APPENDIX A

PROJECT HISTORY AND ALTERNATIVES DEVELOPMENT

HISTORY AND PROCESS USED TO FORMULATE THE ALTERNATIVES

PROJECT HISTORY

In August 1953, the State Water Resources Control Board published Bulletin No. 5, "Santa Cruz – Monterey Counties Investigation." This was the first comprehensive study of water resources in the Pajaro Valley, where groundwater serves the needs of this predominantly agricultural area.

The Bulletin No. 5 investigation documented groundwater overdraft, seawater intrusion, and safe (sustainable) yield in the Basin. Four decades later, Bulletin No. 5 projections of Basin sustainable yield and increasing water demand generally have been proven.

PROJECT HISTORY

- **1953** State identifies seawater intrusion in Pajaro Valley
- **1964** Confirmed by Reclamation
- **1967** Congress enacts legislation to deliver CVP water to area
- **1975** Reclamation commits water to area
- **1984** State creates and voters approve PVWMA
- **1988** Groundwater model developed
- **1992** Congress approves Central Valley Project Improvement Act (CVPIA)
- **1993** Basin Management Plan (BMP) adopted by PVWMA
- **2002** Revised BMP adopted by PVWMA

In 1964, Reclamation completed a feasibility report that recommended implementation of conveyance and distribution facilities to deliver water for irrigation, municipal, and industrial uses in Monterey, Santa Cruz, and San Benito Counties. On August 27, 1967, the U.S. Congress adopted Public Law 90-72, authorizing the construction of the San Felipe Unit of the CVP.

In the ensuing years, Santa Clara and San Benito Counties proceeded with studies and plans, and ultimately Reclamation constructed the facilities required to convey San Felipe water from the San Luis Reservoir to these counties. In 1975, Reclamation's regional director requested and received a reservation commitment from the San Felipe Committee of the CVP for 19,900 acre-feet per year (afy) of water for the Watsonville subarea, to which PVWMA now holds a future entitlement.[1]

Local interest increased in the late 1970s, and in early 1980s a group of interested citizens formed a committee to sponsor the formation of a local agency that would retain the responsibility and authority to manage the basin's water resources. In 1984, the state legislature passed the statutes that created the PVWMA. The PVWMA has the authority to develop and initiate many activities in the exercise of its management responsibilities and has actively pursued the necessary

[1] The initial agreement was valid until 1990. In 1988, Reclamation extended the reservation until two years after the completion of a study (the 1993 BMP and, subsequently, the Revised BMP) to determine the cost of providing irrigation water service to the Watsonville sub-area. With the passage of the Central Valley Project Improvement Act (CVPIA) in 1992 (Public Law 102-575), CVPIA prohibited the Secretary of the Interior from renewing existing long-term contracts for water supply until an environmental analysis (the *Central Valley Project Improvement Act Programmatic Environmental Impact Statement* [PEIS]) was completed and prohibited new contracts for purpose other than fish and wildlife before the provisions of 3406(b)-(d) are met. Reclamation signed the Record of Decision for the CVPIA PEIS in January 2001. Reclamation does not expect the environmental review implementation requirements in the Record of Decision to be completed for several years, at which point PVWMA could negotiate a contract with Reclamation.

technical investigations. These investigations led to the adoption of the Basin Management Plan in November 1993 (1993 BMP), and the Revised Basin Management Plan in February 2002 (Revised BMP).

ALTERNATIVES FORMULATION

This EIS relies on the extensive alternatives screening that occurred during preparation of the 1993 BMP and 2002 Revised BMP and attendant EIRs, described in the following sections.[2] Through preparation of these earlier documents, a wide variety of alternatives to meet the purpose of and need for the proposed action have been systematically identified and evaluated. In all, over 30 individual projects have been combined into numerous system alternatives and evaluated based on engineering, economic, environmental, and other criteria.

