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THE POPULATION PROJECTION METHODOLOGY OF THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT'S 2003 DISTRICT WATER SUPPLY ASSESSMENT AND 2005 DISTRICT WATER SUPPLY PLAN

The Population Projection Methodology of The St. Johns River Water Management District's 2003 District Water Supply Assessment And 2005 District Water Supply Plan

Prepared for

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I. INTRODUCTION

The purpose of this document is to describe the methodologies used by the St. Johns River Water Management District (SJRWMD), Division of Water Supply Management (Division), to project population for the 2003 District Water Supply Assessment and 2005 District Water Supply Plan. A model was developed to provide small-area population projections for the 18 counties within SJRWMD, upon which the future water demand projections are based.

II. THE NEED FOR A SMALL-AREA POPULATION PROJECTION MODEL

SJRWMD covers all or parts of 18 counties, yet the model must estimate future population for units small enough to accurately aggregate the results to water utility service area boundaries. For example, the 27 large public supply utilities in Orange County have service areas defined by polygons with a median size of 219 acres. This need for small area projections requires small modeling units (the minimum units of measure for which the projections are made).

The population projections made by the University of Florida's Bureau of Economic and Business Research (BEBR) are generally accepted as the standard throughout the State of Florida. However, these projections are made at the county level only. To project future water demand, SJRWMD requires a much smaller resolution. Therefore, to facilitate the aggregation of model projections to water utility service area boundaries and Traffic Analysis Zones (TAZs), the census block level of census geography was selected as the logical modeling unit choice.

III. MODEL OVERVIEW

The District's GIS-based model projects future residential population growth at the census block level, and normalizes those projections at the county level to the county growth projections of the University of Florida's Bureau of Economic and Business Research (BEBR). It does this by calculating a weighted average of the historical growth rate of each block, and factoring in the positive influence of spatial features such as roads, water bodies, and existing residential and commercial areas. It then excludes non-developable lands, including wetlands, conservation areas, inappropriate land uses, road rights-of-way, and areas that are "built out" based on future land use. The remaining areas are then allocated population growth by census block according to the block's growth rate and spatial influences. These projections are made in five-year increments out to 2025, and are aggregated by Utility Service Area boundaries, Traffic Analysis Zone (TAZ) boundaries, and other boundaries for comparison with government and utility projections.

The model is based on a raster data structure, which converts map features to a uniform grid (not unlike the pixels on a television or computer screen). This enables the use of modeling methods that are either impossible or impractical using vector data (where map features are represented by points, lines, and polygons). The grid cell size chosen for this model is 30 x 30 meters. Based on past raster modeling experience, and taking into account data scale and accuracy, this grid cell size represents a reasonable compromise between precision and processing speed.

The model consists of two primary elements: one based on historical growth trends and one based on spatial features that influence growth. (See Figure 1 for a flowchart outlining the model's methodology.) The Historical Element projects growth based on past growth trends, and the Spatial Element guides where the growth will be distributed within a given area. The combination of the two is essential to accurately distribute population into small areas.

Modeling Periods

The base year for the model is 2000. Projections were made through the year 2025 in the following five-year increments:

- 2001 through 2005
- 2006 through 2010
- 2011 through 2015
- 2016 through 2020
- 2021 through 2025

