



Autoridad Del Canal De Panama
Oficina de Proyectos de Capacidad del Canal

Panama Canal

Work Order No.4
Long-Term Forecast for
M&I Water Demand and
Raw Water Consumption/
Comparative Analysis of
Cost and Pricing

Contract Number CC-3-536

Appendices G and H



HARZA

Harza Engineering Company, Inc.
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AUTORIDAD DEL CANAL DE PANAMA
Oficina de Proyectos de Capacidad del Canal

THE PANAMA CANAL

**Long-Term Forecast for
Municipal and Industrial Water Demand
and Raw Water Consumption /
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Appendices G and H

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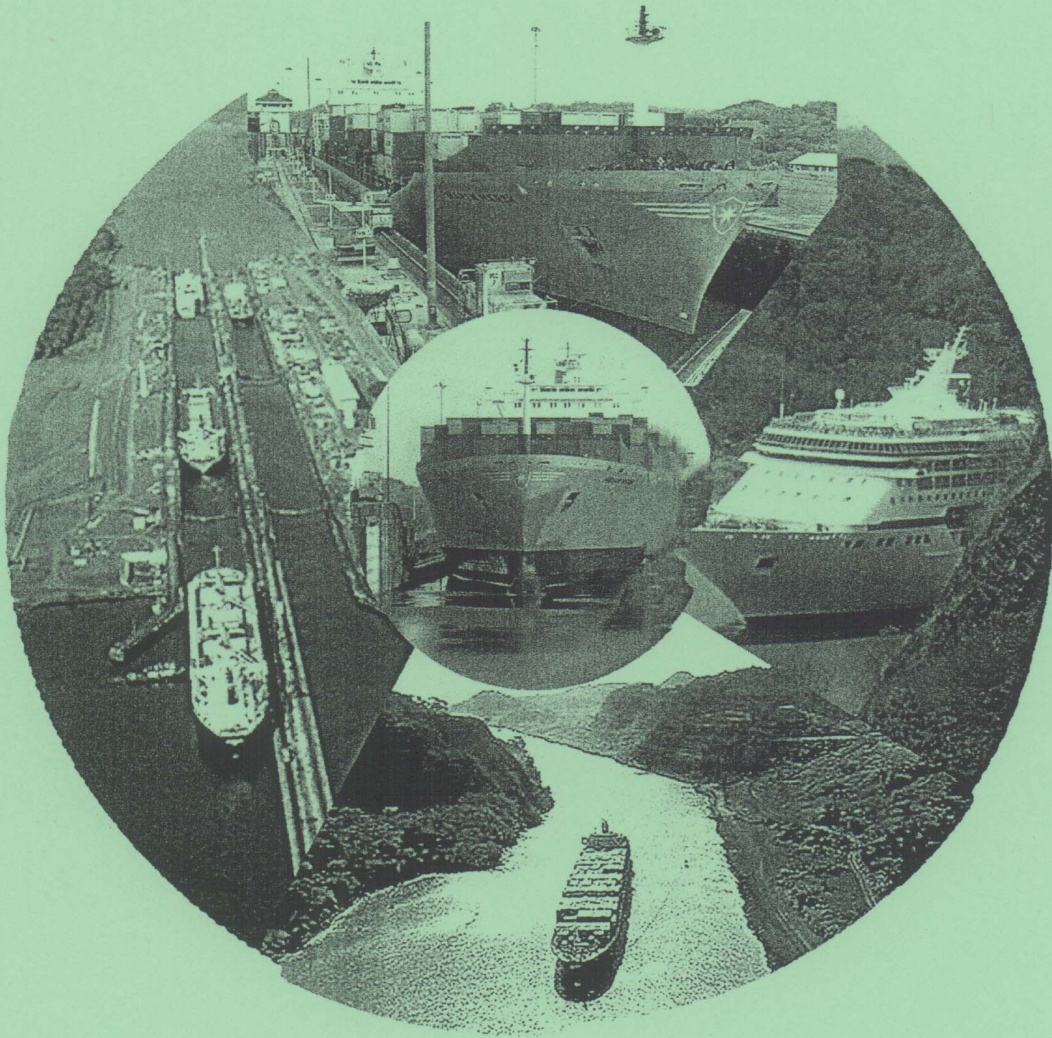
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Appendix G

Forecast Model Documentation



APPENDIX G

DEMAND FORECAST MODEL DOCUMENTATION

G.1 Introduction

The need for a structured modeling tool to be used in the development of water requirement projections for the central part of Panama was identified at the outset of this project. A large number of factors have the potential to impact actual municipal and industrial water requirements in the central part of Panama over the next 60 years. While the projections presented in this study represent best estimates based on currently anticipated conditions, it is likely that actual conditions may vary from those assumed at this time. An effective modeling tool provides the ACP with a mechanism for assessing the possible impacts of these variations on demand forecasts over time.

Chapter 4 of the Main Report describes the general demand forecast methodology adopted for this project, and the issues considered in selection of that methodology. This appendix provides more detailed documentation of the specific elements that make up the demand forecast model.

G.2 Structure of the Model

The overall demand forecast model developed for this study includes two types of elements. Data input functions, all computations, and tabular output production are accomplished within a set of Microsoft Excel spreadsheets. Graphical representation of model input and output data on a spatial basis is provided through ArcView projects linked to the spreadsheets. This structure provides users with a mechanism for data input, data manipulation and tabular output of model results that is familiar to most ACP staff, while facilitating production of graphical output showing the spatial distribution of key input parameters and model output.

The general structure of the model is shown in Figure G.1 below. Details related to the function and use of the individual spreadsheet elements are presented in subsequent sections of this appendix. Additional details pertaining to the graphical elements of the model are summarized in Appendix H.

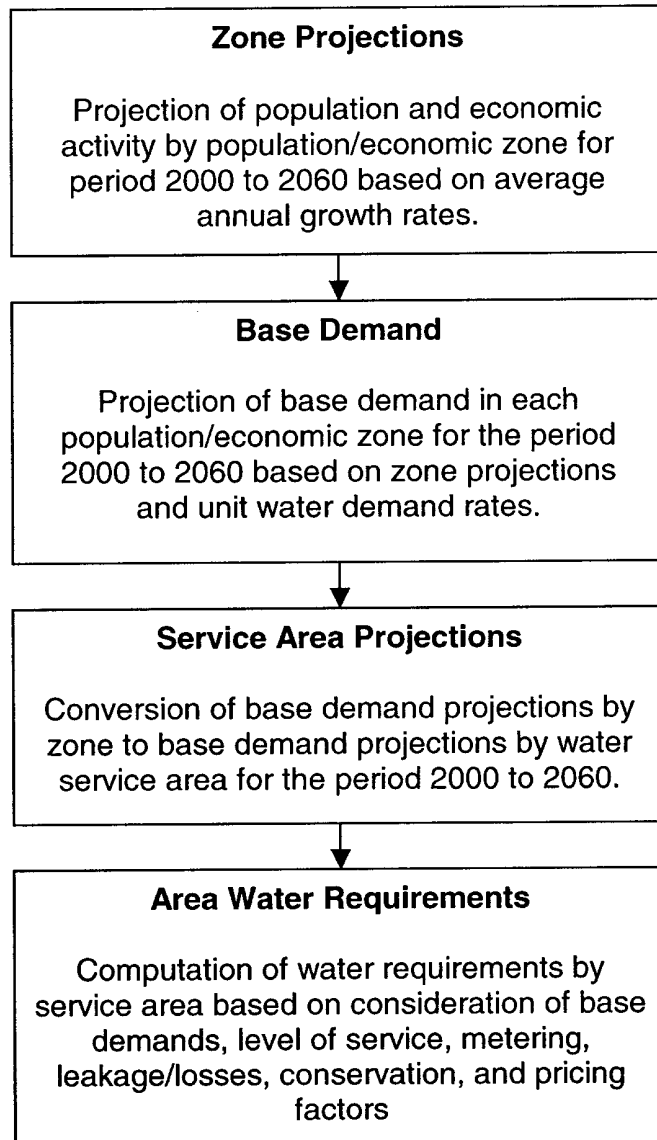


Figure G.1 - General Structure of the Demand Forecast Model

G.3 Model Conventions

A number of conventions have been adopted to facilitate use of the demand forecast model by ACP staff. Key conventions include the following:

1. Spreadsheet Links. The four spreadsheet elements of the demand forecast model are linked to each other to provide for transparent exchange of data and updating of dependent computations. Maintenance of appropriate links is critical to the proper use of the model. Therefore, it is recommended that all four of the spreadsheet files be installed in a common folder. If multiple demand forecast scenarios are to be generated and saved, a separate folder should be created for each scenario, and all four files used to produce the scenario results should be saved to that location. Regular checks of the spreadsheet linkages should be made using the **EDIT/LINKS** menu option in Excel.
2. Color Coding of Cells. Cells in the various spreadsheets have been color coded to help the user identify areas where input is required. Color coding conventions are as follows:

No Color -	Model Input: User input or default values required
Light Yellow -	Computed Values: Automatic computations, no input required.
Blue -	Computed Totals Automatic computations, no input required
Bright Yellow -	Titles and Headings

In addition, references are included in the spreadsheets to document the source, type, display format, and units for key input parameters and computed values.

G.4 Model Elements

As indicated above, the spreadsheet component of the demand forecast model consists of four linked Microsoft Excel worksheets. Detailed descriptions of the structure and function of each of these worksheet files are provided in tabular format below.

G.4.1 Zone Projection Module

The Zone Projection Module contains the spreadsheets required to project future population and levels of economic activity in each of the eight zones that make up the study area. Details of the zone projections spreadsheet are summarized below. Additional details related to each of the worksheet pages contained in the spreadsheet follow.

<u>Filename:</u>	ZONE PROJECTIONS.XLS
<u>Purpose:</u>	The Zone Projections module includes the computations necessary to quantitatively describe projected future demographic and economic conditions in the study area.
<u>Dependent Links:</u>	None
<u>Spatial Basis:</u>	Population and Economic Zones
<u>General Input:</u>	<ul style="list-style-type: none"> - Base year (2000) figures for population and economic activity. - Projected growth rates for population and economic activity (10-year intervals for period 2000 to 2060)
<u>General Output:</u>	- Projections of population and economic activity by zone at 10-year intervals for the period 2000 to 2060
<u>Worksheet Pages:</u>	<ul style="list-style-type: none"> - Summary - Projection Plots - Population Projections - Agriculture - Wet Industry - Other Mfg - Ports - Utilities - FabConst - RetailOffice - Schools - Hospitals - Tourism

G.4.1.1 Worksheet Page: Summary

<u>Worksheet Page:</u>	Summary
<u>Purpose:</u>	Summarize population and economic activity projections by population/economic zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	None
Computations	
	This worksheet contains no computations. All values are retrieved from other worksheet pages in the file.

G.4.1.2 Worksheet Page: Projection Plots

<i>Worksheet Page:</i>	Projection Plots
<i>Purpose:</i>	Present bar charts showing projected levels of population and economic activity by zone for 10-year intervals from 2000 to 2060.
<i>Input Required:</i>	None
Computations	
	This worksheet contains no computations. All values are retrieved from other worksheet pages in the file.

G.4.1.3 Worksheet Page: Population Projections

<u>Worksheet Page:</u>	Population Projections
<u>Purpose:</u>	Compute population levels by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 Population for each population zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for population zones for each 10-year period between 2000 and 2060.
Computations	
<u>Zone Population:</u> <i>(repeated for each zone)</i>	$\text{ZONEPOP}_{2010} = \text{ZONEPOP}_{2000} * (1 + \text{POPRATE}_{2010})^{10}$ $\text{ZONEPOP}_{2020} = \text{ZONEPOP}_{2010} * (1 + \text{POPRATE}_{2020})^{10}$ $\text{ZONEPOP}_{2030} = \text{ZONEPOP}_{2020} * (1 + \text{POPRATE}_{2030})^{10}$ $\text{ZONEPOP}_{2040} = \text{ZONEPOP}_{2030} * (1 + \text{POPRATE}_{2040})^{10}$ $\text{ZONEPOP}_{2050} = \text{ZONEPOP}_{2040} * (1 + \text{POPRATE}_{2050})^{10}$ $\text{ZONEPOP}_{2060} = \text{ZONEPOP}_{2050} * (1 + \text{POPRATE}_{2060})^{10}$

G.4.1.4 Worksheet Page: Agriculture

<u>Worksheet Page:</u>	Agriculture
<u>Purpose:</u>	Compute levels of agricultural development (as measured in hectares) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of agricultural development (hectares) for each population zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for agricultural development for each 10-year period between 2000 and 2060.
Computations	
<u>Agricultural Development:</u> <i>(repeated for each zone)</i>	$Z_G1_AREA_2010 = Z_G1_AREA_2000 * (1 + Z_G1_RATE_0010)^{10}$ $Z_G1_AREA_2020 = Z_G1_AREA_2010 * (1 + Z_G1_RATE_1020)^{10}$ $Z_G1_AREA_2030 = Z_G1_AREA_2020 * (1 + Z_G1_RATE_2030)^{10}$ $Z_G1_AREA_2040 = Z_G1_AREA_2030 * (1 + Z_G1_RATE_3040)^{10}$ $Z_G1_AREA_2050 = Z_G1_AREA_2040 * (1 + Z_G1_RATE_4050)^{10}$ $Z_G1_AREA_2060 = Z_G1_AREA_2050 * (1 + Z_G1_RATE_5060)^{10}$

G.4.1.5 Worksheet Page: Wet Industry

<u>Worksheet Page:</u>	Wet Industry
<u>Purpose:</u>	Compute levels of wet industrial production (as based on employee levels) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of wet industrial employment (employees) for each economic activity zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for wet industrial development for each 10-year period between 2000 and 2060.
Computations	
<u>Wet Industrial Development:</u> <i>(repeated for each zone)</i>	$Z_G2_EMP_2010 = Z_G2_EMP_2000 * (1 + Z_G2_RATE_0010)^{10}$ $Z_G2_EMP_2020 = Z_G2_EMP_2010 * (1 + Z_G2_RATE_1020)^{10}$ $Z_G2_EMP_2030 = Z_G2_EMP_2020 * (1 + Z_G2_RATE_2030)^{10}$ $Z_G2_EMP_2040 = Z_G2_EMP_2030 * (1 + Z_G2_RATE_3040)^{10}$ $Z_G2_EMP_2050 = Z_G2_EMP_2040 * (1 + Z_G2_RATE_4050)^{10}$ $Z_G2_EMP_2060 = Z_G2_EMP_2050 * (1 + Z_G2_RATE_5060)^{10}$

G.4.1.6 Worksheet Page: Other Mfg

<u>Worksheet Page:</u>	Other Mfg
<u>Purpose:</u>	Compute levels of other manufacturing production (as based on employee levels) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of other manufacturing employment (employees) for each economic activity zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for other manufacturing employment for each 10-year period between 2000 and 2060.
Computations	
<u>Other Manufacturing Development:</u> <i>(repeated for each zone)</i>	$Z_G3_EMP_2010 = Z_G3_EMP_2000 * (1 + Z_G3_RATE_0010)^{10}$ $Z_G3_EMP_2020 = Z_G3_EMP_2010 * (1 + Z_G3_RATE_1020)^{10}$ $Z_G3_EMP_2030 = Z_G3_EMP_2020 * (1 + Z_G3_RATE_2030)^{10}$ $Z_G3_EMP_2040 = Z_G3_EMP_2030 * (1 + Z_G3_RATE_3040)^{10}$ $Z_G3_EMP_2050 = Z_G3_EMP_2040 * (1 + Z_G3_RATE_4050)^{10}$ $Z_G3_EMP_2060 = Z_G3_EMP_2050 * (1 + Z_G3_RATE_5060)^{10}$

G.4.1.7 Worksheet Page: Ports

<u>Worksheet Page:</u>	Ports
<u>Purpose:</u>	Compute levels of economic activity associated with ports, warehouses and railroads (metric tons) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of port/warehouse/railroad activity (metric tons) for each economic activity zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for port/warehouse/railroad activity for each 10-year period between 2000 and 2060.
Computations	
<u>Ports/Warehouse/Railroad Activity:</u> <i>(repeated for each zone)</i>	$Z_G4_WT_2010 = Z_G4_WT_2000 * (1 + Z_G4_RATE_0010)^{10}$ $Z_G4_WT_2020 = Z_G4_WT_2010 * (1 + Z_G4_RATE_1020)^{10}$ $Z_G4_WT_2030 = Z_G4_WT_2020 * (1 + Z_G4_RATE_2030)^{10}$ $Z_G4_WT_2040 = Z_G4_WT_2030 * (1 + Z_G4_RATE_3040)^{10}$ $Z_G4_WT_2050 = Z_G4_WT_2040 * (1 + Z_G4_RATE_4050)^{10}$ $Z_G4_WT_2060 = Z_G4_WT_2050 * (1 + Z_G4_RATE_5060)^{10}$

G.4.1.8 Worksheet Page: Utilities

<u>Worksheet Page:</u>	Utilities
<u>Purpose:</u>	Compute levels of utility-based economic activity (as based on employee levels) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of utility employment (employees) for each economic activity zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for utility employment for each 10-year period between 2000 and 2060.
Computations	
<u>Utility Development:</u> <i>(repeated for each zone)</i>	$Z_G5_EMP_2010 = Z_G5_EMP_2000 * (1 + Z_G5_RATE_0010)^{10}$ $Z_G5_EMP_2020 = Z_G5_EMP_2010 * (1 + Z_G5_RATE_1020)^{10}$ $Z_G5_EMP_2030 = Z_G5_EMP_2020 * (1 + Z_G5_RATE_2030)^{10}$ $Z_G5_EMP_2040 = Z_G5_EMP_2030 * (1 + Z_G5_RATE_3040)^{10}$ $Z_G5_EMP_2050 = Z_G5_EMP_2040 * (1 + Z_G5_RATE_4050)^{10}$ $Z_G5_EMP_2060 = Z_G5_EMP_2050 * (1 + Z_G5_RATE_5060)^{10}$

G.4.1.9 Worksheet Page: FabConst

<u>Worksheet Page:</u>	FabConst
<u>Purpose:</u>	Compute levels of fabrication and construction (as based on estimates of value added) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of fabrication/construction value added (1000's of 1982 Balboas) for each economic activity zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for fabrication/construction value added for each 10-year period between 2000 and 2060.
Computations	
<u>Fabrication/Construction:</u> <i>(repeated for each zone)</i>	$Z_G6_VA_2010 = Z_G6_VA_2000 * (1 + Z_G6_RATE_0010)^{10}$ $Z_G6_VA_2020 = Z_G6_VA_2010 * (1 + Z_G6_RATE_1020)^{10}$ $Z_G6_VA_2030 = Z_G6_VA_2020 * (1 + Z_G6_RATE_2030)^{10}$ $Z_G6_VA_2040 = Z_G6_VA_2030 * (1 + Z_G6_RATE_3040)^{10}$ $Z_G6_VA_2050 = Z_G6_VA_2040 * (1 + Z_G6_RATE_4050)^{10}$ $Z_G6_VA_2060 = Z_G6_VA_2050 * (1 + Z_G6_RATE_5060)^{10}$

G.4.1.10 Worksheet Page: RetailOffice

<u>Worksheet Page:</u>	RetailOffice
<u>Purpose:</u>	Compute levels of retail and office economic activity (as based on employee levels) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of retail/office employment (employees) for each economic activity zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for retail/office employment for each 10-year period between 2000 and 2060.
Computations	
<u>Retail/Office Development:</u> <i>(repeated for each zone)</i>	$Z_G8A_EMP_2010 = Z_G8A_EMP_2000 * (1 + Z_G8A_RATE_0010)^{10}$ $Z_G8A_EMP_2020 = Z_G8A_EMP_2010 * (1 + Z_G8A_RATE_1020)^{10}$ $Z_G8A_EMP_2030 = Z_G8A_EMP_2020 * (1 + Z_G8A_RATE_2030)^{10}$ $Z_G8A_EMP_2040 = Z_G8A_EMP_2030 * (1 + Z_G8A_RATE_3040)^{10}$ $Z_G8A_EMP_2050 = Z_G8A_EMP_2040 * (1 + Z_G8A_RATE_4050)^{10}$ $Z_G8A_EMP_2060 = Z_G8A_EMP_2050 * (1 + Z_G8A_RATE_5060)^{10}$

G.4.1.11 Worksheet Page: Schools

<u>Worksheet Page:</u>	Schools
<u>Purpose:</u>	Compute levels of economic activity associated with schools (as based on student levels) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of enrollment (students) for each economic activity zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for enrollment for each 10-year period between 2000 and 2060.
Computations	
<u>School Enrollment:</u> <i>(repeated for each zone)</i>	$Z_G8B_STU_2010 = Z_G8B_STU_2000 * (1 + Z_G8B_RATE_0010)^{10}$ $Z_G8B_STU_2020 = Z_G8B_STU_2010 * (1 + Z_G8B_RATE_1020)^{10}$ $Z_G8B_STU_2030 = Z_G8B_STU_2020 * (1 + Z_G8B_RATE_2030)^{10}$ $Z_G8B_STU_2040 = Z_G8B_STU_2030 * (1 + Z_G8B_RATE_3040)^{10}$ $Z_G8B_STU_2050 = Z_G8B_STU_2040 * (1 + Z_G8B_RATE_4050)^{10}$ $Z_G8B_STU_2060 = Z_G8B_STU_2050 * (1 + Z_G8B_RATE_5060)^{10}$

G.4.1.12 Worksheet Page: Hospitals

<u>Worksheet Page:</u>	Hospitals
<u>Purpose:</u>	Compute levels of economic activity associated with hospitals (as based on number of hospital beds) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of hospital beds (beds) for each economic activity zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for hospital beds for each 10-year period between 2000 and 2060.
Computations	
<u>Hospital Beds:</u> <i>(repeated for each zone)</i>	$Z_G8C_BED_2010 = Z_G8C_BED_2000 * (1 + Z_G8C_RATE_0010)^{10}$ $Z_G8C_BED_2020 = Z_G8C_BED_2010 * (1 + Z_G8C_RATE_1020)^{10}$ $Z_G8C_BED_2030 = Z_G8C_BED_2020 * (1 + Z_G8C_RATE_2030)^{10}$ $Z_G8C_BED_2040 = Z_G8C_BED_2030 * (1 + Z_G8C_RATE_3040)^{10}$ $Z_G8C_BED_2050 = Z_G8C_BED_2040 * (1 + Z_G8C_RATE_4050)^{10}$ $Z_G8C_BED_2060 = Z_G8C_BED_2050 * (1 + Z_G8C_RATE_5060)^{10}$

G.4.1.13 Worksheet Page: Tourism

<u>Worksheet Page:</u>	Tourism
<u>Purpose:</u>	Compute levels of economic activity associated with tourism (as based on number of tourists) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Year 2000 levels of tourism (guests) for each economic activity zone (Note: values given are estimates developed for this study by CELA.) - Projected annual growth rates for tourism for each 10-year period between 2000 and 2060.
Computations	
<u>Tourism:</u> <i>(repeated for each zone)</i>	$Z_G9_GST_2010 = Z_G9_GST_2000 * (1 + Z_G9_RATE_0010)^{10}$ $Z_G9_GST_2020 = Z_G9_GST_2010 * (1 + Z_G9_RATE_1020)^{10}$ $Z_G9_GST_2030 = Z_G9_GST_2020 * (1 + Z_G9_RATE_2030)^{10}$ $Z_G9_GST_2040 = Z_G9_GST_2030 * (1 + Z_G9_RATE_3040)^{10}$ $Z_G9_GST_2050 = Z_G9_GST_2040 * (1 + Z_G9_RATE_4050)^{10}$ $Z_G9_GST_2060 = Z_G9_GST_2050 * (1 + Z_G9_RATE_5060)^{10}$

G.4.2 Base Demand Module

The Base Demand Module contains the spreadsheets required to project future base water demand (not including allowances for waste, excessive use, leakage/losses, etc.) in each of the eight zones that make up the study area. Details of the base demand spreadsheet are summarized below. Additional details related to each of the worksheet pages contained in the spreadsheet follow.

Long-Term Forecast for M&I Water Demand

<u>Filename:</u>	BASE DEMAND.XLS
<u>Purpose:</u>	The Base Demand module calculates normal water demands in the population and economic activity zones based on demographic projections from the Zone Projections module and user-specified unit rates for water demand.
<u>Dependent Links:</u>	Zone Projections.xls
<u>Spatial Basis:</u>	Population and Economic Zones
<u>General Input:</u>	<ul style="list-style-type: none"> - Unit water demand rates for residential development and other economic activities. - Factors for projected variations in residential unit demand rates across zones and over time. - Urban activity demand factors representing the ratio of base demand rate in urban areas to the overall base demand rate for each non-residential activity.
<u>General Output:</u>	- Projections of base water demand for residential development and other economic activity by zone at 10-year intervals for the period 2000 to 2060
<u>Worksheet Pages:</u>	<ul style="list-style-type: none"> - Summary - Residential - Agriculture - Wet Industry - Other Mfg - Ports - Utilities - FabConst - RetailOffice - Schools - Hospitals - Tourism

G.4.2.1 Worksheet Page: Summary

<u>Worksheet Page:</u>	Summary
<u>Purpose:</u>	Summarize estimates of base water demand by population/economic zone and economic activity group for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	None
Computations	
	This worksheet contains no computations. All values are retrieved from other worksheet pages in the file.

G.4.2.2 Worksheet Page: Residential

<u>Worksheet Page:</u>	Residential
<u>Purpose:</u>	Compute future base water demands associated with residential development (based on population and per capita use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per capita per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base residential water demand rate between zones and over time
Computations	
<u>Residential:</u> <i>(repeated for each zone)</i>	$Z_DEMRA_{T_2000} = BASEDEMRA_{T_2000} * Z_RDEMFA_{CT_2000}$ $ZRESDEM_{2000} = ZONEPOP_{2000} * Z_DEMRA_{T_2000}$ $Z_DEMRA_{T_2010} = BASEDEMRA_{T_2010} * Z_RDEMFA_{CT_2010}$ $ZRESDEM_{2010} = ZONEPOP_{2010} * Z_DEMRA_{T_2010}$ $Z_DEMRA_{T_2020} = BASEDEMRA_{T_2020} * Z_RDEMFA_{CT_2020}$ $ZRESDEM_{2020} = ZONEPOP_{2020} * Z_DEMRA_{T_2020}$ $Z_DEMRA_{T_2030} = BASEDEMRA_{T_2030} * Z_RDEMFA_{CT_2030}$ $ZRESDEM_{2030} = ZONEPOP_{2030} * Z_DEMRA_{T_2030}$ $Z_DEMRA_{T_2040} = BASEDEMRA_{T_2040} * Z_RDEMFA_{CT_2040}$ $ZRESDEM_{2040} = ZONEPOP_{2040} * Z_DEMRA_{T_2040}$ $Z_DEMRA_{T_2050} = BASEDEMRA_{T_2050} * Z_RDEMFA_{CT_2050}$ $ZRESDEM_{2050} = ZONEPOP_{2050} * Z_DEMRA_{T_2050}$ $Z_DEMRA_{T_2060} = BASEDEMRA_{T_2060} * Z_RDEMFA_{CT_2060}$ $ZRESDEM_{2060} = ZONEPOP_{2060} * Z_DEMRA_{T_2060}$

G.4.2.3 Worksheet Page: Agriculture

<u>Worksheet Page:</u>	Agriculture
<u>Purpose:</u>	Compute future base water demands associated with agricultural development (based on developed area and per hectare use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per hectare per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base agricultural water demand rate between zones and over time
Computations	
<u>Agricultural:</u> <i>(repeated for each zone)</i>	$Z_G1RAT_2000 = BASEG1RATE_2000 * Z_G1DEMFCT_2000$ $ZG1DEM_2000 = Z_G1_AREA_2000 * Z_G1_DEMRAT_2000$ $Z_G1RAT_2010 = BASEG1RATE_2010 * Z_G1DEMFCT_2010$ $ZG1DEM_2010 = Z_G1_AREA_2010 * Z_G1_DEMRAT_2010$ $Z_G1RAT_2020 = BASEG1RATE_2020 * Z_G1DEMFCT_2020$ $ZG1DEM_2020 = Z_G1_AREA_2020 * Z_G1_DEMRAT_2020$ $Z_G1RAT_2030 = BASEG1RATE_2030 * Z_G1DEMFCT_2030$ $ZG1DEM_2030 = Z_G1_AREA_2030 * Z_G1_DEMRAT_2030$ $Z_G1RAT_2040 = BASEG1RATE_2040 * Z_G1DEMFCT_2040$ $ZG1DEM_2040 = Z_G1_AREA_2040 * Z_G1_DEMRAT_2040$ $Z_G1RAT_2050 = BASEG1RATE_2050 * Z_G1DEMFCT_2050$ $ZG1DEM_2050 = Z_G1_AREA_2050 * Z_G1_DEMRAT_2050$ $Z_G1RAT_2060 = BASEG1RATE_2060 * Z_G1DEMFCT_2060$ $ZG1DEM_2060 = Z_G1_AREA_2060 * Z_G1_DEMRAT_2060$

G.4.2.4 Worksheet Page: Wet Industry

<u>Worksheet Page:</u>	Wet Industry
<u>Purpose:</u>	Compute future base water demands associated with wet industrial production (based on employees and per employee use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per employee per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base wet industrial water demand rate between zones and over time
Computations	
<u>Wet Industrial:</u> <i>(repeated for each zone)</i>	$Z_G2RAT_2000 = BASEG2RATE_2000 * Z_G2DEMFACT_2000$ $ZG2DEM_2000 = Z_G2_EMP_2000 * Z_G2_DEMRAT_2000$ $Z_G2RAT_2010 = BASEG2RATE_2010 * Z_G2DEMFACT_2010$ $ZG2DEM_2010 = Z_G2_EMP_2010 * Z_G2_DEMRAT_2010$ $Z_G2RAT_2020 = BASEG2RATE_2020 * Z_G2DEMFACT_2020$ $ZG2DEM_2020 = Z_G2_EMP_2020 * Z_G2_DEMRAT_2020$ $Z_G2RAT_2030 = BASEG2RATE_2030 * Z_G2DEMFACT_2030$ $ZG2DEM_2030 = Z_G2_EMP_2030 * Z_G2_DEMRAT_2030$ $Z_G2RAT_2040 = BASEG2RATE_2040 * Z_G2DEMFACT_2040$ $ZG2DEM_2040 = Z_G2_EMP_2040 * Z_G2_DEMRAT_2040$ $Z_G2RAT_2050 = BASEG2RATE_2050 * Z_G2DEMFACT_2050$ $ZG2DEM_2050 = Z_G2_EMP_2050 * Z_G2_DEMRAT_2050$ $Z_G2RAT_2060 = BASEG2RATE_2060 * Z_G2DEMFACT_2060$ $ZG2DEM_2060 = Z_G2_EMP_2060 * Z_G2_DEMRAT_2060$

G.4.2.5 Worksheet Page: Other Mfg

<u>Worksheet Page:</u>	Other Mfg
<u>Purpose:</u>	Compute future base water demands associated with other manufacturing production (based on employees and per employee use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per employee per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base water demand rate for other manufacturing uses between zones and over time
Computations	
<u>Other Manufacturing:</u> <i>(repeated for each zone)</i>	$Z_G3RAT_2000 = BASEG3RATE_2000 * Z_G3DEMFCT_2000$ $ZG3DEM_2000 = Z_G3_EMP_2000 * Z_G3_DEMRAT_2000$ $Z_G3RAT_2010 = BASEG3RATE_2010 * Z_G3DEMFCT_2010$ $ZG3DEM_2010 = Z_G3_EMP_2010 * Z_G3_DEMRAT_2010$ $Z_G3RAT_2020 = BASEG3RATE_2020 * Z_G3DEMFCT_2020$ $ZG3DEM_2020 = Z_G3_EMP_2020 * Z_G3_DEMRAT_2020$ $Z_G3RAT_2030 = BASEG3RATE_2030 * Z_G3DEMFCT_2030$ $ZG3DEM_2030 = Z_G3_EMP_2030 * Z_G3_DEMRAT_2030$ $Z_G3RAT_2040 = BASEG3RATE_2040 * Z_G3DEMFCT_2040$ $ZG3DEM_2040 = Z_G3_EMP_2040 * Z_G3_DEMRAT_2040$ $Z_G3RAT_2050 = BASEG3RATE_2050 * Z_G3DEMFCT_2050$ $ZG3DEM_2050 = Z_G3_EMP_2050 * Z_G3_DEMRAT_2050$ $Z_G3RAT_2060 = BASEG3RATE_2060 * Z_G3DEMFCT_2060$ $ZG3DEM_2060 = Z_G3_EMP_2060 * Z_G3_DEMRAT_2060$

G.4.2.6 Worksheet Page: Ports

<u>Worksheet Page:</u>	Ports
<u>Purpose:</u>	Compute future base water demands associated with port/warehouse/railroad operations (based on metric tons of freight and per ton use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per metric ton per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base water demand rate for port/warehouse/railroad activities between zones and over time
Computations	
<u>Ports/Warehouse</u> <u>/Railroads:</u> <i>(repeated for each zone)</i>	$Z_G4RAT_2000 = BASEG4RATE_2000 * Z_G4DEMFCT_2000$ $ZG4DEM_2000 = Z_G4_WT_2000 * Z_G4_DEMRA T_2000$ $Z_G4RAT_2010 = BASEG4RATE_2010 * Z_G4DEMFCT_2010$ $ZG4DEM_2010 = Z_G4_WT_2010 * Z_G4_DEMRA T_2010$ $Z_G4RAT_2020 = BASEG4RATE_2020 * Z_G4DEMFCT_2020$ $ZG4DEM_2020 = Z_G4_WT_2020 * Z_G4_DEMRA T_2020$ $Z_G4RAT_2030 = BASEG4RATE_2030 * Z_G4DEMFCT_2030$ $ZG4DEM_2030 = Z_G4_WT_2030 * Z_G4_DEMRA T_2030$ $Z_G4RAT_2040 = BASEG4RATE_2040 * Z_G4DEMFCT_2040$ $ZG4DEM_2040 = Z_G4_WT_2040 * Z_G4_DEMRA T_2040$ $Z_G4RAT_2050 = BASEG4RATE_2050 * Z_G4DEMFCT_2050$ $ZG4DEM_2050 = Z_G4_WT_2050 * Z_G4_DEMRA T_2050$ $Z_G4RAT_2060 = BASEG4RATE_2060 * Z_G4DEMFCT_2060$ $ZG4DEM_2060 = Z_G4_WT_2060 * Z_G4_DEMRA T_2060$

G.4.2.7 Worksheet Page: Utilities

<u>Worksheet Page:</u>	Utilities
<u>Purpose:</u>	Compute future base water demands associated with utility operations (based on employees and per employee use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per employee per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base water demand rate for utilities between zones and over time
Computations	
<u>Utilities:</u> <i>(repeated for each zone)</i>	$Z_G5RAT_2000 = BASEG5RATE_2000 * Z_G5DEMFCT_2000$ $ZG5DEM_2000 = Z_G5_EMP_2000 * Z_G5_DEMRAT_2000$ $Z_G5RAT_2010 = BASEG5RATE_2010 * Z_G5DEMFCT_2010$ $ZG5DEM_2010 = Z_G5_EMP_2010 * Z_G5_DEMRAT_2010$ $Z_G5RAT_2020 = BASEG5RATE_2020 * Z_G5DEMFCT_2020$ $ZG5DEM_2020 = Z_G5_EMP_2020 * Z_G5_DEMRAT_2020$ $Z_G5RAT_2030 = BASEG5RATE_2030 * Z_G5DEMFCT_2030$ $ZG5DEM_2030 = Z_G5_EMP_2030 * Z_G5_DEMRAT_2030$ $Z_G5RAT_2040 = BASEG5RATE_2040 * Z_G5DEMFCT_2040$ $ZG5DEM_2040 = Z_G5_EMP_2040 * Z_G5_DEMRAT_2040$ $Z_G5RAT_2050 = BASEG5RATE_2050 * Z_G5DEMFCT_2050$ $ZG5DEM_2050 = Z_G5_EMP_2050 * Z_G5_DEMRAT_2050$ $Z_G5RAT_2060 = BASEG5RATE_2060 * Z_G5DEMFCT_2060$ $ZG5DEM_2060 = Z_G5_EMP_2060 * Z_G5_DEMRAT_2060$

G.4.2.8 Worksheet Page: FabConst

<u>Worksheet Page:</u>	FabConst
<u>Purpose:</u>	Compute future base water demands associated with fabrication and construction (based on value added and per dollar value use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per dollar value per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base water demand rate for fabrication and construction between zones and over time
Computations	
<u>Fabrication/ Construction:</u> <i>(repeated for each zone)</i>	$Z_G6RAT_2000 = BASEG6RATE_2000 * Z_G6DEMFCT_2000$ $ZG6DEM_2000 = Z_G6_VA_2000 * Z_G6_DEMRAT_2000$ $Z_G6RAT_2010 = BASEG6RATE_2010 * Z_G6DEMFCT_2010$ $ZG6DEM_2010 = Z_G6_VA_2010 * Z_G6_DEMRAT_2010$ $Z_G6RAT_2020 = BASEG6RATE_2020 * Z_G6DEMFCT_2020$ $ZG6DEM_2020 = Z_G6_VA_2020 * Z_G6_DEMRAT_2020$ $Z_G6RAT_2030 = BASEG6RATE_2030 * Z_G6DEMFCT_2030$ $ZG6DEM_2030 = Z_G6_VA_2030 * Z_G6_DEMRAT_2030$ $Z_G6RAT_2040 = BASEG6RATE_2040 * Z_G6DEMFCT_2040$ $ZG6DEM_2040 = Z_G6_VA_2040 * Z_G6_DEMRAT_2040$ $Z_G6RAT_2050 = BASEG6RATE_2050 * Z_G6DEMFCT_2050$ $ZG6DEM_2050 = Z_G6_VA_2050 * Z_G6_DEMRAT_2050$ $Z_G6RAT_2060 = BASEG6RATE_2060 * Z_G6DEMFCT_2060$ $ZG6DEM_2060 = Z_G6_VA_2060 * Z_G6_DEMRAT_2060$

G.4.2.9 Worksheet Page: RetailOffice

<u>Worksheet Page:</u>	RetailOffice
<u>Purpose:</u>	Compute future base water demands associated with retail/office development (based on employment and per employee use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per employee per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base water demand rate for retail/office use between zones and over time
Computations	
<u>Retail/Office:</u> <i>(repeated for each zone)</i>	$Z_G8ARAT_2000 = BASEG8ARATE_2000 * Z_G8ADEMFCT_2000$ $ZG8ADEM_2000 = Z_G8A_EMP_2000 * Z_G8A_DEMRAT_2000$ $Z_G8ARAT_2010 = BASEG8ARATE_2010 * Z_G8ADEMFCT_2010$ $ZG8ADEM_2010 = Z_G8A_EMP_2010 * Z_G8A_DEMRAT_2010$ $Z_G8ARAT_2020 = BASEG8ARATE_2020 * Z_G8ADEMFCT_2020$ $ZG8ADEM_2020 = Z_G8A_EMP_2020 * Z_G8A_DEMRAT_2020$ $Z_G8ARAT_2030 = BASEG8ARATE_2030 * Z_G8ADEMFCT_2030$ $ZG8ADEM_2030 = Z_G8A_EMP_2030 * Z_G8A_DEMRAT_2030$ $Z_G8ARAT_2040 = BASEG8ARATE_2040 * Z_G8ADEMFCT_2040$ $ZG8ADEM_2040 = Z_G8A_EMP_2040 * Z_G8A_DEMRAT_2040$ $Z_G8ARAT_2050 = BASEG8ARATE_2050 * Z_G8ADEMFCT_2050$ $ZG8ADEM_2050 = Z_G8A_EMP_2050 * Z_G8A_DEMRAT_2050$ $Z_G8ARAT_2060 = BASEG8ARATE_2060 * Z_G8ADEMFCT_2060$ $ZG8ADEM_2060 = Z_G8A_EMP_2060 * Z_G8A_DEMRAT_2060$

G.4.2.10 Worksheet Page: Schools

<u>Worksheet Page:</u>	Schools
<u>Purpose:</u>	Compute future base water demands associated with educational facilities (based on enrollment and per student use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per student per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base water demand rate for educational facilities between zones and over time
Computations	
<u>Schools:</u> <i>(repeated for each zone)</i>	$Z_G8BRAT_2000 = BASEG8BRATE_2000 * Z_G8BDEMFACT_2000$ $ZG8BDEM_2000 = Z_G8B_STU_2000 * Z_G8B_DEMFACT_2000$ $Z_G8BRAT_2010 = BASEG8BRATE_2010 * Z_G8BDEMFACT_2010$ $ZG8BDEM_2010 = Z_G8B_STU_2010 * Z_G8B_DEMFACT_2010$ $Z_G8BRAT_2020 = BASEG8BRATE_2020 * Z_G8BDEMFACT_2020$ $ZG8BDEM_2020 = Z_G8B_STU_2020 * Z_G8B_DEMFACT_2020$ $Z_G8BRAT_2030 = BASEG8BRATE_2030 * Z_G8BDEMFACT_2030$ $ZG8BDEM_2030 = Z_G8B_STU_2030 * Z_G8B_DEMFACT_2030$ $Z_G8BRAT_2040 = BASEG8BRATE_2040 * Z_G8BDEMFACT_2040$ $ZG8BDEM_2040 = Z_G8B_STU_2040 * Z_G8B_DEMFACT_2040$ $Z_G8BRAT_2050 = BASEG8BRATE_2050 * Z_G8BDEMFACT_2050$ $ZG8BDEM_2050 = Z_G8B_STU_2050 * Z_G8B_DEMFACT_2050$ $Z_G8BRAT_2060 = BASEG8BRATE_2060 * Z_G8BDEMFACT_2060$ $ZG8BDEM_2060 = Z_G8B_STU_2060 * Z_G8B_DEMFACT_2060$

G.4.2.11 Worksheet Page: Hospitals

<u>Worksheet Page:</u>	Hospitals
<u>Purpose:</u>	Compute future base water demands associated with hospitals (based on number of beds and per bed use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per hospital bed per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base water demand rate for hospitals between zones and over time
Computations	
<u>Hospitals:</u> <i>(repeated for each zone)</i>	$Z_G8CRAT_2000 = BASEG8CRATE_2000 * Z_G8CDEMFACT_2000$ $ZG8CDEM_2000 = Z_G8C_BED_2000 * Z_G8C_DEMRAT_2000$ $Z_G8CRAT_2010 = BASEG8CRATE_2010 * Z_G8CDEMFACT_2010$ $ZG8CDEM_2010 = Z_G8C_BED_2010 * Z_G8C_DEMRAT_2010$ $Z_G8CRAT_2020 = BASEG8CRATE_2020 * Z_G8CDEMFACT_2020$ $ZG8CDEM_2020 = Z_G8C_BED_2020 * Z_G8C_DEMRAT_2020$ $Z_G8CRAT_2030 = BASEG8CRATE_2030 * Z_G8CDEMFACT_2030$ $ZG8CDEM_2030 = Z_G8C_BED_2030 * Z_G8C_DEMRAT_2030$ $Z_G8CRAT_2040 = BASEG8CRATE_2040 * Z_G8CDEMFACT_2040$ $ZG8CDEM_2040 = Z_G8C_BED_2040 * Z_G8C_DEMRAT_2040$ $Z_G8CRAT_2050 = BASEG8CRATE_2050 * Z_G8CDEMFACT_2050$ $ZG8CDEM_2050 = Z_G8C_BED_2050 * Z_G8C_DEMRAT_2050$ $Z_G8CRAT_2060 = BASEG8CRATE_2060 * Z_G8CDEMFACT_2060$ $ZG8CDEM_2060 = Z_G8C_BED_2060 * Z_G8C_DEMRAT_2060$

G.4.2.12 Worksheet Page: Tourism

<u>Worksheet Page:</u>	Tourism
<u>Purpose:</u>	Compute future base water demands associated with tourist activities (based on tourism and per guest use rates) by zone for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Estimated base water demand rate (gallons per guest per day) for each 10 year period from 2000 to 2060 - Factors to account for variations in base tourist water demand rate between zones and over time
Computations	
<u>Tourism:</u> <i>(repeated for each zone)</i>	$Z_G9RAT_2000 = BASEG9RATE_2000 * Z_G9DEMFCT_2000$ $ZG9DEM_2000 = Z_G9_GST_2000 * Z_G9_DEMRAT_2000$ $Z_G9RAT_2010 = BASEG9RATE_2010 * Z_G9DEMFCT_2010$ $ZG9DEM_2010 = Z_G9_GST_2010 * Z_G9_DEMRAT_2010$ $Z_G9RAT_2020 = BASEG9RATE_2020 * Z_G9DEMFCT_2020$ $ZG9DEM_2020 = Z_G9_GST_2020 * Z_G9_DEMRAT_2020$ $Z_G9RAT_2030 = BASEG9RATE_2030 * Z_G9DEMFCT_2030$ $ZG9DEM_2030 = Z_G9_GST_2030 * Z_G9_DEMRAT_2030$ $Z_G9RAT_2040 = BASEG9RATE_2040 * Z_G9DEMFCT_2040$ $ZG9DEM_2040 = Z_G9_GST_2040 * Z_G9_DEMRAT_2040$ $Z_G9RAT_2050 = BASEG9RATE_2050 * Z_G9DEMFCT_2050$ $ZG9DEM_2050 = Z_G9_GST_2050 * Z_G9_DEMRAT_2050$ $Z_G9RAT_2060 = BASEG9RATE_2060 * Z_G9DEMFCT_2060$ $ZG9DEM_2060 = Z_G9_GST_2060 * Z_G9_DEMRAT_2060$

G.4.3 Service Area Projections Module

The Service Area Module contains the spreadsheets required to convert projections of base water demand by population/economic zone to projections by water service area. Details of the service area projections spreadsheet are summarized below. Additional details related to each of the worksheet pages contained in the spreadsheet follow.

<u>Filename:</u>	SERVICE AREA PROJECTIONS.XLS
<u>Purpose:</u>	The Service Area Projections module includes the computations necessary to convert estimates of base water demand by population and economic activity zone into estimates by Water Service Area.
<u>Dependent Links:</u>	Zone Projections.xls Base Demand.xls
<u>Spatial Basis:</u>	- Population and Economic Zones - Water Service Areas
<u>General Input:</u>	No input to this module is required. Over time, some changes to the distribution between population/economic activity zones and water service area zones may be required; However, such changes are addressed under the description of model maintenance requirements.
<u>General Output:</u>	Projections of residential and non-residential base water demand by water service area
<u>Worksheet Pages:</u>	- Zone to Area - Base Demand by Zone - Base Demand by Area

G.4.3.1 Worksheet Page: Zone to Area

<u>Worksheet Page:</u>	Zone to Area
<u>Purpose:</u>	Quantify the relative distribution of base water demand between population/economic zones and projected water service areas.
<u>Input Required:</u>	None, percentages for residential and non-residential demand are defined based on analysis of historic data.
Computations	
	This worksheet contains no computations. Values in this worksheet are used as input to subsequent distributions of base demand between population/economic zones and water service areas.

G.4.3.2 Worksheet Page: Base Demand by Zone

<u>Worksheet Page:</u>	Base Demand by Zone
<u>Purpose:</u>	Compute the portion of the base water demand in each population/economic zone to be assigned to each water service area for each 10-year period from 2000 to 2060.
<u>Input Required:</u>	No input required. All required values are drawn from other worksheets.
Computations	
<u>Base Demands by Zone:</u> <i>(repeated for each zone and each 10-year interval)</i>	$\text{WSA1Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA1}$ $\text{WSA2Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA2}$ $\text{WSA3Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA3}$ $\text{WSA4Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA4}$ $\text{WSA5Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA5}$ $\text{WSA6Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA6}$ $\text{WSA7Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA7}$ $\text{WSA8Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA8}$ $\text{WSA9Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA9}$ $\text{WSA10Z1_RDEM_2000} = \text{Z1RESDEM_2000} * \text{PCT_RZ1_WSA10}$ $\text{Z1_NRDEM_2000} = \text{Z1G1DEM_2000} + \text{Z1G2DEM_2000} + \text{Z1G3DEM_2000} + \text{Z1G4DEM_2000} + \text{Z1G5DEM_2000} + \text{Z1G6DEM_2000} + \text{Z1G8ADEM_2000} + \text{Z1G8BDEM_2000} + \text{Z1G8CDEM_2000} + \text{Z1G9DEM_2000}$ $\text{WSA1Z1_NRDEM_2000} = \text{Z1_NRDEM_2000} * \text{PCT_NRZ1_WSA1}$ $\text{WSA2Z1_NRDEM_2000} = \text{Z1_NRDEM_2000} * \text{PCT_NRZ1_WSA2}$ $\text{WSA3Z1_NRDEM_2000} = \text{Z1_NRDEM_2000} * \text{PCT_NRZ1_WSA3}$ $\text{WSA4Z1_NRDEM_2000} = \text{Z1_NRDEM_2000} * \text{PCT_NRZ1_WSA4}$

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	$WSA5Z1_NRDEM_2000 = Z1_NRDEM_2000 * PCT_NRZ1_WSA5$
	$WSA6Z1_NRDEM_2000 = Z1_NRDEM_2000 * PCT_NRZ1_WSA6$
	$WSA7Z1_NRDEM_2000 = Z1_NRDEM_2000 * PCT_NRZ1_WSA7$
	$WSA8Z1_NRDEM_2000 = Z1_NRDEM_2000 * PCT_NRZ1_WSA8$
	$WSA9Z1_NRDEM_2000 = Z1_NRDEM_2000 * PCT_NRZ1_WSA9$
	$WSA10Z1_NRDEM_2000 = Z1_NRDEM_2000 * PCT_NRZ1_WSA10$

G.4.3.3 Worksheet Page: Base Demand by Area

<u>Worksheet Page:</u>	Base Demand by Area
<u>Purpose:</u>	Compute the portion of the base water demand in each projected water service area for each 10-year period from 2000 to 2060.
<u>Input Required:</u>	No input required. All required values are drawn from other worksheets.
Computations	
<u>Base Demands by Area:</u> <i>(repeated for each water service area and each 10-year interval)</i>	<p>WSA1_RESDEM_2000 = WSA1Z1_RDEM_2000+ WSA1Z2_RDEM_2000+WSA1Z3_RDEM_2000+ WSA1Z4_RDEM_2000+WSA1Z5_RDEM_2000+ WSA1Z6_RDEM_2000+WSA1Z7_RDEM_2000+ WSAIZ8_RDEM_2000</p> <p>WSA2_RESDEM_2000 = WSA2Z1_RDEM_2000+ WSA2Z2_RDEM_2000+WSA2Z3_RDEM_2000+ WSA2Z4_RDEM_2000+WSA2Z5_RDEM_2000+ WSA2Z6_RDEM_2000+WSA2Z7_RDEM_2000+ WSAIZ8_RDEM_2000</p> <p>WSA3_RESDEM_2000 = WSA3Z1_RDEM_2000+ WSA3Z2_RDEM_2000+WSA3Z3_RDEM_2000+ WSA3Z4_RDEM_2000+WSA3Z5_RDEM_2000+ WSA3Z6_RDEM_2000+WSA3Z7_RDEM_2000+ WSAIZ8_RDEM_2000</p> <p>WSA4_RESDEM_2000 = WSA4Z1_RDEM_2000+ WSA4Z2_RDEM_2000+WSA4Z3_RDEM_2000+ WSA4Z4_RDEM_2000+WSA4Z5_RDEM_2000+ WSA4Z6_RDEM_2000+WSA4Z7_RDEM_2000+ WSAIZ8_RDEM_2000</p> <p>WSA5_RESDEM_2000 = WSA5Z1_RDEM_2000+ WSA5Z2_RDEM_2000+WSA5Z3_RDEM_2000+ WSA5Z4_RDEM_2000+WSA5Z5_RDEM_2000+ WSA5Z6_RDEM_2000+WSA5Z7_RDEM_2000+ WSAIZ8_RDEM_2000</p> <p>WSA6_RESDEM_2000 = WSA6Z1_RDEM_2000+ WSA6Z2_RDEM_2000+WSA6Z3_RDEM_2000+ WSA6Z4_RDEM_2000+WSA6Z5_RDEM_2000+ WSA6Z6_RDEM_2000+WSA6Z7_RDEM_2000+</p>

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	<p>WSA6Z8_RDEM_2000</p> <p>WSA7_RESDEM_2000 = WSA7Z1_RDEM_2000+ WSA7Z2_RDEM_2000+WSA7Z3_RDEM_2000+ WSA7Z4_RDEM_2000+WSA7Z5_RDEM_2000+ WSA7Z6_RDEM_2000+WSA7Z7_RDEM_2000+ WSAIZ8_RDEM_2000</p> <p>WSA8_RESDEM_2000 = WSA8Z1_RDEM_2000+ WSA8Z2_RDEM_2000+WSA8Z3_RDEM_2000+ WSA8Z4_RDEM_2000+WSA8Z5_RDEM_2000+ WSA8Z6_RDEM_2000+WSA8Z7_RDEM_2000+ WSAIZ8_RDEM_2000</p> <p>WSA9_RESDEM_2000 = WSA9Z1_RDEM_2000+ WSA9Z2_RDEM_2000+WSA9Z3_RDEM_2000+ WSA9Z4_RDEM_2000+WSA9Z5_RDEM_2000+ WSA9Z6_RDEM_2000+WSA9Z7_RDEM_2000+ WSAIZ8_RDEM_2000</p> <p>WSA10_RESDEM_2000 = WSA10Z1_RDEM_2000+ WSA10Z2_RDEM_2000+WSA10Z3_RDEM_2000+ WSA10Z4_RDEM_2000+WSA10Z5_RDEM_2000+ WSA10Z6_RDEM_2000+WSA10Z7_RDEM_2000+ WSAIZ8_RDEM_2000</p> <p>WSA1_NRDEM_2000 = WSA1Z1_NRDEM_2000+ WSA1Z2_NRDEM_2000+WSA1Z3_NRDEM_2000+ WSA1Z4_NRDEM_2000+WSA1Z5_NRDEM_2000+ WSA1Z6_NRDEM_2000+WSA1Z7_NRDEM_2000+ WSAIZ8_NRDEM_2000</p> <p>WSA2_NRDEM_2000 = WSA2Z1_NRDEM_2000+ WSA2Z2_NRDEM_2000+WSA2Z3_NRDEM_2000+ WSA2Z4_NRDEM_2000+WSA2Z5_NRDEM_2000+ WSA2Z6_NRDEM_2000+WSA2Z7_NRDEM_2000+ WSAIZ8_NRDEM_2000</p> <p>WSA3_NRDEM_2000 = WSA3Z1_NRDEM_2000+ WSA3Z2_NRDEM_2000+WSA3Z3_NRDEM_2000+ WSA3Z4_NRDEM_2000+WSA3Z5_NRDEM_2000+ WSA3Z6_NRDEM_2000+WSA3Z7_NRDEM_2000+ WSAIZ8_NRDEM_2000</p> <p>WSA4_NRDEM_2000 = WSA4Z1_NRDEM_2000+ WSA4Z2_NRDEM_2000+WSA4Z3_NRDEM_2000+ WSA4Z4_NRDEM_2000+WSA4Z5_NRDEM_2000+ WSA4Z6_NRDEM_2000+WSA4Z7_NRDEM_2000+ WSAIZ8_NRDEM_2000</p>
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Long-Term Forecast for M&I Water Demand

	<p>WSA5_NRDEM_2000 = WSA5Z1_NRDEM_2000+ WSA5Z2_NRDEM_2000+WSA5Z3_NRDEM_2000+ WSA5Z4_NRDEM_2000+WSA5Z5_NRDEM_2000+ WSA5Z6_NRDEM_2000+WSA5Z7_NRDEM_2000+ WSAIZ8_NRDEM_2000</p> <p>WSA6_NRDEM_2000 = WSA6Z1_NRDEM_2000+ WSA6Z2_NRDEM_2000+WSA6Z3_NRDEM_2000+ WSA6Z4_NRDEM_2000+WSA6Z5_NRDEM_2000+ WSA6Z6_NRDEM_2000+WSA6Z7_NRDEM_2000+ WSA6Z8_NRDEM_2000</p> <p>WSA7_NRDEM_2000 = WSA7Z1_NRDEM_2000+ WSA7Z2_NRDEM_2000+WSA7Z3_NRDEM_2000+ WSA7Z4_NRDEM_2000+WSA7Z5_NRDEM_2000+ WSA7Z6_NRDEM_2000+WSA7Z7_NRDEM_2000+ WSAIZ8_NRDEM_2000</p> <p>WSA8_NRDEM_2000 = WSA8Z1_NRDEM_2000+ WSA8Z2_NRDEM_2000+WSA8Z3_NRDEM_2000+ WSA8Z4_NRDEM_2000+WSA8Z5_NRDEM_2000+ WSA8Z6_NRDEM_2000+WSA8Z7_NRDEM_2000+ WSAIZ8_NRDEM_2000</p> <p>WSA9_NRDEM_2000 = WSA9Z1_NRDEM_2000+ WSA9Z2_NRDEM_2000+WSA9Z3_NRDEM_2000+ WSA9Z4_NRDEM_2000+WSA9Z5_NRDEM_2000+ WSA9Z6_NRDEM_2000+WSA9Z7_NRDEM_2000+ WSAIZ8_NRDEM_2000</p> <p>WSA10_NRDEM_2000 = WSA10Z1_NRDEM_2000+ WSA10Z2_NRDEM_2000+WSA10Z3_NRDEM_2000+ WSA10Z4_NRDEM_2000+WSA10Z5_NRDEM_2000+ WSA10Z6_NRDEM_2000+WSA10Z7_NRDEM_2000+ WSAIZ8_NRDEM_2000</p>
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G.4.4 Water Requirements Module

The Water Requirements Module contains the spreadsheets required to project future water requirements including adjustments for level of service, excessive use in unmetered areas, leakage/losses, conservation practices, and pricing policies, in each of the ten water service areas identified within the study area. Details of the water requirements spreadsheet are summarized below. Additional details related to each of the worksheet pages contained in the spreadsheet follow.

<u>Filename:</u>	AREA WATER REQUIREMENTS.XLS
<u>Purpose:</u>	The Area Water Requirements module accepts user-defined values for parameters used to compute total water requirements on a service area basis from base demand projections.
<u>Dependent Links:</u>	Zone Projections.xls Base Demand.xls Service area Projections.xls
<u>Spatial Basis:</u>	Water Service Areas
<u>General Input:</u>	<ul style="list-style-type: none"> - % of service areas with centralized service - Water system characteristics (Level of service, Metering, Leakage/Losses) - Conservation and price elasticity factors - % increase in tariff
<u>General Output:</u>	- Projections of water requirements by water service area at 10-year intervals for the period 2000 to 2060
<u>Worksheet Pages:</u>	<ul style="list-style-type: none"> - Summary - Panama Metro - ArraijanChorrera - Colon - Upper Caimito - Panama Este - Rio Gatun - Gatun Noroeste - Gatun Suroeste - Upper Chagres - Ancon

G.4.4.1 Worksheet Page: Summary

<u>Worksheet Page:</u>	Summary
<u>Purpose:</u>	Summarize estimates of total water demand by service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	None
Computations	
	This worksheet contains no computations. All values are retrieved from other worksheet pages in the file.

G.4.4.2 Worksheet Page: Panama Metro

<u>Worksheet Page:</u>	Panama Metro
<u>Purpose:</u>	Compute future water requirement for the Panama Metro Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % increase in tariff
Computations	
<u>Requirements:</u> <i>(Repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1 - % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor - 1)* Unmetered Residential Demand</p>

Long-Term Forecast for M&I Water Demand

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use <u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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Long-Term Forecast for M&I Water Demand

	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp}(\text{Elasticity Factor} * \% \text{ increase in Tariff})) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.4.4.3 Worksheet Page: ArraijanChorrera

<u>Worksheet Page:</u>	ArraijanChorrera
<u>Purpose:</u>	Compute future water requirement for the ArraijanChorrera Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % increase in tariff
Computations	
<u>Requirements:</u> <i>(repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1 - % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor -1)* Unmetered Residential Demand</p>

Long-Term Forecast for M&I Water Demand

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use <u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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Long-Term Forecast for M&I Water Demand

	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp}(\text{Elasticity Factor} * \% \text{ increase in Tariff})) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.4.4.4 Worksheet Page: Colon

<u>Worksheet Page:</u>	Colon
<u>Purpose:</u>	Compute future water requirement for the Colon Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % increase in tariff
Computations	
<u>Requirements:</u> <i>(repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1 - % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor - 1)* Unmetered Residential Demand</p>

Long-Term Forecast for M&I Water Demand

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use <u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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Long-Term Forecast for M&I Water Demand

	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp}(\text{Elasticity Factor} * \% \text{ increase in Tariff})) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.4.4.5 Worksheet Page: Upper Caimito

<u>Worksheet Page:</u>	Upper Caimito
<u>Purpose:</u>	Compute future water requirement for the Upper Caimito Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % increase in tariff
Computations	
<u>Requirements:</u> <i>(repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1 - % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor -1)* Unmetered Residential Demand</p>

Long-Term Forecast for M&I Water Demand

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use</p> <p><u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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Long-Term Forecast for M&I Water Demand

	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp}(\text{Elasticity Factor} * \% \text{ increase in Tariff})) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.4.4.6 Worksheet Page: Panama Este

<u>Worksheet Page:</u>	Panama Este
<u>Purpose:</u>	Compute future water requirement for the Panama Este Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % increase in tariff
Computations	
<u>Requirements:</u> <i>(repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1- % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor -1)* Unmetered Residential Demand</p>

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use <u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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Long-Term Forecast for M&I Water Demand

	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp}(\text{Elasticity Factor} * \% \text{ increase in Tariff})) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.4.4.7 Worksheet Page: Rio Gatun

<u>Worksheet Page:</u>	Rio Gatun
<u>Purpose:</u>	Compute future water requirement for the Rio Gatun Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % rise in tariff
Computations	
<u>Requirements:</u> <i>(repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1 - % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor -1)* Unmetered Residential Demand</p>

Long-Term Forecast for M&I Water Demand

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use</p> <p><u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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Long-Term Forecast for M&I Water Demand

	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp}(\text{Elasticity Factor} * \% \text{ increase in Tariff})) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.4.4.8 Worksheet Page: Gatun Noroeste

<u>Worksheet Page:</u>	Gatun Noroeste
<u>Purpose:</u>	Compute future water requirement for the Gatun Noroeste Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % increase in tariff
Computations	
<u>Requirements:</u> <i>(repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1- % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor -1)* Unmetered Residential Demand</p>

Long-Term Forecast for M&I Water Demand

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use <u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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Long-Term Forecast for M&I Water Demand

	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp}(\text{Elasticity Factor} * \% \text{ increase in Tariff})) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.4.4.9 Gatun Suroeste

<u>Worksheet Page:</u>	Gatun Suroeste
<u>Purpose:</u>	Compute future water requirement for the Gatun Suroeste Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % increase in tariff
Computations	
<u>Requirements:</u> <i>(repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1 - % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor -1)* Unmetered Residential Demand</p>

Long-Term Forecast for M&I Water Demand

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use</p> <p><u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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Long-Term Forecast for M&I Water Demand

	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp}(\text{Elasticity Factor} * \% \text{ increase in Tariff})) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.4.4.10 Upper Chagres

<u>Worksheet Page:</u>	Upper Chagres
<u>Purpose:</u>	Compute future water requirement for the Upper Chagres Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % increase in tariff
Computations	
<u>Requirements:</u> <i>(repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1- % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor -1)* Unmetered Residential Demand</p>

Long-Term Forecast for M&I Water Demand

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use <u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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Long-Term Forecast for M&I Water Demand

	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp}(\text{Elasticity Factor} * \% \text{ increase in Tariff})) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.4.4.11 Ancon

<u>Worksheet Page:</u>	Ancon
<u>Purpose:</u>	Compute future water requirement for the Ancon Service area for 10-year intervals from 2000 to 2060.
<u>Input Required:</u>	<ul style="list-style-type: none"> - Percentage of residential and non-residential customers within the centralized system - Level of Service in non-centralized and centralized system - % Residential connections metered - Excess use factor for unmetered connections - Leakage and Production Loss Factors - Conservation and price elasticity factors - % increase in tariff
Computations	
<u>Requirements:</u> <i>(repeated for each year)</i>	<p>Base Demand Total Base Demand = Base Demand-Residential + Base Demand-Non-Residential</p> <p>Total Water Requirement <u>Non-Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * (1- % of Residential Service Area with Centralized System)</p> <p>Non-Residential Demand = Base Demand-Non-Residential * (1 - % Non-Residential Service Area with Centralized System)</p> <p>Normal Demand in Non-Centralized Systems = Normal Residential Water Demand + Normal Non-Residential Demand</p> <p><u>Centralized System - Normal Demand</u> Residential Demand = Base Demand-Residential * % of Residential Service Area with Centralized System</p> <p>Non-Residential Demand = Base demand-Non-Residential * % Non-Residential Service Area with Centralized System</p> <p>Normal Demand in Centralized Systems = Normal Residential Demand + Normal Non-Residential Demand</p> <p>Unmetered Residential Demand = (1-% of Residential metered connections)* Normal Residential Demand</p> <p>Estimated Excessive Use = (Excessive Use Factor -1)* Unmetered Residential Demand</p>

Long-Term Forecast for M&I Water Demand

	<p>Estimated Physical Leakage = $[(\text{Normal Demand} + \text{Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Normal Demand} + \text{Excessive Use})$</p> <p>Estimated Production Losses = $[(\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Normal Demand} + \text{Excessive Use} + \text{Physical Leakage})$</p> <p>Requirement Summary Total Water Requirement = Normal Demand in Non-Centralized Systems + Normal Demand in Centralized Systems + Excessive Use + Physical Leakage + Production Losses</p> <p>Actual Water Use <u>Non-Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Non-Centralized Systems = Normal Demand in Non-Centralized Systems * Non-Centralized System Level of Service Factor</p> <p><u>Centralized Systems – Actual Water Use</u> Satisfied Water Demand in Centralized Systems = Normal Demand in Centralized Systems * Centralized System Level of Service Factor</p> <p>Estimated Actual Excessive Use = Estimated Excessive Use * Centralized System Level of Service Factor</p> <p>Actual Physical Leakage = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use}) / (1 - \% \text{ Leakage Factor})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use})$</p> <p>Actual Production Losses = $[(\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage}) / (1 - \% \text{ Production Losses})] - (\text{Satisfied Water Demand} + \text{Actual Excessive Use} + \text{Actual Physical Leakage})$</p> <p>Actual Water Use in Centralized Water Systems = Satisfied Water Demand + Actual Excessive Use + Actual Physical Leakage + Actual Production Losses</p> <p>Total Actual Water Use = Satisfied Water Demand in Centralized Water Systems + Satisfied Water Demand in Non-Centralized Systems.</p> <p>Unsatisfied Water Demand Unsatisfied Water Demand = Total Water Requirement – Total Actual Water Use</p>
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	<p>Adjusted Water Requirement Elastic Adjustment = $(1 - \text{Exp (Elasticity Factor * \% increase in Tariff)}) * \text{Total Water Requirement}$</p> <p>Conservation Adjustment = $\text{Total Water Requirement} * \text{Conservation Factor}$</p> <p>Adjusted Water Requirement = $\text{Total Water Requirement} - \text{Elastic Adjustment} - \text{Conservation Adjustment}$</p>
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G.5 Model Use Considerations

The model described above has been developed specifically for use by the Panama Canal Authority for the projection of future water requirements within the defined study area. While the structure of the model is highly flexible and able to accommodate changes in a large number of factors that may affect future water requirements, the population/economic zones and water service areas used are unique to the study area for this project. As such, the model should not be used for development of demand forecasts for locations other than the study area without careful review and modification.

G.5.1 Software Requirements

The spreadsheets that make up the demand forecast model were developed using Microsoft Excel 97. Final versions of the spreadsheets submitted with the final deliverables for the project were saved as Microsoft Excel 2000 files. The files are fully compatible with both the Excel 97 and Excel 2000 versions of the software. No other software is required to make use of the demand forecast spreadsheets.

G.5.2 Model Installation

To install the demand forecast model on a computer, the four Microsoft Excel files that make up the model and a fifth Microsoft Excel file (GISLink.xls) must be copied to a common directory on the computer's hard drive. As long as all the files are copied to the new directory together, all of the links between the files will automatically update.

Use of the GISLink file is described in Appendix H.

G.5.3 Model Maintenance

It is suggested that a new folder (or directory) containing the five Excel files be created each time that a new demand scenario is to be analyzed. For example, a separate folder containing all of the Excel files required for the model was created for each forecast scenario examined in this study (probable, optimistic, pessimistic). A similar approach is recommended for all future use of the model. This approach minimizes the potential for links between spreadsheets to be lost or changed improperly.

Should a question arise regarding the correctness of links between the model spreadsheets, the current status of the links can be reviewed and/or changed using the Edit/Links command from the Excel menu. Clicking on the Edit item on the Excel menu will give a drop down menu with a Links item near the bottom of the list. Clicking on this item will open a dialog box that shows the user the current status of links in the spreadsheets and allows the links to be reset.

Model maintenance may also include updating of basic demographic data in the spreadsheets. Currently, no cells in the spreadsheet files are protected. That is, all cells, including values, labels and formulae can be changed by any user. As updated information pertaining to population, economic activity, and/or water use become available, ACP staff can modify the values in the spreadsheets and save the updated file as a new version of the demand forecasting system.

G.6 Conclusion

The demand forecasting model developed for the ACP is a comprehensive and flexible tool for projecting future water requirements in the project study area. Users can manipulate a large number of demographic, economic, and water use parameters to assess the impact of various trends or policies on long-term water needs. At the same time, the model makes use of commercially available spreadsheet software that is widely used by ACP staff and the staff of other agencies throughout Panama. This allows for widespread distribution and use of the model by individuals involved in various studies of water use in the central part of the Republic of Panama.

