

**POTABLE WATER  
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## **8.0 POTABLE WATER ELEMENT** *[Rule 9J-5.011, F.A.C]*

The Potable Water Element of the Monroe County (County) Comprehensive Plan addresses the data inventory requirements of 9J-5.005(2) of the Florida Administrative Code (F.A.C.). The data inventory requirements will support the development of goals, objectives, policies, and implementation programs for the Potable Water Element.

The purpose of the Potable Water Element of the Comprehensive Plan is to provide principles and guidelines for infrastructure requirements supporting future and existing land uses.

### **8.1 Introduction**

The Potable Water Element serves as a guide on the existing and future potable water systems based on the problems and needs associated with those facilities. Several considerations in the development of the Potable Water Element include: an analysis of existing data, identification of present and potential problems, needs and their solutions, and projection of future potable water issue and needs for planning purposes. For the purpose of the County's Comprehensive Plan, potable water is defined as water of sufficient quality to serve as drinking water.

The Florida Keys (the Keys) are in a unique situation with regard to the supply of potable water. With virtually no freshwater rivers, lakes or streams, and few freshwater lenses, residents have had to rely on man-made collection and distribution systems in order to survive. In 1937, the Florida Legislature, aware that cisterns and container water could not adequately support the development of the Keys, created the Florida Keys Aqueduct Commission (FKAC). The Commission was formed to develop potable water facilities for the County. Until 1940, no centralized public water supply system existed; residents relied, as they had for more than a century, on the unpredictable source of rainwater collected from roofs into cisterns. Private wells supplemented this source, but could only be tapped in the few areas where freshwater lenses exist.

The FKAC reached an agreement with the United States Navy to share in the cost of a water main from the mainland. Water was pumped from the Biscayne Aquifer, and an 18-inch main was constructed from well fields near Florida City along the entire length of the Keys to Key West. The Florida Keys Aqueduct Authority (FKAA) replaced the FKAC in the 1970's and assumed responsibility for the water system. In 1981, FKAA, with financial assistance from the Farmer's Home Administration, commenced construction of major improvements to the system.

## 8.2 Sources of Water

There are no significant sources of fresh surface water in the populated Florida Keys portions of the County. Two sources of groundwater underlie the County - the Floridan Aquifer System, and the Biscayne Aquifer. **Table 8.1** illustrates the relative positions and productivities of these hydrogeologic units.

The Floridan Aquifer System (FAS) is a confined artesian aquifer. In the Keys, wells tapping the FAS will flow at land surface at rates ranging from 75 to 1,000 gallons per minute (gpm). Although available in significant quantities, Floridan water requires desalination treatment before it is suitable for either potable or irrigation use. Chloride concentrations in the FAS range from 1,600 to 20,000 milligrams per liter (mg/l), with concentrations generally increasing to the south.

**Table 8.1 - Ground Water Systems in Monroe County**

Hydrogeologic System	Hydrogeologic Unit	Water Resource Potential
Surficial Aquifer System	Biscayne Aquifer	Largely saline, a lens of relatively freshwater floats above the saltwater on some of the larger keys. Must be desalinated for potable use. No additional withdrawals will be permitted. Vulnerable to spills and contamination.
Intermediate Confining Unit	Hawthorn Confining Beds	Very low permeability, confining unit for the Floridan Aquifer System.
Floridan Aquifer System	Floridan Aquifer	Wells yield from 75 to 1,000 gallons of saline water per minute. Requires desalination for all uses. Some zones may be suitable for Aquifer Storage Recovery (ASR) applications.

Source: South Florida Water Management District

The Biscayne Aquifer is the largest supplier of freshwater in southeast Florida. In the Keys, water from the Biscayne Aquifer ranges from brackish to chloride levels associated with seawater and requires desalination for potable use. Some Monroe County residents provide their own water supply for landscape irrigation using home Reverse Osmosis (RO) plants to desalinate Biscayne Aquifer water or collecting rain water in cisterns. However, due to the limited availability of fresh groundwater, its vulnerability to saltwater intrusion and its importance to wildlife, only a limited number wells have been permitted in this shallow aquifer since February 1986.

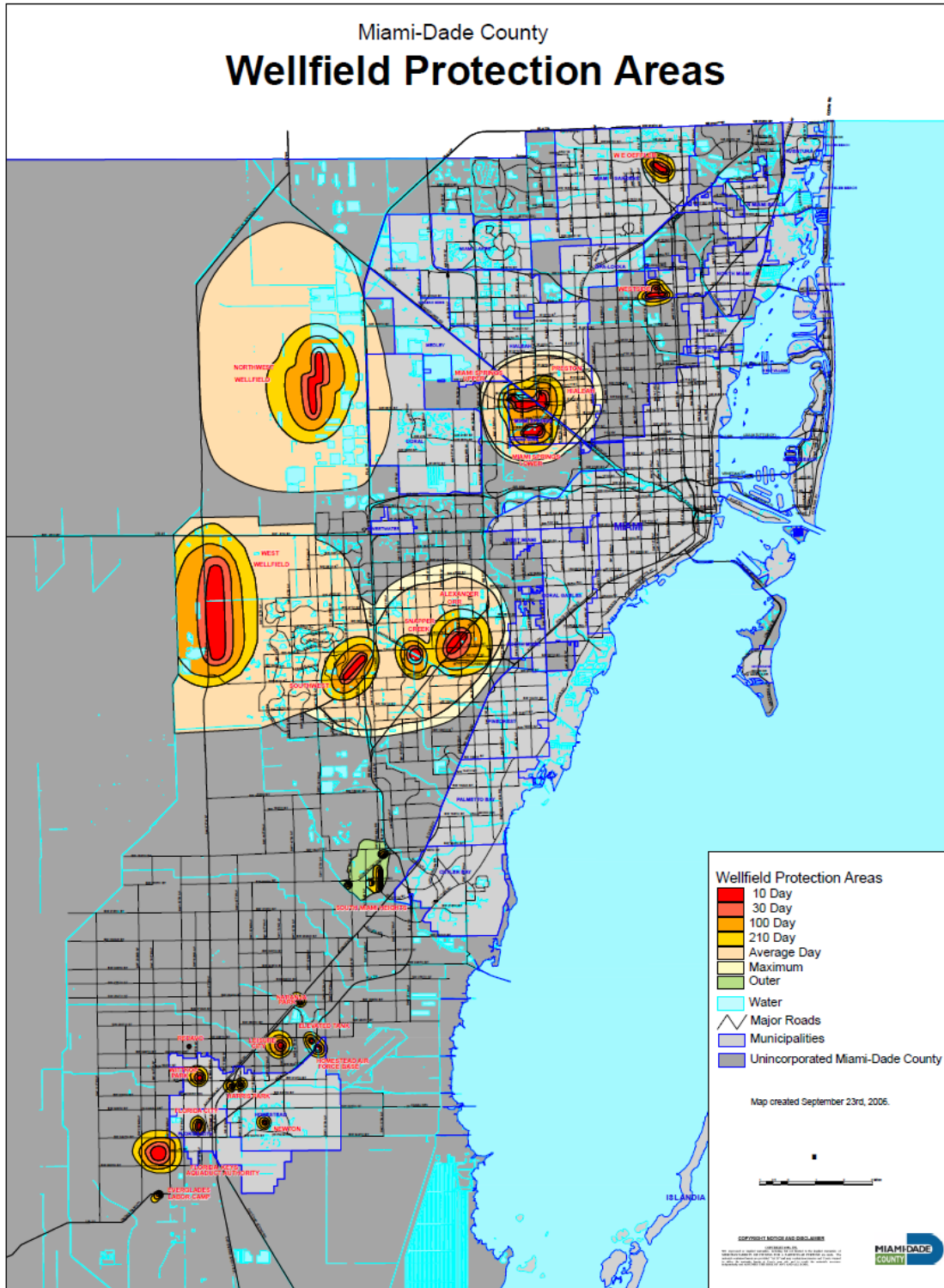
On some of the larger keys, a lens of freshwater floats above the saltwater. The largest of these freshwater lenses occur on Key West and Big Pine Key. Limited quantities also occur on Cudjoe and Sugarloaf Keys. Chloride levels in these lenses are too high for human consumption, but are suitable for most irrigation purposes, and provide the major source of drinking water for wildlife.

Today, the FCAA remains the sole supplier of centralized potable water to the Keys, and the vast majority of the County residents receive their potable water, supply and distribution, from the FCAA system. Therefore, the County, being a retail customer of FCAA, does not have any local responsibility for potable water supply or distribution to its citizens. The primary source of water to the Keys is from the FCAA's Florida City wellfield, which pumps water from the Biscayne Aquifer and the Floridan Aquifer System in southeastern Miami-Dade County (see **Figure 8.1**).

There are alternative potable and non-potable water supplies in use in the Keys; They include private cisterns, private wells (See Natural Groundwater Aquifer Recharge element for listing), home desalinization systems, and bottled water. Most users of these alternative sources rely on them only as supplements to the FCAA water. Cistern and well water, are often reserved for irrigation and other non-potable uses. A few residents of mainland Monroe County are served by private wells and cisterns.

In order to ensure the availability of an adequate quantity and quality of potable water, an intricate framework of federal, state and local regulations controls the process of supplying water to the Keys. After a brief discussion of regulatory system, existing facilities and planned improvements are described. A discussion of water conservation programs is included, followed by a discussion on the status of the FCAA system. Finally, a needs assessment and levels of service (LOS) standards are presented.

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Source: Miami-Dade County

**Figure 8.1 - Miami-Dade County Wellfield Protection Areas**

**8.3 Regulatory**  
*[Rule 9]-5.011 (1)(h), F.A.C]*

*8.3.1 Federal Regulations*

U.S. Public Law 104-182, “Safe Drinking Water Act” (SDWA) was originally passed in 1974 and amended in 1986 and 1996 to protect public health by regulating the nation’s public drinking water supply. The act requires the U.S. Environmental Protection Agency (EPA) to develop criteria for selecting critical aquifer protection areas and gives the EPA authority to set national health based standards for drinking water. The program calls for state and local governments to map those areas and develop protection plans, subject to EPA review and approval. Once a plan is approved, EPA may enter into an agreement with the local government to implement the plan.

