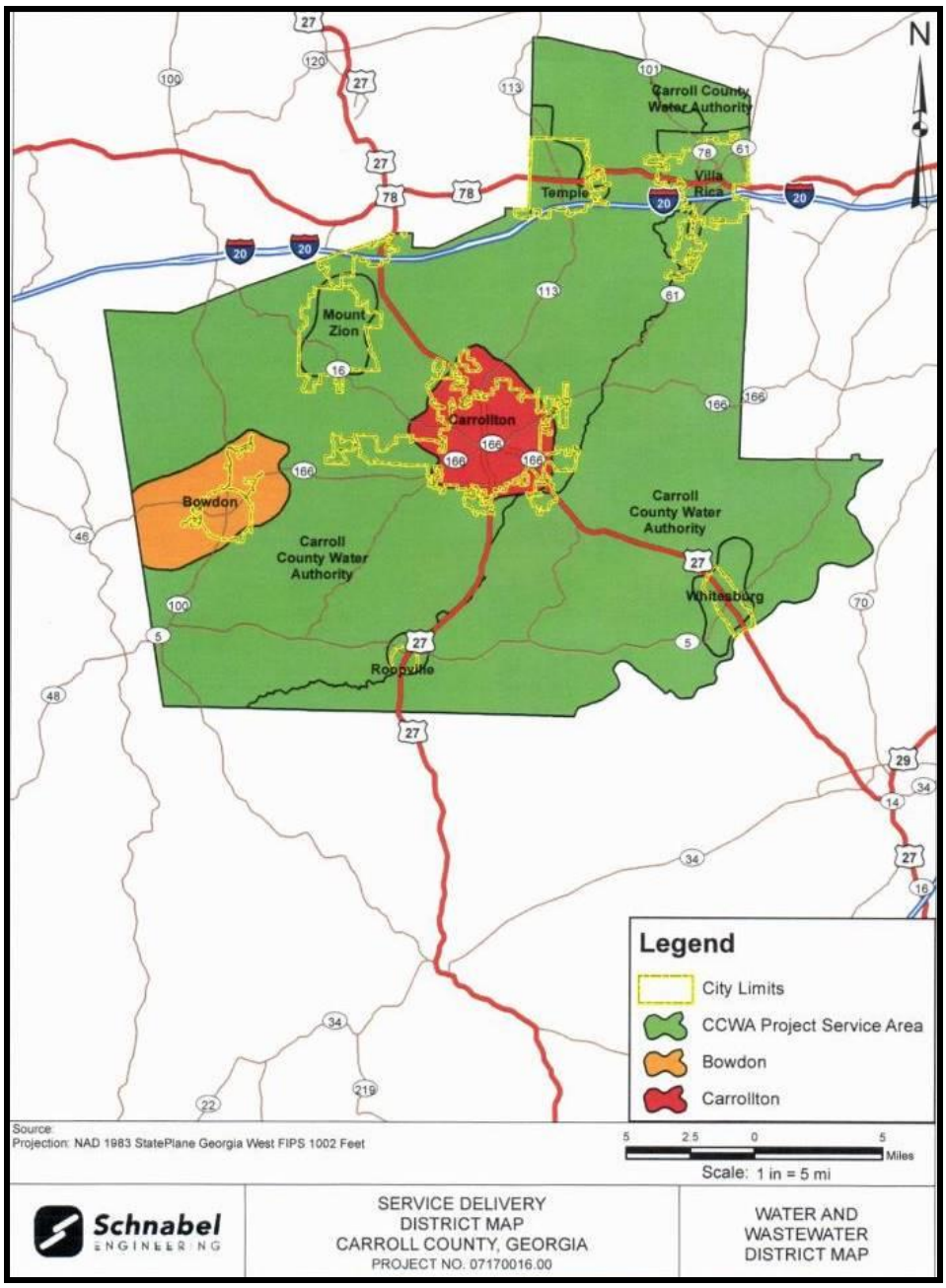


**Figure D-1. Carroll County Water Service Delivery District Map.**

Letters from Villa Rica, Temple, and Mount Zion supporting the Indian Creek Reservoir project and authorizing CCWA to use their population projections to support the need thereof are attached hereto as Appendix A.

## E. Need

On January 28, 2016, EPD certified a 2065 unmet demand for CCWA's service area of 6 mgd. This unmet demand was based on a projected 2065 population of 184,545 for CCWA's service

area. These populations were based on an extrapolation of OPB's 2015 projections prepared through coordination with EPD and consultation with the Carl Vinson Institute of Government, the State's demographer. The 2065 per capita usage rate started at 110 gallons per capita per day ("gpcpd") but with conservation measures was ultimately reduced and certified at 89 gpcpd. Accordingly, the total 2065 demand for CCWA's service area is approximately 16 mgd. The existing permitted supplies in CCWA's service area total approximately 10 mgd which include: 8 mgd from CCWA's Snake Creek Reservoir, 0.750 mgd from CCWA's wells, 1.5 mgd from Villa Rica's surface water supply, and 0.125 mgd from Villa Rica's well. Deducting existing supplies from the total 2065 demand results in a 2065 unmet water supply need of 6 mgd.

## F. Preliminary Alternatives Analysis

The following is a summary of the preliminary engineering review of alternatives potentially capable of supplying Carroll County's unmet water supply demand. The review includes an analysis of avoidance alternatives, surface water alternatives, and means of reducing the environmental impact of surface water alternatives. The analysis resulted in a "short-list" of alternatives reasonably capable of meeting Carroll County's projected unmet water supply demand. Further analysis of "short-listed" alternatives and the basis for selection of the preferred alternative are discussed in greater detail in Subsection G.

### *1. Avoidance Alternatives.*

Avoidance alternatives are potential courses of action or inaction that prevent additional impacts to jurisdictional waters. Potential avoidance alternatives include the following.

***a. No Action.*** This alternative eliminates the construction of any new facilities for water supply. The "no action" alternative results in CCWA being unable to meet the long-term water supply needs of Carroll County.

Carroll County's projected unmet water supply demand in 2065 is estimated to be 6 mgd; therefore, if the "no action" alternative is selected, the service area will have a 6 mgd shortfall. This alternative was rejected since it does not meet CCWA's purpose and needs.

***b. Water Conservation.*** This alternative utilizes implementation of water conservation measures to reduce future water demand in an attempt to eliminate the need for an additional water supply source. With the implementation of efficient water technologies and environmentally conscious regulations, the increase in future water demand will be lessened due to overall water conservation. Predicting the 50-year reduction in water demand due to conservation requires a number of assumptions including population growth, savings due to individual conservation efforts, and public participation.

Carroll County's projected 2065 demand of 6 mgd incorporates a very conservative population projection and an even more conservative per capita usage rate to account for reductions in demand to be realized by conservation. In its discussions with EPD on per capita water usage, a usage rate of 110 gpcpd, which was down from the 135 gpcpd requested in its 2008 application, was deemed reasonable. At 110 gpcpd, the 2065 unmet need would have been 10 mgd. After careful review and in anticipation of future conservation efforts, EPD ultimately certified a 2065

per capita usage rate of 89 gpcpd and a service area population of 184,545. In 2006, the average per capita water use in the Metro North Georgia Water Planning District ("MNGWPD") Counties totaled 168 =gpcpd. In 2016, the MNGWPD's updated plan projected a 2050 blended per capita usage rate of 108 gpcpd.

CCWA evaluated current conservation practices and system operation and considered goals for future expansion of conservation opportunities under EPA Region 4 Guidelines on Water Efficiency Measures for Water Supply Projects in the Southeast (2010) and Best Practices to Consider when Evaluating Water Conservation and Efficiency as an Alternative for Water Supply Expansion (2016). A separate report addressing these guidelines is attached in Appendix B.

Water conservation alone is not sufficient to avoid the construction of a new water supply resource; however, water conservation is a means of reducing the level of unmet water demand and avoiding unnecessary adverse impacts on the human and aquatic environment.

Since the projected water supply demand already includes water conservation measures, this alternative is not considered a viable stand-alone alternative.

***c. Recycle and Reuse of Wastewater.*** This alternative utilizes wastewater recycling and reuse measures to reduce future water demand and ultimately avoid the need for an additional water supply resource. Primary applications for reuse of wastewater include irrigation, cooling water, and in-building, non-potable uses (toilet and urinal flushing). Wastewater discharges are generally not judged to be suited for direct reuse, even when tertiary and advanced treatment techniques are applied. Therefore, the efficacy and economics of wastewater reuse are most viable when a concentrated, non-potable water demand can be met using highly treated municipal wastewater effluent in place of potable water. As an example, treated wastewater used to irrigate a nearby golf course can relieve demand from either a potable water system or from nearby surface or groundwater resources.

Reuse and recycling of wastewater is not a viable option to supply Carroll County's water supply needs. CCWA currently provides 0.45 mgd of wastewater treatment capacity through a Land Application System at Fairfield Plantation. The limited additional capacity that could potentially be generated would not justify the considerable expense associated with this option and there is considerable uncertainty as to whether a direct reuse project could be reasonably permitted. This alternative is not practicable for meeting the CCWA's project purpose and was eliminated from further review

***d. Groundwater.*** This alternative includes the construction a series of groundwater wells to meet CCWA's future water demand. Groundwater has long been used in Carroll County to serve individual homes, farms, and businesses in areas not served by community water systems. Groundwater wells also serve several subdivisions and mobile home parks in the county. In addition, the cities of Carrollton, Roopville, Temple, Villa Rica and Whitesburg utilize wells to some degree. The CCWA has three wells that were drilled several decades ago. The two smallest wells remain in operation although they present operational challenges. The largest producing well is maintained as a back-up due to its unreliable water quality and quantity.

CCWA has attempted to install additional groundwater wells with all efforts being unsuccessful in locating additional reliable water supply. The permitted groundwater supplies for Villa Rica (0.125 mgd) and CCWA (0.75 mgd) were incorporated into the 2065 unmet need determination. However, it is noted that reliance upon these wells for long-term water supply may not be conservative or prudent.

**Physiogeographic Setting:** Carroll County is located in the Southern Piedmont physiographic province as shown in Figure F-1. The Piedmont province is characterized by crystalline rocks of Precambrian and Paleozoic ages. Piedmont aquifers are a two-part system, with groundwater being stored in porous regolith and then transmitted to wells via geologic discontinuities (fractures and joints) in crystalline rocks. While some fractures can be highly productive, drilling into a fracture does not guarantee that water will be available.

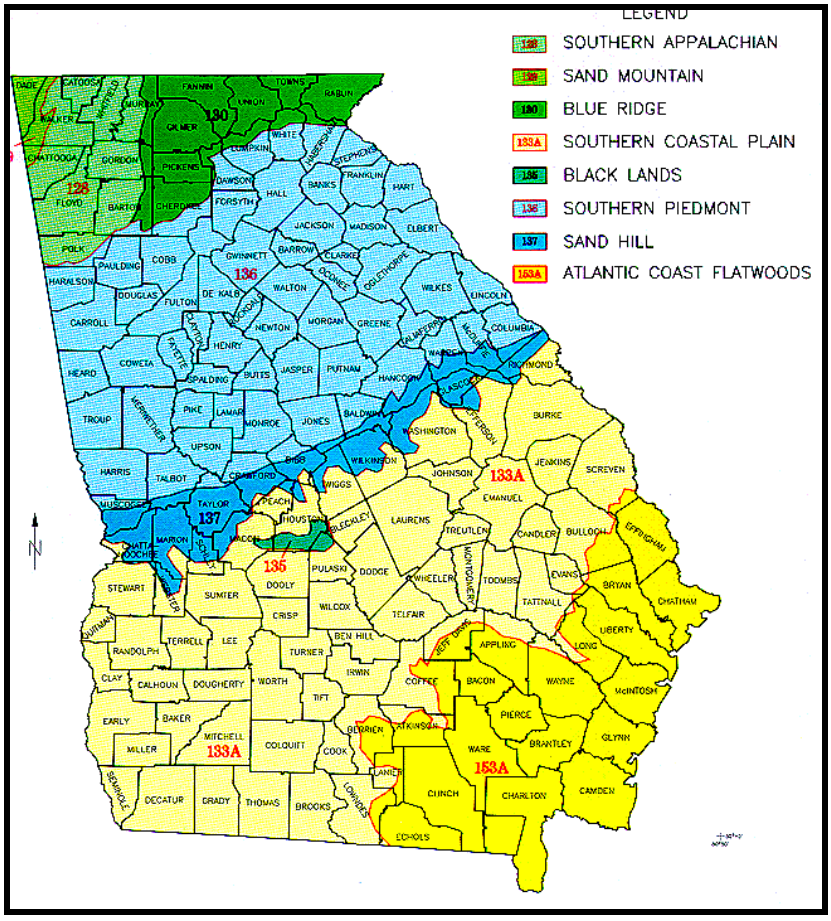


**Figure F-1. Hydrogeologic Provinces in Georgia.**

**Groundwater Quantity:** A number of hydrogeologic studies have been conducted in Carroll County and in the counties of Douglas, Haralson, Paulding and Polk. These studies are listed and discussed in a letter from William H. McLemore, Ph.D., P.G., dated December 1, 2008. This letter is attached as Appendix C. Dr. McLemore served in the Georgia Environmental Protection Division as the State Geologist of Georgia for more than 20 years until his retirement in 2005. The CCWA commissioned Dr. William H. McLemore to review and summarize these hydrogeologic studies. Based on his review, Dr. McLemore concluded that large groundwater

yields are unlikely in Carroll County, although an occasional well yielding more than 100,000 gallons per day (gpd) is possible.

Dr. McLemore identified six studies dating from 1989 to 1995. He deemed the 1993 study conducted by the Georgia Geologic Survey as the most comprehensive review of groundwater availability in Carroll County. The 1993 study by the Georgia Geologic Survey includes a preliminary reconnaissance estimate of the ground-water resources of Carroll, Douglas, Haralson, Polk and Paulding Counties, Georgia. The study concludes that there is approximately 40 mgd of additional groundwater available from wells in the Piedmont. However, the study also noted that obtaining the 40 mgd would require a minimum of 280 wells, averaging a yield of 100,000 gpd. Each of these wells would need to be carefully sited by a geologist (rather than drilled randomly) at widely scattered locations in the 1,357 square miles of the Piedmont province within the five counties for a yield of 29,500 gpd per square mile.

In addition, only CCWA's wells (permitted for 0.75 mgd) and Villa Rica's wells (permitted for 0.125 mgd) produce sufficient water to necessitate a groundwater withdrawal permit from Georgia EPD. This alone is a strong indicator that groundwater has relatively low potential to provide the additional 6 mgd needed by 2065.

Based on the foregoing, there are insufficient quantities of groundwater that can be practicably obtained in Carroll County to meet CCWA's water supply needs through 2065.

**Groundwater Quality:** In addition to whether wells can produce an adequate supply of water, the quality of the water must be considered. In general, groundwater consistently has higher and more uniform water quality than surface water; however, groundwater may contain high dissolved solids or manmade substances just like surface water. According to the Water Quality in Georgia's Private Drinking Water Wells prepared by the University of Georgia in 2005, the contaminants that most often impact groundwater are nitrate, lead and copper followed by iron and manganese. The study reviewed over 27,000 well samples with over 66% of the samples originating from the Southern Piedmont region.

The samples from the Southern Piedmont region show a high occurrence of iron and manganese contamination. As shown in Figure E-2 below, nearly 20% of Piedmont wells tested had higher than the allowed maximum contaminant levels of manganese. 15% of Piedmont wells tested had iron levels above the maximum contaminant level.

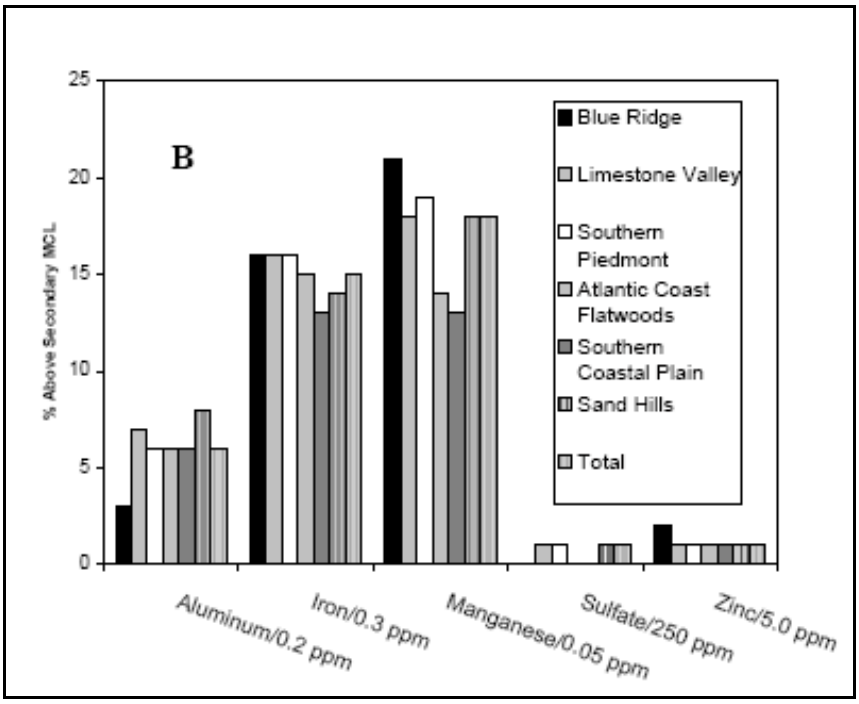


**Figure F-2. Percentage of well samples above the maximum contaminant levels.**

Thus, there is a highly likelihood that wells in Carroll County would have iron and manganese levels above the maximum contaminant levels allowed which would create a public health and safety concern for CCWA in developing an untreated groundwater-based supply of drinking water for its customers.

CCWA has three groundwater wells that are permitted for a withdrawal of 0.75 mgd. The three wells produced approximately 0.57 mgd for many years until concerns were raised related to iron and manganese concentrations in the water produced by the largest well. Higher iron and manganese was leading to increased complaints from customers within the well's service area. CCWA made the decision to discontinue the operation this well on a daily basis and reserve it for emergency or backup supply. With the largest well out of production the current average daily withdrawal is approximately 0.16 mgd.

**Impacts to the Natural Environment:** If groundwater was a viable means for meeting a significant portion of CCWA's future unmet water demand, it would have adverse impacts to jurisdictional waters. In the Piedmont province, the most likely sources of groundwater are in low lying areas in the flood plain and adjacent to streams and wetlands. The diverting subsurface water for drinking water would significantly reduce the subsurface water available to provide base flows to streams and wetlands. These effects would be most profound during times of low flow.

Adverse impacts to protected species would be due to the reduced, dry-weather in-stream flows resulting from the diversion of subsurface water for drinking purposes. As with impacts to jurisdictional waters and downstream flows, these effects would be most profound during times of drought.

**Impacts to the Human Environment:** Adverse impacts to historic and prehistoric resources would be expected since the well fields will be necessarily located in areas adjacent to surface water where the likelihood of encountering these resources is high.

Due to the probable location of successful groundwater wells, direct relocations are not likely, but land uses would need to be restricted in the 4.5 acres Inner Management Zone around each well.

There are not likely to be any significant impacts to existing infrastructure; however, substantial new piping systems and pumping systems would be needed.

The social and political impacts resulting from reliance on groundwater would include the continuing uncertainty as to the adequacy of the water supply in drought conditions, the failure of the county to provide for adequate water supplies, the cost to implement a geographically diverse system of wells, and the land restrictions and acquisition associated with wellhead protection.

**Wellhead Protection:** If sufficient highly productive wells could be developed, protecting sufficient land to provide appropriate wellhead protection areas is a significant challenge. Georgia's Safe Drinking Water Standards for Wellhead Protection call for Inner and Outer Management Zones. Inner Management Zones prohibit non-domestic septic tanks and some other land uses within a radius of 250 feet of any well. Assuming 100 gpm wells (an exceptionally high value for Piedmont wells) the area required for the Inner Management Zone would be approximately 4.5 acres for each well. Outer Management Zones vary between 100 feet to an area of several square miles. Land uses would need to be restricted in this zone.

**Cost:** Using 100 gpm as an optimistic dependable yield, approximately 42 wells would be needed to supply 6 mgd. It is worthwhile to note that the expectation of 100 gpm yield is very optimistic as the only two wells that CCWA consistently operates pump at 30 – 60% below this pumping rate. Each well would require acquisition of property and restrictive covenants (at a minimum) for wellhead protection. Furthermore, the wells would need to be scattered through Carroll County to minimize groundwater drawdown in any one location. This would require a network of pumping stations and a delivery system, with associated pipeline construction throughout the county, to convey the raw water to one or more treatment facilities. The needed infrastructure could more than double the cost of the wells themselves.

**Conclusion:** Given the uncertainties regarding the availability, reliability and quality of groundwater in the project area, this resource is not considered sufficient to meet the project purpose. It may provide nominal means of reducing demands upon other sources, and CCWA and Villa Rica's current groundwater withdrawal permit limits were deducted as existing supplies resulting in an unmet need of 6 mgd. In view of the inability of groundwater to supply the water needed by the Applicant, the potential for wells to become contaminated, the impacts to jurisdictional waters and downstream flows during low flows, the amount of land required for wells and wellhead protection and the cost of a groundwater system, this alternative was eliminated from further consideration.

**e. *Purchase of Water from Other Suppliers.*** This alternative would be to purchase or otherwise acquire water from a nearby water supplier. Purchasing adequate quantities of water would eliminate the need for construction of any new facilities for water supply.

CCWA has 39 interconnections with 12 water providers. The vast majority of these allow CCWA to sell water to other water providers. A few interconnections, approximately 8, allow CCWA to purchase water specifically those with the City of Carrollton, Douglasville-Douglas County Water Authority, Haralson County and Heard County in limited quantities to assist CCWA should it have an emergency or outage at its water treatment plant.