**PROBABLE SCENARIO
WATER DEMAND FORECAST MODEL OUTPUT
(FULL OUTPUT)**

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 06/02/2001
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Population	1	Zone 1	14,555	16,964	18,555	20,047	21,391	22,297	22,886
	2	Zone 2	23,293	29,475	32,949	36,873	38,153	39,710	40,791
	3	Zone 3	80,742	103,789	115,724	125,642	133,081	138,071	141,889
	4	Zone 4	145,924	234,699	280,465	317,032	339,329	353,434	363,818
	5	Zone 5	152,345	180,657	197,767	212,657	225,051	233,226	239,383
	6	Zone 6	136,627	150,217	161,057	171,590	181,644	188,371	193,222
	7	Zone 7	338,516	385,591	438,295	486,057	528,306	560,852	576,174
	8	Zone 8	656,258	766,354	863,644	941,138	996,019	1,035,520	1,064,988
Total			1,548,260	1,867,746	2,108,456	2,310,036	2,462,974	2,571,481	2,643,151

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Agriculture	1	Zone 1	2,199	2,141	2,086	2,035	1,987	1,942	1,900
	2	Zone 2	11,404	11,173	10,961	10,766	10,589	10,429	10,286
	3	Zone 3	4,003	3,912	3,828	3,750	3,678	3,612	3,552
	4	Zone 4	2,150	2,141	2,135	2,133	2,134	2,139	2,147
	5	Zone 5	9,339	9,080	8,836	8,606	8,390	8,188	7,999
	6	Zone 6	525	519	513	508	504	501	499
	7	Zone 7	302	291	281	271	262	253	245
	8	Zone 8	3,381	3,317	3,258	3,204	3,155	3,111	3,072
Total			33,302	32,574	31,898	31,273	30,699	30,175	29,700

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 06/02/2001
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Wet Industry	1	Zone 1	3	4	4	5	5	6	6
	2	Zone 2	439	537	629	707	778	804	849
	3	Zone 3	1,630	1,991	2,334	2,624	2,887	2,984	3,150
	4	Zone 4	1,707	2,085	2,445	2,748	3,025	3,126	3,300
	5	Zone 5	1,730	2,114	2,478	2,786	3,066	3,168	3,345
	6	Zone 6	991	1,210	1,419	1,595	1,755	1,814	1,915
	7	Zone 7	34,134	41,695	48,875	54,949	60,470	62,492	65,975
	8	Zone 8	14,321	17,493	20,505	23,053	25,370	26,218	27,679
Total			67,128	78,689	88,468	97,356	100,611	106,219	

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Other Manufacturing	1	Zone 1	3	4	4	5	5	6	6
	2	Zone 2	5	6	7	8	8	9	9
	3	Zone 3	699	854	1,001	1,125	1,238	1,280	1,351
	4	Zone 4	25	30	36	40	44	46	48
	5	Zone 5	174	212	249	280	308	318	336
	6	Zone 6	409	500	586	659	725	749	791
	7	Zone 7	7,745	9,460	11,089	12,467	13,720	14,179	14,969
	8	Zone 8	11,893	14,527	17,029	19,146	21,069	21,774	22,987
Total			20,952	25,593	30,001	33,729	37,118	38,359	40,497

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 06/02/2001
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Ports/Warehouse	1	Zone 1	0	0	0	0	0	0	0
	2	Zone 2	0	0	0	0	0	0	0
	3	Zone 3	0	0	0	0	0	0	0
	4	Zone 4	0	0	0	0	0	0	0
Metric Tons	5	Zone 5	1,369,764	1,811,513	2,395,726	3,168,347	4,190,139	5,541,459	7,328,580
	6	Zone 6	12,327,876	16,303,616	21,561,533	28,515,127	37,711,255	49,873,135	65,957,222
	7	Zone 7	10,958,112	14,492,103	19,165,807	25,346,780	33,521,116	44,331,676	58,628,641
	8	Zone 8	2,739,528	3,623,026	4,791,452	6,336,695	8,380,279	11,082,919	14,657,160
Total			36,230,259	47,914,517	63,366,949	83,802,790	110,829,190	146,571,603	

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Utilities	1	Zone 1	113	138	162	182	200	207	218
	2	Zone 2	181	221	259	291	320	331	349
	3	Zone 3	1,437	1,755	2,058	2,313	2,546	2,631	2,777
	4	Zone 4	1,134	1,385	1,623	1,825	2,008	2,075	2,191
Employees	5	Zone 5	1,183	1,446	1,695	1,905	2,097	2,167	2,287
	6	Zone 6	1,061	1,297	1,520	1,709	1,880	1,943	2,052
	7	Zone 7	2,637	3,221	3,776	4,245	4,672	4,828	5,097
	8	Zone 8	5,098	6,228	7,300	8,207	9,032	9,334	9,854
Total			12,845	15,690	18,392	20,678	22,755	23,516	24,827

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION
PREPARED FOR THE PANAMA CANAL AUTHORITY**

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 06/02/2001
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Fabrication / Construction	1	Zone 1	3	4	6	7	9	10	12
	2	Zone 2	5	7	9	12	14	16	19
	3	Zone 3	18	25	32	40	49	57	66
	4	Zone 4	33	45	59	74	90	103	121
	5	Zone 5	36	48	63	79	96	111	130
	6	Zone 6	33	44	58	72	88	101	118
	7	Zone 7	164	223	291	363	444	511	599
	8	Zone 8	173	235	307	383	469	538	631
Total			466	632	824	1,030	1,260	1,447	1,697

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Retail/Office	1	Zone 1	511	624	732	822	905	935	987
	2	Zone 2	2,736	3,342	3,918	4,405	4,847	5,009	5,289
	3	Zone 3	3,580	4,374	5,127	5,764	6,343	6,555	6,920
	4	Zone 4	5,248	6,410	7,514	8,448	9,297	9,608	10,144
Employees	5	Zone 5	16,452	20,096	23,557	26,484	29,145	30,120	31,798
	6	Zone 6	45,011	54,981	64,449	72,459	79,739	82,405	86,998
	7	Zone 7	386,600	472,234	553,561	622,353	684,882	707,782	747,231
	8	Zone 8	52,060	63,591	74,543	83,806	92,227	95,310	100,622
Total			512,197	625,652	733,400	824,541	907,385	937,725	989,989

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 06/02/2001
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Schools	1	Zone 1	4,043	4,641	5,052	5,434	5,789	6,053	6,257
	2	Zone 2	6,471	8,080	8,992	9,750	10,359	10,836	11,211
	3	Zone 3	22,428	28,442	31,570	34,132	36,095	37,550	38,860
	4	Zone 4	40,535	64,579	76,882	86,560	92,479	96,708	100,296
Students	5	Zone 5	42,318	49,605	54,096	57,935	61,219	63,698	65,862
	6	Zone 6	41,401	44,936	47,978	50,913	53,805	55,987	57,845
	7	Zone 7	112,839	116,670	125,229	133,927	143,553	151,063	155,960
	8	Zone 8	218,753	252,205	271,603	287,059	299,797	308,971	319,443
Total			569,158	621,401	665,710	703,095	730,866	755,734	

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Hospitals	1	Zone 1	22	25	27	29	31	33	34
	2	Zone 2	37	47	52	56	60	62	65
	3	Zone 3	137	174	193	209	221	230	238
	4	Zone 4	263	418	498	561	599	627	650
Beds	5	Zone 5	335	393	428	459	485	504	522
	6	Zone 6	369	400	427	454	479	499	515
	7	Zone 7	1,320	1,365	1,465	1,567	1,680	1,767	1,825
	8	Zone 8	2,428	2,799	3,015	3,186	3,328	3,430	3,546
Total			4,911	5,622	6,106	6,521	6,883	7,152	7,394

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

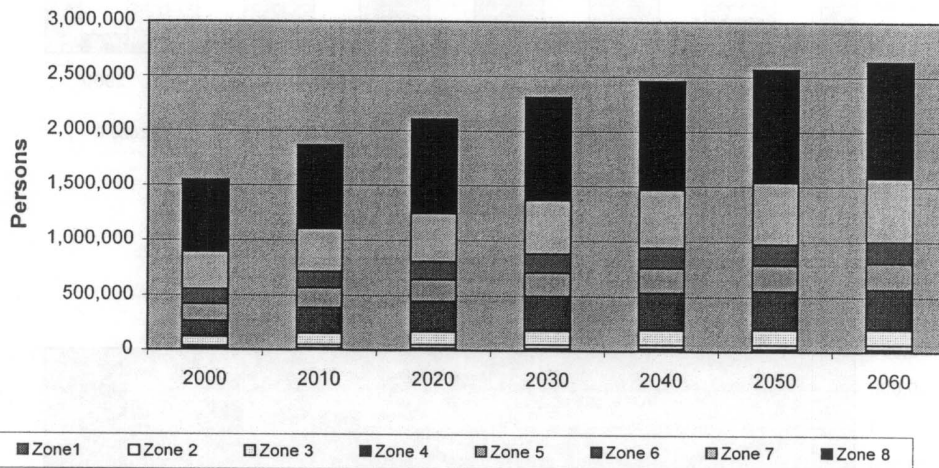
HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 06/02/2001
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Tourism	1	Zone 1	1,899	2,278	2,592	2,914	3,245	3,546	3,917
	2	Zone 2	3,038	4,221	5,226	6,304	7,452	8,672	10,528
	3	Zone 3	45,636	60,844	71,003	80,706	89,729	98,140	109,483
	4	Zone 4	95,169	158,482	197,212	232,084	259,175	283,293	313,971
Guests	5	Zone 5	139,097	167,481	187,609	206,388	224,014	239,422	257,722
	6	Zone 6	106,923	131,223	158,419	190,082	227,139	267,241	331,983
	7	Zone 7	515,133	598,886	722,787	869,154	1,047,519	1,239,449	1,525,692
	8	Zone 8	256,797	316,891	365,269	413,209	461,899	509,516	583,331
Total			1,440,306	1,710,116	2,000,841	2,320,171	2,649,281	3,136,628	

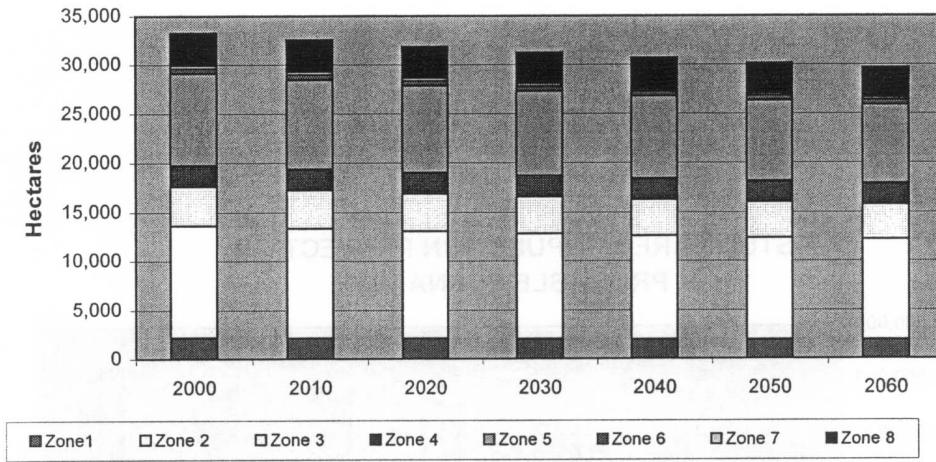
Long-Term Forecast for Municipal and Industrial Water Demands

STUDY AREA POPULATION PROJECTION PROBABLE SCENARIO

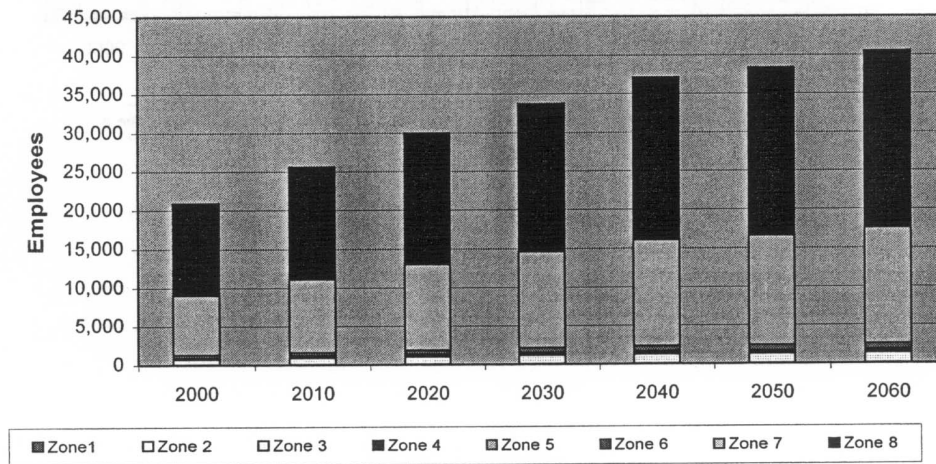


Long-Term Forecast for Municipal and Industrial Water Demands

AGRICULTURAL ACTIVITY PROJECTION PROBABLE SCENARIO

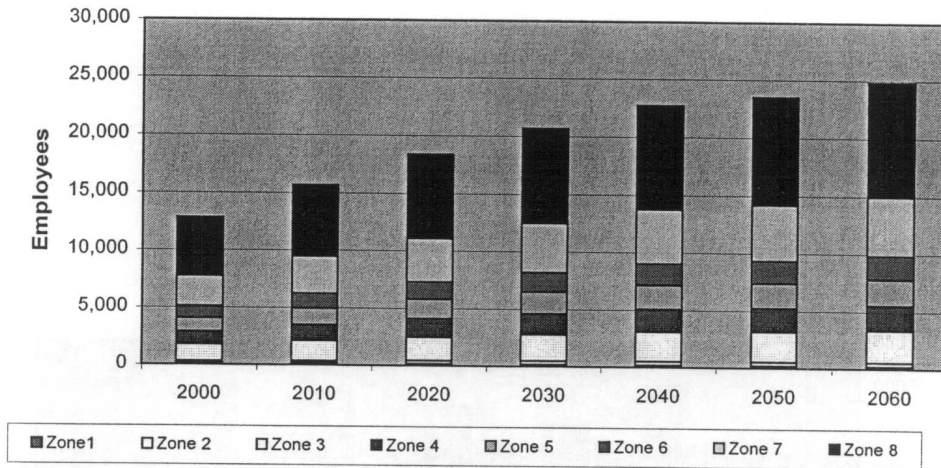


OTHER MFG ACTIVITY PROJECTION PROBABLE SCENARIO

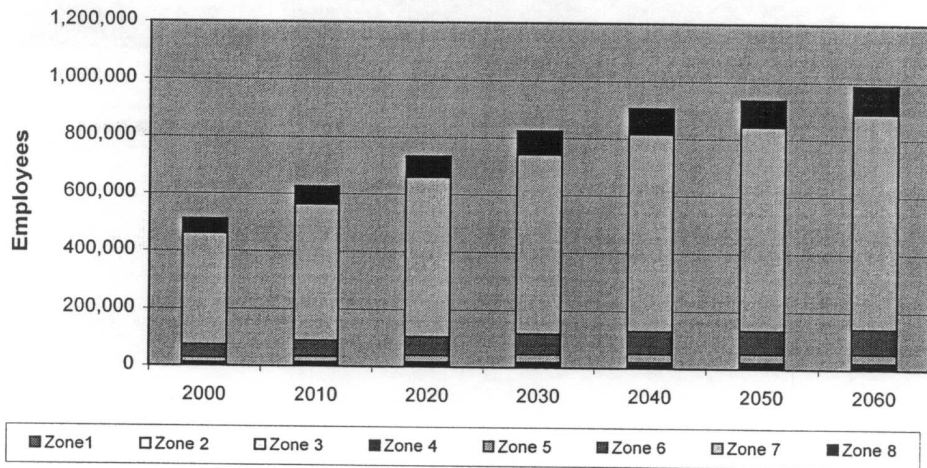


Long-Term Forecast for Municipal and Industrial Water Demands

UTILITIES ACTIVITY PROJECTION PROBABLE SCENARIO

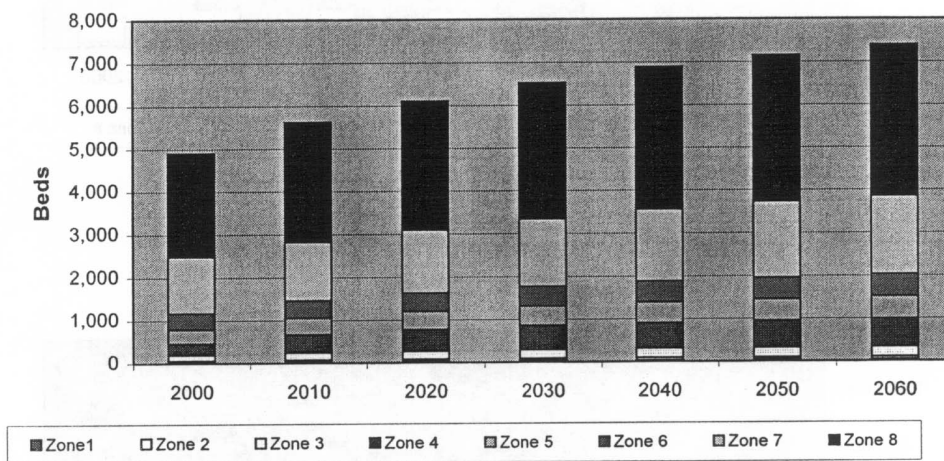


RETAIL/OFFICE ACTIVITY PROJECTION PROBABLE SCENARIO



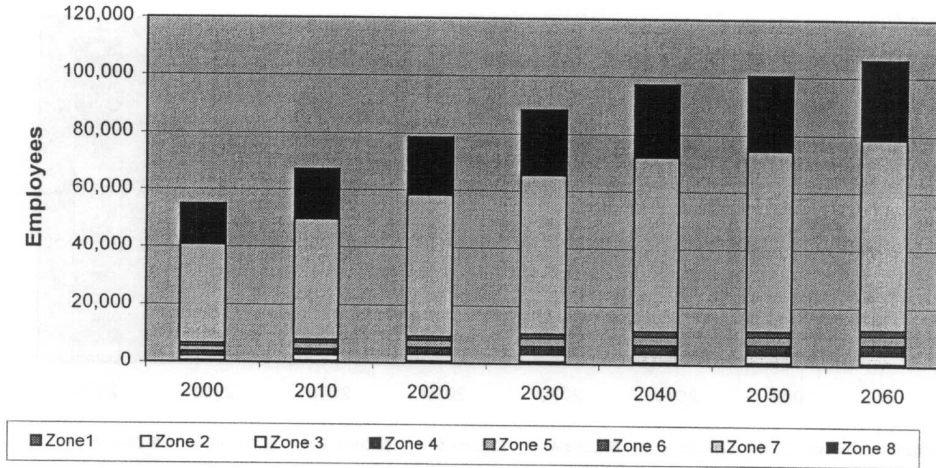
Long-Term Forecast for Municipal and Industrial Water Demands

HOSPITAL ACTIVITY PROJECTION PROBABLE SCENARIO

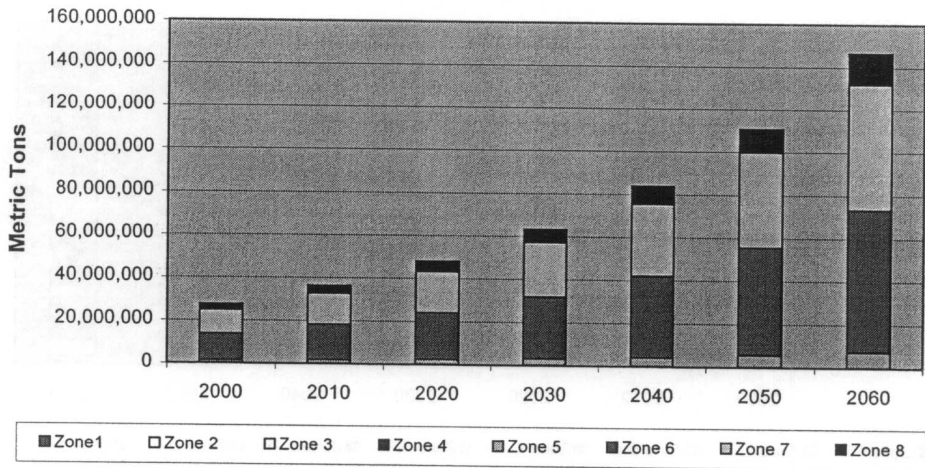


Long-Term Forecast for Municipal and Industrial Water Demands

WET INDUSTRIAL ACTIVITY PROJECTION PROBABLE SCENARIO

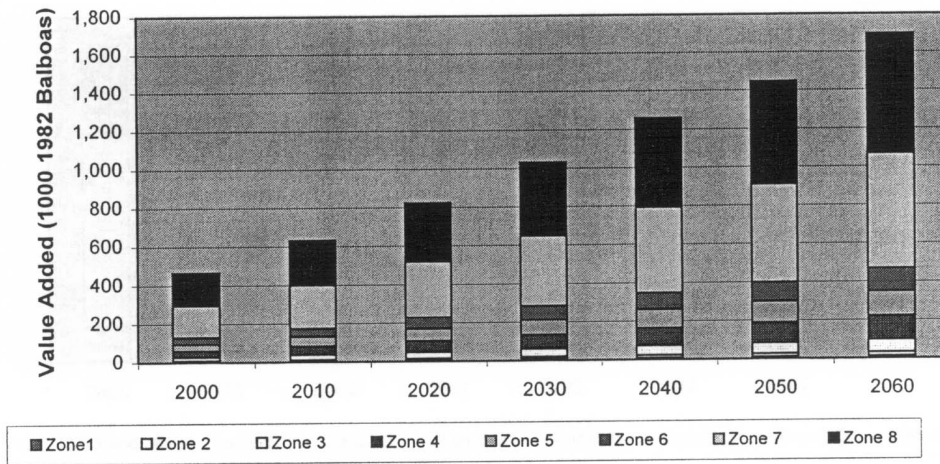


PORTS/WAREHOUSE ACTIVITY PROJECTION PROBABLE SCENARIO

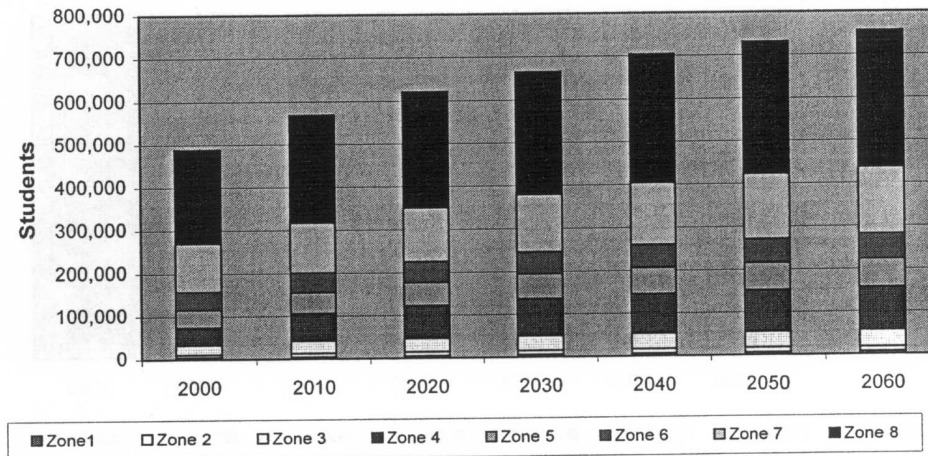


Long-Term Forecast for Municipal and Industrial Water Demands

FABRICATION/CONSTRUCTION PROJECTION PROBABLE SCENARIO

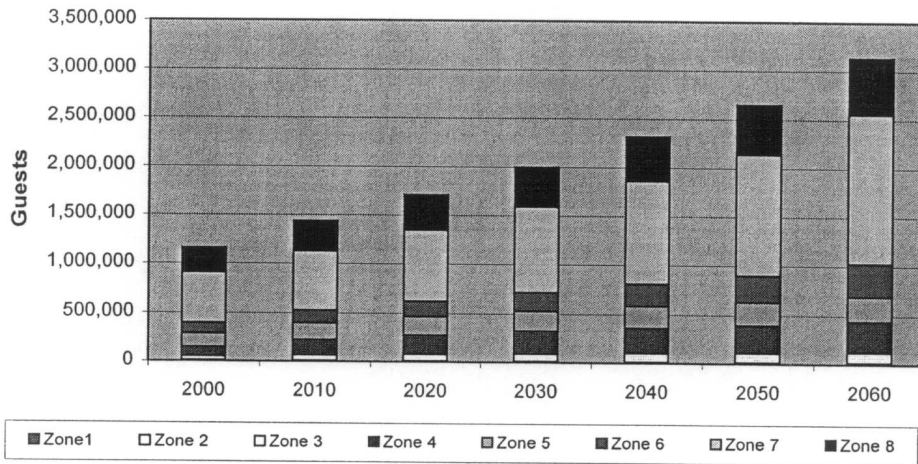


SCHOOLS ACTIVITY PROJECTION PROBABLE SCENARIO



Long-Term Forecast for Municipal and Industrial Water Demands

TOURISM ACTIVITY PROJECTION PROBABLE SCENARIO



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 06/02/2001
WORKSHEET: Population Projections BY: TJJ

Description	Zone Number	Zone Name	Population 1960	Population 1970	Population 1980	Population 1990	Population 2000
Year			1960	1970	1980	1990	2000
Type	integer	text	real	real	real	real	real
Display	#	text	###	###	###	###	###
Unit			People	People	People	People	People
Comment	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input
Source			Census	Census	Census	Census	CELA (6-00)
Formula							
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_1960	ZONEPOP_1970	ZONEPOP_1980	ZONEPOP_1990	ZONEPOP_2000
	1	Zone 1	7,917	10,267	10,386	11,041	14,555
	2	Zone 2	4,770	8,980	12,035	15,302	23,293
	3	Zone 3	14,661	25,820	34,793	51,068	80,742
	4	Zone 4	11,128	19,347	37,186	61,849	145,924
	5	Zone 5	19,399	55,691	81,729	111,114	152,345
	6	Zone 6	75,571	90,694	97,132	112,903	136,627
	7	Zone 7	276,103	342,001	333,535	310,318	338,516
	8	Zone 8	26,837	131,183	302,727	487,896	656,258
Sum/Average			436,386	683,983	909,523	1,161,491	1,548,260

**ZONE MODEL FOR LONG-TERM FORECAST
M&I WATER DEMAND AND RAW WATER CO**

PREPARED FOR THE PANAMA CANAL AUT

HARZA ENGINEERING COMPANY - CHICAG

FILE: ZONE PROJECTIONS
WORKSHEET: Population Projections

Description	Zone Number	Zone Name	Annual Growth Rate 2000 - 2010	Population 2010	Annual Growth Rate 2010 - 2020	Population 2020	Annual Growth Rate 2020 - 2030
Year			real	real	real	real	real
Type	integer	text	#.##%	#.###	#.##%	#.###	#.##%
Display	#	text	Percentage	People	Percentage	People	Percentage
Unit			input	computed	input	input	input
Comment	input (locked)	input (locked)					
Source				CELA (6-00)		CELA (6-00)	
Formula				ZONEPOP_2000*(POP RATE_2010^10)		ZONEPOP_2010*(POP RATE_2020^10)	
Column Name	POP_ZONE	POP_ZONE_NAME	POPRATE_2010	ZONEPOP_2010	POPRATE_2020	ZONEPOP_2020	POPRATE_2030
	1	Zone1	1.54%	16,964	0.90%	18,555	0.78%
	2	Zone 2	2.38%	29,475	1.12%	32,949	0.85%
	3	Zone 3	2.54%	103,789	1.09%	115,724	0.83%
	4	Zone 4	4.87%	234,699	1.80%	280,465	1.23%
	5	Zone 5	1.72%	180,657	0.91%	197,767	0.73%
	6	Zone 6	0.95%	150,217	0.70%	161,057	0.64%
	7	Zone 7	1.31%	385,591	1.29%	438,295	1.04%
	8	Zone 8	1.56%	766,354	1.20%	863,644	0.86%
Sum/Average			1.9%	1,867,746	1.2%	2,108,456	0.9%

**ZONE MODEL FOR LONG-TERM FORECAST
M&I WATER DEMAND AND RAW WATER CO**

PREPARED FOR THE PANAMA CANAL AUT

HARZA ENGINEERING COMPANY - CHICAG

FILE: ZONE PROJECTIONS
WORKSHEET: Population Projections

Description	Zone Number	Zone Name	Population	Annual Growth Rate	Population	Annual Growth Rate	Population
Year			2030	2030 - 2040	2040	2040 - 2050	2050
Type	integer	text	real	real	real	real	real
Display	#	text	###	###%	###	###%	###
Unit			People	Percentage	People	Percentage	People
Comment	input (locked)	input (locked)	computed	input	computed	input	computed
Source			CELA (6-00)		CELA (6-00)		CELA (6-00)
Formula			ZONEPOP_2020*(POP RATE_2030^10)		ZONEPOP_2030*(POP RATE_2040^10)		ZONEPOP_2040*(POP RATE_2050^10)
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2030	POPRATE_2040	ZONEPOP_2040	POPRATE_4050	ZONEPOP_2050
	1	Zone1	20,047	0.65%	21,391	0.42%	22,297
	2	Zone 2	35,873	0.62%	38,153	0.40%	39,710
	3	Zone 3	125,642	0.58%	133,081	0.37%	138,071
	4	Zone 4	317,032	0.68%	339,329	0.41%	353,434
	5	Zone 5	212,657	0.57%	225,051	0.36%	233,226
	6	Zone 6	171,590	0.57%	181,644	0.36%	188,371
	7	Zone 7	486,057	0.84%	528,306	0.60%	560,852
	8	Zone 8	941,138	0.57%	996,019	0.39%	1,035,520
Sum/Average			2,310,036	0.6%	2,462,974	0.4%	2,571,481

**ZONE MODEL FOR LONG-TERM FORECAST
M&I WATER DEMAND AND RAW WATER CO**

PREPARED FOR THE PANAMA CANAL AUT

HARZA ENGINEERING COMPANY - CHICAG

**FILE: ZONE PROJECTIONS
WORKSHEET: Population Projections**

Description	Zone Number	Zone Name	Annual Growth Rate	Population
Year			2050 - 2060	2060
Type	integer	text	real	real
Display	#	text	###%	###
Unit			Percentage	People
Comment	input (locked)	input (locked)	input	computed
Source				CELA (6-00)
Formula				ZONEPOP_2050*(POP RATE_2060^10)
Column Name	POP_ZONE	POP_ZONE_NAME	POP_RATE_5060	ZONEPOP_2060
	1	Zone 1	0.26%	22,886
	2	Zone 2	0.27%	40,791
	3	Zone 3	0.27%	141,889
	4	Zone 4	0.29%	363,818
	5	Zone 5	0.26%	239,383
	6	Zone 6	0.25%	193,222
	7	Zone 7	0.27%	576,174
	8	Zone 8	0.28%	1,064,988
Sum/Average			0.3%	2,643,151

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Agriculture

LAST UPDATE: 06/02/2001
BY: TJJ

Group	1	1	1	1	1	1
Economic Activity	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture
Year	2000	2000	2010	2010	2010	2010
Description	Zone Number	Zone Name	Zone Area	Area	Area	Annual Growth Rate
Unit		Km2		Hectare	Hectare	Percentage
Type	Integer	Text	Integer	Integer	Integer	Percentage
Display	#	text	##	#	#	###%
Comment	input (locked)	input (locked)	input (locked)	Input	Calculated	Input
Source		CELA	CELA	CELA		CELA
Formula						
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G1_AREA_2000	Z_G1_AREA_2010	Z_G1_RATE_0010^10
	1	Zone1	540	2,199	2,141	-0.26%
	2	Zone 2	840	11,404	11,173	-0.19%
	3	Zone 3	1453	4,003	3,912	-0.22%
	4	Zone 4	170	2,150	2,141	-0.03%
	5	Zone 5	1244	9,339	9,080	-0.27%
	6	Zone 6	866	525	519	-0.11%
	7	Zone 7	707	302	291	-0.35%
	8	Zone 8	792	3,381	3,317	-0.18%
Sum/Average			6,612	33,302	32,574	-0.2%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Agriculture

Group	1	1	1	1	1	
Economic Activity	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture	
Year	2020	2020	2030	2030	2030	
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Annual Growth Rate	
Unit		Km2	Hectare	Percentage	Percentage	
Type	Integer	Text	Integer	Percentage	Percentage	
Display	#	##	#	###%	###%	
Comment	input (locked)	input (locked)	Calculated	Input	Input	
Source		CELA		CELA	CELA	
Formula			Z_G1_AREA_2010*(1+ Z_G1_RATE_1020)^10		Z_G1_AREA_2020*(1+ Z_G1_RATE_2030)^10	
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_AREA_2020	Z_G1_AREA_2030	Z_G1_AREA_2030	
1	Zone1	540	2,086	-0.25%	2,035	-0.24%
2	Zone 2	840	10,961	-0.18%	10,766	-0.17%
3	Zone 3	1453	3,828	-0.21%	3,750	-0.19%
4	Zone 4	170	2,135	-0.01%	2,133	0.01%
5	Zone 5	1244	8,836	-0.26%	8,606	-0.25%
6	Zone 6	866	513	-0.10%	508	-0.08%
7	Zone 7	707	281	-0.35%	271	-0.34%
8	Zone 8	792	3,258	-0.17%	3,204	-0.15%
Sum/Average		6,612	31,898	-0.2%	31,273	-0.2%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Agriculture

Group	1	1	1	1	1	1
Economic Activity	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture
Year	2040	2040	2050	2050	2050	2050
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Area	Annual Growth Rate
Unit			Km2	Percentage	Hectare	Percentage
Type	Integer	Text	Integer	Percentage	Integer	Percentage
Display	#	text	##	###%	#	###%
Comment	input (locked)	input (locked)	input (locked)	Input	Calculated	Input
Source			CELA	CELA		CELA
Formula						
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G1_AREA_2030*(1+Z_G1_RATE_3040)^10	Z_G1_AREA_2040*(1+Z_G1_RATE_4050)^10	Z_G1_AREA_2050
	1	Zone1	540	1,987	1,942	-0.22%
	2	Zone 2	840	10,589	10,429	-0.14%
	3	Zone 3	1453	3,678	3,612	-0.17%
	4	Zone 4	170	2,134	2,139	0.04%
	5	Zone 5	1244	8,390	8,188	-0.23%
	6	Zone 6	866	504	501	-0.05%
	7	Zone 7	707	262	253	-0.34%
	8	Zone 8	792	3,155	3,111	-0.12%
Sum/Average			6,612	30,699	30,175	-0.2%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Agriculture

Group									1	
Economic Activity										Agriculture
Year										2060
Description										Area
Unit										Hectare
Type										Integer
Display										#
Comment										Calculated
Source										
Formula										Z_G1_AREA_2050*(1+
Column Name										Z_G1_RATE_5060)^10
										Z_G1_AREA_2060
										1,900
										10,286
										3,552
										2,147
										7,999
										499
										245
										3,072
Sum/Average									6,612	29,700

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Wet Industry

LAST UPDATE: 06/02/2001
BY: TJJ

Group	2	2	2	2	2	2
Economic Activity	Wet Industry	Wet Industry	Wet Industry	Wet Industry	Wet Industry	Wet Industry
Year	2000	2000	2010	2010	2010	2010
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Employees	Annual Growth Rate
Unit	Integer	Text	Km2	Percentage	Integer	Percentage
Type	Integer	text	Integer	Percentage	Integer	Percentage
Display	#	##	##	###%	#	###%
Comment	input (locked)	input (locked)	copied	Input	Calculated	Input
Source			CELA	CELA		CELA
Formula						
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G2_EMP_2000	Z_G2_EMP_2000*(1+Z_G2_RATE_0010)^10	Z_G2_EMP_2010
	1	Zone1	540	3	4	1.60%
	2	Zone 2	840	439	537	1.60%
	3	Zone 3	1453	1,630	1,991	1.60%
	4	Zone 4	170	1,707	2,085	1.60%
	5	Zone 5	1244	1,730	2,114	1.60%
	6	Zone 6	866	991	1,210	1.60%
	7	Zone 7	707	34,134	41,695	1.60%
	8	Zone 8	792	14,321	17,493	1.60%
Sum/Average			6,612	54,955	67,128	1.6%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Wet Industry

Group	2	2	2	2	2
Economic Activity	Wet Industry	Wet Industry	Wet Industry	Wet Industry	Wet Industry
Year	2020	2030	2030	2030	2030
Description	Employees	Employees	Employees	Employees	Annual Growth Rate
Unit	Integer	Integer	Integer	Integer	Percentage
Type	#	#	#	#	Percentage
Display	input (locked)	input (locked)	input (locked)	input (locked)	###%
Comment					
Source					CELA
Formula	Z_G2_EMP_2010*(1+Z_G2_RATE_1020)^10	Z_G2_EMP_2020*(1+Z_G2_RATE_2030)^10	Z_G2_EMP_2020*(1+Z_G2_RATE_2030)^10	Z_G2_EMP_2020*(1+Z_G2_RATE_2030)^10	
Column Name	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	
	1	2	3	4	5
	Zone1	Zone 2	Zone 3	Zone 4	Zone 5
	840	1453	170	1244	866
	540	629	2,445	2,478	1,419
	1.18%	1.18%	1.18%	1.18%	1.18%
	707	2,624	2,748	2,786	1,595
	48,875	54,949	23,053	23,053	23,053
	792	20,505	20,505	20,505	23,053
Sum/Average	6,612	78,689	78,689	78,689	88,468
		1.2%	1.2%	1.2%	1.0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Wet Industry

Group	2	2	2	2	2	2	2
Economic Activity	Wet Industry	Wet Industry	Wet Industry	Wet Industry	Wet Industry	Wet Industry	Wet Industry
Year	2040	2040	2040	2050	2050	2050	2050
Description	Zone Number	Zone Name	Zone Area	Employees	Annual Growth Rate	Employees	Annual Growth Rate
Unit	Integer	Text	Km2	Employees	Percentage	Employees	Percentage
Type	Integer	Integer	Integer	Integer	Percentage	Integer	Percentage
Display	#	text	##	#	###%	#	###%
Comment	input (locked)	input (locked)	copied	Calculated	Input	Calculated	Input
Source			CELA		CELA		CELA
Formula				Z_G2_EMP_2030*(1+Z_G2_RATE_3040)^10		Z_G2_EMP_2040*(1+Z_G2_RATE_4050)^10	
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G2_EMP_2040		Z_G2_EMP_2050	
	1	Zone1	540	5	0.33%	6	0.54%
	2	Zone 2	840	778	0.33%	804	0.54%
	3	Zone 3	1453	2,887	0.33%	2,984	0.54%
	4	Zone 4	170	3,025	0.33%	3,126	0.54%
	5	Zone 5	1244	3,066	0.33%	3,168	0.54%
	6	Zone 6	866	1,755	0.33%	1,814	0.54%
	7	Zone 7	707	60,470	0.33%	62,492	0.54%
	8	Zone 8	792	25,370	0.33%	26,218	0.54%
Sum/Average			6,612	97,356	0.3%	100,611	0.5%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Wet Industry

Group									2	
Economic Activity									Wet Industry	
Year									2060	
Description		Zone Number	Zone Name	Zone Area	Employees					
Unit				Km2	Integer				Integer	
Type		Integer	Text	Integer	#				#	
Display		#	text	##						
Comment		input (locked)	input (locked)	copied	Calculated					
Source				CELA						
Formula										$Z_G2_EMP_2050*(1+Z_G2_RATE_5060)^{10}$
Column Name		POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G2_EMP_2060					
		1	Zone1	540	6					
		2	Zone 2	840	849					
		3	Zone 3	1453	3,150					
		4	Zone 4	170	3,300					
		5	Zone 5	1244	3,345					
		6	Zone 6	866	1,915					
		7	Zone 7	707	65,975					
		8	Zone 8	792	27,679					
Sum/Average				6,612	106,219					

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Other Manufacturing

LAST UPDATE: 06/02/2001
BY: TJJ

Group	3	3	3	3	3	3	3
Economic Activity	Other Manufacturing	Other Manufacturing	Other Manufacturing	Other Manufacturing	Other Manufacturing	Other Manufacturing	Other Manufacturing
Year	2000	2000	2000	2010	2010	2010	2010
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Employees	Annual Growth Rate	Annual Growth Rate
Unit	Integer	Text	Km2	Percentage	Employees	Percentage	Percentage
Type	Integer	text	Integer	Percentage	Integer	Percentage	Percentage
Display	#	input (locked)	##	###%	#	###%	###%
Comment	input (locked)	input (locked)	copied	Input	Calculated	Input	Input
Source			CELA	CELA		CELA	CELA
Formula							
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G3_EMP_2000	Z_G3_EMP_2000	Z_G3_EMP_2000*(1+Z_G3_RATE_0010)^10	Z_G3_EMP_2010
	1	Zone1	540	3	3	2.02%	4
	2	Zone 2	840	5	5	2.02%	6
	3	Zone 3	1453	699	699	2.02%	854
	4	Zone 4	170	25	25	2.02%	30
	5	Zone 5	1244	174	174	2.02%	212
	6	Zone 6	866	409	409	2.02%	500
	7	Zone 7	707	7,745	7,745	2.02%	9,460
	8	Zone 8	792	11,893	11,893	2.02%	14,527
Sum/Average			6,612	20,952	20,952	2.0%	25,593
							1.6%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Other Manufacturing

Group	3		3		3		3	
Economic Activity			Other Manufacturing		Other Manufacturing		Other Manufacturing	
Year	2020		2020		2030		2030	
Description	Zone Number	Zone Name	Zone Area	Employees	Annual Growth Rate	Employees	Annual Growth Rate	Employees
Unit	Integer	Text	Km2	Integer	Percentage	Integer	Percentage	Integer
Type	#	text	##	#	###%	#	###%	#
Display	input (locked)	input (locked)	copied	Calculated	Input	Calculated	Input	Input
Comment			CELA		CELA		CELA	
Source								
Formula				Z_G3_EMP_2010*(1+Z_G3_RATE_1020)^10		Z_G3_EMP_2020*(1+Z_G3_RATE_2030)^10		
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G3_EMP_2020		Z_G3_EMP_2030		
	1	Zone1	540	4	1.18%	5	0.96%	
	2	Zone 2	840	7	1.18%	8	0.96%	
	3	Zone 3	1453	1,001	1.18%	1,125	0.96%	
	4	Zone 4	170	36	1.18%	40	0.96%	
	5	Zone 5	1244	249	1.18%	280	0.96%	
	6	Zone 6	866	586	1.18%	659	0.96%	
	7	Zone 7	707	11,089	1.18%	12,467	0.96%	
	8	Zone 8	792	17,029	1.18%	19,146	0.96%	
Sum/Average			6,612	30,001	1.2%	33,729	1.0%	

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Other Manufacturing

Group	3	3	3	3	3	3
Economic Activity	Other Manufacturing	Other Manufacturing	Other Manufacturing	Other Manufacturing	Other Manufacturing	Other Manufacturing
Year	2040	2040	2040	2050	2050	2050
Description	Zone Number	Zone Name	Zone Area	Employees	Employees	Annual Growth Rate
Unit	Integer	Text	Km2	Employees	Employees	Percentage
Type	Integer	Text	Integer	Integer	Integer	Percentage
Display	#	text	##	#	#	###%
Comment	input (locked)	input (locked)	copied	Calculated	Calculated	Input
Source			CELA	CELA	CELA	CELA
Formula						
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G3_EMP_2030*(1+Z_G3_RATE_3040)^10	Z_G3_EMP_2040*(1+Z_G3_RATE_4050)^10	Z_G3_EMP_2050*(1+Z_G3_RATE_4050)^10
	1	Zone1	540	5	5	0.33%
	2	Zone 2	840	8	8	0.33%
	3	Zone 3	1453	1,238	1,280	0.33%
	4	Zone 4	170	44	46	0.33%
	5	Zone 5	1244	308	318	0.33%
	6	Zone 6	866	725	749	0.33%
	7	Zone 7	707	13,720	14,179	0.33%
	8	Zone 8	792	21,069	21,774	0.33%
Sum/Average			6,612	37,118	38,359	0.3%
						0.54%
						0.54%
						0.54%
						0.54%
						0.54%
						0.54%
						0.54%
						0.54%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Other Manufacturing

Group							3
Economic Activity							Other Manufacturing
Year							2060
Description	Zone Number	Zone Name	Zone Area	Employees			
Unit			Km2	Integer			
Type	Integer	Text	Integer	Integer			
Display	#	text	##	#			
Comment	input (locked)	input (locked)	copied	Calculated			
Source			CELA				
Formula							$Z_G3_EMP_2050*(1+Z_G3_RATE_5060)^{10}$
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G3_EMP_2060			
	1	Zone1	540	6			
	2	Zone 2	840	9			
	3	Zone 3	1453	1,351			
	4	Zone 4	170	48			
	5	Zone 5	1244	336			
	6	Zone 6	866	791			
	7	Zone 7	707	14,969			
	8	Zone 8	792	22,987			
Sum/Average			6,612	40,497			

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Ports/Warehouse/Railroad

LAST UPDATE: 06/02/2001
BY: TJJ

Group				4	4	4	4	4
Economic Activity				Ports/Warehouse	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse
Year				2000	2000	2010	2010	2010
Description	Zone Number	Zone Name	Zone Area	Weight	Annual Growth Rate	Weight	Annual Growth Rate	Annual Growth Rate
Unit			Km2	Metric Tons	Percentage	Metric Tons	Percentage	Percentage
Type	Integer	Text	Integer	Integer	Percentage	Integer	Percentage	Percentage
Display	#	text	##	#	###%	#	###%	###%
Comment	input (locked)	input (locked)	copied	Input	Input	Calculated	Input	Input
Source			CELA	CELA	CELA		CELA	CELA
Formula								
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G4_WT_2000		Z_G4_WT_2000	Z_G4_WT_2000*(1+Z_G4_RATE_0010)^10	Z_G4_WT_2010
	1	Zone 1	540	0	0.00%	0	0	0.00%
	2	Zone 2	840	0	0.00%	0	0	0.00%
	3	Zone 3	1453	0	0.00%	0	0	0.00%
	4	Zone 4	170	0	0.00%	0	0	0.00%
	5	Zone 5	1244	1,369,764	2.83%	1,811,513	1,811,513	2.83%
	6	Zone 6	866	12,327,876	2.83%	16,303,616	16,303,616	2.83%
	7	Zone 7	707	10,958,112	2.83%	14,492,103	14,492,103	2.83%
	8	Zone 8	792	2,739,528	2.83%	3,623,026	3,623,026	2.83%
Sum/Average			6,612	27,395,281	2.8%	36,230,259		2.8%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Ports/Warehouse/Railroad

Group	4	4	4	4	4	4
Economic Activity	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse
Year	2020	2020	2020	2020	2030	2030
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Weight	Annual Growth Rate
Unit			Km2	Percentage	Metric Tons	Percentage
Type	Integer #	Text	Integer ##	Percentage #.##%	Integer #	Percentage #.##%
Display	input (locked)	input (locked)	copied	Input	Calculated	Input
Comment			CELA	CELA		CELA
Source						
Formula						
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G4_WT_2010*(1+Z_G4_RATE_1020)^10	Z_G4_WT_2020*(1+Z_G4_RATE_2030)^10	Z_G4_WT_2030
1	Zone1		540	0	0	0
2	Zone 2		840	0	0	0
3	Zone 3		1453	0	0	0
4	Zone 4		170	0	0	0
5	Zone 5		1244	2,395,726	3,168,347	2.83%
6	Zone 6		866	21,561,533	28,515,127	2.83%
7	Zone 7		707	19,165,807	25,346,780	2.83%
8	Zone 8		792	4,791,452	6,336,695	2.83%
Sum/Average			6,612	47,914,517	63,366,949	2.8%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Ports/Warehouse/Railroad

Group	4	4	4	4	4	4
Economic Activity	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse	Ports/Warehouse
Year	2040	2040	2040	2050	2050	2050
Description	Zone Number	Zone Name	Zone Area	Weight	Annual Growth Rate	Annual Growth Rate
Unit		Km2		Metric Tons	Percentage	Percentage
Type	Integer	Integer	Integer	Integer	Percentage	Percentage
Display	#	##	##	#	###%	###%
Comment	input (locked)	input (locked)	copied	Calculated	Input	Input
Source		CELA	CELA		CELA	CELA
Formula						
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G4_WT_2030*(1+Z_G4_RATE_3040)^10	Z_G4_WT_2040*(1+Z_G4_RATE_4050)^10	Z_G4_WT_2050*(1+Z_G4_RATE_4050)^10
1	Zone1		540	0	0.00%	0.00%
2	Zone 2		840	0	0.00%	0.00%
3	Zone 3		1453	0	0.00%	0.00%
4	Zone 4		170	0	0.00%	0.00%
5	Zone 5		1244	4,190,139	2.83%	2.83%
6	Zone 6		866	37,711,255	2.83%	2.83%
7	Zone 7		707	33,521,116	2.83%	2.83%
8	Zone 8		792	8,380,279	2.83%	2.83%
Sum/Average			6,612	83,802,790	2.8%	2.8%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Ports/Warehouse/Railroad

Group							4
Economic Activity							Ports/Warehouse
Year							2060
Description	Zone Number	Zone Name	Zone Area	Weight			
Unit			Km2	Metric Tons			
Type	Integer	Text	Integer	Integer			
Display	#	text	##	#			
Comment	input (locked)	input (locked)	copied	Calculated			
Source			CELA				
Formula							Z_G4_WT_2050*(1+Z_G4_RATE_5060)^10
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G4_WT_2060			
	1	Zone1		540			0
	2	Zone 2		840			0
	3	Zone 3		1453			0
	4	Zone 4		170			0
	5	Zone 5		1244			7,328,580
	6	Zone 6		866			65,957,222
	7	Zone 7		707			58,628,641
	8	Zone 8		792			14,657,160
Sum/Average				6,612			146,571,603

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Utilities

LAST UPDATE: 06/02/2001
BY: TJJ

Group	5		5		5	
Economic Activity	Utilities	Utilities	Utilities	Utilities	Utilities	Utilities
Year	2000	2000	2000	2010	2010	
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Employees	Annual Growth Rate
Unit	Integer	Text	Km2	Percentage	Employees	Percentage
Type	Integer	text	Integer	Percentage	Integer	Percentage
Display	#	text	##	###%	#	###%
Comment	Input (locked)	input (locked)	copied	Input	Calculated	Input
Source			CELA	CELA		CELA
Formula					Z_G5_EMP_2000*(1+Z_G5_RATE_0010)^10	
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G5_EMP_2000	Z_G5_EMP_2010	
	1	Zone1	540	113	138	1.60%
	2	Zone 2	840	181	221	1.60%
	3	Zone 3	1453	1,437	1,755	1.60%
	4	Zone 4	170	1,134	1,385	1.60%
	5	Zone 5	1244	1,183	1,446	1.60%
	6	Zone 6	866	1,061	1,297	1.60%
	7	Zone 7	707	2,637	3,221	1.60%
	8	Zone 8	792	5,098	6,228	1.60%
Sum/Average			6,612	12,845	15,690	1.6%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Utilities

Group	5		5		5	
Economic Activity	Utilities		Utilities		Utilities	
Year	2020		2030		2030	
Description	Zone Number	Zone Name	Zone Area	Employees	Employees	Annual Growth Rate
Unit	Km2			Employees	Employees	Percentage
Type	Integer	Text	Integer	Integer	Integer	Percentage
Display	#	text	##	#	#	###%
Comment	input (locked)	input (locked)	copied	Calculated	Calculated	Input
Source			CELA			CELA
Formula				Z_G5_EMP_2010*(1+Z_G5_RATE_1020)^10	Z_G5_EMP_2020*(1+Z_G5_RATE_2030)^10	
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G5_EMP_2020	Z_G5_EMP_2030	
	1	Zone1	540	162	182	0.96%
	2	Zone 2	840	259	291	0.96%
	3	Zone 3	1453	2,058	2,313	0.96%
	4	Zone 4	170	1,623	1,825	0.96%
	5	Zone 5	1244	1,695	1,905	0.96%
	6	Zone 6	866	1,520	1,709	0.96%
	7	Zone 7	707	3,776	4,245	0.96%
	8	Zone 8	792	7,300	8,207	0.96%
Sum/Average			6,612	18,392	20,678	1.0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Utilities

Group	5		5		5	
Economic Activity		Utilities		Utilities		Utilities
Year		2040		2040		2050
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Employees	Annual Growth Rate
Unit			Km2	Percentage	Employees	Percentage
Type	Integer	Text	Integer	Percentage	Integer	Percentage
Display	#	text	##	###%	#	###%
Comment	input (locked)	input (locked)	copied	Input	Calculated	Input
Source			CELA	CELA		CELA
Formula						
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G5_EMP_2030*(1+Z_G5_RATE_3040)^10	Z_G5_EMP_2040*(1+Z_G5_RATE_4050)^10	Z_G5_EMP_2050
1	Zone 1	540	200	0.33%	207	0.54%
2	Zone 2	840	320	0.33%	331	0.54%
3	Zone 3	1453	2,546	0.33%	2,631	0.54%
4	Zone 4	170	2,008	0.33%	2,075	0.54%
5	Zone 5	1244	2,097	0.33%	2,167	0.54%
6	Zone 6	866	1,880	0.33%	1,943	0.54%
7	Zone 7	707	4,672	0.33%	4,828	0.54%
8	Zone 8	792	9,032	0.33%	9,334	0.54%
Sum/Average		6,612	22,755	0.3%	23,516	0.5%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS

WORKSHEET: Utilities

Group									5
Economic Activity									Utilities
Year									2060
Description									Employees
Unit									Integer
Type	Integer		Text						#
Display	#		text						Calculated
Comment	input (locked)		input (locked)						
Source									
Formula									Z_G5_EMP_2050*(1+Z_G5_RATE_5060)^10
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA						Z_G5_EMP_2060
	1	Zone1	540						218
	2	Zone 2	840						349
	3	Zone 3	1453						2,777
	4	Zone 4	170						2,191
	5	Zone 5	1244						2,287
	6	Zone 6	866						2,052
	7	Zone 7	707						5,097
	8	Zone 8	792						9,854
Sum/Average			6,612						24,827

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Fabrication / Construction

LAST UPDATE: 06/02/2001
BY: TJJ

Group	6	6	6	6	6	6
Economic Activity	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction
Year	2000	2000	2000	2010	2010	2010
Description	Zone Number	Zone Name	Zone Area	Value Added	Annual Growth Rate	Annual Growth Rate
Unit			Km2	1000 1982	1000 1982	1000 1982
Type	Integer	Text	Integer	Balboas	Percentage	Percentage
Display	#	text	##	Real	Percentage	Percentage
Comment	input (locked)	input (locked)	input (locked)	#:#	#:##%	#:##%
Source			CELA	Input	Calculated	Input
Formula				CELA	CELA	CELA
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G1_VA_2000	Z_G1_VA_2000*(1+Z_G1_RATE_0010)^10	Z_G1_VA_2010
	1	Zone1	540	3.3	3.10%	4.4
	2	Zone 2	840	5.2	3.10%	7.1
	3	Zone 3	1453	18.2	3.10%	24.7
	4	Zone 4	170	33.3	3.10%	45.2
	5	Zone 5	1244	35.7	3.10%	48.5
	6	Zone 6	866	32.6	3.10%	44.2
	7	Zone 7	707	164.2	3.11%	223.0
	8	Zone 8	792	173.3	3.11%	235.2
Sum/Average			6,612	7,362	0.4%	7,660
						0.4%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Fabrication / Construction

Group	6	6	6	6	6
Economic Activity	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction
Year	2020	2030	2020	2030	2030
Description	Zone Number	Zone Name	Zone Area	Value Added	Annual Growth Rate
Unit			Km2	1000 1982	
Type	Integer	Text	Integer	Balboas	Percentage
Display	#	text	##	Real	Percentage
Comment	input (locked)	input (locked)	input (locked)	Calculated	###%
Source			CELA	Input	Input
Formula					CELA
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G1_VA_2010*(1+Z_G1_RATE_1020)^10	Z_G1_VA_2020*(1+Z_G1_RATE_2030)^10
	1	Zone1	540	5.8	7.2
	2	Zone 2	840	9.3	11.6
	3	Zone 3	1453	32.2	40.2
	4	Zone 4	170	58.9	73.6
	5	Zone 5	1244	63.1	78.9
	6	Zone 6	866	57.6	71.9
	7	Zone 7	707	290.6	363.2
	8	Zone 8	792	306.5	383.0
Sum/Average			6,612	7,969	8,292
				0.4%	0.4%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Fabrication / Construction

Group	6	6	6	6	6	6
Economic Activity	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction	Fabrication / Construction
Year	2040	2040	2040	2050	2050	2050
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Value Added	Annual Growth Rate
Unit			Km2	Percentage	1000 1982	Percentage
Type	Integer	Text	Integer	Percentage	Balboas	Percentage
Display	#	text	##	###%	Real	###%
Comment	input (locked)	input (locked)	input (locked)	Input	Calculated	Input
Source			CELA	CELA		CELA
Formula						
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA		Z_G1_VA_2040*(1+Z_G1_RATE_4050)^10	Z_G1_VA_2050
1	Zone1	540	8.8	1.39%	10.1	1.60%
2	Zone 2	840	14.1	1.39%	16.2	1.60%
3	Zone 3	1453	49.2	1.39%	56.5	1.60%
4	Zone 4	170	90.0	1.39%	103.4	1.60%
5	Zone 5	1244	96.5	1.40%	110.8	1.60%
6	Zone 6	866	88.0	1.39%	101.1	1.60%
7	Zone 7	707	444.4	1.40%	510.6	1.61%
8	Zone 8	792	468.5	1.40%	538.2	1.60%
Sum/Average		6,612	8,627	0.4%	8,976	0.4%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Fabrication / Construction

Group							6	
Economic Activity							Fabrication / Construction	
Year							2060	
Description	Zone Number	Zone Name	Zone Area	Value Added				
Unit			Km2	1000 1982			Balboas	
Type	Integer	Text	Integer	Real				
Display	#	text	##	#.#				
Comment	input (locked)	input (locked)	input (locked)	Calculated				
Source			CELA					
Formula								Z_G1_VA_2050*(1+Z_G1_RATE_5060)^10
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G1_VA_2060				
	1	Zone1	540	11.8				
	2	Zone 2	840	19.0				
	3	Zone 3	1453	66.3				
	4	Zone 4	170	121.2				
	5	Zone 5	1244	129.9				
	6	Zone 6	866	118.5				
	7	Zone 7	707	598.8				
	8	Zone 8	792	631.0				
Sum/Average			6,612	9,340				

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: RetailOffice

LAST UPDATE: 06/02/2001
BY: TJJ

Group	7	7	7	7	7	7	7
Economic Activity	Retail/Office	Retail/Office	Retail/Office	Retail/Office	Retail/Office	Retail/Office	Retail/Office
Year	2000	2000	2000	2000	2010	2010	2010
Description	Zone Number	Zone Name	Zone Area	Employees	Annual Growth Rate	Employees	Annual Growth Rate
Unit			Km2	Employees	Percentage	Employees	Percentage
Type	Integer	Text	Integer	Integer	Percentage	Integer	Percentage
Display	#	text	##	#	###%	#	###%
Comment	input (locked)	input (locked)	copied	Input	Input	Calculated	Input
Source			CELA	CELA	CELA		CELA
Formula						Z_G8A_EMP_2000*(1+Z_G8A_RATE_0010)^N1	
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8A_EMP_2000		Z_G8A_EMP_2010	
	1	Zone1	540	511	2.02%	624	1.60%
	2	Zone 2	840	2,736	2.02%	3,342	1.60%
	3	Zone 3	1453	3,580	2.02%	4,374	1.60%
	4	Zone 4	170	5,248	2.02%	6,410	1.60%
	5	Zone 5	1244	16,452	2.02%	20,096	1.60%
	6	Zone 6	866	45,011	2.02%	54,981	1.60%
	7	Zone 7	707	386,600	2.02%	472,234	1.60%
	8	Zone 8	792	52,060	2.02%	63,591	1.60%
Sum/Average			6,612	512,197	2.0%	625,652	1.6%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: RetailOffice

Group				7		7		7		7
Economic Activity				Retail/Office		Retail/Office		Retail/Office		Retail/Office
Year				2020		2020		2030		2030
Description	Zone Number	Zone Name	Zone Area	Employees	Annual Growth Rate	Employees	Annual Growth Rate	Employees	Annual Growth Rate	Employees
Unit	Integer	Text	Km2	Integer	Percentage	Integer	Percentage	Integer	Percentage	Integer
Type	#	text	##	#	###%	#	###%	#	###%	#
Display	input (locked)	input (locked)	copied	Calculated	Input	Calculated	Input	Calculated	Input	Calculated
Comment			CELA		CELA		CELA		CELA	
Source										
Formula				Z_G8A_EMP_2010^(1+ Z_G8A_RATE_1020)^1 0		Z_G8A_EMP_2020^(1+ Z_G8A_RATE_2030)^1 0		Z_G8A_EMP_2020*(1+ Z_G8A_RATE_2030)^1 0		Z_G8A_EMP_2030
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8A_EMP_2020		Z_G8A_EMP_2020		Z_G8A_EMP_2030		Z_G8A_EMP_2030
	1	Zone1	540	732	1.18%	822	1.18%	822	0.96%	822
	2	Zone 2	840	3,918	1.18%	4,405	1.18%	4,405	0.96%	4,405
	3	Zone 3	1453	5,127	1.18%	5,764	1.18%	5,764	0.96%	5,764
	4	Zone 4	170	7,514	1.18%	8,448	1.18%	8,448	0.96%	8,448
	5	Zone 5	1244	23,557	1.18%	26,484	1.18%	26,484	0.96%	26,484
	6	Zone 6	866	64,449	1.18%	72,459	1.18%	72,459	0.96%	72,459
	7	Zone 7	707	553,561	1.18%	622,353	1.18%	622,353	0.96%	622,353
	8	Zone 8	792	74,543	1.18%	83,806	1.18%	83,806	0.96%	83,806
Sum/Average			6,612	733,400	1.2%	824,541	1.2%	824,541	1.0%	824,541

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: RetailOffice

Group	7	7	7	7	7	7
Economic Activity	Retail/Office	Retail/Office	Retail/Office	Retail/Office	Retail/Office	Retail/Office
Year	2040	2040	2040	2040	2050	2050
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Employees	Annual Growth Rate
Unit	Integer	Text	Km2	Percentage	Employees	Percentage
Type	Integer	text	Integer	Percentage	Integer	Percentage
Display	#	input (locked)	##	###%	#	###%
Comment	input (locked)	input (locked)	copied	Input	Calculated	Input
Source			CELA	CELA	CELA	CELA
Formula						
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8A_EMP_2030*(1+Z_G8A_RATE_3040)^1	Z_G8A_EMP_2040*(1+Z_G8A_RATE_4050)^1	Z_G8A_EMP_2050
	1	Zone1	540	905	935	0.54%
	2	Zone 2	840	4,847	5,009	0.54%
	3	Zone 3	1453	6,343	6,555	0.54%
	4	Zone 4	170	9,297	9,608	0.54%
	5	Zone 5	1244	29,145	30,120	0.54%
	6	Zone 6	866	79,739	82,405	0.54%
	7	Zone 7	707	684,882	707,782	0.54%
	8	Zone 8	792	92,227	95,310	0.54%
Sum/Average			6,612	907,385	937,725	0.5%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: RetailOffice

Group								7	
Economic Activity								Retail/Office	
Year								2060	
Description		Zone Number	Zone Name	Zone Area	Employees				
Unit				Km2	Employees				
Type		Integer	Text	Integer	Integer				
Display		#	text	##	#				
Comment		input (locked)	input (locked)	copied	Calculated				
Source				CELA					
Formula								Z_G8A_EMP_2050*(1+	
Column Name		POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8A_EMP_2060			Z_G8A_RATE_5060)^1	
		1	Zone1		0				
		2	Zone 2	540					987
		3	Zone 3	840					5,289
		4	Zone 4	1453					6,920
		5	Zone 5	170					10,144
		6	Zone 6	1244					31,798
		7	Zone 7	866					86,998
		8	Zone 8	707					747,231
				792					100,622
Sum/Average				6,612					989,989

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Schools

LAST UPDATE: 06/02/2001
BY: TJJ

Group				8	8	8	8	8	8
Economic Activity				Schools	Schools	Schools	Schools	Schools	Schools
Year				2000	2000	2010	2010	2010	2010
Description	Zone Number	Zone Name	Zone Area	Students	Students	Students	Students	Students	Annual Growth Rate
Unit			Km2	Students	Students	Students	Students	Students	Percentage
Type	Integer	Text	Integer	Integer	Integer	Integer	Integer	Integer	Percentage
Display	#	text	##	#	#	#	#	#	###%
Comment	input (locked)	input (locked)	copied	Input	Input	Calculated	Input	Input	
Source			CELA	CELA	CELA		CELA	CELA	
Formula									
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8B_STU_2000	Z_G8B_STU_2000	Z_G8B_STU_2010	Z_G8B_STU_2010	Z_G8B_STU_2000*(1+ Z_G8B_RATE_0010)^10	Z_G8B_STU_2000*(1+ Z_G8B_RATE_0010)^10
	1	Zone 1	540	4,043	4,043	4,641	4,641	1.39%	0.85%
	2	Zone 2	840	6,471	6,471	8,080	8,080	2.25%	1.08%
	3	Zone 3	1453	22,428	22,428	28,442	28,442	2.40%	1.05%
	4	Zone 4	170	40,535	40,535	64,579	64,579	4.77%	1.76%
	5	Zone 5	1244	42,318	42,318	49,605	49,605	1.60%	0.87%
	6	Zone 6	866	41,401	41,401	44,936	44,936	0.82%	0.66%
	7	Zone 7	707	112,839	112,839	116,670	116,670	0.33%	0.71%
	8	Zone 8	792	218,753	218,753	252,205	252,205	1.43%	0.74%
Sum/Average			6,612	488,787	488,787	569,158	569,158	1.5%	0.9%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Schools

Group	8	8	8	8	8	8
Economic Activity	Schools	Schools	Schools	Schools	Schools	Schools
Year	2020	2020	2020	2020	2020	2020
Description	Zone Number	Zone Name	Zone Area	Students	Students	Annual Growth Rate
Unit	Km2	Integer	Integer	Students	Students	Percentage
Type	Integer	Text	Integer	Integer	Integer	Percentage
Display	#	text	##	#	#	###%
Comment	input (locked)	input (locked)	copied	Calculated	Calculated	Input
Source			CELA	CELA	CELA	CELA
Formula				$Z_G8B_STU_2010^{(1+Z_G8B_RATE_1020)^1}$	$Z_G8B_STU_2020^{(1+Z_G8B_RATE_2030)^1}$	
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8B_STU_2020	Z_G8B_STU_2030	
	1	Zone1	540	5,052	5,434	0.64%
	2	Zone 2	840	8,992	9,750	0.61%
	3	Zone 3	1453	31,570	34,132	0.56%
	4	Zone 4	170	76,882	86,560	0.66%
	5	Zone 5	1244	54,096	57,935	0.55%
	6	Zone 6	866	47,978	50,913	0.55%
	7	Zone 7	707	125,229	133,927	0.70%
	8	Zone 8	792	271,603	287,059	0.44%
Sum/Average			6,612	621,401	665,710	0.5%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Schools

Group	8	8	8	8	8	8
Economic Activity	Schools	Schools	Schools	Schools	Schools	Schools
Year	2040	2040	2040	2050	2050	2050
Description	Zone Number	Zone Name	Zone Area	Students	Students	Annual Growth Rate
Unit		Km2		Students	Students	Rate
Type	Integer	Text	Integer	Integer	Integer	Percentage
Display	#	##	##	#	#	###%
Comment	input (locked)	input (locked)	copied	Calculated	Calculated	Input
Source			CELA	CELA	CELA	CELA
Formula				Z_G8B_STU_2030*(1+ Z_G8B_RATE_3040)^1 0	Z_G8B_STU_2040*(1+ Z_G8B_RATE_4050)^1 0	
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8B_STU_2040	Z_G8B_STU_2050	
	1	Zone1	540	5,789	6,053	0.33%
	2	Zone 2	840	10,359	10,836	0.34%
	3	Zone 3	1453	36,095	37,550	0.34%
	4	Zone 4	170	92,479	96,708	0.36%
	5	Zone 5	1244	61,219	63,698	0.33%
	6	Zone 6	866	53,805	55,987	0.33%
	7	Zone 7	707	143,553	151,063	0.32%
	8	Zone 8	792	299,797	308,971	0.33%
Sum/Average			6,612	703,095	730,866	0.3%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Schools

Group					8	
Economic Activity					Schools	
Year					2060	
Description	Zone Number	Zone Name	Zone Area	Students		
Unit			Km2	Students		
Type	Integer	Text	Integer	Integer		
Display	#	text	##	#		
Comment	input (locked)	input (locked)	copied	Calculated		
Source			CELA			
Formula					$Z_G8B_STU_2050^{*(1+Z_G8B_RATE_5060)^1}$	
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8B_STU_2060		
	1	Zone1		540	6,257	
	2	Zone 2		840	11,211	
	3	Zone 3		1453	38,860	
	4	Zone 4		170	100,296	
	5	Zone 5		1244	65,862	
	6	Zone 6		866	57,845	
	7	Zone 7		707	155,960	
	8	Zone 8		792	319,443	
Sum/Average				6,612	755,734	

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Hospitals

Group	9		9		9		9	
Economic Activity	Hospitals		Hospitals		Hospitals		Hospitals	
Year	2020		2020		2020		2030	
Description	Zone Number	Zone Name	Zone Area	Beds	Annual Growth Rate	Beds	Annual Growth Rate	Beds
Unit			Km2	Beds	Percentage	Beds	Percentage	Beds
Type	Integer	Text	Integer	Integer	Percentage	Integer	Percentage	Integer
Display	#	text	##	#	###%	#	###%	#
Comment	input (locked)	input (locked)	copied	Calculated	Input	Calculated	Input	Calculated
Source			CELA	CELA	CELA	CELA	CELA	CELA
Formula				Z_G8C_BED_2010*(1+ Z_G8C_RATE_1020)^ 10		Z_G8C_BED_2020*(1+ Z_G8C_RATE_2030)^ 10		Z_G8C_BED_2020*(1+ Z_G8C_RATE_2030)^ 10
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8C_BED_2020		Z_G8C_BED_2030		
	1	Zone1	540	27	0.73%	29	0.64%	
	2	Zone 2	840	52	0.81%	56	0.61%	
	3	Zone 3	1453	193	0.78%	209	0.56%	
	4	Zone 4	170	498	1.19%	561	0.66%	
	5	Zone 5	1244	428	0.69%	459	0.55%	
	6	Zone 6	866	427	0.60%	454	0.55%	
	7	Zone 7	707	1,465	0.67%	1,567	0.70%	
	8	Zone 8	792	3,015	0.55%	3,186	0.44%	
Sum/Average			6,612	6,106	0.7%	6,521	0.5%	

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Hospitals

Group				9	Hospitals	9	Hospitals	9	Hospitals
Economic Activity									Hospitals
Year				2040		2040		2050	
Description	Zone Number	Zone Name	Zone Area			Annual Growth Rate		Annual Growth Rate	
Unit			Km2			Percentage		Percentage	
Type	Integer	Text	Integer			Percentage		Integer	
Display	#	text	##			###%		#	###%
Comment	input (locked)	input (locked)	copied			Input		Calculated	Input
Source			CELA			CELA			CELA
Formula									
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G8C_BED_2030*(1+ Z_G8C_RATE_3040)^ 10	Z_G8C_BED_2040	Z_G8C_BED_2040*(1+ Z_G8C_RATE_4050)^ 10	Z_G8C_BED_2050	Z_G8C_BED_2050	
	1	Zone1	540	31		0.45%		33	0.33%
	2	Zone 2	840	60		0.45%		62	0.34%
	3	Zone 3	1453	221		0.40%		230	0.34%
	4	Zone 4	170	599		0.45%		627	0.36%
	5	Zone 5	1244	485		0.40%		504	0.33%
	6	Zone 6	866	479		0.40%		499	0.33%
	7	Zone 7	707	1,680		0.51%		1,767	0.32%
	8	Zone 8	792	3,328		0.30%		3,430	0.33%
Sum/Average			6,612	6,883		0.4%		7,152	0.3%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Hospitals

Group						9	
Economic Activity						Hospitals	
Year						2060	
Description	Zone Number	Zone Name	Zone Area	Zone Area	Zone Area	Beds	
Unit			Km2			Beds	
Type	Integer	Text	Integer			Integer	
Display	#	text	##			#	
Comment	input (locked)	input (locked)	copied			Calculated	
Source			CELA				
Formula						$Z_G8C_BED_2050^{*(1+Z_G8C_RATE_5060)^{10}}$	
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	ZONE_AREA	ZONE_AREA	Z_G8C_BED_2060	
	1	Zone1				34	
	2	Zone 2				840	
	3	Zone 3				1453	
	4	Zone 4				170	
	5	Zone 5				1244	
	6	Zone 6				866	
	7	Zone 7				707	
	8	Zone 8				792	
Sum/Average						6,612	7,394

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Tourism

LAST UPDATE: 06/02/2001
BY: TJJ

Group	10	10	10	10	10
Economic Activity	Tourism	Tourism	Tourism	Tourism	Tourism
Year	2000	2000	2010	2010	2010
Description	Zone Number	Zone Name	Zone Area	Annual Growth Rate	Annual Growth Rate
Unit		Km2		Guests	Percentage
Type	Integer	Text	Integer	Guests	Percentage
Display	#	text	#	Integer	#.##%
Comment	input (locked)	input (locked)	copied	Input	Input
Source		CELA	CELA	Calculated	CELA
Formula					
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G9_GST_2000*(1+Z_G9_RATE_0010)^10	Z_G9_GST_2010
	1	Zone1	540	1,899	2,278
	2	Zone 2	840	3,038	4,221
	3	Zone 3	1453	45,636	60,844
	4	Zone 4	170	95,169	158,482
	5	Zone 5	1244	139,097	167,481
	6	Zone 6	866	106,923	131,223
	7	Zone 7	707	515,133	598,886
	8	Zone 8	792	256,797	316,891
Sum/Average			6,612	1,163,691	1,440,306
				2.2%	1.7%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Tourism

Group				10	10	10
Economic Activity				Tourism	Tourism	Tourism
Year				2020	2030	2030
Description	Zone Number	Zone Name	Zone Area	Guests	Guests	Annual Growth Rate
Unit			Km2	Guests	Guests	Percentage
Type	Integer	Text	Integer	Integer	Integer	Percentage
Display	#	text	##	#	#	###%
Comment	input (locked)	input (locked)	copied	Calculated	Calculated	Input
Source			CELA			CELA
Formula				Z_G9_GST_2010*(1+Z_G9_RATE_1020)^10	Z_G9_GST_2020*(1+Z_G9_RATE_2030)^10	
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G9_GST_2020	Z_G9_GST_2030	
	1	Zone1	540	2,592	2,914	1.08%
	2	Zone 2	840	5,226	6,304	1.69%
	3	Zone 3	1453	71,003	80,706	1.07%
	4	Zone 4	170	197,212	232,084	1.11%
	5	Zone 5	1244	187,609	206,388	0.82%
	6	Zone 6	866	158,419	190,082	1.80%
	7	Zone 7	707	722,787	869,154	1.88%
	8	Zone 8	792	365,269	413,209	1.12%
Sum/Average			6,612	1,710,116	2,000,841	1.5%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Tourism

Group	10		10		10		10	
Economic Activity		Tourism		Tourism		Tourism		Tourism
Year		2040		2040		2050		2050
Description	Zone Number	Zone Name	Zone Area	Guests	Annual Growth Rate	Guests	Annual Growth Rate	Annual Growth Rate
Unit			Km2	Guests	Percentage	Guests	Percentage	Percentage
Type	Integer	Text	Integer	Integer	Percentage	Integer	Percentage	Percentage
Display	#	text	##	#	###%	#	###%	###%
Comment	input (locked)	input (locked)	copied	Calculated	Input	Calculated	Input	Input
Source			CELA		CELA		CELA	CELA
Formula				Z_G9_GST_2030*(1+Z_G9_RATE_3040)^10		Z_G9_GST_2040*(1+Z_G9_RATE_4050)^10		
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G9_GST_2040		Z_G9_GST_2050		
	1	Zone1	540	3,245	0.89%	3,546	1.00%	
	2	Zone 2	840	7,452	1.53%	8,672	1.96%	
	3	Zone 3	1453	89,729	0.90%	98,140	1.10%	
	4	Zone 4	170	259,175	0.89%	283,293	1.03%	
	5	Zone 5	1244	224,014	0.67%	239,422	0.74%	
	6	Zone 6	866	227,139	1.64%	267,241	2.19%	
	7	Zone 7	707	1,047,519	1.70%	1,239,449	2.10%	
	8	Zone 8	792	461,899	0.99%	509,516	1.36%	
Sum/Average			6,612	2,320,171	1.3%	2,649,281	1.7%	