In 2010, EPA published proposed, “Water Quality Standards for the State of Florida’s Lakes and Flowing Waters” 40 CRF 131 which describes numeric nutrient water quality criteria to protect aquatic life in lakes and flowing waters, including canals, within the State of Florida and proposing regulations to establish a framework for Florida to develop “restoration standards” for impaired waters.

*8.3.2 State Regulations*

The Safe Drinking Water Act provides for the protection of public water system wellfield and aquifers used as the sole source of a community drinking water supply. Amendments provide for wellfield protection which requires states to work with local governments through the planning process to identify and to protect wellhead areas.

In accordance with federal guidelines, the Florida Safe Drinking Water Act (Sections 403.850-403.864, F.S.) has been adopted, which designates the Florida Department of Environmental Protection (DEP) as the state agency responsible for the regulation of drinking water. The DEP has therefore promulgated rules classifying and regulating public water systems, including mandatory water treatment criteria (Chapter 62-528. F.A.C.) The DEP enforces both the primary (health) and secondary (aesthetics) water quality standards for public water supplies in Florida.

In addition to the direct regulation of water distributed in public water supply systems, DEP establishes standards for various designated uses of natural waters, including potable water. Under DEP's classification system, Class 1 waters are designated for use as public potable water supplies. These waters are regulated under standards specifically designed to protect the public health. The DEP also regulates the use of certain alternative water supply systems, such as Reverse Osmosis (RO) plants.

The South Florida Water Management District (SFWMD) is responsible for managing water resources for a large region which extends from Kissimmee Valley to Key West and spans the territories of over eighty local governments. Through the consumptive use permitting process, SFWMD allocates water supplies among public utilities and other users to be distributed to consumers. The SFWMD can issue Consumptive Use Permits (CUPs) for up to a 20-year period. The CUPs authorize annual allocations, and can include a number of limiting conditions that address issues such as maximum daily withdrawals, water level monitoring, maintenance, and emergency procedures. An important addition to this permitting process is the water conservation requirement. Since 1988, SFWMD requires CUP applicants requesting 100,000 gallons per day (gpd) or greater to submit a water conservation plan that meets SFWMD Guidelines. The FCAA updated its most recent plan as part of its Permit renewal approved in March 2008.

### 8.3.3 *Local Regulations*

The provision of potable water in unincorporated Monroe County is affected primarily by the regulations and policies of two governmental bodies, the FCAA and Monroe County, and peripherally by a third, Miami-Dade County. The FCAA, actually an independent special district, serves as an autonomous corporate and political body whose primary function is to obtain, supply, and distribute an adequate water supply for the Florida Keys. As the only centralized public water source, the FCAA requires, with a few exceptions to be described later, that all entities desiring a potable water supply may connect to the FCAA facilities if and when distribution lines are available. FCAA was created by Chapter 76-441, Laws of Florida and is subject to the provisions of Chapter 120, F.S. and the Florida Administrative Procedures Act.

The FCAA is governed by a Board of Directors, which appoints an Executive Director to manage the day-to-day operations and the field, administrative, technical and legal staff. FCAA's basic operating regulations are outlined in their *Policy and Procedure Handbook*, Chapter 48, which is available online and upon request. These policies cover the detailed organizational rules, provision of water service, service fees, engineering requirements, service area limitations, and alternative supplies.

Besides managing the centralized public water supply system, FCAA has "the authority to regulate all potable water supplies within its boundaries." (FCAA, Chapter 48-8.001(1), F.A.C.) The FCAA therefore has authority over the installation and operation of alternative water supplies. Single family and duplex residences using alternative systems, and water supply systems used solely for domestic purposes are exempt from FCAA permitting requirements. However, any other entity wishing to construct or operate a well, cistern, RO system or other alternative supply system must comply with FCAA's conditions for approval (FCAA, Chapter 48-8.004, F.A.C.)

Although the FCAA has primary responsibility for the potable water supply, the County has some jurisdiction over supply sources and distribution, especially with regard to land use and single family or duplex residential development. In compliance with FCAA regulations, the Monroe County Code requires "sufficient" potable water from an approved and permitted

source. The Code recognizes alternative water sources, such as wells and cisterns, in addition to FCAA's distribution system. Section 114-16 of the Monroe County Land Development Code (MCLDC) states that, "...individual wells shall only be permitted where there is no public supply of water feasible." Residents are allowed to continue the use of existing wells; yet, cisterns and other types of, "independent water systems shall be encouraged whenever permitted" (Sec. 114-46). The County has also incorporated water efficiency standards to augment SFWMD and FCAA programs as defined in the 2007 Florida Building Code provided in **Table 8.2**.

**Table 8.2 – Maximum Flow Rates and Consumption for Plumbing Fixtures and Fixture Fittings**

Plumbing Fixture or Fixture Fitting	Maximum Flow Rate or Quantity <sup>b</sup>
Lavatory, private	2.2 gpm at 60 psi
Lavatory, public, (metering)	0.25 gallon per metering cycle
Lavatory, public (other than metering)	0.5 gpm at 60 psi
Shower head <sup>a</sup>	2.5 gpm at 80 psi
Sink Faucet	2.2 gpm at 60 psi
Urinal	1.0 gallon per flushing cycle
Water closet	1.6 gallons per flushing cycle

Source: 2007 Florida Building Code

For SI: 1 gallon = 3.785 L, 1 gallon per minute (gpm) = 3.785 L/m,  
1 pound per square inch (psi) = 6.895 kPa.

a. A hand-held shower spray is a shower head

b. Consumption tolerances shall be determined from referenced standards.

**8.4 Wellfields**  
*[Rule 9J-5.011 (1)(g), F.A.C]*

**8.4.1 Wellfield Conditions**

The capacity of the FCAA's Florida City wellfield was evaluated in a report prepared by F.W. Meyer of the U.S. Geological Survey in 1974. In this report water levels in southern Miami-Dade County, the potentiometric surface of the aquifer, and chloride levels at USGS monitoring wells were evaluated. Current and planned surface water conveyance systems in the vicinity were also reviewed.

The potentiometric surface of the Biscayne Aquifer as measured during the 1974 study showed that, during the period 1960-1971, the average water table elevation at the FCAA wellfield was 3.75 feet above Mean Sea Level (MSL). The lowest yearly elevation was slightly below MSL and the average for highest year was slightly higher than five feet above MSL.

In 1984, the United States Geologic Survey (USGS) conducted another survey of the potentiometric surface of the Biscayne Aquifer. These surveys, one conducted immediately following the wet season (October 1984) and the other conducted following the dry season (May 1984), can be used to evaluate regional water levels within the Biscayne Aquifer. From the surveys, the wet season potentiometric surface at the wellfield was estimated at 3 feet above MSL and the dry season at 1.5 feet above MSL.

The regional potentiometric surface is affected by groundwater withdrawals, recharge from conveyance canals, rainfall, and evapotranspiration. The apparent small effect of increased withdrawals on the aquifer can be attributed to an extremely high transmissivity and storage coefficient. Consultants to FKAA have asserted that the aquifer could sustain withdrawals of up to 18 million gallons per day (MGD) average daily flow (ADF) without significant effect on regional water levels.

Recent data from the USGS water level records indicates that the aquifer has sustained a mean surface elevation of approximately 2.5 feet above National Geodetic Vertical Datum (NGVD). This is cited as evidence of minimal effect of increased pumpage on the water table.

The FKAA wellfield could potentially be impacted by salt water intrusion and/or development in the surrounding area. Presently, the FKAA, in cooperation with the USGS and Miami-Dade County Environmental Resource Management maintains a ground and surface water monitoring network around the well field to provide sufficient warning in the event of serious salt water intrusion. Chlorides average approximately 45 mg/l or less at the surface water monitoring points.

#### *8.4.2 Miami-Dade County Wellfield Protection Program*

Wellfield protection of the FKAA Florida City Wellfield is accomplished through the provisions of the Miami-Dade County Potable Water Supply Well Protection Ordinance (Miami-Dade County Code 24-43). This Code contains the following provisions regarding the protection of the County's water supply service: Septic Tanks, Sanitary Sewers, Stormwater Disposal Methods, Prohibition of Hazardous Materials within Wellfield Protection Areas, Excavation, Pipelines for Hazardous Materials and Prohibition of Resource Recovery and Management Facilities with Wellfield Protection Areas.

#### *8.4.3 Septic Tanks*

The Ordinance provides for regulation of septic tanks within the wellfield cone of influence as defined by Section 24-43 by requiring that the Miami-Dade County Department of Environmental Resources Management (DERM) find that the placement of septic tanks and septic tank drainfields are installed on a parcel of land as far away as is reasonably possible from potable water supply wells and by establishing specific septic tank sewage loading standards. In addition, the Ordinance requires that for septic tanks or septic tank drainfields located within the maximum day wellfield protection area, a minimum separation from the

nearest public utility potable supply well equivalent to ten days travel time be provided. The specific distance of the ten-day travel time is dependent upon the transmissivity of the aquifer.

#### 8.4.4 *Sanitary Sewers*

Section 24-43 establishes the following sewage loading restrictions and facilities construction requirements for all sanitary sewers installed within the wellfield protection area:

- Residential land use - No gravity sanitary sewer shall have an exfiltration rate greater than 50 gallons per inch pipe diameter per mile per day. Sewer lateral lines located in the public right-of-way shall be a minimum of six inches in diameter.
- Nonresidential land use - No gravity sanitary sewer shall have an exfiltration rate greater than 20 gallons per inch pipe diameter per mile per day. Sewer lateral lines located in the public right-of-way shall be a minimum of six inches in diameter.

All sanitary sewer force mains shall be constructed of either ductile iron or reinforced concrete pressure sewer pipe. No such ductile iron sanitary sewer force main shall exfiltrate at a rate greater than the allowable leakage rate specified in American Water Works Association Standard C600-82 at a test pressure of 100 pounds per square inch. No such reinforced concrete pressure sanitary sewer force main shall exfiltrate at a rate greater than one-half the allowable leakage rate specified for ductile iron pipe in American Water Works Association Standard C600-82 at a test pressure of 100 pounds per square inch.