Currently, there are no water suppliers in the Carroll County area that have the excess capacity to meet CCWA's 6 mgd need. CCWA is a wholesale provider to Villa Rica, Whitesburg, Mount Zion, Roopville, Temple and Cleburne County, Alabama. CCWA supports interconnections for emergency/backup water supply and currently has connections with twelve water providers. CCWA did investigate the possibility of the Anniston Water Works and Sewer Board ("AWWSB") in Anniston, Alabama supplying water to CCWA in late 2007 and early 2008 with a portion of their capacity. Discussions centered on transmitting 1 to 2 mgd to the CCWA through the Cleburne County water system. To accommodate the transmission, substantial upgrades would have to be made to both the CCWA's and Cleburne County's distribution system. Additionally, the discussions between AWWSB and CCWA centered around a 5-year purchase water agreement with a maximum agreement term of 20 years. Since CCWA could not secure a long-term commitment that guaranteed both the quantity and price of water through the 50-year planning horizon, CCWA would not have any control over its costs for acquiring water, and thus would be limited in successfully planning for the future. Moreover, the available supply of 1 to 2 mgd would not meet CCWA's long-term needs and would come at the cost of substantial upgrades to existing distribution systems.

**Conclusion.** Given CCWA's role as the wholesale supplier in Carroll County and its need to secure reliable supply over a 50-year planning period, this option was eliminated from further consideration. However, CCWA will continue to seek and offer interconnections for emergency/backup supplies.

**f. Request Increased Withdrawal at Existing Intake Site.** This alternative would be to expand the capacity of an existing intake site. Increasing the capacity at existing intake sites could eliminate the need for construction of any new facilities for water supply if adequate storage exists.

CCWA does not have an existing intake site in the Little Tallapoosa Basin, but does have an intake on its Snake Creek Reservoir in the Chattahoochee Basin. However, given the limited reservoir safe yield of approximately 8 mgd, the capacity at the existing intake is already fully utilized at its currently permitted level. This alternative was eliminated from further consideration because it is not capable of meeting the project purpose.

**g. Upland Constructed Flow Augmentation Reservoir.** This alternative would include the construction of a reservoir in an upland area and to augment its flow through diversions from an existing river.

Upland reservoirs are most viable where the center of demand is located downstream of the reservoir. Releases from augmentation reservoirs direct flow to urban centers by gravity. Growth of the Atlanta metropolitan area is expanding into the eastern portion of Carroll County. To take advantage of upland reservoir releases, reservoirs storing water diverted from the Little Tallapoosa River would need to be located in western Carroll County. Currently, there are five upland reservoirs in the Little Tallapoosa River (three are Carrollton augmentation reservoirs). These reservoirs serve the water supply needs of Carrollton. In combination, these five reservoirs and the City of Carrollton's river intake provide about 11 mgd in water supply yield. It is unlikely that additional upland reservoirs could individually support yields of more than a few million gallons per day due to the extent of current water supply development in the upper Little Tallapoosa River. Satisfying the project purpose of supplying 6 mgd in unmet demand over the 50-year planning period would therefore require many large upland reservoirs with aggregate environmental impacts and costs many times that of the identified preferred alternative.

This alternative is not practicable for meeting the Authority's project purpose and was eliminated from further review.

### *2. Surface Water Supply Alternatives.*

***a. <u>Traditional Reservoir (No Pumped Storage)</u>.*** This alternative involves the development of a reservoir directly on a stream to store water to supply the unmet need in the service area. In order to provide sufficient water supply for this project, a traditional reservoir will need to be located on the main-stem of a large stream or river.

A traditional reservoir would have greater adverse environmental impacts than pumped-storage alternatives. Because larger drainage area streams have very nominal bed slopes and wide flood plains, a traditional reservoir would have a much larger surface area than a pumped-storage reservoir. As examples, consider the consequences of an impoundment on the Little Tallapoosa River and the lower reach of Indian Creek:

- **Little Tallapoosa River** – A reservoir on the Little Tallapoosa River would need to be located about 0.8 miles upstream of the Georgia-Alabama state line. If a Little Tallapoosa reservoir is moved further upstream it would inundate Buffalo Creek and impact substantially more streams and wetlands. To impound 27 feet of water (a very shallow reservoir), approximately 9 miles of the Little Tallapoosa River would be inundated, along with an estimated additional 8 miles of tributary streams, totaling 17 miles of stream impacts. The surface area of the reservoir would be approximately 1178 acres and would provide a total storage of about 4.1 billion gallons. Stream and wetland impacts would be unacceptably high since the Little Tallapoosa River is a mild gradient river (less than 1 foot per thousand) with a wide floodplain. Infrastructure impacts (including 8 bridges) would also be great, and a large, shallow reservoir would have significantly increased evaporation losses.

- **Indian Creek** – A traditional reservoir on Indian Creek would need to be located about 0.6 miles upstream of the Georgia-Alabama state line. To impound 36 feet of water (a

somewhat shallow reservoir), a traditional reservoir on Indian Creek would impact approximately 2 times the stream length that would be impacted by a pumped storage reservoir on Indian Creek. Similarly, the surface area of the reservoir would be approximately 2.5 times the size of a pumped-storage reservoir on Indian Creek. Infrastructure impacts (including 7 bridges) would also be great.

Since a traditional reservoir has a much larger surface area, greater impacts to wetlands, streams, endangered species, infrastructure and cultural resources are expected. Likewise, a dam on the main-stem of a river separates a larger percentage of the aquatic habitat. As a result, it has greater direct and indirect impacts to aquatic species than the impacts caused by a pump-storage reservoir located on a small tributary stream. In addition, traditional reservoirs cause more impacts on downstream flows because larger reservoirs provide a greater attenuation of flows. During lower flows, downstream impacts from a traditional and pumped-storage reservoir are roughly comparable. High flow events have a greater impact on downstream geomorphology than lower flows. Based on the foregoing this alternative was eliminated from further consideration.

***b. Construction of Several Reservoirs.*** This alternative utilizes multiple smaller reservoirs to achieve the desired future yield. It is generally acknowledged that the construction of multiple water supply reservoirs results in greater cumulative impact on the environment and cost more than a single larger reservoir.

Multiple reservoirs will impact more linear feet of stream than a single larger reservoir because a majority of a reservoir's storage is located in the upper elevations. By downsizing the area of the lake, a disproportionate percentage of the lake's storage capacity is lost. Therefore, the ratio of impacted stream length to storage decreases as the water supply pool elevation increases. As a result, to achieve the same storage and yield with multiple reservoirs, more linear feet of free-flowing stream will be inundated than with a single larger project. Furthermore, with each new reservoir, an additional stream system is impacted, creating disjunction of aquatic habitat. A single larger reservoir only impacts one stream system.

In addition to increased stream impacts, greater wetland impacts are expected with multiple reservoirs. Typically, wetlands impacted by a reservoir lie in the lower elevations. Therefore, as the normal pool elevation of a single site is increased, the additional impacts to wetlands are minimal. Therefore, to achieve the same storage and yield with multiple reservoirs, more acres of wetlands will typically be inundated than with a single larger project.

The construction of multiple reservoirs not only results in increased environmental impacts, but also increases the overall project costs. With multiple reservoirs, the economies of scale associated with the construction of a single dam are lost and land acquisition needs increase markedly. Multiple dams to impound the same volume of water will cost significantly more than a single dam alternative.

This alternative may result in smaller impacts per reservoir; however, the cumulative total impacts associated with multiple reservoirs will be greater than those associated with the proposed alternative. In addition, the combined cost of multiple reservoirs and associated

treatment and transmission systems will exceed the cost of a single project. Based on the foregoing, this alternative was eliminated from further review.

***c. River Intake System (No Storage Reservoir).*** This alternative requires construction of water intake pumps on a stream or river large enough to provide the volume of water needed. In order to provide sufficient water supply for this project, intake lines will need to be located on the main-stem of a river. Based on the information available, this may be a viable source of water when coupled with a storage reservoir; however, as explained in detail below, when moderate to low flows are experienced, direct withdrawal without storage cannot provide a reliable source of water.

The largest watershed in Carroll County is the Little Tallapoosa River Basin with a drainage area of 320 square miles at the Georgia-Alabama state line. Based on apportioned flow data from United States Geologic Survey (USGS) Station 02412000, river flows at the Tallapoosa River near Heflin, AL (448 square miles) would be insufficient to deliver any reliable water supply without significant reservoir storage. Schnabel computed the Monthly 7Q10 flow apportioned from the Heflin gage, and the approximate Annual 7Q10 flow for the Little Tallapoosa River at the Georgia-Alabama state line is 18.1 cfs. During the 81-day period from September 9th, 2016 through November 28th, 2016, flows in the Tallapoosa River at the state line were less than the annual 7Q10 flow, with a minimum flow of 0.12 cfs and a period average flow of 5.7 cfs (apportioned based on drainage area from Heflin gage).

A vital aspect of the project purpose is the development of a water supply source that will be reliable during times of drought. Reliability is defined as being capable of supplying the projected demand throughout the drought of record. Direct withdrawal cannot consistently provide water and continue to meet minimum downstream flow requirements in times of drought. As presented above, even in the absence of an in-stream flow requirement, there are identified periods when river flow is insufficient to meet the project purpose. Additionally, direct river withdrawal is not protective of the aquatic resources in the rivers. Impacts to instream flow from excessive pumping during times of low flows can have disastrous effects on the aquatic resources in a river. A pumped storage reservoir provides for adequate water storage during times of high flows for use during periods of drought and low flows. If pumping is curtailed to protect aquatic habitat downstream of the intake, a direct withdrawal will be even less reliable in times of drought and low flows. In order to protect the river, storage of water in a basin is the preferred alternative given that during times of drought water is withdrawn from the basin, not the river.

One benefit of direct withdrawal is that it avoids the substantial expense associated with the construction of a reservoir. Direct withdrawal also avoids the wetland and stream impacts associated with reservoir construction. However, the inconsistent availability of water during times of drought and the substantial impacts to the aquatic resources in the river make this alternative less favorable.

**Conclusion.** Based on the foregoing, direct withdrawal is not considered feasible because under drought conditions, CCWA cannot withdraw sufficient water to meet its demand. This

alternative does not meet the project purpose of providing an adequate supply of water in times of drought. In addition, the potential environmental impact on the river from pumping during periods of low flow is unacceptable.

***d. River or Stream Intake with One Storage Reservoir (Proposed Alternative).*** This alternative places a dam on a small watershed stream. Water from a nearby stream or river is withdrawn during periods of higher flow to supplement natural reservoir storage recharge. This allows water that is available during periods of higher flow to be stored for use when direct stream withdrawals would otherwise fail to meet demand. This is the major component of the CCWA's plan to meet future water demand.

**Impacts to the natural environment:** Single pumped-storage reservoirs are typically more protective of the environment than larger traditional reservoirs or multiple smaller reservoirs. The potential for a single pumped-storage reservoir is defined by its storage capacity and its proximity to adequate sources of additional water (diversion withdrawal) and not by the amount of water available within the basin of the reservoir. Typically, pumped-storage reservoirs have fewer adverse impacts to jurisdictional waters as compared to other reservoir alternatives. In addition, pumped-storage reservoirs preserve more of the natural variation of stream flows in the system by slightly reducing, rather than drastically dampening, higher flows.

Potential impacts to aquatic species due to the construction of a reservoir are dependent upon the species present in the area of anticipated construction. Species found in smaller systems are more likely to suffer direct adverse impacts from pumped-storage reservoirs. Likewise, species found in the main stem of a river are more likely to be adversely impacted by a traditional reservoir project. In addition, as discussed above, a single traditional reservoir will separate a larger percentage of habitats than a smaller, pumped-storage reservoir.

The above environmental factors typically favor development of a pumped-storage reservoir.

**Impacts to the human environment:** In addition to concerns about the natural environment, it is also important to evaluate a project's impact to the human environment and the human environment impacts to the project. In general, pumped-storage reservoirs are located in the headwater of the drainage basin and have smaller surface areas than other reservoir alternatives; therefore, they tend to impact fewer historic resources. Impacts to the human environment due to impacts to existing infrastructure tend to be site specific when comparing a single pumped-storage alternative to traditional reservoir and multiple reservoir alternatives. Moreover, water quality concerns also decrease because pumped-storage reservoirs are typically located in smaller watershed areas. Since pumped-storage reservoirs are perceived to have greater shoreline fluctuation, they may generate opposition from adjoining landowners and the community. Fluctuations are greater in terms of elevation; however, because they typically are in steeper valleys, they don't expose mud flats.

**i. Identification of alternatives:** In 2008, Schnabel identified eight pumped-storage reservoirs in the CCWA service area capable of yielding 18 mgd. The identified reservoirs are summarized below.

(1) Mountain Creek

(2) Turkey Creek & Jumpin In Creek,
(3) Buck Creek Upper
(4) Buck Creek Lower
(5) Tributary to Garrett Creek
(6) Tributary to Turkey Creek
(7) Indian Branch
(8) Indian Creek.

The eight sites identified by the initial screening were narrowed to four based on their yield and impacts to infrastructure, streams, wetlands, and cultural resources. The four short-listed sites were: (1) Tributary to Garrett Creek, (2) Tributary to Turkey Creek, (3) Indian Branch and (4) Indian Creek. Ultimately, the Indian Creek Reservoir was selected as the least environmentally damaging, practicable alternative capable of meeting the 18 mgd need.

In 2017, Schnabel identified potential pumped-storage reservoir alternatives capable of meeting the project purpose with a reduced 2065 need of 6 mgd. Initial screening identified the following twelve pumped-storage options:

(1) Indian Creek Tributary
(2) Turkey Creek
(3) Indian Creek
(4) Jumpin In Creek Upper
(5) Little Buck Creek
(6) Indian Branch Upper
(7) Holland Creek
(8) Jumpin In Creek Lower
(9) Mountain Creek Lower
(10) Indian Branch Lower
(11) Garrett Creek Lower
(12) Buck Creek.

The twelve sites were reduced to six sites that currently have NRCS impoundments at the proposed dam sites and are, therefore, considered impaired stream systems. The six mid-listed sites are: (1) Indian Creek Tributary, (2) Turkey Creek, (3) Indian Creek, (4) Indian Branch Lower, (5) Indian Branch Upper, (6) Jumpin In Creek Lower. These six sites were evaluated based on their ability to meet the project purpose of providing a reliable yield of 6 mgd during drought conditions as discussed in more detail below. Four of the six sites (Indian Branch Lower, Indian Branch Upper, Indian Creek, Jumpin In Creek Lower) met the required criteria and were then evaluated based on impacts to streams, wetlands, watersheds, roads, utilities, structures, relative cost, raw water quality and storage expandability. Ultimately, three sites were short-listed for field evaluations and more detailed analysis including: (1) Indian Branch Lower, (2) Indian Branch Upper and (3) Indian Creek. These sites are discussed in detail in Section G.

**ii. Evaluation of six (6) mid-listed sites:** The six mid-listed sites, (1) Indian Creek Tributary, (2) Turkey Creek, (3) Indian Creek, (4) Indian Branch Lower, (5) Indian Branch Upper, (6) Jumpin In Creek Lower, were evaluated in detail to determine their resiliency to stream flow

changes, storage capacity and pumping rates. This required yield modeling for each proposed project. A map of the six sites is below:

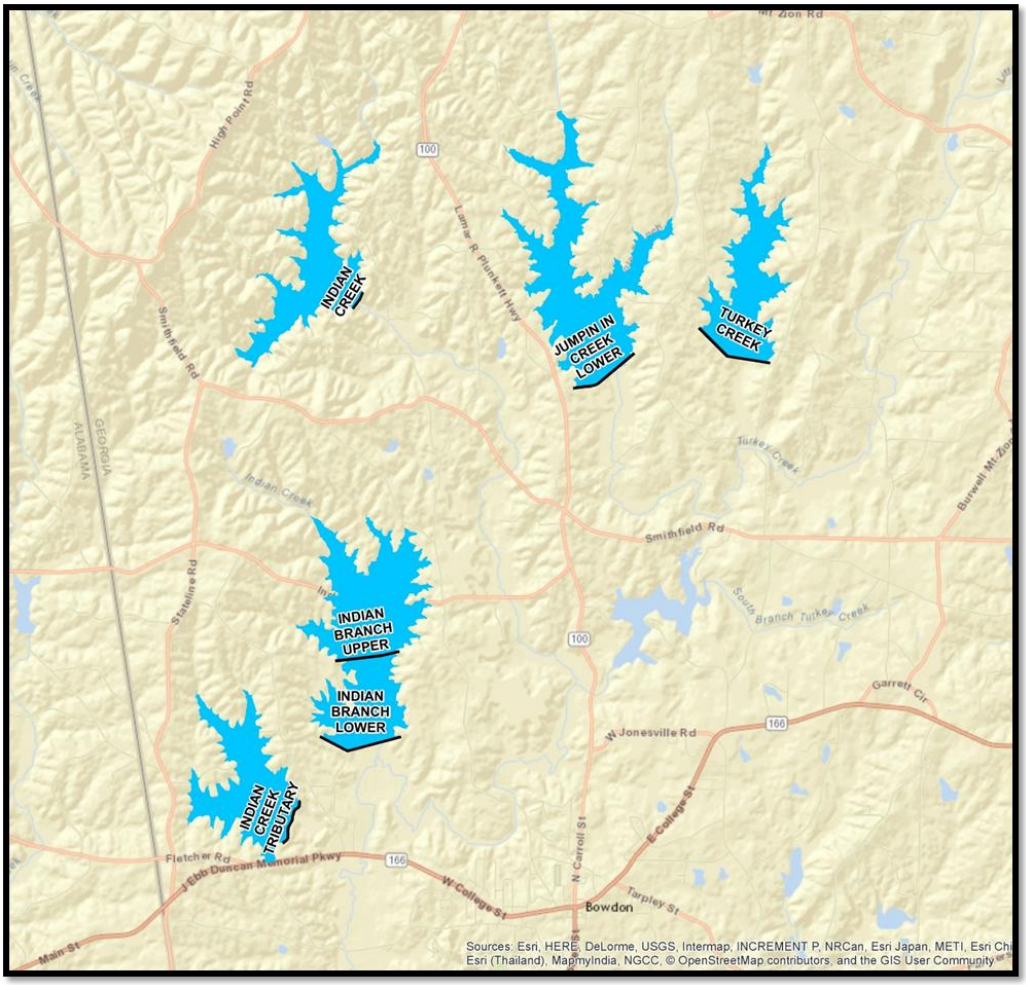


**Figure F-3. Six mid-listed alternative sites.**

Schnabel Engineering studied the river gages nearest the Tallapoosa basin portion of Carroll County with at least 20 years of data and a drainage area between 100-400 square miles. The Heflin gage showed a 31% decrease in Tallapoosa river flows between the period 1952-2006 and the period 2006-2017. The Sweetwater Creek gage showed a 24% decrease in flows between the period 1937-2006 and the period 2006-2017. The New River gage showed a 23% decrease in flows between the period 1978-2006 and the period 2006-2017. These results show that based on historic records, a reservoir must be able to withstand a 25% decrease in river flows over the 50-year planning horizon. Therefore, to reliably yield 6 mgd in 2065 while considering potential flow reduction of at least 25% over that time period, the six reservoirs were sized to provide 8 mgd in 2017. Additionally, five drought resiliency criteria were incorporated into the safe yield analyses. To meet these criteria, it was found that a reservoir must provide at least 5 BG of storage with maximum required diversions of 25 mgd (higher diversion capability had diminishing returns). The results of this analysis are presented below.

Table 1: Required Minimum Reservoir Elevation and Diversion Pumping to Meet Sate Yield Criteria

| Site | Required Project Parameters | | | |
|---|---|---|---|---|
| | Top of Dam EL | Reservoir NP EL | Reservoir Storage (BG) | Diversion Pumping (mgd) |
| Indian Branch Lower | 1035.5 | 1025.5 | 5.3 | 21.0 |
| Indian Branch Upper | 1062.5 | 1052.5 | 5.2 | 21.0 |
| Indian Creek | 1171 | 1161 | 5.1 | 19.4 |
| Indian Creek Tributary[1] | 1072 | 1062 | 3.2[2] | >50[3] |
| Jumpin In Lower | 1123 | 1113 | 5.7 | 19.0 |
| Turkey Creek[1] | 1120 | 1110 | 3.6[2] | 27.1[3] |

1. Eliminated from further consideration.
2. Maximum storage available at site. Fails to meet minimum reservoir storage requirements.
3. Fails to meet resilient pumping utilization rate.

**Table F-1. Mid-list sites storage volumes and pumping rates.**

Accordingly, Indian Creek Tributary and Turkey Creek were eliminated from further consideration due to their inability to meet the basic project purpose of yielding 6 mgd in 2065 due to their low storage volume and high pumping rates. Further analysis was completed for the four remaining sites.

**iii. Evaluation of four (4) sites leading up to short-list:** CCWA evaluated the four remaining sites, Indian Branch Lower, Indian Branch Upper, Indian Creek and Jumpin In Creek Lower based on environmental and practicability factors to determine on a comparison basis which sites warranted more detailed field evaluation. A rating system was developed to rank the sites on each evaluation criteria. The four sites are depicted in Figures F-4 through F-7 below. For comparative purposes, top of dam elevations in this section were set at 10 feet above normal pool. The final top of dam elevation for the preferred alternative will be set during final design when additional site specific information is available and more detailed analysis is performed.

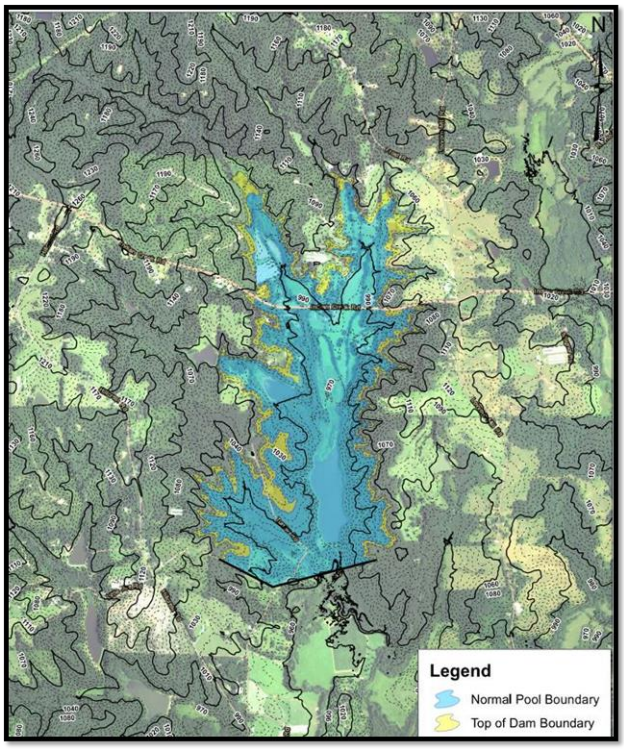


**Figure F-4. Indian Branch Lower.**

The proposed Indian Branch Lower site has a normal operating pool elevation of 1,025.5 feet msl and a top of dam elevation of 1035.5 feet msl with a top of dam surface area of 680-acres and storage of 5.3 BG at elevation. To meet the required safe yield, 21 mgd of diversion or supplemental pumping is required from the Little Tallapoosa River.

