BROWARD WATER RESOURCES TASK FORCE REPORT

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EXECUTIVE SUMMARY

The Broward Water Resources Task Force was established on June 24, 2008 through enabling resolutions of the Broward County Board of County Commissioners, Broward Leagues of Cities and the South Florida Water Management District. The Task Force was charged with identifying and evaluating opportunities and impediments to providing future regional water supply, water conservation, wastewater treatment, and water reclamation strategies of greatest efficiency and cost effectiveness.

The Task Force embarked on its work with the recognition that limits on the future use of the region's primary source of water supply, the Biscayne Aquifer, and with increasing financial constraints and escalating population growth, Broward water providers could not effectively address current and future water demands without considering the benefits of a more regional approach. Through the convening of monthly Task Force meetings and the contributions of a supporting Technical Team, the Task Force considered the magnitude and diversity of the water supply challenges facing the region and the status of various efforts being undertaken to address these challenges. Key to the process was the participation of numerous water managers, governmental agencies, and private sector representatives from throughout the state and beyond Florida's borders, on strategies being applied or considered to address similar water supply challenges on a regional scale.

The Task Force concluded that many water conservation, reuse and other alternative water supply strategies could be implemented or expanded to more effectively provide water, both now and in the future. Water conservation was repeatedly identified as a strategy warranting aggressive implementation through a variety of initiatives, including continued support for and expansion of regional water conservation education and outreach programs, development of a county-wide water conservation and incentives program, and the capture and reuse of cooling tower wastewater and condensate. Project concepts and recommendations lending support to regional obligations to develop beneficial reuse within Broward County, consistent with state legislative requirements, were also recognized as having enhanced value, as well as related policy and planning coordination with state and agency partners. The Task Force developed recommendations in support of regional water supply project concepts designed to capitalize on and maximize the effectiveness of existing systems as well as future investments in infrastructure. These include the creation of regional surface water storage capacity, development of regional water supply infrastructure, expansion of existing facilities to serve neighboring communities, and coordinated development of reclaimed water projects to provide demand management and aquifer recharge.

The recommendations outlined in the following pages are designed to ensure that Broward County has a coordinated, strategic and regional approach for providing an adequate supply of clean water for future consumptive use and natural systems needs. They are intended to provide a foundation upon which local governments, water providers, and water managers can move forward with decision-making regarding future water resource planning, development and management.

Section I	Introduces the water resource management structure of Broward County
Section II	Provides information about the Task Force and outlines its guiding principles
Section III	Outlines issues and challenges and provides technical background information
Section IV	Discusses specific Task Force recommendations and considerations
Section V	Presents the Task Force's recommendations, including a proposal for and future role of the Task Force, and discussion of next steps

The Task Force believes that addressing future water supply and demand will continue to be a top priority for water providers and governmental officials, and an intrinsic, ongoing part of their responsibilities to ensure the continued economic vitality of the region, sustainability of the environment, and high quality of life enjoyed by Broward residents. Some of the Task Force's most significant recommendations include:

- **Water Conservation** efforts focused on achieving significant and measurable reductions in water consumption through a county-wide water conservation incentives/rebate program, permanent water conservation measures and their enforcement, and incentives for water utilities including the retention of consumptive use permit allocations.

- **Regional Water Supply Projects** including the continued exploration of the C-51 Reservoir as a regional strategy with both water supply and environmental benefits and pursuit of proposed sub-regional alternative water supply projects identified and ranked by the Task Force.

- **Development of Reuse** with efforts directed at meeting obligations of the State's ocean outfall legislation with specific recommendations including creation of a regional reuse master plan to help guide and coordinate local efforts as well as local ordinances to further the use of reuse in landscape irrigation.

- **Research and Investigations** geared at ensuring that the appropriate technical tools continue to be developed for the purpose of analyzing regional water resources and for planning effective resource management strategies, and investigations to allow water providers to assess and respond to the short and long-term threats posed by saltwater intrusion and climate change.

- **Continuation of the Water Resources Task Force** for the purpose of evaluating progress in the implementation of Task Force recommendations, and identifying new trends and evolving needs where regional coordination could benefit local efforts in water supply planning and development.

The Task Force recognizes the complexities and challenges associated with successful advancement of many of the recommendations included in this report, especially those associated with proposed regional water supply projects. The Task Force is committed to providing continued regional coordination and collaboration to help advance these recommendations in support of sustainable and cost-effective water supply planning for Broward's water future.

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I. INTRODUCTION

Water resource management in Broward County is provided by a diverse group of agencies, water utilities, and water managers. On a regional scale the South Florida Water Management District (SFWMD) is responsible for water resource planning, water supply permitting, and the operation of an extensive water management system for a service area that includes all or portions of 16 different counties, including Broward County. As part of its operations, the SFWMD maintains a regional network of canals that constitutes a comprehensive drainage and surface water management system. This canal network is critical to effective water resources management and water supply operations in Broward County, with surface waters deliveries from the broader regional system an important part of the hydrologic budget for urban Broward County. Within urban Broward County local drainage/water control districts are responsible for the maintenance and operations of discrete, but interconnected surface water management systems that include secondary canals, pumps, controls, and related infrastructure. These systems are directly connected to, and operated in coordination with, the primary canals managed by the SFWMD (Figure 1).

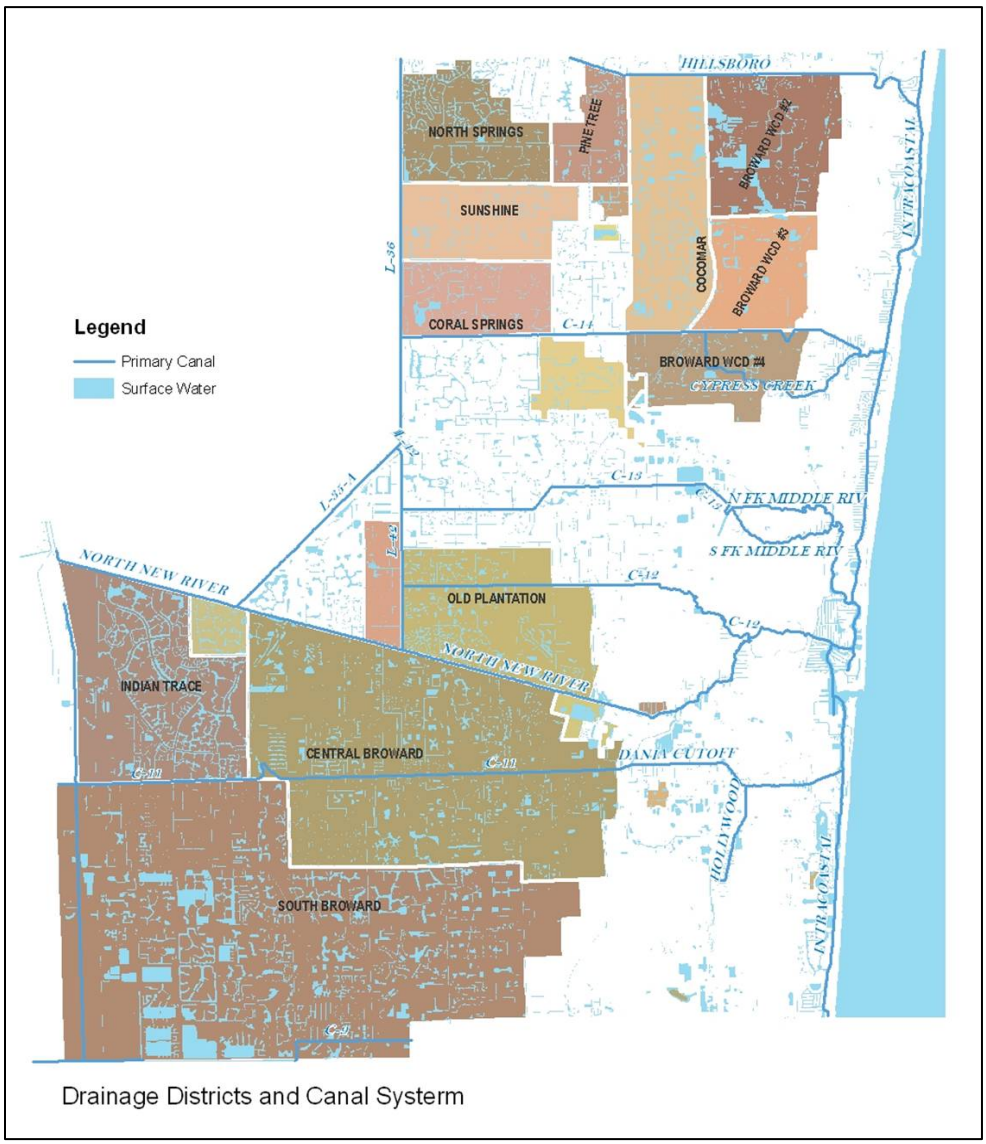

Figure 1: Primary Canals and Drainage/Water Control Districts in Broward County

The primary canals provide a source of surface water that can be delivered to these secondary water management systems for storage and distribution, which helps to maintain groundwater elevations by recharging the shallow and highly transmissive Biscayne Aquifer that underlies all of Broward County and most of Southeast Florida (Figure 2). The Biscayne Aquifer currently serves as the primary source of drinking water for the region. Within Broward County, water supply responsibilities are shared by 28 municipal and private water utilities who jointly meet the needs of Broward's 1.8 million residents, with a combined potable water demand resulting in groundwater withdrawals of 264 million gallons per day (Figure 3).

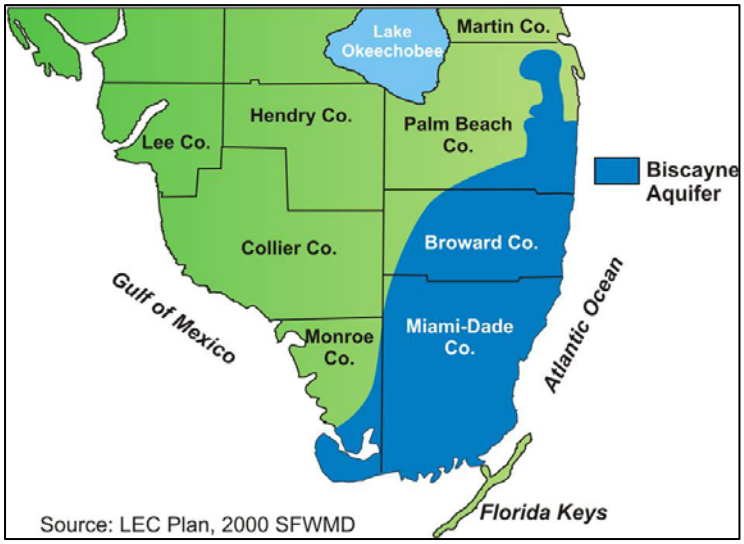

Figure 2: The Biscayne aquifer underlies much of southeast Florida

The Biscayne Aquifer has historically provided a high quality and abundant source of groundwater for potable water systems throughout the County. Thus, potable water supply development in Broward County has relied almost entirely upon the Biscayne Aquifer as the source water for meeting urban water needs. However, mounting impacts to the natural systems that provide direct and indirect recharge to the Biscayne Aquifer and changes in water resource protection policies at the regional and state levels will require significant adjustments in the way that local governments and water providers plan for future growth and water supply production.

One significant policy driver has been the growing issues related to urban water use and apparent conflicts with state and federal efforts to restore the Everglades ecosystem. Without additional recharge for the Biscayne aquifer, continued urban growth and increased water demands would reduce the quality and reliability of the water supply for the existing residents of Broward County. As a result, the South Florida Water Management District adopted the Regional Water Availability Rule in February 2007 with dramatic implications for water supply planning and development in Southeast Florida. In essence, the Regional Water Availability Rule restricts urban withdrawals from the Biscayne Aquifer to those levels realized prior to April 2006 and requires that any water demands beyond these levels be met with the production of alternative water supplies. Alternative water supply options include use of the brackish Floridan Aquifer as source water, reclaimed wastewater, regional surface water storage, aquifer storage and recovery, and reverse osmosis or desalination.

Another significant policy decision influencing the future of water supply development in Broward County was legislation adopted by the State in 2008 (Senate Bill 1302) requiring the elimination of ocean outfalls by 2025 and the transfer of 60% of facility actual flow on an annual basis to reuse applications. Two of the six ocean outfalls affected by this legislation are located in Broward County; one is operated by Broward County's Water and Wastewater Services and the other by the City of Hollywood. Both of these wastewater plants are regional facilities serving multiple municipalities. The combined flows of these two facilities is approximately 77.5 MGD; hence, fulfillment of obligations under this legislation will require that 46.5 MGD of current wastewater flows be redirected to

beneficial reuse applications within Broward County. While these requirements create challenges, the legislation also offers the opportunity to offset some portion of future water supply needs.

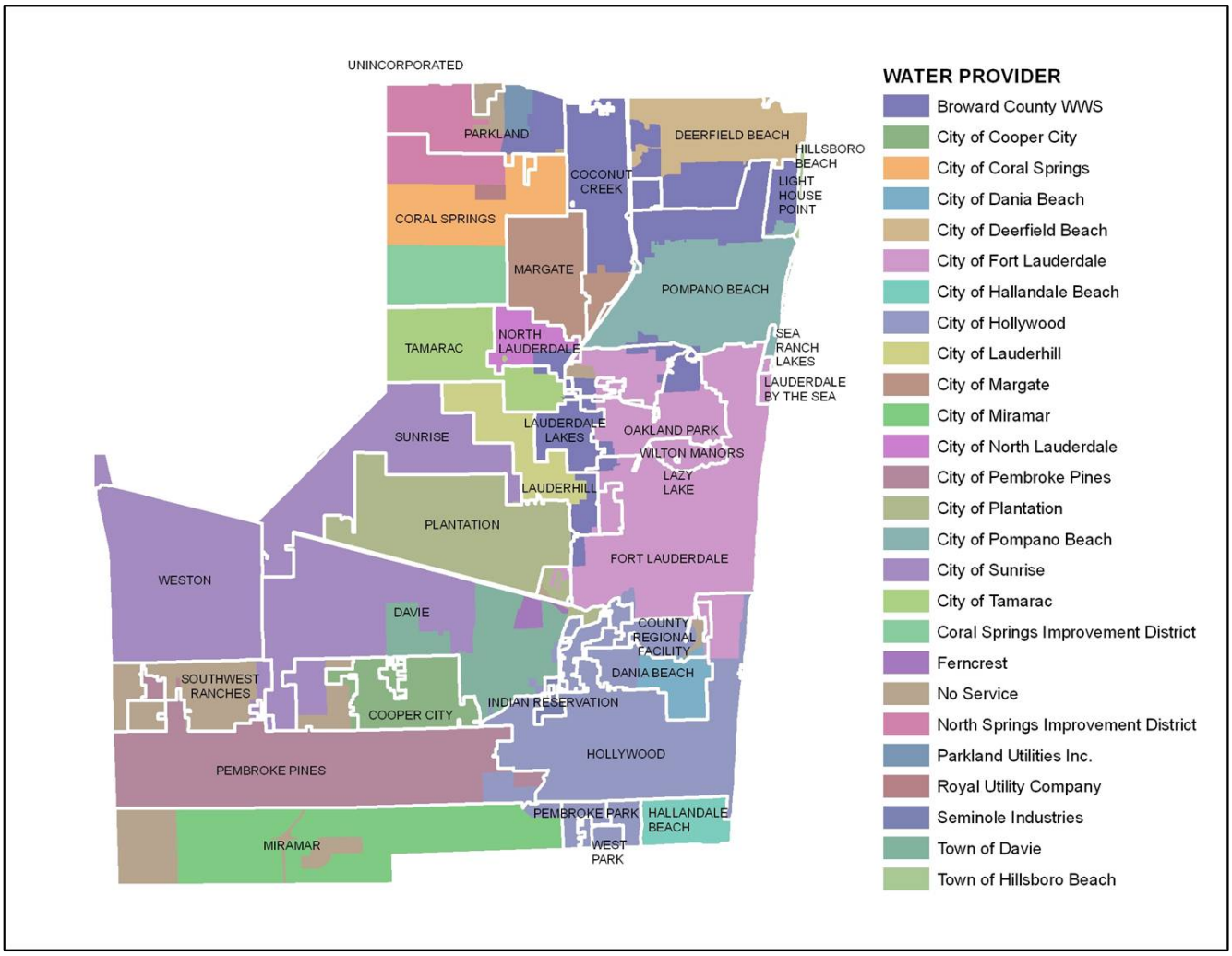

Figure 3: Service areas for Broward County's 25 water providers

Clearly the state and regional legal requirements to protect the Biscayne aquifer, the Everglades, and the nearshore reefs and coastal ecosystems will require major changes in the way that potable water is produced and wastewater is treated and disposed of in Broward County, which, until this point, had not needed to invest in alternative water supplies to support its continued population growth. This change has major implications for rate payers of at least some of the 28 utilities in the county who will be obligated to pay for major capital investments in new infrastructure, more costly technology as part of advanced treatment requirements, disposal of treatment by-products, and growing operational expenses associated with the higher energy demands required as part of the treatment process for most alternative water supply options.

II. BACKGROUND

A. Creation of Task Force

In recognition of the growing challenges and complexities relating to regional water resource management, water supply development, and planning for future growth, the Broward County Board of County Commissioners and the South Florida Water Management District Governing Board Members identified the future water supply and water resource challenges as topics for the joint meeting of the two governing bodies. In further appreciation of the regional implications of these policy decisions for all governing bodies and water providers in Broward County, the workshop was expanded to include the participation of elected officials representing each of the 31 municipalities in Broward County.

The Joint Broward County/SFWMD/Municipal Water Workshop was convened on May 12, 2008 and resulted in broad attendance of elected officials, agency staff, water utility directors, water managers, planners, and other interested parties. Presentations delivered by SFWMD and Broward County staff provided an overview of regional water resource management; factors influencing the SFWMD Governing Board's adoption of the Regional Water Availability Rule; statutory requirements of local governments in completing mandated 10-year Water Supply Facility Work Plans; and water resource management in urban Broward County. Following these presentations, extensive discussion ensued regarding the cost of alternative water supplies, the lack of coordination among individual water providers, the potential for achieving economies-of-scale with a coordinated plan or sub-regional approach, and the value of water conservation in long-term water supply planning. The need for a regional evaluation of these issues led to the recommendation to work collaboratively to find potential environmentally, economically, and technically feasible strategies and solutions to the County's future water resource needs and to provide recommendations. It was agreed that this initiative should be undertaken by a Task Force to be convened for this purpose with analyses to include consideration of regional water supply projects as well as opportunities for enhancing and promoting water conservation as a prominent aspect in regional water supply planning.

With this determination, several participants representing Broward County, the SFWMD, and the municipalities agreed to coordinate in drafting a resolution to support the creation of a Broward Water Resources Task Force to be considered for action by the Broward County Board of County Commissioners, the South Florida Water Management District Governing Board, and the Board of Directors of the Broward League of Cities. The committee of elected officials coordinated to develop the subject resolution, including the proposed structure, organization, and objectives of the Task Force. Detailed within the resolution, the Committee proposed the creation of a 15-member Task Force consisting of policy makers to be supported by a 21-member staff workgroup (Technical Team) consisting of staff and representatives from partner agencies. The resolution was adopted by each of the aforementioned boards in June 2008: Broward County Resolution 2008-457, SFWMD Resolution 2008-642, Broward League of Cities Resolution 2008-B05 (Appendix A).

B. Structure of Task Force and Technical Team

The 15-member Broward Water Resources Task Force (Task Force) was created and convened on a monthly basis in accordance with the terms and conditions established in the enabling resolutions. The Task Force membership includes:

1) Six (6) policy makers appointed by the Broward League of Cities representing small, medium, and large cities;
2) Five (5) elected officials appointed by the Broward League of Mayors also representing small, medium, and large cities;
3) One (1) Broward County Commissioner appointed by the Broward County Board of County Commissioners;
4) One (1) official representing a Special Independent District Water Provider appointed by the Surface Water Coordination Committee;
5) One (1) elected official representing a Drainage/Water Control District appointed by the Surface Water Coordination Committee; and
6) One (1) South Florida Water Management District Governing Board Member appointed by the SFWMD Governing Board.

Alternates were appointed by each of the appointing bodies to serve in the place of the primary member in the event of a member absence (Appendix B).

The initial term of the Task Force was established for a period of one year per the enabling resolution; however, the term would later be extended by eight months to allow for adequate consideration of the numerous and complex issues being explored prior to finalizing recommendations as part of the Task Force report.

The 21-member Technical Team was structured to include the participation of a technical staff person representing the same entities included in the Task Force membership, but was expanded to include two staff persons from Broward County; a representative from the Technical Advisory Committee of the Broward Water Advisory Board; representatives from the Builders Association of South Florida and the South Florida Chapter of the U.S. Green Building Council; and staff persons from the Florida Department of Environmental Protection and the Broward Department of Health. The Technical Team was created for the purpose of lending technical support to the Task Force and was to convene as needed. Technical Team members agreed early in the process to maintain an aggressive schedule that included participation in monthly joint meetings with the Task Force immediately followed by separate Technical Team meetings, and the scheduling of interim meetings as needed. During the course of the Task Force's activities, several subcommittees were convened and met regularly to provide focused attention on issues requiring additional investigation or consideration, including water conservation strategies, water demand projections, and the development of sub-regional water supply concepts.

C. Goals and Guiding Principles

The Task Force first convened on September 19, 2008 for an organizational meeting with business focused on the election of a Chair and Vice Chair, development of a mission statement, detailing of duties and responsibilities, and the establishment of guiding principles.

The membership agreed upon a mission statement consistent with objectives stated at the joint workshop in May 2008, but expanded upon the initial concept of seeking coordination in the evaluation of regional water supply and conservation strategies to include consideration of water quality in these evaluations.

Mission Statement:

> "To work collaboratively to identify and evaluate potential regional and sub-regional water supply strategies and solutions of appropriate water quality to meet county-wide future water resource needs and water conservation goals."

Duties and responsibilities of the Task Force were also agreed upon, consistent with language in the enabling resolution with the addition of water quality as a point of consideration.

Duties and Responsibilities:

> "The Task Force's duties and responsibilities will be to identify and evaluate opportunities and impediments to providing future water supply of appropriate water quality, conservation, wastewater treatment, and reuse or reclaimed water opportunities that are most efficient and cost effective and to make recommendations."

The Task Force members gave early recognition to the interplay of the diverse issues influencing water resources management and water supply planning, including resource sustainability, economics, climate change, intergovernmental coordination and politics. Thus it was agreed that in order to be effective and relevant, their efforts would be guided by several overarching principles.

Guiding Principles:

1) Focus first on water conservation – water conservation offers the lowest cost of future water and should be a prominent and significant part of water supply planning efforts;

2) Preserve water quality – water quality protections have been a focus of regulatory and voluntary efforts in Broward County. Water quality should not be compromised in the process of developing new water supplies;

3) Make regional approaches to water provision a top priority - evaluate efficiencies of regionalization, recognizing that shared investment in resources can offer cost-effective and long-term solutions perhaps not otherwise possible; and

4) Consider recommendations within the context of climate change – give consideration to the influence of changing climate conditions on resource availability as well as the energy demands associated with advanced treatment technologies.

These themes would be recurrent elements of presentations and discussions held as part of Task Force's deliberations and are substantially represented in the recommendations and prioritized strategies presented in this report.

D. Task Force and Technical Team Activities

The meeting schedule and presentation topics for the Task Force and the Technical Team were largely organized by an internal staff workgroup consisting of agency staff from the Broward County Natural Resources Planning and Management Division (NRPMD), Broward County's Water and Wastewater

Services, and the SFWMD, with staffing of the Task Force and Technical Team provided by the NRPMD and the SFWMD. A calendar of activities and subject presentations was developed with a one-year time table as the target for completion of the Task Force report and recommendations. Joint meetings with the Technical Team were scheduled at monthly intervals and two separate meeting dates were reserved for field trips that would provide the Task Force membership with first hand exposure to water resources issues and projects. Additionally, one meeting of the Broward Water Resources Task Force was held jointly with the Palm Beach Water Resources Task Force for the purpose of discussing a regional water supply concept of potential mutual benefit.

In order to provide the Task Force with a comprehensive understanding of the various technical issues, policy decisions, and resource challenges influencing urban water supply planning, and to create a strong foundation for their decision-making, the first six months of meeting agendas focused heavily on issues relating to water resource management and water supply planning. A series of presentations and the participation of knowledgeable guest speakers provided the membership with insight into issues of regional and urban water resource management, trends and challenges in local water supply planning, and matters of water policy and governance.

Field Trips

To maximize the understanding of the water resource challenges confronting water managers and water providers, Task Force members were provided education through immersion as part of two half-day field excursions that included outdoor field activities coupled with formal presentations providing background and context. The first field trip was designed to provide members with a better appreciation of the relationship between the regional Everglades system and urban water resources, including regional water availability, water quality concerns, and surface water management. The program included a journey into the interior regions of Everglades Water Conservation Areas accessible only by airboat west of urban Broward County, tour of a major water management pump station operated by the SFWMD as part of flood control operations benefiting urban Broward County, and a visit to the South Broward Drainage District to learn about urban water management.

The second field trip was focused on reuse applications in the urban environment and included a tour of the Pompano Beach Reuse Treatment Facility in Broward County where reuse water is used in an urban setting for golf course and residential landscape irrigation. This site visit was followed by a trip to the City of West Palm Beach to learn about advanced wastewater treatment as part of a wetlands rehydration and indirect potable recharge applications. These site visits served to introduce the membership to the various technologies involved in reuse applications and to provide a sense of scale with regards to treatment facilities and applications.

Water Resources and Water Supply Planning

The subject of water resources and water supply planning was one that occupied several early meeting agendas with background information presented on the operation of the urban and regional water management system. This included review of the local hydrologic cycle and the relationship between urban Broward County and the regional Everglades system; local geology and water sources; traditional treatment technologies; and the brackish Floridan Aquifer as an alternative water supply. Presentations also highlighted the importance of surface water management as a means of providing aquifer recharge, serving to recharge wellfields and to help abate saltwater intrusion in eastern Broward County where some of the most productive potable wellfields are located.

After achieving a better understanding of historical water resource management practices in Broward County, the membership learned about Florida water law, key regional and state water policy decisions to implement the law, and implications of these legal mandates for water supply planning and development in Broward County. Discussion focused on the adoption of the Regional Water Availability Rule by the SFWMD in February 2007 and State legislation adopted in 2008 mandating the elimination of ocean outfalls and diversion of 60% of flows to beneficial reuse projects. It is widely recognized that these policy decisions to implement state law have begun to affect water supply planning in Broward County and throughout the southeast Florida region in general.

