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PRIVATIZATION OF WATER IN GOVERNMENT OWNED HOUSING: A FORECASTING MODEL

by

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December, 1997

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13. ABSTRACT (maximum 200 words)

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PRIVATIZATION OF WATER IN GOVERNMENT OWNED HOUSING: A FORECASTING MODEL

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ABSTRACT

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I. INTRODUCTION

A. PROBLEM BACKGROUND

The Office of the Chief of Naval Operations Instruction (OPNAVINST) 5090.1B requires that the Commanding Officers of shore activities "review the various uses of water at their activities to ensure that all economically practical water conservation measures are taken." Executive Order 12902, "Water and Water Efficiency in Federal Facilities," further directs agencies to identify conservation opportunities and install cost-effective conservation measures. Additionally, the Federal Water Policy Act of 1992 (EPAct) established national water efficiency standards for plumbing fixtures and equipment. The Federal Water Management Program (FEMP) and the Department of the Navy have a defined water conservation strategy to reduce costs and usage. Specifically, three major program goals are to:

- Ensure that water at any activity is being used appropriately and efficiently, to minimize water waste, and to identify a yearly target reduction volume.
- Ensure the Federal Water Management Program includes conservation education, awareness and support.
- Implement, to the maximum extent possible, the Water Policy Act of 1992 which requires Federal agencies to identify and implement by 2005, all life cycle cost-effective water conservation measures with a payback period of less than 10 years(Federal Water Management Program (FEMP) "Focus" 1997, p. 1).

In view of these goals, the Navy must aggressively look at all water users.¹ Some users that could provide significant water savings are the residents of Government Owned Housing (GOH).

In the South Western Division of the Naval Facilities Engineering Command, (all of the West Coast, including San Diego and Monterey), the Navy manages approximately 12,000 GOH units (Naval Facilities Engineering

¹A "user" is defined as any organization or individual that uses water.

Command, Southwest Division, 1997, p. 1). Because the Navy pays all waterrelated bills, there are generally no individual monitoring devices or programs to provide incentives for residents of these housing areas to reduce water consumption.

Because there are not any individual monitoring devices and no way to pinpoint which, if any, resident is wasting water, residents of GOH have no incentives to reduce overall water consumption and can, essentially, use as much water as they desire.² In private sector housing (PSH), residents can also use as much water as they desire. However, there is an incentive for these individuals to reduce their overall water consumption. Since PSH residents must pay for all water consumed, given that as consumption increases costs increase, most will employ a water reduction program to reduce overall water costs to a level that they can afford.

This thesis examines the potential savings that could be achieved by creating incentives for residents of GOH to reduce overall water consumption. It will focus on potential water savings that could be achieved by paying residents of GOH a forecasted amount (based on PSH consumption) to pay water bills directly to the water provider. Once residents of GOH are given a fixed dollar amount for water usage, they will have essentially one of two options:

• Pay additional costs (out of pocket) for going over the predetermined amount.

• Reduce overall water consumption to either break-even or gain monetarily from benefits of reduction.

Although residents of GOH forfeit all housing allowances once they move in, a Water Allowance (WA) could be generated from a forecasting model to create an incentive to reduce overall water consumption. The forecasted allowance would be based on the average consumption used by local PSH residents. The

²Navy water conservation programs do exist for GOH residents, however these programs are in the form of "water conservation awareness" vice water conservation compliance. Additionally, often these programs are only administered by posting bulletins and passing information in the local housing flyers. Only 1 water meter is installed for the entire 877 units at the LaMesa Village Housing area Monterey, CA. There is no way to determine who is complying and who is not complying with the overall water conservation program.

forecasting model examines the water consumption behavior of PSH residents and then compares it to the consumption pattern of GOH residents.

Specifically, the model addresses consumption patterns of Naval Postgraduate School (NPS) GOH residents and PSH residents in the same geographical area- Monterey, California. The thesis provides steps to implement similar models in other Navy housing areas.

B. SPECIFIC FACTORS WITH RESPECT TO WATER USAGE

Though the primary scope of this study focuses on usage, certain cost factors that complicate implementation of an incentive plan must be discussed. These include the following factors:

1. Multiple Water Rate Structures

California-American Water Company, Monterey Division (CAL-AM) charges multiple rates for its various residential customers depending on geographical location. There are three residential rates that CAL-AM charges its customers, based on the type of service that is provided, to the Monterey Peninsula area. NPS is charged under one of these rates, while a majority of PSH residents (in the Monterey area) are charged under the other two rates. The three rate schedules are summarized below:

2. Special Water Schedule for La Mesa Housing

La Mesa housing complex is charged a negotiated contract price for water usage. This fee is a combination of meter rates and usage rates. The monthly charge for service under this contract is the sum of meter charges and total water consumed (Schedule No. Mo-1 1997, p.1):

- The meter charge is a flat monthly fee per meter
- There is a flat fee per 100 cubic feet³ of water delivered. It is charged at the rate of \$2.3805 per 100 cubic feet per meter, per month.

3. Apartments and Multi-Family Master Metered Category

This schedule includes water services supplied to multifamily accommodations through one master meter where all the accommodations are not

³100 cubic feet of water is equal to 748.05 gallons of water. Data that is provided by CAL-AM is usually measured in acre-feet. (1 Acre foot=325,872 gallons).

separately sub-metered. Water charges under this schedule are broken down as follows:

- For every 100 cubic feet of water delivered the charged is \$1.7854 per meter, per month.
- In 1st elevation zone⁴, for every 100 cubic feet of water delivered the charged is \$1.8953 per meter, per month.
- In 2nd elevation zone, for every 100 cubic feet of water delivered the charged is \$2.09525 per meter, per month.

4. Residential and Program for Alternative Rates (PAR) Service

Includes water services provided to single-family dwellings and to flats and apartments separately metered by CAL-AM. Charges include:

- For the first 800 Cubic feet of water delivered, the charge per 100 cubic feet of water is \$2.6201, per meter, per month.
- For the next 800 Cubic feet of water delivered, the charge per 100 cubic feet of water is charged \$3.2152, per meter, per month.
- For over 1600 Cubic feet of water delivered, the charge per 100 cubic feet of water is \$5.5957, per meter, per month

In summary, water rates differ somewhat between GOH and PSH. These differences will become important when conducting a cost benefit analysis of creating an incentive system for GOH occupants. Assumptions about future rate schedules must be speculated.

C. THESIS OBJECTIVES AND METHODOLOGY

The Navy goal of ensuring that all economically practical water conservation measures are taken requires adherence to national and local water conservation measures and incentives to reduce water consumption. In today's environment of a declining Defense Budget, it is critical that we spend every dollar wisely. This thesis proposes to shift some of the responsibility of conserving water from the Department of the Navy to the individual service member. Through the adoption of the proposed initiative the Department of the Navy could achieve

⁴Elevation zone is the level above sea level. The 1st zone is 200 feet above sea level. It requires one pumping station. The 2nd zone is 400-600 feet above sea level. It requires two pumping stations.

significant reductions in water related costs. This thesis will attempt to determine if any savings can be achieved by privatizing water utilities in GOH.

The first task was to sample PSH water consumption within the same geographical area to determine water consumption rates. The second task was to determine the water consumption rates for GOH. The third task was to analyze the data and draw some conclusions about historical usage between GOH and PSH. Data were drawn from actual GOH usage as well as data provided by CAL-AM for PSH. The data items were chosen to enable computation of predicted water usage. The fourth task was to develop a forecasting model based on statistical information. The model was developed to represent an accurate forecast of water usage. The fifth and final task was to analyze the forecasted water usage for PSH and if representative, then project any savings that could be generated by creating an incentive system for GOH residents.

D. RESEARCH QUESTIONS

Can the Department of the Navy generate any significant water and monetary savings by creating an incentive system for GOH residents? If so, what are the predictor variables that should be used and how should they be selected? What would be the cost of implementing monitoring programs and would such programs outweigh the potential savings generated?

E. GENERAL COMPLICATING FACTORS

Determination of water consumption patterns for individual GOH residents, as well as PSH residents, and forecasting a baseline usage rate for both are complicated due to a number of general factors. A discussion of these factors follows.

1. Individual GOH Units Are Not Metered

NPS has approximately 877 GOH units of various sizes.⁵ There is a single master meter for all water consumed by these units. Therefore, it is impossible to precisely determine water consumption by each individual unit.

2. GOH Units and Lots Are Not the Same Size

NPS manages various units including single family, duplex, triplex, apartment, and townhouse dwellings. Because of this diversity in unit size and lot size, each home will consume different amounts of water.

⁵NPS GOH units vary in size from 811 square Feet to 1622 square feet.

3. Numbers of Occupants Vary in Individual GOH Units

Assignment of GOH is not dependent on size of individual families.⁶ Consequently, the number of occupants in each household varies. It is intuitive to expect smaller families to consume less water. Also a smaller family will have a smaller lot therefore less yard to water.

4. Historical Data was not available before 1994 for PSH

It is difficult to determine monthly consumption of water for PSH due to unavailability of data before 1994. Vendor records were not available before 1994 for the city of Monterey.⁷ This complicates the implementation of an accurate forecasting model for PSH due to comparison of only three years of data vice ten for GOH. To overcome this problem, estimates were based on three years of historical records. The data therefore are not as accurate as the GOH model but still can be used for comparison purposes.

5. There are Large Variations in PSH Sizes

In developing an accurate forecasting model, the average size PSH and lot must be determined in order to allow comparison to GOH. The Monterey Peninsula governmental agencies do not collect this statistical data. Information must be gathered from local Realtors who have historical sales records. In order to generate the average size of PSH, a representative sample of home sizes sold in the local area was computed.

6. GOH Lots and PSH Lots are not the same size nor do they have the same type of vegetation.

The difference in lot sizes and vegetation among GOH units is similar to the differences between GOH units and PSH units. The differences are not only in size of units, but also include type of construction, number of residents and location the type of vegetation. It is not feasible to accurately determine the size of lots, water efficiency, and number of occupants of each PSH unit in the local area. Assumptions and estimates from available data were used in determining a forecasting model.

⁶To be assigned GOH, the occupant must be a member of the armed forces and married, or if an International Student just be married.

⁷Vendor in this situation refers to California America Water Company Monterey District (CAL-AM) the provider of water to La Mesa Housing Complex.

F. SCOPE

This study used water consumption data from the Naval Postgraduate School GOH and surrounding community to develop a forecasting model. This thesis also examined the necessary steps to implement the model in other Navy housing areas.

The main focus of this research was be to develop a forecasting model based on statistical analysis of the historical water usage data in both GOH and PSH for the past ten years.

It specifically investigated those variables that were required in the model to provide a realistic forecast. The thesis does not analyze the water usage rates or cost for any area other than NPS La Mesa Housing area. Additionally, it was beyond the scope of this thesis to determine exact water consumption of individual housing units. The intent of the thesis is to illustrate the inefficiencies of GOH residents water usage.

A summarization of the findings includes recommendations for potential solutions that could be implemented.

G. ASSUMPTIONS

Since it was not practical, given the scope and time limit of this thesis, to measure the efficiency of each housing unit in the sample area, it is assumed that on aggregate, units are alike. Comparison of water usage data is based on the premise that the aggregate home and lot in the PSH market is of like construction and quality to GOH. It was also assumed that the aggregate household size in PSH is 2.0 persons per unit (Census data for 1990) and for GOH there are 4.08 persons per unit (La Mesa Housing data). It also assumed that all water used for common areas and all day workers, such as PWC employees, was charged entirely to GOH residents. Additionally, only residential water usage amounts were used. All other users of water, including the La Mesa Village School and La Mesa Village Store were factored out. These amounts were factored out based on a historical average daily usage. The thesis only addresses average water consumption rates. It is not feasible to generate accurate individual usage rates for GOH because individual units are not metered. Additionally, determination of exact individual water consumption patterns in PSH would not be practical given the time limitations of this thesis.

H. RESEARCH SOURCES

Research for this thesis was conducted using primarily archival research at the Naval Postgraduate School and CAL-AM and investigative research at the La Mesa housing complex.

Actual water usage for LMV was provided by NPS Public Works Center (PWC) in the form of NAVCOMPT Form 2035 Summary of Accounting Data reports and CAL-AM monthly billing reports. CAL-AM reports are submitted for archiving to their Headquarters in San Diego, CA. The CAL-AM reports provide specific water usage each month for La Mesa Housing area and bi-monthly data for Monterey City. CAL-AM provided PSH data with a breakdown of water usage by city, number of customers, consumption per month, consumption per day per account and type of customer.⁸ Other data used for the cost-benefits analysis was obtained through personal interviews with PWC engineers and PWC housing staff.

I. ORGANIZATION OF THE STUDY

The thesis is divided into five chapters including the introduction. Chapter II provides the water consumption review of GOH and PSH based on archival research. Chapter III provides the model selection and predictor variables used to compare and develop a forecast of future water consumption to generate an incentive system. Chapter IV presents the findings and analysis from this study. Chapter V provides a brief summary, conclusions and lessons learned from this thesis.

⁸Type of customer refers to single family residents and multiple family dwellings with individual meters. Both of these categories fall under CAL-AM Residential and Program for Alternative Schedules.

II. ARCHIVAL DATA REVIEW

A. BACKGROUND

1. La Mesa Village

The Navy manages 877 GOH units in the La Mesa Village Housing (LMV) area. Normally, all units are reserved for the use of students and active duty officers assigned to NPS.⁹ Historically, occupancy rates at LMV have varied from 68% to 86% per month with the average occupancy rate at 76.49% per month. The key factors that affect overall occupancy rates are size of the reporting class and number of unit out or service for upgrades and maintenance. Figure 2.1 illustrates the occupancy rates at LMV (Naval Postgraduate School, 1997, p. 1).



Figure 2.1. Percent Occupied

2. Requirements of Occupancy at LMV

Upon accepting assignment to GOH, a service member agrees to forfeit all housing allowance, in return, the member is assigned housing at no cost. The

⁹ NPS also manages the Presidio of Monterey Annex housing complex. This area is reserved for eligible enlisted member, Defense Language Institute students, and NPS students, including International students, who could not be assigned in La Mesa.

Navy pays for all utilities, including water usage, and all related maintenance during occupancy. These benefits are funded under the Family Housing, Navy and Marine Corps (FH, N&MC) appropriation. The FH, N&MC appropriation is composed of two categories, Construction and Operations & Maintenance (O&MN). The O&MN part of the appropriation provides funding for the cost of housing management, appliances, services, leasing, repairs and utilities (Autrey, 1996, p. 12).

The amount of water consumed will generally differ from each household depending on the size of the unit, size of the lot associated with the unit, and the number of occupants per unit. Housing at LMV is assigned based on a person's rank and number of dependents. Field Grade Officers¹⁰ and service members with large families received larger quarters with more bedrooms, more overall square feet, and usually a larger lot size. The exact demographic make up of LMV is beyond the scope of this thesis, however, to be able to compare GOH data to PSH data, all data were converted to per person per day consumption. Therefore, the average occupancy rate and the average number of tenants per day were computed from historical data. The average number of tenants per day ranged from a high of 3026 to a low of 2262 with the average at 2672. The average number of tenants along with the occupancy rate of 76.49 % was used to find the average number of persons using water each day for the LMV. Figure 2.2 illustrates the average number of tenants for LMV(Naval Postgraduate School, 1997, p. 1).



Figure 2.2. Average Tenants Per Year

¹⁰Field Grade Officer generally refers to O-4s and O-5s.

3. Water Consumption at LMV

CAL-AM is the sole provider of water at LMV. A single master meter for the water delivered is used to assess the amount of water consumed by the LMV residents. As noted in chapter one, CAL-AM charges a negotiated price for the water usage. CAL-AM sends a summary and detailed water bill to the NPS Comptroller's Officer for payment. This bill is then forwarded to the LMV housing office and PWC Department where it is reviewed and payment authorized.

4. Navy Water Conservation Programs

Naval Facilities Engineering Command (NAVFAC), as the facilities expert, issues all direction and guidance related to water conservation matters (Naval Facilities Engineering Command, 1988. p. 1). NPS has established an Energy/Resource Conservation Committee to educate personnel, identify energy and resource conservation projects, assess the progress toward conservation goals and to report on the recommendations of action to conserve resources. The committee is primarily composed of the Commanding Officer, the Public Works Officer, and Energy/Resource Conservation Coordinator, and PWC civilian In supporting the committee's goals the Energy/Resource engineers. Conservation Committee conducts an annual Energy/Resource Conservation Week. This is the only program that targets LMV residents. During this week, pamphlets, posters and flyers are placed at various locations in the command. Because the information is not sent directly to every individual, the assumption is that not all residents receive or review all the information. Also, since there is only one water meter for the entire LMV complex, it is impossible to provide feedback to those residents who are complying with water conservation measures.

According to the Congressional Budget Office, utility costs drop by 20% when residents become responsible for their own usage(Autrey, 1996, p. 14). This thesis makes the assumption that LMV residents, as a whole, are not aware of water usage because they do not pay any of the costs.

B. WATER CONSUMPTION REVIEW OF LMV

1. Introduction

This section examines the consumption rate of water for LMV residents and allows a comparison to PSH residents for Monterey, California. Specifically, consumption is compared on a per person per day basis. Since it was not possible to determine the exact usage of individual residents, an average consumption rate per day was used. Also, since the data consisted of chronologically arranged observations of water consumption, it was consistent with time series data. The underlying assumption of time series is that there exists a pattern, which is a function of time. This data can be broken down or decomposed into subpatterns that reflect the different groups of forces that influence the value of the series (Liao, 1997, pp.1-2):

- Long Term Trend: The trend represents the long-term behavior of the data, and can be increasing, decreasing or unchanged.
- Seasonal Variation: A time series is said to exhibit a seasonal pattern if the value of the variable changes according to the seasonal regularity. It reflects periodic fluctuations of constant length in time.
- Cyclical Variation: A behavior with no distinct upward or downward long-term trend with time. The distinction between seasonality and cyclicality is that seasonality repeats itself at fixed intervals such as a year or month, while cyclical factors have a longer duration that varies from cycle to cycle.
- Random Deviation: There is no discernible pattern whatsoever to the time series. It wanders about some average value in a random way. This element of error or randomness is always present in a typical time series.

2. Actual Water Consumption for LMV

Figure 2.3 shows the actual water consumption per person assigned for LMV from 1987 to 1997. The long-term trend suggests that water consumption is fairly consistent from one year to the next with maximum consumption remaining below 210 gallons of water per person per day. There seems to be a slight downward trend of overall water consumption since 1987. This perhaps can be contributed to the drought of 1989 through 1992 and to education of residents about water conservation. However, since individual units are not monitored for consumption, it is hard to determine the actual cause. By looking at the data in Figure 2.3, a seasonal variation is noted with the highest consumption occurring in the month of August and the lowest consumption occurring in the month of February. The values differ from year to year, but the differences can be attributed to random variation of the data. The data do not suggest that there are any cyclical variations.



Figure 2.3 La Mesa Water Consumption Per Person Per Day

C. WATER CONSUMPTION REVIEW OF PSH

1. Introduction

As stated in the Navy's Energy Management Plan (NEMP), "Restrictions shall not be levied on Navy family housing, which would reduce quality of life below that normally available to families in the civilian community" (Autrey, 1994, p. 18). The NEMP also includes water conservation methods. Investigation of PSH water consumption was conducted to esure GOH complied with NEMP guidelines.

In order to develop a forecasting model to apply to GOH residents, consumption data for the local Monterey, California area were analyzed. Since La Mesa Village is located within the city of Monterey; Monterey City was chosen to provide PSH data. CAL-AM provided the number of customers and amount of water consumption per account.

2. Actual Water Consumption for Monterey City

A review of Monterey City's water consumption was limited to three years; 1994 though 1996. The data were also presented in a bi-monthly format. This amount of data was adequate to provide a comparison baseline for LMV. The data suggest that the residents of Monterey City follow very closely the long term trend noted in LMV data. However, while the long-term trend for LMV was slightly decreasing, the long-term trend for Monterey City suggests a slightly increasing trend. Figure 2.4 illustrates the water consumption per person per day for Monterey City.



Figure 2.4 Monterey City Water Consumption Per Person Per Day

By examining the data in Figure 2.4, a definite seasonal variation is noted with the time series data with the highest consumption occurring in the months of July and August and the lowest consumption occurring in the months of March and April. The seasonal patterns observed occur at approximately the same periods during the year. The values differ from year to year, but the differences can be attributed to random variation of the data. The data do not suggest that there are any cyclical variations.

D. LMV VERSUS PSH WATER CONSUMPTION

1. Introduction

This section provides a comparison of water usage per person per day between LMV and PSH. All data were provided by CAL-AM water reports and NPS Public Works Center NAVCOMPT Form 2035 Summary of Accounting Data reports. The number of LMV residents was computed as discussed in Chapter 1. The number of residents per water account was computed by using the 1990 census data for Monterey City.

2. LMV and PSH Water Consumption Comparison

As previously discussed, both LMV and PSH time series data are seasonal in nature and show no cyclical variation. Long-term trends that were identified in the water consumption are probably correlated to the same variable. Additionally, random deviation in the data cannot be identified with a common variable. Figure 2.5 shows the comparison between LMV and PSH water consumption. All the data presented are per person per day to allow ease of comparison. LMV data show more random deviation that PSH. It is also apparent, from Figure 2.5 that LMV residents, on the average, consume more water than their private sector counterparts.



Figure 2.5 LMV Versus Monterey City Water Consumption

Based on the same three year average, LMV residents use approximately 23% more water than Monterey City residents use.