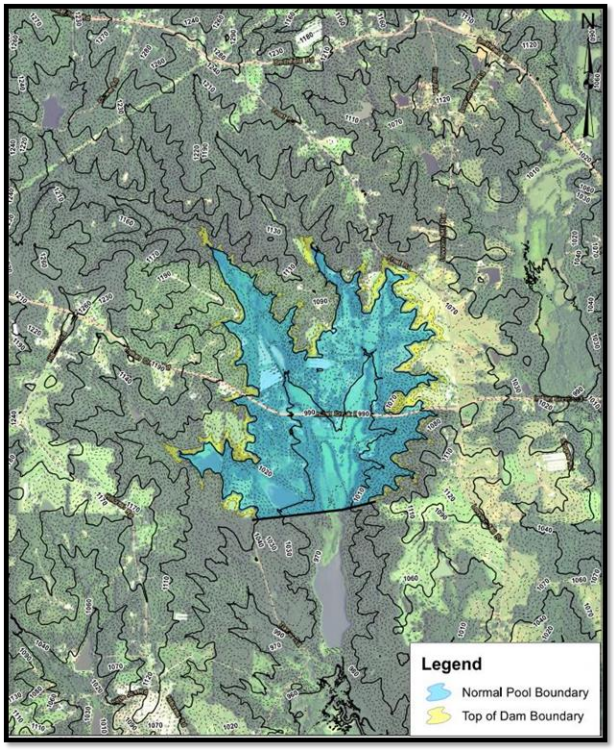

**Figure F-5. Indian Branch Upper.**
The proposed Indian Branch Upper site has a normal operating pool elevation of 1,052.5 feet msl and a top of dam elevation of 1062.5 feet msl with a top of dam acreage of 590 and storage of 5.2 BG. To meet the required safe yield, 21 mgd of diversion or supplemental pumping is required from the Little Tallapoosa River.

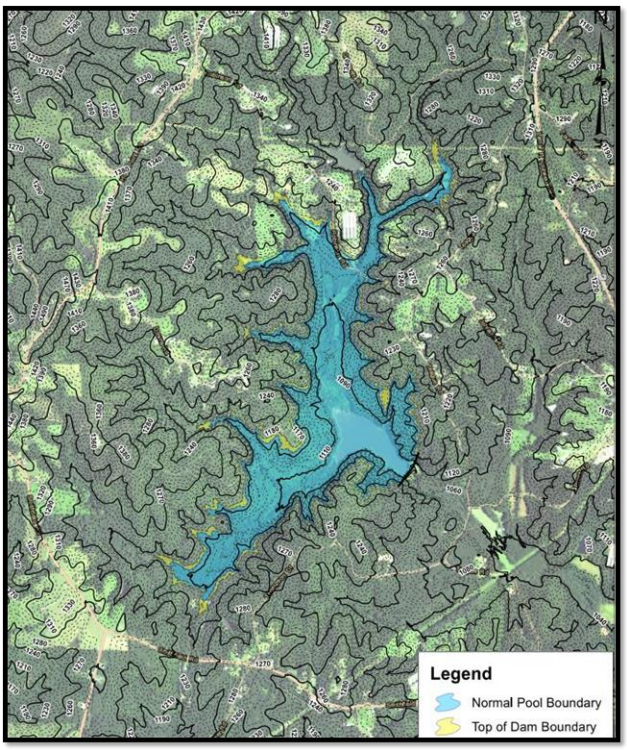


**Figure F-6. Indian Creek Reservoir.**
The proposed Indian Creek site has a normal operating pool elevation of 1,161 feet msl and top of dam elevation of 1,171 feet msl and stores 5.1 BG of water. The top of dam surface area is 480-acres. To meet the required safe yield, 19.4 mgd of diversion or supplemental pumping is required from the Little Tallapoosa River.

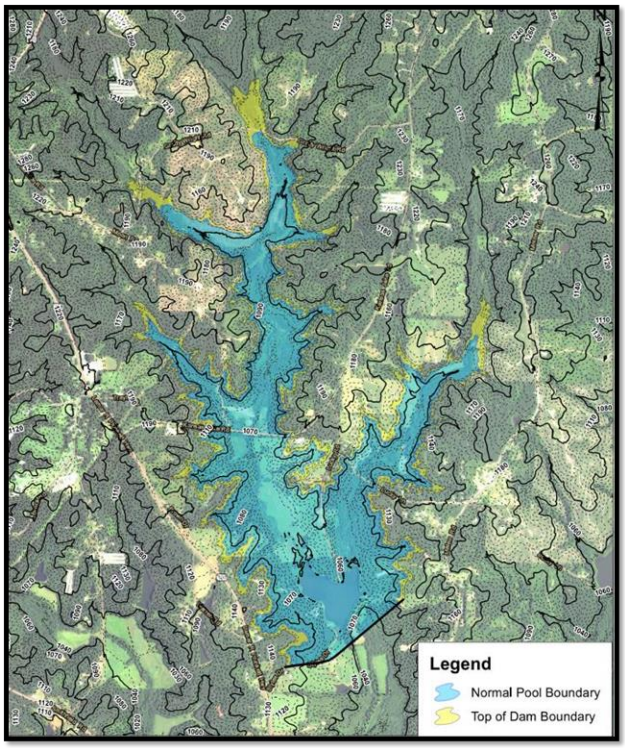


**Figure F-7. Jumpin In Creek Lower.**

The proposed Jumpin In Creek Lower site has a normal operating pool elevation of 1,113 feet msl and a top of dam elevation of 1,123 feet msl resulting in a top of dam surface area of 810-acres and storage of 5.7 BG. To meet the required safe yield, 19 mgd of diversion or supplemental pumping is required from the Little Tallapoosa River.

Environmental Impact Evaluation. CCWA evaluated each of these four sites for: impacts to linear feet of stream, impacts to acres of wetland, and quality of the existing watershed. These analyses were conducted using desktop evaluations and review of available geographic information system (GIS) data sets, topographic mapping and normal pool boundary shapefiles of each alternative. The watershed quality for each site was evaluated based on whether the alternative proposed to inundate a 303(d) listed stream or contained a 303(d) listed stream within its respective 12-digit Hydrologic Unit Code (HUC) boundary. The watershed quality for each site was also evaluated using the percentage of forested land cover within the respective drainage basin using the USGS 2010 North America Land Cover dataset. The higher the watershed quality based on these two metrics, the greater environmental impact the reservoir would have on the stream and wetland system. A rating system of 1-5 for each criterion was developed to ultimately rank the sites, with one being the least environmentally damaging and five being the most. Value ranges were calculated for forested landcover percentage, stream linear footage, and wetland acreage. These ranges were then divided by five to establish incremental value thresholds for each of the five rating classifications.

Impacts to linear feet of stream ranged from 24,634 lf to 30,037 lf. Impacts to wetland acreage ranged from 9.78 acre to 21.25 acres. Percentage of forested landcover ranged from 57.36% to 61.99% and only one site, Indian Creek Reservoir, contained a 303(d) listed stream within its

normal pool, while the other three sites contained a 303(d) listed stream within their 12-digit HUC boundaries. A chart summarizing the results is below:

| Alternative | Watershed Health | | Aquatic Resources | | Average Environmental Impact Rating |
|---|---|---|---|---|---|
| | Watershed Landcover Rating | EPD 303(d) Listing Rating | Stream Impact Rating | Wetland Impact Rating | |
| Indian Branch Lower | 4 | 3 | 1 | 5 | 3.25 |
| Indian Branch Upper | 1 | 3 | 1 | 1 | 1.50 |
| Indian Creek | 3 | 1 | 1 | 1 | 1.50 |
| Jumpin In Creek Lower | 5 | 3 | 5 | 2 | 3.75 |

**Table F-2. Environmental Impact Ratings.**

Based on the above rating system, the sites rank as follows from least environmentally damaging to most:

1. Indian Branch Upper and Indian Creek
2. Indian Branch Lower
3. Jumpin In Creek Lower

Practicability Evaluation: CCWA evaluated the practicability of the four sites based on impacts to infrastructure (miles of roads, feet of utilities and number of structures), relative cost, raw water quality and storage expandability. Raw water quality was determined based on reservoir depth, with a deeper reservoir providing more options for withdrawal and having more usable storage. Storage expandability was evaluated based on the maximum reservoir pool elevation possible given site constraints. Expandability is an important factor in planning for water supplies in that it is an offset to future conditions that may undermine the project purpose including population growth, stream flow decreases and increased per capita usage. This, in turn translates to avoidance of environmental impacts associated with a new reservoir and potentially significant cost savings to remedy a shortfall in future water supplies. Any increase in normal pool elevation of the alternatives would require a new or amended 404 Permit for additional impacts to stream and wetlands, but the new impacts would be to an already impacted stream system and would be incrementally less than constructing a new reservoir.

The impacts to infrastructure ranged from 1.18 miles to .44 miles of roads, 3,840 feet to 0 feet of utilities, and 25 to 0 structures. Project cost was based on a comparative value of the cost of the

dam, spillway, land acquisition and diversion pipeline length. Raw water quality ranged based on reservoir depths from 96 feet to 63 feet. Reservoir expandability ranged from potential additional storage of 0.18 mgd to 4.9 mgd. A summary of the ratings is below:

| Site | Ratings | | | | Practicability Score |
|---|---|---|---|---|---|
| | Infrastructure Impacts | Construction Cost | Raw Water Quality | Expandability | |
| **Indian Branch Lower** | 3 | 4 | 3 | 5 | 15 |
| **Indian Branch Upper** | 4 | 3 | 2 | 5 | 14 |
| **Indian Creek** | 1 | 3 | 1 | 1 | 6 |
| **Jumpin In Creek Lower** | 5 | 5 | 5 | 5 | 20 |

**Table F-3. Practicability Impact Ratings.**

Based on the above rating system, the sites rank as follows from most practicable to least:

1. Indian Creek
2. Indian Branch Upper
3. Indian Branch Lower
4. Jumpin In Creek Lower

**Conclusion:** Based on the foregoing, CCWA concluded a pumped-storage reservoir is the least environmentally damaging practicable alternative to reliably supply 6 mgd during the drought of record. Twelve sites were identified and were narrowed to three sites based on evaluation of environmental and practicability factors. The three sites which ranked as the least environmentally damaging and most practicable (Indian Branch Lower, Indian Branch Upper and Indian Creek) were selected for more detailed, field investigations in the final alternatives analysis which is discussed in Section G below.

***e. Construction of Several Intakes with Storage Reservoirs.*** This alternative involves construction of several reservoirs with stream or river intakes. For the same reasons detailed under the multiple reservoir option, this alternative will result in greater impacts to the environment and greater construction and operation costs. Therefore, this alternative was eliminated from further consideration.

### *3. Minimization Alternatives.*

***a. Combine Water Conservation with Applicant's Proposal.*** Water conservation measures were included in the Applicant's water demand projections. As stated previously, CCWA's projected water supply demand in 2065 is 6 mgd which already includes substantial water conservation. Without conservation, the 2065 demand increases to 10 mgd. Therefore, this minimization alternative is already incorporated into the Applicant's proposal.

***b. Combine Groundwater Use with Applicant's Proposal.*** As stated previously, groundwater quantity in this physiographic region has proven to be unreliable especially during times of drought. Furthermore, development of a groundwater supply requires identification and establishment of multiple, highly productive wells and also requires restrictions on large tracts of land for well head protection. Water quality concerns are also associated with developing a groundwater-based supply of water. CCWA does anticipate that some residents will continue to utilize private individual wells for part of their water supply needs. However, recent droughts have shown that many private wells are unreliable during drought conditions. Therefore, private groundwater wells are not considered a reliable contribution of water. In addition, CCWA and Villa Rica's currently permitted groundwater withdrawals of 0.750 mgd and 0.125 mgd respectively are incorporated into the water demand estimates.

***c. Combine Purchase of Water with Applicant's Proposal.*** As stated previously, purchasing water is not a reliable long-term or short-term option for meeting the CCWA's 6 mgd needs.

***d. Reduce the Size of the Reservoir for Applicant's Proposal.*** The Applicant could reduce the size of the proposed reservoir; however, such a reduction will not provide the Applicant with sufficient water to meet future unmet demand or will have a greater impact on the Little Tallapoosa River because the pumping rates will have to be increased. Additionally, reduction in reservoir size does not address the USACE mandate to include resilience in public works projects. Future unmet demand is estimated to be 6 mgd. If the proposed pumping regime remains the same, a smaller reservoir will not yield the required 6 mgd. This will require the Applicant to develop a supplemental water supply source at an earlier time than anticipated by the proposed project. Decreasing the water supply capabilities of the proposed project is unacceptable as it does not ensure a reliable and resilient supply of water throughout the planning period. In order to maintain the current yield of 6 mgd, the proposed pumping regime from the Little Tallapoosa River would need to be revised to account for the smaller volume of storage. The Applicant would need to pump more frequently and at a greater rate than under the current proposal. Reliance on an increased rate of pumping from a river that demonstrates decreasing flows over time will result in an unsustainable water supply project. Adequate reservoir storage has been shown to provide superior resilience to climate variability. Additionally, this would result in a lower pumping utilization rate (ratio of average pump rate on pumping days to maximum pump rate), which would be less efficient and costlier. In addition, reducing the size of the reservoir will only result in a slight reduction in the wetlands and linear feet of free-flowing stream to be inundated by the project.

For the foregoing reasons, this minimization alternative is not incorporated into the Applicant's proposal.

***e. Expansion of Existing Reservoir.*** This alternative involves increasing the elevation of an existing reservoir. The three short-listed sites are all expansion projects as they each have an existing NRCS dam on their main stem.

### *4. Conclusions of Preliminary Alternatives Analysis.*

The preliminary analysis of alternatives considered avoidance alternatives, surface water alternatives and minimization alternatives. Avoidance alternatives evaluated include water conservation, recycling and reuse of wastewater, groundwater and purchase of water. Surface water alternatives examined include traditional reservoirs, multiple reservoirs, pumped-storage reservoirs and direct withdrawal. Pumped-storage reservoirs were identified for more detailed analysis. Twelve pumped-storage reservoirs were identified and were narrowed to three sites based on evaluation of environmental and practicability factors. The three sites which ranked as the least environmentally damaging and most practicable (Indian Branch Lower, Indian Branch Upper and Indian Creek) were selected for more detailed, field investigations in the final alternatives analysis which is discussed in Section G below.

## G. Final Alternatives Analysis

Based on the preliminary alternatives analysis, the following pumped-storage reservoirs were selected for further investigation:

- Pumped-Storage Reservoirs:
    - Indian Branch Lower
    - Indian Branch Upper
    - Indian Creek

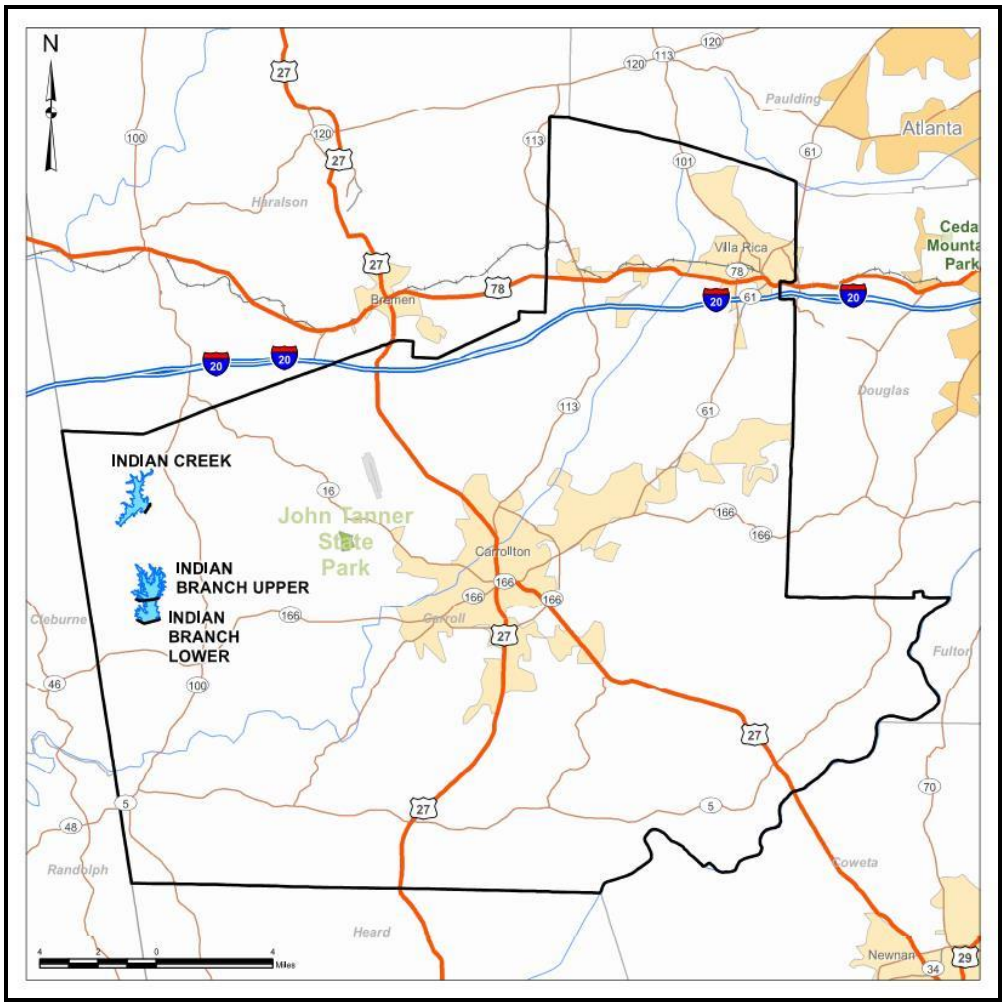


**Figure G-1. Three Short-Listed Alternatives.**

## 1. *Evaluation Criteria*

The following criteria were utilized to evaluate each alternative in order to identify the least environmentally damaging, practicable alternative capable of achieving the project purpose:

**a.** ***Ability to Meet Project Purpose.*** For any alternative to be practicable it must meet the threshold requirement of being capable of achieving the stated project purpose of providing a reliable source of public water supply providing the 6 mgd necessary to meet the unmet water demand of the Applicant during drought conditions throughout the project planning period.

**b. Raw *Water Quality.*** Each alternative was evaluated for raw water quality to determine if there are specific contaminates that make the raw water unfit for drinking and based on practicable considerations for accessing quality raw water stored in the reservoir.

Applicant searched data from the U.S. Environmental Protection Agency (EPA) through its website to determine the location, if any, of Superfund National Priority List Sites, Nationally

Pollutant Discharge Elimination System Sites, Hazardous and Toxic Waste Sites, and Toxic Release Inventory Sites within the project area of each alternative.

Raw water quality was also evaluated based on the depth of the reservoir alternatives. Deeper reservoirs tend to have higher raw water quality and allow more flexibility in reservoir operations with multiple withdrawal points at various elevations.

The raw water intake proposed for all the alternatives is downstream of a closed landfill. CCWA commissioned Mr. William F. Hodges, a Professional Engineer specializing in solid waste design and environmental issues, to determine the water quality in the Little Tallapoosa River in the vicinity of the closed Carroll County Landfill at Simonton Mill Road and Hwy 166. A copy of Mr. Hodges' report without attachments (which will be provided upon request) is attached hereto as Appendix D. The landfill received municipal solid waste from 1976 to 1997. Under its post-closure care plan, the site undergoes stormwater management, groundwater monitoring, surface water monitoring, and methane monitoring. The Little Tallapoosa River is also monitored upstream and downstream of the landfill. The Georgia Environmental Protection Division evaluates the monitoring reports twice yearly. The results confirm that the Little Tallapoosa River is not adversely affected by the presence of the landfill and will not cause water quality problems for withdrawals to the proposed alternatives.

**c.** ***Stream Flow Impacts.*** Each alternative was evaluated to determine if minimum in-stream flows could be maintained while achieving the required yield of 6 mgd through the year 2065. The amount that is released downstream of the reservoir varies depending on the reservoir watershed area and the month of the year (monthly 7Q10 basis). Diversion pumping capacity required to achieve a 6 mgd safe yield varies with a range of reservoir considerations including natural watershed, storage capacity and surface area. However, the total volume of water diverted over the modeled 65 years of gaging station record does not vary significantly between the short-listed alternatives.

The initial assessment of diversion sources focused on the Little Tallapoosa River because it has sufficient flows to sustain a pumped-diversion reservoir with a 6 mgd yield requirement. Graphs were developed for wet, dry and average years for each site to model the differences between pre- and post-project flows. Each of the three shortlisted sites have minimal impacts to downstream flows.

**d.** ***Jurisdictional Waters Impacts.*** Each alternative was evaluated for primary environmental impacts (linear feet of streams and acres of wetland) and secondary impacts (303(d) listed stream, existing impoundment, closed canopy forest impacts, % of drainage area forested, proximity to protected lands). Eco-Tech used available GIS data sets, topographic mapping, and proposed normal pool boundary shapefiles, supplied by Schnabel Engineering, to complete the desktop analysis. Eco-Tech downloaded the most recent available USGS National Hydrologic Database (NHD), United States Fish and Wildlife Service National Wetland Inventory (NWI), USGS 2010 North America Land Cover, and GA EPD's 2014 305(b)/303(d) List of Waters datasets for the watershed study area. Eco-Tech then field verified the estimates with two field teams using sub-meter global position system (GPS) equipment and methodology consistent with the three-parameter method described in the 1987 USACE Wetland Delineation Manual

(Environmental Laboratory 1987) and the Regional Supplement to the USACE Wetlands Delineation Manual (USACE 2012; Regional Supplement) for the Eastern Mountains and Piedmont Region (MLRA 136 of LRR P).