Notwithstanding the provisions of Section 24-43 (4)(b), all gravity sanitary sewers with invert elevations above the average surrounding water table elevation and all sanitary sewer force mains shall be tested to ensure compliance with the aforementioned exfiltration rate standards.

A registered professional engineer shall provide written certification of the exfiltration rate for all manhole/gravity sewer pipe systems installed, in equivalent gallons per inch pipe diameter per mile of pipe per day (24 hours), and the exfiltration rate for all sanitary sewer force mains in gallons per hour per 1,000 feet of sanitary sewer force main installed. Existing gravity sanitary sewers with pipe diameters of eight inches or more shall be visually inspected by television every five years by the responsible utility or property owner to ensure both structural and pipe joint integrity. Existing manholes shall be visually inspected for both structural and incoming pipe connection integrity every five years.

Certified test and inspection results and repair logs shall be submitted to the department of environmental resources management within 30 days after completion of the particular test, inspection, or repair.

8.4.5 *Stormwater Disposal Methods*

Stormwater disposal methods which are required by the Wellfield Protection Ordinance within the wellfield protection area are listed in **Table 8.3**.

**Table 8.3 - Allowable Storm Water Disposal Methods for Residential and Nonresidential Property**

Travel Time in Days or Distance in Feet from Property to Nearest Public Utility Potable Water Supply Well	Allowable Methods for Storm Water Disposal
More than 30 days but not exceeding 210 days	Infiltration or seepage or overflow outfalls only
More than 10 days but not exceeding 30 days	Infiltration or seepage only
More than 100 feet but not exceeding 10 days	Infiltration only
100 feet or less	None

Source: Miami-Dade County Ordinance, Section 24-43, Table C-1.

Liquid Waste Storage Disposal or Treatment Methods other than septic tanks utilized for the disposal discharge, storage or treatment of domestic sewage, sanitary sewer lift stations; and public sanitary sewers are subject to the following provisions:

Notwithstanding the grandfathering provisions of the wellfield protection ordinance, liquid waste storage, disposal or treatment methods (other than septic tanks utilized for the disposal discharge, storage or treatment of domestic sewage; sanitary sewer lift stations, and public sanitary sewers) are prohibited within the wellfield protection area.

8.4.6 *Prohibition of Hazardous Materials Within Wellfield Protection Areas*

Notwithstanding any provisions of the Wellfield Protection Ordinance, no County or municipal officer, agent, employee or Board shall approve, grant or issue any building permit, certificate of use and occupancy (except for changes in ownership), municipal occupational license (except for changes in ownership), platting action (final plat, waiver of plat or equivalent municipal platting action) or zoning action (district boundary change, unusual use, use variance or equivalent municipal zoning action) for any nonresidential land use, other than a bona fide agricultural land use, a bona fide rockmining use (lake excavation), a public sewer facilities use, or a public water supply facilities use, within the Northwest Wellfield protection area or within the West Wellfield Interim protection area or within the outer wellfield protection zone of the South Miami Heights Wellfield Complex, or within the maximum day pumpage wellfield protection area of the Alexander Orr Wellfield, Snapper Creek Wellfield, Southwest Wellfield, Miami Springs Lower Wellfield, John E. Preston Wellfield, or Hialeah Wellfield or within the basic wellfield protection area of any public utility potable water supply well, without obtaining the prior written

approval of the Director or the Director's designee. The Director or the Director's designee shall issue the Director's or the Director's designee's written approval only if the Director or the Director's designee determines that the nonresidential land use is in compliance with Sections 24-43(5)(a), 24-43(5)(b) or 24-43(5)(c).

Approval by the DERM is required for any non-residential use, excluding agricultural and rock mining uses, within the maximum day pumpage wellfield protection area. This approval is required of any land use which generates, handles, disposes of, discharges or stores hazardous materials. Approval is granted only if the DERM determines that all potential sources of pollution will be located as far away as is reasonably possible from all potable water supply wells; that hazardous materials will not be used generated, handled, disposed of, discharged or stored on that portion of the property; and that the following water pollution prevention and abatement measures are addressed:

- monitoring and detection of water pollution caused by hazardous materials;
- secondary containment of water pollution caused by hazardous materials;
- inventory control and record keeping of hazardous materials;
- stormwater management of water pollution caused by hazardous materials; and
- protection and security of facilities utilized for the generation, storage, usage, handling, disposal or discharge of hazardous materials.

Replacement, modification or limited expansion of existing facilities which will substantially reduce the existing risk of pollution from hazardous materials are reviewed by the DERM based on the following criteria:

- whether the proposed replacement, modification or limited expansion of the facility will provide adequate and increased monitoring and detection of pollution which may be or which has been caused by the hazardous materials on the property;
- whether the proposed replacement, modification or limited expansion of the facility will provide adequate and increased secondary containment of pollution which may be or which has been caused by the hazardous materials on the property;
- whether the proposed replacement, modification or limited expansion will provide adequate and increased inventory control and record keeping of hazardous materials on the property;
- whether the proposed replacement, modification or limited expansion will provide adequate and increased stormwater management of pollution which may be or which has been caused by the hazardous materials on the property; and

- whether the proposed replacement, modification or limited expansion will provide adequate and increased protection and security of the facilities utilized for the generation, storage, usage, handling, disposal or discharge of hazardous materials on the property.

#### 8.4.7 *Excavation*

Excavation activities within the Wellfield Protection Areas require approval from the DERM and must comply with the following requirements:

- The property upon which the excavation has occurred or will occur and that portion of the property which has not been excavated or will not be excavated shall be provided with protection and security measures to prohibit the handling, disposal of, discharge storage of hazardous materials, solid waste, or liquid waste in the excavation area or on the property which has not been excavated or will not be excavated. Said protection and security shall be subject to the approval of the director or his designee;
- Furthermore, the owner of the property upon which the excavation has occurred or will occur and that portion of the property which has not been excavated or will not be excavated in form(s) prescribed by the director and approved by the Board of County Commissioners. The covenants shall be recorded in the public records of Miami-Dade County, Florida, by the DERM at the expense of the owner of the property upon which the excavation is to occur; or
- The excavation has a valid excavation permit or equivalent municipal permit for excavation and a valid Class IV permit, if required by Article II of the Wellfield Protection Ordinance, which was obtained prior to September 30, 1983, which permits have been valid and continuously in full force and effect since their issuance.

#### 8.4.8 *Pipelines for Hazardous Materials*

Notwithstanding the grandfathering provisions of the Potable Water Supply Well Protection Ordinance, no installation, construction or operation of any pipeline or portion of pipeline used for the transmission or storage of any hazardous materials within the basic wellfield protection area is allowed. The grandfathering provisions provide that pipelines constructed prior to July 13, 1984, the effective date of the ordinance, are not subject to the ordinance and can remain operational.

*8.4.9 Prohibition of Resource Recovery and Management Facilities within Wellfield Protection Areas*

Notwithstanding the grandfathering provisions of the Potable Water Supply Well Protection Ordinance, no permits are issued for any resources recovery and management facility within the basic wellfield protection area of any public utility water supply well. The grandfathering provisions of the ordinance provide that valid permits for resource recovery facilities issued no later than March 12, 1987, may be renewed.

**8.5 Potable Water Supply and Treatment Facilities**

*[Rule 9J-5.011 (1)(c),(d) and (e), F.A.C]*

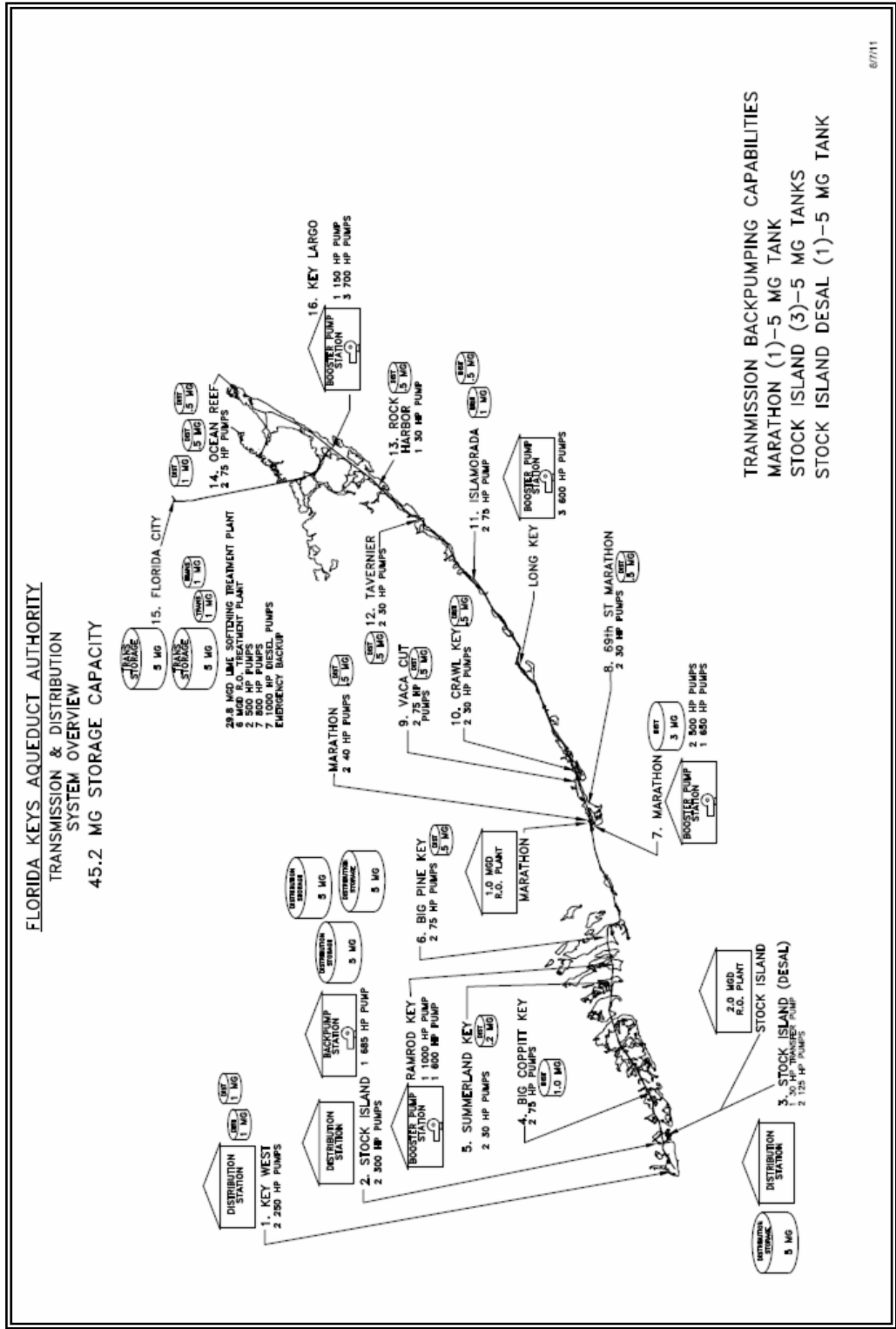
*8.5.1 The Florida Keys Aqueduct Authority*

The Florida Keys Aqueduct Authority (FKAA) is the sole supplier of potable water to the County. The primary purpose of the FKAA is to obtain, supply, and distribute an adequate water supply for the Florida Keys. The service area of the FKAA includes all of the lands within the County, but the Authority has the power to obtain potable water outside of its boundaries and transmit it for sale within its geographic boundaries, and also to serve customers residing within one mile of its existing pipeline and wellfield at Florida City in Miami-Dade County. The dominant land use classification within the service area remains conservation and residential. Commercial, education, industrial, institutional, military, public facilities, and recreational uses are also served.

