Technical Memorandum
Joint North Florida Regional Water Supply Plan
Population and Water Demand Projection Methodology
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Contributors

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Introduction

The SJRWMD and SRWMD (Districts) develop water demand projections to satisfy the need to determine "existing legal uses, anticipated future needs, and existing and reasonably anticipated sources of water and conservation efforts." This directive is based on the requirements of Subparagraph 373.036(2)(b)4a, Florida Statutes (F.S.). The Districts' goal in projecting water demands is to develop estimates of projected need that appear to be reasonable based on the best information available and that are mutually acceptable to the water users, SJRWMD and SRWMD. The Water Demand Protection Subcommittee (WDPS), a subcommittee of the Water Planning Coordination Group (WPCG), developed the currently used definitions of the water use categories (WDPS 1998a). WDPS was composed of representatives of the state's five water management districts (WMDs) and the Florida Department of Environmental Protection (FDEP)(WDPS 1998a). In addition, definitions of the water use categories (used in this process) were recently updated through the statewide consumptive use permitting (CUP) consistency process, initiated by FDEP. The six water use categories as defined by WDPS are:

1. Public Supply
2. Domestic Self-supply and Small Public Supply Systems
3. Agricultural Irrigation Self-supply
4. Landscape / Recreational / Aesthetic Irrigation Self-supply
5. Commercial / Industrial / Institutional and Mining / Dewatering Self-supply
6. Thermoelectric Power Generation Self-supply

In addition, the Districts project future reclaimed water flows that could potentially be used to offset water demand.

Purpose

This technical memorandum details the actions taken and methodologies utilized to develop the water demand projections for the six water use categories, as well as future reclaimed water flows. This technical memorandum also details the methodologies utilized to for the spatial distribution of future groundwater withdrawals for modeling purposes for water use categories listed above, with the exception of agriculture. Water demand projections for the six water use categories were calculated for the years 2015, 2020, 2025, 2030 and 2035 (Chapter 62-40.531 (1)(a) Florida Administrative Code (F.A.C.), requires intermediate water use projections for every five-year interval). Water demand projections were also calculated for a 1-in-10 drought event for year 2035. The 1-in-10 "is an event that results in an increase in water demand of a magnitude that would have

a 10 percent probability of occurring during any given year," (WDPS 1998). Future reclaimed water flows were calculated for the year 2035.

Water use is defined as current or historic levels of water withdrawn from fresh (ground and surface) water sources and is expressed in average million gallons per day (mgd) unless otherwise noted.

Water demand is defined as future estimates (projections) of water or water requirements that will be needed (withdrawn from fresh (ground and surface) water sources) to meet the needs of increasing population and needs of the water use categories into the future and is expressed in average mgd unless otherwise noted.

Reclaimed water is treated wastewater that has received at least secondary treatment and basic disinfection and is expressed in average mgd unless otherwise noted.

Background

SJRWMD completed Water Supply Assessments in 1994, 1998 and 2003 (WSA 1998 and WSA 2003) (Vergara 1994 & 1998, SJRWMD 2006). The 1994 assessment is commonly referred to as the water supply needs and sources assessment. For the WSA 1998, year 1995 water use served as the base year for the 2020 projections and for the WSA 2003, year 2000 water use served as the base year for the 2025 projections. The SJRWMD also has a Draft District Water Supply Plan (SJRWMD 2013b) in which year 2005 water use served as the base year for the 2035 projections. SRWMD completed a 2010 Water Supply Assessment (SRWMD 2011), in which year 2005 water use served as the base year for the 2030 projections. In the 2015 Joint North Florida Regional Water Supply Plan (NFRWSP), year 2010 will be the starting point, or baseline year, for the purpose of developing and reporting water demand projections. This is consistent with the methodology agreed upon by the WPCG. The data for the baseline year consist of reported and estimated usage for 2010, whereas data for the years 2015 through 2035 are projected demands (estimated needs). The NFRWSP will consist of projections from the following counties: SJRWMD – Alachua, Baker, Bradford, Clay, Duval, Flagler, Nassau, Putnam and St. Johns (SJRWMD Region 1) and SRWMD – Alachua, Baker, Bradford, Columbia, Gilchrist, Hamilton, Suwannee and Union. Although the NFRWSP contains limited counties, projections were developed for all of the SJRWMD and SRWMD counties for modeling purposes, e.g., Madison County.

Data and Information Sources

The methodology to develop population and water demand projections utilizes many data sources such as:

1. Water use and population estimates reported by utilities collected by the FDEP, commonly called Monthly Operating Reports (MORs).
2. Water use estimates reported by utilities collected by SJRWMD through the EN50 form, commonly called EN50 data.
3. SJRWMD annual water use inventory data, commonly called Annual Water Use Survey (AWUS) data (SJRWMD 2007-2011, 2013a and 2014-2015).
4. Water use, population, permitted quantities and percentages of use reported in CUPs and water use permits (WUPs).
5. SJRWMD's Public Supply Permittee Historic Database, which contains historic population, water use and gross per capita rates for all SJRWMD public supply permittees.

