GUIDELINES FOR PREPARATION OF SOURCE/TREATMENT/STORAGE CAPACITY ANALYSIS REPORTS FOR PUBLIC WATER SYSTEMS

July 2004

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LIST OF ABBREVIATIONS AND ACRONYMS

ACHD	approved county health department
ADD	average daily demand
ADP	average daily production
BEBR	Bureau of Economic and Business Research (at the University of Florida)
CWS	community water system
DEP	Department of Environmental Protection
ES	equalization storage
F.A.C.	Florida Administrative Code
FS	fire storage
gpcd	gallons per capita per day
gpm	gallons per minute
MDD	maximum-day demand
MDP	maximum-day production
MG	million gallons
MGD	million gallons per day
MOR	monthly operation report
NFFD	needed fire-flow duration
NFFR	needed fire-flow rate
PHD	peak-hour demand
psi	pounds per square inch
PWS	public water system
TPC	treatment plant capacity

PURPOSE/APPLICABILITY OF THESE GUIDELINES

The purpose of these guidelines is to supplement Rule 62-555.348, Florida Administrative Code (F.A.C.), and provide detailed guidance for the preparation of source/treatment/storage capacity analysis reports for public water systems (PWSs).

As currently written, Rule 62-555.348, F.A.C., applies to all PWSs that are community water systems (CWSs) and that serve, or are designed to serve, 350 or more persons or 150 or more service connections. However, the Department of Environmental Protection (DEP) intends to amend Rule 62-555.348 so the rule is applicable to only those CWSs serving, or designed to serve more than 3,300 persons. Therefore, CWSs serving, or designed to serve, greater than or equal to 350 persons or 150 service connections but less than or equal to 3,300 persons do not have to comply with Rule 62-555.348 unless the DEP or appropriate approved county health department (ACHD) specifically notifies them otherwise, and Rule 62-555.348 and these guidelines should be considered applicable to only CWSs serving, or designed to serve, more than 3,300 persons. Accordingly, PWSs that are CWSs serving, or designed to serve, more than 3,300 persons shall do the following:

- routinely compare the total net quantity of finished water produced each day by their treatment plant(s) with the total permitted maximum-day operating capacity of their plant(s); and

- submit capacity analysis reports to the appropriate DEP district office or ACHD when the total maximum-day quantity of finished water produced by all treatment plants connected to the PWS, including water produced to meet any fire-flow demand but excluding water produced to meet any demand that the PWS documents to be highly unusual and nonrecurring, exceeds 75 percent of the total permitted maximum-day operating capacity of the plants.

SUBMITTAL OF CAPACITY ANALYSIS REPORTS

Per paragraph 62-555.348(3)(a), Florida Administrative Code (F.A.C.), an initial capacity analysis report must be submitted to the Department of Environmental Protection (DEP) or appropriate approved county health department (ACHD) within six months after the month in which the total maximum-day quantity of finished water produced by a public water system's (PWS's) treatment plant(s) first exceeds 75 percent of the total permitted maximum-day operating capacity of the plant(s) or by August 28, 2004, whichever occurs later.

Per paragraph 62-555.348(3)(b), F.A.C., updated capacity analysis reports must be submitted as follows:

If the Initial or Latest Updated Capacity Analysis Report Indicates…	**Due Date for Next Updated Capacity Analysis Report**
total maximum-day demand at build-out will be ≤ current total permitted maximum-day operating capacity of treatment plant(s) & total finished-water storage need at build-out will be ≤ existing total useful finished-water storage capacity	no additional capacity analysis report is required
total maximum-day demand will be ≤ current total permitted maximum-day operating capacity of treatment plant(s) for ≥ 10 years & total finished-water storage need will be ≤ existing total useful finished-water storage capacity for ≥ 10 years	5 years after submittal of previous capacity analysis report
total maximum-day demand will be > current total permitted maximum-day operating capacity of treatment plant(s) in < 10 years but ≥ 5 years or total finished-water storage need will be > existing total useful finished-water storage capacity in < 10 years but ≥ 5 years	2 years after submittal of previous capacity analysis report
total maximum-day demand will be > current total permitted maximum-day operating capacity of treatment plant(s) in < 5 years or total finished-water storage need will be > existing total useful finished-water storage capacity in < 5 years	1 year after submittal of previous capacity analysis report

In no case shall it be necessary for any PWS to submit more than one capacity analysis report annually.

Capacity analysis reports shall be submitted to the appropriate DEP district office or ACHD. For a list of DEP district offices, please visit the following DEP web page: www.dep.state.fl.us/secretary/dist/. For a list of ACHDs, please visit the following DEP web page: www.dep.state.fl.us/water/drinkingwater/organize.htm.

CONTENTS OF CAPACITY ANALYSIS REPORTS

Subsection 62-555.348(4), Florida Administrative Code (F.A.C.), lists the information that must be included in capacity analysis reports. The following sections provide detailed guidance on how to obtain or determine, and present, the required information.

Persons preparing a capacity analysis report should consider, and coordinate appropriate aspects of the report with, applicable local government comprehensive plans and applicable regional water supply plans prepared by water management districts.

Cover Page

Each capacity analysis report should have a cover page containing the following information:

- the type of capacity analysis report ("initial capacity analysis report" or "updated capacity analysis report");
- the name and Department of Environmental Protection (DEP) identification number of the public water system (PWS);
- the county in which the PWS is located;
- the date of the capacity analysis report; and
- the name, mailing address, telephone number, and e-mail address of the company and/or professional engineer preparing the capacity analysis report.

The preparation of a capacity analysis report is considered "engineering" or "professional engineering" as the terms are defined in subsection 471.005(7), Florida Statutes. Accordingly, subsection 62-555.348(5), F.A.C., states that capacity analysis reports must be prepared under the responsible charge of a professional engineer licensed in Florida and must be signed, sealed, and dated by the professional engineer in responsible charge. The cover page is the appropriate place for the signature, seal, and date of the professional engineer in responsible charge of preparing a capacity analysis report.

Section 1: Description of Public Water System

Each capacity analysis report should include a brief description of the PWS. Although not explicitly required under subsection 62-555.348(4), F.A.C., a brief description of the PWS will establish a foundation for the remainder of the capacity analysis report. The brief description of the PWS should include the following information:

- The owner of the PWS.

- A brief description of interconnections, and agreements, with adjacent PWSs.

- A brief description of the service area of the PWS and the service area of each consecutive system that the PWS supplies with water, including description of the following: current service area boundaries; political boundaries and geographic features that may impact future service area growth; current land uses and zoning in and around the service area(s); and the estimated average service population for the PWS during the most recent complete calendar year or the most recent 12-month period. An excellent way to describe most service area characteristics is to use maps. When estimating the average service population for the PWS during the most recent complete calendar year or the most recent 12-month period, one can use pertinent population estimates from the Bureau of Economic and Business Research (BEBR) at the University of Florida or multiply the average number of active residential service connections during that calendar year or 12-month period by an appropriate persons-per-residence factor. (According to the U.S. Census Bureau, Florida's average household size in 2000 was about 2.5 persons. However, average household size generally will vary between 1.0 and 3.0 persons depending upon location and type of residence.) The BEBR produces Florida's official state and local population estimates and projections. (The website address for the BEBR is www.bebr.ufl.edu.)