Since the County is a consumer, (a shared facility user), any proportional capacity analyses are initially based on the service area population. Therefore, consumption rate of unincorporated Monroe County is factored by its percentage share of the FKAA total service area population.

The FKAA's source of water for withdrawal is the Biscayne and Floridan Aquifers. The South Florida Water Management District (SFWMD) regulates water withdrawal from the aquifers through the issuance of Consumptive Use Permits (CUP). The Consumptive Use Permit currently in effect (SFWMD Water Use Permit No. 13-00005-W) was issued on March 13, 2008, and is valid for a twenty year period ending March 13, 2028. This permit is actually a re-issuance of a permit granted by SFWMD on November 14, 2002. The current permit contains an annual withdrawal of 8.751 billion gallons per year, an average monthly allocation of 809 million gallons, or 17.79 MGD and an average dry season (December 1 – April 30) of 17 MGD.

The following schematic shows the FKAA's facilities and water production and distribution system excerpted from the Authority's 2008 Application for Water Use Permit Modification and Renewal. The FKAA system components are shown in **Figure 8.2**. The entire system consists of wells, pumps and storage tanks at Florida City, which connects to the water treatment facility and then to main and distribution lines, pump stations, and various storage tanks along the chain of keys to Key West.



Source: Florida Keys Aqueduct

Figure 8.2 - FKAA Facilities

### *8.5.2 Florida City Wellfield*

The primary raw water source for the system is a wellfield withdrawing from the Biscayne Aquifer west of Florida City in southeast Miami-Dade County. The aquifer consists of highly permeable limestone and underlies most of Miami-Dade and Broward Counties. The aquifer, approximately 75 feet thick at the FKAA wellfield, is recharged directly by rainfall, the network of SFWMD canals, and ground water seepage. The aquifer discharges through evapotranspiration, drainage and seepage to the Florida and Biscayne Bays, and by wellfield pumping.

A condition of the SFWMD CUP requires FKAA to monitor and submit data from the Salt Water Intrusion Monitoring (SWIM) program to the SFWMD on a monthly basis. In accordance with an additional condition of the permit FKAA is implementing a Saline Water Intrusion Monitoring Program (SALT) that utilizes 15 monitoring wells to measure any movement of the saline water interface. The SFWMD criterion to prevent saltwater intrusion is that one-foot head of fresh water be maintained between the wellfield and the saline water source. Saltwater intrusion usually results from a sustained decrease in fresh water head, allowing saltwater to migrate inland. Results of groundwater modeling indicate that drawdowns associated with increased withdrawals are minimal. The FKAA in cooperation with the United States Geologic Survey (USGS) maintains a ground and surface water quality monitoring network around the wellfield that is sampled monthly.

The network consists of ten FKAA wells and nine USGS wells that include two wells with continuous water level recorders. From the data included in the 2008 Application for Water Use Permit Modification-Renewal, it was concluded that in 2008 the 1,000 mg/lisochlor was estimated to be six miles southeast of the wellfield and was in approximately the same location as was reported in 1974.

### *8.5.3 Water Treatment and Storage Facilities.*

The Florida City Water Treatment Plant (FCWTP) underwent extensive modification completed in August 1989 and is the sole water treatment facility utilized by the FKAA. The FDEP rated capacity for the FCWTP is 23.8 MGD. The FCWTP uses a process of lime softening followed by filtration as the core of its treatment process. Water disinfection is accomplished through contact with free or combined chlorine. Fluoridation is also provided to reduce the incidence of dental cavities.

The raw water flow rate is measured at each well discharge line by electronic, propeller type flow meters. A raw water metering facility measures total flow into the treatment system. Following treatment, the total treated water is pumped to the transmission main and measured with a flow meter. Finally, water consumption is measured with a meter at the end user location.

The raw water quality in the Biscayne Aquifer continues to be acceptable for potable water supply. Prior to treatment, this water meets all federal and state primary and secondary

water quality standards. In addition to governmental quality standards, potable water should appeal to the public: clear, colorless, pleasant to the taste, cool, non-staining, and convenient to use. The raw water supply at Florida City is also capable of satisfying all these criteria with minimal treatment. However, the total hardness of the raw water does pose problems with the longevity of the infrastructure. The raw water hardness at Florida City, 280 mg/l as CaCO<sub>3</sub>, exceeds what is normally considered the desirable range for domestic use. The American Waterworks Association suggests a finished water hardness goal of 100 mg/l as CaCO<sub>3</sub> for distribution. The Florida City Treatment Plant currently produces finished water with a total hardness between 80 mg/l and 110 mg/l as CaCO<sub>3</sub>.

In order to comply with Biscayne Aquifer withdrawal limitations, a new Floridan wellfield and reverse osmosis (RO) water treatment process were recently constructed. Operational since the fall of 2009, the RO water treatment plant treats the brackish water of the Floridan Aquifer. The Floridan raw water contains approximately 4,000 to 5,000 parts per million of salts. This concentration is significantly lower than the 35,000 ppm typically found in seawater. This RO system utilizes very fine membrane elements mounted on RO system skids. The water is pressurized to approximately 250 pounds per square inch (psi) rejecting the salt while allowing the passage of the pure finished water. The RO water is disinfected in the same manner as the Biscayne lime-softened water. Finished water from the RO process is blended with water treated from the Biscayne Aquifer.

Storage facilities maintained by the FKAA have a total storage capacity of 45.2 MG; of this amount, there is 12 MG of storage available in above ground storage reservoirs at Florida City. The remaining capacity is obtained from tanks located throughout the transmission and distribution system that provide an additional 33.2 MG of storage capacity.

The FKAA is a closed system that does not have any interconnects with other water supply systems. FKAA also operates emergency pumping stations located at Florida City, Key Largo, Long Key, Marathon, Ramrod Key and Stock Island.

#### *8.5.4 Reverse Osmosis Water Treatment Facility*

The FKAA has two RO desalinization plants located in Marathon and on Stock Island. The treatment plants have a total capacity of 3.0 MGD and are maintained on a standby condition. In the 1980's the Stock Island RO plant was originally constructed to provide 3.0 MGD of additional treated water while the 18" transmission system was being upgraded in 1983. The RO plant was then mothballed. In the early 2000's the FKAA rehabilitated the Stock Island RO plant and relocated a portion of the capacity to Marathon. The emergency Stock Island and Marathon RO treatment capacities are 2 MGD and 1 MGD respectively.

#### *8.5.5 Water Transmission and Distribution*

The FKAA distributes potable water from the treatment plant to the Keys via a 130-mile, large-diameter main running the length of U.S. 1 that is connected to a series of storage and

pumping facilities. A separate network of small distribution lines on each Key connect to the transmission main.

The current transmission system in the Middle and Upper Keys consists of 36-inch and 30-inch-diameter transmission mains along U.S. 1 and a 12-inch-diameter transmission main along Route 905 to Ocean Reef. These transmission mains were constructed in the early 1980s. The current transmission system continues with 24-inch-diameter transmission mains that were constructed in the Lower Keys in the late 1980s and mid-1990s. Approximately 52 miles of the original 18-inch-diameter transmission main are still in service and supplement the newer 36-inch to 24-inch-diameter transmissions mains to meet the increasing water demands of the Keys.

## **8.6 FCAA System Status**

*[Rule 9J-5.011 (1)(d), F.A.C]*

### *8.6.1 Impact of FCAA Florida City Wellfield on Adjacent Users*

FCAA has evaluated the impacts of its Florida City Wellfield on adjacent users of the Biscayne and Floridan Aquifer System. Regional groundwater flows at the site are towards the southeast. The aquifer's ability to yield water in this area is extremely high and it has been ranked as one of the most permeable in the world (Klien and Hull, 1978: USGS WRI 78-107). Pumping tests conducted by FCAA at the site since 1987, as part of a well replacement program, supports the Klein and Hull analysis.

To project the impacts from the proposed allocation on adjacent users, FCAA staff simulated the projected drawdown cone. The intent of the model parameters was to approximate worst case conditions, 90 days of maximum pumpage with no recharge from rainfall or canals. FCAA concluded that the potential for adverse impacts on adjacent legal users as a result of the approved allocation is minimal. The existing legal users were identified by FCAA and were addressed in the predicted drawdowns.

For the Biscayne Aquifer, per the SFWMD Consumptive Use Permit (CUP), the available drawdown availability is approximately 81 feet. A maximum volume of water utilization of 17.79 MGD withdrawal therefore will not exceed the yield capacity of the aquifer. The water resource availability of the Biscayne Aquifer is not expected to be exceeded as a result of the withdrawal of the recommended allocation. For the Floridan Aquifer, a simulated withdrawal of 10.27 MGD resulted in a drawdown of approximately 15 feet. The available drawdown in the aquifer is approximately 929 feet. The potential for harm to occur to the water resource availability of the Floridan Aquifer System as a result of the withdrawal of the recommended allocation is considered minimal.

