WATER PLANNING AREA #3 – LOS OSOS/MORRO BAY

Water Planning Area 3 (WPA 3) encompasses Morro Bay and those portions of the community of Los Osos that are within the Chorro Creek watershed. WPA 3 extends along Highway 1 (Cuesta College, Camp SLO, Dairy Creek Golf Course, and CMC). Three water purveyors serve the Los Osos area: County Service Area #9, Southern California Water Company and S&T Mutual Water Company.

DEMAND

The development of demands for the San Luis Obispo (SLO) MWP Update involved collection and analysis of four types of existing data: 1) urban demand; 2) agricultural demand; 3) rural demand; and 4) environmental demand. Following the review of existing plans and data, existing demands for each of the four categories were prepared for each of the 12 Water Planning Areas (WPAs). Next, data regarding growth and future water use was analyzed to develop a preferred approach for the development of future water demands. These future demands were then prepared and projected by the same four demand categories for each of the WPAs.

The total existing and future demands for WPA 3 are listed in Table 1. A discussion of demands by each category follows.

Table 1
WPA 3 Demand by Category [a]

Category of Demand	Existing Demand (ac-ft/yr)	Projected Demand (ac-ft/yr)
Urban	3,700	5,170 – 6,930
Agricultural	6,880	5,290 – 7,490
Rural	620	780
Environmental	NA	NA
Subtotal	**11,200**	**11,240 – 15,200**

a. All figures have been rounded to the nearest 10's.

Urban Demand

This section documents existing and projected urban water demands for WPA 3. The existing and projected figures have been prepared upon review of the water master plan of the city of Morro Bay and the County growth figures and historical per capita demand levels for the community of Los Osos. Table 2 summarizes the current and projected urban water demands for WPA 3.

Table 2
WPA 3 Urban Water Demands [a]

Existing Demand (AF/yr)	2020 Demand (AF/yr)	Buildout [b] Demand (AF/yr)
3,700	5,170	6,930

a. All figures have been rounded to the nearest 10's.

Many incorporated cities within the County and/or purveyors to those cities have prepared water master plans for planning purposes. The City of Morro Bay recently completed a 1997 Water Master Plan Update, which details historical water production for the period 1960-1996.

Urban water demand in Morro Bay in 1995 was 1,445 AF. The city's population was estimated at 9,988 and the gross per capita use was estimated at 129 gallons per capita per day (gpcd). Since the drought, per capita demand has ranged between 124 and 134 gpcd. Projected demand within the Water Master Plan Update was developed based upon examination of the vacant lot and general plan land use information and an ultimate buildout population of 14,760. Projected average demand was calculated at approximately 2,330 AF annually, which equates to a per capita of 141 gpcd. Table 3 includes the existing and projected water demand for the city of Morro Bay.

Table 3
Summary of Water Demands for the City of Morro Bay

Existing Demand (AF)	2020 Demand (AF)	BuildoutDemand (AF)
1,445	2,327	2,463

In order to determine additional existing and future urban water demand for WPA 3, an average water production figure of 2,256 AF was calculated from the County's *Annual Resource Summary Report* for the period 1993 to 1997 for the unincorporated community of Los Osos. This average production figure was then used in combination with a 1995 population figure (see Table 3) to determine an existing per capita water use rate of 139 gpcd.

In order to determine future water demands for Los Osos, the existing per capita water value was applied to the projected 2020 and buildout population figures obtained from the County. Projected population figures are shown in Table 4 and the future water demands are reflected in Table 5.

Although per capita use is expected to go down in the future, the number of people per households is generally expected to increase. Therefore, the same per capita value was maintained under existing and future scenarios. A discussion on the uncertainty of per capita water use is discussed in Chapter 2.

Table 4
Existing and Projected Population Figures for Los Osos

1990[1]	1995[2]	2020[3]	Buildout[4]
14,369	14,444	18,275	28,688

Source: San Luis Obispo County Planning Department.