- Discussion of the level of fire protection being provided by the PWS, including discussion of the design or needed fire-flow rate and duration. The decision about whether to size a PWS for fire protection must be made by the PWS and the governing body of the community being served by the PWS. Responsibility for determining needed fire flows usually rests with local fire officials. (The needed fire flow for single-family residential areas is typically 500 to 1,500 gallons per minute [gpm] for two hours, while the needed fire flow for commercial or industrial areas may range from 500 to 2,500 gpm for two hours to 3,000 to 3,500 gpm for three hours to 4,000 to 12,000 gpm for four hours or more.) If fire protection is being provided, the needed fire flow (i.e., the needed fire-flow rate times the needed fire-flow duration) must be included in the design maximum-day water demand to be met by source, treatment, and high-service pumping facilities. Additionally, if fire protection is being provided, the capacity of high-service pumping facilities (excluding standby pumps), together with the capacity of any elevated finished-water storage facilities, must be sufficient to meet peak-hour water demand for at least four consecutive hours and must be sufficient to supply the needed fire-flow rate plus a background water demand equivalent to the maximum-day water demand for the needed fire-flow duration.

- A brief description of existing PWS facilities, including description of the following: the number and type of service connections; and the number and type of source, treatment, pumping, or finished-water storage facilities. An excellent way to describe the number and type of source, treatment, pumping, or finished-water storage facilities—as well as to provide the capacities of such facilities as discussed below—is to use tables; example tables are shown in Table 1 on pages 12 and 13. Flow schematics may be helpful.

Per paragraph 62-555.348(4)(a), F.A.C., each capacity analysis report must include the capacity of each water treatment plant's source facilities and treatment facilities; the permitted maximum-day operating capacity and, if applicable, permitted peak operating capacity of each water treatment plant; and the useful capacity of each finished-water storage facility. Additionally, each capacity analysis report should include the capacity of high-service pumping facilities. Furthermore, to facilitate compliance with paragraph 62-555.348(4)(d), F.A.C., capacity analysis reports for PWSs with multiple treatment plants or multiple finished-water storage facilities should include the total or combined permitted operating capacity of all of the PWS's plants and the total or combined useful storage capacity of all of the PWS's finished-water storage facilities. An excellent way to present capacities of source, treatment, pumping, or finished-water storage facilities—as well as to describe the number and type of such facilities as discussed above—is to use tables; see Table 1 on pages 12 and 13 for example tables.

The permitted operating capacity of each water treatment plant is as specified in the latest DEP construction permit concerning source or treatment facilities for the plant. Refer to subsection 62-555.320(6), F.A.C., which became effective August 28, 2003, and reads, in part, as follows:

> "…the Department shall specify in its construction permit for the plant's new or altered source water or treatment facilities the permitted maximum-day operating capacity of the plant and, if the plant is being designed to meet peak water demand or to supplement finished-water storage facilities in meeting peak water demand, the permitted peak operating capacity of the plant. The Department shall not specify a permitted plant operating capacity greater than the design capacity of the plant's treatment facilities as established by the applicant. However, the Department shall specify a permitted plant operating capacity less than the design capacity of the plant's treatment facilities if the actual design capacity of the plant's source water facilities, regardless of any water use permit limitations set by the water management district, is less than the design capacity of the plant's treatment facilities; in such a case:
>
> (a) The construction permit for the plant's new or altered source water or treatment facilities shall indicate the design capacity of the plant's treatment facilities, shall state that permitted plant operating capacity is being limited because of the actual design capacity of the plant's source water facilities, and shall specify a permitted plant operating capacity equal to the actual design capacity of the plant's source water facilities.
>
> (b) Each subsequent construction permit for new or altered source water facilities for the plant shall update the permitted plant operating capacity as appropriate."

In cases where the latest DEP construction permit concerning source or treatment facilities for a water treatment plant was issued before August 28, 2003, and no permitted operating capacity was specified in the permit, the appropriate DEP district office or approved county health department (ACHD) is to establish the permitted maximum-day operating capacity of the plant and, if the plant is designed to meet peak water demand or to supplement finished-water storage facilities in meeting peak water demand, the permitted peak operating capacity of the plant based upon information that is included in or with pertinent construction permit applications or that is provided by the PWS and based upon design requirements in Part III of Chapter 62-555, F.A.C. If a PWS wishes to obtain a rerating of the permitted operating capacity of a treatment plant without altering or expanding the plant, the PWS can apply for a capacity rerating in accordance with Rule 62-555.528, F.A.C.

Useful finished-water storage capacity is finished-water storage capacity that is in excess of any storage volume necessary to provide required disinfectant contact time (for PWSs required to achieve three-log *Giardia lamblia* removal/inactivation and/or four-log virus

removal/inactivation) and that either (1) is located at an elevation so it can be utilized while maintaining a minimum gauge pressure of 20 pounds per square inch (psi) in the water distribution system or (2) can be utilized by pumping. Finished-water storage capacity below the pump shutoff level in a ground storage tank is not useful storage capacity, and finished-water storage capacity that is in an elevated storage tank and that cannot be utilized while maintaining a minimum gauge pressure of 20 psi in the water distribution system is not useful storage capacity.

Section 2: Past Water Production

Per paragraph 62-555.348(4)(b), F.A.C., each capacity analysis report must include the annual average daily and maximum-day quantities of finished water produced by each water treatment plant during each of the past ten years or during each of the years the plant has been in operation, whichever is less. Additionally, to facilitate compliance with paragraph 62-555.348(4)(c), F.A.C., capacity analysis reports for PWSs with multiple treatment plants should include the total or combined annual average daily and maximum-day quantities of finished water produced by all of the PWS's plants during each of the past ten years or during each of the years the PWS has been in operation, whichever is less. An excellent way to summarize and present finished-water production data is to use tables; see Table 2 on page 14 for an example table. The PWS's total annual average daily water production and maximum-day water production during each of the past ten years or during each of the years the PWS has been in operation, whichever is less, should be plotted on a graph; see Figure 1 on page 15 for an example graph.

Water production data for each treatment plant can be obtained from the DEP-required monthly operation reports (MORs) for the plant, which are supposed to be prepared using DEP Form 62-555.900(2) or (3). The PWS should have copies of past MORs available for review (PWSs are required to keep copies of MORs for at least ten years), but if the PWS does not have copies of past MORs available for review, copies of past MORs may be available for review at the appropriate DEP district office or ACHD. Each MOR for a treatment plant includes an entry for the monthly average daily quantity of finished water produced by the plant—i.e., the plant's monthly average daily production (monthly ADP)—and an entry for the monthly maximum-day quantity of finished water produced by the plant—i.e., the plant's monthly maximum-day production (monthly MDP). Such monthly ADP and MDP entries can be extracted from each pertinent MOR for a treatment plant and listed in a table similar to that shown as Table 2. Then the treatment plant's annual ADP during a given year or 12-month period can be calculated by taking the arithmetic average of the plant's 12 monthly ADP values for that year or 12-month period, and the plant's annual MDP during a given year or 12-month period can be determined by taking the greatest of the plant's 12 monthly MDP values for that year or 12-month period. Note that, when determining and reporting a treatment plant's monthly MDP, the PWS must consider those days on which water is produced to meet fire-flow demand but may exclude any day on which water is produced to meet a highly unusual and nonrecurring demand if the PWS explains about the highly unusual and nonrecurring demand on or with the MOR. An example of a highly unusual and nonrecurring water demand is the water demand resulting from the break of a large transmission main.

The total/combined monthly or annual ADP for a PWS with multiple treatment plants can be calculated by simply summing the monthly or annual ADP values for the individual plants. However, the total/combined monthly or annual MDP for a PWS with multiple treatment plants cannot be calculated the same way! To calculate the total/combined monthly MDP during a given month for a PWS with multiple treatment plants, one should first calculate the PWS's total/combined water production for each day of the month by summing the water produced by each individual plant on that day and should then determine the PWS's total/combined monthly MDP by taking the greatest of the daily total/combined production values for that month. Effective September 2003, community water systems that are serving, or are designed to serve, more than 3,300 persons and that have multiple treatment plants should be calculating and reporting the PWS's total/combined monthly MDP using DEP Form 62-555.900(11). Once total/combined monthly MDP values are calculated for a PWS with multiple treatment plants, the PWS's total/combined annual MDP during a given year or 12-month period can be determined by taking the greatest of the PWS's 12 monthly MDP values for that year or 12-month period.