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Tourism

Group									10
Economic Activity									Tourism
Year									2060
Description			Zone Name		Zone Area				Guests
Unit			Km2		Integer				Guests
Type			Integer		Integer				Integer
Display			#		##				#
Comment			input (locked)		input (locked)				Calculated
Source					CELA				
Formula									
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA	Z_G9_GST_2050*(1+Z_G9_RATE_5060)^10	Z_G9_GST_2060				
	1	Zone1	540	3,917					
	2	Zone 2	840	10,528					
	3	Zone 3	1453	109,483					
	4	Zone 4	170	313,971					
	5	Zone 5	1244	257,722					
	6	Zone 6	866	331,983					
	7	Zone 7	707	1,525,692					
	8	Zone 8	792	583,331					
Sum/Average			6,612	3,136,628					

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND LAST UPDATE: 06/02/2001
WORKSHEET: Summary BY: TJJ

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population CELA (6-00)	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Display	#	text	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Unit	input (locked)	input (locked)	ZONEPOP_2000	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	POP_ZONE	POP_ZONE_NAME									
Column Name	1	2	3	4	5	6	7	8	9	10	11
	1	Zone1	14,555	1.2	83	0.9	64	0.3	0.2	0.0	0.0
	2	Zone 2	23,293	3.1	135	1.8	76	1.4	1.1	0.1	0.0
	3	Zone 3	80,742	7.2	89	5.9	73	1.3	0.4	0.4	0.1
	4	Zone 4	145,924	10.6	73	9.3	64	1.3	0.2	0.4	0.0
	5	Zone 5	152,345	12.4	81	9.5	62	2.9	0.9	0.4	0.0
	6	Zone 6	136,627	17.2	126	9.4	69	7.8	0.1	0.2	0.1
	7	Zone 7	338,516	59.9	177	39.6	117	20.3	0.0	8.4	1.0
	8	Zone 8	656,258	47.0	72	36.7	56	10.3	0.3	3.5	1.5
Sum/Average			1,548,260	159	102	113	73	46	3	14	3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
06/02/2001
TJJ

LAST UPDATE:
BY:

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population CELA (6-00)	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	real	real	real	real	real	real	real	real	real
Display	#	text	###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2010								
	1	Zone1	16,964	1.4	81	1.1	64	0.3	0.2	0.0	0.0
	2	Zone 2	29,475	3.6	123	2.2	76	1.4	1.1	0.1	0.0
	3	Zone 3	103,789	9.1	87	7.6	73	1.5	0.4	0.5	0.1
	4	Zone 4	234,699	16.7	71	15.0	64	1.7	0.2	0.5	0.0
	5	Zone 5	180,657	14.6	81	11.3	62	3.4	0.9	0.5	0.0
	6	Zone 6	150,217	20.5	137	10.3	69	10.2	0.1	0.3	0.1
	7	Zone 7	385,591	70.5	183	45.1	117	25.4	0.0	10.3	1.2
	8	Zone 8	766,354	55.6	73	42.9	56	12.7	0.3	4.3	1.8
Sum/Average			1,867,746	192	103	136	73	56	3	17	3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

06/02/2001
TJJ

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population CELA (6-00)	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	#,###	###.#	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Display	#	text	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Unit	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2020								
Column Name											
	1	Zone1	18,555	1.5	80	1.2	64	0.3	0.2	0.0	0.0
	2	Zone 2	32,949	3.9	119	2.5	76	1.4	1.1	0.2	0.0
	3	Zone 3	115,724	10.1	87	8.4	73	1.7	0.4	0.6	0.1
	4	Zone 4	280,465	19.9	71	17.9	64	2.0	0.2	0.6	0.0
	5	Zone 5	197,767	16.2	82	12.3	62	3.9	0.9	0.6	0.0
	6	Zone 6	161,057	24.3	151	11.1	69	13.2	0.1	0.4	0.1
	7	Zone 7	438,295	82.3	188	51.3	117	31.0	0.0	12.1	1.4
	8	Zone 8	863,644	63.4	73	48.4	56	15.1	0.3	5.1	2.1
Sum/Average			2,108,456	222	105	153	73	69	3	19	4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND LAST UPDATE: 06/02/2001
WORKSHEET: Summary BY: TJJ

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	CELA (6-00)	Harza	Harza	Harza	Harza	Harza	Harza	Harza	Harza
Display	#	text	#,###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2030								
	1	Zone 1	20,047	1.6	79	1.3	64	0.3	0.2	0.0	0.0
	2	Zone 2	35,873	4.2	116	2.7	76	1.4	1.1	0.2	0.0
	3	Zone 3	125,642	11.0	88	9.2	73	1.8	0.4	0.6	0.1
	4	Zone 4	317,032	22.5	71	20.3	64	2.2	0.2	0.7	0.0
	5	Zone 5	212,657	17.8	84	13.2	62	4.5	0.9	0.7	0.0
	6	Zone 6	171,590	28.9	169	11.8	69	17.2	0.1	0.4	0.1
	7	Zone 7	486,057	93.9	193	56.9	117	37.0	0.0	13.6	1.6
	8	Zone 8	941,138	70.2	75	52.7	56	17.5	0.3	5.7	2.4
Sum/Average			2,310,036	250	108	168	73	82	3	22	4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY: TJJ

06/02/2001
TJJ

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
integer #	text	text	real #,###	real #,###	real #,###	real #,###	real #,###	real #,###	real #,###	real #,###	real #,###
input (locked)	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
POP_ZONE	POP_ZONE	POP_ZONE	ZONEPOP_2040	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
1	Zone1		21,391	1.7	78	1.4	64	0.3	0.2	0.0	0.0
2	Zone 2		38,153	4.4	115	2.9	76	1.5	1.1	0.2	0.0
3	Zone 3		133,081	11.7	88	9.7	73	2.0	0.4	0.7	0.2
4	Zone 4		339,329	24.2	71	21.7	64	2.5	0.2	0.7	0.0
5	Zone 5		225,051	19.3	86	14.0	62	5.3	0.8	0.8	0.0
6	Zone 6		181,644	34.8	191	12.5	69	22.3	0.1	0.4	0.1
7	Zone 7		528,306	105.8	200	61.8	117	44.0	0.0	14.9	1.7
8	Zone 8		996,019	75.8	76	55.8	56	20.1	0.3	6.3	2.6
Sum/Average			2,462,974	278	113	180	73	98	3	24	5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE: 06/02/2001
BY: TJJ

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population CELA (6-00)	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Type	integer #	text	real ###	Harza real ###.# mgd	Harza real ### gpcd	Harza real ###.# mgd	Harza real ### gpcd	Harza real ###.# mgd	Harza real ###.# mgd	Harza real ###.# mgd	Harza real ###.# mgd
Unit	input (locked)	input (locked)	People copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2050								
Column Name											
	1	Zone1	22,297	1.7	78	1.4	64	0.3	0.2	0.0	0.0
	2	Zone 2	39,710	4.5	113	3.0	76	1.5	1.0	0.2	0.0
	3	Zone 3	138,071	12.2	88	10.1	73	2.1	0.4	0.7	0.2
	4	Zone 4	353,434	25.2	71	22.6	64	2.6	0.2	0.8	0.0
	5	Zone 5	233,226	20.7	89	14.5	62	6.1	0.8	0.8	0.0
	6	Zone 6	188,371	41.8	222	12.9	69	28.9	0.1	0.4	0.1
	7	Zone 7	560,852	116.6	208	65.6	117	51.0	0.0	15.4	1.8
	8	Zone 8	1,035,520	80.3	78	58.0	56	22.3	0.3	6.5	2.7
Sum/Average			2,571,481	303	118	188	73	115	3	25	5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION
PREPARED FOR THE PANAMA CANAL AUTHORITY**

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY: TJJ

06/02/2001
TJJ

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population CELA (6-00)	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source											
Type	integer	text	real	real	real	real	real	real	real	real	real
Display	#	text	###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2060								
	1	Zone1	22,886	1.8	78	1.5	64	0.3	0.2	0.0	0.0
	2	Zone 2	40,791	4.6	113	3.1	76	1.5	1.0	0.2	0.0
	3	Zone 3	141,889	12.6	89	10.4	73	2.2	0.4	0.8	0.2
	4	Zone 4	363,818	26.1	72	23.3	64	2.8	0.2	0.8	0.0
	5	Zone 5	239,383	22.2	93	14.9	62	7.3	0.8	0.8	0.0
	6	Zone 6	193,222	50.9	263	13.3	69	37.6	0.0	0.5	0.1
	7	Zone 7	576,174	127.9	222	67.4	117	60.5	0.0	16.3	1.9
	8	Zone 8	1,064,988	85.1	80	59.6	56	25.5	0.3	6.8	2.9
Sum/Average			2,643,151	331	125	193	73	138	3	26	5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE:
BY:

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports	Utilities	Fab Const.	RetailOffice	Schools	Hospitals	Tourism
			CELA (6-00)	People							
Type	integer	text	real	People	real	real	real	real	real	real	real
Display	#	text	### #	copied	### #	### #	### #	### #	### #	### #	### #
Unit				ZONEPOP_2000	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)			calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME									
	1	Zone1	14,555		0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	23,293		0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	80,742		0.0	0.1	0.1	0.0	0.1	0.0	0.0
	4	Zone 4	145,924		0.0	0.1	0.2	0.0	0.3	0.0	0.1
	5	Zone 5	152,345		0.7	0.1	0.2	0.1	0.3	0.0	0.1
	6	Zone 6	136,627		6.5	0.1	0.2	0.3	0.3	0.1	0.1
	7	Zone 7	338,516		5.8	0.1	0.9	2.9	0.7	0.2	0.3
	8	Zone 8	666,258		1.5	0.3	1.0	0.4	1.4	0.3	0.1
Sum/Average			1,548,260		15	1	3	4	3	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE: BY:

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports	Utilities	Fab Const	RetailOffice	Schools	Hospitals	Tourism								
			CELA (6-00)	People								Harza	mgd	Harza	real	Harza	real	Harza	real
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	input (locked)	POP_ZONE_NAME	input (locked)	POP_ZONE_NAME	Zone1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Sum/Average
	integer	text	real			16,964	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1
	#	text	###			29,475	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1
			copied			103,789	0.0		0.1		0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	4
			ZONEPOP_2010			234,699	0.0		0.1		0.3	0.1	0.4	0.0	0.1	0.1	0.1	0.1	5
						180,657	1.0		0.1		0.1	0.3	0.3	0.1	0.1	0.1	0.1	0.1	4
						150,217	8.6		0.1		0.3	0.4	0.3	0.1	0.1	0.1	0.1	0.1	4
						385,591	7.7		0.2		1.3	3.5	0.7	0.2	0.2	0.2	0.3	0.3	5
						766,354	1.9		0.3		1.4	0.5	1.6	0.4	0.4	0.4	0.2	0.2	4
						1,867,746	19		1		4	5	4	1	1	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND LAST UPDATE:
WORKSHEET: Summary BY:

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports	Utilities	Fab Const	RetailOffice	Schools	Hospitals	Tourism
			CELA (6-00)	real							
Type	integer	text	###	###	###	###	###	###	###	###	###
Display	#	text	People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit											
Comment	input (locked)	input (locked)	ZONEPOP_2020		calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2020		calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Zone1	18,555	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	32,949	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0
	3	Zone 3	115,724	0.0	0.0	0.1	0.2	0.0	0.2	0.0	0.0
	4	Zone 4	280,465	0.0	0.0	0.1	0.3	0.1	0.5	0.1	0.1
	5	Zone 5	197,767	1.3	0.1	0.1	0.4	0.2	0.3	0.1	0.1
	6	Zone 6	161,057	11.4	0.1	0.1	0.3	0.5	0.3	0.1	0.1
	7	Zone 7	438,295	10.2	0.2	0.2	1.7	4.1	0.8	0.2	0.4
	8	Zone 8	863,644	2.5	0.4	0.4	1.8	0.6	1.7	0.4	0.2
Sum/Average			2,108,456	25	1	1	5	5	4	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

YEAR 2030 BASE DEMAND

Description Source	Zone Number integer #	Zone Name text text	Zone Population		Ports Harza real ###.# mgd calculated	Utilities Harza real ###.# mgd calculated	Fab Const Harza real ###.# mgd calculated	RetailOffice Harza real ###.# mgd calculated	Schools Harza real ###.# mgd calculated	Hospitals Harza real ###.# mgd calculated	Tourism Harza real ###.# mgd calculated
			CELA (6-00) real # People copied	ZONEPOP_2030							
Column Name	input (locked) POP_ZONE	input (locked) POP_ZONE_NAME									
	1	Zone1	20,047	20,047	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	35,873	35,873	0.0	0.0	0.1	0.0	0.1	0.0	0.0
	3	Zone 3	125,642	125,642	0.0	0.1	0.2	0.0	0.2	0.0	0.0
	4	Zone 4	317,032	317,032	0.0	0.1	0.4	0.1	0.5	0.1	0.1
	5	Zone 5	212,657	212,657	1.7	0.1	0.5	0.2	0.4	0.1	0.1
	6	Zone 6	171,590	171,590	15.1	0.1	0.4	0.5	0.3	0.1	0.1
	7	Zone 7	486,057	486,057	13.4	0.2	2.1	4.6	0.8	0.2	0.5
	8	Zone 8	941,138	941,138	3.4	0.4	2.2	0.6	1.8	0.4	0.2
Sum/Average			2,310,036	2,310,036	34	1	6	6	4	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND **LAST UPDATE:**
WORKSHEET: Summary **BY:**

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports	Utilities	Fab Const	RetailOffice	Schools	Hospitals	Tourism
			CELA (6-00)	real							
Type	integer	text	real	real	Harza	real	real	real	real	real	real
Display	#	text	###,###	###,###	###,###	###,###	###,###	###,###	###,###	###,###	###,###
Unit			People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)			calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2040								
	1	Zone1	21,391	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	38,153	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0
	3	Zone 3	133,081	0.0	0.1	0.0	0.3	0.0	0.2	0.0	0.0
	4	Zone 4	339,329	0.0	0.1	0.1	0.5	0.1	0.6	0.1	0.1
	5	Zone 5	225,051	2.2	0.1	0.1	0.6	0.2	0.4	0.1	0.1
	6	Zone 6	181,644	20.0	0.1	0.1	0.5	0.6	0.3	0.1	0.1
	7	Zone 7	528,306	17.8	0.2	0.2	2.6	5.1	0.9	0.2	0.6
	8	Zone 8	996,019	4.4	0.5	0.5	2.7	0.7	1.9	0.5	0.2
Sum/Average			2,462,974	44	1	7	7	4	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND Summary
WORKSHEET: Summary
LAST UPDATE: BY:

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports	Utilities	Fab Const	Retail/Office	Schools	Hospitals	Tourism
			CELA (6-00)	People							
Source			real	copied	real	real	real	real	real	real	real
Type	integer	text	###	###	###	###	###	###	###	###	###
Display	#	text									
Unit			People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)			calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2050								
	1	Zone1	22,297	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	39,710	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0
	3	Zone 3	138,071	0.0	0.0	0.1	0.3	0.0	0.2	0.0	0.1
	4	Zone 4	353,434	0.0	0.0	0.1	0.6	0.1	0.6	0.1	0.2
	5	Zone 5	233,226	2.9	2.9	0.1	0.6	0.2	0.4	0.1	0.1
	6	Zone 6	188,371	26.4	26.4	0.1	0.6	0.6	0.3	0.1	0.1
	7	Zone 7	560,852	23.5	23.5	0.3	2.9	5.2	0.9	0.2	0.7
	8	Zone 8	1,035,520	5.9	5.9	0.5	3.1	0.7	1.9	0.5	0.3
Sum/Average			2,571,481	59	59	1	8	7	5	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE:
BY:

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports	Utilities	Fab Const	RetailOffice	Schools	Hospitals	Tourism
			CELA (6-00)	People							
Source			real	copied	real	real	real	real	real	real	real
Type	integer	text	###.#	People	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Display	#	text									
Unit											
Comment	input (locked)	input (locked)									
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2060		calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Zone1	22,886		0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	40,791		0.0	0.0	0.1	0.0	0.1	0.0	0.0
	3	Zone 3	141,889		0.0	0.1	0.4	0.1	0.2	0.0	0.1
	4	Zone 4	363,818		0.0	0.1	0.7	0.1	0.6	0.1	0.2
	5	Zone 5	239,383		3.9	0.1	0.8	0.2	0.4	0.1	0.1
	6	Zone 6	193,222		35.0	0.1	0.7	0.6	0.4	0.1	0.2
	7	Zone 7	576,174		31.1	0.3	3.5	5.5	1.0	0.3	0.8
	8	Zone 8	1,064,988		7.8	0.5	3.6	0.7	2.0	0.5	0.3
Sum/Average			2,643,151		78	1	10	7	5	1	2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Residential

LAST UPDATE: 06/02/2001
BY: TJJ

RESIDENTIAL BASE DEMAND RATE AND ZONE FACTORS

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpcd)	72.6	72.6	72.6	72.6	72.6	72.6	72.6
Zone 1 Water Demand Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Zone 1 Rate (gpcd)	63.7	63.7	63.7	63.7	63.7	63.7	63.7
Zone 2 Water Demand Factor	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Zone 2 Rate (gpcd)	76.3	76.3	76.3	76.3	76.3	76.3	76.3
Zone 3 Water Demand Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Zone 3 Rate (gpcd)	73.0	73.0	73.0	73.0	73.0	73.0	73.0
Zone 4 Water Demand Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Zone 4 Rate (gpcd)	64.0	64.0	64.0	64.0	64.0	64.0	64.0
Zone 5 Water Demand Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Zone 5 Rate (gpcd)	62.3	62.3	62.3	62.3	62.3	62.3	62.3
Zone 6 Water Demand Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Zone 6 Rate (gpcd)	68.7	68.7	68.7	68.7	68.7	68.7	68.7
Zone 7 Water Demand Factor	1.61	1.61	1.61	1.61	1.61	1.61	1.61
Zone 7 Rate (gpcd)	117.0	117.0	117.0	117.0	117.0	117.0	117.0
Zone 8 Water Demand Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Zone 8 Rate (gpcd)	56.0	56.0	56.0	56.0	56.0	56.0	56.0

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Residential

LAST UPDATE: 06/02/2001
BY: TJJ

YEAR 2000 BASE RESIDENTIAL DEMAND

Base Demand Rate = 72.6 gpcd

Description	Zone Number	Zone Name	Zone Population	Zone Demand Factor	Residential Demand Rate	Residential Base Demand
Source			CELA (6-00)	Harza		
Type	integer	text	real	real	real	real
Display	#	text	###	###	###	###.#
Unit			People		gpcd	mgd
Comment	input (locked)	input (locked)	copied	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2000	Z_RDEMFACT_2000	Z_DEMRAT_2000	ZRESDEM_2000
	1	Zone1	14,555	0.88	64	0.9
	2	Zone 2	23,293	1.05	76	1.8
	3	Zone 3	80,742	1.01	73	5.9
	4	Zone 4	145,924	0.88	64	9.3
	5	Zone 5	152,345	0.86	62	9.5
	6	Zone 6	136,627	0.95	69	9.4
	7	Zone 7	338,516	1.61	117	39.6
	8	Zone 8	656,258	0.77	56	36.7
Sum/Average			1,548,260		73	113

YEAR 2010 BASE RESIDENTIAL DEMAND

Base Demand Rate = 72.6 gpcd

Description	Zone Number	Zone Name	Zone Population	Zone Demand Factor	Residential Demand Rate	Residential Base Demand
Source			CELA (6-00)	Harza		
Type	integer	text	real	real	real	real
Display	#	text	###	###	###	###.#
Unit			People		gpcd	mgd
Comment	input (locked)	input (locked)	copied	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2010	Z_RDEMFACT_2010	Z_DEMRAT_2010	ZRESDEM_2010
	1	Zone1	16,964	0.88	64	1.1
	2	Zone 2	29,475	1.05	76	2.2
	3	Zone 3	103,789	1.01	73	7.6
	4	Zone 4	234,699	0.88	64	15.0
	5	Zone 5	180,657	0.86	62	11.3
	6	Zone 6	150,217	0.95	69	10.3
	7	Zone 7	385,591	1.61	117	45.1
	8	Zone 8	766,354	0.77	56	42.9
Sum/Average			1,867,746		73	136

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Residential

LAST UPDATE: 06/02/2001
BY: TJJ

YEAR 2020 BASE RESIDENTIAL DEMAND

Base Demand Rate = 72.6 gpcd

Description	Zone Number	Zone Name	Zone Population	Zone Demand Factor	Residential Demand Rate	Residential Base Demand
Source			CELA (6-00)	Harza		
Type	integer	text	real	real	real	real
Display	#	text	###	##	###	###.#
Unit			People		gpcd	mgd
Comment	input (locked)	input (locked)	copied	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2020	Z_RDEMFACT_2020	Z_DEMRAT_2020	ZRESDEM_2020
	1	Zone1	18,555	0.88	64	1.2
	2	Zone 2	32,949	1.05	76	2.5
	3	Zone 3	115,724	1.01	73	8.4
	4	Zone 4	280,465	0.88	64	17.9
	5	Zone 5	197,767	0.86	62	12.3
	6	Zone 6	161,057	0.95	69	11.1
	7	Zone 7	438,295	1.61	117	51.3
	8	Zone 8	863,644	0.77	56	48.4
Sum/Average			2,108,456		73	153

YEAR 2030 BASE RESIDENTIAL DEMAND

Base Demand Rate = 72.6 gpcd

Description	Zone Number	Zone Name	Zone Population	Zone Demand Factor	Residential Demand Rate	Residential Base Demand
Source			CELA (6-00)	Harza		
Type	integer	text	real	real	real	real
Display	#	text	###	##	###	###.#
Unit			People		gpcd	mgd
Comment	input (locked)	input (locked)	copied	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2030	Z_RDEMFACT_2030	Z_DEMRAT_2030	ZRESDEM_2030
	1	Zone1	20,047	0.88	64	1.3
	2	Zone 2	35,873	1.05	76	2.7
	3	Zone 3	125,642	1.01	73	9.2
	4	Zone 4	317,032	0.88	64	20.3
	5	Zone 5	212,657	0.86	62	13.2
	6	Zone 6	171,590	0.95	69	11.8
	7	Zone 7	486,057	1.61	117	56.9
	8	Zone 8	941,138	0.77	56	52.7
Sum/Average			2,310,036		73	168

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Residential

LAST UPDATE: 06/02/2001
BY: TJJ

YEAR 2040 BASE RESIDENTIAL DEMAND

Base Demand Rate = 72.6 gpcd

Description	Zone Number	Zone Name	Zone Population	Zone Demand Factor	Residential Demand Rate	Residential Base Demand
Source			CELA (6-00)	Harza		
Type	integer	text	real	real	real	real
Display	#	text	###	##	###	###.#
Unit			People		gpcd	mgd
Comment	input (locked)	input (locked)	copied	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2040	Z_RDEMFACT_2040	Z_DEMRAT_2040	ZRESDEM_2040
	1	Zone1	21,391	0.88	64	1.4
	2	Zone 2	38,153	1.05	76	2.9
	3	Zone 3	133,081	1.01	73	9.7
	4	Zone 4	339,329	0.88	64	21.7
	5	Zone 5	225,051	0.86	62	14.0
	6	Zone 6	181,644	0.95	69	12.5
	7	Zone 7	528,306	1.61	117	61.8
	8	Zone 8	996,019	0.77	56	55.8
Sum/Average			2,462,974		73	180

YEAR 2050 BASE RESIDENTIAL DEMAND

Base Demand Rate = 72.6 gpcd

Description	Zone Number	Zone Name	Zone Population	Zone Demand Factor	Residential Demand Rate	Residential Base Demand
Source			CELA (6-00)	Harza		
Type	integer	text	real	real	real	real
Display	#	text	###	##	###	###.#
Unit			People		gpcd	mgd
Comment	input (locked)	input (locked)	copied	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2050	Z_RDEMFACT_2050	Z_DEMRAT_2050	ZRESDEM_2050
	1	Zone1	22,297	0.88	64	1.4
	2	Zone 2	39,710	1.05	76	3.0
	3	Zone 3	138,071	1.01	73	10.1
	4	Zone 4	353,434	0.88	64	22.6
	5	Zone 5	233,226	0.86	62	14.5
	6	Zone 6	188,371	0.95	69	12.9
	7	Zone 7	560,852	1.61	117	65.6
	8	Zone 8	1,035,520	0.77	56	58.0
Sum/Average			2,571,481		73	188

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Residential

LAST UPDATE: 06/02/2001
BY: TJJ

YEAR 2060 BASE RESIDENTIAL DEMAND

Base Demand Rate = 72.6 gpcd

Description	Zone Number	Zone Name	Zone Population	Zone Demand Factor	Residential Demand Rate	Residential Base Demand
Source			CELA (6-00)	Harza		
Type	integer	text	real	real	real	real
Display	#	text	#,###	###	###	###.#
Unit			People		gpcd	mgd
Comment	input (locked)	input (locked)	copied	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2060	Z_RDEMFACT_2060	Z_DEMRAT_2060	ZRESDEM_2060
	1	Zone1	22,886	0.88	64	1.5
	2	Zone 2	40,791	1.05	76	3.1
	3	Zone 3	141,889	1.01	73	10.4
	4	Zone 4	363,818	0.88	64	23.3
	5	Zone 5	239,383	0.86	62	14.9
	6	Zone 6	193,222	0.95	69	13.3
	7	Zone 7	576,174	1.61	117	67.4
	8	Zone 8	1,064,988	0.77	56	59.6
Sum/Average			2,643,151		73	193

RESIDENTIAL BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.9	1.1	1.2	1.3	1.4	1.4	1.5
Zone 2	1.8	2.2	2.5	2.7	2.9	3.0	3.1
Zone 3	5.9	7.6	8.4	9.2	9.7	10.1	10.4
Zone 4	9.3	15.0	17.9	20.3	21.7	22.6	23.3
Zone 5	9.5	11.3	12.3	13.2	14.0	14.5	14.9
Zone 6	9.4	10.3	11.1	11.8	12.5	12.9	13.3
Zone 7	39.6	45.1	51.3	56.9	61.8	65.6	67.4
Zone 8	36.7	42.9	48.4	52.7	55.8	58.0	59.6
Study Area Total	113	136	153	168	180	188	193

THE MODEL FOR LONG TERM FORECAST FOR
 1981 WATER DEMAND AND FLOW WATER CONDUCTION

PREPARED FOR THE MANAGER OF WATER AUTHORITY

HADJA ENGINEERING COMPANY LTD

DATE: 1980
 PROJECT: WATER DEMAND AND FLOW WATER CONDUCTION
 SHEET NO: 1 OF 1

Year	Population (Millions)	Per Capita Consumption (liters/day)	Industrial Consumption (Million liters/day)	Commercial Consumption (Million liters/day)	Total Consumption (Million liters/day)
1980	1.5	150	10	5	22.5
1981	1.5	150	10	5	22.5
1982	1.5	150	10	5	22.5
1983	1.5	150	10	5	22.5
1984	1.5	150	10	5	22.5
1985	1.5	150	10	5	22.5
1986	1.5	150	10	5	22.5
1987	1.5	150	10	5	22.5
1988	1.5	150	10	5	22.5
1989	1.5	150	10	5	22.5
1990	1.5	150	10	5	22.5
1991	1.5	150	10	5	22.5
1992	1.5	150	10	5	22.5
1993	1.5	150	10	5	22.5
1994	1.5	150	10	5	22.5
1995	1.5	150	10	5	22.5
1996	1.5	150	10	5	22.5
1997	1.5	150	10	5	22.5
1998	1.5	150	10	5	22.5
1999	1.5	150	10	5	22.5
2000	1.5	150	10	5	22.5

AGRICULTURAL WATER DEMAND FORECAST

Year	Crop Area (Million Hectares)	Water Requirement (Million m ³ /year)
1980	1.0	100
1981	1.0	100
1982	1.0	100
1983	1.0	100
1984	1.0	100
1985	1.0	100
1986	1.0	100
1987	1.0	100
1988	1.0	100
1989	1.0	100
1990	1.0	100
1991	1.0	100
1992	1.0	100
1993	1.0	100
1994	1.0	100
1995	1.0	100
1996	1.0	100
1997	1.0	100
1998	1.0	100
1999	1.0	100
2000	1.0	100

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Agriculture

LAST UPDATE:
BY:

06/02/2001
TJJ

BASE DEMAND RATE AND ZONE FACTORS - GROUP 1

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	100	100	100	100	100	100	100
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	0%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	100	100	100	100	100	100	100
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	100	100	100	100	100	100	100
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	100	100	100	100	100	100	100
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	100	100	100	100	100	100	100
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	100	100	100	100	100	100	100
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	100	100	100	100	100	100	100
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	100	100	100	100	100	100	100
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	100	100	100	100	100	100	100

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Agriculture

LAST UPDATE: 06/02/2001
BY: TJJ

YEAR 2000 BASE DEMAND - GROUP 1

Base Demand Rate = 100 gpd/Ha

Description	Zone Number	Zone Name	Area	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Hectare		gpd/Hectare	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_AREA_2000			
	1	Zone1	2,199	1.00	100	0.22
	2	Zone 2	11,404	1.00	100	1.14
	3	Zone 3	4,003	1.00	100	0.40
	4	Zone 4	2,150	1.00	100	0.22
	5	Zone 5	9,339	1.00	100	0.93
	6	Zone 6	525	1.00	100	0.05
	7	Zone 7	302	1.00	100	0.03
	8	Zone 8	3,381	1.00	100	0.34
Sum/Average			33,302		100	3.33

YEAR 2010 BASE DEMAND - GROUP 1

Base Demand Rate = 100 gpd/Ha

Description	Zone Number	Zone Name	Area	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Hectare		gpd/Hectare	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_AREA_2010			
	1	Zone1	2,141	1.00	100	0.21
	2	Zone 2	11,173	1.00	100	1.12
	3	Zone 3	3,912	1.00	100	0.39
	4	Zone 4	2,141	1.00	100	0.21
	5	Zone 5	9,080	1.00	100	0.91
	6	Zone 6	519	1.00	100	0.05
	7	Zone 7	291	1.00	100	0.03
	8	Zone 8	3,317	1.00	100	0.33
Sum/Average			32,574		100	3.26

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Agriculture

LAST UPDATE: 06/02/2001
BY: TJJ

YEAR 2020 BASE DEMAND - GROUP 1

Base Demand Rate = 100 gpd/Ha

Description	Zone Number	Zone Name	Area	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Hectare		gpd/Hectare	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_AREA_2020			
	1	Zone1	2,086	1.00	100	0.21
	2	Zone 2	10,961	1.00	100	1.10
	3	Zone 3	3,828	1.00	100	0.38
	4	Zone 4	2,135	1.00	100	0.21
	5	Zone 5	8,836	1.00	100	0.88
	6	Zone 6	513	1.00	100	0.05
	7	Zone 7	281	1.00	100	0.03
	8	Zone 8	3,258	1.00	100	0.33
Sum/Average			31,898		100	3.19

YEAR 2030 BASE DEMAND - GROUP 1

Base Demand Rate = 100 gpd/Ha

Description	Zone Number	Zone Name	Area	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Hectare		gpd/Hectare	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_AREA_2030			
	1	Zone1	2,035	1.00	100	0.20
	2	Zone 2	10,766	1.00	100	1.08
	3	Zone 3	3,750	1.00	100	0.38
	4	Zone 4	2,133	1.00	100	0.21
	5	Zone 5	8,606	1.00	100	0.86
	6	Zone 6	508	1.00	100	0.05
	7	Zone 7	271	1.00	100	0.03
	8	Zone 8	3,204	1.00	100	0.32
Sum/Average			31,273		100	3.13

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Agriculture

LAST UPDATE: 06/02/2001
BY: TJJ

YEAR 2040 BASE DEMAND - GROUP 1

Base Demand Rate = 100 gpd/Ha

Description	Zone Number	Zone Name	Area	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Hectare		gpd/Hectare	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_AREA_2040			
	1	Zone1	1,987	1.00	100	0.20
	2	Zone 2	10,589	1.00	100	1.06
	3	Zone 3	3,678	1.00	100	0.37
	4	Zone 4	2,134	1.00	100	0.21
	5	Zone 5	8,390	1.00	100	0.84
	6	Zone 6	504	1.00	100	0.05
	7	Zone 7	262	1.00	100	0.03
	8	Zone 8	3,155	1.00	100	0.32
Sum/Average			30,699		100	3.07

YEAR 2050 BASE DEMAND - GROUP 1

Base Demand Rate = 100 gpd/Ha

Description	Zone Number	Zone Name	Area	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Hectare		gpd/Hectare	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_AREA_2050			
	1	Zone1	1,942	1.00	100	0.19
	2	Zone 2	10,429	1.00	100	1.04
	3	Zone 3	3,612	1.00	100	0.36
	4	Zone 4	2,139	1.00	100	0.21
	5	Zone 5	8,188	1.00	100	0.82
	6	Zone 6	501	1.00	100	0.05
	7	Zone 7	253	1.00	100	0.03
	8	Zone 8	3,111	1.00	100	0.31
Sum/Average			30,175		100	3.02

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Agriculture

LAST UPDATE: 06/02/2001
BY: TJJ

YEAR 2060 BASE DEMAND - GROUP 1

Base Demand Rate = 100 gpd/Ha

Description	Zone Number	Zone Name	Area	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Hectare		gpd/Hectare	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_AREA_2060			
	1	Zone1	1,900	1.00	100	0.19
	2	Zone 2	10,286	1.00	100	1.03
	3	Zone 3	3,552	1.00	100	0.36
	4	Zone 4	2,147	1.00	100	0.21
	5	Zone 5	7,999	1.00	100	0.80
	6	Zone 6	499	1.00	100	0.05
	7	Zone 7	245	1.00	100	0.02
	8	Zone 8	3,072	1.00	100	0.31
Sum/Average			29,700		100	2.97

GROUP 1 BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Zone 2	1.1	1.1	1.1	1.1	1.1	1.0	1.0
Zone 3	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Zone 4	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Zone 5	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Zone 6	0.1	0.1	0.1	0.1	0.1	0.1	0.0
Zone 7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 8	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Study Area Total	3.3	3.3	3.2	3.1	3.1	3.0	3.0

ZONE MODEL FOR LONG TERM FORECAST FOR
RAW WATER DEMAND AND RAW WATER CONSUMPTION

PREPARED FOR THE HANABA CANAL AUTHORITY

HARSA ENGINEERING COMPANY - CHICAGO

WORKSHEET: Demand Forecast
DATE: 01/20/07
PROJECT: Year Base Demand - Project

YEAR BASE DEMAND - PROJECT

Zone	Year	Raw Water Demand	Raw Water Consumption	Loss	Wastewater	Population
Zone 1	2007	1000	1000	0	0	1000
	2008	1050	1050	0	0	1050
	2009	1100	1100	0	0	1100
	2010	1150	1150	0	0	1150
	2011	1200	1200	0	0	1200
	2012	1250	1250	0	0	1250
	2013	1300	1300	0	0	1300
	2014	1350	1350	0	0	1350
	2015	1400	1400	0	0	1400
	2016	1450	1450	0	0	1450
Zone 2	2007	500	500	0	0	500
Zone 3	2007	300	300	0	0	300
Zone 4	2007	200	200	0	0	200
Zone 5	2007	100	100	0	0	100
Zone 6	2007	100	100	0	0	100
Zone 7	2007	100	100	0	0	100
Zone 8	2007	100	100	0	0	100
Zone 9	2007	100	100	0	0	100
Zone 10	2007	100	100	0	0	100

GROUP / BASE DEMAND SUMMARY (All values are in million gallons per day)

Zone	Year	Raw Water Demand	Raw Water Consumption	Loss	Wastewater	Population
Zone 1	2007	1000	1000	0	0	1000
Zone 2	2007	500	500	0	0	500
Zone 3	2007	300	300	0	0	300
Zone 4	2007	200	200	0	0	200
Zone 5	2007	100	100	0	0	100
Zone 6	2007	100	100	0	0	100
Zone 7	2007	100	100	0	0	100
Zone 8	2007	100	100	0	0	100
Zone 9	2007	100	100	0	0	100
Zone 10	2007	100	100	0	0	100

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Wet Industry

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 2

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	246.74	246.74	246.74	246.74	246.74	246.74	246.74
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	247	247	247	247	247	247	247
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	247	247	247	247	247	247	247
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	247	247	247	247	247	247	247
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	247	247	247	247	247	247	247
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	247	247	247	247	247	247	247
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	247	247	247	247	247	247	247
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	247	247	247	247	247	247	247
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	247	247	247	247	247	247	247

YEAR 2000 BASE DEMAND - Group 2

Base Demand Rate = 246.74 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	##	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G2_EMP_2000			
	1	Zone1	3	1.00	247	0.00
	2	Zone 2	439	1.00	247	0.11
	3	Zone 3	1,630	1.00	247	0.40
	4	Zone 4	1,707	1.00	247	0.42
	5	Zone 5	1,730	1.00	247	0.43
	6	Zone 6	991	1.00	247	0.24
	7	Zone 7	34,134	1.00	247	8.42
	8	Zone 8	14,321	1.00	247	3.53
Sum/Average			54,955		247	13.56

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Wet Industry

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 2
YEAR 2010 BASE DEMAND - Group 2**

Base Demand Rate = 246.74 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G2_EMP_2010			
	1	Zone1	4	1.00	247	0.00
	2	Zone 2	537	1.00	247	0.13
	3	Zone 3	1,991	1.00	247	0.49
	4	Zone 4	2,085	1.00	247	0.51
	5	Zone 5	2,114	1.00	247	0.52
	6	Zone 6	1,210	1.00	247	0.30
	7	Zone 7	41,695	1.00	247	10.29
	8	Zone 8	17,493	1.00	247	4.32
Sum/Average			67,128		247	16.56

YEAR 2020 BASE DEMAND - Group 2

Base Demand Rate = 246.74 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G2_EMP_2020			
	1	Zone1	4	1.00	247	0.00
	2	Zone 2	629	1.00	247	0.16
	3	Zone 3	2,334	1.00	247	0.58
	4	Zone 4	2,445	1.00	247	0.60
	5	Zone 5	2,478	1.00	247	0.61
	6	Zone 6	1,419	1.00	247	0.35
	7	Zone 7	48,875	1.00	247	12.06
	8	Zone 8	20,505	1.00	247	5.06
Sum/Average			78,689		247	19.42

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Wet Industry

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 2
YEAR 2030 BASE DEMAND - Group 2**

Base Demand Rate = 246.74 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	##.	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G2_EMP_2030			
	1	Zone1	5	1.00	247	0.00
	2	Zone 2	707	1.00	247	0.17
	3	Zone 3	2,624	1.00	247	0.65
	4	Zone 4	2,748	1.00	247	0.68
	5	Zone 5	2,786	1.00	247	0.69
	6	Zone 6	1,595	1.00	247	0.39
	7	Zone 7	54,949	1.00	247	13.56
	8	Zone 8	23,053	1.00	247	5.69
Sum/Average			88,468		247	21.83

YEAR 2040 BASE DEMAND - Group 2

Base Demand Rate = 246.74 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	##.	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G2_EMP_2040			
	1	Zone1	5	1.00	247	0.00
	2	Zone 2	778	1.00	247	0.19
	3	Zone 3	2,887	1.00	247	0.71
	4	Zone 4	3,025	1.00	247	0.75
	5	Zone 5	3,066	1.00	247	0.76
	6	Zone 6	1,755	1.00	247	0.43
	7	Zone 7	60,470	1.00	247	14.92
	8	Zone 8	25,370	1.00	247	6.26
Sum/Average			97,356		247	24.02

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Wet Industry

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 2
YEAR 2050 BASE DEMAND - Group 2

Base Demand Rate = 246.74 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G2_EMP_2050			
	1	Zone 1	6	1.00	247	0.00
	2	Zone 2	804	1.00	247	0.20
	3	Zone 3	2,984	1.00	247	0.74
	4	Zone 4	3,126	1.00	247	0.77
	5	Zone 5	3,168	1.00	247	0.78
	6	Zone 6	1,814	1.00	247	0.45
	7	Zone 7	62,492	1.00	247	15.42
	8	Zone 8	26,218	1.00	247	6.47
Sum/Average			100,611		247	24.82

YEAR 2060 BASE DEMAND - Group 2

Base Demand Rate = 246.74 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G2_EMP_2060			
	1	Zone 1	6	1.00	247	0.00
	2	Zone 2	849	1.00	247	0.21
	3	Zone 3	3,150	1.00	247	0.78
	4	Zone 4	3,300	1.00	247	0.81
	5	Zone 5	3,345	1.00	247	0.83
	6	Zone 6	1,915	1.00	247	0.47
	7	Zone 7	65,975	1.00	247	16.28
	8	Zone 8	27,679	1.00	247	6.83
Sum/Average			106,219		247	26.21

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Wet Industry

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 2

Group 2 BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Zone 3	0.4	0.5	0.6	0.6	0.7	0.7	0.8
Zone 4	0.4	0.5	0.6	0.7	0.7	0.8	0.8
Zone 5	0.4	0.5	0.6	0.7	0.8	0.8	0.8
Zone 6	0.2	0.3	0.4	0.4	0.4	0.4	0.5
Zone 7	8.4	10.3	12.1	13.6	14.9	15.4	16.3
Zone 8	3.5	4.3	5.1	5.7	6.3	6.5	6.8
Study Area Total	13.6	16.6	19.4	21.8	24.0	24.8	26.2

REPORT ON THE PROGRESS OF THE WORK DURING THE YEAR 1900

BY THE DIRECTOR OF THE BUREAU OF MINES

U. S. DEPARTMENT OF THE INTERIOR

WASHINGTON, D. C.

1901

Published by the Government Printing Office

No.	Name of the Mine	Production of Coal, in tons	Production of Anthracite, in tons	Production of Bituminous Coal, in tons	Production of Lignite, in tons	Total Production, in tons
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Other Mfg

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 3

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	124.88	124.88	124.88	124.88	124.88	124.88	124.88
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	125	125	125	125	125	125	125
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	125	125	125	125	125	125	125
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	125	125	125	125	125	125	125
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	125	125	125	125	125	125	125
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	125	125	125	125	125	125	125
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	125	125	125	125	125	125	125
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	125	125	125	125	125	125	125
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	125	125	125	125	125	125	125

YEAR 2000 BASE DEMAND - Group 3

Base Demand Rate = 124.88 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G3_EMP_2000			
	1	Zone1	3	1.00	125	0.00
	2	Zone 2	5	1.00	125	0.00
	3	Zone 3	699	1.00	125	0.09
	4	Zone 4	25	1.00	125	0.00
	5	Zone 5	174	1.00	125	0.02
	6	Zone 6	409	1.00	125	0.05
	7	Zone 7	7,745	1.00	125	0.97
	8	Zone 8	11,893	1.00	125	1.49
Sum/Average			20,952		125	2.62

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Other Mfg

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 3
YEAR 2010 BASE DEMAND - Group 3**

Base Demand Rate = 124.88 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G3_EMP_2010			
	1	Zone1	4	1.00	125	0.00
	2	Zone 2	6	1.00	125	0.00
	3	Zone 3	854	1.00	125	0.11
	4	Zone 4	30	1.00	125	0.00
	5	Zone 5	212	1.00	125	0.03
	6	Zone 6	500	1.00	125	0.06
	7	Zone 7	9,460	1.00	125	1.18
	8	Zone 8	14,527	1.00	125	1.81
Sum/Average			25,593		125	3.20

YEAR 2020 BASE DEMAND - Group 3

Base Demand Rate = 124.88 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G3_EMP_2020			
	1	Zone1	4	1.00	125	0.00
	2	Zone 2	7	1.00	125	0.00
	3	Zone 3	1,001	1.00	125	0.12
	4	Zone 4	36	1.00	125	0.00
	5	Zone 5	249	1.00	125	0.03
	6	Zone 6	586	1.00	125	0.07
	7	Zone 7	11,089	1.00	125	1.38
	8	Zone 8	17,029	1.00	125	2.13
Sum/Average			30,001		125	3.75

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Other Mfg

LAST UPDATE: 6/2/01
BY: TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 3
YEAR 2030 BASE DEMAND - Group 3**

Base Demand Rate = 124.88 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G3_EMP_2030			
	1	Zone1	5	1.00	125	0.00
	2	Zone 2	8	1.00	125	0.00
	3	Zone 3	1,125	1.00	125	0.14
	4	Zone 4	40	1.00	125	0.01
	5	Zone 5	280	1.00	125	0.03
	6	Zone 6	659	1.00	125	0.08
	7	Zone 7	12,467	1.00	125	1.56
	8	Zone 8	19,146	1.00	125	2.39
Sum/Average			33,729		125	4.21

YEAR 2040 BASE DEMAND - Group 3

Base Demand Rate = 124.88 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G3_EMP_2040			
	1	Zone1	5	1.00	125	0.00
	2	Zone 2	8	1.00	125	0.00
	3	Zone 3	1,238	1.00	125	0.15
	4	Zone 4	44	1.00	125	0.01
	5	Zone 5	308	1.00	125	0.04
	6	Zone 6	725	1.00	125	0.09
	7	Zone 7	13,720	1.00	125	1.71
	8	Zone 8	21,069	1.00	125	2.63
Sum/Average			37,118		125	4.64

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Other Mfg

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 3
YEAR 2050 BASE DEMAND - Group 3**

Base Demand Rate = 124.88 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G3_EMP_2050			
	1	Zone 1	6	1.00	125	0.00
	2	Zone 2	9	1.00	125	0.00
	3	Zone 3	1,280	1.00	125	0.16
	4	Zone 4	46	1.00	125	0.01
	5	Zone 5	318	1.00	125	0.04
	6	Zone 6	749	1.00	125	0.09
	7	Zone 7	14,179	1.00	125	1.77
	8	Zone 8	21,774	1.00	125	2.72
Sum/Average			38,359		125	4.79

YEAR 2060 BASE DEMAND - Group 3

Base Demand Rate = 124.88 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G3_EMP_2060			
	1	Zone 1	6	1.00	125	0.00
	2	Zone 2	9	1.00	125	0.00
	3	Zone 3	1,351	1.00	125	0.17
	4	Zone 4	48	1.00	125	0.01
	5	Zone 5	336	1.00	125	0.04
	6	Zone 6	791	1.00	125	0.10
	7	Zone 7	14,969	1.00	125	1.87
	8	Zone 8	22,987	1.00	125	2.87
Sum/Average			40,497		125	5.06

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Other Mfg

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 3

Group 3 BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Zone 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 6	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zone 7	1.0	1.2	1.4	1.6	1.7	1.8	1.9
Zone 8	1.5	1.8	2.1	2.4	2.6	2.7	2.9
Study Area Total	2.6	3.2	3.7	4.2	4.6	4.8	5.1

SOME MODEL FOR ESTIMATION OF COST FOR
THE WATER DELIVERY AND THE WATER QUALITY

PREPARED FOR THE WATER QUALITY

ANALYSIS REPORT FOR THE YEAR

FOR THE YEAR 2000
FOR THE YEAR 2000

BASED ON THE DATA PROVIDED

DATE: 10/10/2000

Year	Water Quality	Water Delivery	Cost	Estimate	Model	Estimate	Model
2000	100	100	100	100	100	100	100
2001	100	100	100	100	100	100	100
2002	100	100	100	100	100	100	100
2003	100	100	100	100	100	100	100
2004	100	100	100	100	100	100	100
2005	100	100	100	100	100	100	100
2006	100	100	100	100	100	100	100
2007	100	100	100	100	100	100	100
2008	100	100	100	100	100	100	100
2009	100	100	100	100	100	100	100
2010	100	100	100	100	100	100	100

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Ports

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 4

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53

YEAR 2000 BASE DEMAND - Group 4

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Weight	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Metric Tons		gpd/Metric Tons	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G4_WT_2000			
	1	Zone1	0	1.00	1	0.00
	2	Zone 2	0	1.00	1	0.00
	3	Zone 3	0	1.00	1	0.00
	4	Zone 4	0	1.00	1	0.00
	5	Zone 5	1,369,764	1.00	1	0.73
	6	Zone 6	12,327,876	1.00	1	6.53
	7	Zone 7	10,958,112	1.00	1	5.81
	8	Zone 8	2,739,528	1.00	1	1.45
Sum/Average			27,395,281		1	14.52

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Ports

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 4
YEAR 2010 BASE DEMAND - Group 4**

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Weight	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Metric Tons		gpd/Metric Tons	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G4_WT_2010			
	1	Zone1	0	1.00	1	0.00
	2	Zone 2	0	1.00	1	0.00
	3	Zone 3	0	1.00	1	0.00
	4	Zone 4	0	1.00	1	0.00
	5	Zone 5	1,811,513	1.00	1	0.96
	6	Zone 6	16,303,616	1.00	1	8.64
	7	Zone 7	14,492,103	1.00	1	7.68
	8	Zone 8	3,623,026	1.00	1	1.92
Sum/Average			36,230,259		1	19.20

YEAR 2020 BASE DEMAND - Group 4

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Weight	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Metric Tons		gpd/Metric Tons	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G4_WT_2020			
	1	Zone1	0	1.00	1	0.00
	2	Zone 2	0	1.00	1	0.00
	3	Zone 3	0	1.00	1	0.00
	4	Zone 4	0	1.00	1	0.00
	5	Zone 5	2,395,726	1.00	1	1.27
	6	Zone 6	21,561,533	1.00	1	11.43
	7	Zone 7	19,165,807	1.00	1	10.16
	8	Zone 8	4,791,452	1.00	1	2.54
Sum/Average			47,914,517		1	25.39

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Ports

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 4
YEAR 2030 BASE DEMAND - Group 4**

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Weight	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Metric Tons		gpd/Metric Tons	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G4_WT_2030			
	1	Zone1	0	1.00	1	0.00
	2	Zone 2	0	1.00	1	0.00
	3	Zone 3	0	1.00	1	0.00
	4	Zone 4	0	1.00	1	0.00
	5	Zone 5	3,168,347	1.00	1	1.68
	6	Zone 6	28,515,127	1.00	1	15.11
	7	Zone 7	25,346,780	1.00	1	13.43
	8	Zone 8	6,336,695	1.00	1	3.36
Sum/Average			63,366,949		1	33.58

YEAR 2040 BASE DEMAND - Group 4

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Weight	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Metric Tons		gpd/Metric Tons	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G4_WT_2040			
	1	Zone1	0	1.00	1	0.00
	2	Zone 2	0	1.00	1	0.00
	3	Zone 3	0	1.00	1	0.00
	4	Zone 4	0	1.00	1	0.00
	5	Zone 5	4,190,139	1.00	1	2.22
	6	Zone 6	37,711,255	1.00	1	19.99
	7	Zone 7	33,521,116	1.00	1	17.77
	8	Zone 8	8,380,279	1.00	1	4.44
Sum/Average			83,802,790		1	44.42

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Ports

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 4
YEAR 2050 BASE DEMAND - Group 4**

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Weight	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Metric Tons		gpd/Metric Tons	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G4_WT_2050			
	1	Zone1	0	1.00	1	0.00
	2	Zone 2	0	1.00	1	0.00
	3	Zone 3	0	1.00	1	0.00
	4	Zone 4	0	1.00	1	0.00
	5	Zone 5	5,541,459	1.00	1	2.94
	6	Zone 6	49,873,135	1.00	1	26.43
	7	Zone 7	44,331,676	1.00	1	23.50
	8	Zone 8	11,082,919	1.00	1	5.87
Sum/Average			110,829,190		1	58.74

YEAR 2060 BASE DEMAND - Group 4

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Weight	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Metric Tons		gpd/Metric Tons	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G4_WT_2060			
	1	Zone1	0	1.00	1	0.00
	2	Zone 2	0	1.00	1	0.00
	3	Zone 3	0	1.00	1	0.00
	4	Zone 4	0	1.00	1	0.00
	5	Zone 5	7,328,580	1.00	1	3.88
	6	Zone 6	65,957,222	1.00	1	34.96
	7	Zone 7	58,628,641	1.00	1	31.07
	8	Zone 8	14,657,160	1.00	1	7.77
Sum/Average			146,571,603		1	77.68

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Ports

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 4

Group 4 BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 5	0.7	1.0	1.3	1.7	2.2	2.9	3.9
Zone 6	6.5	8.6	11.4	15.1	20.0	26.4	35.0
Zone 7	5.8	7.7	10.2	13.4	17.8	23.5	31.1
Zone 8	1.5	1.9	2.5	3.4	4.4	5.9	7.8
Study Area Total	14.5	19.2	25.4	33.6	44.4	58.7	77.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Utilities

LAST UPDATE:
BY:

6/2/01
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BASE DEMAND RATE AND ZONE FACTORS - Group 5

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	51.86	51.86	51.86	51.86	51.86	51.86	51.86
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	52	52	52	52	52	52	52
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	52	52	52	52	52	52	52
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	52	52	52	52	52	52	52
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	52	52	52	52	52	52	52
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	52	52	52	52	52	52	52
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	52	52	52	52	52	52	52
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	52	52	52	52	52	52	52
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	52	52	52	52	52	52	52

YEAR 2000 BASE DEMAND - Group 5

Base Demand Rate = 51.86 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G5_EMP_2000			
	1	Zone1	113	1.00	52	0.01
	2	Zone 2	181	1.00	52	0.01
	3	Zone 3	1,437	1.00	52	0.07
	4	Zone 4	1,134	1.00	52	0.06
	5	Zone 5	1,183	1.00	52	0.06
	6	Zone 6	1,061	1.00	52	0.06
	7	Zone 7	2,637	1.00	52	0.14
	8	Zone 8	5,098	1.00	52	0.26
Sum/Average			12,845		52	0.67

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Utilities

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 5
YEAR 2010 BASE DEMAND - Group 5

Base Demand Rate = 51.86 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G5_EMP_2010			
	1	Zone 1	138	1.00	52	0.01
	2	Zone 2	221	1.00	52	0.01
	3	Zone 3	1,755	1.00	52	0.09
	4	Zone 4	1,385	1.00	52	0.07
	5	Zone 5	1,446	1.00	52	0.07
	6	Zone 6	1,297	1.00	52	0.07
	7	Zone 7	3,221	1.00	52	0.17
	8	Zone 8	6,228	1.00	52	0.32
Sum/Average			15,690		52	0.81

YEAR 2020 BASE DEMAND - Group 5

Base Demand Rate = 51.86 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G5_EMP_2020			
	1	Zone 1	162	1.00	52	0.01
	2	Zone 2	259	1.00	52	0.01
	3	Zone 3	2,058	1.00	52	0.11
	4	Zone 4	1,623	1.00	52	0.08
	5	Zone 5	1,695	1.00	52	0.09
	6	Zone 6	1,520	1.00	52	0.08
	7	Zone 7	3,776	1.00	52	0.20
	8	Zone 8	7,300	1.00	52	0.38
Sum/Average			18,392		52	0.95

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Utilities

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 5
YEAR 2030 BASE DEMAND - Group 5**

Base Demand Rate = 51.86 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G5_EMP_2030			
	1	Zone1	182	1.00	52	0.01
	2	Zone 2	291	1.00	52	0.02
	3	Zone 3	2,313	1.00	52	0.12
	4	Zone 4	1,825	1.00	52	0.09
	5	Zone 5	1,905	1.00	52	0.10
	6	Zone 6	1,709	1.00	52	0.09
	7	Zone 7	4,245	1.00	52	0.22
	8	Zone 8	8,207	1.00	52	0.43
Sum/Average			20,678		52	1.07

YEAR 2040 BASE DEMAND - Group 5

Base Demand Rate = 51.86 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G5_EMP_2040			
	1	Zone1	200	1.00	52	0.01
	2	Zone 2	320	1.00	52	0.02
	3	Zone 3	2,546	1.00	52	0.13
	4	Zone 4	2,008	1.00	52	0.10
	5	Zone 5	2,097	1.00	52	0.11
	6	Zone 6	1,880	1.00	52	0.10
	7	Zone 7	4,672	1.00	52	0.24
	8	Zone 8	9,032	1.00	52	0.47
Sum/Average			22,755		52	1.18

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Utilities

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 5
YEAR 2050 BASE DEMAND - Group 5

Base Demand Rate = 51.86 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G5_EMP_2050			
	1	Zone1	207	1.00	52	0.01
	2	Zone 2	331	1.00	52	0.02
	3	Zone 3	2,631	1.00	52	0.14
	4	Zone 4	2,075	1.00	52	0.11
	5	Zone 5	2,167	1.00	52	0.11
	6	Zone 6	1,943	1.00	52	0.10
	7	Zone 7	4,828	1.00	52	0.25
	8	Zone 8	9,334	1.00	52	0.48
Sum/Average			23,516		52	1.22

YEAR 2060 BASE DEMAND - Group 5

Base Demand Rate = 51.86 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G5_EMP_2060			
	1	Zone1	218	1.00	52	0.01
	2	Zone 2	349	1.00	52	0.02
	3	Zone 3	2,777	1.00	52	0.14
	4	Zone 4	2,191	1.00	52	0.11
	5	Zone 5	2,287	1.00	52	0.12
	6	Zone 6	2,052	1.00	52	0.11
	7	Zone 7	5,097	1.00	52	0.26
	8	Zone 8	9,854	1.00	52	0.51
Sum/Average			24,827		52	1.29

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Utilities

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 5
Group 5 BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zone 4	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zone 5	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zone 6	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zone 7	0.1	0.2	0.2	0.2	0.2	0.3	0.3
Zone 8	0.3	0.3	0.4	0.4	0.5	0.5	0.5
Study Area Total	0.7	0.8	1.0	1.1	1.2	1.2	1.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Fab Const

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 6

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	5775.97	5775.97	5775.97	5775.97	5775.97	5775.97	5775.97
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	5776	5776	5776	5776	5776	5776	5776
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	5776	5776	5776	5776	5776	5776	5776
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	5776	5776	5776	5776	5776	5776	5776
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	5776	5776	5776	5776	5776	5776	5776
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	5776	5776	5776	5776	5776	5776	5776
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	5776	5776	5776	5776	5776	5776	5776
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	5776	5776	5776	5776	5776	5776	5776
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	5776	5776	5776	5776	5776	5776	5776

YEAR 2000 BASE DEMAND - Group 6

Base Demand Rate = 5775.97 gpcd

Description	Zone Number	Zone Name	Value Added	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Real	real	real	real
Display	#	text	#. #	#. ##	###	###. #
Unit		1000 1982 Balboas			gpd/1000 1982 Balboas	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_VA_2000			
	1	Zone1	3	1.00	5,776	0.02
	2	Zone 2	5	1.00	5,776	0.03
	3	Zone 3	18	1.00	5,776	0.11
	4	Zone 4	33	1.00	5,776	0.19
	5	Zone 5	36	1.00	5,776	0.21
	6	Zone 6	33	1.00	5,776	0.19
	7	Zone 7	164	1.00	5,776	0.95
	8	Zone 8	173	1.00	5,776	1.00
Sum/Average			466		5776	2.69

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Fab Const

LAST UPDATE: 6/2/01
BY: TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 6
YEAR 2010 BASE DEMAND - Group 6

Base Demand Rate = 5775.97 gpcd

Description	Zone Number	Zone Name	Value Added	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Real	real	real	real
Display	#	text	##	###	###	###.#
Unit			1000 1982 Balboas		gpd/1000 1982 Balboas	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_VA_2010			
	1	Zone1	4	1.00	5,776	0.03
	2	Zone 2	7	1.00	5,776	0.04
	3	Zone 3	25	1.00	5,776	0.14
	4	Zone 4	45	1.00	5,776	0.26
	5	Zone 5	48	1.00	5,776	0.28
	6	Zone 6	44	1.00	5,776	0.26
	7	Zone 7	223	1.00	5,776	1.29
	8	Zone 8	235	1.00	5,776	1.36
Sum/Average			632		5776	3.65

YEAR 2020 BASE DEMAND - Group 6

Base Demand Rate = 5775.97 gpcd

Description	Zone Number	Zone Name	Value Added	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Real	real	real	real
Display	#	text	##	###	###	###.#
Unit			1000 1982 Balboas		gpd/1000 1982 Balboas	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_VA_2020			
	1	Zone1	6	1.00	5,776	0.03
	2	Zone 2	9	1.00	5,776	0.05
	3	Zone 3	32	1.00	5,776	0.19
	4	Zone 4	59	1.00	5,776	0.34
	5	Zone 5	63	1.00	5,776	0.36
	6	Zone 6	58	1.00	5,776	0.33
	7	Zone 7	291	1.00	5,776	1.68
	8	Zone 8	307	1.00	5,776	1.77
Sum/Average			824		5776	4.76

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Fab Const

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 6
YEAR 2030 BASE DEMAND - Group 6

Base Demand Rate = 5775.97 gpcd

Description	Zone Number	Zone Name	Value Added	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Real	real	real	real
Display	#	text	#. #	#. ##	###	###. #
Unit		1000 1982 Balboas			gpd/1000 1982 Balboas	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NA ME	Z_G1_VA_2030			
	1	Zone1	7	1.00	5,776	0.04
	2	Zone 2	12	1.00	5,776	0.07
	3	Zone 3	40	1.00	5,776	0.23
	4	Zone 4	74	1.00	5,776	0.43
	5	Zone 5	79	1.00	5,776	0.46
	6	Zone 6	72	1.00	5,776	0.42
	7	Zone 7	363	1.00	5,776	2.10
	8	Zone 8	383	1.00	5,776	2.21
Sum/Average			1,030		5776	5.95

YEAR 2040 BASE DEMAND - Group 6

Base Demand Rate = 5775.97 gpcd

Description	Zone Number	Zone Name	Value Added	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Real	real	real	real
Display	#	text	#. #	#. ##	###	###. #
Unit		1000 1982 Balboas			gpd/1000 1982 Balboas	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NA ME	Z_G1_VA_2040			
	1	Zone1	9	1.00	5,776	0.05
	2	Zone 2	14	1.00	5,776	0.08
	3	Zone 3	49	1.00	5,776	0.28
	4	Zone 4	90	1.00	5,776	0.52
	5	Zone 5	96	1.00	5,776	0.56
	6	Zone 6	88	1.00	5,776	0.51
	7	Zone 7	444	1.00	5,776	2.57
	8	Zone 8	469	1.00	5,776	2.71
Sum/Average			1,260		5776	7.28

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Fab Const

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 6
YEAR 2050 BASE DEMAND - Group 6**

Base Demand Rate = 5775.97 gpcd

Description	Zone Number	Zone Name	Value Added	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Real	real	real	real
Display	#	text	##	###	###	###.#
Unit			1000 1982 Balboas		gpd/1000 1982 Balboas	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_VA_2050			
	1	Zone1	10	1.00	5,776	0.06
	2	Zone 2	16	1.00	5,776	0.09
	3	Zone 3	57	1.00	5,776	0.33
	4	Zone 4	103	1.00	5,776	0.60
	5	Zone 5	111	1.00	5,776	0.64
	6	Zone 6	101	1.00	5,776	0.58
	7	Zone 7	511	1.00	5,776	2.95
	8	Zone 8	538	1.00	5,776	3.11
Sum/Average			1,447		5776	8.36

YEAR 2060 BASE DEMAND - Group 6

Base Demand Rate = 5775.97 gpcd

Description	Zone Number	Zone Name	Value Added	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Real	real	real	real
Display	#	text	##	###	###	###.#
Unit			1000 1982 Balboas		gpd/1000 1982 Balboas	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G1_VA_2060			
	1	Zone1	12	1.00	5,776	0.07
	2	Zone 2	19	1.00	5,776	0.11
	3	Zone 3	66	1.00	5,776	0.38
	4	Zone 4	121	1.00	5,776	0.70
	5	Zone 5	130	1.00	5,776	0.75
	6	Zone 6	118	1.00	5,776	0.68
	7	Zone 7	599	1.00	5,776	3.46
	8	Zone 8	631	1.00	5,776	3.64
Sum/Average			1,697		5776	9.80

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Fab Const

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 6
Group 6 BASE DEMAND SUMMARY (All values are in millions of gallons per day)**

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Zone 2	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Zone 3	0.1	0.1	0.2	0.2	0.3	0.3	0.4
Zone 4	0.2	0.3	0.3	0.4	0.5	0.6	0.7
Zone 5	0.2	0.3	0.4	0.5	0.6	0.6	0.8
Zone 6	0.2	0.3	0.3	0.4	0.5	0.6	0.7
Zone 7	0.9	1.3	1.7	2.1	2.6	2.9	3.5
Zone 8	1.0	1.4	1.8	2.2	2.7	3.1	3.6
Study Area Total	2.7	3.7	4.8	5.9	7.3	8.4	9.8

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: RetailOffice

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - GROUP 7

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	7.41	7.41	7.41	7.41	7.41	7.41	7.41
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	7	7	7	7	7	7	7
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	7	7	7	7	7	7	7
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	7	7	7	7	7	7	7
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	7	7	7	7	7	7	7
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	7	7	7	7	7	7	7
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	7	7	7	7	7	7	7
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	7	7	7	7	7	7	7
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	7	7	7	7	7	7	7

YEAR 2000 BASE DEMAND - Group 7

Base Demand Rate = 7.41 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8A_EMP_2000			
	1	Zone1	511	1.00	7	0.00
	2	Zone 2	2,736	1.00	7	0.02
	3	Zone 3	3,580	1.00	7	0.03
	4	Zone 4	5,248	1.00	7	0.04
	5	Zone 5	16,452	1.00	7	0.12
	6	Zone 6	45,011	1.00	7	0.33
	7	Zone 7	386,600	1.00	7	2.86
	8	Zone 8	52,060	1.00	7	0.39
Sum/Average			512,197		7	3.80

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: RetailOffice

LAST UPDATE: 6/2/01
BY: TJJ

**BASE DEMAND RATE AND ZONE FACTORS - GROUP 7
YEAR 2010 BASE DEMAND - Group 7**

Base Demand Rate = 7.41 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8A_EMP_2010			
	1	Zone1	624	1.00	7	0.00
	2	Zone 2	3,342	1.00	7	0.02
	3	Zone 3	4,374	1.00	7	0.03
	4	Zone 4	6,410	1.00	7	0.05
	5	Zone 5	20,096	1.00	7	0.15
	6	Zone 6	54,981	1.00	7	0.41
	7	Zone 7	472,234	1.00	7	3.50
	8	Zone 8	63,591	1.00	7	0.47
Sum/Average			625,652		7	4.64

YEAR 2020 BASE DEMAND - Group 7

Base Demand Rate = 7.41 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8A_EMP_2020			
	1	Zone1	732	1.00	7	0.01
	2	Zone 2	3,918	1.00	7	0.03
	3	Zone 3	5,127	1.00	7	0.04
	4	Zone 4	7,514	1.00	7	0.06
	5	Zone 5	23,557	1.00	7	0.17
	6	Zone 6	64,449	1.00	7	0.48
	7	Zone 7	553,561	1.00	7	4.10
	8	Zone 8	74,543	1.00	7	0.55
Sum/Average			733,400		7	5.43

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: RetailOffice

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - GROUP 7
YEAR 2030 BASE DEMAND - Group 7**

Base Demand Rate = 7.41 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8A_EMP_2030			
	1	Zone1	822	1.00	7	0.01
	2	Zone 2	4,405	1.00	7	0.03
	3	Zone 3	5,764	1.00	7	0.04
	4	Zone 4	8,448	1.00	7	0.06
	5	Zone 5	26,484	1.00	7	0.20
	6	Zone 6	72,459	1.00	7	0.54
	7	Zone 7	622,353	1.00	7	4.61
	8	Zone 8	83,806	1.00	7	0.62
Sum/Average			824,541		7	6.11

YEAR 2040 BASE DEMAND - Group 7

Base Demand Rate = 7.41 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8A_EMP_2040			
	1	Zone1	905	1.00	7	0.01
	2	Zone 2	4,847	1.00	7	0.04
	3	Zone 3	6,343	1.00	7	0.05
	4	Zone 4	9,297	1.00	7	0.07
	5	Zone 5	29,145	1.00	7	0.22
	6	Zone 6	79,739	1.00	7	0.59
	7	Zone 7	684,882	1.00	7	5.07
	8	Zone 8	92,227	1.00	7	0.68
Sum/Average			907,385		7	6.72

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: RetailOffice

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - GROUP 7
YEAR 2050 BASE DEMAND - Group 7

Base Demand Rate = 7.41 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8A_EMP_2050			
	1	Zone 1	935	1.00	7	0.01
	2	Zone 2	5,009	1.00	7	0.04
	3	Zone 3	6,555	1.00	7	0.05
	4	Zone 4	9,608	1.00	7	0.07
	5	Zone 5	30,120	1.00	7	0.22
	6	Zone 6	82,405	1.00	7	0.61
	7	Zone 7	707,782	1.00	7	5.24
	8	Zone 8	95,310	1.00	7	0.71
Sum/Average			937,725		7	6.95

YEAR 2060 BASE DEMAND - Group 7

Base Demand Rate = 7.41 gpcd

Description	Zone Number	Zone Name	Employees	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Employees		gpd/Employees	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8A_EMP_2060			
	1	Zone 1	987	1.00	7	0.01
	2	Zone 2	5,289	1.00	7	0.04
	3	Zone 3	6,920	1.00	7	0.05
	4	Zone 4	10,144	1.00	7	0.08
	5	Zone 5	31,798	1.00	7	0.24
	6	Zone 6	86,998	1.00	7	0.64
	7	Zone 7	747,231	1.00	7	5.54
	8	Zone 8	100,622	1.00	7	0.75
Sum/Average			989,989		7	7.34

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: RetailOffice

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - GROUP 7
Group 7 BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Zone 4	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Zone 5	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Zone 6	0.3	0.4	0.5	0.5	0.6	0.6	0.6
Zone 7	2.9	3.5	4.1	4.6	5.1	5.2	5.5
Zone 8	0.4	0.5	0.6	0.6	0.7	0.7	0.7
Study Area Total	3.8	4.6	5.4	6.1	6.7	6.9	7.3

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**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Schools

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 8

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	6.19	6.19	6.19	6.19	6.19	6.19	6.19
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	6	6	6	6	6	6	6
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	6	6	6	6	6	6	6
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	6	6	6	6	6	6	6
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	6	6	6	6	6	6	6
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	6	6	6	6	6	6	6
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	6	6	6	6	6	6	6
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	6	6	6	6	6	6	6
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	6	6	6	6	6	6	6

YEAR 2000 BASE DEMAND - Group 8

Base Demand Rate = 6.19 gpcd

Description	Zone Number	Zone Name	Students	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Students		gpd/Students	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8B_STU_2000			
	1	Zone1	4,043	1.00	6	0.03
	2	Zone 2	6,471	1.00	6	0.04
	3	Zone 3	22,428	1.00	6	0.14
	4	Zone 4	40,535	1.00	6	0.25
	5	Zone 5	42,318	1.00	6	0.26
	6	Zone 6	41,401	1.00	6	0.26
	7	Zone 7	112,839	1.00	6	0.70
	8	Zone 8	218,753	1.00	6	1.35
Sum/Average			488,787		6	3.03

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Schools

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 8
YEAR 2010 BASE DEMAND - Group 8**

Base Demand Rate = 6.19 gpcd

Description	Zone Number	Zone Name	Students	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Students		gpd/Students	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8B_STU_2010			
	1	Zone1	4,641	1.00	6	0.03
	2	Zone 2	8,080	1.00	6	0.05
	3	Zone 3	28,442	1.00	6	0.18
	4	Zone 4	64,579	1.00	6	0.40
	5	Zone 5	49,605	1.00	6	0.31
	6	Zone 6	44,936	1.00	6	0.28
	7	Zone 7	116,670	1.00	6	0.72
	8	Zone 8	252,205	1.00	6	1.56
Sum/Average			569,158		6	3.52

YEAR 2020 BASE DEMAND - Group 8

Base Demand Rate = 6.19 gpcd

Description	Zone Number	Zone Name	Students	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Students		gpd/Students	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8B_STU_2020			
	1	Zone1	5,052	1.00	6	0.03
	2	Zone 2	8,992	1.00	6	0.06
	3	Zone 3	31,570	1.00	6	0.20
	4	Zone 4	76,882	1.00	6	0.48
	5	Zone 5	54,096	1.00	6	0.33
	6	Zone 6	47,978	1.00	6	0.30
	7	Zone 7	125,229	1.00	6	0.78
	8	Zone 8	271,603	1.00	6	1.68
Sum/Average			621,401		6	3.85

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Schools

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 8
YEAR 2030 BASE DEMAND - Group 8**