1. Population numbers are from the U.S. Census of Population and Housing. Avila Beach and Santa Margarita were developed by County Planning Department.
2. 1995 figures based upon the California Department of Finance and County Planning, and include group quarters.
3. 2020 figures have been projected by the County.
4. Buildout figures were obtained from the County

Table 5
Summary of Urban Water Demands for Los Osos
(acre-feet/year)

ExistingDemand	2020 Demand	Buildout Demand
2,256	2,845	4,466

Agricultural Demand

This section documents existing and projected Gross Irrigation Water Requirements (GIWRs) for WPA 3. The existing and projected demand figures relied upon published data and accepted methods, along with information gathered from extension agents, consultants, growers, and irrigation specialists. Tables 6 and 7 summarize the current and projected agricultural water demands for WPA 3. . An increase in Irrigation Efficiency, particularly for citrus and deciduous crops, accounts for the reduction in projected GIWR.

Table 6
Existing GIWR for WPA 3 (AF/Yr)

Low	High	Average
5,659	8,104	6,882

Table 7
Projected GIWR for WPA 3 (AF/Yr).

Low	High	Average
5,289	7,490	6,389

Procedures and Concepts

Estimating GIWR for local conditions can be characterized by the following general formula:

$$\text{GIWR} = \frac{\text{Crop ET} - \text{Contrib. from rain or shallow water table}}{(1 - \text{Leaching Requirement}) \times \frac{\text{Irrigation Efficiency}}{100}} + \text{Climate Control}$$

This analysis must be completed for each crop group, acreage, and weather pattern to calculate total GIWR (in AF) by WPA (WPA). The elements of the formula and the corresponding values associated with WPA1 are described in the following sections.

Cropping Patterns
Table 8 summarizes estimates of irrigated cropping acreage for WPA 3.

Table 8
Estimated cropping acreage for WPA 3

Nursery	Permanent		Veg.	Total
	Citrus	Decid.		
50	450	0	4,500	5,000

Source: Estimated from annual crop report, county GIS records and pesticide use records.

Crop Evapotranspiration

Several UC Cooperative Extension Leaflets describe estimating crop evapotranspiration (ETc) where:

ETc = ETo x Kc

Etc is estimated by multiplying the weather factor (ETo) with the crop coefficient (Kc). ETo values for the Morro Bay climate group (39.9 in/yr)were assigned to WPA 3 and Kc values are specific to the crop groupings (see Chapter 2). Yearly ETc totals for WPA 3 are summarized in Table 9.

Table 9
Yearly crop evapotranspiration (ft) for each crop group in WPA 3

Nursery	Permanent		Vegetable
	Citrus	Decid.	
1.7	1.9	NA	1.3

Effective Rainfall

WPA 3 was assigned the San Luis Obispo rainfall group (21.9 in/yr) for the purpose of estimating effective rainfall (See chapter 2). Ranges of percentage of effective precipitation were applied to the crop groupings in WPA 3 and are listed in Table 10. Higher percentages were assigned to the deeper rooted crops according to their larger rootzone water holding capacity.

Table 10
Assigned ranges of typical effective precipitation for crop groups in WPA 3

Crop Group	Effective Precipitation Range (%) [1]	
	Low	High
Nursery	30	50
Permanent		
Citrus	40	60
Vegetable [2]	15	25

1. As a percentage of total annual rainfall.
2. 2x adjustment factor for multiple cropping.

Frost Protection

No crops in WPA 3 require frost protection.

Leaching Requirements

The amount of extra irrigation water that needs to be applied to satisfy the leaching requirement for a particular crop depends on the salt tolerance of the crop and the irrigation water quality. Ground water quality in San Luis Obispo County is typically adequate for crop production and does not necessitate additional *irrigation* water applied for leaching since it is typically satisfied by normal rainfall. Chipping et al. 1993 reports that of the wells tested in the Paso Robles Ground Water Basin Study, most of the wells tested have EC levels < 1.0 dS/m. Given these water qualities and salt tolerances typical with central coast crops, leaching requirements would be satisfied by rainfall.

Irrigation Efficiencies

Irrigation efficiency can be expressed by the following relationship:

Irrigation Efficiency = Distribution Uniformity x (1 – Losses)

The Cachuma Resource Conservation District routinely conducts irrigation evaluations in Santa Barbara and San Luis Obispo Counties and are excellent resource in describing the actual performances of irrigation systems in the region. Irrigation efficiencies were assigned to crop group according to prevalent irrigation system type and knowledge of typical local uniformities (Table 11).

