Georgia Water Supply Redundancy Study
Upper Flint Water Planning Region
Georgia Environmental Finance Authority (GEFA)

Prepared for:

Georgia Environmental Finance Authority

Georgia Water Supply Redundancy Study

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Acronyms

ADD	Average Daily Demand
ASR	Aquifer Storage and Recovery
DIP	Ductile Iron Pipe
EPD	Environmental Protection Division
GEFA	Georgia Environmental Finance Authority
GSWCC	Georgia Soil and Water Conservation Commission
MGD	Million Gallon(s) Per Day
MNGWPD	Metropolitan North Georgia Water Planning District
QWS	Qualified Water System(s)
RWP	Regional Water Plan
USGS	U.S. Geological Survey
Wood	Wood Environment & Infrastructure Solutions, Inc.
WSIRRA	Water System Interconnection, Redundancy, and Reliability Act
WTP	Water Treatment Plant

1.0 Introduction

In May 2010, the Water System Interconnection, Redundancy, and Reliability Act was signed into law (Senate Bill 380). A main goal of the Act was to identify and increase interconnections and redundancies for the Metropolitan North Georgia Water Planning District (MNGWPD). With this Act, Georgia affirmed the importance of comprehensive water emergency planning and the value of effectively sharing our current water resources through well-considered redundancy and interconnection planning. While the Act did not apply to water planning regions outside of the MNGWPD, its concepts and framework are useful for emergency planning throughout Georgia.

The Georgia Environmental Finance Authority (GEFA), through the services of Wood Environment & Infrastructure Solutions, Inc. (Wood), conducted a study identifying opportunities for water supply redundancy for qualified water systems (QWS) outside the MNGWPD. For the purposes of this report, a QWS is a public water system owned and operated by a city, county, or water authority that serves a total population (retail plus consecutive populations served) greater than 3,300 people. Some systems serving just below the population threshold of 3,300 are included as well. This report details the Upper Flint Water Planning Region, which consists of 13 counties in west-central Georgia, as shown in Figure 1-1. GEFA identified 15 QWS in the Upper Flint Region, as shown in Figure 1-2.

1.1 Purpose

The purpose of the Water Supply Redundancy Study is to increase Georgia's water supply solvency and reliability. This study evaluates drinking water supply, demand, treatment, storage, distribution, and interconnectivity to identify redundant water supply sources capable of providing backup water supply for each QWS.

Emergency scenarios were evaluated consistent with similar emergency supply planning projects in the state, such as the GEFA Water System Interconnection, Redundancy and Reliability Act Emergency Supply Plan (CH2MHill, Jacobs, Lowe Engineers, 2011) for the MNGWPD. These emergency scenarios include:

- Failure of largest treatment facility within a planning region
- Short-term catastrophic failure of distribution system
- Short-term contamination of a raw water source
- Failure of an existing dam of a raw water source
- Water supply reduction due to drought

Potential interconnection and redundancy projects were identified and prioritized. Each planning-level potential project includes the steps required to modify a QWS's operation and infrastructure to share water with adjacent water providers. Wood developed a decision-based prioritization tool that summarizes the specific system deficiencies (in volumetric demand) from emergency situations and quantifies emergency supply goals. The prioritization tool highlights available emergency water supply and deficits under existing and future conditions. Potential projects were prioritized and recommended based on performance using weighted quantitative and qualitative criteria.

1.2 Study Approach

An overview of each step of the study approach is outlined below.

1.2.1 QWS Data Collection

A detailed questionnaire and data request list were developed to collect data from each QWS. The questionnaire included general system data, water demand and usage, infrastructure and supply, and other planning information. QWS were contacted to conduct a follow-up interview. The results of the survey and interview were tabulated and reviewed. Study participation was optional. Some QWS opted not to participate or to partially participate. If data were unavailable or incomplete, professional reasoning was used to recommend a technically-sound approach for dealing with missing or incomplete data, including use of publicly available data.

1.2.2 Redundant Water Supply Sources

The collected survey data and additional information gathered from other sources, such as the Georgia Environmental Protection Division (EPD), regional water plans (RWPs), and the *GEFA Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs* (MACTEC, 2008) report served as the foundation to evaluate sources of water supply capable of providing redundant supply for each QWS. Such water sources include raw and potable water sources, interconnections between systems, and excess capacity of current allocations. These identified water supply sources were pre-screened for their potential to serve regional or multi-jurisdictional water needs. Where sufficient information was available, quantitative screening criteria were used to compare sites and, where quantitative information was not readily available, qualitative evaluation and professional reasoning were used for the initial screening. These locations and other nearby stream networks were examined at a planning-level scale, taking into consideration issues such as current and/or future hydrographs, low-flow conditions, stream capacity, downstream non-depletable flow requirements, water quality, pumping and transmission requirements, permitting requirements, treatment requirements, and cost.

1.2.3 Emergency Planning Benchmarks

The QWS average daily demand (ADD) obtained from the data collection process was used to quantify tiered emergency supply goals within each system. This method highlights where full supply of demand may not be available during some emergency scenarios although reduced critical needs can be met by another system. For consistency with the MNGWPD study, the following reliability targets were used:

- 100% ADD
- 65% ADD
- 35% ADD

It is assumed that the 35% and 65% reliability targets correspond to estimated usage associated with essential water needs. GEFA has identified customers with essential water needs as hospitals, nursing home/assisted living facilities, correctional facilities, critical industry needs, and schools.

1.2.4 Water Supply Risk Evaluations

To carry out the preliminary screening, specific system deficiencies (in volumetric demand) of the emergency scenarios and supply goals within the focus area were calculated. The purpose of this is to highlight available emergency supply and deficits under existing and future conditions. The reliability targets were applied to each QWS under specified emergency situations to evaluate the capability of a QWS to supply sufficient water during that emergency. Deficiencies (in volumetric demand) from emergency situations were quantified for each QWS. In addition, the maximum deficit (Critical Scenario Deficit) was determined for each QWS.

1.2.5 Evaluation of Potential Projects

Potential redundancy projects were conceptualized for each QWS. These projects may include infrastructure redundancy, new interconnections, and upgrades to existing interconnections. Planning-level costs were estimated for potential redundancy projects based on the EPD *Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison* that was developed to provide a statewide reference tool for planning contractors to encourage consistency in relative cost estimates throughout the state and to support regional water planning council decision making (EPD, 2011).

1.2.6 Recommended Projects

Using a decision-based prioritization tool, absolute and weighted scores were calculated for each option. The options were then ranked using defined criteria (e.g., cost, environmental impacts). A sensitivity assessment was undertaken to test the influence of the category weightings on the rank outcome. Potential projects were then prioritized based on performance under these weighted quantitative and qualitative criteria.

2.0 QWS Data Collection

Detailed information about each QWS was obtained via a survey-based questionnaire, follow-up interviews, publicly available documents, information supplied by EPD, and data provided by the QWS.

2.1 Data Request

Each QWS was sent a standardized questionnaire approved by GEFA. The general categories are listed as follows:

- General system data (e.g., facility type, ownership type, and population served)
- Customer information (e.g., number of customers and critical facilities served)
- Water source information (e.g., source type and capacity, purchased water information, and water sales information)
- Permit conditions and limitations
- System infrastructure data (e.g., storage, treatment, and distribution data)
- System interconnection data
- Future planning considerations

Each QWS was also sent a data request list approved by GEFA, as follows:

- Master Plan
- Capital Improvement Plan
- Water Withdrawal Permits (both groundwater and surface water withdrawal)
- Public Water System Operating Permit(s)
- Surface Water and Groundwater Withdrawal Values (2015 through 2019)
- Sanitary Surveys (2015 through 2019)
- Water Sale Documents
- Emergency Planning Documents
- Mapping Information

2.2 Current and Future Conditions

For this study, 15 QWS in the Upper Flint Water Planning Region were surveyed. Agriculture is the primary economic sector in the Upper Flint Region. Land cover in the region is composed of approximately 48% forest, 24% row crops/pasture, 8% wetland, 6% urban, 1% water, and 13% other (Upper Flint Water Planning Council, 2017).

2.2.1 General System Information

Table 2-1 shows key general information about the 15 QWS. The QWS in this region serve primarily municipal customers, and to a lesser extent, industrial customers. Water for agricultural purposes is almost exclusively obtained from private sources, such as private wells. The Montezuma QWS serves the smallest total population and has four water supply wells while the Griffin QWS serves the largest total population and has three surface water supply sources.

Findings from data collection include the following general information about the Upper Flint Region:

- Ten QWS have groundwater-only drinking water sources.
- Three QWS (Griffin, Manchester, and Thomaston) have surface water-only drinking water sources.

- Two QWS (Spalding County and Talbot County) are purchase-only systems that do not have raw water sources.
- Distribution systems range from approximately 18 years old to more than 100 years old, with 4 systems more than 70 years old. Two QWS are of an unknown system age.
- The largest system customers are typically industries, educational facilities, correctional facilities, and critical care facilities (e.g., hospitals). However, other public water systems are large customers for Griffin, Manchester, Schley County, Talbot County, and Thomaston.
- Spalding County, Talbot County, and Upson County purchase water from other public water systems.
- Ten systems have at least one backup power source/facility.
- Six systems reportedly have current distribution system flow surplus capabilities.
- The following system interconnections, including emergency interconnections, were reported:
    - Griffin is interconnected with nine systems: Spalding County, Coweta County, Butts County/Jackson/Jenkinsburg, Henry County, Clayton County, Williamson, Zebulon, Concord, and Barnesville.
    - Lake Blackshear is interconnected with Veterans State Park.
    - Manchester is interconnected with Talbot County and Warm Springs.
    - Marion County is interconnected with Buena Vista.
    - Schley County is interconnected with Ellaville and Andersonville.
    - Spalding County is interconnected with Griffin and Griffin's interconnections.
    - Talbot County is interconnected with seven systems: Manchester, Columbus, Geneva, Harris County, Woodlawn, Talbotton, and Junction City.
    - Thomaston is interconnected with Upson County and Lincoln Park.
    - Upson County is interconnected with Thomaston.

It is important to note that Spalding County owns its water system assets (i.e., tanks, pipes, associated pipe infrastructure); but, has a contract with Griffin for Griffin to maintain Spalding County's assets. Therefore, Spalding County is also interconnected with the systems that Griffin is interconnected with. Also, Lake Blackshear is funded by the U.S. Department of Agriculture rather than a county or municipality.

Overall, data collected show that the QWS have a 2019 combined average treatment capacity of over 21 million gallons per day (MGD) and a 2019 combined peak operational capacity of over 30 MGD. Note, these values do not include the purchase-only systems. The 15 QWS serve a total estimated direct population of approximately 139,500 people and a total estimated consecutive population of 110,800 people. For this report, a consecutive population is defined as the population benefited from a system's regular water sales to another water system. Note that combining the direct and consecutive population values may result in certain users being counted twice. For example, Griffin regularly sells water to Spalding County and Manchester regularly sells water to Talbot County.

2.2.2 Mapping Data

Mapping data were requested of the QWS. Specifically, information was requested related to drinking water infrastructure, such as: pumping and treatment facilities, storage tanks (ground and elevated), pipelines, booster pumps, distribution systems, hydrants, elevation values, etc. Digital mapping data (specifically GIS format) were preferred. However, hydraulic computer models and hard copy/PDF maps were also accepted. If hard copy/PDF maps were manually digitized, priority was given to digitizing water

lines on the edges of the QWS distribution system because identifying potential interconnection opportunities was a main objective.

Table 2-2 shows mapping data (if any) received from the 15 QWS. Five systems provided GIS data and one system provided CAD data. Hard copy/PDF maps were obtained from seven QWS. Hard copy maps were georeferenced and digitized based on known landmarks.

2.2.3 Reports and Documents

Several reports and documents were requested from each QWS, as detailed in Section 2.1.

Table 2-3 shows the reports and documents received from the 15 QWS. The 15 QWS had documents available, with comprehensive plans, water loss audits, permits, and sanitary surveys being the most frequently provided documents. EPD supplied recent sanitary surveys and 2015 and 2019 water audits for many systems and the Georgia Department of Community Affairs website contained comprehensive plans for many QWS. Based on review of comprehensive plans and survey responses, future (post-2019) planned water infrastructure improvements include:

- A new well for Americus, Cordele, and Vienna
- A new storage tank for Cordele and Vienna
- New generators for Montezuma and Upson County
- An expanded distribution system for Griffin, Spalding County, Upson County, and Vienna,
- Reservoir dredging for Griffin
- Treatment plant expansion for Griffin
- Addition of raw water transmission lines for Griffin
- A backwash tank for Thomaston
- General water infrastructure upgrades for Griffin, Manchester, Marion County, Montezuma, Spalding County, Talbot County, and Vienna

3.0 Redundant Water Supply Sources

Water supply sources were evaluated for their potential ability to provide surplus water to a neighboring water system during an emergency. Such water sources include excess capacity of current permitted allocations, new water sources, and interconnections between systems. Factors potentially affecting source availability were also noted.

3.1 Excess Capacity from Existing Water Sources

Existing water source excess capacity was evaluated for availability during short-term, defined durations, which are often less than three days but no more than 120 days. Long-term, undefined durations, as detailed further in Section 5, do not apply to this region because this region does not obtain its raw water from the Allatoona Lake/Etowah River or Lake Lanier/Chattahoochee River systems. Therefore, existing water sources were only assessed for the 2015 and 2050 short-term, defined duration scenarios.

Table 3-1 presents the 2015 and 2050 peak day design capacity, ADD, and resultant excess capacity for each QWS, as well as current permitted peak withdrawal capacity. The ADD values exclude purchased water to portray the true net regional water need. Purchase-only QWS have no reported values because their demand is accounted for in the demand allocation of their supplier(s). Appendix A describes the peak day design capacity and ADD calculations.

Excess capacity for a groundwater QWS short-term, defined emergency scenario was calculated by subtracting the ADD (water withdrawal only, not including purchased water) from the peak day design capacity. For surface water QWS, the smaller of the peak day design capacity value and the peak permitted withdrawal value (24-hr maximum) was used for the excess capacity calculation. For this region, permit limits do not affect the excess capacity calculation. The excess capacity evaluation has a few key assumptions. It relies on readily available interconnections with the appropriate capacities. It also assumes that a QWS can increase to above-average production to supply water to another QWS experiencing an emergency. This assumption may not be appropriate if local needs of the supplying QWS are above average during the same emergency, resulting in less available excess capacity. In addition, because QWS data for this water planning region were collected in 2020, the self-reported 2015 peak day design capacity may reflect capital improvements that a QWS implemented between 2015 and the time the QWS was surveyed for this current analysis.

As Table 3-1 shows, there is sufficient excess capacity from existing sources for short-term, defined emergency durations for 2015 for the 13 non-purchase-only QWS. As noted above, purchase-only QWS are reported in Table 3-1 and Table A-4 as “not applicable.” For 2015 demands, excess capacity is at least two times a given QWS’s 2015 ADD for seven QWS: Cordele, Lake Blackshear, Marion County, Oglethorpe, Schley County, Thomaston, and Vienna. The 2015 excess capacity values range from 0.1 MGD (Montezuma) to 16.3 MGD (Griffin).

For 2050 demands, there is sufficient capacity for 12 of the 13 QWS, while Upson County has a deficit of 0.2 MGD. While it may be likely that Upson County would increase peak day design capacity before the predicted ADD surpasses it, the potential lack of excess capacity highlights the need for increased capacity in 2050. Excess capacity is at least two times a given QWS’s 2050 ADD for seven QWS: Americus, Cordele, Lake Blackshear, Manchester, Marion County, Oglethorpe, and Vienna. The 2050 excess capacity values range from -0.2 MGD (Upson County) to 13.4 MGD (Griffin). The QWS’ capacities were scaled to allow for a comparison of excess capacities. Appendix A describes and shows the excess capacity index calculations

and values. Excluding Upson County's 2050 negative excess capacity, Montezuma's 2015 and Schley County's 2050 scaled excess capacity sufficiency is the lowest relative to other Upper Flint QWS.

3.2 Potential Water Sources and Storage Options

Potential additional water supply sources include groundwater, surface water, and surface water impoundments (e.g., dammed reservoirs). The Upper Flint Water Planning Region is bisected by the Georgia fall line, which separates the Piedmont geologic region from the Coastal Plain geologic region. The Piedmont geologic region is characterized by igneous and metamorphic rocks with clayey soils, while the Coastal Plain geologic region is characterized by sedimentary rocks with sandy soils.

Water withdrawals in the Flint River Basin have received special attention over the past several decades. Certain conservation measures have been implemented due to growing concern of water use decreasing streamflow, especially during severe droughts. As discussed in Section 3.2.1 and Section 3.2.2, most water withdrawals in the Flint River Basin are for agricultural use, which is almost exclusively from private sources rather than public water systems. According to the *Flint River Basin Regional Water Development and Conservation Plan*, the cumulative impact of municipal and industrial groundwater withdrawals "on stream-aquifer flux and the regional groundwater budget is negligible" (EPD, 2006). Municipal water supply accounted for 17% of the region's total 2010 water demand (Upper Flint Water Planning Council, 2017). The Upper Flint Water Planning Council identified seven water demand management practices that focus on improved water use efficiency, conservation practices, and management of agricultural withdrawal permits. Five of the seven demand management practices (DM1, DM4, DM5, DM6, and DM7) specifically address agricultural water uses.

3.2.1 Groundwater

Groundwater sources accounted for 57% of the region's 2010 water supply, whereas surface water sources accounted for 43% of the region's 2010 water supply. The 2010 groundwater withdrawal by category is as follows: 75% agriculture, 13% municipal, 8% domestic/self-supply, 3% mining, and 1% industrial (Upper Flint Water Planning Council, 2017). Aquifer systems in the Upper Flint Region include crystalline rock aquifers in the Piedmont geologic region and the Claiborne, Clayton, Cretaceous, and Floridan aquifers in the Coastal Plain geologic region. Figure 3-1 shows relevant aquifers in the Upper Flint Region.

The RWP included groundwater resource assessments of the Claiborne Aquifer, the Upper Flint Region Cretaceous Aquifer, the Upper Floridan Aquifer in the Dougherty Plain, and the South-Central Georgia Upper Floridan Aquifer. Aquifer sustainable yield for the purposes of the resource assessment was defined as, "the amount of water that can be withdrawn without reaching specific thresholds that indicate the potential for local or regional impacts." Impacts included localized aquifer drawdown, reduced stream baseflow, and long-term aquifer drawdown. Estimated sustainable yield for each aquifer was reported as a range, which reflects several computer model simulations with different assumptions. According to the RWP, total regional 2015 and estimated 2050 withdrawals from the Upper Flint Region Cretaceous Aquifer are within the aquifer's estimated sustainable yield range. Total regional 2015 and estimated 2050 withdrawals from the Claiborne Aquifer and South-Central Georgia Upper Floridan Aquifer are below their respective sustainable yields. Total regional 2015 and estimated 2050 withdrawals from the Upper Floridan Aquifer in the Dougherty Plain, however, exceed the aquifer's estimated sustainable yield (both low and high ends of the range). This aquifer's sustainable yield exceedance was driven by the reduced stream baseflow impact threshold. This potential gap in groundwater availability does not necessarily

mean that the aquifer is likely to be exhausted. Rather, management practices like DM1, DM2, DM4, DM5, and DM6 were identified to address potential gaps. (Upper Flint Water Planning Council, 2017)

Municipal groundwater withdrawals are primarily from the Cretaceous Aquifer, with less withdrawal from the Floridan, Claiborne, and crystalline rock aquifers (Black & Veatch, 2017). Most of the regional groundwater demand is driven by agriculture, especially agricultural withdrawals from the Claiborne, Cretaceous, and Floridan aquifers (Black & Veatch, 2017). The Clayton Aquifer is not recommended as a potential source due to the current water withdrawal permit moratorium. Therefore, new municipal wells should target the Claiborne and South-Central Georgia Upper Floridan aquifers where feasible. Even so, based on municipal water demand projections remaining relatively constant from 2015 (30 MGD) to 2050 (28 MGD), it is unlikely that additional municipal supply wells, other than replacement wells, are needed in the Upper Flint Region.

3.2.2 Surface Water

The 2010 surface water withdrawal by category is as follows: 61% agriculture, 22% municipal, and 17% industrial (Upper Flint Water Planning Council, 2017). The Upper Flint Region contains portions of the following major river basins: Flint River Basin in the northern, central, and southern part of the region; Ocmulgee River Basin in the far northeastern and southeastern part of the region; Suwannee River Basin in far southeastern part of the region; and Chattahoochee River Basin in the far western and northwestern part of the region. Figure 3-2 shows relevant river basins in the Upper Flint Region. The Flint River is the major river within the region. Lake Blackshear is a major reservoir within the region.

Surface water availability resource assessment models were conducted by EPD to evaluate consumptive demand and dry conditions on stream flows and lake storage. Potential gaps in terms of magnitude and duration were identified when a model fell below a threshold. Model results for 2015 and 2050 in the Flint River Basin indicated that no potential gaps exist at Carsonville or Montezuma nodes, while potential gaps exist at the Bainbridge node. For context, Bainbridge is a Lower Flint-Ochlockonee QWS located near the Bainbridge node. The Upper Flint Water Planning Council noted that potential gaps at the Bainbridge node are affected in part by groundwater within the Upper Floridan Aquifer in the Dougherty Plain because of the high groundwater-surface water connection in this area. The Council identified four supply management and flow augmentation practices, SF1, SF2, SF3, and SF4, to address potential gaps. Management Practice SF1 includes an evaluation of "a full range of storage and reservoir options" (Upper Flint Water Planning Council, 2017).

Municipal surface water withdrawals are primarily from the Flint River Basin (Black & Veatch, 2017). Most of the regional surface water demand is driven by agriculture. Even so, based on municipal water demand projections remaining relatively constant from 2015 to 2050, it is unlikely that additional major municipal supply reservoirs are needed in the Upper Flint Region.

3.2.3 New Reservoirs

Of all the potential water source and storage options, new reservoirs are the most environmentally sensitive, costly, and time-consuming (MACTEC, 2008). Specific new reservoirs were not identified by the Upper Flint Water Planning Council, but the need to evaluate storage options in the Flint River Basin was emphasized via high priority Management Practice SF1 as one way to satisfy potential gaps at the Bainbridge node. Additional resource assessment modeling was performed to better understand the cause and magnitude of potential gaps identified during initial surface water availability modeling. Modeling indicated that "a reservoir, or reservoirs, of significant size [162,223 acre-feet, or 53 billion

gallons] would be needed to fully offset the potential gap identified by the resource assessment model at Bainbridge" (Upper Flint Water Planning Council, 2017).

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

3.2.4 Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs

In the 2008 report *GEFA Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs*, MACTEC Engineering and Consulting, Inc., now Wood, and other consultants inventoried and surveyed drinking water supply reservoirs in Georgia (MACTEC, 2008). The effort focused on the potential to expand existing reservoirs via increasing dam heights and supplemental pumping from nearby streams. The report focused on the 78 counties above the Georgia fall line. Spalding, Meriwether, Pike, and Upson Counties are above the fall line, most of Talbot County and part of Taylor County are above the fall line, and Marion, Schley, Macon, Webster, Sumter, Dooley, and Crisp Counties are below the fall line. Existing reservoirs were screened for expansion potential and 16 reservoirs were identified in the report for potential expansion.

Two of these reservoirs, Heads Creek Reservoir (Spalding County) and Still Branch Reservoir (Pike County), are surface water supply sources for Griffin. The report estimated that both Heads Creek Reservoir and Still Branch Reservoir could be expanded. Griffin noted that Heads Creek Reservoir could increase to 2 billion gallons of storage and Still Branch Reservoir already has sufficient capacity (3.9 billion gallons) at normal (unraised) pool elevation. In its capital improvements plan, Griffin lists regular removal of siltation in Heads Creek Reservoir, which indicates active water volume management. Therefore, these two reservoirs do not appear currently in need of increased capacity.

Cane Creek Structure Number Two, in Meriwether County, was identified in the 2008 report. The nearest QWS, Manchester, obtains its surface water from different sources. Therefore, this reservoir is not likely to be used by an Upper Flint QWS.

Rush Creek Reservoir, in Talbot County, is a surface water supply source for Manchester. The 2008 report estimated that the current volume of 0.8 billion gallons could be expanded to 2.9 billion gallons. While this may be possible, given Manchester's decreased 2050 ADD (Table 3-1), coupled with Meriwether and Talbot Counties' (QWS) decreased 2050 population (Table A-1), this reservoir does not appear currently in need of increased capacity.

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

3.2.5 Georgia Soil and Water Conservation Commission Flood Control Dams

In the 2007 report *Inventory and Assessment of USDA/Soil and Water Conservation District Watershed Dams: Finding Report*, the Georgia Soil and Water Conservation Commission (GSWCC), Natural Resource Conservation Service, EPD, and consultants assessed existing watershed flood control dams that could be potentially modified to serve as water supply reservoirs (GSWCC, 2007). After 357 watershed dams were assessed, , 166 were prioritized for further evaluation based on environmental impacts, infrastructure impacts, and potential water supply yield. Twenty watershed dams were initially selected for more detailed studies. Eight additional watershed dams were evaluated in areas where "demand would exceed supply in the near future" (GSWCC, 2009).

The Upper Flint Region has ten watershed dams, four of which are in Meriwether County, five in Pike County, and one in Upson County. Five of these watershed dams were part of the 166 prioritized

watershed dams: Potato CR 006, Potato CR 056, Potato CR 058, Potato CR 066, and Potato CR 082. One watershed dam, Potato CR 082 in Pike County, was identified by GSWCC as a high-potential water supply reservoir in the 2009 study. Potato CR 082 is approximately 4.5 miles east of Zebulon (Pike County), approximately 4 miles west of Milner (Lamar County), approximately 15 miles north of Thomaston (Upson County), and approximately 9.5 miles south of downtown Griffin (Spalding County).

The GSWCC issued individual reports for each of the 28 high-potential water supply reservoirs. As explained in its individual report, Potato CR 082 was intended for Upson County, and specifically Thomaston (Schnabel, 2009). The report also noted that Pike County was initially considered as a withdrawal participant; but, the construction of Still Branch Reservoir preempted Pike County from consideration. Construction of a larger dam would increase the Potato CR 082 impoundment's surface area to 490 acres and the safe yield to approximately 5.1 MGD (including pumped water diversions from Potato Creek). Given Upson County's (QWS) and Thomaston's increased future ADD and decreased excess capacities, it is possible that this flood control dam could be used as a water supply reservoir. The individual report noted that its results should be used as screening information. Therefore, further studies should be performed before considering the Potato CR 082 impoundment as a water supply reservoir.

One of the 28 high-potential water supply reservoirs, Potato CR 078, is located approximately 3 miles northwest of Milner and approximately 6 miles south of Griffin. Although this watershed dam is in Lamar County and within the Middle Ocmulgee Water Planning Region, this potential water supply reservoir is relatively close to Griffin. Given Griffin's increased 2050 ADD and decreased 2050 excess capacity, relative to its 2015 values, Potato CR 078 may be a potential water supply reservoir for Griffin.