Stream impact calculations include perennial, intermittent, and ephemeral tributaries with flow regime classifications established in the field using methodologies consistent with the North Carolina Division of Water Quality's Methodology for Identification of Intermittent and Perennial Streams and Their Origins (version 4.11; NC Stream ID Manual). Wetland impact calculations include forested, scrub-shrub, and emergent communities with Cowardin classifications established in the field based on dominant vegetation strata. Man-made open water wetlands such as existing NRCS impoundments and farm ponds were not included within this assessment with consideration that the proposed project would create hundreds of acres of open water habitat and thus self-mitigate any impacts to this wetland community type.

Direct impacts to close canopy forest within each site were evaluated based on the USGS Gap Analysis Project (GAP) Land Cover Data Set. Data was stratified based on group level National Vegetation Classifications so that early successional and disturbed forests could be excluded from this total in an effort to quantity potential impacts to mature, closed canopy systems.

Proximity to protected lands was evaluated in an effort to compare potential conservation opportunities within the respective sites. GIS dataset provided by the Georgia Department of Natural Resources depicting all lands managed by natural resource agencies, local governments, and conservation organizations within Georgia were used to calculate distance to each site's boundary.

Each of the three short-listed sites are located on existing NRCS dam sites; therefore, the stream systems are already separated by a lake, resulting in less impacts to the aquatic environment than the selection of sites that have not been previously impacted.

Each of the three short-listed sties are within the Indian Creek 10-digit HUC and Little Tallapoosa River 8-digit HUC, which were classified by the Georgia Department of Natural Resources (GDNR) as a high priority watershed within the 2015 Georgia State Wildlife Action Plan (SWAP). The SWAP identifies these watersheds under "Map Class 1" which is of "moderate global significance", the lowest tier of high priority watershed designation within this plan.

**e.** ***Threatened and Endangered Species Impacts.*** Each alternative was reviewed for occurrence of federally protected species or habitat and reported occurrences of state protected species. Early coordination was initiated with the U.S. Fish and Wildlife Service (USFWS) and GDNR to obtain the most recent and accurate records of occurrences within 3-miles of each site. Additionally, the USFWS' Environmental Conservation Online System (ECOS) Information for Planning and Consultation (IPaC) and GDNR's Rare Natural Element Data Portal were accessed to evaluate potential occurrences of rare or protected species within each site. There are no records of federally protected species on any of the sites. There are, however, state protected species in or near the sites as discussed in detail below.

**f.** ***Cultural Resources Impacts.*** To comply with the National Historic Preservation Act, a consultant was retained by the Applicant to perform background studies and to conduct surveys for cultural and historic resources in the reservoir sites and the areas of potential effect.

**g.** ***Human Environment Impacts.*** Each alternative was evaluated for potential impacts on the human environment. Alternatives were examined using USGS 7.5-minute series topographic maps, Carroll County road maps, Carroll County Tax Assessor database, available GIS databases, and aerial photographs to identify existing structures and utilities such as roads, power lines, pipelines, industrial facilities, and buildings/structures. Site visits were also conducted to verify the extent of any infrastructure impact**.**

Each alternative was also assessed for potential social and political opposition or support within the community, and among the CCWA members, Carroll County Commissioners, non-governmental organizations and interest groups, state and federal agencies, and other political entities. The Applicant held three public meetings in 2017 to discuss the three short-listed reservoir sites to gauge local opposition and support for the sites.

**h.** ***Project Costs.*** The costs of selected alternatives were estimated and include dam and spillway, land acquisition and diversion pipeline. Land acquisition requirements are based on the surface area of the top of dam elevation to account for purchase of buffers. Each of the three alternatives are pumped diversion reservoirs which require a raw water diversion from the Little Tallapoosa River to the reservoir. All three sites utilize the same main route for the pipeline except for the spurs running from the main line to the reservoir alternative. The pipeline length associated with each site is as follows: 5.5 miles to Indian Branch Lower, 6.3 miles to Indian Branch Upper, and 9.3 miles to Indian Creek. The pipeline routes are depicted in Figure G-2 below.

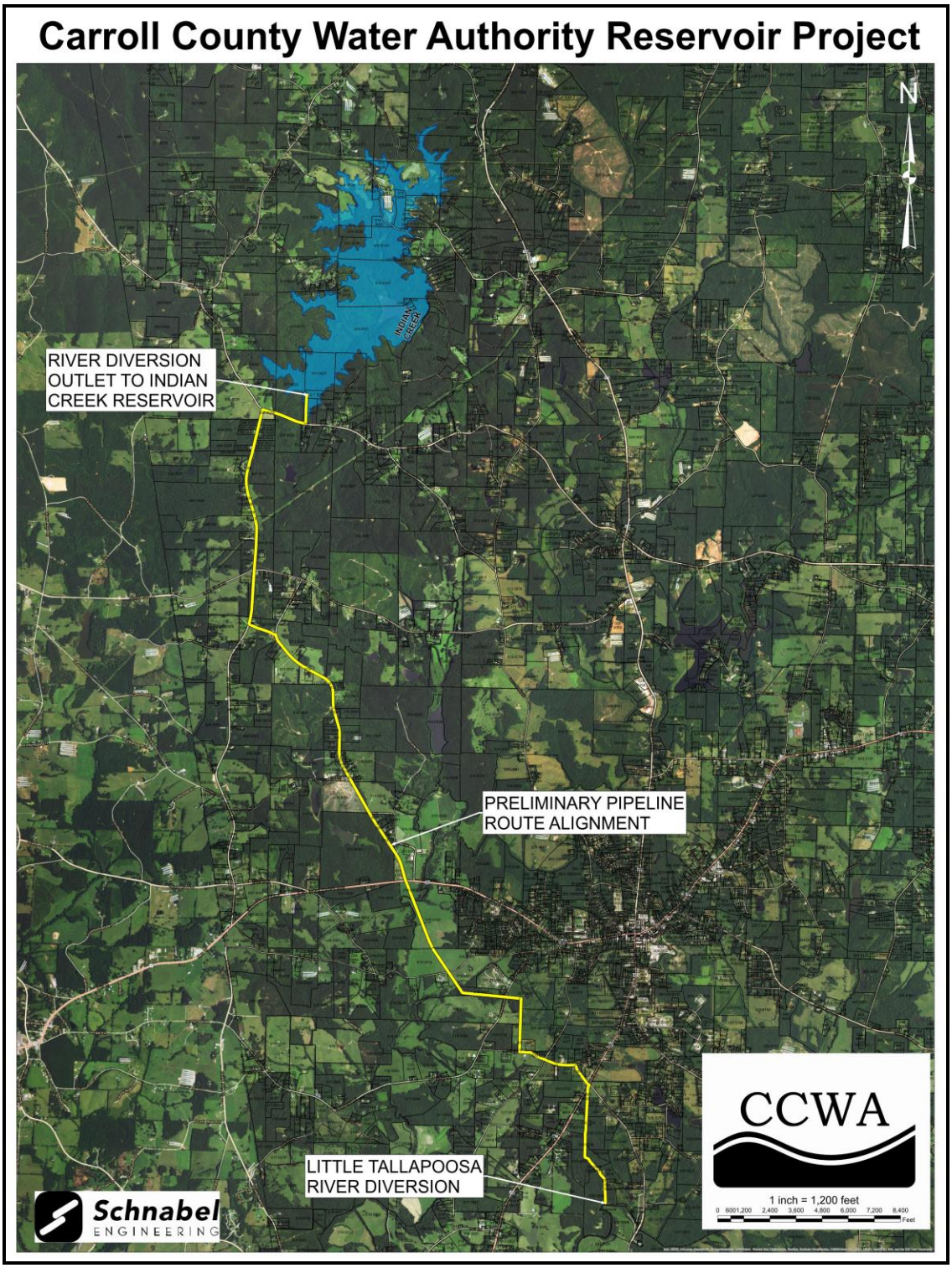


**Figure G-2. Diversion Pipeline Routes.**

## 2. *EVALUATION OF ALTERNATIVES*

### a. ***Pumped-Storage Reservoir on Indian Branch Lower ("Indian Branch Lower").***

The first pumped-storage reservoir considered is located on Indian Branch Lower and has a drainage area of 4.6 square miles. At a normal pool elevation of 1025.5 feet MSL it provides 5.3 billion gallons of water storage and at a top of dam elevation of 1035.5 feet MSL has a 680-acre surface area. As shown in Figure G-3 below, the location of the Indian Branch Lower reservoir site is northwest of Bowdon along Indian Creek Road.

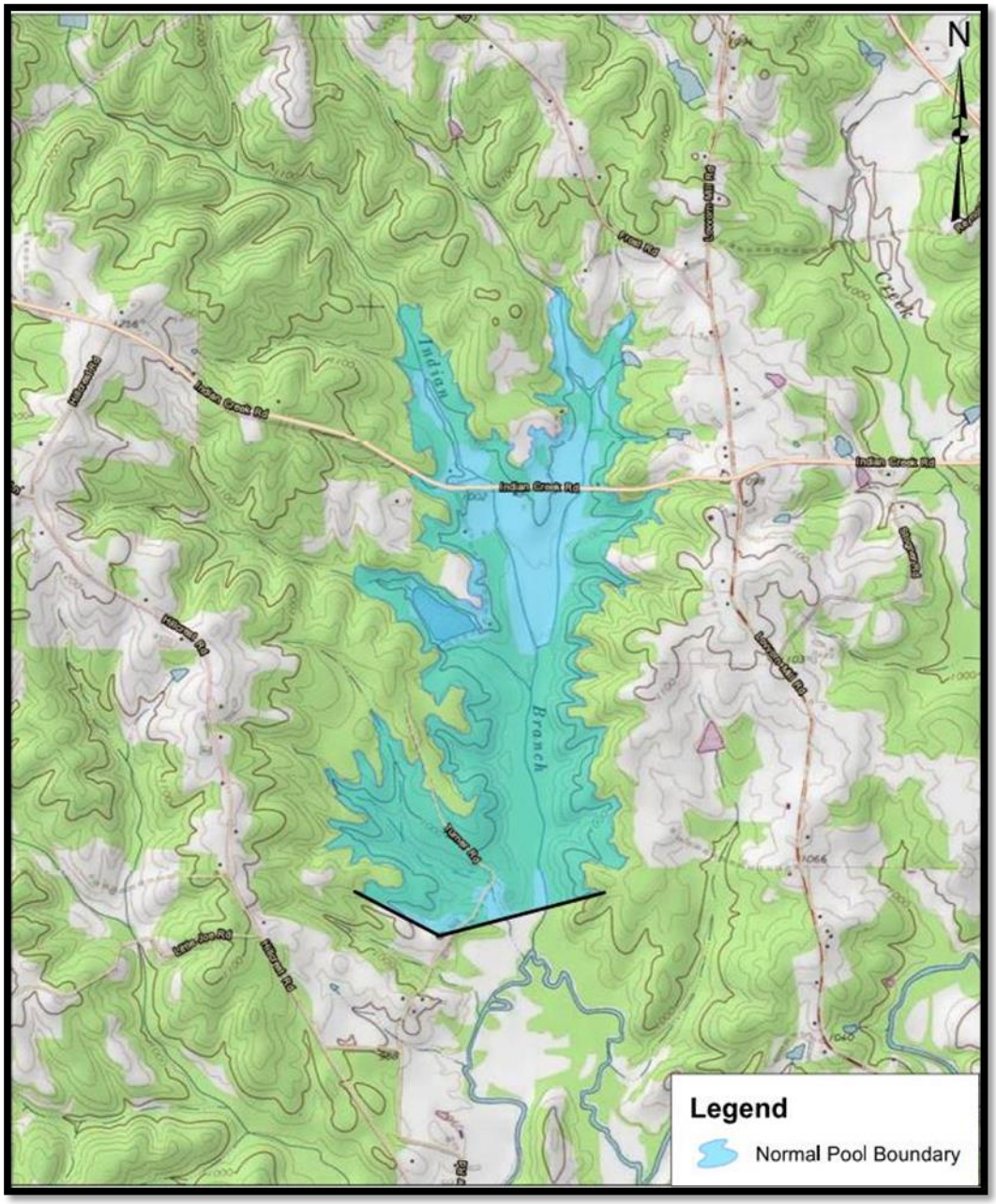


**Figure G-3. Location of Indian Branch Lower Reservoir Alternative.**

**1.** ***Ability to Meet Project Purpose*****.** A pumped-storage reservoir on Indian Branch Lower will yield 6 mgd in 2065 and therefore would satisfy the project purpose.

**2. Raw** ***Water Quality*****.** Based on a review of information available from EPA's maps there are no Superfund National Priority List Sites, Nationally Pollutant Discharge Elimination System Sites, Hazardous and Toxic Waste Sites, or Toxic Release Inventory Sites within the project area.

Indian Branch Lower is the shallowest of the three alternative sites with a maximum depth of 78 feet. This limits the ability to vary intake locations within the reservoir and increases the amount of storage included in the dead pool storage which is generally not of suitable quality for withdrawal. Overall, Indian Branch Lower ranks third in raw water quality.

**3.** ***Stream Flow Impacts*****.** A reservoir on Indian Branch Lower would be located on a small tributary stream with a drainage area of 4.6 square miles. As such, it should be expected that in-stream flows from the reservoir would exceed prescribed minimum in-stream flow only when significant rainfalls occur with an already full or nearly full reservoir. Given the small size of the affected watershed, impacts would be similar for all alternatives and stream flows downstream from the reservoir would recover substantially within a relatively short distance.

The diversion for the Indian Branch Lower Reservoir alternative was sited near the Reavesville Road Bridge over the Little Tallapoosa River, located South-Southwest of Bowdon, with a river drainage area of 237 square miles. Little Tallapoosa River flows appear to be similarly impacted by diversion pumping for each of the alternatives. Based upon the alternatives level in-stream flow basis (M7Q10), a diversion capacity of 21 mgd would be required for the Indian Branch Lower alternative. Graphical presentation of Little Tallapoosa River stream flow impacts at the diversion site are presented below in Figures 4-6 for the Indian Branch Lower Reservoir alternative. Graphs were developed to present drought year, average year and wet year conditions (2007, 2002, 1979).

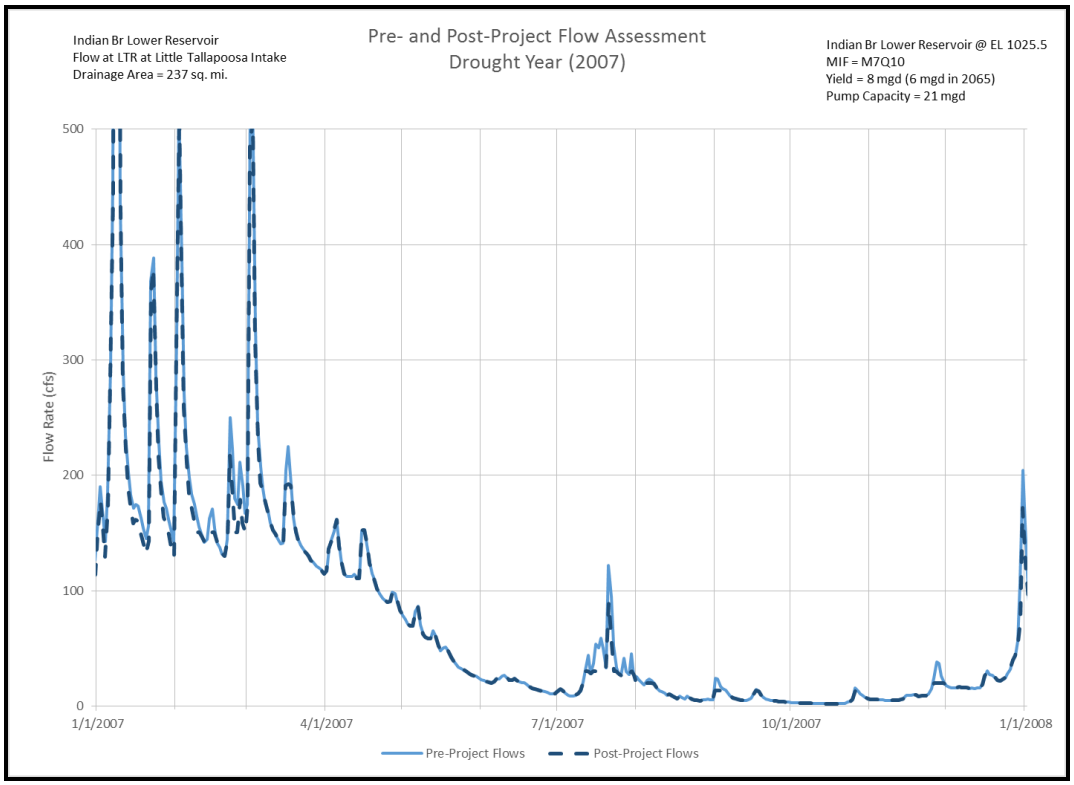


**Figure G-4. Indian Branch Lower Impacts to Stream Flow: Drought Year.**

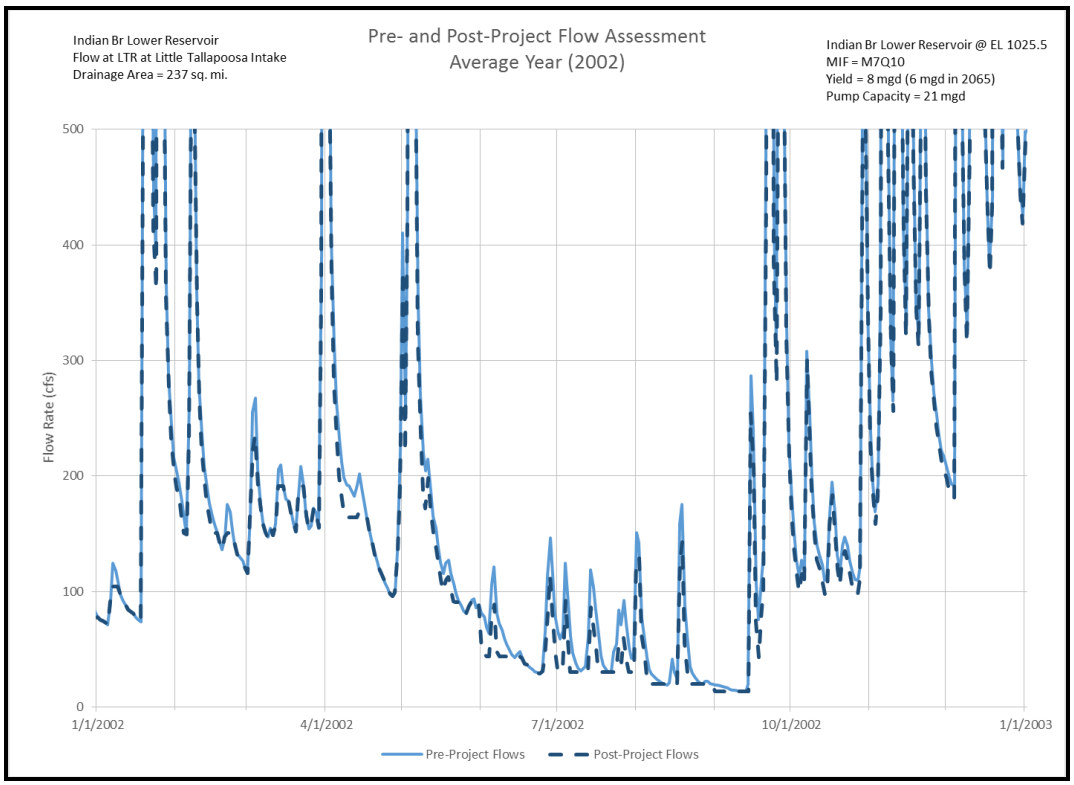


**Figure G-5. Indian Branch Lower Impacts to Stream Flow: Average Year.**

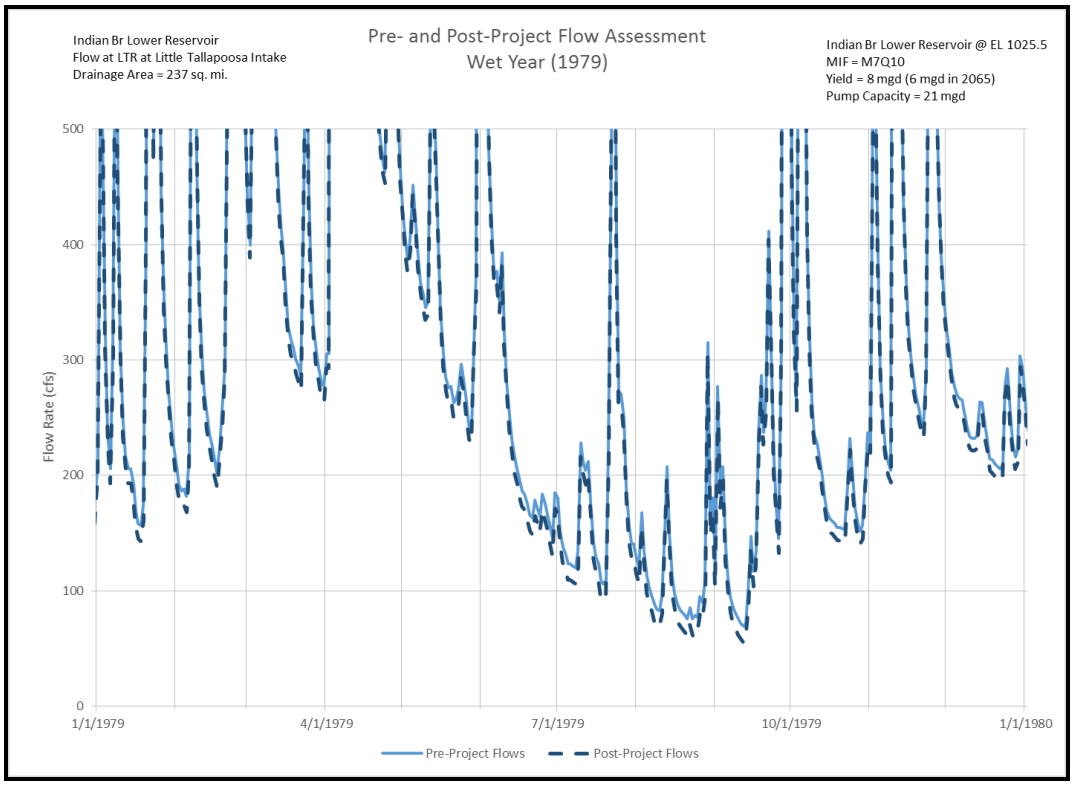


**Figure G-6. Indian Branch Lower Impacts to Stream Flow: Wet Year.**

**4. *Jurisdictional Waters and Aquatic Habitat Impacts*.** Based on the methodology stated above, Eco-Tech identified the following impacts:

a. *Primary Impact.* Using the above-listed sources, it is estimated that the Indian Branch Lower alternative would impact 38,277 linear feet of stream and 34.48 acres of wetlands including:

- 22,321 linear feet of perennial stream
- 10,497 linear feet of intermittent stream
- 5,459 linear feet of ephemeral stream

- 3.83 acres of forested wetland
- 7.96 acres of scrub-shrub wetland
- 22.69 acres of emergent wetland

This site has the greatest amount of wetland impacts among the three alternatives and comparable impacts to streams.

b. *Secondary Impacts.* Like the other two alternatives, the Indian Branch Lower site is located on an existing NRCS dam which bifurcates the stream system. The drainage area is comprised of 37% closed canopy forest and 294.94 acres of closed canopy forest would be directly impacted. It is located approximately 3.95 miles from a permanent NRCS conservation easement. This site has the greatest amount of direct impacts to

canopy forest but comparable percentage of impacts to closed canopy forest available within the drainage area as the other sites. There are no 303(d) listed streams in the normal pool of this reservoir which means that this watershed may be less impaired by non-point source pollutants such as fecal coliform as compared to the Indian Creek Reservoir alternative.