6. University of Florida's Bureau of Economic and Business Research (BEBR) publications (Smith 2007-2010, 2011a, 2011b, 2012-2015).
7. United States Geological Survey (USGS) water use estimates (Marella 2009, 2014).
8. FDEP Annual Reuse Inventory Reports (FDEP 2011).
9. Ten-Year Site Plans collected by the Public Service Commission (PSC).

Assumptions

The Districts make a considerable effort to develop water demand projections that are consistent with the specific plans of major water users at the time projections are made. For the purposes of the NFRWSP, the Districts assume that projected increases in supply will come from traditional sources, which is fresh groundwater, unless water suppliers have made a final commitment to the development and use of other sources of supply. Public water supply utilities in Florida are in varying stages of transitioning exclusively from fresh groundwater sources to alternative sources, which include reclaimed water, surface water, brackish groundwater and seawater. Future water supply assessments will include water use projections based on commitments to develop alternative sources as the transition to diversified sources progresses. In addition, the Districts assume that current levels of water conservation and use of reclaimed water will continue through the year 2035 projection horizon. If water conservation efforts and the use of reclaimed water of the Districts and water users are effective in reducing demands, then 2035 water use should be less than projected under average climatic conditions.

Public Supply and Small Public Supply Systems

Water demand was calculated for each public supply and small public supply system that has a public water utility service area boundary (PWSAB). The Public Supply category includes water use provided by any municipality, county, regional water supply authority, special district, public or privately owned water utility or multijurisdictional water supply authority for human consumption and other purposes (sometimes a public supply permit is not classified as a utility). The Public Supply category includes those permittees that have average annual permitted quantities of 0.1 mgd or more.

Small Public Supply Systems (which are combined with the Domestic Self-supply (DSS) category for reporting purposes) are permittees that have average annual permitted quantities of less than 0.1 mgd.

<u>Demand</u>

The per capita water use rate is the factor applied to projected population (described below) to project water demand. Therefore, it is necessary for the base per capita rate to represent water use in an average year. Water demand projections were based on the most recent five-year average gross per capita rate (at the time the projections were developed), which accounts for annual variations in water use with respect to climatic variations and recent implementations of conservation programs. To address this variability, the Districts calculated five-year average gross per capita use rates for each individual public supply and small public supply system.

For the NFRWSP, the five-year average gross per capita rate was comprised of the years 2010-2014. The relationship between public supply water use and annual precipitation amounts is typically inverse (less rain results in increased water use, largely due to outdoor water use). This is confirmed

by a higher SJRWMD average gross per capita water use rate in 2011 of 141 gallons per day (gpd) versus the SJRWMD average gross per capita water use rate of 134 gpd in 2012. The SJRWMD rainfall for these respective years was 45.05 inches and 49.26 inches (SJRWMD 2012, 2013a). As such, water use projections based solely on observed 2011 per capita rates would be higher than a reasonable average water use projection and water use projections based on observed 2012 per capita rates would be lower than a reasonable average water use projection.

For public supply and small public supply systems, the gross per capita rate is defined as the total water use (including residential and non-residential uses) for each individual permittee divided by its' respective residential population served. The gross per capita rate (in gallons per capita per day or gpcd) represents on average how much water one person would use in a day. Water use and population served for each year (2010-2014) and for each public supply system (as discussed above) was obtained from the sources listed in the Data and Information Sources Section. These sources include the *SJRWMD's Public Supply Permittee Historic Database*. The database, which contains historic population, water use and gross per capita rates for all SJRWMD public supply permittees, was developed by the water use planning bureau to assist in planning and permitting efforts and to allow for the automatic calculation of gross per capita rates and rolling five-year average gross per capita rates. The data contained in the database was derived from FDEP MORs, EN50s, AWUS data, CUPs and BEBR. In cases where water use data was not available from these sources, the Districts used professional analyses of historical data and trends to estimate values.

The SJRWMD and Southwest Florida Water Management District (SWFWMD) currently have in their CUP rules (SJRWMD - Applicant's Handbook: Consumptive Uses of Water - Section 2.2.2.2 - Page 2-4 and SWFWMD - Water Use Permit - Applicant's Handbook, Part B - Section 2.3.7.2.2 - Page 19) the use of a historical five-year average gross per capita (most recent five years) for calculating demand for public supply permits. In an attempt to be consistent with the CUP program, as well as to represent water use in an average year, the Districts use a five-year average gross per capita in planning for calculating demand for public supply permits. The CUP rules do allow for varying the five-year average if sufficient data is not available (e.g. for new applicants) or if data has been provided indicating that future development and growth will have different characteristics than historic/present development and growth. Of note, since 2008, 198 public supply CUPs in SJRWMD have been issued using current SJRWMD CUP rules, five-year average per capita rates, of which 33 were located in the NFRWSP region. In addition, it is recognized that public supply permittees also use a five-year average per capita rate in their water resource master plans (JEA 2013).