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

3.2.6 Quarries

Abandoned rock quarries may serve as potential water storage reservoirs, particularly during emergency or drought scenarios. Quarry wall stability, rock permeability, and geographic proximity are important considerations for site selection. Because the Upper Flint Water Planning Region is bisected by the fall line, both the Piedmont and Coastal Plain geologic regions are present. Piedmont geologic region bedrock and soils are generally igneous or metamorphic in origin and impermeable (unless fractured). Coastal Plain geologic region bedrock and soils are generally sedimentary in origin and permeable. Therefore, hard-rock (igneous or metamorphic) and mineral quarries are present in the Piedmont geologic region, while sand and gravel quarries are present in the Coastal Plain geologic region.

A GIS investigation was performed to assess the availability of quarries as potential reservoirs. A 5-mile radius was drawn around QWS municipal boundaries. The following cities were used as the radius origin for County Authority QWS: Thomaston for Upson County, Talbotton for Talbot County, Buena Vista for Marion County, and Ellaville for Schley County. For Spalding County, the entire west side of the county was investigated because Heads Creek Reservoir and the Flint River are on the county's west side. Aerial imagery was visually inspected to identify quarries. In addition, publicly available online quarry inventories were checked.

In the Upper Flint Region, three potential quarries were identified. USGS GIS data from *The State Geologic Map Compilation (SGMC) Geodatabase of the Conterminous United States* was used to identify quarry bedrock (Horton et al., 2017). In Spalding County, a seemingly active Vulcan Materials Company quarry exists approximately 6 miles west-southwest of downtown Griffin and approximately 4.6 miles east of the

Flint River. The quarry's bedrock is undifferentiated granite (Horton et al., 2017). Spalding County's (QWS) distribution system is in the vicinity of the quarry. Therefore, this quarry could serve as a potential future water storage reservoir. In Talbot County, two seemingly active quarries, one operated by Junction City Mining and one operated by Martin Marietta, exist approximately 3 and 5 miles, respectively, southeast of Talbotton. The quarries' bedrock is biotite gneiss, and they are positioned on the edge of the Georgia fall line (Horton et al., 2017). Talbot County's (QWS) distribution system is in the vicinity of the quarries. Therefore, these quarries could serve as potential future water storage reservoirs.

Consideration should be given to the technical issues important for development and operation of the reservoir, including the potential for water seepage from the reservoir through the jointed and fractured rock mass and the stability of the rock quarry slopes, environmental permitting requirements, and water quality considerations.

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

3.2.7 Aquifer Storage and Recovery

Aquifer Storage and Recovery (ASR) involves injecting treated water into an aquifer and later recovering the stored water for beneficial reuse, such as for drinking water supply. ASR offers a redundant water supply that can be accessed if aquifer storage is sufficient. EPD oversees the permitting and regulation of ASR projects, and to-date, EPD has not received ASR applications nor is aware of ASR projects in Georgia (EPD, 2021a). Therefore, each QWS should individually consider the feasibility of ASR.

3.3 Return Flow Reuse

There are two types of potable water reuse. Indirect potable reuse uses an environmental buffer, such as a lake, river, or a groundwater aquifer, before the water is treated at a drinking water treatment plant (EPD, 2021b). The *Indirect Potable Reuse Guidance Document* dated March 2021 describes the decision framework EPD uses to evaluate potential indirect potable reuse projects. Direct potable reuse involves the treatment and distribution of water without an environmental buffer. Potable water reuse provides another option for expanding a region's water resource portfolio.

Drinking water treatment and wastewater treatment typically occur in the same or nearby locations. When implementing direct potable reuse, the proximity of both wastewater and drinking water treatment may present considerable cost saving opportunities for municipalities. Some direct potable reuse systems may require additional water quality or process performance monitoring and/or an engineered storage buffer. In addition, because direct potable reuse has not been widely implemented, there is a lack of consensus in the scientific community about its safety. Therefore, each QWS should individually consider the feasibility of direct potable reuse.

The Upper Flint RWP identifies Management Practice RM1 to restrict the development of new land application systems for wastewater treatment (Upper Flint Water Planning Council, 2017). The Council's preference is for return flows via discharge to surface water rather than land application.

3.4 Current Interconnections Between Systems

Several QWS interconnections exist in the Upper Flint Region. Eight QWS indicated at least one interconnection with another public water system, and one QWS (Lake Blackshear) indicated one emergency outgoing interconnection with a recreation area (Veterans State Park). Outgoing

interconnections would need to be adjusted (e.g., infrastructure and potentially the water chemistry) such that a QWS would be able to receive water through the interconnections.

Figure 3-4 displays the available mapping data for the water region. As Figure 3-4 shows, multiple QWS are currently interconnected with another QWS, and several QWS have the potential to interconnect, which will be further discussed in Section 6.

3.5 Factors Affecting Availability of Water Supply

The viability of redundant water supply sources relies on certain factors, such as conveyance infrastructure, geographical barriers, permitting requirements, and source water quality compatibility.

3.5.1 Conveyance Factors

The feasibility of conveying water is a major consideration when assessing the practicality of using unused water sources to supply emergency water. Conveyance of water between two QWS or from new water sources would require construction of new pumping and piping infrastructure. The associated costs are key concerns and depend heavily on the proximity of the water source(s) to the QWS to be supplied. In addition, interconnections may be limited by natural obstructions, such as topography and surface water bodies, as well as man-made obstructions, such as roads, railroads, and buildings.

In general, groundwater systems are not interconnected in the Upper Flint Region due to the geographic distance between QWS and the relative ease of obtaining groundwater in this region below the Georgia fall line. Surface water systems are generally interconnected in the Upper Flint Region due to the cost and upkeep requirements of surface water reservoirs and water treatment plants (WTPs).

3.5.2 Water Withdrawal Permitting Factors

Any entity who withdraws, obtains, or utilizes groundwater in excess of 0.1 MGD must obtain a water withdrawal permit from EPD. Any entity who withdraws from, diverts from, or impounds waters of the state by more than 0.1 MGD on a monthly average basis must obtain a water withdrawal permit from EPD. The withdrawal permit identifies the permit expiration date, withdrawal purpose, withdrawal source, and standard conditions and special conditions for resource use. Table 3-1 shows the current peak permitted withdrawal limit for each QWS. For groundwater withdrawal permits, a daily peak can be above the permitted limit if the annual and monthly average withdrawals are below their respective limits. A short-term emergency water need met by excess capacity is likely to keep the QWS below their permitted values. If new water withdrawal sources are requested, they will be subject to EPD's permitting process and associated requirements, which will focus on the protection of both water quality and water quantity and take into consideration downstream impacts. The permit application may require a drought contingency plan, water conservation plan, a watershed protection plan, and/or reservoir management plan, where applicable. Therefore, water withdrawal permitting should be a key consideration when proposing new or expanded water withdrawal.

3.5.3 Water Quality Factors

Ten of the 15 QWS in this region utilize groundwater sources. Raw water treatment for these ten QWS is similar, although certain differences exist. Differences are mainly attributed to pumping from one of the multiple principal aquifer systems, which may differ in water quality compared to the other aquifers. Within an individual aquifer, localized water chemistry and heterogeneity can be further responsible for raw water quality differences and, therefore, treatment differences.

Three of the 15 QWS in this region utilize surface water sources. Raw water treatment for these three QWS is more robust and can vary. Differences are mainly attributed to pumping from one of the multiple surface water systems. Factors that may affect surface water source quality include land use, potential pollutant sources, nutrient loading, and storm events within the water supply basin. If a new surface water source is proposed, a source water assessment plan may be required to evaluate its suitability.

Finished water quality should be accounted for when considering QWS interconnections such that blended water does not cause mineral precipitates, unpalatable water, or corrosion of the system infrastructure components. If interconnections are designed for water to flow in one direction, reverse flows can be another source of undesirable finished water quality. Reverse flows may resuspend settled particles or dislodge pipe scale.

4.0 Emergency Planning Benchmarks

Total demand and reliability target values were calculated for current usage (2015, immediate reliability target) and future usage (2050, long-range reliability target). The total ADD was first calculated for each QWS based on the 2015 EPD-validated water audit values. In the event a QWS is not in that dataset, as identified in Table 2-3, QWS-provided values are reported. Then, tiered reliability targets were applied to each QWS's total demand to highlight where full supply of demand may not be available during some emergency scenarios. Redundant water supply may supplement existing water sources to meet demand during these scenarios.

4.1 Calculating Total Demand

Current total ADD was calculated as follows:

Total Demand = Raw Water Withdrawal
\+ Purchased Water (within county)
\+ Purchased Water (outside county)

The individual values were obtained through the data collection process identified in Section 2.1. Table 4-1 shows 2015 total demand and the values that sum to total demand, as well as 2050 total demand. Note that 2050 total demand is reported the same as 2050 ADD (Water Withdrawal Only) for QWS that do not purchase water. Section 3.1 and Appendix A describe the methodology for obtaining 2015 and 2050 ADD, which are presented in Table 3-1. The same methodology for obtaining 2050 ADD was used to obtain values for purchase-only QWS, and those calculations are described in Appendix A and shown in Table A-2 and Table A-3. Griffin's and Spalding County's values were sourced from the *City of Griffin Water Master Plan 2010-2050* (Engineering Strategies, 2011). Purchased water values were reported by QWS, and aggregate volumes were checked against the 2015 EPD-validated water loss audit, as available. Where available, total water used (including non-revenue water) is reported rather than billed water.

Total demand is counted for customers both internal and external (i.e., other QWS to which water is sold) to a QWS. For example, Griffin withdrew 8.85 MGD in 2015, of which 3.12 MGD was provided to Spalding County. This 3.12 MGD is also reported for Spalding County, which is appropriate because both Griffin and Spalding County require that amount of water to meet their total demand.

4.2 Reliability Targets

The WSIRRA states that an emergency plan should "evaluate risks and, where feasible, plan for a district-wide interconnection reliability target for immediate implementation of approximately 35% of the ADD and long-range district-wide interconnection reliability planning goal of approximately 65% of the ADD" (Senate Bill 380). These general targets provided preliminary benchmarks for emergency planning in the study and the current (i.e., year 2015) and long-range (i.e., year 2050) water demands that were calculated for each QWS. Therefore, for consistency with the MNGWPD study, the following reliability targets were used:

- 100% ADD (total demand)
- 65% ADD
- 35% ADD

The 35% and 65% reliability targets correspond to estimated usage associated with essential water needs. GEFA has identified customers with essential water needs as: hospitals, nursing home/assisted living facilities, correctional facilities, critical industry needs, and schools. It should be noted that demand includes both internal customers and external customers.

Table 4-2 shows each reliability target applied to the 2015 and 2050 water demands. The reliability targets were not compared with actual QWS essential water needs; they were compared to the total ADD. QWS should verify what their essential water needs are as they may be less than the 35% and 65% reliability targets. If their essential water needs are greater than the 35% and 65% reliability targets, the QWS should plan to achieve higher targets for emergency scenarios.

5.0 Water Supply Risk Evaluations

Water supply risks and corresponding emergency scenarios were identified for a statewide effort. Therefore, not every risk and scenario apply to the Upper Flint Region. To carry out the screening, specific system deficiencies (in volumetric demand) of the emergency scenarios and supply goals were calculated. Whereas Section 4 presented a general overview of the overall water availability under the reliability targets, Section 5 provides more specific information about how those reliability targets are applied to each QWS under emergency situations. The intent of Section 5 is to evaluate the capability of a QWS to supply sufficient water during a given emergency. Deficiencies from emergency situations were quantified for each QWS for current and future conditions. The maximum deficit (Critical Scenario Deficit) was determined for each QWS.

5.1 Emergency Scenarios

Table 5-1 shows the statewide water supply risks and emergency scenarios. Scenarios were assigned a duration and an evaluation selection criterion. Some of the QWS in the Upper Flint Region treat groundwater at each withdrawal well. For the purposes of this study, an individual well that receives water treatment is classified as a WTP. Alternately, a groundwater QWS can be designed with two or more wells in parallel supplying raw water to one WTP, as is the case for Americus and Montezuma. Water supply Risks A, B, C, D, G, and H are short-term defined durations, meaning less than 120 days, and often less than 3 days. Risks E and F are long-term undefined durations, meaning greater than 365 days and potentially having an indefinite duration.

Risks A through D are more traditional emergencies that are often addressed in an emergency response plan. These risks apply to systems that own drinking water infrastructure assets, whether they are pumps, WTPs, or distribution systems. These criteria were met for the QWS in this region, with exceptions for purchase-only QWS. Only Risk C applies to Spalding County, and only Risks B and C apply to Talbot County.

Risks E and F apply to QWS that receive water directly from the Allatoona Lake/Etowah River or Lake Lanier/Chattahoochee River systems. These two risks relate to the tri-state water litigation. Because the QWS in this region are not part of the specified lake/river systems, Risks E and F did not apply to QWS in this region.

Risk G applies to surface water QWS that have a raw water supply from a dammed reservoir. In the Upper Flint Region, Risk G applies to Griffin, Manchester, and Thomaston.

Risk H was assessed for the most vulnerable surface water QWS during a drought scenario. Risk H is often addressed by local governments in a water conservation plan, which outlines consumer practices that are either encouraged (voluntary) or enforced. Further, EPD has drought management rules, consistent with rules and regulations of the State of Georgia Chapter 391-3-30, that require public water systems to follow drought response strategies and actions during specified levels of declared drought. It was assumed that available raw water supply for each QWS is 40% of ADD due to drought. The screening criteria for Risk H are described below:

1. Small watersheds are defined as Hydrologic Unit Code (HUC)-10 watersheds less than 100 square miles (CH2M, Black & Veatch, 2017). The U.S. Department of Agriculture's Natural Resources Conservation Service Geospatial Data Gateway was used to obtain GIS data. Specifically, the

shapefile "10 Digit Watershed Boundary Dataset in HUC8" was used to calculate the area (in square miles) for HUC-10 watersheds.

2. Strahler Stream Order is a hierarchical method of categorizing streams by size. Strahler Stream Orders range from 1 (headwaters with no tributaries) to 12 (e.g., mouth of the Amazon River). For consistency with USGS literature on Georgia rivers (Elliott et al., 2014), major rivers in this study are defined as being Strahler Stream Order 6 or greater. The National Hydrography Dataset Plus, developed and maintained by the U.S. Environmental Protection Agency and USGS, is a collection of GIS and geospatial databases. It contains Strahler Stream Order as a "value added attribute," which was used to identify major rivers for the Upper Flint Region.

To meet the criteria, a QWS would need to have 1) a dammed reservoir in a small watershed; and/or 2) withdrawal is not from a major river. Because both criteria were not met for Upper Flint surface water QWS (see Appendix B for QWS-specific explanations) and Risk H is a short-term, defined scenario, Risk H does not apply to QWS in this region.

5.2 Methodology

Water supply risk evaluations were performed to understand the capability of a QWS to supply sufficient water during a given emergency. WTP capacity and QWS demand values reported correspond to the values and concepts described in Sections 3 and 4. Note that the reliability target values were determined as described in Section 4.2. They are constants that do not depend on the emergency scenarios. The following process was performed for both 2015 and 2050 water supply risk evaluations.

Deficit was calculated as follows:

Deficit = Available Water Supply
- Reliability Target Demands

Where:

Available Water Supply = Peak Day Design Capacity
+ Maximum Possible Purchased Water Supply
+ Stored Water (Scenarios A1, B, D1, D2)
- Capacity Loss Due to Emergency

For a given QWS, each WTP peak day design capacity was identified as described in Appendix A. For surface water QWS, the smaller of the peak day design capacity value and the peak permitted withdrawal value (24-hr maximum) was used for the available water supply calculation. For this region, permit limits do not affect the available water supply calculation. The maximum possible purchased water supply (applicable to QWS with interconnections) and stored water (applicable only to Scenarios A1, B, D1, and D2) were then added. Other than water supply Risk C, each emergency scenario prescribes a situation that involves a QWS-wide capacity loss (e.g., critical asset failure). The available water supply is thus the capacity remaining after the loss was subtracted and the source, purchased, and stored water were added, as applicable.

The deficit for both 2015 and 2050 was then calculated by subtracting the reliability target demands from the available water supply. In the case of a negative deficit, meaning there is more available water supply than demand, the deficit is reported as zero.

5.3 Key Assumptions

Table 5-1 presents key assumptions specific to each scenario. The following key assumptions apply to all scenarios and the corresponding deficit calculations:

- Only one QWS-wide emergency occurs at a time (i.e., Scenarios A1 and C do not occur simultaneously).
- Only one region-wide emergency occurs at a time (i.e., both Griffin and Thomaston do not experience an emergency) except for Risk H (drought).
- The 2050 available water supply accounts for additional capacity due to planned capital improvements. (Americus, Cordele, Griffin, and Vienna each provided an estimated increase in water capacity due to planned capital improvements.)
- Under an emergency scenario, QWS permit restrictions are followed.
    - For groundwater withdrawal permits, a daily peak can be above the permitted limit if the annual and monthly average withdrawals are below their respective limits. Scenario A2 (30 days) is the only applicable scenario in which monthly average emergency withdrawals may approach permit limits. All groundwater QWS in this region have backup equipment available, rendering no capacity loss for Scenario A2. Therefore, permit limits are assumed to be followed.
    - For surface water withdrawal permits, a daily peak must adhere to the 24-hour maximum withdrawal limit. If a longer emergency scenario requires a QWS to exceed their permitted withdrawal limit, QWS may do so given EPD approval. Under Water Quality Control Rule 391-3-6-.07(9)(b), systems may receive a temporary permit modification to exceed existing permitted withdrawal limits for emergencies lasting less than 180 days (Ga. Comp. R. & Regs. r. 391-3-6-.07).
- As applicable, a QWS indefinitely maintains its current infrastructure, backup power, and backup equipment.
- As applicable, a QWS indefinitely maintains its current permitted withdrawal limits and existing water sale/purchase contracts and interconnections.

5.4 Evaluation Results

Table 5-2 summarizes calculated deficits by QWS for 2015 and 2050. As noted above, Risks A, B, C, D, and G applied to the Upper Flint Region. One QWS, Manchester, had a 2015 total demand deficit (i.e., 100% ADD). Manchester's deficit caused 65% ADD and 35% ADD deficits. Three QWS had a 2050 total demand deficit: Griffin, Manchester, and Schley County. Manchester's deficit caused 65% ADD and 35% ADD deficits, and Griffin's deficits caused a 65% ADD deficit. Detailed available water supply and deficit calculations by QWS are provided in Appendix B. Figure 5-1 is a summary schematic of QWS 2050 ADD, deficits, and interconnections. This figure demonstrates QWS potential future water withdrawal and sharing.

Surface water QWS in the Upper Flint Region perform less favorably when faced with the emergency scenarios because their often single WTP design lacks inherent redundancy. Chemical treatment redundancy and unit process redundancy can be part of the WTP design, but Risk G is especially difficult for surface water QWS to address. Manchester is particularly vulnerable because with only one WTP and no active interconnections, Risk G leaves Manchester with no available water supply. Therefore, its deficit equals its demand.

Groundwater QWS in the Upper Flint Region perform well when faced with the emergency scenarios because their multi-well, multi-WTP design offers inherent redundancy. South of the Georgia fall line, the overall flat topography of the region also allows for QWS to have a systemwide distribution system positioned mainly within the city limits rather than across multiple pressure zones. This means that if one WTP fails, large portions of the system will not be without water. Another reason that QWS do not have deficits is because in general, their ADD is relatively low compared to their available water supply, which is primarily driven by peak day design capacities.

Upson County demonstrates the benefits of interconnections. Despite relatively low peak day design capacity (0.4 MGD) and limited redundancy, which led to low 2015 excess capacity (0.1 MGD) and no 2050 excess capacity (-0.2 MGD; see Table 3-1), Upson County has no total demand deficit because of its interconnections with Thomason. Its capacity losses are essentially negligible compared to its maximum possible purchased water. Although Upson County's maximum possible purchased water value is unlikely to be fully met by Thomaston (limited by peak day design capacity and ADD), Upson County would likely not approach the maximum possible purchased water based on their 2015 ADD (0.4 MGD) and 2050 ADD (0.6 MGD). Therefore, Thomaston would likely be able to fulfil Upson County's full capacity, if needed.

For QWS experiencing more than one deficit, the highest deficit with the longest duration and/or highest relative likelihood, or the Critical Scenario Deficit, was selected for further evaluation. The Critical Scenario Deficit, if applicable, is highlighted in gray in Table 5-2. If a QWS does not have a Critical Scenario Deficit, the scenario rendering a given QWS with the least available water supply was selected for further evaluation.

6.0 Evaluation of Potential Projects

The water supply risk evaluations estimated the immediate and long-range potential emergency deficits for each QWS in the Upper Flint Region. As described in Section 5.4 and Table 5-2, three Upper Flint QWS have a 2050 deficit, and the Critical Scenario Deficit was selected for further evaluation. If a QWS does not have a Critical Scenario Deficit, the scenario(s) rendering a given QWS with the least available water supply was/were further evaluated. Potential conceptual-level redundancy projects were developed for a QWS based on their reduced water supply, available information, cost of implementation, and other criteria. These projects may include, but are not limited to, internal infrastructure redundancy, new interconnections, and upgrades to existing interconnections.

6.1 Potential Projects

Emergency scenarios affecting QWS, as detailed in Appendix B, were evaluated for the feasibility of a potential project to address capacity losses. Beyond QWS with a Critical Scenario Deficit, if QWS 2050 available water supply was less than two times their 2050 total demand, a project was recommended. Thus, not all QWS have recommended projects. This was done to prioritize logical, implementable projects for QWS with less available water supply relative to other QWS. Note that Griffin, as its water supplier, maintains Spalding County's assets. Therefore, potential projects recommended for these two QWS are mutually beneficial. The starting point for identifying a potential project is deciding if it will be an interconnection project (new or upgrade to existing) or internal infrastructure redundancy project. For potential projects, the following considerations were taken, as applicable:

- Potential environmental impacts
- Withdrawal permit impacts
- Water quality impacts
- Community impacts

The above four considerations are applicable to interconnection projects. Interconnection projects can address emergency scenarios A1, A2, B, D1, D2, G, and H. Depending on the project, the above four considerations are sometimes applicable to internal infrastructure redundancy projects. Table 6-1 identifies certain internal infrastructure redundancy projects for certain emergency scenarios.

For the Upper Flint Region, four types of projects are recommended: 1) new interconnection, 2) upgrade to existing interconnection, 3) restore existing interconnection, and 4) new well and WTP (which includes a backup generator) to supply internal infrastructure redundancy. Internal infrastructure redundancy projects highlight the potential for a future management practice: encourage public water systems to enhance their water supply redundancy and treatment/unit process redundancy. Table 6-2 shows the potential projects and provides the emergency scenarios addressed, maximum capacity added, and impact considerations.

Potential environmental impacts vary widely across project types. Recall that the cumulative impact of Flint River Basin municipal and industrial groundwater withdrawals "on stream-aquifer flux and the regional groundwater budget is negligible" (EPD, 2006). Local gaps may occur if withdrawal rates exceed aquifer or surface water sustainable yield. Therefore, stream-aquifer impacts due to short-term municipal withdrawal increases during emergencies are not considered to be significant environmental impacts for this region. Designations and impacts by project type are detailed below.

- For interconnection projects, impacts due to excavation (for pipelines), stream crossings, and wetlands disturbance were considered, as applicable. The relative difficulty of permitting steps is implied for the following designations. A "low" designation was applied to a potential project if known streams/wetlands are not likely affected and if offsite excavation is less than 200 feet. A "medium-low" designation was applied if known streams/wetlands are not likely affected and if offsite excavation is greater than 200 but less than 5,000 feet. A "medium-high" designation was applied if known streams/wetlands may be affected and/or if offsite excavation is greater than 200 but less than 5,000 feet. A "high" designation was applied if more than 5,000 feet of offsite excavation is needed and/or wetlands are likely affected and/or a stream crossing is likely needed. A list of threatened/endangered species was not compiled for each potential project. Prior to construction, a review of site-specific threatened/endangered species should be conducted. Cost and permitting requirements may increase if species or critical habitats are impacted.

- Based on the groundwater demands of certain QWS in this region, one of the potential projects is a new well and groundwater WTP. For new well and WTP projects, impacts due to drilling, regional groundwater resource gaps, and excavation (for pipelines) were considered, as applicable. A "medium-low" designation was applied as the baseline due to drilling/excavation-related activities. Designations were applied for regional resource gaps by aquifer: "medium-low" was applied if no gaps were identified; "medium-high" was applied if aquifer withdrawals are within the aquifer's estimated sustainable yield; "high" was applied if aquifer withdrawals are above the aquifer's estimated sustainable yield. Designations were applied for excavation in the same way as interconnection projects.
    - The new well and WTP project considered for this region includes a backup generator. The potential environmental impacts of a backup generator include fuel storage, stormwater runoff control, and air permitting requirements. Cost and permitting requirements may increase depending on QWS-specific site conditions, electrical loading requirements, and electrical infrastructure layout.

Water withdrawal permit factors are described in Section 3.5.2. For groundwater QWS, the QWS' 2050 ADD was compared to current monthly average permitted withdrawal limits (Table 3-1) to understand their ability to supply water to another QWS experiencing an emergency. Note that monthly average permitted withdrawal is higher than annual average permitted withdrawal for groundwater systems. Using monthly average values is appropriate because of the short-term, defined duration scenarios considered. For surface water QWS, the potential projects (Projects 2 through 5) involve one-way interconnections into the QWS from non-Upper Flint QWS. Thus, Upper Flint QWS do not have withdrawal permit impacts. Instead, the MNGWPD study was referenced for Clayton County and Henry County, the Middle Ocmulgee Water Planning Region data were referenced for Butts County/Jackson/Jenkinsburg, and information was collected from Warm Springs. A "low" designation was applied to a potential project if permit withdrawal limits would not limit the maximum capacity added. A "medium-low" designation was applied if permit withdrawal limits would limit the maximum capacity added by 1-49%, and a "medium-high" designation was applied if permit withdrawal limits would limit the maximum capacity added by 50-99%. A "high" designation was applied if permit withdrawal limits would completely limit the maximum capacity added.

Water quality factors are described in Section 3.5.3. A "low" designation was applied to a potential project if water treatment (e.g., treatment chemicals, chemistry, and processes) is compatible between QWS. For example, if chlorination and fluoridation, a common treatment scheme for groundwater systems, are used

at both QWS. A "medium-low" designation was applied if one water treatment type differs between QWS, and a "medium-high" designation was applied if two water treatment types differ. A "high" designation was applied if water treatment significantly differs between QWS. For example, if three or more treatment types differ or if groundwater QWS and surface water QWS exchange water. If an interconnection project progresses beyond the planning-level evaluation discussed in this report, water chemistry analyses and hydraulic flow modeling should be conducted to assess both systems' abilities to exchange water.

Community impacts include excavation, easement/right of way acquisition, and multijurisdictional agreements. For the purposes of this project, easement/right of way considerations are included in approximated offsite excavation distances. A "low" designation was applied to a potential project if it occurs entirely on QWS property. A "medium-low" designation was applied if offsite excavation is less than 200 feet and/or a multijurisdictional agreement is needed. A "medium-high" designation was applied if offsite excavation is greater than 200 but less than 5,000 feet and/or a multijurisdictional agreement is needed. A "high" designation was applied if offsite excavation is more than 5,000 feet and/or a multijurisdictional agreement is needed.