Section 3: Projected Water Demand and Finished-Water Storage Need

Per paragraph 62-555.348(4)(c), F.A.C., each capacity analysis report must include projected total water demands—i.e., total annual average daily water demand and total maximum-day water demand (including fire-flow demand if fire protection is being provided)—for at least the next ten years and projected total finished-water storage need (including fire storage if fire protection is being provided) for at least the next ten years. Additionally, capacity analysis reports for PWSs with ground-level finished-water storage facilities should include projected peak-hour water demand for at least the next ten years. An excellent way to summarize and present projections of water demand and finished-water storage need is to use a table; see Table 3 on page 16 for an example table. Each capacity analysis report should explain how projections of water demand and projections of finished-water storage need were made and should mention any documents—such as local government comprehensive plans, regional water supply plans prepared by water management districts, engineering references, etc.—from which information was obtained. Capacity analysis reports for a PWS that is projected to have no, or limited, growth in water demand and finished-water storage need because the PWS's service area is "built out" or will be "built out" during the planning period should include in Section 1 of the report information demonstrating that the service area is indeed "built out" or will indeed be "built out" during the planning period. The PWS's projected total annual average daily water demand and total maximum-day water demand for at least the next ten years should be plotted as a continuation of the graph of the PWS's past total water production, and the PWS's projected total finished-water storage need for at least the next ten years should be graphed; see Figures 2 and 3 on pages 17 and 18 for example graphs.

Projections of annual average daily water demand typically are made by multiplying population projections by an appropriate per capita average daily water demand rate. Oftentimes, pertinent population projection information can be obtained from applicable local government comprehensive plans, from applicable regional water supply plans prepared by water management districts, or from the BEBR. An appropriate per capita average daily water demand rate frequently can be obtained from applicable local government comprehensive plans or from

applicable regional water supply plans prepared by water management districts. Alternatively, an appropriate per capita annual average daily water demand rate for a PWS can be calculated by dividing the PWS's annual ADP during a recent calendar year or 12-month period by the average population that the PWS supplied with water during that calendar year or 12-month period. (According to reports by the U.S. Geological Survey, Florida's per capita average daily water demand from 1990 to 2000 was about 100 to 110 gallons/capita/day [gpcd] when considering only domestic water use and about 170 gpcd when considering total water use, including commercial and industrial water use. However, per capita annual average daily water demand generally will vary between 80 and 150 gpcd for domestic water use and 100 to 200 gpcd for total water use depending upon location, water rates, extent of commercialization and industrialization, and PWS size.)

In cases where no pertinent population projection information is available from other sources, projections of population (and direct projections of annual average daily water demand) can be made using a mathematical method to extrapolate past population data (or past water production data). The mathematical methods generally used to make short-term (one- to ten-year) projections are as follows: arithmetic progression or uniform growth rate, geometric progression or constant-percentage growth rate, and decreasing rate of growth. Such mathematical methods are based upon an "S" growth curve consisting of three segments described approximately by a geometric progression, an arithmetic progression, and a decreasing rate of growth. A typical "S" growth curve, arithmetic progression formulas, geometric progression formulas, decreasing rate of growth formulas, and example population projections and water demand projections are shown in Figures 4 through 6 on pages 19 through 21. To decide which mathematical method is the most appropriate to use for a PWS at a given time, consider the service area characteristics for the PWS and its consecutive systems and look at the graph of the PWS's total annual ADP during the past ten years.

Projections of maximum-day or peak-hour water demand usually are made by multiplying projections of annual average daily water demand by an appropriate peaking factor. Peaking factors vary depending upon PWS size, the extent of commercialization and industrialization, etc. Therefore, maximum-day to average-day peaking factors should be determined specifically for each PWS by looking at past water production data for the PWS. (According to *Water Distribution Systems Handbook*, which is incorporated as an engineering reference into Rule 62-555.330, F.A.C., maximum-day water demand typically ranges from 1.5 to 3.5 times average daily water demand.) Peak-hour to average-day peaking factors should be determined specifically for each PWS based upon flow measurement data if possible; but oftentimes, peak-hour to average-day peaking factors will have to be estimated. (According to *Water Distribution Systems Handbook*, peak-hour water demand typically ranges from 2.0 to 7.0 times average daily water demand.)

Finished-water storage need is the finished-water storage capacity needed for operational equalization to meet peak water demand and comply with subsection 62-555.320(19), F.A.C., plus finished-water storage capacity needed to meet any fire-flow requirements. Subsection 62-555.320(19), F.A.C., reads as follows:

> "Finished-Drinking-Water Storage Capacity. This subsection addresses finished-water storage capacity necessary for operational equalization to meet peak water demand. (If fire protection is being provided,

additional finished-water storage capacity shall be provided as necessary to meet the design fire-flow rate for the design fire-flow duration.) The finished-water storage capacity necessary to meet the peak water demand for a consecutive system may be provided by the consecutive system or by a wholesale system delivering water to the consecutive system.

(a) Except as noted in paragraph (b) below, the total useful finished-water storage capacity (excluding any storage capacity for fire protection) connected to a water system shall at least equal 25 percent of the system's maximum-day water demand, excluding any design fire-flow demand.

(b) A total useful finished-water storage capacity less than that specified in paragraph (a) above is acceptable if the supplier of water or construction permit applicant makes one of the following demonstrations:

1. A demonstration consistent with Section 10.6.3 in Water Distribution Systems Handbook as incorporated into Rule 62-555.330, F.A.C., showing that the water system's total useful finished-water storage capacity (excluding any storage capacity for fire protection) is sufficient for operational equalization.

2. A demonstration showing that, in conjunction with the capacity of the water system's source, treatment, and finished-water pumping facilities, the water system's total useful finished-water storage capacity (excluding any storage capacity for fire protection) is sufficient to meet the water system's peak-hour water demand for at least four consecutive hours. For small water systems with hydropneumatic tanks that are installed under a construction permit for which the Department receives a complete application on or after August 28, 2003, the supplier of water or construction permit applicant also shall demonstrate that, in conjunction with the capacity of the water system's source, treatment, and finished-water pumping facilities, the water system's total useful finished-water storage capacity (i.e., the water system's total effective hydropneumatic tank volume) is sufficient to meet the water system's peak instantaneous water demand for at least 20 consecutive minutes."

Therefore, projections of finished-water storage needed for operational equalization typically are made by multiplying the projected maximum-day water demand by 25 percent. Alternatively, projections of finished-water storage needed for operational equalization can be made as follows:

- By calculating the area between a PWS's water demand rate curve and water production rate curve for the design maximum day as mentioned in Section 10.6.3 of *Water Distribution Systems Handbook* and as discussed in more detail in textbooks written by Clark, Viessman, and Hammer; etc.

- By using the equation…

$$ES = (PHD - TPC)\ (4\ hours)$$

where ES = equalization storage, PHD = peak-hour demand, and TPC = treatment plant capacity (i.e., total maximum-day or peak capacity of a PWS's treatment plants). For example, if the design average daily demand (ADD) for a PWS is 4.0 million gallons per day (MGD), the design maximum-day demand (MDD) for the PWS is 10.0 MGD (2.5 times ADD), the design PHD for the PWS is 25.0 MGD (6.25 times ADD), and the PWS has treatment plants with a total design maximum-day capacity of 10.0 MGD, the design finished-water storage needed for operational equalization would be…

ES = (25.0 MGD – 10.0 MGD) (4/24 day) = 2.5 million gallons (MG), which is 25% of MDD.