Base Demand Rate = 6.19 gpcd

Description	Zone Number	Zone Name	Students	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	##	###	###.#
Unit			Students		gpd/Students	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8B_STU_2030			
	1	Zone1	5,434	1.00	6	0.03
	2	Zone 2	9,750	1.00	6	0.06
	3	Zone 3	34,132	1.00	6	0.21
	4	Zone 4	86,560	1.00	6	0.54
	5	Zone 5	57,935	1.00	6	0.36
	6	Zone 6	50,913	1.00	6	0.32
	7	Zone 7	133,927	1.00	6	0.83
	8	Zone 8	287,059	1.00	6	1.78
Sum/Average			665,710		6	4.12

YEAR 2040 BASE DEMAND - Group 8

Base Demand Rate = 6.19 gpcd

Description	Zone Number	Zone Name	Students	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	##	###	###.#
Unit			Students		gpd/Students	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8B_STU_2040			
	1	Zone1	5,789	1.00	6	0.04
	2	Zone 2	10,359	1.00	6	0.06
	3	Zone 3	36,095	1.00	6	0.22
	4	Zone 4	92,479	1.00	6	0.57
	5	Zone 5	61,219	1.00	6	0.38
	6	Zone 6	53,805	1.00	6	0.33
	7	Zone 7	143,553	1.00	6	0.89
	8	Zone 8	299,797	1.00	6	1.86
Sum/Average			703,095		6	4.35

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Schools

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - Group 8
YEAR 2050 BASE DEMAND - Group 8**

Base Demand Rate = 6.19 gpcd

Description	Zone Number	Zone Name	Students	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Students		gpd/Students	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8B_STU_2050			
	1	Zone1	6,053	1.00	6	0.04
	2	Zone 2	10,836	1.00	6	0.07
	3	Zone 3	37,550	1.00	6	0.23
	4	Zone 4	96,708	1.00	6	0.60
	5	Zone 5	63,698	1.00	6	0.39
	6	Zone 6	55,987	1.00	6	0.35
	7	Zone 7	151,063	1.00	6	0.94
	8	Zone 8	308,971	1.00	6	1.91
Sum/Average			730,866		6	4.52

YEAR 2060 BASE DEMAND - Group 8

Base Demand Rate = 6.19 gpcd

Description	Zone Number	Zone Name	Students	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Students		gpd/Students	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8B_STU_2060			
	1	Zone1	6,257	1.00	6	0.04
	2	Zone 2	11,211	1.00	6	0.07
	3	Zone 3	38,860	1.00	6	0.24
	4	Zone 4	100,296	1.00	6	0.62
	5	Zone 5	65,862	1.00	6	0.41
	6	Zone 6	57,845	1.00	6	0.36
	7	Zone 7	155,960	1.00	6	0.97
	8	Zone 8	319,443	1.00	6	1.98
Sum/Average			755,734		6	4.68

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Schools

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 8
Group 8 BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Zone 3	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Zone 4	0.3	0.4	0.5	0.5	0.6	0.6	0.6
Zone 5	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Zone 6	0.3	0.3	0.3	0.3	0.3	0.3	0.4
Zone 7	0.7	0.7	0.8	0.8	0.9	0.9	1.0
Zone 8	1.4	1.6	1.7	1.8	1.9	1.9	2.0
Study Area Total	3.0	3.5	3.8	4.1	4.4	4.5	4.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Hospitals

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - GROUP 9

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	140.7	140.7	140.7	140.7	140.7	140.7	140.7
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	141	141	141	141	141	141	141
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	141	141	141	141	141	141	141
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	141	141	141	141	141	141	141
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	141	141	141	141	141	141	141
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	141	141	141	141	141	141	141
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	141	141	141	141	141	141	141
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	141	141	141	141	141	141	141
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	141	141	141	141	141	141	141

YEAR 2000 BASE DEMAND - Group 9

Base Demand Rate = 140.7 gpcd

Description	Zone Number	Zone Name	Beds	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Beds		gpd/Beds	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8C_BED_2000			
	1	Zone1	22	1.00	141	0.00
	2	Zone 2	37	1.00	141	0.01
	3	Zone 3	137	1.00	141	0.02
	4	Zone 4	263	1.00	141	0.04
	5	Zone 5	335	1.00	141	0.05
	6	Zone 6	369	1.00	141	0.05
	7	Zone 7	1,320	1.00	141	0.19
	8	Zone 8	2,428	1.00	141	0.34
Sum/Average			4,911		141	0.69

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Hospitals

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - GROUP 9
YEAR 2010 BASE DEMAND - Group 9

Base Demand Rate = 140.7 gpcd

Description	Zone Number	Zone Name	Beds	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Beds		gpd/Beds	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8C_BED_2010			
	1	Zone1	25	1.00	141	0.00
	2	Zone 2	47	1.00	141	0.01
	3	Zone 3	174	1.00	141	0.02
	4	Zone 4	418	1.00	141	0.06
	5	Zone 5	393	1.00	141	0.06
	6	Zone 6	400	1.00	141	0.06
	7	Zone 7	1,365	1.00	141	0.19
	8	Zone 8	2,799	1.00	141	0.39
Sum/Average			5,622		141	0.79

YEAR 2020 BASE DEMAND - Group 9

Base Demand Rate = 140.7 gpcd

Description	Zone Number	Zone Name	Beds	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Beds		gpd/Beds	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8C_BED_2020			
	1	Zone1	27	1.00	141	0.00
	2	Zone 2	52	1.00	141	0.01
	3	Zone 3	193	1.00	141	0.03
	4	Zone 4	498	1.00	141	0.07
	5	Zone 5	428	1.00	141	0.06
	6	Zone 6	427	1.00	141	0.06
	7	Zone 7	1,465	1.00	141	0.21
	8	Zone 8	3,015	1.00	141	0.42
Sum/Average			6,106		141	0.86

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Hospitals

LAST UPDATE: 6/2/01
BY: TJJ

BASE DEMAND RATE AND ZONE FACTORS - GROUP 9
YEAR 2030 BASE DEMAND - Group 9

Base Demand Rate = 140.7 gpcd

Description	Zone Number	Zone Name	Beds	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Beds		gpd/Beds	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8C_BED_2030			
	1	Zone1	29	1.00	141	0.00
	2	Zone 2	56	1.00	141	0.01
	3	Zone 3	209	1.00	141	0.03
	4	Zone 4	561	1.00	141	0.08
	5	Zone 5	459	1.00	141	0.06
	6	Zone 6	454	1.00	141	0.06
	7	Zone 7	1,567	1.00	141	0.22
	8	Zone 8	3,186	1.00	141	0.45
Sum/Average			6,521		141	0.92

YEAR 2040 BASE DEMAND - Group 9

Base Demand Rate = 140.7 gpcd

Description	Zone Number	Zone Name	Beds	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Beds		gpd/Beds	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8C_BED_2040			
	1	Zone1	31	1.00	141	0.00
	2	Zone 2	60	1.00	141	0.01
	3	Zone 3	221	1.00	141	0.03
	4	Zone 4	599	1.00	141	0.08
	5	Zone 5	485	1.00	141	0.07
	6	Zone 6	479	1.00	141	0.07
	7	Zone 7	1,680	1.00	141	0.24
	8	Zone 8	3,328	1.00	141	0.47
Sum/Average			6,883		141	0.97

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Hospitals

LAST UPDATE:
BY:

6/2/01
TJJ

**BASE DEMAND RATE AND ZONE FACTORS - GROUP 9
YEAR 2050 BASE DEMAND - Group 9**

Base Demand Rate = 140.7 gpcd

Description	Zone Number	Zone Name	Beds	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Beds		gpd/Beds	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8C_BED_2050			
	1	Zone1	33	1.00	141	0.00
	2	Zone 2	62	1.00	141	0.01
	3	Zone 3	230	1.00	141	0.03
	4	Zone 4	627	1.00	141	0.09
	5	Zone 5	504	1.00	141	0.07
	6	Zone 6	499	1.00	141	0.07
	7	Zone 7	1,767	1.00	141	0.25
	8	Zone 8	3,430	1.00	141	0.48
Sum/Average			7,152		141	1.01

YEAR 2060 BASE DEMAND - Group 9

Base Demand Rate = 140.7 gpcd

Description	Zone Number	Zone Name	Beds	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Beds		gpd/Beds	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G8C_BED_2060			
	1	Zone1	34	1.00	141	0.00
	2	Zone 2	65	1.00	141	0.01
	3	Zone 3	238	1.00	141	0.03
	4	Zone 4	650	1.00	141	0.09
	5	Zone 5	522	1.00	141	0.07
	6	Zone 6	515	1.00	141	0.07
	7	Zone 7	1,825	1.00	141	0.26
	8	Zone 8	3,546	1.00	141	0.50
Sum/Average			7,394		141	1.04

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Hospitals

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - GROUP 9
Group 9 BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Zone 5	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Zone 6	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zone 7	0.2	0.2	0.2	0.2	0.2	0.2	0.3
Zone 8	0.3	0.4	0.4	0.4	0.5	0.5	0.5
Study Area Total	0.7	0.8	0.9	0.9	1.0	1.0	1.0

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Tourism

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 10

	2000	2010	2020	2030	2040	2050	2060
Base Water Demand Rate (gpd/unit)	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Urban Activity Demand Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zone 1 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 1 Demand Rate (gpd/unit)	1	1	1	1	1	1	1
Zone 2 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 2 Demand Rate (gpd/unit)	1	1	1	1	1	1	1
Zone 3 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 3 Demand Rate (gpd/unit)	1	1	1	1	1	1	1
Zone 4 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 4 Demand Rate (gpd/unit)	1	1	1	1	1	1	1
Zone 5 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 5 Demand Rate (gpd/unit)	1	1	1	1	1	1	1
Zone 6 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 6 Demand Rate (gpd/unit)	1	1	1	1	1	1	1
Zone 7 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 7 Demand Rate (gpd/unit)	1	1	1	1	1	1	1
Zone 8 Percent Urban Activity	100%	100%	100%	100%	100%	100%	100%
Zone 8 Demand Rate (gpd/unit)	1	1	1	1	1	1	1

YEAR 2000 BASE DEMAND - Group 10

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Guests	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Guests		gpd/Guests	mgd
Comment	input (locked)	input (locked)	Input	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G9_GST_2000			
	1	Zone1	1,899	1.00	1	0.00
	2	Zone 2	3,038	1.00	1	0.00
	3	Zone 3	45,636	1.00	1	0.02
	4	Zone 4	95,169	1.00	1	0.05
	5	Zone 5	139,097	1.00	1	0.07
	6	Zone 6	106,923	1.00	1	0.06
	7	Zone 7	515,133	1.00	1	0.27
	8	Zone 8	256,797	1.00	1	0.14
Sum/Average			1,163,691		1	0.62

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Tourism

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 10
YEAR 2010 BASE DEMAND - Group 10

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Guests	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Guests		gpd/Guests	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G9_GST_2010			
	1	Zone1	2,278	1.00	1	0.00
	2	Zone 2	4,221	1.00	1	0.00
	3	Zone 3	60,844	1.00	1	0.03
	4	Zone 4	158,482	1.00	1	0.08
	5	Zone 5	167,481	1.00	1	0.09
	6	Zone 6	131,223	1.00	1	0.07
	7	Zone 7	598,886	1.00	1	0.32
	8	Zone 8	316,891	1.00	1	0.17
Sum/Average			1,440,306		1	0.76

YEAR 2020 BASE DEMAND - Group 10

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Guests	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Guests		gpd/Guests	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G9_GST_2020			
	1	Zone1	2,592	1.00	1	0.00
	2	Zone 2	5,226	1.00	1	0.00
	3	Zone 3	71,003	1.00	1	0.04
	4	Zone 4	197,212	1.00	1	0.10
	5	Zone 5	187,609	1.00	1	0.10
	6	Zone 6	158,419	1.00	1	0.08
	7	Zone 7	722,787	1.00	1	0.38
	8	Zone 8	365,269	1.00	1	0.19
Sum/Average			1,710,116		1	0.91

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Tourism

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 10
YEAR 2030 BASE DEMAND - Group 10

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Guests	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Guests		gpd/Guests	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G9_GST_2030			
	1	Zone1	2,914	1.00	1	0.00
	2	Zone 2	6,304	1.00	1	0.00
	3	Zone 3	80,706	1.00	1	0.04
	4	Zone 4	232,084	1.00	1	0.12
	5	Zone 5	206,388	1.00	1	0.11
	6	Zone 6	190,082	1.00	1	0.10
	7	Zone 7	869,154	1.00	1	0.46
	8	Zone 8	413,209	1.00	1	0.22
Sum/Average			2,000,841		1	1.06

YEAR 2040 BASE DEMAND - Group 10

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Guests	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Guests		gpd/Guests	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G9_GST_2040			
	1	Zone1	3,245	1.00	1	0.00
	2	Zone 2	7,452	1.00	1	0.00
	3	Zone 3	89,729	1.00	1	0.05
	4	Zone 4	259,175	1.00	1	0.14
	5	Zone 5	224,014	1.00	1	0.12
	6	Zone 6	227,139	1.00	1	0.12
	7	Zone 7	1,047,519	1.00	1	0.56
	8	Zone 8	461,899	1.00	1	0.24
Sum/Average			2,320,171		1	1.23

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Tourism

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 10
YEAR 2050 BASE DEMAND - Group 10

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Guests	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Guests		gpd/Guests	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G9_GST_2050			
	1	Zone 1	3,546	1.00	1	0.00
	2	Zone 2	8,672	1.00	1	0.00
	3	Zone 3	98,140	1.00	1	0.05
	4	Zone 4	283,293	1.00	1	0.15
	5	Zone 5	239,422	1.00	1	0.13
	6	Zone 6	267,241	1.00	1	0.14
	7	Zone 7	1,239,449	1.00	1	0.66
	8	Zone 8	509,516	1.00	1	0.27
Sum/Average			2,649,281		1	1.40

YEAR 2060 BASE DEMAND - Group 10

Base Demand Rate = 0.53 gpcd

Description	Zone Number	Zone Name	Guests	Zone Demand Factor	Base Demand Rate	Base Demand
Source			CELA	Harza		
Type	integer	text	Integer	real	real	real
Display	#	text	#	###	###	###.#
Unit			Guests		gpd/Guests	mgd
Comment	input (locked)	input (locked)	Input	input	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	Z_G9_GST_2060			
	1	Zone 1	3,917	1.00	1	0.00
	2	Zone 2	10,528	1.00	1	0.01
	3	Zone 3	109,483	1.00	1	0.06
	4	Zone 4	313,971	1.00	1	0.17
	5	Zone 5	257,722	1.00	1	0.14
	6	Zone 6	331,983	1.00	1	0.18
	7	Zone 7	1,525,692	1.00	1	0.81
	8	Zone 8	583,331	1.00	1	0.31
Sum/Average			3,136,628		1	1.66

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: BASE DEMAND
WORKSHEET: Tourism

LAST UPDATE:
BY:

6/2/01
TJJ

BASE DEMAND RATE AND ZONE FACTORS - Group 10
Group 10 BASE DEMAND SUMMARY (All values are in millions of gallons per day)

Population Zone	2000	2010	2020	2030	2040	2050	2060
Zone 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Zone 4	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Zone 5	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zone 6	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Zone 7	0.3	0.3	0.4	0.5	0.6	0.7	0.8
Zone 8	0.1	0.2	0.2	0.2	0.2	0.3	0.3
Study Area Total	0.6	0.8	0.9	1.1	1.2	1.4	1.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Zone to Area**

**LAST UPDATE:
BY:**

06/02/01
TJJ

**PROBABLE SCENARIO
ZONE TO SERVICE AREA CONVERSION MATRIX (Residential)**

Description	Zone Number	Zone Name	Zone Area	% Water Service Area 1	% Water Service Area 2	% Water Service Area 3	% Water Service Area 4	% Water Service Area 5	% Water Service Area 6
Source	integer	text	real	Harza percentage ###.###%	Harza percentage ###.###%	Harza percentage ###.###%	Harza percentage ###.###%	Harza percentage ###.###%	Harza percentage ###.###%
Type	#	text	###	###.###%	###.###%	###.###%	###.###%	###.###%	###.###%
Display		text							
Unit		text							
Comment	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)
Column Name	POP_ZONE	POP_ZONE_NAM	ZONE_AREA	Pan_Metro	Arrajian/Chorrer	Colon	Upper_Caimito	Pan_Este	Rio_Gatun
	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)
	POP_ZONE	E	ZONE_AREA						
	1	Zone1	539.8	0%	0%	0%	15%	0%	0%
	2	Zone 2	839.5	0%	0%	0%	0%	100%	0%
	3	Zone 3	1453.4	77%	0%	0%	0%	0%	10%
	4	Zone 4	170.1	0%	89%	0%	9%	0%	0%
	5	Zone 5	1243.7	0%	75%	0%	21%	0%	0%
	6	Zone 6	866.2	0%	0%	99%	0%	0%	0%
	7	Zone 7	707.0	99%	1%	0%	0%	0%	0%
	8	Zone 8	791.8	90%	0%	0%	0%	10%	0%
Sum/Average			6611.5	2526	1083	854	357	922	142

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Zone to Area

LAST UPDATE: 06/02/01
BY: TJJ

ZONE TO SERVICE AREA CONVERSION MATRIX (Non-Residential)

Description	Zone Number	Zone Name	Zone Area	% Water Service Area 1	% Water Service Area 2	% Water Service Area 3	% Water Service Area 4	% Water Service Area 5	% Water Service Area 6
Source	integer	text	CELA	Harza	Harza	Harza	Harza	Harza	Harza
Type	#	text	real	percentage	percentage	percentage	percentage	percentage	percentage
Display		text	###	###.###%	###.###%	###.###%	###.###%	###.###%	###.###%
Unit									
Comment	input (locked)	input (locked)	input (locked)	Pan_Metro	Araijan/Chorrer	Colon	Upper_Caimito	Pan_Este	Rio_Gatun
Column Name	POP_ZONE	POP_ZONE_NAM	ZONE_AREA	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)
	1	Zone1	539.8	0%	0%	0%	15%	0%	0%
	2	Zone 2	839.5	0%	0%	0%	0%	100%	0%
	3	Zone 3	1453.4	77%	0%	0%	0%	0%	10%
	4	Zone 4	170.1	0%	89%	0%	9%	0%	0%
	5	Zone 5	1243.7	0%	75%	0%	21%	0%	0%
	6	Zone 6	866.2	0%	0%	99%	0%	0%	0%
	7	Zone 7	707.0	99%	1%	0%	0%	0%	0%
	8	Zone 8	791.8	90%	0%	0%	0%	10%	0%
Sum/Average			6611.5	2526	1083	854	357	922	142

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMP**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Zone to Area

ZONE TO SERVICE AREA CONVERSION MATRIX (Non-Residen

Description	Zone Number	Zone Name	Zone Area	% Water Service Area 7	% Water Service Area 8	% Water Service Area 9	% Water Service Area 10	Total Study Area
Source	integer	text	CELA	Harza	Harza	Harza	Harza	Total Study Area
Type	#	text	###	percentage ##.##%	percentage ##.##%	percentage ##.##%	percentage ##.##%	percentage ##.##%
Display								
Unit				Gatun_NW	Gatun_SW	Upper_Chagres	Ancon	
Comment	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONE_AREA					
	1	Zone1	539.8	21%	64%	0%	0%	100.0%
	2	Zone 2	839.5	0%	0%	0%	0%	100.0%
	3	Zone 3	1453.4	0%	0%	13%	0%	100.0%
	4	Zone 4	170.1	0%	2%	0%	0%	100.0%
	5	Zone 5	1243.7	0%	4%	0%	0%	100.0%
	6	Zone 6	866.2	1%	0%	0%	0%	100.0%
	7	Zone 7	707.0	0%	0%	0%	0%	100.0%
	8	Zone 8	791.8	0%	0%	0%	0%	100.0%
Sum/Average			6611.5	127	402	196	2	6611.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Zone to Area**

**PROBABLE SCENARIO
ZONE TO SERVICE AREA CONVERSION MATRIX (Residential)**

Description	Zone Number	Zone Name	Zone Area CELA	% Water Service Area 7 Harza	% Water Service Area 8 Harza	% Water Service Area 9 Harza	% Water Service Area 10 Harza	Total Study Area
Source	integer	text	real	percentage ###.###%	percentage ###.###%	percentage ###.###%	percentage ###.###%	percentage ###.###%
Type	#	text	###	Gatun_NW input (locked)	Gatun_SW input (locked)	Upper_Chagres input (locked)	Ancon input (locked)	calculated
Display	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	percentage ###.###%
Unit	POP_ZONE	POP_ZONE_NAM	ZONE_AREA					
Comment	1	Zone1	539.8	21%	64%	0%	0%	100.0%
Column Name	2	Zone 2	839.5	0%	0%	0%	0%	100.0%
	3	Zone 3	1453.4	0%	0%	13%	0%	100.0%
	4	Zone 4	170.1	0%	2%	0%	0%	100.0%
	5	Zone 5	1243.7	0%	4%	0%	0%	100.0%
	6	Zone 6	866.2	1%	0%	0%	0%	100.0%
	7	Zone 7	707.0	0%	0%	0%	0%	100.0%
	8	Zone 8	791.8	0%	0%	0%	0%	100.0%
Sum/Average			6611.5	127	402	196	2	6611.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS LAST UPDATE: 06/02/01
WORKSHEET: Base Demand by Zone BY: TJJ

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Residential Base Demand Service Area 1
Source	integer	text	CELA (6-00)	Harza	Harza	Harza	Harza	Harza	Harza
Type	#	text	real	real	real	real	real	real	real
Display		text	#####	#####	###	#####	###	#####	#####
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2000						
	1	Zone1	14,555	1.2	83	0.9	64	0.3	0.0
	2	Zone 2	23,293	3.1	135	1.8	76	1.4	0.0
	3	Zone 3	80,742	7.2	89	5.9	73	1.3	4.5
	4	Zone 4	145,924	10.6	73	9.3	64	1.3	0.0
	5	Zone 5	152,345	12.4	81	9.5	62	2.9	0.0
	6	Zone 6	136,627	17.2	126	9.4	69	7.8	0.0
	7	Zone 7	338,516	59.9	177	39.6	117	20.3	39.3
	8	Zone 8	656,258	47.0	72	36.7	56	10.3	32.9
Sum/Average			1,548,260	159	102	113	73	46	76.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS LAST UPDATE: 10/23/00
WORKSHEET: Base Demand by Zone BY: VFA

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Residential Base Demand Service Area 1
Source	Type	text	CELA (6-00)	Harza	Harza	Harza	Harza	Harza	Residential Base Demand Service Area 1
Display	integer #	text	#,###	###.#	###	###.#	###	###.#	###.#
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2010						
	1	Zone1	16,964	1.4	81	1.1	64	0.3	0.0
	2	Zone 2	29,475	3.6	123	2.2	76	1.4	0.0
	3	Zone 3	103,789	9.1	87	7.6	73	1.5	5.8
	4	Zone 4	234,699	16.7	71	15.0	64	1.7	0.0
	5	Zone 5	180,657	14.6	81	11.3	62	3.4	0.0
	6	Zone 6	150,217	20.5	137	10.3	69	10.2	0.0
	7	Zone 7	385,591	70.5	183	45.1	117	25.4	44.7
	8	Zone 8	766,354	55.6	73	42.9	56	12.7	38.4
Sum/Average			1,867,746	192	103	136	73	56	89.0

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS LAST UPDATE: 10/23/00
 WORKSHEET: Base Demand by Zone BY: VFA

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Residential Base Demand Service Area 1
Source	Type	text	CELA (6-00)	Harza	Harza	Harza	Harza	Harza	Residential Base Demand Service Area 1
Display	integer #	text	real #,###	real ###.#	real ###	real ###.#	real ###	real ###.#	real ###.#
Unit	#	text	People	mgd	gpcd	mgd	gpcd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2020						
	1	Zone1	18,555	1.5	80	1.2	64	0.3	0.0
	2	Zone 2	32,949	3.9	119	2.5	76	1.4	0.0
	3	Zone 3	115,724	10.1	87	8.4	73	1.7	6.5
	4	Zone 4	280,465	19.9	71	17.9	64	2.0	0.0
	5	Zone 5	197,767	16.2	82	12.3	62	3.9	0.0
	6	Zone 6	161,057	24.3	151	11.1	69	13.2	0.0
	7	Zone 7	438,295	82.3	188	51.3	117	31.0	50.8
	8	Zone 8	863,644	63.4	73	48.4	56	15.1	43.3
Sum/Average			2,108,456	222	105	153	73	69	100.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS LAST UPDATE: 10/23/00
WORKSHEET: Base Demand by Zone BY: VFA

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Residential Base Demand Service Area 1
Source	Type	text	CELA (6-00)	Harza	Harza	Harza	Harza	Harza	Residential Base Demand Service Area 1
Display	#	text	#,###	###.#	###	###.#	###	###.#	###.#
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2030						
	1	Zone1	20,047	1.6	79	1.3	64	0.3	0.0
	2	Zone 2	35,873	4.2	116	2.7	76	1.4	0.0
	3	Zone 3	125,642	11.0	88	9.2	73	1.8	7.0
	4	Zone 4	317,032	22.5	71	20.3	64	2.2	0.0
	5	Zone 5	212,657	17.8	84	13.2	62	4.5	0.0
	6	Zone 6	171,590	28.9	169	11.8	69	17.2	0.0
	7	Zone 7	486,057	93.9	193	56.9	117	37.0	56.4
	8	Zone 8	941,138	70.2	75	52.7	56	17.5	47.2
Sum/Average			2,310,036	250	108	168	73	82	110.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS 10/23/00
WORKSHEET: Base Demand by Zone VFA

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Residential Base Demand Service Area 1
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM
	integer	text	real	CELA (6-00)	Harza	real	###.#	real	real
	#	text	###	People	Harza	###.#	###	###.#	###.#
	input (locked)	input (locked)	input (locked)	copied	Harza	###.#	gpcd	mgd	mgd
	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2040	ZONEPOP_2040	calculated	calculated	calculated	calculated	calculated
	1	Zone1	21,391	1.7	78	1.4	64	0.3	0.0
	2	Zone 2	38,153	4.4	115	2.9	76	1.5	0.0
	3	Zone 3	133,081	11.7	88	9.7	73	2.0	7.5
	4	Zone 4	339,329	24.2	71	21.7	64	2.5	0.0
	5	Zone 5	225,051	19.3	86	14.0	62	5.3	0.0
	6	Zone 6	181,644	34.8	191	12.5	69	22.3	0.0
	7	Zone 7	528,306	105.8	200	61.8	117	44.0	61.3
	8	Zone 8	996,019	75.8	76	55.8	56	20.1	50.0
Sum/Average			2,462,974	278	113	180	73	98	118.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS LAST UPDATE: 10/23/00
 WORKSHEET: Base Demand by Zone BY: VFA

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Residential Base Demand Service Area 1
Source	Type	text	CELA (6-00)	Harza	Harza	Harza	Harza	Harza	Real
Display	#	text	###	###	###	###	###	###	###
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2050						
	1	Zone1	22,297	1.7	78	1.4	64	0.3	0.0
	2	Zone 2	39,710	4.5	113	3.0	76	1.5	0.0
	3	Zone 3	138,071	12.2	88	10.1	73	2.1	7.7
	4	Zone 4	353,434	25.2	71	22.6	64	2.6	0.0
	5	Zone 5	233,226	20.7	89	14.5	62	6.1	0.0
	6	Zone 6	188,371	41.8	222	12.9	69	28.9	0.0
	7	Zone 7	560,852	116.6	208	65.6	117	51.0	65.1
	8	Zone 8	1,035,520	80.3	78	58.0	56	22.3	51.9
Sum/Average			2,571,481	303	118	188	73	115	124.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS 10/23/00
WORKSHEET: Base Demand by Zone VFA

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Residential Base Demand Service Area 1
Source	Type	text	CELA (6-00)	Harza	Harza	Harza	Harza	Harza	Harza
Display	integer #	text	real #,###	real ###.#	real ###	real ###.#	real ###	real ###.#	real ###.#
Unit	#	text	People	mgd	gpcd	mgd	gpcd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2060						
	1	Zone1	22,886	1.8	78	1.5	64	0.3	0.0
	2	Zone 2	40,791	4.6	113	3.1	76	1.5	0.0
	3	Zone 3	141,889	12.6	89	10.4	73	2.2	8.0
	4	Zone 4	363,818	26.1	72	23.3	64	2.8	0.0
	5	Zone 5	239,383	22.2	93	14.9	62	7.3	0.0
	6	Zone 6	193,222	50.9	263	13.3	69	37.6	0.0
	7	Zone 7	576,174	127.9	222	67.4	117	60.5	66.8
	8	Zone 8	1,064,988	85.1	80	59.6	56	25.5	53.4
Sum/Average			2,643,151	331	125	193	73	138	128.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 2	Residential Base Demand Service Area 3	Residential Base Demand Service Area 4	Residential Base Demand Service Area 5	Residential Base Demand Service Area 6	Residential Base Demand Service Area 7
Source	Type	Unit	CELA (6-00)	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###	###
Comment	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
Column Name	POP_ZONE	POP_ZONE_NAM	copied	calculated	calculated	calculated	calculated	calculated	calculated
	1	Zone1	14,555	0.0	0.0	0.1	0.0	0.0	0.2
	2	Zone 2	23,293	0.0	0.0	0.0	1.8	0.0	0.0
	3	Zone 3	80,742	0.0	0.0	0.0	0.0	0.6	0.0
	4	Zone 4	145,924	8.3	0.0	0.8	0.0	0.0	0.0
	5	Zone 5	152,345	7.1	0.0	2.0	0.0	0.0	0.0
	6	Zone 6	136,627	0.0	9.3	0.0	0.0	0.0	0.1
	7	Zone 7	338,516	0.2	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	656,258	0.0	0.0	0.0	3.8	0.0	0.0
Sum/Average			1,548,260	15.6	9.3	2.9	5.6	0.6	0.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 2	Residential Base Demand Service Area 3	Residential Base Demand Service Area 4	Residential Base Demand Service Area 5	Residential Base Demand Service Area 6	Residential Base Demand Service Area 7
Source	Type	CELA (6-00)	real	real	real	real	real	real	real
Display	#	text	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Unit	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	POP_ZONE	POP_ZONE_NAME	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	E	ZONEPOP_2010						
	1	Zone 1	16,964	0.0	0.0	0.2	0.0	0.0	0.2
	2	Zone 2	29,475	0.0	0.0	0.0	2.2	0.0	0.0
	3	Zone 3	103,789	0.0	0.0	0.0	0.0	0.7	0.0
	4	Zone 4	234,699	13.4	0.0	1.3	0.0	0.0	0.0
	5	Zone 5	180,657	8.4	0.0	2.4	0.0	0.0	0.0
	6	Zone 6	150,217	0.0	10.2	0.0	0.0	0.0	0.1
	7	Zone 7	385,591	0.2	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	766,354	0.0	0.0	0.0	4.5	0.0	0.0
Sum/Average			1,867,746	22.0	10.2	3.8	6.7	0.7	0.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS

WORKSHEET: Base Demand by Zone

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 2	Residential Base Demand Service Area 3	Residential Base Demand Service Area 4	Residential Base Demand Service Area 5	Residential Base Demand Service Area 6	Residential Base Demand Service Area 7
Source			CELA (6-00)						
Type	integer	text	real	real	real	real	real	real	real
Display	#	text	#,###	###.#	###.#	###.#	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2020						
	1	Zone1	18,555	0.0	0.0	0.2	0.0	0.0	0.3
	2	Zone 2	32,949	0.0	0.0	0.0	2.5	0.0	0.0
	3	Zone 3	115,724	0.0	0.0	0.0	0.0	0.8	0.0
	4	Zone 4	280,465	16.0	0.0	1.5	0.0	0.0	0.0
	5	Zone 5	197,767	9.2	0.0	2.6	0.0	0.0	0.0
	6	Zone 6	161,057	0.0	10.9	0.0	0.0	0.0	0.2
	7	Zone 7	438,295	0.3	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	863,644	0.0	0.0	0.0	5.0	0.0	0.0
Sum/Average			2,108,456	25.5	10.9	4.3	7.6	0.8	0.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 2	Residential Base Demand Service Area 3	Residential Base Demand Service Area 4	Residential Base Demand Service Area 5	Residential Base Demand Service Area 6	Residential Base Demand Service Area 7
Source	Type	Text	CELA (6-00)	real	real	real	real	real	real
Display	integer #	text	###	###.#	###.#	###.#	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2030						
	1	Zone1	20,047	0.0	0.0	0.2	0.0	0.0	0.3
	2	Zone 2	35,873	0.0	0.0	0.0	2.7	0.0	0.0
	3	Zone 3	125,642	0.0	0.0	0.0	0.0	0.9	0.0
	4	Zone 4	317,032	18.1	0.0	1.8	0.0	0.0	0.0
	5	Zone 5	212,657	9.9	0.0	2.8	0.0	0.0	0.0
	6	Zone 6	171,590	0.0	11.6	0.0	0.0	0.0	0.2
	7	Zone 7	486,057	0.3	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	941,138	0.0	0.0	0.0	5.5	0.0	0.0
Sum/Average			2,310,036	28.3	11.6	4.7	8.2	0.9	0.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 2	Residential Base Demand Service Area 3	Residential Base Demand Service Area 4	Residential Base Demand Service Area 5	Residential Base Demand Service Area 6	Residential Base Demand Service Area 7
Source	Type	Unit	CELA (6-00)	real	real	real	real	real	real
Display	#	text	###	###.#	###.#	###.#	###.#	###.#	###.#
Unit		text	People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2040						
	1	Zone1	21,391	0.0	0.0	0.2	0.0	0.0	0.3
	2	Zone 2	38,153	0.0	0.0	0.0	2.9	0.0	0.0
	3	Zone 3	133,081	0.0	0.0	0.0	0.0	0.9	0.0
	4	Zone 4	339,329	19.4	0.0	1.9	0.0	0.0	0.0
	5	Zone 5	225,051	10.5	0.0	2.9	0.0	0.0	0.0
	6	Zone 6	181,644	0.0	12.3	0.0	0.0	0.0	0.2
	7	Zone 7	528,306	0.3	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	996,019	0.0	0.0	0.0	5.8	0.0	0.0
Sum/Average			2,462,974	30.1	12.3	5.0	8.7	0.9	0.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 2	Residential Base Demand Service Area 3	Residential Base Demand Service Area 4	Residential Base Demand Service Area 5	Residential Base Demand Service Area 6	Residential Base Demand Service Area 7
Source	Type	text	CEL (6-00)	real	real	real	real	real	real
Display	integer #	text	###	###.#	###.#	###.#	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2050						
	1	Zone1	22,297	0.0	0.0	0.2	0.0	0.0	0.3
	2	Zone 2	39,710	0.0	0.0	0.0	3.0	0.0	0.0
	3	Zone 3	138,071	0.0	0.0	0.0	0.0	1.0	0.0
	4	Zone 4	353,434	20.2	0.0	2.0	0.0	0.0	0.0
	5	Zone 5	233,226	10.8	0.0	3.0	0.0	0.0	0.0
	6	Zone 6	188,371	0.0	12.8	0.0	0.0	0.0	0.2
	7	Zone 7	560,852	0.3	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	1,035,520	0.0	0.0	0.0	6.0	0.0	0.0
Sum/Average			2,571,481	31.4	12.8	5.2	9.1	1.0	0.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 2	Residential Base Demand Service Area 3	Residential Base Demand Service Area 4	Residential Base Demand Service Area 5	Residential Base Demand Service Area 6	Residential Base Demand Service Area 7
Source	integer #	text	CELA (6-00) real ### # People	real ### # mgd	real ### # mgd	real ### # mgd	real ### # mgd	real ### # mgd	real ### # mgd
Type	#	text	copied	calculated	calculated	calculated	calculated	calculated	calculated
Display		input (locked)	POP_ZONE_NAM						
Unit	input (locked)	POP_ZONE	E						
Comment									
Column Name	POP_ZONE		ZONEPOP_2060						
	1	Zone1	22,886	0.0	0.0	0.2	0.0	0.0	0.3
	2	Zone 2	40,791	0.0	0.0	0.0	3.1	0.0	0.0
	3	Zone 3	141,889	0.0	0.0	0.0	0.0	1.0	0.0
	4	Zone 4	363,818	20.8	0.0	2.0	0.0	0.0	0.0
	5	Zone 5	239,383	11.1	0.0	3.1	0.0	0.0	0.0
	6	Zone 6	193,222	0.0	13.1	0.0	0.0	0.0	0.2
	7	Zone 7	576,174	0.3	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	1,064,988	0.0	0.0	0.0	6.2	0.0	0.0
Sum/Average			2,643,151	32.2	13.1	5.4	9.3	1.0	0.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 8	Residential Base Demand Service Area 9	Residential Base Demand Service Area 10	Total Residential Base Demand	Non-Resid Base Demand Service Area 1	Non-Resid Base Demand Service Area 2
Source	Type	text	real	real	real	real	real	real	real
Display	integer	text	#####	#####	#####	#####	#####	#####	#####
Unit	#	text	People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2000						
	1	Zone 1	14,555	0.6	0.0	0.0	0.9	0.0	0.0
	2	Zone 2	23,293	0.0	0.0	0.0	1.8	0.0	0.0
	3	Zone 3	80,742	0.0	0.8	0.0	5.9	1.0	0.0
	4	Zone 4	145,924	0.2	0.0	0.0	9.3	0.0	1.1
	5	Zone 5	152,345	0.4	0.0	0.0	9.5	0.0	2.1
	6	Zone 6	136,627	0.0	0.0	0.0	9.4	0.0	0.0
	7	Zone 7	338,516	0.0	0.0	0.1	39.6	20.2	0.1
	8	Zone 8	656,258	0.0	0.0	0.0	36.7	9.2	0.0
Sum/Average			1,548,260	1.2	0.8	0.1	113.2	30.4	3.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 8	Residential Base Demand Service Area 9	Residential Base Demand Service Area 10	Total Residential Base Demand	Non-Resid Base Demand Service Area 1	Non-Resid Base Demand Service Area 2
Source	Type	Text	CEL (6-00)	real	real	real	real	real	real
Display	#	text	#,###	###.#	###.#	###.#	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2010						
	1	Zone1	16,964	0.7	0.0	0.0	1.1	0.0	0.0
	2	Zone 2	29,475	0.0	0.0	0.0	2.2	0.0	0.0
	3	Zone 3	103,789	0.0	1.0	0.0	7.6	1.1	0.0
	4	Zone 4	234,699	0.3	0.0	0.0	15.0	0.0	1.5
	5	Zone 5	180,657	0.5	0.0	0.0	11.3	0.0	2.5
	6	Zone 6	150,217	0.0	0.0	0.0	10.3	0.0	0.0
	7	Zone 7	385,591	0.0	0.0	0.2	45.1	25.1	0.1
	8	Zone 8	766,354	0.0	0.0	0.0	42.9	11.3	0.0
Sum/Average			1,867,746	1.5	1.0	0.2	135.5	37.6	4.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 8	Residential Base Demand Service Area 9	Residential Base Demand Service Area 10	Total Residential Base Demand	Non-Resid Base Demand Service Area 1	Non-Resid Base Demand Service Area 2
Source	Type	Text	CELA (6-00)	real	real	real	real	real	real
Display	integer #	text	#####	#####	#####	#####	#####	#####	#####
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2020						
	1	Zone1	18,555	0.8	0.0	0.0	1.2	0.0	0.0
	2	Zone 2	32,949	0.0	0.0	0.0	2.5	0.0	0.0
	3	Zone 3	115,724	0.0	1.1	0.0	8.4	1.3	0.0
	4	Zone 4	280,465	0.4	0.0	0.0	17.9	0.0	1.7
	5	Zone 5	197,767	0.5	0.0	0.0	12.3	0.0	2.9
	6	Zone 6	161,057	0.0	0.0	0.0	11.1	0.0	0.0
	7	Zone 7	438,295	0.0	0.0	0.2	51.3	30.7	0.2
	8	Zone 8	863,644	0.0	0.0	0.0	48.4	13.5	0.0
Sum/Average			2,108,456	1.7	1.1	0.2	153.1	45.5	4.8

ZONE MODEL FOR LONG-TERM FORECAST FOR M&I WATER DEMAND AND RAW WATER CONSUMPT

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 8	Residential Base Demand Service Area 9	Residential Base Demand Service Area 10	Total Residential Base Demand	Non-Resid Base Demand Service Area 1	Non-Resid Base Demand Service Area 2
Source	Type	Unit	Unit	Unit	Unit	Unit	Unit	Unit	Unit
Display	#	text	real	real	real	real	real	real	real
Unit	#	text	###	###	###	###	###	###	###
Comment	input (locked)	input (locked)	People copied	mgd	mgd	mgd	mgd	mgd	mgd
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2030	calculated	calculated	calculated	calculated	calculated	calculated
	1	Zone 1	20,047	0.0	0.0	0.0	1.3	0.0	0.0
	2	Zone 2	35,873	0.0	0.0	0.0	2.7	0.0	0.0
	3	Zone 3	125,642	0.0	1.2	0.0	9.2	1.4	0.0
	4	Zone 4	317,032	0.4	0.0	0.0	20.3	0.0	2.0
	5	Zone 5	212,657	0.6	0.0	0.0	13.2	0.0	3.4
	6	Zone 6	171,590	0.0	0.0	0.0	11.8	0.0	0.0
	7	Zone 7	486,057	0.0	0.0	0.2	56.9	36.7	0.2
	8	Zone 8	941,138	0.0	0.0	0.0	52.7	15.6	0.0
Sum/Average			2,310,036	1.8	1.2	0.2	168.1	53.8	5.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 8	Residential Base Demand Service Area 9	Residential Base Demand Service Area 10	Total Residential Base Demand	Non-Resid Base Demand Service Area 1	Non-Resid Base Demand Service Area 2
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM
	integer	text	real	real	real	real	real	real	real
	#	text	###	###	###	###	###	###	###
	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
	POP_ZONE	POP_ZONE_NAM	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2040						
	1	Zone1	21,391	0.9	0.0	0.0	1.4	0.0	0.0
	2	Zone 2	38,153	0.0	0.0	0.0	2.9	0.0	0.0
	3	Zone 3	133,081	0.0	1.3	0.0	9.7	1.5	0.0
	4	Zone 4	339,329	0.5	0.0	0.0	21.7	0.0	2.2
	5	Zone 5	225,051	0.6	0.0	0.0	14.0	0.0	4.0
	6	Zone 6	181,644	0.0	0.0	0.0	12.5	0.0	0.0
	7	Zone 7	528,306	0.0	0.0	0.2	61.8	43.6	0.2
	8	Zone 8	996,019	0.0	0.0	0.0	55.8	18.0	0.0
Sum/Average			2,462,974	2.0	1.3	0.2	179.8	63.1	6.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 8	Residential Base Demand Service Area 9	Residential Base Demand Service Area 10	Total Residential Base Demand	Non-Resid Base Demand Service Area 1	Non-Resid Base Demand Service Area 2
Source	Type	Unit	Display	Unit	Unit	Unit	Unit	Unit	Unit
Comment	input (locked)	input (locked)	input (locked)	real	real	real	real	real	real
Column Name	POP_ZONE	POP_ZONE_NAM	POP_ZONE	###.#	###.#	###.#	###.#	###.#	###.#
	POP_ZONE	E	ZONEPOP_2050	mgd	mgd	mgd	mgd	mgd	mgd
	1	Zone1	22,297	0.9	0.0	0.0	1.4	0.0	0.0
	2	Zone 2	39,710	0.0	0.0	0.0	3.0	0.0	0.0
	3	Zone 3	138,071	0.0	1.4	0.0	10.1	1.6	0.0
	4	Zone 4	353,434	0.5	0.0	0.0	22.6	0.0	2.3
	5	Zone 5	233,226	0.6	0.0	0.0	14.5	0.0	4.6
	6	Zone 6	188,371	0.0	0.0	0.0	12.9	0.0	0.0
	7	Zone 7	560,852	0.0	0.0	0.2	65.6	50.6	0.3
	8	Zone 8	1,035,520	0.0	0.0	0.0	58.0	20.0	0.0
Sum/Average			2,571,481	2.0	1.4	0.2	188.2	72.2	7.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Residential Base Demand Service Area 8	Residential Base Demand Service Area 9	Residential Base Demand Service Area 10	Total Residential Base Demand	Non-Resid Base Demand Service Area 1	Non-Resid Base Demand Service Area 2
Source	Type	Text	CELA (6-00)	Real	Real	Real	Real	Real	Real
Display	#	Text	###	###	###	###	###	###	###
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2060						
	1	Zone 1	22,886	0.9	0.0	0.0	1.5	0.0	0.0
	2	Zone 2	40,791	0.0	0.0	0.0	3.1	0.0	0.0
	3	Zone 3	141,889	0.0	1.4	0.0	10.4	1.7	0.0
	4	Zone 4	363,818	0.5	0.0	0.0	23.3	0.0	2.5
	5	Zone 5	239,383	0.7	0.0	0.0	14.9	0.0	5.4
	6	Zone 6	193,222	0.0	0.0	0.0	13.3	0.0	0.0
	7	Zone 7	576,174	0.0	0.0	0.2	67.4	60.0	0.3
	8	Zone 8	1,064,988	0.0	0.0	0.0	59.6	22.8	0.0
Sum/Average			2,643,151	2.1	1.4	0.2	193.4	84.5	8.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 3	Non-Resid Base Demand Service Area 4	Non-Resid Base Demand Service Area 5	Non-Resid Base Demand Service Area 6	Non-Resid Base Demand Service Area 7	Non-Resid Base Demand Service Area 8
Source			CELA (6-00)						
Type	integer	text	real	real	real	real	real	real	real
Display	#	text	#,###	###.#	###.#	###.#	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2000						
	1	Zone1	14,555	0.0	0.0	0.0	0.0	0.1	0.2
	2	Zone 2	23,293	0.0	0.0	1.4	0.0	0.0	0.0
	3	Zone 3	80,742	0.0	0.0	0.0	0.1	0.0	0.0
	4	Zone 4	145,924	0.0	0.1	0.0	0.0	0.0	0.0
	5	Zone 5	152,345	0.0	0.6	0.0	0.0	0.0	0.1
	6	Zone 6	136,627	7.7	0.0	0.0	0.0	0.1	0.0
	7	Zone 7	338,516	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	656,258	0.0	0.0	1.1	0.0	0.0	0.0
Sum/Average			1,548,260	7.7	0.8	2.4	0.1	0.2	0.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 3	Non-Resid Base Demand Service Area 4	Non-Resid Base Demand Service Area 5	Non-Resid Base Demand Service Area 6	Non-Resid Base Demand Service Area 7	Non-Resid Base Demand Service Area 8
Source	Type	Zone Name	Population	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8
Display	integer #	text	real #,###	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#
Unit	#	text	People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2010						
	1	Zone1	16,964	0.0	0.0	0.0	0.0	0.1	0.2
	2	Zone 2	29,475	0.0	0.0	1.4	0.0	0.0	0.0
	3	Zone 3	103,789	0.0	0.0	0.0	0.1	0.0	0.0
	4	Zone 4	234,699	0.0	0.1	0.0	0.0	0.0	0.0
	5	Zone 5	180,657	0.0	0.7	0.0	0.0	0.0	0.2
	6	Zone 6	150,217	10.0	0.0	0.0	0.0	0.1	0.0
	7	Zone 7	385,591	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	766,354	0.0	0.0	1.3	0.0	0.0	0.0
Sum/Average			1,867,746	10.0	0.9	2.7	0.1	0.2	0.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 3	Non-Resid Base Demand Service Area 4	Non-Resid Base Demand Service Area 5	Non-Resid Base Demand Service Area 6	Non-Resid Base Demand Service Area 7	Non-Resid Base Demand Service Area 8
Source	Type	text	real	real	real	real	real	real	real
Display	#	text	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2020						
	1	Zone1	18,555	0.0	0.0	0.0	0.0	0.1	0.2
	2	Zone 2	32,949	0.0	0.0	1.4	0.0	0.0	0.0
	3	Zone 3	115,724	0.0	0.0	0.0	0.2	0.0	0.0
	4	Zone 4	280,465	0.0	0.2	0.0	0.0	0.0	0.0
	5	Zone 5	197,767	0.0	0.8	0.0	0.0	0.0	0.2
	6	Zone 6	161,057	13.1	0.0	0.0	0.0	0.2	0.0
	7	Zone 7	438,295	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	863,644	0.0	0.0	1.6	0.0	0.0	0.0
Sum/Average			2,108,456	13.1	1.0	3.0	0.2	0.2	0.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 3	Non-Resid Base Demand Service Area 4	Non-Resid Base Demand Service Area 5	Non-Resid Base Demand Service Area 6	Non-Resid Base Demand Service Area 7	Non-Resid Base Demand Service Area 8
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
	integer	text	real	real	real	real	real	real	real
	#	text	###	###	###	###	###	###	###
	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2030	calculated	calculated	calculated	calculated	calculated	calculated
	1	Zone1	20,047	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	35,873	0.0	0.0	1.4	0.0	0.0	0.0
	3	Zone 3	125,642	0.0	0.0	0.0	0.2	0.0	0.0
	4	Zone 4	317,032	0.0	0.2	0.0	0.0	0.0	0.0
	5	Zone 5	212,657	0.0	1.0	0.0	0.0	0.0	0.2
	6	Zone 6	171,590	16.9	0.0	0.0	0.0	0.2	0.0
	7	Zone 7	486,057	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	941,138	0.0	0.0	1.8	0.0	0.0	0.0
Sum/Average			2,310,036	16.9	1.2	3.3	0.2	0.3	0.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 3	Non-Resid Base Demand Service Area 4	Non-Resid Base Demand Service Area 5	Non-Resid Base Demand Service Area 6	Non-Resid Base Demand Service Area 7	Non-Resid Base Demand Service Area 8
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE_NAM	Zone Population	CELA (6-00)
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE_NAM	Zone Population	CELA (6-00)
	integer	text	real	real	real	real	real	real	real
	#	text	###.#	###.#	###.#	###.#	###.#	###.#	###.#
	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
	POP_ZONE	POP_ZONE_NAM	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2040						
	1	Zone1	21,391	0.0	0.0	0.0	0.0	0.1	0.2
	2	Zone 2	38,153	0.0	0.0	1.5	0.0	0.0	0.0
	3	Zone 3	133,081	0.0	0.0	0.0	0.2	0.0	0.0
	4	Zone 4	339,329	0.0	0.2	0.0	0.0	0.0	0.1
	5	Zone 5	225,051	0.0	1.1	0.0	0.0	0.0	0.2
	6	Zone 6	181,644	22.0	0.0	0.0	0.0	0.3	0.0
	7	Zone 7	528,306	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	996,019	0.0	0.0	2.1	0.0	0.0	0.0
Sum/Average			2,462,974	22.0	1.4	3.6	0.2	0.4	0.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 3	Non-Resid Base Demand Service Area 4	Non-Resid Base Demand Service Area 5	Non-Resid Base Demand Service Area 6	Non-Resid Base Demand Service Area 7	Non-Resid Base Demand Service Area 8
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
	integer	text	real	real	real	real	real	real	real
	#	text	#####	#####	#####	#####	#####	#####	#####
	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
	POP_ZONE	POP_ZONE_NAM	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2050						
	1	Zone1	22,297	0.0	0.0	0.0	0.0	0.1	0.2
	2	Zone2	39,710	0.0	0.0	1.5	0.0	0.0	0.0
	3	Zone3	138,071	0.0	0.0	0.0	0.2	0.0	0.0
	4	Zone4	353,434	0.0	0.2	0.0	0.0	0.0	0.1
	5	Zone5	233,226	0.0	1.3	0.0	0.0	0.0	0.3
	6	Zone6	188,371	28.5	0.0	0.0	0.0	0.4	0.0
	7	Zone7	560,852	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone8	1,035,520	0.0	0.0	2.3	0.0	0.0	0.0
Sum/Average			2,571,481	28.5	1.6	3.8	0.2	0.5	0.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 3	Non-Resid Base Demand Service Area 4	Non-Resid Base Demand Service Area 5	Non-Resid Base Demand Service Area 6	Non-Resid Base Demand Service Area 7	Non-Resid Base Demand Service Area 8
Source	Type	Text	CELA (6-00)	real	real	real	real	real	real
Display	#	text	###	###.#	###.#	###.#	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2060						
	1	Zone1	22,886	0.0	0.0	0.0	0.0	0.1	0.2
	2	Zone 2	40,791	0.0	0.0	1.5	0.0	0.0	0.0
	3	Zone 3	141,889	0.0	0.0	0.0	0.2	0.0	0.0
	4	Zone 4	363,818	0.0	0.2	0.0	0.0	0.0	0.1
	5	Zone 5	239,383	0.0	1.5	0.0	0.0	0.0	0.3
	6	Zone 6	193,222	37.1	0.0	0.0	0.0	0.5	0.0
	7	Zone 7	576,174	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	1,064,988	0.0	0.0	2.7	0.0	0.0	0.0
Sum/Average			2,643,151	37.1	1.8	4.1	0.2	0.6	0.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 9	Non-Resid Base Demand Service Area 10	Total Non-Resid Base Demand	Total Base Demand Service Area 1	Total Base Demand Service Area 2	Total Base Demand Service Area 3
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
	integer	text	real	real	real	real	real	real	real
	#	text	###	###	###	###	###	###	###
	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2000						
	1	Zone1	14,555	0.0	0.0	0.3	0.0	0.0	0.0
	2	Zone 2	23,293	0.0	0.0	1.4	0.0	0.0	0.0
	3	Zone 3	80,742	0.2	0.0	1.3	5.5	0.0	0.0
	4	Zone 4	145,924	0.0	0.0	1.3	0.0	9.5	0.0
	5	Zone 5	152,345	0.0	0.0	2.9	0.0	9.2	0.0
	6	Zone 6	136,627	0.0	0.0	7.8	0.0	0.0	17.0
	7	Zone 7	338,516	0.0	0.1	20.3	59.4	0.3	0.0
	8	Zone 8	656,258	0.0	0.0	10.3	42.1	0.0	0.0
Sum/Average			1,548,260	0.2	0.1	45.5	107.1	19.0	17.0

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 9	Non-Resid Base Demand Service Area 10	Total Non-Resid Base Demand	Total Base Demand Service Area 1	Total Base Demand Service Area 2	Total Base Demand Service Area 3
Source	Type	Text	Population	real	real	real	real	real	real
Display	#	text	#,###	###.#	###.#	###	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2010						
	1	Zone1	16,964	0.0	0.0	0.3	0.0	0.0	0.0
	2	Zone2	29,475	0.0	0.0	1.4	0.0	0.0	0.0
	3	Zone3	103,789	0.2	0.0	1.5	7.0	0.0	0.0
	4	Zone4	234,699	0.0	0.0	1.7	0.0	14.9	0.0
	5	Zone5	180,657	0.0	0.0	3.4	0.0	10.9	0.0
	6	Zone6	150,217	0.0	0.0	10.2	0.0	0.0	20.2
	7	Zone7	385,591	0.0	0.1	25.4	69.9	0.4	0.0
	8	Zone8	766,354	0.0	0.0	12.7	49.8	0.0	0.0
Sum/Average			1,867,746	0.2	0.1	56.4	126.6	26.1	20.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 9	Non-Resid Base Demand Service Area 10	Total Non-Resid Base Demand	Total Base Demand Service Area 1	Total Base Demand Service Area 2	Total Base Demand Service Area 3
Source	Type	Text	CELA (6-00)	real	real	real	real	real	real
Display	#	text	###	###.#	###.#	###	###.#	###.#	###.#
Unit	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	POP_ZONE	POP_ZONE_NAME	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	E	ZONEPOP_2020						
	1	Zone1	18,555	0.0	0.0	0.3	0.0	0.0	0.0
	2	Zone 2	32,949	0.0	0.0	1.4	0.0	0.0	0.0
	3	Zone 3	115,724	0.2	0.0	1.7	7.8	0.0	0.0
	4	Zone 4	280,465	0.0	0.0	2.0	0.0	17.8	0.0
	5	Zone 5	197,767	0.0	0.0	3.9	0.0	12.1	0.0
	6	Zone 6	161,057	0.0	0.0	13.2	0.0	0.0	24.0
	7	Zone 7	438,295	0.0	0.1	31.0	81.5	0.4	0.0
	8	Zone 8	863,644	0.0	0.0	15.1	56.8	0.0	0.0
Sum/Average			2,108,456	0.2	0.1	68.5	146.1	30.3	24.0

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 9	Non-Resid Base Demand Service Area 10	Total Non-Resid Base Demand	Total Base Demand Service Area 1	Total Base Demand Service Area 2	Total Base Demand Service Area 3
Source	integer #	text	real CELA (6-00)	real ###.#	real ###.#	real ###	real ###.#	real ###.#	real ###.#
Type	#	text	People	mgd	mgd	mgd	mgd	mgd	mgd
Display		input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Unit		POP_ZONE_NAM							
Comment	input (locked)	POP_ZONE							
Column Name	POP_ZONE	E	ZONEPOP_2030						
	1	Zone1	20,047	0.0	0.0	0.3	0.0	0.0	0.0
	2	Zone 2	35,873	0.0	0.0	1.4	0.0	0.0	0.0
	3	Zone 3	125,642	0.2	0.0	1.8	8.5	0.0	0.0
	4	Zone 4	317,032	0.0	0.0	2.2	0.0	20.1	0.0
	5	Zone 5	212,657	0.0	0.0	4.5	0.0	13.3	0.0
	6	Zone 6	171,590	0.0	0.0	17.2	0.0	0.0	28.6
	7	Zone 7	486,057	0.0	0.1	37.0	93.1	0.5	0.0
	8	Zone 8	941,138	0.0	0.0	17.5	62.9	0.0	0.0
Sum/Average			2,310,036	0.2	0.1	82.0	164.4	33.8	28.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 9	Non-Resid Base Demand Service Area 10	Total Non-Resid Base Demand	Total Base Demand Service Area 1	Total Base Demand Service Area 2	Total Base Demand Service Area 3
Source	Type	CELA (6-00)	real	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###	###
Unit	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	POP_ZONE	POP_ZONE_NAM	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	E	ZONEPOP_2040						
	1	Zone1	21,391	0.0	0.0	0.3	0.0	0.0	0.0
	2	Zone 2	38,153	0.0	0.0	1.5	0.0	0.0	0.0
	3	Zone 3	133,081	0.3	0.0	2.0	9.0	0.0	0.0
	4	Zone 4	339,329	0.0	0.0	2.5	0.0	21.6	0.0
	5	Zone 5	225,051	0.0	0.0	5.3	0.0	14.4	0.0
	6	Zone 6	181,644	0.0	0.0	22.3	0.0	0.0	34.3
	7	Zone 7	528,306	0.0	0.2	44.0	104.9	0.5	0.0
	8	Zone 8	996,019	0.0	0.0	20.1	67.9	0.0	0.0
Sum/Average			2,462,974	0.3	0.2	97.9	181.8	36.5	34.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 9	Non-Resid Base Demand Service Area 10	Total Non-Resid Base Demand	Total Base Demand Service Area 1	Total Base Demand Service Area 2	Total Base Demand Service Area 3
Source	Type		CELA (6-00)						
Display	integer #	text	real #,###	real ###.#	real ###.#	real ###	real ###.#	real ###.#	real ###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2050						
	1	Zone1	22,297	0.0	0.0	0.3	0.0	0.0	0.0
	2	Zone 2	39,710	0.0	0.0	1.5	0.0	0.0	0.0
	3	Zone 3	138,071	0.3	0.0	2.1	9.3	0.0	0.0
	4	Zone 4	353,434	0.0	0.0	2.6	0.0	22.5	0.0
	5	Zone 5	233,226	0.0	0.0	6.1	0.0	15.4	0.0
	6	Zone 6	188,371	0.0	0.0	28.9	0.0	0.0	41.2
	7	Zone 7	560,852	0.0	0.2	51.0	115.6	0.6	0.0
	8	Zone 8	1,035,520	0.0	0.0	22.3	72.0	0.0	0.0
Sum/Average			2,571,481	0.3	0.2	114.8	196.9	38.5	41.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Non-Resid Base Demand Service Area 9	Non-Resid Base Demand Service Area 10	Total Non-Resid Base Demand	Total Base Demand Service Area 1	Total Base Demand Service Area 2	Total Base Demand Service Area 3											
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM											
Source	Type	Display	Unit	Comment	Column Name	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM											
	integer	text	real	CELA (6-00)	Zone	Population	real	###.#	mgd	calculated	real	###.#	mgd	calculated	real	###.#	mgd	calculated		
	#	text	###.#	People	copied	ZONEPOP_2060	ZONEPOP_2060	###.#	mgd	calculated	###.#	mgd	calculated	###.#	mgd	calculated	###.#	mgd	calculated	
	input (locked)	input (locked)	input (locked)																	
Column Name	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM	POP_ZONE	POP_ZONE_NAM
	1	Zone1	22,886	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	40,791	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	141,889	0.3	0.0	2.2	0.0	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	363,818	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	Zone 5	239,383	0.0	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	Zone 6	193,222	0.0	0.0	37.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	7	Zone 7	576,174	0.0	0.2	60.5	0.0	126.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	1,064,988	0.0	0.0	25.5	0.0	76.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum/Average			2,643,151	0.3	0.2	137.7	0.2	212.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 4	Total Base Demand Service Area 5	Total Base Demand Service Area 6	Total Base Demand Service Area 7	Total Base Demand Service Area 8	Total Base Demand Service Area 9
Source			CELA (6-00)						
Type	integer	text	real	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###	###
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2000						
	1	Zone1	14,555	0.2	0.0	0.0	0.3	0.8	0.0
	2	Zone 2	23,293	0.0	3.1	0.0	0.0	0.0	0.0
	3	Zone 3	80,742	0.0	0.0	0.7	0.0	0.0	1.0
	4	Zone 4	145,924	0.9	0.0	0.0	0.0	0.2	0.0
	5	Zone 5	152,345	2.6	0.0	0.0	0.0	0.6	0.0
	6	Zone 6	136,627	0.0	0.0	0.0	0.2	0.0	0.0
	7	Zone 7	338,516	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	656,258	0.0	4.9	0.0	0.0	0.0	0.0
Sum/Average			1,548,260	3.7	8.0	0.7	0.5	1.5	1.0

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 4	Total Base Demand Service Area 5	Total Base Demand Service Area 6	Total Base Demand Service Area 7	Total Base Demand Service Area 8	Total Base Demand Service Area 9
Source	integer	text	CELA (6-00)	real	real	real	real	real	real
Type	#	text	###	###.#	###.#	###.#	###.#	###.#	###.#
Display		text	People	mgd	mgd	mgd	mgd	mgd	mgd
Unit			copied	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
Column Name	POP_ZONE	POP_ZONE	ZONEPOP_2010	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
	1	Zone1	16,964	0.2	0.0	0.0	0.3	0.9	0.0
	2	Zone 2	29,475	0.0	3.6	0.0	0.0	0.0	0.0
	3	Zone 3	103,789	0.0	0.0	0.9	0.0	0.0	1.2
	4	Zone 4	234,699	1.4	0.0	0.0	0.0	0.4	0.0
	5	Zone 5	180,657	3.1	0.0	0.0	0.0	0.7	0.0
	6	Zone 6	150,217	0.0	0.0	0.0	0.3	0.0	0.0
	7	Zone 7	385,591	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	766,354	0.0	5.8	0.0	0.0	0.0	0.0
Sum/Average			1,867,746	4.7	9.4	0.9	0.6	1.9	1.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 4	Total Base Demand Service Area 5	Total Base Demand Service Area 6	Total Base Demand Service Area 7	Total Base Demand Service Area 8	Total Base Demand Service Area 9
Source			CELA (6-00)						
Type	integer	text	real	real	real	real	real	real	real
Display	#	text	###	###.#	###.#	###.#	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2020						
	1	Zone1	18,555	0.2	0.0	0.0	0.3	0.9	0.0
	2	Zone 2	32,949	0.0	3.9	0.0	0.0	0.0	0.0
	3	Zone 3	115,724	0.0	0.0	1.0	0.0	0.0	1.4
	4	Zone 4	280,465	1.7	0.0	0.0	0.0	0.4	0.0
	5	Zone 5	197,767	3.4	0.0	0.0	0.0	0.7	0.0
	6	Zone 6	161,057	0.0	0.0	0.0	0.3	0.0	0.0
	7	Zone 7	438,295	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	863,644	0.0	6.6	0.0	0.0	0.0	0.0
Sum/Average			2,108,456	5.3	10.5	1.0	0.6	2.1	1.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 4	Total Base Demand Service Area 5	Total Base Demand Service Area 6	Total Base Demand Service Area 7	Total Base Demand Service Area 8	Total Base Demand Service Area 9
Source	Type	Unit	CELA (6-00)	Area 4	Area 5	Area 6	Area 7	Area 8	Area 9
Display	integer #	text	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#
Unit	#	text	People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM E	ZONEPOP_2030						
	1	Zone 1	20,047	0.2	0.0	0.0	0.3	1.0	0.0
	2	Zone 2	35,873	0.0	4.2	0.0	0.0	0.0	0.0
	3	Zone 3	125,642	0.0	0.0	1.1	0.0	0.0	1.5
	4	Zone 4	317,032	1.9	0.0	0.0	0.0	0.5	0.0
	5	Zone 5	212,657	3.7	0.0	0.0	0.0	0.8	0.0
	6	Zone 6	171,590	0.0	0.0	0.0	0.4	0.0	0.0
	7	Zone 7	486,057	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	941,138	0.0	7.3	0.0	0.0	0.0	0.0
Sum/Average			2,310,036	5.9	11.5	1.1	0.7	2.3	1.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 4	Total Base Demand Service Area 5	Total Base Demand Service Area 6	Total Base Demand Service Area 7	Total Base Demand Service Area 8	Total Base Demand Service Area 9
Source			CELA (6-00)						
Type	integer	text	real	real	real	real	real	real	real
Display	#	text	#####	#####	#####	#####	#####	#####	#####
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2040						
	1	Zone1	21,391	0.3	0.0	0.0	0.4	1.1	0.0
	2	Zone 2	38,153	0.0	4.4	0.0	0.0	0.0	0.0
	3	Zone 3	133,081	0.0	0.0	1.1	0.0	0.0	1.6
	4	Zone 4	339,329	2.1	0.0	0.0	0.0	0.5	0.0
	5	Zone 5	225,051	4.1	0.0	0.0	0.0	0.9	0.0
	6	Zone 6	181,644	0.0	0.0	0.0	0.5	0.0	0.0
	7	Zone 7	528,306	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	996,019	0.0	7.9	0.0	0.0	0.0	0.0
Sum/Average			2,462,974	6.4	12.3	1.1	0.8	2.4	1.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 4	Total Base Demand Service Area 5	Total Base Demand Service Area 6	Total Base Demand Service Area 7	Total Base Demand Service Area 8	Total Base Demand Service Area 9
Source	Type	Text	CELA (6-00)	real	real	real	real	real	real
Display	#	text	###	###.#	###.#	###.#	###.#	###.#	###.#
Unit	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	POP_ZONE	POP_ZONE_NAME	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	E	ZONEPOP_2050						
	1	Zone1	22,297	0.3	0.0	0.0	0.4	1.1	0.0
	2	Zone2	39,710	0.0	4.5	0.0	0.0	0.0	0.0
	3	Zone3	138,071	0.0	0.0	1.2	0.0	0.0	1.6
	4	Zone4	353,434	2.2	0.0	0.0	0.0	0.5	0.0
	5	Zone5	233,226	4.3	0.0	0.0	0.0	0.9	0.0
	6	Zone6	188,371	0.0	0.0	0.0	0.6	0.0	0.0
	7	Zone7	560,852	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone8	1,035,520	0.0	8.4	0.0	0.0	0.0	0.0
Sum/Average			2,571,481	6.8	12.9	1.2	0.9	2.6	1.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 4	Total Base Demand Service Area 5	Total Base Demand Service Area 6	Total Base Demand Service Area 7	Total Base Demand Service Area 8	Total Base Demand Service Area 9
Source			CELA (6-00)						
Type	integer	text	real	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###	###
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2060						
	1	Zone1	22,886	0.3	0.0	0.0	0.4	1.1	0.0
	2	Zone 2	40,791	0.0	4.6	0.0	0.0	0.0	0.0
	3	Zone 3	141,889	0.0	0.0	1.2	0.0	0.0	1.7
	4	Zone 4	363,818	2.3	0.0	0.0	0.0	0.6	0.0
	5	Zone 5	239,383	4.7	0.0	0.0	0.0	1.0	0.0
	6	Zone 6	193,222	0.0	0.0	0.0	0.7	0.0	0.0
	7	Zone 7	576,174	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	1,064,988	0.0	8.9	0.0	0.0	0.0	0.0
Sum/Average			2,643,151	7.2	13.5	1.2	1.1	2.7	1.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 10	Total Total Base Demand
Source	Type	Display	Unit	Comment	Column Name
	integer	text	real	real	real
	#	text	###	###	###
	input (locked)	input (locked)	People	mgd	mgd
	POP_ZONE	POP_ZONE_NAM	copied	calculated	calculated
	POP_ZONE	E	ZONEPOP_2000		
	1	Zone1	14,555	0.0	1.2
	2	Zone 2	23,293	0.0	3.1
	3	Zone 3	80,742	0.0	7.2
	4	Zone 4	145,924	0.0	10.6
	5	Zone 5	152,345	0.0	12.4
	6	Zone 6	136,627	0.0	17.2
	7	Zone 7	338,516	0.2	59.9
	8	Zone 8	656,258	0.0	47.0
Sum/Average			1,548,260	0.2	158.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS

WORKSHEET: Base Demand by Zone

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 10	Total Total Base Demand
Source	Type	Display	Unit	Comment	Column Name
integer #	text	text	real ###.#	real ###.#	real ###.#
input (locked)	input (locked)	input (locked)	copied	calculated	calculated
POP_ZONE	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2010		
1	Zone 1		16,964	0.0	1.4
2	Zone 2		29,475	0.0	3.6
3	Zone 3		103,789	0.0	9.1
4	Zone 4		234,699	0.0	16.7
5	Zone 5		180,657	0.0	14.6
6	Zone 6		150,217	0.0	20.5
7	Zone 7		385,591	0.2	70.5
8	Zone 8		766,354	0.0	55.6
Sum/Average			1,867,746	0.2	191.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 10	Total Total Base Demand
Source			CELA (6-00)		
Type	integer	text	real	real	real
Display	#	text	###	###.#	###
Unit			People	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2020		
	1	Zone1	18,555	0.0	1.5
	2	Zone 2	32,949	0.0	3.9
	3	Zone 3	115,724	0.0	10.1
	4	Zone 4	280,465	0.0	19.9
	5	Zone 5	197,767	0.0	16.2
	6	Zone 6	161,057	0.0	24.3
	7	Zone 7	438,295	0.3	82.3
	8	Zone 8	863,644	0.0	63.4
Sum/Average			2,108,456	0.3	221.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 10	Total Total Base Demand
Source			CELA (6-00)		
Type	integer	text	real	real	real
Display	#	text	#,###	###.#	###
Unit			People	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2030		
	1	Zone1	20,047	0.0	1.6
	2	Zone 2	35,873	0.0	4.2
	3	Zone 3	125,642	0.0	11.0
	4	Zone 4	317,032	0.0	22.5
	5	Zone 5	212,657	0.0	17.8
	6	Zone 6	171,590	0.0	28.9
	7	Zone 7	486,057	0.3	93.9
	8	Zone 8	941,138	0.0	70.2
Sum/Average			2,310,036	0.3	250.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 10	Total Total Base Demand
Source	Type	Display	Unit	Comment	Column Name
	integer #	text	real CELA (6-00)	real ### #	real ###
	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)
	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2040	mgd calculated	mgd calculated
	1	Zone 1	21,391	0.0	1.7
	2	Zone 2	38,153	0.0	4.4
	3	Zone 3	133,081	0.0	11.7
	4	Zone 4	339,329	0.0	24.2
	5	Zone 5	225,051	0.0	19.3
	6	Zone 6	181,644	0.0	34.8
	7	Zone 7	528,306	0.4	105.8
	8	Zone 8	996,019	0.0	75.8
Sum/Average			2,462,974	0.4	277.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 10	Total Total Base Demand
Source	Type	Display	Unit	Comment	Column Name
	integer #	text	real ### #	real ### #	real ### #
	input (locked)	text	People copied	mgd calculated	mgd calculated
	input (locked)	input (locked)	POP_ZONE	POP_ZONE	POP_ZONE
	POP_ZONE	POP_ZONE	ZONEPOP_2050		
	1	Zone1	22,297	0.0	1.7
	2	Zone 2	39,710	0.0	4.5
	3	Zone 3	138,071	0.0	12.2
	4	Zone 4	353,434	0.0	25.2
	5	Zone 5	233,226	0.0	20.7
	6	Zone 6	188,371	0.0	41.8
	7	Zone 7	560,852	0.4	116.6
	8	Zone 8	1,035,520	0.0	80.3
Sum/Average			2,571,481	0.4	303.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPT**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Zone**

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand Service Area 10	Total Total Base Demand
Source			CELA (6-00)		
Type	integer	text	real	real	real
Display	#	text	###	###	###
Unit			People	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAM	ZONEPOP_2060		
	1	Zone1	22,886	0.0	1.8
	2	Zone 2	40,791	0.0	4.6
	3	Zone 3	141,889	0.0	12.6
	4	Zone 4	363,818	0.0	26.1
	5	Zone 5	239,383	0.0	22.2
	6	Zone 6	193,222	0.0	50.9
	7	Zone 7	576,174	0.4	127.9
	8	Zone 8	1,064,988	0.0	85.1
Sum/Average			2,643,151	0.4	331.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