6.1.1 Interconnections

Six interconnection projects were evaluated. QWS modifications for interconnection projects include connecting, metering, pumping, and operation and maintenance requirements of new pipelines and associated appurtenances. The maximum capacity added (in MGD) from a potential project is an important factor that depends on each specific project's details. Interconnection project pipe diameter, average system pressure, QWS future excess capacity, and maximum capacity added are detailed in Table 6-3. Additional information is provided below.

- Project 1 – Americus and Schley County QWS water mains are within 50 linear feet and one interconnection option exists along Lacross Road. Figure 6-1 shows large-scale available mapping data for these QWS. Americus's existing pipe diameters in the area of interest typically range from 12 inches to 16 inches. Schley County's existing pipe diameters in the area of interest are 8 inches. Approximately 50 feet of 8-inch diameter ductile iron pipe (DIP) is estimated for this project.
- Project 2 – Griffin/Spalding County QWS and Clayton County are interconnected along Wildwood Road near the Spalding County and Clayton County lines. Spalding County-provided GIS data indicate a 6-inch diameter interconnection, although Griffin reported an 8-inch diameter interconnection. Figure 6-2 shows large-scale available mapping data for these systems. To upgrade the interconnection, approximately 2.82 miles of 12-inch diameter DIP is estimated to tie-in to the existing 12-inch diameter Spalding County loop.
- Project 3 – Griffin/Spalding County QWS and Henry County are interconnected along Hillview Road near the Spalding County and Henry County lines. It is currently an 8-inch diameter interconnection. Figure 6-3 shows large-scale available mapping data for these systems. To upgrade the interconnection, approximately 0.6 miles of 12-inch diameter DIP is estimated to tie-in to the existing 12-inch diameter Spalding County loop. Excavation would involve crossing a railroad track.
- Project 4 – Griffin/Spalding County QWS and Butts County/Jackson/Jenkinsburg are interconnected along Jackson Road near the Spalding County and Butts County lines. It is currently an 8-inch diameter interconnection. Figure 6-4 shows large-scale available mapping

data for these systems. To upgrade the interconnection, approximately 4.2 miles of 12-inch diameter DIP is estimated to tie-in to the existing 12-inch diameter Spalding County loop.

- Project 5 – Manchester QWS and Warm Springs are interconnected along Roosevelt Highway. It is currently a 4-inch diameter, 2.5-mile inoperable interconnection. The interconnection would be restored rather than upgraded.
- Project 6 – Montezuma and Oglethorpe QWS water mains are within 1 linear mile and one interconnection option exists along Riverview Drive/Walnut Street. Figure 6-5 shows large-scale available mapping data for these QWS. Montezuma's existing pipe diameters in the area of interest typically range from 2 inches to 8 inches. Oglethorpe's existing pipe diameters in the area of interest are 8 inches. Approximately 1 mile of 6-inch DIP is estimated for this project. Water head loss due to pipe friction, pipe bends, and elevation changes becomes a more important factor when pipelines extend for longer distances. Booster pump stations are needed to overcome head losses. A 50-horsepower pump was estimated to convey water from Montezuma to Oglethorpe and from Oglethorpe to Montezuma.

Schley County's current permitted monthly average withdrawal is 0.6 MGD. Schley County may need to request an increased permit limit, particularly because their 2050 total demand (1.1 MGD) is above this withdrawal limit and their 2050 scaled excess capacity sufficiency is the lowest relative to other Upper Flint QWS, excluding Upson County.

The above-mentioned interconnection projects are not a comprehensive list of all possible interconnections. Per Table 2-2, mapping data were not available or not complete for all QWS. Therefore, only select interconnections are discussed where data are available.

6.1.2 Internal Infrastructure Redundancy

As shown in Table 6-2, potential Project 7 is a new well and WTP to supply internal infrastructure redundancy. This project type can address emergency scenarios A1, A2, B, D1, D2, G, and H. QWS modifications for new well and WTP projects include the ability to site and manage a new well/WTP, connect treated water to the distribution system, and potentially increase permit limits. The maximum capacity added (in MGD) was estimated based on QWS-specific information. Unadilla's current permitted monthly average withdrawal is 1.15 MGD. Unadilla would likely not need to request an increased permit limit based on their 2050 total demand. A new generator to supply internal infrastructure redundancy is included in this potential project. QWS modifications for generators include the ability to connect and store a backup generator. The maximum capacity (in MGD) of a generator was assumed to be the peak day design capacity of the well/WTP receiving the generator.

6.2 Planning-Level Costs

Planning-level costs were estimated for potential redundancy projects in one of three ways: RSMeans (a construction cost estimating software), manufacturer prices, or the EPD *Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison*. Estimated unit prices represent rough order of magnitude project prices based on assumptions summarized in the following sections. A macro-level, approximate project timeframe in months was also scoped out for each project. For interconnection projects, it was assumed that multijurisdictional agreements and procurement would take 6 months, engineering design and hydraulic modeling would take 4 months, and procurement of materials and

construction would take a minimum of 2 months. If a project requires a booster pump station, an extra 4 months was added to the materials procurement and construction time. For restoring the existing interconnection between Manchester and Warm Springs, 6 months was assumed. For new well and WTP projects, it was assumed that procurement and permitting would take 6 months, engineering design and hydraulic modeling would take 4 months, and drilling and construction would take a minimum of 2 months. Planning-level costs and macro-level timeframes are presented in Table 6-4.

6.2.1 Interconnections

Pipeline costs were estimated per linear foot of pipe. Manufacturer prices were obtained for several standard DIP sizes between 4 and 60 inches. Prices were adjusted to include a 20% mark-up for taxes and contractor overhead and profit. RSMeans was used to estimate excavation, backfill, and installation costs. Erosion control, sediment control, site clearing, and site grading considerations were also included. Construction mark-ups, including mobilization, temporary facilities, quality control testing, administration, and oversight, were 23% and applied to the subtotal construction unit prices. Additional mark-ups, including engineering design, permitting, and overall contingency, were 31% and applied to the subtotal construction unit prices and construction mark-ups. These cost estimates do not include land acquisition costs.

An underground concrete vault was assumed for interconnection locations such that valves can be manually opened/closed. RSMeans was used to estimate concrete vault construction, valves, water meters, and associated appurtenances. Mark-ups include installation mark-ups and overall contingency.

RSMeans was used to estimate booster pump and motor costs, while a parametric cost estimating formula was used to estimate booster pump station (structure, appurtenances, electrical system) costs. Mark-ups include construction mark-ups, engineering design, and overall contingency.

For restoring the existing interconnection between Manchester and Warm Springs, a value was estimated to encompass potential work involved based on engineering judgement. This value is consistent with the MNGWPD study, and the value will need to be adjusted based on site-specific information.

In addition to water head loss, operational pressure differences between interconnections may require a booster pump station or additional appurtenances to establish a functional interconnection. Therefore, hydraulic modeling is necessary to establish interconnection feasibility before a project can advance beyond this planning-level stage.

6.2.2 Internal Infrastructure Redundancy

New well and WTP costs were estimated from the EPD supplemental guidance document. The document provides unit costs for anticipated water management practices, of which "WS-3 New Groundwater Sources" and "WT-1 Water Treatment Plant (New)" were applicable (EPD, 2011). The middle-range cost was assumed to be representative for Unadilla's proposed new well and the low-range cost was assumed to be representative for Unadilla's proposed new WTP because of the relatively fewer treatment components for groundwater QWS. The 2011 costs were brought to 2021 dollars using the Engineering News-Record's Construction Cost Index. The unit costs were multiplied by the number of units (0.50 MGD for Project 2's maximum capacity added) and the sum appears as the additional cost in Table 6-4. Applicable pipeline costs were also estimated for this project type.

The generators considered have a standby rating, meaning they can supply power for short-term, defined durations, as opposed to a prime rating, which is meant for power needs when a system is not regularly wired to the electrical grid. QWS-specific electrical loads and configurations are needed to accurately scale and cost a generator. Therefore, a relationship between known QWS peak day design capacity and generator power was developed to estimate the generator power needed for a proposed project. Prices were then estimated based on generator power needed.

7.0 Recommended Projects

Once potential projects were identified and planning-level costs were estimated, potential projects were then prioritized based on performance under weighted quantitative and qualitative criteria. Using a decision-based prioritization tool, absolute and weighted scores were calculated for each potential project. The options were then ranked using defined criteria (e.g., cost, potential environmental impacts). A sensitivity analysis was undertaken to test the influence of the criteria weightings on the project rank outcome. Ranking reflects projects that will most benefit the Upper Flint Water Planning Region as a whole.

7.1 Prioritization Approach

Potential project prioritization was done to compare complex information among QWS. Quantitative and qualitative scoring criteria and weighting were selected to reflect the objectives of the redundancy study. Table 7-1 presents the scoring criteria and their weighting.

Scores were assigned either 1, 2, 3, or 4. A score of 1 implies a lower overall benefit of a potential project (e.g., relatively low maximum capacity added, high cost, and high impacts), while a score of 4 implies a higher overall benefit of a potential project (e.g., relatively high maximum capacity added, low cost, and low impacts). For interconnection projects, which have the capacity to benefit multiple water systems, select criteria were assigned the average of the two interconnecting system scores. These criteria include Criterion 4 (Added Capacity as a Percent of Total Demand), Criterion 7 (Potential System and Community Impacts), and Criterion 8 (Excess Capacity Index). For example, Project 1 (Americus - Schley County interconnection) received a Criterion 8 score of 1 for Americus and 3 for Schley County. The assigned score was the average of these individual scores, resulting in a score of 2. For Criterion 3 (Critical Scenario Duration), if no Critical Scenario Deficit exists and if multiple scenarios are addressed, the highest day duration of the scenarios addressed was used to assign a score. Non-weighted values were summed and divided by the applicable number of criteria to obtain an absolute score. The larger the absolute score, the more beneficial the potential project.

Criterion weights were assigned either 1, 2, or 3, with 1 holding less decision weight and 3 holding the most decision weight. Initial weights were assigned based on professional judgement and later tested with a sensitivity analysis. Criterion scores were multiplied by criterion weights. Values were summed and divided by the applicable number of criteria to obtain a weighted score. The larger the weighted score, the more beneficial the potential project.

Table 7-2 shows each criterion metric and its corresponding assigned score for this region's potential projects, as well as their absolute and initial weighted scores. In addition, cost per 1 MGD yield and cost per individual supplied were calculated. Table 7-3 is a decision-making summary to present the decision metrics for each potential project. An initial manual rank was assigned to each potential project based on initial weighted scores. In the case of a tie, such as Project 2 and Project 4, the absolute score was considered, and in the case of a further tie, the lower cost per individual supplied broke the tie.

7.2 Sensitivity Analysis

A sensitivity analysis was conducted to test the influence of criterion weightings on the initial manual rank outcome. First, all criteria were assigned the highest weight (3). The effect of this weighting adjustment is equivalent to the absolute score because although it amplified score values, the rank outcome was the

same. Second, one of the eight criteria was assigned the highest weight (3) with the remaining seven criteria assigned the lowest weight (1). The effects of these weighting variations are described in Appendix C. The sensitivity analysis results demonstrate that certain criteria are somewhat sensitive to weighting. Initially assigned weights were retained nonetheless, and sensitivity analysis results can qualify the weighted scores.

7.3 Recommended Projects

With weighting reasonably assigned, as demonstrated by the sensitivity analysis results, the final manual ranks equal the initial manual ranks, which appear in Table 7-3. It is recommended that decision making priority be given to potential projects with higher rank order because the order accounts for the foremost quantitative and qualitative criteria pertinent to water supply redundancy.

Regarding interconnection projects, fair and equitable project cost allocation to each beneficiary can be achieved in several ways. First, if an interconnection primarily benefits one QWS (purchaser), that QWS will likely bear the majority of costs. The provider QWS will financially benefit if water is sold to the purchaser; thus, the provider may bear some of the costs. Second, if an interconnection primarily benefits one QWS but also adds redundancy for the provider QWS, the provider QWS may bear further costs, such as assisting with immediate costs and/or operation and maintenance costs. Third, if an interconnection mutually benefits both QWS, a cost allocation strategy would be appropriate. Such strategies can be based on QWS population served, ADD, added capacity as a percent of total demand, or other creative approaches.

7.4 Conclusion

The purpose of the Water Supply Redundancy Study is to increase Georgia's water supply solvency and reliability. This study evaluated drinking water supply, demand, treatment, storage, distribution, and interconnectivity to identify redundant water supply sources capable of providing backup water supply for each QWS.

Fifteen QWS in the Upper Flint Water Planning Region were evaluated for water supply redundancy. QWS data were collected, summarized, and evaluated for current and future conditions. Redundant water supply sources were explored, and water supply risk evaluations were conducted. Potential redundancy projects were conceptualized and costed for QWS left with notably reduced water supply during an emergency scenario. Potential projects were scored via a decision-based prioritization tool using weighted quantitative and qualitative criteria and subsequently ranked. Table 7-4 presents the potential projects sorted by final rank order. This study illustrated opportunities for improved QWS water supply redundancy and resiliency when faced with potential emergencies in the Upper Flint Water Planning Region.

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TABLES

Table 2-1
Key General Information

County	Qualified Water System	Public Water System Identification Number	Estimated Population Directly Served[1]	Estimated Consecutive Population Served[2]	Raw Water Source(s)[3]	Regular Purchases 2015-2019[4]	Irregular / Emergency Purchases 2015-2019[4]	Regular Sales 2015-2019[4]	Irregular / Emergency Sales 2015-2019[4]
Sumter	Americus	GA2610000	16,100	0	Groundwater Wells (6)	-	-	-	-
Crisp	Cordele	GA0810001	11,200	0	Groundwater Wells (6)	-	-	-	-
Spalding	Griffin	GA2550000	23,500	100,000	Surface Water (3)	-	-	Spalding County Coweta County Zebulon Williamson Butts County	-
Crisp	Lake Blackshear	GA0810064	3,500	0	Groundwater Wells (2)	-	-	-	-
Meriwether	Manchester	GA1990003	4,000	2,700	Surface Water (2)	-	-	Talbot County	-
Marion	Marion County	GA1970003	3,300	0	Groundwater Wells (3)	-	-	-	-
Macon	Montezuma	GA1930002	3,000	0	Groundwater Wells (4)	-	-	-	-
Macon	Oglethorpe	GA1930003	3,800	0	Groundwater Wells (3)	-	-	-	-
Schley	Schley County	GA2490004	2,500	2,100	Groundwater Wells (2)	-	-	Ellaville Andersonville	-
Spalding	Spalding County	GA2550036	40,400	0	Wholesale Purchase	Griffin	-	-	-
Talbot	Talbot County	GA2630005	3,300	400	Wholesale Purchase	Manchester Columbus	-	Geneva Harris County	-
Upson	Thomaston	GA2930000	12,500	5,700	Surface Water (3)	-	-	Upson County Lincoln Park	-
Dooly	Unadilla	GA0930003	3,600	0	Groundwater Wells (3)	-	-	-	-
Upson	Upson County	GA2930010	4,900	0	Groundwater Wells (2)	Thomaston	-	-	-
Dooly	Vienna	GA0930004	3,900	0	Groundwater Wells (6)	-	-	-	-

Prepared by: GJH 10/15/20
Checked by: KMD 10/26/20

Notes:

1. The population that the system directly sells water to, rounded to the nearest 100.
2. The population benefited from the system's sale to another system, rounded to the nearest 100.
3. The value in parentheses indicates the number of sources.
4. Purchases/sales are from/to other water systems.

Table 2-2
Mapping Data Received

			Level of Mapping Data Received					
County	**Qualified Water System**	**Estimated Population Directly Served[1]**	**No Mapping Data**	**Hard Copy/PDF Maps**	**Digital Mapping Data - GIS**	**Digital Mapping Data - CAD**	**Digital Mapping Data - Google Earth**	**Hydraulic Computer Model**
Sumter	Americus	16,100			◊			
Crisp	Cordele	11,200		◊		◊		
Spalding	Griffin	23,500		◊	◊			
Crisp	Lake Blackshear	3,500		◊				
Meriwether	Manchester	4,000	◊					
Marion	Marion County	3,300	◊					
Macon	Montezuma	3,000		◊				
Macon	Oglethorpe	3,800		◊				
Schley	Schley County	2,500		◊				
Spalding	Spalding County	40,400		◊	◊			
Talbot	Talbot County	3,300		◊				
Upson	Thomaston	12,500			◊			
Dooly	Unadilla	3,600	◊					
Upson	Upson County	4,900			◊			
Dooly	Vienna	3,900		◊				

Prepared by: GJH 10/15/20
Checked by: KMD 10/20/20

Notes:

1. The population that the system directly sells water to, rounded to the nearest 100.

Table 2-3
Reports and Documents Received

			Reports and Documents Received[3]								
County	**Qualified Water System**	**Estimated Population Directly Served[1]**	**Comprehensive / Capital Improvement Plan[2]**	**Permits**	**Sanitary Survey[4]**	**Water Sale / Purchase Agreements**	**Water Conservation Plan**	**Consumption / Withdrawal Reports**	**Insurance Services Office Report**	**2015 Water Loss Audit[4]**	**Emergency Response Plan**
Sumter	Americus	16,100	◊	◊	◊		◊	◊		◊	◊
Crisp	Cordele	11,200	◊	◊	◊		◊			◊	
Spalding	Griffin	23,500	◊	◊	◊	◊	◊	◊		◊	◊
Crisp	Lake Blackshear	3,500		◊	◊			◊			
Meriwether	Manchester	4,000	◊	◊	◊					◊	
Marion	Marion County	3,300	◊	◊	◊						
Macon	Montezuma	3,000	◊	◊	◊					◊	
Macon	Oglethorpe	3,800	◊	◊	◊		◊			◊	◊
Schley	Schley County	2,500	◊	◊	◊						◊
Spalding	Spalding County	40,400	◊	◊	◊	◊	◊			◊	◊
Talbot	Talbot County	3,300	◊		◊					◊	
Upson	Thomaston	12,500	◊	◊	◊					◊	
Dooly	Unadilla	3,600	◊	◊	◊						
Upson	Upson County	4,900	◊	◊	◊	◊		◊		◊	
Dooly	Vienna	3,900	◊	◊	◊		◊	◊		◊	

Prepared by: GJH 10/15/20

Checked by: KMD 10/26/20

Notes:

1. The population that the system directly sells water to, rounded to the nearest 100.
2. The Georgia Department of Community Affairs website contained comprehensive plans.
3. Some systems provided additional, potentially relevant documents.
4. EPD supplied recent sanitary surveys and 2015 water audits for many systems. The Unadilla-provided values are reported rather than 2015 water audit values for that system.

Table 3-1
Current and Future Excess Capacity

County	Qualified Water System (QWS)	Raw Water Source(s)[1]	2015 Peak Day Design Capacity (MGD)	2015 ADD (MGD) (Water Withdrawal Only)[2]	2015 Excess Capacity (MGD)	Current Peak Permitted Withdrawal (MGD)[3]	2050 Peak Day Design Capacity (MGD)[4]	2050 ADD (MGD) (Water Withdrawal Only)[5]	2050 Excess Capacity (MGD)
Sumter	Americus	Groundwater Wells (6)	6.9	2.4	4.5	4.2	11.2	1.3	9.9
Crisp	Cordele	Groundwater Wells (6)	9.3	1.7	7.6	4.1	10.8	1.1	9.7
Spalding	Griffin	Surface Water (3)	25.2	8.9	16.3	111.2(6)	37.2	23.8	13.4
Crisp	Lake Blackshear	Groundwater Wells (2)	2.4	0.3	2.1	1.0	2.4	0.334	2.1
Meriwether	Manchester	Surface Water (2)	2.0	1.1	0.9	6.3(6)	2.0	0.5	1.5
Marion	Marion County	Groundwater Wells (3)	2.7	0.9(7)	1.8	1.3	2.7	0.5	2.2
Macon	Montezuma	Groundwater Wells (4)	0.5	0.4	0.1	1.25	0.5	0.3	0.1
Macon	Oglethorpe	Groundwater Wells (3)	1.9	0.5	1.4	0.75	1.9	0.4	1.5
Schley	Schley County	Groundwater Wells (2)	1.5	0.3	1.1	0.6	1.5	1.1	0.3
Spalding	Spalding County	Wholesale Purchase	NA	NA	NA	NA	NA	NA	NA
Talbot	Talbot County	Wholesale Purchase	NA	NA	NA	NA	NA	NA	NA
Upson	Thomaston	Surface Water (3)	6.0	1.6	4.4	11.8(6)	6.0	2.4	3.6
Dooly	Unadilla	Groundwater Wells (3)	0.7	0.5	0.2	1.15	0.7	0.5	0.2
Upson	Upson County	Groundwater Wells (2)	0.4	0.4	0.1	0.47	0.4	0.6	-0.2
Dooly	Vienna	Groundwater Wells (6)	9.1	1.6	7.5	2.609	9.3	0.9	8.4
Totals			**68.6**	**20.5**	**48.1**	**146.7**	**86.7**	**33.8**	**52.8**

Prepared by: GJH 01/08/21

Checked by: LCT 01/26/21

Notes:

ADD - average daily demand

MGD - million gallons per day

NA - not applicable because these are purchase-only QWS

QWS - qualified water system

1. The value in parentheses indicates the number of sources.
2. 2015 EPD-validated water loss audit values are reported. In the event a QWS is not in that dataset, as identified in Table 2-3, QWS-provided values are reported.
3. Values for groundwater systems are MGD - monthly average; values for surface water systems are combined (if multiple permits) MGD - 24-hour max.
4. Americus indicated taking Well 11 online (2.16 MGD) and a new well (2.16 MGD); Cordele indicated a new well (1.5 MGD); Griffin indicated expanding a WTP by 12 MGD; Vienna indicated a new well (2.16 MGD) to replace two old wells (combined 1.9 MGD).
5. Municipal and publicly-supplied industrial demand by county were allocated to each QWS. Griffin's values are from *City of Griffin Water Master Plan 2010-2050* (Engineering Strategies, 2011).
6. Surface water permitted withdrawal values include withdrawals for immediate water treatment and for reservoir filling.
7. 2018 EPD-validated water audit value is reported because Marion County did not appear in 2015-2017 water audits.

Table 4-1
Total Water Demands

County	Qualified Water System (QWS)	2015 ADD (MGD) (Water Withdrawal Only)	2015 Regular Purchased Volume - Outside County (MGD)[1]	2015 Regular Purchased Volume - Inside County (MGD)[1]	2015 Total Demand (MGD)	2050 Total Demand (MGD)
Sumter	Americus	2.43	0.00	0.00	2.43	1.31
Crisp	Cordele	1.69	0.00	0.00	1.69	1.07
Spalding	Griffin	8.85	0.00	0.00	8.85	23.84[(2)]
Crisp	Lake Blackshear	0.27	0.00	0.00	0.27	0.33
Meriwether	Manchester	1.11	0.00	0.00	1.11	0.51
Marion	Marion County	0.87	0.00	0.00	0.87	0.52
Macon	Montezuma	0.39	0.00	0.00	0.39	0.32
Macon	Oglethorpe	0.50	0.00	0.00	0.50	0.40
Schley	Schley County	0.31	0.00	0.00	0.31	1.11
Spalding	Spalding County	0.00	0.00	3.12	3.12	10.07[(2)]
Talbot	Talbot County	0.00	0.41	0.00	0.41	0.21
Upson	Thomaston	1.57	0.00	0.00	1.57	2.35
Dooly	Unadilla	0.50	0.00	0.00	0.50	0.52
Upson	Upson County	0.36	0.00	0.01	0.37	0.62
Dooly	Vienna	1.57	0.00	0.00	1.57	0.90
	Totals	**20.43**	**0.41**	**3.12**	**23.96**	**44.10**

Prepared by: GJH 01/14/21

Checked by: LCT 01/20/21

Notes:

ADD - average daily demand

MGD - million gallons per day

QWS - qualified water system

1. Values were reported by QWS, and aggregate volumes were verified with the 2015 EPD-validated water loss audit, as available.
2. Values are from *City of Griffin Water Master Plan 2010-2050* (Engineering Strategies, 2011).

Table 4-2
Reliability Targets for Current and Future Demand

			2015 - Immediate Reliability Target			2050 - Long-Range Reliability Target		
County	**Qualified Water System**	**Public Water System Identification Number**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**
Sumter	Americus	GA2610000	2.4	1.6	0.9	1.3	0.9	0.5
Crisp	Cordele	GA0810001	1.7	1.1	0.6	1.1	0.7	0.4
Spalding	Griffin	GA2550000	8.9	5.8	3.1	23.8	15.5	8.3
Crisp	Lake Blackshear	GA0810064	0.3	0.2	0.1	0.3	0.2	0.1
Meriwether	Manchester	GA1990003	1.1	0.7	0.4	0.5	0.3	0.2
Marion	Marion County	GA1970003	0.9	0.6	0.3	0.5	0.3	0.2
Macon	Montezuma	GA1930002	0.4	0.3	0.1	0.3	0.2	0.1
Macon	Oglethorpe	GA1930003	0.5	0.3	0.2	0.4	0.3	0.1
Schley	Schley County	GA2490004	0.3	0.2	0.1	1.1	0.7	0.4
Spalding	Spalding County	GA2550036	3.1	2.0	1.1	10.1	6.5	3.5
Talbot	Talbot County	GA2630005	0.4	0.3	0.1	0.2	0.1	0.1
Upson	Thomaston	GA2930000	1.6	1.0	0.6	2.4	1.5	0.8
Dooly	Unadilla	GA0930003	0.5	0.3	0.2	0.5	0.3	0.2
Upson	Upson County	GA2930010	0.4	0.2	0.1	0.6	0.4	0.2
Dooly	Vienna	GA0930004	1.6	1.0	0.5	0.9	0.6	0.3
Totals			**24.0**	**15.6**	**8.4**	**44.1**	**28.7**	**15.4**

Prepared by: GJH 01/20/21

Checked by: LCT 01/20/21

Notes:

ADD - average daily demand

MGD - million gallons per day

1. Total demand (withdrawal plus purchases) is defined the same as 100% annual average day demand.

Table 5-1
Water Supply Risks and Emergency Scenarios

Water Supply Risk	Emergency Scenario	Type	Duration (Days)	Evaluation Selection Criteria	Key Assumptions
A. Failure of largest water treatment plant (WTP)	A1. Power supply failure of largest WTP	Short-term Defined Duration	1	QWS that receive water from a system-owned WTP	- Treatment capacity is based on the backup generator's capacity, if available. Otherwise, 80% of peak treatment is assumed. - In the event a QWS has a portable generator, it is assumed that generator is used at the largest WTP, per this scenario - 60% of QWS treated water storage is available at the beginning of the emergency.
	A2. Critical asset failure at largest WTP (e.g., loss of clearwell, loss of chemical treatment)	Short-term Defined Duration	30		- The longer duration excludes the availability of water storage supply. - Each WTP was evaluated for unit process redundancy and the ability to operate at a higher rate. - Critical assets for groundwater QWS include chemical treatment. Backup chemical feed equipment is required for WTPs installed after 1/1/1998.
B. Short-term catastrophic failure of a water distribution system	Critical transmission main failure from largest WTP or interconnection	Short-term Defined Duration	1	QWS with a distribution system	- 60% of QWS treated water storage is available at the beginning of the emergency.
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers a boil water notice	Short-term Defined Duration	3	QWS with a distribution system	- No capacity is lost - Water is non-potable
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Short-term Defined Duration	1	QWS that pump from a raw water source	- In the case of groundwater QWS, the aquifer supplying the largest WTP is assumed to be locally contaminated. - 60% of QWS treated water storage is available at the beginning of the emergency. - 60% of QWS raw water storage and clearwell storage is available at the beginning of the emergency.
	D2. Chemical contamination of largest raw water source	Short-term Defined Duration	1		- In the case of groundwater QWS, the aquifer supplying the largest WTP is assumed to be locally contaminated. - 60% of QWS treated water storage is available at the beginning of the emergency. - 60% of QWS raw water storage and clearwell storage is available at the beginning of the emergency.
E. Full unavailability of major raw water sources due to federal or state government actions	--	Long-term Undefined Duration	>365	QWS that use Lake Lanier/Chattahoochee River or Allatoona Lake/Etowah River as a raw water source	- Not currently applicable
F. Limited or reduced availability of major raw water sources due to federal or state government actions	--	Long-term Undefined Duration	>365	QWS that use Lake Lanier/Chattahoochee River or Allatoona Lake/Etowah River as a raw water source	- Not currently applicable

Table 5-1
Water Supply Risks and Emergency Scenarios

Water Supply Risk	Emergency Scenario	Type	Duration (Days)	Evaluation Selection Criteria	Key Assumptions
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Short-term Defined Duration	30	QWS that have a raw water supply from a dammed reservoir (not including Lake Lanier or Lake Allatoona)	- The longer duration excludes the availability of water storage supply.
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Short-term Defined Duration	120	QWS with reservoirs in small watersheds and no direct withdrawal from a major river	- Available raw water supply for each QWS is 40% of ADD due to drought.

