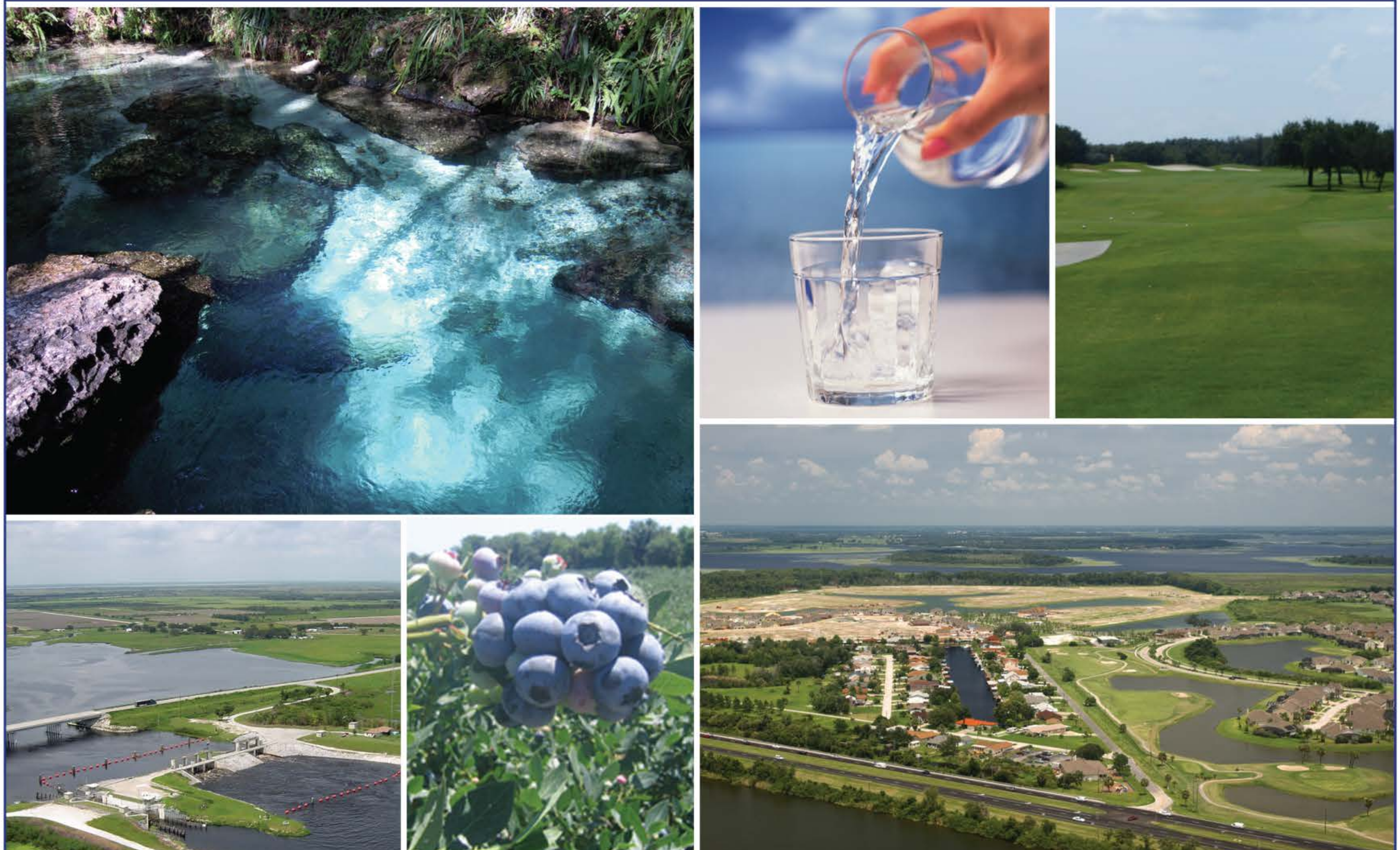
Central Florida Water Initiative

Solutions Strategies, Volume II



REGIONAL WATER SUPPLY PLAN: 2035 WATER RESOURCES PROTECTION AND WATER SUPPLY STRATEGIES

2015

A comprehensive plan for Orange, Osceola, Polk, Seminole, and southern Lake counties

This document is the Central Florida Water Initiative (CFWI) Regional Water Supply Plan (RWSP), Volume II, 2035 Water Resources Protection and Water Supply Strategies (Solutions Strategies) document. Staff from the South Florida Water Management District (SFWMD), St. Johns River Water Management District (SJRWMD), and Southwest Florida Water Management District (SWFWMD) worked together and in conjunction with members of various Central Florida Water Initiative technical teams and other stakeholders to generate this Solutions Strategies document. Section 373.709, Florida Statutes (F.S.), details the components of regional water supply plans.

In November 2015, the respective governing boards of the three water management districts approved the 2015 CFWI RWSP, Volumes I and II with their associated appendices. These documents are available at cfwiwater.com.

Preface

CENTRAL FLORIDA WATER INITIATIVE

In Florida, the water management districts develop regional water supply plans to identify sustainable water supply for all water uses while protecting water resources and related natural systems. Through the Central Florida Water Initiative (CFWI), three water management districts — the St. Johns River Water Management District, South Florida Water Management District, and Southwest Florida Water Management District — are working collaboratively with other agencies and stakeholders to implement effective water resource planning, including water resource and supply development and management strategies to protect, conserve, and restore our water resources. The CFWI Planning Area includes all of Orange, Osceola, Seminole, and Polk counties and southern Lake County. This effort used a unified process to address central Florida's current and long-term water supply needs. The guiding principles of the CFWI as contained in the CFWI Guiding Document are

- Identify the sustainable quantities of traditional groundwater sources available for water supplies that can be used without causing unacceptable harm to the water resources and associated natural systems.
- Develop strategies to meet water demands that are in excess of the sustainable yield of existing traditional groundwater sources. Strategies include optimizing the use of existing groundwater sources, implementing demand management, and identifying alternative water supplies that can be permitted and will be implemented as demands approach the sustainable yield of existing sources.
- Establish consistent rules and regulations for the three water management districts that meet their collective goals, and implement the results of the Central Florida Water Initiative.

The goals of the CFWI, also contained in the CFWI Guiding Document, are one model, one uniform definition of harm, one reference condition, one process for permit reviews, one consistent process, where appropriate, to set MFLs and reservations, and one coordinated regional water supply plan, including any needed recovery and prevention strategies.

The work of the CFWI is captured in a series of documents that makeup the Regional Water Supply Plan. The following table summarizes the main types of information found in each document of the CFWI RWSP. Each of these documents is available from www.cfwiwater.com.

CFWI RWSP: Summary of Volume Contents

Volume I Regional Water Supply Plan (CFWI 2015b)	Volume IA Regional Water Supply Plan Appendices to Volume I (CFWI 2015c)	Volume II Regional Water Supply Plan: 2035 Water Resources Protection and Water Supply Strategies Plan (CFWI 2015d)	Volume IIA Regional Water Supply Plan Appendices to Volume II (CFWI 2015e)
• Introduction • Population and Water Demands • Resource Protection and Assessment Criteria • Evaluation of Water Resources • Water Conservation • Water Source Options • Water Supply Development • Water Resource Development • Funding for Water Supply and Water Resource Development Projects • Conclusion • Recommendations/Future Direction	• Appendix A: Population and Water Demand Estimates • Appendix B: Proposed MFLs for Evaluating Groundwater Availability • Appendix C: Overview and Use of the ECFT Groundwater Model • Appendix C-I: Evaluation of Water Quality Degradation Potential in the CFWI Planning Area • Appendix D: Agricultural Best Management Practices (BMPs) • Appendix E: Reclaimed Water Use Inventory • Appendix F: Water Supply Project Options	• Introduction • Water Conservation • Solutions Strategies Projects • Solutions Strategies Environmental Evaluation • Regulatory • Financial Assessment • Conclusions and Implementation Strategies	• Appendix A: Conservation Projects, BMPs, and Programs • Appendix B: Cost Estimating Tool • Appendix C: Solutions Strategies Projects • Appendix D: Updated CFWI Water Supply Project Options • Appendix E: Solutions Strategies Modeling • Appendix F: Solutions Strategies Environmental Evaluations • Appendix G: Regulatory

These CFWI RWSP volumes were available for public review and comment from May 8 through August 17, 2015. A series of public meetings and workshops were also conducted during this period. Comments from the public and other stakeholders were received through a variety of forums including online through the web portal, by mail, at public meetings and workshops, or via email. These comments were compiled along with responses in the CFWI RWSP Comments and Responses Document (CFWI 2015f), including any resulting changes made to the documents.

Acknowledgements

The Central Florida Water Initiative recognizes and thanks the utilities, state agencies, agribusinesses, environmental interest groups, and other stakeholders for their participation, contributions, comments, advice, information, and assistance throughout the development of the CFWI Regional Water Supply Plan (2010-2035).

Furthermore, the St. Johns River, the South Florida, and the Southwest Florida water management districts express their appreciation to all staff who contributed to the development and production of this collaborative regional plan.

For further information about this document, please visit cfwiwater.com.

November 2015 Final

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Executive Summary

This Central Florida Water Initiative (CFWI) 2035 Water Resources Protection and Water Supply Strategies document (Solutions Strategies) addresses future steps toward meeting the water supply needs of the CFWI Planning Area. This Solutions Strategies document together with its appendices completes the CFWI Regional Water Supply Plan (RWSP). In May 2014, the governing boards of the St. Johns River Water Management District (SJRWMD), South Florida Water Management District (SFWMD), and Southwest Florida Water Management District (SWFWMD) (Districts) acknowledged delivery of the 2014 Final Draft CFWI RWSP (Volume I). The governing boards of the three Districts chose to delay final agency action on the CFWI RWSP until the completion of the CFWI Solutions Planning Phase and Solutions Strategies and any resulting changes or refinements to the CFWI RWSP.

The CFWI RWSP including the Solutions Strategies, was jointly developed by the Districts in coordination with the Florida Department of Environmental Protection (FDEP), the Florida Department of Agricultural and Consumer Services (FDACS), water utilities and other stakeholders. These documents identify programs, projects and strategies to ensure that adequate and sustainable water supplies are available to meet future water supply needs while protecting the environment and water resources. The CFWI Planning effort was based on a planning horizon extending through 2035 and identifies water conservation measures, water supply development project options, and water resource development project options.

The CFWI Planning Area is located in central Florida and consists of all of Orange, Osceola, Seminole, and Polk counties and southern Lake County. The planning area was based predominantly on the public supply utility service areas in the central Florida region where the boundaries of the three water management districts converge (Volume II, Figure 1). Public supply constitutes the largest water use in the region. The CFWI Planning Area is currently home to approximately 2.7 million people and supports a large tourist industry, significant agricultural industry, and a growing industrial and commercial sector. This region's population is expected to increase by 49 percent to more than 4.1 million by 2035. Average total water use is projected to increase from approximately 800 million gallons per day (mgd) to about 1,100 mgd in 2035. Based on the CFWI RWSP work, it was estimated that approximately 50 mgd of additional, traditional groundwater could be available for water supply on a regional basis through the implementation of local management activities (e.g., wellfield optimization, aquifer recharge, and augmentation) to avoid or mitigate impacts to the region's water resources. Based on the 2035 demands, the resulting deficit is approximately 250 mgd. Additional groundwater may be available, but environmental constraints and economic realities, along with regionally appropriate management and operational controls including additional mitigation, will need to be carefully considered as part of implementing additional groundwater development.

Minimum flows and levels (MFLs) have been established for 46 water bodies in the CFWI Planning Area. All of these water bodies are located in the SJRWMD and SWFWMD portions of the CFWI Planning Area. In addition, there are more than 150,000 acres of non-MFL lakes and wetlands within the CFWI Planning Area. The status assessment of MFLs as part of the CFWI RWSP identified 10 water bodies within the CFWI Planning Area that are currently below their established MFLs and an additional 15 water bodies that are projected to fall below their established MFLs within the planning horizon if projected demands were to come from traditional sources. In addition, the Southern Water Use Caution Area (SWUCA) Saltwater Intrusion Minimum Aquifer Level (SWIMAL) is not currently being met and water levels in regulatory monitoring wells in the Lake Wales Ridge area associated with the SWUCA Recovery Strategy are projected to not be met by 2035. Although this SWUCA SWIMAL is not located directly within the CFWI Planning Area, groundwater withdrawals from the southwestern portion of the CFWI can adversely impact the ability of the SWFWMD to meet this level.

The Solutions Planning Phase efforts support the CFWI RWSP (**Volume I**) conclusion that development of traditional water sources is near, has already reached, or in some areas, has exceeded the sustainable limits, and that alternative and nontraditional water sources will need to be developed to meet the projected needs while not impacting water resources and natural systems (**Volume I**, **Chapter 4**). Traditional groundwater resources alone cannot meet future water demands, or currently permitted allocations, without resulting in unacceptable impacts to water resources and related natural systems. Primary areas that appear to be more susceptible to the effects of groundwater withdrawals include the Wekiwa Springs/Wekiva River System, western Seminole County, western Orange County, southern Lake County, the Lake Wales Ridge, and the Upper Peace River Basin due to low confinement between the surficial aquifer system and the underlying Upper Floridan aquifer. Cumulative effects from withdrawals throughout much of the CFWI Planning Area can impact these areas, not just those withdrawals located within these susceptible areas. The evaluations also indicated that expansion of withdrawals associated with projected demands through 2035 will increase the amount and areal extent of water resource stress within the CFWI Planning Area.

The sustainable limits of groundwater withdrawals are used by the Districts for planning purposes only and should not be viewed as regulatory constraints for specific consumptive use permits. Consumptive use permitting decisions are made with additional information that is more site-specific and which may consider opportunities for water resource development, management strategies, and mitigation of impacts.

SOLUTIONS PLANNING PHASE

The Solutions Planning Phase was established to further the planning results completed in the CFWI RWSP (**Volume I**) effort to address future water supply needs of the region by developing alternatives to meet the water supply needs by optimizing the use of existing groundwater, and by identifying viable water conservation and other management strategies, viable alternative or nontraditional water supplies, areas that may require recovery or resource protection, and areas where regulatory and water resource protection strategy consistency may be needed. The estimated 850 mgd total water use condition was used as a starting point or Baseline Condition for the Solutions Planning Phase, which evaluated water conservation options, water supply project options, and conceptual management strategies to meet the estimated 250 mgd future deficit.

Water Conservation

Water conservation by all water use categories will continue to be a priority to meet the region's future water needs. While significant conservation efforts have been implemented in the CFWI Planning Area, additional conservation is critical. Initial evaluations estimated an additional 42 mgd could be saved with increased conservation efforts. During the Solutions Strategies phase, potential water savings through the implementation of public supply and agricultural best management practices was further evaluated; the water savings estimate was revised to meet or exceed 37 mgd in order to reflect current levels of agricultural conservation. Of this, approximately 76 percent could be conserved by public supply utilities, 12 percent by other self-supplied users, and 12 percent by agricultural operations. Additional savings could be possible through higher participation rates of best management practices or the implementation of other conservation measures.

Achieving long-term water use reductions will require a combination of advanced technologies, best management practices, and behavioral changes. Education, outreach, and public engagement are essential for accomplishing a measurable change in water conservation and instilling a lasting conservation ethic in central Florida. Targeted education and public information provide opportunities for building a conservation culture, a stewardship ethic, and permanently reducing individual, agricultural, industrial, and commercial water use. Establishing statewide clearinghouses for Public Supply and Agriculture are recommended to serve as a repository for conservation data, publications, and planning tools.

As part of the "Next Steps" it is anticipated that efforts will focus on evaluating options to accelerate and increase the implementation of conservation measures in the CFWI Planning Area.

Projects

Project-type specific criteria were established to guide the selection of water supply project options for assessment in the Solutions Planning Phase. The criteria focused on project capacity, projects that are multi-jurisdictional, and those project options that encourage regional interconnections and maximize economies of scale. The project capacity criteria used for each project type are:

- Groundwater - 5 mgd or greater
- Surface Water - 10 mgd or greater

- Stormwater - 1 mgd or greater
- Reclaimed Water - 1 mgd or greater

Sixteen regional, multi-jurisdictional water supply project options were evaluated during the Solutions Planning Phase. Most of these were previously identified in the CFWI RWSP, but also included projects conceptualized during the Solutions Planning Phase. Relevant project information needed to further develop specific water supply projects through partnerships with water users was compiled, including project cost estimates, potential sources of water, feasibility and permitability analysis, and identification of governance structure options. The water supply project options evaluated included three Lower Floridan aquifer groundwater, five surface water, five reclaimed water, and three stormwater projects. The 16 water supply project options are estimated to potentially produce up to 256 mgd of finished water and potentially up to an additional 122 mgd in raw surface water.

Overall, 8 new water supply project options were identified during the Solutions Planning Phase increasing the potential water supply project options from 142 in the CFWI RWSP to 150. The updated list includes 37 brackish/nontraditional water, 87 reclaimed water, 17 surface water, 6 stormwater, and 3 management strategies project options. Cumulatively, the 150 water supply project options could potentially provide more than 334 mgd of additional finished water supply or water resource benefit, exceeding the estimated 250 mgd deficit. The purpose of identifying project options that exceed the estimated 250 mgd deficit is to provide the users with options, giving them maximum latitude to select projects that meet a host of economic, water supply, and environmental benefits criteria.

Assessment

The East Central Florida Transient groundwater model served as a tool to simulate groundwater conditions to evaluate the effects of proposed groundwater projects and associated water use changes as well as conceptual management options for the area's water resources. During the Solutions Planning Phase, a series of updates were implemented to the East Central Florida Transient groundwater model to incorporate new information or improve model estimates. Changes included updates to specific water uses, and modifications to improve the representation of agricultural reuse, rapid infiltration basins, agricultural irrigation, and residential landscape irrigation. These changes were applied to the CFWI RWSP 2005 Reference Condition and 2015 withdrawal scenarios. In the Solutions Planning Phase, these updated scenarios are referred to as the Updated 2005 Reference Condition and the Baseline Condition, respectively.

In the Solutions Planning Phase, water supply project options and conceptual management options were selected for evaluation based on their ability to directly affect the groundwater system. Results could be quantified using the East Central Florida Transient groundwater model and evaluated against MFL constraints and considerations, as well as statistical and GIS-based analysis for non-MFL wetlands. This is the same approach used to evaluate future water needs as part of the CFWI RWSP.

The assessment of potential effects of groundwater withdrawals on environmental features was largely focused on changes in water levels in the surficial aquifer system and upper Floridan Aquifer, as well as on changes in spring flows. Modeling scenarios consisted of permitted and proposed groundwater project options, focusing on the lower Floridan Aquifer. Other scenarios were conceptual in nature, generally simulating management options intended to minimize environmental impacts. All of the scenarios were evaluated for impacts to isolated non-MFL wetlands, as well as MFL constraints and considerations. The assessment identified

- Brackish/nontraditional groundwater project options from the lower Floridan Aquifer have the potential to meet some of the future needs. While these projects have some impact to water resource constraints and considerations, the impact would not be as great as meeting future needs through traditional groundwater sources. These simulations shifted a portion of the 2035 demand from the upper to the lower Floridan Aquifer.
- A conceptual new lower Floridan Aquifer Centralized Wellfield (62.5 mgd withdrawal capacity; 50 mgd of finished water capacity) could be strategically located away from the areas susceptible to impacts such that there is little or no change in stressed non-MFL isolated wetlands acres, and no change in MFL considerations or constraints relative to the Baseline Condition.
- A conceptual shifting of withdrawals of 50 mgd away from the susceptible areas could potentially result in approximately 1,400 fewer acres of stressed non-MFL isolated wetlands and the potential for reduced MFL constraint and consideration exceedances.
- A conceptual targeted recharge of 28 mgd at locations adjacent to specific MFL water bodies could have a positive result on the potential impacts of traditional groundwater withdrawals. Predicted increases in surficial aquifer system groundwater levels of up to 10 feet, and increases in upper Floridan Aquifer potentiometric surface levels of 5 to 10 feet, occur in the immediate vicinity of the MFL water bodies where simulated recharge is applied in the model. This potentially results in approximately 2,500 fewer acres of stressed non-MFL isolated wetlands.

Groundwater

Brackish/nontraditional groundwater project options have the potential to meet some of the future demand while reducing the impact to water resource constraints when compared to the use of traditional groundwater sources. The brackish/nontraditional projects evaluated as alternative water supply sources were all lower Floridan Aquifer projects, some of which are known to be in areas of brackish groundwater. For long-term management of the withdrawals, it will be necessary to expand current data collection and testing to ensure these quantities can be developed in a manner that minimizes environmental impacts and changes in aquifer water quality.

Reclaimed Water

Reclaimed water use is a key component of water resource management in central Florida. Wastewater management has transitioned from a means of simple disposal to uses that are recognized as a viable alternative water supply needing to be managed and used appropriately. Currently, over 178 mgd of the treated wastewater in the region is beneficially reused. The beneficial use of reclaimed water for irrigation has provided a means for reducing groundwater use. Going forward, it is recommended an integrated approach between wastewater management and water supply continues to be implemented that maintains historically high levels of reuse and maximizes reclaimed water benefits, including consideration and study of potable reuse.

Surface Water

Despite the abundance of surface water features in the region, a relatively small amount is currently withdrawn for public supply or other uses. Lakes, rivers, and creeks in the CFWI Planning Area support significant ecological resources, which must be protected from harmful impacts of any proposed withdrawals or capture of flows from these systems. Such surface water projects would need to obtain, among other permits, a consumptive use permit prior to the withdrawal of water. Before such a permit could be issued, all details of the project's design and operation would be prepared by a permit applicant and submitted for review in a permit application. The application would then be reviewed for consistency with all of the consumptive use permitting criteria applicable to the project, including established MFLs and other environmental protection criteria. The surface water project options have the potential to supply up to 144 mgd of alternative water supply to the CFWI Planning Area. Capturing flows from these surface water bodies for water supply, particularly to support conjunctive use projects, may be effective but can be expected to have varying levels of reliability, depending on available storage alternatives and climatic conditions.

Among the five surface water projects discussed in the Solutions Strategies document are three projects that utilize the St. Johns River. These projects are the St. Johns River/Taylor Creek Reservoir, the St. Johns River near SR 46 and the St. Johns River near Yankee Lake. In 2012 SJRWMD published the results of a four-year Water Supply Impact Study, which provided a comprehensive and scientifically rigorous analysis of the potential environmental effects to the St. Johns River associated with annual average surface water withdrawals of 155 mgd from the middle and upper St. Johns River. The Water Supply Impact Study, which was peer-reviewed by the National Research Council, confirms the findings of earlier investigations indicating that the St. Johns River can be used as an alternative water supply source with minimal to negligible environmental effects. The Water Supply Impact Study identified alternative water supplies that protect both groundwater and surface water resources and included the development of tools to help guide future decision-making regarding the increased use of surface water from the St. Johns River (SJRWMD 2012).

Based on the demand projections and water supply project options included within the plan it is not envisioned that all three river projects would need to be implemented during the 20-year planning horizon. The more likely scenario is that, at most, two of the three river projects would be constructed. Furthermore, the river projects will likely not be needed until the end of the planning horizon.

Stormwater

Stormwater is normally captured and/or conveyed by maintained ponds, swales, or similar features for water quality treatment or flood control. Capturing available stormwater for water supply, particularly to support conjunctive use projects, may be effective but can be expected to have varying levels of reliability, depending on storage and climatic conditions. Further analysis of stormwater use should be conducted to ensure that hydrologic and ecological functions of lakes and downstream environmental needs are maintained when attempting to identify potentially available quantities.

Governance Structure Options

To support and coordinate future implementation of strategies and initiatives in the CFWI Planning Area, it is recommended that potential institutional framework options be identified and evaluated to assist the Districts' Governing Boards in implementing their responsibilities in water supply planning and water use permitting responsibilities. Implementation of this plan, including major water supply project options, relies on the continued collaboration of responsible entities and appropriate agencies. The ability to proceed requires effective governance and support among the existing water supply agencies and local governments with regulatory and financial support from regional and state agencies.

Implementation Costs and Funding

Project costs were estimated, potential cost scenarios were identified, and strategies that address data collection needs and environmental recovery projects were developed to provide a balanced approach for a sustainable water supply. Cost scenarios represent implementation of a combination of evaluated projects, programs, and initiatives to better understand the water resources, conservation, and best management practices to reduce groundwater use. One scenario could produce about 225 mgd of finished water and an additional 122 mgd of raw water from alternative and nontraditional water sources, at a total projected cost of approximately $2.8 billion over a 20-year period. With this scenario, Conservation initiatives are estimated to cost $170 million (6% of the plan), Environmental Recovery $50 million (2% of the plan), Research and Investigations $42.9 million (2% of the plan) and $2,512.6 million (90% of the plan) is estimated for alternative water supply projects (**Chapter 6**). These costs are conceptual and will need to be refined for individual projects as they are further developed. In addition, the implementation of environmental recovery projects as well as other alternative water supply projects in the Solutions Strategies (**Volume IIA**, **Appendix D**) could address any remaining estimated future deficit.

Funding for the development of alternative water supplies, based on the provisions of Section 373.705 (1), F.S., is the primary responsibility of water suppliers and users. The state of Florida and the Districts may provide funding assistance, dependent on annual allocation in State and District budgets. The Water Protection and Sustainability Program, established in 2005 by the Florida Legislature, provides a framework for state and water management district cost-share assistance for construction of selected alternative water supply projects. Funding for the development of water resource development projects is primarily the responsibility of the Districts, with funding assistance from water supply entities.

Reporting

This CFWI RWSP should be updated no later than five years from the date of approval. If warranted, more frequent updates or amendments to the CFWI RWSP could be considered to address any fundamental developments including refinement of major project options or regulatory criteria.

To monitor progress, it is recommended that annual status reporting be developed by FDEP and the Districts. Annual reporting may include progress on implementation strategies, modeling, permitting, and refinements to monitoring and data collection needs.

CONCLUSION AND SUMMARY OF KEY FINDINGS

The Solutions Planning Phase efforts support the CFWI RWSP conclusion that development of traditional water sources is near, has already reached, or in some areas, has exceeded the sustainable limits, and that alternative and nontraditional water sources will need to be developed to meet the projected needs while not impacting water resources and natural systems (**Volume I**, **Chapter 4**). The Solutions Planning Phase has identified sufficient project options for the development of water supplies to meet the region's needs through 2035. A total of 150 water supply project options were identified through the CFWI RWSP (142) and the Solutions Strategies (8) phases (**Volume IIA**, **Appendix D**).

CFWI key findings

- Water conservation is an important element in meeting future water needs. During the Solutions Strategies phase, potential water savings through the implementation of public supply and agricultural best management practices was further evaluated; the water savings estimate was revised to meet or exceed 37 mgd in order to reflect current levels of agricultural conservation (**Volume II**, **Chapter 2**). Of this 37 mgd, it was estimated that 76 percent could be conserved by public supply utilities, 12 percent by other self-supply users, and 12 percent by agricultural operations.

Additional savings could be possible through higher participation rates of best management practices or implementation of other conservation measures.

- Sixteen regional, multi-jurisdictional alternative water supply project options were evaluated during the Solutions Planning Phase (**Volume II**, **Chapter 3**). These projects could potentially provide up to 256 mgd of additional water supply, exceeding the 250 mgd estimated future deficit. Water supply project options evaluated included three lower Floridan Aquifer groundwater, five reclaimed water, five surface water, and three stormwater projects.
- There are sufficient water supply project options for the development of water supplies to meet the regions' needs through 2035. Projects included in this CFWI RWSP are options from which local governments, utilities, and others may choose. There is no legal requirement for these project options to be implemented. Current permits and laws limit the scope of regulatory actions that can be taken to impose specific solutions on users. A total of 150 water supply project options were identified through the CFWI RWSP (142) and the Solutions Strategies (8) phases (**Volume IIA, Appendix D)**. The total water supply project options list includes the 16 regional multi-jurisdictional water supply project options evaluated in the Solutions Planning Phase. Cumulatively, the 150 water supply project options could potentially provide more than 334 mgd of additional finished water supply or water resource benefit, exceeding the estimated 250 mgd future deficit. An additional 122 mgd of raw water may be available as well. However, some of these projects are still conceptual and will require further evaluation prior to implementation. It is the intent of the RWSPs to identify more options than are needed; therefore, it is anticipated that not all proposed projects will be constructed.
- Conceptual management strategies evaluated during the Solutions Planning Phase can be developed into specific projects and strategies to address protection and recovery of the regions environmental systems. The results of this evaluation and future plans provide information needed to manage existing withdrawals and to develop new water supply options or other mitigation strategies (**Volume II**, **Chapter 4**). Implementation of these strategies will continue to provide for the protection and recovery of the water resources.
- Stakeholder engagement has and will continue to be an important component of the extensive outreach efforts associated with the development of the CFWI RWSP. The Solutions Planning Phase effort informed and gathered input from key stakeholders from the public and business community across central Florida to ensure the Solutions Strategies document reflects the issues and concerns of the region (**Volume I**, **Chapter 1**).
- Project costs were estimated, potential cost scenarios were identified, and strategies that address data collection needs and environmental recovery projects were developed to provide a balanced approach for a sustainable water supply. Approximately 225 mgd of finished water and an additional 122 mgd of raw water from alternative and nontraditional water sources is estimated to cost $2.8 billion for four main categories -- Conservation, Environmental Recovery, Research and Investigations, and Alternative Water Supply (**Volume II**, **Chapter 6**). These

projects represent one possibility of how to meet most of the needs of the CFWI Planning Area. The implementation of environmental recovery projects as well as other alternative water supply projects in the Solutions Strategies document (**Volume IIA**, **Appendix D**) could address any remaining deficit.

- The development and establishment of consistent rules and regulations for the Districts will be required to meet the CFWI collaborative process goals and implement the results of the CFWI Planning effort (**Volume II**, **Chapter 5**).
- Implementing the results of the CFWI Planning effort is critical to the long-term sustainability of the region's water supplies (**Volume II**, **Chapter 7**).

NEXT STEPS

The Steering Committee identified eight "Next Steps" that are critical to achieve water resource sustainability in the CFWI Planning Area. The successful implementation of these "Next Steps" will require the continued commitment and collaboration by the Districts and stakeholders to initiate and achieve the key findings and recommendations of the CFWI RWSP (see **Volume I**, **Chapter 11** and **Volume II**, **Chapter 7** for more detail). The following actions will guide future water supply solutions and will help ensure that future water needs are met without resulting in unacceptable impacts to water resources and related natural systems.

Recommended actions for implementing the results of the CFWI Planning effort include the following steps:

- **Implement Water Conservation Programs**

  Effective water conservation programs rely on the participation of local governments, residents, the agricultural community, and other users. Comprehensive conservation programs should be developed that include voluntary and incentive-based initiatives, research, education and outreach initiatives, and regulatory initiatives to achieve savings including prioritization of allocated funding to meet or exceed the estimated CFWI RWSP conservation savings.

  These conservation programs should support participation at local, regional (CFWI Planning Area), and State levels. These programs could identify and secure funding, develop and implement comprehensive public education and outreach programs, identify and evaluate statewide clearinghouse options for public supply and agriculture, and work to enact water-conserving building codes. Other programs could develop consistent year-round irrigation rules, expand use of SMART irrigation controllers and soil moisture sensors, increase water use irrigation evaluations, expand cost-share programs for agricultural conservation, and support licensing of irrigation professionals.

- **Develop Specific Prevention and Recovery Strategies**

  Prevention and recovery strategies are critical to the protection and recovery of natural systems. Districts should promptly complete MFL prevention and recovery strategies and continue to monitor, study, and evaluate non-MFL water bodies. As evaluations of stressed and threatened wetland systems are completed, management strategies and projects could be identified and implemented to mitigate for stressed and threatened wetland systems. District Governing Boards should consider using CFWI identified water supply project options and management strategies and support continued coordination among all appropriate stakeholders to achieve resource recovery and protection.

- **Support Development and Implementation of Regional Project Solutions**

  Regional project solutions should maximize sustainable yields, while minimizing impacts. Proposed groundwater actions should include continuing to monitor, study, and evaluate the Upper and Lower Floridan aquifers for maximum sustainable yields. Regional analysis should continue to explore appropriate uses and users for reclaimed water, including the use of reclaimed water for natural system enhancement and recharge and indirect and direct potable reuse.

  The opportunities for additional surface water storage, while continuing to ensure the environmental needs of surface water bodies are met, should continue to be explored. Stormwater projects should continue to be investigated for opportunities to provide natural system enhancement and recharge; optimize potential beneficial use of stormwater by evaluating existing drainage; and encourage coordination of watershed planning, water supply, water quality, natural systems restoration, and flood protection initiatives.

- **Support Additional Alternative Water Supply (AWS) Projects**

  The Solutions Planning Phase focused on 16 regional, multi-jurisdictional projects options from the 150 water supply project options identified in the CFWI RWSP (**Volume IIA, Appendix D**). These 150 water supply project options have the potential to generate significant water to meet future needs.

- **Improve Water Resource Assessment Tools and Supporting Data**

  The East Central Florida Transient Model was used to simulate water withdrawals. Although the model was sufficient for this task, recommended model updates to support future modeling efforts will reduce model run times and improve modeling efficiency and accuracy. Some of the recommended model updates include expanding the model boundaries to incorporate the actual hydrologic boundaries and areas outside the CFWI Planning Area that could influence water levels within the area. Incorporating additional hydrologic and geohydrologic data, and more recent land use information will improve model accuracy. Implementation of the Data Management and Information Team's Five-Year Work Plan is necessary to collect critical hydrologic and environmental data for the region.

- **Develop Options for Consistent Rules and Regulations**

  With the Solutions Planning Phase substantially complete, the Regulatory Team will continue to work on developing consistent rules and regulations that meet CFWI collaborative process goals and implement the results of the CFWI. Some proposals for consideration include matching the CFWI program's approach and regulatory tools to the problem; establishing performance measures and timetables; defining the role of regulation in achieving sustainability of water resources; implementing adaptive management; defining existing legal uses; appropriately apportioning regulatory components of prevention and recovery among existing legal uses; and providing options for all projected reasonable-beneficial uses of water.

- **Continued Communication and Outreach**

  CFWI is a collaborative process that depends on the active engagement and participation of the stakeholders. Communications will continue to be critical to keep all stakeholders informed and engaged as programs and projects develop.

- **Identify Options for Future CFWI Framework to Support Implementation Strategies**

  Implementation of this plan relies on the continued collaboration among the responsible entities and appropriate agencies. Recommendations include evaluating potential institutional framework options to support and coordinate strategy implementation; annual reporting on the status of the projects and actions; and conducting a 5-year assessment and update of the 2015 CFWI RWSP.

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Acronyms and Abbreviations

AADF	average annual daily flow
ADF	average daily flow
AFSIRS	Agricultural Field Scale Irrigation Requirements Simulation
AGMOD	Agricultural Water Use Model
AMI	advanced metering infrastructure
AMR	automatic meter reading
ASR	aquifer storage and recovery
AWE	Alliance for Water Efficiency
AWS	alternative water supply
BCWU	base condition water use
BMPs	best management practices
CE Tool	Cost Estimating Tool
CFCA	Central Florida Coordination Area
cfs	cubic feet per second
CFWI	Central Florida Water Initiative
CII	commercial/industrial/institutional
CUP	consumptive use permit
DMIT	Data, Monitoring, and Investigations Team
DPR	direct potable reuse
DSS	domestic self-supply
DWM	dispersed water management
DWSP	District Water Supply Plan
EAC	equivalent annual cost
ECFT	East Central Florida Transient Groundwater Model

EDR	electrodialysis reversal
EEST	Environmental Evaluation Subteam
ELU	existing legal user
EMT	Environmental Measures Team
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
ET	evapotranspiration
F.A.C.	Florida Administrative Code
FARMS	Facilitating Agricultural Resource Management Systems
FAS	Floridan aquifer system
FAWN	Florida Automated Weather Network
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FFL	Florida-Friendly Landscaping Program™
FGUA	Florida Government Utility Authority
F.S.	Florida Statute
FWS	Florida Water Star℠
FY	Fiscal Year
GAT	Groundwater Availability Team
GIS	Geographic Information System
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
HAT	Hydrologic Analysis Team
IFAS	Institute of Food and Agricultural Services

IPR	indirect potable reuse
kgal	1,000 gallons
LEC	Lower East Coast
LEED	Leadership in Energy and Environmental Design
LFA	Lower Floridan aquifer
LRA	landscape/recreational/aesthetic
MAC	minimal aquifer connection
MAL	minimum aquifer level
MALPZ	Minimum Aquifer Level Protection Zone
MD	mining dewatering
MDF	maximum daily flow
MFL	Minimum Flow and Level
MFLT	Minimum Flows and Levels Team
MG	million gallons
mg/L	milligrams per liter
mgd	million gallons per day
MIA	Most Impacted Area
MIL	mobile irrigation laboratory
MODFLOW	Modular Three-Dimensional Finite-Difference Ground-Water Flow Model
MOR	Monthly Operating Report
MOU	Memorandum of Understanding
ND	Not determined
NRCS	Natural Resource Conservation Service
O&M	operation and maintenance
OAWP	Office of Agricultural Water Policy
OCU	Orange County Utilities

OPC	opinion of probable cost
OSS	other self-supply – combines DSS, LRA, CII, and PG
OUC	Orlando Utility Commission
PCU	Polk County Utilities
PD&E	preliminary design and engineering
PG	power generation
PS	public supply
R-B use	Reasonable-beneficial use
RCID	Reedy Creek Improvement District
Res	residential
RIB	Rapid Infiltration Basin
RO	reverse osmosis
ROW	right-of-way
RT	Regulatory Team
RWSP	Regional Water Supply Plan
RWST	reclaimed water subteam
SAS	Surficial aquifer system
SFWMD	South Florida Water Management District
SHA	significantly hydrologically altered
SJRWMD	St. Johns River Water Management District
SMS	soil moisture sensor
SPT	Solutions Planning Team
SSI	self-supplied irrigation
STA	stormwater treatment area
SWCD	Soil and Water Conservation District
SWFWMD	Southwest Florida Water Management District

SWIMAL	Saltwater Intrusion Minimum Aquifer Level
SWUCA	Southern Water Use Caution Area
SWWTP	TWA Southwest Water Treatment Plant
TBW	Tampa Bay Water
TDS	total dissolved solids
TWA	Tohopekaliga Water Authority
UF	University of Florida
UFA	Upper Floridan aquifer
UPC	unit production cost
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
Water CHAMP℠	Water Conservation Hotel and Motel Program
WaterSense®	USEPA WaterSense® water conservation program
WCCF	Water Cooperative of Central Florida
WPSP	Water Protection and Sustainability Program
WRAP	Water Restoration Action Plan
WRD	Water Resource Development
WRF	water reclamation facility
WSIS	Water Supply Impact Study
WSPO	water supply project option
WTP	water treatment plant
WUP	water use permit

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Introduction

This Central Florida Water Initiative (CFWI) 2035 Water Resources Protection and Water Supply Strategies Plan (Solutions Strategies) addresses future steps toward meeting the water supply needs of the CFWI Planning Area. This Solutions Strategies document, in combination with the updated CFWI Regional Water Supply Plan (RWSP) and associated Appendices, make up the 2015 CFWI RWSP. In May 2014, the governing boards of the South Florida, St. Johns River, and Southwest Florida water management districts (Districts) acknowledged delivery of the 2014 Final Draft CFWI RWSP (CFWI RWSP), delaying final agency action on the CFWI RWSP until the completion of the Solutions Strategies and any resulting changes or refinements to the CFWI RWSP.

The CFWI Planning Area is located in central Florida and consists of all of Orange, Osceola, Seminole, and Polk counties and southern Lake County (**Figure 1**). This region's population is expected to increase from approximately 2.7 million in 2010 to more than 4.1 million by 2035, a 49 percent increase. The CFWI RWSP concluded traditional groundwater resources alone cannot meet future water demands, or currently permitted allocations, without resulting in unacceptable impacts to water resources and related natural systems. Average total water use in the CFWI Planning Area is projected to increase from approximately 800 million gallons per day (mgd) to about 1,100 mgd in 2035. Based on the CFWI RWSP work, it was estimated that approximately 50 mgd of additional traditional groundwater could be available for water supply on a regional basis, through the implementation of local management activities (e.g., wellfield optimization, aquifer recharge, and augmentation) to avoid or mitigate impacts to the region's water resources. Based on the 2035 demands, the resulting future deficit is approximately 250 mgd. The CFWI RWSP identified potential water supply development project options that could meet or exceed estimated future water supply needs through the planning horizon. Additional groundwater may be available but environmental constraints, along with regionally appropriate management and operational controls (e.g., additional mitigation) will need to be carefully considered. Therefore, even with the implementation of demand-reduction strategies, alternative and nontraditional sources of water will need to be developed to meet a portion of the total projected regional water supply demands.

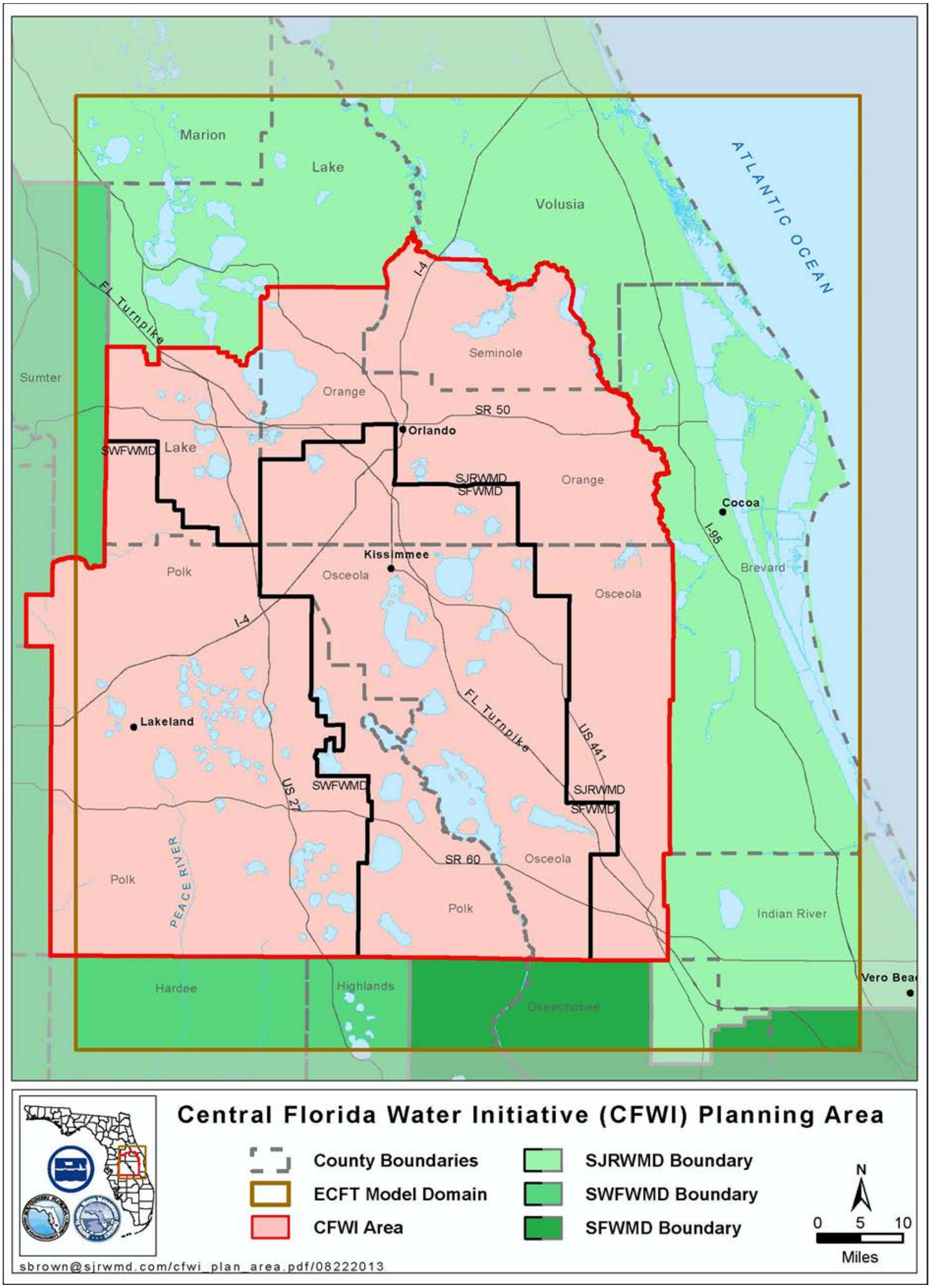

Figure 1. Map of Central Florida Water Initiative (CFWI) Planning Area.

A set of committees and teams were established to achieve the goals for the CFWI. The relationship between these groups is shown in **Figure 2**. The Steering Committee (SC) oversaw the CFWI process and provided guidance to the technical teams and Management Oversight Committee (MOC) that developed and refined information on all aspects of central Florida's water resources. The MOC oversaw technical teams, ensured coordination between the teams, and identified policy issues that needed to be elevated to the SC as the process evolved. Specialized technical collaborative teams included:

- Solutions Planning Team (SPT)
- Regulatory Team (RT)
- RWSP Technical Teams
    - Minimum flows and levels and water reservations team (MFLT)
    - Hydrologic analysis team (HAT)
    - Environmental measures team (EMT)
    - Data, monitoring, and investigations team (DMIT)
    - Groundwater availability team (GAT)

The SPT and RT were formed to further the planning results of the CFWI RWSP effort to address the future water supply needs of the region. The goals, objectives, and scopes of the SPT and the RT were incorporated into the CFWI Guiding Document, which can be found at http://cfwiwater.com. The teams collectively were charged with developing alternatives to meet the water demands by optimizing the use of existing groundwater, and by identifying viable conservation and other management strategies, viable alternative and nontraditional water supplies, areas that may require recovery or resource protection, and areas where regulatory and water resource protection strategy consistency may be needed.

This Solutions Strategies document provides relevant project information to further develop specific water supply projects through partnerships with water users. This includes project cost estimates, potential sources of water, feasibility and permittability analysis, and identification of governance structure options. In addition, groundwater modeling and other analysis tools were updated to provide estimates of impacts and benefits to natural systems associated with potential projects as well as conceptual management strategies.