As a second example, if the design ADD for a PWS is 4.0 MGD, the design MDD for the PWS is 10.0 MGD (2.5 times ADD), the design PHD for the PWS is 18.0 MGD (4.5 times ADD), and the PWS has treatment plants with a total design peak capacity of 14.0 MGD, the design finished-water storage needed for operational equalization would be…

ES = (18.0 MGD – 14.0 MGD) (4/24 day) = 0.7 MG, which is 7% of MDD.

Finished-water storage needed to meet fire-flow requirements can be calculated using the equation…

FS = (NFFR + MDD – TPC) (NFFD)

where FS = fire storage, NFFR = needed fire-flow rate, MDD = maximum-day demand, TPC = treatment plant capacity (i.e., total maximum-day or peak capacity of a PWS's treatment plants), and NFFD = needed fire-flow duration. So, if the NFFR and NFFD for a PWS is 3,500 gpm (5.04 MGD) for three hours, the design ADD for the PWS is 4.0 MGD, the design MDD for the PWS is 10.0 MGD (2.5 times ADD), and the PWS has treatment plants with a total design maximum-day capacity of 10.0 MGD, the design finished-water storage needed to meet fire-flow requirements would be…

FS = (5.04 MGD + 10.0 MGD – 10.0 MGD) (3/24 day) = 0.63 MG.

Section 4: Recommendations for New or Expanded Facilities

Per paragraph 62-555.348(4)(d), F.A.C., each capacity analysis report must include an estimate of the time required for total maximum-day water demand to exceed the current total permitted maximum-day operating capacity of the water treatment plant(s) and an estimate of the time required for total finished-water storage need to exceed the existing total useful finished-water storage capacity. The current total permitted maximum-day operating capacity of the PWS's treatment plant(s) should be plotted on the graph of the PWS's projected total water demand to show when the total maximum-day water demand will exceed the total permitted maximum-day operating capacity, and the PWS's existing total useful finished water storage capacity should be plotted on the graph of the PWS's projected total finished-water storage need to show when the total finished-water storage need will exceed the total useful finished-water storage capacity; see Figures 7 and 8 on pages 22 and 23 for example graphs.

Per paragraphs 62-555.348(4)(e) and (f), F.A.C., each capacity analysis report must include recommendations for new or expanded source, treatment, or finished-water storage facilities and a schedule showing dates for design, permitting, and construction of such recommended new or expanded facilities. Additionally, each capacity analysis report should include recommendations and a schedule for new or expanded high-service pumping facilities. If new or expanded facilities will be necessary in less than five years to meet projected water demand or finished-water storage need, the recommended new or expanded facilities and their schedule for design, permitting, and construction should be discussed in as much detail as possible (e.g., the type, capacity, and location of facilities and the approximate month and year for beginning and

completing design, permitting, and construction of the facilities should be discussed). If new or expanded facilities will be necessary in less than ten years but greater than or equal to five years in order to meet projected water demand or finished-water storage need, the recommended new or expanded facilities and their schedule for design, permitting, and construction may be discussed in less detail (e.g., just the type of facilities and the approximate year for completing construction of the facilities may be discussed). If new or expanded facilities will be necessary in greater than or equal to ten years, recommendations regarding the new or expanded facilities may be excluded from the capacity analysis report. Each capacity analysis report should mention any documents—such as local government comprehensive plans, regional water supply plans prepared by water management districts, etc.—from which information was obtained. Alternatives other than new or expanded facilities—such as rerating of water treatment plants, connection to another PWS, etc.—may be recommended.

Table 1: Example Tables for Describing a PWS's Existing Source, Treatment, Pumping, or Finished-Water Storage Facilities

Wells

Name/Location of Well	Pumps from: (Name of Aquifer)	Pumps to: (Name/Location of Water Treatment Plant)	Design Capacity of Well Pump, MGD

MGD = million gallons per day.

Surface Water Intake Pumping Stations

Name/Location of Pumping Station	Pumps from: (Name of Surface Water Body)	Pumps to: (Name/Location of Water Treatment Plant)	Number & Capacity of Pumps	Total Firm Design Capacity of Pumping Station (Excluding Standby Pump), MGD

MGD = million gallons per day.

Water Treatment Plants

Name/Location of Plant	Type of Treatment	Total Design Capacity of Source Facilities (Wells, Etc.), MGD	Design Capacity of Plant, MGD		Permitted Operating Capacity of Plant, MGD	
			Maximum-Day	Peak, if Applicable	Maximum-Day	Peak, if Applicable
Total or Combined Permitted Operating Capacity of All Treatment Plants:						

MGD = million gallons per day.

Table 1 (continued)

High-Service Pumping Stations

Name/Location of Pumping Station	Pumps from:	Pumps to:	Number & Capacity of Pumps	Total Firm Design Capacity of Pumping Station (Excluding Standby Pump), MGD

MGD = million gallons per day.

Finished-Water Storage Facilities

Name/Location of Storage Facility	Type of Storage Facility	Useful Capacity of Storage Facility, MG		
		Useful Fire Storage Capacity, if Applicable	Useful Equalization Storage Capacity	Total Useful Storage Capacity
Total or Combined Useful Storage Capacity of All Storage Facilities:				

MG = million gallons.

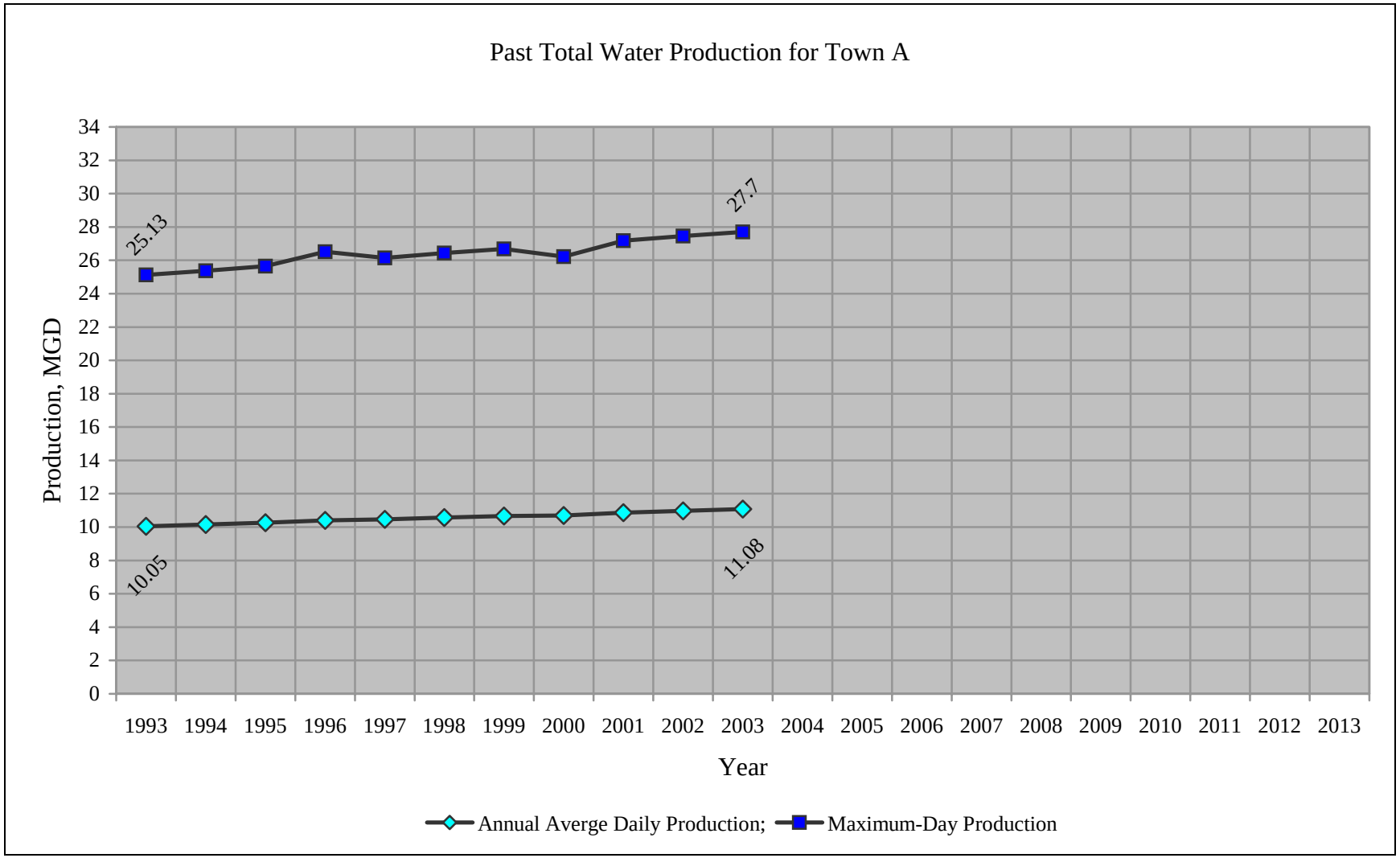
Table 2: Example Table for Summarizing/Presenting Water Production by a Treatment Plant or PWS During the Past Ten Years

