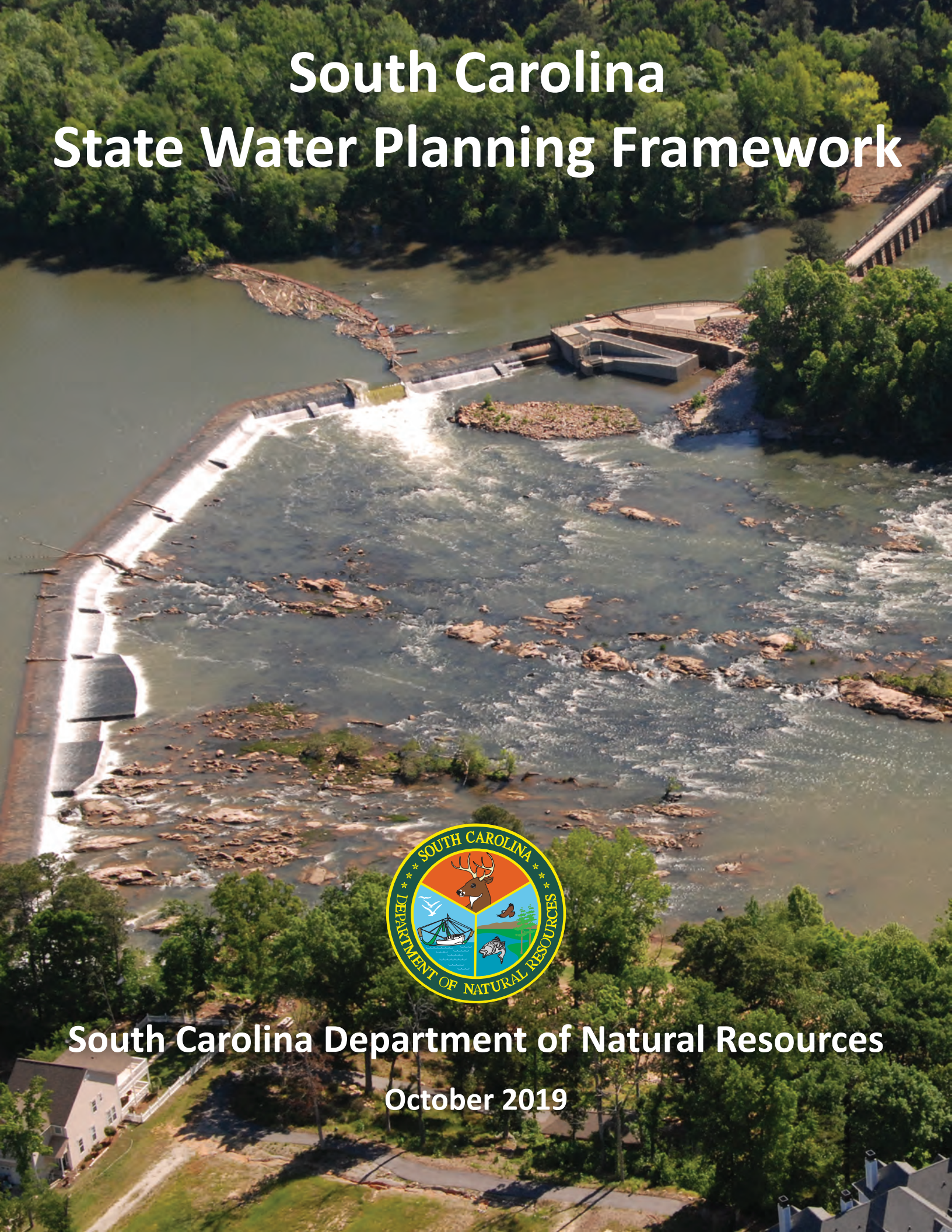
South Carolina State Water Planning Framework



South Carolina Department of Natural Resources

October 2019

On the Cover: Looking east toward the Broad River and the Columbia Canal Diversion Dam, located near Columbia, South Carolina. Water is diverted from the Broad River into the Columbia Canal (upper right corner of photograph) by the Columbia Canal Diversion Dam. The Columbia Canal, originally completed in 1824 to provide navigation past local rapids, was redesigned in 1891 to provide hydroelectric power to local industries. Since the early 1900s, the canal has served as a source of public-supply water for the City of Columbia. In 2006, a fish passage was constructed by the City as a condition for the dam license issued by the Federal Energy Regulatory Commission and is the concrete structure visible on the east side of the diversion dam in the photograph. Today, the fish passage and the canal form part of Columbia's Riverfront Park. Operation of the hydroelectric plant at the lower end of the canal (not shown in photo) has been temporarily stopped as a result of damage to the canal sustained during the flood of October 2015.

(Photograph by Phillip Jones, South Carolina Department of Natural Resources)

South Carolina
State Water Planning Framework

Prepared by
South Carolina Department of Natural Resources
and the
State Water Planning Process Advisory Committee

South Carolina Department of Natural Resources
Land, Water and Conservation Division
1000 Assembly Street
Columbia, SC 29201

October 2019

STATE OF SOUTH CAROLINA

The Honorable Henry D. McMaster, Governor

South Carolina Department of Natural Resources

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SCDNR is grateful to Ann Nolte for her editorial review of this manuscript.

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Acronyms and Abbreviations

ACE basin – Ashepoo-Combahee-Edisto River basin

ASR – Aquifer Storage and Recovery

CHEOPS – Computerized Hydro Electric Operations Planning Software

CWWMG – Catawba-Wateree Water Management Group

DMA – Drought Management Area

DRC – Drought Response Committee

EPA – United States Environmental Protection Agency

FERC – Federal Energy Regulatory Commission

GMG – Groundwater Management Group

HEC ResSim – Hydrologic Engineering Center Reservoir System Simulation

IRC – Interbasin River Council

MAR – Managed Aquifer Recharge

MGD – Million Gallons per Day

MISC – Minimum Increment of Significant Change

MODFLOW – Modular Three-Dimensional Finite Difference Groundwater Flow Model

NPDES – National Pollutant Discharge Elimination System

PDSI – Palmer Drought Severity Index; a metric used to indicate the severity of drought conditions

PPAC – State Water Planning Process Advisory Committee

RBC – River Basin Council

RFP – Request for Proposal

SCDHEC – South Carolina Department of Health and Environmental Control

SCDNR – South Carolina Department of Natural Resources

SWBM – Soil-Water-Balance Model

SWAM – Simplified Water Allocation Model; a computer program for surface water modeling

TAC – Technical Advisory Committee

USACE – United States Army Corps of Engineers

USGS – United States Geological Survey

YPDWMG – Yadkin-Pee Dee Water Management Group

Definitions

Advisor – an individual with specific expertise or information who may participate in RBC discussions, typically on a regular basis, for the benefit of and at the pleasure of the RBC; however, advisors are not RBC members and will therefore not vote in the RBC decision-making process.

Alternate – a person selected by a member of an RBC to serve in his or her place if the member must be absent from an RBC meeting.

Baseline Scenario – the model scenario used as a basis for comparing the relative impact of potential water management strategies on water availability. For the purposes of river basin planning, the Baseline Scenario is the Permitted and Registered Water Use Scenario for surface water and the Permitted Groundwater Use Scenario for groundwater.

Business-As-Usual Water-Demand Projection Scenario – a surface water or groundwater model simulation incorporating a water-demand projection based on normal weather conditions (average irrigation) and moderate growth in the population and economy.

Capacity Use Area – an area designated under the Groundwater Use and Reporting Act where excessive groundwater withdrawals have been shown to present potential adverse effects to the resource, threaten the long-term integrity of a groundwater source, or pose a threat to public health, safety, or economic welfare.

Coordinator – SCDNR contractor who will provide all meeting logistical support (e.g., acquiring meeting space, preparing agendas and other meeting materials, providing food and refreshments as needed, keeping meeting minutes, etc.); educate RBC members; do research; assist in the preparation, production, and distribution of the River Basin Plan reports; and coordinate with other contractors.

Current Groundwater Use Scenario – a groundwater model simulation incorporating an estimate of current water use.

Current Reservoir Safe Yield – the Reservoir Safe Yield estimated from reservoir inflows based on the Current Surface Water Use Scenario.

Current Surface Water Use Scenario – a surface water model simulation incorporating an estimate of current water use, generally estimated as a recent 10-year average for each surface water user (e.g., the initial River Basin Plans typically will use 2004-2013 as the averaging period).

Drought Response Committee (DRC) – a statewide committee designated under the South Carolina Drought Response Act, chaired and supported by SCDNR and the State Climatology Office, which serves as the primary drought decision-making entity in the state.

Facilitator – SCDNR contractor, sometimes referred to as the RBC Facilitator, who will guide RBC meetings in an efficient manner and encourage full participation of all RBC members while remaining neutral throughout the process. The RBC Facilitator also will focus on ensuring the administration of the planning process is effective and will guide meetings by supporting interest-based negotiation to implement the goals of the RBC according to its bylaws and the Planning Framework.

Groundwater Area of Concern – an area in the Coastal Plain, designated by a River Basin Council, where groundwater withdrawals from a specified aquifer are causing or are expected to cause unacceptable impacts to the resource or to the public health and well-being.

Groundwater Condition – a limitation, defined by the RBCs, on the amount of groundwater that can be withdrawn from an aquifer and which can be applied to evaluate Groundwater Supply for planning purposes.

Groundwater Management Plan – a management plan established and implemented in Capacity Use Areas by SCDHEC with the support of a stakeholder advisory group and designed to ensure groundwater development is managed to meet the needs of the present without compromising the ability of future generations to meet their needs.

Groundwater Management Strategy – a water management strategy proposed to address a Groundwater Area of Concern or Groundwater Shortage.

Groundwater Shortage – a state in which groundwater withdrawals from a specific aquifer violate a Groundwater Condition applied on that aquifer.

Groundwater Supply – the volume of water that can be withdrawn annually from a specified aquifer in a designated location without violating any applied Groundwater Conditions on the groundwater source.

High Water-Demand Projection Scenario – a surface water or groundwater simulation incorporating water-demand projections based on the assumptions of a hot and dry climate (increased irrigation) and high population and economic growth.

Implementation Plan – a management plan describing specific action items to be implemented by a River Basin Council and other stakeholders during the first five years after the completion of the initial River Basin Plan. Implementation Plans are updated after each subsequent iteration of the River Basin Plan (approximately every five years).

Interbasin River Council (IRC) – a group consisting of members from two or more RBCs, with no more than five members from each RBC, formed to facilitate collaboration between two or more basins.

Minimum Instream Flow – as defined in the South Carolina Surface Water Withdrawal, Permitting, Use, and Reporting Act, "*…the flow that provides an adequate supply of water at the surface water withdrawal point to maintain the biological, chemical, and physical integrity of the stream taking into account the needs of downstream users, recreation, and navigation and that flow is set at forty percent of the mean annual daily flow for the months of January, February, March, and April; thirty percent of the mean annual daily flow for the months of May, June, and December; and twenty percent of the mean annual daily flow for the months of July through November for surface water withdrawers as described in Section 49 4 150(A)(1). For surface water withdrawal points located on a surface water segment downstream of and influenced by a licensed or otherwise flow controlled impoundment, "minimum instream flow" means the flow that provides an adequate supply of water at the surface water withdrawal point to maintain the biological, chemical, and physical integrity of the stream taking into account the needs of downstream users, recreation, and navigation and that flow is set in Section 49 4 150(A)(3).*"

Performance Measure – a quantitative measure of change in a user-defined condition from an established baseline used to assess the performance of a proposed water management strategy or combination of strategies.

Permitted Groundwater Use Scenario – a groundwater model simulation incorporating the fully permitted water use allowable under existing groundwater permits for all groundwater users in Capacity Use Areas and maximum annual water use reported to SCDHEC by those groundwater users outside of Capacity Use Areas.

Permitted and Registered Surface Water Use Scenario – a surface water model simulation incorporating the fully permitted and registered water use allowable under existing surface water permits and registrations for all water users.

Physically Available Surface Water Supply – the maximum amount of water that occurs 100% of the time at a location on a surface water body with no defined Surface Water Conditions applied on the surface water body.

Planning Framework – this document (*South Carolina State Water Planning Framework*) which provides guidance on the formation of River Basin Councils and the development of River Basin Plans and the State Water Plan.

Planning Horizon – the 50-year period considered within a River Basin Plan for ensuring the surface and groundwater resources of a basin will be available for all current and future uses.

Planning Process Advisory Committee (PPAC) – a diverse group of water-resource experts representing water suppliers, industry, power generation, agriculture, trade, conservation organizations, state agencies, and academia established to develop and help implement a framework for state and river basin water planning.

Predevelopment Groundwater Use Scenario – a groundwater model simulation which removes all groundwater withdrawals and simulates groundwater levels prior to any groundwater development.

Process Metric – a benchmark used to monitor the success or failure of a process which led to an RBC action.

Progress Metric – a benchmark used to monitor the success or failure of an action taken by an RBC.

Public Outreach Coordinator – SCDNR contractor providing public outreach functions for the RBC. The Public Outreach Coordinator is responsible for ensuring the public notice and participation guidelines are followed.

Reach of Interest – a stream reach defined by an RBC which experiences undesired impacts, environmental or otherwise, determined from current or future water-demand scenarios or proposed water management strategies. Such reaches may or may not have identified Surface Water Shortages.

Reservoir Safe Yield – the Surface Water Supply for a reservoir or system of reservoirs over the simulated hydrologic period of record.

River Basin Council (RBC) – a group of diverse stakeholders with water-related interests in a basin assembled specifically to develop and help implement a River Basin Plan consistent with the Planning Framework.

River Basin Plan – a collection of recommended water management strategies developed by a River Basin Council and supported by a summary of analyses designed to ensure the surface water and groundwater resources of a river basin will be available for all uses over the Planning Horizon.

Safe Yield – as defined in the South Carolina Surface Water Withdrawal, Permitting, Use and Reporting Act for a stream not influenced by a flow-controlled impoundment, "*…the difference between the mean annual daily flow and twenty (20) percent of mean annual daily flow at the withdrawal point, taking into consideration natural and artificial replenishment of the surface water and affected downstream withdrawals*".

Strategic Node – a location on a surface water body or aquifer designated to evaluate the cumulative impacts of water management strategies for a given model scenario and which serves as a primary point of interest from which to evaluate a model scenario's Performance Measures. Strategic nodes are defined by an RBC.

Surface Water Condition – a limitation, defined by the RBCs, on the amount of water that can be withdrawn from a surface water source and which can be applied to evaluate Surface Water Supply for planning purposes.

Surface Water Management Strategy – a water management strategy proposed to eliminate a Surface Water Shortage, reduce a Surface Water Shortage, or generally increase Surface Water Supply.

Surface Water Shortage – a state in which water demand exceeds the Surface Water Supply for any water user in the basin.

Surface Water Supply – the maximum amount of water available for withdrawal 100% of the time at a location on a surface water body without violating any applied Surface Water Conditions on the surface water source and considering upstream demands.

Technical Advisory Committee – a statewide committee(s) consisting of individuals with specific technical expertise established in accordance with the Planning Framework to enhance the science and engineering aspects of the water planning process.

Unallocated Reservoir Safe Yield – the Reservoir Safe Yield estimated from reservoir inflows based on the Permitted and Registered Surface Water Use Scenario.

1.0 Executive Summary

Sound, long-term management of South Carolina's water resources is vital to the continued economic prosperity of the state and to the well-being of its citizens and environment. Increased demand resulting from population and economic growth will increase competition for water across the state, particularly during droughts when the resource is most limited. Recent droughts have highlighted the importance of developing long-term, comprehensive water resource management plans to allow for the continued growth of the state's population and economy, while protecting the state's water resources for generations to come.

Through the South Carolina Water Resources Planning and Coordination Act, the South Carolina Department of Natural Resources (SCDNR) is legislatively mandated to formulate and establish a comprehensive water resources policy, or water plan, for South Carolina. SCDNR published the first State Water Plan in 1998, which was updated in 2004 incorporating lessons learned from the 1998-2002 drought. The 2004 plan offers numerous recommendations on the management of the state's water resources including the formation of advisory committees to develop comprehensive water resource plans for the major river basins in the state.

The legislative mandate requiring SCDNR to establish water resource policies for the state also authorizes the agency to convene public advisory boards as necessary to assist its efforts. Recognizing effective water planning is beyond the scope of any one agency, SCDNR convened the State Water Planning Process Advisory Committee (PPAC) in March 2018 to provide guidance to the agency on regional and statewide planning initiatives. The PPAC is a diverse group of water-resource experts representing water suppliers, power generation, agriculture, trade, conservation organizations, state agencies, and academia.

The PPAC is largely responsible for the contents of this document—the *South Carolina State Water Planning Framework* (Planning Framework). The Planning Framework provides detailed guidance to stakeholders and the public on the development and contents of regional water resource management plans, now formally designated as River Basin Plans. As envisioned, a River Basin Plan will be developed for each of the eight major planning basins in the state—Broad, Catawba, Edisto, Pee Dee, Salkehatchie, Saluda, Santee, and Savannah. The Planning Framework describes a bottom-up approach to water planning in which local stakeholders work together to develop management plans to address basin-specific issues and concerns. An analysis and compilation of information and recommendations contained in the River Basin Plans will be summarized in the new State Water Plan. River Basin Plans and the new State Water Plan will guide the policy, management, and conservation of the state's water resources for the next 50 years.

The river basin planning process will be accomplished through the formation of a River Basin Council (RBC) for each basin. An RBC is a group of up to 25 stakeholders with water-related interests in their designated basin. Each RBC will be tasked with developing, by consensus and through a stakeholder engagement process, a basin-wide plan that meets all water needs over the 50-year planning horizon (Planning Horizon). The Planning Framework describes the RBC appointment process, RBC term durations, and RBC roles and responsibilities. RBC membership will include at least one representative from each of the following categories: 1) agriculture, forestry and irrigation interests, 2) local governments, 3) water and sewer utilities, 4) electric-power utilities and non-federal reservoir operators, 5) industry and economic development interests, 6) water-based recreational interests, 7) environmental interests, and 8) at-large water-based interests. SCDNR will solicit RBC members through an open process and will make selections based on

the applicant's credentials and supported by recommendations made by various interest groups or organizations. A set of bylaws will govern RBC meetings and decision-making.

The Planning Framework includes provisions for public engagement during the development of River Basin Plans. The entire process will be open to the public, and all RBC meetings will be subject to state open-meeting laws. Public meetings will be held allowing the public to express their concerns, make recommendations, and call attention to issues in the basin. Websites will be created to facilitate the exchange of information between the public and the RBCs and to post meeting notes and other relevant information generated from the work of the RBCs. The public also will have the opportunity to provide feedback on each draft River Basin Plan through a formal comment period.

The roles of various state and federal agencies are outlined in the Planning Framework. Many of those agencies will have the opportunity to serve in an advisory role to the RBCs as River Basin Plans are developed. The long-term roles of the PPAC in the planning process also are described and include reviewing draft River Basin Plans, advocating for SCDNR-approved plans, ensuring consistency between the eight River Basin Plans, amending the Planning Framework as necessary, and aiding SCDNR during the development of the State Water Plan. The Planning Framework also acknowledges the existence of other formal surface and groundwater planning or management bodies in the state and offers guidance on the coordination of planning activities with such groups.

The Planning Framework also describes the roles of contractors in developing River Basin Plans. The completion of River Basin Plans will heavily rely on the expertise of outside contractors. Professional facilitators and coordinators will be solicited and hired by SCDNR to expedite and manage RBC meetings. Technical contractors will be hired to complete current and future water availability assessments, to assist the RBCs in understanding and evaluating the water resources of the basin, and to prepare final basin plans in accordance with the Planning Framework. SCDNR will provide administrative and technical assistance throughout plan development.

With the support of SCDNR and state-funded contractors, RBCs will complete a comprehensive assessment of current and future ground- and surface-water availability based on the methodologies outlined in the Planning Framework. Using hydrologic models and water-demand projections, the plans will identify areas where water shortages or other problems are predicted to occur over the Planning Horizon. Proposed water supply and water demand management strategies, designed to reduce or eliminate anticipated shortages or mitigate other problems, will be evaluated, and water management strategy recommendations will be documented and prioritized in the River Basin Plans.

The Planning Framework provides detailed information on the expected contents of each River Basin Plan. In addition to documenting the assessment of current and future water availability and recommended water management strategies, each River Basin Plan will include: 1) a physical and socioeconomic description of the basin; 2) a summary of current water use, permitted and registered water use, and projected water use in the basin; 3) documentation of basin-wide drought response initiatives; 4) a list of legislative, policy, regulatory, and planning process recommendations developed by the RBC; and 5) an Implementation Plan designed to achieve short-term planning and management objectives in the basin.

The implementation of the river basin planning process is described and includes a general schedule for planning activities for both SCDNR and the RBCs. Provisions for monitoring plan development and the role of SCDNR in implementing the planning process are described in the

Planning Framework as well. After the RBC is established, the development of a River Basin Plan is expected to be approximately a two-year process, with options for an RBC to request SCDNR approval for justified time extensions and for SCDNR to complete the River Basin Plan on its own after one time extension if SCDNR determines the RBC is not likely to complete the River Basin Plan within a three-year total period.

The river basin planning process will culminate with the development of a new State Water Plan. The contents of the State Water Plan are outlined in the Planning Framework along with general guidance for SCDNR on how the River Basin Plans will be used as the foundation for the new State Water Plan. It is expected that completion of all eight River Basin Plans and the new State Water Plan will take five years, after which plans will be updated approximately every five years as new information is gathered and new issues arise. As envisioned, the state and river basin planning will be a continuous, long-term process.

Lastly, the Planning Framework emphasizes the need for an adaptive management approach to state water planning. The outline for state and river basin planning presented in this document is the most comprehensive framework for water-resource planning ever produced in the state; and successful management of the state's water resources will require significant collaboration between numerous stakeholders, government entities, and the public. As the planning process progresses and experience is acquired by the PPAC, RBCs, and SCDNR, many lessons will be learned necessitating revisions to the planning process outlined in this document. Thus, the Planning Framework is not to be viewed as a static document, but rather a living document that will be revised as needed to improve the water planning process.

2.0 Introduction

2.1 South Carolina's Water Resources

2.1.1 Introduction

The earth's water is in constant motion above, on, and under its surface. Energy from the sun causes water to evaporate from the surface and drives plants to transpire water into the atmosphere. Water vapor concentrates into clouds and precipitates to earth. Once on the earth's surface, water flows into streams, lakes, and oceans; evaporates and transpires into the atmosphere; or infiltrates into the subsurface and enters the groundwater system. This continuous change in the geographical position and physical state of water is known as the hydrologic cycle, or water cycle (Figure 1). Precipitation, evapotranspiration, groundwater infiltration, and surface runoff compose the four basic processes of the water cycle.

The water resources of South Carolina include both surface water and groundwater. Surface water refers to any water occurring on the surface of the earth, in creeks, streams, rivers, lakes, ponds, and wetlands. Groundwater refers to any water present beneath the land surface, in pore spaces of soils and sediments, and in fractures of rock formations. Groundwater originates as precipitation or surface water that infiltrates into the soil, slowly moving deeper into the pore spaces of sediments or fractures in rock. Most groundwater occurs in aquifers, which are layers of permeable sediment capable of storing and transmitting large quantities of water.

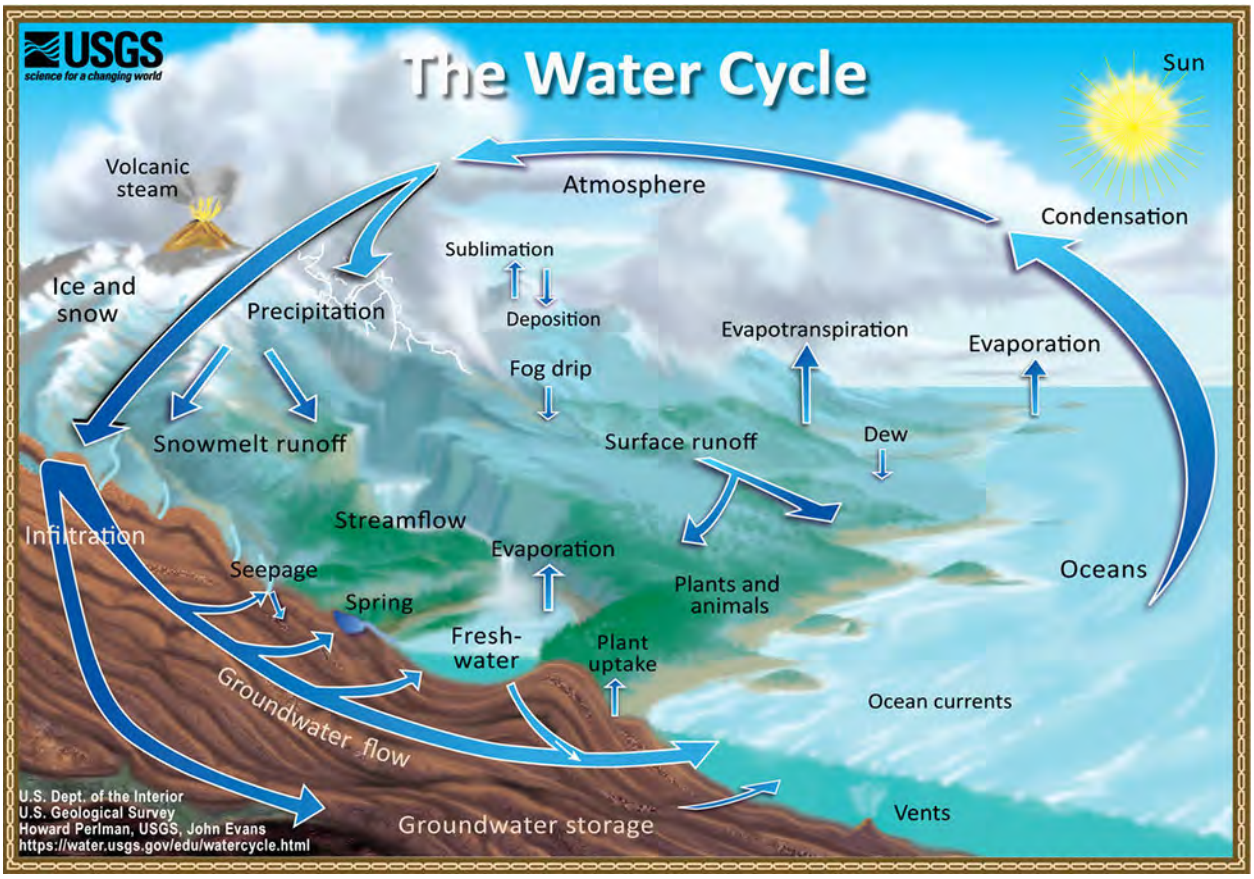


Figure 1. The Water Cycle (courtesy of the United States Geological Survey).

Surface water systems are generally controlled by the topography in which the water occurs. A drainage basin, or watershed, is an area of land in which precipitation collects and drains down-gradient to a common outlet, such as a stream or river. Drainage basins connect with other drainage basins as streams join to form larger streams and rivers that eventually drain to the ocean. Drainage basins can vary greatly in size, from local watersheds only a few square miles in area, to large river basins encompassing thousands of square miles.

Because drainage basins are defined by surface topography, the movement of surface water and, to some extent, groundwater in shallow water-table aquifers generally is restricted to individual basins. The movement of groundwater in deeper aquifers, however, is not restricted by watershed boundaries.

Surface water and groundwater systems are connected, but their interaction is often overlooked in water resource management considerations. Groundwater in shallow aquifers often contributes to streamflow. During dry periods, groundwater discharge into the surface water system may be the primary source of water in streams. Because many natural processes and human actions affect this interaction, it is important for water managers to consider groundwater and surface water as a single resource.

The state's physiographic, geologic, and climatic settings are key factors determining the availability and distribution of the state's water resources. South Carolina contains parts of three major physiographic provinces that encompass the southeastern United States. These provinces—Blue Ridge, Piedmont, and Coastal Plain—are defined based on physical geography and geology (Figure 2). The boundary between the Blue Ridge and Piedmont is defined by a sharp change in topographic slope at an elevation of about 1,000 feet, but from a hydrogeologic perspective, the Piedmont and Blue Ridge provinces are similar. The boundary between the Piedmont and Coastal Plain, called the Fall Line, is defined as the surface contact between the metamorphic rocks of the Piedmont and the unconsolidated sediments of the Coastal Plain. Hydrologically, the Piedmont and Coastal Plain regions are very different, particularly regarding groundwater availability, as the state's major aquifers are found only in the Coastal Plain.

South Carolina has an abundance of clean, fresh water, but it is unevenly distributed in both location and time. Almost all the state's water occurs as groundwater, with only about one percent of the state's water occurring as surface water. Most groundwater is stored in Coastal Plain aquifers, while most surface water is stored in reservoirs on large rivers in the Piedmont. Water is usually more abundant during the spring months when streamflow and groundwater levels are highest; and less available during the late summer and early fall, when streamflow and groundwater levels are typically at their lowest.

Although there is much more water under the ground, surface water is the source for most of the large water supplies in the state because of its convenience and availability. About three quarters of the state's population uses surface water for household use, and about one quarter uses groundwater. Unlike surface water, some groundwater is almost always available everywhere in the state and can be utilized without large-scale water-treatment facilities and distribution systems, making groundwater a much more practical water supply in rural areas.

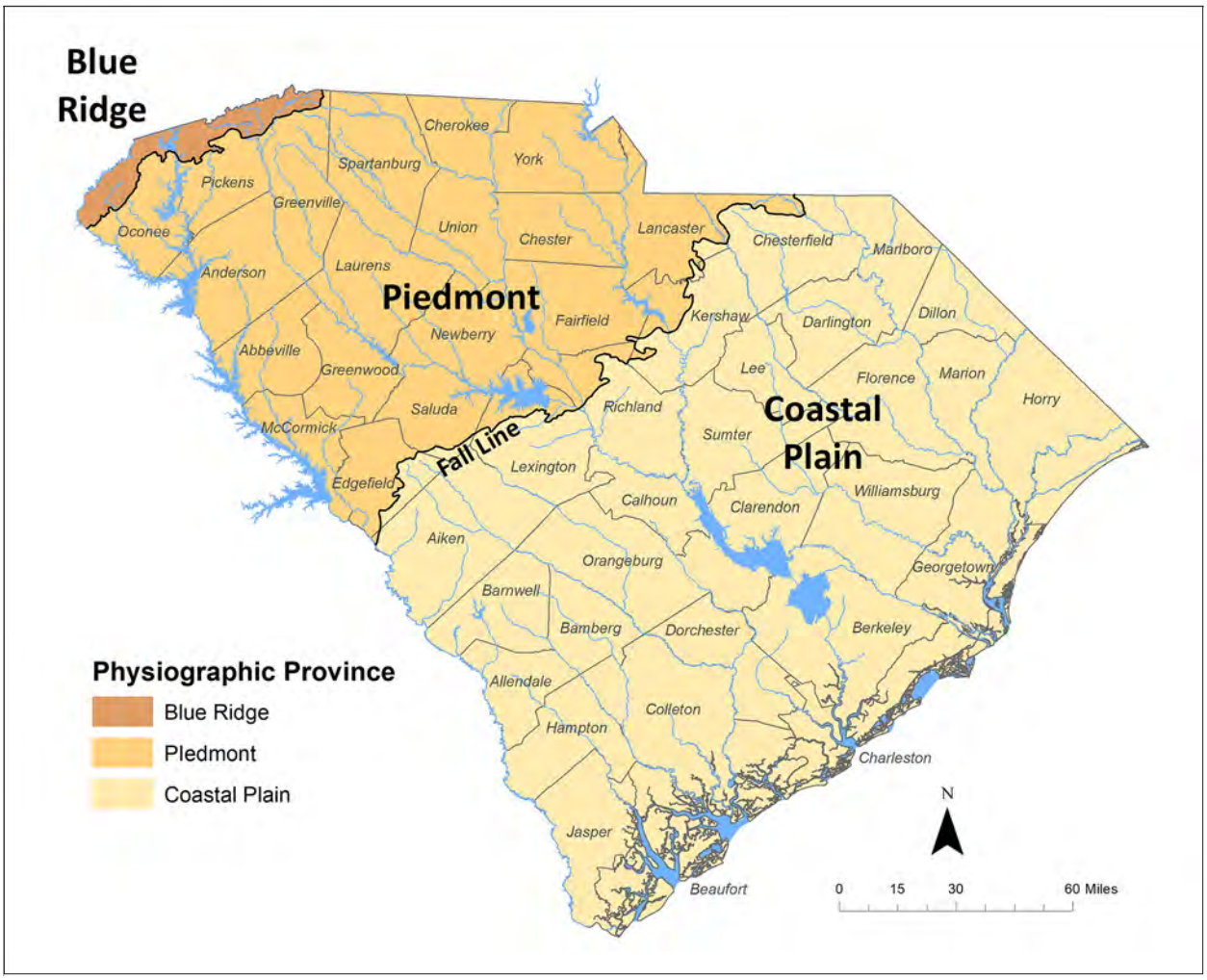


Figure 2. Map showing the Blue Ridge, Piedmont, and Coastal Plain physiographic provinces in South Carolina.

2.1.2 Surface Water Resources

There are more than 11,000 miles of permanently flowing streams in South Carolina, draining an average of more than 30 billion gallons per day to the ocean through four major river basins (Figure 3). The two largest basins, the Pee Dee and the Santee, encompass about 25 percent and 34 percent, respectively, of South Carolina's area. Both basins are shared with North Carolina, and a small portion of the Pee Dee basin is shared with Virginia. The Savannah basin encompasses about 15 percent of the state and is evenly shared with Georgia, with a small area at its northern tip located in North Carolina. The ACE (Ashepoo-Combahee-Edisto) basin, which covers about 26 percent of the state, is the only major basin located entirely within South Carolina. South Carolina's four major basins can be divided based on local drainage patterns into smaller sub-basins, which can be further partitioned into even smaller local watersheds. The United States Geological Survey (USGS) has delineated more than 1,000 watersheds in South Carolina[1].

1 Bower, D.E., Lowry, C., Jr., Lowry, M.A., and Hurley, N.M., 1999, Development of a 14-digit hydrologic unit code numbering system for South Carolina: U.S. Geologic Survey Water Resources Investigations Report 99-4015, *prepared in cooperation with* S.C. Department of Health and Environmental Control *and* U.S. Department of Agriculture, Natural Resources Conservation Service. (https://pubs.er.usgs.gov/publication/wri994015)

South Carolina's surface water resources are not geographically or temporally uniform. Streamflow is influenced by the physical characteristics of the watershed, and streams in different physiographic provinces have behaviors characteristic of those regions. Piedmont streams are highly dependent on rainfall and runoff, with groundwater providing little additional flow. In the lower Piedmont region, no-flow conditions during dry summer and fall months are common. In the upper Coastal Plain, there is often a strong connection between streams and shallow aquifers whereby streams are supported by groundwater discharge and typically exhibit less variable flow year-round. In the lower Coastal Plain, streams are more dependent on rainfall and runoff than on groundwater discharge, and no-flow conditions are common during dry periods.