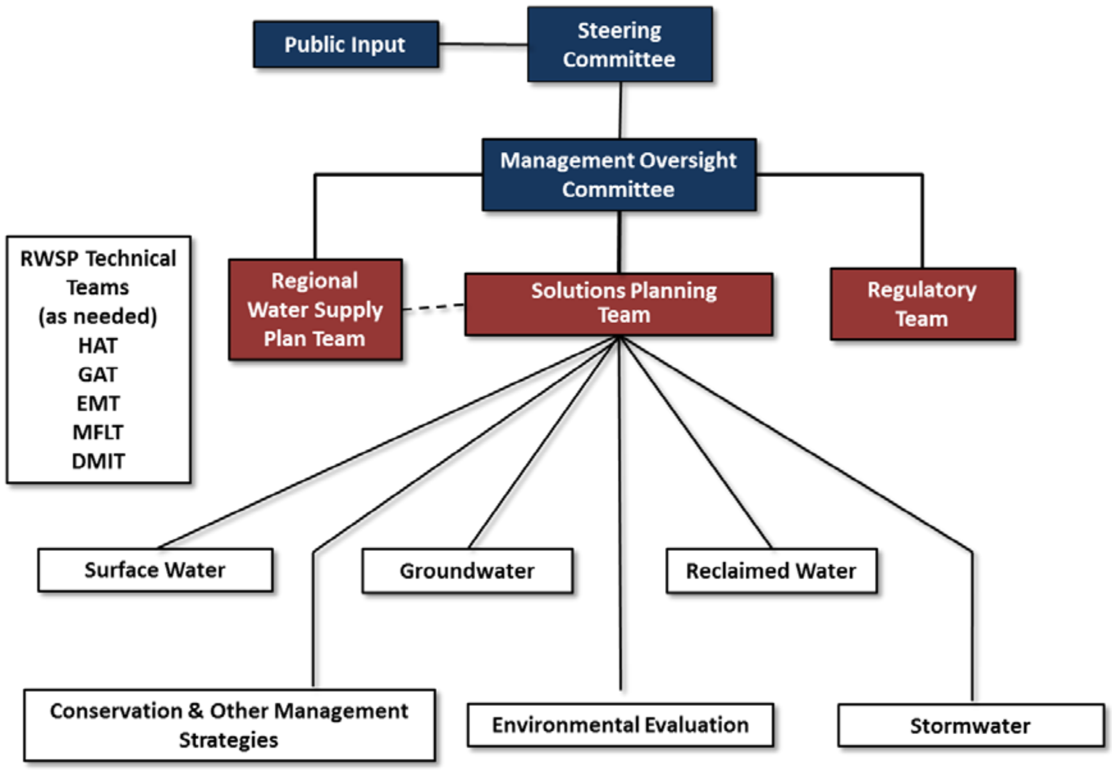

Figure 2. The relationships of the CFWI committees and teams.

SOLUTIONS PLANNING TEAM

The SPT members collaborated to address future water supply needs of the region and oversaw the preparation of this Solutions Strategies document. The SPT was composed of senior management staff from the Florida Department of Environmental Protection (FDEP), Florida Department of Agriculture and Consumer Services (FDACS), and the Districts, together with public supply utilities, agricultural landowners, environmental groups, regional leaders, and business representatives. The SPT operated under the guidance of the SC and MOC to fulfill the Guiding Principles of the CFWI (CFWI 2015a). The SPT's approach was a collaborative sharing of ideas, information, alternatives, and responsibilities.

Several Solutions Planning subteams were created to assist with the identification and evaluation of potential projects options. The six SPT subteams were:

- Surface Water (SW)
- Groundwater (GW)
- Conservation and other management strategies (Conservation)
- Reclaimed Water (RW)
- Environmental Evaluation (EE)
- Stormwater (ST)

There were many meetings of the SPT and subteams throughout the Solutions Planning Phase. Significant coordination among the subteams ensured a comprehensive assessment and approach. In addition, many of the participants who were involved in development of the CFWI RWSP also participated in the Solutions Planning Phase, providing consistency and continuity between the two efforts. This work was closely coordinated with the MOC and SC.

SPT Goal and Objectives

> **Solutions Planning Team Goal ⦿**
>
> The CFWI SPT will develop alternatives to meet water demands by optimizing the use of existing groundwater and by identifying viable conservation and other management strategies, viable alternative and nontraditional water supplies, areas that may require recovery or resource protection, and areas where regulatory and water resource protection strategy consistency may be needed. The final work product of the SPT will be the findings to the Steering Committee in a "CFWI 2035 Water Resources Protection and Water Supply Strategies" document.
>
> CFWI Guiding Document (CFWI 2015a)

Furthermore, this goal will be accomplished through a series of objectives:

- Understand the products and deliverables from the CFWI RWSP, created through a collaborative effort with the GAT, EMT, HAT, MFLT, and DMIT.
- Present practical and cost-effective regional water supply projects and conservation measures identified by the CFWI RWSP Team and SPT Subteams.
- Identify alternatives for developing available groundwater from 850 mgd to an amount up to 925 mgd (with appropriate regional management and operational controls).
- Identify regional water supply projects including cost-benefit analysis of yield, cost estimates, sources, water resource constraints, potential partnerships, additional pumping and transmission configurations, feasibility and permittability, and funding options. These projects should be regional, multi-jurisdictional solutions that serve more than one utility.
- When appropriate, create Water Resource Development subteams to refine specific regional projects or CFWI Alternative Water Supply (AWS) projects. This effort shall be coordinated with members of the GAT, EMT, HAT, MLRT, and DMIT and other appropriate district activities.
- Identify regional water supply project limitations or constraints resulting from the inconsistency of the rules of the three Districts in the CFWI Planning Area and report them to the MOC.

- Coordinate with the CFWI RWSP Team and appropriate stakeholders to develop future steps toward achieving sustainable, long-term, water supply alternatives.
- Present the CFWI 2035 Water Resources Protection and Water Supply Strategies (Solutions Strategies) to other key stakeholders.
- Present the CFWI 2035 Water Resources Protection and Water Supply Strategies (Solutions Strategies) to the three water management districts, FDEP, and FDACS for their consideration to amend the CFWI regional supply plan.

REGULATORY TEAM

The Regulatory Team's (RT) directive was to build upon the results of the CFWI RWSP technical analysis and planning process as well as perform additional analysis to develop options to address the RT's goals. The RT also ensured that appropriate regulatory and non-regulatory management activities reflected a balanced approach between public interest considerations, permitted water user rights, and sustainability of the water resources.

The RT is comprised of regulatory staff from the three Districts; a FDEP representative; a FDACS representative; public supply utility representatives; and an environmental group representative. The RT worked under the guidance of the SC and MOC to fulfill the Guiding Principles of the CFWI (CFWI 2015a). The RT interacted with the other CFWI technical teams to evaluate regulatory options identified for ensuring sustainable water supplies. The RT's approach was a collaborative sharing of ideas, information, alternatives, and responsibilities.

Regulatory Team Goal and Objectives

Regulatory Team Goal

. . . to "establish consistent rules and regulations for the three water management districts that meet the Collaborative Process Goals and implement the results of this Central Florida Water Initiative".

CFWI Guiding Document (CFWI 2015a)

The objectives of the RT are to develop options for consistent regulations as well as identify legislative changes, as needed, to implement the solution strategies identified in the CFWI process, to assist with resource recovery strategies, and to provide for equitable and predictable review of consumptive use permit applications among the Districts.

STAKEHOLDER COMMUNICATION

In March 2014, a community outreach and consensus building effort was initiated for the development phase of the Solutions Strategies. This continues the extensive outreach efforts associated with the development of the CFWI RWSP (**Volumes I** and **IA**). The focus of the Solutions Planning Phase effort was to inform and solicit input from key stakeholders from the public and business community across Central Florida to ensure the Solutions Strategies document reflects the issues and concerns of the region.

To identify specific stakeholder concerns, telephone interviews and meetings were held with CFWI stakeholders including the Orange, Osceola, Seminole, Lake, and Polk county managers. A common CFWI stakeholder concern was that few local elected officials or their staff had sufficient information about the CFWI Solutions Strategies goals and process.

Two community workshops were held in October 2014 for elected officials in Orange, Osceola, south Lake, Polk, and Seminole counties. These workshops provided an opportunity for local government officials and their staff, as well as interested members of local communities, to talk with representatives from the water management districts about the CFWI Solutions Planning Phase process. The two workshops were recorded by The Florida Channel, a public affairs programming service based in Tallahassee, and are available online from their archives: the October 16th workshop video can be viewed at http://thefloridachannel.org/videos/101614-central-florida-water-initiative-workshop/ and the October 29th workshop video also can be viewed at http://thefloridachannel.org/videos/102914-central-florida-water-initiative-community-workshop/. More than 130 local elected officials and staff members attended the two workshops.

The Districts also coordinated with the Central Florida Partnership to present at the Central Florida Regional Leadership Forum on November 21, 2014. The Regional Leadership Forum targeted business, government, and independent sector leaders to discuss and gain a better understanding of water issues, including how the CFWI is seeking business, government, and community input in developing a long-term water plan. A total of 178 local leaders from the public and private sectors attended this event. Other presentations were conducted for the East Central Florida Corridors Task Force and the Central Florida Congress of Regional Leaders. The Districts also supported the work of the Regional Values Study, led by the Central Florida Partnership and MetroPlan Orlando.

The CFWI Solutions Strategies document was developed in an open, public process, in coordination and cooperation with the Districts, FDEP, FDACS, water supply authorities, local government utilities, agricultural and industrial communities, environmental organizations, and other interested parties. Coordination and public participation was critical to ensuring the plan reflects the issues and concerns of stakeholders in the area. A variety of methods and forums were used to notify and solicit input from stakeholders to ensure the Solutions Strategies reflect the issues and concerns of the region.

A series of public meetings, focus groups, and workshops were held to discuss and review the draft Solutions Strategies document. Stakeholders representing a cross-section of interests in the region, including agricultural, industrial, environmental, utilities, local government planning departments, state and federal agencies, and the general public, were invited to attend the meetings, focus groups, and workshops. Participants provided comments regarding key plan elements and also discussed water supply issues, the condition of regional water resources, water source options, and other key aspects of the CFWI RWSP.

In summary, during the development of CFWI Solutions Strategies document, the communication and outreach efforts reached approximately 1,600 individuals. This community outreach included public meetings, presentations, focus groups, and workshops.

CHANGES AND UPDATES TO THE CFWI RWSP

Significant work was conducted during the development phase of the Solutions Strategies document. These efforts included building on the projects, findings, and conclusions of the CFWI RWSP, updating the groundwater model data and model scenarios, using the groundwater model to evaluate potential alternatives, and developing strategies. The work associated with the Solutions Planning Phase and updated information has been captured in this Solutions Strategies document; minimal changes were made to the CFWI RWSP - updated information is included in this Solutions Strategies document.

The information presented in the CFWI RWSP and updated in this Solutions Strategies document includes

- Historical water use data
- East Central Florida Transient (ECFT) groundwater model
- Water Supply Project Options (WSPOs)
- Minimum Flows and Levels
- Water Reservations
- Public supply utilities included in the CFWI Planning Area

Historical Water Use in the CFWI Planning Area

The CFWI RWSP reported that average groundwater use for the period of 1995 through 2010 in the CFWI Planning Area is approximately 800 mgd. Specifically, the 800 mgd reflects an approximation of average total water use, consisting of about 740 mgd of groundwater and 63 mgd of surface water use (**Table 1**). Annual water use data are influenced by changes in population, rainfall, the economy, social awareness, and crop type. Thus, the 800 mgd total water use represents a long-term average, not a single year average. The water use data from 2011 and 2012 continue to support a long-term average total water use of approximately 800 mgd.

Table 1. Historical water use in the CFWI Planning Area (1995-2010) expressed in millions of gallons per day (mgd).

Source	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
Groundwater	648	675	705	783	747	869	763	747	744	757	739	821	736	697	696	716	**740**
Surface Water	80	88	77	94	45	60	47	40	81	106	34	85	54	48	48	27	**63**
Totals	728	763	782	877	792	929	810	787	825	863	773	906	790	745	744	743	**803**

Improvements to the East Central Florida Transient (ECFT) Groundwater Model

The ECFT model served as a tool to simulate groundwater conditions, evaluate the effects of proposed groundwater projects and associated water use changes, and evaluate the conceptual management options of the area's water resources. During the Solutions Planning Phase, a series of updates were implemented to the ECFT model to incorporate new information or improve model estimates. Changes included updates to specific water uses, and modifications to improve the representation of agricultural reuse, rapid infiltration basins (RIBs), agricultural irrigation, and residential landscape irrigation. These changes were applied to the CFWI RWSP 2005 Reference Condition and 2015 withdrawal scenarios. In the Solutions Planning Phase, these updated scenarios are referred to as the Updated 2005 Reference Condition and the Baseline Condition. These are not an exhaustive list of improvements to the model identified by the HAT; however, they were sufficiently important to undertake to improve water use estimates and could be implemented within the time available for the Solutions Planning Phase. Additional improvements are planned for future versions of the model. Refer to **Volume IIA, Appendix E** for detailed information on the Solutions Planning Phase updates to the ECFT model.

The Baseline Condition was used as the basis of comparison for modeled results in the Solutions Planning Phase. The Baseline Condition used the CFWI RWSP projected 2015 demands as a means of distributing groundwater that was determined to be available, assuming sufficient management strategies were implemented.

Updates to Water Supply Project Options

The CFWI RWSP (Volume IA, Appendix F) identified 142 potential WSPOs. An additional 8 projects were identified during the Solutions Planning Phase. The updated list of 150 WSPOs includes 37 brackish/nontraditional groundwater, 87 reclaimed water, 17 surface water, 6 stormwater, and 3 management strategy options which are summarized in **Volume IIA, Appendix D, Table D-1** which replaces the CFWI RWSP Volume IA, Appendix F, Table F-1.

Updates to Minimum Flows and Levels

MFLs are discussed in Chapter 3 of the CFWI RWSP. Section 373.042(2), F.S., requires water management districts to submit to FDEP for review and approval a MFL priority list and schedule for the establishment of MFLs for water bodies, water courses, wetlands, and aquifers. The statute requires that the priority list be based upon the importance of the waters to the state or region and the existence of, or potential for, significant harm to the water resources or ecology of the state or region. The list must include those waters which are experiencing or may reasonably be expected to experience adverse impacts (373.042[2], F.S.). The following water bodies located inside the CFWI Planning Area are on SJRWMD's and SWFWMD's 2015 priority lists and scheduled for rule development in 2015-16: Lake Apopka, Lake Hancock, and St. Johns River at State Road 520 - Lake Poinsett. These MFLs along with Lake Hiawassee, which was removed from the SJRWMD MFL priority list, were not included in the Solutions Planning Phase evaluation. No MFLs are proposed for the SFWMD within the CFWI Planning Area.

SWFWMD will reevaluate MFLs for Lakes Clinch, Crooked, Eagle, McLeod, Starr, and Wailes. SJRWMD will also reevaluate MFLs for Lakes Apshawa North, Apshawa South, Prevatt, and Sylvan as well as Wekiva River at State Road 46. Additionally, the SJRWMD will be developing prevention and recovery strategies for the following existing MFL lakes: Apshawa North, Apshawa South, Brantley, Cherry, Louisa, Minneola, Pine Island, Prevatt; and the following existing MFL springs: Rock, Sanlando, Starbuck, Palm, and Wekiwa.

The following water bodies, outside the CFWI Planning Area and inside the ECFT model domain, are also on SJRWMD's priority list and scheduled for rule development in 2015-16: Lake Beauclair, Lake Dora, Lake Eustis, Lake Griffin, and Lake Harris. If it is determined during the MFL rule development process that a prevention or recovery strategy pursuant to Section 373.0421, F.S., is needed for any of these water bodies, it will be simultaneously approved with the MFL as required by Rule 62-40.473(5)(a), Florida Administrative Code (F.A.C.).

Updates to Water Reservations

Water Reservations are discussed in **Volume I, Chapter 3** of the CFWI RWSP. The SFWMD is in the process of developing a reservation of water for the Kissimmee River and Kissimmee Chain of Lakes and expects to adopt the rule in 2015. This will be the first reservation for the CFWI Planning Area. The SWFWMD is developing a reservation for Lake Hancock to support the MFL recovery strategy for the Upper Peace River. No reservations are proposed to be developed for SJRWMD in the CFWI Planning Area.

Updates to Public Supply Utilities included in the CFWI Planning Area

At the request of the cities of Leesburg and Mount Dora, their inclusion in the CFWI Planning Area was reviewed. The CFWI Planning Area includes very small portions of Leesburg's and Mount Dora's public supply service areas. Because Mount Dora has no existing or projected population within the CFWI Planning Area, and Leesburg has fewer than 800 people currently and has a 2035 projected population of 3,300 people, these public supply utilities have been removed from the CFWI Planning Area (**Figure 3** and **Table 2**). The CFWI RWSP was not updated to reflect this change and contains the entire service area population for these two utilities; future updates to the CFWI RWSP will reflect this change.

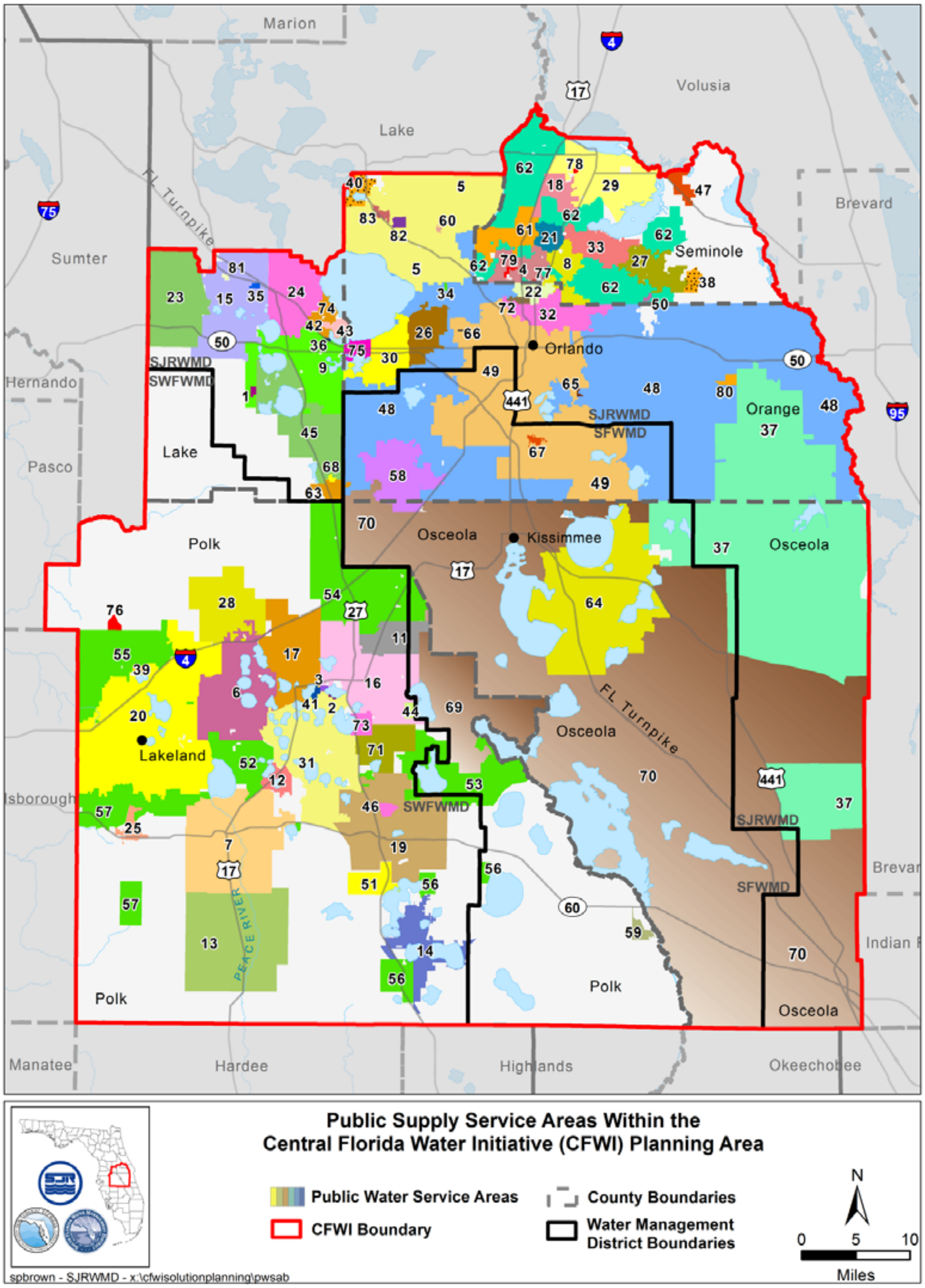

Figure 3. Map of public supply service areas within the CFWI Planning Area.

Table 2. List of public supply utilities in the CFWI Planning Area for **Figure 3**.

Utility Name	ID	Utility Name	ID
Barrington Estates	1	Ginn Pine Island II LLLP	43
CHCIII Swift Village MHP	2	Grenelefe Resort Utility, Inc.	44
CHCVII Lake Henry MHP	3	Lake Utility Services Inc.	45
City of Altamonte Springs	4	Mountain Lake Corporation	46
City of Apopka	5	Mullet Lake Water Association Inc.	47
City of Auburndale	6	Orange County Utilities (OCU)	48
City of Bartow	7	Orlando Utilities Commission (OUC)	49
City of Casselberry	8	Palm Valley Manufactured Home Community	50
City of Clermont	9	Park Water Company	51
City of Cocoa	10	Polk County Utilities (PCU) - CRSA	52
City of Davenport	11	Polk County Utilities (PCU) – ERUSA	53
City of Eagle Lake	12	Polk County Utilities (PCU) – NERUSA	54
City of Fort Meade	13	Polk County Utilities (PCU) – NWRSA	55
City of Frostproof	14	Polk County Utilities (PCU) – SERUSA	56
City of Groveland	15	Polk County Utilities (PCU) – SWRSA	57
City of Haines City	16	Reedy Creek Improvement District (RCID)	58
City of Lake Alfred	17	River Ranch SF	59
City of Lake Mary	18	Rock Springs Palm Isles MHC LLC	60
City of Lake Wales	19	Sanlando Utilities Corp.	61
City of Lakeland Electric and Water	20	Seminole County Environmental Services (SCES)	62
City of Longwood	21	Southlake Utilities Inc.	63
City of Maitland	22	St. Cloud Utility	64
City of Mascotte	23	Starlight Ranch MHC	65
City of Minneola	24	Sun Communities Inc.	66
City of Mulberry	25	Taft Water Association	67
City of Ocoee	26	Thousand Trails	68
City of Oviedo	27	Tohopekaliga Water Authority – Poinciana	69
City of Polk City	28	Tohopekaliga Water Authority	70
City of Sanford	29	Town of Dundee	71
City of Winter Garden	30	Town of Eatonville	72
City of Winter Haven	31	Town of Lake Hamilton	73
City of Winter Park	32	Town of Montverde	74
City of Winter Springs	33	Town of Oakland	75
Clarcona Golf & RV Resort	34	Utilities Inc. – Cypress Lakes	76
Clerbrook Golf & RV Resort	35	Utilities Inc. – Oakland Shores	77
Colina Bay Water Company	36	Utilities Inc. – Ravenna Park	78
East Central FL Services Inc. (ECF)	37	Utilities Inc. – Weathersfield	79
Florida Governmental Utility Authority (FGUA) – Chuluota	38	Wedgefield Utilities Inc.	80
Florida Governmental Utility Authority (FGUA) – Lake Gibson	39	Woodlands Church Lake LLC	81
Florida Governmental Utility Authority (FGUA) – Tangerine Park	40	Zellwood Station Community Assoc.	82
Four Lakes Mobile Home Park	41	Zellwood Water Users Inc.	83
Ginn La Pine Island LTD LLLP	42		

WATER RESOURCES IN THE CFWI PLANNING AREA

Current water sources in the CFWI Planning Area include groundwater (fresh and brackish), reclaimed water, surface water, and stormwater. Fresh groundwater sources (i.e., surficial, intermediate, and Floridan aquifers) are considered traditional water sources whereas nontraditional or alternative water sources include brackish groundwater, surface water, seawater, reclaimed water, and water stored in ASRs and reservoirs. The region also contains significant natural features.

Groundwater

The primary source of water supply in the region is traditional groundwater. Groundwater is supplied from the surficial, intermediate, and Floridan aquifer systems. The surficial aquifer system (SAS) is a shallow, unconfined aquifer that generally yields low quantities of water. The intermediate aquifer system (IAS) does not produce large quantities of water and acts as a semi-confining unit in most areas separating the overlying surficial aquifer from the underlying Floridan aquifer system (FAS). The FAS is subdivided into the Upper and Lower Floridan aquifers. The Upper Floridan aquifer (UFA) is a semi-confined aquifer, portions of which are capable of producing large amounts of water. The UFA has historically been the primary source of water supply throughout the region, though the Lower Floridan aquifer (LFA) in some areas of the CFWI has also been used.

The LFA has the potential to provide additional water in the CFWI Planning Area and a number of studies are in progress to evaluate this potential water source. However, there is limited hydrogeologic information available for the LFA, so the potential local and regional effects of pumping from the LFA are not as well understood in some areas of the CFWI.

Reclaimed Water

Utilities within the CFWI Planning Area are leaders in developing reclaimed water systems and reuse over 90 percent of all domestic wastewater flows within the region (**Volume IA**, **Appendix E**, **Table E-1**). Currently, 178 of the 193 mgd of treated wastewater generated is reused for beneficial purposes, including groundwater recharge, agricultural irrigation, environmental restoration, public access irrigation, and cooling water at power generation facilities. Reclaimed water has played a critical role in meeting the current water needs in this region and will continue to support those water needs through 2035.

Surface Water

The CFWI Planning Area has several major rivers including the St. Johns, Ocklawaha, Peace, Kissimmee, and Withlacoochee, and hundreds of lakes, including the interconnected Alligator and Kissimmee Chains of Lakes. Despite the abundance of surface water features in the region, a relatively small amount is currently withdrawn for public supply or other uses. The lakes, rivers, and creeks in the CFWI region support significant ecological resources that must be protected from harmful impacts of withdrawals or capture of flows from these systems. Capturing flows from these surface water bodies for water supply, particularly to support conjunctive use projects, may be effective but can be expected to have varying levels of reliability depending on climatic conditions.

Natural Features

The CFWI Planning Area contains the headwaters for seven river systems (Alafia, Hillsborough, Kissimmee, Ocklawaha, Peace, St. Johns, and Withlacoochee rivers) and contains four distinct groundwater basins. There are approximately 1,200 square miles (782,000 acres) of wetlands and approximately 475 square miles (300,300 acres) of open water bodies (USFWS 2012) such as lakes. Regional wetlands systems include Green Swamp, Reedy Creek Swamp, Davenport Creek Swamp, Big Bend Swamp, Cat Island Swamp, Boggy Creek Swamp, and Shingle Creek Swamp. There are 16 first, second, and third magnitude springs in the region (FDEP 2004).

THE SOLUTIONS STRATEGIES

In Florida, water supply plans are developed by the water management districts to ensure that an adequate supply of water exists to protect water resources and natural systems and to meet existing and future reasonable-beneficial uses. This Solutions Strategies document, jointly developed by the SJRWMD, SFWMD, and SWFWMD in coordination with stakeholders, is a component of the CFWI RWSP and, is consistent with the water supply planning requirements of Chapter 373, F.S. The CFWI RWSP builds upon, and updates, previous water supply plans completed by each of the three Districts that include portions of the CFWI Planning Area. This Solutions Strategies document provides relevant program and project information to further develop water conservation options as well as specific water supply projects through partnerships with water users. This document also includes a preliminary environmental evaluation of some Solutions Planning Phase projects and conceptual management options, as well as cost estimates, project permittability analysis, and identification of implementation strategies.

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Water Conservation

INTRODUCTION

> **Conservation**
>
> . . . any activity or action which reduces the demand for water including those that prevent or reduce wasteful or unnecessary uses and those that improve efficiency of use.

Water conservation (conservation) includes any activity or action which reduces the demand for water including those that prevent or reduce wasteful or unnecessary uses and those that improve efficiency of use. The CFWI RWSP concluded that traditional groundwater resources alone will not be able to meet future water demands or current permitted allocations. Conservation is one of the primary solutions identified to extend the available supply of water to support existing and future needs.

Conservation opportunities exist across all water use sectors in the CFWI Planning Area. Individuals, businesses, the agricultural industry, water providers, and the natural environment will all benefit greatly from additional conservation. Implementing effective conservation throughout the CFWI Planning Area will require coordinated efforts among stakeholder groups. As the cost of developing new water supplies increases, more costly water conservation projects will become more appealing.

Many studies show that implementation of conservation programs is often among the lowest cost solutions to meet future water needs and, in many cases, can reduce costs to ratepayers over the long term, if properly planned and implemented. For water suppliers, a well-crafted conservation/demand management plan can reduce, defer, or eliminate the need for investments in new production capacity, which may include development of higher cost alternative water supply sources.

Water Conservation Trends in the CFWI Planning Area

Improvements in water use efficiency have been observed over the past two decades within the CFWI Planning Area. This is largely due to the conservation efforts of utilities, Districts, state and local governments, the agriculture community, and other potable water end users to prevent or reduce unnecessary use and to increase overall water use efficiency. The CFWI Planning Area is benefiting from the on-going, long-term conservation programs and Best

Management Practices (BMPs) that have been in place for over 20 years. For the purposes of this chapter, the term BMP refers to any measure, practice, program, device replacement, or action which results in an improvement of water use efficiency.

For the public supply sector, both gross and residential per capita water use has decreased greatly from 1995 to 2012 (**Figure 4**). Gross water use dropped from 183 gallons per capita per day (gpcd) in 1995 to 143 gpcd in 2012, a 22 percent reduction. For residential water use, the decrease was even greater from 165 gpcd in 1995 to 101 gpcd in 2012, a 39 percent reduction. These reductions in per capita water use are attributable to several BMPs including the installation of higher efficiency fixtures and appliances; increased use of reclaimed water; year-round watering restrictions and enforcement of landscape irrigation ordinances; inclining block rates; irrigation system improved efficiencies; urban mobile irrigation labs (MIL); customer water audits (indoor and outdoor); year-round public education campaigns and customer outreach; customer incentives and rebates; and other conservation BMPs. The installation of private irrigation wells and other external factors may also contribute to this decrease.

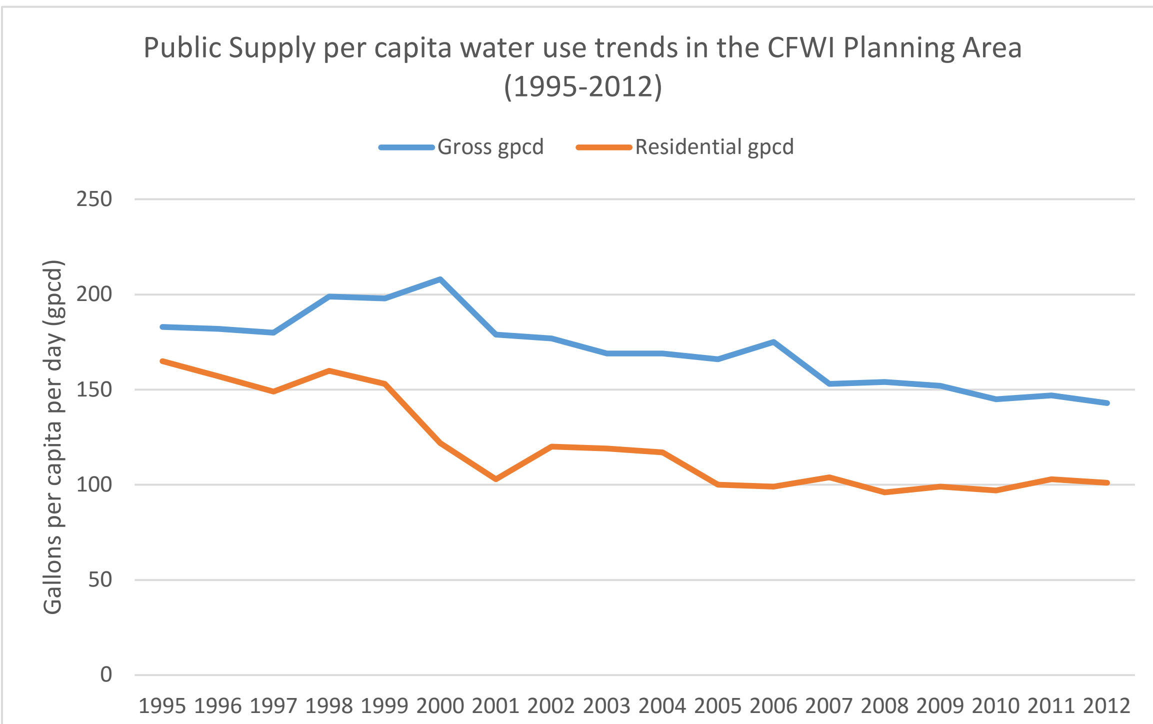

Figure 5. Public Supply (PS) per capita water use trends in the CFWI Planning Area.

The increased use of reclaimed water for irrigation has contributed to reductions in per capita water use among the utilities operating within the CFWI Planning Area. It is important that these efforts be maintained and enhanced to the extent feasible by responsible supplementation with other sources such as surface water and stormwater. Additional information on select reclaimed water projects is provided in **Chapter 3**.

Water users within the CFWI Planning Area have implemented many of the conservation BMPs identified in this chapter to varying degrees. However, as can be seen in **Figure 4**, the gross gpcd rate appears to be declining while the residential gpcd rate reduction has moderated over the past decade. Data and conservation modeling show there are numerous BMPs that can still be implemented to achieve additional water conservation in the CFWI Planning Area.

The agriculture community has been proactive in the conservation of water for many years. The CFWI RWSP estimates show water savings for agriculture over time are mostly associated with improvements in irrigation system efficiency. Other water conservation BMPs implemented on citrus groves, pasture lands, and other agricultural areas have also contributed to water savings.

SOLUTIONS PHASE EVALUATION

The Conservation and Other Management Strategies Subteam's (Conservation Subteam) goal was to identify and evaluate options for water conservation projects and programs that would reduce future demands by a minimum 42 mgd. This goal was established through the findings in the CFWI RWSP, which determined that projected demand in 2035 could be reduced by an estimated 42.3 mgd through implementation of enhanced conservation over and above current conservation efforts (**Table 3**). It is important to note that reductions in gpcd resulting from current and historical water conservation (**Figure 4**) are reflected in the 2035 demand projections. The CFWI RWSP conservation estimates are influenced by several factors including voluntary consumer actions, level of conservation education and financial incentives, and assumed participation rates in conservation BMPs. Additional details on the conservation estimates generated during the CFWI RWSP effort are described in **Volume I**, **Chapter 5**.

Table 3. Projected 2035 conservation potential in the CFWI Planning Area.

Water Use Category	Projected RWSP 2035 Conservation (mgd)	Revised Projected Solutions Strategies 2035 Conservation (mgd)
Public Supply (PS)	26.78	27.91
Agriculture (AG)	10.90	4.30
Landscape/Recreational/Aesthetic (LRA)	2.02	2.02
Domestic Self-Supply (DSS)	1.19	1.19
Commercial/Industrial/Institutional (CII)	1.15	1.15
Power Generation (PG)	0.27	0.27
Total	**42.32**	**36.84**

During the Solutions Strategies phase, potential water savings through the implementation of public supply and agricultural best management practices was further evaluated; the water savings estimate was revised to meet or exceed 37 mgd by implementing and funding the conservation BMPs and the agricultural programmatic efforts. For example, agricultural savings includes practices such as, irrigation system retrofits, tailwater recovery, and use of reclaimed water that result in reductions in groundwater use. Additional savings are possible through higher participation rates of evaluated BMPs and/or the implementation of other measures not evaluated but recognized as being applicable within the CFWI Planning Area (**Table 3**).

Team Objectives

- For the agriculture, public supply, and other self-supply water use categories, and their related subcategories, identify options for water conservation projects/programs.
- Develop a comprehensive listing of potential water conservation project/ program options for each water use category.
- Perform a preliminary evaluation of the all projects/programs identified by quantifying the potential water savings and cost.
- Request input from the Steering Committee (SC) regarding whether or not the SC seeks additional evaluation of any of identified projects/programs options.
- Perform a detailed evaluation of the projects/programs that address the 11 project evaluation questions developed by the Solutions Planning Team.

Water Conservation Project and Program Options

The Conservation Subteam compiled a comprehensive list of conservation BMPs for all water use categories and organized them into three major water use categories; Agriculture (AG), Public Supply (PS), and Other Self-Supply (OSS). The OSS category combines Domestic Self-Supply (DSS), Landscape/Recreational/Aesthetic (LRA), Commercial/Industrial/ Institutional (CII), and Power Generation (PG). The OSS category derives water from private wells or other sources rather than using potable water provided by a PS utility. The PS category includes the following subsector users that are supplied water by a public or private utility: residential (Res), CII, LRA, and, though limited primarily to domestic use, PG.

Achieving long-term water use reductions will require a combination of advanced technologies, best management practices, and behavioral changes. Education, outreach, and social marketing are essential to accomplish a measurable change in water conservation and instill a lasting conservation ethic in central Florida. Public information and involvement are also critical to the success of water conservation. Targeted education, public information, and social marketing provide opportunities for building a conservation culture, a stewardship ethic, and permanently reducing individual, agricultural, industrial, and commercial water use.

Water Conservation Education Programs

Successful implementation of many conservation efforts depends on public awareness and an understanding of the need to conserve water. The State of Florida has a long history of promoting conservation and resource management. Efforts to educate users on the benefits of conservation are widespread and include statewide recognition of April as conservation month since 1998. Education and outreach are critical to any conservation strategy in creating awareness about the value of water and can permanently change our water use behavior for the future. Experience and literature suggests that education is important to people and crucial to their success in adopting new behaviors (Felter 2013). If specific and necessary details are not provided, the participant may feel confused and lack the confidence needed to make behavioral changes.

Minimizing water use, waste, and loss over time is heavily dependent on continually evaluating and adopting new advanced technologies and practices. Education and technical assistance programs are important in motivating behavioral changes that can impact water use, quality, and supply. Knowledge and understanding of the value of water is an important prerequisite for any conservation achievement.

The Districts' broader perspective is to ensure sufficient water supply sources to meet existing and future reasonable-beneficial uses, while sustaining water resources and related natural systems. Local governments and water providers are uniquely challenged by their responsibility to provide a service to their customers while simultaneously keeping short- and long-term costs low. However, water providers also are typically the first point of contact between the resource and the end users. Therefore, Districts have long provided support to water providers in their efforts to promote, develop, and implement conservation, in addition to their own direct efforts to reach end-users and professionals.

Many educational and outreach programs have already been implemented in the CFWI region by water providers, local governments, the water management districts, University of Florida Institute of Food and Agricultural Sciences (UF IFAS), and the agriculture community. These programs, when combined with conservation BMPs, have yielded substantial water savings that can be documented and reproduced by others. Some of the programs and activities are:

- **School Educational Programs** are paramount in framing the water issues, making students stewards of the environment, and creating a water ethic for a lifetime.
- **Media Campaigns** use of print, television, radio, billboards, direct mail, websites and social media outlets have been documented to have a positive impact on a consumer's water use practices.
- **Informative Billing** allows water suppliers to educate users on how their use compares to their neighbors' or has changed over time and how they can reduce personal consumption.

- **Training** staff and associates at facilities that provide irrigation materials, services, and supplies and/or Florida-Friendly Landscaping™ supplies have been shown to yield a significant increase in their awareness.
- **Florida-Friendly Landscape Demonstration Gardens** showcase designs that can promote and show the beauty of a well-manicured landscape using 'water-smart' principles.
- **Workshops and Exhibits** inspire community engagement and then reward that engagement by having awards and recognition for 'water–smart' neighborhoods.
- **Landscape Design and Irrigation Education** includes providing educational materials to residents as well as landscape and irrigation industry professionals.
- **Irrigation Water Audits** for residential, commercial, and agricultural users have been documented to yield significant water savings. Education is a key component to the success of this BMP.
- **Indoor Water Use Audits** for residential and commercial users assess water use to determine how much water can be saved. Education is a key component to the success of this BMP.
- **Retrofit and Rebate Programs** for replacing high-water use devices, such as toilets, showerheads, faucets, and older appliances with more water efficient devices and appliances is a way to make permanent measurable changes to water use. Education is a key component to the success of retrofit and rebate programs.

Agriculture is the second largest water user in the CFWI Planning Area following PS. There are several agencies working with agricultural users to ensure the latest research and methods in production, environmental stewardship, and conservation are implemented. The UF IFAS Extension network covers all counties within the CFWI Planning Area. Agricultural support agencies and organizations partner with UF IFAS on research and educational programming. Some of these include the Florida Department of Agriculture and Consumers Services (FDACS), Florida Farm Bureau, specific commodity groups, the landscape and irrigation industries, and trade associations. UF IFAS utilizes meetings, workshops, demonstration clinics, web-based teaching, social media, field and onsite consultations, and written materials as educational delivery methods. The Soil and Water Conservation Districts (SWCD) also have a presence in the CFWI region. Each SWCD is a governmental subdivision of the State and receives funding from a variety of sources including county governments, grants, donations, sales, and contracts for services. Many of the SWCDs have developed partnerships with water management districts, United States Department of Agriculture Natural Resources Conservation Service (NRCS), Resource Conservation and Development Council, and FDACS. These groups actively promote conservation BMPs through education and outreach. The FDACS Office of Agricultural Water Policy (FDACS - OAWP) funds MILs throughout the State. Growers who have been advised by the MIL staff on how to reduce their water use can use SWCDs for support in obtaining funding from federal, state, regional, and local sources.

The responsibility for ensuring a sustainable water future lies with the community and the region as a whole. Therefore, educating all users is crucial to generating an understanding of the issues, creating acceptance of conservation efforts, and encouraging behavioral changes. Public education and outreach are essential to the successful adoption of conservation practices. It is important to provide the public with a basic understanding of water resource management and to explain the associated economic and environmental benefits or impacts.

As we move forward, it is important to ensure that conservation messaging and education are consistent and sustainable in the CFWI Planning Area.

Identifying Conservation BMPs and Programs

More than 200 potential conservation BMPs and conservation-related management strategies were assembled and reviewed by the Conservation Subteam. A final list of 80 BMPs applicable to PS and OSS as well as 47 BMPs applicable to Agriculture were identified for further evaluation by the Conservation Subteam. Available planning tools were used to analyze and quantify the potential water savings for 12 PS and OSS and 16 Agriculture conservation BMPs. A brief description of the final list of 80 PS and OSS and 47 Agriculture BMPs and strategies can be found in **Volume IIA, Appendix A.**

PS and OSS Conservation BMPs

Eighty conservation BMPs were identified that PS and OSS users may use to increase efficiency and achieve conservation savings. Many of these BMPs are equally applicable to various water users regardless of the water use type (PS or OSS). A brief description of the conservation BMPs organized by functional use; Indoor Conservation, Outdoor Conservation, Water Use Efficiency Audits, Conservation Programs, and Public Supply Utility BMPs are listed below. A notation in parenthesis identifies water user groups applicable to each BMP. Additional information can be found in **Volume IIA**, **Appendix A.**

Indoor Conservation

Indoor water use includes water used by sanitary plumbing fixtures and appliances in residential and non-residential settings. Standard flow rates for most fixtures are in accordance with the Energy Policy Act of 1992. High-efficiency fixtures, which receive the EPA's WaterSense® label, use at least 20% less water than standard fixtures and have been third-party tested to ensure that end user performance expectations are met (**Table 4**)**.** ENERGY STAR Qualified appliances (residential and commercial clothes washers, dishwashers as well as water-using equipment in commercial kitchens), typically use less water than standard models. The following indoor conservation BMPs are included in this category:

- Clothes washer high-efficiency replacement – (Res, DSS, CII)
- Combination oven high-efficiency replacement – (CII)

- Dishwasher high-efficiency replacement – (Res, DSS, CII, PG)
- Faucet Aerator high-efficiency replacement – (Res, DSS, CII, PG)
- Faucet installation, metered-flow – (CII, PG)
- Ice making machines high-efficiency replacement – (CII)
- Pre-rinse spray valve high-efficiency replacement – (CII, PG)
- Showerhead high-efficiency replacement – (Res, DSS, CII, PG)
- Steam cooker replacement, high-efficiency – (CII)
- Toilet fill cycle diverters – (Res, DSS, CII, PG)
- Toilets, flapperless use – (Res, DSS, CII, PG)
- Toilet, redesigned flapper use – (Res, DSS, CII, PG)
- Toilet replacement, dual flush – (Res, DSS, CII, PG)
- Toilet replacement, high-efficiency – (Res, DSS, CII, PG)
- Urinal replacement high-efficiency – (CII, PG)
- Urinal replacement, waterless – (CII, PG)

Table 4. WaterSense® maximum flow rates for indoor plumbing fixtures.

Fixture	Maximum Flow Rate
Toilet	1.28 gpf
Urinal	0.5 gpf
Faucets (Bath)	1.5 gpm
Showerhead	2.0 gpm
Pre-rinse Spray Valve	1.25 gpm

Notes:
gpf = gallons per flush
gpm = gallons per minute
Rates are accurate as of November 2014.
WaterSense® also provides standards for irrigation equipment (not shown).
Source: http://www.epa.gov/watersense/

Other indoor water uses include process water use and water used by heating, ventilation and air conditioning (HVAC) cooling towers. Process water use refers to water used by commercial businesses and industrial manufacturers for purposes other than domestic uses or for air conditioning. Process water can be used to cool equipment, convey (float) objects within a plant, rinse, clean or sterilize items, lubricate objects or surfaces, or can be part of the end product. Cooling tower water use is the single largest point of consumption for many large commercial and institutional buildings. Increasing the efficiency of this equipment is one of the most cost-effective areas of indoor conservation. Water efficiency for these (other) indoor uses can be increased through the use of high-efficiency hardware, increased water use monitoring, cultural behavioral changes, and the capture and reuse of on-site generated water. The following other indoor conservation BMPs are included in this category and are further defined in **Volume IIA**, **Appendix A**:

- Air-cooled device (replacing water-cooled devices) – (CII)
- Automatic shut-off valve use – (CII)
- Car wash equipment, low flow/recirculating –(CII)
- Garbage disposal efficient usage – (CII, PG)
- Greenroofs – (CII)
- Heating ventilation and air conditioning (HVAC) cooling tower efficiency improvements– (CII)
- Hot water use (Efficient) – (Res, DSS, CII, PG)
- Metering and submetering (Indoor) – (CII)
- On-site alternative water source reuse – (Res, CII)
- Restriction of one-pass (once-through) equipment – (CII)
- Steam boiler efficiency – (CII)
- Water use efficiency improvement plan development – (CII)

Outdoor Conservation

A significant amount of water is used for outdoor purposes such as irrigation. Therefore, outdoor water use efficiency improvements can be gained primarily by implementing landscaping and irrigation BMPs. Implementation of the mandatory year-round landscape irrigation conservation rules [SJRWMD, Ch. 40C-2; SFWMD, Ch. 40E-24; and SWFWMD, Ch. 40D-22, F.A.C.] has reduced landscape irrigation water use throughout the CFWI Planning Area.