E. CONCLUSIONS BASED ON ARCHIVAL DATA REVIEW

Based on the results of the archival data review, it appears that LMV residents do not practice water conservation method to a large degree. There is not an incentive plan to encourage saving water. Additionally, the residents are not individually monitored on the amount of water they use and therefore are not held accountable for overuse. Over the three years analyzed, LMV residents average

approximately 23% more water usage than PSH residents. In some months LMV consumption rates per resident are as much as 1.69 times as much as their civilian counterparts.

The data from this chapter clearly indicate a need for some type of incentive program to reduce water consumption for GOH residents. Although the data analyzed are for LMV family housing, it can be assumed that the same inefficiencies are being demonstrated in other GOH areas.

III. MODEL SELECTION

A. INTRODUCTION

1. Background

The differences between GOH and PSH water consumption rates were shown in Chapter II. Given the Navy's goal of reducing overall water consumption, and identifying and executing by 2005 all shore facilities water conservation projects with a payback period of less than 10 years, creating an incentive program for GOH residents would be useful towards reaching this goal. Although there are several initiatives that may be created to meet this goal, the primary focus of this thesis is to determine the effects of privatizing water providers for GOH. Residents would then become responsible for paying the water provider for all consumption. A Water Allowance (WA), based on PSH consumption, would be provided to GOH residents to offset the expected costs of this utility. By creating and providing a WA, the resident would then become responsible for water consumption management. This chapter shows how the model and variables are selected and used in forecasting water usage.

2. Model Selection

A critical aspect of creating an incentive program for GOH residents is to accurately forecast future water consumption. Generally, forecasting can be classified as either quantitative or qualitative. Quantitative forecasting methods are based on an analysis of historical data. Qualitative methods generally employ managerial judgment, expertise, and opinions to make forecasts. (Taylor, 1996, p. 583). Qualitative forecasting methods generally utilize the judgment of experts to make forecasts in situations where no historical data are available.

There are generally only three types of forecasting techniques available:

a. It-is-Going-To-Be-Just-Like-Now. This method of forecasting is to assume that things will not change. For most short-term decisions, this is the method used. However, as the period of time the forecast extends the more questionable this technique becomes (Liao, 1997, p. 1).

b. Analysis of the Causative Forces at Work. This is the most rational approach to forecasting. The causative forces operating on the variable to be predicted are analyzed and the forecast is based on the underlying relationship and

on any anticipated changes in these forces and their operation. The most important tool in this method is knowledge of the phenomena under study, professional experience and mature judgment. Mathematical techniques are necessary in this method to determine if certain relationships are important enough to be worthy of consideration. Regression analysis is probably the most frequently and extensively used in this category (Liao, 1997, p. 1).

c. Empirical Regularities in Time. The analysis of the past history of relevant data for the detection of observable and reasonably dependable regularities, and the projection of these regularities into the future is a very widely used forecasting technique. Many of the values of these variables change with time. A function, which gives a variable a value over time, is referred to as a times series (Liao, 1997, p. 1).

Figure 3.1 illustrates an overview of forecasting methods (Anderson, Sweeney, and Williams, 1994, p.687). Since the historical data are available, Figure 3.1 only illustrates the quantitative techniques available.



Figure 3.1. Quantitative Forecasting Methods

The first step in determining the appropriate quantitative forecasting model is to determine if time series data are available. Since Chapter II established that data for GOH and PSH water consumption were historical and time series related, then a causal model is not appropriate.

Causal models use regression analysis to show how variables are related. If data on causal factors are available, this method would be used to develop accurate forecasts. Since causal factors are not available, and probably not applicable, time series model will be used for forecasting.

To help explain the pattern or behavior of the data in a time series, it is often helpful to think of time series as consisting of four components. These four components are: trend, cyclical, seasonal, and random or irregular errors. These components combine to provide specific values for the time series. By analyzing the time series plot, the choice of model selection can be determined. A discussion of the various methods follows (Anderson, Sweeney, and Williams, 1994, p. 687).

a. Forecasting Using Smoothing

If time series data are fairly stable and do not exhibit significant trends, cyclical or seasonal effects, then the objective of the forecasting method is to "smooth out" the irregular component of the time series through an averaging process (Anderson, Sweeney, and Williams, 1994, p. 690). This method can be accomplished by using a moving average, a weighted moving average or exponential smoothing. Since the data in Chapter II indicate a trend and significant seasonal effects, these methods are not discussed.

b. Forecasting Using Trend Projection

If the time series data show some up or down movement that appears linear over time, the data are said to have an upward or downward linear long-term trend. Excluding any significant indication of seasonal or cyclical effects, simple linear trend projection can be used to develop a forecast, based on the historical data. Because not all trends are linear over time, more advanced techniques must be used to forecast curvilinear or nonlinear time series data.

Because of the nature of the data being analyzed in this thesis, this method is not applicable. It is assumed that even in the most stable climates, there will be some seasonal variations in water consumption.

c. Forecasting with Trend and Seasonal Components

If a time series is influenced by more than one component previously mentioned, then the components are superimposed on each other. To determine how the individual components affect a time series, the decomposition method must be used. Data used in this thesis show the presence of strong seasonal and trend components. Therefore, this method is used for forecasting future consumption patterns.

B. TIME SERIES ANALYSIS - THE CLASSICAL DECOMPOSITION METHOD OF FORECASTING

1. Model

A time series may be regarded as affected by and showing the influence of four separate but not necessarily separable groups of forces. Although there are several alternative approaches to decomposing a time series, equation (1) shows the *multiplicative time series model*, the most common decomposition model where Y is the variable of interest.(Liao, 1997 p.1) :

$$Y = T \times S \times C \times R \tag{1}$$

From this equation, the trend (T), seasonal variation (S), cyclical variation (C) and random error (R) effects can be isolated to determine the predicted forecast value (Y). It should be noted that cyclical effects are recurrent and do not reflect periodic regularity, therefore, are not susceptible to analysis by the decomposition method unless there is a long history of data (Liao, 1997, p. 3).

Decomposition is best suited for analysis of long-term trends and seasonal fluctuations. The random variation (R) accounts for any random effects in the time series that cannot be explained by the trend and seasonal component process. Random variation, by definition, cannot be analyzed. (Liao, 1997 p. 4). Given the data available for this study, the decomposition method is the most appropriate tool for analysis.

2. Steps to Create a Forecast Using the Decomposition Method

The following discussion provides the steps and procedure used to create forecasted consumption values for GOH and PSH. Microsoft Excel was used to construct the forecast; however, any similar spreadsheet will allow easy computation of data. Additionally, for the purposes of this thesis, the decomposition example used will be data from GOH water consumption. PSH water consumption was decomposed in a similar fashion.

a. Step One

The decomposition method relies on the ratio-to-moving-averages concept for its computation. This method isolates the trend and cyclical factors. The number of terms used for the moving average should equal the length of season. This process will smooth out the data by removing the unusually high and low observations when the values are averaged. In addition, the process will remove periodic variations associated with cyclical periodicity. Therefore, in Equation (2), the moving averages (M) represents: (Liao, 1996, p. 4)

$$M = T \times C \tag{2}$$

Dividing Equation (1) by Equation (2):

$$\frac{Y/M = \underline{T \times S \times C \times R}}{T \times C} = S \times R$$
(3)

Equation (3) is the ratio of the actual observed values-to-moving averages, therefore isolating the seasonal and random components of the time series. The most accurate way of obtaining a moving average is to use the *centered moving average* method.

This method centers the moving average to the middle of the averaged data points. Since the data in this thesis displays a strong 12-month seasonal pattern, it is necessary to compute a *double moving average*. This method alleviates the problem associated with centering moving averages with even numbers of terms. The following formula illustrates the procedure: (Liao, 1997, p.5)

$$M_{6.5} = (Y_1 + Y_2 + ... + Y_{11} + Y_{12})/12$$

$$M_{7.5} = (Y_2 + Y_3 + ... + Y_{12} + Y_{13})/12$$

$$M_7 = (Y_{6.5} + Y_{7.5})/2, \text{ or}$$

$$M_i = (Y_{i-6} + 2(Y_{i-5} + Y_i + Y_{i+5}) + Y_{i+6})/24$$
(4)

This procedure calculates the moving average of two twelve-point averages ($M_{6.5}$ and $M_{7.5}$) and sums them together. The average (M_7) is then computed from the two averages ($M_{6.5}$ and $M_{7.5}$) and placed at i=(2+12)/2=7.¹¹

In other words, the moving average for a series with a 12-period seasonal cycle, is actually a 13-period weighted moving average and is placed at period seven (Liao, 1997, pp. 6-7). Table 3.1 provides an abbreviated illustration on how the centered moving average for GOH water consumption is computed. Note when using a spreadsheet to compute the moving average, Equation (4) can easily be converted as illustrated in the following formula:

Cell D8 = (period 1 value + period 13 value + 2(period 2 + period 3 +..+ period 12))/24.

| Period | Value Gallons | 12-Period | Sum of Adjacent | Centered Moving |
|--------|------------------|---------------------------|-----------------|-----------------|
| F | 00.1(5020.10 | Averages | Averages | Averages |
| 1 | 90.16523949 | - | - | - |
| 2 | 97.71927285 | - | - | - |
| 3 | 89.81216044 | - | - | - |
| 4 | 104.4184832 | - | - | - |
| 5 | 177.9332581 | - | - | - |
| 6 | 176.7439392 | - | - | - |
| | | $M_{6.5} = 144.16$ | | |
| 7 | 195.1783822 | | 291.190332 | 145.595166 |
| | | M _{7.5} = 147.03 | | |
| 8 | 207.3410263 | | 293.497734 | 146.748867 |
| | | $M_{8.5} = 146.47$ | | |
| 9 | | | | |
| | | $M_{9.5} =$ | | |
| Etc | | | | |

 Table 3.1. Computation of Centered Moving Averages

The computations illustrated in Table 3.1 are conducted for the remaining monthly data. Appendices A through D provide the detailed computations for GOH and PSH water data.

b. Step Two

The second phase of the decomposition method is to separate the seasonal variations from the long-term trend and cyclical variations and then isolate the randomness. This is accomplished by dividing the centered moving averages into the raw data of the series, Equation (3). The resulting value isolates the effects of seasonal variations and random errors. To eliminate the randomness from the ratios, some form of averaging (e.g., mean, median, or modal value for the same months) is required. The method used in classical decomposition is an approach called the *modified mean method* (Liao, 1997, pp. 7-9).

c. Step Three

The modified mean method, also called the *medial average method*, computes the mean value for each month after the largest and smallest values have been excluded (Liao, 1997, p. 10). This eliminates the year-to-year fluctuations that are attributed primarily to the random errors. The resulting values represent a reasonable estimate of seasonal influences or *seasonal indexes*. Table 3.2 illustrates the procedure for computing the seasonal index.

| | Table 3.2 Computation of Seasonal Indices | | | | | | | | |] | | |
|-------|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|-----------|
| Month | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | Med Avg | Adj Avg |
| Jan | | 0.88474 | 0.81788 | 0.84195 | 0.89630 | 0.67335 | 0.77628 | 0.75499 | 0.69882 | 0.66390 | 0.777986 | 0.7826588 |
| Feb | | 0.65972 | 0.83148 | 0.81676 | 0.85352 | 0.76734 | 0.76451 | 0.76875 | 0.68991 | 0.64694 | 0.761458 | 0.7660320 |
| Mar | | 0.83889 | 0.81534 | 0.85060 | 0.80320 | 0.77018 | 0.77497 | 0.71123 | 0.70719 | 0.73064 | 0.778870 | 0.7835481 |
| Apr | | 1.02075 | 0.95638 | 0.97954 | 0.89012 | 1.32158 | 0.85831 | 0.86514 | 0.78421 | 0.68588 | 0.909902 | 0.9153673 |
| May | | 0.77751 | 0.89354 | 0.94011 | 0.90904 | 1.06349 | 0.99196 | 0.78135 | 0.86311 | 0.98647 | 0.918457 | 0.9239734 |
| Jun | | 1.14379 | 1.04950 | 1.04641 | 1.06223 | 1.48942 | 0.98548 | 1.10414 | 1.28335 | 1.2139 | 1.114715 | 1.1214097 |
| Jul | 1.34055 | 1.36862 | 1.01716 | 1.01058 | 0.98468 | 1.03808 | 1.17434 | 1.52095 | 1.20376 | | 1.160397 | 1.1673667 |
| Aug | 1.41289 | 1.37580 | 1.10118 | 1.35768 | 1.36007 | 1.20715 | 1.49191 | 1.50042 | 1.44898 | | 1.391091 | 1.3994459 |
| Sep | 1.18275 | 1.34488 | 1.31697 | 1.22216 | 1.30112 | 1.11269 | 1.28613 | 1.51532 | 1.45178 | | 1.286374 | 1.2941001 |
| Oct | 1.14169 | 0.94774 | 1.1433 | 1.16887 | 1.03342 | 1.19615 | 1.18510 | 0.99153 | 1.17089 | | 1.14 | 1.1468465 |
| Nov | 0.83432 | 0.89865 | 0.95130 | 0.90749 | 0.95971 | 0.84995 | 0.99626 | 0.83909 | 1.03223 | | 0.911252 | 0.9167255 |
| Dec | 0.85123 | 0.74663 | 0.87772 | 0.87603 | 0.72967 | 0.76057 | 0.77634 | 0.68398 | 0.71525 | | 0.777853 | 0.7825255 |
| | | | | | | | | | | | 11.92836 | 12 |

Indicates Extreme Values

By rearranging the ratios of actual-to-moving averages by month for all years as shown in Table 3.2, a medial average can be computed. This is done by computing the mean value for each month after the largest and smallest values have been excluded. The number of extreme values to be excluded will depend on the number of observations available (Liao, 1997, pp. 9-10).

Since this thesis analyzed data for a 10-year period, the two highest and two lowest values were removed. Note in Table 3.2, that there are only nine years of full data. This is a result of the moving average computations previously discussed. Additonally, the shaded blocks in Table 3.2 are the extreme values; the two largest and smallest values for each month. The remaining five observations for each month were used to compute the mean. For example, by looking at the actual-to-moving average values for January in Table 3.2, we see that the extreme values occur in 1988, 1991, 1992, and 1996. Removing these ratios, we then summed the remaining ratios, 0.81788 + 0.84195 + 0.77628 + 0.75499 + 0.69882= 3.88992. This is then divided by 5 to obtain the medial value of 0.777986. The remaining months are similarly computed. The sum of the medial averages is 11.92836.

To achieve a more precise seasonal index, an adjustment is made by multiplying each medial average by 1.006 = (12/11.92836). This step adjusts the indices as close to one as possible. If the seasonal pattern remains the same in the future, the adjusted average is used as the seasonal index for the period in question in each cycle, past, current, or future. Using this assumption, seasonal indices can be used to forecast the outcome of a particular month. However, if it is clear that

seasonal patterns are changing then averaged seasonal indices may not be an adequate representation of seasonal variations and then a trend-line must be established. This can be accomplished either by visual curve fitting or by the least square method. In this case, there will be a different seasonal index for each month of the year given a particular month. Forecasting under this condition will be more difficult and requires additional quantitative techniques (Liao, 1997, p. 10).

For the purposes of this thesis, water consumption is assumed to remain constant from year to year. Although it is recognized that there may be periodic increases or decreases in consumption, over the long term, usage will remain consistent based on the users past behavior.

d. Step Four

Once seasonal indices are computed, we can remove the seasonal effects from the time series. Recalling Equation (1), $Y=T \ge C \ge R \ge S$, by dividing the observed value (Y) with the seasonal index (S), the resulting ratio, Y/S is referred to as the *deseasonalized or seasonally adjusted* data (Liao, 1997, p. 11). These values can now be used to determine if a trend exists. The trend line may be linear or nonlinear, depending on the distribution of the deseasonalized data. However, assuming a linear trend exits in the data, then the estimated consumption of water expressed as a function of time can be written as follows, Equation (5):

$$T_t = b_0 + b_1 t \tag{5}$$

In this equation, trend of consumption in period t (T_t) equals the intercept of the trend line (b_0) + the slope of the trend line (b_1) x period t. Simply stated, by conducting regression analysis on the ratio Y/S versus time, the resultant value is the least squared straight line derived from the seasonally adjusted data. Figure 3.2 illustrates the regression output for GOH water consumption.

| Regression | Statistics | - | | | | | |
|----------------------|--------------|-------------------|-----------|----------|----------------|-----------|--|
| Multiple R | 0.397931 | - | | | | | |
| R Square | 0.158349 | | | | | | |
| Adjusted F Square | R 0.151216 | | | | | | |
| Standard Error | 20.40188 | | | | | | |
| Observations | 120 | | | | | | |
| Analysis Variance | | | | | | | |
| | df | SS | MS | F | Significance F | | |
| Regression | 1 | 9240.712 | 9240.712 | 22.20062 | 6.77E-06 | - | |
| Residual | 118 | 49115.93 | 416.2367 | | | | |
| Total | 119 | 58356.64 | | | | | |
| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | |
| Intercept | 120.6466 | 3.748259 | 32.18738 | 1.44E-60 | 113.2241 | 128.0692 | |
| X Variable 1 | -0.25333 | 0.053766 | -4.711753 | 6.72E-06 | -0.3598 | -0.14686 | |

Figure 3.2. GOH Regression Output

Note that in the summary output of Figure 3.2, the intercept is 120.6466 and the X variable is -0.25333. These figures represent the intercept of the trend line and slope of the trend line respectively. Therefore, $T_t = 120.6466-0.25333t$. Since it does not matter what month is chosen as the base period (t), the base period used in this thesis is December 1986. Therefore, December 1986 equals base period 0, January 1987 equals 1, February 1987 equals 2 and so on. Now using only the trend component, we can now forecast future year water consumption. For example, substituting t =109 into Equation (5) yields a projection for January 1996. Using GOH water consumption data:

 $T_{109} = 120.6466 - 0.25333(109) = 93.0336$ (6)

In other words, using Equation (6), the trend projection forecast only, we would expect a GOH resident to consume 93.0336 gallons of water per day in January 1996. However, this projection does not account for the seasonal effects. To gain an accurate forecast, we must adjust the data to reflect seasonal indices.

e. Step Five

To obtain an accurate forecast, we simply include the seasonal effects into our trend forecast. This is accomplished by multiplying the seasonal effect (S) with the trend (T). By multiplying Equation (6) by the seasonal index derived in Table 3.2, the projected water consumption level would be:

 $Y_{Jan 1996} = 0.66390 \times 93.0336 = 61.765$ gallons

To illustrate the predicting ability of the forecasting model, Table 3.3 shows the actual water consumption per person versus the forecasted water consumption for GOH in 1996.

| | | · · · · · · · · · · · · · · · · · · · | | | I |
|---------|----------|---------------------------------------|----------|----------|----------|
| Month | Actual | Forecasted | Error | Percent | Absolute |
| L | | | | Error | Value |
| Jan-96 | 64.9108 | 61.765286 | 3.14551 | 5.0927 | 0.050927 |
| Feb-96 | 64.19535 | 60.023324 | 4.172022 | 6.9507 | 0.069507 |
| Mar-96 | 73.22674 | 67.604013 | 5.622724 | 8.3171 | 0.083171 |
| Apr-96 | 68.89687 | 63.289448 | 5.607424 | 8.8600 | 0.0886 |
| May-96 | 99.02009 | 90.775627 | 8.244464 | 9.0822 | 0.090822 |
| Jun-96 | 120.5022 | 111.3959 | 9.106262 | 8.1747 | 0.081747 |
| Jul-96 | 123.0945 | 110.16088 | 12.93363 | 11.7407 | 0.117407 |
| Aug-96 | 167.6289 | 132.23516 | 35.39377 | 26.7658 | 0.267658 |
| Sep-96 | 135.9354 | 132.12218 | 3.813255 | 2.8862 | 0.028862 |
| Oct-96 | 122.7693 | 106.26309 | 16.50621 | 15.5333 | 0.155333 |
| Nov-96 | 88.84584 | 93.417553 | -4.57171 | -4.8940 | 0.048938 |
| Dec-96 | 54.5693 | 64.549571 | -9.98027 | -15.4610 | 0 154614 |
| Monthly | Average | Differences: | 7.49944 | MAPE: | 0.103132 |

Table 3.3. GOH Actual vs. Forecasted Daily Water Consumption in 1996

The data in Table 3.3 suggest that on average, the forecasting model will over predict the amount of water consumed by a resident by 7.49944 gallons of water per person per day. By calculating a Mean, Absolute, Percent Error (MAPE) closeness-of-fit test, we see from Table 3.3, that the MAPE is .103132 or 10.31%. This tells us that the GOH Water Forecasting Model is accurate within 10.31% for 1996. This is not a significant amount, the purpose for forecasting GOH water usage, instead of using a ten-year average, is to allow consistent cost comparisons between forecasted PSH data and GOH data in Chapter IV. This validates the methodology used. Chapter IV provides the analysis of PSH forecasts.

3. Cyclical Effects on Time Series Data

Although not specifically illustrated in part B, section 2 of this chapter, the cyclical effects on time series data can also be analyzed. This is accomplished by dividing the seasonally adjusted data (Y/S) by the trend (T). The result will identify the cyclical component expressed as a percentage of trend.

Cyclical effects are analogous to the seasonal component, but over a longer period of time. Due the length of time involved, it is often difficult to obtain enough relevant data to estimate the cyclical component using the decomposition method. Another difficulty is that the length of cycles usually varies (Anderson, Sweeney, and Williams, 1994, p. 709). Therefore, using decomposition for analysis of cyclical effects is rarely attempted.