Table 11
Assigned irrigation efficiency averages for each crop group in WPA 3

Crop Group	Irrigation Efficiency Range (%)	
	Low	High
Nursery	60	70
Permanent	60	70
Vegetable	65	75

Existing Gross Irrigation Water Requirement by Crop Group

Existing GIWRs for WPA 3 are summarized in Table 12. The ranges provided in Table 12 do not represent the extremes in GIWR, but do represent the typical ranges in a normal year given local variations in effective precipitation and irrigation efficiencies. Table 1 summarizes the current agricultural water demands for WPA 3.

Table 12
Summary of Existing GIWR for WPA 3 by crop group (AF/Ac/Yr).

Nursery		Permanent-Citrus		Vegetable	
Low	High	Low	High	Low	High
1.1	1.9	1.1	1.9	1.1	1.6

Future Gross Irrigation Water Requirements by Crop Group

Several issues would affect changes in future irrigation water requirements:

- Changes in cropping acreage and type of crop
- Changes in irrigation methods

Cropping Patterns

Trends in cropping patterns were examined through historical crop reports and previous water use projections completed by the Department of Water Resources. Table 13 summarizes projected crop acreages in WPA 3.

Table 13
Projected cropping acreage for WPA 3

Nursery	Permanent		Veg.	Total
	Citrus	Decid.		
60	450	0	4,500	5,010

Irrigation Methods

Table 14 reflects the projected irrigation efficiencies by crop group in WPA 3.

Table 14
Projected irrigation efficiencies by crop group in WPA 3

Crop Group	Irrigation Efficiency Range (%)	
	Low	High
Nursery	60	70
Permanent	70	80
Vegetable	70	80

The same procedures that were utilized to calculate existing agricultural demands were utilized in estimating projected irrigation water requirements. The projected values reflect the changes in cropping acreage and irrigation efficiencies. Table 15 summarizes the projected agricultural water demands for WPA 3.

Table 15
Summary of Projected GIWR by crop group for WPA 3 (AF/Ac/Yr).

Nursery		Permanent-Citrus		Vegetable	
Low	High	Low	High	Low	High
1.1	1.9	1.0	1.6	1.1	1.5

Rural Demands

Rural water demands in the Morro Bay WPA include dwelling units scattered throughout the hills and Chorro and Los Osos valleys. The commercial areas are not included in Tables 16 and 17 below, but included in the urban demand for Morro Bay and Los Osos. Water is produced in private wells from the groundwater basins in the area.

Table 16
Current Demand – 1995

Population	Pop/Du	Houses	Duty	Demand[a]
1,223	2.57	476	1.3	620

a. Demand figure has been rounded to the nearest 10's.

Table 17
Projected Demand – 2020

Population	Pop/Du	Houses	Duty	Demand[a]
1,538	2.57	598	1.3	780

a. Demand figure has been rounded to the nearest 10's.

Data Deficiencies

The following additional data would improve the accuracy of this study:

- **Dwelling Units**. The study was based upon population numbers, with an estimate of dwelling units derived from population figures divided by persons per household. Demand should be based upon a count of dwelling units by WPA. This information would be derived from assessor data.

- **Certificate Lots**. Many parcels of land may be buildable. It is difficult to ascertain how many will be built upon.

- **Golf Courses.** There are several golf courses in the area. These use between 1.5 to 2.5 acre feet/acre/year. An 18-hole course would have approximately 100 acres of irrigated turf, resulting in the use of between 150 and 250 acre feet per year. Return flow from golf course irrigation is estimated to be 15%. This information should be added to the rural demand.

Environmental Demands

Current Demands

Information on current environmental water demands is available from two sources: 1) conditions on water rights permits and licenses and associated orders on file with the State Water Resources Control Board, and 2) agreements between the California Department of Fish and Game and other entities. A discussion of current environmental demands in WPA 2, as reflected in actual permit conditions, is presented below.

Chorro Creek

Flow in Chorro Creek is regulated by a series of MOUs between the CDFG and the California Mens Colony. An August, 1996: MOA calls for 180 af of effluent to be released into Chorro Creek from May 1 to Nov 30 and stored water to be released on a prescribed schedule.