BASIN MANAGEMENT PLAN

PVWMA prepared the 1993 BMP to investigate the water supply problems of the Pajaro Valley, to outline the extent and degree of seawater intrusion, and to identify a preferred water supply alternative for meeting supply needs. The BMP evaluated 33 management measures to address groundwater overdraft and seawater intrusion problems. The basic approach to formulate alternatives was to identify the full range of options, conduct a preliminary evaluation, screen out the less promising candidates, and perform more detailed analysis on the more promising candidates. Preliminary alternatives were evaluated, scored, and ranked based on the criteria shown to the right.

PRIMARY SCREENING CRITERIA

- Provide for maximum beneficial water use.
- Provide for the needs of water users.
- Reduce overdraft.
- Maintain water of suitable quality.
- Integrate PVWMA actions with the activities of other agencies (to achieve cost savings and to maximize available water resources).
- Provide cost-effective alternatives.
- Protect basin recharge.

All alternatives were then tested against secondary criteria, shown to the right. The six most promising alternative plans capable of achieving the objectives of balancing water supply and demand by the year 2040 were advanced and evaluated in the 1993 BMP EIR (described in Section 1.4 of this EIS).

SECONDARY SCREENING CRITERIA

- Protect environmental values.
- Protect areas of cultural and biological significance.
- Recognize needs of the study area.
- Recognize San Felipe Unit water-use constraints.
- Recognize regulatory agency requirements.
- Recognize local agency interests.

Each of the alternative plans consisted of three types of elements: nonstructural, near-term water demand management measures; local recharge projects; and structural elements to increase the in-basin water supply or to import water into the basin. The nonstructural, near-term management elements incorporated into all of the 1993 BMP alternatives included metering of all larger production wells; conservation programs for urban, rural, and agricultural uses; and recharge area and

[2] The 1993 BMP and EIR and the Revised BMP and EIR are available for review at Reclamation offices, at 1243 N Street, Fresno, CA, 93721; and PVWMA offices at 36 Brennan Street, Watsonville, CA, 95076.

aquifer protection. Today, these elements either have been implemented or are in progress. In addition, the 1993 BMP Program EIR evaluated a No Project Alternative and Demand Management Alternative.

The preferred alternative that emerged from the 1993 BMP process included (1) development of local surface water supplies, (2) delivery facilities for conveyance and distribution of new water supplies, (3) water conservation and demand management, and (4) importation of surface water.

PVWMA has initiated the first phase of these projects, which includes the construction of facilities to utilize local surface water supplies available from Harkins Slough and the construction and operation of pipelines, pumping, treatment, and diversion facilities for this supply. These projects, along with other local water supply projects listed at the end of this chapter, were evaluated in the "Local Projects" EIR (described in Section 1.4 of this EIS).

Local Ballot Initiatives

PVWMA deferred evaluation of an important part of its project, the importation of surface water into the Pajaro Valley and construction of an import pipeline, pending completion of the Revised BMP. The passage of Measure D in 1998 by voters within the PVWMA service area, among other issues, prohibited the construction of an imported water pipeline prior to 2008 and limited the maximum PVWMA augmentation charge to $50 per acre-foot. These aspects of Measure D were overturned by the voters in March 2002 with the passage of Measure N. Measure N removes the cap on the augmentation charge (allowing it to increase consistent with state law) and authorizes the PVWMA to implement water supply projects, including local, recycled, or imported water, adopted by the PVWMA Board of Directors.

REVISED BASIN MANAGEMENT PLAN

In 2000, PVWMA initiated the update of the 1993 BMP (the Revised BMP). Since completion of the 1993 BMP, PVWMA has conducted extensive groundwater modeling that has been used to quantify the extent, magnitude, and character of the overdraft conditions. The Revised BMP utilized updated modeling of the basin's sustainable yield (the maximum amount of groundwater that can be extracted from the aquifer system without adverse effect) to refine development of alternative strategies for managing the basin. In addition, members of the community expressed an interest in strategies with a greater reliance on development of local water supplies than the preferred project that emerged from the 1993 BMP planning process. Consequently, the Revised BMP evaluated four separate basin management strategies (see **Table A.1**), including one that relied entirely on development of local water supplies (the Local-Only Alternative), and another that relied heavily on local water supplies (the Modified Local-Only Alternative). The remaining two alternatives (the BMP 2000 and Modified BMP 2000 Alternatives) relied more heavily on an imported water supply. These alternatives were then evaluated and ranked using the following criteria:

- Meets existing and future water needs
- Limited dependence on out-of-basin water supplies

TABLE A.1
ALTERNATIVES EVALUATED IN THE REVISED BASIN MANAGEMENT PLAN

Project	Alternative			
	BMP 2000	**Local-Only**	**Modified Local**	**Modified BMP**
Water Conservation (5,000 af)	♦	♦	♦	♦
Intensified Water Conservation (10,000 af) with Land Fallowing		♦		
Pumping Management	♦	♦	♦	♦
Harkins Slough	♦	♦	♦	♦
Coastal Distribution System	♦	♦	♦	♦
Water Recycling Project (4,000 af)	♦			♦
Water Recycling Project (6,000 af)			♦	
Water Recycling Project (7,700 af)		♦		
Murphy Crossing and Inland Distribution System	♦			
Watsonville Slough		♦	♦	
College Lake with Pinto Lake Diversion			♦	
Expanded College Lake with Corralitos Creek and Pinto Lake Diversions		♦		
Aquifer Storage and Recovery of Local Water Supplies		♦		
Import Water Project with supplemental wells	♦		♦	♦
Aquifer Storage and Recovery (Conjunctive use)/Import Water				♦

SOURCE: RMC, Inc., 2002

- Minimizes regulatory hurdles
- Meets water quality goals
- Economic impact.

Each of the alternatives was ranked based on its ability to meet these criteria. The ranking system was based on a plus (+) or minus (-) scale, with plus/minus (+/-) representing a neutral ranking. **Table A.2** presents the results of this ranking.

According to the Revised BMP, the Local-Only Alternative ranks lowest because it would require fallowing of 2,200 acres of agricultural land; the recharge of groundwater with tertiary-treated recycled water would adversely affect groundwater quality and would require regulatory approval that could be problematic (reverse-osmosis treatment would likely be required); and water quality would not meet the requirements of agricultural users. The BMP 2000 and Modified BMP 2000 Alternatives have similar ratings, but the BMP 2000 Alternative includes

TABLE A.2
REVISED BMP ALTERNATIVE RANKING

Criteria	BMP 2000 Alternative	Local-Only Alternative	Modified Local-Only Alternative	Modified BMP 2000 Alternative
Meets Existing and Future Water Needs	+	-	+/-	+
Limited Dependence on Out-of-Basin Water Supplies	-	+	+/-	-
Minimizes Regulatory Hurdles	+/-	-	+/-	+
Meets Water Quality Goals	+	-	+/-	+
Economic Impact	+	-	+	+

SOURCE: RMC, Inc., 2002

Murphy Crossing, which has a California Department of Fish and Game (CDFG) water rights protest against it. The Modified BMP 2000 Alternative includes temporary storage in the aquifer and subsequent recovery (conjunctive use) of CVP water, which appears to comply with regulatory statutes. The three alternatives using imported water all have the flexibility to meet future water demands through importation of water. However, the Modified Local-Only Alternative is limited, and would require construction of a pump station or other method of increasing capacity of the Import Pipeline.

The Revised BMP EIR also included a comparison of the four alternatives plus the No Action Alternative. All alternatives are considered environmentally superior to the No Action Alternative, which allows for continued degradation of the groundwater basin from overdraft and seawater intrusion and would result in land fallowing. The EIR concluded that the Modified BMP and BMP 2000 Alternatives are environmentally superior to the Local-Only and Modified Local-Only Alternatives. The Local-Only Alternative fails to meet the project's primary objective because it fails to provide sufficient water without the fallowing of more than 2,000 acres of farmland and does not lessen environmental impacts. The Modified BMP Alternative is environmentally preferable to the BMP 2000 Alternative in that it would reduce or eliminate impacts to aquatic habitat and steelhead and would have the least impact on wetlands/waters of the U.S. and riparian species habitat. The Modified BMP 2000 Alternative includes fewer facilities and would result in less construction while providing the highest quality source water.

