# SECTION 4 PROJECT DESCRIPTION

This section provides a detailed description of the proposed project and includes information about project objectives, project location, technical characteristics, construction details, operational and maintenance details, potential future project expansion, and required permits and approvals. Please see **Section 3, Project Background**, for detailed information about the purpose and need for the proposed project.

## 4.1 Project Objectives

The objectives of the proposed desalination project presented below address the need for a supplemental water supply, as identified by both the City of Santa Cruz (City) Integrated Water Plan (IWP) and the Soquel Creek Water District (District) Integrated Resources Plan (IRP). These project objectives were developed primarily to achieve the broad policy and planning objectives of the IWP and IRP, as described in detail in **Section 3**. However, other current water planning objectives are also considered, such as those associated with the City's habitat conservation planning process. The objectives apply to both agencies, unless otherwise stated.

1. Provide for a supplemental water supply in a timely manner that meets the IWP and IRP program objectives and provides for the amount of supplemental water supply identified as necessary in the City and District 2010 UWMPs and/or in other available City and District reports (see **Section 3**) that complements on-going and future water conservation and drought curtailment efforts. The City and District need the supplemental water supply for the following reasons:

    - City - During the dry season of dry and critically dry years, a supplemental supply is needed to limit peak season shortages to 15 percent of normal water needs currently projected through 2030[1], which is the reliability objective set by the City in the long term. The supplemental supply needs to support potable uses given that irrigation and other outdoor uses will already be restricted during these periods.
    - District - A supplemental supply is needed in the near-term to meet the District's target groundwater yield during the time period in which the basin recovers from overdraft and in the long-term to provide for currently projected water demand through 2030[1].

[1] Use of the desalination plant is anticipated beyond 2030, but it is sized to meet existing and projected demand through 2030 from growth anticipated in existing adopted general plans of the City, County, and Capitola and in the current urban water management plans for the City and District.

2. Allow the City to reduce its ongoing effects on listed species in the coastal streams and rivers from which the City currently diverts water by developing a supplemental water supply sufficient to permit the City to reduce the extent of its existing reliance on those coastal streams and rivers, as part of the City's pending habitat conservation planning process.

3. Provide the District with a supplemental water supply that will offset groundwater pumping, and thereby assist the District in operating its wells in a manner that reduces overdraft, allows for aquifer recovery to protective target groundwater levels, and thus reduces the potential for seawater intrusion.

4. Protect the local economy and community from the effects of an uncertain water supply due to high levels of curtailments needed to address drought and/or groundwater quality and quantity issues associated with seawater intrusion in the City and District service areas.

5. Develop a supplemental water supply project that promotes efficient use of resources and infrastructure, avoids duplicative infrastructure and effort, and has regional benefits by serving multiple agencies and water users.

6. Provide a supplemental water supply that serves to diversify the water supplies available to the City and District, is readily available, reliable, drought-proof, and avoids uncertainty and/or risks during project operations and/or maintenance. Reliability and diversification will allow for operational flexibility for the City with the use of Loch Lomond Reservoir and other surface water resources and for the District to significantly reduce pumping at differing wells.

7. Provide flexibility to efficiently and cost effectively meet future changed conditions, including changes in demand, changes in regulatory requirements, or changes in source water quality. This flexibility will help to ensure that a supplemental water supply will accommodate planned growth, and will not otherwise support growth above and beyond that allowed in relevant agency planning documents. This flexibility will also allow for adjustments to be made in treatment and/or technologies in response to changing regulatory requirements.

8. Plan for climate change, as summarized below:

    - City - Consistent with the City's Climate Adaptation Plan, diversify and supplement the City's water supply portfolio in anticipation of possible changes in precipitation patterns, greater variability (reduced reliability) in water supply, increased water demand, water quality degradation and reduced quantity and modified seasonal patterns of groundwater recharge resulting from climate change.

- District - Provide the District with a supplemental water supply in anticipation of reduced quantity and modified seasonal patterns of groundwater recharge, increased water demand, and water quality degradation resulting from climate change.

9. Provide a supplemental water supply that avoids or minimizes significant environmental impacts, including—but not limited to—adverse impacts to marine and coastal resources.

10. Provide a supplemental water supply that does not increase greenhouse gas emissions over those generated by the existing water supply systems of the City and District.

11. Provide a supplemental water supply that helps the City to respond to the significantly reduced groundwater yield from the existing over drafted Live Oak well field.

12. Provide a supplemental water supply that is relatively cost-effective in terms of both capital and operation/maintenance costs.

## 4.2 Project Overview

The City and District have partnered to implement the **scwd**[2] Desalination Program. This program proposes to construct and operate a seawater reverse osmosis (SWRO) desalination plant and related facilities to provide up to 2.5 million gallons per day (mgd) of potable water. The water supply from the proposed project would allow the District to reduce pumping in the Soquel-Aptos area, to allow coastal groundwater levels to recover. It would also help the City meet its water needs during periods of water supply shortages as a result of drought and reduced surface water diversions needed to provide improved river and stream flows for fish, and to plan for climate change by diversifying its water portfolio. The City and District propose to cooperatively operate the desalination plant to provide water to each agency concurrently or during different times to meet the specific objectives and needs of the two agencies. See **Section 4.6, Operation and Maintenance,** for additional information about how the two agencies would operate the plant.

There are four basic functional components of the proposed seawater desalination project: (1) seawater intake; (2) pretreatment and salt removal through reverse osmosis filtration; (3) disposal of by-products including brine and solids that are removed in the pretreatment process; and (4) conveyance and delivery of the product water to existing City and District water distribution system. Given these functional components, the proposed desalination project[2] would consist of:

1. A seawater intake and conveyance system consisting of an intake structure, intake piping, pump station, and transfer piping;

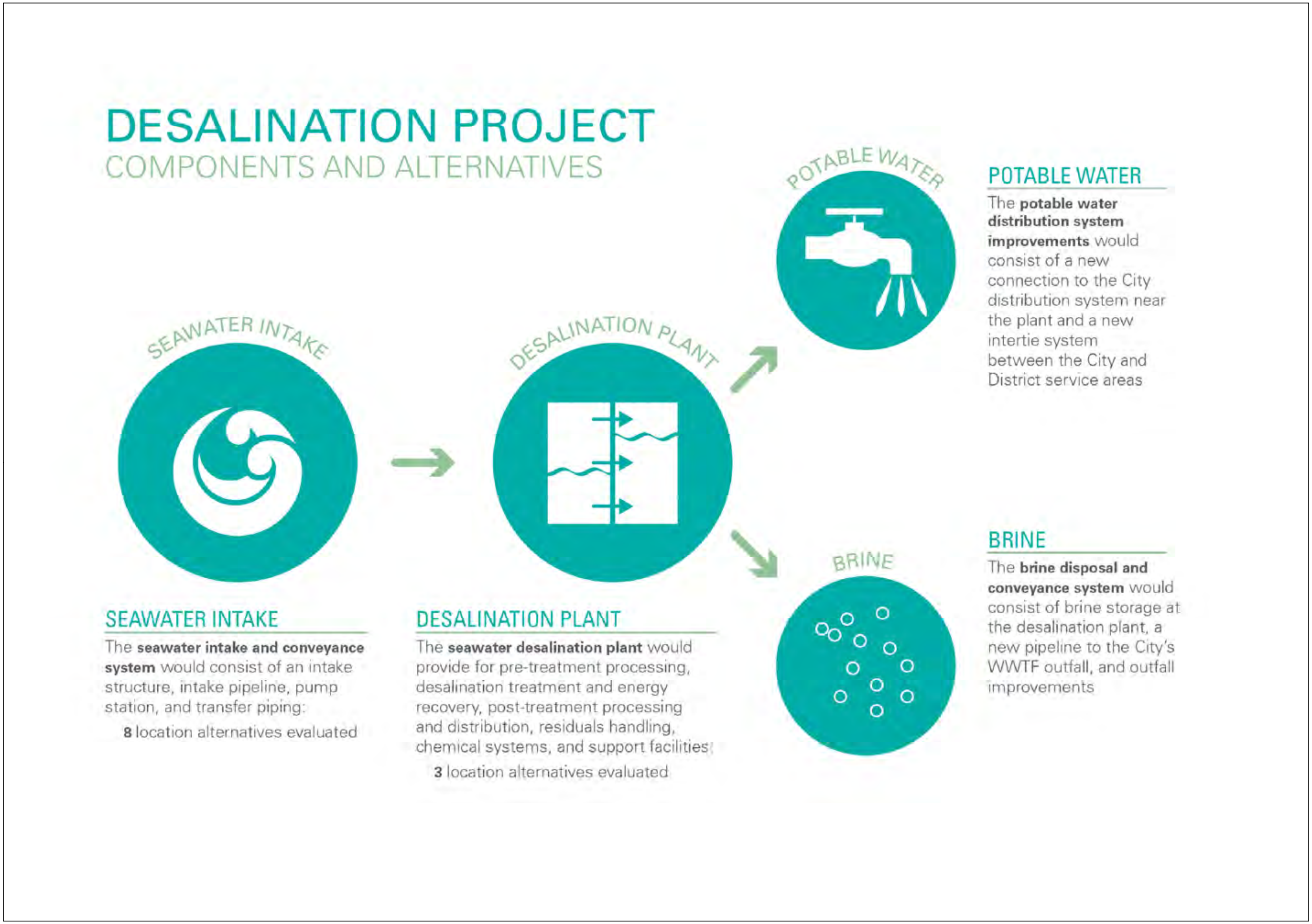
[2] The term “proposed desalination project" or "proposed project" is used throughout this document to refer to all components of the project, including the desalination plant and the other related components, as described above.

2. A seawater desalination plant[3] that would provide for pre-treatment processing, desalination treatment and energy recovery, post-treatment processing and distribution, brine storage, residuals handling and disposal, chemical systems, and their associated support facilities;
3. A brine storage, disposal, and conveyance system consisting of brine storage at the desalination plant, a new pipeline to the City's Wastewater Treatment Facility (WWTF) outfall, and outfall improvements;
4. Potable water distribution system improvements, consisting of a new connection to the City distribution system and a new intertie system between the City and District service areas, including new pipelines and pump station improvements; and,
5. Environmental design, construction, and operational features, consisting of various features of the components of the project and the project overall that would be implemented to avoid, reduce, or minimize potential environmental effects that might occur in the absence of such elements.

The following sections describe the various project components and component alternatives that are evaluated in this EIR (see **Figure 4-1, Desalination Project Components and Alternatives**). Alternative sites for the seawater intake system and the desalination plant have been included and are evaluated in this EIR. To the extent that potentially feasible component alternatives are identified, the intent of the EIR is to evaluate each at a sufficient level of detail such that any combination of components could be identified and considered by the City and District for approval. Only one seawater intake site and one plant site would be selected. **Section 8.1.2, Desalination Component Alternatives Considered in Detail,** provides a comparison of these alternatives, based on the outcome of the environmental analysis contained within this EIR, and other relevant information.

As indicated in **Section 3**, the City's IWP indicated that the City's water supply should be diversified through the construction of a 2.5-mgd seawater desalination plant and related facilities with the ability to expand the plant up to 4.5 mgd to meet future needs through 2030. Given this objective, most below-ground and offshore components of the proposed 2.5-mgd desalination project are designed with the capacity to produce up to 4.5 mgd of product water. Likewise, in some cases building square footage would also ultimately allow for equipment to support capacity increases up to 4.5 mgd. These features would allow the City to expand the plant in the future, if needed, in an economically efficient manner. This approach is based on prudent planning practices for public agencies. See **Section 4.8** for additional information about the possibility that the plant would need to be expanded in the future, and about the additional construction of facilities and installation of equipment that would be required.

[3] The term "desalination plant" is used throughout this document to refer only to the desalination plant and related on-site improvements to be located on the Westside of the City of Santa Cruz.




City of Santa Cruz and Soquel Creek Water District
**scwd²** Regional Seawater Desalination Project

**Figure 4-1**
Desalination Project Components and Alternatives

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# 4.3 Project Location

The proposed desalination project and its various components would be located within the City of Santa Cruz (City), unincorporated Santa Cruz County (County), City of Capitola (Capitola), and offshore in the Monterey Bay (see **Figure 4-2, Regional and Project Vicinity Map**). The locations of the various project components are further described below.

## 4.3.1 Seawater Intake and Conveyance System Location

The seawater intake and conveyance system, consisting of an intake structure, intake pipeline, pump station, and transfer piping, would be located between an offshore location in the Monterey Bay and a desalination plant site. A number of alternative locations for the seawater intake and conveyance system are being considered on or near the Municipal Wharf, along West Cliff Drive, and on sites that are on or near the alternative desalination plant sites (see **Figure 4-3, Desalination System Area**). Only one of these location alternatives would be implemented.

## 4.3.2 Desalination Plant Location

The IWP Program EIR considered three potential areas for a desalination plant site, all of which were located on the Westside of the City within the City's service area (see **Figure 4-4, Desalination Plant Site Alternatives**) (IWP Program EIR, Chapter 4). The three areas, identified as Area A (Industrial Park Area), Area B (Shaffer Road/Antonelli Pond Area), and Area C (Terrace Point/Marine Science Campus Area) were selected based on: (1) proximity to possible intake locations and brine disposal facilities at the City's WWTF, distribution system infrastructure, and power supply; (2) adequate space requirements; and (3) consistency with surrounding land uses.

Since the certification of the IWP Program EIR in 2005, the potential sites for the desalination plant have been further narrowed. The Shaffer Road/Antonelli Pond Area (Area B) was eliminated from further consideration, as it is unlikely that enough land area would be available for the plant site when taking into consideration environmental constraints and regulatory requirements. The Terrace Point/Marine Science Campus Area (Area C) was eliminated from further consideration, as the University of California, Santa Cruz Marine Science Campus Coastal Long Range Development Plan does not contemplate a desalination plant on that site. See **Appendix K, Site Selection for Seawater Desalination Treatment Plant,** and **Section 8** for additional information about these and other eliminated sites.

The Industrial Park Area (Area A) continues to be considered, and three alternative plant site locations within this area (A-1, A-2, and A-3) are evaluated in this EIR. The approximately 4- to 8-acre sites are located on mostly undeveloped private land on infill parcels. These sites are generally bounded by the Santa Cruz Branch Rail Line tracks on the north, Natural Bridges Drive on the west, Delaware Avenue on the south, and the realigned Arroyo Seco stream on the east, as shown in **Figure 4-4**. Only one of these location alternatives would be implemented.

### 4.3.3 Brine Storage, Disposal, and Conveyance System Location

Brine storage would be provided on the desalination plant site. The pipeline to convey the brine from the desalination plant to the City's WWTF outfall pipeline would be located primarily in the City's rights-of-way. Improvements to the WWTF outfall pipeline would occur within onshore and offshore segments of this pipeline, which traverses from the WWTF on Bay Street southwest to the Junction Structure located at Mitchell's Cove Beach and then extends approximately 2 miles offshore (see **Figure 4-3**).

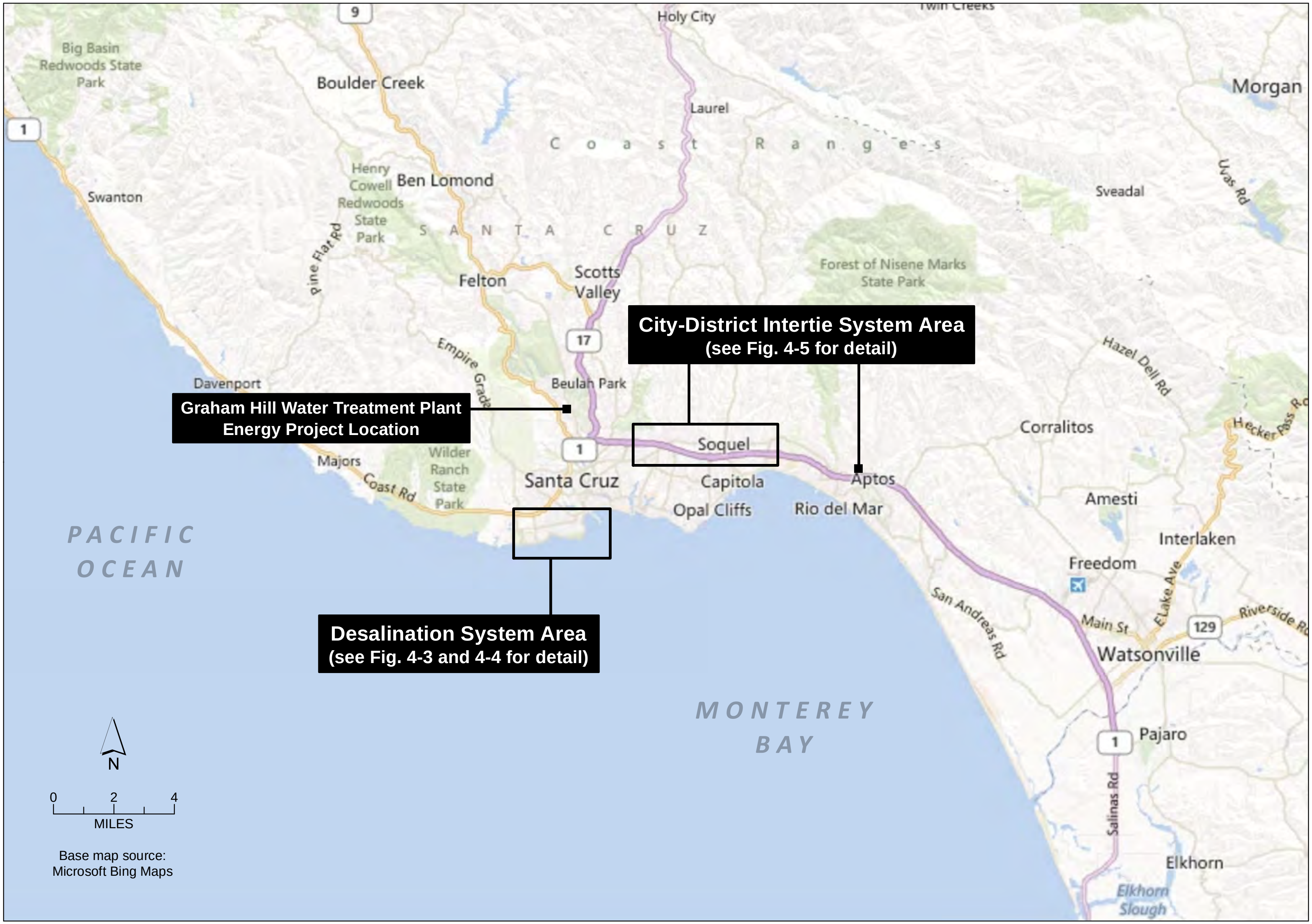
### 4.3.4 Potable Water Distribution System Location

The pipeline to convey the product water from the plant to the City's existing potable water distribution system would run from the alternative desalination plant locations in Area A to the existing adjacent potable water distribution pipe located within Delaware Avenue directly south of Area A, or in Natural Bridges Drive directly west of Area A.

The new intertie system between the City and District service areas, consisting of new and replacement pipelines and pump station improvements would run from Morrissey Boulevard in the City, to the DeLaveaga water storage tanks, then through portions of the County along Soquel Drive to Park Avenue, and into Capitola, South of Highway 1. The pump station improvements would be located at the existing Morrissey pump station, the planned and approved McGregor pump station and Aptos pump station. **Figure 4-5, City-District Intertie System Area**, illustrates these locations.

### 4.3.5 Environmental Features - Potential Energy Project Locations

The environmental design, construction, and operational features of the proposed project include the implementation of potential energy minimizing and GHG reduction measures and projects. These projects would be located at the proposed desalination plant site (installation of photovoltaic panels) and the Graham Hill Water Treatment Plant (installation of micro-hydro turbines) (see **Figure 4-2**).




