

METHOD FOR DETERMINING FUTURE WATER DEMAND NEEDS FOR PUBLIC/PRIVATE WATER SYSTEMS

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COMPANION SPREADSHEETS ARE LOCATED AT <http://www.gadnr.org/cws/>

**Georgia Environmental Protection Division
Watershed Protection Branch
Guidance Document**

METHOD FOR DETERMINING FUTURE WATER DEMAND NEEDS FOR PUBLIC/PRIVATE WATER SYSTEMS

Developed by the Georgia Environmental Protection Division (EPD)
To support the “*Coastal Georgia Water and Wastewater Permitting
Plan for Managing Saltwater Intrusion*”

July 2007

This guidance document is intended for entities in the 24-county area of Georgia’s coast addressed in the “Coastal Georgia Water and Wastewater Permitting Plan for Managing Saltwater Intrusion”, located in Sub-Regions 1, 2 and 3, that are:

- Privately Owned or Operated Public Community Drinking Water Systems with ONLY an Operating Permit;
- Public Community Water Systems with Water Withdrawal and/or Operating Permits;
- Governmentally Owned or Operated Public Drinking Water Systems with an Operating Permit; or
- Governmentally Owned or Operated Transient Non-Community or Non-Transient Non-Community Public Water Systems with either an Operating Permit and/or a Withdrawal Permit.

When to use this guidance document: For a groundwater withdrawal permit application to be complete according to the 2006 Coastal Plan, EPD will now require a detailed justification of need for the existing amount of water allocated on your present permit, and a forecast of your future water demand needs through 2030. This document is designed to guide public or private water systems in calculating future water demand needs. You should use it when applying for a new withdrawal permit, or when you are asking for a modification or renewal of your existing permit. Your new or renewed permit will expire in 10 years. Your requested annual average permit limit must be consistent with your 10 year projected water demand forecast. If you are in Sub-region 1, Red Zone, be aware that Upper Floridan Aquifer groundwater may not be available to meet these needs. If your water demand needs exceed your 2004 groundwater withdrawal amount, you will be requested to explore alternate supply sources as a part of the permit application process.

How to use this guidance document: The guidance is broken down into 3 parts: Part 1 describes the common methods for large and small systems that are used to delineate service areas and make future population projections. Part 2 outlines a method for small water systems to calculate future water demands for Public/Private Water Systems serving less than 3300 people or withdrawing less than 330,000 gpd. Part 3 outlines a method for large water systems to calculate future water demands for Public/Private Water Systems serving more than 3300 people or withdrawing more than 330,000 gpd. Each part has tables that you can use as worksheets to calculate population demands and future water needs. Each part will tell you where you can find most of the numbers you will need, and step-by-step instructions on how to calculate other numbers. A companion spreadsheet for each of the water demand methods can be found on EPD’s website: <http://www.gadnr.org/cws/>. These spreadsheets can be used and submitted instead of the worksheets. When completed by the permit applicant, the worksheets or spreadsheets must be submitted with the completed permit application. At the end of this document, you will find reference to further technical guidance on alternative water sources, which will be especially important to permittees in Sub-Region 1 whose permits may be limited by total Upper Floridan aquifer withdrawals from 2004.

EPD contact: If you have any questions, or require additional information, please contact the EPD Water Withdrawal Program, at 404-675-1680. As the 2006 Coastal Plan is implemented, EPD will welcome feedback from permittees regarding this guidance document.

METHOD FOR DETERMINING FUTURE WATER DEMAND NEEDS FOR PUBLIC/PRIVATE WATER SYSTEMS

Groundwater use in Georgia must be both reasonable and beneficial. The amount of water needed for reasonable and beneficial use must be clearly demonstrated by a permit applicant. For smaller public systems, this amount can be calculated based upon a simple per capita (per person) usage calculation, taking into account the projected needs of the population and the industrial, commercial and other users supplied by the applicant. For larger public/private systems, the amount of water needed can be calculated based on the projected water demand needs of the population and each of the individual industrial, commercial and other users supplied by the water system.