The Regional Water Availability Rule

The Regional Water Availability Rule was discussed to have been implemented for the purpose of ensuring the sustainability of the hydrology of the Everglades system. The need for the Rule was driven by concerns about increasing population growth and water demands in the urban environment, limited availability of regional water during droughts to meet urban demands, and the knowledge that the hydrologic connections make the Everglades and related portions of the regional system sensitive to water withdrawals. The Rule serves to prevent additional demands upon the regional system for the purpose of meeting urban water supply needs by capping direct and indirect impacts to the Everglades system from groundwater withdrawals by water users. The levels of regional system impact may not exceed those caused by legally allowed water withdrawals that were realized prior to April 2006 (the maximum withdrawal measured over any consecutive 12 month period between April 2001 and April 2006). As a consequence, some urban water providers will need to meet any future water demands in excess of this historical demand through a combination of increased water conservation and development of alternative water supplies, which will require substantial investment in water supply development and treatment technologies. Provisions of the Rule permit water utilities substantially constrained in their ability to develop the necessary alternative water supplies in accordance with near-term demands to obtain a short-term allocation for additional water from the regional system while alternative sources are being developed. Such a short-term allocation is sometimes referred to as "borrowing." It was acknowledged that while several Broward utilities have been approved for temporary allocations, recent slowdown in population growth and a widespread reduction in per capita use rates have lowered water demands and resulted in just one Broward municipality making use of a temporary increase under its Consumptive Use Permit.

Ocean Outfall Legislation

The passage of Senate Bill 1302 (Wastewater Discharge/Ocean Outfall legislation) was also identified as a policy decision of particular consequence to future water and wastewater operations in Broward County. The legislation was designed to achieve the dual objectives of achieving water quality improvements/environmental protection in offshore waters and increasing the use of reclaimed water/reuse in urban water supply planning in Southeast Florida. This latter objective is achieved by requiring that wastewater discharges to ocean outfalls meet Advanced Wastewater Treatment standards by the year 2018 with eventual elimination of these discharges by the year 2025, except as an emergency backup. Additionally, the legislation requires that with the elimination of ocean outfall wastewater discharges, that 60% of facility actual flow on an annual basis (average annual daily flow for years 2003-2007) be transferred to beneficial reuse applications, but allows for ocean outfall discharges under wet weather conditions. There are two ocean outfalls located offshore of Broward County which are operated by the regional wastewater service providers of Broward County Water and

Wastewater Services (WWS) and the City of Hollywood. The secondarily treated wastewater flow discharged via these outfalls for each of the facilities is 37.6 and 40.1 mgd, respectively. Thus, implementation of the ocean outfall legislation will require development of 46.5 mgd in additional reuse applications (60% of combined ocean outfall discharges) between WWS and the City of Hollywood by the year 2025. As regional service providers with wastewater treatment service areas that extend beyond the potable water service areas of either entity and include multiple municipalities, the implications of such this legislative mandate will have regional impacts and require a collaborative approach to ensure timely integration of the necessary reuse projects and applications in local water supply planning efforts (Table 1).

The Technical Team was directed to give special consideration to reuse opportunities as part of later development of regional water supply alternatives for the Task Force's consideration.

Water Demand Projections

Water policy and water supply planning has been extremely dynamic in south Florida since the early 1990's when the population began to explode and realized growth far exceeded projections. Coupled with increased interest in Everglades restoration and a regional drought, the state legislature began to focus on issues of water concurrency in local government comprehensive planning. In 2003, Chapter 163, F.S., the Growth Management Act, was amended to require all local governments with water supply responsibilities to develop and adopt 10-year Water Supply Facility Work Plans detailing utility

Table 1
Regional Wastewater Treatment Facilities with Ocean Outfalls and Areas Serviced

Broward County Regional Wastewater Treatment Facility	**Reuse Obligations**	**City of Hollywood Regional Wastewater Treatment Facility**	**Reuse Obligations**
Broward County District 1A and 2A		City of Hollywood	21.883 MGD
City of Pompano Beach		City of Cooper City	0.958 MGD
City of Deerfield Beach		Town of Davie	1.218 MGD
City of Coconut Creek		City of Hallandale Beach	
City of Coral Springs		City of Miramar	
City of Tamarac		City of Dania Beach	
City of Oakland Park		City of Pembroke Pines	
City of Lauderhill		City of Pembroke Park	
North Springs Improvement District		Unincorporated Areas	
Royal Utilities		Broward County District 3	
Total	**22.4 MGD**		**24.1 MGD**

Plans for meeting projected water supply needs. With this, comprehensive plan requirements were expanded beyond the basic analysis of necessary treatment facilities and conveyance infrastructure to also include demonstrated availability of source water.

Water policy and planning requirements really began to take center stage several years later. In 2007, the SFWMD adopted the Regional Water Availability Rule and concurrently completed the update to

the Lower East Coast Regional Water Supply Plan (LEC Update). The result was the promulgation of regional water policy and finalization of regional planning documents that would strongly influence the course of local water supply planning and the subsequent development of required Water Supply Facility Work Plans (Work Plans) by local governments. The LEC Update would be a particularly influential document as state guidelines require consistency between this Regional Water Supply Plans developed by Water Management Districts and local Work Plans. Sensitive to this fact, a great deal of collaborative effort was directed at developing consistent water demand projections for use in preparing the LEC Update. These water demand projections were presented for individual water providers and based upon the most current population data and growth projections available at the time, derived from a 2005 population update and predictive analysis. The 2005 projections were heavily influenced by the period of exceptional growth occurring at the time. That boom would come to a dramatic end in 2008 and the economic crisis that followed resulted in unprecedented reductions in population and growth throughout south Florida and in Broward County. As a result of these sudden changes, the 2005 water demand projections would no longer be considered an appropriate planning reference, and the SFWMD and local governments were beginning to calculate revised demands. As such, Task Force members recognized the need for calculating updated demand projections based on reduced rates of population growth as well as lower rates of per capita water consumption resulting from water use restrictions that limited landscape irrigation imposed by the SFWMD starting in 2007 during drought-conditions. Landscape irrigation restrictions became permanent and many utilities continued to develop and implement individual water conservation plans. This would become a critical assignment for the Technical Team as these water demand projections would influence decisions and recommendations of the Task Force.

Regional and Sub-regional Alternatives

The concomitant implementation of the Regional Water Availability Rule and the Ocean Outfall Legislation impose major obligations on many local water providers and governments which, regardless of size or existing infrastructure and capacity, will be required to develop new and alternative water supplies. Compliance could be especially difficult for some of the smaller water providers with limited financial resources. Additionally, with 25 distinct entities serving as water providers in Broward County, there is also real potential for unnecessary investment in redundant infrastructure. Task Force members voiced early concerns about the magnitude of the financial burden this would create and inquired as to whether, especially in today's economic climate, a regional or sub-regional strategy might be prudent. With this in mind, presentations offered by Technical Team members included comparative information regarding the cost of developing several smaller-scale alternative water supply projects versus the cost of expanding existing facilities or constructing a single larger project, with the demonstration that collaborations result in significant capital and operational cost savings. A major assignment to the Technical Team was the development of regional water supply project concepts for consideration by the Task Force membership.

Existing Infrastructure

Regional water supply discussions revealed an additional aspect of water supply planning in need of further consideration – constrained use of existing infrastructure. As a result of saltwater intrusion, other water quality issues, and the Regional Water Availability Rule, withdrawals from many Biscayne Aquifer wellfields are restricted to levels below their designed capacity. These constraints result in underutilized or "stranded" capacity at many of the associated water treatment facilities where treatment infrastructure was sized in anticipation of greater future wellfield pumpage. Alternative

water supply projects offering offsets to additional withdrawals from the Biscayne Aquifer might allow water providers to increase withdrawals from certain Biscayne wellfields in order to take advantage of at least a portion of this existing capital infrastructure and, in several instances, might even avoid the cost of developing new capital facilities. The Task Force determined that such opportunities would be viewed favorably in evaluating regional water supply options. Technical Team members were asked to assess water demands and Biscayne allocations relative to treatment plant capacity and to quantify existing capital infrastructure available for further utilization.

Governance Options

There has been a growing emphasis on encouraging multi-jurisdictional projects in water supply planning. In 2005, the State Legislature recognized that traditional, less expensive sources of freshwater, such as the Biscayne aquifer, could not meet future demand for Florida's growth and placed priority on funding alternative water supply projects involving more than one entity. Apart from preferential funding or permitting, there is value in considering regional and sub-regional alternatives that provide economies-of-scale. This is especially significant when considering the higher unit cost of newer technologies to treat the available water sources and meet water quality standards. The introduction of regional project concepts then led to the question of governance and how such projects might be managed. To gain insight into various governance options, and strategies that have been employed both within and beyond the state of Florida, representatives familiar with various multi-jurisdictional water supply projects were invited to participate in a panel discussion and to share experiences and perspectives. Panel participants spoke at length about the importance of identifying projects first and to allow governance strategies to emerge later. The Strategies and Recommendations presented by the Task Force reflect the guidance offered by these panel members.

<u>Joint Meeting with the Palm Beach Water Resource Task Force</u>

One regional water supply concept developed in advance of the Water Resources Task Force, and which received substantial consideration by the membership, was the proposed C-51 Reservoir project (Figure 4). This project concept entails the construction of a regional surface water reservoir for the capture and redistribution of stormwater runoff with potential benefits for Palm Beach and Broward Counties. Shortly after the Broward Water Resources Task Force was convened, a similar Task Force was convened by Palm Beach County with several objectives, including analysis of the merits of the C-51 Reservoir project proposal as a viable regional water supply project.

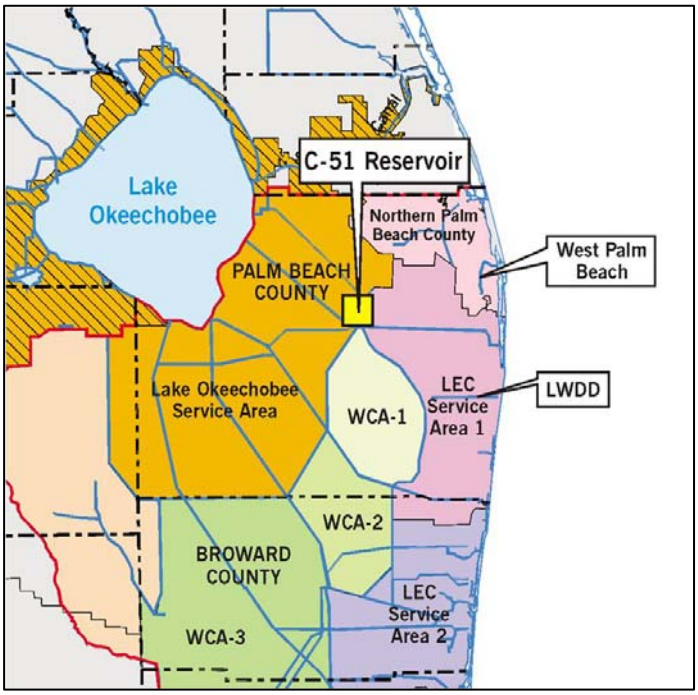

Figure 4: Location of proposed C-51 Reservoir in Palm Beach County

Given the shared interest in the C-51 Reservoir project and the resources invested by utilities in both counties to investigate its feasibility, a joint meeting of the Broward and Palm Beach Water Resources Task Forces was convened

on June 5, 2009. The purpose of the meeting was to bring together the elected leadership, water managers, and stakeholders representing the two counties to partner in discussions with technical staff and regulators regarding the project proposal, its status, and regulatory concerns. By the conclusion of the meeting, both task forces concurred that continued exploration of the concept, funded by the seven original utilities, should proceed. The next phase of analysis would be a portion of the larger proposed Phase 2 study in response to selected questions raised by regulatory and environmental interests. It was anticipated that the results of this next phase of analysis (Phase 2A) would provide sufficient information for determining the value and extent of any subsequent investments in the project proposal. The Technical Team was requested to participate in the evaluation of the C-51 project as a regional water supply option and to review deliverables that would be forthcoming as part of a Phase 2A Study.

Water Conservation

In conjunction with alternative water supply development, water conservation was identified as an essential water resource management strategy in need of expansion in Broward County. Consistent with discussion leading to the formation of the Task Force, the need for an aggressive, prominent, and comprehensive water conservation strategy was a resounding message shared by the Task Force members. Water conservation, through reduced demands, was acknowledged to offer the lowest cost means of making water available to help meet future needs. Rather than treating water conservation as a secondary component in water supply planning, the membership was eager to elevate water conservation to the forefront of planning efforts as a strategic means of reducing longer-term and more costly investments in water supply development. As a demonstration of the potential rewards, it was shared that a 10% reduction in current water demands would translate into approximately 26 mgd in water savings, eliminating about 50% of the 2035 water deficit for Broward County. To fully respond to the Task Force members' interest in water conservation strategies and benefits, representatives from regional water utilities with successful water conservation programs were invited to share their programs with the Task Force with presentations including information on water conservation strategies and diversification of water supplies through alternative water supply development. In addition to utility and local government water conservation programs, the Task Force voiced interest in learning more about how to incentivize water conservation within the business community and on the part of residents. During the course of the Task Force calendar, the Technical Team was requested to present a wealth of information relating to water conservation including overall benefits, existing programs and efforts, water conservation rate structures, opportunities for achieving water conservation in building operations (i.e., cooling towers, and air conditioning condensers), and perspectives on permanent landscape irrigation restrictions.

III. CHALLENGES, ISSUES AND TECHNICAL BACKGROUND INFORMATION

A. Primary Water Resource Issues

Water Demand Projections and Water Supply Work Plans

A series of presentations was delivered by Technical Team members providing detail on the status of local Water Supply Facility Work Plans and the challenges posed by needing to comply with planning and construction timetables built upon growth trends that are no longer relevant. Current and accurate water demand projections are critical to water supply planning efforts. Construction of major water

supply infrastructure requires a typical 5-year timeframe to take a project from design through permitting and construction. As purveyors of water, water utilities are dependent upon the revenues generated from the sale of water to pay for capital investments that might be bonded out for a period of 20 years, thus great care is taken to ensure that the completion of capital projects coincides precisely with the onset of projected water demands so that water supplies are not only in place when the water is needed, but so that the necessary revenue streams will be available to cover utility bond obligations.

Population projections for Broward County are provided by the Broward County Planning Services Division and are derived from application of the Broward County Population Forecasting Model. Water demand projections are estimated based on projected population growth and per capita water demands. Water demand projections included in the LEC Update were reflective of populations projections derived from the 2005 update to the County's population forecasting model with an estimated increase in county-wide water demand of 106 mgd by the year 2025. These data would also serve as the basis for water planning efforts reflected in 10-Year Water Supply Utility Work Plans prepared by local governments in fulfillment of state mandates in comprehensive planning. Thus, neither regional or local planning documents includes water demands adjusted to reflect recent reductions in Broward's local population and slower longer-term growth trends that are now anticipated. An updated assessment of population growth and trends would be essential for developing revised estimates of the County's overall future water demand as well as estimates of water demand on a utility-by-utility basis. These data would be expected to influence the Task Force's identification and evaluation of various regional water supply alternatives and later consideration of time schedules for project planning and completion, as well as provide necessary information for accurate update of the aforementioned planning documents and project commitments.

Floridan Aquifer

Technical presentations providing background with respect to water resource management and planning introduced the Floridan Aquifer as an important resource for future water supply development in Broward County. The Floridan Aquifer is an extensive and highly productive aquifer that underlies an area of approximately 100,000 square miles and serves as the primary source of drinking water for many communities and large cities throughout the State of Florida, and in neighboring states. In south Florida, where the Floridan Aquifer is not fresh, but brackish, the Aquifer has been only minimally developed as a potable water source, with preferential development of the shallower, freshwater Biscayne Aquifer. However, with the limited availability of new water supplies from the Biscayne, many local water providers have identified the Floridan Aquifer as their preferred alternative water supply with plans to install one or more Floridan wells or expand existing systems. At the same time, reservations have been expressed by water providers based on the general lack of technical data and knowledge regarding the long-term sustainability of the Floridan Aquifer as source water for the region. Concerns relate to variable water quality and lower rates of aquifer transmissivity which result in broad recharge/capture zones and the potential for individual wellfield operations to influence the operations of neighboring systems, potentially reducing recharge and/or producing changes in chloride concentrations. Several water providers have been moving forward with individual Floridan aquifer projects, however, the limited development of the Floridan has resulted in a shortage of quality hydrogeologic data on which to base a model to simulate these and anticipated future projects. Thus, there has been limited modeling of the Floridan Aquifer's long-term capacity to support current and projected water supply development. Also lacking has been an analysis of the potential economic and resource-based benefits of constructing several larger, strategically-sited, regional Floridan projects in lieu of developing numerous smaller-scale, and disperse projects across

the county. This latter point was one that Task Force members sought to explore with the assistance of the Technical Team.

Reuse Development

As discussed in previous sections of this report, local governments, water providers, and wastewater utilities face several critical challenges relating to the necessary development of reuse projects in Broward County. While the Regional Water Availability Rule alone is expected to encourage additional development of reuse projects in the County, a more pressing influence is the 2008 ocean outfall legislation requiring the elimination of treated wastewater disposal via ocean outfalls and the transfer of 60% of facility actual flow on an annual basis to beneficial reuse applications. Water and wastewater service providers are aware of the many challenges associated with reuse development in Broward's urban environment and in achieving real water supply benefits that serve to offset potable water demands.

Reclaimed water or "reuse" has been commonly used as alternative source water for irrigation applications throughout the state, most often in agricultural crop irrigation where large volumes could be applied and in urban landscape irrigation in new developments where systems could be installed without major disruption to existing infrastructure. Since urban Broward County is already fully developed, the installation of extensive reuse systems for irrigation applications would require substantial disruption of existing infrastructure while supporting a relatively small amount of reuse for the size of the investment. The ability to effectively pursue such projects is complicated by the diversity of entities with which coordination is required and the lack of a regional reuse plan. Another challenge associated with reuse development for irrigation applications is the fluctuating demand which can result from seasonal variability in landscape irrigation and virtual elimination of irrigation demands during wet season storm events. Such variable and unpredictable demands for reuse water requires that an alternative disposal mechanism be available to manage wastewater flows when reuse demands drop-off.

Given the constraints and limitations associated with traditional reuse applications, non-traditional reuse projects having been gaining interest, such as the advanced treatment of wastewater to a level suitable for recharge of surface water and groundwater resources. Reuse for surface water and aquifer recharge could produce a variety of water reuse benefits including wellfield recharge, abatement of saltwater intrusion, and natural systems rehydration. These types of applications are attractive in that large volumes of reuse water can be utilized, with presumably less conveyance infrastructure than required for traditional irrigation applications. The drawback is the increased cost of treatment that would be required for direct discharge to the County's surface waters or groundwaters, as compared to irrigation quality reuse. Recharge of the Floridan Aquifer offers another potential reuse application with the potential for "freshening" the aquifer and abating the intrusion of saline ocean water into eastern Floridan wells. Since the Floridan Aquifer exhibits a lower water quality than the Biscayne Aquifer, there may be lesser treatment requirements for water used to recharge the Floridan Aquifer, as compared to the Biscayne, thereby reducing treatment costs associated with this potential reuse application.

Another aspect to be considered in developing reuse plans and projects are the objectives to be achieved. Ideally, projects implemented for the purpose of satisfying obligations of ocean outfall legislation would achieve the multiple benefits of creating an alternative method of wastewater disposal, producing water resource benefits, and meeting some portion of the county's projected water

supply demand. It should be recognized, however, that reuse applications will not necessarily achieve a 1:1 offset of potable water demand, depending on the historical source water used in irrigation applications. For example, many water users in Broward County utilize individual irrigation wells for landscape irrigation, as well as canals, stormwater lakes, and other surface water features. In these instances, reuse water delivered for this purpose may not result in an equivalent reduction in demand measured at the water utility and thus may not achieve a 1:1 potable water offset. Such projects may have enhanced value in eastern portions of the County where saltwater intrusion requires water users to rely more heavily upon potable water for landscape irrigation. Efforts might also focus on means of achieving quantifiable benefits of surface and groundwater recharge at discrete wellfields in order to achieve credit for recharge projects and recognized offsets to expanded wellfield operations, in accordance with the Regional Water Availability Rule. Technical Team members were requested to give special consideration to reuse opportunities in their identification of possible regional water project concepts, and the specific provisions of the ocean outfall legislation.

Broward municipalities, water utilities, and wastewater service providers have recognized the potential water supply benefits of investing in reuse and as a result a growing number of reuse projects were being developed even in advance of the state's ocean outfall legislation. Entities with active reuse programs have included the City of Hollywood, Broward County's Water and Wastewater Services, the City of Pompano Beach, the City of Miramar, and the City of Coconut Creek. Notable efforts include the expansion of reuse systems into unincorporated parts of the County and the development of reuse applications to offset potable demands and provide aquifer recharge in eastern Pompano where potable wells have been subject to saltwater intrusion. Reuse planning continues to advance in Broward County with many entities considering a diversity of traditional and non-traditional reuse applications. Broward County's WWS and the City of Hollywood are expanding and refining their own reuse master plans for concurrency with legislative reuse obligations, as are several of the municipalities who are similarly impacted as large users included in one of these regional wastewater service areas.

C-51 Reservoir

The C-51 Reservoir project concept was originally presented as a component of the Comprehensive Everglades Restoration Plan (CERP) as a means of providing surface water storage for stormwater runoff that would otherwise discharge via the C-51 Canal to the Lake Worth Lagoon. These excessive discharges were observed to negatively impact the downstream aquatic system. The purpose of the proposed surface water reservoir was to provide an environmental benefit by reducing the magnitude of excess freshwater flows and associated nutrient inputs to the downstream system. The project's effectiveness, however, would be dependent upon an unknown user who would take consistent advantage of this water supply, thereby maintaining continuous storage capacity within the reservoir for the diversion of additional freshwater flows. With no identified large user, and with many CERP projects being reevaluated, the project concept had not actively progressed as part of CERP but remained a viable strategy for meeting both environmental and water supply goals.

In 2006, seven water utilities from Palm Beach and Broward counties began to explore the feasibility of developing a regional surface water reservoir in an area immediately north of the C-51 canal in Palm Beach County. This interest was based, in part, on an existing reservoir in central Palm Beach County (the L-8 Reservoir) that had demonstrated promise in providing long-term surface water storage, and the availability of land adjacent to this site for similar use. Interest in the project grew with adoption of the Regional Water Availability Rule, based on the project's potential to capture and

store large volumes of stormwater runoff that could provide an important mechanism for supplementing regional water deliveries and serve an alternative water supply.

Recognizing the magnitude of the initiative, in terms of both regional coordination and regulatory considerations, the partners invited the participation of the SFWMD whose contributions, among others, would include the provision of technical support and a mediator to help facilitate regional discussions. The mediator provided valuable assistance in helping partners frame the regulatory issues requiring coordination with the SFWMD and worked to facilitate communications. Ultimately, Broward and Palm Beach utilities agreed to participate financially in a feasibility analysis to investigate the possible development and benefits of a regional surface water storage reservoir, which would come to be referred to as the C-51 Reservoir Project. Partner utilities included Broward County, Palm Beach County, City of Fort Lauderdale, City of Plantation, City of Sunrise, City of Pompano Beach, and the City of Hollywood. The City of Fort Lauderdale served as the lead coordinating agency in the effort with contract services provided by Hazen and Sawyer.

Investigations and analyses performed between 2007 and 2008 included the calculation of updated water demand projections for Broward and Palm Beach water utilities, quantification of potential source water availability, hydrologic modeling, development of a proposed facilities plan, and rough cost estimates. As a result of these analyses it was estimated that the proposed reservoir could provide approximately 120 mgd of raw water for regional distribution via surface water canals for the purpose of providing aquifer recharge and to offset wellfield operations. It was estimated that 1 mgd of aquifer recharge could offset wellfield withdrawals at a ratio of 1:1.33, with 120 mgd of recharge supporting 160 mgd in wellfield withdrawals, and thereby satisfying approximately 66% of the 248 mgd unmet raw water demand projected for the two counties by the year 2025. Capital costs were estimated at $2.70 per gallon, lower than any of the other alternative water supply options being considered.

The results of the Hazen and Sawyer study were sufficiently promising from both a water supply and cost perspective to include the C-51 Reservoir as regional water supply project to be considered by the Task Force. The C-51 Reservoir was discussed at several Broward County and Palm Beach Task Force meetings. Dialog highlighted the potential merits of the project as well as a variety of issues requiring further analysis or resolution, including possible water quality constraints, proposed conveyance strategies, operational questions, utility credits, and cost accounting. In advance of the Joint Meeting with the Palm Beach Water Task Force, the outline for a Phase 2 Scope of Work was developed and agreed upon by the various technical parties. A result of the Joint Meeting was the stated support by each body for the continued pursuit of the project, including the proposed Phase 2 Scope of Work. It was later determined by project partners that many of the Phase 2 deliverables were more appropriately addressed by the SFWMD and in consideration of funds limitations a scaled back Phase 2A scope of work was ultimately agreed upon as the next level of analysis to be undertaken. The Scope was to include:

- Updated raw water demand projections;
- Description of a regulatory certification process for the project;
- Evaluation of two alternative direct conveyance options;
- Description of geologic and hydrologic conditions at a potential project site;
- Updated project cost estimates.

The Technical Team was asked to evaluate the C-51 Reservoir as a regional project concept and to update the Task Force on the outcome of the Phase 2A project deliverables.

Water Conservation

Water conservation has long been a part of water supply planning in Broward County with utilities investing heavily in leak detection programs and having adopted water conservation rate structures to encourage conservation by users. Task Force members provided clear direction in their desire to include water conservation as a priority recommendation and to be provided more information regarding existing efforts, realized benefits, and opportunities for expanding efforts in both the residential and commercial sector. Background information presented to Task Force members included water utility presentations regarding the cost-benefit of water conservation as a premier component in water supply planning, presentations by water managers in neighboring counties where water conservation has proven essential to meeting regional water supply needs, and review of existing county-wide water conservation initiatives, including the NatureScape Broward program, Water Matters Day, and the NatureScape Irrigation Service, which all involve broad community collaborations.

While existing water conservation efforts were celebrated, there was strong sentiment on the part of the Task Force members to be more aggressive through outreach, ordinances, and regulation. In response, the membership was presented with a proposal for a county-wide water conservation and incentives program that would deliver a uniform message and offer common program benefits to all residents throughout Broward County. This program proposal not only gained the support of the Task Force, but it was requested that the program proposal be presented to the Broward League of Cities, where additional support was later secured as well. In the area or ordinances, the membership requested that the Technical Team investigate and present information on means for achieving enhanced water conservation through modifications to building codes. Of specific interest was the potential to achieve significant reductions in water consumption through more efficient cooling tower technologies as cooling towers are estimated to account for as much as 80% of total water consumption in large commercial and residential structures. With respect to regulations, the membership discussed the value of implementing a permanent 2-day per week limitation on landscape irrigation, a proposal that had been pursued by the SFWMD on a regional level, but which had met with strong resistance. Concurrent with these discussions, the Broward County Board of County Commissioners moved forward with and ultimately adopted an ordinance providing for county-wide year-round water conservation measures limiting landscape irrigation to no more than twice per week While the item was never formally considered for a vote by the Task Force members due to lack of quorum at the time of consideration, support for the ordinance was expressed by the majority of members present.

Despite the overwhelming and frequent support stated by Task Force members for water conservation, the membership felt it would be important to weigh the performance and economics of various water conservation strategies against other water supply options and also requested additional information on water utility conservation rate structures. It was acknowledged by the Task Force that one of the principal difficulties with water conservation efforts is the mistaken perception that this approach is “no cost” rather than “low cost.” There has been a failure to invest adequately in water conservation programs and messaging, which must be regularly reinforced, and the Task Force was eager to put a dollar amount to any forthcoming recommendations in this area.