Prepared by: GJH 11/10/20
Checked by: LCT 12/22/20

Notes:
ADD - average daily demand
QWS - qualified water system
WTP - water treatment plant

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Sumter	Americus	A1	8.6	2.4	1.6	0.9	0.0	0.0	0.0	12.9	1.3	0.9	0.5	0.0	0.0	0.0
		A2	6.9	2.4	1.6	0.9	0.0	0.0	0.0	11.2	1.3	0.9	0.5	0.0	0.0	0.0
		B	3.8	2.4	1.6	0.9	0.0	0.0	0.0	8.2	1.3	0.9	0.5	0.0	0.0	0.0
		C	6.9	2.4	1.6	0.9	0.0	0.0	0.0	11.2	1.3	0.9	0.5	0.0	0.0	0.0
		D1	4.8	2.4	1.6	0.9	0.0	0.0	0.0	9.1	1.3	0.9	0.5	0.0	0.0	0.0
		D2	4.8	2.4	1.6	0.9	0.0	0.0	0.0	9.1	1.3	0.9	0.5	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Crisp	Cordele	A1	10.6	1.7	1.1	0.6	0.0	0.0	0.0	12.3	1.1	0.7	0.4	0.0	0.0	0.0
		A2	9.3	1.7	1.1	0.6	0.0	0.0	0.0	10.8	1.1	0.7	0.4	0.0	0.0	0.0
		B	8.6	1.7	1.1	0.6	0.0	0.0	0.0	10.4	1.1	0.7	0.4	0.0	0.0	0.0
		C	9.3	1.7	1.1	0.6	0.0	0.0	0.0	10.8	1.1	0.7	0.4	0.0	0.0	0.0
		D1	8.6	1.7	1.1	0.6	0.0	0.0	0.0	10.4	1.1	0.7	0.4	0.0	0.0	0.0
		D2	8.6	1.7	1.1	0.6	0.0	0.0	0.0	10.4	1.1	0.7	0.4	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Spalding	Griffin	A1	29.3	8.9	5.8	3.1	0.0	0.0	0.0	29.3	23.8	15.5	8.3	0.0	0.0	0.0
		A2	14.3	8.9	5.8	3.1	0.0	0.0	0.0	27.5	23.8	15.5	8.3	0.0	0.0	0.0
		B	16.1	8.9	5.8	3.1	0.0	0.0	0.0	17.3	23.8	15.5	8.3	6.6	0.0	0.0
		C	27.5	8.9	5.8	3.1	0.0	0.0	0.0	39.5	23.8	15.5	8.3	0.0	0.0	0.0
		D1	20.0	8.9	5.8	3.1	0.0	0.0	0.0	21.2	23.8	15.5	8.3	2.7	0.0	0.0
		D2	20.0	8.9	5.8	3.1	0.0	0.0	0.0	21.2	23.8	15.5	8.3	2.7	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	14.3	8.9	5.8	3.1	0.0	0.0	0.0	**15.5**	**23.8**	**15.5**	**8.3**	**8.4**	**0.05**	0.0
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Crisp	Lake Blackshear	A1	2.8	0.3	0.2	0.1	0.0	0.0	0.0	2.8	0.3	0.2	0.1	0.0	0.0	0.0
		A2	2.4	0.3	0.2	0.1	0.0	0.0	0.0	2.4	0.3	0.2	0.1	0.0	0.0	0.0
		B	1.6	0.3	0.2	0.1	0.0	0.0	0.0	1.6	0.3	0.2	0.1	0.0	0.0	0.0
		C	2.4	0.3	0.2	0.1	0.0	0.0	0.0	2.4	0.3	0.2	0.1	0.0	0.0	0.0
		D1	1.6	0.3	0.2	0.1	0.0	0.0	0.0	1.6	0.3	0.2	0.1	0.0	0.0	0.0
		D2	1.6	0.3	0.2	0.1	0.0	0.0	0.0	1.6	0.3	0.2	0.1	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Meriwether	Manchester	A1	1.1	1.1	0.7	0.4	0.0	0.0	0.0	1.1	0.5	0.3	0.2	0.0	0.0	0.0
		A2	2.0	1.1	0.7	0.4	0.0	0.0	0.0	2.0	0.5	0.3	0.2	0.0	0.0	0.0
		B	1.1	1.1	0.7	0.4	0.0	0.0	0.0	1.1	0.5	0.3	0.2	0.0	0.0	0.0
		C	2.0	1.1	0.7	0.4	0.0	0.0	0.0	2.0	0.5	0.3	0.2	0.0	0.0	0.0
		D1	1.4	1.1	0.7	0.4	0.0	0.0	0.0	1.4	0.5	0.3	0.2	0.0	0.0	0.0
		D2	1.4	1.1	0.7	0.4	0.0	0.0	0.0	1.4	0.5	0.3	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	**0.0**	**1.1**	**0.7**	**0.4**	**1.1**	**0.7**	**0.4**	**0.0**	**0.5**	**0.3**	**0.2**	**0.5**	**0.3**	**0.2**
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Marion	Marion County	A1	2.4	0.9	0.6	0.3	0.0	0.0	0.0	2.4	0.5	0.3	0.2	0.0	0.0	0.0
		A2	3.4	0.9	0.6	0.3	0.0	0.0	0.0	3.4	0.5	0.3	0.2	0.0	0.0	0.0
		B	2.4	0.9	0.6	0.3	0.0	0.0	0.0	2.4	0.5	0.3	0.2	0.0	0.0	0.0
		C	3.4	0.9	0.6	0.3	0.0	0.0	0.0	3.4	0.5	0.3	0.2	0.0	0.0	0.0
		D1	2.5	0.9	0.6	0.3	0.0	0.0	0.0	2.5	0.5	0.3	0.2	0.0	0.0	0.0
		D2	2.5	0.9	0.6	0.3	0.0	0.0	0.0	2.5	0.5	0.3	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Macon	Montezuma	A1	0.9	0.4	0.3	0.1	0.0	0.0	0.0	0.9	0.3	0.2	0.1	0.0	0.0	0.0
		A2	0.5	0.4	0.3	0.1	0.0	0.0	0.0	0.5	0.3	0.2	0.1	0.0	0.0	0.0
		B	0.5	0.4	0.3	0.1	0.0	0.0	0.0	0.5	0.3	0.2	0.1	0.0	0.0	0.0
		C	0.5	0.4	0.3	0.1	0.0	0.0	0.0	0.5	0.3	0.2	0.1	0.0	0.0	0.0
		D1	0.5	0.4	0.3	0.1	0.0	0.0	0.0	0.5	0.3	0.2	0.1	0.0	0.0	0.0
		D2	0.5	0.4	0.3	0.1	0.0	0.0	0.0	0.5	0.3	0.2	0.1	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Macon	Oglethorpe	A1	2.5	0.5	0.3	0.2	0.0	0.0	0.0	2.5	0.4	0.3	0.1	0.0	0.0	0.0
		A2	1.9	0.5	0.3	0.2	0.0	0.0	0.0	1.9	0.4	0.3	0.1	0.0	0.0	0.0
		B	1.0	0.5	0.3	0.2	0.0	0.0	0.0	1.0	0.4	0.3	0.1	0.0	0.0	0.0
		C	1.9	0.5	0.3	0.2	0.0	0.0	0.0	1.9	0.4	0.3	0.1	0.0	0.0	0.0
		D1	1.0	0.5	0.3	0.2	0.0	0.0	0.0	1.0	0.4	0.3	0.1	0.0	0.0	0.0
		D2	1.0	0.5	0.3	0.2	0.0	0.0	0.0	1.0	0.4	0.3	0.1	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Schley	Schley County	A1	1.8	0.3	0.2	0.1	0.0	0.0	0.0	1.8	1.1	0.7	0.4	0.0	0.0	0.0
		A2	1.5	0.3	0.2	0.1	0.0	0.0	0.0	1.5	1.1	0.7	0.4	0.0	0.0	0.0
		B	1.1	0.3	0.2	0.1	0.0	0.0	0.0	1.1	1.1	0.7	0.4	0.02	0.0	0.0
		C	1.5	0.3	0.2	0.1	0.0	0.0	0.0	1.5	1.1	0.7	0.4	0.0	0.0	0.0
		D1	1.1	0.3	0.2	0.1	0.0	0.0	0.0	**1.1**	**1.1**	**0.7**	**0.4**	**0.02**	0.0	0.0
		D2	1.1	0.3	0.2	0.1	0.0	0.0	0.0	1.1	1.1	0.7	0.4	0.02	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Spalding	Spalding County	A1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		A2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		C	11.8	3.1	2.0	1.1	0.0	0.0	0.0	11.8	10.1	6.5	3.5	0.0	0.0	0.0
		D1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		D2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Talbot	Talbot County	A1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		A2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	1.8	0.4	0.3	0.1	0.0	0.0	0.0	1.8	0.2	0.1	0.1	0.0	0.0	0.0
		C	2.9	0.4	0.3	0.1	0.0	0.0	0.0	2.9	0.2	0.1	0.1	0.0	0.0	0.0
		D1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		D2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Upson	Thomaston	A1	7.0	1.6	1.0	0.6	0.0	0.0	0.0	7.0	2.4	1.5	0.8	0.0	0.0	0.0
		A2	6.0	1.6	1.0	0.6	0.0	0.0	0.0	6.0	2.4	1.5	0.8	0.0	0.0	0.0
		B	7.0	1.6	1.0	0.6	0.0	0.0	0.0	7.0	2.4	1.5	0.8	0.0	0.0	0.0
		C	6.0	1.6	1.0	0.6	0.0	0.0	0.0	6.0	2.4	1.5	0.8	0.0	0.0	0.0
		D1	7.2	1.6	1.0	0.6	0.0	0.0	0.0	7.2	2.4	1.5	0.8	0.0	0.0	0.0
		D2	7.2	1.6	1.0	0.6	0.0	0.0	0.0	7.2	2.4	1.5	0.8	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	6.0	1.6	1.0	0.6	0.0	0.0	0.0	6.0	2.4	1.5	0.8	0.0	0.0	0.0
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Dooly	Unadilla	A1	0.8	0.5	0.3	0.2	0.0	0.0	0.0	0.8	0.5	0.3	0.2	0.0	0.0	0.0
		A2	0.7	0.5	0.3	0.2	0.0	0.0	0.0	0.7	0.5	0.3	0.2	0.0	0.0	0.0
		B	0.8	0.5	0.3	0.2	0.0	0.0	0.0	0.8	0.5	0.3	0.2	0.0	0.0	0.0
		C	0.7	0.5	0.3	0.2	0.0	0.0	0.0	0.7	0.5	0.3	0.2	0.0	0.0	0.0
		D1	0.8	0.5	0.3	0.2	0.0	0.0	0.0	0.8	0.5	0.3	0.2	0.0	0.0	0.0
		D2	0.8	0.5	0.3	0.2	0.0	0.0	0.0	0.8	0.5	0.3	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Upson	Upson County	A1	5.5	0.4	0.2	0.1	0.0	0.0	0.0	4.7	0.6	0.4	0.2	0.0	0.0	0.0
		A2	4.9	0.4	0.2	0.1	0.0	0.0	0.0	4.1	0.6	0.4	0.2	0.0	0.0	0.0
		B	5.3	0.4	0.2	0.1	0.0	0.0	0.0	4.5	0.6	0.4	0.2	0.0	0.0	0.0
		C	4.9	0.4	0.2	0.1	0.0	0.0	0.0	4.1	0.6	0.4	0.2	0.0	0.0	0.0
		D1	5.3	0.4	0.2	0.1	0.0	0.0	0.0	4.5	0.6	0.4	0.2	0.0	0.0	0.0
		D2	5.3	0.4	0.2	0.1	0.0	0.0	0.0	4.5	0.6	0.4	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Dooly	Vienna	A1	7.5	1.6	1.0	0.5	0.0	0.0	0.0	8.0	0.9	0.6	0.3	0.0	0.0	0.0
		A2	9.1	1.6	1.0	0.5	0.0	0.0	0.0	9.3	0.9	0.6	0.3	0.0	0.0	0.0
		B	7.5	1.6	1.0	0.5	0.0	0.0	0.0	8.0	0.9	0.6	0.3	0.0	0.0	0.0
		C	9.1	1.6	1.0	0.5	0.0	0.0	0.0	9.3	0.9	0.6	0.3	0.0	0.0	0.0
		D1	7.5	1.6	1.0	0.5	0.0	0.0	0.0	8.0	0.9	0.6	0.3	0.0	0.0	0.0
		D2	7.5	1.6	1.0	0.5	0.0	0.0	0.0	8.0	0.9	0.6	0.3	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by: GJH 01/22/21
Checked by: LCT 02/01/21

Notes:
ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.
= Critical Scenario Deficit

Table 6-1
Emergency Scenarios and Potential Internal Infrastructure Redundancy Projects

Water Supply Risk	Emergency Scenario	Internal Infrastructure Redundancy Project	Relevant Considerations: Potential Environmental Impacts	Withdrawal Permit Impacts	Water Quality Impacts	Community Impacts
A. Failure of largest water treatment plant (WTP)	A1. Power supply failure of largest WTP	Backup Generator	◊	-	-	-
	A2. Critical asset failure at largest WTP (e.g., loss of clearwell, loss of chemical treatment)	Unit Process Redundancy	-	-	-	-
B. Short-term catastrophic failure of a water distribution system	Critical transmission main failure from largest WTP or interconnection	-	-	-	-	-
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers a boil water notice	-	-	-	-	-
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	New Well New WTP New Surface Water Source	◊	◊	◊	◊
	D2. Chemical contamination of largest raw water source	New Well New WTP New Surface Water Source	◊	◊	◊	◊
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	New Well New WTP New Surface Water Source	◊	◊	◊	◊
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	-	-	-	-	-

Prepared by: GJH 02/11/21
Checked by: LCT 03/25/21

Notes:
ADD - average daily demand
WTP - water treatment plant

Table 6-2
Potential Projects and Details

							System Impacts		
County	**Qualified Water System**	**Project Number**	**Potential Project Description**	**Emergency Scenario(s) Addressed**	**Maximum Capacity Added (MGD)**	**Potential Environmental Impacts**	**Withdrawal Permit Impacts**	**Water Quality Impacts**	**Community Impacts**
Sumter	Americus	1	Interconnection: Americus-Schley County 50 feet along Lacross Road	A1, A2, B, D1, D2	1.13	Low: less than 200 ft excavation	Americus: low Schley County: high	High	Medium-low: less than 200 ft excavation; multijurisdictional agreement.
Crisp	Cordele	-	No recommended project	-	-	-	-	-	-
Spalding	Griffin	2	Upgrade existing interconnection: Clayton County[1]	A1, A2, B, D1, D2, G	2.54	High: more than 5000 ft excavation	Griffin: NA Spalding County: NA Clayton County: low	Low[3]	High: more than 5000 ft excavation; multijurisdictional agreement.
		3	Upgrade existing interconnection: Henry County[1]	A1, A2, B, D1, D2, G	2.54	Medium-high: between 200 ft and 5000 ft excavation	Griffin: NA Spalding County: NA Henry County: low	Low[3]	Medium-high: between 200 ft and 5000 ft excavation; multijurisdictional agreement
		4	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg[1]	A1, A2, B, D1, D2, G	2.54	High: more than 5000 ft excavation	Griffin: NA Spalding County: NA Butts County: low	Low[3]	High: more than 5000 ft excavation; multijurisdictional agreement.
Crisp	Lake Blackshear	-	No recommended project	-	-	-	-	-	-
Meriwether	Manchester	5	Restore existing interconnection: Manchester-Warm Springs[1]	A1, A2, B, D1, D2, G	0.28	Low: potentially no excavation	Manchester: NA Warm Springs: medium-low	High	Medium-low: multijurisdictional agreement.
Marion	Marion County	-	No recommended project	-	-	-	-	-	-
Macon	Montezuma	6	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	A1, A2, B, D1, D2	0.63	High: more than 5000 ft excavation; one stream/wetlands crossings	Montezuma: low Oglethorpe: medium-low	Medium-high	High: more than 5000 ft excavation; multijurisdictional agreement.
Macon	Oglethorpe	6	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	A1, A2, B, D1, D2	0.63	High: more than 5000 ft excavation; one stream/wetlands crossings	Montezuma: low Oglethorpe: medium-low	Medium-high	High: more than 5000 ft excavation; multijurisdictional agreement.
Schley	Schley County	1	Interconnection: Americus-Schley County 50 feet along Lacross Road	A1, A2, B, D1, D2	1.13	Low: less than 200 ft excavation	Americus: low Schley County: high	High	Medium-low: less than 200 ft excavation; multijurisdictional agreement.
Spalding	Spalding County	2	Upgrade existing interconnection: Clayton County[1]	A1, A2, B, D1, D2, G	2.54	High: more than 5000 ft excavation	Griffin: NA Spalding County: NA Clayton County: low	Low[3]	High: more than 5000 ft excavation; multijurisdictional agreement.
		3	Upgrade existing interconnection: Henry County[1]	A1, A2, B, D1, D2, G	2.54	Medium-high: between 200 ft and 5000 ft excavation	Griffin: NA Spalding County: NA Henry County: low	Low[3]	Medium-high: between 200 ft and 5000 ft excavation; multijurisdictional agreement
		4	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg[1]	A1, A2, B, D1, D2, G	2.54	High: more than 5000 ft excavation	Griffin: NA Spalding County: NA Butts County: low	Low[3]	High: more than 5000 ft excavation; multijurisdictional agreement.
Talbot	Talbot County	-	No recommended project	-	-	-	-	-	-
Upson	Thomaston	-	No recommended project	-	-	-	-	-	-
Dooly	Unadilla	7	New Well and WTP	A1, A2, B, D1, D2	0.50[(2)]	Medium-low: less than 200 ft excavation; no regional groundwater resource gaps for the Claiborne Aquifer.	Low	Low	Medium-low: offsite excavation less than 200 feet
Upson	Upson County	-	No recommended project	-	-	-	-	-	-
Dooly	Vienna	-	No recommended project	-	-	-	-	-	-

Prepared by: GJH 04/16/21
Checked by: LCT 05/05/21

Notes:
ft - feet
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. This is a one-way interconnection into the QWS. Thus, the QWS does not have withdrawal permit impacts.
2. This value was estimated based on QWS-specific information.
3. Griffin indicated no known water quality/chemistry impacts from existing interconnections.

Table 6-3
Interconnection Project Capacity Added

Project ID	Potential Project Description	Water System Involved	Pipe Diameter (inches)	Average Pressure (psi)	2050 Excess Capacity (MGD)	Maximum Capacity Added (MGD)[1]
1	Interconnection: Americus-Schley County 50 feet along Lacross Road	Americus	8	65	9.92	1.13
		Schley County	8	60	0.34	1.13
2	Upgrade existing interconnection: Clayton County	Griffin / Spalding County	12	54-110	13.36	2.54
		Clayton County	12	unknown	unknown	0.00
3	Upgrade existing interconnection: Henry County	Griffin / Spalding County	12	54-110	13.36	2.54
		Henry County	12	unknown	unknown	0.00
4	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg	Griffin / Spalding County	12	54-110	13.36	2.54
		Butts County	12	65-100	pending	0.00
5	Restore existing interconnection: Manchester-Warm Springs	Manchester	4	55-60	1.49	0.28
		Warm Springs	4	34-43	0.20[(2)]	0.00
7	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	Montezuma	6	53	0.13	0.63
		Oglethorpe	6	60	1.54	0.63

Prepared by: GJH 04/16/21
Checked by: LCT 05/05/21

Notes:
MGD - million gallons per day
psi - pound-force per square inch
1. In the case of a one-way interconnection, the supplier's maximum capacity added is 0 MGD.
2. This value was estimated based on information provided by Warm Springs.

Table 6-4
Planning-Level Costs for Potential Projects

Project Number	Qualified Water System(s) Benefitted	Potential Project Description	Maximum Capacity Added (MGD)	Length of Pipes (ft)	Project Specifics	Estimated Unit Cost ($)	Additional Cost Items	Additional Cost ($)	Total Estimated Cost ($)	Macro-Level Project Timeframe
1	Americus Schley County	Interconnection: Americus-Schley County 50 feet along Lacross Road	1.13	50	8-inch diameter DIP	$ 170	(1) control valve station	$ 39,050	$ 47,600	12 months
2	Griffin Spalding County	Upgrade existing interconnection: Clayton County	2.54	14890	12-inch diameter DIP	$ 240	-	-	$ 3,573,500	12 months
3	Griffin Spalding County	Upgrade existing interconnection: Henry County	2.54	3168	12-inch diameter DIP	$ 240	-	-	$ 760,300	12 months
4	Griffin Spalding County	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg	2.54	22176	12-inch diameter DIP	$ 240	-	-	$ 5,322,200	12 months
5	Manchester	Restore existing interconnection: Manchester-Warm Springs	0.28	-	4-inch diameter DIP	-	-	-	$ 50,000	6 months
6	Montezuma Oglethorpe	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	0.63	5280	6-inch diameter DIP	$ 140	(1) control valve station (1) 50 HP booster pump	$ 1,107,485	$ 1,846,700	16 months
7	Unadilla	New Well and WTP	0.50	175	6-inch diameter DIP	$ 140	(1) new groundwater source (1) new WTP (1) 200 KW generator	$ 2,106,300	$ 2,130,800	12 months

Prepared by: GJH 04/21/21
Checked by: LCT 05/05/21

Notes:
DIP - ductile iron pipe
ft - feet
HP - horsepower
KW - kilowatts
MGD - million gallons per day
WTP - water treatment plant

Table 7-1
Potential Project Scoring Criteria Matrix

		Assigned Score				
	Criterion	**1**	**2**	**3**	**4**	**Weighting**
1	Systems Benefitted	One (Internal Project)	Mutually Benefits One Non-QWS	Mutually Benefits Two or More Non-QWS	Mutually Benefits Another QWS	1
2	Population Benefitted	<5,000	5,000 - 15,000	15,000 - 25,000	>25,000	3
3	Critical Scenario Duration (days)	1	3	30	120	1
4	Added Capacity as a Percent of Total Demand (%)	0-25%	26-50%	50-76%	>76%	2
5	Cost ($)	> $2,000,000	$1,000,000 - $2,000,000	$150,000 - $1,000,000	< $150,000	3
6	Potential Environmental Impacts	High	Medium-high	Medium-low	Low	3
7	Potential System and Community Impacts	High	Medium-high	Medium-low	Low	3
8	Excess Capacity Index	Positive Excess Capacity >0.5	Positive Excess Capacity <0.5	Negative Excess Capacity	No Excess Capacity	2

Prepared by: GJH 02/04/21

Checked by: LCT 03/25/21

Notes:
QWS - qualified water system

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			1: Systems Benefitted		2: Population Benefitted		3: Critical Scenario Duration	
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**Water System(s) Benefitted**	**Score: Systems Benefitted**	**Population Benefitted[1]**	**Score: Population Benefitted**	**Emergency Scenario(s) Addressed**	**Score: Critical Scenario Duration**
1	Americus Schley County	Interconnection: Americus-Schley County 50 feet along Lacross Road	Americus Schley County	4	20,700	3	A1, A2, B, D1, D2	3
2	Griffin Spalding County	Upgrade existing interconnection: Clayton County	Griffin Spalding County	4	123,500	4	A1, A2, B, D1, D2, G	3
3	Griffin Spalding County	Upgrade existing interconnection: Henry County	Griffin Spalding County	4	123,500	4	A1, A2, B, D1, D2, G	3
4	Griffin Spalding County	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg	Griffin Spalding County	4	123,500	4	A1, A2, B, D1, D2, G	3
5	Manchester	Restore existing interconnection: Manchester-Warm Springs	Manchester	1	6,700	2	A1, A2, B, D1, D2	3
6	Montezuma Oglethorpe	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	Montezuma Oglethorpe	4	6,800	2	A1, A2, B, D1, D2	3
7	Unadilla	New Well and WTP	Unadilla	1	3,600	1	A1, A2, B, D1, D2	3

Notes:
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. Direct and consecutive population were included except for Spalding County because the entire population is included in Griffin's consecutive population.

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			4: Added Capacity as a Percent of Total Demand					5: Cost	
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**Maximum Capacity Added (MGD)**	**2050 Total Demand (MGD)**	**Capacity as a Percent of Total Demand (%)**	**Individual Scores**	**Score: Added Capacity as a Percent of Total Demand**	**Cost ($)**	**Score: Cost**
1	Americus Schley County	Interconnection: Americus-Schley County 50 feet along Lacross Road	1.13	Americus: 1.3 Schley County: 1.1	Americus: 86% Schley County: 102%	Americus: 4 Schley County: 4	4	$ 47,600	4
2	Griffin Spalding County	Upgrade existing interconnection: Clayton County	2.54	Griffin: 23.8 Spalding County: 10.1	Griffin: 11% Spalding County: 25%	Griffin: 1 Spalding County: 1	1	$ 3,573,500	1
3	Griffin Spalding County	Upgrade existing interconnection: Henry County	2.54	Griffin: 23.8 Spalding County: 10.1	Griffin: 11% Spalding County: 25%	Griffin: 1 Spalding County: 1	1	$ 760,300	3
4	Griffin Spalding County	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg	2.54	Griffin: 23.8 Spalding County: 10.1	Griffin: 11% Spalding County: 25%	Griffin: 1 Spalding County: 1	1	$ 5,322,200	1
5	Manchester	Restore existing interconnection: Manchester-Warm Springs	0.28	0.5	55%	-	3	$ 50,000	4
6	Montezuma Oglethorpe	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	0.63	Montezuma: 0.3 Oglethorpe: 0.4	Montezuma: 196% Oglethorpe: 157%	Montezuma: 4 Oglethorpe: 4	4	$ 1,846,700	2
7	Unadilla	New Well and WTP	0.50	0.5	96%	-	4	$ 2,130,800	1

Notes:
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. Direct and consecutive population were included except for Spalding County because the entire population is included in Griffin's consecutive population.

