# Option Submittal Form

Contact Information (optional):

☐ Keep my contact information private

Contact Name: ______________ Title: ______________

Affiliation: ______________

Address ______________

Telephone: ______________ E-mail Address: ______________

Date Option Submitted: 2/8/12

Option Name:

Rosarito Beach Binational Seawater Desalination Plant

Description of Option:

A 50-mgd seawater desalination plant located in Rosarito Beach, Baja California, Mexico. The product water from the plant could be delivered to either Mexican or U.S. water users using either a direct pipeline delivery or water exchange between Mexican and U.S. water users. In 2010, the San Diego County Water Authority, Central Arizona Water Conservation District, Metropolitan Water District of Southern California, and Southern Nevada Water Authority completed the first phase of a four-phase study of the feasibility of a Rosarito Beach Binational seawater desalination plant. This study is attached for reference and to provide additional detail.

**Location:** Describe location(s) where option could be implemented and other areas that the option would affect, if applicable. Attach a map, if applicable.

The desalination plant would be located in Rosarito Beach, Baja California, Mexico. Product water could be distributed to Mexican water users in Baja California, delivered via a pipeline connection to the U.S. border at San Diego County, or exchanged for Colorado River water for U.S. users at other locations.

**Quantity and Timing:** Roughly quantify the range of the potential amount of water that the option could provide over the next 50 years and in what timeframe that amount could be available. If option could be implemented in phases, include quantity estimates associated with each phase. If known, specify any important seasonal (e.g,. more water could be available in winter) and/or frequency (e.g., more water could likely be available during above-average hydrologic years) considerations. If known, describe any key assumptions made in order to quantify the potential amount.

The plant would be sized to produce 50 million gallons per day (mgd), but likely could be scaled up in phases to produce up to 75 mgd. Over 50 years, at 50 mgd the plant would produce about 2.8 million acre-feet of water. The plant could be designed and constructed in 5 to 10 years, so that product water could be available starting in 2017 to 2022.

# Additional Information

**Technical Feasibility:** Describe the maturity and feasibility of the concept/technology being proposed, and what research and/or technological development might first be needed.

The plant would be constructed using existing reverse osmosis desalination technology. A pilot plant would be constructed to research ocean source water and product water quality and to assist in designing the plant.

**Costs:** Provide cost and funding information, if available, including capital, operations, maintenance, repair, replacement, and any other costs and sources of funds (e.g., public, private, or both public and private). Identify what is and is not included in the provided cost numbers and provide references used for cost justification. Methodologies for calculating unit costs (e.g., $/acre-foot or $/million gallons) vary widely; therefore, do not provide unit costs without also providing the assumed capital and annual costs for the option, and the methodology used to calculate unit costs.

Cost information is not yet available.

**Permitting:** List the permits and/or approvals required and status of any permits and/or approvals received.

The project would have to conform to all applicable U.S. and Mexican law regarding environmental permitting. A table of anticipated permits is included in the attached Phase 1 study on page 5-34.

**Legal / Public Policy Considerations:** Describe legal/public policy considerations associated with the option. Describe any agreements necessary for implementation and any potential water rights issues, if known.

A number of legal and public policy considerations exist, including the potential for water exchanges to deliver product water in the U.S., environmental considerations, water quality considerations for product water delivered directly to California users via pipeline, security, and binational cooperation.

**Implementation Risk / Uncertainty:** Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

The project would be unique in providing a large-scale desalination plant with product water shared across the U.S. / Mexican border. As such, there is a relatively high degree of risk and uncertainty compared with developing a comparable plant in the U.S.

**Reliability:** Describe the anticipated reliability of the option and any known risks to supply or demand, such as: drought risk, water contamination risk, risk of infrastructure failure, etc.

Product water would be highly reliable, controlled through the operation of the plant.

**Water Quality:** Identify key water quality implications (salinity and other constituents) associated with the option in all of the locations the option may affect.

The plant would produce high-quality water suitable for introducing into Mexico's water distribution system, or delivering via pipeline to U.S. water users in San Diego County.

**Energy Needs:** Describe, and quantify if known, the energy needs associated with the option. Include any energy required to obtain, treat, and deliver the water to the defined location at the defined quality.

| Energy Required | Source(s) of Energy |
|---|---|
| Estimated 33 MW for plant; 7 MW for pumping product water | Existing power plant at Rosarito Beach site |
| | |

**Hydroelectric Energy Generation:** Describe, and quantify if known, any anticipated increases or decreases in hydroelectric energy generation as a result of the option.

| Location of Generation | Impact to Generation |
|---|---|
| Not applicable | |
| | |

**Recreation:** Describe any anticipated positive or negative effects on recreation.

| Locations | Anticipate Benefits or Impacts |
|---|---|
| None known. | |
| | |

**Environment:** Describe any anticipated positive or negative effects on ecosystems within or outside of the Colorado River Basin.

| Locations | Anticipated Benefits or Impacts |
|---|---|
| Rosarito Beach, Baja California, Mexico | Impacts to near-ocean environment through intake of seawater and dischar |
| | |

**Socioeconomics:** Describe anticipated positive or negative socioeconomic (social and economic factors) effects.

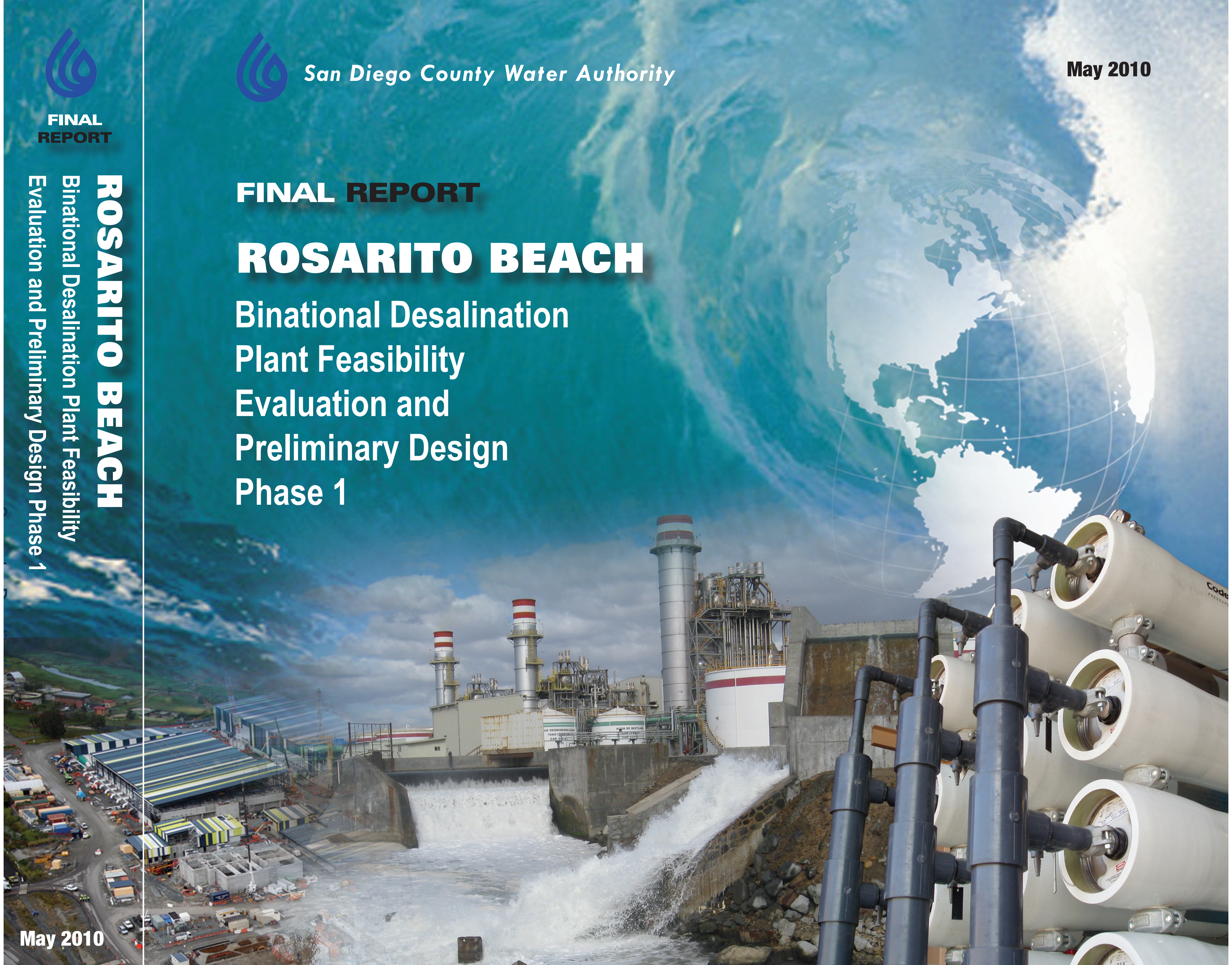
Not known at this time.

**Other Information:** Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Please see attached report additional information: "Rosarito Beach Binational Desalination Plant Feasibility Evaluation and Preliminary Design Phase 1."

San Diego County Water Authority

May 2010



**FINAL REPORT**

# ROSARITO BEACH

## Binational Desalination Plant Feasibility Evaluation and Preliminary Design Phase 1

MALCOLM PIRNIE

SINCLAIR KNIGHT MERZ SKM

VEOLIA WATER

A T Analytica LLC

DUDEK

Servicios de Ingeniería e Informática S.C.

FINAL REPORT

ROSARITO BEACH Binational Desalination Plant Feasibility Evaluation and Preliminary Design Phase 1

May 2010

MALCOLM PIRNIE

SKM

VEOLIA WATER

**San Diego County Water Authority**
4677 Overland Avenue • San Diego, CA 92123

# Rosarito Beach Binational Desalination Plant Feasibility Evaluation and Preliminary Design Phase 1

May 2010

Report Prepared By:

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MALCOLM PIRNIE

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## Acronyms Used in the Report

| | |
|---|---|
| AC | acres |
| ACOE | Army Corp of Engineers |
| AF | acre-feet |
| AFY | acre-feet per year |
| BECC | Border Environment Cooperation Commission |
| BEIF | Border Environment Infrastructure Fund |
| btu | British thermal unit |
| °C | degrees Celcius |
| CAA | Clean Air Act |
| CAAQS | California Ambient Air Quality Standards |
| Cal/OSHA | California Occupational Safety and Health Administration |
| Caltrans | California Department of Transportation |
| CARB | California Air Resources Board |
| CAWCD | Central Arizona Water Conservation District |
| CCC | California Coast Commission |
| CCGT | Combined cycle gas turbine |
| CDFG | California Department of Fish and Game |
| CDPH | California Department of Public Health |
| CEA | Comisión Estatal de Agua (State Water Commission) |
| CESA | California Endangered Specied Act |
| CESPT | Comisión Estatal de Servicios Públicos de Tijuana (State Public Services of Tijuana). |
| CEQA | California Environmental Quality Act |
| CFE | Comisión Federal de Electridad (Federal Electricity Commission) |
| CHP | California Highway Patrol |
| CILA | Comisión Internacional de Límitas y Aguas (International Boundary and Water Commission) |
| CONAGUA | Comisión Nacional del Agua (National Water Commission) |
| CWA | Clean Water Act |
| DAF | Dissolved Air Filtration |
| DGE | Dirección General de Ecología (General Directorate of Ecology) |
| DHS | Department of Health Services |
| DTSC | Department of Toxic Substances Control |
| EA | Environmental Assessment |
| ECBC | Emergency Cross Border Connection |
| EIR | Environmental Impact Report |
| EIS | Environmental Impact Statement |
| EPA | U.S. Environmental Protection Agency |
| ESA | Endangered Species Act |
| ft/s | feet per second |
| GHG | greenhouse gases |
| GLEEP | Ley General del Equilibrio Ecológico y la Protección al Ambiente (General Law for Ecological Balance and Environmental Protection) |
| gpd | gallons per day |

| | |
|---|---|
| ha | hectare |
| hp | horse power |
| HP | High Pressure |
| HRSG | Heat recovery steam generator |
| IBWC | International Boundary Water Commission |
| km | kilometers |
| kWhr | kilowatt hours (one thousand watts operating for one hour) |
| l/s | liters per second |
| m | meters |
| $m^3$ | cubic meters |
| MF | microfiltration |
| mg | million gallons |
| mgd | million gallons per day |
| MIA | Manifesticion de Impacto Ambiental |
| MLD | million liters per day |
| MP | Malcolm Pirnie, Inc. |
| MRO | operating reserve margin |
| m/s | meters per second |
| MW | Mega Watts |
| NADB | North American Development Bank |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| No. | number |
| NPDES | National Pollution Discharge Elimination System |
| O3 | Ozone |
| Peso $ | Mexican Peso |
| PCC | Portland Cement Concrete |
| PFD | process flow diagram |
| ppt | parts per thousand |
| psi | pounds per square inch |
| PV | Photo voltaic |
| RFP | Request for Proposal |
| RO | reverse osmosis |
| ROW | Right of Way |
| RWQCB | Regional Water Quality Control Board |
| SDAB | San Diego Air Basin |
| SDAPCD | San Diego Air Pollution Control District |
| SEMARNAT | Secretaria de Medico Ambiente y Recursos Naturales (Secretariat for the Environment and Natural Resources) |
| SDCWA | San Diego County Water Authority |
| SIN | National Interconnection System |
| SWRO | Seawater Reverse Osmosis |
| TM | Technical Memorandum |

| | |
|---|---|
| UF | ultrafiltration |
| U.S. | United States |
| USFWS | United States Fish and Wildlife Service |
| UWMP | Urban Water Management Plan |
| WW | Wastewater |
| WWTP | Wastewater treatment plant |
| ZOFEMAT | Federal Maritime-Terrestrial Zone Permit |
| $ | U.S. Dollars |

# Glossary of Water Agencies

**Mexican Agencies**

- Comisión Nacional del Agua (CONAGUA) - The National Water Commission (CONAGUA) is an administrative, normative, technical, consultative and decentralized agency of the Ministry of the Environment and Natural Resources (SEMARNAT). CONAGUA's tasks: a) Administration of the National Waters; b) Management and control of the hydrologic system; and c) Promotion of social development. The Mission of the National Water Commission is to manage and preserve national waters and their inherent goods in order to achieve sustainable use, with joint responsibility of the three tiers of government (federal, state, and municipal) and society as a whole.
- Comisión Estatal de Servicios Públicos de Tijuana (CESPT)- The 5th Legislature of the State of Baja California, issued Decree No. 44 through which CESPT was created. CESPT is a decentralized agency. The function of CESPT is to provide drinking water and sanitary sewer collection to the cities of Tijuana and Playas de Rosarito, as well as wastewater treatment to prevent pollution of the sea.
- Comisión Estatal del Agua (CEA)- The State Water Commission of the State of Baja California was created to develop and coordinate the systems associated with delivering wholesale water to communities in the State, to plan, to regulate and to coordinate the systems of water distribution, wastewater collection and treatment, and reclaimed water reuse. The main goals of the current administration are to increase efficiency, service delivery, actual coverage of potable water and sanitary and stormwater sewer, and as a special goal, to increase treated wastewater reuse.
- Comisión Internacional de Limites y Aguas - Sección Mexicana (CILA)- The IBWC is an international body composed of a Mexican Section and a United States Section, each of which is headed by a Commissioner engineer appointed by the President of their country. The IBWC has become a pioneer agency within a binational context and has assisted both governments in the improvement and conservation of the environment of the United States-Mexico border, focusing its activities on developing jointly international solutions consisting of environmental infrastructure projects and control, conservation and use of water, designed and built and operated by the two countries under the supervision of the IBWC. It is incumbent on the IBWC, among other tasks, to verify that the operation and maintenance of their facilities are carried out according to agreements between Mexico and the United States with respect to international boundary and water issues. Likewise, each section of the IBWC is responsible for coordinating with their relevant agencies in their country, the supervision and implementation of joint international technical studies.

**United States Agencies**

- San Diego County Water Authority (SDCWA)- As a water wholesaler, the San Diego County Water Authority's mission is to provide a safe and reliable supply of water to its 24 member agencies in the San Diego region.
- Central Arizona Water Conservation District (CAWCD)- In 1971, the Central Arizona Water Conservation District was created to provide a means for Arizona to repay the federal government for the reimbursable costs of construction and to manage and operate the Central Arizona Project (CAP). CAP is designed to bring about 1.5 million acre-feet of Colorado River water per year to Pima, Pinal and Maricopa counties. CAP carries water from Lake Havasu near Parker to the southern boundary of the San Xavier Indian Reservation southwest of Tucson. It is a 336-mile long system of aqueducts, tunnels, pumping plants and pipelines and is the largest single resource of renewable water supplies in the state of Arizona.
- Metropolitan Water District of Southern California (MWD)-The Metropolitan Water District of Southern California is a consortium of 26 cities and water district that provides drinking

water to nearly 19 million people in part of Los Angeles, Orange, San Diego, Riverside, San Bernardino and Ventura counties.

- Southern Nevada Water Authority (SNWA). SNWA is a cooperative agency formed in 1991 to address Southern Nevada's unique water needs on a regional basis. SNWA is governed by a seven-member agency comprised of representatives from each of its member organizations.

# Conversions

| To Convert | Multiply By | To Obtain |
|---|---|---|
| acre | 0.4047 | hectare |
| acre-feet | 3.259x10^5 | gallons |
| cubic meters | 264.2 | gallons |
| feet | 0.3048 | meter |
| gallons | 3.785x10^-3 | cubic meters |
| horsepower | 0.746 | kilowatts |
| °C | (°CxP9/5)+32 | °F |
| feet/sec | 18.29 | meters/min |
| meters | 39.37 | inches |
| AFY | 8.93x10^-4 | mgd* |
| AFY | 0.0391 | l/s* |

*Assumes 365 days/yr operation

# Executive Summary

This report summarizes the results of Phase 1 of a 4 Phase joint effort between the United States and Mexico to study the feasibility of a binational seawater desalination facility. The seawater reverse osmosis (SWRO) plant would be located at Rosarito Beach, Mexico and would supply potable water to both Mexico and the United States. The agencies participating in this effort are:

- U.S./Mexico need new water sources
- Desalination is a new source
- A binational project in Mexico offers a solution

**United States**

- San Diego County Water Authority (SDCWA)
- Central Arizona Water Conservation District
- Metropolitan Water District of Southern California
- Southern Nevada Water Authority

**México**

- Comisión Nacional del Agua (CONAGUA)
- Comisión Estatal de Servicios Públicos de Tijuana (CESPT)
- Comisión Estatal del Agua (CEA)
- Comisión Internacional de Limites y Aguas Sección Mexicana (CILA)

## Background

In 2005, the San Diego County Water Authority evaluated the feasibility of a binational seawater desalination facility. The 2005 Report, *Feasibility Study of Seawater Desalination Development Opportunities for the San Diego/Tijuana Region*, considered several possible locations for the desalination plant, one of which was in Rosarito Beach, Mexico. An advantage offered by the Rosarito Beach site is the potential access to the CFE power plant intake and outfall facilities. A feasibility-level cost estimate was developed for two different locations in the United States and two Mexico sites. Capital, operating, and water cost estimates were developed. The 2005 Report was based upon a maximum production of 50 mgd (2,190 l/s) with 28.33 mgd (1,240 l/s) for Mexico and 21.67 mgd (940 l/s) to the U.S. from a pipeline originate at the desalination plant site and terminating in San Diego County. The U. S. and Mexico cost shares were based on the ratio of total water production that each county would receive from the desalination plant.

This project builds upon the knowledge gained from the 2005 Report to ultimately provide a "10 percent" design for a seawater desalting plant located at Rosarito Beach. The design would be such that product water could be made available to water users in Mexico and across the border to a U.S. connection in San Diego County. The project is jointly funded by the San Diego County Water Authority, Metropolitan Water District of Southern California, the Southern Nevada Water Authority, and the Central Arizona Water Conservation District.

The team of Malcolm Pirnie, Sinclair Knight Merz (SKM), and Veolia Water supported by specialty subconsultants were selected to perform this study which began in October, 2009.

## Purpose

The overall purpose of this project is to produce a Preliminary Design Submittal, which may be described as a “10 percent” design, for the construction of a 25 mgd (1,095 l/s) reverse osmosis (RO) seawater desalination plant, expandable to 50 mgd (2,190 l/s). The seawater RO plant design will include the feedwater intake and brine discharge facilities, product water conveyance system to water users in both Mexico and the U.S., and related necessary facilities.

As originally envisioned, the project is organized into four phases. Each phase consists of specific tasks required to produce the Preliminary Design Submittal. This report covers only Phase 1-Feasibility Evaluation and consists of a series of Technical Memorandums (TM). Subsequent phases produce other TM’s that lead to the “10 percent” design. The four phases are:

- Phase 1: Feasibility Evaluation-A feasibility study of the project site and associated facilities.
- Phase 2-Product Water Conveyance Evaluation-Pumping requirements, operational storage requirements, pipeline sizes and materials, and pipeline alignment options for delivery of desalinated water to Mexico and U.S. aqueduct systems.
- Phase 3-Pilot Plant Development and Testing-Develop a pilot seawater desalination plant at or near the project site that will be used to obtain information necessary for the full-scale preliminary desalination plant design.
- Phase 4-Preliminary Design-Complete the full scale preliminary design of the desalination plant and relate facilities. The design will be for a plant that is initially capable of producing 25 mgd (1,095 l/s) of product water, be expandable to the ultimately produce 50 mgd (2,190 l/s) of product water, and deliver product water to Mexican and U.S. water users.

The project site is located in the city of Rosarito Beach in Baja California, Mexico, near a Federal Electric Commission (CFE) power facility containing three electrical power generation plants. These power plants use a once-through seawater cooling system and have intake and outfall facilities to the Pacific Ocean. Nearby plots of land could be used for the desalination project facilities.

## Phase 1-Feasibility Evaluation Goal

The primary goal of this project is a ***technically-feasible, permittable, and cost-effective strategy to move forward with full-scale implementation of desalination*** to meet the future needs of the United States and Mexico. In other words, are there any "fatal flaws" in this concept and, if so, identify them early on in the Preliminary Design. To meet the goal, assistance was required from the Mexican water agencies and the Rosarito Beach CFE power plant.

Phase 1 is designed to answer the fundamental questions:

1. What size plant will water demand projections support?
2. Will the site accommodate facilities to meet those demands?
3. How might water be distributed in the service area and what pipelines/corridors would make sense?
4. How might a desalination plant at the Rosarito Beach site be powered?
5. What environmental permitting issues are envisioned and how might those be systematically addressed?

## Results

### Water Demand

- ***What size plant will water demand projections support?***

Water demand information was compiled from a combination of existing documents and interviews with key staff at participating Mexican and U.S. water agencies. These agencies were asked to provide demand projections (and supporting documentation) at five-year increments over a 25-year planning period ranging from 2015 to 2040.

Seawater reverse osmosis desalinated water was not identified as a water source by the SDCWA member agencies in its 2005 Urban Water Master Plan (UWMP) but other alternative supplies were identified (i.e. reclamation, brackish groundwater, etc). These alternate supplies were assumed to be economically replaced by SWRO. Currently the SDCWA is in the process of updating its UWMP which is due in 2011. The results of this update may specifically identify the potential demand for desalinated seawater.

A summary of the total potential demand for water from a Rosarito Beach SWRO plant is provided in Table ES-1, which combines the U.S. and Mexican demands.

**Table ES-1**
**Total Rosarito Beach SWRO Demand**

| Country | | Demand (mgd) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| United States | SDCWA | 34 | 46.1 | 66.2 | 94 | 94 | 94 |
| | EXCHANGE** | 89 | 112 | 134 | 156 | 179 | 223 |
| | TOTAL US | 123 | 158.1 | 200.2 | 250 | 273 | 317 |
| Mexico | | 11 | 14.4 | 17.4 | 20 | 23 | 26.7 |
| Total* | mgd | 134 | 173 | 218 | 270 | 296 | 344 |
| | AFY | 150,100 | 193,200 | 243,700 | 302,400 | 331,500 | 384,900 |
| | l/s | 5,870 | 7,550 | 9,530 | 11,800 | 13,000 | 15,000 |

*All totals rounded to 3 significant figures

** SNWA, CAWCD, and MWD could benefit by a potential exchange agreement for Colorado River supply.

As shown in Table ES-1, there is potential combined demand for desalinated seawater from the U.S. and Mexico of 134 mgd (5,869 l/s) by 2015, the earliest year evaluated in this analysis. At that time, the potential U.S. demand for desalinated seawater will have already exceeded the 21.67 mgd (949 l/s) allocation assumed in the 2005 Report. Mexico's demand in 2015 will be 11 mgd (482 l/s) and will increase to 26.7 mgd (1,170 l/s) in 2040, nearly the value of 28.33 mgd (1,241 l/s), used in the 2005 Report. Thus there is sufficient demand for a 50 mgd plant.

### Site Evaluation

> ***Will the site accommodate necessary facilities to meet those demands?***

The 2005 Report identified several potential sites in Rosarito Beach for the desalination plant. These sites are shown in Figure ES-1.

During site visits, the study team met with both the Mexican water agencies and CFE to determine information about the sites. Based upon these meetings:

- Site S1 offers the advantages of closeness to the outfall facilities (approximately 1,300 ft) (400 m) and largest available area. It is privately owned and not readily available.
- Sites S2 and S3 are located at the CFE power plant but are unavailable for the desalination plant. However, access to the CFE outfall facilities can be obtained with recognition of the need for power plant site security and development of an acceptable access plan with CFE.
- Only sites S5 and S6 are readily available. S5 is owned while S6 is being re-titled by CESPT. S6 would be preferred as it is larger and closer to the CFE supporting facilities. Two pipelines of approximately 6,000 ft (1,800 m) long would be required to transmit feedwater and return brine from the desalination plant to the outfall.

- Other sites might be available but would require changes in ownership.
- The area between S5 and S6 currently houses a building and has facilities for future buildings. This area, if required, would also require acquisition.
- Future plans for the power plant need to be considered in conjunction with the desalination plant design as the power plant's outfall will be utilized by the desalination plant. The first intake/outfall started in 1963 and a second separate intake was installed in 2004.
- A seawater RO pilot plant was tested in 2004 and is currently located at the CESPT Rosarito Beach offices. Information from the previous testing was obtained and can assist in development of a pilot plant test program.

**Figure ES-1: Rosarito Beach Site Aerial View**

### Desalination Plant Layout

A preliminary layout for the required desalination facilities including pretreatment was developed. Site S6 was recommended as the primary site for treatment facilities with site S5 for product water storage (project water storage could ultimately be located off-site). Conservative assumptions were used to identify pretreatment equipment for the SWRO units. A layout was developed for site S6 for the 25 and 50 mgd (1,095 and 2,190 l/s) phased development.

In addition to these facilities, off-site facilities located at the power plant include the feedwater intake, pumping, screening (drum screens) facilities, and pipelines to deliver water to Site S6 and return brine from the plant to the outfall. These facilities should be located in the vicinity of the CFE cooling water outfall.

### Water Distribution

- ***How might water be distributed to Mexico and the U. S. and what pipelines/corridors would make sense?***

Two pipeline alignments were identified in the 2005 Report for delivery of the U.S. portion of the desalinated water to San Diego County. Both of these alignments present significant challenges. However, a third alignment, identified as Corridor 2000, was identified by CESPT during the site visits. This alignment offers significant advantages over the previously identified alignments. Other alignments may offer other advantages as well.

### Power

- ***How might a desalination plant at the Rosarito Beach site be powered?***

Several power alternatives were considered to supply backup power to the desalination facility, to confirm the cost of electric power used in the 2005 Report, and to consider other power supply alternatives.

- Electric power is a major cost component of the delivered water cost. The 2005 Report estimated up to 33 MW for the SWRO process and 7 MW for water pipeline pumping.
- The electric power rate for the desalination process is higher than that given in the 2005 Report. This would increase the desalination water cost by about 15%. However, use of currently available high efficiency RO energy recovery devices would decrease the total SWRO power required by over 20%.
- CFE has sufficient electrical capacity to supply the power for a 50 mgd (2,190 l/s) desalination facility and the pumping requirements.
- As the CFE power plant has sufficient power capacity for the desalination plant, an alternative supply need only be considered if it can show to offer major advantages.

- Alternative electrical sources could also be considered. Wind would likely be the most cost effective. Both wind and solar have large and site specific requirements which would necessitate locations other than the desalination plant.
- Waste heat (heated seawater) is beneficial to the SWRO process as it decreases either the number of membranes required or the electrical energy requirements. Thus, there are additional advantages for use of the existing seawater discharge from the Rosarito power plant.

### Permitting

- ***What environmental permitting issues are envisioned and how might those be systematically addressed?***

Both Mexico and the U.S. have regulations to protect the environment and improve environmental quality and have similar environmental laws and regulations.