PART 1: SERVICE AREA DELINEATION AND POPULATION PROJECTIONS

The methods for calculating future water demand needs for large and small systems differ significantly in some ways; however, they both have common elements that are described below. Both system types must clearly delineate their service area and make population projections using published reports on coastal Georgia.

A) Designated Planning Period (for large and small systems)

The time frame for Georgia's water demand forecasting is for the period 2000-2030, done in five-year increments (2000-2005-2010-2015-2020-2025-2030). Population projections for much of Georgia have been published using this time frame. Actual population and water use numbers must be used for 2000 and 2005, and projected numbers must be used for the remaining years.

B) Information on Service Delivery Area (for large and small systems)

You must provide EPD with the following information regarding your service delivery area:

- 1) A map defining your current service delivery area
- 2) A copy of the approved County Service Delivery contract under which you operate.
- 3) Proof of your compliance with the existing provisions of your County Service Delivery Strategy.
- 4) If you have any plans on expanding your service area in the future, please document what those expansion plans are, provide a map clearly showing your proposed expansion, and provide complete documentation as to whether your neighboring water systems agree with your expansion plans. In the event of a dispute between neighboring water systems, EPD cannot permit overlapping or competing claims for delineated service areas until the dispute is resolved.

C) Information on Population Projections (for large and small systems)

1) For population projections in **Bryan, Bulloch, Camden, Chatham, Effingham, Glynn, Liberty, Long, McIntosh, and Screven counties**, you must use the population figures published in the September 2006 report: **Georgia Coast 2030: Population Projections for the 10-county Coastal Region**. This report was prepared by the Center for Quality Growth and Regional Development at the Georgia Institute of Technology, specifically for the Coastal Georgia Regional Development Center. This report is available online at: www.coastalgeorgiarcd.org/docs/cgrdc_population_report_101806.pdf . Be sure to subtract households in your service area who you do not serve, such as those on private wells.

2) For population projections in the Georgia coastal counties not included in the 10 county study area of the above report: that is, **Appling, Bacon, Brantley, Burke, Candler, Charlton, Emanuel, Evans, Jenkins, Pierce, Tattnall, Toombs, Ware, and Wayne counties**:

a) You must provide your projected service area population, by starting with any existing Office of Planning and Budget at <http://www.gadata.org/> , or US Census Bureau population projections at <http://www.census.gov/> for your designated service area. Be sure to subtract residents in your service area who you do not serve, such as households on residential wells.

b) If you do not use the population data from an existing source such as the Office of Planning and Budget or the US Census Bureau, you must explain the reason why you are using different population numbers. You must then defensibly support and justify any significant difference in population projections for your service area.

3) If your distribution or service area is different from any established city or county boundary defined in the reference materials noted above, you must provide a clear explanation of how you determined your projected population in the areas outside of well-documented municipal boundaries. You must provide documentation supporting the following conditions:

- a) Known and documented population being served outside the municipal boundaries;
- b) Projected additional population being served outside of the municipality boundary.

This could be based on:

- 1) Proportional areas - comparing population percentages to surface area
- 2) Proportional population distribution
- 3) Any other method (please explain on a separate sheet with your application).
- c) Households in your service area not served by your water system, such as those using private wells.

Using the appropriate choice of the three methods described above, calculate or enter the population figures for the customer base in your entire service area in the following table, and then again in the companion on-line spreadsheet (see below) in the column labeled “Residential Population Served”.

Table 1: Residential population served

| | | |
|-----------|---------|-------|
| Year 2000 | POP2000 | _____ |
| Year 2005 | POP2005 | _____ |
| Year 2010 | POP2010 | _____ |
| Year 2015 | POP2015 | _____ |
| Year 2020 | POP2020 | _____ |
| Year 2025 | POP2025 | _____ |
| Year 2030 | POP2030 | _____ |

PART 2: SMALL SYSTEM METHOD

(“Standard Per Capita Method” for projecting future water demands for Public/Private Water Systems serving less than 3300 people or withdrawing less than 330,000 gpd.)