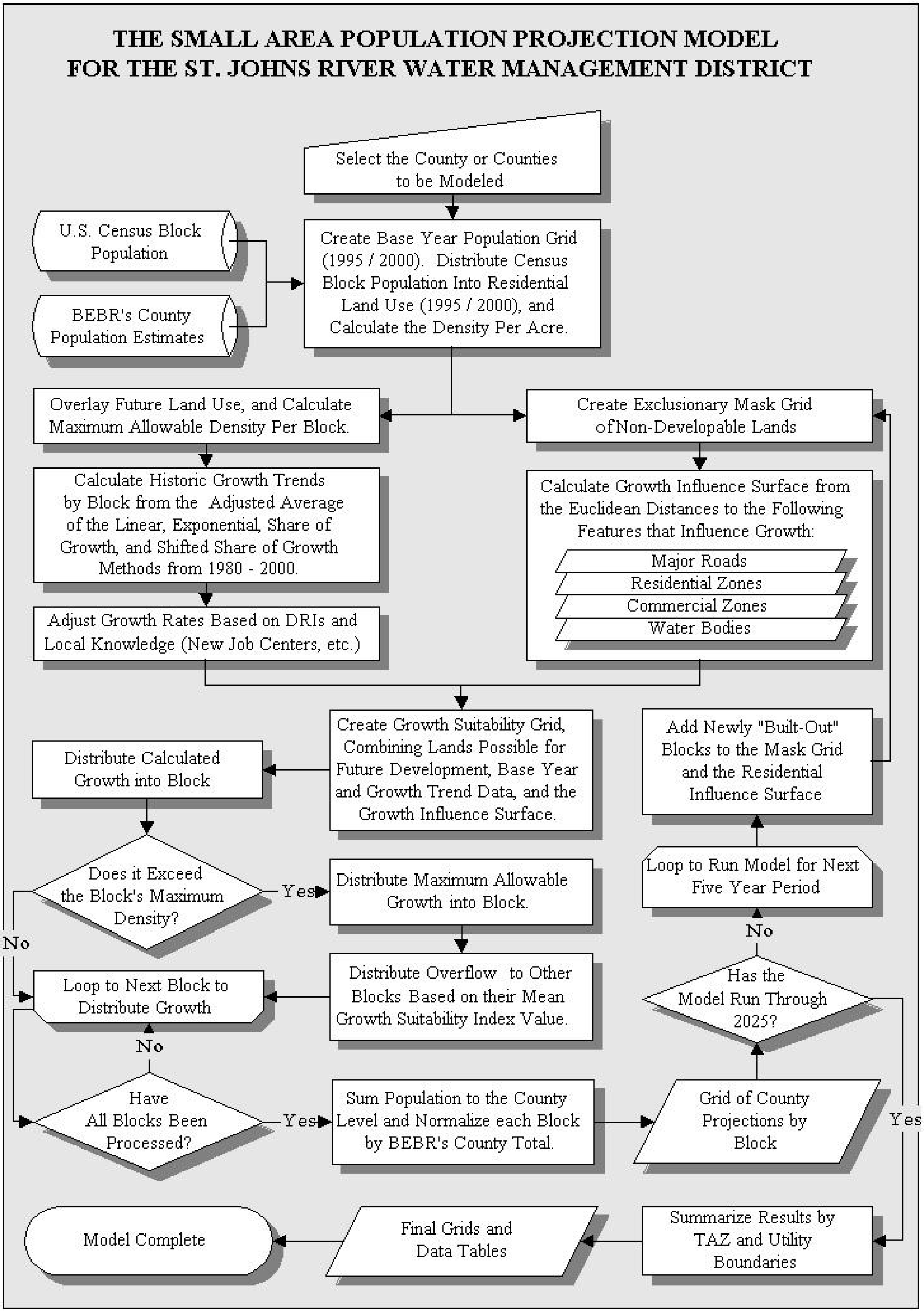

Figure 1. The Modeling Process for Predicting the Spatial Distribution of Future Population Growth for the St. Johns River Water Management District

IV. HISTORICAL ELEMENT

Historical Element Overview

The model calculates historic population growth trends from census data, along with land use constraints and other local factors described further herein, to make projections of future population growth. Block-level population data from the 1990 and 2000 censuses were attached to the 2000 block boundaries by the State of Florida as part of its Senate Redistricting effort, where the State calibrated 1990 population data to 2000 block boundaries. Population data from the 1980 Census were utilized at the tract level (as block-level data for 1980 is not available). To use this 1980 data for trend calculation, the 2000 data were summed to the tract level, the growth rate calculations were made, and the growth rates were applied to all 2000 blocks within each tract.

These projections are normalized with county level projections made by BEBR. BEBR's projections are highly regarded throughout Florida, but county level projections are not spatially precise enough for the needs of SJRWMD. Because the SJRWMD model's projections are normalized to BEBR's projections for each modeling period, the model is more a distribution model than a projection model. Although the model projects population growth, it provides the added benefit of accurately projecting the distribution of that growth within a given county.

Base Year Residential Population Grid

The Base Year Population Grid is created by overlaying 2000 census block boundaries (including attached population data) with a combined grid of the SJRWMD's 1995 residential land use and 2000 residential property parcels (for those counties with digital parcel maps). This parcel data augmented the out-of-date land use data, identifying residential areas developed after 1995. Population is then allocated to the residential portion of census blocks.

Historic Growth Trends Grid

The Historic Growth Trends Grid distributes future growth based on the extrapolation of past growth trends. These trends are based on growth rates over the following historical periods (with the latter period receiving additional weight):

- 1980 through 1990
- 1990 through 2000

The historic population growth trends are derived from an average of four methods: Linear, Growth Rate, Share of Growth, and Shifted Share of Growth. The Linear and Growth Rate techniques employ a bottom-up approach, extrapolating the historic growth trends of each census block with no consideration for the county's overall growth. The Share of Growth and Shifted Share of Growth techniques employ a top-down approach, allocating a portion of the total projected county growth to each census block based on that census block's percentage of county growth over the historical period. Each of the four methods is a good predictor of growth in different situations and growth patterns, so an average of the four was the best way to avoid the largest possible errors resulting from the "worst" techniques for each census block within the 18 county area (Sipe and Hopkins 1984: p. 23). This methodology is patterned after that used by BEBR, and is well suited for small area population projections. The results of each of the four projection methods varied from census block to census block, but there were some general trends that can be identified.

Linear Projection Method. The Linear Projection Method assumes that future population change for each census block will be the same as over the historic period (Sipe and Hopkins 1984: p. 25). Two linear growth rate calculations were made, one from 1980 through 2000, and one from 1990 through 2000. In the Linear method (LIN), five-year population changes were calculated using the following formulas (using the 2000–2005 growth projections as an example):

$$LIN_1 = [\ 5 \times (\ (\ Pop2000 - Pop1980\ ) / 20\ )\ ]$$

$$LIN_2 = [\ 5 \times (\ (\ Pop2000 - Pop1990\ ) / 10\ )\ ]$$

Growth Rate Projection Method. The Growth Rate Projection Method assumes that population will continue to change at the same five-year growth rate as over the historic period. In the Growth Rate method (GRO), five-year population changes were calculated using the formula (using the 2000–2005 growth projection as an example):

$$GRO = [\ Pop2000 \times (\ 5 \times (\ (\ (\ Pop2000 - Pop1990\ ) / Pop1990\ ) / 10\ )\ )\ ]$$

Note that the Growth Rate Method is very similar to BEBR's Exponential Growth Method, but it does not account for compounding. Therefore, it will be slightly higher than a true Exponential rate calculation. BEBR's Exponential Method would use the formula (using the 2005 population projection as an example):

$$Pop2005 = e^{5r}$$
$$\text{where } r = [\ [\ \ln(\ Pop2000 / Pop1990\ )\ ] / 10\ ]$$

In an analysis comparing the two methods, it was determined that the slight differences were not significant to the projections. BEBR concurred with this conclusion.