In February 2002, relying on information in the Revised BMP and Revised BMP EIR, the PVWMA Board of Directors identified a "Recommended Alternative" (for clarity, referred to herein as the Water Supply Project), adopted the Revised BMP, and certified the EIR. **Table A.3** lists all of the projects under the Water Supply Project by implementation phase; **Figure A.1** depicts their general location. All of the Phase 1 projects are underway; Phase 3 consists of

TABLE A.3
PVWMA WATER SUPPLY PROJECT

Project	Status
Phase 1	
▪ Coastal Distribution System (Harkins Slough portion only)	Currently underway; completion in 2003
▪ Conservation: (5,000 afy)	Currently underway; full implementation in 2007
▪ Harkins Slough with Harkins Slough Recharge Basin, Supplemental Wells, and Connections (1,100 afy)	In operation
Phase 2 – 2004-2007	
▪ Remaining portions of the Integrated Coastal Distribution System (ICDS)	Evaluated in this EIS
▪ Import Water Project with Out-of-Basin Banking (13,400 afy) and Supplemental Wells	Evaluated in this EIS
▪ Water Recycling Project (4,000 afy)	Evaluated in this EIS
▪ Watershed Management Programs (e.g., nitrate management)	To be developed
Phase 3 – After 2007 (Potential Future Projects)	
▪ Wells for conjunctive use of CVP water ▪ Inland Distribution System ▪ College Lake (storage project) ▪ Watsonville Slough (local surface water diversion project) ▪ Murphy Crossing (local surface water diversion project)	Need for and selection of Phase 3 projects to be implemented will be determined after 2007, based on future water supply and demand conditions. Not addressed in this EIS; additional environmental review will be required.

SOURCE: RMC, Inc., 2002

potential future projects, the need for which will be evaluated after 2007. Phase 2 projects, as indicated in **Table A.3**, require Reclamation review and approval and are addressed in this EIS.

The formulation and screening of action alternatives for this EIS continues the winnowing process that occurred through the Revised BMP and Revised BMP EIR. This document presents alternatives that:

- Meet the purpose of and need for the project, focusing on the need to develop sufficient water supplies to meet near-term (through 2007) demand;
- Are consistent with PVWMA's objectives;
- Are reasonable and feasible; and
- Include input from other agencies and the public.