Water Efficient Landscaping

Water efficient landscaping refers to the selection, design, and maintenance of plants that are appropriate for a landscaped area. Water efficiency gains begin with selecting plants that are compatible with the local soil and climate conditions as those plants will likely have all or most of their water needs met by rainfall. Additional water use efficiency can be gained by grouping plants within the landscape according to their water and other needs. Finally, certain maintenance procedures can help plants increase their natural drought hardiness, making them less dependent on irrigation during periods of low rainfall. These and other landscape BMPs are described thoroughly under the Florida-Friendly Landscaping™ Program. The following water efficient BMPs are included in this category:

- Fertilization efficiency practices – (Res, DSS, CII, PG, LRA)
- Limiting high volume irrigation areas – (Res, DSS, CII, PG, LRA)
- Limiting irrigated areas – (Res, DSS, CII, PG, LRA)
- Limiting turf traffic on golf courses – (LRA)
- Prudent use of turfgrass in landscapes – (Res, DSS, CII, PG, LRA)

- Soil amendment use for water efficiency – (Res, DSS, CII, PG, LRA)
- Soil cultivation techniques for water efficiency – (Res, DSS, CII, PG, LRA)
- Turfgrass, improved cultivar uses – (Res, DSS, CII, PG, LRA)
- Turfgrass maintenance for water efficiency – (Res, CII)
- Water budgeting – (Res, DSS, CII, PG, LRA)
- Waterwise Florida Landscaping – (Res, DSS, CII, PG, LRA)

Efficient Irrigation Systems

Efficient irrigation systems are ones designed to provide only enough water where needed to meet plant needs supplemental to what they receive through natural rainfall. Irrigation efficiency is accomplished by having the components designed and installed at the correct overlapped spacing, with the appropriate nozzles, operating at the appropriate pressure, programmed to operate to meet the needs of the plants (as a supplement to rainfall), and regularly maintained and adjusted to the constantly growing landscape and change of seasons. The control of an efficient system can benefit from a properly installed and programmed 'smart' controller – one that senses local environmental conditions and initiates or restricts irrigation cycles accordingly. Proper scheduling, adjustments, and maintenance of these systems are essential to ensure efficiency is maintained. The following irrigation BMPs are included this category:

Programmable Irrigation System

- Cyclic scheduled irrigation – (Res, DSS, CII, PG, LRA)
- Irrigation efficiency nozzle and head use– (Res, DSS, CII, PG, LRA)
- Irrigation scheduling – (Res, DSS, CII, PG, LRA)
- Irrigation system maintenance (routine) – (Res, DSS, CII, PG, LRA)
- Isolation valve use – (Res, DSS, CII, PG, LRA)
- Licensed irrigation and design professional, working with – (Res, DSS, CII, PG, LRA)
- Metering and submetering water (outdoor) – (Res, DSS, CII, PG, LRA)
- Microirrigation use (drip/bubbler/microspray) – (Res, DSS, CII, PG, LRA)
- Net irrigation-requirement-based irrigation calculations – (Res, DSS, CII, PG, LRA)
- Rain sensor shut-off device– (Res, DSS, CII, PG, LRA)
- Soil moisture sensor irrigation controllers – (Res, DSS, CII, PG, LRA)
- Weather-based irrigation controllers – (Res, DSS, CII, PG, LRA)

Other Outdoor Water Use Efficiency

While outdoor water use is dominated by landscape and irrigation water use, there are several other areas where outdoor water use efficiency can be improved. The target use areas include fountains, swimming pools, and cleaning activities. The following BMPs are included in this category:

- On-site rain harvesting and reuse – (Res, DSS, CII, PG, LRA)
- Sidewalk and driveway cleaning practices – (Res, DSS, CII, PG, LRA)
- Swimming pool and hot tub water use efficiency – (Res, DSS, CII, PG, LRA)

Water Use Efficiency Audits

Water use efficiency audits evaluate water use and identify ways to increase efficiency. Typically, these audits target one or more of the following use areas: in-ground irrigation systems, landscaping, and all types of indoor uses. Audits can take place in residential as well as in CII facilities. The following BMPs are included in this category:

- Facility water use assessment/audit – (CII, PG)
- Indoor residential water use assessment/audit – (Res)
- Irrigation system audit/evaluation – (Res, DSS, CII, PG, LRA)
- Landscape efficiency audit – (Res, DSS, CII, PG, LRA)

PS and OSS Conservation Programs

Conservation programs, such as EPA's WaterSense®, provide a service to conservation professionals and others by providing standards, information, and other resource materials on conservation. Other conservation programs award certifications or recognition (to existing and/or newly constructed buildings or entities) or accreditations (to individuals) for having met a specific set of efficiency criteria, including water use. With respect to conservation, these programs can be designed to focus on reducing water use indoors, outdoors or both (such as Florida Water Star℠); or, contain water use efficiency as a single element of a holistic sustainability program (e.g., Florida Green Building Coalition). Local governments and utilities typically encourage the participation of end users in these types of conservation programs through advocacy, administration, or funding support. The following PS and OSS conservation programs are included in this category:

- Florida Green Building Coalition – (Res, DSS, CII, PG)
- Florida Green Lodging Program – (CII)
- Florida Water Star℠ – (Res, DSS, CII, PG)
- Florida-Friendly Landscaping Program™– (Res, DSS, CII, PG, LRA)
- Florida-Friendly Yard Recognition Program – (Res, DSS, CII, PG, LRA)

- Green Restaurant Association Program – (CII)
- Leadership in Energy and Environmental Design (LEED) – (Res, DSS, CII, PG)
- The Water Conservation Hotel and Motel Program (Water CHAMP) – (CII)
- Urban Mobile Irrigation Labs – (PS - Utility)
- WaterSense® Program (EPA) – (Res, DSS, CII, PG, LRA)

Public Supply Utility

Many utilities can increase their operational efficiencies by implementing fundamental BMPs. Some efficiency improvement practices occur directly at the treatment facilities themselves using advanced hardware and other equipment, while other practices are applied to the distribution system, such as active leak detection and repair programs. Demand management planning can reduce peak demands and extend the use of current supplies, thus reducing, deferring or even eliminating the need for new capacity development. Enhanced outreach can reduce demands on the system as a whole. The following PS efficiency BMPs are included in this category:

- Automatic meter reading and advanced metering infrastructure (AMR/AMI) technology
- Conservation analysis using a planning tool
- Distribution system audits, leak detection and repair
- Goal-based water conservation planning
- Improved billing and accounting software
- Line flushing, automatic devices
- Line flushing, looping
- Line flushing, unidirectional
- Rate structure
- Treatment system efficiency increases

Building Standards and Codes

Water use efficiency standards provide performance criteria with a minimum level of efficiency. Standards can be incorporated into building codes (e.g., new construction or major renovations). Codes can be adopted targeting irrigation, landscaping, and indoor water use. These standards are typically applied to new construction for a region, county, municipality, or utility service area. The following standards and codes are included in this category:

- Indoor high-efficiency codes adoption – (Res, DSS, CII, PG)
- Irrigation codes, adoption of higher efficiency – (Res, DSS, CII, PG, LRA)
- Landscape codes, adoption of water efficiency – (Res, DSS, CII, PG, LRA)

Agriculture Conservation BMPs

Forty-seven agriculture conservation BMPs were identified for further evaluation and organized into eight functional categories; Electronics, Irrigation System Retrofits, Maintenance/Management, Water Control, Additional Practices, Tailwater Recovery, Frost/Freeze Protection, and Conservation Programs. Following is a brief description of each functional category along with specific BMPs. For example, agricultural savings include practices such as irrigation system retrofits, tailwater recovery and use of reclaimed water that result in reductions in groundwater use. Multiple conservation BMPs are often implemented together on a single agricultural operation to maximize water use efficiency and maintain crop yields. Additional information on the BMPs listed below can be found in **Volume IIA**, **Appendix A**.

Electronics

Using electronics such as soil moisture sensors and weather stations to schedule irrigation based on the current crop needs and environmental conditions can conserve water in agriculture. However, the potential percentage reduction in water use may not be as high in agriculture as it is in other applications. The significant cost of fuel or electricity for pumping water in agricultural operations encourages most farmers to irrigate as efficiently as possible using their current irrigation system hardware and components. Electronics allow for more precision in controlling when irrigation should occur and when it should end. There are many farms within the CFWI Planning Area that could benefit from the addition of electronics to conserve water. The following agricultural electronic devices are included in this category:

- AMR/AMI technology
- Automated valves
- Auto pump start / stop
- Multi-stage greenhouse control systems
- Smart irrigation controllers
- Soil moisture sensor(s)
- Weather station with ET measurement

Smart Irrigation Controller

Irrigation System Retrofits

Irrigation system retrofits refer to the replacement of existing systems or their components with more water efficient equipment. Retrofits are an effective method of conserving water if the new systems are maintained and managed properly. System retrofits require a significant investment for both the materials and installation, but can significantly reduce pumping costs and increase yields. The following agricultural irrigation system retrofit BMPs are included in this category and will vary according to crop type, soil type, and topography:

- Drip / microirrigation system conversion
- Fully enclosed seepage irrigation system conversion
- Gated and flexible pipe for field water distribution systems
- Irrigation and lateral canal replacement with pipelines
- Linear move sprinkler irrigation system conversion
- Lining of irrigation canals and on-farm irrigation ditches
- Low pressure center pivot sprinkler irrigation system conversion
- On-farm irrigation ditch replacement with pipelines
- Overhead irrigation of indoor containerized plants replacement with drip, microirrigation or subirrigation

Maintenance and Management

Regular maintenance and intensive management of an existing irrigation system can provide conservation without the capital costs of replacing the system or the learning curve of using new electronics. For example, replacement of worn irrigation nozzles or malfunctioning emitters with equipment that meets or exceeds the specifications for the irrigation systems can bring systems back to their maximum water application uniformity potential. These practices should be encouraged on all operations within the CFWI Planning Area through education, self-audits, and programs such as the MILs. The following maintenance and management BMPs are included in this category:

- Cyclic scheduled irrigation
- Irrigation scheduling
- Irrigation system evaluation (or survey)
- Net irrigation requirement based irrigation determination
- Routine system maintenance
- Volumetric measurement of irrigation water use
- Water budget development

Water Control

Water control BMPs use structures and irrigation practices to increase groundwater storage and maximize capillary action, reducing the need for irrigation. These BMPs can conserve water most effectively in systems where surficial water table management is most prevalent, such as within existing drainage ways, when irrigating from a surface water body, or when seepage irrigation is used. The material costs of water control BMPs may be relatively inexpensive to implement compared to the water savings potentials. To achieve the maximum benefit from water control, active management is often required; therefore, the true potential of these systems can be challenging to achieve. As with all of the other practices, its applicability should be evaluated on a farm-by-farm basis, and may require some level of review and regulatory approval prior to implementation. The following water control BMPs are included in this category:

- Furrow dikes
- Water control structures
- Water table observation well(s)

Additional Practices

New technology, practices, and programs to conserve water or reduce use of groundwater in agriculture are being introduced on a frequent basis. A practice that has been observed to conserve water should not be excluded from consideration/implementation because it is not included in this chapter. Each farm should be evaluated individually to determine the most applicable and economically feasible conservation practice. The following additional practices are included in this category:

- Brush control/management
- Crop residue management and conservation tillage
- Group nursery plants according to water needs
- Laser land leveling
- Other proven water conservation techniques and ideas
- Reclaimed water use
- Shade control structures
- Soil amendments
- Soil cultivation techniques
- Surge flow irrigation use for field water distribution systems
- Water metering

Tailwater Recovery

Tailwater recovery systems are typically designed to use surface water features to capture, reuse, and recycle irrigation and stormwater runoff. A properly designed and operated system that effectively recycles captured water can offset the use of groundwater; however, recovered tailwater is an intermittent source of water that is not available at all times (e.g., during a drought) and therefore is not considered reliable for long-range planning purposes. The implementation of tailwater recovery systems is limited in some situations due to concerns with the redistribution of plant pathogens (bacteria, fungi, viruses) and, when used on edible crops, the possible introduction of organisms potentially causing food-borne disease unless the water has been treated, which is a practice that is commonly used and effective. The following tailwater recovery BMPs are included in this category:

- Capturing greenhouse roof run-off and/or irrigation water runoff for reuse
- Tailwater recovery and reuse system

Frost/Freeze Protection

For crops susceptible to damage from cold temperatures, water is applied onto the plants as an effective method for frost/freeze protection. The application of warm water combined with the additional release of heat as water turns to ice helps protect the crop from direct freeze damage. Typically, water must be applied continuously so that ice keeps forming, otherwise the crop may be even more severely damaged, due to evaporative cooling, than if no water was applied. There are ways to reduce the amount of water used for cold protection such as the use of emitters that rewet the plants more frequently than do traditional impact sprinklers. There are also other measures in addition to using water that can help protect crops from cold damage, albeit most of these methods are less or not effective during intense freezes.

Frost/freeze protection water demand occurs during an extreme weather event and is outside the normal volume of water necessary for crop irrigation. These volumes were not considered in the demand projections contained in the CFWI RWSP. However, considerable water can be saved by switching to alternative measures for these climatic events. Having to maintain an irrigation system with the ability to distribute water for frost/freeze events can also preclude switching to a more efficient irrigation system for year-round usage. Implementing BMPs to conserve groundwater during frost/freeze events can require a significant investment in equipment, but the total water use savings from frost/freeze events can be substantial when annualized and compared to annual average daily supplemental irrigation. The following frost/freeze BMPs are included in this category:

- Crop row covers/frost blankets
- Selective inverted sink
- Sprinkler heads and spacing retrofits
- Use fog for cold protection in greenhouses/shade houses
- Wind machines

Agriculture Conservation Programs

Agricultural conservation programs include those providing a service, education, training or cost-share funding to agricultural users. Education and training programs educate agricultural users on BMPs, how to improve efficiency and/or yield of their operations, and on how to identify cost-share funding to implement efficiency BMPs. Service based programs provide resource materials and farm evaluations to determine actions that can be taken to reduce water use while maintaining crop yields, such as MILs. Existing cost-share programs assist growers with funds to implement conservation BMPs. The following agricultural conservation BMP programs are included in this category:

- Agricultural MILs
- NRCS Environmental Quality Incentives Program (EQIP)
- SWFWMD's – Facilitating Agricultural Resource Management Systems (FARMS) Program

Quantifying Potential Water Savings

Water conservation planning tools were used to analyze and quantify the potential water savings for 12 PS and OSS conservation BMPs. Estimated water savings for Agriculture was based on historical agricultural program data, which included 16 BMPs. Cost effectiveness, expressed as cost per 1,000 gallons saved, is used to compare BMPs.

PS and OSS

EZ Guide Model Analysis

The CFWI RWSP used the Conserve Florida Water Clearinghouse EZ Guide (EZ Guide) planning tool to estimate conservation potential for the nine BMPs listed below (see **Volume I**, **Chapter 5** or Switt 2011). In general, output from the EZ Guide provided a summary of total water savings estimates for indoor and outdoor residential, and publicly supplied indoor CII using the following equipment or procedures:

- High-efficiency toilets
- High-efficiency faucet aerators
- High-efficiency showerheads
- High-efficiency urinals
- Pre-rinse spray valves
- Soil moisture sensors
- Irrigation system audits
- CII facility water assessment/audit
- High efficiency clothes washers

Estimates of conservation potential for DSS, CII, LRA, and PG were extrapolated from various segments of the EZ Guide outputs for PS (**Table 5**). EZ Guide results were limited by a maximum cost of $3.00 per 1,000 gallons and participation rates of 23 percent for retrofit-based BMPs and 12.5 percent for BMPs that require another party to visit the site. These participation rates were based on historical participation rates of actual conservation projects supported by SWFWMD's conservation cooperative funding programs and used in the SWFWMD RWSP (2011) and draft SJRWMD DWSP (2014).

To build on the analysis performed using the EZ Guide Tool as part of the CFWI RWSP, the SJRWMD water conservation method, formerly referred to as Florida Automated Water Conservation Estimation Tool conservation modeling tool was used to analyze conservation potential for three additional PS BMPs not included in the EZ Guide tool. A brief explanation of the SJRWMD water conservation method and the application in this effort is presented below.

SJRWMD Water Conservation Method

The SJRWMD water conservation method employs is a linear program to calculate potential future water demand reduction that may be achieved through conservation for all uses except agriculture. The SJRWMD water conservation method used data from PS utility accounts for residential, single-family water use. This dataset includes water use estimates by parcel, based on historical actual water use of approximately 400,000 accounts. The accounts were used to develop typical use patterns (load profiles) which were then applied to parcel data within the CFWI Planning Area since actual billing data was not available. The SJRWMD water conservation method accounted for all existing parcels and uses within a utility service area as well as a projected number of parcels representing future growth within the planning horizon. Benchmark approaches were used to develop water use estimates for users other than residential single-family use. Additional assumptions used in the SJRWMD water conservation method include the following information:

- PS water use base year 2010 (395 mgd) and projection year 2035 (653 mgd) as described in the CFWI RWSP
- Single family residential irrigators utilizing reclaimed water were excluded
- The following participation rates over the planning horizon were used
    - High efficiency dishwasher, 23%
    - Evapotranspiration controllers, 12.5%
    - Waterwise Florida Landscape, 0.1%
- A maximum of $3.00 per 1,000 gallons cost was used to screen BMPs

Below is a listing of the BMPs that the SJRWMD water conservation method considered in calculating conservation estimates. Many of these were previously analyzed using the EZGuide for the CFWI RWSP. Three BMPs, as indicated with an asterisk (*), were evaluated during the Solution Planning Phase using the SJRWMD water conservation method (BMP definitions are provided in **Volume IIA**, **Appendix A**).

- Advanced ET irrigation controllers*
- High efficiency dishwashers*
- Waterwise Florida Landscaping*
- CII facility water assessment/audit
- High-efficiency clothes washers

- High-efficiency toilets
- High-efficiency faucet aerators
- High-efficiency showerheads
- High-efficiency urinals
- Pre rinse spray valves
- Soil moisture sensors
- Higher efficiency indoor standards ordinance adoption
- Modifications to land development regulations for water efficiency

The SJRWMD water conservation method results include 2,845 implementations for Advanced ET Controllers with a program savings of 258,651 gallons per day (gpd), and a total capital cost of $1,138,000, resulting in a cost of $0.86 per 1,000 gallons saved. Results also include 3,956 program implementations for Waterwise Florida Landscaping with a program savings of 870,811 gallons per day and a total capital cost of $7,912,000, resulting in a cost of $1.77 per 1,000 gallons saved (**Table 5**). Dishwasher savings were not reported because the cost threshold of $3.00 per 1,000 gallons was exceeded.

The combined savings for the two selected BMPs using the SJRWMD water conservation method was approximately 1.1 mgd. Including water savings estimates from the additional BMPs evaluated using EZ Guide, the PS quantifiable savings estimate increases from 26.78 mgd to 27.91 mgd with a total estimated implementation cost of $122.1 million. The potential water conservation savings estimates for PS and OSS are 32.54 mgd with a total estimated cost of $140.1 million (**Table 5**). The costs for these BMPs range from $0.04 to $2.65 per 1,000 gallons saved. BMP costs can be shared between one or more funding agencies and end-users via cost-share and rebate programs. The amounts shown in **Table 5** include the entire cost of the BMP for its estimated life (though some service lives are less than 20 years) and costs potentially borne by third parties that would include non-rebate portions. When costs borne by third parties (end users) are factored in, actual costs to funding agencies for implementing some BMPs may be lower than costs shown in **Table 5**.

Table 5. Summary of conservation potential estimates for Public Supply and Other Self-Supply conservation best management practices (BMPs).

Use Sector	Conservation BMP	Modeled Participation Rate	Modeled Service Life[e] (years)	Total Number of Implementations	Cost ($/kgal)[b]	Total Cost ($ million)	Estimated Savings (mgd)
Public Supply	Advanced ET Irrigation Controllers[a]	23%	10	2,845	$0.86	$1.14	0.26
	CII Facility Water Assessment/Audit	12.50%	5	169	$2.41	$0.50	0.10
	Irrigation System Audits	12.50%	5	99,605	$2.65	$6.00	1.21
	High-Efficiency Toilets	23%	40 Res 25 CII	373,215	$0.74	$74.70	7.45
	High-Efficiency Faucet Aerators	23%	15	1,057,602	$0.40	$16.30	7.35
	High-Efficiency Showerheads	23%	40 Res 8 CII	527,728	$0.09	$11.30	8.66
	High-Efficiency Urinals	23%	25	3,808	$0.52	$1.40	0.30
	Pre Rinse Spray Valves	23%	5	307	$0.04	$0.02	0.20
	Soil Moisture Sensors	23%	5	28,617	$1.07	$2.90	1.51
	Waterwise Florida Landscaping[a]	0.10%	20	3,956	$1.77	$7.91	0.87
	PS Subtotal					**$122.17**	**27.91**
Other Self-Supplied	CII Facility Water Assessment/Audit	12.50%	5	8	$2.41	$0.02	0.005
	Irrigation System Audits	12.50%	5	TBD[c]	$2.65	$4.80	0.95
	High-Efficiency Toilets	23%	40 Res 25 CII	39,275	$0.74	$7.86	0.78
	High-Efficiency Faucet Aerators	23%	15	111,292	$0.40	$1.72	0.77
	High-Efficiency Showerheads	23%	40 Res 8 CII	55,533	$0.09	$1.19	0.9
	High-Efficiency Urinals	23%	25	226	$0.52	$0.08	0.02
	Pre Rinse Spray Valves	23%	5	18	$0.04	$0.00	0.01
	Soil Moisture Sensors	23%	5	TBD[d]	$1.07	$2.30	1.19
	Other Self-Supply subtotal					**$17.97**	**4.63**
	Total					**$140.14**	**32.54**

[a] Source SJRWMD water conservation method, all other practices derived from EZ Guide.
[b] Cost/thousand gallons
[c] Estimated number of implementations for domestic self-supply (DSS) users is 4,459. The number of implementations for landscape/recreational/aesthetic (LRA) users cannot be determined using the tools and methods applied here.
[d] Estimated number of implementations for DSS users is 1,310. The number of implementations for LRA cannot be determined using the tools and methods applied here.
[e] The modeled service life refers to the minimum length of time it is expected to perform as designed. Additional BMP replacements after service life will be required to sustain savings.

Planning Tool Considerations

The conservation planning tools used during the Conservation Subteam's analysis of conservation potential are appropriate tools for this level of analysis. However, as with any model, several limitations were identified. Future improvements to these planning tools should provide greater functionality and fewer limitations.

BMP Data

The conservation tools used for this analysis allowed for the detailed evaluation of several BMPs which have been well-researched and for which reliable data is available. However, the ability to quantify the savings realized by additional BMPs was limited by the availability of research and data to support accurate estimates. Therefore, many measures and practices could not be analyzed to determine water savings and costs due to model and data limitations. For example, cooling tower water consumption is often the single largest area of use in many commercial buildings. One study in southwest Florida estimated the cost to save 1,000 gallons of water through cooling tower efficiency measures to be $0.07, which makes it a cost-effective conservation BMP (Hazen and Sawyer 2013). However, there were insufficient data available to evaluate this BMP as part of the Solutions Planning Phase.

It is important for conservation planners to recognize unquantified measures or BMPs (such as the cooling tower example above) and retain them for consideration when planning conservation activities for a specific location or use sector. The ability to analyze a greater variety of BMPs, as well as greater functionality, is expected in future versions of the planning tools.

Passive Savings

Passive savings refer to water savings that occur as a result of users implementing conservation BMPs in the absence of incentives. These are typically the result of education or due to codes or ordinances which mandate the installation of high-efficiency items in new construction and renovations as well as use of other equipment not covered by such mandates. Cumulative passive savings can lower per capita water use. Passive savings will occur in addition to the estimated 37 mgd of water savings through conservation BMPs.

Cost

The cost of water saved, expressed as dollars spent per 1,000 gallons saved, is a factor that affects estimates of conservation potential. The feasibility and attractiveness of spending more on conservation becomes greater as the cost to develop additional alternative water supplies rises. All estimates of conservation potential for PS and OSS were limited by a maximum cost of $3.00 per 1,000 gallons saved. In many areas of the CFWI Planning Area, the cost of new WSPOs is expected to be greater than $3.00 per 1,000 gallons. In these areas, implementation of conservation measures greater than $3.00 per 1,000 gallons may result in additional water savings.

Participation Rates

The participation rate of a conservation BMP is defined as the percentage of users who adopt a conservation measure from the total pool of potential adopters. Participation rates are key assumptions used to estimate potential water savings from different conservation programs. As previously stated, participation rates used in EZ Guide and SJRWMD water conservation method analyses were based on historical participation rates of actual conservation projects supported by SWFWMD's conservation cooperative funding programs and used in the SWFWMD RWSP (2011) and draft SJRWMD DWSP (2014). The EZ Guide and SJRWMD water conservation method assume increasing or decreasing the participation rate will proportionately change the calculated water savings and estimated cost. In practice, this relationship may not be linear and increases in participation rates may require increased expenditures. Increased outreach, education, and funding improve the probability that participation rates and resulting water savings will be achieved.

BMP Service Life

The service life of a conservation BMP refers to the minimum length of time (years) it is expected to perform as designed. The actual useful life of individual conservation BMP can vary. Some BMPs may remain useful long after their (minimum) service life, while others may experience erosion in performance, others still may stop working altogether. The modeled service life of conservation BMPs refers to assumed service life of each BMP as entered into either the EZ Guide or SJRWMD water conservation method assumptions for the purpose of estimating potential water savings.

Agriculture

To estimate agriculture conservation potential, multiple options were considered including: (a) utilizing MIL data originally presented in the CFWI RWSP, (b) utilizing data derived from the SJRWMD irrigation efficiency method, formerly referred to as Florida Automated Agriculture Resource Model, and (c) utilizing historical data based on SWFWMD's FARMS Program. An overview of these tools and approaches are presented below.

CFWI RWSP MIL Analysis

For the CFWI RWSP, agricultural conservation potential was limited to crop irrigation based on MIL evaluations of farms that had follow-up evaluations after farmers had the opportunity to implement recommended efficiency improvements. MIL data were limited in the CFWI Planning Area with only 67 follow-up evaluations in the CFWI over a three-year period and these were all located in Lake County. Additional MIL follow-up evaluations from outside the CFWI Planning Area were included in the CFWI RWSP estimate, increasing the number of MIL evaluations to 130; however, many were not representative of agricultural operations in the CFWI Planning Area. This dataset was considered the best available at that time and projected savings were estimated to be 10.9 mgd using a 12.5 percent participation rate. Additional analysis of the CFWI RWSP estimates during the Solutions Planning Phase, prompted the Conservation Subteam to consider alternative methodologies to estimate potential agricultural water savings.

SJRWMD Irrigation Efficiency Method

The irrigation efficiency method developed by the SJRWMD uses standardized Florida agricultural geodatabases that include acreage, crop type, and irrigation system type. The irrigation efficiency method establishes baseline conditions to estimate efficiency on farms using the Natural Resource Conservation Services (NRCS) Farm Irrigation Rating Method (FIRM). Currently, the irrigation efficiency method uses the beginning assumptions for efficiency used in FIRM for all farms and a savings assumption and cost per acre developed from the literature, of which some do not originate in Florida. The Conservation Subteam concurred that the irrigation efficiency method has great potential to advance estimates for agricultural conservation. Additional research to characterize current efficiencies for crop types and irrigation systems in central Florida, as well as additional documentation and further database review is needed before extensive use of the tool.

FARMS

The SWFWMD's FARMS Program is an established agricultural BMP cost-share reimbursement program to reduce groundwater use by using alternative water supplies and water conservation. The program has more than 10 years' experience in partnering with growers to implement conservation BMP and other projects resulting in groundwater savings. The FARMS Program has implemented 165 production-scale agricultural BMP projects (from program inception through September 2014) that provide resource benefits including water quality improvement, reduction of Upper Floridan aquifer withdrawals and/or conservation, and restoration or augmentation of the area's water resources and related natural systems.

Agricultural Programmatic Approach

The Conservation Subteam concluded that historical data from the FARMS Program and other existing cost-share BMP programs, as well as what is known about agriculture within the CFWI Planning Area, should be used to estimate potential water savings. This approach considers several factors in the development of a conservation estimate including participation rate, water savings, BMPs, and project costs.

The participation rate in agricultural BMPs is critical to achieving desired outcomes. Data from NRCS EQIP, SWFWMD's FARMS and Mini-FARMS programs, and FDACS' My Florida Farm Weather suggests a participation rate ranging between 10 to 15 percent within the 20-year planning horizon. These participation rates were used in the development of the Solutions Planning Phase conservation estimates.

The potential for conservation varies from farm to farm based on the crop grown, type of irrigation system, soil conditions, drainage characteristics, other site-specific conditions, and existing conservation BMPs in operation. It is estimated that the savings and groundwater offset from agricultural programmatic BMP implementation can range from 1 to 100 percent on a single farm. Based on the best available information, the Conservation Subteam used an average 20 percent savings estimate that was applied to the 2035 demand

(20% of 214.8 mgd or 43 mgd). Applying a participation rate of 10 to 15 percent, the revised potential agricultural conservation ranges from 4.3 mgd to 6.4 mgd.

Numerous BMPs implemented through the SWFWMD FARMS Program (**Table 6**) were used to develop conservation BMP cost estimates. Factors included total project cost, programmatic reimbursement cost, and the farmer/grower contribution cost.

Table 6. List of selected SWFWMD FARMS best management practices.

Irrigation system retrofits	Rain sensor shut off devices
Smart irrigation controller	Soil moisture sensor(s)
Water table observation wells	Auto pump start / stop
Automated valves	Weather station with ET measurement
Reclaimed Water	Water control structures
Crop row covers / frost blankets	Tailwater/Surface Water Recovery and Reuse System
Capture and reuse of roof rainwater runoff	Wind machines
Selective inverted sink	Other proven water conservation techniques and ideas

The programmatic approach resulted in a revised potential agriculture conservation savings ranging from 4.3 mgd to 6.4 mgd, which is less than the 10.9 mgd estimate reported in the CFWI RWSP (**Volume I**). The cost estimate range to achieve these savings is $10.1 million to $19.9 million.

Agricultural Programmatic Approach Considerations

The programmatic approach is based on implemented projects and historical data. This approach recognizes that each farm is unique and must be evaluated on a farm-by-farm basis, which has limitations when calculating conservation potential on a regional basis.

The CFWI Planning Area contains farms, ranches, and nurseries in three different water management districts. SWFWMD's FARMS program represents projects in a wide variety of commodity areas. Although SWFWMD has the majority of the farms within the CFWI Planning Area, it isn't necessarily representative of the crop types and acreages found in the other two water management districts (**Tables 7** and **8**). This could cause estimated conservation results to vary throughout the CFWI Planning Area. As additional cost-share programs are implemented and data are collected, it is expected that more accurate estimates of water savings will be developed.

Table 7. Number of farms and estimated 2010 agricultural acreage and demand by county.

County	SFWMD			SJRWMD			SWFWMD		
	# farms	# acres	Demand Projection	# farms	# acres	Demand Projection	# farms	# acres	Demand Projection
Lake	-	-	-	316	15,828	9.47	37	1,447	1.69
Orange	42	3,557	5.17	708	9,191	12.04	-	-	-
Osceola	94	19,951	27.57	21	8,442	26.18	-	-	-
Polk	21	4,418	8.37	-	-	-	1,859	84,196	87.37
Seminole	-	-	-	128	4,591	7.36	-	-	-
Totals	**157**	**27,926**	**41.11**	**1,173**	**38,052**	**55.05**	**1,896**	**85,643**	**89.06**

Note: Based on **Volume IA**, Tables A-17, A-18, and A-19 in the CFWI RWSP.

Table 8. Estimated 2010 agricultural acreage and demand by crop type.

Crop Type	SFWMD		SJRWMD		SWFWMD	
	Acres	Estimated Demand (mgd)	Acres	Estimated Demand (mgd)	Acres	Estimated Demand (mgd)
Citrus	13,170	11.09	20,331	16.55	74,822	76.57
Sod/Pasture	8,030	16.88	8,697	26.77	5,667	5.49
Vegetables/Melons/Berries/ Fruit/Nuts/Misc	6,088	11.82	3,157	1.78	3,871	5.76
Nursery	638	1.31	5,867	9.95	1,283	1.24
Totals	**27,926**	**41.11**	**38,052**	**55.05**	**85,643**	**89.06**

Note: Based on **Volume IA**, Tables A-17, A-18, and A-19 in the CFWI RWSP.

Summary of Potential Water Savings

The Conservation Subteam quantified potential water savings for PS, OSS, and Agriculture conservation options. Over 200 conservation BMPs and conservation-related management strategies was assembled, reviewed, and then reduced to 80 BMPs applicable to PS and OSS users and 47 BMPs applicable to Agriculture users. Available planning tools and estimation methods were used to analyze and quantify the potential water savings from 12 PS and OSS BMPs and 16 Agriculture BMPs. The Solutions Planning Phase estimated approximately 37 mgd of water savings should be met or exceeded from conservation BMPs (**Table 9**). The savings estimates are based on historical participation rates of actual conservation projects and are the result of past levels of education, outreach and incentive funding.

Table 9. Revised projected 2035 conservation potential in the CFWI Planning Area.

Water Use Category	Projected 2035 Conservation (mgd)
Public Supply (PS)	27.91
Agriculture (AG)	4.30
Landscape/Recreational/Aesthetic (LRA)	2.02
Domestic Self-Supply (DSS)	1.19
Commercial/Industrial/Institutional (CII)	1.15
Power Generation (PG)	0.27
Total	**36.84**

Adoption of conservation BMPs and actual water savings could possibly be enhanced with increased levels of education, outreach efforts and funding. Furthermore, there are many additional BMPs, not quantified during these analyses that could be implemented to yield additional savings. Subsequent planning updates may be able to quantify some of these BMPs as well as estimate passive savings known to occur in the absence of program efforts.

Project summaries for each of the BMPs or BMP categories identified during this process are shown in **Volume IIA**, **Appendix A**. These project summaries could contain information including, but not limited to, a brief overview, cost per 1,000 gallons of water saved, constraints, feasibility, limitations, potential project partners, and potential funding sources.

CHALLENGES TO ACHIEVE CONSERVATION

The effectiveness of conservation practices often depends on the funding available to implement BMPs as well as the willingness and ability of water users to change established habits. Overcoming a reluctance to change can be an enormous challenge, while financial limitations can also limit hardware-based BMP adoption rates. Achieving the savings estimates shown and discussed in this chapter will require a blend of educational and outreach efforts, funded incentive-based programs, and, in some cases, regulatory measures. This subsection describes some of the hurdles to achieving the savings estimates. Possible solutions to these challenges are also discussed.

Water Conservation Awareness

Water conservation awareness can lead to the willingness of water users to change established habits. In some cases the reluctance to conserve water stems from the end-user viewpoint that there is plenty of water available and saving water is not necessary. Some individuals feel that access to inexpensive water is a right the public should enjoy and, as long as they are willing and able to pay for it, they should be able to use it as much, and in whatever manner, they see fit. In other instances, lack of direct billing for water use (e.g., rental properties, private irrigation wells), cost for implementation of efficiency improvements, or financial impact of conservation, may be barriers to change.

Increased awareness developed through education and outreach is widely recognized as being a prerequisite to the adoption of conservation-related behaviors and to the participation in conservation and efficiency programs. Education and outreach efforts have been underway for decades and have contributed to significant improvements in water use efficiency in the CFWI Planning Area. The continuation or enhancement of education and outreach programs is needed to increase public awareness for water conservation.

Water users from all stakeholder groups must be made aware of the current challenges to the resource to provide reason and motivation for them to embrace conservation. Users must know how to adapt, which options are the most feasible, and should be made aware of assistance programs (i.e., training, funding) which have been put in place to help them make these changes. Furthermore, educating all users about the limited and public nature of the region’s water resources, the basics of Florida water law and the fundamentals of consumptive use permitting is the first step to changing water use and ensuring users and permittees have the information they need to conserve. Education, increased conservation awareness, and financial assistance may also assist users in accepting changes that result in lower water use.

The need for continued and enhanced outreach efforts to achieve and exceed the identified potential savings was a key finding of the Conservation Subteam. Additional funding and support will facilitate implementing an expanded education and outreach program.

Regulatory Measures

Regulatory measures are one of the three main tools of an effective conservation program, following incentive-based programs and education and outreach initiatives. Regulations or mandates can be used to shift improved practices or devices into mainstream use. To ease potential burdens on end users needing to make more costly transitions to high-efficiency hardware, some regulations could be matched with financial assistance. Furthermore, regulations can be used to incentivize additional conservation. For example, the FDEP and water management districts recently implemented conservation rules that allow a public supply permittee to obtain a permit extension by implementing a conservation plan and demonstrating quantifiable water savings attributable to conservation beyond that required to achieve efficient water use in the permit. The FDEP and water management districts may identify and evaluate options to provide a similar opportunity for agriculture permittees. The Conservation Subteam identified the following ways which regulations, mandates, or incentives could be adopted: statewide, by statute; by local governments, per ordinance; by water management districts, by rule; while some utilities may be able to require their implementation as a condition of service.

Funding

Reducing current water demands using conservation BMPs is often less expensive than developing alternative water supplies, but can also require capital expenditures. Many water users have limited discretionary income that can be used for efficiency upgrades. Furthermore, unlike costs associated with alternative water supply projects, the costs to implement conservation projects are not generally financed by bonds and must be assumed by the party implementing the project. Financial incentives and assistance for end users are often necessary with a variety of funding mechanisms available, such as rebates, grants, and credits. Cost share programs at the state and water management districts, often provide annual reoccurring funding assistance to aid local partners with implementation. Continued funding of these programs will help ensure that these water use reductions are achieved.

Implementing BMPs

The Conservation Subteam was successful in identifying and quantifying potential cost-effective water savings for 10 PS and OSS BMPs and 16 Agriculture BMPs. Implementation of BMPs over the next 20 years requires additional planning and development regarding target locations, implementation schedules, responsible parties, monitoring programs, budget and funding sources. For example, it was estimated that the replacement of 412,490 conventional toilets with high-efficiency toilets would result in a water savings of approximately 7.5 mgd at a cost of $ 82.6 million. To ensure accountability, locations, implementing entities, and funding sources will need to be identified for results tracking. Public suppliers and agricultural users are best positioned to conduct detailed analyses of which BMPs are most applicable. Tools such as those used in this analysis are available to evaluate different options. Additional data and advances in tools would be beneficial to improve these evaluations, including a statewide clearinghouse for PS and Agriculture.

The same level of planning and scope development will be needed to successfully implement any of the other BMPs and programs. For example, the Subteam identified irrigation system retrofits as a viable Agriculture BMP. Identifying specific types of retrofits applicable to individual farms or types of farms has yet to be determined. This will require an in-depth accounting of farms in the CFWI Planning Area and their respective irrigation systems. Once completed, implementation schedules, responsible parties, monitoring programs, budget and funding sources will need to be identified.

Challenges to implementing successful regional conservation efforts can be overcome with the application of several time-tested approaches including: comprehensive, region-wide outreach and education campaigns; funding to assist with implementation; and, if necessary, additional regulations and mandates for higher water use efficiency.

3

Solutions Strategies Projects

This chapter provides an overview of Water Supply Project Options (WSPOs) evaluated by the Groundwater (GW), Reclaimed Water (RW), Surface Water (SW), and Stormwater (ST) Solutions Planning subteams. The Solutions Planning Team (SPT) charged the subteams with further assessing the WSPOs identified in the CFWI RWSP Volume IA, Appendix F, Table F-1. In addition, all subteams were tasked with conceptualizing new potential WSPOs that meet their respective subteam criteria. Newly developed projects were also included in this Solutions Planning Phase (**Volume IIA**, **Appendix D**). Subteam members used the Cost Estimating (CE) Tool to assess the planning level costs for each WSPO. The CE Tool is summarized in the next section and is described in detail in **Volume IIA**, **Appendix B**. The selected Solutions Planning Phase WSPOs are described in the sections below.

COST ESTIMATING APPROACH

A Cost Estimating Group (CE Group) was formed with the primary goal of developing a uniform cost estimating approach. The CE Group provided the Solutions Planning subteams with a planning level CE tool that provides consistent calculation of the following cost parameters:

- Total Capital Cost (including non-construction capital costs, and land, if required)
- Equivalent Annual Capital Cost
- Annual Operation and Maintenance Cost
- Total Equivalent Annual Cost
- Unit Production Cost

The CE Group consisted of representatives from the three water management districts, as well as other technical representatives. A significant challenge was to develop a cost estimating approach that would be applicable to a wide variety of project types, while ensuring a consistent "apples to apples" comparison of WSPOs. The approach included collecting cost data for various water supply facilities and components, developing cost equations, identifying consistent values for parameters (e.g., discount rate), and developing a user-friendly tool preloaded with systems and components data.

The CE Tool was designed to achieve a Class 5 Estimate level (AACE International 2005). A Class 5 Estimate is considered a "Conceptual Screening" level, with an expected accuracy range of -50 to +100 percent. As projects are developed further, costs will be revised to reflect additional project details.

Cost Data

Cost data were gathered from various central Florida projects. After a review of these data, the CE Group determined that an existing study, "Engineering Assistance in Updating Information on Water Supply and Reuse System Component Costs", 2008-SP10, by Black & Veatch for SJRWMD, revised May 2008 (CE Report) contained a reasonable and well-documented basis for estimating costs of the identified CFWI WSPOs. The CE Report is available on the SJRWMD website. All costing information was escalated to March 2014 economic conditions using the Engineering News Record Construction Cost Indices (ENRCCI).

For consistency among calculations, values for some parameters were used in all calculations where applicable. This included providing a consistent discount rate for all projects, and a recommended listing of life cycles. The discount rate used was the Fiscal Year 2014 Federal Water Resources Planning Discount Rate (USACE 2014). The CFWI Technical Memorandum – Cost Estimating and Economic Criteria for 2014 provides a summary of CFWI project assumptions and is included in **Volume IIA**, **Appendix B**.

CE Tool

The CE Group gave significant consideration to the format and input requirements of the CE Tool to facilitate the use by a variety of users. Given the potential complexity associated with this effort, and after reviewing various options, a spreadsheet model that could use system and component cost equations was selected as the most effective platform. To simplify the application of the CE Tool, only basic information such as flow rates, volumes, and lengths is required. The use of cost equations allowed for flexibility in the use of input variables that could be for a variety of projects. The CE Tool was tested prior to use by the subteams.

The Solutions Planning subteams grouped the WSPOs into major systems and components for purposes of cost estimation. Systems consist of larger processes or operations (i.e., treatment processes), while components are infrastructure specific (i.e., piping and valves). For a few unique projects that required a customized approach to costing, the CE Tool was flexible enough to use after some customization. However, for some WSPOs the CE Tool was not appropriate (e.g., earthwork) and costs from previously developed project feasibility studies were used in place of the CE Tool. For additional information, refer to **Volume IIA, Appendix B**.

WATER SUPPLY PROJECT OPTION ASSESSMENT

Under the guidance of the SC, the SPT established project type-specific criteria to aid in the selection of projects for assessment. This section provides an evaluation of the projects that have met these criteria.

The criteria focus on project capacity, projects that are multi-jurisdictional, and those projects that encourage regional interconnections and maximize economies of scale. The project capacity criteria for each subteam are

- Groundwater - 5 mgd or greater
- Reclaimed Water - 1 mgd or greater
- Surface Water - 10 mgd or greater
- Stormwater - 1 mgd or greater

LAW/CODE

Multi-jurisdictional projects are defined in Section 373.019(12), F.S. as

. . . two or more water utilities or local governments that have organized into a larger entity, or entered into an interlocal agreement or contract, for the purpose of more efficiently pursuing water supply development or alternative water supply development projects listed pursuant to a regional water supply plan.

WSPOs meeting the applicable SC criteria were further assessed and summarized by the following categories:

- Project description
- Cost-benefit analysis of yield ($/1,000 gallons)
- Cost estimates (Capital & Annual O&M)
- Water resource constraints
- Potential partners and governance options
- Pumping, storage, and transmission configurations
- Project feasibility and estimated property requirements
- Funding sources
- Regional water supply project limitations or constraints resulting from the inconsistency of the rules
- Other considerations – public concerns or nontechnical issues
- Estimated implementation schedule

The groundwater, reclaimed water, surface water, and stormwater projects evaluated during the Solutions Planning Phase are shown on **Figure 5**.

SOLUTIONS PHASE WATER SUPPLY PROJECT OPTIONS

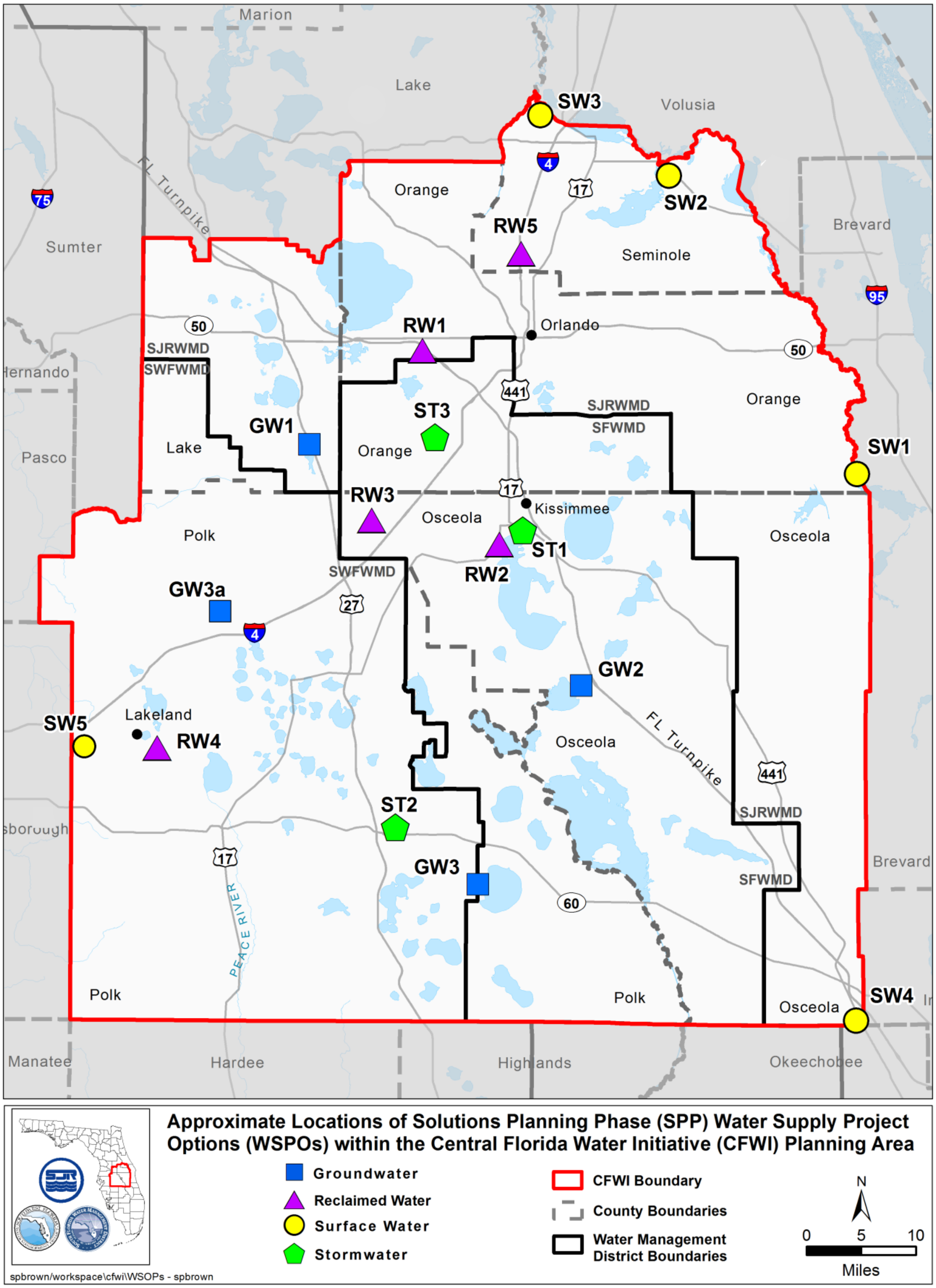

Figure 6. Map of Solutions Planning Phase Water Supply Project Options.