- The proposed project has unique characteristics because it includes components on both sides of the U.S.-Mexico border which complicates direct comparisons to existing permitted facilities.
- Currently, it is not certain whether approvals/entitlements and construction of the project would be pursued by a private party, a water agency, a U.S. governmental agency, or a Mexican governmental agency. Permitting and legal compliance responsibilities would vary depending on such arrangements.
- Both Mexico and the U.S. have regulations to protect the environment and improve environmental quality. The project has unique characteristics because it includes components on both sides of the U.S./Mexico border. Project funding and delivery options/jurisdiction will affect regulatory requirements. All applicable California and U.S. laws would apply to project components within California. Similarly, all applicable Mexican law would apply to project components within Mexico. Sovereign nation issues and public opinion may affect requirements. There is limited policy guidance or legal precedent for permitting the plant.
- The project is outside of the CDPH direct jurisdiction so early and detailed discussion with CDPH representatives and, very likely, USEPA is warranted to define water quality/operational requirements for the plant.
- Permitting is estimated to require about 29 months after the preliminary design and project description details have been finalized.

## Conclusions

The overall conclusions are:

- There are no fatal flaw issues at this time
- Mexico/U.S. water demand is at least 50 mgd (2,190 l/s)
- The CESPT sites are viable for a 25 or 50 mgd plant

- An alternative pipeline alignment is a promising alternative
- Sufficient electrical power is available from CFE
- A seawater pilot plant with operating data is available
- There are complex cross-border environmental permitting issues

## Recommendations and Next Steps

Based upon the Phase 1 results, the originally envisioned Phase 2 detailed study of the product water conveyance routes should be modified and the design delayed.  Instead, the following further efforts are recommended for Phase 2:

- Analyze pilot plant data
- Reevaluate the desalination plant conceptual design/Evaluate new sites/update treatment process criteria
- Consider water delivery and exchange scenarios
- Evaluate new conveying alignments as they maybe more feasible than the 2005 Report's alignments
- Develop a desalination plant conceptual cost
- Confirm water demands based on updated unit water costs
- Conduct preliminary discussions with permitting agencies
- Provide a stakeholder outreach support
- Provide project management and translation services

# Chapter 1 Introduction

## 1.1. Background

The San Diego County Water Authority has the goal of diversifying its water supply in order to continue to meet changes in demand. In 2005, the Authority evaluated the feasibility of a binational seawater desalination facility. The 2005 study, *Feasibility Study of Seawater Desalination Development Opportunities for the San Diego/Tijuana Region*, considered several possible locations for the desalination plant, one of which was in Rosarito Beach in Mexico. A feasibility level cost estimate was developed for two different locations in the United States and two Mexico sites. Capital and delivered water cost estimates were developed. The U. S. and Mexico capital cost shares were based on the ratio of total water production that each county would receive from the desalination plant. The lowest cost for delivered water from Mexico was estimated at $1,016 $/acre foot delivered to Mexico and $1,419 $/acre foot for water delivered to the United States from a 50 mgd (2,190 l/s) plant. Water cost to the U. S was higher due to the water transmission costs.

This project builds upon the knowledge gained from the 2005 study to ultimately provide a “10 percent” design for a seawater desalting plant located at Rosarito Beach. The design would be such that product water could be made available to water users in Mexico and across the border to a U.S. connection in San Diego county. The project is jointly funded by the San Diego County Water Authority (Water Authority), Metropolitan Water District of Southern California, the Southern Nevada Water Authority, and the Central Arizona Water Conservation District.

The team of Malcolm Pirnie, Sinclair Knight Merz (SKM), and Veolia Water supported by several specialty sub-contractors were selected to perform this study which began in October, 2009.

## 1.2. Project Purpose

The purpose of this project is to produce a Preliminary Design Submittal, which may be described as a “10 percent” design, for the construction of a 25 mgd (1,095 l/s) reverse osmosis (RO) seawater desalination plant, expandable to 50 mgd (2,190 l/s). The seawater RO plant design will include the feedwater intake and brine discharge facilities, product water conveyance system to water users in both Mexico and the U.S, and related necessary facilities.

The project site is located in the city of Rosarito Beach in Baja California, Mexico, near a Federal Electricity Commission (CFE) power facility. This power plant uses a once-through seawater cooling system and has intake and outfall facilities to the Pacific Ocean. Nearby plots of land could be used for the desalination project facilities.

The study is organized into four specific and discrete phases each of which results in a series of

Technical Memorandums (TM). Each phase of work consists of specific tasks required to produce the Preliminary Design Submittal. This report covers only Phase 1-Feasibility Evaluation. Subsequent phases produce other TM's that lead to the "10 percent" design. The four phases are:

- Phase 1: Feasibility Evaluation-A feasibility study of the project site and associated facilities.
- Phase 2-Product Water Conveyance Evaluation-Pumping requirements, operational storage requirements, pipeline sizes and materials, and pipeline alignment options for delivery of desalinated water to Mexico and U.S. aqueduct systems.
- Phase 3-Pilot Plant Development and Testing-Develop a pilot seawater desalination plant at or near the project site that will be used to obtain information necessary for the full-scale preliminary desalination plant design.
- Phase 4-Preliminary Design-Complete the full scale preliminary design of the desalination plant and relate facilities. The design will be for a plant that is initially capable of producing 25 mgd (1,095 l/s) of product water, be expandable to the ultimately produce 50 mgd (2,190 l/s) of product water, and deliver product water to Mexican and U.S. water users.

## 1.3. Phase 1-Feasibility Evaluation

The primary goal of this project is a ***technically-feasible, permittable, and cost-effective strategy to move forward with full-scale implementation of desalination*** to meet the future needs of the project Sponsors. As part of developing an understanding of the important issues, assistance was obtained from Mexican water agencies and the CFE power plant personnel. The Mexican agencies include:

- Comisión Nacional del Agua (CONAGUA)
- Comisión Estatal de Servicios Públicos de Tijuana (CESPT)
- Comisión Estatal del Agua (CEA)
- Comisión Internacional de Limites y Aguas Sección Mexicana (CILA)
- Federal Electricity Commission (CFE)

Phase 1 is designed to answer the fundamental questions:

1. How might water be distributed to Mexico and US and what pipelines/corridors would make sense?
2. How might a desalination plant at the Rosarito Beach site be powered?
3. What size plant will water demand projections support?
4. Will the site accommodate necessary facilities to meet those demands?
5. What environmental permitting issues are envisioned and how might those be systematically addressed?

Phase 1 was divided into 4 tasks:

- Task 1.1 Data Collection and Field Reconnaissance
- Task 1.2 Site Evaluation (including a power supply investigation)
- Task 1.3 Water Demand Assessment
- Task 1.4 Environmental and Permitting Issues

Each of the following chapters covers one of these tasks.  These chapters include the Technical Memoranda containing the results of the analysis and evaluations.

# Chapter 2 Task 1.1 – Data Collection and Field Reconnaissance

## 2.1. Objectives

This Technical Memorandum covers the requirements of Task 1.1. This task includes both data collection and a field reconnaissance survey of the site and selected potential water conveyance alignment corridors identified in the 2005 *Feasibility Study of Seawater Desalination Development Opportunities for the San Diego I Tijuana Region* (2005 Report) prepared for the San Diego County Water Authority. The information will be used to determine if a suitable site for a 25 mgd expandable to 50 mgd (1,095 and 2,190 l/s) desalination plant can be located at the Rosarito Beach site and where an appropriate pipeline alignment exists.

## 2.2. Background and Methodology

### 2.2.1. Background

In the 2005 Report, several options for a 50 mgd (2,190 l/s) binational desalination plant were evaluated at different sites and different alignments identified for transporting water to Mexico and to the United States (U.S.). The desalinated water flow would be shared between the U.S. and Mexico. This current study focused exclusively on a site in Rosarito Beach, Mexico to confirm the potential site availability and alignment's feasibility.

### 2.2.2. Methodology

To gather this important information, meetings were arranged with the Mexican water agencies and the CFE power plant personnel. Following initial written requests, a meeting was held with Mexican water agencies on Nov 17 and 18, 2009 in Tijuana. In addition, a meeting was held at the CFE Rosarito Beach power plant on December 8, 2009 to determine the availability of the site and whether the existing intake/outfall facilities could be utilized for the desalination project.

## 2.3. Data Collection

An important part of any project is the preservation of data collected during its execution. The RFP listed information to be collected during this project and this information is shown in Table 2-1. The collected information is included in a separate Data Disk as an appendix to the Final Report. The material is organized into Sections as identified in the Table 2-1, e.g. Section 1 contains information on the 2005 Report.

**Table 2-1**
## Data Collection Directory

| SECTION | INFORMATION |
|---|---|
| 1 | 2005 "*Feasibility Study of Seawater Desalination Development Opportunities for the San Diego / Tijuana Region*" (Feasibility Study) prepared by the San Diego County Water Authority, and the 2007 "*Pre-Feasibility Report of Water Management Opportunities in Baja California, Mexico*" prepared by the Metropolitan Water District of Southern California |
| 2 | Relevant correspondence, meeting minutes, calculations, estimates, spreadsheets, engineering sketches and drawings; |
| 3 | Water supply and system master planning reports and analysis; including identification of potential connection points and hydraulic grade line elevations, quantification of existing and projected demand, system flow, and system flow capacity downstream of each point of connection |
| 4 | Topographic and system maps |
| 5 | Property and ROW descriptions |
| 6 | Other reports on the pipe alignment |
| 7 | Information on Data Gaps relating to the hydraulic and operation models |
| 8 | Geologic studies and geotechnical reports |
| 9 | Facility drawings and maps |
| 10 | Electric power costs and Rosarito Power Plant operations |
| 11 | Fuel (e.g. Natural gas) cost and availability at the site. |
| 12 | Grid power cost at the site |
| 13 | Electronic files for plant layouts/ aerials in PB 2005 study |
| 14 | Water agency contacts to identify water desalination requirements |
| 15 | 2006 CDM CESPT Report on Tijuana and Rosarito |
| 16 | Subsequent reports on desalination water requirements in the effect areas of the US and Mexico |
| 17 | Permit and environmental requirements. |
| 18 | Available design drawings, specifications, and calculations of water intake and discharge systems, including previous inspection reports, photographs, and videos of intake and discharge facilities |
| 19 | Flow and temperature data for power plant intake and discharge canals and modeling used in the design and operation of these facilities |
| 20 | Source water quality data |
| 21 | Anticipated product water quality |
| 22 | Local marine near shore conditions, i.e. Tidal ranges, seasonal water chemistry (salinity/temperature) variations, surf ranges, and local circulation patterns |
| 23 | Aquatic resources in the vicinity and areas of special marine biological significance |

Not all the requested data can be obtained at this time. Security has become a very important issue since 9/11 at all public facilities. This is especially important at both water and power facilities. Therefore, detailed engineering information regarding the water and power facilities cannot be supplied without the Mexican Federal agency headquarters assistance. This can be accomplished in future project phases when specific information is identified.

## 2.4. Site Reconnaissance

Fundamental issues in the siting of a seawater desalination project are:

- Access to seawater (A power plant co-location eliminates need for new intake/outfall facilities)
- Available land (large contiguous area is required)
- Available and sufficient electrical power supply (electric power is required)
- System integration with existing distribution system (distance, water quality issues)

The Rosarito Beach area offers these advantages because of potential for available land and for access to the CFE power plant seawater intake/outfall. The CFE Presidente Juarez power complex has three generating plants with a steam cycle (1963), combined cycle (2001), and a combustion turbine peaking plant. The power plants use seawater in a once-through cooling system that must be maintained during power production. Seawater flow from the older plants is operated infrequently as compared to the combined cycle plant. The original intake and outfall cooling waters channels were for the steam cycle plants. The most recent combined cycle plant uses a separate offshore intake with a discharge structure that empties into the discharge channel of the original units.

### 2.4.1. Potential Desalination Sites

An aerial view of the Rosarito Beach area near the CFE power plant is shown in Figure 2-1. The potential desalination sites are identified by the designation SX where X is the site number, e.g. S1 is Site 1. Using information gathered from the meetings and site visits, facts were gathered on site availability and their characteristics.

The 2005 Report provided an estimate of the land area required for the SWRO plant. The estimates were: 3.5 acres (1.4 ha) for the 25 mgd (1,095 l/s) facility and 5 acres (2.0 ha) for the 50 mgd (2,190 l/s) facility. These area requirements are further investigated in Task 1.2 on Site Evaluation to determine if less area is required. Technical improvements and the necessity for efficient space utilization can lessen the land requirements.

**Figure 2-1: Rosarito Beach Site Aerial View**


A brief description of the sites follows along with their approximate area:

S1- S1 is privately owned and reportedly to be used to install a desalination plant (the 2005 Report stated this site was CFE owned but current information disputes this claim). This is a large and undeveloped area with a location near the outfall canal (65 acres/26 ha).

S2 and S3-The two sites are within the CFE and are unavailable because of power plant needs and security issues. Note that S3 was the location of a desalting plant in the 60's which was removed (S2 4.9 acres/2.0 ha, S3 2.0 acres/0.8 ha).

S4-This was a co-operative's land and is reportedly owned by others. This site is located east of PEMEX storage tanks and is bounded by two high voltage power lines on either side. CFE's Right Of Way (ROW) restrictions require a 15-meter easement to each side of the power corridor center line. Thus the usable site width will be reduced by at least 30 meters. Also, this property is the location of a natural gas compressor station owned by the gas supplier, Sempra Energy. (15 acres/6 ha).

S5-This site is owned by CESPT. This site has a total of 11 acres/4.5 ha and includes CESPT's Wastewater Treatment Plant (WWTP) and is shown in Figure 2-2. Future plans for the WWTP include a capacity expansion which will limit the amount of land available for the desalination plant. Currently there are 6 acres/2.4 ha available but this will be limited after expansion to 1.5 ha. The land area connecting S5 and S6 is owned by CESPT and is part of S5 (3.5 acres/1.5 ha).

**Figure 2-2: Sites S5 and S6**


S6-This site is not currently owned by CESPT but is being re-titled to reflect CESPT as the owner. The site is currently a maintenance supply area for CESPT. An existing tank is no longer usable as a tank. The whole site would need to be cleared for the desalination plant. Figure 2-3 shows the tank and maintenance supplies (5.9 acres/2.4 ha).

**Figure 2-3: Site S6-Tanks and Maintenance Area**

Located between the CESPT sites are the Society of Civil Engineers building on municipal property (Figure 2-4). There are also plans for an architectural building to be located adjacent to this building. An option could be to acquire this building's location for use as part of the desalination project if required. The narrow strip of land connecting S5 and S6 is part of S5.

**Figure 2-4: Between S5 and S6-Civil Engineering Society Building**

S7- Another site is located east of the wastewater treatment plant but was not considered further because it is designated as a recreation site (12.8 acres/5.2 ha).

S8-This area is owned by PEMEX and used for off loading of fuel oil. However, in the event a new intake or outfall is required, this area might be usable for that purpose but not for a desalination plant.

The results of the site reconnaissance for potential sites are summarized in Table 2-2. Upon review of the available sites, only sites S5 and S6 would be easily available for the desalination plant. If property were to be procured, then S1 would possibly be acquired through eminent domain at some unknown cost.

**Table 2-2**
**Potential Desalination Sites Evaluation**

| SITE | OWNER | DESCRIPTION | AREA Acres/ha | COMMENTS | AVAILABLE FOR SWRO PLANT |
|---|---|---|---|---|---|
| 1 | Commercial Property | Flat and undeveloped. Large area near the power plant outfall. | 65/26 | Thought to be site of a desalination plant | No/Maybe |
| 2 | CFE | Flat and level. | 4.9/2.0 | Not available | No |
| 3 | CFE | Flat and level. | 2.0/0.8 | Not available | No |
| 4 | Commercial Property | Power lines are on both side of the property and regulations require a 15 m ROW clearance. | 15/6.0 | | No |
| 5 | CESPT | A wastewater (WW) treatment east of property. WW outfall is on the north side of the property. | 3.8 /1.5 | WW plant to be expanded. Includes land connecting S5 and S6. | Yes |
| 6 | CESPT | Current maintenance area with an unusable water tank and other facilities. | 5.9/2.4 | Ownership being changed to CESPT. Land between S5 and S6 is municipal owned. | Yes |
| 7 | Others | Future park | 12.8/5.2 | Has been designated as recreation site. | No |
| 8 | PEMEX | Flat and undeveloped | NA | This land might be used for access to the sea if required. | No |

### 2.4.2. Support Facilities

The site reconnaissance also included gathering information on the supporting facilities for the desalination plant.

#### 2.4.2.1. Intake/Outfall

Access to the power plant's seawater intake would present issues as the desalination plant's water would subtract from the current cooling water supply to the power plant. However, the Plant superintendent stated we could get access to the outfall. The outfall is more desirable for SWRO operation as it is a source for warmed seawater. As noted in other report sections, heated seawater can reduce the cost for producing desalinated seawater. There should be sufficient outfall flow to serve as feed to the SWRO facility. The 2005 Report estimated the seawater feed requirement as 111 mgd whereas the minimum discharge flow was 328 mgd (14,400 l/s). Thus, with a 45% recovery ratio, there would remain 278 mgd (12,200 l/s) of discharge flow.

The exact location and design of the desalination plant intake and routing of seawater to the desalination plant is to be further evaluated in subsequent project phases. Preliminary information for the SWRO intake structure design was given in the 2005 Report's Appendix A. The new intake would be located near the outfall shown in Figure 2-5.

The desalination plant would require access to the outfall facility for maintenance. CFE's security would need to be guaranteed; PEMEX has worked out an operating arrangement for maintenance with CFE and the desalination project could be expected to do the same.

**Figure 2-5: CFE Power Plant Outfall**

As a critical element of a full-scale desalination plant, the intake/outfall must have a sufficient life for supporting the desalination plant. Similarly, the intake/outfall must be maintained to keep the power plant operating. As such, CFE has a dredging program and other maintenance programs to maintain these facilities. The power complex is critical infrastructure for Northern Baja California and is anticipated to remain so. However, long term plans for the CFE power plant need to be taken into account in the desalination plant design so that adequate seawater flow is always available.

#### 2.4.2.2. Energy Supply

A 50 mgd (2,190 l/s) desalination facility's electric power demand could be as high as 40 MW based upon the estimate of up to 33 MW desalination plant plus up to an addition 7 MW for product water pumping. Based upon the meeting with CFE, the power plant has sufficient spare capacity so that the 40 MW demand can be met and the power supply would not be an issue for a desalination facility of this size. This is a significant advantage.

A report in 2008 by the Mexican Secretary of Energy projects the electrical power requirements (*Prospects for Electric Sector, 2008 to 2017*). For Baja California, the adopted minimum value for Operating Reserve Margin (MRO) is either 1) the capacity of the largest power plant; or 2) 15% of the maximum demand (after discounting the capacity that is not available due to maintenance). In the rest of the nation, the MRO is 6%. Starting in 2013, the Baja California system will be interconnected to the National Interconnection System (SIN) through an interconnection with a capacity of 300 MW. Currently there is an intertie with the U.S. system. The report estimated the 2010 reserve to be 370 MW and increasing with time. Although there appears to be sufficient power available, the desalination plant should be included in future demand projections.

Natural gas would be required if on-site power generation were selected. There is gas present at the site in a 36 inch line from a compressor station located on site S4. The gas is provided by TGN/SEMPRA.

#### 2.4.2.3. RO Pilot Plant

During the site reconnaissance, a seawater RO pilot plant was located, see Figure 2-6. This plant, which has a capacity of 3.5 l/s (80,000 gpd), is located within CESPT's Rosarito District office on the ocean side of site S6. This plant was operated for about 6 to 8 months, and stopped working circa April 2004. Test data information from this pilot plant is available and very useful for the future phases of this project. The plant appears to be in good condition with no apparent signs of corrosion (e.g. fiberglass pressure vessels and stainless steel construction). Most likely the membranes will require replacement. The pretreatment equipment is very limited and it is likely new pretreatment equipment would be needed to satisfy future test plans. The pilot plant is not owned by CESPT but would need to be purchased or leased from others.

**Figure 2-6: Seawater RO Pilot Plant**


### 2.4.3. Site Evaluation Results

The 2005 Report identified several potential sites for location of the desalination plant. The current study team held meetings with both the water agencies and CFE to determine information on the sites and their supporting facilities. Bases upon these meetings:

- Site S1 offers the advantages of closeness to the outfall facilities (approximately 1,300 ft (400 m) pipeline) and largest available area. However, it is privately owned and not readily available.
- Only sites S5 and S6 are readily available. S6 would be preferred as it is larger and closer to the CFE supporting facilities. Two pipelines approximately 6,000 ft (1,800m)

long would be required to transmit feedwater to the desalination site from the current outfall and return the brine stream.

- The area between S5 and S6 currently houses a building and has facilities for future buildings. This area would also require acquisition if S5 and S6 sites were fully utilized.
- Other sites might be available but would require changes in ownership. Eminent domain might be required to acquire an alternative site.
- The CFE power plant contains sites S2 and S3 and is unavailable.
- Access to the CFE outfall facilities can be obtained with recognition of the need for security and development of an acceptable access plan with CFE.
- Future plans for the power plant need to be considered in conjunction with the desalination plant design as the power plant's intake/outfall will be utilized by the desalination plant. The earliest intake started in 1963 and the newest intake was installed in 2001. Additional intake maintenance procedures maybe required to assure an adequate life for that of the desalination plant.
- CFE has sufficient electrical capacity to supply the power for a 50 mgd (2,190 l/s) desalination facility and the pumping requirements.
- A seawater RO pilot plant is located at the CESPT offices on the west side of S6. Information from the previous testing should be obtained to assist in development of a pilot plant test program and identify whether the pilot plant could be refurbished to save pilot testing costs in subsequent project phases.

## 2.5. Alignment Reconnaissance

The 2005 Report stated that a conveyance pipeline will be needed to deliver the water from the product water pumping station to the points of delivery in Mexico and the United States. The sizing (diameter) of the pipeline was based on a maximum flow velocity of 7.5 feet per second (2.29 m/s).

The following delivery points were identified in the 2005 Report:

- A storage tank "Constitucion Parte Alta (P/A)" located east of Rosarito Beach.
- A storage tank "Porticos de San Antonio" located about 7.5 miles (13 km) northeast of Rosarito Beach.
- The southern end of San Diego County Water Authority Pipeline #4, located near Lower Otay Reservoir.
- More recent information suggests another connection point needs to be considered as an alternative to Porticos de San Antonio. The new connection point is Tanque Lomas (2,500 m3) in Tijuana.

### 2.5.1. 2005 Report Alignments

Based on these two delivery points, two alignments were identified:

- Inland Route, the "Free Road"
- Coastal Route, the "Toll Road".

These alignments were identified in the 2005 Report as Figure 4-3. Additional alignment details are given in the Report starting on page 4-17. These details include pumping power, pipeline size, and length.

#### 2.5.1.1. Inland Route "Free Road"

As envisioned in the 2005 Report, the inland route begins with a 42-inch (1,067 mm) diameter pipeline at the Rosarito Beach Desalination Plant and follows the free road to Point Gloria. A separate 20-inch (508 mm) diameter pipeline will deliver water east to the Constitucion Parte Alta Tank. A 30-inch (762 mm) diameter water line would continue northeast from Point Gloria along the free road from Rosarito to Tijuana. At "H" Street in Tijuana, the alignment would leave the free road and continue northeasterly in "H" Street. The alignment then would continue along Aeropuerto Street, then along Lazaro Carendas Street towards the international border. The pipeline would then run easterly along the border in Belles Artes Avenue to a border crossing near the existing emergency connection pipeline. From the crossing point, the pipeline would follow a parallel alignment with the Otay Water District Alta Road pipeline to the San Diego County Water Authority Pipeline # 4.

#### 2.5.1.2. Coastal Route "Toll Road"

The Coastal Route would include a 36-inch (915 mm) diameter pipeline alignment paralleling the toll road from Rosarito Beach to Tijuana to the toll road's entrance at Playas de Tijuana Road. The pipeline would then traverse east along the border for about 1.25 miles (2 km) where the pipeline would cross the border onto the International Boundary and Water Commission (IBWC) Treatment Plant site.

From the IBWC site, the pipeline would travel east in Dairy Mart Road, the east parallel to SR 905. The pipeline would then continue east under I-805 to Dennery Road. The pipeline would then follow Dennery Road until it meets the track along the southern side of Otay River Valley where it would then go north to the Water Authority Pipeline #4.

### 2.5.2. Field Alignment Reconnaissance

The two alignments were discussed in a meeting with CESPT (see Data Disk for meeting notes) on November 17, 2009. A field reconnaissance of the two alignments was performed on November 18, 2009. Based on the CESPT meeting and the field reconnaissance, the following observations of the two alignments can be made.

#### 2.5.2.1. Inland Alignment

The inland alignment is very challenging. The city streets in Tijuana have heavy traffic conditions. The traffic is the heaviest on Aeropuerto neat the “5 and 10” transit center, which is a hub for bus and taxi service.

There is a major street improvement project ongoing in the City of Tijuana. Many major streets are being overlain with 8 inches (200 mm) of reinforced concrete pavement. After the pavement has been constructed, it was reported by the Mexican representatives during the November 17 meeting, that no cutting of the new PCC pavement would be allowed for a period of 15 to 20 years. Many areas of the inland alignment have been or are in the process of being overlain with the new PCC pavement. One major advantage of the inland alignment is that is closer to the points of connection to the CESPT reservoirs.

This alignment is shown on Figure 2-7. Photographs of key areas in the alignment follow the alignment map and additional photos are on the Data Disk. Locations where photos were taken are identified with a number. The photo number corresponds to the number on the figure.

**Figure 2-7: Treated Water Pipeline Alignment Alternatives**


**Toll road Showing Edge of ROW**


**Grade Separation at Real del Mar**


**Steep Cut Slopes**


**Toll Booth**


**Toll Road Near the Border**

### 2.5.2.2. Coastal Alignment

The coastal alignment that generally follows the toll road is also a very challenging alignment. The toll road is essentially a freeway with two lanes in each direction. It was reported cutting of pavement to place a pipe in the traveled way would not be allowed.

There appears to be room outside the traveled way, but not within the right-of-way, for the pipeline. However there are steep cut slopes in many areas that would make construction very difficult and tunneling would likely be required. Also, it will be difficult to find a suitable alignment around the several grade separation crossings of streets and the toll booth. Once in the Playas de Tijuana area, it may be possible to leave the toll road right-of-way and locate the pipe within city streets.

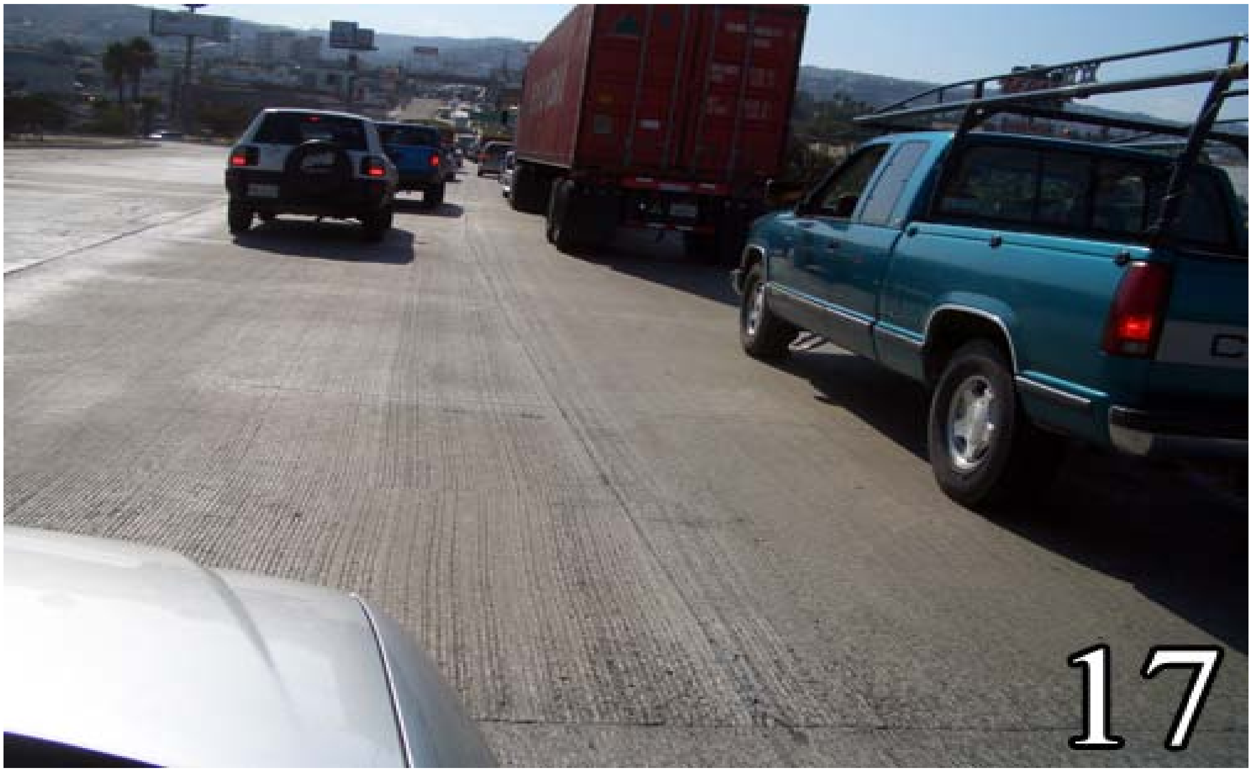
The alignment is further away from the CESPT reservoir connection points and crosses the border significantly west of the San Diego County Water Authority Pipeline #4.