URS City of Santa Cruz and Soquel Creek Water District
**scwd²** Regional Seawater Desalination Project

**Figure 4-2**
Regional and Project Vicinity Map

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Existing Waste Water Treatment Facility (WWTF) Effluent Outfall Pipeline; new valves to be installed on diffuser ports

Brine Discharge Alternatives; includes brine discharge pipeline and brine discharge/WWTF outfall point of connection

Raw Water Transfer Pipeline Alternatives

Seawater Intake (SI) Alternatives; includes pump station (PS), intake pipeline, and intake structure

**Desalination Plant Site Alternatives**

- A-1
- A-2
- A-3

N

0 1,000 2,000
FEET

Base map source:
Microsoft Bing Maps

URS City of Santa Cruz and Soquel Creek Water District
**scwd**[2] Regional Seawater Desalination Project

**Figure 4-3**
Desalination System Area

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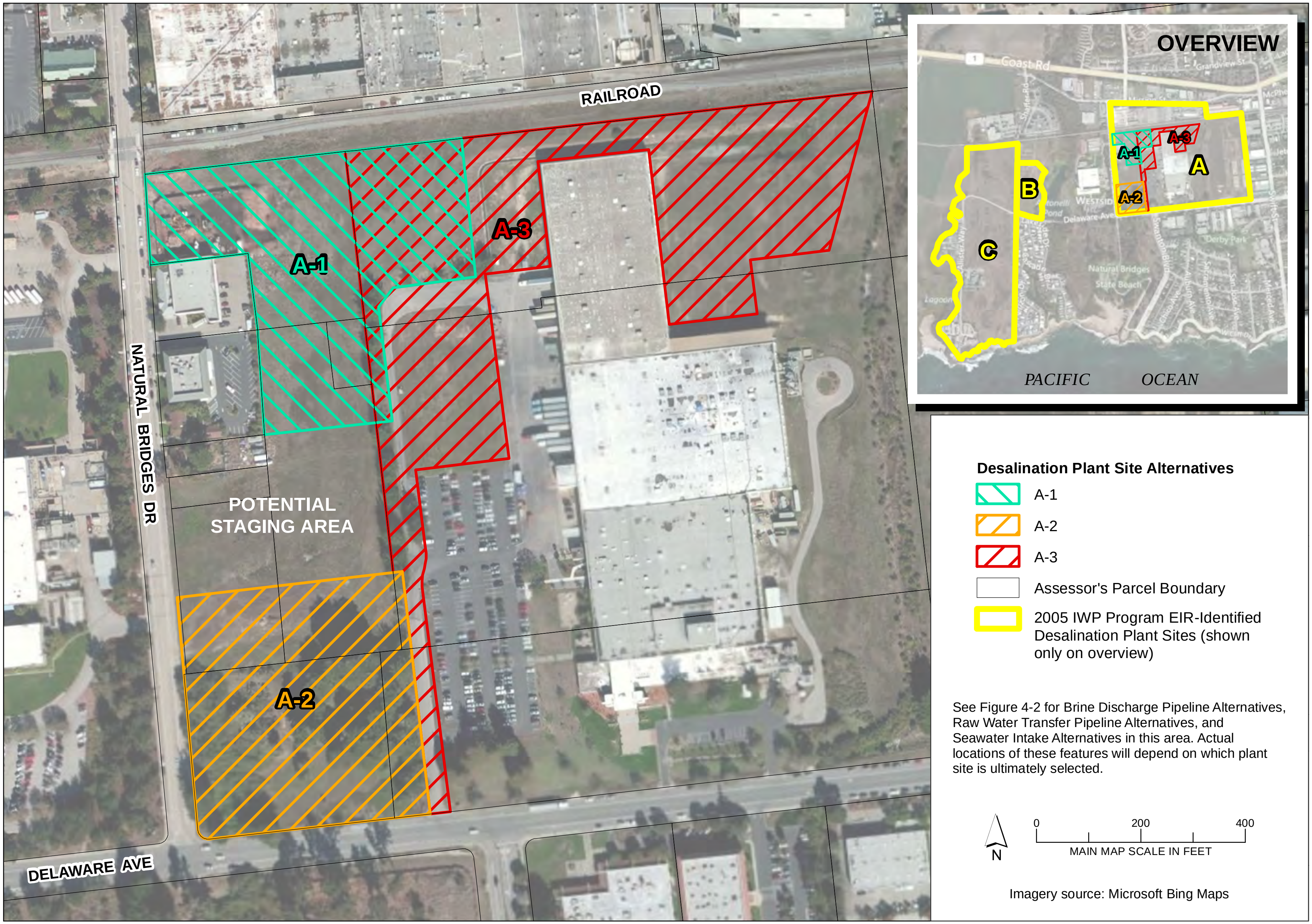


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**Figure 4-4**
Desalination Plant Site Alternatives

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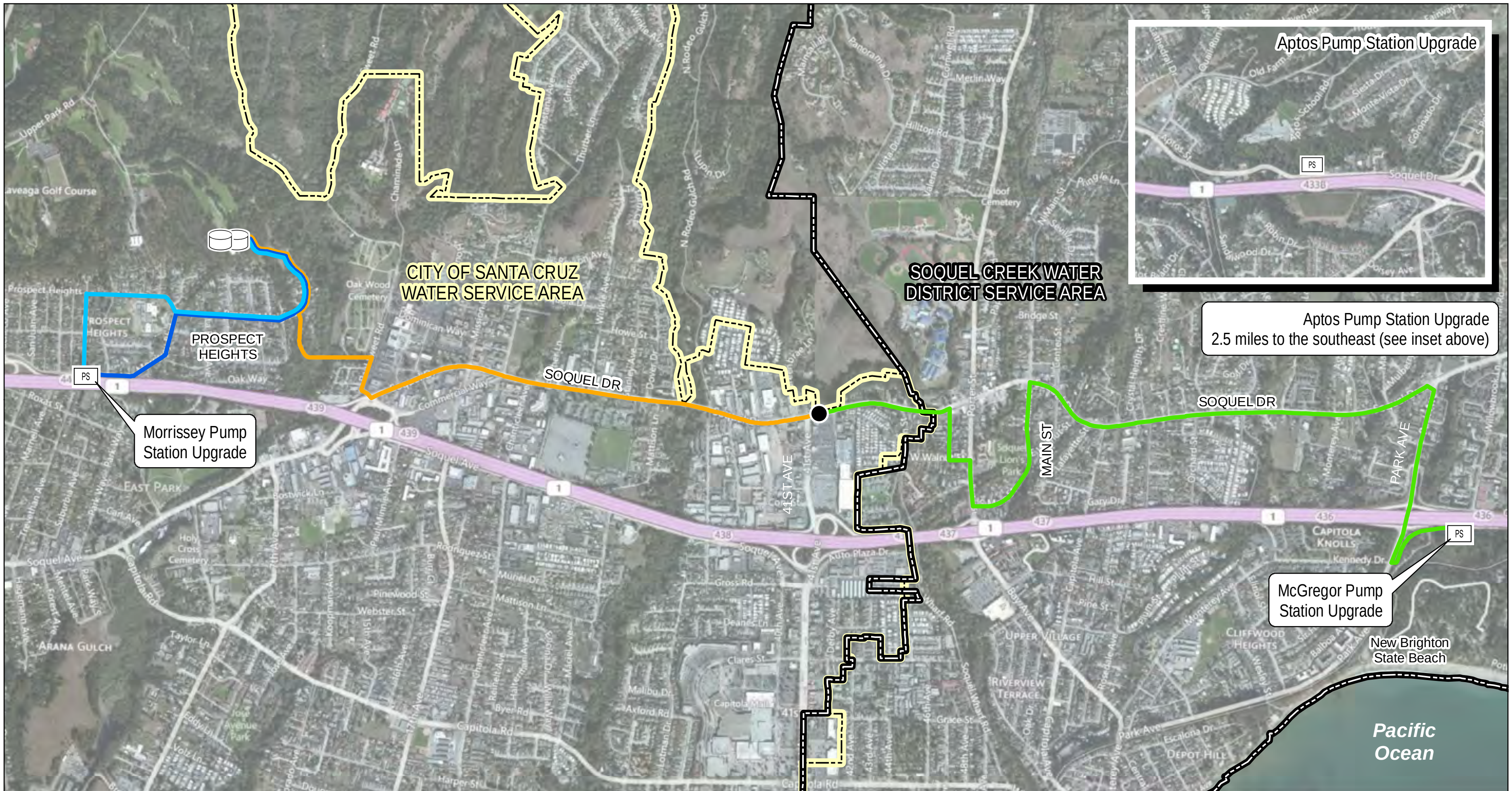


**Potable Water Pipeline Alignments**

- Morrissey PS to DeLaveaga Tanks - Morrissey Alignment Option
- Morrissey PS to DeLaveaga Tanks - Trevethan Alignment Option
- DeLaveaga Tanks to City-District Intertie
- City-District Intertie to McGregor PS

DeLaveaga Tanks
Pump Station (PS)
Intertie location at Soquel Dr
Soquel Creek Water District Service Area Boundary
City of Santa Cruz Water Service Area Boundary

N

0 0.5 1
SCALE IN MILES

Base map source: Microsoft Bing Maps

URS City of Santa Cruz and Soquel Creek Water District
**scwd²** Regional Seawater Desalination Project

**Figure 4-5**
City-District Intertie System Area

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# 4.4 Seawater Desalination Project Characteristics

## 4.4.1 Introduction

As described in **Section 4.2, Project Overview**, the proposed desalination project would consist of: (1) a seawater intake and conveyance system; (2) a seawater desalination plant; (3) a brine storage, disposal, and conveyance system; (4) potable water distribution system improvements; and (5) environmental design, construction, and operational features. These project components include different types of facilities, such as buildings, pumps, and pipelines. **Table 4-1, Summary of Proposed Project Facilities**, provides a detailed summary of all of the facility components of the project. This summary is based on the design information developed to date for each of the components of the project. The estimations of numbers of buildings, square footage, height, and so forth, are intended to provide an overall characterization of the proposed project and are not intended to be definitive, as these aspects of the proposed project may be modified as the design process proceeds.

The subsequent sections describe each of the components of the project in greater detail, as well as the environmental design, construction, and operational features of the project. Some of these features are incorporated into the design of project components and others reflect construction methods or operational approaches. These features are described in detail in **Section 4.7, Environmental Design, Construction, and Operational Features**.

## 4.4.2 Seawater Intake and Conveyance System

### *Seawater Intake Site Alternatives*

The seawater intake and conveyance system would be comprised of a seawater intake structure in the Monterey Bay to draw in raw seawater (source water), intake piping to deliver the seawater to the shore, and a pump station to pump the seawater to the desalination plant via transfer piping. To produce 2.5 mgd of treated product water reliably, the seawater intake system would be designed with a capacity to provide a maximum flow of 7 mgd of raw seawater. In practice, the maximum flow of seawater delivered from the proposed intake would be 6.3 mgd. However, the intake and pumping system would be designed for a slightly higher capacity (i.e., 7.0 mgd) to allow for anticipated reductions in capacity of the system, commonly caused by the accumulation of debris or sediment at the screens and/or in the pipelines. Designing the intake system with a slightly higher capacity will provide: (1) added reliability to meet production goals; (2) more efficient operation under normal operating conditions; and (3) less downtime for periodic inspections, cleanings and related maintenance activities.

## Table 4-1. Summary of Proposed Project Facilities

| Buildings, Structures, and Facilities | Quantity | Approximate Size | Maximum Height (in feet above grade)[1] | Other Characteristics |
|---|---|---|---|---|
| Seawater Intake and Conveyance System[2] | | | | |
| Seawater Intake Structure | 1 | 7 mgd capacity<br>Two screens, approximately 3 feet diameter and 12 feet in length<br>2 millimeter (mm) screen slot size | 10 | Screened, open-ocean intake would be placed on ocean floor. Eight intake structure locations evaluated.<br>7 mgd capacity adequate for 2.5-mgd desalination plant. |
| Seawater Intake Pipelines | 2 | 36-inch diameter | NA | Pipelines between intake structure and intake pump station. Pipelines would be fully or partially below the sea floor. Dual-intake system would allow one screen/pipeline to undergo maintenance while the other is in service. |
| Intake Pump Station | 1 | 2,500-square foot pump station<br>Three vertical-turbine pumps (with fourth in standby mode) with a maximum capacity of 7 mgd | 10-15 | Pump station would be either in an enclosed, below-grade facility or in an above-grade single story building. Eight intake pump station locations evaluated. 7 mgd capacity adequate for 2.5-mgd desalination plant. |
| Transfer Pipeline | 1-2 | 16 to 24-inch diameter | NA | Pipelines between intake pump station and desalination plant. Pipelines would be below ground. |
| New overhead power line on existing poles | 1 | 12 kilovolt | NA | Required for Intake Sites SI-4, SI-5, and SI-7. New line could be connected to existing nearby services (e.g., WWTF, Industrial Park Area). All work conducted in paved public rights-of-way. |
| Seawater Desalination Plant[3] | | | | |
| Membrane Building<br>(Includes MF/UF, SWRO and Chemical Systems) | 1 | 32,000 – 39,000 square feet<br>(Plant Sites A-1 and A-3) | 35 | For Plant Sites A-1 and A-3, MF/UF pretreatment and SWRO desalination components and equipment would be in one building. |
| MF/UF Building | 1 | 11,200 square feet<br>(Plant Site A-2) | 35 | For Plant Site A-2 MF/UF, pretreatment components and equipment would be in a separate building. |

### Table 4-1. Summary of Proposed Project Facilities

| Buildings, Structures, and Facilities | Quantity | Approximate Size | Maximum Height (in feet above grade)[1] | Other Characteristics |
|---|---|---|---|---|
| SWRO Building (Includes Chemical Systems) | 1 | 20,200 square feet (Plant Site A-2) | 35 | For Plant Site A-2, SWRO components and equipment would be in separate building. |
| Control Building | 1 | 5,000 – 5,400 square feet | 25 | Includes operational uses, such as control room, laboratory, conference room, offices, kitchen, restrooms. |
| Potential Maintenance Building | 1 | 1,600 square feet | 25 | Maintenance uses would be provided for either in a separate building or within another building. |
| DAF Basins | 2 | 1,200 square feet each; 2,400 total | 20 | Pretreatment system component. |
| DAF Mechanical/Electrical Building | 1 | 1,100 square feet | 20 | Pretreatment system component. |
| Used Washwater Equalization Basin | 1 | 600 square feet | 20 | Residuals handling and disposal system component. |
| Reclaimed Wash-Water Pump Station | 1 | 200 square feet | 20 | Residuals handling and disposal system component. |
| 2nd Pass SWRO Building | 1 | 8,000 square feet | 35 | Desalination treatment system component that would not be constructed initially but could be constructed in the future if needed to meet future regulations or water quality objectives. |
| Solids Clarifiers/Thickeners | 2 | 1,500 square feet each; 3,000 total | 20 | Residuals handling and disposal system component. |
| Recycled Water Pump Station | 1 | 200 square feet | 15 | Residuals handling and disposal system component. |
| Solids Disposal Pump Station | 1 | 200 square feet | 15 | Residuals handling and disposal system component. |
| Solids Handling Building | 1 | 2,000 square feet | 35 | Residuals handling and disposal system component. If residual solids cannot be discharged to the City sewer system, a solids dewatering facility would be required so that the solids could be dried and sent to the landfill. |
| Clearwell | 1 | 2,500 square feet | 25 | Post-treatment process component. |
| High Service Pump Station | 1 | 800 square feet | 20 | Post-treatment process component. |

**Table 4-1. Summary of Proposed Project Facilities**

| Buildings, Structures, and Facilities | Quantity | Approximate Size | Maximum Height (in feet above grade)[1] | Other Characteristics |
|---|---|---|---|---|
| $CO_2$ System | 1 | 500 square feet | 25 | Post-treatment process component. |
| Calcite Contactors | 6 | 2,000 square feet | 25 | Post-treatment process component. |
| Emergency Generator | 1 | 300 square feet<br>250-kW with integrated, double-contained fuel storage | 20 | Emergency diesel generator would be provided for operation of critical life safety systems and equipment shutdown systems in a power outage. |
| Chemical Systems and Storage Area | 1 | Included in square footage of other major buildings (see above) | 25 | Approximately eight chemical storage tanks would be included within storage area. |
| Pumps | numerous | NA | NA | Numerous pumps would be installed to allow for the movement of water through the various processes. |
| Utility Connections | numerous | various | NA | Includes connections to sewer, water, electricity, and natural gas services. |
| Pacific Gas & Electric Transformers | 1-2 | NA | NA | Includes connections to plant site. Located in roadway right-of-way near plant site or on plant site. |
| Brine Storage, Disposal, and Conveyance System | | | | |
| Brine (Concentrate) Equalization Basin & Disposal Pumps | 1 | 5,500 square feet<br>600,000 gallons | 20 | Brine equalization basin and disposal pumps would be located at the plant site. |
| Brine Conveyance Pipeline | 1 | 30-inch diameter<br>7,100 to 7,600 linear feet | NA | Pipeline would be below ground. Two points of connection to WWTF outfall are evaluated in this EIR. |
| New Valves on WWTF Outfall Diffuser Ports | numerous | NA | NA | New valves would be installed over existing ports. |
| Potable Water Distribution System Improvements | | | | |
| Morrissey Pump Station Upgrade | 1 | 600-square foot pump station<br>Install three 1,250-gpm pumps and a<br>250 kW emergency generator with integrated, double-contained fuel storage | 20 | Two of the pumps would be in operation and one in stand-by mode. The existing pump station would be reconstructed to accommodate improvements. New building constructed on existing 600 square foot footprint. |

## Table 4-1. Summary of Proposed Project Facilities

| Buildings, Structures, and Facilities | Quantity | Approximate Size | Maximum Height (in feet above grade)[1] | Other Characteristics |
|---|---|---|---|---|
| McGregor Pump Station Upgrade | 1 | Install up to 670-gpm additional pumping capacity and a 125 kW emergency diesel generator with integrated, double-contained fuel storage | NA | No building construction required for this upgrade. |
| Aptos Pump Station Upgrade | 1 | Install a 100 kW emergency diesel generator with integrated, double-contained fuel storage | NA | No building construction required for this upgrade. |
| New and Replacement Piping | Numerous segments | 12- to 24-inches in diameter pipe<br>29,000 linear feet between Morrissey Pump Station and McGregor Pump Station | NA | Two alignment options between Morrissey Pump Station and DeLaveaga water storage tanks are evaluated in this EIR. Pipelines would be below ground. |
| Environmental Features – Potential Energy Projects | | | | |
| Solar Photovoltaic (PV) Panels | numerous | Up to 25,000 square feet of PV panels based on available roof space | Integral roof panels (0 feet) and rotating/ tilting panels (5 feet) of additional height to maximum building height above | New PV panels could be added to the Control Building, Membrane Building(s), DAF Building, Brine Equalization Basin, Chlorine Contact Basin, and High Service Pump Station. |
| Micro-hydro Turbine – Graham Hill Water Treatment Plant | 1 | 1.3 mgd / 65 kW turbine | NA | No building construction required for this project. The turbine would be installed in the basement of the existing GHWTP. |

Notes:
1. Some structures may be buried or partially buried. Maximum building height presented is above ground level, but at the plant site does not encompass HVAC and solar PV equipment. Ultimate building height at the plant site with this equipment would be at or less than the maximum height allowed in Industrial Districts in the City of Santa Cruz, which is 50 feet.
2. Eight seawater intake location alternatives are under consideration.
3. Three desalination plant site location alternatives are under consideration.

Acronyms:
$CO_2$ = carbon dioxide
DAF = dissolved air flotation
GHWTP = Graham Hill Water Treatment Plant
gpm = gallons per minute
HVAC = heating, ventilation, and air conditioning
kW = kilowatt
MF/UF = microfiltration/ultrafiltration
mgd = million gallons per day
NA = not applicable
PV = photovoltaic
SWRO = seawater reverse osmosis
WWTF = wastewater treatment facility

**Appendix I, Seawater Intake Facility Conceptual Design Report scwd² Regional Seawater Desalination Project** (Intake Conceptual Design Report), prepared for the proposed project, identified a number of feasible alternative seawater intake and conveyance system locations on or near the Municipal Wharf, along West Cliff Drive, and on sites on or near the alternative desalination plant sites. The Intake Conceptual Design Report evaluated 18 locations and determined that 8 would be viable. At each of these alternative locations, the intake pipelines would extend into the Monterey Bay from a pump station and the intake structure locations are located outside of kelp forest habitat areas to reduce marine impacts (see **Figure 4-3**). **Table 4-2, Summary of Intake System Site Alternatives**, identifies and describes these sites. Only one of these location alternatives would be implemented.

**Table 4-2. Summary of Intake System Site Alternatives**

| Intake Site#[1] | Intake Pump Station Location | Intake Structure Location |
|---|---|---|
| SI-4 | Woodrow Ave and West Cliff Drive, small park/greenbelt on City property | Off West Cliff Drive, 100 feet beyond outer edge of kelp forests |
| SI-5 | 1102 David Way at West Cliff Drive, undeveloped parcel | Off West Cliff Drive, 100 feet beyond outer edge of kelp forests |
| SI-7 | 1700 West Cliff Drive at Merced Ave, 3 contiguous undeveloped parcels | Off West Cliff Drive, 100 feet beyond outer edge of kelp forests |
| SI-9 | Motel parking lot at 525 2nd Street, facing Beach Street, east of Pacific Ave | Near Municipal Wharf on sandy bottom |
| SI-14 | Desalination Plant Area A, 2240 Delaware Avenue | Off West Cliff Drive, 100 feet beyond outer edge of kelp forests |
| SI-16 | Pacific Collegiate School sports field, 255 Swift Street (Santa Cruz City Schools property) | Off West Cliff Drive, 100 feet beyond outer edge of kelp forests |
| SI-17 | Adjacent to the Santa Cruz Municipal Wharf | Off Municipal Wharf on sandy bottom |
| SI-18 | SCCRTC property located south of Depot Park and used by the City as a corporation yard for the wharf | Near Municipal Wharf on sandy bottom |

Source: Appendix I, Seawater Intake Facility Conceptual Design Report scwd² Regional Seawater Desalination Project.
Notes:
1. The Intake Site #s are based on the numbering used in Appendix I, which evaluated 18 sites, and determined that 8 were viable.

The IWP Program EIR identified using an abandoned pipeline extending out approximately 2,000 feet offshore of Mitchell's Cove Beach and associated Junction Structure as the location for a seawater intake system (City, 2005a). The Intake Conceptual Design Report (**Appendix I)** recommends eliminating this option from further consideration, because there would be construction and operational problems with a pump station at the existing Junction Structure, and there was not enough land area onshore to allow for the installation of the intake pipeline. See **Appendix I** for additional information about this and other intake system locations determined not to be feasible. See **Section 8.1.2, Desalination Component Alternatives Considered in Detail** for a comparison of the eight intake sites based on the project objectives, the outcome of the environmental analysis contained in **Section 5, Environmental Analysis,** and the engineering evaluation contained in **Appendix I**.

The proposed intake structure, intake pipeline, pump station, and transfer piping, are further described in the sections below.

## *Seawater Intake Structure*

### Intake Structure Selection Process

Two fundamental types of intake structures were evaluated by the **scwd²** Desalination Program: sub-seafloor intakes; and screened, open-ocean intakes[4]. A number of studies have been conducted since 2001 that have informed the **scwd²** Desalination Program about the types of intake structures, and possible locations that could be considered for the proposed project.

In 2001, a conceptual-level hydrogeological study was conducted to evaluate the potential for vertical beach-well intakes (Black and Veatch Engineers and Hopkins Groundwater Consultants, 2002), which is a type of sub-seafloor intake. The report concluded that the Santa Cruz coastline from the beachfront adjacent to the Santa Cruz Boardwalk to Rio Del Mar does not have suitable geology and hydrogeological conditions for vertical beach wells to produce sufficient source water for a 2.5-mgd desalination plant. In 2008, a review of new technologies and approaches to sub-seafloor intakes being developed in California and in other areas of the world was conducted (Kennedy/Jenks Consultants, 2008). Due to the potential advantages of sub-seafloor intake technologies in providing passive protection of marine organisms, this study recommended that additional investigation and evaluation of sub-seafloor intake systems be conducted.

In general, deep sand and gravel alluvium that is hydraulically connected to the ocean is required for sub-seafloor intakes to function reliably over time. With that consideration, the **scwd²** Desalination Program conducted a detailed offshore geophysical study to identify the location, dimensions, and depth of the probable offshore portion of an alluvial basin associated with the San Lorenzo River, and to provide an initial characterization of the type of sediment filling the basin (see **Appendix F, scwd² Seawater Desalination Program Offshore Geophysical Study**). The offshore portion of this alluvial basin was the focus of the study, based on the results of the Hopkins study and consultation with United States Geological Survey staff[5]. The geophysical and hydrogeological data and information obtained were used in the evaluation of the technical and engineering feasibility of the sub-seafloor intake approaches for the **scwd²** Desalination

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4 Sub-seafloor intakes can draw in brackish groundwater and/or seawater from beneath the seafloor. Screened, open-ocean intakes draw seawater from an open-ocean environment through protective, fine-mesh screens.

5 City and District staff met with local United States Geological Survey scientists to discuss and re-evaluate potential locations for sub-seafloor–type intakes along the coast near Santa Cruz. The coastline from above Wilder Ranch State Park down to Capitola was evaluated. To the west of Santa Cruz and offshore of Wilder Ranch State Park, the streams that discharge into the ocean are too small to have carved out an alluvial channel that could be suitable for a sub-seafloor intake system. Likewise, beaches and locations where streams discharge into the ocean south of Santa Cruz are also too shallow to have enough sediments for a sub-seafloor intake system. Because of the above disadvantages, these locations were not considered further (Appendix H).

Program, provided in **Appendix H, scwd² Seawater Desalination Intake Technical Feasibility Study** (Intake Technical Feasibility Study).

The Intake Technical Feasibility Study evaluated the feasibility and site-specific requirements of both sub-seafloor and screened, open-ocean intake approaches (**Appendix H)**. Based on specific design, operational, and/or siting requirements for the type of intake, the Intake Technical Feasibility Study concluded that a screened, open-ocean intake is the "apparent best intake approach" in terms of engineering feasibility. The sub-seafloor options, including vertical beach wells, slant wells, offshore engineered infiltration gallery, and offshore radial collector wells were determined to be not feasible or recommended for the proposed project. Criteria used in reaching these conclusions included: production capacity and reliability; proven technology and track record (risk); energy use; permitting; operational flexibility and maintainability; constructability; and project lifecycle costs. See **Appendix H** and **Section 8** for additional information about the intake approaches determined not to be feasible or recommended.