Groundwater

The primary source of water supply in the CFWI Planning Area is traditional groundwater. In some areas, Lower Florida Aquifer (LFA) groundwater project options have the potential to meet some of the future demand while reducing the impact to water resource constraints when compared to the Upper Floridan Aquifer (UFA). The projects evaluated by the Groundwater (GW) Subteam were primarily LFA projects, some of which are known to be in areas with brackish groundwater; however, the location of brackish water within the LFA is not well defined in the CFWI Planning Area. For alternative or nontraditional water supply planning purposes in the CFWI Planning Area for SJRWMD and SWFWMD, brackish water is generally defined as water with a total dissolved solids (TDS) concentration of greater than 500 mg/L. The SFWMD defines saline water as water with chloride concentrations greater than 250 mg/L. This deeper groundwater source has a higher unit cost of production than traditional groundwater sources due primarily to the cost to treat the water for consumption. The treatment of brackish groundwater typically may be accomplished by using low pressure reverse osmosis (RO) or electrodialysis reversal (EDR): each method requires disposal of concentrate or reject water. Other technologies available to treat brackish water are typically more costly (e.g., ion exchange and distillation).

Solutions Phase Evaluation

The GW Subteam's goal was to advance the evaluation of groundwater WSPOs identified in the CFWI RWSP, as well as, to identify additional groundwater options that may help meet the water supply needs of the region. The team focused on regional, 5 mgd or larger projects.

GW Subteam Objectives

- Evaluate the existing ECFT model and understand limitations and capability of the model.
- Identify groundwater supply project options from the CFWI RWSP and any other potential project options that are identified during this process.
- Establish processes for running the model and groundwater withdrawal scenarios to be modeled.
- Assess modeled effects of the withdrawal scenarios on the identified "measuring sticks" (described in **Chapter 4** and **Volume IIA, Appendix F**).
- Estimate potential additional available groundwater based upon the model results and assessed effects on the measuring sticks.
- Document findings and identify recommended actions for further implementation of project alternatives.

Groundwater Project Options

The GW Subteam began by reviewing the 35 brackish/nontraditional groundwater projects and 1 management strategy identified in the CFWI RWSP that have a total estimated water supply capacity of approximately 75 mgd and 6 mgd, respectively (Volume IA, Appendix F). The management strategy, Wellfield Sharing, was not evaluated under the Solutions Planning Phase. This management strategy was not considered to be a long-term solution by the implementing entity or entities. The GW Subteam identified two projects that met the SC criteria (Cypress Lake Wellfield and Southeast Polk County Wellfield) and developed an additional option to the Southeast Polk County Wellfield by combining 16 related projects (Polk County Blended LFA Distributed Wellfield). In addition, a new project (South Lake County Wellfield) also met the SC criteria and was included in the full evaluation. These three WSPOs were further evaluated based on the SC criteria and are listed in **Table 10** (GW1-GW3a) and shown on **Figure 5**. These projects are briefly described below and additional information on each project is included in **Volume IIA**, **Appendix C.**

Table 10. Solutions Planning Phase groundwater project options.

Solutions Project ID	RWSP Project #	County	CFWI Sub-Regions	Project Name	Est. Finished Water Generated (AADF mgd)
GW1	1 & 2[a]	Lake	SJRWMD	South Lake County Wellfield	12.7
GW2	3, 4, & 5	Osceola	SFWMD	Cypress Lake Wellfield	20.5[b]
GW3	28	Polk	SFWMD	Southeast Polk County Wellfield	30
GW3a[b]	6-9, 11, 14, 16-18, 21-24, 26, 30, & 37	Polk	SWFWMD/ SFWMD	Polk County Blended LFA Distributed Wellfield	9.8

[a] Newly developed CFWI WSPO identified during the Solutions Planning Phase
[b] Total project is 30 mgd of finished water
AADF = average annual daily flow

Groundwater modeling was completed assessing potential groundwater availability and impacts to water resources. Modeling results are presented and discussed in **Chapter 4**.

South Lake County Wellfield – GW1

The South Lake County Wellfield Project has the potential to supply 12.7 mgd of finished water to the members of the South Lake Regional Water Initiative (SLRWI), which includes Lake County government, Lake Utility Services, Inc. (LUSI) a private utility provider, and the communities of Clermont, Mascotte, Groveland, Minneola, and Montverde. The project is a collaborative effort among these entities, which have entered into an interlocal agreement setting forth the structure for cooperatively bringing a water supply project forward.

There are two options for implementing this project: a Centralized LFA wellfield or a Distributed LFA wellfield in south Lake County. Development of a Centralized wellfield, which is assumed to be brackish, includes the construction of a new water treatment plant (WTP), wellfield and raw water transmission systems, concentrate disposal well(s), water storage tank(s) and the distribution water mains to facilitate water wheeling among the SLRWI members. The Distributed project includes the construction of a series of LFA wells using existing municipal UFA wellfield sites owned by the SLRWI member communities. Because the LFA is anticipated to be of potable quality in the area of the distributed wells, the Distributed project eliminates the need for a brackish groundwater treatment facility and concentrate disposal well. This project option includes minimal storage, pump station, and transmission main components because it takes advantage of existing storage and transmission infrastructure by collocating the wells at existing UFA well sites. Both project options have the potential to provide 12.7 mgd of finished water to the SLRWI members as part of the sustainable yield through 2035.

The groundwater modeling shows both project options have potential impacts to MFL lakes and springs as well as non-MFL water resources. Although the model does show impacts, producing water from the LFA should reduce the potential for impacts when compared to using traditional UFA sources. **Chapter 4** discusses the environmental evaluations for these two project options in more detail.

The Centralized wellfield planning level capital cost is estimated to be approximately $116.5 million with a unit production cost of $3.57 per 1,000 gallons. The Distributed wellfield planning level total capital cost is estimated to be approximately $26.8 million with a unit production cost of $0.33 per 1,000 gallons. The project implementation schedule will be based, in part, on the availability of the traditional water supply to satisfy the SLRWI member's future water demands. Design and construction to complete the project facilities is anticipated to take 5 to 7 years with a likely completion date of no later than 2022.

Cypress Lake Wellfield Project – GW2

The Cypress Lake Wellfield Project, water treatment plant, and associated infrastructure is anticipated to supply up to 30 mgd of finished water to members of the Water Cooperative of Central Florida (WCCF), which consists of the Tohopekaliga Water Authority (TWA), Orange County Utilities (OCU), Polk County Utilities (PCU), and the City of St. Cloud. The Reedy Creek Improvement District (RCID) is also a partner on this project with the WCCF.

The project is the development of a nontraditional LFA groundwater wellfield in central Osceola County. The project includes the construction of a new WTP, wellfield and raw water transmission systems, concentrate disposal well(s), and the distribution water mains to facilitate water wheeling among the WCCF partners. For the Solutions Planning Phase, this project was evaluated at a finished water supply quantity of 20.5 mgd. The initial 9.5 mgd of finished supply from this project is included in the modeled Baseline Condition. A 30-year water use permit (WUP No. 49-02051-W) was issued to the WCCF partners and RCID on Oct. 3, 2011 for a total withdrawal of 37.5 mgd (including water associated with advanced treatment losses).

Impacts to wetlands and lakes near the wellfield are expected to be minimal due to extensive confining units above the LFA where water is being withdrawn. Producing water from the LFA should minimize the potential for impacts along the ridges and into Polk County; however, the Cypress Lakes Wellfield is one of a number of groundwater withdrawal locations projected to grow beyond the Baseline Condition and as such may contribute to possible impacts to MFL lakes and wetlands closer to the ridge areas. The water use permit issued by the SFWMD includes an environmental monitoring program. **Chapter 4** discusses the environmental evaluations for this project in more detail.

The construction schedule has 15 mgd of finished water being made available by fiscal year (FY) 2019-2020. Planning level capital cost is estimated at $374.3 million at a unit production cost of $3.57 per 1,000 gallons.

Southeast Polk County Wellfield Project – GW3

The Southeast Polk County Wellfield Project is anticipated to supply up to 30 mgd of finished water to 10 municipal service areas — the cities of Auburndale, Davenport, Eagle Lake, Frostproof, Haines City, Lake Alfred, Lake Wales, Winter Haven, the Town of Dundee, and the Town of Lake Hamilton — and three Polk County Utilities service areas: East Regional Utility Service Area (ERUSA), Northeast Regional Utility Service Area (NERUSA), and Southeast Regional Utility Service Area (SERUSA). As part of the advancement of this project, the municipalities for these service areas and Polk County are forming a regional water supply entity.

The project is the development of a centralized nontraditional LFA groundwater wellfield in southeast Polk County. The project includes the construction of a new WTP, wellfield and raw water transmission systems, concentrate disposal well(s), and the distribution water mains to facilitate water wheeling among the Polk County project partners. The project is expected to yield 30 mgd of finished water for the project partners. A 40-year water use permit (WUP No. 53-00293-W) was issued to Polk County on January 27, 2014 in the amount of 37.5 mgd (which includes water associated with advanced treatment losses).

Impacts to wetlands and lakes near the wellfield are expected to be minimal due to extensive confining units above the LFA where water is being withdrawn. Producing water from the LFA should minimize the potential for impacts along the ridges within Polk County; however, the Southeast Polk County Wellfield is one of a number of groundwater withdrawal locations projected to grow beyond the Baseline Condition and as such may contribute to possible impacts to MFL lakes and wetlands closer to the ridge areas. The water use permit issued by the SFWMD includes an environmental monitoring program. **Chapter 4** discusses the environmental evaluations for this project in more detail.

The implementation schedule has 10 mgd of water being made available by FY 2022-2023. The planning level capital cost is estimated to be approximately $284.6 million with a unit production cost of $2.59 per 1,000 gallons.

Polk County Blended LFA Distributed Wellfield – GW3a

The Polk County Blended LFA Distributed Wells is a combination of blending projects under the category of brackish/nontraditional water supply, delivering 9.8 mgd of finished water to 14 municipal service areas — the cities of Auburndale, Bartow, Davenport, Fort Meade, Frostproof, Haines City, Lake Alfred, Lake Wales, Winter Haven, Lakeland, Mulberry, Polk City, and the towns of Dundee and Lake Hamilton.

The project includes a total of 16 LFA wells throughout Polk County located at or near the project partners' existing water treatment facilities. This project is proposed as an alternative to a centralized LFA wellfield in southeast Polk County; this project would be beneficial by distributing the impact of 9.8 mgd of withdrawals across a larger area. The remaining 20.2 mgd in this scenario will still need to come from a source such as the Southeast Polk County Wellfield Project to meet a total of 30 mgd of future demands. To eliminate the need for advanced water treatment such as membranes while meeting State drinking water standards, this project will blend the brackish LFA water with potable UFA water. This project consists of 6.4 mgd of LFA withdrawals and 3.4 mgd of UFA withdrawals in order to blend the LFA water to potable supply standards.

The groundwater modeling shows potential impacts to MFL lakes and non-MFL water resources. Although the model does show impacts, producing a portion of the water from the LFA should reduce the potential impacts when compared to traditional Upper Floridan sources. **Chapter 4** discusses the environmental evaluations for this project in more detail.

Planning level capital cost is estimated to be approximately $28.6 million with a unit production cost of $0.31 per 1,000 gallons.

Challenges

The Solutions Planning Phase groundwater project options presented above have the potential to supply up to 63.2 mgd (GW1, GW2, and GW3) of alternative water supply to the CFWI Planning Area. These brackish/nontraditional groundwater projects are capable of meeting future demand while reducing the impact to water resource constraints when compared to traditional groundwater sources. Most of the groundwater quantities identified for these projects will be derived from the LFA. For long-term management of the withdrawals, it will be necessary to expand current data collection and testing to ensure these quantities can be developed in a manner that minimizes environmental impacts and changes in aquifer water quality. This has already been addressed in the two currently permitted projects (Cypress Lake Wellfield and Southeast Polk County Wellfield) through the requirement of environmental monitoring programs. Additionally, the CFWI has presented a plan to improve the monitoring of the water resources including expanded monitoring of the LFA.

Minimum Flows and Levels / Environmental Concerns

Minimum Flows and Levels (MFLs) and Water Reservations have been adopted or are under development for numerous water bodies within the CFWI Planning Area. As projects advance, further analysis should be conducted to ensure that the timing and quantity of withdrawals maintain or improve the hydrologic functions of lakes, wetlands, and other environmental needs, and is consistent with MFL prevention and recovery strategies. With respect to non-MFL water bodies, an improved understanding and quantification of groundwater withdrawal impacts needs to be developed. Work is also needed to identify and evaluate technical, environmental, and economically viable options for restoring levels and flows to water bodies that are currently adversely impacted by groundwater withdrawals and/or to prevent adverse impacts from future groundwater withdrawals.

Reclaimed Water

Reclaimed water is wastewater that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility. Over the years, reclaimed water has played a significant role in providing an offset to potable water use. For the past several years the reclaimed water utilization rate (percentage of wastewater reused) has been over 90 percent among many utilities operating within the CFWI Planning Area. Reclaimed water is used for non-potable purposes such as landscape irrigation, agricultural irrigation, groundwater recharge, environmental enhancement, aesthetic uses, industrial uses, and fire protection purposes. To promote the increased use of reclaimed water, other sources, such as surface water and stormwater, can be treated to reuse standards and used to augment the reclaimed water supply. The use of reclaimed water for irrigation has provided a means for reducing groundwater use. For the Public Supply sector, use of reclaimed water for urban irrigation, especially for residential lots has contributed to the decline of per capita water use rates that have been observed and documented over the past two decades in the CFWI Planning Area.

The State of Florida and the Districts encourage and promote the use of reclaimed water to the maximum extent feasible. The Water Resource Implementation Rule (Chapter 62-40, F.A.C.) requires the FDEP and Districts to advocate the reuse of reclaimed water as an integral part of water management programs, rules, and plans. In order to provide additional incentives for reclaimed water use, the Florida Legislature amended Section 373.250, F.S. in 2012. The amendments required the FDEP to initiate rulemaking to incorporate criteria for the use of "substitution credits" and "impact offsets" when a District is reviewing a consumptive use permit application. Impact offsets can be derived from the use of reclaimed water to reduce or eliminate a harmful impact that has or would otherwise occur as a result of a surface or groundwater withdrawal. A substitution credit means the use of reclaimed water will replace all or a portion of an existing permitted use of a resource-limited surface water or groundwater, allowing a different user or use to initiate a withdrawal or increase its withdrawal from the same resource-limited water resource.

Recent droughts and long-term water shortages in other states and countries have shown that fresh water supply sources are not unlimited. This has increased investigations into the use of reclaimed water as a potable (drinking water) source. Potable reuse is the process of introducing purified water, either directly or indirectly, to augment the supply of water for drinking water and other uses. Potable reuse is a feasible option for the sustainable management of water because it is not dependent on rainfall and has the potential to make a significant contribution to urban water resources. Direct potable reuse (DPR) introduces purified reclaimed water into a drinking water treatment facility or into a drinking water distribution system. Purified water is water derived from municipal wastewater, which has undergone extensive treatment and monitoring to assure that strict potable water quality requirements are met at all times. Although DPR is not currently being implemented by utilities within the Districts, there is increasing interest in the concept and is considered a viable future water supply option. Several high profile projects in western states and in other countries treat reclaimed water to state and federal drinking water standards so that it can be recycled for potable water supply uses. There are four notable recent direct potable reuse projects that are in operation: the Singapore NEWater Project, the Colorado River Municipal Water District's Big Spring Project, the Wichita Falls Texas project, and the Cloudcroft New Mexico project. Several recent studies, reports, and other documents have been published on DPR. Two reports published by the WateReuse Foundation, *Direct Potable Reuse – A Path Forward* and *The Opportunities* (Tchobanoglous et al. 2011) and *Economics of Direct Potable Reuse* (Raucher and Tchobanoglous 2014) concluded water treatment technologies can be used to continuously and reliably meet appropriate potable standards and therefore can offer a relatively economical source of potable water supply.

Indirect potable reuse (IPR) is the planned discharge of purified water to groundwater or surface water to augment the supply of water available for drinking water and other uses. IPR has been implemented locally, nationally and internationally. The City of Clearwater is constructing an IPR pilot project that will use direct aquifer recharge to replenish the UFA. Incidental IPR has taken place for a long time and in many areas, including Florida, through the application of reclaimed water to RIBs, wetlands, and other land-based systems that have resulted in groundwater recharge of water supply sources used for potable water supply. In many areas that use rivers as their potable water supply source, this occurs where wastewater is discharged from a wastewater treatment plant to a river and subsequently used as drinking water source for a downstream community.

In 2010, there were 80 wastewater treatment plants in the CFWI Planning Area including distribution facilities with permitted capacities over 0.1 mgd. These providers generated 193 mgd of treated wastewater: 105 mgd was reused for irrigation and industrial uses; 73 mgd was reused for aquifer recharge and environmental enhancement; and 15 mgd was either discharged to surface water features or disposed of via percolation ponds (FDEP Reuse Inventory 2010). An additional amount of 4 mgd of groundwater or stormwater was used to supplement reclaimed water supplies.

By 2035, wastewater treatment plants in the CFWI Planning Area are projected to generate 314 mgd of wastewater flows, an increase of 121 mgd, between 2010 and 2035. When anticipated supplemental sources of 44 mgd are included with this increased wastewater flow, reclaimed water flows are projected to increase by 165 mgd in 2035. Based on current reuse practices, there is the potential that 106 mgd of potable-quality water could be offset in 2035; however, the exact application and location of the reuse will determine how much offset could be achieved. Historically only a portion of wastewater treated for reuse has been used to offset demands that would otherwise require use of a traditional source. As such, all of the additional reclaimed water flows in 2035 (165 mgd including supplementation) may not result in a 165 mgd reduction in future water demands. Reclaimed water use in the CFWI Planning Area is described in detail in **Volume I**, **Chapter 6** and **Volume IA**, **Appendix E.**

Solutions Phase Evaluation

The Reclaimed Water (RW) Subteam's goal was to advance the evaluation of reclaimed water WSPOs identified in the CFWI RWSP. The team focused on multi-jurisdictional projects with greater than 1.0 mgd of capacity of potable offset.

RW Subteam Objectives

- Evaluate reclaimed water projects identified within the CFWI RWSP including, cost estimates, sources, water resource constraints, potential partnerships, additional pumping and transmission configurations, feasibility and permittability, and funding options.
- Coordinate with the Regulatory Team to identify if there are project limitations or constraints resulting from rule inconsistencies in the CFWI.
- Contribute to the development of the CFWI 2035 Water Resources Protection and Water Supply Strategies Plan.

Reclaimed Water Project Options

A total of 87 potential reclaimed WSPOs were identified in the CFWI RWSP, Volume IA, Appendix F, Table F-1. Of these 87 projects, the Subteam evaluated five (RW1-RW5) that met the SC criteria (**Table 11**). The project locations are depicted in **Figure 5**.

Table 11. Solutions Planning Phase reclaimed water project options.

Solutions Project ID	RWSP Project #	County	CFWI Sub-Regions	Project Name	Est. Water Generated (AADF mgd)
RW1	44	Orange	SJRWMD	Project RENEW	9.2
RW2	59	Osceola	SFWMD	West Ditch Stormwater for Reuse Augmentation	1.5
RW3	60	Osceola	SFWMD	160-ac Site Indirect Potable Reuse	5.0
RW4[a]	100	Polk	SWFWMD	TECO Polk Power Reuse	10.0
RW5[a]	106	Orange	SJRWMD	AFIRST	4.5

[a] These projects are funded and currently under construction.

It is estimated these projects, if implemented, could generate 30.2 mgd. Each of the five projects is briefly described below, with additional details provided in **Volume IIA, Appendix C**.

Project RENEW – RW1

Project RENEW is a regional water reuse project. The proposed project should offset adverse impacts to wetlands and lakes from Orlando Utilities Commission's (OUC's) pumping at full consumptive use permit (CUP) allocation. The project is planned to ultimately provide 9.2 mgd of reclaimed water from the City of Orlando to northwest Orange County. Project RENEW was modeled and accepted by the SJRWMD as part of OUC's CUP to bring 8.55 mgd of reclaimed water to Apopka and 0.65 mgd to Winter Garden for a total of 9.2 mgd. The source of the reclaimed water is the City of Orlando's Iron Bridge Water Reclamation Facility (WRF) or raw wastewater diverted from the Iron Bridge service area and treated at Orlando's Conserv II WRF (also known as McLeod Road WRF). The project as currently planned includes wastewater collection system upgrades to divert wastewater to the Conserv II WRF, wastewater treatment improvements at the Conserv II WRF, and construction of a reclaimed water pump station and transmission mains. As currently planned, the reclaimed water from this project could directly offset pumping from two utilities that use the UFA to serve irrigation water.

Project RENEW is being re-evaluated, given changes that have occurred over the last 10 years, to determine if a better regional option is viable considering the MFL Prevention and Recovery Strategies currently being developed for southern Lake, Orange, and Seminole counties. Completion of the Solutions Planning Phase and the MFL Prevention and Recovery Strategies for these areas will assist in re-evaluating and optimizing the project for regional benefit.

Planning level costs for Project RENEW were made for Phase 1 and Phase 2. Phase 1 is based on constructing a reclaimed transmission pipeline sized for flows from Orlando's Conserv II WRF to Apopka's WRF with a 3.0 mgd pump station. More than half of the land costs have already been spent on acquiring necessary reclaimed water pipeline easements. No improvements to wastewater collection or treatment are expected in Phase 1. The existing wastewater collection system has the capacity to redirect the targeted 3.0 mgd flow. Phase 2 construction will include improvements to Orlando's raw wastewater collection and Conserv II treatment system to redirect flow from east to west, so that 9.2 mgd of reclaimed can be delivered to the northwestern area of Orange County.

Planning level capital costs are estimated to be $50.5 million for Phases 1 and 2. Operation and maintenance costs are estimated at $291,000, annually, which results in a unit production cost of $0.89 per 1,000 gallons. Phase 1 is required by the CUP to be completed by October 2020, and be capable of supplying at least 3.0 mgd of reclaimed water for reuse and/or recharge. Phase 2 will be completed by October 2022, and must provide a total of 9.2 mgd of reclaimed water for reuse and/or recharge.

West Ditch Stormwater for Reuse Augmentation – RW2

The West Ditch Stormwater for Reuse Augmentation project is intended to help meet anticipated demands by capturing and managing stormwater to augment reclaimed water at the Tohopekaliga Water Authority (TWA) South Bermuda Water Reclamation Facility

(SBWRF). TWA currently has a surface water treatment system located at the SBWRF for water withdrawals from Shingle Creek. The stormwater capture system would be used to further supplement the alternative water supply for TWA on an as-available basis. Currently, the City of Kissimmee's West Ditch City basin drains stormwater to Lake Tohopekaliga through a system of ditches and a canal. TWA is planning to collect water from the West Ditch City canal, when available and route it through a series of interconnected ponds to provide stormwater as a reuse supplementation at the SBWRF. Property and/or easements will be needed to collect water and route it to the SBWRF. It is estimated that approximately 55 acres of land will be required for storage ponds. It is assumed that the land required for storage ponds would be an in-kind service provided by the City of Kissimmee. Existing pumping, storage, and transmission configurations at the SBWRF would not need to be altered for this project. It was determined that, on average, approximately 1.5 mgd of stormwater runoff would be available 60 percent of the time (approximately 0.9 mgd finished water), with a peak rate of 2.5 mgd. For periods of time when reclaimed water demands do not need to be supplemented, stormwater could be captured and distributed to RIBs for aquifer recharge.

Planning level capital costs are estimated to be $28.2 million. Operation and maintenance costs are estimated at $446,000 annually, which results in a unit production cost of $3.23 per 1,000 gallons. Most of the estimated cost is for the construction of the storage ponds.

160-acre Site Indirect Potable Reuse – RW3

The 160-acre Site Indirect Potable Reuse project is a TWA proposed project to use a series of existing rapid infiltration basins (RIBs) in northwestern Osceola County for indirect potable reuse. The 160-acre site is located on the Lake Wales Ridge, which is characterized by permeable sand, lack of a confining layer, and a deep water table. The permeable sand provides for a large amount of water storage. As a result, RIBs function well in this area for recharging the UFA. TWA received a variance to increase the permitted capacity of these RIBs in 2014. Based on groundwater model simulations, TWA estimates that it can install water supply wells near the RIBs, taking advantage of aquifer recharge from the reclaimed water.

TWA is considering two options: Option 1 uses proposed wells in the area of the 160-acre Site to withdraw and transmit recharge water to TWA's Southwest Water Treatment Plant (SWWTP) for potable use (Indirect Potable Use), and Option 2 uses the proposed wells for irrigation of the neighboring Stoneybrook South and ChampionsGate areas. For the purposes of this evaluation, it is assumed Option 1 is implemented, with five wells installed to recover the water. Each well will have a capacity of 1.0 mgd, for a total capacity of 5.0 mgd. Raw water will be sent to the SWWTP via a raw water main.

Planning level capital costs are estimated to be $7.7 million. Operation and maintenance costs are estimated at $95,000 annually, which results in a unit production cost of $0.29 per 1,000 gallons. TWA's 2015-19 Capital Improvement Plan anticipates project construction will begin in FY 2019.

TECO Polk Power Reuse – RW4

The TECO Polk Power Reuse project is an ongoing project within the SWFWMD portion of Polk County to supply 10.0 mgd of reclaimed water to the Tampa Electric Company (TECO) Polk Power Generation Facility. Ultimately this project will supply up to 17.0 mgd of reclaimed water in the Southern Water Use Caution Area (SWUCA) that would otherwise come from groundwater sources. The project components include reclaimed water pump stations, storage tanks, water quality treatment at TECO, deep disposal well, and piping.

This ongoing project is cooperatively funded by the TECO and the SWFWMD. The project will be owned and operated by TECO. Three utilities (Lakeland, Mulberry, and Polk County) have agreed to supply TECO with excess reclaimed water for a period of 30 years.

Construction began in January 2011 and is scheduled for completion in January 2017. Total capital costs are $96.9 million and an estimated unit production cost of $2.34 per 1,000 gallons.

AFIRST – RW5

The AFIRST project is an ongoing project that will integrate stormwater and reclaimed water by capturing a portion of the stormwater from the “I-4 Ultimate” FDOT project in the City of Altamonte Spring’s Regional Stormwater Facility at Cranes Roost. After transfer and treatment, the water will blended with the City’s reclaimed water to augment supply. Excess reclaimed water not used within the City of Altamonte Springs will be sent to the City of Apopka via a six-mile pipeline for reuse and recharge. The project provides additional water for reuse and recharge within the City of Altamonte Springs and City of Apopka reuse service areas, reduces the nutrient loading from wet weather discharges of stormwater and reclaimed water to the Little Wekiva River, and reduces the need for augmentation of the reclaimed water supply with groundwater sources. The project components include an augmentation facility, pumping facility, and piping.

Construction is expected to be complete in the second half of 2015. Total capital costs are $13.3 million and an estimated unit production cost of $0.93 per 1,000 gallons.

Challenges

Reclaimed water utilization is a key component of water resource management in central Florida. Wastewater management has transitioned from a means of simple disposal to uses that are recognized as a viable alternative water supply needing to be managed and used appropriately. Public supply demand projections in the CFWI RWSP assumed that past water use is predictive of future water use and incorporated current economic conditions and rates of reclaimed water use into future projections. Decisions concerning the optimal use of reclaimed water to meet future demand need to consider utility-specific demographics; environmental impacts and targeted recovery locations; partnering opportunities; and budget and funding sources.

Public Acceptance of Potable Reuse

Public acceptance will be critical to the implementation of DPR and IPR in the CFWI Planning Area. Although communities have accepted reclaimed water for non-potable purposes such as irrigation, active engagement of the community and education will be required to gain public acceptance of potable reuse. Advancements in water treatment technologies and experience have demonstrated that purified water can be produced where drinking water standards can reliably be met or exceeded for the protection of public health. The result has been an increased consideration of potable reuse. Education and outreach will be key to gaining the public's trust and acceptance.

There are many facets of education in building and maintaining community support for potable reuse projects including: providing information for all stakeholders, including why potable reuse is needed; promoting public dialogue; demonstrating that water treatment technologies are adequate to produce purified water that protects human health and convey 'success stories' of other communities where potable reuse has been implemented. An important next step would be one or more potable reuse demonstration projects in CFWI, where advanced technologies can be operated for a period of time to produce purified water, with adequate testing and documentation of the finished water product before any actual implementation is proposed.

Surface Water

The CFWI Planning Area has several major rivers including the St. Johns, Ocklawaha, Peace, Kissimmee, and Withlacoochee and hundreds of lakes, including the interconnected Alligator and Kissimmee Chains of Lakes. Despite the abundance of surface water features in the region, a relatively small amount is currently withdrawn for public supply or other uses. Lakes, rivers, and creeks in the CFWI Planning Area support significant ecological resources, which must be protected from harmful impacts of any proposed withdrawals or capture of flows from these systems. Capturing flows from these surface water bodies for water supply, particularly to support conjunctive use projects, may be effective but can be expected to have varying levels of reliability, depending on climatic conditions. A number of studies defining the potential of river systems to provide water supply have been completed. The river systems, related studies, and results are described in **Volume I**, **Chapter 6** of the CFWI RWSP.

Solutions Phase Evaluation

The Surface Water (SW) Subteam's goal was to advance the evaluation of surface water WSPOs identified in the CFWI RWSP, as well as, to identify additional surface water options that may help meet the water supply needs of the region. The team focused on regional, 10 mgd or larger projects; however, a review of existing or new projects with less than 10 mgd potential was also completed and a summary of these projects is included in the *Smaller Surface Water Projects* section.

SW Subteam Objectives

- Evaluate surface water projects identified in Volume IA, Appendix F of the CFWI RWSP including cost-benefit analysis of yield, cost estimates, sources, water resource constraints, potential partnerships, additional pumping and transmission configurations, feasibility and permittability, and funding options.
- Identify additional regional, surface water project options for consideration that were not presented in the CFWI RWSP.
- Coordinate with the Regulatory Team to identify if there are project limitations or constraints resulting from rule inconsistencies in the CFWI Planning Area.
- Coordinate with the other SPT Subteams and appropriate stakeholders to identify potential conjunctive use project options to address future demands and natural system constraints.
- Contribute to the development of the CFWI RWSP 2035 Water Resources Protection and Water Supply Strategies Plan (Solutions Strategies).

Surface Water Project Options

The SW Subteam began by reviewing the 15 surface WSPOs identified in the CFWI RWSP (Volume IA, Appendix F). Of these 15 projects, five met the Solutions Planning Phase evaluation criteria. The SW Subteam evaluated three of the five projects: the St. Johns River/TCR, the St. Johns River near SR 46, and the St. Johns River near Yankee Lake projects. The other two projects, the Kissimmee River Basin AWS and the Joint Tampa Bay Water/Polk County projects were not evaluated under the Solutions Planning Phase. The Kissimmee River Basin AWS project has been placed on hold pending the completion of the SFWMD rulemaking for a Kissimmee River Basin water reservation and the corresponding determination of the availability of water in the Kissimmee Chain of Lakes. The Joint Tampa Bay Water/Polk County project was determined to be non-feasible at this time. The SW Subteam identified two new projects that met the SC criteria: the C-25 Grove Land Reservoir and Stormwater Treatment Area (GLRSTA) project and the Polk County Regional Alafia River Basin project (**Table 12**).

The five WSPOs that were further evaluated based on the SC criteria are listed in **Table 12** (SW1-SW5) and shown on **Figure 5**. It is estimated these projects, if implemented, could generate 144 mgd of finished water and an additional 122 mgd of raw water. Each of the five projects is briefly described below, with additional project details provided in **Volume IIA**, **Appendix C**.

Table 12. Solutions Planning Phase surface water project options.

Solutions Project ID	RWSP Project #	County	CFWI Sub-Regions	Project Name	Est. Water Generated (AADF mgd)
SW1	126	Orange	SJRWMD/ SFWMD	St. Johns River/TCR	54
SW2	135	Seminole	SJRWMD	St. Johns River Near SR 46	40
SW3	138	Seminole	SJRWMD	St. Johns River Near Yankee Lake	40
SW4	144[b]	Okeechobee /Indian River	SFWMD / SJRWMD	Grove Land Reservoir & STA	122[a]
SW5	150[b]	Polk	SWFWMD	Polk County Regional Alafia River Basin	10

[a] 122 mgd is raw water
[b] Newly developed CFWI WSPOs identified during the Solutions Planning Phase.
AADF = average annual daily flow

St. Johns River/Taylor Creek Reservoir – SW1

The St. Johns River/Taylor Creek Reservoir (SJR/TCR) option is a regional alternative water supply (AWS) project that will develop a fresh surface water source and would supply water from a nontraditional source to meet 2035 future public supply, or future 2035 agriculture water supply, or both. (Note: SJRWMD considers all sources other than fresh groundwater to be nontraditional.) It will also involve the addition of new storage capacity for surface or groundwater and will utilize surface water captured predominately during wet-weather flows. The project would withdraw up to 60 mgd of surface water to yield up to 54 mgd of long-term average finished water supply at a unit production cost of $2.89 per

1,000 gallons. Proposed withdrawals are from both the Taylor Creek Reservoir and the St. Johns River at State Road (SR) 520.

A conceptual-level project description was originally developed by SJRWMD in 2005. From 2006 to 2009, water supply entities (City of Cocoa, East Central Florida Services, Orange County, Orlando Utilities Commission, the City of Titusville, and the TWA), the SJRWMD, and the SFWMD funded and developed a preliminary design report (PDR) and environmental information document (PDR/EID) for this project (CH2M/PB Water JV 2009). Based on the preliminary design, the preferred project configuration yielded 54 mgd AADF of water above the existing permitted allocations (City of Cocoa, 8.83 mgd) from the TCR.

To address concerns with potential environmental effects of withdrawals from the St. Johns River, the SJRWMD conducted the St. Johns River Water Supply Impact Study (WSIS) (St. Johns River Water Supply Impact Study Technical Publication SJ2012-1) from 2007 to 2012. In the WSIS, the SJRWMD concluded that the St. Johns River could yield 55 mgd, on an average day withdrawal basis, near Lake Poinsett without unacceptable ecologic and hydrologic impacts. Information from the WSIS should be used in formulating project design and operational regimes to avoid any adverse impacts to the river.

The project includes several components, including raw water intakes, raw water transmission mains, potable water treatment plant and storage facilities, potable water transmission mains, and potentially potable water re-treatment by the end users. The addition of new storage capacity for this surface water project also includes reservoir enhancements that are planned to be implemented by the SJRWMD, such as raising and improving the L-73 levee, expanding the S-164 structure, and updating the operation schedule for the reservoir. Planning level capital costs are estimated to be $637.5 million. It is anticipated that project detailed design and construction can be completed within 10 years.

The current project partners are the City of Cocoa, East Central Florida Services, Orange County, Orlando Utilities Commission, and the TWA. These partners are working on governance and the final project configuration and implementation details. Since 2009, consumptive use permit applications have been in review by the SJRWMD and are currently pending until the partners finalize the project governance.

Contingent upon the project partners executing one or more agreements regarding the terms for developing and operating the project, the St. Johns River/Taylor Creek Reservoir (SJR/TCR) option is a regional alternative water supply (AWS) project that will develop a fresh surface water source and would supply water from a nontraditional source to meet 2035 future public supply, or 2035 future agriculture water supply, or both. This project was and will remain a “regional” project as contemplated by applicable Florida law, irrespective of the addition of an agricultural water supply component to the previous descriptions of this project in prior water supply plans.

St. Johns River near State Road 46 - SW2

The St. Johns River near State Road (SR) 46 project option is a regional AWS project that will develop a brackish surface water source and supply water from a nontraditional source to meet 2035 future public supply demands and potential augmentation of reclaimed water systems. (Note: SJRWMD considers all sources other than fresh groundwater to be nontraditional.) SJRWMD generally identifies source waters that do not always meet federal and state drinking water standards for chloride, sulfate, or total dissolved solids as "brackish" waters. The project would withdraw up to 50 mgd of surface water from the St. Johns River to produce 40 mgd of long-term average supply finished water at a unit production cost of $4.68 per 1,000 gallons.

The project is technically feasible with appropriately designed components to treat variable water quality from the St. Johns River. Potential environmental effects can be managed by proper intake design and by appropriate timing of withdrawals from the St. Johns River. To address concerns about potential environmental effects of withdrawals from the St. Johns River, the SJRWMD conducted the St. Johns River Water Supply Impact Study (WSIS; SJRWMD 2012) from 2007 to 2012. In the WSIS, the SJRWMD concluded that the St. Johns River could yield approximately 50 mgd, on a maximum annual average day withdrawal basis, at this location without unacceptable ecologic and hydrologic impacts. Information from the WSIS should be used in formulating project design and operational regimes to avoid any adverse impacts to the river.

The project includes several components, including raw water intake, raw water transmission mains, potable water treatment and storage, an injection concentrate disposal well, potable water transmission, and potentially potable water re-treatment by the end users. The project also may include potential treatment to reclaimed water augmentation standards and a separate transmission system for this quality of water. Planning level capital costs are estimated to be $584.3 million. It is anticipated that project detailed design and construction can be completed in approximately 10 years.

In 2009, an agreement was executed with project partners, but that agreement has been on hold since 2011. Project partners would need to be identified and project governance developed for this project.

St. Johns River near Yankee Lake – SW3

The St. Johns River near Yankee Lake project is an AWS project that will develop a brackish surface water source and will supply water from a nontraditional source to meet 2035 potable water demands for various entities within the CFWI Planning Area. (Note: SJRWMD considers all sources other than fresh groundwater to be nontraditional.) Three scenarios were evaluated that deliver water to various end users, which were identified by comparing potable water demands developed in the CFWI RWSP to various permittee's groundwater allocations in their consumptive use permit (CUP). Project partnerships and governance would need to be developed based on a final selected scenario.

The three scenarios are

- Scenario 1 - assumes transmission of 40 mgd of potable water to 6 utilities (Seminole County, Sanlando Utilities Corp., Leesburg, Lake Utility Services Inc., Apopka, and Volusia County)
- Scenario 2 - assumes transmission of 40 mgd of potable water to 6 utilities (Seminole County, Sanlando Utilities Corp., Leesburg, Lake Utility Services Inc., Apopka, and OUC)
- Scenario 3 - assumes transmission of 27.6 mgd of potable water to 4 utilities (Seminole County, Sanlando Utilities Corp., Apopka, and OUC) and includes an option to inject 12.4 mgd of finished water into the aquifer near Wekiwa and Rock Springs to address MFLs for springs in this area.

The project would withdraw 50 mgd of surface water to produce 40 mgd of finished water at a unit production cost ranging from $3.96 to $4.09 per 1,000 gallons. Planning-level capital costs are estimated to range between $501.5 to $565.8 million, depending on the scenario. It is anticipated that project detailed design and construction can be completed in approximately 10 years.

Each project scenario is technically feasible with appropriately designed components to treat potentially variable water quality from the St. Johns River. The project includes several components, including potable water treatment of a brackish surface water, LFA injection well for reverse osmosis (RO) concentrate disposal, approximately 90 miles of large diameter pipe for transmission of finished potable water, booster pumping stations, residual disinfection, and storage. The surface water intake structure and raw water transmission have already been constructed, and have been in operation since December 2012.

The project is technically feasible with appropriately designed components to treat variable water quality from the St. Johns River. Potential environmental effects can be managed by proper intake design and by appropriate timing of withdrawals from the St. Johns River. To address concerns about potential environmental effects of withdrawals from the St. Johns River, the SJRWMD conducted the St. Johns River Water Supply Impact Study (WSIS; SJRWMD 2012) from 2007 to 2012. The information in the WSIS should be used in formulating the project design and operation to avoid any adverse impacts to the river.

Preliminary partnership meetings were held by Seminole County with various potential water users in the late 2000s to discuss partnership options. However, no partnership agreements were reached, largely due to the economic downturn. Project partners would need to be identified and project governance developed for this project.

Grove Land Reservoir and Stormwater Treatment Area – SW4

The proposed Grove Land Reservoir and Stormwater Treatment Area (GLRSTA) project is a river augmentation project with the potential to discharge 122 mgd of water into the headwaters of the St. Johns River. The project is located in northern Okeechobee and southern Indian River counties on land owned by Evans Properties, Inc. Although the project is not located within the CFWI Planning Area there is the potential to provide a variety of benefits, including surface water augmentation of the St. Johns River, groundwater recharge of the surficial aquifer system within the project boundaries, and nutrient reduction in the St. Lucie Basin.

The GLRSTA consists of a 5,000-acre reservoir, 2,000-acre stormwater treatment area (STA), intake/discharge structures, conveyance improvements, and other associated facilities. The reservoir water would be supplied from excess stormwater runoff captured from the C-25, C-24, and C-23 basins via the C-25, C-24, and C-23 Canals, which are owned by the South Florida Water Management District (SFWMD). Water from the reservoir would enter the stormwater treatment area (STA) which would be sited north of the reservoir. The STA would reduce total phosphorus (TP) and total nitrogen (TN) concentrations. This treated water could be discharged to the SJRWMD C-52 flow-way and subsequently north to the St. Johns River when water levels in the St. John Upper Basin Project are not too high or south to the SFWMD's C-25 Canal.

The project has been conceptually designed to deliver 136 mgd. The analysis showed the reservoir was capable of delivering water at this rate 90 percent of the time using a 41-year simulation period utilizing historical daily rainfall and canal flow data. This is estimated to be roughly equivalent to a 1-in-10 year drought event. It was concluded there would be 122.4 mgd of raw water potentially made available for use accounting for natural system losses.

A conceptual evaluation of this GLRSTA project conducted by Hazen and Sawyer, P.C. in association with Federico, Lamb and Associates, Inc. and AMEC has found the project to be technically feasible as long as a sufficient water supply can be legally obtained from the C-25, C-24, and C-23 Canals. The estimated capital cost is $435.4 million. The estimated annual O&M cost is $2.7 million and the estimated unit production cost is $0.48 per 1,000 gallons of raw water potentially made available. These costs do not include potable treatment and transmission costs, financing cost, contingency/financial risk, and renewal and replacement. Additionally, the CE tool was not used to develop excavation costs for this project.

Project partnerships and project governance will need to be developed for this project.

Polk County Regional Alafia River Basin – SW5

The Polk County Regional Alafia River Basin is an AWS project that will use a surface water source to meet future public supply demands. Surface water is not traditionally used within Polk County: the cities, county, and self-supplied customers rely primarily on UFA wells to supply potable water. The project would harvest 10 mgd of surface water from the Alafia River during high flows at one or more intake locations, treat/store, and then supply potable water to customers on the west side of Polk County.

The project components include two river water intakes and pump stations on the Alafia River, raw water transmission mains, preliminary treatment of raw water, storage, potable water transmission, and water re-treatment by the end users (depending on blending and final regional partners receiving the water). It is possible the water might be used to augment reclaimed water which would require a lower level of treatment and a separate transmission system for this quality of water. Prior to development of the project, Polk County would work with the SWFWMD to finalize a location and determine an expected yield. An earlier estimate of potential yield from the Alafia River was conducted by SWFWMD in approximately 2008, and this project falls within the remaining yield not currently used by other permitted water users. Planning level capital costs are estimated to be $263.4 million with a unit production cost of $4.33 per 1,000 gallons.

Potential project partners include other regional water suppliers, industrial, and commercial users. There are also potential agricultural partners, as well as at least three other regional water suppliers that may be interested as interconnections are strengthened. Project partnerships and project governance will need to be developed for this project.

Smaller Surface Water Projects

Of the 15 surface water projects identified in the CFWI RWSP, 10 did not meet the SC criteria of 10 mgd or greater. However, these projects have the potential to generate significant water for reuse augmentation or potable water. The SW Subteam discussed each of the 10 projects, as well as one new project, and identified five projects that may contribute to future water supply or contribute to protection and recovery of MFLs (**Table 13**). These projects were not fully evaluated but are worthy of mention here due to their potential to serve the public interest by increasing the availability of water for reasonable-beneficial uses.

Table 13. Solutions Planning Phase small surface water project options – Not fully evaluated.

RWSP Project #	County	CFWI Sub-Regions	Project Name	Est. Water Generated (mgd)
127	Orange, Seminole	SJRWMD	Lake Apopka Reuse Augmentation Project	5
130	Osceola	SFWMD	Shingle Creek Reuse Augmentation	2
136	Seminole	SJRWMD	Sanford Surface Water Treatment Plant on Lake Monroe	4
139	Seminole	SJRWMD	Winter Springs–Lake Jesup Reclaimed Water Augmentation Project	2.23
--	Seminole	SJRWMD	AquaFiber Lake Jesup Reuse Augmentation Project	4

The total additional water that could be provided by the five surface water projects is about 17 mgd; 13 mgd for reclaimed water augmentation and 4 mgd is potable. Each project could also serve a secondary, TMDL reduction role because nutrients and other constituents will be removed from impaired surface waters during the treatment process.

Dispersed Water Management

Dispersed water management (DWM) can be defined as shallow storage of water across distributed parcel landscapes using relatively simple structures. The water management districts are working with a coalition of agencies, environmental organizations, ranchers, and researchers to enhance opportunities for storing excess surface water on private and public lands. In addition to using regional public projects, dispersed water storage encourages property owners to retain water on their land rather than drain it, accept and detain regional runoff, or do both. Holding water on these lands is one tool to reduce the amount of water discharged to coastal estuaries for flood protection.

Since 2005, the SFWMD has been implementing a DWM program to reduce the volume of excess stormwater and phosphorus discharging to downstream water bodies such as Lake Okeechobee, the St. Lucie River, and the Caloosahatchee River.

Some resulting groundwater recharge may occur depending on the location of these projects, as well as, minimal short-term water supply availability, but these projects are not designed to be water supply projects. It is not anticipated that DWM projects will contain enough water during dry periods for irrigation or other water supply needs. As a result, implementation of DWM in the CFWI Planning Area may not be a reliable water supply source to meet the future water supply needs, but could potentially be a conjunctive use source. This potential source will need to be investigated further.

Challenges

The surface water project options have the potential to supply up to 144 mgd of alternative water supply to the CFWI Planning Area. These surface water projects are capable of meeting future demand without adverse effects on water resource constraints, and may provide a means to achieve MFL prevention or recovery strategy through aquifer recharge and management of existing groundwater withdrawals through conjunctive use. Implementation of these large regional surface water projects come with many challenges.

Minimum Flows and Levels / Environmental Concerns

Minimum Flows and Levels (MFLs) and Water Reservations have been adopted or are under development for numerous water bodies within the CFWI Planning Area. As projects advance, further analysis should be conducted to ensure that the timing and quantity of withdrawals maintain the hydrologic functions of lakes and downstream environmental needs, including complying with the applicable MFLs and Water Reservations. Additional storage options may need to be evaluated to efficiently capture and store river/creek water during times of high flows. Proposed surface water projects on the St. Johns River have been developed to consider the need to comply with existing MFLs adopted on the St. Johns River and Taylor Creek. As these projects further develop, they will need to continue to be formulated, designed, and operated to avoid adverse impacts, including consideration of the information provided in the St. Johns River WSIS (SJRWMD 2012).

Stormwater

Stormwater (ST) refers to water that does not infiltrate, but accumulates on land as a result of storm runoff, irrigation runoff, or drainage from areas, such as roads and roofs. This water is normally captured and/or conveyed by maintained ponds, swales, or similar features for water quality treatment or flood control. Capturing available stormwater for water supply, particularly to support conjunctive use projects, may be effective but can be expected to have varying levels of reliability, depending on storage and climatic conditions. Further, analysis of stormwater use should be conducted to ensure that hydrologic functions of lakes and downstream environmental needs are maintained when attempting to identify potentially available quantities. Limited fresh water availability in many areas has led to rapid advances for the use of stormwater as a water supply strategy. Central Florida utilities have begun embracing this concept, primarily for augmenting reclaimed water systems for residential irrigation or other non-potable uses.