There are more than 1,600 manmade lakes in South Carolina having an area of 10 acres or more. These impoundments store more than 15 million acre-feet of water, 95 percent of which is contained in the state's 12 largest reservoirs. These 12 major reservoirs—each of which can store more than 250,000 acre-feet—are located primarily in the Piedmont or Blue Ridge provinces. Only two major reservoirs—Lakes Marion and Moultrie—are in the Coastal Plain. These large impoundments have hydroelectric power plants and most also serve as sites for recreation and as sources of water for municipal supplies. Several smaller impoundments, also mostly in the

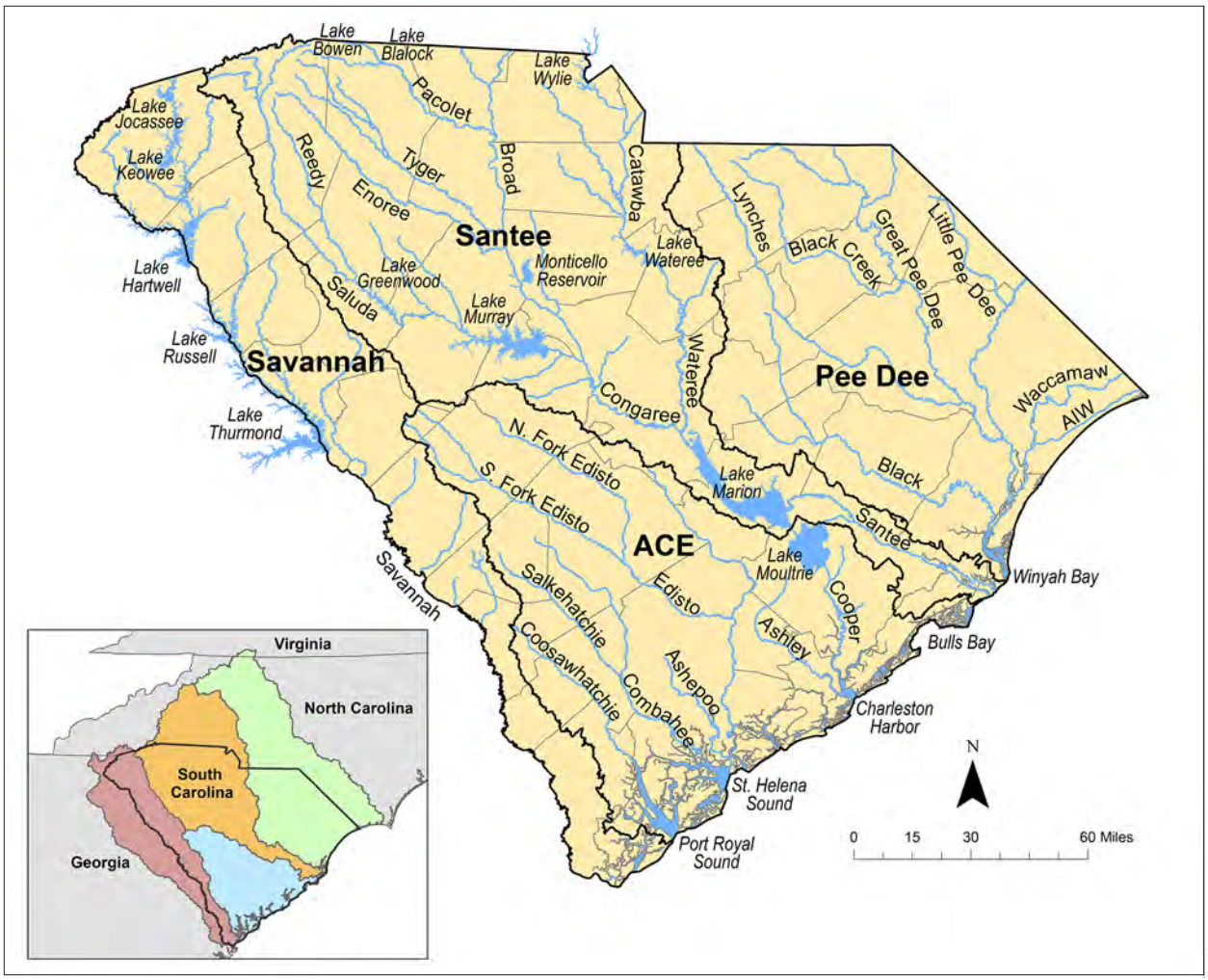


Figure 3. Map of South Carolina showing the major river basins and lakes.

Piedmont, have been constructed for hydroelectric power generation and as a source for reliable water supplies. Thousands of smaller, mostly privately-owned ponds have been constructed on lesser streams throughout the state.

Lakes and rivers in a common basin are connected and interdependent. What happens in a river affects downstream reservoirs, and what happens in a reservoir affects the river downstream. Instream reservoirs have significant impacts on the river in which the reservoirs are constructed. Some impacts can be beneficial, such as reservoir flow releases sustaining streamflow during extended dry periods. Other impacts can be detrimental, such as the alteration of ecosystem habitats and the interruption of fish passage along the river. Perhaps the most significant impact a reservoir has on its river is the change in the downstream flow regime. The effective management of the state's surface water systems requires a coordinated and balanced management of both lakes and rivers.

Although surface water is used throughout the state, it is of particular importance in the Piedmont region, where groundwater supplies are limited and many population centers exist. Most municipalities and larger water systems in the Piedmont withdraw water from reservoirs or rivers. Numerous larger water providers in the Coastal Plain also rely on surface water for their needs.

2.1.3 Groundwater Resources

The Coastal Plain, encompassing roughly the southeastern two-thirds of the state, is characterized by a wedge of sand, clay, silt, and limestone sediments overlying metamorphic and igneous bedrock (Figure 2). These sediments, which thicken seaward from zero at the Fall Line to more than 1,500 feet in Horry County and more than 4,000 feet in southern Jasper and Beaufort counties, occur as distinct layers of sand, clay, or limestone, all of which are saturated with water (Figure 4). The permeable sand and limestone layers form the state's largest and most important aquifers including the McQueen Branch, Crouch Branch, and Floridan. Impermeable clay layers form confining units that separate the aquifers.

Because of their volume, Coastal Plain aquifers can store large quantities of water; about 95 percent of the state's total volume of groundwater is estimated to be contained in these aquifers. The permeable nature of these aquifers also means wells pumping from them can typically produce at least several hundred gallons of water per minute.

Owing to its abundance and availability, groundwater is a vital resource throughout the Coastal Plain. Groundwater is an important source of water for many public, industrial, agricultural, and domestic uses; and in some areas, groundwater is the only significant water source available. Many small towns not located near large rivers rely on groundwater for their water supplies; the City of Sumter, for example, uses groundwater exclusively for its water needs. Other cities and regional water systems use groundwater in conjunction with surface water. In rural areas where residents do not have access to regional water systems, groundwater is the primary water source for household use. The ability to produce hundreds of gallons per minute from wells makes groundwater especially important for agricultural irrigation almost everywhere in the Coastal Plain.

In the Piedmont region, which lacks the porous sediments that form the aquifers in the Coastal Plain, groundwater is stored in fractures in the bedrock and in a soil-like layer of weathered rock called saprolite that rests on the bedrock. The continuity and permeability of bedrock fractures and the thickness of saprolite control the occurrence of groundwater. Generally, the

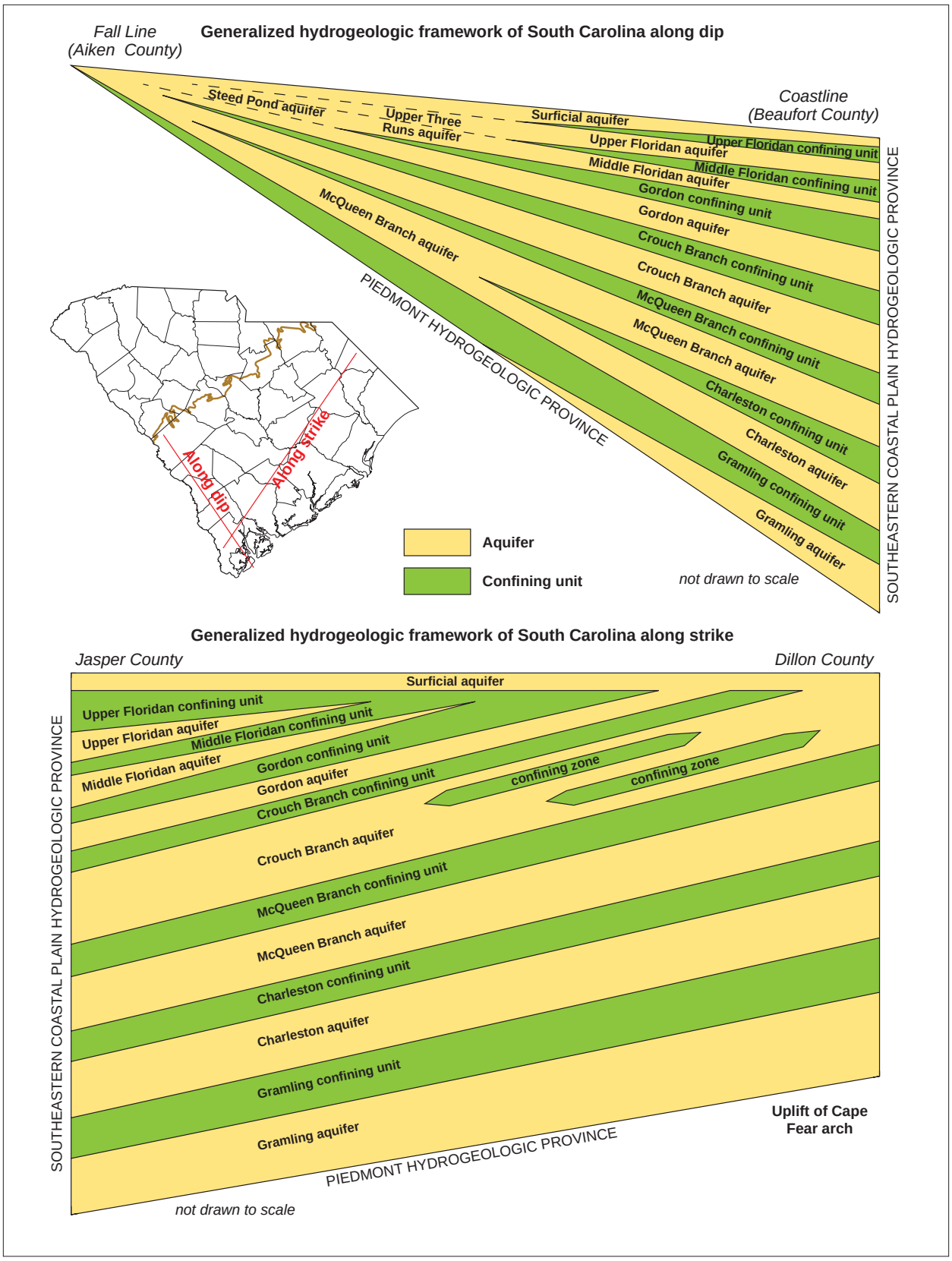


Figure 4. Generalized hydrogeologic framework of the South Carolina Coastal Plain.

storage capacity of fractures and saprolite is very small compared to the Coastal Plain aquifers, and wells in the Piedmont typically yield less than 10 gallons per minute. Because Piedmont wells generally have low yields, groundwater is rarely used for applications requiring large volumes of water. Groundwater is an important source of water for many rural domestic uses in the Piedmont.

Groundwater is a renewable resource, but pumping from wells at rates exceeding natural replenishment (0–20 inches per year for the surficial aquifer system and 0–2 inches per year for deeper aquifers) ultimately causes groundwater levels to decline. In most aquifers, regional water-level declines have been observed, and local water-level declines of more than 200 feet have been seen in some areas of heavy groundwater use. Significant lowering of groundwater levels can result in many undesirable consequences, including a reduction in yields of nearby wells, increased pumping costs, reduced flow rates in streams, altered groundwater flow patterns that can lead to saltwater intrusion in coastal areas, depletion of wetlands, land subsidence, the development of sinkholes, and the irreversible compaction of the aquifer and permanent depletion of the resource.

2.2 Need for Water Resources Management and Planning

Water is essential to life and is one of the most important natural resources on earth. Adequate supplies of water are vital to the continued growth and economic development of South Carolina and to the well-being of its people and natural environment. Throughout its history, the state has benefitted from a richness of surface water and groundwater, but its water supplies are not unlimited.

Increased water demand resulting from population and economic growth will increase competition for water across the state, particularly when the water supply is limited because of drought. Recent droughts have highlighted the importance of developing long-term, comprehensive, water resource management plans across the state to allow for the continued growth of the state's population and economy while protecting the state's water resources for generations to come.

2.2.1 Population Growth and Increased Water Demand

During the period from 1990 to 2018, South Carolina's population increased from 3.5 to 5.1 million, and it is projected to increase to 5.7 million by 2030[2]. The state's population growth since the year 1900, along with population projections for 2020 and 2030, is shown in Figure 5. As the state's population increases, the volume of water used for energy generation, public supplies, and irrigation also will increase. Additional information on the state's water use can be found in the *South Carolina Water Use Report – 2018 Summary*[3].

2 South Carolina Revenue and Fiscal Affairs Office, 2019 (http://abstract.sc.gov/chapter14.html)

3 South Carolina Department of Health and Environmental Control, 2019, South Carolina Water Use Report – 2018 Summary, Technical Document Number 0528-19, 55p. (https://www.scdhec.gov/sites/default/files/media/document/South%20Carolina%20Water%20Use%20Report%202018%20Summary%20%281%29.pdf)

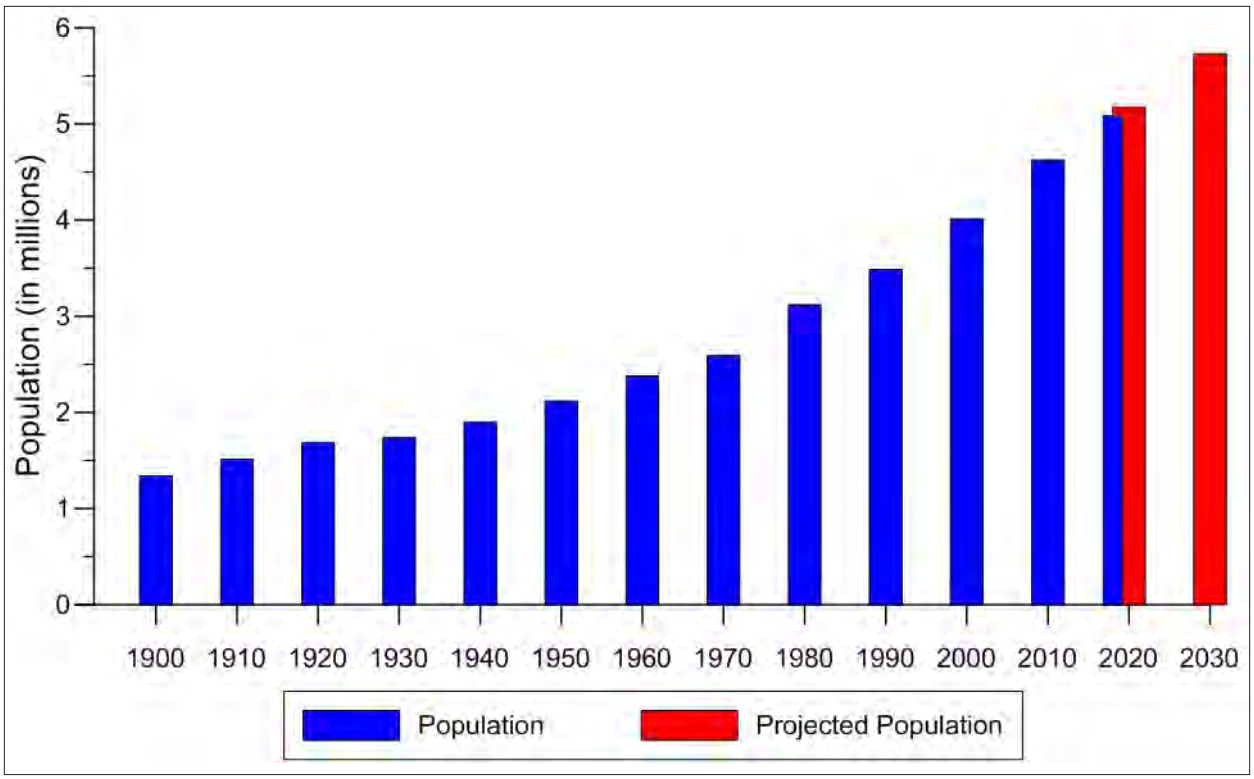


Figure 5. South Carolina population growth from 1900 to 2018 and projections for 2020 and 2030[2].

2.2.2 Drought and Climate Variability

Although South Carolina usually has an abundance of water, the state has experienced many severe, statewide droughts in its history (Figure 6). Droughts can occur at any time and last from several months to several years. Recent droughts in 1998–2002, 2006–2009, and 2011–2012 have demonstrated there are limitations to the state's water supplies. During the drought of 1998–2002, rivers and lakes throughout the state were at historic lows, threatening water-supply intakes and causing saltwater encroachment in coastal areas. Groundwater levels in both shallow and deep aquifers dropped to record lows. The drought of 2006–2009 also was particularly severe, especially in the Savannah River basin where lake levels dropped faster during that drought than during any other drought on record. Severe, multi-year droughts like those experienced during the past 20 years illustrate the vulnerability of the state's water resources, as well as the wide-ranging impacts droughts can have on agriculture, forestry, power generation, public water supply, tourism, recreation, fisheries, and ecosystems.

Recent studies using dendroclimatology—the science of analyzing tree ring growth to characterize past climate conditions—suggest the droughts experienced in South Carolina during the instrumental period of record (approximately the last 100 years) may have been less severe and of shorter duration than droughts which occurred in the previous four to five centuries[4,5].

4 Pederson, N., Bell, A.R., Knight, T.A., Leland, C., Malcomb, N., Anchukaitis, K.J., Tackett, K., Scheff, J., Brice, A., Catron, B., Blozan, W., and Riddle, J., 2012, A long-term perspective on a modern drought in the American Southeast, *Environ. Res. Lett.* 7, 014034, 8 p.

5 Cook, B.I., Cook, E.R., Smerdon, J.E., Seager, R., Williams, A.P., Coats, S., Stahle, D.W., and Diaz, J.V., 2016, North American megadroughts in the Common Era: reconstructions and simulations: *WIREs Clim Change*, 22 p.

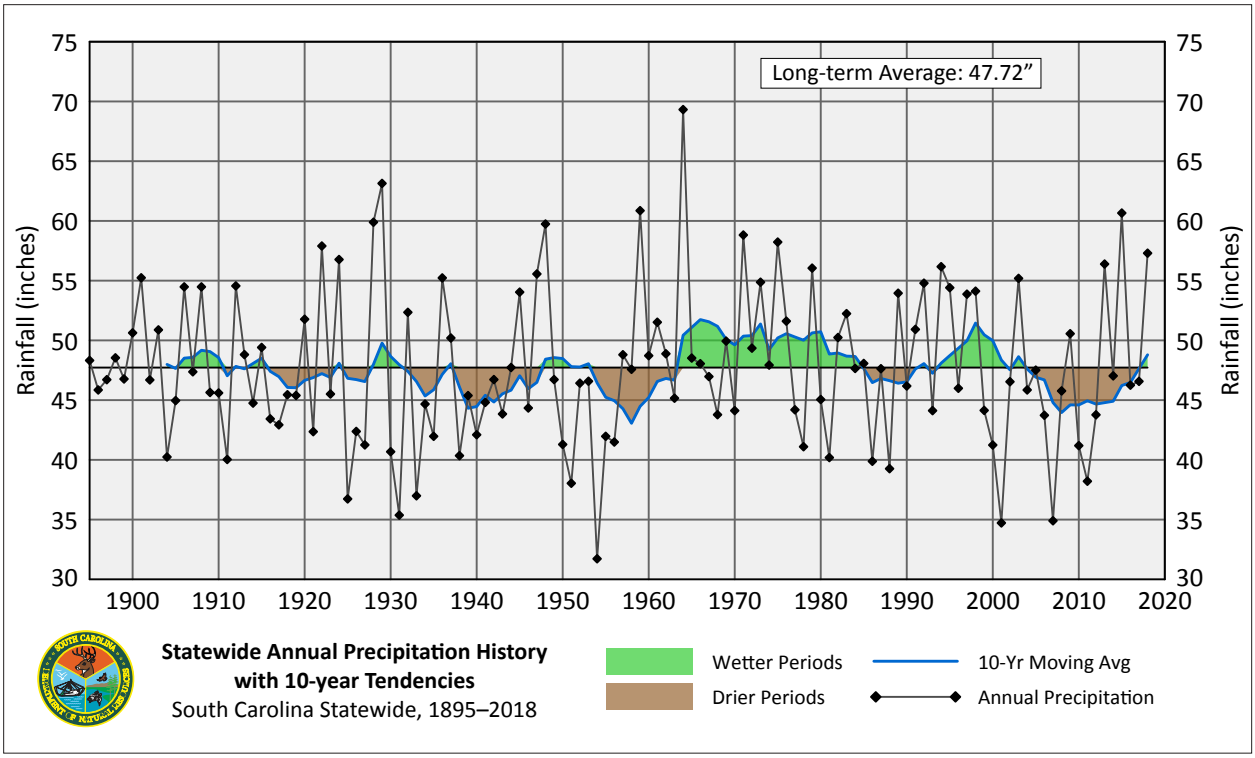


Figure 6. Statewide average annual precipitation (inches) for South Carolina, with 10-year averages used to show wetter (green) and drier (brown) periods. While it can be difficult to compare drought impacts across different time periods, this graph shows that South Carolina's most prominent droughts occurred in the 1920s, 1930s, 1950s, 1980s, and 2000s. The state's single driest year was 1954 when the statewide average precipitation was 32.96 inches, an approximate 15-inch deficit. (Source: South Carolina State Climatology Office)

Such studies typically involve the reconstruction of the Palmer Drought Severity Index (PDSI), a common metric used to assess drought. Figure 7 shows an annual PDSI reconstruction for South Carolina from 1600–2006 using data obtained from the North American Drought Atlas[6] along with a running 10-year average. The running 10-year average indicates the occurrence of more severe and longer-duration drought periods, often referred to as “megadroughts”, in the 16th and 17th centuries as compared to those of the 20th century. Though the term megadrought is not formally defined in the literature, the term is often used to refer to those droughts preceding the industrial period with a duration of greater than ten years and to differentiate them from more recent, shorter-term drought periods. Though the causes of these megadroughts are not well understood, water resource planners should be aware of the potential for longer and more severe droughts than those experienced in South Carolina during the past 100 years.

6 Cook, E.R. and Krusic, P.J., 2004, The North American drought atlas: Lamont-Doherty Earth Observatory and the National Science Foundation (http://iridl.ldeo.columbia.edu/SOURCES/.LDEO/.TRL/.NADA2004/.pdsi-atlas.html)

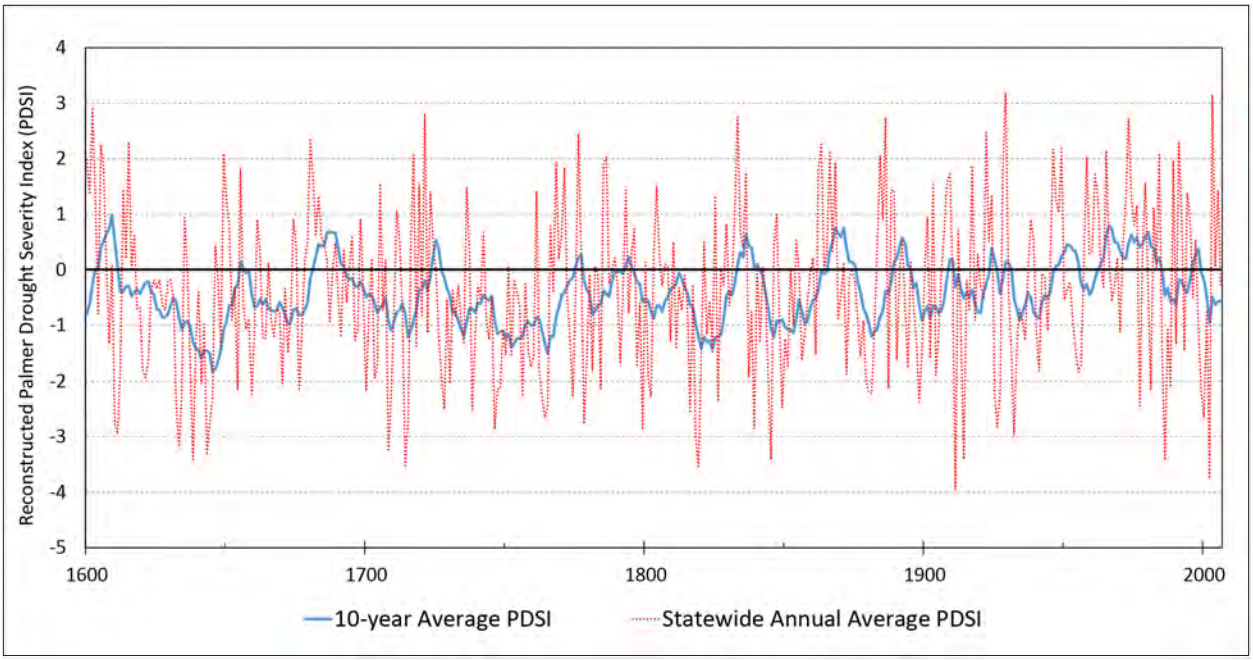


Figure 7. Reconstructed Statewide Annual PDSI (red dashed line) and 10-year running average PDSI (solid blue line) for South Carolina. Statewide Annual PDSI was determined by averaging PDSI values obtained from the North American Drought Atlas for three grid point reconstructions located in South Carolina[6]. Drought conditions are indicated when the PDSI value is negative: -2 is moderate drought; -3 is severe drought; and -4 is extreme drought.

2.2.3 Previous State Water Plans

The South Carolina Department of Natural Resources (SCDNR) is legislatively mandated through the South Carolina Water Resources Planning and Coordination Act[7] to formulate and establish a comprehensive water resources policy for the state, which is presented in a document known as a water plan. A state water plan presents a water vision for the state; articulates the state's water-resource policies and goals; and can be used to develop or modify legislation, regulations, and programs to help the state achieve those goals.

The first edition of the South Carolina Water Plan was published by SCDNR in 1998[8]. The plan was updated in 2004[9] and offered 81 policy recommendations and guidelines for the efficient, economical, and environmentally responsible management of the state's water resources. One recommendation was to establish an advisory committee for each of the state's four major river basins—the Ashepoo-Combahee-Edisto (ACE), Pee Dee, Santee, and Savannah—that would work to optimize water use throughout each basin. Recognizing the multitude of users and the complexity of water issues occurring in a basin, the 2004 Plan recommended each committee be composed of representatives from federal, state, and local agencies and stakeholders who would

7 S.C. Code 49-3-10, *et seq*., Code of Laws of South Carolina, 1976, as amended.

8 Cherry, R.N. and Badr, A.W., 1998, South Carolina Water Plan: South Carolina Department of Natural Resources, 62 p.

9 Badr, A. W., Wachob, A., and Gellici, J.A., 2004, South Carolina Water Plan, second edition: South Carolina Department of Natural Resources, 120 p. (http://dnr.sc.gov/lwc/pubs/pdfs/SCWaterPlan2.pdf)

work together to develop basin-wide water management plans. The 2004 Plan, however, did not offer sufficient guidance regarding the membership and duties of the water planning committees, nor did it detail the contents of the basin-wide water plans or describe how those plans would be implemented.

2.2.4 New State Water Plan

Based on the recommendation for basin-wide water management from the 2004 State Water Plan and the general recognition of the need for regional planning to address basin-specific issues, the new State Water Plan will be developed from basin-wide water management plans, now formally designated as River Basin Plans. This document—*South Carolina State Water Planning Framework* (**Planning Framework**)—is intended to provide the guidance and details needed to proceed with the formation of basin-level planning groups, with the completion of River Basin Plans, and with the development of a new State Water Plan. River Basin Plans will be developed for the eight major river basins in the state (Figure 8) through a stakeholder-driven process described in this document. Upon the completion of the River Basin Plans, the State Water Plan will be written by SCDNR. Information and results contained in the River Basin Plans will be summarized and will form the foundation of the new State Water Plan (see Section 8 for details).

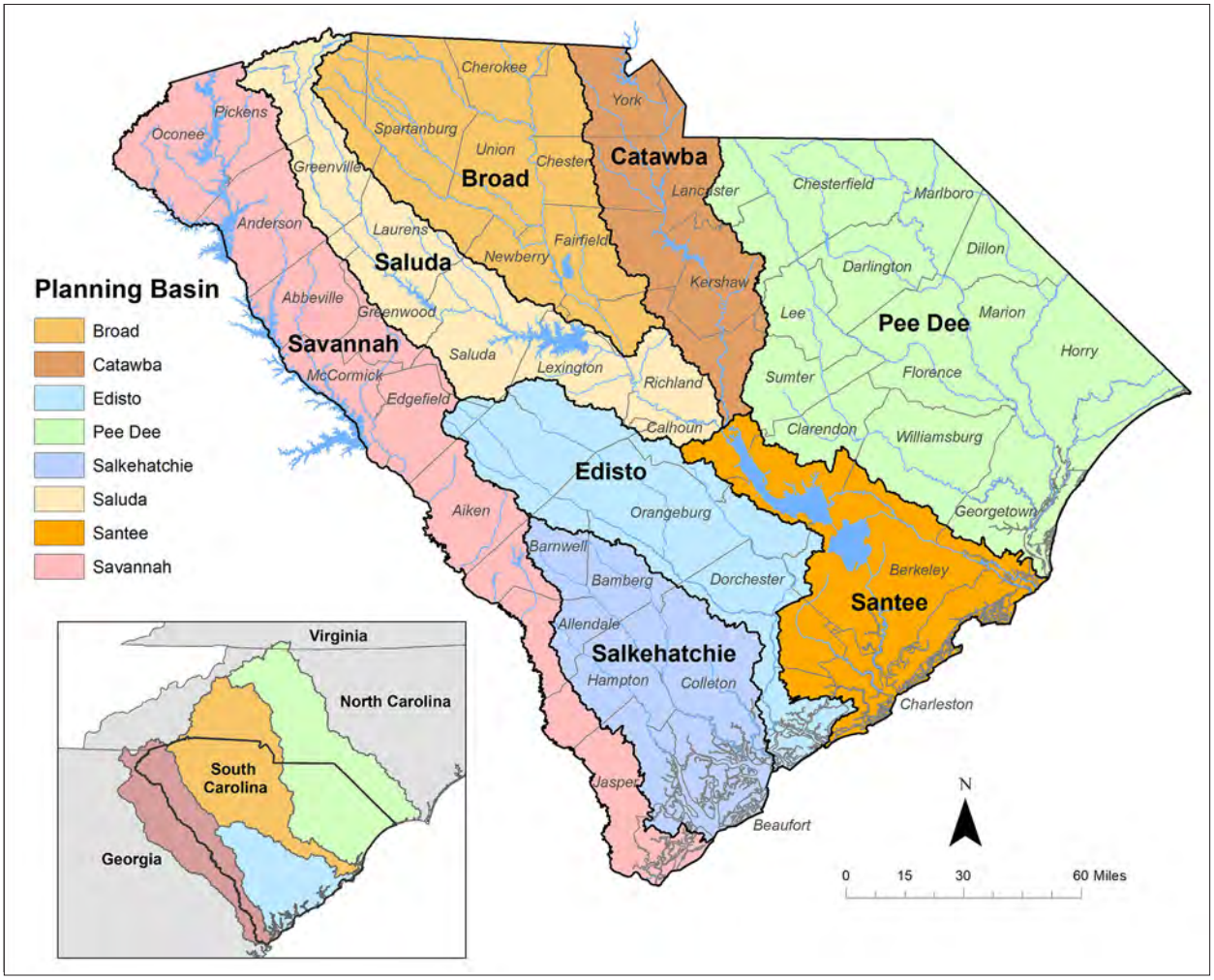


Figure 8. Map showing South Carolina's eight river basin planning areas.

2.3 Overview of River Basin Water Planning

2.3.1 River Basin Plan Description

A **River Basin Plan** is *a collection of water management strategies supported by a summary of data and analyses designed to ensure the surface water and groundwater resources of a river basin will be available for all uses for years to come, even under drought conditions*. River Basin Plans will be developed for a 50-year planning horizon (**Planning Horizon**) and updated regularly. A River Basin Plan answers four questions:

1. What is the basin's current available water supply and demand?
2. What are the current permitted and registered water uses within the basin?
3. What will be the water demand in the basin throughout the Planning Horizon and will the available water supply be adequate to meet that demand?
4. What water management strategies will be employed in the basin to ensure the available supply meets or exceeds the projected demand throughout the Planning Horizon?

The first three questions are essentially technical in nature and can be addressed using information and tools available to planners. When evaluating water availability, it is important to know and consider the quantity of water specified in all existing water-use permits and registrations. Water availability generally should be calculated assuming all water users will use the full amount of water allowed under existing permits and registrations.

Answering the fourth question is the heart of the water-planning process and greatly benefits from cooperation and consensus among all stakeholders throughout the basin. A successful and equitable River Basin Plan addresses the effects all water users have on one another and on the resource. The River Basin Plans described in this document are intended to focus on water quantity issues; water quality concerns, however, may be highlighted when appropriate in a River Basin Plan. Water quality considerations will be more fully developed in later iterations of the River Basin Plans.

2.3.2 Motivation for Basin Scale Planning

Because surface water in a river basin is geographically controlled and generally isolated from water in surrounding basins, the river basin is a natural unit for planning. A river basin offers a means of accounting for surface water availability and use; and, thus, for planning and budgeting for how it can be most efficiently managed. Aquifers, however, generally are not bounded by surface topography, and the occurrence and movement of groundwater is largely unconstrained by drainage divides defining river basins. Ideally, groundwater would be managed over the entire extent of each aquifer; but because the boundaries of aquifers do not coincide with the boundaries of surface water basins, a compromise is needed if both systems are to be considered concurrently during the water planning process. For this water planning effort, planning regions were chosen to correspond to surface water basins; additional interaction and cooperation among neighboring planning regions will be required to address groundwater issues.

Water planning at the river-basin scale is used in many states, including Georgia, North Carolina, Florida, and Texas. The planning regions in Georgia and Texas approximately conform to the boundaries of its major river basins, but the planning regions are ultimately defined by political (county) subdivisions. North Carolina's planning regions conform exactly to the boundaries of its river basins.

Although the 2004 South Carolina Water Plan recommended developing water plans for the state's four major basins, SCDNR and the South Carolina Department of Health and Environmental Control (SCDHEC) subsequently decided to subdivide two of the larger basins and make the planning basins consistent with those basin boundaries used for SCDHEC's water quality assessments. The Santee basin was divided into the Saluda, Broad, Catawba, and Santee basins; and the ACE basin was divided into the Edisto and Salkehatchie basins, with the Ashley-Cooper basin included in the Santee basin. Following those subdivisions, River Basin Plans will be developed for each of the following eight river basins: Broad, Catawba, Edisto, Pee Dee, Salkehatchie, Saluda, Santee, and Savannah (Figure 8).

2.3.3 The River Basin Planning Process

The development of each River Basin Plan will be the responsibility of that basin's **River Basin Council** (RBC), *a group of diverse stakeholders with water-related interests in the basin assembled specifically to develop a River Basin Plan consistent with the guidelines in this document*. SCDNR, SCDHEC, and contractors will provide technical support and guidance during the development of the River Basin Plans.

SCDNR, in cooperation with SCDHEC, has developed surface water and groundwater hydrologic models and is developing water-demand projections for each basin. The models will quantify each basin's surface and groundwater resources, and the water-demand projections will be used in conjunction with the hydrologic models to assess the adequacy of future available water supplies. The hydrologic models also provide a means to evaluate the effectiveness of proposed water management strategies intended to address any potential water shortages predicted by the hydrologic modeling.

The diverse membership of each RBC is intended to allow for a variety of perspectives during the formulation of the River Basin Plan. The planning process will be a consensus-driven approach, in which local stakeholders work together to develop a water plan that fairly and adequately addresses the needs and concerns of all water users. The planning process is intended to be transparent and will include a significant amount of public outreach.

2.4 State Water Planning Process Advisory Committee (PPAC)

The legislative mandate requiring SCDNR to establish a comprehensive water-resources policy for the state also authorizes SCDNR to appoint interdepartmental and public advisory boards as necessary to advise and assist the agency in developing policies for recommendation to the Governor and the General Assembly. To that end, SCDNR established the State Water **Planning Process Advisory Committee** (PPAC) in 2018 to assist with developing a framework for River Basin Plans and the new State Water Plan. The PPAC is *a diverse group of 19 water-resource experts representing water suppliers, power generation, agriculture, trade, conservation organizations, state agencies, and academia*.

The PPAC, whose work is guided by its Charter[10] and its vision—*Reflecting our values of water as a shared resource with a shared responsibility, we will work together to develop and maintain an actionable State Water Plan balancing economic, environmental and social needs of South Carolina for generations to come*—was tasked with developing a set of guidelines in appropriate detail so River Basin Plans can be successfully prepared and implemented. The PPAC is largely responsible for the content of this Planning Framework.

10 State Water Planning Process Advisory Committee Charter - https://www.clemson.edu/public/water-assessment/downloads/ppaccharterfinal1.pdf.

2.5 Organization of this Planning Framework Document

This Planning Framework document is intended to offer the guidance and details needed for the formation of RBCs and the guidance for the development of their respective River Basin Plans. These ideas and methodologies represent the PPAC's current consensus as to how the water planning process should proceed as the RBCs begin developing River Basin Plans. The experiences of the RBCs and others involved in the water planning process will be incorporated into a revised Planning Framework as this process is refined and improved.

Section 3 describes the formation and composition of the RBCs, as well as the roles and responsibilities of the various groups and agencies involved in the water planning process.

Section 4 describes the surface water and groundwater models, as well as the water-demand projections, that will be used for evaluating current and future water availability. This section also presents a methodology for determining water availability and identifying water shortages that will be addressed in the River Basin Plans.