## Proposed Screened, Open-Ocean Intake

The proposed project would include the construction and operation of a screened, open-ocean intake, which would draw seawater from the near shore open-ocean environment through protective, fine-mesh screens. The Intake Technical Feasibility Study (**Appendix H**) indicates that the passive narrow slot wedgewire screen is the recommended screen technology for a screened, open-ocean intake, as it offers protection to early life stages of marine life from impingement and entrainment.[6]

This recommendation is based on a pilot-test investigation of this screen type performed in **Appendix G, City of Santa Cruz Water Department & Soquel Creek Water District scwd² Desalination Program Open Ocean Intake Effects Study**, which was prepared by Tenera Environmental in 2010. This investigation concluded that this type of screen with a two millimeter slot size would withdraw seawater without appreciable fouling and would prevent impingement and entrainment of marine organisms that are larger than the screen size. The pilot-test results indicated that copper-nickel alloy had appreciably less fouling than other tested materials; therefore, it was the recommended screen material in the study. Final design and permitting could influence the type of screen material ultimately selected. See **Appendix G** for additional information about the pilot screen investigations.

A dual-screen/pipeline intake system is recommended in both the Intake Technical Feasibility Study (**Appendix H**) and the Intake Conceptual Design Report (**Appendix I**) to facilitate operations and maintenance. A dual-screen/pipeline intake system allows one screen/pipeline to

6 Entrainment is the passage of planktonic organisms through a water intake system. Impingement is the entrapment of fish and invertebrates on intake screens (Appendix G).

be out of service for maintenance, while the other screen/pipeline is in service, thereby providing service reliability and redundancy.

A universal design approach has been developed in the Intake Conceptual Design Report (**Appendix I**) that can be applied to the various intake location alternatives being considered. This approach consists of screen dimensions of approximately 3 feet in diameter by 12 feet in length. The surface area provided by this size screen provides a low through-screen velocity of less than or equal to 0.33 foot per second to achieve a total intake capacity of up to 7 mgd[7]. Final design would include consideration of screens of different dimensions that would achieve the same surface area and therefore the same through-screen velocity.

The intake structure would be attached to a precast, reinforced-concrete base slab with pipe supports. The intake structure would extend approximately 8 to 10 feet above the seafloor. There are two general geologic conditions at the intake screen locations: the eastern sandy soils area near the Municipal Wharf, and the western bedrock area off of West Cliff Drive. In the eastern sandy area (Intake Sites SI-9, SI-17, and SI-18), the design approach is to set the intake structure on the sandy ocean floor unanchored and design to account for movement. In the western bedrock area (Intake Sites SI-4, SI-5, SI-7, SI-14, and SI-16), the design approach is to anchor the intake structure to bedrock. A conceptual schematic of the intake structure is shown on **Figure 4-6, Conceptual Screened, Open-Ocean Intake Structure**.

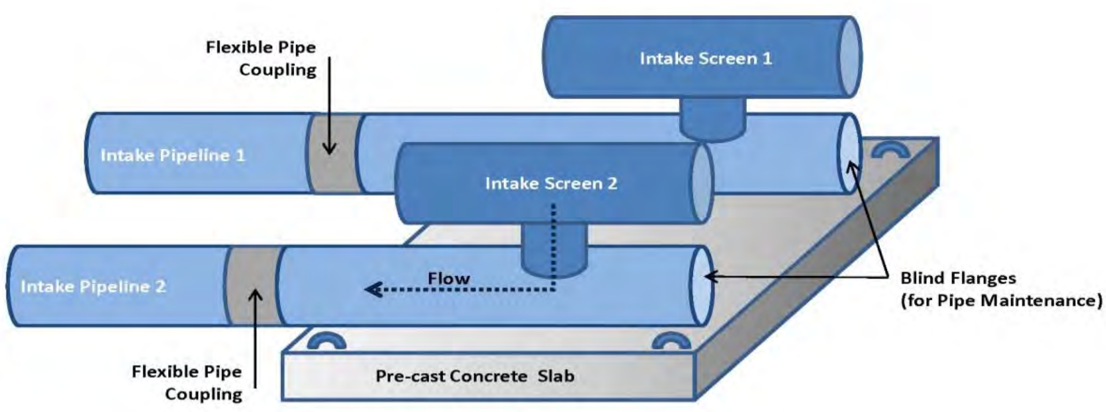


**Figure 4-6. Conceptual Screened, Open-Ocean Intake Structure**

## *Seawater Intake Piping*

The dual-screen intake system described above for a screened, open-ocean intake structure would also include two 36-inch intake pipelines to allow one screen/pipeline to be out of service

[7] This approach velocity is consistent with the approach velocity recommended by the fish screening criteria of the California Department of Fish and Wildlife (CDFG, 2011).

for maintenance while the other screen/pipeline is in service. The intake pipelines would be connected to the intake structure with flexible pipe couplings.

## Seawater Intake Pump Station

The Intake Conceptual Design Report (**Appendix I**) provides a universal pump station design for all of the alternative intake locations. The pump stations at these alternative sites would be different only in depth of the wet well, which would depend on hydraulic requirements. The capacity of the pump station would provide for pumping up to approximately 7 mgd of seawater, which is the volume of raw seawater needed to reliably generate 2.5-mgd of product water at the desalination plant. The pump station pumping capacity could be provided by three vertical-turbine pumps, with a fourth in standby mode. The pump operation would be controlled to serve the demands of the desalination plant.

The 2,500-square-foot pump station could be an enclosed, below-grade facility, to reduce its visibility from surrounding locations. With this approach, some components would still need to be placed above grade, such as access hatches, electrical transformers, parking, driveways, and fencing. The pump station could also be constructed in an above-grade, single-story building, approximately 10 to 15 feet in height, designed to reflect the surrounding development at each site. The EIR considers both options as appropriate throughout the analysis.

The SI-17 pump station alternative would be located immediately adjacent to the Municipal Wharf, near the mid-point bend of the existing wharf. The 2,500-square-foot pump station would be surrounded by new decking. The pump station and decking combined would be approximately 7,000 square feet in area. A short ramp between the new decking and the existing wharf would be the only connection between the two structures. The pump station facilities (e.g., pumps, electrical controls) would be located below the surface of the new decking, but access points and maintenance hatches would be installed on the surface of the new pump station structure. A pump station at this location would extend 10 to 15 feet below the decking surface. The pump station wet well would extend from the pump station down to the ocean floor. The pump station and wet well would be made of concrete with surface color and texture designed to blend with the materials of the existing wharf. The pump station would be faced toward the ocean so as to be less visible from points onshore.

## Seawater Transfer Piping

The transfer piping would deliver the seawater from the pump station to the desalination plant. The preliminary alignment routes for the transfer piping from the pump station sites are shown on **Figure 4-3.** The alignments would be refined during design, and could include other developed City rights-of-way. The transfer piping would consist of one or two pipelines, approximately 16 to 24 inches in diameter. The ultimate design of the transfer piping would be determined during final design with the objective of ensuring flexibility and redundancy in operations and maintenance.

### 4.4.3 Seawater Desalination Plant

#### *Plant Site Alternatives*

The proposed desalination plant would be located at one of three alternative plant site locations (Plant Site A-1, A-2, or A-3), all of which are on the Westside of the City (see **Section 4.3, Project Location**). Acreages for the three plant site locations are provided below in **Table 4-3, Summary of Plant Site Location Alternatives**. The plant facilities are expected to require approximately 4 to 8 acres of land, depending on the alternative.

**Table 4-3. Summary of Plant Site Location Alternatives**

| Plant Site # | Description | Approximate Acreage[1] | | |
|---|---|---|---|---|
| | | Plant Site | Additional Paving & Conveyance | Total |
| A-1 | All or portions of 4 contiguous parcels located in the northwestern corner of Area A | 3.9 | 0.8 | 4.7 |
| A-2 | All or portions of 5 contiguous parcels located in the southwestern corner of Area A; Acreage does not include riparian area (1.0 acre). | 3.4 | 0.7 | 4.1 |
| A-3 | All or portions of 3 contiguous parcels in mostly the northeastern corner of Area A, but access would extend into the southern portion of Area A. Two subareas of the site are connected by a utility corridor. | 5.9 | 1.5 | 7.4 |

Source: Derived from Appendix L, scwd² Seawater Desalination Plant – Phase 1 Preliminary Design: Volume 1 – Report & Volume 2 – Drawings.

Notes:

1. The total acreages for each of the plant sites vary due to the characteristics and orientation of each site and related access requirements. Plant Site A-3 is substantially larger than the other two plant sites to account for the need to provide access and utility connections between the two subareas.

All of the plant facilities identified in **Table 4-1** above would be components of the plant at each of the alternative sites. However, the configuration of these facilities would be unique to each site, as illustrated in **Figures 4.7 through 4.10, Conceptual Site Plans for Desalination Plant Site Alternatives**. These figures provide conceptual layouts for each of the plant site alternatives under consideration. The site plan of the selected site would be refined during the final design process. See **Section 8.1.2** for a comparison of the three plant site alternatives based on project objectives and the outcome of the environmental analysis contained in **Section 5**.

#### *Desalination Plant Processes and Facilities*

The 2.5-mgd desalination plant would provide for all the equipment used for the desalination process, except for the seawater intake system and pipeline conveyance systems for source water, brine disposal, and potable water. According to **Appendix L, scwd² Seawater Desalination Plant – Phase 1 Preliminary Design: Volume 1 – Report & Volume 2 – Drawings** (Desalination Plant Preliminary Design Report), the plant would provide for the following primary systems:

- Pre-treatment Processing
- Seawater Desalination Treatment
- Post-treatment Processing and Distribution
- Brine Storage (see Section 4.4.4 below)
- Residuals Handling and Disposal
- Chemical Systems

**Appendix D, scwd[2] Final Seawater Reverse Osmosis Desalination Pilot Test Program Report and Appendices** (Desalination Plant Pilot Study Report), considered different pre-treatment processes, SWRO desalination treatment, post-treatment processes, and residuals-handling processes. The selected processes and related equipment identified in the Desalination Plant Pilot Study Report are further described below, and illustrated on **Figure 4-11, Diagram of Desalination Treatment Process**. The desalination plant would also include space for other related and support uses, including but not limited to: (1) operations and control systems; (2) maintenance and facilities storage; (3) electrical operations and utility connections; (4) parking and access; (5) stormwater detention and treatment; (6) landscaping; and (7) outdoor viewing and gathering areas.

## Pre-treatment Process

Pretreatment refers to the removal of suspended solids from ocean source water to reduce fouling, clogging, and scaling of the SWRO membranes used for desalination. Several types of pretreatment systems were evaluated as part of the Desalination Plant Pilot Study Report (**Appendix D**) described above to determine which system would be the most effective in controlling the fouling of SWRO membranes. Based on this and subsequent evaluation conducted for the Desalination Plant Preliminary Design Report (**Appendix L)**, the pre-treatment process would consist of rapid mixing, dissolved air flotation (DAF) units, and pressurized microfiltration/ultrafiltration (MF/UF) membranes, which are further described below. This pretreatment process was selected because it is the most reliable under all anticipated water quality conditions. See **Section 8** for additional information about other pretreatment systems evaluated.

Rapid mixing would include the addition of a coagulant (ferric chloride) to raw seawater to combine with particulates and organic matter to form larger particles that can be more easily removed by clarification and filtration processes. Periodically, sodium hypochlorite may be added to the raw water to oxidize trace metals and/or to control algae or bacteria growth that can potentially foul the MF/UF and SWRO membranes. The proposed pumped water injection system would provide rapid mixing of the pre-treatment chemicals with raw seawater. See the **Chemical Use and Storage Facilities** subsection below, for further information about chemical use and storage.

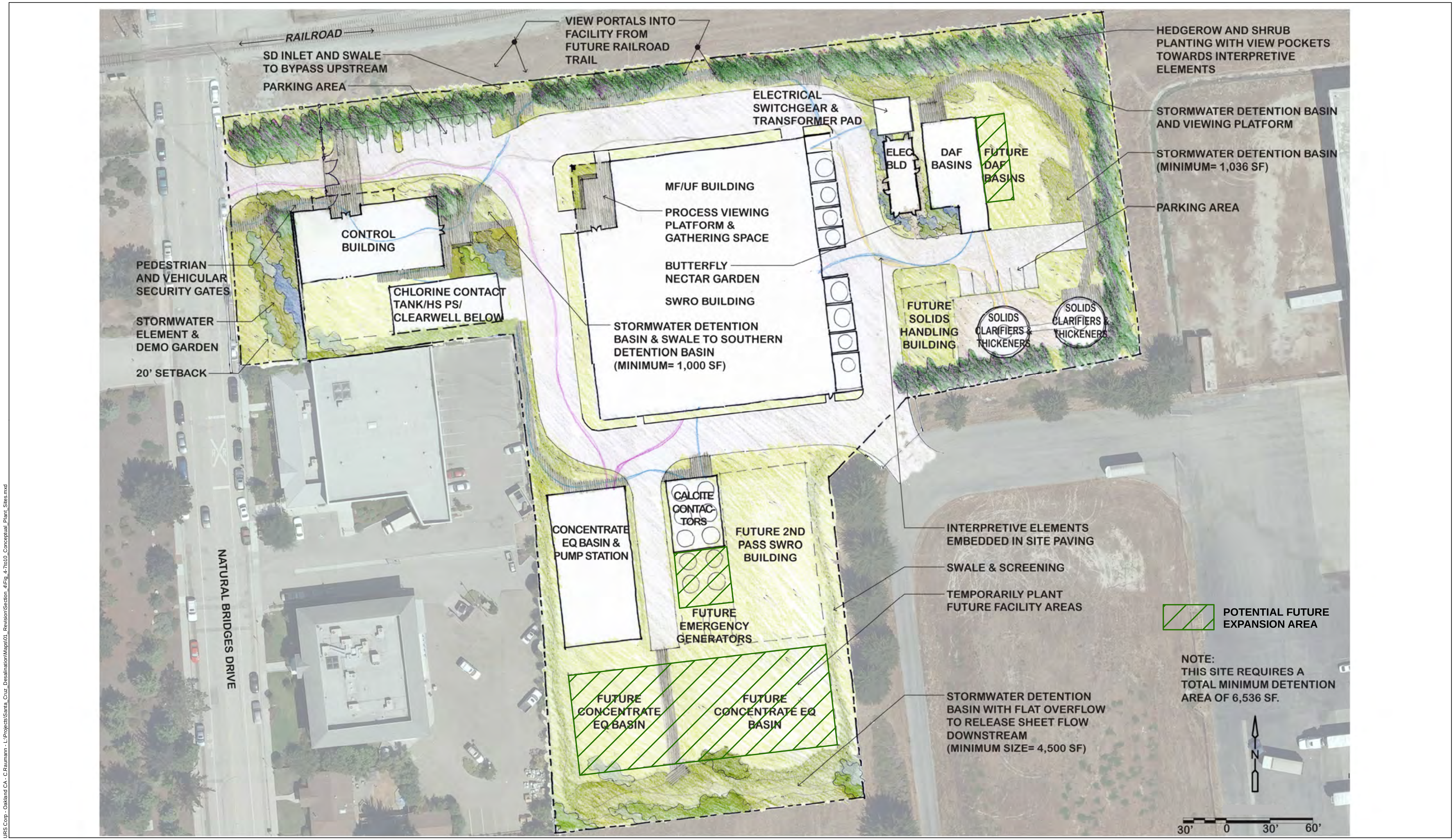


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**Figure 4-7**
Conceptual Site Plan for Desalination Plant Site Alternative A-1

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**Figure 4-8**
Conceptual Site Plan for Desalination Plant Site Alternative A-2

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**Figure 4-9**
Conceptual Site Plan for Desalination Plant Site Alternative A-3 (east)

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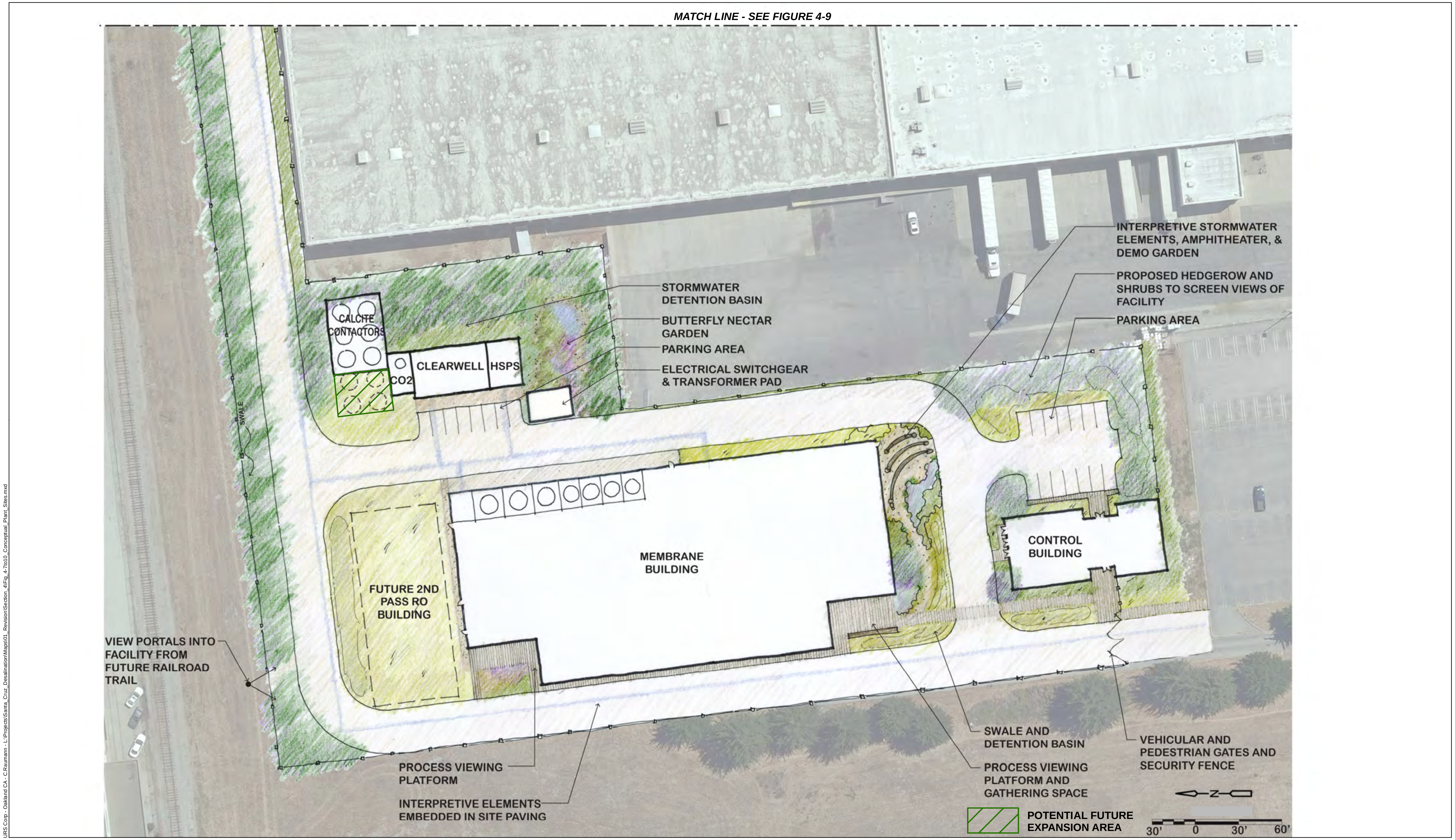


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City of Santa Cruz and Soquel Creek Water District
**scwd$^2$** Regional Seawater Desalination Project

**Figure 4-10**
Conceptual Site Plan for Desalination Plant Site Alternative A-3 (west)

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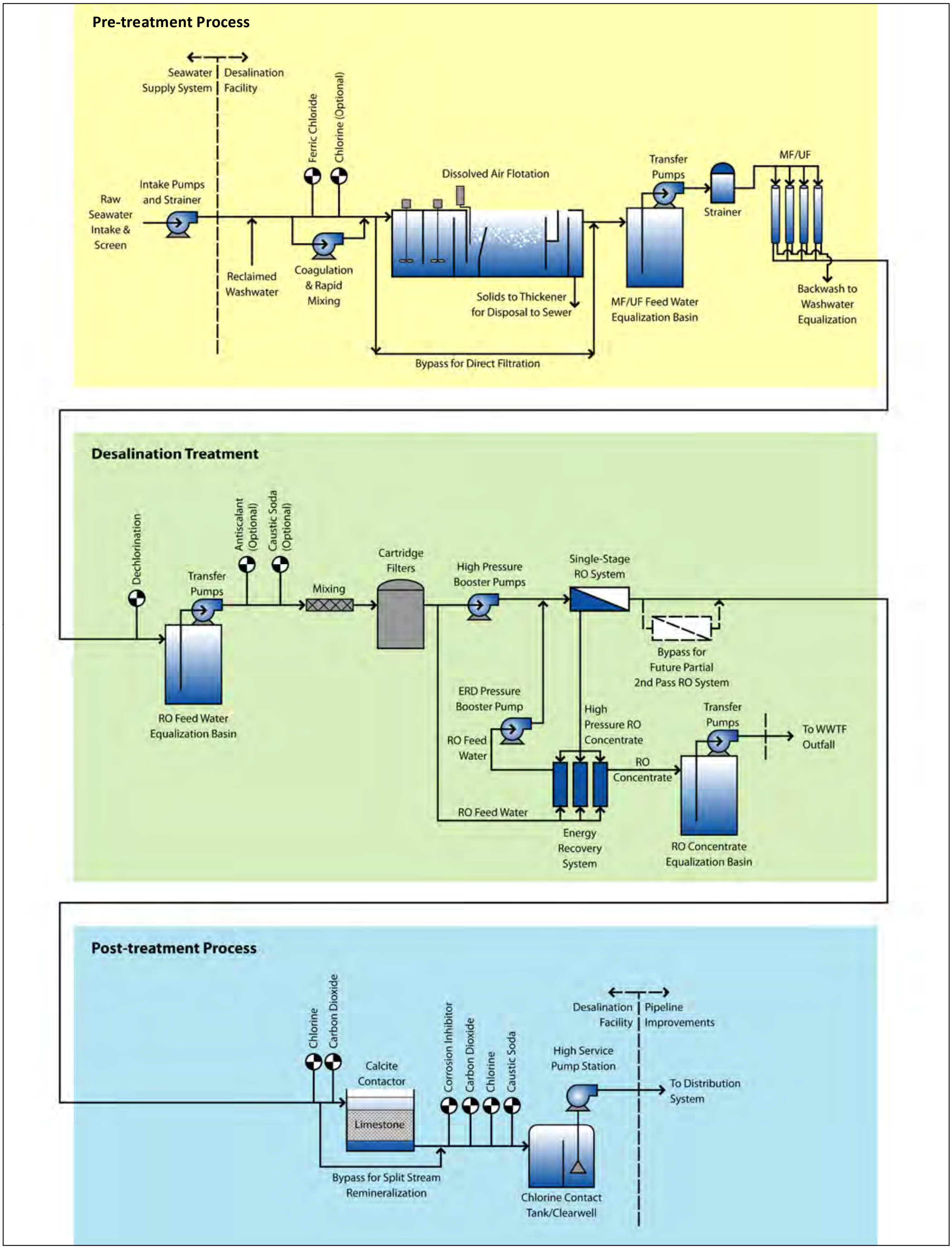




**Figure 4-11**
Diagram of Desalination Treatment Process

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The DAF process causes organic and inorganic material in raw seawater to coagulate and float to the surface for easy removal. After rapid mixing, DAF units would remove the majority of suspended solids from the coagulated water before the downstream membrane filtration and desalination processes. Removal of algae and suspended solids would be critical to the efficient operation of the MF/UF membranes and to reduce the fouling potential at the SWRO membranes.