There is also a 1 cfs streamflow required below the reservoir on California National Guard property in the upper watershed (app 16757, permit 11527, lic. 7844). Under the license, "the licensee shall release or bypass a flow of at least one cubic foot per second into the natural channel of Chorro Creek below the point of diversion (South fifty-five degrees west one thousand five hundred (1500) feet from NE corner of projected Section 9, T30S, R12E, MDB&M, being within NE1/4 of NE1/4 of said Section 9.) whenever the natural flow of the stream entering the reservoir above the point of diversion is two cubic feet per second or more: and at least one-half of the natural flow into the reservoir shall be bypassed whenever that natural inflow to the reservoir is less than two cubic feet per second. Releases of water from Licensee's storage will not be required to comply with the foregoing provision."

"For the protection of fish and wildlife habitat and other public trust resources in Chorro Creek and Morro Bay, beginning when deliveries are available from the State Water Project Permittee shall: a) Cease all diversions from Well 11A (Romero well field), or from any wells constructed or operated as replacement wells for Well 11A,whenever surface flow measured in Chorro Creek downstream of the reach depleted by extractions of ground water from Well 11A, or other wells as described above, is less than 1.4 cubic feet per second; and b) Cease all diversions from Wells 9, 9A, 10, 10A, 12, and 16 (Ashurst well field), or from any wells constructed or operated as replacement wells for the Ashurst well field, whenever surface flow measured in Chorro Creek downstream of the Ashurst well field is less than 1.4 cubic feet per second." (App 24239 permit 20866, App 24245, permit 20867, App 27386, Permit 20868)

Los Osos

Los Osos Creek has been declared fully appropriated by the SWRCB (Worcester 1991)

Future Demands

The CDFG is currently developing a protocol for determining stream flow needs to protect environmental values (Waithman, CDFG, Yountville, personal communication, February 1998). This protocol is under development and has not been formally accepted or even formally proposed. It is presented here to indicate one estimate of possible future demand. This protocol has not been adopted by CDFG and if it were, it may not be accepted by other groups or agencies. Key provisions may include the following:

- Reservation of 60% of the average annual unimpaired wet-season flow for instream habitat.
- Bypass of all natural flow during dry season (June to September).
- No diversions until stream flows to the ocean (sandbar breached).

Watersheds on the west side of the coast range generally receive higher rainfall than the streams draining inland areas. These watersheds are also somewhat cooler during the summer than inland areas and are more likely to support steelhead. Tidewater goby are also found in lagoons at the mouths of streams in the coastal watersheds. Annual runoff during drought years in these streams can be 10% or less of the average runoff and result in extreme conditions for aquatic life. Extreme high flow events can also occur and these can also be detrimental to aquatic life in the streams. Based on these considerations future environmental water demand for minimum instream uses in WPA 3 was estimated to range from 10% of unimpaired average annual runoff during drought years to 100% of unimpaired average annual runoff in wet years. This assumes that some uncontrolled high flows will still occur with a frequency that maintains basic stream habitat features.

Data Deficiencies

There has been no organized complete effort to quantify instream flow needs in streams of San Luis Obispo County. Studies have been conducted on some streams and restrictions have been placed on certain water rights permit holders to protect instream uses but these have generally focused on the needs of one or a few key species and have not resulted in clear, objective assessments of instream flow needs.

There is not sufficient data to complete a detailed analysis of environmental water demands for all streams in the County. There is no known data for unimpaired runoff for any stream though it is possible estimates could be developed from available rainfall data. The only readily available (electronic) data is from USGS and County maintained streamflow gaging stations. The USGS data presents average runoff estimates as well as minimum and maximum runoff for each station but this data reflects existing water use and water project operations and in most cases does not reflect unimpaired conditions. Average runoff estimates could also be developed for the SLO gage data and discontinued USGS gages but the information would need to be in an accessible database.

A generic approach to instream flow needs assessment may be useful and data for such an assessment may be available. The County should consider a Tennant type approach using unimpaired runoff estimates generated from rainfall data. Given the wide annual variability in rainfall and runoff, an instream flow needs assessment should account for differences in normal, wet, and dry year flow needs. The County should also have all streamflow data entered in a computer database to facilitate its use.