Section 5 outlines and describes the content to be included in each River Basin Plan, including the specific tasks the RBCs, SCDNR, contractors, and other groups will undertake to develop those plans.

Section 6 describes the process by which the River Basin Plans will be developed, including specific tasks required of the RBCs, the PPAC, and SCDNR, and includes a general schedule for planning activities.

Section 7 describes the process by which the River Basin Plans will be implemented after they have been written.

Section 8 outlines and describes the content to be included in the State Water Plan.

The Appendix provides the RBC bylaws governing river basin planning.

2.6 Guiding Principles

When developing River Basin Plans, RBCs should strive to develop plans consistent with the following principles:

Water is a critical resource

- Water is a limited natural resource and is a major factor for economic development and environmental protection. An adequate amount of water for domestic use, agriculture, power generation, industry, commerce, and fish and wildlife is essential to the health, safety, and welfare of the people and environment.
- River Basin Plans should strive for the equitable use of water resources with the goal of ensuring water is available for all uses, when and where needed, throughout the Planning Horizon and under drought conditions.
- River Basin Plans should protect the public's health and well-being and should balance social, economic, and environmental needs.

Water planning is a continuous process that requires cooperation and transparency

- The effective management of South Carolina's water resources is beyond the scope of any one agency or organization and requires cooperation and shared responsibility among federal, state, and local agencies, as well as public and private stakeholders.
- River Basin Plans should be open and accountable to the public with decisions based on accurate, objective, and reliable information.

- River Basin Plans, where applicable, should cultivate productive relationships with stakeholders in adjoining basins, as well as with North Carolina and Georgia, for the protection of water quality and quantity and for the equitable allocation of surface and groundwater.
- Water resources planning is a continuous process and requires continual reassessment and updating to address changing social, economic, and environmental conditions to reflect new data, knowledge, and technologies that become available.

Plans must recognize existing laws and regulations but should recommend needed policy changes

- Waters of the state are subject to the Public Trust Doctrine and, therefore, are too important to be owned by one person.
- South Carolina abides by the Regulated Riparian Rights Doctrine and incorporates the concept of reasonable use in the Riparian Rights Doctrine.
- River Basin Plans must be consistent with the laws and regulations governing the state's surface water and groundwater resources; however, River Basin Plans also should recommend changes to existing laws and regulations if needed to improve surface-water and groundwater management.
- River Basin Plans should identify policies and actions needed to meet the state's water needs.
- River Basin Plans should consider water planning and management activities of local, regional, state, and federal agencies and consider existing state and federal programs and goals.

Plans should utilize effective supply and demand water management strategies

- River Basin Plans should utilize sound science and recommend suitable but cost-effective management strategies which embrace new, proven technologies, procedures, and practices to enable more efficient use of water and to maximize water availability.
- Management strategies should be flexible; should be responsive to trial, monitoring, and feedback; and should change in response to new scientific information and technical knowledge.
- Water planning should include both surface and groundwater resource management.
- River Basin Plans should consider the conjunctive use of surface and groundwater as a potential water management strategy.
- River Basin Plans should support a water-conservation and water-efficiency ethic.
- Water conservation should become an integral component of water resources management and be one of the first approaches for extending or augmenting available supplies.
- River Basin Plans should consider both water-demand management strategies and water-supply strategies, such as: water conservation, improved efficiency, pricing structures, reclaimed/recycled water, new wells, new reservoirs, expansion of reservoirs, lowering of intakes in reservoirs or rivers, aquifer storage and recovery, reverse osmosis/desalination, interbasin transfers, and conjunctive use of surface and groundwater.
- River Basin Plans should promote the efficient use of existing water supplies and consider opportunities for and the benefits of developing regional water-supply facilities or providing regional management of water facilities.

2.7 Regulatory Framework

2.7.1 Important Legislation Regarding the State's Water Resources

State and river basin planning must comply with the state's existing regulatory framework. Several state and federal laws regarding the use and management of the state's surface water and groundwater resources warrant special consideration during the river basin planning process. RBC members should become knowledgeable about these laws to ensure all proposed management strategies are consistent with existing regulations. Several significant laws which may impact or inform the development of River Basin Plans are described below:

2.7.1.1 South Carolina Surface Water Withdrawal, Permitting Use, and Reporting Act[11]

This Act, administered by SCDHEC, describes registration and permitting requirements for surface water withdrawers. The Act defines three types of surface water users: existing users (those who were already withdrawing, had a proposed withdrawal, or had their application administratively complete to start withdrawing by January 1, 2011); new permitted users (those who would, after the establishment of the Act, apply for a new surface water withdrawal permit not for agricultural use after January 1, 2011); and registered users (persons who make surface water withdrawal for agricultural uses at an agricultural facility or aquaculture facility). This Act defines Safe Yield as a criterion for the issuance of new permits and registrations, as well as minimum in-stream flow and minimum lake level requirements, as applicable, for new permits. Water withdrawals which include an interbasin transfer component also are regulated under this Act, eliminating the need for a separate interbasin transfer permit.

There are several important considerations for the development of River Basin Plans regarding this Act. Though River Basin Plans may include recommendations regarding changes to the legislation, nothing in a River Basin Plan shall supersede the current permitting requirements as described in the Act and supporting regulations. River Basin Plans can inform potential new users of future water availability to help in their planning decisions. Furthermore, SCDHEC may incorporate the surface water models (Section 4.1.2) used to support the development of River Basin Plans in their decision-making; however, RBCs should understand that final SCDHEC approval for new permits or registrations is based on the requirements set forth in the supporting regulations of the Act.

In addition, the Safe Yield for a stream not controlled by a flow-controlled impoundment as defined in the regulations for the Act describes the amount of water that can legally be made available for new users. The **Safe Yield** for such streams is defined as "*the difference between the mean annual daily flow and twenty (20) percent of mean annual daily flow at the withdrawal point, taking into consideration natural and artificial replenishment of the surface water and affected downstream withdrawals*". The definition, however, is not consistent with the concepts of available Surface Water Supply and Surface Water Shortages as defined in the Planning Framework for planning purposes (see Section 4.3.1). The regulatory Safe Yield denotes water that can be made legally available to new users, but the description provides no useful information on the reliability of the water source or the occurrence of Surface Water Shortages resulting from a limited Surface Water Supply.

11 S.C. Code Ann. § 49-4-10 *et seq*.

2.7.1.2 The Groundwater Use and Reporting Act[12]

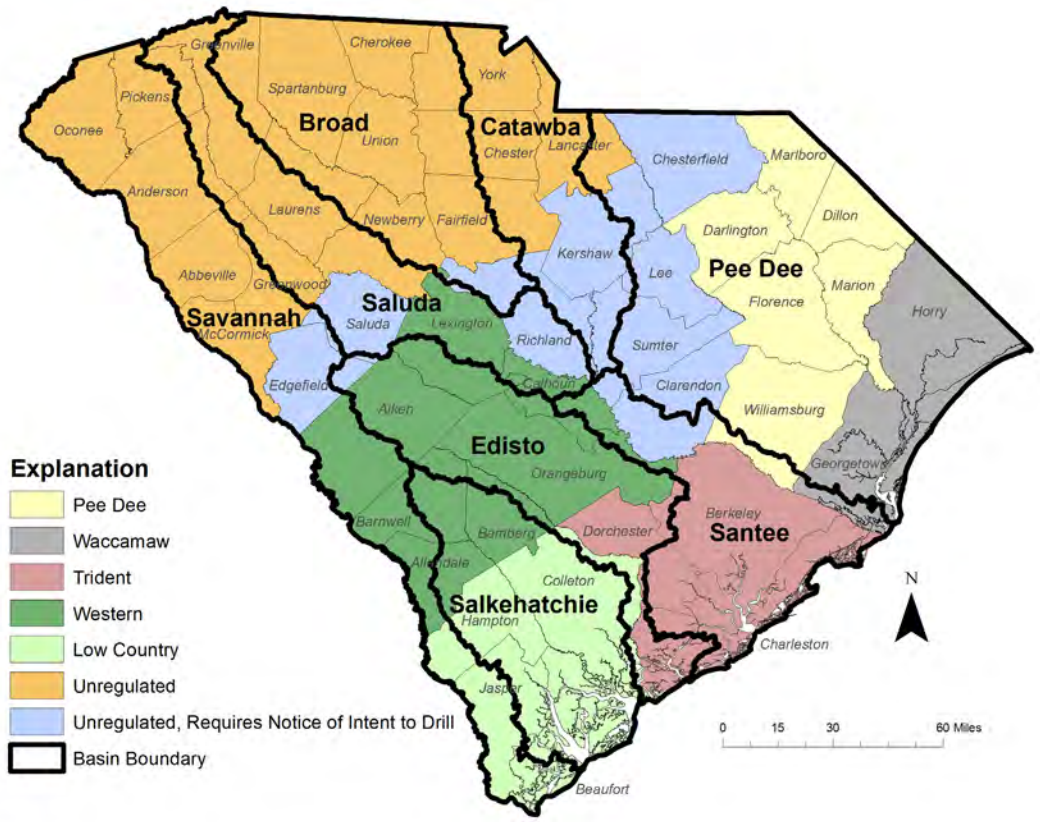
This Act, administered by SCDHEC, is the principal law governing the management of groundwater quantity in South Carolina. This Act establishes conditions for the designation of **Capacity Use Areas** defined as *areas in which excessive groundwater withdrawals have been shown to present potential adverse effects to the resource, to threaten the long-term integrity of a groundwater source, or to pose a threat to public health, safety, or economic welfare*.

As of 2019, there are five designated Capacity Use Areas, comprising most counties in the Coastal Plain of South Carolina (Figure 9). These are: 1) the Waccamaw Capacity Use Area, consisting of Georgetown and Horry counties; 2) the Trident Capacity Use Area, consisting of Berkeley, Charleston, and Dorchester counties; 3) the Lowcountry Capacity Use Area, consisting of Beaufort, Colleton, Hampton, and Jasper counties; 4) the Pee Dee Capacity Use Area, consisting of Darlington, Dillon, Florence, Marion, Marlboro, and Williamsburg counties; and (5) the Western Capacity Use Area, consisting of Aiken, Allendale, Bamberg, Barnwell, Calhoun, Lexington, and Orangeburg counties.

The Act directs SCDHEC to establish and implement local **Groundwater Management Plans** for each Capacity Use Area. The guiding principle in the development of these plans is "sustainability of the resource" such that groundwater development is managed to meet the needs of the present without compromising the ability of future generations to meet their needs. SCDHEC coordinates with local stakeholders during the development of the Groundwater Management Plans. In some Capacity Use Areas, stakeholders may establish formal Groundwater Management Groups (GMGs) to assist in developing the Groundwater Management Plans and to advise SCDHEC on permitting decisions. In Capacity Use Areas, permits are required for groundwater withdrawals of three million gallons or more in any month. SCDHEC has the authority to issue, modify, revoke, or deny groundwater-use permits, as well as set limits on pumping rates, on well spacing, and on the number of wells withdrawing from an aquifer. Permitting decisions must be consistent with the established Groundwater Management Plans, and existing permits are evaluated and reissued every five years. In Capacity Use Areas, permitted groundwater withdrawers must report their groundwater sources and groundwater use to SCDHEC.

Groundwater Management Strategies (Section 4.5.2) proposed in a River Basin Plan must be consistent with the Groundwater Management Plans adopted by SCDHEC for Capacity Use Areas. Six of the eight river basin planning areas overlie at least one Capacity Use Area, so significant coordination between the RBCs and any existing GMGs will be beneficial. Such coordination will face challenges owing to inconsistencies between the boundaries of planning basins and Capacity Use Areas which are defined by county boundaries. Boundaries of the major aquifers also do not coincide with boundaries of either the Capacity Use Areas or the planning basins. As such, groundwater use in one Capacity Use Area or planning basin may impact groundwater availability in an adjacent Capacity Use Area or planning basin. Section 3.10.1 of the Planning Framework describes how RBCs should coordinate with GMGs in the river basin planning process to ensure consistency between River Basin Plans and Groundwater Management Plans.

12 S.C. Code Ann. § 49-5-10 *et seq*. (Supp. 2002).



River Basin Planning Area	Capacity Use Areas within Planning Basin
Broad	none
Catawba	none
Edisto	Low Country Trident Western
Pee Dee	Pee Dee Waccamaw
Salkehatchie	Low Country Western
Saluda	Western
Santee	Pee Dee Trident Waccamaw Western
Savannah	Low Country Western

Figure 9. Designated Capacity Use Areas and water planning basins of South Carolina.

2.7.1.3 South Carolina Drought Response Act[13]

This Act provides the state with a mechanism to respond to drought conditions. Under the Act, SCDNR is responsible for formulating and executing a Drought Mitigation Plan, monitoring drought conditions, making investigations to determine whether action is necessary, determining levels of drought after consultation with the **Drought Response Committee** (DRC), and establishing Drought Management Areas (DMAs). The DRC is *a statewide committee chaired and supported by SCDNR and the State Climatology Office which serves as the primary drought decision-making entity in the state*. SCDNR is responsible for coordinating the appropriate response to drought in consultation with the DRC.

The Act established four DMAs in the state which are the Central DMA (Santee basin), the Northeast DMA (Pee Dee basin), the West DMA (Savannah basin), and the Southern DMA (ACE basin). The DMAs are delineated by geopolitical boundaries (counties), but approximate the four major designated river basins in the state. In contrast, the planning areas defined in the Planning Framework are based on the boundaries of the eight major planning basins as delineated by SCDHEC for their water quality assessments (Figure 10). RBCs should recognize the inconsistency between the DMA boundaries and planning basin boundaries. Because of this inconsistency, a DMA may include more than one planning basin, and a planning basin may include more than one DMA. For example, Barnwell County is entirely located in the West DMA, but Barnwell County includes portions of the Savannah, Salkehatchie, and Edisto planning basins. Another example of the geographic inconsistencies is highlighted by three DMAs (West, Southern, and Central) that contain portions of the Edisto planning basin.

As outlined in Section 3.9 of this document, RBCs will have to develop and implement drought response initiatives. Any such initiatives should be informed by the DRC, and RBCs, therefore, should coordinate to the extent possible with the DRC. Because of this misalignment between planning basins and the DMAs, any such coordination may be a challenge for the RBCs. Ideally, one or more RBC members should seek DRC membership to foster effective coordination and communication between the two groups. In addition, the state should consider redefining DMAs to coincide with planning basins to promote more effective and efficient drought response planning in the future. However, modifying DMA boundaries would require formal revisions to the State Drought Response Act.

2.7.1.4 Federal Power Act[14]

The Federal Power Act establishes a comprehensive federal program for the development of hydroelectric power under the Commerce Clause of the U.S. Constitution and preempts any state law or regulation which conflicts with its provisions. The Federal Energy Regulatory Commission (FERC) is authorized to issue licenses for the operation of hydropower dams located on a navigable waterway of the United States. A FERC license can extend for a maximum term of 50 years. Throughout the life of a license, the licensee must comply with its terms and any applicable FERC regulations and orders. These terms, regulations, and orders require management of water resources in a manner that gives equal consideration to both power and non-power resource values, including: electrical generation, fish and wildlife habitat, visual resources, cultural resources, recreational opportunities, irrigation, water supply, and flood control.

13 S.C. Code Ann. §49-23-10 (Supp. 2002).

14 16 U.S.C. § 791 et seq. (2000).

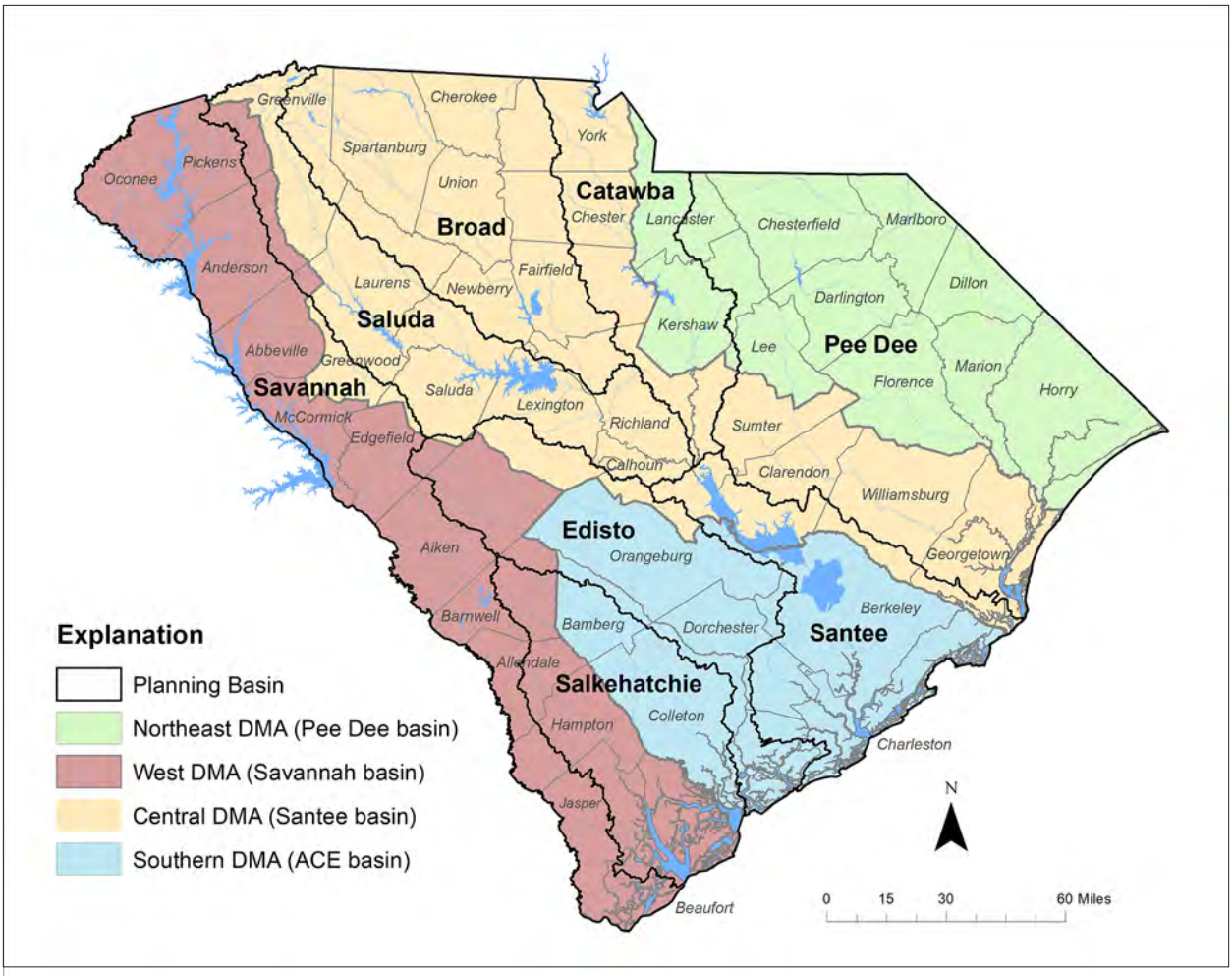


Figure 10. Map showing the State's four Drought Management Areas in relation to the eight river basin planning areas.

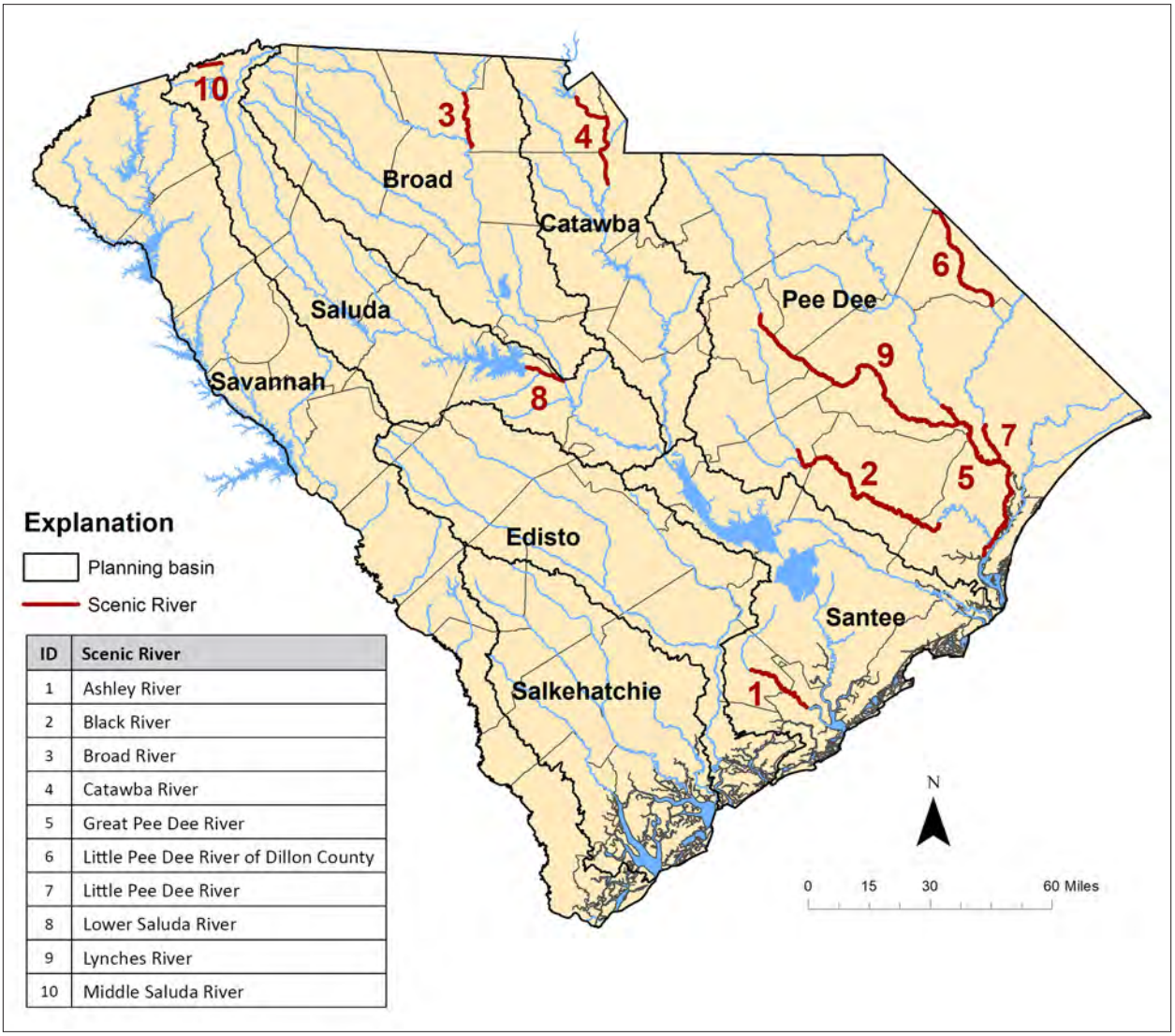
FERC licenses stipulate the operating and management guidelines regarding power generation and the resources affected by a hydropower project. There are currently 25 FERC-licensed projects in South Carolina or in the states of North Carolina and Georgia that impact South Carolina. Over the past few decades, most of the large FERC projects in the state, or nearby in Georgia or North Carolina, have undergone the relicensing process. These projects include Santee-Cooper (No. 199, license pending), Saluda (No. 516, license pending), Parr Shoals (No. 1894, license pending), Catawba-Wateree (No. 2232), Yadkin-Pee Dee (No. 2206), and Keowee-Toxaway (No. 2503). Other large projects in the state include Buzzards Roost (Lake Greenwood, No. 1267), relicensed in 1995, and Bad Creek Pumped Storage (No. 2740), which project's license expires in 2027. Other projects in the state regulated by FERC typically have relatively small power generation capacity and limited available reservoir storage.

RBCs must ensure River Basin Plans and recommended management strategies are consistent with the operating and management guidelines described in the FERC licenses. In addition, the evaluation of water availability in any surface water modeling tools applied in the basin must incorporate existing reservoir operating rules and low inflow protocols. RBCs, as major state-sponsored planning groups, are expected to participate in future relicensing efforts in the state.

2.7.1.5 Scenic Rivers Act[15]

This Act, administered by SCDNR, protects "*unique or outstanding scenic, recreational, geologic, botanical, fish, wildlife, historic or cultural values*" of selected rivers or river segments in the state. The Scenic Rivers Program promotes conservation of South Carolina's river heritage through partnerships and cooperation among local landowners and river users working within a Scenic River Advisory Council established for any river or river segment designated as a State Scenic River by the South Carolina General Assembly. The advisory council works with SCDNR to draft and implement a scenic river management plan for the designated river or reach. Each RBC should be aware of any State Scenic Rivers, or river segments, in their basin and consider those designations in the development of each River Basin Plan. There are currently ten designated Scenic Rivers in South Carolina (Figure 11).

15 S.C. Ann. § 49-29-10 *et seq*.



ID	Scenic River
1	Ashley River
2	Black River
3	Broad River
4	Catawba River
5	Great Pee Dee River
6	Little Pee Dee River of Dillon County
7	Little Pee Dee River
8	Lower Saluda River
9	Lynches River
10	Middle Saluda River

Figure 11. Designated Scenic Rivers in South Carolina.

2.7.2 Additional Legislation Regarding the State's Water Resources

Other legislation regarding the state's surface and groundwater resources that may affect the development of River Basin Plans is described below. These laws, however, are not anticipated to significantly impact the river basin planning process.

- T*he Dams and Reservoirs Safety Act*[16] is established to protect citizens' health, safety, and welfare by creating a regulatory program to reduce the risk of dam failure. The Act authorizes SCDHEC to have a dams and reservoirs safety program, to promulgate regulations, require permits, conduct inspections, and to take enforcement actions. Dams regulated by SCDHEC are classified based on size and hazards.

- *The Navigable Waters Permit Program*[17] is administered by SCDHEC and requires permits for construction, dredging, filling, or alterations in State navigable waterways. SCDHEC's permitting program is based on statutes declaring a State navigational servitude and control of vacant State lands. SCDHEC is designated as the coordinating agency for the program, assigned the duty of obtaining and reviewing comments from the public, as well as interested state agencies, and issuing permits.

- *The South Carolina Pollution Control Act*[18] establishes public policy to maintain reasonable standards of air and water purity to balance the needs of public health and welfare with employment and industrial development. The Act directs SCDHEC to adopt standards indicating polluted conditions in water and air. Broad powers are granted to SCDHEC to carry out the fundamental purposes of the Act, including the regulation of various wastewater discharges and implementation of the Federal Water Pollution Control Act in South Carolina.

- *The State Safe Drinking Water Act*[19] seeks to protect the quality of the state's drinking water supplies. The Act gives SCDHEC authority to set standards for the design and construction of public water systems and the proper functioning of those systems. SCDHEC also issues required permits for the construction, expansion, or modification of public water facilities.

- *The Stormwater Management and Sediment Reduction Act*[20] is administered by SCDHEC, which may delegate implementation of certain provisions to a local government. SCDHEC is responsible for developing regulations, minimum standards, guidelines, and criteria for carrying out provisions of the Act. Under the Act, a stormwater-management and sediment-control plan must first be submitted to obtain a permit before any soil-disturbing activity. All land-disturbing activities must be done according to the submitted plan.

16 S.C. Code Ann. § 49-11-10 *et seq*. (Supp. 2002).

17 23 S.C. Code Ann. Regs. 19-450(A) (Supp. 2002).

18 S.C. Code Ann. § 48-1-10 *et seq*. (1987).

19 S.C. Code Ann. § 44-55-10 *et seq*. (2002).

20 S.C. Code Ann. § 48-14-10 *et seq*. (Supp. 2002).

- *The Soil and Water Conservation Districts Act*[21] provides for the creation of local Soil and Water Conservation Districts in each of the state's 46 counties, the appointment and election of commissioners, and the assistance and coordination by SCDNR in addressing a wide range of soil, water, land, and natural resource conservation issues.

- *The Watershed Conservation Districts Act*[22] sets out a process for the creation of Watershed Conservation Districts which are political subdivisions of the state. These districts may be created within one or more of the Soil and Water Conservation Districts to develop plans relating to erosion control, flooding, soil and water conservation, storm water management, or water disposal (drainage). There are currently 41 Watershed Conservation Districts in the state.

- *The Coastal Tidelands and Wetlands Act*[23] provides the State, through SCDHEC's Office of Ocean and Coastal Resource Management, with authority to develop a comprehensive coastal management program and undertake responsibility of enforcing the program which involves the regulation of activities in coastal tidelands and wetlands.

- *The National Wild and Scenic Rivers Act*[24] was created to preserve certain rivers, and their immediate environments, possessing "*outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values*" in a freely-flowing condition for the benefit for both present and future generations. Such rivers are designated by Congress and in some cases, the Secretary of the Interior, and each river is classified as a wild, scenic or recreational river area. The Act protects the special features of a river system, but also recognizes the potential for the appropriate use and development of a designated river. The Chattooga River in the Savannah basin is the only federally designated river under this Act in South Carolina. The Horsepasture River which is an inflow tributary to Lake Jocassee in the Savannah Basin also is listed as a Wild and Scenic River; however, the designated river reach is entirely in North Carolina.

21 S.C. Code Ann. § 48-9-20 (1987).

22 S.C. Code Ann. § 48-11-10 *et seq*. (Supp. 2002).

23 S.C. Code Ann. § 48-39-10 *et seq*.

24 16 U.S.C. § 1271 *et seq*. (1968).

- *The Federal Water Pollution Control Act*[25] was established in 1972 to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The law was extensively amended by the Clean Water Act in 1977 and provides a comprehensive scheme to upgrade and protect the Nation's waters. Three important programs were created by the Act:
    1. Section 401 requires an applicant to obtain certification from the State-designated permitting agency before federal licensing or permitting of an activity that may result in a discharge to a navigable water. Section 401 certification is a state program conducted pursuant to state (SCDHEC) as well as federal authority.
    2. Section 402 creates the "National Pollutant Discharge Elimination System" (NPDES) which requires a permit for the point-source discharge of pollutants into the waters of the United States. In South Carolina, the program is implemented by SCDHEC.
    3. Section 404 prohibits the discharge of dredged or fill material into the navigable waterways of the United States without first obtaining a permit. This is a joint responsibility of the United States Army Corps of Engineers (USACE) and the United States Environmental Protection Agency (EPA).

25 33 U.S.C. § 1251 *et seq*. (2000).

3.0 River Basin Planning Process

3.1 Overview

River Basin Plans will be developed for each of the state's eight designated major river basins—the Broad, Catawba, Edisto, Pee Dee, Salkehatchie, Saluda, Santee, and Savannah (Figure 8). The boundaries of these eight water-planning regions were selected to match the basin delineations used by SCDHEC for its water-quality assessments and for the permitting of interbasin water transfers.

River Basin Plans are intended to assess surface water and groundwater availability and use throughout a basin, identify and evaluate current or future water-resource shortages or other concerns, and recommend strategies for resolving those concerns. Though these plans are not regulatory, the plans can guide the development of local water planning, inform permitting decisions, and recommend changes to state policies, laws, and regulations.

For each river basin, development of the River Basin Plan will be the responsibility of an RBC created specifically to accomplish this task. Each RBC will consist of no more than 25 members, appointed by SCDNR, who have a water-resources background or a vested interest in the water resources of the basin. Membership in the RBC will be determined so various interests and perspectives are equitably represented.

The PPAC formulated a set of bylaws to govern the membership and operation of the RBCs (Appendix). The bylaws describe RBC membership and the associated appointment procedure; how the RBC will be managed; the RBC's decision-making processes; and how the RBC will effectively communicate internally and externally with a variety of other stakeholders.

Each RBC will use the framework presented here to develop a River Basin Plan for its basin consistent in content and scope with the guidelines presented in this document. This Planning Framework is intended to assist each RBC in producing a complete and effective River Basin Plan. It also will ensure consistency between the eight River Basin Plans. RBCs will work with contractors, including a professional facilitator, and representatives of state and federal resource agencies to develop River Basin Plans for the Planning Horizon using data and technical analyses provided by the state and its consultants. RBCs will be responsible for prioritizing water-related issues, educating the public, and articulating actions and policies needed to implement the River Basin Plans. After completion of the River Basin Plans, RBCs will promote implementation of the recommended management strategies and monitor progress toward established goals through the development of a five-year **Implementation Plan** outlined in Section 7 of the Planning Framework.

RBC meetings will serve as an open forum for addressing basin-specific water resource issues and will be open to stakeholders and the public. Draft and final River Basin Plans will be vetted through a rigorous stakeholder process led by a contracted public outreach coordinator.

During the development of the River Basin Plans, each RBC must communicate with the RBCs of its neighboring basins. Communication is particularly important for the Broad, Saluda, Catawba, and Santee basins, as these basins are all part of one large watershed. RBCs also should work with any GMGs or other water-management groups active in the planning area. For those planning areas bordering another state, or whose basin shares water resources with another state, the RBCs of those areas must coordinate with representatives of those states.

New or unforeseen circumstances in each basin along with new data or information also will necessitate the periodic reassessment of the initial River Basin Plan. The long-term vision for river basin planning in the state is to update or revise River Basin Plans every five years to account

for changing circumstances or additional information. Thus, the work of the RBCs will extend well beyond the initial development of each River Basin Plan. RBCs also will be obligated to fulfill tasks described in each basin's Implementation Plan as outlined in Section 7 of the Planning Framework to the extent available funding allows. Hence, river basin planning will be an ongoing, continuous process.

3.2 River Basin Council (RBC) Membership

3.2.1 RBC Representation

River Basin Councils will consist of a maximum of 25 voting members, all appointed by SCDNR. Membership should include a minimum of one representative from each of the eight broadly defined stakeholder interest categories listed below.

1. Agriculture, Forestry, and Irrigation Interests

This category refers to those persons, groups or professional organizations working in the field of agriculture or forestry or who are involved in other industries utilizing large volumes of water for irrigation purposes, such as golf courses.

Agricultural interests are defined as those persons or entities associated with the production or processing of plant or animal products. This includes, but is not limited to, people who raise field crops, decorative plants (nurseries), orchards, vineyards, aquaculture, poultry, or other livestock.

Forestry interests are defined as those persons or entities associated with the practice of planting, managing, and caring for forests; and those associated with logging, timber trade, and the production of forest products such as wood pulp for the pulp and paper industry.

Irrigation interests refer to those persons or entities associated with selling, installing, or maintaining irrigation systems, such as water well drillers, or those who use large volumes of water for irrigation purposes, such as managers or owners of golf courses.

2. Local Governments

This category refers to locally elected government officials (or their qualified designees) from the state's municipalities, counties, and districts.

Municipalities are defined as the governments of the 269 incorporated towns and cities in South Carolina. Counties are defined as the governments of the 46 counties in South Carolina.

Districts are independent, special-purpose governmental units that exist separately from local governments, such as county or municipal governments. This category includes, but is not limited to, special purpose districts, public service districts, councils of governments, Watershed Conservation Districts, and Soil and Water Conservation Districts or associated professional organizations.

3. Water and Sewer Utilities

This category refers to those persons, groups or professional organizations involved in the operation or management of a water or sewer utility.

A water utility is defined as any publicly or privately-owned waterworks system which provides water through a piped-conveyance system for human consumption.

A sewer (wastewater) utility is defined as any publicly or privately-owned system which uses a process to convert wastewater into an effluent that can be returned to the water cycle with minimum impact on the environment or directly reused. The latter is called water reclamation because treated wastewater can then be used for other purposes.

To the extent possible, RBC membership for this category should include at least one large water utility, one small water utility, and one wastewater treatment facility.

4. Electric-Power Utilities and Non-Federal Reservoir Operators

This category refers to those persons or entities using large volumes of water to produce electricity or who own or operate certain large reservoirs. Electric-power utilities are defined as entities owning or operating equipment and facilities to generate electric energy sold to the public, industries, or other customers. Electric-power utilities include, but are not limited to, those generating electricity by heating water using nuclear or fossil fuels to make steam or turn combustion turbines (i.e., thermoelectric power plants), or by releasing water from dams to turn water turbines (i.e., hydroelectric power plants).

Non-federal reservoir operators are those persons or entities other than federal agencies (such as the USACE) owning or operating large water storage reservoirs which typically serve multiple human uses.

5. Industry and Economic Development Interests

This category refers to those persons or groups that: 1) own or are affiliated with a manufacturing or industrial facility that uses a large volume of water; 2) own or operate a small business; or 3) represent business interests, such as, but not limited to, the S.C. Chamber of Commerce or the National Association of Manufacturers.

Industries are defined as corporations, partnerships, sole proprietorships, or other legal entities formed to make a profit by producing or manufacturing goods, and which are not small businesses.

Small businesses are defined as corporations, partnerships, sole proprietorships, or other legal entities formed for making a profit, are independently owned and operated, and have fewer than 100 employees or less than $1 million in gross annual receipts.