LAST UPDATE: 06/02/01
BY: TJJ

YEAR 2000 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand
Source	integer #	text	real #,###	Harza real ###.#	Harza real ###	Harza real ###.#	Harza real ###	Harza real ###.#
Type	input (locked)	input (locked)	People	mgd	gpcd	mgd	gpcd	mgd
Display	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Unit								
Comment								
Column Name								
	1	Panama Metro	985,477	107.1	109	76.7	78	30.4
	2	Arraijan/Chorrera	245,533	19.0	77	15.6	64	3.4
	3	Colon	134,756	17.0	126	9.3	69	7.7
	4	Upper Calimito	46,754	3.7	79	2.9	63	0.8
	5	Panama Este	91,665	8.0	88	5.6	61	2.4
	6	Rio Gatun	7,864	0.7	89	0.6	73	0.1
	7	Gatun Noroeste	4,985	0.5	99	0.3	66	0.2
	8	Gatun Suroeste	19,169	1.5	81	1.2	63	0.3
	9	Upper Chagres	10,892	1.0	89	0.8	73	0.2
	10	Ancon	1,165	0.2	177	0.1	117	0.1
Sum/Average			1,548,260	159	102	113	73	46

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS LAST UPDATE: 06/02/01
WORKSHEET: Base Demand by Area BY: TJJ

YEAR 2010 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand
Source	integer #	text	real	real	real	real	real	real
Type	#	text	###	###	###	###	###	###
Display		text	People	mgd	gpcd	mgd	gpcd	mgd
Unit			calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)						
Column Name								
	1	Panama Metro	1,148,466	126.6	110	89.0	77	37.6
	2	Arrajani/Chorrera	346,096	26.1	76	22.0	64	4.1
	3	Colon	148,160	20.2	137	10.2	69	10.0
	4	Upper Caimito	60,722	4.7	78	3.8	63	0.9
	5	Panama Este	109,317	9.4	86	6.7	61	2.7
	6	Rio Gatun	10,109	0.9	87	0.7	73	0.1
	7	Gatun Noroeste	5,686	0.6	101	0.4	66	0.2
	8	Gatun Suroeste	23,863	1.9	79	1.5	63	0.4
	9	Upper Chagres	14,001	1.2	87	1.0	73	0.2
	10	Ancon	1,326	0.2	183	0.2	117	0.1
Sum/Average			1,867,746	192	103	136	73	56

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

LAST UPDATE: 06/02/01
BY: TJJ

YEAR 2020 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand
Source	Type	text	real	Harza	Harza	Harza	Harza	Harza
Display	#	text	#,###	###.#	real	real	###	###.#
Unit	input (locked)	input (locked)	People	mgd	gpcd	gpcd	gpcd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,297,033	146.1	113	100.6	78	45.5
	2	Arrajian/Chorrera	399,960	30.3	76	25.5	64	4.8
	3	Colon	158,851	24.0	151	10.9	69	13.1
	4	Upper Calmito	68,502	5.3	78	4.3	63	1.0
	5	Panama Este	122,927	10.5	86	7.6	61	3.0
	6	Rio Gatun	11,272	1.0	87	0.8	73	0.2
	7	Gatun Noroeste	6,175	0.6	105	0.4	65	0.2
	8	Gatun Suroeste	26,617	2.1	78	1.7	63	0.4
	9	Upper Chagres	15,611	1.4	87	1.1	73	0.2
	10	Ancon	1,508	0.3	188	0.2	117	0.1
Sum/Average			2,108,456	222	105	153	73	69

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS 06/02/01
WORKSHEET: Base Demand by Area TJJ

LAST UPDATE:
BY:

YEAR 2030 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand
Source	integer	text	real	Harza	Harza	Harza	Harza	Harza
Type	#	text	#,###	real	real	real	real	real
Display	input (locked)	input (locked)	People	###.#	###.#	###.#	###.#	###.#
Unit	input (locked)	input (locked)	calculated	mgd	gpcd	mgd	gpcd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,421,419	164.4	116	110.6	78	53.8
	2	Arraijan/Chorrera	443,936	33.8	76	28.3	64	5.6
	3	Colon	169,240	28.6	169	11.6	69	16.9
	4	Upper Caimito	75,008	5.9	79	4.7	63	1.2
	5	Panama Este	133,925	11.5	86	8.2	61	3.3
	6	Rio Gatun	12,238	1.1	88	0.9	73	0.2
	7	Gatun Noroeste	6,639	0.7	111	0.4	65	0.3
	8	Gatun Sureste	29,012	2.3	79	1.8	63	0.4
	9	Upper Chagres	16,948	1.5	88	1.2	73	0.2
	10	Ancon	1,672	0.3	193	0.2	117	0.1
Sum/Average			2,310,036	250	108	168	73	82

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS 06/02/01
WORKSHEET: Base Demand by Area TJJ

YEAR 2040 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand
Source	Type	text	real	Harza	Harza	Harza	Harza	Harza
Display	integer	text	#,###	real	real	real	real	real
Unit	#	text	People	###.#	###.#	###.#	###.#	###.#
Comment	input (locked)	input (locked)	calculated	mgd	gpcd	mgd	gpcd	mgd
Column Name	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
	1	Panama Metro	1,518,179	181.8	120	118.7	78	63.1
	2	Arrajian/Chorrera	473,289	36.5	77	30.1	64	6.4
	3	Colon	179,156	34.3	191	12.3	69	22.0
	4	Upper Calimito	79,735	6.4	80	5.0	63	1.4
	5	Panama Este	141,923	12.3	86	8.7	61	3.6
	6	Rio Gatun	12,962	1.1	88	0.9	73	0.2
	7	Gatun Noroeste	7,064	0.8	118	0.5	65	0.4
	8	Gatun Suroeste	30,896	2.4	79	2.0	63	0.5
	9	Upper Chagres	17,952	1.6	88	1.3	73	0.3
	10	Ancon	1,817	0.4	200	0.2	117	0.2
Sum/Average			2,462,974	278	113	180	73	98

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS **LAST UPDATE:** 06/02/01
WORKSHEET: Base Demand by Area **BY:** TJJ

YEAR 2050 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand
Source	integer	text	real	Harza	Harza	Harza	Harza	Harza
Type	#	text	###	real	real	real	real	real
Display		text	###	###	###	###	###	###
Unit			People	mgd	gpcd	mgd	gpcd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,589,661	196.9	124	124.7	78	72.2
	2	Arrajian/Chorrera	492,137	38.5	78	31.4	64	7.2
	3	Colon	185,791	41.2	222	12.8	69	28.5
	4	Upper Caimito	82,805	6.8	82	5.2	63	1.6
	5	Panama Este	147,595	12.9	87	9.1	61	3.8
	6	Rio Gatun	13,448	1.2	88	1.0	73	0.2
	7	Gatun Noroeste	7,350	0.9	128	0.5	65	0.5
	8	Gatun Suroeste	32,139	2.6	80	2.0	63	0.5
	9	Upper Chagres	18,625	1.6	88	1.4	73	0.3
	10	Ancon	1,929	0.4	208	0.2	117	0.2
Sum/Average			2,571,481	303	118	188	73	115

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS **LAST UPDATE:** 06/02/01
WORKSHEET: Base Demand by Area **BY:** TJJ

YEAR 2060 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand
Source	integer #	text	real	Harza real	Harza real	Harza real	Harza real	Harza real
Display	#	text	###	###	###	###	###	###
Unit			People	mgd	gpcd	mgd	gpcd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,634,180	212.7	130	128.2	78	84.5
	2	Arraijan/Chorrera	506,072	40.5	80	32.2	64	8.2
	3	Colon	190,576	50.2	263	13.1	69	37.1
	4	Upper Calimito	85,082	7.2	84	5.4	63	1.8
	5	Panama Este	151,746	13.5	89	9.3	61	4.1
	6	Rio Gatun	13,820	1.2	89	1.0	73	0.2
	7	Gatun Noroeste	7,542	1.1	143	0.5	65	0.6
	8	Gatun Suroeste	33,010	2.7	81	2.1	63	0.6
	9	Upper Chagres	19,140	1.7	89	1.4	73	0.3
	10	Ancon	1,982	0.4	222	0.2	117	0.2
Sum/Average			2,643,151	331	125	193	73	138

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2000 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Residential Base Demand Zone 1		Residential Base Demand Zone 2		Residential Base Demand Zone 3		Residential Base Demand Zone 4		Residential Base Demand Zone 5	
				integer #	input (locked)	text	real #,###	real People	real ###.#	real mgd	real ###.#	real mgd	real ###.#
Source	Type	Display	Unit	Comment	Column Name	input (locked)	input (locked)	text	text	text	text	text	text
	1	Panama Metro	985,477			0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0
	2	Arraijan/Chorrera	245,533			0.0	0.0	0.0	0.0	8.3	7.1	0.0	0.0
	3	Colon	134,756			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	Upper Caimito	46,754			0.1	0.0	0.0	0.0	0.8	2.0	0.0	0.0
	5	Panama Este	91,665			0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	7,864			0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	4,985			0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	Gatun Suroeste	19,169			0.6	0.0	0.0	0.0	0.2	0.4	0.0	0.0
	9	Upper Chagres	10,892			0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0
	10	Ancon	1,165			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum/Average			1,548,260			0.9	1.8	5.9	9.3	9.5			

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2010 BASE DEMAND

Description Source	Service Area integer #	Service Area Name text text	Service Area Population #,### People	Residential Base Demand Zone 1		Residential Base Demand Zone 2		Residential Base Demand Zone 3		Residential Base Demand Zone 4		Residential Base Demand Zone 5	
				input (locked) mgd calculated	real ###.# mgd calculated	input (locked) mgd calculated	real ###.# mgd calculated	input (locked) mgd calculated	real ###.# mgd calculated	input (locked) mgd calculated	real ###.# mgd calculated		
	1	Panama Metro	1,148,466	0.0	0.0	0.0	5.8	0.0	0.0	0.0	0.0	0.0	
	2	Arraijan/Chorrera	346,096	0.0	0.0	0.0	0.0	0.0	13.4	0.0	8.4	0.0	
	3	Colon	148,160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	4	Upper Caimito	60,722	0.2	0.0	0.0	0.0	0.0	1.3	0.0	2.4	0.0	
	5	Panama Este	109,317	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	
	6	Rio Gatun	10,109	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	
	7	Gatun Noroeste	5,686	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	8	Gatun Suroeste	23,863	0.7	0.0	0.0	0.0	0.0	0.3	0.0	0.5	0.0	
	9	Upper Chagres	14,001	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	
	10	Ancon	1,326	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sum/Average			1,867,746	1.1	2.2	7.6	15.0	11.3					

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2020 BASE DEMAND

Description Source	Service Area integer #	Service Area Name text text	Service Area Population #,### People	Residential Base Demand Zone 1		Residential Base Demand Zone 2		Residential Base Demand Zone 3		Residential Base Demand Zone 4		Residential Base Demand Zone 5	
				input (locked) mgd	input (locked) mgd	input (locked) mgd	input (locked) mgd	input (locked) mgd	input (locked) mgd	input (locked) mgd	input (locked) mgd	input (locked) mgd	input (locked) mgd
Column Name			calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Panama Metro	1,297,033	0.0	0.0	0.0	0.0	6.5	0.0	0.0	0.0	0.0	0.0
	2	Arraijan/Chorrera	399,960	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	9.2
	3	Colon	158,851	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	Upper Caimito	68,502	0.2	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	2.6
	5	Panama Este	122,927	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	11,272	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	6,175	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	Gatun Suroeste	26,617	0.8	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.5
	9	Upper Chagres	15,611	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
	10	Ancon	1,508	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum/Average			2,108,456	1.2	2.5	8.4	17.9	12.3					

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2030 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Residential Base Demand				
				Demand Zone 1	Demand Zone 2	Demand Zone 3	Demand Zone 4	Demand Zone 5
Source	integer	text	real	real	real	real	real	real
Type	#	text	###	###	###	###	###	###
Display		text	People	mgd	mgd	mgd	mgd	mgd
Unit			calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)						
Column Name								
	1	Panama Metro	1,421,419	0.0	0.0	7.0	0.0	0.0
	2	Arrajan/Chorrera	443,936	0.0	0.0	0.0	18.1	9.9
	3	Colon	169,240	0.0	0.0	0.0	0.0	0.0
	4	Upper Caimito	75,008	0.2	0.0	0.0	1.8	2.8
	5	Panama Este	133,925	0.0	2.7	0.0	0.0	0.0
	6	Rio Gatun	12,238	0.0	0.0	0.9	0.0	0.0
	7	Gatun Noroeste	6,639	0.3	0.0	0.0	0.0	0.0
	8	Gatun Suroeste	29,012	0.8	0.0	0.0	0.4	0.6
	9	Upper Chagres	16,948	0.0	0.0	1.2	0.0	0.0
	10	Ancon	1,672	0.0	0.0	0.0	0.0	0.0
Sum/Average			2,310,036	1.3	2.7	9.2	20.3	13.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2040 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Residential Base Demand Zone 1		Residential Base Demand Zone 2		Residential Base Demand Zone 3		Residential Base Demand Zone 4		Residential Base Demand Zone 5	
				integer #	text	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#
Source	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Type	integer #	text	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#
Display	#	text	People	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)											
Column Name													
	1	Panama Metro	1,518,179	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Arraijan/Chorrera	473,289	0.0	0.0	0.0	0.0	19.4	0.0	10.5	0.0	0.0	0.0
	3	Colon	179,156	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	Upper Cairmito	79,735	0.2	0.0	0.0	0.0	1.9	0.0	2.9	0.0	0.0	0.0
	5	Panama Este	141,923	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	12,962	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	7,064	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	Gatun Suroeste	30,896	0.9	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.6	0.0
	9	Upper Chagres	17,952	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10	Ancon	1,817	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum/Average			2,462,974	1.4	2.9	9.7	21.7	14.0					

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2050 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Residential Base Demand Zone 1	Residential Base Demand Zone 2	Residential Base Demand Zone 3	Residential Base Demand Zone 4	Residential Base Demand Zone 5
Source	integer	text	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###
Unit			People	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,589,661	0.0	0.0	7.7	0.0	0.0
	2	Arrajian/Chorrera	492,137	0.0	0.0	0.0	20.2	10.8
	3	Colon	185,791	0.0	0.0	0.0	0.0	0.0
	4	Upper Caimito	82,805	0.2	0.0	0.0	2.0	3.0
	5	Panama Este	147,595	0.0	3.0	0.0	0.0	0.0
	6	Rio Gatun	13,448	0.0	0.0	1.0	0.0	0.0
	7	Gatun Noroeste	7,350	0.3	0.0	0.0	0.0	0.0
	8	Gatun Suroeste	32,139	0.9	0.0	0.0	0.5	0.6
	9	Upper Chagres	18,625	0.0	0.0	1.4	0.0	0.0
	10	Ancon	1,929	0.0	0.0	0.0	0.0	0.0
Sum/Average			2,571,481	1.4	3.0	10.1	22.6	14.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2060 BASE DEMAND

Description	Service Area	Service Area Name		Service Area Population		Residential Base Demand Zone 1		Residential Base Demand Zone 2		Residential Base Demand Zone 3		Residential Base Demand Zone 4		Residential Base Demand Zone 5	
		integer #	text	real #,###	real People	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#
Unit	input (locked)	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	input (locked)	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Panama Metro		1,634,180	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Arraijan/Chorrera		506,072	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.8	11.1	0.0	0.0
	3	Colon		190,576	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	Upper Caimito		85,082	0.2	0.0	0.0	0.0	0.0	0.0	0.0	2.0	3.1	0.0	0.0
	5	Panama Este		151,746	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun		13,820	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	7	Gatun Noroeste		7,542	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	Gatun Suroeste		33,010	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.7	0.0	0.0
	9	Upper Chagres		19,140	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10	Ancon		1,982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum/Average				2,643,151	1.5	3.1	10.4	23.3	14.9						

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2000 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Residential Base Demand Zone 6	Residential Base Demand Zone 7	Residential Base Demand Zone 8	Total Residential Base Demand	Non-Resid Base Demand Zone 1
Source	Type	Display	Unit	Comment	Column Name	Sum/Average		
	integer #	text	text	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)
	#	###	###	###	###	###	###	###
	People	mgd	mgd	mgd	mgd	mgd	mgd	mgd
	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
	real	real	real	real	real	real	real	real
	###	###	###	###	###	###	###	###
	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
1	Panama Metro	985,477	0.0	39.3	32.9	76.7	0.0	0.0
2	Arraijan/Chorrera	245,533	0.0	0.2	0.0	15.6	0.0	0.0
3	Colon	134,756	9.3	0.0	0.0	9.3	0.0	0.0
4	Upper Calimito	46,754	0.0	0.0	0.0	2.9	0.0	0.0
5	Panama Este	91,665	0.0	0.0	3.8	5.6	0.0	0.0
6	Rio Gatun	7,864	0.0	0.0	0.0	0.6	0.0	0.0
7	Gatun Noroeste	4,985	0.1	0.0	0.0	0.3	0.1	0.1
8	Gatun Suroeste	19,169	0.0	0.0	0.0	1.2	0.2	0.2
9	Upper Chagres	10,892	0.0	0.0	0.0	0.8	0.0	0.0
10	Ancon	1,165	0.0	0.1	0.0	0.1	0.0	0.0
Sum/Average		1,548,260	9.4	39.6	36.7	113.2	0.3	0.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2010 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Residential Base Demand Zone 6	Residential Base Demand Zone 7	Residential Base Demand Zone 8	Total Residential Base Demand	Non-Resid Base Demand Zone 1
Source	integer #	text	real #,###	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#
Display	input (locked)	text	People	mgd	mgd	mgd	mgd	mgd
Unit	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
	1	Panama Metro	1,148,466	0.0	44.7	38.4	89.0	0.0
	2	Arraijan/Chorrera	346,096	0.0	0.2	0.0	22.0	0.0
	3	Colon	148,160	10.2	0.0	0.0	10.2	0.0
	4	Upper Caimito	60,722	0.0	0.0	0.0	3.8	0.0
	5	Panama Este	109,317	0.0	0.0	4.5	6.7	0.0
	6	Rio Gatun	10,109	0.0	0.0	0.0	0.7	0.0
	7	Gatun Noroeste	5,686	0.1	0.0	0.0	0.4	0.1
	8	Gatun Suroeste	23,863	0.0	0.0	0.0	1.5	0.2
	9	Upper Chagres	14,001	0.0	0.0	0.0	1.0	0.0
	10	Ancon	1,326	0.0	0.2	0.0	0.2	0.0
Sum/Average			1,867,746	10.3	45.1	42.9	135.5	0.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2020 BASE DEMAND

Description Source	Service Area integer #	Service Area Name text text	Service Area Population #,### People	Residential Base Demand Zone 6	Residential Base Demand Zone 7	Residential Base Demand Zone 8	Total Residential Base Demand	Non-Resid Base Demand Zone 1
				real ###.# mgd	real ###.# mgd	real ###.# mgd	real ### mgd	real ###.# mgd
Comment Column Name	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
	1	Panama Metro	1,297,033	0.0	50.8	43.3	100.6	0.0
	2	Arrajian/Chorrera	399,960	0.0	0.3	0.0	25.5	0.0
	3	Colon	158,851	10.9	0.0	0.0	10.9	0.0
	4	Upper Calimito	68,502	0.0	0.0	0.0	4.3	0.0
	5	Panama Este	122,927	0.0	0.0	5.0	7.6	0.0
	6	Rio Gatun	11,272	0.0	0.0	0.0	0.8	0.0
	7	Gatun Noroeste	6,175	0.2	0.0	0.0	0.4	0.1
	8	Gatun Suroeste	26,617	0.0	0.0	0.0	1.7	0.2
	9	Upper Chagres	15,611	0.0	0.0	0.0	1.1	0.0
	10	Ancon	1,508	0.0	0.2	0.0	0.2	0.0
Sum/Average			2,108,456	11.1	51.3	48.4	153.1	0.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area**

YEAR 2030 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Residential Base Demand Zone 6	Residential Base Demand Zone 7	Residential Base Demand Zone 8	Total Residential Base Demand	Non-Resid Base Demand Zone 1
Source	integer	text	real	real	real	real	real	real
Type	#	text	###	###	###	###	###	###
Display	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd
Unit	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)						
Column Name								
	1	Panama Metro	1,421,419	0.0	56.4	47.2	110.6	0.0
	2	Arrajian/Chorrera	443,936	0.0	0.3	0.0	28.3	0.0
	3	Colon	169,240	11.6	0.0	0.0	11.6	0.0
	4	Upper Caimito	75,008	0.0	0.0	0.0	4.7	0.0
	5	Panama Este	133,925	0.0	0.0	5.5	8.2	0.0
	6	Rio Gatun	12,238	0.0	0.0	0.0	0.9	0.0
	7	Gatun Noroeste	6,639	0.2	0.0	0.0	0.4	0.1
	8	Gatun Suroeste	29,012	0.0	0.0	0.0	1.8	0.2
	9	Upper Chagres	16,948	0.0	0.0	0.0	1.2	0.0
	10	Ancon	1,672	0.0	0.2	0.0	0.2	0.0
Sum/Average			2,310,036	11.8	56.9	52.7	168.1	0.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2040 BASE DEMAND

Description Source	Service Area integer #	Service Area Name text text	Service Area Population # ,### People	Residential Base Demand Zone 6 real ###.# mgd	Residential Base Demand Zone 7 real ###.# mgd	Residential Base Demand Zone 8 real ###.# mgd	Total Residential Base Demand real ### mgd	Non-Resid Base Demand Zone 1 real ###.# mgd
	1	Panama Metro	1,518,179	0.0	61.3	50.0	118.7	0.0
	2	Arraijan/Chorrera	473,289	0.0	0.3	0.0	30.1	0.0
	3	Colon	179,156	12.3	0.0	0.0	12.3	0.0
	4	Upper Calimito	79,735	0.0	0.0	0.0	5.0	0.0
	5	Panama Este	141,923	0.0	0.0	5.8	8.7	0.0
	6	Rio Gatun	12,962	0.0	0.0	0.0	0.9	0.0
	7	Gatun Noroeste	7,064	0.2	0.0	0.0	0.5	0.1
	8	Gatun Suroeste	30,896	0.0	0.0	0.0	2.0	0.2
	9	Upper Chagres	17,952	0.0	0.0	0.0	1.3	0.0
	10	Ancon	1,817	0.0	0.2	0.0	0.2	0.0
Sum/Average			2,462,974	12.5	61.8	55.8	179.8	0.3

Service Area Projections.xls/Base Demand by Area

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2050 BASE DEMAND

Description Source	Service Area integer #	Service Area Name text	Service Area Population #,###	Residential Base Demand Zone 6		Residential Base Demand Zone 7		Residential Base Demand Zone 8		Total Residential Base Demand		Non-Resid Base Demand Zone 1	
				input (locked) ###.#	calculated mgd	real ###.#	calculated mgd	real ###.#	calculated mgd	real ###.#	calculated mgd	real ###.#	calculated mgd
	1	Panama Metro	1,589,661	0.0		65.1		51.9		124.7		0.0	
	2	Arraijan/Chorrera	492,137	0.0		0.3		0.0		31.4		0.0	
	3	Colon	185,791	12.8		0.0		0.0		12.8		0.0	
	4	Upper Caimito	82,805	0.0		0.0		0.0		5.2		0.0	
	5	Panama Este	147,595	0.0		0.0		6.0		9.1		0.0	
	6	Rio Gatun	13,448	0.0		0.0		0.0		1.0		0.0	
	7	Gatun Noroeste	7,350	0.2		0.0		0.0		0.5		0.1	
	8	Gatun Suroeste	32,139	0.0		0.0		0.0		2.0		0.2	
	9	Upper Chagres	18,625	0.0		0.0		0.0		1.4		0.0	
	10	Ancon	1,929	0.0		0.2		0.0		0.2		0.0	
Sum/Average			2,571,481	12.9		65.6		58.0		188.2		0.3	

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2060 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Residential Base Demand Zone 6	Residential Base Demand Zone 7	Residential Base Demand Zone 8	Total Residential Base Demand	Non-Resid Base Demand Zone 1
Source	integer #	text	real #,###	real ###.#	real ###.#	real ###.#	real ###	real ###.#
Type	integer #	text	real #,###	real ###.#	real ###.#	real ###.#	real ###	real ###.#
Display	integer #	text	real #,###	real ###.#	real ###.#	real ###.#	real ###	real ###.#
Unit	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
	1	Panama Metro	1,634,180	0.0	66.8	53.4	128.2	0.0
	2	Arrajan/Chorrera	506,072	0.0	0.3	0.0	32.2	0.0
	3	Colon	190,576	13.1	0.0	0.0	13.1	0.0
	4	Upper Caimito	85,082	0.0	0.0	0.0	5.4	0.0
	5	Panama Este	151,746	0.0	0.0	6.2	9.3	0.0
	6	Rio Gatun	13,820	0.0	0.0	0.0	1.0	0.0
	7	Gatun Noroeste	7,542	0.2	0.0	0.0	0.5	0.1
	8	Gatun Suroeste	33,010	0.0	0.0	0.0	2.1	0.2
	9	Upper Chagres	19,140	0.0	0.0	0.0	1.4	0.0
	10	Ancon	1,982	0.0	0.2	0.0	0.2	0.0
Sum/Average			2,643,151	13.3	67.4	59.6	193.4	0.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2000 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 2	Non-Resid Base Demand Zone 3	Non-Resid Base Demand Zone 4	Non-Resid Base Demand Zone 5	Non-Resid Base Demand Zone 6
Source	integer	text	real	real	real	real	real	real
Type	#	text	###	###	###	###	###	###
Display	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd
Unit	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Comment								
Column Name								
	1	Panama Metro	985,477	0.0	1.0	0.0	0.0	0.0
	2	Arraijan/Chorrera	245,533	0.0	0.0	1.1	2.1	0.0
	3	Colon	134,756	0.0	0.0	0.0	0.0	7.7
	4	Upper Caimito	46,754	0.0	0.0	0.1	0.6	0.0
	5	Panama Este	91,665	1.4	0.0	0.0	0.0	0.0
	6	Rio Gatun	7,864	0.0	0.1	0.0	0.0	0.0
	7	Gatun Noroeste	4,985	0.0	0.0	0.0	0.0	0.1
	8	Gatun Suroeste	19,169	0.0	0.0	0.0	0.1	0.0
	9	Upper Chagres	10,892	0.0	0.2	0.0	0.0	0.0
	10	Ancon	1,165	0.0	0.0	0.0	0.0	0.0
Sum/Average			1,548,260	1.4	1.3	1.3	2.9	7.8

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2010 BASE DEMAND

Description Source	Service Area integer #	Service Area Name text text	Service Area Population # ,### People	Non-Resid Base Demand Zone 2		Non-Resid Base Demand Zone 3		Non-Resid Base Demand Zone 4		Non-Resid Base Demand Zone 5		Non-Resid Base Demand Zone 6	
				real ###.# mgd	calculated mgd	real ###.# mgd	calculated mgd	real ###.# mgd	calculated mgd	real ###.# mgd	calculated mgd	real ###.# mgd	calculated mgd
	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Panama Metro	1,148,466	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Arraijan/Chorrera	346,096	0.0	0.0	0.0	1.5	0.0	2.5	0.0	0.0	0.0	0.0
	3	Colon	148,160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0
	4	Upper Cairito	60,722	0.0	0.0	0.0	0.0	0.1	0.7	0.0	0.0	0.0	0.0
	5	Panama Este	109,317	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	10,109	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	5,686	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
	8	Gatun Suroeste	23,863	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
	9	Upper Chagres	14,001	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10	Ancon	1,326	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum/Average			1,867,746	1.4	1.5	1.7	3.4	10.2					

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2020 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 2	Non-Resid Base Demand Zone 3	Non-Resid Base Demand Zone 4	Non-Resid Base Demand Zone 5	Non-Resid Base Demand Zone 6
Source	integer #	text	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#
Type	#	text	People	mgd	mgd	mgd	mgd	mgd
Display	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Unit	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
	1	Panama Metro	1,297,033	0.0	1.3	0.0	0.0	0.0
	2	Arraijan/Chorrera	399,960	0.0	0.0	1.7	2.9	0.0
	3	Colon	158,851	0.0	0.0	0.0	0.0	13.1
	4	Upper Caimito	68,502	0.0	0.0	0.2	0.8	0.0
	5	Panama Este	122,927	1.4	0.0	0.0	0.0	0.0
	6	Rio Gatun	11,272	0.0	0.2	0.0	0.0	0.0
	7	Gatun Noroeste	6,175	0.0	0.0	0.0	0.0	0.2
	8	Gatun Suroeste	26,617	0.0	0.0	0.0	0.2	0.0
	9	Upper Chagres	15,611	0.0	0.2	0.0	0.0	0.0
	10	Ancon	1,508	0.0	0.0	0.0	0.0	0.0
Sum/Average			2,108,456	1.4	1.7	2.0	3.9	13.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2030 BASE DEMAND

Description Source	Service Area integer #	Service Area Name text	Service Area Population #,### People	Non-Resid Base Demand Zone 2		Non-Resid Base Demand Zone 3		Non-Resid Base Demand Zone 4		Non-Resid Base Demand Zone 5		Non-Resid Base Demand Zone 6	
				input (locked) mgd	calculated mgd	input (locked) mgd	calculated mgd	input (locked) mgd	calculated mgd	input (locked) mgd	calculated mgd	input (locked) mgd	calculated mgd
	1	Panama Metro	1,421,419	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Arraijan/Chorrera	443,936	0.0	0.0	2.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
	3	Colon	169,240	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.9	0.0
	4	Upper Caimito	75,008	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	5	Panama Este	133,925	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	12,238	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	6,639	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
	8	Gatun Suroeste	29,012	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	9	Upper Chagres	16,948	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10	Ancon	1,672	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum/Average			2,310,036	1.4	1.8	2.2	4.5	17.2					

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2040 BASE DEMAND

Description	Service Area		Service Area Name		Service Area Population		Non-Resid Base Demand Zone 2		Non-Resid Base Demand Zone 3		Non-Resid Base Demand Zone 4		Non-Resid Base Demand Zone 5		Non-Resid Base Demand Zone 6	
	integer #	input (locked)	text	text	real #,###	real People	real ###.#	real mgd	real ###.#	real mgd	real ###.#	real mgd	real ###.#	real mgd	real ###.#	real mgd
Unit	input (locked)	input (locked)	input (locked)		calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment																
Column Name																
	1		Panama Metro		1,518,179		0.0		1.5		0.0		0.0		0.0	
	2		Arrajani/Chorrera		473,289		0.0		0.0		2.2		4.0		0.0	
	3		Colon		179,156		0.0		0.0		0.0		0.0		22.0	
	4		Upper Caimito		79,735		0.0		0.0		0.2		1.1		0.0	
	5		Panama Este		141,923		1.5		0.0		0.0		0.0		0.0	
	6		Rio Gatun		12,962		0.0		0.2		0.0		0.0		0.0	
	7		Gatun Noroeste		7,064		0.0		0.0		0.0		0.0		0.3	
	8		Gatun Suroeste		30,896		0.0		0.0		0.1		0.2		0.0	
	9		Upper Chagres		17,952		0.0		0.3		0.0		0.0		0.0	
	10		Ancon		1,817		0.0		0.0		0.0		0.0		0.0	
Sum/Average					2,462,974		1.5		2.0		2.5		5.3		22.3	

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area**

YEAR 2050 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 2	Non-Resid Base Demand Zone 3	Non-Resid Base Demand Zone 4	Non-Resid Base Demand Zone 5	Non-Resid Base Demand Zone 6
Source	integer #	text	real #,###	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#
Type	input (locked)	input (locked)	People calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated
Display	input (locked)	text	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated
Unit	input (locked)	text	People calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated
Comment	input (locked)	input (locked)	People calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated
Column Name	input (locked)	input (locked)	People calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated
	1	Panama Metro	1,589,661	0.0	1.6	0.0	0.0	0.0
	2	Arraijan/Chorrera	492,137	0.0	0.0	2.3	4.6	0.0
	3	Colon	185,791	0.0	0.0	0.0	0.0	28.5
	4	Upper Caimito	82,805	0.0	0.0	0.2	1.3	0.0
	5	Panama Este	147,595	1.5	0.0	0.0	0.0	0.0
	6	Rio Gatun	13,448	0.0	0.2	0.0	0.0	0.0
	7	Gatun Noroeste	7,350	0.0	0.0	0.0	0.0	0.4
	8	Gatun Suroeste	32,139	0.0	0.0	0.1	0.3	0.0
	9	Upper Chagres	18,625	0.0	0.3	0.0	0.0	0.0
	10	Ancon	1,929	0.0	0.0	0.0	0.0	0.0
Sum/Average			2,571,481	1.5	2.1	2.6	6.1	28.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2060 BASE DEMAND

Description Source	Service Area #	Service Area Name text	Service Area Population #	Non-Resid Base Demand Zone 2		Non-Resid Base Demand Zone 3		Non-Resid Base Demand Zone 4		Non-Resid Base Demand Zone 5		Non-Resid Base Demand Zone 6	
				input (locked)	calculated	input (locked)	calculated	input (locked)	calculated	input (locked)	calculated	input (locked)	calculated
Type	integer	text	real	real	real	real	real	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###	###	###	###	###	###
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	
Column Name													
	1	Panama Metro	1,634,180	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	2	Arrajian/Chorrera	506,072	0.0	0.0	0.0	2.5	5.4	0.0	0.0	0.0	0.0	
	3	Colon	190,576	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.1	
	4	Upper Caimito	85,082	0.0	0.0	0.0	0.2	1.5	0.0	0.0	0.0	0.0	
	5	Panama Este	151,746	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	6	Rio Gatun	13,820	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	7	Gatun Noroeste	7,542	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	
	8	Gatun Suroeste	33,010	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	
	9	Upper Chagres	19,140	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	10	Ancon	1,982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sum/Average			2,643,151	1.5	2.2	2.8	7.3	37.6					

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2000 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 7	Non-Resid Base Demand Zone 8	Total Non-Resid Base Demand	Total Base Demand Zone 1	Total Base Demand Zone 2
Source	integer	text	real	real	real	real	real	real
Type	#	text	###.#	###.#	###.#	###.#	###.#	###.#
Display			People	mgd	mgd	mgd	mgd	mgd
Unit			calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)						
Column Name								
	1	Panama Metro	985,477	20.2	9.2	30.4	0.0	0.0
	2	Arrajan/Chorrera	245,533	0.1	0.0	3.4	0.0	0.0
	3	Colon	134,756	0.0	0.0	7.7	0.0	0.0
	4	Upper Caimito	46,754	0.0	0.0	0.8	0.2	0.0
	5	Panama Este	91,665	0.0	1.1	2.4	0.0	3.1
	6	Rio Gatun	7,864	0.0	0.0	0.1	0.0	0.0
	7	Gatun Noroeste	4,985	0.0	0.0	0.2	0.3	0.0
	8	Gatun Suroeste	19,169	0.0	0.0	0.3	0.8	0.0
	9	Upper Chagres	10,892	0.0	0.0	0.2	0.0	0.0
	10	Ancon	1,165	0.1	0.0	0.1	0.0	0.0
Sum/Average			1,548,260	20.3	10.3	45.5	1.2	3.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2010 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 7	Non-Resid Base Demand Zone 8	Total Non-Resid Base Demand	Total Base Demand Zone 1	Total Base Demand Zone 2
Source	integer #	text	real #,###	real ###.#	real ###.#	real ###	real ###.#	real ###.#
Unit	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,148,466	25.1	11.3	37.6	0.0	0.0
	2	Arraijan/Chorrera	346,096	0.1	0.0	4.1	0.0	0.0
	3	Colon	148,160	0.0	0.0	10.0	0.0	0.0
	4	Upper Caimito	60,722	0.0	0.0	0.9	0.2	0.0
	5	Panama Este	109,317	0.0	1.3	2.7	0.0	3.6
	6	Rio Gatun	10,109	0.0	0.0	0.1	0.0	0.0
	7	Gatun Noroeste	5,686	0.0	0.0	0.2	0.3	0.0
	8	Gatun Suroeste	23,863	0.0	0.0	0.4	0.9	0.0
	9	Upper Chagres	14,001	0.0	0.0	0.2	0.0	0.0
	10	Ancon	1,326	0.1	0.0	0.1	0.0	0.0
Sum/Average			1,867,746	25.4	12.7	56.4	1.4	3.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2020 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 7	Non-Resid Base Demand Zone 8	Total Non-Resid Base Demand	Total Base Demand Zone 1	Total Base Demand Zone 2
Source	integer	text	real	real	real	real	real	real
Display	#	text	#,###	###.#	###.#	###	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,297,033	30.7	13.5	45.5	0.0	0.0
	2	Arraijan/Chorrera	399,960	0.2	0.0	4.8	0.0	0.0
	3	Colon	158,851	0.0	0.0	13.1	0.0	0.0
	4	Upper Caimito	68,502	0.0	0.0	1.0	0.2	0.0
	5	Panama Este	122,927	0.0	1.6	3.0	0.0	3.9
	6	Rio Gatun	11,272	0.0	0.0	0.2	0.0	0.0
	7	Gatun Noroeste	6,175	0.0	0.0	0.2	0.3	0.0
	8	Gatun Suroeste	26,617	0.0	0.0	0.4	0.9	0.0
	9	Upper Chagres	15,611	0.0	0.0	0.2	0.0	0.0
	10	Ancon	1,508	0.1	0.0	0.1	0.0	0.0
Sum/Average			2,108,456	31.0	15.1	68.5	1.5	3.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2030 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 7	Non-Resid Base Demand Zone 8	Total Non-Resid Base Demand	Total Base Demand Zone 1	Total Base Demand Zone 2
Source	integer	text	real	real	real	real	real	real
Type	#	text	###	###	###	###	###	###
Display			People	mgd	mgd	mgd	mgd	mgd
Unit			calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)						
Column Name								
	1	Panama Metro	1,421,419	36.7	15.6	53.8	0.0	0.0
	2	Arraijan/Chorrera	443,936	0.2	0.0	5.6	0.0	0.0
	3	Colon	169,240	0.0	0.0	16.9	0.0	0.0
	4	Upper Caimito	75,008	0.0	0.0	1.2	0.2	0.0
	5	Panama Este	133,925	0.0	1.8	3.3	0.0	4.2
	6	Rio Gatun	12,238	0.0	0.0	0.2	0.0	0.0
	7	Gatun Noroeste	6,639	0.0	0.0	0.3	0.3	0.0
	8	Gatun Suroeste	29,012	0.0	0.0	0.4	1.0	0.0
	9	Upper Chagres	16,948	0.0	0.0	0.2	0.0	0.0
	10	Ancon	1,672	0.1	0.0	0.1	0.0	0.0
Sum/Average			2,310,036	37.0	17.5	82.0	1.6	4.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2040 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 7	Non-Resid Base Demand Zone 8	Total Non-Resid Base Demand	Total Base Demand Zone 1	Total Base Demand Zone 2
Source	integer	text	real	real	real	real	real	real
Type	#	text	###	###	###	###	###	###
Display			People	mgd	mgd	mgd	mgd	mgd
Unit			calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)						
Column Name								
	1	Panama Metro	1,518,179	43.6	18.0	63.1	0.0	0.0
	2	Arraijan/Chorrera	473,289	0.2	0.0	6.4	0.0	0.0
	3	Colon	179,156	0.0	0.0	22.0	0.0	0.0
	4	Upper Caimito	79,735	0.0	0.0	1.4	0.3	0.0
	5	Panama Este	141,923	0.0	2.1	3.6	0.0	4.4
	6	Rio Gatun	12,962	0.0	0.0	0.2	0.0	0.0
	7	Gatun Noroeste	7,064	0.0	0.0	0.4	0.4	0.0
	8	Gatun Suroeste	30,896	0.0	0.0	0.5	1.1	0.0
	9	Upper Chagres	17,952	0.0	0.0	0.3	0.0	0.0
	10	Ancon	1,817	0.2	0.0	0.2	0.0	0.0
Sum/Average			2,462,974	44.0	20.1	97.9	1.7	4.4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2050 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 7	Non-Resid Base Demand Zone 8	Total Non-Resid Base Demand	Total Base Demand Zone 1	Total Base Demand Zone 2
Source	Type	Text	real	real	real	real	real	real
Display	#	text	###.#	###.#	###.#	###.#	###.#	###.#
Unit	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,589,661	50.6	20.0	72.2	0.0	0.0
	2	Arraijan/Chorrera	492,137	0.3	0.0	7.2	0.0	0.0
	3	Colon	185,791	0.0	0.0	28.5	0.0	0.0
	4	Upper Cairito	82,805	0.0	0.0	1.6	0.3	0.0
	5	Panama Este	147,595	0.0	2.3	3.8	0.0	4.5
	6	Rio Gatun	13,448	0.0	0.0	0.2	0.0	0.0
	7	Gatun Noroeste	7,350	0.0	0.0	0.5	0.4	0.0
	8	Gatun Suroeste	32,139	0.0	0.0	0.5	1.1	0.0
	9	Upper Chagres	18,625	0.0	0.0	0.3	0.0	0.0
	10	Ancon	1,929	0.2	0.0	0.2	0.0	0.0
Sum/Average			2,571,481	51.0	22.3	114.8	1.7	4.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2060 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Non-Resid Base Demand Zone 7	Non-Resid Base Demand Zone 8	Total Non-Resid Base Demand	Total Base Demand Zone 1	Total Base Demand Zone 2
Source	integer	text	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###
Unit		People	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,634,180	60.0	22.8	84.5	0.0	0.0
	2	Arraijan/Chorrera	506,072	0.3	0.0	8.2	0.0	0.0
	3	Colon	190,576	0.0	0.0	37.1	0.0	0.0
	4	Upper Calimito	85,082	0.0	0.0	1.8	0.3	0.0
	5	Panama Este	151,746	0.0	2.7	4.1	0.0	4.6
	6	Rio Gatun	13,820	0.0	0.0	0.2	0.0	0.0
	7	Gatun Noroeste	7,542	0.0	0.0	0.6	0.4	0.0
	8	Gatun Suroeste	33,010	0.0	0.0	0.6	1.1	0.0
	9	Upper Chagres	19,140	0.0	0.0	0.3	0.0	0.0
	10	Ancon	1,982	0.2	0.0	0.2	0.0	0.0
Sum/Average			2,643,151	60.5	25.5	137.7	1.8	4.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2000 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 3	Total Base Demand Zone 4	Total Base Demand Zone 5	Total Base Demand Zone 6	Total Base Demand Zone 7
Source	integer #	text	real #,###	real ###.#	real ###.#	real ###.#	real ###.#	real ###.#
Unit	input (locked)	input (locked)	People	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	985,477	5.5	0.0	0.0	0.0	59.4
	2	Arrajian/Chorrera	245,533	0.0	9.5	9.2	0.0	0.3
	3	Colon	134,756	0.0	0.0	0.0	17.0	0.0
	4	Upper Caimito	46,754	0.0	0.9	2.6	0.0	0.0
	5	Panama Este	91,665	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	7,864	0.7	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	4,985	0.0	0.0	0.0	0.2	0.0
	8	Gatun Suroeste	19,169	0.0	0.2	0.6	0.0	0.0
	9	Upper Chagres	10,892	1.0	0.0	0.0	0.0	0.0
	10	Ancon	1,165	0.0	0.0	0.0	0.0	0.2
Sum/Average			1,548,260	7.2	10.6	12.4	17.2	59.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2010 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 3	Total Base Demand Zone 4	Total Base Demand Zone 5	Total Base Demand Zone 6	Total Base Demand Zone 7
Source	integer	text	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###
Unit			People	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,148,466	7.0	0.0	0.0	0.0	69.9
	2	Arrajan/Chorrera	346,096	0.0	14.9	10.9	0.0	0.4
	3	Colon	148,160	0.0	0.0	0.0	20.2	0.0
	4	Upper Caimito	60,722	0.0	1.4	3.1	0.0	0.0
	5	Panama Este	109,317	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	10,109	0.9	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	5,686	0.0	0.0	0.0	0.3	0.0
	8	Gatun Suroeste	23,863	0.0	0.4	0.7	0.0	0.0
	9	Upper Chagres	14,001	1.2	0.0	0.0	0.0	0.0
	10	Ancon	1,326	0.0	0.0	0.0	0.0	0.2
Sum/Average			1,867,746	9.1	16.7	14.6	20.5	70.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area**

YEAR 2020 BASE DEMAND

Description Source	Service Area integer #	Service Area Name text text	Service Area Population # ,###	Total Base Demand Zone 3		Total Base Demand Zone 4		Total Base Demand Zone 5		Total Base Demand Zone 6		Total Base Demand Zone 7	
				real ###.#	calculated mgd	real ###.#	calculated mgd	real ###.#	calculated mgd	real ###.#	calculated mgd	real ###.#	calculated mgd
Comment Column Name	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Panama Metro	1,297,033	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.5	
	2	Arraijan/Chorrera	399,960	0.0	17.8	12.1	0.0	0.0	0.0	0.0	0.0	0.4	
	3	Colon	158,851	0.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0	
	4	Upper Calimito	68,502	0.0	1.7	3.4	0.0	0.0	0.0	0.0	0.0	0.0	
	5	Panama Este	122,927	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	6	Rio Gatun	11,272	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	7	Gatun Noroeste	6,175	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	
	8	Gatun Suroeste	26,617	0.0	0.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	
	9	Upper Chagres	15,611	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	10	Ancon	1,508	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	
Sum/Average			2,108,456	10.1	19.9	16.2	24.3	82.3					

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area**

YEAR 2030 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 3	Total Base Demand Zone 4	Total Base Demand Zone 5	Total Base Demand Zone 6	Total Base Demand Zone 7
Source	integer	text	real	real	real	real	real	real
Type	#	text	###	###	###	###	###	###
Display			People	mgd	mgd	mgd	mgd	mgd
Unit			calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)						
Column Name								
	1	Panama Metro	1,421,419	8.5	0.0	0.0	0.0	93.1
	2	Arrajan/Chorrera	443,936	0.0	20.1	13.3	0.0	0.5
	3	Colon	169,240	0.0	0.0	0.0	28.6	0.0
	4	Upper Caimito	75,008	0.0	1.9	3.7	0.0	0.0
	5	Panama Este	133,925	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	12,238	1.1	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	6,639	0.0	0.0	0.0	0.4	0.0
	8	Gatun Suroeste	29,012	0.0	0.5	0.8	0.0	0.0
	9	Upper Chagres	16,948	1.5	0.0	0.0	0.0	0.0
	10	Ancon	1,672	0.0	0.0	0.0	0.0	0.3
Sum/Average			2,310,036	11.0	22.5	17.8	28.9	93.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2040 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 3	Total Base Demand Zone 4	Total Base Demand Zone 5	Total Base Demand Zone 6	Total Base Demand Zone 7
Source	integer	text	real	real	real	real	real	real
Type	#	text	###.#	###.#	###.#	###.#	###.#	###.#
Display			People	mgd	mgd	mgd	mgd	mgd
Unit	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Comment								
Column Name								
	1	Panama Metro	1,518,179	9.0	0.0	0.0	0.0	104.9
	2	Arrajian/Chorrera	473,289	0.0	21.6	14.4	0.0	0.5
	3	Colon	179,156	0.0	0.0	0.0	34.3	0.0
	4	Upper Caimito	79,735	0.0	2.1	4.1	0.0	0.0
	5	Panama Este	141,923	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	12,962	1.1	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	7,064	0.0	0.0	0.0	0.5	0.0
	8	Gatun Suroeste	30,896	0.0	0.5	0.9	0.0	0.0
	9	Upper Chagres	17,952	1.6	0.0	0.0	0.0	0.0
	10	Ancon	1,817	0.0	0.0	0.0	0.0	0.4
Sum/Average			2,462,974	11.7	24.2	19.3	34.8	105.8

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2050 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 3	Total Base Demand Zone 4	Total Base Demand Zone 5	Total Base Demand Zone 6	Total Base Demand Zone 7
Source	integer	text	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###
Unit			People	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,589,661	9.3	0.0	0.0	0.0	115.6
	2	Arraijan/Chorrera	492,137	0.0	22.5	15.4	0.0	0.6
	3	Colon	185,791	0.0	0.0	0.0	41.2	0.0
	4	Upper Caimito	82,805	0.0	2.2	4.3	0.0	0.0
	5	Panama Este	147,595	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	13,448	1.2	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	7,350	0.0	0.0	0.0	0.6	0.0
	8	Gatun Suroeste	32,139	0.0	0.5	0.9	0.0	0.0
	9	Upper Chagres	18,625	1.6	0.0	0.0	0.0	0.0
	10	Ancon	1,929	0.0	0.0	0.0	0.0	0.4
Sum/Average			2,571,481	12.2	25.2	20.7	41.8	116.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2060 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 3	Total Base Demand Zone 4	Total Base Demand Zone 5	Total Base Demand Zone 6	Total Base Demand Zone 7
Source								
Type	integer	text	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###
Unit			People	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated
Column Name								
	1	Panama Metro	1,634,180	9.6	0.0	0.0	0.0	126.8
	2	Arraijan/Chorrera	506,072	0.0	23.3	16.5	0.0	0.7
	3	Colon	190,576	0.0	0.0	0.0	50.2	0.0
	4	Upper Caimito	85,082	0.0	2.3	4.7	0.0	0.0
	5	Panama Este	151,746	0.0	0.0	0.0	0.0	0.0
	6	Rio Gatun	13,820	1.2	0.0	0.0	0.0	0.0
	7	Gatun Noroeste	7,542	0.0	0.0	0.0	0.7	0.0
	8	Gatun Suroeste	33,010	0.0	0.6	1.0	0.0	0.0
	9	Upper Chagres	19,140	1.7	0.0	0.0	0.0	0.0
	10	Ancon	1,982	0.0	0.0	0.0	0.0	0.4
Sum/Average			2,643,151	12.6	26.1	22.2	50.9	127.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2000 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 8	Total Total Base Demand
Source	Type	Text	real	real	real
Display	#	text	###	###	###
Unit			People	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated
Column Name					
	1	Panama Metro	985,477	42.1	107.1
	2	Arrajian/Chorrera	245,533	0.0	19.0
	3	Colon	134,756	0.0	17.0
	4	Upper Caimito	46,754	0.0	3.7
	5	Panama Este	91,665	4.9	8.0
	6	Rio Gatun	7,864	0.0	0.7
	7	Gatun Noroeste	4,985	0.0	0.5
	8	Gatun Suroeste	19,169	0.0	1.5
	9	Upper Chagres	10,892	0.0	1.0
	10	Ancon	1,165	0.0	0.2
Sum/Average			1,548,260	47.0	158.7

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2010 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 8	Total Total Base Demand
Source	integer	text	real	real	real
Type	#	text	###	###	###
Display			People	mgd	mgd
Unit			calculated	calculated	calculated
Comment	input (locked)	input (locked)			
Column Name					
	1	Panama Metro	1,148,466	49.8	126.6
	2	Arraijan/Chorrera	346,096	0.0	26.1
	3	Colon	148,160	0.0	20.2
	4	Upper Caimito	60,722	0.0	4.7
	5	Panama Este	109,317	5.8	9.4
	6	Rio Gatun	10,109	0.0	0.9
	7	Gatun Noroeste	5,686	0.0	0.6
	8	Gatun Suroeste	23,863	0.0	1.9
	9	Upper Chagres	14,001	0.0	1.2
	10	Ancon	1,326	0.0	0.2
Sum/Average			1,867,746	55.6	191.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2020 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 8	Total Total Base Demand
Source	integer #	text	real ###	real ###	real ###
Type	integer #	text	real ###	real ###	real ###
Display	#	text	###	###	###
Unit			People	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated
Column Name					
	1	Panama Metro	1,297,033	56.8	146.1
	2	Arrajan/Chorrera	399,960	0.0	30.3
	3	Colon	158,851	0.0	24.0
	4	Upper Caimito	68,502	0.0	5.3
	5	Panama Este	122,927	6.6	10.5
	6	Rio Gatun	11,272	0.0	1.0
	7	Gatun Noroeste	6,175	0.0	0.6
	8	Gatun Suroeste	26,617	0.0	2.1
	9	Upper Chagres	15,611	0.0	1.4
	10	Ancon	1,508	0.0	0.3
Sum/Average			2,108,456	63.4	221.6

Service Area Projections.xls/Base Demand by Area

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area**

YEAR 2030 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 8	Total Total Base Demand
Source	Type	Display	Unit	Comment	Column Name
1	integer	text	real	real	real
2	#	text	###	###	###
3	input (locked)	input (locked)	People	mgd	mgd
4	1	Panama Metro	1,421,419	62.9	164.4
5	2	Arrajani/Chorrera	443,936	0.0	33.8
6	3	Colon	169,240	0.0	28.6
7	4	Upper Caimito	75,008	0.0	5.9
8	5	Panama Este	133,925	7.3	11.5
9	6	Rio Gatun	12,238	0.0	1.1
10	7	Gatun Noroeste	6,639	0.0	0.7
	8	Gatun Suroeste	29,012	0.0	2.3
	9	Upper Chagres	16,948	0.0	1.5
	10	Ancon	1,672	0.0	0.3
Sum/Average			2,310,036	70.2	250.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area**

YEAR 2040 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 8	Total Total Base Demand
Source	Type	Display	Unit	Comment	Column Name
integer #	text	input (locked)	real ###	real ###	real ###
input (locked)	People	calculated	mgd	mgd	mgd
input (locked)	calculated	calculated	calculated	calculated	calculated
1	Panama Metro	1,518,179	67.9	181.8	
2	Arraijan/Chorrera	473,289	0.0	36.5	
3	Colon	179,156	0.0	34.3	
4	Upper Caimito	79,735	0.0	6.4	
5	Panama Este	141,923	7.9	12.3	
6	Rio Gatun	12,962	0.0	1.1	
7	Gatun Noroeste	7,064	0.0	0.8	
8	Gatun Suroeste	30,896	0.0	2.4	
9	Upper Chagres	17,952	0.0	1.6	
10	Ancon	1,817	0.0	0.4	
Sum/Average		2,462,974	75.8	277.7	

DEFINISHED FOR THE BATTERY COMPANY, PANAMA

Service Area Projections.xls/Base Demand by Area
06/03/2001

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area**

YEAR 2050 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 8	Total Total Base Demand
Source	integer	text	real	real	real
Display	#	text	#,###	###.#	###
Unit			People	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated
Column Name					
	1	Panama Metro	1,589,661	72.0	196.9
	2	Arraijan/Chorrera	492,137	0.0	38.5
	3	Colon	185,791	0.0	41.2
	4	Upper Caimito	82,805	0.0	6.8
	5	Panama Este	147,595	8.4	12.9
	6	Rio Gatun	13,448	0.0	1.2
	7	Gatun Noroeste	7,350	0.0	0.9
	8	Gatun Suroeste	32,139	0.0	2.6
	9	Upper Chagres	18,625	0.0	1.6
	10	Ancon	1,929	0.0	0.4
Sum/Average			2,571,481	80.3	303.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: SERVICE AREA PROJECTIONS
WORKSHEET: Base Demand by Area

YEAR 2060 BASE DEMAND

Description	Service Area	Service Area Name	Service Area Population	Total Base Demand Zone 8	Total Total Base Demand
Source	Type	Text	real	real	real
Display	#	text	###.#	###.#	###
Unit			People	mgd	mgd
Comment	input (locked)	input (locked)	calculated	calculated	calculated
Column Name					
	1	Panama Metro	1,634,180	76.2	212.7
	2	Arraijan/Chorrera	506,072	0.0	40.5
	3	Colon	190,576	0.0	50.2
	4	Upper Caimito	85,082	0.0	7.2
	5	Panama Este	151,746	8.9	13.5
	6	Rio Gatun	13,820	0.0	1.2
	7	Gatun Noroeste	7,542	0.0	1.1
	8	Gatun Suroeste	33,010	0.0	2.7
	9	Upper Chagres	19,140	0.0	1.7
	10	Ancon	1,982	0.0	0.4
Sum/Average			2,643,151	85.1	331.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

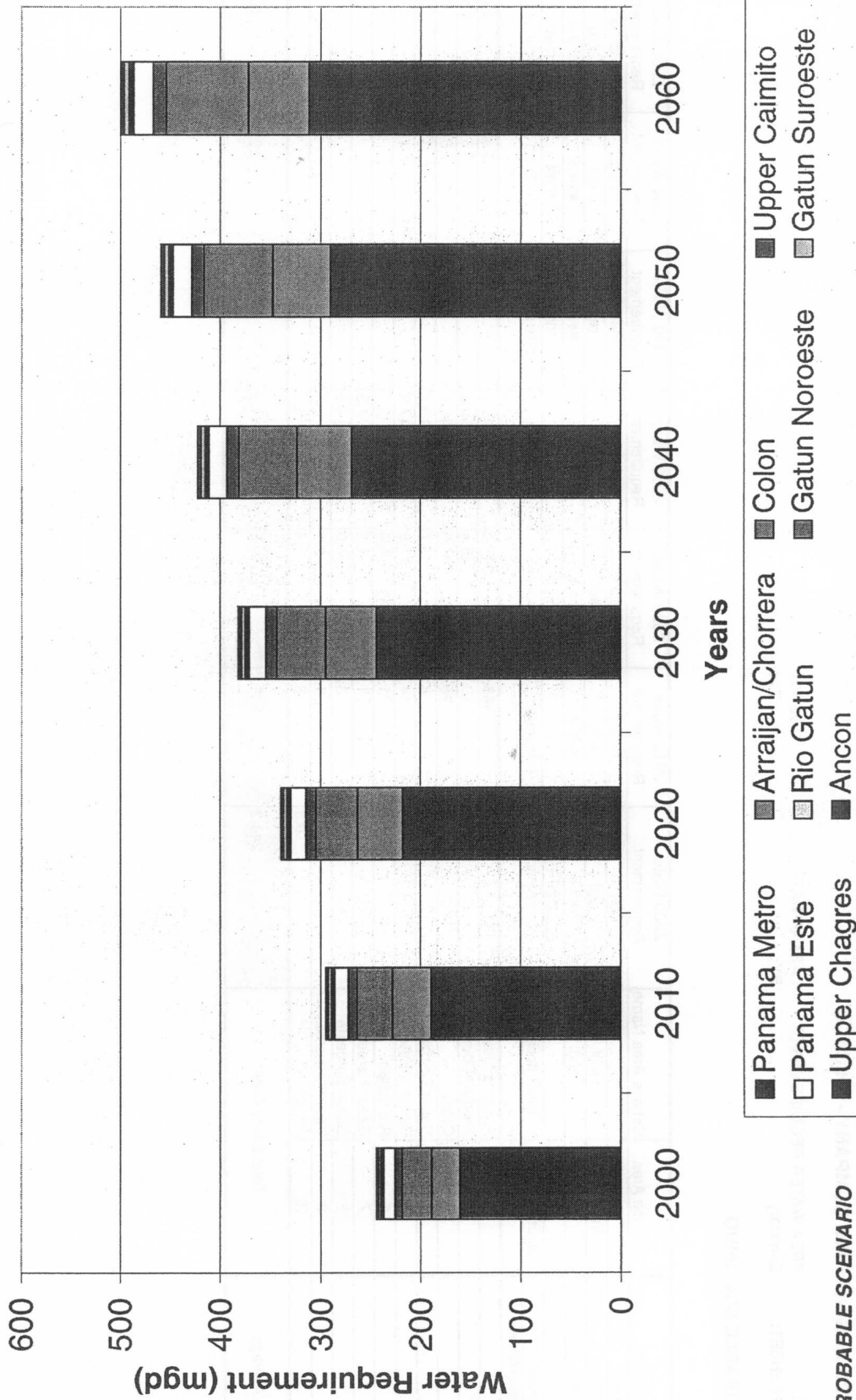
HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS 06/02/01
WORKSHEET: Summary BY: TJJ

PROBABLE SCENARIO

Description	Service Area	Service Area Name	2000 Water Requirement	2010 Water Requirement	2020 Water Requirement	2030 Water Requirement	2040 Water Requirement	2050 Water Requirement	2060 Water Requirement
Source Type	integer	text	Harza real	Harza real	Harza real	Harza real	Harza real	Harza real	Harza real
Display Unit	#	text	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Comment Column Name	input (locked)	input (locked)	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated
	1	Panama Metro	160.1	188.9	217.4	243.9	268.8	290.0	311.5
	2	Arraijan/Chorrera	28.4	39.2	45.4	50.6	54.6	57.4	60.2
	3	Colon	30.1	35.5	41.5	48.8	57.8	68.6	82.3
	4	Upper Cairmito	6.7	8.6	9.7	10.7	11.6	12.2	12.9
	5	Panama Este	12.0	14.1	15.8	17.2	18.3	19.2	20.1
	6	Rio Gatun	1.3	1.7	1.9	2.1	2.2	2.3	2.3
	7	Gatun Noroeste	0.9	1.0	1.2	1.3	1.5	1.7	1.9
	8	Gatun Suroeste	2.9	3.6	4.0	4.3	4.6	4.9	5.1
	9	Upper Chagres	1.5	1.9	2.1	2.3	2.4	2.5	2.6
	10	Ancon	0.3	0.4	0.4	0.5	0.5	0.6	0.6
Sum/Average	Total Study Area		244.2	294.7	339.3	381.7	422.3	459.3	499.5

TOTAL WATER REQUIREMENT PANAMA CANAL WATERSHED SERVICE AREA



PROBABLE SCENARIO

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Panama Metro
PROBABLE SCENARIO

LAST UPDATE: 6/2/01
BY: TJJ

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	52%	52%	52%	52%	52%	52%	52%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	23%	23%	23%	23%	23%	23%	23%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Panama Metro
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 6/2/01
BY: TJJ

**WATER REQUIREMENT SUMMARIES
PANAMA METRO WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
Residential (mgd)	76.7	89.0	100.6	110.6	118.7	124.7	128.2
Non-Residential (mgd)	30.4	37.6	45.5	53.8	63.1	72.2	84.5
Total Base Demand (mgd)	107.1	126.6	146.1	164.4	181.8	196.9	212.7
	985477						
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
Residential Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Residential Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
Residential (mgd)	76.7	89.0	100.6	110.6	118.7	124.7	128.2
Non-Residential Demand (mgd)	30.4	37.6	45.5	53.8	63.1	72.2	84.5
Subtotal (mgd)	107.1	126.6	146.1	164.4	181.8	196.9	212.7
Excessive Use							
Unmetered Residential Demand (mgd)	36.9	42.8	48.4	53.2	57.1	60.0	61.7
Estimated Excessive Use (mgd)	16.2	18.8	21.3	23.4	25.1	26.4	27.1
Physical Leakage							
Estimated Physical Leakage (mgd)	36.8	43.4	50.0	56.1	61.8	66.7	71.6
Production Losses							
Estimated Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	107.1	126.6	146.1	164.4	181.8	196.9	212.7
Excessive Use (mgd)	16.2	18.8	21.3	23.4	25.1	26.4	27.1
Physical Leakage (mgd)	36.8	43.4	50.0	56.1	61.8	66.7	71.6
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	160.1	188.9	217.4	243.9	268.8	290.0	311.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE:
WORKSHEET:
MODEL RUN:**

**AREA WATER REQUIREMENTS
Panama Metro
PROBABLE SCENARIO**

**LAST UPDATE: 6/2/01
BY: TJJ**

**WATER REQUIREMENT SUMMARIES
PANAMA METRO WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	107.1	126.6	146.1	164.4	181.8	196.9	212.7
Excessive Use (mgd)	16.2	18.8	21.3	23.4	25.1	26.4	27.1
Physical Leakage (mgd)	36.8	43.4	50.0	56.1	61.8	66.7	71.6
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	160.1	188.9	217.4	243.9	268.8	290.0	311.5
Total Actual Water Use (mgd)	160.1	188.9	217.4	243.9	268.8	290.0	311.5
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	160.1	188.9	217.4	243.9	268.8	290.0	311.5
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	160.1	188.9	217.4	243.9	268.8	290.0	311.5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

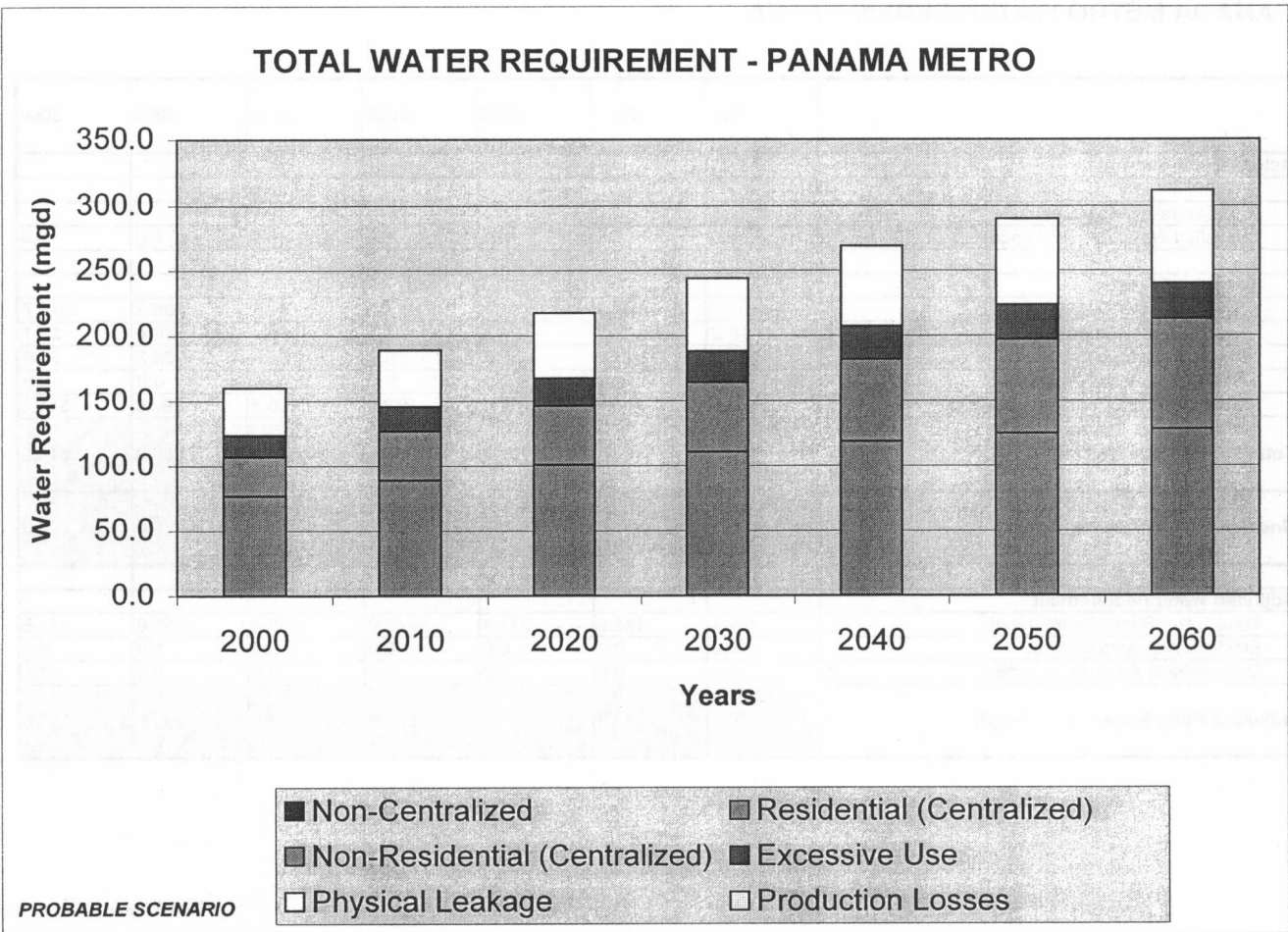
PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Panama Metro
PROBABLE SCENARIO

LAST UPDATE: 06/02/2001
BY: TJJ



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

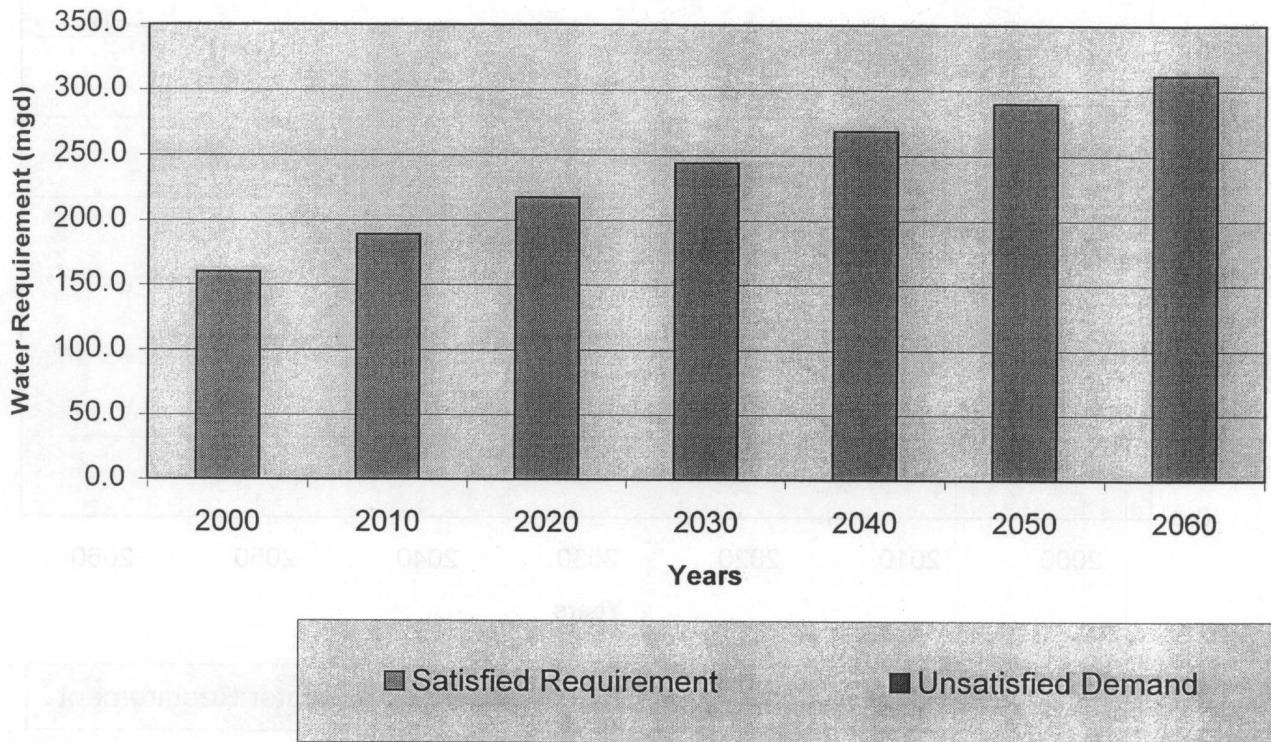
HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Panama Metro
PROBABLE SCENARIO

LAST UPDATE: 06/02/2001
BY: TJJ

**SATISFIED/UNSATISFIED WATER REQUIREMENT - PANAMA
METRO**



PROBABLE SCENARIO

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

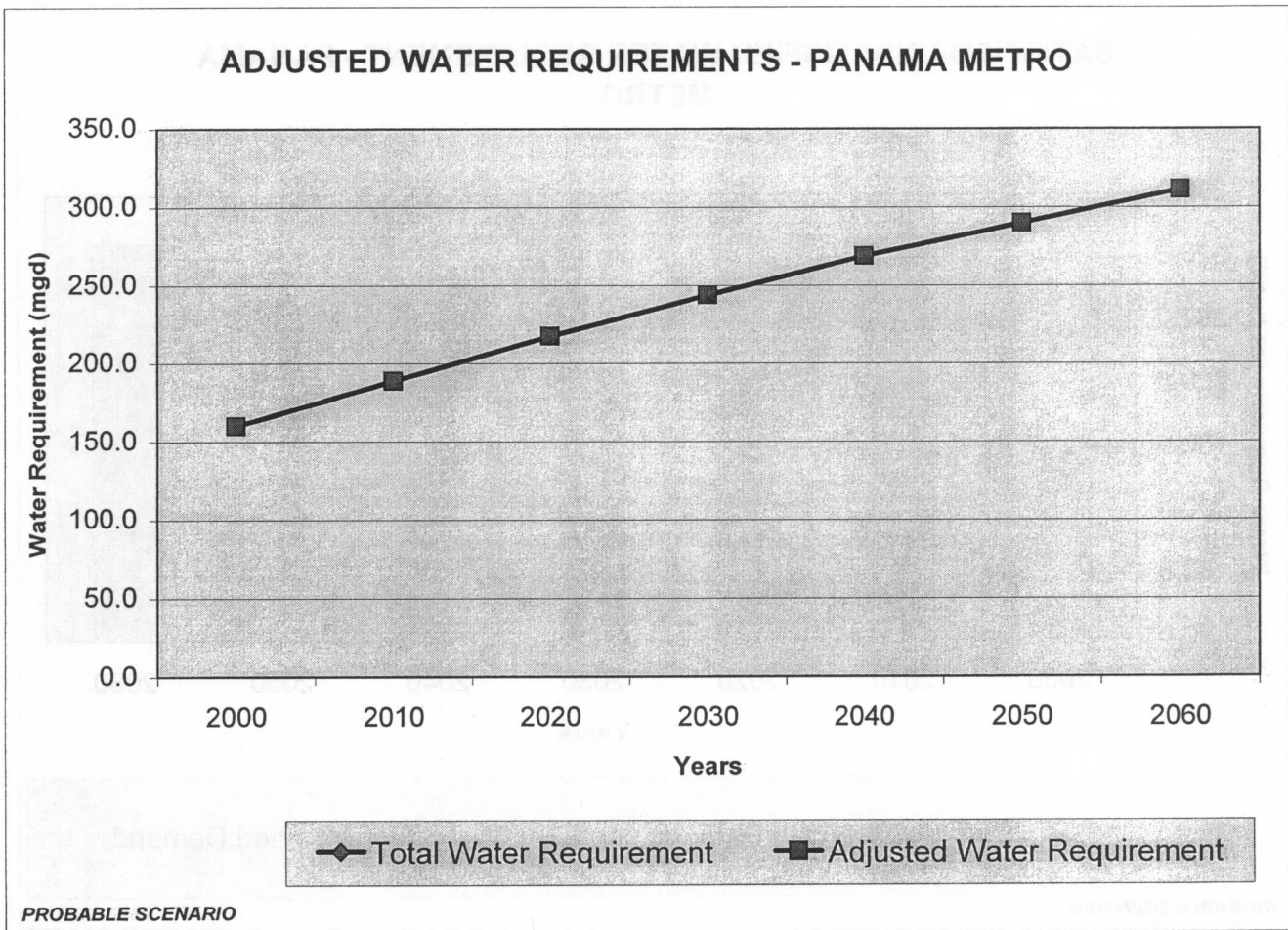
PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Panama Metro
PROBABLE SCENARIO