This alignment is shown on Figure 2-7. Photographs of key areas in the alignment follow the alignment map with additional photos on the Data Disk.


**International Emergency Connection**


**Construction of 8” PCC Overlay**


**Tijuana River Crossing**




**Traffic Congestion at the "5 and 10"**


**Grade Separation at "H" Street and the Free Road**

### 2.5.2.3. 2005 Report Results

Both the coastal and the inland alignments identified in the 2005 Report are very challenging. Both alignments may have fatal flaws that would prevent their implementation. For example, the coastal alignment is within a freeway and approval to use the freeway right-of-way may not be possible. The inland alignment would be areas that were recently repaved and pavement cutting may not be allowed for many years.

## 2.5.3. "Corridor 2000" Alignment

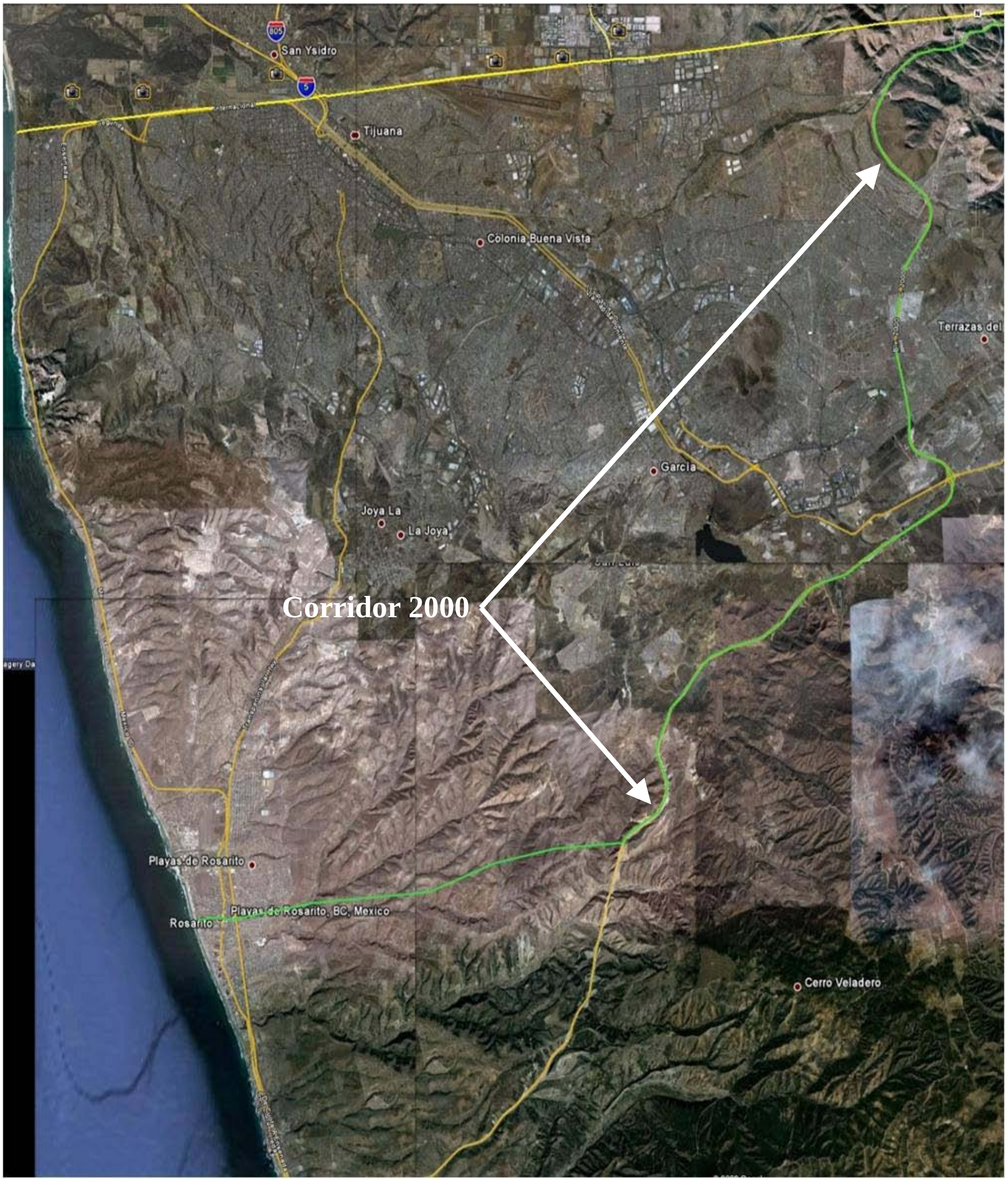
CESPT identified a third alignment for evaluation which is called the "Corridor 2000" alignment. This alignment reportedly would overcome some of the major challenges of the previous two alignments discussed. This alignment needs to be studied during following phases of this project.

The alignment begins at the Rosarito Beach desalination plant similar to the inland alignment. It then heads east cross-country to an existing CESPT water tank. It then continues east until it intersects with "Corridor 2000". The alignment then follows Corridor 2000 in a northeasterly direction to Rodriguez Reservoir, then north towards the international border. A map of this alignment is shown on Figure 2-8.

The advantages of the alignment are:

- There is reduced traffic,
- The areas around the alignment are less developed, making the location of the pipeline easier.
- There will be less resistance to the pavement being cut for construction of the pipeline.

**Figure 2-8: CEPST Alignment - "Corridor 2000"**



### 2.5.4. Alignment Data Gaps

At the current level of study, there is insufficient data to recommend pursuing either of the two current alignments. The following is an initial list of additional information needed to evaluate the alignments:

- Traffic information
- Underground utilities
- Geotechnical Data
- Hydraulic Information for the Tijuana and Rosarito Beach systems
- Details of street resurfacing plans and schedule
- Identification of stakeholders
- Identification of key decision makers
- Process for selecting and adopting an alignment
- Governmental agencies having jurisdiction

The information on the Coastal and Inland alignments is very limited at this point. The information obtained to date from the 2005 Report consists mainly of street maps. The information has been supplemented by information from Google Maps and Google Earth. Major data gaps include the following:

- Street plans of the alignments being studied.
- Underground utilities information
- Traffic information
- Street resurfacing plans and schedule
- Topographic mapping
- Governmental agencies having jurisdiction on location of pipelines in public streets.
- Identification of other stakeholders.
- More detailed hydraulic analyses.

The data gaps described above would be addressed by initiating a data collection program. Street plans, underground utilities, traffic information and street resurfacing plans can be obtained by contacting the appropriate government agencies. Topographic mapping can be obtained from commercially available sources (some topographic maps are included on the Data Disk). Identification of stakeholders and governmental agencies having jurisdiction can be obtained by contacting Mexican governmental agencies and discussing the project with them. A detailed hydraulic analysis can be performed once the alignment is determined in more detail and topographic mapping is obtained.

### 2.5.5. Alignment Results

Two alignments were identified in the 2005 Report. However, a third alignment was identified by CESPT during the site reconnaissance that offers advantages over the previously identified alignments. Potentially other alignments may offer other advantages as well. Therefore, it is recommended that an alignment study be initiated to further evaluate the two original alignments and the third new alignment Corridor 2000, and identify other potential alignments for study. The study scope would have the following major elements:

- Establish and alignment evaluation process and gain acceptance of stakeholders
- Identify major stakeholders
- Meet with major stakeholders and determine key stakeholder issues
- Identify alternative alignments
  - Include beach/coast alignment alternative
  - Evaluate an inland alternative
  - Others
- Conduct preliminary data collection
  - Underground utilities
  - Traffic
  - Base mapping
- Perform preliminary alignment evaluation
- Conduct an alignment coarse screening analysis
- Study connection points for all customers and border crossing including the newly identified Tanque Lomas in Tijuana
- Coordinate with environmental review
- Consider pumping electrical power usage in alternative comparison

# Chapter 3 Task 1.2 – Power and Site Evaluation

## 3.1. Objective

This Technical Memorandum (TM) covers the two objectives of Phase 1, Task 1.2 of the Rosarito Beach Binational Desalination Plant Feasibility Evaluation and Preliminary Design. The objectives are to:

1. Conduct a power supply investigation that:
   - Determines the estimated cost of an all-electric power source base-line alternative for the desalination plant and related facilities,
   - Explores the feasibility of an independent electric power back up supply for the plant,
   - Study alternatives to purchasing electric power from the grid,
   - Evaluates potential benefits from capturing and reusing waste heat from engine-driven on-site power generators or combustion turbines,
   - Consider use of a gas fueled engine to drive the high pressure RO pump
2. Prepare a site layout and process flow schematic for a 25 (1,095 l/s) expandable 50 mgd (2,190 l/s) desalination plant at the Rosarito Beach site.

## 3.2. Background and Methodology

### 3.2.1. Background

In the 2005 Report, a design was developed for a 25 and 50 mgd seawater desalination plant at Rosarito. Electric power cost is generally the largest portion of operating cost. The 2005 Report estimated the plant's power demand at between 30 and 33 MW for the 50 mgd (2,190 l/s) facility, exclusive of the feedwater pumping. Only the total power usage was provided in the 2005 Report with no details on the specific electric energy requirements. In addition, conveyance pumping power is also a large power cost. Depending upon the product water alignment, as much as 7 MW of additional energy is required for product water pumping.

A site layout was developed in the 2005 Report, but this layout needs to be brought current based on the currently available site information to determine if the specified plants can be accommodated.

### 3.2.2. Power Methodology

The methodology used to develop "high level" electric power cost estimates is based upon utilizing published information from well known sources such as the California Energy Commission. Their cost estimates provide a general guideline on the expected costs of different technologies to assist planners in screening power generation options.

The published information uses differing assumptions regarding fuel cost and other capital and operation cost parameters. For the fossil fuel processes, the cost of fuel represents over 50% of the electrical energy cost. The methodology used is to provide the "high level" cost estimate is to adjust to a common fuel cost for each of the sources. The screening level electricity costs are adjusted by using the current natural gas price in Mexico.

As noted, the 2005 Report did not specifically identify the individual power usage within the desalination plant. A process flow diagram (PFD) was developed to identify the power usage based upon the design conditions given in the Report. Assumptions were made for key operating parameters so that a match with the total power usage could be estimated. Using this PFD, individual power users were identified (For SWRO, the high pressure pump is the largest power user). With this PFD, major equipment sizing could be estimated and potentially for further energy improvements identified.

### 3.2.3. Facility Site Plans Methodology

In the 2005 Report, the selected process train did not include pre-treatment facilities which are necessary for removal of algae and other constituents. It also proposed that the planned site was located within the CFE power plant (Site S2). This TM assumes an algae control process will be required for this plant.

The area requirements of existing desalination plants on constrained sites (plants co-located with another facility) similar to the Rosarito Beach options were determined, and then applied to the proposed plant for the 25 and 50 mgd(1,095, 2,190 l/s) sizes. A conventional, conservative process flow train was developed in order to select site(s) that could accommodate all necessary processes and facilities. The optimum sites, which can accommodate the necessary area, were selected and preliminary site layouts prepared.

## 3.3. Power Supply Investigations

CFE supplies power in Mexico and one of its major power facilities, the Presidente Juarez power complex, is located at Rosarito Beach. The 2005 Report assumed one electric power cost for the desalination plant operation and a different cost for the pumping facilities. The Work Scope includes verification of the desalination plant electrical cost and consideration of several independent alternative supplies for backup power.

The final selection of power alternatives is beyond this project's scope. The choice for selection of an alternative supply would include several important considerations including:

- CFE power availability and reliability
- Alternative supply environmental considerations
- Maintenance cost and complexity
- Power demand vs. time (staged constriction)

- CFE requirements for integration of a independent power supply
- Tax incentives and other financial considerations

### 3.3.1. Base-Line Electrical Alternative

The 2005 Report assumed that the water utility could obtain power at a lower cost than the standard commercial power cost, see Table 3-1. However, following discussions with both the Water Agencies and CFE, this was found not to be the case and an increased power cost is required which affects both the pumping and desalination costs. In addition, CFE was contacted to determine the availability of sufficient power to supply the desalination plant supply and they indicated there was sufficient power for the desalination plant and the pumping energy needs (40 MW).

Rate information was obtained from CFE for the Baja California region based upon an industrial rate structure. Information was also obtained from CESPT personnel. The rate structure is based on:

- Two different seasonal rates
- Three hourly rates during each seasonal period
- Demand charge

This medium voltage rate bracket includes a charge per kWhr for billable demand and a charge per kWhr during peak, medium and low periods. There are two distinct seasonal charge periods for the Baja California region. The first charge period begins on May 1st and runs until the Saturday before the last Sunday of October (177 days). The second charge period begins on the last Sunday of October to April 30th (188 days). The peak, medium, and low periods for energy costs are Pesos$ 1.7845 kWhr, Pesos$ 0.8737 kWhr, and Pesos$ 0.6866 kWhr, respectively. Based upon the above, the calculated charge of Pesos$ 0.9817 kWhr for the first period (from May 1st to the Saturday before the last Sunday of October), and for the second period (last Sunday of October to April 30th) an energy cost of Pesos$ 0.8497 kWhr (see Section S10 of the Data Disk).

CFE uses a formula to calculate the cost per kilowatt of chargeable demand. Demand charge covers the costs associated with CFE maintaining sufficient electrical facilities at all times to meet each customer's highest demand for energy. It is based on the greatest amount of electricity used by the customer in each billing period. This demand charge yielded a percentage of 32.18% that would be imposed per kWhr during both periods. Hence the average cost is Pesos$ 1.209/kWhr (0.093 $/kWhr).

The effect of an increase in power cost is to increase the expected water cost as power is a large portion of the total water cost. The water cost increase is about 15% using the design basis in the 2005 Report. However, other process improvements identified by the project team can potentially reduce energy use, offsetting some or all of this increase. These improvements need to be considered before the water cost is confirmed. One example of a process improvement is explored in Section 3.3.8 which demonstrates that the total electrical demand can be decreased.

**Table 3-1**
**Power Cost Revision**

| VALUE | PUMPING $/kWhr | RO PROCESS $/kWhr | WATER COST % INCREASE |
|---|---|---|---|
| 2005 Report | 0.100 | 0.055 | -- |
| Revised | 0.093 | 0.093 | 15 |

### 3.3.2. Alternatives to Electrical Power Supply

Several alternatives to a direct used of electrical energy and to alternative electrical supplies were investigated. These alternatives included:

- Reciprocating Engine Power Generation
- Alternative Means of Electric Power Generation
- Reciprocating Engine Direct Drive of High Pressure Pumps
- Other Means of Improved Energy Efficiency

As no power design details were provided in the 2005 Report, a process design was developed to account for the power usage estimates in the 2005 Report for comparison purposes. This design is used to consider the power alternatives and to suggest other power energy improvements. The design conditions are summarized in Table 3-2. In addition, meetings were held with the Mexican water agencies and CFE personnel to obtain other information as related to the power usage and cost. The Mexican agencies include:

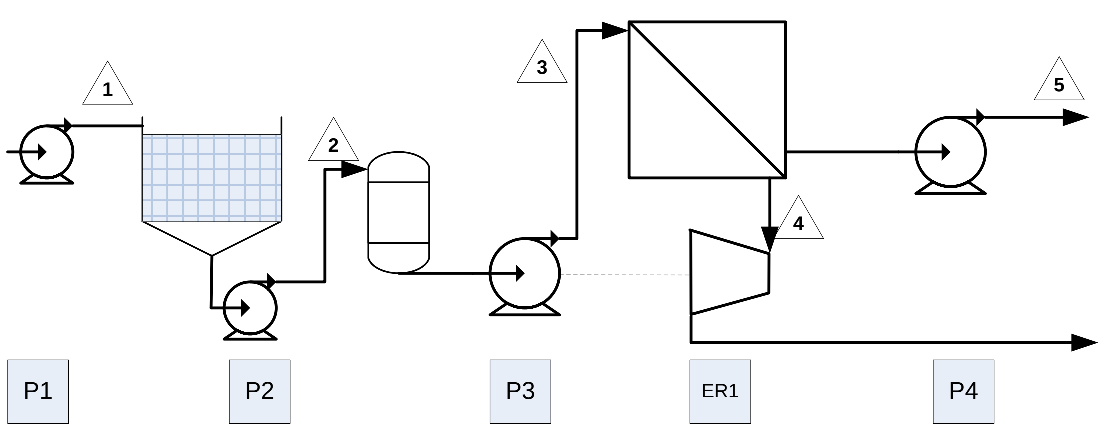
- CEA-State Water Commission
- CESPT-State Public Services of Tijuana
- CILA-International Boundary and water Commission
- CNA-National Water Commission
- CFE-Federal Electricity Commission

**Table 3-2**
**2005 Report Design Conditions**

| QUANTITY | VALUE | UNITS |
|---|---|---|
| Total Electric Power | 30-33 | MW |
| Reverse Osmosis Trains | 12+2 | Operating+Standby |
| Total Production (with standby operation) | 58 | mgd |
| Production Per Train | 4.14 | mgd |
| Continuous Production | 50 | mgd |
| Recovery Ratio | 45 | % |
| Feed Flow | 111 | mgd |
| Membrane Pressure | 800-1000 | psi |
| Energy Recover (% of High Pressure Pump Power) | 30 | % |

Other design conditions were also required to be assumed for comparison purposes, e.g. typical values for pump pressure, to match the estimated total electric power usage. The values for a single RO train are summarized in a simplified flow diagram, Figure 3-1. Seawater is pumped (P1) through a filtration system then boosted (P2) through a cartridge filter followed by a high pressure RO pump (P3). Energy is recovered (ER1) with an energy recovery device that is assumed to recover 30% of the high pressure pump power. The product water is pressurized (P4) before entering the product storage facilities.

**Figure 3-1: Single Train Flow Diagram**



| QUANTITY | UNITS | SW FEED | HP BOOSTER | HP PUMP | 30% ENERGY RECOVERY | PRODUCT PUMP |
|---|---|---|---|---|---|---|
| Stream | | 1 | 2 | 3 | 4 | 5 |
| Flow | GPM | 6432 | 6432 | 6432 | 3538 | 2894 |
| Pressure | PSI | 60 | 60 | 950 | 903 | 30 |
| Power | HP | 285 | 285 | 4331 | -1299 | 64 |
| | KW | 212 | 212 | 3231 | -969 | 48 |

SUMMARY

| | | |
|---|---|---|
| Net HP Pump | 2262 | kW |
| Total Train Power | 2735 | kW for 4.1 mgd |
| Unit Energy | 15.75 | kWhr/kgal |
| | 4.2 | kWhr/m3 |
| Total Plant Power | 32.8 | MW for 50 mgd |

Therefore the total plant power demand for 50 mgd is on the order of 32.8 MW. Since this level of power supply is significant and therefore costly, other alternatives for supplying this level of power have been identified and are described in the following sections.

#### 3.3.2.1. Reciprocating Engine Power Generators

Natural gas engines are essentially four-stroke diesel engines that have been adapted to burn natural gas as fuel. A Caterpillar model GCM34 engine operating at 720 rpm, with 6520 kWe capacity is an example of an engine for this application. Five of these natural gas engine generators would be required to supply the necessary 32,600 kW. One additional unit for standby operation is advisable.

An advantage of the reciprocating engine is the use of waste heat. Natural gas engines are also widely used in cogeneration systems. These generators have the potential for further efficiency improvements through co-generation. The engine's exhaust gases are at temperatures in the range of about 350°C to 450°C which make them suitable for generation of low pressure steam, up to 5 bars gauge.

Low pressure steam can be utilized for thermal desalination processes such as multi-stage flash or multi-effect distillation. However, this would increase the complexity of the desalination plant as both RO and a thermal process would be utilized.

Another alternative is use of the engine cooling water waste heat. A significant portion of heat losses in gas engines is due to cooling. Cooling of the gas engines includes engine jacket cooling, lube oil cooling, and charge air cooling. However, since this is a low-level heat, usually below 100°C, it cannot be used for steam generation but could be used for feed water preheating (see Section 3.3.7).

### 3.3.2.2. Combined Cycle Gas Turbine Power Generation

In a combined cycle gas turbine (CCGT) plant, a gas turbine generates electricity and the turbine's waste heat is used to make steam to generate additional electricity via a steam turbine. The steam cycle enhances the efficiency of electricity generation. Most new natural gas power plants are of this type because of their potential high efficiency. A gas turbine (simple cycle) is relatively inefficient (~30-35%). However when combined with the steam turbine, an efficiency of over 50% can be achieved.

A simple cycle gas turbine has a compressor, a combustor and a turbine. In this type of cycle, the input temperature to the turbine is relatively high (900 to 1,400 °C). The exhaust temperature is also high (450 to 650 °C). This is therefore high enough to provide heat for a second cycle which uses steam as the working fluid.

In a CCGT power plant, the heat of the gas turbine's exhaust is used to generate steam by passing it through a heat recovery steam generator (HRSG) with a live steam temperature between 420 and 580 C. The steam, after passing through the turbine, is condensed by use of seawater cooling.

CCGT power plants can be provided to supply the power requirements for the desalination plant. However, larger size CCGT plants (i.e. 500 MW) are more economic than smaller units. For the smaller size application as on this project, a reciprocating engine power plant can be an alternative. The high efficiency of reciprocating engines is comparable to that of a CCGT power plant in the smaller power sizes. In the range of 20 to 30 MW (the desalination plant will be built in stages from 25 expanded to50 mgd which uses as much as 33 MW), the reciprocating engine could be the better choice.

Other considerations in selection of CCGT or a reciprocating engine include those associated with:

- Maintenance cost
- Environmental considerations, e.g. NOx emissions
- Potential for sale of excess generated power
- With natural gas on site, the overall area classification may require change to explosion proof status with resulting cost implications.

### 3.3.2.3. Solar and Wind Electrical Energy Sources

#### Solar Energy

Solar power is the conversion of sunlight to electricity. Sunlight can be converted directly into electricity using photovoltaic (PV), or indirectly with concentrating solar power which focuses the sun's energy to boil water and create steam. The steam is used to create electrical energy. Photovoltaics were initially used to power small and medium-sized applications. Solar power plants can face high initial equipment and installation costs, although this factor has been decreasing due to the learning curve. Since solar radiation is intermittent, solar power generation is usually combined either with storage or other energy sources to provide continuous power. There are no fuel costs or emissions during operation of the power stations. However, large land area is required.

**Wind Energy**

Many potential sites for wind farms are far from demand centers, requiring substantially producing wind energy is equipment, installation, and construction and there are no fuel costs, the average cost of wind energy per unit of production depends on a few key assumptions, such as the cost of capital and years of assumed service.

**Mexico Projects**

Several wind projects have started in Mexico. Mexico recently opened the La Venta II wind power project in the state of Oaxaca. Such projects are an important step in reducing Mexico's consumption of fossil fuels. The 88 MW project will be expanded by the addition of La Venta III which adds another 103 MW. Others estimate a total of 3,800 MW of wind energy could be developed in Oaxaca in the medium term.

Another Mexican alternative energy project is the Aubanel Wind and Solar Project, Baja California. The project is located 10 miles south of the US-Mexico border - adjacent to the Rumorosa wind project and covers over 100 square miles. It is expected to yield 1,000 MW of wind and 1,000 MW of solar power serving approximately 500,000 and 375,000 households respectively. The project will serve US southwest and northern Mexico markets in three to five years when it is complete.

#### 3.3.2.4. Power Supply Comparison

A comparison of the various technologies as an alternative to the existing CFE power supply is shown in Table 3-3. It is important to note that CFE has indicated they have sufficient supply for the desalination plant, even at the higher power requirements as noted in the 2005 Report.

**Table 3-3**
**Power Technology Comparison**

| TECHNOLOGY | OPERATING MODE | GROSS CAPACITY* MW | DIRECT COST LEVELIZED (cents/kWhr) | COMMENTS |
|---|---|---|---|---|
| Reciprocating Engine | Continuous/ Backup | 10 | 8.7 (1) | At fuel cost of 6.49 $/mbtu |
| Combined Cycle | Baseload | 500 | 10.7 (2) | At fuel cost of 6.49 $/mbtu Less efficient at small sizes |
| Solar-Photovoltaic | Load Following | 110 | 32.0 (2) | Off site, requires transmission lines |
| Wind (Class 3) | Intermittent | 50 | 8.05 (2) | Off site, requires transmission lines |
| CFE | Baseload | Adequate for estimated demand | 9.3 (3) | Can supply sufficient power. No additional permitting |

*Size of application for the levelized cost estimate
1. *Clean Coal Diesel Demonstration Project*, US Department of Energy, July 2007
2. *Comparative Costs of California Central Station Electricity Generation*, California Energy Commission, CEC-200-2009-017-SD, August 2009
3. See section 3.3.1

There are limitations to these report's estimates because of differing assumptions. Fuel cost represents over 50% of the CCGT and reciprocating engine electric cost. Therefore, the electric costs were adjusted to a common natural gas price basis. Natural gas prices have been extremely volatile so future costs are hard to predict. For example, the CEC reference estimates the price of natural gas will increase 33% over the next 5 years. The cost of natural gas in Mexico in January 2010 was USD$ 6.49/million btu. The cost of natural gas in the USA was USD $4.56/ million btu in 2009

The costs estimates provide a basic method for evaluating the cost of building and operating different electricity generation technology resources but these costs do not reflect the total costs of using these technologies. This project may require transmission additions, fuel delivery, system upgrades or environmental mitigation expenses. In addition, the cost of the developing technologies of solar and wind can be expected to decrease with further developments. However, this comparison does show that other energy supplies could be considered but they would have to show significant advantages.

### 3.3.3. Engine Direct Drive Pumps

The 2005 Report desalination plant assumed 14 high pressure pumps of 3000 hp each for the direct drive application. The product water pumps would best be serviced by electrical motors as they are too small to justify the complications of direct drive but the conveyance pumps might also be direct driven.

In general, there are no large desalination facilities operating with engine driven pumps as the disadvantages outweigh the advantages.

#### 3.3.3.1. Advantages

- Variable frequency drives are not required as the engines can be ramped up and the RPM's adjusted to suit the head and flow. This assumes the engine allows for variable speed otherwise a gearbox will be needed
- The incoming transformer and all high voltage switch gear cost will be reduced.
- New power transmission lines may not be required.
- Electrical inefficiencies will be reduced.
- Could supply waste heat for other applications

#### 3.3.3.2. Disadvantages

- High voltage switch gear will be required for the booster pumps.
- Engines require maintenance so redundancy will be required. This may mean additional spare pumps or spare trains will be required, all depending on the overall online availability requirements.
- The overall spaces required for the plant will need to be expanded as the pump and engine sets are significantly larger than pump & electrical motor sets. In addition large amounts of natural gas will be needed so delivery lines will be needed.
- As there will be natural gas on site, the overall area classification may require change to explosion proof status with increased safety and equipment cost.
- A large maintenance facility will be required for engine maintenance.
- Engine emissions and permitting need to be considered.

### 3.3.4. Waste Heat Utilization

The CFE power plant utilizes once-through cooling. The temperature of seawater at the power plant discharge is usually 3 to 5 °C higher than the water at the intake. This waste heat can be utilized for the benefit of RO seawater desalination. Waste heat can also be recovered from the on-site electric power generation (if required). A heat exchanger could be used to recover the heat from the reciprocating engine and used to heat the seawater feed to the RO units.

Increasing seawater temperature may be beneficial for the RO units. For all membranes, water production is a function of temperature (at constant pressure). Membrane water production increases with temperature at the rate of 2.5 to 3% per degree Celsius. This increase has the potential of either reducing the required number of RO membrane elements or reducing the pressure and thus energy requirements. This seawater temperature increase due to power plant operation is beneficial as it increases membrane permeability.

A further increase of feed water temperature above 30 °C may not be beneficial. A further increase of feed water temperature does not result in any significant decrease of feed pressure. Also, depending on feed salinity and recovery rate, in the temperature range of 30 to 40 C, higher membrane permeability at higher temperature is adversely compensated by increased osmotic pressure resulting in higher salt passage. This increase of salt passage could require operation of a second pass RO membrane system. The higher feed water temperature can actually result in higher power consumption for this plant.

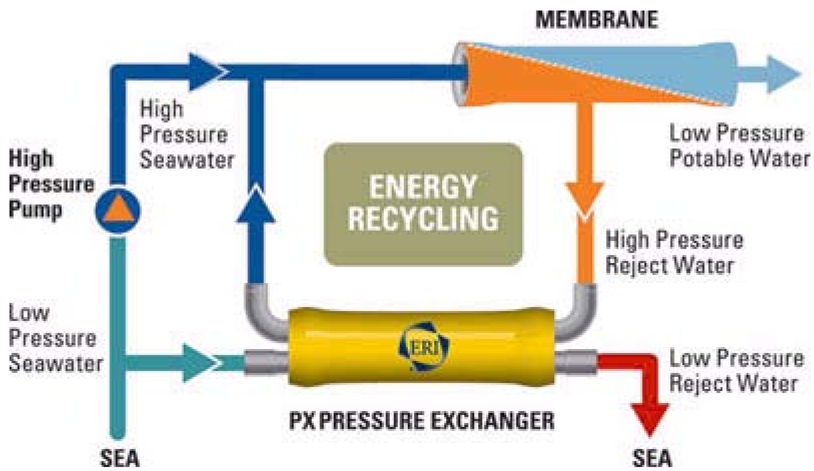
Several recent co-located power and desalting complexes utilize the power plant cooling water discharge to preheat the RO feedwater. With the preheated seawater, either the capital or operating cost will be decreased. Another benefit is the elimination of additional seawater intake costs.

