Plumbing

Proposed Code Modifications

Including Comments

This document created by the Florida Department of Business and Professional Regulation - 850-487-1824

TAC: Plumbing

Sub Code: Existing Building

Total Mods for Plumbing: 26

P6668

Date Submitted	12/20/2015	**Section**	609.2	**Proponent**	Josh Madden
Chapter	6	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

6610, 6661

Summary of Modification

Adopt high efficiency flow rates for plumbing fixtures and fittings.

Rationale

As a concerned citizen and native Floridian I care about and enjoy Florida's water resources and natural ecosystems. This State has been blessed with a wealth of springs, wetlands, river, and lakes. These systems are not only a pleasure to enjoy in a recreational sense and provide a large economic benefit to the region, but are in fact essential to public health, safety and well being. In many areas of the State, there have been well documented negative impacts on springs, lakes, aquifers and other water resources as a result of over pumping of groundwater. Domestic consumption of publicly supplied water is one of the largest uses of water. As population in the State continues to grow, demand on water resources is expected to grow. This expected increase in demand can be curbed by conservation efforts such as the proposed code modification.

Florida is not the only state in the nation to face water supply challenges. California, Colorado Texas and Georgia have endured drought, and as result have adopted similar water fixture efficiency measures to those in this proposal. Some Counties within Florida have already adopted similar measures (Broward, Miami Dade).

The proposed efficiency measures can reduce deficits of future increased demand. As a result of this proposed modification, a direct impact in reducing demand and ensuring the long-term sustainability of Florida's water resources can be had without significant sacrifice by any party. This change would provide a foundation for further improvement of water use efficiency at a statewide level.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This primarily a change in the criteria for allowable flow rate of fixtures. Currently for existing structures, only water closets are inspected. This modification would require all plumbing fixtures be inspected. This should be considered a very minor change, and no training is necessary.

Impact to building and property owners relative to cost of compliance with code

On average, homeowners can expect to save approximately 20% on their water usage. This will provide homeowners with long term savings on their water, sewer, and electric bills (water heating).

Impact to industry relative to the cost of compliance with code

Most fixtures that meet Water SenseR are comparable in price to conventional fixtures. For an average home, additional costs will be less than $100. This small additional cost would provide homeowners with long term savings on their water, sewer, and electric bills (water heating).

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Having adequate supply of potable water for public consumption is obviously essential to health, safety and welfare of the general public. Conservation measures in this proposal will extend existing water sources to future populations.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The modification involves equivalent but more efficient products that have been tested and shown to meet national EPA WaterSenseR standards for functionality and dependability. Products are at least 20% more efficient. The modifications were replicated from the 2015 IgCC.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Products involved are already common in markets statewide. Nationally, there is an abundance of fixture models that meet WaterSenseR: 2,506 toilet; 362 urinal; 9,068 facet; 3,445 showerhead; 22 pre-rinse spray valve.

Does not degrade the effectiveness of the code

Proposed code is consistent with International Green Construction Code and does not contradict other chapters/sections.

Is the proposed code modification part of a prior code version? No

SECTION 609 PLUMBING

609.1 Materials.

Plumbing materials and supplies shall not be used for repairs that are prohibited in the *Florida Building Code, Plumbing*.

609.2 ~~Water Closet~~ Plumbing fixture replacement.

The maximum water consumption flow rates and quantities for all replaced plumbing fixtures and fixture fittings shall be in accordance with Section 604.4 of the *Florida Building Code, Plumbing.* ~~water closets shall be 1.6 gallons (6L) per flushing cycle.~~

Exceptions:

Commercial buildings where effective drainline transport of solid waste is understood to necessitate 1.6 gallon per flush water closets. ~~Blowout design water closets [3.5 gallons (13L per flusing cycle].~~

Sub Code: Fuel Gas

P6849

Date Submitted	12/28/2015	**Section**	202	**Proponent**	Joseph Eysie
Chapter	2	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Summary of Modification

Expand the Appliance definition to include compressed fuel gas

Rationale

A new generation of residential CNG fueling systems are design certified to the new ANSI standard, NGV 5.1, Home Refueling Appliances. These appliances would not be considered an appliance under the current definition. They will consume electricity to compress fuels.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Zero impact

Impact to building and property owners relative to cost of compliance with code

Zero impact

Impact to industry relative to the cost of compliance with code

Zero impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against construction material, methods, products or systems.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version? No

[M] APPLIANCE. Any apparatus or device that utilizes a fuel or raw material to produce light, heat, power, refrigeration, ~~or~~ air conditioning, or compressed fuel gas. This definition also shall include a vented decorative appliance.

Date Submitted	12/28/2015	**Section**	401.10	**Proponent**	Joseph Eysie
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review

Commission Action Pending Review

Related Modifications

Summary of Modification

Replace the 2015 ICC base code language with the 2018 ICC base code language and add an exception.

Rationale

This requirement in the International Fuel Gas Code has far ranging impact that wasn't anticipated at the code development hearings. In many cases, there are no certifcation or testing requirements to use for flare nuts, tees, pipe nipples, etc. The current requirement in section 401.10 is extremely onerous to the fuel gas industry with very little, if any, benefit to society. Piping, tubing and fittings are fabricated to various materials standards, such as those published by the American Society for Testing and Materials (ASTM) and the American Society of Mechanical Engineers (ASME). The material standards are shown in Section 403 of the IFGC. Third party testing or certifcation is a needless and unjustified expense to the industry. There has been no data presented to indicate that piping and fittings have been failing in the field.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Zero impact to enforcement

Impact to building and property owners relative to cost of compliance with code

Zero impact to building & property owners

Impact to industry relative to the cost of compliance with code

Manufacturers will not be required to pay for a needless exercise of obtaining a third party certi?cation to verify that their manufactured products comply with the appropriate material standards.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Will not impact health, safety or welfare of general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the accuracy of the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against construction material, products or systems.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version? No

401.10 ~~Third Party Testing and Certification~~ **401.10. Piping Materials Standards.**

~~Piping, tubing and fittings shall comply with applicable referenced standards, specification and performance criteria of this code and shall be identified in accordance with Section 401.9. Piping, tubing and fittings shall either be tested by an approved third-party testing agency or certified by an approved third-party certification agency.~~

Piping, tubing and fittings shall be manufactured to the applicable referenced standards, specifications and performance criteria listed in Section 403 of this code and shall be identified in accordance with Section 401.9.

P6847

Date Submitted	12/28/2015	**Section**	401.10	**Proponent**	Joseph Eysie
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

6833- This mod is being submitted as an alternative to Mod 6837, with 6837 being the preferred Mod by proponent

Summary of Modification

Continue the current (5th edition FBC, Fuel Gas) requirement for 401.10

Rationale

This requirement in the International Fuel Gas Code has far ranging impact that wasn't anticipated at the code development hearings. In many cases, there are no certification or testing requirements to use for ?are nuts, tees, pipe nipples, etc. The current requirement in section 401.10 is extremely onerous to the fuel gas industry with very little, if any, benefit to society. Piping, tubing and fittings are fabricated to various materials standards, such as those published by the American Society for Testing and Materials (ASTM) and the American Society of Mechanical Engineers (ASME). The material standards are shown in Section 403 of the IFGC. Third party testing or certification is a needless and unjustified expense to the industry. There has been no data presented to indicate that piping and fittings have been failing in the field.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
Zero impact

Impact to building and property owners relative to cost of compliance with code
Zero impact

Impact to industry relative to the cost of compliance with code
Zero impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Maintains current code

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities
Does not discriminate against construction material, methods, products or systems

Does not degrade the effectiveness of the code
Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version?
YES

The provisions contained in the proposed amendment are addressed in the applicable international code?
NO

The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exihibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?
YES

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?
NO

~~**401.10 Third-party testing and certification.**~~

~~Piping, tubing and fittings shall comply with the applicable referenced standards, specifications and performance criteria of this code and shall be identified in accordance with Section 401.9. Piping, tubing and fittings shall either be tested by an approved third-party testing agency or certified by an approved third party certification agency.~~ (Reserved)

Screen shot of 5th Edition FBC, Fuel Gas

floridabuilding2.iccsafe.org/app/book/content/2014_Florida/Fuel%20Gas%20Code/Chapter%204.html

Fire Prevention Code and NFPA 58.

401.3 Modifications to existing systems.
In modifying or adding to existing *piping* systems, sizes shall be maintained in accordance with this chapter.

401.4 Additional appliances.
Where an additional *appliance* is to be served, the existing *piping* shall be checked to determine if it has adequate capacity for all *appliances* served. If inadequate, the existing system shall be enlarged as required or separate *piping* of adequate capacity shall be provided.

401.5 Identification.
For other than steel pipe, exposed *piping* shall be identified by a yellow label marked "Gas" in black letters. The marking shall be spaced at intervals not exceeding 5 feet (1524 mm). The marking shall not be required on pipe located in the same room as the *appliance* served.

401.6 Interconnections.
Where two or more meters are installed on the same premises but supply separate consumers, the *piping* systems shall not be interconnected on the *outlet* side of the meters.

401.7 Piping meter identification.
Piping from multiple meter installations shall be marked with an *approved* permanent identification by the installer so that the *piping* system supplied by each meter is readily identifiable.

401.8 Minimum sizes.
All pipe utilized for the installation, extension and *alteration* of any *piping* system shall be sized to supply the full number of outlets for the intended purpose and shall be sized in accordance with Section 402.

401.9 Identification.
Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer.

Exception: The manufacturer identification for fittings and pipe nipples shall be on each piece or shall be printed on the fitting or nipple packaging or provided documentation

401.10 Third-party testing and certification.
Reserved.

P6831

Date Submitted	12/28/2015	**Section**	401.9	**Proponent**	Joseph Eysie
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Summary of Modification

Provide additional clarity for the exceptions listed within

Rationale

REASON: The new exceptions are specific to schedule 40 steel pipe used in fuel gas installations. The new exceptions would allow the following:

1. Short lengths of steel pipe that are cut from longer pipe stock where the stock has identification markings. It is common practice to cut short lengths of pipe from longer pipe stock. In those cases the identification marks may not appear on the cut pieces. The UMC already contains an exception to permit nipples created from cutting and threading of approved pipe.
2. Small fittings such as bushings and couplings where markings have not been traditionally been included. These small diameter fittings are commonly used in low pressure gas piping systems rand represent an extremely low risk of failure.
3. Where the packaging or documentation for the part has the manufacturer's identification but the part does not. Very small fittings and accessories often come in packaging that have the manufacturer's identification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Zero Impact

Impact to building and property owners relative to cost of compliance with code

Zero Impact

Impact to industry relative to the cost of compliance with code

Zero Impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, provides more clarity to section 401.9 of the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, provides more clarity to section 401.9 of the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against construction material, methods, products or systems.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version? No

401.9 Identification.

Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer.

Exceptions:

1. Steel pipe sections that are: two feet and less in length and cut from longer sections of pipe in the field and threaded in the field.

2. Steel pipe fittings 2 inch and less in size.

3. Where identification is provided on the product packaging or crating.

4. Where other approved documentation is provided.

Date Submitted	12/28/2015	**Section**	401.9	**Proponent**	Joseph Eysie
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review

Commission Action Pending Review

Related Modifications

6831-This Mod is being submitted as an alternative to 6831 which deals with this same issue. Mod 6831 is the preferred option by the proponent

Summary of Modification

Provide additional clarity for the exception listed within

Rationale

Short lengths of steel pipe that are cut from longer pipe stock where the stock has identification markings. It is common practice to cut short lengths of pipe from longer pipe stock. In those cases the identification marks may not appear on the cut pieces. The UMC already contains an exception to permit nipples created from cutting and threading of approved pipe.

Small fittings such as bushings and couplings where markings have not been traditionally been included. These small diameter fittings are commonly used in low pressure gas piping systems rand represent an extremely low risk of failure.

Where the packaging or documentation for the part has the manufacturer's identification but the part does not. Very small fittings and accessories often come in packaging that have the manufacturer's identification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Zero impact

Impact to building and property owners relative to cost of compliance with code

Zero impact

Impact to industry relative to the cost of compliance with code

Zero impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, provides more clarity to section 401.9 of the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against construction material, methods, products or systems.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version?

YES

The provisions contained in the proposed amendment are addressed in the applicable international code?

NO

The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exihibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?

YES

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?

NO

401.9 Identification-

Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer.

Exception: The manufacturer identification for fittings and pipe nipples shall be on each piece or shall be printed on the fitting or nipple packaging or provided documentation.

Screen shot of 5th Edition FBC, Fuel Gas

floridabuilding2.iccsafe.org/app/book/content/2014_Florida/Fuel%20Gas%20Code/Chapter%204.html

Fire Prevention Code and NFPA 58.

401.3 Modifications to existing systems.
In modifying or adding to existing *piping* systems, sizes shall be maintained in accordance with this chapter.

401.4 Additional appliances.
Where an additional *appliance* is to be served, the existing *piping* shall be checked to determine if it has adequate capacity for all *appliances* served. If inadequate, the existing system shall be enlarged as required or separate *piping* of adequate capacity shall be provided.

401.5 Identification.
For other than steel pipe, exposed *piping* shall be identified by a yellow label marked "Gas" in black letters. The marking shall be spaced at intervals not exceeding 5 feet (1524 mm). The marking shall not be required on pipe located in the same room as the *appliance* served.

401.6 Interconnections.
Where two or more meters are installed on the same premises but supply separate consumers, the *piping* systems shall not be interconnected on the *outlet* side of the meters.

401.7 Piping meter identification.
Piping from multiple meter installations shall be marked with an *approved* permanent identification by the installer so that the *piping* system supplied by each meter is readily identifiable.

401.8 Minimum sizes.
All pipe utilized for the installation, extension and *alteration* of any *piping* system shall be sized to supply the full number of outlets for the intended purpose and shall be sized in accordance with Section 402.

401.9 Identification.
Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer.

Exception: The manufacturer identification for fittings and pipe nipples shall be on each piece or shall be printed on the fitting or nipple packaging or provided documentation

401.10 Third-party testing and certification.
Reserved.

P6851

Date Submitted	12/28/2015	**Section**	404.6	**Proponent**	Joseph Eysie
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Summary of Modification

Suggesting NFPA 7.1.5 Piping Through Foundation Wall language

Rationale

A utility service line is installed at a depth of 36” cover before it enters the structure through the foundation wall as is allowed. Florida Fuel Gas required only 12” of cover allowing any line leakage to vent out to the atmosphere easily; besides we do not have ground frost that would cap any potential leakage disallowing venting and dissipation of any potential gas leakage. If the wall penetration is sealed and the annual space between the underground house piping and sleeve are sealed with approved sealing methods or material it should be permissible.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

little to no impact

Impact to building and property owners relative to cost of compliance with code

Zero Impact

Impact to industry relative to the cost of compliance with code

Zero Impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against construction material, methods, products or systems.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version? No

404.6 Underground Penetrations ~~Prohibited~~

~~Gas piping show not penetrate building foundation walls at any point below grade. Gas piping shall enter and exit a building at a point above grade and the annular space between the pipe in the wall shall be sealed.~~

(NFPA 7.1.5) Piping Through Foundation Wall. Underground piping, where installed through the outer foundation or basement wall of a building, shall be encased in a protective sleeve or protected by an approved device or method. The space between the gas piping and the sleeve and between the sleeve and the wall shall be sealed to prevent entry of gas and water.

Sub Code: Plumbing

P6421

Date Submitted	12/7/2015	**Section**	312.2	**Proponent**	Gary Kozan
Chapter	3	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Plumbing Code 312.6 - for consistency with sewer testing
Residential Code 2503.4 - for consistency between the Residential and the Plumbing codes

Summary of Modification

Reinstates the traditional 5-foot head testing for DWV systems, making it consistent with the Residential Code

Rationale

The base code 2015 IRC now recognizes 5-foot head testing for DWV systems. However, no companion change was proposed for the 2015 IPC. This creates inconsistency between the IRC and IPC. This modification would reinstate the 5-foot head test that was used in Florida for decades prior to being removed automatically in the last code cycle.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Creates consistency between the Plumbing and Residential Codes. Promotes uniformity in enforcement.

Impact to building and property owners relative to cost of compliance with code

No cost impact

Impact to industry relative to the cost of compliance with code

Reinstates 5-foot head testing to Florida again, which had fallen victim to the indiscriminate removal of all Florida-specific amendments in the last code cycle.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Florida has a 50 year history of allowing 5-foot head testing for DWV systems. The IRC now officially recognizes this as an acceptable practice.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

A 5-foot head test is preferred by most Florida code officials and contractors, because it provides actual visual verification of watertight-ness without resorting to ladders or "shaking the stack."

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

5-foot head testing is now referenced in the IRC

Does not degrade the effectiveness of the code

Simply reinstates a proven Florida practice

Is the proposed code modification part of a prior code version?

YES

The provisions contained in the proposed amendment are addressed in the applicable international code?

NO

The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exihibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?

YES

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?

YES

312.2 Drainage and vent water test.

A water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but no section shall be tested with less than a ~~10~~5-foot (3048 mm) head of water. In testing successive sections, at least the upper ~~10~~5 feet (3048 mm) of the next preceding section shall be tested so that no joint or pipe in the building, except the uppermost 10 feet (3048 mm) of the system, shall have been submitted to a test of less than a ~~10~~5-foot (3048 mm) head of water. This pressure shall be held for not less than 15 minutes. The system shall then be tight at all points.

P6422

Date Submitted	12/7/2015	**Section**	312.6	**Proponent**	Gary Kozan
Chapter	3	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Plumbing Code 312.2 - for consistency with interior DWV testing
Residential Code 2503.4 - for consistency between the Residential and the Plumbing Codes

Summary of Modification

Modifies building sewer testing to 5-foot head, making it consistent with interior DWV testing and with IRC requirements

Rationale

The base code 2015 IRC now recognizes 5-foot head testing for DWV systems. However, no companion changes were proposed for the 2015 IPC. This creates inconsistency between the IRC and IPC. This modification would reinstate the 5-foot head test that was used in Florida for decades prior to being removed automatically in the last code cycle.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Creates consistency between the Plumbing and Residential Codes. Promotes uniformity in enforcement.

Impact to building and property owners relative to cost of compliance with code

No cost impact

Impact to industry relative to the cost of compliance with code

Reinstates 5-foot head testing to Florida again, which had fallen victim to the indiscriminate removal of all Florida-specific amendments in the last code cycle.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Florida has a 50 year history of allowing 5-foot head testing for DWV systems. The IRC no officially recognizes this as an acceptable practice.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

A 5-foot head test is preferred by most Florida code officials and contractors, because it provides actual visual verification of watertight-ness without resorting to ladders or "shaking the stack."

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

5-foot head testing is now referenced in the IRC

Does not degrade the effectiveness of the code

Simply reinstates a proven Florida practice

Is the proposed code modification part of a prior code version? No

312.6 Gravity sewer test.

Gravity *sewer* tests shall consist of plugging the end of the *building sewer* at the point of connection with the public sewer, filling the *building sewer* with water, testing with not less than a ~~10~~5-foot (3048 mm) head of water and maintaining such pressure for 15 minutes.

Date Submitted	12/31/2015	**Section**	403.2	**Proponent**	Robert Fine
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review

Commission Action Pending Review

Related Modifications

Summary of Modification

This modification allows for the use of unisex toilet rooms (and lets these toilet rooms contribute to the required fixture count) in facilities undergoing barrier removal or alterations to help businesses facilitate compliance with the Americans with Disabilities Act.

Rationale

The ADA (statute and regulations) imposes obligations on places of public accommodation and commercial facilities to provide accessible features beyond that required by the Florida Accessibility Code. Many existing facilities have limitations on available space to provide accessible toilet facilities and end up not providing such accessible facilities because it is technically infeasible or not readily achievable given such available space constraints. A code change that allows for the use of unisex single user toilet rooms that can contribute to required fixture count can facilitate greater accessibility while maintaining the overall total fixture count in buildings at lesser hardship to building owners. Because this proposed code change specifies barrier removal and alterations it is effectively limited to existing buildings and facilities.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There should be no cost impact, positive or negative, to local entities relative to enforcement of the code. No additional plan review, inspections or enforcement from the current code provision will be required.

Impact to building and property owners relative to cost of compliance with code

Building owners will save money if this provision is adopted. It provides a cost-saving option for providing accessible toilet facilities in alterations and barrier removal projects.

Impact to industry relative to the cost of compliance with code

Industry will save money if this provision is adopted. It provides a cost-saving option for providing accessible toilet facilities in alterations and barrier removal projects.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Provides greater opportunities for businesses and buildings to provide accessibility without reducing overall required fixture count.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the ability of businesses to perform barrier removal in, or alterations to, toilet facilities without falling short of full accessibility due to technical infeasibility (or in the case of barrier removal, not being readily achievable).

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods or systems of construction of demonstrated capabilities. This code modification utilizes the same products, methods and systems of construction as would the code without this modification.

Does not degrade the effectiveness of the code

This enhances the effectiveness of the code by allowing for accessibility where in some cases it would not be possible without reducing overall required fixture count.

Is the proposed code modification part of a prior code version? No

403.2 Separate facilities.

Where plumbing fixtures are required, separate facilities shall be provided for each sex.

Exceptions:

1. Separate facilities shall not be required for dwelling units and sleeping units.

2. Separate facilities shall not be required in structures or tenant spaces with a total occupant load, including both employees and customers, of 15 or fewer.

3. Separate facilities shall not be required in mercantile *occupancies* in which the maximum occupant load is 100 or fewer.

4. Separate facilities shall not be required for single-user facilities in places of public accommodation (as defined in 28 C.F.R. 36.104) undergoing removal of barriers (as set forth in 28 C.F.R. 36.304) or alterations. Two single-user facilities that are not identified for exclusive use by either sex shall be permitted to serve as required separate facilities. Signage identifying these facilities shall be provided as set forth in the Florida Building Code-Accessibility.

P6418

Date Submitted	12/7/2015	**Section**	417.5.2	**Proponent**	Gary Kozan
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Residential Code P2709.2 - Same criteria needed in Residential Code for consistency

Summary of Modification

Adds requirements for recessed shower compartments, and provides an exception for shower linings in such.

Rationale

The base I-Codes do not address recessed shower compartments, which are common throughout Florida. Shower pans linings are not necessary in a properly-constructed shower recess.Beginning with the Fifth Edition (2014) of the FBC, previous Florida-specific amendments were automatically removed. Adding exception 3 reinstates the identical Florida-specific modification found in the previous four editions of the Florida Building Code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Provides clear guidance and improves consistency of enforcement between AHJs

Impact to building and property owners relative to cost of compliance with code

Reinstates a proven, cost-effective option

Impact to industry relative to the cost of compliance with code

Provides clear guidance and improves consistency of code compliance for contractors working in different areas

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Recessed shower compartments have a proven track record in Florida and there is less chance of water damage because the recess contains all of the water

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Adds guidance and requirements for shower recesses that provide a proven, cost-effective option for builders

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not change the requirements for built-up showers, it just adds requirements for shower recesses

Does not degrade the effectiveness of the code

This modification reinstates the Florida-specific code language found in the first four editions of the FBC. It clears up confusion in the field over the applicability and proper construction of shower recesses.

Is the proposed code modification part of a prior code version?

YES

The provisions contained in the proposed amendment are addressed in the applicable international code?

NO

The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exhibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?

YES

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?

NO

417.5.2 Shower lining.
Floors under shower compartments, except where prefabricated receptors have been provided, shall be lined and made water tight utilizing material complying with Sections 417.5.2.1 through 417.5.2.6. Such liners shall turn up on all sides not less than 2 inches (51 mm) above the finished threshold level. Liners shall be recessed and fastened to an *approved* backing so as not to occupy the space required for wall covering, and shall not be nailed or perforated at any point less than 1 inch (25 mm) above the finished threshold. Liners shall be pitched one-fourth unit vertical in 12 units horizontal (2-percent slope) and shall be sloped toward the fixture drains and be securely fastened to the waste outlet at the seepage entrance, making a water-tight joint between the liner and the outlet. The completed liner shall be tested in accordance with Section 312.9.

Exceptions:

1. Floor surfaces under shower heads provided for rinsing laid directly on the ground are not required to comply with this section.

2. Where a sheet-applied, load-bearing, bonded, waterproof membrane is installed as the shower lining, the membrane shall not be required to be recessed.

3. Shower compartments where the finished shower drain is depressed a minimum of 2 inches (51 mm) below the surrounding finished floor on the first floor level and the shower recess is poured integrally with the adjoining floor.

P6818

Date Submitted	12/28/2015	**Section**	417.5.2	**Proponent**	Joseph Belcher
Chapter	4	**Affects HVHZ**	Yes	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Summary of Modification

Reinstates shower lining exception for depressed shower on first floor.

Rationale

The proposal reinstates a Florida specific amendment that appeared in all editions of the FBC-P except the 5th Edition. Exception 3 was an approved Florida specific amendment in all previous editions of the code. According to the original proponent, the Exceptions were inadvertently not submitted for the FBC-P, 5th Edition; there was no intent to eliminate the Exception.

The climate and high water table of Florida precludes the proliferation of basements in Florida and slabs-on-ground are a popular method of constructing the first floor. This type of construction is ideal for the use of the cost-effective alternate of recessed shower compartments. The provisions for recessed shower compartments have been widely used in Florida for many years with no reported problems.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities for code enforcement. Most inspectors are familiar with the system as it has been in use for many years throughout Florida.

Impact to building and property owners relative to cost of compliance with code

Approval of the proposal will have a positive impact on building and property owners by readopting a Florida specific amendment that provides a well proven cost-effective method of construction for shower compartments.

Impact to industry relative to the cost of compliance with code

Approval of the proposal will have a positive impact on building and property owners by bringing back a Florida specific amendment that provides a well proven cost-effective method of construction for shower compartments

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, reinstates a time proven cost-effective alternate method of constructing shower compartments in Florida.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, reinstates a time proven cost-effective alternate method of constructing shower compartments in Florida.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No, does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

No, does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version?

YES

The provisions contained in the proposed amendment are addressed in the applicable international code?

NO

The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exhibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?

YES

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?

NO

417.5.2 Shower lining.

Floors under shower compartments, except where prefabricated receptors have been provided, shall be lined and made water tight utilizing material complying with Sections 417.5.2.1 through 417.5.2.5. Such liners shall turn up on all sides at least 2 inches (51 mm) above the finished threshold level. Liners shall be recessed and fastened to an approved backing so as not to occupy the space required for wall covering, and shall not be nailed or perforated at any point less than 1 inch (25 mm) above the finished threshold. Liners shall be pitched one-fourth unit vertical in 12 units horizontal (2-percent slope) and shall be sloped toward the fixture drains and be securely fastened to the waste outlet at the seepage entrance, making a water-tight joint between the liner and the outlet. The completed liner shall be tested in accordance with Section 312.9.

Exceptions:

1. Floor surfaces under shower heads provided for rinsing laid directly on the ground are not required to comply with this section.

2. Where a sheet-applied, load-bearing, bonded, waterproof membrane is installed as the shower lining, the membrane shall not be required to be recessed.

3. Shower compartments where the finished shower drain is depressed a minimum of 2 inches (51 mm) below the surrounding finished floor on the first floor level and the shower recess is poured integrally with the adjoining floor.

Yes, the climate and high water table in Florida allows the use of a proven alternate method previously permitted by all editions of the Florida Building Code.

Date Submitted	12/21/2015	**Section**	604.4	**Proponent**	Josh Madden
Chapter	6	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

6610, 6668

Summary of Modification

Adopt plumbing fixture and fitting flow rates for increased water efficiency. Modification mirrors Chapter 7 Section 702.1 through 702.4 of the 2015 International Green Construction Code.

Rationale

As a concerned citizen and native Floridian I care about and enjoy Florida's water resources and natural ecosystems. This State has been blessed with a wealth of springs, wetlands, river, and lakes. These systems are not only a pleasure to enjoy in a recreational sense and provide a large economic benefit to the region, but are in fact essential to public health, safety and well being. In many areas of the State, there have been well documented negative impacts on springs, lakes, aquifers and other water resources as a result of over pumping of groundwater. Domestic consumption of publicly supplied water is one of the largest uses of water. As population in the State continues to grow, demand on water resources is expected to grow. This expected increase in demand can be curbed by conservation efforts such as the proposed code modification.

Florida is not the only state in the nation to face water supply challenges. California, Colorado Texas and Georgia have endured drought, and as result have adopted similar water fixture efficiency measures to those in this proposal. Some Counties within Florida have already adopted similar measures (Broward, Miami Dade).

The proposed efficiency measures can reduce deficits of future increased demand by saving approximately 15.5 million gallons per day by 2035 for commercial, industrial and institutional buildings. As a result of this proposed modification, a direct impact in reducing demand and ensuring the long-term sustainability of Florida's water resources can be had without significant sacrifice by any party. This change would provide a foundation for further improvement of water use efficiency at a statewide level.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This only changes the criteria for allowable flow rate of fixtures. No additional inspection protocol is needed.

Impact to building and property owners relative to cost of compliance with code

On average, property owners can expect to save approximately 20% on their water usage. This will provide homeowners with long term savings on their water, sewer, and electric bills (water heating).

Impact to industry relative to the cost of compliance with code

Most fixtures that meet WaterSenseR are comparable in price to conventional fixtures. For an average home, additional costs will be less than $100. This small additional cost would provide property owners with long term savings on their water, sewer, and electric bills (water heating).

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Having adequate supply of potable water for public consumption is obviously essential to health, safety and welfare of the general public. Conservation measures in this proposal will extend existing water sources to future populations.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The modification involves equivalent but more efficient products that have been tested and shown to meet national EPA WaterSenseR standards for functionality and dependability. Products are at least 20% more efficient. The modifications were replicated from the 2015 IgCC.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Products involved are already common in markets statewide. Nationally, there is an abundance of fixture models that meet WaterSenseR: 2,506 toilet; 362 urinal; 9,068 facet; 3,445 showerhead; 22 pre-rinse spray valve.

Does not degrade the effectiveness of the code

Proposed code is consistent with International Green Construction Code and does not contradict other chapters/sections.

Is the proposed code modification part of a prior code version? No

604.4 Maximum flow and water consumption. The maximum water consumption flow rates and quantities for all plumbing fixtures and fixture fittings shall be in accordance with Table 604.4 and the following:

Exceptions:

1. Blowout design water closets having a water consumption not greater than 3 1/2 gallons (13 L) per flushing cycle.

2. Vegetable sprays.

3. Clinical sinks having a water consumption not greater than 4 1/2 gallons (17 L) per flushing cycle.

4. Service sinks.

5. Emergency showers.

TABLE 604.4

MAXIMUM FLOW RATES AND CONSUMPTION FOR

PLUMBING FIXTURES AND FIXTURE FITTINGS[f,g]

PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE OR QUANTITY[b]
Lavatory and bar sink - private	~~2.2~~ 1.5 gpm at 60 psi
Lavatory, public (metering)	0.25 gallon per metering cycle [b]
Lavatory, public (other than metering)	0.5 gpm at 60 psi
Shower head a	~~2.5~~ 2.0gpm at 80 psi and WaterSense® labeled
~~Sink~~ Kitchen faucet - Private	~~2.2~~ 1.8 gpm at 60 psi
Urinal	~~1.0~~ 0.5 gallons per flushing cycle and WaterSense® labeled or nonwater urinal
Water Closet- public and remote c	1.6 gallons per flushing cycle
Water closet – public and nonremote	1.28 gpf average d,e
Water closet tank type, private	1.28 gpf and WaterSense® labeled d
Water closet-flushometer type, private	1.28 gpf e
Kitchen and bar sink faucets in other than dwelling units and guestrooms	2.2 gpm at 60 psi
Pre-rinse spray valves	1.3 gpm and WaterSense® labeled
Drinking fountains (manual)	0.7 gpm
Drinking fountains (metered)	0.25 gpc b

For SI: 1 foot = 304.8 mm, 1 gallon per cycle (gpc) = 3.8 Lpc, 1 gallon per flush (gpf) = 3.8 Lpf, 1 gallon per minute (gpm) = 3.8 Lpm1 pound per square inch = 6.895 kPa.

a. ~~A hand-held shower spray is a shower head~~ Includes hand showers, body sprays, rainfall panels and jets. Showerheads shall be supplied by automatic compensating valves that comply with ASSE 1016 or ASME A112.18.1/CSA B125.1 and that are specifically designed to function at the flow rate of the showerheads being used.

b. ~~Consumption tolerances shall be determined from referenced standards~~ Gallons per cycle of water volume discharged from each activation of a metered faucet.

c. A remote water closet is a water closet located not less than 30 feet upstream of other drain line connections or fixtures and is located where less than 1.5 drainage fixture units are upstream of the drain line connection.

d. The effective flush volume for a dual-flush water closet is defined as the composite, average flush volume of two reduced flushes and one full flush.

e. In public settings, the maximum water use of a dual flush water closet is based solely on its full flush operation; not an average of full and reduced volume flushes.

f. Water dispensers associated with drinking fountains shall not have limitations for flow rate.

g. Where a faucet has a pot filler mode, the flow shall not exceed 2.2 gpm at 60 psi. Such faucets shall automatically return to the flow rate indicated in table when the pot filler mode activation mechanism is released or when the faucet flow is turned off.

604.4.1 Combination tub and shower valves. Tub spout leakage from combination tub and shower valves that occurs when the outlet flow is diverted to the shower shall not exceed 0.1 gpm, measured in accordance with the requirements of ASME A112.18.1/CSA B125.1.

604.4.2 Food establishment pre-rinse spray valves. Food establishment pre-rinse spray valves shall have a maximum flow rate in accordance with Table **604.4** and shall shut off automatically when released.

604.4.3 Drinking fountain controls. Drinking fountains equipped with manually controlled valves shall shut off automatically upon the release of the valve. Metered drinking fountains shall comply with the flow volume specified in Table **604.4**.

604.5 Size of fixture supply. The minimum size of a fixture supply pipe shall be as shown in Table 604.5. The fixture supply pipe shall terminate not more than 30 inches (762 mm) from the point of connection to the fixture. A reduced size flexible water connector installed between the supply pipe and the fixture shall be of an *approved* type. The supply pipe shall extend to the floor or wall adjacent to the fixture. The minimum size of individual distribution lines utilized in gridded or parallel water distribution systems shall be as shown in Table 604.5.

P6423

Date Submitted	12/7/2015	**Section**	607.3	**Proponent**	Gary Kozan
Chapter	6	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Summary of Modification

Provides options for thermal expansion control - as per code all editions prior to and subsequent to the 2015 IPC

Rationale

Earlier editions of the IPC had always permitted multiple "means" for the control of thermal expansion. This changed in the 2015 edition, which limited thermal expansion control solely to thermal expansion tanks. The 2018 IPC committee recognized this as being overly-restrictive, and adopted revised language in the 2018 IPC. This modification updates this section to the most recent language of the 2018 IPC. It restores options for the designer and installer.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No cost impact

Impact to building and property owners relative to cost of compliance with code

No cost impact

Impact to industry relative to the cost of compliance with code

No cost impact - it increases the options available for thermal expansion control

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Restores multiple options for control of thermal expansion.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Allows designers and contractors to make the best selection for thermal expansion control.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Opens the marketplace to more products

Does not degrade the effectiveness of the code

Simply restores the options available under previous code editions.

Is the proposed code modification part of a prior code version? No

607.3 Thermal expansion control.

Where a storage water heater is supplied with cold water that passes through a check valve, pressure reducing valve or backflow preventer, a thermal expansion ~~tank~~ control device shall be connected to the water heater cold water supply pipe at a point that is downstream of all check valves, pressure reducing valves and backflow preventers. Thermal expansion ~~tanks~~ control devices shall be sized in accordance with the ~~tank~~ manufacturer's instructions and shall be sized such that the pressure in the water distribution system shall not exceed that required by Section 604.8.

P6416

Date Submitted	10/6/2015	**Section**	614	**Proponent**	Thomas Legler
Chapter	6	**Affects HVHZ**	Yes	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Summary of Modification

Section 614 which regulated private potable water wells of the 2010 Florida Plumbing code was not adopted and removed from the 2014 5th Edition of the Florida Plumbing code. Requesting section 614 of the 2010 FBC-P be added to the 2017 6th Edition of the FBC-P.

Rationale

Hillsborough County has hundreds of private potable water wells which provide water to residential and commercial occupants. Without this code section we have no authority to inspect or codes to ensure the proper installation of private potable water wells. F.S 373 references the Florida plumbing code for installation. The SWWMD regulates the location and well casings, however they do no regulate the pumps, valves, relief valves, tank and other equipment required for private potable water wells. In other words without this code there is no regulation.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - Prior to the adoption of the 5th Edition private potable water wells were permitted and inspected for code compliance.

Impact to building and property owners relative to cost of compliance with code

Cost of a permit fee.

Impact to industry relative to the cost of compliance with code

Contractors would be required to obtain a permit for the installation of private potable water wells.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proper installation of private potable water wells, pumps and related fittings and appurtenances is essential to the health, safety and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This code modification would strengthen and improve the code by setting the minimum requires for the installation of private potable water wells as previously adopted in earlier versions of the Plumbing code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This code change does not discriminate against materials, products, methods or systems.

Does not degrade the effectiveness of the code

This code modification does not degrade the effectiveness it only improves it's effectiveness.

Is the proposed code modification part of a prior code version?

YES

The provisions contained in the proposed amendment are addressed in the applicable international code?

NO

The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exihibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?

NO

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?

NO

SECTION 614 WELL PUMPS AND TANKS USED FOR PRIVATE POTABLE WATER SYSTEMS

614.1 Pumps.

Well pumps used for potable water shall comply with Sections 614.1.1 and 614.1.2

TABLE 614.1 MINIMUM PRIVATE POTABLE WATER SYSTEM PUMP SIZE

	BATHROOMS IN HOME				
MINIMUM PUMP SIZE	1	1 – 1 1/2	2 – 2 1/2	3 – 4	5 – 6
	7 gpm	10 gpm	14 gpm	17 gpm	21 gpm

Notes:

1. Values given are average and do not include higher or low extremes.
2. Installations over 6 bathrooms shall be approved by the code official.

614.1.1 Pump installation.

Pumps shall be installed for operation without repriming or breaking suction. Pumps shall be connected to the well head by means of a union, companion flange or compression coupling in such a manner that it is accessible for maintenance, repair and removal.

614.1.2 Pump sizing.

Minimum pump size shall be determined by Table 614.1.

614.2 Pressure tanks.

Tanks relying on expansion of a flexible membrane within a restricting container, or tanks with direct water-to-air interface to provide pressure in the water system, shall be used. All pressure tanks for storing potable water under pressure, including those having an air-space for pressure for expansion, shall be identified by seal, label or plate indicating the manufacturer's name and model number and shall meet the following specifications:

1. Pressure tank drawdown shall be a minimum of 1 gallon (3.8 L) for every gallon per minute produced by the pump.

Exception: Pump start applications, constant pressure devices and variable speed pumps.

2. Pressure tanks shall be constructed of steel, fiberglass or comparable materials. Tanks to be buried shall be built by the manufacturer specifically for underground use. Fiberglass or other nonmetallic tanks to be buried shall have the structural strength to prevent collapse.

614.3 Piping.

Piping associated with pumps and tanks shall comply with Sections 614.3.1 through 614.3.3.

614.3.1 Drop pipe.

The drop pipe from the submersible pump to the first fitting past the well seal shall be either galvanized steel, stainless steel or PVC Schedule 80 threaded/coupled or lock joint pipe. The drop pipe for a single pipe, deep well jet pump shall be either galvanized steel or stainless steel. The drop pipe for a double pipe, deep well jet pump shall be either galvanized steel on the suction side and/or minimum PVC schedule 40 on the pressure side.

614.3.2 Pump discharge pipe sizing.

For submersible pumps, pipe size shall be equal to the pump discharge. Piping for all other types of pumps shall be sized in accordance with the pump manufacturer's specifications.