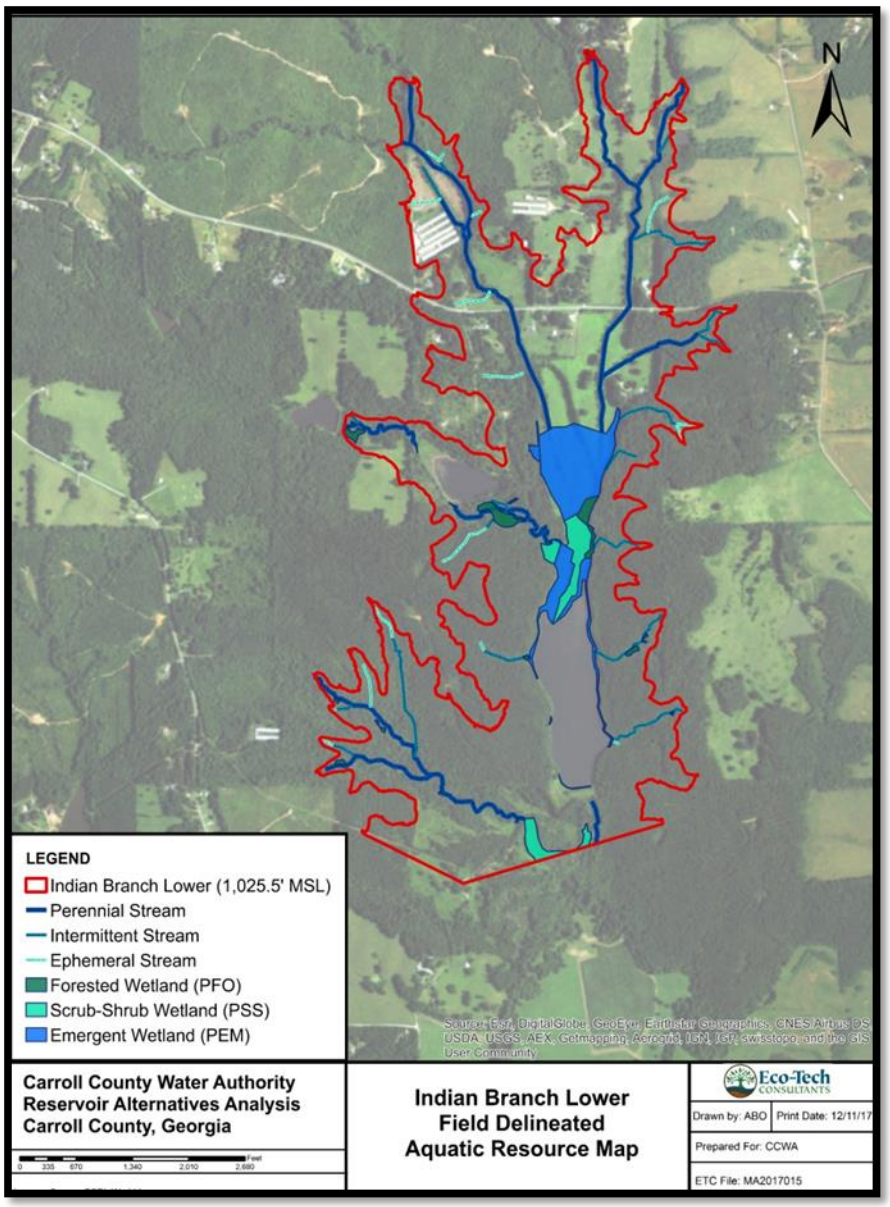


**Figure G-7. Indian Branch Lower Impacts to Streams and Wetlands.**

**5. *Threatened and Endangered Species Impacts*.** The United States Fish and Wildlife Service's lists of protected species do not list any federally protected species within the immediate vicinity of the Indian Branch Lower alternative. However, GDNR's database shows seven (7) occurrences of state listed species within a 3-mile radius of the reservoir with one (1) of those occurrences located in the normal pool of the reservoir. Species include: Tallapoosa crayfish (*Cambarus englishi*), Tallapoosa shiner (*Cyprinella gibbsi*), Tallapoosa Darter (*Etheostoma*

*tallapoosae*; within normal pool), Lined chub (*Hybopsis lineapunctata*), Muscadine Darter (*Percina smithvanizi*), and tri-colored bat (*Perimyotis subflavus*). This site, like the other alternatives, is located within the SWAP high priority watershed of Big Indian Creek. Of the three alternatives, Indian Branch Lower has the second highest potential impact to state listed species. However, Indian Branch Upper also has an occurrence recorded within its normal pool.

**6. *Cultural Resource Impacts*.** To assess the cultural resources impacts on the Indian Branch Lower alternative, Applicant commissioned a cultural resources literature review of the 680-acre project area. Figure G-8 depicts the project area and the archeological sites and historic structures identified by the study.

**Archeological Sites**. The literature review identified numerous locations outside of the upland areas suitable for prehistoric archeological sites including the potential that these sites are buried within alluvial settings. Seven prehistoric sites were recorded by previous studies and all were deemed ineligible for National Register of Historic Places listing.

**Historic Structures**. The cultural resources review also revealed two State-recognized historic structures located within 1,000 feet of this alternative. No Civil War Features, cemeteries, or 1827 Land Lottery features were identified in the study area. Fifteen historic structures were identified on maps and aerial photographs along with five possible structure complexes within the study area. Some or all of these twenty sites may be eligible for the National Registry of Historic Places as rural properties and/or as a rural farming community district.

Indian Branch Lower has the greatest amount of impacts to cultural resources between the three short-listed sites with significantly more recorded and potential historic structures in the study area in addition to the largest number of State-recognized archeological sites.

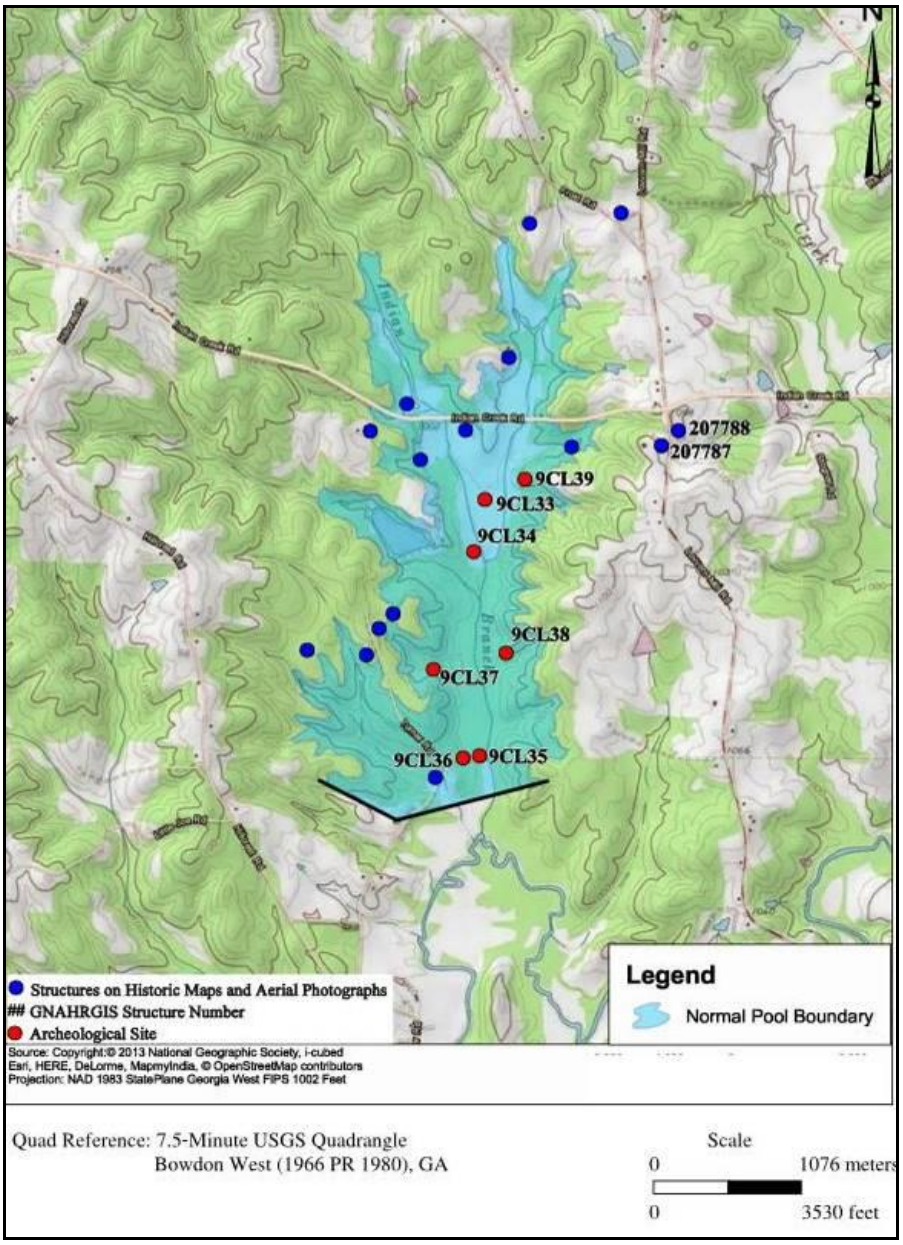


**Figure G-8. Previously Recorded Cultural Resources in Indian Branch Lower Reservoir.**

**7. *Human Environment Impacts*.**

**Infrastructure Impacts.** This potential reservoir site was examined using USGS 7.5-minute series topographic maps, Georgia Department of Transportation (GDOT) and Carroll County road maps, available GIS datasets, and aerial photographs to identify existing structures and utilities such as roads, power lines, pipelines, industrial facilities, and buildings/structures that will be impacted by the proposed reservoir. Table G-1 summarizes the impacts to structures, infrastructure, and utilities at the Indian Branch Lower alternative site.

| Indian Branch Lower | |
|---|---|
| Size (at top of dam elevation) | 680 acres |
| Impacts to Roads | 0.92-Mile |
| Impacts to Utilities | 0 feet |
| Number of Parcels impacted | 36 |
| Structures Impacted | 21 |

**Table G-1. Infrastructure Impacts, Indian Branch Lower Reservoir Alternative.**

**Infrastructure.** This alternative site impacts 21 structures. Seven (7) of the structures are chicken houses, ten (10) are homes and four (4) are other buildings which is comparable to Indian Branch Upper but significantly more than Indian Creek Reservoir which impacts no structures. This alternative would impact 0.92 miles of roads including Indian Creek Road which is a main thoroughfare.

**Social/Political.** The Indian Branch Lower reservoir is located in a traditionally agrarian area of Carroll County. Public meetings held in the county revealed that a number of residents within the area are opposed to a reservoir at this location. Moreover, the number of homes and structures impacted by this reservoir in addition to the disruption of a main thoroughfare road is significant and would cause both social and political opposition.

**Land Acquisition.** This alternative encompasses over 680 acres for the pool and buffers. Additional acreage for the treatment plant, public access, and the pump diversion line from the Little Tallapoosa River will be required. As shown in Figure G-9 a total of 36 parcels with 32 different property owners would be impacted by constructing the Indian Branch Lower Reservoir which is comparable to the preferred alternative.

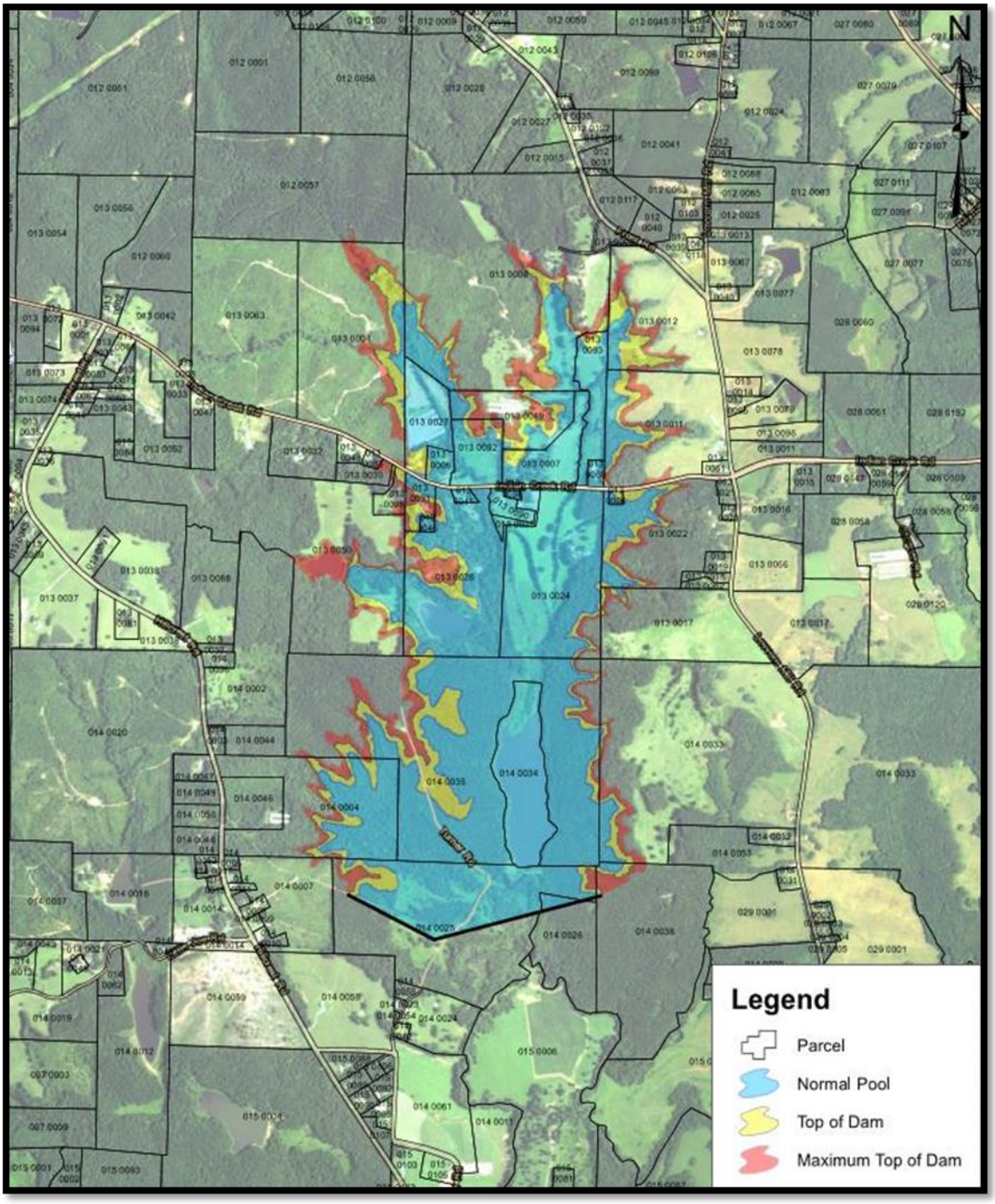


**Figure G-9. Parcels Impacted by Indian Branch Lower.**

**8.** ***Project Cost.*** The dam and spillway for the Indian Branch Lower site is estimated to cost $54.1 million. This site also has the largest footprint at 680 acres which would result in higher land acquisition costs. The diversion pipeline route is the shortest for this site at 5.5 miles. Overall, the Indian Branch Lower site is projected to be the most expensive of the three alternatives.

**9.** ***Conclusion*****.** The Indian Branch Lower alternative was eliminated from further consideration

because it has the greatest impacts to wetlands and cultural resources and the second greatest impacts to streams, state listed species, and the human environment. Additionally, this alternative is the most expensive.

**b. *Pumped-Storage Reservoir on Indian Branch Upper***

A pumped-storage reservoir on Indian Branch Upper was also evaluated. At a normal pool elevation of 1052.5 feet MSL it provides 5.2 billion gallons of water storage and at a top of dam elevation of 1062.5 feet MSL has a 590-acre surface area. As shown in Figure G-10, the location of the alternate site is northwest of Bowdon.

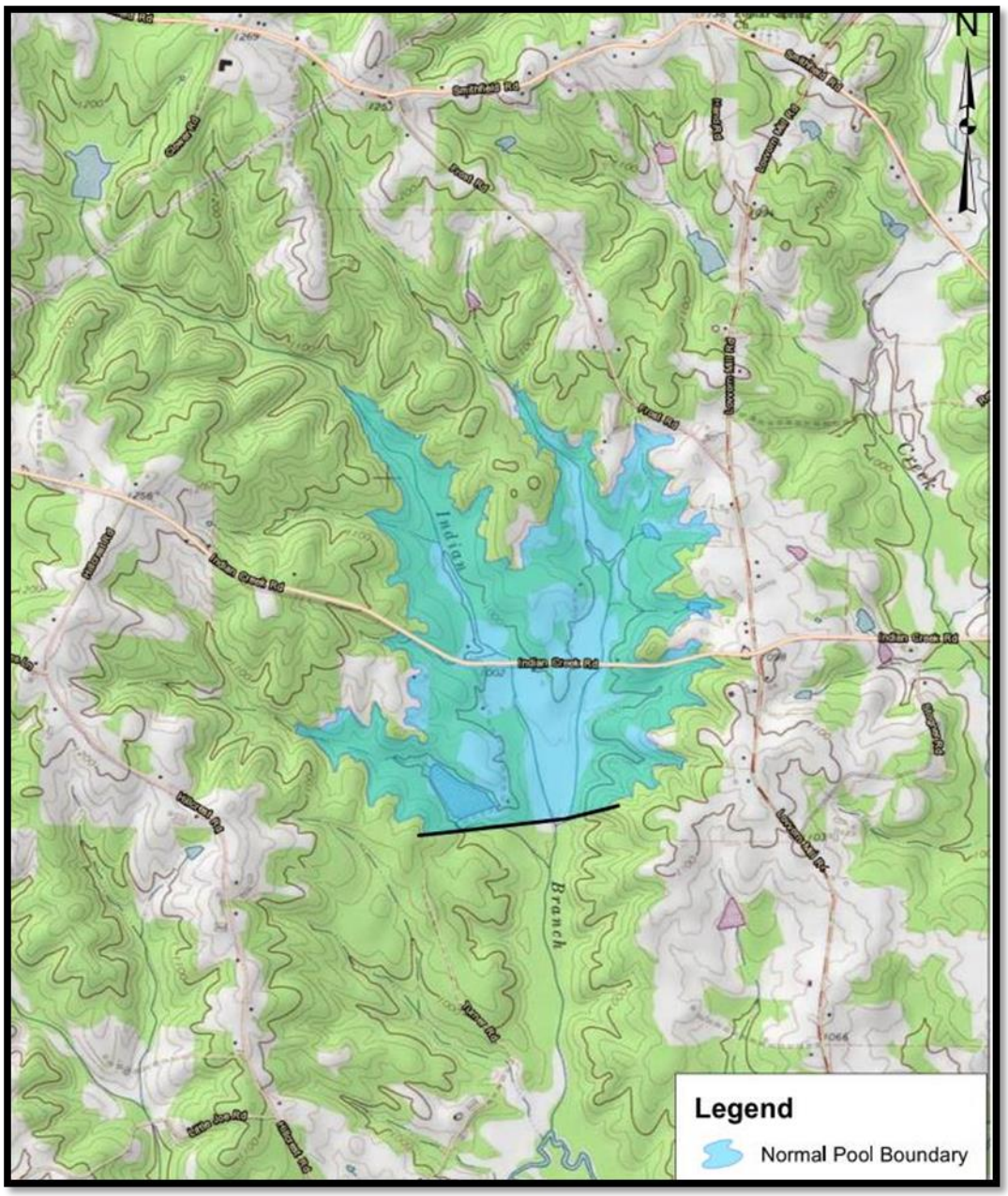


**Figure G-10. Location of Indian Branch Upper Reservoir Alternative.**

**1. *Ability to Meet Project Purpose*.** The Indian Branch Upper site is capable of yielding 6 mgd in 2065 and thereby meets the project purpose.

**2. *Raw Water Quality*.** Based on a review of information available from EPA's maps there are no Superfund National Priority List Sites, Nationally Pollutant Discharge Elimination System Sites, Hazardous and Toxic Waste Sites, or Toxic Release Inventory Sites within the project area.

Indian Branch Upper is the second most shallow of the three alternative sites with a maximum depth of 85 feet. This limits the ability to vary intake locations within the reservoir and increases the amount of storage included in the dead pool storage which is generally not of suitable quality for withdrawal. Overall, Indian Branch Upper ranks second in raw water quality.