LAST UPDATE: 06/02/2001
BY: TJJ



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Arraijan/Chorrera
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	59%	59%	59%	59%	59%	59%	59%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	23%	23%	23%	23%	23%	23%	23%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Arraijan/Chorrera
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
ARRAIJAN/CHORRERA WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
<i>Residential (mgd)</i>	15.6	22.0	25.5	28.3	30.1	31.4	32.2
<i>Non-Residential (mgd)</i>	3.4	4.1	4.8	5.6	6.4	7.2	8.2
Total Base Demand (mgd)	19.0	26.1	30.3	33.8	36.5	38.5	40.5
	245533						
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
<i>Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Non-Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
<i>Residential (mgd)</i>	15.6	22.0	25.5	28.3	30.1	31.4	32.2
<i>Non-Residential Demand (mgd)</i>	3.4	4.1	4.8	5.6	6.4	7.2	8.2
Subtotal (mgd)	19.0	26.1	30.3	33.8	36.5	38.5	40.5
Excessive Use							
<i>Unmetered Residential Demand (mgd)</i>	6.5	9.1	10.5	11.7	12.5	13.0	13.3
Estimated Excessive Use (mgd)	2.8	4.0	4.6	5.2	5.5	5.7	5.9
Physical Leakage							
Estimated Physical Leakage (mgd)	6.5	9.0	10.4	11.6	12.5	13.2	13.8
Production Losses							
Estimated Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	19.0	26.1	30.3	33.8	36.5	38.5	40.5
Excessive Use (mgd)	2.8	4.0	4.6	5.2	5.5	5.7	5.9
Physical Leakage (mgd)	6.5	9.0	10.4	11.6	12.5	13.2	13.8
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	28.4	39.2	45.4	50.6	54.6	57.4	60.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Arraijan/Chorrera
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
ARRAIJAN/CHORRERA WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	19.0	26.1	30.3	33.8	36.5	38.5	40.5
Excessive Use (mgd)	2.8	4.0	4.6	5.2	5.5	5.7	5.9
Physical Leakage (mgd)	6.5	9.0	10.4	11.6	12.5	13.2	13.8
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	28.4	39.2	45.4	50.6	54.6	57.4	60.2
Total Actual Water Use (mgd)	28.4	39.2	45.4	50.6	54.6	57.4	60.2
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	28.4	39.2	45.4	50.6	54.6	57.4	60.2
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	28.4	39.2	45.4	50.6	54.6	57.4	60.2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

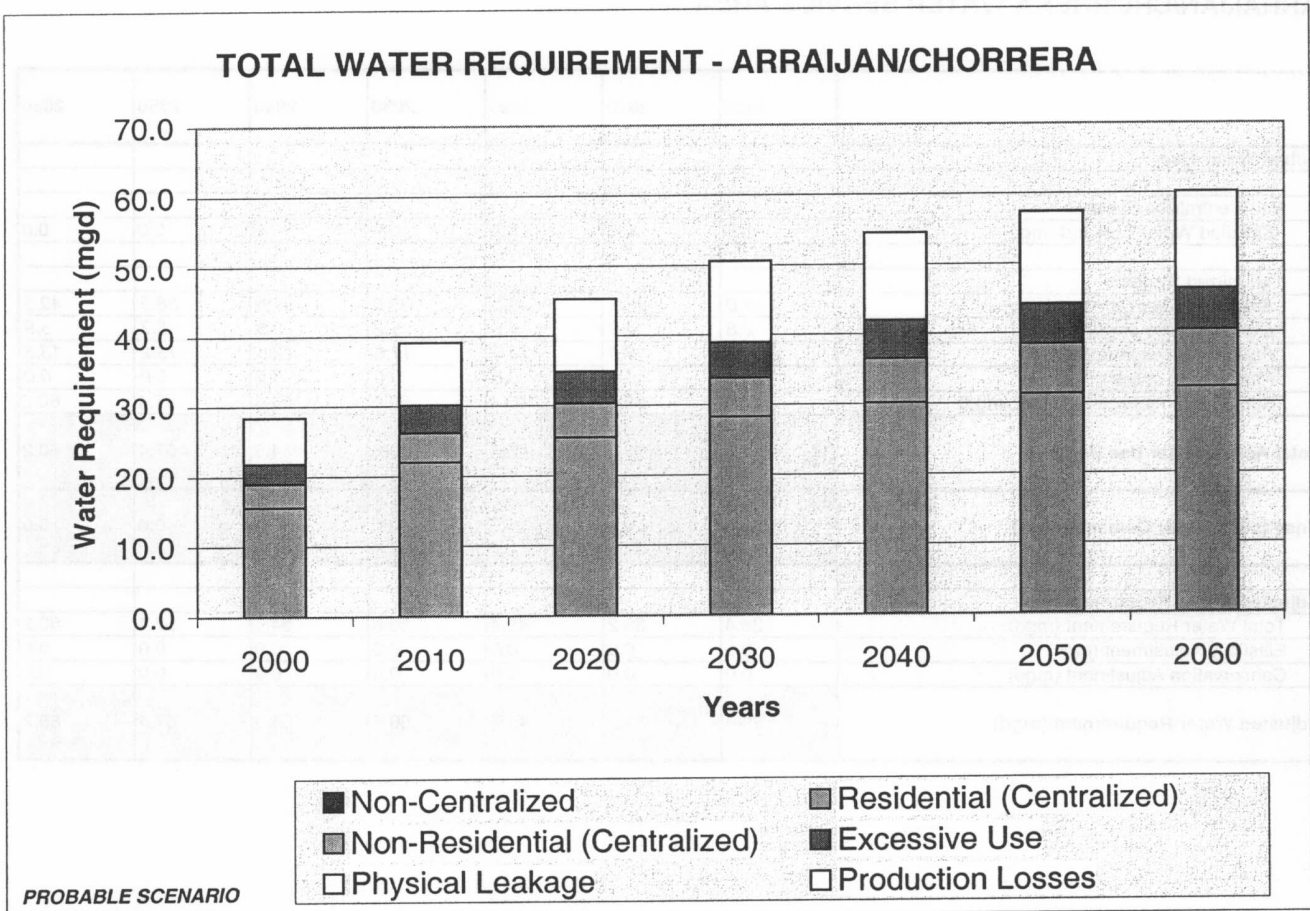
HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Arraijan/Chorrera
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

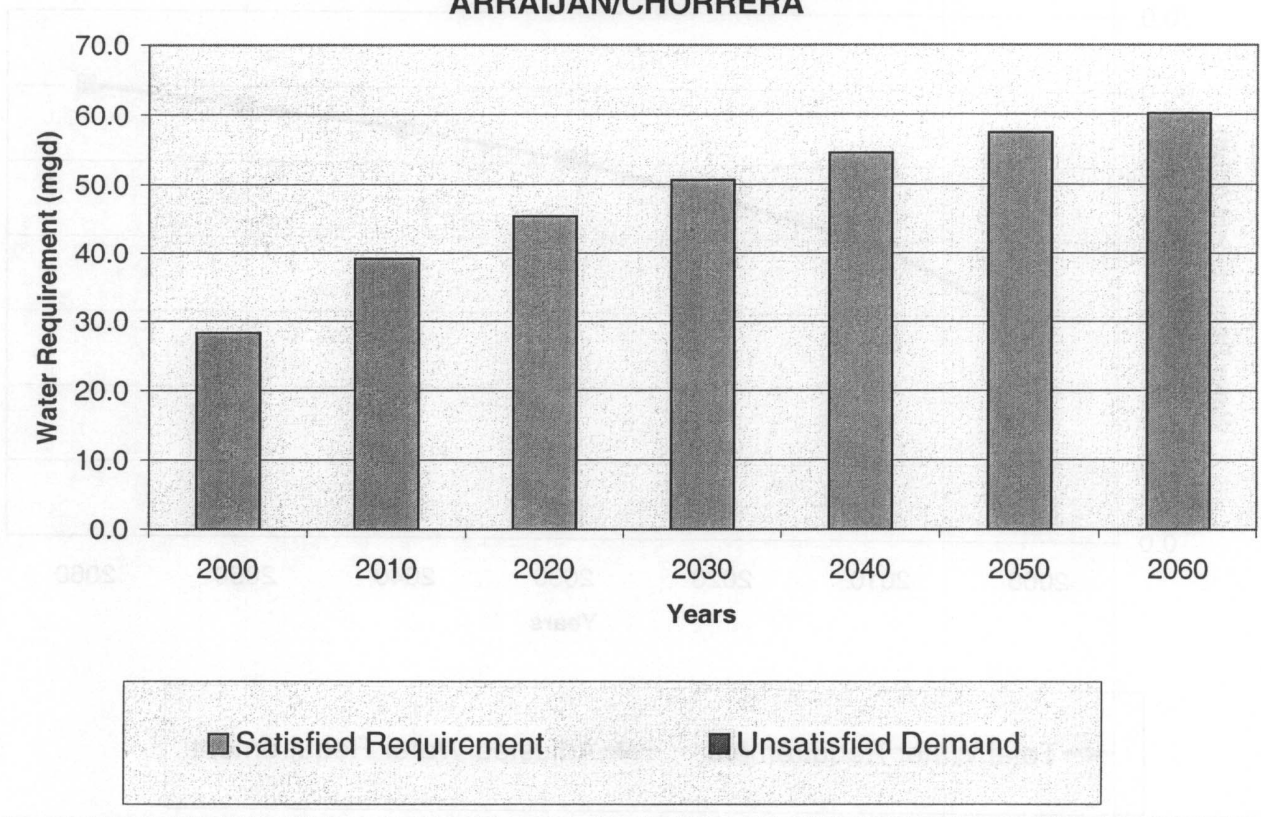
FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Arraijan/Chorrera
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**SATISFIED/UNSATISFIED WATER REQUIREMENT -
ARRAIJAN/CHORRERA**



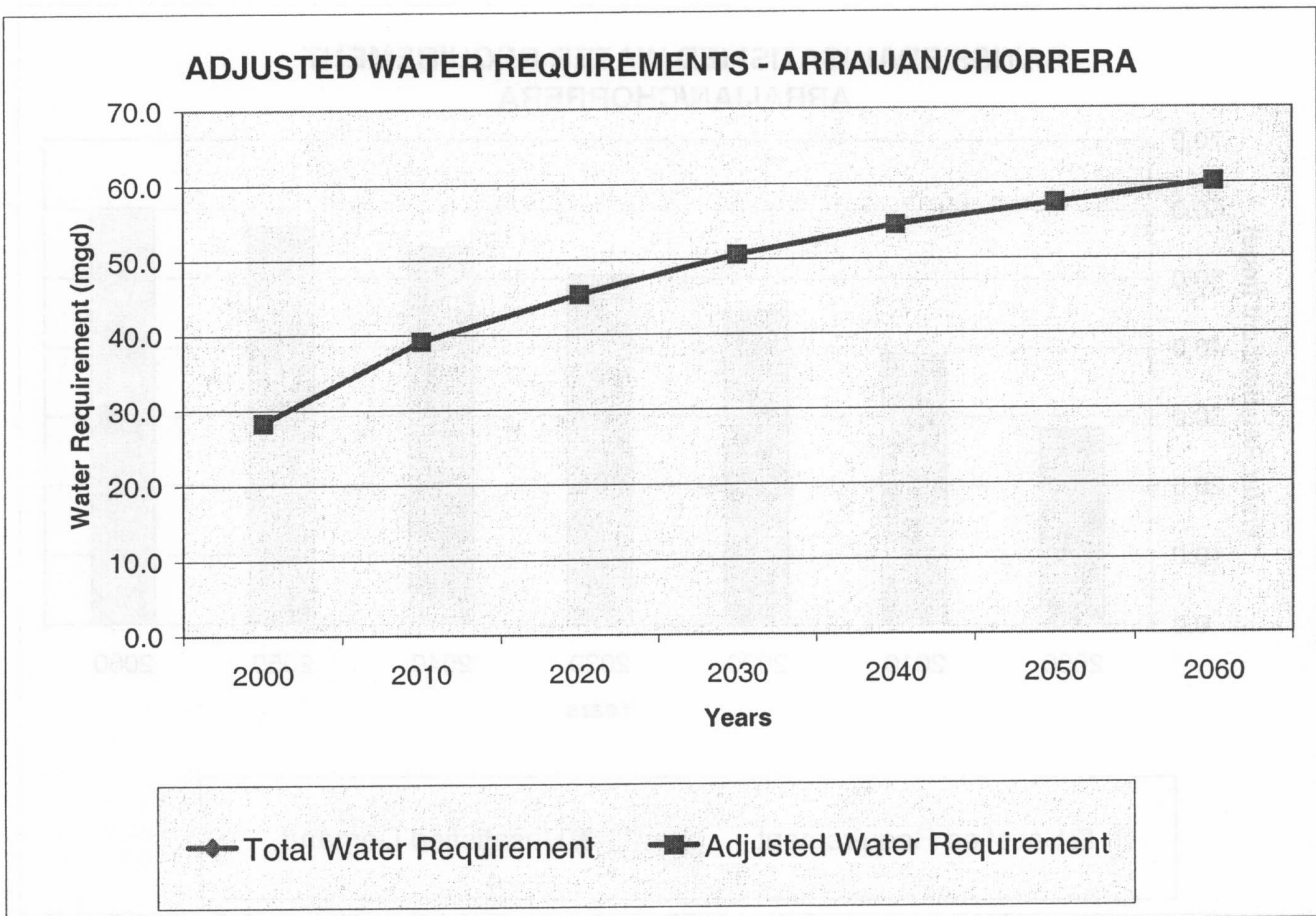
**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:	AREA WATER REQUIREMENTS	LAST UPDATE:	10/9/00
WORKSHEET:	Arraijan/Chorrera	BY:	VFA
MODEL RUN:	PROBABLE SCENARIO		

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Colon
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	28%	28%	28%	28%	28%	28%	28%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	34%	34%	34%	34%	34%	34%	34%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Colon
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
COLON WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
<i>Residential (mgd)</i>	9.3	10.2	10.9	11.6	12.3	12.8	13.1
<i>Non-Residential (mgd)</i>	7.7	10.0	13.1	16.9	22.0	28.5	37.1
Total Base Demand (mgd)	17.0	20.2	24.0	28.6	34.3	41.2	50.2
	134756						
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
<i>Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Non-Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
<i>Residential (mgd)</i>	9.3	10.2	10.9	11.6	12.3	12.8	13.1
<i>Non-Residential Demand (mgd)</i>	7.7	10.0	13.1	16.9	22.0	28.5	37.1
Subtotal (mgd)	17.0	20.2	24.0	28.6	34.3	41.2	50.2
Excessive Use							
<i>Unmetered Residential Demand (mgd)</i>	6.6	7.3	7.8	8.3	8.8	9.1	9.4
Estimated Excessive Use (mgd)	2.9	3.2	3.4	3.7	3.9	4.0	4.1
Physical Leakage							
Estimated Physical Leakage (mgd)	10.2	12.1	14.1	16.6	19.7	23.3	28.0
Production Losses							
Estimated Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	17.0	20.2	24.0	28.6	34.3	41.2	50.2
Excessive Use (mgd)	2.9	3.2	3.4	3.7	3.9	4.0	4.1
Physical Leakage (mgd)	10.2	12.1	14.1	16.6	19.7	23.3	28.0
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	30.1	35.5	41.5	48.8	57.8	68.6	82.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
 WORKSHEET: Colon
 MODEL RUN: PROBABLE SCENARIO
 LAST UPDATE: 10/9/00
 BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
COLON WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	17.0	20.2	24.0	28.6	34.3	41.2	50.2
Excessive Use (mgd)	2.9	3.2	3.4	3.7	3.9	4.0	4.1
Physical Leakage (mgd)	10.2	12.1	14.1	16.6	19.7	23.3	28.0
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	30.1	35.5	41.5	48.8	57.8	68.6	82.3
Total Actual Water Use (mgd)	30.1	35.5	41.5	48.8	57.8	68.6	82.3
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	30.1	35.5	41.5	48.8	57.8	68.6	82.3
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	30.1	35.5	41.5	48.8	57.8	68.6	82.3

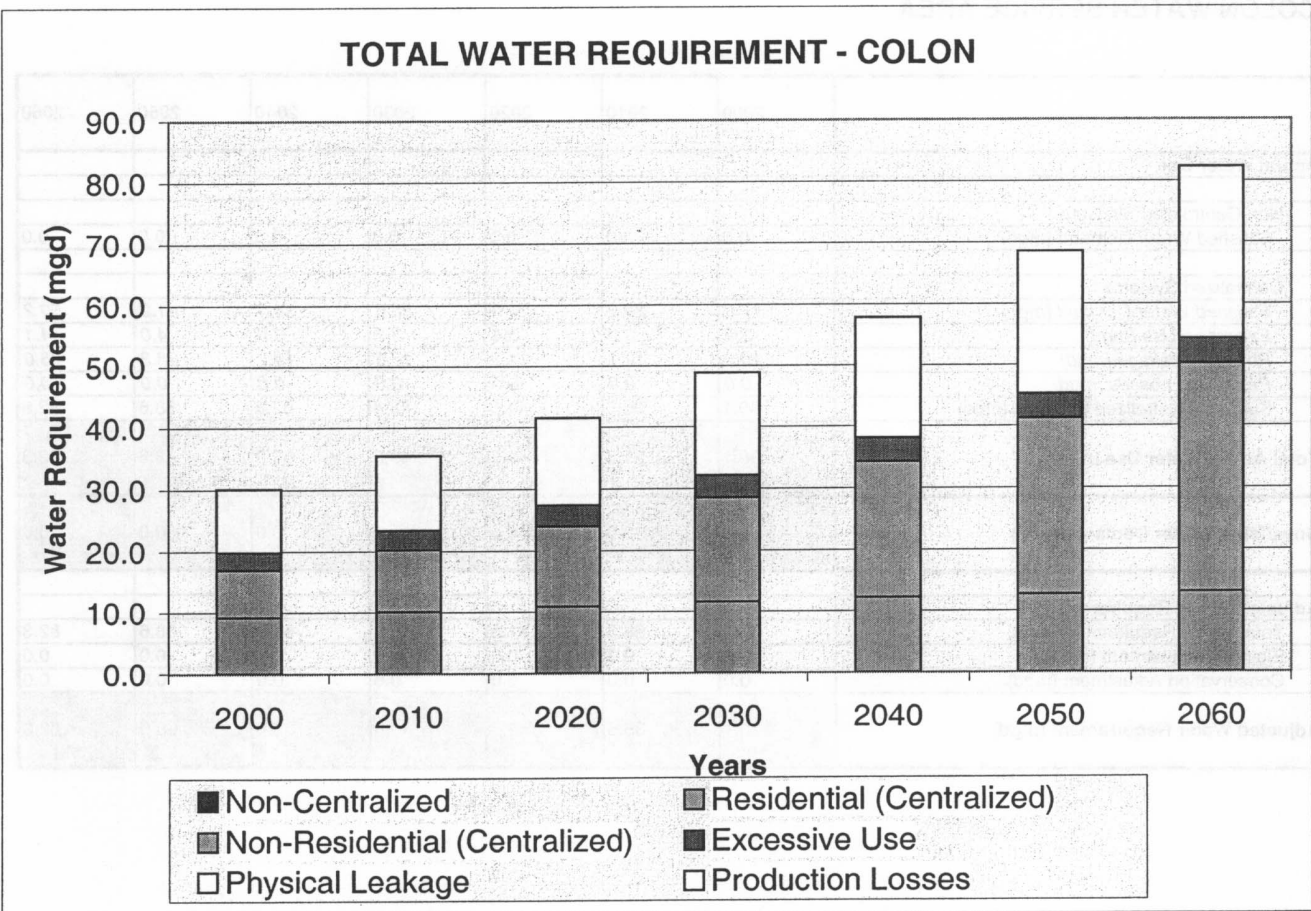
**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: 00001	AREA WATER REQUIREMENTS	LAST UPDATE: 10/9/00
WORKSHEET: 1.0	Colon	BY: VFA
MODEL RUN:	PROBABLE SCENARIO	

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

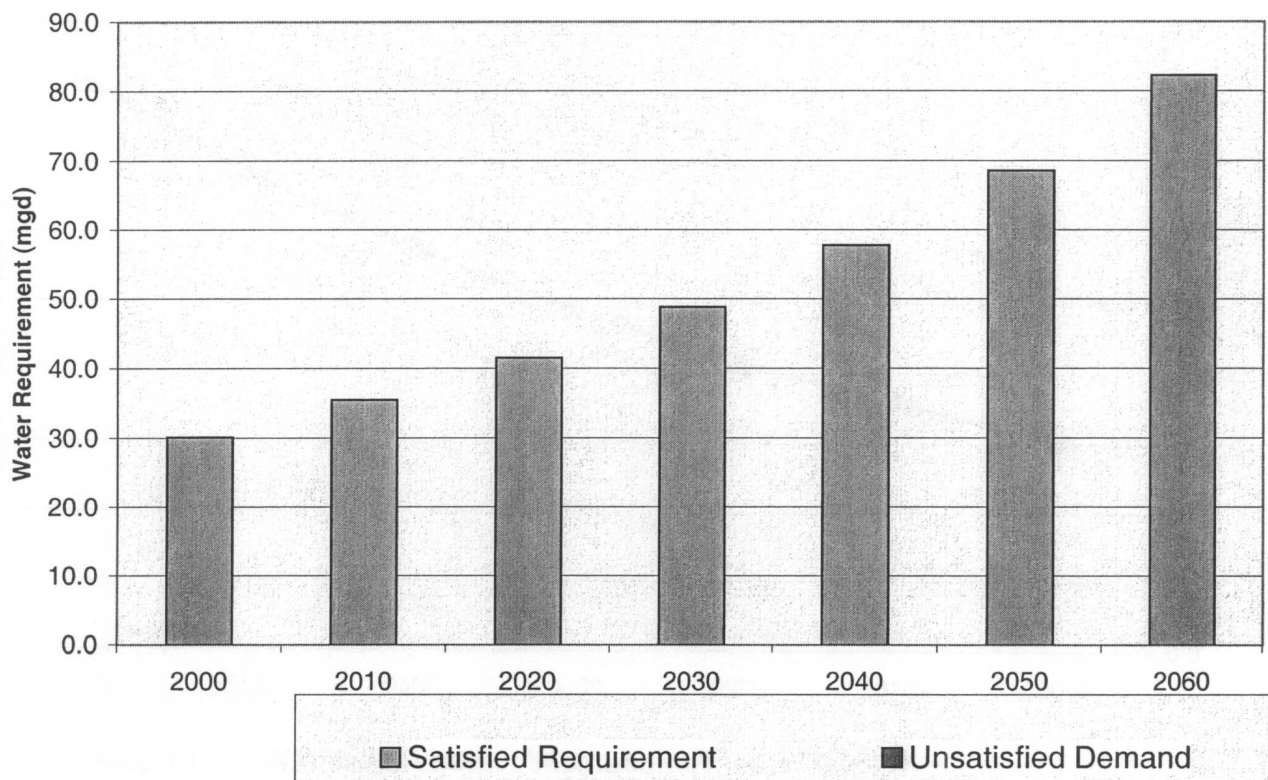
HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Colon
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

SATISFIED/UNSATISFIED WATER REQUIREMENT - COLON



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

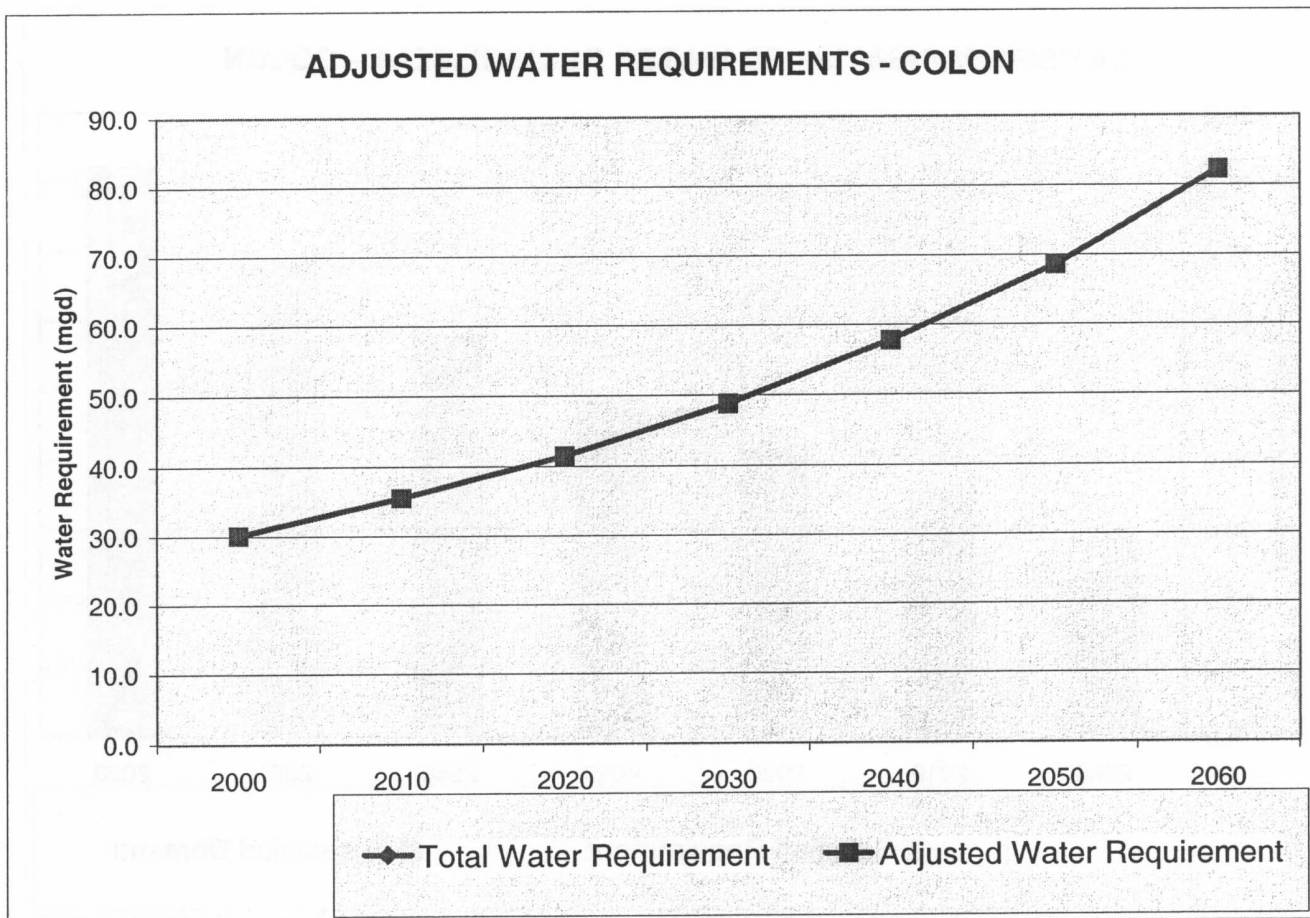
PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Colon
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Upper Caimito
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	65%	65%	65%	65%	65%	65%	65%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	38%	38%	38%	38%	38%	38%	38%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Upper Caimito
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
UPPER CAIMITO WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
<i>Residential (mgd)</i>	2.9	3.8	4.3	4.7	5.0	5.2	5.4
<i>Non-Residential (mgd)</i>	0.8	0.9	1.0	1.2	1.4	1.6	1.8
Total Base Demand (mgd)	3.7	4.7	5.3	5.9	6.4	6.8	7.2
	46754						
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
<i>Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Non-Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
<i>Residential (mgd)</i>	2.9	3.8	4.3	4.7	5.0	5.2	5.4
<i>Non-Residential Demand (mgd)</i>	0.8	0.9	1.0	1.2	1.4	1.6	1.8
Subtotal (mgd)	3.7	4.7	5.3	5.9	6.4	6.8	7.2
Excessive Use							
<i>Unmetered Residential Demand (mgd)</i>	1.0	1.3	1.5	1.7	1.8	1.8	1.9
Estimated Excessive Use (mgd)	0.5	0.6	0.7	0.7	0.8	0.8	0.8
Physical Leakage							
Estimated Physical Leakage (mgd)	2.5	3.2	3.7	4.1	4.4	4.6	4.9
Production Losses							
Estimated Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	3.7	4.7	5.3	5.9	6.4	6.8	7.2
Excessive Use (mgd)	0.5	0.6	0.7	0.7	0.8	0.8	0.8
Physical Leakage (mgd)	2.5	3.2	3.7	4.1	4.4	4.6	4.9
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	6.7	8.6	9.7	10.7	11.6	12.2	12.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Upper Caimito
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
UPPER CAIMITO WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	3.7	4.7	5.3	5.9	6.4	6.8	7.2
Excessive Use (mgd)	0.5	0.6	0.7	0.7	0.8	0.8	0.8
Physical Leakage (mgd)	2.5	3.2	3.7	4.1	4.4	4.6	4.9
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	6.7	8.6	9.7	10.7	11.6	12.2	12.9
Total Actual Water Use (mgd)	6.7	8.6	9.7	10.7	11.6	12.2	12.9
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	6.7	8.6	9.7	10.7	11.6	12.2	12.9
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	6.7	8.6	9.7	10.7	11.6	12.2	12.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

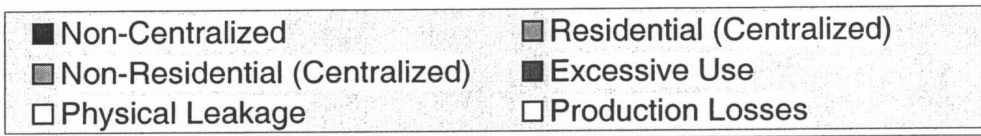
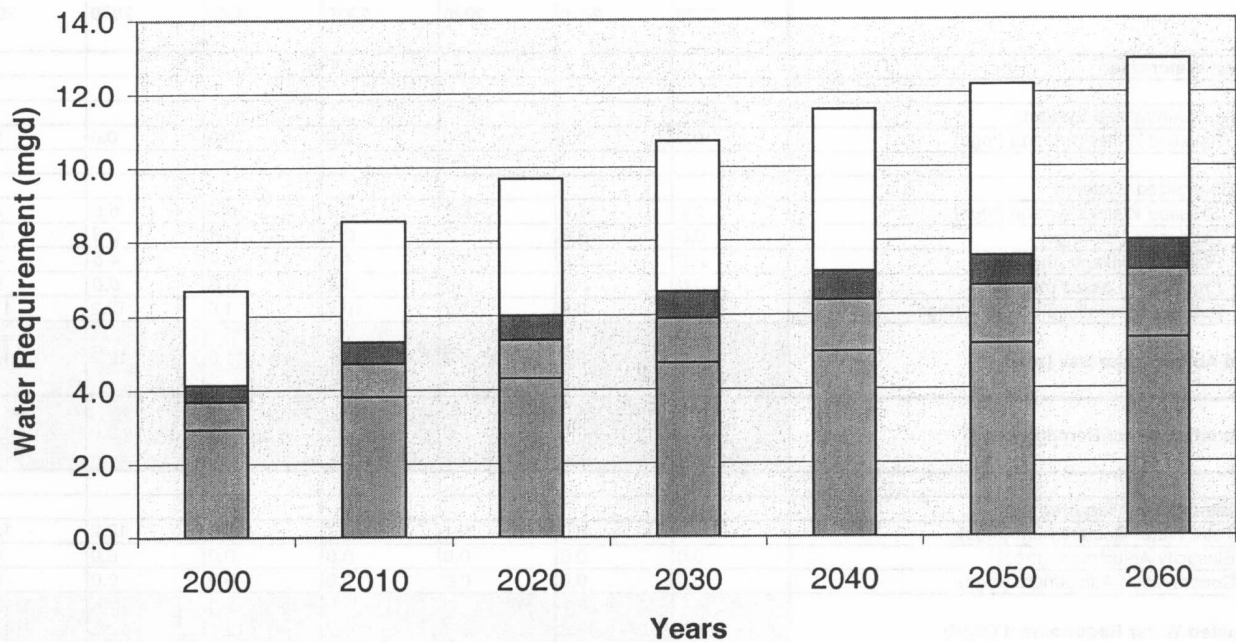
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WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Upper Caimito
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

TOTAL WATER REQUIREMENT - UPPER CAIMITO



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

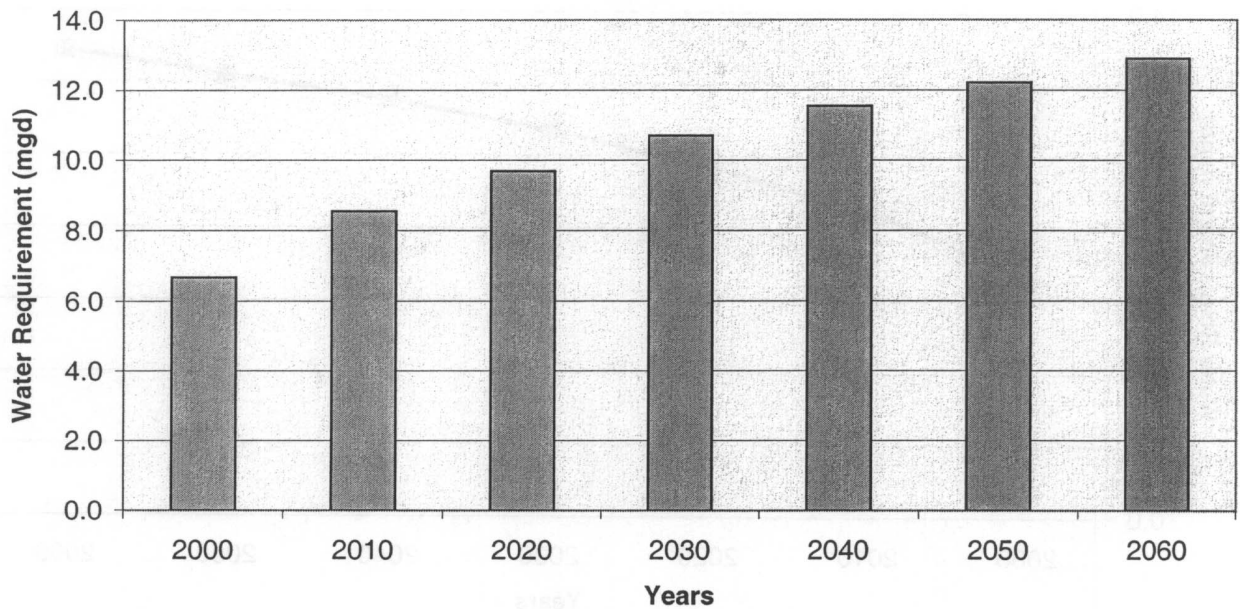
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MODEL RUN:

AREA WATER REQUIREMENTS
Upper Caimito
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**SATISFIED/UNSATISFIED WATER REQUIREMENT - UPPER
CAIMITO**



■ Satisfied Requirement

■ Unsatisfied Demand

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

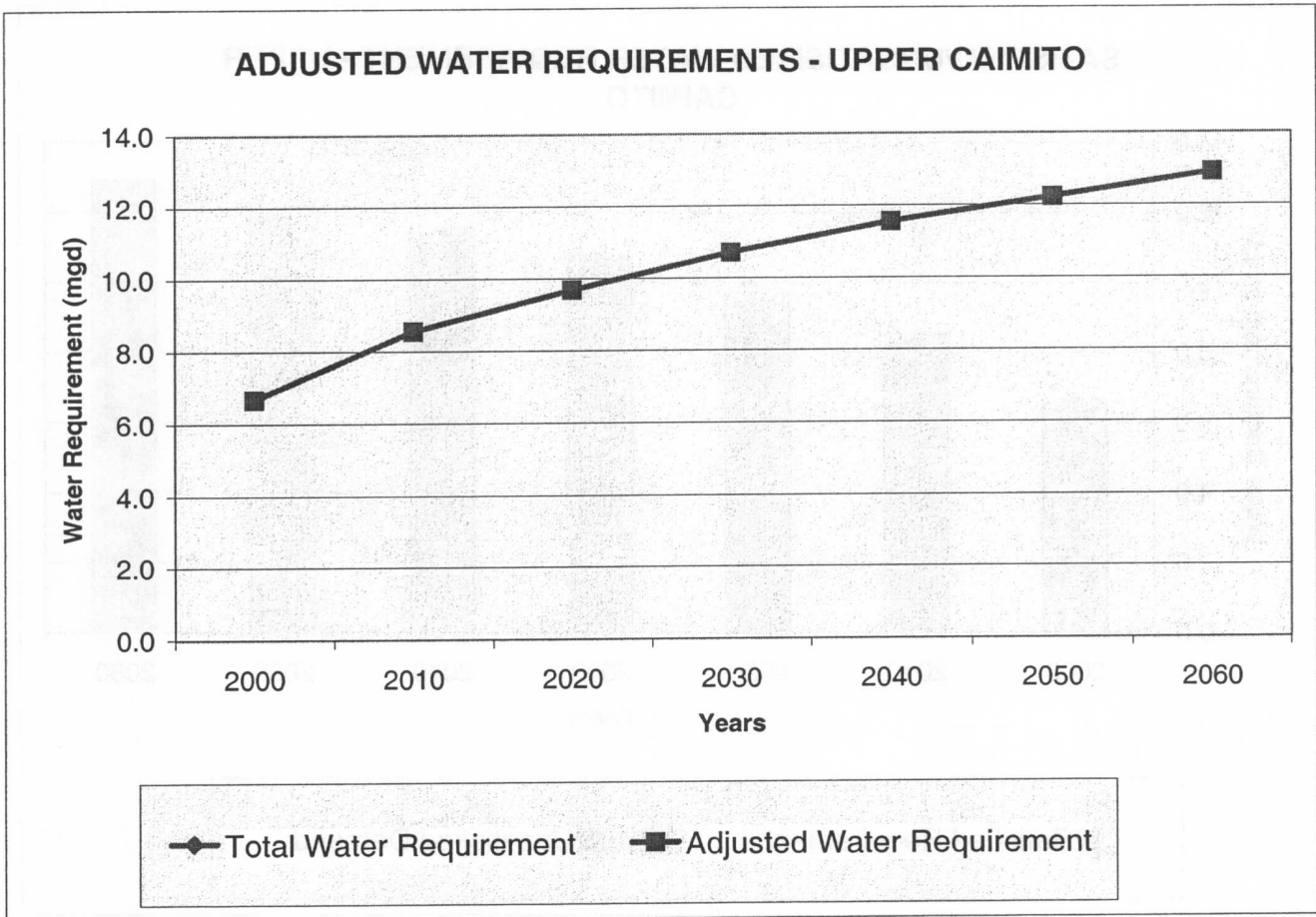
PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Upper Caimito
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE:
WORKSHEET:
MODEL RUN:**

**AREA WATER REQUIREMENTS
Panama Este
PROBABLE SCENARIO**

**LAST UPDATE: 10/9/00
BY: VFA**

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	52%	52%	52%	52%	52%	52%	52%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	23%	23%	23%	23%	23%	23%	23%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Panama Este
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
PANAMA ESTE WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
<i>Residential (mgd)</i>	5.6	6.7	7.6	8.2	8.7	9.1	9.3
<i>Non-Residential (mgd)</i>	2.4	2.7	3.0	3.3	3.6	3.8	4.1
Total Base Demand (mgd)	8.0	9.4	10.5	11.5	12.3	12.9	13.5
	91665						
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
<i>Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Non-Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
<i>Residential (mgd)</i>	5.6	6.7	7.6	8.2	8.7	9.1	9.3
<i>Non-Residential Demand (mgd)</i>	2.4	2.7	3.0	3.3	3.6	3.8	4.1
Subtotal (mgd)	8.0	9.4	10.5	11.5	12.3	12.9	13.5
Excessive Use							
<i>Unmetered Residential Demand (mgd)</i>	2.7	3.2	3.6	4.0	4.2	4.4	4.5
Estimated Excessive Use (mgd)	1.2	1.4	1.6	1.7	1.8	1.9	2.0
Physical Leakage							
Estimated Physical Leakage (mgd)	2.8	3.2	3.6	4.0	4.2	4.4	4.6
Production Losses							
Estimated Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	8.0	9.4	10.5	11.5	12.3	12.9	13.5
Excessive Use (mgd)	1.2	1.4	1.6	1.7	1.8	1.9	2.0
Physical Leakage (mgd)	2.8	3.2	3.6	4.0	4.2	4.4	4.6
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	12.0	14.1	15.8	17.2	18.3	19.2	20.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Panama Este
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
PANAMA ESTE WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	8.0	9.4	10.5	11.5	12.3	12.9	13.5
Excessive Use (mgd)	1.2	1.4	1.6	1.7	1.8	1.9	2.0
Physical Leakage (mgd)	2.8	3.2	3.6	4.0	4.2	4.4	4.6
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	12.0	14.1	15.8	17.2	18.3	19.2	20.1
Total Actual Water Use (mgd)	12.0	14.1	15.8	17.2	18.3	19.2	20.1
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	12.0	14.1	15.8	17.2	18.3	19.2	20.1
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	12.0	14.1	15.8	17.2	18.3	19.2	20.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

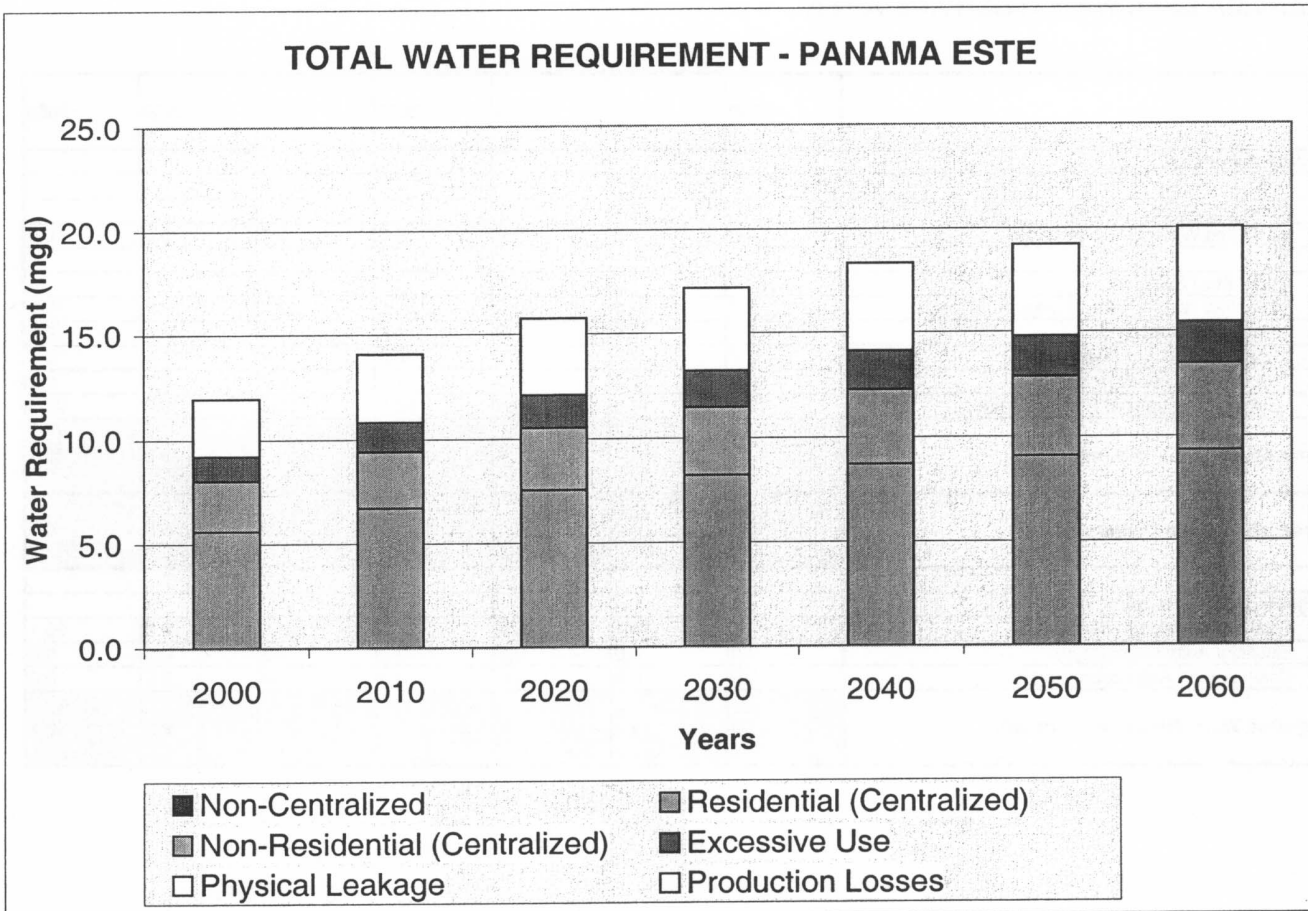
PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Panama Este
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

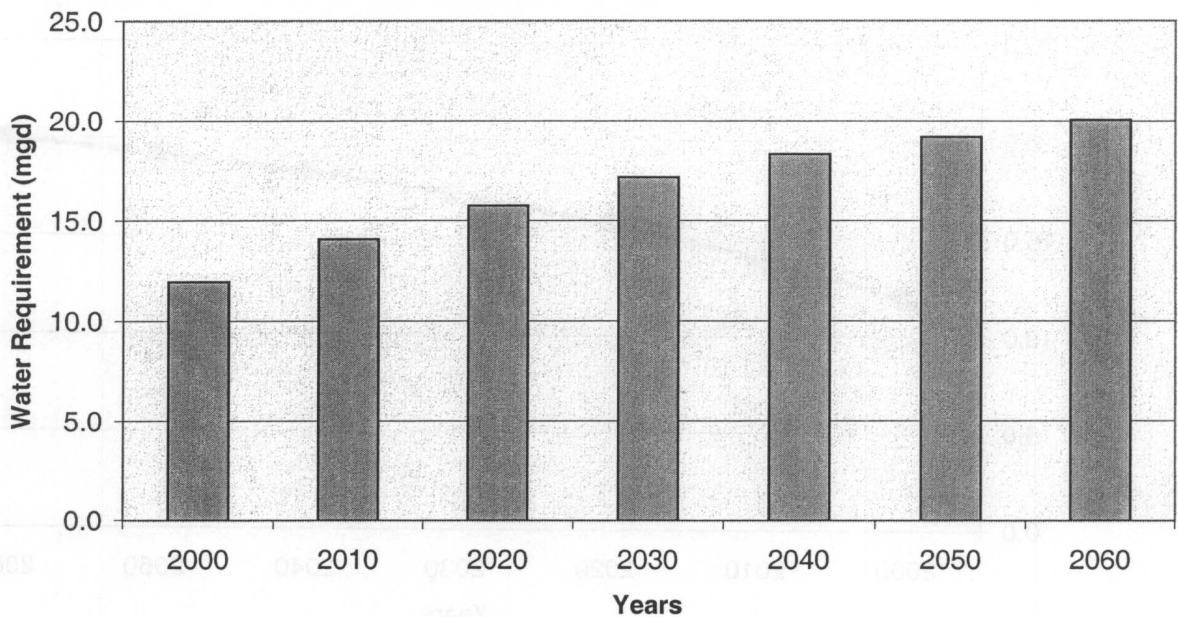
FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Panama Este
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

SATISFIED/UNSATISFIED WATER REQUIREMENT - PANAMA ESTE



■ Satisfied Requirement

■ Unsatisfied Demand

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

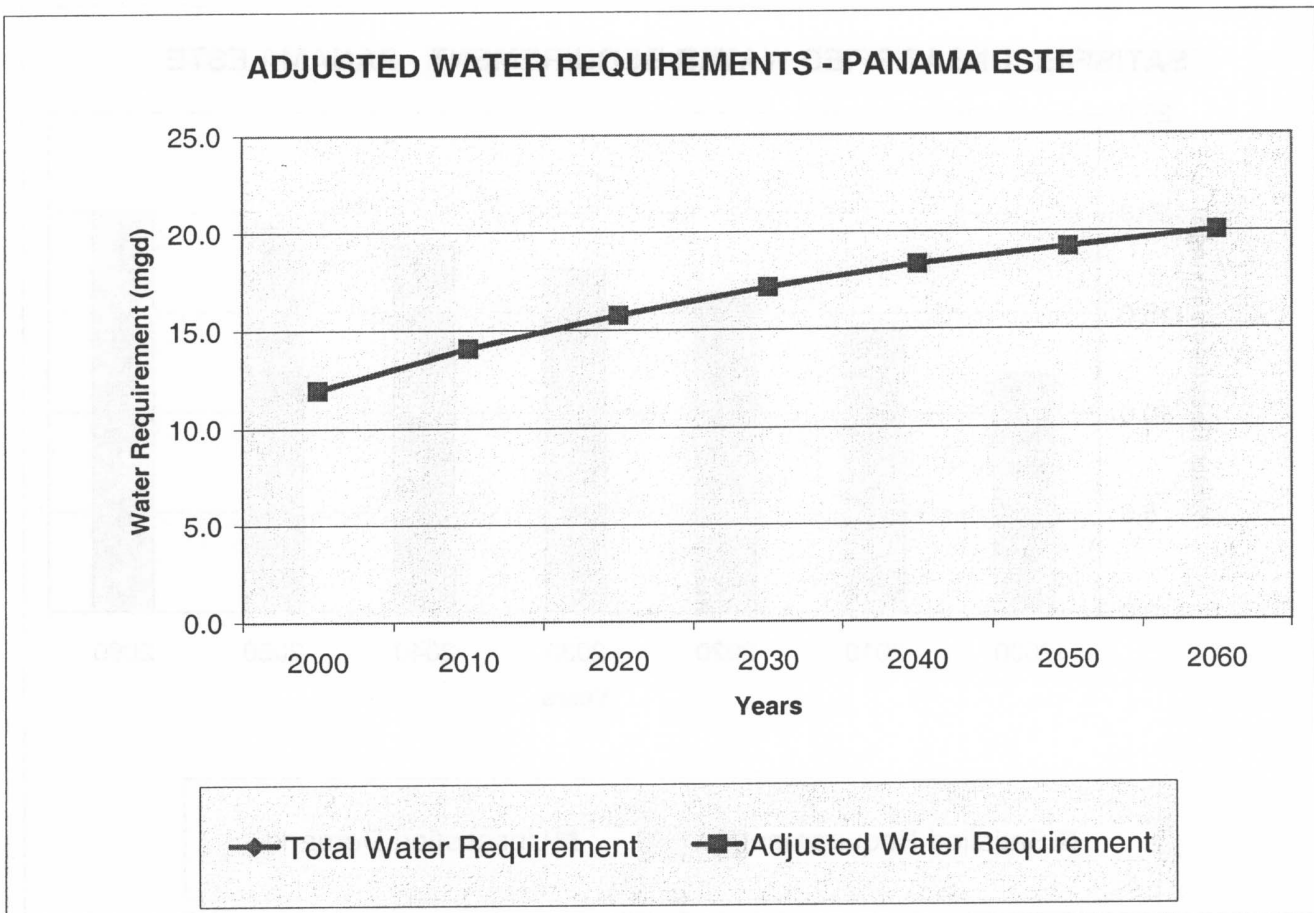
PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Panama Este
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Rio Gatun
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	28%	28%	28%	28%	28%	28%	28%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	34%	34%	34%	34%	34%	34%	34%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Rio Gatun
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
RIO GATUN WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
<i>Residential (mgd)</i>	0.6	0.7	0.8	0.9	0.9	1.0	1.0
<i>Non-Residential (mgd)</i>	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Total Base Demand (mgd)	0.7	0.9	1.0	1.1	1.1	1.2	1.2
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
<i>Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Non-Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
<i>Residential (mgd)</i>	0.6	0.7	0.8	0.9	0.9	1.0	1.0
<i>Non-Residential Demand (mgd)</i>	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Subtotal (mgd)	0.7	0.9	1.0	1.1	1.1	1.2	1.2
Excessive Use							
<i>Unmetered Residential Demand (mgd)</i>	0.4	0.5	0.6	0.6	0.7	0.7	0.7
Estimated Excessive Use (mgd)	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Physical Leakage							
Estimated Physical Leakage (mgd)	0.5	0.6	0.6	0.7	0.7	0.8	0.8
Production Losses							
Estimated Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	0.7	0.9	1.0	1.1	1.1	1.2	1.2
Excessive Use (mgd)	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Physical Leakage (mgd)	0.5	0.6	0.6	0.7	0.7	0.8	0.8
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	1.3	1.7	1.9	2.1	2.2	2.3	2.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Rio Gatun
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
RIO GATUN WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	0.7	0.9	1.0	1.1	1.1	1.2	1.2
Excessive Use (mgd)	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Physical Leakage (mgd)	0.5	0.6	0.6	0.7	0.7	0.8	0.8
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	1.3	1.7	1.9	2.1	2.2	2.3	2.3
Total Actual Water Use (mgd)	1.3	1.7	1.9	2.1	2.2	2.3	2.3
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	1.3	1.7	1.9	2.1	2.2	2.3	2.3
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	1.3	1.7	1.9	2.1	2.2	2.3	2.3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

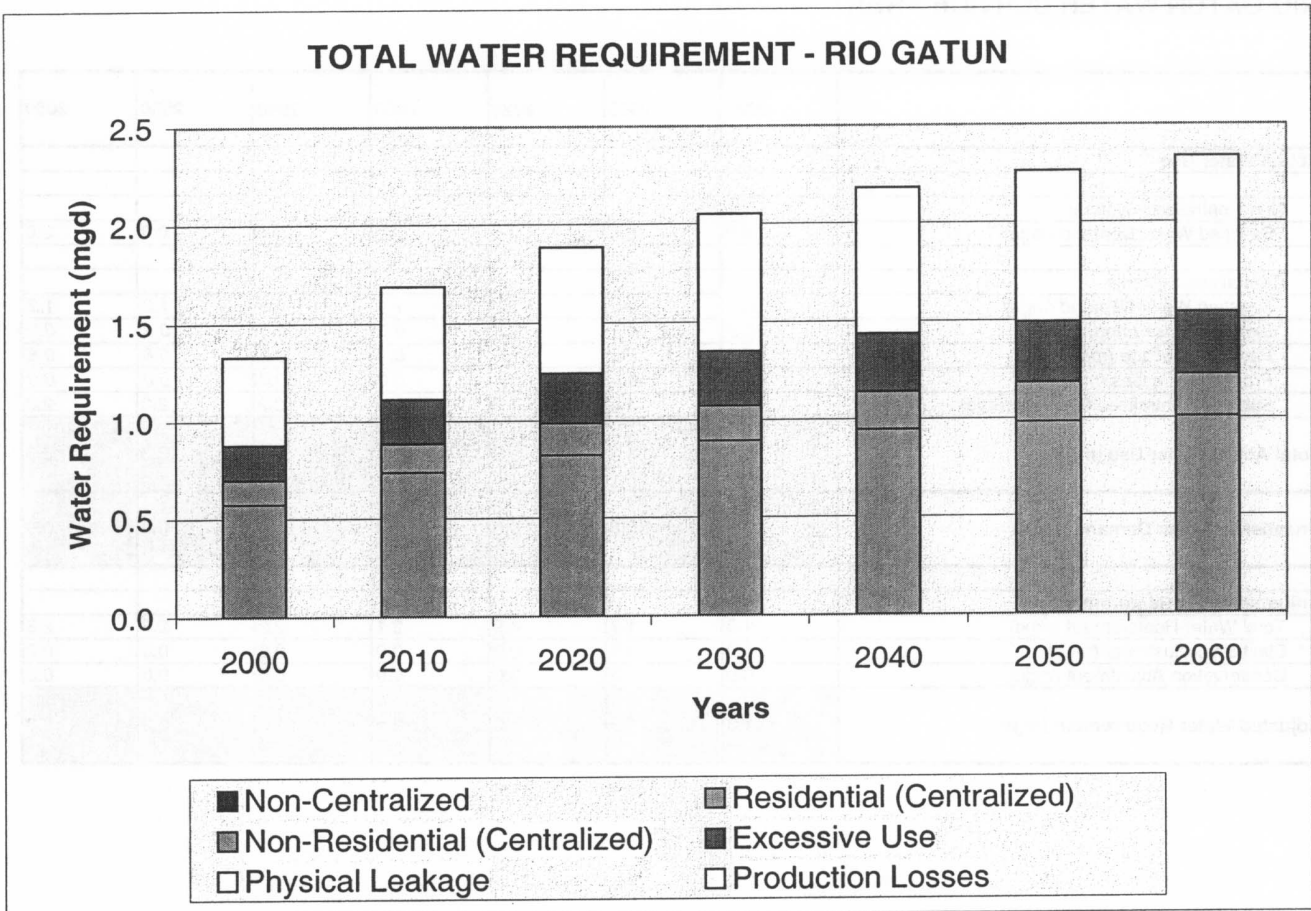
PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Rio Gatun
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

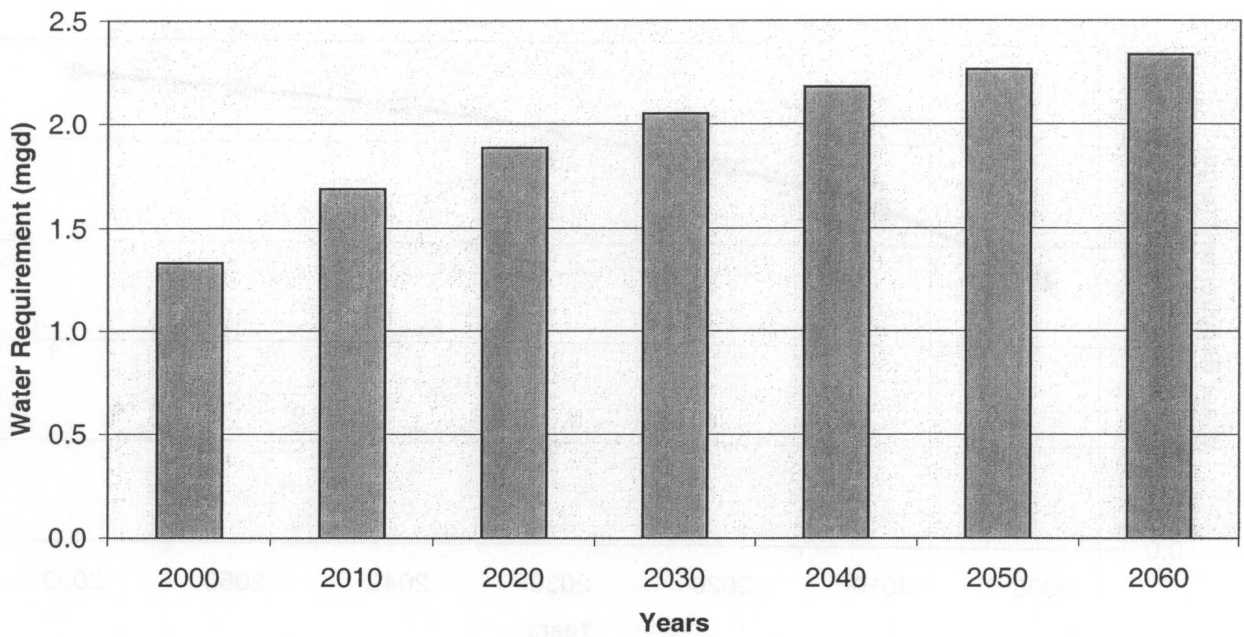
FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Rio Gatun
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

SATISFIED/UNSATISFIED WATER REQUIREMENT - RIO GATUN



■ Satisfied Requirement

■ Unsatisfied Demand

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

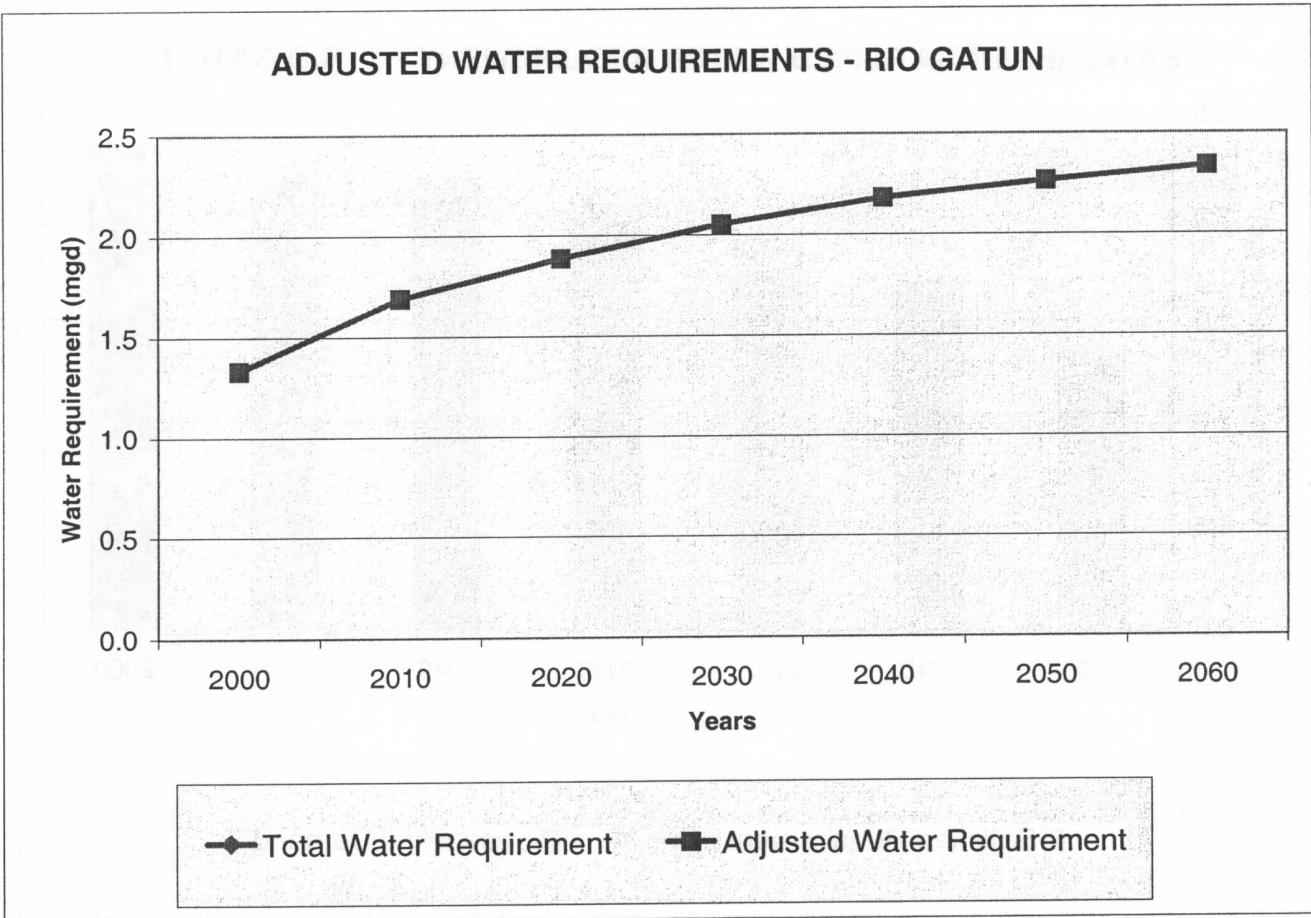
HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Rio Gatun
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

**FILE:
WORKSHEET:
MODEL RUN:**

**AREA WATER REQUIREMENTS
Gatun Noroeste
PROBABLE SCENARIO**

**LAST UPDATE: 10/9/00
BY: VFA**

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	28%	28%	28%	28%	28%	28%	28%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	34%	34%	34%	34%	34%	34%	34%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Gatun Noroeste
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
GATUN NOROESTE WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
<i>Residential (mgd)</i>	0.3	0.4	0.4	0.4	0.5	0.5	0.5
<i>Non-Residential (mgd)</i>	0.2	0.2	0.2	0.3	0.4	0.5	0.6
Total Base Demand (mgd)	0.5	0.6	0.6	0.7	0.8	0.9	1.1
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
<i>Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Non-Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
<i>Residential (mgd)</i>	0.3	0.4	0.4	0.4	0.5	0.5	0.5
<i>Non-Residential Demand (mgd)</i>	0.2	0.2	0.2	0.3	0.4	0.5	0.6
Subtotal (mgd)	0.5	0.6	0.6	0.7	0.8	0.9	1.1
Excessive Use							
<i>Unmetered Residential Demand (mgd)</i>	0.2	0.3	0.3	0.3	0.3	0.3	0.4
<i>Estimated Excessive Use (mgd)</i>	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Physical Leakage							
<i>Estimated Physical Leakage (mgd)</i>	0.3	0.4	0.4	0.4	0.5	0.6	0.6
Production Losses							
<i>Estimated Production Losses (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	0.5	0.6	0.6	0.7	0.8	0.9	1.1
Excessive Use (mgd)	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Physical Leakage (mgd)	0.3	0.4	0.4	0.4	0.5	0.6	0.6
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	0.9	1.0	1.2	1.3	1.5	1.7	1.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Gatun Noroeste
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
GATUN NOROESTE WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	0.5	0.6	0.6	0.7	0.8	0.9	1.1
Excessive Use (mgd)	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Physical Leakage (mgd)	0.3	0.4	0.4	0.4	0.5	0.6	0.6
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	0.9	1.0	1.2	1.3	1.5	1.7	1.9
Total Actual Water Use (mgd)	0.9	1.0	1.2	1.3	1.5	1.7	1.9
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	0.9	1.0	1.2	1.3	1.5	1.7	1.9
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	0.9	1.0	1.2	1.3	1.5	1.7	1.9

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

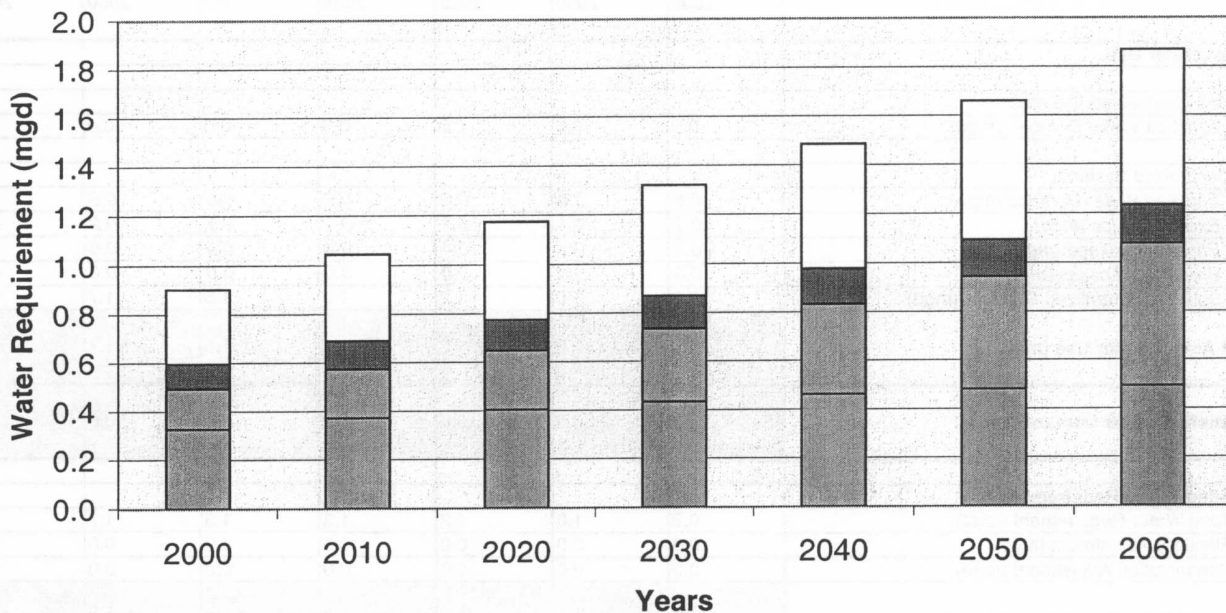
HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Gatun Noroeste
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

TOTAL WATER REQUIREMENT - GATUN NOROESTE



■ Non-Centralized	■ Residential (Centralized)
■ Non-Residential (Centralized)	■ Excessive Use
□ Physical Leakage	□ Production Losses

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

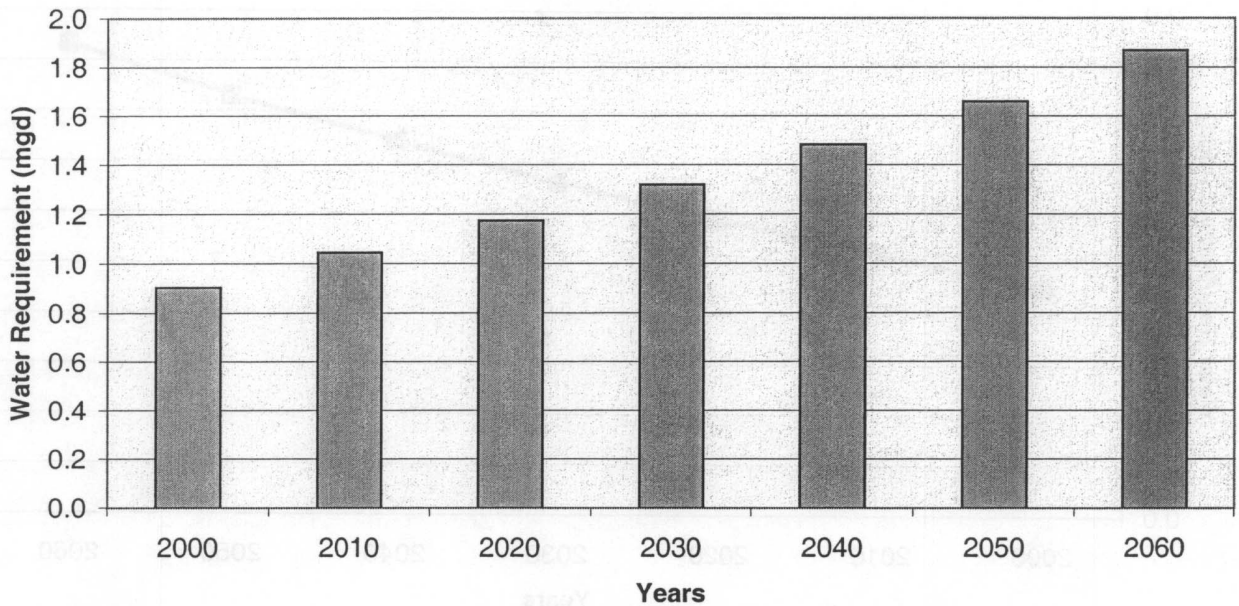
FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Gatun Noroeste
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**SATISFIED/UNSATISFIED WATER REQUIREMENT - GATUN
NOROESTE**