614.3.3 Pressure tank pipe sizing.

Piping size for the offset of the pressure tank shall use the piping friction loss charts for the piping material used.

614.4 Electrical wiring.

All wiring shall be installed in accordance with Chapter 27 of the *Florida Building Code, Building*.

614.5 Disinfection.

The pump installer shall disinfect any potable well and water system in accordance with Section 610.

614.6 Valves.

A pressure relief valve shall be installed on any pumping system that can produce pressures of 75 psi (517 kPa) or greater. A check valve shall be installed at the well head of submersible pumps.

P6667

Date Submitted	12/30/2015	**Section**	12345678	**Proponent**	Harris Cheryl
Chapter	3206	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Summary of Modification

This modification provides alternate and extended wording to the Current and Proposed Appendix F. As there were extensive modifications the full Appendix is submitted in lieu of submitting modifications to each section.

Rationale

The proposed modifications reflect updated industry standards that ensure water efficiency, reduction of nutrient runoff and change technical terms to those that are standard industry terminology.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The additions and clarification assist enforcement to inspect against a standard for sections of the irrigation system previously missing and integral to a working, water efficient system and eliminating nutrient runoff. The additions do not increase the cost or time for enforcement.

Impact to building and property owners relative to cost of compliance with code

The changes will assist owners in understanding what is needed to properly install a water efficient system and reduce nutrient runoff. The additions may increase the costs to a building/property owner but be offset by lower costs of water usage, landscaping materials replacement, repairs.

Impact to industry relative to the cost of compliance with code

The additions and clarifications to the Appendix will not negatively impact industry in the cost to comply.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Addresses water conservation and nutrient runoff for the welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the Appendix by updating to industry standards to insure a water efficient system is installed and lowers nutrient runoff.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

There are no proprietary products, methods or systems of construction added to the Appendix.

Does not degrade the effectiveness of the code

The additions/clarifications do not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version?

YES

The provisions contained in the proposed amendment are addressed in the applicable international code?

NO

The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exihibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?

NO

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?

NO

Delete the entire Appendix F and replace with new wording that follows.

-

~~**APPENDIX F**~~

~~**PROPOSED CONSTRUCTION BUILDING CODES FOR TURF AND**~~

~~**LANDSCAPE IRRIGATION SYSTEMS**~~

-

~~**PART 1: GENERAL**~~

~~**A. Description.**~~

~~1. Purpose. To establish uniform minimum standards and requirements for the design and installation of safe, cost effective, reliable irrigation systems for turf and landscape areas which promote the efficient use and protection of water and other natural resources.~~

~~2. Definition. Turf and landscape irrigation systems apply water by means of permanent above-ground or subsurface sprinkler or microsprinkler equipment under pressure.~~

~~3. Scope. These construction codes shall apply to all irrigation systems used on residential and commercial landscape areas. They address the design requirements, water quality, materials, installation, inspection, and testing for such systems. These construction codes do not apply to irrigation systems for golf courses, nurseries, greenhouses, or agricultural production systems.~~

~~4. Application. All new irrigation systems and any new work to existing irrigation systems shall conform to the requirements of this code.~~

~~5. Application to existing irrigation installations. Nothing contained in this code shall be deemed to require any irrigation system or part thereof, which existed prior to the establishment of this code, to be changed altered or modified to meet the standards of this code.~~

~~**B. Permits.**~~

~~1. Permits required. It shall be unlawful to construct, enlarge, alter, modify, repair, or move any irrigation system or part thereof, or to install or alter any equipment for which provision is made or the installation of which is regulated by this code without first having filed application and obtained a permit therefore from the building official. A permit shall be deemed issued when signed by the building official and impressed with the seal of the governmental agency issuing said permit.~~

~~2. Exceptions. All work where exempt from permit shall still be required to comply with the code. No permit shall be required for general maintenance or repairs which do not change the structure or alter the system and the value of which does not exceed $600.00 in labor and material based on invoice value.~~

~~**C. Preconstruction submittals.**~~

~~1. Plans or drawings.~~

a. Single-family residence. Provide design drawings or shop drawings, where required, for the installation prior to start of construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, and include all improvements. Drawings can be prepared by a properly licensed qualified contractor.

b. Commercial, industrial, municipal and multiple-family. Provide professionally designed drawings prior to start of construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, including all improvements, and shall include but not be limited to: date, scale, revisions, legend, specifications which list all aspects of equipment and assembly thereof, water source, water meter and/or point of connection, backflow prevention devices, pump station size, pump station location, design operating pressure and flow rate per zone, locations of pipe, controllers, valves, sprinklers, sleeves, gate valves, etc. The plans and specifications shall be prepared in accordance with Section 106 of the *Florida Building Code, Building*.

D. Definitions.

ABS Pipe. Acrylonitrile-butadiene-styrene black, semi-rigid, plastic pipe extruded to IPS. ABS pipe is in limited use in present day irrigation systems. Solvent weld fittings are used with this pipe (see ASTM D 1788).

Air Release Valve. A valve which will automatically release to the atmosphere accumulated small pockets of air from a pressurized pipeline. A small orifice is used to release air at low flow rates. Air release valves are normally required at all summits of mainline and submain pipelines in an irrigation system.

Anti-Siphon Device. A safety device used to prevent back-flow of irrigation water to the water source by back-siphonage.

Application Rate. The average rate at which water is applied by an irrigation system, sometimes also called precipitation rate. Units are typically inches/hr or mm/hr.

Arc. The angle of coverage of a sprinkler in degrees from one side of throw to the other. A 90-degree arc would be a quarter-circle sprinkler.

Atmospheric Vacuum Breaker. An anti-siphon device which uses a floating seat to direct water flow. Water draining back from irrigation lines is directed to the atmosphere to protect the potable water supply.

Automatic Control Valve. A valve in a sprinkler system which is activated by an automatic controller by way of hydraulic or electrical control lines and controls a single device or multiple devices.

Automatic System. An irrigation system which operates following a preset program entered into an automatic controller.

Backflow Prevention Device. An approved safety device used to prevent pollution or contamination of the irrigation water supply due to backflow from the irrigation system.

Belled (Pipe). Pipe which is enlarged at one end so that the spigot end of another length of pipe can be inserted into it during the assembly of a pipeline.

Block (of sprinklers). A group of sprinklers controlled by one valve. Also called zones or subunits.

Block System. An irrigation system in which several groups of sprinklers are controlled by one valve for each group.

Bubbler Irrigation. The application of water to the soil surface or a container as a small stream or fountain. Bubbler emitter discharge rates are greater than the 0.5 to 2 gph characteristic of drip emitters, but generally less than 60 gph.

~~**Check Valve.** A valve which permits water to flow in one direction only.~~

~~**Chemical Water Treatment.** The addition of chemicals to water to make it acceptable for use in irrigation systems~~

~~**Chemigation.** The application of water soluble chemicals by mixing or injecting with the water applied through an irrigation system.~~

~~**Contractor.** Any person who engages in the fabrication and installation of any type of irrigation system on a contractual basis in accordance with all stipulations receiving his compensation.~~

~~**Control Lines**. Hydraulic or electrical lines which carry signals (to open and close the valves) from the controller to the automatic valves.~~

~~**Controller.** The timing mechanism and its mounting box. The controller signals the automatic valves to open and close on a pre-set program or based on sensor readings.~~

~~**Coverage.** Refers to the way water is applied to an area.~~

~~**Cycle.** Refers to one complete run of a controller through all programmed controller stations.~~

~~**Demand (or irrigation demand).** Refers to the irrigation requirements of the irrigated area. Demand primarily depends on the type of crop, stage of growth, and climatic factors.~~

~~**Design Area.** The specific land area to which water is to be applied by an irrigation system.~~

~~**Design Emission Uniformity**. An estimate of the uniformity of water application with an irrigation system.~~

~~**Design Pressure.** The pressure at which the irrigation system or certain components are designed to operate. The irrigation system design pressure is that measured at the pump discharge or entrance to the system if there is no pump, and a zone design pressure is the average operating pressure of all emitters within that zone.~~

~~**Direct Burial Wire.** Plastic-coated single-strand copper wire for use as control line for electric valves.~~

~~**Discharge Rate.** The instantaneous flow rate of an individual sprinkler, emitter, or other water emitting device, or a unit length of line-source micro irrigation tubing. Also, the flow rate from a pumping system.~~

~~**Double Check Valve.** An approved assembly of two single, independently-acting check valves with test ports to permit independent testing of each check valve.~~

~~**Drain Valve.** A valve used to drain water from a line. The valve may be manually or automatically operated.~~

~~**Drip Irrigation.** The precise low-rate application of water to or beneath the soil surface near or directly into the plant root zone. Applications normally occur as small streams, discrete or continuous drops, in the range of 0.5 to 2.0 gph.~~

~~**Effluent water.** Also referred to as reclaimed or gray water is wastewater which has been treated per Florida Statute, §403.086 and is suitable for use as a water supply for irrigation systems.~~

~~**Emitters.** Devices which are used to control the discharge of irrigation water from lateral pipes. This term is primarily used to refer to the low flow rate devices used in micro irrigation systems.~~

~~**Fertigation.** The application of soluble fertilizers with the water applied through an irrigation system.~~

~~**Filtration System**. The assembly of physical components used to remove suspended solids from irrigation water. These include both pressure and gravity type devices, such as settling basins, screens, media filters, and centrifugal force units (vortex sand separators).~~

~~**Flexible Swing Joint.** A flexible connection between the lateral pipe and the sprinkler which allows the sprinkler to move when force is applied to it.~~

~~**Flow Meters.** Devices used to measure the volume of flow of water (typically in gallons), or flow rates (typically in gpm), and to provide data on system usage.~~

~~**Gauge (Wire).** Standard specification for wire size. The larger the gauge number, the smaller the wire diameter.~~

~~**Head.** A sprinkler head. Sometimes used interchangeably with and in conjunction with "Sprinkler."~~

~~**Infiltration Rate.** The rate of water flow across the surface of the soil and into the soil profile. Units are usually inches/hr.~~

~~**Irrigation.** Application of water by artificial means, that is, means other than natural precipitation. Irrigation is practiced to supply crop water requirements, leach salts, apply chemicals, and for environmental control including crop cooling and freeze protection.~~

~~**Irrigation Water Requirement or Irrigation Requirement.** The quantity of water that is required for crop production, exclusive of effective rainfall.~~

~~**Landscape.** Refers to any and all areas which are ornamentally planted, including but not limited to turf, ground covers, flowers, shrubs, trees, and similar plant materials as opposed to agricultural crops grown and harvested for monetary return.~~

~~**Lateral.** The water delivery pipeline that supplies water to the emitters or sprinklers from a manifold or header pipeline downstream of the control valve.~~

~~**Line-Source Emitters.** Lateral pipelines which are porous or contain closely-spaced perforations so that water is discharged as a continuous band or in overlapping patterns rather than discrete widely-spaced points along the pipeline length.~~

~~**Looped System**. A piping system which allows more than one path for water to flow from the supply to the emitters or sprinklers.~~

~~**Mainline.** A pipeline which carries water from the control station to submains or to manifolds or header pipelines of the water distribution system.~~

~~**Manifold.** The water delivery pipeline that conveys water from the main or submain pipelines to the laterals. Also sometimes called a header pipeline.~~

~~**Manual System.** A system in which control valves are manually operated rather than operated by automatic controls.~~

~~**Meter Box.** A concrete or plastic box buried flush to grade which houses flow (water) meters or other components.~~

~~**Microirrigation.** The frequent application of small quantities of water directly on or below the soil surface, usually as discrete drops, tiny streams, or miniature sprays through emitters placed along the water delivery pipes (laterals). Microirrigation encompasses a number of methods or concepts, including drip, subsurface, bubbler, and spray irrigation. Previously known as trickle irrigation.~~

~~**Overlap.** The amount one sprinkler pattern overlaps another one when installed in a pattern. Expressed as a percentage of the diameter of coverage.~~

~~**PE Pipe.** Flexible polyethylene pipe for use in irrigation systems, normally manufactured with carbon black for resistance to degradation by ultraviolet radiation.~~

~~**Potable Water.** Water which is suitable in quality for human consumption and meets the requirements of the Health Authority having jurisdiction.~~

~~**Pressure Relief Valve**. A valve which will open and discharge to atmosphere when the pressure in a pipeline or pressure vessel exceeds a pre-set point to relieve the high-pressure condition.~~

~~**Pressure Vacuum Breaker**. A backflow prevention device which includes a spring-loaded check valve and a spring-loaded vacuum breaker to prevent the backflow of irrigation system water to the water source.~~

~~**Pumping Station.** The pump or pumps that provide water to an irrigation system, together with all of the necessary accessories such as bases or foundations, sumps, screens, valves, motor controls, safety devices, shelters and fences.~~

~~**PVC Pipe**. Polyvinyl chloride plastic pipe made in standard thermoplastic pipe dimension ratios and pressure rated for water. Manufactured in accordance with AWWA C-900 or ASTM D-2241.~~

~~**Rain Shut off Device**. A calibrated device that is designed to detect rainfall and override the irrigation cycle of the sprinkler system when a predetermined amount of rain fall has occurred.~~

~~**Riser.** A threaded pipe to which sprinklers or other emitters are attached for above-ground placement.~~

~~**Sleeve.** A pipe used to enclose other pipes, wire, or tubing; usually under pavement, sidewalks, or planters.~~

~~**Spacing.** The distance between sprinklers or other emitters.~~

~~**Spray Irrigation.** The micro irrigation application of water to the soil or plant surface by low flow rate sprays or mists.~~

~~**Sprinkler.** The sprinkler head. Sometimes called "Head."~~

~~**Supply (Water Source).** The origin of the water used in the irrigation system.~~

~~**Swing Joint.** A ridged connection between the lateral pipe and the sprinkler, utilizing multiple ells and nipples, which allows the sprinkler to move when force is applied to it.~~

~~**Tubing.** Generally used to refer to flexible plastic hydraulic control lines which are usually constructed of PE or PVC.~~

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~~**PART II — DESIGN CRITERIA**~~

~~**A. Design defined**. Within the scope of this code, irrigation system design is defined as the science and art of properly selecting and applying all components within the system.~~

~~**B. Water supply.**~~

~~1. The water source shall be adequate from the stand-point of volume, flow rate, pressure, and quality to meet the irrigation requirements of the area to be irrigated, as well as other demands, if any, both at the time the system is designed and for the expected life of the system.~~

~~2. If the water source is effluent, it shall meet the advanced waste treatment standard as set forth in Florida Statute §403.086(4) as well as any other standard as set forth by the controlling governmental agency.~~

~~**C. Application uniformity**. Irrigation application uniformity describes how evenly water is distributed within an irrigation zone. Irrigation system uniformity is the uniformity coefficient. Use application rates which avoid runoff and permit uniform water infiltration into the soil. Land slope, soil hydraulic properties, vegetative ground cover, and prevailing winds will be considered when application rates are specified. Sprinkler irrigation systems should be designed with the appropriate uniformity for the type of plant being grown and the type of soil found in that area. The general watering of different types of plants as one group without regard to their individual water requirements is to be avoided if at all possible. Different types of sprinklers with different application rates, i.e., spray heads vs. rotor heads, shall not be combined on the same zone or circuit.~~

~~**D. System zoning.** The irrigation system should be divided into zones based on consideration of the following:~~

~~1. Available flow rate.~~

~~2. Cultural use of the area.~~

~~3. Type of vegetation irrigated, i.e., turf, shrubs, native plants, etc.~~

~~4. Type of sprinkler, i.e., sprinklers with matching precipitation rates.~~

~~5. Soil characteristics.~~

~~**E. Sprinkler/emitter spacing and selection.** Sprinkler/Emitter spacing will be determined considering the irrigation requirements, hydraulic characteristics of the soil and device, and water quality with its effect on plant growth, sidewalks, buildings, and public access areas. When using square spacing, sprinklers should not be spaced farther apart than 55 percent of their manufacturer-specified diameters of coverage for prevailing wind speeds of 5 miles per hour (mph) or less. Spacing should not exceed 50 percent of sprinkler diameters of coverage for wind speeds of 5 to 10 mph, and 45 percent for prevailing wind speeds greater than 10 mph. When using triangular spacing, the above overlap percentages can be reduced by five percent. Water conservation will be emphasized by minimizing irrigation of non-vegetated areas. Microirrigation systems should be designed using the Emission Uniformity concept. Space microirrigation emitters to wet 100 percent of the root zone in turf areas and 50 percent of the root zone for shrubs and trees.~~

~~**F. Pipelines**. Pipelines will be sized to limit pressure variations so that the working pressure at all points in the irrigation system will be in the range required for uniform water application. Velocities will be kept to 5 feet (1524 mm) per second.~~

~~**G. Wells.**~~

~~1. Well diameters and depths are to be sized to correspond to the irrigation system demand. Refer to SCS Code FL-642 and local water management district regulations.~~

~~2. Well location and depth shall be in compliance with applicable state, water management district and local codes.~~

~~**H. Pumps.**~~

~~1. Pump and motor combinations shall be capable of satisfying the total system demand without invading the service factor of the motor except during start-up and between zones.~~

~~2. Pumps shall be positioned with respect to the water surface in order to ensure that the net positive suction head required (NPSHr) for proper pump operation is achieved.~~

~~3. The pumping system shall be protected against the effects of the interruption of water flow.~~

~~**I. Control valves.**~~

~~1. Control valve size shall be based on the flow rate through the valve. Friction loss through the valve, an approved air gap separation, or a reduced pressure should not exceed 10 percent of the static mainline head.~~

~~2. Control systems using hydraulic communication between controller and valve(s) shall comply with the manufacturer's recommendations for maximum distance between controller and valve, both horizontally and vertically (elevation change).~~

~~3. The size of the electrical control wire shall be in accordance with the valve manufacturer's specifications; based on the solenoid in-rush amperage and the circuit length, considering the number of solenoids operating on the circuit. Minimum of # 14 AWG single strand control wire shall be used on all systems, except individual, single lot residential systems.~~

~~4. Locate manually operated control valves so that they can be operated without wetting the operator.~~

~~**J. Automatic irrigation controller.** Automatic irrigation controllers must be UL approved and have an adequate number of stations and power output per station to accommodate the irrigation system design. The controller shall be capable of incorporating a rain shut off device to override the irrigation cycle when adequate rainfall has occurred, as required by Florida Statutes, Section 373.62.~~

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~~**K. Chemical injection.**~~

~~1. Chemical injection systems for the injection of fertilizer, pesticides, rust inhibitors, or any other injected substance will be located and sized according to the manufacturers' recommendations.~~

~~2. Injection systems will be located downstream of the applicable backflow prevention devices as required by Florida Statutes, Section 487.021 and 487.055; the Environmental Protection Agency (EPA); Pesticide Regulation Notice 87-1; or other applicable codes.~~

~~3. If an irrigation water supply is also used for human consumption, an air gap separation or an approved reduced pressure principal backflow prevention device is required.~~

~~**L. Backflow prevention methods**. Provide backflow prevention assemblies at all cross connections with all water supplies in accordance with county, municipal or other applicable codes to determine acceptable backflow prevention assembly types and installation procedures for a given application. In the event of conflicting regulation provide the assembly type which gives the highest degree of protection.~~

~~1. Irrigation systems into which chemicals are injected shall conform to Florida state law (Florida Statutes 487.021 and 487.055) and Environmental Protection Agency Pesticide Regulation Notice 87-1, which requires backflow prevention regulations to be printed on the chemical label.~~

~~2. For municipal water supplies, chemical injection equipment must be separated from the water supply by an approved air gap separation or a reduced pressure principle assembly that is approved by the Foundation for CCC and the Hydraulic Research Institute. The equipment must also comply with ASSE 1013 to protect the water supply from back-siphonage and back-pressure.~~

~~3. For other water supplies, Florida State law, EPA regulations, or other applicable local codes must be followed. In the absence of legal guidelines at least a PVB should be used.~~

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~~**PART III — STANDARDS**~~

~~**1. American Society of Agricultural Engineers (ASAE) Standards:**~~

~~**ASAE S330.1**: Procedure for sprinkler distribution testing for research purposes.~~

~~**ASAE S376.1:** Design, installation, and performance of underground thermoplastic irrigation pipelines.~~

~~**ASAE S397.1:** Electrical service and equipment for irrigation.~~

~~**ASAE S435**: Drip/Trickle Polyethylene Pipe used for irrigation laterals.~~

~~**ASAE S398.1:** Procedure for sprinkler testing and performance reporting.~~

~~**ASAE S339**: Uniform classification for water hardness.~~

~~**ASAE S394:** Specifications for irrigation hose and couplings used with self-propelled, hose-drag agricultural irrigation system.~~

~~**ASAE EP400.1:** Designing and constructing irrigation wells.~~

~~**ASAE EP405:** Design, installation, and performance of trickle irrigation systems.~~

~~**ASAE EP409:** Safety devices for applying liquid chemicals through irrigation systems.~~

~~**2. ASTM International Standards:**~~

~~**ASTM D 2241:** Poly (Vinyl Chloride) (PVC) Plastic pipe (SDR-PR).~~

~~**ASTM D 2239:** Specification for polyethylene (PE) plastic pipe (SDR-PR).~~

~~**ASTM D 2466:** Specification for socket-type poly (vinyl chloride) (PVC) and chlorinated poly (vinyl chloride) (CPVC) plastic pipe fittings, Schedule 40.~~

~~**ASTM D 2855:** Standard recommended practice for making solvent cemented joints with polyvinyl chloride pipe and fittings.~~

~~**ASTM D 3139:** Specification for joints for plastic pressure pipes using flexible elastomeric seals.~~

~~**ASTM F 477**: Specification for elastomeric seals (gaskets for joining plastic pipe).~~

~~**3. American Water Works Association (AWWA) standards:**~~

AWWA C-900: PVC pipe standards and specifications

4. American Society of Sanitary Engineers (ASSE) Standards:

ASSE 1001: Pipe applied atmospheric type vacuum breakers.

ASSE 1013: Reduced pressure principle backflow preventers.

ASSE 1015: Double check valve type back pressure backflow preventers.

ASSE 1020: Vacuum breakers, anti-siphon, pressure type.

ASSE 1024: Dual check valve type backflow preventers.

5. Hydraulic Institute Standards, 14th Edition

6. Standards and Specifications For Turf and Landscape Irrigation Systems Florida Irrigation Society (FIS) Standards

7. Soil Conservation Service (SCS) Field Office Technical Guide, Section IV-A — Cropland Codes:

SCS Code 430-DD: Irrigation water conveyance, underground, plastic pipeline.

SCS Code 430-EE: Irrigation water conveyance. Low pressure, underground, plastic pipeline.

SCS Code 430-FF: Irrigation water conveyance, steel pipeline.

SOS Code 441-1: Irrigation system, trickle.

SCS Code 442: Irrigation system sprinkler.

SCS Code 449: Irrigation water management.

SCS Code 533: Pumping plant for water control.

SCS Code 642: Well.

PART IV: MATERIALS

A. PVC pipe and fittings.

1. PVC pipe should comply with one of the following standards ASTM D 1785, ASTM D 2241, AWWA C-900, or AWWA C-905. SDR-PR pipe shall have a minimum wall thickness as required by SDR-26. All pipe used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.

2. All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 as set forth in ASTM D 2466.

3. Threaded PVC pipe firings shall meet the requirements of Schedule 40 as set forth in ASTM D 2464.

4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 477.

5. PVC flexible pipe should be pressure rated as described in ASTM D 2740 with standard outside diameters compatible with PVC IPS solvent-weld fittings.

6. PVC cement should meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.

B. Ductile iron pipe and fittings.

1. Gasket fittings for iron pipe should be of materials and type compatible with the piping material being used.

C. Steel pipe and fittings.

1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or black in accordance with ASTM 53.

2. Threaded fittings for steel pipe should be Schedule 40 Malleable Iron.

D. Polyethylene pipe.

1. Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 kPa) in accordance with ASTM D 2239.

2. Low pressure polyethylene pipe for micro-irrigation systems shall conform with ASAE S-435.

3. Use fittings manufactured specifically for the type and dimensions of polyethylene pipe used.

E. Sprinklers, spray heads, and emitters.

1. Select units and nozzles in accordance with the size of the area and the type of plant material being irrigated. Sprinklers must fit the area they are intended to water without excessive overspray onto anything but the lot individual landscaped surface. Intentional direct spray onto walkways, buildings, roadways, and drives is prohibited. All sprinklers used with effluent water systems shall be designated for non-potable use by either label or by the industry standard color purple.

2. Use equipment that is protected from contamination and damage by use of seals, screens, and springs where site conditions present a potential for damage.

3. Support riser-mounted sprinklers to minimize movement of the riser resulting from the action of the sprinkler.

4. Swing joints, either flexible or rigid, shall be constructed to provide a leak-free connection between the sprinkler and lateral pipeline to allow movement in any direction and to prevent equipment damage.

F. Valves.

1. Valves must have a maximum working pressure rating equal to or greater than the maximum pressure of the system, but not less than 125 psi (861 kPa). This requirement may be waived for low mainline pressure systems [30 psi (207 kPa) or less]. All valves used with effluent water systems shall be designated for non-potable use by either label or by the industry standard color purple.

2. Only valves that are constructed of materials designed for use with the water and soil conditions of the installation shall be used. Valves that are constructed from materials that will not be deteriorated by chemicals injected into the system shall be used on all chemical injection systems.

G. Valve boxes.

~~1. Valve boxes are to be constructed to withstand traffic loads common to the area in which they are installed. They should be sized to allow manual operation of the enclosed valves without excavation.~~

~~2. Each valve box should be permanently labeled to identify its contents. All valve boxes used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.~~

~~H. Low voltage wiring.~~

~~1. All low voltage wire which is directly buried must be labeled for direct burial wire. Wire not labeled for direct burial must be installed in watertight conduits, and be UL listed TWN or THHN type wire as described in the NEC. All wire traveling under any hardscape or roadway must installed within a pipe and sleeve.~~

~~2. The size of the electrical control wire shall be in accordance with the valve manufacturer's specifications, based on the solenoid in-rush amperage and the circuit length, considering the number of solenoids operating, on the circuit. Minimum of # 14 AWG single strand control wire shall be used on all systems, except single lot individual residential systems.~~

~~3. Connections are to be made using UL approved devices specifically designed for direct burial. All splices shall be enclosed within a valve box.~~

~~I. Irrigation controllers.~~

~~1. All irrigation controllers shall be UL listed, conform to the provisions of the National Electric Code (NEC), and be properly grounded in accordance with manufacturer's recommendations. Equip solid state controls with surge suppressors on the primary and secondary wiring, except single lot residential systems.~~

~~2. The controller housing or enclosure shall protect the controller from the hazards of the environment in which it is installed.~~

~~The rain switch shall be placed on a stationary structure minimum of 5-foot (1524 mm) clearance from other outdoor equipment, free and clear of any tree canopy or other overhead obstructions, and above the height of the sprinkler coverage.~~

~~J. Pumps and wells.~~

~~1. Irrigation pump electrical control systems must conform to NEC and local building codes.~~

~~2. The pumping system shall be protected from the hazards of the environment in which it is installed.~~

~~3. Use electric motors with a nominal horsepower rating greater than the maximum horsepower requirement of the pump during normal operation. Motor shall have a service factor of at least 1.15.~~

~~4. Casings for drilled wells may be steel, reinforced plastic mortar, plastic, or fiberglass pipe. Only steel pipe casings shall be used in driven wells. Steel pipe must have a wall thickness equal to or greater than Schedule 40. See SCS code FL-642. Steel casings shall be equal to or exceed requirements of ASTM A 589.~~

~~K. Chemical injection equipment.~~

~~1. Chemical injection equipment must be constructed of materials capable of withstanding the potential corrosive effects of the chemicals being used. Equipment shall be used only for those chemicals for which it was intended as stated by the injection equipment manufacturer.~~

~~L. Filters and strainers.~~

1. Filtration equipment and strainers constructed of materials resistant to the potential corrosive and erosive effects of the water shall be used. They shall be sized to prevent the passage of foreign material that would obstruct the sprinkler/emitter outlets in accordance with the manufacturer's recommendations.

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PART V: INSTALLATION

A. Pipe installation.

1. Pipe shall be installed at sufficient depth below ground to protect it from hazards such as vehicular traffic or routine occurrences which occur in the normal use and maintenance of a property. Depths of cover shall meet or exceed SCS Code 430-DD, Water Conveyance, as follows:

a. Vehicle traffic areas.

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Pipe Size (inches)	Depth of Cover (inches)
½ – 2 ½	18 - 24
3 - 5	24 - 30
6 and larger	30 - 36

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b. All areas except vehicle traffic:

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Pipe Size (inches)	Depth of Cover (inches)
½ – 1 ½	6
2 - 3	12
4 - 6	18
More than 6	24

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2. Make all pipe joints and connections according to manufacturer's recommendations. Perform all solvent-weld connections in accordance with ASTM D 2855.

3. Minimum clearances shall be maintained between irrigation lines and other utilities. In no case shall one irrigation pipe rest upon another. Comingling or mixing of different types of pipe assemblies shall be prohibited.

4. Thrust blocks must be used on all gasketed PVC systems. They must be formed against a solid, hand-excavated trench wall undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the

pipe and trench shall be filled to the height of the outside diameter of the pipe. Size thrustblocks in accordance with ASAE S-376.1.

5. The trench bottom must be uniform, free of debris, and of sufficient width to properly place pipe and support it over its entire length. Native excavated material may be used to backfill the pipe trench. However, the initial backfill material shall be free from rocks or stones larger than 1-inch in diameter. At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. Blocking or mounding shall not be used to bring the pipe to final grade.

6. Pipe sleeves must be used to protect pipes or wires installed under pavement or roadways. Use pipe sleeves two pipe sizes larger than the carrier pipe or twice the diameter of the wire bundle to be placed under the paving or roadway and extending a minimum of 3 feet beyond the paved area or as required by the Florida Department of Transportation (FDOT). Use sleeve pipe with wall thickness at least equal to the thickness of schedule 40 or PR 160 pipe, whichever is thicker. Proper backfill and compaction procedures should be followed.

B. Control valve installation.

1. Valve installation shall allow enough clearance for proper operation and maintenance. Where valves are installed underground, they shall be provided with a valve box with cover extending from grade to the body of the valve. The top of the valve body should have a minimum of 6 inches (152 mm) of cover in nontraffic and noncultivated areas and 18 inches (457 mm) of cover in traffic areas. If an automatic valve is installed under each sprinkler, then the valve box may be omitted.

2. Install valve boxes so that they do not rest on the pipe, the box cover does not conflict with the valve stem or interfere with valve operation, they are flush with the ground surface and do not present a tripping hazard or interfere with routine maintenance of the landscape.

3. Install quick coupling valves on swing joints or flexible pipe with the top of the valve at ground level.

Any above-ground manually-operated valves on nonpotable water systems will be adequately identified with distinctive purple colored paint. Do not provide hose connections on irrigation systems that utilize nonpotable water supplies.

C. Sprinkler installation.

1. On flat landscaped areas, install sprinklers plumb. In areas where they are installed on slopes, sprinklers may be tilted as required to prevent erosion. Sprinklers should be adjusted to avoid unnecessary discharge on pavements and structures. Adjust sprinklers so they do not water on roads.

2. Provide a minimum separation of 4 inches (102 mm) between sprinklers and pavement. Provide a minimum separation of 12 inches (305 mm) between sprinklers and buildings and other vertical structures. Piping must be thoroughly flushed before installation of sprinkler nozzles. Surface mounted and pop-up heads shall be installed on swing joints, flexible pipe, or polyethylene (PE) nipples. Above-ground (riser mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be effectively stabilized.

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D. Pump installation.

1. Install pumps as per the manufacturer's recommendations. Set pumps plumb and secure to a firm concrete base. There should be no strain or distortion on the pipe and fittings. Pipe and fittings should be supported to avoid placing undue strain on the pump. Steel pipe should be used on pumps 5 horsepower (hp) or larger whenever practical.

2. Pumps must be installed in a manner to avoid loss of prime. Install suction line to prevent the accumulation of air pockets. All connections and reductions in suction pipe sizes should be designed to avoid causing air pockets and cavitation.

3. Pumps must be located to facilitate service and ease of removal. Appropriate fittings should be provided to allow the pump to readily be primed, serviced, and disconnected. Provide an enclosure of adequate size and strength, with proper ventilation, to protect the pump from the elements (except residential systems).

E. Low voltage wire installation.

1. Install low voltage wire (30 volts or less) with a minimum depth of cover of 12 inches (305 mm). Provide a sufficient length of wire at each connection to allow for thermal expansion/shrinkage. As a minimum, provide a 12-inch (305 mm) diameter loop at all splices and connections. Terminations at valves will have 24 inches (610 mm) minimum free wire.

2. Install all above-ground wire runs and wire entries into buildings in electrical conduit. Provide common wires with a different color than the power wires (white shall be used for common wires). Connections are to be made using UL approved devices specifically designed for direct burial. All splices shall be enclosed within a valve box.

F. Hydraulic control tubing.

1. For hydraulic control systems, use a water supply that is filtered and free of deleterious materials, as defined by the hydraulic control system manufacturer. Install a backflow prevention device where the hydraulic control system is connected to potable water supplies.

2. Install tubing in trenches freely and spaced so that it will not rub against pipe, fittings, or other objects that could score the tubing, and with a minimum 12-inch (305 mm) diameter loop at all turns and connections. Provide a minimum depth of cover of 12 inches (305 mm).

3. Connect tubing with couplings and collars recommended by the tubing manufacturer. All splices shall be made in valve boxes. Prefill tubing with water, expelling entrapped air and testing for leaks prior to installation.

Install exposed tubing in a protective conduit manufactured from Schedule 40 UV protected PVC or electrical conduit.

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PART VI: TESTING & INSPECTIONS

A. Purpose. All materials and installations covered by the Irrigation Code shall be inspected by the governing agency to verify compliance with the Irrigation Code.

B. Rough inspections. Rough inspections will be performed throughout the duration of the installation. These inspections will be made by the governing agency to ensure that the installation is in compliance with the design intent, specifications, and the Irrigation Codes. Inspections will be made on the following items at the discretion of the governing agency:

1. Sprinkler layout and spacing: This inspection will verify that the irrigation system design is accurately installed in the field. It will also provide for alteration or modification of the system to meet field conditions. To pass this inspection, sprinkler/emitter spacing should be within ± 5 percent of the design spacing.

2. Pipe installation depth: All pipes in the system shall be installed to depths as previously described in this code.

~~Test all mainlines upstream of the zone valves as follows:~~

~~a. Fill the completely installed pipeline slowly with water to expel air. Allow the pipe to sit full of water for 24 hours to dissolve remaining trapped air.~~

~~b. Using a metering pump, elevate the water pressure to the maximum static supply pressure expected and hold there for a period of 2 hours, solvent-weld pipe connections shall have no leakage.~~

~~c. For gasketed pipe main lines add water as needed to maintain the pressure. Record the amount of water added to the system over the 2-hour period.~~

~~d. Use the following formulas to determine the maximum allowable leakage limit of gasketed pipe.~~

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~~**DUCTILE IRON:**~~

$$L = \frac{SDP}{133{,}200}$$

~~-~~

~~-~~

~~**PVC, GASKETED JOINT:**~~

$$L = \frac{NDP}{7{,}400}$$

~~Where:~~

~~L = allowable leakage (gph),~~

~~N = number of joints,~~

~~D = nominal diameter of pipe (inches),~~

~~P = average test pressure (psi), and~~

~~S = length of pipe (ft).~~

~~e. When testing a system which contains metal-seated valves, an additional leakage per closed valve of 0.078 gph/inch of nominal valve size is allowed.~~

~~**C. Final inspection**. When the work is complete the contractor shall request a final inspection.~~

~~1. Cross connection control and backflow prevention.~~

~~a. Public or domestic water systems: Check that an approved backflow prevention assembly is properly installed and functioning correctly. Review the location of the assembly to check that it is not creating a hazard to pedestrians or vehicular traffic.~~

~~b. Water systems other than public or domestic water systems: Check that the proper backflow prevention assemblies are provided.~~

~~c. All assemblies that can be, will be tested by a certified technician prior to being placed into service.~~

~~2. Sprinkler coverage testing.~~

~~a. All sprinklers must be adjusted to minimize overspray onto buildings and paved areas.~~

~~b. All sprinkler controls must be adjusted to minimize runoff of irrigated water.~~

~~c. All sprinklers must operate at their design radius of throw. Nozzle sizes and types called for in the system design must have been used.~~

~~d. Spray patterns must overlap as designed.~~

~~e. Sprinklers must be connected, as designed, to the appropriate zone.~~

~~**D. Site restoration.**~~

~~1. All existing landscaping, pavement, and grade of areas affected by work must be restored to original condition or to the satisfaction of the governing authority.~~

~~Verify that the pipeline trenches have been properly compacted to the densities required by the plans and specifications.~~

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APPENDIX F

PROPOSED CONSTRUCTION BUILDING CODES FOR TURF AND

LANDSCAPE IRRIGATION SYSTEMS (Spelling Correction Also Requested on the PreSet Chapter Topic Selection from Irragation to Irrigation)

PART 1: GENERAL

A. Description.

1. Purpose. To establish uniform minimum standards and requirements for the design and installation of safe, cost effective, reliable irrigation systems for turf and landscape areas which promote the efficient use and protection of water and other natural resources.

2. Definition. Turf and landscape irrigation systems apply water by means of permanent above-ground or subsurface sprinkler or microsprinkler equipment under pressure.

3. Scope. These construction codes shall apply to all irrigation systems used on residential and commercial landscape areas. They address the design requirements, water quality, materials, installation, inspection, and testing

for such systems. These construction codes do not apply to irrigation systems for golf courses, nurseries, greenhouses, or agricultural production systems.

4. Application. All new irrigation systems and any new work to existing irrigation systems shall conform to the requirements of this code.

5. Application to existing irrigation installations. Nothing contained in this code shall be deemed to require any irrigation system or part thereof, which existed prior to the establishment of this code, to be changed altered or modified to meet the standards of this code.

B. Permits.

1. Permits required. It shall be unlawful to construct, enlarge, alter, modify, repair, or move any irrigation system or part thereof, or to install or alter any equipment for which provision is made or the installation of which is regulated by this code without first having filed application and obtained a permit therefore from the building official. A permit shall be deemed issued when signed by the building official and impressed with the seal of the governmental agency issuing said permit.

2. Exceptions. All work where exempt from permit shall still be required to comply with the code. No permit shall be required for general maintenance or repairs which do not change the structure or alter the system and the value of which does not exceed $600.00 in labor and material based on invoice value.

C. Preconstruction submittals.

1. Plans or drawings.

a. Single-family residence. Provide design drawings or shop drawings, where required, for the installation prior to start of construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, and include all improvements. Drawings can be prepared by a properly licensed qualified contractor.

b. Commercial, industrial, municipal and multiple-family. Provide professionally designed drawings prior to start of construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, including all improvements, and shall include but not be limited to: date, scale, revisions, legend, specifications which list all aspects of equipment and assembly there of, water source, water meter and/or point of connection, backflow prevention devices, pump station size, pump station location, design operating pressure and flow rate per zone, precipitation rate per zone, locations of pipe, controllers, valves, sprinklers, sleeves, gate valves, etc. The plans and specifications shall be prepared in accordance with Section 106 of the *Florida Building Code, Building*.

D. Definitions.

ABS Pipe. Acrylonitrile-butadiene-styrene black, semi-rigid, plastic pipe extruded to IPS. ABS pipe is in limited use in present day irrigation systems. Solvent weld fittings are used with this pipe (see ASTM D 1788).

Air Release Valve. A valve which will automatically release to the atmosphere accumulated small pockets of air from a pressurized pipeline. A small orifice is used to release air at low flow rates. Air release valves are normally required at all summits of mainline and submain pipelines in an irrigation system.