Share of Growth Projection Method. The Share of Growth Projection Method assumes that each census block's percentage of the county's total growth will be the same as over the historic period (Sipe and Hopkins 1984: p. 23). Two share of growth rate calculations were made, one from 1980 through 2000, and one from 1990 through 2000. In the Share of Growth method (SOG), five-year population changes were calculated using the following formulas (using the 2000–2005 growth projections as an example):

$$SOG_1 = [\ (\ Pop2000 - Pop1980\ ) / (\ Co.Pop2000 - Co.Pop1980\ ) \\ \times (\ Projected\ Co.Pop2005 - Co.Pop2000\ )\ ]$$

$$SOG_2 = [\ (\ Pop2000 - Pop1990\ ) / (\ Co\ Pop2000 - Co.Pop1990\ ) \\ \times (\ Projected\ Co.Pop2005 - Co.Pop2000\ )\ ]$$

Shifted Share of Growth Projection Method. The Shifted Share of Growth Projection Method assumes that each census block's percentage of the county's total growth will change at the same rate as over the historic period. It makes a linear extrapolation of the change in each census block's share of the county population over the historic period (Sipe and Hopkins 1984: p. 25). In the Shifted Share of Growth method (SSH), five-year population changes were calculated with the following formula (using the 2000–2005 growth projection as an example):

$$SSH = [\ (\ (\ 5 \times (\ (\ Pop2000 / Co.Pop2000\ ) - (\ Pop1990 / Co.Pop1990\ )\ ) / 10\ ) \\ + (\ Pop2000 / Co.Pop2000\ )\ ) \times (\ Projected\ Co.Pop2005 - Co.Pop2000\ )\ ]$$

By their definitions, the "Share of Growth" and the "Shifted Share of Growth" Methods will project census block population that will add up to the county total. Differences at the census block level varied, but like the Growth Rate Method, the Shifted Share of Growth projection could be significantly lower than the Share of Growth projection if the growth from 1980 through 1990 was considerably higher than the growth from 1990 through 2000. The county summaries of the estimates made with the Share of Growth and Shifted Share of Growth Methods roughly equaled BEBR's estimates (by their definitions).

Average of the Projection Methods. The minimum and maximum of the six methods are dropped to reduce errors resulting from the "worst" techniques for each census block. The four remaining methods are then averaged to account for the considerable variation in growth rates and patterns over all of the census blocks within the 18 county area (Sipe and Hopkins 1984: p. 26). All four remaining methods are weighted equally, so the average is calculated with the basic formula:

$$AVG = [(METHOD_1 + METHOD_2 + METHOD_3 + METHOD_4) / 4]$$

The averaging of the four remaining projection methods reduced the errors associated with using various techniques for each census block. Although it has been suggested that some of the four methods may not be appropriate for certain areas, this averaging reduces the error associated with not using location-specific modeling methods.

Maximum Density Determination

The method for determining when a census block reaches maximum density, or becomes "built-out", is based on future land use maps developed as part of the comprehensive planning process. The maximum population is calculated for each census block by multiplying the acreage of future residential land uses by the number of dwelling units per acre; this product is multiplied by the county average number of persons per household. For each period over which the model is run, it tests each census block's calculated growth for that period against this number. If the growth exceeds the available capacity, the growth is calculated to be the capacity less the current population. The additional "lost" growth is stored and later distributed to census blocks with the available capacity and high Growth Influence Surface values. This Growth Influence Surface will be described in detail in the discussion on the Spatial Element in the next section.

V. SPATIAL ELEMENT

Spatial Element Overview

The Spatial Element of the model helps to guide where growth is distributed within a given county using the relationship of spatial features to future population growth. This Element consists of two primary components: "the Non-Developable Lands Exclusionary Mask Grid" and the "Growth Influence Surface". The Non-Developable Lands Exclusionary Mask Grid identifies areas where future growth is very unlikely to occur based on physical features (such as water bodies) and land uses/restrictions (such as conservation lands). The Growth Influence Surface is a composite of four other grids identifying areas where future growth is likely to occur also based on proximity to physical features (such as along major roads) and land use types (such as near commercial zones).

Non-Developable Lands Exclusionary Mask Grid

The Non-Developable Lands Exclusionary Mask Grid excludes future growth from physical features and land uses/restricted lands that are unlikely to be developed for residential use. The data layers included in the Mask are listed in Table 1:

Data Layer	Data Source, Date Developed
Water Bodies	SJRWMD Level 2 Land Use, 1995
Wetlands	SJRWMD Level 2 Land Use, 1995
Conservation and Other Public Lands	Conservation and Other Public Lands from the University of Florida's GeoPlan Center and SJRWMD, 1999, updated with Florida Natural Areas Inventory (FNAI) Managed Areas, Feb 2001
Major Road Rights-of-Way	Florida Department of Transportation (FDOT) Primary and Secondary Roads, 1996, with 1999 spatial and tabular updates from SJRWMD
Built-Out Residential Areas	SJRWMD Level 2 Land Use, 1995, and Future Land Use, SJRWMD

Table 1. Data Layers in Exclusionary Mask Grid

Growth Influence Surface

The Growth Influence Surface is developed from physical features and land uses that significantly attract future population growth. The data layers included in the Growth Influence Surface are listed in Table 2:

Data Layer	Data Source
Major Roads	Florida Department of Transportation (FDOT) Primary and Secondary Roads, 1996, with 1999 spatial and tabular updates from SJRWMD
Residential Areas	SJRWMD Level 2 Land Use, 1995
Commercial Areas	SJRWMD Level 2 Land Use, 1995
Water Bodies	SJRWMD Level 2 Land Use, 1995

Table 2. Data Layers in Growth Influence Surface

The Growth Influence Surface is created based upon the proximity to the data layers listed in Table 2. The Euclidean distance is calculated from the center of the source cell to the center of each of the surrounding cells by measuring the hypotenuse of a triangle with the X and Y distances as the other two legs (ESRI 1995). This true Euclidean, rather than cell distance, is calculated outward from each feature independently, normalized as a percent of total (creating values of 0 to 100), and then the four surfaces are combined into a single one. The mean influence value per census block is then calculated based on the sum of the normalized Euclidean distance values. This value is then used to determine which census blocks receive the overflow growth of built-out census blocks.