Since 1983, land development has included stormwater management facilities that receive water quality treatment and peak storm flow attenuation. Most of these stormwater management facilities have infiltration components with some discharge into other water bodies like wetlands, streams, canals, rivers, and lakes. Capturing excess stormwater presents an opportunity for stormwater harvesting for increased infiltration and other water supply benefits on a larger scale.

In addition, man-made canals, ditches, and underdrain systems have penetrated and artificially drained the surficial aquifer contributing to elevated post-development base flows in five identified major Central Florida basin stream systems. These basins are strong candidate sources and locations for stormwater harvesting for beneficial purposes, such as environmental restoration or supplemental water supply.

Central Florida contains a number of closed basins with limited stormwater removal capabilities. However, these closed basins typically provide for the recharge of the underlying Floridan aquifer system either passively through karst features or mechanically through drainage wells. For example, the City of Orlando maintains flood control in some of these locations by using drainage wells, which discharge stormwater directly into the upper Floridan aquifer. A stormwater management option to be explored is redirecting a portion of drainage well discharges to recharge the Floridan aquifer via the surficial aquifer in strategic locations where spring flows and water levels in wetland systems have been reduced by drainage system construction and groundwater withdrawals.

Solutions Phase Evaluation

The ST Subteam's goal was to identify and evaluate stormwater and other related water supply options that exist, or are under consideration, that could be successfully designed and permitted to help alleviate projected water supply demands and resource constraints.

ST Subteam Objectives

- Evaluate stormwater projects within the CFWI Planning Area including cost-benefit analysis of yield, sources, water resources constraints, water quality and potential hazardous materials, seasonal supply characteristics, potential partnerships, pumping and transmission configurations, feasibility, and permittability, and funding options.
- Identify and evaluate additional project opportunities that can be considered which were not presented in the CFWI RWSP.
- Coordinate with the Regulatory Team to identify project limitations or constraints resulting from the inconsistency of rules of the three water management districts within the CFWI Planning Area.
- Coordinate with the CFWI RWSP Team and appropriate affected stakeholders to identify potential future steps toward achieving sustainable, long-term, water supply alternatives.
- Collaborate with the CFWI SW and RW Subteams to identify shared project opportunities, including jointly used dispersed storage, and properly evaluate options for linking project opportunities to the appropriate Solutions subteam.
- Contribute sustainable solution options for the development of the CFWI 2035 Water Resources Protection and Water Supply Strategies Plan.

Stormwater Project Options

One potential stormwater project option was identified in the CFWI RWSP (Volume IA, Appendix F) and this project met the SC criteria. In addition to reviewing this project, the subteam was tasked with identifying additional regional stormwater projects. Two new projects and one CFWI RWSP project were selected for full evaluation: Judge Farms, Reedy Creek, and Lake Wailes projects. The three WSPOs that were further evaluated based on the SC criteria are listed in **Table 14** (ST1-ST3) and shown on **Figure 5**.

Table 14. Solutions Planning Phase Stormwater water supply project options.

Solutions Project ID	RWSP Project #	County	CFWI Sub-Regions	Project Name	Est. Water Generated (AADF mgd)
ST1	128	Osceola	SFWMD	Judge Farms Reservoir and Impoundment	5
ST2	143a & b[a]-	Polk	SWFWMD	Lake Wailes Stormwater Mitigation	1.4
ST3	145[a]	Orange	SFWMD	Reedy Creek Stormwater Mitigation / Recharge	4

[a] Newly developed CFWI WSPOs identified during the Solutions Planning Phase.

It is estimated these three projects, if implemented as a water supply source, collectively could provide 10.4 mgd of water with an estimated 70 percent reliability. The reliability increases when used as source water for recharge. Each of the three projects is briefly described below, with additional details provided in **Volume IIA**, **Appendix C**.

Judge Farms Reservoir and Impoundment – ST1

The Judge Farms project is a proposed stormwater storage facility that uses natural topography in combination with berms to intercept and store stormwater. The project is located along the northeast shore of Lake Tohopekaliga and consists of a 200-acre reservoir with an initial effective storage capacity of 109 million gallons. Options to raise the perimeter berm elevations and provide additional inflows from local water sources could increase the capacity of this facility from the proposed 5 mgd to approximately 20 mgd. The primary benefit is reclaimed water augmentation for Tohopekaliga Water Authority (TWA) and the City of St. Cloud to be used for irrigation. This project will also provide water quality benefits to Lake Tohopekaliga.

TWA has submitted a permit application for construction of the Judge Farms project consisting of reservoir construction, pumping and piping to treatment facilities. Treatment and reclaimed water distribution costs are not included, but are estimated to be minor elements of the overall existing reclaimed systems costs. Planning level capital costs are estimated to be $28.3 million. Operation and maintenance costs are estimated at $250,000 annually, which results in a unit production cost of $0.91 per 1,000 gallons. Construction is estimated for years 2018-2020. The water supply is estimated to be 5 mgd with a 77 percent reliable.

TWA, City of St. Cloud, City of Kissimmee, and Osceola County have been the stakeholders in this project effort. They recently were awarded a $1 million State grant to proceed with efforts to begin purchasing needed properties. Project governance will need to be developed for this project.

Lake Wailes Stormwater Mitigation – ST2

The Lake Wailes Stormwater Mitigation project is an AWS project that will develop a stormwater source to assist in meeting the SWFWMD MFL for Lake Wailes. The project will transfer flows from the Peace Creek Canal, when available, to Lake Wailes. The project is estimated to produce on average 1.4 mgd with a maximum 6 mgd under high flow conditions. The beneficial recovery of the lake level is estimated at 0.2 to 2 feet. It is important to note that no water supply is directly made available by this project, though additional groundwater is potentially available if the minimum lake level can be achieved.

Two project options were evaluated, a north corridor option which routes water into Lake Wailes and a south corridor option which routes water to a rapid infiltration basin (RIB) near Lake Wailes. Both options will require intake structures, a pump station at the canal, 20- to 24-inch pipeline, and outlet structures. The north corridor option will require an additional culvert to Lake Wailes. Additional investigations may be required to address water quality requirements.

Planning level capital costs are estimated to be $13.5 million, which includes a pumping facility, piping, and minimal land cost. Operation and maintenance costs are estimated at $33,000 annually, which results in a unit production cost of $1.30 per 1,000 gallons. Again, it is important to note that no water supply is directly made available by this project. The project is estimated to be completed during FY 2016-2019.

Potential project partners include SWFWMD, City of Lake Wales, Polk County, Florida Department of Transportation (FDOT), and local sponsors. Project partners and project governance will need to be finalized for this project.

Reedy Creek Stormwater Mitigation/Recharge – ST3

The Reedy Creek Stormwater Mitigation/Recharge project is a stormwater project that will capture and develop 4 mgd of stormwater to recharge the surficial aquifer in strategic locations that are currently stressed or projected to worsen in the future. This project does not directly provide a new supply of water, but may indirectly make additional fresh groundwater supplies available as a result of increased recharge. The quantity of water that could be made available has not been determined. Highest and best use of the water would be determined at the time of development. In addition to water supply benefits, the proposed project will also improve flood protection, water quality, and natural systems.

The Reedy Creek Basin, located in Orange and Osceola counties, would be the source of stormwater for this project. Project construction elements include a water level control weir, low head pumping unit and intake structure, piping systems, and receiving storage areas. The construction of a new water control structure would have to be designed and implemented to not cause any adverse flooding impacts upstream or adverse changes in flow downstream of the new weir as well as all other permit criteria would need to be met. Additionally, this project could not adversely impact RCID's stormwater management system. The need for additional land purchases will be determined during design.

Planning level capital costs are estimated to be $1.56 million. Operation and maintenance costs are estimated at $50,000 annually, which results in a unit production cost of $0.09 per 1,000 gallons. This assumes a 4 mgd stormwater capture system is developed. However, as previously noted the quantity of additional water supplies (if any) that could be made available by this project is unknown. In addition, these costs do not include the infrastructure potentially associated with any water supply aspects of this proposed project. As such, the capital and O&M costs provided herein are only for the stormwater recovery aspects of this project. Construction is estimated for years 2019-2020. Funding sources for this potential project still need to be identified.

Project monitoring and groundwater, surface water, and stormwater modeling will be required to determine the feasibility of capturing and reapplying stormwater, if this project may be used for groundwater offsets, and does not cause adverse flooding impacts. Stormwater treatment areas and other natural low-lying areas may be used for water quality treatment prior to being use for surficial aquifer recharge. Discharges to existing stormwater systems will need to be implemented as to not adversely affect the functionality of the ponds. Modifications of existing ponds may be required to accommodate the additional flow. The use of existing low-lying areas cannot result in adverse flooding impacts or impacts to adjacent land uses and will also require coordination with stakeholders.

Potential project partners include, but are not limited to, Town of Celebration, RCID, Town of Windermere, Central Florida Expressway Authority, FDOT, and other private property interests. There may be interest from other potential partners that hold groundwater permits in the region as the benefits to the surficial aquifer may also improve groundwater availability.

Future Conceptual Stormwater Projects

The ST Subteam's evaluations indicate that positive impacts on future groundwater withdrawals may be realized through strategic introduction of stormwater into natural systems and known recharge zones, thereby contributing to the reestablishment of specific Floridan and surficial aquifer systems to acceptable levels. Results from the ECFT groundwater model can aid in identifying strategic locations for groundwater recharge using harvested stormwater to offset withdrawals.

The ST Subteam evaluated the Shingle Creek and Reedy Creek basins for future stormwater harvesting potential and determined that urbanized basins with similar characteristics could potentially produce about 7 to 11 mgd of water per basin for potential recharge. The Econlockhatchee River, Lake Jesup, Wekiva River, Peace Creek, Shingle and Boggy Creek basins are all strategically located sources of stormwater that could be harvested and potentially provide a positive impact on water supply and water resources. However, these types of projects are conceptual and additional data, evaluations, and planning would be required to determine the feasibility and potential water made available.

Another major conceptual project opportunity is the ability for local governments and utilities to partner with the FDOT on stormwater capture and harvesting projects. The FDOT has recently embraced this approach on a statewide basis. Collaborating with FDOT when roadway Project Development and Environmental planning level studies are initiated can lead to identifying stormwater harvesting opportunities, and creating partnerships for executing future projects. If the FDOT uses stormwater harvesting there can be benefits including: reduction of land purchases; smaller stormwater treatment areas; and reduced maintenance costs. Environmental look-around efforts, a tool to identify potential partnering opportunities used by FDOT, can assist local utilities and the Districts in identifying sources of stormwater for reclaimed water augmentation and MFL recovery. As an example, a 2 mgd reclaimed water augmentation project for the City of Ocoee in partnership with FDOT was identified by the ST Subteam in conjunction with SR 50 widening in Orange County, and is currently under preliminary study by FDOT.

There are many drainage wells dating back to the early 1900s in the urbanized areas of Orange County. The location of these wells was not prepared with a comprehensive vison of the possible water supply benefit and recharge characteristics of the Florida Aquifer.

Further, these drainage wells represent a significant management challenge to the various operators of the wells. The stormwater team has identified a need to work more closely integrate future water supply into watershed management plans in cooperation with the operators of the drainage wells.

Challenges

Collaboration between members of the groundwater, environmental, and stormwater subteams has yielded a strong consensus involving the requirement for better data, expanded monitoring, an integrated project feasibility study approach, and mutual problem solving. A significant budget for data collection and monitoring of potential water harvesting sources will need to be funded to provide accurate information on reliable stormwater supply sources. Water quality (WQ) is a concern when utilizing stormwater for augmenting reclaimed water systems, or rehydrating natural systems. While filtration and disinfection is sufficient in many cases, seasonal variation in WQ and sources with known nutrient and chemical Total Maximum Daily Load (TMDL) issues may require additional treatment depending on use. The expense and feasibility of use for these source waters will be an element of future required studies referenced in this report.

Recharge and MFL restoration waters are primarily needed from northwest Orange County to east-central Polk County. Much of the stormwater that could be captured and harvested is located in the central and eastern portions of the CFWI Planning Area, between Orlando and Winter Springs. As an example, pumping treated stormwater from the Howell Creek basin to the Upper Wekiva basin would constitute a basin-to-basin transfer of water, which may be a challenge. The effects of the removal of stormwater on downstream natural systems would have to be modeled and made acceptable to the Districts on a project-by-project basis.

Storage of harvested stormwater can be a land intensive effort. The preferred design condition reduces storage needed by using infiltration for aquifer recharge in strategic locations. This involves pumping and transfer of water over short distances, in many cases. Coordination between multiple jurisdictions will be required to secure needed land, easements, rights-of-way, and project funding.

Identification of water supply opportunities and the creation of partnerships to capitalize on excess stormwater for water supply is a challenge. The parties often have different mission objectives, such as removing surface drainage for public safety, compared to providing water supply and improved water quality. Bringing objectives like TMDL, the Basin Management Action Plans (BMAPs), Minimum Flows and Levels (MFLs), and RWSP objectives into a coherent planning process will result in synergistic and lower cost solutions for all outcomes. A regional effort will be needed to memorialize this approach and transform it into an institutionalized process, in order to secure long-term success for all the CFWI objectives.

Finally, in the future, municipalities may want to consider modifying their stormwater management plans and designs to more explicitly leverage rainfall and associated stormwater runoff to supplement local water supplies and/or to provide additional recharge to the underlying aquifer. At the site level, stormwater could be captured and used with buildingscale systems, while larger quantities of stormwater or urban runoff could be managed to gradually recharge aquifers and reduce impacts to downstream ecosystems. Effective use of stormwater runoff as a water supply element requires engineers, scientists and design consultants to reimagine how to design and build cityscapes, treating them as water infrastructure to capture, infiltrate and manage runoff. Urban and suburban landscapes would provide opportunities for low-impact development and green infrastructure, supporting a dispersed approach to recharging aquifers and intercepting stormwater.

COMMON CHALLENGES

Partners and Governance

Partnerships offer the potential to deliver outcomes that a single entity cannot, or to deliver outcomes more efficiently. Such partnerships will be critical in implementing any of these proposed projects. Good governance (accountability, transparency, legitimacy, disclosure, participation, decision-making, grievance management, and performance reporting) is paramount in the successful delivery of projects or outcomes. Partnerships must develop appropriate mechanisms and institutional frameworks for decision-making, implementing and operating projects cooperatively, funding, maintaining accountability, and responding to stakeholder concerns to promote regional thinking and facilitate regional-level cooperation.

Identifying and attracting partners to invest in future project opportunities will require regional cooperation implemented as part of the CFWI process well into the future. The tendency to splinter into separate District areas will be a constant challenge. Many project opportunities will span District boundaries and will only be successful if local governments, utilities, water management districts, FDOT, and the FDEP remain committed to the mission of solving CFWI water supply challenges together. Maintaining the collaboration implemented through the CFWI process well into the future will facilitate developing effective affordable solutions to meet the area's water supply needs of central Florida.

Funding

The projects discussed in this Chapter would provide nontraditional and alternative water supply project options. However, since these projects will produce water at a higher cost than traditional groundwater sources, support from a variety of funding sources (public supply utilities, state, local, etc.) will be needed. Funding agreements will need to be an integral component in the development of partnership governances.

4

Solutions Strategies Environmental Evaluation

INTRODUCTION

The CFWI RWSP concluded that traditional groundwater resources alone cannot meet future water demands without resulting in unacceptable impacts to water resources and related natural systems. Total water demands are projected to increase from an estimated current total water use of 800 mgd to almost 1,100 mgd by 2035. Based on the CFWI RWSP evaluation of available groundwater, it is possible that an additional 50 mgd of groundwater could be sustainably developed to meet additional demands with the implementation of local management activities (e.g., wellfield optimization, aquifer recharge and augmentation). Beyond that, an additional 75 mgd of groundwater may be developed but it would require the implementation of appropriate regional management strategies. Recognizing this potential, the goals of the Solutions Planning Phase included evaluating additional feasible groundwater supply project options and identifying alternative and nontraditional water supply project options (WSPOs) within the CFWI Planning Area and where appropriate, identifying and evaluating management activities that would be necessary to alleviate water resource constraints.

Understanding the relationship and effect of meeting existing and future demands on the natural system is critical to water supply planning. This chapter provides an overview of the water resource assessment tools, the environmental evaluation methodology and results from the Solutions Planning Phase.

SOLUTIONS STRATEGIES ENVIRONMENTAL EVALUATION

The Environmental Evaluation (EE) Subteam is one of six subteams that support the Solutions Planning Team (SPT). The Steering Committee (SC) provided the following goal statements:

- Work within the CFWI process to develop and assess water supply and water resource development project options for the protection or restoration of water resources. This includes projects identified in the CFWI RWSP and other projects developed during the Solutions Planning Phase.
- Provide technical support to the SPT on potential environmental effects of various project options.

The EE Subteam did not make any policy decisions, recommendations, or prioritize options. The EE Subteam worked pursuant to the instructions given by the SC as set forth in the CFWI Guiding Document. The SC directed the EE Subteam to use the same methodologies that were used in the CFWI RWSP effort to achieve the goals of the EE Subteam.

Summary of CFWI RWSP Water Resource Assessment

Section 373.042, F.S., requires the FDEP or the Districts to establish minimum flows for surface watercourses and minimum levels for both groundwater and surface water. MFLs represent the level at which further withdrawals would be significantly harmful to the water resources or ecology of the area. MFLs are adopted by administrative rule for priority water bodies and calculated using the best information available. MFLs have been adopted for 46 water bodies, including 33 lakes or wetlands, 6 springs, and 7 river/stream systems within the SJRWMD and SWFWMD portions of the CFWI Planning Area. MFLs have not been adopted within the SFWMD portion of the CFWI Planning Area. The locations of adopted and proposed MFLs in the CFWI Planning Area and East Central Florida Transient (ECFT) groundwater model domain are shown in **Figure 6**. No reservations have been adopted in the CFWI Planning Area, although a number of reservations are planned. The locations of the proposed water reservations are also shown in **Figure 6**. Any new MFLs and reservations adopted will be evaluated during the regional water supply plan update in five years.

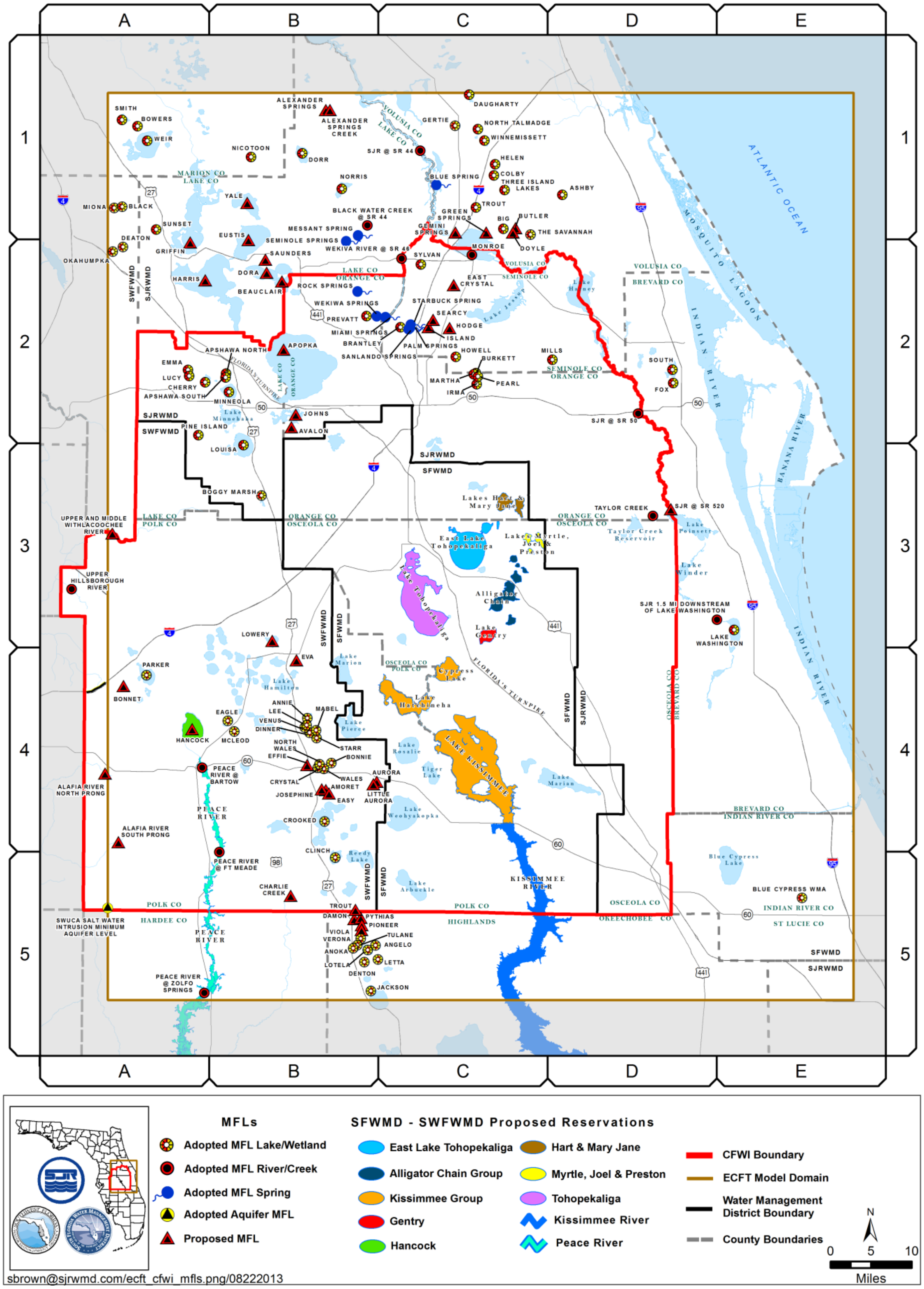

Figure 7. Locations of adopted and proposed MFLs and reservations in the CFWI Planning Area and ECFT groundwater model domain.

A number of MFL sites in the CFWI Planning Area were used as "measuring sticks" for evaluation of regional groundwater availability (**Volume IA**, **Appendix B**) and to assess some Solutions Planning Phase WSPOs. The allowable changes in UFA potentiometric surface, spring flow, or groundwater flow at MFL measuring stick locations were based on the differences between adopted MFLs and recent conditions determined through field observation and site specific and regional modeling and statistical evaluations. This allowable change is referred to as "freeboard" and is the magnitude of change that can occur without causing exceedance of an adopted or proposed MFL. For each withdrawal condition or Solutions Planning Phase WSPOs evaluated, the ECFT groundwater flow model predicted changes in UFA potentiometric surface, spring flow, or groundwater flow were used to develop the "remaining freeboard." The remaining freeboard represents the approximate amount of change in UFA potentiometric surface, springflow, or groundwater flow remaining once a specific withdrawal condition or WSPO is considered. The process of evaluating MFL measuring sticks is described in more detail later in this section.

MFLs have been adopted for 46 water bodies within the CFWI Planning Area. The measuring sticks identified for evaluation were based on adopted and proposed MFLs associated with the CFWI Planning Area. Twenty-five lakes/wetlands and six springs with adopted MFLs were chosen as measuring sticks, referred to as "constraints," based upon the availability of predictive tools to evaluate the MFLs. Some lake systems with established MFLs were excluded from consideration as constraints due to the lack of basin-specific water budget models that are essential for assessment of remaining freeboard. MFLs established for some river systems were excluded because ECFT groundwater flow model predicted changes in river flows were considered less robust than those predicted for the UFA potentiometric surface and spring flow, which were respectively used to assess lakes and springs MFLs, or because the rivers have no significant UFA spring flow contributions. Selected river segments with established or proposed MFLs and several lakes with proposed MFLs were used as measuring sticks referred to as "considerations" for the analysis. Additionally, the ECFT groundwater model simulated groundwater flows across the model boundary that could affect the SWUCA SWIMAL and water levels in regulatory monitoring wells associated with the SWFWMD's SWUCA Recovery Strategy, both of which were assessed as MFL considerations.

The CFWI Planning Area contains many water bodies that are valuable environmental resources, yet do not have an adopted or proposed MFL. The evaluation of lakes and wetlands without MFLs within the CFWI Planning Area was also an integral part of the analysis. This evaluation included review of previous environmental assessments conducted, additional wetland assessments, and development of a set of tools that could be used to evaluate likely effects of groundwater withdrawals, as predicted by modeled water levels, on wetland resources.

Two methods were used to evaluate wetlands under future modeled water level conditions: statistical evaluation of isolated lake and wetland systems; and a GIS-based method. The primary method, as directed by the Steering Committee (SC), used a statistical evaluation of isolated lake and wetland systems. Isolated systems are considered to be inherently more vulnerable to impacts from lowered groundwater levels. The statistical method addressed the probability of change in stress status (stressed or unstressed) based upon the observed ecologic and hydrologic conditions of 44 wetland sites, which had both ecological and hydrological data. Data from these sites was used to develop statistical relationships between water levels and the probability of stress occurring in the wetland systems. These statistical relationships provided a method to estimate the probability that a stressed or unstressed wetland would have a change in stress status in response to any specified change of water levels. This method was applied to thousands of known wetland locations throughout the CFWI Planning Area using the ECFT estimated future groundwater withdrawal scenarios to estimate changes in water levels at each location. Wetlands used for this assessment were adjusted to correct for locations considered to be significantly hydrologically altered by draining, ditching, diking, surrounding land use and other conditions. This approach minimized confounding effects of those factors on the relationship between groundwater level changes and stress condition (**Volume I**, **Chapter 3** and **Volume IA**, **Appendix B**).

The second method used a GIS-based approach to examine outputs from modeled future groundwater withdrawal scenarios. These were used to calculate estimated Surficial Aquifer System (SAS) water table elevation changes at the location of assessed wetlands to examine potential impacts under the scenarios. The mean SAS water level was calculated for each wetland assessment site from monthly model outputs from withdrawal scenarios. The difference between the mean SAS water level for the Reference Condition and a future modeled withdrawal scenario was used to determine if wetland SAS water levels would be expected to increase, decrease, or remain the same under the future condition. The magnitudes of SAS water level change from the Reference Condition, at assessed wetland sites, were mapped to indicate areas of greatest change.

Areas Susceptible to Groundwater Withdrawals

For the CFWI RWSP a status assessment of 46 adopted MFLs determined that 10 water bodies were currently not meeting their MFL within the CFWI Planning Area. In addition, a subset of the non-MFL lakes and wetlands was evaluated to determine their current ecological condition. A determination of the presence of substantial hydrological alteration and wetland stress was made for each site; however, the cause of stress was undetermined. Of the total 357 wetlands evaluated, 234 wetlands did not have obvious hydrologic alterations. The patterns of stress were found primarily in elevated ridge areas located in Polk County along the Lake Wales Ridge, the Upper Peace River Basin, and in western Orange and southeastern Lake counties. The recent status of both MFL and non-MFL water resources is shown in **Figure 8.**

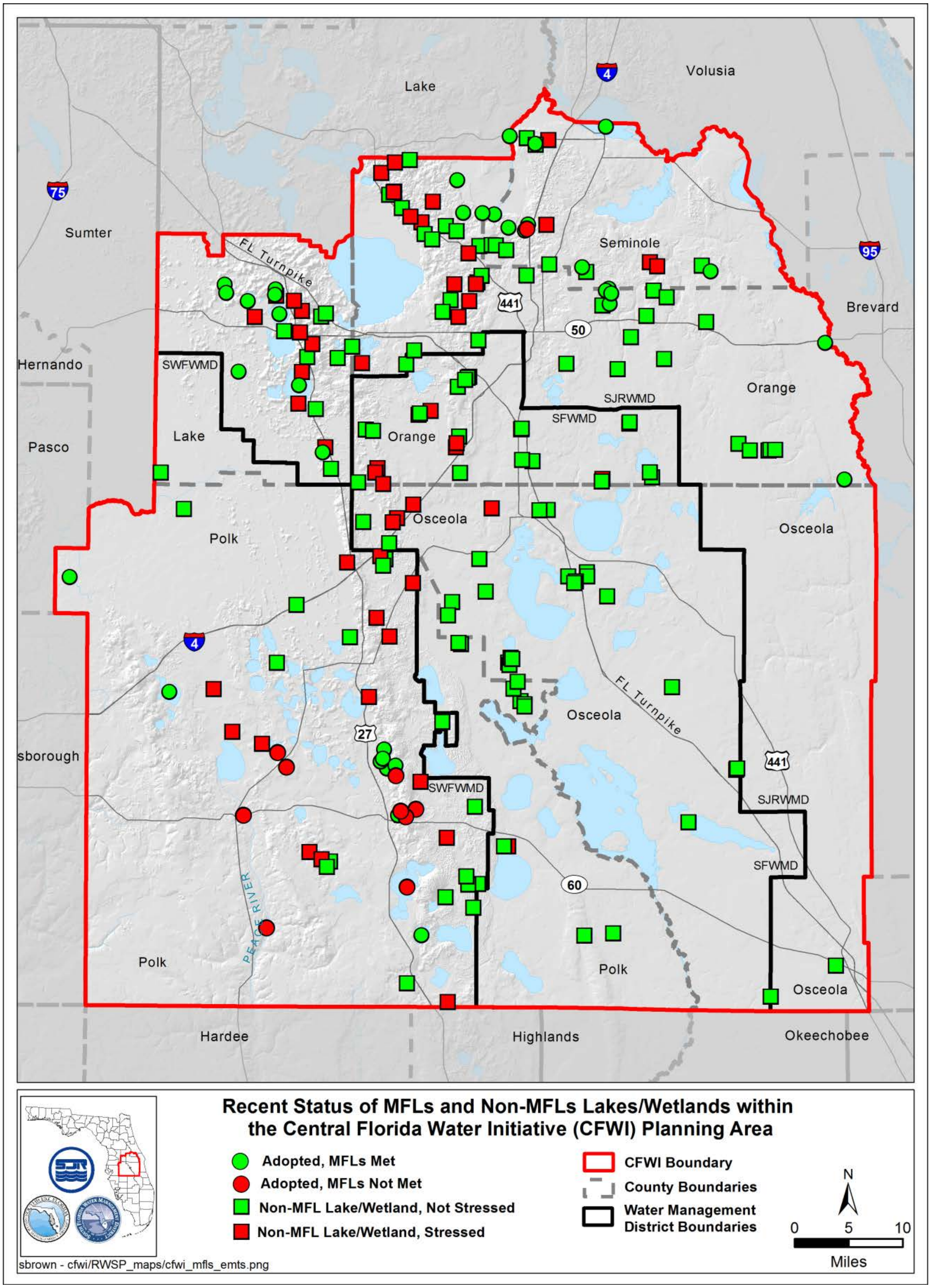

Figure 8. Recent status of MFLs and characterization of stressed condition of non-MFL lake and wetland sites that have not been substantially hydrologically altered in the CFWI Planning Area. Causation of stress is undetermined.

The recent status of existing water resources within the CFWI Planning Area combined with other information such as the location of existing and projected groundwater withdrawals, projected change in the SAS and UFA water levels, and physiographic regions (i.e., ridges, plains), was used to determine areas where surface water features were most susceptible to environmental impacts resulting from future groundwater withdrawals. Five regions were identified as most susceptible to groundwater withdrawals, are shown on **Figure 9** and are discussed below.

Wekiwa Springs/Wekiva River System – This system is located near the northern boundary of the CFWI Planning Area in western Seminole County and northwestern Orange County. The Wekiva River system is designated a national wild and scenic river with over 70,000 acres of state protected lands in the basin. This ecosystem provides habitat for a variety of rare flora and fauna including the Wood Stork, Bald Eagle, and Florida Black Bear. Land use in the area is primarily urban, consisting of mixed development types (residential, commercial, etc.).

West Seminole County/West Orange County – This area is also located near the northern boundary of the CFWI Planning Area and extends from western Seminole County southwest into western Orange County and south of Lake Apopka. This area is dominated by ridge features including the Lake Wales Ridge (White 1970). Predominant land use is urban and largely associated with the Orlando metropolitan area.

South Lake County – This area is located in the northwest portion of the CFWI Planning Area in southern Lake County and is located on the Lake Wales Ridge (White 1970). The dominant land uses are urban and agricultural.

Lake Wales Ridge – The Lake Wales Ridge is the largest ridge feature in the CFWI Planning Area and has the highest land elevations in peninsular Florida. This ridge feature has numerous sand-bottomed lakes, sinkhole lakes, and seepage wetlands that form along the ridge slopes. Within the CFWI Planning Area, this ridge feature extends from the southern portions of Lake County south through Polk County. Land uses along this ridge include urban and agricultural, including large-scale citrus operations.

Upper Peace River Basin – The Peace River extends 120 miles to Charlotte Harbor, with the headwaters and upper portion of the river being contained within the CFWI Planning Area. The Upper Peace River has a well-defined channel that connects to the groundwater systems. This sensitive area is located in southwestern Polk County. Additionally, the Winter Haven Ridge area that is generally located within the Upper Peace Basin contains numerous lakes that have varying degrees of interconnection with the underlying UFA. Land uses in the Upper Peace River Basin include urban, agricultural, large phosphate mines and extensive phosphate mine reclamation areas.

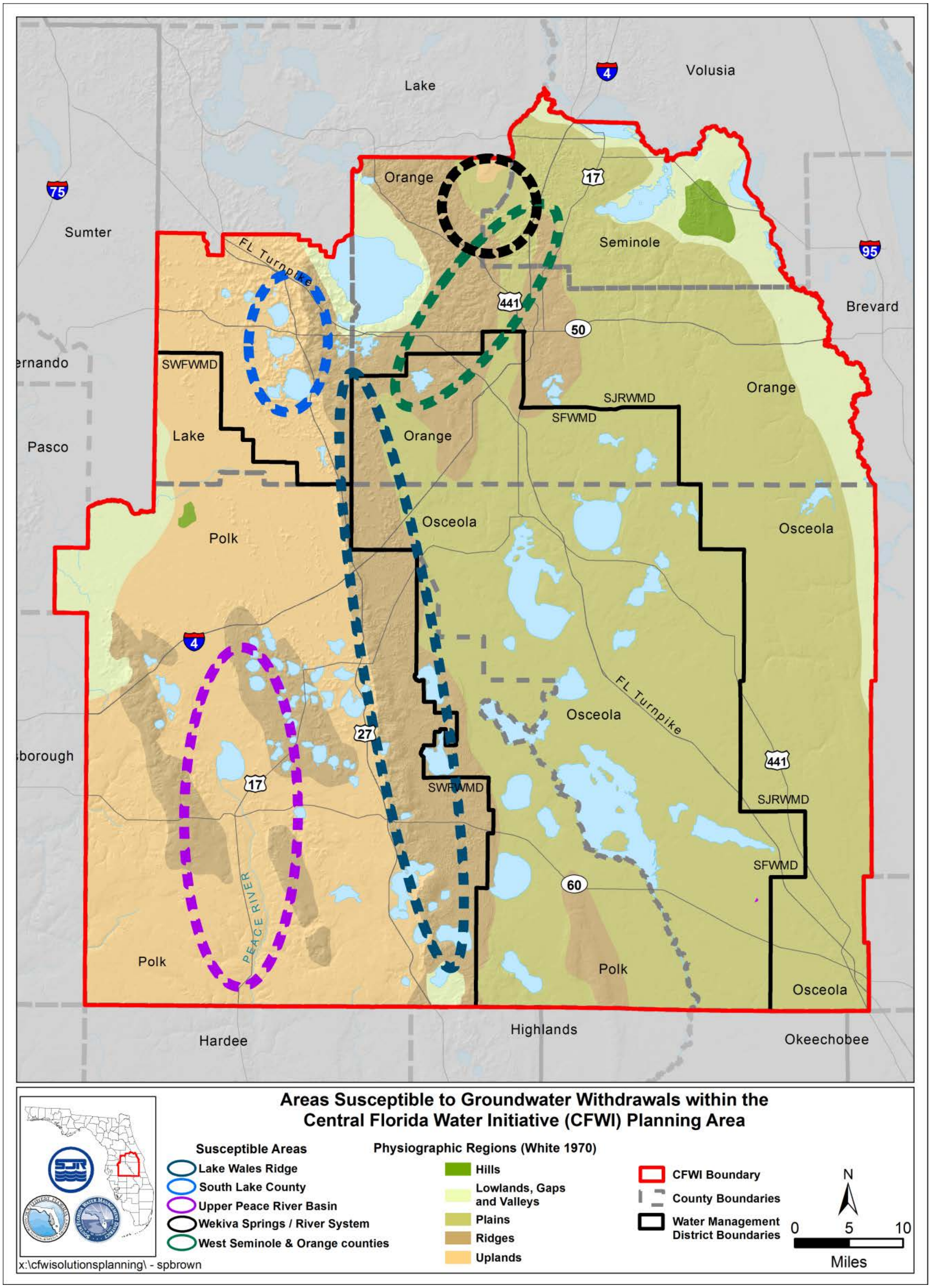

Figure 9. Regions in the CFWI Planning Area susceptible to groundwater withdrawals.

These five areas are generally more susceptible to impacts from groundwater withdrawals due to low confinement between the SAS and the underlying UFA. Cumulative effects from withdrawals throughout much of the CFWI Planning Area can impact these areas, not just those withdrawals located within these susceptible areas. Flows from the springs are especially susceptible to changes in the UFA water levels because they are direct discharge points from the aquifer; lower water levels translate to lower spring flows (**Volume I**, **Chapter 3**). In addition to the five areas of susceptibility to groundwater withdrawals due to poor confinement of the UFA, the SWFWMD's SWIMAL is also susceptible to groundwater withdrawals within the portion of Polk County contained in the SWUCA. This susceptibility is not related to the UFA level of confinement, rather it is due to regional lowering of groundwater levels within the SWUCA allowing saltwater to intrude landward along the coast.

Understanding the spatial relationship between WSPOs and areas potentially susceptible to groundwater withdrawals was the first step in developing a regional strategy for the CFWI Planning Area. During the CFWI RWSP planning process, a list of 142 WSPOs was developed in coordination with CFWI stakeholders (Volume IA, Appendix F). An additional 8 WSPOs were identified during the Solutions Planning Phase. The updated list includes 37 brackish/nontraditional water, 87 reclaimed water, 17 surface water, 6 stormwater, and 3 management strategies project options (**Volume IIA, Appendix D**). The CFWI RWSP also identified potential demand reduction measures that could be implemented, including water conservation programs. **Figure 10** shows the location of WSPOs in relationship to the areas potentially susceptible to groundwater withdrawals.

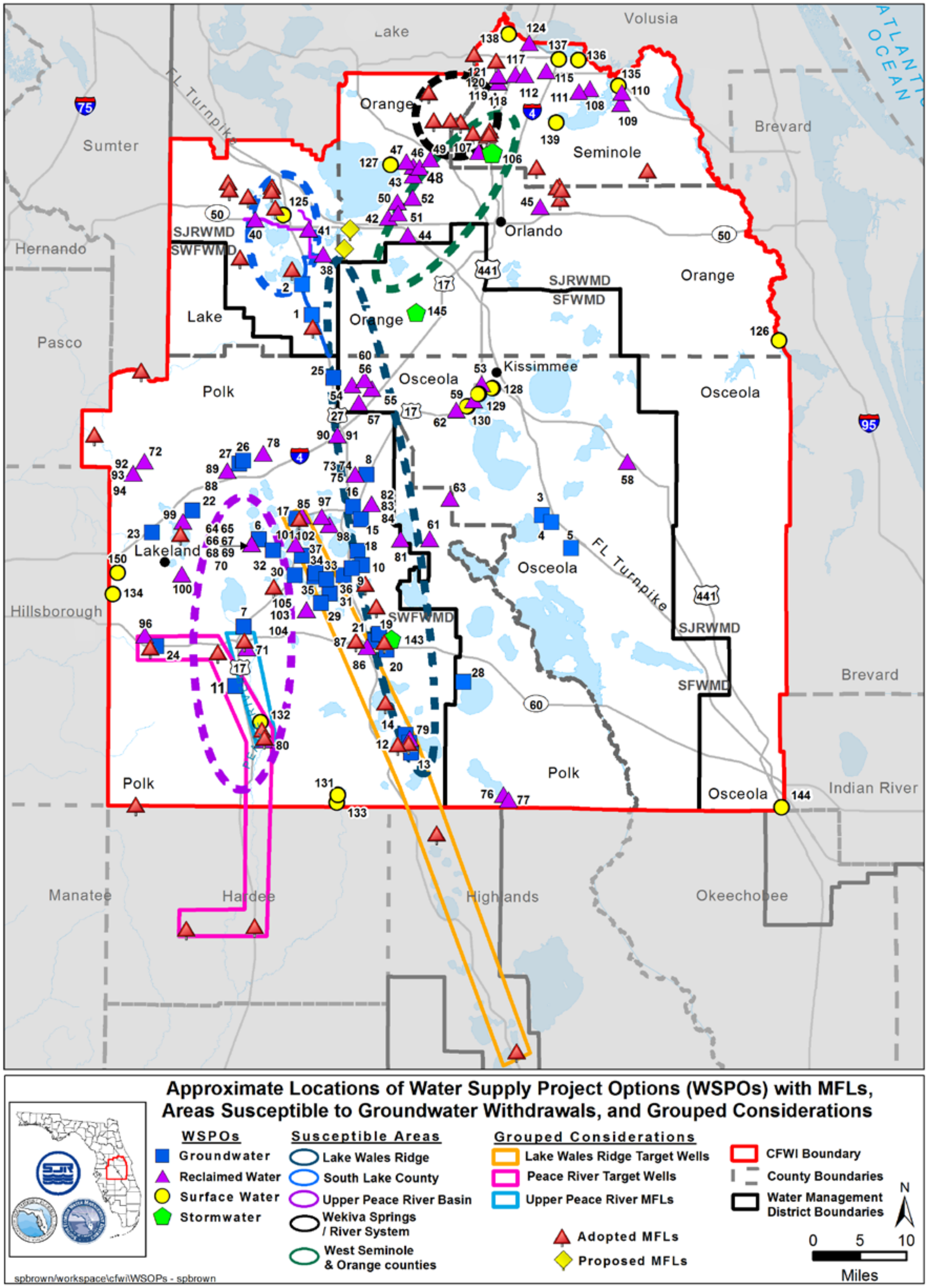

Figure 10. Water supply project options, adopted minimum flows and levels (MFLs), other MFL-associated considerations, and areas potentially susceptible to groundwater withdrawals in the CFWI Planning Area.

Environmental Evaluation Process

Water supply projects that directly affect the groundwater system in a manner that could be quantified were evaluated using the ECFT groundwater model output, MFL constraints and considerations measuring sticks, and the statistical and GIS-based methods for non-MFL wetlands. This is the same approach used to develop planning level estimates of groundwater availability as part of the CFWI RWSP. The measuring sticks, which are discussed in more detail in **Volume IA**, **Appendix B**, include

- Adopted and proposed MFL water bodies within the CFWI Planning Area
- Other regulatory considerations, including the SWFWMD SWUCA regulatory target wells
- Non-MFL lakes and wetlands within the CFWI Planning Area
- Potential for saltwater intrusion

Based on these measuring sticks, a variety of methods and assumptions were used to determine the magnitude of hydrologic change predicted by the ECFT groundwater model that could occur without

- Violating adopted or proposed MFLs
- Reducing groundwater levels below target levels established for the SWUCA Recovery Strategy
- Significant reductions in groundwater flow to the Most Impacted Area (MIA) of the SWUCA
- Causing an unacceptable increased risk that non-MFL lake or wetland constraints would become hydrologically stressed

Minimum Flow and Level Water Bodies

MFL measuring sticks used in the CFWI RWSP were also used for the Solutions Planning Phase. Freeboard was calculated as the allowable change in the UFA potentiometric surface in the vicinity of MFL surface water bodies or allowable change in spring flow for springs with adopted MFLs. Evaluation of adopted and proposed lake, wetland, or spring MFL measuring sticks was accomplished by using the EFCT groundwater model to estimate the UFA potentiometric surface drawdown (in feet) in the vicinity of MFL surface water sites or change in spring flow and subtracting this value from the freeboard to calculate a remaining freeboard. In cases where MFLs are currently not being achieved, the freeboard is a negative value. In cases where MFLs are currently being achieved but are not projected to be achieved for the evaluated scenario, the remaining freeboard would also be negative for the simulated condition.

Regulatory well targets developed to support MFLs recovery in the SWUCA were evaluated using the same approach that was used for evaluating potential withdrawal effects on adopted and proposed MFLs. The magnitude of drawdown of the potentiometric surface of the UFA in the regulatory wells that could occur without causing groundwater levels to fall below the measuring sticks (i.e., the remaining freeboard) was characterized for all Solutions Planning Phase scenarios.

Effects associated with the UFA potentiometric surface drawdown on some MFL measuring sticks were characterized using metrics other than freeboard and remaining freeboard. For example, drawdown effects for the Peace and Hillsborough rivers, where MFLs have been established, were characterized based on model-predicted groundwater exchange between the rivers and underlying aquifer systems and groundwater flow across the ECFT groundwater model domain boundary. Similarly, simulated changes in groundwater flow along the southwest boundary of the ECFT model domain were evaluated to predict the potential for adverse effects on the SWIMAL established to slow the landward movement of saltwater into the UFA in the MIA of the SWUCA.

Non-MFL Water Bodies (Lakes and Wetlands)

There are more than 150,000 acres of hydrologically isolated non-MFL wetlands and lakes in the CFWI Planning Area. It is not possible to assess the condition of every wetland, partly because of time and budget constraints and partly because many of them are located in remote locations and/or on private property where access is difficult or cannot be obtained, but a concerted effort must be made to gathering more of this data in future CFWI phases. To develop an assessment of wetland conditions, a representative sample of wetlands was inspected and assessed. The results of this assessment were used to extrapolate conditions for all of the isolated wetlands in the CFWI Planning Area. A total of 357 hydrologically isolated wetlands and lakes without established MFLs were assessed as part of the CFWI RWSP effort. Determinations of wetland stress and the presence of substantial hydrological alteration were made for each of the evaluated wetlands and lakes. Isolated wetlands were evaluated because they are considered to be more vulnerable to impacts from lowered groundwater levels than other wetland types. Relatively robust hydrologic records were available for 44 of the assessed wetlands; this subset of sites was referred to as the “Class 1” wetland data set. Several of the Class 1 wetlands were located outside the CFWI Planning Area, but in similar hydrobiological settings. These were included to increase the number of Class 1 wetlands sites and improve the ability to calculate statistical relationships between observed water levels and the probability of stress. While the Class 1 wetland data are a relatively small subset of the thousands of isolated wetlands in the planning area, it was the largest data set that could be developed with adequate records of historical water levels to assess the relationship between groundwater levels and wetland stress. The remaining 313 assessed wetlands, which had an evaluation of current stress condition but lacked historical hydrologic records, were categorized as “Class 2” wetlands. The thousands of other isolated wetlands in the CFWI Planning Area that were not included in the field survey and lack information on the current stress condition and historical water level data were referred to as “Class 3” wetlands.