■ Satisfied Requirement

■ Unsatisfied Demand

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

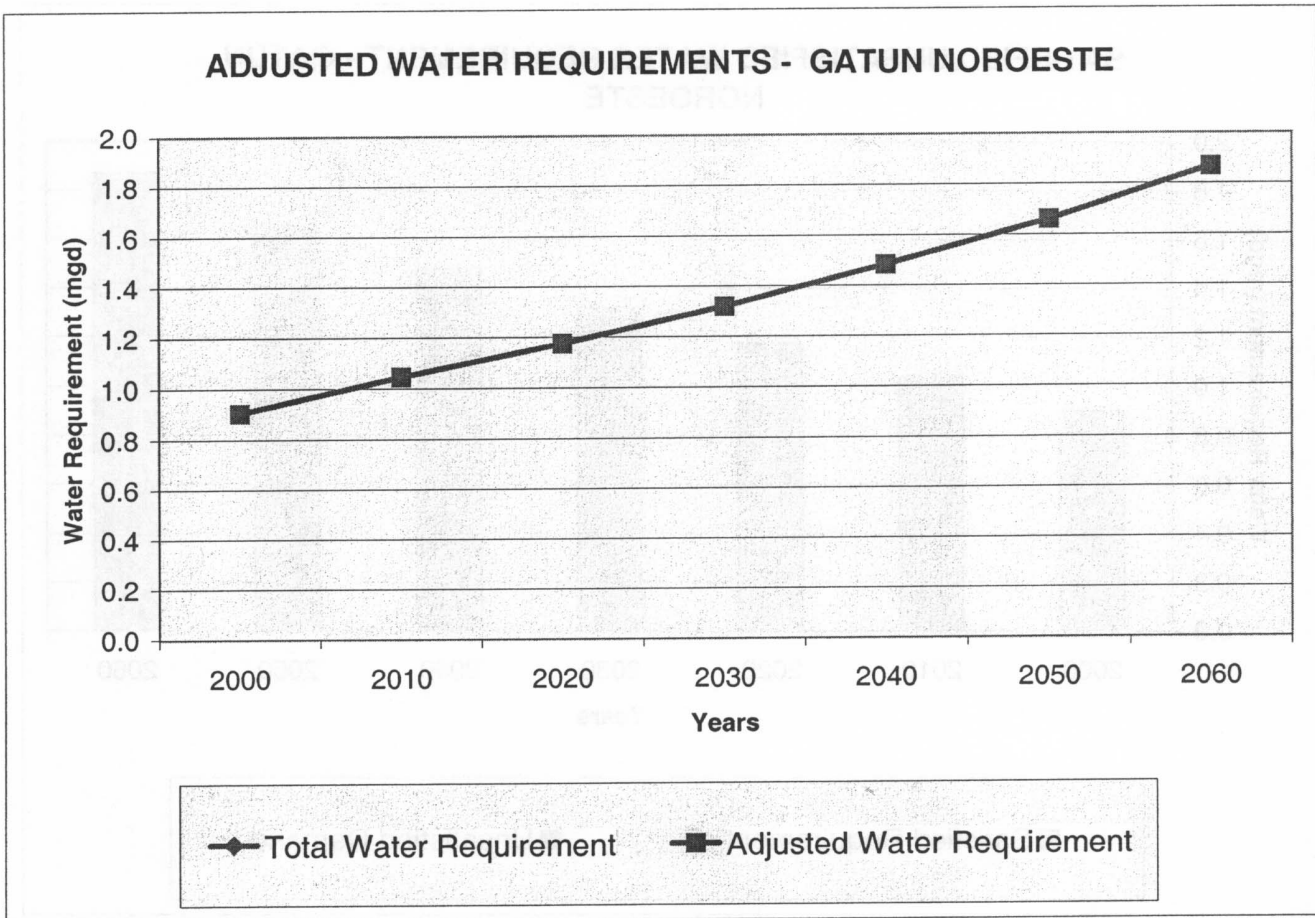
HARZA ENGINEERING COMPANY - CHICAGO

**FILE:
WORKSHEET:
MODEL RUN:**

**AREA WATER REQUIREMENTS
Gatun Noroeste
PROBABLE SCENARIO**

**LAST UPDATE: 10/9/00
BY: VFA**

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS **LAST UPDATE:** 10/9/00
WORKSHEET: Gatun Suroeste **BY:** VFA
MODEL RUN: PROBABLE SCENARIO

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	28%	28%	28%	28%	28%	28%	28%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	34%	34%	34%	34%	34%	34%	34%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Gatun Suroeste
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
GATUN SUROESTE WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
<i>Residential (mgd)</i>	1.2	1.5	1.7	1.8	2.0	2.0	2.1
<i>Non-Residential (mgd)</i>	0.3	0.4	0.4	0.4	0.5	0.5	0.6
Total Base Demand (mgd)	1.5	1.9	2.1	2.3	2.4	2.6	2.7
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
<i>Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Non-Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
<i>Residential (mgd)</i>	1.2	1.5	1.7	1.8	2.0	2.0	2.1
<i>Non-Residential Demand (mgd)</i>	0.3	0.4	0.4	0.4	0.5	0.5	0.6
Subtotal (mgd)	1.5	1.9	2.1	2.3	2.4	2.6	2.7
Excessive Use							
<i>Unmetered Residential Demand (mgd)</i>	0.9	1.1	1.2	1.3	1.4	1.5	1.5
<i>Estimated Excessive Use (mgd)</i>	0.4	0.5	0.5	0.6	0.6	0.6	0.7
Physical Leakage							
<i>Estimated Physical Leakage (mgd)</i>	1.0	1.2	1.3	1.5	1.6	1.7	1.7
Production Losses							
<i>Estimated Production Losses (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	1.5	1.9	2.1	2.3	2.4	2.6	2.7
Excessive Use (mgd)	0.4	0.5	0.5	0.6	0.6	0.6	0.7
Physical Leakage (mgd)	1.0	1.2	1.3	1.5	1.6	1.7	1.7
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	2.9	3.6	4.0	4.3	4.6	4.9	5.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Gatun Suroeste
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
GATUN SUROESTE WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	1.5	1.9	2.1	2.3	2.4	2.6	2.7
Excessive Use (mgd)	0.4	0.5	0.5	0.6	0.6	0.6	0.7
Physical Leakage (mgd)	1.0	1.2	1.3	1.5	1.6	1.7	1.7
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	2.9	3.6	4.0	4.3	4.6	4.9	5.1
Total Actual Water Use (mgd)	2.9	3.6	4.0	4.3	4.6	4.9	5.1
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	2.9	3.6	4.0	4.3	4.6	4.9	5.1
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	2.9	3.6	4.0	4.3	4.6	4.9	5.1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

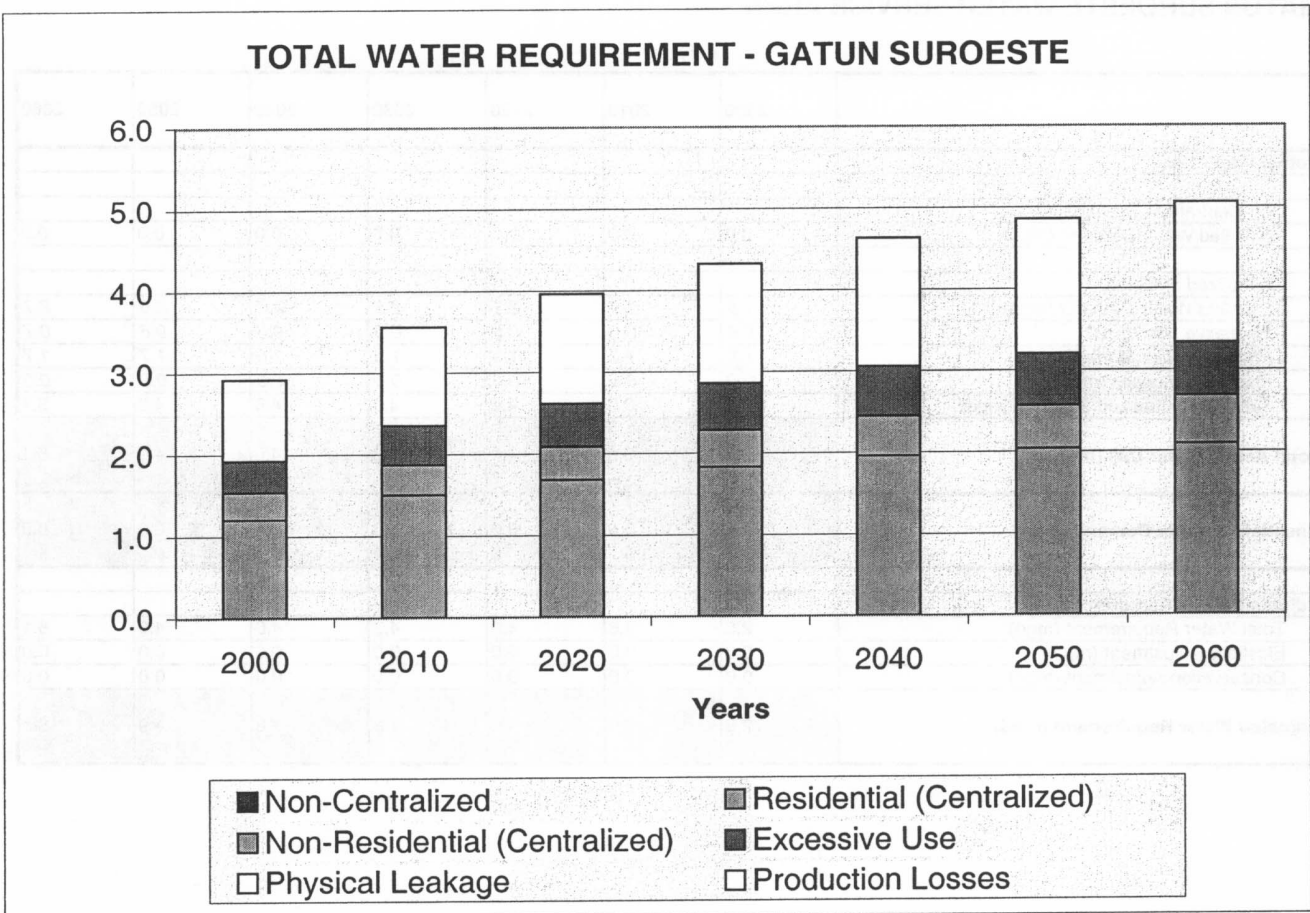
HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Gatun Suroeste
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

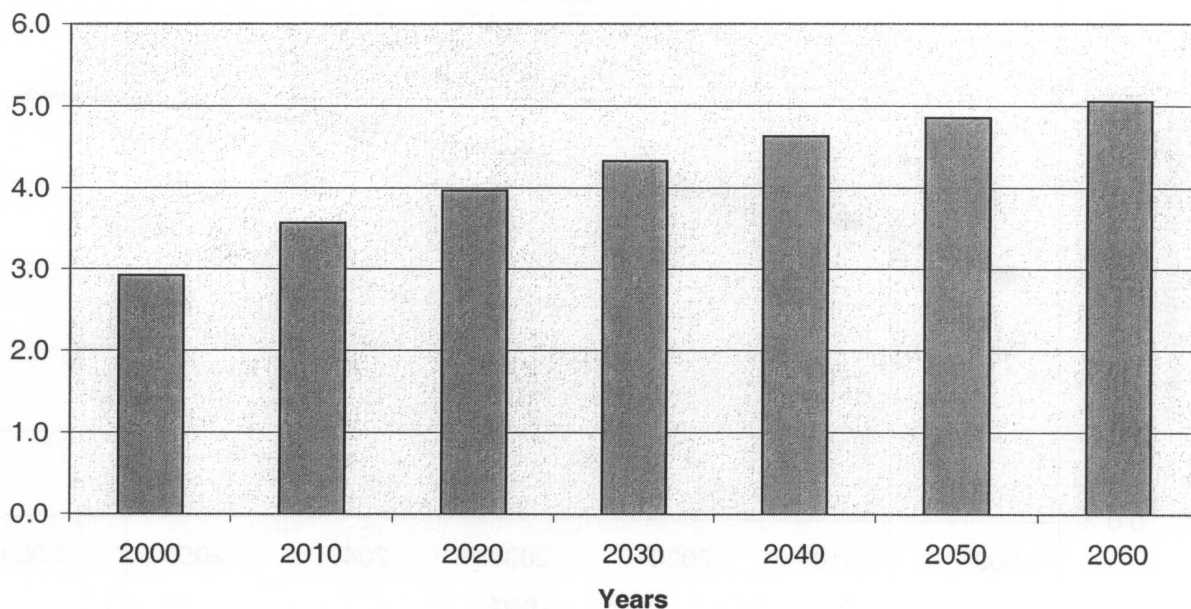
FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Gatun Suroeste
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**SATISFIED/UNSATISFIED WATER REQUIREMENT - GATUN
SUROESTE**



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

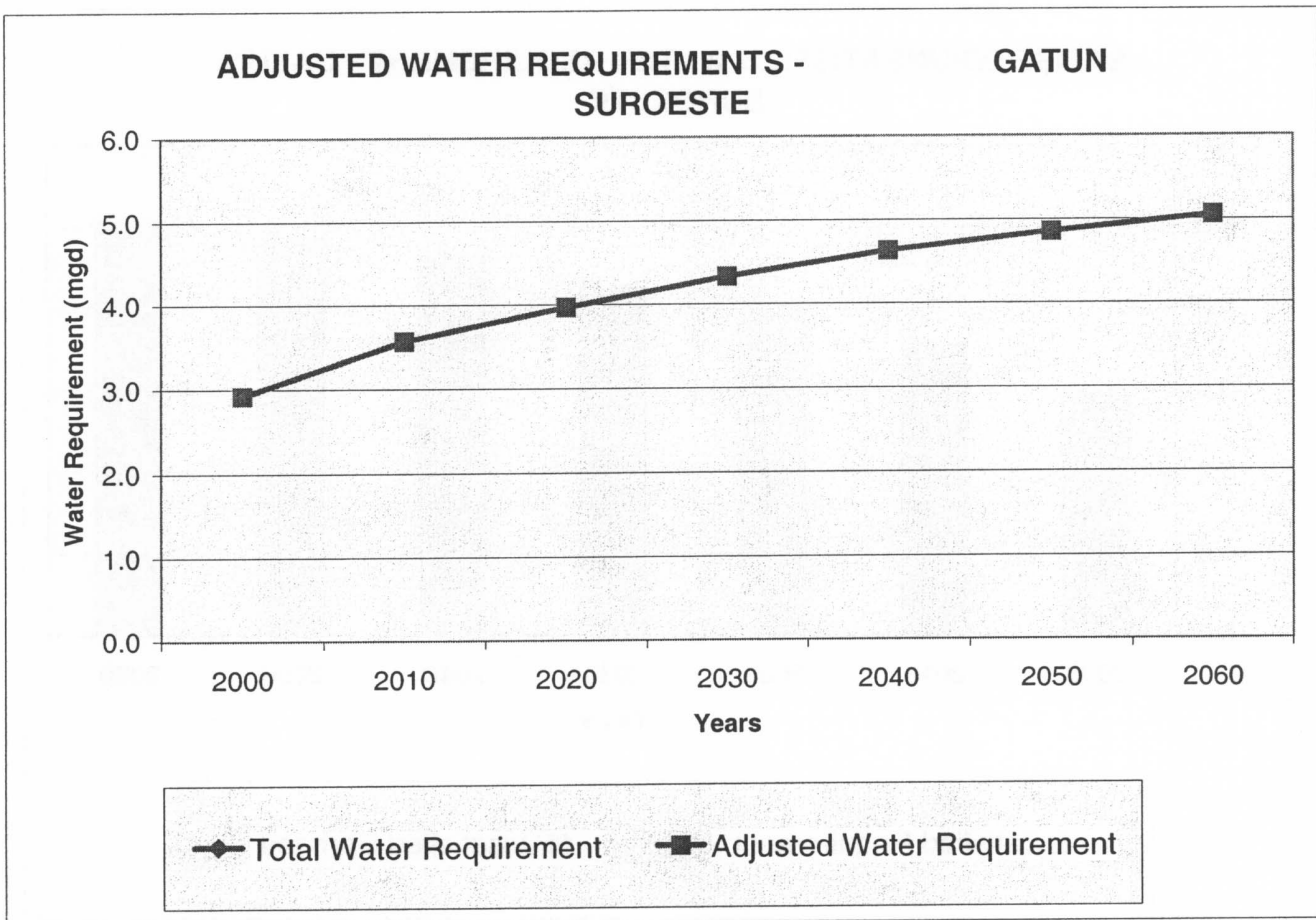
HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Gatun Suroeste
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Upper Chagres
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	52%	52%	52%	52%	52%	52%	52%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	23%	23%	23%	23%	23%	23%	23%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Upper Chagres
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
UPPER CHAGRES WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
<i>Residential (mgd)</i>	0.8	1.0	1.1	1.2	1.3	1.4	1.4
<i>Non-Residential (mgd)</i>	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Total Base Demand (mgd)	1.0	1.2	1.4	1.5	1.6	1.6	1.7
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
<i>Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Non-Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
<i>Residential (mgd)</i>	0.8	1.0	1.1	1.2	1.3	1.4	1.4
<i>Non-Residential Demand (mgd)</i>	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Subtotal (mgd)	1.0	1.2	1.4	1.5	1.6	1.6	1.7
Excessive Use							
<i>Unmetered Residential Demand (mgd)</i>	0.4	0.5	0.5	0.6	0.6	0.7	0.7
<i>Estimated Excessive Use (mgd)</i>	0.2	0.2	0.2	0.3	0.3	0.3	0.3
Physical Leakage							
<i>Estimated Physical Leakage (mgd)</i>	0.3	0.4	0.5	0.5	0.6	0.6	0.6
Production Losses							
<i>Estimated Production Losses (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	1.0	1.2	1.4	1.5	1.6	1.6	1.7
Excessive Use (mgd)	0.2	0.2	0.2	0.3	0.3	0.3	0.3
Physical Leakage (mgd)	0.3	0.4	0.5	0.5	0.6	0.6	0.6
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	1.5	1.9	2.1	2.3	2.4	2.5	2.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS LAST UPDATE: 10/9/00
 WORKSHEET: Upper Chagres BY: VFA
 MODEL RUN: PROBABLE SCENARIO

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
UPPER CHAGRES WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	1.0	1.2	1.4	1.5	1.6	1.6	1.7
Excessive Use (mgd)	0.2	0.2	0.2	0.3	0.3	0.3	0.3
Physical Leakage (mgd)	0.3	0.4	0.5	0.5	0.6	0.6	0.6
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	1.5	1.9	2.1	2.3	2.4	2.5	2.6
Total Actual Water Use (mgd)	1.5	1.9	2.1	2.3	2.4	2.5	2.6
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	1.5	1.9	2.1	2.3	2.4	2.5	2.6
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	1.5	1.9	2.1	2.3	2.4	2.5	2.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

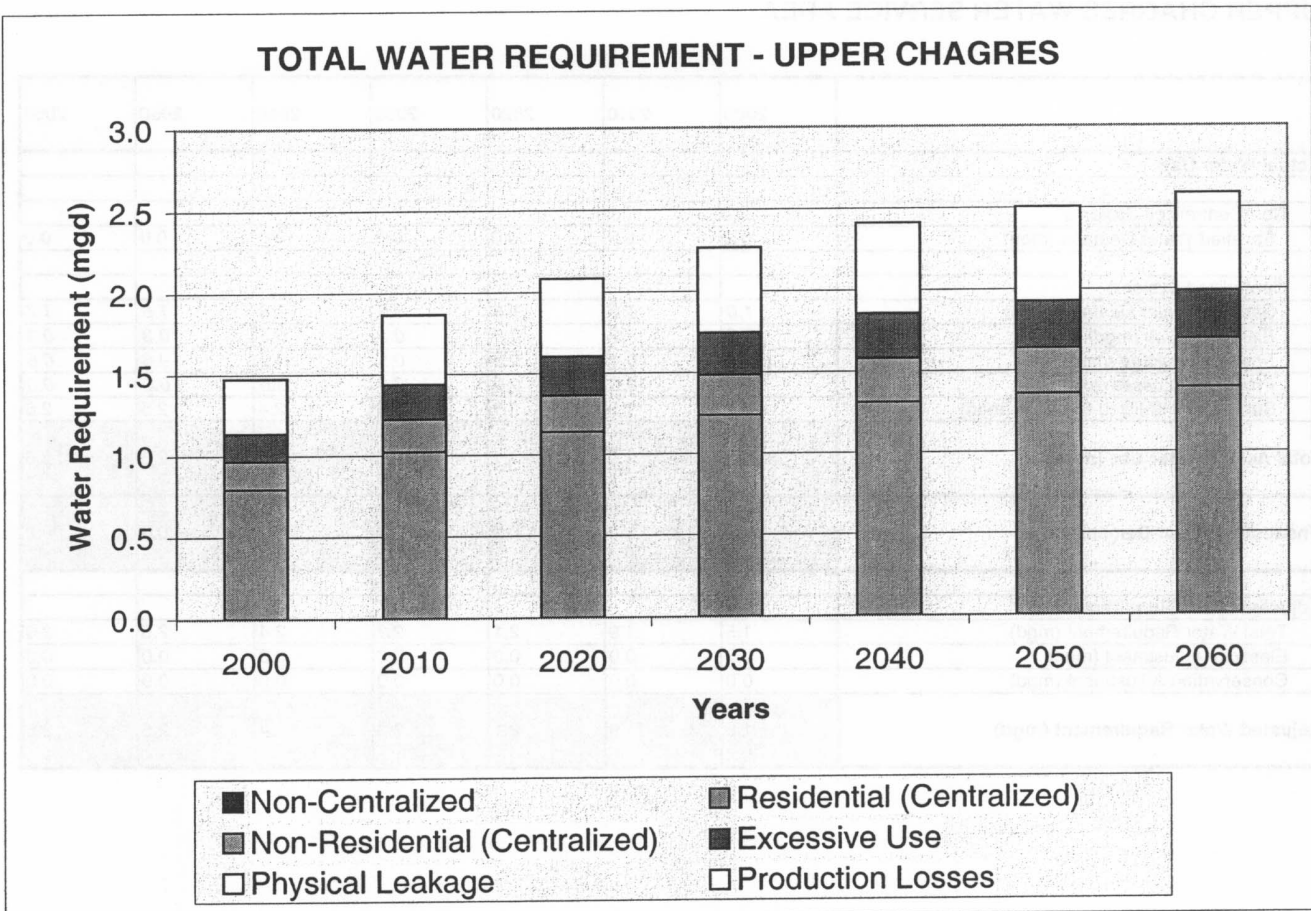
HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Upper Chagres
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

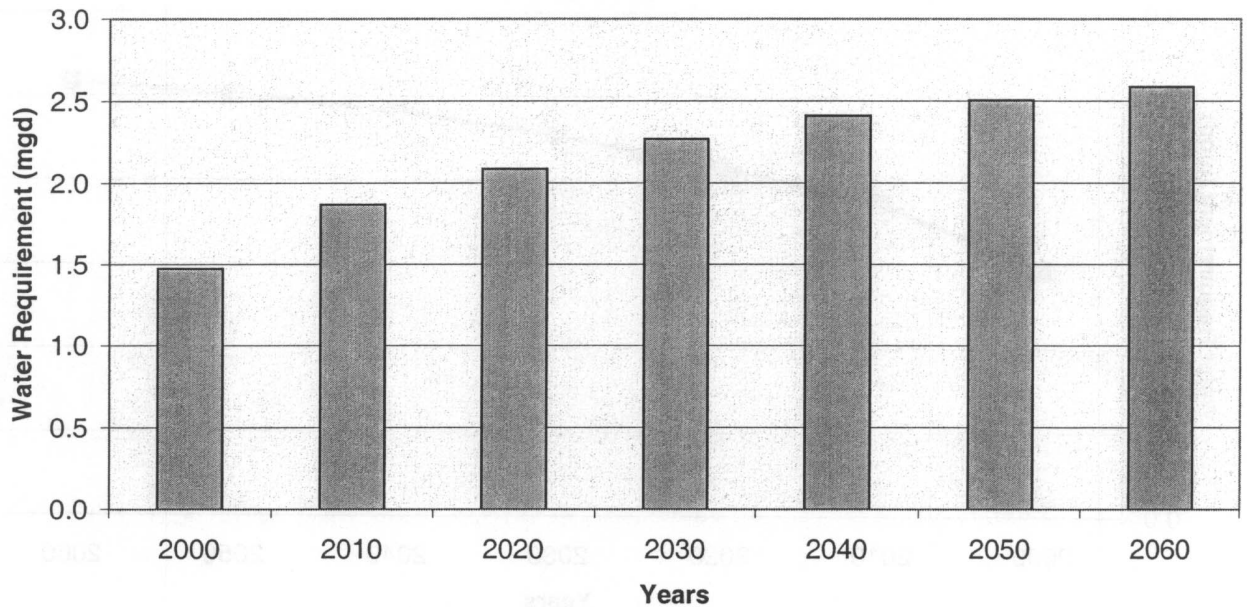
HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Upper Chagres
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**SATISFIED/UNSATISFIED WATER REQUIREMENT - UPPER
CHAGRES**



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

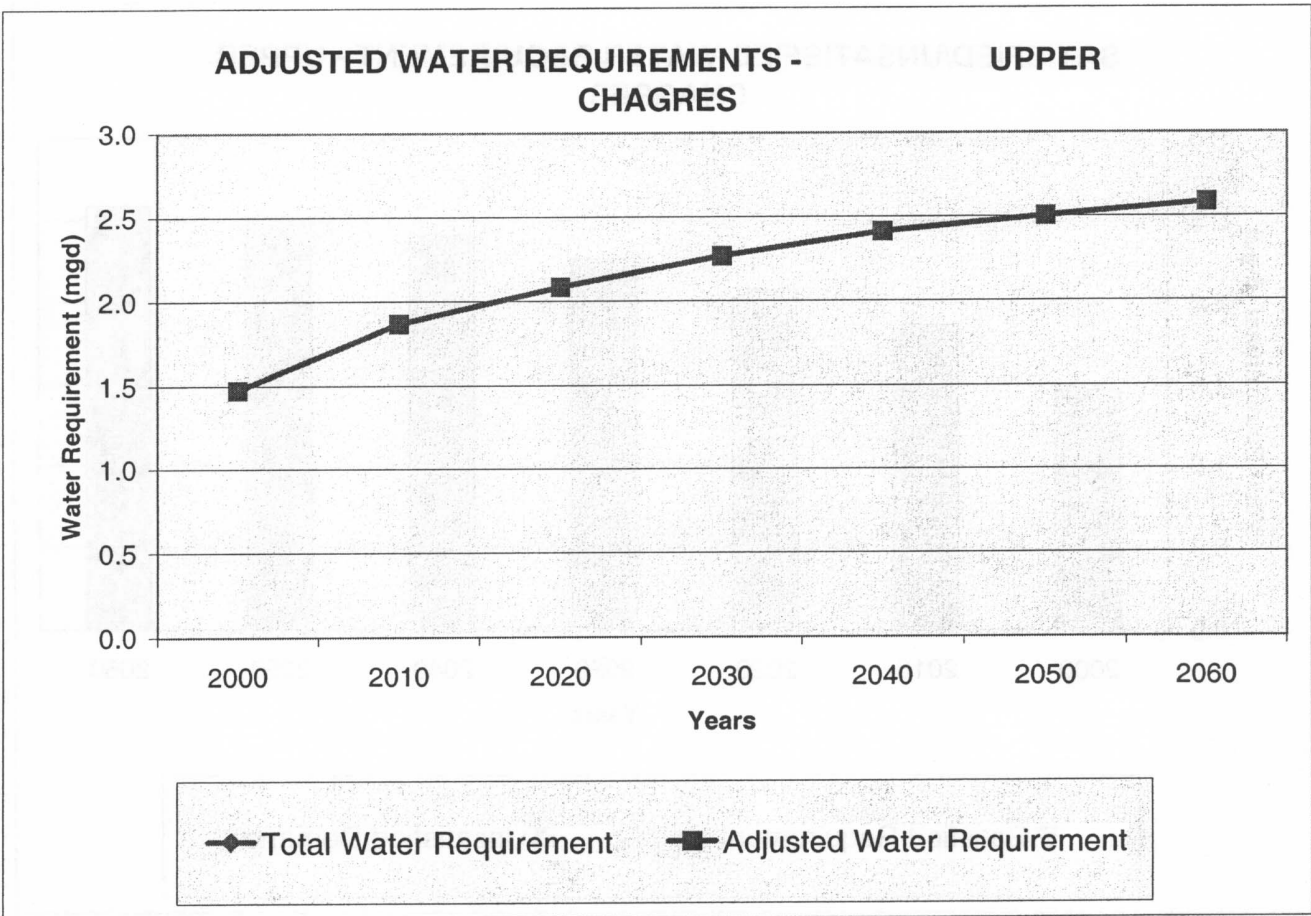
HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Upper Chagres
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Ancon
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

	2000	2010	2020	2030	2040	2050	2060
% of Service Area with Centralized System							
Residential	100%	100%	100%	100%	100%	100%	100%
Non-Residential	100%	100%	100%	100%	100%	100%	100%
Non-Centralized System Factors							
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Centralized System Factors							
% of Residential Connections Metered	52%	52%	52%	52%	52%	52%	52%
Excessive Use Factor	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Level of Service							
% of Area w/ 24 hour Service	100%	100%	100%	100%	100%	100%	100%
% of Area w/ 12-23 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < 12 hour Service	0%	0%	0%	0%	0%	0%	0%
% of Area w/ < Daily Service	0%	0%	0%	0%	0%	0%	0%
Level of Service Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Leakage Factor (% of Total Requirement)	23%	23%	23%	23%	23%	23%	23%
Production Losses (% of Total Requirement)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Conservation Factor	0%	0%	0%	0%	0%	0%	0%
Price Elasticity Factors							
Elasticity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Increase in Tariff	0%	0%	0%	0%	0%	0%	0%

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Ancon
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
ANCON WATER SERVICE AREA**

PROBABLE SCENARIO

	2000	2010	2020	2030	2040	2050	2060
Base Demand							
<i>Residential (mgd)</i>	0.1	0.2	0.2	0.2	0.2	0.2	0.2
<i>Non-Residential (mgd)</i>	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Total Base Demand (mgd)	0.2	0.2	0.3	0.3	0.4	0.4	0.4
Total Water Requirement							
Non-Centralized Systems							
Normal Demand							
<i>Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Non-Residential Demand (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Normal Demand							
<i>Residential (mgd)</i>	0.1	0.2	0.2	0.2	0.2	0.2	0.2
<i>Non-Residential Demand (mgd)</i>	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Subtotal (mgd)	0.2	0.2	0.3	0.3	0.4	0.4	0.4
Excessive Use							
<i>Unmetered Residential Demand (mgd)</i>	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<i>Estimated Excessive Use (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Physical Leakage							
<i>Estimated Physical Leakage (mgd)</i>	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Production Losses							
<i>Estimated Production Losses (mgd)</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirement Summary							
Normal Demand (mgd)	0.2	0.2	0.3	0.3	0.4	0.4	0.4
Excessive Use (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Physical Leakage (mgd)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Water Requirement (mgd)	0.3	0.4	0.4	0.5	0.5	0.6	0.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS
WORKSHEET: Ancon
MODEL RUN: PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

**WATER REQUIREMENT SUMMARIES
ANCON WATER SERVICE AREA**

	2000	2010	2020	2030	2040	2050	2060
Actual Water Use							
Non-Centralized Systems							
Satisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Centralized Systems							
Satisfied Water Demand (mgd)	0.2	0.2	0.3	0.3	0.4	0.4	0.4
Excessive Use (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Physical Leakage (mgd)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Production Losses (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Centralized Systems (mgd)	0.3	0.4	0.4	0.5	0.5	0.6	0.6
Total Actual Water Use (mgd)	0.3	0.4	0.4	0.5	0.5	0.6	0.6
Unsatisfied Water Demand (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement							
Total Water Requirement (mgd)	0.3	0.4	0.4	0.5	0.5	0.6	0.6
Elasticity Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conservation Adjustment (mgd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adjusted Water Requirement (mgd)	0.3	0.4	0.4	0.5	0.5	0.6	0.6

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

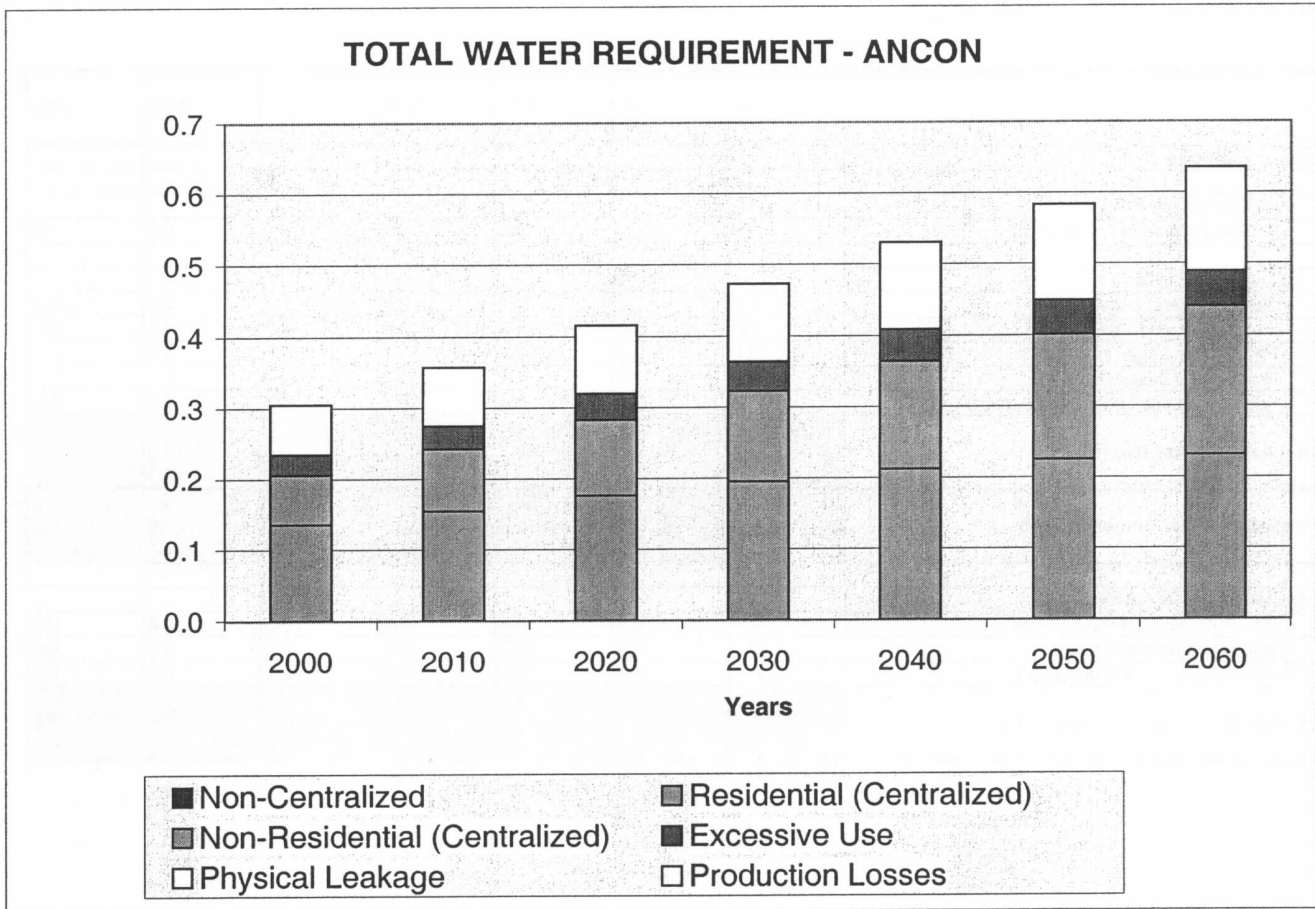
HARZA ENGINEERING COMPANY - CHICAGO

FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Ancon
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

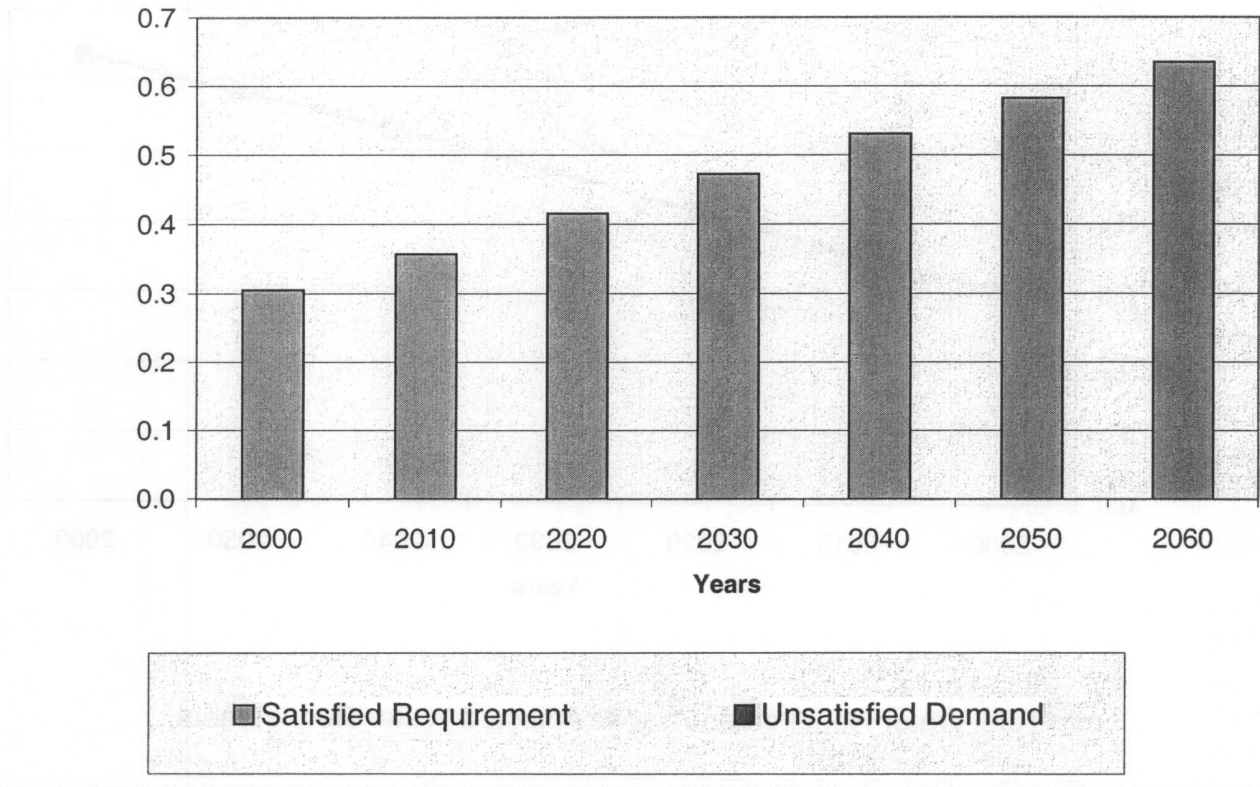
FILE:
WORKSHEET:
MODEL RUN:

AREA WATER REQUIREMENTS
Ancon
PROBABLE SCENARIO

LAST UPDATE: 10/9/00
BY: VFA

WATER REQUIREMENT ADJUSTMENT FACTORS

SATISFIED/UNSATISFIED WATER REQUIREMENT - ANCON



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

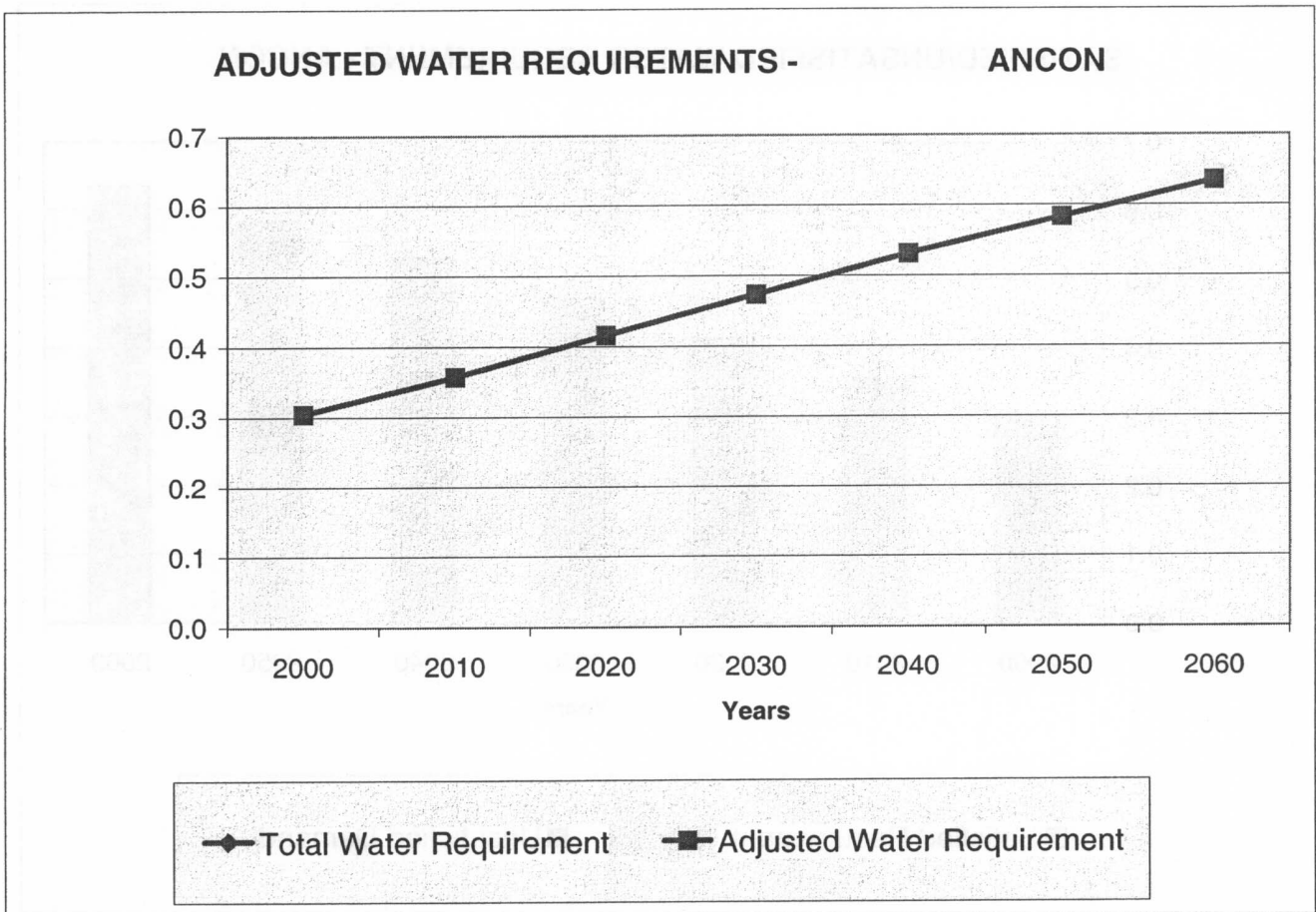
HARZA ENGINEERING COMPANY - CHICAGO

**FILE:
WORKSHEET:
MODEL RUN:**

**AREA WATER REQUIREMENTS
Ancon
PROBABLE SCENARIO**

**LAST UPDATE: 10/9/00
BY: VFA**

WATER REQUIREMENT ADJUSTMENT FACTORS



**PESSIMISTIC SCENARIO
WATER DEMAND FORECAST MODEL OUTPUT
(SUMMARY OUTPUT)**

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 6/2/01
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Population	1	Zone 1	14,555	16,323	16,998	17,425	17,451	17,256	16,965
	2	Zone 2	23,293	28,419	30,291	31,491	31,307	30,790	30,317
	3	Zone 3	80,742	99,802	105,723	109,210	107,612	105,096	103,521
	4	Zone 4	145,924	226,559	258,603	279,099	278,240	272,631	269,258
	5	Zone 5	152,345	174,353	182,155	186,944	184,673	180,359	177,473
	6	Zone 6	136,627	144,876	148,340	151,082	149,863	147,208	144,836
	7	Zone 7	338,516	380,115	425,822	463,594	485,341	489,777	482,289
	8	Zone 8	656,258	749,709	824,501	874,658	877,301	853,228	841,074
Total			1,548,260	1,820,156	1,992,433	2,113,503	2,131,788	2,096,345	2,065,733

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Agriculture	1	Zone 1	2,199	2,141	2,086	2,035	1,987	1,942	1,900
	2	Zone 2	11,404	11,173	10,961	10,766	10,589	10,429	10,286
	3	Zone 3	4,003	3,912	3,828	3,750	3,678	3,612	3,552
	4	Zone 4	2,150	2,141	2,135	2,133	2,134	2,139	2,147
	5	Zone 5	9,339	9,080	8,836	8,606	8,390	8,188	7,999
	6	Zone 6	525	519	513	508	504	501	499
	7	Zone 7	302	291	281	271	262	253	245
	8	Zone 8	3,381	3,317	3,258	3,204	3,155	3,111	3,072
Total			33,302	32,574	31,898	31,273	30,699	30,175	29,700

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Summary
LAST UPDATE: 6/2/01
BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Wet Industry	1	Zone 1	3	4	4	5	5	6	6
	2	Zone 2	439	537	629	707	778	804	849
	3	Zone 3	1,630	1,991	2,334	2,624	2,887	2,984	3,150
	4	Zone 4	1,707	2,085	2,445	2,748	3,025	3,126	3,300
Employees	5	Zone 5	1,730	2,114	2,478	2,786	3,066	3,168	3,345
	6	Zone 6	991	1,210	1,419	1,595	1,755	1,814	1,915
	7	Zone 7	34,134	41,695	48,875	54,949	60,470	62,492	65,975
	8	Zone 8	14,321	17,493	20,505	23,053	25,370	26,218	27,679
Total			67,128	78,689	88,468	97,356	100,611	106,219	

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Other Manufacturing	1	Zone 1	3	4	4	5	5	6	6
	2	Zone 2	5	6	7	8	8	9	9
	3	Zone 3	699	854	1,001	1,125	1,238	1,280	1,351
	4	Zone 4	25	30	36	40	44	46	48
Employees	5	Zone 5	174	212	249	280	308	318	336
	6	Zone 6	409	500	586	659	725	749	791
	7	Zone 7	7,745	9,460	11,089	12,467	13,720	14,179	14,969
	8	Zone 8	11,893	14,527	17,029	19,146	21,069	21,774	22,987
Total			20,952	25,593	30,001	33,729	37,118	38,359	40,497

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Summary

LAST UPDATE: 6/2/01
BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Ports/Warehouse	1	Zone 1	0	0	0	0	0	0	0
	2	Zone 2	0	0	0	0	0	0	0
	3	Zone 3	0	0	0	0	0	0	0
	4	Zone 4	0	0	0	0	0	0	0
Metric Tons	5	Zone 5	1,369,764	1,811,513	2,395,726	3,168,347	4,190,139	5,541,459	7,328,580
	6	Zone 6	12,327,876	16,303,616	21,561,533	28,515,127	37,711,255	49,873,135	65,957,222
	7	Zone 7	10,958,112	14,492,103	19,165,807	25,346,780	33,521,116	44,331,676	58,628,641
	8	Zone 8	2,739,528	3,623,026	4,791,452	6,336,695	8,380,279	11,082,919	14,657,160
Total			27,395,281	36,230,259	47,914,517	63,366,949	83,802,790	110,829,190	146,571,603

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Utilities	1	Zone 1	113	138	162	182	200	207	218
	2	Zone 2	181	221	259	291	320	331	349
	3	Zone 3	1,437	1,755	2,058	2,313	2,546	2,631	2,777
	4	Zone 4	1,134	1,385	1,623	1,825	2,008	2,075	2,191
Employees	5	Zone 5	1,183	1,446	1,695	1,905	2,097	2,167	2,287
	6	Zone 6	1,061	1,297	1,520	1,709	1,880	1,943	2,052
	7	Zone 7	2,637	3,221	3,776	4,245	4,672	4,828	5,097
	8	Zone 8	5,098	6,228	7,300	8,207	9,032	9,334	9,854
Total			12,845	15,690	18,392	20,678	22,755	23,516	24,827

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Summary
LAST UPDATE: 6/2/01
BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Fabrication / Construction	1	Zone 1	3	4	6	7	9	10	12
	2	Zone 2	5	7	9	12	14	16	19
	3	Zone 3	18	25	32	40	49	57	66
	4	Zone 4	33	45	59	74	90	103	121
1000 1982 Balboas	5	Zone 5	36	48	63	79	96	111	130
	6	Zone 6	33	44	58	72	88	101	118
	7	Zone 7	164	223	291	363	444	511	599
	8	Zone 8	173	235	307	383	469	538	631
Total			466	632	824	1,030	1,260	1,447	1,697

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Retail/Office	1	Zone 1	511	624	732	822	905	935	987
	2	Zone 2	2,736	3,342	3,918	4,405	4,847	5,009	5,289
	3	Zone 3	3,580	4,374	5,127	5,764	6,343	6,555	6,920
	4	Zone 4	5,248	6,410	7,514	8,448	9,297	9,608	10,144
Employees	5	Zone 5	16,452	20,096	23,557	26,484	29,145	30,120	31,798
	6	Zone 6	45,011	54,981	64,449	72,459	79,739	82,405	86,998
	7	Zone 7	386,600	472,234	553,561	622,353	684,882	707,782	747,231
	8	Zone 8	52,060	63,591	74,543	83,806	92,227	95,310	100,622
Total		512,197	625,652	733,400	824,541	907,385	937,725	989,989	

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 6/2/01
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Schools	1	Zone 1	4,043	4,641	5,052	5,434	5,789	6,053	6,257
	2	Zone 2	6,471	8,080	8,992	9,750	10,359	10,836	11,211
	3	Zone 3	22,428	28,442	31,570	34,132	36,095	37,550	38,860
	4	Zone 4	40,535	64,579	76,882	86,560	92,479	96,708	100,296
Students	5	Zone 5	42,318	49,605	54,096	57,935	61,219	63,698	65,862
	6	Zone 6	41,401	44,936	47,978	50,913	53,805	55,987	57,845
	7	Zone 7	112,839	116,670	125,229	133,927	143,553	151,063	155,960
	8	Zone 8	218,753	252,205	271,603	287,059	299,797	308,971	319,443
Total			488,787	569,158	621,401	665,710	703,095	730,866	755,734

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Hospitals	1	Zone 1	22	25	27	29	31	33	34
	2	Zone 2	37	47	52	56	60	62	65
	3	Zone 3	137	174	193	209	221	230	238
	4	Zone 4	263	418	498	561	599	627	650
Beds	5	Zone 5	335	393	428	459	485	504	522
	6	Zone 6	369	400	427	454	479	499	515
	7	Zone 7	1,320	1,365	1,465	1,567	1,680	1,767	1,825
	8	Zone 8	2,428	2,799	3,015	3,186	3,328	3,430	3,546
Total			4,911	5,622	6,106	6,521	6,883	7,152	7,394

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

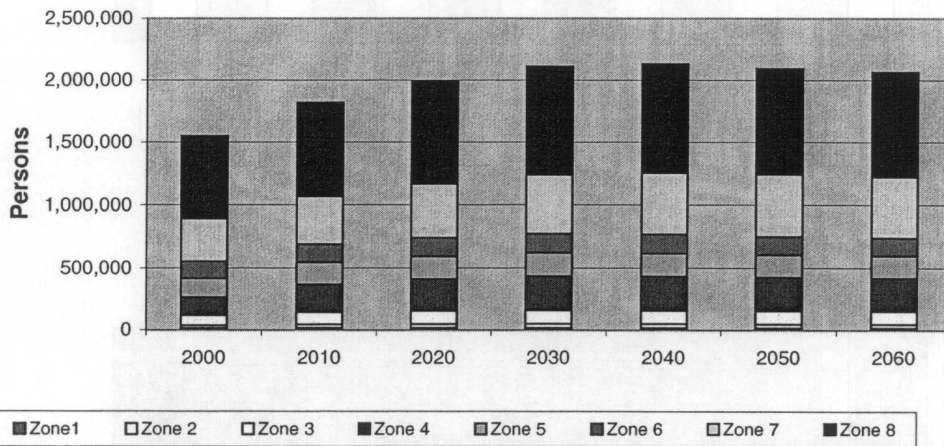
HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Summary
LAST UPDATE: 6/2/01
BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Tourism	1	Zone 1	1,899	2,278	2,592	2,914	3,245	3,546	3,917
	2	Zone 2	3,038	4,221	5,226	6,304	7,452	8,672	10,528
	3	Zone 3	45,636	60,844	71,003	80,706	89,729	98,140	109,483
	4	Zone 4	95,169	158,482	197,212	232,084	259,175	283,293	313,971
Guests	5	Zone 5	139,097	167,481	187,609	206,388	224,014	239,422	257,722
	6	Zone 6	106,923	131,223	158,419	190,082	227,139	267,241	331,983
	7	Zone 7	515,133	598,886	722,787	869,154	1,047,519	1,239,449	1,525,692
	8	Zone 8	256,797	316,891	365,269	413,209	461,899	509,516	583,331
Total			1,440,306	1,710,116	2,000,841	2,320,171	2,649,281	3,136,628	

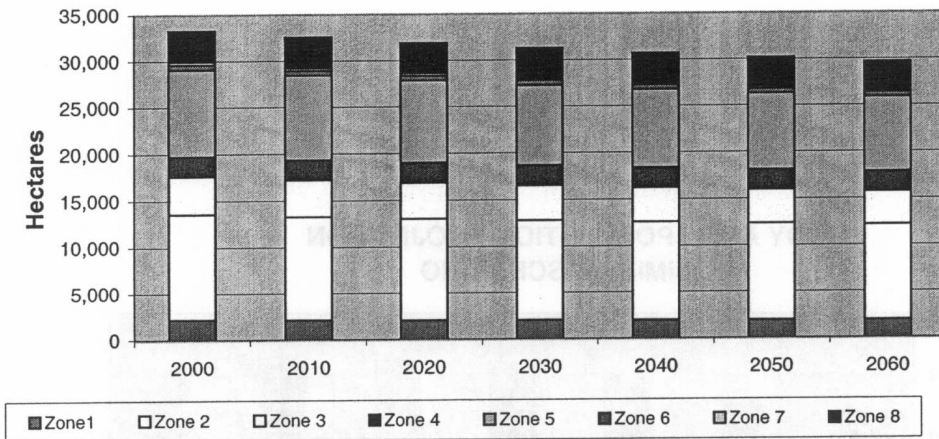
Long-Term Forecast for Municipal and Industrial Water Demands

STUDY AREA POPULATION PROJECTION PESSIMISTIC SCENARIO

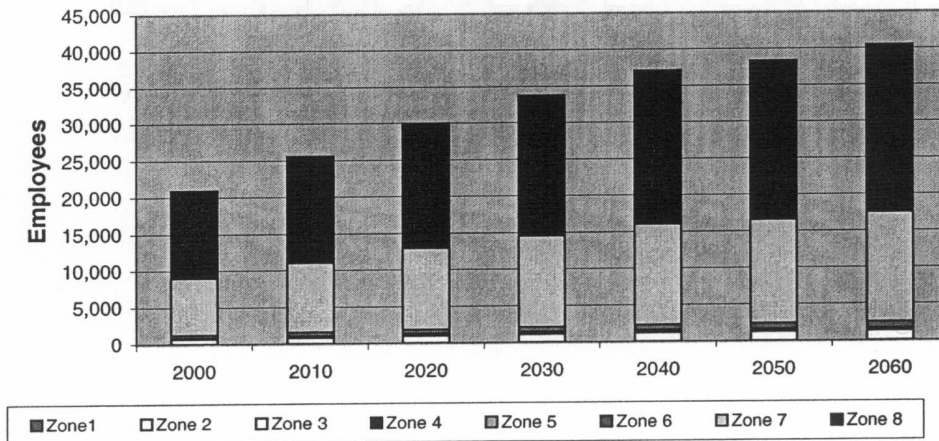


Long-Term Forecast for Municipal and Industrial Water Demands

AGRICULTURAL ACTIVITY PROJECTION PESSIMISTIC SCENARIO

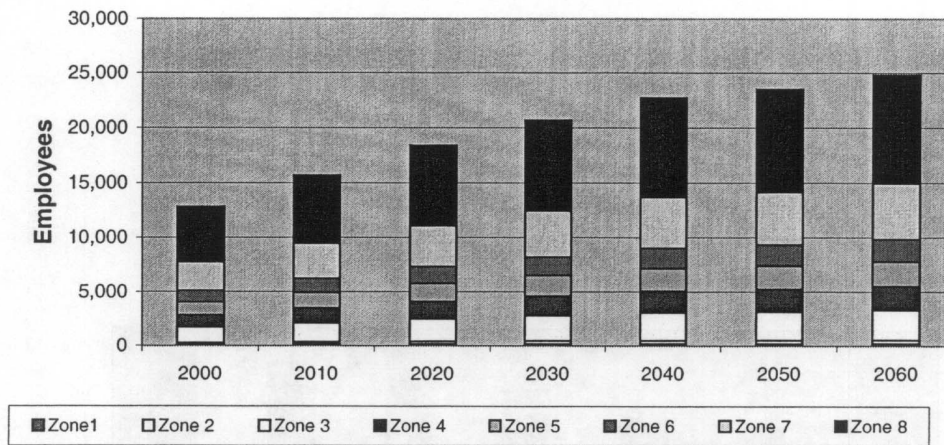


OTHER MFG ACTIVITY PROJECTION PESSIMISTIC SCENARIO

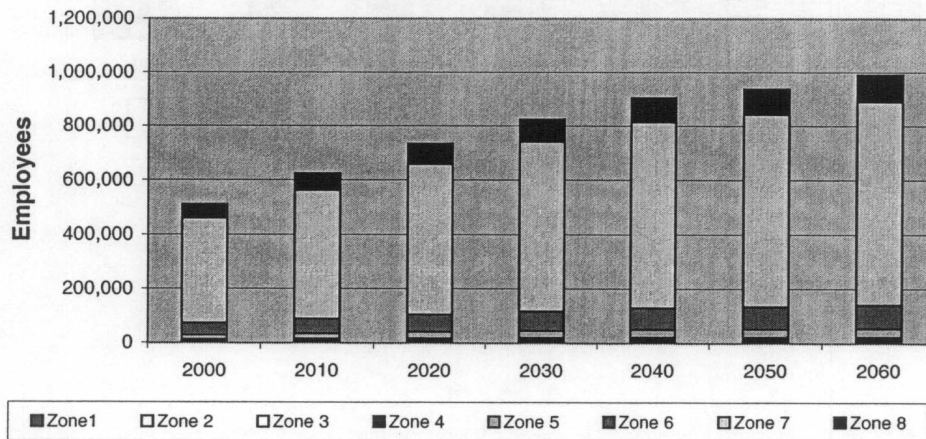


Long-Term Forecast for Municipal and Industrial Water Demands

UTILITIES ACTIVITY PROJECTION PESSIMISTIC SCENARIO

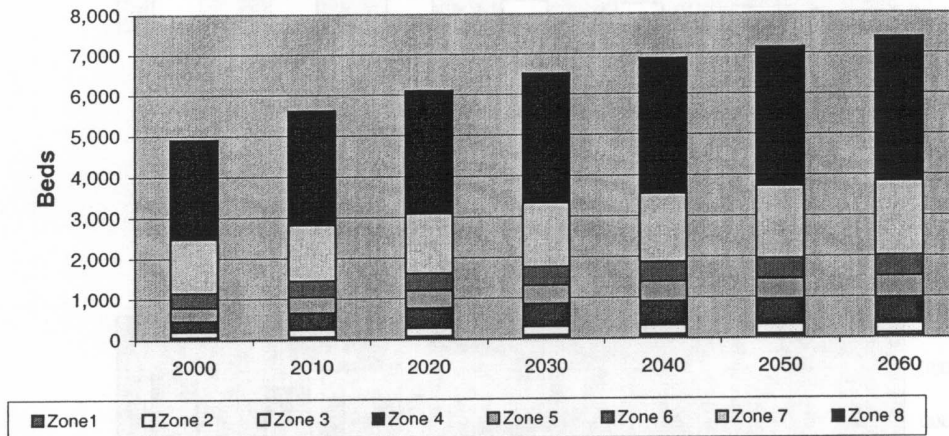


RETAIL/OFFICE ACTIVITY PROJECTION PESSIMISTIC SCENARIO



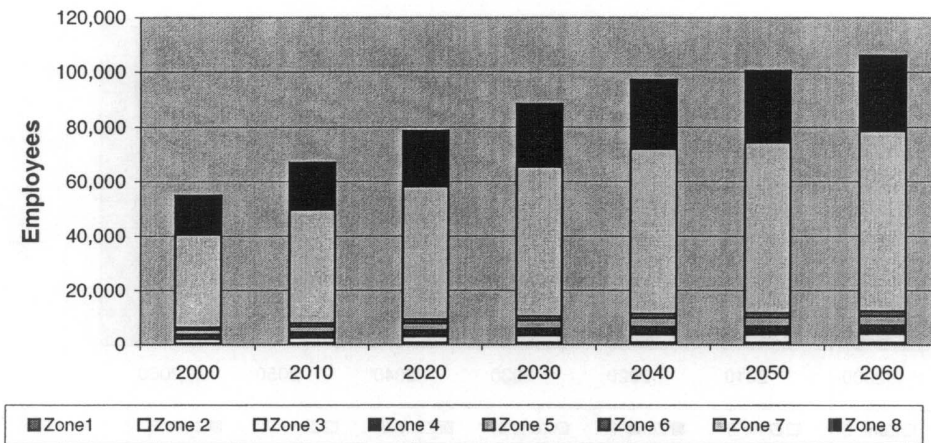
Long-Term Forecast for Municipal and Industrial Water Demands

HOSPITAL ACTIVITY PROJECTION PESSIMISTIC SCENARIO

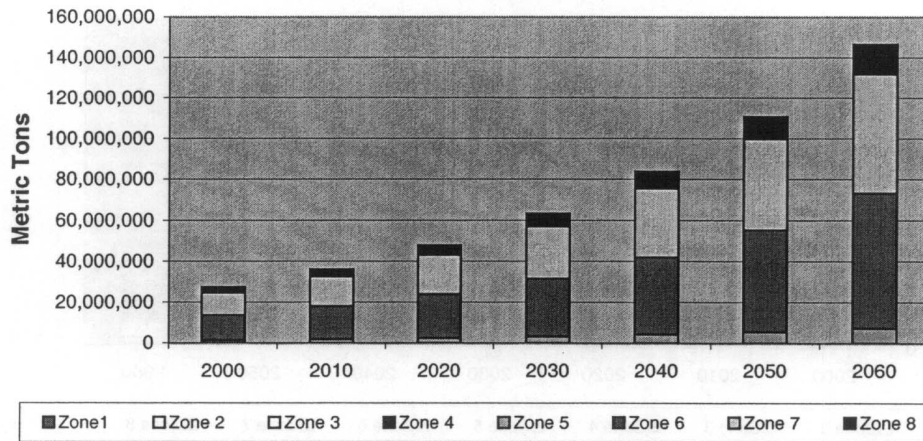


Long-Term Forecast for Municipal and Industrial Water Demands

WET INDUSTRIAL ACTIVITY PROJECTION PESSIMISTIC SCENARIO

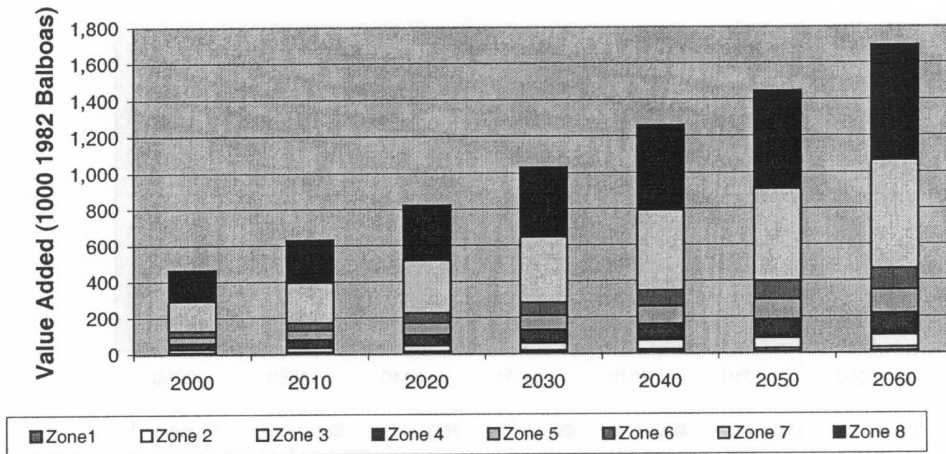


PORTS/WAREHOUSE ACTIVITY PROJECTION PESSIMISTIC SCENARIO

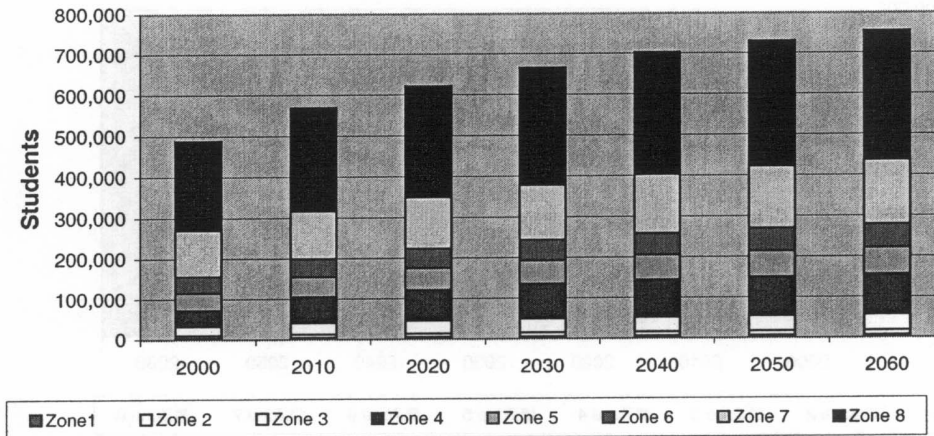


Long-Term Forecast for Municipal and Industrial Water Demands

FABRICATION/CONSTRUCTION PROJECTION PESSIMISTIC SCENARIO

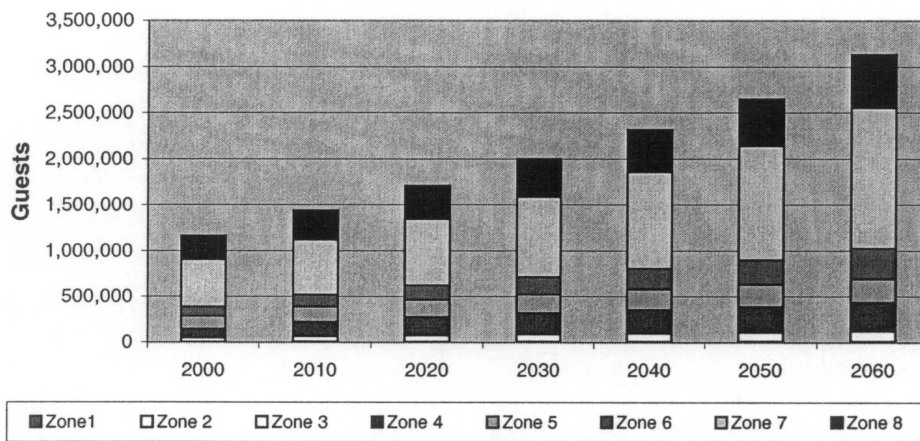


SCHOOLS ACTIVITY PROJECTION PESSIMISTIC SCENARIO



Long-Term Forecast for Municipal and Industrial Water Demands

TOURISM ACTIVITY PROJECTION PESSIMISTIC SCENARIO



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	CELA (6-00)	real	real	real	real	real	Harza	Harza	Harza
Display	#	text	#,###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Unit	input (locked)	input (locked)	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	POP_ZONE	POP_ZONE_NAME	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2000								
	1	Zone1	14,555	1.2	83	0.9	64	0.3	0.2	0.0	0.0
	2	Zone 2	23,293	3.1	135	1.8	76	1.4	1.1	0.1	0.0
	3	Zone 3	80,742	7.2	89	5.9	73	1.3	0.4	0.4	0.1
	4	Zone 4	145,924	10.6	73	9.3	64	1.3	0.2	0.4	0.0
	5	Zone 5	152,345	12.4	81	9.5	62	2.9	0.9	0.4	0.0
	6	Zone 6	136,627	17.2	126	9.4	69	7.8	0.1	0.2	0.1
	7	Zone 7	338,516	59.9	177	39.6	117	20.3	0.0	8.4	1.0
	8	Zone 8	656,258	47.0	72	36.7	56	10.3	0.3	3.5	1.5
Sum/Average			1,548,260	159	102	113	73	46	3	14	3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	CELA (6-00)	Harza	real	Harza	real	Harza	real	Harza	real
Display	#	text	#,###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Unit	input (locked)	input (locked)	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2010	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Zone1	16,323	1.3	81	1.0	64	0.3	0.2	0.0	0.0
	2	Zone 2	28,419	3.6	125	2.2	76	1.4	1.1	0.1	0.0
	3	Zone 3	99,802	8.8	88	7.3	73	1.5	0.4	0.5	0.1
	4	Zone 4	226,559	16.2	71	14.5	64	1.7	0.2	0.5	0.0
	5	Zone 5	174,353	14.2	82	10.9	62	3.4	0.9	0.5	0.0
	6	Zone 6	144,876	20.1	139	10.0	69	10.2	0.1	0.3	0.1
	7	Zone 7	380,115	69.8	184	44.5	117	25.4	0.0	10.3	1.2
	8	Zone 8	749,709	54.6	73	42.0	56	12.7	0.3	4.3	1.8
Sum/Average			1,820,156	189	104	132	73	56	3	17	3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2020 BASE DEMAND

Description Source	Zone Number integer #	Zone Name text text	Zone Population CELA (6-00) #,,## People	Total Base Demand Harza real ###.# mgd calculated	Base Per Capita Demand Harza real ### gpcd calculated	Residential Base Demand Harza real ###.# mgd calculated	Residential Per Capita Demand Harza real ### gpcd calculated	Non-Resid Base Demand Harza real ###.# mgd calculated	Agriculture Harza real ###.# mgd calculated	Wet Industry Harza real ###.# mgd calculated	Other Mfg Harza real ###.# mgd calculated
Sum/Average			1,992,433	214	107	145	73	69	3	19	4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	CELA (6-00)	Harza	Harza	Harza	Harza	Harza	Harza	Harza	Harza
Display	#	text	#,###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2030								
	1	Zone1	17,425	1.4	81	1.1	64	0.3	0.2	0.0	0.0
	2	Zone 2	31,491	3.8	122	2.4	76	1.4	1.1	0.2	0.0
	3	Zone 3	109,210	9.8	90	8.0	73	1.8	0.4	0.6	0.1
	4	Zone 4	279,099	20.1	72	17.9	64	2.2	0.2	0.7	0.0
	5	Zone 5	186,944	16.2	87	11.6	62	4.5	0.9	0.7	0.0
	6	Zone 6	151,082	27.5	182	10.4	69	17.2	0.1	0.4	0.1
	7	Zone 7	463,594	91.3	197	54.2	117	37.0	0.0	13.6	1.6
	8	Zone 8	874,658	66.4	76	49.0	56	17.5	0.3	5.7	2.4
Sum/Average			2,113,503	237	112	155	73	82	3	22	4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2040 BASE DEMAND

Description Source	Zone Number	Zone Name	Zone Population CELA (6-00)	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Type	integer	text	#,###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Display	#	text	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Unit			copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)	ZONEPOP_2040								
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2040								
	1	Zone1	17,451	1.4	81	1.1	64	0.3	0.2	0.0	0.0
	2	Zone 2	31,307	3.9	123	2.4	76	1.5	1.1	0.2	0.0
	3	Zone 3	107,612	9.9	92	7.9	73	2.0	0.4	0.7	0.2
	4	Zone 4	278,240	20.3	73	17.8	64	2.5	0.2	0.7	0.0
	5	Zone 5	184,673	16.8	91	11.5	62	5.3	0.8	0.8	0.0
	6	Zone 6	149,863	32.6	217	10.3	69	22.3	0.1	0.4	0.1
	7	Zone 7	485,341	100.8	208	56.8	117	44.0	0.0	14.9	1.7
	8	Zone 8	877,301	69.2	79	49.1	56	20.1	0.3	6.3	2.6
Sum/Average			2,131,788	255	119	157	74	98	3	24	5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real
Display	#	text	###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Unit	input (locked)	input (locked)	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	POP_ZONE	POP_ZONE_NAME	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	ZONEPOP_2050	ZONEPOP_2050	ZONEPOP_2050	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Zone1	17,256	1.4	82	1.1	64	0.3	0.2	0.0	0.0
	2	Zone 2	30,790	3.8	124	2.3	76	1.5	1.0	0.2	0.0
	3	Zone 3	105,096	9.8	93	7.7	73	2.1	0.4	0.7	0.2
	4	Zone 4	272,631	20.1	74	17.4	64	2.6	0.2	0.8	0.0
	5	Zone 5	180,359	17.4	96	11.2	62	6.1	0.8	0.8	0.0
	6	Zone 6	147,208	39.0	265	10.1	69	28.9	0.1	0.4	0.1
	7	Zone 7	489,777	108.3	221	57.3	117	51.0	0.0	15.4	1.8
	8	Zone 8	853,228	70.1	82	47.8	56	22.3	0.3	6.5	2.7
Sum/Average			2,096,345	270	129	155	74	115	3	25	5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION
PREPARED FOR THE PANAMA CANAL AUTHORITY**