The positive influences in this layer have a significant larger area influence in population growth. Disincentives to growth (landfills, sewage treatment plants, prisons, etc.) were initially considered, but because they are more site-specific and would have a more limited influence in deterring population growth, they were not incorporated into this layer.

VI. GROWTH CALCULATIONS

<u>Growth Suitability Grid</u>

The Growth Influence Surface is then combined with the Historical Growth Trends Grid to create the Growth Suitability Grid. Existing residential land uses and anticipated future residential land uses are used to create a new grid in which future growth can be distributed. The per census block Historical Growth Trends and the mean values from the Growth Suitability Surface are then attached to the new Grid.

<u>Calculation of Growth by Census Block</u>

The growth is calculated for each census block over the specified period using the per census block growth rates from the Historic Growth Trends Grid. This adjusted average growth is added to the base year population for each census block to derive the future distribution of that growth within the county.

As was anticipated, the majority of the projected growth moved farther away from the current urban areas with each succeeding period. Over the earlier periods (2001 through 2005, 2006 through 2010, and 2011 through 2015), most of the projected growth was still clustered around current urban areas. Over the later periods however (2016 through 2020 and 2021 through 2025), much of the growth was projected to occur well outside the current urban areas.

These estimates are based on current densities and development patterns, but as yet there is little indication that these are likely to change in the near future. Consumer preferences and developer costs drive these development patterns and densities. Until the supply of land becomes scarce enough (thus increasing the cost of land), or governmental regulations encourage denser development, we must assume that there will be no fundamental change in current development patterns and densities at least for the near future.

<u>Normalize Growth with BEBR's County Total.</u> Now that the relative distribution of the growth has been determined, the model normalizes this projected growth using BEBR's medium projection county population total. To normalize to BEBR's medium county population totals, the model proportionately adjusts the projected population growth by census block so that the model's projected county total population is equal to BEBR's medium county total population. This results in a population projection for each census block that is normalized to BEBR's medium county population projection. This was done for all counties except Seminole and St. Johns.

Based on conversations with Seminole County planners, the decision was made to reduce the BEBR medium projections for 2020 and 2025 due to the lack of available, developable land. Seminole County projects build-out due to land use regulations in approximately 2015. However, the model's 2020 and 2025 projections show growth beyond 2015 based upon the assumption that there will be some conversion of other land uses to residential, and that redevelopment that will increase population density will occur. Therefore, model projections exceed those of Seminole County for 2020 and 2025, but do not reach the BEBR medium projections for those periods. If land use restrictions are relaxed to allow more residential development or development at higher densities in the future than we have projected, the 2020 and 2025 population projections for Seminole County could be higher.

The projections for St. Johns County are higher than BEBR's medium projection, as the northern portion of the county is currently being developed at a much more rapid rate than could have been predicted using historical data.

Test for Build-Out. Each census block is then tested to determine if it has exceeded its maximum capacity, or is built-out. If the base year population plus the projected growth does exceed the census block's growth capacity, the growth will be calculated to equal the capacity minus the base year population. A field in the table is then calculated equal to the excess projected growth. This field containing the excess projected growth is summed for all the census blocks in the county.

Redistribute Any Growth Exceeding Capacity. Census blocks that have not exceeded their capacity for growth are then selected one at a time in the order of their mean growth influence value. Each is again normalized to absorb any excess projected growth. If a census block becomes built-out at this stage, the additional projected growth is distributed to the census block with the highest suitability value that can absorb that growth.

VII. AGGREGATION TO UTILITY SERVICE AREAS AND TAZS

The final grids containing the distribution of population growth by census block are then summarized by water utility Service Area Boundaries (SABs) districtwide, and by Traffic Analysis Zones (TAZs) for certain counties. For each period, the population totals by census block are divided by the number of residential (both current and future), 30-meter grid cells within the census block to derive per-cell population totals. The Utility Service Area Boundaries (or TAZ boundaries) are then overlaid, and the per-cell values are re-aggregated to these boundaries. Separate population grids are created for each projection period, which are then joined together with the utility service area grid (or TAZ grid). The new joined grid's Value Attribute Table is then summarized by utility service area (or TAZ), resulting in a table with a record for each unique utility service area (or TAZ) within a particular county. This table is then exported to a dBASE file, imported into Microsoft Excel, reformatted, and "plugged in" to SJRWMD's Future Water Demand Model.

Quality Assurance Review of the Re-aggregation Process

The automated portion of this methodology assumes a homogeneous distribution and density within an individual census block. Although population distribution and density within a given census block could vary a great deal, it is not possible with the available data to automatically account for varied densities within a given census block. Therefore, a manual (visual) quality assurance (QA) review of the results of the aggregation was performed.

This review was accomplished by visually examining census blocks atop DOQs (Digital Orthophoto Quads, which are 40,000-scale color infrared digital aerial photographs). These aerials were taken between late 1998 through 2000 with the bulk done in 1999, so they roughly correspond with the 2000 Census data. They were scanned with a one-meter resolution, so individual homes are easily distinguishable (and countable, if necessary). Although occupancy status cannot be determined from aerials, they were invaluable in evaluating the accuracy of the automated re-aggregation and making any necessary adjustments.

Digital parcel maps were also used in conjunction with the DOQs to augment the QA effort in some counties. Parcels with a residential land use classification (according to the Florida

Department of Revenue's classification system) within a split block could be selected, and the portion of those occupying one SAB (or TAZ) could then be selected to determine proportionality. Any differences in the density within the split block (in terms of both households per parcel and persons per household) were taken into account using the parcel land use codes (single family, multi-family, mobile home, vacant residential, etc.).

VIII. PROJECTION ADJUSTMENTS TO BASELINE MODEL RESULTS

The automated model produced a "baseline" set of projections for the 18 counties within SJRWMD. These baseline projections were then compared with other projections made by utilities and local planning agencies. These other projections were frequently in the form of TAZ-based models employed by some of the utilities and many of the local planning agencies. To facilitate the comparison, the Model's utility service area-level results were disaggregated to TAZ.