As documented in the Desalination Plant Pilot Study Report (**Appendix D**) and described in the Desalination Plant Preliminary Design Report (**Appendix L**), seawater from Monterey Bay is often high quality and contains only small amounts of algae and suspended solids. However, raw water quality can be adversely affected during storms and/or algae blooms. Plant operators would therefore have the option to bypass the DAF system when raw water is of high quality, and direct the coagulated water to the MF/UF membranes. Bypassing the DAF system would reduce chemical and energy use under favorable raw water quality conditions. The DAF system would consist of two partially buried concrete basins, mechanical equipment, electrical equipment, pumps, air compressors, saturators, and controls.

MF/UF membranes provided the most consistent and effective pretreatment during normal and adverse raw water conditions. Clarified water from the DAF units would flow to a feedwater[8] equalization basin where MF/UF feed pumps would direct flow through the strainers and MF/UF membranes. Four MF/UF racks would be provided for the 2.5-mgd plant. Following filtration, the filtered water would enter an equalization basin prior to desalination, as further described below.

## Seawater Desalination Treatment

As indicated previously, the plant would use a SWRO system to desalinate treated feedwater. SWRO is a pressure-driven process using semi-permeable membranes. SWRO membranes separate water molecules from impurities in the seawater by permitting water to pass, and limiting the passage of salts and other constituents. The results are a permeate stream (or product water) and a concentrate stream (or brine). The product water from the plant is referred to as “product water” throughout the EIR.

Several SWRO system configurations and several types of commercially available SWRO desalination membranes were evaluated during the Desalination Plant Pilot Study Report to assess energy requirements, cleaning intervals, salt rejection, membrane integrity, and product water quality (see **Appendix D**). Based on this evaluation, the preliminary project design includes a single-stage, single-pass SWRO process. According to the Desalination Plant Preliminary Design Report (**Appendix L**), this process would provide the most economical and

[8] The source water that goes into the desalination plant, as well as the water being processed at different stages (pre-treatment, SWRO desalination, post-treatment) is often described as “feedwater.”

energy efficient desalination technique to meet the current drinking water standards and **scwd²** water quality and operational goals. The proposed single-pass SWRO treatment process consists of the following components, which are further described below:

- Equalization Basin
- Transfer Pump Station
- Cartridge Filters
- Feedwater Conditioning
- High Pressure Feed Pumps
- SWRO Membrane Skids (Or Units)
- Energy Recovery Devices
- SWRO Membrane Cleaning and Flushing Systems
- Allowance for a Future Partial Second Pass Reverse Osmosis System

After passing through the pre-treatment process, the treated feedwater would be temporarily stored in an equalization basin to equalize flows from the pre-treatment filter units and to allow for the removal of any residual chlorine. Transfer pumps would pump the water out of the equalization basin and through cartridge filters to remove any suspended particles that may have accumulated downstream of the MF/UF process.

Feedwater conditioning would involve chemical supply lines and a static mixer with injection ports for adding antiscalant, caustic soda, or sodium bisulfite after the cartridge filters as necessary. Antiscalant addition may be desired to reduce fouling of the SWRO membranes. Caustic soda addition may be required to temporarily reduce boron concentrations in the desalinated water. Sodium bisulfite addition would be necessary for dechlorination when chlorine is added upstream.

The feedwater flow would then be pumped through the SWRO single-stage system using high-pressure feed pumps. The product water (or permeate) will typically range between 40 and 50 percent of the feedwater flow; and the brine (or concentrate) will comprise the remaining 50 to 60 percent of the flow. The brine will pass through energy recovery devices (ERDs) and approximately 95 percent of the energy retained in the brine will be used to pressurize the feedwater before the SWRO membranes. By pressurizing the feedwater, pumping requirements will be reduced and the ERDs will result in the net recovery of approximately 45 to 55 percent of the overall energy required to operate the SWRO membranes.

To produce 2.5 mgd of product water that can be directed to the potable water distribution system, the desalination process would include a number of single-stage SWRO units (skids). Each SWRO membrane skid would be configured with a hybrid arrangement of high boron rejection SWRO membranes and low energy consumption SWRO membranes. This hybrid arrangement would provide the optimum balance of boron removal to meet treatment objectives while minimizing system energy requirements.

The SWRO system would have the ability to operate with a recovery rate ranging from 40 to 50 percent (40 to 50 gallons of fresh drinking water per 100 gallons of seawater). However, it is anticipated that the SWRO system would typically operate with a recovery rate ranging from 40 to 45 percent. Recovery rates for SWRO membranes would vary based on a number of factors including but not limited to water quality, membrane type or manufacturer's model and membrane age or condition. For example, water temperature and salinity may vary seasonally and would affect rejection and recovery rates. Also, as the membranes age over several years of service, the rejection efficiencies typically degrade and recovery rates tend to drop until water quality and production goals can no longer be met; then the used membranes would be recycled and replaced with new membranes.

**Table 4-4, 2.5-mgd Seawater Desalination Plant Flow Rates**, provides the operational recovery rates that could occur with the plant, and indicates the amount of raw seawater that would be needed and brine that would be generated with the 2.5-mgd plant. For example, given a SWRO system recovery rate of 40 percent, the single-stage system would require 6.3 mgd of raw seawater per day to generate 2.5 mgd of product water under the most challenging operating conditions.[9] In addition to the 6.3 mgd of seawater flow that would be drawn directly from the screened open-ocean intake, an additional flow of approximately 0.8 mgd consisting of partially treated reclaimed water from the residuals streams produced by the DAF and MF/UF pretreatment systems, would be taken through the treatment process, resulting in a total influent to the plant of 7.1 mgd. At a recovery rate of 40 percent, the single-stage system would also generate about 3.8 mgd of brine.

Membrane cleaning and flushing systems would also be incorporated into the design to remove dissolved and suspended solids on the membranes. A clean-in-place system would be provided for periodic cleaning of the SWRO membranes, as further described below. The primary components of the clean-in-place system would include cleaning tanks each with a tank water heater, cleaning pumps, and cartridge filters. The primary cleaning chemicals anticipated for use in the facility would be acid for low pH cleaning and sodium hydroxide for high pH cleaning. Other acids or bases may be used for less common cleaning applications. Various common detergents may also be used in combination with the acidic and basic solutions. After use, these high pH and low pH cleaning solutions would be neutralized prior to being discharged to the sanitary sewer for treatment at the City's WWTF.

Provisions for a future second pass of low-pressure SWRO membranes have been incorporated into the preliminary design, should future regulations or water quality objectives require additional treatment. However, final design and construction of the second pass would occur in the future only if needed. The EIR analysis assumes that a future second-pass system could be required and implemented as part of the project.

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[9] The intake and pumping system would be designed for a slightly higher capacity (i.e., 7.0 mgd) to allow for anticipated reductions in capacity of the system, as previously described at the beginning of **Section 4.4.2**.

**Table 4-4. 2.5-mgd Seawater Desalination Plant Flow Rates**

| Production Capacities | Production Capacity (mgd) | SWRO Recovery Rate (%) |
|---|---|---|
| Seawater (from Seawater Intake System) | | |
| Minimum | 1.7 | 50 (maximum) |
| Average | 3.7 | 43 (average) |
| Maximum | 6.3 | 40 (minimum) |
| Combined Plant Influent (Seawater + Recycled Water from Plant) | | |
| Minimum | 1.8 | 50 (maximum) |
| Average | 4.1 | 43 (average) |
| Maximum | 7.1 | 40 (minimum) |
| Treated Water | | |
| Minimum | 0.8 | 50 (maximum) |
| Average | 1.6 | 43 (average) |
| Maximum | 2.5 | 40 (minimum) |
| Brine | | |
| Minimum | 0.8 | 50 (maximum) |
| Average | 2.1 | 43 (average) |
| Maximum | 3.8 | 40 (minimum) |

Source: Appendix L, scwd[2] Seawater Desalination Plant – Phase 1 Preliminary Design: Volume 1 – Report & Volume 2 – Drawings.
Acronyms:
mgd = million gallons per day
SWRO = seawater reverse osmosis

## Post-Treatment Processes and Distribution

Reverse osmosis removes many of the minerals from the water, such as calcium, magnesium, and bicarbonate. Lack of hardness and alkalinity makes the water more corrosive to concrete and other materials in the water delivery system. Additionally, without treatment, lack of minerals can make the water taste flat as compared to the existing drinking water supply. Post-treatment is required to control the corrosiveness of the water and provide adequate disinfection prior to distribution, as is common for potable water generated from surface and/or groundwater sources. The post-treatment and distribution system would consist of stabilization and corrosion control, disinfection, and product water pumping to the potable water distribution system.

The desalinated water would be treated with carbon dioxide, calcium carbonate within the calcite contactors, and sodium hydroxide (caustic soda) to stabilize and re-mineralize the water. Chlorine (sodium hypochlorite) would be added before and/or after the calcite contactors for disinfection. A corrosion inhibitor (monosodium phosphate), identical to the chemical currently used for corrosion control at the Graham Hill Water Treatment Plant, would be added after the calcite contactors to provide additional stabilization to reduce corrosion in the water supply distribution system.

The water would then pass through a chlorine contact basin, also called a clearwell, to meet the most stringent regulatory requirements for primary disinfection. The clearwell provides for the required contact time, with chlorine (sodium hypochlorite) added upstream of the clearwell for disinfection. A high-service pump station would then pump the product water directly into the potable water supply distribution system adjacent to the desalination plant. No on-site storage of product water would be provided and no mixing of the product water with other sources of potable water would be necessary to achieve water quality or storage objectives. See **Section 4.6, Operation and Maintenance,** for information on product water quality.

## Residuals Handling and Disposal

Operation of the desalination plant would generate solids from the DAF units, used washwater from the MF/UF system, and chemical cleaning solutions from clean-in-place procedures of the MF/UF filters and SWRO membrane units that would be conducted periodically. Solids from the DAF units and from the MF/UF washwater would consist of naturally occurring organic and inorganic matter in the raw seawater, and iron precipitated from coagulation with ferric chloride used in the pre-treatment system. Two options for handling solids from these systems are presented below. This EIR addresses both of these options for disposing of solids. See **Section 5.9, Utilities and Service Systems,** for additional information about directing solids to the sewer system and landfilling of dewatered solids.

### *Sanitary Sewer Disposal Option*

The recommended residuals-handling system is shown on **Figure 4-12, Residuals Handling System – Sanitary Sewer Disposal Option**, and consists of a DAF solids transfer pump station, washwater equalization basin and pump station, two clarifier thickeners, a reclaimed water pump station and a solids disposal pump station. The system would separate the liquids and solids, and recycle this reclaimed water to the desalination plant influent for treatment. The remaining thickened solids containing 0.3 to 2.0 percent dry solids by weight, would typically be released daily to the sanitary sewer, but can also be stored within the clarifiers for 1 to 4 weeks depending on plant influent flow, raw seawater quality and associated volume of solids.

Thickened solids at the potential range of 0.3 to 2.0 percent solids would allow for operational flexibility and coordination with the City's WWTF to address the potential adverse effects of increased solids loading in the distribution system and at the WWTF. For example, discharging a higher percentage of solids (e.g., 2.0 percent dry solids by weight) to the sanitary sewer would provide the following benefits: (1) reduce the amount of raw seawater withdrawn from the ocean and treated at the proposed plant; (2) reduce chemical consumption and energy use; and (3) lower solids disposal costs based on flow to the sanitary sewer system. However, if discharging high concentrations of solids results in settling and lost capacity in the sanitary sewer collection system, or if high solids adversely impact treatment at the City's WWTF, the operators at the proposed seawater desalination plant could alter the solids disposal process to discharge a more dilute waste stream (e.g., 0.3 percent dry solids by weight) to address the potential impacts. This proposed residuals-handling system is similar to the residuals-handling system at the City's Graham Hill Water Treatment Plant.

**Table 4-5, Summary of Estimated Sewer Discharges,** provides a summary of estimated sewer discharges from all categories of discharges. Assuming an average plant production of 1.6 mgd of product water, approximately 2,000 gallons of liquid per day containing 2.0 percent solids would be released from the plant to the sewer. The maximum anticipated discharge of thickened solids could be 17,700 gallons per day (gpd) when the plant is operating at the design production capacity of 2.5 mgd during winter storm events, when the solids in the raw seawater are at their highest anticipated concentration.

The discharge volume of thickened solids would increase to approximately 13,600 gpd for average production and approximately 118,000 gpd for maximum production, with a solids concentration at 0.3 percent. The City Water Department is in the process of coordinating with the City Public Works Department regarding the allowable limits and potential effects of discharging thickened solids at the potential range of 0.3 to 2.0 percent solids. See **Section 5.9** for additional information.

SWRO membranes tend to foul over time and require periodic cleaning. A clean-in-place system would be provided for periodic cleaning of the SWRO membranes and the MF/UF filters. Daily maintenance washes of the MF/UF filters would be conducted with potable water from the adjacent potable water distribution system. Additionally, chemical cleaning solutions would be used during the clean-in-place procedures conducted periodically at the MF/UF filters (approximately once every 3 months) and SWRO membrane units (once every 3 to 6 months). Chemicals would include combinations of chlorinated and low- and high-pH solutions. The used cleaning solutions would be pumped to a neutralization tank, where the contents would be de-chlorinated and neutralized before being sent to the sanitary sewer for disposal (see **Table 4-5**).

*Landfill Disposal Option*

If discharging solids to the City's sewer system is determined not to be feasible or desirable now or in the future, the Desalination Plant Pilot Study Report (**Appendix D**) indicates that dewatered solids could also be sent to a landfill, likely the City's landfill at Dimeo Lane. This would require a solids dewatering facility, which would be located in a building at the plant (see **Table 4.1** and **Figures 4-7** through **4-10**). The dewatering system would take the thickened solids from the treatment process and produce a cake (approximately 25 to 50 percent dry solids) that could be delivered to the landfill by truck, assuming the solids meet all relevant requirements for disposal in a municipal solid waste landfill. **Section 5.9** describes landfill disposal requirements in more detail.

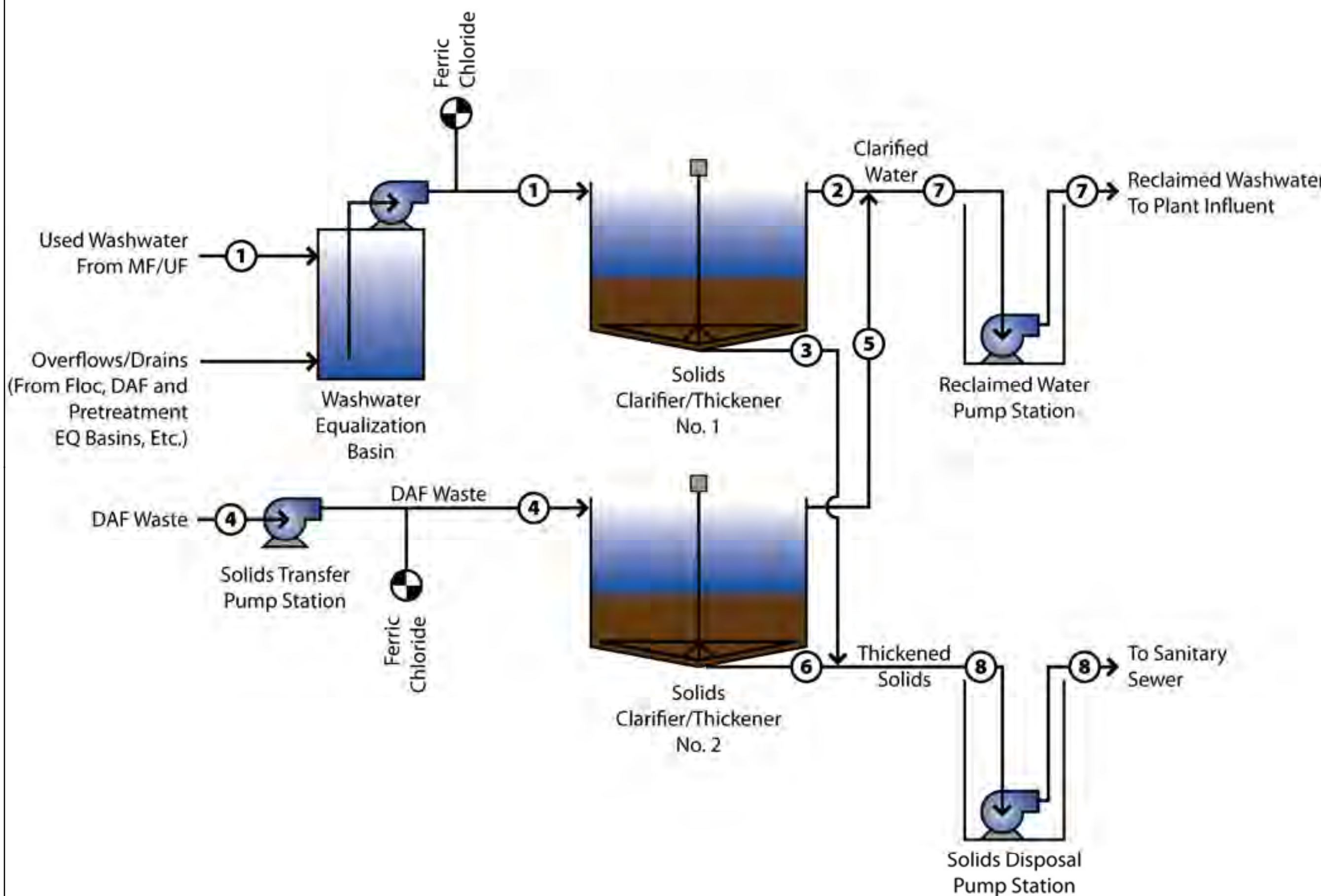




**Figure 4-12**. Diagram of Residuals Handling System – Sanitary Sewer Disposal Option

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## Table 4-5. Summary of Estimated Sewer Discharges

| Discharge Description | Frequency | Plant Capacity 2.5 mgd | |
|---|---|---|---|
| | | Average Day[1] (gpd) | Maximum Day[2] (gpd) |
| DISCHARGE COMPONENTS | | | |
| MF/UF Maintenance Washes[3,4] | Daily | 16,000 | 16,000 |
| Thickened Solids (2% solids) | Daily | 2,040 | 17,700 |
| Thickened Solids (0.3% solids) | Daily | 13,600 | 118,000 |
| Monitoring Instrument/Reagent Waste | Daily | 2,880 | 4,320 |
| Staff Potable Water Use | Daily | 120 | 140 |
| Equipment Washdown | 1 day in 30 | 0 | 1,200 |
| Plant Tours and Visitors' Water Use | 1 per day | 80 | 80 |
| MF/UF Cleaning Solutions Waste[3] | 1 day in 90 | 0 | 4,000 (not included in totals below)[3] |
| SWRO Cleaning Solutions Waste[3] | 1 day in 90 | 0 | 8,000 |
| TOTAL SEWER DISCHARGES – SANITARY SEWER OPTION[5] | | | |
| Total Sewer Discharge (2% solids)[5] | | 21,100 | 47,400 |
| Total Sewer Discharge (0.3% solids)[5] | | 32,700 | 148,000 |
| TOTAL SEWER DISCHARGES – LANDFILL DISPOSAL OPTION[5] | | | |
| Total Sewer Discharge (dewatered solids trucked offsite)[6] | | 19,100 | 29,700 |

Source: Information for table provided by CDM Smith.

Notes:

1. Average operations assume that the plant is producing 1.6 mgd of product water.
2. Maximum operations assume that the plant is operating at its design capacity of 2.5 mgd during winter storm events, when the solids in the raw seawater are at their highest anticipated concentration.
3. MF/UF maintenance washes (4 washes; 1 per unit; 4,000 gallons per wash) and MF/UF chemical cleanings would occur on separate days and therefore the cleaning waste is not added in the total discharges. MF/UF maintenance washes and SWRO chemical cleanings could occur on the same day and therefore both discharges are included in the discharge totals.
4. The California Department of Public Health (CDPH) advises water suppliers to dispose of the spent maintenance wash solutions instead of recycling the neutralized streams back into drinking water plants for treatment. The City and District may pursue provisions in the CDPH operating permit to allow for recycling of the maintenance wash streams. If this were allowed, it could reduce the average daily discharge to the sanitary sewer by 16,000 gpd. Recycling the neutralized MF/UF maintenance streams would not present increased health risks, and would have little or no effect on treatment.
5. All numbers are rounded to the nearest 100 or 1,000.
6. If thickened solids are directed to the landfill, all filtrate from the dewatering process would be recycled at the plant; and other discharges would be directed to the sewer system.

Acronyms:

CDPH = California Department of Public Health
gpd = gallons per day
MF/UF = microfiltration/ultrafiltration
mgd = million gallons per day
SWRO = seawater reverse osmosis

Assuming an average production of 1.6 mgd and dry weather conditions, approximately 340 pounds per day of dry solids by weight could be generated by the plant. When the plant is operating at the design production capacity of 2.5 mgd during winter storm conditions, approximately 2,950 pounds per day of dry solids by weight could be generated by the plant. The actual weight would depend on the percent of dry solids in the dewatered cake, which would range from approximately 25 to 50 percent dry solids, as noted above. **Table 4-6, Estimated Weight of Solids for Landfill Disposal,** provides the estimated weight of daily and annual solids that could be disposed of at a landfill, based on this range.

**Table 4-6. Estimated Weight of Solids for Landfill Disposal**

| Operating Conditions | Days Assumed | Dry Solids Weight (pounds/day) | Percent Dry Solids (%) by Weight | Landfill Disposal | |
|---|---|---|---|---|---|
| | | | | Daily Weight (pounds/day) | Annual Weight (pounds/year) |
| Average (1.6 mgd and dry weather conditions) | 335 | 340 | 25% | 1,360 | 455,600 |
| | | | 35% | 971 | 325,429 |
| | | | 50% | 680 | 227,800 |
| Maximum (2.5 mgd and winter storm conditions) | 30 | 2,950 | 25% | 11,800 | 354,000 |
| | | | 35% | 8,429 | 252,857 |
| | | | 50% | 5,900 | 177,000 |
| TOTAL ANNUAL[1] | | | 25% | -- | 809,600 |
| | | | 35% | -- | 578,286 |
| | | | 50% | -- | 404,800 |

Source: Information for table provided by CDM Smith and City of Santa Cruz.
Notes:
1. The total annual pounds per year is based on the addition of the pounds per year under average operating conditions (assumed to be 335 days per year) and pounds per year under maximum operating conditions (assumed to be 30 days per year).
Acronyms:
mgd = million gallons per day

## Chemical Use and Storage Facilities

As indicated above, a variety of chemicals would be required for treatment, disinfection, and membrane cleaning at the desalination plant. A list of the likely chemicals, a description of their purpose and how they are used, and estimated daily use and storage amounts for a maximum production of 2.5 mgd are provided in **Table 4-7, Chemical Use and Storage Requirements.** Material Safety Data Sheets for each of these chemicals are provided in **Appendix L**.