C. CONCLUSIONS

This chapter details the most appropriate model, variables and steps in forecasting future water consumption in GOH. Assuming that historical usage remains constant, there is a need to create an incentive program to encourage savings. Dwindling budget dollars in the Department of the Navy will necessitate the need to consider innovative ideas for reducing overall operating costs. The WA concept will more closely tie the GOH residents' water consumption to the PSH community by allocating a specified dollar amount for water usage. If the GOH resident chooses to consume more, then the difference should be paid "out of pocket." Conversely, being able to retain the difference between the allocated dollar amount and actual payment if consumption is lower would reward the resident.

By conducting an analysis of PSH water consumption, using the method outlined in this chapter, a forecast can be generated for the WA. Using data that are specific to the geographical area of the GOH location, a more precise analysis of the savings can be generated, without penalizing the GOH resident. Chapter IV provides an in depth analysis of savings that could be generated if a WA concept were to be instituted in GOH housing area using PSH consumption data.

IV. ANALYSIS BASED ON PUBLIC SECTOR CONSUMPTION

A. ANALYSIS OF PSH FORECASTED VALUES

1. Introduction

Chapter II demonstrated that La Mesa Village residents consume more water than the average PSH resident. Utilizing the model outlined in Chapter III, this chapter analyzes the forecasted values generated from PSH data and develops a baseline consumption rate per month to be applied to LMV residents under the WA concept. All forecasts in this chapter are based on per person per day consumption.

Additionally, this chapter assumes that if the WA concept was implemented in LMV, the rate schedule would be changed to the standard residential schedules as outlined in Chapter I. All cost-benefit analysis under the WA concept uses the standard CAL-AM Residential and Program for Alternative Rates(PAR) service rates.

2. Analysis of Monterey's Forecasted Water Consumption a. Analysis of the Historical Data

As discussed in Chapter II, there is a definite seasonal effect in the historical data. The highest consumption occurring in the months of July and August and the lowest consumption occurring in the months of March and April. Appendix 3 provides the detailed decomposition of Monterey's water consumption for the past three years using the procedure outlined in Chapter III. Figure 4.1



Figure 4.1. Water Consumption, Monterey City (Y/S vs. T)

shows the seasonally adjusted consumption data (Y/S) plotted against the trend (T). The trend is the least square equation from conducting a regression of the deseasonalized data versus time. By including the seasonal effect into our trend, as illustrated in Figure 4.1, we can see that there are no large deviations. There are small deviations that do not normally occur form year to year and therefore can be treated as random errors.

If we take a closer look a the smooth trend line (T), it is obvious that as time passes the consumption of water is increasing. Explaining this increase is at best difficult, however it is likely that now that the drought of 1989 through 1992 is over, residents are less aware of a water shortages. By using the smooth trend line and adding the seasonal effect back in, we can obtain a forecast of expected future consumption.

b. Analysis of Monterey's Water Forecast

Including the seasonal effect into the trend, as illustrated in Figure 4.2. we obtain a fairly accurate forecast of future behavior.



Figure 4.2 Actual vs. Forecasted Water Consumption, Monterey City

We can see the forecasted values are consistent with historical consumption. Although forecasted consumption is not exact, it is very close, this is a good indication that the historical data is predictive of future consumption patterns. To take a closer look at the data we can compare historical data with forecasted data for 1996. This will give us a precise indication of how well the

| Month | Actual | Forecasted | Error | Percent | Absolute |
|------------|---------|--------------|----------|---------|----------|
| | | | | Error | Value |
| Jan-Feb 96 | 67.585 | 67.280067 | 0.304933 | 0.4532 | 0.004532 |
| Mar-Apr 96 | 68.94 | 68.195558 | 0.744442 | 1.0916 | 0.010916 |
| May-Jun 96 | 90.495 | 89.655312 | 0.839688 | 0.9366 | 0.009366 |
| Jul-Aug 96 | 98.615 | 99.02859 | -0.41359 | -0.418 | 0.004176 |
| Sep-Oct 96 | 93.865 | 90.346239 | 3.518761 | 3.8948 | 0.038948 |
| Nov-Dec 96 | 72.675 | 80.340955 | -7.66595 | -9.542 | 0.095418 |
| Monthly | Average | Differences: | -0.44529 | MAPE: | 0.027226 |

forecasting model predicts usage. Table 4.1 shows the actual and forecasted values for 1996.

Table 4.1 Actual vs. Forecasted Water Consumption, Monterey City (in
gallons per person per day)

The data in Table 4.1 suggest that on average, the forecasting model will under predict the amount of water consumed by a resident by .44529 gallons of water per person per day. Notice that November- December data have the largest difference, this difference is still less than ten percent. By calculating a Mean, Absolute, Percent Error (MAPE) closeness-of-fit test, we see from Table 4.1, that the MAPE is .027226 or 2.72%. This tells us that the PSH Water Forecasting Model is accurate within 2.72% for 1996. This is a very insignificant amount.

3. Summary of PSH Forecast

As noted and shown in the previous sections, all data used to forecast consumption demonstrate similar patterns, including seasonal patterns and trends. Although there were some random errors present, the cause cannot be specifically identified. Using the decomposition method smoothes out these random errors by using the sum of the square regression line as the foundation for the forecast. When seasonal effects were added back into the model, it was demonstrated that the forecasted values in all cases are predictive of future consumption pattern.

The model was used to determine forecast consumption for future years to establish a consumption baseline for PSH. This baseline will be used for the WA concept. By comparing the baseline to the historical consumption rates of LMV resident, the potential savings can be analyzed.

B. ESTABLISHMENT OF BASELINE USAGE RATE

1. Determination of Water Allowance Baseline

By using the forecasting model developed in the previous sections, we can set a baseline water consumption rate for LMV residents. Table 4.2 compares the forecasted values for 1997 between Monterey and LMV.

| Month | Monterey | LMV | Difference | |
|---------|--------------------|--------------------|--------------------|--|
| | (Daily in Gallons) | (Daily in Gallons) | (Daily in Gallons) | |
| Jan-97 | 74.260648 | 59.747048 | -14.51360047 | |
| Feb-97 | 74.260648 | 58.056651 | -16.2039968 | |
| Mar-97 | 67.623722 | 65.382893 | -2.240829533 | |
| Apr-97 | 67.623722 | 61.204374 | -6.41934837 | |
| May-97 | 84.678859 | 87.776786 | 3.097926492 | |
| Jun-97 | 84.678859 | 107.7057 | 23.02683593 | |
| Jul-97 | 97.801724 | 106.50148 | 8.699760605 | |
| Aug-97 | 97.801724 | 127.83029 | 30.0285659 | |
| Sep-97 | 93.172881 | 127.70882 | 34.53594304 | |
| Oct-97 | 93.172881 | 102.70361 | 9.530732331 | |
| Nov-97 | 78.75501 | 90.279602 | 11.5245925 | |
| Dec-97 | 78.75501 | 62.375226 | -16.37978356 | |
| Average | 82.715474 | 88.106041 | 5 390566505 | |

 Table 4.2 Forecasted Water Consumption Monterey City vs LMV(in gallons per person per day)

Notice the differences in water consumption varies according to the season. The largest difference occur in the summer months as expected, based on historical data and the forecasting model.

C. COST-BENEFIT ANALYSIS

1. Cost of Implementing the WA Concept at LMV

Before a water monitoring program can be implement at LMV, first the water meters must be installed for each unit. This thesis assumes all water monitoring will be conduct by the local water company, CAL-AM, which will incur some of the cost for the meter installation.

Based on engineering estimates, the cost to install a single, 3/4 inch 26 gallon per minute water meter would total \$400.00 per installation (Brego, 1997, Interview). This cost includes the material at \$200.00, labor at \$200.00 and includes overhead and profit. CAL-AM would provide the meters at no charge, although they would make up for some cost of the meter and personnel to monitor the meter though the standard rate which includes a meter charge. Total cost of

metering LMV, would be a one-time charge of \$237,200.00. This figure is based on installing meters in the 593 units at LMV. Only 593 meters need to be installed, because NPS Housing is taking 284 units out of service permanently by January 1998. This number of residents will remain approximately the same as historical data has shown in Chapter II, however, the occupancy rate will increase to approximately 99%.

2. Savings Generated from Implementing a WA Program

Using the standard CAL-AM for Residential and Program for Alternative Rates(PAR) service rates and the forecasted baseline consumption rates form the previous sections, the expected total water savings per resident per year would be \$6.97. Total savings based on the historical average number of residents of 2672, would be \$18,635.00 per year under the WA concept. Appendix 8 provide the detailed savings breakdown per day and per month using PSH and LMV forecasts for 1997 and CAL-AM rate schedules from the previous sections.

Since annual water savings generated from switching to a WA concept is \$18,635.00 per year, the payback period for installation and metering boxes is essentially 12.7 years. This does meets the Navy's Goal to identify and implement by 2005, all life cycle cost-effective water conservation measures with a payback period of less than 10 years.

V. SUMMARY AND CONCLUSIONS

A. SUMMARY

Chapter I outlined the Department of the Navy's water strategy, with the goal to identify and implement by 2005, all life cycle cost-effective water conservation measures with a payback period of less than 10 years. As was shown in Chapter II, the annual average water consumption for LMV residents is 1.23 to 1.69 times higher than the PSH residents' consumption. Because the GOH resident does not pay for utilities, there are no real incentives for the GOH resident to reduce overall consumption.

Given a finite amount of resources, PSH residents will generally employ some type of water reduction program. The water consumption data for the city of Monterey presumably reflects this rational behavior. Therefore, it is logical to use the PSH water consumption patterns as a benchmark to evaluate any incentive programs targeted at GOH residents. One recommendation, and the focus of this thesis, was to institute a Water Allowance (WA) based on the local PSH consumption rates. GOH residents would then use the allowance to pay the utility provider directly. Any water consumption above the baseline established for the WA would be paid "out of pocket" by the GOH resident.

B. CONCLUSIONS

This thesis explored the savings that could be generated by instituting a WA at the Naval Postgraduate School's La Mesa Village housing complex. Using past water consumption rates, and then generating a forecasting model to predict future consumption, a comparison was made between LMV and PSH residents. Chapter IV demonstrated that, by instituting a WA based on PSH consumption, the Navy could save approximately \$18,635.00 annually. There is a one-time charge of installing meter boxes and plumbing connections in existing homes. This one time cost of approximately \$237,200.00 could not be recouped within the 10-year timeframe goal. The WA concept would reduce water consumption and overall costs to the Navy, it could be implemented and have a payback period of approximately 12.7 years, This timeframe would allow the initial metering cost to be recouped. Additionally, under the WA concept, residents would become more observant about water usage. Table 5.1 provides an illustration of the average

reductions that could be achieved by implementation of a WA based on 1997 forecasted values per month.

| Current | WA |
|---------------|---------------|
| 88.12 Gallons | 82.72 Gallons |
| Savings | 6.12% |

Table 5.1. Average Water Savings Per Person Per Day.

Of course there may be GOH residents that exceed the baseline rates established, but it is also assumed that others will be below it. Therefore, due to the fact that water is relatively inexpensive as compared to other utilities, it would take longer for the LMV residents to meet the goals set by the Navy.

Consumer water costs will continue to increase in the long-term, because of the limited amount of source water available to Central California and population growth. Sewer costs will also continue to increase because of more stringent Clean Water Act standards. Monterey Peninsula residents will face tighter water-conservation rules shortly including limiting outdoor watering. This is a result of the California-American Water Company's failure to meet state orders to trim pumping from the Carmel River by 20 percent. To meet current water requirements from residents, CAL-AM is pumping more water from the Carmel River than allowed.(Parsons, 1997, p.1) This trend will continue in the foreseeable future. This will mean that more fines will be levied and the rates for water will go up. If this is the case then the payback from the WA concept could be potentially more significant than this thesis predicts.

Although this study focused on the Naval Postgraduate School's family housing area, it is assumed that similar inefficiencies in water consumption are being demonstrated in other GOH areas. Therefore, the benefits derived from implementing a WA concept are potentially significant when applied to all GOH residents.

C. RECOMMENDATIONS

The following actions are recommended:

• Implement a Water Allowance concept based on the local Public Sector Housing consumption rates. Even though as demonstrated in this thesis, the initial metering costs may not be recovered within ten years, doing so will reduce the overall water costs currently being paid. Additionally, the timeframe of recouping the initial cost is very close to the ten-year goal.

- Implement the forecasting methods developed in Chapter III to assess the differences in GOH water consumption and PSH consumption.
- Implement a monitoring program for water consumption. Although the Navy is responsible for some costs, as outlined in Chapter IV, generally, the Utility Company subsidizes the monitoring of the meters and other costs.
- Investigate methods to lower the initial metering costs. Determine is it is cheaper to contract out or to install the meters by PWC.
- Require all residents of GOH to attend water conservation seminars. As stated in Chapter I, the current energy awareness programs do not target individual residents. Combined training with representatives from Naval Facilities Engineering Command, Southwest Division, Public Works, Housing, and Residents, can foster new and innovative solutions to reducing overall water consumption.

D. FOLLOW-ON RESEARCH

The study of implementing a Water Allowance as an incentive for GOH residents to reduce water consumption has generated a number of related issues that were not addressed in this thesis. These issues may serve as possible topics for further study.

Although this study proposes a WA concept to reduce consumption of water, the thesis did not explore all the possible incentive programs that could be implemented. One possible research topic might be to determine the effectiveness of water consumption monitoring programs that are implemented and conducted by the various Navy Commands. Since the utility provider will not pay for these costs, this study should include the cost of installing meters and the personnel to monitor the program. It should also include the most cost effective monitoring systems, such as telemetry type meters versus personnel monitored meters. Additionally, a procedure to enforce compliance would also have to be analyzed. After determining the specific procedures for implementing this system it could be compared to the proposed program, as outlined in this thesis, to determine the most cost effective alternative.

As stated in Chapter I of this thesis, due to the scope and time limitation, the lot size and square footage of individual homes between PSH and GOH were assumed to be equal. As a means of reducing water consumption and ultimately costs, a study determining the exact vegetation and efficiency of such vegetation of GOH compared to PSH would be extremely beneficial.

A detailed analysis of the water requirements for different family sizes would also be beneficial. Although this thesis used the aggregate PSH home and compared it to the aggregate GOH home, it did not specifically address the individual water needs based on family size. If the water requirements based on family size are significantly different from the findings in this thesis, then the baseline rates established in Chapter IV may have to be adjusted.

Because of time limitations this thesis did not research the laws and regulations that might preclude the implementation of the WA concept. A study that researches any restrictions with regards to the WA concept would be beneficial. The research should detail any modifications to existing laws and regulations that would be required to allow the implementation of the WA concept.