A Chamber of Commerce, or a similar organization, is defined as an organization whose members work to improve business opportunities in their city or local area.

6. Water-Based Recreation Interests

This category refers to those persons or groups that enjoy water-related recreational activities in the state and the professional organizations or businesses supporting or depending on those activities. This includes, but is not limited to, boaters, recreational fishermen, paddlers, marina operators, outfitters, and waterfront-park operators.

7. Environmental Interests

This category refers to those persons, groups or professional organizations that advocate for conservation and ecological issues in the state. This includes, but is not limited to, Riverkeepers, land trusts, and conservation groups.

8. At-Large Water-Based Interests

This category refers to those persons or entities with significant interests in the basin's water resources but who are not affiliated with any of the specific interest groups listed above.

SCDNR always will reserve at least one seat for each of the above eight interest categories and will not eliminate an interest category, even if a seat remains vacant for that interest category. The distribution of these eight stakeholder categories varies from basin to basin, and though SCDNR will strive to select at least three members for each category listed above to the extent possible, the proper balance of representation will be at the discretion of SCDNR.

3.2.2 Appointment of RBC Members

Appointments to the RBCs will be made by SCDNR based on an applicant's credentials and on recommendations made by various interest groups, organizations, or the PPAC. Members of an RBC must be knowledgeable and experienced in the category of interest they represent and are required to either reside, work, or officially represent an entity having a significant interest in the water resources of the river basin the RBC represents. SCDNR will be responsible for determining if an RBC applicant who does not reside or work in the basin has a qualifying interest to serve on the RBC. If an umbrella association exists for a stakeholder interest group, the respective association may recommend a council member by submitting an endorsement letter to the PPAC or SCDNR. Membership on the State DRC or a recognized GMG should be used as an additional qualifier for selecting members to RBC slots. In basins having significant groundwater use, RBC membership should include persons knowledgeable of local groundwater resources. Efforts will be made by SCDNR to appoint members with significant water-related interests in different geographic areas of the basin so different regions have representation on the RBC. Ensuring the geographic diversity of RBC membership will be particularly important in larger basins, such as the Savannah and Pee Dee.

All vacant seats will be advertised on the SCDNR website for at least 30 days, after which, the PPAC will review all applications and make recommendations to SCDNR for final appointment. At any time, an RBC can recommend to SCDNR that an individual's application be considered to fill a vacant seat.

Following the final appointment of RBC members, SCDNR will host an orientation meeting to ensure a clear understanding of the expectations for participation, to introduce members to each other and agency staff, and to provide an introductory training on the water planning process. Orientation also will be held for any new member appointed to fill a vacant seat after the initial formation of an RBC.

Each appointed RBC member shall designate one alternate (**Alternate**) to represent him/her when he/she is unable to attend a meeting. The Alternate must represent the same interest category as the RBC member he/she is substituting for and is subject to the provisions described in the RBC bylaws (see Appendix).

3.2.3 Duration of RBC Membership

The initial duration of RBC terms will be either for two years, three years, or four years. The staggering of the initial terms will prevent the replacement of all or a large percentage of RBC members at one time to improve the efficiency and continuity of the planning process. The staggered term limits are designated so that approximately one-third of the members' terms will expire in two years, one-third of the terms will expire in three years, and one-third of the terms will expire in four years. RBC members will draw lots for the initial terms of two, three, and four years. Since the expected size of an RBC is 25 members, which is not evenly divisible by three, the remaining member, if the RBC does have 25 members, will serve an initial term of three years.

Each subsequent term will have a duration of three years. After serving an initial two-, three-, or four-year term, RBC members may request to serve for an additional three-year term, but the reappointment will be subject to SCDNR approval. RBC members may not serve for more than three consecutive terms. SCDNR will solicit RBC membership applications and make new appointments to replace any RBC membership vacancies.

3.3 Roles and Responsibilities of River Basin Councils

Each of South Carolina's eight designated river basins will have an RBC charged with developing, implementing, monitoring, and periodically revising a River Basin Plan for the surface and groundwater resources in its river basin. Plans will ensure those water resources can meet the projected needs throughout the identified Planning Horizon while protecting the ecological environment. The RBC will be supported in its work by staff from state and local agencies including SCDNR and SCDHEC, as well as contractors hired by SCDNR. Specific roles and responsibilities of the RBCs include the following:

Develop and Implement the River Basin Plan

- Describe the river basin planning area.
- Review population and water-demand projections provided by SCDNR for the river basin. RBCs are expected to utilize SCDNR's projections unless there is a clear justification to use alternate projections. Any alternate projections must be thoroughly vetted and approved by SCDNR before being used by the RBC.
- With assistance from SCDNR and technical contractors, utilize surface water and groundwater models to evaluate the ability of the basin's water resources to meet human and ecological needs throughout the Planning Horizon.
- Identify projected water shortages, stresses, or conflicts throughout the Planning Horizon, with an emphasis on the first 20 years.
- Seek input from **Advisors** as needed. Advisors are *individuals with specific expertise or information who may participate in Council discussions, typically on a regular basis, for the benefit of and at the pleasure of the Council; however, Advisors are not RBC members and will not vote in the RBC decision-making process*.
- Request the assistance of State-appointed **Technical Advisory Committees** (TACs) as described in Section 4.1.1 to assist with the review and interpretation of technical data and analyses.
- Form short-term (ad hoc) and/or long-term subcommittees as needed to address specific issues or to focus on specific geographic areas or water sources. Such committees may consist of RBC members and non-members (Advisors) including but not limited to representatives from state and federal agencies described in Section 3.4. However, final planning decisions are made by the RBC as a whole, and non-members do not have voting privileges.
- Establish and prioritize water management strategies to mitigate or eliminate any identified conflicts or water shortages, and estimate implementation costs and benefits.
- Evaluate the impacts of proposed water management strategies on the water resources of the basin.
- Identify needs for additional data and recommend mechanisms for obtaining additional information or resources to benefit future water planning efforts.
- Assist in the preparation of a written draft of the River Basin Plan for review by SCDNR, SCDHEC, other government agencies, the PPAC, stakeholders, and the public.
- Solicit comments on the draft River Basin Plan from all stakeholders and government agencies; respond to all comments; and incorporate comments, as appropriate, into the draft River Basin Plan to produce a final River Basin Plan.

- Deliver a final River Basin Plan to SCDNR that meets the published criteria by the date agreed upon.
- Once the final River Basin Plan has been approved by SCDNR, serve as its champion by promoting implementation of the plan's management strategies and monitoring progress toward the established goals outlined in the five-year Implementation Plan (Section 7).
- Update River Basin Plans every five years.
- Meet at least once a year between successive iterations of river basin planning to discuss progress on plan implementation and communicate any new water-related issues since the last River Basin Plan publication.
- Amend River Basin Plans if needed between successive five-year iterations.
- Fulfill responsibilities of any established subcommittees as part of the five-year Implementation Plan.

Communicate with Stakeholders

- Establish communication protocols to ensure compliance with State open-meeting laws.
- Create and conduct a stakeholder education and engagement process to ensure residents of the river basin and users of the basin's water resources have an opportunity to understand and comment on the development of the River Basin Plan.
- Communicate regularly with stakeholders both within and adjoining the river basin to maintain a current understanding of the RBC's activities, the River Basin Plan, and emerging issues that may require action by the RBC, stakeholders, or other entities.
- Coordinate with other RBCs, GMGs, and other formal planning groups in the basin as needed on shared water resources and related issues.
- Strive to resolve disputes among stakeholders and achieve consensus on the River Basin Plan as outlined in the RBC Bylaws (Appendix).
- Identify and assume an effective communications role in managing water resources during periods of drought.
- Serve as a participant in a forum for regional learning and communication about important water-related issues.

Identify Recommendations for Policy, Legislative, Regulatory, or Process Changes

- Provide input to SCDNR, SCDHEC, and elected officials concerning river basin issues and recommend any policy, legislative, or regulatory changes that could effectively address those issues.
- At least once every five years, the RBC will assess its progress in meeting its stated goals and the effectiveness of communicating with stakeholders. The RBC also will recommend improvements to the RBC bylaws, work, or communications processes to significantly increase effectiveness or efficiency.

3.4 Roles and Responsibilities of State and Federal Agencies

3.4.1 Roles and Responsibilities of SCDNR and SCDHEC

As the agency responsible for formulating and establishing a comprehensive water resource policy for the state under the Water Resources Planning and Coordination Act, SCDNR is the primary oversight agency for the river basin planning process. SCDNR will oversee the implementation of the Planning Framework as follows:

- Appoint members to the PPAC and RBCs as needed.
- Educate RBC members on the financial, technical, economic, and political information the RBC will need to fulfill its responsibilities.
- Provide RBCs and contractors with surface water and groundwater models for use in each basin.
- Provide RBCs and contractors with necessary hydrologic information.
- Compile water-use data and provide water-demand projections for each basin.
- Evaluate any modification of the water-demand projections requested by the RBC; determine if any modifications are warranted; and provide revised projections as needed to the RBC.
- Hire contractors, as necessary, to assist with modeling and other technical work, stakeholder outreach, and logistical support for the RBCs.
- Oversee the river basin planning process to ensure consistency with guidelines established in the Planning Framework.
- Ensure work is completed by contractors in a timely and efficient manner according to the defined scope of work.
- Distribute state-allocated funding for planning activities including the distribution of payments to contractors for completed work.
- Serve in a formal advisory role in the management of the state's water resources.
- Communicate with other state and federal agencies as needed regarding water-planning activities.
- Establish and maintain a website documenting the planning activities in each basin.
- Review and approve final River Basin Plans.
- Revise the Planning Framework as needed in collaboration with the PPAC.

To fulfill these responsibilities, it is anticipated that SCDNR will assign a minimum of one staff member per basin to serve in an advisory and support role.

SCDHEC, as a regulatory agency, administers several laws regarding water quality and water use in the state. As such, SCDHEC will participate in the water-planning process in an advisory role. Specific roles include:

- Assist SCDNR in ensuring the river basin planning process is consistent with the guidelines established in the Planning Framework.
- Ensure River Basin Plan recommendations, management strategies, and implementation plans are consistent with existing laws and regulations regarding the state's water resources.
- Seek to integrate the agency's groundwater management requirements with the river basin planning process.
- Serve in an advisory capacity for any recommended or proposed changes to existing water law, regulation, or policy.

3.4.2 Roles of Other State Agencies

Successful river basin planning will be dependent on the participation of various state agencies, particularly during plan implementation. To this end, it is recommended the following agencies fulfill a formal role as Advisors on each RBC:

- South Carolina Department of Agriculture
- South Carolina Department of Commerce
- South Carolina Forestry Commission
- South Carolina Rural Infrastructure Authority
- South Carolina Department of Parks, Recreation, and Tourism
- South Carolina Sea Grant Consortium
- South Carolina Emergency Management Division
- South Carolina Energy Office
- South Carolina Department of Transportation

Representatives from each of these agencies may be requested to regularly attend RBC meetings in an advisory capacity to provide their agency's perspective on water planning and management in each river basin. Participating agencies will receive formal meeting notices and be provided with relevant meeting materials prior to each meeting. These agencies also will receive copies of draft River Basin Plans and can review and submit comments and recommendations to the RBCs regarding River Basin Plans. Advisors from these agencies may be requested to participate in ad hoc or semi-permanent subcommittees at the discretion of the RBC.

For those basins bordering a neighboring state, or whose water resources are shared with a neighboring state, representatives from those states will be invited to attend RBC meetings, provide their perspectives on water planning and management in each river basin, and review and comment on draft River Basin Plans. The state agencies are most likely to be the North Carolina Department of Environmental Quality and the Georgia Environmental Protection Division, but other state agencies may also participate.

3.4.3 Roles of Federal Agencies

Successful river basin planning also will rely on the participation of federal agencies. Several federal agencies or entities have particular importance in the planning process and include:

- United States Geological Survey (USGS)
- United States Army Corps of Engineers (USACE) – Savannah and Santee basins only
- Southeastern Power Administration (SEPA) – Savannah basin only
- Catawba Indian Nation – Catawba basin only

It is recommended that these entities serve in a formal role as Advisors. The USGS, in cooperation with SCDNR and SCDHEC, developed the groundwater flow model (see Section 4.1.3) to evaluate groundwater availability in the Coastal Plain aquifers. Thus, the USGS will have a significant advisory role in groundwater modeling applications during the planning process. Because the USACE has hydroelectric projects in the Savannah and Santee River basins, this agency will be requested to serve in an advisory role for those basins to ensure RBC planning activities are consistent with USACE reservoir management policies and objectives. The Catawba Indian Nation is the only federally recognized Indian Nation in South Carolina and is in the Catawba basin. The Catawba Indian

Nation has historic and significant interests along the Catawba River in South Carolina and, thus, should be requested to serve in a formal advisory role in that river basin's planning process.

Other federal agencies may be requested to serve in an advisory role and include:

- United States Environmental Protection Agency (EPA)
- United States Fish and Wildlife Service
- National Marine Fisheries Service
- United States Forest Service
- Natural Resources Conservation Service

Representatives from any federal agency serving in an advisory role will be requested to regularly attend RBC meetings to provide their agency's perspective on water planning and management in each river basin. Participating agencies will receive formal meeting notices and be provided with relevant meeting materials prior to each meeting. These agencies also will receive copies of draft River Basin Plans and can review and submit comments and recommendations to the RBCs. Advisors from these agencies may also be requested to serve on ad hoc or long-term subcommittees at the discretion of the RBC.

3.5 Roles and Responsibilities of Contractors

To successfully complete the roles and responsibilities described for the RBCs in the development of River Basin Plans, the RBCs will require significant support from qualified individuals capable of performing the many tasks necessary to run productive meetings and keep the process of preparing a successful, actionable plan on track. Though SCDNR and SCDHEC will work closely with contractors in the planning process, the support necessary for RBCs to fulfill their responsibilities will come primarily from private contractors who specialize in the various aspects of the water planning process.

There will be five types of general functions needed, and these functions are described below:

- *Administrative functions* include providing all meeting logistical support (e.g., acquiring meeting space, preparing agendas and other meeting materials, providing food and refreshments as needed, keeping meeting minutes, etc.); educating RBC members; doing research; assisting in the preparation, production, and distribution of the River Basin Plan reports; coordinating with other contractors; and fulfilling other duties as requested by the RBC Chair and Vice Chair. These functions will be the responsibility of the RBC **Coordinator** and are expected to be relatively straightforward and consistent from basin to basin.
- *Facilitative functions* include guiding RBC meetings in an efficient manner and encouraging full participation of all RBC members while remaining neutral throughout the process. The responsibilities of the RBC **Facilitator** are described in the RBC bylaws and this role shall be filled by a contractor. The RBC Facilitator also will focus on ensuring the administration of the planning process is effective and will guide meetings by supporting interest-based negotiation to implement the goals of the RBC according to its bylaws and this document. The Facilitator is also responsible for the adequacy and evaluation of process and progress metrics described in Section 6.4.

- *Technical functions* include running appropriate surface water and groundwater models; analyzing and summarizing the results of the modeling work; incorporating proposed management scenarios into the models for evaluation; conducting cost-benefit analyses of management strategies; writing technical reports as needed; and assisting in River Basin Plan report writing. SCDNR shall provide or arrange for the use of the surface water models, groundwater models, and water-demand projections that will be used during the planning process. Contractors will be responsible for using the models and projections to complete technical analyses regarding water availability, water use, and water management strategies as outlined in Section 4. Contractors will work with the RBC Coordinator to summarize model output and communicate results to the RBCs. These technical analyses will be used by the RBCs to support the development of River Basin Plans. Modeling contractors may be asked to provide written descriptions of the modeling work and analyses of the modeling results for inclusion in the River Basin Plan. The amount of technical support needed from the contractor will vary from basin to basin, and separate contractors may be required for surface and groundwater modeling applications.
- *River Basin Plan authorship functions* include writing, preparing, and publishing the eight River Basin Plan reports and will be the responsibility of contractors. This function may be fulfilled by either the facilitative, administrative and technical contractors or by a separate contractor in collaboration with the technical, facilitative, and administrative contractors.
- *Public outreach functions* include engaging stakeholders and the public in the planning process. Preferably, the support for the stakeholder-involvement process should be provided by one statewide consulting firm supporting an individual **Public Outreach Coordinator** in each basin. This will allow the materials and general message to be consistent across the state with the local coordinator responsible for using those messages and materials to involve local groups and individuals in the process. However, if more than one contractor is hired to perform public outreach functions across the state, SCDNR will be responsible for ensuring consistent messaging and materials are implemented by each contractor. The Public Outreach Coordinator, in cooperation with the RBC Coordinator, also will be responsible for ensuring the public notice and participation guidelines set forth in Section 3.7 are followed.

A minimally sufficient number of contractors, as deemed appropriate by SCDNR, will be hired to fulfill the functions described above, and more than one function may be outsourced to an individual contractor. SCDNR shall be responsible for soliciting, evaluating, and hiring all contractors associated with the RBC planning process using state-allocated funding. Clear lines of accountability shall be established and enforced to assure cooperation between all the various state officials and contractors working in any one basin. To that end, the contractor activities in each basin shall be coordinated by the SCDNR employee assigned to the RBC, while working in concert with the RBC Chair and Coordinator. All contractor invoices involving work at the RBC level will be approved for payment by the SCDNR staff member assigned to the designated river basin.

3.6 Roles and Responsibilities of the PPAC

Oversight of the river basin planning process will be necessary during the development of the eight River Basin Plans. Therefore, the PPAC will continue to provide guidance to state agencies and RBCs beyond the development of the initial Planning Framework. The PPAC will serve in a formal advisory role for at least one complete planning cycle, which includes the completion of all eight River Basin Plans and the update of the State Water Plan (Section 8). Specific roles and responsibilities include but are not limited to:

- Reviewing RBC membership applications and making recommendations to SCDNR.
- Amending the initial State Water Planning Framework document as needed, which may incorporate recommendations from RBCs.
- Reviewing draft and final River Basin Plans.
- Sponsoring and advocating for SCDNR-approved River Basin Plans.
- Addressing miscellaneous issues arising during the river basin planning process.
- Advocating for policy, legislative, and regulatory changes regarding plan implementation.
- Overseeing and ensuring consistency between the eight River Basin Plans.
- Advising SCDNR through the development of a new State Water Plan and any subsequent updates and amendments.

After the first planning cycle is completed, members of the PPAC will have the option of serving through a second planning cycle. Any new members will be added according to the process as outlined in the PPAC Charter. The PPAC will complete a reevaluation of the Planning Framework prior to each new iteration of River Basin Plan development.

3.7 Stakeholder and Public Participation

SCDNR recognizes the importance of effective public participation during all stages of the river basin planning process. To that end, RBC activities and the planning process are designed so transparency, timeliness, accuracy of information exchange, and two-way communication between RBCs and the public are key priorities. RBCs will work in cooperation with the RBC Coordinator and Public Outreach Coordinator (see Section 3.5) to develop protocols and mechanisms adhering to state open meeting laws[26] and additional guidelines provided below. In addition, these coordinators will strive to effectively implement the RBC's responsibilities documented in the bylaws regarding communication with RBC members and the public.

Public participation will be available through two types of meetings in the planning process: RBC meetings and public meetings. RBC meetings typically will be held monthly during initial River Basin Plan development (approximately a two-year process) and are open to public attendance. RBC meetings will comply with the following set of guidelines regarding public notice and participation:

- Meeting notices shall be posted on a public website (the SCDNR website is sufficient, but RBCs can post meeting notices on other public websites as well) as early as practical and at least two weeks prior to the meeting. RBC meeting information also will be distributed by email, with email notices available to all those who choose to register on an established email list.

26 S.C. Code Ann. § 30-4-10 *et seq*.

- Meeting notices will include the agenda, date, time, expected duration, and place of the meeting.
- Meeting notices shall be posted in a publicly accessible site at the meeting place of the RBC at least 24 hours prior to the meeting.
- Meeting agendas can be modified up to 24 hours before the scheduled meeting. Modified agendas shall be posted on a public website (the SCDNR website is sufficient, but RBCs can post meeting notices on other public websites as well) and distributed to those registered on an established email list at least 24 hours before a scheduled meeting.
- The agenda must include as a minimum: 1) quorum determination; 2) public comment period; 3) approval of the minutes of the previous meeting; 4) any reports or items of information; and 5) any actions the RBC needs to consider. Each action (e.g., decision) should be listed as a separate agenda item.
- Meeting minutes shall be taken and shall include the time, date, and place of the meeting; the members of the RBC who attended; the members of the RBC who were absent; the substance of any matter discussed and decided by the RBC; and any other content a member requests to be included.
- Meeting minutes approved by the RBC shall be posted on a public website (the SCDNR website is sufficient, but RBCs can post meeting minutes on other public websites as well) within two weeks of the date of RBC approval.
- The public shall be allowed to submit comments or questions during a public comment period scheduled for each RBC meeting (typically near the beginning of the meeting). Any written responses from the RBC to any comments shall be incorporated into the meeting minutes.
- After RBC meetings, the meeting materials will be provided as part of the meeting minutes posted to the public website.

Public meetings will be convened by SCDNR or the RBC at several stages in the planning process, including but not limited to: 1) prior to the initial RBC meeting and basin-planning process; 2) after the release of the draft River Basin Plan; and 3) after the final River Basin Plan is completed. The first public meeting is designed to inform the public on the basin-planning process and how the public can participate. This meeting will also include the solicitation of RBC membership applications. The second meeting will provide an overview or summary of the draft River Basin Plan and will include a public comment period, followed by a period of at least 30 days to allow for written comments. The third meeting is designed to publicly address any revisions incorporated into the final plan.

Public meetings convened by SCDNR or the RBC shall be subject to the following guidelines regarding public notice and participation:

- Meeting notices shall be posted on a public website (the SCDNR website is sufficient, but RBCs can post meeting notices on other public websites as well) as early as practical and at least 30 days prior to the meeting.
- Meeting notices will include an agenda, date, time, expected duration, and place of the meeting.
- Meeting notices shall be posted in a publicly accessible site at the meeting place at least 24 hours prior to the meeting.

- Meeting notices shall be published in local media outlets to the extent practical.
- Public comments regarding topics discussed in the meeting shall be accepted up to 30 days following the meeting.
- Written responses to comments and questions submitted by stakeholders at and following the meeting shall be compiled by the RBC's Public Outreach Coordinator in cooperation with SCDNR and posted on a public website within 60 days following the meeting.

Public participation also will include a comment period during the review of draft River Basin Plans developed by the RBCs. The comment period, in addition to the requirements set forth above for public meetings, shall be subject to the following guidelines:

- Notification of the release of the draft River Basin Plan shall be posted on a public website (typically the SCDNR website should be sufficient, but RBCs can post notices on other public websites as well) at least 30 days prior to the draft River Basin Plan public meeting.
- Draft River Basin Plans shall be made available for download on the public website(s) at least 30 days prior to the draft River Basin Plan public meeting.

3.8 Coordination among RBCs

At times, RBCs from adjoining basins will need to communicate and coordinate with each other on mutual interests, which may include selecting model scenarios, data sharing, and development of water management and conservation strategies. Neighboring RBCs also may need to resolve potential conflicts involving shared water resources. This will be especially true for the Saluda, Broad, Catawba, and Santee basins, as those planning areas all lie within the same large watershed.

To facilitate collaboration between two or more basins, RBCs can form **Interbasin River Councils** (IRCs). Each IRC will *consist of members from two or more of the RBCs, with no more than five members from each RBC*. IRC members will be selected by each respective RBC. IRCs should meet at least twice a year, or more frequently, if necessary.

Because of the need for communication and coordination among the Saluda, Broad, Catawba, and Santee basins, an IRC should be created from the RBCs of those four basins. The creation of other IRCs is optional and left to the discretion of the RBCs.

IRCs may be particularly useful when trying to resolve any conflicts between neighboring RBCs. If conflicts can be resolved within the framework of the IRC, the IRC will make recommendations to the full membership of its respective RBC for consensus. If conflicts among RBCs cannot be resolved within the framework of the IRCs, SCDNR will make attempts at mediating such issues. If SCDNR and the IRC cannot come to a resolution, the issue will remain unresolved and will be documented in the River Basin Plans.

3.9 Coordination of RBCs with the Drought Response Committee

The South Carolina Drought Response Act establishes and defines the roles and responsibilities of the South Carolina **Drought Response Committee** (DRC). The DRC serves as the primary drought decision-making entity in the state and is chaired and supported by SCDNR and the South Carolina State Climatology Office. The DRC is composed of state and local members and is responsible for monitoring climatic conditions, evaluating drought indicators, and consulting with stakeholders to issue drought status updates.

Local members of the DRC are organized according to four Drought Management Areas (DMAs) defined by groups of counties approximately aligning with the four major river basins in the state (see Figure 10). The DMAs are the West DMA (Savannah basin), the Central DMA (Santee basin), the Northeast DMA (Pee Dee basin), and the Southern DMA (ACE basin). Because river basin planning areas are defined as eight basins, a DMA may include more than one planning basin, and a planning basin may include more than one DMA.

Each RBC will support drought response, collect drought information, and coordinate drought response activities. The RBC will convene during periods of drought and will meet monthly (typically by conference call) while any part of the basin is in a declared drought as determined by the DRC. Specific obligations of the RBC, with support from the SCDNR, include:

- Collecting and evaluating local hydrologic information for drought assessment.
- Providing local drought information and recommendations to the DRC regarding drought declarations.
- Communicating drought conditions and drought declarations to the rest of the RBC, stakeholders, and the public.
- Advocating for a coordinated, basin-wide response by entities with drought management responsibilities (e.g., water utilities, reservoir operators, large water users).
- Coordinating with other drought management groups in the basin as needed (e.g., the Drought Management Advisory Groups established through hydropower relicensing processes in the Pee Dee, Catawba and Savannah basins).

3.10 Coordination among RBCs and Other Water Planning Groups

3.10.1 Coordination among RBCs and Groundwater Management Groups

The Groundwater Use and Reporting Act directing SCDHEC to establish Capacity Use Areas also calls for the development of Groundwater Management Plans for each Capacity Use Area; and SCDHEC coordinates with local stakeholders to solicit input, recommendations, and comments for the Groundwater Management Plans. Stakeholders in a Capacity Use Area may form an advisory Groundwater Management Group (GMG) to assist with the development of the plan. These GMGs have historically included representatives from utilities, industries, local governments, and environmental interest groups. A formal GMG has been established in the Trident Capacity Use Area to advise and assist SCDHEC in monitoring and implementing aspects of the Trident plan.

The establishment of Capacity Use Areas and the development of Groundwater Management Plans dictate that RBCs work with any established GMGs on groundwater issues in the basin. It is recommended that each RBC create a formal groundwater subcommittee to focus on such issues and to meet with counterparts from other RBCs and with relevant GMGs quarterly or as needed. Members of the GMGs should be invited to attend and participate in discussions during RBC meetings, but no GMG member who is not part of an RBC has voting privileges.

After preliminary groundwater management strategies are proposed by an RBC, the effects of projected withdrawals will be evaluated using groundwater flow models and other available data. Results from the models will be evaluated by SCDHEC, SCDNR, and the appropriate GMGs to determine if the proposed management strategy complies with the appropriate Groundwater Management Plan. If the strategy complies, it can be incorporated into the River Basin Plan. If not, the strategy should be revised by the RBC to comply with the Groundwater Management Plan or it can be rejected.

There may be instances in which the effectiveness or impacts of a proposed management strategy are uncertain, either because there is a lack of information about whether the proposed management strategy poses a future harm or because of limitations of the groundwater models. In those cases, the strategy may be approved by SCDHEC who may impose one or more conditions for incorporating the strategy. One such condition may be the establishment of a monitoring network to detect any potential negative effects the proposed management strategy might cause.

As previously indicated, the boundaries of Capacity Use Areas are inconsistent with the boundaries of river basin planning areas (see Figure 9). Furthermore, boundaries of the major aquifers do not coincide with boundaries of either the Capacity Use Areas or the river basins. Because groundwater flow is generally confined by the boundaries of aquifers, not to political subdivisions or surface water divides, pumping in one area may affect groundwater availability in an adjacent Capacity Use Area or in an adjacent river basin. Efforts should be made to evaluate the impacts of groundwater withdrawals on the entire aquifer, not just areas of the aquifer in a river basin. Where possible, aquifer-wide water plans should be considered when developing plans for groundwater, using aquifers as the planning unit and integrating them with basin-wide water plans that are being developed for surface water. More information on groundwater management in South Carolina can be found on the SCDHEC Groundwater Management Planning website[27].

3.10.2 Coordination among RBCs and Interstate Water Planning Groups

Formal water planning groups currently exist in the Savannah, Catawba, and Pee Dee River basins, including areas outside of South Carolina. RBCs in these basins should become familiar with these other planning groups and work with these groups to produce complimentary rather than contradictory water plans and to minimize redundant work efforts.

The Catawba-Wateree Water Management Group (CWWMG) is a non-profit corporation composed of Duke Energy and 18 water utilities in the Catawba River basin of North and South Carolina. The CWWMG has been a highly active planning group in the basin since its founding in 2007, and most recently updated its Water Supply Master Plan in 2014[28]. The CWWMG's planning efforts focus primarily on the eleven reservoirs in the basin from the headwaters down to and including Lake Wateree. The Catawba RBC will focus primarily on the portion of the basin from Lake Wylie to the confluence of the Wateree River with the Congaree River. In addition, the SWAM surface water model developed by the state (see Section 4.1.2) relies on the output of CHEOPS, the model used by the CWWMG for planning purposes. Therefore, the Catawba RBC should work in close cooperation with the CWWMG, and the RBC ideally would include one or more South Carolina affiliated members of the CWWMG.

The Yadkin-Pee Dee Water Management Group (YPDWMG) was formally established as an unincorporated association in 2016 for water supply planning purposes. The YPDWMG includes 19 entities representing public water utilities, reservoir operators, and North Carolina local governments and is currently working to develop a Long-Range Water Resources Plan. The YPDWMG currently does not have representation from any South Carolina water users. Since the proposed Water Resources Plan will directly impact the water resources of the Pee Dee basin in

27 SCDHEC Groundwater Management Planning https://www.scdhec.gov/environment/water-quality/groundwater-use-reporting/groundwater-management-planning

28 Catawba-Wateree Water Management Group, 2014, Catawba-Wateree River Basin Water Supply Master Plan, 254 p. (https://drive.google.com/file/d/0Bxck3-wbAJTAWVk5R2JfdjVxdFE/view)

South Carolina, the Pee Dee RBC should establish a formal relationship with the YPDWMG to foster effective communication and information sharing. YPDWMG members should be encouraged to attend Pee Dee RBC meetings to the extent practical.

In 2008, the state of Georgia established a Comprehensive Statewide Water Management Plan to guide regional planning efforts for ten defined water planning regions in the state. In contrast to South Carolina, Georgia's Water Planning Regions are defined primarily by geopolitical boundaries. Two of Georgia's Water Planning Regions—the Savannah-Upper Ogeechee Region and the Coastal Georgia Region—include portions of the Savannah River basin. Regional Water Plans[29,30] for both planning regions were first completed in 2011 and updated plans were completed in 2017. The Regional Water Plans were developed by each region's Water Planning Council, Georgia's counterpart to South Carolina's RBCs as defined by this Planning Framework. The Savannah RBC should establish relationships with Georgia's Savannah-Upper Ogeechee and Coastal Georgia Water Planning Councils to foster future consistency and cooperation regarding the long-term water planning initiatives in each state.

29 Savannah-Upper Ogeechee Regional Water Plan - https://waterplanning.georgia.gov/documents/savannah-upper-ogeechee-regional-water-plan

30 Coastal Georgia Regional Water Plan - https://waterplanning.georgia.gov/documents/coastal-georgia-regional-water-plan

4.0 Methodologies for Evaluating Water Availability

4.1 Surface and Groundwater Models

The evaluation of water availability in a river basin must rely on sound science and reliable decision-making tools. To address those needs, SCDNR, in cooperation with SCDHEC, completed a set of hydrologic models for both the state's surface water and groundwater resources. In addition, SCDNR is completing water-demand projections for each basin for incorporation into the hydrologic models. The models and water-demand projections are intended to provide information on current and future water availability and will help identify any existing or future water shortages or issues. These models also can be used to evaluate water management strategies to address water shortages or other stresses on the state's water resources.

4.1.1 Surface Water and Groundwater Technical Advisory Committees

Technical Advisory Committees (TACs) were formed to assist SCDNR in the development of the surface water and groundwater models described in Sections 4.1.2 and 4.1.3. The initial Surface Water Assessment TAC was composed of a diverse group of stakeholders and included representation from public water supply, industry, energy utilities, conservation groups, and agriculture. This Surface Water Assessment TAC periodically met with SCDNR, SCDHEC, and CDM Smith, Inc. (the contractor for the surface water models) and provided valuable feedback on issues that arose during model development.

The initial Surface Water Assessment TAC will form the foundation for a long-term State Surface Water TAC to advise SCDNR and SCDHEC on technical considerations regarding the modeling of the state's surface water resources. Specifically, this TAC will advise the state agencies on any new data, model revisions or extensions, and alternative modeling platforms that could be incorporated into the planning process. The State Surface Water TAC also may be asked to provide advice to the RBCs on model scenarios and on the interpretation of model runs. The State Surface Water TAC will have 8 to 10 members, primarily scientists, engineers, and statisticians, selected to provide technical review and consultation representing a wide range of perspectives. SCDNR will be responsible for appointing TAC members and coordinating TAC activities.

Similarly, an initial Groundwater Assessment TAC was developed to help update the groundwater flow model described in Section 4.1.3. This TAC currently consists of seven members representing academia, public water supply, and industry and meets periodically with SCDNR, SCDHEC, and the USGS (the contractor for the Coastal Plain groundwater flow model) to provide technical input to model development and application. The Groundwater Assessment TAC, like the initial Surface Water Assessment TAC, will form the foundation of another State Groundwater TAC that will continue to advise state agencies on groundwater modeling tools and data. The State Groundwater TAC also may be asked to provide advice to the RBCs on model scenarios and on the interpretation of model runs. The State Groundwater TAC will have 8 to 10 members, appointed by SCDNR, who have expertise in groundwater hydrology or management. TAC activities will be coordinated by SCDNR.

4.1.2 Surface Water Models

4.1.2.1 SWAM Model Description

In August 2014, SCDNR contracted with CDM Smith, Inc. to complete surface water models for the eight, designated planning basins in the state (Figure 8) using the Simplified Water Allocation Model (SWAM). SWAM provides a consistent technical platform in each river basin to evaluate water availability. The PPAC recognized the need for a consistent platform for all basins to improve the efficiency of the water planning process; and as such, the SWAM models serve as the primary planning models for assessing surface water availability. The eight SWAM models were completed in 2017 and are available for use in the river basin planning process on the SCDNR website[31].

SWAM is an Excel-based, water allocation model that computes water availability at user-defined nodes in a networked river system. The model incorporates water withdrawals and discharges and can simulate reservoir operations of varying complexity. SWAM was developed to provide efficient planning-level analyses of water supply and river basins, while maintaining a high level of accessibility to a wide range of end-users. More information about the SWAM model and its functionality can be found in the South Carolina Surface Water Quantity Models Modeling Plan report[32].

A set of SWAM models incorporating a range of water-demand scenarios (Section 4.3.1) will be provided to each RBC. One model will include current levels of water use, while another model will include current permitted and registered surface water withdrawal amounts. These scenarios will be used in the SWAM model to assess water availability under current water use and under current permitted and registered withdrawal amounts. Two water-demand projection scenarios also will be incorporated into the SWAM models to evaluate future water availability. In all models, the current operational plans (reservoir operating rules, for example) existing in each basin will be included. The models also can be used to assess various water management strategies that could be implemented to address water availability issues. The technical work associated with running model simulations and processing output generally will be the responsibility of technical contractors as described in Section 3.5.

4.1.2.2 SWAM Model Limitations

Awareness of the limitations of water allocation models is crucial. Specific limitations of the SWAM model are described below:

- Stationarity assumption – SWAM models were developed based on historical hydrology as determined primarily from USGS streamflow data in each basin, and any evaluation of future water availability using SWAM assumes future hydrologic conditions will be similar to past hydrologic conditions. However, there is substantial uncertainty about how climate change or natural variations in long-term climate cycles might change the frequency and severity of future droughts and their impacts on water availability. SWAM cannot readily incorporate climate change projection information, but methods may be developed in the future to incorporate climate change information to the extent possible in the models. This will allow future iterations of river basin planning to consider climate change information for planning purposes.