Anti-Siphon Device. A safety device used to prevent back-flow of irrigation water to the water source by back-siphonage.

Application Rate. The average rate at which water is applied by an irrigation system, sometimes also called precipitation rate. Units are typically inches/hr or mm/hr.

Application Uniformity. Irrigation application uniformity (also known as distribution uniformity) describes how evenly water is distributed within an irrigation zone.

Arc. The angle of coverage of a sprinkler in degrees from one side of throw to the other. A 90-degree arc would be a quarter-circle sprinkler.

Atmospheric Vacuum Breaker. An anti-siphon device which uses a floating seat to direct water flow. Water draining back from irrigation lines is directed to the atmosphere to protect the potable water supply.

Automatic Control Valve. A valve in a sprinkler system which is activated by an automatic controller by way of hydraulic or electrical control lines and controls a single device or multiple devices.

Automatic System. An irrigation system which operates following a preset program entered into an automatic controller.

Backflow Prevention Device. An approved safety device used to prevent pollution or contamination of the irrigation water supply due to backflow from the irrigation system.

Belled (Pipe). Pipe which is enlarged at one end so that the spigot end of another length of pipe can be inserted into it during the assembly of a pipeline.

Block (of sprinklers). A group of sprinklers controlled by one valve. Also called zones or subunits.

Block System. An irrigation system in which several groups of sprinklers are controlled by one valve for each group.

Bubbler Irrigation. The application of water to the soil surface or a container as a small stream or fountain. Bubbler emitter discharge rates are greater than the 0.5 to 2 gph characteristic of drip emitters, but generally less than 60 gph.

Check Valve. A valve which permits water to flow in one direction only.

Chemical Water Treatment. The addition of chemicals to water to make it acceptable for use in irrigation systems

Chemigation. The application of water soluble chemicals by mixing or injecting with the water applied through an irrigation system.

Contractor. Any person who engages in the fabrication and installation of any type of irrigation system on a contractual basis in accordance with all stipulations receiving his compensation.

Control Lines. Hydraulic or electrical lines which carry signals (to open and close the valves) from the controller to the automatic valves.

Controller. The timing mechanism and its mounting box. The controller signals the automatic valves to open and close on a pre-set program or based on sensor readings.

Coverage. Refers to the way water is applied to an area.

Cycle. Refers to one complete run of a controller through all programmed controller stations.

Demand (or irrigation demand). Refers to the irrigation requirements of the irrigated area. Demand primarily depends on the type of crop, stage of growth, and climatic factors.

Design Area. The specific land area to which water is to be applied by an irrigation system.

Design Emission Uniformity. An estimate of the uniformity of water application with an irrigation system.

Design Pressure. The pressure at which the irrigation system or certain components are designed to operate. The irrigation system design pressure is that measured at the pump discharge or entrance to the system if there is no pump, and a zone design pressure is the average operating pressure of all emitters within that zone.

Direct Burial Wire. Plastic-coated single-strand copper wire for use as control line for electric valves.

Discharge Rate. The instantaneous flow rate of an individual sprinkler, emitter, or other water emitting device, or a unit length of line-source micro irrigation tubing. Also, the flow rate from a pumping system.

Double Check Valve. An approved assembly of two single, independently-acting check valves with test ports to permit independent testing of each check valve.

Drain Valve. A valve used to drain water from a line. The valve may be manually or automatically operated.

Drip Irrigation. The precise low-rate application of water to or beneath the soil surface near or directly into the plant root zone. Applications normally occur as small streams, discrete or continuous drops, in the range of 0.5 to 2.0 gph.

Effluent water. Also referred to as reclaimed or gray water is wastewater which has been treated per Florida Statute, §403.086 and is suitable for use as a water supply for irrigation systems.

Emitters. Devices which are used to control the discharge of irrigation water from lateral pipes. This term is primarily used to refer to the low flow rate devices used in micro irrigation systems.

Fertigation. The application of soluble fertilizers with the water applied through an irrigation system.

Filtration System. The assembly of physical components used to remove suspended solids from irrigation water. These include both pressure and gravity type devices, such as settling basins, screens, media filters, and centrifugal force units (vortex sand separators).

Flexible Swing Joint. A flexible connection between the lateral pipe and the sprinkler which allows the sprinkler to move when force is applied to it.

Flow Meters. Devices used to measure the volume of flow of water (typically in gallons), or flow rates (typically in gpm), and to provide data on system usage.

Gauge (Wire). Standard specification for wire size. The larger the gauge number, the smaller the wire diameter.

Head. A sprinkler head. Sometimes used interchangeably with and in conjunction with "Sprinkler."

Infiltration Rate. The rate of water flow across the surface of the soil and into the soil profile. Units are usually inches/hr.

Irrigation. Application of water by artificial means, that is, means other than natural precipitation. Irrigation is practiced to supply crop water requirements, leach salts, apply chemicals, and for environmental control including crop cooling and freeze protection.

Irrigation Water Requirement or Irrigation Requirement The quantity of water that is required for crop production, exclusive of effective rainfall.

Landscape. Refers to any and all areas which are ornamentally planted, including but not limited to turf, ground covers, flowers, shrubs, trees, and similar plant materials as opposed to agricultural crops grown and harvested for monetary return.

Lateral. The water delivery pipeline that supplies water to the emitters or sprinklers from a manifold or header pipeline downstream of the control valve.

Line-Source Emitters. Lateral pipelines which are porous or contain closely-spaced perforations so that water is discharged as a continuous band or in overlapping patterns rather than discrete widely-spaced points along the pipeline length.

Looped System. A piping system which allows more than one path for water to flow from the supply to the emitters or sprinklers.

Low Volume Sprinklers. Sprinkler heads that emit less than .5 gallons per minute.

Mainline. A pipeline which carries water from the control station to submains or to manifolds or header pipelines of the water distribution system.

Manifold. The water delivery pipeline that conveys water from the main or submain pipelines to the laterals. Also sometimes called a header pipeline.

Manual System. A system in which control valves are manually operated rather than operated by automatic controls.

Matched Precipitation. An equal distribution of water over a given area or zone.

Meter Box. A concrete or plastic box buried flush to grade which houses flow (water) meters or other components.

Microirrigation. The frequent application of small quantities of water directly on or below the soil surface, usually as discrete drops, tiny streams, or miniature sprays through emitters placed along the water delivery pipes (laterals). Microirrigation encompasses a number of methods or concepts, including drip, subsurface, bubbler, and spray irrigation. Previously known as trickle irrigation.

Overlap. The amount one sprinkler pattern overlaps another one when installed in a pattern. Expressed as a percentage of the diameter of coverage.

PE Pipe. Flexible polyethylene pipe for use in irrigation systems, normally manufactured with carbon black for resistance to degradation by ultraviolet radiation.

Potable Water. Water which is suitable in quality for human consumption and meets the requirements of the Health Authority having jurisdiction.

Pressure Relief Valve. A valve which will open and discharge to atmosphere when the pressure in a pipeline or pressure vessel exceeds a pre-set point to relieve the high-pressure condition.

Pressure Vacuum Breaker. A backflow prevention device which includes a spring-loaded check valve and a spring-loaded vacuum breaker to prevent the backflow of irrigation system water to the water source.

Pumping Station. The pump or pumps that provide water to an irrigation system, together with all of the necessary accessories such as bases or foundations, sumps, screens, valves, motor controls, safety devices, shelters and fences.

PVC Pipe. Polyvinyl chloride plastic pipe made in standard thermoplastic pipe dimension ratios and pressure rated for water. Manufactured in accordance with AWWA C-900 or ASTM D-2241.

Rain Shut off Device. A calibrated device that is designed to detect rainfall and override the irrigation cycle of the sprinkler system when a predetermined amount of rain fall has occurred.

Riser. A threaded pipe to which sprinklers or other emitters are attached for above-ground placement.

Sleeve. A pipe used to enclose other pipes, wire, or tubing; usually under pavement, sidewalks, or planters.

Spacing. The distance between sprinklers or other emitters.

Spray Irrigation. The micro irrigation application of water to the soil or plant surface by low flow rate sprays or mists.

Sprinkler. The sprinkler head. Sometimes called "Head."

Supply (Water Source). The origin of the water used in the irrigation system.

Swing Joint. A ridged connection between the lateral pipe and the sprinkler, utilizing multiple ells and nipples, which allows the sprinkler to move when force is applied to it.

Tubing. Generally used to refer to flexible plastic hydraulic control lines which are usually constructed of PE or PVC.

PART II — DESIGN CRITERIA

A. Design defined. Within the scope of this code, irrigation system design is defined as the science and art of properly selecting and applying all components within the system. The irrigation system shall be designed and installed to achieve the highest possible efficiency by providing operating pressures, sprinkler placement and nozzle selection that are within the manufacture's recommendations, and maintained to keep the system at or within those ranges.

B. Water supply.

1. The water source shall be adequate from the stand-point of volume, flow rate, pressure, and quality to meet the irrigation requirements of the area to be irrigated, as well as other demands, if any, both at the time the system is designed and for the expected life of the system. The irrigation system shall use the lowest quality water source available on site.

2. If the water source is effluent, it shall meet the advanced waste treatment standard as set forth in Florida Statute §403.086(4) as well as any other standard as set forth by the controlling governmental agency.

C. Application uniformity.

1. Sprinkler irrigation systems should be designed with the appropriate uniformity for the type of plants being grown and the type of soil found in that area. The general watering of different types of plants as one group without regard to their individual water requirements is to be avoided.

2. Use sprinkler head spacing, type and nozzle selection to achieve the highest application uniformity.

3. Use application rates which avoid runoff and permit uniform water infiltration into the soil. Land slope, soil hydraulic properties, vegetative ground cover, and prevailing winds and sun exposure will be considered when application rates are specified. Different types of sprinklers with different application rates, i.e., spray heads vs. rotor heads, bubbler heads vs rotor heads, shall not be combined on the same zone or circuit.

D. System zoning. The irrigation system should be divided into zones based on consideration of the following hydrozoning practices.

1. Available flow rate.

2. Cultural use of the area.

3. Type of vegetation irrigated, i.e., turf, shrubs, native plants, etc.

4. Type of sprinkler, i.e., sprinklers with matching precipitation rates.

5. Soil characteristics and slope.

6. Sun exposure.

E. Sprinkler/emitter spacing and selection.

1. Sprinkler/Emitter spacing will be determined considering the irrigation requirements, hydraulic characteristics of the soil and device, and water quality with its effect on plant growth, sidewalks, buildings, and public access areas.

2. All pop-up spray head bodies in turf areas shall be no less than 6" in height for St. Augustine, Zoysia and Bahia and no less than 4" in height for Bermuda, Centapede and Seashore Paspalum.

3. Sprinklers should be located in all corners and on the perimeter of each irrigated zone area for a matched precipitation rate objective.

4. Single row head spacing should only occur when an additional row will cause saturated soils at the toe of a slope or other inefficiencies.

5. All heads shall not exceed 50% of manufacturer's specified diameters of coverage.

6. Water conservation will be emphasized by minimizing irrigation of non-vegetated areas.

7. Microirrigation systems should be designed using the Emission Uniformity concept. Space microirrigation emitters to wet 100 percent of the root zone in turf areas and 50 percent of the root zone for shrubs and trees.

8. Microirrigation or low volume heads shall be required in all areas less than 4 feet in either direction.

9. All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to PVC pipe to protect the emission devices from contamination from a PD main or lateral break.

10. Each plant shall have an adequate number and size (gph) of microirrigation devices, properly placed, to meet the plant water requirements for no rainfall.

F. Pipelines. Pipelines will be sized to limit pressure variations so that the working pressure at all points in the irrigation system will be in the range required for uniform water application. Velocities will be kept to 5 feet (1524 mm) per second.

G. Wells.

1. Well diameters and depths are to be sized to correspond to the irrigation system demand. Refer to SCS Code FL-642 and local water management district regulations.

2. Well location and depth shall be in compliance with applicable state, water management district and local codes.

H. Pumps.

1. Pump and motor combinations shall be capable of satisfying the total system demand without invading the service factor of the motor except during start-up and between zones.

2. Pumps shall be positioned with respect to the water surface in order to ensure that the net positive suction head required (NPSHr) for proper pump operation is achieved.

3. The pumping system shall be protected against the effects of the interruption of water flow.

I. Control valves.

1. Control valve size shall be based on the flow rate through the valve. Friction loss through the valve, an approved air gap separation, or a reduced pressure should not exceed 10 percent of the static mainline head.

2. Control systems using hydraulic communication between controller and valve(s) shall comply with the manufacturer's recommendations for maximum distance between controller and valve, both horizontally and vertically (elevation change).

3. The size of the electrical control wire shall be in accordance with the valve manufacturer's specifications; based on the solenoid in-rush amperage and the circuit length, considering the number of solenoids operating on the circuit. Minimum of # 14 AWG single strand control wire shall be used on all systems, except individual, single lot residential systems.

4. Locate manually operated control valves so that they can be operated without wetting the operator.

5. Locate inground valves away from large tree and palm root zones.

6. A manual shut off valve shall be required to be installed close to the point of connection but downstream from any backflow device to minimize water loss when the system is shut off for repairs or emergencies.

7. An automatic shut-off valve (normally closed) is required on all systems with a constantly pressurized mainline to confine the water loss from minor main line leaks, weeping valves, or stuck on valves to just the time the system is operating automatically.

J. Automatic irrigation controller. Automatic irrigation controllers must be UL approved and have an adequate number of stations and power output per station to accommodate the irrigation system design. The controller shall be

capable of incorporating a rain shut off device or other sensors to override the irrigation cycle when adequate rainfall has occurred as required by Florida Statutes, Section 373.62.

K. Chemical injection.

1. Chemical injection systems for the injection of fertilizer, pesticides, rust inhibitors, or any other injected substance will be located and sized according to the manufacturers' recommendations.

2. Injection systems will be located downstream of the applicable backflow prevention devices as required by Florida Statutes, Section 487.021 and 487.055; the Environmental Protection Agency (EPA); Pesticide Regulation Notice 87-1; or other applicable codes.

3. If an irrigation water supply is also used for human consumption, an air gap separation or an approved reduced pressure principal backflow prevention device is required.

L. Backflow prevention methods. Provide backflow prevention assemblies at all cross connections with all water supplies in accordance with county, municipal or other applicable codes to determine acceptable backflow prevention assembly types and installation procedures for a given application. In the event of conflicting regulation provide the assembly type which gives the highest degree of protection.

1. Irrigation systems into which chemicals are injected shall conform to Florida state law (Florida Statutes 487.021 and 487.055) and Environmental Protection Agency Pesticide Regulation Notice 87-1, which requires backflow prevention regulations to be printed on the chemical label.

2. For municipal water supplies, chemical injection equipment must be separated from the water supply by an approved air gap separation or a reduced pressure principle assembly that is approved by the Foundation for CCC and the Hydraulic Research Institute. The equipment must also comply with ASSE 1013 to protect the water supply from back-siphonage and back-pressure.

3. For other water supplies, Florida State law, EPA regulations, or other applicable local codes must be followed. In the absence of legal guidelines at least a PVB should be used.

PART III — STANDARDS

1. American Society of Agricultural Engineers (ASAE) Standards:

ASAE S330.1: Procedure for sprinkler distribution testing for research purposes.

ASAE S376.1: Design, installation, and performance of underground thermoplastic irrigation pipelines.

ASAE S397.1: Electrical service and equipment for irrigation.

ASAE S435: Drip/Trickle Polyethylene Pipe used for irrigation laterals.

ASAE S398.1: Procedure for sprinkler testing and performance reporting.

ASAE S339: Uniform classification for water hardness.

ASAE S394: Specifications for irrigation hose and couplings used with self-propelled, hose-drag agricultural irrigation system.

ASAE EP400.1: Designing and constructing irrigation wells.

ASAE EP405: Design, installation, and performance of trickle irrigation systems.

ASAE EP409: Safety devices for applying liquid chemicals through irrigation systems.

2. ASTM International Standards:

ASTM D 2241: Poly (Vinyl Chloride) (PVC) Plastic pipe (SDR-PR).

ASTM D 2239: Specification for polyethylene (PE) plastic pipe (SDR-PR).

ASTM D 2466: Specification for socket-type poly (vinyl chloride) (PVC) and chlorinated poly (vinyl chloride) (CPVC) plastic pipe fittings, Schedule 40.

ASTM D 2855: Standard recommended practice for making solvent cemented joints with polyvinyl chloride pipe and fittings.

ASTM D 3139: Specification for joints for plastic pressure pipes using flexible elastomeric seals.

ASTM F 477: Specification for elastomeric seals (gaskets for joining plastic pipe).

3. American Water Works Association (AWWA) standards:

AWWA C-900: PVC pipe standards and specifications

4. American Society of Sanitary Engineers (ASSE) Standards:

ASSE 1001: Pipe applied atmospheric type vacuum breakers.

ASSE 1013: Reduced pressure principle backflow preventers.

ASSE 1015: Double check valve type back pressure backflow preventers.

ASSE 1020: Vacuum breakers, anti-siphon, pressure type.

ASSE 1024: Dual check valve type backflow preventers.

5. Hydraulic Institute Standards, 14th Edition

6. Standards and Specifications For Turf and Landscape Irrigation Systems Florida Irrigation Society (FIS) Standards

7. Soil Conservation Service (SCS) Field Office Technical Guide, Section IV-A — Cropland Codes:

SCS Code 430-DD: Irrigation water conveyance, underground, plastic pipeline.

SCS Code 430-EE: Irrigation water conveyance. Low pressure, underground, plastic pipeline.

SCS Code 430-FF: Irrigation water conveyance, steel pipeline.

SOS Code 441-1: Irrigation system, trickle.

SCS Code 442: Irrigation system sprinkler.

SCS Code 449: Irrigation water management.

SCS Code 533: Pumping plant for water control.

SCS Code 642: Well.

PART IV: MATERIALS

A. PVC pipe and fittings.

1. PVC pipe should comply with one of the following standards ASTM D 1785, ASTM D 2241, AWWA C-900, or AWWA C-905. SDR-PR pipe shall have a minimum wall thickness as required by SDR-26. All pipe used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.

2. All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 as set forth in ASTM D 2466.

3. Threaded PVC pipe firings shall meet the requirements of Schedule 40 as set forth in ASTM D 2464.

4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 477.

5. PVC flexible pipe should be pressure rated as described in ASTM D 2740 with standard outside diameters compatible with PVC IPS solvent-weld fittings.

6. PVC cement should meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.

B. Ductile iron pipe and fittings.

1. Gasket fittings for iron pipe should be of materials and type compatible with the piping material being used.

C. Steel pipe and fittings.

1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or black in accordance with ASTM 53.

2. Threaded fittings for steel pipe should be Schedule 40 Malleable Iron.

D. Polyethylene pipe.

1. Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 kPa) in accordance with ASTM D 2239.

2. Low pressure polyethylene pipe for micro-irrigation systems shall conform with ASAE S-435.

3. Use fittings manufactured specifically for the type and dimensions of polyethylene pipe used.

E. Sprinklers, spray heads, and emitters.

1 Select units and nozzles in accordance with the size of the area and the type of plant material being irrigated. Sprinklers must fit the area they are intended to water without excessive overspray onto anything but the lot individual landscaped surface. Intentional direct spray onto walkways, buildings, roadways, and drives is prohibited. All sprinklers used with effluent water systems shall be designated for non-potable use by either label or by the industry standard color purple.

2 Use equipment that is protected from contamination and damage by use of seals, screens, and springs where site conditions present a potential for damage.

3 Support riser-mounted sprinklers to minimize movement of the riser resulting from the action of the sprinkler.

4 Swing joints, either flexible or rigid, shall be constructed to provide a leak-free connection between the sprinkler and lateral pipeline to allow movement in any direction and to prevent equipment damage.

5 Check valves shall be installed on any sprinkler where low point drainage occurs.

6 All tubing shall be installed under ground cover using staples at close enough intervals (24-36") to secure the tubing and prevent it from moving through the mulch bed.

F. Valves.

1. Valves must have a maximum working pressure rating equal to or greater than the maximum pressure of the system, but not less than 125 psi (861 kPa). This requirement may be waived for low mainline pressure systems [30 psi (207 kPa) or less]. All valves used with effluent water systems shall be designated for non-potable use by either label or by the industry standard color purple.

2. Only valves that are constructed of materials designed for use with the water and soil conditions of the installation shall be used. Valves that are constructed from materials that will not be deteriorated by chemicals injected into the system shall be used on all chemical injection systems.

G. Valve boxes.

1. Valve boxes are to be constructed to withstand traffic loads common to the area in which they are installed. They should be sized to allow manual operation of the enclosed valves without excavation.

2. Each valve box should be permanently labeled to identify its contents. All valve boxes used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.

H. Low voltage wiring.

1. All low voltage wire which is directly buried must be labeled for direct burial wire. Wire not labeled for direct burial must be installed in watertight conduits, and be UL listed TWN or THHN type wire as described in the NEC. All wire traveling under any hardscape or roadway must installed within a pipe and sleeve.

2. The size of the electrical control wire shall be in accordance with the valve manufacturer's specifications, based on the solenoid in-rush amperage and the circuit length, considering the number of solenoids operating, on the

circuit. Minimum of # 14 AWG single strand control wire shall be used on all systems, except single lot individual residential systems.

3. Connections are to be made using UL approved devices specifically designed for direct burial. All splices shall be enclosed within a valve box.

I. Irrigation controllers.

1. All irrigation controllers shall be UL listed, conform to the provisions of the National Electric Code (NEC), and be properly grounded in accordance with manufacturer's recommendations. Equip solid state controls with surge suppressors on the primary and secondary wiring, except single lot residential systems.

2. The controller housing or enclosure shall protect the controller from the hazards of the environment in which it is installed.

3. The rain switch shall be placed on a stationary structure minimum of 5-foot (1524 mm) clearance from other outdoor equipment, free and clear of any tree canopy or other overhead obstructions, and above the height of the sprinkler coverage. Soil moisture sensors and ET sensors shall be installed and monitored per manufacturer's guidelines per Florida Statutes, Section 373.62 requirements.

J. Pumps and wells.

1. Irrigation pump electrical control systems must conform to NEC and local building codes.

2. The pumping system shall be protected from the hazards of the environment in which it is installed.

3. Use electric motors with a nominal horsepower rating greater than the maximum horsepower requirement of the pump during normal operation. Motor shall have a service factor of at least 1.15.

4. Casings for drilled wells may be steel, reinforced plastic mortar, plastic, or fiberglass pipe. Only steel pipe casings shall be used in driven wells. Steel pipe must have a wall thickness equal to or greater than Schedule 40. See SCS code FL-642. Steel casings shall be equal to or exceed requirements of ASTM A 589.

K. Chemical injection equipment.

1. Chemical injection equipment must be constructed of materials capable of withstanding the potential corrosive effects of the chemicals being used. Equipment shall be used only for those chemicals for which it was intended as stated by the injection equipment manufacturer.

L. Filters and strainers.

1. Filtration equipment and strainers constructed of materials resistant to the potential corrosive and erosive effects of the water shall be used. They shall be sized to prevent the passage of foreign material that would obstruct the sprinkler/emitter outlets in accordance with the manufacturer's recommendations.

PART V: INSTALLATION

A. Pipe installation.

1. Pipe shall be installed at sufficient depth below ground to protect it from hazards such as vehicular traffic or routine occurrences which occur in the normal use and maintenance of a property. Depths of cover shall meet or exceed SCS Code 430-DD, Water Conveyance, as follows:

a. Vehicle traffic areas.

Pipe Size (inches)	Depth of Cover (inches)
½ – 2 ½	18 ~~– 24~~
3 - 5	24 ~~– 30~~
6 and larger	30 ~~– 36~~

b. All areas except vehicle traffic:

Pipe Size (inches)	Depth of Cover (inches)
½ – 1 ½	6
2 - 3	12
4 - 6	18
More than 6	24

2. Make all pipe joints and connections according to manufacturer's recommendations. Perform all solvent-weld connections in accordance with ASTM D 2855.

3. Minimum clearances shall be maintained between irrigation lines and other utilities. In no case shall one irrigation pipe rest upon another. Comingling or mixing of different types of pipe assemblies shall be prohibited.

4. Thrust blocks must be used on all gasketed PVC systems. They must be formed against a solid, hand-excavated trench wall undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the pipe and trench shall be filled to the height of the outside diameter of the pipe. Size thrust blocks in accordance with ASAE S-376.1.

5. The trench bottom must be uniform, free of debris, and of sufficient width to properly place pipe and support it over its entire length. Native excavated material may be used to backfill the pipe trench. However, the initial backfill material shall be free from rocks or stones larger than 1-inch in diameter. At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. Blocking or mounding shall not be used to bring the pipe to final grade.

6. Pipe sleeves must be used to protect pipes or wires installed under pavement or roadways. Use pipe sleeves two pipe sizes larger than the carrier pipe or twice the diameter of the wire bundle to be placed under the paving or roadway and extending a minimum of 3 feet beyond the paved area or as required by the Florida Department of Transportation (FDOT). Use sleeve pipe with wall thickness at least equal to the thickness of schedule 40 or PR 160 pipe, whichever is thicker. Proper backfill and compaction procedures should be followed.

B. Control valve installation.

1. Valve installation shall allow enough clearance for proper operation and maintenance. Where valves are installed underground, they shall be provided with a valve box with cover extending from grade to the body of the valve. The top of the valve body should have a minimum of 6 inches (152 mm) of cover in nontraffic and noncultivated areas and 18 inches (457 mm) of cover in traffic areas. The valve box shall be installed so as to minimize the effect of soil intrusion within the valve box with the use of filter fabric, pea gravel, or other acceptable material. If an automatic valve is installed under each sprinkler, then the valve box may be omitted.

2. Install valve boxes so that they do not rest on the pipe, the box cover does not conflict with the valve stem or interfere with valve operation, they are flush with the ground surface and do not present a tripping hazard or interfere with routine maintenance of the landscape.

3. Install quick coupling valves on swing joints or flexible pipe with the top of the valve at ground level.

4. Any above-ground manually-operated valves on nonpotable water systems will be adequately identified with distinctive purple colored paint. Do not provide hose connections on irrigation systems that utilize nonpotable water supplies.

C. Sprinkler installation.

1. On flat landscaped areas, install sprinklers plumb. In areas where they are installed on slopes, sprinklers may be tilted as required to prevent erosion.

2. Sprinklers should be adjusted to avoid unnecessary discharge on pavements and structures.

a. Adjust sprinklers so they do not water on roads.

b. Provide a minimum separation of 4 inches (102 mm) between sprinklers and pavement.

c. Provide a minimum separation of 12 inches (305 mm) between sprinklers and buildings and other vertical structures.

d. Polyethylene (PE) nipples shall not be used in maintenance equipment traffic areas or alongside roadways and driveways.

3. Piping must be thoroughly flushed before installation of sprinkler nozzles.

4. Surface mounted and pop-up heads shall be installed on swing joints or flexible pipe.

5. Above-ground (riser mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be effectively stabilized.

6. The pop-up height for sprays and rotator nozzles shall be adequate to prevent being obstructed by the turf grass blades: 6" height for St. Augustine, Zoysia and Bahia, 4" height for Bermuda, Centapede and Seashore Paspalum.

7. All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to PVC pipe to protect the emission devices from contamination from a PVC main or lateral break.

8 All microirrigation zones shall have adequate pressure regulation installed at the zone valve or at the point where the drip tubin is attached to the PVC to ensure that all emission devices meet the manufacturer's performance standards.

9. Each plant shall have a adequate number and size(gph) of microirrigation devices, properly placed to meet the plant water requirements for no rainfall.

10. All tubing shall be installed under ground cover using staples at close enough intervals (24-36") to secure the tubing and prevent it from moving through the mulch bed.

D. Pump installation.

1. Install pumps as per the manufacturer's recommendations. Set pumps plumb and secure to a firm concrete base. There should be no strain or distortion on the pipe and fittings. Pipe and fittings should be supported to avoid placing undue strain on the pump. Steel pipe should be used on pumps 5 horsepower (hp) or larger whenever practical.

2. Pumps must be installed in a manner to avoid loss of prime. Install suction line to prevent the accumulation of air pockets. All connections and reductions in suction pipe sizes should be designed to avoid causing air pockets and cavitation.

3. Pumps must be located to facilitate service and ease of removal. Appropriate fittings should be provided to allow the pump to readily be primed, serviced, and disconnected. Provide an enclosure of adequate size and strength, with proper ventilation, to protect the pump from the elements (except residential systems).

E. Low voltage wire installation.

1. Install low voltage wire (less than 98 volts) with a minimum depth of cover of 12 inches (305 mm) where not installed directly under the mainline.

2. Provide a sufficient length of wire at each connection to allow for thermal expansion/shrinkage.

3. As a minimum, provide a 12-inch (305 mm) diameter loop at all splices and connections.

4. Terminations at valves will have 24 inches (610 mm) minimum free wire.

5. Install all above-ground wire runs and wire entries into buildings in electrical conduit.

Exception: No conduit is required when wiring above ground manifolds from the valve to the ground immediately beneath it.

6. Provide common wires with a different color than the power wires (white shall be used for common wires).

7. Connections are to be made using UL approved devices specifically designed for direct burial.

8. All splices shall be enclosed within a valve box.

F. Hydraulic control tubing.

1. For hydraulic control systems, use a water supply that is filtered and free of deleterious materials, as defined by the hydraulic control system manufacturer. Install a backflow prevention device where the hydraulic control system is connected to potable water supplies.

2. Install tubing in trenches freely and spaced so that it will not rub against pipe, fittings, or other objects that could score the tubing, and with a minimum 12-inch (305 mm) diameter loop at all turns and connections. Provide a minimum depth of cover of 12 inches (305 mm).

3. Connect tubing with couplings and collars recommended by the tubing manufacturer. All splices shall be made in valve boxes. Prefill tubing with water, expelling entrapped air and testing for leaks prior to installation.

Install exposed tubing in a protective conduit manufactured from Schedule 40 UV protected PVC or electrical conduit.

PART VI: TESTING & INSPECTIONS

A. Purpose. All materials and installations covered by the Irrigation Code shall be inspected by the governing agency to verify compliance with the Irrigation Code.

B. Rough inspections. Rough inspections will be performed throughout the duration of the installation. These inspections will be made by the governing agency to ensure that the installation is in compliance with the design intent, specifications, and the Irrigation Codes. Inspections will be made on the following items at the discretion of the governing agency:

1. Sprinkler layout and spacing: This inspection will verify that the irrigation system design is accurately installed in the field. It will also provide for alteration or modification of the system to meet field conditions. To pass this inspection, sprinkler/emitter spacing should be within ± 5 percent of the design spacing.

2. Pipe installation depth: All pipes in the system shall be installed to depths as previously described in this code.

3. Test all mainlines upstream of the zone valves as follows:

a. Fill the completely installed pipeline slowly with water to expel air. Allow the pipe to sit full of water for 24 hours to dissolve remaining trapped air.

b. Using a metering pump, elevate the water pressure to the maximum static supply pressure expected and hold there for a period of 2 hours, solvent-weld pipe connections shall have no leakage.

c. For gasketed pipe main lines add water as needed to maintain the pressure. Record the amount of water added to the system over the 2-hour period.

d. Use the following formulas to determine the maximum allowable leakage limit of gasketed pipe.

DUCTILE IRON:

$$L = \frac{SDP}{133{,}200}$$

PVC, GASKETED JOINT:

$$L = \frac{NDP}{7,400}$$

Where:

L = allowable leakage (gph),

N = number of joints,

D = nominal diameter of pipe (inches),

P = average test pressure (psi), and

S = length of pipe (fi).

e. When testing a system which contains metal-seated valves, an additional leakage per closed valve of 0.078 gph/inch of nominal valve size is allowed.

C. Final inspection. When the work is complete the contractor shall request a final inspection.

1. Cross connection control and backflow prevention.

a. Public or domestic water systems: Check that an approved backflow prevention assembly is properly installed and functioning correctly. Review the location of the assembly to check that it is not creating a hazard to pedestrians or vehicular traffic.

b. Water systems other than public or domestic water systems: Check that the proper backflow prevention assemblies are provided.

c. All assemblies that can be, will be tested by a technician certified for back flow testing by a State recognized certifying board prior to being placed into service.

2. Sprinkler coverage testing.

a. All sprinklers must be adjusted to minimize overspray onto buildings and paved areas. Minor tolerances shall be made to allow for prevailing winds.

b. All sprinkler controls must be adjusted to minimize runoff of irrigated water. Water application rates shall not exceed the absorption rate of the soil.

c. All sprinklers must operate at their design radius of throw. Nozzle sizes and types called for in the system design must have been used. All nozzles within the same zone shall have matched precipitation rates unless otherwise directed in order to increase efficiency by adjusting the nozzle selection to match site conditions.

d. Spray patterns must overlap as designed (a.k.a. head to head coverage) or placed to achieve the highest possible distribution uniformity using the manufacturer's specifications.

e. Sprinklers must be connected, as designed, to the appropriate zone.

f. Sprinkler heads must operate within 20% of the optimum operating pressure but not more than the maximum nor less than the minimum guidelines as specified by the manufacturer. If the dynamic water pressure at the site's water source(s) is too low to achieve this pressure range at the sprinklers, a booster pump or alternate source shall be required. If the dynamic water pressure at the sites water source(s) is too high to achieve this pressure range at the sprinklers, a pressure regulating device shall be required at either the source, the zone valve, or the sprinklers, or any combination there of.

D. Site restoration.

1. All existing landscaping, pavement, and grade of areas affected by work must be restored to original condition or to the satisfaction of the governing authority.

Verify that the pipeline trenches have been properly compacted to the densities required by the plans and specifications

E. Record Drawings.

1. A record drawing shall be required of all irrigation systems installed on commercial and residential developments and shall contain the following information:

a. Location, type pressure and maximum flow available of all water sources.

Include limitations like days of week watering requirements.

b. Location type and size of all components including sprinklers, microirrigation, main and lateral piping, master valves, valves, moisture sensors, rain sensors, controllers, pump start relays, backflow devices, pumps, wells, etc.

c. The flow rate, application rate(inches per hour), and the operating pressure for the sprinklers and micro irrigation within each zone.

d. An irrigation schedule for each zone, for each season (monthly is preferred), indicating the frequency and duration each zone should operate to meet the plant water requirements without rainfall and stay within the hydraulic capacities of the sprinkler system installed.

e. The name, address, phone, email, professional license or certification number of the installation contractor.

f. Date of installation.

g. Irrigation system maintenance schedule that shall include, but is not limited to the following:

1. routine visual inspections (at least 4 per year),

2. adjustments to components to keep sprinklers straight,

at the right height,

3. aligned and unobstructed nozzles and screens cleaned,

4. filters cleaned and sensors monitored,

5. pressures and flows at the source and sprinklers are correct for original design.

F. Irrigation System Maintenance

a. Repairs to all irrigation components shall be done with originally installed components, equivalent components or those with greater efficiency.

b. The operation of the irrigation system outside of the normal watering window shall be allowed for evaluating, maintaining or repairing the system or its components.

G. Irrigation system management

a. The frequency (times per week/month) and duration (minutes/hours) of the operation of each zone shall be adjusted and operate in order to meet the water needs of the plants within each zone as a supplement to rainfall. Adjustments shall be made a minimum 4 times per year to match the seasonal changes of the plants and the operational restrictions.

b. It is recommended that the schedule be adjusted monthly or controllers be properly installed and programmed to automatically adjust to maximize water savings.

The modifications submitted included information prepared but not formally submitted by the following Water Management Districts:

Southwest Florida Water Management District
St. Johns River Water Management District
South Florida Water Management District
Northwest Florida Water Management District
Suwannee River Water Management District

Summary of Modification

Proposed modification to Chapter 6 Section 604.4 of the Florida Plumbing Code to adopt certain design criteria for in-ground irrigation systems reduced water consumption proposal mirrors 2015 International Green Construction Code related to irrigation.

Rationale

In accordance with Section 373.709 of *Florida Statutes*, Water Management Districts (WMDs) develop Regional Water Supply Plans (RWSPs) to assess projected water demands and to identify potential sources of water to meet those needs over a 20-year planning horizon. At the same time, protecting and maintaining the state's water-related natural resources is an important role of the WMDs. In many areas of the state, WMDs have documented unacceptable impacts on springs, wetlands, rivers, and lakes, as well as saltwater intrusion into drinking water wellfields. Population projections indicate increases in demands on water resources will occur within the planning horizon, and the proposed code modification will help address that increased demand. Water conservation by all water users will be essential in meeting future water needs.

Irrigation design criteria has been handled previously in an optional appendix to the plumbing code (Appendix F) and in land development codes by local governments, and as such Florida has a patchwork of inconsistent codes and expectations for irrigation design. The goal of this proposal is the expand the existing criteria in the plumbing code to include more design criteria that will allow for the more efficient use of water in residential landscapes.

Fiscal Impact Statement

Impact to local entity relative to enforcement code

This proposal increases allowable criteria for in-ground irrigation systems so additional inspection procedures will required. Inspectors will require some training to understand the criteria and how to inspect for them. Alternately the Commission could recommend third party certification of irrigations systems if a particular local government does not want to inspect irrigation systems.

Impact to building and property owners relative to cost of compliance with code

Installing irrigation systems to meet the criteria in this proposal may, particularly in jurisdictions that do not have any existing local code, cost more than typical systems without any design criteria. Adoption of

similar Florida Water Star criteria in Osceola county results in a cost increase of less than one percent of the cost of the homes in that area. In the Ocala area there has been close to a 40% increase in cost of the irrigation system from $1,178 to $1891 (includes labor). This small investment would provide homeowners, water supply utilities, commercial and industrial facilities a significant long-term financial benefit. On average, homeowners can expect to save approximately 20 - 30% on irrigation water use (assuming the irrigation timer is set not to exceed irrigation restrictions). This results in savings on their water, and sewer bills. Water supply utilities can expect to reduce operational expenses by reducing water pumping and treatment costs as well as by deferring the need to develop costly alternative water supply projects.

Impact to industry relative to the cost of compliance with code

In recent years, the Construction Industry Licensing Board has developed a new specialty license for the installation, repair, maintenance, and design of irrigation systems. The scope of work permitted to be performed by a certified irrigation specialty contractor can be found in Rule 61G4-15.035, Florida Administrative Code. The Florida Irrigation Society and the Florida Water Star AP program both offer training that will easily prepare the industry to design and install irrigation systems that meet the criteria. There will be an impact to some builders as irrigation installers in jurisdictions that do not have local government codes may charge up to 40% more for a system that meets the code. In areas where an existing local government land development code with similar irrigation requirements exists, there should be no discernable cost increase.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Issues with water demand nearing sustainable levels of groundwater supplies has been well documented in many areas of the state, including the Central Florida Water Initiative (CFWI). The proposed code modifications benefit the welfare of the general public by promoting water efficiency measures that will help meet public supply water demands into the future. These efforts help protect and sustain Florida's water resources for future generations. No adverse health or safety issues have been identified.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed code modifications involve equivalent but more efficient irrigation systems standards for functionality and dependability. A system designed to meet these design criteria allows for an application rate that will result in shorter run times and thus less water being used overall. The modifications were guided by the 2015 International Green Construction Code and the with ASABE/ICC-802 Landscape Irrigation Sprinkler and Emitter Standard.