APPENDIX A. LA MESA WATER CONSUMPTION PER PERSON PER DAY IN GALLONS

| | | | La Mesi | Water Con | sumption | Percitious | esin Galla | | | | 2022 | | |
|---------|--------|----------|----------------|---------------|-------------|-------------|-------------|-------------|-------------|--------------|----------------|-----------------|---------------------------------------|
| Meas | Ferrod | 100 cabs | ft gal/pers/ti | W MA | YMA | | | | | с. (| | | |
| Jan-87 | 1 | 9704 | 90.165239 | 49 | | 0.782658 | 87 115 2037 | 754 120 303 | 311 04 2268 | 022 4 06466 | D CARACENESS | 27 ADSCINC VAID | Regression Output |
| Feb-87 | 2 | 10517 | 97,719272 | 85 | | 0 766032 | 05 127 565 | 15 120.333 | 311 34.2200 | 922 -4.06165 | 27 -0.04310502 | 0.043105027 | 120.646641 |
| Mar-87 | 3 | 9666 | 89 812160 | 44 | <u> </u> | 0.700032 | 12 444 0000 | 015 120,139 | 981 92.0310 | 5.688196 | 82 0.06180734 | 9 0.061807349 | -0.253329961 |
| Ant-87 | 4 | 11220 | 104 41949 | 22 | + | 0.763546 | 13 114.6223 | 119.8866 | 51 93.9369 | 615 -4.12480 | 11 -0.0439103 | 1 0.04391031 | |
| May 07 | | 11230 | 104.41040. | <u>22</u> | | 0.915367 | 35 114.0727 | 63 119.6333 | 321 109.508 | 437 -5.08995 | 34 -0.04648001 | 2 0.046480012 | |
| Way-07 | | 19150 | 177.933250 | 51 | | 0.9239734 | 192.57 | 4 119.3799 | 91 110.303 | 939 67.62931 | 87 0.61311789 | 2 0.613117892 | 7 |
| Jun-67 | | 19022 | 1/6./43939 | 32 | | 1.1214097 | 79 157.608 | 7 119.1266 | 61 133.589 | 804 43.15413 | 51 0.32303464 | 7 0.323034647 | 7 |
| Jul-87 | 7 | 21006 | 195.178382 | 22 145.595166 | 1.3405553 | 7 1.1673667 | 76 167.1954 | 25 118.8733 | 331 138.768 | 776 56.40960 | 65 0.40650071 | 4 0.406500714 | - |
| Aug-87 | 8 | 22315 | 207.341026 | 53 146.748867 | 1.4128969 | 5 1.3994459 | 2 148.1593 | 37 118.6200 | 01 166.002 | 277 41.33874 | 0.24902519 | 3 0 249025193 | |
| Sep-87 | 9 | 18772 | 174.421050 | 7 147.469737 | 1.1827582 | 7 1.2941001 | 2 134,7817 | 29 118.3666 | 71 153 178 | 323 21 24272 | 74 0 13867972 | 3 0 138670722 | - |
| Oct-87 | 10 | 18401 | 170.973884 | 2 149.754685 | 1.1416930 | 1.1468465 | 4 149.0817 | 45 118 1133 | 41 135 457 | 77 35 51600 | A 0.26210225 | 0.1500/3/23 | - |
| Nov-87 | 11 | 13272 | 123.31750 | 4 147.805394 | 0.83432343 | 0.9167255 | 3 134 5195 | 49 117 8600 | 11 108 045 | 011 05.51800 | 0.26219225 | 0.262192258 | -1 |
| Dec-87 | 12 | 13122 | 121,923770 | 9 143 231627 | 0.85123498 | 0 7825255 | 1 155 8080 | 45 117.0000 | 94 02 0202 | 15.2/222 | 3 0.141350205 | 0.141350209 | 4 |
| Jan-88 | 13 | 13405 | 124 553280 | 6 140 779431 | 0.00120400 | 0.7025255 | 7 450 4440 | 43 117.6066 | 61 92.0302 | 29 29.89354 | 9 0.324823074 | 0.324823074 | _ |
| Feb-88 | 14 | 0706 | 01.0000534 | 6 437 000442 | 0.00474002 | 0.7826588 | 7 159.1412 | 12 117.3533 | 52 91.84764 | 09 32.70563 | 0.356085789 | 0.356085789 | |
| Mar.88 | 14 | 3/30 | 91.0200624 | 5 137.966413 | 0.65972624 | 0.7660320 | 5 118.8201 | 75 117.1000 | 22 89.70236 | 96 1.3176928 | 5 0.01468961 | 0.01468961 | 1 |
| Mia1-00 | 15 | 12249 | 113.812244 | 3 135.669463 | 0.8388936 | 0.7835481 | 3 145.2523 | 97 116.8466 | 92 91.55500 | 69 22.257237 | 4 0.243102351 | 0.243102351 | 1 |
| Apr-88 | 16 | 14557 | 135.257150 | 8 132.506851 | 1.02075591 | 0.9153673 | 5 147.76269 | 99 116.5933 | 62 106.7257 | 57 28.531393 | 8 0.267333722 | 0.267333722 | 1 |
| May-88 | 17 | 10796 | 100.311616 | 4 129.015937 | 0.77751338 | 0.9239734 | 2 108.56547 | 78 116.3400 | 32 107.4950 | 98 -7.183481 | 1 -0.066826128 | 0.066826128 | - |
| Jun-88 | 18 | 15562 | 144.595162 | 5 126.417012 | 1.14379513 | 1.1214097 | 9 128.94052 | 21 116.0867 | 02 130,1807 | 64 14 414398 | 9 0 110726028 | 0.110726028 | 4 |
| Jul-88 | 19 | 18132 | 168.474456 | 1 123.097217 | 1.36862929 | 1,1673667 | 6 144 32007 | 115 8333 | 72 135 2200 | 78 22 254426 | 1 0.045000074 | 0.110720028 | - |
| Aug-88 | 20 | 17923 | 166.532521 | 4 121.043783 | 1 375804 | 1 3994459 | 2 118 99880 | 7 115 5800 | 12 161 7490 | 20 33.234420 | 1 0.245928274 | 0.245928274 | 4 |
| Sep-88 | 21 | 17231 | 160 102766 | 119 045712 | 1 34488478 | 1 2941001 | 2 402 7474 | 5/ 115.5000 | 42 101.7400 | 16 4.7845031 | 6 0.02957998 | 0.02957998 | 1 |
| Oct-88 | 777 | 11772 | 100 380464 | 5 115 AD0457 | 0.04774700 | 1.2.341001. | 4 05 0000 | 5 115.3267 | 12 149.2443 | 11 10.858454 | 8 0.072756239 | 0.072756239 | J |
| Nov 99 | | 10000 | 103.309404 | 113.420457 | 0.94//4/63 | 1.1468465 | 4 95.382826 | 2 115.07338 | 5Z 131.9715 | -22.58204 | 6 -0.171113035 | 0.171113035 |] |
| NUV-00 | 23 | 10883 | 101.119981 | 112.523428 | U.89865713 | 0.9167255 | 3 110.30562 | 4 114.82005 | 52 105.2584 | 72 -4.138490 | -0.039317413 | 0.039317413 |] |
| Dec-88 | 24 | 8798 | 81.7470916 | 2 109.487413 | 0.74663461 | 0.7825255 | 1 104.4657: | 2 114.56672 | 22 89.65138 | 31 -7.904291 | 5 -0.088166977 | 0.088166977 | 1 |
| Jan-89 | 25 | 9154 | 85.0548848 | 2 103.994169 | 0.81788129 | 0.78265887 | 7 108.67427 | 5 114.31339 | 89.46838 | 97 -4.413504 | 3 -0.049330326 | 0.049330326 | 1 |
| Feb-89 | 26 | 8743 | 81.2360561 | 5 97.7003026 | 0.83148213 | 0.76603205 | 5 106.04785 | 5 114.06006 | 2 87.37366 | 32 -6,137607 | -0.070245504 | 0.070245504 | 1 |
| Mar-89 | 27 | 8141 | 75.6425406 | 92.7738433 | 0.8153434 | 0.78354813 | 96.538473 | 7 113.80671 | 2 89 17305 | 23 .13 53064 | 0.070240004 | 0.070240004 | 4 |
| Apr-89 | 28 | 9301 | 86.42074325 | 90.3615236 | 0.95638874 | 0.91536734 | 94 410995 | 6 113 55340 | 12 103 0420 | 77 -17 50000 | 0.101/33189 | 0.151/33189 | 4 |
| May-89 | 29 | 8569 | 79.61932576 | 89 105228 | 0.8935427 | 0.92397345 | 86 170570 | 8 412 20007 | 103.9430 | -17.52233 | -0.1685/6248 | 0.168576248 | |
| Jun-89 | 30 | 9947 | 92 4230871 | 88 0637007 | 1.04050147 | 1 42440070 | 00.170579 | 8 113.30007 | 2 104.6862 | -25.06693 | -0.239448147 | 0.239448147 | |
| Jul 89 | 31 | 0559 | 99 90867764 | 87 2400004 | 1.04950147 | 1.121409/5 | 82.4168/2 | 1 113.04674 | 2 126.77172 | 23 -34.34863 | -0.27094872 | 0.27094872 | |
| Aug. 90 | 20 | 9000 | 00.0000720 | 87.3100224 | 1.01/164/ | 1.16/366/6 | 76.076067 | 6 112.79341 | 2 131.6712 | 8 -42.862608 | -0.325527386 | 0.325527386 | |
| Fag 90 | 32 | 10240 | 95.1455124 | 86.4025473 | 1.10118874 | 1.39944592 | 67.987987 | 9 112.54008 | 2 157.49375 | 62.34824 | -0.395877571 | 0.395877571 | |
| Gep-69 | 33 | 12189 | 113.254751 | 85.996429 | 1.3169704 | 1.29410012 | 87.516220 | 4 112.28675 | 2 145.31029 | 9 -32.055548 | -0.220600662 | 0.220600662 | i i i i i i i i i i i i i i i i i i i |
| 06689 | 34 | 10584 | 98.34180696 | 86.0157864 | 1.14329952 | 1.14684654 | 85.749752 | 2 112.03342 | 2 128.48514 | 3 -30.143336 | -0.234605617 | 0.234605617 | |
| Nov-89 | 35 | 8827 | 82.01654668 | 86.2147805 | 0.95130494 | 0.91672553 | 89.466851 | 7 111.78009 | 2 102.47166 | 4 -20.455117 | -0.199617304 | 0.199617304 | |
| Dec-89 | 36 | 8164 | 75.85624641 | 86.4238404 | 0.87772362 | 0.78252551 | 96.937729 | 2 111.52676 | 2 87.272537 | 2 -11.416291 | -0.13081195 | 0.13081195 | |
| Jan-90 | 37 | 7841 | 72.85507449 | 86.5310805 | 0.84195267 | 0.78265887 | 93.0866278 | 8 111.27343 | 2 87.089138 | 4 -14.234064 | -0.16344247 | 0 16344247 | |
| Feb-90 | 38 | 7712 | 71.65646403 | 87.7320138 | 0.81676529 | 0.76603205 | 93.5423838 | 8 111.02010 | 3 85,044956 | 7 -13 388493 | -0 157428415 | 0.157428415 | |
| Mar-90 | 39 | 8123 | 75.4752927 | 88.7316301 | 0.85060189 | 0.78354813 | 96.3250242 | 2 110,76677 | 3 86 791097 | 7 -11 315805 | -0 130370780 | 0.130270780 | |
| Apr-90 | 40 | 9369 | 87.05256892 | 88.8706163 | 0.97954276 | 0.91536735 | 95,1012383 | 3 110 51344 | 3 101 16039 | 8 -14 107820 | 0.130450006 | 0.130373703 | |
| May-90 | 41 | 9015 | 83.76335882 | 89.0990337 | 0.94011523 | 0.92397342 | 90 6555931 | 110 26011 | 3 101 87741 | 4 -18 114055 | -0.139439990 | 0.139459995 | |
| Jun-90 | 42 | 10041 | 93,29649317 | 89,1582673 | 1 04641438 | 1 12140979 | 83 195718 | 110.20071 | 101.07741 | 10,114035 | -0.177602463 | 0.177802463 | |
| Jul-90 | 43 | 9741 | 90 50902699 | 89 561 2885 | 1 01058201 | 1 16736676 | 77 5300400 | 110.00076 | 3 123.30200 | 3 -30.06619 | -0.243/21918 | 0.243721918 | |
| Aug-90 | 44 | 13159 | 122 2675584 | 90.0556766 | 1 2570953 | 1.10/300/0 | 77.5526401 | 109.75345 | 3 128.12253 | 3 -37.613506 | -0.293574478 | 0.293574478 | |
| Sep-90 | 45 | 11950 | 110 1024074 | 00.4050045 | 1.33766632 | 1.39944392 | 87.3685481 | 109.500123 | 3 153.2395 | -30.971942 | -0.20211461 | 0.20211461 | |
| Oct 00 | 40 | 11052 | 110.1234974 | 90.1052315 | 1.22216541 | 1.29410012 | 85.0965825 | 109.246793 | 3 141.37628 | 7 -31.25279 | -0.221061046 | 0.221061046 | |
| OCF90 | 40 | 11280 | 104.8087285 | 89.6662056 | 1.16887659 | 1.14684654 | 91.3886248 | 108.993463 | 3 124.99877 | 6 -20.190048 | -0.161521963 | 0.161521963 | |
| NOV-90 | 4/ | 8721 | 81.03164196 | 89.2918334 | 0.9074922 | 0.91672553 | 88.3924792 | 108.740133 | 99.684855 | 5 -18.653214 | -0.187121839 | 0.187121839 | |
| Dec-90 | 48 | 8423 | 78.26275889 | 89.3371297 | 0.87603843 | 0.78252551 | 100.013044 | 108.486803 | 84.893691 | 3 -6.6309324 | -0.078108659 | 0.078108659 | |
| Jan-91 | 49 | 8623 | 80.12106967 | 89.390169 | 0.8963074 | 0.78265887 | 102.37036 | 108.233473 | 84,709887 | -4.5888174 | -0.054170978 | 0.054170978 | |
| Feb-91 | 50 | 8207 | 76.25578323 | 89.3425498 | 0.85352146 | 0.76603205 | 99.5464657 | 107.980143 | 82,716250 | -6.4604671 | -0.078103065 | 0.078103065 | |
| Mar-91 | 51 | 7756 | 72.0652924 | 89.7219549 | 0.80320689 | 0.78354813 | 91 9730256 | 107 726813 | 84 400143 | 12 242854 | -0.070103903 | 0.078103965 | |
| Apr-91 | 52 | 8602 | 79.92594704 | 89.7916416 | 0.8901268 | 0.91536735 | 87 3157062 | 107 473483 | 98 377747 | -12.343031 | 0.140238313 | 0.140238313 | |
| May-91 | 53 | 8815 | 81,90504803 | 90,1005858 | 90904013 | 0 92397740 | 88 64437C4 | 107 320450 | 00.0000000 | 10.451//1 | -0.10/560468 | 0.18/560468 | |
| Jun-91 | 54 | 10358 | 96 24191577 | 90 6034911 | 1.06722407 | 1 12140070 | 95 90007 | 107.220153 | 99.0685721 | -17.163524 | -0.173248929 | 0.173248929 | |
| Jul-91 | 55 | 9561 | 88 83654770 | 90 2496050 | 1.0022310/ | 1.121409/9 | 00.022204 | 106.966823 | 119.953643 | -23.711727 | -0.197674087 | 0.197674087 | |
| Aurigi | | 12240 | 412 707-700 | 00 200059 (| | 1.10/36676 | /6.0999458 | 106.713493 | 124.573785 | -35.737238 | -0.286876068 | 0.286876068 | |
| Sep 04 | 50 | 15210 | 122./9/1/69 | JU.∠86804 | 1.3600789 | 1.39944592 | 87.7469968 | 106.460163 | 148.985241 | -26.188064 | -0.175776232 | 0.175776232 | |
| Sep-91 | 57 | 12775 | 118.6996017 | 91.2283481 1 | 1.30112628 | 1.29410012 | 91.7236619 | 106.206833 | 137.442275 | -18.742674 | -0.136367603 | 0.136367603 | |
| Uct-91 | 58 | 10537 | 97.90510393 | 94.7382326 | 1.0334276 | 1.14684654 | 85.3689663 | 105.953503 | 121.512409 | -23.607305 | -0.194278966 | 0.194278966 | |
| Nov-91 | 59 | 10262 | 95.34992659 | 99.3522635 | 0.9597157 | 0.91672553 | 104.011423 | 105.700173 | 96.898047 | -1.5481204 | -0.015976797 | 0.015976797 | |
| Dec-91 | 60 | 8181 | 76.01420283 | 104.174967 | 0.7296782 | 0.78252551 | 97.1395838 | 105.446843 | 82.5148454 | -6.5006426 | -0.078781404 | 0.078781404 | |
| Jan-92 | 61 | 7871 | 73.13382111 | 108.61091 0 | .67335612 | 0.78265887 | 93,4427812 | 105,193513 | 82 3306359 | -9 1968147 | -0 111705000 | 0.111705000 | |
| Feb-92 | 62 | 9135 | 84.87834529 | 110.612853 0 | 76734614 | 0.76603205 | 110.802603 | 104 940192 | 80 3875420 | A 40000444 | 0.055904004 | 0.111/02063 | |
| Mar-92 | 63 | 9260 | 86.03978954 | 111,713515 | 77018246 | 78354813 | 109 807040 | 104 696650 | 82 027400- | 4.04200141 | 0.000064394 | 0.055864394 | |
| Apr-92 | 64 | 16164 | 150 188678 | 113 643061 4 | 32158248 | 91536795 | 164 074755 | 104.000003 | 02.02/1885 | 4.01260108 | J.U4891794 | 0.04891794 | |
| May-92 | 65 | 13171 | 122 370057 | 115 073444 | 06240007 | 07207045 | 104.0/4/59 | 104.433524 | 95.5950381 | 54.5936398 | 0.571092819 | 0.571092819 | |
| Jun-92 | | 18450 | 171 64070-0 | 115.072411 1 | .00349607 (| 404 | 132.448676 | 104.180194 | 96.2597303 | 26.1193268 | 0.271342198 | 0.271342198 | |
| Jul 02 | 00 | 10409 | 1/1.512/943 | 115.1541 1 | .48941979 1 | .12140979 | 152.943907 | 103.926864 | 116.544602 | 54.9681921 | 0.471649404 | 0.471649404 | |
| JUP-92 | | 12918 | 120.0282939 | 115.624484 1 | .03808717 1 | .16736676 | 102.819695 | 103.673534 | 121.025037 | -0.9967433 | -0.008235844 | 0.008235844 | |
| Aug-92 | 68 | 15030 | 139.6520558 | 115.687202 1 | .20715216 1 | .39944592 | 99.7909627 | 103.420204 | 144.730982 | -5.0789265 | -0.035092186 | 0.035092186 | |
| Sep-92 | 69 | 13804 | 128.2606107 | 115.269857 1 | .11269862 1 | .29410012 | 99.1118144 | 103.166874 | 133.508263 | -5.2476527 | -0.039305827 | 0.039305827 | |
| Oct-92 | 70 | 14492 | 134.6531998 | 112.571822 1. | 19615369 1 | .14684654 | 117.411698 | 102.913544 | 118.026042 | 16.6271578 | 0 140877026 | 0 140877026 | |
| Nov-92 | 71 | 9999 | 92.9062479 | 109.307776 0. | 84995095 0 | 91672553 | 101.345763 | 102,660214 | 94 1112395 | -1 2040000 | 0.012802807 | 0.1400/7026 | |
| Dec-92 | 72 | 8655 | 80.4183994 | 105.733625 0 | 76057545 0 | 78252551 | 102 767767 | 102 406884 | AD 1350005 | 0.2822000 | 0.012003897 | 0.012803897 | |
| Jan-93 | 73 | 8612 | 80.01886258 | 103 079338 0 | 77628424 | 78265997 | 102 22077 | 102 45955 | 00.1359995 | 0.2623999 | 0.003524008 | 0.003524008 | |
| Feb-93 | 74 | 8556 | 79 49853566 | 103 985266 0 | 76451720 | 76602000 | 102.239// | 102.103554 | 19.9513846 | 0.06747802 | 0.000843988 | 0.000843988 | |
| Mar-93 | 75 | 8764 | 81 40320445 | 105 020 100 | 77407000 | .10003205 | 103.779647 | 101.900224 | /8.0588375 | 1.43969811 | 0.018443755 | 0.018443755 | |
| | | 0101 | 01.9030412 | 100.039469 0. | 1149/825 0 | .18354813 | 103.890624 | 101.646894 | 79.6452339 | 1.75807027 | 0.022073766 | 0 022073766 | |