Each of the subjects highlighted above became an area of special consideration and assignment by the Technical Team with work products that were produced and reported. These efforts are discussed in further detail below with deliverables included in the report appendices.

B. Climate Change

Background presentations delivered by Technical Team members detailed the close linkages between water resource sustainability and water supply development in South Florida with implications for both climate change mitigation and adaptation strategies. One of the most significant effects of climate change on water supply is related to projected increases in sea level rise and the resultant intrusion of saltwater into the Biscayne Aquifer. Saltwater intrusion already threatens several of the most productive wellfields in eastern Broward County with municipal wellfields operated by the Cities of Dania Beach and Hallandale Beach most constrained by rising chloride concentrations (Figure 5). The City of Pompano Beach has also been challenged by saltwater intrusion that constrains the City's eastern wellfield and the City having implemented several mitigation projects. Saltwater intrusion into the Biscayne Aquifer is primarily the result of historical drainage of the Everglades and urban counties. With the reduction in groundwater levels and freshwater head or pressure, saltwater from the ocean is able to protrude farther into the Biscayne Aquifer (Figure 6).

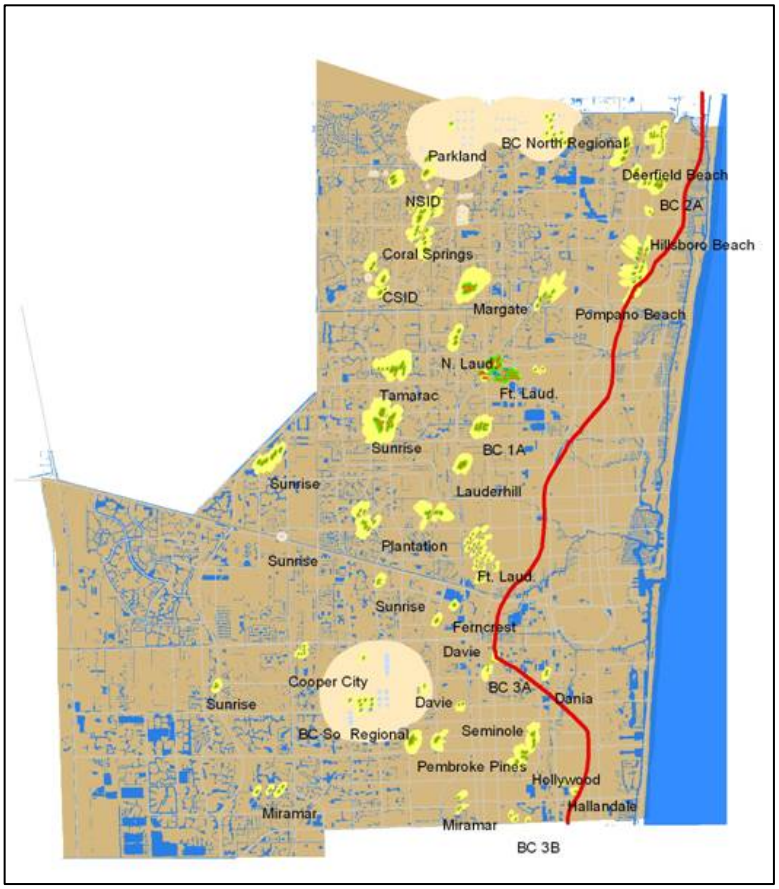

Figure 5: Saltwater intrusion has impacted some coastal wellfields in Broward County

Hydrologic modeling has demonstrated that wellfield operations and drought can exacerbate saltwater intrusion by lowering groundwater levels. Application of Broward County's north regional saltwater model investigated the contributions of climatologic and operational influences on saltwater intrusion and revealed that the progression of saltwater intrusion was substantially hastened by the combined effects of wellfield operations and sealevel rise, beyond that which might be predicted based on individual contributions of each of these factors. Technical presentations also showed that saltwater intrusion can be abated by mitigation activities designed to increase groundwater levels, such as the maintenance of higher control elevations in nearby canals, aquifer recharge, and modified wellfield operations. Furthermore, it was demonstrated that mitigation strategies not only serve to

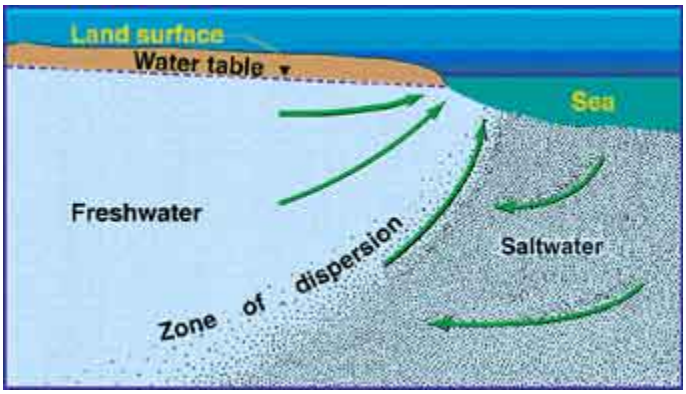

Figure 6: Schematic of saltwater intrusion

abate saltwater intrusion, but can also reverse this trend, albeit at a rate ten times slower than the rate of the initial progression of the saltwater front.

Another aspect of water supply planning considering within the context of climate change was that relating to the energy demands of the various treatments technologies used to produce potable water. Technical presentations highlighted the fact that the current treatment of source water from the Biscayne Aquifer is the least energy intensive of the various water supply strategies currently used or being considered, requiring approximately 1 kwh/1000 gallons water produced. Energy demands will intensify with the development of alternative water supplies with as much as a 5-fold increase in energy demands for treatment of source water from the Floridan Aquifer and a 15-fold increase for high pressure reverse osmosis required for desalination. Thus, achievement of regional carbon emissions reduction goals will have to account for the increasing energy demands of potable water production. This makes investments in water conservation not only prudent from water supply standpoint, but also as a strategy for helping to achieve regional greenhouse gas reduction targets.

Given the strong linkages between water supply planning and issues of climate change the Task Force emphasized the importance of staying apprised of the concurrent activities of the Broward Climate Change Task Force so that the longer-term effects of climate change and saltwater intrusion are considered when developing new water supply project proposals and strategies for preserving capacity at existing wellfields. Furthermore, interest was stated in achieving optimal use of existing treatment infrastructure which is expected to remain substantially underutilized due to limits on withdrawals from the Biscayne Aquifer. Alternative water supply projects designed to provide aquifer recharge with offsets to wellfield withdrawals might offer a means for gaining additional use of existing infrastructure and avoiding production of the same volume of water via more energy-intensive treatment technologies.

C. Role and Special Assignments of Technical Team

The Task Force's consideration of the issues detailed above resulted in several comprehensive assignments delegated to the Technical Team, these included: 1) update of local water demand projections to aid in regional planning efforts; 2) evaluation of current water supply development commitments and timetables for new water; 3) development and ranking of potential regional water supply projects; 4) investigation of cooling tower water conservation strategies and implementation options; 5) evaluation and prioritization of water conservation options; and 6) preparation of a briefing white paper on the status of C-51 Project concept.

Water Demand Projections and Water Supply Work Plans

The first major undertaking by the Technical Team was to update regional water demand projections based on current growth trends and rates of per capita water consumption. Fundamental to this assignment was updated population projections provided by the Broward County Environmental Protection and Growth Management Department derived from application of the County's Population Forecasting Model based on population data measured in 2008 and projected through 2035. Comparison of the 2005 and 2008 model runs revealed notable differences, particularly for the period from 2005 to 2010 when annual average population growth is predicted to drop from the earlier estimate of 27,883 to just 6,515, with annual population growth rates expected to remain below historical levels through 2015 (Table 2).

Table 2: Broward County Population Comparisons

				Population			
	2000	2005	2010	2015	2020	2025	2030
2005 Model	1,623,018	1,765,855	1,905,271	2,038,381	2,159,926	2,264,855	2,348,552
2008 Model	**1,623,018**	**1,739,487**	**1,772,060**	**1,876,261**	**2,000,888**	**2,114,586**	**2,214,420**
difference	0	26,368	133,211	162,120	159,038	150,269	134,132
				Annual Average Population Growth			
		2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
2005 Model	-	28,567	27,883	26,622	24,309	20,986	16,739
2008 Model	-	**23,294**	**6,515**	**20,840**	**24,925**	**22,740**	**19,967**
difference	-	5,274	21,369	5,782	-616	-1,754	-3,227
				Historic Annual Average Population Growth			
	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	
	51,318	28,313	21,176	26,279	34,635	38,862	

Data were then refined by the Natural Resources Planning and Management Division staff to develop projections for individual water utilities utilizing population data for Traffic Analysis Zones and GIS coverages developed for each of the water utility service areas. Regional and utility-specific water demand projections were then recalculated based on the 2008 population update and per capita water demands provided by individual water utilities as part of their 10-Year Water Supply Facility Work Plans (Table 3). While reduced rates of population growth clearly affect the timing of projected water demands, reduced rates in per capita water demand were found to exert significant influence on the overall magnitude of future demands and the demand-not-met calculation. The per capita rate of water consumption has exhibited a remarkable 25% reduction between 2000 and 2010 when demands dropped from 161 to 137 gallons per capita per day as a result of water conservation measures implemented during the water shortage in 2007. Additional water conservation efforts could further reduce and delay the need for major water supply projects throughout Broward County.

Table 3: Water Demands 2010-2035, based on population projections						***July 24, 2009***
UTILITY	YEAR 2010 DEMAND, mgd	YEAR 2015 DEMAND, mgd	YEAR 2020 DEMAND, mgd	YEAR 2025 DEMAND, mgd	YEAR 2030 DEMAND, mgd	YEAR 2035 DEMAND, mgd
BC District 1	8.4	9.2	10.2	11.0	11.7	12.2
BC District 2/North Regional	14.7	15.7	16.9	17.9	18.8	19.3
Cooper City	3.2	3.7	3.8	3.8	3.9	3.9
Coral Springs	7.7	8.2	8.9	9.4	9.7	9.9
CSID	4.6	4.7	4.7	4.8	4.9	5.0
Dania	2.2	2.5	3.0	3.3	3.6	3.7
Davie	4.5	5.0	5.5	6.0	6.3	6.5
Deerfield Beach	7.8	8.2	8.6	9.1	9.5	9.8
Ferncrest	0.4	0.4	0.4	0.5	0.5	0.5
Fort Lauderdale	38.8	41.0	44.0	47.0	49.9	52.0
Hallandale	4.9	5.4	6.0	6.6	7.2	7.6
Hillsboro Beach	0.8	0.8	0.9	1.0	1.1	1.2
Hollywood	23.9	25.4	27.4	29.5	31.5	33.0
Lauderhill	8.0	8.4	8.9	9.4	9.7	10.0
Margate	8.1	8.5	8.8	9.3	9.8	10.2
Miramar	9.4	9.9	10.5	11.1	11.6	11.8
North Lauderdale	3.4	3.5	3.7	3.9	4.1	4.1
NSID	4.2	4.5	4.9	5.1	5.3	5.3
Parkland Utilities, Inc.	0.2	0.3	0.3	0.3	0.4	0.4
Pembroke Pines	12.6	13.0	13.5	13.9	14.2	14.4
Plantation	14.6	15.4	16.4	17.3	18.0	18.4
Pompano Beach	15.4	16.4	17.6	18.9	20.1	21.1
Royal Utility Company	0.4	0.4	0.4	0.4	0.4	0.4
Seminole	0.0	0.0	0.0	0.0	0.0	0.0
Sunrise	31.8	33.4	35.2	36.6	37.7	38.3
Tamarac	7.1	7.4	7.7	7.9	8.2	8.3
TOTALS:	**237**	**251**	**268**	**284**	**298**	**307**

These data were reviewed with SFWMD staff and water utility directors to arrive at revised County-wide unmet water demand projections of 20-47 mgd by 2035, a significant reduction from the 106 mgd deficit that was predicted for 2025 at the time of the LEC Update. This predicted reduction in total water demand was perceived as offering some reprieve for water providers who may now have additional time for project planning, analysis, and decision-making. Consideration of these updated water demand figures alongside reasonable water conservation targets and mandated reuse obligations reveals a significant opportunity to realize a major portion of the future county-wide unmet water demand through these two water supply strategies, with the potential to largely defer other major capital investments for several decades.

Concurrent with this analysis was an assessment of utility treatment plant capacity compared to finished water allocations from the Biscayne Aquifer, and anticipated demands for finished water derived from the Biscayne Aquifer based on alternative water supply project commitments through 2025, as represented in the LEC Update (Figure 7).

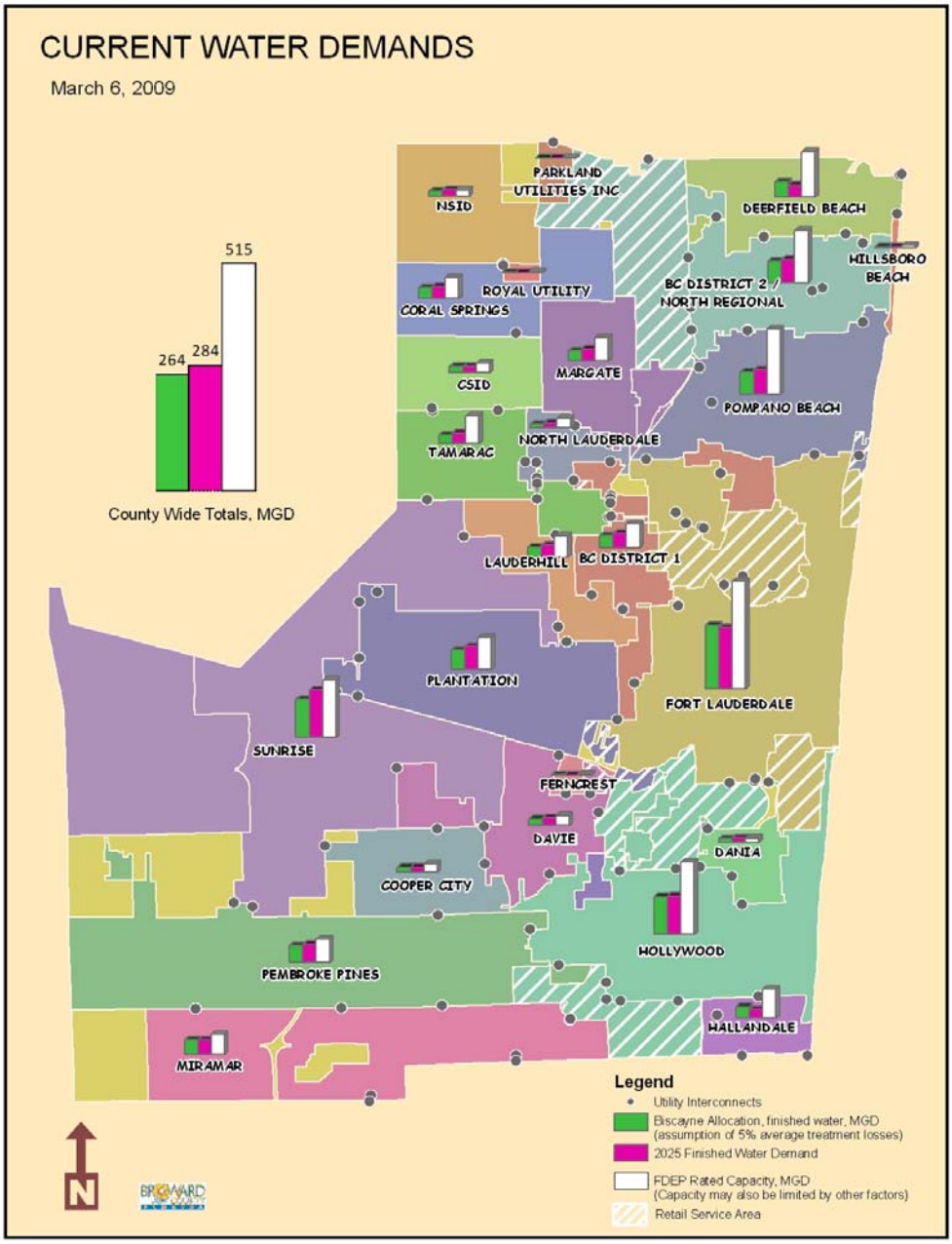

Figure 7: Current Water Demands as of March 2009

The purpose of this exercise was to identify those regions of the county where constraints on wellfield withdrawals are expected to result in stranded capacity at water treatment facilities. While some utilities are expected to implement aquifer recharge projects as a means to offset additional wellfield operations, these projects are relatively small in scale and in most instances there is little difference between the current Biscayne allocation and the anticipated demand on the Biscayne in 2025. This analysis revealed a tremendous excess of treatment plant capacity, particularly in eastern portions of the County where saltwater intrusion has restricted the use of coastal wellfields, and the potential for making greater use of existing infrastructure at these and other sites through aquifer recharge and offsets to additional Biscayne withdrawals.

Evaluation of Water Supply Commitments

Regional water demands and utility plans to invest in Floridan wells was another area of analysis by the Technical Team with the objective of determining where opportunities might exist for consolidation of Floridan systems or the building of additional capacity into programmed projects. The assessment was undertaken based upon project commitments through 2013, submitted as part of water utility Work Plans, and updated water demand projections. The exercise also served to quantify the 2025 unmet demand following development of planned Floridan projects. However, recognizing that the demand predictions are estimates, the absolute numbers were of less importance than the spatial distribution and general scale of the programmed projects which did reveal several larger scale Floridan systems planned by at least four Broward water utilities and neighboring communities with relatively small future demands where collaborations might be worth exploring (Figure 8).

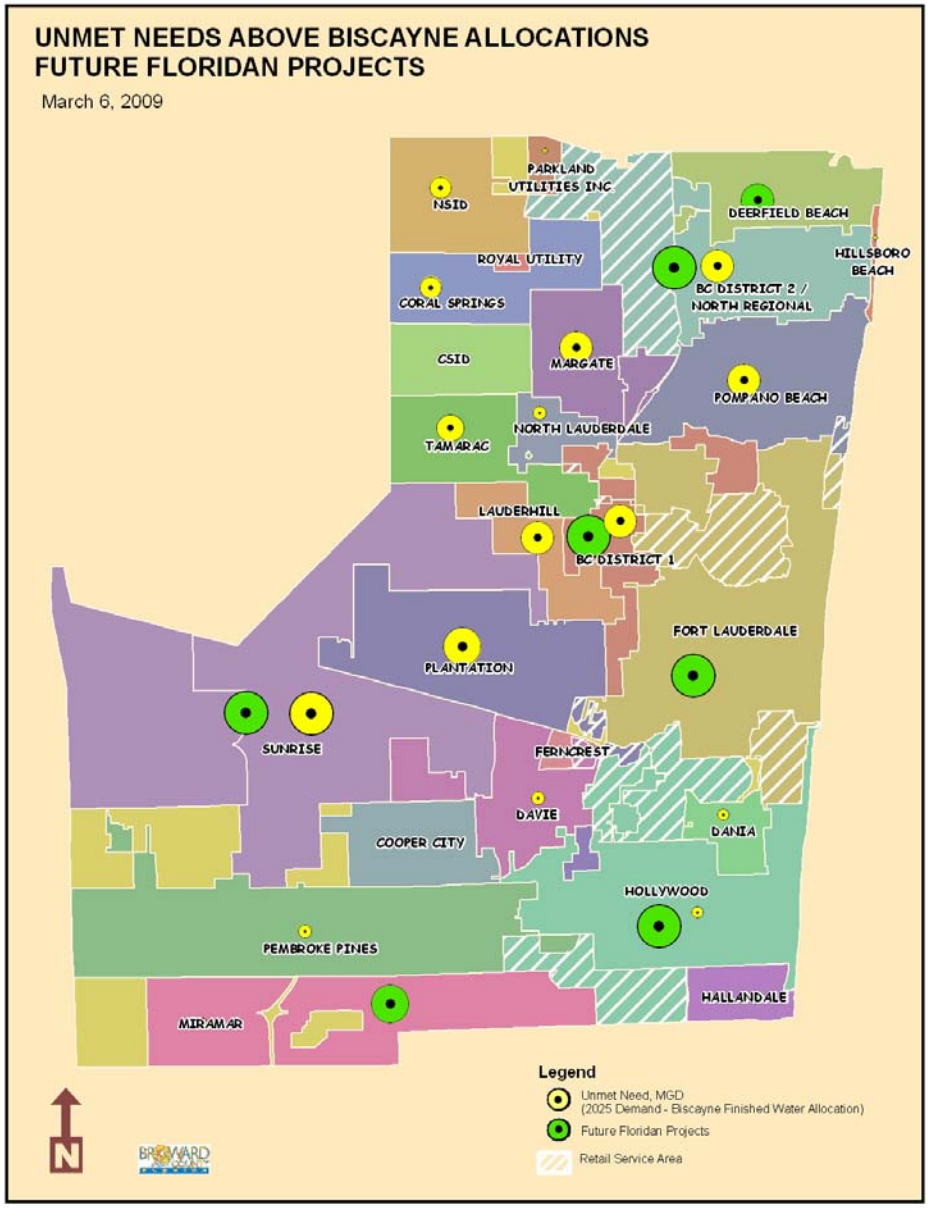

Figure 8: Unmet Water Needs above Biscayne Allocation and Proposed Floridan Projects

Building upon the evaluation of Floridan water supply commitments, a timetable was constructed to show projected water demands at 5-year intervals for each of the water providers in Broward County presented alongside current Biscayne water allocations and Floridan water supply commitments for each of these entities (see WRTF Water Supply Milestones Table in Appendix C). The table provided a simple tool for visualizing when water demands for each of the water providers was expected to exceed the combined availability of water from Biscayne and Floridan sources. Also identified were points in time when alternative water supply project development should commence in order to ensure the necessary availability of water and assuming a standard 5-year timeframe for completion of project design, permitting, and construction.

These analyses, the recalculation of water demand projections, identification of facilities with stranded capacity, the spatial distribution, timing and scale of planned Floridan projects, and future unmet demands, provided vital information for the next major assignment assumed by the Technical Team, the development and subsequent rating of proposed regional water supply project concepts.

Regional Water Supply Project Concepts

The development of regional water supply projects presented a major undertaking for Technical Team members. The assignment was approached by dividing the county into 3 sub-regions with subcommittees created to focus on the development of project proposals within each of the regions. The following table is a summary of water utility service areas included in each of the regional analyses.

Region 1 **Northeast and Central**	**Region 2** **Southwest and Central**	**Region 3** **Southeast**
Deerfield Beach	Sunrise	Fort Lauderdale
Broward County 1A/2A	Pembroke Pines	Dania Beach
Pompano Beach	Miramar	Hollywood
Coconut Creek	Cooper City	Hallandale Beach
Hillsboro Beach	Davie	Lauderdale Lakes
Lauderdale by the Sea	Plantation	Wilton Manors
	Lauderhill	Oakland Park
		Broward County 3

The Technical Team did not include northwestern Broward County in the analysis as it was understood that water utilities in this region of the county were already coordinating in the development of regional project concepts inclusive of their service areas.

The participants in the regional projects subcommittees convened independent of the full Technical Team to develop a strategy for project identification and evaluation. It was agreed that each of the subcommittees should, to the extent practical, seek to identify regional project concepts involving the Floridan Aquifer, wastewater reuse, and aquifer recharge with the C-51 Regional Reservoir to be included in each of the regional evaluations. Each proposal was to include a project description, potential partners, an evaluation of the project pros and cons, a detailing of any issues, a plausible timeframe for targeted development, and the unit cost of water. The sizing of proposed projects was not addressed in the exercise as it was agreed that the scale of any proposed project could be variable and influenced by numerous undetermined factors.

The results of this effort were summarized in a matrix listing proposed regional water supply concepts by region and project type (see Appendix D). Several project concepts for each region were selected for presentation before the Task Force to provide a sense of the type of collaboration and project benefits that might be achieved for regional projects involving Floridan systems and reuse. The full complement of proposed Floridan and reuse projects is summarized below with an asterisk identifying those projects individually presented to the Task Force. Those projects selected for presentation are accompanied by figures which show the geographic location of the proposed project, the location of relevant water supply infrastructure, and the spatial extent of anticipated project benefits. Project details can be found in the project matrix.

C-51 Regional Reservoir

The C-51 Regional Reservoir project proposal received substantial consideration by the Technical Team with the project concept presented before the Task Force and serving as the basis for a joint meeting with the Palm Beach Water Resources Task Force. In this process, the Technical Team coordinated with counterparts supporting the Palm Beach Water Resources Task Force in the review and evaluation of key unanswered concerns related to the project and potential tasks for inclusion in a Phase 2 analysis. As discussed earlier, both the Broward and Palm Beach Water Resources Task Forces voted to support further investigation of the feasibility of the project with a Phase 2 Scope of Work. Partners in the project determined that insufficient funds were available to complete all potential Phase 2 tasks that had been identified, but that a more detailed analysis of some of the technical aspects of the project could be undertaken as part of a Phase 2A Scope or Work, and that these findings would strongly influence the determination of project feasibility from water supply, environmental, and cost perspectives. In response to specific concerns and questions raised during concept development, the Phase 2A Scope of Work was finalized to include and update of raw water demand projections; a process for regulatory certification of the project and water made available; evaluation of conveyance options; geologic and hydrologic conditions of the proposed site; and updated cost estimates.

In January 2010, the Task Force was provided a "C-51 White Paper Briefing Document" that included a summary of each of the project deliverable completed under the Phase 2A Scope of Work and suggested next steps (see Appendix E).

Primary conclusions were as follows:

1) The study results support continued development of the project concept based on geotechnical analyses which appear promising regarding the potential function of the proposed C-51 site as a water storage reservoir, recognizing that more detailed analyses will need to be undertaken as part of a more detailed project design.

2) To avoid any potential for water quality impacts on the Loxahatchee Refuge, recommended conveyance alternatives include routing through the EAA and the use of the LWDD secondary canal system.

3) The EAA conveyance alternative is estimated to provide a $50 Million cost savings over the LWDD conveyance alternative by avoiding certain capital improvements to secondary canal infrastructure within the LWDD. However, a final determination by the SFWMD about the capacity of the EAA to receive C-51 water deliveries is still required.

4) Updated water demand and cost projections continue to identify the C-51 reservoir as a potentially cost-effective waters supply alternative for water providers within Palm Beach and Broward Counties with a capital cost estimated to range from $3.08 to $4.11 per gallon and total cost (including operations and maintenance) ranging from $0.68 to $1.01 per 1,000 gallons. These estimates assume that the full capacity of the reservoir is utilized by participating water providers and will increase if demands on the reservoir are less than the projected 120 mgd to be available for delivery.

It was suggested that the Phase 2A report be disseminated for review and comment prior to finalizing and that project partners meet with the SFWMD to discuss the draft Phase 2A study and issues relating to regulation, restoration, existing infrastructure, and system operations. Once the report is finalized, it was recommended that the report be presented to both the Broward and Palm Beach Water Resource Task Forces and that consensus be sought on how to proceed, which might include project abandonment or development of a more detailed Phase 2B Scope of Work. At the time of preparation of this report, project partners were meeting with SFWMD staff to discuss advancement of the project concept and project deliverables had been distributed for stakeholder, agency and Task Force review.