Projection Adjustments

To fully understand the differences between projections, a dialogue was opened with utilities and local and regional planners via meetings and conference calls. An important part of this effort was to solicit information from these "local" stakeholders to leverage their knowledge of what is occurring at the local level that would influence future growth. Available information was collected about anything that could cause future projections to deviate significantly from historic trends. Examples of information collected include:

- Developments of Regional Impact (DRIs) and Planned Unit Developments (PUDs)
- New or lost industries/major job centers
- Major road or bridge construction/widening projects
- Potential changes to local land use regulations that will either relax or tighten restrictions on uses or densities
- Estimates of population within a specific utility service area not served by the utility

The information received from these local stakeholders was used to make adjustments to model results. These adjustments included augmenting or reducing growth rates from the baseline projections (exemplified by the increased projected growth rates in western Volusia County due to the widening of I-4), or overriding the rates in favor of using other data (exemplified by replacing baseline model projections with DRI or PUD projections of local planners). Local input was invaluable for adjusting the sometimes aggressive projections of developers (in the case of new developments) and utilities (which tend to be conservative in their planning, leading to projections on the high end).

IX. FINAL RESULTS

The final results are provided in tabular (spreadsheet) and GIS formats. The spatial results (the final population grids) are useful in that they graphically depict projected patterns of future growth (see Figures 3-10). However, the primary end products are the utility output tables (derived from the service area grids' Value Attribute Tables), which are "plugged into" SJRWMD's spreadsheet-based Future Water Demand Model. Tables 3 and 4 contain the population projections by utility service area for Volusia and Seminole counties respectively. Throughout this section, the spatial and tabular results from these counties are provided as examples of the final outputs of the model.

VOLUSIA COUNTY PUBLIC SUPPLY UTILITIES PUMPING MORE THAN 0.1 AMGD	POPULATION ESTIMATES AND PROJECTIONS							
	1990 Census Data	1995	2000 Census Data	2005	2010	2015	2020	2025
DAYTONA BEACH CITY OF	85,121	86,146	88,751	91,966	96,460	102,470	116,373	125,767
DELAND CITY OF	42,188	45,687	49,938	53,078	55,775	59,220	62,313	66,037
EDGEWATER CITY OF	15,030	16,335	18,462	20,634	23,659	26,908	29,214	31,254
FLORIDA WATER SERVICES CORP	45,451	55,166	65,169	74,209	84,708	93,278	97,686	101,343
HOLLY HILL CITY OF	11,796	12,132	12,568	13,261	13,982	14,966	16,144	17,091
LAKE BERESFORD WATER ASSOC INC	1,070	1,161	1,228	1,334	1,481	1,684	1,705	1,741
LAKE HELEN CITY OF	2,314	2,529	2,743	3,088	3,515	4,033	4,621	5,233
NEW SMYRNA BEACH CITY OF	24,584	26,101	27,753	29,497	31,355	33,828	36,667	38,431
ORANGE CITY	9,355	10,203	11,051	11,916	12,771	13,603	14,087	14,452
ORMOND BEACH CITY OF	39,448	41,893	46,961	51,769	56,853	61,188	65,275	68,899
PIERSON TOWN OF	2,039	2,212	2,400	2,630	2,729	2,855	2,935	2,994
PORT ORANGE CITY OF	43,537	49,706	55,874	61,892	67,015	71,408	75,031	78,148
PONCE INLET TOWN OF	1,744	2,150	2,500	2,895	3,148	3,434	3,509	3,575
VOLUSIA COUNTY UTILITIES	10,171	15,656	22,282	32,427	39,895	46,844	53,302	59,326
COUNTY TOTALS	333,847	367,076	407,679	450,596	493,346	535,719	578,860	614,291

Table 3: Population Projections for Volusia County by Utility Service Area

SEMINOLE COUNTY PUBLIC SUPPLY UTILITIES PUMPING MORE THAN 0.1 AMGD	POPULATION ESTIMATES AND PROJECTIONS							
	1990 Census Data	1995	2000 Census Data	2005	2010	2015	2020	2025
ALTAMONTE SPRINGS CITY OF	43,387	46,226	49,064	55,576	60,620	64,625	67,540	68,701
CASSELBERRY CITY OF	44,240	45,257	46,274	49,727	53,732	61,159	63,467	64,778
FLORIDA WATER SERVICES CORP - APPLE VALLEY	2,622	2,643	2,660	2,966	3,344	3,774	4,101	4,380
FLORIDA WATER SERVICES CORP - CHULUOTA	1,623	1,879	2,134	3,937	4,921	5,781	6,643	7,382
FLORIDA WATER SERVICES CORP - DRUID HILLS / BRETTON WOODS	855	717	579	579	579	579	579	579
FLORIDA WATER SERVICES CORP - MEREDITH MANOR	1,218	1,258	1,297	1,349	1,401	1,436	1,451	1,467
LAKE MARY CITY OF	5,955	8,707	11,458	13,411	14,815	16,797	17,012	17,187
LONGWOOD CITY OF	12,905	13,038	13,171	14,265	15,608	17,542	17,961	19,332
OVIEDO CITY OF	11,471	18,516	25,561	28,478	31,094	34,393	34,847	35,861
PALM VALLEY MHP	658	1,060	1,462	1,812	1,949	2,254	2,221	2,275
SANFORD CITY OF	34,760	36,604	38,447	47,982	57,022	64,423	68,180	70,333
SEMINOLE COUNTY - INDIAN HILLS / CONSUMER / HAYS	25,257	31,987	39,149	41,663	43,853	45,719	47,007	47,934
SEMINOLE COUNTY - LYNWOOD / BELAIRE	6,060	7,042	8,079	8,995	9,824	10,582	10,970	11,289
SEMINOLE COUNTY - COUNTRY CLUB / GREENWOOD	9,209	12,089	15,158	17,400	19,839	22,708	23,336	23,792
SEMINOLE COUNTY - HANOVER / HEATHROW / MONROE	4,890	7,832	10,979	17,143	23,485	30,005	30,437	30,870
SEMINOLE COUNTY - CHASE GROVE / PLANT 42	247	1,139	2,031	2,449	2,728	2,471	3,011	3,088
UTILITIES INC OF FLORIDA - SANLANDO UTILITIES CORP	33,430	33,509	33,587	35,174	36,629	37,529	37,830	38,071
UTILITIES INC OF FLORIDA - JANSEN	598	637	675	713	749	749	749	749
UTILITIES INC OF FLORIDA - OAKLAND SHORES	355	341	326	326	326	326	326	326
UTILITIES INC OF FLORIDA - RAVENNA PARK	951	925	898	925	951	976	976	976
UTILITIES INC OF FLORIDA - WEATHERSFIELD	3,208	3,230	3,252	3,278	3,307	3,319	3,319	3,319
WINTER SPRINGS CITY OF	22,448	26,765	31,083	36,944	37,641	39,694	42,093	43,595
COUNTY TOTALS	266,348	301,397	337,324	385,091	424,417	466,842	484,057	496,283