**3. *Stream Flow Impacts*.** A reservoir on Indian Branch would be located on the upper portion of a small tributary stream with a drainage area of 3.7 square miles. As such, it should be expected that in-stream flows from the reservoir would exceed prescribed minimum in-stream flow only when significant rainfalls occur with an already full or nearly full reservoir. Given the small sizes of the affected watershed, impacts would be similar for all alternatives and stream flows downstream from the reservoir would recover substantially within a relatively short distance.

The diversion for the Indian Branch Upper Reservoir alternative was sited near the Reavesville Road Bridge over the Little Tallapoosa River, located South-Southwest of Bowdon, with a river drainage area of 237 square miles. Little Tallapoosa River flows appear to be similarly impacted by diversion pumping for each of the alternatives. Based upon the alternatives level in-stream flow basis (M7Q10), a diversion capacity of 21 mgd would be required for the Indian Branch Upper alternative. Graphical presentation of Little Tallapoosa River stream flow impacts at the diversion site are presented below in Figures 11-13 for the Indian Branch Upper Reservoir alternative. Graphs were developed to present drought year, average year and wet year conditions (2007, 2002, 1979).

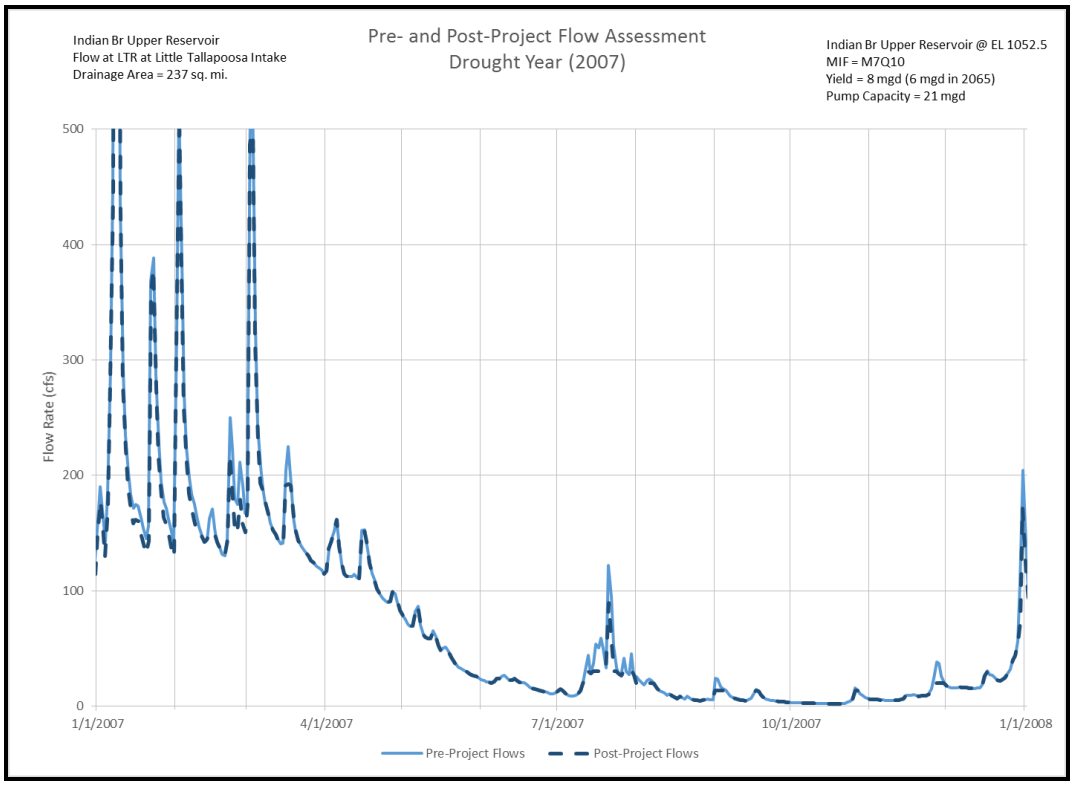


**Figure G-11. Indian Branch Upper Impact to Stream Flow: Drought Year.**

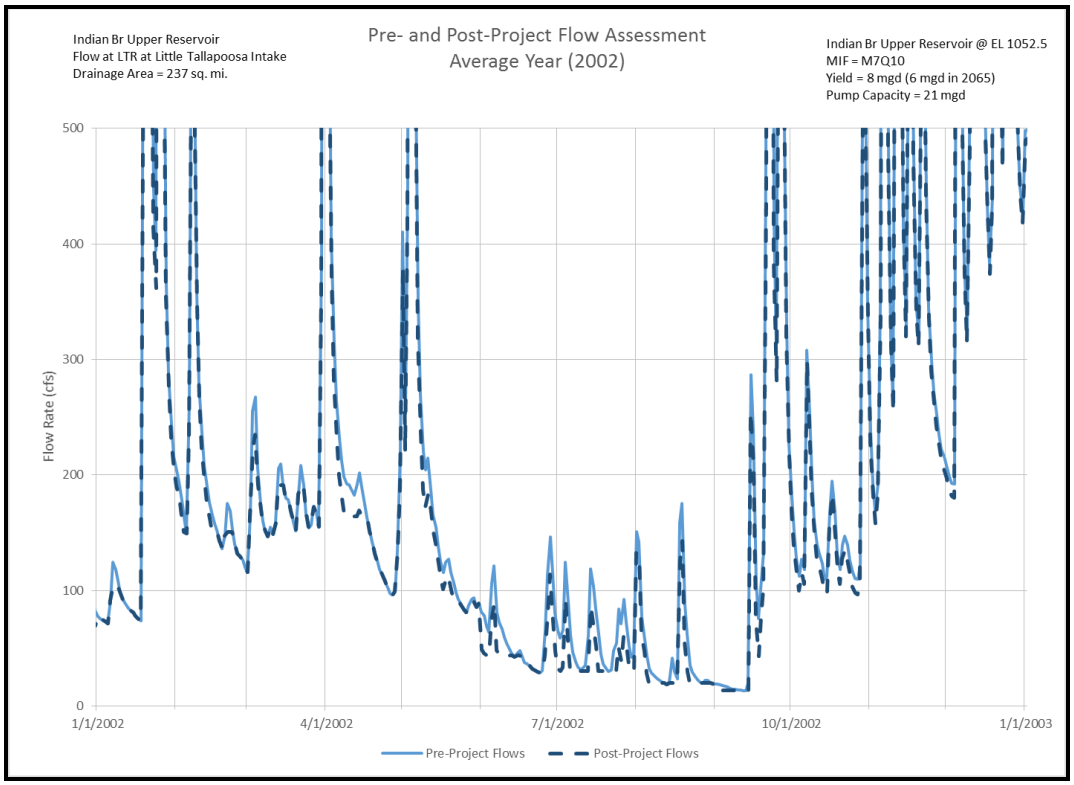


**Figure G-12. Indian Branch Upper Impact to Stream Flow: Average Year.**

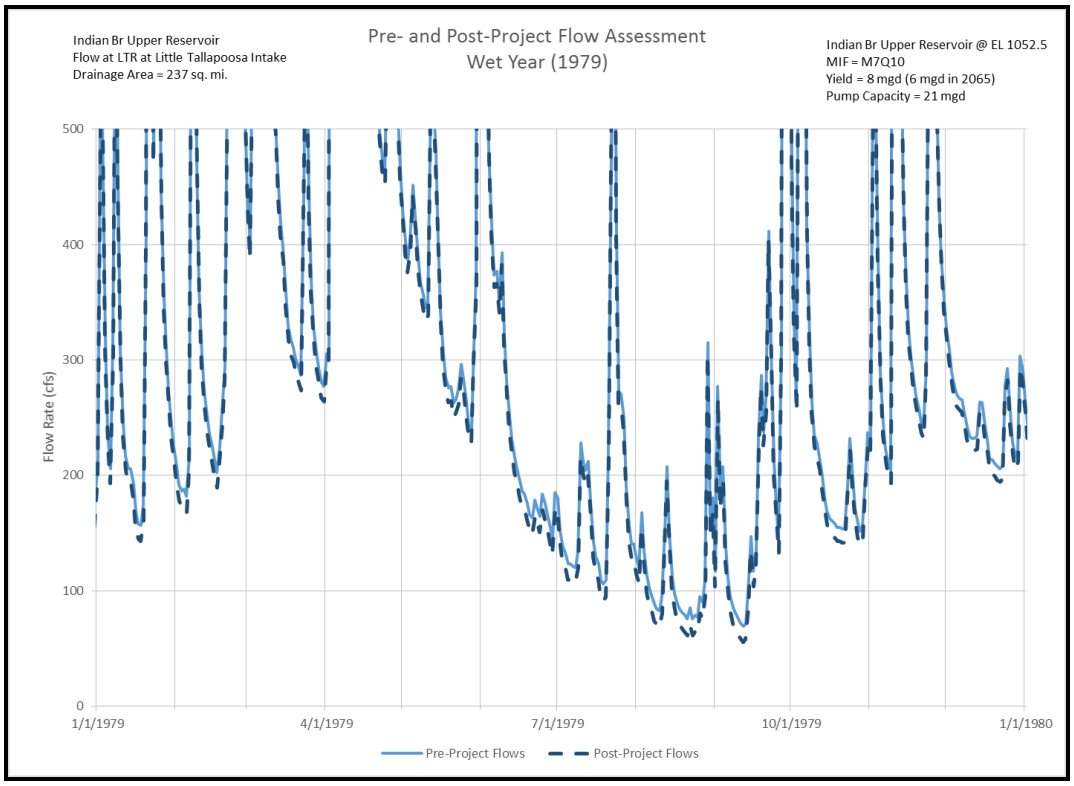


**Figure G-13. Pre- and Post-Project Flow Assessment. Wet Year 1979.**

**4. *Jurisdictional Waters and Aquatic Habitat Impacts*.** Based on the methodology stated above, Eco-Tech identified the following impacts:

a. *Primary Impact.* Using the above-listed sources, it is estimated that the Indian Branch Upper alternative would impact 33,472 linear feet of streams and 19.44 acres of wetlands including:

- 20,785 linear feet of perennial stream
- 7,014 linear feet of intermittent stream
- 5,673 linear feet of ephemeral stream

- 1.7 acres of forested wetland
- 0.98-acre of scrub-shrub wetland
- 16.75 acres of emergent wetland

This site has the least amount of stream impacts and the second greatest amount of wetland impacts among the three alternatives.

b. *Secondary Impacts.* Like the other two alternatives, the Indian Branch Upper site is located at an existing NRCS dam which bifurcates the stream system. The drainage area is comprised of 37% closed canopy forest and 182.62 acres of canopy forest would be directly impacted. It is located 4.42 miles from a permanent NRCS conservation

easement. This site has the least amount of direct impacts to closed canopy forest but comparable percentage of impacts to closed canopy forest available within the drainage area as the other sites. There are no 303(d) listed streams in the normal pool of this reservoir which means that this watershed may be less impaired by non-point source pollutants such as fecal coliform as compared to the Indian Creek Reservoir alternative.

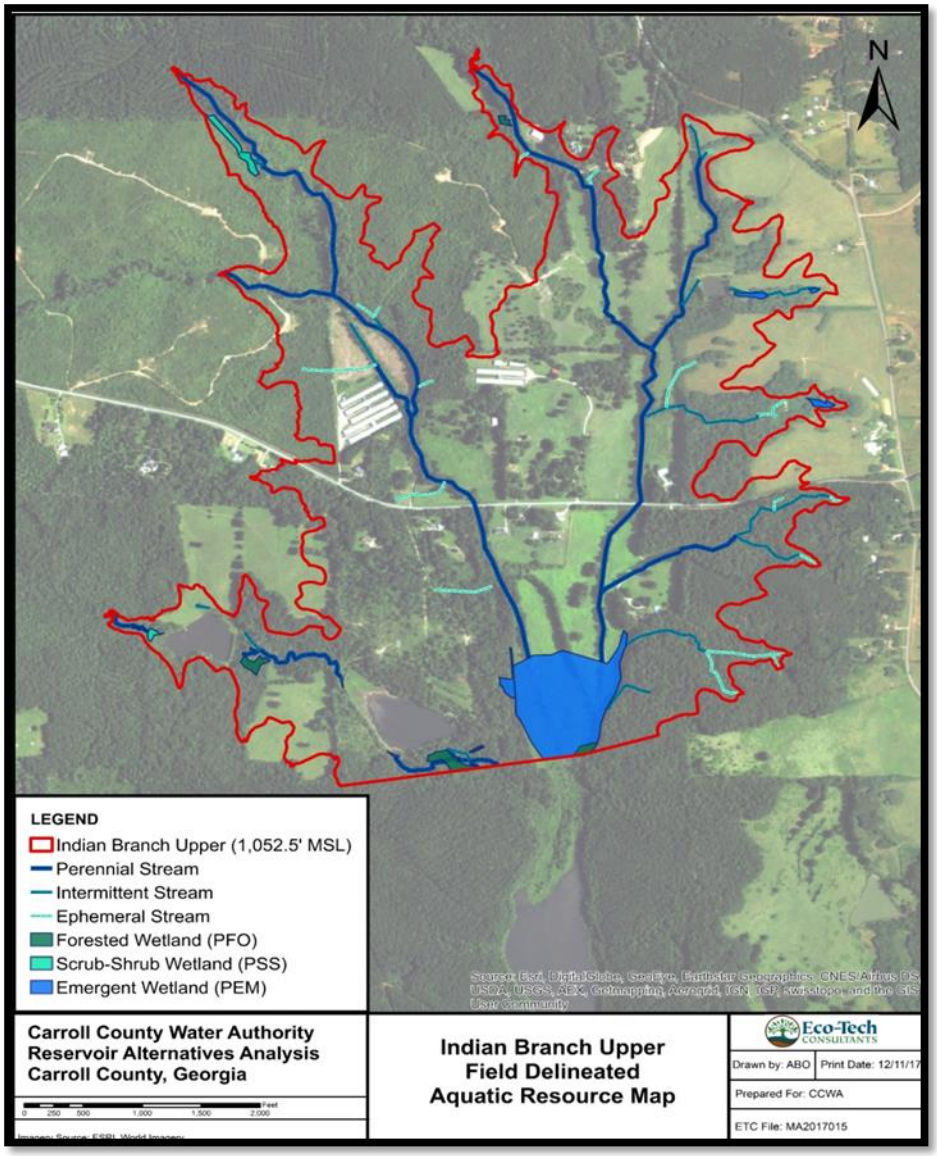


**Figure G-14. Indian Branch Upper Impacts to Streams and Wetlands.**

**5. *Threatened and Endangered Species.*** The United States Fish and Wildlife Service's lists of protected species do not list any federally protected species within the immediate vicinity of the Indian Branch Upper alternative. However, GDNR's database shows seven (9) occurrences of State listed species within a 3-mile radius of the reservoir with one (1) of those occurrences located in the normal pool of the reservoir. Species include: Tallapoosa crayfish, Tallapoosa shiner, Tallapoosa darter (within normal pool), Lined chub, Muscadine darter, tri-colored bat. This site, like the other alternatives, is located within a high priority watershed for Big Indian

Creek. Of the three alternatives, Indian Branch Upper has the highest potential impact to state listed species. However, Indian Branch Lower also has an occurrence of the same species (Tallapoosa darter) recorded within its normal pool.

**6. *Cultural Resource Impacts*.** To assess the cultural resources impacts on the Indian Branch Upper alternative, Applicant commissioned a cultural resources literature review of the 590-acre project area. Figure G-15 depicts the project area and the archeological sites and historic structures identified by the study.

**Archeological Sites**. The literature review identified a number of locations outside of the upland areas suitable for prehistoric archeological sites including the potential that these sites are buried within alluvial settings. There are three (3) State-recognized archeological sites within the study area. None were recommended for NRHP listing.

**Historic Structures**. There are two (2) State-recognized historic structures located within the Indian Branch Upper study area. Historic maps indicate that ten historic structures and four structure complexes were present within the project area during the early and mid-20$^{th}$ century. Some of these structures may still be present. There are no cemeteries, Civil War features or 1827 Carroll County Land Lottery features identified.

The Indian Branch Upper Reservoir site has the second most historic structures identified in the study area but the least amount of State-recognized archeological sites.

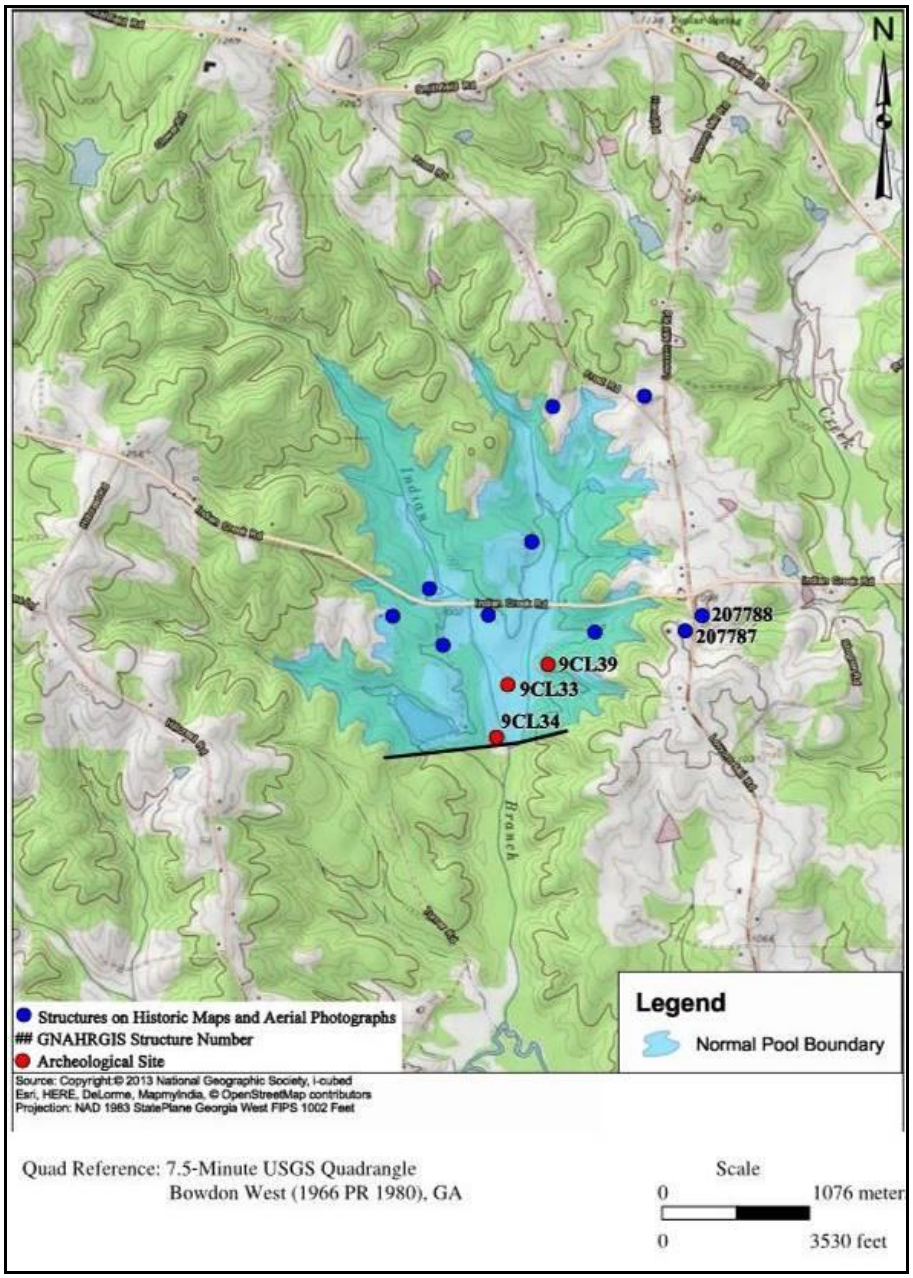


**Figure G-15. Previously Recorded Cultural Resources in Indian Branch Upper Reservoir.**

**7. *Human Environment Impacts*.**

**Infrastructure Impacts.** The potential reservoir sites were examined using USGS 7.5-minute series topographic maps, GDOT and Carroll County road maps, and aerial photographs to identify existing structures and utilities such as roads, power lines, pipelines, industrial facilities, and buildings/structures that will be impacted by the proposed reservoirs. Table G-2 summarizes the impacts to structures, infrastructure, and utilities at the Indian Branch Upper alternative.

| Indian Branch Upper | |
|---|---|
| Size (at top of dam elevation) | 590 |
| Impacts to Roads | 1.01 miles |
| Impacts to Utilities | 0 feet |
| Number of Parcels impacted | 36 |
| Structures Impacted | 25 |

**Table G-2, Infrastructure Impacts at Indian Branch Upper Reservoir Alternative.**

**Infrastructure.** This alternative site impacts 25 structures. Seven (7) of the structures are chicken houses, fourteen (14) are homes and four (4) are other buildings which is the highest of the alternatives. This alternative would impact 1.01 miles of roads including Indian Creek Road which is a main thoroughfare.

**Social/Political.** The Indian Branch Upper reservoir is located in a traditionally agrarian area of Carroll County. Public meetings held in the county revealed that a number of residents in the area are opposed to a reservoir at this location. Moreover, the number of homes and structures impacted by this reservoir in addition to the disruption of a main thoroughfare road is significant and would cause both social and political opposition.

**Land Acquisition.** This alternative encompasses over 590 acres for the pool and buffers. Additional acreage for the treatment plant, public access, and the pump diversion line from the Little Tallapoosa River will be required. As shown in Figure G-16 a total of 36 parcels with 32 different property owners would be impacted by constructing the Indian Branch Upper Reservoir which is comparable to the preferred alternative.