## Table 4-7. Chemical Use and Storage Requirements

| Chemical | Description of Use | Primary Application Points | Daily Use (gallons per day)[1] | Number of Tanks | Volume (gallons) |
|---|---|---|---|---|---|
| Ferric Chloride | Continuous coagulant addition to improve removal of suspended particulates and dissolved constituents during pretreatment. | Raw water before pre-treatment; Used washwater | Max: 167<br>Ave: 14 | 1 | 7,000 |
| Sodium Hypochlorite | Continuous use as a disinfectant at various process stages. | Raw water before pre-treatment; Post-treatment – before and after calcite contactors; MF/UF cleaning tanks | Max: 2,344<br>Ave: 300 | 1-2 | 5,000 – 12,000 |
| Sodium Hydroxide (Caustic Soda) | Intermittent use to improve boron rejection, control product water pH, clean MF/UF and SWRO membranes, and neutralize acidic cleaning solutions. | SWRO desalination treatment – before cartridge filters; Post-treatment – after calcite contactors; MF/UF and SWRO cleaning and neutralization tanks | Max: 192<br>Ave: 74 | 1 | 7,000 |
| Carbon Dioxide | Continuous alkalinity addition and pH reduction to improve calcium uptake during post-treatment. | Post-treatment – before and after calcite contactors | Max: 125<br>Ave: 48 | 1 | 3,100 |
| Calcite (Calcium Carbonate) | Continuous use to increase calcium levels and raise pH during post-treatment. | Post-treatment – within calcite contactors | Max: 7 cubic feet per day<br>Ave: 3 cubic feet per day | NA | No on-site storage[2] |
| Sodium Bisulfite | Use to de-chlorinate SWRO feedwater and prior to disposal of chlorinated discharges/solutions. | SWRO desalination treatment – before feedwater equalization basin; MF/UF and SWRO cleaning and neutralization tanks | Max: 168<br>Ave: 57 | 1 | 3,000 |
| Corrosion Inhibitor (phosphate) | Continuous phosphate addition to inhibit corrosion in the distribution system. | Post-treatment – before or after calcite contactors | Max: 9<br>Ave: 2 | 1 | 1,000 |
| Anti-scalant | To minimize SWRO membrane scaling and/or iron fouling | SWRO desalination treatment – before cartridge filters | Max: 14<br>Ave: 4 | 1 | 500 |
| Citric Acid/ Other Cleaning Chemicals | Used intermittently as a chelating agent to clean MF/UF and SWRO membranes. Other membrane-cleaning chemicals may also be recommended. | MF/UF and SWRO cleaning and neutralization tanks | Intermittent Use | 1 | 1,000[3] |
| Future/ Spare Chemicals | Space included allowing up to two chemicals for future treatment or cleaning requirements. | MF/UF and SWRO cleaning and neutralization tanks; Post-treatment - before or after chlorine contact basin (clearwell) | TBD | TBD | TBD |

Source: Adapted from Appendix L, scwd2 Seawater Desalination Plant – Phase 1 Preliminary Design: Volume 1 – Report & Volume 2 – Drawings, with additional information provided by CDM Smith.

Notes:
1. Maximum daily chemical use is based on operation of the plant at 2.5 mgd. Average daily chemical use is based on operation of the plant at an average rate of 1.6 mgd.
2. Delivered in bulk for loading into calcite contactors.
3. Ordered as needed and stored temporarily.

Acronyms:
MF/UF = microfiltration/ultrafiltration
mgd = million gallons per day
SWRO = seawater reverse osmosis
TBD = to be determined

The chemical systems would be divided into two separate areas, including outdoor storage and containment facilities and indoor metering equipment. Chemical storage tanks would be located along an outer wall of the membrane building or SWRO building, depending on the plant site alternative. The chemicals would be stored in accordance with applicable building and seismic codes, and applicable regulatory requirements for hazardous materials storage. In particular, each tank would be mounted on a concrete pad within a concrete containment structure sized to accommodate approximately 1.2 times the volume of the respective chemical tank to contain potential spills or leaks. Adjacent truck loading stations would have similar containment structures.

A canopy would cover the storage/containment area and concrete walls would separate each chemical area. Chemical resistant coatings would be applied to all concrete surfaces that could be exposed to chemicals. Chemical resistant sump pumps would be provided to remove potential spills or leaks from the storage/containment area and from adjacent truck loading stations. Manually operated drains to the sanitary sewer and storm drains would also be provided to remove wash-down water or rainwater. Safety showers/eyewash stations would be provided in each chemical containment structure and near truck loading stations.

Chemical feed areas would be located inside the membrane or SWRO building and adjacent to the outdoor chemical storage/containment areas. For each chemical system, metering pumps and/or transfer pumps, piping, instrumentation and controls would be mounted in a containment area separated from adjacent systems by a containment curb. Piping of hazardous chemicals would be double contained and would be located outside of containment areas. If leaks or spills occur the liquids would drain back to the outdoor containment structures for each respective chemical. Chemical application piping would be routed throughout the buildings in pipe trenches; and buried, double-contained pipe runs would be used to deliver chemicals to other facilities throughout the sites. Chemical resistant coatings and materials would be used in the chemical feed areas and safety showers/eyewash stations would be provided.

## Other Plant Facilities and Improvements

The desalination plant would also include space for other uses, including but not limited to: 1) operations and control, likely to also include reception, office(s), laboratory, conference room, restrooms, and kitchen/break room; (2) maintenance and facilities storage; (3) electrical operations and utility connections; (4) parking and access; (5) stormwater detention and retention; (6) landscaping; and (7) outdoor viewing and gathering areas. These facilities and improvements are further described below.

### *Operations and Control*

The control building would provide approximately 5,000 to 5,400 square feet of space for a range of operational uses, including a control room, a laboratory for water quality testing, a conference room, and offices. Other ancillary facilities in the building could include a kitchen and break room, and restrooms with lockers and showers.

### *Maintenance and Facilities Storage*

Space for a maintenance shop and a facilities storage area could also be included in the project to support the on-going operation of the plant. The building would provide space to park a vehicle indoors, load/unload equipment, tools and parts storage, workbench, and possibly a welding area.

### *Utilities and Services*

**Electricity.** According to the Desalination Plant Preliminary Design Report (**Appendix L)** and discussions with Pacific Gas and Electric Company (PG&E), primary electrical service (21 kilovolt) and secondary electrical service (4160 volt and lower) would be provided to the proposed desalination plant from existing electrical lines located in Natural Bridges Drive or Swift Street. The proposed project would install a service pad or small building at the plant site or the roadway right-of-way that would house transformers. The transformers would convert the 21 kilovolt primary service to medium voltage (4160 volt) to power the SWRO high pressure feed pumps and to low voltage (480 volt or less) to power all the other plant loads. The proposed design approach is similar to the recent electrical upgrade/expansion project at the City's Graham Hill Water Treatment Plant. However, PG&E would determine the actual configuration for the new electrical service to the plant during final design.

Standby power for the main process equipment is not proposed. Because the desalination plant provides a supplemental water supply, the **scwd²** Desalination Program anticipates that periodic, short-term interruptions in plant operations caused by power outages would be acceptable given the existing primary water supplies and existing treated water storage in the distribution systems of both the City and District service areas.

To protect personnel and facilities, a 250-kilowatt (kW) emergency diesel generator with integrated, double-contained fuel storage would be provided for operation of critical life safety systems and equipment shutdown systems in the event of an interruption in power supply from PG&E. These critical life safety systems include but may not be limited to onsite computers and data logging/control systems, SWRO system flush pumps, fire pump and sprinkler systems, ventilation equipment in areas with hazardous chemicals, and egress lighting.

A photovoltaic (PV) system could also be included at the proposed desalination plant. The preliminary design assumes that PV panels could be mounted on the roof of the control building, membrane building(s), DAF building, concentrate equalization basin, chlorine contact basin, and high service pump station. Sizing and design criteria for the PV system would be developed during final design. See **Section 4.6.6, Energy Use and GHG Minimization** for additional information about solar PV at the plant site.

**Natural Gas.** Gas service could be supplied to Plant Site A-1 from a 6-inch gas main in Natural Bridges Drive. Gas service could be supplied to Plant Sites A-2 and A-3 from a 4-inch gas main in Delaware Avenue. An existing 12-inch gas main traverses Plant Sites A-1 and A-3, which would need to be relocated to the north to accommodate project facilities on these sites.

**Sewer.** Sewer service for the plant would need to handle flows from both the sanitary system and the residuals or solids handling system. Sewer service for the plant site alternatives would be provided by an existing 10-inch sewer line in Natural Bridges Drive, or by an existing 15-inch sewer line in Delaware Avenue, depending on the plant site location and other factors.

For Plant Site A-1, a new sewer line and pump would be installed at this site to transport the flows west to the 10-inch line in Natural Bridges Drive. For Plant Site A-2, a new sewer line connection to the 15-inch line in Delaware Avenue would provide sewer services to this site. For Plant Site A-3, a new sewer line connection and pump would be installed at this site to transport flows to the western portion of this site where they could gravity flow south to the 15-inch line in Delaware Avenue. The sizing of new sewer service connections would be defined as design proceeds.

**Potable Water.** Water service for the plant site alternatives would be provided by an existing 10-inch water main in Natural Bridges Drive or by an existing 12-inch water main in Delaware Avenue, depending on the plant site location. For Plant Site A-1, a new water line to deliver potable water would be installed from Natural Bridges Drive. For Plant Sites A-2 and A-3, a new water line would be installed at these sites to deliver potable water from Delaware Avenue. The sizing of new water service connections would be defined as design proceeds.

*Stormwater Facilities*

According to the Desalination Plant Preliminary Design Report (**Appendix L)**, stormwater handling at the three alternative plant sites follows the City of Santa Cruz current requirements for Low Impact Development. The stormwater handling requirements for the three plant site alternatives were calculated based on the 25-year storm event and a safety factor of 1.25. Each site would allow for runoff from impervious roofs, structures, and roadways to first travel through vegetated swales, then to bio-retention areas. Excess stormwater flows would leave the site though storm drains under Delaware Avenue to Natural Bridges Creek and eventually into Natural Bridges State Beach Lagoon. The stormwater requirements for the proposed project are summarized in **Table 4-8, Stormwater Handling Requirements at Plant Site Alternatives**, and additional figures and data are provided in **Appendix L**.

The stormwater Low Impact Development requirements noted above are specified in the current City's Storm Water Best Management Practices (BMP) Manual, which is part of the City's Storm Water Management Plan (City, 2010b). The BMPs are mandatory under Municipal Code Section 16.19.130. The selection of the 25-year peak storm event noted above and other design specifications provided in **Appendix L** complies with the City's BMP Manual. Additionally, as indicated in the BMP Manual, peak stormwater runoff rates from the desalination plant site shall not exceed the estimated pre-development rate for this peak storm event.

**Table 4-8. Stormwater Handling Requirements at Plant Site Alternatives**

| Plant Site# | Project Area (square feet) | Design Flow Rate (cubic feet/second) | Minimum Required Bio-Swale Areas (square feet) | Required 25-Year Storm Event Volume (cubic feet) | Required Water Quality Treatment Volume (cubic feet) |
|---|---|---|---|---|---|
| A-1 | 191,300 | 12.44 | 6,100 | 7,000 | 18,025 |
| A-2 | 174,500 | 11.34 | 5,600 | 6,400 | 16,442 |
| A-3 | 290,611 | 18.89 | 9,300 | 10,600 | 27,382 |

Source: Appendix L, scwd2 Seawater Desalination Plant – Phase 1 Preliminary Design: Volume 1 – Report & Volume 2 – Drawings.

The proposed facilities for stormwater handling would capture the runoff at pavement edges and roof drains and contain the flow to slow the velocity, cool the temperature, filter the particulates, and percolate or detain the water. Several swales and smaller detention basins would be located throughout the sites rather than concentrating stormwater in one area. Detention basins would be planted with plant species that thrive in both extended dry and wet conditions. The stormwater facilities would be fully integrated into the landscape plans at each site.

The City's existing stormwater regulations will be revised effective September 2013[10]. **Appendix M, Santa Cruz Seawater Desalination Facility, Technical Memorandum on New Storm Water Regulations for the Central Coast Region of the Regional Water Quality Control Board,** was prepared by Bowman & Williams to evaluate the implications of the new regulations on the stormwater design and specifications for the proposed project. Based on this evaluation it is assumed that additional bioretention area above and beyond that recommended in **Appendix L** and described in **Table 4-8** above would be required to meet the new regulations. If additional area is not available at the plant sites under consideration, the implementation of an underdrain system would be required. An underdrain would consist of perforated pipes under the bioretention areas to drain out the collected runoff. The use of pervious pavement would also be considered to reduce the amount of additional bioretention areas needed. During final design, more detailed site investigations, involving soil percolation tests and other design-level studies, would be performed as the basis for developing the Stormwater Management Plan for the project in compliance with the new regulations. See **Appendix M** and **Section 5.1, Hydrology and Water Quality** for additional information.

[10] The new regulations will require that projects over 22,500 square feet in this area infiltrate runoff from the 95th percentile 24-hour rainfall event on site, including peak flow management for 2-year and 10-year storm events. If onsite conditions limit the ability to fully infiltrate the runoff at this rate, projects will have to ensure treatment of the runoff from the 85th percentile 24-hour rainfall event and the treatment may include an underdrain with an orifice to ensure that a minimum 48 hours of extended detention is provided for the treatment volume (Appendix M).

*Access and Parking*

Vehicle and pedestrian access would be provided from Natural Bridges Drive to Plant Site A-1; and from Delaware Avenue to Plant Sites A-2 and A-3. Access and internal roadways would be a minimum of 20 feet wide to accommodate emergency vehicle requirements, chemical delivery trucks and maintenance/light construction vehicles and/or equipment. Pedestrian access would comply with the Americans with Disabilities Act requirements. Because security would be important, perimeter site fencing would be installed and would likely consist of 8-foot high, visually-permeable metal fencing. An entry gate or gates would also be provided.

Parking spaces would be provided for the plant staff and a limited number of visitors' vehicles (including handicap spaces). The number of parking spaces would be refined during the design process and in conformance with the City's zoning ordinance. Additional parking for tour groups and visitors would be provided along Delaware Avenue and Natural Bridges Drive.

*Landscaping*

Landscaping would be provided at the desalination plant site. The ultimate landscaping plan would be determined as design progresses. At a minimum the landscaping would include grasses and butterfly nectar plants, as indicated in the Desalination Plant Preliminary Design Report (**Appendix L)**. See **Section 4.7** below for additional information about the planting of nectar plants.

*Outdoor Viewing and Gathering Areas*

Public outdoor viewing and gathering areas could also be provided at the plant. **Figures 4.7** through **4.10** illustrate how this type of area could be incorporated into the design of the plant.

## 4.4.4 Brine Storage, Disposal, and Conveyance System

During the SWRO process at the desalination plant, brine would be generated, and would be approximately twice as saline as seawater or about 60 parts per thousand. As indicated previously, the SWRO system would have the ability to operate with a recovery rate ranging from 40 to 50 percent and would generate up to about 3.8 mgd of brine, depending upon the recovery rate (see **Table 4-4**, above).

The brine would be blended with effluent from the City's WWTF and returned to Monterey Bay via the City's existing outfall. The ability to control brine discharge flow rates is needed to meet the potential regulatory limits for blending the brine with treated wastewater effluent. A brine equalization basin at the desalination plant would provide for on-site storage of brine, which would allow for controlled release of the brine (see **Figure 4-11**), as further described below.

The City's existing WWTF National Pollutant Discharge Elimination System (NPDES) discharge permit has a minimum initial dilution requirement (MIDR) of 139:1. While the existing permit and MIDR do not contemplate brine disposal, the proposed project has been designed to operate within the MIDR requirements of the existing permit. An additional design objective is that the combined discharge does not exceed ambient salinity of the receiving seawater. **Appendix J, Dilution Analysis for Brine Disposal via Ocean Outfall** (Dilution Analysis), was conducted by Brown and Caldwell in 2011 to determine the blending ratios of brine to WWTF effluent that would be achieved with the anticipated addition of brine to the WWTF outfall. The Dilution Analysis concludes that the NPDES MIDR requirements and the ambient salinity objective could be maintained by:

- **Improving WWTF outfall diffuser ports** - This improvement involves opening all of the existing WWTF outfall diffuser ports, and then adding new valves (Red Valves©) to the ports. Installing new valves over existing ports would allow the City to have all ports available at low flows, thus spreading the effluent flow along the entire diffuser length.

- **Providing for brine storage at the desalination plant** - The brine equalization basin would store brine during periods of low WWTF effluent flows, so that the brine can be discharged when the WWTF effluent has the flow rates needed to maintain the NPDES dilution requirements. Expected periods of low WWTF effluent flows requiring on-site storage of brine would occur at nighttime year round, and in the morning during the summer and fall.

The Dilution Analysis (**Appendix J**) also concluded that with properly sized brine storage and appropriate discharge controls, the combined discharge would not exceed the salinity of the receiving seawater (about 34 parts per thousand). The size of the brine equalization basin would be approximately 600,000 gallons; however, the size of the basin would be confirmed during final design and could be above or partially below ground.

The brine would be conveyed to the WWTF outfall via a new 30-inch pipeline between the desalination plant and the City's existing WWTF effluent outfall pipeline. The new 30-inch pipeline would be installed underground within the City rights-of-way between the desalination plant and the City's existing WWTF effluent outfall pipeline, at one of two potential connection points (see **Figure 4-3**). **Table 4-9, Potential Brine Conveyance Connection Points**, further describes these locations. Approximately 7,100 to 7,600 linear feet of new pipe would be required between the plant and the WWTF outfall, depending upon which connection point is pursued. Further, a 12-inch nozzle would inject brine into the WWTF effluent outfall at sufficient velocities to ensure complete mixing at all flow rates.

**Table 4-9. Potential Brine Conveyance Connection Points**

| Connection Point | Pipeline Route Street Location | Approximate Pipe Diameter (inches) | Approximate Pipe Length (linear feet) |
|---|---|---|---|
| Delaware Avenue/Palmetta Street | Delaware Avenue<br>Palmetta Street | 30 | 7,600 |
| Oxford Way, near David Way | Delaware Avenue<br>Almar Avenue<br>Oxford Way | 30 | 7,100 |

## 4.4.5 Potable Water Distribution System Improvements

A number of improvements to the existing potable water distribution system would be required to distribute product water from the desalination plant into the City's adjacent distribution system, and to share potable water with the District. A high-service pump station at the plant would pump the product water into the City's existing potable water distribution system, the closest point of which is located in Natural Bridges Drive (Plant Site A-1) or Delaware Avenue (Plant Sites A-2 and A-3).

The District would receive potable water from the City's distribution system through a new intertie between the two distribution systems, as shown in **Figure 4-5**. This water, provided to the District via the City-District intertie, would consist of water from various City sources, including desalinated product water from the proposed project.

The intertie would consist of new and replacement pipelines and upgrades to the existing Morrissey pump station and the planned and approved McGregor and Aptos pump stations. The existing underground Morrissey pump station would require additional pumping capacity and a 250-kW emergency generator with integrated, double-contained fuel storage. To accommodate this equipment, a reconstructed pump station would be built on the existing 600-square-foot pump station footprint. The new building could be up to 20 feet in height.

The District is planning to construct two new pump stations on McGregor Drive and Soquel Drive as part of their current Capital Improvement Plan. If the proposed desalination project is approved and permitted, these planned pumped stations would need to be upgraded. The McGregor pump station would require additional pumping capacity and a 125 kW emergency generator and the Aptos pump station would require a 100 kW emergency generator. Both of these generators would have integrated double-contained fuel storage.

Up to approximately 29,000 linear feet of new and replacement piping, likely ranging from 12 to 24 inches in diameter, would be required for the new intertie system. This piping would be located primarily within developed rights-of-way of the City, County, and Capitola. Preliminary alignments, including street locations, are provided in **Table 4-10, Summary of City-District Intertie System Improvements**. However, these alignments would be refined during design, and other developed rights-of-way could be included. Two alignment options are provided for the segment of the intertie system between the Morrissey pump station and the DeLaveaga water storage tanks. The preferred alignment option will be selected during final design based on engineering considerations and other factors.

**Table 4-10. Summary of City-District Intertie System Improvements**

| Type of Improvement | Description | Street Location | Approximate Pipe Diameter | Approximate Pipe Length |
|---|---|---|---|---|
| Morrissey Pump Station Upgrade | | | | |
| Pump Station Upgrade | Install three 2,100-gpm pumps; two in operation and one in standby mode. Install a 250 kW emergency generator with integrated, double-contained fuel storage. Expand existing pump station by constructing an above grade building on existing 600-square foot pump station footprint, to accommodate the above installations. | Morrissey Boulevard; Highway 1 | NA | NA |
| Morrissey Pump Station to DeLaveaga Tanks – Morrissey Alignment Option | | | | |
| Pipe | Install new piping between pump station and tanks. | Morrissey Boulevard; Prospect Heights; City Right-of-Way | 24-inch | 5,150 feet |
| Morrissey Pump Station to DeLaveaga Tanks – Trevethan Alignment Option | | | | |
| Pipe | Install new piping between pump station and tanks. | Trevethan Avenue; Prospect Heights; City Right-of-Way | 24-inch | 6,000 feet |
| DeLaveaga Water Storage Tank to City-District Intertie | | | | |
| Pipe | Install new piping. | City Right-of-Way; Brookwood Drive; Paul Sweet Road; Commercial Way; Soquel Drive | 24-inch<br>20-inch | 7,950 feet<br>2,250 feet |
| City-District Intertie to Planned McGregor Pump Station | | | | |
| Valve | Install underground vaulted pressure-reducing valve / flow control valve at connection point. | Soquel Drive; 41st Avenue | NA | NA |
| Pipe | Install new piping. | Soquel Drive; Daubenbiss Avenue; Walnut Street; Porter Street; Main Street; Soquel Drive; Park Avenue; McGregor Drive | 12- to 18-inch | 12,600 feet |
| McGregor Pump Station Upgrade | | | | |
| Pump Station Upgrade | Upgrade pump station to provide up to 670 gpm of additional pumping capacity. This upgrade would provide for a total capacity of 1,740 gpm. Install a 125 kW emergency generator with integrated, double-contained fuel storage. No building expansion is contemplated. | McGregor Drive | NA | NA |
| Aptos Pump Station Upgrade | | | | |
| Pump Station Upgrade | Install a 100 kW emergency generator with integrated, double-contained fuel storage. No building expansion is contemplated. | Soquel Drive | NA | NA |

Source: Appendix BB, Desalination Plant Hydraulic Modeling and Analysis.
Acronyms:
gpm = gallons per minute kW = kilowatt NA = not applicable

# 4.5 Project Construction

This section describes the construction phase of the proposed desalination project. **Appendix N, scwd**[2] **Regional Seawater Desalination Project EIR Project Construction Assumptions,** provides additional information about the construction details of each project component, including but not limited to the area of disturbance, estimates for cut and fill, trench dimensions for pipeline construction, construction duration, and construction equipment. Additionally, construction specifications related to erosion control, dust control, noise and vibration control, and traffic control are incorporated into the proposed project definition (see **Section 4.7** for these specifications). These assumptions and specifications are incorporated into the environmental evaluation contained in this EIR, as relevant.