Table 4: Population Projections for Seminole County by Utility Service Area

Figure 2 illustrates the water utility service areas in Volusia and Seminole counties. There are some small public supply utilities not shown on this figure, but only these utilities [which pumped more than 0.1 MGD (million gallons per day) in the year 2000] were included in the re-aggregation process.

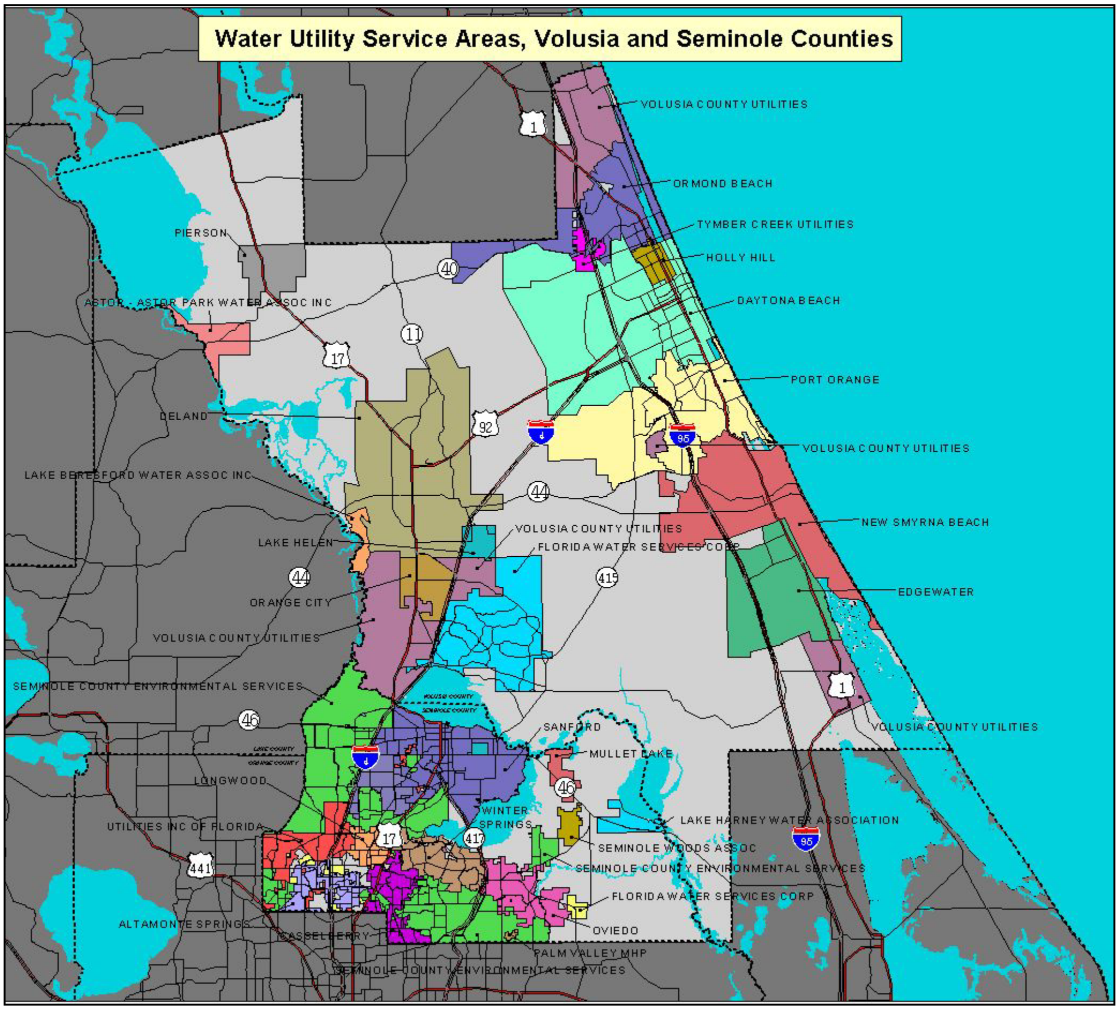

Figure 2: Potable Water Utility Service Areas in Volusia and Seminole Counties

The spatial (map) results were particularly useful for communicating the spatial allocation of growth, and for depicting areas that are projected to have particularly high and/or low growth relative to the region as a whole. Model results disaggregated to TAZs enhanced this effort, as TAZs represent smaller areas (increasing the specificity of the allocation). Additionally, local planners use TAZs for their own forecasting, so this disaggregation facilitated comparison of model results with other projections.