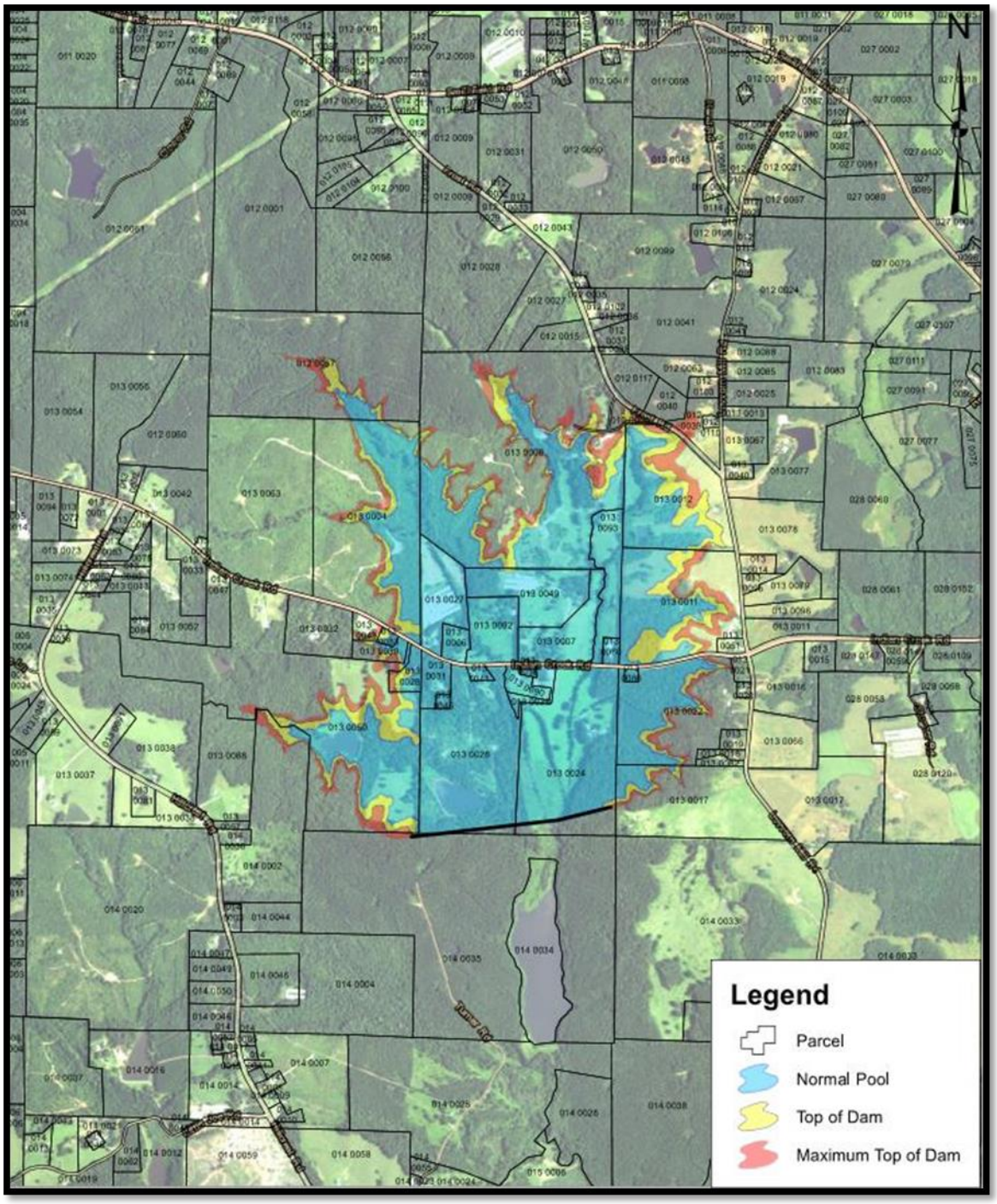


**Figure G-16. Parcels Impacted by Indian Branch Upper Reservoir.**

**8. *Project Cost*.** The dam and spillway for the Indian Branch Upper site is estimated to cost $46.2 million. This site also has the second largest footprint at 590 acres which would result in higher land acquisition costs. The diversion pipeline route is the second highest for this site at 6.3 miles. Overall, the Indian Branch Upper site is projected to be the second most expensive of the three alternatives.

**9. *Conclusion*.** Overall, the Indian Branch Upper site is the second most costly of the three alternatives, inundates a major thoroughfare road and impacts the greatest number of structures and homes. Indian Branch Upper is comparable to the preferred alternative in the amount of stream and wetland impacts and the length of pipelines. However, the incrementally higher cost and greatest impacts to the human environment make Indian Branch Upper inferior to the preferred alternative.

**c. *Preferred Alternative: Pumped-Storage Reservoir on Indian Creek*.**

The preferred alternative is to build a reservoir on Indian Creek and to supplement its yield by pumping water from the Little Tallapoosa for storage in the reservoir. The drainage area for Indian Creek is 4.8 square miles. At a normal pool elevation of 1,161 feet MSL it provides 5.1 billion gallons of water storage and at a top of dam elevation of 1,171 feet MSL has a 480-acre surface area. As shown in Figure G-17**,** the preferred alternative is located west of Hwy 100 and just north of Smithfield Road.

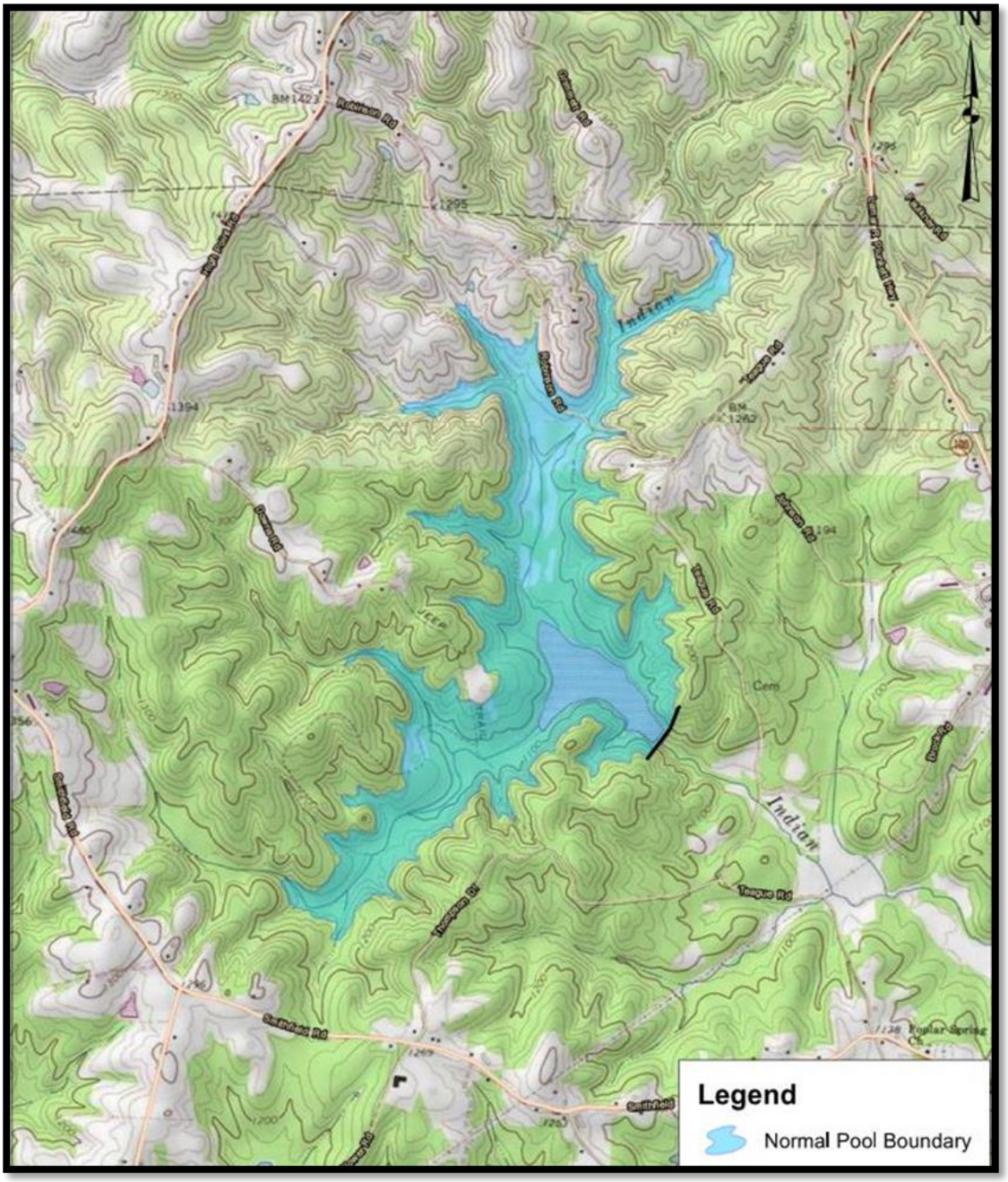


**Figure G-17. Location of Indian Creek Reservoir.**

**1. *Ability to Meet Project Purpose.*** A pumped-storage reservoir on Indian Creek will yield 6 mgd in the year 2065 and thereby meets the project purpose.

**2. *Raw Water Quality*.** Based on a review of information available from EPA's maps there are no Superfund National Priority List Sites, Nationally Pollutant Discharge Elimination System Sites, Hazardous and Toxic Waste Sites, or Toxic Release Inventory Sites within the project area.

Indian Creek Reservoir is the deepest of the three alternative sites with a maximum depth of 96 feet. This expands the ability to vary intake locations within the reservoir and increases the amount of usable storage.

Applicant commissioned a Phase I Environmental Site Assessment ("ESA") of the Indian Creek Reservoir site which determined that there are no substantial water quality issues or other environmental contamination concerns within the reservoir site. The ESA study area included the 643-acre reservoir site associated with the 2008 permit application in addition to an additional 2,427 acres that encompasses the watershed surrounding the reservoir site. Specifically, the ESA found no evidence of recognized environmental conditions or historical recognized environmental conditions within the study area. A complete copy of the ESA was included as a part of the 2008 Section 404 permit application under tab 12.

The Indian Creek Reservoir alternative is in a relatively rural area of Carroll County. Its steep terrain and limited access by gravel road have resulted in limited development.

Overall, Indian Creek has the highest potential for quality raw water among the three alternatives.

**3. S*tream Flow Impacts*.** A reservoir on Indian Creek would be located on the upper portion of a small tributary stream with a drainage area of 4.8 square miles. As such, it should be expected that in-stream flows from the reservoir would exceed prescribed minimum in-stream flow only when significant rainfalls occur with an already full or nearly full reservoir. Given the small sizes of the affected watershed, impacts would be similar for all alternatives and stream flows downstream from the reservoir would recover substantially within a relatively short distance.

The diversion for the Indian Creek Reservoir alternative was sited near the Reavesville Road Bridge over the Little Tallapoosa River, located South-Southwest of Bowdon, with a river drainage area of 237 square miles. Little Tallapoosa River flows appear to be similarly impacted by diversion pumping for each of the alternatives. Based upon the alternatives level in-stream flow basis (M7Q10), a diversion capacity of 19.4 mgd would be required for the Indian Creek Reservoir alternative. Graphical presentation of Little Tallapoosa River stream flow impacts at the diversion site are presented below in Figures 18-20 for the Indian Creek Reservoir alternative. Graphs were developed to present drought year, average year and wet year conditions (2007, 2002, 1979).

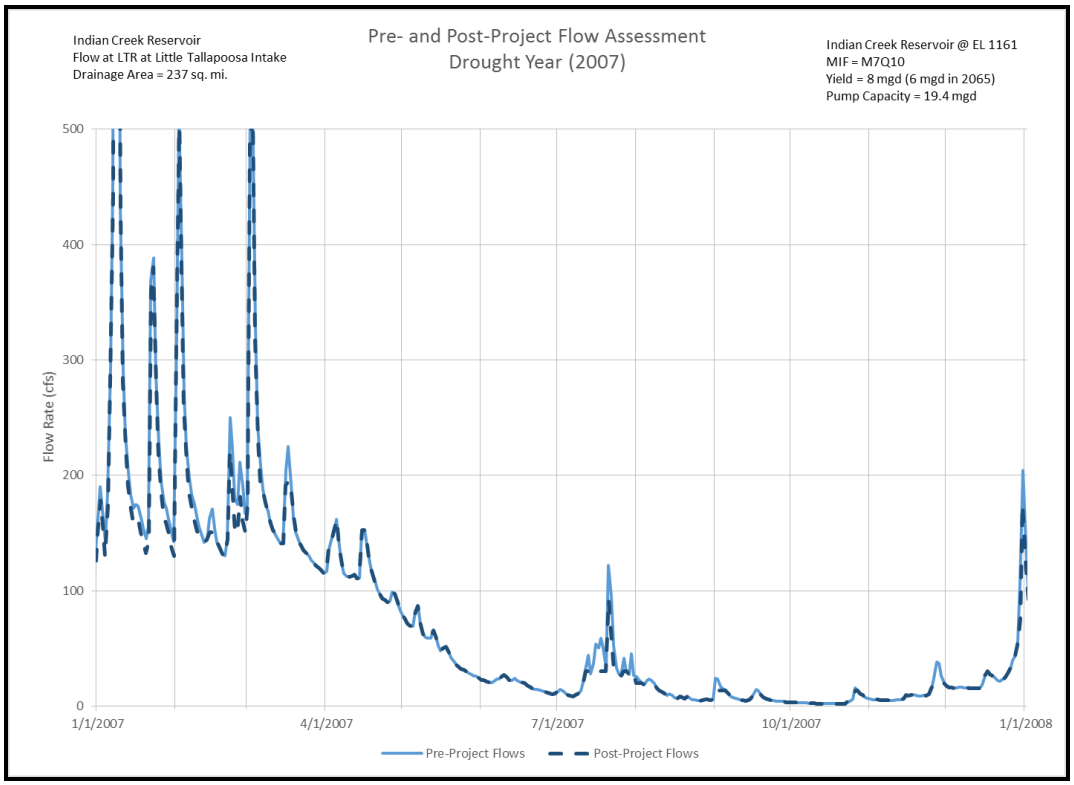


**Figure G-18. Indian Creek Reservoir Impacts to Stream Flow: Drought Year**

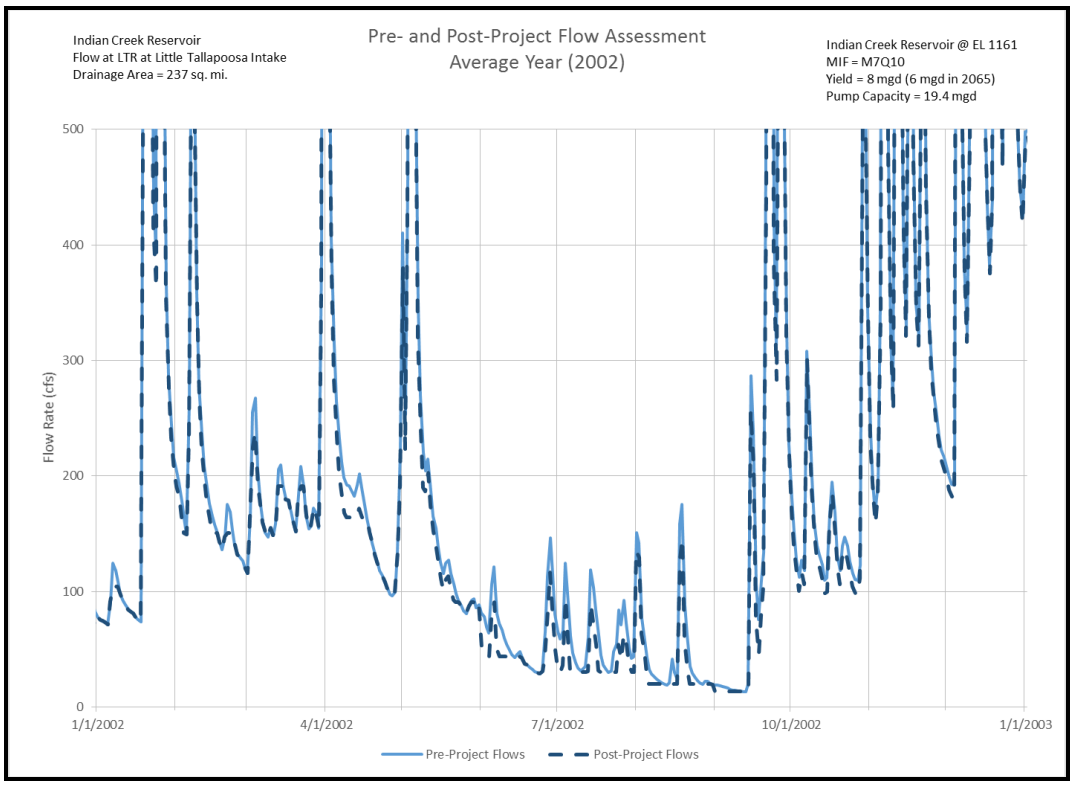


**Figure G-19. Indian Creek Reservoir Impacts to Stream Flow: Average Year**

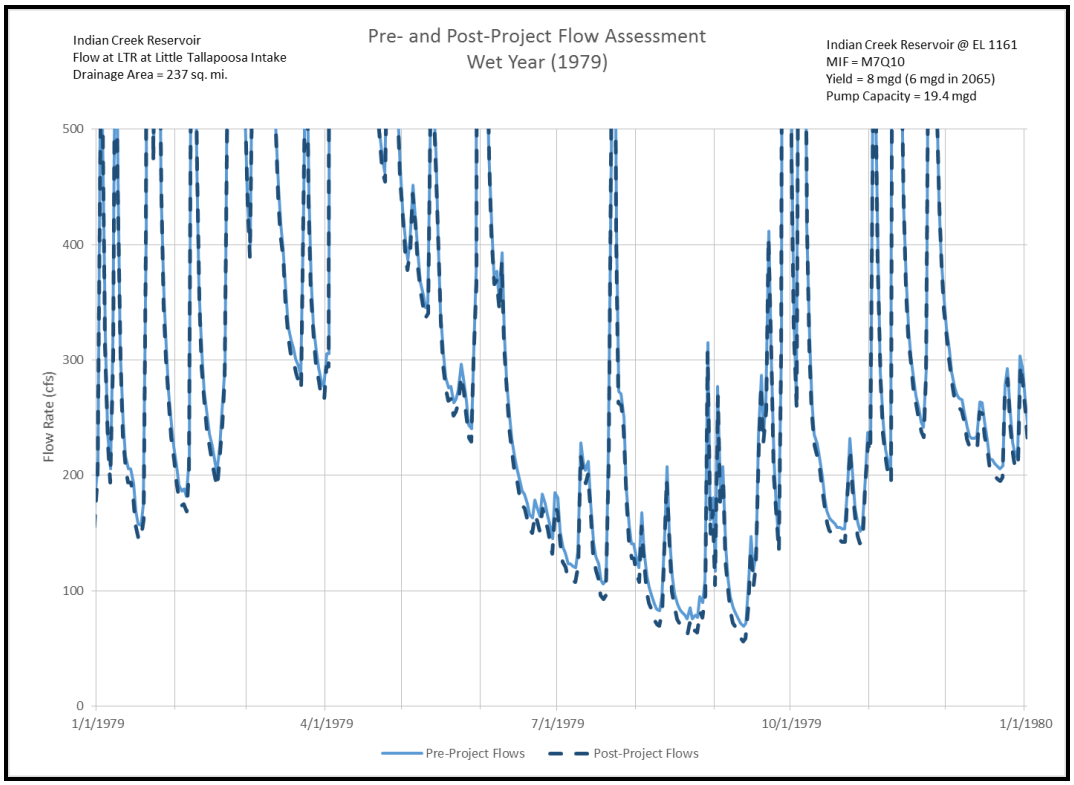


**Figure G-20. Indian Creek Reservoir Impact on Stream Flow: Wet Year.**

After Indian Creek Reservoir was identified as the preferred alternative, additional figures were developed for the detailed downstream flow analysis. Drought year, average year and wet year flows are compared at the following locations:

- Indian Creek at the reservoir outlet
- Indian Creek at the confluence of Turkey Creek
- Indian Creek above its confluence with the Little Tallapoosa River
- Little Tallapoosa River at the Georgia-Alabama state line (immediately downstream of the confluence of Indian Creek)

The results of these more detailed models are included in the Safe Yield Computations and In-Stream Flow Considerations report included under Tab 7 of this revised 404 Permit application. Overall, Indian Creek Reservoir would have a minimal impact on the flows of the Little Tallapoosa River.

**4. *Jurisdictional Waters and Aquatic Habitats*.** Based on the methodology stated above, Eco-Tech identified the following impacts:

a. *Primary Impact.* Using the above-listed sources, it is estimated that the Indian Branch Upper alternative would impact 43,831 linear feet of streams and 12.91 acres of wetlands including:

- 29,519 linear feet of perennial stream
- 10,159 linear feet of intermittent stream
- 4,153 linear feet of ephemeral stream

- 5.89 acres of forested wetland
- 6.53 acres of scrub-shrub wetland
- 0.49-acre of emergent wetland

This site has the greatest amount of stream impacts and the least amount of wetland impacts among the three alternatives.

b. *Secondary Impacts.* Like the other two alternatives, the Indian Creek Reservoir site is located on an existing NRCS dam which bifurcates the stream system. Indian Creek is listed on the integrated 305(b)/303(d) list for not supporting its designated use of fishing in two locations. The fact that the Indian Creek Reservoir alternative already has impaired streams means that construction of a reservoir expansion will not impact pristine stream systems and thereby has a lower overall impact on the environment.

The drainage area is comprised of 38% closed canopy forest and 197.12 acres of closed canopy forest would be directly impacted. It is located 4.89 miles from a GDOT conservation easement. This site has the second greatest amount of direct impacts to closed canopy forest but comparable percentage of impacts to closed canopy forest available within the drainage area as the other sites.