In this section, you will perform a series of calculations that will lead you to your future water demand numbers. This guidance document also serves as a worksheet to help you keep track of your calculations. You may choose to complete the calculations in the worksheets below, or enter the numbers into the companion on-line spreadsheet referenced below. Submit either the spreadsheet or worksheet with your completed withdrawal permit application. The future water demand number calculated here, and all the information and work required in this guidance document must be included in any application for a new, renewed or increased groundwater withdrawal permit.

A) Information on Per Capita Use

First, you will determine your system's current '**per capita use**' in gallons per day per capita. You will have to calculate this per capita number for both of the years 2000 and 2005. The following steps will show you how to do this. Each step will determine a different number that you will enter into a table in this document and into the companion spreadsheet, “Water Usage for Small Systems” available on line at <http://www.gadnr.org/cws/>

- 1) How much water was withdrawn in 2000, expressed in gallons per day (gpd), using an annual average? This number will be referred to as “WD2000” in the calculations below. On the companion spreadsheet, enter this number in Column ‘C’.
- 2) How much additional water was purchased or derived from other sources in 2000, expressed in gpd - annual average? This number will be referred to as “PD2000” in the calculations below. On the companion spreadsheet, enter this number in Column ‘D’.
- 3) How much water was sold to other systems expressed in gpd (annual average)? This will be referred to as “SD2000” in the calculations below. On the companion spreadsheet, enter this number into Column ‘E’.
- 4) How much Total System Water (“TSW2000”) was used? It is the sum of WD2000 + PD2000 minus SD2000. This value is automatically calculated in column ‘F’ of the companion spreadsheet.
- 5) What is the population (“POP2000”) of your service area in 2000? Use the numbers entered in Table 1: Residential population served (see part 3 above). Also, in the companion spreadsheet “Water Usage Small Systems”, residual population served is entered in Column ‘B’.
- 6) Determine your Per Capita Usage for the year 2000 (“PCU2000”). To do this, divide Total System Water by Population for that year. That is, $PCU2000 = TSW2000 / POP2000$. On the companion spreadsheet, this value is automatically calculated in Column ‘G’.
- 7) Repeat steps 1 through 5 using the actual numbers for the year 2005 and calculate PCU2005.
- 8) Calculate the average Per Capita Use (“**PCUbase**”) for 2000 and 2005 by adding them and dividing by two. That is, $PCUbase = (PCU2000 + PCU2005) / 2$. This is your system’s current **per capita use** number. Enter this number in the first line of the table below. This value is automatically calculated in Column I, Row 14 of the companion spreadsheet.

Table 2: Calculation of per capita use

- | | |
|-----------|-------|
| 1) WD2000 | _____ |
| 2) PD2000 | _____ |

- 3) SD2000 _____
- 4) TSW2000 _____
- 5) POP2000 _____
- 6) PCU2000 _____
- 7) PCUbase _____

B) Water Conservation Correction

As the coastal counties continue to grow, EPD expects genuine water conservation efforts on the part of all water systems. As these water conservation efforts are implemented, and as users become more efficient in their water usage, we anticipate that per capita water usage will decrease. Previous studies from other areas in Georgia and the US indicate that a minimum of least a 1% decrease in per capita usage per year can be achieved. The 1% per year value takes into account the expectation that your required future enhanced water conservation efforts and future leak detection programs will be effective. Consideration will be given for any system using a different projected per capita use calculation, if defensible reasoning and comprehensive documentation are provided.

Although a 1% reduction in per capita use sounds like a small number, over a long period of time it can add up and have a significant impact on future water demand needs. To calculate your future water demand needs corrected for expected conservation, you will start with your Per Capita Use base number which you calculated in Step 8 above. These new per capita numbers are the basic building block for your projected future water needs. Enter PCUbase on line (1), and multiply that times the numbers shown below. Enter your calculations in the table.