31 SWAM Public Release - http://www.dnr.sc.gov/swam-models/index.html

32 CDM Smith, Inc., 2014, South Carolina Surface Water Quantity Models Modeling Plan, 42 p. (http://www.dnr.sc.gov/water/waterplan/swmpdfs/TechnicalReports/ScSwqmModelingPlan)

- Limited USGS streamflow gage data – The availability of USGS gage data presently varies significantly from planning basin to planning basin. Since the SWAM models rely on streamflow data as the fundamental hydrologic input, model confidence for planning basins with limited gage data is lower than for planning basins with more data. The Salkehatchie River basin SWAM model, for example, uses only one streamflow gage on the mainstem as the basis for developing inflow data sets for every modeled tributary. Other basins lack historic gage data on significant tributaries that either have important water users (Shaw Creek in the Edisto basin, for example) or were critical for model calibration (Four Hole Swamp in the Edisto basin, for example). Though the models have utility for planning purposes, RBCs should be aware of how limited gage data may affect model confidence. SCDNR will advise RBCs on any documented model confidence issues.
- Limited confidence in daily time-step simulations – Generally, there is higher confidence in model simulations for the monthly time-step as compared to the daily time-step. There are two main factors leading to a higher confidence in monthly simulations: 1) the lack of a flow-routing function in the SWAM model, and 2) the difficulty inherent in reproducing the day-to-day management decisions regarding reservoir operations during the calibration process. Both factors can produce notable errors in daily flow estimates when calibrating the model to historic daily flows. Flow-routing and reservoir management are less of a concern at a monthly time-step, and model calibration primarily focused on monthly simulations. Caution is warranted for model simulations using a daily time-step. SCDNR will serve in an advisory role for model applications requiring a daily time-step.

4.1.2.3 Application of Other Surface Water Models

SCDNR recognizes other water quantity models are utilized in the state and have potential to provide additional information to RBCs in the planning process. Although the SWAM model will serve as the primary decision-making tool to the extent possible in each basin, RBCs will have the discretion to evaluate other existing models. Any such model used in planning, however, must be a well-established modeling platform and must be thoroughly vetted and approved by the State Surface Water TAC. The application of other models in the planning process is subject to final approval by SCDNR and SCDHEC. The technical work associated with the application of any additional models in a basin's planning process will be the responsibility of SCDNR either through internal staff support or through contractors as discussed in Section 3.5.

Two water quantity models that may be applicable to the planning process are the HEC ResSim model in the Savannah River basin and the CHEOPS model in both the Savannah and Catawba basins. Those models are well established and have a long history of application in their respective basins. The Savannah HEC ResSim model is a reservoir model utilized by the USACE for drought management planning and for reservoir operations and management activities. The CHEOPS[33] model is a reservoir model used extensively by Duke Energy and other stakeholders

33 The settlement agreement dated December 3, 2010 for the US Supreme Court Case South Carolina v. North Carolina (No. 138, Original) requires a long-range water supply study for the Catawba-Wateree River Basin to be updated every 10 years using the CHEOPS model unless another model is agreed upon by four state government departments from North and South Carolina, the Catawba-Wateree Water Management Group, the Catawba River Water Supply Project, and Duke Energy (see page 3 of said settlement agreement, the second paragraph under "Agreement"). The same settlement agreement also requires those same entities to be involved in planning for those water supply study updates. The legal requirements of the U.S. Supreme Court settlement agreement will need to be addressed in the formation of the River Basin Council and in the implementation of the planning process, including water quantity modeling for the Catawba River basin.

in the Catawba basin in both North Carolina and South Carolina for planning purposes including drought management. The CHEOPS model in the Catawba basin has been modified to include tributary water resource assessments. In addition, the Catawba SWAM model currently relies on output from the Catawba CHEOPS model for headwater flow inputs.

4.1.3 Coastal Plain Groundwater Model

4.1.3.1 Model Description

Changing patterns of groundwater use and groundwater levels present management challenges to water users and managers. One important tool available to assist groundwater managers and planners is a groundwater flow model capable of simulating current and future groundwater conditions, assessing the effects of future groundwater use, and providing insights into various potential management strategies.

In 2010, the USGS in Columbia, South Carolina, completed a groundwater flow model, using MODFLOW, which included the entire South Carolina Coastal Plain[34]. The 2010 model was calibrated to 2004 groundwater conditions; but in the last 15 years, there have been many changes in groundwater withdrawal patterns and use in South Carolina.

In February 2016, SCDNR contracted the USGS to update the South Carolina Coastal Plain Groundwater Flow Model. The model is being updated using MODFLOW-NWT[35] and will include new groundwater-related data (through 2015), such as: water use data; groundwater levels; hydraulic properties of aquifers obtained from pumping tests; and hydrogeologic information from water wells, core holes, and well cluster sites. Further refinements include a modified surficial aquifer model layer, a smaller model-grid size (from 2 x 2 miles to 2,000 x 2,000 feet), a more detailed representation of the Fall Line area, and incorporation of modeled groundwater recharge rates. The updated model will be calibrated to more current conditions and is scheduled for completion in October 2019[36].

As part of the update of the groundwater flow model, a groundwater recharge model was developed using the USGS Soil-Water-Balance Model[37] (SWBM). Input to the recharge model included: gridded climate data, hydrologic soil groups, flow direction data, available soil moisture capacity, land use, and land cover data. Daily recharge rates to the surficial aquifer were estimated by the model for the period from 1979–2015 and used as input to the groundwater model for calibration purposes.

The 2019 South Carolina Coastal Plain Groundwater Flow model will serve as the primary groundwater model for evaluating the impacts future groundwater withdrawals will have on groundwater levels during the river basin planning process.

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34 Campbell, B.G., and Coes, A.L., eds., 2010, Groundwater availability in the Atlantic Coastal Plain of North and South Carolina: U.S. Geological Survey Professional Paper 1773, 241 p., 7 pls. (http://pubs.usgs.gov/pp/1773/)

35 Niswonger, R.G., Panday, S., and Ibaraki, M., 2011, MODFLOW-NWT, A Newton formulation for MODFLOW-2005: U.S. Geological Survey Techniques and Methods 6-A37, 44 p. (https://pubs.usgs.gov/tm/tm6a37/pdf/tm6a37.pdf)

36 Update for the South Carolina Coastal Plain Groundwater Model - https://www.usgs.gov/centers/sa-water/science/update-south-carolina-atlantic-coastal-plain-groundwater-availability-0?qt-science_center_objects=1#qt-science_center_objects

37 Westenbroek, S.M., Kelson, V.A., Dripps, W.R., Hunt, R.J., and Bradbury, K.R., 2010, SWB—A modified Thornthwaite-Mather Soil-Water-Balance code for estimating groundwater recharge: U.S. Geological Survey Techniques and Methods 6–A31, 60 p. (https://pubs.usgs.gov/tm/tm6-a31/tm6a31.pdf)

4.1.3.2 Groundwater Model Limitations

Awareness of the limitations of the groundwater flow model and its associated components is crucial. Specific limitations are described below:

- Groundwater flow model – Numerical models are based on limited data and are simplifications of actual groundwater flow systems. The simplifications incorporated into the development of a groundwater model can limit the ability of the model to predict actual hydrologic conditions over time. Accuracy and prediction capabilities of this model are affected by boundary conditions, hydraulic properties, and observations used in the model calibration.

  The model was spatially divided into a grid of 2,000 by 2,000-foot cells and was temporally divided into one steady-state stress period and 41 transient stress periods. The 41 transient stress periods range in length from 10 years (in the earlier periods of the model) to one year (in the more recent time periods of the model). The variable-length stress periods are appropriate for the accuracy of the water-use data and temporally sparse observations but cannot represent seasonal variation within the groundwater flow system.

  Groundwater withdrawals simulated in the model underrepresent actual historical water use because pumping rates less than three million gallons per month are not required to be reported to the state agencies and, therefore, are unknown. In addition, approximately 10 percent of the total volume of reported water use in South Carolina was not simulated in the model because either the pumped aquifer or the well location was unknown. The calibrated model was very sensitive to groundwater withdrawals; model error improved by 31 percent when the amount of simulated groundwater withdrawals was increased by 20 percent. The sensitivity of the model to withdrawals and the known underrepresentation of pumping emphasize the importance and need for improved monitoring of groundwater use in South Carolina.

  Properties such as hydraulic conductivity, specific storage, and specific yield were all calibrated to some degree during the simulation process. Initial values of hydraulic conductivity and specific storage for the aquifer were derived from published transmissivity and storage coefficient data and are the best-defined hydraulic properties in the model. In some cases, however, aquifer thicknesses at the wells had to be assumed from screen length. The model was most sensitive to the hydraulic conductivity of the aquifer.

- Recharge model – The SWBM recharge model limitations are similar to those of the groundwater model. The various types of input data (precipitation, temperature, soil properties, and land surface altitudes) all have inherent errors of collection and scale. The data were gridded the same as the groundwater model (2,000 by 2,000 foot) which is larger than the soil, land surface altitude, and climatic data. The SWBM calculates daily recharge but the groundwater model is temporally discretized into (mostly) one-year stress periods. The SWBM output is summed into the annual groundwater model stress periods, but most of the groundwater recharge occurs in the winter months.

- Hydrogeologic framework – The hydrogeologic framework describes the spatial distribution of aquifers and confining units composing the Coastal Plain. The framework was developed by delineating and mapping aquifers and confining units using information obtained from water wells and test holes. This information, however, was not evenly distributed across the Coastal Plain. Some areas of the state, such as near the Savannah River

Site, have an abundance of shallow and deep wells and test holes that were used to accurately map the framework. In other areas, such as in Beaufort and Jasper counties, there is an abundance of shallow wells but very few deep wells or test holes. Consequently, much is known about the shallow aquifers but little about the deep aquifers. Still, in other areas of the state where few wells and test holes have been drilled, there is a general lack of information about the aquifers. In these areas, the lateral continuity and the depths and thicknesses of the aquifers and confining units are less certain.

4.1.3.3 Application of Other Groundwater Models

Other groundwater flow models have been or are being developed by the USGS at a more detailed scale for site-specific or county-level studies. A recent USGS groundwater study in the Chesterfield County area produced a MODFLOW groundwater flow model with 300 x 300-foot model cells adequately simulating groundwater-surface water interactions[38]. A similar model is currently being developed for the Aiken County area. A detailed model also was recently developed to simulate conditions in the Charleston aquifer in the Mount Pleasant area. Each of these models can be utilized by the RBCs in their evaluation of groundwater conditions and management scenarios during the planning process.

The Chesterfield, Charleston, and Aiken County (when completed) models will be reviewed by the State Groundwater TAC. The TAC will advise SCDNR and SCDHEC on the use of these models, but final approval must be given by SCDNR and SCDHEC if the models are to be applied in the planning process. Technical work associated with running model simulations and processing output will generally be the responsibility of contractors with oversight from SCDNR and SCDHEC.

4.1.4 Water-Demand Projections

An assessment of future water availability requires an estimate of future water demand in each planning basin. To that end, SCDNR, in a joint project with the USACE and Clemson University's South Carolina Water Resources Center, developed population and water-demand projection methodologies. Those methodologies will be applied in each basin to estimate future water demand for thermoelectric power, public supply, industry, agricultural irrigation, and other uses over the Planning Horizon. Two sets of projections will be developed: the **Business-as-Usual Water-Demand Projection Scenario** will *estimate future demand based on water use during normal weather conditions and assuming moderate growth in the population and economy*, whereas the **High Water-Demand Projection Scenario** will *estimate future demand based on water use during hot and dry conditions and assuming high population and economic growth*. The projections will be completed in 5-year intervals for the first 20 years and in 10-year intervals for the following 30 years. This information will be used in the surface water and groundwater models to assess future water availability. More information on the water-demand methodologies can be found in the *Projection Methods for Off-stream Water Demand in South Carolina* report[39].

The projections will be developed using a consistent set of methodologies and a separate stakeholder process. RBCs are expected to utilize SCDNR's projections unless there is clear justification to use alternate projections. The RBCs shall have the opportunity to review the projections

38 Campbell, B.G. and Landmeyer, J.E., 2014, Groundwater availability in the Crouch Branch and McQueen Branch aquifers, Chesterfield County, South Carolina, 1900–2012: U.S. Geological Survey Scientific Investigations Report 2014–5050, 68 p. (https://pubs.usgs.gov/sir/2014/5050/)

39 Pellet, Alex, 2019, Projection methods for off-stream water demand in South Carolina: South Carolina Department of Natural Resources, 55 p. (http://hydrology.dnr.sc.gov/water-demand.html)

and may request revisions be made to the projections based on new information or conditions in a basin. Proposed revisions must be submitted in writing to SCDNR, and the RBC must provide detailed documentation justifying the proposed revisions. SCDNR will review the RBC's recommendations and make a final determination as to whether the projections need to be modified. Final SCDNR determinations will be presented in writing to the RBC, typically within thirty days of receiving the RBC's proposed revisions. If any or all the RBC's proposed revisions are accepted, SCDNR will be responsible for providing new projections to the RBC.

Water-demand projections are being completed only for water users who reside within the state's boundaries. Three of South Carolina's planning basins are shared with North Carolina (Broad, Catawba, and Pee Dee) and one basin is shared with Georgia and North Carolina (Savannah). Water-demand projections completed by the states of Georgia and North Carolina or by formal water planning organizations in those states (See Section 3.10.2), to the extent data are available, will be incorporated into future water-demand scenarios.

4.2 Performance Measures

To facilitate the process of comparing the results of simulated scenarios and evaluating potential water management strategies, **Performance Measures** will be developed by each RBC as a means for comparing water resource impacts (negative and positive) of each scenario. A Performance Measure is defined as *a quantitative measure of change in a user-defined condition from an established baseline used to assess the performance of a proposed water management strategy or combination of strategies*. Performance Measures establish an objective means with which to compare scenarios to the baseline case. For comparing potential water management strategies, the **Baseline Scenario** is defined as the *Permitted and Registered Surface Water Use Scenario* as defined in Section 4.3.1.2 for surface water and the *Permitted Groundwater Use Scenario* as defined in Section 4.4.1.3 for groundwater. Also, the RBC may consider establishing a Minimum Increment of Significant Change (MISC) for each Performance Measure to indicate the degree of difference necessary before two scenarios being compared are considered to differ for that Performance Measure. Performance Measures can be applied to both surface and groundwater scenario comparisons.

SCDNR can provide a set of Performance Measures for each RBC to consider in the comparison of model scenarios. RBCs can propose additional Performance Measures or propose modifications of SCDNR measures to reflect basin-specific or aquifer-specific issues. In developing measures, considerations for recreation, instream flow, low-flow statistics, groundwater level declines, economic factors, and the ability to increase water availability could be considered.

Specific examples for Performance Measures may include but are not limited to:

- Percent change in a monthly minimum flow or 5th percentile flow
- Percent change in Surface Water Supply
- Percent change in magnitude of Surface Water Shortages
- Percent of time a reservoir was in a low inflow protocol
- Percent of time recreational facilities were unavailable on a reservoir (public boat landings or public swimming areas, for example)
- Percent change in lowest reservoir elevation occurring during simulated period of record
- Changes in aquifer levels

Because **Minimum Instream Flow** is defined in the South Carolina Surface Water Withdrawal, Permitting, Use, and Reporting Act, RBCs should consider incorporating the following criterion as a Performance Measure when comparing surface water simulations. This Act defines the Minimum Instream Flow as "*… the flow that provides an adequate supply of water at the surface water withdrawal point to maintain the biological, chemical, and physical integrity of the stream taking into account the needs of downstream users, recreation, and navigation and that flow is set at forty percent of the mean annual daily flow for the months of January, February, March, and April; thirty percent of the mean annual daily flow for the months of May, June, and December; and twenty percent of the mean annual daily flow for the months of July through November for surface water withdrawers as described in Section 49 4 150(A)(1). For surface water withdrawal points located on a surface water segment downstream of and influenced by a licensed or otherwise flow controlled impoundment, "minimum instream flow" means the flow that provides an adequate supply of water at the surface water withdrawal point to maintain the biological, chemical, and physical integrity of the stream taking into account the needs of downstream users, recreation, and navigation and that flow is set in Section 49 4 150(A)(3)*."

For streams not downstream of, or influenced by, a flow-controlled impoundment, streamflow levels will naturally decrease below the 20%, 30%, and 40% mean annual daily flows. Though in some cases the Minimum Instream Flow should be applied as a condition (see Section 4.3.2), the Minimum Instream Flow may be utilized as a Performance Measure instead using the change in the number and magnitude of excursions below the 20%, 30%, and 40% mean annual daily flows when comparing each scenario to the Baseline Scenario. RBCs also can consider other Performance Measures for instream flows.

Specific Performance Measures used to compare groundwater management strategies may be limited to changes in aquifer levels simulated at existing monitoring wells, hypothetical wells, or as represented on potentiometric maps. Other conditions altered by pumping, such as changes in baseflow, water quality or subsidence, will be difficult to simulate with current models, but those conditions may be available as Performance Measures to the RBCs in the future.

RBCs may choose to designate **Strategic Nodes** to facilitate or simplify the comparison of model scenarios and associated Performance Measures. A Strategic Node is *an RBC-defined location on a surface water body or aquifer designated to evaluate the cumulative impacts of water management strategies for a given model scenario and serving as a primary point of interest from which to evaluate a model scenario's Performance Measures*. For surface water simulations, Strategic Nodes may be designated on a reservoir or a river segment of interest in the SWAM model. For groundwater simulations, a Strategic Node is designated by a monitoring well with which to evaluate groundwater levels in an aquifer.

4.3 Approach to Determining Surface Water Availability

4.3.1 General Approach to Identifying Surface Water Shortages

Surface water models, as described in Section 4.1.2, will be used to assess water availability and to identify potential Surface Water Shortages under current water use, permitted and registered water use, and future water use scenarios (scenarios are described in more detail below). **Physically Available Surface Water Supply** is defined as *the maximum amount of water that occurs 100% of the time at a location on a surface water body, with no defined conditions applied on the surface water body*. Physically Available Surface Water Supply is determined from SWAM (or other approved model) simulations over the period of record in each basin. This definition

implies the entire volume of water stored in a surface water body is accessible for use. In most cases, withdrawing the entire volume of water from a surface water body is both unrealistic and undesirable. It is, therefore, instructive to define water availability in terms of defined conditions that limit the amount of water that can be withdrawn from a surface water body. **Surface Water Supply** is defined as *the maximum amount of water available for withdrawal 100% of the time at a location on a surface water body without violating any applied **Surface Water Conditions** on the surface water source and considering upstream demands*. Surface Water Supply also is determined from SWAM (or other approved model) simulations over the period of record in each basin. Applied Surface Water Conditions *are defined by the RBCs, are intended to physically limit the amount of water that can be withdrawn from a surface water source, and are independent of water demand*. Example conditions include setting a minimum allowable flow on a non-regulated stream (see Section 4.3.2) or defining a critical elevation in a reservoir for evaluating Reservoir Safe Yield (see Section 4.3.4). Applied conditions are used strictly for planning purposes as RBCs do not have the authority to create legally binding restrictions. In addition, Surface Water Supply does not consider whether infrastructure exists to make use of the entire Surface Water Supply.

Surface Water Supply is typically defined by a basin's lowest flow period, which may vary from basin to basin, and will be determined from monthly simulations over the hydrologic period of record specific to the basin. The determination of Surface Water Supply from daily simulations may be considered as well. RBCs will consult with SCDNR and the technical contractors to evaluate the feasibility of determining Surface Water Supply on a daily time-step.

A **Surface Water Shortage** occurs *when the water demand exceeds the Surface Water Supply for any water user in the basin*. The identification of Surface Water Shortages and the evaluation of Surface Water Management Strategies (Section 4.5.1) to address these shortages are major components of the planning process. A Surface Water Shortage may exist in the Current Water Use Scenario, in the Permitted and Registered Water Use Scenario, and/or in a Projected Water-Demand Scenario as described below.

Surface Water Supply and Surface Water Shortages will be determined for each of the water-demand scenarios described below (Sections 4.3.1.1 – 4.3.1.3). This set of scenarios provides a consistent starting point for all RBCs; and RBCs are required to evaluate these scenarios, at a minimum, as part of the planning process. RBCs also have the option of evaluating a fifth scenario which simulates the unimpaired surface water hydrology of the basin. In this scenario, water discharges and withdrawals would be set to zero in the surface water simulation.

4.3.1.1 Current Surface Water Use Scenario

The **Current Surface Water Use Scenario** *incorporates an estimate of current water use in the surface water simulations*. Current water use is generally defined as a recent 10-year average for each water user (typically 2004-2013 for the initial River Basin Plans). This simulation will provide information to the RBCs on the potential for Surface Water Shortages that could immediately result under a repeat of historic droughts in a basin. The identification of such shortages would highlight the need for short-term planning initiatives including the development of recommended Surface Water Management Strategies by the RBC.

4.3.1.2 Permitted and Registered Surface Water Use Scenario

The **Permitted and Registered Surface Water Use Scenario** *incorporates the fully permitted or registered water use allowable under existing surface water permits and registrations for all water users*. These surface water simulations will provide information to the RBCs on the

potential for Surface Water Shortages that might occur under a repeat of historic droughts in a basin if the maximum legally allowable amounts were withdrawn. The scenario would provide limited information on when such Surface Water Shortages may occur, but valuable information is provided on where Surface Water Shortages are likely to occur and whether surface water is currently over-allocated. In developing Surface Water Management Strategies to eliminate or mitigate shortages, RBCs must consider the Surface Water Shortages identified by this scenario. In situations where no Surface Water Shortages are determined, the Surface Water Supply determined from this scenario denotes the unallocated available water.

4.3.1.3 Water-Demand Projection Scenarios

Water-demand projections will be incorporated into the surface water simulations for the following scenarios:

1. **Business-as-Usual Water-Demand Projection Scenario** – *surface water simulation using a future water-demand projection based on the assumptions of a normal climate (i.e., average irrigation) and moderate population and economic growth*.
2. **High Water-Demand Projection Scenario** – *surface water simulation using a future water-demand projection based on the assumptions of a hot and dry climate (i.e., increased irrigation) and high population and economic growth*.

SWAM simulations incorporating the business-as-usual and high demand projection scenarios will provide information to the RBCs on when and where future Surface Water Shortages could possibly occur. RBCs are expected to evaluate future water availability over the Planning Horizon, and multiple simulations will be completed for each projection scenario at 5-and 10-year intervals to determine when future shortages, if any, may occur.

The evaluation of future water-demand projection scenarios will inform RBC recommendations regarding the need for short- and long-term planning initiatives or Surface Water Management Strategies (Section 4.5.1). In some cases, the projected water demand may exceed current permitted and registered amounts and result in larger Surface Water Shortages compared to the shortages identified in the Permitted and Registered Surface Water Use Scenario. In such cases, RBCs should develop and evaluate Surface Water Management Strategies that address the Surface Water Shortages identified under the projection scenarios.

Conversely, if no Surface Water Shortages are determined for a user and if demand projections for the given user and all upstream users are less than the permitted or registered amounts for the given user and all upstream users, the Surface Water Supply should be determined as outlined in the Permitted and Registered Surface Water Use Scenario (Section 4.3.1.2). In this way, permitted and registered amounts are always considered in final Surface Water Supply determinations.

Though the two water-demand projection scenarios described above provide a reasonable expected range of future water demand, an RBC can propose additional future water- demand scenarios based on a set of assumptions different from those described above (a projection that incorporates more aggressive economic growth, for example; or a scenario that incorporates a high-demand projection for one category of water use and a low demand-projection for another category). SCDNR, in collaboration with the technical contractors, will be responsible for developing any additional water-demand projection datasets. RBCs will be required to describe the relevance of any additional water-demand projection scenarios. The identification of Surface Water Shortages will be completed for any new water-demand projection scenarios.

4.3.2 Water Availability Considerations for Streams

As described above, RBCs may elect to evaluate applied Surface Water Conditions on streams in their determination of Surface Water Supply. Surface Water Conditions typically will cause the Surface Water Supply to be less than the Physically Available Surface Water Supply. Thus, the conditions may result in additional or more severe Surface Water Shortages.

Surface Water Conditions may be associated with minimum streamflows necessary to maintain the usability of an intake, if such streamflow levels are known. Conditions also may be associated with an instream flow need where a minimum flow requirement is modeled to protect the ecological health of a stream.

In some cases, conditions might be based on the Minimum Instream Flow as defined in the South Carolina Surface Water Withdrawal, Permitting, Use, and Reporting Act. For any new users subject to the permitting requirements of this Act, the Minimum Instream Flow could be used as a required condition to evaluate water availability for these users. Since streamflow levels will naturally decrease below the 20%, 30%, and 40% mean annual daily flows for streams not downstream of, or influenced by, a flow controlled impoundment, RBCs should also consider incorporating Minimum Instream Flow as a Performance Measure on such streams as outlined in Section 4.2.

Any Surface Water Conditions applied in the determination of Surface Water Supply must be agreed upon by the RBC, and any applied conditions may not supersede any regulations governing the legal availability of surface water withdrawals. It should be noted that the applied conditions as defined in this section are for river basin planning (i.e., modeling) purposes only.

4.3.3 Reaches of Interest

In addition to identifying Surface Water Shortages and determining Surface Water Supply, RBCs may utilize the surface water models to identify **Reaches of Interest** in a basin. Reaches of Interest are defined as *specific stream reaches that may have no identified Surface Water Shortage but experience undesired impacts, environmental or otherwise, determined from current or future water-demand scenarios or proposed water management strategies*. The designation of a Reach of Interest must be agreed upon by the RBC and may be related to recreational flows or instream flow considerations. Performance Measures may be used to evaluate the effectiveness of proposed water management strategies in addressing issues associated with Reaches of Interest.

4.3.4 Reservoir Safe Yield Computations

Reservoir Safe Yield is defined as *the Surface Water Supply for a reservoir or system of reservoirs over the simulated hydrologic period of record*. Reservoir Safe Yield analyses will be subject to the following requirements:

- Reservoir Safe Yield determinations will be based primarily on the SWAM models described in Section 4.1.2, but RBCs can utilize other surface water allocation models that have been fully vetted by the Surface Water TAC and approved by SCDNR as outlined in Sections 4.1.1 and 4.1.2.
- Reservoir Safe Yield will be based on the shallowest intake for an essential water use in a reservoir (highest critical public water supply intake, for example), but other Surface Water Conditions can be evaluated by an RBC. Essential water use in this context will include power generation.
- Reservoir Safe Yield determinations will use current reservoir operating rules described in existing FERC licenses for hydropower projects or described in any other legal agreements,

management plans, or memorandums of understanding between reservoir operators and state agencies regarding reservoir operating rules.

- Reservoir Safe Yield analyses should consider any historical safe yield studies previously completed in each basin.

Reservoir Safe Yield determinations should be considered for the following large reservoirs in the state, and SCDNR will advise RBCs on the need for such determinations:

- Murray and Greenwood (Saluda basin)
- Bowen and Blalock (Broad basin)
- Marion and Moultrie (Santee basin)
- Bad Creek, Jocassee, Keowee[40], Hartwell, Russell, and Thurmond (Savannah basin)
- Wylie, Fishing Creek, Great Falls, Cedar Creek, and Wateree (Catawba basin)

Reservoir Safe Yield analyses will generally be the responsibility of the technical contractors with oversight from SCDNR. Reservoir Safe Yield computations typically will be based on monthly simulations. SCDNR, along with the technical contractors, will advise RBCs on the feasibility of determining Reservoir Safe Yield based on daily simulations. RBCs also can recommend Reservoir Safe Yield analyses for smaller reservoirs, but such analyses will be dependent upon the amount of streamflow data used to develop the SWAM model in each planning basin. SWAM model confidence is lower in basins or sub-basins with little to no USGS gage data from which to develop Reservoir Safe Yield estimates. Caution is warranted in the application of Reservoir Safe Yield analyses for smaller reservoirs in those basins or sub-basins with limited to no streamflow gage data.

Reservoir Safe Yield is typically computed by assuming a time series of reservoir inflows and systematically increasing water withdrawals from the reservoir or system of reservoirs until the defined surface water condition is violated (water levels decrease below the shallowest intake of an essential water use, for example). Two Reservoir Safe Yield determinations, each based on a different reservoir inflow estimate, should be completed as described below:

1. **Current Reservoir Safe Yield** – the Reservoir Safe Yield estimated from reservoir inflows based on the Current Surface Water Use Scenario. Current Reservoir Safe Yield provides information on the volume of water that could be removed from a reservoir without violating a Surface Water Condition and is based on historic hydrologic conditions and an estimate of current water use for all upstream users. Water-demand projections can then be used to assess the potential for the Current Reservoir Safe Yield to be depleted over the Planning Horizon.
2. **Unallocated Reservoir Safe Yield** – the Reservoir Safe Yield estimated from reservoir inflows based on the Permitted and Registered Surface Water Use Scenario. Unallocated Reservoir Safe Yield provides information on the volume of water that could be removed from a reservoir without violating a Surface Water Condition and is based on historical hydrology and incorporating the maximum amount of current allowable withdrawals upstream and in the reservoir. A nonzero Unallocated Reservoir Safe Yield provides an estimate of the unallocated water volume that could be withdrawn from a reservoir before violating a defined Surface Water Condition.

40 Due to their pumped storage connection, Reservoir Safe Yield for Bad Creek, Keowee, and Jocassee should be determined as a system and not individually for each reservoir.

4.4 Approach to Determining Groundwater Availability

4.4.1 General Approach to Identifying Groundwater Shortages

South Carolina's groundwater resources are available primarily in the Coastal Plain Province, which encompasses about two-thirds of the state (Figure 2). Although groundwater occurs throughout the Piedmont and Blue Ridge Provinces, availability is generally limited in those areas to yields on the order of 5 to 10 gallons per minute. In the Coastal Plain, withdrawals of several thousand gallons per minute can be obtained from the more productive aquifers.

Groundwater levels, which are an indication of groundwater availability, are monitored statewide, but there are areas where data are lacking. Currently, groundwater levels are monitored in over 170 wells by SCDNR and in about 20 wells by the USGS. In addition, water levels from a network of private wells are measured periodically and combined with data from the permanent wells to produce potentiometric maps of the major Coastal Plain aquifers. These maps are used to identify changes in the direction and rate of groundwater flow, to calibrate groundwater models, and to assess changes in groundwater availability.

Although groundwater is a renewable resource, pumping from wells at rates exceeding natural replenishment ultimately causes groundwater levels to decline and can result in irreversible compaction of the aquifer and permanent depletion of the resource. Other undesirable consequences of pumping and subsequent lowering of groundwater levels include: reductions in yields of nearby wells; increased pumping costs; reduced flow rates in streams; altered groundwater flow patterns that can lead to saltwater intrusion and degradation of water quality; depletion of wetlands; land subsidence; and the development of sinkholes. Cones of depression have been identified on potentiometric maps in areas where aquifers have been stressed by over-pumping, with water-level declines of more than 200 feet recorded.

Declines in aquifer levels are mainly a function of pumping rates, recharge rates, and hydraulic properties of the aquifer. Groundwater flow models, such as the one developed for the South Carolina Coastal Plain (Section 4.1.3), can be used to predict the depths to which groundwater levels will decline in an aquifer based on pumping rates and aquifer properties; however, the models cannot predict if or when undesirable impacts will occur. The magnitude of groundwater level declines which can occur before these impacts take place is currently unknown. Therefore, the effects pumping has on the resource, environment, and other users must be monitored in order to effectively manage groundwater.

Groundwater Management Plans developed by SCDHEC for Capacity Use Areas take an adaptive approach to managing the state's groundwater resources. Restrictions on groundwater use are based on an evaluation not only of groundwater levels observed in monitoring wells but also on an evaluation of other factors affected by groundwater drawdowns, such as water quality, subsidence, interference with other users, and saltwater intrusion. Owing to the uncertainty associated with the amount of groundwater that can be withdrawn before these negative impacts occur, the amount of groundwater that can be safely withdrawn from an aquifer is currently unknown. Consequently, the RBCs, when developing their water plans and evaluating groundwater availability, will not have firm numbers regarding the amount of groundwater available for future use.

Groundwater models, as described in Section 4.1.3, used in conjunction with information obtained from groundwater monitoring networks, will be used to evaluate the effects of future groundwater pumping and to identify Groundwater Areas of Concern and Groundwater Shortages under current water use, permitted and registered water use, and water-demand projection

scenarios, which are described below. A **Groundwater Area of Concern** is defined as *an area where current or future groundwater withdrawals from an aquifer are causing or are expected to cause unacceptable impacts to the resource or to the public health and well-being*. **Groundwater Supply** is defined as *the volume of water that can be withdrawn annually from a specified aquifer in a designated location without violating any applied **Groundwater Conditions** on the groundwater source*. A Groundwater Condition is *a physical limitation on the amount of groundwater withdrawn from an aquifer and which can be applied to evaluate Groundwater Supply for planning purposes*. A **Groundwater Shortage** occurs when *current or future groundwater withdrawals from a specified aquifer are violating or are expected to violate a Groundwater Condition applied on that aquifer*. Except for a few areas in the state, there currently are no conditions limiting the amount of water that can be pumped from an aquifer. RBCs, in consultation with SCDNR and SCDHEC, may propose Groundwater Conditions for aquifers in a Capacity Use Area of the basin, but those conditions would not be binding unless incorporated into the Groundwater Management Plan and approved by SCDHEC. Some examples of conditions include a fixed groundwater elevation, a rate of decline of water levels, a water quality parameter, or a baseflow condition.

4.4.1.1 Predevelopment Groundwater Use Scenario

The **Predevelopment Groundwater Use Scenario** r*emoves all groundwater withdrawals from the model and simulates groundwater levels prior to any groundwater development*. Maps showing predicted groundwater levels of the major aquifers prior to development will be available to the RBCs. These maps can be used in conjunction with current groundwater level data obtained from the monitoring networks, potentiometric maps, or with output from other model scenarios to identify areas where groundwater levels have declined or are predicted to decline in the future.

4.4.1.2 Current Groundwater Use Scenario

The **Current Groundwater Use Scenario** *incorporates current groundwater use in the model simulations*. This scenario simulates groundwater levels each year through 2065 if the total volume of groundwater currently being used does not vary and is withdrawn every year from 2016–2065. This scenario can provide information to the RBCs on the cumulative effects current rates of pumping will have on groundwater levels. Areas where future groundwater levels diverge significantly from predevelopment levels or from current levels observed in monitoring wells may indicate Groundwater Areas of Concern or Groundwater Shortages that may require the development of Groundwater Management Strategies (Section 4.5.2) by the RBC.

4.4.1.3 Permitted Groundwater Use Scenario

The **Permitted Groundwater Use Scenario** *incorporates the fully permitted water use allowable under existing groundwater permits for all groundwater users in Capacity Use Areas*. This scenario also incorporates the maximum annual water use reported to SCDHEC by those groundwater users outside of Capacity Use Areas. This scenario simulates groundwater levels each year through 2065 if the total volume of groundwater that has been permitted in Capacity Use Areas and the maximum reported use outside of Capacity Use Areas is withdrawn every year from 2016–2065. This scenario can provide information to the RBCs on the cumulative effects permitted pumping rates will have on groundwater levels. Areas where future groundwater levels diverge significantly from predevelopment levels or from current levels may indicate Groundwater Areas of Concern or Groundwater Shortages that may require the development of Groundwater Management Strategies (Section 4.5.2) by the RBC.

4.4.1.4 Water-Demand Projection Scenarios

Water-demand projections will be incorporated into the groundwater simulations for the following scenarios:

1. **Business-as-usual Water-Demand Projection Scenario** – *groundwater simulation using a future water-demand projection based on the assumptions of a normal climate (i.e., average irrigation) and moderate population and economic growth*.
2. **High Water-Demand Projection Scenario** – *groundwater simulation using a future water-demand projection based on the assumptions of a hot and dry climate (i.e., increased irrigation) and high population and economic growth*.

Simulations incorporating the business-as-usual and high demand projection scenarios will provide information to the RBCs on *when* and *where* future Groundwater Areas of Concern or Groundwater Shortages may occur. RBCs are expected to evaluate future water availability over the Planning Horizon and can evaluate groundwater availability in 5-and 10-year intervals to determine when Groundwater Areas of Concern or Groundwater Shortages, if any, may develop.

RBCs can propose additional water-demand projection scenarios based on a set of assumptions different from those described above (a projection incorporating more aggressive economic growth, for example). SCDNR, in collaboration with the technical contractors, will be responsible for developing any additional water-demand projection datasets. RBCs will be required to describe the relevance of any additional water-demand projection scenarios.

4.4.2 Water Availability Considerations for Groundwater

As indicated above, a major challenge for groundwater resource management is understanding the relationship between groundwater level declines and the resulting impacts caused by those declines. The 1998 South Carolina Water Plan recommended water level declines of 150 feet from predevelopment levels in the Black Creek and Middendorf aquifers, and declines of 75 feet in the Floridan aquifer be used to trigger the declaration of Capacity Use Areas or to initiate a “water shortage procedure”. The impacts associated with these trigger levels were never fully understood; and as a result, the use of trigger levels was never implemented. Appropriate trigger levels may be explored and applied by an RBC and may include a warning level trigger and an action level trigger for each aquifer.