### 3.3.5. Other Energy Improvements

The majority of currently operating large SWRO plants are using isobaric energy recovery devices. These devices allow for up to 30% more energy to be saved based on the conventional Pelton wheel and turbocharger energy recovery devices. One of the major differences in these devices is that the high pressure pumps are about 50% smaller than the pumps used on conventional systems. This means that a SWRO train that would have used a 3,000 HP motor would be approximately 30-50% smaller, i.e. 1,500-2,000 HP motor. With this configuration, an additional relatively small pump is then used as an inline booster pump.

The RO membrane process is the largest electrical usage in a SWRO plant but much of the energy can be recovered from the brine stream. With the 45% recovery design, 55% of the pressurized feed (as brine) is available for energy recovery. The brine stream has only a small pressure loss through the membranes. Energy recovery from this stream is possible and energy recovery device's efficiency has evolved. Early devices were Pelton wheels and reverse running pumps. However, more current isobaric devices recover over 90% of this energy. One example of a high efficiency device is produced by Energy Recovery, Inc (ERI) as shown in Figure 3-2.

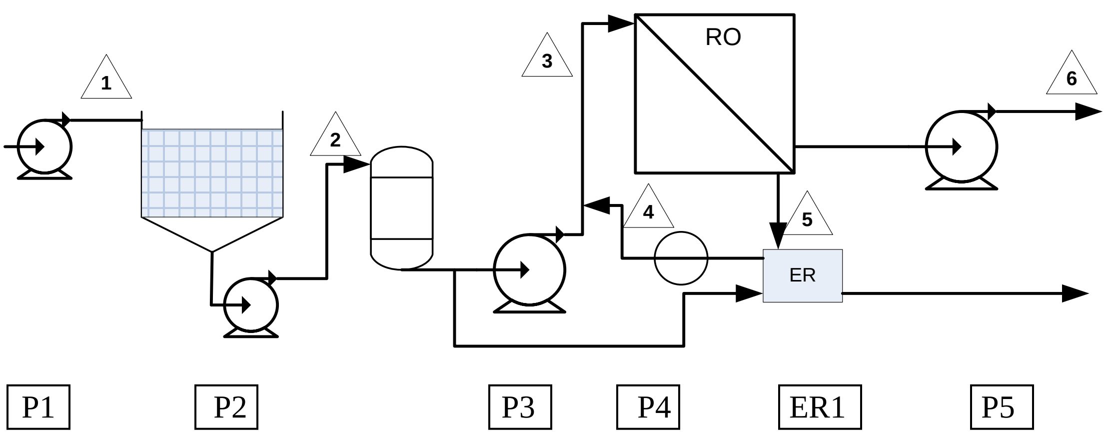
**Figure 3-2: Energy Recovery**




**Isobaric Systems**

Using this device on the Rosarito Beach design, the total electrical energy could be reduced by over 25% (32.8 MW to 24.5 MW) as compared to the current design. This is shown in Figure 3-3. This more than offsets the increased electric energy cost noted in Section 3.3.1.

**Figure 3-3: Single Train Flow Diagram with Improved Energy Recovery Device**



| QUANTITY | UNITS | SW FEED | HP BOOSTER | HP PUMP | INLINE PUMP | ENERGY RECOVERY IN | PRODUCT PUMP |
|---|---|---|---|---|---|---|---|
| Stream | | 1 | 2 | 3 | 4 | 5 | 6 |
| Flow | GPM | 6432 | 6432 | 2941 | 3491 | 3537 | 2894 |
| Pressure | PSI | 60 | 60 | 950 | 950 | 903 | 30 |
| Power | HP | 285 | 285 | 1981 | 121 | | 64 |
| | KW | 212 | 212 | 1477 | 90 | | 48 |

SUMMARY

| | | |
|---|---|---|
| HP Pump | 1477 | kW |
| Total Train Power | 2041 | kW |
| Unit Energy | 11.75 | kWhr/kgal |
| | 3.1 | kWhr/m3 |
| Total Plant Power | 24.5 | MW |

The simplified flow diagram is shown in Figure 3-3. Seawater is pumped (P1) through a filtration system then boosted (P2) through a cartridge filter followed by a high pressure RO pump (P3). The brine flow energy is recovered (ER1) with an isobaric energy recovery device at over 90% efficiency while some feedwater is pressurized to the membrane feed pressure by an inline booster pump (P4). The product water is pressurized (P5) before entering the storage.

Using this design, the unit energy consumption has decreased substantially. As a benchmark, other current RO plants have demonstrated improved energy efficiency by use of the high efficiency energy recovery devices. One efficient example is a 38 mgd SWRO plant in Perth, Australia. The total energy consumption is between 12 and 13 kWhr/kgal which includes intake, pretreatment, two RO passes, post-treatment and potable water pumping to a reservoir 7.5 miles (12 kilometers) away. The first pass RO used 8.3 kWhr/kgal (HP pump, booster pump, and product delivery pump) with the remainder of the plant using 3.8 to 4.9 kWhr/kgal.

### 3.3.6. Power Supply Investigation Results

- The CFE power plant has sufficient power capacity for the desalination plant and an alternative supply only need be considered if it can show some major benefits.
- Power supply reliability needs to be considered in evaluation of the desalination plant availability.
- The electric power cost for the desalination process is higher than that given in the 2005 Report. The effect of the analysis presented above increases the desalting process water cost by about 15%. However, use of a high efficiency energy recovery device would decrease the total SWRO power required by over 20%. Additional energy savings should be part of the pipeline alignment design as the conveyance pumping is over 20% of the total electrical energy demand.
- Direct drive of the high pressure pumps would likely not be beneficial for this plant as the disadvantages far outweigh the advantages.

- Reciprocating engines could be used for onsite power generation. However, they have the same disadvantage as direct drive pumps, e.g. high maintenance.
- CCGT is generally a more efficient process than reciprocating engines for electric power generation. However, for the size of this application, the reciprocating engine should be considered if onsite power generation is required.
- Alternative electrical sources could be considered. Wind would likely be the most cost effective. There are some very large alternative energy projects being built in Mexico. These projects should be considered as a partial alternative power source.
- All the power generation processes would not necessarily have to be located on the desalination plant site. Both wind and solar have large and site specific requirements which would necessitate locations other than the desalination plant.
- Waste heat (heated seawater) is beneficial to the SWRO process as it decreases either the number of membranes required or the electrical energy requirements. Thus the once-through power plant discharge should be used for the process feedwater and the waste heat from on-site generation, if used.

## 3.4. Facility Site Plans

This TM identifies a preliminary process treatment train and on-site facility requirements, presents a process flow diagram (Figure 3-4), and includes a preliminary site layout identifying potential facility and equipment arrangements for the recommended site location, Sites S5 and S6 (Figure 3-5 and 3-6). An area map is also provided to identify relative locations of on-site facilities to proposed off-site facility locations (Figure 3-7).

### 3.4.1. Alternative Site Evaluation

The possible sites that meet the needs of the potential desalination water treatment plant were shown and described in Chapter 2. Based on that information, the following sites as shown in Table 3-4 were considered further:

**Table 3-4**
**Possible Sites for the Desalination Plant**

| Stage 1 (25 mgd) | Stage 2 (50 mgd total) |
|---|---|
| Site 2 | Site 2 |
| Site 4 | Site 4 |
| Site 5 | Site 5 |
| Site 6 | Site 6 |

As mentioned earlier, Site S2 is within the CFE power plant, and therefore unavailable for the desalination plant. Although Site S4 has sufficient space for the desalination plant, the site is constrained by power line easements, existing natural gas facilities, and ownership questions.

Sites S5 and S6 are currently occupied by CESPT, but are viable candidates for the desalination plant. Site S6 has more area than Site S5, which is located next to the CESPT wastewater treatment plant. Since Site S6 has more area, it has been used for the layout of the desalination plant with Site S5 being used for the treated water storage and potential further expansion.

### 3.4.2. Site Layout Criteria

#### 3.4.2.1. Staged Capacity

The proposed Rosarito Beach Desalination Plant is intended to address long-term water supply needs for both the San Diego County Water Authority and other potential users as described in Chapter 4 and Mexico. Specific project goals include increased reliability and diversification of water supply portfolios. As such, the development of this project and desalination plant is intended to occur in a phased approach. Initial indications are that the first phase will target a product water capacity of 25-mgd (1,095 l/s). The second phase is currently considered the build-out phase, which would expand the facility to 50-mgd (2,190 l/s). The site layouts developed as part of this memorandum consider only these two phases of plant capacities.

#### 3.4.2.2. Area Requirements

The desalination plant site would accommodate pre-treatment, desalination and post-treatment processes, chemical storage facilities, product water storage (clearwell) and pumping facilities, and other pertinent facilities. The source water intake, feed pumping and screening facilities will be located at the source water supply location (CFE Power Plant Cooling Water outfall location). Also, for these first two phases (25 expanded to 50-mgd), it is assumed that site area for on-site power generation will not be required. Therefore, space allocation for additional power (i.e., power co-generation system) is not necessary for the first two phases as sufficient power is available from CFE.

Table 3-5 identifies the approximate land area requirements for the Rosarito Beach Desalination Plant:

**Table 3-5**
**Approximate Area Requirements for Proposed Rosarito Beach Ocean Water Desalination Plant**

| Stage | Capacity | | | Approximate Area Requirements | |
|---|---|---|---|---|---|
| | MLD | mgd | l/s | HA (B) | AC (A) |
| Initial | 95 | 25 | 1,100 | 1.1 | 2.7 |
| Maximum | 190 | 50 | 2,200 | 2.1 | 5.5 |

A-Based on reference-project average of 9 mgd/acre (constrained sites)
B-Based on reference-project average of 89 MLD/HA (constrained sites)

Table 3-6 identifies the unit footprint criteria for constrained sites:

**Table 3-6**
**Area Requirements for Ocean Water Desalination Plants - Constrained Sites**

| Reference Plant | Capacity | | | Total Area | | Unit Area | | |
|---|---|---|---|---|---|---|---|---|
| | MLD | mgd | l/s | HA | AC | MLD /HA | mgd/ AC | ls/HA |
| Tampa FL | 95 | 25 | 1,100 | 1.8 | 4.5 | 53 | 5.5 | 611 |
| Carlsbad/ Encina CA | 190 | 50 | 2,199 | 1.6 | 4.0 | 120 | 12.5 | 1,375 |
| Jeddah - SA | 57 | 15 | 660 | 1.3 | 3.3 | 44 | 4.5 | 507 |
| **Weighted Average** | - | - | - | - | - | **89** | **9** | **1,020** |

Table 3-7 identifies the available area based on the field investigated sites:

**Table 3-7**
**Area of Field Investigated Desalination Plant Sites**

| Site | | Area | |
|---|---|---|---|
| **#** | **Location** | **HA** | **AC** |
| 1 | South Commercial Site | 26 | 65 |
| 2 | CFE Power Plant | 2.0 | 4.9 |
| 3 | CFE Intake | 0.8 | 2.0 |
| 4 | CFE East | 6.0 | 15 |
| 5 | CESPT* | 1.5 | 3.8 |
| 6 | CESPT | 2.4 | 5.9 |
| 7 | Future Park | 5.2 | 12.8 |
| 8 | PEMEX | 2.0 | 4.9 |

*After expansion of wastewater treatment plant

### 3.4.3. Treatment Process Footprint Requirements

This section addresses the primary considerations involved in accounting for the specific footprint requirements associated with the desalination facility at Rosarito Beach.

#### 3.4.3.1. Treatment Processes

The proposed desalination plant would treat seawater collected at the CFE Cooling Water Effluent Outfall. The seawater that is collected for cooling water is obtained from an open intake used for cooling water for the existing power plant. The 2005 Report based the design on seawater reverse osmosis (SWRO).

For the objective of this memorandum, a preliminary selection of unit processes are identified to assess footprint requirements and to further screen potential site locations. A preliminary Process Flow Diagram (PFD) is included as Figure 3-4. This process flow diagram is conceptual and subject to revision based upon detailed analysis of source water quality data and pilot testing information to be conducted in later phases. Figure 3-4 identifies flow rates at various locations throughout the process treatment train that correspond with the two phases of this project, for 25 and 50 mgd (1,095, 2,190 l/s).

### Pretreatment Processes

SWRO membranes require special consideration for pre-treatment and post-treatment to ensure long-term system reliability and acceptable product water quality. At this stage in the planning for the plant, it is prudent to be conservative by reserving area on the site for pre- and post-treatment processes until final raw water quality and pilot testing information is available. Therefore, the proposed SWRO pre-treatment facilities include the following:

- Intake screens
- Coagulation/flocculation basins
- Dissolve air flotation (DAF)
- Filtration: dual media or micro- or ultra- membrane filtration
- Cartridge filtration
- Chemical conditioning (i.e. scale inhibitors, pH adjustment)

### SWRO Process

The heart of the process is RO. After water is pretreated and following chemical conditioning, the water is pressurized before being fed to the RO membrane elements. The RO process then produces product water and a brine (concentrated seawater) stream. This SWRO process includes:

- High pressure pump
- Membrane elements
- Energy recovery
- In-line pump to pressurize a portion of the pretreated feedwater

### Post-treatment Processes

After the SWRO process, the product water (permeate) requires post-treatment conditioning to provide a stable and compatible product water. This entails the addition of minerals to the RO permeate to mitigate the corrosive nature of the permeate and to ensure compatibility with current water supplies. Post-treatment process includes:

- Lime addition via calcite beds

- Carbon dioxide addition
- pH adjustment with caustic soda or sodium hydroxide
- Disinfection

**Solids Handling Facilities**

Additional unit processes are required to handle, treat and reuse residuals streams generated from the pre-treatment processes. These sludge and backwash waste treatment and reuse processes include:

- Sludge/backwash thickening
- Sludge dewatering (i.e., centrifuge)

#### 3.4.3.2. Possible Process Variations

As noted above, the unit processes identified in the process flow diagram are preliminary and are provided to assess a conservative footprint requirement. A more detailed assessment and evaluation of the alternatives that will consider other factors (i.e., performance, reliability and cost) will be performed during future phases (see Section 3.4.4.3). Among the process evaluations that will be considered, several would have an impact on footprint requirements, including the following:

- Pretreatment-DAF for consideration of algal blooms vs. direct filtration.
- Filtration-Dual media filters vs. MF/UF membrane filtration.
- SWRO membrane size-Standard 8-inch diameter elements vs. 16, or 18-inch diameter elements
- Post-treatment-Chemical addition vs. calcite beds

However, in each case, the more conservative alternative with respect to footprint requirement is currently included in the PFD.

#### 3.4.3.3. Peripheral Facilities

In addition to the treatment processes and facilities described above, footprint consideration is also required for the following peripheral, or appurtenant, facilities:

- Chemical storage and handling
- Product water storage/ clearwell
- Product water pumping
- Administrative area/control room
- Maintenance areas
- Power co-generation (for phases involving plant capacities greater than 50 mgd).
- Residuals waste management and reuse

- Onsite piping
- Onsite electrical distribution
- Access to equipment and room for maintenance

## 3.4.4. Facility Site Plan Results

### 3.4.4.1. Preliminary Site Layout

This section identifies a preliminary layout for the required facilities associated with the desalination plant. Based on the previous site evaluation study, site S6 was recommended as the primary site for treatment facilities. Figure 3-5 presents a layout at this site, in a phased approach. Based on the preliminary processes and footprint requirements identified above, additional space (in addition to site S6) is required to accommodate on-site product water storage (clearwell). The area available for product water storage on Site S5 is shown on Figure 3-6. The current wastewater treatment plant is shown along with the area set aside for the wastewater treatment plant expansion. After this change, a limited amount of water storage will be available. Additional offsite storage might be required which could be accomplished by increasing the size of existing Mexico storage tanks.

In addition to the facilities shown in Figures 3-5 and 3-6, off-site facilities include the feed water intake, pumping, screening (drum screens) facilities, and pipelines to deliver water to Site S6 and return brine from the plant to the outfall. These facilities should be located in the vicinity of the CFE cooling water outfall. As such, site S3 was tentatively selected to hold these facilities. Also off-site is the brine outfall/diffuser location. These off-site items, including their relative locations to Sites S5 and S6 (the desalination plant sites), are presented in Figure 3-7.

### 3.4.4.2. Phase I Results

From the work completed during this Phase 1, the following can be concluded regarding the site planning and layout:

- Site S6 has sufficient space to contain the treatment facilities for either 25 mgd or 50 mgd capacity;
- Site S5 will also be needed to contain the product water storage clearwell facilities for 25-50 mgd and possibly other support facilities;
- Several refinements should be considered in future investigations to either improve the pretreatment process or to improve the overall desalination plant design to maximize the use of available area;

### 3.4.4.3. Recommendations

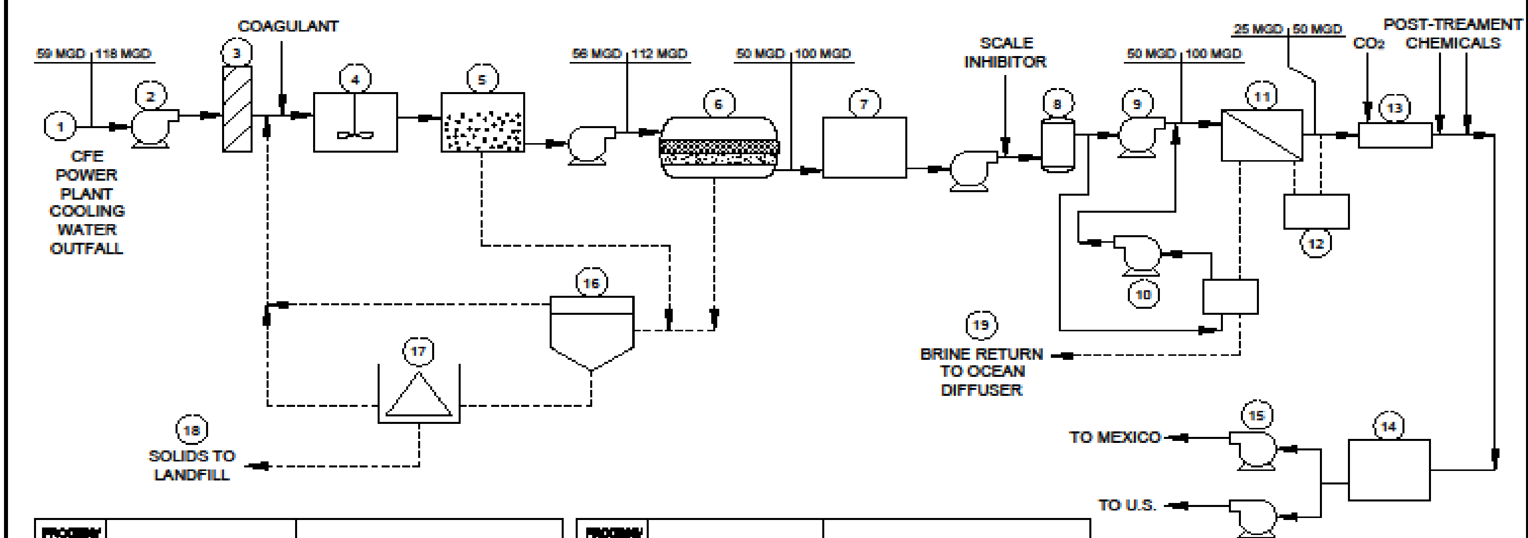
During future work, the following desalination plant process facilities and layout refinements should be evaluated:

- Incorporate the findings of the previous pilot plant testing program.

- Conduct focused pilot testing.
- Refine the desalination plant process requirements:
  - Pre-treatment options,
  - RO membrane refinements,
  - Post-treatment options, and
  - Possible use of CESPT ocean outfall for brine dispersion.
- Refine the process flow diagram.
- Refine the desalination plant facilities layout, including product water pump station surge facilities.
- Determine space requirements, additional available site(s) needed, and desalination plant facilities layouts if the water demands increase beyond the 50 mgd (2,190 l/s) total.
- Update previous estimates for capital, O&M, annual and unit costs.

**Figure 3-4: Process Flow Diagram 25 MGD/50 MGD**

User: orivas Spec: PIRNIE STANDARD File: I:\ACAD\PROJ\4198028 Rosarito Bch\PFD.DWG Scale: 1:1 Date: 12/22/2009 Time: 17:06 Layout: PFD



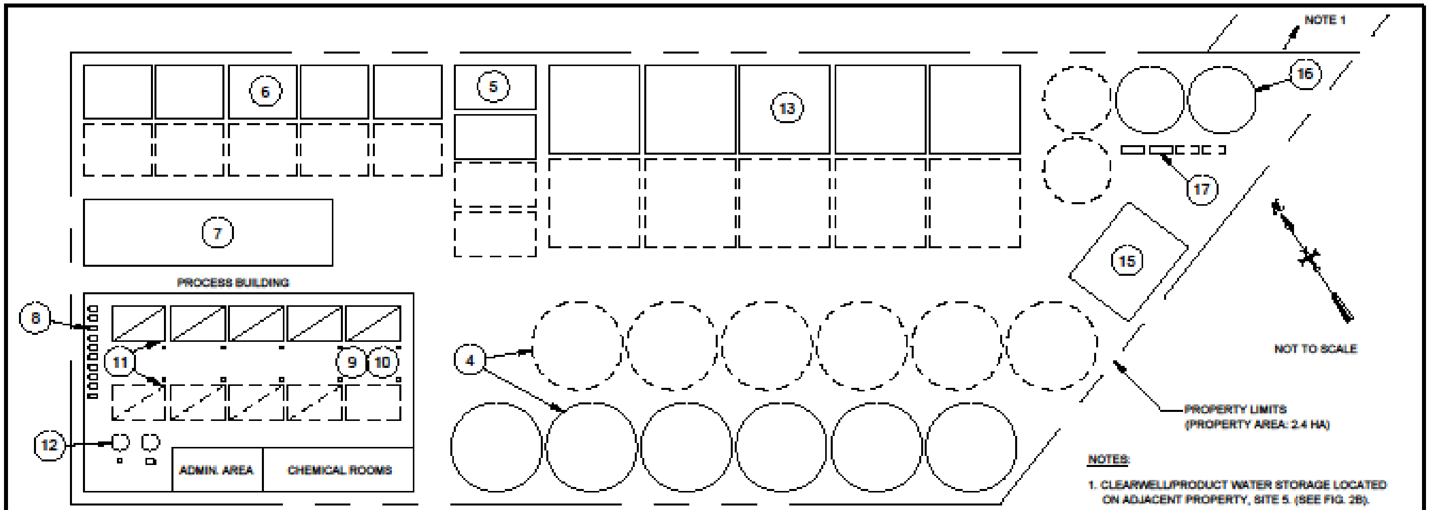

| PROCESS EQUIPMENT NO. | DESCRIPTION | COMMENTS |
|---|---|---|
| 1 | CFE POWER PLANT COOLING WATER OUTFALL | FEED WATER INTAKE |
| 2 | FEED WATER PUMP STATION | FEED WATER PUMP STATION |
| 3 | FEED WATER SCREEN | DRUM SCREENS |
| 4 | FLOCCULATION | COAGULANT ADDITION, FLOCCULATION MIXING |
| 5 | DISSOLVED AIR FLOTATION | FLOTATION TANKS |
| 6 | DUAL MEDIA FILTRATION | GRAVITY FILTERS |
| 7 | FILTER EFFLUENT TRANSFER PUMP STATION | EQUALIZATION/TRANSFER |
| 8 | PRE-TREATMENT | CARTRIDGE FILTRATION AND SCALE INHIBITOR ADDITION |
| 9 | REVERSE OSMOSIS FEED PUMPS | REVERSE OSMOSIS FEED PUMPS |
| 10 | ENERGY RECOVERY | PRESSURE EXCHANGER ENERGY RECOVERY |

| PROCESS EQUIPMENT NO. | DESCRIPTION | COMMENTS |
|---|---|---|
| 11 | REVERSE OSMOSIS TREATMENT | SINGLE PASS, 5-MGD, 50% RECOVERY |
| 12 | CLEAN-IN-PLACE (CIP) | R.O. CLEANING SYSTEM |
| 13 | POST-TREATMENT | REMINERALIZATION CALCITE BEDS, CO2 AND CAUSTIC ADDITION, DISINFECTION |
| 14 | CLEARWELL | PRODUCT WATER STORAGE |
| 15 | PRODUCT WATER PUMP STATION | DEDICATED PUMPS TO MEXICO AND U.S. |
| 16 | BACKWASH/SLUDGE THICKENER | DAF SLUDGE AND FILTER BACKWASH THICKENING |
| 17 | SLUDGE DEWATERING | CENTRIFUGE - SLUDGE DEWATERING |
| 18 | DEWATERED SOLIDS TO WASTE | RESIDUALS DISPOSAL |
| 19 | BRINE OUTFALL DIFFUSER | BRINE DISCHARGE |

| | | | |
|---|---|---|---|
| MALCOLM PIRNIE | SAN DIEGO COUNTY WATER AUTHORITY<br>Project 4198028 | ROSARITO BEACH BINATION DESALINATION PROJECT<br>SITE EVALUATION<br>PROCESS FLOW DIAGRAM 25 MGD/50 MGD | MALCOLM PIRNIE, INC.<br>Dec 2009<br>Fig. 3-4 |

**Figure 3-5: Proposed Site Plan - Site 6**

User: orivas Spec: PIRNIE STANDARD File: I:\ACAD\PROJ\4198028 Rosarito Bch\PFD.DWG Scale: 1:1 Date: 12/22/2009 Time: 17:06 Layout: PFD




| PROCESS/ EQUIPMENT NO. | DESCRIPTION | COMMENTS | NO. of UNITS 25 MGD/50 MGD | SURFACE AREA PER UNIT (M²) |
|---|---|---|---|---|
| 1 | CFE POWER PLANT COOLING WATER OUTFALL | LOCATED OFF-SITE | | |
| 2 | FEED WATER PUMP STATION | | | |
| 3 | FEED WATER SCREEN | | | |
| 4 | FLOCCULATION | COAGULANT ADDITION, FLOCCULATION MIXING | 6/12 | 2,830 |
| 5 | DISSOLVED AIR FLOTATION | FLOTATION TANKS | 2/4 | 180 |
| 6 | DUAL MEDIA FILTRATION | GRAVITY FILTERS | 5/10 | 190 |
| 7 | FILTER EFFLUENT TRANSFER PUMP STATION | EQUALIZATION/TRANSFER | 1/1 | 860 |
| 8 | PRE-TREATMENT | CARTRIDGE FILTRATION AND SCALE INHIBITOR ADDITION | 10/20 | 2 |
| 9 | REVERSE OSMOSIS FEED PUMPS | REVERSE OSMOSIS FEED PUMPS | 5/10 | 1.5 |
| 10 | ENERGY RECOVERY | PRESSURE EXCHANGER ENERGY RECOVERY | 5/10 | 1.5 |

| PROCESS/ EQUIPMENT NO. | DESCRIPTION | COMMENTS | NO. of UNITS 25 MGD/50 MGD | SURFACE AREA PER UNIT (M²) |
|---|---|---|---|---|
| 11 | REVERSE OSMOSIS TREATMENT | SINGLE PASS, 5-MGD, 50% RECOVERY | 5/10 | 100 |
| 12 | CLEAN-IN-PLACE (CIP) | R.O. CLEANING SYSTEM | 1/1 | 70 |
| 13 | POST-TREATMENT | REMINERALIZATION CALCITE BEDS, CO2 AND CAUSTIC ADDITION, DISINFECTION | 5/10 | 330 |
| 14 | CLEARWELL | LOCATED ON ADJACENT PROPERTY - SITE 5 | 1/2 | 3,850 |
| 15 | PRODUCT WATER PUMP STATION | DEDICATED PUMPS TO MEXICO AND U.S. | LOCATED OFF-SITE | |
| 16 | BACKWASH/SLUDGE THICKENER | DAF SLUDGE AND FILTER BACKWASH THICKENING | 2/4 | 180 |
| 17 | SLUDGE DEWATERING | CENTRIFUGE - SLUDGE DEWATERING | 2/4 | 5 |
| 18 | DEWATERED SOLIDS TO WASTE | RESIDUALS DISPOSAL | LOCATED OFF-SITE | |
| 19 | BRINE OUTFALL DIFFUSER | LOCATED OFF-SITE | | |

| | | | |
|---|---|---|---|
| MALCOLM PIRNIE | SAN DIEGO COUNTY WATER AUTHORITY<br>Project 4198028 | ROSARITO BEACH BINATION DESALINATION PROJECT<br>SITE EVALUATION<br>PROPOSED SITE PLAN - SITE 6 | MALCOLM PIRNIE, INC.<br>Dec 2009<br>Fig. 3-5 |

**Figure 3-6: Site Plan - Site S6**

**Figure 3-7: Proposed Facilities Site Plan**

User: orivas Spec: PIRNIE STANDARD File: I:\ACAD\PROJ\4198028 Rosarito Bch\PFD.DWG Scale: 1:1 Date: 12/22/2009 Time: 17:06 Layout: PFD


| | | | |
|---|---|---|---|
| MALCOLM PIRNIE | SAN DIEGO COUNTY WATER AUTHORITY<br>Project 4198028 | ROSARITO BEACH BINATION DESALINATION PROJECT<br>SITE EVALUATION<br>PROPOSED FACILITIES PLAN | MALCOLM PIRNIE, INC.<br>Dec 2009<br>Fig. 3-7 |

# Chapter 4 Task 1.3 - Water Demand Assessment

## 4.1. Objective

This Technical Memorandum addresses Task 1.3 of the Scope of Work for Phase 1 of the Rosarito Beach Binational Desalination Plant Feasibility Evaluation and Preliminary Design. The objective is to assess the potential water demand from the seawater reverse osmosis (SWRO) facility. This information will be used to determine whether or not demand for desalinated seawater is sufficient to justify a 25 or 50 mgd (1,095 or 2,190 l/s) plant.