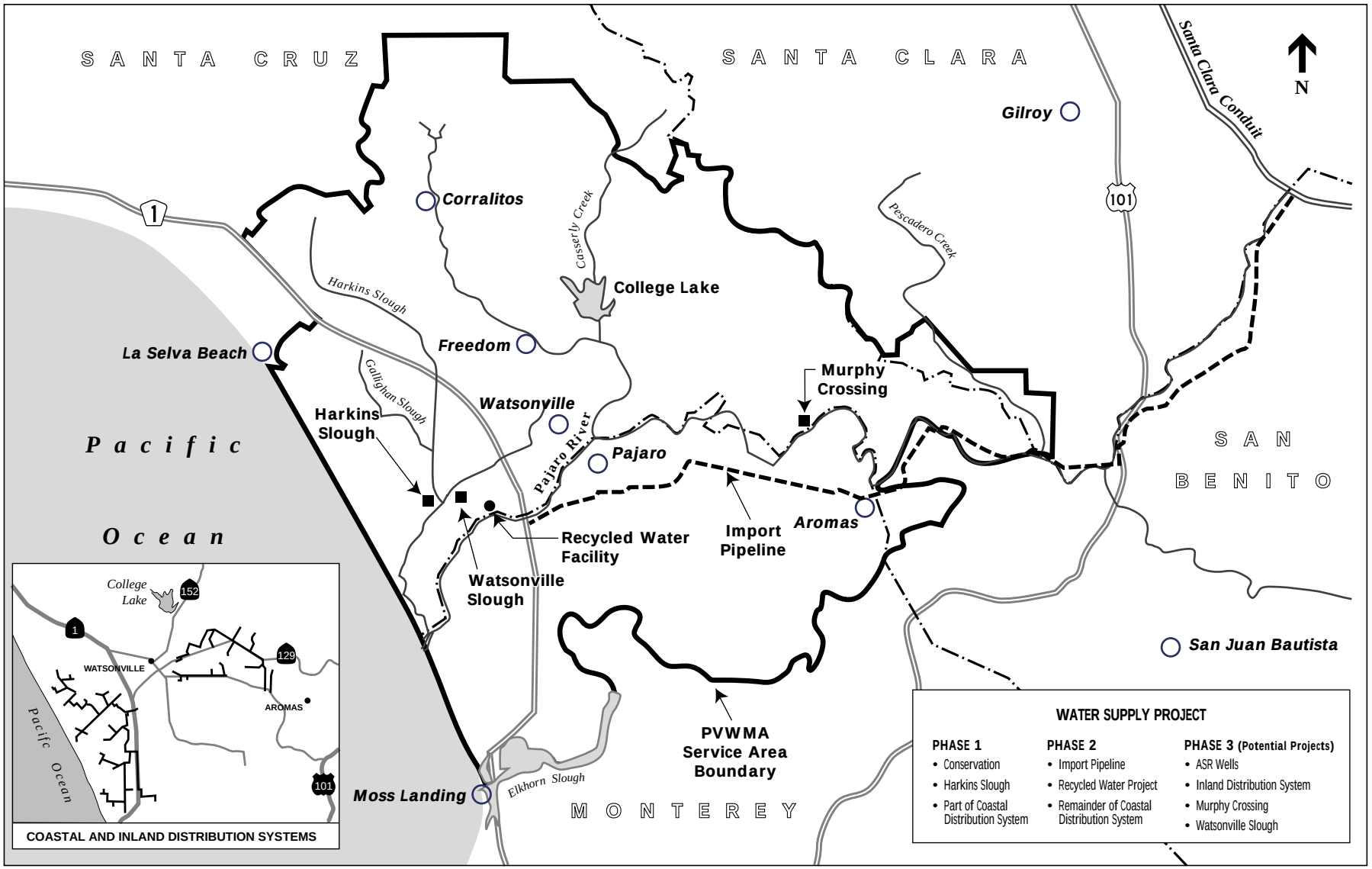

Figure A.1
Water Supply Project

Alternative B–Water Recycling Project and Import Water Project (see Section 2.3) includes the two largest water projects of PVWMA's Water Supply Project and incorporates various refinements to the Modified BMP 2000 Alternative, including out-of-basin banking as a storage alternative to conjunctive use of CVP water within the Pajaro Valley. Alternative C–Import Water Project Only includes the Import Water Project, but excludes the Water Recycling Project. Alternative C includes an increase in imported water supply to account for the lack of recycled water supply. The Phase 3 projects represent potential future projects under either Alternative B or Alternative C.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER STUDY

PVWMA's Water Supply Project is comprised of projects from each of the four system alternatives evaluated in the Revised BMP. The action alternatives evaluated in this EIS are the major water supply projects PVWMA is proposing to move forward at this time; consideration of smaller projects has been deferred until after 2007. A number of potential projects were considered by the PVWMA and Reclamation, but eliminated or are not analyzed in detail in this EIS because they did not meet the purpose and need. The following potential project alternatives were considered but not analyzed in detail and eliminated from further study for the reasons described below.

LOCAL-ONLY ALTERNATIVE/INCREASED DEMAND MANAGEMENT

The Local-Only Alternative was devised as a strategy to meet water in the Pajaro Valley through demand management and development of in-valley water supplies. **Table A.1** lists the projects under the Local-Only Alternative.

In comparison with the action alternatives and PVWMA's Water Supply Project as a whole, the Local-Only Alternative has the potential to generate greater-magnitude environmental impacts to water quality (groundwater), aquatic habitat, wetlands/waters of the U.S./riparian habitat, and visual quality, and impacts related to permanent conversion of agricultural land and land fallowing. The Local-Only Alternative proved incapable of generating sufficient water supply to meet existing demand and, therefore, did not meet the basic objectives of the project to reduce groundwater overdraft, stop seawater intrusion, and protect existing agriculture. Under the Local-Only Alternative, higher levels of water conservation (a doubling of conservation [10,000 afy total] relative to other alternatives and to the recommendations of PVWMA's *Water Conservation 2000* planning report) would have been required within Pajaro Valley. Other than tiered water pricing,[3] the developers of the Local-Only Alternative did not identify a strategy to achieve these levels of conservation; consequently, it is likely that additional land fallowing would have been required.