As a project with the potential to provide water supply benefits to users in each of the regions evaluated, the C-51 Project Concept was included in the project rankings for each regional evaluation of water supply project options.

Region 1 – Northeast and Central Broward

A total of eight project concepts were developed for Region 1, including four Floridan projects and four reuse projects. The basic project concepts consist of the following:

Floridan Projects

1) Expand the Floridan system under development at the Fort Lauderdale Peele-Dixie Water Treatment Plant for wholesale to Broward County District 1A

2) Expand the planned Floridan system at Broward County District 1A Water Treatment Plant for potential wholesale to Margate, North Lauderdale, Lauderhill and/or Tamarac (Figure 9)

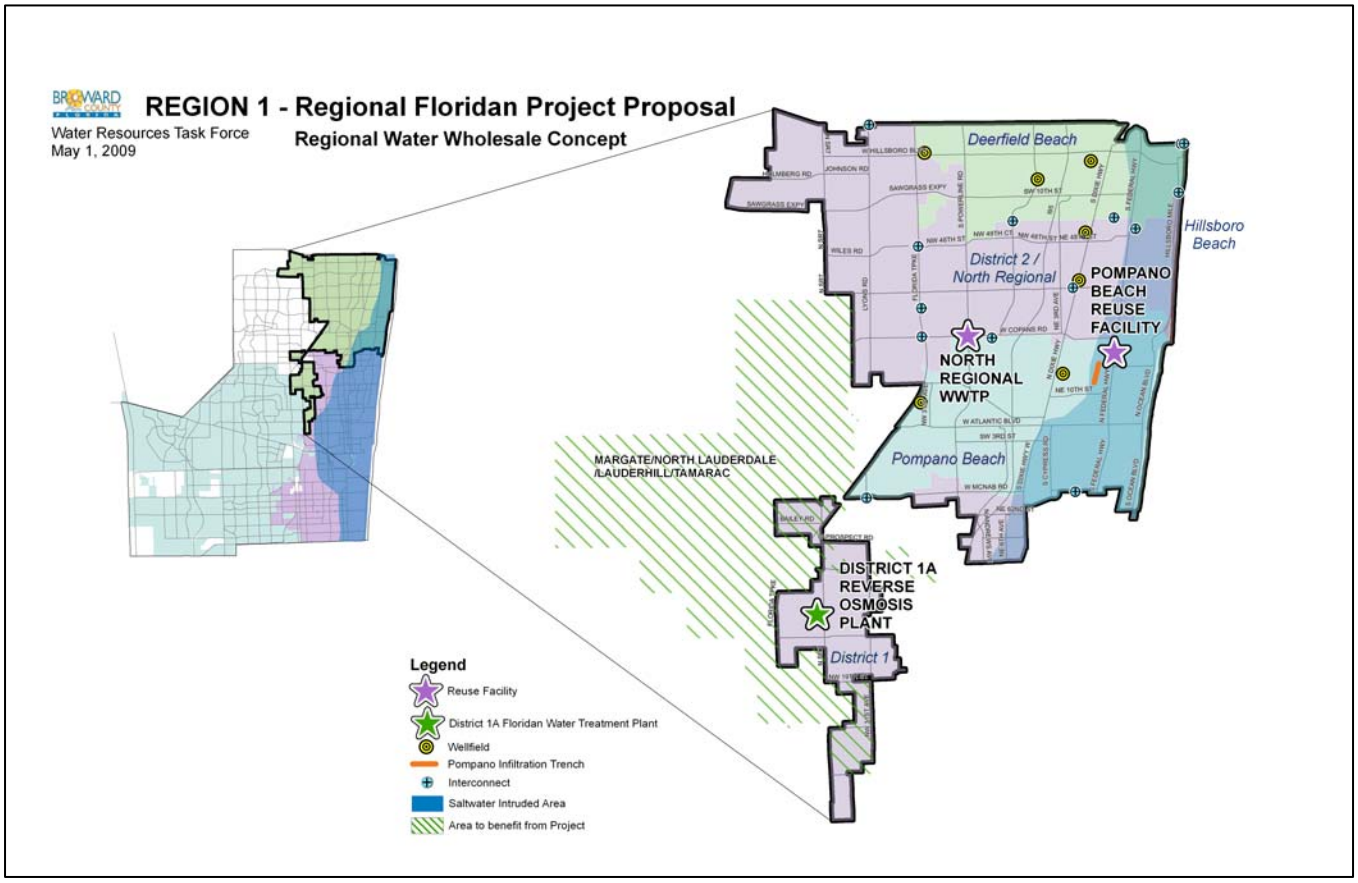

Figure 9: Region 1 Floridan Project

3) Expand the existing Floridan system at Deerfield Beach or the planned Pompano Beach system for wholesale to Broward County and transfer of Deerfield Biscayne allocation to Broward County District 2A for wholesale to Deerfield Beach

4) Construct a single Floridan Water Treatment Plant to serve Broward County District 1A and 2A

Reuse Projects

5) Increase provision of reuse water from Broward County to Coconut Creek for Irrigation (Figure 10)

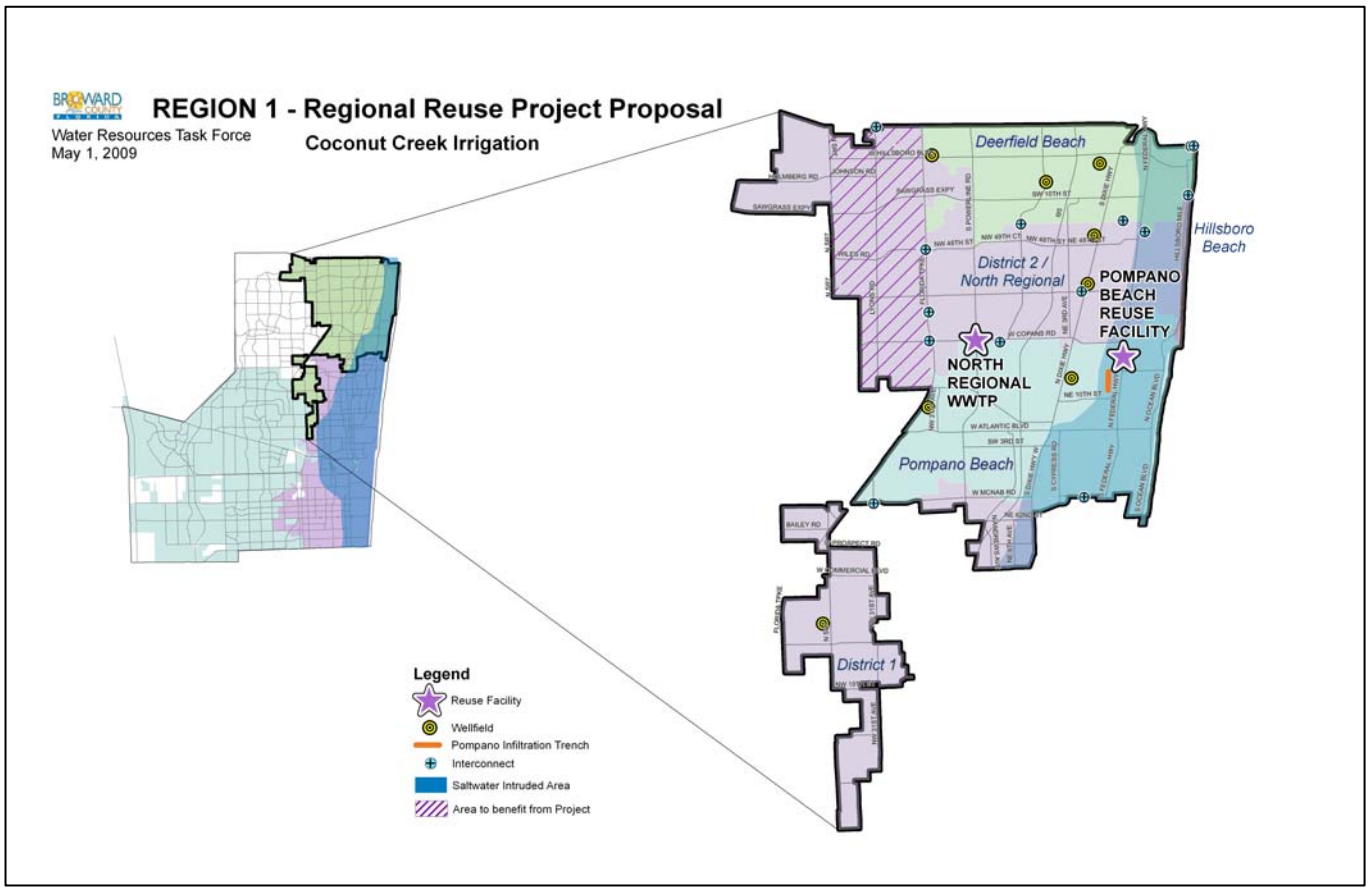

Figure 10: Region 1 Regional Reuse Project for Coconut Creek Irrigation

6) Provide new and/or expanded development of reuse for irrigation applications to reduce demands on Biscayne within service areas of Broward County, Pompano Beach, Deerfield Beach and Lighthouse Point (Figure 11)

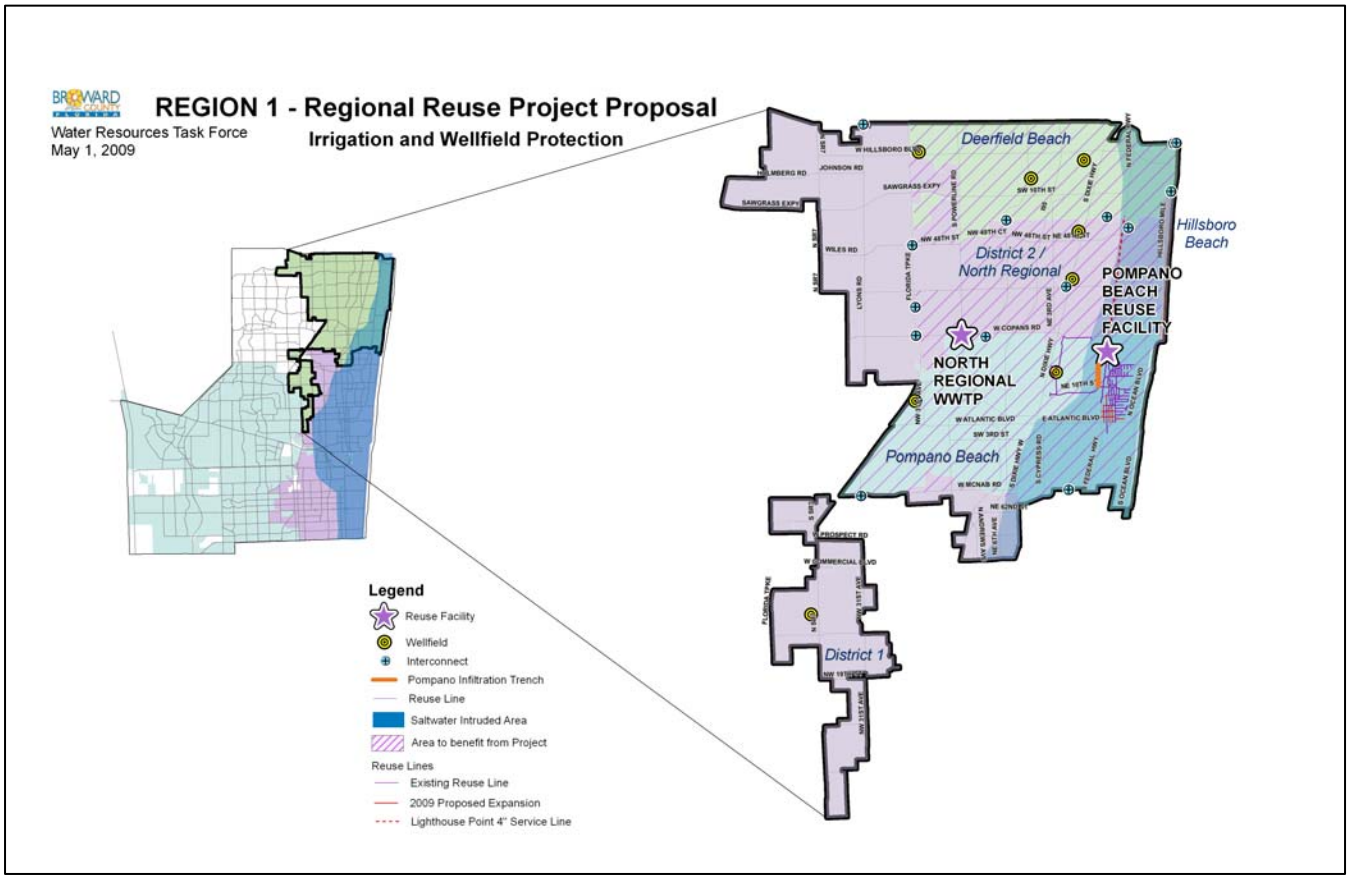

Figure 11: Region 1 Regional Reuse Project for Irrigation and Wellfield Protection

Region 2 – Southwest and Central Broward

A total of 2 project concepts were developed for Region 2.

Floridan Project

1) Construct a new Floridan Water Treatment Plant at the City of Sunrise's Park City site sized to handle the water supply needs of one to four adjacent utilities with potentially including Davie, Plantation, Cooper City, and Lauderhill (Figure 12)

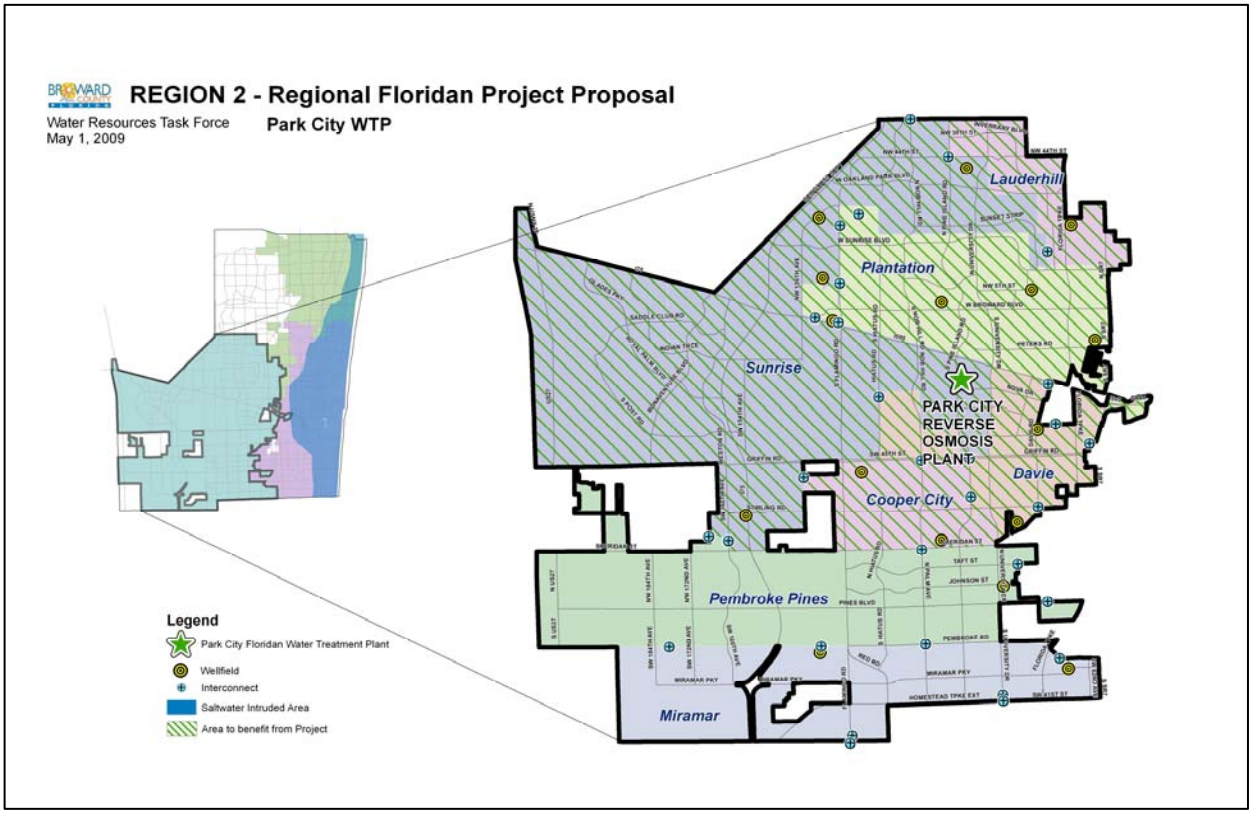

Figure 12: Region 2 Regional Floridan Project

Reuse Project

2) Expand the Sunrise Springtree Wastewater Treatment Plant to add high level disinfection to the reuse distribution system and provide reuse water for the City of Lauderhill (Figure 13)

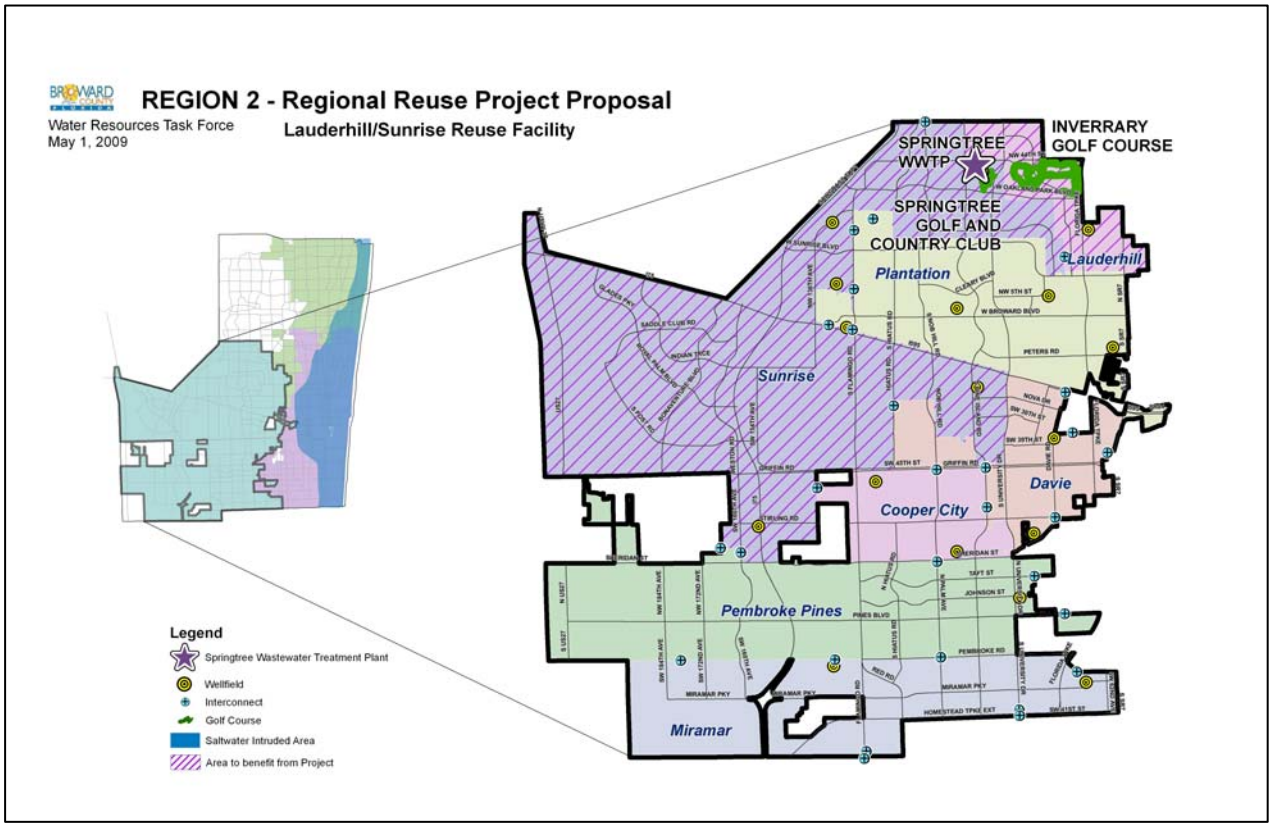

Figure 13: Region 2 Regional Reuse Project

Region 3 – Southeast Broward

A total of 3 project concepts were developed for Region 3.

Floridan Project

1) Expand an existing Floridan system operated by the City of Hollywood to provide wholesale and emergency water to nearby communities with potential partners to include Hallandale Beach, Dania Beach, and Broward County District 3 (Figure 14)

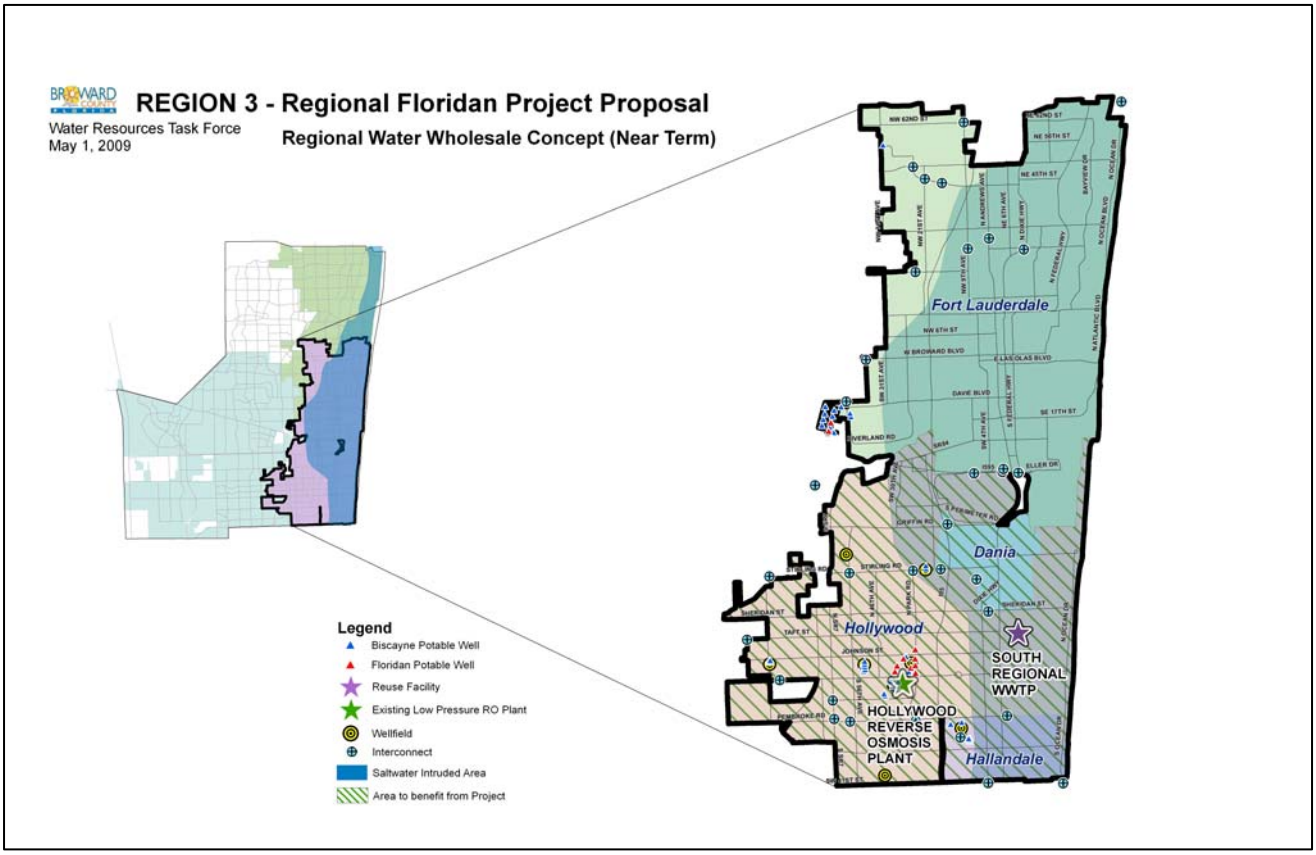

Figure 14: Region 3 Regional Floridan Project

Reuse Projects

2) Treat secondary effluent from the Southern Regional Wastewater Treatment Plant to provide recharge to the Hollywood Floridan wells for the purpose of freshening the Aquifer (Figure 15)

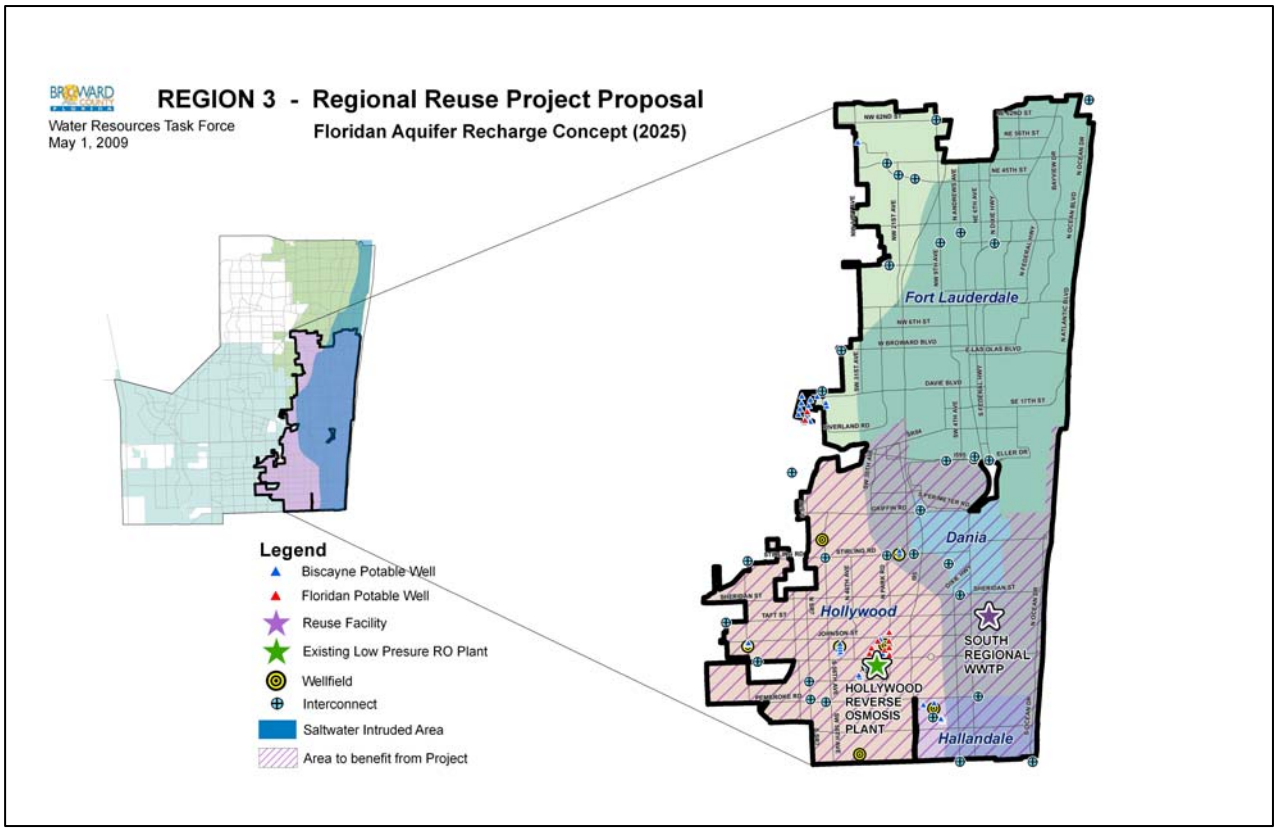

Figure 15: Region 3 Regional Reuse Project

3) Treat secondary effluent from the Southern Regional Wastewater Treatment Plant Treat to and recharge Biscayne Aquifer wellfields (Hollywood and Brian Piccolo) and also look at opportunties to retard the influence of saltwater on eastern wellfields (Dania Beach and Hallandale Beach).