## 4.2. Background and Methodology

### 4.2.1. Previous and Current Studies

In the 2005 Report, options for a 50 mgd (2,190 l/s) binational plant at several different sites were evaluated, with the desalinated water flow split between the United States (U.S.) and Mexico. This evaluation examined demand in both countries and, based on the analysis, assumed Mexico would receive 28.33mgd (1,241 l/s), with the remaining 21.67 mgd (949 l/s) allocated to the U.S. These figures were subsequently utilized in the feasibility studies for a potential seawater desalination plant. This current study, focused exclusively on a site in Rosarito Beach, Mexico, establishes the current projected demand from a binational seawater desalination plant by directly contacting potential water agencies in both the U.S. and Mexico.

### 4.2.2. Methodology

Water demand information was compiled from a combination of existing reference documents and interviews with key staff at participating Mexican and U.S. water agencies. These agencies were asked to provide demand projections (and supporting documentation) at five-year increments over a 25-year planning period ranging from 2015 to 2040. Requested projections included those for seawater desalination supplies and any articulated unmet demand, as well as groundwater, recycled water, imported water, and other supplies that could be offset by desalinated seawater. For the purposes of this demand assessment, it was assumed that the cost of desalinated seawater was comparable to that of the supplies that it would replace. However, it is acknowledged that the actual cost of desalinated seawater relative to other potential supplies will ultimately affect demand for this water. The collected data were combined to yield the total estimated demand for the Rosarito Beach SWRO facility. A summary of the organizations that provided input into the demand projections are shown in Table 4-1 below:

**Table 4-1**
**Participants in Development of Demand Estimates**

**Mexico**

- Comision Nacional del Agua (CONAGUA)
- Comision Estatal de Servicios Publicos de Tijuana (CESPT)
- Comision Estatal del Agua (CEA)
- Comision Internacional de Limites y Aquas Seccion Mexicana (CILA)

**United States**

- San Diego County Water Authority (SDCWA)
- Metropolitan Water District of Southern California (MWD)
- Southern Nevada Water Authority (SNWA)
- Central Arizona Water Conservation District (CAWCD)

## 4.3. United States Demand

Four participating U.S. project purchasers were contacted to assess demand from a potential Rosarito Beach SWRO plant: the San Diego County Water Authority, the Southern Nevada Water Authority, and the Central Arizona Water Conservation District, and the Metropolitan Water District of Southern California. Information obtained from these agencies is discussed in Sections 4.3. Section 4.3.1 reviews SDCWA while 4.3.2 reviews by the other participating agencies seawater desalination requirements to augment existing supplies. Total U.S. demand is summarized in Section 4.3.3. Section 4.4 discusses the Mexican requirements for seawater desalination from the Rosarito Desalination plant. Note that U.S. demand is expressed in acre-feet per year (AFY) and/or million gallons per day (mgd) and also liters per second (l/s), as is typically used in Mexico.

### 4.3.1. San Diego County Water Authority

Demand projections for the SDCWA were developed with assistance of a Water Resources Specialist at SDCWA who referenced the 2005 *Urban Water Management Plan* (UWMP, finalized in April 2007) as the comprehensive planning document that captures demand projections of the SDCWA's 24 member agencies through 2030. Historically, SDCWA projections have balanced supply and demand. Thus, although this method of forecasting may change with the next UWMP update, anticipated in June 2011, at this time the SDCWA does not project any unmet demand.

Appendix F of the 2005 UWMP lists SDCWA member agency demand for both groundwater (including conjunctive use, as well as both fresh and brackish sources) and recycled water from 2005 to 2030 in five-year increments, including both verifiable and other potential (i.e., unverifiable) projects. For verifiable projects, any increase in member agency demand for either groundwater or recycled water beginning in 2015 over and above that for 2010 was considered to be potentially satisfied by desalinated seawater. For the “other potential projects,” it was assumed that these unverifiable supplies will not be developed by 2015, and thus may likewise be offset by desalinated seawater. This potential SWRO demand, offsetting groundwater (including both existing and new potential supplies) and recycled water projects, is summarized in Tables 4-2 and 4-3, respectively. Note, because the UWMP only projects demand out to 2030, figures for 2030 were extended to 2040 (the end of the planning period for Rosarito SWRO project) without any increase. However, actual demand may be higher during these latter years.

**Table 4-2**
**Summary of Potential SWRO Demand Offsetting Groundwater Projects**

| Agency | | Demand (AFY) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Marine Corps Base Camp Pendleton | | 1,770 | 2,600 | 2,600 | 2,600 | 2,600 | 2,600 |
| Oceanside, City of | | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| Olivenhain Municipal Water District | | 100 | 100 | 150 | 150 | 150 | 150 |
| Otay Water District | | 3,800 | 3,800 | 3,800 | 3,800 | 3,800 | 3,800 |
| San Diego, City of | | 19,400 | 22,200 | 22,200 | 22,200 | 22,200 | 22,200 |
| **Total** | **AFY** | **28,570** | **32,200** | **32,250** | **32,250** | **32,250** | **32,250** |
| | **mgd** | **25.5** | **28.8** | **28.8** | **28.8** | **28.8** | **28.8** |
| | **l/s** | **1,117** | **1,261** | **1,261** | **1,261** | **1,261** | **1,261** |

**Source: 2005 SDCWA Urban Water Management Plan**

**Table 4-3**
**Summary of Potential SWRO Demand Offsetting Recycled Water Projects**

| Agency | | Demand (AFY) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| Carlsbad Municipal Water District | | 176 | 439 | 439 | 439 | 439 | 439 |
| Del Mar, City of | | 60 | 70 | 70 | 70 | 70 | 70 |
| Escondido, City of | | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Fallbrook, Public Utilities District | | 50 | 110 | 120 | 120 | 120 | 120 |
| Marine Corps Base Camp Pendleton | | 650 | 650 | 650 | 650 | 650 | 650 |
| Olivenhain Municipal Water District | | 130 | 180 | 180 | 180 | 180 | 180 |
| Otay Water District | | 644 | 1,390 | 2,254 | 3,256 | 3,256 | 3,256 |
| Padre Dam Municipal Water District | | 625 | 700 | 700 | 700 | 700 | 700 |
| Poway, City of | | 225 | 225 | 225 | 225 | 225 | 225 |
| Ramona Municipal Water District | | 600 | 600 | 600 | 600 | 600 | 600 |
| San Diego, City of | | 4,025 | 7,025 | 7,025 | 7,025 | 7,025 | 7,025 |
| San Dieguito Water District | | 20 | 40 | 60 | 60 | 60 | 60 |
| Santa Fe Irrigation District | | 200 | 225 | 240 | 300 | 300 | 300 |
| Sweetwater Authority | | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| Valley Center Municipal Water District | | 844 | 1,271 | 1,394 | 1,433 | 1,433 | 1,433 |
| **Total** | **AFY** | **13,249** | **17,925** | **18,957** | **20,058** | **20,058** | **20,058** |
| | **mgd** | **12.0** | **16.0** | **16.9** | **17.9** | **17.9** | **17.9** |
| | **l/s** | **518** | **701** | **740** | **784** | **784** | **784** |

Nine of the SDCWA member agencies have agreed to purchase desalinated seawater produced at Poseidon Resource's proposed 50 mgd (2,190 l/s) plant in Carlsbad. Four of these agencies executed agreements with Poseidon Resources prior to April 2007, and thus are included in the demand projections provided in the 2005 UWMP: Carlsbad Municipal Water District, Valley Center Municipal Water District, Rincon del Diablo Municipal Water District, and the Sweetwater Authority. The other five agencies executed agreements after the final 2005 UWMP was issued:

- Rainbow Municipal Water District: 7,500 AFY (6.7 mgd, 293 l/s)
- Santa Fe Irrigation District: 2,000 AFY (1.8 mgd, 78 l/s)
- Vallecitos Water District: 7,500 AFY (6.7 mgd, 293 l/s)

- Olivenhain Municipal Water District: 5,000 AFY (4.5 mgd, 196 l/s)
- City of Oceanside: 5,000 AFY (4.5 mgd, 196 l/s)

Three of these five agencies – the Olivenhain Municipal Water District, Santa Fe Irrigation District, and the City of Oceanside – indicated verifiable or potential projects using groundwater or recycled water, as summarized in Tables 4-2 and 4-3. Thus, the water that these agencies have contracted to purchase from the Poseidon seawater desalination plant must be subtracted from their respective demand that could be satisfied by the Rosarito Beach SWRO facility.

A summary of the total Rosarito Beach SWRO demand that could offset SDCWA member agency local groundwater and recycled water projects is compiled in Table 4-4. This table combines the totals from Tables 4-2 and 4-3 and subtracts the water currently contracted for purchased from Poseidon for the three applicable member agencies. Because the amount of the Poseidon water purchase agreement exceeds each agency's potential demand from local groundwater and recycled water projects, the resulting demand for each of these three agencies from the Rosarito Beach SWRO plant was assumed to be zero, as shown in Table 4-3. Note that the projections in Table 4-3 do not account for any demand that may be satisfied by a potential 50 or 100 mgd (2,190 or 4,380 l/s) Camp Pendleton seawater desalination plant.

As shown in Table 4-4, the Otay Water District (Otay) has the second highest potential demand that could be satisfied by a Rosarito Beach SWRO plant at each five-year increment, ranging from 4,444 AFY (174 l/s) in 2015 to 7,056 AFY (276 l/s) in 2030. This is consistent with Otay's October 2008 Water Resources Master Plan Update (finalized more than a year after the SDCWA 2005 UWMP), which projects a potential 5,000 AFY (196 l/s) of desalinated seawater to be developed between 2010 and 2030, generated from regional projects in Carlsbad (U.S.), South Bay/San Diego (U.S.), and/or Rosarito Beach (Mexico). Currently, there is no active SWRO project in development for the South Bay/San Diego site, and the capacity of Poseidon's Carlsbad plant is fully allocated under contract with the nine aforementioned SDCWA member agencies.

**Table 4-4**
**Total Potential SDCWA Rosarito Beach SWRO Demand Offsetting Local Projects**

| Agency | | Demand (AFY) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| Carlsbad Municipal Water District | | 176 | 439 | 439 | 439 | 439 | 439 |
| Del Mar, City of | | 60 | 70 | 70 | 70 | 70 | 70 |
| Escondido, City of | | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Fallbrook, Public Utilities District | | 50 | 110 | 120 | 120 | 120 | 120 |
| Marine Corps Base Camp Pendleton | | 2,420 | 3,250 | 3,250 | 3,250 | 3,250 | 3,250 |
| Oceanside, City of | | 0 | 0 | 0 | 0 | 0 | 0 |
| Olivenhain Municipal Water District | | 0 | 0 | 0 | 0 | 0 | 0 |
| Otay Water District | | 4,444 | 5,190 | 6,054 | 7,056 | 7,056 | 7,056 |
| Padre Dam Municipal Water District | | 625 | 700 | 700 | 700 | 700 | 700 |
| Poway, City of | | 225 | 225 | 225 | 225 | 225 | 225 |
| Ramona Municipal Water District | | 600 | 600 | 600 | 600 | 600 | 600 |
| San Diego, City of | | 23,425 | 29,225 | 29,225 | 29,225 | 29,225 | 29,225 |
| San Dieguito Water District | | 20 | 40 | 60 | 60 | 60 | 60 |
| Santa Fe Irrigation District | | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweetwater Authority | | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| Valley Center Municipal Water District | | 844 | 1,271 | 1,394 | 1,433 | 1,433 | 1,433 |
| **Total** | **AFY** | **37,889** | **46,120** | **47,137** | **48,178** | **48,178** | **48,178** |
| | **mgd** | **34.0** | **41.2** | **42.1** | **43.0** | **43.0** | **43.0** |
| | **l/s** | **1,482** | **1,800** | **1,844** | **1,883** | **1,883** | **1,883** |

The 2005 UWMP also projects a 57,064 AFY (2,232 l/s) increase in imported water demand between 2010 and 2030, which could also be offset by a local supply of desalinated seawater from the Rosarito Beach plant. Table 4-5 summarizes this increase above 2010 levels, based on the data given in Table 2-9 of the 2005 UWMP. As in the previous tables, demand at 2030 – the furthest year projected in the UWMP – was assumed the same at a constant level through 2040. Also, note that for 2015 the demand for imported water was less than that projected for 2010; thus, the demand from the Rosarito Beach SWRO plant offsetting imported water increases in 2015 is listed as zero.

**Table 4-5**
**Total Potential SDCWA Rosarito Beach SWRO Demand Offsetting Imported Water Increases**

| Agency | | Demand | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| Total | AFY | 0 | 5,516 | 27,012 | 57,064 | 57,064 | 57,064 |
| | mgd | 0 | 4.9 | 24 | 51 | 51 | 51 |
| | l/s | 0 | 216 | 1,056 | 2,232 | 2,232 | 2,232 |

The total potential SDCWA demand for desalinated seawater from a proposed Rosarito Beach plant, including offsets of both local and imported water supplies (i.e., combining the totals from Tables 4-4 and 4-5), is summarized in Table 4-6. These projections show that the SDCWA has sufficient demand beginning in 2015 to justify its goal of 33,600 AFY (1,314 l/s) of regional desalinated seawater in excess of that produced at Poseidon's Carlsbad SWRO plant, as expressed in the 2005 UWMP.

**Table 4-6**
**Total Potential SDCWA Rosarito Beach SWRO Demand**

| Agency | | Demand | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| Total | AFY | 37,889 | 51,636 | 74,149 | 105,242 | 105,242 | 105,242 |
| | mgd | 34 | 46.1 | 66.2 | 94.0 | 94.0 | 94.0 |
| | l/s | 1,482 | 2,019 | 2,900 | 4,116 | 4,116 | 4,116 |

### 4.3.2. Potential Demand for Exchange Water

A primary goal of the Rosarito Beach project is to augment Colorado River supplies. While SDCWA and Mexican water agencies could receive water from the Rosarito Beach project to meet their direct delivery demands, SNWA, CAWCD and MWD could benefit by developing an agreement to exchange Colorado River supplies with one or more of the agencies directly receiving desalinated water. The portion of the total supply available for exchange is ultimately limited by the capacity of the project and the direct delivery demands.

SNWA, CAWCD, and MWD are each investigating options to augment their Colorado River supplies. A portion of that augmentation need could be met through an exchange agreement for Rosarito Desalinated water. Each agency's future need for augmentation is affected by a number of factors, including the development of local supplies, changes in water demands, and the frequency of shortage declaration on the Colorado River. The cost of augmentation options will also affect potential demand from these agencies, and how any exchange supplies would be shared among the agencies.

This report estimates the overall need for augmenting Colorado River supplies for the SNWA, CAWCD, and MWD based upon information provided by these agencies. A portion of this demand could be met by Rosarito Desalinated water, depending upon costs and other factors affecting a potential water exchange. These demand estimates are as follows:

**Table 4-7**
**Total Estimated Exchange Demand for Augmentation Supplies for SNWA, CAWCD, and MWD**

| SNWA, CAWCD, MWD | | Demand | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| Total | AFY | 100,000 | 125,000 | 150,000 | 175,000 | 200,000 | 250,000 |
| | mgd | 89 | 112 | 134 | 156 | 179 | 223 |
| | l/s | 3,911 | 4,889 | 5,866 | 6,844 | 7,822 | 9,763 |

### 4.3.3. Summary of U.S. Demand

A summary of the total potential U.S. demand is presented in Table 4-11, which combines the totals of Tables 4-6, 4-7, 4-8, and 4-10. As shown in the summary table, there is sufficient U.S. demand to justify a 25 mgd (1,095 l/s) Rosarito Beach SWRO plant by 2015 and a 50 mgd (2,190 l/s) plant by 2020.

**Table 4-8**
**Total Potential U.S. Rosarito Beach SWRO Demand**

| Agency | | Demand (AFY) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| San Diego County Water Authority | | 37,889 | 51,636 | 74,149 | 105,242 | 105,242 | 105,242 |
| Exchange (SNWA, CAWCD, MWD) | | 100,000 | 125,000 | 150,000 | 175,000 | 200,000 | 250,000 |
| Total | AFY | 137,889 | 176,636 | 224,149 | 280,242 | 305,242 | 355,242 |
| | mgd | 123 | 158 | 200 | 250 | 273 | 317 |
| | l/s | 5,393 | 6,908 | 8,766 | 10,960 | 11,938 | 13,893 |

## 4.4. Mexican Water Demand

As with the U.S. agencies, the participating Mexican project proponents were contacted to assess their demand from a potential Rosarito Beach SWRO plant. These four agencies included the following:

- Comision Nacional del Agua (CONAGUA)
- Comision Estatal de Servicios Publicos de Tijuana (CESPT)
- Comision Estatal del Agua (CEA)
- Comision Internacional de Limites y Aguas Seccion Mexicana (CILA)

Close coordination between these agencies is important for a reliable demand estimate. Therefore a meeting was arranged with the Mexican water agencies and was conducted on November 17-18, 2009 in Tijuana, Mexico. The objective was to discuss both water demand and other aspects of the Rosarito Beach SWRO project. The agencies were asked in advance to provide information similar to that requested of the U.S. participants, including five-year demand projections from 2015 to 2040. The requested projections included those for seawater desalination supplies as well as groundwater, recycled water, imported water, and other supplies that could be offset by desalinated seawater. Note that the desalination water supply would be a new supply to supplement current sources (aquifers, water from other watersheds, etc.)

The water demand for both the Tijuana and Rosarito Beach areas – the only two regions identified for receipt of water from a Rosarito Beach SWRO plant – was compiled by CESPT and independently validated by CONAGUA and CEA. The water demand areas are shown in Figure 4-1 for west of Tijuana and north of the Rosarito Beach area. Demand for each area is based on the expected population growth at the current per capita consumption. The data for these two areas are combined to yield the average potential Mexican demand from a Rosarito Beach SWRO plant, as summarized in Table 4-9. Note that Mexican demand is expressed in liters per second (l/s) and then converted to acre-feet per year (AFY) and million gallons per day (mgd).

**Figure 4-1: Tijuana and Rosarito Water Demand Areas**

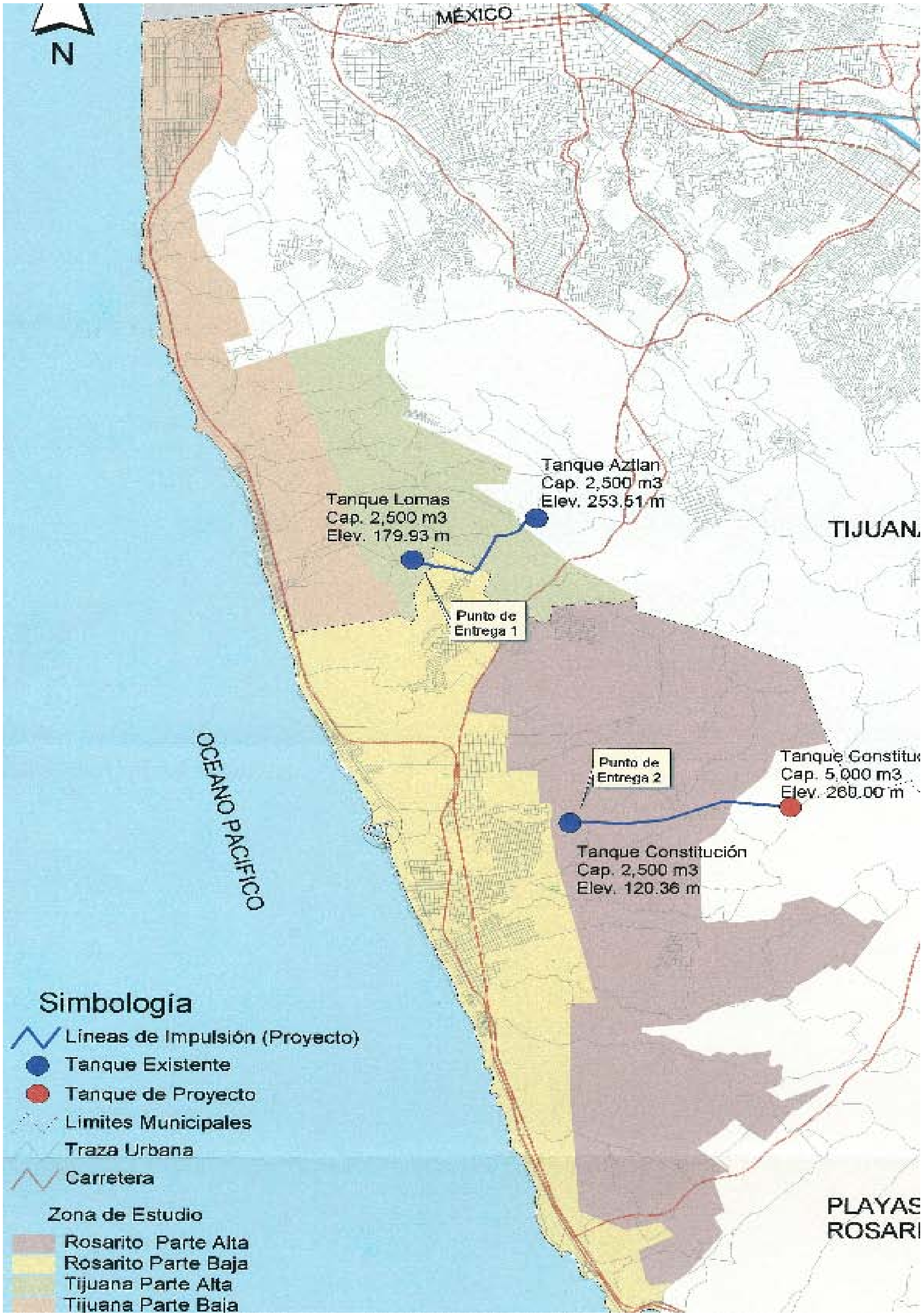


**Table 4-9**
**Average Potential Mexico Rosarito Beach SWRO Demand**

| Location | | Demand (l/s) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Tijuana (West of City) | | 218 | 298 | 357 | 383 | 411 | 443 |
| Rosarito (North of City) | | 182 | 226 | 280 | 346 | 429 | 532 |
| **Total** | **l/s** | **400** | **524** | **637** | **729** | **840** | **975** |
| | **mgd** | **9.1** | **12.0** | **14.5** | **16.6** | **19.2** | **22.3** |
| | **AFY** | **10,228** | **13,399** | **16,289** | **18,641** | **21,479** | **24,932** |

The Mexican agencies indicated that it is necessary to augment the average projections by 20 percent to yield an appropriate total estimate. These total figures are provided in Table 4-10, which reflect this 20 percent increase over the average data shown in Table 4-9.

**Table 4-10**
**Total Potential Mexico Rosarito Beach SWRO Demand**

| Location | | Demand (l/s) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Tijuana (West of City) | | 262 | 358 | 428 | 460 | 493 | 532 |
| Rosarito (North of City) | | 218 | 271 | 336 | 415 | 515 | 638 |
| **Total** | **l/s** | **480** | **629** | **764** | **875** | **1,008** | **1,170** |
| | **mgd** | **11.0** | **14.4** | **17.4** | **20.0** | **23.0** | **26.7** |
| | **AFY** | **12,273** | **16,084** | **19,536** | **22,374** | **25,775** | **29,918** |

## 4.5. Water Demand Results

Water demand information was compiled from a combination of existing documents and interviews with key staff at participating U.S. and Mexican water agencies. These contacts included:

**Mexico**

- Comision Nacional del Agua
- Comision Estatal de Servicios Publicos de Tijuana
- Comision Estatal del Agua
- Comision Internacional de Limites y Aguas Seccion Mexicana

**United States**

- San Diego County Water Authority
- Metropolitan Water District of Southern California
- Southern Nevada Water Authority
- Central Arizona Water Conservation District

SWRO was not identified by the SDCWA member agencies in its 2005 UWMP but other alternative supplies were identified (reclamation, brackish groundwater, etc) which were assumed could be met by SWRO. Currently the SDCWA is in the process of updating its UWMP, which is due in 2011. The results of this update may specifically identify the potential demand for desalinated seawater. Note that any SWRO production is expected to be used directly by the participating agencies or by exchange between agencies in the U.S. or in Mexico.

A summary of the total potential demand for water from a Rosarito Beach SWRO plant is provided in Table 4-11, combining the U.S. and Mexican totals from Tables 4-8 and 4-10, respectively. Figures for each of the two countries are shown in units of mgd for ease of comparison with prior reports and the proposed capacity of the plant, which has been expressed as either 25 of 50 mgd. The combined totals are given in mgd, AFY, and l/s to reflect the range of units commonly used in both countries.

**Table 4-11**
**Total Rosarito Beach SWRO Demand**

| Country | | Demand (mgd) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| United States | SDCWA | 34 | 46.1 | 66.2 | 94 | 94 | 94 |
| | EXCHANGE** | 89 | 112 | 134 | 156 | 179 | 223 |
| | TOTAL US | 123 | 158.1 | 200.2 | 250 | 273 | 317 |
| Mexico | | 11 | 14.4 | 17.4 | 20 | 23 | 26.7 |
| Total* | mgd | 134 | 173 | 218 | 270 | 296 | 344 |
| | AFY | 150,100 | 193,200 | 243,700 | 302,400 | 331,500 | 384,900 |
| | l/s | 5,870 | 7,550 | 9,530 | 11,800 | 13,000 | 15,000 |

*All totals rounded to 3 significant figures
** SNWA, CAWCD, and MWD could benefit by a potential exchange agreement for Colorado River supply.

As shown in Table 4-11, there is potential combined demand for desalinated seawater from the U.S. and Mexico of 134 mgd (5,869 l/s) by 2015, the earliest year evaluated in this analysis. At that time, the potential U.S. demand for desalinated seawater will have already exceeded the 21.67 mgd (949 l/s) allocation assumed in the 2005 Report.. Mexico's demand in 2015 will be

11 mgd (482 l/s) and will increase to 26.7 mgd (1,170 l/s) in 2040, nearly the design value of 28.33 mgd (1,241 l/s), used in the 2005 Report.

Based upon these demands (and subject to subsequent verification of costs), plans for a desalination plant equal to or larger than the 25 or 50 mgd should be considered. However, the concept of a larger plant should evaluated in conjunction with the viability of other potential SWRO projects in the U.S. or Mexico that have not yet advanced to the point of being included in regional water demand planning forecasts. For example, possible facilities in Huntington Beach (50 mgd) and at the Marine Corps Base Camp Pendleton (up to 150 mgd) are being studied by Poseidon Resources and the SDCWA, respectively. These projects could offset the need for a larger Rosarito Beach SWRO facility. Additional facilities may also be under evaluation in Mexico. A 5.7 mgd SWRO plant is planned for Ensenada to meet that regions requirements.

# Chapter 5 Task 1.4 – Environmental & Permitting Issues & Work Plan

## 5.1. Objective

This combined Technical Memorandum and Permitting Work Plan covers the objectives of Task 1.4 of the Rosarito Beach Binational Desalination Plant Feasibility Evaluation and Preliminary Design. This task provides a summary of the environmental and permitting issues related to the project and provides the elements of a Permitting Work Plan (PWP). This PWP is a summary of the environmental and permitting issues related to the Rosarito Beach Binational Desalination Plant. The proposed project would involve an oceanwater desalination plant built more than 20 miles south of the U.S./Mexican border with over 25 miles of pipeline delivering water by contract to both Mexican and U.S. water utilities. The relevant Mexican and United States environmental, regulatory, and permitting conditions of the project are outlined, and the permit application requirements, permitting agencies, and application process and time requirements are presented with this combined Technical Memorandum and Permitting Work Plan.

## 5.2. Background

The proposed project has unique characteristics because it includes a desalination plant to be constructed in Mexico with potable water being delivered to municipal systems in both Mexico and the U.S., with water delivery components on both sides of the U.S./Mexico border. This complicates direct comparisons to existing permitted facilities. There are uncertainties associated with how the project would ultimately be delivered, issues associated with regulatory institutional jurisdiction, national sovereignty, and other bi-national challenges. For purposes of background, regulatory settings in Mexico and the U.S. are provided below followed by a brief discussion of cross-border considerations.