Past Water Production by Treatment Plant or PWS

Month/Parameter		Year										
January	**ADP**											
	MDP											
February	**ADP**											
	MDP											
March	**ADP**											
	MDP											
April	**ADP**											
	MDP											
May	**ADP**											
	MDP											
June	**ADP**											
	MDP											
July	**ADP**											
	MDP											
August	**ADP**											
	MDP											
September	**ADP**											
	MDP											
October	**ADP**											
	MDP											
November	**ADP**											
	MDP											
December	**ADP**											
	MDP											
Annual	**ADP**											
	MDP											
	MDP/ADP Peaking Factor											

ADP = Average Daily Production; MDP = Maximum-Day Production; MGD = million gallons per day.

Figure 1: Example Graph Showing a PWS's Total Water Production During the Past Ten Years



MGD = million gallons per day.

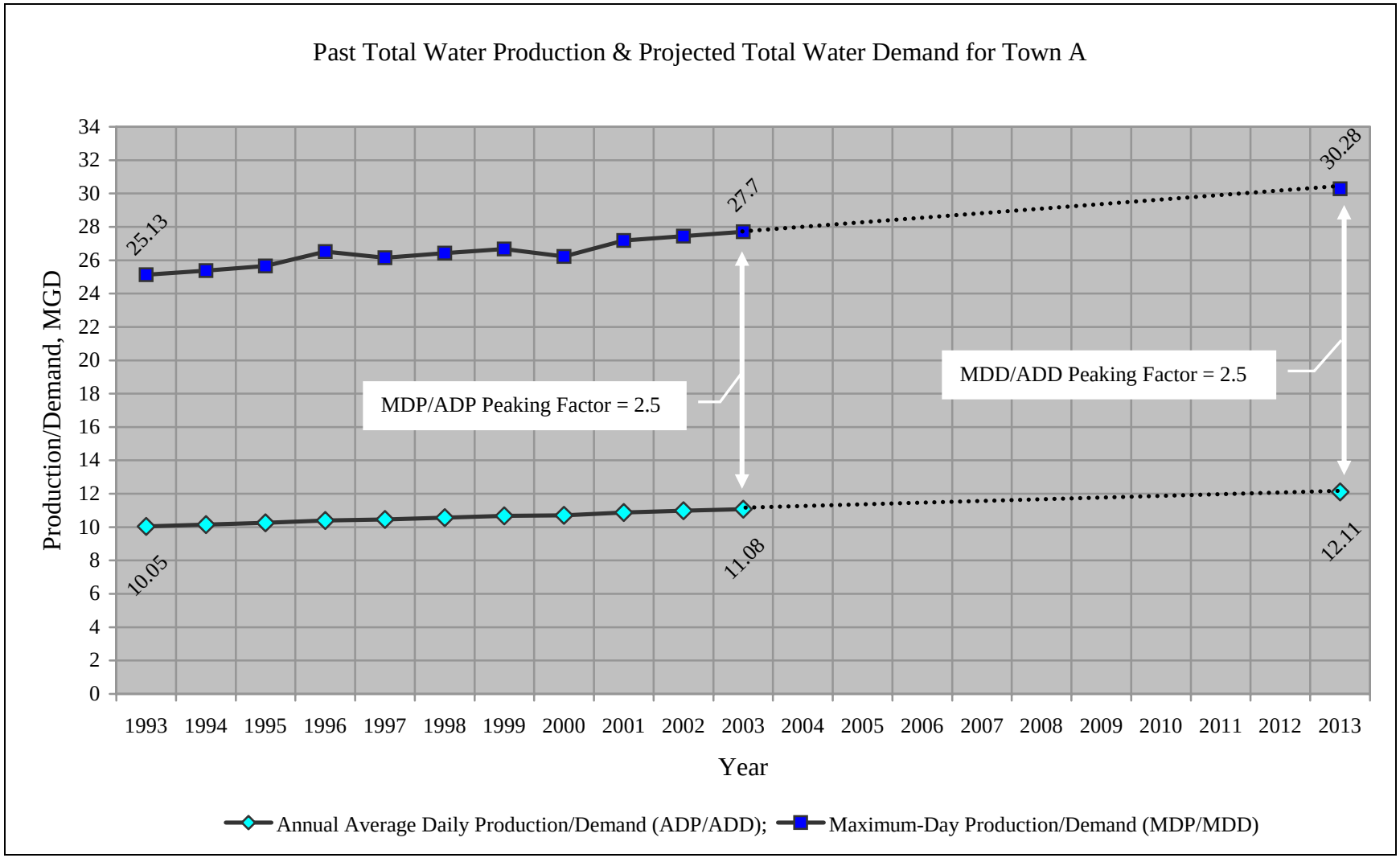
Table 3: Example Table for Summarizing/Presenting a PWS's Projected Water Demand and Finished-Water Storage Need for at Least the Next Ten Years

Projected Water Demand and Finished-Water Storage Need for PWS

Parameter		Year										
Projected Water Demand	Service Population, thousands											
	Per Capita Average Daily Demand, gpcd											
	Annual Average Daily Demand (ADD), MGD											
	MDD/ADD Peaking Factor											
	Maximum-Day Demand (MDD), MGD											
	PHD/ADD Peaking Factor											
	Peak-Hour Demand (PHD), MGD											
Projected Finished-Water Storage Need	Needed Fire Storage, MG											
	Needed Equalization Storage, MG											
	Total Needed Storage, MG											