Regional Water Supply Project Ranking

Completion of the regional water supply projects matrix and presentation to the Task Force was followed by a request for projects to be evaluated and ranked by the Technical Team. Representatives of the regional subcommittees along with Broward County and SFWMD staff worked to develop consistent evaluation criteria and a ranking system that could be applied across projects and within regions. Evaluation criteria were developed in consideration of regulatory and policy mandates, cost factors, infrastructure requirements and implications, system efficiencies, etc. A total of 15 evaluation criteria were decided upon which were then grouped into categories. A rating scale was then developed for the individual criteria with assigned scores of 1, 3 or 5. Scores were summed across criteria with the high scores identifying those projects of potentially greatest benefit and low scores identifying those projects of potentially lesser benefit. Each of the criteria were equally weighted, with the exception of those considered to "meet multiple objectives" with average scores calculated for criteria included in this particular category. While it was recognized that political feasibility might trump all other criteria, the Technical Team chose not to address this point, but to remain focused on the technical merits of each proposed project concept. Results of this analysis are presented in a Regional Project Prioritization Matrix prepared for Regions 1, 2, and 3 in Appendix D.

Project evaluation and ranking revealed consistently high scores for the C-51 Regional Reservoir Project across regions, outscoring other projects in Regions 2 and 3, and achieving the highest ranked score along with 2 reuse projects in Region 1. Reuse projects ranking highest in Region 1 included the development of reuse for irrigation applications. It is interesting to note that none of the proposed regional Floridan system projects in Region 1 were among the highest ranked projects and in fact these projects scored approximately 10 points or 25 percent lower than the C-51 project and irrigation quality reuse projects. Review of the data suggests this is largely due to the higher capital and operational costs of Floridan systems relative to the C-51 and irrigation quality reuse projects, environmental issues relating to energy demands and treatment byproducts of Floridan systems, and the inability of Floridan projects to help meet reuse obligations. The results of this evaluation should not be interpreted to diminish the overall value or need for any of the projects, but it does underscore the importance of advancing certain reuse projects and strategies as part of near-term alternative water supply planning.

In Region 2, the next highest ranked project following the C-51 Regional Reservoir was also an irrigation quality reuse regional project with potential for collaboration between the City of Sunrise and the City of Lauderhill. The high ranking of this project relative to other projects proposed for Region 2 is similar to the explanations offered for projects in Region 1, with the cost of Floridan systems and the value of reuse projects strongly influencing the overall project ranking.

In Region 3, the second highest ranked project was the expansion of the existing Floridan system operated by the City of Hollywood with potential partners to include Broward County and the Cities of Hallandale Beach and Dania Beach. The explanation for the higher ranking of this Floridan system proposal as compared to other Floridan projects considered in Regions 1 and 2 is largely a result of the lower cost associated with expansion of an existing system relative to the construction and permitting of a new system. Additionally, reuse project proposals in Region 3 did not rank higher as none of the proposed concepts entailed irrigation quality reuse, but rather reuse for aquifer recharge which involves higher treatment levels and cost. Expanded reuse for landscape irrigation was not a project concept included in Region 3 due to the higher chloride concentrations present in the wastewater flows

as a result of infiltration of salty groundwater into the wastewater collection system. These salts would require removal at a significant increase in treatment cost in order to produce a water quality suitable for landscape irrigation.

The timeframe for implementation was not included as an evaluation factor in the project rankings, however, it is worth noting that certain projects could be implemented in shorter time-frame as compared to others. For example, Floridan projects are considered relatively straight forward and predictable with regards to project design, permitting, and construction, and could thus be implemented rather expeditiously as compared with the C-51 project and some of the proposed reuse projects which might involve protracted permitting and uncertain regulatory requirements. The issue of project timeframe becomes a rather influential factor for water utilities that must weigh the benefits of various regional project options against the uncertainties involved. As time progresses and utilities begin to advance with more predictable and individual plans, opportunities for regional collaborations will be reduced and perhaps even foreclosed as a result of changing economics when fewer potential partners able to share in the regional project costs. Thus, the provision of regulatory assurances with regards to project outcomes could be an important driver influencing the feasibility of several regional water supply project concepts.

Cooling Towers and Condensate Recovery

The Technical Team dedicated several meetings to presentation and discussion of water consumption in cooling tower and air handler systems with a subcommittee convened to provide detailed technical review and presentation of the potential benefits of employing "no bleed" technologies and recommendations for implementation. Cooling towers provide a cooling mechanism for central air cooling and heating systems. As water is evaporated from the system, the dissolved materials in the water become more concentrated and begin to form a precipitate or scaling within the system. To avoid this occurrence, water is regularly discharged to the sanitary sewer system and replaced with new water. Cooling tower "bleed-off" is estimated to result in the loss of 5.6 mgd of water county-wide. Advances in cooling tower technologies have produced anti-scaling chemical treatment systems that dramatically reduce the need for replacement water within the system and at a lower monthly operational cost than traditional cooling tower technologies. Cost analyses performed by the subcommittee estimated that the initial system installation for a 1000 ton air conditioning system would be $8,500 offset by an assumed credit of approximately $13,000 due to avoided impact fees, resulting in an immediate cost savings of $4,500. Additionally, annual operational savings are estimated at $14,500 based on an average 1000-ton cooling system with the cost savings generated from avoided water purchase.

Also evaluated were ways to further water conservation in the built environment with condensate recovery systems. These systems can be used to capture air conditioning system condensate for return to the cooling tower as make up water. It is estimated that this conservation strategy could result in an additional 5 to 7.5 mgd of water savings and reduce sanitary treatment by 3 to 5.6 mgd. The initial cost of installation is ca. $5,500 for a 20-gallon system and $14,400 for a 45-gallon system. An additional transmission cost is applied for each floor of building height if the condensate pipe system is not at ground level. For a 28-story building this cost would range from $1,250 and $1,500, depending on the size of the system, bringing the total system cost to $14,000 for the 20-gallon system and $49,400 for the 45-gallon system being piped from ground to roof. However, if installed at the time of cooling tower upgrade, the $4,500 cost savings from the upgrade could be used to offset the initial cost of the condensate recovery system installation. Based on annual average cost savings of ca. $3,535 for a 1000-ton system the payback time for the worst case 20 and 45-gallon systems without benefit of the

cooling tower upgrade credit and not including any savings for not incurring any sewer charges would be 4 and 14 years, respectively.

A cost-benefit analysis was conducted to determine the cost-effectiveness of cooling tower upgrades and condensate recovery systems as compared to water-efficient plumbing upgrades promoted in the residential sector. The analyses were based upon the cost of the upgrade and projected water savings in the first year with both strategies demonstrating cost-benefits equivalent to residential water-efficient plumbing retrofits.

Device	Final Cost	Years for Payback	Cost per gallon saved
Cooling tower upgrade	$-4,500	immediate	$0.000
Condensate recovery - 20 gallon	$14,000	4	$0.011
Condensate recovery - 45 gallon	$49,500	14	$0.040
Low-flow faucet aerator	$5 - $10	1 to 2	$0.008 - $0.024
Low-flow toilets	$99 - $410	3 to 13	$0.011 - $0.092
Low-flow shower heads	$15- $60	½ to 10	$0.002 - $0.016

Several implementation strategies for achieving water conservation through mandatory cooling tower upgrades and installation of condensate recovery systems were presented by the subcommittee. The subcommittee recommended changes in either Florida Building Code or the adoption of local ordinances that would require these installations at the time of cooling tower replacement, so as to achieve the full benefit of existing investments and facilitate the transition during the course of necessary capital improvements. A three step strategy was proposed:

1) Submit proposed changes to the Florida Building Commission for revision to Florida Building Code to require conservation measures at the time of cooling tower replacement, and to request that cities and county send letters in support of the Building Code Amendment.
2) Submit proposed changes to the Broward County Board of Rules and Appeals if the state amendment fails or if there is a desire to attempt fast-tracking through a local process.
3) Draft local ordinances for adoption if the proposed amendment to Florida Building Code is not achieved.

In presenting these alternatives it was acknowledged by subcommittee members as well as representatives of the Broward County Board of Rules and Appeals that local amendments to state building code can be difficult to achieve with historical practice focused on maintaining consistency in building code regulations across the state. There were, however, no objections expressed with respect to possible pursuit of a local amendment, if necessary. Draft language for the proposed amendment to state building code was prepared for consideration by the Task Force (see Appendix F).

Water Conservation Options and Benefits

Presentation by the Technical Team of the regional water supply project concepts raised several questions by Task Force members about the value and ranking of water conservation strategies as compared to capital projects and investments in alternative water supply development. Concern was expressed that the Task Force had deliberated at great length with regards to the water conservation and its prominence in the recommendations of the Task Force, and while the intrinsic value was well understood, there is often an assumption that water conservation has no cost. An ability to capture the

cost of conservation would be important to ensure that water conservation efforts are appropriately budgeted. It was requested that the Technical Team prepare cost-benefit information for various water conservation strategies for budgeting purposes and for consideration alongside regional water supply project proposals.

Broward County staff conducted a comprehensive analysis of water conservation efforts, reports and achievements for a number of programs across the country and within the State of Florida. It soon became clear that caution should be exercised in drawing too specific of comparisons between programs as data reflect numerous unknown factors and assumptions. For example, the water savings and cost-benefit of an individual practice are typically presented as amortized over the lifetime of the device, or the length of time for which a program/practice has been in place. Thus, the newer the program the less cost-effective the program might appear, not yet having the benefit of being able to claim several years of continuous water savings as a result of the initial investment. Furthermore, performance data can be skewed based on the geographic region or demographics included in the program.

Thus the principal objective of this exercise was to summarize and present the cost-benefits of known conservation strategies achieved through established programs for consideration as part of regional conservation efforts in Broward County. Analysis of various program efforts revealed a wealth of data available for individual best management practices, such as toilet rebates, toilet distributions, washing machine rebates, etc. While program costs were available, there was a lack of data or quantifiable measures of effectiveness for water conservation outreach and educational efforts. Although recognized to be important and necessary tools, specific water savings were generally assigned to program components rather than the overall campaign.

The comparison of water conservation programs and initiatives to the cost of capital projects is not straightforward. Conservation efforts are generally reported as operational expenses while regional project proposals were evaluated based on capital costs. Nonetheless, the estimated cost of various alternative water supply strategies considered as part of regional projects was compared to the cost of water conservation initiatives in Broward County and regional water conservation programs outside of the County (Table 4). These comparisons indicate that water conservation efforts should be able to produce the same volume water at just a fraction of the cost of a major capital project.

Table 4 - Proposed Broward capital project costs as compared to costs for various conservation programs	
Project	**$ Cost/1000 gallons**
C-51 Reservoir Project	$2,700 + treatment
Floridan Expansion	$7,000
Reuse systems	$10,000-$12,000
Floridan – Expansion of Hollywood WTP	$3,000
Biscayne aquifer recharge	$15,000
NatureScape Irrigation Service (2009)	$1.41
Condensate Recovery System[1]	$0.38-$1.79
Plantation HET Program	$9.78-$10.91
Water SIP Projects (2003-2010)	$5.15
SAWS conservation program (2009)	$9.59
Tampa Bay Water indoor program (2009)[2]	$15.95
Public Outreach Program-Cary, NC (2001)[3]	$0.49

[1] Per Bassett, amortized 20 years

[2] Compilation of Member's 5 Year Conservation Plans – Table B – BMP Implementation Status/Cost Effectiveness, Tampa Bay Water (2009). Not amortized over life of fixture

[3] EPA Cases in Water Conservation (2002), cost adjusted to 2008 CPI

To better evaluate the comparative value of individual water conservation strategies that are either already being employed or that might be considered for inclusion in a regional water conservation strategy, a comprehensive summary of best management practice and program performance was prepared (Table 5).

The assessment included both demand and supply-side conservation measures and a variety of conservation tools, such as high efficiency plumbing retrofits and rebates, landscape irrigation evaluations, residential and commercial audits, leak detection programs, and comprehensive conservation programs. Based on this analysis, it appears that the more traditional and widely-proven measures achieve a cost-benefit of ca. $1.40 (or less) per 1000 gallons of water saved. Strategies costing much more may not represent the most cost-effective investment for a regional water conservation campaign. Comprehensive water conservation programs are shown to have a much higher cost, ranging from $16 to $25.5 per 1000 gallons, but again, the full benefit of comprehensive outreach programs are routinely underestimated and difficult to quantify.

Table 5: Cost of Water Conservation Measures

Demand Side Conservation Measures	**$/1000 gal**
Conservation Audits*	$3.91
Device Giveaways*	$1.38
Washing Machine Rebate*	$1.23
Landscape Conversion Rebate*	$3.38
Toilet Rebates*	$1.30
Toilet Distibution*	$0.54
Residential Ultra Low Flow Toilet (ULFT) Rebates*	$1.38
Residential ULFT Direct Install*	$1.20
Commercial,Institutional, Industrial ULFT Replacement*	$1.92
H-Axis Washer Rebates*	$3.91
Home Survey - Targeted*	$4.91
Home Survey - Untargeted*	$5.53
Residential Metering*	$0.69
Tampa Bay Water	
High-Efficiency Clothes Washer Replacement-Single Family Home	>$1.50
High-Efficiency Toilet Replacement	$0.75-$1.25
Urinal Replacement	<$0.50
ICI Water-Use Evaluations/Implementation	$0.50-$1.00
Distribution Side Conservation Measures	
includes active leak detection, district metered area, pressure management	
7 United States Utilities (average)*	$1.32
Orange County Utilities-Florida*	$1.42

SOURCE:

*** Sturm & Thornton, Water Loss Control in North America: More Cost Effective Than Customer Side Conservation - Why Wouldn't Your Do It?! (2007)**

IV. TASK FORCE STRATEGIES AND RECOMMENDATIONS

The Broward Water Resources Task Force convened monthly over a period of 16 months with the goal to work collaboratively in developing regional and sub-regional strategies to help meet shared water resource needs and water conservation goals. The Technical Team worked closely with Task Force members to provide background information and respond to requests for information that would help guide decision making. During the course of these meetings, the Task Force considered diverse means for achieving complex and interrelated water resource goals ranging from regional water supply projects, to water conservation strategies, to technical analyses and investigations, to coordinated water management strategies, to governance.

A. Areas of Consideration

Water Conservation

Water conservation remained an area of strong support for the Task Force membership with nearly 25% of the Task Force's final recommendations geared at achieving broad and consistent participation in conservation strategies. Recommendations include initiatives involving outreach and education, code amendments, regulations, and planning and management. The Task Force acknowledged the need for dollars to be budgeted for conservation programs, similar to capital programs, and that conservation can no longer be considered the sideshow or the secondary activity, but conservation programs and practices should be the most prominent part of an effective water management strategy for the region. Notable actions included a vote to support the creation of a county-wide water conservation and incentives program and support for a resolution encouraging local governments and water utilities to budget the necessary funds for the program in FY '11. The Task Force also supported the pursuit of amendment to Florida Building Code concurrent with the adoption of local ordinances to advance water conservation in cooling towers and air handling systems. While not a formal action, the Task Force members spoke in general support of the County's adoption of a permanent 2-day per week restriction on landscape irrigation and required enforcement as well as the need for continued implementation of existing county-wide water conservation programs such as the NatureScape Irrigation Service, NatureScape Broward, and Water Matters Day.

Regional Water Supply Projects

The C-51 Regional Reservoir project proposal was recognized to be of great potential benefit to water providers in Palm Beach and Broward Counties, but with many unresolved issues. The Task Force supported moving the C-51 project forward with the Phase 2A Scope of Work and awaits finalization of project deliverables following integration of stakeholders comments. Once completed, another joint meeting of the Broward and Palm Beach Water Resources Task Forces might serve as a platform for developing regional recommendations regarding the feasibility of the project, additional analysis, and future investments. In the meantime, the Task Force supported inclusion of this project in the County-wide Integrated Water Resources Management Master Plan (IWRMMP) being developed by Broward County which includes the hydrologic modeling of water demands and water supply projects involving both the Biscayne and Floridan Aquifers. This analysis will provide water providers and managers with additional technical information relating to conveyance strategies and anticipated water supply benefits for urban Broward County.

The C-51 and other regional water supply project concepts developed for the Task Force's consideration were evaluated and ranked by the Technical Team. It was acknowledged that the scarcity of technical information pertaining to the sustainability of the Floridan Aquifer substantially constrains decision making relevant to the development of future water supply projects and regional strategies. The Task Force agreed that inclusion of the Floridan water supply project concepts in the IWRMMP would offer the next appropriate level of analysis. Application of a telescoped Floridan model that provides high resolution focus on Broward County as part of the IWRMMP will involve the first hydrologic analysis of planned Floridan projects in the County as well as the only analysis to date as to the potential benefits of a more regional approach with regards to overall resource sustainability.

Beyond the technical feasibility of the water resource project concepts is the question of political feasibility and questions of governance. Consistent with the recommendations of panelists who shared

their experience and recommendations relating to regional water supply project development, the Task Force chose not to explore these issues at this stage of collaboration. Specific recommendations provided by expert panelists relating to multi-jurisdictional projects included the following:

- Identify a project first and the give consideration to the appropriate governance option rather then trying to develop a governance structure in advance of the project;
- Allow interests to prevail over governance, keep focused on the water supply objectives and the needs of the community;
- Consider the variety of governance options, including scale and formality, which might include interlocal partnerships, a multi-jurisdictional collaborative, or the creation of a water supply authority;
- Require a cost impact analysis up front so that all parties are fully apprised of and understand the relative cost implications early on; and
- Identify funding sources early.

With the development of the regional water supply project matrix and ranking, the Task Force has sought to provide local governments and water providers with preliminary information to help formulate the collaborative investigations necessary for advancing any of the proposed concepts. Additional technical information to be provided through the County's hydrologic modeling and development of the IWRMMP is also expected to guide decision making. These analyses will be completed and available for consideration by the Task Force, municipalities, and water providers in fall 2010.

Reuse Planning and Development

Reuse projects and planning efforts will be a major part of future water supply planning efforts and resource development in Broward County. Several of the highest ranked regional water supply project concepts involve the development of reuse water as an alternative water supply and mechanism for providing aquifer recharge. However, the Task Force recognizes that despite the various water supply obligations and state mandates relating to reuse development projects, implementation has been hampered by the lack of coordination between critical partner agencies and the absence of a regional reuse strategy or masterplan, with these issues compounded by a variety of other factors, including the county's state of development, cost, salinity in wastewater flows, and lack of wet season customers.

As discussed above, the installation of traditional reuse irrigation systems in urban Broward County is a costly proposition given the major disruptions to roadways and other existing infrastructure that would be required. However, the installation of reuse lines could be substantially facilitated from a logistical and cost perspective if coupled with planned improvements to public infrastructure. The Task Force identified policy coordination with the Broward Metropolitan Planning Organization (Broward MPO) and project coordination with the Florida Department of Transportation (FDOT) as necessary areas of improvement. The Broward MPO is responsible for developing and maintaining in coordination with local governments a 25-year regional transportation plan and policies relating to its implementation. The Broward MPO is also a principal partner with the FDOT, establishing and prioritizing regional transportation projects for FDOT implementation. As such, partnerships with both the Broward MPO and FDOT focused on collaborations to further the installation of necessary reuse infrastructure as part of planned roadway improvement projects could substantially improve the county-wide efforts to successfully developed beneficial reuse projects. Concurrent with improved collaborations, the Task Force identified a regional reuse masterplan as an area of need. Without such a

plan providing long-term visioning and guidance, regional coordination efforts between wastewater utilities, water providers, municipalities, regional planning agencies, and the Florida Department of Transportation will be substantially constrained and limited in scope.

Research and Investigations

The Task Force's consideration of water resources issues and water supply development served to underscore the importance of maintaining access to reliable and current technical information and tools to aid in water resource planning and management decisions. Questions regarding the ability of the Floridan Aquifer to support the production of nearly 30 mgd of finished water planned for 2025, uncertainty about the effects of sea level rise on saltwater intrusion and potable water supplies, concerns relating to the protection of water quality as part of water management activities, and interest in achieving more efficient use and management of regional water resources have reinforced the need to invest in research and technical investigations that support well-informed decision making. The Task Force has recommended the continued support for several existing efforts as well as the investment in new tools and analyses that can be utilized in planning and management decisions with the understanding that these relatively low-cost analyses are cost-saving measures fundamental to developing effective policy, providing prudent water resource management, and ensuring cost-effective water supply development in the long-term.

Future Role of the Task Force

Enabling resolutions that led to the creation of the Task Force initially referenced a one year timeframe for completing their objectives. It soon became apparent, however, that the Task Force would need additional time to evaluate the issues and provide recommendations which led to an 8-month extension to the original 12-month term. With the Final Report soon to be complete and the amended 20-month term of the Task Force to come to a close, the Task Force members discussed the potential for a longer-term role in providing oversight in the implementation of the Task Force recommendations, identifying new trends and tracking project progress. The Task Force could also provide an effective means for achieving coordinated and unified advocacy on regional water resources issues of local importance. The membership voiced concurrence with a proposal to seek a second amendment to the enabling resolution to provide for the continued efforts of the Task Force, with future meetings to be conducted bi-monthly. Recommendations also include the request that the County's Natural Resources Planning and Management Division continue to provide staff support to the Task Force. A resolution providing for an indefinite term and detailing the future role of the Task Force was prepared for consideration by the Broward County Board of County Commissioners and was approved on March 6, 2010.

B. Summary of Task Force Recommendations by Topic

The following Strategies and Recommendations were developed by the Task Force to address Broward's regional water resource needs. They represent a subset of those considered by the Task Force thought to be the most feasible, beneficial and protective of local water resources and the public good. The Strategies and Recommendations are numbered for reference purposes only, and do not confer any particular priority upon them. Parties noted in parentheses after each item have been identified as those responsible for carrying the recommendation forward. Timeframes for implementation are also noted as follows: "immediate" identifies those recommendations that can be actively pursued today; "short term" identifies those requiring 2-3 years for completion; "mid term"

identifies those recommendations likely to 3 -5 years to realize significant progress; and "ongoing" identifies those recommendations requiring continuous attention and/or investment.

Water Conservation

Strategy: Encourage the prudent use of water through implementation of water conservation strategies that are made prominent in regional planning efforts

Recommendations:

1) Provide incentives for saving water indoor – Implement a county-wide water conservation and incentives program to effectively deliver water conservation education and outreach, and indoor plumbing fixture retrofits and rebates (Broward County and Interlocal Partners - immediate)

2) Mandate the sale and use of high-efficiency plumbing fixtures – Pursue regulations that require wholesalers and retailers to offer for sale high-efficiency plumbing fixtures, and require the exclusive use of such fixtures in new construction and retrofit projects. (Broward County - short term)

3) Incentivize utility water conservation efforts – Request SFWMD to provide incentives to water providers for implementing water conservation programs, such as the ability to retain current groundwater allocations to support future demands, pursuant to Ch. 373, FS and the SFWMD basis of review. (SFWMD and Local Water Providers - short term)

4) Recycle cooling tower condensate and wastewater – Pursue a local amendment of the Florida Building Code through the Broward County Board of Rules and Appeals to require installation and operation of wastewater and condensate harvesting mechanisms in replaced and new cooling tower systems. (Broward County - immediate)

5) Enhance water conservation efforts through landscape codes – Develop and adopt new county and/or municipal landscape ordinances, or amend current ordinances, to require landscaping methods that conserve water. (Broward County - short term)

6) Maintain and strengthen existing regional and subregional water conservation programs – To promote a regional ethic of conservation, support the continuation of existing water conservation initiatives, including the Broward County Water Matters Program and Water Matters Day event, NatureScape Broward, and NatureScape Irrigation Service, and the South Florida Water Management District's Comprehensive Water Conservation Program and WaterSIP grants program. (Broward County - ongoing)

7) Adopt permanent landscape irrigation water conservation measures – Amend local ordinances to require and provide for enforcement of mandatory year-round landscape irrigation schedules, as has been accomplished in other regions of the State. (Broward County and Municipalities - immediate)

8) Implement green technologies – Promote the integration of green technologies in redevelopment and new development processes that increase water conservation. (Broward County and Municipalities – short term)

9) Implement non-traditional and/or innovative water conservation strategies – Encourage, and promote, through effective planning, public relations programs, and industry workshops, the development of new and innovative water conservation strategies, or those that go beyond traditional modes of conservation, such as the use of cisterns for the storage of stormwater that can be used for irrigation. (SFWMD, Broward County, Municipalities – short term)

10) Advocate for water conservation measures in building practices – Encourage the Florida Building Commission to incorporate more water conservation oriented guidelines in the Florida Building Code. (SWMD, Broward County, Municipalities – short term)

11) Increase water conservation in public facilities – Encourage governments to conduct internal water audits to identify where opportunities exist to increase water conservation in government operations and facilities. (Broward County and Municipalities – short term)

12) Provide sub-metering in housing and commercial structures - Increase awareness of, and participation in, water conservation by providing tenants with individual waters meters when cost feasible and appropriate.