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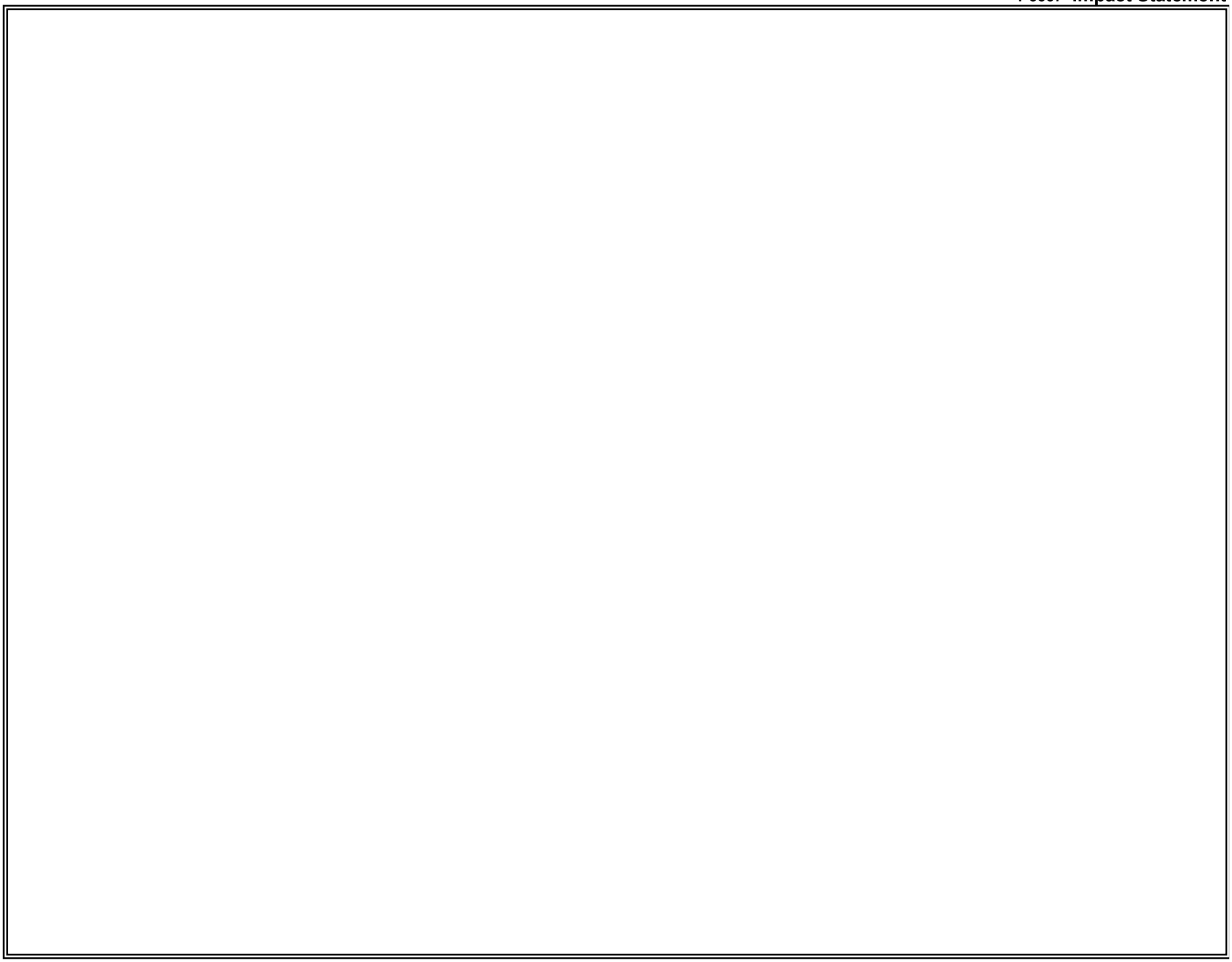
Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

All products referenced in the proposal are the same as those currently used in irrigation installations. More careful attention to how and where materials are installed will be the focus of the proposal.

Does not degrade the effectiveness of the code

Proposed code is consistent with the International Green Construction Code, and does not contradict other chapters/sections.



University of Florida Water Use Study

The low end of the range was the savings documented in the referenced Haley and Dukes paper (the SJRWMD study we did in the central ridge in neighborhoods). The other end of the range is 100% savings due to no irrigation after establishment for shrubs based on the other studies cited. Savings are per 1000 sq ft. The baseline we are using is based on the SJRWMD study. Based on what I'm hearing for central FL it is representative of new development. Anecdotally it's representative of new development in other areas of the state.

From:	Residential Irrigation Water Use in Central Florida	Percent High Vol.	Irrigation (mm/month)	Irrigation inches/ month	inches/ year
T1	Control	100%	149	5.9	70.4
T2	Clock adjst.	100%	105	4.1	49.6
T3	Clock adjst. And less turf	38%	74	2.9	35.0

T3 - T2 =	14.65	Inches/year

62% high irrigation reduction =	14.65	less irrigation needed
A 1% turf reduction = 14.65/62 =	0.24	inches

The Haley/Dukes study considered a reduction of "turf" from 75% to 40%. HOWEVER, the 75% turf scenario was still 100% high volume (all sprays and rotors). This code (modeled after FWS) would go from 100% high volume irrigation to 60%. A reduction of high volume irrigation by 40%.

FWS goes from 100% high volume irrigation to 60%		
High volume to micro % change =	40	%
Gain from reducing High irrig from 100 to 60%	9.45	inches

mm	inches
1	0.03937

ft2		
10,000	Quarter-acre Lot-ish	10,890 is a quarter acre
4,000	Home	
6,000	Landscapable area	

9.45	inches =	0.79	feet
6,000	square feet =	4,724	ft3
4,724	cubic feet =	35,339	gals/year

https://edis.ifas.ufl.edu/ae515
https://edis.ifas.ufl.edu/ae482
http://edis.ifas.ufl.edu/ae220

FFL Activity	Water Savings (gal/1,000 sq ft/yr)	Approximate cost ($)	Documentation
Convert turfgrass area to landscaped bed with micro irrigation	15,569–31,767	$ 750	*Rationale:* Trenholm et al. (2002) recommends that ornamental plants be irrigated only as needed once established. This recommendation is based on studies of ornamentals grown in Florida (Scheiber et al. 2008; Wiese et al. 2009). Alternatively, Haley and Dukes (2007) reported that mixed turf and ornamental landscapes that used micro irrigation in landscaped beds irrigated 74 mm/month over the entire landscape, which is equal to 55 mm/month (16,198 gal/1,000 sq ft/yr) for the ornamentals, as compared to 105 mm/month for irrigation with sprinklers only. *Calculation:* (31,767−16,198) = 15,569

Baseline case: A homeowner irrigates their turfgrass according to UF/IFAS recommendations (Table 5 in Dukes and Haman 2002) twice per week with 100% evapotranspiration (ET) replacement and an irrigation rate of 1.0 in/hr. Annual baseline irrigation is 31,787 gal/1,000 sq ft of turfgrass.

Typical Emitter Efficiency	
Rotors	70-75%
Spray	60-65%
Micro	90%

Our proposal is to use micro on 40% of the landscape, which is a 40% reduction from high to low irrigation.

Average landscaped area = 6,000ft2	2,400	sqr feet of micro
Using 15,569 gals saved per 1,000ft2	37,366	gals per year
(see email below)	102.37	gals saved per day

Most BMPs listed below increase the application efficiency of a system. The intended delivery amount in inches is delivered with less waste.
For example a poorly designed system may need to emit 2.75 inches in order for 1.0 inches to be delivered to all areas of the landscape.
Conversely, a well-designed system may need to emit 1.2 inches in order for 1.0 inche to be delivered to all areas of the landscape.

1. Irrigation systems shall not direct water onto buildings, paved surfaces, or adjoining lots
2. Turfgrass and beds shall be on separate irrigation zones
3. Only micro-irrigation shall be used in landscape beds
4. Micro-irrigation shall be equipped with pressure regulators
5. High-volume sprinkler irrigated zones cannot exceed 60% of the landscaped area
6. High-volume sprinklers are prohibited on landscape areas that are less than 4 feet in any dimension.
7. All nozzles that are on the same zone shall have matched precipitation rates.
8. Sprinkles shall have head to head coverage.
9. Automatic shut off device shall be installed as required by FL statute

144,000 cubic inches in 1,000ft2
1 cubic inch = 0.004329 gallons
623 gals/1000ft2/inch applied

Dukes' baseline case
51 inches/year
51 x 623 = 31,792.18 gals

623 gals needed to apply 1 inch at 100%

7.48 g/ft cube

NOTES

The low end of the range was the savings we documented in he referenced Haley and Dukes paper (the SJRWMD study we did in the central ridge in neighborhoods). The other end of the range is 100% savings due to no irrigation after establishment for shrubs based on the other studies cited. Savings are per 1000 sq ft. The baseline we are using is based on the SJRWMD study. Based on what I'm hearing for central FL it is representative of new development. Anecdotally its representative of new development in other areas of the state.

623 373.8
249.2
1038
622.8

0.60019268

Document also available in EDIS at https://edis.ifas.ufl.edu/ae515

Date Submitted	12/30/2015	**Section**	12345678	**Proponent**	Harris Cheryl
Chapter	3206	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Eliminates Section 318 and Appendix F

Summary of Modification

Eliminate Appendix F and place in base Code As Chapter 14

Rationale

Except for an optional Appendix F there is no state-wide Irrigation System Code that is to be followed by irrigation contractors and designers. Water conservation and nutritional runoff issues are highly important to the State of Florida and should be addressed in the base Code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

For jurisdictions that adopted Appendix F there is little impact. For others trying to adopt new ordinances, the code will be beneficial to their efforts. For those without ordinances they will have to add permitting and inspection processes. Permit costs should offset the cost of inspections.

Impact to building and property owners relative to cost of compliance with code

Having a code will assist owners in understanding what is needed to properly install a water efficient system and reduce nutrient runoff. The additions may increase the costs to a building/property owner but be offset by lower costs of water usage, landscaping materials replacement, repairs.

Impact to industry relative to the cost of compliance with code

Incorporating Appendix F into the base code will not negatively impact industry in the cost to comply.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Addresses water conservation and nutrient runoff for the welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Code is improved by changing irrigation methods/systems of construction from optional standards to base code standards that incorporates industry best practices and some of the new ASABE/ICC-802-Landscape and Irrigation Sprinkler and Emmiter Standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Industry standards were used and do not discriminate or require any proprietary materials, products, methods or systems of construction.

Does not degrade the effectiveness of the code

Changing an optional Appendix to the base code improves the effectiveness of setting statewide standards for irrigation systems that will conserve water and decrease nutrient runoff.

Is the proposed code modification part of a prior code version? No

Change Numbering of Chapter 14, Referenced Standards to Chapter 15, Referenced Standards and insert the following proposed Chapter 14, Turf and Landscape Irrigation Systems and eliminate Appendix F

CHAPTER 14, TURF ANDLANDSCAPE IRRIGATION SYSTEMS

Section 1401 GENERAL

1401.1 Description.

1401.1.1 Purpose. To establish uniform minimum standards and requirements for the design and installation of safe, cost effective, reliable irrigation systems for turf and landscape areas which promote the efficient use and protection of water and other natural resources.

1401.1.2 Definition. Turf and landscape irrigation systems apply water by means of permanent above-ground or subsurface sprinkler or microsprinkler equipment under pressure.

1401.1.3 Scope. These construction codes shall apply to all irrigation systems used on residential and commercial landscape areas. They address the design requirements, water quality, materials, installation, inspection, and testing for such systems. These construction codes do not apply to irrigation systems for golf courses, nurseries, greenhouses, or agricultural production systems.

1401.1.4 Application. All new irrigation systems and any new work to existing irrigation systems shall conform to the requirements of this code.

1401.1.5 Application to existing irrigation installations. Nothing contained in this code shall be deemed to require any irrigation system or part thereof, which existed prior to the establishment of this code, to be changed altered or modified to meet the standards of this code.

1401.2 Permits.

1401.2.1 Permits required. It shall be unlawful to construct, enlarge, alter, modify, repair, or move any irrigation system or part thereof, or to install or alter any equipment for which provision is made or the installation of which is regulated by this code without first having filed application and obtained a permit therefore from the building official. A permit shall be deemed issued when signed by the building official and impressed with the seal of the governmental agency issuing said permit.

Exceptions. All work where exempt from permit shall still be required to comply with the code. No permit shall be required for general maintenance or repairs which do not change the structure or alter the system and the value of which does not exceed $600.00 in labor and material based on invoice value.

1401.3 Preconstruction submittals.

1401.3.1 Plans or drawings.

1401.3.1.1 Single-family residence. Provide design drawings or shop drawings, where required, for the installation prior to start of construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, and include all improvements. Drawings can be prepared by a properly licensed qualified contractor.

1401.3.1.2 Commercial, industrial, municipal and multiple-family. Provide professionally designed drawings prior to start of construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, including all improvements, and shall include but not be limited to: date, scale, revisions, legend, specifications which list all aspects of equipment and assembly there of, water source, water meter and/or point of connection, backflow prevention devices, pump station size, pump station location, design operating pressure and flow rate per zone, precipitation rate per zone, locations of pipe, controllers, valves, sprinklers, sleeves, gate valves, etc. The plans and specifications shall be prepared in accordance with Section 106 of the *Florida Building Code, Building*.

1401.4 Definitions.

ABS Pipe. Acrylonitrile-butadiene-styrene black, semi-rigid, plastic pipe extruded to IPS. ABS pipe is in limited use in present day irrigation systems. Solvent weld fittings are used with this pipe (see ASTM D 1788).

Air Release Valve. A valve which will automatically release to the atmosphere accumulated small pockets of air from a pressurized pipeline. A small orifice is used to release air at low flow rates. Air release valves are normally required at all summits of mainline and submain pipelines in an irrigation system.

Anti-Siphon Device. A safety device used to prevent back-flow of irrigation water to the water source by back-siphonage.

Application Rate. The average rate at which water is applied by an irrigation system, sometimes also called precipitation rate. Units are typically inches/hr or mm/hr.

Application uniformity. Irrigation application uniformity (also known as distribution uniformity) describes how evenly water is distributed within an irrigation zone.

Arc. The angle of coverage of a sprinkler in degrees from one side of throw to the other. A 90-degree arc would be a quarter-circle sprinkler.

Atmospheric Vacuum Breaker. An anti-siphon device which uses a floating seat to direct water flow. Water draining back from irrigation lines is directed to the atmosphere to protect the potable water supply.

Automatic Control Valve. A valve in a sprinkler system which is activated by an automatic controller by way of hydraulic or electrical control lines and controls a single device or multiple devices.

Automatic System. An irrigation system which operates following a preset program entered into an automatic controller.

Backflow Prevention Device. An approved safety device used to prevent pollution or contamination of the irrigation water supply due to backflow from the irrigation system.

Belled (Pipe). Pipe which is enlarged at one end so that the spigot end of another length of pipe can be inserted into it during the assembly of a pipeline.

Block (of sprinklers). A group of sprinklers controlled by one valve. Also called zones or subunits.

Block System. An irrigation system in which several groups of sprinklers are controlled by one valve for each group.

Bubbler Irrigation. The application of water to the soil surface or a container as a small stream or fountain. Bubbler emitter discharge rates are greater than the 0.5 to 2 gph characteristic of drip emitters, but generally less than 60 gph.

Check Valve. A valve which permits water to flow in one direction only.

Chemical Water Treatment. The addition of chemicals to water to make it acceptable for use in irrigation systems

Chemigation. The application of water soluble chemicals by mixing or injecting with the water applied through an irrigation system.

Contractor. Any person who engages in the fabrication and installation of any type of irrigation system on a contractual basis in accordance with all stipulations receiving his compensation.

Control Lines. Hydraulic or electrical lines which carry signals (to open and close the valves) from the controller to the automatic valves.

Controller. The timing mechanism and its mounting box. The controller signals the automatic valves to open and close on a pre-set program or based on sensor readings.

Coverage. Refers to the way water is applied to an area.

Cycle. Refers to one complete run of a controller through all programmed controller stations.

Demand (or irrigation demand). Refers to the irrigation requirements of the irrigated area. Demand primarily depends on the type of crop, stage of growth, and climatic factors.

Design Area. The specific land area to which water is to be applied by an irrigation system.

Design Emission Uniformity. An estimate of the uniformity of water application with an irrigation system.

Design Pressure. The pressure at which the irrigation system or certain components are designed to operate. The irrigation system design pressure is that measured at the pump discharge or entrance to the system if there is no pump, and a zone design pressure is the average operating pressure of all emitters within that zone.

Direct Burial Wire. Plastic-coated single-strand copper wire for use as control line for electric valves.

Discharge Rate. The instantaneous flow rate of an individual sprinkler, emitter, or other water emitting device, or a unit length of line-source micro irrigation tubing. Also, the flow rate from a pumping system.

Double Check Valve. An approved assembly of two single, independently-acting check valves with test ports to permit independent testing of each check valve.

Drain Valve. A valve used to drain water from a line. The valve may be manually or automatically operated.

Drip Irrigation. The precise low-rate application of water to or beneath the soil surface near or directly into the plant root zone. Applications normally occur as small streams, discrete or continuous drops, in the range of 0.5 to 2.0 gph.

Effluent water. Also referred to as reclaimed or gray water is wastewater which has been treated per Florida Statute, §403.086 and is suitable for use as a water supply for irrigation systems.

Emitters. Devices which are used to control the discharge of irrigation water from lateral pipes. This term is primarily used to refer to the low flow rate devices used in micro irrigation systems.

Fertigation. The application of soluble fertilizers with the water applied through an irrigation system.

Filtration System. The assembly of physical components used to remove suspended solids from irrigation water. These include both pressure and gravity type devices, such as settling basins, screens, media filters, and centrifugal force units (vortex sand separators).

Flexible Swing Joint. A flexible connection between the lateral pipe and the sprinkler which allows the sprinkler to move when force is applied to it.

Flow Meters. Devices used to measure the volume of flow of water (typically in gallons), or flow rates (typically in gpm), and to provide data on system usage.

Gauge (Wire). Standard specification for wire size. The larger the gauge number, the smaller the wire diameter.

Head. A sprinkler head. Sometimes used interchangeably with and in conjunction with "Sprinkler."

Infiltration Rate. The rate of water flow across the surface of the soil and into the soil profile. Units are usually inches/hr.

Irrigation. Application of water by artificial means, that is, means other than natural precipitation. Irrigation is practiced to supply crop water requirements, leach salts, apply chemicals, and for environmental control including crop cooling and freeze protection.

Irrigation Water Requirement or Irrigation Requirement. The quantity of water that is required for crop production, exclusive of effective rainfall.

Landscape. Refers to any and all areas which are ornamentally planted, including but not limited to turf, ground covers, flowers, shrubs, trees, and similar plant materials as opposed to agricultural crops grown and harvested for monetary return.

Lateral. The water delivery pipeline that supplies water to the emitters or sprinklers from a manifold or header pipeline downstream of the control valve.

Line-Source Emitters. Lateral pipelines which are porous or contain closely-spaced perforations so that water is discharged as a continuous band or in overlapping patterns rather than discrete widely-spaced points along the pipeline length.

Looped System. A piping system which allows more than one path for water to flow from the supply to the emitters or sprinklers.

Low Volume Sprinklers. Sprinkler heads that emit less than .5 gallons per minute.

Mainline. A pipeline which carries water from the control station to submains or to manifolds or header pipelines of the water distribution system.

Manifold. The water delivery pipeline that conveys water from the main or submain pipelines to the laterals. Also sometimes called a header pipeline.

Manual System. A system in which control valves are manually operated rather than operated by automatic controls.

Matched Precipitation. An equal distribution of water over a given area or zone.

Meter Box. A concrete or plastic box buried flush to grade which houses flow (water) meters or other components.

Microirrigation. The frequent application of small quantities of water directly on or below the soil surface, usually as discrete drops, tiny streams, or miniature sprays through emitters placed along the water delivery pipes (laterals). Microirrigation encompasses a number of methods or concepts, including drip, subsurface, bubbler, and spray irrigation. Previously known as trickle irrigation.

Overlap. The amount one sprinkler pattern overlaps another one when installed in a pattern. Expressed as a percentage of the diameter of coverage.

PE Pipe. Flexible polyethylene pipe for use in irrigation systems, normally manufactured with carbon black for resistance to degradation by ultraviolet radiation.

Potable Water. Water which is suitable in quality for human consumption and meets the requirements of the Health Authority having jurisdiction.

Pressure Relief Valve. A valve which will open and discharge to atmosphere when the pressure in a pipeline or pressure vessel exceeds a pre-set point to relieve the high-pressure condition.

Pressure Vacuum Breaker. A backflow prevention device which includes a spring-loaded check valve and a spring-loaded vacuum breaker to prevent the backflow of irrigation system water to the water source.

Pumping Station. The pump or pumps that provide water to an irrigation system, together with all of the necessary accessories such as bases or foundations, sumps, screens, valves, motor controls, safety devices, shelters and fences.

PVC Pipe. Polyvinyl chloride plastic pipe made in standard thermoplastic pipe dimension ratios and pressure rated for water. Manufactured in accordance with AWWA C-900 or ASTM D-2241.

Rain Shut off Device. A calibrated device that is designed to detect rainfall and override the irrigation cycle of the sprinkler system when a predetermined amount of rain fall has occurred.

Riser. A threaded pipe to which sprinklers or other emitters are attached for above-ground placement.

Sleeve. A pipe used to enclose other pipes, wire, or tubing; usually under pavement, sidewalks, or planters.

Spacing. The distance between sprinklers or other emitters.

Spray Irrigation. The micro irrigation application of water to the soil or plant surface by low flow rate sprays or mists.

Sprinkler. The sprinkler head. Sometimes called “Head.”

Supply (Water Source). The origin of the water used in the irrigation system.

Swing Joint. A ridged connection between the lateral pipe and the sprinkler, utilizing multiple ells and nipples, which allows the sprinkler to move when force is applied to it.

Tubing. Generally used to refer to flexible plastic hydraulic control lines which are usually constructed of PE or PVC.

Section 1402 DESIGN CRITERIA

1402.1 Design defined. Within the scope of this code, irrigation system design is defined as the science and art of properly selecting and applying all components within the system. The irrigation system shall be designed and installed to achieve the highest possible efficiency by providing operating pressures, sprinkler placement and nozzle selection that are within the manufacture's recommendations, and maintained to keep the system at or within those ranges.

1402.2 Water supply.

1402.2.1 The water source shall be adequate from the stand-point of volume, flow rate, pressure, and quality to meet the irrigation requirements of the area to be irrigated, as well as other demands, if any, both at the time the system is designed and for the expected life of the system. The irrigation system shall use the lowest quality water source available on site.

1402.2.2 If the water source is effluent, it shall meet the advanced waste treatment standard as set forth in Florida Statute §403.086(4) as well as any other standard as set forth by the controlling governmental agency.

1402.3 Application uniformity.

1402.3.1 Sprinkler irrigation systems should be designed with the appropriate uniformity for the type of plants being grown and the type of soil found in that area. The general watering of different types of plants as one group without regard to their individual water requirements is to be avoided.

1402.3.2 Use sprinkler head spacing, type and nozzle selection to achieve the highest application uniformity.

1402.3.3 Use application rates which avoid runoff and permit uniform water infiltration into the soil. Land slope, soil hydraulic properties, vegetative ground cover, and prevailing winds and sun exposure will be considered when application rates are specified. Different types of sprinklers with different application rates, i.e., spray heads vs. rotor heads, bubbler heads vs rotor heads, shall not be combined on the same zone or circuit.

1402.4 System zoning. The irrigation system should be divided into zones based on consideration of the following hydrozoning practices.

1402.4.1 Available flow rate.

1402.4.2 Cultural use of the area.

1402.4.3 Type of vegetation irrigated, i.e., turf, shrubs, native plants, etc.

1402.4.4 Type of sprinkler, i.e., sprinklers with matching precipitation rates.

1402.4.5 Soil characteristics and slope.

1401.4.6 Sun exposure.

1402.5 Sprinkler/emitter spacing and selection.

1402.5.1 Sprinkler/Emitter spacing will be determined considering the irrigation requirements, hydraulic characteristics of the soil and device, and water quality with its effect on plant growth, sidewalks, buildings, and public access areas.

1402.5.2 All pop-up spray head bodies in turf areas shall be no less than 6" in height for St. Augustine, Zoysia and Bahia and no less than 4" in height for Bermuda, Centapede and Seashore Paspalum.

1402.5.3 Sprinklers should be located in all corners and on the perimeter of each irrigated zone area for a matched precipitation rate objective.

1402.5.4 Single row head spacing should only occur when an additional row will cause saturated soils at the toe of a slope or other inefficiencies.

1402.5.5 All heads shall not exceed 50% of manufacturer's specified diameters of coverage.

1402.5.6 Water conservation will be emphasized by minimizing irrigation of non-vegetated areas.

1402.5.7 Microirrigation systems should be designed using the Emission Uniformity concept. Space microirrigation emitters to wet 100 percent of the root zone in turf areas and 50 percent of the root zone for shrubs and trees. Microirrigation or low volume heads shall be required in all areas less then 4 feet in either direction.

1402.5.8 Microirrigation or low volume heads shall be required in all areas less than 4 feet in either direction.

1402.5.9 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to PVC pipe to protect the emission devices from contamination from a PD main or lateral break.

1402.5.10 Each plant shall have an adequate number and size (gph) of microirrigation devices, properly placed, to meet the plant water requirements for no rainfall.

1402.6 Pipelines. Pipelines will be sized to limit pressure variations so that the working pressure at all points in the irrigation system will be in the range required for uniform water application. Velocities will be kept to 5 feet (1524 mm) per second.

1402.7 Wells.

1402.7.1 Well diameters and depths are to be sized to correspond to the irrigation system demand. Refer to SCS Code FL-642 and local water management district regulations.

1402.7.2 Well location and depth shall be in compliance with applicable state, water management district and local codes.

1402.8 Pumps.

1402.8.1 Pump and motor combinations shall be capable of satisfying the total system demand without invading the service factor of the motor except during start-up and between zones.

1402.8.2 Pumps shall be positioned with respect to the water surface in order to ensure that the net positive suction head required (NPSHr) for proper pump operation is achieved.

1402.8.3 The pumping system shall be protected against the effects of the interruption of water flow.

1402.9 Control valves.

1402.9.1 Control valve size shall be based on the flow rate through the valve. Friction loss through the valve, an approved air gap separation, or a reduced pressure should not exceed 10 percent of the static mainline head.

1402.9.2 Control systems using hydraulic communication between controller and valve(s) shall comply with the manufacturer's recommendations for maximum distance between controller and valve, both horizontally and vertically (elevation change).

1402.9.3 The size of the electrical control wire shall be in accordance with the valve manufacturer's specifications; based on the solenoid in-rush amperage and the circuit length, considering the number of solenoids operating on the circuit. Minimum of # 14 AWG single strand control wire shall be used on all systems, except individual, single lot residential systems.

1402.9.4 Locate manually operated control valves so that they can be operated without wetting the operator..

1402.9.5 Locate inground valves away from large tree and palm root zones.

1402.9.6 A manual shut off valve shall be required to be installed close to the point of connection but downstream from any backflow device to minimize water loss when the system is shut off for repairs or emergencies.

1402.9.7 An automatic shut-off valve (normally closed) is required on all systems with a constantly pressurized mainline to confine the water loss from minoe main line leaks, weeping valves, or stuck on valves to just the time the system is operating automatically.

1402.10 Automatic irrigation controller. Automatic irrigation controllers must be UL approved and have an adequate number of stations and power output per station to accommodate the irrigation system design. The controller shall be capable of incorporating a rain shut off device to override the irrigation cycle when adequate rainfall has occurred, as required by Florida Statutes, Section 373.62.

1402.11 Chemical injection.

1402.11.1 Chemical injection systems for the injection of fertilizer, pesticides, rust inhibitors, or any other injected substance will be located and sized according to the manufacturers' recommendations.

1402.11.2 Injection systems will be located downstream of the applicable backflow prevention devices as required by Florida Statutes, Section 487.021 and 487.055; the Environmental Protection Agency (EPA); Pesticide Regulation Notice 87-1; or other applicable codes.

1402.11.3 If an irrigation water supply is also used for human consumption, an air gap separation or an approved reduced pressure principal backflow prevention device is required.

1402.12 Backflow prevention methods. Provide backflow prevention assemblies at all cross connections with all water supplies in accordance with county, municipal or other applicable codes to determine acceptable backflow

prevention assembly types and installation procedures for a given application. In the event of conflicting regulation provide the assembly type which gives the highest degree of protection.

1402.12.1 Irrigation systems into which chemicals are injected shall conform to Florida state law (Florida Statutes 487.021 and 487.055) and Environmental Protection Agency Pesticide Regulation Notice 87-1, which requires backflow prevention regulations to be printed on the chemical label.

1402.12.2 For municipal water supplies, chemical injection equipment must be separated from the water supply by an approved air gap separation or a reduced pressure principle assembly that is approved by the Foundation for CCC and the Hydraulic Research Institute. The equipment must also comply with ASSE 1013 to protect the water supply from back-siphonage and back-pressure.

1402.12.3 For other water supplies, Florida State law, EPA regulations, or other applicable local codes must be followed. In the absence of legal guidelines at least a PVB should be used.

Section 1403 REFERENCED STANDARDS

1403.1 American Society of Agricultural Engineers (ASAE) Standards:

ASAE S330.1: Procedure for sprinkler distribution testing for research purposes.

ASAE S376.1: Design, installation, and performance of underground thermoplastic irrigation pipelines.

ASAE S397.1: Electrical service and equipment for irrigation.

ASAE S435: Drip/Trickle Polyethylene Pipe used for irrigation laterals.

ASAE S398.1: Procedure for sprinkler testing and performance reporting.

ASAE S339: Uniform classification for water hardness.

ASAE S394: Specifications for irrigation hose and couplings used with self-propelled, hose-drag agricultural irrigation system.

ASAE EP400.1: Designing and constructing irrigation wells.

ASAE EP405: Design, installation, and performance of trickle irrigation systems.

ASAE EP409: Safety devices for applying liquid chemicals through irrigation systems.

1403.2 ASTM International Standards:

ASTM D 2241: Poly (Vinyl Chloride) (PVC) Plastic pipe (SDR-PR).

ASTM D 2239: Specification for polyethylene (PE) plastic pipe (SDR-PR).

ASTM D 2466: Specification for socket-type poly (vinyl chloride) (PVC) and chlorinated poly (vinyl chloride) (CPVC) plastic pipe fittings, Schedule 40.

ASTM D 2855: Standard recommended practice for making solvent cemented joints with polyvinyl chloride pipe and fittings.

ASTM D 3139: Specification for joints for plastic pressure pipes using flexible elastomeric seals.

ASTM F 477: Specification for elastomeric seals (gaskets for joining plastic pipe).

1403.3 American Water Works Association (AWWA) standards:

AWWA C-900: PVC pipe standards and specifications

1403.4 American Society of Sanitary Engineers (ASSE) Standards:

ASSE 1001: Pipe applied atmospheric type vacuum breakers.

ASSE 1013: Reduced pressure principle backflow preventers.

ASSE 1015: Double check valve type back pressure backflow preventers.

ASSE 1020: Vacuum breakers, anti-siphon, pressure type.

ASSE 1024: Dual check valve type backflow preventers.

1403.5 Hydraulic Institute Standards, 14th Edition

1403.6 Standards and Specifications For Turf and Landscape Irrigation Systems Florida Irrigation Society (FIS) Standards

1403.7 Soil Conservation Service (SCS) Field Office Technical Guide, Section IV-A — Cropland Codes:

SCS Code 430-DD: Irrigation water conveyance, underground, plastic pipeline.

SCS Code 430-EE: Irrigation water conveyance. Low pressure, underground, plastic pipeline.

SCS Code 430-FF: Irrigation water conveyance, steel pipeline.

SOS Code 441-1: Irrigation system, trickle.

SCS Code 442: Irrigation system sprinkler.

SCS Code 449: Irrigation water management.

SCS Code 533: Pumping plant for water control.

SCS Code 642: Well.

Section 1404 MATERIALS

1404.1 PVC pipe and fittings.

1404.1.1. PVC pipe should comply with one of the following standards ASTM D 1785, ASTM D 2241, AWWA C-900, or AWWA C-905. SDR-PR pipe shall have a minimum wall thickness as required by SDR-26. All pipe used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.

1404.1.2 All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 as set forth in ASTM D 2466.

1404.1.3. Threaded PVC pipe firings shall meet the requirements of Schedule 40 as set forth in ASTM D 2464.

1404.1.4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 477.

1404.1.5. PVC flexible pipe should be pressure rated as described in ASTM D 2740 with standard outside diameters compatible with PVC IPS solvent-weld fittings.

1404.1.6. PVC cement should meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.

1404.2 **Ductile iron pipe and fittings.**

1404.2.1 Gasket fittings for iron pipe should be of materials and type compatible with the piping material being used.

1404.3. Steel pipe and fittings.

1404.3.1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or black in accordance with ASTM 53.

1404.3.2 Threaded fittings for steel pipe should be Schedule 40 Malleable Iron.

1404.4 Polyethylene pipe.

1404.4.1 Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 kPa) in accordance with ASTM D 2239.

1404.4.2 Low pressure polyethylene pipe for micro-irrigation systems shall conform with ASAE S-435.

1404.4.3 Use fittings manufactured specifically for the type and dimensions of polyethylene pipe used.

1404.5 Sprinklers, spray heads, and emitters.

1404.5.1 Select units and nozzles in accordance with the size of the area and the type of plant material being irrigated. Sprinklers must fit the area they are intended to water without excessive overspray onto anything but the lot individual landscaped surface. Intentional direct spray onto walkways, buildings, roadways, and drives is prohibited. All sprinklers used with effluent water systems shall be designated for non-potable use by either label or by the industry standard color purple.

1404.5.2 Use equipment that is protected from contamination and damage by use of seals, screens, and springs where site conditions present a potential for damage.

1404.5.3 Support riser-mounted sprinklers to minimize movement of the riser resulting from the action of the sprinkler.

1404.5.4 Swing joints, either flexible or rigid, shall be constructed to provide a leak-free connection between the sprinkler and lateral pipeline to allow movement in any direction and to prevent equipment damage.

1404.5.5 Check valves shall be installed on any sprinkler where low point drainage occurs.

1404.5.6 The pop-up height for sprays and rotator nozzles shall be adequate to prevent being obstructed by the turf grass blades. 6" height for St. Augustine, Zoysia and Bahia, 4" height for Bermuda, Centapede and Seashore Paspalum.

1404.5.7 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to PVC pipe to protect the emission devices from contamination from a PVC main or lateral break.

1404.5.8 All microirrigation zones shall have adequate pressure regulation installed at the zone valve or at the point where the drip tubin is attached to the PVC to ensure that all emission devices meet the manufacturer's performance standards.

1404.5.9 Each plant shall have a adequate number and size(gph) of microirrigation devices, properly placed to meet the plant water requirements for no rainfall.

1404.5.10 All tubing shall be installed under ground cover using staples at close enough intervals (24-36") to secure the tubing and prevent it from moving through the mulch bed.

1404.6 Valves.

1404.6.1 Valves must have a maximum working pressure rating equal to or greater than the maximum pressure of the system, but not less than 125 psi (861 kPa). This requirement may be waived for low mainline pressure systems [30 psi (207 kPa) or less]. All valves used with effluent water systems shall be designated for non-potable use by either label or by the industry standard color purple.

1404.6.2 Only valves that are constructed of materials designed for use with the water and soil conditions of the installation shall be used. Valves that are constructed from materials that will not be deteriorated by chemicals injected into the system shall be used on all chemical injection systems.

1404.7 Valve boxes.

1404.7.1 Valve boxes are to be constructed to withstand traffic loads common to the area in which they are installed. They should be sized to allow manual operation of the enclosed valves without excavation.

1404.7.2. Each valve box should be permanently labeled to identify its contents. All valve boxes used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.

1404.8 Low voltage wiring.

1404.8.1 All low voltage wire which is directly buried must be labeled for direct burial wire. Wire not labeled for direct burial must be installed in watertight conduits, and be UL listed TWN or THHN type wire as described in the NEC. All wire traveling under any hardscape or roadway must installed within a pipe and sleeve.

1404.8.2 The size of the electrical control wire shall be in accordance with the valve manufacturer's specifications, based on the solenoid in-rush amperage and the circuit length, considering the number of solenoids operating, on the circuit. Minimum of # 14 AWG single strand control wire shall be used on all systems, except single lot individual residential systems.

1404.8.3 Connections are to be made using UL approved devices specifically designed for direct burial. All splices shall be enclosed within a valve box.

1404.9 Irrigation controllers.

1404.9.1 All irrigation controllers shall be UL listed, conform to the provisions of the National Electric Code (NEC), and be properly grounded in accordance with manufacturer's recommendations. Equip solid state controls with surge suppressors on the primary and secondary wiring, except single lot residential systems.

1404.9.2 The controller housing or enclosure shall protect the controller from the hazards of the environment in which it is installed.

1404.9.3 The rain switch shall be placed on a stationary structure minimum of 5-foot (1524 mm) clearance from other outdoor equipment, free and clear of any tree canopy or other overhead obstructions, and above the height of the sprinkler coverage. Soil moisture sensors and ET sensors shall be installed and monitored per manufacturer's guidelines per Florida Statutes, Section 373.62 requirements.

1404.10 Pumps and wells.

1404.10.1 Irrigation pump electrical control systems must conform to NEC and local building codes.

1404.10.2 The pumping system shall be protected from the hazards of the environment in which it is installed.

1404.10.3 Use electric motors with a nominal horsepower rating greater than the maximum horsepower requirement of the pump during normal operation. Motor shall have a service factor of at least 1.15.

1404.10.4 Casings for drilled wells may be steel, reinforced plastic mortar, plastic, or fiberglass pipe. Only steel pipe casings shall be used in driven wells. Steel pipe must have a wall thickness equal to or greater than Schedule 40. See SCS code FL-642. Steel casings shall be equal to or exceed requirements of ASTM A 589.

1404.11 Chemical injection equipment.

1404.11.1 Chemical injection equipment must be constructed of materials capable of withstanding the potential corrosive effects of the chemicals being used. Equipment shall be used only for those chemicals for which it was intended as stated by the injection equipment manufacturer.

1404.12 Filters and strainers.

1404.12.1 Filtration equipment and strainers constructed of materials resistant to the potential corrosive and erosive effects of the water shall be used. They shall be sized to prevent the passage of foreign material that would obstruct the sprinkler/emitter outlets in accordance with the manufacturer's recommendations.

Section 1405 INSTALLATION

1405.1 Pipe installation.

1405.1.1 Pipe shall be installed at sufficient depth below ground to protect it from hazards such as vehicular traffic or routine occurrences which occur in the normal use and maintenance of a property. Depths of cover shall meet or exceed SCS Code 430-DD, Water Conveyance, as follows:

1405.1.1.1 Vehicle traffic areas.

Pipe Size (inches)	Depth of Cover (inches)
½ – 2 ½	18 ~~24~~
3 - 5	24 ~~30~~
6 and larger	30 ~~36~~

1405.1.1.2 All areas except vehicle traffic:

Pipe Size (inches)	Depth of Cover (inches)
½ – 1 ½	6
2 - 3	12
4 - 6	18
More than 6	24

1405.1.2 Make all pipe joints and connections according to manufacturer's recommendations. Perform all solvent-weld connections in accordance with ASTM D 2855.

1405.1.3 Minimum clearances shall be maintained between irrigation lines and other utilities. In no case shall one irrigation pipe rest upon another. Comingling or mixing of different types of pipe assemblies shall be prohibited.

1405.1.4 Thrust blocks must be used on all gasketed PVC systems. They must be formed against a solid, hand-excavated trench wall undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the pipe and trench shall be filled to the height of the outside diameter of the pipe. Size thrust blocks in accordance with ASAE S-376.1.

1405.1.5 The trench bottom must be uniform, free of debris, and of sufficient width to properly place pipe and support it over its entire length. Native excavated material may be used to backfill the pipe trench. However, the initial backfill material shall be free from rocks or stones larger than 1-inch in diameter. At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. Blocking or mounding shall not be used to bring the pipe to final grade.