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			6: Potential Environmental Impacts		7: Potential System and Community Impacts				
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**Potential Environmental Impacts**	**Score: Potential Environmental Impacts**	**Withdrawal Permit Impacts**	**Water Quality Impacts**	**Community Impacts**	**Individual Scores**	**Score: Community Impacts**
1	Americus Schley County	Interconnection: Americus-Schley County 50 feet along Lacross Road	Low	4	Americus: low Schley County: high	High	Medium-low	Withdrawal: (4+1)/2 = 2.5 Water Quality: 1 Community: 3	2.2
2	Griffin Spalding County	Upgrade existing interconnection: Clayton County	High	1	Griffin: NA Spalding County: NA Clayton County: low	Low	High	Withdrawal: 4 Water Quality: 4 Community: 1	3
3	Griffin Spalding County	Upgrade existing interconnection: Henry County	Medium-high	2	Griffin: NA Spalding County: NA Henry County: low	Low	Medium-high	Withdrawal: 4 Water Quality: 4 Community: 2	3.3
4	Griffin Spalding County	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg	High	1	Griffin: NA Spalding County: NA Butts County: low	Low	High	Withdrawal: 4 Water Quality: 4 Community: 1	3
5	Manchester	Restore existing interconnection: Manchester-Warm Springs	Low	4	Manchester: NA Warm Springs: medium-low	High	Medium-low	Withdrawal: 3 Water Quality: 1 Community: 3	2.3
6	Montezuma Oglethorpe	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	High	1	Montezuma: low Oglethorpe: medium-low	Medium-high	High	Withdrawal: (4+3)/2 = 3.5 Water Quality: 2 Community: 1	2.2
7	Unadilla	New Well and WTP	Medium-low	3	Low	Low	Medium-low	Withdrawal: 4 Water Quality: 4 Community: 3	3.7

Notes:
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. Direct and consecutive population were included except for Spalding County because the entire population is included in Griffin's consecutive population.

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			8: Excess Capacity Index				Weighing Calculation								
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**2050 Excess Capacity Index**	**Individual Scores**	**Score: Excess Capacity Index**	**Absolute Score**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Weighted Score**
1	Americus Schley County	Interconnection: Americus-Schley County 50 feet along Lacross Road	Americus: (+) >0.5 Schley County: (-)	Americus: 1 Schley County: 3	2	3.27	4	9	3	8	12	12	6.5	4	7.31
2	Griffin Spalding County	Upgrade existing interconnection: Clayton County	Griffin: (-) Spalding County: NA	-	3	2.50	4	12	3	2	3	3	9	6	5.25
3	Griffin Spalding County	Upgrade existing interconnection: Henry County	Griffin: (-) Spalding County: NA	-	3	2.92	4	12	3	2	9	6	10	6	6.50
4	Griffin Spalding County	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg	Griffin: (-) Spalding County: NA	-	3	2.50	4	12	3	2	3	3	9	6	5.25
5	Manchester	Restore existing interconnection: Manchester-Warm Springs	(+) >0.5	-	1	2.54	1	6	3	6	12	12	7	2	6.13
6	Montezuma Oglethorpe	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	Montezuma: (-) Oglethorpe: (+) >0.5	Montezuma: 3 Oglethorpe: 1	2	2.52	4	6	3	8	6	3	6.5	4	5.06
7	Unadilla	New Well and WTP	(-)	-	3	2.46	1	3	3	8	3	9	11	6	5.50

Prepared by: GJH 04/23/21
Checked by: LCT 05/06/21

Notes:
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. Direct and consecutive population were included except for Spalding County because the entire population is included in Griffin's consecutive population.

Table 7-3
Potential Project Decision-Making Summary

Project Number	Qualified Water System(s) Benefitted	Potential Project Description	Cost Per 1 MGD Yield ($/MGD)	Cost Per Individual Supplied ($/Capita)	Absolute Score	Weighted Score	Manual Rank
1	Americus Schley County	Interconnection: Americus-Schley County 50 feet along Lacross Road	$ 42,199	$ 2.30	3.27	7.31	1
2	Griffin Spalding County	Upgrade existing interconnection: Clayton County	$ 1,407,998	$ 28.94	2.50	5.25	5
3	Griffin Spalding County	Upgrade existing interconnection: Henry County	$ 299,567	$ 6.16	2.92	6.50	2
4	Griffin Spalding County	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg	$ 2,097,006	$ 43.09	2.50	5.25	6
5	Manchester	Restore existing interconnection: Manchester-Warm Springs	$ 177,305	$ 7.46	2.54	6.13	3
6	Montezuma Oglethorpe	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	$ 2,910,388	$ 271.57	2.52	5.06	7
7	Unadilla	New Well and WTP	$ 4,227,778	$ 591.89	2.46	5.50	4

Prepared by: GJH 04/23/21
Checked by: LCT 05/06/21

Notes:
WTP - water treatment plant

Table 7-4
Potential Projects Sorted by Final Rank Order

Project Number	Qualified Water System(s) Benefitted	Potential Project Description	Cost ($)	Final Rank
1	Americus Schley County	Interconnection: Americus-Schley County 50 feet along Lacross Road	$ 47,600	1
3	Griffin Spalding County	Upgrade existing interconnection: Henry County	$ 760,300	2
5	Manchester	Restore existing interconnection: Manchester-Warm Springs	$ 50,000	3
7	Unadilla	New Well and WTP	$ 2,130,800	4
2	Griffin Spalding County	Upgrade existing interconnection: Clayton County	$ 3,573,500	5
4	Griffin Spalding County	Upgrade existing interconnection: Butts County/Jackson/Jenkinsburg	$ 5,322,200	6
6	Montezuma Oglethorpe	Interconnection: Montezuma-Oglethorpe 1 mile along Riverview Dr/Walnut St	$ 1,846,700	7

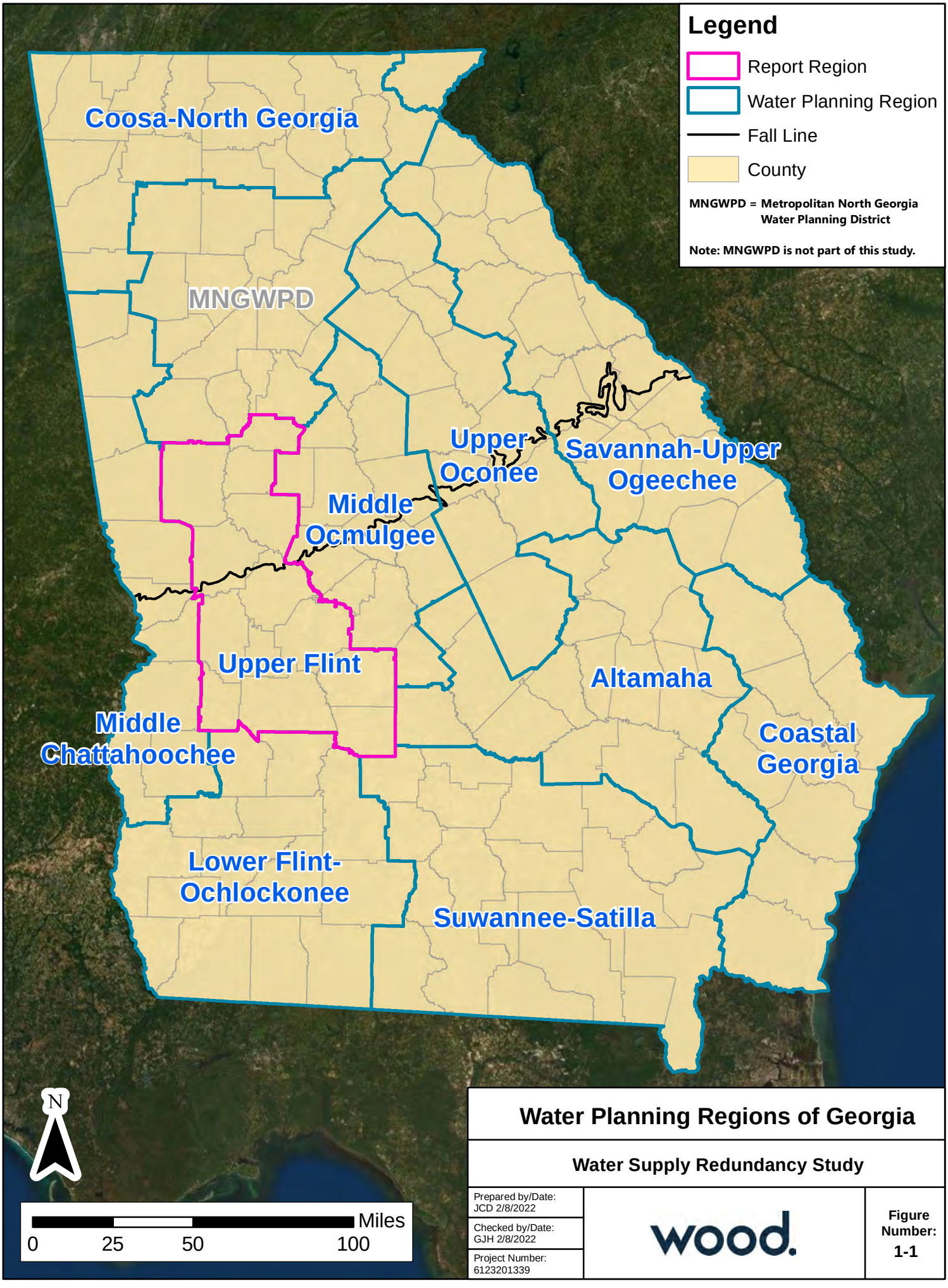
Prepared by: GJH 04/23/21

Checked by: LCT 05/06/21

Notes:

WTP - water treatment plant

FIGURES



Water Planning Regions of Georgia

Water Supply Redundancy Study

Prepared by/Date: JCD 2/8/2022	wood.	Figure Number: 1-1
Checked by/Date: GJH 2/8/2022		
Project Number: 6123201339		

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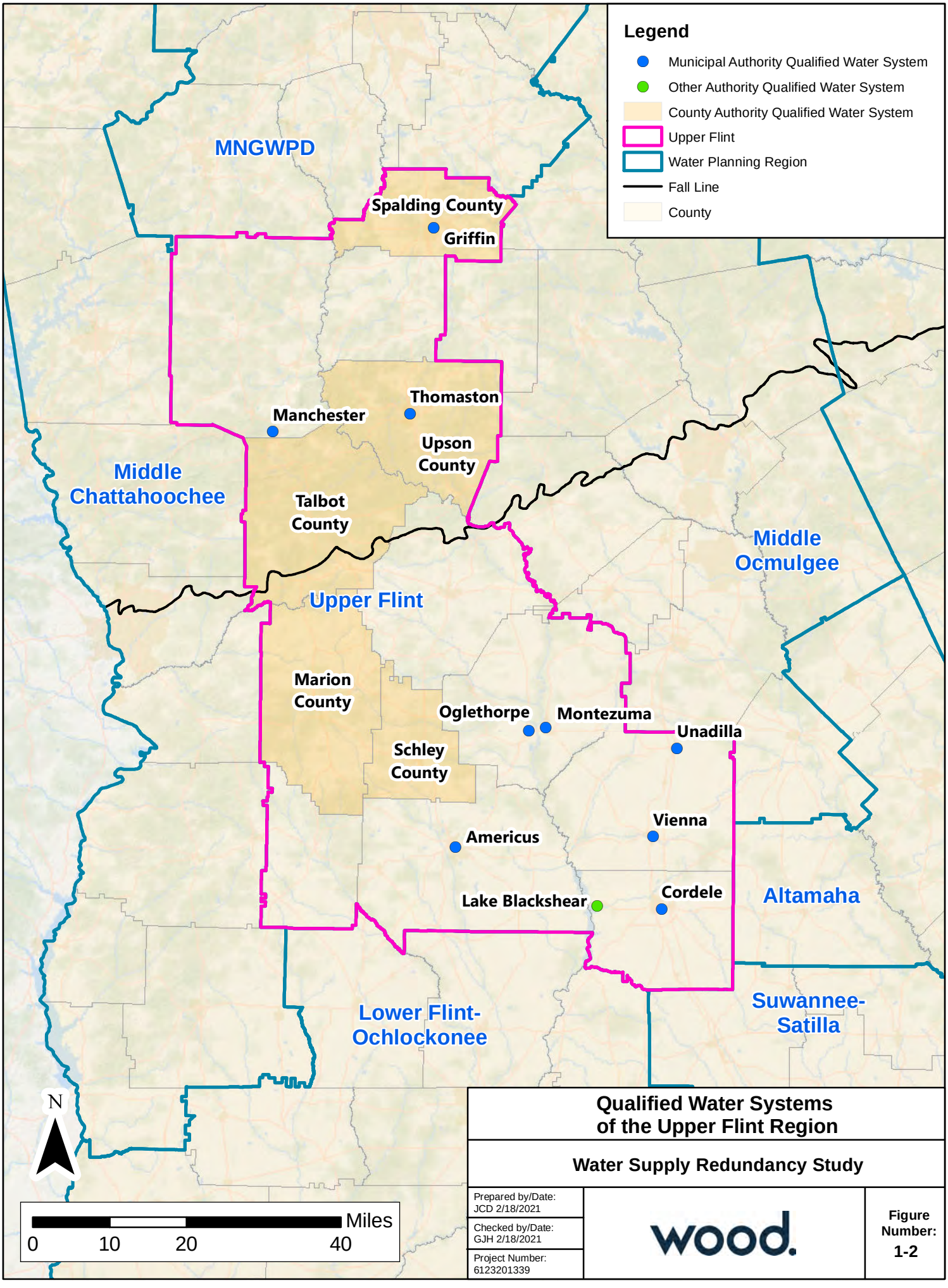

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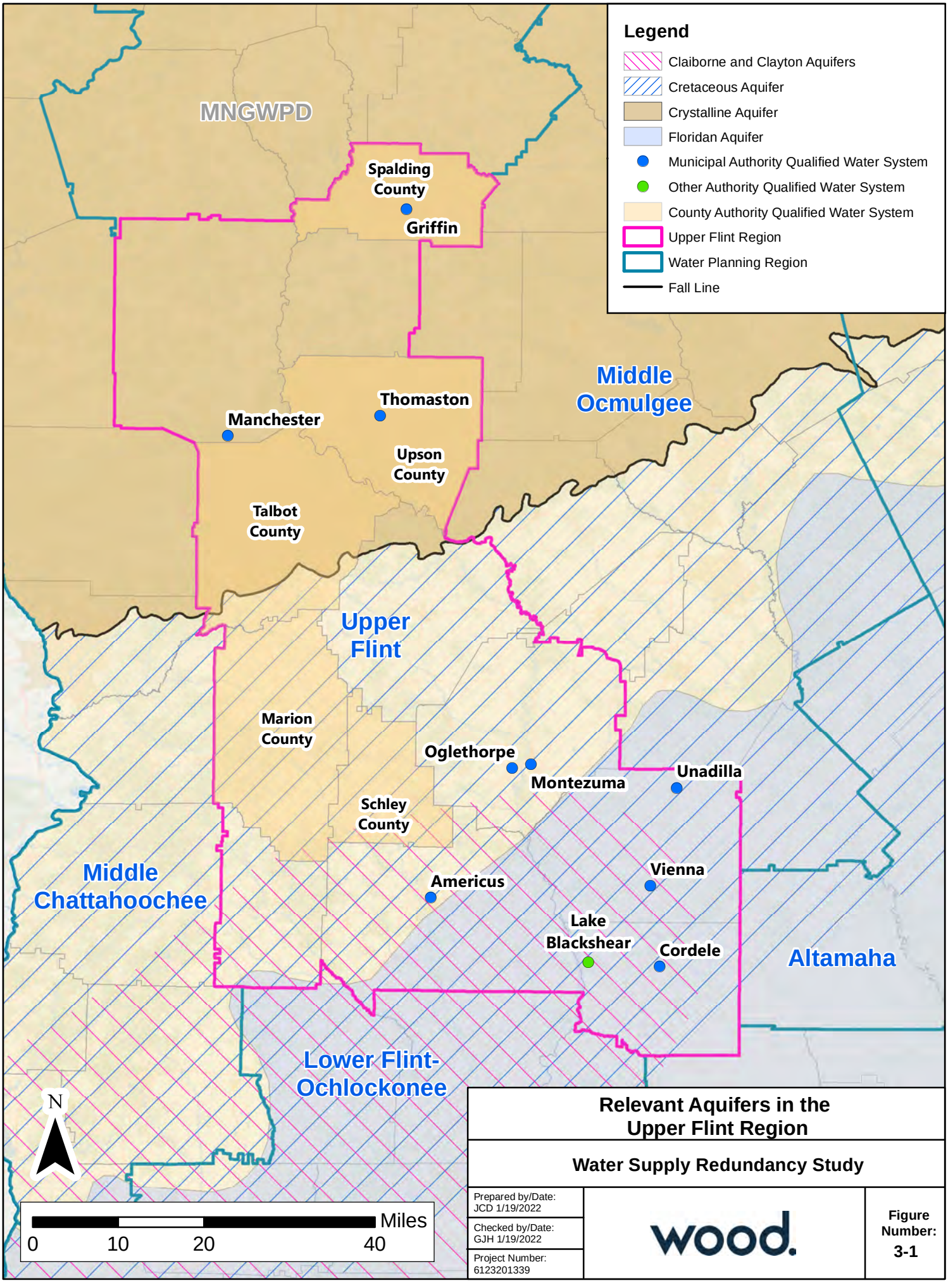
Qualified Water Systems of the Upper Flint Region

Water Supply Redundancy Study

Prepared by/Date: JCD 2/18/2021	wood.	Figure Number: 1-2
Checked by/Date: GJH 2/18/2021		
Project Number: 6123201339		



Relevant Aquifers in the Upper Flint Region

Water Supply Redundancy Study

Prepared by/Date: JCD 1/19/2022	
Checked by/Date: GJH 1/19/2022	
Project Number: 6123201339	

wood.

Figure Number: 3-1

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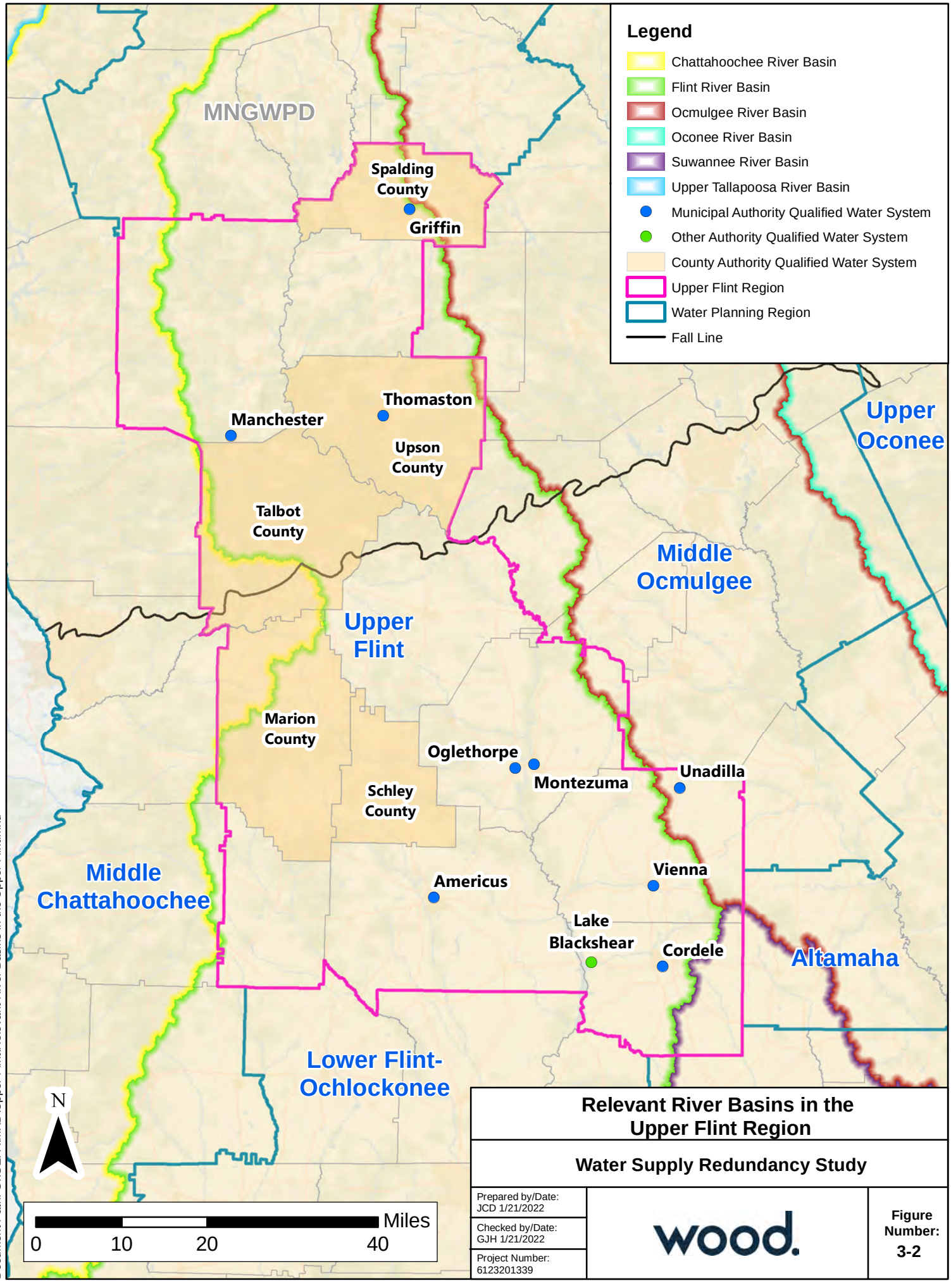

Relevant River Basins in the Upper Flint Region

Water Supply Redundancy Study

Prepared by/Date: JCD 1/21/2022	
Checked by/Date: GJH 1/21/2022	
Project Number: 6123201339	

wood.

Figure Number: 3-2

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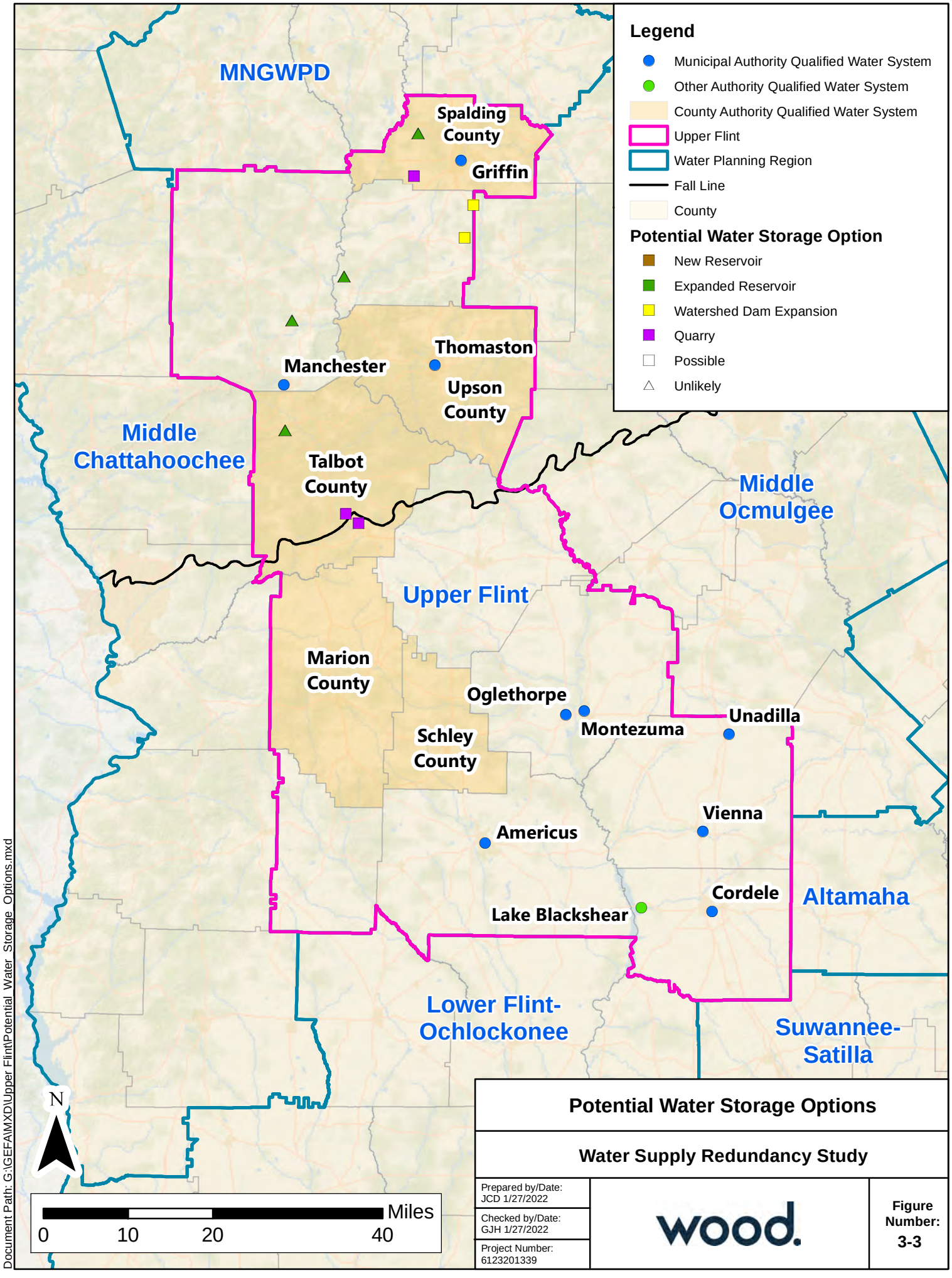


Potential Water Storage Options

Water Supply Redundancy Study

Prepared by/Date: JCD 1/27/2022	wood.	Figure Number: 3-3
Checked by/Date: GJH 1/27/2022		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Upper Flint\Potential_Water_Storage_Options.mxd

Water System

- Talbot County
- Upson County
- Thomaston
- Griffin
- Spalding County
- Water Planning Region

Spalding County

Griffin

Upson County

Thomaston

Talbot County

Notes:

1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.

0 5 10 20 Miles

N

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Available Mapping Data for Upper Flint Region - North

Water Supply Redundancy Study

Prepared by/Date: JCD 1/28/2021	wood.	Figure Number: 3-4a
Checked by/Date: GJH 1/28/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Upper_Flint_Interconnection_North.mxd

Water System

- Cordele
- Lake Blackshear
- Montezuma
- Oglethorpe
- Schley County
- Vienna
- Americus
- Water Planning Region

N

Oglethorpe

Montezuma

Schley County

Americus

Vienna

Cordele

Lake Blackshear

Notes:

1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.