A statistical approach was used to evaluate wetlands in the CFWI Planning Area. The approach identified the probability of change in stress status of isolated Class 3 wetlands based upon observed statistical relationships between stress and hydrologic conditions of the Class 1 wetlands and the statistical distribution of stressed and unstressed conditions in Class 2 wetlands. The distributions of stressed and unstressed Class 2 wetlands were used to infer the general probability of stressed Class 3 wetlands within the CFWI Planning Area for the updated Reference Condition, Baseline Condition, and other Solutions Planning Phase scenarios. For the analyses, the wetlands were further classified into those that were located within plains and ridge physiographic province settings to identify statistics that were most useful for discerning between stressed and unstressed wetlands in these different landscapes. It should be noted that the distribution of stressed wetlands in the updated Reference Condition includes wetland stress from all causes, not just from groundwater withdrawals. The strong correlation of wetland stress with field observations of substantial hydrological alteration, especially in urbanized plains areas, strongly suggests that factors other than groundwater withdrawals are a major contributor to wetland stress in much of the CFWI Planning Area. Plains wetlands also showed much stronger correlation to SAS water table changes than UFA potentiometric surface changes.

The probability of change in stress conditions was assessed based on the predicted change in SAS water table and UFA potentiometric surface elevations at the location of wetlands (used to determine wetland water levels) from the updated Reference Condition to the Baseline Condition withdrawal scenarios and other Solutions Planning Phase scenarios, and on the statistical relationship between probability of stress and the statistical distribution of water levels that was derived from the 44 Class 1 wetlands.

The initial hydrological conditions of the Class 2 wetlands are unknown. Similarly, both the initial hydrological conditions and the initial stress conditions of the Class 3 wetlands are unknown. The statistical wetland risk assessment relies on extrapolating the population-averaged occurrence of stress in the updated Reference Condition to the Class 3 wetlands, and the population-averaged response of wetlands to changes in water levels to the Class 2 and Class 3 wetlands. This approach overcame the limitations of the unknown initial conditions in these wetland systems. Because it uses population-averaged initial condition information, it provides a good estimate of the total risk of change in stressed area across the sum of many individual wetlands. However, it is not possible to make accurate predictions in this way for individual wetland systems, or even for combinations of a relatively small number of individual wetlands. Therefore the assessment results are presented as a total value for the whole CFWI Planning Area, as this allows a large enough number of wetlands to be included in the assessment so that the effects of approximating the unknown initial wetland conditions with population-averaged values will yield a reasonable prediction of the total change in stressed wetland area.

Application of the ECFT Groundwater Model to the CFWI Solutions Planning Phase

The ECFT model served as a tool to simulate groundwater conditions to evaluate the effects of proposed groundwater projects and associated water use changes as well as conceptual management options of the area's water resources. During the Solutions Planning Phase, a series of updates were implemented to the ECFT model to incorporate new information or improve model estimates. Changes included updates to specific water uses, and modifications to improve the representation of agricultural reuse, rapid infiltration basins (RIBs), agricultural irrigation, and residential landscape irrigation. These changes resulted in the updated Reference Condition and Baseline Condition. This is not an exhaustive list of planned improvements to the model; however, they were sufficiently important to undertake to improve water use estimates and could be implemented within the time available for the Solutions Planning Phase. Additional improvements are planned for future versions of the model. Refer to **Volume IIA**, **Appendix E** for detailed information on the Solutions Planning Phase updates to the ECFT model.

The Baseline Condition was established and used as the basis for comparison of modeled results in the Solutions Planning Phase. The Baseline Condition incorporated the CFWI RWSP projected 2015 demands as a means of distributing the additional 50 mgd of groundwater that was estimated to be available, if sufficient management strategies are implemented. As a starting point, impacts to MFL and non-MFL water bodies and remaining freeboard were determined for the Baseline Condition; the potential effects of Round 1 and Round 2 scenario groundwater withdrawals and remaining freeboard were then determined, and were compared to either the Baseline Condition or to other scenarios (see following section). **Figures 11** and **12** show the Baseline Condition status of MFL and non-MFL water bodies evaluated as part of the CFWI process, and the simulated change in UFA potentiometric surface elevation at these water bodies compared to Reference Condition elevations. The status counts of MFL constraints and other considerations evaluated for the Baseline Condition indicate that five additional constraints were not met with the increased groundwater withdrawal under this condition compared to the updated 2005 Reference Condition (**Volume IIA, Appendix F, Table F-3**).

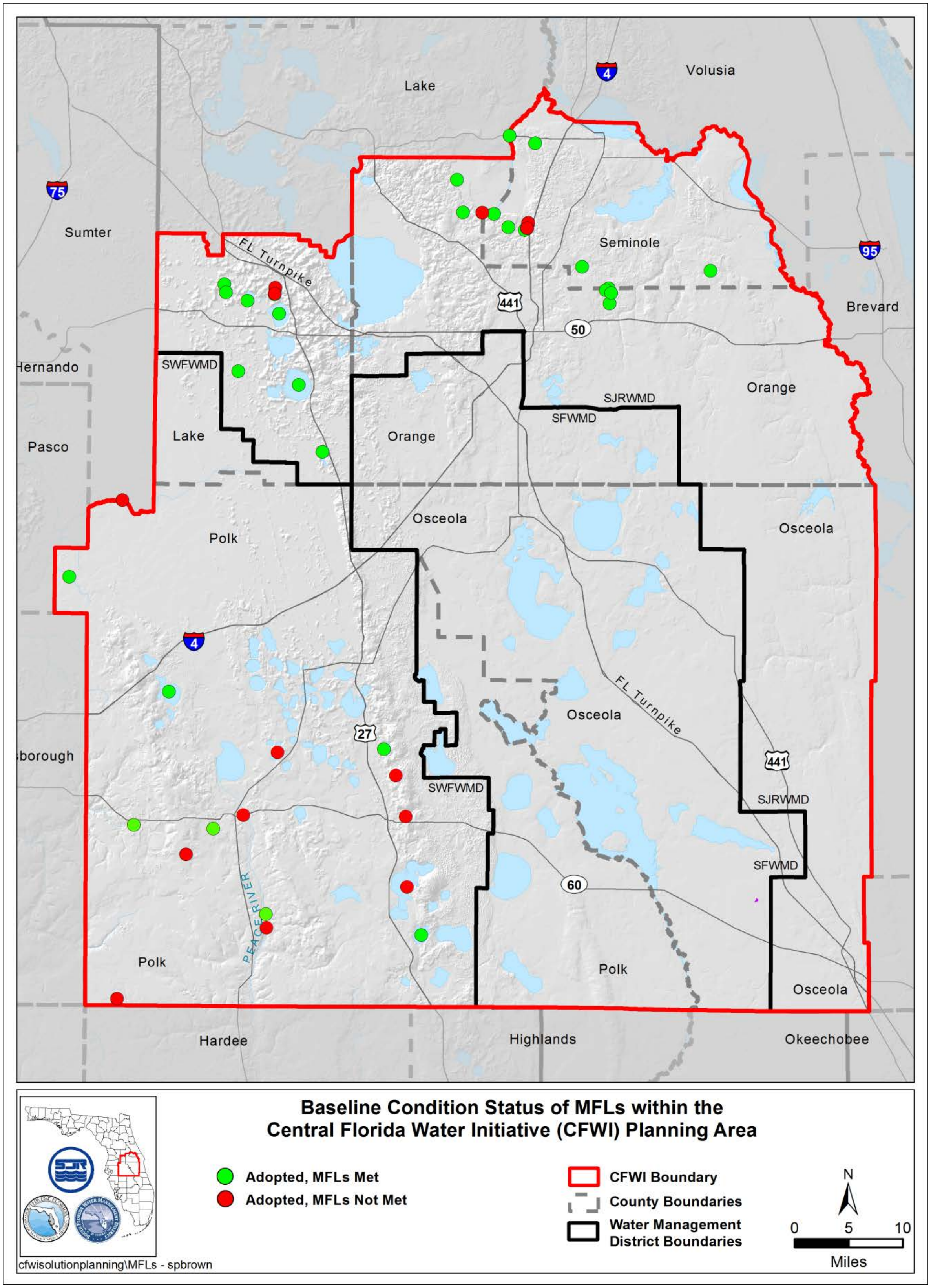

Figure 11. Baseline Condition status of MFLs within the CFWI Planning Area.

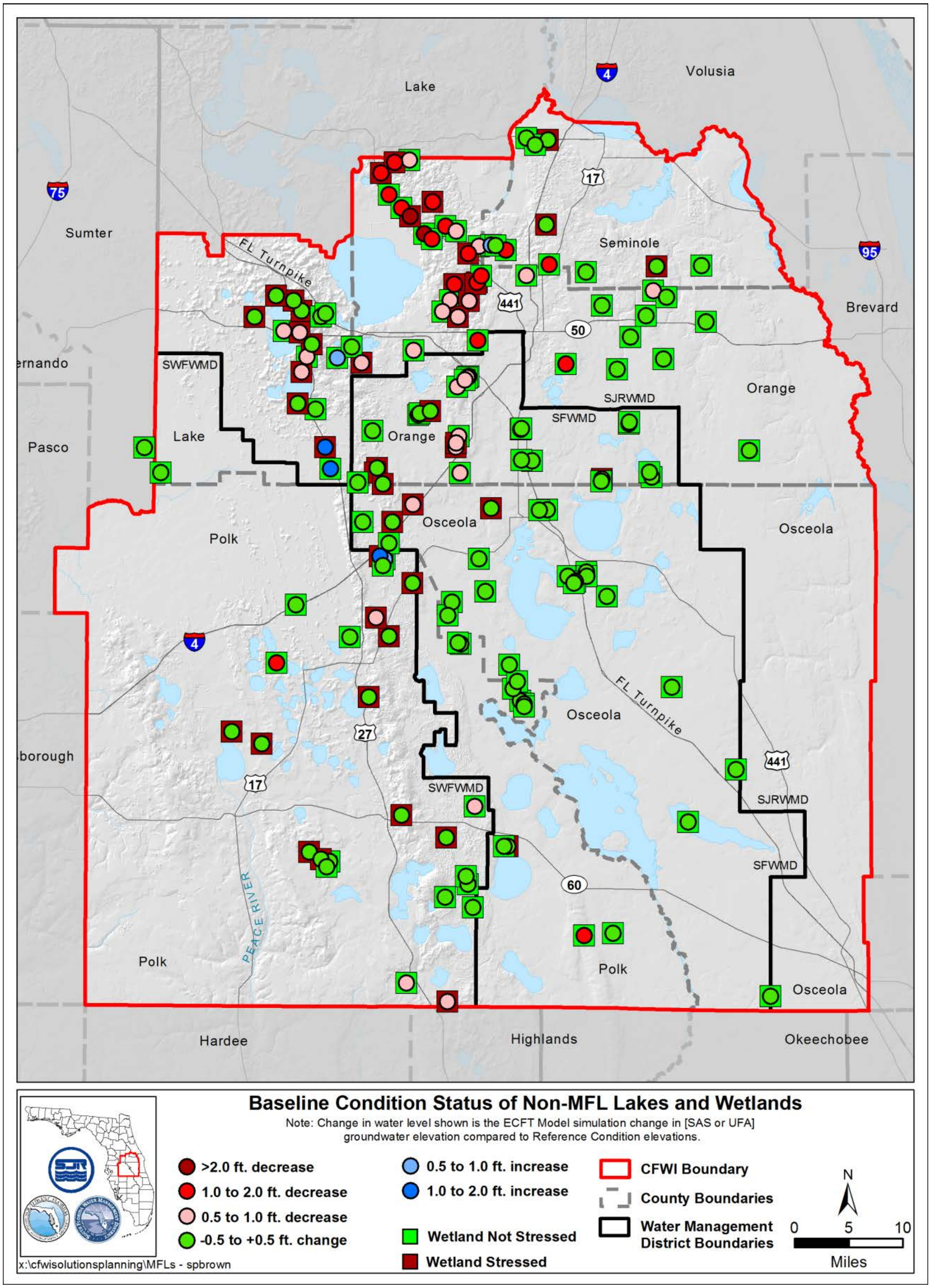

Figure 12. Baseline Condition status of non-MFL lakes and wetlands within the CFWI Planning Area.

Solutions Planning Phase Modeling Scenarios

The assessment of potential effects of groundwater withdrawals on environmental features was largely focused on changes in water levels in the SAS and UFA, as well as on changes in spring flows. The ECFT groundwater model was the principal tool used to quantify effects of different projects and conceptual management options. Two rounds of groundwater modeling were conducted as part of the Solutions Planning Phase. The Round 1 scenarios consisted of permitted and proposed groundwater project options, focusing on the LFA. Specific groundwater projects were included in the modeling scenario if they met the SC guidance that the projects produce at least 5 mgd and are multi-jurisdictional. The Round 2 scenarios were conceptual in nature, generally simulating management options intended to minimize environmental impacts. All of the scenarios were evaluated for impacts to isolated non-MFL wetlands, and MFL constraints and considerations.

Round 1 Scenarios

Groundwater project options included in the Round 1 scenarios were the Cypress Lake wellfield, the Southeast Polk County Wellfield, Polk County Blended LFA Distributed Wellfield, and the South Lake County Wellfield (Centralized and Distributed). With the exception of the Cypress Lake Wellfield project, withdrawals from the identified projects were not included in the Baseline Condition. For the Cypress Lake Wellfield project, 11.9 mgd of withdrawals from the LFA to supply 9.5 mgd of finished water was included in the Baseline Condition. Cypress Lake wellfield is planned to produce another 20.5 mgd of finished water (corresponding to a 25.6 mgd withdrawal from the LFA), which is the additional quantity that was modeled during the Round 1 scenarios.

For the proposed LFA projects, it was necessary to withdraw more water than what was projected to be supplied due to the potentially poor water quality in the aquifer. It was assumed that groundwater withdrawn from the LFA as part of these projects would be brackish and it was assumed that about 20 percent of the water withdrawn would be disposed of as a result of the membrane treatment process. An important consideration for determining effects of these withdrawals was the return of some of the water that is withdrawn from the groundwater system through landscape irrigation. During the evaluation process, irrigation return flows were applied to the surficial aquifer in the county from which the groundwater withdrawals occurred. A general description of withdrawals associated with each project option is provided below. Detailed Round 1 modeling results are presented in **Volume IIA**, **Appendix E**.

Cypress Lake Wellfield Project

This project will be developed by the Water Cooperative of Central Florida and Reedy Creek Improvement District. It is permitted (SFWMD Permit 49-02051-W) to withdraw up to 37.5 mgd of brackish groundwater from the LFA to supply 30 mgd of finished water. Development of this project is scheduled to be completed over the 2035 planning horizon with 9.5 mgd of finished water supply being included in the Baseline Condition.

Southeast Polk County Wellfield Project

This project will be developed by Polk County Utilities in coordination with utility partners in Polk County. The project is permitted (SFWMD Permit 53-00293 W) to withdraw up to 37.5 mgd of brackish groundwater from the LFA to supply 30 mgd of finished water. It is projected that only 20 mgd of supply will be developed over the 2035 planning horizon.

Polk County Blended LFA Distributed Wellfield Project

This project is an alternative to withdrawing all the water from a centralized wellfield such as the Southeast Polk County Wellfield. Several utilities were identified in the CFWI RWSP as collectively proposing to develop 9.8 mgd of water supply from both the LFA and UFA at distributed wellfields. Water from the LFA would be blended with existing and new withdrawals from the UFA to provide potable quality water without advanced treatment processes. This project assumes 20.2 mgd of finished water (25.2 mgd of raw water) is supplied from the centralized Southeast Polk County Wellfield for a total finished water supply of 30 mgd. The Polk County Blended project was included to evaluate distributed wellfields against the centralized wellfield of the Southeast Polk County Wellfield project.

South Lake County Wellfield – Centralized and Distributed Project

This project is proposed to provide 12.7 mgd of finished water to meet projected demands in South Lake County over the 2035 planning horizon. Two options for development of this water have been identified. The first is to develop a centralized wellfield in southern Lake County to withdraw 15.9 mgd from the LFA to supply 12.7 mgd of finished water. The second option is to provide the same amount of finished water supply by distributing the LFA withdrawals among cooperating utilities in Lake County.

The Round 1 scenarios included these projects:

- LFA Wellfields Scenario (Cypress Lake, Southeast Polk County, and South Lake County projects)
- Polk County Blended LFA Distributed Wellfield Scenario
- South Lake County Wellfield - Centralized Scenario
- South Lake County Wellfield - Distributed Scenario

Round 2 Scenarios

As previously stated, the GW Subteam's Round 1 scenarios were developed to simulate specific projects currently being implemented or proposed by stakeholders. All of the projects involved the development of groundwater at specific locations identified by the project participants. Round 2 scenarios were developed to evaluate potential benefits of conceptual management options that could be used to address resource constraints and considerations. These scenarios incorporate some management options, such as deepening wells and distributing the withdrawals over larger areas. The Round 2 scenarios were developed to provide a more robust assessment of potential management options that users can implement to potentially develop additional groundwater supplies in the region or achieve an environmental benefit.

The Round 2 scenarios included a series of conceptual management options:

- LFA Wellfield – Centralized and Distributed
- Shifting withdrawals from UFA to LFA
- Moving UFA withdrawals away from susceptible areas
- Replace UFA withdrawals with non-groundwater AWS
- Targeted recharge for MFL water bodies
- Return flow associated with non-groundwater AWS

The first conceptual management option listed above was developed to further explore if additional groundwater could be developed without adverse impacts to the environment. The remaining scenarios were intended to evaluate the potential to minimize environmental impacts and one scenario (Targeted Recharge) was designed to estimate the quantity of recharge needed to achieve MFL recovery. Though the Round 2 simulations do not represent specific projects by specific stakeholders, these conceptual management options provide instructive information to allow stakeholders to conceptually evaluate if particular project types would be beneficial to further investigate. Detailed modeling results are presented in **Volume IIA, Appendix E**.

The following details should be noted with regard to the Round 2 conceptual scenarios:

- The new wells included in Round2 conceptual scenarios are hypothetical wells and were used in the ECFT groundwater model to demonstrate the concept. These wells are not associated with any existing permittee or stakeholder.
- Each Round 2 conceptual scenario (excluding Targeted Recharge) was developed to simulate 50 mgd of finished water supply, with 10 mgd being supplied to each of the five CFWI counties.
- It was assumed that groundwater withdrawn from LFA wells would require membrane treatment with an 80 percent recovery factor to meet drinking water standards (e.g., slightly brackish raw water supply). The recovery factor was based on two recently permitted regional LFA brackish groundwater projects being implemented in the CFWI Planning Area. Note that UFA wellfields are assumed to be 100 percent efficient due to the typically freshwater quality of the UFA in this area.
- The quantity and distribution of landscape irrigation (LSI) associated with increased supply was assumed to be the same for each Round 2 conceptual scenario (excluding Targeted Recharge) because it was assumed that the same quantity of finished water was being supplied to each of the five CFWI counties in each of the scenarios performed. LSI is discussed in more detail in **Volume IIA, Appendix E**.

These options represented the types of projects that could be implemented by stakeholders to potentially minimize or reduce impacts to environmental systems and develop additional water supplies. Information from these scenarios can be used by stakeholders to develop management strategies for existing withdrawals, as well as for planning future water supply options. The conceptual management options are described below.

Conceptual LFA Wellfields Scenario – Centralized and Distributed

This scenario assesses the potential to develop an additional 50 mgd of supply from either a new regional LFA wellfield in south Osceola County or a series of distributed subregional LFA groundwater supply projects. Because it is anticipated that the LFA would be brackish in the identified withdrawal areas, it was necessary to withdraw 62.5 mgd during the groundwater modeling in order to supply 50 mgd of finished water, to account for treatment losses. The two options were evaluated to compare the differences between a centralized LFA wellfield and a distributed LFA wellfield.

Shifting Withdrawals from UFA to LFA Conceptual Scenario

This scenario assesses the potential environmental benefits of shifting UFA withdrawals to the LFA. In general, it tests the concept that the middle confining unit separating the UFA and LFA is restrictive to the vertical movement of water and, that by shifting withdrawals to the LFA there will be less impact to lakes and wetlands, and potentially springs.

Moving UFA Withdrawals Away from Susceptible Areas Conceptual Scenario

This scenario assesses the environmental benefits of relocating UFA withdrawals away from environmentally susceptible areas.

Replace UFA Withdrawals with Non-groundwater AWS Conceptual Scenario

This scenario assesses the potential environmental benefits of replacing UFA withdrawals with a non-groundwater AWS source. Potential benefits result from a combination of both water level recovery due to reduced groundwater withdrawals and continued LSI with the non-groundwater source that replaces the UFA withdrawals.

Targeted Recharge for MFL Water Bodies Conceptual Scenario

This scenario assesses the potential quantities that may be needed to recover or prevent impacts to specific MFL water bodies as well as secondary benefits to non-MFL water bodies. Since the environmental evaluations were based on changes to the UFA water levels beneath impacted water bodies, the evaluations only considered the effects of simulated direct recharge to the UFA as well as use of rapid infiltration basins (RIBs). The goal of direct recharge was to increase water levels in the UFA and reduce the potential for lake leakage losses.

Return flow Associated with Non-groundwater AWS Conceptual Scenario

This scenario assesses the potential hydrologic and environmental benefits associated with PS irrigation generated from non-groundwater AWS projects. This scenario also provides insight into effects of irrigation application rates on the irrigable areas assumed in the ECFT model.

ENVIRONMENTAL EVALUATION RESULTS

Groundwater Project Options (Round 1 Modeling)

Lower Floridan Aquifer (LFA) Wellfields Scenario

The projects simulated in this scenario include

- Cypress Lake wellfield
- Southeast Polk County wellfield
- South Lake County wellfield

The Cypress Lake Wellfield is a 30 mgd (finished water supply) LFA permitted regional project currently under design. The project was included in the groundwater modeling performed in support of the CFWI RWSP effort, in which 9.5 mgd of the total permitted (finished water supply) allocation was included in the Baseline Condition. For the Solutions Planning Phase, the portion of the allocation projected to be used beyond 2015 (20.5 mgd) was included in the groundwater flow model. The Southeast Polk County wellfield is a permitted 30 mgd (finished water supply) LFA regional project. The proposed South Lake County wellfield project is currently under feasibility study and has not yet been permitted. For this scenario, the project would supply up to 12.7 mgd as a regional centralized wellfield. The location of the LFA Wellfields and simulation results are shown on **Figure 13.**

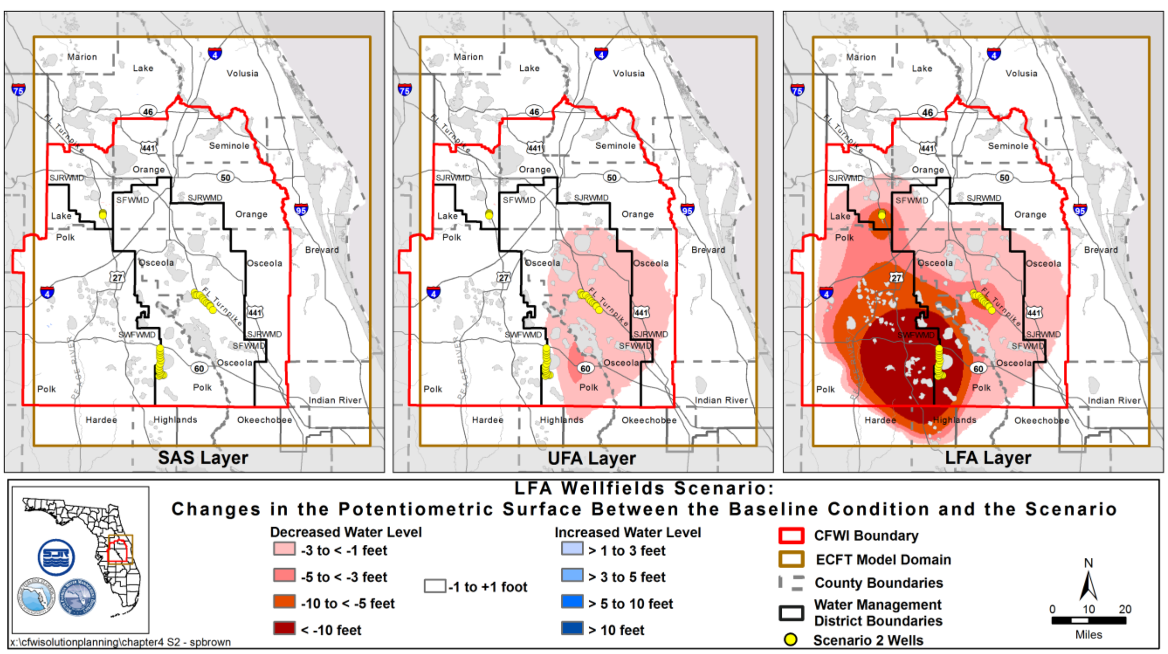

Figure 13. LFA Wellfields Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers between the Baseline Condition and the scenario. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

Evaluation of the model results indicated that the LFA Wellfields Scenario could potentially result in approximately 1,100 acres of additional stressed non-MFL isolated wetlands. The evaluation also indicated that the scenario could potentially result in one additional MFL constraint exceeded and three additional MFL considerations exceeded when compared to the Baseline Condition.

This scenario consists of permitted and unpermitted LFA wellfields. The permitted wellfields in this scenario have stringent permit conditions requiring monitoring for impacts with the ability to modify the permits if unacceptable impacts are realized. Any potential adverse impacts associated with this scenario might be mitigated or offset through implementation of some of the management strategies that were evaluated in the conceptual scenarios evaluated as part of the Round 2 modeling and are discussed in the next section.

Polk County Blended LFA Distributed Wellfield Scenario

This scenario is similar to the LFA Wellfield Scenario, but a portion of the proposed withdrawals from the Southeast Polk County Wellfield are distributed into the LFA and UFA throughout Polk County to provide 9.8 mgd of finished water supply. The location of the proposed Polk County Blended LFA Distributed wellfield and simulation results is shown in **Figure 14**.

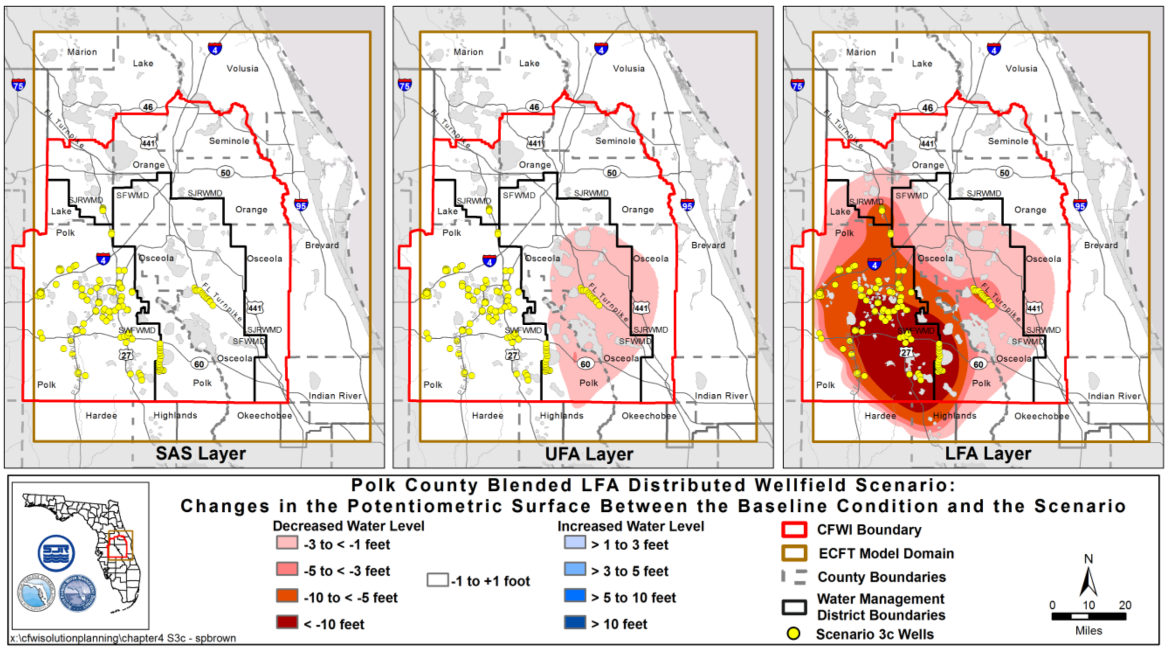

Figure 14. Polk County Blended LFA Distributed Wellfield Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers between the Baseline Condition and the scenario. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The evaluation of the model results indicated that the Polk County Blended LFA Distributed Scenario potentially results in approximately 1,400 acres of additional stressed non-MFL isolated wetlands. The evaluation also indicated that one additional MFL constraint and three additional MFL considerations could potentially be exceeded when compared to the Baseline Condition. This scenario results in less favorable environmental performance than the LFA Wellfield Scenario because the Polk County Blended LFA Distributed Wellfield includes UFA withdrawals near the areas potentially susceptible to groundwater withdrawals, while the LFA Wellfield Scenario is entirely composed of LFA withdrawals further away from the susceptible areas.

South Lake County Wellfield – Centralized Scenario

Groundwater withdrawals simulated in the Centralized South Lake County Scenario represent the 2035 projected demand growth for utilities in this area. The Centralized scenario simulates the withdrawal of 15.9 mgd of raw water, which yields 12.7 mgd of finished water supply. This scenario is intended to represent the implementation of a single regional facility. An alternative scenario (South Lake County - Distributed Scenario) was developed to simulate the same quantity of groundwater pumping from distributed wellfields in lieu of a single regional facility. The location of the proposed centralized wellfield and simulation results are shown in **Figure 15**.

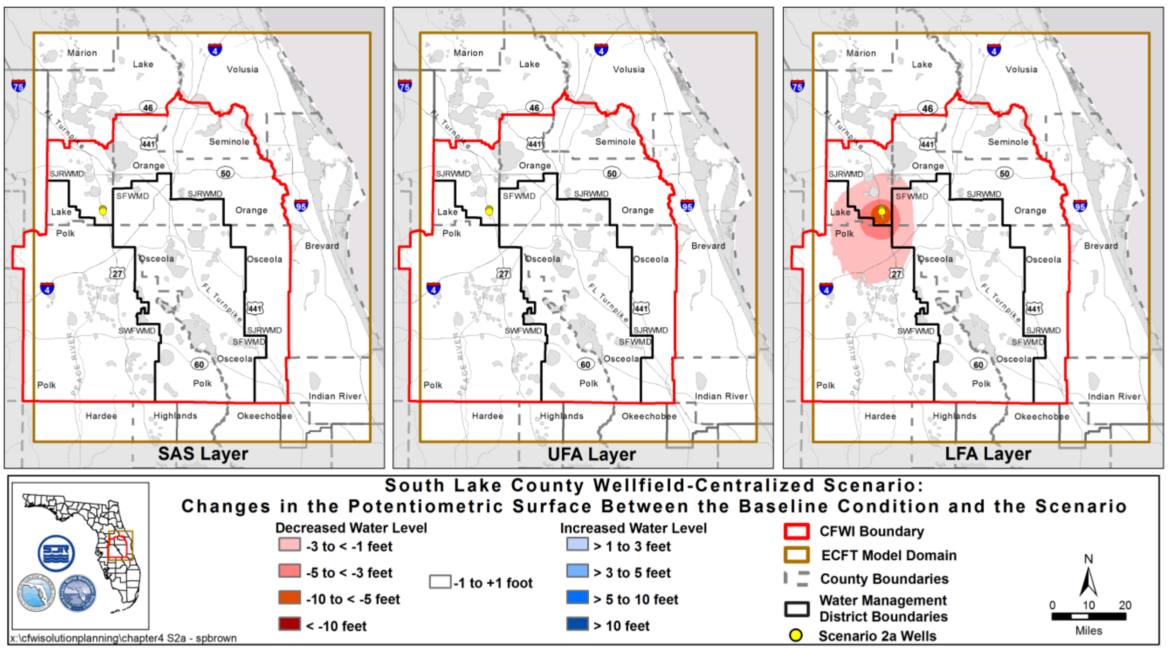

Figure 15. South Lake County Wellfield – Centralized Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers between the Baseline Condition and the scenario. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The evaluation of the model results indicated that the Centralized South Lake County Scenario could potentially result in approximately 300 acres of additional stressed non-MFL isolated wetlands. The evaluation also indicated that there was no change in exceedances of MFL constraints but three additional MFL considerations could potentially be exceeded when compared to the Baseline Condition. The Centralized Scenario indicates slightly less favorable results for non-MFL isolated wetlands than the South Lake County Distributed Scenario (described below), but is slightly more favorable for MFL constraints and considerations. While the modeling results show this project could result in unfavorable environmental impacts, any potential adverse impacts might be mitigated or offset through implementation of management strategies that were evaluated as part of the Round 2 modeling and are discussed in the next section.

South Lake County Wellfield – Distributed Scenario

The groundwater withdrawals simulated in the Distributed South Lake County Scenario represent the 2035 projected demand growth for utilities in the area. The scenario simulates 12.7 mgd of finished water supply and is intended to be an alternate wellfield configuration to that simulated in the Centralized South Lake County Scenario. The location of the proposed distributed wellfield and simulation results are shown in **Figure 16**.

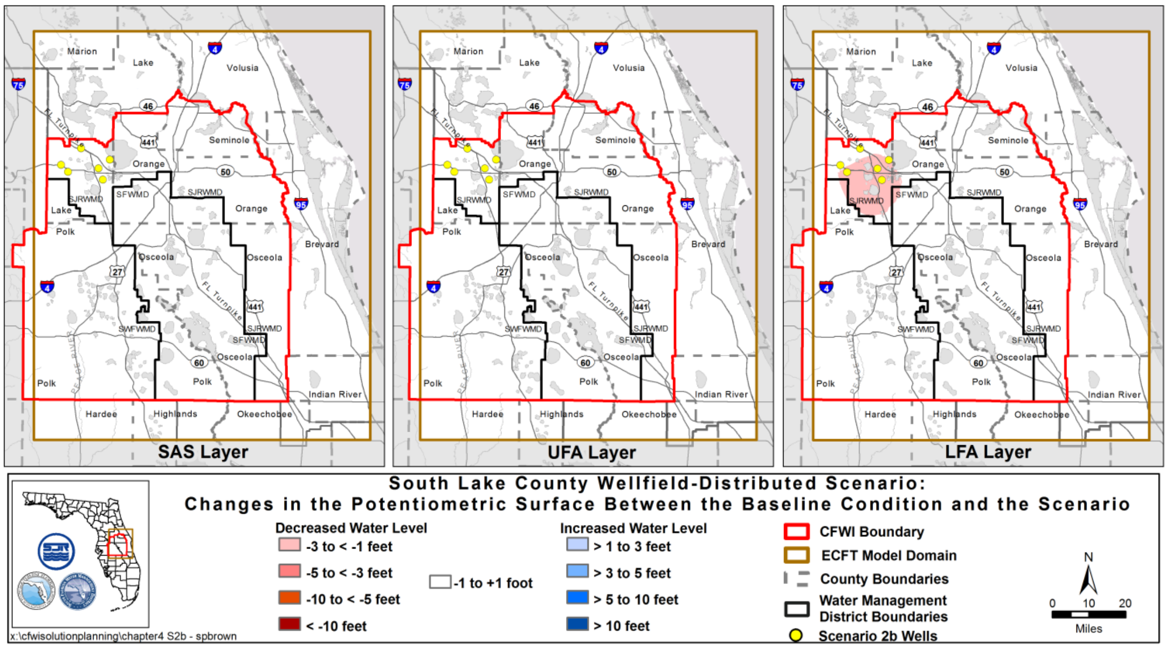

Figure 16. South Lake County Wellfield – Distributed Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers between the Baseline Condition and the scenario. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The South Lake County Distributed Scenario potentially results in approximately 150 acres of additional stressed non-MFL isolated wetlands. The evaluation also indicated that one additional MFL constraint and three additional MFL considerations could potentially be exceeded when compared to the Baseline Condition. It is slightly more favorable for isolated non-MFL wetlands than the Centralized Scenario but less favorable for MFL constraints and considerations than the Centralized Scenario. While the modeling results show this project could result in unfavorable environmental impacts, any potential adverse impacts associated with this scenario might be mitigated or offset through implementation of management strategies that were evaluated as part of the Round 2 modeling and are discussed in the next section.

Conceptualized Management Options (Round 2 Modeling)

Conceptual LFA Centralized Wellfield Scenario

This scenario evaluates the concept of a developing a centralized LFA wellfield in south-central Osceola County, generally located further away from areas potentially susceptible to groundwater withdrawals. The purpose of this scenario was to evaluate the viability of future LFA groundwater development. The scenario simulates the withdrawal of 62.5 mgd of raw water, which equates to 50 mgd of finished water supply. The location of the centralized wellfield and simulation results are shown on **Figure 17**.

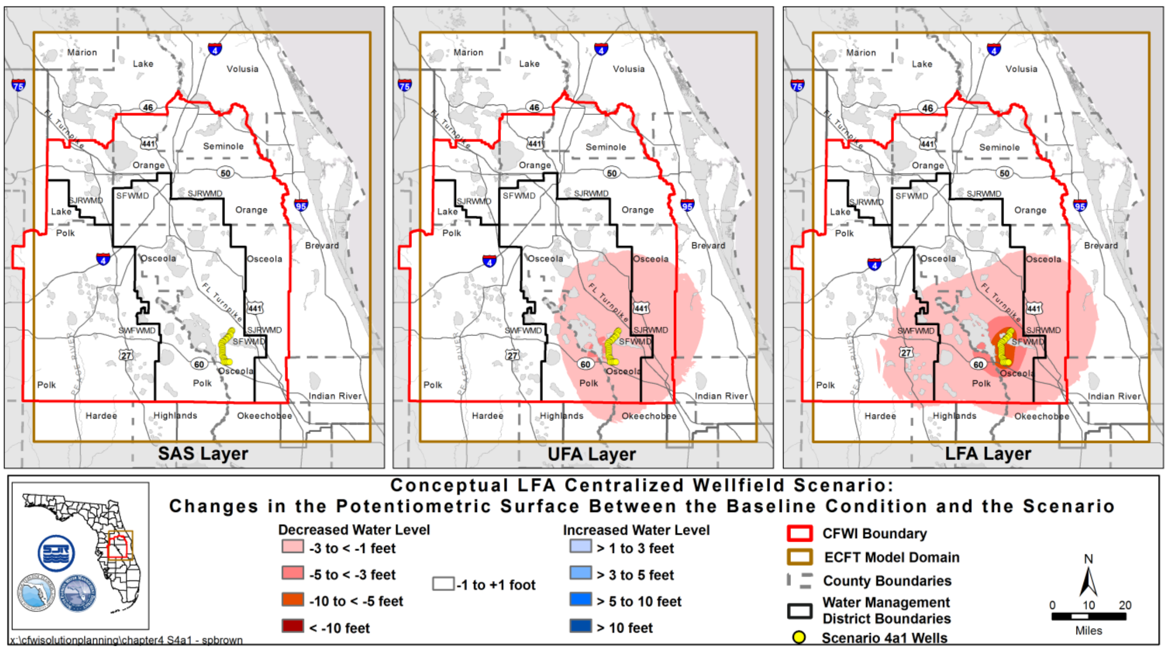

Figure 17. Conceptual LFA Centralized Wellfield Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers between the Baseline Condition and the scenario. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The evaluation of the model results indicated that this Conceptual LFA Centralized Scenario could potentially decrease stressed non-MFL isolated wetlands by approximately 750 acres. It would potentially have no impact on MFL constraints and considerations. The potentially favorable impact on non-MFL isolated wetlands is because the simulated withdrawal is located away from the susceptible areas, but the return flow (e.g., irrigation) associated with the increased groundwater withdrawal is located north and west of the wellfield, closer to susceptible areas. This return flow provides an increase in recharge to the SAS and UFA. This conceptual project configuration is more favorable than the conceptual project configuration simulated in the Conceptual LFA Distributed Wellfield Scenario (described below), which includes distributed increases in LFA groundwater withdrawals throughout the CFWI Planning Area.

Conceptual LFA Distributed Wellfield Scenario

The purpose of this scenario is to evaluate the concept of developing five 10 mgd, widely-distributed, LFA wellfields throughout the CFWI Planning Area. The Conceptual LFA Distributed Wellfield Scenario simulates the withdrawal of 62.5 mgd of raw water, which equates to 50 mgd of finished water supply. The configuration of these distributed wellfields and simulation results are shown on **Figure 18**.

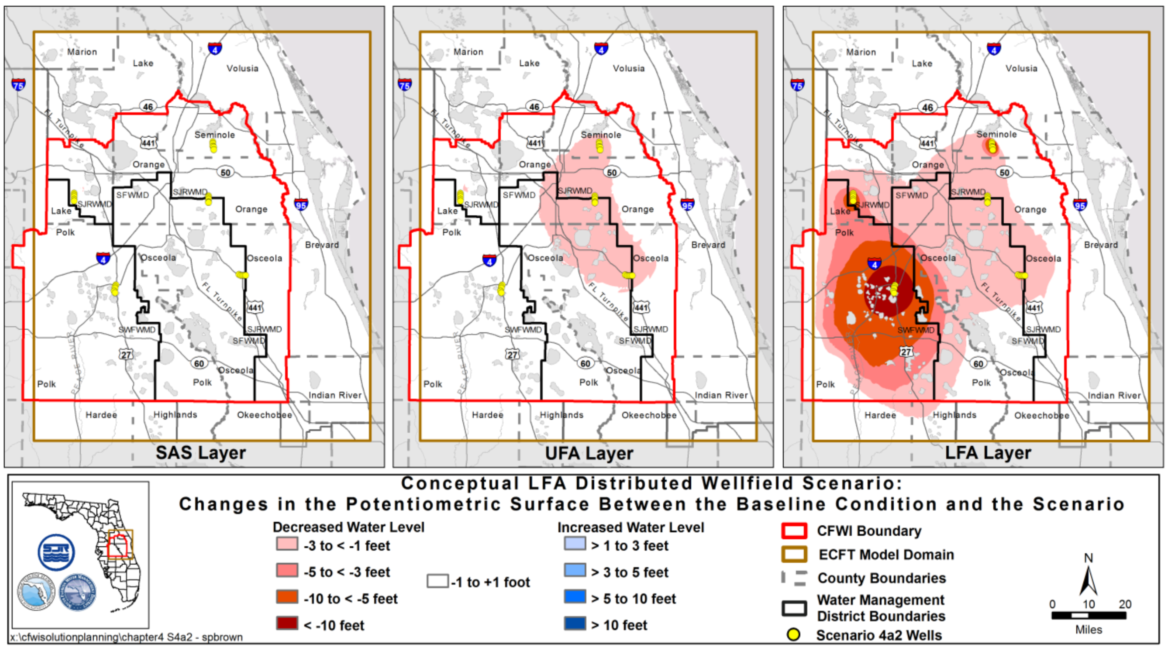

Figure 18. Conceptual LFA Distributed Wellfield Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers between the Baseline Condition and the scenario. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The evaluation of the model results indicated that this Conceptual LFA Distributed Wellfield Scenario could potentially increase the number of stressed non-MFL isolated wetlands by approximately 800 acres. The evaluation also indicated that one additional MFL constraint and three MFL considerations could potentially be exceeded when compared to the Baseline Condition. The unfavorable environmental performance of this scenario is likely due to the fact that some of the distributed withdrawals were located very near areas identified as potentially susceptible to groundwater withdrawals. The Conceptual LFA Distributed Wellfield Scenario is less favorable than the project configuration simulated in the Conceptual LFA Centralized Wellfield Scenario, which includes a single centralized conceptual wellfield in south-central Osceola County, far removed from the most susceptible areas.

Shift Withdrawals from UFA to LFA Conceptual Scenario

This conceptual scenario evaluates the management strategy of shifting withdrawals from the UFA to the LFA. Two model runs were performed to evaluate five conceptual wellfields, 10 mgd each, distributed across the CFWI Planning Area for a total of 50 mgd of finished water supply. The initial model run simulated 50 mgd of groundwater withdrawn from the UFA. The second model run simulated 62.5 mgd of groundwater withdrawn from the LFA. These two model runs produce the same amount of finished water after treatment losses. The wellfields simulated in both model runs are in the same locations and are conceptualized to be UFA wells being deepened into the LFA. The location of these wellfields and simulation results are shown on **Figure 19**.

It is important to note that the two groundwater flow model simulations performed in support of this scenario are compared to one another and not to the Baseline Condition.

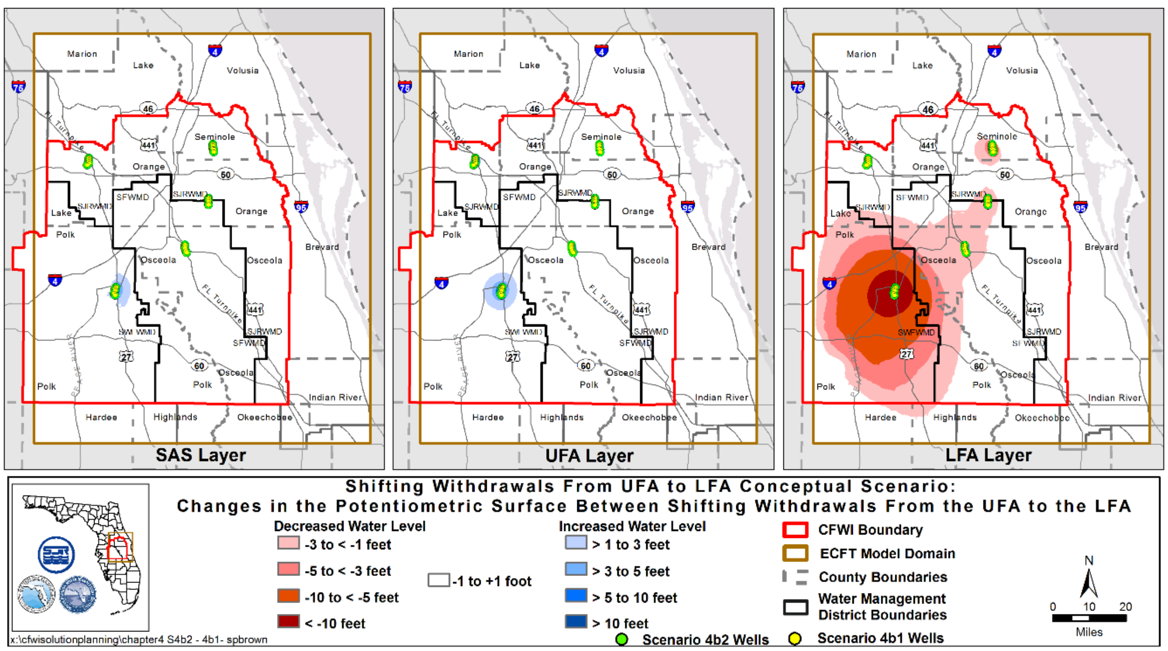

Figure 19. Shifting Withdrawals from UFA to LFA Conceptual Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers between shifting withdrawals from the UFA to the LFA. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The evaluation of the model results indicated that shifting withdrawals from the UFA to the LFA could potentially reduce the number of stressed non-MFL isolated wetlands by approximately 1,000 acres. The evaluation also indicated an increase in potentiometric surface elevations at MFL water bodies, which could result in recovery of some of these systems.

This management strategy generally reduces impacts near water bodies and wetlands and increases impacts further away. It could potentially be favorable to non-MFL isolated wetlands and MFL wetlands and lakes. The evaluation also indicated that this management strategy may not always be favorable for MFL springs. Overall, shifting UFA withdrawals to the LFA appears to be a favorable strategy when the withdrawals are developed away from spring areas.