Beginning in early 2012, the WMDs and DEP began the CUP Consistency effort. A portion of this effort was to have all the WMDs come to a consensus on the basis for public supply projections in planning and consumptive use permitting. During this intensive collaborative effort, the WMDs and DEP agreed that the basis for public supply projections in planning and consumptive use permitting would be a five-year average gross per capita rate. Unfortunately, a formal CUP Consistency guidance document was not created, due to factors unrelated to the five-year timeframe. Also, as a result, F.S. related to water supply planning (373.709, F.S.) and CUP / WUP rules in the South Florida Water Management District (SFWMD), SRWMD and Northwest Florida Water Management District were not updated to reflect the consensus of a five-year average gross per capita rate. Currently, SWFWMD does use the most recent five-year average gross per capita rate for public supply projections in planning. Also, during the Central Florida Water Initiative (CFWI) Regional Water Supply Plan (RWSP) development the SFWMD, SJRWMD, SWFWMD, DEP, Florida Department of Agriculture and Consumer Services (FDACS) and utility stakeholders agreed to use a five-year average gross per capita rate for public supply projections.

Gross per capita rates are a function of several factors that have to be considered. The Districts have observed a reduction in per capita water use that may be attributed to a variety of factors, including a downturn in economic conditions, indoor and outdoor conservation and source substitution. Alternatively, the converse of these observed conditions could have the opposite effect. The use of a five-year average per capita accounts for variability in these factors.

Water demand for each public supply system is shown in a table, with county totals, and includes the years 2015, 2020, 2025, 2030 and 2035. Water use for 2010 and water demand for a 2035 1-in-10 drought year is also shown for analysis purposes. Water demand for small public supply systems were aggregated for each county and were added to the respective county demand for the DSS category. The water demand by county is shown in a separate table and includes the years 2015, 2020, 2025, 2030 and 2035. Water use for 2010 and water demand for a 2035 1-in-10 drought year is also shown for analysis purposes. Although the water demand for each small public supply system is not listed out separately in a table in the NFRWSP, the data is available in the NFRWSP appendices and can be of use in other planning efforts.

The 1-in-10 year Drought Subcommittee of the WPCG, as stated in their final report (WDPS 1998a), determined that a six percent increase in demand would occur in such an event for public supply water use. Therefore, the 1-in-10 year water demand projections are the average year demands multiplied by 1.06.

Population

Using BEBR's estimates of population by county (Smith 2011a), a percent of 2010 county population for each public supply and small public supply system was calculated. These respective percentages were used to calculate future population projections for the years 2015, 2020, 2025, 2030 and 2035 for each public supply and small public supply system. The projection methodology is commonly referred to as a percent-share method. For example, if a utility serves 10 percent of the county population in 2010, then this utility will also serve 10 percent of the county population in 2035.

The population projections developed by 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)1a, F.S.]. These projections are made at the county level only (Smith 2015) and require specific methods to distribute the county level projections among public supply systems. While the percent-share method does not take into account varying growth rates, it is generally accepted as a valid method for regional planning purposes. The Districts did estimate a "build-out" population, or the maximum population within a PWSAB, for each public supply and small public supply system using current land use and zoning / parcel layers.

As a result of the North Florida Regional Water Supply Stakeholder Advisory Committee and North Florida Utility Coordination Group comments from December 15, 2014; a 1 percent per year conversion of domestic-self-supply to public supply systems was added to viable public supply systems by proportion in Baker, Clay, Duval, Lake (CFWI), Nassau, Orange and St. Johns Counties.

While not available for this joint planning effort, the SJRWMD is developing a Population Distribution Model, which will distribute population to the parcel level using growth drivers and growth inhibitors. It is anticipated that this model will be used in future joint RWSP efforts.

Spatial Groundwater Distribution

As noted above, projected water demand for each public supply and small public system was estimated. For modeling purposes, the groundwater demand and associated location of withdrawal needed to be determined. It should be noted that there are some public systems within the SJRWMD that have surface water withdrawals; for this purpose, only the groundwater demand estimated was distributed. For those permits with surface water, groundwater demand was estimated as the total demand minus the permitted surface water withdrawal. The Districts, as part of the CUP process have the location of each well or station associated with a public supply and small public supply system. The future groundwater demand, specific to each public supply and small public system, was distributed evenly to their respective active or proposed wells/stations. In addition, well size and pumping capabilities were taken into account, so as to not exceed the maximum yield of the well/station. Also, it should be noted that for public supply systems with multiple wellfields and/or specific wellfield allocations, the associated demand was divided proportionally amongst the respective wellfields and then further to the wellfields' respective wells/stations.