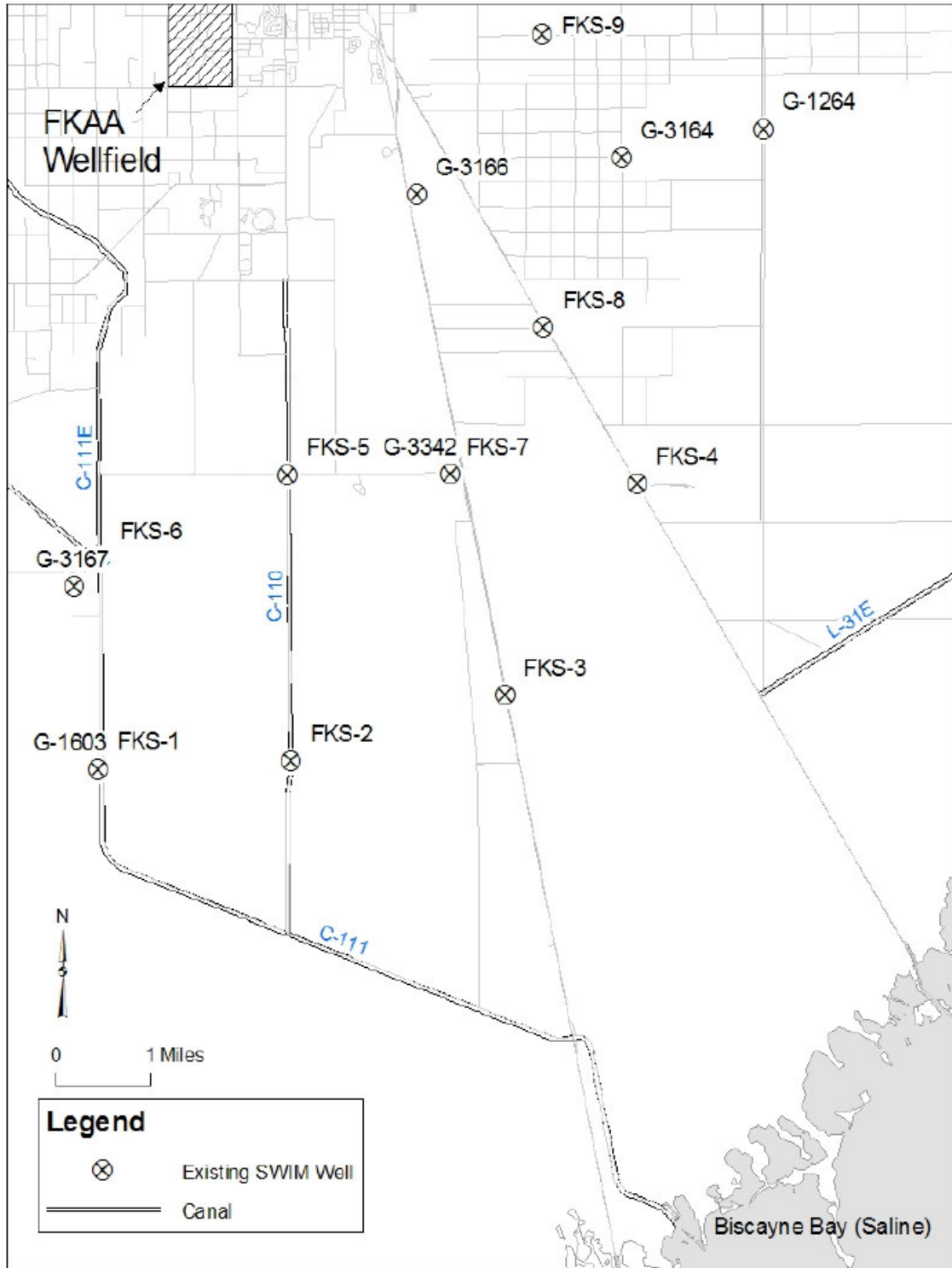
FCAA therefore concluded that the potential for adverse environmental impacts or impacts on existing legal users as a result of their proposed allocation is minimal.

**8.7 Water Quality**  
*[Rule 9J-5.011 (1)(f), F.A.C]*

**8.7.1 Salt Water Intrusion**

FKAA employs a Saltwater Intrusion Monitoring (SWIM) network consisting of 15 wells. (see locations depicted on **Figure 8.3**). The FKAA monitors water levels, chloride concentrations, and conductivity between the wellfield and the saltwater source. Variations in chloride and conductivity have been recorded as the saltwater fronts moves past the sampling zone. Because of these variations, collected water samples may not be representative of the actual fresh-saltwater interface.

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Source: Florida Keys Aqueduct Authority,

**Figure 8.3 – FKA Florida City Monitoring Network**

## **8.8 Potable Water System Improvements**

*[Rule 9]-5.011 (1)(f), F.A.C*

### **8.8.1 FKAA Capital Improvements Plan**

The FKAA has a long range capital improvements plan which addresses both distribution systems and transmission and supply systems improvements through the year 2020. The program's projected expenditures total is \$208.6 million, with \$47.5 million earmarked for distribution system improvements and \$33.5 million earmarked for pump and storage improvements. The capital improvements plan is to be funded by system development fees and the existing surcharge on water sales. The FKAA Capital Improvements Program for the next 5 years is presented in **Table 8.4**.

The FKAA assesses System Development Fees to new and existing customers who modify, add or construct facilities which impose a potential increased demand on the water system. This fee is charged in order to equitably adjust the fiscal burden of new pipeline and to expanded or improve appurtenant facilities between existing customers and new water users.

All System Development Fees are allocated to the direct and indirect cost of capital improvements made necessary by actual and expected increased demand on the water system. In addition, the FKAA is authorized to charge tapping fees, meter test fees, and investigation fees.

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**Table 8.4 - FCAA Budget and Financial Plan – FY ending September 2011**

Description	2011	2012	2013	2014	2015	Five year total expenditures
AMI meter replacement	\$2,000,000	\$2,000,000	\$2,000,000	\$1,500,000		\$7,500,000
Distribution replacements	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$10,000,000
Distribution replacement (accelerated	\$1,724,000	\$2,446,800	\$1,110,000			\$5,280,800
Marathon RO improvements	\$1,000,000					\$1,000,000
Stock Island RO plant upgrades	\$500,000					\$500,000
Boca Chica Bridge – 24” WM	\$1,800,000					\$1,800,000
Key West 18” main replacement (N.	\$3,700,000					\$3,700,000
Key West Administration building	\$700,000					\$700,000
Reclaimed water system – Duck Key, Big	\$1,500,000	\$1,500,000				\$3,000,000
Sewer lateral connections for Marathon &	\$135,000					\$135,000
Hawk’s Cay advanced water treatment &	\$1,268,500					\$1,268,500
Pump station & force main to connect Navy	\$100,000					\$1,300,000
Property for expanded Navy capacity at Big	\$1,000,000					\$1,000,000
Property for expanded Navy capacity at Big	\$1,000,000					\$1,000,000
Navy Water Improvements	\$677,000	\$677,000	\$677,000	\$677,000	\$677,000	\$3,385,000
North Key largo 12” water main		\$250,000	\$500,000			\$750,000
Florida City 5 mg storage tank			\$2,600,000	\$2,600,000		\$5,200,000
Marathon 4 mg storage tank				\$50,000	\$4,100,000	\$4,150,000
Marathon customer service building				\$3,000,000	\$1,000,000	\$4,000,000
<b>TOTAL</b>	<b>\$19,104,500</b>	<b>\$10,073,800</b>	<b>\$8,887,000</b>	<b>\$9,827,000</b>	<b>\$7,777,000</b>	<b>\$55,669,300</b>

Source: FCAA

8.8.2 *Fire Flows*

The FKAA has not had sufficient water pressure to provide fire protection throughout the Keys. The following **Table 8.5** chart provides the parameters for the new and proposed (upgraded) systems.

**Table 8.5 – Fire Protection Parameters for Selected Distribution Systems throughout the Keys**

Distribution System	Fire Flow Rate for 2-hour Duration (gpm)	Required Storage Volume (gal)
Lake Surprise – Between Adams Cut and Lake Surprise	1,000	120,000
Rock Harbor	1,000	120,000
Tavernier	500	60,000
Plantation Key	500	60,000
Lower Matecumbe	500	60,000
Duck Key/Grassy Key	750	90,000
Marathon, Crawl Key	1,000	120,000
Marathon, 69 <sup>th</sup> Street	500	60,000
Marathon, Vaca Cut	1,000	120,000
Marathon, 33 <sup>rd</sup> Street	1,000	120,000
Ramrod Key	500	60,000
Summerland Key	500	60,000
Upper Sugarloaf Key	500	60,000
Lower Sugarloaf Key	500	60,000
Stock Island Distribution	1,000	120,000

Source: FKAA 20-Year Water System CIP Master Plan, December 2006  
 Monroe County, FL, 10 Year Water Supply Facilities Work Plan, May 2009

The FKAA and Monroe County had entered into entered into an agreement in September 2007, for installation and maintenance of fire hydrants in unincorporated Monroe County. This agreement acknowledges the majority of the water distribution system is not designed to provide fire flow and FKAA does not guarantee fire flow and purpose of the fire hydrants will be to provide various locations to fill fire fighting apparatus. The agreement continues stating the County Fire Rescue will recommend fire hydrant locations for proposed plans on the Distribution system, while FKAA will evaluate the technical and economic feasibility of the recommended locations. Only

hydrants that are determined to be technically feasible will be installed and the County will fund any hydrants found to be technically feasible but not economically feasible. Technical feasibility will be based on a 250 GPM and pressure of 20 PSI. The agreement continues to define funding and maintenance fee responsibilities between the County and the FCAA.

### 8.8.3 Storage

The FCAA Master Plan for Water Supply, Treatment and Transmission Facilities proposes increased storage capacity, to a total goal of 90 MG in the year 2025. This will provide for reliable service for distribution during plant or power outages, supplying 10 days of storage at 50 percent of the annual average daily flow in the year 2010. The total storage requirements will be divided between transmission and distribution systems. Fifty percent of the total storage capacity will be accessible to the transmission system for pumping and backpumping during plant and pipeline outages. The remaining 50 percent will be within the distribution system.