1405.1.6. Pipe sleeves must be used to protect pipes or wires installed under pavement or roadways. Use pipe sleeves two pipe sizes larger than the carrier pipe or twice the diameter of the wire bundle to be placed under the paving or roadway and extending a minimum of 3 feet beyond the paved area or as required by the Florida Department of Transportation (FDOT). Use sleeve pipe with wall thickness at least equal to the thickness of schedule 40 or PR 160 pipe, whichever is thicker. Proper backfill and compaction procedures should be followed.

1405.2 Control valve installation.

1405.2.1 Valve installation shall allow enough clearance for proper operation and maintenance. Where valves are installed underground, they shall be provided with a valve box with cover extending from grade to the body of the valve. The top of the valve body should have a minimum of 6 inches (152 mm) of cover in nontraffic and noncultivated areas and 18 inches (457 mm) of cover in traffic areas. The valve box shall be installed so as to

minimize the effect of soil intrusion within the valve box with the use of filter fabric, pea gravel, or other acceptable material. If an automatic valve is installed under each sprinkler, then the valve box may be omitted.

1405.2.2 Install valve boxes so that they do not rest on the pipe, the box cover does not conflict with the valve stem or interfere with valve operation, they are flush with the ground surface and do not present a tripping hazard or interfere with routine maintenance of the landscape.

1405.2.3. Install quick coupling valves on swing joints or flexible pipe with the top of the valve at ground level.

1405.2.4 Any above-ground manually-operated valves on nonpotable water systems will be adequately identified with distinctive purple colored paint. Do not provide hose connections on irrigation systems that utilize nonpotable water supplies.

1405.3 Sprinkler installation.

1405.3.1. On flat landscaped areas, install sprinklers plumb. In areas where they are installed on slopes, sprinklers may be tilted as required to prevent erosion. Sprinklers should be adjusted to avoid unnecessary discharge on pavements and structures. Adjust sprinklers so they do not water on roads.

1405.3.2. Provide a minimum separation of 4 inches (102 mm) between sprinklers and pavement. Provide a minimum separation of 12 inches (305 mm) between sprinklers and buildings and other vertical structures. Piping must be thoroughly flushed before installation of sprinkler nozzles. Surface mounted and pop-up heads shall be installed on swing joints or flexible pipe. Polyethylene (PE) nipples shall not be used in maintenance equipment traffic areas or alongside roadways and driveways. Above-ground (riser mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be effectively stabilized.

1405.4 **Pump installation.**

1405.4.1 Install pumps as per the manufacturer's recommendations. Set pumps plumb and secure to a firm concrete base. There should be no strain or distortion on the pipe and fittings. Pipe and fittings should be supported to avoid placing undue strain on the pump. Steel pipe should be used on pumps 5 horsepower (hp) or larger whenever practical.

1405.4.2 Pumps must be installed in a manner to avoid loss of prime. Install suction line to prevent the accumulation of air pockets. All connections and reductions in suction pipe sizes should be designed to avoid causing air pockets and cavitation.

1405.4.3 Pumps must be located to facilitate service and ease of removal. Appropriate fittings should be provided to allow the pump to readily be primed, serviced, and disconnected. Provide an enclosure of adequate size and strength, with proper ventilation, to protect the pump from the elements (except residential systems).

1405.5 Low voltage wire installation.

1405.5.1 Install low voltage wire (less than 98 volts) with a minimum depth of cover of 12 inches (305 mm) where not installed directly under the mainline. Provide a sufficient length of wire at each connection to allow for thermal expansion/shrinkage. As a minimum, provide a 12-inch (305 mm) diameter loop at all splices and connections. Terminations at valves will have 24 inches (610 mm) minimum free wire.

1405.5.2. Install all above-ground wire runs and wire entries into buildings in electrical conduit. Provide common wires with a different color than the power wires (white shall be used for common wires). Connections are to be

made using UL approved devices specifically designed for direct burial. All splices shall be enclosed within a valve box.

Exception: When wiring above ground manifolds from the valve to the ground immediateley beneath it, no conduit is required.

1405.6. Hydraulic control tubing.

1405.6.1. For hydraulic control systems, use a water supply that is filtered and free of deleterious materials, as defined by the hydraulic control system manufacturer. Install a backflow prevention device where the hydraulic control system is connected to potable water supplies.

1405.6.2. Install tubing in trenches freely and spaced so that it will not rub against pipe, fittings, or other objects that could score the tubing, and with a minimum 12-inch (305 mm) diameter loop at all turns and connections. Provide a minimum depth of cover of 12 inches (305 mm).

1405.6.3. Connect tubing with couplings and collars recommended by the tubing manufacturer. All splices shall be made in valve boxes. Prefill tubing with water, expelling entrapped air and testing for leaks prior to installation.

1405.6.4 Install exposed tubing in a protective conduit manufactured from Schedule 40 UV protected PVC or electrical conduit.

Section 1406 TESTING & INSPECTIONS

1406.1. Purpose. All materials and installations covered by the Irrigation Code shall be inspected by the governing agency to verify compliance with the Irrigation Code.

1406.2 Rough inspections. Rough inspections will be performed throughout the duration of the installation. These inspections will be made by the governing agency to ensure that the installation is in compliance with the design intent, specifications, and the Irrigation Codes. Inspections will be made on the following items at the discretion of the governing agency:

1406.2.1 Sprinkler layout and spacing: This inspection will verify that the irrigation system design is accurately installed in the field. It will also provide for alteration or modification of the system to meet field conditions. To pass this inspection, sprinkler/emitter spacing should be within ± 5 percent of the design spacing.

1406.2.2 Pipe installation depth: All pipes in the system shall be installed to depths as previously described in this code.

1406.2.3 Test all mainlines upstream of the zone valves as follows:

1406.2.3.1 Fill the completely installed pipeline slowly with water to expel air. Allow the pipe to sit full of water for 24 hours to dissolve remaining trapped air.

1406.2.3.2 Using a metering pump, elevate the water pressure to the maximum static supply pressure expected and hold there for a period of 2 hours, solvent-weld pipe connections shall have no leakage.

1406.2.3.3 For gasketed pipe main lines add water as needed to maintain the pressure. Record the amount of water added to the system over the 2-hour period.

1406.2.3.4 Use the following formulas to determine the maximum allowable leakage limit of gasketed pipe.

DUCTILE IRON:

$$L = \frac{SDP}{133{,}200}$$

PVC, GASKETED JOINT:

$$L = \frac{NDP}{7{,}400}$$

Where:

L = allowable leakage (gph),

N = number of joints,

D = nominal diameter of pipe (inches),

P = average test pressure (psi), and

S = length of pipe (fi).

1406.2.4 When testing a system which contains metal-seated valves, an additional leakage per closed valve of 0.078 gph/inch of nominal valve size is allowed.

1406.3 **Final inspection**. When the work is complete the contractor shall request a final inspection.

1406.3.1 Cross connection control and backflow prevention.

1406.3.1.1 Public or domestic water systems: Check that an approved backflow prevention assembly is properly installed and functioning correctly. Review the location of the assembly to check that it is not creating a hazard to pedestrians or vehicular traffic.

1406.3.1.2 Water systems other than public or domestic water systems: Check that the proper backflow prevention assemblies are provided.

1406.3.1.3 All assemblies that can be, will be tested by a certified technician prior to being placed into service.

1406.3.2 Sprinkler coverage testing.

1406.3.2.1 All sprinklers must be adjusted to minimize overspray onto buildings and paved areas. Minor tolerances shall be made to allow for prevailing winds.

1406.3.2.2 All sprinkler controls must be adjusted to minimize runoff of irrigated water. Water application rates shall not exceed the absorption rate of the soil.

1406.3.2.3 All sprinklers must operate at their design radius of throw. Nozzle sizes and types called for in the system design must have been used. All nozzles within the same zone shall have matched precipitation rates unless otherwise directed in order to increase efficiency by adjusting the nozzle selection to match site conditions.

1406.3.2.4 Spray patterns must overlap as designed (a.k.a. head to head coverage) or placed to achieve the highest possible distribution uniformity using the manufacturer's specifications.

1406.3.2.5 Sprinklers must be connected, as designed, to the appropriate zone.

1406.3.2.6 Sprinkler heads must operate within 20% of the optimum operating pressure but not more than the maximum nor less than the minimum guidelines as specified by the manufacturer. If the dynamic water pressure at the site's water source(s) is too low to achieve this pressure range at the sprinklers, a booster pump or alternate source shall be required. If the dynamic water pressure at the sites water source(s) is too high to achieve this pressure range at the sprinklers, a pressure regulating device shall be required at either the source, the zone valve, or the sprinklers, or any combination there of.

1406.4 Site restoration.

1406.4.1 All existing landscaping, pavement, and grade of areas affected by work must be restored to original condition or to the satisfaction of the governing authority.

1406.4.2 Verify that the pipeline trenches have been properly compacted to the densities required by the plans and specifications

1406.5 Record Drawings.

1406.5.1 A record drawing shall be required of all irrigation systems installed on commercial and residential developments and shall contain the following information:

1406.5.1.1 Location, type pressure and maximum flow available of all water sources.

Include limitations like days of week watering requirements.

1406.5.1.2 Location type and size of all components including sprinklers, microirrigation, main and lateral piping, master valves, valves, moisture sensors, rain sensors, controllers, pump start relays, backflow devices, pumps, wells, etc.

1406.5.1.3 The flow rate, application rate(inches per hour), and the operating pressure for the sprinklers and micro irrigation within each zone.

1406.5.1.4 An irrigation schedule for each zone, for each season (monthly is preferred), indicating the frequency and duration each zone should operate to meet the plant water requirements without rainfall and stay within the hydraulic capacities of the sprinkler system installed.

1406.5.1.5 The name, address, phone, email, professional license or certification number of the installation contractor.

1406.5.1.6 Date of installation.

1406.6 Irrigation system maintenance

1406.6.1 An irrigation maintenance schedule shall be included with the record drawing that shall include, but is not limited to; routine visual inspections (at least 4 per year), adjustments to components to keep sprinklers straight ,at the right height, aligned and unobstructed nozzles and screens cleaned, filters cleaned and sensors monitored. Pressures and flows at the source and sprinklers are correct for original design.

1406.6.2 Repairs to all irrigation components shall be done with originally installed components, equivalent components or those with greater efficiency.

1406.6.2.1 The operation of the irrigation system outside of the normal watering window shall be allowed for evaluating, maintaining or repairing the system or its components.

1406.7 Irrigation system management

1406.7.1 The frequency (times per week/month) and duration (minutes/hours) of the operation of each zone shall be adjusted and operate in order to meet the water needs of the plants within each zone as a supplement to rainfall. Adjustments shall be made a minimum 4 times per year to match the seasonal changes of the plants and the operational restrictions.

1406.7.2 It is recommended that the schedule be adjusted monthly or controllers be properly installed and programmed to automatically adjust to maximize water savings.

The modifications submitted included information prepared but not formally submitted by the following Water Management Districts:

Southwest Florida Water Management District
St. Johns River Water Management District
South Florida Water Management District
Northwest Florida Water Management District
Suwannee River Water Management District

Summary of Modification

Proposed modification to Chapter 6 Section 604.4 of the Florida Plumbing Code to adopt certain design criteria for in-ground irrigation systems reduced water consumption proposal mirrors 2015 International Green Construction Code related to irrigation.

Rationale

In accordance with Section 373.709 of *Florida Statutes*, Water Management Districts (WMDs) develop Regional Water Supply Plans (RWSPs) to assess projected water demands and to identify potential sources of water to meet those needs over a 20-year planning horizon. At the same time, protecting and maintaining the state's water-related natural resources is an important role of the WMDs. In many areas of the state, WMDs have documented unacceptable impacts on springs, wetlands, rivers, and lakes, as well as saltwater intrusion into drinking water wellfields. Population projections indicate increases in demands on water resources will occur within the planning horizon, and the proposed code modification will help address that increased demand. Water conservation by all water users will be essential in meeting future water needs.

Irrigation design criteria has been handled previously in an optional appendix to the plumbing code (Appendix F) and in land development codes by local governments, and as such Florida has a patchwork of inconsistent codes and expectations for irrigation design. The goal of this proposal is the expand the existing criteria in the plumbing code to include more design criteria that will allow for the more efficient use of water in residential landscapes.

Fiscal Impact Statement

Impact to local entity relative to enforcement code

This proposal increases allowable criteria for in-ground irrigation systems so additional inspection procedures will required. Inspectors will require some training to understand the criteria and how to inspect for them. Alternately the Commission could recommend third party certification of irrigations systems if a particular local government does not want to inspect irrigation systems.

Impact to building and property owners relative to cost of compliance with code

Installing irrigation systems to meet the criteria in this proposal may, particularly in jurisdictions that do not have any existing local code, cost more than typical systems without any design criteria. Adoption of

similar Florida Water Star criteria in Osceola county results in a cost increase of less than one percent of the cost of the homes in that area. In the Ocala area there has been close to a 40% increase in cost of the irrigation system from $1,178 to $1891 (includes labor). This small investment would provide homeowners, water supply utilities, commercial and industrial facilities a significant long-term financial benefit. On average, homeowners can expect to save approximately 20 - 30% on irrigation water use (assuming the irrigation timer is set not to exceed irrigation restrictions). This results in savings on their water, and sewer bills. Water supply utilities can expect to reduce operational expenses by reducing water pumping and treatment costs as well as by deferring the need to develop costly alternative water supply projects.

Impact to industry relative to the cost of compliance with code

In recent years, the Construction Industry Licensing Board has developed a new specialty license for the installation, repair, maintenance, and design of irrigation systems. The scope of work permitted to be performed by a certified irrigation specialty contractor can be found in Rule 61G4-15.035, Florida Administrative Code. The Florida Irrigation Society and the Florida Water Star AP program both offer training that will easily prepare the industry to design and install irrigation systems that meet the criteria. There will be an impact to some builders as irrigation installers in jurisdictions that do not have local government codes may charge up to 40% more for a system that meets the code. In areas where an existing local government land development code with similar irrigation requirements exists, there should be no discernable cost increase.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Issues with water demand nearing sustainable levels of groundwater supplies has been well documented in many areas of the state, including the Central Florida Water Initiative (CFWI). The proposed code modifications benefit the welfare of the general public by promoting water efficiency measures that will help meet public supply water demands into the future. These efforts help protect and sustain Florida's water resources for future generations. No adverse health or safety issues have been identified.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed code modifications involve equivalent but more efficient irrigation systems standards for functionality and dependability. A system designed to meet these design criteria allows for an application rate that will result in shorter run times and thus less water being used overall. The modifications were guided by the 2015 International Green Construction Code and the with ASABE/ICC-802 Landscape Irrigation Sprinkler and Emitter Standard.

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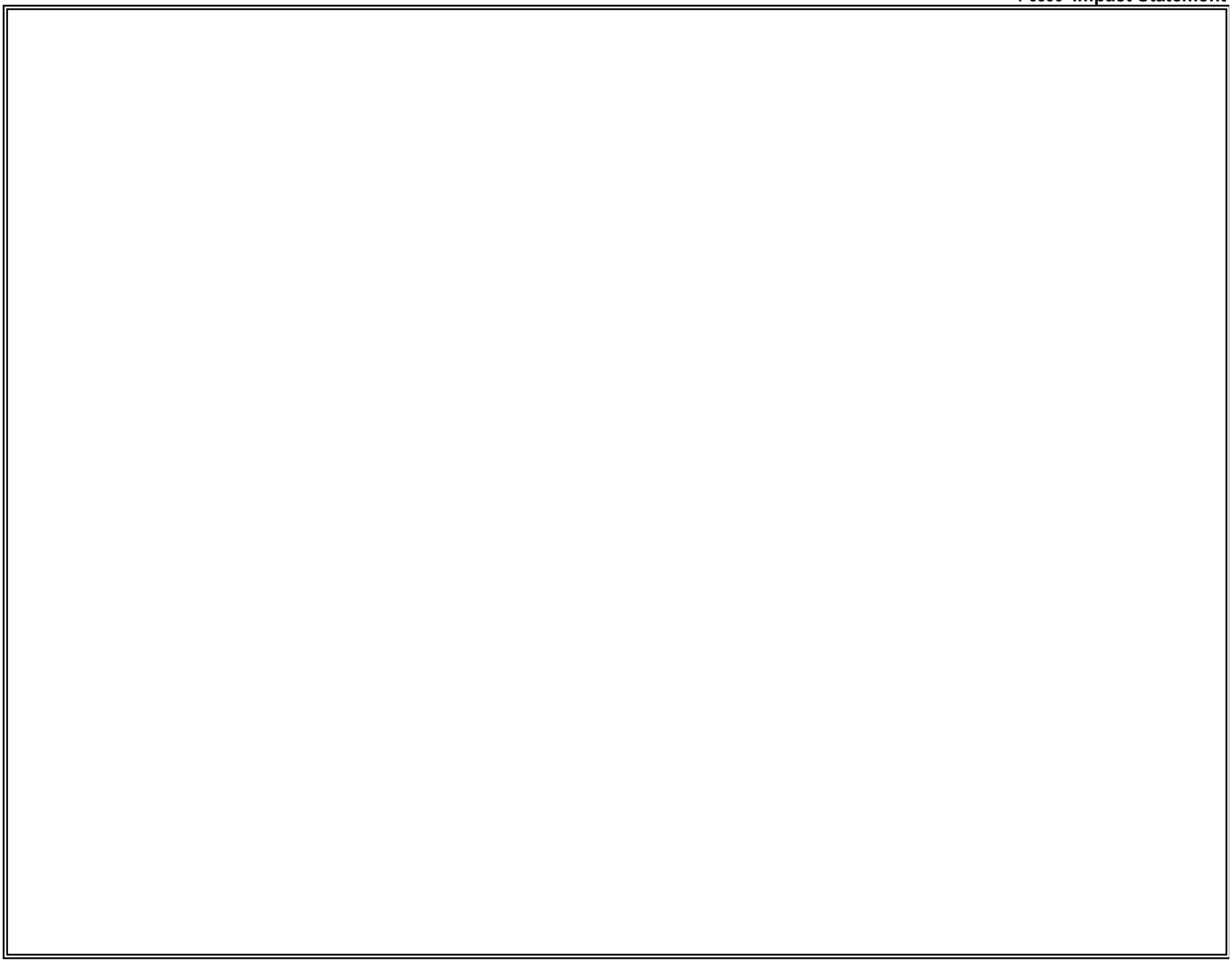
Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

All products referenced in the proposal are the same as those currently used in irrigation installations. More careful attention to how and where materials are installed will be the focus of the proposal.

Does not degrade the effectiveness of the code

Proposed code is consistent with the International Green Construction Code, and does not contradict other chapters/sections.



University of Florida Water Use Study

The low end of the range was the savings documented in the referenced Haley and Dukes paper (the SJRWMD study we did in the central ridge in neighborhoods). The other end of the range is 100% savings due to no irrigation after establishment for shrubs based on the other studies cited. Savings are per 1000 sq ft. The baseline we are using is based on the SJRWMD study. Based on what I'm hearing for central FL it is representative of new development. Anecdotally it's representative of new development in other areas of the state.

From:	Residential Irrigation Water Use in Central Florida	Percent High Vol.	Irrigation (mm/month)	Irrigation inches/ month	inches/ year
T1	Control	100%	149	5.9	70.4
T2	Clock adjst.	100%	105	4.1	49.6
T3	Clock adjst. And less turf	38%	74	2.9	35.0

T3 - T2 =	14.65	Inches/year

62% high irrigation reduction =	14.65	less irrigation needed
A 1% turf reduction = 14.65/62 =	0.24	inches

The Haley/Dukes study considered a reduction of "turf" from 75% to 40%. HOWEVER, the 75% turf scenario was still 100% high volume (all sprays and rotors). This code (modeled after FWS) would go from 100% high volume irrigation to 60%. A reduction of high volume irrigation by 40%.

FWS goes from 100% high volume irrigation to 60%		
High volume to micro % change =	40	%
Gain from reducing High irrig from 100 to 60%	9.45	inches

mm	inches
1	0.03937

ft2		
10,000	Quarter-acre Lot-ish	10,890 is a quarter acre
4,000	Home	
6,000	Landscapable area	

9.45	inches =	0.79	feet
6,000	square feet =	4,724	ft3
4,724	cubic feet =	35,339	gals/year

https://edis.ifas.ufl.edu/ae515
https://edis.ifas.ufl.edu/ae482
http://edis.ifas.ufl.edu/ae220

FFL Activity	Water Savings (gal/1,000 sq ft/yr)	Approximate cost ($)	Documentation
Convert turfgrass area to landscaped bed with micro irrigation	15,569–31,767	$ 750	*Rationale:* Trenholm et al. (2002) recommends that ornamental plants be irrigated only as needed once established. This recommendation is based on studies of ornamentals grown in Florida (Scheiber et al. 2008; Wiese et al. 2009). Alternatively, Haley and Dukes (2007) reported that mixed turf and ornamental landscapes that used micro irrigation in landscaped beds irrigated 74 mm/month over the entire landscape, which is equal to 55 mm/month (16,198 gal/1,000 sq ft/yr) for the ornamentals, as compared to 105 mm/month for irrigation with sprinklers only. *Calculation:* (31,767−16,198) = 15,569

Baseline case: A homeowner irrigates their turfgrass according to UF/IFAS recommendations (Table 5 in Dukes and Haman 2002) twice per week with 100% evapotranspiration (ET) replacement and an irrigation rate of 1.0 in/hr. Annual baseline irrigation is 31,787 gal/1,000 sq ft of turfgrass.

Typical Emitter Efficiency	
Rotors	70-75%
Spray	60-65%
Micro	90%

Our proposal is to use micro on 40% of the landscape, which is a 40% reduction from high to low irrigation.

Average landscaped area = 6,000ft2	2,400	sqr feet of micro
Using 15,569 gals saved per 1,000ft2	37,366	gals per year
(see email below)	102.37	gals saved per day

Most BMPs listed below increase the application efficiency of a system. The intended delivery amount in inches is delivered with less waste.
For example a poorly designed system may need to emit 2.75 inches in order for 1.0 inches to be delivered to all areas of the landscape.
Conversely, a well-designed system may need to emit 1.2 inches in order for 1.0 inche to be delivered to all areas of the landscape.

1. Irrigation systems shall not direct water onto buildings, paved surfaces, or adjoining lots
2. Turfgrass and beds shall be on separate irrigation zones
3. Only micro-irrigation shall be used in landscape beds
4. Micro-irrigation shall be equipped with pressure regulators
5. High-volume sprinkler irrigated zones cannot exceed 60% of the landscaped area
6. High-volume sprinklers are prohibited on landscape areas that are less than 4 feet in any dimension.
7. All nozzles that are on the same zone shall have matched precipitation rates.
8. Sprinkles shall have head to head coverage.
9. Automatic shut off device shall be installed as required by FL statute

144,000 cubic inches in 1,000ft2
1 cubic inch = 0.004329 gallons
623 gals/1000ft2/inch applied

Dukes' baseline case
51 inches/year
51 x 623 = 31,792.18 gals

623 gals needed to apply 1 inch at 100%

7.48 g/ft cube

NOTES

The low end of the range was the savings we documented in he referenced Haley and Dukes paper (the SJRWMD study we did in the central ridge in neighborhoods). The other end of the range is 100% savings due to no irrigation after establishment for shrubs based on the other studies cited. Savings are per 1000 sq ft. The baseline we are using is based on the SJRWMD study. Based on what I'm hearing for central FL it is representative of new development. Anecdotally its representative of new development in other areas of the state.

623 373.8
249.2
1038
622.8

0.60019268

Document also available in EDIS at https://edis.ifas.ufl.edu/ae515

Central Florida Water Initiative

Planning Document, Volume I

REGIONAL WATER SUPPLY PLAN 2015

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

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

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

Preface

CENTRAL FLORIDA WATER INITIATIVE

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

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

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

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

CFWI RWSP: Summary of Volume Contents

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

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

Acknowledgements

The Central Florida Water Initiative recognizes and thanks the utilities, state agencies, and other stakeholders for their contributions, comments, advice, information, and assistance throughout the development of the Central Florida Water Initiative (CFWI) Regional Water Supply Plan (RWSP).

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

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

November 2015 Final

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Executive Summary

In Florida, the water management districts develop regional water supply plans to identify sustainable water supply for all water uses while protecting water resources and related natural systems. This Central Florida Water Initiative (CFWI) Regional Water Supply Plan (RWSP), including the 2035 Water Resources Protection and Water Supply Strategies document (Solutions Strategies Volume II) was jointly developed by the St. Johns River Water Management District (SJRWMD), South Florida Water Management District (SFWMD), and Southwest Florida Water Management District (SWFWMD) (Districts) in coordination with the Florida Department of Environmental Protection (FDEP) and Florida Department of Agriculture and Consumer Services (FDACS) staff, representatives from utilities, agriculture, and industry, and included input from the public. The CFWI Planning Area is located in central Florida and consists of all of Orange, Osceola, Seminole, and Polk counties and southern Lake County, covering approximately 5,300 square miles. The planning area was based predominantly on the public supply utility service areas in the central Florida region where the boundaries of the three water management districts converge (CFWI RWSP, **Volume I, Figure 1**).

This CFWI RWSP is consistent with the water supply planning requirements of Chapter 373, Florida Statutes (F.S.). **Volume I** of the CFWI RWSP builds upon, and updates, previous water supply plans completed by each of the three Districts that include portions of the CFWI Planning Area. The CFWI RWSP **Volume I** planning effort focused on water demand estimations and projections, water resource assessments based in part on groundwater modeling, and on developing feasible water supply and water resource development options that will meet future water supply needs in a manner that sustains the water resources and related natural systems. **Volume II** of the CFWI RWSP (Solutions Strategies) supplements planning results completed in the CFWI RWSP **Volume I** planning effort to address future water supply needs of the region by evaluating water conservation options and regional alternatives to meet the water supply demand. The CFWI RWSP identifies programs and projects to ensure that adequate and sustainable water supplies are available to meet future water supply needs while protecting the environment and water resources. The CFWI RWSP is based on a planning horizon extending through 2035 and identifies water conservation measures, water supply project options, and water resource development project options.

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

associated with projected demands through 2035 will increase the existing areas of water resource stress within the CFWI Planning Area.

Total water demands by all water use categories are projected to increase from an average total water use of approximately 800 mgd to almost 1,100 mgd in 2035. In some areas, utilization of traditional groundwater is near, has already reached, and in some areas has exceeded the sustainable limits. Adverse impacts from withdrawals are already occurring in several areas. Based on the evaluation of groundwater availability, it was estimated that the CFWI Planning Area could potentially sustain an additional estimated 50 mgd of traditional groundwater use but coordinated management strategies will be needed (e.g., wellfield optimization, aquifer recharge and augmentation) to address unacceptable impacts. Additional traditional groundwater, beyond the 50 mgd, is bound by environmental constraints, along with regionally appropriate management and operational controls including additional mitigation will need to be carefully considered. Based on the 2035 demands, the resulting deficit is approximately 250 mgd.

Public water supply constitutes the largest water use in the region. The CFWI Planning Area is currently home to approximately 2.7 million people and supports a large tourist industry, significant agricultural industry, and a growing industrial and commercial sector. The area's population is projected to reach approximately 4.1 million by 2035, which is a 49 percent increase from the 2010 estimate. Agriculture represents the second largest water use in the region, with a projected acreage of 165,000 in 2035. Agricultural acreage is projected to decline within the central urban areas. In other portions of the CFWI Planning Area, industry trends indicate movement toward crop intensification. The CFWI Planning Area also encompasses extensive natural systems such as Green Swamp, Reedy Creek Swamp, Boggy Creek Swamp, Shingle Creek Swamp, the Kissimmee Chain of Lakes (the headwaters to the Kissimmee River), 16 springs, and numerous wetland and surface water bodies.

Current water sources in the CFWI Planning Area include groundwater (fresh and brackish), reclaimed water, surface water, and stormwater. Fresh groundwater sources (i.e., surficial, intermediate, and Floridan aquifers) are considered traditional water sources whereas nontraditional or alternative water sources include brackish groundwater, surface water, seawater, reclaimed water, and water stored in aquifer storage and recovery wells and reservoirs. The CFWI Planning Area has relied on traditional groundwater from the Floridan aquifer system as a primary water source for urban, agricultural, and industrial uses. In addition, over 90 percent of the treated wastewater in the region is reused (178 million gallons per day [mgd]) for landscape irrigation, industrial uses, groundwater recharge, and environmental enhancement.

Total average water use in the CFWI Planning Area is projected to increase from approximately 800 mgd in 2010 to about 1,100 mgd in 2035. This projected increase of approximately 300 mgd represents a total increase in water use of approximately 40 percent. Public supply is now and is projected to continue to be the largest use category in the CFWI Planning Area, and accounts for more than 70 percent of this total projected increase.

Previous central Florida planning efforts and SWFWMD water supply planning and assessment investigations [most notably in the Southern Water Use Caution Area (SWUCA)] have documented that the rate of groundwater withdrawal in certain areas of the CFWI Planning Area is either rapidly approaching, or has surpassed the maximum rate that can be sustained without causing harm or adverse impacts to the water resources and related natural systems.

With the need to have a single, unified tool to effectively evaluate water withdrawals and their associated effects on the water resources and natural systems, the United States Geological Survey was retained to develop an updated, calibrated version of the East Central Florida Transient groundwater flow model. Hydrologic modeling was performed and the results were used along with resource constraints and considerations to evaluate various water-use scenarios. The sustainable limits of groundwater withdrawals reported in this CFWI RWSP are used by the Districts for planning purposes only and should not be viewed as regulatory constraints for specific water use permits. Water use permitting decisions are made with additional information that is more site-specific and which may consider opportunities for water resource development, management strategies, and mitigation of impacts.

Minimum flows and levels (MFLs) have been established for 46 water bodies in the CFWI Planning Area. All 46 of these water bodies are located in the SJRWMD and SWFWMD portions of the CFWI Planning Area. The recent status assessment of MFLs as part of this CFWI RWSP identified 10 water bodies within the CFWI Planning Area that are currently below their established MFLs and an additional 15 water bodies that are projected to fall below their established MFLs within the planning horizon if projected demands were to come from traditional sources. In addition, the SWUCA Saltwater Intrusion Minimum Aquifer Level is not currently being met and water levels in regulatory monitoring wells in the Lake Wales Ridge area associated with the SWUCA Recovery Strategy are projected to not be met by 2035. The CFWI RWSP identifies general prevention and recovery strategies to ensure recovery to the established MFLs as soon as practicable or to prevent the flows and levels from falling below the established MFLs. Adverse impacts to wetlands from withdrawals are currently occurring in several areas and examination of modeled water levels in non-MFL wetlands and water bodies indicated that the number and extent of stressed wetlands are projected to increase in future scenarios. The existence of adverse impacts to wetlands has been documented through field work. Some wetland impacts are most probably the result of multiple factors, including groundwater withdrawals. In some cases, where the cause has been determined, mitigation measures have been implemented.

The risk of water quality change for select wellfields in the eastern portion of the CFWI Planning Area was evaluated as part of this CFWI RWSP. A total of six selected locations were identified through their water use permits as having a history of water quality issues in the production wells but these utilities have been able to maintain delivery of potable quality water through management of their wellfield operations. The evaluation demonstrated that some increased potential for risk of water quality changes but are manageable through wellfield operations.

To meet current and future water needs while protecting the environment and water resources, this CFWI RWSP identified water conservation efforts, groundwater withdrawal optimization, prevention and recovery strategies for targeted MFL water bodies, water supply project options, and water resource development project options.

Water conservation by all water use categories will continue to be a priority to meet the region's future water needs. While significant conservation efforts have been implemented in the CFWI Planning Area, additional conservation is critical. Initial evaluations estimated an additional 42 mgd could be saved with increased conservation efforts. During the Solutions Strategies phase, potential water savings through the implementation of public supply and agricultural best management practices was further evaluated; the water savings estimate was revised to meet or exceed 37 mgd in order to reflect the current levels of agricultural conservation (**Volume II**, **Chapter 2**). These water savings estimates are influenced by several factors including, but not limited to, voluntary consumer actions, level of conservation education and financial incentives, passive savings, and assumed participation rates in conservation best management practices. As part of the "Next Steps" it is anticipated that efforts will focus on evaluating options to accelerate and increase the implementation of conservation measures in the CFWI Planning Area.

Several sources of water and storage options were considered to address future water needs. The draft CFWI RWSP identified 142 potential water supply project options. Eight new water supply project options were identified during the Solutions Planning Phase, increasing the number of potential water supply project options to 150. The updated list includes 37 brackish/nontraditional groundwater, 87 reclaimed water, 17 surface water (increased from 15), 6 stormwater (new), and 3 management strategies project options. Cumulatively, the 150 water supply project options have the capacity to produce up to 505 mgd (approximately 334 mgd finished water) of additional water supply or water resource benefit, exceeding the estimated future need of 250 mgd. In addition, potentially 122 mgd of raw surface water may be available (see **Volume IIA**, **Appendix D**, for more detail).

Funding for the development of alternative water supplies is primarily the responsibility of water suppliers and users with potential funding assistance from the state of Florida and the Districts (**Volume I, Chapter 9**).

Although ample water supply project options (**Volume I**, **Chapter 7**) have been identified, it is not necessarily ensured that projected demands would be met in all places without unacceptable impacts, therefore it will be necessary to optimize groundwater withdrawals, and identify and implement a combination of water conservation and alternative water supply project options to adequately address the projected 2035 water needs.

Uncertainty is inherent in water resource analyses. The Districts considered major sources of uncertainty including water demand projections, groundwater and surface water models, climate variability, and water resource constraints. At a regional level, the best strategy for dealing with uncertainty is the implementation of increased water conservation and a suite of water supply sources and ample water supply project options. Water supply plans are

not self-implementing. Projects included in this CFWI RWSP are options from which local governments, utilities, and others may choose. There is no legal requirement for these project options to be implemented. Current permits and laws limit the scope of regulatory actions that can be taken to impose specific solutions on users. Budgetary constraints and uncertainties of both users and agencies also create hurdles to assuring specific solutions will be economically feasible and affordable.

The CFWI RWSP concludes that the future water demands of the CFWI Planning Area can be met through the 2035 planning horizon, while sustaining the water resources and related natural systems, with appropriate management, continued diversification of water supply sources, conservation, and implementation of the water supply and water resource development projects identified in this plan. Future challenges in water resource development and natural resource protection in the CFWI Planning Area require concerted efforts to monitor, implement management measures, characterize current hydrologic conditions, and project future conditions. Successful implementation of this CFWI RWSP requires close coordination and collaboration with other regional and local governments, utilities, and other water users. Public and private partnering can ensure that water resources in the CFWI Planning Area are appropriately managed.

In May 2014, the governing boards of the three water management districts acknowledged delivery of the Final Draft CFWI RWSP (**Volume I**). The governing boards chose to delay final agency action on the draft plan until the completion of the CFWI Solutions Planning Phase and Solutions Strategies document with any resulting changes or refinements.

The CFWI Solutions Planning Phase was established to address future water supply needs of the region by evaluating water conservation options and regional alternatives to meet the water supply demands identified in the CFWI RWSP. The Solutions Planning Phase also focused on developing the "Next Steps" necessary for CFWI region to meet the water supply needs and protect the environmental systems. The final work product is the CFWI 2035 Water Resources Protection and Water Supply Strategies document (Solutions Strategies), which is included as **Volume II** of this CFWI RWSP. The Solutions Strategies document provides relevant project information to further develop specific water supply project options through partnerships with water users. The document includes project cost estimates, potential sources of water, feasibility and permittability analysis, and identification of governance structure options.

Some of the evaluations described in the Solutions Strategies, **Volume II**, represent different, refined, or expanded evaluations of certain aspects of the CFWI RWSP, **Volume I**. These evaluations were based on specific assumptions developed by the Districts and CFWI stakeholders to generate a potential implementation and funding scenario for a specific set of project options identified for the CFWI Planning Area. As a result, some of the results presented in the Solutions Strategies Appendices, **Volume IIA** (e.g., projections for future potential conservation) are not the same as the results presented in other sections of the CFWI RWSP, **Volume I**. These results are not inconsistent, but rather represent the results of two evaluations performed for different purposes.

NEXT STEPS

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

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

- Implement Water Conservation Programs

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

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

- Develop Specific Prevention and Recovery Strategies

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

- Support Development and Implementation of Regional Project Solutions

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

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

- Support Additional Alternative Water Supply Project Options

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

- Improve Water Resource Assessment Tools and Supporting Data

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

- Develop Options for Consistent Rules and Regulations

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

regulatory components of prevention and recovery among existing legal uses; and providing options for all projected reasonable-beneficial uses of water.

- Continued Communication and Outreach

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

- Identify Options for Future CFWI Framework to Support Implementation Strategies

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

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Acronyms and Abbreviations

AFSIRS	Agricultural Field Scale Irrigation Requirements Simulation
AGMOD	Agricultural Water Use Model
ASR	aquifer storage and recovery
AWEP	Agriculture Water Enhancement Program
AWS	alternative water supply
BEBR	University of Florida's Bureau of Economic and Business Research
BMPs	best management practices
CII	commercial/industrial/institutional
CERP	Comprehensive Everglades Restoration Plan
CFCA	Central Florida Coordination Area
CFI	Cooperative Funding Initiative
cfs	cubic feet per second
CFWI	Central Florida Water Initiative
CUP	consumptive use permit
DO	dissolved oxygen
DSS	domestic self-supply and small utility
DWSP	District Water Supply Plan
ECFT	East Central Florida Transient Groundwater Model
EDR	electrodialysis reversal
EMT	Environmental Measures Team
EOP	end of permit
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
F.A.C.	Florida Administrative Code

FARMS	Facilitating Agricultural Resource Management Systems
FAS	Floridan aquifer system
FASS	Florida Agricultural Statistics Service
FAWN	Florida Automated Weather Network
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FFL	Florida-Friendly Landscaping™
FGBC	Florida Green Building Coalition
FGLP	Florida Green Lodging Program
FGUA	Florida Government Utility Authority
F.S.	Florida Statute
ft bls	feet below land surface
FWS	Florida Water Star℠
FY	Fiscal Year
GAT	Groundwater Assessment Team
GIS	Geographic Information System
gpcd	gallons per capita per day
gpd	gallons per day
gpdpp	gallons per person per day
gpm	gallons per minute
HAT	Hydrologic Assessment Team
IFAS	Institute of Food and Agricultural Services
IGCC	International Green Construction Code
KBWSP	Kissimmee Basin Water Supply Plan
KCOL	Kissimmee Chain of Lakes

LRA	landscape/recreational/aesthetic
LEED	Leadership in Energy and Environmental Design
LFA	Lower Floridan aquifer
M/D	mining/dewatering
MAC	minimal aquifer connection
MFL	Minimum Flows and Levels
MFLRT	Minimum Flows and Levels and Reservations Team
MFR	multi-family residential
mg/L	milligrams per liter
mgd	million gallons per day
MIL	mobile irrigation laboratory
MODFLOW	Modular groundwater flow model
ND	Not determined
NGVD	National Geodetic Vertical Datum of 1929
NRCS	Natural Resource Conservation Service
OCU	Orange County Utilities
OUC	Orlando Utility Commission
PRMRWSA	Peace River Manasota Regional Water Supply Authority
RCID	Reedy Creek Improvement District
RIB	Rapid Infiltration Basin
RO	reverse osmosis
RT	Regulatory Team
RWSP	Regional Water Supply Plan
SAS	Surficial aquifer system
SFR	single-family residential
SFWMD	South Florida Water Management District

SHA	significantly hydrologically altered
SJRWMD	St. Johns River Water Management District
SPT	Solutions Planning Team
STAG	State and Tribal Assistance Grants
Subgroup	Population and Water Demand Subgroup
SWFWMD	Southwest Florida Water Management District
SWIMAL	Saltwater Intrusion Minimum Aquifer Level
SWUCA	Southern Water Use Caution Area
TAZ	traffic analysis zone
TBW	Tampa Bay Water
TDS	total dissolved solids
TWA	Tohopekaliga Water Authority
UF	University of Florida
UFA	Upper Floridan aquifer
USACE	U.S. Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
Water CHAMP℠	Water Conservation Hotel and Motel Program
Water PRO	Water conservation program for restaurants
WaterSIP	Water Savings Incentive Program
WCCF	Water Cooperative of Central Florida
WPCG	Water Planning Coordination Group
WPSP	Water Protection and Sustainability Program
WRAP	Water Restoration Action Plan
WRD	Water Resource Development
WSIS	Water Supply Impact Study

WTP	water treatment plant
WWTP	wastewater treatment plant

Lake Joel – Kissimmee Chain of Lakes

1 Introduction

In Florida, the water management districts (Districts) develop regional water supply plans (RWSPs) to provide for current and future water needs while protecting Florida's water and natural resources. This RWSP assesses existing and projected water needs and water sources required to meet those needs through 2035 in the Central Florida Water Initiative (CFWI) Planning Area. This Planning Area is home to an extensive agricultural industry, large urban communities, active tourism industry, and valued ecosystems.