Table 3: Per capita usage with conservation factor

- 1) Beginning per capita usage average number (from Step 7 above) {PCUbase} _____
- 2) 2010 projected per capita usage number (PCUbase times 0.98) {PCU2010} _____
- 3) 2015 projected per capita usage number (PCUbase times 0.93) {PCU2015} _____
- 4) 2020 projected per capita usage number (PCUbase times 0.90) {PCU2020} _____
- 5) 2025 projected per capita usage number (PCUbase times 0.90) {PCU2025} _____
- 6) 2030 projected per capita usage number (PCUbase times 0.90) {PCU2030} _____

C) Future Water Demand Calculation

Finally, complete the future water demand calculations by multiplying the projected population number (for example, "POP2010") by the appropriate per capita usage number (e.g. "PCU2010"). This will be your calculated, **Future Water Demand** number for that year. On the companion spreadsheet, these values are automatically calculated in Column 'K'.

Table 4: Future water demand through 2030

- 1) Current Water Demand (actual 2007 numbers) _____ mgd
- 2) 2010 Future Water Demand {POP2010 x PCU2010 = PWD2010} _____ mgd
- 3) 2015 Future Water Demand {POP2015 x PCU2015 = PWD2015} _____ mgd
- 4) 2020 Future Water Demand {POP2020 x PCU2020 = PWD2020} _____ mgd
- 5) 2025 Future Water Demand {POP2025 x PCU2025 = PWD2025} _____ mgd
- 6) 2030 Future Water Demand {POP2030 x PCU2030 = PWD2030} _____ mgd

PART 3: LARGE SYSTEM METHOD

(“Detailed Per Capita Method” for projecting future and historic water demands for Public/Private Water Systems serving more than 3300 people or withdrawing more than 330,000 gpd.)

A) Historic Use

Coastal Georgia has experienced rapid population growth in the past decade. Tracking past water use and comparing it to projected future water demands is very useful in monitoring system efficiency, conservation, changes in use patterns, and other trends. This information will be very valuable in your planning process, as well as valuable to EPD and other regional water planning entities. Therefore, the first step in Part 3 is to calculate your past average daily water use for the preceding 5-year period by completing the table below using numbers from your own records.

You will have to enter numbers from your records for each category of water use in the table below or the companion spreadsheet available online at: <http://www.gadnr.org/cws/>. The spreadsheet is titled “Historic Usage for Large Public/Private Systems”. Present all water use numbers in gallons per day (gpd). The categories of water use needed to enter usage numbers are as follows:

- 1) Past Population in your service area / number of residents (POP) (This is column B in the companion spreadsheet.)
- 2) Number of residential units served in your service area; that is, the number of households (UNITs) Average Household use (HU) (Column C of the companion spreadsheet.)
- 3) Annual average water withdrawn (WD) (Column D of the companion spreadsheet.)
- 4) Annual average water purchased from other systems (PD) (Column E of the companion spreadsheet.)
- 5) Annual average water sold to other systems (SD) (Column F of the companion spreadsheet.)
- 6) Annual average water distributed to your system (TSW) (Column G of the companion spreadsheet.) (WD + PD – SD = TSW)
- 7) Annual average residential household usage (HU) (Column H of the companion spreadsheet.)
- 8) Annual Per Capita Usage (Column I of the companion spreadsheet.) (Column H/Column C * 1000000)
- 9) Average Commercial / Industrial use (CIU) (Column J of the companion spreadsheet.)
- 10) Average Irrigation use in urban landscaping (IU) (Column K of the companion spreadsheet.)
- 11) Usual Water Utility Usage (monitored usage, e.g. fire protection sewer flushing, construction & maintenance, etc.) (WUU) (Column L of the companion spreadsheet.)
- 12) Unaccounted for Water (from an audit of your system) (UAW) (Column M of the companion spreadsheet.)
- 13) Your final calculation will be to determine Total Annual Usage (Column N of the companion spreadsheet.) (HU + CIU + IU + WUU + UAW)

Table 5: Historic water use for the past five years

Complete the following calculations for the last five years. For example, calculations for 2007 would be:

POP2007 = _____ gpd
UNITS2007 = _____ gpd
WD2007 = _____ gpd
PD2007 = _____ gpd
SD2007 = _____ gpd
TSW2007 = _____ gpd
HU2007 = _____ gpd
CIU2007 = _____ gpd
IU2007 = _____ gpd
WUU2007 = _____ gpd
UAW2007 = _____ gpd
TOT. ANNUAL 2007 = _____ gpd