## 8.9 Water Conservation Programs

*[Rule 9J-5.011 (1)(h), F.A.C]*

The Water Resources Act of 1972, Chapter 373, F.S. formally designated the conservation of water as a key policy of the state and mandated that state and regional water resource agencies take steps to prohibit wasteful and unreasonable uses of the state's water supply. For South Florida, the adoption of the act thrust the SFWMD into a lead role in water supply planning and regulation.

Water conservation is a high priority in SFWMD policy and rules as well as in DEP rules, in keeping with the statutory mandate. To maximize the reasonable and beneficial uses of water, the SFWMD applies water conservation related criteria District-wide.

As part of its efforts to conserve freshwater resources in areas of high demand, the SFWMD will continue to analyze and support the development of alternative water sources such as use of Floridan Aquifer withdrawals reverse osmosis and use of reclaimed water. Also, as noted below, the SFWMD will continue to investigate and support other supply augmentation alternatives. The development of other supply sources, however, does not lessen the requirements for conservation and efficient water uses. As discussed below, inefficient or wasteful uses of water are not considered reasonable or beneficial.

A related concept found in Florida's water use policy is the use of the lowest quality water available and appropriate for a specific use. This policy, for example, encourages the replacement of high quality ground water with treated wastewater for irrigation purposes if a feasible source is available. The effect of this policy is to optimize the utilization of available resources by requiring diversification of sources.

The SFWMD identifies areas that have or will experience water supply problems in the next 20 years. During the past decade, the use of potable water for lawn and landscape irrigation has drawn extensive attention, culminating in new Year Round Water Conservation rules, Rule 40E-2 and 20, F.A.C., and has been the focus of numerous conservation campaigns. These efforts have included water shortage awareness campaigns and Florida-Friendly (low-irrigation landscaping) programs. These types of aggressive water conservation/efficient uses campaigns are supported by the Potable Water policies in the Policy Document.

The SFWMD will continue to work closely with local governments to encourage programs to reduce demands, develop alternative supply sources, protect environmental resources and otherwise carry out the Potable Water policies contained in the Policy Document.

The SFWMD imposed as a limiting condition on the Consumptive Use Permit issued in March 2008, a requirement for continued use and updating of the water conservation plan within the FKAA service area. The FKAA prepared its latest Water Conservation Plan in March 2007. The next sections (8.9.1 – 8.9.7) review the major components of the Water Conservation Plan.

### *8.9.1 Leak Detection*

Leaks in the transmission/distribution system have historically contributed to tremendous losses in potable water; losses that have now been substantially reduced by an aggressive leak detection program. The FKAA has implemented Advanced Metering Infrastructure (AMI) technology that not only assists the FKAA in leak detection but also notifies customers of potential leaks on the consumer-side of the meter. Routine leak detection investigations are performed in each area of the County. Monthly reports are submitted to the FKAA Operations Department and filed for future reference. Two people are assigned the responsibility of leak detection, with assistance available from the Operations personnel. A detection device was utilized in 1985, during which time FKAA unaccounted for water (leaks) totaled 33 percent based on production versus sales. The latest figures available indicate an average unaccounted for water figure of 13 percent signifying a dramatic reduction in water loss from leaks.

### *8.9.2 Public Information Program*

Since 1988, the FKAA has made available Water Conservation Kits that include a shower flow restrictor, a toilet tank water bag, and leak detector dye tablets. The aqueduct immediately informs customers when their water consumption exceeds four times their average bill. Additionally, the Aqueduct educates the customer on conservation and leak troubleshooting and will meet the customer onsite if desired. The Aqueduct conducts educational seminars and presentations at schools

throughout the County and distributes informational pamphlets and water conservation activity books.

### 8.9.3 *Florida-Friendly Landscape Ordinance/Permanent Irrigation Ordinance*

As defined by Section 373.185, F.S., the State's Water Management Districts are required to design and implement incentive programs to encourage local governments to adopt a "Florida Friendly" Landscape Ordinance. Currently, Monroe County does not have a Florida-Friendly landscape ordinance or a permanent irrigation ordinance, but intends to develop such regulations with input from the FKAA, SFWMD, and other appropriate agencies. Section 114-102 of the current Monroe County Land Development Code requires that 70 percent of the plant materials used to satisfy landscaping requirements for new development will be native species which require little irrigation. Florida-Friendly landscaping involves the utilization of plants which require little water or grouping plants according to their water needs thus irrigating more efficiently.

Additionally, the County has a water conservation component of the Nonresidential Rate of Growth Ordinance (Section 138-47). The intent of this ordinance is to encourage the planting of native vegetation and promote water conservation. The graded scale (points) are assigned to the project based on the percentage of native landscape plants on the property beyond that is required within landscaped bufferyards and parking areas.

A water efficient irrigation system can be achieved through an irrigation system audit and calibration program. Of the 45,000 accounts within the FKAA service area approximately 600 have some form of landscape irrigation system, of which approximately 100 are not supplied by the FKAA's potable water system. Irrigation system auditing would include testing of the water source for pressure and output rate, testing sprinkler heads for precipitation rate and coefficient of uniformity and setting irrigation zones for proper times and frequencies. Using the SFWMD Blaney Criddle model as the ideal irrigation requirement, a 5,000 square foot lot would take a technician approximately two hours to complete an audit. Based on a study conducted in Hillsborough County, Florida, which documented water savings resulting from a calibrated and properly scheduled irrigation system, an average of 27 percent water savings would result at each participating home. Assuming that outdoor water use is approximately 25 percent of the consumer total use, potential water savings per home would be approximately 4,000 gallons per year.

#### 8.9.4 *Plumbing Fixture Efficiency Standards*

As stated above, the County's plumbing fixture standards require the installation of ultra-low volume fixtures for all new construction. The projected average monthly water consumption reduction per residential unit is expected be approximately 15 gallons per capita per day.

#### 8.9.5 *Filter Backwash Recycling*

Recycling of the filter backwash and sludge decant from the sludge thickeners is performed continually at the Florida City Water Treatment Plant.

#### 8.9.6 *Reuse of Wastewater*

In an effort to provide the highest quality potable water while reducing the environmental impact associated with increased aquifer withdrawals, the FKAA is constantly seeking out viable Alternative Water Supplies (AWS). This includes reclaimed water for reuse and wastewater recycling. As stated in the FKAA conservation plan, the benefits of using reclaimed water include the disposal of effluent in an environmentally friendly manner, extending the life of drinking water supply sources, postponing costly additional potable water infrastructure, and providing an irrigation supply during drought restrictions. At the time, the Monroe County Wastewater Master Plan concluded that reclaimed water was not feasible to install, operate, and maintain in the Florida Keys/Monroe County. Currently the FKAA evaluates each of its wastewater service areas to determine ways to implement and feasibly provide reclaimed water for its customers. Both the Big Coppitt Wastewater Treatment Plant and the Hawk's Cay/Duck Key Wastewater Treatment Plant are water reclamation facilities providing reclaimed water to a portion of their service areas. The Cudjoe Regional Wastewater Treatment Plant, once constructed, will also serve as a water reclamation facility, providing reclaimed water to a portion of the service area.

#### 8.9.7 *Metering*

The FKAA has the capability to meter raw water withdrawal and finished water production into the transmission lines at the Florida City Water Treatment Plant. Point of delivery metering is accomplished at every consumer within the FKAA system. The metering data is utilized in the preparation of the monthly unaccounted for water report.

## **8.10 Proposed Level of Service** *[Rule 9J-5.011 (1)(e)(5), F.A.C]*

### *8.10.1 Water Quality Level of Service*

Potable water quality can be expressed in terms of the water quality standards as defined in Chapter 62-550 of Florida Administrative Code, "Safe Drinking Water Act". This legislation was promulgated in order to assure that public drinking water systems meet minimum drinking water requirements.

The United States Environmental Protection Agency (EPA) is expected to enforce recently adopted federal drinking water standards under the 1996 Safe Drinking Water Act. These standards, when in effect, will supersede all other drinking water standards.

The water quality LOS standards for the County are as follows:

- Minimum potable water quality shall be as defined by the U.S. Environmental Protection Agency.
- The FKAA's construction of new treatment facilities has achieved the following planned objectives:
  - Produce finished water that meets all primary and secondary water standards including trihalomethanes;
  - Provide full treatment including softening and filtration;
  - Produce stable non-corrosive water for distribution; and

As a condition of the SFWMD CUP, and consistent with the 2005-2006 Lower East Coast Water Supply Plan Update (February, 2007), the FKAA must be compliant with the Minimum Flows and Levels Recovery Plan, Rule 40E-8, F.A.C. with its water resource operations. Any changes to the recovery plan by SFWMD will require a modification to the CUP, to remain consistent with the provisions of Chapter 373, F. S.

### *8.10.2 Water Quantity Level of Service*

The potable water quantity LOS methodology was developed in conjunction with the SFWMD and the FKAA, from which the data was obtained.

The potable water LOS is divided into two categories: residential in gallons/capita/day, and nonresidential, expressed in gallons/square foot/day. Residential use is defined as permanent and seasonal residences including single

family, multifamily, senior, and mobile homes. Nonresidential is defined as commercial use with hotels and motels included in this category and the Navy and governmental uses excluded due to their uniqueness and their projected constant consumption rates.

The residential LOS is based on the permanent population plus the portion of the seasonal population living in residences. The seasonal number is defined as the average daily seasonal population living in residences on an annual basis. This level is 57.0 gallons/capita/day.

The nonresidential LOS is based upon building square footages of commercial space in the unincorporated County including hotels and motels. This level is 0.29 gallons/square foot/day.

The overall consumption goal for the system is 86.00 gallons/capita/day.