TOPICS

- Statutory Requirements and Legal Framework
- Goal and Guiding Principles
- Description of the CFWI Planning Area
- Previous Planning Initiatives
- Water Resources in the CFWI Planning Area
- Water Supply Planning for the Next 20 Years

This plan is an update to portions of existing individual District's water supply plans that include the CFWI Planning Area. Current and projected populations, water demands for all use categories, evaluation of water resource impacts associated with water use, water resource and water supply project options, and related water supply planning information is presented in this document.

Regional water supply plans provide the following information:

- Water demand estimates and projections
- An evaluation of existing regional water resources
- Identification of water supply-related issues
- A discussion of current water source options to meet projected water demands
- Water resource and water supply development components, including funding strategies
- Recommendations for meeting projected demands in the region

This CFWI RWSP also includes a discussion of Minimum Flows and Levels (MFLs) established within the CFWI Planning Area, MFL recovery and prevention strategies where

appropriate, water reservations adopted by rule, technical data, and supporting information.

Statutory Requirements and Legal Framework

The legal authority and requirements for water supply plans are primarily found in Chapter 373, F.S. Additional direction about water supply plans is provided in Chapters 163, 187, and 403, F.S. In 2005, legislative amendments strengthened the link between land use and water supply planning as well as created the Water Protection and Sustainability Program (WPSP).

LAW/CODE

The governing board of each water management district shall conduct water supply planning for any water supply planning region within the district identified in the appropriate district water supply plan under Section 373.036, F.S., where it determines that existing sources of water are not adequate to supply water for all existing and future reasonable-beneficial uses and to sustain the water resources and related natural systems for the planning period. (Section 373.709(1), F.S.)

The 2005 amendments tighten the connection between RWSPs and the potable water provisions contained within each local government's comprehensive plan. This portion of the law is designed to ensure that adequate potable water facilities are constructed and are concurrently available with new development. Water supply development projects must be identified and listed, thereby fostering better communications among water planners, local government planners, and local utilities.

The alternative water supply portion of this program is intended to reduce competition between users and natural systems for available water by encouraging the development of alternative water supplies. The WPSP provides annual state revenues and matching District funds to support the development of alternative water supplies by local governments, water supply authorities, and other water users.

It has been determined the CFWI Planning Area is appropriate for water supply planning pursuant to Section 373.036, F.S. The water supply planning region identified in this plan shall be considered a Water Resource Caution Area for the purposes of Section 403.064, F.S., and affected parties may challenge the designation pursuant to Section 120.569, F.S.

Goal and Guiding Principles

The goal for the CFWI RWSP is to ensure sufficient water supply sources and future projects to meet existing and future reasonable-beneficial uses during a 1-in-10 year drought condition through 2035 while sustaining water resources and related natural systems. This goal will be accomplished by

- Identifying the sustainable quantities of traditional groundwater sources available for water supplies that can be used without causing harm to the water resources and associated natural systems
- Identifying water conservation and alternative water supply development options to meet reasonable-beneficial water demands that are in excess of the sustainable yield of traditional groundwater sources
- Protecting and enhancing the environment, including the natural resource areas and systems identified by the Districts as well as any federal, state, and locally identified natural resource areas
- Providing information to support local government comprehensive plans
- Achieving compatibility and integration with other state and federal regional resource initiatives
- Establishing consistent regulatory programs to accomplish the above-listed goals

DESCRIPTION OF THE CFWI PLANNING AREA

History

The St. Johns River Water Management District (SJRWMD), South Florida Water Management District (SFWMD), and Southwest Florida Water Management District (SWFWMD) agreed in 2006 to a Central Florida Coordination Area (CFCA) Action Plan to address the short-term and long-term development of water supplies in the central Florida area, which included Orange, Osceola, Seminole, Polk, and southern Lake counties. The CFCA Action Plan consisted of two phases.

In Phase I, a framework was established to address short-term water resource issues. Phase I concluded in 2008, with interim water use regulations limiting groundwater withdrawals to projected 2013 demands and requiring development of alternative water supplies (AWS) to meet future needs. Because the SWFWMD had already adopted rules for its Southern Water Use Caution Area (SWUCA) that were as restrictive, if not more restrictive, than the CFCA rules, and Polk County has portions in both areas, only the portion of Polk County that is outside the SWUCA was subject to the CFCA rules. The interim CFCA rules sunsetted on December 31, 2012.

Phase II of the CFCA Action Plan began in 2009 with the primary objectives to establish new rules prior to the sunset date and to implement a long-term approach to water resource management in central Florida. This phase involved coordinated activities on a variety of issues including regional water supply planning; investigation and development of traditional and alternative water supply projects; assessment of environmental impacts and groundwater sustainability; and development of water use rules and permitting criteria. The CFWI was created, in part, to incorporate the CFCA Phase II process and broaden

membership to include local government, agriculture, and commercial interests and further emphasize public input.

Central Florida Water Initiative

A primary focus of the CFCA Phase II process was the development and calibration of a hydrologic groundwater flow model to determine the sustainability of groundwater supplies. Because of the complexity of the water resources assessment in the area, the need for additional data, and the desire to build a consensus among the Districts, Florida Department of Environmental Protection (FDEP), Florida Department of Agriculture and Consumer Services (FDACS), utility companies, local governments, and agricultural industry representatives from the area, the analysis was not completed prior to the sunsetting of the interim CFCA rule. As a result of the economic slowdown in central Florida, projected population and associated water demands grew more slowly than initially predicted. Therefore, the demand for additional water supply was delayed so it was no longer as critical to fast-track certain activities.

It was also agreed that a single RWSP for the area would be appropriate. Therefore, the executive directors of the Districts, in consultation with FDEP and stakeholder groups including public water suppliers, suspended the CFCA Phase II process, to allow for completion of a more robust technical analysis for the planning process. A coordinated effort to protect and restore, where necessary, the water resources of Central Florida remains a priority.

To address the limitations of the 2006 CFCA Action Plan schedule and yet fulfill the overarching objectives outlined in that plan, the CFWI was created in 2011. The CFWI is a collaborative effort among the Districts with other agencies and stakeholders to implement effective and consistent water resource planning, development, and management through the CFWI.

The CFWI builds on the previous work of the CFCA. As a result of the CFWI, the previous CFCA implementation schedule and goals were revised to accommodate additional investigative and collaborative efforts. An executive level Steering Committee was formed to direct the coordinated efforts of the CFWI.

Planning Area Description

The CFWI Planning Area is located in central Florida and consists of all of Orange, Osceola, Seminole, and Polk counties and southern Lake County (**Figure 1**), covering approximately 5,300 square miles. The CFWI Planning Area was based on the utility service areas in the central Florida region where the boundaries of the three Districts converge.

The area is characterized by 43 local and county governments with a growing population and substantial urban sector. The City of Orlando has the largest population in the CFWI Planning Area. However, the residential areas with the largest growth rates are north and

south of Orlando along the I-4 corridor and other major transportation routes. This area supports a large tourist industry and a growing industrial and commercial sector. Agricultural acreage is decreasing in the CFWI urban area. However, agricultural industry trends indicate a shift toward crop intensification on fewer acres, which could result in similar water demands rather than reductions.

Population and Water Demands

Overall, the water demand for all use categories in the CFWI Planning Area is expected to increase by approximately 40 percent from 800 mgd in 2010 to 1,100 mgd in 2035 for average rainfall conditions. The total population in CFWI Planning Area is projected to increase by approximately 49 percent from 2.7 million in 2010 to more than 4.1 million in 2035.

Public supply is the largest water use type in the area, serving an estimated population of 2.6 million people in 2010 (96% of total population). Public supply for the area is provided by 85 private and public utilities, each with a capacity of 0.1 mgd or more. These utilities provide potable water supply for residential, landscape, and industrial uses within the CFWI Planning Area. Public supply demand is projected to increase by approximately 50 percent from 435 mgd in 2010 to 654 mgd in 2035. In 2010, approximately 166,000 people received 20 mgd of water supply from domestic self-supply or small public suppliers (less than 0.1 mgd) and is expected to increase by approximately 20 percent by 2035 to 24 mgd.

Agriculture is the second largest water use type in the CFWI Planning Area. In 2010, there were approximately 152,000 irrigated agricultural acres, with an average water demand of 185 mgd. Agricultural demands are projected to increase only in Osceola County, while decreases are projected to occur in all other CFWI counties. Total irrigated agricultural acreage is expected to increase by about 9 percent to approximately 164,500 acres and average water demand is expected to increase by approximately 16 percent to 215 mgd by 2035.

Other categories of water use in the CFWI include commercial/industrial/institutional and mining/dewatering, power generation, and landscape/recreation/aesthetic categories. Additional information for these water use types can be found in **Chapter 2**.

Natural Features

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

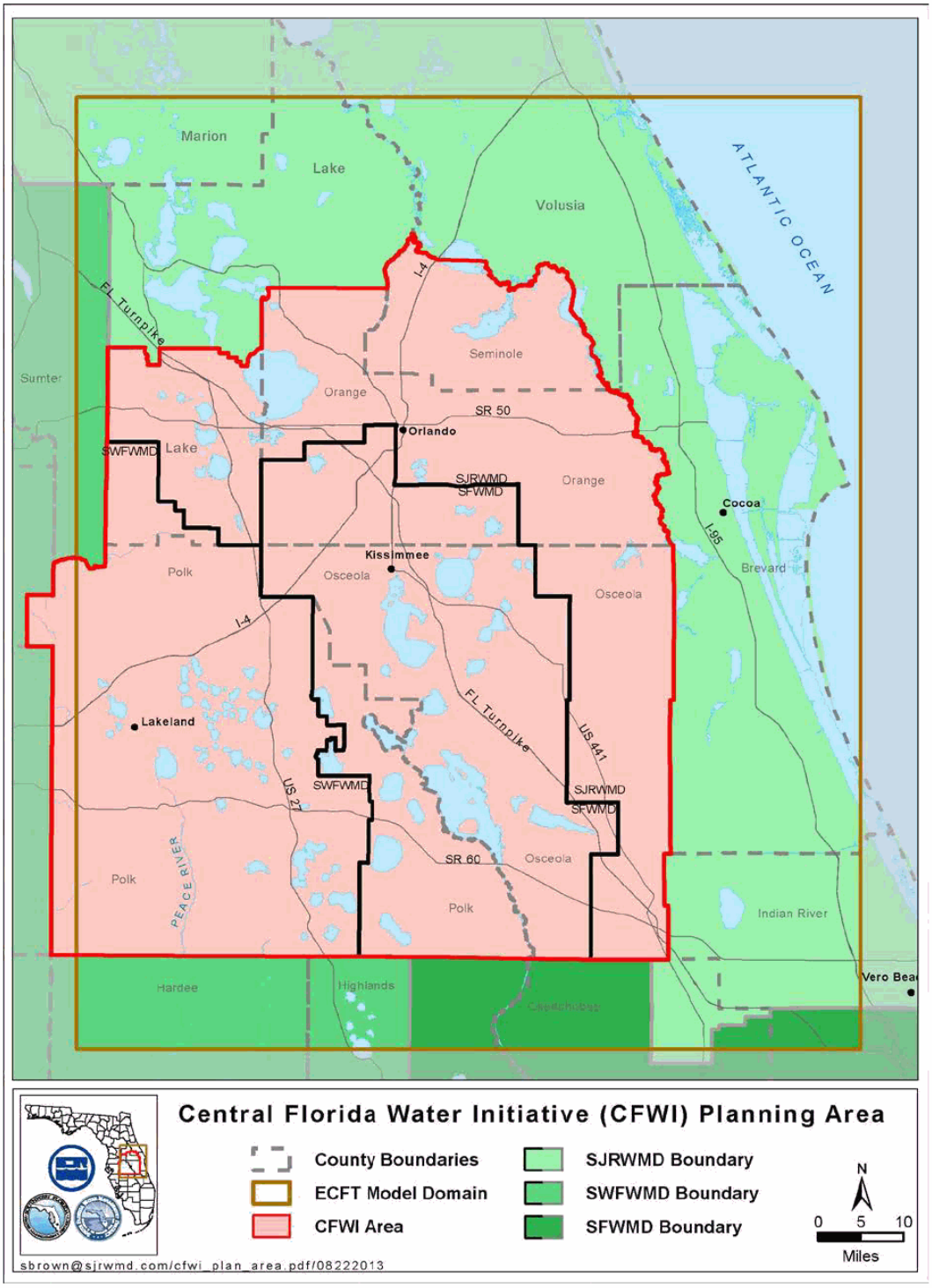


Figure 1. Map of the Central Florida Water Initiative (CFWI) Planning Area.

PREVIOUS PLANNING INITIATIVES

The boundaries of three Districts meet in the CFWI Planning Area. Each District has previously developed water supply plans that included their respective areas of the CFWI Planning Area. Below is a summary of previous water supply planning activities, findings, and recommendations by the individual Districts' water supply plans.

South Florida Water Management District

The portion of the SFWMD that falls in the CFWI Planning Area has been included in the Kissimmee Basin Water Supply Plan (KBWSP). The initial KBWSP was completed in 2000 (SFWMD 2000) and was updated in 2006 (2005-2006 KB Plan Update; SFWMD 2006a, 2006b). The 2005-2006 KB Plan Update supported the 2000 Kissimmee Basin Water Supply Plan's (2000 KB Plan) findings and recommendations, which called for development of alternative water sources to meet most of the region's future water supply needs through 2025. Fresh groundwater from the Floridan aquifer system and groundwater from the surficial aquifer system served the Kissimmee Basin (KB) Planning Area as traditional water sources (SFWMD 2006a). The 2005-2006 KB Plan Update concluded that increased conservation and the development of alternative water supplies were needed to meet water needs, as further development of traditional supplies becomes increasingly limited. The alternative water supply source options identified for the KB Planning Area included brackish groundwater; fresh surface water from the Kissimmee River and Chain of Lakes and associated tributaries; stormwater runoff collection and storage; and reclaimed water.

St. Johns River Water Management District

The SJRWMD historically developed one water supply plan for their entire District, including the Central Florida area. The initial SJRWMD RWSP was completed in 2000 and was updated in 2005 (SJRWMD 2005b); subsequent updates were completed annually from 2006 through 2009 with addenda (SJRWMD 2006a, 2007, 2008, 2009b). SJRWMD's water supply planning and assessment investigations have documented that the rate of withdrawal of groundwater in certain areas of SJRWMD is approaching the maximum sustainable rate that will cause unacceptable adverse impacts to the water resources and related natural systems. Previous plans generally placed this region in a water resource caution area.

To meet the future water use demands in the SJRWMD, the RWSP identified several water supply and water resource development options/projects. These included increased use of reclaimed water, development of brackish groundwater sources, surface water storage through reservoirs, and conservation (SJRWMD 2006a).

Southwest Florida Water Management District

The portion of the SWFWMD located within the CFWI Planning Area has been included in the Heartland Region, which is one of four planning regions of the SWFWMD RWSP. The 2010 Update for the Heartland Planning Region (SWFWMD 2011b) determined that water supply demands for all use categories can be met through 2030 with continued development of alternative water supply sources and conservation. The increase in water demand in the Heartland Planning Region from 2005 to 2030 was projected to be about 130 mgd. As of 2010, it was estimated that at least 16 percent of that demand (22 mgd) has either been met or will be met by projects that are under development. The remaining 108 mgd will be supplied by 41 mgd of unused groundwater quantities that have been permitted to utilities in Polk County, by 43 mgd of offset quantities of reclaimed water that will be available in the region by 2030, and up to 21 mgd through non-agricultural water conservation. An additional source includes reductions in agricultural, commercial/industrial/institutional and mining/dewatering, power generation, and groundwater use resulting from conservation measures and land-use transitions (SWFWMD 2010). Polk County may also be able to meet future demands from nontraditional sources such as surface water and LFA groundwater supplies within Polk County or from importation of water from supplies developed in cooperation with other regional entities outside of Polk County.

Preparation and Coordination with Partners

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

Six public workshops were conducted during the CFWI RWSP development. Stakeholders representing a cross-section of interests in the region, including agricultural, industrial, environmental, utilities, local government planning departments, state and federal agencies, and the general public, were invited to attend the workshops. During the workshops, participants reviewed and provided comments regarding projected demands and other key plan elements. Water demand projections were coordinated through individual meetings with local government planning departments, utilities, and agricultural industry representatives. Participants also reviewed and provided input on water supply issues, the condition of regional water resources, water source options, and other key aspects of the CFWI RWSP drafts.

Meetings were held with stakeholders from interest groups. Presentations were made before the regional planning councils, advisory committees, professional organizations, and numerous city councils and county commissions. Affected parties were engaged in the

development of the CFWI RWSP by coordinating methods for projecting water demands and assisting with the identification of potential water supply project options. A CFWI RWSP web page was developed to disseminate information, provide draft documents, advertise all public meetings, and solicit comments from interested parties, including the general public. Input received from stakeholders and the public has been incorporated into this plan and will shape and guide water supply development in the CFWI Planning Area for years to come.

Linkage to Regional and Local Planning

The CFWI RWSP process is closely coordinated and linked to the water supply planning of local governments and utilities. Within 6 months following approval of the water supply plan, water management districts are required to notify each public supply utility of the projects identified in this CFWI RWSP for that utility to consider and incorporate into its corresponding local government required water supply facilities work plan in meeting future water demands.

In addition to these utility requirements, local governments are required to adopt water supply facilities work plans, covering at least a 10-year planning period, and related amendments to their comprehensive plans within 18 months following approval of the CFWI RWSP. The work plans contain information to update the comprehensive plan's capital improvements element, which outlines specifics about the need for, and the location of, public facilities, principles for construction, cost estimates, and a schedule of capital improvements. More detailed information on these requirements is contained in **Chapter 7**.

WATER RESOURCES IN THE CFWI PLANNING AREA

Water resources in the CFWI Planning Area include primarily groundwater (fresh and brackish), surface water, and reclaimed water.

Groundwater

Groundwater is supplied from the surficial, intermediate, and Floridan aquifer systems. The surficial aquifer system (SAS) is a shallow, unconfined aquifer that generally yields low quantities of water, and consists of mostly unconsolidated materials. The intermediate aquifer system (IAS) is confined and occurs within layers of sand and clay that, in most areas, separate the overlying surficial aquifer from the underlying Floridan aquifer system. The intermediate aquifer also acts predominantly as a confining layer for the underlying Floridan aquifer system. Due to the makeup of the sediments in this aquifer system it does not produce large quantities of water. The Floridan aquifer system (FAS) is a semi-confined aquifer and is capable of producing large amounts of water. The FAS is composed of sequential layers of limestone and dolomite and is traditionally subdivided into the upper and lower aquifers, which are separated by less productive horizons called the middle

confining unit. The FAS has historically been the primary source of water supply throughout the region.

Declines in groundwater levels, spring flows, river flows, lake levels, and wetlands, as well as increases in groundwater chloride concentrations, have occurred in the CFWI Planning Area. Therefore, alternatives to traditional groundwater need to be developed and implemented to meet the region's growing demands. Nontraditional or AWS sources are presented and described in **Chapter 6**. These sources include reclaimed water, brackish groundwater, surface water, seawater, and stormwater. Aquifer storage and recovery (ASR) systems have great potential to maximize the storage and utilization of surface water and reclaimed water by using the Floridan aquifer to store excess water for retrieval later as needed. Conservation measures by all users will continue to have an important role in managing increasing water demands and enabling water supply systems to support more users.

The Lower Floridan aquifer (LFA) has the potential to be a source of additional water in the CFWI Planning Area, and a number of studies are in progress to evaluate this potential source. However, limited water quality data exists within the LFA and our understanding of the potential local and regional impacts that could result from LFA pumping in areas of the region have not historically utilized this source. Studies should address these concerns prior to the LFA becoming a major source of additional water in areas lacking sufficient data.

Surface Water

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

Reclaimed Water

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

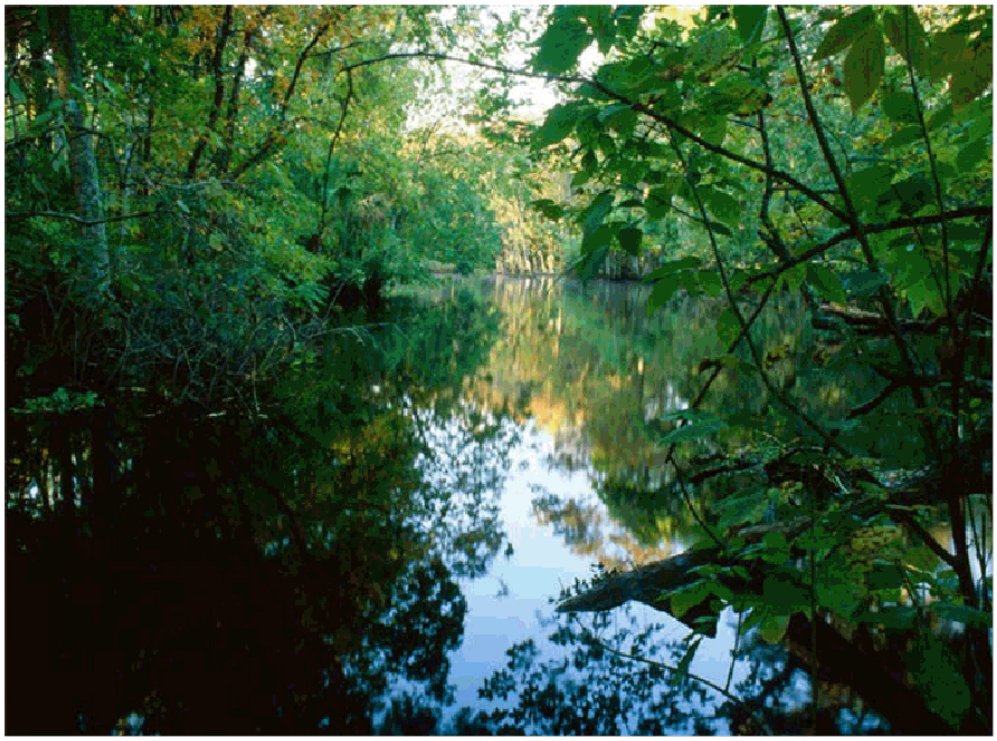
WATER SUPPLY PLANNING FOR THE NEXT 20 YEARS

Chapter 2 presents the population and water demand projections by water use category through 2035. The total population and total water demands in the CFWI Planning Area are projected to increase by approximately 49 and 40 percent, respectively. The projected water supply to meet the projected demand will come from a combination of traditional and alternative water supply sources.

The CFWI RWSP will be updated every five years as directed by Rule 62-40.531, F.A.C. Each update will address any changes in the economy, growth trends, water usage, water resource and natural systems, and water supply development progress. These updates will reflect changes in the demand estimates and projections while coordinating with the Districts' Consumptive Use Permitting Programs and incorporating changes to local governments' water supply facilities work plans.

NAVIGATE

The CFWI Regional Water Supply Plan (RWSP) consists of this Planning Document (Volume I) and Appendices (Volume IA). These documents are available from CFWIwater.com.



Wekiva River

2

Population and Water Demands

This chapter summarizes the comprehensive analysis of the demand for water for all use categories in the Central Florida Water Initiative (CFWI) Planning Area for the 2010 to 2035 planning period. This chapter describes the methods and assumptions used by the three Districts in projecting water demand for each county within their jurisdiction. SJRWMD and SWFWMD methods, assumptions, and water demand projections were developed in the most recent water supply plans and were vetted during a public input process. As part of the efforts to prepare a single regional water supply plan (RWSP) and to achieve consistency for the CFWI Planning Area, a Population and Water Demand Subgroup (Demand Subgroup) was formed to review and update population and water demand projections for the CFWI Planning Area. The Demand Subgroup consisted of SFWMD, SJRWMD, SWFWMD, Florida Department of Environmental Protection (FDEP), and Florida Department of Agriculture and Consumer Services (FDACS) staff, as well as utility and agricultural industry representatives from the CFWI Planning Area. The water demand projections are provided in five-year increments and include a discussion of important trends in demands. The water demand projections are to be updated at least once every five years commensurate with this CFWI RWSP pursuant to Rule 62-40.531, F.A.C. The guidance for development of population and demand projections for the CFWI RWSP is provided in Subsection 373.709(2), F.S. and Rule 62-40.531, F.A.C., which describe the minimum requirements for developing demand projections for regional water supply plans. In addition, general reporting conventions and calculations for drought condition (1-in-10 year) for the CFWI

TOPICS

Water Demand Categories

- Public Supply
- Domestic Self-supply
- Agriculture
- Commercial/Industrial/Institutional and Mining/Dewatering (CII and MD)
- Power Generation
- Landscape/Recreational/Aesthetic (LRA)

LAW/CODE

The plan shall be based on at least a 20-year planning period, shall be developed and revised in cooperation with other agencies, regional water supply authorities, units of government, and interested parties, and shall be updated at least once every 5 years (Subsection 373.036(2)(a), F.S.).

RWSP were guided by the documents developed by the Water Planning Coordination Group (WPCG) comprised of staff from FDEP and each of the state's five water management districts (WDPS 1998a, 1998b).

DEMAND ESTIMATES AND PROJECTIONS

Water demands for the public supply, domestic self-supply and small utility, agricultural, commercial/industrial/institutional and mining/dewatering, power generation, and landscape/recreational/aesthetic categories have been projected for each county in the CFWI Planning Area for the years 2010 through 2035. The 2010 water demand values used in this CFWI RWSP are planning projections. The projections were provided by each District based on their water supply planning efforts at the time the CFWI water supply planning began. Because the 2010 numbers are projections, they will not reflect the reported water use values for 2010. The methodologies used by each District to project demands vary for each water use category and are summarized in this chapter. The various methodologies used to project demands are described in more detail in **Volume IA, Appendix A**.

The water demand projections represent those reasonable-beneficial uses of water that are anticipated through the year 2035. Average condition (5-in-10 year) and drought condition (1-in-10 year) demands have been estimated in five-year intervals from 2010 to 2035 for each category. The water demand projections for Lake County reflect only the anticipated demands within the portion of the county in the CFWI Planning Area. Projections for the City of Cocoa are included in the CFWI RWSP, as the utility's water supplies are located within the CFWI Planning Area.

Estimated demand projections for each water use category are intended for planning purposes and do not include potential reductions that could be achieved by additional demand management measures. The use of water conservation and water supply sources to meet water demands are described in **Chapters 5** and **6.**

NAVIGATE

Chapter 5 describes potential conservation-related water use reduction methods.

Chapter 6 describes options for diversifying water supply sources.

Public Supply

The public supply category consists of utilities that have permitted average water use thresholds equal to or greater than 0.1 million gallons per day (mgd).

Potable Water Pump Station Large Diameter Water Main

Methodology for Projecting Population

The population projections developed by the University of Florida's Bureau of Economic and Business Research (BEBR) are generally accepted as the standard throughout Florida. In developing RWSPs, the Districts must consider BEBR medium population projections. [Section 373.709(2)(a)(1)(a), F.S.]. These projections are made at the county level only and require specific methods to distribute the county level projections among utility service providers.

SJRWMD and SWFWMD use a proprietary model that projects future permanent population growth at the census block level, distributes that growth based on growth drivers and inhibitors to parcels within each block, and normalizes those projections to BEBR Medium county projections. These methods are described in published reports (Doty 2009a, 2009b, 2011). For SJRWMD, the City of Cocoa, Seminole County, and the portions of Lake, Orange

(including all of Orange County Utilities (OCU) and Orlando Utilities Commission (OUC)), and Osceola counties located in SJRWMD were included in the model. For SWFWMD, the portions of Lake and Polk counties located in SWFWMD were included in the model. The SJRWMD and SWFWMD methodologies are described in **Volume IA**, **Appendix A**.

The SFWMD coordinates with public supply utilities to prepare a currently served and future service area maps, distribute current population to the traffic analysis zone (TAZ) boundary level, distribute BEBR Medium county projections using a percent share method, and coordinate with utilities to understand their planned future growth, adjust growth rates, and establish projections. The SFWMD projection area included the portions of Orange (excluding OCU and OUC), Osceola, and Polk counties located in SFWMD. The SFWMD methodology is described in **Volume IA**, **Appendix A**.

The original 2010 population projections of each District were updated to reflect 2011 published BEBR Medium permanent resident population projections, current service area boundaries, and 2006 to 2010 five-year average gross per capita rates (Smith and Rayer 2011).

Population Projections

Table 1 shows the projected public supply population for the planning period from 2010 to 2035. The permanent population in the CFWI Planning Area is expected to increase by 1,315,124 or 51 percent. Population projections for each utility can be found in **Volume IA**, **Appendix A, Table A-1**.

Table 1. Public supply population projections for the CFWI Planning Area.

County / City	Permanent Resident Population Projections						2010-2035 Change	2010-2035 Percent Change
	2010	2015	2020	2025	2030	2035		
City of Cocoa	173,445	183,644	194,956	205,230	215,019	224,781	51,336	30%
Lake	130,229	149,914	171,722	193,880	216,532	237,314	107,085	82%
Orange	1,127,098	1,235,208	1,362,603	1,485,046	1,600,443	1,707,286	580,188	51%
Osceola	202,198	253,108	303,718	354,661	405,938	453,751	251,553	124%
Polk	547,344	592,082	644,124	695,952	744,727	789,760	242,416	44%
Seminole	410,787	432,451	457,116	473,558	485,070	493,333	82,546	20%
Total	**2,591,101**	**2,846,407**	**3,134,239**	**3,408,327**	**3,667,729**	**3,906,225**	**1,315,124**	**51%**

Methodology for Water Demand Projections

Public supply use for each utility was derived by multiplying its average 2006 to 2010 unadjusted gross per capita rate by its projected population for that five-year increment shown in **Table 1**. Population served and water use data used to calculate the average gross per capita for each utility were derived from the Estimated Water Use Reports (Jackson and White 2012; Nourani and Antoine 2008, 2009; Nourani and Bader 2009; Scott and White

2011), Annual Water Use Data Reports (Hornsby 2007, 2008; SJRWMD 2009, 2010, 2011), and FDEP Monthly Operating Reports. These per capita data had been previously collected and analyzed by the Districts or from data provided as part of the Districts' most recent water supply planning process.

Water Demand Projections

Table 2 shows the projected public supply demand (unadjusted for additional conservation) for the planning period from 2010 to 2035. Water demand in the CFWI Planning Area is expected to increase by 218.31 mgd or 50 percent for the average year (5-in-10 year) condition. Demand projections for each utility are presented in **Volume IA, Appendix A, Table A-1**.

Table 2. Public supply water demand projections (mgd) for the CFWI Planning Area.

County / City	Water Demand Projections (5-in-10)						2035 1-in-10 Demand	2010-2035 (5-in-10) Change	2010-2035 (5-in-10) Percent Change
	2010	2015	2020	2025	2030	2035			
City of Cocoa	23.76	25.16	26.71	28.12	29.46	30.79	32.64	7.03	30%
Lake	29.08	33.39	38.51	43.79	48.85	53.25	56.45	24.17	83%
Orange	201.84	219.18	241.11	262.41	281.43	297.66	315.53	95.82	47%
Osceola	38.05	46.43	54.93	63.81	73.12	81.83	86.74	43.78	115%
Polk	80.65	87.20	94.75	102.24	109.28	115.71	122.65	35.06	43%
Seminole	62.65	65.92	69.56	72.06	73.80	75.10	79.60	12.45	20%
Total	**436.03**	**477.28**	**525.57**	**572.43**	**615.94**	**654.34**	**693.61**	**218.31**	**50%**

Note: mgd = million gallons per day

Considerations

The Subgroup used the best available data for determining public supply needs. SJRWMD has not updated model inputs, other than developments of regional impact, since 2006. The BEBR Medium projections capture the projected CFWI Planning Area rate of growth for the permanent population. However, using the permanent population may not, for some utilities, incorporate some of the important demand drivers inherent to public supply service areas, such as seasonal population, short-term rental population, or tourist population. The Subgroup created a scenario for the public supply utilities which involved updating their respective existing population projections proportionally by county based on the BEBR High population projections published in 2011 (Smith and Rayer 2011). The results from this scenario can be found in **Volume IA, Appendix A, Tables A-9** to **A-16.** The projected population and projected demand for the region in 2035 has the potential to be 15 percent and 14 percent higher, respectively (**Table A-15**).

The use of gross per capita rates is nationally recognized as standard methodology for water supply planning. However, this practice assumes that past water use is predictive of

future water use and incorporates the current economic conditions and current rates of reclaimed water use and water conservation into the future projections. Factors such as conservation, less landscape irrigation with potable water, and increases in multifamily housing can decrease the gross per capita rates. Conversely, expanded tourism and other commercial development, larger irrigated lots, and increases in single-family housing can increase the gross per capita rates. Factors affecting gross per capita rates and public supply water demands will be captured during future water supply plan updates.

The data used to calculate the Districts' most recent five-year average gross per capita is a combination of FDEP's monthly operating report data and metered data. Although both are valid methodologies, they may produce differing results.

Domestic Self-supply and Small Utility

The domestic self-supply and small utility (DSS) category consists of two subcategories: (1) small utilities that have permitted or annual average water use thresholds below 0.1 mgd, and (2) domestic self-supply (individual private homes or businesses that are not utility customers and receive their water from wells that do not require a consumptive use permit). The population and water demand projections for the DSS category include estimates for both subcategories.

Methodology for Projecting Population

The DSS population projections are calculated as the difference between the total BEBR Medium county projections (Smith and Rayer 2011) and the population projections estimated for utility service areas.

Population Projections

Table 3 shows the projected DSS population for the planning period from 2010 to 2035. The population in the CFWI Planning Area is expected to increase by 47,837 or 29 percent. Although the overall DSS population in the CFWI Planning Area is projected to increase, there are counties in which the DSS population is expected to decrease. This is a result of the expansion of public supply systems and the conversion of DSS residents to a public supply system. Population projections are presented in **Volume IA**, **Appendix A**, **Table A-3**.

Table 3. Domestic self-supply population projections for the CFWI Planning Area.

County	Population Projections						2010-2035 Change	2010-2035 Percent Change
	2010	2015	2020	2025	2030	2035		
Lake	13,486	15,950	17,789	20,445	23,190	25,080	11,594	86%
Orange	18,858	16,792	14,997	13,554	12,157	10,414	−8,444	−45%
Osceola	66,487	57,292	54,082	49,339	42,062	35,249	−31,238	−47%
Polk	54,751	62,518	69,776	76,348	83,773	91,940	37,189	68%
Seminole	11,931	12,849	15,084	24,642	37,230	50,667	38,736	325%
Total	**165,513**	**165,401**	**171,728**	**184,328**	**198,412**	**213,350**	**47,837**	**29%**

Methodology for Water Demand Projections

The per capita rate for the DSS category was derived by multiplying the average 2006 to 2010 county residential per capita rate by the projected DSS population for each county. The water use data used were the same as described in the public supply category.

Water Demand Projections

Table 4 shows the projected DSS demand for the planning period from 2010 to 2035. Demand in the CFWI Planning Area is expected to increase by 4.06 mgd or 20 percent for the average year (5-in-10) condition. Demand projections are presented in **Volume IA, Appendix A, Table A-3**.

Table 4. Domestic self-supply water demand (mgd) projections for the CFWI Planning Area.

County	Water Demand Projections						2035 1-in-10 Demand	2010-2035 (5-in-10) Change	2010-2035 (5-in-10) Percent Change
	2010	2015	2020	2025	2030	2035			
Lake	1.75	2.09	2.34	2.71	3.09	3.35	3.55	1.60	91%
Orange	2.37	2.15	1.96	1.80	1.64	1.46	1.55	−0.91	−38%
Osceola	8.80	7.56	7.13	6.50	5.55	4.66	4.94	−4.14	−47%
Polk	6.29	7.16	7.84	8.43	9.10	9.83	10.42	3.54	56%
Seminole	1.15	1.26	1.48	2.48	3.75	5.12	5.43	3.97	345%
Total	**20.36**	**20.22**	**20.75**	**21.92**	**23.13**	**24.42**	**25.89**	**4.06**	**20%**

Note: mgd = million gallons per day

Considerations

DSS water use is typically not metered, thus estimates of future demand are based on reasonable assumptions of water use. If these assumptions are incorrect, the resulting demand could be either higher or lower than anticipated. This limitation is expected to have little impact on estimating total water use in the CFWI Planning Area as any estimate of increased residential water demand will be either captured by this category or by the public supply category.

Agriculture

Agriculture is the second largest category of water use in the CFWI Planning Area. This category includes the self-supplied irrigation of crops and other miscellaneous water uses associated with agricultural production. Irrigated acreage and projected water demands were determined for a variety of crop categories, such as citrus, vegetables, melons, berries, field crops, greenhouse/ nursery, sod, and pasture. In addition, only SFWMD and SWFWMD included projected demands associated with other agriculture, such as aquaculture, dairy/cattle, poultry, and swine, which are reported as miscellaneous type uses.

Field Crop - Broccoli

Methodology for Acreage Projections

Each District calculated agricultural acreage projections for crop types using their standard methodology. The methodologies are comprehensively described in published reports (SFWMD 2010; Doty 2011; SWFWMD 2011c) and briefly summarized below.

Acreage projections for the portions of Orange, Osceola, and Polk counties in SFWMD were formulated based on a cumulative review of the information through geographic information system (GIS)/permitting analysis, analysis of historical Florida Agricultural Statistics Service (FASS) data, market trends, agricultural agency and stakeholder input, and other sources. SFWMD combined land use/land cover information from 2005 aerial photography with a GIS analysis to create a baseline of existing acreage.

Acreage projections for Seminole County and the portions of Lake and Orange counties located in SJRWMD were based on the existing 2005 agricultural spatial layer and the acres projected to intersect with population growth developed by the proprietary model discussed in the public supply section. For the portion of Osceola County in SJRWMD, the 2010 agricultural acreage was determined based on data received from county extension agents (University of Florida [UF]/ Institute of Food and Agricultural Science [IFAS]) (UF/IFAS). For each subsequent 5-year increment in the planning horizon, the percent change from 2002 to 2007 in acreage for farms with irrigated acres in Osceola County based on FASS data was applied.

Acreage projections for the portions of Lake and Polk counties in SWFWMD were formulated using a base year of 2005 and based on analyses of GIS, permitting data, analysis of historical FASS data, and other sources. SWFWMD's GIS resources were used to compare the agricultural water use permitting information and land use/land cover property appraiser parcel data for each county and to record the future land use for each parcel and permitted area. Aerial photography provided another layer of information for land use/land cover analysis and commodity category determination.