Domestic Self-supply

The DSS category consists of residential dwellings that are provided water from a dedicated, on-site well and are not connected to a central utility. As noted above, historic water use and population and water demand and population projections for small public supply systems are calculated individually, but are combined with the DSS category for reporting purposes at the county level.

Demand

For DSS, the residential per capita rate (also referred to as household) is defined as the water use for solely residential purposes. The residential per capita is estimated from the county level residential population served and residential water use. To achieve this, the water use for each year (2010-2014) for each of SJRWMD's public supply and small public supply system, obtained from the gross per capita methodology above, is multiplied by the percent of the total water use allocated to residential use, as authorized in the CUPs. The resulting residential water use values for each of SJRWMD's public supply and small public supply system are then summed to the county level and divided by the total public supply population served (at county level) to obtain the county-level average 2010-2014 residential per capita value. The average 2010-2014 residential per capita (by county) value is then multiplied by the projected 2015, 2020, 2025, 2030 and 2035 DSS population (by county)(described below). SRWMD currently does not collect sufficiently detailed information on the total water use allocated to solely residential use in their public supply WUPs. As such, the SJRWMD average 2010-2014 residential per capita value for Alachua, Baker and Bradford counties was used for the SRWMD portions of the respective counties and the SJRWMD total average 2010-2014 residential per capita value was used for the remaining SRWMD counties.

The DSS water demand by county (after adding the total water demand for small public supply systems) is shown in a table and includes the years 2015, 2020, 2025, 2030 and 2035. Water use for 2010 and water demand for a 2035 1-in-10 drought year is also shown for analysis purposes.

The 1-in-10 year Drought Subcommittee of the WPCG, as stated in their final report, determined that a six percent increase in demand would occur in such an event for DSS water use. Therefore, the 1-in-10 year water demand projections are the average year demands multiplied by 1.06.

Population

The 2010 population for DSS was estimated for each county using the total 2010 population from public supply and small public supply systems and subtracting the BEBR Estimate of Population by County, (Smith 2011a). The 2010 DSS county estimates was compared and adjusted when necessary to coincide with the Districts' DSS parcel estimates. The SJRWMD developed a DSS parcel calculation using Department of Revenue codes and housing units built for areas outside of PWSABs. The total number of 2010 DSS parcels was multiplied by the 2010 persons per household value from BEBR (Smith 2011b) to verify the estimate of the 2010 DSS population.

Years 2015, 2020, 2025, 2030 and 2035 population for DSS was estimated for each county using the total 2015, 2020, 2025, 2030 and 2035 population from the public supply and small public supply systems and subtracting the BEBR medium population projections (Smith 2015). The population by county (after adding the total population for small public supply systems for each respective county) is shown in a table and includes the years 2015, 2020, 2025, 2030 and 2035. Population for 2010 is also shown for analysis purposes.

As noted in the Public Supply section, a 1 percent per year conversion of domestic-self-supply to public supply systems was added to viable public supply systems by proportion in Baker, Clay, Duval, Lake (CFWI), Nassau, Orange and St. Johns Counties.

Spatial Groundwater Distribution

Small public supply system future groundwater demand and location of withdrawal was spatially distributed as defined above in the public supply section.

As noted above, the SJRWMD developed a DSS parcel model using Department of Revenue codes and housing units built for areas outside of PWSABs; a point is added to the centroid of each identified parcel to represent a well/station. The SJRWMD also has approximately twenty public supply systems that have provided account level billing data. This data allows the SJRWMD to determine DSS within those respective service areas. Well completion reports, identified as DSS were also taken into consideration to determine the location of DSS within PWSABs. The DSS demand for each five-year increment was then distributed evenly amongst the DSS parcels identified. It should be noted that DSS demand is only anticipated to come from groundwater withdrawal sources. It should be noted, that for counties contained in more than one water management district (e.g., Alachua County) the projected DSS demand for the respective water management district was only applied to the respective DSS parcels identified within their portion of the county.

Agricultural Irrigation Self-supply

The Agricultural Irrigation Self-supply category includes the irrigation of crops and other miscellaneous water uses associated with agricultural production. Self-supply categories obtain water from a dedicated, on-site well and are not connected to a central utility. 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, projected demands associated with other agriculture uses were estimated and reported as miscellaneous type uses, such as aquaculture, dairy/cattle, poultry and swine.

In 2013, legislation was passed that requires the Districts, in developing RWSPs, must consider agricultural demand projections produced by FDACS [Section 373.709(2)(a)1b, F.S.]. FDACS, through a contract with The Balmoral Group, developed future agricultural acreage and water demand projections for the State of Florida for the years 2015, 2020, 2025, 2030 and 2035, as well as a water demand for a 2035 1-in-10 drought year and delivered the Final Draft to the Districts on June 5, 2015 (FDACS, 2015). This product is known as the Florida Statewide Agricultural Irrigation Demand (FSAID) and the June 5, 2015 version is identified as FSAID II.