*8.10.3 Potable Water Level of Service Standards Table*

**Table 8.6 - Potable Water Level of Service Standards**

Residential LOS	66.5 gallons/capita/day
Non-Residential LOS	0.35 gallons/square foot/day

Note:

Equivalent Residential Unit: 149 gallons per day (2.24 average persons per household X 66.5 gallons/capita/day)

**Table 8.7 - Goal Potable Water Consumption**

Residential	57 gallons/capita/day
Non-residential	.29 gallons/square foot/day
Overall	86 gallons/capita/day

Source: FCAA

**8.11 Present and Projected Future Ability to Meet Level of Service Standards** *[Rule 9J-5.011 (1)(f), F.A.C]*

*8.11.1 Alternative Water Supplies*

The alternatives for persons living in the Keys who do not obtain water from FCAA are cisterns, home desalination systems, and bottled water for potable use with a supplemental well used for toilets and showers.

The groundwater in the Keys is characteristically high in hydrogen sulfide which is very corrosive to fixtures if used untreated. For this reason, home reverse osmosis plants are useful in the Keys. DEP permits these plants, but FCAA estimates that only

a handful are presently in use in the Keys. Monroe County has recently undertaken a plan to inventory all wells and cisterns so that the extent of these forms of alternative water supply use will be known.

Because the County does not own or operate any portion of the water supply, treatment, or distribution system, and is merely a retail customer of the FKAA, the requirements to “evaluate the degree to which the County has implemented the work plan for building public, private, and regional water supply facilities” is not applicable. The County will continue to support the FKAA and participate in conservation and other potable water initiatives sponsored by the Authority.

*8.11.2 Florida Keys Carrying Capacity Limitations, Facilities Inadequacies and Policy Constraints*

The active Consumptive Use Permit (Limiting Condition Number 25) indicates that the allocation contained in SFWMD Water Use Permit No. 13-00005-W is, "... based on the population projections from in the Monroe County Planning Department at the time of the application in 2008". This permit is subject to modification if the population projections within the plan are revised or modified and at the time of renewal, prior to March 2028.

*8.11.3 Projected Demand*

The future potable water demand was calculated for the current year using the established LOS of 66.66 gallons/capita/day for residential and 0.35 gallons/square foot/day for non-residential. The 20 year planning period (2005-2025) depicted in the County’s 2009 Water Supply Plan (May 2009), and the FKAA 20-Year Water System Capital Improvement Plan, indicated the demand was calculated using the projected water demand rate accounting for the FKAA leak detection program which has a goal of 10 percent unaccounted for water. These demand projections also concurs with the total Unincorporated Functional Population Project with this Comprehensive Plan. A summary of future water supply demands are provided in **Table 8.8**.

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**Table 8.8 - Future Potable Water Supply Needs**

	2010	2015	2020	2025	2030
FKAA Service Population*	157,933	158,511	159,091	159,674	160,173#
Unincorporated County Population **	69,923	70,445	70,951	71,458	71,964
% Population Unincorporated	44%	44%	45%	45%	45%#
Average Daily Flow – Total System (MGD) *	20.07	22.08	23.41	23.88	24.34 <sup>#</sup>
Average Daily Flow – Unincorporated County (MGD)	8.89	9.81	10.44	10.69	10.94##

\* SFWMD Consumptive Use Permit Application Number: 050329-23 (FKAA), March 2008

\*\* Population Projections Unincorporated Monroe County, August 30, 2010

# Extrapolated Value

## Interpolated Value

The projected Finished Water Demand is expected to increase to 22.08 MGD in 2015 and 23.41 MGD in 2020.

#### 8.11.4 Needs, Goals and Opportunities

A primary goal of the County will be to continue to support the FKAA in fulfillment of their statutory obligation and authority to provide for safe, high quality and adequate supply, treatment, distribution, and conservation of potable water to meet the needs of present and future residents. The County shall also ensure that at the time of development permit issue, adequate potable water supply is available for the proposed use at the adopted level of service.

The County will continue to utilize the following goals in addressing system needs. These shall include:

- Implement a concurrency management system that is consistent with the South Florida Water Management District Lower East Coast Regional Water Supply Plan and Florida Keys Aqueduct Authority 20-year Water System Capital Improvement Master Plan;
- Prepare and maintain a 10-year Water Supply Work Plan that identifies alternative water supply projects, traditional water supply projects, conservation, and reuse necessary to meet the Monroe County Unincorporated Area water supply needs, consistent with the SFWMD Lower East Coast Regional Water Supply Plan and the FKAA 20-year Water System Capital Improvement Master Plan;

- Secure funding through all available means, including but not limited to, grants, loans and user assessments to assure the completion of capital improvement projects in accordance with the County CIP priority and timeline; and
- Update the 10-year Water Supply Work Plan every 5 years or within 18 months after the governing board of the SFWMD approves an updated regional water supply plan.
- Finally, the identified goals for Potable water supply and distribution include:

All distribution pump stations and upgrades to distribution lines will be designed to provide opportunities for fire protection.

- Proposed Fire Protection Areas:
  1. Key West and Stock Island (current fire flow areas)
  2. Everywhere on US 1, except non-developable areas
  3. Ocean Reef
  4. Key Colony Beach
  5. Layton
  6. Marathon
  7. Duck Key
  8. Tavernier
- Proposed Fire Flow Requirements by Land Use Zone:
  1. Suburban Residential 750 gpm
  2. Mobile Home, Recreational Vehicle 1,500 gpm
  3. Urban Commercial, Suburban Commercial, and Commercial 2,000 gpm
- All commercial facilities not along US 1 shall provide "on site" fire abatement, as currently required. In all other areas, the FKAA water system shall not be considered even as a future primary fire abatement source; however, all future water main upgrades will be designed and constructed so as to provide approximately 250 gpm and 20 psi to extreme locations.

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South Florida Water Management District, Draft Water Supply Policy Document, April 1991

South Florida Water Management District, Draft Water Supply Needs and Sources, 1990-2010, June 1991.

Supplemental and updated information furnish by Julie Cheon, Water Quality and Environmental Manager, FCAA, (personal communication (email), June 10, 2011).

## CHAPTER 8.0 – POTABLE WATER – COMMENT RESPONSES

<b>Commenter: Kathy Grasser, Date Received: 8/17/10</b>		
<b>Location</b>	<b>County Comment</b>	<b>K&amp;S Action</b>
<b>Throughout 8.0 Potable Water Element</b>	Formatting, minor verbiage revisions “without affecting content”, grammar, punctuation marks, acronyms, and font style changes.	Agree, revised as suggested.
<b>8.0 Potable Water Element</b>	Insert reviewers “purpose of this element”, delete original	Agree, revised as suggested.
<b>8.1 Introduction</b>	Insert Definition of Potable Water	Agree, revised as suggested
<b>Figure 8.1</b>	Replace Figure 8.1 with Miami-Dade County Wellfield Protection Areas	Agree, revised as suggested.
<b>8.2.1 Federal Reguations</b>	Verbiage changes regarding Safe Drinking Water Act and paragraph moved to section 8.2.1	Agree, revised as suggested
<b>8.2.3 Local Regulations</b>	Table 604.4 2007 Florida Building Code inserted as Table 8.2	Agree, revised as suggested.
<b>8.3 Wellfields</b>	Rename Section to Wellfields and move Section 8.6.2 to 8.3.1 Wellfield Conditions	Agree, revised as suggested.
<b>Figure 8.2</b>	Replace Figure 8.2	No change due to higher quality print not available from source.
<b>8.8.3 Florida Friendly Landscape</b>	Verbiage added regarding Florida-Friendly Landscape	Agree, revised as suggested.
<b>8.8.3 Florida Friendly Landscape</b>	Remove paragraphs 2 and 4	Agree, revised as suggested
<b>8.9.1 Water Quality LOS</b>	Make corrections to Chapter No. of F.A.C. and “Safe Drinking Water Act”	Agree, revised as suggested
<b>8.10.3 Project Demand</b>	No revisions requested	Table 8.8 added - Future Potable Water Supply Needs
<b>Bibliography</b>	Updated sources to be listed	Agree, revised as suggested.

**Committer: FCAA**  
**Date Received: 10/25/10**

Location	County Comment	K&S Action
<b>Section 8.2</b>	1. Section 8.2 Sources of Water (page 3) discusses the FCAA's primary source of Biscayne Aquifer in Florida City but does not discuss the FCAA's new source of water, Floridan Aquifer, in Florida City.	Agree, revised as suggested.
<b>Section 8.5</b>	1. Section 8.5 Potable Water Supply and Treatment Facilities: a. Section 8.5.1 (Page 13, 2 <sup>nd</sup> paragraph) – The FCAA's WUP is based on the population of the entire service area. It does not allocate by municipal boundary. b. Section 8.5.1 (page 13, 3 <sup>rd</sup> paragraph) discusses the FCAA's withdrawals from the Biscayne Aquifer but does not discuss the additional withdrawals from the Floridan Aquifer in Florida City. Please refer to the MC Facilities Plan; there is a summary table with FCAA allocation withdrawals from the different water sources.	a.-f.) Agree, revised as suggested. Additional information has been added as suggested

Location	County Comment	K&S Action
	<p>c. Section 8.5.2 (page 15) Florida City Wellfield- There are 15 monitoring wells; please refer to FKAA Wellfield Protection Program Section 3.5. Also, only two of those wells have continuous water level recorders.</p> <p>d. Section 8.5.3 (pages 15-16) Water Treatment and Storage Facilities - In August 2009, the Floridan Aquifer Desalination Facility became operational at the Florida City WTP. The FDEP permitted capacity for the reverse osmosis desalination WTP is 6 MGD. Softening of the source water is performed to prolong the life expectancy of the pipeline and home fixtures and appliances. Substitute domestic consumption with domestic use. When the storage tanks are discussed, there is a math error - 9.5 MG should be 28.2 MG. There are emergency pumping stations located in Florida City, Key Largo, Long Key, Marathon, Ramrod, and Stock Island. Remove capacities.</p>	

Location	County Comment	K&S Action
	<ul style="list-style-type: none"> <li>e. Section 8.5.4 (page 16) "Emergency" Reverse Osmosis Water Treatment Facility – The emergency seawater reverse osmosis plants located on Stock Island and Marathon have capacities of 2 MGD and 1 MGD, respectively.</li> <li>f. Section 8.5.5 (page 16) Water Transmission and Distribution – Remove "Recent water main installations have been buried as a means of hazard mitigation".</li> </ul>	
<b>Section 8.6</b>	<ul style="list-style-type: none"> <li>1. Section 8.6 FKAA System Status: <ul style="list-style-type: none"> <li>a. Section 8.6.1 (page 17) Impact of FKAA Florida City Wellfield on Adjacent Users – Needs to be updated to reflect latest simulations performed for the 2008 WUP both on the Biscayne Aquifer and the Floridan Aquifer.</li> </ul> </li> </ul>	Agree, revised as suggested.
<b>Section 8.7</b>	<ul style="list-style-type: none"> <li>1. Section 8.7 (page 17) Water Quality – revise 1<sup>st</sup> sentence. Also, the canals are not part of the FKAA SWIM network. Please refer to the FKAA Wellfield Protection Program section 3.5.</li> </ul>	Agree, revised as suggested.