The following sections provide an overview of construction activities related to onshore project components, as well as shoreline and offshore project components. The level of detail provided for the shoreline and offshore project components is greater than that provided for the onshore components given the complexities of constructing facilities in coastal environments.

## 4.5.1 Onshore Components

Construction activities for the desalination plant would include:

- Mobilizing temporary field offices;
- Preparing temporary equipment and materials staging areas;
- Installing temporary power, lighting, potable water, security systems, and other items;
- Clearing and grading site; building elevations and earthwork calculations would be determined during final design, but it is preliminarily estimated that approximately 14,000 cubic yards of cut, and approximately 11,000 cubic yards of fill could be required, depending on the plant site chosen;
- Implementing stormwater handling facilities;
- Constructing underground utilities and yard piping for brine, process water, potable water, wastewater, natural gas, and electrical transmission lines;
- Constructing foundations for buildings and treatment structures (e.g., buried, partially buried, and above grade facilities); foundations may include mat foundations, driven piles, or potentially other variations based on geotechnical conditions;
- Constructing buildings and treatment facilities;
- Installing mechanical, electrical, and instrumentation and control system equipment;
- Construction concrete pad and electrical transformers;
- Installing paving, landscaping, stormwater handling, and security features; and
- Inspecting, starting-up, and testing equipment and systems.

Because the three alternative plant sites may not include sufficient additional open space for construction-related activities, up to approximately one acre of additional area could be required for the temporary field offices and staging. The staging area would be defined in the final design documents after a site has been selected. Staging areas would most likely be on the plant site or on immediately adjacent infill properties within Area A (see **Figure 4-4**).

Construction activities for onshore pipelines associated with the desalination plant, including the raw water transfer pipeline to the plant, the brine pipeline to the City's WWTF outfall, and the potable water pipelines, would involve clearing and grading, trenching, pipe installation, backfilling and compaction, hydrostatic testing, and cleanup and restoration.

The vast majority of pipeline construction would occur in paved public rights-of-way. An exception to this includes the crossing of Arana Creek at Brookwood Drive for the installation of potable water piping associated with the City-District intertie. Given the characteristics of this existing roadway crossing, construction of the pipeline within the existing road and bridge crossing would not likely be possible. The creek would be crossed using one of two methods. The first option includes crossing the creek using instream work. This first option would involve diverting stream flow from the creek with a temporary bypass, trenching through the existing Brookwood Drive crossing of the creek using a box trench if needed, pipe installation, backfilling and compaction, hydrostatic testing, and cleanup and restoration, as described above for other pipelines. There could be certain conditions under which the existing culvert smay need to be replaced with such an option. The second option includes the use of tunneling methods (e.g., horizontal directional drilling, microtunneling) under the creek, which would not result in instream construction activities. These two options are illustrated in **Figure 4-13, Arana Creek Crossing Construction Options**.

The Morrissey pump station upgrades would involve expansion of the existing underground pump station building, and would involve the installation and testing of new pumps, an emergency generator, and related equipment. The McGregor pump station upgrades would only involve the installation and testing of new pumps and related equipment, as well as the addition of an emergency generator; however, no building construction is anticipated. An emergency generator would also need to be added to the planned Aptos pump station, which would involve minimal construction.

## 4.5.2 Shoreline and Offshore Components

The seawater intake structure and intake pipeline would extend offshore from an onshore or nearshore intake pump station. The connection of the brine pipeline to the WWTF outfall could occur at one of two brine pipeline connection points being considered, which would result in the need for some construction-related activities at or near the Junction Structure at Mitchell's Cove. The construction of both of these elements is further described below.

## *Seawater Intake System*

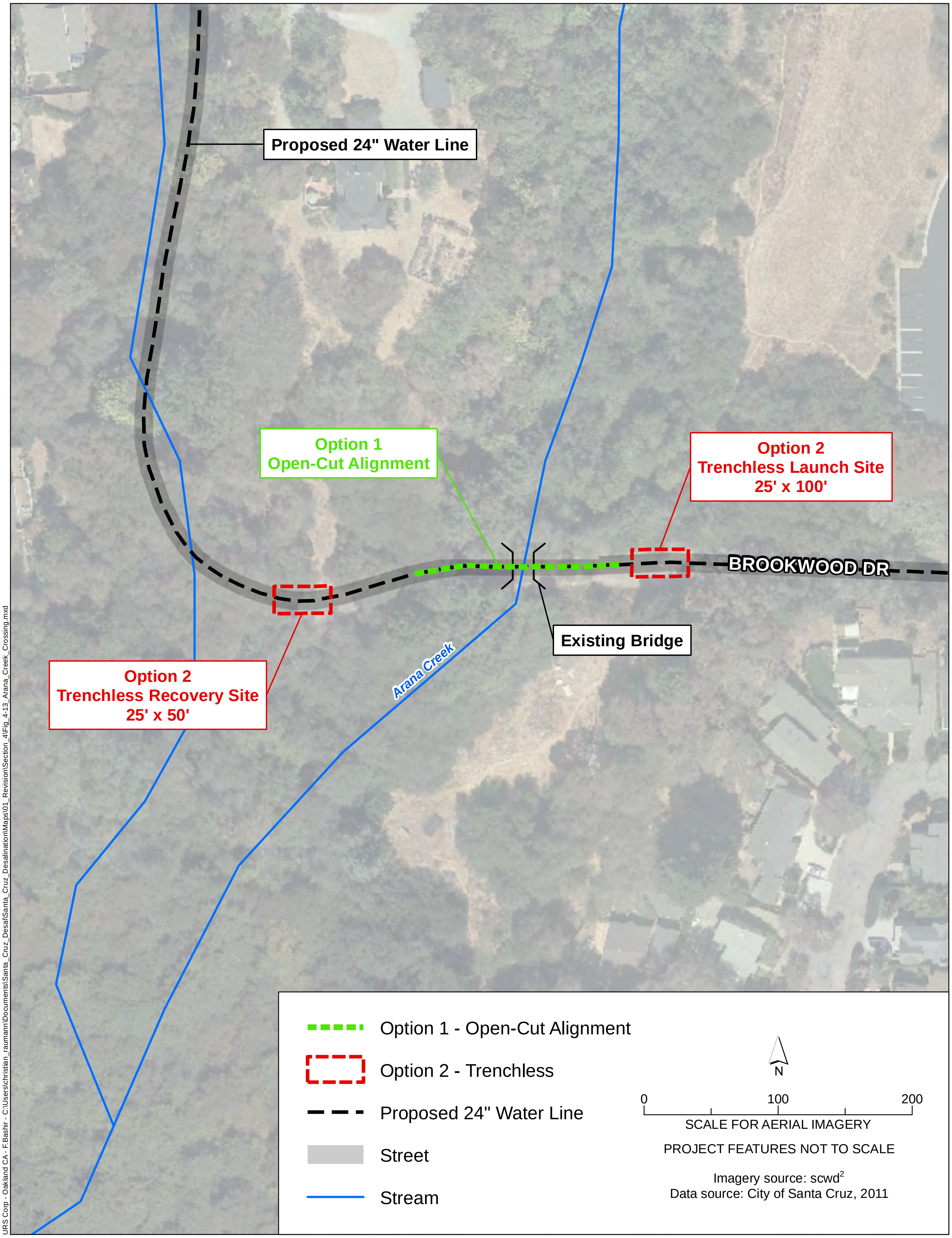
The likely construction methods for the intake sites under consideration have been defined in the Intake Conceptual Design Report (**Appendix I**), based on the geologic profile for each site location. There are two general geologic soil types in the local offshore environment: sandy soils (Intake Sites SI-9, SI-17, and SI-18), and bedrock (Intake Sites SI-4, SI-5, SI-7, SI-14, and SI-16). It is preliminarily estimated that up to approximately 19,000 cubic yards of material would be side cast and reused during intake pipeline construction in sandy soils (SI-9, SI-17, and SI-18), and approximately 7,500 cubic yards of material would be removed during the excavation and installation of the intake structure and intake pipelines in bedrock (SI-4, SI-5, SI-7, SI-14, and SI-16).

The construction of each of the components of the intake system is further described below.

### Intake Pump Station

The construction for the seawater intake system would be initiated at the selected pump station location. For a pump station on any one of the onshore sites (Intake Sites SI-4, SI-5, SI-7, SI-14, SI-16 and SI-18), the initial activity would be site clearing, followed by construction of a temporary launch shaft for tunneling the intake pipeline. The launch shaft would be modified to accommodate the pump station wet well, which would be sized large enough to accommodate the pre-cast concrete forms used in the construction. Once the structural work is complete, the piping, power supply and site wiring, pumps, and other equipment would be installed. Site improvements would also likely include final grading, paving for driveway and parking spaces, fencing and gates, and possibly minor landscaping.

Intake Site SI-17 would entail constructing a new free-standing pump station immediately adjacent to the Municipal Wharf, which would be surrounded by new decking. If this site is selected, the precise distance from the Wharf will be determined during final design, in coordination with the City Parks and Recreation Department to ensure the integrity of the existing wharf structure is maintained. The new pump station would be built in the sandy soil area upon a pile foundation. Pile installation would be accomplished from a barge, placed into the sandy soils using driven or vibratory methods. Approximately 25 piles are anticipated which would be placed 50 feet deep. After the piles are installed, construction of the pump station building would commence. The pump station building would be made of reinforced concrete and could be built either on land (in the dry) or in water (in the wet). If built in the dry, the pump station building would be fully constructed at a nearby port or harbor then floated over to the Municipal Wharf and then lowered into place. If built in the wet, the pump station building would be fully constructed at the end of Municipal Wharf.

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URS City of Santa Cruz and Soquel Creek Water District
**scwd**[2] Regional Seawater Desalination Project

**Figure 4-13**
Arana Creek Crossing Construction Options

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Building in the wet would require placement of temporary forms in the water to shape the concrete. Placement of concrete in water areas uses a method called tremmie, which is a well-established construction method. In the tremmie method, concrete is placed from the bottom of the structure upwards which displaces the water as the concrete fills the temporary forms. Concrete placed in sea water locations would include special additives to make it resistant to the saline environment. The concrete would cure for about 7 days and then the temporary forms would be removed. Once the pump station building is finished, work would begin on the interior components (e.g., mechanical, electrical).

## Intake Pipeline

The recommended intake pipeline construction for the eastern sandy area (Intake Sites SI-9 and SI-18) identified in the Intake Conceptual Design Report (**Appendix I**) would be completed in two segments. The first segment would be constructed from the pump station using tunneling methods, and would address the portion of the alignment from the pump station sites, under Beach Street, the Boardwalk, and out past the surf zone. Tunneling would stop without penetrating the ocean floor. The second segment would be constructed using dredging methods, and would address the portion of the alignment in the ocean from just past the surf zone to the intake screens. Construction would begin just off shore using a barge and clamshell-type dredging equipment to expose the first segment of intake pipeline. A new trench would be dredged for the intake pipelines to a location adjacent to the end of the Wharf. The dredged material would be side cast and used to cover the intake pipelines once in place. It is possible that the second segment could also be laid on the ocean floor and anchored, as opposed to dredged and buried. This would also involve the use of a barge mounted crane.

The eastern sandy area also includes Intake Site SI-17, and the intake pipelines from the pump station for SI-17 would also be constructed using dredging methods similar to those described above for the second segment of piping for Intake Sites SI-9 and SI-18. The transfer pipelines from the pump station for SI-17 to the shore, which would deliver the seawater to the desalination plant, would be placed well off the east side of the Wharf and buried below or laid upon the sea floor and anchored. Tunneling would be used to get the transfer pipelines through the beach and surf zone, as described above for the first segment of intake piping for Intake Sites SI-9 and SI-18.

The recommended intake pipeline construction in the western bedrock area (Intake Sites SI-4, SI-5, SI-7, SI-14, and SI-16) would also be completed in two segments. The first segment would be constructed from the pump station using tunneling methods and would address the portion of the alignment from the pump station site on shore, through the surf zone, and out past the kelp forest to the intake structure location. Tunneling would stop without penetrating the ocean floor. The second segment would be constructed using dredging methods and would address the short connecting pipeline to the intake screens. Construction would include removal of the sandy layer over the bedrock and excavation of bedrock to expose the first segment of intake pipeline. The sand would be pushed back from the work area and stockpiled on the seafloor for future replacement. A number of construction methods could be used to excavate the rock, including: drilling, sawing, or hammering, as described below:

- Drilling would involve using a small- or large-diameter drill to break up the rock.
- Sawing would involve using a large hydraulic saw, similar to a chainsaw, to make cuts down into the rock.
- Hammering would involve using a hydraulic hammer, similar to a jack hammer, which would break the rock up in layers.

The loose rock would be removed and set aside on site using a barge mounted clamshell dredge. Additional work would be required by divers to trim the excavation to the final shape. This work would be done by hand with impact tools (e.g., hammers, shovels). Turbidity screens could be used to contain the excavation work, due to the presence of kelp forests nearby. A turbidity screen (or turbidity curtain) is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather it prevents suspended sediment from getting out (California Stormwater Quality Association, 2009).

## Intake Structure

At intake alternative sites SI-4, SI-5, SI-7, SI-14, and SI-16, located in rocky-bottom habitats, tunneling underground would be done from land to approximately 100 feet offshore from the edge of kelp beds, to avoid sensitive kelp bed habitats. The 100-foot distance from the edge of the kelp bed was established for design purposes during the Intake Conceptual Design Report (**Appendix I**). The location and setback from the kelp beds would be further refined during design, and as a result of regulatory permitting.

The screened, open-ocean intake structures are well suited for factory construction. All of the components could be assembled and attached to a precast, reinforced-concrete base slab on land and then placed in the ocean with a barge mounted crane. This approach would allow a high degree of precision for locating the screens in an optimum location. In the eastern sandy area (Intake Sites SI-9, SI-17, and SI-18), the design approach is to set the screen assembly on the sandy ocean floor unanchored, which would not involve any dredging or excavation. In the western bedrock area (Intake Sites SI-4, SI-5, SI-7, SI-14, and SI-16), the design approach is to anchor the screen assembly to the bedrock, which would involve removing the sand layer on the seafloor above bedrock. Holes would then be drilled in the bedrock to anchor the screen assembly to the bedrock. Once the new intake screens are lowered into place, they would be attached to the intake pipelines as described above.

## Construction Staging

Construction staging for Intake Sites SI-4, SI-5, SI-7, SI-14, and SI-16 would be located at or near the selected desalination plant site, as described previously. Construction staging for Intake Sites SI-9, SI-17, and SI-18 could be located on a Beach Area parking lot, Depot Park, or at a more remote location, if necessary to avoid Beach Area conflicts. The staging area would be defined in the final design documents after a site has been selected. Traffic control plans will minimize or avoid temporary loss of parking and lane closures in coastal locations due to worker parking and construction staging (see **Section 4.7** for construction specifications requiring traffic control plans).

### *Brine Pipeline*

The Dilution Analysis (**Appendix J**) recommends that brine be added downstream of the sluice gates through the precast slab, to limit the exposure of structures in the WWTF outfall to high-salinity water and increased corrosion potential. However, this would require construction on the beach. To avoid beach construction, the two brine pipeline connection points being considered are upstream of the sluice gates. To address corrosion potential, the sluice gates located in the Junction Structure would either have to be coated with corrosion resistant material or replaced.

Replacement or coating of the gates would require removal of the existing covers over the sluice gate junction box and removal of the existing gates and installation of new gates or coating of the existing gates in place. The use of a crane over several weeks would be required, which would be located at street level above Mitchell's Cove. No construction on the beach would be required. Since the WWTF outfall discharges continuously, work would require several flow outages from the WWTF and from the City of Scotts Valley and County of Santa Cruz discharges that also flow through the outfall system. This would likely require night-time construction work during low wastewater flow periods.

## 4.5.3 Construction Equipment Requirements

Construction of the proposed desalination project would require a variety of construction equipment ranging from earthmoving equipment, barges, and cranes, to delivery trucks and personal vehicles. Temporary facilities for lighting, power, stormwater handling, as well as other uses would also be required. **Appendix N** presents an estimate of the major construction equipment that would likely be required for the construction of the proposed desalination project.

## 4.5.4 Workforce and Schedule

The exact construction schedule for the proposed 2.5-mgd project is not known with precision given the complexity of the project approval and regulatory permitting process. However, if approved and permitted, construction could begin in 2016 and be complete by 2019.

The construction workforce at the proposed desalination project would include personnel primarily associated with the general contractor and subcontractors, owners, engineer, and construction manager. Frequent visits to the plant site would occur from regulators, special inspectors, equipment vendors, and others. **Appendix N** presents the construction schedule for the proposed project and the likely overlap of the construction of the various components.

Based on the anticipated construction schedules of 30 months for Plant Sites A-1 and A-2, and 32 months for Plant Site A-3, the desalination plant would initially require a workforce of approximately 4 to 8 persons during the initial mobilization and site preparation phases. The workforce at the site would increase during months 6 through 18, with an average estimated workforce of 40 persons, and a conservative peak workforce of up to 80 persons. During the testing and commissioning phases, approximately 15 to 30 persons are anticipated at the site, including the operating staff.

The intake system, brine conveyance, intertie pipelines, and pump station upgrades would be constructed concurrently during a 14- to 16-month construction schedule that would overlap with the construction schedule of the desalination plant. During this construction schedule, offshore work involving the use of a barge would take: approximately 3 months for Intake Sites SI-4, SI-5, SI-7, SI-14, and SI-16; approximately 9 months for Intake Sites SI-9 and SI-18; and up to 15 months for Intake Site SI-17. Based on the anticipated construction schedule for these elements, each of these components would require a workforce ranging from approximately 6 to 16 persons during the majority of the construction period. Assuming that construction of these components takes place concurrently, a total average estimated workforce of 34 persons, and a peak workforce of up to 64 persons, could be required for these components of the project.

It is generally assumed that construction activities would occur Monday through Friday, and would comply with the noise ordinances of the jurisdiction where the construction would take place. See **Section 5.6, Noise**, for additional information about construction-related noise.

# 4.6 Operation and Maintenance

## 4.6.1 Project Operations

The desalination plant would likely operate 24-hours a day, 365 days a year. The plant would be centrally operated from a computerized control system that would assist the plant staff in operating and monitoring the process equipment. Operators would regularly inspect equipment and conduct water quality analyses during each shift to check water quality and verify instrument readings. The seawater intake pump station would be remotely controlled from the desalination plant.

The City and District propose to cooperatively operate the desalination plant to provide water to each agency during different times to meet the different objectives and needs of the two agencies. **Table 4-11, Desalination Project Priority System**, shows which agency would have priority for the desalinated water each month, and the maximum daily amount that they could use.

**Table 4-11. Desalination Project Priority System**

| Month | 1st Priority Quantity (mgd) | 2nd Priority Quantity (mgd) |
|---|---|---|
| January | District 2.5 | City 2.5 |
| February | District 2.5 | City 2.5 |
| March | District 2.5 | City 2.5 |
| April | Shared 1.25 each | Shared 1.25 each |
| May | City 2.5 | District 2.5 |
| June | City 2.5 | District 2.5 |
| July | City 2.5 | District 2.5 |
| August | City 2.5 | District 2.5 |
| September | City 2.5 | District 2.5 |
| October | City 2.5 | District 2.5 |
| November | Shared 1.25 each | Shared 1.25 each |
| December | District 2.5 | City 2.5 |

Source: Appendix P, City of Santa Cruz and Soquel Creek Water District Agreements Related to the Proposed Seawater Desalination Projects.
Acronyms:
mgd = million gallons per day

Although the City would have priority to use the desalination plant during the summer months of any year, it is expected that the City would typically use the desalination plant during years of below-normal water supply, as determined by stream flows and diversion limits in the City's surface water sources. The proposed priority of use schedule would provide the City with a reliable water supply during water supply shortages, and allow for operational flexibility with the use of Loch Lomond Reservoir and surface water sources. Water supply shortages may occur during dry or drought conditions or as a result of the City's pending habitat conservation planning, which will likely reduce surface water supplies available to the City. During all other times, the desalination plant is expected to operate at a lesser capacity to provide the District water to offset groundwater that would otherwise be pumped from the aquifers, therefore allowing coastal groundwater levels to recover to target levels. Given that the capacity of the proposed desalination plant is 2.5 mgd, this EIR provides for a worst-case analysis of the proposed project operating at its full capacity, and there are instances where average plant operations (1.6 mgd) are also evaluated.

For the City, the IWP sized the plant at 2.5 mgd to meet the approved reliability targets, which limit the frequency and magnitude of curtailment during droughts, given estimates of projected demand. Recent 2012 modeling confirms the need for a 2.5 mgd plant, based on estimates of reduced surface water diversions likely to result from the HCP process and current demand projections (see **Appendix C, Evaluation of Future Water Supply Shortages and Need for Supplemental Supply Given Probably Habitat Conservation Plan Conservation Strategy Flow Requirements**). For the District, the 2012 IRP Update documents the need for supplemental supply to be approximately 1,500 acre-feet per year (afy) (or 1.3 mgd) in 2015.

This is based on the supply shortfall arrived at by using District demand projections identified in the 2010 UWMP and limiting District groundwater pumping to 2,900 afy to help restore protective groundwater levels. The preliminary design of the SWRO Treatment Plant would allow this annual supplemental supply goal to be met in all year types. In other words, the treatment plant design allows for a range of production from approximately 0.8 mgd to 2.5 mgd. For example, in a normal water year, the District could receive 1.3 mgd throughout the year; in a critically dry year they could receive 2.5 mgd during the winter months as the City would likely have exercised its priority during summer months. The average production condition is conservatively estimated at 1.6 mgd.

## 4.6.2 Maintenance Procedures

### *Desalination Plant*

Operation and maintenance activities would likely include the activities listed below. The frequency of maintenance activities is also provided below where possible.

- Treatment system operation and periodic cleaning, inspection, and maintenance (daily);
- Periodic pipeline cleaning, inspection, and maintenance (annually or more frequently);
- Water quality sampling and analysis (daily, weekly, monthly);
- Chemical delivery oversight (weekly and monthly);
- Solids thickening operations, testing, and discharge (daily or weekly, see discussion of Residuals Handling and Disposal in **Section 4.4.3, Seawater Desalination Plant,** above);
- Membrane integrity testing, cleaning, and replacement (daily, weekly, monthly; frequency of membrane replacement to be determined, see discussion of Residuals Handling and Disposal in **Section 4.4.3** above);
- Cleaning solution neutralization and disposal (daily, weekly, or monthly, see discussion of Residuals Handling and Disposal in **Section 4.4.3** above);
- Electrical testing and service (annually or more frequently);
- Emergency generator testing (monthly);
- Instrument testing and calibration (daily, weekly, or monthly); and
- Miscellaneous tasks required for preventative maintenance of all mechanical equipment, instruments, treatment systems, and support systems (frequency to be determined);
- Grounds and landscaping maintenance (daily or weekly);
- General maintenance, cleaning, and housekeeping (daily or weekly); and
- Vehicle maintenance (daily, weekly, or monthly).