[3] Tiered water pricing is a management mechanism to promote conservation and/or alter water use practices through potential cost savings. Water prices are set to correspond with water application rates for various crop types.

Reasons For Elimination: This alternative does not satisfy the purpose of and need for the project or the project's basic objectives and is considered infeasible based on economic and social considerations.

ALTERNATIVE REQUIRING FALLOWING OF COASTAL FARMLAND

One commenter on the Notice of Intent suggested that PVWMA (in partnership with Soquel Creek Water District) retire 10,000 acres of irrigated agricultural land along the coast. The fallowing of 10,000 acres of prime farmland, approximately one-third of farmland in the Pajaro Valley, would have a substantial adverse effect on the economy in the region. This is inconsistent with PVWMA's objective "to create a reliable, long-term water supply, an important cornerstone of the long-term economic vitality of the Pajaro Valley."

Reasons For Elimination: This alternative is considered infeasible and impractical based on economic and social considerations. This alternative does not meet the project's basic objectives.

SEAWATER DESALINATION

The BMP evaluated construction of a reverse-osmosis desalination plant to treat Monterey Bay seawater for agricultural irrigation. A desalination project would consist of a reverse-osmosis plant, an onshore pumping station and chemical treatment unit, a seawater intake structure, an onshore/offshore seawater supply pipeline between the onshore pump station and offshore seawater intake, pipelines to transport seawater and chemicals between the desalination plant and onshore pump station/chemical treatment area, and a pipeline to transport concentrated seawater brine from the desalination plant site to an ocean outfall (or use of the WWTF's existing outfall). A desalination project could also require construction of a power substation. The quality of the desalinated water would require blending with either recycled water or groundwater prior to irrigation. One option would be to size the plant to supply 16 to 27 mgd to the Pajaro Valley during irrigation months.

Another option is a regional desalination plant that would provide irrigation as well as augment drinking water supplies for both Santa Cruz and Monterey Water Districts; the overall plant capacity would be 30 to 65 mgd. Two sites were evaluated: (1) adjacent to the proposed WWTF recycled water plant; and (2) adjacent to the existing thermal electric generating facility at Moss Landing. Siting the desalination plant at the WWTF could take advantage of proposed water recycling facilities, and the brine from the desalination facility would be discharged via the existing WWTF outfall. The advantages of the Moss Landing site would derive from the coupling of a desalination plant with an existing power generation facility. The existing thermal electricity facility cycles approximately 800 mgd of seawater as cooling water. Other advantages include elevated feed water temperature, which reduces energy needs; existing land and storage plants; and potential to partner with other agencies for a regional facility.

Reasons For Elimination: This alternative is considered infeasible and impractical for PVWMA based on economic considerations and therefore could not meet the purpose of and need for the

proposed action. There are high energy costs associated with this alternative, in addition to the costs for land acquisition, seawater intake, and potentially a brine water discharge line and brine water outfall. The extremely high cost for desalination, coupled with its dependency on large quantities of power, prevented this type of project from being carried forward. The Monterey Bay is a protected marine sanctuary. Discharge of waste brine would be dispersed by ocean currents, affecting temperature, nutrients, and turbidity and therefore the abundance and diversity of marine organisms. Potential impacts related to oceanography and marine water quality include changes in temperature, dissolved oxygen, or salinity; possible localized changes in currents or in turbidity due to the presence of intake pipes on the ocean bottom or due to the pumping/discharge of effluents from the desalination plant; and possible changes in dispersion of sewage plume effluent due to added discharge of brine effluent from the desalination plant. As such, a desalination project would require a baseline study to establish offshore conditions prior to desalination plant startup, and quarterly marine water quality/biological monitoring in accordance with Regional Water Quality Control Board requirements during the operational phase. Locating the desalination plant at the existing WWTF would allow brine discharge via the existing WWTF outfall and would require water quality consistent with the WWTF's discharge permit.