Regional Water Supply Projects

Strategy: Promote the development of alternative water supply projects, with regional and sub-regional benefits, through collaborative partnerships

Recommendations:

13) Continue to explore the C-51 Reservoir Project as a regional strategy with both water supply and environmental benefits – The C-51 Reservoir Project Phase 2A analysis draft document has been released since the last Task Force meeting and is currently under review. This recommendation will be further developed as the review process progresses. (Broward Water Resources Task Force – short term)

14) Develop other regional project concepts – Pursue development of the proposed sub-regional alternative water supply projects, fully considering expected costs, timing, and the necessary infrastructure and partnerships involved. (Local Governments and Water Providers – short term)

- Region 1 Projects (from project concepts matrix)
- Region 2 Projects (from project concepts matrix)
- Region 3 Projects (from project concepts matrix)

15) Encourage and support local government collaborations – Perform preliminary feasibility analysis for inclusion of project concepts in the regionally Integrated Water Resources Master Plan Model being developed by Broward County in cooperation with interlocal partners. (Broward County – short term)

16) Support the development of regional water storage and recharge projects – Encourage and promote the efforts of the SFWMD and others to invest in regional projects and initiatives that provide economies of scale and broad water supply benefits. (SFWMD, Broward County, Municipalities – mid term)

17) Coordinate alternative water supply development efforts with water quality protection priorities – Implement measures to protect and preserve the quality of our surface and ground waters from potential impacts associated with the development of alternative water supply strategies. (Broward County and Water Providers - ongoing)

Reuse Planning and Development

Strategy: Support the reuse of reclaimed wastewater and stormwater as a means of reducing demands upon existing groundwater sources

Recommendations:

18) Reuse ocean outfall discharges – Continue to promote collaborative regional water supply strategies that provide economies of scale and regional benefits, with special emphasis on those areas that currently contribute to the volume of wastewater being discharged through open ocean outfalls, and with the goal of achieving 60% reuse of water currently discharged via outfalls by the year 2025, as required by State legislation. (Broward Water Resources Task Force- mid term)

19) Develop a regional reuse master plan – Work to establish a regionally coordinated master plan for the development and delivery of reclaimed water on a county-wide basis. (Broward County, Municipalities, and Water Providers – short term)

20) Recognize utility investments in reuse – Pursue a system of allocated alternative water supply credits for utilities that pay for reuse. (SFWMD and Water Providers – short term)

21) Develop and maintain a regional coverage of local reuse infrastructure – Support County efforts to develop a regional GIS coverage of local reuse infrastructure for use in future reuse planning. (Broward County – short term)

22) Coordinate with the Florida Department of Transportation (FDOT) – Work with the FDOT to obtain annual updates of the District IV 5-year resurfacing and capital projects plan for application in reuse planning. (Broward County - immediate)

23) Coordinate with the Florida Department of Environmental Protection (FDEP) Reuse Work Group and related entities – Work to develop regional and local reuse opportunities through statewide reuse efforts. (Water Providers - ongoing)

24) Utilize corridors in reuse planning efforts – Investigate the use of rights-of-way, canals and other waterbodies for laying reuse lines. (SFWMD, Local Governments, Utilities – short term)

25) Coordinate with the Broward County Metropolitan Planning Organization (MPO) – Work with the MPO to integrate reuse policies and projects in regional transportation and planning initiatives. (Broward County - immediate)

26) Update local 5-Year Capital Improvement Plans (CIP) – Phase into 5-year CIPs the necessary infrastructure to more fully utilize available reclaimed water supplies. (Broward County and Municipalities – short term)

27) Amend land use and comprehensive plans – Encourage better integration of reuse planning and projects in future development and redevelopment plans through amendments to county and municipal land use and comprehensive plans. (Broward County and Municipalities – short term)

28) Further the use of reclaimed water for irrigation – Develop new county and/or municipal ordinances, or amend current ordinances, to require connection of existing and new irrigation systems to available reclaimed water lines for use in irrigating landscapes and pursue the establishment of mandatory reuse zones, fully considering the availability of flows, proximity of irrigation systems to reclaimed water lines, costs and the effectiveness of such connections. (Broward County and Municipalities – short term)

Research and Investigations

Strategy: Further the pursuit of information that better informs decisions about how water resources are developed, utilized and managed in Broward County, and that which provides insight into new opportunities for alternative water supply development

Recommendations:

29) Develop essential technical tools – Encourage continued investment by Broward County and SFWMD in the development of technical tools for analyzing regional water resources and for planning effective resource management strategies. (Broward County and SFWMD – ongoing)

30) Further existing research efforts – Support Broward County's continued analysis of water resources and the provision of grant funding, made available as part of the Broward County Integrated Water Resource Plan (IWRP), to help further projects with regional water resource benefits. (SFWMD, Broward County, Local Governments, Water Providers - ongoing)

31) Further secondary canal integration efforts – Continue to support the integration of secondary canals for improved water management, water deliveries and aquifer recharge as part of water supply planning. (SFWMD, Broward County, Local Governments, Water Providers – ongoing)

32) Integrate water quality measures with ongoing water management efforts – Support projects and activities designed to achieve water quality improvements as part of surface water management strategies. (Broward County and Local Governments- ongoing)

33) Advocate for funding to support development of alternative water supply projects – Seek federal funding to assist communities in the development and implementation of alternative water supply options and support full State funding of the Water Protection and Sustainability

Trust Fund pursuant to 2005 SB 444. (SFWMD, Broward County, Municipalities, Water Providers – short term)

34) Further Floridan research – Support current regional and subregional efforts to evaluate the utility and feasibility of the Floridan Aquifer as an alternative water source and promote further research to increase understanding of this resource. (SFWMD, Broward County, Water Providers – short term)

35) Further saltwater intrusion studies as a measure to protect groundwater supplies – Support new and existing studies into the causes and patterns of saltwater intrusion, including Broward County's saltwater intrusion modeling efforts and the maintenance of the regional saltwater monitoring network. (SFWMD, Broward County, Water Providers – mid term)

36) Investigate the effects of climate change on water resources – Invest in research to determine the effects of climate change and associated sea level rise on regional and subregional water supplies and on future water demands, and how to best mitigate these effects. (SFWMD, Broward County, Local Governments - ongoing)

37) Consider alternative water supply development needs in the context of climate change – Invest in research to identify the most feasible and cost-effective alternative water supply options that are most consistent with carbon reduction goals. (Broward County and Water Providers - ongoing)

Role of the Task Force

Strategy: Ensure the goals and objectives of the Task Force are met over time

Recommendations:

38) Implement future meetings of the Task Force – Continue to convene the Task Force at least quarterly for the purposes of discussing progress made on implementation of recommendations, and identifying new trends and evolving needs, recognizing that not all of the issues facing the Task Force can be fully addressed at this time, and both physical and policy environments are likely to evolve. (SFWMD, Broward County, Municipalities - immediate)

39) Maintain the viability and relevance of Task Force work products – Annually revisit, amend as appropriate and reapprove Task Force regional water resource strategies and recommendations. (Broward Water Resources Task Force and Technical Team – short term)

40) Provide oversight on the implementation of Task Force strategies and recommendations – Recommend the Broward County Natural Resources Planning and Management Division to continue to lend support to the Task Force to include tracking the implementation of Task Force strategies and recommendations. (Broward County- ongoing)

V. SUMMARY AND CONCLUSIONS

The Broward Water Resources Task Force was convened in response to increasing difficulty in meeting the water supply needs of a growing urban population in a manner consistent with regional efforts to ensure long-term resource sustainability and environmental protection. Local leaders agreed to work together to evaluate whether coordination in regional water supply development and conservation efforts might prove beneficial for the resource, water providers, and residents.

The dedication and perseverance of the Task Force members and their alternates, the Technical Team and support staff, and the participation of guest speakers and water experts, provided for a comprehensive analysis of the varied and complex issues influencing water supply planning and development in urban Broward County. Topics covered included water resource policy, planning and management; urban water supply planning; water conservation and alternative water supplies; and climate change. Special assignments and technical analyses undertaken at the direction of the Task Force provided essential information relating to water demand projections, regional water supply project alternatives, and water conservation strategies that would serve as a basis for the Task Force's recommendations.

The Task Force developed 40 recommendations for consideration by Broward County, the Broward League of Cities, local governments, water providers, and the SFWMD in support of a regional strategy for coordinated effort in water resource management, conservation, and water supply development. Coordination is a common theme reflected in many of the Task Force's recommendations and it is important to note that many existing resources are available to facilitate implementation. Several recommendations speak to the necessary continuation of existing programs and efforts recognized to be instrumental to regional efforts in water resource planning and management. Other recommendations can be furthered by taking advantage of existing conservation activities and technical projects managed by Broward County's Natural Resources Planning and Management Division (NRPMD).

Recommendations relating to the pursuit of regional capital projects are geared toward urging potential collaborators to partner in the next phase of feasibility analysis. Here too, it is expected that existing NRPMD program efforts may be able to provide additional technical information regarding the potential project benefits that might aid decision making in this area. The Task Force is eager to give further consideration to these project proposals based upon the forthcoming technical evaluations and may itself serve as a critical body in advancing some of the project concepts in so far as the project is sufficiently regional in nature to warrant the participation of the Task Force, or should the project partners choose to involve the Task Force as a whole. The Task Force may be able to help advance certain projects where regional policies or rules are a consideration.

The Task Force considered the complexities, constraints, and challenges associated with successful advancement of regional water supply concepts reflected in this document. The current lack of technical data to support modeling of the Floridan Aquifer and uncertainties relating to the extent to which the Floridan Aquifer can support future regional water demands is an area requiring attention and investment. Reuse planning represents another prominent water supply development strategy being pursued by water providers in Broward County, with ocean outfall legislation establishing major requirements with regards to the total volume and timeframe for implementation. Regional coordination and participation will be necessary to ensure implementation of beneficial and affordable reuse strategies that meet these requirements. The issue of timing may be one of greatest hurdles to

furthering certain regional water supply concepts. As utilities continue to plan and commit to projects in accordance with CUP and Comp Plan requirements, there is less opportunity to integrate regional projects into these more immediate planning needs. Utilities will need to have greater certainty with regards to the regulatory feasibility, water supply benefits, and project timeframes of regional water supply concepts if these are to be adequately considered as part of viable water supply plans. Additional resources investments will be needed to perform the necessary feasibility analysis and obtain the necessary regulatory assurances needed for decision making.

Future meetings of the Task Force are expected to involve the presentation of information relating to additional review of regional project concepts and updates regarding the implementation of other Task Force recommendations. Quarterly meetings will allow the Task Force to monitor project progress, to refine efforts, and to identify new opportunities for collaboration. Task Force members will also be kept apprised of any emerging issues relating to regional policies and/or issues influencing water supply planning and will be able to develop new recommendations as needed.

ACKNOWLEDGEMENTS

The Task Force wishes to acknowledge the contributions of the many individuals and entities that provided services and support to assist the Task Force in its efforts. The Task Force is especially recognizing of the contributions of the members of the Technical Team who invested extensive effort and time in the preparation of various work products and presentations and who lent incredible insight and expertise to the discussion of complex and critical water resource issues.

The Task Force thanks the City of Pompano Beach, the City of West Palm Beach, and the South Broward Drainage District for opening their facilities and lending staff support as part of the educational field trips attended by the membership. Specifically, the Task Force wishes to recognize Mr. Joseph Carlini and staff of the East Central Regional Wastewater Reclamation Facility in West Palm Beach, Mr. Randolph Brown and staff of the Pompano Beach Reuse Treatment Facility in Pompano Beach, and Mr. Leo Schwartzberg and staff of the South Broward Drainage District.

The Task Force is thankful for the contributions of Margaret McPherson; Dawn Miller-Walker, the Science Eye; and Liz Perez, Brown & Caldwell as part of the Everglades tour and presentation that followed.

The Task Force wishes to thank the various guest speakers who provided unique perspectives and expertise relating to topics of special interest and concern to the membership, including many whose participation required travel, they are: Dr. Honey Rand, Environmental Communications & Marketing; Mary Anne Connors, Volusia County; Bruce Loucks, City of Cooper City; Edward P. de la Parte, Jr., de la Parte and Gilbert; Brian Shields, Palm Beach County; Walter J. Winrow, Infrastructure Capital Partners; Paul E. Mattausch, Collier County; Patricia DiPiero, Lee County; and Patrick Davis, Hazen and Sawyer.

The Task Force recognizes the individuals who supported discussions of the C-51 Reservoir Project including Albert Carbone, City of Fort Lauderdale; Ken Todd, Palm Beach County, and Brian Shields, Palm Beach County.

The Task Force is grateful for the support of staff with Broward County and the South Florida Water Management District throughout the activities of the Task Force with special appreciation extended to those who served as support staff to the Task Force.

The Task Force also extends thanks to Broward County, the South Florida Water Management District, and the Broward League of Cities for their role in the initial creation and convening of the Task Force.

APPENDICES

APPENDIX A

ENABLING RESOLUTIONS

Resolution 2008-457

A RESOLUTION OF THE BROWARD COUNTY BOARD OF COUNTY COMMISSIONERS; RECOGNIZING THE NEED FOR A COLLABORATIVE, MULTI-JURISDICTIONAL APPROACH TO ADDRESS COUNTY-WIDE WATER RESOURCE NEEDS; ESTABLISHING THE BROWARD WATER RESOURCES TASK FORCE COMPOSED OF ELECTED COUNTY AND CITY COMMISSIONERS AND OFFICIALS REPRESENTING THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT GOVERNING BOARD, SPECIAL DISTRICTS, AND WATER CONTROL DISTRICTS; AUTHORIZING THE DESIGNATION OF A TECHNICAL/PROFESSIONAL STAFF WORKGROUP TO ADVISE THE TASK FORCE; PROVIDING FOR DUTIES OF THE TASK FORCE; PROVIDING FOR MEETINGS OF THE TASK FORCE AND TECHNICAL/PROFESSIONAL STAFF WORKGROUP; PROVIDING FOR STAFF SUPPORT; PROVIDING FOR REPORTING AND MAINTENANCE OF RECORDS; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, Broward County has long depended upon the Biscayne Aquifer for the County's primary source of water; and

WHEREAS, it has been determined that further withdrawals and continued dependence upon the Biscayne Aquifer impact the ecological health of the Everglades; and

WHEREAS, in response to efforts to restore the Everglades, in 2007 the South Florida Water Management District adopted the Regional Water Availability Rule which restricts future withdrawals from the Biscayne Aquifer; and

WHEREAS, Broward County's local government leaders recognize it is critical to address the availability of water resources within the County to protect the public health, ensure the sustainability of sensitive environmental resources and natural systems, and provide viable economic opportunities for our communities and residents; and

WHEREAS, pursuant to Senate Bill CS/CS/SB 1302 *(Wastewater Discharge/Ocean Outfalls* legislation) passed by the 2008 Legislature, two regional wastewater treatment providers in Broward County will be required to reuse significant amounts of treated domestic wastewater currently being disposed of via ocean outfalls; and

WHEREAS, the County is facing significant and costly projected water supply needs, which cannot be met with increased demands on the Biscayne Aquifer unless appropriate measures are taken in accordance with the Regional Water Availability Rule, wastewater disposal needs that cannot be addressed through traditional discharge methods, and pressing decisions related to the development of alternative water supply projects such as the use of reclaimed water; and

WHEREAS, local leaders are committed to ensuring that the long-term water resource needs of all Broward's water users are effectively planned for and met, including those of water providers, wholesale and retail purchasers, and their customers; and

WHEREAS, these needs may be met more efficiently and cost effectively through collaborative partnerships, evaluation of existing and planned infrastructure and by considering regional or sub-regional approaches; and

WHEREAS, there is no effective forum to consider these opportunities; and

WHEREAS, in 2005 the Florida Legislature enacted Chapter 2005-291, Laws of Florida, SB 444, legislation that encourages cooperation with local entities to plan for multi-jurisdictional water supply entities to maximize state funding for alternative water supply projects; and

WHEREAS, at a Joint Workshop Meeting on May 12, 2008, the Broward County Board of County Commissioners, the South Florida Water Management District Governing Board, and Mayors representing the County's various municipalities, inclusive of water providers and users, agreed to work collaboratively to find potential environmentally, economically, and technically feasible strategies and solutions to the County's future water resources needs and provide recommendations; NOW, THEREFORE,

BE IT RESOLVED BY THE Broward County Board of County Commissioners:

Section 1. The adoption of this and companion resolutions by the Broward League of Cities and the South Florida Water Management District Governing Board shall have the effect of creating the Broward Water Resources Task Force ("Task Force").

Section 2. The Task Force shall be composed of elected and appointed officials designated by the government entities identified in Section 3 of this resolution. A Technical/Professional staff workgroup may be designated by the entities in Section 4 to advise the Task Force on matters such as, but not limited to, water resource availability, management, facilities and infrastructure, supply and constraints, and other technical, environmental, and professional subject matters as requested by the Task Force.

Section 3. The Task Force shall be composed of representatives of the following entities:

(a) Six (6) City elected officials appointed by the Broward League of Cities, which represents a cross section of small, medium, and

large cities, one of whom shall be an elected official of a city that purchases water from another municipality or water utility. For each of the six members appointed, the Broward League of Cities shall also appoint an alternate member to serve in the appointed member's absence. Alternate members must be municipal elected officials and must be from a different similarly-sized municipality.

(b) Five (5) City elected officials appointed by the Broward League of Mayors, which represents a cross section of small, medium, and large cities, one of whom shall be an elected official of a city that purchases water from another municipality or water utility. For each of the five members appointed, the Broward League of Mayors shall also appoint an alternate member to serve in the appointed member's absence. Alternate members must be municipal elected officials and must be from a different similarly-sized municipality.

(c) One (1) County Commissioner and an alternate appointed by the Broward County Board of County Commissioners.

(d) One (1) Special Independent District Water Provider official and an alternate appointed by the Surface Water Coordinating Committee.

(e) One (1) Drainage/Water Control District elected official and an alternate appointed by the Surface Water Coordinating Committee.

(f) One (1) South Florida Water Management District Governing Board Member and an alternate appointed by the Governing Board.

When making appointments, each entity shall consider and balance its appointments to reflect the diverse racial, ethnic, religious, economic, and geographic representation within the County.

Section 4. The following entities may designate appropriate Technical/Professional staff, as provided in Section 2, to assist the Task Force:

(a) Eleven (11) Municipal staff persons appointed by Task Force members represented in the categories of Section 3(a) and (b).

(b) Two (2) County staff persons appointed by the Broward County Administrator.

(c) One (1) staff person appointed from the Drainage District/Water Control member participating on the Task Force.

(d) One (1) staff person appointed from the Special Independent District Water Provider member participating on the Task Force.

(e) One (1) water management staff person appointed by the South Florida Water Management District Governing Board.

(f) One (1) representative of the Water Advisory Board's Technical Advisory Committee appointed by the Water Advisory Board to the Broward County Board of County Commissioners.

(g) One (1) builder representative appointed by the Builders Association of South Florida.

(h) One (1) builder representative appointed by the South Florida Chapter of the U.S. Green Building Council.

(i) One (1) staff person appointed by the Florida Department of Environmental Protection.

(j) One (1) staff person appointed by the Broward County Health Department.

Section 5. The Task Force will identify and evaluate opportunities and impediments to providing future water supply, conservation, wastewater treatment, and reuse or reclaimed water opportunities that are most efficient and cost effective.

Section 6. The Task Force shall meet monthly for a one-year period following its initial organizational meeting. The Task Force shall, at its organizational meeting, elect a Chair and Vice-Chair, adopt rules of procedure, including provisions for quorum, voting, and consideration of motions and other items, and establish such standing committees as necessary to conduct the work of the Task Force.

Section 7. The Technical/Professional staff workgroup may meet as necessary to address any issues assigned by the Task Force. The staff workgroup shall meet following the appointments made pursuant to Section 4 for the purpose of selecting a Chair and Vice-Chair, adopting any necessary rules of procedure, and appointing any standing workgroup subcommittees.

Section 8. The Broward League of Cities, Broward County, and the South Florida Water Management District shall provide staff support to the Task Force.

Section 9. Support staff will prepare meeting notices and minutes, maintain records, coordinate or prepare draft reports, and prepare the final report containing the findings and recommendations of the Task Force.

Section 10. The governmental entities adopting this resolution recognize and agree their participation as members of the Task Force is a voluntary effort. The participating governments further recognize that any final report issued by the Task Force shall not be construed as imposing any mandates upon the participants or other

government entities within Broward County. It is understood and desired, rather, that the collaborative work of the Task Force serve as recommendations for Broward's local governments, businesses, and residents as each community moves forward with consideration and decision-making regarding future water resources planning, development, and management.

Section 11. EFFECTIVE DATE.

This Resolution shall become effective upon adoption.

ADOPTED this 24th day June, 2008. #130

MCO
06/27/2008
BWRTFResoFinal.doc

STATE OF FLORIDA)

) SS

COUNTY OF BROWARD)

I, Bertha Henry, Interim County Administrator, in and for Broward County, Florida, and Ex-Officio Clerk of the Board of County Commissioners of said County, DO HEREBY CERTIFY that the above and foregoing is a true and correct copy of Resolution 2008-457 as the same appears of record in the minutes of a said meeting of said Board of County Commissioners held on the 24th day of June, 2008.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 30th day of June, 2008.

BOARD OF COUNTY COMMISSIONERS CREATED OCT. 1ST 1915 BROWARD COUNTY FLORIDA

(S E A L)

Bertha Henry
INTERIM COUNTY ADMINISTRATOR

By Mary Anne Daly
Deputy Clerk

RESOLUTION NO. 2008- B05

A RESOLUTION OF THE BROWARD COUNTY LEAGUE OF CITIES RECOGNIZING THE NEED FOR A COLLABORATIVE, MULTI-JURISDICTIONAL APPROACH TO ADDRESS COUNTY-WIDE WATER RESOURCE NEEDS; ESTABLISHING THE BROWARD WATER RESOURCES TASK FORCE COMPOSED OF ELECTED COUNTY AND CITY COMMISSIONERS AND OFFICIALS REPRESENTING THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT GOVERNING BOARD, SPECIAL DISTRICTS, AND WATER CONTROL DISTRICTS; AUTHORIZING THE DESIGNATION OF A TECHNICAL/PROFESSIONAL STAFF WORKGROUP TO ADVISE THE TASK FORCE; PROVIDING FOR DUTIES OF THE TASK FORCE; PROVIDING FOR MEETINGS OF THE TASK FORCE AND TECHNICAL/PROFESSIONAL STAFF WORKGROUP; PROVIDING FOR STAFF SUPPORT; PROVIDING FOR REPORTING AND MAINTENANCE OF RECORDS; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, Broward County has long depended upon the Biscayne Aquifer for the County's primary source of water; and

WHEREAS, it has been determined that further withdrawals and continued dependence upon the Biscayne Aquifer impact the ecological health of the Everglades; and

WHEREAS, in response to efforts to restore the Everglades, in 2007 the South Florida Water Management District adopted the Regional Water Availability Rule which restricts future withdrawals from the Biscayne Aquifer; and

WHEREAS, Broward County's local government leaders recognize it is critical to address the availability of water resources within the County to protect the public health, ensure the sustainability of sensitive environmental resources and natural systems, and provide viable economic opportunities for our communities and residents; and

WHEREAS, pursuant to Senate Bill CS/CS/SB 1302 *(Wastewater Discharge/Ocean Outfalls* legislation) passed by the 2008 Legislature, two regional wastewater treatment providers in Broward County will be required to reuse significant amounts of treated domestic wastewater currently being disposed of via ocean outfalls; and

WHEREAS, the County is facing significant and costly projected water supply needs, which cannot be met with increased demands on the Biscayne Aquifer unless appropriate measures are taken in accordance with the Regional Water Availability Rule, wastewater disposal needs that cannot be addressed through traditional discharge methods, and pressing decisions related to the development of alternative water supply projects such as the use of reclaimed water; and

WHEREAS, local leaders are committed to ensuring that the long-term water resource needs of all Broward's water users are effectively planned for and met, including those of water providers, wholesale and retail purchasers, and their customers; and

WHEREAS, these needs may be met more efficiently and cost effectively through collaborative partnerships, evaluation of existing and planned infrastructure and by considering regional or sub-regional approaches; and

WHEREAS, there is no effective forum to consider these opportunities; and

WHEREAS, in 2005 the Florida Legislature enacted Chapter 2005-291, Laws of Florida, SB 444, legislation that encourages cooperation with local entities to plan for multi-jurisdictional water supply entities to maximize state funding for alternative water supply projects; and

WHEREAS, at a Joint Workshop Meeting on May 12, 2008, the Broward County Board of County Commissioners, the South Florida Water Management District Governing Board, and Elected Officials representing the County's various municipalities, inclusive of water providers and users, agreed to work collaboratively to find potential environmentally, economically, and technically feasible strategies and solutions to the County's future water resources needs and provide recommendations;

NOW, THEREFORE, BE IT RESOLVED BY THE BROWARD COUNTY LEAGUE OF CITIES:

Section 1. The adoption of this and companion resolutions by the Broward County Board of County Commissioners, the South Florida Water Management District Governing Board and others shall have the effect of creating the Broward Water Resources Task Force ("Task Force").

Section 2. The Task Force shall be composed of elected and appointed officials designated by the government entities identified in Section 3 of this resolution. A Technical/Professional staff workgroup may be designated by the entities in Section 4 to advise the Task Force on matters such as, but not limited to, water resource availability, management, facilities and infrastructure, supply and constraints, and other technical, environmental, and professional subject matters as requested by the Task Force.

Section 3. The Task Force shall be composed of representatives of the following entities:

(a) Six (6) City elected officials appointed by the Broward League of Cities, which represents a cross section of small, medium, and

large cities, one of whom shall be an elected official of a city that purchases water from another municipality or water utility. For each of the six members appointed, the Broward League of Cities shall also appoint an alternate member to serve in the appointed member's absence. Alternate members must be municipal elected officials and must be from a different similarly-sized municipality.

(b) Five (5) City elected officials appointed by the Broward League of Mayors, which represents a cross section of small, medium, and large cities, one of whom shall be an elected official of a city that purchases water from another municipality or water utility. For each of the five members appointed, the Broward League of Mayors shall also appoint an alternate member to serve in the appointed member's absence. Alternate members must be municipal elected officials and must be from a different similarly-sized municipality.

(c) One (1) County Commissioner and an alternate appointed by the Broward County Board of County Commissioners.

(d) One (1) Special Independent District Water Provider official and an alternate appointed by the Surface Water Coordinating Committee.

(e) One (1) Drainage/Water Control District elected official and an alternate appointed by the Surface Water Coordinating Committee.

(f) One (1) South Florida Water Management District Governing Board Member and an alternate appointed by the Governing Board.

When making appointments, each entity shall consider and balance its appointments to reflect the diverse racial, ethnic, religious, economic, and geographic representation within the County.

Section 4. The following entities may designate appropriate Technical/Professional staff, as provided in Section 2, to assist the Task Force:

(a) Eleven (11) Municipal staff persons appointed by Task Force members represented in the categories of Section 3(a) and (b).

(b) Two (2) County staff persons appointed by the Broward County Administrator.

(c) One (1) staff person appointed from the Drainage District/Water Control member participating on the Task Force.

(d) One (1) staff person appointed from the Special Independent District Water Provider member participating on the Task Force.

(e) One (1) water management staff person appointed by the South Florida Water Management District Governing Board.

(f) One (1) representative of the Water Advisory Board's Technical Advisory Committee appointed by the Water Advisory Board to the Broward County Board of County Commissioners.

(g) One (1) builder representative appointed by the Builders Association of South Florida.

(h) One (1) builder representative appointed by the South Florida Chapter of the U.S. Green Building Council.

Section 5. The Task Force will identify and evaluate opportunities and impediments to providing future water supply, conservation, wastewater treatment, and reuse or reclaimed water opportunities that are most efficient and cost effective.

Section 6. The Task Force shall meet monthly for a one-year period following its initial organizational meeting. The Task Force shall, at its organizational meeting, elect a Chair and Vice-Chair, adopt rules of procedure, including provisions for quorum, voting, and consideration of motions and other items, and establish such standing committees as necessary to conduct the work of the Task Force.

Section 7. The Technical/Professional staff workgroup may meet as necessary to address any issues assigned by the Task Force. The staff workgroup shall meet following the appointments made pursuant to Section 4 for the purpose of selecting a Chair and Vice-Chair, adopting any necessary rules of procedure, and appointing any standing workgroup subcommittees.

Section 8. The Broward County League of Cities, Broward County, and the South Florida Water Management District shall provide staff support to the Task Force.

Section 9. Support staff will prepare meeting notices and minutes, maintain records, coordinate or prepare draft reports, and prepare the final report containing the findings and recommendations of the Task Force.