0 5 10 20 Miles

Avilable Mapping Data for Upper Flint Region - South

Water Supply Redundancy Study

Prepared by/Date: JCD 1/28/2021	
Checked by/Date: GJH 1/28/2021	wood.
Project Number: 6123201339	Figure Number: 3-4b

Document Path: G:\GEFA\MXD\Upper_Flint_Interconnection_South.mxd

Notes:
1. The river basin shapefile is courtesy of the USGS.
2. The aquifer shapefile is courtesy of the USGS.
3. Interconnection lines are schematic to reflect interconnected systems. They do not reflect pipeline locations.

Spalding County
Griffin
Upson County
Thomaston
Manchester
Talbot County
Marion County
Oglethorpe
Montezuma
Unadilla
Schley County
Americus
Vienna
Lake Blackshear
Cordele

Coweta County
Clayton County
Henry County
Butts County
Williamson
Concord
Zebulon
Barnesville
Warm Springs
Lincoln Park
Woodland
Harris County
Talbotton
Columbus
Geneva
Junction City
Buena Vista
Ellaville
Andersonville
Veterans State Park

McDonough
Locust Grove
Jackson
Fayette
Coweta
Hogansville
Woodbury
Forsyth
Barnesville
Butler
Reynolds
Fort Valley
Perry
Warner Robins
Robins Air Force Base
Fort Benning
Stewart
Webster
Sumter
Randolph
Terrell
Lee
Dougherty
Albany
Cuthbert
Shellman

Water Planning Region
County
Interconnection
Fall Line
Claiborne and Clayton Aquifers
Cretaceous Aquifer
Crystalline Aquifer
Floridan Aquifer
Chattahoochee River Basin
Flint River Basin
Ocmulgee River Basin
Suwannee River Basin

2050 Total Demand (MGD)
0 -1
1-2
2 - 5
> 5

Raw Water Source
Groundwater
Surface Water
Wholesale Purchase

2050 Deficit Type
None
100% ADD
65% ADD
35% ADD

N

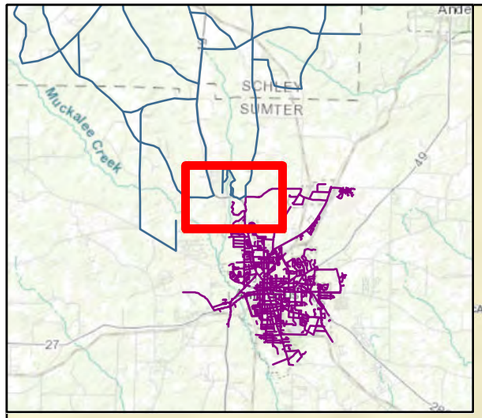
0 4 8 16 Miles

Document Path: G:\GEFA\MXD\Upper Flint\Upper Flint QWS key data.mxd

Schematic of Key QWS Data for the Upper Flint Region

Water Supply Redundancy Study

Prepared by/Date: JCD 3/28/2022	wood.	Figure Number: 5-1
Checked by/Date: GJH 3/28/2022		
Project Number: 6123201339		



N

PVC 8"

Violet Dr

Aster Dr

Jasmine Dr

Marigold Dr

Tulip Dr

Orchid Rd

Memorial Mile

Arthur Dr

PVC 8"

Cameron Ct

Keller Lake

Lacross Rd

PVC 8"

PVC 8"

Lake Collins

Ductile Iron
16"

Potential
Interconnection

Ductile Iron
16"

PVC 8"

PVC 8"

Shiloh Rd

Parkers Mill Creek Rd

PVC 12"

PVC 8"

Lakeshore Dr

Ductile Iron
16"

PVC 6"

PVC 10"

Morris Dr

Lake Collins

Reedy Rd

Rosanna Ct

Notes:
1. **Data are sourced as shown in Table 2-2.**
2. **Data are meant for planning purposes only, and do not reflect survey-grade accuracy.**
3. **In many cases, the entire extent of a given distribution system is not shown due to lack of data.**

0 400 800 1,600 Feet

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Water System
- Schley County
- Americus

Schley County and Americus Pipes

Water Supply Redundancy Study

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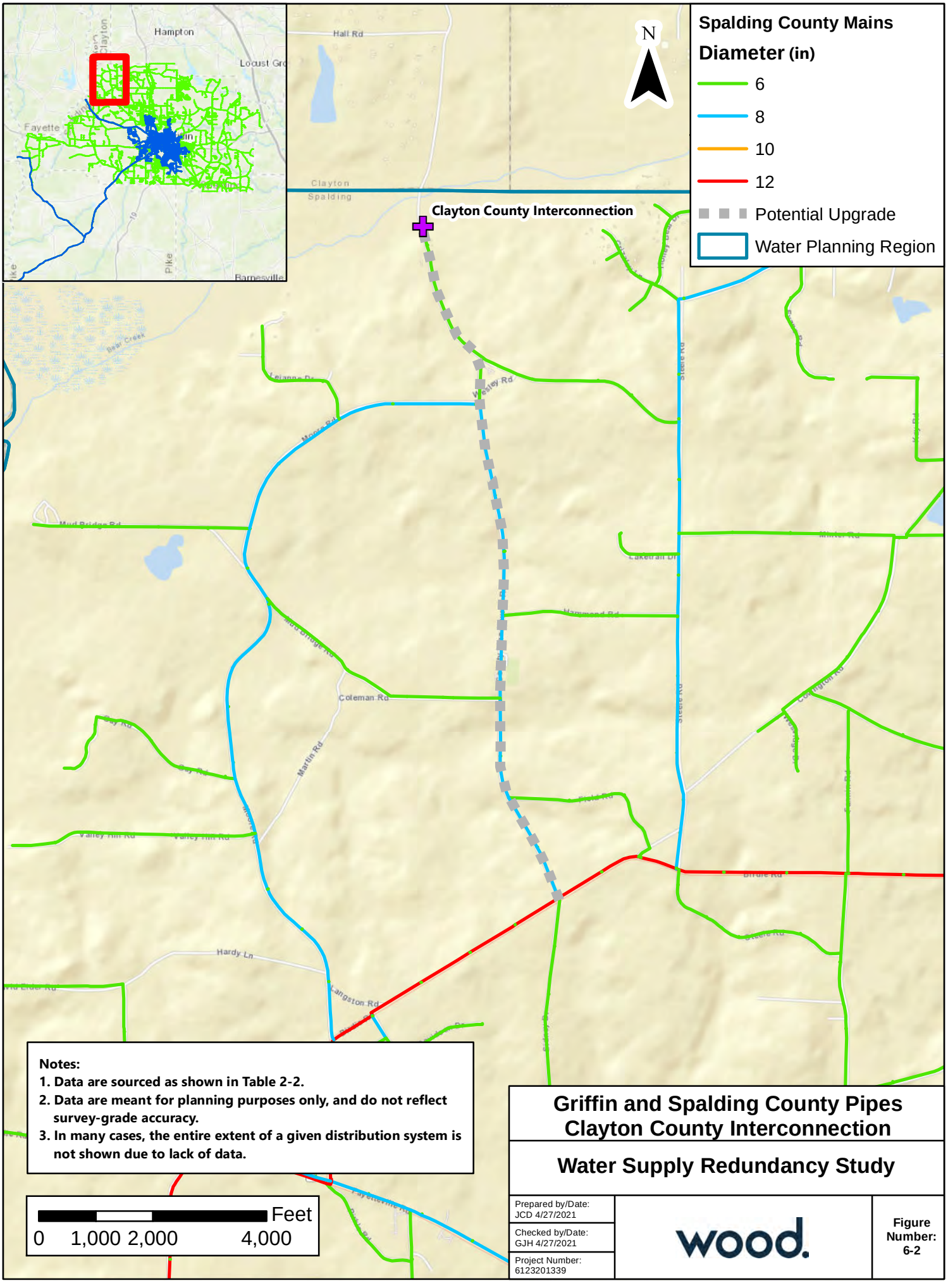
Checked by/Date: GJH 4/27/2021	wood.
Project Number: 6123201339	Figure Number: 6-1

Document Path: G:\GEFA\MXD\Schley_Americus_Pipes.mxd



Notes:

1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.

Griffin and Spalding County Pipes
Clayton County Interconnection

Water Supply Redundancy Study

Prepared by/Date: JCD 4/27/2021	
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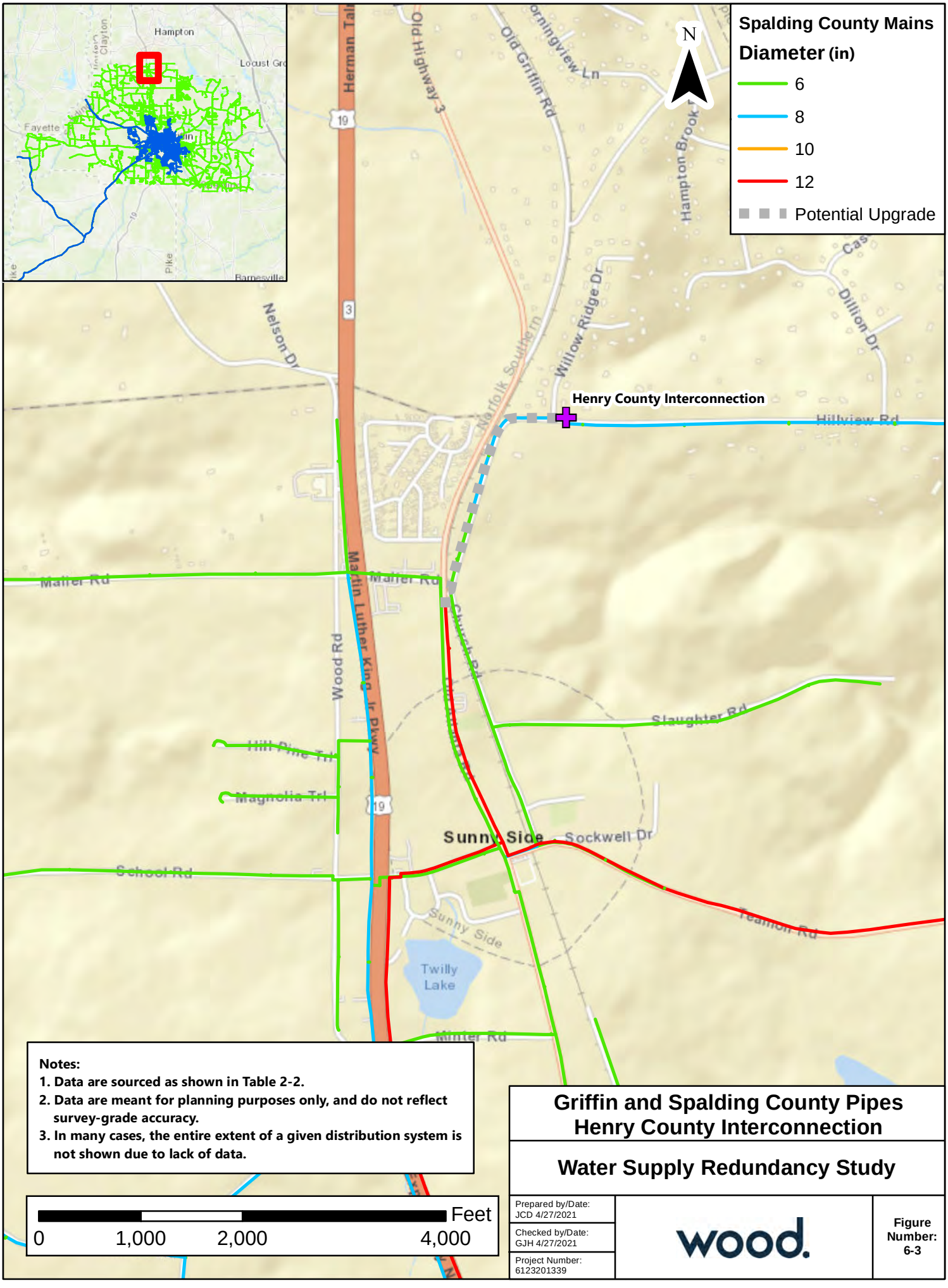
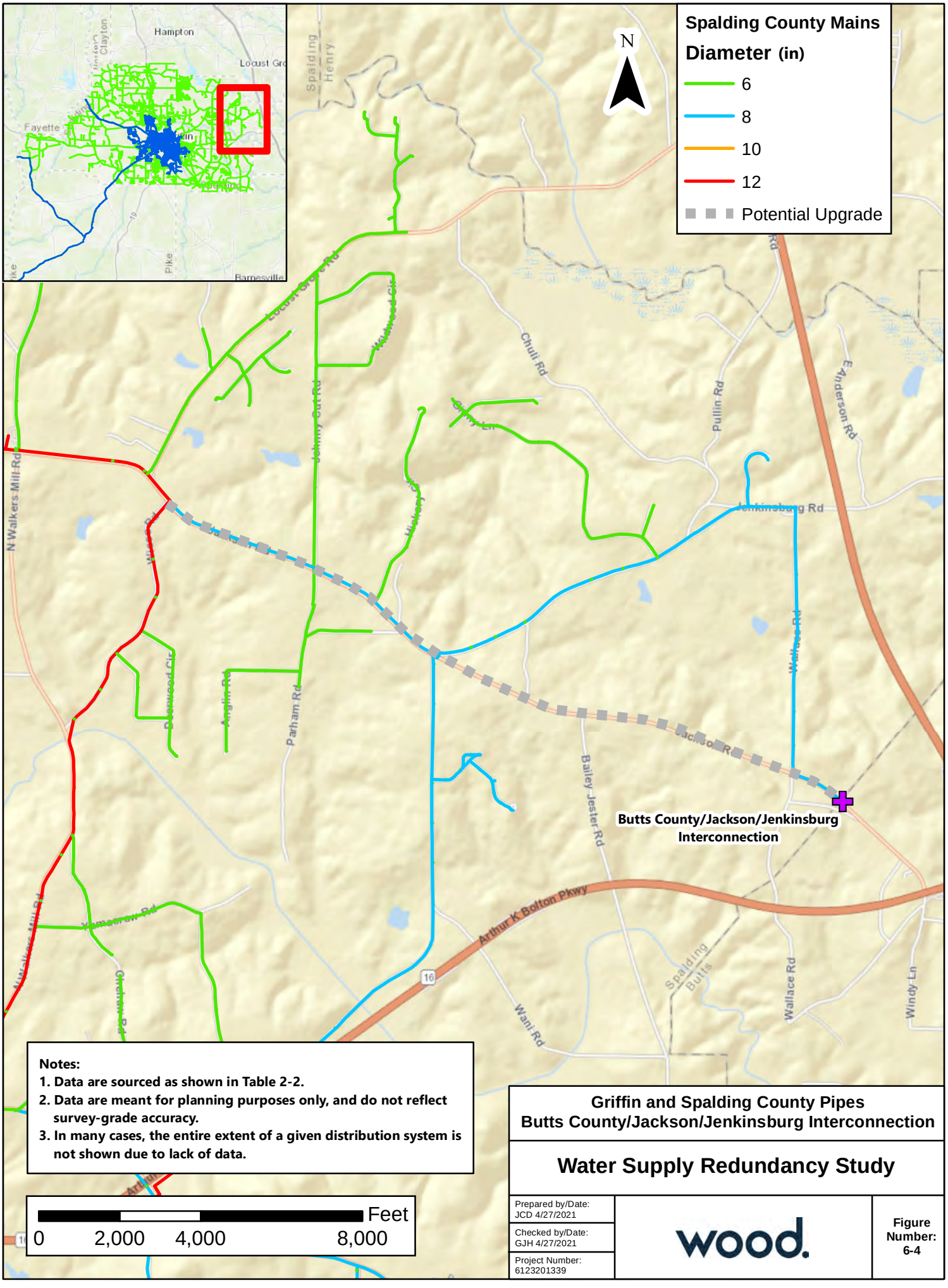
Project Number: 6123201339	wood.

Figure Number: 6-2

Document Path: G:\GEFA\MXD\Upper_Flint_Spalding_Clayton_Pipes.mxd


Spalding County Mains
Diameter (in)
6
8
10
12
Potential Upgrade
N
Henry County Interconnection
Hampton
Locust Grove
Fayette
Pike
Barnesville
Herman Talmadge Memorial Hwy
Old Highway 3
Old Griffin Rd
Morningview Ln
Hampton Brook Dr
Willow Ridge Dr
Dillion Dr
Nelson Dr
Norfolk Southern
Hillview Rd
Maller Rd
Martin Luther King Jr Pkwy
Wood Rd
Church Rd
Slaughter Rd
Hill Pine Trl
Magnolia Trl
Sunny Side
Sockwell Dr
School Rd
Sunny Side
Twilly Lake
Teamon Rd
Miller Rd
19
3
Notes:
1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.
0
1,000
2,000
4,000
Feet
Griffin and Spalding County Pipes
Henry County Interconnection
Water Supply Redundancy Study
Prepared by/Date: JCD 4/27/2021
Checked by/Date: GJH 4/27/2021
Project Number: 6123201339
wood.
Figure Number: 6-3
Document Path: G:\GEFA\MXD\Upper_Flint_Spalding_Henry_Pipes.mxd



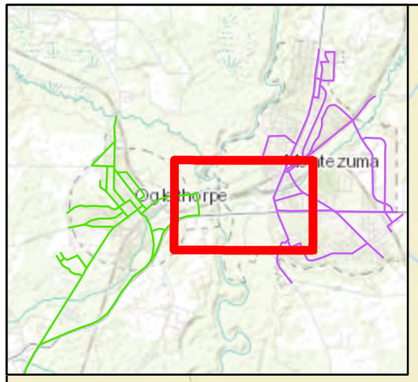
Document Path: G:\GEFA\MXD\Upper_Flint_Spalding_Butts_Pipes.mxd

Griffin and Spalding County Pipes
Butts County/Jackson/Jenkinsburg Interconnection

Water Supply Redundancy Study

Prepared by/Date: JCD 4/27/2021	
Checked by/Date: GJH 4/27/2021	
Project Number: 6123201339	wood.

Figure Number: 6-4



N

8" Water Main

8" Water Main

8" Water Main

8" Water Main

8" Water Main

4" Water Main

6" Water Main

Montezuma

Oglethorpe

Oglethorpe Rd

Chatham St

W Railroad St

Cherry St

Cherry St Loop

Beaver St

Beaver Creek

Tank St

De Vaughn Ave

S Dooley St

Spaulding Rd

Drayton Aly

Cabot St

Seed Rd

Babs St

Drayton St

White Line

Norris St

Pool St

Virginia Cir

Walnut St

Patricia Cir

Pecan Dr

Sumter St

Houston St

Cross St

Richardson St

Riverview Rd

Mill Creek

Norfolk Southern

CSX Transportation

Notes:

1. **Data are sourced as shown in Table 2-2.**
2. **Data are meant for planning purposes only, and do not reflect survey-grade accuracy.**
3. **In many cases, the entire extent of a given distribution system is not shown due to lack of data.**

Water System

- Montezuma
- Oglethorpe
- Potential Interconnection

0 400 800 1,600 Feet

Montezuma and Oglethorpe Pipes

Water Supply Redundancy Study

Prepared by/Date: JCD 4/27/2021	wood.	Figure Number: 6-5
Checked by/Date: GJH 4/27/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Upper_Flint_Montezuma_Oglethorpe.mxd

Appendix A: Excess Capacity Calculations

Contents

List of Tables

Acronyms

ADD	Average Daily Demand
EPD	Environmental Protection Division
GEFA	Georgia Environmental Finance Authority
GPM	Gallons Per Minute
MGD	Million Gallon(s) Per Day
QWS	Qualified Water System(s)
RWP	Regional Water Plan
USGS	U.S. Geological Survey

1.0 Introduction

This appendix describes the peak day design capacity, average daily demand (ADD), and excess capacity index calculations.

2.0 Calculations

2.1 Peak Day Design Capacity

Peak day design capacity, defined as the maximum amount of water that can be pumped and treated within 24 hours, depends mostly on the water treatment plant configuration. For a groundwater-based qualified water system(s) (QWS), if water is treated at each well, then the peak day design value was calculated as the sum of each pump peak capacity (in gallons per minute [GPM] converted to million gallon(s) per day [MGD]). If water is treated at a single treatment plant after being pumped from multiple wells, then the peak day design value was calculated as the sum of each treatment plant's peak treatment capacity.

The 2050 peak day design capacity reflects current 2015 QWS peak day design capacity plus any capacity-expanding capital improvements identified by the QWS. For this water planning region, Americus indicated taking Well 11 online (2.16 MGD) and a new well (2.16 MGD); Cordele indicated a new well (1.5 MGD); Griffin indicated expanding a WTP by 12 MGD; Vienna indicated a new well (2.16 MGD) to replace two old wells (combined 1.9 MGD).

2.2 Average Daily Demand

The 2015 ADD (water withdrawal only, not including purchased water) was obtained from the Environmental Protection Division (EPD)-validated 2015 water loss audit data by dividing "volume from own sources (million gallons per year)" by 365 days to convert values to MGD. Four QWS did not have 2015 water loss audit data: Lake Blackshear, Marion County, Schley County, and Unadilla (which lacked reliable 2015 water loss audit data). These values were instead self-reported via the survey-based questionnaire, except for Marion County, in which the EPD-validated 2018 water loss audit data was used.

The 2050 ADD (water withdrawal or purchased water) for each QWS was estimated from each individual county's total municipal and industrial water demand projections. The region's *Water and Wastewater Forecasting Technical Memorandum* included 2050 population data and municipal water demand projections by county (Black & Veatch, 2017). As defined by the Upper Flint Water Planning Council, the municipal sector includes public and private water withdrawal data for residential, commercial, and small industrial use. County municipal water demand values were allocated to each QWS based on the QWS' current total population served, obtained during the data collection stage. Griffin's and Spalding County's values, however, are reported as not applicable because 2050 total demand values (Table 4-1) were sourced from the *City of Griffin Water Master Plan 2010-2050* (Engineering Strategies, 2011). In this case, QWS-reported values were preferred. Table A-1 shows population forecasts and 2050 municipal demand by county. QWS 2050 municipal demand estimates are shown in Table A-2.

Because the 2015 ADD values include industrial water use, it is necessary to incorporate the 2050 regional industrial demand projections into the 2050 ADD estimates. The Regional Water Plan (RWP) and Technical Memorandum provided a total regional projection for industrial water use rather than projections by county. However, the U.S. Geological Survey (USGS) report *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015* showed 2015 county-level withdrawals and use by category, including

industrial (Painter, 2019). It also reported withdrawals by major public suppliers, and 11 of 15 QWS (lacking Cordele, Lake Blackshear, Spalding County, and Talbot County) were included in the report. For the four QWS lacking USGS data, along with Griffin (of which reported data appeared anomalous), 2015 total demand values from Table 4-1 are reported. This USGS report was used to calculate the municipally-supplied industrial use per county. The county industrial use was allocated to a QWS based on the QWS water use as a percent of the county water use. The 2015 QWS-supplied industrial demand value was then divided by the 2015 RWP regional industrial value (26 MGD) to obtain a QWS-specific percent. This percent was then applied to the 2050 RWP regional industrial projection (31 MGD) to obtain the 2050 QWS-supplied industrial demand (MGD). Similar to municipal demand, Griffin's and Spalding County's values do not appear because total demand values (Table 4-1) were sourced from the *City of Griffin Water Master Plan 2010-2050* (Engineering Strategies, 2011). In this case, QWS-reported values were preferred. Table A-3 shows 2015 withdrawal and use data by county and the estimated 2050 municipally-supplied industrial demand values for each QWS.

2.3 Excess Capacity Index

The QWS' capacities were scaled to allow for a comparison of excess capacities. The index was calculated, as applicable, for each QWS for 2015 and 2050 capacities using the following equation:

$$(1) \qquad Index = 1 - \frac{ADD}{Excess\ Capacity}$$

Where:

Excess Capacity = Peak Day Design Capacity - ADD

A comparison of indices provides insight into the magnitude of difference with respect to each QWS' excess capacity. The following index regimes exist, which depend upon the relationship between ADD and excess capacity. Excess capacity, in turn, depends on both ADD and peak day design capacity.

(a) If ADD is zero, the index is 1.
(b) If ADD is greater than zero and less than 50% of the peak day design capacity, the index is a positive value between 0 and 1.
    i. As ADD approaches 50% of the peak day design capacity, the index approaches zero.
    ii. The higher the index in this regime, the more excess capacity the QWS has relative to other QWS.
(c) If ADD is more than 50% but less than 100% of the peak day design capacity, the index is a negative value.
    i. As ADD approaches 100% of the peak day design capacity, the index approaches negative infinity.
    ii. In this regime, the closer the index is to zero, the more excess capacity the QWS has relative to other QWS.
(d) If ADD is more than peak day design capacity, excess capacity is negative. The index was not calculated for this regime because there is no excess capacity sufficiency.

Regime (a) above is not meaningful to this study because the ADD is not zero for the QWS in this region. Regime (b) is meaningful to the Upper Flint QWS because many QWS' ADD is less than 50% of their peak day design capacity. Regime (c) is also meaningful to the Upper Flint QWS because four QWS' 2015 ADD

and four QWS' 2050 ADD exceed 50% but remain below 100% of their peak day design capacity. Regime (d) Applies to Upson County because their 2050 ADD exceeds their 2050 peak day design capacity.

Table A-4 shows the 2015 and 2050 peak day design capacity, ADD, resultant excess capacity, and calculated excess capacity index, as applicable, for each QWS. The four QWS with the lowest 2015 excess capacity sufficiency, as defined by Regime (c), are Montezuma, Upson County, Unadilla, and Manchester. Upson County has no 2050 excess capacity sufficiency, as defined by Regime (d). The next four QWS with the lowest 2050 excess capacity sufficiency, as defined by Regime (c), are Schley County, Unadilla, Montezuma, and Griffin.

References

Black & Veatch, 2017. *Upper Flint Water Planning Region: Water and Wastewater Forecasting Technical Memorandum*. February 15, 2017.

Engineering Strategies, 2011. *City of Griffin Water Master Plan 2010-2050*. May, 2011.

Painter, 2019. *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015*. U.S. Geological Survey Open-File Report 2019–1086.