Acreage Projections

Table 5 shows the projected agricultural acreage in the CFWI Planning Area for the planning period. Agricultural acreage is expected to increase by 12,894 acres or 9 percent from 2010-2035. The majority of this increase is related to the production of energy crops in Osceola County. Agricultural acreage and demand is projected to decrease in other counties because of projected population growth, the conversion of agricultural lands to residential, commercial or industrial use, and the influence of agricultural market trends in the region. Acreage projections by county, District, and crop type can be found in **Volume IA**, **Appendix A, Tables A-17** through **A-19**.

Table 5. Agricultural acreage projections for the CFWI Planning Area.

County	Total Acreage Projected						2010-2035 Change	2010-2035 Percent Change
	2010	2015	2020	2025	2030	2035		
Lake	17,275	16,776	16,276	15,776	15,278	14,782	−2,493	−14%
Orange	12,748	10,501	9,218	8,043	7,306	5,895	−6,853	−54%
Osceola	28,393	52,030	52,543	53,176	54,161	54,773	26,380	93%
Polk	88,614	88,142	88,026	87,910	87,794	87,677	−937	−1%
Seminole	4,591	3,950	3,310	2,669	2,029	1,388	−3,203	−70%
Total	**151,621**	**171,399**	**169,373**	**167,574**	**166,568**	**164,515**	**12,894**	**9%**

Methodology for Water Demand Projections

The Districts calculated average demand projections for irrigated commodities using different methodologies. SFWMD and SWFWMD determined demands (for the respective areas as noted above) by multiplying projected irrigated acreage by the irrigation requirements of each crop type (based on Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) and Agricultural Water Use Model (AGMOD), respectively). For the portions of Lake, Orange, and Seminole counties in SJRWMD, demands were determined by multiplying the percentage change in agricultural acreage (2005 to 2035) by the 2005 agricultural self-supply water use as reported in the Annual Water Use Data Report (SJRWMD 2005a). Demand projections for the portion of Osceola County in SJRWMD were determined by multiplying projected irrigated acreage by the irrigation requirements of each crop type (based on Modified Blaney-Criddle). The estimates for miscellaneous type

uses, such as aquaculture, equestrian, dairy/cattle, poultry, and swine are based on regulatory data or a per head water use rate.

Water Demand Projections

Table 6 shows the projected agricultural demand for the planning period from 2010 to 2035. Overall, CFWI Planning Area agricultural average demands are expected to increase by 29.60 mgd or 16 percent by 2035. Agricultural demands are projected to increase in Osceola County, while decreases are projected to occur in all other counties. Agricultural demand projections by crop type and for miscellaneous uses can be found in **Volume IA, Appendix A, Tables A-17** to **A-19**.

Table 6. Agricultural water demand (mgd) projections for the CFWI Planning Area.

County	Water Demand Projections						2035 1-in-10 Demand	2010-2035 (5-in-10) Change	2010-2035 (5-in-10) Percent Change
	2010	2015	2020	2025	2030	2035			
Lake	11.17	10.83	10.38	10.04	9.70	9.35	13.62	−1.82	−16%
Orange	17.21	15.44	13.66	11.86	10.09	8.30	13.32	−8.91	−52%
Osceola	53.75	91.03	93.00	95.27	97.87	100.83	160.15	47.08	88%
Polk	95.75	95.14	94.89	94.64	94.38	94.13	130.69	−1.62	−2%
Seminole	7.36	6.34	5.31	4.28	3.26	2.23	3.40	−5.13	−70%
Total	**185.24**	**218.78**	**217.24**	**216.09**	**215.30**	**214.84**	**321.18**	**29.60**	**16%**

Note: mgd = million gallons per day

Considerations

Agricultural acreages and water demands are difficult to predict because they depend upon the choices individual agricultural producers make from year to year. Those choices are affected by numerous factors, including weather, markets, disease, proprietary information, and demand for agricultural land for other uses. SJRWMD and SWFWMD projections were based on existing respective water supply plans that relied on BEBR population projections that project continued population growth and development, and corresponding declines in agricultural acreage and water use (Smith 2008, 2009). Agricultural projections can be volatile and it is uncertain how population changes/future land use conversions may affect them.

The Districts each use different methods and land use coverages for projecting acreage and water demands. In 2013, Chapter 373.709, F.S. was amended to provide that for future water supply plans, the FDACS provide data indicative of future Agriculture Self-Supply water demands. Any adjustments of or deviation from the data provided by FDACS must be described and presented along with the original data.

As stated earlier in the chapter, the 2010 data are based on projections. This resulted in inconsistencies between data in the plan and data that are now available. For example, 2010 water use data show increases in agricultural water use from 2005 to 2010 for some counties in the CFWI Planning Area. However, this CFWI RWSP projects decreases for those counties in 2010 and throughout the planning period. In addition, the 2010 water use data indicate that the acreage for some crops (e.g., blueberries) expanded rapidly from 2005 to 2010; however, this expansion is not reflected in the plan.

It is difficult to project acreage and water use demands for crops that are relatively new or expanding rapidly because there are limited data available upon which to base projections. Biofuel feedstocks and blueberries could potentially have increased acreage during the planning period, resulting in increased agricultural water demands. The single biofuel feedstock project included in this CFWI RWSP suggests that biofuel feedstock production can significantly increase agricultural water demands in the future. Although central Florida accounts for 35 percent of the state's blueberry acreage and has been identified as an area with potential for expansion in the future (UF/IFAS 2012), this plan does not project any increased acreage for blueberry production.

Agricultural demand projections used in the CFWI planning process generally assume that agricultural water use will change in direct proportion to changes in acreage. However, increased agricultural water use also can occur when the number of acres remains constant or even declines if more intensive crop production methods are used. Double or triple cropping and converting to more water intensive crops are examples of production changes that could result in increased water use per irrigated acre. The CFWI projections did not consider uses proposed in pending water use permit applications because of the uncertainty inherent in the permit application process. In addition, the SFWMD projections include no irrigated pasture acreage and any future demands associated with conversion of these acres are not included in the CFWI planning process.

Commercial/Industrial/Institutional and Mining/Dewatering

This category represents the self-supplied water use associated with the production of goods or provisions of services by commercial, industrial, and institutional (CII) establishments. This category also includes the use of water associated with mining and long-term dewatering operations (MD). Commercial uses include general businesses, office complexes, commercial cooling and heating, bottled water, food and beverage processing restaurants, gas stations, hotels, car washes, laundromats, and water used in zoos, theme parks, waterslides, and other attractions. Industrial uses include manufacturing and chemical processing plants and other industrial facilities; spraying water for dust control; maintenance, cleaning, and washing of structures and mobile equipment; and the washing of streets, driveways, sidewalks, and similar areas. Institutional uses include hospitals, group home / assisted living facilities, churches, prisons, schools, universities, military bases, and other types of institutions. Mining uses include water associated with the extraction, transport, and processing of subsurface materials and minerals. Dewatering includes the removal of water to control surface or groundwater levels during construction

or excavation activities. Short-term dewatering activities and landscape irrigation of the property around the CII facilities in SFWMD are not included in this category.

Methodology for Water Demand Projections

For SJRWMD and SWFWMD, water demand for the CII and MD category incorporated historical water use trends, percent of historical permitted water use, and trends in population growth. For SFWMD, CII and MD water demand is derived from the District's water use permitting database and, where available, reported water use. The methodologies are described in published reports (SFWMD 2012; Doty 2011; SWFWMD 2011c). This type of water demand was not found to vary significantly during drought conditions (1-in-10 year); therefore, the average and 1-in-10 demands are the same.

Water Demand Projections

Water demand by the CII and M/D category is expected to increase by 21.80 mgd or 29 percent by 2035 (see **Table 7**). While the overall trend for the CFWI Planning Area is an increase in CII and M/D, there are expected decreases in Polk and Seminole counties as a result of conversion or hook-up to a public supply utility, market trends, and trends in decreasing self-supply. The CII/ and MD water demand projections by county and District can be found in **Volume IA, Appendix A, Table A-5**.

Table 7. Commercial/Industrial/Institutional and Mining/Dewatering water demand (mgd) projections in the CFWI Planning Area.

County	Water Demand Projections						2035 1-in-10 Demand	2010-2035 (5-in-10) Change	2010-2035 (5-in-10) Percent Change
	2010	2015	2020	2025	2030	2035			
Lake	7.75	9.96	12.17	14.38	16.60	18.82	18.82	11.07	143%
Orange	10.31	12.13	14.16	16.44	19.02	21.59	21.59	11.28	109%
Osceola	0.64	0.76	0.92	1.11	1.33	1.55	1.55	0.91	142%
Polk	54.99	48.30	49.20	50.64	52.12	53.70	53.70	−1.29	−2%
Seminole	0.36	0.32	0.29	0.25	0.22	0.19	0.19	−0.17	−47%
Total	**74.05**	**71.47**	**76.74**	**82.82**	**89.29**	**95.85**	**95.85**	**21.80**	**29%**

Note: mgd = million gallons per day

Considerations

Projections can be challenging because growth plans are often considered proprietary until the projects become public and there is considerable turnover in the number of permits in the CII and MD category.

Power Generation

This category represents the self-supplied water use associated with power plant and power generation facilities. Power generation includes the use of water for steam generation, cooling, and replenishment of cooling reservoirs.

Methodology for Water Demand Projections

The Districts incorporated historical water use trends, percent of historical permitted water use, trends in population growth, and power generation facilities' 10-year site plans to estimate future power generation demands. The methodologies are described in published reports (SFWMD 2012a; Doty 2011; SWFWMD 2011c). Because power generation water demand was not found to vary significantly during drought conditions (1-in-10 year), the average and 1-in-10 demand projections are the same.

Water Demand Projections

Table 8 shows the projected power generation demand projections for the planning period from 2010 to 2035. Power generation demands are expected to increase by 5.21 mgd or 30 percent. Power generation demand projections by county and District can be found in **Volume IA, Appendix A, Table A-6**.

Table 8. Power generation water demand (mgd) projections for the CFWI Planning Area.

County	Water Demand Projections						2035 1-in-10 Demand	2010-2035 (5-in-10) Change	2010-2035 (5-in-10) Percent Change
	2010	2015	2020	2025	2030	2035			
Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%
Orange	0.89	1.02	1.16	1.29	1.42	1.55	1.55	0.66	74%
Osceola	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.00	0%
Polk	15.35	15.95	16.81	17.75	18.80	19.90	19.90	4.55	30%
Seminole	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%
Total	**17.20**	**17.93**	**18.93**	**20.00**	**21.18**	**22.41**	**22.41**	**5.21**	**30%**

Note: mgd = million gallons per day

Considerations

The Districts rely on voluntary data and cooperation from stakeholders, as not all facilities are required to report water use to the Districts and/or are exempt from obtaining water use permits from the Districts. In addition, most facility site plans only include projections for 10 years, while this CFWI RWSP projects water demand through 2035.

Landscape/Recreational/Aesthetic

The landscape, recreational and aesthetic (LRA) category represents the self-supplied water use associated with the irrigation, maintenance, and operation of golf courses, cemeteries, parks, medians, attractions, and other large self-supplied green areas. Landscape use includes the outside watering of plants, shrubs, lawns, ground cover, trees, and other flora in such diverse locations as the common areas of residential developments and industrial buildings, parks, recreational areas, cemeteries, public right-of-ways, and medians. Recreational use includes the irrigation of recreational areas such as golf courses, soccer, baseball and football fields, and playgrounds. Water-based recreation use is also included in this category, which includes public or private swimming and wading pools, and other water-oriented recreation such as water slides. Aesthetic includes fountains, waterfalls, and landscape lakes and ponds where such uses are ornamental and decorative. SFWMD does not issue consumptive use permits to aesthetic uses. Therefore, only aesthetic uses in SJRWMD and SWFWMD are included in the projection estimates.

Walt Disney World Magnolia Golf Course

The LRA category also includes projections for miscellaneous irrigation or additional irrigation demand. Miscellaneous irrigation use represents wells that are less than six inches in diameter, and those uses that have a permit by rule, and are used for irrigation at residences that receive potable water for indoor use from a utility. Miscellaneous irrigation

use is only projected for those areas within the SWFWMD boundaries of the CFWI Planning Area.

Methodology for Acreage Projections

Although the acreage projection methods differ slightly between the Districts all methods incorporated historical acreages, permitted data, historical golf course trends, and also examined population growth trends. SFWMD also incorporates data from the golf course industry to identify the rate of future growth. The methodologies are described in published reports (SFWMD 2012; Doty 2011; SWFWMD 2011c). The methodology for projecting the number of miscellaneous irrigation wells in the SWFWMD is addressed in a separate report (Smith 2004). SWFWMD estimates that approximately 300 gallons per day are used for each well.

Acreage Projections

Table 9 shows the projected LRA acreage projections for the planning period. LRA acreage is projected to increase by 7,601 acres or 90 percent by 2035. Acreage projections by county and District can be found in **Volume IA, Appendix A, Table A-7**.

Table 9. Landscape/Recreational/Aesthetic acreage projections for the CFWI Planning Area.

County	Total Acreage Projections						2010-2035 Change (acres)	2010-2035 Percent Change
	2010	2015	2020	2025	2030	2035		
Lake	1,491	1,706	1,919	2,132	2,348	2,558	1,067	72%
Orange	4,948	5,136	5,961	6,860	7,841	8,791	3,843	78%
Osceola	1,156	1,299	1,689	2,111	2,573	2,773	1,617	140%
Polk	142	194	246	299	352	405	263	185%
Seminole	667	830	991	1,154	1,315	1,478	811	122%
Total	**8,404**	**9,165**	**10,806**	**12,556**	**14,429**	**16,005**	**7,601**	**90%**

Methodology for Water Demand Projections

Although the water demand projection methods differ slightly between Districts, all methods incorporated historical water use trends and percent of historical permitted water use.

Water Demand Projections

Table 10 shows the projected LRA demand projections for the planning period from 2010 to 2035. LRA demand is expected to increase by 31.97 mgd or 80 percent. Water demand projections by county and District can be found in **Volume IA, Appendix A, Table A-7**. The projected number of wells and miscellaneous irrigation demand projections for the SWFWMD can be found in Smith (2004).

Table 10. Landscape/Recreational/Aesthetic water demand (mgd) projections for the CFWI Planning Area.

County	Water Demand Projections [a]						2035 1-in-10 Demand	2010-2035 (5-in-10) Change	2010-2035 (5-in-10) Percent Change
	2010	2015	2020	2025	2030	2035			
Lake	3.81	4.36	4.90	5.44	5.99	6.53	8.41	2.72	71%
Orange	11.85	12.45	14.37	16.44	18.68	22.59	26.46	10.74	91%
Osceola	2.71	3.04	3.95	4.94	6.02	6.49	7.60	3.78	139%
Polk	17.95	20.09	22.05	23.99	25.95	27.95	35.48	10.00	56%
Seminole	3.89	4.84	5.78	6.73	7.67	8.62	11.10	4.73	122%
Total	**40.21**	**44.78**	**51.05**	**57.54**	**64.31**	**72.18**	**89.05**	**31.97**	**80%**

Note: mgd = million gallons per day

[a] Demand projections include miscellaneous irrigation

Considerations

SWFWMD is currently the only district that projects water demand for miscellaneous irrigation use (additional irrigation demand). The miscellaneous irrigation water use is typically not metered, thus estimates of future demand are based on reasonable assumptions of water use.

Stakeholder Review

Population, agricultural acreages and water demand projection methodologies, results, and analyses used in their most recent water supply planning process and carried into this CFWI planning process were provided to the Districts' water use regulation staff and stakeholders for review. Changes suggested by stakeholders were incorporated only if they were based on approved methodologies and supported by complete documentation. Stakeholders also provided input to the CFWI RWSP water demand projections. Comments from stakeholders can be found in **Volume IA, Appendix A; Table A-21**.

SUMMARY

The Districts estimated water demand projections are for counties or portions of counties located within the CFWI Planning Area and represent those reasonable-beneficial uses of water that are anticipated to occur through 2035. Total water demand does not account for reductions that could be achieved by additional demand management measures such as water conservation.

While it was understood that the planning demand projection methodology differed among the Districts, changes were made in nearly all Districts population projection methodologies to help achieve some consistency. These changes make it inappropriate to compare the

planning demand projections in this CFWI RWSP with current or in-progress District RWSPs or projections produced by individual Districts for use in consumptive use permitting.

Overall, for the CFWI Planning Area, water demand for all use categories is expected to increase by 310.95 mgd or 40 percent by the year 2035. **Table 11** shows the demand projection summaries for each water use category. The public supply category shows the largest increase in water demand for the CFWI Planning Area with an additional need of 218.31 mgd, representing 70 percent of the total additional demand. The LRA category is projected to have a high percent increase in water use (80 percent).

Table 11. Summary of projected water demand (mgd) in the CFWI Planning Area.

Category	Water Demand Projections						2035 1-in-10 Demand	2010-2035 (5-in-10) Change	2010-2035 (5-in-10) Percent Change
	2010	2015	2020	2025	2030	2035			
Public Supply									
	436.03	477.28	525.57	572.43	615.94	654.34	693.61	218.31	50%
Domestic Self-supply and Small Utilities (DSS)									
	20.36	20.22	20.75	21.92	23.13	24.42	25.89	4.06	20%
Agriculture									
	185.24	218.78	217.24	216.09	215.30	214.84	321.18	29.60	16%
Commercial/Industrial/Institutional and Mining/Dewatering (CII and MD)									
	74.05	71.47	76.74	82.82	89.29	95.85	95.85	21.80	29%
Power Generation									
	17.20	17.93	18.93	20.00	21.18	22.41	22.41	5.21	30%
Landscape/Recreational/Aesthetic (LRA)									
	40.21	44.78	51.05	57.54	64.31	72.18	89.05	31.97	80%
Total	**773.09**	**850.46**	**910.28**	**970.80**	**1,029.15**	**1,084.04**	**1,247.99**	**310.95**	**40%**

Note: mgd = million gallons per day.

3

Resource Protection and Assessment Criteria

Water supply to meet the demands described in **Chapter 2** is largely dependent on the availability of water resources. Understanding the relationship and effect of meeting existing and future water demands on the natural system is critical to water supply planning. This chapter provides an overview and summary of the resource protection tools, definitions, statutory and rule criteria, and their relationship to each other and the related assessment criteria used in this CFWI RWSP.

REGULATORY PROTECTION OF WATER RESOURCES

- Consumptive use permitting addresses the use of water resources so that the water resource is protected from harm (Section 373.219, F.S.).
- Minimum Flow and Level (MFL) criteria define the point at which further withdrawals will be significantly harmful to the water resources or the ecology of the area (Sections 373.042 and 373.0421, F.S.).
- Water reservations set aside water for the protection of fish and wildlife or public health and safety. Reserved water is not available to be allocated to consumptive uses (Subsection 373.223(4), F.S.).
- Water shortage restrictions are used to limit water use when sufficient water is temporarily unavailable to meet user needs or when conditions require temporary reductions in use to prevent serious harm to water resources (Sections 373.175 and 373.246, F.S.).

Chapter 373, F.S., directs Florida's water resources shall be managed to ensure their sustainability (Section 373.016, F.S.). Each District has developed water resource protection standards or regulatory tools consistent with this legislative direction. These regulatory tools are discussed in this chapter and are summarized in **Volume IA**, **Appendix B, Table B-1** and include

Consumptive Use Permitting

Pursuant to the provisions of Section 373.223, F.S., an applicant seeking a consumptive use permit must provide reasonable assurances to the respective District that the proposed use of water

1) Is a reasonable-beneficial use as defined in Section 373.019, F.S.
2) Will not interfere with any existing legal use of water
3) Is consistent with the public interest

Each District specifies the procedures and criteria used by District staff to review consumptive use permit applications in adopted rules and incorporated documents commonly referred to as a Basis of Review or Applicant's Handbook. These criteria direct applicants on how to provide reasonable assurances to meet the conditions for issuance, including how to demonstrate demand, complete assessments on the potential for impacts, and request a permit duration.

- Saltwater intrusion
- Wetland and other surface waters
- Pollution
- Impacts to off-site land uses
- Use of reclaimed water
- Interference with existing legal uses
- Minimum Flows and Levels
- Water Reservations
- Restricted Allocation Areas within SFWMD

Permits are conditioned to ensure uses are consistent with the overall objectives of the District and are not harmful to the water resources of the area (Section 373.219, F.S). Conditions for issuance of a consumptive use permit address multiple issues, including but not limited to

Level of Certainty

The consumptive use permitting program allocates water to accommodate this variability in demand by establishing a level of certainty linked to a drought condition. If a water shortage declaration is issued, a permit holder can expect temporary reductions in allocation through implementation of water shortage criteria (Sections 373.175 and 373.246, F.S.). In wet years, permit holders are expected to use less water than allocated. Permitting to a level of certainty allows for economic certainty in access to water.

The Florida legislature established a 1-in-10 year drought event level of certainty planning goal [Section 373.709(2)(a), F.S.]. Each District has implemented a level of certainty commensurate with the need for resource protection. SFWMD uses the planning goal in its consumptive use permitting program; therefore SFWMD permit applicants must demonstrate the conditions for permit issuance permit are satisfied during a 1-in-10 year drought condition. Demands are calculated assuming the 1-in-10 year drought condition and impacts resulting from a proposed withdrawal are analyzed during this same drought event. Permit applicants for irrigation uses in SWFWMD and SJRWMD must demonstrate the conditions for permit issuance are satisfied during a 2-in-10 year drought condition, except within the SWFWMD's Southern Water Use Caution Area (which includes most of Polk County) where a 5-in-10 year drought condition is used for crops that receive effective rainfall.

Impact Evaluation Criteria

Impact evaluation criteria are applied to various resource functions and existing legal user interference criteria to establish the hydrologic change that can occur without causing harm. For the purposes of consumptive use allocation, the harm standard addresses each of the following

- Saltwater intrusion
- Wetland and other surface water bodies
- Aquifer mining
- Pollution movement
- Off-site land uses
- Existing legal users

Minimum Flows and Levels (MFLs)

Section 373.042, F.S., requires the FDEP or the Districts to establish minimum flows for surface watercourses and minimum levels for both groundwater and surface water. MFLs represent the level at which further withdrawals would be significantly harmful to the water resources or ecology of the area. MFLs are adopted by administrative rule for priority water bodies and calculated using the best information available.

Each District is required to submit an annual priority list and schedule for the establishment of MFLs to FDEP for approval. The priority list is based on the importance of waters to the state or region and the existence of or potential for significant harm to the water resources or ecology of the region. Considerations and exclusions associated with MFL establishment and implementation, including changes and structural alterations that affect hydrology, minimum water body size requirements, and whether a water body currently serves its historical hydrologic functions, are provided in Section 373.042 (1), F.S.

If the water body is below or projected to fall below existing MFL criteria, the District shall expeditiously develop and implement a recovery or prevention strategy. At the time the minimum flow or level is initially adopted, if the water body is below or projected to fall below the initial minimum flow or level, the District shall simultaneously develop and approve a recovery or prevention strategy with the MFL. The goal of a recovery strategy is to achieve the adopted MFL as soon as practicable. The recovery strategy must include the provision of sufficient water supplies for all existing and projected reasonable-beneficial uses, and may include the development of additional supplies, construction of new or improved storage facilities, and implementation of conservation or other efficiency measures. The strategy, when appropriate, should include development of additional water supplies, water conservation, and other efficiency measures concurrent with, to the extent practical, and to offset, reductions in permitted withdrawals, consistent with the provisions in Chapter 373, F.S.

St. Johns River – Middle Basin

A prevention strategy is developed concurrently with the adoption of the MFL or subsequent to adoption when the MFL's criteria are currently met, but are projected not to be met within the next 20 years. The goal of a prevention strategy is for the water body to continue to meet the established MFL criteria in the future. Both recovery and prevention strategies must include phasing or a timetable that allows for the provision of sufficient water supplies for all existing and projected reasonable-beneficial uses. These strategies must include provisions to provide sufficient water supplies for all existing and projected

reasonable-beneficial uses and may include the development of additional water supply and water resource projects.

The State Water Resource Implementation Rule 62-40.473, F.A.C., directs the Districts to consider environmental values associated with coastal estuarine, riverine, spring, aquatic, and wetlands ecology and express MFLs as one or more flows and levels defining a minimum hydrologic regime to establish the limit beyond which further withdrawals would cause significant harm. However, a minimum flow or level need not be expressed as multiple flows or levels if other resource protection tools, such as reservations implemented to protect fish and wildlife or public health and safety, that provide equivalent or greater protection of the hydrologic regime of the water body, are developed and adopted in coordination with the minimum flow or level.

Chapters 40C-8, 40D-8, and 40E-8, F.A.C., contain the adopted MFLs as well as definitions and the policy and purpose considerations used in the establishment of MFLs, and Chapter 40D-80 contains the regulatory portion of MFL Recovery and Prevention Strategies for certain MFLs. These MFLs are used in regulatory permitting programs as a resource constraint. These MFLs are also considered in the CFWI RWSP process to determine sustainable water supply.

Adopted and Proposed MFLs in the CFWI Planning Area

MFLs have been adopted for 46 water bodies, including 33 lakes or wetlands, 6 springs, and 7 river/stream systems (**Table 12**) within the SJRWMD and SWFWMD portions of the CFWI Planning Area. MFLs have not been adopted within the SFWMD portion of the CFWI Planning Area. The location of adopted and proposed MFLs in the East Central Florida Transient (ECFT) groundwater model domain are shown in **Figure 2**. Additional information on adopted and proposed MFLs is provided in **Volume IA**, **Appendix B**.

Twenty-eight water bodies within the CFWI Planning Area and 24 water bodies outside the CFWI Planning Area but within the ECFT groundwater flow model domain are currently scheduled for development or reevaluation of the MFLs. Reevaluation involves the review of the previously adopted MFL and, if appropriate, revising the MFL. Proposed MFLs have been developed for some of these water bodies, but have not yet been adopted as District rules.

Table 12. Lakes, wetlands, and rivers with adopted MFLs in the CFWI Planning Area.

Lakes	District	Grid
Cherry Lake	SJRWMD	A-2
Crooked Lake	SWFWMD	B-4
Crystal Lake	SWFWMD	B-4
Dinner Lake	SWFWMD	B-4
Eagle Lake	SWFWMD	B-4
Lake Annie	SWFWMD	B-4
Lake Bonnie	SWFWMD	B-4
Lake Brantley	SJRWMD	C-2
Lake Burkett	SJRWMD	C-2
Lake Clinch	SWFWMD	B-5
Lake Emma	SJRWMD	A-2
Lake Howell	SJRWMD	C-2
Lake Irma	SJRWMD	C-2
Lake Lee	SWFWMD	B-4
Lake Louisa	SJRWMD	B-2
Lake Lucy	SJRWMD	A-2
Lake Martha	SJRWMD	C-2
Lake Minneola	SJRWMD	B-2
Lake Mabel	SWFWMD	B-4
Lake McLeod	SWFWMD	B-4
Lake Parker	SWFWMD	A-4
Lake Pearl	SJRWMD	C-2
Lake Starr	SWFWMD	B-4
Lake Wailes	SWFWMD	B-4
Mills Lake	SJRWMD	D-2
North Lake Apshawa	SJRWMD	B-2

Lakes	District	Grid
North Lake Wales	SWFWMD	B-4
Pine Island Lake	SJRWMD	A-2
Prevatt Lake	SJRWMD	B-2
South Lake Apshawa	SJRWMD	B-2
Sylvan Lake	SJRWMD	C-2
Venus Lake	SWFWMD	B-4

Wetlands	District	Grid
Boggy Marsh	SJRWMD	B-3

Springs	District	Grid
Miami Spring	SJRWMD	C-2
Palm Spring	SJRWMD	C-2
Rock Spring	SJRWMD	B-2
Sanlando Spring	SJRWMD	C-2
Starbuck Spring	SJRWMD	C-2
Wekiwa Spring	SJRWMD	B-2

Rivers	District	Grid
Lake Monroe	SJRWMD	C-2
Peace River at Bartow	SWFWMD	A-4
Peace River at Ft. Meade	SWFWMD	B-5
St. Johns River at S.R. 50	SJRWMD	D-2
Taylor Creek	SJRWMD	D-3
Upper Hillsborough River	SWFWMD	A-3
Wekiva River at S.R. 46	SJRWMD	C-2

District = water management district; SJRWMD = St. Johns River Water Management District; SWFWMD = Southwest Florida Water Management District; Grid refers to **Figure 2**; reports on adopted MFLs for individual water bodies are available from the SWFMWD web site (http://www.swfwmd.state.fl.us/projects/mfl/mfl_reports.php) and the SJRWMD technical library.

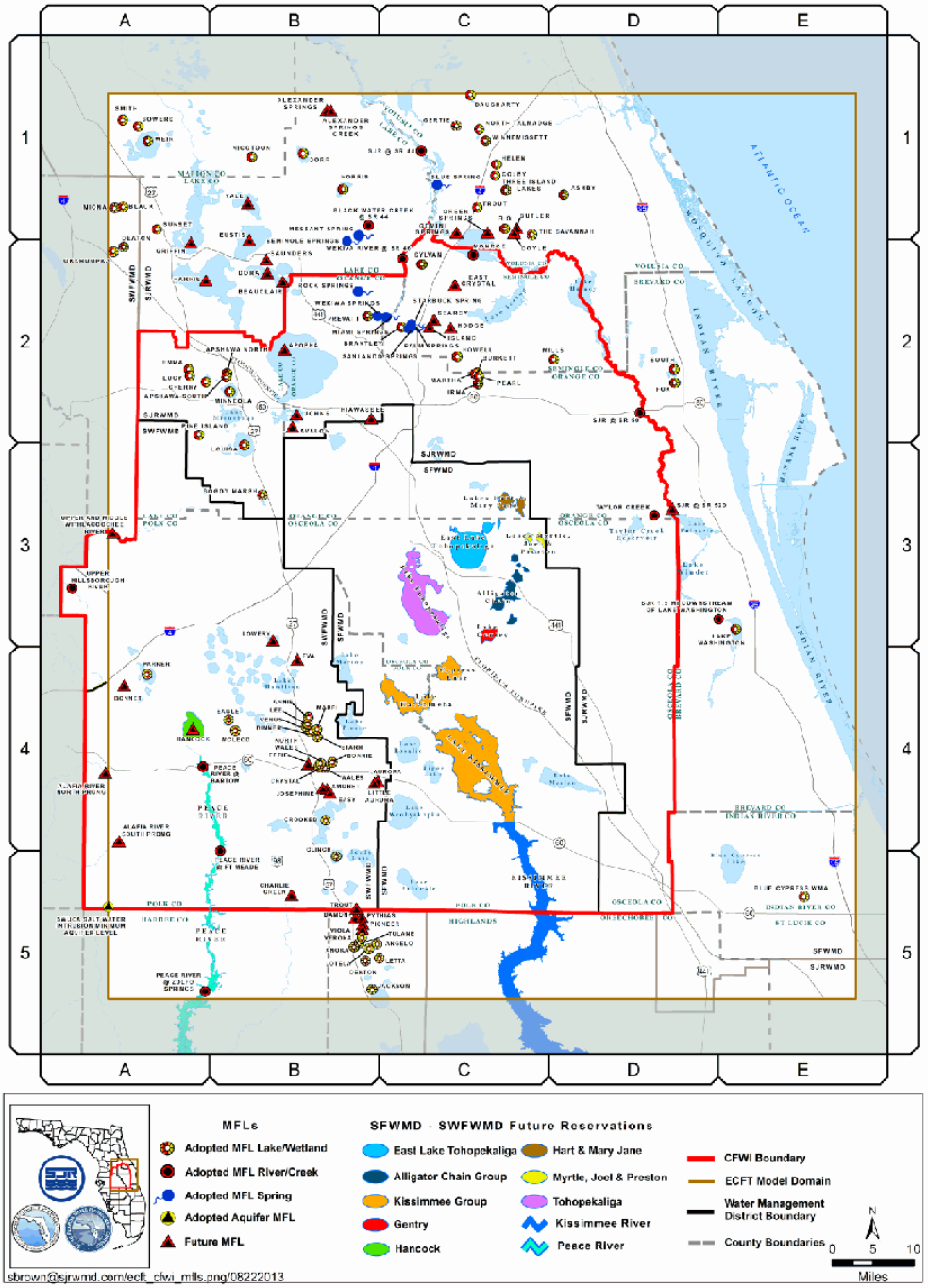


Figure 2. Locations of adopted and proposed MFLs and reservations in the CFWI Planning Area and ECFT groundwater model domain. (Proposed MFLs are subject to change; this figure represents proposed MFLs at the time of evaluation.)

Water Reservations

A water reservation rule sets aside water for the protection of fish and wildlife or public health and safety. When a volume of water is reserved, it is unavailable for allocation to water uses. Water reservations are developed based on existing water availability and/or consideration of future water supplies that water resource projects make available. Water reservations are adopted into rule by the Districts or FDEP. Reservations are subject to review at least every five years and revised if necessary (Section 373.223(4), F.S.; Rule 62-40.474 F.A.C.). All present existing legal uses of water are protected when adopting a reservation, so long as such use is not contrary to the public interest.

All Districts are required to submit an annual priority list and schedule for the establishment of reservations within their boundary to FDEP for approval.

The SWFWMD anticipates reserving from use water necessary to recover and protect MFLs established for the Southern Water Use Caution Area (SWUCA), a 5,100 square mile section of the District where lowered aquifer levels have caused salt water to intrude into the Floridan aquifer near the coast in a region identified as the Most Impacted Area (MIA) and contributed to reduced flows in the upper Peace River and lowered lake levels in portions of Polk and Highlands counties (SWFWMD 2006). Future reservations in the SWUCA will be established on a case-by-case basis to address water that is developed through water resource development projects designed to recover and maintain established MFLs. The SWFWMD anticipates adopting a reservation for Lake Hancock, which is located in the CFWI Planning Area, to support recovery of minimum flows in the Peace River (see **Figure 2**).

The SFWMD has proposed the Kissimmee Basin water reservation, which includes the Upper Chain of Lakes and the Kissimmee River and its floodplain (see **Figure 2**) in its 2014 Priority Water Body List for future adoption. Initial technical work to support establishment of a water reservation for the Kissimmee Basin was conducted in 2008 and a substantial ecologic and hydrologic analysis of the region/system/area was completed and documented in the draft Technical Document (SFWMD 2009b). This Technical Document underwent a voluntary independent scientific peer review in 2009. The technical information is being reassessed to determine the quantity of water needed for the water reservation. Rulemaking was initiated in 2014 to develop a water reservation rule for the Kissimmee Basin in the CFWI Planning Area.

Water Shortage

In accordance with Sections 373.175 and 373.246, F.S., water shortages are declared when necessary to prevent serious harm from occurring to the water resources. The goal is to protect the remaining supply through demand management and ensure a fair distribution of that supply. Chapters 40C-21, 40D-21, 40E-21, and 40E-22, F.A.C., contain the Water Shortage Plans for the three Districts involved in the CFWI Planning Area.

RESOURCE PROTECTION OVERVIEW

Environmental Assessment Considerations

The estimation of available traditional groundwater in the CFWI Planning Area was based on observation of existing environmental conditions and the estimation of potential water resource impacts resulting from groundwater withdrawals on identified environmental constraints. Chapter 373, Florida Statues (F.S.), directs that Florida's water resources shall be managed to ensure their sustainability (Section 373.016, F.S.). Determining sustainable levels of groundwater withdrawals requires a detailed level of evaluation. For the CFWI Planning Area, measuring sticks were developed by the CFWI Environmental Measures Team (EMT) that would link model output to anticipated environmental response to address the sustainability of the water resources. The measuring sticks, identified in **Volume IA**, **Appendix B** and in CFWI 2013a, b, were developed for water resources including MFLs, non-MFL water bodies, wetlands and water quality, springs, rivers and groundwater system, and were used as constraints or considerations along with other regulatory considerations by the Districts to review potential environmental concerns in a uniform manner.

Additional information was also considered in support of this evaluation. This included statistical analyses of long-term trends in hydrologic data for the central Florida region (Intera 2010) and GIS-based analyses of the spatial distribution of the potential susceptibility of surface water features to groundwater withdrawal-induced hydrologic changes and land alteration (CFWI 2013a)

MFL Assessment for the CFWI Planning Area

To support the CFWI RWSP process, the most recent compliance status of MFL water bodies in the CFWI Planning Area was evaluated. Assessments for MFLs within and performed by the SJRWMD represent compliance status as of 2005. Compliance for MFLs within the SWFWMD was determined using information collected through 2011 that reflected site-specific hydrologic conditions.

Additionally, the adopted or currently proposed MFL sites were used as measuring sticks for evaluations of regional groundwater availability. Based on the ECFT groundwater model predicted changes in Upper Floridan aquifer (UFA) water levels, spring flows, or groundwater flows, the magnitude of drawdowns of the potentiometric surface of the UFA in the vicinities of the MFL lakes, wetlands, or springs that could occur without causing exceedance of adopted (or proposed) MFLs was estimated. This allowable UFA drawdown is referred to as the MFLs measuring stick "freeboard" or "remaining freeboard." The remaining freeboard represents the approximate amount of additional UFA drawdown under the MFL water body that can occur in association with future increases in water withdrawals.

The measuring sticks identified for consideration were based on adopted and proposed MFLs associated with the CFWI Planning Area. Twenty-five lakes/wetlands and six springs with MFLs were chosen as measuring sticks based upon the availability of predictive tools to evaluate the MFLs. Other considerations associated with this analysis included proposed MFLs for several lakes and established and proposed MFLs for several river segments. Additionally, the ECFT groundwater model simulated groundwater flows across the model boundary that could affect the SWUCA Saltwater Intrusion Minimum Aquifer Level (SWIMAL) (an MFL) and water levels in regulatory monitoring wells associated with the SWFWMD SWUCA Recovery Strategy were assessed. Additional information regarding MFLs measuring sticks and their use is available in **Volume IA**, **Appendix B**.

MFL Prevention and Recovery Strategies

An important part of the water supply planning process is the assessment of MFL water bodies to determine if existing flows and levels are below the MFL or projected to fall below, the MFL within 20 years. For existing MFLs, the Districts shall expeditiously develop and implement a recovery or prevention strategy. At the time the minimum flow or level is initially adopted, if the water body is below or is projected to fall within 20 years below, the initial minimum flow or level, the District shall simultaneously approve the recovery or prevention strategy required by Section 373.0421(2), F.S.

SWFWMD

The SWFWMD established SWUCA in 1992 due to environmental concerns related to groundwater withdrawals in the southern and central regions of the SWFWMD. The primary resource concerns within the SWUCA include lake levels along the Lake Wales Ridge, flows in the upper Peace River, and saltwater intrusion into the UFA from the Gulf of Mexico. In 2006 SWFWMD adopted lake and river MFLs within the SWUCA and SWIMAL for the Most Impacted Area of the SWUCA to address these resource concerns. The District has also adopted regulatory well water level target to support recovery of MFLs within the SWUCA.

The SWUCA Recovery Strategy (SWFWMD 2006) is the only recovery strategy currently being implemented in the CFWI Planning Area. The strategy is relevant to recovery of several CFWI Planning Area water bodies, including Lakes Bonnie, Crooked, Eagle, McLeod, North Wales, Starr, Wailes and two segments of the Peace River (Peace River at Bartow and Ft. Mead). See **Table 12** and **Figure 2** for water body locations. Recovery for the SWIMAL adopted for the Most Impacted Area (MIA) of the SWUCA is also addressed by the strategy. The purpose of this recovery strategy is to reduce the rate of saltwater intrusion in the UFA from the coastal region, identified as the MIA, restore low surface water flows to the upper Peace River, and increase surface water levels in area lakes by 2025, while providing for sufficient water supplies. The strategy has six basic components: conservation, alternative water supply development, resource recovery projects, land-use transitions, water use permitting, and monitoring and reporting.