Figures 3 and 4 on the following page depict the population density in Volusia and Seminole counties by TAZ in 2000 and 2025 respectively. This TAZ population normalized by TAZ acreage is more meaningful than total TAZ population, as TAZs can vary widely in size.

Figures 5–10 show the growth by TAZ for each of the five-year periods in a dot density format. The growth dots show areas of new growth atop the 2000 base year population.

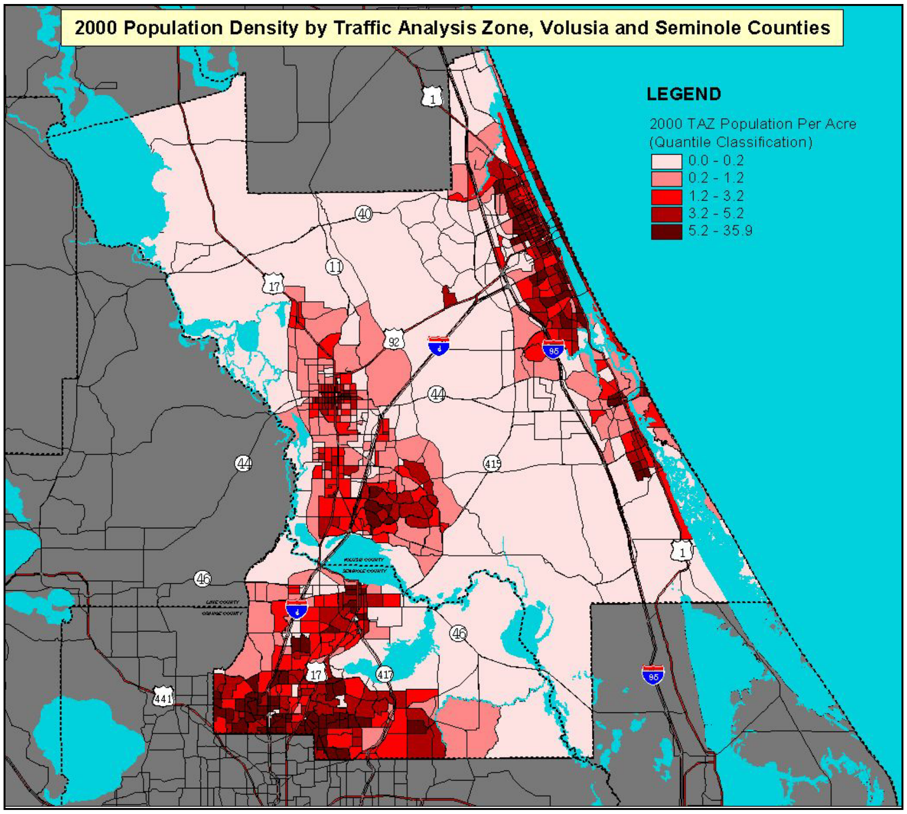

Figure 3: Year 2000 Population Density by TAZ

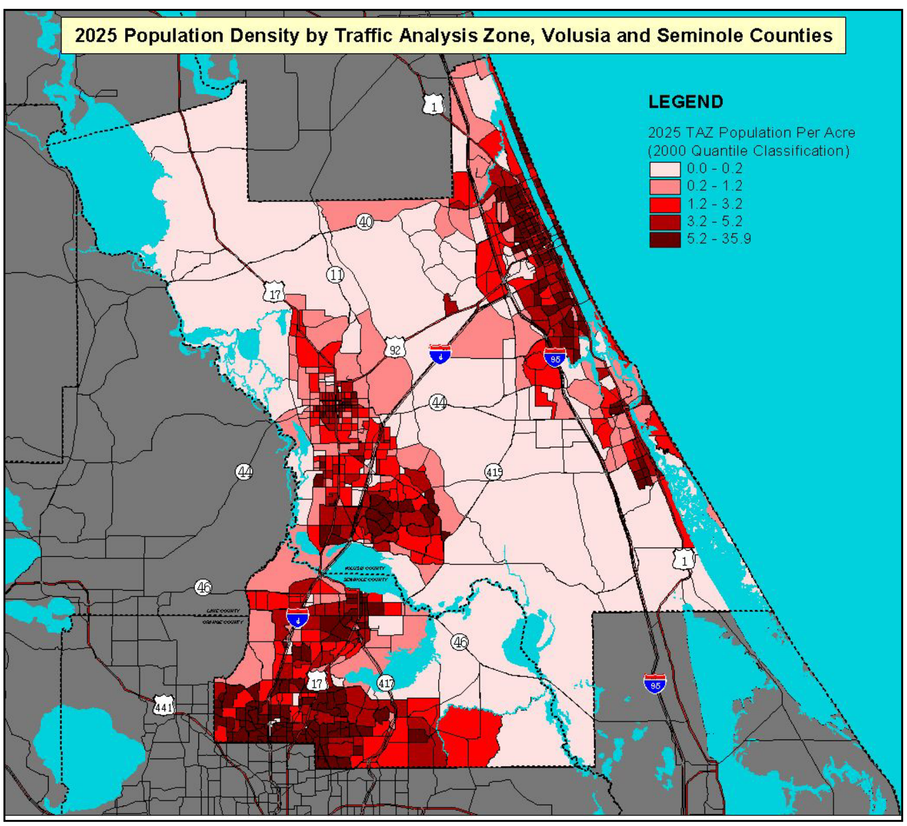