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	integer	text	CELA (6-00) real # ,###	Harza real ###.#	Harza real ###	Harza real ###.#	Harza real ###	Harza real ###.#	Harza real ###.#	Harza real ###.#	Harza real ###.#
Type	#	text	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Display		text	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Unit		text	ZONEPOP_2060								
Comment	input (locked)	input (locked)									
Column Name	POP_ZONE	POP_ZONE_NAME									
	1	Zone1	16,965	1.4	83	1.1	64	0.3	0.2	0.0	0.0
	2	Zone 2	30,317	3.8	125	2.3	76	1.5	1.0	0.2	0.0
	3	Zone 3	103,521	9.8	94	7.6	73	2.2	0.4	0.8	0.2
	4	Zone 4	269,258	20.0	74	17.2	64	2.8	0.2	0.8	0.0
	5	Zone 5	177,473	18.3	103	11.1	62	7.3	0.8	0.8	0.0
	6	Zone 6	144,836	47.6	328	10.0	69	37.6	0.0	0.5	0.1
	7	Zone 7	482,289	117.0	243	56.4	117	60.5	0.0	16.3	1.9
	8	Zone 8	841,074	72.6	86	47.1	56	25.5	0.3	6.8	2.9
Sum/Average			2,065,733	290	141	153	74	138	3	26	5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE:
BY:

YEAR 2000 BASE DEMAND

Description Source	Zone Number	Zone Name	Zone Population		Ports	Utilities	Fab Const	Retail/Office	Schools	Hospitals	Tourism
			CELA (6-00)	People							
Type	integer	text	real	People	real	real	real	real	real	real	real
Display	#	text	###	copied	###	###	###	###	###	###	###
Unit					mgd	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)			calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2000								
	1	Zone1	14,555		0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	23,293		0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	80,742		0.0	0.1	0.0	0.1	0.0	0.0	0.0
	4	Zone 4	145,924		0.0	0.1	0.2	0.3	0.3	0.0	0.1
	5	Zone 5	152,345		0.7	0.1	0.2	0.1	0.3	0.0	0.1
	6	Zone 6	136,627		6.5	0.1	0.2	0.3	0.3	0.1	0.1
	7	Zone 7	338,516		5.8	0.1	0.9	2.9	0.7	0.2	0.3
	8	Zone 8	656,258		1.5	0.3	1.0	0.4	1.4	0.3	0.1
Sum/Average			1,548,260		15	1	3	4	3	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE:
BY:

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		RetailOffice		Schools		Hospitals		Tourism	
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Type	integer	text	#,###	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Display	#	text	People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit																		
Comment	input (locked)	input (locked)	POP_ZONE	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME
Column Name	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE	ZONE_ZONE
	1	Zone1	16,323	16,323	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	28,419	28,419	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	99,802	99,802	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	226,559	226,559	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	Zone 5	174,353	174,353	1.0	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1
	6	Zone 6	144,876	144,876	8.6	0.1	0.3	0.1	0.3	0.4	0.4	0.3	0.3	0.1	0.1	0.1	0.1	0.1
	7	Zone 7	380,115	380,115	7.7	0.2	0.2	0.2	1.3	3.5	0.7	0.7	0.2	0.2	0.2	0.2	0.2	0.3
	8	Zone 8	749,709	749,709	1.9	0.3	0.3	0.3	1.4	0.5	1.6	0.4	0.4	0.4	0.4	0.4	0.4	0.2
Sum/Average			1,820,156	1,820,156	19	1	1	1	4	5	4	4	5	4	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		RetailOffice		Schools		Hospitals		Tourism	
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Type	integer	text	#,###	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Display	#	text	People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit																		
Comment	input (locked)	input (locked)	ZONEPOP_2020	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2020	ZONEPOP_2020	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Zone1	16,998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	30,291	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	105,723	0.0	0.0	0.2	0.0	0.1	0.2	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	258,603	0.0	0.0	0.1	0.1	0.1	0.3	0.1	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1
	5	Zone 5	182,155	1.3	0.1	0.4	0.1	0.1	0.4	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1
	6	Zone 6	148,340	11.4	0.1	0.3	0.1	0.1	0.3	0.3	0.5	0.3	0.1	0.1	0.1	0.1	0.1	0.1
	7	Zone 7	425,822	10.2	0.2	1.7	0.2	0.2	1.7	4.1	4.1	0.8	0.2	0.2	0.2	0.2	0.4	0.4
	8	Zone 8	824,501	2.5	0.4	1.8	0.4	0.4	1.8	0.6	0.6	1.7	0.4	0.4	0.4	0.4	0.2	0.2
Sum/Average			1,992,433	25	1	5	5	5	5	4	4	4	4	1	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE:
BY:

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		Retail/Office		Schools		Hospitals		Tourism	
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Type	integer	text	#,###	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Display	#	text	People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit				ZONEPOP_2030	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)	POP_ZONE	POP_ZONE_NAME														
Column Name																		
	1	Zone1	17,425		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	31,491		0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	109,210		0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	279,099		0.0	0.0	0.0	0.1	0.4	0.1	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1
	5	Zone 5	186,944		1.7	0.1	0.1	0.1	0.5	0.2	0.2	0.4	0.4	0.1	0.1	0.1	0.1	0.1
	6	Zone 6	151,082		15.1	0.1	0.1	0.2	0.4	0.5	0.5	0.3	0.1	0.1	0.1	0.1	0.1	0.1
	7	Zone 7	463,594		13.4	0.2	0.2	0.2	2.1	4.6	4.6	0.8	0.2	0.2	0.2	0.2	0.2	0.5
	8	Zone 8	874,658		3.4	0.4	0.4	0.4	2.2	0.6	0.6	1.8	0.4	0.4	0.4	0.4	0.4	0.2
Sum/Average			2,113,503		34	1	6	6	6	6	6	4	1	1	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND LAST UPDATE:
WORKSHEET: Summary BY:

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		Retail/Office		Schools		Hospitals		Tourism		
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza
Type	integer	text	#,###	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Display	#	text	People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit																			
Comment	input (locked)	input (locked)	ZONEPOP_2040	ZONEPOP_2040	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME	POP_ZONE_NAME
	1	Zone1	17,451	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	31,307	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	107,612	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	278,240	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	5	Zone 5	184,673	2.2	0.1	0.1	0.1	0.1	0.6	0.2	0.2	0.2	0.4	0.1	0.1	0.1	0.1	0.1	0.1
	6	Zone 6	149,863	20.0	0.1	0.1	0.1	0.1	0.5	0.5	0.6	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1
	7	Zone 7	485,341	17.8	0.2	0.2	0.2	0.2	2.6	5.1	5.1	0.9	0.9	0.2	0.2	0.2	0.2	0.2	0.6
	8	Zone 8	877,301	4.4	0.5	0.5	0.5	0.5	2.7	0.7	0.7	1.9	1.9	0.5	0.5	0.5	0.5	0.5	0.2
Sum/Average			2,131,788	44	1	7	7	7	7	7	7	4	4	1	1	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

YEAR 2050 BASE DEMAND

Description Source	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		Retail/Office		Schools		Hospitals		Tourism		
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza
Type	integer	text	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###
Display	#	text	People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)
Comment	POP_ZONE	POP_ZONE_NAME	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
Column Name	POP_ZONE	POP_ZONE_NAME	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
	1	Zone 1	17,256	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	30,790	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	105,096	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	272,631	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	Zone 5	180,359	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	Zone 6	147,208	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	7	Zone 7	489,777	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	Zone 8	853,228	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum/Average			2,096,345	59	1	8	7	5	1	8	7	5	1	1	1	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION
PREPARED FOR THE PANAMA CANAL AUTHORITY**

FILE: BASE DEMAND LAST UPDATE:
WORKSHEET: Summary BY:

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		Retail/Office		Schools		Hospitals		Tourism	
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Type	integer	text	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###
Display	#	text	People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit																		
Comment	input (locked)	input (locked)	ZONEPOP_2060		calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	POP_ZONE_2060	ZONEPOP_2060	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
	1	Zone1	16,965	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	30,317	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	103,521	0.0	0.0	0.0	0.1	0.1	0.4	0.1	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.1
	4	Zone 4	269,258	0.0	0.0	0.0	0.1	0.1	0.7	0.1	0.1	0.6	0.1	0.1	0.1	0.1	0.2	0.2
	5	Zone 5	177,473	3.9	0.1	0.1	0.1	0.1	0.8	0.1	0.2	0.4	0.1	0.1	0.1	0.1	0.1	0.1
	6	Zone 6	144,836	35.0	0.1	0.1	0.1	0.1	0.7	0.7	0.6	0.4	0.4	0.1	0.1	0.1	0.2	0.2
	7	Zone 7	482,289	31.1	0.3	0.3	0.3	0.3	3.5	5.5	5.5	1.0	1.0	0.3	0.3	0.3	0.8	0.8
	8	Zone 8	841,074	7.8	0.5	0.5	0.5	0.5	3.6	0.7	0.7	2.0	2.0	0.5	0.5	0.5	0.3	0.3
Sum/Average			2,065,733	78	1	10	7	5	1	7	10	7	5	1	1	2	2	2

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

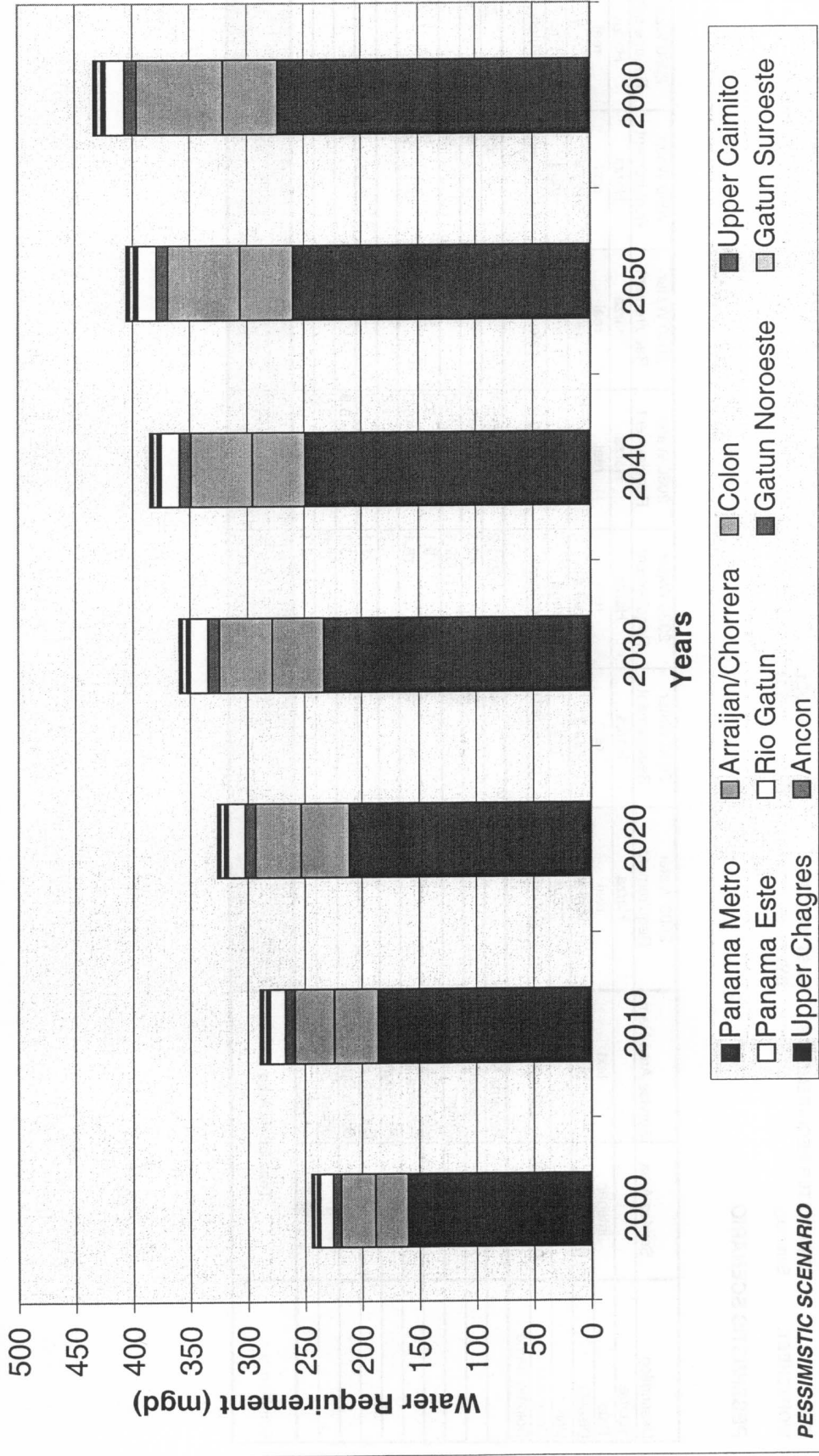
HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS Summary 06/02/01
WORKSHEET: TJJ

PESSIMISTIC SCENARIO

Description Source	Service Area	Service Area Name	2000 Water Requirement		2010 Water Requirement		2020 Water Requirement		2030 Water Requirement		2040 Water Requirement		2050 Water Requirement		2060 Water Requirement	
			Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Display	integer	text	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Unit	#	text	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	
Column Name	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	
	1	Panama Metro	160.1	186.2	211.2	233.1	249.3	259.7	273.3							
	2	Arraijan/Chorrera	28.4	38.0	42.3	45.4	46.3	46.5	47.4							
	3	Colon	30.1	34.8	39.8	46.0	53.5	63.0	75.8							
	4	Upper Calimito	6.7	8.3	9.1	9.6	9.9	10.0	10.3							
	5	Panama Este	12.0	13.8	15.1	16.0	16.4	16.5	16.7							
	6	Rio Gatun	1.3	1.6	1.7	1.8	1.8	1.8	1.8							
	7	Gatun Noroeste	0.9	1.0	1.1	1.2	1.3	1.4	1.6							
	8	Gatun Suroeste	2.9	3.5	3.7	3.9	3.9	3.9	4.0							
	9	Upper Chagres	1.5	1.8	1.9	2.0	2.0	2.0	2.0							
	10	Ancon	0.3	0.4	0.4	0.5	0.5	0.5	0.6							
Sum/Average		Total Study Area	244.2	289.4	326.3	359.7	385.0	405.5	433.5							

TOTAL WATER REQUIREMENT PANAMA CANAL WATERSHED SERVICE AREA



**OPTIMISTIC SCENARIO
WATER DEMAND FORECAST MODEL OUTPUT
(SUMMARY OUTPUT)**

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS 6/2/01
WORKSHEET: Summary TJJ
LAST UPDATE:
BY:

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Population	1	Zone 1	14,555	17,739	20,318	23,019	25,820	28,578	31,334
	2	Zone 2	23,293	30,726	35,938	41,106	46,102	51,090	56,059
	3	Zone 3	80,742	108,574	127,046	145,422	162,959	180,301	197,886
	4	Zone 4	145,924	244,357	305,113	362,572	410,672	457,042	502,606
	5	Zone 5	152,345	188,057	215,288	243,240	271,687	300,150	329,106
	6	Zone 6	136,627	156,842	175,927	196,745	219,562	242,125	265,258
	7	Zone 7	338,516	392,932	455,518	518,952	586,807	652,167	714,180
	8	Zone 8	656,258	787,866	912,024	1,029,822	1,147,570	1,264,219	1,385,899
Total			1,548,260	1,927,093	2,247,172	2,560,878	2,871,179	3,175,672	3,482,328

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Agriculture	1	Zone 1	2,199	2,141	2,086	2,035	1,987	1,942	1,900
	2	Zone 2	11,404	11,173	10,961	10,766	10,589	10,429	10,286
	3	Zone 3	4,003	3,912	3,828	3,750	3,678	3,612	3,552
	4	Zone 4	2,150	2,141	2,135	2,133	2,134	2,139	2,147
	5	Zone 5	9,339	9,080	8,836	8,606	8,390	8,188	7,999
	6	Zone 6	525	519	513	508	504	501	499
	7	Zone 7	302	291	281	271	262	253	245
	8	Zone 8	3,381	3,317	3,258	3,204	3,155	3,111	3,072
Total			33,302	32,574	31,898	31,273	30,699	30,175	29,700

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Summary
LAST UPDATE: 6/2/01
BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Wet Industry	1	Zone 1	3	4	4	5	5	6	6
	2	Zone 2	439	537	629	707	778	804	849
	3	Zone 3	1,630	1,991	2,334	2,624	2,887	2,984	3,150
	4	Zone 4	1,707	2,085	2,445	2,748	3,025	3,126	3,300
Employees	5	Zone 5	1,730	2,114	2,478	2,786	3,066	3,168	3,345
	6	Zone 6	991	1,210	1,419	1,595	1,755	1,814	1,915
	7	Zone 7	34,134	41,695	48,875	54,949	60,470	62,492	65,975
	8	Zone 8	14,321	17,493	20,505	23,053	25,370	26,218	27,679
Total			67,128	78,689	88,468	97,356	100,611	106,219	

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Other Manufacturing	1	Zone 1	3	4	4	5	5	6	6
	2	Zone 2	5	6	7	8	8	9	9
	3	Zone 3	699	854	1,001	1,125	1,238	1,280	1,351
	4	Zone 4	25	30	36	40	44	46	48
Employees	5	Zone 5	174	212	249	280	308	318	336
	6	Zone 6	409	500	586	659	725	749	791
	7	Zone 7	7,745	9,460	11,089	12,467	13,720	14,179	14,969
	8	Zone 8	11,893	14,527	17,029	19,146	21,069	21,774	22,987
Total			20,952	25,593	30,001	33,729	37,118	38,359	40,497

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Summary

LAST UPDATE: 6/2/01
BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Ports/Warehouse	1	Zone 1	0	0	0	0	0	0	0
	2	Zone 2	0	0	0	0	0	0	0
	3	Zone 3	0	0	0	0	0	0	0
	4	Zone 4	0	0	0	0	0	0	0
Metric Tons	5	Zone 5	1,369,764	1,811,513	2,395,726	3,168,347	4,190,139	5,541,459	7,328,580
	6	Zone 6	12,327,876	16,303,616	21,561,533	28,515,127	37,711,255	49,873,135	65,957,222
	7	Zone 7	10,958,112	14,492,103	19,165,807	25,346,780	33,521,116	44,331,676	58,628,641
	8	Zone 8	2,739,528	3,623,026	4,791,452	6,336,695	8,380,279	11,082,919	14,657,160
Total			27,395,281	36,230,259	47,914,517	63,366,949	83,802,790	110,829,190	146,571,603

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Utilities	1	Zone 1	113	138	162	182	200	207	218
	2	Zone 2	181	221	259	291	320	331	349
	3	Zone 3	1,437	1,755	2,058	2,313	2,546	2,631	2,777
	4	Zone 4	1,134	1,385	1,623	1,825	2,008	2,075	2,191
Employees	5	Zone 5	1,183	1,446	1,695	1,905	2,097	2,167	2,287
	6	Zone 6	1,061	1,297	1,520	1,709	1,880	1,943	2,052
	7	Zone 7	2,637	3,221	3,776	4,245	4,672	4,828	5,097
	8	Zone 8	5,098	6,228	7,300	8,207	9,032	9,334	9,854
Total			12,845	15,690	18,392	20,678	22,755	23,516	24,827

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS
WORKSHEET: Summary
LAST UPDATE: 6/2/01
BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Fabrication / Construction	1	Zone 1	3	4	6	7	9	10	12
	2	Zone 2	5	7	9	12	14	16	19
	3	Zone 3	18	25	32	40	49	57	66
	4	Zone 4	33	45	59	74	90	103	121
	5	Zone 5	36	48	63	79	96	111	130
	6	Zone 6	33	44	58	72	88	101	118
	7	Zone 7	164	223	291	363	444	511	599
	8	Zone 8	173	235	307	383	469	538	631
Total			466	632	824	1,030	1,260	1,447	1,697

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Retail/Office	1	Zone 1	511	624	732	822	905	935	987
	2	Zone 2	2,736	3,342	3,918	4,405	4,847	5,009	5,289
	3	Zone 3	3,580	4,374	5,127	5,764	6,343	6,555	6,920
	4	Zone 4	5,248	6,410	7,514	8,448	9,297	9,608	10,144
Employees	5	Zone 5	16,452	20,096	23,557	26,484	29,145	30,120	31,798
	6	Zone 6	45,011	54,981	64,449	72,459	79,739	82,405	86,998
	7	Zone 7	386,600	472,234	553,561	622,353	684,882	707,782	747,231
	8	Zone 8	52,060	63,591	74,543	83,806	92,227	95,310	100,622
Total			512,197	625,652	733,400	824,541	907,385	937,725	989,989

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 6/2/01
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Schools	1	Zone 1	4,043	4,641	5,052	5,434	5,789	6,053	6,257
	2	Zone 2	6,471	8,080	8,992	9,750	10,359	10,836	11,211
	3	Zone 3	22,428	28,442	31,570	34,132	36,095	37,550	38,860
	4	Zone 4	40,535	64,579	76,882	86,560	92,479	96,708	100,296
Students	5	Zone 5	42,318	49,605	54,096	57,935	61,219	63,698	65,862
	6	Zone 6	41,401	44,936	47,978	50,913	53,805	55,987	57,845
	7	Zone 7	112,839	116,670	125,229	133,927	143,553	151,063	155,960
	8	Zone 8	218,753	252,205	271,603	287,059	299,797	308,971	319,443
Total			488,787	569,158	621,401	665,710	703,095	730,866	755,734

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Hospitals	1	Zone 1	22	25	27	29	31	33	34
	2	Zone 2	37	47	52	56	60	62	65
	3	Zone 3	137	174	193	209	221	230	238
	4	Zone 4	263	418	498	561	599	627	660
Beds	5	Zone 5	335	393	428	459	485	504	522
	6	Zone 6	369	400	427	454	479	499	515
	7	Zone 7	1,320	1,365	1,465	1,567	1,680	1,767	1,825
	8	Zone 8	2,428	2,799	3,015	3,186	3,328	3,430	3,546
Total			4,911	5,622	6,106	6,521	6,883	7,152	7,394

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

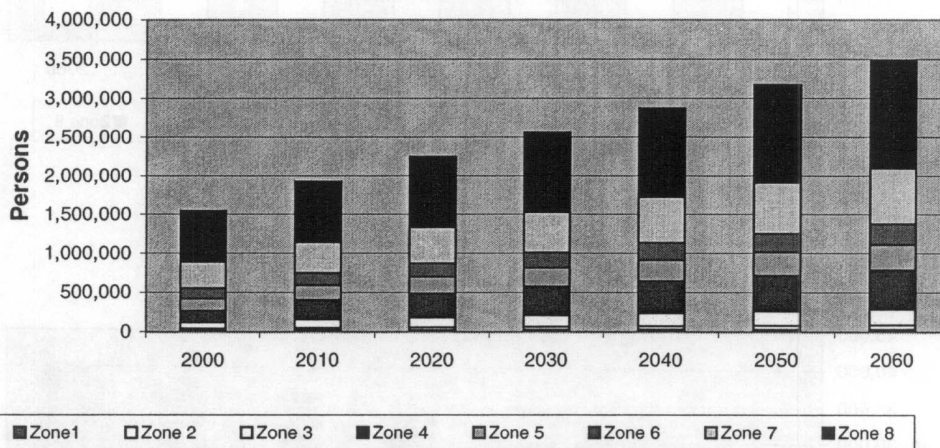
HARZA ENGINEERING COMPANY - CHICAGO

FILE: ZONE PROJECTIONS LAST UPDATE: 6/2/01
WORKSHEET: Summary BY: TJJ

Economic Activity/Units	Zone Number	Zone Name	2000	2010	2020	2030	2040	2050	2060
Tourism	1	Zone 1	1,899	2,278	2,592	2,914	3,245	3,546	3,917
	2	Zone 2	3,038	4,221	5,226	6,304	7,452	8,672	10,528
	3	Zone 3	45,636	60,844	71,003	80,706	89,729	98,140	109,483
	4	Zone 4	95,169	158,482	197,212	232,084	259,175	283,293	313,971
Guests	5	Zone 5	139,097	167,481	187,609	206,388	224,014	239,422	257,722
	6	Zone 6	106,923	131,223	158,419	190,082	227,139	267,241	331,983
	7	Zone 7	515,133	598,886	722,787	869,154	1,047,519	1,239,449	1,525,692
	8	Zone 8	256,797	316,891	365,269	413,209	461,899	509,516	583,331
Total			1,440,306	1,710,116	2,000,841	2,320,171	2,649,281	3,136,628	

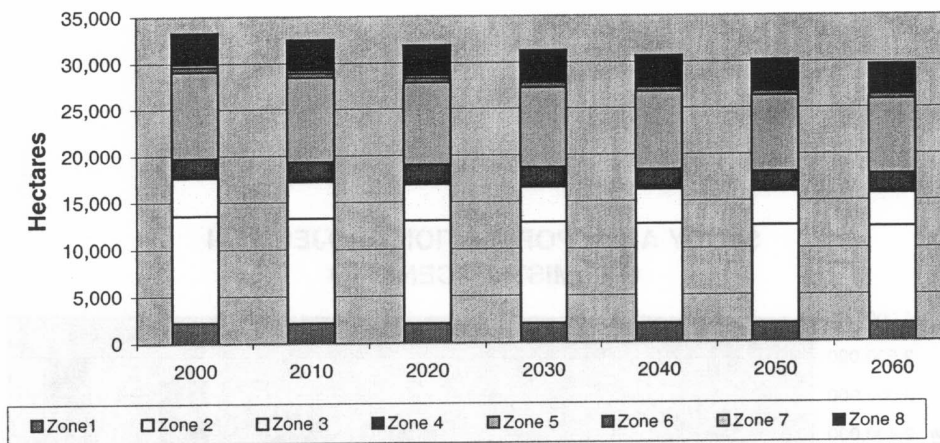
Long-Term Forecast for Municipal and Industrial Water Demands

STUDY AREA POPULATION PROJECTION OPTIMISTIC SCENARIO

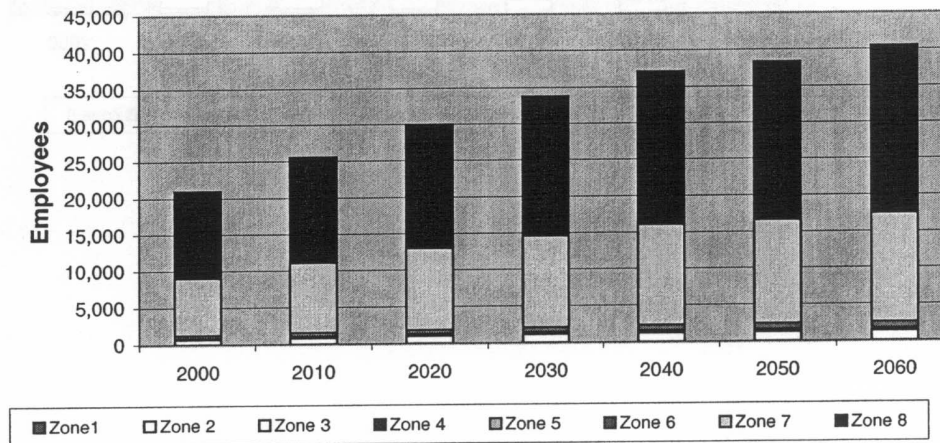


Long-Term Forecast for Municipal and Industrial Water Demands

AGRICULTURAL ACTIVITY PROJECTION OPTIMISTIC SCENARIO

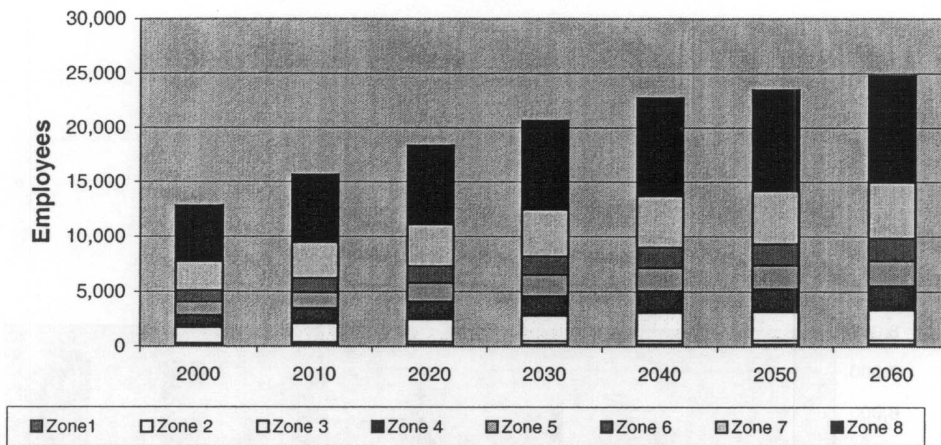


OTHER MFG ACTIVITY PROJECTION OPTIMISTIC SCENARIO

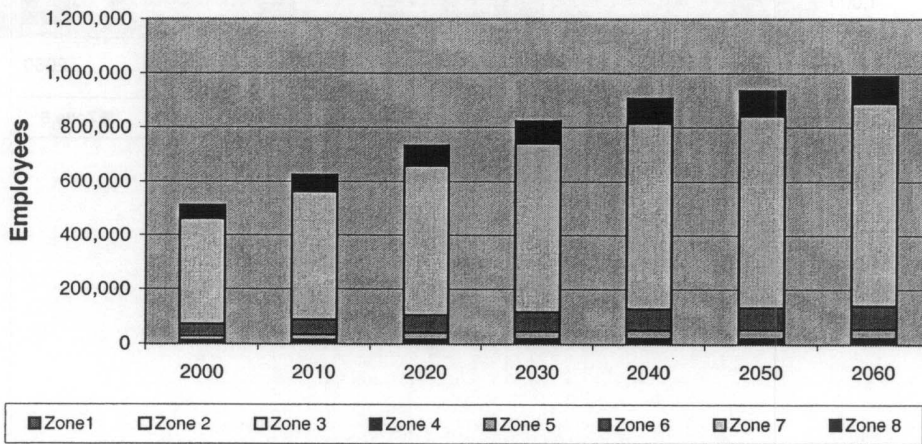


Long-Term Forecast for Municipal and Industrial Water Demands

UTILITIES ACTIVITY PROJECTION OPTIMISTIC SCENARIO

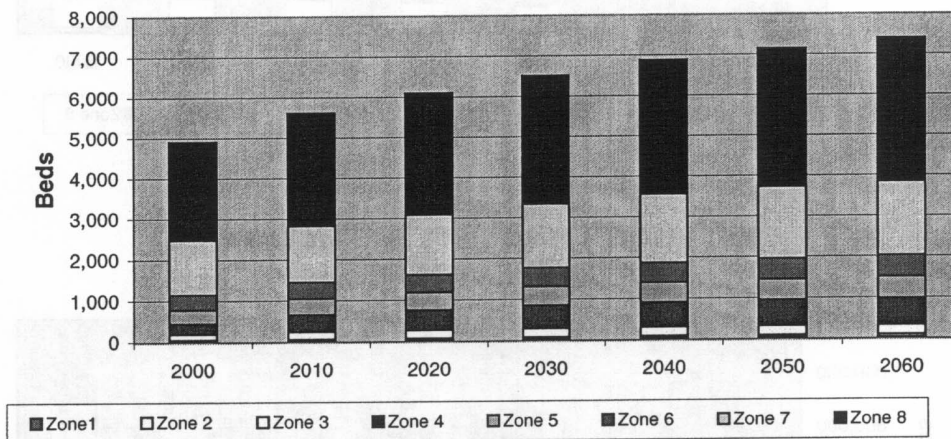


RETAIL/OFFICE ACTIVITY PROJECTION OPTIMISTIC SCENARIO



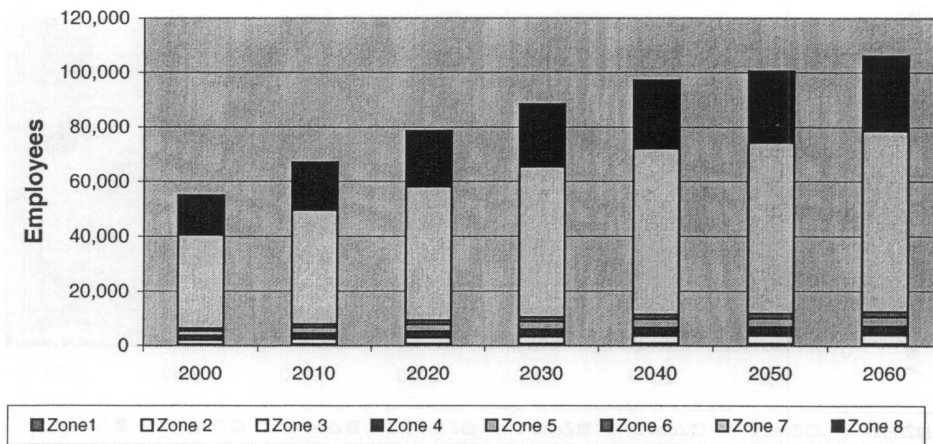
Long-Term Forecast for Municipal and Industrial Water Demands

HOSPITAL ACTIVITY PROJECTION OPTIMISTIC SCENARIO

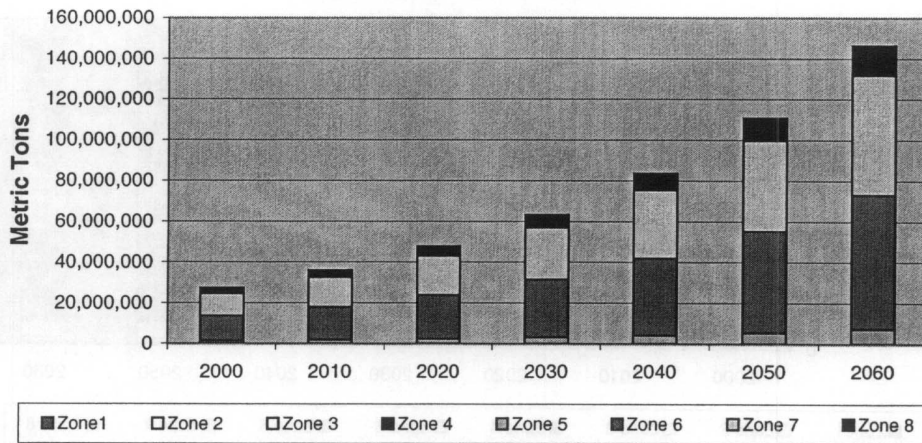


Long-Term Forecast for Municipal and Industrial Water Demands

WET INDUSTRIAL ACTIVITY PROJECTION OPTIMISTIC SCENARIO

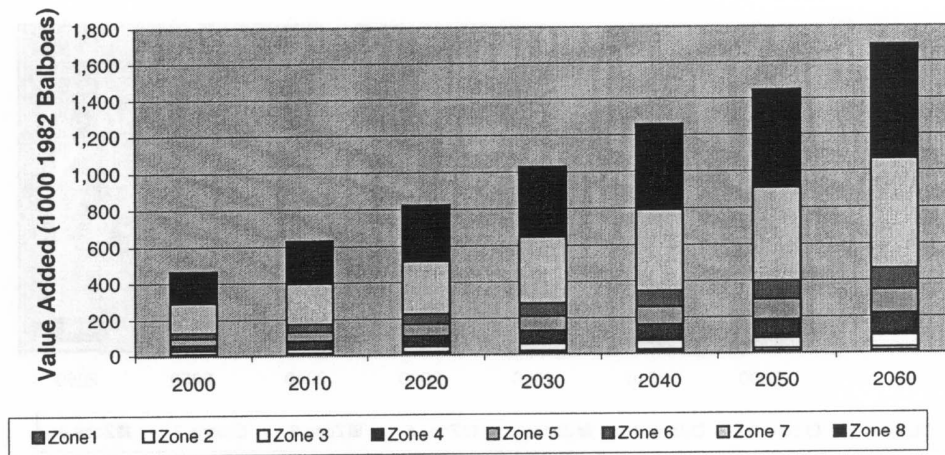


PORTS/WAREHOUSE ACTIVITY PROJECTION OPTIMISTIC SCENARIO

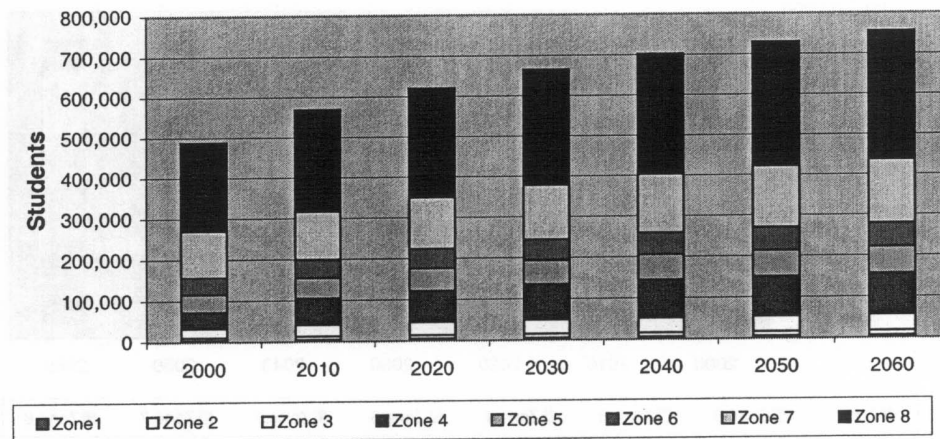


Long-Term Forecast for Municipal and Industrial Water Demands

FABRICATION/CONSTRUCTION PROJECTION OPTIMISTIC SCENARIO

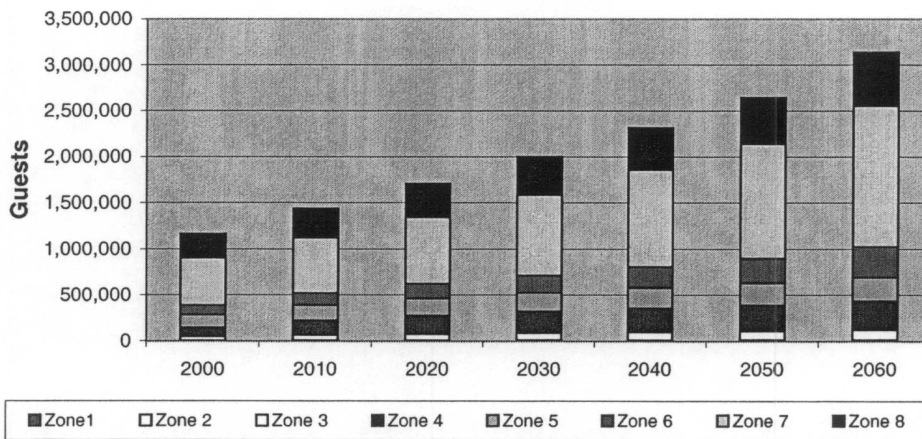


SCHOOLS ACTIVITY PROJECTION OPTIMISTIC SCENARIO



Long-Term Forecast for Municipal and Industrial Water Demands

TOURISM ACTIVITY PROJECTION OPTIMISTIC SCENARIO



**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2000 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population CELA (6-00)	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	real	real	real	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###	###	###	###
Unit	input (locked)	input (locked)	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	POP_ZONE	POP_ZONE_NAME	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2000								
	1	Zone1	14,555	1.2	83	0.9	64	0.3	0.2	0.0	0.0
	2	Zone 2	23,293	3.1	135	1.8	76	1.4	1.1	0.1	0.0
	3	Zone 3	80,742	7.2	89	5.9	73	1.3	0.4	0.4	0.1
	4	Zone 4	145,924	10.6	73	9.3	64	1.3	0.2	0.4	0.0
	5	Zone 5	152,345	12.4	81	9.5	62	2.9	0.9	0.4	0.0
	6	Zone 6	136,627	17.2	126	9.4	69	7.8	0.1	0.2	0.1
	7	Zone 7	338,516	59.9	177	39.6	117	20.3	0.0	8.4	1.0
	8	Zone 8	656,258	47.0	72	36.7	56	10.3	0.3	3.5	1.5
Sum/Average			1,548,260	159	102	113	73	46	3	14	3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2010 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type		CELA (6-00)	real	real	real	real	real	real	real	real
Display	#	text	###	###	###	###	###	###	###	###	###
Unit		text	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2010								
	1	Zone 1	17,739	1.4	80	1.1	64	0.3	0.2	0.0	0.0
	2	Zone 2	30,726	3.7	121	2.3	76	1.4	1.1	0.1	0.0
	3	Zone 3	108,574	9.4	87	7.9	73	1.5	0.4	0.5	0.1
	4	Zone 4	244,357	17.3	71	15.6	64	1.7	0.2	0.5	0.0
	5	Zone 5	188,057	15.1	80	11.7	62	3.4	0.9	0.5	0.0
	6	Zone 6	156,842	21.0	134	10.8	69	10.2	0.1	0.3	0.1
	7	Zone 7	392,932	71.3	182	46.0	117	25.4	0.0	10.3	1.2
	8	Zone 8	787,866	56.8	72	44.1	56	12.7	0.3	4.3	1.8
Sum/Average			1,927,093	196	102	140	72	56	3	17	3

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND Summary
 WORKSHEET: Summary
 YEAR 2020 BASE DEMAND
 LAST UPDATE: 6/2/01
 BY: TJJ

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type		CELA (6-00)	Harza	Harza	Harza	Harza	Harza	Harza	Harza	Harza
Display	#	text	###	###	###	###	###	###	###	###	###
Unit		text	People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2020								
	1	Zone1	20,318	1.6	78	1.3	64	0.3	0.2	0.0	0.0
	2	Zone 2	35,938	4.2	116	2.7	76	1.4	1.1	0.2	0.0
	3	Zone 3	127,046	10.9	86	9.3	73	1.7	0.4	0.6	0.1
	4	Zone 4	305,113	21.5	70	19.5	64	2.0	0.2	0.6	0.0
	5	Zone 5	215,288	17.3	80	13.4	62	3.9	0.9	0.6	0.0
	6	Zone 6	175,927	25.3	144	12.1	69	13.2	0.1	0.4	0.1
	7	Zone 7	455,518	84.3	185	53.3	117	31.0	0.0	12.1	1.4
	8	Zone 8	912,024	66.1	72	51.1	56	15.1	0.3	5.1	2.1
Sum/Average			2,247,172	231	103	163	72	69	3	19	4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2030 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	CELA (6-00)	real	real	real	real	real	real	real	real
Display	#	text	#,###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2030								
	1	Zone1	23,019	1.8	77	1.5	64	0.3	0.2	0.0	0.0
	2	Zone 2	41,106	4.6	111	3.1	76	1.4	1.1	0.2	0.0
	3	Zone 3	145,422	12.5	86	10.6	73	1.8	0.4	0.6	0.1
	4	Zone 4	362,572	25.4	70	23.2	64	2.2	0.2	0.7	0.0
	5	Zone 5	243,240	19.7	81	15.2	62	4.5	0.9	0.7	0.0
	6	Zone 6	196,745	30.7	156	13.5	69	17.2	0.1	0.4	0.1
	7	Zone 7	518,952	97.7	188	60.7	117	37.0	0.0	13.6	1.6
	8	Zone 8	1,029,822	75.1	73	57.7	56	17.5	0.3	5.7	2.4
Sum/Average			2,560,878	267	104	185	72	82	3	22	4

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION
PREPARED FOR THE PANAMA CANAL AUTHORITY**

FILE: BASE DEMAND LAST UPDATE: 6/2/01
WORKSHEET: Summary BY: TJJ

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	CELA (6-00)	real	Harza	Harza	real	Harza	Harza	Harza	Harza
Display	#	text	###	###	###	###	###	###	###	###	###
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2040								
	1	Zone 1	25,820	2.0	76	1.6	64	0.3	0.2	0.0	0.0
	2	Zone 2	46,102	5.0	108	3.5	76	1.5	1.1	0.2	0.0
	3	Zone 3	162,959	13.9	85	11.9	73	2.0	0.4	0.7	0.2
	4	Zone 4	410,672	28.7	70	26.3	64	2.5	0.2	0.7	0.0
	5	Zone 5	271,687	22.2	82	16.9	62	5.3	0.8	0.8	0.0
	6	Zone 6	219,562	37.4	170	15.1	69	22.3	0.1	0.4	0.1
	7	Zone 7	586,807	112.6	192	68.7	117	44.0	0.0	14.9	1.7
	8	Zone 8	1,147,570	84.3	73	64.3	56	20.1	0.3	6.3	2.6
Sum/Average			2,871,179	306	107	208	73	98	3	24	5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

6/2/01
TJJ

YEAR 2050 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	CELA (6-00)	real	real	real	real	real	real	real	real
Display	#	text	#,###	###.#	###	###.#	###	###.#	###.#	###.#	###.#
Unit			People	mgd	gpcd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2050								
	1	Zone1	28,578	2.1	75	1.8	64	0.3	0.2	0.0	0.0
	2	Zone 2	51,090	5.4	105	3.9	76	1.5	1.0	0.2	0.0
	3	Zone 3	180,301	15.2	85	13.2	73	2.1	0.4	0.7	0.2
	4	Zone 4	457,042	31.9	70	29.2	64	2.6	0.2	0.8	0.0
	5	Zone 5	300,150	24.8	83	18.7	62	6.1	0.8	0.8	0.0
	6	Zone 6	242,125	45.5	188	16.6	69	28.9	0.1	0.4	0.1
	7	Zone 7	652,167	127.3	195	76.3	117	51.0	0.0	15.4	1.8
	8	Zone 8	1,264,219	93.1	74	70.8	56	22.3	0.3	6.5	2.7
Sum/Average			3,175,672	345	109	231	73	115	3	25	5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY: TJJ

6/2/01
TJJ

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population	Total Base Demand	Base Per Capita Demand	Residential Base Demand	Residential Per Capita Demand	Non-Resid Base Demand	Agriculture	Wet Industry	Other Mfg
Source	Type	text	CELIA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza
Display	#	text	###	###	###	###	###	###	###	###	###
Unit			People	mgd	mgd	mgd	gpcd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2060								
	1	Zone 1	31,334	2.3	74	2.0	64	0.3	0.2	0.0	0.0
	2	Zone 2	56,059	5.8	103	4.3	76	1.5	1.0	0.2	0.0
	3	Zone 3	197,886	16.7	84	14.4	73	2.2	0.4	0.8	0.2
	4	Zone 4	502,606	35.0	70	32.2	64	2.8	0.2	0.8	0.0
	5	Zone 5	329,106	27.8	84	20.5	62	7.3	0.8	0.8	0.0
	6	Zone 6	265,258	55.8	211	18.2	69	37.6	0.0	0.5	0.1
	7	Zone 7	714,180	144.1	202	83.6	117	60.5	0.0	16.3	1.9
	8	Zone 8	1,385,899	103.1	74	77.6	56	25.5	0.3	6.8	2.9
Sum/Average			3,482,328	390	112	253	73	138	3	26	5

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE:
BY:

YEAR 2000 BASE DEMAND

Description Source	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		Retail/Office		Schools		Hospitals		Tourism	
			CELA (6-00)	real ###	Harza	real ###	Harza	real ###	Harza	real ###	Harza	real ###	Harza	real ###	Harza	real ###	Harza	real ###
Type	integer #	text text	People copied	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated	mgd calculated
Unit	input (locked)	input (locked)	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
Comment	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
Column Name	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE	POP_ZONE
	1	Zone1	14,555	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	23,293	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	80,742	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	145,924	0.0	0.1	0.2	0.0	0.1	0.2	0.2	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1
	5	Zone 5	152,345	0.7	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.3	0.0	0.0	0.0	0.1	0.1
	6	Zone 6	136,627	6.5	0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1
	7	Zone 7	338,516	5.8	0.1	0.9	0.1	0.1	0.9	0.9	2.9	0.7	0.7	0.2	0.2	0.3	0.3	0.3
	8	Zone 8	656,258	1.5	0.3	1.0	0.3	0.3	1.0	0.4	0.4	1.4	1.4	0.3	0.3	0.1	0.1	0.1
Sum/Average			1,548,260	15	1	3	4	3	3	4	3	3	3	1	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE:
BY:

YEAR 2010 BASE DEMAND

Description Source	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		RetailOffice		Schools		Hospitals		Tourism	
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Type	integer	text	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###
Display	#	text	People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit			ZONEPOP_2010		calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)																
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2010															
	1	Zone1	17,739		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	30,726		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	108,574		0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	244,357		0.0	0.1	0.3	0.1	0.3	0.0	0.0	0.4	0.1	0.1	0.1	0.1	0.1	0.1
	5	Zone 5	188,057		1.0	0.1	0.3	0.1	0.3	0.1	0.1	0.3	0.3	0.1	0.1	0.1	0.1	0.1
	6	Zone 6	156,842		8.6	0.1	0.3	0.1	0.3	0.4	0.4	0.3	0.3	0.1	0.1	0.1	0.1	0.1
	7	Zone 7	392,932		7.7	0.2	1.3	0.2	1.3	3.5	3.5	0.7	0.2	0.2	0.2	0.2	0.2	0.3
	8	Zone 8	787,866		1.9	0.3	1.4	0.3	1.4	0.5	0.5	1.6	0.4	0.4	0.4	0.4	0.4	0.2
Sum/Average			1,927,093		19	1	4	5	4	4	5	4	4	4	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary
LAST UPDATE:
BY:

YEAR 2020 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		RetailOffice		Schools		Hospitals		Tourism	
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Source																		
Type	integer	text																
Display	#	text	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###
Unit			People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	
Comment	input (locked)	input (locked)																
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2020	ZONEPOP_2020	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	
	1	Zone1	20,318	20,318	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	2	Zone 2	35,938	35,938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	3	Zone 3	127,046	127,046	0.0	0.1	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	4	Zone 4	305,113	305,113	0.0	0.1	0.3	0.1	0.3	0.1	0.1	0.5	0.1	0.1	0.1	0.1	0.1	
	5	Zone 5	215,288	215,288	1.3	0.1	0.4	0.1	0.4	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.1	
	6	Zone 6	175,927	175,927	11.4	0.1	0.3	0.1	0.3	0.5	0.3	0.3	0.1	0.1	0.1	0.1	0.1	
	7	Zone 7	455,518	455,518	10.2	0.2	1.7	0.2	1.7	4.1	4.1	0.8	0.2	0.2	0.2	0.2	0.4	
	8	Zone 8	912,024	912,024	2.5	0.4	1.8	0.4	1.8	0.6	0.6	1.7	0.4	0.4	0.4	0.4	0.2	
Sum/Average			2,247,172	2,247,172	25	1	5	5	5	4	4	1	1	1	1	1	1	

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

YEAR 2030 BASE DEMAND

Description Source	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		Retail/Office		Schools		Hospitals		Tourism	
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Type	integer	text	#,###	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Display	#	text	People	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit			copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)	ZONEPOP_2030															
Column Name	POP_ZONE	POP_ZONE_NAME																
	1	Zone1	23,019	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	41,106	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	145,422	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	362,572	0.0	0.0	0.0	0.1	0.4	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.1	0.1
	5	Zone 5	243,240	1.7	0.1	0.1	0.1	0.5	0.4	0.2	0.2	0.2	0.4	0.3	0.1	0.1	0.1	0.1
	6	Zone 6	196,745	15.1	0.1	0.1	0.1	0.4	0.4	0.4	0.5	0.3	0.3	0.1	0.1	0.1	0.1	0.1
	7	Zone 7	518,952	13.4	0.2	0.2	0.2	2.1	2.1	4.6	4.6	0.8	0.8	0.2	0.2	0.2	0.5	0.5
	8	Zone 8	1,029,822	3.4	0.4	0.4	0.4	2.2	2.2	0.6	0.6	1.8	1.8	0.4	0.4	0.4	0.2	0.2
Sum/Average			2,560,878	34	1	6	6	6	6	6	6	4	4	1	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

YEAR 2040 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports		Utilities		Fab Const		RetailOffice		Schools		Hospitals		Tourism	
			CELA (6-00)	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Source	Type		#,###	People	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Unit																		
Comment	input (locked)	input (locked)	copied	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2040	ZONEPOP_2040														
	1	Zone1	25,820	25,820	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	46,102	46,102	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	162,959	162,959	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	4	Zone 4	410,672	410,672	0.0	0.0	0.0	0.1	0.5	0.1	0.1	0.6	0.1	0.1	0.1	0.1	0.1	0.1
	5	Zone 5	271,687	271,687	2.2	2.2	0.1	0.1	0.6	0.2	0.2	0.4	0.1	0.1	0.1	0.1	0.1	0.1
	6	Zone 6	219,562	219,562	20.0	20.0	0.1	0.1	0.5	0.6	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1
	7	Zone 7	586,807	586,807	17.8	17.8	0.2	0.2	2.6	5.1	0.9	0.9	0.2	0.2	0.2	0.2	0.2	0.6
	8	Zone 8	1,147,570	1,147,570	4.4	4.4	0.5	0.5	2.7	0.7	1.9	0.7	0.5	0.5	0.5	0.5	0.5	0.2
Sum/Average			2,871,179	2,871,179	44	44	1	1	7	7	4	4	1	1	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

YEAR 2050 BASE DEMAND

Description Source	Zone Number	Zone Name	Zone Population		Ports	Utilities		Fab Const		Retail/Office		Schools		Hospitals		Tourism	
			CELA (6-00)	real		Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Type	integer	text	###	###	###	###	###	###	###	###	###	###	###	###	###	###	###
Display	#	text	People	copied	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Unit				ZONEPOP_2050	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Comment	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)	input (locked)
Column Name	POP_ZONE	POP_ZONE_NAME	POP_ZONE	POP_ZONE_NAME	POP_ZONE	POP_ZONE_NAME	POP_ZONE	POP_ZONE_NAME	POP_ZONE	POP_ZONE_NAME	POP_ZONE	POP_ZONE_NAME	POP_ZONE	POP_ZONE_NAME	POP_ZONE	POP_ZONE_NAME	POP_ZONE
	1	Zone1	28,578	Zone1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	51,090	Zone 2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	3	Zone 3	180,301	Zone 3	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1
	4	Zone 4	457,042	Zone 4	0.0	0.0	0.1	0.6	0.1	0.0	0.1	0.6	0.1	0.1	0.1	0.2	0.2
	5	Zone 5	300,150	Zone 5	2.9	0.1	0.1	0.6	0.2	0.2	0.1	0.4	0.1	0.1	0.1	0.1	0.1
	6	Zone 6	242,125	Zone 6	26.4	0.1	0.1	0.6	0.6	0.6	0.3	0.3	0.1	0.1	0.1	0.1	0.1
	7	Zone 7	652,167	Zone 7	23.5	0.3	0.3	2.9	5.2	5.2	0.9	0.9	0.2	0.2	0.2	0.7	0.7
	8	Zone 8	1,264,219	Zone 8	5.9	0.5	0.5	3.1	0.7	0.7	1.9	1.9	0.5	0.5	0.5	0.3	0.3
Sum/Average			3,175,672		59	1	8	7	5	1	8	7	5	1	1	1	1

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

FILE: BASE DEMAND
WORKSHEET: Summary

LAST UPDATE:
BY:

YEAR 2060 BASE DEMAND

Description	Zone Number	Zone Name	Zone Population		Ports	Utilities	Fab Const	RetailOffice	Schools	Hospitals	Tourism
			CELA (6-00)	real							
Source											
Type	integer	text			Harza	Harza	Harza	Harza	Harza	Harza	Harza
Display	#	text	###	real	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Unit			People	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd
Comment	input (locked)	input (locked)	copied	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated
Column Name	POP_ZONE	POP_ZONE_NAME	ZONEPOP_2060								
	1	Zone1	31,334	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Zone 2	56,059	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
	3	Zone 3	197,886	0.0	0.1	0.1	0.4	0.1	0.2	0.0	0.1
	4	Zone 4	502,606	0.0	0.0	0.1	0.7	0.1	0.6	0.1	0.2
	5	Zone 5	329,106	3.9	0.1	0.1	0.8	0.2	0.4	0.1	0.1
	6	Zone 6	265,258	35.0	0.1	0.1	0.7	0.6	0.4	0.1	0.2
	7	Zone 7	714,180	31.1	0.3	0.3	3.5	5.5	1.0	0.3	0.8
	8	Zone 8	1,385,899	7.8	0.5	0.5	3.6	0.7	2.0	0.5	0.3
Sum/Average			3,482,328	78	1	10	7	5	1	2	

**ZONE MODEL FOR LONG-TERM FORECAST FOR
M&I WATER DEMAND AND RAW WATER CONSUMPTION**

PREPARED FOR THE PANAMA CANAL AUTHORITY

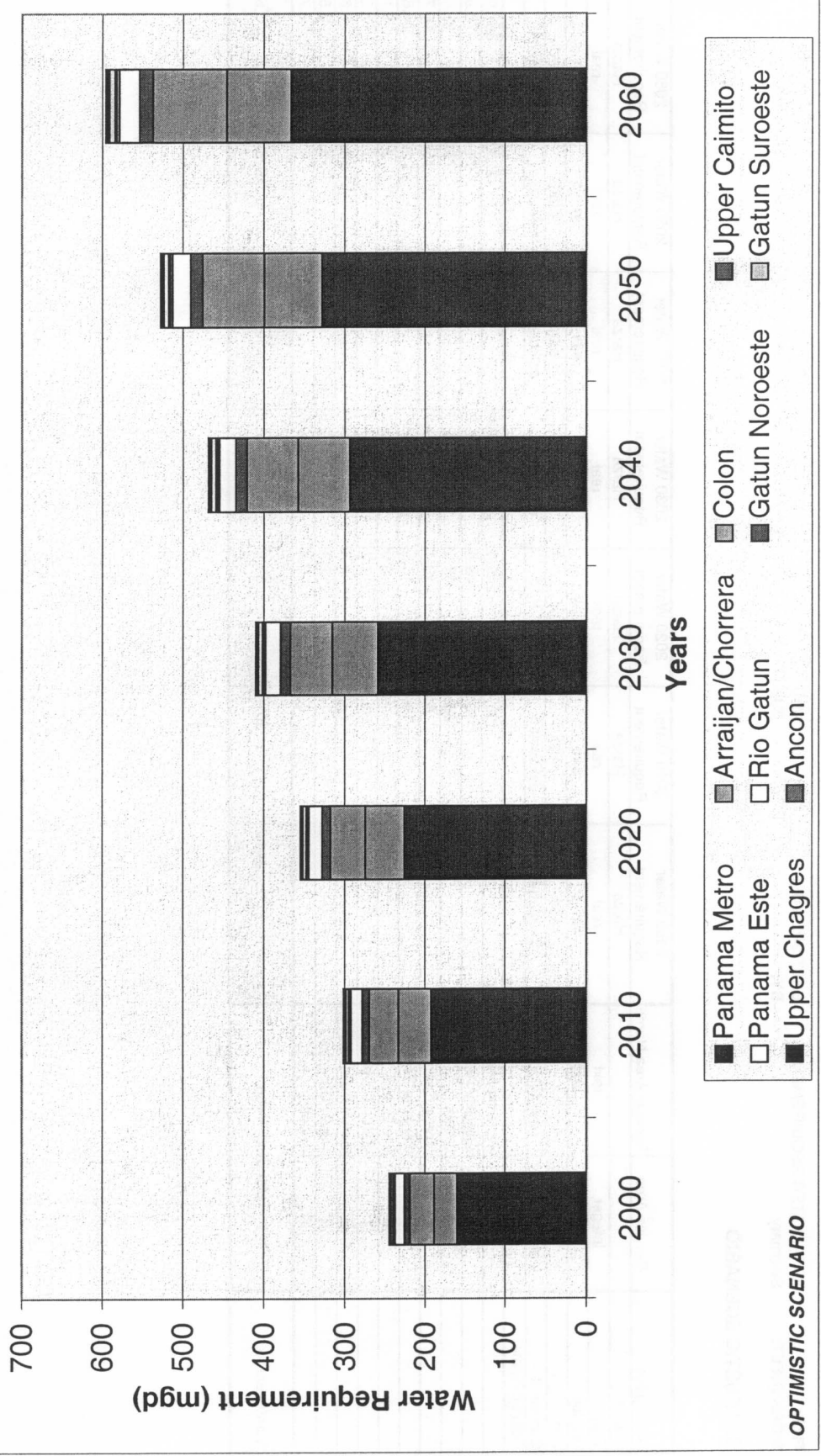
HARZA ENGINEERING COMPANY - CHICAGO

FILE: AREA WATER REQUIREMENTS LAST UPDATE: 06/02/01
WORKSHEET: Summary BY: TJJ

OPTIMISTIC SCENARIO

Description	Service Area	Service Area Name	2000 Water Requirement		2010 Water Requirement		2020 Water Requirement		2030 Water Requirement		2040 Water Requirement		2050 Water Requirement		2060 Water Requirement	
			Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real	Harza	real
Type	integer	text	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#	###.#
Unit	input (locked)	input (locked)	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	mgd	
Comment	input (locked)	input (locked)	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	calculated	
Column Name																
1		Panama Metro	160.1	192.4	225.4	258.6	294.0	328.5	367.0							
2		Arraijan/Chorrera	28.4	40.5	48.8	56.8	64.2	71.4	78.9							
3		Colon	30.1	36.4	43.5	52.2	62.9	75.8	92.0							
4		Upper Caimito	6.7	8.8	10.4	12.0	13.5	15.0	16.7							
5		Panama Este	12.0	14.4	16.6	18.6	20.7	22.7	24.8							
6		Rio Gatun	1.3	1.8	2.0	2.3	2.6	2.9	3.1							
7		Gatun Noroeste	0.9	1.1	1.3	1.4	1.7	1.9	2.2							
8		Gatun Suroeste	2.9	3.7	4.3	4.9	5.4	6.0	6.6							
9		Upper Chagres	1.5	1.9	2.3	2.6	2.9	3.2	3.5							
10		Ancon	0.3	0.4	0.4	0.5	0.6	0.6	0.7							
Sum/Average		Total Study Area	244.2	301.4	354.9	410.0	468.5	528.0	595.5							

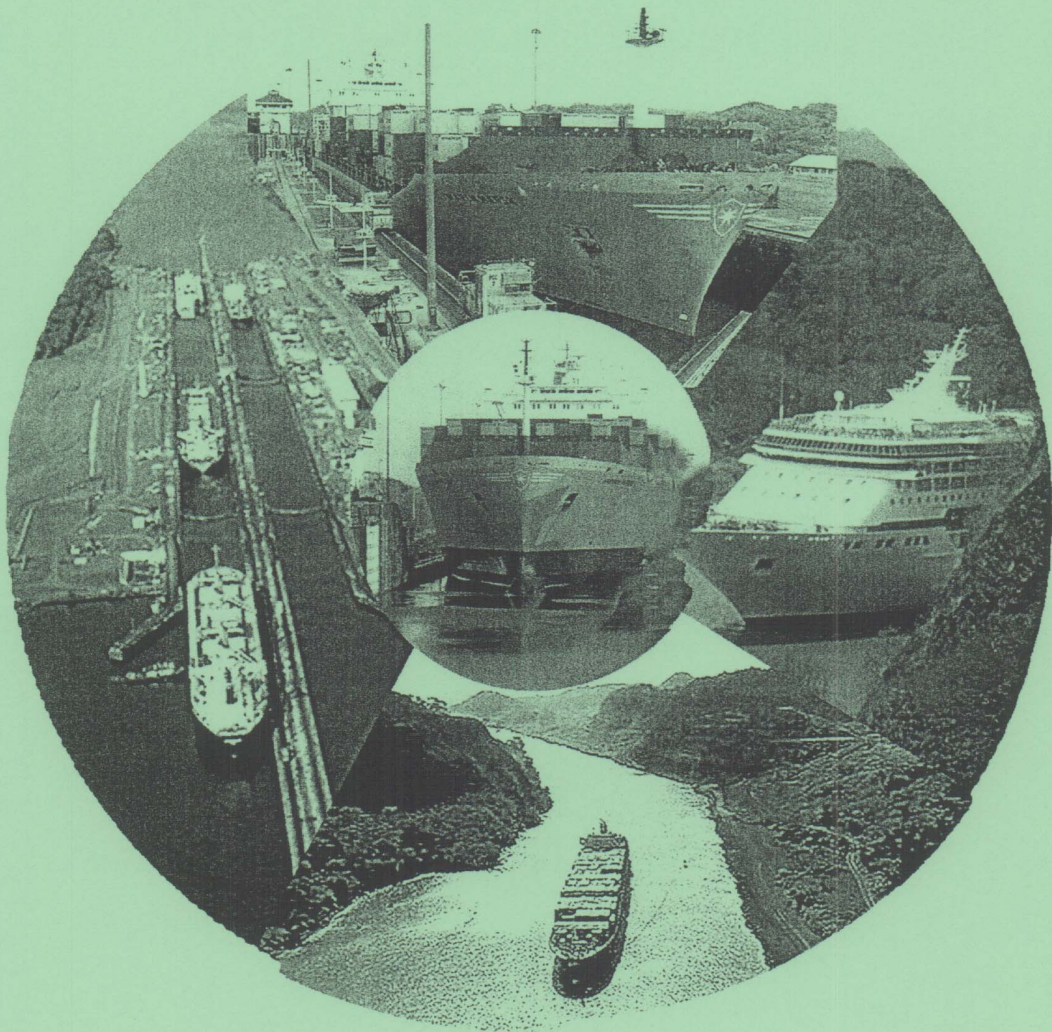
TOTAL WATER REQUIREMENT PANAMA CANAL WATERSHED SERVICE AREA



OPTIMISTIC SCENARIO

Appendix H

GIS Application



APPENDIX H

GIS APPLICATION

H.1 Introduction

A Geographic Information System (GIS) interface was created to compliment the Water Demand Forecast Model presented in Appendix G and data described in the Main Report. This interface can display forecast data, summary information, and other related parameters that are included in the model. Data is presented against the corresponding location of the Study Area to which it is relevant giving the user a sense of the spatial distribution of the data.

The following data, which is described in the main report, can be presented through the GIS interface:

- Forecast populations for the years 2000 to 2060 for each Population Zone
- Forecast levels of agricultural activity for the years 2000 to 2060 for each Economic Zone
- Forecast levels of 'wet' industrial activity for the years 2000 to 2060 for each Economic Zone
- Forecast levels of manufacturing activity for the years 2000 to 2060 for each Economic Zone
- Forecast levels of port and warehouse activities for the years 2000 to 2060 for each Economic Zone
- Forecast levels of utility activity for the years 2000 to 2060 for each Economic Zone
- Forecast levels of fabrication and construction activities for the years 2000 to 2060 for each Economic Zone
- Forecast levels of retail and office activities for the years 2000 to 2060 for each Economic Zone
- Forecast student populations for the years 2000 to 2060 for each Economic Zone
- Forecast hospital use for the years 2000 to 2060 for each Economic Zone
- Forecast levels of tourism for the years 2000 to 2060 for each Economic Zone
- Forecast total water requirement for the years 2000 to 2060 for each Water Service Area
- Forecast total normal demand for the years 2000 to 2060 for each Water Service Area
- Estimated excessive use for the years 2000 to 2060 for each Water Service Area
- Estimated physical leakage for the years 2000 to 2060 for each Water Service Area
- Estimated production losses for the years 2000 to 2060 for each Water Service Area
- Forecast non-centralized normal demand for the years 2000 to 2060 for each Water Service Area

- Forecast non-centralized normal residential demand for the years 2000 to 2060 for each Water Service Area
- Forecast non-centralized normal non-residential demand for the years 2000 to 2060 for each Water Service Area
- Forecast centralized normal demand for the years 2000 to 2060 for each Water Service Area
- Forecast centralized normal residential demand for the years 2000 to 2060 for each Water Service Area
- Forecast centralized normal non-residential demand for the years 2000 to 2060 for each Water Service Area
- Forecast total actual water use for the years 2000 to 2060 for each Water Service Area
- Forecast unsatisfied water demand for the years 2000 to 2060 for each Water Service Area
- Percent of residential area with centralized system for the years 2000 to 2060 for each Water Service Area
- Percent of non-residential area with centralized system for the years 2000 to 2060 for each Water Service Area
- Non-centralized system level of service factors for the years 2000 to 2060 for each Water Service Area
- Centralized system level of service factors for the years 2000 to 2060 for each Water Service Area
- Percent of centralized residential connections metered for the years 2000 to 2060 for each Water Service Area
- Excessive use factors for the years 2000 to 2060 for each Water Service Area
- Centralized system leakage factor for the years 2000 to 2060 for each Water Service Area
- Forecast centralized system production losses for the years 2000 to 2060 for each Water Service Area
- Forecast adjusted water requirement for the years 2000 to 2060 for each Water Service Area
- Conservation factors for the years 2000 to 2060 for each Water Service Area
- Conservation adjustment for the years 2000 to 2060 for each Water Service Area
- Price elasticity factors for the years 2000 to 2060 for each Water Service Area
- Percent increase in tariff for the years 2000 to 2060 for each Water Service Area
- Elasticity adjustment for the years 2000 to 2060 for each Water Service Area

H.2 Installation

To install the ArcView display application, the ArcView project file Analysis_p.apr and the folder Vector (with all the files contained in it) must be installed in a common directory on the computer to be used. The Excel files that make up the Demand Forecast Model and the GISLink.xls file do not need to be in this same directory. Rather it is recommended that separate copies of the demand forecast model files and the corresponding GISLink.xls file be created and stored in their own folder each time a new

demand scenario is analyzed. The ArcView display application can then be used to view results from different demand scenario files using procedures described below.

H.3 Startup

The following steps are required to start the GIS display application for the water demand forecast model.

Open ArcView and choose *Open Project...*

Browse to the location of Analysis_p.apr and open the file.

When prompted, browse for the file GISLink.xls to connect via Open DataBase Connectivity (ODBC) and select it.

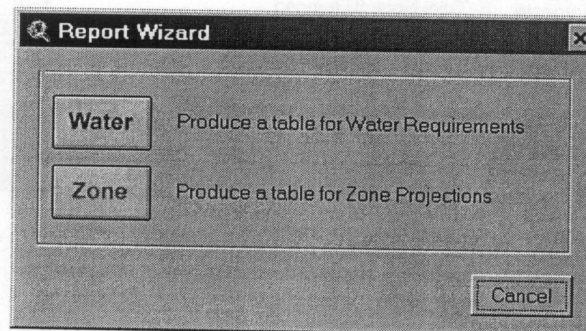
The data displayed through the GIS interface is from the Excel file GISLink.xls selected in the step above. Therefore, data from any version of the Water Demand Forecast Model can be displayed by selecting the corresponding file at this time. As described in Appendix G, it is recommended that a separate folder (or directory) be created each time a new demand scenario is analyzed using the model. Each folder created will contain the four Excel files that make up the demand forecast model and the GISLink.xls file that provides connectivity with the ArcView project. Using this approach, a user can change the demand scenario results being viewed in ArcView simply by selecting the GISLink.xls file in the appropriate demand scenario folder.

H.4 Analysis Tool

The following steps are required to make use of the GIS display application.

From either a view or the project document window, select the 4-color button (■) to invoke the analysis tool.

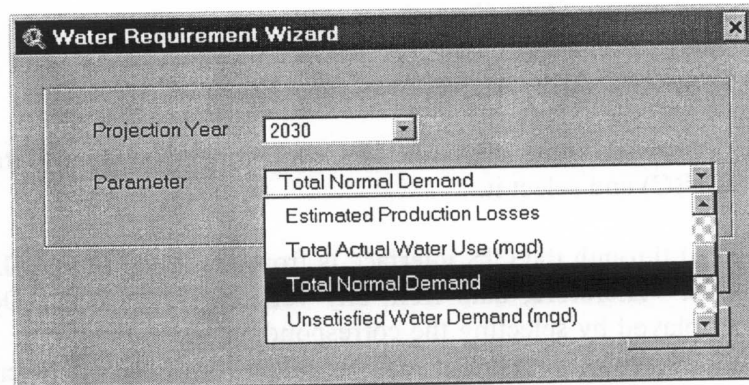
Choose to either Water or Zone to view the corresponding map and data:



Long-Term Forecast for M&I Water Demand

When Water is selected, a map of the study area is shown divided into Water Service Areas. When Zone is selected, the study area is displayed divided into Population and Economic Activity Zones.

Data shown in the areas are controlled by the Wizard window. From the dropdown boxes, choose a year and a parameter to display:



Cancel closes the choice window

Click OK to view the selected data on the map and in a tabular report:

WSA	Parameter	mgd
Panama Metro	Total Normal Demand	164.38
Arraijan/Chorrera	Total Normal Demand	33.83
Colon	Total Normal Demand	28.55
Upper Caimito	Total Normal Demand	5.91
Panama Este	Total Normal Demand	11.49
Rio Gatun	Total Normal Demand	1.07
Gatun Noroeste	Total Normal Demand	0.73
Gatun Suroeste	Total Normal Demand	2.28
Upper Chagres	Total Normal Demand	1.49
Ancon	Total Normal Demand	0.32

Print prompts the user to choose a printer and print the report.

Exit closes the report window.

The map can be modified or printed as any ArcView view would be.

H.5 Other Tools



Clears all labels from the current view.

H.6 Modifying Data

Any changes made to data through ArcView will NOT be reflected in the corresponding Water Demand Forecast Model. To modify the model and display the new data, the complete model must first be run. Once the changes in all four files of the model are completed and saved, open GISLink.xls located in the same directory as the modified model. Update, save, and close GISLink.xls. This version of GISLink.xls can then be selected when opening the GIS interface as described above in Start Up.

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