| Apr-00 77 984 96.0722328 08.447130 0.56872786 0.4007265 10.130544 2.200244 0.200822320 0.09822370 June 30 71 1111 10.130518 0.150304 10.200344 0.100213 0.111115064 0.10111501 0.001115021 June 30 10.33304 0.11111500 0.11111500 0.11111500 0.11111500 0.11111500 0.11111500 0.11111500 0.11111500 0.11111500 0.01111100 0.00111100 0.00111100 0.00111100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.0011100 0.00111000 0.00111000 0.00111000 0.00111000 0.00111000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.00011000 0.000110000 0.0001100000 0.000110000 | | | | | | | | | | | | | |
|---|---------|------|-------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|---------------|
| Mp-60 77 11210 104.45017 105.20020 0.5207240 10.2200746 101.45024 0.01.60024 0 | Apr-93 | 76 | 9694 | 90.07232 | 395 104.9411 | 33 0.8583128 | 6 0.9153673 | 35 98.40019 | 26 101.3935 | 64 92.81235 | 84 -2.74003 | 45 -0.02952230 | 2 0.029522302 |
| June 3 76 1118 10.355055 103.45627 103.55055 103.55055 11111552 31.11152 31. | May-93 | 77 | 11210 | 104.1583 | 197 105.0023 | 03 0.9919622 | 4 0.9239734 | 2 112.7286 | 96 101.1402 | 34 93.45088 | 84 10.70743 | 13 0.114578165 | 0.114578165 |
| Jube 3 78 1333 12.8.842888 10.642421 11.072871 00.53274 11.7.472891 0.55457771 0.65457771 0.65457771 0.65457771 0.65457771 0.65457771 0.65457771 0.65457771 0.6745971 0.7545971 0.1245911 0.1245721 0.1245921 0.123721 0.1245971 0.123721 0.0277057 | Jun-93 | 78 | 11188 | 103.95390 | 055 105.4850 | 6 0.9854844 | 8 1.1214097 | 9 92.69930 | 28 100.8869 | 04 113.1355 | 62 -9 18165 | 62 -0 08115623 | 0.081156735 |
| Auge 8 00 1985 197.33227 105.8903 112.97100 102.0244 10.47722 107.19730 0.714641 0.714641 Cp4.90 01 1402 55.97277 100.8903 120.97104 10.239744 10.529745 10.0075571 0.0705571 0.0705571 0.0705571 0.0705571 0.0205400 Dev-93 80 11209 10.440220 10.92722 10.9275571 10.9075401 10.3026401 11.2435801 0.102254311 0.0205401 0.0205401 Dev-93 84 4902 0.7225501 10.9276571 10.9276571 10.9276571 10.927641 10.725331 5984034 7.775133 2.9286113 0.02054511 0.0 | Jul-93 | 79 | 13333 | 123.88428 | 888 105.4924 | 32 1.174342 | 1.1673667 | 6 106.1228 | 1 100.6335 | 4 117 4762 | 89 6 407999 | 28 0 054547171 | 0.054547171 |
| Bep-0 01 14822 155.752277 105.46835 12.241021 102.44102 107.1911 105.974211 105.974211 105.97421 </td <td>Aug-93</td> <td>80</td> <td>16955</td> <td>157.53829</td> <td>72 105.59502</td> <td>6 1,491910</td> <td>2 1.3994459</td> <td>2 112.57190</td> <td>8 100 3802</td> <td>4 140 4767</td> <td>23 17 06157</td> <td>38 0 12145491</td> <td>0.034347171</td> | Aug-93 | 80 | 16955 | 157.53829 | 72 105.59502 | 6 1,491910 | 2 1.3994459 | 2 112.57190 | 8 100 3802 | 4 140 4767 | 23 17 06157 | 38 0 12145491 | 0.034347171 |
| Oct-83 62 1940 124.87465 11400501 11400501 11400501 11400501 1000204003 1000204003 1000204003 1000204003 1000204003 1000204003 1000204003 1000204003 1000204003 1000204003 1000204003 1000204003 1000204003 100020403 100200403 1002 | Sep-93 | 81 | 14602 | 135.67527 | 07 105.49088 | 3 1.2861326 | 6 1,2941001 | 2 104 84140 | 12 100 1269 | 4 129 5742 | 51 6 101010 | 30 0.12145401 | 0.12145461 |
| New-59 8.3 111299 104.1402221 04.593271 0.995275 115.098276 0.9323561 12.302501 0.1502500 0.03084510 0.1502500 0.03084510 0.1502500 0.03084510 0.03084500 0.03084500 0.03084500 0.03084500 0.03084500 0.03084500 0.03084500 0.02085012 0.03084500 0.02085012 0.03084500 0.02085012 0.03084500 0.02085012 0.03084500 0.02085012 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0.03084501 0. | Oct-93 | 82 | 13440 | 124.8784 | 85 105,3731 | 9 1.1851068 | 1 1 1468465 | 4 108 88857 | 4 99 87358/ | 2 114 5206 | 75 40 22004 | 0.047085121 | 0.047085121 |
| Dee.59 84 69/22 80.762/198 104.20280 </td <td>Nov-93</td> <td>83</td> <td>11209</td> <td>104,14902</td> <td>82 104 53927</td> <td>3 0.996267</td> <td>0.9167255</td> <td>3 113 60085</td> <td>7 00 62026</td> <td>2 04 3344</td> <td>10.0000</td> <td>01 0.090264008</td> <td>0.090264008</td> | Nov-93 | 83 | 11209 | 104,14902 | 82 104 53927 | 3 0.996267 | 0.9167255 | 3 113 60085 | 7 00 62026 | 2 04 3344 | 10.0000 | 01 0.090264008 | 0.090264008 |
| Jane 4 65 654 79.8 (5) (441) 105.79657 0.724603 0.7262037 0.8208437 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02383512 0.02483512 0.02218512 0.0231761 0.0268176 0.02717685 0.02717685 0.02717685 0.02717685 0.02717685 0 | Dec-93 | 84 | 8692 | 80,76218 | 59 104 02901 | 2 0 7763429 | 2 0 7825255 | 1 103 20700 | 7 00 2000 | 3 31.3244 | 12.82459 | 82 0.140428998 | D.140428998 |
| ebe-9 86 9139 82 1204533 10532725 07207303 1722728 10732733 10727203 1002740 10727203 1002740 10727203 1002740 10727203 1002740 10727203 1002740 10727203 1002740 10727203 1002740 1002740 10727203 1002740 1002740 10727203 1002740 1002740 10027400 1002740 107270327 1002740 1002740 1002740 1002740 1002740 1002740 10027400 1002740 1002740 1002740 1002740 1002740 1002740 1002740 1002741 1002741 1002741 10027420 10027420 1002741 </td <td>Jan-94</td> <td>85</td> <td>8594</td> <td>79.851614</td> <td>61 105 76459</td> <td>7 0 7549935</td> <td>0 7876588</td> <td>7 103.20703</td> <td>9 00 11250</td> <td>4 77 570400</td> <td>36 3.005033</td> <td>29 0.03864639</td> <td>0.03864639</td> | Jan-94 | 85 | 8594 | 79.851614 | 61 105 76459 | 7 0 7549935 | 0 7876588 | 7 103.20703 | 9 00 11250 | 4 77 570400 | 36 3.005033 | 29 0.03864639 | 0.03864639 |
| Mm-9 07 8203 78.2746063 107.24154 0.0242630 107.24152 0.02706230 107.24154 0.02448075 0.04448075 Apr-94 66 842 D 27.25223 100.776215 0.02706230 100.776215 0.02706230 0.02706230 0.02706230 0.02706230 0.02706230 0.0270630 | Feb-94 | 86 | 8839 | 82 128045 | 33 106 83273 | 0 0 7687535 | 3 0 7660320 | 5 107 21220 | 2 09.000004 | 4 77. 70040 | 3 2.2/9481 | 32 0.029385312 | 0.029385312 |
| Ap-94 08 Dec/2 D0.778221 D0.776210 D0.871200 D0.778200 D0.87720 D0.88172 D.007780201 D0.7782000 D0.7782000 D0.7782000 D0.7782000 D0.7782000 D0.7782000 D0.7782000 D0.7782000 D0.77820000 D0.7782000 D0.77820000 D0.77820000 D0.77820000 D0.77820000 D0.778200000 D0.77820000000000000000000000000000000000 | Mar-94 | 87 | 8209 | 76 274366 | 34 107 24105 | 4 0 7112362 | 0.7000320 | 07.044000 | 5 90.000264 | 4 75.73013 | 1 6.39/914 | 3 0.084483075 | 0.084483075 |
| Mby-94 Bit Desc Districts Districts <thdistricts< th=""> Districts Distrists<td>Apr-94</td><td>88</td><td>9942</td><td>97 376629</td><td>33 106 77621</td><td>5 0.9651402</td><td>0.0452672</td><td>5 97.344030</td><td>5 98.606934</td><td>4 77.263279</td><td>2 -0.988912</td><td>9 -0.012799261</td><td>0.012799261</td></thdistricts<> | Apr-94 | 88 | 9942 | 97 376629 | 33 106 77621 | 5 0.9651402 | 0.0452672 | 5 97.344030 | 5 98.606934 | 4 77.263279 | 2 -0.988912 | 9 -0.012799261 | 0.012799261 |
| Insel Doc Origination 1 Description 2 Description 2 <thdescription 2<="" th=""></thdescription> | May-94 | 89 | 8809 | 81 840007 | 15 106.77621 | 5 0.0051423 | 0.91536/3 | 5 100.91/54 | 8 98.353604 | 5 90.029678 | 2.3469506 | 0.026068633 | 0.026068633 |
| Lance Log Ligit 2 Ligit 2 <thligit 2<="" th=""> <thligit 2<="" th=""> <thligit 2<="" td=""><td>Jun-94</td><td>00</td><td>12272</td><td>114.0350</td><td>13 104.74136</td><td>0.7813532</td><td>0.9239734</td><td>2 88.573983</td><td>8 98.100274</td><td>5 90.642046</td><td>6 -8.802039</td><td>5 -0.097107687</td><td>0.097107687</td></thligit></thligit></thligit> | Jun-94 | 00 | 12272 | 114.0350 | 13 104.74136 | 0.7813532 | 0.9239734 | 2 88.573983 | 8 98.100274 | 5 90.642046 | 6 -8.802039 | 5 -0.097107687 | 0.097107687 |
| b.m. b.m. c.m. c.m. <thc.m.< th=""> c.m. c.m. <thc< td=""><td>hul.QA</td><td>01</td><td>16722</td><td>155 40000</td><td>5 103.27058</td><td>9 1.1041473</td><td>1.12140979</td><td>101.68089</td><td>4 97.846944</td><td>6 109.72652</td><td>1 4.299428</td><td>5 0.03918313</td><td>0.03918313</td></thc<></thc.m.<> | hul.QA | 01 | 16722 | 155 40000 | 5 103.27058 | 9 1.1041473 | 1.12140979 | 101.68089 | 4 97.846944 | 6 109.72652 | 1 4.299428 | 5 0.03918313 | 0.03918313 |
| r.m ze 10315 10.317.00 10.1026/51 10.00000 10.00000 10.00000 0.11222455 0.01221455 0.0000141471 0.000014471 0.010044751 0.010044751 0.010044751 0.000014471 0.010044751 0.000014471 0.000014471 0.000014471 0.000014471 0.000014471 0.000014471 0.000014471 0.0000141 0.000014471 0.000014471 0.000014471 0.000014471 0.000014471 0.000014471 0.000014471 0.000014471 0.000014471 0.000014471 0.0000144 0.0000144 0.0000144 0.0000144 0.0000144 0.0000144 0.0000144 0.0000144 | Aug. 04 | 1 07 | 10/32 | 155.40628 | 102.21638 | 1.52095264 | 1.16736676 | 133.17689 | 5 97.593614 | 6 113.92754 | 2 41.538738 | 9 0.364606646 | 0.364606646 |
| sep-sr 5.0 15.49 15.443 15.4328 15.532854 1.12841021 17.22875 19.7086527 12.640238 28.502784 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.208370697 0.20837067767 0.20837067767 0.20837067767 0.20837067767 0.20837067767 0.20837067767767 0.208370677677677677677 0.208377767767767776776777677767776777677767 | | 92 | 16315 | 151.59170 | 26 101.03287 | 1.50041959 | 1.39944592 | 2 108.32265 | 97.340284 | 5 136.22246 | 4 15.369238 | 2 0.11282455 | 0.11282455 |
| LCC+3 94 10-040 97.95227650 80.7680313 0.95153726 1.1468464 85.392716 96.332627 110.53306 131.03232 -0.111644425 0.111644425 Dec.94 96 7249 67.35447455 98.032086 0.070322551 96.073992 96.328984 73.2783077 6.023332 -0.10644751 0.10644751 Jan-95 97 7314 67.35447455 98.0728640 73.4783077 6.023332 -0.1064751 0.10644751 Jan-95 7165 66.5739402 94.137650 0.78354471 0.783544750 85.580749 7.7444654 -0.006211865 0.060534 Mar-95 100 75.9514775 94.239981 0.78354725 80.5310461 7.2437461 -11057384438 0.152384438 0.152384438 0.152384438 0.152384438 1.05271736 10.047161 11.048065 10.347611 95.586747 1.0527861 1.052797141 11.0480685 10.377611 1.045066 1.126077 1.052384438 0.1552384438 1.052797144 1.0527971441 0.0567791444 0.057791 | | 93 | 16299 | 151.44303 | 0 99.940728 | 1.51532854 | 1.29410012 | 2 117.02575 | 97.086954 | 7 125.64023 | 9 25.802798 | 4 0.205370497 | 0.205370497 |
| rev:+s to: des3 des3 des3 0.970377 ges320284 0.873215 e.873464 0.07024509 0.00024599 Jane5 97 7314 67.3544255 94.73343 0.6989335 0.7025251 80.379947 80.238332 -0.10644751 0.10644751 0.10644751 0.10644751 0.10644751 0.10644751 0.10644751 0.10644751 0.10644751 0.10644751 0.10640753 Beb-95 98 7062 65.5738402 94.710250 0.68891323 0.7063256 95.589747 40.31246 -7.234456 -0.006534 0.110600534 Apr.95 100 7555 7.35914776 94.309801 0.7442161 0.9137724 0.3784755 95.693315 87.333246 -13.285621 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389430 0.152389433 0.038477373 0.2384673< | UCI-94 | 94 | 10540 | 97.932978 | 9 98.768831 | 0.99153728 | 1.14684654 | 85.393271 | 96.833624 | 7 111.05330 | 8 -13.12032 | 9 -0.118144425 | 0.118144425 |
| Lbc-94 96 7740 67.3447455 98.478245 0.6839635 0.7322551 88.0731962 95.378377 48.023332 -0.1064751 0.1064751 0.1064751 0.1064751 0.1064751 0.1064751 0.1064751 0.10621185 Hau-95 99 7165 66.57388402 94.1377660 0.707574 0.7665165 85.030346 75.108427 7.2344565 0.00621185 0.1066534 May-95 100 7656 7.35614776 0.7462416 0.756756 0.767657 0.5730577 1.0230470 0.10820871 0.108208752 0.533046 7.244566 0.10820871 0.10820871 0.02877941 0.058770941 0.10820871 0.108228721 0.108228721 0.108228721 0.108228721 0.108228721 0.108228721 0.108228721 0.052476482 0.052476482 0.052476482 0.052476482 0.052476482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 0.0524876482 | Nov-94 | 95 | 8853 | 82.2581270 | 08 98.032088 | 0.8390939 | 0.91672553 | 89,730377 | 96.580294 | 88.537621 | 5 -6.279494 | 4 -0.070924589 | 0.070924589 |
| Jan-85 97 7134 67.9584256 97.473330 0.68962241 0.7626627 98.8201907 96.0738246 75.19282 7.234465 0.096211985 0.096211985 0.096211985 0.096211985 0.096211985 0.096211985 0.096211985 0.096234 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096034 0.096211985 0.0563143 0.0563143 0.0563143 0.0563143 0.0563143 0.0563143 0 | Dec-94 | 96 | 7249 | 67.3544745 | 5 98.4738245 | 0.68398353 | 0.78252551 | 86.0731992 | 96.326964 | 75.378307 | 7 -8.023833 | 2 -0.10644751 | 0.10644751 |
| Feb-9 98 7062 65.6195337 (95.1091205 0.68091222 0.76602205 85.658236 95.820369 7.4014246 7.7844706 0.1060534 0.1060534 Apr-95 100 7859 73.95147765 94.23984 0.742161 0.7384513 84.964766 95.568974 74.813246 4.3073466 4.3073466 4.3073466 4.3073466 4.3073466 4.3087466 0.505970441 0.055770341 Jun-55 102 13333 12.384268 1.3333666 1.1209791104 77.844705 50.05977041 0.055770341 0.055770341 0.055770341 Jun-55 103 12.503 116.17229 96.574994 1.2037647 1.6738672 99.516533 94.553851 10.37874 5738042 0.055297721 0.155229721 0.155744742 Aug-55 104 15021 11.4479853 1.3084452 98.710071 94.8095851 10.378745 5738042 0.055791341 0.057791341 Jun-95 102 10.37877 96.808351 1.7098922 1.44791072 10.4682 | Jan-95 | 97 | 7314 | 67.9584255 | 6 97.2473393 | 0.69882041 | 0.78265887 | 86.8301997 | 96.0736348 | 75.192882 | -7.234456 | 5 -0.096211985 | 0.096211985 |
| Mar-65 99 7165 66.7398402 94.1377650 0.7079741 0.7363413 64.9647665 56.569749 74.8813246 8.3073405 0.110940086 0.037461 1.3253240 0.05249742 0.05249742 0.05249742 0.05249742 0.05249742 0.05249742 0.05249742 0.05249742 0.05249742 0.05249742 0.05249742 0.05249742 0.05249742 0.05248742 0.05248742 0.05248742 0.05248742 0.05248742 0.05248742 0.05248742 0.05248742 0.05248742 0.05248742 0.05248742 0.05248742 0.05248742 <th< td=""><td>Feb-95</td><td>98</td><td>7062</td><td>65.6169539</td><td>7 95.1091205</td><td>0.68991232</td><td>0.76603205</td><td>85.6582358</td><td>95.8203049</td><td>73.401424</td><td>3 -7.784470</td><td>6 -0.1060534</td><td>0.1060534</td></th<> | Feb-95 | 98 | 7062 | 65.6169539 | 7 95.1091205 | 0.68991232 | 0.76603205 | 85.6582358 | 95.8203049 | 73.401424 | 3 -7.784470 | 6 -0.1060534 | 0.1060534 |
| Apr.55 100 7959 7.3.5147765 94.29991 0.7421519 0.91537732 80.7847505 95.313645 87.248983 -1.3.29521 -0.15238433 0.05770941 0.053770941 0.055791344 0.055791344 0.055791344 0.055791344 0.055791344 0.055791344 0.055791344 0.05579134 0.05579134 <th< td=""><td>Mar-95</td><td>99</td><td>7165</td><td>66.5739840</td><td>2 94.1377659</td><td>0.70719741</td><td>0.78354813</td><td>84.9647665</td><td>95.5669749</td><td>74.881324</td><td>5 -8.3073406</td><td>-0.110940086</td><td>0 110940086</td></th<> | Mar-95 | 99 | 7165 | 66.5739840 | 2 94.1377659 | 0.70719741 | 0.78354813 | 84.9647665 | 95.5669749 | 74.881324 | 5 -8.3073406 | -0.110940086 | 0 110940086 |
| May-P5 101 6888 8E.28333147 95.8800511 0.8237742 95.974705 95.00315 97.832048 -5.2498733 -0.059770941 0.059770941 Jun-95 103 123333 123.884288 95.5515025 12333506 11.2140979 110.47197 94.609885 110.37874 7.558047 0.05227721 0.165229721 0.165229721 0.165229721 0.165229721 0.165229721 0.165229721 0.165229721 0.165229721 0.15574595 0.1558147 0.01535103 0.16355103 0.16355103 0.16355103 0.16355103 0.16355103 | Apr-95 | 100 | 7959 | 73.9514778 | 5 94.299981 | 0.78421519 | 0.91536735 | 80.7888522 | 95.313645 | 87.246999 | -13,29552 | -0 152389438 | 0 152389438 |
| Jun-85 102 13333 122.8842888 98.5316025 12240976 110.471917 94.806865 106.317481 17.5668077 0.165229721 Jul-95 103 12503 116.172299 98.5074994 1.20376447 1.1673676 94.506531 110.378744 570550492 0.052474822 0.052474822 Sep-95 105 15044 140.1537997 96.505334 1.3944522 94.506551 110.378744 570550492 0.052474822 0.057591344 0.057591344 0.057591344 0.057591344 0.057591344 0.057591344 0.057591344 0.057591344 0.051581247 | May-95 | 101 | 8888 | 82.5833314 | 7 95.6805511 | 0.86311513 | 0.92397342 | 89.3784705 | 95.060315 | 87.8332048 | -5.249873 | -0.059770941 | 0.059770941 |
| Jub-55 103 12603 116.172293 96.5074944 12037647 11675276 99.5165383 94.5536551 110.378794 5.79350492 0.052487482 0.052487482 Aup-55 105 15044 140.153797 96.653251 1.13984552 93.712076 94.4003251 131.986205 7.60022368 0.057591344 0.057591344 Oct-55 106 12174 113.1153777 96.605335 1.17089521 1.1484654 96.831634 93.373076821 15.4447533 0.051581247 0.051582126 0.051631247 | Jun-95 | 102 | 13333 | 123.884288 | 8 96.5315025 | 1.28335606 | 1.12140979 | 110.471917 | 94.806985 | 106.317481 | 17.566807 | 0 165229721 | 0.165229721 |
| Aug-95 104 15021 139.5684316 98.3212811 144989653 139.944502 99.7312076 94.3003251 131.968205 7.60022363 0.057591344 0.057591344 Sep-95 105 14504 140.153797 96.50362455 1.44998653 121.706227 18.4475723 0.051574596 0.057591344 0.057591344 0.057591344 0.057591344 Nov-95 107 10725 100.204093 97.600914 1.3223339 0.91672553 109.312337 93.540352 25.570631 14.4455663 0.0168611769 0.0454511769 0.045472016 0.043472016 0.043472016 0.043472016 0.043472016 0.043472016 0.043472016 0.043472016 0.043472016 0.043472016 0.043472016 0.043472016 0.010835103 0.043472016 0.010835103 0.043472016 0.010835103 0.010835103 0.010835103 0.010835103 0.010835103 0.009765287 0.044604 0.6869404 0.76803205 82.362456 83.4643183 15.56747 0.043472016 0.010835103 0.010835103 0.010835103 0.010835103 0.010835103 0.010835103 0.01003273 0.01003273 0.01003273 | Jul-95 | 103 | 12503 | 116.172299 | 96.5074994 | 1.20376447 | 1.16736676 | 99.5165383 | 94.5536551 | 110.378794 | 5,79350492 | 0.052487482 | 0.057487482 |
| Sep-5 105 15044 140.153797 96.532455 1.4577005 1.29410012 108.30213 94.0489351 121.706227 18.4475723 0.151574596 0.151574596 Oct-95 106 12174 113.1153777 96.05633 1.7708552 1.1484654 98.3756652 107.560841 5.5443967 0.0151574396 0.151574596 0.151574596 0.151574596 0.151574596 0.151574596 0.151574596 0.151574596 0.151574596 0.151574596 0.151574596 0.151574596 0.151574596 0.015157127 0.063771717 0.6530073 0.932337 0.354036753 72.994616 3.173433 -0.043472018 0.404372018 <td>Aug-95</td> <td>104</td> <td>15021</td> <td>139.568431</td> <td>8 96.3212811</td> <td>1.44898853</td> <td>1.39944592</td> <td>99.7312076</td> <td>94.3003251</td> <td>131.968205</td> <td>7.60022636</td> <td>0.057591344</td> <td>0.057591344</td> | Aug-95 | 104 | 15021 | 139.568431 | 8 96.3212811 | 1.44898853 | 1.39944592 | 99.7312076 | 94.3003251 | 131.968205 | 7.60022636 | 0.057591344 | 0.057591344 |
| Oct-85 106 12174 113.1153777 96.605835 1.1709592 1.14684654 98.6316594 93.7936652 107.566841 5.54843687 0.051581247 0.051581247 Nov-95 1007 10785 100.2094031 97.0800314 1.0322343 0.9167253 195.32737 35.403352 65.750813 14.4555963 0.168611769 0.168611769 0.168611769 0.168611769 0.168611769 0.168611769 0.168611769 0.168611769 0.168611769 0.168611769 0.168511769 0.168511769 0.043472018 0.056787 0.043472018 0.056787 0.043673724 0.016927479 0.019677479 0.0196777 | Sep-95 | 105 | 15084 | 140.153799 | 7 96.5392455 | 1.45178056 | 1.29410012 | 108.30213 | 94.0469951 | 121,706227 | 18.4475723 | 0 151574596 | 0 151574596 |
| Nov-95 107 10785 100.2094093 97.0800914 1.0322433 0.91672553 109.312337 93.5403352 16.7505813 14.458593 0.186811769 0.168611769 Dec-95 109 65986 64.91079957 97.6240344 0.7826581 82.316309 93.2870033 72.8994181 -3.173433 -0.043472018 0.043472018 Jan-96 110 6909 64.19534621 99.2291604 0.666390276 0.78265807 82.316309 3.2870033 7.7107162 -6.067732 -0.006765287 0.04937503 Apr:96 111 7881 73.22673665 100.222572 0.70804116 0.7835413 93.455314 92.5770154 72.49397 0.72736622 0.01003273 0.01003273 Apr:96 111 7881 73.22673665 100.222572 0.7306413 9.165739 0.2307342 0.237353 72.269363 15.36747 0.01003273 0.01003273 Apr:96 114 12969 120.5021631 99.2868395 1.2130971 0.9153675 107.465628 91.7770255 | Oct-95 | 106 | 12174 | 113.115377 | 7 96.605835 | 1.17089592 | 1.14684654 | 98.6316594 | 93,7936652 | 107.566941 | 5 54843697 | 0.051581247 | 0.051581247 |
| Dec-95 108 7515 69.8260279 97.6240344 0.78252551 89.2316309 93.2870053 72.994618 3.173433 0.043472018 0.043472018 Jan-96 100 6986 64.91079557 97.7715378 0.66390276 0.78265807 82.336256 93.033673 72.8994618 3.173433 0.043472018 0.043472018 Mar-96 111 7881 73.22673665 100.222572 0.73064116 0.78354813 93.455314 22.527104 72.49937 0.29756527 0.098765287 Mar-96 1112 7415 68.8667251 100.449054 0.8688871 0.9153673 75.2669103 92.2736654 84.4643193 15.567447 0.184307865 0.184307865 May-96 113 10657 99.020904 100.377819 0.9864732 0.92397342 107.167682 92.020355 85.024383 31.9957274 0.184307865 0.184307865 Jul-96 114 12969 120.5021631 199.288638 1.12140671 107.167862 92.030555 16.0320481 1.5257441 | Nov-95 | 107 | 10785 | 100.209409 | 3 97.0800914 | 1.03223439 | 0.91672553 | 109.312337 | 93.5403352 | 85,750813 | 14 4585967 | 0.051001247 | 0.051501247 |
| Jan-96 109 6986 84.91079587 97.7715378 0.66390278 0.7825587 82.936255 93.033753 72.813530 -1.03633 10.048321015 0.108535103 Feb-96 110 6509 64.19534621 99.229150 0.6469404 0.7603205 83.8024266 92.7803453 72.8135307 -7.9028349 -0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.108535103 0.096765287 0.096765287 0.096765287 0.096765287 0.096765287 0.096765287 0.098765287 0.098765287 0.018330736 2.7273665 0.12833013 0.1525687 0.018330736 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 0.184307965 | Dec-95 | 108 | 7515 | 69.8260279 | 97.6240344 | 0.71525448 | 0.78252551 | 89,2316309 | 93 2870053 | 72 9994618 | -3 173/330 | 0.100011703 | 0.042472040 |
| Feb-96 110 6909 64.1953462 99.2291504 0.6469404 0.76603205 83.8024266 92.7030435 71.072174 -0.096755287 -0.099765287 Mar-96 111 7861 73.22673665 100.22572 0.73064116 0.78354813 93.455314 92.273665 71.072174 -0.096755287 0.099765287 Apr-96 112 7415 66.86867251 100.449054 0.68568871 0.91536735 75.2665103 92.2736654 44.643133 -15.567447 -0.184307965 0.184307965 Jun-96 114 12699 120.5021631 99.2686398 1.21309742 107.167632 92.203355 85.024383 13.9957274 0.184307965 0.184307965 Jun-96 114 12969 120.5021631 99.2686398 1.2140979 107.167632 91.272155 102.502441 1.5352471 0.184507463 0.15646430 0.152246122 0.152246122 0.152246122 0.152246122 0.152246122 0.152246122 0.152246122 0.152246122 0.15224512 0.15224512 0.15224512 0 | Jan-96 | 109 | 6986 | 64.9107958 | 97.7715378 | 0.66390278 | 0,78265887 | 82 9362558 | 93 0336753 | 72 8136307 | 7.0028240 | -0.043472018 | 0.043472018 |
| Mai-96 111 7881 73.22673665 100.22572 0.73064116 0.78354813 93.455314 92.6270154 72.4997 0.7273662 0.01003273 0.01003273 Apr-96 112 7415 68.89687251 100.449054 0.8867362 0.91536735 75.2669103 92.2736854 84.4643183 -15.567447 -0.184307965 0.164307965 May-96 113 10657 99.0200904 100.377819 0.98647382 0.9237342 107.167682 92.0203555 85.024363 13.9957274 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.164608436 0.16420822 0.7270655 0.16450722 0.16420822 0.170964814 0.170964814 0.170964814 0.170964814 0.170964814 0.170964814 0.170964814 0.170964814 0.170964814 0.152246122 0.16422322 0.154224522 0.152246122 0.152246122 0.152246122 0.152246122 0.152245122 0.152245122 0.152245122 0.152245122 0.152245122 0.152245122 | Feb-96 | 110 | 6909 | 64.1953462 | 1 99.2291504 | 0.6469404 | 0.76603205 | 83 8024286 | 92 7803453 | 71 0727492 | 6 877272 | -0.108535103 | 0.108535103 |
| Ap:-96 112 7415 68.89687251 100.449054 0.6858871 0.91536735 75.2669103 92.2273685 84.443183 15.567447 0.184307965 0.184307965 May-96 113 10657 99.0200904 100.377819 0.98647382 0.92397342 107.167682 92.020355 85.024363 13.3957274 0.164608436 0.164808436 Jun-96 114 12969 120.5021531 99.2885395 1.21399961 1.12140979 107.455985 91.7670255 102.908441 17.5937224 0.170964814 0.1582246122 Jul-96 115 13248 123.0945067 1.1673676 105.445301 91.5136955 108.83046 10.72364814 0.172964814 0.170964814 0.170964814 0.170964814 0.170964814 0.170964814 0.170964814 0.170964814 0.15224217 0.312534217 | Mar-96 | 111 | 7881 | 73.2267366 | 100.222572 | 0 73064116 | 0 78354813 | 93 455314 | 92 5270154 | 70 40027 | •0.077372 | -0.096/6528/ | 0.096765287 |
| May-96 113 10657 99.020090 100.377819 0.98647382 0.92337342 107.167682 92.020355 85.024363 13.997274 0.164608436 0.164608436 Jun-96 114 12969 120.5021631 99.2686396 1.21389961 1.12140979 107.457682 92.020355 85.024363 13.9967274 0.170964814 0.170264112 0.152246122 0.15924523 0.154223292 0.154223292 0.154223292 0.154223292 0.154223292 0.1592553 96.916 | Apr-96 | 112 | 7415 | 68.8968725 | 100,449054 | 0.68588871 | 0.91536735 | 75 2669103 | 02 2726954 | 12.49931 | 0.72736662 | 0.01003273 | 0.01003273 |
| Jun-96 114 12969 120.502163 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.00000000 0.00000000 0.00000000 0.00000000 0.00000000 0.00000000 0.000000000 0.000000000 0.0000000000 0.00000000000 0.0000000000000 0.0000000000000000 0.00000000000000000000000000000000000 | May-96 | 113 | 10657 | 99.0200904 | 100 377819 | 0.98647382 | D 92397342 | 107 167692 | 02 0202555 | 04.4043193 | -10.06/447 | -0.184307965 | U.184307965 |
| Jul-96 115 13248 123443 123443 12353217 03325342143 037685251 0765 | Jun-96 | 114 | 12969 | 120,5021631 | 99.2686305 | 1 21380061 | 1 121/0070 | 107 455050 | 92.0203005 | 00.024363 | 13.9957274 | 0.164608436 | 0.164608436 |
| Aug-96 116 18041 167.6289247 1.39944592 19.5136953 108.83048 16.5244633 0.152246122 0.152246122 Sep-96 117 14630 135.9354342 1.39944592 19.72352 91.2603656 127.713946 39.9149782 0.312534217 0.312534217 Oct-96 118 132.13 122.7693023 1.14684654 107.049459 90.7537057 104.080574 18.6887266 0.154223392 0.154223392 Nov-96 119 9562 88.84583883 0.91672553 96.9165103 90.5003757 82.964045 5.88183433 0.07089622 0.07089622 Dec-96 120 5673 54.55929632 0.78252551 69.7348461 90.2470457 70.6206159 -16.05132 -0.227289431 0.227289431 </td <td>Jul-96</td> <td>115</td> <td>13248</td> <td>123.0945067</td> <td>-0.2000353</td> <td>1.21303301</td> <td>1 16736676</td> <td>107.400958</td> <td>91./0/0255</td> <td>102.908441</td> <td>17.5937224</td> <td>0.170964814</td> <td>0.170964814</td> | Jul-96 | 115 | 13248 | 123.0945067 | -0.2000353 | 1.21303301 | 1 16736676 | 107.400958 | 91./0/0255 | 102.908441 | 17.5937224 | 0.170964814 | 0.170964814 |
| Sep-96 117 14630 153.932547 1.33944932 17.76232 91.723366 39.9149782 0.312534217 0.312534217 Oct-96 118 13213 122.7693023 1.14684654 107.04459 90.7537057 104.080574 18.682786 0.154223292 0.154223292 Nov-96 119 9562 88.8458383 0.91672553 96.9165103 90.503757 82.964045 5.88183433 0.07089622 0.07089623 0.07089622 0.0708963 | Aug-96 | 116 | 18041 | 167 6289247 | , | | 1 20044602 | 100.446301 | 91.0136955 | 105.830046 | 16.2644603 | 0.152246122 | 0.152246122 |
| Dec-96 122 22.7693023 1.1468464 107.034459 90.7537057 104.080574 18.6887286 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.022728931 0. | Sep-96 | 117 | 14630 | 135 9354347 | , | | 1.39944092 | 119.782352 | 91.2603656 | 127.713946 | 39.9149782 | 0.312534217 | 0.312534217 |
| Nov-96 119 3562 88.4533883 0.91672553 96.9165103 90.537057 104.080574 10.6887286 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.1795602 0.07089622 0.027289431 0.227 | Oct-96 | 118 | 13213 | 122 7603022 | | | 1.29410012 | 105.04244 | 91.00/0356 | 117.772215 | 18.1632188 | 0.154223292 | 0.154223292 |
| Dec-96 120 5573 54.58920032 0.71072535 95.9167103 90.5003/57 82.9640045 5.88183433 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089622 0.07089623 0.227289431 0.227289 | Nov-96 | 119 | 9562 | 88 84583883 | | | 0.01672552 | 107.049459 | 90.7537057 | 104.080574 | 18.6887286 | 0.1795602 | 0.1795602 |
| Jan-97 121 4779 44.40433631 0.227289431 0.227289431 0.227289431 Feb-97 122 8302 77.13840066 0 0 0 Mar-97 123 8144 75.67041533 0 0 0 Mar-97 124 10111 93.94690195 0 0 0 Jun-97 125 12841 119.3128442 0 0 Jun-97 126 16888 156.915763 0 0 Jun-97 128 0 0 0 0 Oct-97 130 0 0 0 0 Nov-97 131 0 0 0 0 Dec-97 132 0 0 0 0 | Dec-96 | 120 | 5873 | 54 56929632 | 1 | | 0.910/2003 | 30.9165103 | 90.5003757 | 82.9640045 | 5.88183433 | 0.07089622 | 0.07089622 |
| Feb-97 122 8302 77.13848086 Some Mar-97 123 8144 75.67041533 Some Apr-97 124 10111 93.94690195 Some May-97 125 12841 119.3128442 Some Jun-97 126 16688 156.915763 Some Jul-97 127 13395 124.4503651 Some Aug-97 128 O Some Oct-97 130 O Some Nov-97 131 O Some | Jan-97 | 121 | 4779 | 44 40433621 | | | 0.10202001 | 03.1048461 | 90.24/0457 | 70.6206159 | -16.05132 | -0.227289431 | 0.227289431 |
| Mar-97 123 8144 75.67041533 | Feb-97 | 177 | 9303 | 77 120 40000 | ╂ | | | | _ | | | Seme | 17.5474454 |
| Inc. 1 Inc. 1 Inc. 1 Inc. 1 Inc. 1 Inc. 1 Ap-97 124 10111 93.94690195 | Mar-97 | 122 | 8144 | 76 67044500 | ┼────┤ | | | | | | | | |
| Current 124 10111 53,340501155 Image: Current for the state | Apr-97 | 123 | 0144 | 10.0/041033 | ├ | | | | | | | | |
| Jun-97 126 169/31/26442 Jun-97 126 16888 156.915763 Jul-97 127 13395 124.4603651 Jun-97 128 0 | Max 07 | 124 | 10111 | 93.94690195 | | | | | | | | | |
| Juli-97 120 106885 156,915/63 Image: Constraint of the system of | widy-9/ | 125 | 12841 | 119.3128442 | <u>├</u> ↓ | | | | | | | | |
| Jurez 127 1395 124.4603651 Aug-97 128 0 Sep-97 129 0 Oct-97 130 0 Nov-97 131 0 Dec-97 132 0 | 111.07 | 126 | 16888 | 156.915763 | ┟────┤ | | | | | | | | |
| Aug-97 128 0 | JUE97 | 127 | 13395 | 124.4603651 | | | | | | | | | |
| SEP-97 129 0 1 Oct-97 130 0 1 1 Nov-97 131 0 1 1 Dec-97 132 0 1 1 | Aug-97 | 128 | | 0 | | | | | | | | | |
| Octs// 130 0 Nov-97 131 0 Dec-97 132 0 | Sep-97 | 129 | | 0 | | | | | | | | | |
| NOV-9/ 131 0 Dec-97 132 0 | Oct-97 | 130 | | 0 | L | | | | | | | | |
| Uec-9/ 132 0 | NOV-97 | 131 | | 0 | |] | | | | | | | |
| | Dec-97 | 132 | | 0 | LT | T | | | | | | | |