Uncertainties

In many cases permit or license conditions do not specify a reservation of stream flow for environmental benefit. Rather, they are restrictions on use by individual rights holders. These restrictions are intended to provide benefits to fish and wildlife. However, it is not usually clear how restrictions on an individual water right interact with other water rights and effect streamflows. In addition, it is not always clear how permit conditions are interpreted in terms of an environmental demand. For example, many of the permit conditions call for a "visible surface flow" in a given stream but it is not clear how much water this represents.

Future environmental water demand is subject to great uncertainty due to lack of knowledge of instream flow needed to protect the aquatic resources, lack of information on existing runoff conditions and diversions, and the inherent annual variability in rainfall and runoff. For planning purposes, one could assume that the upper range of future demand will be defined by a percentage of the average annual unimpaired runoff (UAAR) during the wet season and no diversion during the dry season. This task is complicated since many streams are not gaged streams and unimpaired flow must be estimated using hydrologic modeling. This information is not presently available.

References

Stalnaker, C., B.L.Lamb, J. Henriksen, K. Bovee, and J. Bartholow. 1995. The Instream Flow Incremental Methodology: A primer for IFIM. Biological Report 29. U.S.D.I., National Biological Survey, Washington, D.C.

SWRCB, 1997. Staff Report Russian River Watershed. Proposed Actions to be taken by the Division of Water Rights on Pending Water Right Applications within the Russian River Watershed. Division of Water Rights. Sacramento, California

SUPPLY

The City of Morro Bay's distribution system is not adjacent to neighboring systems. However, the City is linked to the State Water Pipeline via the Chorro Valley Pipeline. The Whale Rock Pipeline traverses the City.

The community of Los Osos receives water service from three primary purveyors -- County Service Area 9, Cal Cities Water Company, and S&T Mutual Water Company. Similar to Cayucos, the three purveyors' systems share common boundaries. Cal Cities and CSA 9 systems are interconnected with the ability to flow in both directions. Cal Cities also shares an interconnection with S&T Mutual Water Company. Los Osos is not intertied with other communities. It is about twelve miles distant from Morro Bay, and nine miles distant from San Luis Obispo.

CMC, Cuesta College, Camp San Luis Obispo, County Main Jail and Operations Center, and County Superintendent of Schools share a common water system. These facilities receive water via CMC. CMC receives water from Whale Rock as well as the State Water Project.

Groundwater Supply

Table 18 lists the ground water basins in WPA 3. Estimates of "basin yield" are provided for those basins that have been studied, coupled with estimates of ground water production. An

estimate of annual ground water production is provided on the table, along with the year representing the estimate and a reference to the source of information.

Within WPA3, there are two coastal valley basins (Morro and Chorro) and the Los Osos ground water basin. These three basins provide ground water to municipal, agricultural, recreational, institutional and local domestic users. While these three basins have been grouped together within this planning area, the three basins are very different in terms of their management issues.

The Morro Basin is similar to some of the north coastal basins where agricultural and local domestic water uses occur over most of the basin with municipal wells located at the downstream end of the basin. The municipal wells are somewhat different than in other basins in that they include wells designed to produce brackish sea (as a supply source for the desalination plant) as well as the conventional water wells downstream of Highway 1. Sea water intrusion has been documented by both the DWR and consultants to the City of Morro Bay (Cleath & Associates).

Chorro Basin has a complex management situation in that different sources of imported water are brought into the basin and discharged to the basin through wastewater disposal and irrigation returnflow, along with a reservoir on Upper Chorro Creek which serves to delay runoff and increase off peak ground water recharge. Ground water is supplied for institutional uses, agricultural uses, recreational uses, local domestic uses and for municipal uses. This basin, along with the Los Osos ground water basin, is upstream of Morro Bay, which is designated as a national estuary. The water quantity and quality which issue from these basins into the bay are important to the management of these basins. Ground water studies of the Chorro Basin have been performed by the DWR, Boyle Engineering/Cleath & Associates and Converse Consultants-both for the City of Morro Bay and in environmental studies performed for the County of San Luis Obispo by Envicom/Cleath & Associates.

Los Osos ground water basin provides water primarily to the communities of Los Osos-Baywood Park as well as to agricultural and recreational water users. The DWR and US Geological Survey, as well as several consultants to the County of San Luis Obispo and the Regional Water Quality Control Board, have studied the ground water basin. Sea water intrusion and nitrate concentrations in ground water have been identified as important issues in this basin. Improvements to wastewater treatment and disposal practices in the basin are being considered to improve the basin water quality while maintaining the benefit of wastewater reuse. The problem of shallow ground water in some residential areas is also an important issue in water management for this basin.