### 5.2.1. Mexican Regulatory Setting

**SEMARNAT**

The Ministry of Environment and Natural Resources (SEMARNAT) is Mexico's federal government agency whose main purpose is to promote protection, restoration, and conservation of ecosystems and natural resources, as well as environmental goods and services, in order to promote their sustainable use and development. Similar to the U.S. National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA), which require preparation of an Environmental Impact Statement (EIS) or Environmental Impact Report (EIR) in order to disclose the potential impacts of a proposed project, Mexico's SEMARNAT requires the preparation of a Manifestacion de Impacto Ambiental (MIA) document. The MIA document analyzes a preferred alternative selected through constraints analysis. The MIA process considers impacts from pre-construction, construction, maintenance, and operations activities, including air, water, vegetation, land use, visual, socioeconomic, and regional ecosystem impacts. The MIA is prepared pursuant to Article 28 of the General Law for Ecological Equilibrium and Environment Protection (GLEEEP). An MIA would be required for this project.

Under SEMARNAT's GLEEEP, the documents that are submitted to SEMARNAT are also sent to the state and municipal agencies for their review and input. SEMARNAT acts as the central agency within Mexico for permitting and their requirements are much more comprehensive than those of the local governments.

#### National Water Commission (CONAGUA)

CONAGUA is the Mexican federal agency responsible for regulating everything associated with domestic waters as stipulated in the Law of National Waters. Article 2 stipulates the directives that are applicable to all national waters, whether these are above ground (surface level) or in an aquifer (groundwater). Their jurisdiction also applies to maritime waters. The Law of National Waters includes provisions associated with preserving and controlling water resources and water quality. Specific regulations that apply to this project include: NOM-127-SSA1-1994r Permissible Quality and Treatment Limits for Potable Water; NOM-179-SSA1-1998, Monitoring and Evaluation of Quality Control of Water for Human Use and Consumption through Public Supply Systems; and NOM-012-SSA1-1993, Sanitary Requirements to Which Public and Private Water Supply Systems for Human Use and Consumption Must Comply. CONAGUA regulates all public water resources in Mexico.

### 5.2.2. U.S. Regulatory Setting

#### California Environmental Quality Act (CEQA)

Portions of the project located within California would be primarily composed of water conveyance facilities, and would require permits and approvals by agencies that are subdivisions of the state of California. These components would be subject to environmental review under CEQA. CEQA establishes a duty for public agencies to analyze and disclose environmental effects and to avoid or minimize environmental impacts where feasible. If significant impacts were to be found that cannot be mitigated, an Environmental Impact Report (EIR) would be required.

#### Additional State and Local Requirements

Depending on the final location, alignment and design of the U.S. components of the project, various other state and local regulatory requirements may also be applicable. Background on those regulatory processes is provided in Sections 5.5.2.2 and 5.5.2.3.

**U.S. Department of State**

Under Executive Order 11423, as amended, the U.S. Secretary of State has the authority to receive applications for and to issue Presidential Permits for the construction, connection, operation, or maintenance of certain facilities at the borders of the U.S. with Canada and Mexico. Permits are required for all border facilities, including land crossings, bridges, water and gas pipelines, tunnels, conveyor belts, and tramways. Working with other involved federal agencies, the Department of State determines whether a proposed border-crossing project is in the U.S. national interest. The Department also coordinates closely with concerned state and local agencies, and invites public comment before arriving at a determination. This permit instructs that Applicants consult with relevant federal and state agencies, including as applicable, the General Services Administration, the Department of Transportation's Federal Highway Administration, the Department of Homeland Security's Bureau of Customs and Border Protection, EPA, the Department of the Interior's Fish and Wildlife Service, the Coast Guard (if the project is an international bridge), and the U.S. Section of the International Boundary Water Commission, as well as the Department of State.

**Additional U.S. Federal Requirements**

As with state and local requirements, federal regulatory processes, approvals and permits would depend on specific project information for the U.S. components of the project. Additionally, federal funding could trigger the need for review under NEPA. Background on those regulatory processes is provided in Section 5.5.2.1, and 5.6.

### 5.2.3. Cross-Border Considerations

**International Boundary and Water Commission (IBWC)**

The 1889 International Boundary Convention established the International Boundary Commission. The Water Treaty of 1944 replaced the International Boundary Commission with the IBWC, and granted the U.S. Section of the IBWC authority to address water quality, conservation, and use issues within the U.S. The IBWC was created by the governments of the U.S. and Mexico to apply the provisions of various border and water treaties and settle differences arising from such applications through a joint international commission. All international border and water treaties with respect to Mexico are coordinated through the IBWC. IBWC coordinates the exchange of information between the U.S. and Mexico for all program activities that involve watersheds or aquifers crossing into Mexico. The IBWC jurisdiction extends along the U.S.-Mexico International Border, and inland into both countries where international border and water projects may exist. The IBWC has coordinated the establishment of cooperative relationships with federal, state, and local agencies, both in the U.S. and Mexico, in carrying out its border projects and activities.

#### Border Environment Cooperation Commission (BECC) and North American Development Bank (NADB)

The BECC, headquartered in Ciudad Juarez, Chihuahua, Mexico, is a binational organization created in 1994 by the Governments of the U.S. and Mexico, under a side-agreement to the North American Free Trade Agreement (NAFTA). BECC, along with its sister-institution the NADB, established by the same agreement and headquartered in San Antonio, Texas, are charged with helping to improve the environmental conditions of the U.S.-Mexico border region in order to advance the well-being of residents in both nations. The scope of their mandate and the specific functions of each institution are defined in the agreement between the two governments (the "Charter"), as amended in August 2004.

Both institutions fulfill an essential role in effectively applying bi-national policies and programs that support the sustainable development of environmental infrastructure on both sides of the U.S.-Mexico border. BECC works in close coordination with NADB and other border stakeholders including federal, state, and local agencies, the private-sector and civil society to identify, develop, certify and implement environmental infrastructure projects in five key sectors: Water, Wastewater, Waste Management, Air Quality, as well as Clean and Efficient Energy. BECC focuses on the technical, environmental, and social aspects of project development, while NADB concentrates on project financing and oversight for project implementation. Both entities offer various types of technical assistance to support the development and long-term sustainability of these projects.

#### Border Environment Infrastructure Fund (BEIF)

The NADB established the BEIF to administer grant resources provided by the EPA to help finance the construction of water and wastewater projects in the U.S.-Mexico border region. The objective of the BEIF is to make environmental infrastructure projects affordable for communities throughout the U.S.-Mexico border region by combining grant funds with loans and other forms of financing. It is designed to reduce project debt to a manageable level in cases where users would otherwise face undue financial hardship and projects could not be implemented.

## 5.3. Methodology

The proposed project has unique characteristics because it includes components on both sides of the U.S.-Mexico border, which complicates direct comparisons to existing permitted facilities and the processes that are in place. The project would be the first seawater desalination plant with bi-national characteristics, and there are several uncertain institutional arrangements regarding how the project would ultimately be delivered that may affect environmental review and permitting requirements for the project. For example, it is not certain whether approvals/entitlements and construction of the project would be pursued by a private party, a U.S. governmental agency, or a

Mexican governmental agency. Permitting and legal compliance responsibilities would vary depending on such arrangements.

The components of the proposed project that would be located in Mexico include the desalination plant, feedwater intake and brine discharge facilities, conveyance pipelines, and related necessary facilities. Components that would be located in California include conveyance pipelines and related necessary facilities. All applicable Mexican regulatory and permitting requirements would apply to the project components within the jurisdiction of Mexico, regardless of the entity that ultimately serves as the project sponsor/applicant. Similarly, all California and U.S. laws and regulations would apply to the project components within California. For the purposes of this analysis, it is assumed that U.S. laws and regulations would not be applied to project components located in Mexico, and vice versa.

It is, however, important to note that development of large-scale, regional seawater desalination is an emerging phenomenon in the context of the existing regulatory structure on both sides of the border. Therefore, there is limited policy guidance or legal precedent for reviewing and permitting regional desalination plants in either the U.S. or Mexico, and depending on the institutional arrangement that is ultimately decided upon, there may be overlap or conflict between Mexican and U.S. requirements. This is further discussed in Section 5.6.

The information and analyses contained within this Work Plan are based on data collection and field reconnaissance completed by Malcolm Pirnie; an outline of the Mexican permitting requirements prepared by A T Analytica; a discussion of the regulatory background contained in the *Rosarito Beach Binational Desalination Plant Feasibility Evaluation and Preliminary Design*; and the 2005 *Feasibility Study of Seawater Desalination Development Opportunities for the San Diego/Tijuana Region*. Analyses regarding the potential environmental impacts of desalination facilities are based upon recent environmental studies for similar desalination projects in southern California, including environmental reports and permitting documents related to the Carlsbad and Huntington Beach desalination plants, and feasibility studies for the proposed Camp Pendleton desalination plant.

## 5.4. Environmental Review and Permitting Requirements - Mexico

### 5.4.1. Mexican Environmental Review

As mentioned earlier, SEMARNAT requires the preparation of an MIA document in order to disclose the potential environmental impacts of a project. The MIA is prepared pursuant to Article 28 of the GLEEEP. An MIA would be required for this project.

The potential short-term, long-term, and cumulative environmental impacts of the project would result from construction and operation of the following project components located in Mexico: a desalination plant in Rosarito Beach (including feedwater intake and brine discharge facilities), a product water conveyance system to water users in Mexico which would continue north to the border. These potential impacts are described below.

#### 5.4.1.1. Aesthetics

Project impacts on the aesthetic character of the site should be analyzed and evaluated in relation to existing and surrounding site conditions. Consideration of public scenic views, introduction of new sources of light and glare, and compatibility of the proposed project with adjacent local aesthetic resources would need to be considered.

**Desalination Facility**

The preferred location of the proposed desalination facility has not been finalized at this time. Several potential sites have been identified along the Pacific coast in Rosarito Beach, Mexico. Several of the potential sites are currently developed with existing industrial facilities and the surrounding area is similar. Other potential sites are undeveloped and have adjacent uses that include industrial facilities, undeveloped land, and/or residential development. The proposed desalination facility would be similar in façade and height to industrial structures currently in the general area. Depending on the site chosen the desalination facility may be visible from surrounding viewsheds and residential development.

**Pipeline Alignment**

The proposed product water pipeline alignment is not firmly established. However, regardless of the exact alignment, the majority of the pipeline would be constructed underground within existing right-of-ways, and is expected to have limited impacts on aesthetics during construction.

#### 5.4.1.2. Agricultural Resources

The areas that have been identified as potential sites for the desalination facility, as well as the potential pipeline alignments for water conveyance, are located in developed, urban settings or along existing roadway areas or open areas and would not impact agricultural land uses. If pipeline alignments were to be constructed outside of existing roadways, these areas would need to be analyzed to assess their significance. Any impact to agricultural lands in Mexico would have to be addressed in the MIA.

#### 5.4.1.3. Air Quality

Future construction on the project site and the associated pipeline alignments in Mexico would generate short-term air quality impacts during demolition, grading, and construction operations. Construction activities that would affect air quality could include:

- Clearing, grading, excavating, and using heavy equipment or trucks creating fugitive dust
- Heavy equipment required for grading and construction generates and emits diesel exhaust emissions
- The vehicles of commuting construction workers and trucks hauling equipment generate and emit exhaust emissions.

Construction activities are a source of fugitive dust emissions that may have a temporary impact on local air quality. In addition, fugitive dust may be a nuisance to those living and working in the project vicinity. Fugitive dust emissions are associated with land clearing, ground excavation, cut and fill operations, and truck travel on unpaved roadways. Dust emissions also vary substantially from day to day, depending on the level of activity, the specific operations, and weather conditions. Fugitive dust from grading and construction is expected to be short-term and would cease following project completion.

In addition to gaseous and particulate emissions, the application of asphalt and surface coatings creates Reactive Organic Gas emissions, which are ozone (O3) precursors.

Diesel particulate matter is part of a complex mixture that makes up diesel exhaust. Diesel exhaust is commonly found throughout the environment and is addressed by SEMARNAT. Diesel exhaust is emitted from a broad range of diesel engines; the on-road diesel engines of trucks, buses and cars and the off-road diesel engines that include locomotives, marine vessels and heavy duty equipment. Project construction would result in emissions of diesel particulate from heavy construction equipment and trucks accessing the site. Diesel particulate is characterized as a toxic air contaminant in Mexico. Carcinogenic and chronic noncarcinogenic effects have been identified from long-term exposure, but no health effects have been identified due to short-term exposure to diesel exhaust. Due to the temporary nature of project construction, these impacts are not expected to be significant.

The operation of the proposed project involve three primary activities (some of which may be cumulative in nature) that would generate air emissions. These activities include:

- Electricity generation by others for consumption to operate the project facilities and equipment
- Electricity generation by others for consumption related to pump station operations
- Mobile source emissions from employee and truck delivery operations.

The potential air quality impacts during construction and operation would be addressed in the MIA document.

**Greenhouse Gas Emissions**

The project would produce potable water using reverse osmosis membrane separation. The treatment processes would not generate greenhouse gases (GHGs) directly. It is likely that the project would not generate its own power but rather use electrical power from the adjacent CFE power plant which has sufficient spare capacity for the 40 MW demand of the proposed project. The project would not store or use fossil fuels on site. There would be no direct fugitive emissions from the plant and as a result operation of the plant would not create direct sources of GHG emissions. The only exception would be for equipment emissions during construction and operator's vehicles when the project comes on line. This would be addressed in the MIA document.

### 5.4.1.4. Biological Resources

**Desalination Facility**

The proposed seawater desalination facility would be sited adjacent to the Pacific ocean and would have the potential to impact marine biological resources as a result of concentrated seawater discharge, impingement, and entrainment. Surveys of the marine resources in the area would be necessary to determine the significance of the following impacts to these resources.

*Concentrated Brine Discharge to Ocean*

There would be elevated salinity levels entering the ocean due to the brine discharge from the desalination plant. Concentrations to the ocean are dependent on the operational parameters of the desalination plant including flow rate and recovery ratio, and the flow rate and volume of once-through cooling water discharged by the power plant.

Pelagic and planktonic species are unlikely to be affected by increased salinity levels due to their limited exposure to high salinity concentrations. On the other hand, benthic species at the base of the power plant outfall are likely to be exposed to higher than normal salinity variations for a prolonged period and it is possible for impacts to result.

*Impingement*

Impingement impacts upon marine organisms occur as a result of organisms being trapped against screens, filters or other mechanisms associated with a seawater intake system and suffer damage or mortality as a result of pressure exerted from the flow of water. The proposed desalination facility would receive its source water from the existing outfall of the CFE Presidente Juarez power plant. It is assumed that the proposed facility would neither require any additional quantity of seawater to be withdrawn nor would it increase the velocity of the seawater withdrawn, beyond that necessary for power plant operation, and thus would have no additional effects on impingement.

*Entrainment*

Entrainment effects occur when small planktonic organisms are drawn through the intake system, and suffer damage or mortality as a result of pressure changes, mechanical damage, temperature increases, or turbulence in the water flow. Some level of entrainment currently occurs as a result of seawater intake by the CFE Presidente Juarez power plant for process and cooling purposes. A portion of the organisms surviving the cooling water process could be impacted by the desalination plant. In order to determine the amount and significance of any additional entrainment, studies on larval survival would be required.

**Pipeline Alignment**

There are three potential pipeline alignments under consideration. All alignments generally follow existing roadways, however, if the proposed alignments were to be sited such that the pipeline would traverse undeveloped tracts of land, then the sensitivity of the ecological resources in the area would need to be considered. Biological resources would most likely be impacted indirectly as a result of the "edge effects" of construction activities associated with laying the water conveyance pipelines. During construction of the project, edge effects may include dust from soil disruption which could affect plant vitality, or construction related soil erosion and run-off.

Impacts to biological resources in Mexico would need to be further evaluated in the MIA document, as required by SEMARNAT.

#### 5.4.1.5. Cultural Resources

The areas that have been identified as potential sites for the desalination facility, as well as the potential pipeline alignments for water conveyance, are generally located in developed, urban settings or existing roadways and would not be expected to contain any cultural or archaeological resources. During trenching activities associated with the water conveyance pipeline, any discovery of buried historical/archaeological resources would require that construction be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds. SEMARNAT requires cultural resources reporting.

#### 5.4.1.6. Geology and Soils

**Desalination Facility**

Construction of the proposed seawater desalination facility would require the analysis of the geologic features of the proposed project site. Rosarito Beach is subject to typical seismic hazards of Baja Norte. The project site should be assessed to determine the stability of the soils including but not limited to the potential for earthquake shaking hazards, surface rupture, shallow groundwater, and unstable soils (liquefaction, subsidence, lateral spread) to support the construction of the proposed seawater desalination facility. Construction of the proposed plant would also be subject to standard erosion control measures as required by Mexican regulations to contain any potential wind and water erosion on-site.

**Pipeline Alignments**

The proposed off-site pipeline alignments would traverse a wide range of surficial soils with varying characteristics and qualities, as the Mexican portions of the pipeline alignment would travel from Rosarito, Mexico to the U.S.-Mexico border. As with the desalination facility site, the off-site pipelines are subject to typical seismic hazards of Baja Norte.

Depending on the proposed pipeline alignment, impacts to natural topography may occur. Due to the potential for ground shaking in a seismic event and seismic related ground failures (such as liquefaction), the project shall comply with the standards set forth in the Mexican Construction Code to assure safety to the satisfaction of the applicable local jurisdiction's department of building and safety prior to issuance of a building permit. Depending on the proximity of the proposed pipeline alignment to existing faults and other geologic hazards, more stringent measures may be warranted.

Construction of the proposed pipelines would also be subject to standard erosion control measures as required by Mexican regulations to contain any potential wind and water erosion on-site.

### 5.4.1.7. Hazards and Hazardous Materials

**Desalination Facility**

The proposed seawater desalination facility would involve the storage, handling, and use of hazardous materials. The plant would therefore be required to comply with all the appropriate Mexican regulations concerning hazardous materials. Hazardous materials would likely be utilized for three components of desalination facility operation: 1) periodic cleaning of the reverse osmosis membranes; 2) treatment of potable product water; and 3) storage of diesel fuel for emergency backup electricity generators at the desalination plant. Hazardous materials would need to be transported, stored, handled and disposed of using all necessary precautions to avoid releases and associated impacts to facility employees, the local water table, and the general public. Per Mexican regulations, the desalination facility operator would be required to prepare an accident prevention plan due to the use of chlorine gas on the site. The means of transportation should also be addressed, including the transport of hazardous materials on Mexican federal highways.

**Pipeline Alignments**

The off-site pipeline alignment would travel from the desalination facility to the U.S-Mexico border to transport potable water to the U.S. The pipeline alignment would occur adjacent to a variety of land uses, and may require trenchless construction to cross waterways and roadways with a high sensitivity to traffic disturbance. Three potential methods for consideration are micro-tunneling, directional boring, or traditional tunneling. Depending on the site conditions, frac-outs may occur. A frac-out is the condition where drilling mud is released through fractured bedrock into the surrounding rock and sand and travels toward the surface of a stream or river and therefore must be controlled. A Frac-Out Contingency Plan would establish operational procedures and responsibilities for the prevention, containment, and clean-up of frac-outs associated with the directional drilling activities associated with the construction of the product water pipeline. All contractors responsible for the work must adhere to this plan during the directional drilling process.

Hazardous materials and waste impacts due to long-term operation of the pipelines are not anticipated to occur.

#### 5.4.1.8. Hydrology and Water Quality

**Desalination Facility**

The preferred location of the proposed desalination facility has not been finalized at this time. Therefore, the specific hydrological and topographic conditions at the Rosarito desalination facility site are not known. However, considering that the site location would be near the coast, the local groundwater may be at a level that would require dewatering of the site during construction of the proposed facility. For example, construction of water storage tanks may require excavation of the site to a depth below existing groundwater levels, and therefore require temporary dewatering. Dewatering would occur over a limited area during construction.

Several potential sites have been identified, some of which are currently developed with existing industrial facilities and surrounded by industrial development. Other potential sites are vacant and have adjacent uses that include industrial facilities, vacant land and/or residential development. Construction of the proposed desalination facility would alter the existing drainage pattern at the site, and potentially alter the drainage pattern of the surrounding area. Patterns of historic water flows during significant storm events would have to be documented and considered during the design and construction of the proposed facility.

Prior to construction, the applicant would be required to submit project drawings and structural plans and obtain a construction license from the local government.

The product water of the proposed seawater desalination plant has the potential to be impacted by changes in ocean water salinity, temperature, turbidity, and pathogen concentration. Ocean water quality may be affected by surface runoff and by discharges from wastewater plants. There are currently two secondary wastewater treatment plants in Rosarito Beach, both of which discharge directly into the Pacific ocean. Additionally, there are occasional algae blooms which accumulate into dense visible patches near the ocean surface in the surf zone during late summer or fall. There is also the potential for oil spills or other hazardous material spills into the marine environment in proximity to the power plant intake.

In Mexico, the construction permit and application for license to construct would have to be processed with the construction departments of the City of Tijuana and the City of Rosarito. In addition, the water quality data, including construction dewatering, would be presented to CONAGUA.

The Secretariat of the Navy enforces water pollution regulations associated with off-shore and areas along the coastline.

**Pipeline Alignment**

Though the exact product water pipeline alignment is not yet determined, construction of the pipeline could potentially impact local hydrology.

Potable water would be conveyed both to Mexico and across the border to the U.S., blending with other existing municipal water sources. Issues to be considered during blending of water sources include: water quality, corrosion of the existing water distribution system, disinfection including the formation and nature of disinfection byproducts, water taste and odor, and overall system hydraulics.

Further analysis is necessary to determine the potential impacts and to recommend adequate mitigation measures in order to obtain approval by Mexico's CONAGUA.

#### 5.4.1.9. Land Use

The proposed desalination facility would be located in an industrial developed area near an electrical power generating plant, and thus would be compatible with existing land uses. The off-site pipeline alignments would transport potable water north to communities in Mexico and the U.S. The pipeline alignments would traverse a variety of land uses in Mexico and would be expected to comply with all applicable land use policies, plans, and regulations. A license from the IBWC would be necessary for authority to perform work or place structures on or across rights-of-way of projects under the jurisdiction of the IBWC.

SEMARNAT, as well as state and municipal agencies, would be engaged in regulating the land use proposed project.

#### 5.4.1.10. Mineral Resources

The areas that have been identified as potential sites for the desalination facility, as well as the potential pipeline alignments for water conveyance, are located in developed, urban settings or existing roadways and would not be expected to decrease the availability of known mineral resources in Mexico.

In Mexico, there are laws that regulate the loss of mineral resources. If any minerals are located in project areas and are to be used on-site or extracted, the Secretariat of Energy would have to be notified. However, if there would be no mining on-site as part of the project and there are no known mineral deposits at the site or along the pipeline alignments, a letter to the Secretariat of Energy should be provided to that effect. A statement to that effect should also be included in the MIA.

#### 5.4.1.11. Noise

**Desalination Facility**

High ground-borne noise levels and other miscellaneous noise levels can be created by the operation of heavy-duty trucks, backhoes, bulldozers, excavators, front-end loaders, compactors, graders, and other heavy-duty construction equipment. The grading phase of the project would include mostly site preparation activities with rough grading followed by fine grading. Construction equipment utilized during this phase would include graders, heavy-duty trucks, tractors, loaders, and a water truck. The building and paving phase would involve building construction and asphalt lay down activities which would utilize graders, backhoes, trucks, pavers, rollers, and a crane. For construction noise, a substantial noise increase can be defined as interference with activities during the day and night. Construction noise associated with the proposed project would require analysis regarding whether or not it would expose surrounding sensitive receptors to substantial noise levels during construction. In addition, potential long-term operational impacts may occur with operations of the desalination facility or pump stations. Potential noise sources include pumps, truck deliveries, generators, and other equipment.

Persons residing and working in the area surrounding the project could also be exposed to the generation of excessive ground-borne vibration or ground-borne noise levels related to construction activities. Site ground vibrations from construction activities very rarely reach the levels that can damage structures, but they can achieve the audible range and be felt in buildings very close to the site. The primary and most intensive vibration source associated with the development of the project would be the use of heavy equipment during grading activities. These types of equipment can create intense noise and can result in ground vibrations.

In Mexico, the Labor and Social Welfare Department regulates noise at the workplace. SEMARNAT regulates noise outside the workplace.

**Pipeline Alignment**

Potential short-term construction impacts may occur during trenching and installation activities, which may have indirect effects on sensitive biological resources and other sensitive receptors within the vicinity of the pipeline alignment. Long-term impacts are not anticipated, as the pipelines would be located entirely underground.

### 5.4.1.12. Population and Housing

**Desalination Facility**

The proposed desalination facility would be sited on land currently developed for industrial purposes. The facilities construction would not directly impact any private residences, nor would it displace any housing or people. In the case that the proposed project site were to change such that it would be necessary to displace residences and people, the proposed project impacts on population and housing would need to be reconsidered.

**Pipeline Alignments**

A majority of the water conveyance pipelines in Mexico are expected to follow existing roadways, and thus would not displace residences or people.

### 5.4.1.13. Public Services and Utilities

**Desalination Facility**

Construction of the desalination facility would generate solid waste and stormwater runoff. In addition, the facility would result in the need for additional: water (for drinking fountains and restrooms), electricity, gas, telephone, internet, telemetry, and wastewater services. Since the facility would store hazardous chemicals on site, additional fire protection service may be required. Coordination with local service providers would be required to ensure that adequate availability of these services exist for the proposed project.

**Pipeline Alignments**

Depending on the location of the proposed pipeline alignment, impacts to underground utilities may occur. If the installation of the proposed off-site pipelines would occur within existing street right-of-way, an assessment would be needed to determine if the pipes would consume underground space for utilities (telephone, cable television, electricity, small diameter pipes) along the streets the pipeline is proposed to occupy.

Installation of the proposed pipelines may result in the need for additional solid waste disposal services. The proposed pipelines are not anticipated to result in the need for solid waste disposal during the operational phase of the project.

The proposed off-site pipelines are not anticipated to require the use of the following public services and utilities: water, reclaimed water, schools, parks, gas, electricity, library, wastewater, stormwater, police, fire, solid waste, telephone, or cable.

### 5.4.1.14. Recreation

The proposed project would not include the construction or expansion of any recreational facilities adversely affecting the environment. The proposed desalination facility would be sited on developed, industrial land which already limits coastal access and associated recreational uses. However, additional impacts to marine recreational issues such as beach front, surf, and fishing would have to be addressed in the environmental document.

Construction of the pipelines would potentially affect the use of existing neighborhood and regional parks or recreational facilities depending on the alignment of the conveyance pipelines, and would have to be evaluated accordingly.

#### 5.4.1.15. Transportation/Traffic

**Desalination Facility**

Short-term impacts would result from increased vehicle trips involved in the construction of the desalination facility. These construction phase trips are not expected to result in substantial traffic congestion. The number of trips generated by the project on a long-term basis would be considered negligible, given that staff trips and chemical deliveries would not be expected to constitute a significant increase in localized traffic.

The height of future structures would not penetrate navigable airspace or otherwise impact air traffic patterns.

**Pipeline Alignment**

Short-term traffic impacts associated with the pipeline alignment would result from increased vehicle trips involved in the construction phase, as well as the potential for temporary road closures along the water conveyance alignment. Two alignments were identified in the 2005 Report, and a third alignment has been identified during site reconnaissance. An alignment study has been recommended to further evaluate these alignments; however, all alignments would result in short-term construction-related impacts and could involve temporary road closures or traffic diversions.

### 5.4.2. Mexican Regulatory Compliance and Permitting

**International Boundary and Water Commission (IBWC)**

The IBWC coordinates cooperative relationships with federal, state, and local agencies, both in the U.S. and Mexico, in carrying out its border projects and activities. ***A permit would be required for all activities in the IBWC right-of-way at the border or on IBWC maintained floodways. It is likely that an IBWC Minute would be required for this project.*** (Bold italics used to highlight actual permit obtaining activities.)

**SEMARNAT**

In addition to the required environmental documentation as part of the MIA process, SEMARNAT is also the agency responsible for granting various permits. The permits that are anticipated to apply to the proposed project are listed below.

Any hazardous materials associated with the project would have to be included in the MIA and associated environment risk study. ***If the facility proposes to use chlorine gas, an Accident Prevention Program (Programa Para La Prevención de Accidentes)***

***assessment must be prepared, per Article 5, Section X, 17, 145, 146, and 147 of the GLEEEP, as well as Article 27, Su-Title XXXII, 37, subsections XVI and XVII of the Organization Law of the Federal Public Administration, and Article 3 listing hazardous materials requiring special management***. This assessment would take two to three months to complete and may require about three to four months for SEMARNAT to review.

***In the case that any proposed tracts of land for development are located within forest land and that the native vegetative layer needs to be removed to make room for the facility and/or the conveyance system, a Land Use Change for Properties Located in Forest Country assessment would need to occur***. The assessment would take two to three months to complete and would require an additional four to five months for review by SEMARNAT.

***Because the project may encroach onto coastal land and may modify the land morphology, an Authorization for Land-to-Sea Encroachment would be required***. The assessment process would require two to three months and the review process by SEMARNAT would require approximately eight to nine months.

***While it is not anticipated for this project, if a significant amount of forestry land were to be impacted, a Notification for Property Transition and Usage Rights over Forestry would need to be prepared***. Preparation would require one to two months, with an additional four to five months needed for review by SEMARNAT.