| | | | | | Seaso | nainy.Calo | ulations | | | | | i - |
|-------------|-----------------|-------------|-----------------|------------|------------|-----------------------|------------|--------------|------------|------------|----------------|-------------|
| Montel Year | e)))))))) | 68 | 85 | 90 | 81 | ¥2 | 93 | 94 | .96 | 95 | Med Ave | ABAVE |
| Jan | | 0.88474062 | 0.817881288 | 0.84195267 | 1.6963674 | 0.67335612 | 0.77628421 | 0.7549938 | 0.69882041 | 0.66320276 | 0.777986475 | 0.782658865 |
| Feb | | 0.55972624 | 0.831482135 | 0.81676529 | 0.45452746 | 0.76734614 | 0.76451732 | 0.76875353 | 0.68991232 | 0.6459404 | 0.761458921 | 0.76603205 |
| Mat | | 0.6368936 | 0.815343399 | 0.85060189 | 0.80320689 | 0.77018246 | 0.77497825 | 0.70123525 | 0.70719741 | 0.73064116 | 0.778870433 | 0.783548132 |
| Apr | | 3.0207559 | 0.956388735 | 0.97954276 | 0.8901268 | 1-32158246 | 0.85831286 | 0.86514238 | 0.78421515 | 0.68586873 | 0.909902709 | 0.915367354 |
| | | 9.05.031338 | 0.893542697 | 0.94011523 | 0.90904013 | 1.06349607 | 0.99396224 | 0.78135325 | 0.86311513 | 0.98647382 | 0.918457402 | 0.923973425 |
| | 041000000000000 | 1.143/9513 | 1.049501468 | 1.04641438 | 1.06223187 | 1 46941979 | 0.98546448 | 1.10414738 | 4:28335606 | 1.21389961 | 1.114715092 | 1.121409789 |
| | 1 41280505 | 1 275904 | 1.017164699 | 3.01008201 | 0.90468035 | 1.03808717 | 1.1743429 | 1.52095264 | 1.20376447 | | 1.160397706 | 1.167366761 |
| | 1.41205033 | 1 34488479 | 1 216070205 | 1.35768652 | 1.3600789 | 0120725236 | 3.4919102 | 1.50041959 | 1.44898853 | | 1.39109138 | 1.399445922 |
| 0.4 | 1 14169306 | 6 5#776752 | 4 4/10000000000 | 1 16997650 | 1.30112628 | 813682205205 <u>0</u> | 1.28613266 | 1.51532854 | 3.45172026 | | 1.286374478 | 1.294100117 |
| Nev | 0.83433343 | 0 89865713 | 0 951304941 | 0.9074922 | 0.0507457 | 01012010000 | 1.18510681 | 0.99153728 | 1.17089592 | | 1.139999993 | 1.146846544 |
| Dec | 0.65123498 | 0.74663461 | 0.872723674 | 0.87603843 | 0.3337137 | 0 76057545 | 0.77624202 | 0.8390939 | 3543223439 | | 0.911252772 | 0.916725526 |
| | | | | 0.07003043 | 0.7230702 | 0.70057545 | 0.77634292 | 0.4852843333 | U.4152594E | | 0.777853921 | 0.782525515 |
| | | | | | | | | | | 1 | 01115536363728 | |







APPENDIX B. MONTEREY WATER CONSUMPTION PER PERSON PER DAY IN GALLONS

43

| Jan-Feb 94 | Period | Gals/day/acc | Contraction of the second | | end in the second state of the | | | | | | | | |
|------------|--------|--|---------------------------|------------|--------------------------------|------------|------------|------------|------------|------------|---------------|----------------|------------------------|
| Jan-Feb 94 | 1 | and the second | gaupers/oay | MA | Y/MA | Sec. S | Y/S | | V=T*S | Error | Percent Error | Absolute Value | Rapine close Childrent |
| | | 141.08 | 70.54 | | | 0.90180852 | 78.2205957 | 79.7991734 | 71.9635748 | -1.4235748 | -0.019781881 | 0.019781881 | 79 65766316 |
| Mar-Apr 94 | 2 | 138.69 | 69.345 | | | 0.81980203 | 84.5874949 | 79.9406837 | 65.5355347 | 3.80946525 | 0.058128239 | 0.058128239 | 0 1/151026 |
| May-Jun 94 | 3 | 149.01 | 74.505 | | | 1.02480329 | 72.7017575 | 80.0821939 | 82.0684955 | -7.5634955 | -0 092160767 | 0.092160767 | 0.14101020 |
| Jul-Aug 94 | 4 | 187.59 | 93.795 | 80.3670833 | 1.16708229 | 1.18159566 | 79.3799461 | 80,2237042 | 94,7919809 | -0.9969809 | -0.010517566 | 0.010517555 | |
| Sep-Oct 94 | 5 | 187.54 | 93.77 | 80.93 | 1.15865563 | 1.12375086 | 83.4437624 | 80.3652145 | 90.310479 | 3 45952096 | 0.038306972 | 0.010317508 | |
| Nov-Dec 94 | 6 | 150.49 | 75.245 | 80.965 | 0.92935219 | 0.94823964 | 79.3523042 | 80.5067247 | 76.3396673 | -1.0946673 | -0.01433943 | 0.038300972 | |
| Jan-Feb 95 | 7 | 161.09 | 80.545 | 81.5425 | 0.98776712 | 0.90180852 | 89.3149685 | 80.648235 | 72,7292658 | 7.8157342 | 0 1074634 | 0.1074634 | |
| Mar-Apr 95 | 8 | 132.19 | 66.095 | 81.28875 | 0.81308914 | 0.81980203 | 80.6231231 | 80.7897452 | 66.2315971 | -0 1365971 | -0.002062416 | 0.002062416 | |
| May-Jun 95 | 9 | 156.35 | 78.175 | 81.06625 | 0.96433473 | 1.02480329 | 76.2829326 | 80,9312555 | 82 9386165 | 4 7636165 | -0.057435447 | 0.057425447 | |
| Jul-Aug 95 | 10 | 194.11 | 97.055 | 80.2891667 | 1.20881813 | 1.18159566 | 82.1389271 | 81.0727658 | 95 7952283 | 1 25977166 | 0.013150672 | 0.012150672 | |
| Sep-Oct 95 | 11 | 174.93 | 87.465 | 79.44625 | 1.10093302 | 1.12375086 | 77.8330882 | 81,214276 | 91 2646127 | -3 7996127 | 0.013130072 | 0.013130872 | |
| Nov-Dec 95 | 12 | 157.76 | 78.88 | 80.71 | 0.97732623 | 0.94823964 | 83.1857234 | 81,3557863 | 77 1447811 | 1 73521886 | 0.022402017 | 0.041032924 | |
| Jan-Feb 96 | 13 | 135.17 | 67.585 | 81.8666667 | 0.82554967 | 0.90180852 | 74.9438469 | 81,4972965 | 73 4949567 | -5 9099567 | -0.022493017 | 0.022493017 | |
| Mar-Apr 96 | 14 | 137.88 | 68.94 | 82,53 | 0.83533261 | 0.81980203 | 84.0934732 | 81,6388068 | 66 9276595 | 2 01234047 | 0.030067306 | 0.080413092 | |
| May-Jun 96 | 15 | 180.99 | 90.495 | 82.54625 | 1.0962945 | 1.02480329 | 88.304752 | 81 7803171 | 83 8087376 | 6.68626220 | 0.030067396 | 0.030067396 | |
| Jul-Aug 96 | 16 | 197.23 | 98.615 | | | 1.18159566 | 83 4591757 | 81 9218273 | 96 7984758 | 1 81652421 | 0.019760016 | 0.079780016 | |
| Sep-Oct 96 | 17 | 187.73 | 93.865 | | | 1,12375086 | 83 5283008 | 82 0633376 | 92 2187464 | 1.64636364 | 0.017954646 | 0.018/66041 | |
| Nov-Dec 96 | 18 | 145.35 | 72.675 | | | 0.94823964 | 76.6420188 | 82 2048478 | 77 949895 | -5 274995 | 0.017651616 | 0.017851616 | |
| | | | | | | | | | 11.043030 | -0.214090 | -0.007070328 | 0.007670328 | |

0.00643351

| Month/Year | 94 | 85 | 96 | Mad Avo | Ad Avo |
|------------|------------|------------|------------|------------|------------------|
| Jan-Feb | | 0.98778712 | 0.82554967 | 0.90665839 | 0.90180852 |
| Mar-Apr | | 0.81308914 | 0.83533261 | 0.82421087 | 0.81980203 |
| May-Jun | | 0.96433473 | 1.0962945 | 1.03031461 | 1.02480329 |
| Jul-Aug | 1.16708229 | 1.20881813 | | 1.18795021 | 1.18159566 |
| Sep-Oct | 1.15865563 | 1.10093302 | | 1.12979432 | 1.12375086 |
| Nov-Dec | 0.92935219 | 0.97732623 | | 0.95333921 | 0.94823964 |
| | | hadaaaaa | | 6.03226763 | 201 6 a 2 |