Table 18
WPA 3 Ground Water Basins

Basin Name	Basin Area in Square Miles	Basin yield with original descriptive term in acre-feet per year	Production - year in acre-feet
Morro	1.3 (9)	1,500 ground water yield (9)	1,879 – 1992 (9)
Chorro	1.1 (9)		1,833 – 1992 (9)
Los Osos	8.6 (10)	2,200 long-term sustainable yield (10a)	3,540 – 1988 (9)

9. Cleath & Associates, October 1993, City of Morro Bay Water Management Plan – Appendix B Ground Water Analysis.
10. Yates, E.B. and Wiese, J.H., 1988, Hydrogeology and water resources of the Los Osos Valley ground-water basin, San Luis Obispo County, California: U.S. Geological Survey Water-Resources Investigations Report 88-4081, 74 p.

10a. California Department of Water Resources, 1989, Geohydrology and Management of Los Osos Valley Ground Water Basin, San Luis Obispo County: District Report.

Data Deficiencies

The estimates in Table 18 represent the results of published data from numerous sources. It is also important to note that most of the basins have not been studied in detail, and true perennial yield values are not known. Thus, much of the information does not reflect current conditions, population, water usage, and agricultural trends. It also tends to point out the necessity of developing new data to more accurately describe the hydrologic conditions of the basins. Most of the estimates of ground water extraction are at least 10 years old.

Uncertainties

The "basin yield" values described in the table reflect the results of a variety of methods of determining yield, including annual recharge, safe yield, seasonal replenishment, and net safe annual extractions, and thus may or may not reflect an accurate perennial yield value for the basin.

Surface Water Supply

A list of existing water supplies in WPA 3 is included in Table 19. Surface water supplies to WPA 3 include Whale Rock Reservoir supplies (to CMC and Cuesta College), State Water supplies (to the City of Morro Bay, Cuesta College, County Operations Center, and CMC), and appropriated stream flows in Morro and Chorro Creeks estimated at 1,758 AFY. The City of Morro Bay also owns a seawater desalination plant which is capable of being operated during a water supply emergency.

The Dairy Creek Golf Course will be irrigated with reclaimed water from the CMC wastewater treatment plant. The golf course is being irrigated with Whale Rock water temporarily, until improvements to the wastewater treatment plant are completed.

Table 19
Existing, Developed Water Sources Other Than Ground Water
(Approx. Yield, acre-feet per year)

Existing Source	Approx. Yield
Whale Rock Reservoir	521 (CMC, Cuesta)
Seawater Desalination	645
State Water Project	2,338
Reclaimed water –Other than passive return flow	? (Dairy Creek Golf)
Appropriated Stream Flows	1,758
TOTAL NON-GROUND WATER YIELD [1]	**5,262**

1. Source: Water Rights Information Management System printout dated April 23, 1998 from the State Water Resources Control Board for all water rights in SLO County.
Figures shown are "Maximum Annual Use" totals by WPA as noted in water rights filings.
Figures do not include estimated supplies to entities whose app. rights state a max. direct diversion (in cfs) or a max. storage volume (in acre-feet). Due to this, appropriated stream flows stated here are probably under-stated.

Uncertainties

While the water rights information states the amount of water individuals and agencies are entitled to withdraw, it does not tabulate actual withdrawals. For example, an owner may be entitled to divert 86,000 gallons per day from May through October of each year. This does

not mean that the owner typically diverts this each and every day for six months. On the other hand, this same owner may, in a dry year, want to divert his full entitlement over the six month period. However, if there is not enough water in the creek to support his diversion, it may not be physically possible to divert the full amount.

The reader is alerted to this especially when interpreting the estimates of appropriated stream flows stated in Table 19.

DEFICIENCIES

The Dairy Creek Reclamation project is not yet included in the supply totals, and the deficit appears to be overstated. The two largest uncertainties are supply from the Los Osos ground water basin and the status of the sewer. Morro Bay has state water, desalination and a conservation program.