Section 10. The governmental entities adopting this resolution recognize and agree their participation as members of the Task Force is a voluntary effort. The participating governments further recognize that any final report issued by the Task Force shall not be construed as imposing any mandates upon the participants or other government entities within Broward County. It is understood and desired, rather, that the collaborative work of the Task Force serve as recommendations for Broward's local

governments, businesses, and residents as each community moves forward with consideration and decision-making regarding future water resources planning, development, and management.

Section 11. EFFECTIVE DATE.

This Resolution shall become effective upon adoption.

ADOPTED this 7th day August , 2008.

BROWARD COUNTY LEAGUE OF CITIES

BY: M. Margaret Bates

President M. Margaret Bates

ATTEST:

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

RESOLUTION NO. 2008-642

A RESOLUTION OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT; RECOGNIZING THE NEED FOR A COLLABORATIVE, MULTI-JURISDICTIONAL APPROACH TO ADDRESS COUNTY-WIDE WATER RESOURCE NEEDS; ENDORSING THE ESTABLISHMENT OF THE BROWARD WATER RESOURCES TASK FORCE COMPOSED OF ELECTED COUNTY AND CITY COMMISSIONERS, AND OFFICIALS REPRESENTING THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT GOVERNING BOARD, SPECIAL DISTRICTS AND WATER CONTROL DISTRICTS; PROVIDING FOR STAFF SUPPORT; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, this resolution is a companion to Resolution #457 approved by the Broward County Commission on June 24, 2008 establishing the Broward County Water Resources Task Force; and

WHEREAS, Broward County has long depended upon water from the Everglades to recharge the Biscayne Aquifer as the county's primary source of water; and

WHEREAS, it has been determined that increased dependence upon the Everglades for recharging the Biscayne Aquifer would further impact the ecological health of the Everglades; and

WHEREAS, in response to efforts to restore the Everglades and to assist in implementing the Everglades Minimum Flow and Level recovery plan, the South Florida Water Management District adopted a Regional Water Availability Rule in 2007, requiring development of water supplies within the Lower East Coast in a

manner that does not increase dependence on water supply from the Everglades; and

WHEREAS, Broward County's local government leaders recognize it is critical to address the availability of water resources within the County to protect the public health, ensure the sustainability of sensitive environmental resources and natural systems, and provide viable economic opportunities for our communities and residents; and

WHEREAS, pursuant to CS/CS/SB 1302, *(Wastewater Discharge/Ocean Outfalls* legislation passed by the 2008 Legislature), two regional wastewater treatment providers in Broward County will be required to reuse significant amounts of treated domestic wastewater currently being disposed of via ocean outfalls; and

WHEREAS, the County is facing a variety of water supply related issues including development of significant and potentially costly projected water supplies in a manner that does not cause further dependence on the Everglades, wastewater disposal needs that cannot be addressed through traditional discharge methods, and pressing decisions related to the development of alternative water supply projects such as the use of reclaimed water; and

WHEREAS, local leaders are committed to ensuring that the long-term water resource needs of all Broward's water users are effectively planned for and met, including those of water providers, wholesale and retail purchasers, and their customers; and

WHEREAS, these needs may be met more efficiently and cost effectively through collaborative partnerships, evaluation of existing and planned infrastructure and by considering regional or sub-regional approaches; and

WHEREAS, cooperation between the SFWMD and County water supply providers and users will help to ensure water supply development projects are identified and implemented consistent with SFWMD regional water supply planning and water resource development priorities; and

WHEREAS, there is no effective forum to consider these opportunities; and

WHEREAS, in 2005 the Florida Legislature enacted Chapter 2005-291, Laws of Florida, SB 444, legislation that encourages cooperation with local entities to plan for multi-jurisdictional water supply entities to maximize state funding for alternative water supply projects; and

WHEREAS, at a Joint Workshop Meeting on May 12, 2008, the Broward County Board of County Commissioners, the South Florida Water Management District Governing Board and Mayors representing the County's various municipalities, inclusive of water providers and users, agreed to work collaboratively to find potential environmentally, economically, and technically feasible strategies and solutions to the County's future water resources needs and provide recommendations; and,

NOW THEREFORE, BE IT RESOLVED by the Governing Board of the South Florida Water Management District

Section 1. The Governing Board endorses the efforts of Broward League of Cities and the Broward County Commission to create the Broward Water Resources Task Force ("Task Force") composed of elected county and city commissioners, and officials representing the South Florida Water Management District Governing Board, special districts, and water control districts and approves the participation of the SFWMD in the Task Force.

Section 2. The Governing Board shall appoint one (1) South Florida Water Management District Governing Board Member and an alternate to the Task Force.

Section 3. The Executive Director of the SFWMD shall appoint one (1) technical/professional staff from the South Florida Water Management District to assist the Task Force.

Section 4. The Governing Board shall work cooperatively with the Task Force to identify and evaluate opportunities and impediments to provide future water supply, conservation, wastewater treatment and reuse or reclaimed water opportunities that are most efficient and cost effective.

Section 5. The Governing Board recognizes and agrees its participation as a member of the Task Force is a voluntary effort. The Governing Board further recognizes that any final report issued by the Task Force shall not be construed as imposing any mandates upon the SFWMD. It is understood and desired, rather, that the collaborative work of the Task Force serve as recommendations for Broward's local governments, businesses, and residents as each community

moves forward with consideration and decision-making regarding future water resources planning, development and management.

Section 6. This resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 30 day of June, 2008.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By: _____
Chair Person

ATTEST: _____
District Clerk

GOVERNING BOARD OF SOUTH FLORIDA WATER MANAGEMENT DISTRICT • STATE OF FLORIDA SEAL Established 1949

Approved as to form:
By: _____
Office of Counsel

APPENDIX B

WATER RESOURCES TASK FORCE MEMBERS, ALTERNATES, TECHNICAL TEAM, AND SUPPORT STAFF

Water Resources Task Force

Members

Shannon A. Estenoz	South Florida Water Management District Governing Board Member, WRTF Chair
Kristin D. Jacobs	Broward County Board of County Commissioners, WRTF Vice-chair
Lisa Aronson	Mayor, City of Coconut Creek
Douglas Bell	Chair, Central Broward Water Control District Board of Commissioners
Peter Bober	Mayor, City of Hollywood
Joy Cooper	Mayor, City of Hallandale Beach
Lamar Fisher	Mayor, City of Pompano Beach
Beth Flansbaum-Talabisco	Mayor, City of Tamarac
Glen Hanks	Secretary, Coral Springs Improvement District BOS
Richard Kaplan	Mayor, City of Lauderhill
Jack McCluskey	Vice Mayor, City of Pembroke Pines
Charlotte Rodstrom	Commissioner, City of Fort Lauderdale
Donald Rosen	Commissioner, City of Sunrise
Susan Starkey	Vice-Mayor, Town of Davie
Allegra Webb Murphy	Mayor, City of Oakland Park

Alternates

Richard Blattner (for Susan Starkey)	Commissioner, City of Hollywood
John Sims (for Allegra Webb Murphy)	Commissioner, City of Cooper City
Joe Varsallone (for Lisa Aronson)	Mayor, City of Margate
Robert Fennel (alternate for Mr. Hanks)	President, Coral Springs Improvement District Board of Supervisors
Thomas Good (alternate for Mr. Bell)	Commissioner & Vice-Chair, South Broward Drainage District Board of Commissioners

Technical Team

Albert Perez	Director of Public Utilities, City of Hollywood, Chair
Randy Brown	Utilities Director, City of Pompano Beach, Vice-Chair
Steven Bassett	Eco Advisors, LLC
William Brant	Public Works Director, City of Hallandale Beach
Hank Breitenkam	Director of Utilities, City of Plantation
Hector Castro	Director of Utilities, City of Sunrise
Linda Brien	Administrator, Water Facilities Program, Florida Department of Environmental Protection, Southeast District Office
Heather Cunniff	City Planner, City of Lauderhill
Ray Gagnon	Director of Utilities, City of Tamarac
Alan Garcia	Director, Broward County Water and Wastewater Services
Doug Hyche	Utility Director, Coral Springs and North Springs Improvement Districts
Dr. Jennifer Jurado	Director, Broward County Natural Resources Planning and Management Division
Dylan Larson	Miller Legg
Julie Leonard	Assistant Utility Services Director – Operations, City of Fort Lauderdale
Timothy Mayer	Environmental Administrator, Broward County Health Department
Joe McLaughlin	Professional Engineer, City of Pembroke Pines
Raj Verma	Director of Utilities and Engineering, City of Coconut Creek
David Womacks	Public Works Director, City of Oakland Park
Bruce Taylor	Director of Utilities Operations, Town of Davie
Leo Schwartzberg	Director, South Broward Drainage District
John Mulliken,	Program Implementation Manager, Intergovernmental Programs, South Florida Water Management District

Support Staff

Dr. Jennifer Jurado	Director, Broward County Natural Resources Planning and Management Division
Toni Edwards	Broward County Natural Resources Planning and Management Division
John Crouse	Broward County Water and Wastewater Services
Robert Rudolph	Broward County Natural Resources Planning and Management Division
Carole Morris	South Florida Water Management District
John Mulliken	South Florida Water Management District

APPENDIX C

WATER RESOURCE TASK FORCE WATER SUPPLY MILESTONES

WRTF Water Supply Milestones

Water Provider	Raw	Finished	Finished	Projected Finished Water Demand (MGD)[3]																												
	FDEP Permitted Capacity (MGD Max Day)[1]	Floridan Commitment 2013 (MGD)[2]	Biscayne Allocation (MGD Average Day)[2]	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Past 2035
Broward County District 1	18.0	3.50	9.20	8.40					9.18					10.16					11.01					11.74					12.16	
Broward County District 2 / North Regional	40.0	0.00	16.29	14.70					15.68					16.89					17.93					18.76					19.27	
Cooper City	6.0	0.00	3.83	3.24					3.65					3.78					3.83					3.85					3.86	
Coral Springs	16.0	0.00	8.25	7.74					8.23					8.85					9.35					9.70					9.86	
Coral Springs Improvement District	7.2	0.00	4.84	4.60					4.67					4.73					4.82					4.91					4.96	
Dania Beach	3.0	0.00	2.63	2.20					2.54					2.96					3.31					3.57					3.74	
Davie	7.4	0.00	5.02	4.50					4.97					5.50					5.96					6.33					6.50	
Deerfield Beach	34.8	1.74	11.86	7.81					8.17					8.64					9.09					9.52					9.84	
Ferncrest (Tindall Hammock)	1.3	0.00	0.74	0.39					0.41					0.44					0.47					0.50					0.53	
Fort Lauderdale	82.0	6.73	48.80	38.80					41.02					44.00					46.98					49.93					52.04	
Hallandale Beach	22.0	0.00	8.60	4.89					5.35					6.00					6.61					7.17					7.60	
Hillsboro Beach	2.0	0.00	0.94	0.76					0.81					0.87					0.96					1.07					1.19	
Hollywood	55.5	6.00	28.93	23.88					25.36					27.40					29.47					31.50					32.97	
Lauderhill	16.0	0.00	7.40	8.00					8.38					8.90					9.35					9.73					9.96	
Margate	18.0	0.00	7.66	8.13					8.45					8.84					9.33					9.85					10.22	
Miramar	15.0	2.00	10.98	9.41					9.94					10.54					11.09					11.56					11.85	
North Lauderdale	7.5	0.00	3.08	3.36					3.54					3.74					3.92					4.07					4.14	
North Springs Improvement District	4.8	0.00	3.94	4.21					4.51					4.87					5.14					5.26					5.32	
Parkland Utilities	0.6	0.00	0.28	0.23					0.27					0.32					0.35					0.36					0.36	
Pembroke Pines	18.0	0.00	13.02	12.60					13.03					13.49					13.89					14.22					14.42	
Plantation	24.0	0.00	14.46	14.61					15.44					16.43					17.30					18.05					18.43	
Pompano Beach	50.0	0.00	17.22	15.39					16.40					17.63					18.86					20.11					21.11	
Royal Utilities	1.0	0.00	0.45	0.35					0.36					0.37					0.38					0.39					0.40	
Seminole Industries	0.0	0.00	0.00	0.00					0.00					0.00					0.00					0.00					0.00	
Sunrise	44.0	4.00	29.31	31.82					33.44					35.16					36.59					37.66					38.28	
Tamarac	21.0	0.00	6.55	7.13					7.38					7.65					7.92					8.16					8.33	
Totals	**515.1**	**24.0**	**264.3**	**237.1**					**251.2**					**268.2**					**283.9**					**298.0**					**307.3**	

New water needed to meet future demand	Need to initiate new project to meet future demand	Might need to initiate new project to meet future demand

[1] Source: FDEP February 2009

[2] Source: SFWMD February 2009

[3] Source: Broward County population projections (February 2009) and SFWMD per capita usage rate data (February 2009)

4/30/2010

APPENDIX D

SUMMARY MATRIX OF PROPOSED REGIONAL WATER SUPPLY CONCEPTS

Broward Water Resources Task Force

2009 Regional Project Concepts

Project Name	Project Concept	Project Area	Pros	Cons	Issues	Time Frame	Cost
C-51 Project							
C-51 Reservoir Project	Excess stormwater that would otherwise be sent to tide or into deep injection wells would be stored in rock pits in northern Palm Beach County during the wet season and discharged through surface water management systems to wellfields in Palm Beach and Broward Counties during the dry season	Broward and Palm Beach Counties	1. Could provide 120 MGD of the 186 MGD needed to meet demand not currently met 2. Would likely have smaller carbon footprint and perhaps lower cost than other water supply alternatives 3. Would provide environmental benefits to Lake Worth Lagoon	1. Key questions relating to feasibility and viability from both a permitting and operational perspective remain unanswered 2. Project feasibility is enhanced from a cost perspective with broad participation, may become less attractive as an alternative as other commitments are made.	1. Phase I of the project complete, Phase II under consideration 2. Questions remain regarding responsibility for funding, operating and maintaining facility 3. Where, how and to whom would water be allocated? 4. Potential offset credits 5. Project permitability 6. Willingness of Lake Worth Drainage District to accept C-51 water in light of water quality concerns 7. Conveyance alternatives	2025	$2.70/gal. plus treatment costs
REGION 1 - FLORIDAN SYSTEMS							
Floridan expansion at Fort Lauderdale Peele-Dixie WTP for wholesale to Broward County District 1A	Broward County District 1A purchases finished water for future demands from Fort Lauderdale Floridan System	Region 1	1. Less capital cost for WTPs 2. Less O & M cost for WTPs	1. More capital cost for transmission 2. More roadway disruptions 3. Potential chemical reactions between Biscayne and Floridan waters 4. Long-term reliability of Floridan Aquifer	1. SFWMD WUP requires new capacity on-line by 4/2013 2. Marine seismic work in canals may better characterize the Floridan Aquifer 3. Surcharges to purchaser	2015	$7/gal
Floridan expansion at Broward County District 1A WTP for wholesale to Margate/North Lauderdale/Lauderhill and/or Tamarac	City(ies) purchase finished water for future demands from Broward County D1A Floridan System	Region 1	1. Less capital cost for WTPs 2. Less O & M cost for WTPs	1. Long-term reliability of Floridan Aquifer	1. SFWMD WUP requires new capacity on-line by 4/2013 2. Marine seismic work in canals may better characterize the Floridan Aquifer 3. Surcharges to purchaser	2015	$7/gal

Glossary: ATW-Advanced Treated Wastewater; AWS-Alternative Water Supply; CUP-Consumptive Use Permit; HLD-High Level Disinfection; MGD-Million Gallons per Day; O & M-Operation and Maintenance; WCA-Water Conservation Area; WTP-Water Treatment Plant (Drinking Water); WUP-Water Use Permit; WWTP-Wastewater Treatment Plant

Broward Water Resources Task Force

2009 Regional Project Concepts

Project Name	Project Concept	Project Area	Pros	Cons	Issues	Time Frame	Cost
Single Floridan WTP to serve both Pompano Beach and Broward District 2A	Alternative to building separate plants for each utility	Region 1	1. Less capital cost for WTPs 2. Less O & M cost for WTPs	1. More capital cost for transmission 2. More roadway disruptions 3. Potential chemical reactions between Biscayne and Floridan waters 4. Long-term reliability of Floridan Aquifer	1. SFWMD WUP requires new capacity be on-line by 3/2013 2. Marine seismic work in canals may better characterize the Floridan Aquifer 3. Surcharges to purchaser	2015	$7/gal
Single Floridan WTP to serve both Broward County Districts 1A and 2A	Alternative to building separate plants for each district	Region 1	1. Less capital cost for WTPs 2. Less O & M cost for WTPs	1. More capital cost for transmission 2. More roadway disruptions 3. Potential chemical reactions between Biscayne and Floridan waters 4. Long-term reliability of Floridan Aquifer	1. SFWMD WUP requires new capacity be on-line by 3/2013 (D2A) and 4/2013 (D1A) 2. Marine seismic work in canals may better characterize the Floridan Aquifer 3. Surcharges to purchaser	2015	$7/gal
REGION 1 - REUSE SYSTEMS							
Coconut Creek Irrigation - Broward County and Coconut Creek	Broward provides tertiary treated water to Coconut Creek for irrigation	Region 1	1. Ocean outfall 2. Good demand 3. State objectives	1. Residential retrofits 2. Water quality requirements will increase cost 3. Wet weather disposal	1. Cost driven by water quality requirements 2. Permitting 3. Cost	2015	$10-$12/gal
Irrigation and Wellfield Protection - Broward County, Pompano Beach, Deerfield and Lighthouse Point	Tertiary treated water provided for irrigation to reduce demand on Biscayne Aquifer	Region 1	1. Ocean outfall 2. Sea level rise 3. Reuse plant available 4. Trans line from Broward available 5. State objectives	1. No line to Deerfield 2. Demand uncertain	1. Continue discussions with Deerfield 2. Deerfield does not need AWS	2025	$10-$12/gal
Broward County, Pompano Beach and Deerfield Beach saltwater intrusion protection	Pompano provides ATW to Deerfield Beach for selected sites to create head pressure and push back saltwater intrusion line	Region 1	1. Ocean outfall 2. Wellfield protection 3. Sea level rise 4. Reuse plant exists 5. Trans line from Broward available 6. State objectives	1. No line to Deerfield 2. Pompano does not have ATW capabilities yet 3. Water quality requirements 4. Will raise electric usage and disposal 5. Separate mains will be needed for ATW	1. Continue discussions with Deerfield 2. Deerfield has no unmet demands 3. Permitting	2025	$10-$12/gal

Broward Water Resources Task Force

2009 Regional Project Concepts

Project Name	Project Concept	Project Area	Pros	Cons	Issues	Time Frame	Cost
Broward County, Coconut Creek and Margate	Broward provides tertiary reuse to Coconut Creek and Margate	Region 1	1. Ocean outfall 2. State objectives 3. Demand 4. Margate needs 1.6 MGD by 2025	1. Wet weather disposal	1. Continue discussions with Margate	2020	$10-$12/gal
REGION 2 - FLORIDAN SYSTEMS							
Park City Floridan WTP	New WTP sized to handle one to four adjacent utilities needs. (Davie, Plantation, Cooper City, Sunrise, Lauderhill)	Region 2	1. Economies of scale cost advantage 2. Provides phased approach allowing utilities in need to gain capacity in a timely manner	1. Cost 2. Creates additional waste stream that requires disposal solution 3. Highly energy intensive technology - not environmentally sound water augmentation solution	1. Funding 2. Interlocal Agreement 3. Concern over sustainability of Floridan Aquifer	2013 - 2018	$7/gal
REGION 2 - REUSE SYSTEMS							
Lauderhill/Sunrise Reuse Facility	Expansion of Sunrise Springtree WWTP to add HLD and reuse distribution system	Region 2	1. Complies with SFWMD mandate to reuse water 2. Potential to transfer the golf course CUP to one of the cities 3. Potential pursuit of additional offset	1. High initial capital cost 2. High O & M costs 3. High distribution system costs	1. Funding 2. Interlocal Agreement 3. Chapter 27 water quality requirements	2015	$10-$12/gal
REGION 3 - FLORIDAN SYSTEMS							
Regional Water Wholesale Concept (Near Term)	Expansion of existing reverse osmosis plant at the City of Hollywood and wholesale water to nearby communities within Region 3 (Hallandale Beach, Dania Beach, Broward County District 3)	Region 3	1. Realize economies of scale savings as a result of the expansion of an existing facility as opposed to constructing a facility to serve a single user 2. Regional projects are better candidates for state and federal funding 3. Regional opportunities allow for spreading costs within a greater pool which may result in lower O & M costs	1. Sustainability of Floridan Aquifer water quality is questionable 2. May be more expensive to operate in long run if water quality degrades	1. Establishment of wholesale agreements and distribution system improvements	2015	$3/gal

Broward Water Resources Task Force

2009 Regional Project Concepts

Project Name	Project Concept	Project Area	Pros	Cons	Issues	Time Frame	Cost
REGION 3 - REUSE SYSTEMS							
Floridan Aquifer Recharge Concept (2025)	Treat secondary effluent from the Southern Regional WWTP and recharge the Hollywood Floridan Aquifer wells.	Region 3	1. Potential of providing localized replenishment of the Floridan Aquifer 2. Water quality goals may be less restrictive than Biscayne Aquifer recharge 3. May be the lowest cost option to meet ocean outfall legislation 4. Potential for regional benefits	1. Floridan Aquifer model has not been completed to determine benefits of this option 2. Need to explore possibility of water quality variance for Floridan Aquifer recharge with regulatory agency 3. Possible higher O & M costs than Biscayne Aquifer recharge option 4. Energy intensive	1. This is not a concept that has been explored to date, thus the requirement to conduct further studies to assess feasibility prior to full scale implementation	2025 - per ocean outfall legislation	$10-$12/gal
Biscayne Aquifer Recharge Concept (2025)	Treat secondary effluent from the Southern Regional WWTP and recharge Biscayne Aquifer wellfields (Hollywood and Brian Piccolo) and also look at opportunities to retard the influence of saltwater on eastern wellfields (Dania Beach and Hallandale Beach)	Region 3	1. Potential of providing offset that would allow increases in Biscayne Aquifer allocations 2. Potential regional benefits for users of the County's Brian Piccolo wellfield 3. Allows for further utilization of Biscayne Aquifer thus lessening the amount of existing lime softening capacity that could be stranded	1. Second highest cost option to meet ocean outfall legislation 2. Given the relatively high groundwater elevation in the region there is a possibility that a significant amount of this water may be wasted to tide for flood prevention 3. Need to determine whether the potential offsets / credits are worthy of the investment 4. Impacts of climate change and sea level rise have not been assessed 5. Energy intensive	1. While this is a concept that has been applied in other locations, it is important that studies at a pilot scale be conducted to evaluate treatability, feasibility and the impact of aquifer recharge in the study area prior to full scale implementation	2025 - per ocean outfall legislation	$15/gal

Broward Water Resources Task Force

Region 1 Project Prioritization Matrix

Criterion	Rating Scale	A	B	C	D	E	F	G	H	I	Comments
		Broward and Palm Beach Counties	Region 1 Projects (Northeast and Central)								
			FLORIDAN				REUSE				
		C-51 Reservoir Project	Floridan expansion at Fort Lauderdale Peele-Dixie WTP for wholesale to Broward District 1A	Floridan expansion at Broward District 1A WTP for wholesale to Margate / North Lauderdale / Lauderhill and / or Tamarac	Single Floridan WTP to serve both Pompano Beach and Broward District 2A	Single Floridan WTP to serve both Broward Districts 1A and 2A	Coconut Creek Irrigation - Broward County and Coconut Creek	Irrigation and Wellfield Protection - Broward County, Pompano Beach, Deerfield and Lighthouse Point	Broward County, Pompano Beach and Deerfield Beach saltwater intrusion protection	Broward County, Coconut Creek and Margate	
Meets Multiple Objectives											
Supports Ocean Outfall Legislation	**1** = No **3** = Potentially **5** = Yes	1	1	1	1	1	5	5	5	5	
Increases Potable Water Supply		5	5	5	5	5	3	3	3	3	Provides additional potable water or provides offset for increasing supplies.
Preserves/Utilizes Existing Capacity		5	1	1	1	1	5	3	5	3	
Utilizes Stranded Capacity		5	1	1	1	1	3	3	5	3	
Avoids/Reduces Redundant Infrastructure		5	3	3	3	5	5	5	3	3	
		Meets Multiple Objectives Category Average Scores									
		4	2	2	2	3	4	4	4	3	
Cost											
Capital Cost (price per gallon of water) [1]	**1** = $11 to $14 **3** = $7 to $10 **5** = $3 to $6	5	3	3	3	3	5	5	1	3	Some costs for expansion in the Biscayne Aquifer will vary by utility.
Operation & Maintenance Cost (price per thousand gallons of water) [1]	**1** = $1.01 - $1.50 **3** = $0.51 - $1.00 **5** = $0.01 - $0.50	3	1	1	1	1	3	3	1	3	
Permitability											
	1 = Challenging **3** = Uncertain **5** = Probable	3	5	5	5	5	5	5	3	5	Considered timeframes.
Environmental Issues											
Disposal (By Products and Residuals)	**1** = Disposal method needed but unavailable **3** = Disposal method already available **5** = No disposal method needed	5	3	1	1	1	3	3	1	3	
Energy Demand/Carbon Footprint [2]	**1** = Seawater RO (15 kwh/1000 gallons) **3** = Nanofiltration or Floridan Low Pressure RO (3 - 5 kwh/1000 gallons) **5** = Lime Softening (1 kwh/1000 gallons)	5	1	1	1	1	3	3	3	3	Reflective of water quality uncertainty in the Floridan Aquifer and disposal costs for reverse osmosis (RO) concentrate.

Criterion	Rating Scale	A	B	C	D	E	F	G	H	I	Comments
		Broward and Palm Beach Counties	Region 1 Projects (Northeast and Central)								
			FLORIDAN				REUSE				
		C-51 Reservoir Project	Floridan expansion at Fort Lauderdale Peele-Dixie WTP for wholesale to Broward District 1A	Floridan expansion at Broward District 1A WTP for wholesale to Margate / North Lauderdale / Lauderhill and / or Tamarac	Single Floridan WTP to serve both Pompano Beach and Broward District 2A	Single Floridan WTP to serve both Broward Districts 1A and 2A	Coconut Creek Irrigation - Broward County and Coconut Creek	Irrigation and Wellfield Protection - Broward County, Pompano Beach, Deerfield and Lighthouse Point	Broward County, Pompano Beach and Deerfield Beach saltwater intrusion protection	Broward County, Coconut Creek and Margate	
Stakeholder and Public Acceptance											
	1 = Challenging (requires intense outreach) **3** = Requires some level of outreach **5** = Status quo	3	5	5	5	5	3	3	3	3	Considered "ick" factor.
Technology											
Delivery/Conveyance (Magnitude of Challenge)	**1** = Requires significant level of new infrastructure **3** = Requires intermediate level of new infrastructure with limited disruption **5** = Utilizes existing infrastructure and/or minimal new infrastructure	3	1	1	3	1	3	3	1	3	Considered level of disruption.
Certainty/Reliability of Water Quality and Quantity	**1** = Uncertain long term treatment requirements and water quality **3** = Some variability anticipated **5** = Stable source water and treatment requirements	5	3	3	3	3	5	5	5	5	
Component Compatibility	**1** = Many concerns and/or unknowns **3** = Minimal concerns **5** = No concerns	3	3	3	3	3	5	5	3	5	Considered hydraulic/chemical compatibility, blending of different source waters, etc..
Outside Funding Opportunities											
	1 = No known outside sources **3** = Limited opportunities **5** = Multiple opportunities	3	3	3	3	3	3	3	3	3	
Total Score [3]		**42**	**30**	**28**	**30**	**29**	**42**	**42**	**28**	**39**	

Criterion	Rating Scale	A	B	C	D	E	F	G	H	I	Comments
		Broward and Palm Beach Counties	Region 1 Projects (Northeast and Central)								
			FLORIDAN				REUSE				
		C-51 Reservoir Project	Floridan expansion at Fort Lauderdale Peele-Dixie WTP for wholesale to Broward District 1A	Floridan expansion at Broward District 1A WTP for wholesale to Margate / North Lauderdale / Lauderhill and / or Tamarac	Single Floridan WTP to serve both Pompano Beach and Broward District 2A	Single Floridan WTP to serve both Broward Districts 1A and 2A	Coconut Creek Irrigation - Broward County and Coconut Creek	Irrigation and Wellfield Protection - Broward County, Pompano Beach, Deerfield and Lighthouse Point	Broward County, Pompano Beach and Deerfield Beach saltwater intrusion protection	Broward County, Coconut Creek and Margate	
Political Feasibility											
	1 = Challenging 3 = Workable 5 = Likely										

[1] From Patrick Davis

[2] From Patrick Gleason

[3] For the Meets Multiple Objectives category, the average of the 5 individual criterion scores was used in the total score calculation rather than the individual criterion scores.