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APPENDIX C. MONTEREY CITY CONSUMPTION FORECAST PER PERSON PER DAY IN GALLONS

| | 3월 - 88 (P | | interey Cit | y Water Co | nsumptio | n Per Acco | ount in Gal | lons | fer De adas a | Alexandetaine 1 | 7 | | |
|------------|------------|--------------|--------------|------------|------------|-----------------|-------------|------------|---------------|-----------------|---------------|---|-------------------|
| Month | Period | Gals/day/acc | gal/pers/day | MA | Y/MA | 0.9 \$ % | ¥/S | Stort is | Y=T'S | Error | Patrent Error | Abrahite Maline | Decision in 1 |
| Jan-Feb 94 | 1 | 141.08 | 70.54 | | | 0.90180852 | 78.2205957 | 79.7991734 | 71,9635748 | -1 4235748 | -0.019781881 | 0.010791991 | Regression Output |
| Mar-Apr 94 | 2 | 138.69 | 69.345 | | | 0.81980203 | 84.5874949 | 79,9406837 | 65,5355347 | 3 80946525 | 0.058128230 | 0.059129220 | /9.65/66316 |
| May-Jun 94 | 3 | 149.01 | 74.505 | | | 1.02480329 | 72.7017575 | 80.0821939 | 82.0684955 | -7 5634955 | -0.092160767 | 0.000120233 | 0.14151026 |
| Jul-Aug 94 | 4 | 187.59 | 93.795 | 80.3670833 | 1.16708229 | 1.18159566 | 79.3799461 | 80 2237042 | 94 7919809 | -0.9969809 | 0.010517565 | 0.010517500 | |
| Sep-Oct 94 | 5 | 187.54 | 93.77 | 80.93 | 1.15865563 | 1.12375086 | 83,4437624 | 80.3652145 | 90 310479 | 3 45952096 | 0.038306073 | 0.010317566 | |
| Nov-Dec 94 | 6 | 150.49 | 75.245 | 80.965 | 0.92935219 | 0.94823964 | 79.3523042 | 80.5067247 | 76 3396673 | -1 0946673 | 0.038300972 | 0.036306972 | |
| Jan-Feb 95 | 7 | 161.09 | 80.545 | 81.5425 | 0.98776712 | 0.90180852 | 89.3149685 | 80.648235 | 72 7292658 | 7 8157342 | 0 107453943 | 0.01433943 | |
| Mar-Apr 95 | 8 | 132.19 | 66.095 | 81.28875 | 0.81308914 | 0.81980203 | 80.6231231 | 80,7897452 | 66 2315971 | -0 1365971 | 0.1074634 | 0.1074034 | |
| May-Jun 95 | 9 | 156.35 | 78.175 | 81.06625 | 0.96433473 | 1.02480329 | 76.2829326 | 80,9312555 | 82 9386165 | 4 7636165 | -0.002002418 | 0.002062416 | |
| Jul-Aug 95 | 10 | 194.11 | 97.055 | 80.2891667 | 1.20881813 | 1.18159566 | 82,1389271 | 81.0727658 | 95 7952283 | 1 25977166 | 0.013150672 | 0.037435447 | |
| Sep-Oct 95 | 11 | 174.93 | 87.465 | 79.44625 | 1.10093302 | 1.12375086 | 77.8330882 | 81,214276 | 91 2646127 | -3 7996127 | 0.013130072 | 0.013150672 | |
| Nov-Dec 95 | 12 | 157.76 | 78.88 | 80.71 | 0.97732623 | 0.94823964 | 83,1857234 | 81 3557863 | 77 1447811 | 1 73521886 | 0.022402017 | 0.041632924 | |
| Jan-Feb 96 | 13 | 135.17 | 67.585 | 81.8666667 | 0.82554967 | 0.90180852 | 74,9438469 | 81 4972965 | 73 4949567 | -5 9099567 | 0.022493017 | 0.022493017 | |
| Mar-Apr 96 | 14 | 137.88 | 68.94 | 82.53 | 0.83533261 | 0.81980203 | 84.0934732 | 81 6388068 | 66 9276595 | 2 01234047 | 0.080413092 | 0.080413092 | |
| May-Jun 96 | 15 | 180.99 | 90.495 | 82,54625 | 1.0962945 | 1.02480329 | 88.304752 | 81 7803171 | 83 8087376 | 6 68626220 | 0.030007396 | 0.030067396 | |
| Jul-Aug 96 | 16 | 197.23 | 98.615 | | | 1.18159566 | 83,4591757 | 81 9218273 | 96 7984758 | 1 81652424 | 0.019760016 | 0.0/9/80016 | |
| Sep-Oct 96 | 17 | 187.73 | 93.865 | | | 1.12375086 | 83,5283008 | 82 0633376 | 92 2187464 | 1.01032421 | 0.017751646 | 0.018766041 | |
| Nov-Dec 96 | 18 | 145.35 | 72.675 | | | 0.94823964 | 76.6420188 | 82 2048478 | 77 949895 | -5 274805 | 0.017651616 | 0.017851616 | |
| Jan-Feb 97 | 19 | | | | | 0.90180852 | | 82 3463581 | 74 2606477 | -0.214035 | -0.001070320 | 0.067670328 | |
| Mar-Apr 97 | 20 | - | | <u>_</u> | | 0.81980203 | | 82 4979694 | 67 6007040 | | Suite | 0.112021221 | MAPE |
| May-Jun 97 | 21 | | | | ł | 1 02480329 | | 82 6202786 | BA 6700507 | | | in a start a st | 0.00643351 |
| Jul-Aug 97 | 22 | | | | | 1.18159566 | | 82 7708990 | 07 9017020 | | | | |
| Sep-Oct 97 | 23 | | | | ł | 1,12375086 | | 82 0123001 | 02 17000 | | | | |
| Nov-Dec 97 | 24 | | | | | 0.94823964 | | 83 0539094 | 78 7550089 | | | | |

| Seasonality Calculations | | | | | | | | | | | | | | |
|--------------------------|----------------------|------------------|------------|------------|------------|--|--|--|--|--|--|--|--|--|
| Month/Year | S. (% 94 17%) | >>> 95 \& | 98 | Med Avg | Adi Avg | | | | | | | | | |
| Jan-Feb | | 0.98776712 | 0.82554967 | 0.90665839 | 0.90180852 | | | | | | | | | |
| Mar-Apr | | 0.81308914 | 0.83533261 | 0.82421087 | 0.81980203 | | | | | | | | | |
| May-Jun | | 0.96433473 | 1.0962945 | 1.03031461 | 1.02480329 | | | | | | | | | |
| Jul-Aug | 1.16708229 | 1.20881813 | | 1.18795021 | 1.18159566 | | | | | | | | | |
| Sep-Oct | 1.15865563 | 1,10093302 | | 1.12979432 | 1.12375086 | | | | | | | | | |
| Nov-Dec | 0.92935219 | 0.97732523 | | 0.95333921 | 0.94823964 | | | | | | | | | |
| | | | | 6.03226763 | 5 | | | | | | | | | |

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APPENDIX D. LA MESA WATER CONSUMPTION FORECAST PER PERSON PER DAY IN GALLONS

51

| | | | La Mesa | Water Con | sumption | PerHouse | | r::::::::::::::::::::::::::::::::::::: | | | | | |
|--------|--------|----------|----------------|---------------|-------------|--------------|-------------|--|-------------|--------------|----------------|----------------|----------------------|
| Meas | Perpod | 100 cobe | fi gal/pers/de | MA | YMA | l s | Yas | - - | | Eror | | | |
| Jan-87 | 1 | 9704 | 90.16523949 | əl | 1 | 0.7826588 | 7 115 2037 | 54 120 3933 | 11 94 22689 | 22 -4 06165 | 27 0 0421050 | 27 0.042405027 | CE REGRESSIES Output |
| Feb-87 | 2 | 10517 | 97.71927285 | 5 | | 0.7660320 | 5 127 5655 | 15 120 1399 | 81 92 0310 | 76 5 688106 | 87 0.04310302 | 0.043105027 | 120.646641 |
| Mar-87 | 3 | 9666 | 89.81216044 | 1 | 1 | 0.7835481 | 3 114 6223 | 91 119 8866 | 51 93 93696 | 15 -4 12480 | 11 0.06180734 | 9 0.061807349 | -0.253329961 |
| Apr-87 | 4 | 11238 | 104.4184832 | 2 | t | 0.9153673 | 5 114.07276 | 63 119 6333 | 21 109 5084 | 37 -5 08995 | 34 -0.0459103 | 0.04391031 | - |
| May-87 | 5 | 19150 | 177.9332581 | 1 | | 0.9239734 | 2 192 574 | 119 3799 | 1 110 3030 | 30 67 62024 | 97 0 040464000 | 2 0.046480012 | - |
| Jun-87 | 6 | 19022 | 176.7439392 | 2 | | 1 1214097 | 9 157 6087 | 7 110 1266 | 1 133 5909 | 04 47 45442 | 0.01311/89 | 2 0.613117892 | 4 |
| Ju⊢87 | 7 | 21006 | 195,1783822 | 145,595166 | 1 34055537 | 1 1673667 | 6 167 10543 | 119.12000 | 1 133.3030 | 76 66 40000 | 0.32303464 | 7 0.323034647 | 4 |
| Aug-87 | 8 | 22315 | 207.3410263 | 146,748867 | 1 41289695 | 1 3994459 | 2 148 1593 | 7 118 52000 | 11 166 0022 | 70 30.40960 | 0.406500/1 | 4 0.406500714 | 4 |
| Sep-87 | 9 | 18772 | 174 4210507 | 147 469737 | 1 18275827 | 1 2041001 | 2 134 79475 | 7 110.02000 | 1 100.0022 | // 41.338/4 | 0.24902519 | 3 0.249025193 | 1 |
| Oct-87 | 10 | 18401 | 170 9738842 | 149 754685 | 1 14160306 | 1 1468465 | 4 440 00474 | 5 110,3000/ | 1 153.1783. | 23 21.242/2 | 4 0.13867972 | 3 0.138679723 | 1 |
| Nov-87 | 11 | 13272 | 123 317504 | 147 805394 | 0.83432343 | 0.0167755 | 4 149.00174 | 15 110.11334 | 1 135.4578 | 77 35.516000 | 68 0.26219225 | 3 0.262192258 | 4 |
| Dec-87 | 12 | 13122 | 121 9237709 | 143 231627 | 0.85123408 | 0.3101233 | 1 455 90004 | 5 447 00001 | 1 108.0452 | 31 15.2/222 | 3 0.141350209 | 0.141350209 | 1 |
| Jan-88 | 13 | 13405 | 124 5532806 | 140 779431 | 0.00123490 | 0.7020200 | 7 450 44404 | 5 117.60668 | 92.03022 | 9 29.89354 | 9 0.324823074 | 0.324823074 | ļ |
| Feb-88 | 14 | 9796 | 91 02006245 | 127 056412 | 0.004/4002 | 0.7626588 | 7 159.14121 | 2 117.35335 | 2 91.847640 | 32.705639 | 0.356085789 | 0.356085789 | |
| Mar-88 | 15 | 12249 | 113 8122443 | 135 660462 | 0.00972624 | 0.7660320 | 5 118.82017 | 5 117.10002 | 2 89.702369 | 06 1.3176928 | 5 0.01468961 | 0.01468961 | |
| Apr-88 | 16 | 14557 | 135 2571509 | 133.003403 | 1.00075504 | 0.76354613 | 3 145.25239 | 7 116.84669 | 2 91.555006 | 59 22.257237 | 4 0.243102351 | 0.243102351 | |
| May-88 | 17 | 10796 | 100 3116164 | 132,500051 | 1.02075591 | 0.91536/35 | 147.76269 | 9 116.59336 | 2 106.72575 | 7 28.531393 | 8 0.267333722 | 0.267333722 | |
| Jun-88 | 18 | 16562 | 144 5951625 | 129.015937 | 0.77751338 | 0.92397342 | 2 108.56547 | 8 116.34003 | 2 107.49509 | 8 -7.183481 | 1 -0.066826128 | 0.066826128 |] |
| Julas | 10 | 19122 | 144.5951625 | 126.41/012 | 1.143/9513 | 1.12140979 | 128.94052 | 1 116.08670 | 2 130.18076 | 4 14.414398 | 9 0.110726028 | 0.110726028 |] |
| Aug-88 | 20 | 17032 | 100.4/44361 | 123.09/21/ | 1.36862929 | 1.16736676 | 5 144.32007 | 3 115.83337 | 2 135.22002 | 8 33.254428 | 1 0.245928274 | 0.245928274 | 1 |
| Sep.89 | 20 | 47024 | 166.5325214 | 121.043/83 | 1.375804 | 1.39944592 | 2 118.99889 | 7 115.58004 | 2 161.74801 | 8 4.7845031 | 6 0.02957998 | 0.02957998 | 1 |
| Oct 99 | | 44770 | 100.102/66 | 119.045712 | 1.34488478 | 1.29410012 | 123.71745 | 115.32671 | 2 149.24431 | 1 10.858454 | 8 0.072756239 | 0.072756239 | Ì |
| Nov 99 | - 22 | 11//3 | 109.3894646 | 115.420457 | U.94774763 | 1.14684654 | 95.382826 | 2 115.07338 | 2 131.9715 | -22.58204 | 6 -0.171113035 | 0.171113035 | |
| Dec 99 | 23 | 10883 | 101.1199816 | 112.523428 | 0.89865713 | 0.91672553 | 110.30562 | 4 114.82005 | 2 105.25847 | 2 -4.138490 | 9 -0.039317413 | 0.039317413 | 1 |
| Lec-86 | 24 | 8798 | 81.74709162 | 109.487413 | 0.74663461 | 0.78252551 | 104.46572 | 114.56672 | 2 89.651383 | 1 -7.904291 | 5 -0.088166977 | 0.088166977 | |
| Jan-69 | 25 | 9154 | 85.05488482 | 103.994169 | 0.81788129 | 0.78265887 | 108.674275 | 5 114.313392 | 2 89.468389 | 7 -4.413504 | 3 -0.049330326 | 0.049330326 | |
| rep-89 | 26 | 8743 | 81.23605615 | 97.7003026 | 0.83148213 | 0.76603205 | 106.047855 | 5 114.060062 | 2 87.373663 | 2 -6.137607 | -0.070245504 | 0.070245504 | |
| Mar-89 | 2/ | 8141 | 75.64254067 | 92.7738433 | 0.8153434 | 0.78354813 | 96.5384737 | 113.806732 | 89.173052 | 3 -13.53051 | 2 -0.151733189 | 0.151733189 | |
| Apr-89 | 28 | 9301 | 86.42074325 | 90.3615236 | 0.95638874 | 0.91536735 | 94.4109956 | 5 113.553402 | 2 103.94307 | 7 -17.522334 | -0.168576248 | 0.168576248 | |
| May-89 | 29 | 8569 | 79.61932576 | 89.105228 | 0.8935427 | 0.92397342 | 86.1705798 | 3 113.300072 | 104.68625 | 6 -25.06693 | -0.239448147 | 0.239448147 | |
| Jun-89 | 30 | 9947 | 92.4230871 | 88.0637997 | 1.04950147 | 1.12140979 | 82.4168721 | 113.046742 | 2 126.77172 | 3 -34.348636 | -0.27094872 | 0.27094872 | |
| Jul-89 | 31 | 9558 | 88.80867261 | 87.3100224 | 1.0171647 | 1.16736676 | 76.0760676 | 112.793412 | 131.67128 | -42.862608 | -0.325527386 | 0.325527386 | |
| Aug-89 | 32 | 10240 | 95.1455124 | 86.4025473 | 1.10118874 | 1.39944592 | 67.9879879 | 112.540082 | 157,493759 | -62.348247 | -0.395877571 | 0.395877571 | |
| Sep-89 | 33 | 12189 | 113.254751 | 85,996429 | 1.3169704 | 1.29410012 | 87.5162204 | 112.286752 | 145.310299 | -32.055548 | -0.220600662 | 0.220600662 | |
| Oct-89 | 34 | 10584 | 98.34180696 | 86.0157864 | 1.14329952 | 1.14684654 | 85.7497522 | 112.033422 | 128.485143 | 3 -30.143336 | -0.234605617 | 0.234605617 | |
| Nov-89 | 35 | 8827 | 82.01654668 | 86.2147805 | 0.95130494 | 0.91672553 | 89.4668517 | 111.780092 | 102.471664 | -20.455117 | -0.199617304 | 0.199617304 | |
| Dec-89 | 36 | 8164 | 75.85624641 | 86.4238404 | 0.87772362 | 0.78252551 | 96.9377292 | 111.526762 | 87.2725372 | -11.416291 | -0.13081195 | 0.13081195 | |
| Jan-90 | 37 | 7841 | 72.85507449 | 86.5310805 | 0.84195267 | 0.78265887 | 93.0866278 | 111.273432 | 87.0891384 | -14.234064 | -0.16344247 | 0.16344247 | |
| Feb-90 | 38 | 7712 | 71.65646403 | 87.7320138 | 0.81676529 | 0.76603205 | 93.5423838 | 111.020103 | 85.0449567 | -13.388493 | -0.157428415 | 0.157428415 | |
| Mar-90 | 39 | 8123 | 75.4752927 | 88.7316301 | 0.85060189 | 0.78354813 | 96.3250242 | 110.766773 | 86,7910977 | -11.315805 | -0.130379789 | 0.130379789 | |
| Apr-90 | 40 | 9369 | 87.05256892 | 88.8706163 | 0.97954276 | 0.91536735 | 95.1012383 | 110.513443 | 101.160398 | -14.107829 | -0.139459996 | 0.139459996 | • |
| May-90 | 41 | 9015 | 83.76335882 | 89.0990337 | 0.94011523 | 0.92397342 | 90.6555931 | 110.260113 | 101.877414 | -18.114055 | -0.177802463 | 0.177802463 | |
| Jun-90 | 42 | 10041 | 93.29649317 | 89.1582673 | 1.04641438 | 1.12140979 | 83.1957186 | 110.006783 | 123.362683 | -30.06619 | -0.243721918 | 0.243721918 | |
| JUF90 | 43 | 9741 | 90.50902699 | 89.5612885 | 1.01058201 | 1.16736676 | 77.5326401 | 109.753453 | 128.122533 | -37.613506 | -0.293574478 | 0.293574478 | |
| Aug-90 | 44 | 13159 | 122.2675584 | 90.0556766 1 | 1.35768852 | 1.39944592 | 87.3685481 | 109.500123 | 153.2395 | -30.971942 | -0.20211461 | 0.20211461 | |
| Sep-90 | 45 | 11852 | 110.1234974 | 90.1052315 | 1.22216541 | 1.29410012 | 85.0965825 | 109.246793 | 141.376287 | -31.25279 | -0.221061046 | 0.221061046 | |
| Oct-90 | 46 | 11280 | 104.8087285 | 89.6662056 1 | 1.16887659 | 1.14684654 | 91.3886248 | 108.993463 | 124.998776 | -20.190048 | -0.161521963 | 0.161521963 | |
| Nov-90 | 47 | 8721 | 81.03164196 | 89.2918334 | 0.9074922 | 0.91672553 | 88.3924792 | 108.740133 | 99.6848555 | -18.653214 | -0.187121839 | 0.187121839 | |
| Dec-90 | 48 | 8423 | 78.26275889 | 89.3371297 | 0.87603843 | 0.78252551 | 100.013044 | 108.486803 | 84.8936913 | -6.6309324 | -0.078108659 | 0.078108659 | |
| Jan-91 | 49 | 8623 | 80.12106967 | 89.390169 | 0.8963074 | 0.78265887 | 102.37036 | 108.233473 | 84.7098871 | -4.5888174 | -0.054170978 | 0.054170978 | |
| Feb-91 | 50 | 8207 | 76.25578323 | 89.3425498 0 | .85352146 | 0.76603205 | 99.5464657 | 107.980143 | 82.7162503 | -6,4604671 | -0.078103965 | 0.078103965 | |
| Mar-91 | 51 | 7756 | 72.0652924 | 89.7219549 0 | .80320689 | 0.78354813 | 91.9730256 | 107.726813 | 84.4091431 | -12.343851 | -0.146238313 | 0.146238313 | |
| Apr-91 | 52 | 8602 | 79.92594704 | 89.7916416 | 0.8901268 | 0.91536735 | 87.3157063 | 107.473483 | 98.3777178 | -18.451771 | -0.18756046A | D.187560468 | |
| May-91 | 53 | 8815 | 81.90504803 | 0.1005858 | .90904013 | 0.92397342 | 88.6443764 | 107.220153 | 99.0685721 | -17.163524 | -0.173248929 | 0.173248929 | |
| Jun-91 | 54 | 10358 | 96.24191577 | 0.6034911 1 | .06223187 | 1.12140979 | 85.822254 | 106.966823 | 119.953643 | -23.711727 | -0.197674087 | 0.197674087 | |
| Jul-91 | 55 | 9561 | 88.83654728 | 0.2186659 0 | 98468035 | 1.16736676 | 76.0999458 | 106.713493 | 124.573785 | -35.737238 | -0.286876068 | 0.286876068 | |
| Aug-91 | 56 | 13216 | 122.7971769 | 90.286804 1 | 1.3600789 1 | 1.39944592 | 87.7469968 | 106.460163 | 148.985241 | -26.188064 | -0.175776232 | 0 175776232 | |
| Sep-91 | 57 | 12775 | 118.6996017 9 | 1.2283481 1 | .30112628 1 | 29410012 | 91.7236619 | 106,206833 | 137.442275 | -18.742674 | -0.136367603 | 0.136367603 | |
| Oct-91 | 58 | 10537 | 97.90510393 9 | 4.7382326 1 | .0334276 1 | 1.14684654 | 85.3689663 | 105.953503 | 121.512409 | -23,607305 | -0.194778966 | 0 194278966 | |
| Nov-91 | 59 | 10262 | 95.34992659 9 | 9.3522635 0 | 0.9597157 0 | .91672553 | 104.011423 | 105.700173 | 96.898047 | -1.5481204 | -0.015976797 | 0.015976797 | |
| Dec-91 | 60 | 8181 | 76.01420283 1 | 04.174967 0 | 0.7296782 0 | .78252551 | 97.1395838 | 105.446843 | 82.5148454 | -6.5006426 | -0.078781491 | 0.078781491 | |
| Jan-92 | 61 | 7871 | 73.13382111 | 108.61091 0. | 67335612 0 | .78265887 | 93.4427812 | 105.193513 | 82.330635A | -9,1968147 | -0 111705863 | 0 111705863 | |
| Feb-92 | 62 | 9135 | 84.87834529 1 | 10.612853 0. | 76734614 0 | 76603205 | 110.802603 | 104.940183 | 80,3875439 | 4,49080141 | 0.055864394 | 0.055864204 | |
| Mar-92 | 63 | 9260 | 86.03978954 1 | 11.713515 0. | 77018246 0 | .78354813 | 109.807919 | 104.686853 | 82.0271885 | 4.01260108 | 0.04891704 | 0.04801704 | |
| Apr-92 | 64 | 16164 | 150.188678 1 | 13.643061 1. | 32158248 0 | 91536735 | 164.074759 | 104,433524 | 95.5950381 | 54 5936308 | 0.57100340 | 0.04031/94 | |
| May-92 | 65 | 13171 | 122.379057 1 | 15.072411 1. | 06349607 0 | 92397342 | 132,448676 | 104,180194 | 96 2597303 | 26 1103260 | 0.271342400 | 0.371092819 | |
| Jun-92 | 66 | 18459 | 171.5127943 | 115.1541 1. | 48941979 1 | .12140979 1 | 152.943907 | 103,926864 | 116,544602 | 54 9681024 | 0.471640404 | 0.471640464 | |
| Jul-92 | 67 | 12918 | 120.0282939 1 | 15.624484 1. | 03808717 1 | 16736676 | 102,819695 | 103.673534 | 121 025037 | -0.9067499 | 0.4/ 1049404 | 0.0092250/1 | |
| Aug-92 | 68 | 15030 | 139.6520558 1 | 15.687202 1 | 20715216 1 | 39944592 | 9,7909627 | 103.420204 | 144 730000 | -5 0780705 | -0.000230844 | 0.006235844 | |
| Sep-92 | 69 | 13804 | 128.2606107 1 | 15.269857 1 | 11269862 1 | 29410012 | 9.1118144 | 103.166874 | 133 508202 | 5 2476507 | 0.030305205 | 0.035092186 | |
| Oct-92 | 70 | 14492 | 134.6531998 1 | 12.571822 1 | 19615369 1 | 14684654 | 17.411698 | 102 913544 | 118 026040 | 16 6374570 | 0.140077000 | 0.039305827 | |
| Nov-92 | 71 | 9999 | 92.9062479 10 | 09.307776 01 | 84995095 n | 91672553 1 | 01 345763 | 102 660214 | 94 111 1205 | 1 2040000 | 0.1408/7026 | 0.140877026 | |
| Dec-92 | 72 | 8655 | 80.4183994 10 | 05.733625 0 1 | 76057545 | 78252551 1 | 02 767767 | 102 406894 | PR 135000F | 0.2822000 | -0.012803897 | 0.012803897 | |
| Jan-93 | 73 | 8612 | 80.01886258 10 | 3.079338 0 1 | 77628421 0 | 78265887 | 102 23077 | 102.400004 | 70.0542945 | 0.2823999 | 0.003524008 | 0.003524008 | |
| Feb-93 | 74 | 8556 | 79.49853556 10 | 3.985265 0.7 | 76451732 0 | 76603205 | 03 770647 | 101 000704 | 78.0500000 | 0.06/47802 | 0.000843988 | 0.000843988 | |
| Mar-93 | 75 | 8761 | 81,40330412 10 | 5.039469 n 7 | 77497825 0 | 78354813 4 | 03.890624 | 101 646904 | 70.000003/5 | 1.43969811 | 0.018443755 | 0.018443755 | |
| | | | | | | , 0004010 [1 | 00.000024 | 101.040094 | 0.0402339 | 1.75807027 | U.U22073766 | 0.022073766 | |