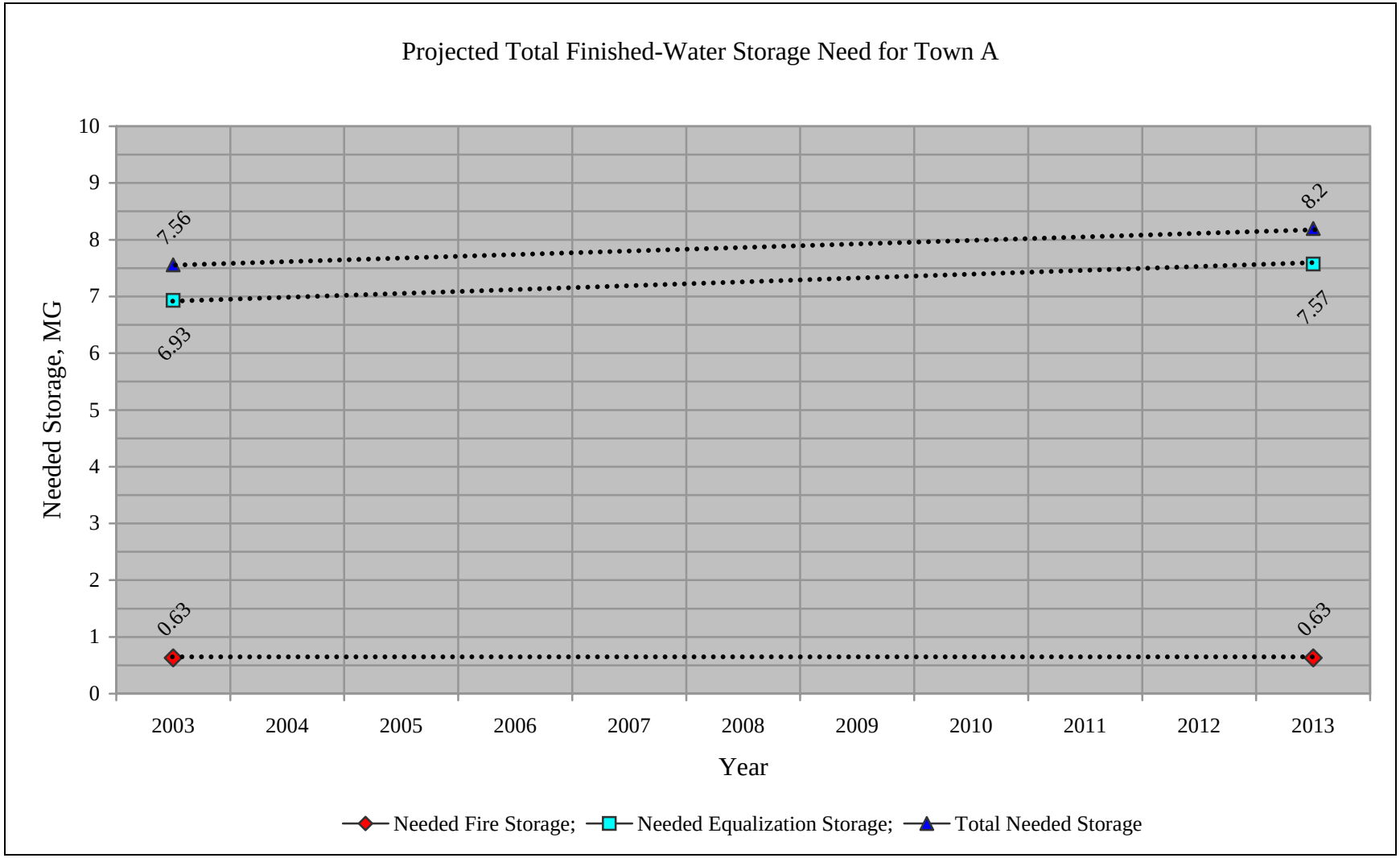
gpcd = gallons per capita per day; MG = million gallons; MGD = million gallons per day.

Figure 2: Example Graph Showing a PWS's Total Water Production During the Past Ten Years and Projected Total Water Demand for the Next Ten Years



MGD = million gallons per day.

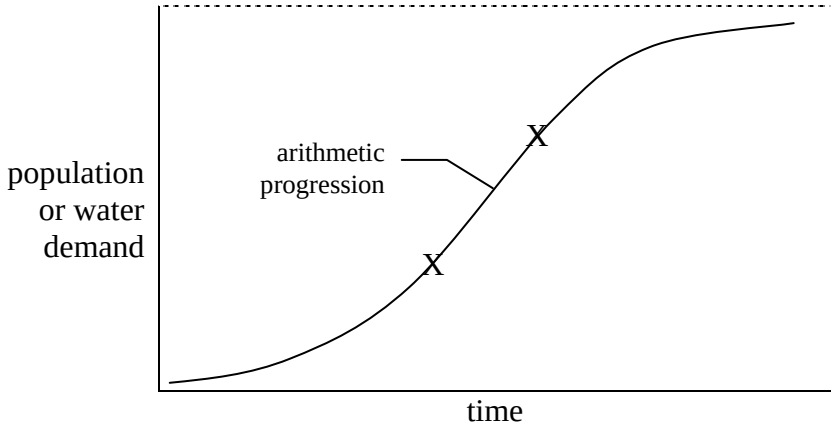
Figure 3: Example Graph Showing a PWS's Projected Total Finished-Water Storage Need for the Next Ten Years



MG = million gallons.

Figure 4: Population, or Water Demand, Projection by Arithmetic Progression

Population, or Water Demand, Growth Curve



Arithmetic Progression Formulas

$$Y = Y_2 + K_a (t - t_2)$$

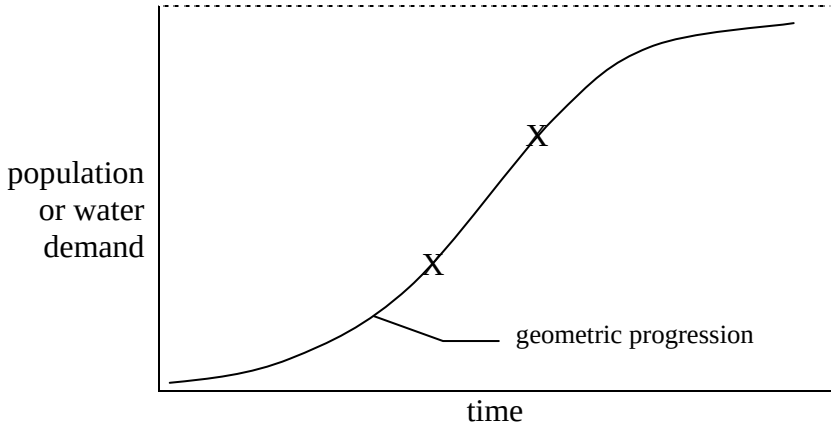
$$K_a = (Y_2 - Y_1) / (t_2 - t_1)$$

where Y = population or water demand
K_a = arithmetic growth constant
t = time

Example Population Projection	Example Water Demand Projection
• Given: The population of Town A grows from 100,500 in 1993 to 110,800 in 2003 (i.e., t_1 = 1993, Y_1 = 100,500, t_2 = 2003, Y_2 = 110,800) • Find/Project: The population of Town A in 2013 (i.e., t = 2013, Y = ?) K_a = (110,800 – 100,500) / (2003 – 1993) = 10,300 / 10 = 1,030 Y = 110,800 + (1,030) (2013 – 2003) = 110,800 + (1,030) (10) = 110,800 + 10,300 = 121,100	• Given: The annual average daily water demand in Town A increases from 10.05 MGD in 1993 to 11.08 MGD in 2003 (i.e., t_1 = 1993, Y_1 = 10.05, t_2 = 2003, Y_2 = 11.08) • Find/Project: The annual average daily water demand in Town A in 2013 (i.e., t = 2013, Y = ?) K_a = (11.08 – 10.05) / (2003 – 1993) = 1.03 / 10 = 0.103 Y = 11.08 + (0.103) (2013 – 2003) = 11.08 + (0.103) (10) = 11.08 + 1.03 = 12.11