Table A-1

Population Forecasts and 2050 Municipal Demand by County

County	2015 Population Forecast[1]	2050 Population Forecast[1]	2050 Municipal Demand Forecast (MGD)[1]
Crisp	23,462	22,550	2.23
Dooly	14,160	10,959	1.77
Macon	13,832	9,686	1.12
Marion	8,680	8,106	1.21
Meriwether	21,186	17,902	1.61
Pike	18,166	24,575	2.11
Schley	5,231	7,737	1.25
Spalding	64,749	70,467	10.20
Sumter	31,110	22,844	2.47
Talbot	6,349	3,463	0.36
Taylor	8,371	5,976	0.66
Upson	26,642	24,035	3.34
Webster	2,648	1,291	0.12
Totals	**244,586**	**229,591**	**28.45**

Prepared by: GJH 01/11/21

Checked by: LCT 01/20/21

Notes:

MGD - million gallons per day

1. Values are from the 2017 Black & Veatch *Upper Flint Water Planning Region: Water and Wastewater Forecasting Technical Memorandum.*

Table A-2
2050 Municipal Demand Estimates

County	Qualified Water System (QWS)	Estimated Population Directly Served[1]	Estimated Consecutive Population Served[2]	Estimated Total Population	Serves Out-of-County Population	QWS Percent of County Population (%)[3]	QWS 2050 Municipal Demand Estimate (MGD)[4]
Sumter	Americus	16,100	0	16,100		52%	1.28
Crisp	Cordele	11,200	0	11,200		48%	1.06
Spalding	Griffin	23,500	100,000	123,500	◊	NA	NA
Crisp	Lake Blackshear	3,500	0	3,500		15%	0.33
Meriwether	Manchester	4,000	2,700	6,700	◊	32%	0.51
Marion	Marion County	3,300	0	3,300		38%	0.46
Macon	Montezuma	3,000	0	3,000		22%	0.24
Macon	Oglethorpe	3,800	0	3,800		27%	0.31
Schley	Schley County	2,500	2,100	4,600	◊	88%	1.10
Spalding	Spalding County	40,400	0	40,400		NA	NA
Talbot	Talbot County	3,300	400	3,700	◊	58%	0.21
Upson	Thomaston	12,500	5,700	18,200		68%	2.28
Dooly	Unadilla	3,600	0	3,600		25%	0.45
Upson	Upson County	4,900	0	4,900		18%	0.61
Dooly	Vienna	3,900	0	3,900		28%	0.49
	Totals	**139,500**	**110,900**	**250,400**	**-**	**-**	**9.34**

Prepared by: GJH 01/11/21

Checked by: LCT 01/20/21

Notes:

MGD - million gallons per day

NA - not applicable because total demand values (Table 4-1) are sourced from *City of Griffin Water Master Plan 2010-2050* (Engineering Strategies, 2011).

QWS - qualified water system

1. The population that the system directly sells water to, rounded to the nearest 100.
2. The population benefited from the system's regular sales to another system, rounded to the nearest 100.
3. 2015 county populations presented in Table A-1 and QWS estimated total populations are used to calculate these QWS-specific values.
4. 2050 county municipal demand forecasts presented in Table A-1 and QWS percent of county population values are used to calculate these QWS-specific values.

Table A-3

2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Regional Water Plan - 2015 Regional Industrial Projection[1]	26 MGD
Regional Water Plan - 2050 Regional Industrial Projection[1]	31 MGD

Americus

Sumter County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.89	2.39	1.50
Commercial	0.02	0.43	0.41
Industrial	0.39	0.42	0.03
Water Loss	-	-	0.54
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.48
		Americus Public Supply (MGD)	2.32
		QWS's Percent of County's Public Supply (%)	94%
		QWS's Supplied Industrial Demand (MGD)	0.03
		2015 QWS Percent of Regional Industrial Demand (%)	0.11%
		2050 QWS Industrial Demand Estimate (MGD)	0.03

Cordele

Crisp County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.82	1.90	1.08
Commercial	0.00	0.56	0.56
Industrial	0.15	0.16	0.01
Water Loss	-	-	0.36
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.01
		Cordele Public Supply (MGD)[3]	1.69
		QWS's Percent of County's Public Supply (%)	84%
		QWS's Supplied Industrial Demand (MGD)	0.01
		2015 QWS Percent of Regional Industrial Demand (%)	0.03%
		2050 QWS Industrial Demand Estimate (MGD)	0.01

Griffin

Spalding County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.22	4.08	3.86
Commercial	0.00	0.91	0.91
Industrial	0.00	0.28	0.28
Water Loss	-	-	1.78
Inter-County Delivery	-	-	0.46
		Total (MGD)	7.29
		Griffin Public Supply (MGD)[3]	8.85
		QWS's Percent of County's Public Supply (%)	NA
		QWS's Supplied Industrial Demand (MGD)	NA
		2015 QWS Percent of Regional Industrial Demand (%)	NA
		2050 QWS Industrial Demand Estimate (MGD)	NA

Lake Blackshear

Crisp County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.82	1.90	1.08
Commercial	0.00	0.56	0.56
Industrial	0.15	0.16	0.01
Water Loss	-	-	0.36
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.01
		Lake Blackshear Public Supply (MGD)[3]	0.27
		QWS's Percent of County's Public Supply (%)	13%
		QWS's Supplied Industrial Demand (MGD)	0.00
		2015 QWS Percent of Regional Industrial Demand (%)	0.01%
		2050 QWS Industrial Demand Estimate (MGD)	0.00

Table A-3

2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Manchester

Meriwether County[2] (Talbot County Reported)[4]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.09	1.75	1.66
Commercial	0.00	0.39	0.39
Industrial	0.00	0.00	0.00
Water Loss	-	-	0.72
Inter-County Delivery	-	-	-1.04
		Total (MGD)	1.73
		Manchester Public Supply	1.23
		QWS's Percent of County's Public Supply (%)	71%
		QWS's Supplied Industrial Demand (MGD)	0.00
		2015 QWS Percent of Regional Industrial Demand (%)	0.00%
		2050 QWS Industrial Demand Estimate (MGD)	0.00

Marion County

Marion County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.24	1.16	0.92
Commercial	0.00	0.12	0.12
Industrial	0.44	0.54	0.10
Water Loss	-	-	0.27
Inter-County Delivery	-	-	0.00
		Total (MGD)	1.41
		Marion County Public Supply (MGD)	0.74
		QWS's Percent of County's Public Supply (%)	52%
		QWS's Supplied Industrial Demand (MGD)	0.05
		2015 QWS Percent of Regional Industrial Demand (%)	0.20%
		2050 QWS Industrial Demand Estimate (MGD)	0.06

Montezuma

Macon County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.39	0.95	0.56
Commercial	0.00	0.09	0.09
Industrial	10.31	10.49	0.18
Water Loss	-	-	0.20
Inter-County Delivery	-	-	0.00
		Total (MGD)	1.03
		Montezuma Public Supply (MGD)	0.39
		QWS's Percent of County's Public Supply (%)	38%
		QWS's Supplied Industrial Demand (MGD)	0.07
		2015 QWS Percent of Regional Industrial Demand (%)	0.26%
		2050 QWS Industrial Demand Estimate (MGD)	0.08

Oglethorpe

Macon County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.39	0.95	0.56
Commercial	0.00	0.09	0.09
Industrial	10.31	10.49	0.18
Water Loss	-	-	0.20
Inter-County Delivery	-	-	0.00
		Total (MGD)	1.03
		Oglethorpe Public Supply (MGD)	0.46
		QWS's Percent of County's Public Supply (%)	45%
		QWS's Supplied Industrial Demand (MGD)	0.08
		2015 QWS Percent of Regional Industrial Demand (%)	0.31%
		2050 QWS Industrial Demand Estimate (MGD)	0.10

Table A-3

2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Schley County

Schley County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.08	0.41	0.33
Commercial	0.00	0.03	0.03
Industrial	0.00	0.01	0.01
Water Loss	-	-	0.08
Inter-County Delivery	-	-	0.00
		Total (MGD)	0.45
		Schley County Public Supply	0.31
		QWS's Percent of County's Public Supply (%)	69%
		QWS's Supplied Industrial Demand (MGD)	0.01
		2015 QWS Percent of Regional Industrial Demand (%)	0.03%
		2050 QWS Industrial Demand Estimate (MGD)	0.01

Spalding County

Spalding County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.22	4.08	3.86
Commercial	0.00	0.91	0.91
Industrial	0.00	0.28	0.28
Water Loss	-	-	1.78
Inter-County Delivery	-	-	0.46
		Total (MGD)	7.29
		Spalding Public Supply (MGD)[3]	3.12
		QWS's Percent of County's Public Supply (%)	NA
		QWS's Supplied Industrial Demand (MGD)	NA
		2015 QWS Percent of Regional Industrial Demand (%)	NA
		2050 QWS Industrial Demand Estimate (MGD)	NA

Talbot County

Talbot County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.09	1.75	1.66
Commercial	0.00	0.39	0.39
Industrial	0.00	0.00	0.00
Water Loss	-	-	0.72
Inter-County Delivery	-	-	-1.04
		Total (MGD)	1.73
		Talbot County Public Supply (MGD)[3]	0.41
		QWS's Percent of County's Public Supply (%)	23%
		QWS's Supplied Industrial Demand (MGD)	0.00
		2015 QWS Percent of Regional Industrial Demand (%)	0.00%
		2050 QWS Industrial Demand Estimate (MGD)	0.00

Thomaston

Upson County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.87	2.67	1.80
Commercial	0.00	0.44	0.44
Industrial	0.28	0.35	0.07
Water Loss	-	-	0.71
Inter-County Delivery	-	-	0.00
		Total (MGD)	3.02
		Thomaston Public Supply (MGD)	2.48
		QWS's Percent of County's Public Supply (%)	82%
		QWS's Supplied Industrial Demand (MGD)	0.06
		2015 QWS Percent of Regional Industrial Demand (%)	0.22%
		2050 QWS Industrial Demand Estimate (MGD)	0.07

Table A-3

2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Unadilla

Dooly County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.39	1.13	0.74
Commercial	0.00	0.49	0.49
Industrial	0.00	0.50	0.50
Water Loss	-	-	0.55
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.28
		Unadilla Public Supply (MGD)	0.28
		QWS's Percent of County's Public Supply (%)	12%
		QWS's Supplied Industrial Demand (MGD)	0.06
		2015 QWS Percent of Regional Industrial Demand (%)	0.24%
		2050 QWS Industrial Demand Estimate (MGD)	0.07

Upson County

Upson County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.87	2.67	1.80
Commercial	0.00	0.44	0.44
Industrial	0.28	0.35	0.07
Water Loss	-	-	0.71
Inter-County Delivery	-	-	0.00
		Total (MGD)	3.02
		Upson County Public Supply (MGD)	0.36
		QWS's Percent of County's Public Supply (%)	12%
		QWS's Supplied Industrial Demand (MGD)	0.01
		2015 QWS Percent of Regional Industrial Demand (%)	0.03%
		2050 QWS Industrial Demand Estimate (MGD)	0.01

Vienna

Dooly County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.39	1.13	0.74
Commercial	0.00	0.49	0.49
Industrial	0.00	0.50	0.50
Water Loss	-	-	0.55
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.28
		Vienna Public Supply (MGD)	1.57
		QWS's Percent of County's Public Supply (%)	69%
		QWS's Supplied Industrial Demand (MGD)	0.34
		2015 QWS Percent of Regional Industrial Demand (%)	1.32%
		2050 QWS Industrial Demand Estimate (MGD)	0.41

Prepared by: GJH 01/11/21

Checked by: LCT 01/20/21

Notes:

MGD - million gallons per day

NA - not applicable because total demand values (Table 4-1) are sourced from *City of Griffin Water Master Plan 2010-2050* (Engineering Strategies, 2011).

QWS - qualified water system

1. Values are from the 2017 Upper Flint Water Planning Council *Upper Flint Regional Water Plan* .
2. Values in the box with thick borders are from Painter, 2019: *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015.*
3. Values do not appear or, in the case of Griffin, they appeared anomalous in the 2019 Painter report; rather, 2015 Total Demand values from Table 4-1 are reported.
4. Manchester is mainly in Meriwether County with a small part in Talbot County. The 2019 Painter report includes Manchester's values in Talbot County.

Table A-4
Excess Capacity Index Values

County	Qualified Water System (QWS)	2015 Peak Day Design Capacity (MGD)	2015 ADD (MGD) (Water Withdrawal Only)[1]	2015 Excess Capacity (MGD)	2015 Excess Capacity Index	2050 Peak Day Design Capacity (MGD)[2]	2050 ADD (MGD) (Water Withdrawal Only)[3]	2050 Excess Capacity (MGD)	2050 Excess Capacity Index
Sumter	Americus	6.9	2.4	4.5	0.46	11.2	1.3	9.9	0.87
Crisp	Cordele	9.3	1.7	7.6	0.78	10.8	1.1	9.7	0.89
Spalding	Griffin	25.2	8.9	16.3	0.46	37.2	23.8	13.4	-0.78
Crisp	Lake Blackshear	2.4	0.3	2.1	0.87	2.4	0.3	2.1	0.84
Meriwether	Manchester	2.0	1.1	0.9	-0.26	2.0	0.5	1.5	0.66
Marion	Marion County	2.7	0.9	1.8	0.51	2.7	0.5	2.2	0.76
Macon	Montezuma	0.5	0.4	0.1	-4.68	0.5	0.3	0.1	-1.42
Macon	Oglethorpe	1.9	0.5	1.4	0.65	1.9	0.4	1.5	0.74
Schley	Schley County	1.5	0.3	1.1	0.72	1.5	1.1	0.3	-2.23
Spalding	Spalding County	NA	NA	NA	NA	NA	NA	NA	NA
Talbot	Talbot County	NA	NA	NA	NA	NA	NA	NA	NA
Upson	Thomaston	6.0	1.6	4.4	0.64	6.0	2.4	3.6	0.36
Dooly	Unadilla	0.7	0.5	0.2	-1.34	0.7	0.5	0.2	-1.66
Upson	Upson County	0.4	0.4	0.1	-3.98	0.4	0.6	-0.2	-
Dooly	Vienna	9.1	1.6	7.5	0.79	9.3	0.9	8.4	0.89
	Totals	**68.6**	**20.5**	**48.1**	**-**	**86.7**	**33.8**	**52.8**	**-**

Prepared by: GJH 01/20/21

Checked by: LCT 01/26/21

Notes:

ADD - average daily demand

NA - not applicable because these are purchase-only QWS

MGD - million gallons per day

QWS - qualified water system

1. 2015 EPD-validated water loss audit values are reported. In the event a QWS is not in that dataset, as identified in Table 2-3, QWS-provided values are reported.
2. Americus indicated taking Well 11 online (2.16 MGD) and a new well (2.16 MGD); Cordele indicated a new well (1.5 MGD); Griffin indicated expanding a WTP by 12 MGD; Vienna indicated a new well (2.16 MGD) to replace two old wells (combined 1.9 MGD).
3. Municipal and publicly-supplied industrial demand by county were allocated to each QWS.

Appendix B: Water Supply Deficit Calcuations

Table B-1a
Americus Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP 1 (Wells 4, 8, 10, 12)	Peak Day Design Capacity (MGD) WTP 2 (Well 9)	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	4.75	2.16	NA	1.68	8.59	0.00	8.59
	A2. Critical asset failure at largest WTP[2]	0.1	30	4.75	2.16	NA	NA	6.91	0.00	6.91
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	4.75	2.16	NA	1.68	8.59	4.75	3.84
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	4.75	2.16	NA	NA	6.91	0.00	6.91
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	4.75	2.16	NA	2.66	9.57	4.75	4.82
	D2. Chemical contamination of largest raw water source	0.1	1	4.75	2.16	NA	2.66	9.57	4.75	4.82
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 1 has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-1b
Americus Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	8.59	2.43	1.58	0.85	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	6.91	2.43	1.58	0.85	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.84	2.43	1.58	0.85	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	6.91	2.43	1.58	0.85	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.82	2.43	1.58	0.85	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.82	2.43	1.58	0.85	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-1c
Americus Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)			Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP 1 (Wells 4, 8, 10, 12)	WTP 2 (Well 9, New Well)	WTP 3 (Well 11)					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	4.75	4.32	2.16	NA	1.68	12.91	0.00	12.91
	A2. Critical asset failure at largest WTP[2]	0.1	30	4.75	4.32	2.16	NA	NA	11.23	0.00	11.23
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	4.75	4.32	2.16	NA	1.68	12.91	4.75	8.16
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	4.75	4.32	2.16	NA	NA	11.23	0.00	11.23
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	4.75	4.32	2.16	NA	2.66	13.89	4.75	9.14
	D2. Chemical contamination of largest raw water source	0.1	1	4.75	4.32	2.16	NA	2.66	13.89	4.75	9.14
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable									
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable									

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 1 has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-1d
Americus Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	12.91	1.31	0.85	0.46	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	11.23	1.31	0.85	0.46	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	8.16	1.31	0.85	0.46	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	11.23	1.31	0.85	0.46	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	9.14	1.31	0.85	0.46	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	9.14	1.31	0.85	0.46	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-2a
Cordele Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 103	WTP Well 104	WTP Well 106	WTP Well 107	WTP All Others[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.00	1.44	1.87	2.08	2.87	NA	1.38	10.64	0.00	10.64
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.00	1.44	1.87	2.08	2.87	NA	NA	9.26	0.00	9.26
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.00	1.44	1.87	2.08	2.87	NA	1.38	10.64	2.08	8.56
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	1.00	1.44	1.87	2.08	2.87	NA	NA	9.26	0.00	9.26
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.00	1.44	1.87	2.08	2.87	NA	1.38	10.64	2.08	8.56
	D2. Chemical contamination of largest raw water source	0.1	1	1.00	1.44	1.87	2.08	2.87	NA	1.38	10.64	2.08	8.56
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP Well 107 has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The two WTPs for Well 108 (1.72 MGD) and Well 109 (1.15 MGD) are summarized in one column.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-2b
Cordele Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	10.64	1.69	1.10	0.59	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	9.26	1.69	1.10	0.59	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	8.56	1.69	1.10	0.59	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	9.26	1.69	1.10	0.59	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	8.56	1.69	1.10	0.59	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	8.56	1.69	1.10	0.59	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-2c
Cordele Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP New Well	WTP Well 104	WTP Well 106	WTP Well 107	WTP All Others[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.50	1.44	1.87	2.08	3.87	NA	1.68	12.44	0.10	12.34
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.50	1.44	1.87	2.08	3.87	NA	NA	10.76	0.00	10.76
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.50	1.44	1.87	2.08	3.87	NA	1.68	12.44	2.08	10.36
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	1.50	1.44	1.87	2.08	3.87	NA	NA	10.76	0.00	10.76
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.50	1.44	1.87	2.08	3.87	NA	1.68	12.44	2.08	10.36
	D2. Chemical contamination of largest raw water source	0.1	1	1.50	1.44	1.87	2.08	3.87	NA	1.68	12.44	2.08	10.36
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP Well 107 has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. WTPs for Well 103 (1.00 MGD), Well 108 (1.72 MGD), and Well 109 (1.15 MGD) are summarized in one column.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw and treated water storage. Cordele indicated one new 0.5 MG tank.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-2d
Cordele Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	12.34	1.07	0.70	0.38	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	10.76	1.07	0.70	0.38	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	10.36	1.07	0.70	0.38	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	10.76	1.07	0.70	0.38	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	10.36	1.07	0.70	0.38	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	10.36	1.07	0.70	0.38	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-3a
Griffin Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Peak Permitted Withdrawal (MGD-24-hour maximum)		Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Simmons WTP	Still Branch WTP	Heads Creek Reservoir (Simmons WTP)[3]	Still Branch Reservoir[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	13.20	12.00	13.20	48.00	2.25	1.80	29.25	0.00	29.25
	A2. Critical asset failure at largest WTP[2]	0.1	30	13.20	12.00	13.20	48.00	2.25	NA	27.45	13.20	14.25
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	13.20	12.00	13.20	48.00	2.25	1.80	29.25	13.20	16.05
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	13.20	12.00	13.20	48.00	2.25	NA	27.45	0.00	27.45
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	13.20	12.00	13.20	48.00	2.25	5.70	33.15	13.20	19.95
	D2. Chemical contamination of largest raw water source	0.1	1	13.20	12.00	13.20	48.00	2.25	5.70	33.15	13.20	19.95
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	13.20	12.00	13.20	48.00	2.25	NA	27.45	13.20	14.25
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[5]										

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Simmons WTP has a backup generator able to supply full capacity, rendering no capacity loss.
2. Simmons WTP did not meet unit process redundancy for coagulation, rendering full capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation. Griffin also has a withdrawal permit (50 MGD 24-hour maximum) to fill Still Branch Reservoir.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
5. Heads Creek Reservoir is in Hydrologic Unit Code-10 "Morning Creek-Flint River," which is greater than 100 square miles;
Still Branch Reservoir is in Hydrologic Unit Code-10 "Flint River-Birch Creek," which is less than 100 square miles but the Flint River is classified as a major river at the withdrawal point.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-3b
Griffin Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	29.25	8.85	5.76	3.10	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	14.25	8.85	5.76	3.10	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	16.05	8.85	5.76	3.10	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	27.45	8.85	5.76	3.10	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	19.95	8.85	5.76	3.10	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	19.95	8.85	5.76	3.10	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	14.25	8.85	5.76	3.10	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-3c
Griffin Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Peak Permitted Withdrawal (MGD-24-hour maximum)		Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Simmons WTP	Still Branch WTP	Heads Creek Reservoir (Simmons WTP)[3]	Still Branch Reservoir[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	13.20	24.00	13.20	48.00	2.25	1.80	41.25	12.00	29.25
	A2. Critical asset failure at largest WTP[2]	0.1	30	13.20	24.00	13.20	48.00	2.25	NA	39.45	12.00	27.45
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	13.20	24.00	13.20	48.00	2.25	1.80	41.25	24.00	17.25
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	13.20	24.00	13.20	48.00	2.25	NA	39.45	0.00	39.45
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	13.20	24.00	13.20	48.00	2.25	5.70	45.15	24.00	21.15
	D2. Chemical contamination of largest raw water source	0.1	1	13.20	24.00	13.20	48.00	2.25	5.70	45.15	24.00	21.15
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	13.20	24.00	13.20	48.00	2.25	NA	39.45	24.00	15.45
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[5]										

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Still Branch WTP has a backup generator able to supply 12 MGD, which is the 2015 peak day design capacity. WTP upgrades may include additional backup power supply, but 12 MGD capacity loss was assumed to be conservative.
2. Still Branch WTP can supply 12 MGD redundancy, which is the 2015 peak day design capacity. WTP upgrades may include additional redundancy measures, but 12 MGD capacity loss was assumed to be conservative.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation. Griffin also has a withdrawal permit (50 MGD 24-hour maximum) to fill Still Branch Reservoir.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
5. Heads Creek Reservoir is in Hydrologic Unit Code-10 "Morning Creek-Flint River," which is greater than 100 square miles;
   Still Branch Reservoir is in Hydrologic Unit Code-10 "Flint River-Birch Creek," which is less than 100 square miles but the Flint River is classified as a major river at the withdrawal point.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-3d
Griffin Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	29.25	23.84	15.50	8.34	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	27.45	23.84	15.50	8.34	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	17.25	23.84	15.50	8.34	6.59	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	39.45	23.84	15.50	8.34	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	21.15	23.84	15.50	8.34	2.69	0.00	0.00
	D2. Chemical contamination of largest raw water source	21.15	23.84	15.50	8.34	2.69	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	15.45	23.84	15.50	8.34	8.39	0.05	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-3e
Griffin Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[2]	Individual System Excess Capacity[3] 2015	Individual System Excess Capacity[3] 2050
1	GA1510001-Henry County[4]	Hill View Road	8	5	1.745	1.128	0.000	0.725	24.1	36.7
2	GA0630000-Clayton County[4]	Bear Creek Road	8	5	1.745	1.128	0.000	0.825	15.4	22.6
3	GA0350051-Butts County/Jackson/Jenkinsburg	Jackson Road	8	5	1.745	1.128	0.000	0.700	2.7	7.4

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. Maximum flow values differ because the QWS reported these values as the maximum possible purchased water. The more conservative values were chosen.
3. The maximum possible purchased water is limited by the provider's ADD, permit limits, and their peak design capacity. The provider's excess capacity is listed here, if available.
4. The excess capacity is estimated utilizing the current and projected peak day design capacities as well as the current and projected ADD found within the 2017 Ch2M and Black and Veatch *Water Resource Management Plan: Metropolitan North Georgia Water Planning District*.

Henry County: 2015: peak day design capacity is 40.5 MGD; ADD is 16.4 MGD; excess capacity is 24.1 MGD.
Henry County: 2050: peak day design capacity is 64.0 MGD; ADD is 27.3 MGD; excess capacity is 36.7 MGD.
Clayton County: 2015: peak day design capacity is 42.0 MGD; ADD is 26.6 MGD; excess capacity is 15.4 MGD.
Clayton County: 2050: peak day design capacity is 62.6 MGD; ADD is 40.0 MGD; excess capacity is 22.6 MGD.