The Districts considered the FDACS' FSAID II projections and decided to use the agricultural acreage and water demand projections as presented in the Final Draft (FDACS, 2015) for the NFRWSP. Detailed methodology can be found in the June 5, 2015 FSAID II Final Report (FDACS, 2015).

Acreage

The FDACS, through a contract with The Balmoral Group, developed a statewide 2010 agricultural acreage land coverage geodatabase. This geodatabase, also known as FSAID I, was used to obtain 2010 irrigated acreage by crop type and by county (FDACS, 2014). As noted above, acreage projections were taken directly from the June 5, 2015 FSAID II Final Report (FDACS, 2015).

The total Agricultural Irrigation Self-supply acreage by county is shown in a table and includes the years 2015, 2020, 2025, 2030 and 2035. Acreage for 2010 is also shown for analysis purposes. Acreage by crop type is included in the NFRWSP appendices and can be of use in other planning efforts.

Demand

Water use for year 2010 from FSAID I (FDACS, 2014) was considered by the Districts, however the Districts decided to use other data, more reflective of the year 2010. For SRWMD, water use was tensioned to 2010 values published by the United States Geologic Survey (USGS) (USGS, 2014) and applied to the agricultural land locations provided from FSAID I (FDACS, 2014). For SJRWMD, 2010 EN50 data was used where available. For agricultural areas in SJRWMD with a CUP where there was no EN50 data and non-CUP agricultural areas, a 2010 water use simulation was ran using the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) Model. As noted above, water demand projections for all years were taken directly from the June 5, 2015 FSAID II Final Report (FDACS, 2015).

The total agricultural water demand by county is shown in a table and includes the years 2015, 2020, 2025, 2030 and 2035. Water use for 2010 and water demand for a 2035 1-in-10 drought year is also shown for analysis purposes. Water demand by crop type and miscellaneous type uses is included in the NFRWSP appendices and can be of use in other planning efforts.

The Districts are committed to working in cooperation with FDACS on agricultural water supply planning and SJRWMD is currently working with FDACS on a joint effort to update the SJRWMD portion of the Statewide Irrigated Lands Geodatabase (FDACS, 2014) with 2015 field verified crop type, irrigation system and acreage estimates for FSAID III. While not available for this joint planning effort, the SJRWMD is also developing an Agricultural Water Use Planning (AWUP) Model, which will use the AFSIRS model to estimate water demand from agricultural acreage projections. It is anticipated that this AWUP model will be used in future joint RWSP efforts to compare with FDACS water demand projections.

It should be noted that 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. Agricultural projections can be volatile and it is uncertain how population changes/future land use conversions may affect them. In addition, 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.

Spatial Groundwater Distribution

As noted above, The Balmoral Group, developed future agricultural acreage and total water demand projections for the State of Florida for the years 2015, 2020, 2025, 2030 and 2035, as well as a water demand for a 2035 1-in-10 drought year and delivered the Final Draft to the Districts on June 5, 2015 (FDACS, 2015). This product is known as the Florida Statewide Agricultural Irrigation Demand (FSAID) and the June 5, 2015 version is identified as FSAID II. The FSAID II deliverable has the spatial location, in polygon format, of all estimated future agricultural demand in the five-year increments necessary for groundwater modeling. The Districts used the FSAID II deliverable and refined to account for those agricultural areas using surface water (via reported CUP data and USGS data from 2010 (SJRWMD, 2011 and USGS, 2014)) and converted the delivered polygon layer to a point layer (tied to CUP well/station location) for use in groundwater modeling. Where a polygon was identified with both groundwater and surface water withdrawals in 2010, the 2010 percent split was applied to future demand years. If an agricultural polygon had more than one groundwater well/station attributed to its location, the future groundwater demand identified was distributed equally.

Landscape / Recreational / Aesthetic Irrigation Self-supply

The Landscape, Recreational and Aesthetic (L/R/A) Irrigation self-supply category represents 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 use includes fountains, waterfalls, and landscape lakes and ponds where such uses are ornamental and decorative.

The L/R/A category also includes miscellaneous irrigation or additional irrigation demand. Miscellaneous irrigation use represents wells that are less than six inches in diameter, and those uses, which have a permit by rule, and are used for irrigation at residences that receive potable water for indoor use from a utility. Currently, due to data limitations, residential irrigation wells are not included in the Districts' future projections.

Demand and Acreage

Demand for the L/R/A category was projected at the county level using a respective L/R/A historic average gpcd. The county specific L/R/A average gpcd was calculated from L/R/A average water use for 2010-2014, obtained from SJRWMD AWUS data (SJRWMD 2011-2012, 2013a and 2014-2015)

and USGS data (Marella 2009, 2014); and BEBR estimates of county population for 2010-2014 (Smith 2011a, 2012-2015).

The average L/R/A gpcd was applied to the additional population projected by BEBR (Smith 2015) for each five-year increment and the associated demand was added to the 2010 base-year water use. Future acreage estimates were interpolated from 2010 acreage and 2010 water use ratios.