***Depending on final project location and configuration, a Request to cede the Rights and Obligations for a Concession for the Use and Utilization or Exploitation of a Beachfront and/or a Federal Land-Maritime Tract and/or Land-to-Sea Encroachment for any Natural Seawater Body may be required.*** The assessment would require one to two months to complete and an additional 11 months for review.

***A Construction Permit would need to be obtained from SEMARNAT***. Two months would be required to complete the application for the permit and SEMARNAT would require about 11 months to review.

**Secretariat of Communication and Transport**

***Because the project would be constructed along the coastline, authorization from the Federal Maritime-Terrestrial Zone would be necessary.*** This Maritime Works Authorization would be granted by the Department of Transportation.

**National Water Commission (CONAGUA)**

CONAGUA as the Mexican federal agency responsible for regulating everything associated with domestic waters as stipulated in the Law of National Waters. ***A National***

***Water Commission permit would be required for this project which would include the anticipated water quality produced by the plant.*** If any drilling would be necessary for a well or water intake for the plant, a geology study would have to be conducted prior to the application for a National Water Commission permit.

**The Secretariat of the Navy**

Among the duties of the Secretariat of the Navy according to Sea Federal Law, Article 6, it is stipulated that the Secretariat of the Navy is in charge of protecting and preserving the sea resources and to prevent their pollution. This includes protecting national maritime, streams and marshlands resources.

The Secretariat of the Navy regulates and enforces regulation of off-shore and coastline issues, and would have to be engaged regarding any construction along the coast and any concentrated seawater discharge associated with this project. Brine disposal to the ocean associated with the project would require an approval from the Secretariat of the Navy.

**The Secretariat of Health**

The Secretariat of Health is the government department in charge of all social health services in Mexico.

The Secretariat will issue a ruling on the effects on human health due to brine discharge to the ocean when the project is presented to them for review and comment. Authorization will allow the project proponent to discharge desalination concentrate into the sea.

**Construction Department of the City of Tijuana and/or Rosarito**

***A Construction License would be required from the local government in order to construct the facilities.*** Documents to be submitted include project drawings (plans) and calculations (structural design). The following site-related information would be required: geographical coordinates; surface area; boundary survey; property taxes; title policy; and a sales contract. The process fee for the license would depend on the size of the tract of land and the location.

The first applications necessary would be with the municipality of Tijuana and Playas de Rosarito in order to obtain ***land use licenses***, alignment and the official street number, that eventually would be included in the MIA and construction license.

### 5.4.3. Summary of Mexican Permit Requirements

A summary of the potential permits and approvals described above is included in Table 5-1. Once project specifics such as siting and conveyance alignments have been determined, this list would be revised to reflect the actual permit conditions and timeframes that the project would be subject to.

**Table 5-1**
## Anticipated Mexican Permits and Approvals

| Agency/Department | Permit/Approval | Required for |
|---|---|---|
| IBWC - MX Section | IBWC Permit | Perform work or place structures on or across rights-of-way of projects under the jurisdiction of the IBWC MX Section |
| SEMARNAT | Environmental Impact Statement Level 2 (MIA) | Impacts to the environment |
| | Accident Prevention Program Assessment | Assessment prepared due to use of chlorine gas |
| | Land Use Change for Properties Located in Forest Country | Process required when property is within forest land and when the native vegetative layer needs to be removed to make room for the facility. |
| | Authorization for Land-to-Sea Encroachment | Required if facility would encroach into the sea. |
| | Notification for Property Transition, Usage Rights over Forestry | Subject to area of land impacted |
| | Request to Use, Utilize, or Exploit Beachfront and/or a Federal Land-Maritime Act of any Natural Seawater Body | Impacts to beachfront and water bodies |
| | Request to Cede Rights and Obligations | For a concession for the use, utilization or exploitation of beachfront and/or a Federal Maritime Tract and/or Land-to-Sea Surface Encroachment or any Natural Seawater Body |
| | Construction Permit | General construction permit |
| Secretariat of Communication and Transport | Maritime Works Authorization | Needed on occasion |
| Local Government | Land Use license | Required for use of government land. |
| Local Government | Construction license | Required to construct facilities |
| National Water Commission | Permit | Assuring water quality |
| Secretariat of the Navy | Approval | Brine disposal to the ocean |
| Secretariat of Health | Ruling | Brine disposal to the ocean |

# 5.5. Environmental Review and Permitting Requirements – U.S.

## 5.5.1. U.S. Potential Environmental Impacts

As mentioned previously, because treated water pipelines for the project would be located within California, an environmental impact review under CEQA would be required. CEQA establishes a duty for public agencies to avoid or minimize environmental impacts where feasible. It is anticipated that an EIR would be required to satisfy these requirements, due to the potential for significant environmental impacts.

The potential short-term, long-term, and cumulative environmental impacts of the project would result from construction and operation of a product water conveyance system from the U.S.-Mexico border to water users in the U.S., These potential impacts are described below.

### 5.5.1.1. Aesthetics

The proposed product water pipeline alignment is not firmly established. However, regardless of the exact alignment, the majority of the pipeline would be constructed underground within existing right-of-ways, and is expected to have limited impacts on aesthetics during construction.

### 5.5.1.2. Agricultural Resources

The areas that have been identified as potential pipeline alignments for water conveyance are located primarily in developed, urban settings or along existing roadway areas or open areas and would not impact agricultural land uses. If pipeline alignments were to be constructed outside of existing roadways, these areas would need to be analyzed to assess their significance in accordance with CEQA and the California Department of Conservation's Farmland Mapping and Monitoring Program.

### 5.5.1.3. Air Quality

Future construction associated with pipeline alignments would generate short-term air quality impacts during grading and construction operations. Construction activities that would affect air quality could include:

- Grading, excavating, and using heavy equipment or trucks creating fugitive dust
- Heavy equipment required for grading and construction generates and emits diesel exhaust emissions
- The vehicles of commuting construction workers and trucks hauling equipment generate and emit exhaust emissions.

Construction activities are a source of fugitive dust emissions that may have a temporary impact on local air quality. In addition, fugitive dust may be a nuisance to those living and working in the project vicinity. Fugitive dust emissions are associated with land clearing, ground excavation, cut and fill operations, and truck travel on unpaved roadways. Dust emissions also vary substantially from day to day, depending on the level of activity, the specific operations, and weather conditions. Fugitive dust from grading and construction is expected to be short-term and would cease following project completion.

In addition to gaseous and particulate emissions, the application of asphalt and surface coatings creates Reactive Organic Gas emissions, which are ozone (O3) precursors.

Diesel particulate matter is part of a complex mixture that makes up diesel exhaust. Diesel exhaust is commonly found throughout the environment and is estimated by EPA's National Scale Assessment to contribute to human health risk. Diesel exhaust is emitted from a broad range of diesel engines; the on-road diesel engines of trucks, buses and cars and the off-road diesel engines that include locomotives, marine vessels and heavy duty equipment. Project construction would result in emissions of diesel particulate from heavy construction equipment and trucks accessing the site. Diesel particulate is characterized as a toxic air contaminant in the State of California. The Office of Environmental Health Hazard Assessment has identified carcinogenic and chronic noncarcinogenic effects from long-term exposure, but has not identified health effects due to short-term exposure to diesel exhaust. Due to the temporary nature of project construction, these impacts are not expected to be significant.

#### Greenhouse Gas Emissions

There would be no direct GHG emissions from operation of the water conveyance facilities. As a result, operation of the conveyance facilities would not create direct sources of GHG emissions except for emissions from construction and operational vehicles. However, a Climate Change Assessment would be necessary to further assess impacts in accordance with CEQA. CEQA was recently updated to require analysis of climate change effects.

### 5.5.1.4. Biological Resources

There are three potential pipeline alignments under consideration. All alignments follow existing roadways, however, if the proposed alignments were to be sited such that the pipeline would traverse undeveloped tracts of land, then the sensitivity of the ecological resources in the area would need to be considered. Biological resources would most likely be impacted indirectly as a result of the "edge effects" of construction activities associated with laying the water conveyance pipelines. During construction of the project, edge effects may include dust from soil disruption which could affect plant vitality, or construction related soil erosion and run-off. All project grading would be subject to the typical restrictions and requirements that address erosion and runoff, including:

- The federal Clean Water Act
- National Pollution Discharge Elimination System (NPDES)
- Preparation of a Stormwater Pollution Prevention Plan.

All potential sensitive habitat locations have not been identified with all alignments. However, the proposed Coastal alignment is in close proximity to the Tijuana River Valley and the Tijuana Estuary and the inland alignments are in close proximity to the Otay Mountain Wilderness Area.

Impacts to biological resources in the U.S. may need to be further evaluated in a Biological Resources Report, as part of the EIR process. In addition, potential impacts to jurisdictional waters (including wetlands) of the US may occur, therefore a Jurisdictional Delineation and subsequent delineation may be required by the Army Corp of Engineers (ACOE), and mitigation measures to ensure this area would not be significantly impacted by construction or operation of the pipeline conveyance system. Consultation with the U.S. Fish and Wildlife Service (USFWS), US National Marine Fisheries Service and the California Department of Fish and Game (CDFG) is recommended to address potential impacts to sensitive biological habitat, resources, or animal species.

#### 5.5.1.5. Cultural Resources

The potential pipeline alignments for water conveyance are located in developed, urban settings or existing roadways and would not be expected to contain any cultural or archaeological resources. During trenching activities associated with the water conveyance pipeline, any discovery of buried historical/archaeological resources would require that construction be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds. A records search would be necessary to identify whether or not any potentially significant cultural resources might exist within the vicinity of the proposed conveyance pipelines in the U.S.

#### 5.5.1.6. Geology and Soils

The proposed pipeline alignments would traverse a wide range of surficial soils with varying characteristics and qualities, as the pipelines would travel from the U.S.-Mexico border through portions of San Diego, California. The pipeline would be subject to typical seismic hazards of Southern California.

Depending on the proposed pipeline alignment, impacts to natural topography may occur. A design-level geotechnical investigation would need to be performed for the final selected pipeline alignment to examine the potential for earthquake shaking hazards, surface rupture, shallow groundwater, and unstable soils (liquefaction, subsidence, lateral spread). Should the potential for such geological hazards exist, adequate mitigation for both pipeline construction and pipeline design would be incorporated to mitigate impacts in this regard to less than significant levels.

Due to the potential for ground shaking in a seismic event and seismic related ground failures (such as liquefaction), the project shall comply with the standards set forth in the Uniform Building Code (most recent edition) to assure safety to the satisfaction of the applicable local jurisdiction's department of building and safety prior to issuance of a building permit, including compliance with California Division of Mines and Geology Special Publication 117 (Guidelines for Evaluating and Mitigating Seismic Hazards in California, adopted March 13, 1997). Depending on the proximity of the proposed pipeline alignment to existing faults and other geologic hazards, more stringent measures may be warranted.

Construction of the proposed pipeline would also be subject to standard erosion control measures as required by U.S. local, state, and federal regulations to contain any potential wind and water erosion on-site.

#### 5.5.1.7. Hazards and Hazardous Materials

The off-site pipeline alignments would cross the U.S-Mexico International Border to transport potable water to the U.S. The pipeline alignments would occur adjacent to a variety of land uses. In order to determine whether the area proposed for the construction/installation of the pipelines contains residual hazardous materials; a Phase I Environmental Site Assessment should be prepared for the project. The Phase I report would include investigating any known materials adjacent to the proposed alignments; a field visit (to determine the conditions of the surface soil along and immediately surrounding the alignments); and consultation with land owners regarding current and past uses of the land. If contaminated soils are identified along or adjacent to the pipeline alignment; A Phase II Environmental Assessment along with remediation of the contamination would be required. The Phase II Environmental Assessment would require the need to perform soil tests to determine the type and quantity of the contamination found at the site. A Remedial Action Plan report would be prepared to outline the measures needed to monitor and remediate the site according to applicable regulations.

The pipeline alignment may require trenchless construction to cross waterways and roadways with a high sensitivity to traffic disturbance. Three potential methods for consideration are micro-tunneling, directional boring, or traditional tunneling. Depending on the site conditions, a Frac-Out Contingency Plan may be required. A frac-out is the condition where drilling mud is released through fractured bedrock into the surrounding rock and sand and travels toward the surface of the stream or river. The Frac-Out Contingency Plan would establish operational procedures and responsibilities for the prevention, containment, and clean-up of frac-outs associated with the directional drilling activities associated with the construction of the product water pipeline. All contractors responsible for the work must adhere to this plan during the directional drilling process.

Hazardous materials and waste impacts due to long-term operation of the pipelines are not anticipated to occur.

#### 5.5.1.8. Hydrology and Water Quality

Though the exact water pipeline alignment is not yet determined, construction of the pipeline could potentially impact local hydrology.

Potable water would be conveyed across the border to the U.S., where it would blend with San Diego County municipal water sources. Issues to be considered during blending of water sources include: water quality, corrosion of the existing water distribution system, water taste and odor, disinfection including the formation and nature of disinfection byproducts, and overall system hydraulics.

Further analysis is necessary to determine the potential impacts and to recommend adequate mitigation measures in order to obtain approval by California's Department of Public Health. See Paragraph 5.5.2.2 for further discussion in this regard.

#### 5.5.1.9. Land Use

The pipeline alignments would cross the U.S./Mexico International Border to transport potable water to the U.S. The pipeline alignment would traverse a variety of land uses in the U.S. and would be expected to comply with all applicable land use policies, plans, and regulations. In the event that the pipeline crosses sensitive habitat, it would be necessary to comply with any applicable habitat conservation or natural community conservation plan. A license from the IBWC –U.S Section would be necessary for authority to perform work or place structures on or across rights-of-way of projects under the jurisdiction of the International Boundary Water Commission (IBWC). A Presidential Permit would be necessary through the U.S. State Department for this construction.

Additionally, per the California Coastal Act of 1976, any development activities within the coastal zone boundary must be approved by either the California Coastal Commission (CCC) or the local government. Based on preliminary project information, one of the three potential pipeline alignments may cross the border and fall within the coastal zone, which extends from the Pacific Ocean to just west of the Tijuana Border Crossing. If any work is required within the coastal zone, a coastal development permit would be required.

#### 5.5.1.10. Mineral Resources

The areas that have been identified as potential pipeline alignments for water conveyance are located in developed, urban settings or existing roadways and would not be expected to decrease the availability of known mineral resources in the U.S.

#### 5.5.1.11. Noise

Potential short-term construction impacts may occur during trenching and installation activities, which may have indirect effects on sensitive biological resources and other sensitive receptors within the vicinity of the pipeline alignment. Long-term impacts are not anticipated, as the pipelines would be located entirely underground.

#### 5.5.1.12. Population and Housing

On the U.S. side of the border, the alignments of the pipeline have the potential to traverse a variety of existing land uses. Configuration of the pipelines would have to be evaluated based on their impacts to housing and people.

**Growth Inducement**

According to the CEQA guidelines, a project is considered to be growth-inducing if it fosters economic or population growth or the construction of additional housing, either directly or indirectly, in the surrounding environment. The growth inducing potential of a project would be considered significant if it stimulates population growth or a population concentration above what is assumed in local and regional and use plans, or in projections made by regional planning authorities. Projects that are generally considered growth-inducing include those that provide for the expansion of urban services into a previously unserved or underserved area, the creation or extension of transportation links, or the removal of major obstacles to growth.

The construction of the proposed water conveyance facilities would provide a connection to a new water supply. An analysis of potential growth-inducing effects would be included in the environmental document to address the extent to which such new supplies have the ability to foster growth within the region.

#### 5.5.1.13. Public Services and Utilities

Depending on the location of the proposed pipeline alignment, impacts to underground utilities may occur. If the installation of the proposed off-site pipelines would occur within existing street right-of-way, an assessment would be needed to determine if the pipes would consume underground space for utilities (telephone, cable television, electricity, small diameter pipes) along the streets the pipeline is proposed to occupy.

Installation of the proposed pipelines may result in the need for additional solid waste disposal services. An assessment would need to be performed by the applicant to determine which landfill has the capacity to accept construction debris from the proposed project. In addition, the applicant would prepare a Waste Reduction Plan for the construction waste generated from this project. The proposed pipelines are not anticipated to result in the need for solid waste disposal during the operational phase of the project.

The proposed off-site pipelines are not anticipated to require the use of the following public services and utilities: water, reclaimed water, schools, parks, gas, electricity, library, wastewater, stormwater, police, fire, solid waste, telephone, or cable.

#### 5.5.1.14. Recreation

The proposed project does not include the construction or expansion of any recreational facilities which would adversely affect the environment. Construction of the pipelines would potentially affect the use of existing neighborhood and regional parks or recreational facilities depending on the alignment of the conveyance pipelines, and would have to be evaluated accordingly.

#### 5.5.1.15. Transportation/Traffic

Short-term traffic impacts associated with the pipeline alignment would result from increased vehicle trips involved in the construction phase, as well as the potential for temporary road closures along the water conveyance alignment. Two alignments were identified in the 2005 feasibility study, and a third alignment has been identified during site reconnaissance. An alignment study has been recommended to further evaluate these alignments; however, all alignments would result in short-term construction-related impacts and could involve temporary road closures or traffic diversions. No long term traffic impacts are anticipated.

### 5.5.2. U.S. Regulatory Compliance and Permitting

#### 5.5.2.1. U.S. Federal Agencies

**International Boundary and Water Commission (IBWC)**

The IBWC coordinates cooperative relationships with federal, state, and local agencies, both in the U.S. and Mexico, in carrying out its border projects and activities. ***A permit would be required for all activities in the IBWC right-of-way at the border or on IBWC maintained floodways. It is likely that an IBWC Minute would be required for this project.***

**ACOE**

*Rivers and Harbors Act of 1899*

***Rivers and Harbors Act, Section 10, establishes permit requirements to prevent unauthorized obstruction or alteration of any navigable water of the U.S.*** This covers construction, excavation, or deposition of materials in, over, or under such waters, or any work which would affect the course, location, condition, or capacity of those waters (RHA 1890 USC 401, et seq. and 403). Section 10 is triggered concurrently with Section 404 when activities occur within a navigable waterway and the potential exists for a disruption to navigation.

*On average, individual permit decisions are made within six to twelve months from receipt of a completed application; nationwide permits can take from three to six months. Applications requiring EISs average about three years to process.*

*Clean Water Act of 1977*

The Clean Water Act (CWA) established the basic structure for regulating discharges of pollutants into the waters of the U.S. It gives EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The CWA also contains requirements to set water quality standards for contaminants of concern in surface waters. The Act makes it unlawful for any person to discharge a pollutant from a point source into navigable waters, unless a permit is obtained under its provisions.

***Section 404 of the CWA requires the issuance of permits for the discharge of dredged or fill materials into waters of the U.S. at specified disposal sites (Clean Water Act 1977 Section 404 (b)(1).)*** Section 404 is triggered if the project requires the placement of fill material (including structural fills) into waters of the US. Waters of the US include wetlands that may be temporarily or permanently filled.

**EPA**

*Clean Air Act of 1970*

The Clean Air Act (CAA) was enacted in 1970 to address air pollution at the federal level. The CAA requires the EPA administration to set national ambient air quality standards and emission standards. Furthermore, the act established auto emission standards. Prior to the passage of the CAA, regulations for air quality control were defined and enforced at the state level. The CAA may allow states to have more stringent standards than those required by the federal government.

The CAA was amended in 1977. The amendment relaxed auto emission standards and established provisions for the deterioration of areas. The CAA was further amended in 1990. The 1990 CAA provides for interstate commissions on air pollution control, which are to develop regional strategies for cleaning up air pollution. The 1990 CAA includes other provisions to reduce interstate air pollution. The CAA also acknowledges that air pollution moves across national borders, and the law addresses pollution that originates in the U.S. and reaches Canada and Mexico.

The 1990 CAA Amendment also created the framework for the creation of a permit program for large point sources of air contaminants.

The CAA requires federal actions to conform to any state implementation plan approved or promulgated under Section 110 of the Act. For EPA actions, the applicable conformity requirements specified in 40 CFR Part 51, Subpart W; 40 CFR Part 93, Subpart B; and the applicable state implementation plan must be met. Under the Federal Rule on General Conformity, 40 CFR Part 93, a conformity determination is required only when emissions occur in a non-attainment area. Much of the work necessary to carry out the CAA is delegated to the states.

**USFWS**

*Endangered Species Act, 16 USC 1536 et seq.*

The Endangered Species Act (ESA), 16 USC 1536 et seq., protects threatened and endangered plants and animals and their habitats. The USFWS of the Department of the Interior implements the ESA at a national level. Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees. Anyone can petition USFWS to include a species on this list. The law prohibits any action, administrative or real, that results in a "taking" of a listed species, or adversely affects habitat. Likewise, import, export, interstate, and foreign commerce of listed species are all prohibited.

Section 7 of the ESA directs all Federal agencies to use their existing authorities to conserve threatened and endangered species and, in consultation with the Service, to ensure that their actions do not jeopardize listed species or destroy or adversely modify critical habitat. ***A Section***

***7 consultation with the USFWS would be required to determine any potential impacts to listed species for this project.***

In the context of this study, the ESA must be observed for any potential impacts to terrestrial habitat in the U.S. resulting from construction activities, as well as impacts to aquatic habitat in the Pacific Ocean.

**U.S. Department of State**

Under Executive Order 11423, as amended, the U.S. Secretary of State has the authority to receive applications for and to issue

Since this potential project includes a water pipeline crossing of the border between the U.S and Mexico a ***Presidential Permit*** for its construction, connection, operation, or maintenance would be required. Working with other involved federal agencies, the Department of State coordinates closely with concerned state and local agencies, and invites public comment in arriving at this determination. This permit also instructs applicants to consult with relevant federal and state agencies as applicable including the Department of Transportation's Federal Highway Administration, the Department of Homeland Security's Bureau of Customs and Border Protection, EPA, the Department of the Interior's Fish and Wildlife Service, and the U.S. Section of the IBWC.

### 5.5.2.2. California State Agencies

**State Water Resources Control Board and Regional Water Quality Control Board**

*Porter-Cologne Water Quality Control Act*

The Porter-Cologne Water Quality Control Act (California Water Code 13000, et seq.) is the principal legislation for controlling storm water pollutants in California. The act requires development of basin plans for drainage basins within California. Each plan serves as a blueprint for protecting water quality within the various watersheds. These basin plans are used in turn to identify more specific controls for discharges (e.g., wastewater treatment plant effluent, urban runoff, and agriculture drainage). Under the Porter-Cologne Act, specific controls are implemented through permits called Waste Discharge Requirements issued by the nine Regional Water Quality Control Boards (RWQCBs). The project site is included within the Water Quality Control Plan for the San Diego Basin, and thus is subject to all applicable rules and regulations contained within the Water Quality Control Plan for the San Diego Basin. ***The Waste Water Discharge Requirements permit would be required for any surface discharge not regulated by the NPDES, such as dewatering, which may be required during construction.***

*CWA of 1977*

Section 303 of the CWA requires the adoption of water quality standards for all surface water in the U.S. Under Section 303(d), states are required to develop lists of water bodies that do not meet water quality objectives after required levels of treatment by point source dischargers. Total Maximum Daily Loads for all pollutants for which these water bodies are listed must be developed in order to bring them into compliance with water quality objectives (33 U.S.C. 1251 et seq.).

In 1972, provisions of the CWA were amended so that discharge of pollutants to waters of the U.S. from any point source is effectively prohibited, unless the discharge is in compliance with an NPDES permit. The 1987 amendments to the CWA added Section 402(p), which established a framework for regulating municipal, industrial, and construction storm water discharges under the NPDES program.

***For projects with soil disturbances of one acre or more, compliance is required with the NPDES General permit for Storm Water Discharges Associated with Construction Activity, General Permit No. CAS000002. For projects with soil disturbances under one acre, erosion and sedimentation control measures shall comply with SDCWA's General Conditions and Standard Specifications, local jurisdictional agency requirements and applicable requirements in local storm water management programs developed to comply with NPDES permits issued by the RWQCB.***

***The Section 401 Water Quality Certification would be required for the project's ACOE Section 404 discharge permit for discharge into the "waters of the U.S.".*** The Clean Water Act Section 401(a)(1) states that " any applicant for a Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the State in which the discharge originates or would originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over the navigable waters at the point where the discharge originates or would originate, that any such discharge would comply with the applicable provisions of sections 301, 302, 303, 306, and 307 of this title."

*Certification typically takes 3 to 6 months to be completed. The State issues the 401 certification, and the ACOE needs the certification as a pre-condition to issuing a 404 permit.*

**California Coastal Commission (CCC)**
The CCC administers the Federal Coastal Zone Management Act. The most significant provisions of the Coastal Zone Management Act give CCC regulatory control over all Federal activities and federally licensed, permitted, or assisted activities if the activity affects coastal resources. The CCC retains permanent coastal permit jurisdiction over development proposed on tidelands, submerged lands, and public trust lands. They also act on appeals from certain local government coastal permit decisions. The California Coastal Act includes several policies intended to protect water quality; requirements include controlling runoff and waste discharges to protect water quality and preventing substantial interference with surface water flows in order

to sustain the biological productivity of coastal waters, and minimizing the alteration of riparian habitats and streams.

The CCC would provide a discretionary review of detailed development plans for any proposed use, structure, or activity located within the coastal zone (unless specifically exempted) as established by the California Coastal Act. ***The State Coastal Development Permit is required for the California Coastal Act compliance.*** However, with the State Coastal Development Permit, all long-lead discretionary permits must be obtained prior to receiving a Coastal Development Permit from the State. However, the Federal Agency must submit documentation stating how the project complies with CCC regulations. The CCC has the ability to approve or deny a project; however, the CCC does not have the ability to conditionally approve the project. Key issues for California Coastal Act compliance include water quality (discharge), marine resources, growth, energy (GHG), coastal access, coastal views, coastal dune resources, and alternatives. As part of the State Coastal Development Permit, the CCC would engage in federal consultation with EPA (Coastal Zone Management Act conformity), USFWS and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service for ESA and Marine Mammals Act compliance, and the Coast Guard. Because the project is not anticipated to have direct impacts on marine resources within the CCC jurisdictional areas, the scope of Coastal Act compliance would likely be limited to impacts associated with pipelines and pump stations located within the California Coastal Zone.

**California Department of Fish and Game (CDFG)**

*California Endangered Species Act*

The CDFG implements the California Endangered Species Act (CESA). The CESA states that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, would be protected or preserved. CDFG maintains a list of special status species within the state.

CDFG is always a trustee agency and must be notified when CEQA projects involve fish and wildlife of the state, rare and endangered native plants, wildlife areas, and ecological reserves. As the trustee agency for fish and wildlife resources, the Department provides requisite biological expertise to review and comment upon CEQA documents, and makes recommendations regarding those resources held in trust for the people of California (Fish and Game Code Section 1802). ***CESA emphasizes early consultation to avoid potential impacts to rare, endangered, and threatened species and to develop appropriate mitigation planning to offset project caused losses of listed species. Compliance with Sections' 2080 and 2081 Incidental Take Permit and with the Section 1600 Streambed Alteration Agreement would be necessary.***

*Streambed Alteration Agreements are typically issued within 2 months of the CDFG receiving the required information.*

**California Department of Public Health (CDPH)**
*California's Safe Drinking Water Act*

The CDPH is the primary agency for implementation of the requirements of the federal Safe Drinking Water Act in California. California's Safe Drinking Water Act contains the specific compliance requirements for public water agencies. Public agencies must obtain and maintain permits for the production and delivery of potable water in California. These permits contain conditions, monitoring, and reporting requirements. At a minimum, CDPH would require a water system taking delivery of potable water across the border to ensure that all state and federal drinking water regulations are met. Since the Seawater Desalination Facility in Rosarito Beach is outside of CDPH's direct jurisdiction, specific early and detailed discussion with CDPH representatives and, very likely, USEPA (and Mexican authorities) is warranted to define water quality/operational requirements for the plant.

***To comply with the narrow CDPH regulatory requirements, the applicant would apply for a domestic water supply permit as a water supply wholesaler pursuant to the Regulations Relating to Domestic Water Systems.*** A Water Supply Assessment with a detailed analysis of the proposed source water's water quality would need to be prepared. Drinking water produced in Mexico (where CDPH has no jurisdiction) and conveyed across the border into California distribution systems would likely present challenges.

**California State Historic Preservation Office**
*National Historic Preservation Act*

The National Historic Preservation Act (NHPA), as amended, 16 USC. 470, directs federal agencies to integrate historic preservation into all activities which either directly or indirectly involve land use decisions. The NHPA is administered by the National Park Service, the Advisory Council on Historic Preservation, State Historic Preservation Officers, and each federal agency. Implementing regulations include 36 CFR Part 800: Regulations of the Advisory Council on Historic Preservation Governing the NHPA Section 106 Review Process. ***Section 106 of the NHPA requires federal agencies to take into consideration the impact that an action may have on historic properties which are included on, or are eligible for inclusion on, the National Register of Historic Places. The Section 106 review process is usually carried out as part of a formal consultation with the State Historic Preservation Officer, the Advisory Council on Historic Preservation, and other parties, such as Indian tribes, that have knowledge of, or a particular interest in, historic resources in the area of the undertaking.*** *There are no specific time restrictions for the completion of this process. Once the State Historic Preservation Officer receives the appropriate documentation, they have 30 days to review and comment. If the Advisory Council on Historic Preservation is consulted, they have an additional 15 days.*

**California Department of Transportation**

*Hazardous Materials*

The California Department of Transportation (Caltrans) regulates the transportation of hazardous materials throughout the state. Caltrans requires that drivers transporting hazardous wastes obtain a certificate of driver training that shows the driver has met the minimum requirements concerning the transport of hazardous materials, including proper labeling and marking procedures, loading/handling processes, incident reporting and emergency procedures, and appropriate driving and parking rules. The California Highway Patrol also requires shippers and carriers to complete hazardous materials employee training before transporting hazardous materials.

