Section 3

Water Demand Projections

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This section discusses existing and projected water demands utilized in the water system model analyis and for evaluation of reservoir and pumping facility capacities. Maximum day and peak hour demand peaking factors were developed based upon existing demand information, as developed using CCSD data provided in 2001.

3.1 Development of Water Demand

Demand data based on meter records from January 1999 to October 2000 were incorporated into GIS format by the Geographic Planning Collaborative (GPC) and utilized for hydraulic analyses. Methodology used was consistent with the "Future Water Demand Forecast Level Analysis Model Logic" paper presented by GPC to CCSD. In that paper, a design for the required model was made and the needed elements and links were identified.

A Development Scenario Table (DST) was created that combines the following data links to establish existing demand and various growth projections using the calculated per capita usage. A script was written and applied (Calc.AnnualConsumRate) to calculate the annual consumption rate of water for the units that have an existing service. The script sums the units used by each customer number in hist99_00.dbf and divide that sum by the number of occurrence of that customer number.

A spatial link was established between the DST and the customer accounts table (file "cust_oct_ 2000.dbf") based on the APN field. Another spatial link was made between the customer table and the table containing the history of water consumption for years 1999-2000 (file "hist99_00.dbf"). This later link was based on the Customer field.

The APN was then linked to the nearest model node and demands assigned to that node by a geoprocessing command in the GIS software which assigns closest parcel demands to the nearest node. The data was then imported into the model.

The CCSD also provided water meter records for the period of January thru December 2001. This total metered consumption data was provided in bi-monthly increments. Well production data were also supplied for the four supply wells, for the period of January 2001 through December 2001. These data were used to develop demand patterns and peaking factors to adjust 1999 values to reflect 2001 data as discussed further below.

3.2 Water Demand Conditions

Demand criteria were developed for each of the following conditions:

- Average Daily Demand
- Average Daily Demand – Summer Conditions
- Average Daily Demand – Winter Conditions

- Maximum Daily Demand – Winter Conditions (Existing and Future)
- Maximum Daily Demand – Summer Conditions (Existing and Future)
- Peak Hour Demand – Winter Conditions (Existing)
- Peak Hour Demand – Summer Conditions (Existing and Future)

3.3 Average Demands – Existing Conditions

1999 Billed vs. Production: The 1999 data provided by the CCSD represented total metered consumption and was originally imported into the hydraulic model. However, there are unaccounted for system losses that occur leading to a difference between the total value of produced water, versus that which was actually billed. These differences can be associated with meters not working properly as well as distribution system losses. The 1999 data provided by the CCSD that was linked to the GIS system represented metered consumption and totaled 388 gpm (approximately 625 AFA). From the December 8, 2000 Baseline Water Supply Analysis (Task 2 of the Water Master Plan) report, there were 3,586 residential, and 210 commercial connections in 1999. This same report noted a total production value (i.e., water pumped into the distribution system) at 779 AFA for 1999. Of this total production, 578 AFA was attributed to residential consumption and 201 AFA was for commercial consumption.

1999 Production AFA: Based on 1999 production, the residential consumption per residential connection averaged 0.161 AFA (about 11.7 ccf/bi-monthly billing period) whereas commercial consumption per commercial connection averaged 0.959 AFA (about 69.6 ccf/bi-monthly billing period). For both residential and commercial connections combined, the water produced per composite connection[5] equated to **0.205 AFA** (about 14.9 ccf/bi-monthly billing period when using a total production of 779 AFA divided by 3,796 total connections).

Adjustment to 1999 Production: The 1999 total production of 779 AFA equates to approximately 480 gpm. For long-term planning purposes, the total demand resulting from summing the modeling nodes (i.e., the old GIS-linked metered data) was first adjusted to match production values by a factor of 1.24 (480 gpm/388 gpm). This approach accounts for the difference in billed versus produced water. This approach also assumes the system losses currently experienced between billed and produced data will be similar in the future. Additionally, the cause of the loss could be self-correcting as defective meters (that normally read low) are eventually replaced and the billed metering totals get closer to the amount of water actually produced.

Adjustment of 1999 Production to Reflect 2003: In 2003, the District had 3,758 residential connections and 219 commercial connections, or a total of 3,977 connections. Using the 1999 combined use of .205 AFA per composite connection, the total baseline production amount for 2003 is approximately 815 AF (505 gpm). The resulting 505 gpm value was used in the hydraulic model in developing an adjusted 2003 average day demand. The 505 gpm value was subsequently adjusted to account for average and maximum day summer and winter demands within the hydraulic model.

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[5] "Composite connection" refers to an overall average that results by dividing total production by the number of residential and commercial connections.