The state of Texas constrains the use of groundwater over their 50-year planning period to an amount that satisfies a “desired future condition” of the aquifer. Some examples of desired future conditions are 1) maintaining groundwater levels at or above a fixed elevation over the 50-year period; 2) preserving a certain volume of storage; or 3) keeping the total dissolved solids concentration below a certain level. The volume of water that can be pumped from an aquifer over the 50-year planning period that achieves the desired future condition is estimated using groundwater models. Using this approach, planners know how much groundwater is available for future use and can plan accordingly. RBCs may elect to consider this approach in the planning process for groundwater.

4.5 Water Management Strategies

RBCs will propose water management strategies to: 1) directly address any surface or groundwater availability issues identified using the methods outlined in Sections 4.3 and 4.4, or 2) enhance or optimize the overall water availability in a basin or an aquifer. Many water management strategies can be applied to either a surface water resource or a groundwater resource

(water conservation, for example), and a water management strategy may include the conjunctive use of surface water and groundwater. Strategies are defined below according to the source being addressed.

When evaluating current and future water availability, each RBC should take an adaptive management approach and recognize the potential for changing hydrologic or socioeconomic conditions, which may lead to new recommendations for water management. The two water-demand projection scenarios described in Section 4.3.1.3 and 4.4.1.4 are designed, in part, to address this potential for varying conditions in a basin. Changing conditions on the water supply side could include the occurrence of a more severe drought during the planning process, as compared to recent historic droughts included in the simulated period of record.

4.5.1 Surface Water Management Strategies

A **Surface Water Management Strategy** is defined as *any water management strategy proposed to eliminate a Surface Water Shortage, reduce a Surface Water Shortage, or generally increase Surface Water Supply*. Though strategies proposed to eliminate or reduce a shortage should increase Surface Water Supply, the distinction made in the definition between eliminating a shortage and increasing supply is intended to consider situations where little to no shortage may be identified by the RBC. In such cases, an RBC may elect to recommend a proactive approach by proposing strategies to increase Surface Water Supply to further reduce the probability of future shortages. Examples of potential Surface Water Management Strategies are provided in Section 4.5.3 and may include the use of a groundwater source or the conjunctive use of both surface and groundwater.

To the extent possible, proposed Surface Water Management Strategies will be simulated with the surface water models to evaluate their effectiveness in eliminating Surface Water Shortages, reducing any such shortages, or increasing Surface Water Supply. Effectiveness of each strategy should be quantified to the extent possible. For strategies designed to address an identified shortage, the effectiveness will be evaluated by the success of the strategy in eliminating or mitigating the shortage. If the shortage is not eliminated by such a strategy, the shortage amount remaining should be quantified and documented in the River Basin Plan. The effectiveness of any strategies proposed to increase Surface Water Supply (and not intended to address a specific shortage) should be based on a quantifiable estimate of how much supply was increased. Documentation of the increase in Surface Water Supply should be included in the River Basin Plan for each strategy or combination of strategies. Other Performance Measures can be evaluated to measure the effectiveness of each strategy or combination of strategies in eliminating/reducing shortages or increasing Surface Water Supply. The results of any such analysis should be documented in the River Basin Plan.

In addition, any impacts (positive or negative) on Reaches of Interest from the strategies designed to eliminate/reduce shortages or to increase water supply as discussed above should be evaluated. In some cases, these strategies may provide enough positive impacts to sufficiently address a Reach of Interest. Additional Performance Measures may be evaluated to determine the effectiveness of the Surface Water Management Strategies on addressing Reaches of Interest, and any such analysis should be documented in the River Basin Plan.

In some cases, groundwater may be used in a Surface Water Management Strategy to address a Surface Water Shortage or to increase Surface Water Supply, where possible. In these cases, the strategy will be evaluated using both the surface and groundwater models to deter-

mine the impacts on both resources. In addition, RBCs may need to address multiple shortages occurring during the same period at different locations. In such cases, the cumulative impact of multiple strategies proposed to address the shortages should be evaluated.

Not all proposed strategies that are effective in eliminating/mitigating a water shortage, increasing water supply, or addressing a Reach of Interest may be feasible for implementation. The feasibility of each proposed Surface Water Management Strategy should be assessed and include the following considerations:

- Costs and benefits of implementing the water management strategy
- Consistency with state regulations
- Reliability of the water source
- Environmental impacts of the water management strategy
- Socioeconomic impacts of the water management strategy
- Potential interbasin and interstate impacts

Additional Performance Measures may be developed and considered, as necessary, to evaluate the feasibility of each proposed Surface Water Management Strategy or combination of strategies.

A cost-benefit analysis of each proposed Surface Water Management Strategy will be evaluated and should consider both the effectiveness and feasibility of each strategy or combination of strategies. Contractors will assist the RBCs in the completion of a cost-benefit analysis for each Surface Water Management Strategy. Each RBC will make recommendations on strategies for implementation with particular consideration given to the cost-benefit analysis. Preference should be given to those strategies determined to be both effective and feasible for eliminating or reducing Surface Water Shortages.

4.5.2 Groundwater Management Strategies

A **Groundwater Management Strategy** is defined as *any water management strategy proposed to address a Groundwater Area of Concern, reduce a Groundwater Shortage, or generally increase Groundwater Supply*. Examples of potential water management strategies, which can be used either separately or in combination, are provided in Section 4.5.3. To the extent possible, Groundwater Management Strategies will be simulated using groundwater models to evaluate their effectiveness in addressing areas of concern and shortages. In some cases, a surface water source may be used in a Groundwater Management Strategy. In these cases, the strategy will be evaluated using both surface and groundwater models to determine the impacts on both resources.

The effectiveness of each strategy should be documented by quantifying its impact on groundwater levels. Performance Measures may be used to assist in the evaluation of Groundwater Management Strategies; however, since no models are currently available to evaluate the secondary impacts of groundwater level declines, such as saltwater intrusion or land subsidence, the evaluation of proposed Groundwater Management Strategies primarily should be based on impacts to groundwater levels.

Not all proposed strategies determined to effectively address a Groundwater Shortage or Groundwater Area of Concern may be feasible for implementation. The feasibility of each proposed Groundwater Management Strategy should be assessed and include the following considerations:

- Cost of implementing the water management strategy
- Consistency with state regulations
- Reliability of the water source
- Environmental impacts of the water management strategy
- Socioeconomic impacts of the water management strategy
- Potential interbasin and interstate impacts

Performance Measures may be developed and considered, as necessary, to evaluate the feasibility of each proposed Groundwater Management Strategy or combination of strategies.

A cost-benefit analysis of each proposed Groundwater Management Strategy will be evaluated and should consider both the effectiveness and feasibility of each strategy or combination of strategies. Contractors will assist the RBCs in the completion of a cost-benefit analysis for each Groundwater Management Strategy. Each RBC will make recommendations on strategies for implementation with particular consideration given to the cost-benefit analysis. Preference should be given to those strategies determined to be both effective and feasible for eliminating or reducing Groundwater Shortages.

4.5.3 Potential Water Management Strategies

Both demand-side and supply-side water management strategies may be considered in the planning process. Demand-side strategies are intended to reduce water demands, whereas supply-side strategies are intended to increase the amount of water available for use. The strategies listed below can be applied as either a Surface Water Management Strategy or a Groundwater Management Strategy. Potential strategies are described below:

Water Conservation

Water conservation is a demand-side strategy and can be defined as any beneficial reduction in water loss, waste, or use. The benefits of implementing water conservation practices are many and should be carefully considered by the RBCs. With increasing demands being placed on the state's water supplies, conservation of water in all sectors will inevitably play an increasingly larger role in water-resources management decisions in South Carolina.

- *Public-Supply Water Conservation* – Public water-supply utilities can utilize several techniques, either independently or collectively, to reduce the quantity of water needed to satisfy customers or to reduce the demand itself. Among these methods are water loss control programs, meter management, and price structuring.

  A water loss control program helps to identify physical losses of water from the water system and apparent losses. Examples of physical losses include leakage from transmission and distribution mains, leakage and overflows from the water system's storage tanks, and leakage from service connections up to and including the meter. Physical losses represent costs to a water system through the additional energy and chemical usage required to treat the lost water without the corresponding revenue. Apparent losses represent a loss of revenue because the water is consumed but not accounted for and thus not billed. Once a water system identifies these physical and apparent losses through a water loss control program, it can implement controls to reduce them. This can reduce the need for costly upgrades and expansions due to population growth and increased demand. Information on water loss programs can be found on the EPA website[41], and additional

41 EPA Water Audits and Water Loss Control for Public Water Systems – https://www.epa.gov/sites/production/files/2015-04/documents/epa816f13002.pdf

guidance can be found in the *American Water Works Association Manual 36, Water Audits and Loss Control Programs*[42]. The CWWMG also has initiated a multi-year study to quantify water loss and associated costs for water systems in the management group.

Accurate metering is essential to monitoring water use and establishing equitable rates and charges. In addition, water use tends to be lower in metered service areas than in unmetered service areas. Meters also allow users to monitor their own use and may encourage conservation efforts.

Conservation price structuring of water rates can be a means to reduce water demand. Rate structures commonly used for conservation water pricing are described below:

Uniform Rate. A constant price per unit of water charged, regardless of quantity used. This pricing method encourages conservation only slightly.

Increasing Block Rate. The price per unit of water increases as the quantity of use increases. As larger quantities are used, the consumer pays a higher rate for the larger portions used. This pricing method is effective in encouraging water conservation.

Peak Period Rate. The price per unit of water depends on the time of day, with higher rates charged during peak demand periods. This pricing method encourages conservation.

Seasonal Rates. The price per unit of water increases or decreases based on water demand and climatic conditions, with higher prices usually occurring in the summer months. This pricing method encourages conservation.

- *Residential Water Conservation* – Water conservation on the domestic level can be accomplished through the installation of new appliances and fixtures that have high water-use efficiencies. Efficiency is the ratio between the amount of water required for a purpose and the amount of water used. More information on water efficiency products and methods can be found on the EPA WaterSense website[43]. Many water utilities also provide websites and other resources that promote and describe various water conservation practices.

  Educating the public is a key component of successful water conservation programs. Significant water use reductions can be achieved when people understand the reasons to conserve. Water users should be kept informed of current and potential water shortages and be provided with the information needed to mitigate these problems.

- *Agricultural Water Conservation* – Droughts and the growing of crops with higher water demands (such as corn) have made irrigation a more common practice in South Carolina. For all practical purposes, agricultural irrigation is a totally consumptive water use, with little water returning directly to its source. Specific conservation practices depend on the crop, soil type, and lay of the land. Drip or trickle irrigation is the most water-conserving irrigation method, but because this method is equipment intensive and it is a permanent system, it is most commonly used for perennial crops, such as peach, apple, or pecan orchards and for specialty crops.

  Sprinkler irrigation systems, including moveable and solid-set pipe systems, center pivots, and traveling guns, are much less labor intensive than other forms of irrigation.

42 American Water Works Association, 2016, AWWA Manual 36 – Water Audits and Loss Control Programs, Fourth Edition, Denver, CO: AWWA. (https://www.awwa.org/Store/Product-Details/productId/51439782)

43 EPA WaterSense - http://www.epa.gov/watersense/

This irrigation method applies water in a manner much like natural rainfall. A large portion of the water, however, can be lost to evaporation; on hot, windy days, nearly one-half of the water sprayed by sprinkler irrigation systems evaporates before the water reaches the crop. Center pivot irrigation systems are used on most sprinkler-irrigated land in the United States. Most systems now have drop pipes that are positioned a few feet above the crop thereby reducing evaporative losses and losses from wind drift.

No-till planting and the application of mulch keep plant residues on the soil surface, helping to reduce evaporative loss. The use of narrow row spacing, selection of plants requiring less water, application of growing practices utilizing available rainfall, and careful selection of planting dates all assist in reducing water use.

- *Industrial Water Conservation* – Some water-conserving measures employed by industries include the reuse and recycling of wastewater; more efficient use of water in industrial processes; the development and use of no-water and low-water industrial process technology; repair and replacement of leaking pipes and equipment; installation of automatic water cutoff valves where practical; and installation of water-saving devices for employee sanitation.
- *Thermoelectric Energy Water Conservation* – The greatest use of water in the state, based on gross withdrawal amounts, is for cooling purposes at thermoelectric power plants, some of which use several hundred million gallons per day to dissipate waste heat, but such plants return most of the used water to its source. Significant reductions in thermoelectric energy water use are possible using alternative cooling methods, such as air-cooling devices or dry cooling towers, but these systems have not been demonstrated to work well in the hot and humid Southeast. Further, thermoelectric generation is trending toward more use of natural gas in combined-cycle plants, which consume less water per unit of energy produced than coal-fired or nuclear plants. Water conservation can reduce overall production costs by decreasing total water intake, pumping costs, and water treatment costs. Reducing electricity usage would also decrease thermoelectric water consumption.

Construction of New Reservoirs

Another method for increasing water availability is to capture excess water during wet periods and store it in reservoirs for use during dry periods. Water stored in reservoirs in South Carolina and its neighboring states played a major role in alleviating the drought of 1998–2002; very low natural flows in the streams were supplemented by releases of water stored in reservoirs.

- *Instream Reservoirs* – An instream reservoir is built by damming a stream to store water. The reservoir changes the natural flow of a stream, reduces flooding, provides water for generation of hydroelectric power and/or other uses, and can augment the streamflow below the dam during low-flow periods. When instream reservoirs are constructed, stream and wetland ecosystems are altered in the reservoir area, upstream from the reservoir, and downstream from the dam. Because instream reservoirs tend to reduce downstream flooding, flood¬plain wetlands adjacent to streams receive less water and often undergo significant ecosystem changes. The migration of fish and other aquatic organisms across dams decreases or ceases, altering ecosystems both above and below the dam. Instream reservoirs also serve as traps for sediment and nutrients, and while nutrient concentrations may be greater in the reservoir than downstream, dissolved-oxygen levels

are often much lower in deeper reservoirs that thermally stratify than in flowing streams. Fish populations in reservoirs and free-flowing streams are different. Also, recreational opportunities for reservoirs and those for free-flowing streams are different, and use of the reservoir is dependent upon ownership and provisions for public access to the reservoir.

- *Off-stream Reservoirs* – An off-stream reservoir is an artificial lake positioned adjacent to a stream rather than in the stream channel and is made without damming the stream or entirely altering the watercourse. An off-stream reservoir can still modify the natural flow of a stream. Water diversion and storage can reduce downstream flows, lessen flooding when streamflow is high, and augment naturally low streamflows during extended dry periods. An off-stream reservoir has considerably less impact on riverine ecosystems than does an instream reservoir, and because the stream remains unimpeded, navigational and recreational uses of the stream are generally not significantly changed. Some terrestrial habitat will be replaced by aquatic habitat, increasing the diversity of aquatic organisms. Because larger natural drainage basins will include flowing streams, off-stream reservoirs are typically smaller and less cost-effective to construct per unit volume of water stored than instream reservoirs.

Reservoir Expansion

The usable storage capacity of a reservoir can be increased by physically raising the height of the dam or the dam's outflow control structure. Usable storage capacity can also be increased by eliminating or reducing factors which limit the lake's drawdown capability (e.g., lowering the shallowest water intake on the lake). The consideration of this strategy may be limited by existing development along the reservoir which may be greatly impacted by an increase in reservoir levels. Storage capacity can also be increased by removing accumulated sediments from existing reservoirs.

Regional Water Utility Interconnections

Interconnections between two or more water utilities can be an effective water demand strategy during times of drought by allowing water to be redistributed across a region to areas where water is needed. Interconnections also provide a level of redundancy for a water system to ensure water supply access during times of emergency. Regional interconnections, however, can be expensive to build. The distance between utilities, along with topographic, physical, and operational barriers, can be significant challenges for developing regional interconnections.

Interbasin Transfer of Water

An interbasin transfer of water involves moving water from one river basin (the origin basin) into another basin (the receiving basin), where it is used and discharged. The significant feature of an interbasin transfer is the water is completely removed from the basin of origin, preventing its use by anyone downstream of the withdrawal point. Such a water transfer results in a net loss of water from the basin of origin and a net gain of water to the receiving basin.

In South Carolina, a permit is required for an interbasin transfer. SCDHEC is responsible for issuing permits through the *South Carolina Surface Water Withdrawal, Permitting, Use, and Reporting Act* (Regulation 61-19). For the purposes of this regulation, an interbasin transfer is considered the transfer of three million gallons or more of water in any one month from one basin to a different basin such that the water is permanently lost from the basin of origin. The transfer of water from one basin to another is not considered an interbasin transfer if the transferred water

is returned or discharged to the basin of origin such that the quantity of water permanently lost to the basin of origin is less than three million gallons in any one month.

Permits are conditioned upon the availability of water in both the origin and receiving basins and whether the transfer will have any detrimental impacts to instream uses. Permits are also conditioned upon whether the use of water in the receiving basin is reasonable and beneficial and whether alternative sources of water within the receiving basin are available. Basin boundaries delineated in the regulation coincide with the planning boundaries described in this report.

Construction of New Groundwater Wells

The construction of new water wells in viable aquifers to supplement existing water supplies is a potential water management strategy in the Coastal Plain region. To help prevent localized groundwater drawdowns from occurring, proper well spacing should be determined prior to drilling by using groundwater flow models or from an analysis of pumping tests. In addition, wells can be constructed in several aquifers to reduce drawdowns.

Desalination

Desalination is the process in which dissolved minerals—primarily salt—are removed from seawater or brackish water, making the water suitable for use in public supply systems. Desalination plants are becoming increasingly common, primarily in high-growth coastal areas of Florida and California. In 1991, Mount Pleasant Waterworks became the first municipal water system in South Carolina to provide drinking water treated with reverse-osmosis technology. The most common objection to using desalination to help meet municipal water needs is the high expense of the process; however, developments in technology and improvements in desalinating processes have reduced the costs over the past 30 years.

Conjunctive Water Use

Conjunctive water use is the combined use of surface and groundwater sources to optimize water availability, increase the reliability of the water supply, or to offset the negative impacts of using a single source. RBCs may consider the implementation of conjunctive strategies for the following conditions:

- If withdrawals from a single source are limited or are unreliable.
- If large withdrawals from aquifers are substantially altering flow patterns or are causing land subsidence or irreversible damage to the aquifers.
- If withdrawals from aquifers are negatively impacting domestic groundwater users.
- If withdrawals from streams are destructive to aquatic ecosystems.
- If water quality from a single source is inconsistent or undesirable.

Aquifer Storage and Recovery

Underground water storage involves the injection or infiltration of water into an aquifer for future use. This practice makes use of an underground reservoir (aquifer) to store water in much the same way that surface water reservoirs are used. This technique has advantages over storage in surface water reservoirs because water stored underground is not subject to evaporation and is less easily contaminated. Artificial aquifer recharge holds significant potential in the Coastal Plain for the storage of surplus, good-quality water for future use.

Aquifer Storage and Recovery (ASR) projects take advantage of a water supplier's unused treatment capacity during times of low water demand (usually in the winter) to treat surface or

groundwater and then pump it into an aquifer for storage until later recovery during times of peak demand or low flow (typically a few days during the summer). ASR helps water suppliers meet peak demands by providing pretreated water to augment water supplies without the need for increased treatment capacity. ASR programs are already in use throughout the United States. In South Carolina, ASR programs are operating in Charleston, Beaufort, Horry, Jasper, and Orangeburg counties.

Managed Aquifer Recharge

Managed Aquifer Recharge (MAR) involves the injection or the augmentation of natural infiltration of water into the ground to replenish water in an aquifer. The strategy also can be used to prevent the movement of saltwater into freshwater aquifers or to control land subsidence. The difference between ASR and MAR is that MAR wells are used to mitigate groundwater problems associated with over pumping, whereas ASR wells are used to store water in the ground and recover the stored water for drinking water supplies, irrigation, industrial needs, or ecosystem restoration projects.

The use of saltwater intrusion barrier wells is an example of a MAR practice. This involves the use of wells to inject water into an aquifer to create a barrier to saltwater intrusion. The water injection must be in accordance with SCDHEC regulations as stipulated in Regulation 61-87, Underground Injection Control Regulations[44].

Gray Water

Gray water is water that can be used twice; it includes the discharge from kitchen sinks and dishwashers (not garbage disposals); bathtubs, showers and lavatories (not toilets); and household laundry (not diaper water). Using gray water can provide a water source for residential landscape irrigation. Currently, South Carolina's health codes do not allow the use of gray water because of possible health risks.

Reclaimed Wastewater

Treated wastewater can be recycled for irrigation, industry, and fire-control purposes. The use of reclaimed water is less expensive, optimizes the resource, provides nutrients to crops, reduces surface water pollution, and conserves freshwater. Because effluent can contain pathogens and harmful chemicals, it must be carefully applied and monitored to prevent direct human contact and contamination of groundwater resources. Only effluent that has passed through a secondary treatment phase and that has been approved by public health officials should be recycled. A separate delivery system must be constructed to prevent contamination to the public water system. If effluent is used for irrigation, monitor wells should be constructed to evaluate the long-term effects on groundwater quality. Effluent irrigation should not be used on row crops or crops that are eaten raw, such as fruits and nuts, but it can be used on grasslands such as turf farms, pastures, golf courses, parks, athletic fields, and cemeteries.

Indirect and Direct Potable Reuse

Indirect potable reuse returns highly treated reclaimed water to an environmental buffer such as an aquifer, lake, or river before the water is again treated for reuse. For example, facilities in several Georgia counties discharge treated wastewater upstream of water supply intakes operated by other jurisdictions. The F. Wayne Hill Wastewater Treatment facility in Georgia treats

44 South Carolina Underground Injection Control Regulations 61-87 - https://www.scdhec.gov/sites/default/files/media/document/R.61-87.pdf

wastewater to extremely stringent levels and returns up to 40 MGD of flow to Lake Lanier, a primary source of drinking water for Atlanta. Direct potable reuse refers to those systems where treatment is followed by storage and use, without the environmental buffer.

Reallocation of Storage Space in USACE-Owned Reservoirs

Water stored in USACE-owned reservoirs is allocated for authorized purposes such as: flood control, hydropower, irrigation, municipal and industrial water supply, recreation, low flow augmentation, water quality, and fish and wildlife conservation. As the construction of major federal reservoir projects came to an end in the 1980s, the focus of the USACE water supply program shifted to reallocation of storage space to serve water supply needs. State or local interests can request a reallocation of storage for water supply. If requested, the USACE must do a study to assess impacts of the reallocation related to public safety, and to identify benefits, costs, and implementation requirements.

5.0 River Basin Plan Table of Contents

5.1 Overview

A template for the River Basin Plan Table of Contents is presented below to describe the organization and general content expected of each River Basin Plan.

Section 5.2 outlines the recommended Table of Contents to be used. This outline represents the minimum requirements and general organizational structure of the River Basin Plan. RBCs may include additional data, information, and analyses (subject to any conditions stated in the Planning Framework) which they believe are beneficial, but RBCs should strive to conform to the defined plan organization. SCDNR will directly assist contractors in the development of content for Chapters 1–4 and provide additional guidance to the contractors and RBCs during the preparation of Chapters 5–10.

Section 5.3 provides more detailed information about the content of each chapter. This guidance information should help each RBC understand expectations for inclusion in each chapter of the River Basin Plan.

5.2 Outline

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3.4 Groundwater Assessment Tools
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- High Water-Demand Projection Scenario
- Other scenarios developed by RBC
- Reservoir Safe Yield analyses

5.4 Scenario Descriptions and Groundwater Simulation Results
- Current Groundwater Use Scenario
- Permitted Groundwater Use Scenario
- Business-as-Usual Water-Demand Projection Scenario
- High Water-Demand Projection Scenario
- Other scenarios developed by RBC

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- Feasibility of each proposed strategy or combination of strategies
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BIBLIOGRAPHY

APPENDICES

5.3 Guidance Documentation

EXECUTIVE SUMMARY

Significant aspects and conclusions of the River Basin Plan are summarized regarding water use; water availability analyses; water management strategy recommendations; planning process, policy, and legislative recommendations; drought response initiatives; and major water-related shortages or issues anticipated within the basin.

ACKNOWLEDGEMENTS

Those individuals and organizations who were instrumental in developing the plan will be acknowledged.

CHAPTER 1. Introduction

Relevant information on the background and purpose for river basin planning, an overview of the river basin planning process, an overview of the public participation process, and a description of how the final plan is organized will be described. SCDNR will contribute significantly to the preparation of the content of this chapter; RBCs, however, can include additional information as needed to address any basin-specific issues or topics.

1.1 Background – This section describes what is meant by a River Basin Plan and explains the purpose for developing the plan. It also states the RBC's long-term vision for water resources of the basin and cites specific goals for achieving this vision. This section will also include a brief history of planning efforts in the basin and summarize any existing local and regional water plans.

1.2 Planning Process – An overview of the planning process will be given and should include: 1) the process of appointing members to the RBC; 2) member names, affiliations, dates of appointment, and term lengths; 3) roles and responsibilities of the RBC; 4) roles and responsibilities of Technical Advisory Committees, subcommittees, and ad-hoc groups; 5) roles and responsibilities of state and federal agencies; and 6) the process used to select contractors and the roles and responsibilities that each contractor had in plan development.

1.3 Public Participation – An overview of public involvement and outreach that was accomplished during the process of developing the plan will be described. The description will include information on public meetings (number and attendance), as well as information on social media programs, educational outreach, and developed websites.

1.4 Organization of this Plan – A description of how the River Basin Plan is structured will be presented. The section will include a brief description of each major chapter and appendix.

CHAPTER 2. Description of the Basin

Descriptions of the basin in terms of its physical environment, its climate, its natural and agricultural resources, and its socioeconomic environment will be given. SCDNR will contribute significantly in the preparation of this content; however, the description of the basin required in the final plan is not limited to the outline provided here. RBCs may wish to describe additional features of the basin not included in the outline or to provide a more detailed description of certain elements that are relevant or unique to the water resources of the basin.

2.1 Physical Environment – Aspects of the basin's land cover, geography, and geology will be described. Land cover refers to how much of the basin's land surface is covered by trees, crops, wetlands, open water bodies, buildings or pavement. Geography includes the basin's overall dimensions (area, length, width, and range in elevation); general topography; physiographic provinces; counties and cities; major lakes and rivers; and any significant, unique, or otherwise noteworthy landforms. Geology includes the occurrence and general description of rocks and sediments comprising the basin and major geologic features found in the basin, such as the Fall Line, escarpments, and sinkholes.

2.2 Climate – The climate of the area will be described and will include temperature, evaporation and precipitation statistics in the basin. Historic droughts and their notable impacts will be described, and RBCs should designate a drought of record for the basin. A history of notable floods and impacts will be described as well.

2.3 Natural Resources – The soils, minerals, vegetation, and fish and wildlife resources of the basin will be described. Information on rare, threatened, and endangered species, unique properties such as heritage preserves and wildlife management areas, state and national forests, and major mining operations will be included.

2.4 Agricultural Resources – Descriptions of agricultural development and resources of the basin (including silviculture, aquaculture, and livestock) will be given and will include: the percentage of the basin currently classified as farmland; percentage of farmland under irrigation; irrigation type; and sources of irrigation water (groundwater versus surface water).

2.5 Socioeconomic Environment – Information on current population, demographics, land use, economic activity, and economic sectors heavily dependent on water resources will be described. Land use is a description of how land in the basin is being used, such as for farming, forestry, mining, urban development, and other functions.

CHAPTER 3. Water Resources of the Basin

The surface and groundwater resources of the basin will be described along with an overview of the computer models and other analytical tools and methods used to evaluate surface and groundwater availability. SCDNR shall assist contractors in the preparation of this content; however, information required for inclusion in the final plan is not limited to the outline provided above. RBCs may wish to describe additional water-related attributes of the basin not specified here or to provide additional details about certain aspects of the water resources important in the basin.

3.1 Surface Water Resources – An overview of the surface water resources in the basin will be presented and will include descriptions of the basin's major rivers and lakes. Descriptions also will include information on surface water monitoring programs, relevant streamflow and lake level statistics and hydrographs, and historic low-flow conditions in the basin. This section will describe how the basin is affected by, or contributes to, other basins (e.g., the Saluda, Broad, and Catawba basins feed into the Santee basin) or other states (e.g., the Broad and Pee Dee basins are shared with North Carolina, and the Savannah basin is shared with Georgia and North Carolina).

Major surface water development projects in the basin, such as major dams and reservoirs, run-of-river projects, diversions, canals, and flood-control projects will be documented. The section also will describe surface water projects, programs, and issues of concern in the basin and may include interbasin transfers of water, river conservation programs, coastal concerns, FERC-licensed hydro-electric projects, USACE projects, binding legal agreements or memorandums of understanding, reservoir sedimentation, significant water quality impairments, or any other related programs or concerns expressed by stakeholders and deemed appropriate for inclusion by the RBC.

3.2 Surface Water Assessment Tools – Descriptions of the SWAM model developed to assess current and future surface water availability and to evaluate the effectiveness of proposed water management strategies will be given. A brief description of the model's framework, capabilities, and limitations will be included. This section also will describe other models and analytical tools that may have been used to assess surface water availability.

3.3 Groundwater Resources – An overview of the groundwater resources of the basin will be presented and will include descriptions of the basin's major aquifers and confining units. Descriptions also will include information on groundwater monitoring programs, groundwater levels, aquifer properties, and well yields.

This section will document major groundwater development projects in the basin, such as major well fields and aquifer storage-and-recovery projects. Capacity Use Areas will be documented. Groundwater issues of concern including cones of depression, water quality problems, saltwater intrusion, sinkhole development, or any other concerns expressed by stakeholders and deemed appropriate for inclusion by the RBC also will be documented.

3.4 Groundwater Assessment Tools – The Coastal Plain Groundwater model used to assess groundwater availability, test the effectiveness of water management strategies, and evaluate the impacts of future withdrawals on groundwater levels in the basin will be described. A summary of the model's framework, capabilities, and limitations also will be provided. Descriptions of other models and analytical tools that may have been used to assess groundwater availability also will be given.

CHAPTER 4. Current and Projected Water Demand

Current and projected water demand in the basin will be summarized. The summary will include permitted and registered (agricultural use) withdrawal amounts. Information in this chapter shall be prepared by SCDNR and SCDHEC and provided to the RBCs and their contractors. Detailed information regarding the current and projected water demand rate for individual water users in the basin will be included in the River Basin Plan as appendices.

4.1 Current Water Demand – Current water demand by source (surface water and groundwater) and by sector will be summarized. The major sectors are:

- Public water supply
- Thermoelectric power
- Industry
- Agricultural irrigation
- Other uses (golf course irrigation, domestic self-supply, etc.)

A table listing all current water users in the basin who report use to SCDHEC, by sector and by source (surface water and groundwater), will be included in an appendix. This table also will include data on each user's water withdrawals and returns. Data for dischargers who may not have a water withdrawal permit also will be included in the appendix.

4.2 Permitted and Registered Water Use – A summary of the amount of water that has been permitted or registered under the Surface Water Withdrawal, Permitting, Use, and Reporting Act (for surface water) and Capacity Use regulations (for groundwater) will be given. A table showing permitted or registered monthly withdrawals and annual withdrawals for all permitted and registered users will be included in an appendix. A basin map will be provided showing the locations of all permitted and registered users.

4.3 Projection Methodology – An overview of the methodologies used to develop the two sets of water-demand projections described in Section 4.1.4 of the Planning Framework will be given.

4.4 Projected Water Demand – The projected water demands for both projection scenarios described in Section 4.1.4 of the Planning Framework will be summarized. Projections will be summarized by sector and by source (surface water and groundwater). Detailed information on individual users will be provided in an appendix. A 50-year population projection by county and by service area (where available) also will be presented in this section.

Chapter 5. Comparison of Water Resource Availability and Water Demand

This chapter, using Section 4 of the Planning Framework as a formal guide, will document the methods used to assess surface water and groundwater supply; will describe any Performance Measures used to evaluate scenarios; will describe scenarios used as a basis for planning; and will present the results of model simulations for each scenario, including the identification of any Surface or Groundwater Shortages, Reaches of Interest and Groundwater Areas of Concern.

5.1 Methodology – An overview of the methodologies, as outlined in Section 4 of the Planning Framework, for assessing Surface Water and Groundwater Supply, identifying shortages, and designating any Reaches of Interest or Groundwater Areas of Concern will be described. Definitions of key terms will be provided.

5.2 Performance Measures – Any Performance Measures and associated MISCs developed and applied by the RBC for the evaluation of simulated scenarios will be described along with the locations of any Strategic Nodes used in the analysis.

5.3 Scenario Descriptions and Surface Water Simulation Results – The scenarios used to evaluate Surface Water Supply and any anticipated Surface Water Shortages for the Current Surface Water Use, Permitted and Registered Surface Water Use, and water-demand projection scenarios will be described. Simulation results for each scenario will be presented. At a minimum, this section will include the descriptions and simulation results for the four scenarios described in Section 4.3.1 of the Planning Framework. For each scenario, the following information will be provided:

- Detailed description
- Justification and description of any applied Surface Water Conditions on a stream that impact Surface Water Supply
- Locations and magnitudes of Surface Water Shortages
- Designation of any Reaches of Interest and associated justification

For any additional water-demand scenarios not explicitly described in Section 4.3.1 of the Planning Framework, the justification or motivation for why the scenario was evaluated by the RBC will be provided.

Any Reservoir Safe Yield determinations will be documented and will include information on the Surface Water Conditions applied on the reservoir or system of reservoirs and any other assumptions made in the determination. Section 4 of the Planning Framework will be used as a guide for Reservoir Safe Yield determinations.

5.4 Scenario Descriptions and Groundwater Simulation Results – The scenarios used to identify Groundwater Shortages and designate Groundwater Areas of Concern for the Current Groundwater Use, Permitted Groundwater Use, and water-demand projection scenarios will be described. Simulation results for each scenario should be presented. At a minimum, this section should include the descriptions and simulation results for the five scenarios described in Section 4.4.1 of the Planning Framework. For each scenario, the following information will be provided:

- Detailed description
- Justification and description of any applied Groundwater Conditions on an aquifer that impacts groundwater supply
- Locations and magnitudes of Ground Water Shortages
- Designation of any Groundwater Areas of Concern and associated justification

For any additional water-demand scenarios not explicitly described in Section 4.4.1 of the Planning Framework, the justification or motivation for why the scenario was evaluated by the RBC will be provided.

5.5 Summary of Water Availability Assessments – The key conclusions resulting from the assessments of water supply for both the surface and groundwater resources will be summarized. RBCs may prioritize the importance of Surface Water Shortages, Groundwater Shortages or Groundwater Areas of Concern if multiple shortages or areas of concern are identified. Similarly, RBCs may prioritize any designated Reaches of Interest if multiple reaches are identified. The summary also will provide sufficient detail to serve as the justification for the water management strategies proposed and evaluated in Chapter 6 of the River Basin Plan.

Chapter 6. Water Management Strategies

Chapter 6 describes proposed strategies developed by each RBC to address shortages or increase water supply and documents the effectiveness and feasibility of each water management strategy or combination of strategies.

6.1 Surface Water Management Strategies – Each Surface Water Management Strategy proposed by the RBC to eliminate or reduce a Surface Water Shortage or increase Surface Water Supply will be described and evaluated. The section will be divided into four parts:

- A detailed description of each strategy, including a detailed description of how the strategy was incorporated into the surface or groundwater model will be given.
- Results from a technical evaluation, using the surface water model(s) to the extent possible, are presented and will include detailed documentation of the effectiveness of each strategy as outlined in Section 4.5.1 of the Planning Framework. Any Performance Measures used to evaluate the effectiveness of Surface Water Management Strategies will be summarized. Any shortages remaining after each Surface Water Management Strategy or combination of strategies is applied will be documented. Any impacts of the strategy on Reaches of Interest will be included as determined from established Performance Measures. The effectiveness of each proposed strategy will be documented in sufficient detail to provide justification for the final selection of recommended strategies.

- A description of the feasibility of each strategy as outlined in Section 4.5.1 of the Planning Framework will be given. Planning Level Costs (economic viability), environmental and socioeconomic impacts, legal constraints, and impacts on other River Basin Plans and other states will be included. Performance Measures may be applied to evaluate the feasibility of each strategy. Sufficient detail on the feasibility of each proposed strategy will be documented to provide justification for the final selection of recommended strategies.
- A cost-benefit analysis of each strategy to determine those strategies that provide a net benefit will be given. The cost-benefit analysis will consider both the effectiveness and feasibility of each strategy. The cost-benefit analysis also may be used to prioritize strategies.