RIVER CONVEYANCE OF CVP WATER

River conveyance of CVP water was explored as a conveyance alternative to the Import Pipeline. Water would be obtained from the existing turnout located on the Santa Clara Conduit east of Gilroy. A pipeline would be constructed along the Import Pipeline alignment to a location in the vicinity of Bolsa Road (SR 25), where water would be discharged to the Pajaro River. Water would then flow in the Pajaro River to a point within the Pajaro Valley, where it would be diverted and pumped into the proposed water distribution system. In comparison to the Import Pipeline, this alternative would generate greater environmental impacts to water quality, riparian and aquatic habitat, and endangered species such as steelhead.

Reasons For Elimination: This project was rejected based on impacts to water quality and biological resources.

WATER RECYCLING ALTERNATIVES

The Draft Watsonville Area Water Recycling Project Feasibility Study (RMC, 2003) determined the feasibility of serving different markets with recycled water, including agriculture, urban, and environmental. Tertiary treatment alternatives were also evaluated, which included filtration, disinfection, and salinity control methods. The following market types, treatment and salinity control methods were found to be infeasible, based on economic, technical, or other reasons.

MARKET TYPES

Urban Reuse

The feasibility of connecting urban customers to the recycled water distribution system was evaluated. Recycled water could be used for landscape irrigation, cooling water, construction

uses such as wash down and dust control, and other applications. Potential customers would be industry, parks, open space, and schools.

Reasons For Elimination: Service to the urban market was eliminated due to utility installation requirements, traffic disruption, and the potential for cross-contamination with the potable water system.

Environmental Uses

Recycled water could be used for environmental restoration or development of constructed wetlands to provide habitat for endangered species or other wildlife.

Reasons For Elimination: Environmental uses of recycled water was eliminated due to the current lack of identification of specific environmental uses of recycled water. In addition, locating wetlands in the coastal area may require conversion of prime agricultural land. Groundwater recharge was eliminated because it would require reverse osmosis (which is very expensive), brine disposal, and would generate less yield.

FILTRATION

Granular Media Filtration

This technology uses granular media filter beds to remove suspended material from the secondary effluent. Four granular media filtration options were evaluated in the Feasibility Study, including: (1) contact granular media filtration, (2) direct granular media filtration, (3) conventional granular media filtration, and (4) two-stage contact filtration.

Reasons For Elimination: A pilot study revealed that contact granular media filtration would not reliably produce effluent meeting Title 22 turbidity requirements during peak food-processing season. Other granular media filtration methods were also rejected for similar concerns regarding safety and reliability requirements.

Treatment Wetlands

Constructed wetlands were evaluated for production of recycled water. Constructed wetlands rely on physical processes and natural processes by plants and microorganisms for removal of suspended solids and nutrients.

Reasons For Elimination: Constructed wetlands are not expected to meet Title 22 suspended solids requirements for unrestricted use. In addition, wetlands treatment is land intensive and would require conversion of approximately 150 acres of farmland to treat the projected 8 MGD of flow from the WWTF.

SALINITY CONTROL

Reverse Osmosis

Reverse osmosis (RO) is the most common technology for removal of salinity for recycled water. The RO process would treat a portion of the recycled water, with product water blended back into the recycled water flow stream to achieve desired salinity. Microfiltration or ultrafiltration membrane would be used as pretreatment.

Reasons For Elimination: RO was eliminated because the level of treatment is not needed for agricultural use. Discharge of waste from the RO process, brine, would increase permitting requirements. In addition, RO is very costly compared to other salinity control measures.

Salinity Source Control

This alternative method would involve decreasing salinity of discharge from specific sources, including food-processing facilities and other industries. This could be achieved by modification of industrial processes, implementation of individual treatment processes prior to discharge, implementation of small decentralized facilities, or restricting discharges.

Reasons For Elimination: This alternative was eliminated due to projected significant impacts on the local economy. In addition, source control would not likely result in effluent meeting irrigation water quality requirements and additional salinity control measures would be required.