The total L/R/A water demand and acreage by county is shown in a table and includes the years 2015, 2020, 2025, 2030 and 2035. Water use and acreage for 2010 and water demand for a 2035 1-in-10 drought year is also shown for analysis purposes.

The 1-in-10 year Drought Subcommittee of the WPCG, as stated in their final report, determined that values using agricultural (irrigation) models, historic data and net irrigation ratios are acceptable when calculating the 1-in-10 year water demand projection. A 1-in-10 year factor was developed for each county, using the highest year water use from 2006-2014 (SJRWMD 2007-2012, 2013a and 2015) and the percent increase from the 2006-2014 L/R/A water use. For example, if water use in 2007 is X percent higher than the 2006-2014 five-year average, X percent was applied to the average 2035 water demand to project a 2035 1-in-10 year water demand.

Spatial Groundwater Distribution

As noted above, projected water demand for the L/R/A category is only estimated at the county level. For modeling purposes, the groundwater demand and associated location of withdrawal needed to be determined. It should be noted that there are several L/R/A CUPs that have surface water withdrawals; for this purpose, only the groundwater demand estimated was distributed. Future groundwater demand for the respective future years at the county level was calculated using the 2010 percent split between groundwater and surface water (via reported CUP data and USGS data from 2010 (SJRWMD, 2011 and USGS, 2014)). The county level groundwater demand for future year scenarios was then distributed to the CUP level using a percent share method of permitted allocation. For example, if an L/R/A's CUP groundwater allocation represented 10 percent of the county's total groundwater allocation in 2010, then the L/R/A CUP allocation will also maintain 10 percent of the county groundwater allocation in 2035. The future groundwater demand estimated, specific to each L/R/A permit, was then distributed evenly to their respective active or proposed wells/stations. In addition, well size and pumping capabilities were taken into account, so as to not exceed the maximum yield of the well/station. It should be noted, that for counties contained in more than one water management district (e.g., Alachua County) the projected L/R/A demand for the respective water management district was only applied to the respective L/R/A permits and wells/stations identified within their portion of the county. While future land use and potential new locations of L/R/A polygons was not taken into consideration, the method applied is generally accepted as a valid method for regional planning purposes.

Commercial / Industrial / Institutional and Mining / Dewatering Self-supply

The Commercial, Industrial, and Institutional (C/I/I) Self-supply category represents water use associated with the production of goods or provisions of services by C/I/I establishments. This category also includes the use of water associated with mining and long-term dewatering operations (M/D). 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, 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 use includes hospitals, group home / assisted living facilities, churches, prisons, schools, universities, military bases, etc. Mining uses include water associated with the extraction, transport, and processing of subsurface materials and minerals. Dewatering uses includes the long-term removal of water to control surface or groundwater levels during construction or excavation activities.

Demand

Demand for the C/I/I and M/D category were projected at the county level using a respective C/I/I and M/D historic average gpcd. The county specific C/I/I and M/D average gpcd was calculated from C/I/I and M/D average water use for 2010-2014, obtained from SJRWMD AWUS data (SJRWMD 2011-2012, 2013a and 2014-2015) and USGS data (Marella 2009, 2014) and BEBR estimates of county population for 2010-2014 (2011a, 2012-2015). C/I/I and M/D historic water use and demand consists of only consumptive uses; recycled surface water or non-consumptive uses were removed. For this NFRWSP, surface water use by mining operations represents 5 percent of surface water use, to account for the loss of water in mining products and evaporation. The remaining surface water was assumed to be recirculated in the mining process and, therefore, is considered nonconsumptive. Nonconsumptive is defined by the Districts as any use of water that does not reduce the water supply from which it is withdrawn or diverted. For further clarification, consumptive use is defined by the Districts as any use of water that reduces the supply from which it is withdrawn or diverted.

The C/I/I and M/D average gpcd was applied to the additional population projected by BEBR (Smith 2015) for each five-year increment and the associated demand was added to the base year, 2010, water use.

The total C/I/I and M/D water demand by county is shown in a table and includes the years 2015, 2020, 2025, 2030 and 2035. Water use for 2010 and water demand for a 2035 1-in-10 drought year is also shown for analysis purposes. The breakout between C/I/I and M/D is included in the NFRWSP appendices and can be of use in other planning efforts.

The 1-in-10 year Drought Subcommittee of the WPCG, as stated in their final report, determined that drought events do not have significant impacts on water use in C/I/I and M/D self-supply category. Water use for these categories are related primarily to processing and production needs.

It should be noted that the M/D category can experience a tremendous amount of volatility in a short amount of time. It has been documented that several factors can impact the M/D industry, such as judicial decisions, permit decisions, government moratoriums, new residential developments, quality and availability of rock, etc. (Herbert, 2007).