Shift UFA Withdrawals Away from Susceptible Areas Conceptual Scenario

Comparison of these two conceptual scenarios was used to evaluate the improvement in environmental performance gained when UFA wellfields are shifted away from the areas susceptible to groundwater withdrawals. The initial model run simulated 50 mgd of groundwater withdrawn from five UFA 10 mgd wellfields each conceptually located near susceptible areas. The second model run simulated shifting the five 10 UFA wellfields away from susceptible areas. The location of the wellfields and simulation results in both model runs are shown on **Figure 20**.

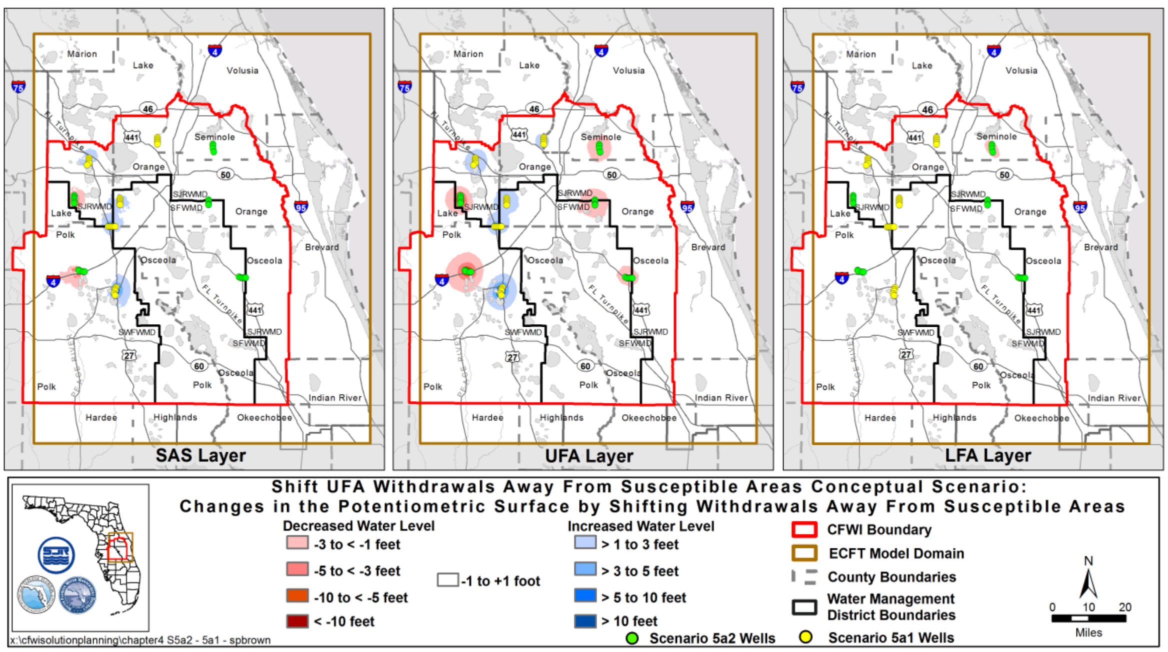

Figure 20. Shift UFA Withdrawals Away from Susceptible Areas Conceptual Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers by shifting UFA withdrawals away from susceptible areas. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The evaluation of the model results indicated that shifting these conceptual wellfields away from the susceptible areas could potentially result in approximately 1,400 fewer acres of stressed non-MFL isolated wetlands. The evaluation also indicated an increase in potentiometric surface elevations at MFL water bodies that could result in recovery of some of these systems. The precise location that withdrawals are shifted to may have a significant influence on the effectiveness of improving environmental performance with this strategy.

Replace UFA Withdrawals with Non-groundwater AWS Conceptual Scenario

This conceptual scenario was used to evaluate the improvement in environmental performance gained when UFA withdrawals are replaced with non-groundwater AWS. For the comparison, five 10 mgd UFA wellfields conceptually located in areas susceptible to groundwater withdrawals are replaced by non-groundwater AWS. The location of the UFA wellfields and simulation results are shown on **Figure 21**.

It is important to note that the two groundwater flow model simulations performed in support of this scenario are compared to one another and not to the Baseline Condition.

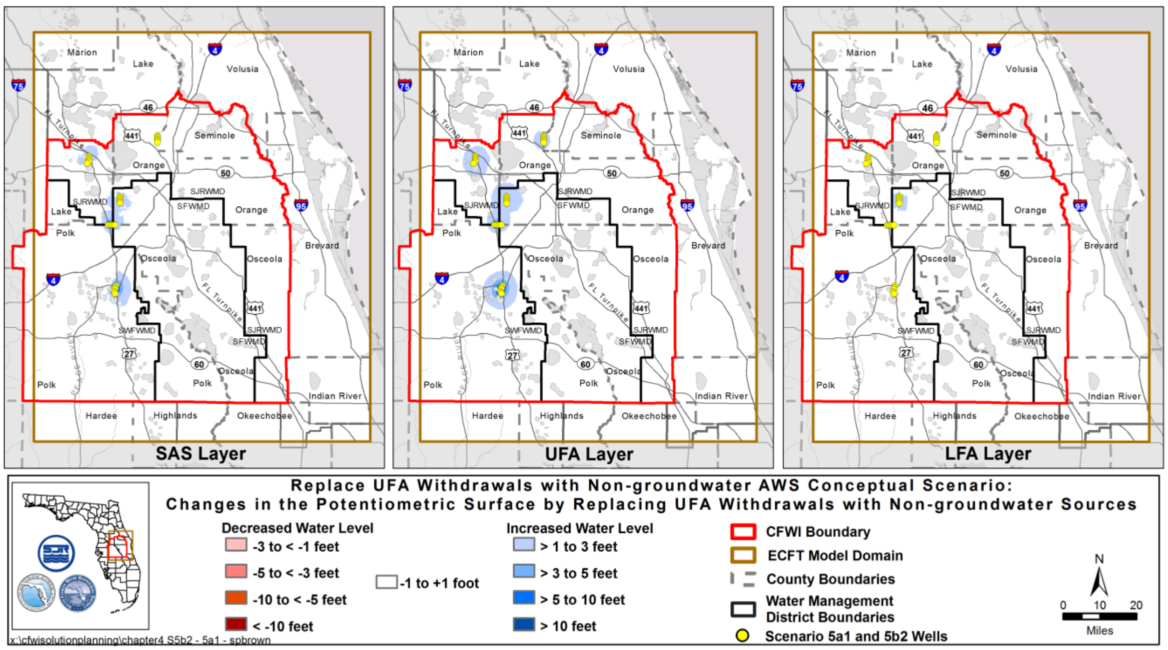

Figure 21. Replace UFA Withdrawals with Non-groundwater AWS Conceptual Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers by replacing UFA withdrawals with non-groundwater sources. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The evaluation of the model results indicated that this strategy could potentially reduce the amount of stressed non-MFL isolated wetlands by almost 5,000 acres. The evaluation also indicated an increase in potentiometric surface elevations at MFL water bodies that could result in recovery of some of these systems. Replacing UFA withdrawals with non-groundwater AWS is a favorable strategy for improving environmental performance. Based on the Return Flow Associated with Non-groundwater AWS Conceptual Scenario below, it appears the improved performance is primarily a result of reducing UFA withdrawals.

Targeted Recharge for MFL Water Bodies Conceptual Scenario

This scenario included 28 mgd of recharge at locations adjacent to specific MFL water bodies. An alternate targeted recharge scenario (Scenario 6A; **Table E-2-1**) estimated that approximately 22 mgd of recharge through a combination of RIBs, a horizontal well, and direct UFA recharge wells could be needed to maintain the subject lakes and springs at their MFL levels. The purpose of this scenario is to identify the amount of water that would be needed to recover MFL measuring sticks that are not being met in the Baseline Condition. This scenario does not include targeted recharge near the SWIMAL MIA and the Upper Peace River MFL, which are part of SWUCA, as discussed below. This scenario simulated direct recharge to the UFA as well as the use of indirect UFA recharge methods such as RIBs. The water level changes and subsequent environmental evaluations were based on the use of direct recharge to the UFA for all MFL water bodies. The modeled recharge scenarios are discussed in **Volume IIA, Appendix E**. The location of the direct recharge areas and simulation results are shown on **Figure 22**.

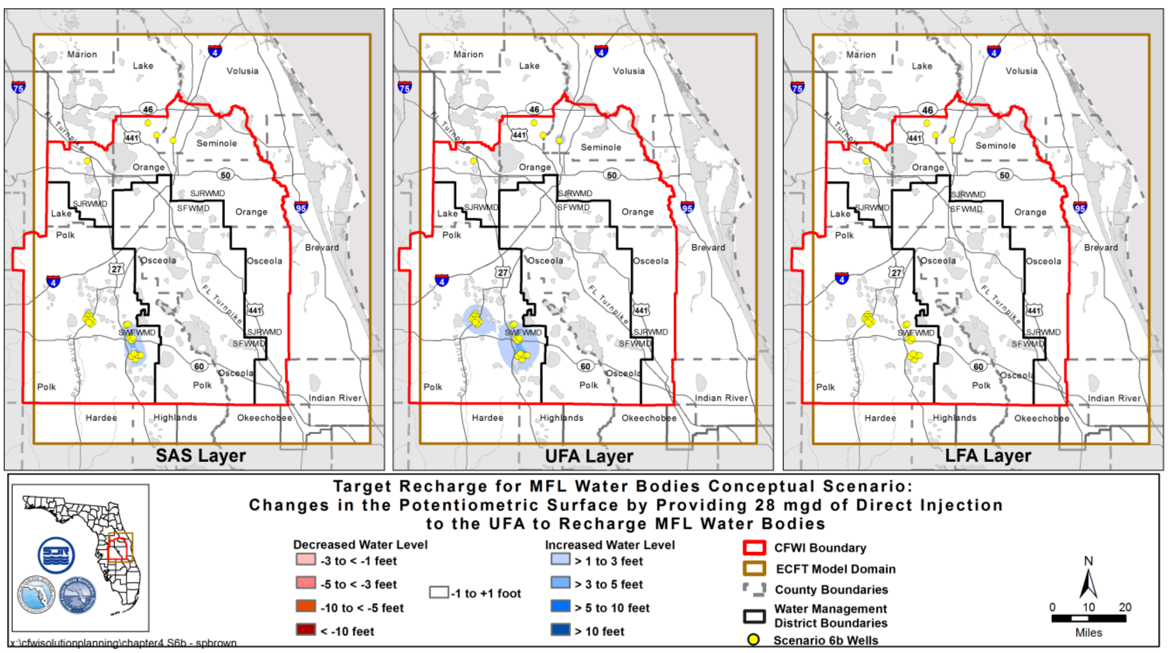

Figure 22. Targeted Recharge for MFL Water Bodies Conceptual Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers by providing 28 mgd of direct injection into the UFA to recharge to MFL water bodies. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The evaluation of this conceptual management option indicated that there is the potential to decrease the area of stressed non-MFL isolated wetlands in the Baseline Condition by approximately 2,500 acres. The scenario also demonstrates that all MFL constraint exceedances specifically targeted as part of this simulation could potentially be eliminated by targeted recharge. Modeled response of the non-MFL isolated wetlands and MFL constraints and considerations indicates that targeted recharge is a favorable strategy for improving environmental performance. This scenario also provides some insight on the potential effect of reductions in groundwater withdrawals. Increased potentiometric surface elevations at these water bodies can be achieved either through recharge or through reductions in groundwater withdrawals. Water quality goals and standards would need to be met to implement this strategy.

Extrapolation of the Targeted Recharge for MFL Water Bodies scenario results to three additional SWFMWD MFL water bodies that were assumed to not be met for the Baseline Condition further supports the conceptual management option. These MFLs were not used as constraints in this model due to data limitations. Exceedance of MFL criteria at two of the three water bodies would be expected to be eliminated as a result of targeted recharge at nearby MFL constraint sites. Recovery at the third water body is expected to require additional site-specific assessment and project development other than targeted groundwater recharge. Similarly, recovery of the MFL considerations associated with the Peace River MFLs and the SWUCA SWIMAL is expected to be achieved through implementation of surface water projects that will enhance river flows and through other ongoing activities associated with the SWUCA recovery strategy. Recovery goals for these considerations were not included in the design of the conceptual recharge scenario. Targeted recharge may be a favorable strategy for improving environmental conditions associated with the recovery of the systems.

Return Flow Associated with Non-groundwater AWS Conceptual Scenario

This scenario investigated the environmental impact of applying 34 mgd of landscape irrigation associated with the implementation of 50 mgd of non-groundwater AWS to meet projected demands. This scenario provides benefits through recharge to the groundwater system by landscape irrigation. The locations and simulation results of this scenario are shown on **Figure 23.**

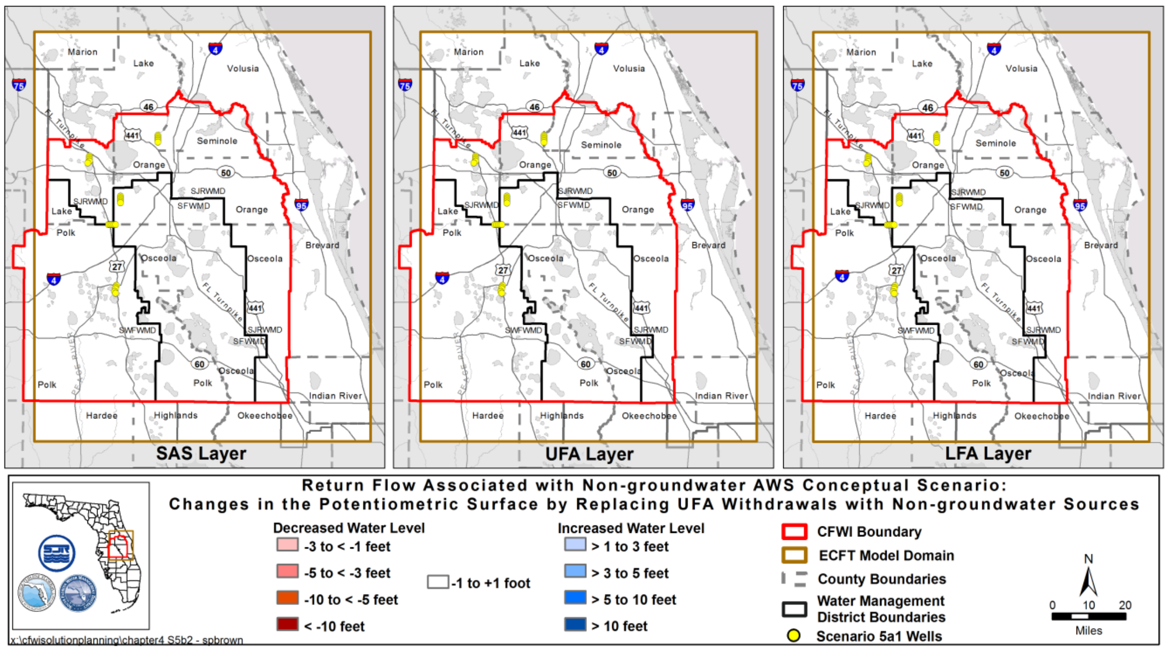

Figure 23. Return Flow Associated with Non-groundwater AWS Conceptual Scenario: Changes in the potentiometric surface for the SAS, UFA, and LFA layers by replacing UFA withdrawals with non-groundwater sources. Higher water levels are shown in blue and lower water levels are shown in red. Water level changes between +1 and –1 ft are not shown.

The evaluation of this management strategy indicated that this scenario has the potential to reduce the acreage of stressed non-MFL isolated wetlands by approximately 1,400 acres. The evaluation also indicated an increase in potentiometric surface elevations at MFL water bodies that could result in recovery of some of these systems. The potentiometric differences are all less than 1 ft in magnitude, and therefore head differences are not visible on the figures. Non-groundwater AWS is a favorable management strategy to improve environmental performance.

SUMMARY

The Round 1 project-based scenarios and the Round 2 conceptual scenarios conducted for the Solutions Planning Phase provide information to further define specific projects for users in the CFWI Planning Area. Either as individual projects or in combination, these results provide information to manage existing withdrawals and/or to develop new water supply options, while minimizing impacts to environmental systems. Results of the environmental evaluations for the two rounds of groundwater flow model simulations are summarized in **Tables 15** and **16**. Detailed information is provided for non-MFL wetlands and for MFL measuring sticks in **Volume IIA**, **Appendix F.**

Table 15. Summary of Round 1 Solutions Planning Phase Groundwater Project Scenarios.

Scenario Name	Model Run Number	Description	Results
LFA Wellfields	2	LFA withdrawals from south Lake County wellfield to supply 12.7 mgd (15.9 mgd withdrawal), Cypress Lake wellfield to supply 20.5 mgd (25.6 mgd) and SE Polk County wellfield to supply 30 mgd (37.5 mgd).	Predicted water level changes in the SAS were within the range of -1 foot to + 1 foot for the model domain. Maximum predicted decreases in LFA potentiometric surface levels of greater than 25 feet occur near the SE Polk County wellfield, with significant drawdown occurring in Polk, Osceola, and Lake counties. Potentially results in approximately 1,100 acres of additional stressed non-MFL isolated wetlands, 3 additional MFL considerations exceeded and one additional MFL constraint exceeded, relative to the Baseline Condition.
Polk County Blended Distributed Wellfield	3C	LFA withdrawals (6.5 mgd) by utilities in Polk County blended with existing supply (60.5 mgd) and increased (3.4 mgd) UFA withdrawals to obtain 9.8 mgd of new supply and 20.2 mgd (25.2 mgd withdrawal) of supply from Southeast Polk County wellfield. Scenario also includes Cypress Lake wellfield to supply 20.5 mgd (25.6 mgd withdrawal) and South Lake County wellfield to supply 12.7 mgd (15.9 mgd withdrawal), the same as in LFA Wellfield Scenario.	Predicted water level changes in the SAS were within the range of -1 foot to + 1 foot for the model domain. Maximum predicted decreases in UFA potentiometric surface levels of 1 to 3 feet occur in Osceola County and southeast Polk County east of the SE Polk County wellfield. Potentially results in approximately 1,400 acres of additional stressed non-MFL isolated wetlands, 3 additional MFL considerations exceeded and 1 additional MFL constraint exceeded, relative to the Baseline Condition.
South Lake County Wellfield – Centralized	2A	LFA withdrawals to supply 12.7 mgd (15.9 mgd withdrawal) from a centralized wellfield in south Lake County area	Predicted water level changes in the SAS were within the range of -1 foot to + 1 foot for the model domain. Maximum predicted decreases in LFA potentiometric surface levels of 3 to 5 feet occur in south Lake County corresponding to the proposed wellfield location. Potentially results in approximately 300 acres of additional stressed non-MFL isolated wetlands, 3 additional MFL considerations exceeded and no change in MFL constraints, relative to the Baseline Condition.
South Lake County Wellfield – Distributed	2B	LFA withdrawals to supply 12.7 mgd (15.9 mgd withdrawal) from proposed LFA wells located at the municipalities existing facilitities in the south Lake County area	Predicted water level changes in the SAS were within the range of -1 foot to + 1 foot for the model domain. Predicted decreases in LFA potentiometric surface levels of 2 to 3 feet occur near the proposed south Lake wellfield. Potentially results in approximately 150 acres of additional stressed non-MFL isolated wetlands, 3 additional MFL considerations exceeded and 1 additional MFL constraint exceeded, relative to the Baseline Condition.

mgd = million gallons per day
LFA = Lower Floridan aquifer
UFA = Upper Floridan aquifer

Table 16. Summary of Round 2 Solutions Planning Phase Conceptual Management Options Scenarios.

Scenario Name	Model Run Number	Description	Results
Conceptual LFA Centralized Wellfield	4a1	Baseline Condition with a conceptual 62.5 mgd (50 mgd finished water) LFA wellfield in south-central Osceola County.	Predicted water level changes in the SAS were within the range of -1 foot to + 1 foot for the model domain. Predicted decreases in UFA potentiometric surface levels of 3 to 5 feet occur in Osceola County but do not extend to Polk or Lake counties. Potentially results in approximately 750 fewer acres of stressed non-MFL isolated wetlands, and no change in MFL considerations and constraints, relative to the Baseline Condition.
Conceptual LFA Distributed Wellfield	4a2	Baseline Condition with five conceptual 12.5 mgd (10 mgd finished water) LFA wellfields - one wellfield in each of the five CFWI counties.	Predicted water level changes in the SAS were within the range of -1 foot to + 1 foot for the model domain. Predicted decreases in UFA potentiometric surface levels are greatest (1 to 3 feet) in northern Osceola and south-central Orange counties, but do not extend into Polk County. Potentially results in approximately 800 acres of additional stressed non-MFL isolated wetlands, 3 additional MFL considerations, and 1 additional MFL constraint exceeded, relative to the Baseline Condition.
Shifting Withdrawals from UFA to LFA	4b	Baseline Condition with five conceptual 10 mgd UFA wellfields being deepened into the LFA (12.5 mgd raw and 10 mgd finsihed supply).	Predicted increases in SAS groundwater levels of 3 to 5 feet in Polk County were observed. Predicted increases in UFA potentiometric surface levels of 5 to 10 feet were observed in the vicinity of the Polk County wellfields. Shifting withdrawals from the UFA to the LFA potentially results in 1,000 acres fewer stressed non-MFL isolated wetlands and the potential for reduced MFL constraint and consideration exceedances.
Moving UFA Withdrawals Away from Susceptible Areas	5a	Baseline Condition with five conceptual 10 mgd UFA wellfields being relocated away from potentially susceptible to groundwater withdrawals.	Predicted increases in SAS groundwater levels of 1 to 3 feet occur in some areas including south Lake, western Orange, NW Osceola, and eastern Polk counties (four corners area). Predicted decreases in SAS groundwater levels occur at the conceptual wellfield locations in Polk and south Lake counties. Predicted increases in UFA potentiometric surface levels of 1 to 3 feet occur predominantly along the Ridge, with predicted decreases in remote locations. Shifting these conceptual wellfields away from the susceptible areas potentially results in approximately 1,400 fewer acres of stressed non-MFL isolated wetlands and the potential for reduced MFL constraint and consideration exceedances.

mgd = million gallons per day
LFA = Lower Floridan aquifer
UFA = Upper Floridan aquifer
MFL = minimum flows and levels
AWS = Alternative water supply

Table 16. Summary of Round 2 Solutions Planning Phase Conceptual Management Options Scenarios (continued).

Scenario Name	Model Run Number	Description	Results
Replace UFA Withdrawals with Non-groundwater AWS	5b	Baseline Condition with five conceptual 10 mgd UFA wellfields being set to 0 mgd.	Predicted increases in SAS groundwater levels of 1 to 3 feet occur in the vicinity of the five conceptual 10 mgd wellfields, with most occurring in Polk County (3 to 5 feet increase) and the four corners area. Predicted decreases in UFA potentiometric surface levels of 1 to 3 feet occur in the vicinity of the five conceptual wellfields, with most occurring in Polk County (3 to 5 feet) and the four corners area. Replacing UFA groundwater withdrawals with non-groundwater AWS potentially results in approximately 5,000 fewer acres of stressed non-MFL isolated wetlands and the potential for reduced MFL constraint and consideration exceedances.
Targeted Recharge for MFL waterbodies	6	Baseline Condition with recharge applied via injection wells at quantities required to bring MFL water bodies currently not meeting or projected to not meet adopted MFLs into compliance.	Predicted increases in SAS groundwater levels of up to 10 feet occur in the immediate vicinity of the MFL water bodies where simulated recharge is applied in the model. Predicted increases in UFA potentiometric surface levels of 5 to 10 feet occur in the vicinity of the MFL water bodies where simulated recharge is applied in the model. Potentially results in approximately 2,500 fewer acres of stressed non-MFL isolated wetlands and no MFL considerations and constraints exceeded.
Return flow associated with Non-groundwater AWS	8	Evaluates only the effect of the increase in LSI that would occur in the same areas that received LSI in the Baseline Condition simulation due to an increase in water use associated with a non-groundwater AWS source (e.g., surface water or stormwater).	No appreciable changes in SAS water levels or UFA potentiometric surface levels are observed. Potentially results in 1,400 fewer acres of stressed non-MFL isolated wetlands and the potential for reduced MFL constraint and consideration exceedances.

mgd = million gallons per day
LFA = Lower Floridan aquifer
UFA = Upper Floridan aquifer
MFL = minimum flows and levels
AWS = Alternative water supply

5

Regulatory

INTRODUCTION

The Regulatory Team (RT) was formed to assist in the solutions planning process by identifying and addressing regulatory issues or constraints that could affect successful implementation of the projects identified by the Solutions Planning Team (SPT), as well as carry out additional assignments to support the SPT efforts. The RT collaboratively shared ideas, information, alternatives, and responsibilities under the guidance of the Steering Committee (SC), Management Oversight Committee (MOC), and SPT to fulfill the Guiding Principles of the CFWI. Team membership was comprised of regulatory staff from the Districts; FDEP, FDACS; public water supply utilities; and environmental group representatives. The RT interacted with the other CFWI technical teams to evaluate regulatory options identified for ensuring sustainable water supplies. The following is a summary of the activities completed by the RT and additional information can be found in **Volume IIA**, **Appendix G**.

INTERIM REGULATORY MEASURES

As described in CFWI RWSP, Chapter 373, F.S., directs Florida's water resources shall be managed to ensure their sustainability (Section 373.016, F.S.) Each District has developed water resource protection standards or regulatory tools consistent with this legislative direction. To address the interim period prior to the selection of specific projects and development of strategies to provide the additional water needed for users and for resource recovery, the RT developed options for SC approval on how the three Districts should continue to perform their statutory responsibility to review and process consumptive use permit applications under applicable statutory and rule provisions. The result is a FDEP Guidance Memo on Interim Consumptive Use Permitting with the CFWI Planning Area (**Volume IIA**, **Appendix G**). This memo provided guidance to the Districts in implementing the CUP program during this interim time period and specifically addresses coordination on pending applications, permit duration, water conservation, proposed agency action documentation, and permit conditions. Monthly reports of pending consumptive use permit applications in the CFWI Planning Area were compiled by the RT and posted on www.cfwiwater.com.

REGULATORY ISSUES THAT MAY AFFECT PLAN IMPLEMENTATION

The RT identified aspects of the CUP program that may vary across districts and explored which, if any, of those variations could affect plan implementation. Comparisons of these provisions are provided in **Volume IIA**, **Appendix G** as described below.

Per Capita

A compilation of per capita and population methodologies used across water management districts by program area can be found in **Volume IIA**, **Appendix G**, **Section 1**. In May 2014, FDEP issued a Fact Sheet that explains various per capita measurements and how each uniquely supports different programmatic goals (**Volume IIA**, **Appendix G**, **Section 10**).

Water Shortage

A compilation of existing, adopted water shortage program criteria across water management districts can be found in **Volume IIA**, **Appendix G**, **Section 2**. Concepts include the policy and purpose, how conditions are monitored, shortage declarations and phasing, region-specific water shortage plans, links to federal project operations, variances, and enforcement.

Aquifer Recharge and Impact Offsets

A compilation of selected, existing programs and applicable criteria that regulate aquifer recharge as implemented by FDEP and water management districts can be found in **Volume IIA**, **Appendix G**, **Section 3**. Impact offset programs are those that work in conjunction with augmentation projects or mitigation that provide environmental benefits and allow for allocations of water. Concepts covered include source water, project sponsors, and water quality considerations.

Resource Redistribution

A compilation of selected, existing programs and applicable criteria that regulate the reallocation of water as implemented by FDEP and water management districts can be found in **Volume IIA**, **Appendix G**, **Section 4**. Circumstances considered include land use transitions, terminated or reduced allocations, optimization, and development of alternative water supplies.

Caution Areas

A compilation of selected, existing programs and applicable criteria that restrict the allocation of water based on resource considerations as implemented by the water management districts can be found in **Volume IIA**, **Appendix G**, **Section 5**. Program components highlighted include goals, linkage to regional water supply planning, relation to minimum flows and levels, regulatory implementation, and alternative water supply programs.

Interdistrict Transfers

An overview of existing statutes governing interdistrict transfers of groundwater as well as rule considerations for transfers of surface waters across district boundaries can be found in **Volume IIA**, **Appendix G**, **Section 6**.

Public Interest

A summary of existing statutes that address public interest considerations can be found in **Volume IIA**, **Appendix G**, **Section 7**.

Permitting Thresholds/Domestic Self-supply

At the request of the SC, the RT provided information on the regulation of well construction and consumptive use permitting including domestic self-supply (DSS). A compilation of criteria describing the types of consumptive use permits issued by the water management districts can be found in **Volume IIA**, **Appendix G**, **Section 8**. Criteria include facility intake diameter, average daily use, withdrawal capacity, regional restrictions, and approval authority.

Conservation

At the request of the Water Conservation Subteam, the RT provided collective guidance on proposals to promote water conservation. Proposals included regulatory mandates, best management practices, incentives, and other programmatic tools. The RT's assistance is reflected in the Water Conservation Subteam's findings within this document.

REGULATORY REVIEW OF SELECTED PROJECTS FROM THE CFWI SOLUTIONS STRATEGIES

In a memorandum dated March 23, 2012, FDEP provided for improved linkage between regional water supply plans and the consumptive use permitting process (**Volume IIA**, **Appendix G**, **Sections 9** and **11**).

The memo finds, "Regional Water Supply Planning is a critical tool for ensuring that existing and future water needs of the state are met while also protecting our valuable natural systems." In addition, the Department calls for better coordination between district staff that develop the regional water supply plans and consumptive use permitting staff. The memo provides that potential permit applicants should have confidence that water supply development projects identified in a regional water supply plan have "undergone initial screening for feasibility and have a likelihood of being permittable."

The RT provided initial screening for 16 water supply project options (WSPOs) identified in the Solutions Planning Phase and found no existing statutory or rule impediments to their implementation. Some WSPOs may require modifications to meet water resource protection criteria. Findings on the likelihood of identified projects being permittable are found in the WSPOs descriptions in **Volume IIA**, **Appendix C**.

FUTURE REGULATORY STRUCTURE

Building on the Solutions Planning Phase, the RT will continue its work to develop options for consistent rules and regulations for the Districts to meet the CFWI collaborative process goals. In addition, the RT will work to implement the results of the CFWI, as described in greater detail under "Develop Options for Consistent Rules and Regulations" in **Chapter 7**. As options for consistent rules and regulations amongst the Districts are developed, it is anticipated to be presented to the Steering Committee for consideration.

In addition, the RT will continue to collaborate on long-term issues that could not be brought to closure at this time such as conjunctive use and self-supplied irrigation (SSI) concerns. Conjunctive uses are generally those that include allocations from multiple sources used on a variable or seasonal basis. As to SSI, even though they represent a small portion of demands within the CFWI Planning Area, the RT will investigate areas where these withdrawals are concentrated in relation to a CFWI constraint as well as the possibility of future conversions to SSI driven by higher cost water alternatives such as potable and reclaimed water.

6

Financial Assessment

INTRODUCTION

This Solutions Strategies document includes significant emphasis on conservation, alternative water supply development, and data collection and monitoring to meet water needs of the CFWI Planning Area while protecting the water resources and natural systems. These can be grouped into two categories: water resource development and water supply development. Water resource development projects are generally the responsibility of Districts. These projects support water supply development and are intended to ensure the availability of an adequate supply of water for all competing uses deemed reasonable and beneficial while maintaining the functions of the natural systems. Water supply development projects are generally the responsibility of the local users. Typical water supply development projects are related to facilities that collect, produce, treat, and distribute water for sale or end use. Currently, the Districts fund both water resource and water supply development projects.

The State of Florida and the Districts have historically provided funding assistance to local water suppliers developing alternative water supplies (AWS) and measurable water conservation programs through the Water Protection and Sustainability Program (WPSP) and their respective District cooperative funding programs. Identification of an AWS project in the CFWI RWSP makes a project eligible for WPSP funding. Under the guidance of the Steering Committee, the Solutions Planning Team (SPT) evaluated 16 water supply project options (WSPOs) in more detail to present conceptual cost estimates and to identify potential partners for implementation. The SPT also evaluated costs associated with public supply and agricultural conservation Best Management Practices (BMPs), data and monitoring, investigations and research.

BACKGROUND

The CFWI RWSP indicated the responsibilities of Districts, local governments, regional planning authorities, and utilities concerning funding water supply development and conservation. Potential sources of funding include the following

- Water Utility Revenue Funding
- Water Management District Funding Options
  - SFWMD-Alternative Water Supply, Water Resource Development Work, Cooperative Funding Program and Water Savings Incentive Program
  - SJRWMD-Water Resource Development Work Program and Cost-Share Funding Program
  - SWFWMD-FARMS Program, Cooperative Funding Initiative, Water Resource Development Work Program
- State Funding Options
  - State of Florida Water Protection and Sustainability Program
  - Drinking Water State Revolving Fund Program
  - Springs Initiative
- Federal Funding Options
  - Environmental Quality Incentive Program
  - Agriculture Water Enhancement Program
  - State and Tribal Assistance Grants
- Public-Private Partnerships, Cooperatives and other Private Investment

Details on each of these funding sources can be found in **Volume I, Chapter 9** of the CFWI RWSP.

Solutions Strategies Cost Summary

Solutions Planning Phase costs and potential benefits were estimated for Conservation, Environmental Recovery, Research and Investigations, and Alternative Water Supply. Brief explanations of these are provided below and summarized in **Table 17**.

Conservation

The Solutions Planning Phase estimated a 2035 conservation potential of about 37 mgd for all use types based on implementing a series of BMPs (**Table 17**). The conservation estimates include assumed participation rates for Public Supply (PS) and Other Self-Supply (OSS) and Agricultural practices. Public Supply BMPs, ranging from irrigation controllers to water audits, would cost $122.17 million and result in about 28 mgd in savings. OSS practices would cost an estimated $17.97 million to achieve approximately 4.5 mgd in savings. These costs are based on the initial implementation of the BMP. Additional costs may be required depending on service life and date of implementation. Refer to **Chapter 2, Table 5** for more information on BMP service lives. Potential Agricultural BMPs, based on past performance and implementation of various cost-shared FARMS Program BMPs. These would cost an estimated $10.1 to $19.9 million to achieve approximately 4.5 to 6.4 mgd reduction in groundwater use. Public education for conservation will be aligned annually with PS and OSS projects and activities. Activities may include: media outreach, including traditional and social media techniques; exhibits, demonstrations and events; support for schools and county extension efforts; and training for irrigation professionals.

In addition, options for a statewide clearinghouse that will serve as a repository for conservation data, publications and goal-based planning tools for PS entities need to be identified and evaluated. The preliminary estimated cost for a PS statewide clearinghouse (year 1-5) is $1.4 million. Options for the agricultural sector statewide clearinghouse for effective agricultural conservation practices and planning tools need to be identified and evaluated.

All estimates of conservation potential for PS and OSS were limited by a maximum unit production cost of $3.00 per 1,000 gallons saved as estimated using SJRWMD water conservation method and EZ Guide (**Table 17**). In many areas of the CFWI Planning Area, the cost of new WSPOs is expected to be greater than $3.00 per 1,000 gallons. The utilities serving areas where new water supplies will exceed $3.00 per 1,000 gallons should independently consider the costs of implementing any and all cost effective conservation measures before investing in new water supply development. Evaluation of conservation projects cannot be compared directly to the costs of AWS projects, as a distinctly different cost estimation tool was used to create those values. Entities should conduct their own evaluations and cost comparisons between conservation options discussed in this Chapter and the proposed AWS projects.

Environmental Recovery Strategies and Projects

Conceptual management strategies evaluated during the Solutions Planning Phase can be developed into specific projects to address protection and recovery of the regions environmental systems (**Table 17**). The process to achieve prevention and/or recovery in the CFWI Planning Area will incorporate three basic steps: (1) Use a science-based approach to establish and assess MFLs; (2) Identify sufficient project options for evaluation and consideration in the prevention or recovery strategy; and (3) Implement the most technically, environmentally, and cost effective options. Implementation of recovery will initially focus on updating and finalizing development of MFLs and addressing impacted wetlands. The SWFWMD has targeted six lakes in the Lake Wales Ridge area of Polk County in the SWUCA for reevaluation in 2015 to ensure enhanced MFL methodologies are incorporated into the adopted levels. In the SJRWMD, identified work for the period 2015 to 2017 includes establishment of MFLs on six additional lakes, one river, and re-evaluation of up to four lakes and one river. As part of this effort, the SJRWMD anticipates development of prevention and recovery strategies for up to six lakes, four springs, and one river.

Once these analyses are complete, recovery strategies and projects can be developed and implemented to achieve MFL recovery, where necessary. Examples of recovery opportunities that have already been identified include the St. Johns River near Yankee Lake surface water project and potential recharge and/or augmentation options such as Project RENEW and other reclaimed water and stormwater projects as discussed in **Chapter 3**.

Research and Investigations

The SPT identified additional areas that require further investigation, which include development of stormwater as a potential source for targeted groundwater recharge; data and monitoring; direct or indirect potable reuse; and improvements to the ECFT groundwater model (**Table 17**).

Data, Monitoring, and Investigations

The Data, Monitoring, and Investigations Team (DMIT) was created to ensure that available hydrologic, environmental, and other pertinent data collected throughout the region are identified, inventoried, and accessible to support the CFWI technical initiative and CFWI regulatory activities (**Table 17**). The DMIT reviewed current data collection efforts and identified options for improvements, specified methods for identifying and prioritizing future sites, estimated preliminary costs, and set preliminary targets for the number of water level monitoring sites to be constructed. It is difficult to develop standardized costs for monitoring wells and data collection sites across such a large and geologically varied area such as the CFWI Planning Area. Costs will vary greatly with each site and specific situation including type, depth, and accessibility. The DMIT Work Plan (DMIT 2015) sets forth targets for annual construction activities in tables and maps. Based on deficiencies and redundancies in current data collection identified in the Solutions Planning Phase, additional data gathering is recommended in the Lower Floridan, Upper Floridan, and the Surficial aquifers along with many wetland areas. A summary of the DMIT recommended sites are

- LFA monitoring sites - 29
- UFA monitoring sites (Avon Park Permeable Zone) - 38
- Surficial aquifer monitoring sites - 117
- Wetland monitoring sites - 107

The DMIT team prioritized sites to expedite implementation of the most critical sites, which is reflected in the scheduling of the overall work plan (DMIT 2015). The implementation of the DMIT recommendations is a critical component to future water supply planning for the CFWI Planning Area. The additional data collected as a result of the DMIT recommendations will facilitate the refinement and expansion of models and hydrologic and environmental analyses, the further development of WSPOs, and the assurance that environmental measures are being met.

Other Investigations: Stormwater for Groundwater Recharge

The Stormwater (ST) Subteam recommended collecting data in the northern portion of the CFWI Planning Area to explore opportunities to use water currently being diverted to drainage wells (**Table 17**). Understanding water quality and quantity in these drainage wells could provide a source for targeted recharge in critical areas or as alternative use. Also recommended was additional surface water monitoring to better characterize flows in Shingle Creek, Econlockhatchee River, Wekiva River, Lake Jesup, Boggy, Reedy, and Peace Creeks.

Other Investigations: Direct Potable Reuse

Potable reuse has been identified as an alternative water supply option that could provide additional water supplies (**Table 17**). Direct potable reuse purifies reclaimed water prior to its introduction into a water treatment facility. Indirect potable reuse augments water supply sources by returning the treated water to an aquifer system or surface water body. Further investigation of direct potable reuse is needed to identify the potential benefit and regulatory issues. Implementing a direct potable reuse pilot project within the CFWI Planning Area may provide the following benefits:

- A replicable model and information for developing the regulatory framework for potable reuse projects in Florida
- An educational component demonstrating the technology and aid in establishing a framework for public awareness and education
- Facilitate the reduction of groundwater pumping
- Investigate reduction in nutrients entering groundwater and surface waters

Other Investigations: ECFT Model Improvements

Improvements to the ECFT groundwater model are needed to continue to support the CFWI planning effort (**Table 17**). The Hydrologic Analysis Team (HAT) supports expanding the model domain and improving modeling processes. Proposed process enhancements include modifications to the partitioning of rainfall, evapotranspiration, runoff and recharge; establishment of a consistent hydrostratigraphic framework for the expanded model area; representation of lakes and rivers; water use; and other updates of model inputs such as the land application of irrigation. Although the model has been and will continue to be used for planning purposes, it is envisioned and desired to have the model available for the regulated community to apply for specific consumptive use permit applications.

Alternative Water Supply

The project evaluation process included use of a planning level cost estimating tool (CE Tool) to provide consistent calculations. The CE Tool is considered a "Conceptual Screening" tool and was designed to produce Class 5 cost estimates, with an expected accuracy of -50% to +100%. The consistent costing approach allows comparison between the different projects (**Table 17**), but not directly against the cost per 1,000 gallons estimates for Conservation projects discussed in **Chapter 2**, as those were derived using a different cost-estimation methods. Additional information on the CE Tool can be found in **Chapter 3** and **Volume IIA**, **Appendix B**, and detailed information on each project including conceptual schedule, planning level costs, and location is in **Volume IIA**, **Appendix C**. Using these planning level project cost estimates, a conceptual funding plan was developed to address the estimated 250 mgd future deficit. The conceptual funding plan used one of several combinations of project and program costs to provide a guide for budgeting funds. The funding scenario should be amended as updated project specific costs are developed.

Table 17. Solutions Planning Phase cost-benefit summary for the 2015 to 2035 period.

Projects	Quantity (mgd)	Total Cost (Million $)	Unit Cost Production ($/kgal)	Potential Benefits
Conservation (All)	36.8[a]	170	0.04 – 2.65	Enhances the region's efficient use of water resources Reduces water demands and reliance on groundwater
Environmental Recovery Projects		50	na	Address specific MFLs and non-MFL water bodies
Research and Investigation				
Data, Monitoring, and Investigation		34	na	Provides necessary information for the region to improve models and better assess the environmental systems for the protection and the recovery of those systems.
Other Investigations		8.9	na	Develops alternative water supply projects from a concept to an implementation stage to continue work of environmental recovery.
Alternative Water Supply				
Groundwater Projects				
South Lake County Wellfield[b]	12.5	116.5	3.57	Further development of LFA projects reduces reliance on traditional groundwater and provides diversification of water sources
Cypress Lake Wellfield	30	374.3	3.57	
Southeast Polk County Wellfield (Centralized may include dispersed options)[b]	30	284.6	2.59	
Reclaimed Water Projects				
Project RENEW	9.2	50.5	0.91	• Reduces reliance on groundwater • Augments potable supplies • Provides water for recharge • Reduces discharges and improves water quality
West Ditch Stormwater for Reuse Augmentation	0.9	28.2	3.23	
160-ac Site Indirect Potable Reuse	4.5	7.6	0.29	
TECO Polk Power Reuse	10	97	$2.34[c]	
AFIRST	4.5	15	0.50[c]	
Surface Water Projects				
St. Johns River/Taylor Creek Reservoir	54	637.6	2.89	• Diversification of water supplies • Reduces reliance on groundwater • Provides water for recharge • Provides supplemental river flows • Reduces discharge impacts to estuaries
St. Johns River near State Road 46	40	584.3	4.68	
St. Johns River near Yankee Lake	40	536.7	3.96 – 4.09	
Polk Regional Alafia River Basin	10	263.4	4.33	
Grove Land Reservoir and Stormwater Treatment	122.4 (raw water)	435.4[d]	0.48[d]	
Stormwater Projects				
Judge Farms Reservoir and Impoundment	5	28.3	0.92	• Augments reclaimed water supplies to improve reliability • Provides water for recharge • Improves water quality
Lake Wailes Stormwater Mitigation	1.4	13.5	1.30 – 2.21	
Reedy Creek Watershed	4	1.6	0.09	
TOTAL SOLUTIONS STRATEGIES PROJECTS	**293 (415 with raw water)**	**3,737.4**		

[a] Conservation is quantity saved not capacity; unit production costs not calculated by CE Tool; therefore should not be compared with unit productions costs of AWS projects

[b] Could include Distributed options and costs may be less

[c] These projects are funded and anticipated completion in 2015

[d] Does not include WQ treatment or transmission costs

[e] Total and unit production costs depending on project status may not include one or more of the following: treatment, pumping, transmission/distribution, land acquisition, financing cost, contingency risk or replacement costs

Regional Implementation Costs

Project costs were estimated, potential cost scenarios were identified, and strategies that address data collection needs and environmental recovery projects were implemented to provide a balanced approach for a sustainable water supply. **Table 18** represents one cost scenario based on implementing a combination of WSPOs, conservation programs, and other initiatives to address the water resource needs along with water supply demands over the next 20 years (2015-2035).

Table 18. Solutions Planning Phase potential cost scenario for the 2015 to 2035 period.

Category/ Projects	Year 1		Year 2		Year 3-5		Year 6-10		Year 11-20		TOTAL	
	Funds (Million $)	Water (mgd)	Funds (Million $)	Water (mgd)	Funds (Million $)	Water (mgd)	Funds (Million $)	Water (mgd)	Funds (Million $)	Water (mgd)	Funds (Million $)	Water (mgd)
Conservation												
Ag Programmatic Approach	1.0	0.43	1.0	0.43	3.0	1.3	1.7	0.71	3.4	1.42	10.1	4.3
Public Supply and Other Self-Supply, including education	2.8	0.5	5.1	1.1	21.5	4.8	43.6	8.7	87.1	17	160.1	32.5
Environmental Recovery												
Recovery Projects	2		1.5		10		16.5		20		50	
Research and Investigations												
Data, Monitoring, and Investigations	3		8		23						34	
Other Investigations	1.3		3.3		3.7		0.6				8.9	
Alternative Water Supply (AWS) Projects[a]												
Groundwater	16.4		28.4		344		211.5	32.7	175.2	40	775.5	72.7
Surface Water[b]	3		5		30		288.5	12.4	1282.6	81.6	1609.1	94
Stormwater	0.5		18.9		19.2	6.4	3.3				41.9	6.4
Reclaimed Water	2.2		3		41.9	9	39	5.6			86.1	14.6
Total	**36.5**	**1.8**	**76.6**	**1.8**	**497.3**	**21**	**601.9**	**59.7**	**1562.8**	**140**	**2775.7**	**224.5**

[a] The CFWI cost estimating tool is considered a "Conceptual Screening" tool and was designed to produce Class 5 cost estimates, with an expected accuracy of -50% to +100%.

[b] AWS surface water costs include raw and finished water projects; however, the water quantity is only finished water.

These costs represent only one possible conceptual cost scenario of how to meet most of the needs of the CFWI Planning Area. In addition, the implementation of environmental recovery projects as well as other AWS projects in the Solutions Strategies (**Volume IIA, Appendix D**) could address any remaining estimated future deficit. The total estimated Solutions Strategies costs are $2,775.7 million (**Table 18**). For this cost scenario, Conservation is estimated to cost $170 million (6% of the plan), Environmental Recovery $50 million (2% of the plan), Research and Investigations $42.9 million (2% of the plan), and Alternative Water Supply Projects $2,512.6 million (90% of the plan). Within the Alternative Water Supply Projects, Groundwater projects represent 31%, Reclaimed Water at 3.4%, Surface Water at 64%, and Stormwater at 1.6%of the estimated cost.