### *Seawater Intake System*

Per the Intake Conceptual Design Report (**Appendix I**), regular maintenance would be required on the open-ocean intake screens and intake pipeline. The initial maintenance schedule is anticipated to be on a quarterly basis, but would be monitored and adjusted accordingly. Although alloy materials are recommended to minimize biogrowth[11] on the intake screens, divers would be required to visit the screens for visual inspection and to manually remove materials from the screen with brushes, if needed. If the screens are extremely fouled (or damaged), they could be unbolted from the pipeline and lifted up to a barge for service.

The interior of the intake and transfer pipelines would be cleaned with a process called pigging. This cleaning method employs an interior scrubbing device called a "pig" that would be inserted into the pipelines at the intake pump station and launched with water pressure through the pipelines toward the intake structure, where it would be released and retrieved. This would also be done less frequently from the desalination plant towards the intake pump station and intake structure. The pig has an abrasive coating that scrubs the pipeline walls, removing any natural buildup of ocean sediments, mineral deposits, and biogrowth. Additionally, a strainer would be placed in-line at the intake pump station to remove barnacles or other larvae that could grow in the transfer pipeline if not removed. These strainers would backflush automatically.

Detailed information is not available at this stage of preliminary design regarding the frequency of pipeline cleanings, volumes of flush water that would be generated, and characteristics and volumes of debris that would be produced. These items and other issues are being further investigated by **scwd²** and results would be incorporated into the final design of the facilities. For example, the design team would consider regular cleanings of the transfer pipeline and the discharge path of the flush water (i.e., the flush water could be stored and blended with treated wastewater effluent or sent directly out from the plant to the Monterey Bay through the pigging process).

Other things being considered include the addition of fresh water or chlorine to the flush water, between the intake pump station and the desalination plant, to prevent biological growth and aid the removal of biofilm and other nuisance growths during pipeline cleanings. If chlorine were added, provisions would be made during final design to apply sodium bisulfite, a dechlorinating agent, to the flush water to eliminate chlorine residuals in the discharges to Monterey Bay.

## 4.6.3 Product Water Quality and Monitoring

The product water produced by the plant must meet all primary and secondary drinking water standards, testing requirements, and procedures set forth in Title 22 of the California Code of Regulations. Based on the pilot studies conducted, the proposed desalination project can meet or

[11] Biogrowth refers to the establishment and growth of marine organisms, such as barnacles, on the intake screens or the inside of the intake pipelines.

exceed all of these drinking water standards (see **Appendix D**). **Section 5.1, Hydrology and Water Quality**, provides additional information about product water quality.

### 4.6.4 Personnel

The proposed plant would be staffed by up to six full-time equivalent operators, two part-time maintenance workers, and a part-time supervisor. The maximum number of staff at the facility at any one time during normal operations would be six, with an additional staff member during worst-case operations. The total workforce is estimated at nine. Other visitors and activities at the plant could include:

- Educational and industry-related tours of the plant; the current assumption is one tour per day with up to 40 visitors per tour.
- Staff meetings, if a conference room is included in the control building, which could include City and District staff, or other agency staff.
- Outside contractors and vendors that would service and inspect equipment and facilities.

### 4.6.5 Emergency Procedures

California law requires the City, as the operator of the plant, to submit a plan to the Santa Cruz County Environmental Health Department that describes in detail the type and volume of chemicals to be used at the proposed desalination plant. The plan must include a reporting and monitoring process for any spills that may occur. It also must include requirements for safety equipment, automatic shut-off valves, and other safety procedures that may be required, depending on the types and volumes of chemicals stored and used. The potential for plant upset conditions and accidents would be minimized by careful design (with secondary containments sized to confine the entire contents of stored chemicals, as previously described), proper training of operators, and having an emergency response plan in place that outlines procedures to quickly react in the event of an accident or spill. See **Section 5.11, Hazards and Hazardous Materials** for additional information about the requirements that would be imposed on the proposed project.

Additionally, the City of Santa Cruz Water Department maintains a *General Emergency Plan and Emergency Response Plan for Terrorist Activity and Natural Disasters* that outlines the procedures to be put into place in the event of an emergency affecting or related to water supply in its service area (City, 2005b). As a water supply in the City's service area, this plan would also apply to the operation of the proposed desalination plant. It addresses the types of emergencies that could occur and provides a response plan, which includes public information and notification procedures that would be implemented in the event of an emergency.

## 4.6.6 Energy Use and GHG Minimization

### *Introduction*

The energy requirement of seawater desalination and associated GHG emissions are among the key issues in the evaluation of the proposed project. To address this issue, the City Council and the District Board of Directors have voluntarily agreed via resolutions that the proposed project would be **net carbon neutral** (City, 2012e; District, 2012b). This means that the proposed project would be designed and operated such that there would be no net increase in GHG emissions as compared to the existing environmental setting. The approach for achieving net carbon neutrality is presented in **Appendix O, Summary of scwd**[2] **Energy and GHG Reduction Approach**, prepared by the **scwd**[2] Desalination Program to support this EIR. The Energy Minimization and GHG Reduction Approach has been prepared by **scwd**[2] to ensure that advanced and energy efficient desalination technologies and approaches are identified and incorporated into the proposed project design, and to identify additional energy efficiency, renewable energy, and GHG reduction projects and programs to offset the net increase in direct and indirect GHG emissions associated with the proposed project. **Appendix O** includes the following:

- The existing energy consumption and indirect GHG emissions for both agencies' collection, treatment and distribution of existing water sources. The existing conditions are based on information gathered for 2010, the year that the California Environmental Quality Act (CEQA) Notice of Preparation for this EIR was issued for the proposed project. (Existing direct emissions are not readily calculated or available for the existing systems and are considered negligible.)
- The maximum energy and GHG emissions (indirect and direct) associated with operations of the project.
- The energy minimizing devices that would be incorporated into the project design.
- GHG reduction requirement to meet the net carbon neutral objective for the project.
- Basis for identifying, assessing and recommending feasible and reliable GHG reduction projects and programs that could ultimately be pursued to achieve the GHG reduction objective of the two agencies.
- Annual indirect and direct GHG emission reduction accounting procedures and Annual True-Up Approach.

### *Basis for Project GHG Calculation*

To assess the net increase in GHG emissions that would result if and when the proposed project were to come on line, the EIR evaluation determines the extent to which the project would increase or reduce GHG emissions as compared to the existing environmental conditions (2010 based on Notice of Preparation issuance). The addition of desalinated product water to the water supply portfolios of both agencies results in changing operations of traditional sources (e.g., reduced groundwater pumping) that, in turn, reduce energy use and GHG emissions of those traditional sources. Therefore, in order to provide a comparison of the effects of the proposed project against existing conditions under CEQA, the GHG emissions associated with the total water supply portfolio of each agency in 2010 (surface and groundwater production) would be compared to the GHG emissions associated with the total water supply portfolio (surface, groundwater and supplemental desalination production) in the assumed earliest likely start year, 2016. Using this approach, the net increase in energy use and associated GHG emissions can be determined.

The project would be designed with high-efficiency processes including energy recovery devices, variable speed pumps, high efficiency motors, and enhanced reverse osmosis membrane materials, as previously described. With these design features incorporated, the project would require 15 kilowatt-hours of power per thousand gallons (kWh/kgal) of water produced, which is considered a conservatively high estimate and within the accepted range for high-efficiency desalination design. This power factor, which addresses the operation of all components of the project, is used in calculating the net increase in energy use and associated GHG emissions that would result with the proposed project. The published PG&E emissions factor for GHG emissions is also used in this calculation. Over time, GHG emissions associated with project operation would be reduced as PG&E complies with Assembly Bill 32 (AB 32) and the California Renewable Energy Executive Order, which would mean that the amount the City and District would have to annually offset would be reduced accordingly.

The annual true-up approach would address any differences between projection assumptions and actual design conditions with regard to this power factor. The annual true-up approach would also ensure that the net carbon neutral objective is met on an annual basis by adjusting required emissions reductions going forward to account for any gap between estimated emissions and actual emissions in a given year. If in any given year the implemented GHG reduction portfolio does not meet the net carbon neutral objective, additional certified offsets would be purchased to make up the difference. An annual GHG True-Up Report would be prepared and submitted to the appropriate regulatory agencies and kept on file at the City and District.

See **Appendix O** and **Section 5.5, Air Quality and Climate**, for additional information about how the net increase in GHG emissions has been calculated.

### *GHG Reduction Analysis*

A GHG reduction project and program analysis has been conducted to review GHG reduction projects and programs that could be implemented to reduce the net increase in GHG emissions that would occur with implementation of the project. The overarching goal of the evaluation was to identify real, verifiable, and permanent GHG reduction projects and programs to ensure their feasibility in achieving the net carbon neutral reduction objective established for the proposed project. The **scwd**[2] Desalination Program convened an Energy Study Technical Working Group to provide independent, scientific review and guidance on the identification, assessment and selection of potential GHG reduction projects.

Based on a set of eligibility criteria, nearly fifty potential projects were considered. Potential GHG reduction projects and programs considered were typically one of three types: water and energy efficiency projects, renewable energy generation projects, and GHG reduction/offset projects.

Water and energy efficiency projects and programs have existed and been put into practice for over thirty years. These types of projects and programs reduce energy and indirectly reduce GHG emissions by improving the efficiency of systems and equipment in homes and businesses. These types of projects include: pump and motor replacement, refrigerator and hot water heater replacement, and water conservation programs.

Renewable energy projects typically generate energy without use of fossil fuels. These types of projects include: solar and wind energy, new hydroelectric, and micro-turbines. Some renewable projects use bio-fuels or fossil fuels more efficiently to reduce GHG emissions. These types of projects include: methane capture energy, waste to energy, or fuel cells that run off natural gas.

GHG reduction or offset projects directly reduce or offset GHG emissions by reducing the amount of fuel consumed, eliminating refrigerant GHGs, or adsorbing GHGs. Examples of GHG offset projects include: reductions in the use of fleet vehicle fuel, truck stop electrification that permits trucks to stop idling, and cooling system monitoring and maintenance programs to reduce chlorofluorocarbon and perfluorocompound releases, and carbon sequestration in forests or wetlands.

The initial list of fifty projects was narrowed down to eleven projects that were considered real, verifiable and permanent GHG reduction projects and programs (see **Appendix O** for a listing of the eleven projects). Each of the eleven projects was considered feasible to acquire, implement, and demonstrate reliable GHG reduction potential. The eleven projects are not a definitive list of the projects and programs that could be implemented if the proposed project is approved and constructed. Rather, the list represents a range of feasible projects and programs that the decision-making bodies can ultimately consider to achieve the adopted objective of net carbon neutrality. Other feasible projects, if identified in the future, could also be considered.

### Proposed GHG Reduction Approach

The decision and pursuit of any particular GHG reduction project or set of projects would occur at a later date; likely during and/or after the project approval and regulatory permitting process. Additionally, projects could also be considered and pursued in the future due to changing technologies or regulations. Therefore, for the purposes of this EIR two options are presented and evaluated for meeting the net carbon neutral objective, as described below. These options demonstrate the feasibility of meeting the net carbon neutral objective. Both options are also evaluated in this EIR in terms of their potential to result in environmental effects, as relevant.

In addition to the considerations noted above, either agency may elect to pursue and construct an energy minimization and GHG reduction project and program before the construction of the desalination plant (referred to below as Early Action Measures). Such measures and programs are in harmony with the Policy Statement on Voluntary Early Actions to Reduce Greenhouse Gas Emissions approved by the California Air Resources Board on February 28, 2008. This provision of AB 32 encourages early reductions of GHG emissions, ensures the recognition of the early actions, and ensures that any credits provided by voluntary early actions are based on emission reductions that are real, permanent, additional, quantifiable, verifiable and enforceable.

## Portfolio Option

Either or both agencies may ultimately assemble a feasible and reliable portfolio of energy minimization and GHG reduction projects and programs. For the purposes of the EIR, a feasible and reliable energy minimization and GHG reduction portfolio was assembled as a viable option for meeting the project's GHG reduction objective. This option is included in the project and evaluated in the EIR, except where described below. The portfolio of potential projects or programs included in this option consists of:

- Installation of PV panels on the available roof space of the desalination facility.
- Installation of micro-hydro turbines at Graham Hill Water Treatment Plant (GHWTP) and Newell Creek Dam. These turbines would be constructed as an Early Action Measure for the proposed project and would undergo a separate CEQA analysis.
- Existing PV panels at the GHWTP. These panels were already constructed as an Early Action Measure for the proposed project.
- The purchase of certified offsets.

This approach or a different approach may be adopted by each agency during the project approval process or as conditions of regulatory permits. However, additional CEQA documentation may be necessary if the reduction portfolio changes in a way that leads to new significant effects on the environment or a substantial increase in the severity of any significant effects disclosed in this EIR.

The approach presented above and in **Appendix O**, would be included in the ultimate Energy Minimization and GHG Reduction Plan (Energy Plan) for the proposed project. The final Energy Plan document would be completed once the EIR has been completed and certified. If additional or replacement projects are identified to reduce the extent of certified offset purchases, these could be identified in the Energy Plan. However, the Energy Plan would also provide the bases for the identification of new and/or replacement projects over time as technologies change, or effectiveness of projects are evaluated.

## Description of Portfolio Option Projects

### *Photovoltaic Panels at Desalination Facility*

Installation of PV panels on the roof space of the desalination facility would provide an emissions-free renewable energy source that reduces the use of grid electricity and the associated indirect GHG emissions. PV panels are considered a tested and reliable source of renewable energy and GHG gas emission reduction. Solar PV cells were developed in the 1950s in the aerospace industry and have been used in utility-scale applications for nearly 30 years. Improved technology has allowed for the expansion of solar PV applications over time, and today there are many utility-scale and small-scale uses. A PV system includes PV panels, support structures to direct panels toward the sun, and components that convert the direct-current electricity produced by modules to alternate-current electricity.

The following areas at the desalination plant were identified as having roof space available for PV panels:

- Control Building Roof
- Membrane Building(s) Roof(s)
- DAF Mechanical/Electrical Building Roof
- Concentrate Equalization Basin
- Chlorine Contact Basin
- High Service Pump Station
- Reserved Areas for Future Facilities (e.g., Concentrate Equalization Basins, Second Pass Reverse Osmosis Building, Solids Dewatering Building)

For the purpose of the EIR analysis, a conservative assumption of 25,000 square feet of roof space was used to determine the GHG reduction potential of PV panels at the desalination facility. PV panels could add up to five feet of additional height to the maximum building heights identified for these facilities in **Table 4-1** above.

*Micro-Hydro Turbine at Graham Hill Water Treatment Plant and Newell Creek Dam*

Two micro-hydro projects, at GHWTP and Newell Creek Dam, would generate renewable energy and reduce indirect GHG emissions from purchased electricity. There are two general categories of hydro turbine – impulse and reaction. The type of turbine used must fit site characteristics. The first project would replace an existing non-operational hydropower turbine at the GHWTP and would utilize hydraulic energy from the existing Newell Creek pipeline, which originates at Loch Lomond and connects to the GHWTP. For this project, a reaction turbine system would be utilized. This system would be installed within the existing piping configuration in the basement of the GHWTP. Electrical and nominal piping and appurtenance upgrades would be necessary for installation, but all construction activities would be within the footprint of the existing GHWTP building. The second project would be placed on a pipeline at the Newell Creek Dam that discharges water to provide stream flows for fish habitat downstream. For this project, a Pelton type turbine would be utilized. This project would be pursued as an Early Action Measure in advance of the proposed project and would undergo a separate CEQA analysis.

Both micro-hydro systems would reliably produce energy, while reducing overall energy use and indirect GHG emissions. This renewable energy source would be utilized for Water Department operations, where they are located. This renewable source of energy would replace PG&E grid power.

Hydro-power generation is considered an incredibly reliable technology. Water power has been used throughout history as a renewable resource. Hydroelectric turbines are used to provide approximately 8 percent of the electricity generated in the United States. California is the second largest producer of hydroelectric power in the United States, generating 33,876 megawatt hours of electricity in 2010, according to the Energy Information Administration. Independent power producers generated 1,478 megawatt hours of electricity during 2010 and many of those systems were in-pipe potable water micro-hydro systems.

Hydroelectric turbines have been used in place of pressure reducing valves in potable water systems for more than 20 years. Turbines have been placed in new installations as well as replacing pressure reducing valves in existing systems. Turbines are reliable and have maintenance requirements similar to pumps. The technology is well known and is similar to conventional hydro turbine installations.

*Photovoltaic Panels at Graham Hill Water Treatment Plant*

In November of 2005, as the culmination of a multi-year, public process, the Santa Cruz City Council resolved to adopt the IWP, as described in detail in **Section 3**. Upon the adoption of the IWP and certification of the IWP Program EIR, the Water Department began to contemplate potential climate neutral energy sources to offset the energy and GHG impacts of the upcoming desalination project. Installation of 8,400 square feet of PV panels at GHWTP was identified as a feasible Early Action Measure for the Water Department (City, 2007a). These panels began generating renewable energy in 2008. GHG reduction credits from the solar PV installation at GHWTP would be used to offset the indirect emissions associated with the proposed desalination project once it becomes operational.

*Certified Offsets*

GHG offsets, or certified carbon offsets, are a tradable commodity representing the reduction of one metric ton of carbon dioxide equivalent. Certified offsets are distinctive from voluntary offsets or carbon reduction projects because they must meet all the eligibility criteria set forth in AB 32: additional, real, permanent, quantifiable, verifiable, and enforceable.

Numerous entities have established processes to certify offset projects:

- California Climate Action Reserve (CAR)
- Chicago Climate Exchange
- Gold Standard
- Voluntary Carbon Standard

There is a rigorous process that an offset project must go through in order to be certified by any one of these entities. Every offset must be certified and verified by an independent third-party. As part of the submittal of a project for certification it must:

- Describe the GHG offset project and the project developer's qualifications.
- Explain how the project meets the AB 32 eligibility criteria: additional, real, permanent, quantifiable, verifiable, and enforceable.
- Explain the methodology/protocol for calculating the project GHG emission reductions, including the quantification of the baseline and the project's incremental emission reductions.
- Provide a monitoring and verification plan.

Most certifying entities have restrictions about what types of offsets they will accept and certify; and some like CAR limit their acceptance to only projects that have fully vetted, peer reviewed, and approved protocols and methodologies. For instance, CAR currently only has protocols for nine types of offset projects:

- Forests (sequestration)
- Urban Forests (sequestration)
- Landfills
- Livestock
- Coal-Mine Methane
- Organic Waste Composting
- Organic Waste Digestion (i.e., wastewater digesters)
- Nitric Acid Production
- Ozone Depleting Substances

### Certified Offsets Option

The second option assumes that both agencies would meet the net carbon neutral objective with the purchase of certified GHG offsets, as described above.

## 4.7 Environmental Design, Construction, and Operational Features

The proposed project includes a number of design, construction, and operational features (called environmental design features throughout this EIR) that the City and District are committed to implementing as part of the proposed project. These elements of the project would serve to reduce or avoid some of the potential environmental effects of the project that might occur in the absence of such features. To ensure that the commitments are implemented as specified, each environmental design feature would be implemented and monitored as part of the Mitigation Monitoring and Reporting Program to be developed and adopted by the City and District for the proposed project. **Table 4-12, Summary of Environmental Design, Construction, and Operational Features**, provides a summary of these features, each of which is described in greater detail elsewhere in this section.

# 4.8 Potential Future Project Expansion

## 4.8.1 Overview

As indicated in **Section 3**, in 2005 the Santa Cruz City Council adopted the IWP as the City's long-term water resource strategy. The IWP indicated that the City's water supply should be diversified through the construction of a 2.5-mgd seawater desalination plant and related facilities with the ability to expand the plant up to 4.5 mgd to meet future needs through 2030. The IWP Program EIR provided a program-level analysis of potential future plant expansion up to 4.5 mgd.

Since the IWP approval in 2005, the City has updated its water demand projections and water supply modeling that formed the basis of the IWP and this information was reported on in the updated City 2010 UWMP. The City UWMP does not specifically address the need for or timing of expansions of the plant beyond 2.5 mgd. However, it does indicate that achieving the reliability objective of limiting peak-season shortages to 15 percent and providing for flows for habitat could require additional water capacity to meet long-term demands by 2030. This has been confirmed by a new 2012 water supply/demand analysis completed to reflect the likely outcome of the pending habitat conservation planning process (**Appendix C**). This analysis shows that additional capacity beyond a 2.5 mgd plant could be needed if significant additional stream flows for endangered fish are required beyond what the City has proposed in its most recent Tier 3/2 Conservation Strategy for the habitat conservation plan. See **Section 3** for additional information about the new water supply/demand analysis.

This EIR provides an updated description of possible future expansions of the plant, given that the City UWMP and IWP identify the potential need for additional water supply capacity above and beyond the 2.5-mgd plant. This EIR also provides an updated program-level environmental analysis based on current information related to location, characteristics of any possible expansions, and environmental conditions. It should be noted that the District's 2010 UWMP and 2012 IRP Update do not contemplate expansion of the proposed desalination project or the need for water from an expanded plant.