Spatial Groundwater Distribution

See the L/R/A spatial groundwater distribution explanation above. The methodology for spatial distribution of future groundwater for the C/I/I and M/D categories modeling purposes is the same, using the projected C/I/I and M/D future groundwater demands.

Thermoelectric Power Generation Self-supply

Thermoelectric Power Generation (PG) Self-supply category represents the water use associated with power plant and power generation facilities. PG water use includes the consumptive use of water for steam generation, cooling, and replenishment of cooling reservoirs.

Demand

Demand was calculated for each PG facility and then summed to the county level for consumptive uses of water only; recycled surface water or non-consumptive uses were removed. For this NFRWSP, surface water use by PG facilities represents 2 percent of surface water use, to account for the loss of water due to evaporation. An example of this nonconsumptive use is surface water used for once-through cooling for power plants, which is recycled.

The PSC requires that each PG facility produce detailed ten-year site plans for each of its facilities. These plans include planned facilities and generating capacity expansion. The 2015 ten-year site plans for each PG facility within the NFRWSP counties were downloaded from the PSC website (http://www.psc.state.fl.us/utilities/electricgas/10yrsiteplans.aspx) and were used in developing the PG demand projections.

For each PG facility with a planned capacity expansion, PG consumptive use capacity projections were interpolated between the existing capacity and the planned capacity, as detailed in the ten-year site plans. The projection of PG consumptive demand beyond the planned expansion in the ten-year site plans was calculated for each facility using a linear extrapolation of the existing and planned expansion dates and data and BEBR medium population projection rates (Smith 2015). In addition, the average daily gallon per megawatt use was estimated for 2010-2014 and used as a proxy to project future water demand beyond the ten-year site plans and when projected water demand (for the ten-year site plan period) was not included.

The total PG water demand by county is shown in a table and includes the years 2015, 2020, 2025, 2030 and 2035. Water use for 2010 and water demand for a 2035 1-in-10 drought year is also shown for analysis purposes. The breakout for individual PG facilities is included in the NFRWSP appendices and can be of use in other planning efforts.

The 1-in-10 year Drought Subcommittee of the WPCG, as stated in their final report, determined that drought events do not have significant impacts on water use in the PG Self-supply category. Water use for this category is related primarily to processing and production needs.

Spatial Groundwater Distribution

Similar to the public supply and small public supply systems category, future water demand was projected in five-year increments through 2035 for each PG facility in the SJRWMD and SRWMD. However, groundwater and surface water was projected separately for each facility based on the five-year (2010-2014) average gallons used per historic megawatt. The Districts, as part of the CUP process or DEP power plant siting plan, have the location of each well or station associated with a PG facility. The future groundwater demand, specific to each PG facility, was distributed evenly to their respective active or proposed wells/stations. In addition, well size and pumping capabilities were taken into account, so as to not exceed the maximum yield of the well/station.

2035 Reclaimed Water

Projections were made for domestic wastewater treatment facilities (WWTF) with 2010 permitted wastewater treatment capacities equal to or greater then 0.1 mgd. The source of information was obtained from the FDEP 2010 Reuse Inventory (FDEP, 2011).

It should be noted that the methodology used (described below) to develop the Districts' reclaimed water projections was developed during the CFWI RWSP process by the Water Supply Options Subgroup, which consisted of staff from the SJRWMD, SFWMD, SWFWMD, FDEP and FDACS staff, as well as utility and agricultural industry representatives from the CFWI Planning Area. This method was also used in the SJRWMD Draft District Water Supply Plan (SJRWMD 2013b).

Existing Flows

The 2010 flows were broken out by total WWTF flow and beneficial reuse.

The Districts consider beneficial reuse to be only those uses in which reclaimed water takes the place of a pre-existing or potential use of higher quality water for which reclaimed water is suitable, such as water used for landscape irrigation. Delivery of reclaimed water to sprayfields, absorption fields and rapid infiltration basins are not considered beneficial reuse. Exceptions are made for studies that show certain areas are recharge areas.

The FDEP has a statewide reuse utilization goal of 75 percent (FDEP, 2003). The total WWTF flow was multiplied by 75 percent. The difference between the 2010 WWTF flow at 75 percent utilization and 2010 beneficial reuse was considered the potential existing additional reclaimed water that could be used for reuse. This method ensured existing flows would not exceed the 75 percent utilization goal. It is recognized that each WWTF is unique and items such as system upgrades and treatment, additional storage, expansion of system, customer availability, etc. have to be taken into consideration.

Future Flows

Using PWSAB and CUPs/WUPs, the Districts identified WWTFs that could potentially receive sewered flow as a result of population growth. The 2010-2035 increase in population for each CUP/WUP identified was obtained from the public supply and small public supply systems projections, described above. It was assumed that 95 percent of the population increase identified will receive sewer service and thereby return wastewater for treatment. It is acknowledged that the percentage of sewered growth population and resulting wastewater flows will vary for individual service providers due to a number of factors.