B) Future Use

As water use in Coastal Georgia continues to grow, EPD, regional water planning entities, and water users will increasingly want to know more about patterns of water use. For example, these entities will want to know if conservation efforts are sufficient, if per capita use is decreasing or increasing, if landscaping water use has become more efficient, etc. Therefore, EPD is asking you to estimate your future water use for the same categories that have been tracked historically. This will be extremely helpful to your water planning efforts, as you will be able to determine if your planning goals are on target or need adjustment. We realize that many of the numbers you use to project your future water use will be estimates; however, the potential value to you and your community make this exercise worthwhile.

Table 6 below is similar to Table 5 for “Historical Use”. Using population projections from the previous sections of this guidance document, published population and commercial growth estimates in the documents referenced above, and your own records of commercial and industrial use, UAW, and other categories, fill in Table 6 on this worksheet, or fill in the on-line spreadsheet, titled “Projected Future Water Usage - Large Public/Private Systems”, using the same numbers you used in Table 5. Present all water use numbers in gallons per day (gpd). The on-line spreadsheet is available at <http://www.gadnr.org/cws/>.

The categories of water use you need to enter usage numbers for are:

- 1) Past Population in your service area / number of residents (POP) (This is column B in the companion spreadsheet.)
- 2) Number of residential units served in your service area; that is, the number of households (UNITS) Average Household use (HU) (Column C of the companion spreadsheet.)
- 3) Annual average water withdrawn (WD) (Column D of the companion spreadsheet.)
- 4) Annual average water purchased from other systems (PD) (Column E of the companion spreadsheet.)
- 5) Annual average water sold to other systems (SD) (Column F of the companion spreadsheet.)
- 6) Annual average water distributed to your system (TSW) (Column G of the companion spreadsheet.) (WD + PD – SD = TSW)
- 7) Annual average residential household usage (HU) (Column H of the companion spreadsheet.)
- 8) Annual Per Capita Usage (CAP) (Column I of the companion spreadsheet.) (Column H/Column C times 1000000)

- 9) Projected water conservation factor (Column J of the companion spreadsheet.)
- 10) Annual average residential household usage with conservation factor (HUC) (Column K of the companion spreadsheet.) (Column H times Column J)
- 11) Average Commercial / Industrial use (CIU) (Column L of the companion spreadsheet.)
- 12) Average Irrigation use in urban landscaping (IU) (Column M of the companion spreadsheet.)
- 13) Usual Water Utility Usage (monitored usage, e.g. fire protection sewer flushing, construction & maintenance, etc.) (WUU) (Column N of the companion spreadsheet.)
- 14) Unaccounted for Water (from an audit of your system) (UAW) (Column O of the companion spreadsheet.)
- 15) Your final calculation will be to determine Total Annual Usage (Column P of the companion spreadsheet.) (HUC + CIU + IU + WUU + UAW)

Table 6: Future water use

Complete the following calculations beginning in 2010 in five-year increments till 2030

POP2010 = _____ gpd
 UNITS2010 = _____ gpd
 WD2010 = _____ gpd
 PD2010 = _____ gpd
 SD2010 = _____ gpd
 TSW2010 = _____ gpd
 HU2010 = _____ gpd
 CAP2010 = _____ gpd
 HUC2010 = _____ gpd
 CIU2010 = _____ gpd
 IU2010 = _____ gpd
 WUU2010 = _____ gpd
 UAW2010 = _____ gpd
 TOT. ANNUAL 2010 = _____ gpd

Add up the individual water demand projections assigned to each of the categories. Calculate overall future projected water demands, making sure to incorporate any water conserving Best Management Practices and other water conservation reductions (a minimum of 1% reduction per year). Large independent users, such as major industries or commercial operations, can be treated on an individual basis and added back in separately for total demand level. Projected demand requires information projected from 2010 and every five years beyond that through 2030.