Location	County Comment	K&S Action
<b>Section 8.8</b>	<ol style="list-style-type: none"> <li>1. Section 8.8 (page 20) Potable Water System Improvements:               <ol style="list-style-type: none"> <li>a. Section 8.8.1 FKAA Capital Improvement Plan - update with Board Approved 2011 CIP Plan with Critical Project list (Table 8.4).</li> <li>b. Section 8.8.2 (page 22) Fire Flows – Need to revise section and discuss current fire hydrant agreement; then, discuss potential distribution upgrades and additional storage to provide opportunities for improved fire protection.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>a) Agree, revised as suggested.</li> <li>b) Information found in Needs and goals section</li> </ol>
<b>Section 8.9</b>	<ol style="list-style-type: none"> <li>1. Section 8.9 Water Conservation Programs:               <ol style="list-style-type: none"> <li>a. Section 8.9.1 (page 24) Leak Detection – Need to revised to reflect the new Automatic Meter Reading (AMR) technology that is being implemented in the FKAA water system. This technology will not only assist FKAA in automatic leak detection but notify customers of potential leaks on their side of the meter.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>a-d) Agree, revised as suggested with additional referenced information.</li> </ol>

Location	County Comment	K&S Action
	<ul style="list-style-type: none"> <li>b. Section 8.9.3 (page 25) Florida Friendly Landscape Ordinance /Permanent Irrigation Ordinance – need to update account info; “One hundred percent participation can be expected using FKAA personnel to perform work”?</li> <li>c. Section 8.11.1 (page 28) Alternative Water Supplies – Where chloride concentrations are not too great, desalination of Floridan Aquifer water could be economically feasible, and even competitive with importing water via the Florida Keys Aqueduct? Please refer to FKAA Water Supply Plan; does this statement take into account the pumping/electrical costs to the customer.</li> <li>d. Section 8.11.4 Needs, Goals, and Opportunities (page 31) – revise bullet to read “FKAA will continue to upgrade the distribution system toward the goal of providing opportunities for fire protection in the following areas;; Please refer to Fire Hydrant agreement for last bullet.</li> </ul>	

**Committer: Commissioner Rice**  
**Date Received: 2/2011**

Location	County Comment	K&S Action
<b>Section 8.2</b>	Section 8.2 Sources of Water – (Page 2) Remove last sentence from second paragraph. “The Ocean Reef Club is the only consumer currently using enough Florida Aquifer water which requires an individual South Florida Water Management District (SFWMD) permit.”	Agree, revised as requested.
<b>Section 8.11</b>	Section 8.11.1 – Alternative Water Supplies (Page 28) Reword second sentence in third paragraph: “Construction of the ASR well commenced in January 2006 and is expected to be completed in October of same year.”	Agree, revised as requested. Sentence reworded to state “well is completed”.

**Commenter: Julie Cheon, FCAA**  
**Date Received: 6/2011**

Location	FCAA Comment	K&S Action
<b>Section 8.0</b>	Multiple entries of updated information of the Potable Water System with preferred language revisions recommended throughout document.	Agreed, all updated information and language revised as requested.
<b>Figure 8.2</b> <b>Page 14</b>	<u>Remove</u> Figure 8.2 FCAA Facilities titled "Operations Department" <u>Insert</u> Figure 8.2 FCAA Facilities titled "Florida Keys Aqueduct Authority"	Agreed, revised as requested.
<b>Section 8.5.3</b> <b>Page 15</b>	<u><b>Insert paragraph:</b></u> In order to comply with Biscayne Aquifer withdrawal limitations, a new Floridan wellfield and reverse osmosis (RO) water treatment process were recently constructed. Operational since the fall of 2009, the RO water treatment plant treats the brackish water of the Floridan Aquifer. The Floridan raw water contains approximately 4,000 to 5,000 parts per million of salts. This concentration is significantly lower than the 35,000 ppm typically found in seawater. This RO system utilizes very fine membrane elements mounted on RO system skids. The water is pressurized to approximately 250 pounds per square inch (psi) rejecting the salt while allowing the passage of the pure finished water. The RO water is disinfected in the same manner as the Biscayne lime-softened water. Finished water from the RO process is blended with water treated from the Biscayne Aquifer.	Agreed and paragraph accepted.

**Committer: Julie Cheon, FCAA continued**  
**Date Received: 6/2011**

Location	FCAA Comment	K&S Action
<p><b>Section 8.9.6</b>  <b>Page 25</b></p>	<p><b><u>Insert following into 1<sup>st</sup> paragraph:</u></b>            Both the Big Coppitt Wastewater Treatment Plant and the Hawk's Cay/Duck Key Wastewater Treatment Plant are water reclamation facilities providing reclaimed water to a portion of their service areas. The Cudjoe Regional Wastewater Treatment Plant, once constructed, will also serve as a water reclamation facility, providing reclaimed water to a portion of the service area.</p>	<p>Agreed, revised as requested.</p>
<p><b>Figure 8.1</b></p>	<p><b><i>Text on previous page refers reader to this graphic to indicate FCAA wellfield location, but location is not clearly labeled. Perhaps a less complex graphic with a label could be used.</i></b></p>	<p>Graphic is current from Miami-Dade County, not aware of others that could be utilized</p>
<p><b>Section 8.6.1.</b>  <b>Paragraph 3</b></p>	<p>RE: 81 feet - <b><i>Not sure what is meant here. Is that referring to the depth of the aquifer? If so calling it drawdown availability may be confusing.</i></b></p>	<p>Terminology as presented in consumptive use permit (CUP) by SFWMD</p>
<p><b>Section 8.6.1.</b>  <b>Paragraph 3</b></p>	<p><b><i>Not sure what is meant here. Is that referring to the depth of the aquifer? If so calling it drawdown availability may be confusing</i></b></p>	<p>Terminology as presented in consumptive use permit (CUP) by SFWMD</p>
<p><b>Section 8.7.1</b></p>	<p><b><i>Not sure what is meant here?</i></b>  <i>"Variations in chloride and conductivity have been recorded as the saltwater fronts moves past the sampling zone. Because of these variations, collected water samples may not be representative of the actual fresh-saltwater interface."</i></p>	<p>Results from samples have shown viations that may not be the true representation of the actual fresh-saltwater interface.</p>

**Committer: Julie Cheon, FCAA continued**  
**Date Received: 6/2011**

Location	FKAA Comment	K&S Action
<b>Section 8.9.3 Paragraph 3</b>	<p><i>Not sure about this number? What is its origin? Does the County do this irrigation audit, or is this paragraph just here to show that an irrigation audit is a tool that could be used?</i></p> <p>A water efficient irrigation system can be achieved through an irrigation system audit and calibration program. Of the 45,000 accounts within the FCAA service area approximately 600 have some form of landscape irrigation system, of which approximately 100 are not supplied by the FCAA's potable water system. Irrigation system auditing would include testing of the water source for pressure and output rate, testing sprinkler heads for precipitation rate and coefficient of uniformity and setting irrigation zones for proper times and frequencies. Using the SFWMD Blaney Criddle model as the ideal irrigation requirement, a 5,000 square foot lot would take a technician approximately two hours to complete an audit. Based on a study conducted in Hillsborough County, Florida, which documented water savings resulting from a calibrated and properly scheduled irrigation system, an average of 27 percent water savings would result at each participating home. Assuming that outdoor water use is approximately 25 percent of the consumer total use, potential water savings per home would be approximately 4,000 gallons per year.</p>	Information as provided by FCAA in prior review and discussions.

**Committer: Julie Cheon, FKAA, continued**  
**Date Received: June 2011**

Location	Comment	K&S Response
<b>Section 8.10.1 Paragraph 3</b>	<b><i>This paragraph speaks more to quantity than quality.</i></b> As a condition of the SFWMD CUP, and consistent with the 2005-2006 Lower East Coast Water Supply Plan Update (February, 2007), the FKAA must be compliant with the Minimum Flows and Levels Recovery Plan, Rule 40E-8, F.A.C. with its water resource operations. Any changes to the recovery plan by SFWMD will require a modification to the CUP, to remain consistent with the provisions of Chapter 373, F. S.	This is a condition in the SFWMD permit report. There may be some overlap.
<b>Table 8.6</b>	<b><i>Does this refer to a particular year?</i></b> Potable Water level of Service Standards	This is the current LOS std for the County
<b>Table 8.6</b>	<b><i>Not sure where this number comes from?</i></b> 149 gallons per day.	Based on documentation provided by the FKAA
<b>Table 8.6</b>	<b><i>Has this number been updated to 2.7?</i></b> 2.24 average persons per household	Based on documentation provided by the FKAA
<b>Table 8.7</b>	<b><i>Table indicates a "goal" but text on previous page seem to indicate that this is the existing LOS?</i></b> Goal Potable Water Consumption	Goal is to provide this minimum level of service for the projected system population
<b>Table 8.7</b>	<b><i>Not sure this is from FKAA? Do you have the original source.</i></b>	Info from SFWMD CUP application
<b>Section 8.11.3</b>	<b><i>Table 8.6 says 66.5</i></b> The future potable water demand was calculated for the current year using the established LOS of 66.66 gallons/capital/day for residential.....	Table 8.6 is the current standard. Table 8.7 is the future goal.

**Commenter: Julie Cheon, FCAA continued**  
**Date: June 2011**

Location	Comment	K&S Response
<b>Table 8.8</b>	<b><i>This does not match the DCA approved projection.</i></b> Row: FCAA Service Population/Column: 2030/ 160,173	This figure "pointed-to" is system wide per the approved SFWMD permit application backup data