6.2 Groundwater Management Strategies – Each Groundwater Management Strategy proposed by the RBC to address a Groundwater Shortage or Groundwater Area of Concern will be described. The section should be divided into three parts:

- A detailed description of each strategy, including a detailed description of how the strategy was incorporated into the surface or groundwater model.
- Results from a technical evaluation, using the groundwater model(s) and/or surface water model(s) to the extent possible, are presented and will include detailed documentation of the effectiveness of each strategy as outlined in Section 4.5.2 of the Planning Framework. Any Performance Measures used to evaluate the effectiveness of Groundwater Management Strategies will be summarized by quantifying reductions in groundwater level declines. The effectiveness of each proposed strategy will be documented in sufficient detail to provide justification for the final selection of recommended strategies.
- A description of the feasibility of each strategy. Planning Level Costs (economic viability), environmental and socioeconomic impacts, legal constraints, and impacts on other River Basin Plans and other states will be considered. Performance Measures may be applied to evaluate the feasibility of each strategy. Sufficient detail on the feasibility of each proposed strategy will be documented to provide justification for the final selection of recommended strategies.
- A cost-benefit analysis of each strategy to determine those strategies that provide a net benefit. The cost-benefit analysis will consider both the effectiveness and feasibility of each strategy. The cost-benefit analysis also may be used to prioritize strategies.

Chapter 7. Water Management Strategy Recommendations

Final recommendations for the implementation of Surface and Groundwater Management Strategies evaluated in Chapter 6 of the River Basin Plan will be presented. These recommended strategies will serve, in part, as the basis for the Implementation Plan described in Chapter 10 of the River Basin Plan.

7.1 Selection, Prioritization, and Justification for each Recommended Water Management Strategy
Recommended Surface and Groundwater Management Strategies will be documented and prioritized. Justification for each recommended strategy also will be included and will consider the cost-benefit analysis of each strategy as described in Chapter 6 of the River Basin Plan.

7.2 Remaining Shortages – Any Surface Water Shortages and Groundwater Shortages expected to remain after all recommendations are implemented will be described and quantified to the extent possible.

7.3 Remaining Issues Regarding Designated Reaches of Interest or Groundwater Areas of Concern
Issues with designated Reaches of Interest or Groundwater Areas of Concern expected to persist after all recommended strategies are implemented will be described.

Chapter 8. Drought Response

A summary of existing drought management plans and existing drought management advisory groups will be presented. Drought response initiatives and recommendations will be described and will include a public outreach plan to communicate state drought conditions and drought declarations.

8.1 Existing Drought Management Plans and Drought Management Advisory Groups – Any drought management plans or ordinances, local or otherwise, that currently exist in the basin will be summarized. Drought Plans will include any drought response plans or ordinances required by the Drought Response Act. Any established drought management advisory groups will be described in this section.

8.2 RBC Drought Response – Drought response initiatives developed by the RBC will be documented. The roles and responsibilities of the RBC regarding drought response are outlined in Section 3.9 which should be used as a guide. Any recommendations on drought management or drought management strategies developed by the RBC also will be documented in this section. Each RBC will document a communication plan to inform both stakeholders and the public on current drought conditions and any activities regarding drought response.

Chapter 9. Policy, Legislative, Regulatory, Technical, and Planning Process Recommendations

The RBCs will make specific recommendations for improving the water planning process on both a basin-wide and state level. These recommendations could include: 1) suggestions for improving the river basin planning process; 2) considerations for additional technical information or tools; and 3) potential changes to state policy or to the existing regulatory or legislative environment that would benefit the water planning process. The three types of water planning process recommendations are described below.

9.1 River Basin Planning Process Recommendations – RBCs may identify deficiencies in the planning process during the development of the River Basin Plan. If deficiencies are identified, recommendations on how the river basin planning process could be improved will be described. Such recommendations will be considered by SCDNR and the PPAC to improve future iterations of state and river basin planning. General examples of the types of recommendations that might be made include:

- Changes to the RBC membership, bylaws, meeting schedules, or procedures
- Ideas to improve communication among RBCs and other groups
- Funding needs and sources of funding
- Improvements to the public outreach process
- Formalizing the River Basin Plan implementation process

9.2 Technical and Program Recommendations – Recommendations that address any data gaps or information needs identified by an RBC during the river basin planning process will be presented. RBCs will document the relevance and justification for each recommendation. General examples of this type of recommendation may include:

- Model improvement (accuracy or functionality)
- Need for more data (such as stream gages or monitoring wells)
- Need for additional models to address specific issues
- Improved water use data, population data or estimates, water demand estimates, land use data, etc.
- Recommendations for technical studies to improve knowledge of specific issues
- Need for additional technical training for the RBC members
- Better definition of “unacceptable” impacts to groundwater and surface water resources
- Improved instream flow requirement information

9.3 Policy, Legislative, or Regulatory Recommendations – Any recommendations for new or revised policies or legislation regarding the state’s water resources will be documented. These recommendations will be evaluated by SCDNR, SCDHEC, and the PPAC for the purposes of potential inclusion in the State Water Plan. Examples of this type of recommendation could include:

- Modifications to existing state or local laws, regulations, or ordinances
- New state or local laws, regulations, or ordinances
- Ideas for recurring funding for water planning work
- Restructuring existing groups or agencies

Chapter 10. River Basin Plan Implementation

An Implementation Plan will be developed by each RBC to provide a process and schedule for implementing recommendations made in the River Basin Plan. Progress on achieving implementation objectives documented in previous iterations of the River Basin Plan also will be described.

10.1 Recommended Five-Year Implementation Plan – A plan describing specific objectives and associated action items to be implemented by the RBC during the first five years after completion of the River Basin Plan will be presented (see Section 7 of the Planning Framework). Objectives will incorporate water management strategies and other recommendations documented in Chapters 7–9 of the River Basin Plan. The Implementation Plan will include the following items:

- Prioritized list of objectives and justification for each
- Five-year schedule that includes 1) a list of action items needed to reach objectives, and 2) goals or milestones for the completion of proposed action items
- Detailed budget
- Funding sources

10.2 Long-term Planning Objectives – Long-term planning objectives will be documented. These are objectives deemed important to the RBC for long-range planning, but which are not feasible or are of a less urgent nature than those objectives listed in the Implementation Plan.

10.3 Progress on River Basin Plan Implementation – A summary of the progress made on achieving planning objectives outlined in previously published River Basin Plans and associated Implementation Plans will be documented. The summary should highlight the progress made to eliminate or mitigate anticipated water shortages and to address designated Reaches of Interest or Groundwater Areas of Concern.

6.0 River Basin Planning Process Implementation

6.1 Overview

This section describes the implementation of the river basin planning process. Since the State has not previously undertaken comprehensive state and river basin planning initiatives to the scale outlined in the Planning Framework, the PPAC and SCDNR will need to follow an adaptive management approach regarding implementation of the Planning Framework in developing River Basin Plans. During the initiation and development of river basin planning activities as described in the Planning Framework, the PPAC and SCDNR will continuously assess the performance of the Planning Framework in providing guidance to RBCs in developing River Basin Plans. Significant insight should be gained on the internal workings of the RBC and on the efficiency of the planning process. SCDNR and the PPAC should identify specific weaknesses of the Planning Framework and determine any planning considerations or guidelines which may need to be added or revised. The PPAC, with assistance from SCDNR, should revise the Planning Framework as appropriate during the planning process.

Prior to the first RBC meeting, the PPAC and SCDNR will complete several preliminary tasks necessary for the implementation of the river basin planning process. The preliminary tasks include holding at least one public meeting to introduce the planning process and solicit RBC membership applications, the appointment of RBC members, and the preparation of Requests for Proposals (RFPs) for contractors and the hiring of contractors. It is anticipated these preliminary responsibilities will require a six-month period.

The two-year RBC planning schedule formally begins with the first RBC orientation meeting, and RBCs are generally expected to meet monthly over the 24-month period. RBC planning activities are divided into four phases:

1. Phase 1 (Months 1–6) includes an introduction to the planning process and deals primarily with the administrative aspects of forming the RBC and providing the background information necessary to develop a River Basin Plan. Specific meetings include an RBC orientation and a kick-off meeting with contractors. Additional meetings will cover background information including a review of water demand projections and recommended revisions; an overview of the basin's water resources and relevant legislation; current permit and registration process; current and permitted/registered water withdrawals; and an overview of the modeling tools used by contractors and the RBCs to evaluate water availability. This phase will also include several RBC field trips designed to educate the RBC on the basin's water users and water resources.
2. Phase 2 (Months 7–12) focuses on the technical analyses used to identify current and future surface and groundwater availability issues. Specifically, any current or existing Surface Water or Groundwater Shortages are identified and quantified; Surface Water and Groundwater Supply are determined; and any Reaches of Interest or Groundwater Areas of Concern are identified.

3. Phase 3 (Months 13–18) focuses on the development and evaluation of proposed water management strategies to address any water availability issues identified in Phase 2. Recommended strategies are prioritized in this stage.
4. Phase 4 (Months 19–24) focuses on the development of legislative, policy, technical, and planning process recommendations and the writing of the River Basin Plan. The Implementation Plan and drought response initiatives are developed. This phase also includes the two public meetings referenced in Section 3.7 regarding public review of draft River Basin Plans.

RBCs, with assistance from contractors, will submit progress reports to SCDNR after each phase of plan development. Progress reports should include:

- Summary of progress including key milestones reached.
- Existing issues regarding funding or schedule, if any.
- Anticipated issues regarding funding or schedule, if any.

A detailed schedule outlining the development of a River Basin Plan is provided below. The PPAC and SCDNR recognize the potential for unforeseen circumstances or challenges during the planning process which may delay the development of a final River Basin Plan. The schedule is intended as a general outline; and though RBCs should strive to complete River Basin Plans within the two-year schedule, RBCs, consistent with the adaptive management approach described above, will be allowed some flexibility regarding the length of time needed to complete a River Basin Plan or various phases. If an RBC determines a time extension is necessary to complete the River Basin Plan, the RBC must notify the SCDNR in writing once such a determination is made. The notification should include justification for the extension along with any anticipated need for additional funding. SCDNR will respond promptly when a time extension is requested and will consider the RBC's justification in its decision. However, to achieve the right balance between adaptive management of the plan development process and timely completion of all eight River Basin Plans in the state, SCDNR:

1. Will only approve extensions of six months or less in duration per request;
2. Reserves the right to move ahead and complete the River Basin Plan without further assistance from the RBC if after at least one approved time extension, SCDNR determines in its sole discretion that the RBC is unlikely to complete the River Basin Plan within a three-year total time period as measured from the first RBC meeting.

6.2 Schedule for River Basin Plan Development

A schedule for completing SCDNR and PPAC responsibilities prior to the first RBC meeting is presented in Section 6.2.1. A detailed schedule of the RBC planning process is presented in Section 6.2.2.

6.2.1 Schedule for PPAC and SCDNR Tasks

1. Months 1–2
    a. SCDNR prepares draft RFP(s) to hire contractors as described in Section 3.5 of the Planning Framework
    b. SCDNR prepares and submits final RFPs to SCDNR procurement office
2. Months 3–4
    a. SCDNR holds Public Meeting(s) – SCDNR introduces river basin planning process, communicates public engagement opportunities and solicits RBC membership applications and recommendations
    b. SCDNR advertises RBC membership solicitation on website
    c. SCDNR releases RFPs for bids
3. Months 5–6
    a. PPAC meeting #1 (and #2 if needed) – SCDNR and PPAC review and discuss RBC membership applications and recommendations made by various interest groups, organizations and the PPAC
    b. SCDNR selects and notifies appointed RBC members
    c. SCDNR reviews proposals and selects contractors

Milestones:

- Public kick-off meeting held
- Formation of RBC
- Contracts signed between SCDNR and contractor(s)

6.2.2 Schedule for RBC River Basin Plan Development

Phase 1 (Months 1–6) – Orientation, Administrative Tasks, and Background Information

- RBC Meeting #1 – Orientation
    a. Purpose of river basin planning
    b. Roles of RBC members
    c. Roles of state agencies
    d. Roles of contractors
    e. Review of Framework Document
    f. Discussion of issues facing basin (based on input from public meeting)
    g. Logistical considerations (reoccurring meeting schedule and location)
- RBC Meeting #2 – Kick-off meeting with contractors
    a. Roles of contractors
    b. Develop/review scope of work and timeline
    c. Review of RBC Bylaws
    d. Selection of RBC Chair and Vice-chair
    e. RBC member water planning perspectives and expectations
- RBC Meeting #3 – Basin Hydrology and Water Legislation
    a. Description of basin
    b. Surface water resources
    c. Groundwater resources
    d. Overview of South Carolina water legislation/permitting processes
    e. Plan RBC field trips
- RBC Meeting #4 – Current, Permitted and Registered, and future water demands
    a. Current water use
    b. Permitted and registered water use
    c. Population projections
    d. Water-demand projections
    e. Recommended revisions to water-demand projections
- RBC Meeting #5 – RBC Field Trip(s)
- RBC Meeting #6 – Surface and Groundwater Models
    a. Overview and demonstration of surface water models
    b. Overview and demonstration of groundwater models
    c. Supplementary models and data, if any
    d. SCDNR response to water-demand projection requests
    e. Performance Measure discussion and recommendations

Phase 1 Milestones:

- RBC members informed of planning process and schedule
- Selection of RBC Chair and Vice Chair
- Water-demand projections finalized
- RBCs informed on basin's water resources, regulatory environment, and decision-making tools

Phase 2 (Months 7–12) – Comparison of Water Resource Availability and Demand

- RBC Meeting #7 – Overview of Methods
    a. Overview of required water-demand scenarios
    b. Approach to assessing surface water availability
    c. Approach to assessing groundwater availability
    d. Define Surface Water and Groundwater Conditions, if any
    e. Finalize Performance Measures
    f. Formation of RBC-defined subcommittees if needed
- RBC Meeting #8–#12 – Model Simulations and Analyses
    a. Surface Water Modeling
        i. Summary of surface water model results
        ii. Performance Measure analysis
        iii. Surface Water Supply determinations
        iv. Identification of Surface Water Shortages
        v. Identification of Reaches of Interest
    b. Groundwater Modeling
        i. Summary of groundwater model results
        ii. Performance Measure analysis
        iii. Identification of Groundwater Shortages
        iv. Identification of Groundwater Areas of Concern

Phase 2 Milestones:

- Surface Water and Groundwater Shortages identified
- Reaches of Interest or Groundwater Areas of Concern designated

Phase 3 (Months 13–18) – Evaluation of Water Management Strategies

- RBC Meeting #13 – Overview of Methods
    a. Overview of Surface and Groundwater Management Strategies
    b. Develop additional Performance Measures as needed
    c. Effectiveness of water management strategies
    d. Feasibility of water management strategies
    e. Cost-benefit analysis of water management strategies
    f. Develop Surface and Groundwater Management Strategies
- RBC Meeting #14–#17 – Evaluation of Water Management Strategies
    a. Review surface and groundwater simulation results
    b. Evaluate effectiveness and feasibility of strategies
    c. Cost-benefit analysis of each strategy
    d. Develop and evaluate additional strategies as needed
- RBC Meeting #18 – Water Management Strategies Recommendations and Prioritization
    a. Complete evaluation of water management strategies
    b. Prioritize strategies
    c. Determine remaining Surface Water or Groundwater Shortages
    d. Finalize designations of Reaches of Interest or Groundwater Areas of Concern

Phase 3 Milestones:

- Prioritized list of recommended water management strategies complete
- Final Reach of Interest and Groundwater Areas of Concern designations made
- Technical review complete

Phase 4 (Months 19–24) – River Basin Plan Preparation

- RBC Meeting #19–#22 River Basin Plan Preparation
    a. Draft Implementation Plan
    b. Draft drought response initiatives
    c. Develop recommendations
        i. River basin planning process revisions
        ii. Technical (new or updated modeling tools, additional studies, etc.)
        iii. Policy, legislative, or regulatory recommendations
    d. Review River Basin Plan drafts
- Public Meeting – Release of Draft River Basin Plan
    a. Overview of report
    b. Question and answer session
- RBC Meeting #23–#24 – Final River Basin Plan Preparation
    a. Review/incorporate public comments
    b. Prepare response to public comments
    c. Review final River Basin Plan drafts
- Public Meeting – Present Final River Basin Plan
    a. Overview of report
    b. Questions and answers

Phase 4 Milestones:

- Public input on River Basin Plans achieved
- River Basin Plan finalized

6.3 Funding Considerations

Substantial financial support will be required to develop each River Basin Plan. Funding for planning and implementation will be provided by the state and administered by SCDNR. Primary costs include the solicitation of contractors as outlined in Section 3.5, but additional funding also will be required for meeting logistics.

SCDNR will be responsible for soliciting and hiring contractors to assist with modeling work, stakeholder outreach, and logistical support; distributing state-allocated funding for planning activities including the distribution of payments to contractors for completed work; ensuring work is completed by contractors in a timely manner according to the defined scope of work; and overseeing the river basin planning process to ensure consistency with guidelines established in the Planning Framework.

Unforeseen circumstances or issues may arise during implementation of the river basin planning process. Such circumstances may necessitate additional financial support to complete all the obligations required for developing a River Basin Plan. Under such circumstances, RBCs will be required to submit in writing the amount of additional funding needed and a detailed justification for the additional funding. Additional funding requests should be made in a timely manner as to not delay the scheduled two-year planning process for each basin. SCDNR will evaluate the funding requests and make final determinations regarding the request within 30 days.

6.4 Monitoring of River Basin Plan Development

Each RBC will be participating in numerous administrative and technical-oriented activities during the development of each River Basin Plan. The success of each River Basin Plan will be dependent upon the completion of these activities as well as upon the effective cooperation between stakeholders, state agencies, and contractors. Metrics should be developed to assess the performance or quality of actions taken by an RBC during the planning process. Metrics are *benchmarks used to monitor the success or failure of selected actions taken by an RBC* (**Progress Metrics**) and *of the processes which led to the RBC actions* (**Process Metrics**).

Process and Progress Metrics will be developed by each RBC under the guidance of the RBC's Facilitator. The RBC Facilitator will be responsible for both ensuring the adequacy of adopted metrics, evaluating the metrics throughout the river basin planning process, and documenting the metrics and how well they were met. The following principles apply to quality metrics:

1. Easy to understand across broad audiences.
2. Easy to replicate. Complex metrics may be required, but should have easy user interfaces or external resource support to enable regular use.
3. Assess both progress and process.
4. Recognize preliminary data is often good enough.
5. Use the smallest sufficient set; large numbers of metrics are defeating.
6. Reflective of goals and strategic plans.
7. Advance scientific progress.
8. Promote quality and are assessed by independent review.
9. Evolve with science and program objectives.
10. Require human, financial, and computational resources.

Suggested Process Metrics include:

- Process to select RBC members is well documented, transparent, and reflects broad-based outreach.
- RBCs develop a River Basin Plan within two years of RBC formation.
- River Basin Plans are actionable, logical, and address or prevent challenges with a level of detail to be cost-accountable.
- RBC meetings adhere to timelines.

Suggested Progress Metrics include:

- Relative water demands are met across sectors accounting for growth over the planning horizon ("Sector" is defined broadly, includes instream health and recreational users).
- Final River Basin Plan has strong support from the RBC, PPAC, SCDNR, elected officials, and the public.
- Monitoring of source water integrity (percent of upstream watershed extent contributing beneficially to raw water supply).
- Drought and interbasin conflicts are identified early by quantitative means and should be resolved without resorting to litigation.

6.5 Future River Basin Plan Updates and Amendments

River basin planning is expected to be an ongoing, long-term process, and River Basin Plans will be updated every five years after the completion of the initial plan. For successive iterations of River Basin Plans, planning activities will commence approximately three years after the publication of the previous plan to allow for an updated plan to be published within five years. In most cases, the completion of later River Basin Plan editions is expected to be less than a two-year process and will focus primarily on Phases 2-4 discussed above.

Though River Basin Plans are expected to be updated every five years, exceptional circumstances may require RBCs to amend the plans between scheduled iterations. Exceptional circumstances may include a new basin drought of record impacting water availability. RBCs will submit in writing any requests to amend a River Basin Plan prior to the plan's regularly scheduled update, and such requests are subject to SCDNR approval. Amendment requests must provide sufficient detail as to why the amendment is necessary, why the amendment should not wait until the next scheduled update, and if there are any anticipated funding needs. Any amendments proposed will require, at a minimum, a public notification and a public comment period of 30 days on the SCDNR webpage and may, at the discretion of SCDNR, require a public hearing.

7.0 River Basin Plan Implementation

7.1 Overview

The long-term success of state and river basin planning will depend on the actions taken by the RBCs and other stakeholders regarding the implementation of a River Basin Plan. River Basin Plans should not be perceived as static documents which are periodically updated, nor should RBCs be viewed as stagnant planning bodies between successive updates to the River Basin Plans. Instead River Basin Plans should be viewed as a "call to action" regarding water management in a basin, and RBCs will be actively engaged in promoting the implementation of the recommendations proposed in a River Basin Plan when and where feasible. Thus, RBCs will have a continuous, long-term role in river basin planning and will continue to meet on a periodic basis to pursue River Basin Plan implementation activities as needed.

To facilitate the implementation of a River Basin Plan, RBCs will develop an Implementation Plan outlining specific goals and objectives over a five-year period following the adoption of a River Basin Plan and detailing specific action items to accomplish those goals. These objectives should address water shortages or other issues documented in the River Basin Plan such as designated Reaches of Interest and Groundwater Areas of Concern. Other objectives may promote the stewardship of the basin's water resources or address the need for additional water resource monitoring and studies to fill information gaps. The objectives will be informed heavily by the recommended water management strategies prioritized in the River Basin Plan as well as by the list of recommendations included in the plan. The Implementation Plan is intended to focus on short-term planning needs in the basin; however, the River Basin Plan also will document long-term objectives which are important to the basin but are not yet ready or feasible to implement in the short-term.

Much of the work associated with the Implementation Plan will require contractors; and as a result, implementation will be dependent on available funding, state or otherwise. Any state-allocated funding for supporting a basin's Implementation Plan will be administered by SCDNR, and the SCDNR will coordinate with the RBCs in the solicitation of contractors and/or studies needed to support the Implementation Plan. Plans as described below will include a detailed budget that clearly outlines the cost for implementing the goals and objectives in the plan.

In addition, RBCs should take an adaptive management approach when developing their Implementation Plans. As new information or funding opportunities become available, RBCs will have the opportunity to revise Implementation Plans as needed to achieve the plan's goals and objectives.

7.2 Implementation Plan

The Implementation Plan will be documented in Chapter 10 of the River Basin Plan and will include, at a minimum, the following sections:

Objectives – The objectives of the Implementation Plan will be presented. The objectives will be developed based on the recommended water management strategies and other recommendations and technical recommendations documented in Chapters 7-9 of a specific River Basin Plan. The objectives should be ranked by importance; however, the prioritization may be informed by budget considerations. Each objective will include a justification describing its importance to water management in the basin.

Schedule – A five-year schedule for accomplishing the Implementation Plan's objectives will be provided and will detail the specific actions needed to achieve those objectives. The schedule will contain specific milestones to be achieved over the five-year period.

Budget – A detailed budget for accomplishing the Implementation Plan's objectives will be presented. A budget should be given and described for each individual objective.
Funding Sources – Potential funding sources need to be described. In many cases, funding may be available only through the State; however, RBCs can pursue external funding sources if opportunities are or become available.

Each RBC will determine an appropriate meeting schedule necessary to achieve objectives in the Implementation Plan. At a minimum, the RBCs, however, should meet once a year to discuss implementation progress and to communicate any new water-related issues or concerns since the most recent publication of the River Basin Plan. RBCs also may elect to form subcommittees to focus on particular aspects of the Implementation Plan.

Progress on fulfilling the objectives in each basin's Implementation Plan will be monitored by the SCDNR, and each RBC will be responsible for submitting biannual progress reports to the agency. Each progress report will include a summary of progress made on each objective including any milestones achieved as well as information regarding any challenges or impediments impacting progress on the Implementation Plan. Revisions to the Implementation Plan also will be included in the summary along with the justification of the revisions. The five-year Implementation Plan and the biannual progress reports will have sufficient detail for SCDNR to effectively evaluate the progress of River Basin Plan implementation.

7.3 Limitations of River Basin Plan Implementation

RBCs should understand the potential limitations of implementing River Basin Plans. One such limitation is the amount of funding available to accomplish the Implementation Plan's objectives. Not all action items in the Implementation Plan may be funded during the five-year period. Therefore, RBCs must consider the relative importance and cost of each action item when prioritizing objectives.

There also may be challenges associated with basin-wide stakeholder acceptance of RBC-recommended water management strategies and implementation objectives. RBCs have no authority to enforce actions or recommendations on stakeholders in the basin. Instead, RBCs must work to establish strong stakeholder relationships and develop effective communication protocols to foster effective, basin-wide collaboration in achieving RBC implementation objectives. Without the support of the stakeholders throughout the basin, the effectiveness of an RBC's Implementation Plan will be limited.

Finally, River Basin Plans and their associated Implementation Plans have no regulatory authority; and though plans may include recommendations for new or revised legislation, regulations, or policies regarding the management of the state's water resources, all plans must be consistent with existing laws and regulations. RBCs may comment on permit applications, as all entities can during public comment periods; however, RBCs should understand the scope of River Basin Plan implementation is limited to planning initiatives and has no prescribed regulatory authority.

7.4 Long-term Planning Objectives

In addition to developing an Implementation Plan, RBCs will document long-term planning goals and objectives in the River Basin Plan. These are objectives deemed important to the RBC for long range planning, but which are not feasible or are of a less urgent nature compared to objectives in the five-year Implementation Plan. After future iterations of river basin planning are complete, these long-term objectives may become more important or more feasible and may subsequently become a formal part of an Implementation Plan.

7.5 Progress on River Basin Plan Implementation

Each iteration of a River Basin Plan will include a summary of the progress made on achieving the short-term planning objectives of the RBC as outlined in previously published River Basin Plans and associated Implementation Plans. Progress, in part, should be measured by the success of implementation activities in addressing anticipated future water shortages or in enhancing available water supply. The success of implementation actions also should be based on their effectiveness in addressing designated Reaches of Interest or Groundwater Areas of Concern.

7.6 Roles of SCDNR in River Basin Plan Implementation

SCDNR will serve as the oversight agency for River Basin Plan implementation activities. Responsibilities of the agency will include:

- Reviewing biannual progress reports summarizing RBC progress on accomplishing objectives in the basin's five-year Implementation Plan.
- Coordinating with RBCs to hire contractors, as necessary, to assist with implementation objectives.
- Distributing state-allocated funding for implementation activities including the distribution of payments to state-funded contractors for completed work.
- Ensuring state-funded work is completed in a timely and efficient manner according to the defined scope of work.
- Serving in a formal advisory role in the management of the state's water resources.
- Providing RBCs and contractors with necessary hydrologic information.

8.0 State Water Plan

8.1 Overview

Upon completion of the eight River Basin Plans and their acceptance, SCDNR staff will prepare the State Water Plan. The State Water Plan will be a compilation of key information from the River Basin Plans and will be developed under the guidance of the PPAC with significant input from the RBCs.

The State Water Plan will summarize and prioritize water policy, regulatory, and legislative recommendations presented in the River Basin Plans. SCDNR will be responsible for highlighting those recommendations considered to be vital to the long-term sustainability of the state's water resources and will elaborate on the implication and implementation of each recommendation. Though the plan will list all policy and legislative recommendations from each basin, the plan will identify and highlight those recommendations common to two or more basins for special consideration.

Recommendations garnered from the River Basin Plans on how to improve the water planning process and enhance stakeholder and public participation also will be described. An overview of the funding necessary for implementing the River Basin Plans and any SCDNR recommendations on the financing and implementation of the basin plans will be included. Program recommendations—including the need for additional surface and groundwater monitoring and additional water resource investigations to fill information gaps—will be presented as well.

Information regarding each basin's current and future water demand as well as any current and future water availability concerns determined by each RBC and documented in the River Basin Plans will be summarized. Recommended water management strategies proposed by each RBC also will be summarized. Notable statewide trends regarding current and future water demand and water availability will be identified and highlighted in the plan. The plan will describe those issues and concerns common to multiple basins, but the plan also will illustrate differences between the river basins in terms of future water availability concerns and other water planning challenges.

In addition, a chapter describing the occurrence of drought in South Carolina along with a summary of drought response recommendations and initiatives described in the River Basin Plans will be included. A chapter on special topics (coastal issues or water quality, for example) also will be included in the State Water Plan.

Prior to publishing the final State Water Plan, SCDNR will release a draft for public comment, notify the RBCs, and hold, at a minimum, one public hearing. Guidelines for the public meetings and comment period will follow those guidelines listed in Section 3.7. After the approval of the new State Water Plan by the SCDNR Land, Water and Conservation Advisory Committee and the SCDNR Board, the plan will be made available to the Governor and the State legislature for their consideration, including soliciting their support for the necessary funding and other assistance in plan implementation.

8.2 State Water Plan Table of Contents

The table of contents for the State Water Plan and a brief description of each section or chapter is provided below.

Acknowledgements

This section acknowledges those who were involved in developing the State Water Plan and the River Basin Plans and, at a minimum, should include a list of all River Basin Council members who participated and their affiliations, members of the Planning Process Advisory Committee, those persons in local, state, and federal government who had a significant role, and any others who are deemed as instrumental in developing the plans.

Executive Summary

This section summarizes key findings from the eight River Basin Plans including, but not limited to, major policy or legislative recommendations, statewide trends in water use, demand and availability, notable water resource issues and planning challenges, and drought response information.

Chapter 1. Introduction

Chapter 1 provides a general overview of the importance of state and river basin planning and a description of the river basin planning process. This chapter will highlight the importance of water resources to the state's economic prosperity; the need for water planning to ensure an adequate supply of water for all instream and off-stream uses for generations to come; and a summary of the river basin planning process including descriptions of the roles of the RBCs, state and federal agencies, contractors, and the public in developing the River Basin Plans.

Chapter 2. Policy and Legislative Recommendations

Chapter 2 summarizes and describes policy and legislative recommendations documented in each of the eight River Basin Plans. SCDNR will be responsible for highlighting those recommendations considered to be vital to the long-term sustainability of our water resources and will elaborate on the implication of each recommendation. Though all recommendations proposed in the River Basin Plans will be listed in the State Water Plan, those recommendations common to two or more basins will be given special consideration.

Chapter 3. Planning Process and Program Recommendations

Chapter 3 will summarize recommendations regarding improvements or modifications to the state and river basin planning process, as well as provide recommendations on additional state surface and groundwater program needs. Planning process recommendations may include changes to RBC membership and roles or to the contents of a River Basin Plan. Program recommendations may include the need for additional water resource data through the expansion of existing surface and groundwater monitoring networks or new studies to improve the understanding of the state's water resources.

Chapter 4. Financing Needs

Chapter 4 will present an overview of the funding necessary to implement water planning activities in each basin and will be based, in part, on each RBC's five-year Implementation Plan described in each River Basin Plan. The chapter also will discuss long-term funding needs for future iterations of state and river basin planning.

Chapter 5. Current and Future Water Demand

Chapter 5 will summarize current water use and future water-demand projections document-

ed in each River Basin Plan. Trends in water use will be identified and described, and a summary of permitted and registered water use will be provided. The chapter also will summarize population projections from both a state and river basin perspective.

Chapter 6. Water Availability Assessment

Chapter 6 will summarize the results of the technical analyses completed to assess current and future water availability as documented in each River Basin Plan. Specifically, this chapter lists all surface water and groundwater shortages identified in each River Basin Plan, as well as all designated Reaches of Interest and Groundwater Areas of Concern.

Chapter 7. Water Management Strategies

Chapter 7 will present an overview of the recommended water management strategies proposed by each RBC and documented in each River Basin Plan. A summary of the effectiveness and feasibility of the strategies in eliminating, or mitigating, water availability issues will be given along with a summary of any water shortages or problems expected to remain after all strategies are implemented. An overview of the expected cost to implement recommended water management strategies also will be provided.

Chapter 8. Drought and Drought Response in South Carolina

Chapter 8 will describe the occurrence and associated impacts of drought in each planning basin. Drought response initiatives along with any drought response recommendations will be summarized based on information documented in each River Basin Plan. This chapter also will include a discussion on the uncertainty of future drought and the implications drought may have on future state and river basin planning.

Chapter 9. Implementation

Chapter 9 will highlight policies, water demand strategies, or water resource programs and projects implemented since the last State Water Plan or which are currently in the process of being implemented. A list of additional policies, strategies, and projects expected to be implemented over the next planning cycle will be included as well.

Chapter 10. Special Topics

Chapter 10 will describe any water resource or water planning topics of special interest or consideration which are not documented elsewhere in the State Water Plan. Special topics may include, but are not limited to coastal issues, innovative water management strategies, water quality, and source water protection. Topics chosen for inclusion in this chapter will be determined based on the contents of each River Basin Plan.

Glossary and Appendices

8.3 State Water Plan Updates and Amendments

The State Water Plan, like the individual River Basin Plans, will be updated approximately every five years. State Water Plan updates will be written after the completion of all eight River Basin Plans. Any updates to the State Water Plan, new or revised recommendations for example, will be driven by the updated River Basin Plans. Amendments to the State Water Plan between successive iterations will be considered by SCDNR if exceptional circumstances dictate the need for such amendments or if any amended River Basin Plans (Section 6.5) warrant associated amendments to the State Water Plan. Any proposed amendments to the State Water Plan will be presented to the PPAC and the RBCs for review and comment.

APPENDIX

River Basin Council Bylaws

RIVER BASIN COUNCIL BYLAWS

TABLE OF CONTENTS

I. BACKGROUND

In 2018, the South Carolina Department of Natural Resources (SCDNR) convened a State Water Planning Process Advisory Committee (PPAC) to develop a multi-faceted framework for statewide water planning (Planning Framework). The Planning Framework was completed in 2019 and targets development of a stakeholder-driven water supply plan (River Basin Plan), including a defined implementation process, for each of the state's eight planning basins to ensure current and future water demands can be met over a 50-year planning horizon (Planning Horizon).

A major component of the Planning Framework is the convening, by SCDNR, of a River Basin Council (RBC) in each of the eight planning basins. The RBC will consist of stakeholders (Members) representing eight defined interest categories (see Section 3.2.1 of the Planning Framework). Each RBC will use the Planning Framework along with technical information (water-demand projections and hydrologic models) provided by SCDNR and others to develop a River Basin Plan that addresses anticipated water needs and water-related issues for the Planning Horizon.

The PPAC determined each RBC should operate in accordance with a set of bylaws developed as part of the Planning Framework. This document serves as the RBC Bylaws and will be used by each RBC to govern how they will operate. Each RBC is authorized by the PPAC to modify the Bylaws to the extent necessary to accommodate special and unique situations present in a planning basin. If such modifications are needed, the RBC should use the procedures in the initial Bylaws to incorporate the modifications needed. Any modifications to these Bylaws must be submitted to the PPAC (for review and comment) and SCDNR (for review, approval, and record-keeping purposes).

II. DEFINITIONS

For the purposes of these Bylaws, the following words and phrases are defined below:

Advisors – Individuals with specific expertise or information who may participate in RBC discussions, typically on a regular basis, for the benefit of and at the pleasure of the RBC. Advisors may be requested to serve on RBC Subcommittees; however, Advisors are not Members of the RBC and will therefore not vote in the RBC's decision making.

Alternate – a person selected by a Member of an RBC to serve in his or her place if the Member must be absent from an RBC meeting.

Closed Meeting or Session – a meeting or session with attendance restricted to Members to discuss sensitive business matters (e.g., contracting, legal proceedings, Member expulsion, etc.) necessitating a closed meeting or session. The Coordinator, Facilitator, and/or SCDNR staff also may attend closed meetings if their attendance is deemed necessary by the Members.

Consensus – when all Members can "*live with*" the outcome or proposal being made.

Coordinator – SCDNR contractor providing all administrative and logistical support for the RBC, including but not limited to, setting agendas, making meeting arrangements, sending meeting notices and drafting meeting summaries.

Facilitator – SCDNR contractor, sometimes referred to as "RBC Facilitator", who will guide meetings in an efficient manner supporting interest-based negotiations to implement the goals for the RBC according to the guidance provided by the Planning Framework and these Bylaws. The Facilitator will remain focused on the process to ensure the process is administered fairly. The Facilitator will not interject his/her own water resource-related interests into the discussions. Due to the need for this independence of thought, the Facilitator will not be an RBC Member.

Interbasin River Council (IRC) – a group consisting of Members from two or more of the RBCs, with no more than five Members from each RBC, created to facilitate collaboration between two or more basins. IRC members will be selected by each respective RBC. IRCs should meet at least twice a year, or more frequently, if necessary.