WHAT NEXT? – WATER SUPPLY SOURCE ALTERNATIVES

The Coastal Georgia Water and Wastewater Permitting Plan for Managing Salt Water Intrusion (2006 Coastal Plan), reduces the amount of water that can be withdrawn from the upper Floridan aquifer in Chatham county and Effingham County south of Georgia Highway 119 (referenced in the 2006 Coastal Plan as Sub-Region 1, Red Zone) to 2004 production levels minus 5 million gallons per day (mgd) from those counties. In Liberty and Bryan counties (Sub-region 1, Yellow Zone), the plan limits production in the upper Floridan aquifer to that amount produced in 2004 plus 5 mgd.

Please study the water demand numbers for the projections you have just calculated. Keep in mind that in Sub-Region 1, Red Zone, increases in upper Floridan groundwater withdrawals may not be possible, and in fact, total permitted allowance of upper Floridan groundwater must be reduced to 2004 actual production values. Limitations may also be required in Sub-region 1, Yellow Zone. Therefore, **do not assume that Upper Floridan aquifer groundwater will automatically be available to meet your demands.** If you cannot meet all your needs by using withdrawals from the Upper Floridan aquifer, you must provide your plan for meeting these additional needs as part of your permit application. Supply alternatives may consider both demand management options and supply enhancement options. Some potential alternate water source options are:

1. **Water transfers.** Other nearby suppliers with surplus capacity may be able to provide sufficient water to offset groundwater use.
2. **Development of groundwater aquifers other than the upper Floridan aquifer.** In coastal Georgia, the Cretaceous aquifer, the lower Floridan aquifer, Brunswick (Miocene) aquifers, and surficial aquifers may provide sufficient water for some needs. These aquifers could potentially be used for recreational uses and landscape irrigation.
3. **Development of surface water resources.** Some rivers and streams in coastal Georgia may have sufficient flow and available water, with treatment, to supplement groundwater supplies. Surface water withdrawals must take existing downstream surface water users into account.
4. **Direct surface water supply reservoir.** In the upland counties where relief is higher, small community surface water supply reservoirs may be practical.
5. **Desalination.** Seawater can be treated to drinking water standards using well-established and widely used technology. In addition, deep groundwater with high mineral content can sometimes be “de-salinated” at much lower cost and with much less waste than desalinated seawater.
6. **Other.** These options may not be practical in every situation. Therefore, you may consider developing cooperative agreements with adjacent or nearby entities to share the cost of a desalination system, small community reservoir, well field, or some other alternative supply source. It is also a fact that the cheapest water available is the water you already have. *For this reason, you are strongly encouraged to develop aggressive and effective water conservation plans, promote re-use of reclaimed water, promote household water efficiency, implement conservation-oriented water rate structures, and develop other practices that will minimize your need for alternative water sources.* Guidance documents addressing these practices can be found at <http://www.gadnr.org/cws/>

Criteria for Consideration

The following is a suggested list of criteria that may be considered in your evaluation of alternative water supplies. Each permittee will have different circumstances to consider, and those circumstances will probably change with time.

- **Financial**
 - Construction and development costs of an alternate supply
 - Operating costs of an alternate source (e.g. a new well field)
 - The degree of control and management which you could exercise if water from outside your delivery area is used
 - Reliability of an alternate source to meet peak demand
 - The flexibility an alternate source provides in meeting your needs
 - The long-term viability of the alternate water supply versus the likely need of additional capital costs at some point in the future

- **Environmental**
 - Aquatic biodiversity. Withdrawals of surface water or construction of reservoirs may have significant negative effects on fish and invertebrate populations, especially if surface water withdrawals occur during drought. Reservoirs may break up a watershed into isolated segments, preventing fish from moving throughout the watershed. Groundwater withdrawals from surficial aquifers may de-water wetlands, causing a collapse of wetland flora and fauna.
 - Water quality. Some streams and rivers in coastal Georgia are near the limit where they can assimilate more wastewater. Additional withdrawals from these streams may impair their water quality.
 - Sustainability

If you believe you are unable to meet your 2004 production target by developing alternate water sources, please contact EPD as soon as possible. We will work with you to develop an appropriate and defined plan to help you meet the 2004 permit targets.