Broward Water Resources Task Force

Region 2 Project Prioritization Matrix

Criterion	Rating Scale	A	B	C	Comments
		Broward and Palm Beach Counties	Region 2 Projects (Southwest and Central)		
			FLORIDAN	REUSE	
		C-51 Reservoir Project	Park City Floridan WTP	Lauderhill / Sunrise Reuse Facility	
Meets Multiple Objectives					
Supports Ocean Outfall Legislation	1 = No 3 = Potentially 5 = Yes	1	1	1	
Increases Potable Water Supply		3	5	3	Provides additional potable water or provides offset for increasing supplies.
Preserves/Utilizes Existing Capacity		5	1	5	
Utilizes Stranded Capacity		5	1	3	
Avoids/Reduces Redundant Infrastructure		5	5	5	
		Meets Multiple Objectives Category Average Scores			
		4	3	3	
Cost					
Capital Cost (price per gallon of water) [1]	1 = $11 to $14 3 = $7 to $10 5 = $3 to $6	5	3	3	Some costs for expansion in the Biscayne Aquifer will vary by utility.
Operation & Maintenance Cost (price per thousand gallons of water) [1]	1 = $1.01 - $1.50 3 = $0.51 - $1.00 5 = $0.01 - $0.50	3	3	3	
Permitability					
	1 = Challenging 3 = Uncertain 5 = Probable	3	5	5	Considered timeframes.
Environmental Issues					
Disposal (By Products and Residuals)	1 = Disposal method needed but unavailable 3 = Disposal method already available 5 = No disposal method needed	5	1	3	
Energy Demand/Carbon Footprint [2]	1 = Seawater RO (15 kwh/1000 gallons) 3 = Nanofiltration or Floridan Low Pressure RO (3 - 5 kwh/1000 gallons) 5 = Lime Softening (1 kwh/1000 gallons)	5	1	3	Reflective of water quality uncertainty in the Floridan Aquifer and disposal costs for reverse osmosis (RO) concentrate.
Stakeholder and Public Acceptance					
	1 = Challenging (requires intense outreach) 3 = Requires some level of outreach 5 = Status quo	3	5	5	Considered "ick" factor.

Criterion	Rating Scale	A	B	C	Comments
		Broward and Palm Beach Counties	Region 2 Projects (Southwest and Central)		
			FLORIDAN	REUSE	
		C-51 Reservoir Project	Park City Floridan WTP	Lauderhill / Sunrise Reuse Facility	
Technology					
Delivery/Conveyance (Magnitude of Challenge)	**1** = Requires significant level of new infrastructure **3** = Requires intermediate level of new infrastructure with limited disruption **5** = Utilizes existing infrastructure and/or minimal new infrastructure	3	1	1	Considered level of disruption.
Certainty/Reliability of Water Quality and Quantity	**1** = Uncertain long term treatment requirements and water quality **3** = Some variability anticipated **5** = Stable source water and treatment requirements	5	3	5	
Component Compatibility	**1** = Many concerns and/or unknowns **3** = Minimal concerns **5** = No concerns	3	3	5	Considered hydraulic/chemical compatibility, blending of different source waters, etc..
Outside Funding Opportunities					
	1 = No known outside sources **3** = Limited opportunities **5** = Multiple opportunities	3	3	3	
Total Score [3]		**42**	**31**	**39**	
Political Feasibility					
	1 = Challenging **3** = Workable **5** = Likely				

[1] From Patrick Davis

[2] From Patrick Gleason

[3] For the Meets Multiple Objectives category, the average of the 5 individual criterion scores was used in the total score calculation rather than the individual criterion scores.

Broward Water Resources Task Force

Region 3 Project Prioritization Matrix

Criterion	Rating Scale	A	B	C	D	Comments
		Broward and Palm Beach Counties	Region 3 Projects (Southeast)			
			FLORIDAN	REUSE		
		C-51 Reservoir Project	Regional Water Wholesale Concept (Near Term)	Floridan Aquifer Recharge Concept (2025)	Biscayne Aquifer Recharge Concept (2025)	
Meets Multiple Objectives						
Supports Ocean Outfall Legislation	1 = No 3 = Potentially 5 = Yes	1	1	5	5	5 if project is beneficial reuse for Floridan wells.
Increases Potable Water Supply		3	5	5	5	Provides additional potable water or provides offset for increasing supplies.
Preserves/Utilizes Existing Capacity		5	3	1	5	Hollywood has existing Floridan capacity but would need to be increased (we thought this may be their nano plant before).
Utilizes Stranded Capacity		5	1	1	5	Ditto.
Avoids/Reduces Redundant Infrastructure		5	5	1	3	
		Meets Multiple Objectives Category Average Scores				
		4	3	3	5	
Cost						
Capital Cost (price per gallon of water) [1]	1 = $11 to $14 3 = $7 to $10 5 = $3 to $6	5	5	3	1	Some costs for expansion in the Biscayne Aquifer will vary by utility. Ditto.
Operation & Maintenance Cost (price per thousand gallons of water) [1]	1 = $1.01 - $1.50 3 = $0.51 - $1.00 5 = $0.01 - $0.50	3	3	3	1	Ditto.
Permitability						
	1 = Challenging 3 = Uncertain 5 = Probable	3	5	3	3	Considered timeframes. Ditto.
Environmental Issues						
Disposal (By Products and Residuals)	1 = Disposal method needed but unavailable 3 = Disposal method already available 5 = No disposal method needed	5	3	3	3	
Energy Demand/Carbon Footprint [2]	1 = Seawater RO (15 kwh/1000 gallons) 3 = Nanofiltration or Floridan Low Pressure RO (3 - 5 kwh/1000 gallons) 5 = Lime Softening (1 kwh/1000 gallons)	5	1	3	3	Reflective of water quality uncertainty in the Floridan Aquifer and disposal costs for reverse osmosis (RO) concentrate.
Stakeholder and Public Acceptance						
	1 = Challenging (requires intense outreach) 3 = Requires some level of outreach 5 = Status quo	3	5	3	1	Considered "ick" factor.

Criterion	Rating Scale	A	B	C	D	Comments
		Broward and Palm Beach Counties	Region 3 Projects (Southeast)			
			FLORIDAN	REUSE		
		C-51 Reservoir Project	Regional Water Wholesale Concept (Near Term)	Floridan Aquifer Recharge Concept (2025)	Biscayne Aquifer Recharge Concept (2025)	
Technology						
Delivery/Conveyance (Magnitude of Challenge)	**1** = Requires significant level of new infrastructure **3** = Requires intermediate level of new infrastructure with limited disruption **5** = Utilizes existing infrastructure and/or minimal new infrastructure	3	3	1	1	Considered level of disruption.
Certainty/Reliability of Water Quality and Quantity	**1** = Uncertain long term treatment requirements and water quality **3** = Some variability anticipated **5** = Stable source water and treatment requirements	5	3	3	3	Floridan source may be irregular - some potential secondary effluent quality issues - ditto.
Component Compatibility	**1** = Many concerns and/or unknowns **3** = Minimal concerns **5** = No concerns	3	3	3	3	Considered hydraulic/chemical compatibility, blending of different source waters, etc..
Outside Funding Opportunities						
	1 = No known outside sources **3** = Limited opportunities **5** = Multiple opportunities	3	3	3	3	
Total Score [3]		**42**	**37**	**31**	**27**	
Political Feasibility						
	1 = Challenging **3** = Workable **5** = Likely					

[1] From Patrick Davis

[2] From Patrick Gleason

[3] For the Meets Multiple Objectives category, the average of the 5 individual criterion scores was used in the total score calculation rather than the individual criterion scores.

APPENDIX E

C-51 WHITE PAPER

C-51 White Paper Briefing Document
Prepared for the Broward Water Resources Task Force
December 20, 2009

Introduction

This document was prepared at the request of the Broward County Water Resources Task Force to summarize the status of C-51 Reservoir Conceptual Project. As noted below, the document is largely based on a series of draft Technical Memoranda produced for the Phase 2A Study of the project. One critical Technical Memorandum, Task 4 – Cost Benefit Analysis, was incomplete. A brief Progress Report was provided on Task 4.

The draft Technical Memoranda were provided in mid-December to members of the Broward County Water Resource Task Force's Technical Team. These documents have not been made available to all stakeholders. It is anticipated that a complete draft of the Phase 2A report will be circulated for technical review by interested parties, including state and federal agencies. This White Paper will be updated for the Task Force after the final Phase 2A Study report becomes available.

Background

The C-51 Reservoir Project Concept was initiated as a collaborative effort between several water utilities in Broward County, the Palm Beach County water utility, and the South Florida Water Management District as a potential strategy for capturing stormwater runoff for wet season storage and later use during the dry season. The project concept evolved from previous Everglades restoration project analyses which had identified wet season discharges from the C-51 canal as having a negative impact on the downstream ecosystem of the Lake Worth Lagoon. Early analyses had also indicated that environmental benefits might be gained by diverting these discharges to an unknown user, thereby reducing the overall magnitude of freshwater discharges and associated environmental impacts to the Lake Worth Lagoon.

The partner water utilities in the C-51 project concept recognized the potential value of serving as this "unknown user" by making beneficial reuse of the available wet season stormwater with the construction of a reservoir that would serve to capture and store stormwater runoff for later distribution to benefit urban water providers. Although local geology is substantially porous and generally limits opportunities for providing effective long-term surface water storage in the region, unusually tight geologic formations have been identified in southern Palm Beach County (in the vicinity of the existing L-8 Reservoir) with the potential to serve as a suitable site for construction of a surface water reservoir (the proposed C-51 Reservoir).

Partner water utilities coordinated in a multi-year effort to more thoroughly evaluate the potential feasibility of the C-51 Reservoir as a viable water resource/water supply project to benefit local water utilities and urban water supply needs. Investigations involved

collaborations with the SFWMD and hydrologic modeling to ascertain the amount of water that might be available for distribution under a 1:10 drought condition. This volume of water was reliably estimated at 120 MGD and was envisioned to create a water supply benefit by providing an offset to enhanced wellfield operations and withdrawals from the Biscayne Aquifer. While hydrologic modeling demonstrated that recharge operations could serve to offset wellfield operations, various questions were raised with regards to the conveyance of the C-51 source water, whether distribution would require routing through the Arthur R. Marshall Loxahatchee Wildlife Refuge, whether water quality in the proposed C-51 reservoir might pose concerns, and the functionality of the "cascade" mechanism for redistributing regional water during conditions more severe than the 1:10 level of service requirement for consumptive use permitting.

The initial feasibility study is now generally known as Phase 1. Questions derived from Phase 1 findings were slated to be addressed in subsequent phases.

Phase 2A Analysis and Findings:

On June 5, 2009 a joint meeting of the Broward and Palm Beach Water Resources Task Forces was held for the purpose of reviewing these issues and ultimately support was gained by both Task Forces for proceeding with a Phase 2A scope of work designed to respond to these questions. The Phase 2A scope of work was finalized with substantial input provided by the SFWMD and included 4 principal tasks. Task descriptions and determinations are summarized below, with substantial use of text and text extracted from Draft Technical Memoranda prepared by Hazen and Sawyer as part of Phase 2A deliverables. Task 4 comments are based on a Progress Report as the Task 4 Technical Memorandum has not been completed.

1. **Update of Raw Water Demand Projections** - to determine the portion of future water supply demands that could benefit from the proposed C-51 Reservoir.

   Updated raw water demand projections for Broward and Palm Beach water utilities and FPL were prepared based on data sets provided by individual water utilities and the SFWMD. For the Broward County water utilities, 2030 raw water demand projections generated from the two data sets totaled 298.7 and 291.2 MGD, respectively. For the southern Palm Beach County water utilities, the 2030 raw water demands totaled 204.98 and 153.20 MGD, respectively, with the difference attributed to an increase in water demand projections submitted by Palm Beach County Water Utilities.

   Determination - The total potential demand for water from the C-51 Reservoir is estimated to be 59 MGD in 2015, 86 MGD in 2020, and 117 MGD in 2030, assuming that current commitments to obtain about 53 MGD form the Floridan Aquifer by 2030 will take place.

2a. Water Supply Certification - to describe a proposed regulatory process for certifying the amount of water to be made available in accordance with the Regional Water Availability Rule with implementation of the C-51 reservoir.

Water can be made available for consumptive use as a "water resource development project" after certification by the SFWMD Governing Board that additional water is available or as a "water supply development project."

A "water resource development project" as defined by Section 373.019(22) F.S. includes "the formulation and implementation of regional water resources management strategies… structural and nonstructural programs to protect and manage water resources…the construction, operation, and maintenance of major public works facilities to provide for flood control, surface and underground water storage, and groundwater recharge augmentation."

If the proposed C-51 reservoir was constructed and operated as a resource development project, the SFWMD Governing Board could certify the volume of water made available for use by the project and approve requests by consumptive water users who could use this project for compliance with the Regional Water Availability Rule.

In contrast, "water supply development" is defined by Section 373.0129 (24) F.S. as 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."

As a water supply project, the District would review an application for an alternative water supply reservoir to provide offsets for additional withdrawals from the surficial aquifer. The allocation of water from a proposed C-51 Reservoir would then be subject to consumptive use permit decisions by the District for both the quantity available for offsets and the service area for use of the offsets. A consumptive use application for each participating water user would also be needed to quantify the offset volume needed for each use.

Determination: The C-51 reservoir project could be considered either a "water resource development project" or a "water supply project" and can comply with requirements of the Regional Water Availability Rule through the certification process, providing a water supply offset, serving as an alternative water supply, and providing available wet season water.

2b. Analysis of Water Conveyance Alternatives – to evaluate routing alternatives for the delivery of water from the C-51 reservoir to water providers in the Palm Beach and Broward counties including use of conveyance infrastructure in the Lake Worth Drainage District (LWDD) and the Everglades Agricultural Area (EAA).

Conveyance Alternative 1 involved the routing of water from the C-51 canal to both Palm Beach and Broward Counties within the LWDD. Routing options requiring internal modifications within the Refuge were not recommended as this option is not supported by the United States Fish and Wildlife Service due to impacts to flora and fauna. Thus, routing mechanisms limited to conveyance system modifications internal to the LWDD are preferred.

Infrastructure modifications to provide conveyance to Broward County via discharges to the Hillsboro Canal would involve the installation of 3 pump stations and 3 gated structures within the LWDD at a capital cost estimated to be $50 M. Additional infrastructure improvements to the secondary canal system in Broward County are estimated at $10 M in capital cost.

Under Conveyance Alternative 2, water within the C-51 Canal could also be delivered to Broward County utilities through the SFWMD canals in the EAA. No additional capital costs are presented for this alternative as it is assumed that existing infrastructure would be adequate to manage these deliveries. However, questions have been raised as to whether there would be sufficient capacity within the EAA Stormwater Treatment Areas (STA) 2 and 3/4 to receive these deliveries and whether water quality originating from the C-51 basin (averaging 111 ppb for Total Phosphorus) would present any challenges.

Determination - Despite the fact that routing of C-51 deliveries through the EAA may have the potential to avoid $50 million in additional capital costs, further analyses are necessary to investigate issues of water quality and quantity before establishing the ultimate feasibility of this routing mechanism.

3. **Geotechnical and Hydrologic Conditions** – to determine whether the geologic conditions that support the operation of the L-8 Reservoir extend to the region being considered for siting of the C-51 Reservoir.

Permeability Rates

Previous field permeability tests conducted for the L-8 pilot storage project showed permeability in what is now cell 3 of the reservoir to range from <1 to 10 feet per day, to a depth of 75 feet. Data for cell 4 of the reservoir showed field permeability ranging from 16 to 20 feet per day, to a depth of 35 feet.

Tests performed at three wells further west (in the area where the C-51 reservoir might be located) showed field permeability ranging from 2 to 28 feet per day. However, a relatively high zone below 35 feet was noted with permeability ranging from 53 to 78 feet per day at a well in the southwest boundary of the study area. Tests performed further north showed field permeability ranging from 10 to 29 feet per day. While field permeability rates measured west of the L-8 may be a bit higher than rates measured within the L-8, these rates are still significantly lower than rates typically measured in the EAA For example, the EAA Reservoir Test Cell Project developed a horizontal conductivity of 400 ft per

day for the Fort Thompson Formation by calibrating groundwater models to measurements taken during the Test Cell Project (SFWMD EAA Reservoir A-1 Basis of Design Report, January 2006).

Dewatering Data

Other important geotechnical information to consider is dewatering data available for the L-8 reservoir. The L-8 reservoir was constructed by dewatering the surficial aquifer to a depth of 30 feet using 2 – 3 8 inch pumps within 100 acre cells. Dewatering at this scale is generally not possible anywhere else in South Florida due to high seepage rates. The dewatering data ranged from 1.43 to 3.85 inches per week. Dewatering in cells to the west of the reservoir was measured at 1.51 to 2.77 inches per week. These similar dewatering rates suggest that seepage rates are consistent between the L-8 reservoir and the mined areas to the west

Seepage Tests

Seepage tests were performed on the L-8 reservoir. The seepage test required less than 24 inches of seepage in 28 days with 20 feet of head between the reservoir and the L-8 canal. The final seepage test demonstrated a rate of 21.7 inches in 28 days, which satisfied the SFMWD requirement of less than 24 inches and the performance of this site as a surface water storage reservoir.

Determination - Because the area adjacent to and west of the L-8 reservoir shares similar aquifer performance and dewatering characteristics, it is expected that a reservoir in this area would have similar seepage characteristics. Final design of any new storage feature to the west of the L-8 reservoir would require further site and performance specific analysis and data collection.

4. **Cost-effectiveness Analysis** – to determine the point at which project development may no longer be cost-effective based upon the total cost of the project, the amount of water to be produced, and the level of utility participation.

In 2007, the original cost estimate for property acquisition and C-51 reservoir construction was $274 million. In 2009, updated cost estimates are $350 million including the addition of slurry walls, slope protection, an inlet to accommodate water flows of 1,200 cfs, and a 450 cfs pump station.

Conveyance Alternative 1 – includes routing and improvements involving the LWDD and conveyance of C-51 water deliveries to water providers within Palm Beach and Broward County. The total cost estimate for this routing alternative is $492.7 Million.

Conveyance Alternative 2 – involves routing through the EAA and includes no additional capital improvements within the EAA with the assumption that existing SFWMD infrastructure can accommodate deliveries. The total cost estimate for this routing alternative is $442.7 Million.

Both Alternatives 1 and 2 are assumed to have operational costs of $200,000 annually.

It is assumed that the 120 MGD of water that could be captured within the C-51 reservoir would support a recharge-to-withdrawal ratio of 0.75. That is to say, that 0.75 MGD of recharge would provide an offset for 1 MGD of wellfield withdrawals. [It is noted that this recharge ratio is an aggregate of all wellfields combined. The ratio for each individual wellfield varies depending primarily on proximity to a regional surface water body.] This would allow for 160 MGD of withdrawal from the surficial aquifer, and, assuming a treatment efficiency of 85%, the production of 136 MGD of potable water. Preliminary cost analyses prepared by Hazen and Sawyer are presented below:

Table 1.

Estimated Capital and O&M Costs of Proposed C-51 Reservoir in 2009 Dollars Using Conveyance Alternative 1 - LWDD

Type of Cost	Capital Cost (million $)	Annual O&M Cost (million $)	Capital Cost In Dollars / Gal of Water Capacity	Annual O&M Cost in Dollars / 1,000 Gal. of Water	Total Cost / 1,000 Gal. of Water (a)
(1)	(2)	(3)	(4) = (2) / mgd	(5) = ((3) x 1,000) / (mgd x 365)	(6)
Cost per Water Offset (120 mgd)	$493	$1.2	$4.11	$0.03	$1.01
Cost per Raw Water Provided (160 mgd)	$493	$1.2	$3.08	$0.02	$0.76
Cost per Potable Water Produced (136 mgd) (b)	$493	$1.2	$3.62	$0.02	$0.89

(a) Based on 20 year municipal bond at 6 percent annual interest.
(b) Does not include the cost ot water treatment and distribution.

Table 2.

Estimated Capital and O&M Costs of Proposed C-51 Reservoir in 2009 Dollars Using Conveyance Alternative 2 – EAA

Type of Cost	Capital Cost (million $)	Annual O&M Cost (million $)	Capital Cost In Dollars / Gal of Water Capacity	Annual O&M Cost in Dollars / 1,000 Gal. of Water	Total Cost / 1,000 Gal. of Water (a)
(1)	(2)	(3)	(4) = (2) / mgd	(5) = ((3) x 1,000) / (mgd x 365)	(6)
Cost per Water Offset (120 mgd)	$443	$1.2	$3.69	$0.03	$0.91
Cost per Raw Water Provided (160 mgd)	$443	$1.2	$2.77	$0.02	$0.68
Cost per Potable Water Produced (136 mgd) (b)	$443	$1.2	$3.26	$0.02	$0.80

(a) Based on 20 year municipal bond at 6 percent annual interest.
(b) Does not include the cost ot water treatment and distribution.

Determination – Since these costs are believed to represent the high end of probable expenses, the preliminary results of the cost-effectiveness analysis (which is still in an early draft form) suggest that the project continues to merit further investigation and pursuit of the C-51 reservoir as a cost-effective water supply strategy with benefits for the Broward and Palm Beach water providers. However, the unit cost of water to be derived from the project will be substantially influenced by the overall demands placed on the reservoir as the cost of reservoir construction represents the bulk of the capital cost. To the extent that the reservoir might be fully constructed but only partially utilized, this could result in a significant increase in the unit cost of water to be extracted from the reservoir. In other words, if a utility or FPL were to drop out of the project, the reservoir would become less cost effective for the remaining participants. Ultimately, the cost-effectiveness of this project would be most fully realized with the complete utilization of the estimated 120 MGD of storage capacity and 160 MGD of surficial aquifer offset that could be supported by the C-51 reservoir.

Conclusions:

The Phase 2A Scope of Work was undertaken in response to several specific concerns raised by stakeholders, the South Florida Water Management District, and U.S. Fish and Wildlife and Loxahatchee Refuge relating to project feasibility. Analyses were focused on addressing potential geotechnical constraints of the proposed project site, environmental constraints, permitting alternatives, and cost-effectiveness. Primary conclusions are as follows:

1. The study results support continued development of the project concept based on geotechnical analyses which appear promising regarding the potential function of the proposed C-51 site as a water storage reservoir, recognizing that more detailed analyses will need to be undertaken as part of a more detailed project design.

2. To avoid any potential for water quality impacts on the Loxahatchee Refuge, recommended conveyance alternatives include routing through the EAA and the use of the LWDD secondary canal system.

3. The EAA conveyance alternative is estimated to provide a $50 Million cost savings over the LWDD conveyance alternative by avoiding certain capital improvements to secondary canal infrastructure within the LWDD. However, a final determination by the SFWMD about the capacity of the EAA to receive C-51 water deliveries is still required.

4. Updated water demand and cost projections continue to identify the C-51 reservoir as a potentially cost-effective water supply alternative for water providers within Palm Beach and Broward counties with a capital cost estimated to range from $3.08 to $4.11 per gallon and total cost (including operations and maintenance) ranging from $0.68 to $0.76 per 1,000 gallons (see Table 1). These estimates assume that the full capacity of the reservoir is utilized by participating water providers and will increase if demands on the reservoir are less than the projected 120 MGD to be available for delivery.

Next Steps:

1. Finish Task Four and circulate a complete version of the draft 2A Report for stakeholder, agency and Task Force Review.

2. Receive and respond to comments on complete version of draft Phase 2A report.

3. Meet with the District regarding draft Phase 2A Study's assumptions, statements, and conclusions in the report, which include issues related to regulations, restoration, existing infrastructure, and system operations.

4. Finalize Phase 2A report.

5. Present Phase 2A findings to both Broward and Palm Beach Task Forces

6. Seek consensus on how to proceed:

    - Abandon the project based on Phase 2A findings/determinations or other factors; or,

- Develop Phase 2B Scope of work for a more detailed feasibility analysis and determine the most appropriate entities to fund and manage the Phase 2B Study.

APPENDIX F

PROPOSED AMENDMENTS TO FLORIDA BUILDING CODE

Proposed Amendments to Building Code

FLORIDA MECHANICAL CODE

301.11 Repair. Defective material or parts shall be replaced or repaired in such a manner so as to preserve the original approval or listing. Cooling tower replacement shall comply with Section 307.2.1 and 908.6 of the FMC.

307.2 Evaporators and cooling coils. Condensate drain systems shall be provided for equipment and appliances containing evaporators or cooling coils. Condensate drain systems shall be designed, constructed and installed in accordance with Sections 307.2.1 through 307.2.4.

307.2.1 Condensate disposal. Condensate from all cooling coils and evaporators shall be conveyed from the drain pan outlet to the cooling tower or other location where it will be used in lieu of potable water. ~~an approved place of disposal. Condensate shall not discharge into a street, alley, or other areas so as to cause a nuisance.~~

908.6 Drainage. Drains and overflows ~~Drains, overflows and blowdown~~ provisions shall be indirectly connected to an approved disposal location. Chemical treatment systems shall be installed to limit the requirement for bleed off to less than .005 gallons per ton per day. Blowdowns shall be installed with a water meter to verify flow and the discharge modified in a manner ~~Discharge of chemical waste shall be~~ approved b y the appropriate regulatory authority.

FLORIDA BUILDING CODE, EXISTING BUILDINGS
SECTION 508
MECHANICAL

508.1 General. Existing mechanical systems undergoing repair shall comply with Section 301.11 of the Florida Building Code, Mechanical and shall not make the building less conforming than it was before the repair was undertaken.

Minor areas of Building code will be researched and changed appropriately. An appropriate size of cooling tower to be eliminated from requirements for restricted blowdown shall be researched and specified as an exempted.