Figure 5: Population, or Water Demand, Projection by Geometric Progression

Population, or Water Demand, Growth Curve



Geometric Progression Formulas

$$\ln Y = \ln Y_2 + K_g (t - t_2)$$

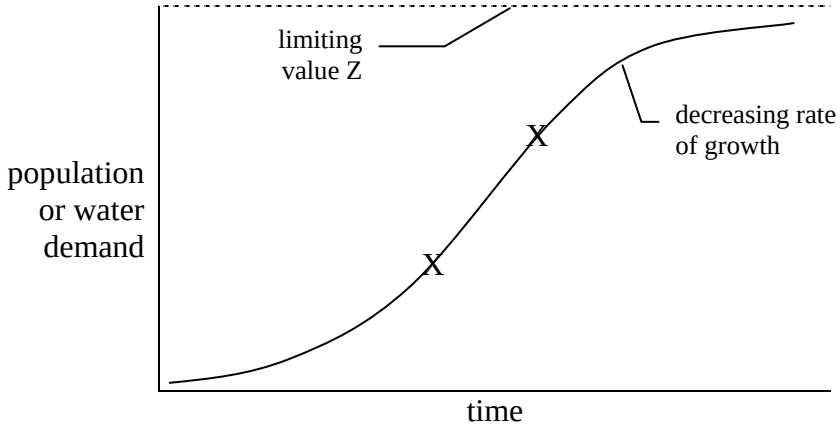
$$K_g = (\ln Y_2 - \ln Y_1) / (t_2 - t_1)$$

where Y = population or water demand
K_g = geometric growth constant
t = time

Example Population Projection	Example Water Demand Projection
• Given: The population of Town A grows from 100,500 in 1993 to 110,800 in 2003 (i.e., t_1 = 1993, Y_1 = 100,500, t_2 = 2003, Y_2 = 110,800) • Find/Project: The population of Town A in 2013 (i.e., t = 2013, Y = ?) K_g = (ln 110,800 – ln 100,500) / (2003 – 1993) = (11.62 – 11.52) / 10 = 0.10 / 10 = 0.010 ln Y = ln 110,800 + (0.010) (2013 – 2003) = 11.62 + (0.010) (10) = 11.62 + 0.10 = 11.72 $Y = e^{(11.72)}$ = 123,000	• Given: The annual average daily water demand in Town A increases from 10.05 MGD in 1993 to 11.08 MGD in 2003 (i.e., t_1 = 1993, Y_1 = 10.05, t_2 = 2003, Y_2 = 11.08) • Find/Project: The annual average daily water demand in Town A in 2013 (i.e., t = 2013, Y = ?) K_g = (ln 11.08 – ln 10.05) / (2003 – 1993) = (2.41 – 2.31) / 10 = 0.10 / 10 = 0.010 ln Y = ln 11.08 + (0.010) (2013 – 2003) = 2.41 + (0.010) (10) = 2.41 + 0.10 = 2.51 $Y = e^{(2.51)}$ = 12.30

Figure 6: Population, or Water Demand, Projection by Decreasing Rate of Growth

Population, or Water Demand, Growth Curve



Decreasing Rate of Growth Formulas

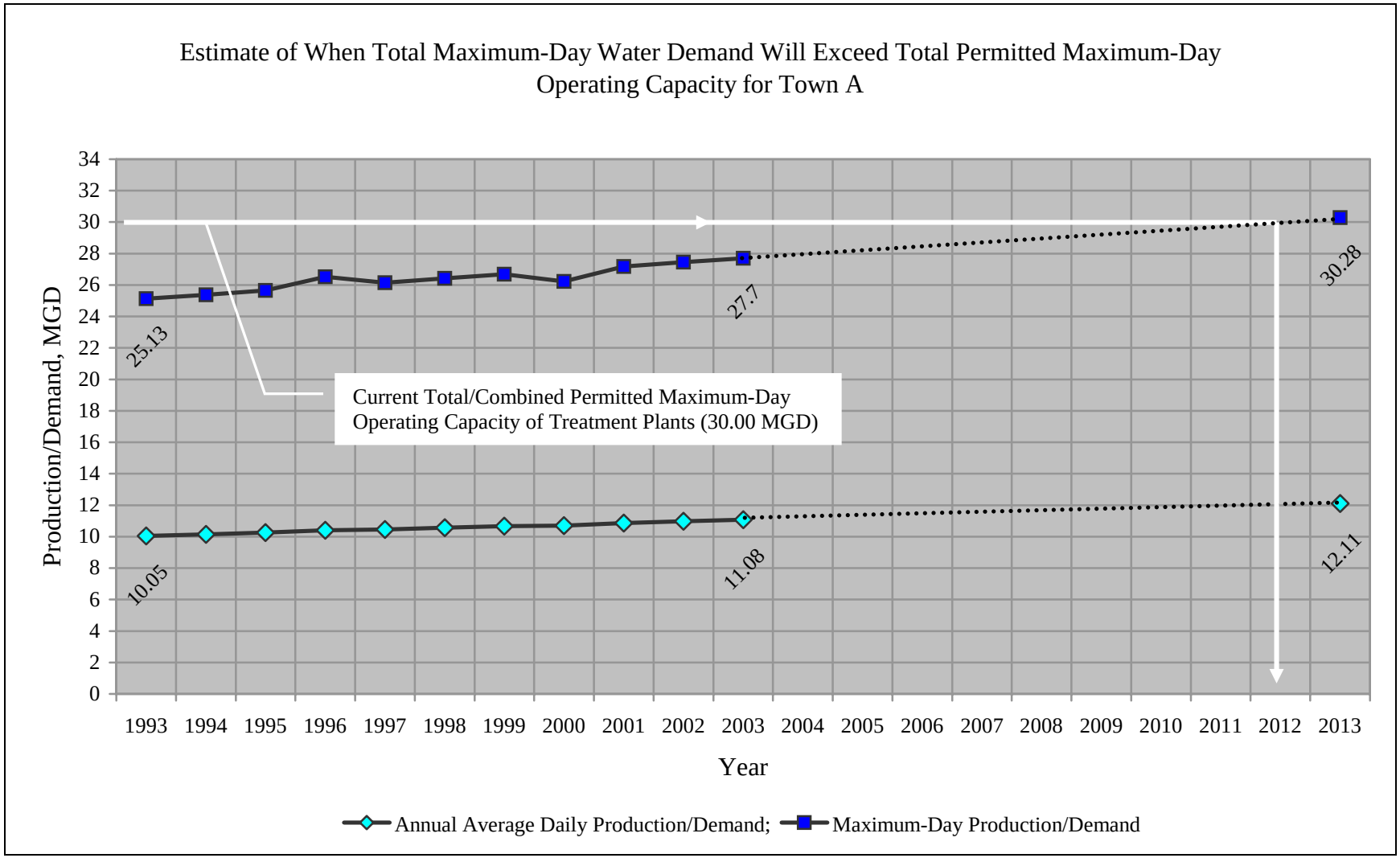
$$Y = Y_2 + (Z - Y_2)\,(1 - e^{-Kd(t - t2)})$$

$$K_d = \{-\ln [(Z - Y_2) / (Z - Y_1)]\} / (t_2 - t_1)$$

where Y = population or water demand
Z = saturation or limiting value of Y
K_d = decreasing rate of growth constant
t = time