Interest-Based Negotiations – RBC decision-making approach seeking to create decisions simultaneously satisfying the basic interests of the Members. Also referred to as "mutual-gains negotiation" and "principled negotiation", it is contrasted with the more traditional "positional bargaining". If a "position" is thought of as the decision, then the "interests" are the criteria each RBC Member will use to evaluate the decision's value to that Member. The approach seeks decisions to simultaneously maximize the value to each RBC Member.

Majority Vote (or Simple Majority) – RBC decision made by vote in favor of a proposed action by more than half of the Members present and voting in favor of the action at a meeting where a quorum exists. Unless otherwise specified herein, all actions by the Members shall be taken by Majority Vote. A Member who is present and either abstains or does not vote is not calculated in the vote tally.

Member – a person selected by SCDNR to serve on a River Basin Council.

Planning Framework – the document (*South Carolina State Water Planning Framework* containing this Appendix) which provides guidance on the formation of River Basin Councils and the development of River Basin Plans and the State Water Plan.

Planning Horizon – the future 50-year period considered in a River Basin Plan for ensuring the surface and groundwater resources of a basin will be available for all uses.

Public Outreach Coordinator – SCDNR contractor providing public outreach functions for the RBC. The Public Outreach Coordinator is responsible for ensuring the public notice and participation guidelines are followed.

River Basin Council (RBC) – a group of diverse stakeholders with water-related interests in a basin assembled specifically to develop and help implement a River Basin Plan consistent with the Planning Framework.

River Basin Plan – a collection of recommended water management strategies developed by a River Basin Council and supported by a summary of analyses designed to ensure the surface water and groundwater resources of a river basin will be available for all uses over the Planning Horizon. Section 5.0 of the Planning Framework provides the Table of Contents and further guidance on the elements of a River Basin Plan.

Subcommittee – a group of Members and designated Advisors formed to address specific issues or to focus on specific geographic areas or water sources. RBC subcommittees may be temporary (ad hoc) or long-term in duration. RBC subcommittees will typically make recommendations to the RBC, but they will not make final decisions (the RBC will make the decisions).

Super Majority Vote – an RBC decision made by vote in favor of a proposed action by two-thirds or more of the Members voting at a meeting where a quorum exists. A Member who is present and either abstains or does not vote is not calculated in the vote tally.

Trial Balloon – an informal, preliminary proposal attempting to bring together recommendations to address RBC issues and interests.

III. RBC ESTABLISHMENT AND PURPOSE

Each of South Carolina's eight designated river basins will have an RBC charged with developing, implementing, monitoring, and periodically revising a River Basin Plan for the surface and groundwater resources in its river basin. Plans will ensure those water resources can meet current and anticipated future needs throughout the Planning Horizon while protecting the ecological environment. River Basin Plans will be developed in accordance with the Planning Framework.

The RBC will strive to improve coordination of efforts among its Members to carry out its roles and responsibilities. The RBC's roles and responsibilities include, but are not limited to, the following:

- Develop and implement the River Basin Plan using the guidelines set forth in the Planning Framework
- Review and update the River Basin Plan at least once every five years or amend it as needed
- Communicate with stakeholders throughout the river basin
- Identify needs for policy, legislative, regulatory or process changes.

The roles and responsibilities of the RBC are more fully described in Appendix A of the Bylaws and Section 3.3 of the Planning Framework document.

IV. PURPOSES OF THE BYLAWS

The purposes of these Bylaws are to define and govern the RBC's decision-making processes, define the membership and associated appointment procedures, define the method of election and powers of the Chair and Vice Chair, describe how the RBC and its work will be managed, and describe the need for the RBC to communicate effectively both internally and with a variety of other stakeholders.

V. MEMBERSHIP

1. Composition

The RBC will consist of no more than 25 total Members (including both filled and vacant seats) distributed across the following eight interest categories (see also Section 3.2.1 of the Planning Framework document):

1. Agriculture, Forestry and Irrigation Interests (including Farm Bureau, farmers, timber companies, golf courses, nurseries, irrigation installers, etc.)
2. Local Governments (including counties, cities, special purpose districts, public service districts, councils of governments, etc.)
3. Water and Sewer Utilities
4. Electric-Power Utilities and Non-Federal Reservoir Operators
5. Industry and Economic Development Interests (including industry, Chambers of Commerce, Economic Development Commissions, Manufacturer's Alliance, etc.)
6. Water-Based Recreation Interests (including boaters, fishermen, marina operators, waterfront park operators, etc.)
7. Environmental Interests (including Riverkeepers, land trusts, and conservation groups)
8. At-Large Water-Based Interests

SCDNR will strive to seat at least one Member for each interest category and will keep a seat open if an interest category remains vacant. SCDNR also will target balanced representation across the interest categories and across the river basin.

2. Terms of Office

The initial duration of RBC terms will be either for two years, three years, or four years. The staggering of the initial terms will prevent the replacement of all or a large percentage of Members at one time to improve the efficiency and continuity of the planning process. The staggered term limits are designed so that approximately one-third of the Members' terms will expire in two years, one-third of the terms will expire in three years, and one-third of the terms will expire in four years. Members will draw lots for the initial terms of two, three, and four years. Since the expected size of an RBC is 25 Members, which is not evenly divisible by three, the remaining Member, if the RBC does have 25 Members, will serve an initial term of three years.

Each subsequent term will have a duration of three years. After serving an initial two-, three-, or four-year term, Members may request to serve for an additional three-year term, but the reappointment will be subject to SCDNR approval. Members may not serve for more than three consecutive terms regardless of the length of those terms.

3. Conditions of Membership
RBC membership is voluntary and subject to the terms and conditions of these Bylaws. Members of an RBC must be knowledgeable and experienced in the interest category they represent and are required to either reside, work, or officially represent an entity having a significant interest in the water resources of the river basin the RBC represents. SCDNR will be responsible for determining if an RBC applicant who does not reside or work in the basin has a qualifying interest to serve on the RBC.

4. Appointment Process
Appointments to the RBCs will be made by SCDNR based on an applicant's credentials and on recommendations made by various interest groups, organizations, or the PPAC. All vacant seats will be advertised on the SCDNR website for at least 30 days, and any person meeting the Conditions of Membership (Section V-3) may request membership on an RBC by submitting a written application to SCDNR if a vacancy exists.

If an umbrella association (e.g., a professional organization) exists for a stakeholder interest category, the respective association may recommend a candidate for RBC membership by submitting an endorsement letter to SCDNR. At any time, an RBC can recommend to SCDNR that an individual's application be considered to fill a vacant seat.

Membership on the State Drought Response Committee or a recognized surface water or groundwater planning or management group may be used as additional qualifiers for selecting Members to RBC slots. In basins having significant groundwater use, RBC membership should include persons knowledgeable of local groundwater resources. Efforts will be made by SCDNR to appoint Members with significant water-related interests in different geographic areas of the basin so different regions have representation on the RBC.

Section 3.2.2 of the Planning Framework document provides more detail on the RBC appointment process.

5. Attendance
Attendance of RBC Members at meetings is important as an expression of continued interest and to keep pace with cumulative and ongoing discussions. Members are expected to fully participate in each meeting/teleconference which includes being present for substantially all of the meetings/teleconferences. A Member will not meet the RBC's minimum attendance standard if the Member has two unexcused absences from meetings in a rolling 12-month period. The RBC Chair will have discretion to excuse Member absences. In evaluating attendance, a Member will not be considered to have missed a meeting if he/she informs the RBC Chair at least three business days prior to the scheduled meeting and either an alternate means of participation (e.g., teleconference) is established or the Member's Alternate (see Section V-6) attends the meeting.

6. Alternates

Each Member of the RBC shall designate one alternate (Alternate) to represent him/her when he/she is unable to attend a meeting. Each Member must notify the Chair of the name and contact information for their designated Alternate by the second regular meeting of the RBC following the Member's addition to the RBC. The Alternate must represent the same interest category as the Member he/she is replacing and shall have the same voting privileges and duties as the Member when serving in the Member's place at meetings. If both the Member and Alternate are present at a meeting, only the Member will cast votes on any decisions being made by the RBC. Alternates must be approved by SCDNR.

7. Code of Conduct

(a) General

Members and designated Alternates are expected to represent the interests of their designated category. Each Member is expected to attend and fully participate in RBC meetings, calls, and any other activities related to implementation of the Planning Framework for the river basin. Alternates also are encouraged to attend all RBC meetings along with the Member to remain current on the proceedings.

Members and Alternates are expected to read appropriate materials and arrive at all meetings prepared to work. Materials to be presented for discussion at meetings should be distributed to all Members and Alternates in advance with adequate time to support the Members' and Alternates' preparation, but distribution should not be less than five business days in advance of a meeting (longer, as practical).

Members and Alternates are expected to agree to operate in good faith at all times. Acting in good faith means: disclosing interests, needs, actions, and issues in a timely manner and committing to the objectives of the RBC's process. Acting in good faith also means respecting the interests, needs, concerns, and time commitments of others and giving the RBC every reasonable chance to reach its objectives before pursuing other alternatives. Good faith describes a state of mind denoting honesty of purpose, freedom from intention to defraud, and being faithful to these obligations.

No Member or designated Alternate of the RBC shall:

- Solicit or accept gratuities, favors, or anything of monetary value from suppliers or potential suppliers of services, materials, or equipment;
- Participate in the selection, award, or administration of a procurement where the Member or designated Alternate has a financial interest in the organization being considered for the award;
- Participate in any deliberation, decision, or vote that would constitute a conflict of interest under federal, state, or local laws.

Potential conflicts of interest shall be stated by a Member or designated Alternate prior to any deliberation or action on an agenda item.

Members and Alternates are expected to read, comprehend, and conduct themselves in accordance with these Bylaws and any other policies and procedures adopted by the Members.

(b) Communication with News Media and Elected Officials

Members and Alternates understand success in reaching RBC objectives will require a cooperative and constructive negotiation forum where ideas and Trial Balloons can be freely offered and discussed; and compromises can be explored, adjusted, and approved. Members and Alternates further understand any Member or Alternate seeking to gain advantage external to the RBC's process through political means or the media will severely inhibit or shut down this cooperative forum.

Members and Alternates should not employ external tactics to the detriment of the RBC's process or other Members' or Alternates' interests. Member and Alternates recognize such behavior may result in consequences as outlined in Section V-8. The restriction does not limit anyone from discussing their own interests with the media or with elected officials. It does not restrict anyone from providing regular reports and their opinions to elected officials even if such reports are open to the public. Further, this restriction does not prohibit Members or Alternates from continuing their normal activities even if related to water resources in the state.

Members and Alternates agree not to negotiate through the media and will avoid making public statements which take issues out of context, sensationalize, or disrupt good-faith discussions and negotiations. Members and Alternates will constrain their comments to their organizational interests and will refrain from opining on the positions or motives of other Members or Alternates.

8. Removal, Resignation and Reinstatement of RBC Members

(a) Removal

These Bylaws describe an open, transparent, interest-based process for developing and implementing a River Basin Plan. To ensure the RBC's process values the time investment of all its Members, Members whose actions contradict these Bylaws may be expelled from the RBC. The RBC may remove a Member from the RBC, subject to SCDNR approval, for the following reasons:

i. Failure to meet the attendance standards described in Section V-5;
ii. Conduct inconsistent with these Bylaws as determined by the RBC or SCDNR;
iii. A Member's status has changed such that the individual no longer represents the interest category he or she was appointed to represent;
iv. Felony conviction;
v. Falsifying documents;
vi. Death;
vii. Member has completed three consecutive terms.

Any Member with knowledge that a Member or designated Alternate has engaged in acts that constitute grounds for removal, as indicated in the section above, should report such information to the Chair. The Chair, upon receiving this information, shall make a written request to the Member or Alternate for an explanation to include why he or she should not be removed from the RBC. Within fifteen days of receipt of the written request by the Chair, the Member or Alternate shall provide a written statement to the Chair of his or her explanation of the charge and for remaining on the RBC. Within five days of receiving the Member's (or Alternate's) explanation, the Chair shall forward copies to all Members. If the Chair suspects valid grounds for removal, the Chair will place the item on the agenda for the next meeting. At the next meeting, the Member or Alternate subject to removal may present evidence to prevent his or her removal from the RBC. Voting Members may only remove the Member or Alternate by a Super Majority Vote.

(b) Member Resignation

Any Member can choose to resign from the RBC for any reason at any time. Any Member who resigns agrees to inform the RBC Chair in writing of his/her decision in a timely manner, preferably with a 30-day notice of an intent to resign. The RBC Chair or the Coordinator will make SCDNR aware of the resignation as soon as possible to allow SCDNR to appoint replacements in an efficient manner according to the guidelines described in Section V-4.

(c) Expelled Member Reinstatement

Any Member who was expelled may rejoin the RBC provided reinstatement is approved by the RBC by a Super Majority Vote and includes a determination by the RBC that such Member has remedied the reason for the expulsion to the extent possible. Member reinstatements are subject to SCDNR approval.

(d) Resigned Member Reinstatement

Any Member who has resigned may rejoin the RBC provided reinstatement is approved by the RBC by a Super Majority Vote. Member reinstatements are subject to SCDNR approval.

9. RBC Service Life

The RBC will continue to exist unless SCDNR determines the RBC is no longer needed.

VI. RBC CHAIR AND VICE CHAIR

A Chair and Vice Chair of the RBC will be nominated and elected by Members of the RBC as described below.

1. Selection and Terms

Nominations for Chair and Vice Chair of the RBC will be made by the Members. The Chair and Vice Chair must be Members of the RBC, each representing a different interest category. Designated Alternates are not eligible for election as Chair or Vice Chair. At the first or second official meeting of the RBC, the Members will elect a Chair and Vice Chair from among the nominees by consensus, or by Majority Vote if consensus is not reached. Both the Chair and Vice Chair will serve for the rest of the first calendar year and the following two calendar years. After that, subsequent Chairs and Vice Chairs will serve for two calendar years.

2. Duties

The Chair will serve as the executive officer and spokesperson of the RBC and, in consultation with the Coordinator and Facilitator, will establish meeting schedules, call for special meetings, establish the meeting agendas, and monitor the RBC's progress toward its overall schedule of completing the River Basin Plan, its amendments, or its update. The Vice Chair will assist the Chair with his/her duties and assume the Chair's responsibilities when the Chair is unable to do so.

3. Removal of Chair or Vice Chair

The RBC may remove the Chair or Vice Chair at any time pursuant to these Bylaws for failure to carry out the duties of the office. Upon written request of at least ten voting Members, notice of pending removal shall be given to the Chair or Vice Chair and included as an agenda item for the next regularly scheduled meeting. Removal shall be by a Majority Vote of the RBC Members present during the meeting. A vacancy occurring among the Chair or Vice Chair may be filled by the RBC pursuant to these Bylaws.

VII. MEETINGS

1. Open Meetings and Public Notice

All RBC meetings will be posted and open to the public in accordance with the South Carolina open meetings laws. All decisions and actions made during an RBC meeting shall be undertaken in an open meeting, unless otherwise authorized by the South Carolina open meetings laws. All materials presented or discussed at RBC meetings shall be made available for public inspection following any meeting of the RBC.

2. Facilitator, Coordinator, and Public Outreach Coordinator

The work of the RBC will be supported by the following contractors solicited and hired by SCDNR. Contractors will not be Members and have no voting privileges.

(a) Facilitator

The Facilitator will guide meetings in an efficient manner supporting interest-based negotiations to implement the goals for the RBC according to the guidance provided by these Bylaws and the Planning Framework. The Facilitator will remain focused on the process to ensure the process is administered fairly and will not interject his/her own water resource-related interests into the discussions.

(b) Coordinator

The Coordinator will be responsible for the administrative functions of the RBC. Those functions include: providing all meeting logistical support (e.g., acquiring meeting space; preparing and properly posting meeting schedules, agendas, and other meeting materials; providing food and refreshments as needed; keeping meeting minutes; etc.); educating Members and Alternates; doing research; assisting in the preparation, production, and distribution of the River Basin Plan reports; coordinating with other contractors; and performing other duties as requested by the Chair and Vice Chair.

(c) Public Outreach Coordinator

The Public Outreach Coordinator is responsible for ensuring the public notice and participation requirements are followed as described in this Section and as outlined in Section 3.7 of the Planning Framework. The Public Outreach Coordinator will work in cooperation with the Facilitator and Coordinator. For efficiency, the same person or contractor may fulfill the roles of both Coordinator and Public Outreach Coordinator.

3. Regular Meetings

Regular Meetings refer to meetings designated for preparing River Basin Plans or fulfilling implementation objectives. All Regular Meetings are led by the Facilitator and supported by the Coordinator as outlined in Section VII-2.

The completion of the River Basin Plan is expected to be a two-year process. During initial River Basin Plan development, RBCs, once established, will meet at least monthly over a two-year period using the schedule outlined in Section 6.2 of the Planning Framework. RBCs will be allowed some flexibility and may request one or more time extensions of no more than six months' duration per request, but SCDNR has the discretion to complete a River Basin Plan if it is unlikely the RBC will complete the plan within a three-year total time period as measured from the first official RBC meeting.

Regular meetings, in addition to the state's open meeting laws, will adhere to the following guidelines regarding public notice and participation:

- Meeting notices shall be posted on a public website (the SCDNR website is sufficient, but RBCs can post meeting notices on other public websites as well) as early as practical and at least two weeks prior to the meeting. RBC meeting information also will be distributed by email, with email notices available to all those who choose to register on an established email list.
- Meeting notices will include the agenda, date, time, expected duration, and place of the meeting.
- Meeting notices shall be posted in a publicly accessible site at the meeting place of the RBC at least 24 hours prior to the meeting.
- Meeting agendas can be modified up to 24 hours before the scheduled meeting. Modified agendas shall be posted on a public website (the SCDNR website is sufficient, but RBCs can post meeting notices on other public websites as well) and distributed to those registered on an established email list at least 24 hours before a scheduled meeting.
- The agenda must include as a minimum: 1) quorum determination; 2) public comment period; 3) approval of the minutes of the previous meeting; 4) any reports or items of information; and 5) any actions the RBC needs to consider. Each action (e.g., decision) should be listed as a separate agenda item.
- Meeting minutes shall be taken and shall include the time, date, and place of the meeting; the Members and Alternates who attended; the Members and Alternates who were absent; the substance of any matter discussed and decided on by the RBC; and any other content a Member requests to be included.
- Meeting minutes approved by the RBC shall be posted on a public website (the SCDNR website is sufficient, but RBCs can post meeting minutes on other public websites as well) within two weeks of the date of RBC approval.
- The public shall be allowed to submit comments or questions during a public comment period scheduled for each RBC meeting (typically near the beginning of the meeting). Any written responses from the RBC to any comments shall be incorporated into the meeting minutes.
- After RBC meetings, the meeting materials will be provided as part of the meeting minutes posted to the public website.

RBCs also will hold regular meetings after River Basin Plans are completed to pursue implementation objectives. The meeting schedule shall be determined by the RBC; however, at a minimum, an annual meeting of the RBC shall be held on such date and at such location determined by the Chair.

4. Closed Meetings

Meetings will be open for public observation unless specifically closed according to this Section. Any Member can propose at any time that a sensitive topic be considered in a Closed Meeting. The Facilitator will then stop the discussion and determine if the RBC agrees by Majority Vote. If the RBC agrees, the topic will either be tabled for a future Closed Meeting or the room will be cleared of everyone except the Members and Alternates before resuming discussion on the topic. The Facilitator, Coordinator, and SCDNR may participate in Closed Meetings upon the request of the Members using a Majority Vote. Members and Alternates agree not to divulge details of the discussion in a Closed Meeting or any information specifically identified as confidential that is introduced in Closed Meetings except as required by law.

5. Special Meetings

Additional meetings of the RBC may be called by the Chair, the Vice Chair, or by request of at least 25 percent of the Members. Special Meetings should be called sparingly and are intended to address unforeseen and time-sensitive circumstances. Special Meetings must be in accordance with state open meeting laws, but such meetings are not subject to the additional public notice requirements stipulated in Section VII-3 for Regular Meetings. The Facilitator and Coordinator must participate in Special Meetings and fulfill their assigned roles and responsibilities as described in Section VII-2.

Notice of any Special Meeting shall be given at least five business days prior to the meeting. However, notice delivered by United States mail must be given at least seven business days prior to the meeting. Such notice will be delivered personally or sent by mail, facsimile transmission, or electronic mail to each Member and his/her Alternate at his/her address as shown by the records provided to the RBC. If mailed, such notice shall be deemed to be delivered when deposited in the United States mail in an addressed sealed envelope with postage thereon prepaid. If sent by facsimile transmission or electronic mail, such notice shall be deemed delivered when confirmation of delivery to the designated number or mailbox is received. Such notice shall specify the purpose for the meeting.

6. Advisors

Advisors are individuals with specific expertise or information who may participate in RBC discussions, typically on a regular basis, for the benefit of and at the pleasure of the RBC. Advisors, however, do not have voting privileges and may not vote in the RBC decision-making process.

Advisors may include, but are not limited to, representatives of the following:

- Federal agencies
  - United States Geological Survey (USGS)
  - United States Army Corps of Engineers (USACE) – Savannah and Santee basins only
  - Southeastern Power Administration (SEPA) – Savannah basin only
  - Catawba Indian Nation – Catawba basin only
  - United States Environmental Protection Agency (EPA)
  - United States Fish and Wildlife Service (USFWS)
  - National Marine Fisheries Service (NMFS)
  - United States Forest Service (USFS)
  - Natural Resources Conservation Service (NRCS)
- State agencies
  - South Carolina Department of Natural Resources (SCDNR)
  - South Carolina Department of Health and Environmental Control (SCDHEC)
  - South Carolina Department of Agriculture (SCDA)
  - South Carolina Department of Commerce
  - South Carolina Forestry Commission (SCFC)
  - South Carolina Rural Infrastructure Authority (RIA)
  - South Carolina Department of Parks, Recreation and Tourism (SCPRT)
  - South Carolina Sea Grant Consortium
  - South Carolina Emergency Management Division (SCEMD)
  - South Carolina Energy Office
  - South Carolina Department of Transportation
- State universities
- Representatives from neighboring states – For river basins shared with another state, the Chair, working with the Coordinator, will invite one or more appropriate Advisors (e.g., water planning and management group leadership, state agency, reservoir manager, etc.) to all scheduled RBC meetings and include them on meeting summaries and other RBC documents.

VIII. ESTABLISHING A QUORUM AND MAKING DECISIONS

1. Quorum

A simple majority of the Members and designated Alternates substituting for a Member at a meeting shall constitute a quorum for the transaction of business at any meeting of the RBC. Once a Member, or their designated Alternate, is present for any purpose at a meeting, the Member, or their designated Alternate, is deemed present for quorum purposes for the remainder of the meeting. A quorum, once established, will not be broken by the departure from the meeting of a Member or designated Alternate. Members, or designated Alternates, may participate and vote in meetings using any means of communication by which all participants may simultaneously hear each other during the meeting. A Member participating in a meeting by this means is deemed to be present in person at the meeting. The vote of each Member, or designated Alternate, present at a meeting in which a quorum exists will be weighted equally.

2. Decision-making Process

(a) Consensus

Unless otherwise noted in the Bylaws, the RBCs will make decisions by consensus. Consensus is achieved when all Members can *"live with*" a decision. The Facilitator will be responsible for leading the RBC in reaching consensus through interest-based negotiations, closing a discussion, identifying consensus, and moving forward in a timely manner. If there is doubt that consensus exists, then any Member can request a test of consensus.

Interest-based negations is a decision-making approach seeking to create decisions simultaneously satisfying the basic interests of all the Members. Also referred to as "mutual-gains negotiation" and "principled negotiation," it is contrasted with the more traditional "positional bargaining." If a "position" is thought of as the decision, then the "interests" are the criteria each Member will use to evaluate the decision's value to that Member. The approach seeks decisions to simultaneously maximize the value to each RBC Member.

Consensus is built upon identifying and debating all Members' interests and by attempting to satisfy those interests to the greatest extent possible. A consensus is reached when all voting Members (or their designated Alternate in the absence of the Member) agree that their interests have been thoroughly vetted so that each Member can *"live with*" the final decision of the group. Building consensus may involve proposing alternative solutions, assessing the impacts of those alternatives, and compromising. Consensus, however, does not necessarily mean unanimity. Some Members may strongly endorse a solution, while others may only accept it as a workable agreement. In a final consensus agreement, Members recognize that the resulting agreement is the best one that the voting Members can make at this time.

(b) Failure to Reach Consensus

If the RBC Chair determines consensus is unlikely after good-faith negotiations, the Chair will apply a Majority or Super Majority Vote as described below.

i. Majority Vote

A Majority Vote is an RBC decision made by vote in favor of a proposed action by more than half of the Members (or their designated Alternate) present and voting in favor of the action at a meeting where a quorum exists. Unless otherwise specified herein, all actions by the Members shall be taken by majority vote if a consensus cannot be reached. A Member who is present and either abstains or does not vote is not calculated in the vote tally. Examples of a decision which can be made by Majority Vote include but are not limited to:

- Approving or revising the River Basin Plan.
- Approving a project for funding.
- Approving a Member to serve as the RBC's representative in the oversight of a project.
- Approving a Member to serve as the RBC's representative on an Interbasin River Council
- Electing RBC Chair and Vice Chair to terms or to complete terms of vacant positions.

ii. Super Majority Vote

A Super Majority Vote is an RBC decision made by vote in favor of a proposed action by two-thirds or more of the Members (or their designated Alternate in the absence of the Member) present and voting at a meeting where a quorum exists. A Member who is present and either abstains or does not vote is not calculated in the vote tally. A Super Majority Vote will be required for the following decisions:

- Recommending SCDNR expel a Member from the RBC.
- Reinstatement of a previously expelled Member of the RBC.

3. River Basin Plan Approval Process

Approval of the Final River Basin Plan shall be reached in two steps. Step One will involve the Members indicating their level of consensus with a copy of the Draft River Basin Plan. In addition to including a draft of the plan, the Draft River Basin Plan also will document discussions and negotiations of the RBC, including items of agreement and disagreement, as well as potential items with stakeholder reservation and dissent. Step Two involves converting the concepts and content of the draft copy into a Final River Basin Plan that is acceptable to as many of the Members as possible. The status of consensus with each individual Member on the draft and final documents will be captured in the Draft and Final River Basin Plan. With this two-step procedure, the negotiating of the Final River Basin Plan is complete.

(a) Testing for Consensus on the Draft River Basin Plan

In measuring consensus on the Draft River Basin Plan, each Member will indicate his/her concurrence using a five-point scale. The scale allows Members to clearly communicate their intentions, assess the degree of agreement that exists, and register any dissatisfaction without holding up the rest of the Members. The five-point scale is as follows:

1. Full Endorsement (i.e., Member likes it).
2. Endorsement but with Minor Points of Contention (i.e., basically Member likes it).
3. Endorsement but with Major Points of Contention (i.e., Member can live with it).
4. Stand aside with Major Reservations (i.e., Member cannot live with it in its current state and can only support it if changes are made).
5. Withdraw - Member will not support the Draft River Basin Plan and will not continue working within the RBC's process. Member has decided to leave the RBC.

Ratings will only be considered by RBC Members. Alternates will not be allowed to participate in the River Basin Plan approval process. The Facilitator will typically conduct a roll call allowing each Member to rate the Draft River Basin Plan one at a time and acknowledging the Member's rating.

(b) Consequences of not Reaching Consensus on the Draft River Basin Plan

Any Member that rates the Draft River Basin Plan as a 4 or 5 must specify their Major Reservations or Dissension, respectively, in a written statement of 500 or fewer words for inclusion in the Draft River Basin Plan. Members who share the same basic concerns can use a single reservation or dissension statement of 500 of fewer words. Members rating the Draft River Basin Plan as a 4 or 5 will also identify themselves by name on their Major Reservation or Dissension Statements.

(c) Consensus on the Final River Basin Plan

For the Final River Basin Plan, the choice is either to support the Final River Basin Plan or not to support it. There are no levels of consensus for the Final River Basin Plan. Each Member who rated the Draft Framework (regardless of their level of consensus) will be given the opportunity to indicate their support or disagreement with the Final River Basin Plan by providing that input to the Facilitator. By indicating support, the Member would be acknowledging his/her concurrence with the Final River Basin Plan and their commitment to support implementation of the plan.

IX. SUBCOMMITTEES AND INTERBASIN RIVER COUNCILS

1. Subcommittees

(a) Establishment

The RBC may by motion establish short-term (ad hoc) or long-term subcommittees to address specific issues or to focus on specific geographic areas or water sources. Such subcommittees are intended to facilitate the development of a River Basin Plan or the completion of implementation objectives.

(b) Membership

Subcommittee membership will consist of Members and Advisors designated by the RBC. Once a subcommittee is established, the Chair, or Vice Chair, will call for volunteers from the RBC and solicit recommendations for Advisors from the RBC. Final appointments are the decision of the Chair or Vice Chair.

(c) Officers

Each subcommittee shall elect a Chair and Vice Chair. The Chair and Vice Chair shall be Members. If the subcommittee cannot reach a consensus on who to elect as subcommittee Chair and Vice Chair, this decision will be made by the RBC Chair. The subcommittee Chair will be responsible for scheduling meetings, setting agendas, preparing meeting summaries, and presenting subcommittee findings and recommendations to the RBC.

(d) Meetings

Subcommittee meetings are not subject to the guidelines for Regular Meetings in Section VII-3, and subcommittees may adopt their own procedural rules as long as such rules do not conflict with other RBC Bylaws or the Planning Framework. Subcommittees also may determine their own meeting schedule as long as such a schedule is not in conflict with the RBC meeting schedule. Though subcommittees may present recommendations to the RBC, final decisions are made by the entire RBC (subject to requirements in Section VIII).

2. Interbasin River Councils

(a) Establishment

To facilitate collaboration between two or more basins, RBCs may form Interbasin River Councils (IRCs). IRCs may be particularly useful when trying to resolve any conflicts between neighboring RBCs. If conflicts can be resolved within the framework of the IRC, the IRC will make recommendations to the full membership of its respective RBC for consensus. If conflicts among RBCs cannot be resolved within the framework of the IRCs, SCDNR will make attempts at mediating such issues. If SCDNR and the IRC cannot come to a resolution, the issue will remain unresolved and documented in the River Basin Plans.

(b) Membership

Each IRC will consist of Members from two or more of the RBCs, with no more than five Members from each RBC. Once an IRC is established, each Chair or Vice Chair for participating RBCs will call for volunteers, but final appointments are the decision of the Chair or Vice Chair for each respective RBC.

(c) Officers

Each IRC shall elect a Chair and Vice Chair. The Chair and Vice Chair shall not be Members of the same RBC. If the IRC cannot reach a consensus on who to elect as IRC Chair and Vice Chair, this decision will be made by SCDNR. The IRC Chair will be responsible for scheduling meetings, setting agendas, preparing meeting summaries, and presenting IRC findings and recommendations to the RBC.

(d) Meetings

IRCs should meet at least twice a year, or more frequently, if necessary. IRC meetings are not subject to the guidelines for Regular Meetings in Section VII-3, and IRCs may adopt their own procedural rules as long as such rules do not conflict with other RBC Bylaws or the Planning Framework. Though the IRCs may present recommendations to each participating RBC, final decisions are made by each RBC independently (subject to requirements in Section VIII).

X. FIVE-YEAR ASSESSMENT

At the end of the first five full calendar years after the RBC is formed and every five calendar years thereafter, the RBC, with assistance from the Facilitator, SCDNR staff, or the Coordinator, will prepare a brief written assessment of its accomplishments for the previous five years. The assessment will include evaluations on how efficient and effective the RBC has been in fulfilling its purposes as stated herein. The RBC may perform these assessments itself. However, it is preferred the Facilitator or Coordinator do the assessments to provide the most objective evaluation and feedback.

XI. BYLAWS ADOPTION AND AMENDMENTS

These Bylaws will be in full effect upon approval and adoption by the RBC. Bylaw adoption will require a Majority Vote.

These Bylaws may be amended by the Members pursuant to the decision requirements of these Bylaws provided at least ten days' written notice is given of intention to alter, amend, repeal, or adopt new bylaws at such meeting and such notice includes a copy of the proposed amendment. Amendments will require a Majority Vote and all amendments of these Bylaws require SCDNR approval.

APPENDIX A. ROLES AND RESPONSIBILITIES OF RIVER BASIN COUNCIL MEMBERS

[Excerpted from the *South Carolina State Water Planning Framework*, Section 3.3]

Each of South Carolina's eight designated river basins will have an RBC charged with developing, implementing, monitoring, and periodically revising a River Basin Plan for the surface and groundwater resources in its river basin. Plans will ensure those water resources can meet the projected needs throughout the identified Planning Horizon while protecting the ecological environment. The RBC will be supported in its work by staff from state and local agencies including SCDNR and SCDHEC, as well as contractors hired by SCDNR. Specific roles and responsibilities of the RBCs include the following:

Develop and Implement the River Basin Plan

- Describe the river basin planning area.
- Review population and water-demand projections provided by SCDNR for the river basin. RBCs are expected to utilize SCDNR's projections unless there is a clear justification to use alternate projections. Any alternate projections must be thoroughly vetted and approved by SCDNR before being used by the RBC.
- With assistance from SCDNR and technical contractors, utilize surface water and groundwater models to evaluate the ability of the basin's water resources to meet human and ecological needs throughout the Planning Horizon.
- Identify projected water shortages, stresses, or conflicts throughout the Planning Horizon, with an emphasis on the first 20 years.
- Seek input from Advisors as needed. Advisors are *individuals with specific expertise or information who may participate in Council discussions, typically on a regular basis, for the benefit of and at the pleasure of the Council; however, Advisors are not RBC members and will not vote in the RBC decision-making process*.
- Request the assistance of State-appointed Technical Advisory Committees (TACs) as described in Section 4.1.1 to assist with the review and interpretation of technical data and analyses.
- Form short-term (ad hoc) and/or long-term subcommittees as needed to address specific issues or to focus on specific geographic areas or water sources. Such committees may consist of RBC members and non-members (Advisors) including but not limited to representatives from state and federal agencies described in Section 3.4. However, final planning decisions are made by the RBC as a whole, and non-members do not have voting privileges.
- Establish and prioritize water management strategies to mitigate or eliminate any identified conflicts or water shortages, and estimate implementation costs and benefits.
- Evaluate the impacts of proposed water management strategies on the water resources of the basin.
- Identify needs for additional data and recommend mechanisms for obtaining additional information or resources to benefit future water planning efforts.

- Assist in the preparation of a written draft of the River Basin Plan for review by SCDNR, SCDHEC, other government agencies, the PPAC, stakeholders, and the public.
- Solicit comments on the draft River Basin Plan from all stakeholders and government agencies; respond to all comments; and incorporate comments, as appropriate, into the draft River Basin Plan to produce a final River Basin Plan.
- Deliver a final River Basin Plan to SCDNR that meets the published criteria by the date agreed upon.
- Once the final River Basin Plan has been approved by SCDNR, serve as its champion by promoting implementation of the plan's management strategies and monitoring progress toward the established goals outlined in the five-year Implementation Plan (Section 7).
- Update River Basin Plans every five years.
- Meet at least once a year between successive iterations of river basin planning to discuss progress on plan implementation and communicate any new water-related issues since the last River Basin Plan publication.
- Amend River Basin Plans if needed between successive five-year iterations.
- Fulfill responsibilities of any established subcommittees as part of the five-year Implementation Plan.

Communicate with Stakeholders

- Establish communication protocols to ensure compliance with State open-meeting laws.
- Create and conduct a stakeholder education and engagement process to ensure residents of the river basin and users of the basin's water resources have an opportunity to understand and comment on the development of the River Basin Plan.
- Communicate regularly with stakeholders both within and adjoining the river basin to maintain a current understanding of the RBC's activities, the River Basin Plan, and emerging issues that may require action by the RBC, stakeholders, or other entities.
- Coordinate with other RBCs, GMGs, and other formal planning groups in the basin as needed on shared water resources and related issues.
- Strive to resolve disputes among stakeholders and achieve consensus on the River Basin Plan as outlined in the RBC Bylaws.
- Identify and assume an effective communications role in managing water resources during periods of drought.
- Serve as a participant in a forum for regional learning and communication about important water-related issues.

Identify Recommendations for Policy, Legislative, Regulatory, or Process Changes

- Provide input to SCDNR, SCDHEC, and elected officials concerning river basin issues and recommend any policy, legislative, or regulatory changes that could effectively address those issues.
- At least once every five years, the RBC will assess its progress in meeting its stated goals and the effectiveness of communicating with stakeholders. The RBC also will recommend improvements to the RBC bylaws, work, or communications processes to significantly increase effectiveness or efficiency.