SWFWMD has developed a three-point prevention strategy to address water bodies within the SWUCA and elsewhere in the District where flows or levels are anticipated to fall below adopted MFLs. The strategy includes (1) monitoring of water levels and flows for water resources/sites with adopted MFLs to evaluate the need for prevention strategies; (2) assessment of potential water supply/resource problems as part of the RWSP process; and (3) implementation of a consumptive use permitting program that ensures consumptive uses do not cause exceedance of adopted MFLs.

The SWUCA recovery strategy will be reevaluated and updated in coordination with the updates to the SWFWMD RWSP updates. This evaluation will include revisiting demand projections, and potential sources, as well as monitoring the recovery in terms of both resource trends and trends in permitted and used quantities of water.

SJRWMD

The SJRWMD (2006b) previously identified eight CFWI water bodies that would likely not meet adopted MFLs if all projected 2025 water use demands were realized, necessitating the development of prevention strategies. These prevention water bodies include Cherry Lake, Lake Louisa, Lake Minneola, North Lake Apshawa, South Lake Apshawa in Lake County, and Lake Brantley, Sylvan Lake, and Starbuck Spring in Seminole County (see **Table 12** and **Figure 2** for water body locations).

SJRWMD's general prevention strategy to prevent water levels or flows from falling below MFLs adopted for these water bodies includes: (1) not issuing consumptive use permits that would cause water levels and flows to fall below adopted MFLs; (2) identification of alternative water supply project options that, if implemented, would prevent water levels and flows from falling below adopted MFLs and assisting, as appropriate, in the implementation of these projects; and (3) identifying water resource development projects that would prevent water levels and flows from falling below adopted minimum values and implementing these projects.

The development of more specific strategies has been on hold during the CFWI RWSP process until new tools, including the ECFT groundwater model, were available. The development of more specific strategies will resume following completion of the CFWI RWSP. However, it is expected that the implementation of alternative water supply project options and water resource development projects identified in this CFWI RWSP will contribute to preventing water levels in the water bodies listed above from falling below established minimums. Specific projects for the individual water bodies or groups of water bodies are provided in SJRWMD 2006b.

Assessment of Wetlands and Non-MFL Lakes

The evaluation of lakes and wetlands without MFLs within the region was an integral part of the CFWI Planning Area analysis. The Environmental Measures Team (EMT) was tasked with determining the current status of wetlands with respect to hydrologic stress and alteration, and to develop tools to evaluate modeled future wetland conditions within the

CFWI Planning Area. The EMT consisted of scientists from the Districts, the FDEP, and representatives of the public supply utilities. The EMT reviewed previous environmental assessments conducted within the region, conducted additional wetland assessments, and performed other tasks in support of the determination of sustainable groundwater withdrawals in the CFWI. The final work product of the EMT was a set of tools that were used to evaluate likely effects of groundwater withdrawals, as predicted by modeled water levels, on wetland resources. Detailed descriptions of the EMT's methods and results can be found in their technical document (CFWI 2013a).

Lake Mary Jane

Between 2007 and 2012, over 350 wetland sites within and near the CFWI Planning Area were visited and assessed by the EMT. Although most of these sites had no recorded water stage elevation measurements, 44 sites had relatively robust hydrologic data records and were used to conduct a statistical analysis of wetland stress. The determination of stress in the assessed non-MFL lakes and wetlands was based on combinations of the following criteria:

- A multi-decadal trend of decreasing water levels seen on historical aerial photography.
- Physical evidence of permanently reduced wetland hydrology or invasion/establishment of species from drier ecological communities.
- Soil oxidation or loss (due to reduced water levels) observed in wetlands that had organic soils.

The term "stress" should not be confused with ecological "stressors" such as periodic extreme hydrologic conditions driven by climate. The stress indicators described above and used for the assessments were developed to exclude the effects of periodic drought or long-term rainfall trends and focused on impacts that were associated with non-natural (outside of normal climatic variability) chronically reduced water levels that have persisted for many years.

In addition, the term "stress" should not be equated with "harm" or "significant harm" which are regulatory terms that should not be equated with the methods used to assess impacts during this planning assessment. While many of the hydrologic indicators observed during field assessments are the same as those gathered during a regulatory review, no determination of harm was made during the assessment.

Two methods were used to evaluate wetlands under future modeled water level conditions. The first method utilized a statistical evaluation of isolated lake and wetland systems, which are considered to be inherently more vulnerable to impacts from lowered groundwater levels. The statistical method evaluated the probability of change in stress status based upon the observed ecologic and hydrologic conditions of 44 wetland sites, which had both ecological and hydrological data ("Class 1" wetlands) [CFWI 2013a].

The second method examined outputs from modeled future water withdrawal scenarios, which were used to calculate surface water level changes in assessed wetlands to examine potential impacts under these scenarios. These model scenarios and outputs are described in **Chapter 4** and **Volume IA**, **Appendix C**. The mean water level was calculated for each wetland assessment site from monthly model outputs from modeled scenarios. The difference between the mean surface water level for the Reference Condition (2005) and a future modeled withdrawal condition was used to determine if wetland water levels would be expected to increase, decrease, or remain the same under the future condition. The magnitudes of water level change from a reference condition, at assessed wetland sites, were mapped to indicate areas of greatest change.

Assessment of Non-MFL Springs

Springs without adopted MFLs were also identified as resource considerations for analyses supporting the assessment of groundwater availability in the CFWI Planning Area. Ten springs have sufficient period of record for discharge measurements to allow for the evaluation of the impacts of projected changes in groundwater withdrawals on spring flow. Of these 10 springs, three are within the CFWI Planning Area. The three springs evaluated are the second magnitude Apopka Spring in Lake County, and the third magnitude Clifton Springs and Island Springs in Seminole County. Results for these springs are summarized in **Chapter 4**.

Water Quality/Saltwater Intrusion

Water quality considerations are those associated with potential upconing of underlying poor quality groundwater at selected wellfields in the eastern portion of the CFWI Planning Area. Consideration of saltwater intrusion related to the SWUCA is discussed in the MFLs section.

The eastern portions of the UFA within the CFWI Planning Area are known to have poorer quality groundwater that has not been flushed from the aquifer by fresh water recharge. Wells and wellfields operating near these regions are subject to the possible migration of this residual poorer quality water as a result of withdrawals. This potential movement is considered local in nature. As such, the modeled changes in aquifer drawdowns within the ECFT model were evaluated for selected wellfield production zones, including facilities operated by the City of Winter Springs, City of Cocoa, City of Oviedo, Florida Governmental Utility Authority (Town of Chuluota), and the City of Sanford. These sites were identified based upon their history of water quality in production and monitoring wells and existing requirements for wellfield management plans within the utilities' consumptive use permits. Increased pumpage from an upper aquifer may result in increased flow from aquifers below and has the potential to increase the local risk to maintain potable water quality.

To evaluate this possibility, the ECFT groundwater model simulated cell-by-cell water flows for areas surrounding each wellfield, which were then examined to determine if the projected withdrawals, in combination with the proposed individual utility operations, would suggest possible increases in risks of upward water movement from lower more saline aquifers into these wellfields. The monthly vertical flows between the production horizon and the model layer below each wellfield were summarized for the 12-year simulation period and the difference between the Reference Condition (2005) and 2035 withdrawal condition results were examined. The comparison in flow changes between these scenarios is intended to provide only a qualitative review of the risk potential for a given wellfield (see **Volume IA**, **Appendix C-I**).

Climate Change and Water Supply in Florida

A reliable and economically feasible water supply is the key to the future of Florida's economy. Climate change has the potential to significantly impact the sustainability of water supplies throughout the state. While climate change is occurring across the globe, impact or effects vary and the degree and rate of change remains uncertain. Long-term data do however indicate changes in parameters such as temperature, rainfall, and sea level.

The uncertainty of climate change challenges water providers as they plan for the future. Traditionally, water resource planning has used historical climatic and other hydrologic data to represent future water supply conditions. Temperature, precipitation, stream flow, groundwater levels, evaporation, and other related factors may be expected to vary as they have in the past. With climate change, future water resource planning must be able to

consider additional uncertainties and greater climatic and hydrologic variability (Water Utility Climate Alliance 2010).

Potential climate change impacts to water supply in the CFWI Planning Area include increased potential for saline groundwater intrusion and more frequent intense rainfall events with longer interim dry periods. Although future quantitative projections of climate change effects will be refined over time, consensus among the scientific community is that the effects of climate change, such as rising sea levels, are occurring. As noted by Berry et al. (2011), these effects represent a broad challenge to traditional water supply planning approaches in Florida:

> *"As climate change progresses hydrologic systems will be altered due to changes in the water cycle and rising sea levels. These fundamental changes to the water system interject uncertainty about how climate change will impact Florida's hydrologic systems and present significant difficulties for water managers attempting to develop strategies to meet long-term water supply needs for the state. The uncertainty about how climate change will impact Florida's water resources and its infrastructure creates a challenge for most sectors of Florida's economy."*

Magnitude of Climate Change Effects in Florida

Understanding the types and magnitude of climate change effects is necessary in order to identify vulnerable infrastructure and to implement an adaptive water supply plan. These effects should not be considered in isolation, because they magnify the impact on water supply infrastructure and the reliability and quality of current and future water sources.

Effects of Climate Change on Water Supply

In Florida, water demand is highly dependent on temperature and precipitation as they relate to evapotranspiration. Three key factors: evaporation, transpiration, and atmospheric humidity are directly proportional to increasing air temperature. These three factors also influence increases in water demand. Fresh water withdrawals for agricultural, recreational, and residential irrigation are largely seasonal in nature; and historical water use data show increased water demand during periods of drought (Marella 2004; Verdi et al. 2006; Marella 2009). Therefore, if climate change causes precipitation in Florida to decline or the frequency of droughts to increase, peak water demand for agricultural, recreational, and residential irrigation may increase (the inverse with opposite impacts could also occur). This could lead to uncertainty in the ability of water supply infrastructure to meet peak demands across these user groups.

On a regional scale, impacts of rising sea levels or other climate change phenomena may be associated with a gradual, continuous shift of populations from coastal communities to inland communities, thus accelerating demand projections. Similarly, population migrations

associated with specific storm events may be associated with shorter-term variation in water demand projections. Demand projections developed by the Districts for all water use categories are revised every five years for regions where water supplies may not be adequate. These scheduled revisions provide an opportunity to incorporate changes to projected populations if migration becomes apparent. Climate change effects may also limit the ability of coastal communities to build resilient water-supply systems. As such, they may seek to strengthen partnerships with inland utilities or regional water supply authorities to utilize inland water sources on an emergency basis after significant storm events or on a relatively continuous basis as saline groundwater potentially migrates landward due to sea-level rise. The options available for adaptive infrastructure development and use may be revisited in the five-year regional water supply planning process.

Managing Uncertainty

Climate change adds to the uncertainty associated with long-term water supply planning, affecting demand projections, infrastructure vulnerability, and potentially the availability of reliable supply options. Current global climate models evaluate long-term water availability, but "have limited uses in impact analysis when the seasonal characteristics of a region's future water availability is the main interest" (Lowe et al. 2012). However, informed planning, adaptive infrastructure, and strong partnerships among utilities and other water users working together to provide solid infrastructure design, future water supply development, and long-term planning can provide the flexibility necessary to ensure long-term sustainable water supplies in Florida and offset future uncertainty.

For example, as a part of future water supply development and long-term water supply planning, local governments and utilities can integrate climate change uncertainty into infrastructure planning and design by evaluating climatic and other hydrologic data with longer periods of record that incorporate relatively greater variability, considering predicted changes in precipitation, sea levels, evaporation, and other hydrologic factors; incorporating projected ranges of climate change effects as constraints when evaluating water supply options; and identifying potentially vulnerable infrastructure.

As part of a collaborative effort to address climate and water resource issues, the Florida Water and Climate Alliance (Alliance) is a stakeholder-scientist partnership focused on increasing the relevance of climate science data and tools for water resource planning and supply operations in Florida. The Alliance is building a learning network, implementing research projects, and sharing knowledge and information on water and climate issues. The Alliance partners include utilities, Districts, and climate/water scientists and experts from the University of Florida, Florida Climate Institute, Southeast Climate Consortium, and the UF/IFAS Center for Public Issues Education (http://floridawca.org).

4

Evaluation of Water Resources

SUMMARY OF ANALYTICAL AND MODELING TOOLS

Groundwater modeling was used to assist in development of this plan. The model represents the performance of a real system through a series of mathematical equations, which describe the physical processes that occur in that system; they represent a simplified version of the real world that may be used to predict the behavior of the modeled system under various conditions. The model simulated the potential impact of the projected water use demands on the environment and groundwater sources in the CFWI Planning Area. Information from local comprehensive plans, utilities, BEBR, FDACS, IFAS, and the Districts' permitting databases were used to support this analysis. Where specific information was not available, professional judgment was used. The ECFT groundwater model was the primary model used in this analysis.

East Central Florida Transient Groundwater Model

With the strong desire to have a single, unified tool to effectively evaluate water withdrawals and their associated effects on the water resources and natural systems, the United States Geological Survey (USGS) was retained to develop an updated, calibrated version of the existing ECFT groundwater model, which was subsequently enhanced by the Districts, FDEP, utilities and other stakeholders in the CFWI Planning Area. The model area or domain includes the CFWI Planning Area, but excludes the western edge of Polk County (**Figure 3**). The ECFT groundwater model uses the USGS modular three-dimensional finite difference groundwater flow model, commonly known as MODFLOW. The model area is divided into 1,250-foot by 1,250-foot cells using a grid defined by series of rows and columns. The model simulates transient groundwater flow in the surficial aquifer system (SAS) and the Floridan aquifer system (FAS). The ECFT groundwater model generates two principal types of output for each model cell: computed head (water levels) that result from the simulated conditions, and water budgets. The water budgets characterize the inflows and outflows for each cell. Detailed information on the ECFT groundwater model is provided in **Volume IA**, **Appendix C**.

Sub Code: Residential

Date Submitted	12/28/2015	**Section**	2403	**Proponent**	Joseph Eysie
Chapter	24	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review

Commission Action Pending Review

Related Modifications

6849, 6853

Summary of Modification

Expand the Appliance definition to include compressed fuel gas

Rationale

A new generation of residential CNG fueling systems are design certified to the new ANSI standard, NGV 5.1, Home Refueling Appliances. These appliances would not be considered an appliance under the current definition. They will consume electricity to compress fuels.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Zero impact

Impact to building and property owners relative to cost of compliance with code

Zero Impact

Impact to industry relative to the cost of compliance with code

Zero Impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against construction material, methods, products or systems

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version? No

~~**APPLIANCE.** Any apparatus or device that utilizes a fuel or raw material to produce light, heat, power, refrigeration or air conditioning.~~

APPLIANCE. Any apparatus or device that utilizes a fuel or raw material to produce light, heat, power, refrigeration~~,~~ ~~or~~ air conditioning~~.~~ , or compressed fuel.

Date Submitted	12/28/2015	**Section**	2412	**Proponent**	Joseph Eysie
Chapter	24	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review

Commission Action Pending Review

Related Modifications

6831

Summary of Modification

Provide additional clarity to the Exception language

Rationale

: The new exceptions are specific to schedule 40 steel pipe used in fuel gas installations. The new exceptions would allow the following:

1. Short lengths of steel pipe that are cut from longer pipe stock where the stock has identification markings. It is common practice to cut short lengths of pipe from longer pipe stock. In those cases the identification marks may not appear on the cut pieces.
2. Small fittings such as bushings and couplings where markings have not been traditionally been included. These small diameter fittings are commonly used in low pressure gas piping systems rand represent an extremely low risk of failure.
3. Where the packaging or documentation for the part has the manufacturer's identification but the part does not. Very small fittings and accessories often come in packaging that have the manufacturer's identification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Zero Impact

Impact to building and property owners relative to cost of compliance with code

Zero Impact

Impact to industry relative to the cost of compliance with code

Zero Impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, provides more clarity to section 401.9 of the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, provides more clarity to section 401.9 of the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against construction material, methods, products or systems.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version? No

G2412.9 (401.9) Identification.
Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer.

Exceptions:

1. Steel pipe sections that are: two feet and less in length and cut from longer sections of pipe in the field and threaded in the field.

2. Steel pipe fittings 2 inch and less in size

3. Where identification is provided on the product packaging or crating

4. Where other approved documentation is provided.

P6858

Date Submitted	12/28/2015	**Section**	2412	**Proponent**	Joseph Eysie
Chapter	24	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

6857-This Mod is being submitted as an alternative to 6857 which deals with this same issue. Mod 6857 is the preferred option by the proponent

Summary of Modification

Provide Exception language from the current 5Th Edition of the FBC

Rationale

Short lengths of steel pipe that are cut from longer pipe stock where the stock has identification markings. It is common practice to cut short lengths of pipe from longer pipe stock. In those cases the identification marks may not appear on the cut pieces. The UMC already contains an exception to permit nipples created from cutting and threading of approved pipe.

Small fittings such as bushings and couplings where markings have not been traditionally been included. These small diameter fittings are commonly used in low pressure gas piping systems rand represent an extremely low risk of failure.

Where the packaging or documentation for the part has the manufacturer's identification but the part does not. Very small fittings and accessories often come in packaging that have the manufacturer's identification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
Zero impact

Impact to building and property owners relative to cost of compliance with code
Zero impact

Impact to industry relative to the cost of compliance with code
Zero impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes, provides more clarity to section 401.9 of the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against construction material, methods, products or systems.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version?
YES

The provisions contained in the proposed amendment are addressed in the applicable international code?
NO

The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exihibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?
YES

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?
NO

G2412.10 (401.10) Third-party testing and certification.
Piping, tubing and fittings shall comply with the applicable referenced standards, specifications and performance criteria of this code and shall be identified in accordance with Section G2412.9. Piping, tubing and fittings shall either be tested by an approved third-party testing agency or certified by an approved *third-party certification agency*.

Exception: The manufacturer identification for fittings and pipe nipples shall be on each piece or shall be printed on the fitting or nipple packaging or provided documentation.

Screen shot of 5th Edition FBC, Fuel Gas

floridabuilding2.iccsafe.org/app/book/content/2014_Florida/Fuel%20Gas%20Code/Chapter%204.html

Fire Prevention Code and NFPA 58.

401.3 Modifications to existing systems.
In modifying or adding to existing *piping* systems, sizes shall be maintained in accordance with this chapter.

401.4 Additional appliances.
Where an additional *appliance* is to be served, the existing *piping* shall be checked to determine if it has adequate capacity for all *appliances* served. If inadequate, the existing system shall be enlarged as required or separate *piping* of adequate capacity shall be provided.

401.5 Identification.
For other than steel pipe, exposed *piping* shall be identified by a yellow label marked "Gas" in black letters. The marking shall be spaced at intervals not exceeding 5 feet (1524 mm). The marking shall not be required on pipe located in the same room as the *appliance* served.

401.6 Interconnections.
Where two or more meters are installed on the same premises but supply separate consumers, the *piping* systems shall not be interconnected on the *outlet* side of the meters.

401.7 Piping meter identification.
Piping from multiple meter installations shall be marked with an *approved* permanent identification by the installer so that the *piping* system supplied by each meter is readily identifiable.

401.8 Minimum sizes.
All pipe utilized for the installation, extension and *alteration* of any *piping* system shall be sized to supply the full number of outlets for the intended purpose and shall be sized in accordance with Section 402.

401.9 Identification.
Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer.

Exception: The manufacturer identification for fittings and pipe nipples shall be on each piece or shall be printed on the fitting or nipple packaging or provided documentation

401.10 Third-party testing and certification.
Reserved.

Date Submitted	12/28/2015	**Section**	2412	**Proponent**	Joseph Eysie
Chapter	24	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review

Commission Action Pending Review

Related Modifications

6833

Summary of Modification

Replace the 2015 ICC base code language with the 2018 ICC base code language and add an exception.

Rationale

This requirement in the International Fuel Gas Code has far ranging impact that wasn't anticipated at the code development hearings. In many cases, there are no certifcation or testing requirements to use for flare nuts, tees, pipe nipples, etc. The current requirement in section 401.10 is extremely onerous to the fuel gas industry with very little, if any, benefit to society. Piping, tubing and fittings are fabricated to various materials standards, such as those published by the American Society for Testing and Materials (ASTM) and the American Society of Mechanical Engineers (ASME). The material standards are shown in Section 403 of the IFGC. Third party testing or certification is a needless and unjustified expense to the industry. There has been no data presented to indicate that piping and fittings have been failing in the field.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Zero impact

Impact to building and property owners relative to cost of compliance with code

Zero impact

Impact to industry relative to the cost of compliance with code

Zero impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, provides additional clarity.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against construction material, methods, products or systems.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version? No

-

G2412.10 (401.10) ~~Third-party testing and certification.~~ Piping Materials Standards.

~~Piping, tubing and fittings shall comply with the applicable referenced standards, specifications and performance criteria of this code and shall be identified in accordance with Section G2412.9. Piping, tubing and fittings shall either be tested by an approved third-party testing agency or certified by an approved *third-party certification agency.*~~ Piping, tubing and fittings shall be manufactured to the applicable referenced standards, specifications and performance criteria listed in Section 403 of this code and shall be identified in accordance with Section 401.9.

P686o

Date Submitted	12/28/2015	**Section**	2412	**Proponent**	Joseph Eysie
Chapter	24	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

6859-This Mod is being submitted as an alternative to 6859 which deals with this same issue. Mod 6859 is the preferred option by the proponent

Summary of Modification

Continue the current (5th edition FBC, Fuel Gas) requirement for 401.10 (G2412.10)

Rationale

This requirement in the International Fuel Gas Code has far ranging impact that wasn't anticipated at the code development hearings. In many cases, there are no certification or testing requirements to use for flare nuts, tees, pipe nipples, etc. The current requirement in section 401.10 is extremely onerous to the fuel gas industry with very little, if any, benefit to society. Piping, tubing and fittings are fabricated to various materials standards, such as those published by the American Society for Testing and Materials (ASTM) and the American Society of Mechanical Engineers (ASME). The material standards are shown in Section 403 of the IFGC. Third party testing or certification is a needless and unjustified expense to the industry. There has been no data presented to indicate that piping and fittings have been failing in the field.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
Zero Impact

Impact to building and property owners relative to cost of compliance with code
Zero Impact

Impact to industry relative to the cost of compliance with code
Zero Impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes, carry's the 5th edition of the FBC forward to the 6th edition.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities
Does not discriminate against construction material, methods, products or systems.

Does not degrade the effectiveness of the code
Does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version?
YES

The provisions contained in the proposed amendment are addressed in the applicable international code?
NO

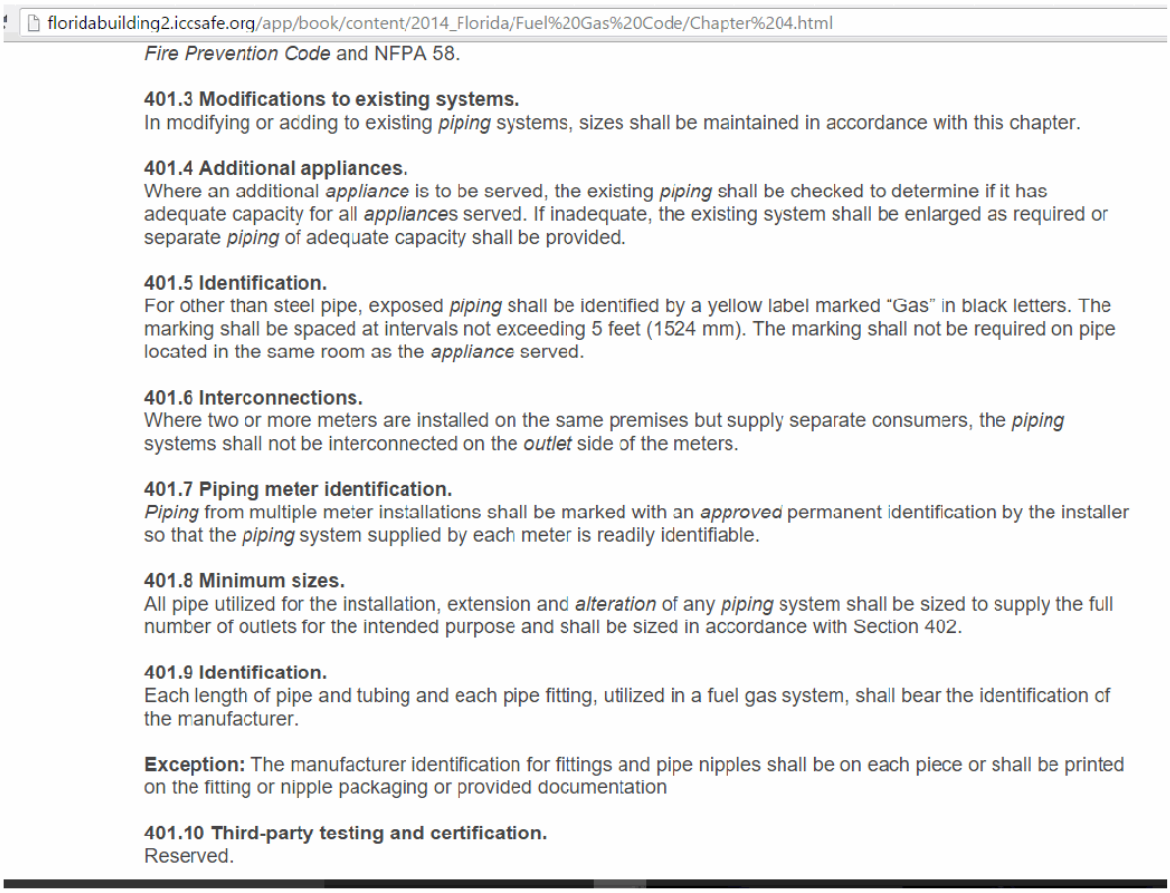
The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exihibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?
YES

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?
NO

G2412.10 (401.10) Third-party testing and certification.

~~Piping, tubing and fittings shall comply with applicable referenced standards, specification and performance criteria of this code and shall be identified in accordance with Section 401.9. Piping, tubing and fittings shall either be tested by an approved third-party testing agency or certified by an approved third-party certification agency.~~ (Reserved)

Screen shot of 5th Edition FBC, Fuel Gas



floridabuilding2.iccsafe.org/app/book/content/2014_Florida/Fuel%20Gas%20Code/Chapter%204.html

Fire Prevention Code and NFPA 58.

401.3 Modifications to existing systems.
In modifying or adding to existing *piping* systems, sizes shall be maintained in accordance with this chapter.

401.4 Additional appliances.
Where an additional *appliance* is to be served, the existing *piping* shall be checked to determine if it has adequate capacity for all *appliances* served. If inadequate, the existing system shall be enlarged as required or separate *piping* of adequate capacity shall be provided.

401.5 Identification.
For other than steel pipe, exposed *piping* shall be identified by a yellow label marked "Gas" in black letters. The marking shall be spaced at intervals not exceeding 5 feet (1524 mm). The marking shall not be required on pipe located in the same room as the *appliance* served.

401.6 Interconnections.
Where two or more meters are installed on the same premises but supply separate consumers, the *piping* systems shall not be interconnected on the *outlet* side of the meters.

401.7 Piping meter identification.
Piping from multiple meter installations shall be marked with an *approved* permanent identification by the installer so that the *piping* system supplied by each meter is readily identifiable.

401.8 Minimum sizes.
All pipe utilized for the installation, extension and *alteration* of any *piping* system shall be sized to supply the full number of outlets for the intended purpose and shall be sized in accordance with Section 402.

401.9 Identification.
Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer.

Exception: The manufacturer identification for fittings and pipe nipples shall be on each piece or shall be printed on the fitting or nipple packaging or provided documentation

401.10 Third-party testing and certification.
Reserved.

P6420

Date Submitted	12/7/2015	**Section**	2503.4	**Proponent**	Gary Kozan
Chapter	25	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Plumbing Code 312.6 - same criteria needed in Plumbing Code for consistency

Summary of Modification

Modifies building sewer testing to 5-foot head, making it consistent with interior DWV testing

Rationale

The base code 2105 IRC finally recognizes 5-foot head testing for DWV systems, but unfortunately, a companion change was not made to the outside sewer testing, which remains at 10-foot head. It makes no sense to allow a 5-foot head test for piping inside a building, yet require a 10-foot head test for outside piping.This proposal makes interior and exterior testing consistent.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Eliminates an unintended oversight in the base code and improves consistency of enforcement between AHJs

Impact to building and property owners relative to cost of compliance with code

No cost impact

Impact to industry relative to the cost of compliance with code

Reinstates 5-foot head testing to Florida once again, which had fallen victim to the indiscriminate removal of all Florida-specific amendments in the last code cycle.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Florida has a 50 year history of allowing 5-foot head testing for DWV systems. The IRC now recognizes this as an acceptable practice.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

A 5-foot head test is preferred by most Florida code officials and contractors, because it provides actual visual verification of watertight-ness without resorting to ladders or "shaking the stack".

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

5-foot head testing is now referenced in the IRC

Does not degrade the effectiveness of the code

Simply reinstates what Florida has done for years

Is the proposed code modification part of a prior code version? No

P2503.4 Building sewer testing.

The *building sewer* shall be tested by insertion of a test plug at the point of connection with the public sewer, filling the *building sewer* with water and pressurizing the sewer to not less than ~~10~~5-foot (3048 mm) head of water. The test pressure shall not decrease during a period of not less than 15 minutes. The *building sewer* shall be watertight at all points.

A forced sewer test shall consist of pressurizing the piping to a pressure of not less than 5 psi (34.5 kPa) greater than the pump rating and maintaining such pressure for not less than 15 minutes. The forced sewer shall be water tight at all points.

P6419

Date Submitted	12/7/2015	**Section**	2709.2	**Proponent**	Gary Kozan
Chapter	27	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Plumbing Code 417.5.2 - Same criteria needed in Plumbing Code for consistency

Summary of Modification

Adds requirements for recessed shower compartments, and provides an exception for shower lining in such

Rationale

The base I-codes do not address recessed shower compartments, which are common throughout Florida. Shower pan linings are not necessary in a properly-constructed shower recess.Beginning with the Fifth Edition (2014) of the FBC, previous Florida-specific amendments were automatically removed. Adding these exceptions reinstates the Florida-specific modification found in the previous four editions of the Florida Building Code. It also brings the FBC-P and FBC-R codes into alignment.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Provides clear guidance and improves consistency of enforcement between AHJs

Impact to building and property owners relative to cost of compliance with code

Reinstates a proven, cost effective option

Impact to industry relative to the cost of compliance with code

Provides clear guidance and improves consistency of code compliance for contractors working in different areas

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Recessed shower compartments have a proven track record in Florida and there is less chance of water damage because the recess contains all of the water

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Adds guidance and requirements for shower recesses that provide a proven, cost-effective option for builders

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not change the requirements for built-up showers, it just adds requirements for shower recesses

Does not degrade the effectiveness of the code

This modification reinstates the Florida-specific code language found in the first four editions of the FBC. It clears up confusion in the field over the applicability and proper construction of shower recesses.

Is the proposed code modification part of a prior code version?

YES

The provisions contained in the proposed amendment are addressed in the applicable international code?

NO

The amendment demonstrates by evidence or data that the geographical jurisdiction of Florida exihibits a need to strengthen the foundation code beyond the needs or regional variation addressed by the foundation code and why the proposed amendment applies to the state?

YES

The proposed amendment was submitted or attempted to be included in the foundation codes to avoid resubmission to the Florida Building Code amendment process?

NO

P2709.2 Lining required.
The adjoining walls and floor framing enclosing on-site built-up shower receptors shall be lined with one of the following materials:

1. Sheet lead.

2. Sheet copper.

3. Plastic liner material that complies with ASTM D 4068 or ASTM D 4551.

4. Hot mopping in accordance with Section P2709.2.3

5. Sheet-applied load-bearing, bonded waterproof membranes that comply with ANSI A118.10.

The lining material shall extend not less than 2 inches (51 mm) beyond or around the rough jambs and not less than 2 inches (51 mm) above finished thresholds. Sheet-applied load bearing, bonded waterproof membranes shall be applied in accordance with the manufacturer's instructions.

Exceptions:

1. Floor surfaces under shower heads provided for rinsing laid directly on the ground are not required to comply with this section.

2. Where a sheet-applied, load-bearing, bonded, waterproof membrane is installed as the shower lining, the membrane shall not be required to be recessed.

3. Shower compartments where the finished shower drain is depressed a minimum of 2 inches (51 mm) below the surrounding finished floor on the first floor level and the shower recess is poured integrally with the adjoining floor.

P6817

Date Submitted	12/28/2015	**Section**	2709.2	**Proponent**	Joseph Belcher
Chapter	27	**Affects HVHZ**	Yes	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

Summary of Modification

Adds Exceptions for shower liners.

Rationale

The proposal reinstates a Florida specific amendment that appeared in all editions of the FBC-R except the 5th Edition and brings the FBC-R in agreement with the FBC-P. Exceptions 1 and 3 were approved Florida specific amendments in all previous editions. According to the original proponent, the Exceptions were inadvertently not submitted for the FBC-R or FBC-P, 5th Edition; there was no intent to eliminate the Exceptions. Exception 2 brings the FBC-R into agreement with Section 417.5.2 of the Florida Building Code-Plumbing

The climate and high water table of Florida precludes the proliferation of basements in Florida and slabs-on-ground are a popular method of constructing the first floor. This type of construction is ideal for the use of the cost-effective alternate of recessed shower compartments. The provisions for recessed shower compartments have been widely used in Florida for many years with no reported problems.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities for code enforcement. Most inspectors are familiar with the system as it has been in use for many years throughout Florida.

Impact to building and property owners relative to cost of compliance with code

Approval of the proposal will have a positive impact on building and property owners by bringing back a Florida specific amendment that provides a well proven cost-effective method of construction for shower compartments.

Impact to industry relative to the cost of compliance with code

Approval of the proposal will have a positive impact on building and property owners by bringing back a Florida specific amendment that provides a well proven cost-effective method of construction for shower compartments

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, reinstates a time proven cost-effective alternate method of constructing shower compartments in Florida.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, reinstates a time proven cost-effective alternate method of constructing shower compartments in Florida.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No, does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

No, does not degrade the effectiveness of the code.

Is the proposed code modification part of a prior code version? No

P2709.2 Lining required.

The adjoining walls and floor framing enclosing on-site built-up shower receptors shall be lined with one of the following materials:

1. **Sheet lead,**
2. **Sheet copper,**
3. **Plastic liner material that complies with ASTM D 4068 or ASTM D 4551,**
4. **Hot mopping in accordance with Section P2709.2.3 or**
5. **Sheet-applied load-bearing, bonded waterproof membranes that comply with ANSI A118.10.**

The lining material shall extend not less than 2 inches (51 mm) beyond or around the rough jambs and not less than 2 inches (51 mm) above finished thresholds. Sheet-applied load bearing, bonded waterproof membranes shall be applied in accordance with the manufacturer's installation instructions.

Exceptions:

1. **Floor surfaces under showerheads provided for rinsing laid directly on the ground.**
2. **2. Where a sheet-applied, load-bearing, bonded, waterproof membrane is installed as the shower lining, the membrane shall not be required to be recessed.**
3. **Shower compartments where the finished shower drain is depressed a minimum of 2 inches (51 mm) below the surrounding finished floor on the first floor level and the shower recess is poured integrally with the adjoining floor.**

Date Submitted	12/21/2015	**Section**	2903.2	**Proponent**	Josh Madden
Chapter	29	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Related Modifications

6668, 6661

Summary of Modification

Adopt high efficiency flow standards for plumbing fixtures and fittings. The proposed modifications mirror Chapter 7 section 702 of the 2015 International Green Construction Code.

Rationale

As a concerned citizen and native Floridian I care about and enjoy Florida's water resources and natural ecosystems. This State has been blessed with a wealth of springs, wetlands, river, and lakes. These systems are not only a pleasure to enjoy in a recreational sense and provide a large economic benefit to the region, but are in fact essential to public health, safety and well being. In many areas of the State, there have been well documented negative impacts on springs, lakes, aquifers and other water resources as a result of over pumping of groundwater. Domestic consumption of publicly supplied water is one of the largest uses of water. As population in the State continues to grow, demand on water resources is expected to grow. This expected increase in demand can be curbed by conservation efforts such as the proposed code modification.

Florida is not the only state in the nation to face water supply challenges. California, Colorado Texas and Georgia have endured drought, and as result have adopted similar water fixture efficiency measures to those in this proposal. Some Counties within Florida have already adopted similar measures (Broward, Miami Dade).

The proposed efficiency measures can reduce deficits of future increased demand by saving approximately 24.1 million gallons per day by 2035 for residential buildings. As a result of this proposed modification, a direct impact in reducing demand and ensuring the long-term sustainability of Florida's water resources can be had without significant sacrifice by any party. This change would provide a foundation for further improvement of water use efficiency at a statewide level.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This only changes the criteria for allowable flow rate of fixtures. No additional inspection protocol is needed.

Impact to building and property owners relative to cost of compliance with code

On average, homeowners can expect to save approximately 20% on their water usage. this will provide homeowners with long term savings on their water, sewer, and electric bills (water heating).

Impact to industry relative to the cost of compliance with code

Most fixtures that meet Water SenseR are comparable in price to conventional fixtures. For an average home, additional costs will be less than $100. This small additional cost would provide homeowners with long term savings on their water, sewer, and electric bills (water heating).

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Having adequate supply of potable water for public consumption is obviously essential to health, safety and welfare of the general public. Conservation measures in this proposal will extend existing water sources to future populations.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The modification involves equivalent but more efficient products that have been tested and shown to meet national EPA WaterSenseR standards for functionality and dependability. Products are at least 20% more efficient. The modifications were replicated from the 2015 IgCC.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Products involved are already common in markets statewide. Nationally, there is an abundance of fixture models that meet WaterSenseR: 2,506 toilet; 362 urinal; 9,068 facet; 3,445 showerhead; 22 pre-rinse spray valve.

Does not degrade the effectiveness of the code

Proposed code is consistent with International Green Construction Code and does not contradict other chapters/sections.

Is the proposed code modification part of a prior code version? No

P2903.2 Maximum flow and water consumption.

The maximum water consumption flow rates and quantities for plumbing fixtures and fixture fittings shall be in accordance with Table P2903.2.

TABLE P2903.2 MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS[b]

PLUMBING FIXTURE OR FIXTURE FITTING	PLUMBING FIXTURE OR FIXTURE FITTINGc
Lavatory faucet	~~2.2~~ 1.5 gpm at 60 psi
Shower heada	~~2.5~~ 2.0 gpm at 80 psi and WaterSenseR labled
Sink faucet	~~2.2~~ 1.8 gpm at 60 psi
Water closet	~~1.6~~ 1.28 gallons per flushing cycle and WaterSenseR labledd

For SI: 1 gallon per minute = 3.785 L/m,

1 pound per square inch = 6.895 kPa.

a. ~~A handheld shower spray shall be considered a shower head.~~ Includes hand showers, body sprayes, rainfall panels and jets. Showerheads shall be supplied by automatic compensating valves that comply with ASSE 1016 or ASME A112.18.1/CSA B125.1 and that are specifically designed to function at the flow rate of the showerheads being used.

b. Consumption tolerances shall be determined from referenced standards.

c. Where a faucet has a pot filler mode, the flow shall not exceed 2.2 gpm at 60 psi. Such faucets shall automatically return to the flow rate indicated in the table when the pot filler mode activation mechanism is relesed or when the faucet flow is turned off.

d. The effective flush volume for a dual-flush water closet is defined as the composite, average flush volume of two reduced flushes and one full flush.

P2903.3 Minimum pressure.

Where the water pressure supplied by the public water main or an individual water supply system is insufficient to provide for the minimum pressures and quantities for the plumbing fixtures in the building, the pressure shall be increased by means of an elevated water tank, a hydropnuematic pressure booster system or a water pressure booster pump.