Table B-4a
Lake Blackshear Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 201	Peak Day Design Capacity (MGD) WTP Well 202	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.20	1.20	NA	0.36	2.76	0.00	2.76
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.20	1.20	NA	NA	2.40	0.00	2.40
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.20	1.20	NA	0.36	2.76	1.20	1.56
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	1.20	1.20	NA	NA	2.40	0.00	2.40
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.20	1.20	NA	0.36	2.76	1.20	1.56
	D2. Chemical contamination of largest raw water source	0.1	1	1.20	1.20	NA	0.36	2.76	1.20	1.56
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

1. Both WTPs have a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Table B-4b
Lake Blackshear Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.76	0.27	0.18	0.09	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.40	0.27	0.18	0.09	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.56	0.27	0.18	0.09	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.40	0.27	0.18	0.09	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.56	0.27	0.18	0.09	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.56	0.27	0.18	0.09	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-4c
Lake Blackshear Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 201	Peak Day Design Capacity (MGD) WTP Well 202	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.20	1.20	NA	0.36	2.76	0.00	2.76
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.20	1.20	NA	NA	2.40	0.00	2.40
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.20	1.20	NA	0.36	2.76	1.20	1.56
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	1.20	1.20	NA	NA	2.40	0.00	2.40
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.20	1.20	NA	0.36	2.76	1.20	1.56
	D2. Chemical contamination of largest raw water source	0.1	1	1.20	1.20	NA	0.36	2.76	1.20	1.56
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

1. Both WTPs have a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-4d
Lake Blackshear Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.76	0.33	0.22	0.12	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.40	0.33	0.22	0.12	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.56	0.33	0.22	0.12	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.40	0.33	0.22	0.12	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.56	0.33	0.22	0.12	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.56	0.33	0.22	0.12	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-5a
Manchester Emergency Scenario Evaluation: 2015

				Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)					
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**Rush Creek WTP**	**Rush Creek Reservoir and Lazer Creek[3]**	**Maximum Possible Purchased Water (MGD)**	**Water Storage (MGD)[4]**	**Total Possible Water Supply (MGD)**	**Capacity Loss (MGD)**	**Available Water Supply (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.00	6.30	NA	1.14	3.14	2.00	1.14
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.00	6.30	NA	NA	2.00	0.00	2.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.00	6.30	NA	1.14	3.14	2.00	1.14
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.00	6.30	NA	NA	2.00	0.00	2.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.00	6.30	NA	1.35	3.35	2.00	1.35
	D2. Chemical contamination of largest raw water source	0.1	1	2.00	6.30	NA	1.35	3.35	2.00	1.35
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	2.00	6.30	NA	NA	2.00	2.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[5]								

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. No backup generators are available, rendering full capacity loss at the largest WTP.
2. The WTP met chemical redundancy and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
5. Rush Creek Reservoir is in Hydrologic Unit Code-10 "Lazer Creek," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-5b
Manchester Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.14	1.11	0.72	0.39	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.00	1.11	0.72	0.39	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.14	1.11	0.72	0.39	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.00	1.11	0.72	0.39	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.35	1.11	0.72	0.39	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.35	1.11	0.72	0.39	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.00	1.11	0.72	0.39	1.11	0.72	0.39
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-5c
Manchester Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Rush Creek WTP	Rush Creek Reservoir and Lazer Creek[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.00	6.30	NA	1.14	3.14	2.00	1.14
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.00	6.30	NA	NA	2.00	0.00	2.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.00	6.30	NA	1.14	3.14	2.00	1.14
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.00	6.30	NA	NA	2.00	0.00	2.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.00	6.30	NA	1.35	3.35	2.00	1.35
	D2. Chemical contamination of largest raw water source	0.1	1	2.00	6.30	NA	1.35	3.35	2.00	1.35
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	2.00	6.30	NA	NA	2.00	2.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[5]								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. No backup generators are available, rendering full capacity loss at the largest WTP.
2. The WTP met chemical redundancy and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
5. Rush Creek Reservoir is in Hydrologic Unit Code-10 "Lazer Creek," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-5d
Manchester Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.14	0.51	0.33	0.18	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.00	0.51	0.33	0.18	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.14	0.51	0.33	0.18	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.00	0.51	0.33	0.18	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.35	0.51	0.33	0.18	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.35	0.51	0.33	0.18	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.00	0.51	0.33	0.18	0.51	0.33	0.18
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-6a
Marion County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP 201 Airport Wells 1 & 2	WTP 202					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.73	1.00	0.63	0.75	4.11	1.73	2.38
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.73	1.00	0.63	NA	3.36	0.00	3.36
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.73	1.00	0.63	0.75	4.11	1.73	2.38
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.73	1.00	0.63	NA	3.36	0.00	3.36
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.73	1.00	0.63	0.87	4.23	1.73	2.50
	D2. Chemical contamination of largest raw water source	0.1	1	1.73	1.00	0.63	0.87	4.23	1.73	2.50
E. Full unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment					Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought					Not Applicable				

Notes:

Prepared by: GJH 01/20/21

Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. No backup generators are available, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnection with Buena Vista is not limited by their permit withdrawal limits.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-6b
Marion County Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.38	0.87	0.56	0.30	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.36	0.87	0.56	0.30	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.38	0.87	0.56	0.30	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.36	0.87	0.56	0.30	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.50	0.87	0.56	0.30	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	2.50	0.87	0.56	0.30	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-6c
Marion County Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP 201 Airport Wells 1 & 2	WTP 202					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.73	1.00	0.63	0.75	4.11	1.73	2.38
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.73	1.00	0.63	NA	3.36	0.00	3.36
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.73	1.00	0.63	0.75	4.11	1.73	2.38
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.73	1.00	0.63	NA	3.36	0.00	3.36
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.73	1.00	0.63	0.87	4.23	1.73	2.50
	D2. Chemical contamination of largest raw water source	0.1	1	1.73	1.00	0.63	0.87	4.23	1.73	2.50
E. Full unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment					Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought					Not Applicable				

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. No backup generators are available, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnection with Buena Vista is not limited by their permit withdrawal limits.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-6d
Marion County Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.38	0.52	0.34	0.18	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.36	0.52	0.34	0.18	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.38	0.52	0.34	0.18	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.36	0.52	0.34	0.18	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.50	0.52	0.34	0.18	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	2.50	0.52	0.34	0.18	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-6e
Marion County Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)
5	GA1970000-Buena Vista	Highway 41 North	6	5	0.982	0.635	0.000	0.635

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.

Table B-7a
Montezuma Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP 1 Wells 101 & 103	Peak Day Design Capacity (MGD) WTP 2 Wells 102 & 104	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.35	0.11	NA	0.41	0.87	0.00	0.87
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.35	0.11	NA	NA	0.46	0.00	0.46
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.35	0.11	NA	0.41	0.87	0.35	0.53
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.35	0.11	NA	NA	0.46	0.00	0.46
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.35	0.11	NA	0.43	0.89	0.35	0.55
	D2. Chemical contamination of largest raw water source	0.1	1	0.35	0.11	NA	0.43	0.89	0.35	0.55
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 1 has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-7b
Montezuma Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	0.87	0.39	0.25	0.14	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	0.46	0.39	0.25	0.14	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.53	0.39	0.25	0.14	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	0.46	0.39	0.25	0.14	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.55	0.39	0.25	0.14	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	0.55	0.39	0.25	0.14	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-7c
Montezuma Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP 1 Wells 101 & 103	Peak Day Design Capacity (MGD) WTP 2 Wells 102 & 104	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.35	0.11	NA	0.41	0.87	0.00	0.87
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.35	0.11	NA	NA	0.46	0.00	0.46
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.35	0.11	NA	0.41	0.87	0.35	0.53
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.35	0.11	NA	NA	0.46	0.00	0.46
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.35	0.11	NA	0.43	0.89	0.35	0.55
	D2. Chemical contamination of largest raw water source	0.1	1	0.35	0.11	NA	0.43	0.89	0.35	0.55
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 1 has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-7d
Montezuma Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	0.87	0.32	0.21	0.11	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	0.46	0.32	0.21	0.11	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.53	0.32	0.21	0.11	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	0.46	0.32	0.21	0.11	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.55	0.32	0.21	0.11	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	0.55	0.32	0.21	0.11	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-8a
Oglethorpe Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP 1 Wells 1 & 2	Peak Day Design Capacity (MGD) WTP 2 Well 4	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.44	0.50	NA	0.53	2.47	0.00	2.47
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.44	0.50	NA	NA	1.94	0.00	1.94
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.44	0.50	NA	0.53	2.47	1.44	1.03
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.44	0.50	NA	NA	1.94	0.00	1.94
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.44	0.50	NA	0.53	2.47	1.44	1.03
	D2. Chemical contamination of largest raw water source	0.1	1	1.44	0.50	NA	0.53	2.47	1.44	1.03
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: GJH 01/20/21

Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 1 has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-8b
Oglethorpe Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.47	0.50	0.33	0.18	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	1.94	0.50	0.33	0.18	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.03	0.50	0.33	0.18	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.94	0.50	0.33	0.18	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.03	0.50	0.33	0.18	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.03	0.50	0.33	0.18	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-8c
Oglethorpe Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP 1 Wells 1 & 2	Peak Day Design Capacity (MGD) WTP 2 Well 4	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.44	0.50	NA	0.53	2.47	0.00	2.47
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.44	0.50	NA	NA	1.94	0.00	1.94
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.44	0.50	NA	0.53	2.47	1.44	1.03
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.44	0.50	NA	NA	1.94	0.00	1.94
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.44	0.50	NA	0.53	2.47	1.44	1.03
	D2. Chemical contamination of largest raw water source	0.1	1	1.44	0.50	NA	0.53	2.47	1.44	1.03
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 1 has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-8d
Oglethorpe Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.47	0.40	0.26	0.14	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	1.94	0.40	0.26	0.14	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.03	0.40	0.26	0.14	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.94	0.40	0.26	0.14	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.03	0.40	0.26	0.14	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.03	0.40	0.26	0.14	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-9a
Schley County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	Peak Day Design Capacity (MGD) WTP Well 102	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.73	0.73	NA	0.36	1.81	0.00	1.81
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.73	0.73	NA	NA	1.45	0.00	1.45
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.73	0.73	NA	0.36	1.81	0.73	1.09
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.73	0.73	NA	NA	1.45	0.00	1.45
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.73	0.73	NA	0.36	1.81	0.73	1.09
	D2. Chemical contamination of largest raw water source	0.1	1	0.73	0.73	NA	0.36	1.81	0.73	1.09
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: GJH 01/20/21

Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

1. Schley County has a backup portable generator able to supply full capacity to either WTP, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Table B-9b
Schley County Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.81	0.31	0.20	0.11	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	1.45	0.31	0.20	0.11	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.09	0.31	0.20	0.11	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.45	0.31	0.20	0.11	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.09	0.31	0.20	0.11	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.09	0.31	0.20	0.11	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-9c
Schley County Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	Peak Day Design Capacity (MGD) WTP Well 102	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.73	0.73	NA	0.36	1.81	0.00	1.81
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.73	0.73	NA	NA	1.45	0.00	1.45
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.73	0.73	NA	0.36	1.81	0.73	1.09
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.73	0.73	NA	NA	1.45	0.00	1.45
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.73	0.73	NA	0.36	1.81	0.73	1.09
	D2. Chemical contamination of largest raw water source	0.1	1	0.73	0.73	NA	0.36	1.81	0.73	1.09
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

1. Schley County has a backup portable generator able to supply full capacity to either WTP, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-9d
Schley County Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.81	1.11	0.72	0.39	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	1.45	1.11	0.72	0.39	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.09	1.11	0.72	0.39	0.02	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.45	1.11	0.72	0.39	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.09	1.11	0.72	0.39	0.02	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.09	1.11	0.72	0.39	0.02	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment				Not Applicable			
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-10a
Spalding County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)[1]	Water Storage (MGD)	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP				Not Applicable			
	A2. Critical asset failure at largest WTP				Not Applicable			
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[2]				Not Applicable			
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	11.76	NA	11.76	0.00	11.76
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source				Not Applicable			
	D2. Chemical contamination of largest raw water source				Not Applicable			
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment				Not Applicable			
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Spalding County's distribution system is an extension of Griffin's distribution system, so the 2015 peak daily purchased water is reported.
2. Spalding County's distribution system is an extension of Griffin's distribution system, so large-scale transmission mains are maintained by Griffin.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-10b
Spalding County Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	Not Applicable						
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	11.76	3.12	2.03	1.09	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-10c
Spalding County Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)[1]	Water Storage (MGD)	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP				Not Applicable			
	A2. Critical asset failure at largest WTP				Not Applicable			
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[2]				Not Applicable			
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	11.76	NA	11.76	0.00	11.76
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source				Not Applicable			
	D2. Chemical contamination of largest raw water source				Not Applicable			
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment				Not Applicable			
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Spalding County's distribution system is an extension of Griffin's distribution system, so the 2015 peak daily purchased water is reported.
2. Spalding County's distribution system is an extension of Griffin's distribution system, so large-scale transmission mains are maintained by Griffin.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-10d
Spalding County Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	Not Applicable						
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	11.76	10.07	6.55	3.52	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-11a
Talbot County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[1]	0.1	1	2.89	0.71	3.60	1.76	1.83
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice[2]	1	3	2.89	NA	2.89	0.00	2.89
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Talbot County is interconnected with Columbus and Manchester. It was assumed that the largest interconnection fails.
2. Talbot County is interconnected with Columbus and Manchester. It was assumed that both interconnections can supply full capacity.
3. The interconnections with Columbus and Manchester are not limited by their permit withdrawal limits.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-11b
Talbot County Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.83	0.41	0.26	0.14	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.89	0.41	0.26	0.14	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-11c
Talbot County Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[1]	0.1	1	2.89	0.71	3.60	1.76	1.83
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice[2]	1	3	2.89	NA	2.89	0.00	2.89
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

Prepared by: GJH 01/20/21

Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Talbot County is interconnected with Columbus and Manchester. It was assumed that the largest interconnection fails.
2. Talbot County is interconnected with Columbus and Manchester. It was assumed that both interconnections can supply full capacity.
3. The interconnections with Columbus and Manchester are not limited by their permit withdrawal limits.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-11d
Talbot County Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.83	0.21	0.14	0.07	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.89	0.21	0.14	0.07	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-11e
Talbot County Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)	Individual System Excess Capacity[2]	
									2015	2050
6	GA1990003-Manchester	Northwest side of county	8	5	1.745	1.128	0.315	1.128	0.89	1.49
7	GA2150000-Columbus	Southwest side of county	10	5	2.727	1.763	0.090	1.763	69.4	49.2

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. The maximum possible purchased water is limited by the provider's ADD, permit limits, and their peak design capacity. The provider's excess capacity is listed here, if available.

Table B-12a
Thomaston Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Thomaston WTP	Potato Creek 1105-01 Potato Creek 1105-02 Potato Creek 1105-03[4]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	6.00	11.80	NA	0.99	6.99	0.00	6.99
	A2. Critical asset failure at largest WTP[2]	0.1	30	6.00	11.80	NA	NA	6.00	0.00	6.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[3]	0.1	1	6.00	11.80	NA	0.99	6.99	0.00	6.99
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	6.00	11.80	NA	NA	6.00	0.00	6.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[6]	0.5	1	6.00	11.80	NA	1.20	7.20	0.00	7.20
	D2. Chemical contamination of largest raw water source[6]	0.1	1	6.00	11.80	NA	1.20	7.20	0.00	7.20
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	0.05	30	6.00	11.80	NA	NA	6.00	0.00	6.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP has a backup generator able to supply full capacity, rendering no capacity loss.
2. The WTP met chemical redundancy and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Four transmission mains exit the WTP and enter the distribution system, indicating redundancy and rendering no capacity loss.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Lake Thomaston (324 MG) and Hannah's Mill Reservoir (120 MG) are large enough to meet Thomaston's ADD for the emergency durations, rendering no capacity loss.
7. Thomaston's reservoirs are in Hydrologic Unit Code-10 "Potato Creek," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-12b
Thomaston Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	6.99	1.57	1.02	0.55	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	6.00	1.57	1.02	0.55	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.99	1.57	1.02	0.55	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	6.00	1.57	1.02	0.55	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	7.20	1.57	1.02	0.55	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	7.20	1.57	1.02	0.55	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	6.00	1.57	1.02	0.55	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-12c
Thomaston Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) Thomaston WTP	Peak Permitted Withdrawal (MGD-24-hour maximum) Potato Creek 1105-01 Potato Creek 1105-02 Potato Creek 1105-03[4]	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	6.00	11.80	NA	0.99	6.99	0.00	6.99
	A2. Critical asset failure at largest WTP[2]	0.1	30	6.00	11.80	NA	NA	6.00	0.00	6.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[3]	0.1	1	6.00	11.80	NA	0.99	6.99	0.00	6.99
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	6.00	11.80	NA	NA	6.00	0.00	6.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[6]	0.5	1	6.00	11.80	NA	1.20	7.20	0.00	7.20
	D2. Chemical contamination of largest raw water source[6]	0.1	1	6.00	11.80	NA	1.20	7.20	0.00	7.20
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	0.05	30	6.00	11.80	NA	NA	6.00	0.00	6.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP has a backup generator able to supply full capacity, rendering no capacity loss.
2. The WTP met chemical redundancy and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Four transmission mains exit the WTP and enter the distribution system, indicating redundancy and rendering no capacity loss.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Lake Thomaston (324 MG) and Hannah's Mill Reservoir (120 MG) are large enough to meet Thomaston's ADD for the emergency durations, rendering no capacity loss.
7. Thomaston's reservoirs are in Hydrologic Unit Code-10 "Potato Creek," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-12d
Thomaston Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	6.99	2.35	1.53	0.82	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	6.00	2.35	1.53	0.82	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.99	2.35	1.53	0.82	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	6.00	2.35	1.53	0.82	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	7.20	2.35	1.53	0.82	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	7.20	2.35	1.53	0.82	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	6.00	2.35	1.53	0.82	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-13a
Unadilla Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)			Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 102	WTP Well 103	WTP Well 104					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.24	0.24	0.24	NA	0.33	1.05	0.24	0.81
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.24	0.24	0.24	NA	NA	0.72	0.00	0.72
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.24	0.24	0.24	NA	0.33	1.05	0.24	0.81
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.24	0.24	0.24	NA	NA	0.72	0.00	0.72
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.24	0.24	0.24	NA	0.33	1.05	0.24	0.81
	D2. Chemical contamination of largest raw water source	0.1	1	0.24	0.24	0.24	NA	0.33	1.05	0.24	0.81
E. Full unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment						Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought						Not Applicable				

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. No WTPs have a backup generator, rendering full capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-13b
Unadilla Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	0.81	0.50	0.33	0.18	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	0.72	0.50	0.33	0.18	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.81	0.50	0.33	0.18	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	0.72	0.50	0.33	0.18	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.81	0.50	0.33	0.18	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	0.81	0.50	0.33	0.18	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-13c
Unadilla Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)			Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 102	WTP Well 103	WTP Well 104					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.24	0.24	0.24	NA	0.33	1.05	0.24	0.81
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.24	0.24	0.24	NA	NA	0.72	0.00	0.72
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.24	0.24	0.24	NA	0.33	1.05	0.24	0.81
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.24	0.24	0.24	NA	NA	0.72	0.00	0.72
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.24	0.24	0.24	NA	0.33	1.05	0.24	0.81
	D2. Chemical contamination of largest raw water source	0.1	1	0.24	0.24	0.24	NA	0.33	1.05	0.24	0.81
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable									
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable									

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. No WTPs have a backup generator, rendering full capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-13d
Unadilla Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	0.81	0.52	0.34	0.18	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	0.72	0.52	0.34	0.18	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.81	0.52	0.34	0.18	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	0.72	0.52	0.34	0.18	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.81	0.52	0.34	0.18	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	0.81	0.52	0.34	0.18	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-14a
Upson County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 102	Peak Day Design Capacity (MGD) WTP Well 103	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.22	0.22	4.43	0.65	5.51	0.00	5.51
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.22	0.22	4.43	NA	4.86	0.00	4.86
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.22	0.22	4.43	0.65	5.51	0.22	5.30
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.22	0.22	4.43	NA	4.86	0.00	4.86
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.22	0.22	4.43	0.65	5.51	0.22	5.30
	D2. Chemical contamination of largest raw water source	0.1	1	0.22	0.22	4.43	0.65	5.51	0.22	5.30
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. One backup generator is able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnections with Thomaston are limited by Thomaston's peak day design capacity and 2015 ADD. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-14e); or 2) the supplier's 2015 ADD subtracted from the supplier's peak day design capacity.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-14b
Upson County Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	5.51	0.37	0.24	0.13	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.86	0.37	0.24	0.13	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	5.30	0.37	0.24	0.13	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.86	0.37	0.24	0.13	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	5.30	0.37	0.24	0.13	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	5.30	0.37	0.24	0.13	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-14c
Upson County Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 102	Peak Day Design Capacity (MGD) WTP Well 103	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.22	0.22	3.65	0.65	4.73	0.00	4.73
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.22	0.22	3.65	NA	4.08	0.00	4.08
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.22	0.22	3.65	0.65	4.73	0.22	4.52
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.22	0.22	3.65	NA	4.08	0.00	4.08
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.22	0.22	3.65	0.65	4.73	0.22	4.52
	D2. Chemical contamination of largest raw water source	0.1	1	0.22	0.22	3.65	0.65	4.73	0.22	4.52
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. One backup generator is able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnections with Thomaston are limited by Thomaston's peak day design capacity and 2015 ADD. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-14e); or 2) the supplier's 2050 ADD subtracted from the supplier's peak day design capacity.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-14d
Upson County Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	4.73	0.62	0.41	0.22	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.08	0.62	0.41	0.22	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.52	0.62	0.41	0.22	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.08	0.62	0.41	0.22	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.52	0.62	0.41	0.22	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.52	0.62	0.41	0.22	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-14e
Upson County Interconnections

Existing Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)[2]	Maximum Possible Purchased Water (MGD)
8	GA2930000-Thomaston	West Moores Crossing	12	5	3.927	2.538	0.002	2.538
9	GA2930000-Thomaston	Highway 19 West County	10	5	2.727	1.763	0.002	1.763
10	GA2930000-Thomaston	Logans Landing / East Moores Crossing	8	5	1.745	1.128	0.002	1.128

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Checked by: LCT 02/01/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. The daily capacity (0.007 MGD) was assumed to be distributed equally among the three interconnections.

Table B-15a
Vienna Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Wells 201 & 202	WTP Well 203	WTP Well 204	WTP Well 205	WTP Well 206					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.90	1.44	2.16	2.16	1.41	NA	0.63	9.70	2.16	7.54
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.90	1.44	2.16	2.16	1.41	NA	NA	9.07	0.00	9.07
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.90	1.44	2.16	2.16	1.41	NA	0.63	9.70	2.16	7.54
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.90	1.44	2.16	2.16	1.41	NA	NA	9.07	0.00	9.07
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.90	1.44	2.16	2.16	1.41	NA	0.63	9.70	2.16	7.54
	D2. Chemical contamination of largest raw water source	0.1	1	1.90	1.44	2.16	2.16	1.41	NA	0.63	9.70	2.16	7.54
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

1. Vienna does not have a backup generator for the largest WTP, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-15b
Vienna Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	7.54	1.57	1.02	0.55	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	9.07	1.57	1.02	0.55	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	7.54	1.57	1.02	0.55	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	9.07	1.57	1.02	0.55	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	7.54	1.57	1.02	0.55	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	7.54	1.57	1.02	0.55	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-15c
Vienna Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[1]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Replace-ment Well	WTP Well 203	WTP Well 204	WTP Well 205	WTP Well 206					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.16	1.44	2.16	2.16	1.41	NA	0.81	10.14	2.16	7.98
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.16	1.44	2.16	2.16	1.41	NA	NA	9.33	0.00	9.33
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.16	1.44	2.16	2.16	1.41	NA	0.81	10.14	2.16	7.98
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.16	1.44	2.16	2.16	1.41	NA	NA	9.33	0.00	9.33
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.16	1.44	2.16	2.16	1.41	NA	0.81	10.14	2.16	7.98
	D2. Chemical contamination of largest raw water source	0.1	1	2.16	1.44	2.16	2.16	1.41	NA	0.81	10.14	2.16	7.98
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Vienna does not have a backup generator for the largest WTP, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Table B-15d
Vienna Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	7.98	0.90	0.58	0.31	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	9.33	0.90	0.58	0.31	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	7.98	0.90	0.58	0.31	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	9.33	0.90	0.58	0.31	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	7.98	0.90	0.58	0.31	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	7.98	0.90	0.58	0.31	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 01/20/21
Checked by: LCT 02/01/21

Appendix C: Sensitivity Analysis

Contents

Acronyms

GEFA	Georgia Environmental Finance Authority
QWS	Qualified Water System(s)

1.0 Introduction

This appendix describes the sensitivity analysis that was conducted to test the influence of criterion weightings on the initial manual rank outcome.

2.0 Sensitivity Analysis

As described in Section 7.1 of the report, scores were assigned either 1, 2, 3, or 4 using a methodology shown in Table 7-1. Criterion weights were initially assigned either 1, 2, or 3 based on professional judgement.

To conduct the sensitivity analysis, scenarios were considered to test the influence of criterion weightings on the rank outcome. First, all criteria were assigned the highest weight (3). The effect of this weighting adjustment is equivalent to the absolute score because although it amplified score values, the rank outcome was the same. Second, one of the eight criteria was assigned the highest weight (3) with the remaining seven criteria assigned the lowest weight (1). The effects of these weighting variations are described below:

1. Systems Benefitted weight = 3; all other criteria weights = 1
    a. Interconnection Projects 2 and 4 improved rank by one rank and Project 6 (Montezuma-Oglethorpe) improved rank by four ranks
    b. Interconnection Project 5 (Manchester) worsened rank by three ranks
    c. New well/WTP Project 7 (Unadilla) worsened rank by three ranks
    d. Interpretation: it is expected that mutually-beneficial interconnection projects improved rank because in this weighting adjustment, higher priority is given to projects that benefit multiple systems.
2. Population Benefitted weight = 3; all other criteria weights = 1
    a. Interconnection Projects 2 and 4 improved rank by two ranks and Project 6 (Montezuma-Oglethorpe) improved rank by one rank
    b. Interconnection Project 5 (Manchester) worsened rank by two ranks
    c. New well/WTP Project 7 (Unadilla) worsened rank by three ranks
    d. Interpretation: it is expected that mutually-beneficial interconnection projects improved rank because in this weighting adjustment, higher priority is given to projects that benefit larger populations.
3. Critical Scenario Duration (days) weight = 3; all other criteria weights = 1
    a. Interconnection Projects 1 through 5 maintained rank
    b. Interconnection Project 6 (Montezuma-Oglethorpe) improved rank by three ranks
    c. New well/WTP Project 7 (Unadilla) worsened rank by three ranks
    d. Interpretation: The seven potential projects received a score of 3 for this criterion. Therefore, the rank changes are driven by other criteria.
4. Added Capacity as a Percent of Total Demand (%) weight = 3; all other criteria weights = 1
    a. Interconnection Projects 2, 4, and 5 worsened rank by one rank. Interconnection Project 3 worsened rank by three ranks.
    b. Interconnection Project 6 (Montezuma-Oglethorpe) improved rank by five ranks
    c. New well/WTP Project 7 (Unadilla) improved rank by one rank

   d. Interpretation: the weighting adjustment result is driven by the QWS total demand. Interconnection Projects 2 through 5 have a relatively small added capacity as a percent of total demand, whereas Projects 6 and 7 have a relatively large added capacity as a percent of total demand.
5. Cost ($) weight = 3; all other criteria weights = 1
   a. Interconnection Projects 1 through 5 maintained rank
   b. Interconnection Project 6 (Montezuma-Oglethorpe) improved rank by three ranks
   c. New well/WTP Project 7 (Unadilla) worsened rank by three ranks
   d. Interpretation: Project 6 is slightly less expensive than Project 7, which may explain the rank order change. It is also suspected that the rank changes are driven by other criteria.
6. Potential Environmental Impacts weight = 3; all other criteria weights = 1
   a. Interconnection Projects 2, 3, and 4 worsened rank by one rank
   b. Interconnection Project 5 (Manchester) improved rank by one rank
   c. Interconnection Project 6 (Montezuma-Oglethorpe) improved rank by two ranks
   d. Interpretation: it is expected that longer-distance excavation interconnection projects worsen rank because in this weighting adjustment, higher priority is given to projects with fewer potential environmental impacts.
7. Potential System and Community Impacts weight = 3; all other criteria weights = 1
   a. Interconnection Projects 2 and 4 improved rank by one rank
   b. Interconnection Project 5 (Manchester) worsened rank by three ranks
   c. New well/WTP Project 7 (Unadilla) improved rank by one rank
   d. Interpretation: this weighting adjustment mainly affected Project 5 because of the potential water quality impacts and potential stress to Warm Springs. Projects 2, 4, and 7 slightly improved rank order due to the Project 5 rank order change.
8. Excess Capacity Index weight = 3; all other criteria weights = 1
   a. Interconnection Projects 2 and 4 improved rank by two ranks and Project 6 (Montezuma-Oglethorpe) improved rank by one rank
   b. Interconnection Project 5 (Manchester) worsened rank by four ranks
   c. New well/WTP Project 7 (Unadilla) worsened rank by one rank
   d. Interpretation: this weighting adjustment had a noticeable effect on rank order. Manchester has a relatively high excess capacity index, which resulted in a worsened rank order for Project 5. Griffin has a relatively low excess capacity index, which resulted in an improved rank order for Projects 2 and 4. The rank order changes for Projects 6 and 7 are likely driven by other criteria.

The sensitivity analysis results demonstrate that certain criteria are somewhat sensitive to weighting. Because the mutually-beneficial interconnection projects ranked higher based on higher Criterion 1, 2, and 3 weights, retaining initial assigned weights of 1, 3, and 1, respectively, is appropriate. Criteria 4 through 8 were sensitive to varying degrees. Regardless, initially assigned weights were retained because sensitivity analysis results are meant to be informative rather than correctional.