Consistent program review will guide funds toward meeting strategic goals. As the projects continue to become more fully developed, an annual update on a project's status and costs would be reviewed and revised to reflect updated information as needed.

7

Conclusions and Implementation Strategy

CFWI RWSP AND SOLUTIONS PHASE FINDINGS

The CFWI RWSP, which includes both the CFWI Regional Water Supply Plan and CFWI Solutions Strategies, was jointly developed by the St. Johns River Water Management District (SJRWMD), South Florida Water Management District (SFWMD), and Southwest Florida Water Management District (SWFWMD) (Districts) in coordination with stakeholders and is consistent with the water supply planning requirements of Chapter 373, Florida Statutes (F.S.). This work built upon previous water supply plans completed by each of the three Districts. It identifies programs and projects to ensure that adequate and sustainable water supplies are available to meet future water supply needs while protecting the environment and water resources. The CFWI Planning effort was based on a planning horizon extending through 2035 and identifies water conservation BMPs, water supply development project options, and water resource development project options.

The CFWI RWSP concluded that traditional groundwater resources alone cannot meet future water demands or currently permitted allocations without resulting in unacceptable impacts to water resources and related natural systems. Primary areas that appear to be more susceptible to the effects of groundwater withdrawals include the Wekiva Springs/River System, western Seminole County, western Orange County, southern Lake County, the Lake Wales Ridge, and the Upper Peace River Basin refer to **Chapter 4, Figure 8**. The evaluations also indicate that expansion of withdrawals associated with projected demands through 2035 will increase the existing areas of water resource stress within the CFWI Planning Area.

Total water demands by all water use categories are projected to increase from an average total water use of approximately 800 mgd to almost 1,100 mgd in 2035. In some areas, utilization of traditional groundwater is near, has already reached, and in some areas has exceeded the sustainable limits. Adverse impacts from withdrawals are already occurring in several areas. Based on the evaluation of groundwater availability, it was estimated that the CFWI Planning Area could potentially sustain an additional estimated 50 mgd of traditional groundwater use but coordinated management strategies will be needed (e.g., wellfield optimization, aquifer recharge and augmentation) to address unacceptable impacts.

Additional traditional groundwater, beyond the 50 mgd, is bound by environmental constraints, along with regionally appropriate management and operational controls including additional mitigation will need to be carefully considered. Based on the 2035 demands, the resulting deficit is approximately 250 mgd.

The Solutions Planning Phase evaluated regional projects and management strategies to meet the estimated 250 mgd future deficit. This included identifying viable conservation and other management strategies, viable alternative water supplies, areas that may require recovery or resource protection, and areas where regulatory and water resource protection strategy consistency may be needed.

CFWI key findings:

- Water conservation is an important element in meeting future water needs. During the Solutions Strategies phase, potential water savings through the implementation of public supply and agricultural best management practices was further evaluated; the water savings estimate was revised to meet or exceed 37 mgd in order to reflect current levels of agricultural conservation (**Chapter 2**). The 37 mgd reduces the projected 250 mgd deficit to 213 mgd. Of this 37 mgd, 76 percent could be conserved by public supply utilities, 12 percent from other self-supply users, and 12 percent by agricultural operations. Additional savings could be possible through higher participation rates of evaluated BMPs and/or the implementation of other measures not evaluated but recognized as being applicable in the CFWI.
- Sixteen regional, multi-jurisdictional alternative water supply project options (WSPOs) were evaluated during the Solutions Planning Phase (**Chapter 3**). These projects could potentially provide up to 256 mgd of additional water supply, exceeding the 250 mgd estimated future deficit. WSPOs evaluated included three LFA groundwater, five reclaimed water, five surface water, and three stormwater projects.
- There are sufficient project options for the development of water supplies to meet the regions' needs through 2035. Projects included in this CFWI RWSP are options from which local governments, utilities, and others may choose. There is no legal requirement for these project options to be implemented. A total of 150 WSPOs were identified through the CFWI RWSP (142 WSPOs) and the Solutions Strategies (8 WSPOs) phases (**Volume IIA**, **Appendix D**). The total WSPOs list includes the 16 regional multi-jurisdictional water supply projects evaluated in the Solutions Planning Phase. Cumulatively, the 150 WSPOs could potentially provide more than 334 mgd of additional finished water supply or water resource benefit, exceeding the estimated 250 mgd future deficit. An additional 122 mgd of raw water may be available as well. However, some of these projects are still conceptual and will require further evaluation prior to implementation. It is the intent of RWSPs to identify more options than are needed; therefore, it is anticipated that not all proposed projects will be constructed.
- Conceptual management strategies evaluated during the Solutions Planning Phase can be developed into specific projects to address protection and recovery of the

region's environmental systems. The results of this evaluation provide information needed to manage existing withdrawals and/or develop new water supply options, or other mitigation strategies (**Chapter 4**). Implementation of these strategies will continue to provide for the protection and recovery of the water resources.

- Implementation of the DMIT recommendations is needed to increase the data available for analyses and modeling related to characterizing the water resources of the region and in support of the development of WSPOs.
- Stakeholder engagement has and will continue to be an important component of the extensive outreach efforts associated with the development of the CFWI RWSP. The Solutions Planning Phase effort informed and gathered input from key stakeholders from the public and business community across central Florida to ensure the Solutions Strategies reflects the issues and concerns of the region (**Chapter 1**).
- Conceptual project costs were estimated and potential cost scenarios were identified implement strategies that provide a balanced approach for a sustainable water supply and addressing data collection needs and implementation of environmental recovery projects. Approximately 225 of the 250 mgd of water needed is estimated to cost $2.8 billion for four main categories -- Conservation, Environmental Recovery, Research and Investigations, and Alternative Water Supply (**Chapter 6**). This represents one possibility of how to meet most of the needs of the CFWI Planning Area. The implementation of environmental recovery projects as well as other AWS projects in the Solutions Strategies (**Appendix D**) could address any remaining deficit.
- The establishment of consistent rules and regulations for the Districts will be developed to meet the CFWI collaborative process goals and implement the results of the CFWI Planning effort (**Chapter 5**).
- Implementing the results of the CFWI Planning effort is critical to the long-term sustainability of the region's water supplies. This implementation strategy is described in the next section.

IMPLEMENTATION STRATEGY

Implementing measures to achieve water resource sustainability in the CFWI Planning Area will require action by the Districts and stakeholders. The implementation process will require continued commitment and collaboration to initiate and realize the key findings and recommendations of the CFWI RWSP. The following steps along with recommendations in **Volume I, Chapter 11** of the CFWI RWSP will guide future water supply solutions to ensure that future water demands are met without resulting in unacceptable impacts to water resources and related natural systems. Recommended actions for implementing the results of the CFWI Planning effort include the following

- Implement Water Conservation Programs
- Develop Specific Prevention and Recovery Strategies

- Support Development and Implementation of Regional Project Solutions
- Support Additional Alternative Water Supply (AWS) Projects
- Improve Water Resource Assessment Tools and Supporting Data
- Develop Options for Consistent Rules and Regulations
- Continued Communication and Outreach
- Identify Options for Future CFWI Framework to Support Implementation Strategies

Implement Water Conservation Programs

Conservation is key to reducing water demands and will require local implementation to achieve optimum results. Regional and state agencies can provide guidance, funding and regulatory support but the effectiveness of water conservation BMPs relies on the participation of local governments, residents, the agricultural community, and other users. A suite of conservation practices are identified and discussed in **Chapter 2** that could be implemented for agriculture, public supply (PS), and other self-supply (OSS) to meet or exceed 37 mgd over 20 years. A CFWI comprehensive conservation implementation scope of work should be developed that includes voluntary and incentive-based initiatives, research, education and outreach initiatives, and regulatory initiatives to achieve these savings including prioritization of allocated funding. An important element of this should be the collection and evaluation of performance data for various conservation practices with some emphasis on establishing linkage to costs and results. Options for distribution of any funding should also be evaluated, which may include existing water management district conservation programs.

In addition, the Solutions Planning Team specifically expressed interest in continuing to provide water conservation planning and analyses for public supply utilities statewide as envisioned by Section 373.227, F.S. The Conserve Florida Water Conservation Clearinghouse at the University of Florida undertook this work previously but that funding has been discontinued. Continued development of a statewide clearinghouse to meet the intent of Section 373.277, F.S. and serve as a repository for conservation data, publications, and goal-based planning tools will benefit PS entities and help optimize future conservation programs as well as promote consistency statewide. The agricultural sector could also benefit from a statewide undertaking that mirrors the clearinghouse for effective Agriculture conservation practices and should be developed.

The following actions may be included in the comprehensive conservation implementation scope of work to support the development of the programs (no implied priority) identified in **Chapter 2**.

- Identify and secure funding to implement Conservation Programs.
- Develop and implement a comprehensive public education and outreach program, which may include support for County Extension Services, school education programs, traditional and social media, training, workshops, and exhibits.

- Identify and evaluate options to continue development of a statewide clearinghouse as a repository for PS conservation data, publications, and goal-based planning tools to optimize future conservation programs and promote consistency.
- Identify and evaluate options for development of a statewide clearinghouse as a repository for agricultural conservation data.
- Develop consistent District year-round landscape irrigation rule requirements for the CFWI Planning Area.
- Support statewide or regional licensing of irrigation professionals for installation and inspection of efficient landscape and irrigation systems to ensure the efficient use of water resources.
- Expand evaluation of conservation potential to include estimated savings without a $3.00 per 1,000 gallons limitation and include consideration of BMPs that could not be evaluated with existing conservation water savings tools.
- Work to amend Florida Building and Plumbing codes and Florida Statutes.
    - Participate in the Florida Building/Plumbing Code modification process to improve water conservation statewide by evaluating the current code provisions affecting water conservation and identify potential amendments to improve water conservation including
        - Efficient landscape and irrigation for all new construction
        - High-efficiency indoor water use standards for all new construction
        - Expansion of current homeowner protection from homeowner association landscaping covenants
    - Potential water savings from Florida Building/Plumbing code modifications is in addition to the estimated 37 mgd conservation savings outlined in the CFWI RWSP
- Expand the use of SMART meters by water utilities, to allow utilities and their customers to understand their water use practices and target more effective conservation BMPs.
- Expand the use of soil moisture sensors and SMART meters to improve landscape irrigation efficiency.
- FDACS should continue to work with agricultural operators to reduce water use and to improve water quality.
- Increase the number of irrigation evaluations and follow-up evaluations within the CFWI Planning Area to better estimate potential water savings within each crop and irrigation type.
- Expand water use accounting for Agriculture to improve water use efficiency and provide improved data and metering for groundwater modeling

- Expand existing or develop new cost-share programs to incentivize implementation of water conservation BMPs in partnership with farmers and growers.
- Identify and evaluate options to allow agricultural water use permittees the ability to extend their consumptive use permit duration when the permittee demonstrates quantifiable water savings attributable to conservation beyond that required to achieve efficient water use in the permit and demonstrates a need for the conserved water to meet projected demands for the term of the extension.

Develop Specific Prevention and Recovery Strategies

The CFWI Planning effort has identified 10 water bodies that are currently not meeting their established minimum flows and levels (MFLs). Nine of the ten water bodies not currently meeting their established MFL are covered in the SWFWMD SWUCA Recovery Strategy, which is included in this CFWI Planning effort, designed to recover established MFLs as soon as practicable or preventing the existing flows or levels from falling below the established MFLs. In addition, SJRWMD's MFL prevention and recovery strategies are in development but not yet completed for MFL lakes and MFL springs requiring such strategies. These strategies will identify and may include the development of water supply and water resource projects in addition to those included in this plan, when needed to achieve recovery to the established minimum flow or level as soon as practicable, or prevent the existing flow or level from falling below the established minimum flow or level. Upon completion, these additional water supply and resource projects will be added to the next update of the CFWI RWSP. Additionally, the Solutions Planning process determined that prevention and recovery strategies may need to be developed for additional water bodies that could be affected in the planning horizon.

Results from field assessments of non-MFL wetlands and water bodies and analysis of future modeled water levels indicated that adverse impacts from withdrawals are currently occurring in several areas and this is projected to increase in future scenarios. The existence of adverse wetland impacts has been documented through fieldwork. Some wetland impacts are likely the result of multiple factors, including groundwater withdrawals, drainage system, land use changes, among other potential causative factors. In some cases, where the cause has been determined, mitigation measures have been implemented. For additional information refer to **Chapter 4** and **Volume IIA**, **Appendix F.**

Proposed actions to address MFLs not being met now and MFLs not anticipated to be met over the 20-year planning horizon and adverse impacts to non-MFL water resources and related natural systems include

- Each District should move forward expeditiously to complete MFL prevention and recovery strategies. Completing these strategies will help prioritize the water resource development and water supply development projects that should move forward, and help prioritize funding assistance.

- In completing strategies, District Governing Boards should consider the recommendations for the WSPOs and management strategies developed in the CFWI Planning process.
- Before moving forward in implementing any specific WSPO or management strategy, it should be confirmed that it would not conflict with any MFL prevention or recovery strategy, it will produce the desired CFWI benefit, and the timing is appropriate.
- Continue to monitor, study, and evaluate non-MFL water bodies, including wetlands, lakes, and springs and include wetlands studied during the CFWI RWSP as well as those that may be affected by consumptive use withdrawals.
- Complete an evaluation of areas where there is a high probability of existing stressed wetland systems caused by groundwater withdrawals and those areas deemed to be at risk from stress caused by future groundwater withdrawals. Identify management strategies and water resource development projects to mitigate the potential for wetlands to be stressed by groundwater withdrawals.
- Districts should continue to coordinate when implementing these strategies. In completing the design and operational plans for WSPOs, opportunities to make positive contributions to strategies should be investigated and implemented in coordination with responsible entities.

Support Development & Implementation of Regional Project Solutions

Sixteen regional, multi-jurisdictional WSPOs were evaluated during the Solutions Planning Phase (**Chapter 3**). These projects could potentially provide up to 256 mgd of additional water supply, exceeding the projected deficit of 250 mgd. WSPOs evaluated included three Lower Floridan aquifer (LFA) groundwater, five surface water, five reclaimed water, and three stormwater projects. Water supply development projects are generally the responsibility of the local users, while water resource development projects are generally the responsibility of Districts.

Groundwater

The primary source of water in the CFWI Planning Area is traditional groundwater from the Upper Floridan aquifer (UFA). The Solutions Planning Phase determined that LFA project options can meet some of the future demand. Three of the WSPOs evaluated by the Groundwater Subteam were LFA projects, some of which are known to be in areas where brackish groundwater is present in the aquifer. Two of these projects are permitted.

Proposed actions to support the sustainable development of groundwater include the following options:

- Continue to monitor, study, and evaluate the UFA to maximize its sustainable yield while minimizing water resource impacts.

- Continue to monitor, study, and evaluate the LFA as a sustainable source of water while minimizing the potential water resource impacts.

Reclaimed Water

Future reclaimed water flows are anticipated to continue to play a critical role in meeting future water needs. The following options have been identified as additional actions that could be undertaken to enhance the beneficial use of reclaimed water in the CFWI Planning Area.

- Conduct further investigation and development of Natural System Enhancement/Recharge Projects by the introduction of reclaimed water to enhance/restore natural systems and enhance aquifer levels (Indirect Potable Reuse).
- Conduct further investigation and development of demonstration or pilot projects for Direct Potable Reuse.
- Explore availability and evaluate water quality of reclaimed water as a potential source for aquifer recharge or groundwater offset to recover environmentally impacted areas.
- Continue regional analysis of beneficial reuse – match sources to needs, identify constraints/impediments and opportunities for implementation and increases in efficiencies; consider disposal needs; and pursue multi-jurisdictional collaborative efforts.

Surface Water

There are opportunities for the development of surface water supplies from the lakes and rivers in or near the CFWI Planning Area. The following options have been identified as additional actions that could be undertaken to enhance the use of surface water.

- Conduct additional analyses, where appropriate, to ensure that hydrologic functions of lakes and downstream environmental needs are maintained when identifying potentially available quantities of surface water.
- Storage is a key component to improving reliability of some surface water projects. Evaluate the potential and locations for storage such as reservoirs and aquifer storage and recovery (ASR) to store excess water for future use to recharge aquifers, provide additional water to wetlands and MFL lakes, and provide water supply.
- Create opportunities for conjunctive use of surface water with other water sources such as stormwater or reclaimed water.

Stormwater

Stormwater management is anticipated to play an increasing role in meeting future water needs. The following options have been identified as additional actions that could be undertaken to enhance the beneficial use of stormwater in the CFWI Planning Area.

- Conduct further investigation and development of Natural System Enhancement/Recharge Projects (the introduction of stormwater to enhance/restore natural systems and enhance aquifer levels).
- Continue regional analysis of beneficial use of stormwater – match sources to needs, identify constraints/impediments, and opportunities for implementation.
    - Address required treatment levels for surficial aquifer recharge, conjunctive use opportunities with reclaimed water, and direct injection to the Floridan Aquifer.
    - Evaluate existing drainage well use in the CFWI Planning Area to optimize potential beneficial use of stormwater.
- Encourage coordination of watershed planning, water supply, water quality, natural systems restoration, and flood protection initiatives to potentially achieve greater return on investment for stormwater projects.
    - Targeted watersheds may include Wekiva River, Reedy Creek and Peace Creek; Little Econ and Boggy Creek; Lake Jesup; and Shingle Creek.

Water Resource Development Priorities

Water resource development is defined in Section 373.019 (24) F.S. as the formulation and implementation of regional water resource management strategies and includes the collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage water resources; the development of regional water resource implementation programs; the construction, operation, and maintenance of major public works facilities to provide for flood control, surface and underground water storage, and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities. Water resource development projects are generally the responsibility of Districts.

The Districts should make it a priority to move forward to implement strategic water resource development projects that may include the following

- Expansion of the Taylor Creek Reservoir by SJRWMD
- Additional diversion of flow from the C-1 canal in Brevard County back to the St. Johns River by SJRWMD
- Further investigation and pilot testing of potable reuse
- Further investigation of targeted aquifer replenishment by injection or RIBs to contribute to protection and recovery of MFLs and impacted wetlands

- Working with interested water utilities in bringing existing aquifer storage and recovery wells into an operational phase for use as storage to increase the reliability of reclaimed water and surface water supplies

The Districts should include recommendations from the CFWI Planning Area as a priority consideration in their annual update to their water resource development work plans.

Regional Cost Scenarios

One possible conceptual cost scenario to meeting the needs of the CFWI Planning Area was presented in **Chapter 6**. The total estimated cost of this scenario is $2,775.7 million. Cost scenarios will be refined as additional project details become available. Additional projects not identified in the CFWI RWSP may come forward and may be developed as part of the annual updates.

The following are considerations for funding CFWI regional projects:

- Water Management Districts (Districts) should take the lead on developing funding plans for water resource development projects, with possible assistance from water users and the state.
- Water users should take the lead on development of funding plans for water supply development projects, with possible assistance from Districts and the state.
- FDEP and the Districts should have the goal of presenting a joint funding request for state funding assistance for CFWI regional projects.
- Cost estimates for funding assistance should reflect updated project specific costs.
- The priority for seeking state funding assistance for both water resource development and water supply development projects should focus on
    - Projects that help to implement MFL prevention and recovery strategies and reduce impacts to non-MFL natural resources
    - Projects that meet water supply needs for the 20-year planning horizon, as opposed to water supply demands that are beyond the 20-year horizon
    - Projects that would, without funding assistance, result in a disproportionate financial burden on a subset of water users in the region, compared to other similar water users in the CFWI Planning Area
    - Provide financial incentives to develop AWS projects

Support Additional AWS Projects

A list of 142 water supply project options (WSPOs) was developed during the CFWI RWSP process. An additional 8 water supply development projects were identified during the Solutions Planning Phase. The updated list of 150 WSPOs includes 37 brackish/nontraditional groundwater, 87 reclaimed water, 17 surface water, 6 stormwater, and 3 management strategies project options (**Volume IIA**, **Appendix D**).

The Solutions Planning Phase focused on 16 large, regional projects. The remaining projects have the potential to generate significant water and could provide reuse augmentation, groundwater recharge, or potable water. RWSPs are intended to provide a list of options to meet future demands but not all projects will be constructed for a variety of reasons.

Improve Water Resource Assessment Tools and Supporting Data

Update the ECFT Model

While the current version of the East Central Florida Transient (ECFT) Model used during the CFWI Solutions Planning Phase was sufficient to meet the CFWI effort's needs, upgrading the model is needed for future use in the CFWI Planning Area for a variety of reasons. Some of the improvements and rationale are described below.

- Recharge-Runoff Partitioning – the current Green-Ampt method, selected by the USGS for the current ECFT model, is effective but is considered data intensive for parameters that are difficult to accurately quantify. Other methods such as Hydrologic Simulation Program - Fortran (HSPF) will be explored to improve computational efficiency and accuracy.
- Extend eastern and western model boundaries to the Atlantic Ocean and Gulf of Mexico – it is good modeling practice to have model boundaries coincide with hydrologic boundaries. This would also be of benefit because there is a small portion of the CFWI planning area that is currently not in the ECFT model domain.
- Extend southern boundary to incorporate withdrawals to the south – not only are some existing and proposed withdrawals currently outside of the ECFT model domain to the south, but the potential influence of those withdrawals on MFL water bodies in SWFWMD are best evaluated if they are included in the expanded model domain.
- Boundary Types – consider using mixed boundary types that are more representative of hydrologic conditions and using persistent flow lines from potentiometric surface maps to more accurately impose model boundary conditions on the north and south.
- Model Package Selection – the unsaturated zone (UZF) package of MODFLOW was used in the ECFT model, but it quickly became evident that this package was not necessary for the vast majority of the model domain and unnecessarily increased model run times due to its computational inefficiency.
- Hydrologic and Hydrogeologic Data – Incorporate additional data gathered since the last model update including data collected as part of the data collection and monitoring program proposed by the Data, Monitoring, and Investigations Team (DMIT).
- Updated Water Use – although this is not a modeling exercise in its strictest sense, and there are inherent limitations when estimating water use in areas where use is

not metered, better coordination and estimation of historical and projected water use is needed for future water supply planning purposes.

- Updated Land Use – the current model used land use from 2004/2005. An update to the model should use more recent land use information.
- Overall Approach – although the model has been and will be used for planning purposes, it is envisioned and desired to have the model available for the regulated community to apply for specific consumptive use permit applications. It is important to note that the above list of model improvements is a significant undertaking with regard to both cost and level of effort.

Implement Critical Water Resource Data Collection

The CFWI SC accepted the DMIT Five-year Plan in January 2015 with an estimated cost of $34 million (DMIT 2015). Annual status reporting should include an update on the DMIT plan. The plan includes the development of new monitoring sites and updates to data inventory and tools.

- 29 LFA monitoring wells on 17 sites
- 38 UFA monitoring wells on 38 sites
- 117 Surficial aquifer monitoring wells on 117 sites
- 107 wetland monitoring stations on 107 sites
- Annual update of the data inventory
- Update and expansion of GIS tools

Develop Options for Consistent Rules and Regulations

Now that the Solutions Planning Phase has identified strategies to achieve water resource sustainability in the CFWI Planning Area, the Regulatory Team (RT) is better positioned to continue its work to develop options for consistent rules and regulations for the Districts that meet CFWI collaborative process goals and implement the results of the CFWI. The CFWI Goals (CFWI 2015a) are

- One model
- One uniform definition of harm
- One reference condition
- One process for permit reviews
- One consistent process, where appropriate, to set MFLs and reservations
- One coordinated regional water supply plan, including any needed recovery and prevention strategies

The process will provide flexibility where prevention and recovery strategies have been adopted such as the Southern Water Use Caution Area in the SWFWMD.

To fulfill the CFWI goals including assisting in establishing a consistent regulatory approach, the RT was tasked with developing options for criteria to be used to measure success for the work of the CFWI. Understanding the value of precedents, the team preliminarily surveyed various water supply and water quality programs around the state to find elements that could be used to guide future CFWI program implementation and regulatory provisions. The RT found the programs surveyed had similar elements designed to address specific challenges. Based on this survey, the RT found the following themes and programmatic goals that should be considered.

- Overall Program Description
  - Match the program's approach/regulatory tools to the problem.
  - Establish performance measures that gauge success in achieving the program goals.
  - Establish timetables, interim milestones, and deadlines to achieve program goals.
- Resource Sustainability
  - Define the role of regulation and integration with other non-regulatory programs in achieving sustainability of the water resources.
  - Incorporate water resource development and restoration projects in achieving sustainability.
  - Follow legislative direction in addressing sustainability.
  - Provide for adaptive management.
- Existing Legal User Rights
  - Define existing legal uses (e.g., actual use or permitted use).
  - Consider implementation timing relative to permit renewal.
  - Appropriately apportion regulatory components of prevention and recovery amongst the existing legal uses.
  - Establish waivers, variances, or other forms of relief based on demonstrated hardship.
  - Consider funding assistance to implement changes to existing legal uses.
- Future Projected Uses
  - Provide options for all projected reasonable-beneficial uses of water (e.g., optimization, efficiency, conservation, preferred sources, alternative water supply development, water resource development).
  - Consider funding assistance for future new alternative water supply projects.

As options for consistent rules and regulations amongst the Districts are developed, it is anticipated to be presented to the Steering Committee for consideration.

Continued Communication and Outreach

Communications and outreach will continue to involve state and local governments, elected officials, utilities, agriculture, business, environmental groups, other stakeholders and the pubic throughout the implementation process. It will be important to keep all stakeholders informed and engaged as programs and projects are developed.

Identify Options for Future CFWI Institutional Framework to Support Implementation Strategies

CFWI Governance Options

Implementation of this plan, including major WSPOs, relies on the continued collaboration of responsible entities and appropriate agencies. The ability to proceed requires effective governance and support among the existing water supply agencies and local governments with regulatory and financial support from regional and state agencies.

- Evaluate potential institutional framework options to support and coordinate implementation strategies and initiatives in the CFWI.

CFWI Water Supply Plan Reporting

- Annual status reporting - DEP and the Districts should implement development of annual status reporting that may include progress on implementation strategies and regional projects, modeling, permitting, and refinements to monitoring and data collection needs.
- Initiate a process for a 5-year assessment and update of the 2015 CFWI RWSP - FDEP should coordinate with the Districts to ensure completion of the required 5-year update to the CFWI water supply plan. If warranted, more frequent updates or amendments to the CFWI RWSP could be considered to address any fundamental developments including refinement of major project options or regulatory criteria.

Glossary

1-in-10 year drought A drought of such intensity that it is expected to have a return frequency of once in 10 years. A drought in which below normal rainfall occurs and has a 90 percent probability of being exceeded over a twelve-month period. A drought event that results in an increase in water demand to a magnitude that would have a 10 percent probability of being exceeded during any given year.

Acre-foot, acre-feet (ac-ft) The volume of water that covers 1 acre to a depth of 1 foot. The equivalent of 43,560 cubic feet, 1,233.5 cubic meters, or 325,872 gallons.

Agricultural best management practice (BMP) A practice or combination of agricultural practices, based on research, field testing, and expert review, determined to be the most effective and practicable means of improving water quality or quantity while maintaining or even enhancing agricultural production.

Alternative water supply (AWS) "Salt water; brackish surface water and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface water or groundwater, water that has been reclaimed after one or more public supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water; stormwater; and, any other water supply source that is designated as nontraditional for a water supply planning region in the applicable regional water supply plan" (Section 373.019, Florida Statutes).

Aquifer A geologic formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield significant quantities of water to wells and springs.

Aquifer storage and recovery (ASR) The underground storage of stormwater, surface water, groundwater or reclaimed water, which is appropriately treated to potable standards and injected into an aquifer through wells during wet periods. The aquifer acts as an underground reservoir for the injected water, reducing water loss to evaporation. The water is stored with the intent to retrieve it later as needed.

Aquifer system A heterogeneous body of (interbedded or intercalated) permeable and less permeable material that functions regionally as a water yielding hydraulic unit and may be composed of more than one aquifer separated at least locally by confining units that impede groundwater movement, but do not greatly affect the hydraulic continuity of the system.

Available supply The maximum amount of reliable water supply including surface water, groundwater, and purchases under secure contracts.

Base flow Sustained flow of a stream in the absence of direct runoff. It includes natural and human-induced stream flows. Natural base flow is sustained largely by groundwater discharges.

Baseline condition A specified period of time of data (scenario) used for comparison with subsequent data. In the Solutions Planning Phase, Baseline Condition refers to a water use scenario of 850 mgd that is comprised of average total water use of 800 mgd (740 mgd groundwater, 60 mgd surface water) plus an additional 50 mgd of groundwater that can be made available by implementation of local management strategies.

Basin (groundwater) A hydrologic unit containing one large aquifer or several connecting and interconnecting aquifers.

Basin (surface water) A tract of land drained by a surface water body or its tributaries.

Below land surface Depth below land surface regardless of land surface elevation.

Brackish water Brackish water, for alternative water supply planning purposes in the CFWI for SJRWMD and SWFWMD, is generally defined as water with a total dissolved solids concentration of greater than 500 mg/L. SFWMD defines saline water, which includes brackish water, as water with chloride concentrations greater than 250 mg/L.

Central Florida Water Initiative (CFWI) This is a collaborative effort among the SJRWMD, SFWMD, and SWFWMD and other state agencies and stakeholders that builds on the prior work of the CFCA. The goal is to implement effective and consistent water resource planning, development, and management in the central Florida area.

Confined aquifer Water-bearing stratum of permeable rock, sand, or gravel (aquifer) who's connection with the atmosphere is impeded by materials of low permeability.

Confining unit A geologic body of significantly less permeable material than the aquifer, or aquifers, that it stratigraphically separates. The hydraulic conductivity may range from nearly zero to some value significantly lower than that of the adjoining aquifers, and impedes the vertical movement of water.

Conservation (Water) The prevention and reduction of wasteful or unreasonable uses of water and the improvement in water use efficiency.

Consumptive use Any use of water that reduces the supply from which it is withdrawn or diverted.

Control structure An artificial structure designed to regulate the level/flow of water in a canal or other water body (e.g., weirs, dams).

Cubic feet per second (cfs) A rate of flow (e.g., in streams and rivers) equal to a volume of water 1 foot high and 1 foot wide flowing a distance of 1 foot in 1 second. One cfs is equal to 7.48 gallons of water flowing each second.

(Water) Demand The quantity of water needed to fulfill a requirement.

Demand management Also known as water conservation, demand management involves reducing the demand for water through activities that alter water use practices, improve efficiency in water use, reduce losses of water, and reduce waste of water.

Desalination A process that treats saltwater water to remove or reduce chlorides and dissolved solids, resulting in the production of fresh water.

Discharge The rate of water movement past a reference point, measured as volume per unit of time (usually expressed as cubic feet per second or meters per second).

Disinfection The process of inactivating microorganisms that cause disease. All potable water requires disinfection as part of the treatment process prior to distribution. Disinfection methods include, but are not limited to, chlorination, ultraviolet radiation, and ozonation.

Disposal The practice of releasing treated effluent back to the environment using ocean outfalls, surface water discharges, or deep injection wells.

Disposal well An injection well installed for the purpose of injecting wastewater, such concentrate produced by a water treatment process, directly into the ground. Disposal wells are generally drilled into unused aquifers or aquifers that do not contain freshwater or are constructed such that the zone of injection is below areas containing freshwater.

Drawdown A lowering of the groundwater surface caused by pumping (typically expressed as (1) the vertical distance between the static water level and the water level in a pumping well surface of the cone of depression. (2) A lowering of the groundwater surface caused by pumping.

Drought A long period of abnormally low rainfall, especially one that adversely affects growing or living conditions.

East Central Florida Transient (ECFT) Groundwater Model a groundwater model for the CFWI Planning Area that simulates transient groundwater flow in the surficial aquifer system and the Floridan aquifer system.

Ecology The study of the interrelationships of plants and animals to one another and to their physical and biological environment.

Ecosystem Biological communities together with their environment, functioning as a unit.

Effective rainfall The portion of rainfall that infiltrates the soil and is stored for plant use in the crop root zone.

Effluent Treated water that is not reused after flowing out of any plant or other works used for treating, stabilizing, or holding wastes.

Electrodialysis Dialysis that is conducted with the aid of an electromotive force applied to electrodes adjacent to both sides of the membrane.

Elevation The height in feet above mean sea level in reference to the North American Vertical Datum of 1988.

Evapotranspiration (ET) The loss of water to the atmosphere by evaporation from land and water surfaces and by transpiration from plants.

Finished water Water that completed a purification or treatment process; water that passed through all the processes in a water treatment plant and is ready to be delivered to consumers.

Fiscal Year (FY) The fiscal year for state agencies begins on October 1 and ends on September 30 the following year.

Florida Administrative Code (F.A.C.) The Florida Administrative Code is the official compilation of the administrative rules and regulations of state agencies.

Florida-Friendly Landscaping Quality landscapes that conserve water, protect the environment, are adaptable to local conditions, and are drought tolerant. The principles of such landscaping include planting the right plant in the right place, efficient watering, appropriate fertilization, mulching, attraction of wildlife, responsible management of yard pests, recycling yard waste, reduction of stormwater runoff, and waterfront protection.

Florida Statutes (F.S.) The Florida Statutes are a permanent collection of state laws organized by subject area into a code made up of titles, chapters, parts, and sections. The Florida Statutes are updated annually by laws that create, amend, or repeal statutory material.

Floridan aquifer system (FAS) An aquifer system composed of sequential layers of limestone and dolomite and is traditionally sub-divided into the Upper and Lower Floridan aquifers which are separated by less productive horizons called middle confining units.

Flow The actual amount of water flowing by a particular point over some specified time. In the context of water supply, flow represents the amount of water being treated, moved, or reused. .

Freeboard For lake or wetland MFLs it is expressed as the potential or allowable drawdown in the UFA, in feet. For spring MFLs constraints it is expressed as a flow rate or a percentage of the flow rate (in cubic feet per second or cfs).

Fresh water For water supply planning purposes, an aqueous solution with a total dissolved solids concentration less than or equal to 500 mg/L.

Gross irrigation demand or **gross irrigation requirement** (AFSIRS model) The amount of water that must be withdrawn from the source in order to be delivered to the plant's root zone. Gross irrigation demand includes both the net irrigation requirement and the losses incurred irrigating the plant's root zone.

Gross water demand (or raw water demand) is the amount of water withdrawn from the water resource to meet a particular need of a water user or customer. Gross demand is the amount of water allocated in a consumptive water use permit.

Groundwater Water beneath the surface of the ground, whether or not flowing through known and definite channels. Specifically, that part of the subsurface water in the saturated zone.

Headwaters The waters at the highest upstream point of a natural system that are considered the major source waters of the system.

Hydrogeology The geology of groundwater, with particular emphasis on the chemistry and movement of water.

Hydrologic condition The state of an area pertaining to the amount and form of water present.

Hydrology The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Impoundment Any lake, reservoir, or other containment of surface water.

Infiltration The movement of water through the soil surface into the soil under the forces of gravity and capillarity.

Inflow (1) The act or process of flowing in or into. (2) The measured quantity of water that moved into a specific location.

Injection well A well installed for the purpose of injecting water directly into the ground. In injection wells can be used to dispose of wastewater, such concentrate produced by a water treatment process, or could be used for aquifer recharge purposes to restore impacted groundwater levels that may be causing saltwater intrusion, reduced spring or river flows, or low surface water levels in lake and wetlands.

Intermediate aquifer system This aquifer system consists of three intervals of alternating confining and producing units. The aquifers within the CFWI Region include the Sandstone (Peace River) and Mid-Hawthorn (upper Arcadia) aquifers.

Irrigation efficiency (1) A measure of the effectiveness of an irrigation system in delivering water to a plant for irrigation and freeze protection purposes. It is expressed as the ratio of the volume of water used for supplemental plant evapotranspiration to the volume pumped or delivered for use. (2) The average percent of total water pumped for use that is delivered to the root zone of a plant. (3) As a modeled factor, irrigation efficiency refers to the average percent of total delivered water applied to the plant's root zone.

Leak detection Systematic method to survey the integrity of a water distribution system and pinpoint the exact locations of leaks (sometimes hidden underground).

Level of certainty A water supply planning goal to assure at least a 90 percent probability any given year that all the needs of reasonable-beneficial water uses will be met, while sustaining water resources and related natural systems during a 1-in-10 year drought event.

Marsh A frequently or continually inundated unforested wetland characterized by emergent herbaceous vegetation adapted to saturated soil conditions.

Measuring sticks Environmental assessment review criteria developed to provide a level of review to confidently address the potential for unacceptable environmental changes.

Microirrigation The application of small quantities of water on or below the soil surface as drops or tiny streams of spray through emitters or applicators placed along a water delivery line. Microirrigation includes a number of methods or concepts, such as bubbler, drip, trickle, mist or microspray, and subsurface irrigation.

Million gallons per day (mgd) A rate of flow of water equal to 133,680.56 cubic feet per day, or 1.5472 cubic feet per second, or 3.0689 acre-feet per day. A flow of one million gallons per day for one year equals 1,120 acre-feet (365 million gallons).

Minimum Flows and Levels (MFL) The point at which additional withdrawals will result in significant harm to the water resources or the ecology of the area (Sections 373.042 and 373.0421, F.S.).

MFL recovery strategy Developed when the water body currently exceeds the MFLs criteria. The goal of a recovery strategy is to achieve the established MFLs as soon as practicable.

MFL prevention strategy Developed when the MFLs criteria are not currently violated, but are projected to be exceeded within the next 20 years. The goal of a prevention strategy is for the water body to continue to meet the established MFLs in the future.

Mitigation The action of lessening in severity or intensity.

Mobile irrigation laboratory A vehicle furnished with irrigation evaluation equipment that is used to carry out on-site evaluations of irrigation systems and to provide recommendations on improving irrigation efficiency. Often referred to as MIL(s).

Model A computer model is a representation of a system and its operations, and provides a cost-effective way to evaluate future system changes, summarize data, and help understand interactions in complex systems.

MODFLOW A modular, three-dimensional, finite-difference groundwater modeling code created by the U.S. Geological Survey, which is used to simulate the flow of groundwater through aquifers.

Monitor well A well used to monitor groundwater conditions or properties (e.g. water levels or pressures, water quality, etc.).

Natural system A self-sustaining living system that supports an interdependent network of aquatic, wetland-dependent, and upland living resources.

Net irrigation demand or **net irrigation requirement** The amount of water the plant needs in addition to anticipated rainfall. This is an estimate of the amount of water (expressed in inches per year) that should be delivered to the plant's root zone.

Net water demand (or user/customer water demand) is the water demand of the end user after accounting for treatment and process losses, and inefficiencies. When discussing Public supply, the term "finished water demand" is commonly used to denote net demand.

Per capita use The average amount of water used per person per day.

Performance measure A scientifically measurable indicator or condition that can be used as a target for meeting water resource management goals. Performance measures quantify how well or how poorly an alternative meets a specific objective.

Permeable The capacity of a porous rock, sediment, or soil for transmitting a fluid.

Planning Area The CFWI Planning Area is located in central Florida and consists of all of Orange, Osceola, Seminole, and Polk counties and southern Lake County. The St. Johns River Water Management District, (SJRWMD), South Florida Water Management District (SFWMD), and the Southwest Florida Water Management District (SWFWMD) each contain portions of the CFWI Planning Area.

Potable water Water that is safe for human consumption.

Potentiometric surface A surface that represents the hydraulic head in an aquifer and is defined by the level to which water will rise above a datum plane in wells that penetrate a confined aquifer.

Process water Water used for nonpotable industrial usage, e.g., mixing cement.

Rapid infiltration basin (RIB) A method by which treated wastewater is applied for percolation through permeable soil deposits.

Raw water Water that is direct from the source—groundwater or surface water—without any treatment for potable purposes.

Reasonable-beneficial use Use of water in such quantity as is needed for economic and efficient use for a purpose, which is both reasonable and beneficial.

Recharge (groundwater) The natural or intentional infiltration of water into the ground to raise groundwater levels.

Recharge (hydrologic) The downward movement of water through soil to groundwater; the process by which water is added to the zone of saturation; or the introduction of surface water or groundwater to groundwater storage, such as an aquifer. Recharge or replenishment of groundwater supplies consists of three types: (1) natural recharge, which consists of precipitation or other natural surface flows making their way into groundwater supplies; (2) artificial or induced recharge, which includes actions specifically designed to increase supplies in groundwater reservoirs through various methods, such as water spreading (flooding), ditches, and pumping techniques; (3) incidental recharge, which consists of actions, such as irrigation and water diversion, which add to groundwater supplies, but are intended for other purposes. Recharge may also refer to the amount of water so added.

Reclaimed water Water that received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility (Rule 62-610.200, Florida Administrative Code).

Reference Condition The Reference Condition was developed to approximate historical conditions and represents aquifer conditions if 2005 water demands were realized over the 12-year simulation period. The Reference Condition was used for comparisons to projected future withdrawal conditions. The year 2005 was selected for the Reference Condition because it corresponds to the timeframe when field hydro-ecological assessments of water bodies were conducted, allowing for ground truthing of observed, measured, and simulated data and giving confidence in the model's use for planning purposes.

(Regional) Water supply plan Detailed plan developed by the Water Management Districts under Section 373.709, F.S., providing an evaluation of available water supply and projected demands at the regional scale. The planning process projects future demand for 20 years and recommends projects to meet identified needs.

Retention The prevention of stormwater runoff from direct discharge into receiving waters; included as examples are systems that discharge through percolation, exfiltration, filtered bleed-down, and evaporation processes.

Retrofit (1) Indoor: the replacement of existing water fixtures, appliances, and devices with more efficient fixtures, appliances, and devices for the purpose of water conservation. (2) Outdoor: the replacement or changing out of an existing irrigation system with a different irrigation system, such as a conversion from an overhead sprinkler system to a micro irrigation system (Basis of Review, SFWMD 2012b).

Reverse osmosis (RO) A membrane process for desalting water using applied pressure to drive the feed water (source water) through a semipermeable membrane.

Runoff That component of rainfall, which is not absorbed by soil, intercepted and stored by surface water bodies, evaporated to the atmosphere, transpired and stored by plants, or infiltrated to groundwater, but which flows to a watercourse as surface water flow.

Saltwater intrusion The movement of a body of salt water into an aquifer or surface water body containing fresh water typically due to a decrease in water level (head) in the body of fresh water but it can also be caused by a rise in the water level (head) of the body of salt water. It can occur either in surface water or groundwater bodies. The term is applied to the flooding of freshwater marshes by seawater, the upward migration of seawater into rivers and navigation channels, and the movement of seawater into freshwater aquifers along coastal regions.

Saltwater Intrusion Minimum Aquifer Level (SWIMAL) Adopted and proposed by the SWFWMD to support MFLs recovery strategy.

Seawater or **salt water** Seawater is defined by the SJRWMD and SFWMD as water with a chloride concentration at or above 19,000 mg/L and by the SWFWMD as water with a TDS concentration greater than or equal to 10,000 mg/L.

Seepage irrigation Irrigation that conveys water through open ditches. Water is either applied to the soil surface (possibly in furrows) and held for a period of time to allow infiltration, or is applied to the soil subsurface by raising the water table to wet the root zone.

Seepage irrigation system A means to artificially supply water for plant growth that relies primarily on gravity to move the water over and through the soil, and does not rely on emitters, sprinklers, or any other type of device to deliver water to the vicinity of expected plant use.

Semi-confined aquifer A completely saturated aquifer that is bounded above by a semi-permeable layer, which has a low, though measurable permeability, and below by a layer that is either impervious or semi-pervious.

Service area The geographical region in which a water supplier has the ability and the legal right to distribute water for use.

Solutions Strategies The CFWI 2035 Water Resources Protection and Water Supply Strategies document, was developed by the Solutions Planning Team and is part of the CFWI RWSP. The Solutions Strategies provides relevant project information to further develop specific water supply project options through partnerships with water users. The document includes project cost estimates, potential sources of water, feasibility and permittability analysis, and identification of governance structure options.

Southern Water Use Caution Area (SWUCA) Established by the SWFWMD in 1992 due to environmental concerns related to groundwater withdrawals in the southern and central regions of the SWFWMD. The primary areas of resource concern within the SWUCA include lake levels along the Lake Wales Ridge, flows in the upper Peace River, and saltwater intrusion into the UFA from the Gulf of Mexico.

Stormwater Water that does not infiltrate, but accumulates on land as a result of storm runoff, irrigation runoff, or drainage from areas, such as roads and roofs.

Stormwater discharge Precipitation runoff from roadways, parking lots, and roof drains.

Surface water Water above the soil or substrate surface, whether contained in bounds, created naturally or artificially, or diffused. Water from natural springs is classified as surface water when it exits from the spring onto the earth's surface.

Surficial aquifer system (SAS) An unconfined aquifer system consisting of varying amounts of limestone and sediments that extend from the land surface to the top of an intermediate confining unit.

Treatment facility Any facility or other works used for the purpose of treating, stabilizing, or holding water or wastewater.

Utility Any legal entity responsible for supplying potable water for a defined service area.

Wastewater The combination of liquid and water carried pollutants from residences, commercial buildings, industrial plants, and institutions together with any groundwater, surface runoff, or leachate that may be present.

Water budget An accounting of total water use or projected water use for a given location or activity.

Water conservation The prevention and reduction of wasteful, uneconomical, impractical, or unreasonable use of water resources (Section 373.227(1) F.S.).

Water conservation rate structure A water rate structure designed to conserve water. Examples of conservation rate structures include, but are not limited to, increasing block rates, seasonal rates, and quantity-based surcharges.

Water Protection and Sustainability Program (WPSP) Florida trust fund created by the legislature to provide Districts with state matching funds to support the development of alternative water supplies by local governments, water supply authorities, and other water users.

Water quality The physical, chemical, and biological condition of water as applied to a specific use. Federal and state guidelines set water quality standards based on the water's intended use, whether it is for recreation, fishing, drinking, navigation, shellfish harvesting, or agriculture.

Water reservation Water set aside for the protection of fish and wildlife or the public health and safety. Reserved water is not available to be allocated to consumptive uses (Subsection 373.223(4), F.S.).

Water resource development The formulation and implementation of regional water resource management strategies, including collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage the water resources; development of regional water resource implementation programs; construction, operation and maintenance of major public works facilities to provide for flood control, surface and groundwater storage, and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities (Section 373.019, Florida Statutes).

Watershed A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water. Watersheds conform to federal hydrologic unit code standards and can be divided into subwatersheds and further divided into catchments. Unlike drainage basins, which are defined by rule, watersheds are continuously evolving as the drainage network evolves.

Water shortage restrictions Limit water use when sufficient water is temporarily unavailable to meet user needs or when conditions require temporary reduction in use to prevent serious harm to water resources (Sections 373.175 and 373.246, F.S.).

Water supply development The planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use. (Section 373.019, F.S.).

Water table The surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere; defined by the level where water within an unconfined aquifer stands in a well.

Water use Any use of water that reduces the supply from which it is withdrawn or diverted.

Water Wheeling To transfer and transmit water supplies from water supply sources between and among multiple utilities through an integrated system of interconnects.

Wellfield more than one well producing water from a subsurface source.

Wetland An area that is inundated or saturated by surface water or groundwater with vegetation adapted for life under those soil conditions (e.g., swamps, bogs, and marshes).

Withdrawal Water removed from a groundwater or surface water source for use.

Yield The quantity of water (expressed as rate of flow or total quantity per year) that can be withdrawn for a given use from surface or groundwater sources.

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to protect, conserve, and restore
our water resources

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