*Rights of Way*

Pipelines aligned with existing roadways would have the potential to encroach on state highways rights-of-way***. Encroachment permits would be necessary for this project.***

**California Air Resources Board**

*California Clean Air Act of 1988*

The CAA delegates the regulation of air pollution control to the states. In California, the task of air quality management and regulation has been legislatively granted to the California Air Resources Board (CARB), with subsidiary responsibilities assigned to air quality management districts and air pollution control districts at the regional and county levels. CARB, which became part of the California Environmental Protection Agency in 1991, is responsible for ensuring implementation of the California Clean Air Act of 1988, responding to the CAA, and regulating emissions from motor vehicles and consumer products.

CARB has established California Ambient Air Quality Standards (CAAQS), consistent with the CAA, which requires state regulations to be at least as restrictive as the federal requirements. The CAAQS describe adverse conditions; that is, pollution levels must be below these standards before a basin can attain the standard. The CAAQS for $O_3$, CO, $SO_2$ (1-hour and 24-hour), $NO_2$, $PM_{10}$, and $PM_{2.5}$ and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded.

**California State Department of Toxic Substances Control**

Existing hazardous materials contamination at some of the Alternative Sites may require permits and/or approvals from the Department of Toxic Substances Control (DTSC), the RWQCB, and/or the Local Enforcement Agency. ***Should contamination be present, the site must be remediated, and to the satisfaction of the DTSC, a Remedial Action Plan would be required and implemented for the proposed project. Should a site require "corrective action" (have contamination, either surface or groundwater, that exceeds a minimum action level), it may take two or more years to go through the DTSC site remediation and site clearance process.*** Should SDCWA proceed in the absence of DTSC clearance, SDCWA may retain liability for eventual site remediation should it be required in the future. An intermediate process is possible, involving informal coordination with DTSC on hazardous materials investigations to determine whether or not the site requires corrective action. SDCWA should explore means of avoiding or limiting liability, such as capping the site to prevent ground disturbance, and avoiding any dewatering or groundwater pumping to affect (and therefore trigger liability) the existing contaminated plumes. If the groundwater were found to be contaminated in proximity of pipeline alignments, effects on subsurface pipelines (feedwater, conveyance, etc.) would have to be investigated.

**California Occupational Safety and Health Administration (Cal/OSHA)**

The California Occupational Safety and Health Administration (Cal/OSHA) is the primary agency responsible for worker safety in the handling and use of chemicals in the work place. Cal/OSHA standards are generally more stringent than federal regulations. The employer is required to monitor worker exposure to listed hazardous substances and notify workers of exposure (8 CCR Sections 337–340). The regulations specify requirements for employee training, availability of safety equipment, accident prevention programs, and hazardous substance exposure warnings.

### 5.5.2.3. California Local Agencies

**San Diego Air Pollution Control District**

A portion of the project site would be located within the San Diego Air Basin (SDAB) and would be subject to the San Diego Air Pollution Control District (SDAPCD) guidelines and regulations. While CARB is responsible for the regulation of mobile emission sources within the state, local air quality management districts and air quality management districts are responsible for enforcing standards and regulating stationary sources. In San Diego County, ozone and particulate matter are the pollutants of main concern, since exceedances of state ambient air quality standards for those pollutants are experienced here in most years. For this reason the SDAB has been designated as a nonattainment area for the state $PM_{10}$, $PM_{2.5}$, and ozone standards. The SDAB is also a federal ozone nonattainment area and a carbon monoxide maintenance area.

**San Diego County Department of Environmental Health**

In the event that grading or construction of proposed facilities would encounter hazardous waste and/or hazardous materials, the applicant shall ensure proper handling of these materials, as well as compliance with all applicable laws and regulations, including the State of California CCR Title 23 Health and Safety Regulations as enforced by the San Diego County Department of Environmental Health, and CCR Title 14 and Title 22. The San Diego County Department of Environmental Health and California RWQCB shall be contacted regarding provisions for possible reuse as backfill of soils impacted by hydrocarbons at applicable locations along the pipeline alignment. If necessary, excavated soils shall be placed on an impermeable liner and covered with an impermeable material to prevent spread of contaminated materials. A health and safety plan shall be prepared to manage and dispose of impacted soil, if encountered during construction.

**Local Jurisdictions**

As a product water conveyance pipeline would be part of the proposed project, it is expected that multiple ***encroachment permits*** would be required for construction. These permits would likely need to be acquired from local agencies such as the City of San Diego (local roadways/infrastructure) and San Diego County (for any regional floodway crossings).

*The timeline associated with obtaining local permits depends on the complexity of the issues involved and usually varies from between 3 to 6 months.*

### 5.5.3. Summary of U.S. Permit Requirements

A summary of the potential permits and approvals described above is included in Table 5-2 below. Once project specifics such as siting and conveyance alignments have been determined, this list would be revised to reflect the actual permit conditions and timeframes that the project would be subject to.

**Table 5-2**
## Anticipated U.S. Permits and Approvals

| Agency/Department | Permit/Approval | Required for |
|---|---|---|
| *U.S. Federal Agencies* | | |
| IBWC - U.S. Section | IBWC Permit | Perform work or place structures on or across rights-of-way of projects under the jurisdiction of the IBWC U.S. Section |
| ACOE | Section 404 Permit | Discharge of dredge/fill into Waters of the U.S., including wetlands |
| | Section 10, Rivers and Harbors Act Permit | Activities affecting navigable waters |
| USFWS | Section 7 Consultation (ESA compliance) | Incidental take of federally-listed species; impacts to habitat |
| U.S. Department of State | Presidential Permit | Construction and maintenance of certain facilities at the border |
| *California State Agencies* | | |
| State Water Resources Control Board, RWQCB | NPDES Permit (CWA Section 402) and General Dewatering Permit | Discharge into waters and wetlands |
| | Section 401 Water Quality Certification | Discharge into waters and wetlands (see ACOE Section 404 permit) |
| | General Construction Activity Storm Water Permit | Storm Water discharges associated with construction activity |
| | Waste Discharge Requirements | Discharge of waste that might affect water quality |
| CCC | Coastal Development Permit | Development within the Coastal Zone |
| CDFG | Section 2080 and 2081- Incidental Take Permit | Activity where a State-listed candidate, threatened, or endangered species under CESA may be present in the Project area. |
| | Section 1600 Streambed Alteration Agreement | Change in natural state of river, stream, lake (includes road or land construction across a natural streambed) |
| CDPH | Domestic Water Supply Permit | The operation of a public water system |
| California State Historic Preservation Office | Section 106 Consultation, NHPA | Consult with appropriate land management agencies, and others regarding activities potentially affecting cultural resources. |
| Caltrans | Encroachment Permit | Encroachments on state highways rights-of-way |
| DTSC | Remedial Action Plan | Required of site is found to be contaminated. |
| *California Local Agencies* | | |
| City of San Diego | Encroachment Permit | Development within the City's Rights-of-Ways |
| County of San Diego | Encroachment Permit | Development within the County's Rights-of-Way or floodway crossings. |
| SDAPCD | Permit to Operate (Local district Rule) | Operating equipment that might emit pollutants from a stationary source; import/export of materials and equipment for heavy trucks |

## 5.6 Other Potential Considerations

The development of large-scale, regional seawater desalination is an emerging phenomenon in the context of the existing regulatory structure on both sides of the border. There is limited policy guidance or legal precedent for reviewing and permitting regional desalination plants in either the U.S. or Mexico and depending on the institutional arrangement that is ultimately decided upon, additional environmental regulations may apply.

The Los Cabos Desalination Plant serves as the best example of a desalination plant that was permitted in Mexico. The plant, which became operational in 2007, was the first municipal desalination plant built in Mexico and operates at a capacity of approximately 4.6 mgd. At a minimum, the proposed Rosarito Beach Binational Desalination Plant can be expected to be placed under similar environmental and permitting requirements as those imposed on the Los Cabos Desalination Plant. It is, however, important to note that the Los Cabos plant is significantly smaller than the proposed project, and environmental requirements have changed in Mexico since the construction of that plant.

It is important to note that it is possible for a bi-national project, under certain circumstances, to be subject to the National Environmental Policy Act (NEPA) and associated requirements. This could occur if the project were to obtain federal funding, or if it were deemed that the project to be a major federal action. NEPA Title I, Section 102 requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. Federal agencies prepare a detailed environmental report which takes the form of either an Environmental Assessment (EA) or, in cases where the environmental impacts are potentially significant, an Environmental Impact Statement (EIS). The purpose of the EA or EIS is to assess the significance of the potential environmental effects of the proposed action as well as reasonable alternatives. The lead federal agency, in cooperation with other involved agencies, makes the determination regarding the need for an EA or EIS.

Importantly, Executive Order 12114 provides guidance on the applicability of NEPA outside of the United States, and requires federal agencies to adopt procedures for implementation of the Order that include evaluation of environmental effects outside of U.S. territory for major federal actions. As a result, it is possible that federal involvement could result in the application of various California/U.S. policies and regulations to portions of the project located in Mexico.

Regional desalination plants that have been approved in California have been subject to permitting and mitigation requirements unique to those facilities, and based on case-by-case analyses. Additionally, the analytical methodologies, and mitigation requirements that have been applied to those facilities are based on surrogate procedures and standards designed for other types of facilities, such as power plants and other coastal-dependent industrial uses. For example, the federal Clean Water Act includes specific requirements for cooling water intake structures in analyzing and permitting impingement and entrainment impacts on marine organisms. Because seawater desalination plants can have similar types of impacts, the Clean Water Act analysis methodologies and mitigation schemes have been applied in permitting of desalination plants, even though the specific Clean Water Act provisions are not applicable to such facilities.

The NEPA Lead Agency would have discretion of analysis methodologies and in determining the level of significance of impacts or effects.

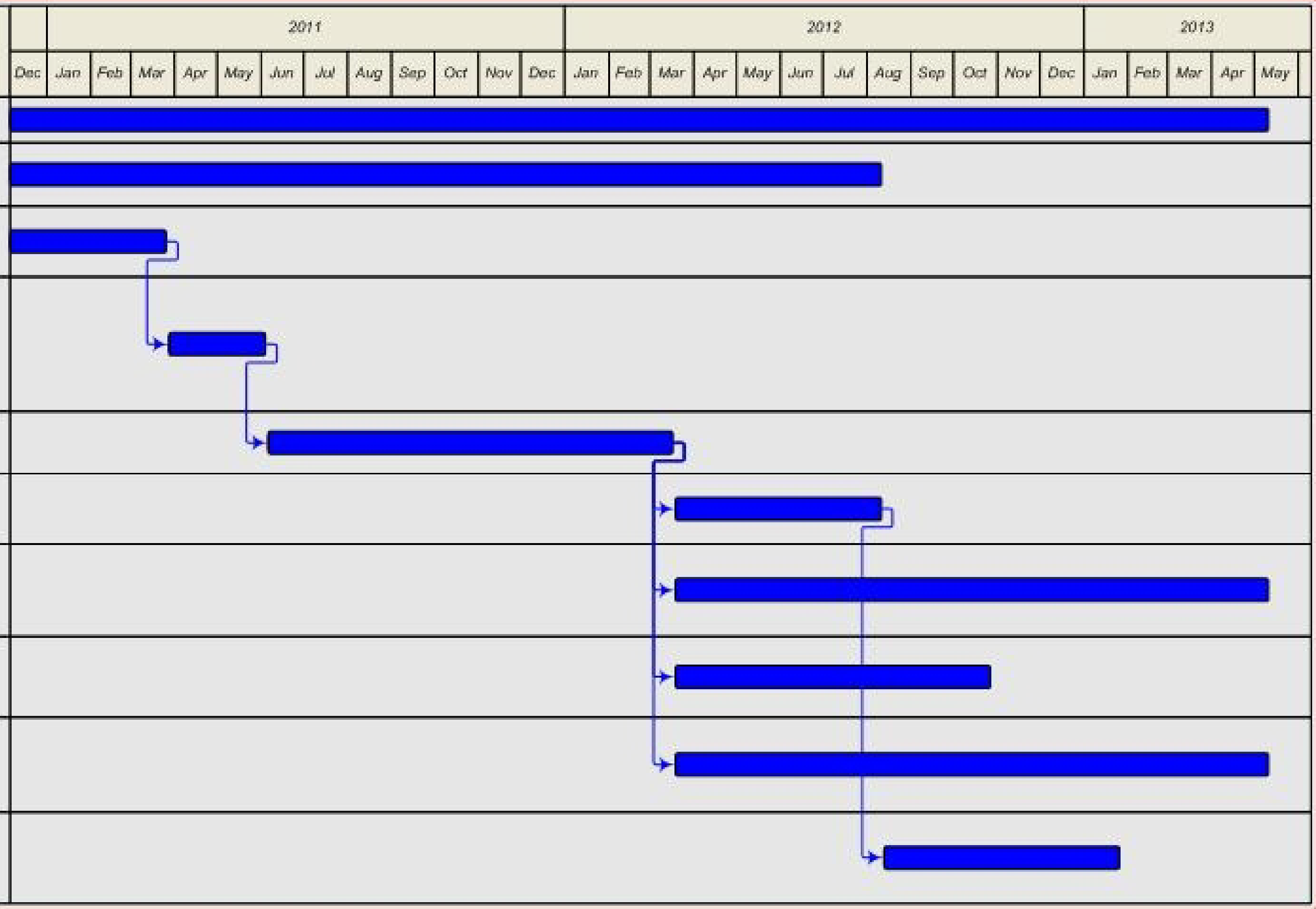
It should also be noted that, while the discussion of environmental and permitting issues presented in this section addresses CEQA in the context of its applicability within the jurisdiction of the state of California, the Lead Agency under CEQA may consider effects that occur beyond the borders of the state. Under CEQA, a Lead Agency is required to analyze the effects of its actions, and is further obligated to consider the "whole of the action". Depending on the institutional arrangements discussed above, and other considerations specific to project design and proposed operation, the project evaluated by the Lead Agency may not be confined to the borders of the State, and the Lead Agency may elect to address the effects of components of the project beyond the jurisdiction of the State.

## 5.7 Project Schedule

A tentative project schedule delineating the environmental analysis and permitting time requirements associated with the proposed project is shown in Figure 5-1 on the following page. The complete process could require over two years. The project schedule assumes that preliminary design and project description details have been finalized, and conservatively assumes an environmental "kick-off" date of December 2010. Possibilities of expediting the process have not investigated but may be possible. Variations from this assumed "kick-off" date would not result in changes to the anticipated durations for the identified environmental tasks. Once project specifics have been determined, this list and durations may be revised to reflect more accurate time requirements based on the extent of work required to complete each task. While it appears Mexican permitting may take longer to obtain than those in the U.S. any unforeseen circumstances on either side of the border could extend the overall time period.

# Figure 5-1 Rosarito Beach Binational Desalination Plant Permitting Schedule

| ID | Task Name | Start | Finish | Duration |
|---|---|---|---|---|
| 1 | Permit Plan | 12/6/2010 | 5/10/2013 | 635d |
| 2 | Environmental Analysis | 12/6/2010 | 8/10/2012 | 440d |
| 3 | Technical Studies | 12/6/2010 | 3/25/2011 | 80d |
| 4 | Initial Study/ Notice of Preparation/ Intent | 3/28/2011 | 6/3/2011 | 50d |
| 5 | Draft EIR/EIS/ MIA | 6/6/2011 | 3/16/2012 | 205d |
| 6 | Final EIR/ EIS/ MIA | 3/19/2012 | 8/10/2012 | 105d |
| 7 | Regulatory Compliance and Permitting | 3/19/2012 | 5/10/2013 | 300d |
| 8 | US Discretionary Permits | 3/19/2012 | 10/26/2012 | 160d |
| 9 | Mexican Discretionary Permits | 3/19/2012 | 5/10/2013 | 300d |
| 10 | Construction Permits | 8/13/2012 | 1/25/2013 | 120d |



# Chapter 6 Conclusions and Recommendations

In 2005, the San Diego County Water Authority evaluated the feasibility of a binational seawater desalination facility that would be located in Mexico, *Feasibility Study of Seawater Desalination Development Opportunities*. The 2005 Report considered several possible locations for the desalination plant, one of which was in Rosarito Beach in Mexico. The Report was based upon several assumptions including the water demand, significant cost elements, and availability of sufficient land for the desalination facility. The plant was expected to use seawater reverse osmosis (SWRO) to produce up to 50 mgd of desalinated water with 28.33 mgd (1,241 l/s) delivered to Mexico and 21.67 mgd (949 l/s) to the United States.

This report is to verify some of the key assumptions used in the 2005 Report. These assumptions include:

1. What size plant will water demand projections support?
2. Is there a site that will accommodate facilities to meet those demands?
3. How might water be distributed in Mexico and US and what pipelines/corridors would make sense?
4. How might a desalination plant at the Rosarito Beach site be powered?
5. What environmental permitting issues are envisioned and how might those be systematically addressed?

The report covers Phase 1 of a 4 phase project. Phase 1 is a feasibility study of the project site and associated facilities. The future phases, as currently planned, are: Phase 2-product water conveyance evaluation; Phase 3-pilot plant development and testing, and Phase 4-preliminary design.

## 6.1. Conclusions

### 6.1.1. Overall

- There are no fatal flaw issues at this time
- Mexico/U.S. water demand is greater than 50 mgd
- Two CESPT-owned sites are viable for a 25 or 50 mgd plant
- The two pipeline alignments conceptually indentified in the 2005 study have significant limitations and cost implications?
- An alternative pipeline alignment (Corridor 2000) is a promising alternative
- Sufficient electrical power is available from CFE for a 50 MGD plant
- A seawater pilot plant with operating data is available

- There are complex Mexico, US, and cross-border environmental permitting issues

### 6.1.2. Water Demand

Water demand information was compiled from a combination of existing documents and interviews with key staff at participating U.S. and Mexican water agencies. The Mexican demand is for areas west of Tijuana and north of Rosarito Beach. Desalination will supplement current water sources. The agencies contacted include:

**United States**

- San Diego County Water Authority
- Central Arizona Water Conservation District
- Metropolitan Water District of Southern California
- Southern Nevada Water Authority

**Mexico**

- Comisión Nacional del Agua (CONAGUA)
- Comisión Estatal de Servicios Públicos de Tijuana (CESPT)
- Comisión Estatal del Agua (CEA)
- Comisión Internacional de Limites y Aguas Sección Mexicana (CILA)

Seawater desalination was not identified by the SDCWA member agencies in its 2005 Urban Water Master Plan (UWMP), but other alternative supplies were identified (reclamation, brackish groundwater,, etc) which were assumed for this study could be met by SWRO. Currently the SDCWA is in the process of updating its UWMP which is due in 2011. The results of this update may specifically identify the potential demand for desalinated seawater.

For the purposes of this study, a summary of the total potential demand for water from a Rosarito Beach SWRO plant is provided in Table 6-1, which combines the U.S. and Mexican totals.

**Table 6-1**
**Total Rosarito Beach SWRO Demand**

| Country | | Demand (mgd) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
| United States | SDCWA | 34 | 46.1 | 66.2 | 94 | 94 | 94 |
| | EXCHANGE** | 89 | 112 | 134 | 156 | 179 | 223 |
| | TOTAL US | 123 | 158.1 | 200.2 | 250 | 273 | 317 |
| Mexico | | 11 | 14.4 | 17.4 | 20 | 23 | 26.7 |
| Total* | mgd | 134 | 173 | 218 | 270 | 296 | 344 |
| | AFY | 150,100 | 193,200 | 243,700 | 302,400 | 331,500 | 384,900 |
| | l/s | 5,870 | 7,550 | 9,530 | 11,800 | 13,000 | 15,000 |

*All totals rounded to 3 significant figures
** SNWA, CAWCD, and MWD could benefit by a potential exchange agreement for Colorado River supply.

As shown in Table 6-1, there is potential combined demand for desalinated seawater from the U.S. and Mexico of 123 mgd (5,869 l/s) by 2015, the earliest year evaluated in this analysis. At that time, the potential U.S. demand for desalinated seawater will have already exceeded the 21.67 mgd (949 l/s) allocation assumed in the 2005 Report. Mexico's demand in 2015 will be 11 mgd (482 l/s) and will increase to 26.7 mgd (1,170 l/s) in 2040, nearly the value of 28.33 mgd (1,241 l/s), used in the 2005 Report.

### 6.1.3. Site Evaluation

The 2005 Report identified several potential land parcels as sites for location of the desalination plant. These are shown in Figure 6-1.

**Figure 6-1: Rosarito Beach Site Aerial View**


The study team held meetings with both the Mexican water agencies and CFE to determine information on the sites and their supporting facilities. Bases upon these meetings:

- Site S1 offers the advantages of closeness to the outfall facilities (approximately 1,300 ft) (400 m) and largest available area. However, it is privately owned and not readily available.
- Only sites S5 and S6 are readily available. S5 is owned while S6 is being re-titled by CESPT. S6 would be preferred as it is larger and closer to the CFE supporting facilities. Two pipelines of approximately 6,000 ft (1,800 m) length would be required to transmit feedwater and return brine from the plant to the outfall.
- Other sites might be available but would require changes in ownership. Eminent domain or its equivalent might be required to acquire an alternative site.

- The area between S5 and S6 currently houses a building and has facilities for future buildings. This area might also require acquisition.
- The CFE power plant contains sites S2 and S3 and is unavailable for the desalination plant.
- Access to the CFE outfall facilities for feedwater purposes can be obtained with recognition of the need for security and development of an acceptable access plan with CFE.
- Future plans for the power plant need to be considered in conjunction with the desalination plant design as the power plant's outfall will be utilized by the desalination plant. The first intake was constructed in 1963 and a second separate intake was installed in 2004. Additional power plant intake maintenance procedures in the future may be required to assure an adequate life so that feedwater is always available for the desalination plant.
- A seawater RO pilot plant was operated in 2003 and is currently located near the CESPT offices. Information from the previous testing was obtained and can assist in development of a pilot plant test program.

### 6.1.4. Desalination Plant Layout

A preliminary layout for the required desalination facilities was developed. Based on the site evaluation, site S6 was recommended as the primary site for treatment facilities with site S5 for product water storage. Figure 3-5 in Chapter 3 presents a layout at this site in the 25 and 50 mgd (1,095 and 2,190 l/s) phased development. Conservative assumptions were used to identify pretreatment equipment for the SWRO units.

In addition to these facilities, off-site facilities include the feedwater intake, pumping, screening (drum screens) facilities, and pipelines to deliver water to Site S6 and return brine from the plant to the outfall downstream of the intake. These facilities should be located in the vicinity of the CFE cooling water outfall. As such, site S3 was selected for the location of these facilities. Also off-site is the brine outfall alignment and ocean diffuser location.

### 6.1.5. Water Distribution

Two pipeline alignments were identified in the 2005 Report for delivery of the U.S. portion of the desalinated product water to the United States. However, a third alignment, identified as Corridor 2000, was identified by CESPT during the site reconnaissance. This alignment offers significant advantages over the previously identified alignments. Potentially other alignments may offer other advantages as well.

### 6.1.6. Power

Several power alternatives were considered for permanent power and backup power to the desalination facility, to confirm the cost of electric power used in the 2005 Report, and to consider other power supply alternatives.

- The 2010 electric power cost for the desalination process is higher than that given in the 2005 Report. The effect of this higher power cost would increase the desalination water cost by about 15%. However, use of currently available high efficiency energy recovery devices would decrease the total SWRO power requirements by over 20% of the amount estimated in the 2005 report. The net effect is an overall decrease in the product water cost.
- CFE has sufficient electrical capacity to supply the power for a 50 mgd (2,190 l/s) desalination facility and the pumping requirements.
- Direct drive of the high pressure pumps would likely not be beneficial as the high maintenance and other disadvantages far outweigh the advantages.
- As the CFE power plant has sufficient power capacity for the desalination plant, an alternative supply only need be considered if it can show major benefits.
- Reciprocating engines could be used for onsite power generation. However, they have the same disadvantage as direct drive pumps, e.g. high maintenance.
- Combined cycle power generation is generally a more efficient process than reciprocating engines for electric power generation. However, for the demands of this size of plant, the reciprocating engine should only be considered if onsite power generation is required.
- Alternative electrical sources could also be considered. Of those sources, wind would likely be the most cost effective. There are some very large alternative energy projects being built in Mexico. These projects should be considered as a partial alternative power source.
- All the power generation processes would not necessarily have to be located on the desalination plant site. Both wind and solar have large and site specific requirements which would necessitate locations other than the desalination plant site.
- Waste heat (heated seawater) is beneficial to the SWRO process as it decreases either the number of membranes required or the electrical energy requirements. Thus the once-through power plant discharge should be used for the process feedwater and the waste heat from on-site generation, if used.

### 6.1.7. Environmental and Permitting Issues

Both Mexico and the U.S. have regulations to protect the environment and improve environmental quality. Refer to Chapter 5 for a detailed discussion of the various regulatory agencies and associated permits/approvals that would need to be considered as part of implementation of the project in both Mexico and the U.S.

- The project has unique characteristics because it includes components on both sides of the U.S./Mexico international border.
- Project funding, delivery options, and jurisdiction will affect final regulatory requirements.

- All applicable California and U.S. laws would apply to project components within California.
- All applicable Mexican law would apply to project components within Mexico.
- Sovereign nation issues and public opinion may affect requirements.
- There is limited policy guidance or legal precedent for permitting the plant and facilities.

## 6.2. Recommendations and Next Steps

### 6.2.1. Water Demand

The desalinated water demands were developed assuming that the cost of desalinated seawater will be comparable to that of the supplies that it would replace. Therefore, the updated conceptual cost estimate can be used to verify the desalinated water demand.

### 6.2.2. Desalination Plant Layout

The site layout was based upon a conservative pretreatment design which requires a substantial portion of the site area requirement.

- Pilot testing needs to be performed to identify the most appropriate pretreatment equipments. This testing will provide a better estimate of the area requirement.
- The availability of other property (including site S1) should be confirmed.
- Further consultation with the Rosarito CFE power plant for feedwater supply and brine discharge access is required.

### 6.2.3. Water Distribution

The water distribution system affects primarily the U.S. portion of the water cost. An alignment selection should consider:

- Establishment of an alignment evaluation process and gaining acceptance of stakeholders
- Identifying alternative alignments besides those already identified.
- Conducting preliminary data collection on such subjects as underground utilities, traffic, and connection points for all customers and border crossing.
- Coordinating the alignment evaluation process and selection with environmental requirements.
- The electrical power usage for pumping in the alignment evaluation process and selection.

### 6.2.4. Power

- Develop conceptual details of the feedwater intake facilities using the existing CFE outfall.

- Obtain the required permission for installation and future maintenance of the feedwater intake facilities on the CFE site.
- Determine the future plans for the power plant to address continued availability of power for the desalination facility.
- Evaluate plant feedwater intake condition and maintenance procedures to assure an adequate life so that feedwater is always available for the desalination plant.

### 6.2.5. Environmental and Permitting Issues

- Begin the process of identifying the most important issues for preparing the permit details.
- Address the CDHS issues of "importation" desalinated drinking water from a desalination plant in Mexico.
- Prepare the permit details following the steps outlined in the environmental Work Plan..
- Prepare an ocean outfall brine discharge assessment to identify brine discharge issues associated with the current outfall.

### 6.2.6. Next Steps

Based upon the Phase 1 results, the originally envisioned Phase 2 detailed study of the product water conveyance routes should be modified and the design delayed. Instead, the following further efforts are recommended for Phase 2:

- Analyze pilot plant data
- Reevaluate the desalination plant conceptual design/Evaluate new sites/update treatment process criteria
- Consider water delivery and exchange scenarios
- Evaluate new conveying alignments
- Develop a desalination plant conceptual cost
- Confirm water demands based on updated unit water costs
- Conduct preliminary discussions with permitting agencies
- Provide a stakeholder outreach support
- Provide project management and translation services

# Appendix A – Data Disk Index

S1/2005 Feasibilitystudy_desalSDTJ.pdf
S1/prefeasibilityreport_baja.pdf
S2/Calcualations
S2/Calcualations\Electric Effect on water.xls
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S16/Otay Master Plan.pdf
S16/prefeasibilityreport_baja.pdf
S18/See Appendix A of the 2005 Report.doc
S21/CFE Request.PDF
S21/EPAandCDPH-11-28-2008.pdf
S21/Mexico Water Stardards-NOM-127-SSA1-1994.eml
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S21/San Diego City.pdf

# San Diego County Water Authority

## Participants

### United States

San Diego County Water Authority

Central Arizona Water  Conservation Project

Metropolitan Water District of Southern California

Southern Nevada Water Authority

### Mexico

Comisión Nacional del Agua

Comisión Estatal de Servicios Públicos de Tijuana

Comisión Estatal del Agua

Comisión Internacional de Limites y Aquas Sección Mexicana

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