| Apr-93 | 3 76 | 969 | 4 90.0723 | 2395 104 941 | 33 0 8583128 | 10 01626 | 725 09 4004 | 220 404 800 | | | | | |
|----------|------|-------|-------------|--|--------------|------------|--------------|-------------|--------------|--------------|----------------|---------------|-------------|
| May-93 | 3 77 | 112 | 10 104 158 | 3197 105 0023 | 03 0 0010622 | 0 0.31330 | 735 98.4001 | 26 101.393 | 564 92.8123 | 584 -2.74003 | 345 -0.0295223 | 02 0.02952230 | 12 |
| Jun-93 | 78 | 1118 | 38 103 953 | 9055 105 4850 | 75 0 0854944 | 4 0.92397. | 342 112.728 | 596 101.140 | 234 93.4508 | 384 10.7074 | 313 0.1145781 | 0.11457816 | 5 |
| Jul-93 | 79 | 1333 | 123 884 | 2888 105 4024 | 70 0.3034844 | 0 1.12140 | 979 92.69930 | 128 100.886 | 904 113.1355 | 62 -9.1816 | 562 -0.0811562 | 35 0.08115623 | 5 |
| Aug-93 | 80 | 1695 | 5 157 538 | 2000 105.4024 | 32 1.174342 | 1.10/300 | 576 106.1228 | 51 100.633 | 574 117.4762 | 89 6.40799 | 0.05454717 | 1 0.05454717 | 1 |
| Sep-93 | 81 | 1460 | 135 675 | 2707 105.000 | 20 1.491910 | 1.39944 | 92 112.5/19 | 08 100.380 | 244 140.4767 | 23 17.06157 | 738 0.1214548 | 1 0.12145481 | |
| Oct-93 | 82 | 1344 | 0 124 878 | 485 405 272 | 03 1.2001320 | 6 1.294100 | 12 104.8414 | 02 100.126 | 914 129.5742 | 51 6.101019 | 0.04708512 | 1 0.04708512 | 1 |
| Nov-93 | 83 | 1120 | 9 104 149 | 103.373 | 19 1.1851068 | 1 1.146846 | 54 108.8885 | 74 99.8735 | 842 114.5396 | 75 10.33881 | 01 0.09026400 | 8 0.090264008 | в |
| Dec-93 | 84 | 8601 | 0 80 7601 | 960 404 9392 | 73 0.996267 | 0.916725 | 53 113.6098 | 27 99.6202 | 543 91.3244 | 3 12.82459 | 82 0.14042899 | 8 0.140428998 | 3 |
| Jan-94 | 85 | 8594 | 70 85161 | 461 105 7045 | 12 0.7763429 | 2 0.782525 | 51 103.2070 | 97 99.3669 | 243 77.75715 | 36 3.005033 | 29 0.03864639 | 0.03864639 | |
| Feb-94 | 86 | 8930 | 13.0310 | 1461 105.7645 | 0.7549938 | 0.782658 | 87 102.0260 | 78 99.11359 | 944 77.57213 | 33 2.279481 | 32 0.02938531 | 2 0.029385312 | 2 |
| Mar-94 | 87 | 8200 | 76 07 02 | 106.8327 | 9 0.7687535 | 3 0.766032 | 05 107.2122 | 83 98.86026 | 544 75.73013 | 1 6.397914 | 3 0.08448307 | 5 0.084483075 | H |
| Apr-94 | AA | 0042 | 02 27662 | 032 402 7702 | 0.71123626 | 0.783548 | 13 97.34483 | 85 98.60693 | 44 77.26327 | 92 -0.98891 | 29 -0.01279926 | 1 0.012799261 | - |
| May-94 | 80 | 8808 | 92.37062 | 933 106.7762 | 5 0.86514238 | 0.915367 | 35 100.91754 | 18 98.35360 | 45 90.029678 | 37 2.346950 | 62 0.02606863 | 0.026068633 | - |
| Jun-94 | | 1227 | 81.84000 | 1/15 104.74136 | 5 0.78135326 | 0.923973 | 42 88.573983 | 38 98.10027 | 45 90.642046 | 6 -8.802039 | -0.09710768 | 7 0.097107687 | |
| JuL94 | | 122/2 | 114.025 | 95 103.27058 | 9 1.10414738 | 1.121409 | 79 101.68089 | 97.84694 | 46 109.72652 | 4.299428 | 6 0.03918313 | 0.03918313 | |
| Aug 94 | | 16/32 | 155.4662 | 806 102.21638 | 5 1.52095264 | 1.1673667 | 76 133.17689 | 97.59361 | 46 113.92754 | 2 41.538738 | 39 0,364606646 | 0 364606646 | -1 |
| Sec.04 | 92 | 16315 | 151.5917 | 026 101.03287 | 3 1.50041959 | 1.3994459 | 2 108.32265 | 8 97.34028 | 46 136.22246 | 4 15.369238 | 0.11282455 | 0.11282455 | -1 |
| Oct 04 | 93 | 16299 | 151.4430 | 3/8 99.940728 | 5 1.51532854 | 1.2941001 | 2 117.02575 | 1 97.08695 | 47 125.64023 | 9 25.802798 | 4 0.205370497 | 0 205370497 | -1 |
| Nev 04 | | 10540 | 97.93297 | 859 98.768831 | 3 0.99153728 | 1.1468465 | 4 85.393271 | 8 96.83362 | 47 111.05330 | 8 -13.12032 | 9 -0.11814442 | 0 118144425 | -1 |
| Dec 04 | 95 | 8853 | 82.25812 | 708 98.032088 | 5 0.8390939 | 0.9167255 | 3 89.730377 | 96.58029 | 48 88.537621 | 5 -6.279494 | 4 -0.070924589 | 0.070924590 | -4 |
| Uec-94 | 96 | 7249 | 67.354474 | 455 98.473824 | 5 0.68398353 | 0.7825255 | 1 86.073199 | 2 96.32696 | 18 75.378307 | 7 -8.023833 | 2 -0.10644751 | 0.10644764 | -1 |
| Cet-02 | 97 | 7314 | 67.958425 | 556 97.247339 | 3 0.69882041 | 0.7826588 | 7 86.830199 | 7 96.073634 | 8 75.192882 | -7.234456 | 5 -0.096711085 | 0.096211095 | -1 |
| Feb-95 | 98 | 7062 | 65.616953 | 397 95.109120 | 5 0.68991232 | 0.7660320 | 5 85.658235 | 8 95.820304 | 9 73.401424 | 5 -7.784470 | 6 -0 1060534 | 0.030211305 | - |
| Mar-95 | 99 | 7165 | 66.573984 | 02 94.137765 | 0.70719741 | 0.7835481 | 3 84.964766 | 5 95.566974 | 9 74.881324 | -8 307340 | 6 -0 110940086 | 0.1000534 | - |
| Apr-95 | 100 | 7959 | 73.951477 | 85 94.299981 | 0.78421519 | 0.9153673 | 5 80.7888522 | 2 95.31364 | 5 87.246999 | -13 29552 | 1 -0 152389438 | 0.110340006 | -1 |
| May-95 | 101 | 8888 | 82.583331 | 47 95.6805511 | 0.86311513 | 0.9239734 | 2 89.3784705 | 95.06031 | 5 87.8332048 | -5 249873 | 3 -0.059770941 | 0.152369438 | -1 |
| Jun-95 | 102 | 13333 | 123.88428 | 88 96.5315025 | 1.28335606 | 1.12140979 | 9 110.471917 | 94.80698 | 5 106.317481 | 17 5668073 | 7 0 165220721 | 0.059770941 | -{ |
| JUF95 | 103 | 12503 | 116.17229 | 99 96.5074994 | 1.20376447 | 1.16736678 | 99.5165383 | 94.553655 | 1 110.378794 | 5 79350493 | 0.100223721 | 0.163229721 | 4 |
| Aug-95 | 104 | 15021 | 139.56843 | 18 96.3212811 | 1.44898853 | 1.39944592 | 2 99.7312076 | 94.300325 | 1 131.968205 | 7.60022636 | 0.057591344 | 0.052487482 | 4 |
| Sep-95 | 105 | 15084 | 140.15379 | 97 96.5392455 | 1.45178056 | 1.29410012 | 108.30213 | 94.046995 | 1 121.706227 | 18,4475723 | 0 151574596 | 0.151574596 | 4 |
| Oct-95 | 106 | 12174 | 113.11537 | 77 96.605835 | 1.17089592 | 1.14684654 | 98.6316594 | 93.793665 | 2 107.566941 | 5 54843697 | 0.051581247 | 0.151574596 | - |
| N0V-95 | 107 | 10785 | 100.20940 | 93 97.0800914 | 1.03223439 | 0.91672553 | 109.312337 | 93.540335 | 2 85.750813 | 14,4585963 | 0 168611769 | 0.168611760 | 4 |
| Dec-95 | 108 | 7515 | 69.826027 | 9 97.6240344 | 0.71525448 | 0.78252551 | 89.2316309 | 93.287005 | 3 72.9994618 | -3.1734339 | -0.043472018 | 0.043472018 | 4 |
| Jan-96 | 109 | 6986 | 64.9107958 | 37 97.7715378 | 0.66390278 | 0.78265887 | 82.9362558 | 93.0336753 | 72.8136307 | -7.9028349 | -0 108535103 | 0.108535102 | ł |
| Feb-96 | 110 | 6909 | 64.1953462 | 21 99.2291504 | 0.6469404 | 0.76603205 | 83.8024286 | 92.7803453 | 3 71.0727182 | -6 877372 | -0.096765287 | 0.006765297 | ł |
| Mar-96 | 111 | 7881 | 73.2267366 | 5 100.222572 | 0.73064116 | 0.78354813 | 93.455314 | 92.5270154 | 72.49937 | 0.72736662 | 0.01003273 | 0.030705287 | 1 |
| Apr-96 | 112 | 7415 | 68.8968725 | 1 100.449054 | 0.68588871 | 0.91536735 | 75.2669103 | 92.2736854 | 84,4643193 | -15 567447 | -0 184307965 | 0.01003273 | |
| May-96 | 113 | 10657 | 99.020090 | 4 100.377819 | 0.98647382 | 0.92397342 | 107.167682 | 92.0203555 | 85.024363 | 13 9957274 | 0 164608436 | 0.164508430 | |
| Jun-96 | 114 | 12969 | 120.502163 | 1 99.2686395 | 1.21389961 | 1.12140979 | 107.455958 | 91.7670255 | 102,908441 | 17 5937224 | 0.170964814 | 0.104000430 | |
| - JUE 00 | 115 | 13248 | 123.094506 | 7 | | 1.16736676 | 105.446301 | 91.5136955 | 106.830046 | 16.2644603 | 0.152246122 | 0 157246122 | |
| Aug-96 | 116 | 18041 | 167.628924 | 7 | | 1.39944592 | 119.782352 | 91.2603656 | 127.713946 | 39.9149782 | 0.312534217 | 0.312534217 | |
| Oct-96 | 11/ | 14630 | 135.935434 | 2 | | 1.29410012 | 105.04244 | 91.0070356 | 117.772215 | 18.1632188 | 0.154223292 | 0.154223292 | |
| Nov-96 | 118 | 13213 | 122.769302 | 3 | 1 | 1.14684654 | 107.049459 | 90.7537057 | 104.080574 | 18.6887286 | 0.1795602 | 0.1795602 | |
| Dec-96 | 119 | 9562 | 88.8458388 | 3 | | 0.91672553 | 96.9165103 | 90.5003757 | 82.9640045 | 5.88183433 | 0.07089627 | 0.07089622 | |
| Jan-97 | 120 | 58/3 | 54.5692963 | 2 | C | .78252551 | 69.7348461 | 90.2470457 | 70.6206159 | -16.05132 | -0.227289431 | 0.227289431 | |
| Eat or | 121 | 4//9 | 44.40433631 | <u>' </u> | 0 | .78265887 | | 89.9937158 | 70.4343795 | | Sume | 47.5474252 | 5 445+HOMAN |
| Pep-9/ | 122 | 8302 | 77.13848086 | <u>i</u> T | 0 | 76603205 | | 89.7403858 | 68.7440117 | | | | |
| Mar-97 | 123 | 8144 | 75.67041533 | ³ | 0 | .78354813 | | 89.4870559 | 70.1174154 | | | | |
| Mp1-97 | 124 | 10111 | 93.94690195 | š | 0 | .91536735 | | 89.2337259 | 81.6816396 | | | | |
| May-9/ | 125 | 12841 | 119.3128442 | · | 0 | .92397342 | | 88.9803959 | 82.2155212 | | | | |
| Jun-9/ | 126 | 16888 | 156.915763 | | 1. | .12140979 | | 88.727066 | 99.4994003 | | | | |
| JU+9/ | 127 | 13395 | 124.4603651 | | 1. | 16736676 | | 88.473736 | 103.281299 | | | | |
| Aug-9/ | 128 | | 0 | | 1. | 39944592 | | 88.2204061 | 123.459688 | | | | |
| 00007 | 129 | | 0 | - I | 1. | 29410012 | | 87.9670761 | 113.838203 | | | | |
| Nov 07 | 130 | | 0 | I I | 1. | 14684654 | | 37.7137461 | 100.594207 | | | | |
| Dec 07 | 137 | | 0 | I | 0. | 91672553 | | 37.4604162 | 80.177196 | | | | |
| Dec-9/ | 132 | | 0 | L T | 0. | 78252551 | 1 | 37,2070862 | 68 24177 | | | | |

| | | | | | Sees t | nality entre | ulations | | | | | 1. |
|--|----------|-------------|-------------|------------|--------------|----------------------|------------|------------|---|------------|-------------|-------------|
| Monte/Year | 87 | .88 | 85 | 90 | 18880 (1988) | 10000 H 20000 | | | 1 | | | |
| Jan | | 0.88474062 | 0.817881288 | 0.84195267 | 1.8963674 | 0.67335643 | 0 77678421 | 0 7540028 | 0.0000044 | 0 D | Med Avg | AdiAva |
| Feb | | 0.66972624 | 0.831482135 | 0.81676529 | 0.85397146 | 0 76734614 | 0 76451732 | 0.7043330 | 0.89662041 | 0.66390276 | 0.777986475 | 0.782658865 |
| Mat | | 0.6368536 | 0.815343399 | 0.85060189 | 0.80320689 | 0 77018246 | 0.77407935 | 0.76675555 | 0.68991232 | 0.8459404 | 0.761458921 | 0.76603205 |
| Apr | | 102075591 | 0 956388735 | 0 97954276 | 0.000220000 | 0.77010240 | 0.77497825 | 9.79123626 | 2270719741 | 0.73064116 | 0.778870433 | 0.783548132 |
| May | | 0 77751308 | 0.893542697 | 0.04044622 | 0.0301200 | 02020235 | 0.85831286 | 0.86514238 | 0.75424545 | 0.68586873 | 0.909902709 | 0.915367354 |
| an a | | 1 14370513 | 1.040501459 | 0.94011525 | 0.90904013 | 1.06549607 | 0.98996224 | 0.78136325 | 0.86311513 | 0.98647382 | 0.918457402 | 0.923973425 |
| | 34054637 | 1 368620201 | 1.049301468 | | 1.06223187 | 146941979 | 0.98546448 | 1.10414738 | 1.28335605 | 1.21389961 | 1.114715092 | 1.121409789 |
| 408 1 | 41280606 | 4.275004 | 1.017164699 | 3:01058201 | 0.95468555 | 1.03808717 | 1.1743429 | 1.52095264 | 1.20376447 | | 1.160397706 | 1,167366761 |
| | 41205055 | 1.375604 | 2.141188243 | 1.35768852 | 1.3600789 | 4-20719236 | 1.4919102 | 1.50041859 | 1.44898853 | | 1.39109138 | 1 399445922 |
| | 162/582/ | 1.34488478 | 1.316970395 | 1.22218541 | 1.30112628 | 1.(1269862 | 1.28613266 | 1-51532854 | 3,4547,056 | | 1,286374478 | 1 294100117 |
| 1 | 14169306 | 0.94774753 | 1.143299517 | 1.16887659 | 1.0334276 | 1 12619365 | 1.18510681 | 0.98153728 | 1.17089592 | | 1 139999993 | 1 146846544 |
| NOX 0.8 | 83432343 | 0.89865713 | 0.951304941 | 0.9074922 | 0.9597157 | 0.64995095 | 0.696267 | 0.8390939 | 100000000000000000000000000000000000000 | | 0.011252772 | 0.040725522 |
| Dec | 85123498 | 0.74663461 | 0.877723624 | 0.87603843 | 0.7296782 | 0.76057545 | 0.77634292 | 0.58398353 | 0.24575448 | | 0.311232112 | 0.916/25526 |
| | | | | | | | | | | | 0.777653921 | 0.782525515 |
| | | | | | | | | | | | 01.52636328 | |







APPENDIX E. WATER SAVINGS UNDER WA CONCEPT

| | | Total Costs Savings Per Month | | (stuenen hau start | (\$4,210.76) | (\$4.246.23) | (4650 13) | (71.000t) | (\$1,802.34) | \$898.79 | | \$0'400.16 | \$2 524 02 | 20.120,24 | \$8,712.04 | \$9 606 53 | | \$2,/55.11 | \$3,235.72 | (# 4 750 40) | (94,732.19) | \$1,552.88 | |
|-----------------|---|-------------------------------|--------------------------|--------------------|---------------|--------------|--------------|-------------|--------------|----------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|------------|--------------|-------------------|---|--|
| 1 | | Cast saving per month | Per berson her month (4) | | (oc.1¢) | (\$1.59) | (\$0.24) | (40.67) | (10:04) | \$0.34 | \$2.47 | ¥5:72 | \$0.94 | | 07.C¢ | \$3.63 | \$1.03 | 00'I A | \$1.21 | (\$1.78) | (c) :: (A) | 3 058 | |
| under WA concep | | Cost Savings | Pei person per day (5) | (\$0.0E) | (co.o4) | (\$0.06) | (\$0.01) | (\$0.02) | (77.0.4) | \$0.01 | \$0.08 | | \$0.03 | ¢D 11 | +0. | \$0.12 | \$0.03 | | \$U.U4 | (\$0.06) | er re | 1 2006 I | |
| Water Costs | 000000000000000000000000000000000000000 | astructure Manager | (LMV) | 1792 411433 | 47.44 0001.40 | 141.033345 | 1961.486787 | 1836.131222 | 1600 000510 | 9/00000000 | 3231.17086 | | 3195.044541 | 3834 9087 | | 3831.264718 | 3081.108396 | 2708 388064 | 1000000017 | 1871.256779 | 36.14 12134.9 | 0-4-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0 | |
| | 00.10000000000000000000000000000000000 | | (Daily) | -14.51360047 | 16 2030060 | 000000701- | -2.240829533 | -6.41934837 | 3 007076407 | 704070 10010 | 23.02683593 | 0 00070001 | 0.0391/0UD | 30.0285659 | | 34.53594304 | 9.530732331 | 11 5245925 | 07001 7011 | -16.37978356 | 5 SURFACE | | |
| | | | (Daily) | 59.7470478 | ER DERESTA | 1 0000000 | 65.3828929 | 61.2043741 | 87 7767850 | 000 10 1 1: 10 | 107.705695 | 105 E01 40E | 100-100-001 | 127.83029 | - 00001 LOV | 121.108824 | 102.703613 | 90.279602 | | 62.375226 | 888 110 E D 210 E | | |
| | MADDAD | | (thed) | 74.2606482 | 74 2606482 | | 67.6237224 | 67.6237224 | 84.6788594 | | 84.6788594 | 97 8017241 | 147100'10 | 97.8017241 | 03 4770000 | 23.17 200US | 93.1728809 | 78.7550095 | | /8./550095 | 82 7154741 | | |
| | and states | | | Jan-97 | Feb-97 | | Mar-97 | Apr-97 | Mav-97 | | 79-nuc | 79-Jul. | 10 100 | Aug-97 | Cen 07 | ic-dec | Oct-97 | 76-voN | 10 10 | Dec-97 | Average | | |

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Water chages are calculated by determining the baseline usage rate for Montery city and subtracting LMV usage The difference is mulplied by \$2.6201 per 100 cubic feet or \$.0035 per gallon of water delivered

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