3.4 Seasonal Demand Factors

Due to fluctuations in water consumption over different periods of the year, a seasonal demand pattern was developed. To establish a demand pattern, the summer season was defined to be the highest consecutive 6-month average water usage and the winter season was defined to be the lowest consecutive 6-month average water usage. 2001 production data from each of the CCSD's wells were averaged for each month of the year. These monthly averages were then averaged for each consecutive 6-month period within the year (January through June, February through July, March through August, etc.). The period from November through April had the lowest 6-month average and was defined as the winter season. The average daily demand for the winter season is 413 gpm. The period from May through October had the highest 6-month average and was defined as the summer season. The average daily demand for the summer season was 575 gpm. The calculations used to determine the summer and winter seasons are shown in Table 3-1.

TABLE 3-1
DETERMINATION OF SUMMER AND WINTER SEASONS

		Average for Six Month Period											
Date	**Avg Q. (gpm)[(a]**	**Aug-Jan Q (gpm)**	**Sep-Feb Q (gpm)**	**Oct-Mar Q (gpm)**	**Nov-Apr Q (gpm)**	**Dec-May Q (gpm)**	**Jan-Jun Q (gpm)**	**Feb-Jul Q (gpm)**	**Mar-Aug Q (gpm)**	**Apr-Sept Q (gpm)**	**May-Oct Q (gpm)**	**Jun-Nov Q (gpm)**	**Jul-Dec Q (gpm)**
January	409.9	488.8											
February	388.3		451.0										
March	408.2			425.4									
April	457.8				412.8								
May	535.1					431.3							
June	584.7						464.0						
July	620.5							499.1					
August	615.2								536.9				
September	562.2									562.6			
October	533.5										575.2		
November	424.1											556.7	
December	388.2												523.9
Total Avg.	**495.0**												

Note: (a) Based on well production data from Cambria Community Services District Water Production Report dated 2001.

To develop summer and winter demands from average demands, seasonal demand factors were developed using the following methodology:

Summer Adjustment Factor = Total Average Monthly Summer Demand (May through October), 575 gpm, divided by the Total Monthly Average Demand, 495 gpm = 1.16.

Winter Adjustment Factor = Total Average Monthly Winter Demand (November through April), 413 gpm, divided by the Total Monthly Average Demand, 495 gpm = 0.83.

Accordingly, the summer and winter demand factors were determined to be 1.16 and 0.83, respectively. These factors were applied to the 2001 average demands to obtain existing demands for summer and winter seasons. The maximum day and peak hour factors were then applied to these demands to obtain maximum day and peak hour demands for summer and winter conditions. These peaking factors were developed as explained below.

3.5 Peaking Factors

Daily well production records for January through December 2001 were used to determine maximum day peaking factors. These records, supplied by CCSD, are presented as Appendix A. The average daily water production, considered as the average daily demand (ADD), for 2001 was calculated per month and compared to the maximum day demand (MDD) within the highest production month over this period of use. The total monthly production is defined as the "net production", after subtracting local losses at the wellsite and is further detailed in Appendix A.

Table 3-2 provides the production data summarized as average daily demand per month in ac-ft perday.

TABLE 3-2
AVERAGE WATER USAGE BY MONTH (2001)

Date	Total Net Q (ac-ft)[a]	Total Avg. Daily Q (ac-ft)[a]
January	56.16	1.84
February	48.05	1.75
March	55.92	1.84
April	60.68	2.05
May	73.30	2.39
June	77.51	2.62
July (Max.Month)	85.01	2.83
August	84.28	2.88
September	74.53	2.64
October	73.08	2.50
November	56.22	1.92
December	53.18	1.74
Avg. Daily Demand (ADD)		**2.25**

Note: (a) Based upon CCSD Water Well Production Data for 2001.

The average daily demand (ADD) for 2001 is 2.25 ac-ft as shown above. The maximum day demand was assumed as the highest production day within the highest production month. As shown in Table 3-2 above, July of 2001 represented the highest production month in 2001. The highest production day within this month is 3.24 ac-ft (see Appendix B), occuring on July 4th, and is considered the maximum day demand (MDD). Therefore, the MDD peaking factor was determined to be 1.44 or the ratio of the MDD divided by ADD(3.24/2.25). Based on District records, staff input, and Master Planned level conservatism, a MDD peaking factor of **1.5** is recommended.

Because there were not sufficient records available to evaluate peak hour demands, Health Services' Waterworks Standards and conversations with CCSD staff were used as reference sources for this peaking factor. Section 64554 Source Capacity of the Department of Health Services' proposed Waterworks Standards recommends that a minimum peak hour factor of 1.5 be applied to maximum day peaking[6]. This recommendation coupled with CCSD system considerations, helped determine an assumed, conservative peak hour factor of 2.0. This factor applied to the recommended MDD peaking factor of 1.5 created a Peak Hour factor of **3.0** as summarized in Table 3-4.

TABLE 3-4
MAXIMUM DAY AND PEAK HOUR FACTORS

Condition	Peaking Factor
Maximum Day	1.5
Peak Hour	3.0

Maximum Day and Peak Hour existing and future water demands are summarized in Appendix A for both summer and winter conditions.