Figure 4: Year 2025 Population Density by TAZ

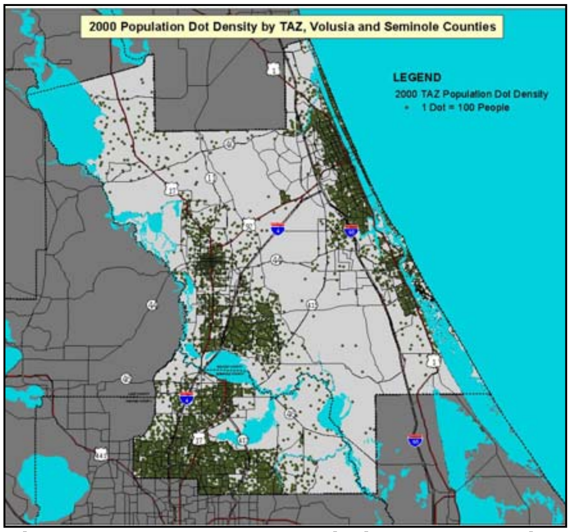

Figure 5: Year 2000 Population Dot Density

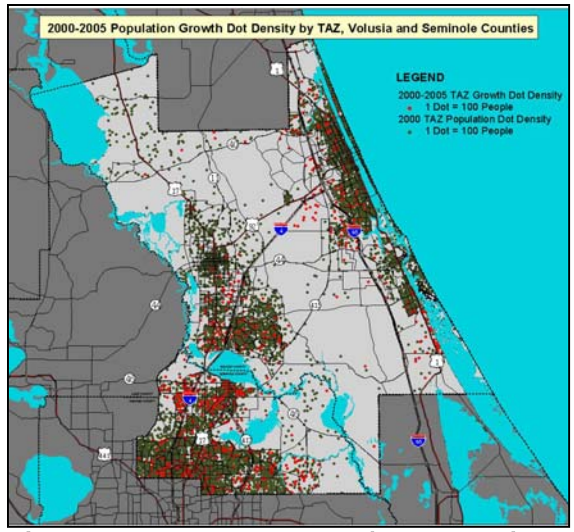

Figure 6: 2000 – 2005 Growth Dot Density

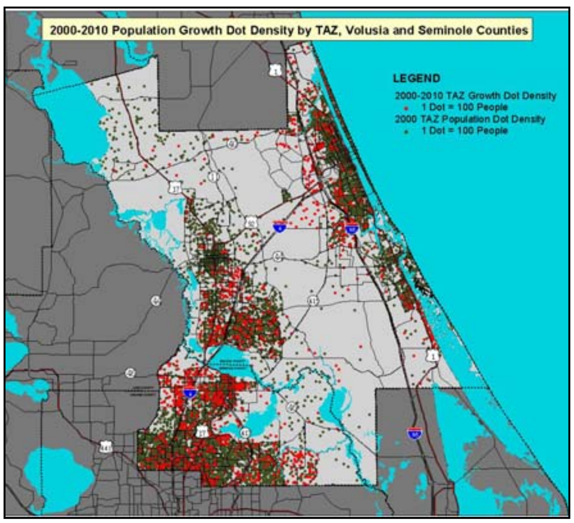

Figure 7: 2000 – 2010 Growth Dot Density

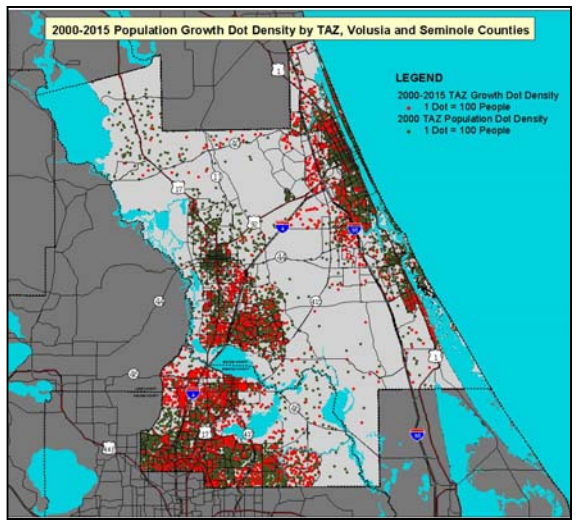

Figure 8: 2000 – 2015 Growth Dot Density

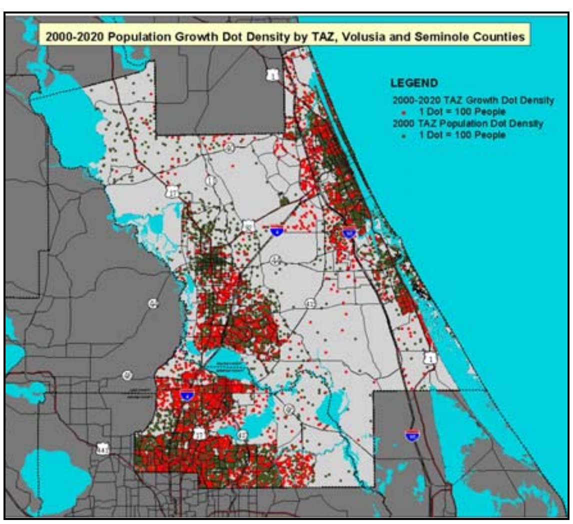

Figure 9: 2000 – 2020 Growth Dot Density

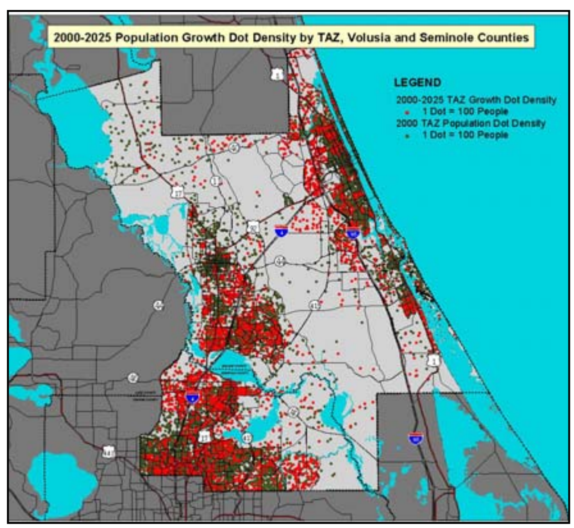

Figure 10: 2000 – 2025 Growth Dot Density

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