Table 20
Existing (ac-ft/yr)

Demand	Grndwater Supply	NonGrndwater Supply	Total Supplies	Balance[a] (Deficiency)
11,200	3,700	5,262	8,962	(2,240)

a. Balance (Deficiency) figure has been rounded to the nearest 10's.

Table 21
Projected (ac-ft/yr)

Demand	Grndwater Supply	NonGrndwater Supply	Total Supplies	Balance[a] (Deficiency)
11,240 – 15,200	3,700	5,262	8,962	(2,280) - (6,240)

a. Balance (Deficiency) figure has been rounded to the nearest 10's.

ALTERNATIVES

This section is an evaluation of future water supply options for various WPA 3. The criteria previously selected by the WRAC are:

- Cost
- Risk
- Reliability
- Water Rights
- Local Control
- Water Quality
- Timing
- Environmental Impacts
- Agricultural Impacts
- Institutional Constraints
- Recreation
- Hydroelectric Potential

Each water supply option summary includes a comparative ranking of the criteria listed above. The rankings are based on the following:

Comparative Rankings

Features of water supply options are ranked 1 to 5, with 5 being the best. A "0" implies a fatal flaw which may render the supply option infeasible. The basis of comparison, in general, is:

Cost: The lower the unit cost ($/AFY), the higher the ranking.

Risk: Primarily a subjective comparison of the potential for project cost escalation.

Reliability: Primarily a comparison of project yield, AFY, during years of below-average rainfall.

Water Rights: A favorable 5 ranking indicates no known problems; a 3 indicates potential challenges; and a 1 indicates known opposition which may stop the project.

Local Control: A favorable 5 indicates physically located in and administered by an agency within the County; a 3 indicates some involvement of outside agencies; and a 1 indicates control from outside the County.

Water Quality: A favorable 5 indicates projects which enhance water quality; a 3 indicates no change; and a 1 indicates a negative impact on water quality.

Timing: A favorable 5 indicates projects with designs complete; a 3 indicates projects for which predesign at least is underway; and a 1 indicates projects for which design is 5 years or more away.

Environmental: A favorable 5 indicates certified EIR in place; a 3 indicates environmental review underway and no significant unmitigable issues identified; and a 1 indicates significant impacts foreseen. A "0" in this category indicates a potential environmental fatal flaw.

Agricultural Impacts: A favorable 5 indicates projects which help agricultural, particularly by reducing competition for ground water and by other means.

Institutional Constraints: Reflects the degree of organizational support. A low ranking is indicative of the need for complex agreements.

Recreation: Reflects the degree to which the project may enhance recreational opportunities. A 3 indicates no direct impact.

Hydroelectric Potential: Indicates the degree to which the project may provide opportunities for hydroelectric power generation. Little information is available regarding hydroelectric power generation opportunities for the supply options examined. In general, options with little or no opportunity for power generation were ranked "1". Options that may expand existing power generation facilities were ranked "3".

Potential water supply projects that may benefit this WPA (and for which information exists), include the Nacimiento Water Supply Project and the City of Morro Bay Reuse. This is not to say that these are the only supplemental water sources available. Rather, published data are currently available for only these potential sources.

Nacimiento

The Nacimiento Water Supply Project described herein is as described in the August 1997 Draft EIR. It involves construction of over 60 miles of pipelines ranging in size from 33- to 8-inches in diameter, plus pump stations, storage tanks, and outlet works. The project is planned to supply 17,500 AFY to 18 water purveyors from Paso Robles to Coastal San Luis Obispo County.