3.6 Future Demands

During its July 24, 2003 Board meeting, staff was requested to plan for up to 18 ccf/bi-monthly billing period (which equals 0.248 AFA) for a typical residential connection. This directive was based in part on a desire to provide some relief to existing customers from current water conserving measures that have evolved from years of shortages. When compared to the December 8, 2000 Baseline Water Supply Analysis report data, this represents an increase of approximately 50 percent for the residential component.

Because the District also has a Coastal Development Permit[7] condition requiring at least 20-percent of its permitted capacity permit be reserved for "public commercial or recreational uses," further checking of the actual 1999 production total versus a hypothetical production total was considered. For example, the actual 1999 production of 779 AFA results in approximately 25-percent of the total being attributed to the CCSD's "commercial" accounts category. Using the 18-ccf per bi-monthly demand per residential connection, and no increase in the commercial use, results in a hypothetical 1999 production of 1,090 AFA. However, this approach results in only 18-percent of the total production being attributable to the commercial category. This review further begged the question on what was actually meant by the old permit condition, "public commercial or recreational uses."

If one assumes the 20-percent permit condition applies to all commercial customers, the commercial component from the hypothetical 1999 production exercise would need to be increased to at least 222 AFA, with a total production of 1,111 AFA. This equates to an overall increase of 43-percent over the actual 1999 production. From District staff's review of the Coastal Act, the intent of the old permit condition appears directed towards enhancing visitor-serving recreation of the coastline. If so, this would indicate that the majority of the District's

[6] State of California, Waterworks Standards (Proposed). Article 1, Section 64554 (b)(2)(D). Dated August 16, 2002.

[7] May 29, 1981 Coastal Development Permit #428-10; issued by the California Coastal Commission to the Cambria Community Services District. Condition No. 5, Reservation of Capacity for Public Commercial and Recreation Uses.

commercial accounts serve such purposes. However, there may be a few minor commercial uses that are deemed to be outside of the 1981 Coastal Permit definition. Additionally, there are residential accounts that serve as commercial vacation rentals and could also be construed as meeting the Coastal Commission's 20-percent permit category. For these reasons, an across-the-board increase of 50-percent to both the residential and commercial uses was used in forecasting future demand scenarios. This also keeps the ratio between residential and commercial uses at its historic level (approximately 25-percent commercial). When applied to the 1999 production, the 50-percent increase results in a hypothetical 1999 production of 1,168 AFA (i.e., 1,168 AFA versus 1,111 AFA). This value also indicates that the overall sensitivity of the total production to an increase in the commercial use category is relatively low. Therefore, a 50-percent increase was applied to both the residential and commercial categories in developing a response to the July 24, 2003 Board meeting directive. (Note: For further discussion on percent increases, also see the Task 4 Water Master Plan Report, "Assessment of Long-Term Supply Alternatives," Sections 2.3 and 2.4.)

In addition to considering future quality of life percent increases, scenarios with 1.66 and 2.21 persons per residential unit were analyzed. From the 2000 census, the average occupancy rate in Cambria is 1.66 persons per household. This relatively low occupancy rate is due to the high vacancy rate of the area. The 2.21 persons per household value was based on the homes that were actually occupied during the 2000 census. To estimate the demand associated with 2.21 persons per household, a simple ratio was applied to the residential demand of 2.21/1.66, or 1.33. From the 1999 data used in the Baseline report, the residential unit demand would increase from about .161 AFA per residential connection to .214 AFA. At this residential density, the combined residential and commercial use equates to .255 AFA per composite connection. Based on 3,977 connections for 2003, a total production of 1,015 AFA results, or about 629 gpm.

As explained above, the 1999 data developed a 0.205 AFA composite connection demand for both residential and commercial connections. This value is based on approximately 25% commercial production as well as a residential demand based on about 1.66 persons per household. Additionally, the adjusted 0.255 AFA composite connection demand keeps the same 25% commercial production intact while adjusting the residential demand for a 33% increase in persons per household, to 2.21.

As each of these base composite connection demand factors (0.205 AFA for the 1.66 persons per household density and 0.255 AFA for the 2.21 persons per household density), an additional correction factor must be applied when multiplying the composite connection factor by the number of residential housing units. Using the District's 2003 data of 3,977 total connections divided by 3,758 residential connections, generates a correction factor of 1.058 (5.8%) to apply to the 0.205 AFA composite demand for 1.66 persons per household and the 0.255 AFA composite demand for 2.21 persons per household. This correction factor ensures the total demand projection will account for both residential and commercial connections while multipliying by composite demands times the total number of proposed housing units. Therefore, the composite base AFA factor for use in future projections was corrected to 0.217 AFA (1.058 times 0.205 AFA) for 1.66 persons per household, and 0.270 AFA (1.058 times 0.255 AFA) for 2.21 persons per household. This approach also maintains the commercial demand at the historical level of approximately 25% of total water production. The corrected composite demand factors of 0.217 AFA and 0.270 AFA also formed the basis for developing baseline demand projections in each of the four-buildout scenarios