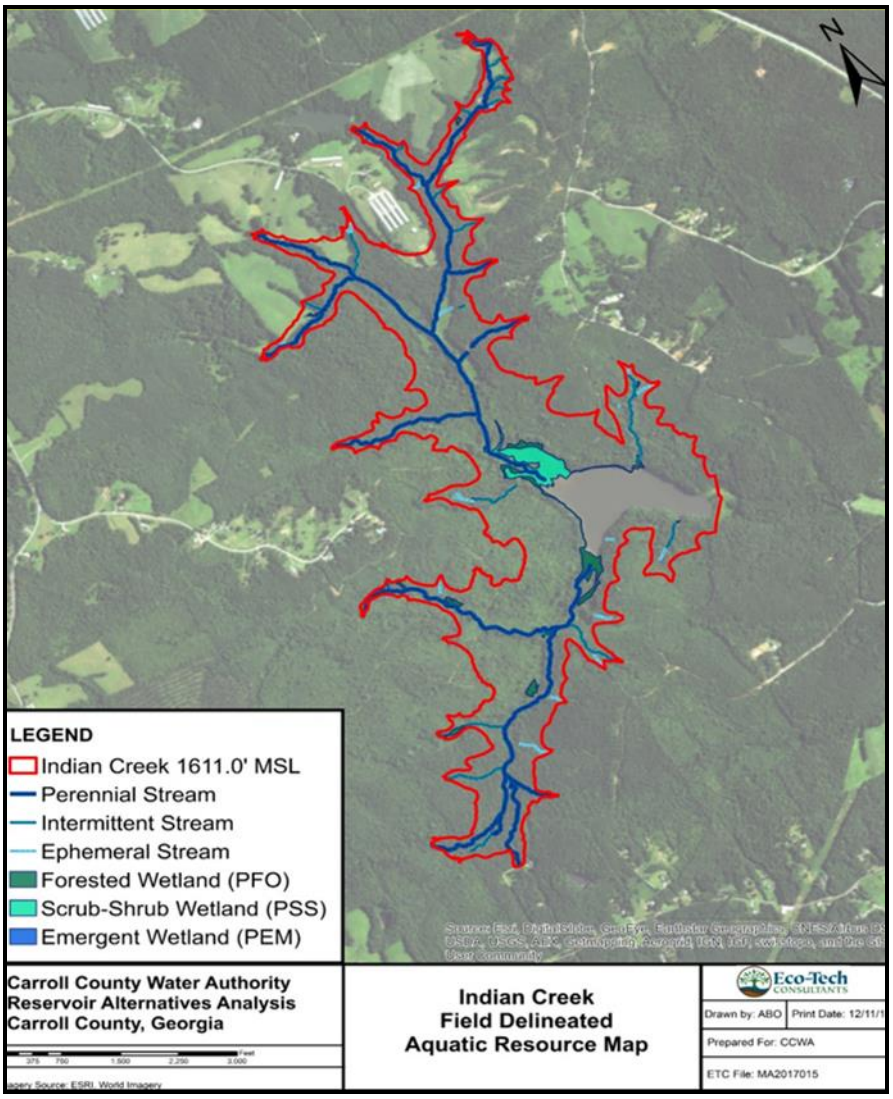


**Figure G-21. Jurisdictional Waters Map – Indian Creek Reservoir Alternative.**

The preferred alternative impacts 14.5% and 30.9% more stream length than Indian Branch Lower and Indian Branch Upper, respectively but it impacts 50.9% and 167.1% less wetland acreage than Indian Branch Upper and Indian Branch Lower, respectively. All three reservoir sites inundate aquatic ecosystems currently isolated from downstream systems by existing earthen dams. The impacts must be considered in light of the already biologically impaired stream systems. The stream and wetland impacts of all three sites are comparable in terms of cumulative impact.

**5. *Threatened and Endangered Species*.** The USFWS does not report any federally protected species within the immediate vicinity of the Indian Creek Reservoir alternative. However, GDNR's database reports six (6) occurrences of state listed species within a 3-mile radius of the reservoir but none located in the normal pool of the reservoir. Species include: Tallapoosa crayfish, Tallapoosa shiner, Tallapoosa darter, Lined chub, and Georgia aster (*Symphyotrichum georgianum*). This site, like the other alternatives, is located within a high priority watershed for Big Indian Creek. Of the three alternatives, Indian Creek Reservoir has the least potential impact

to state listed species with the least total occurrences within a 3-mile radius and the only alternative with no occurrences within its normal pool.

**6. *Cultural Resource Impacts*.** To assess the cultural resources impacts on the Indian Creek Reservoir alternative, Applicant commissioned a cultural resources literature review, a Phase I and Phase II Cultural Resources Study of the 643-acre project area associated with the 18 mgd project and updated this review with a literature search on the 6 mgd project in 2017 in addition to a new Phase I addendum for the new raw water pipeline route from the Little Tallapoosa River to the reservoir. Figure G-21 depicts the project area and the archeological sites and historic structures identified by the literature review completed in 2017. The literature review was used for purposes of comparing the Indian Creek Reservoir site to the other reservoir alternatives. The Phase I study identified sites and structures that were not present in the literature review. Findings of similar significance would be expected from a Phase I for any of the sites. These sites were further investigated in a Phase II study and deemed ineligible for NRHP listing.

**Archeological Sites**. The literature review identified a number of locations outside of the upland areas suitable for prehistoric archeological sites including the potential that these sites are buried within alluvial settings. There are five (5) State-recognized archeological sites within the study area. None were recommended for NRHP listing.

**Historic Structures**. There are two (2) State-recognized historic structures are located within the Indian Creek Reservoir study area. Historic maps indicate that eight historic structures and one structure complexes were present within the project area during the early and mid-20$^{th}$ century. Some of these structures may still be present. There are no cemeteries, Civil War features or 1827 Carroll County Land Lottery features identified.

**Phase I and II Cultural Resource Survey:** In 2008, Applicant commissioned R.S. Webb & Associates to conduct a Phase I Cultural Resource Survey on the Indian Creek Reservoir at elevation 1,195'MSL in addition to two raw-water pipeline routes, two intake sites and a water treatment plant site. The survey was commenced prior to determining the optimal elevation and surface area of the reservoir (1,190'MSL, 643 acres). The Phase I study uncovered 33 archeological sites, a rockshelter of unknown status and five isolated finds. Phase II evaluations were conducted at five prehistoric sites in 2014 and 2015; all were recommended ineligible for the NRHP. By email dated October 13, 2015, the USACE Archeologist concurred that the Indian Creek Reservoir at elevation 1,195' msl would affect no properties eligible for NRHP listing.

Reducing the Indian Creek Reservoir elevation to 1,161'msl would reduce the number of potential impacts to archeological resources by nine. However, since even at the higher elevation, the USACE concurs that there are no NRHP eligible sites, there is no need to re-commence studies.

The pipeline route from the reservoir to the Tallapoosa River did change from the prior permit application and this amended application. In 2017, R.S. Webb & Associates conducted a full Phase I evaluation of the revised pipeline route which is summarized in a separate addendum to the original Phase I and included in this application under Tab 12

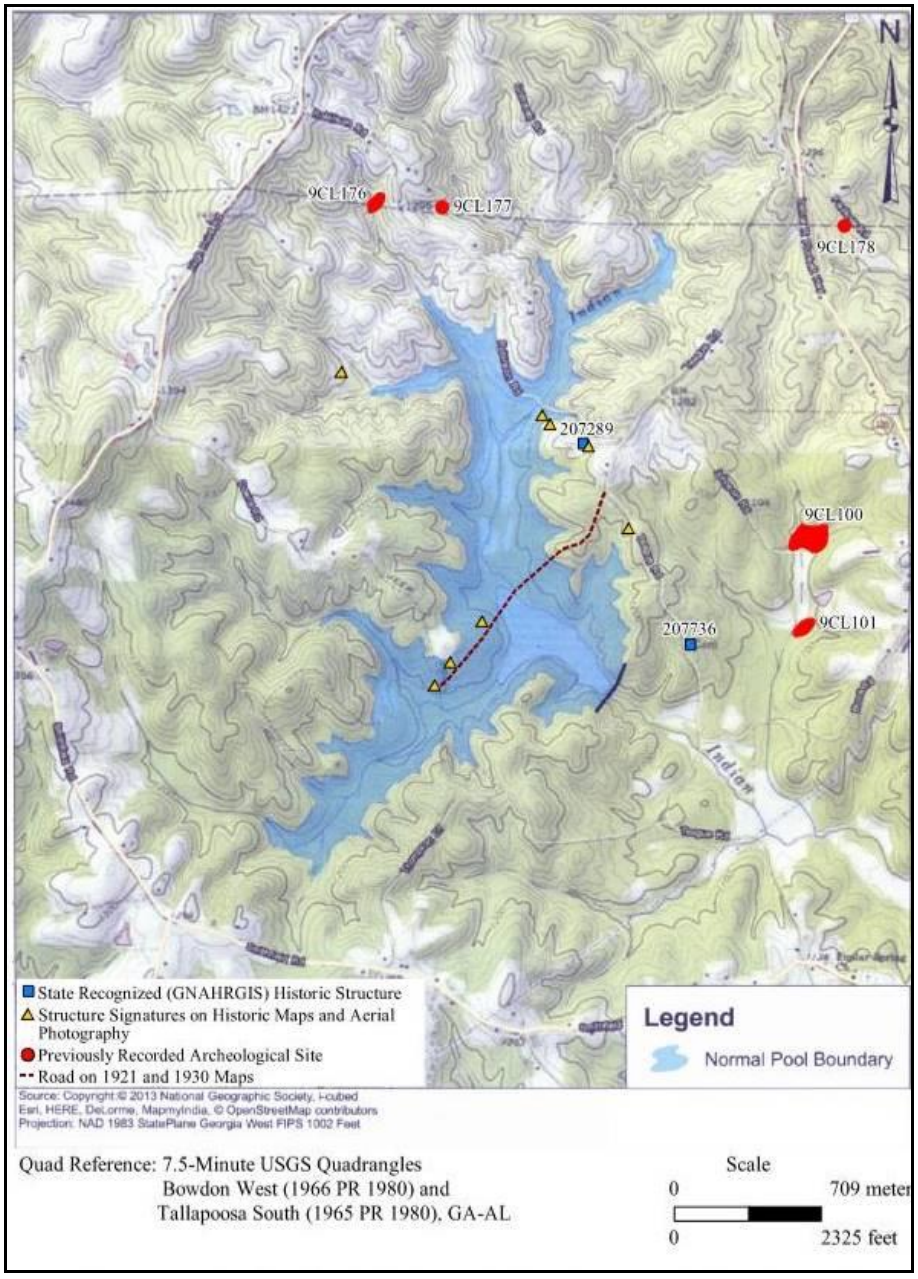


**Figure G-22. Previously Recorded Cultural Resources in Indian Creek Reservoir**

**7. *Human Environment Impacts*.**

**Infrastructure Impacts.** The potential reservoir site was examined using USGS 7.5-minute series topographic maps, GDOT and Carroll County road maps, and aerial photographs to identify existing structures and utilities such as roads, power lines, pipelines, industrial facilities, and buildings/structures that would be impacted by the proposed reservoirs. Site visits were conducted to verify the extent of impacts to infrastructure**.** Table G-3 summarizes the impacts to structures, infrastructure, and utilities at the preferred alternative on Indian Creek.

| Indian Creek | |
|---|---|
| Size (at top of dam elevation) | 480 |
| Impacts to Roads | 0.44-mile |
| Impacts to Utilities | 160 feet |
| Number of Parcels impacted | 69 |
| Structures Impacted | 0 |

**Table G-3. Infrastructures Impacts.**

**Infrastructure**. The Indian Creek Reservoir alternative impacts no structures. The Applicant places a high priority on displacing as few people as possible. The Indian Creek Reservoir site is largely undeveloped due to its difficult topography which makes it an ideal location for a reservoir in the Tallapoosa Basin. Indian Creek Reservoir impacts 0.44 miles of rural gravel roads unlike the Indian Branch sites which impact a main thoroughfare.

This site would also inundate a small portion of a natural gas pipeline owned by Southern Natural Gas along the most northern reaches of the reservoir. Natural gas pipelines are commonly buried in riverbeds and beneath the ocean floor. Precautions do need to be taken to ensure that dredging activities do not occur in the vicinity of the pipeline. So long as the pipelines are not disturbed, there is no threat to the safety of the surrounding property owners or to the water quality.

**Social/Political.** The Indian Creek Reservoir site is the socially and politically favored location for a reservoir in the Tallapoosa Basin. The Applicant held three public meetings to discuss the four short-listed reservoir sites. The location of Indian Creek Reservoir is generally favored because it lies in a relatively undeveloped part of the county and impacts no homes. Moreover, the site is politically palatable because it is the least expensive yet has the greatest volume of storage.

**Land Acquisition.** The preferred site requires acquisition of approximately 480 acres for the top of dam reservoir pool at 1171'MSL. It is estimated fewer than 50 additional acres will be required for the treatment plant, public access, and the pump diversion line from the Indian Creek Reservoir and the Little Tallapoosa River. The reservoir pool is comprised of 69 parcels of land owned by 31 different owners, with the majority of land being largely undeveloped and already owned by CCWA. Figure G-23 depicts the parcels in the Indian Creek Reservoir. It is expected land acquisition for the preferred alternative will be the most practicable and most cost-effective.

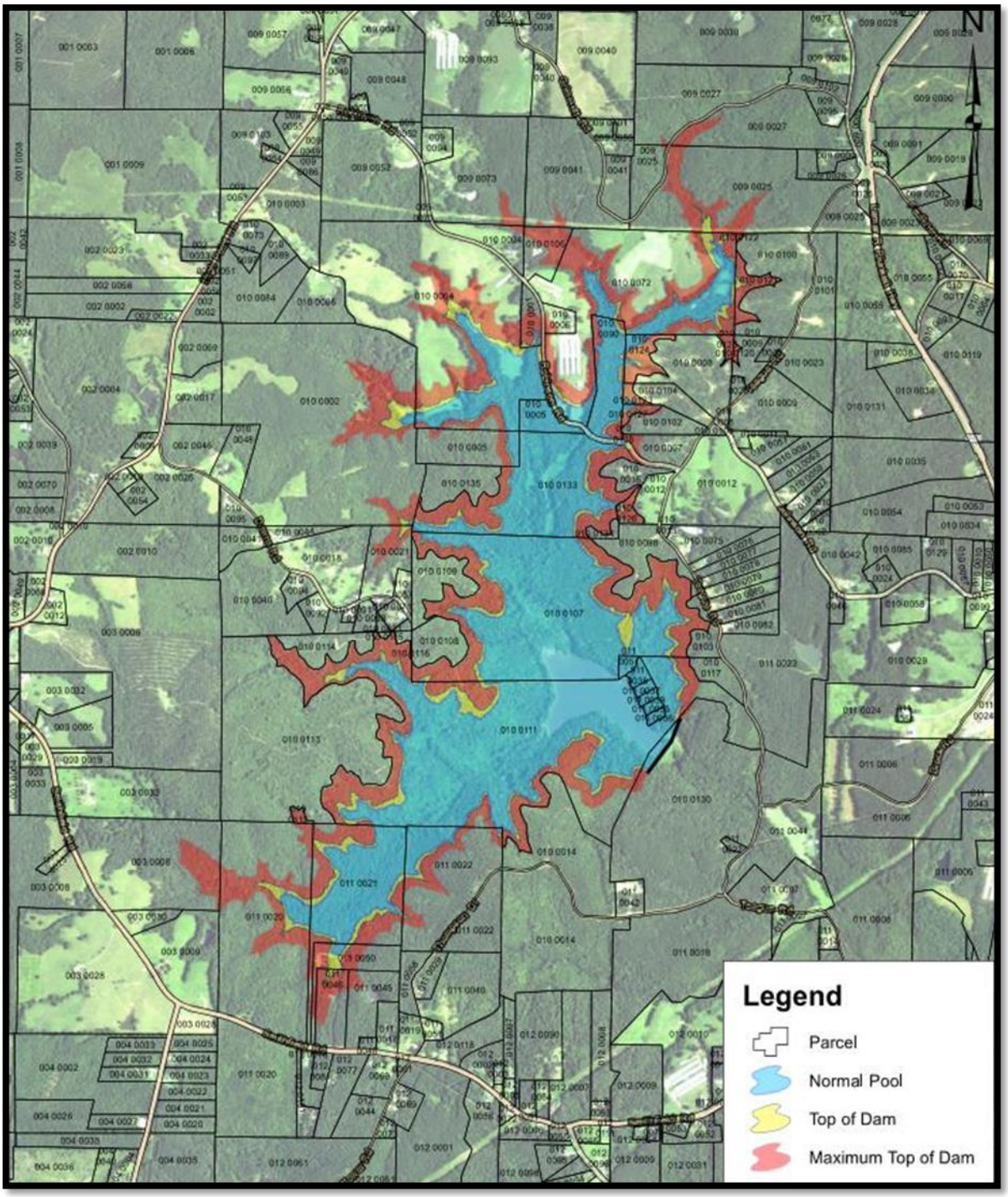


**Figure G-23. Parcels in Indian Creek Reservoir.**

**8.** ***Project Cost.*** The dam and spillway for the Indian Creek Reservoir site is estimated to cost $42.3 million. This site also has the smallest footprint at 480 acres which would result in lower land acquisition costs. The diversion pipeline route is the highest for this site at 9.3 miles. Overall, the Indian Creek Reservoir site is projected to be the least expensive of the three alternatives.

**9. *Conclusion*.** CCWA's preferred alternative is a pumped-storage reservoir on Indian Creek. It is the least environmentally damaging, practicable alternative capable of achieving the project purpose. This site provides the greatest amount of water storage which gives the CCWA more protection during times of drought. The functional impact of the aquatic ecosystem inundated by the Indian Creek Reservoir is comparable to the other sites in that all three reservoir alternatives have existing dams. Indian Creek Reservoir does have the least amount of impacts to wetlands as it would impact half as much wetland acreage as Indian Branch Upper site and approximately one-third as much wetland acreage as the Indian Branch Lower site. The stream impacts for all three sites are comparable. Moreover, this site has the least amount of impacts to cultural resources, infrastructure and State listed species. Due to the steep topography of this alternative, it requires less land and impacts no homes. It is the least expensive option.

For these reasons, Carroll County Water Authority selected a pumped-storage reservoir on Indian Creek Reservoir as its preferred alternative.

## H. Alternative Site Rankings

Rating systems were derived for each evaluation criteria for the three short-listed sites: Indian Branch Lower, Indian Branch Upper and Indian Creek Reservoir. Ratings of 1-5 were assigned based on the range of data for each criterion with 1 being the best rating and 5 the worst. For example, a site with the highest stream impacts would be rated a 5 for the stream impact category and the site with the least impacts would be rated a 1. Once the sites were rated for each category, the ratings were totaled and then the sites were ranked from 1 to 3 based on the total ratings.

The rating tables for each criterion are attached hereto in Appendix E. Using the rating and ranking system, Indian Creek Reservoir ranks as the least environmentally damaging, practicable site.

Below is a summary table showing the overall ranking of the sites.

| | Category Rankings | | | | | | | | | Total Ranking |
|---|---|---|---|---|---|---|---|---|---|---|
| | Water Quality | Stream Flow | Stream Impacts | Wetland Impacts | T&E Species | State Species | Cultural Resc. | Human Enviro. | Cost | |
| Indian Branch Lower | 3 | Minimal | 2 | 3 | None | 2 | 3 | 2 | 3 | 18 |
| Indian Branch Upper | 2 | Minimal | 1 | 2 | None | 3 | 2 | 2 | 1 | 13 |
| Indian Creek | 1 | Minimal | 3 | 1 | None | 1 | 1 | 1 | 1 | 9 |

## H. Public Involvement and Meetings

CCWA places a high priority on keeping the public informed on its operations and to invite public input on plans for future water supply. The CCWA board holds monthly public meetings at which detailed operational, financial and infrastructure updates are given. There is opportunity for public comments at each meeting and the meetings are broadcast on a local cable station. Decisions made on large projects, in particular the Indian Creek Reservoir, receive additional public input through special meetings held in the evening hours with notices published in the newspaper and letters sent to potentially impacted property owners. All of the information presented at the public meeting, including maps, is uploaded on the CCWA website, www.ccwageorgia.com.

### 1. Public involvement for original 404 Permit application (2007 - 2008)

CCWA held four public meetings to discuss the original 404 Permit application for the Indian Creek Reservoir. The first meeting was a CCWA work session on October 4, 2007 at which the alternatives analysis and 404 permitting process were discussed along with the initial screening of potential alternatives.

On August 8, 2008, CCWA held a second public meeting with more detailed information on the four-short-listed, pumped-storage reservoir alternatives. The meeting was advertised in the local newspaper and letter invitations were sent to all potentially impacted property owners. It was held in the evening in Carrollton. A powerpoint presentation was given and then the public was invited to ask questions. Large poster boards showing each site and the impacted parcels were available for attendees to review. The meeting was well attended.

On September 18, 2008 CCWA held its regular public meeting and selected the Indian Creek

Reservoir as the preferred alternative and authorized filing a 404 Permit application. On December 28, 2008, the 404 Permit application was submitted to the USACE.

On March 4, 2010 CCWA hosted a public information meeting in Carrollton during the public comment period. The meeting was advertised in the local newspaper and the agencies were notified. It was attended by USACE representatives and a significant number of Carroll County citizens. A presentation was given followed by a question and answer session. The question and answer session was transcribed by a court reporter and submitted to the USACE as a part of CCWA's response to comments.

### 2. Public involvement for amended 404 Permit application (2017 – 2018)

In 2017, CCWA held three public meetings to present and discuss the amended 404 Permit application. The first was a CCWA work session on October 19, 2017 at which a full update was given on the permit status and on the work completed on the amended Alternatives Analysis which led to the selection of three short-listed pumped-storage reservoirs. The meeting was audio and video recorded and broadcast on the local cable television station. No public comments were made.

The second public meeting was held on November 6, 2017 from 7:00 – 9:00 p.m. in the Exhibition Room at the Carroll County School System Performing Arts Center. This meeting was advertised in the newspaper and invitations were sent by letter to all property owners potentially impacted by the three reservoir sites (Indian Creek, Indian Branch Upper and Indian Branch Lower) and the raw water diversion pipeline in addition to local and state elected officials representing Carroll County. The meeting included a powerpoint presentation of the details of each site, a presentation of large poster boards of each site showing impacted parcels, and a question and answer session. CCWA staff and permitting consultants stayed after the meeting to answer questions for those who did not ask during the presentation. Approximately 60 people attended the meeting. It was video and audio recorded and broadcast on the local cable television station and a short interview was given at the request of the University of West Georgia student media.

The third public meeting was held on December 21, 2017 and was a CCWA board meeting at which a presentation was reviewed discussing the results of the more detailed fieldwork on the three short-listed sites. After review of the information presented, the CCWA board voted to select the Indian Creek Reservoir as the preferred alternative and to file an amended Section 404 Permit application to pursue the same. The meeting was video and audio recorded and broadcast on the local cable television station. No public comments were made.