It was further assumed that the increased sewered population will generate approximately 84 gpcd of wastewater to the local WWTF. The 84 gpcd represents an average of 69 gpcd generated by residential customers (indoor use) and 15 gpcd generated by C/I/I customers (indoor use), based upon the same permanent population. The 84 gpcd is based upon empirical sources for residential flows (Vickers 2001, Mayer 1999). The 69 gpcd, residential indoor, is also supported by the American Water Works Association (AWWA, 1999). Additionally, the F.A.C., Chapter 64E-6, "Standards for Onsite Sewage Treatment and Disposal Systems", Rule 64E-6.008 System Size Determinations, Section (1)(B) Table I (effective date 6/25/2009) - System Design, supports designs for wastewater return flows averaging 15 gpcd for employees at a commercial/industrial facility. The estimated

future flow was then multiplied by the FDEP utilization goal of 75 percent (FDEP, 2003), generating a 2035 potential new additional reclaimed water for reuse.

It is recognized that only a portion of the existing and future wastewater treated for reuse is actually utilized to offset demands that would otherwise require the use of fresh groundwater. The amount of potable-offset that is typically achieved utility-wide is approximately 65 percent to 75 percent, but can range downwards of 50 percent to as much as 100 percent, depending on the type of use being replaced. While the amount of potable offset that is achieved by reuse is dependent upon the demographics of a particular utility's reuse customers, it is important that the utility understands that the projected wastewater flows do not represent an amount equal to the demand reduction due to system losses and inefficiencies of its reuse customers.

Reclaimed water systems are unique to each utility and the potential WWTF flow estimated for this NFRWSP may not necessarily represent the reclaimed water that could be used in projects. Current treatment processes, WWTF capacities, storage and infrastructure have to be considered; which could potentially have a cost impact of utilization of additional or currently available reclaimed water. Likewise, the Districts realize that future and existing utilization may be higher than the scenarios presented, if the WWTF provided reclaimed water for reuse to more efficient customers. For the purposes of this NFRWSP, the Districts also created a future reclaimed water scenario using the 2010 percent beneficial reuse utilization for existing and future flows; which would assume that no changes to current treatment processes are made (e.g., WWTF upgrade). In addition, the Districts recognize potential future wastewater flow could be less if additional residential indoor water conservation is achieved. For example, AWWA has identified on their website (Drinktap.org) that if residences installed, for every instance, more efficient water fixtures and regularly checked for leaks, daily indoor water use could potentially be reduced to 45.2 gpcd (Vickers, 2001).

Spatial Distribution

The Districts did not attempt to identify where future reclaimed water flows or beneficial reuse will occur. Location of potential projects using reclaimed water will be determined if and when groundwater modeling and water resource assessments indicate that potential harm could occur to natural systems within the NFRWSP area.

Review

This technical memorandum, including resulting population and demand projection tables, supporting agricultural tables, PG and DSS tables and reclaimed water projections (Appendices A, B, C, D and E, respectively), was provided to CUP staff and public stakeholders for review. Comments were incorporated as appropriate. It is important to note that as this is a long-term planning effort and methodology changes based on short-term trends will not be incorporated. However, additional refinements may be considered as public supply population and water use is continually monitored. Comments and suggested changes may be taken into consideration if they are justifiable, defensible, based on historical regression data and long term trends, and supported by complete documentation. Of note, during the development of this technical memorandum and draft projections for the NFRWSP, the Districts have already incorporated updated historic data from Clay County Utility Authority, JEA, the City of Lake City and the Florida Department of Corrections Marion/Lowell Correctional Institution. In addition, the NFRWSP Stakeholder Advisory Committee (SAC) voted 12-0 on December 15, 2014 to approve the methodology and associated projections for the public supply and small public supply systems, DSS, L/R/A, C/I/I & M/D categories. The NFRWSP SAC also voted

11-1 on February 17, 2015 to approve the methodology and associated projections for the reclaimed water category.

The Districts understand and share stakeholder's concerns of how critically important accurate demand projections are, however, the Districts must comply with Chapter 373.709(2)(a)1a, F.S. which sets forth requirements for regional water supply planning: *"Population projections used for determining public water supply needs must be based upon the best available data. In determining the best available data, the district shall consider the University of Florida's BEBR medium population projections and any population projection data and analysis submitted by a local government pursuant to the public workshop described in subsection if the data and analysis support the local government's comprehensive plan."*

Summary

The Districts believe that the methodologies presented in this technical memorandum for calculating population and water demand projections for the six water use categories, as well as future reclaimed water flows categories will be consistent with the specific plans of major water users at the time projections are made. The Districts assume that the current levels of water conservation efforts and the use of reclaimed water will continue through the year 2035 projection horizon and that if the water conservation efforts and the use of reclaimed water of the Districts and water users are effective in reducing demands, then 2035 water use should be less than projected under average climatic conditions.

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