Category	Remarks	Comparative Ranking
Cost[i]	▪ $120 million project cost. *WPA 2*: $625 - $1,097 per AFY *WPA 3*: $1,167 - $2,198 per AFY *WPA 4*: $669 - $1,135 per AFY (SLO City) *WPA 4*: $2,488 - $3,783 per AFY (Others) *WPA 9a*: $368 - $1,000 per AFY *WPA 10*: < $200 per AFY (opinion; cursory estimate).	4
Risk[ii,iii]	▪ Long distance conveyance - risk of delivery interruption ▪ EIR seismic evaluation - "Insignificant after mitigation". ▪ Cost sensitive to participation level. ▪ Moderate risk of construction cost escalation. ▪ Forecasted deliveries can be maintained even with a planned 1-month annual maintenance outage.	4
Reliability[ii,iii]	▪ 17,500 AF yield even through 1987-1991 drought. ▪ Complements groundwater supply in planning areas 3, 4, and 9a.	5
Water Rights[iii]	▪ Strong contractual position with Monterey County. ▪ Pending legal challenge originating in Monterey County.	3
Local Control[iv]	▪ Watershed and dam within SLO County, operated by Monterey County Water Resources Agency. ▪ Potential Monterey County and Division of Safety of Dams issues.	4
Water Quality[iv]	▪ Limited data indicates favorable quality.	3
Timing[iv]	▪ High participation needed to advance. ▪ Minimum 3 years for delivery. ▪ Little opportunity for staging (matching supply with demand).	2
Environmental Impacts[ii]	▪ Long term significant residual impacts to recreation and growth inducement. ▪ Cumulative impacts in areas of water resources and fisheries. ▪ Short-term impacts on traffic, air quality and biological resources. ▪ Helps minimize potential overdrafts in regions 9a, 3, and 4.	2

Category	Remarks	Comparative Ranking
Agricultural Impacts[ii]	▪ No short- or long-term significant residual impacts. ▪ Reduces competition between urban and agricultural groundwater users.	4
Institutional Constraints[v]	▪ Usual permitting process for similar pipeline projects. ▪ High project participation required.	3
Recreation[ii]	▪ Associated lake-level impacts may negatively affect recreation.	2
Hydroelectric Potential[iv]	▪ Reduce power generation capability at the dam by < 10 percent. ▪ No new hydro potential identified along pipeline.	1

City of Morro Bay Reuse

The City of Morro Bay water reuse project examined herein is described in the October 1996 feasibility study performed as part of the Community Development Block Grant funding. The reuse project envisions construction of a satellite wastewater treatment plant that would divert approximately 40% of the wastewater flow from the existing Morro Bay-Cayucos treatment plant. Water reclaimed at the proposed satellite plant would be used to both sustain year-round flow in Chorro Creek as well as to supply some irrigation users in the vicinity of the proposed plant.

Category	Remarks	Comparative Ranking
Cost[vi]	▪ $7.5 to 9.1 million (1996) depending on treatment site and type of use.	3
Risk	▪ Moderate risk of construction cost escalation. ▪ Potential changes to discharge permit requirements. ▪ Uses commonly applied engineering practices.	3
Reliability[vi]	▪ 1.5 MGD or 1,680 AFY.	3
Water Rights	▪ No anticipated problems with filings.	5
Local Control	▪ Project will be owned and operated by Morro Bay.	5
Water Quality	▪ Treatment process to be selected based on quality goals/requirements.	3
Timing	▪ Design and permitting process would take at least 2 years. Earliest on-line date would be about 2003.	3
Environmental Impacts[vi]	▪ Positive impact on downstream fisheries in Chorro Creek.	4
Agricultural Impacts	▪ Reduces competition between urban and agricultural groundwater users.	4
Institutional Constraints	▪ Discharge permits will determine level of treatment. ▪ Reduced flows at existing wastewater plant will affect current cost sharing arrangement with Cayucos.	3
Recreation	▪ No identified impacts.	3
Hydroelectric Potential	▪ Not applicable.	1

Data Deficiencies

No data exist for Water Conservation Programs.

References

[i] "Lake Nacimiento Water Supply Project Financing Analysis" by Leifer Capital for San Luis Obispo County Flood Control Water Conservation District, December 1997.
[ii] "Draft EIR Nacimiento Water Project" by Ogden Environmental and Energy Services for County of San Luis Obispo, August 1997.
[iii] "Preliminary Evaluation for the Nacimiento Water Supply Project, Reliability Evaluation" by Boyle Engineering Corporation for San Luis Obispo County Flood Control Water Conservation District, 1992.
[iv] "Nacimiento Water Supply Project EIR preparation Phase Engineering Draft Report" by Carollo Engineers for County of San Luis Obispo, July 1996.
[v] "Nacimiento Water Supply Project Permit Outline" by Boyle Engineering Corporation for San Luis Obispo County, 1997.
[vi] "City of Morro Bay CDBG Wastewater Reclamation Feasibility Study Phase 1" by Boyle Engineering Corporation for City of Morro Bay, October 22, 1996.