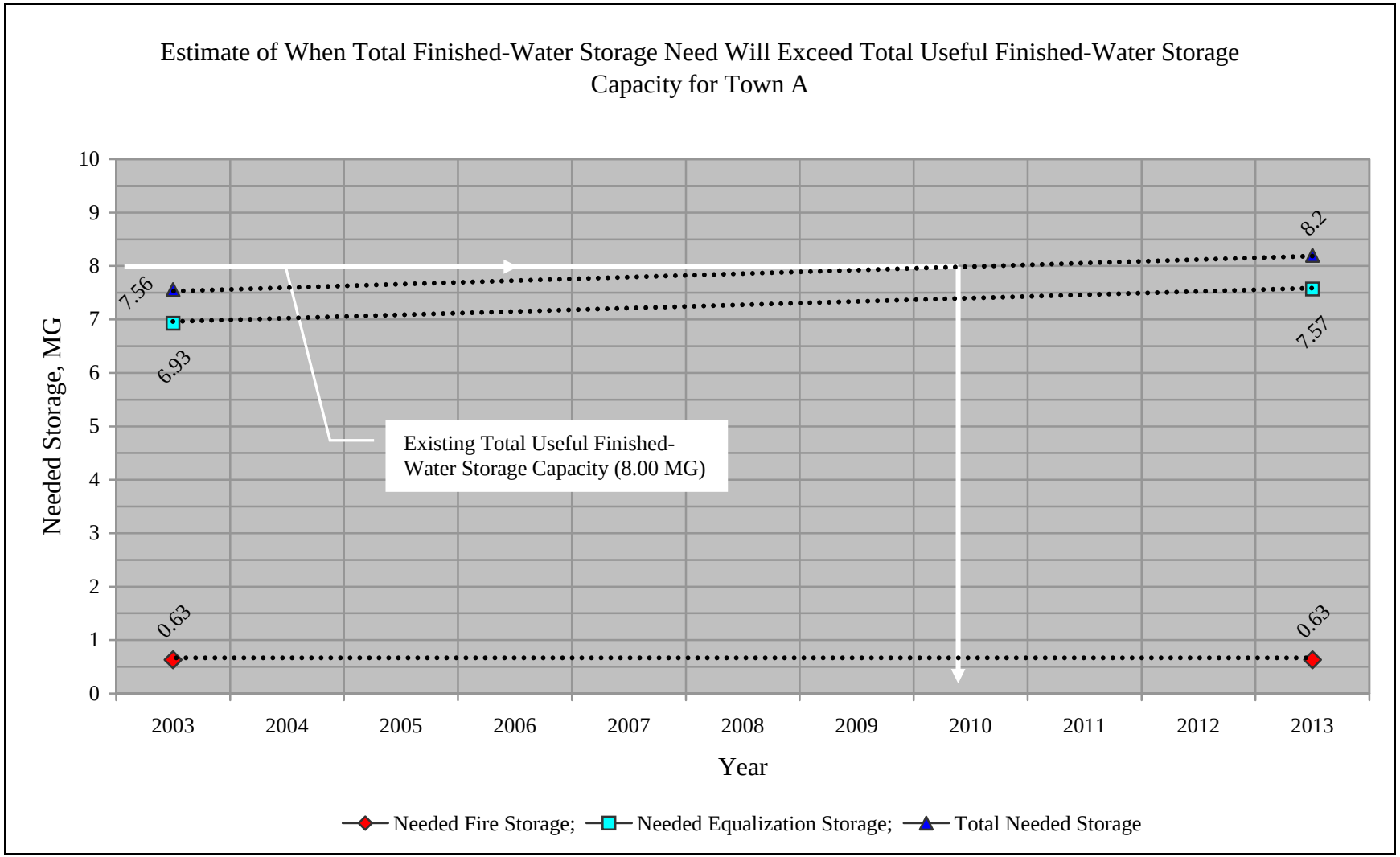
Example Population Projection	Example Water Demand Projection
• Given: The population of Town A grows from 100,500 in 1993 to 110,800 in 2003 (i.e., t_1 = 1993, Y_1 = 100,500, t_2 = 2003, Y_2 = 110,800) • Assume Z = 200,000 • Find/Project: The population of Town A in 2013 (i.e., t = 2013, Y = ?) K_d = {-ln [(200,000 – 110,800) / (200,000 – 100,500)]} / (2003 – 1993) = {-ln [89,200 / 99,500]} / 10 = {-ln 0.8965} / 10 = 0.1093 / 10 = 0.01093 $Y = 110,800 + (200,000 - 110,800)\,(1 - e^{-(0.01093)\,(2013 - 2003)})$ = $110,800 + (89,200)\,(1 - e^{-0.1093})$ = 110,800 + (89,200) (1 – 0.8965) = 110,800 + (89,200) (0.1035) = 110,800 + 9,200 = 120,000	• Given: The annual average daily water demand in Town A increases from 10.05 MGD in 1993 to 11.08 MGD in 2003 (i.e., t_1 = 1993, Y_1 = 10.05, t_2 = 2003, Y_2 = 11.08) • Assume: Z = 20.00 • Find/Project: The annual average daily water demand in Town A in 2013 (i.e., t = 2013, Y = ?) K_d = {-ln [(20.00 – 11.08) / (20.00 – 10.05)]} / (2003 – 1993) = {-ln [8.92 / 9.95]} / 10 = {-ln 0.8965} / 10 = 0.1093 / 10 = 0.01093 $Y = 11.08 + (20.00 - 11.08)\,(1 - e^{-(0.01093)\,(2013 - 2003)})$ = $11.08 + (8.92)\,(1 - e^{-0.1093})$ = 11.08 + (8.92) (1 – 0.8965) = 11.08 + (8.92) (0.1035) = 11.08 + 0.92 = 12.00

Figure 7: Example Graph Showing an Estimate of When a PWS's Total Maximum-Day Water Demand Will Exceed the Current Total Permitted Maximum-Day Operating Capacity of the PWS's Treatment Plant(s)



MGD = million gallons per day.

Figure 8: Example Graph Showing an Estimate of When a PWS's Total Finished-Water Storage Need Will Exceed the PWS's Existing Total Useful Finished-Water Storage Capacity



MG = million gallons.

DOCUMENTATION OF TIMELY DESIGN, PERMITTING, AND CONSTRUCTION OF FACILITIES RECOMMENDED IN CAPACITY ANALYSIS REPORTS

Per subsection 62-555.348(6), Florida Administrative Code, documentation of timely design, permitting, and construction of new or expanded facilities recommended in a capacity analysis report must be submitted with the report if the report indicates that maximum-day water demand will exceed the current total permitted maximum-day operating capacity of the water treatment plant(s) in less than five years or that finished-water storage need will exceed the existing total useful finished-water storage capacity in less than five years. The documentation of timely design, permitting, and construction must consist of a written statement that is signed by an authorized representative of the public water system (PWS). In the written statement, the authorized representative of the PWS shall certify that the PWS is meeting, and intends to meet, the schedule for design, permitting, and construction of new or expanded facilities as recommended in the capacity analysis report. See Figure 9 on page 25 for an example written statement. The written statement may be provided as an attachment to the capacity analysis report or in a separate letter accompanying the report.

Figure 9: Example Written Statement Certifying that a PWS Is Meeting, and Intends to Meet, the Schedule for Design, Permitting, and Construction of New or Expanded Facilities as Recommended in a Capacity Analysis Report

[*date*]

I am duly authorized to sign this statement on behalf of [*name of PWS*]. I certify that [*name of PWS*] is meeting, and intends to meet, the schedule for design, permitting, and construction of new or expanded facilities as recommended in the Capacity Analysis Report dated [*date of capacity analysis report*] and prepared by [*name of professional engineer, including professional engineer's company if applicable, who prepared capacity analysis report*].

[*signature of authorized representative of PWS*]

[*name & title of authorized representative of PWS*]