**Table 4-12. Summary of Environmental Design, Construction, and Operational Features**

| Feature | Feature Type | Characteristics | Avoidance/Minimization/ Reduction |
|---|---|---|---|
| OVERALL PROJECT OPERATIONS | | | |
| Carbon neutral operations | Operations | The operation of the proposed project would be net carbon neutral, which means that it would be designed and operated such that there would be no net increase in GHG emissions as compared to the existing environmental setting. The existing environmental setting consists of the GHG emissions generated by the existing water supply systems of the City and the District in 2010.<br>Net carbon neutral operations would be achieved through the incorporation of high-efficiency design features and the pursuit of one of two options for offsetting the net increase in GHG emissions:<br>• Portfolio Option – This would involve the installation of PV panels at the desalination plant, the potential installation of micro-hydro turbines at GHWTP and Newell Creek Dam, and use of existing PV panels at the GHWTP, in addition to the purchase of certified offsets. Other projects could also be pursued, but may require additional environmental review.<br>• Certified Offsets Option – This would involve the purchase of certified offsets.<br>To accommodate potential future regulatory and carbon reduction technology changes, the City and District will prepare, approve, and implement an Energy Minimization and Greenhouse Gas Reduction Plan (Energy Plan) upon successful completion of EIR certification and prior to project construction. The Energy Plan will address the content and organizational specifications outlined in Appendix O. While the Energy Plan will lay the ground work for managing the GHG emissions of the proposed project, the City and the District will ultimately be responsible for developing their individual GHG reduction strategies for meeting their net carbon neutral GHG reduction objective. | Avoids any net increase in GHG emissions with the proposed project |
| SEAWATER INTAKE AND CONVEYANCE SYSTEM | | | |
| Seawater intake structure | Design & Construction | Provide intake screens on open-ocean intake structure (0.08-inch [2- millimeter] slot size).<br>Provide low through-screen velocity of less than or equal to 0.33 foot per second.<br>Setback seawater intake structure 100 feet from the edge of the rocky kelp forest habitat. | Minimizes entrapment and entrainment of marine life in intake system.<br>Minimizes impingement of marine life on intake screens.<br>Avoids disturbance to kelp forest habitat |
| Seawater intake pipeline construction methods | Construction | Use of trenchless tunneling technology from intake pump station to offshore intake structure location, as further described below:<br>Eastern sandy locations: Tunneling would be used to install the intake pipelines from the intake pump station out past the surf zone. Due to sandy conditions, dredging could be used beyond the surf zone to install the pipeline out to the offshore intake structure location. | Avoids beach and bluff construction.<br>Minimizes sedimentation and turbidity in marine environment during construction. |

**Table 4-12. Summary of Environmental Design, Construction, and Operational Features**

| Feature | Feature Type | Characteristics | Avoidance/Minimization/ Reduction |
|---|---|---|---|
| | | Western bedrock locations: Tunneling would be used to install the intake pipelines from the intake pump station out past the kelp forest near the intake structure location. Dredging and excavation would be required to install the short section of intake pipelines out to the offshore intake structure location. Turbidity curtain would be used during the dredging and excavation activities. | |
| Seawater intake system design storm | Construction | Any project facilities (intakes, intake structures, and pipelines) subject to coastal wave action would be designed to account for wave heights, storm surge, water levels, scouring and erosion, maximum and minimum tides, and currents associated with a 100-year storm event and factoring in anticipated water levels due to sea level rise and global warming over the life of the structures. Design standards may be subject to modification based on regulatory requirements and policies of permitting agencies. | Reduces the potential for substantial damage to proposed facilities |
| SEAWATER DESALINATION PLANT | | | |
| High-efficiency energy recovery devices (ERDs) | Design | Brine would be directed to ERDs, which would recover energy from the brine. ERDs allow for the reuse of some of the energy from the brine, and therefore reduce the SWRO feedwater-pressure energy requirement. Overall, the ERDs would recover approximately 95 percent of the energy from the brine, corresponding to a net recovery of approximately 45 to 55 percent of the overall energy required to operate the SWRO membranes. | Reduces energy requirements of SWRO membranes. |
| High-efficiency pumps and motors | Design | High-efficiency pumps and motors would be used throughout the plant as appropriate. | Reduces energy requirements of plant operations. |
| SWRO membranes in a hybrid configuration | Design | Each SWRO membrane skid or unit would be configured with a hybrid arrangement of high boron rejection SWRO membranes and low energy consumption SWRO membranes. This hybrid arrangement would provide the optimum balance of boron removal to meet treatment objectives while minimizing system energy requirements. | Reduces SWRO system energy requirements and improves product water quality. |
| Stormwater facilities | Design | Stormwater handling at the plant site and intake pump station site would follow the City of Santa Cruz requirements for Low Impact Development, as specified in the City's BMP Manual. Runoff from impervious roofs, structures, and roadways would travel through vegetated swales to bio-retention areas. Swales and smaller bio-retention/detention basins shall be distributed throughout the sites, rather than concentrating stormwater in one area. Excess stormwater flows would leave the site though storm drains under Delaware Avenue. The drainage facilities would handle a 25-year storm event with a safety factor of 1.25. Peak stormwater runoff rates from the desalination plant site shall not exceed the estimated pre-development rate for this peak storm event. The project would also comply with revisions to the City's existing stormwater regulations, which will be effective September 2013. | Minimizes adverse effects due to increased stormwater volumes that can result from new development. |
| Comply with City Green Building | Design | The proposed project would comply with the City of Santa Cruz Green Building Program requirements for Non-Residential (Commercial) Actions. This program closely follows the approach established by the United | Improves performance against established sustainability goals |

**Table 4-12. Summary of Environmental Design, Construction, and Operational Features**

| Feature | Feature Type | Characteristics | Avoidance/Minimization/ Reduction |
|---|---|---|---|
| Program | | States Green Building Council's Leadership in Environmental and Energy Design (LEED) program. | for energy, water use, and building materials. |
| Inclusion of butterfly nectar plants in landscaping | Design | Landscaping would include native nectar plants that support butterfly, bee and other native and beneficial insect species. Nectar plant species preferred by foraging adult monarch butterflies during the fall and winter months would be planted and maintained at the desalination plant site. The plantings would be in sunlit areas, preferably on the southern and western portions of the site and away from substantial vehicle traffic and human activity. A qualified biologist specializing in monarch butterflies would review the planting plans prior to construction. Planting would occur as soon as possible following completion of ground disturbing activities. Should future changes or expansion of the plant result in unsuitable conditions for the nectar plants, additional suitable areas on the desalination plant site or offsite in close proximity to Natural Bridges State Beach would be planted and maintained with nectar species. | Provides nectar source for adjacent Monarch butterfly population in Natural Bridges State Beach, as well as other nectar-loving species. |
| Plant tours | Operations | Conduct tours of the plant outside the A.M. and P.M. peak hours. The peak hours are currently defined as roughly 7 A.M. to 10 A.M. (A.M. peak) and 4 P.M. to 7 P.M. (P.M. peak). | Minimizes the project's contribution to traffic congestion on vicinity roadways. |
| BRINE STORAGE, DISPOSAL, AND CONVEYANCE SYSTEM | | | |
| Blending of brine with WWTF effluent | Design & Operations | Brine from the desalination plant would be blended with WWTF effluent. The blending ratio of brine flow from the plant to WWTF effluent flow would be automatically controlled to meet MIDR of the existing NPDES permit. Variable speed pumps, automated controls and instrumentation, brine storage, outfall injection nozzle, and new outfall diffuser valves would be provided to ensure the proper blending of brine flow and WWTF effluent flow to meet the existing permit requirements. The combined effluent would not exceed the salinity of ambient seawater. | Maintains MIDR of existing NPDES permit and ensures the salinity of the combined effluent matches ambient seawater, unless otherwise allowed for. |
| Brine equalization basin | Design | Brine equalization basin allows for on-site storage of brine such that the rate of disposal can be controlled. | Maintains minimum initial dilution requirements (MIDR) of existing NPDES permit. |
| New valves on WWTF outfall diffuser ports | Design | New valves would be installed over all existing ports on the WWTF outfall diffuser, which would allow the City to have all ports available at low flows, thus spreading the effluent flow along the entire diffuser length. | Maintains MIDR of existing NPDES permit. |
| Brine conveyance pipeline connection to WWTF outfall upstream of | Design & Construction | The brine pipeline connection point with the WWTF outfall would be upstream of the sluice gates. | Avoids beach construction at Mitchell's Cove. |

**Table 4-12. Summary of Environmental Design, Construction, and Operational Features**

| Feature | Feature Type | Characteristics | Avoidance/Minimization/ Reduction |
|---|---|---|---|
| sluice gates | | | |
| POTABLE WATER DISTRIBUTION SYSTEM IMPROVEMENTS | | | |
| Use of existing DeLaveaga water storage tanks | Design | The new intertie system between the City and the District would use the existing DeLaveaga water storage tanks and would not require additional new storage. | Avoids the need for new storage tanks and associated potential environmental effects associated with the placement of such tanks. |
| CONSTRUCTION SPECIFICATONS | | | |
| Erosion control | Construction | The City and District shall prepare and submit an erosion control plan/BMPs by a licensed engineer for the portion of the project located in the City of Santa Cruz, concurrent with the grading permit application submittal, because the project would disturb over 50 cubic yards of grading, and therefore would be subject to Municipal Code Chapter 18.45, Excavation and Grading Regulations. The erosion control plan shall include the City's mandatory BMPs as detailed in the latest BMP Manual, published by the City's Public Works Department. BMPs shall be maintained in full force and effect for the duration of the project, under Municipal Code Chapter 16.19, Stormwater and Urban Runoff Pollution Control. The erosion control plan shall include, but not be limited to, the following measures:<br>- Conduct grading operations in phases to reduce the amount of disturbed areas and exposed soil at any one time.<br>- Clearing, excavation, and grading shall not be conducted during rainy weather unless specifically approved as part of the grading permit, and all rainy season grading must be conducted in accordance with Municipal Code Section 18.45.040.<br>- Delineate clearing limits, setbacks, sensitive or critical areas, trees, drainage courses, and buffer zones to prevent excessive or unnecessary disturbances and exposure prior to or during construction.<br>- Construct access roads and entrances to minimize the tracking of soil, mud, or hazardous materials into the roadway or drains. Install shaker roads and/or washdown facilities for construction vehicles on construction sites greater than 1 acre.<br>- Implement erosion, sediment, and runoff control measures prior to initiating construction and throughout the construction period to prevent a net increase of sediment load in stormwater discharge relative to preconstruction levels. Control measures could include installation of filter fabric, erosion control blankets, geotextiles, mulching, seeding, and vegetation planting on exposed soils; provisions for stockpiling of topsoil or other materials removed during construction; protection of storm drain inlets; and proper installation, inspection, maintenance, and repair of erosion control measures.<br>- Implement good housekeeping measures at the construction site related to the use and storage of | |

**Table 4-12. Summary of Environmental Design, Construction, and Operational Features**

| Feature | Feature Type | Characteristics | Avoidance/Minimization/ Reduction |
|---|---|---|---|
| | | construction equipment and vehicles, paints and other hazardous materials, site cleanup and sweeping, and waste management. | |
| Dust control | Construction | The City and District shall implement the following dust-abatement best management practices at all construction sites:<br>- Water all active construction areas with exposed soil at least twice daily, as warranted, to control dust. Frequency shall be based on the type of operation, soil moisture and other conditions, and wind exposure.<br>- Prohibit all grading activities during periods of high wind (over 15 miles per hour).<br>- Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least 4 consecutive days).<br>- Cover all trucks hauling dirt, sand, or loose materials. Haul trucks shall maintain at least 2 feet of freeboard.<br>- Sweep streets if visible soil material is carried out from the construction site.<br>- Replace ground cover in disturbed areas as soon as possible.<br>- Cover inactive storage piles. | |
| Noise control | Construction | - Construction equipment shall be properly outfitted and maintained with noise-reduction devices to minimize construction-generated noise. Wherever possible, noise-generating construction equipment shall be shielded from nearby residences by noise-attenuating buffers, such as temporary structures, equipment, or trucks. Stationary construction equipment shall be situated on site at the greatest distance possible from nearby noise-sensitive receptors.<br>- Impact tools (e.g., jackhammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered whenever possible to avoid noise associated with compressed-air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed-air exhaust shall be used; such mufflers can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, which could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.<br>- Require contractors to assure that mobile noise-generating equipment and machinery are shut off when not in use.<br>- At least 72 hours prior to commencing nighttime construction, if required, the City shall notify (in writing) all residents within 300 feet of proposed construction sites of the date and time construction will occur. The notice will provide a contact name, phone number, and a location where noise complaints may be submitted. | |

**Table 4-12. Summary of Environmental Design, Construction, and Operational Features**

| Feature | Feature Type | Characteristics | Avoidance/Minimization/ Reduction |
|---|---|---|---|
| Vibration control | Construction | Notify land uses within 200 feet of scheduled pile-driving activities and other activities producing vibration (jackhammers and other high-power tools), and schedule construction activities involving pile driving with the highest potential to produce perceptible vibration to the hours with least potential to affect nearby businesses. | |
| Traffic control | Construction | Prior to construction, prepare and implement a traffic control plan or plans for the affected roadways and intersections for the various pipelines and any other construction in roadways. The traffic control plan(s) must comply with the affected jurisdiction's encroachment permit requirements and will be based on detailed design plans. The affected jurisdiction will review and approve the plan(s) prior to construction. The traffic control plan(s) shall include, but not be limited to the following measures:<br>- Limit the construction work zone in each block to a width that, at a minimum, maintains alternate one-way traffic flow past the construction zone using appropriate signage and flagmen. If this cannot be achieved, a detour plan shall identify appropriate and safe detour routes and installation of signage warning of road closure and detour routes.<br>- Identify areas where construction traffic and construction activities will be limited to non-peak hours to reduce traffic flow restrictions or delays, such as temporary road closures required when a pipeline corridor crosses an intersection.<br>- Prepare a truck routing plan for each work site to minimize impacts from construction truck traffic during equipment or material delivery and/or disposal.<br>- Provide continued access to individual properties adjacent to construction sites and ensure that emergency access will not be restricted. Maintain steel trench plates at the construction sites to restore access across open trenches, as needed. During non-working hours or in the event of an emergency, trenches shall be covered with such plates or backfilled.<br>- Access for emergency vehicles shall be maintained at all times. The emergency service providers shall be notified of the timing, location, and duration of construction activities throughout the construction period.<br>- If the seawater intake will be located at the Municipal Wharf (SI-17) or one of the Beach Area (SI-9) or West Cliff Drive (SI-4, SI-5, or SI-7) locations, the traffic control plans will minimize or avoid to the extent feasible temporary loss of parking and lane closures in these coastal locations due to worker parking and construction staging. Remote parking and staging will be used where necessary to accomplish the above. Minimal construction staging would take place on the Municipal Wharf. | |

Acronyms:
GHG = greenhouse gas
PV = photovoltaic
GHWTP = Graham Hill Water Treatment Plant
ERD = energy recovery device
SWRO = seawater reverse osmosis
MIDR = minimum initial dilution requirements
NPDES = National Pollutant Discharge Elimination System
WWTF = wastewater treatment facility

Below-ground and offshore components, as well as building space for the proposed 2.5-mgd desalination project, are proposed to be sized to accommodate the economic expansion of the plant and related facilities to produce up to 4.5 mgd of product water. However, it should be noted that expansion of the plant beyond 2.5 mgd is not currently being planned as part of any potential project approval. The capability for the desalination plant to produce more than 2.5 mgd would require additional project-level environmental review under CEQA, and additional regulatory permitting following City Council action to proceed with any such expansion. Additional design and construction would also be required, and would likely include the improvements discussed in the following sections.

## 4.8.2 Seawater Intake and Conveyance System

To reliably produce 4.5 mgd of treated product water, the seawater intake system would be designed to provide a maximum flow of 12.5 mgd of raw seawater. **Table 4-13, 4.5-mgd Seawater Desalination Plant Flow Rates** provides the seawater that would be needed under a range of conditions to produce 4.5 mgd. To expand the seawater intake and conveyance system up to 4.5 mgd, additional intake screens would be needed. Additional pumps would also be needed at the intake pump station to increase the pumping capacity of the intake system. No other improvements to the seawater intake and conveyance system would be required.

**Table 4-13. 4.5-mgd Seawater Desalination Plant Flow Rates**

| Production Capacities | Production Capacity (mgd) | SWRO Recovery Rate (%) |
|---|---|---|
| Seawater (from Seawater Intake System) | | |
| Minimum | 1.7 | 50 (maximum) |
| Average | 7.0 | 43 (average) |
| Maximum | 11.3 | 40 (minimum) |
| Combined Plant Influent (Seawater + Recycled Water from Plant) | | |
| Minimum | 1.8 | 50 (maximum) |
| Average | 7.7 | 43 (average) |
| Maximum | 12.8 | 40 (minimum) |
| Treated Water | | |
| Minimum | 0.8 | 50 (maximum) |
| Average | 3.0 | 43 (average) |
| Maximum | 4.5 | 40 (minimum) |
| Brine | | |
| Minimum | 0.8 | 50 (maximum) |
| Average | 4.0 | 43 (average) |
| Maximum | 6.8 | 40 (minimum) |

Source: Appendix L, scwd² Seawater Desalination Plant – Phase 1 Preliminary Design: Volume 1 – Report & Volume 2 - Drawings.
Acronyms: SWRO = Seawater Reverse Osmosis mgd = million gallons per day

## 4.8.3 Seawater Desalination Plant

To expand the desalination plant up to 4.5 mgd, a number of additional facilities and equipment would need to be provided. Additional MF/UF system equipment would need to be installed in the MF/UF or Membrane building. An additional DAF basin would need to be constructed next to the DAF basins for the 2.5 mgd plant. Additional SWRO units and calcite contactors would need to be installed in the SWRO or Membrane building. See **Section 4.4.3** for additional information about these components of the proposed desalination plant. **Figures 4-7** through **4-10** provide a conceptual layout of these facilities. None of the underground components of the plant site, such as piping, would require expansion to increase the capacity to 4.5 mgd.

## 4.8.4 Brine Storage, Disposal, and Conveyance System

As indicated previously, the SWRO system would have the ability to operate with a recovery rate ranging from 40 to 50 percent. If the system were expanded to 4.5 mgd it would generate up to about 6.8 mgd of brine, depending upon the recovery rate (see **Table 4-13** above). Additional brine storage structures could be required to temporarily store brine generated during the treatment process. The size of the brine equalization basins for an expanded plant was estimated at approximately two million gallons (see **Appendix J**); however, the size of the basins would be confirmed if expansion is ever pursued. These structures would be located at the proposed desalination plant. No improvements to the brine conveyance system would be required to accommodate potential future expansion of the proposed project. See **Section 4.4.4** for additional information about this system.

## 4.8.5 Potable Water Distribution System Improvements

No improvements to the potable water distribution system, including the intertie between the City and the District, would be required if the plant and related facilities were expanded in the future up to 4.5 mgd. See **Section 4.4.5, Potable Water Distribution System Improvements**, for additional information about this system.

## 4.8.6 Environmental Design, Construction, and Operational Features

The environmental design, construction, and operational features identified in **Table 4-12** above would be reviewed, evaluated, and augmented as appropriate if and when the proposed desalination plant is considered for expansion. In particular, increasing the capacity of the desalination plant up to 4.5 mgd would increase the energy use and GHG emissions associated with the plant operations. Additional certified offsets and/or energy minimization and GHG reduction projects and programs would need to be implemented to continue to achieve the net carbon neutral objective of the project. Such projects and programs would be considered if and when the plant is considered for expansion in the future.

# 4.9 Intended Uses of the EIR

The proposed project would require a number of potential permits, authorizations, and consultations from federal, state, and local agencies. These approvals include those listed below in **Table 4-14, Potential Permits, Authorizations, or Approvals**. Although federal agencies are required to comply with the National Environmental Policy Act (NEPA) rather than CEQA, the federal agencies listed below are expected to use the information from this EIR in complying with NEPA, where NEPA compliance is required. See **Figure 5.4-1, Jurisdictional Boundaries and Coastal Access** in **Section 5.4, Land Use and Planning**, for jurisdictional boundaries within the project area.

## Table 4-14. Potential Permits, Authorizations, or Approvals

| Regulatory Agency | Potential Regulatory Permit, Authorization, or Approval | Permit/Approval Required For | Relevant Project Components |
|---|---|---|---|
| FEDERAL AGENCIES | | | |
| U.S. Army Corps of Engineers (USACE) | Section 404 Clean Water Act Nationwide or Individual Permit | Required for discharges of dredged or fill material into Waters of the United States. USACE will establish the basis of the permit and scope of their analysis depending upon the area and extent of fill. | Intake pipelines and intake structure (all alternatives)<br>Installation of new valves on the WWTF outfall diffuser ports<br>Plant Site A-3<br>Arana Creek stream crossing at Brookwood Drive (City-District Intertie) |
| | Section 10 Rivers and Harbors Act Individual Permit | Required for building any pipelines, piers, wharfs, or other in-water structures in navigable waters. | Intake pipelines and intake structure (all alternatives)<br>Installation of new valves on the WWTF outfall diffuser ports |
| National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service (NMFS) | Section 7 Consultation under the Endangered Species Act | Required for any federal permitting agency that may adversely affect federally listed marine species or designated critical habitat. USACE would conduct Section 7 Consultation with NMFS. | Intake pipelines and intake structure (all alternatives)<br>Discharge of brine in WWTF effluent<br>Installation of new valves on the WWTF outfall diffuser ports<br>Arana Creek stream crossing at Brookwood Drive (City-District Intertie) |
| | Section 305(b) Consultation under the Magnuson-Stevens Fishery Conservation and Management Act (also known as the Sustainable Fisheries Act) | Required for any federal or state approval that may adversely affect designated essential fish habitat. | Intake pipelines and intake structure (all alternatives)<br>Discharge of brine in WWTF effluent<br>Installation of new valves on the WWTF outfall diffuser ports |

**Table 4-14. Potential Permits, Authorizations, or Approvals**

| Regulatory Agency | Potential Regulatory Permit, Authorization, or Approval | Permit/Approval Required For | Relevant Project Components |
|---|---|---|---|
| NOAA National Marine Sanctuary Program, Monterey Bay National Marine Sanctuary (MBNMS) | Authorization of relevant federal permits under the MBNMS Management Plan and the National Marine Sanctuary Program | Required for proposed facilities located in the Monterey Bay National Marine Sanctuary. The Municipal Wharf and associated Beach Area are located outside of the MBNMS boundaries. | Intake pipelines and intake structure (Intake Sites SI-4, SI-5, SI-7, SI-14, SI-16)<br>Installation of new valves on the WWTF outfall diffuser ports<br>Discharge of brine in WWFT effluent<br>Project construction, operation, and maintenance related to the above project components |
| U.S. Fish and Wildlife Service (USFWS) | Section 7 Consultation under the Endangered Species Act | Required for any federal permitting agency that may adversely affect federally listed terrestrial or freshwater species or their designated critical habitat. USACE would conduct Section 7 Consultation with USFWS. | Potential warranted if Plant Site A-2 is selected. |
| STATE AGENCIES | | | |
| California Coastal Commission | Coastal Development Permit<br>Federal Consistency Review | Required for the portions of the project that lie within the Coastal Commission's areas of retained jurisdiction, such as the off-shore components of the project. | Pump station on Municipal Wharf (Intake Site SI-17)<br>Intake pipelines and intake structure (all alternatives)<br>Installation of new valves on the WWTF outfall diffuser ports<br>Project construction, operation, and maintenance related to the above project components |
| California State Lands Commission (CSLC) | Land Use Lease (Right-of-Way Permit) or modification of an existing lease | Required for the use of state tidelands and submerged lands within 3 nautical miles seaward of the ordinary high water mark. CSLC has granted public trust lands to the City of Santa Cruz near the Municipal Wharf so facilities in this area would not require CSLC approval. | Intake pipelines and intake structure (Intake Sites SI-4, SI-5, SI-7, SI-14, SI-16)<br>Installation of new valves on the WWTF outfall diffuser ports<br>Project construction, operation, and maintenance related to the above project components |
| California Department of Fish and Wildlife | Incidental Take Permit under the California Endangered Species Act | Required if "take" of state-listed endangered, threatened, or candidate species may occur. | Not anticipated to be required for this project |

## Table 4-14. Potential Permits, Authorizations, or Approvals

| Regulatory Agency | Potential Regulatory Permit, Authorization, or Approval | Permit/Approval Required For | Relevant Project Components |
|---|---|---|---|
| | Streambed Alteration Agreement | Required if a project would alter the flow, bed, channel, or bank of a stream or lake. | Arana Creek stream crossing at Brookwood Drive (City-District Intertie) if instream work is used to install pipe |
| California Department of Transportation | Encroachment Permit | Required if the project would encroach upon any portion of a state highway right-of-way, such as State Highway 1. | Morrissey pump station upgrade could require a new encroachment permit or amendment of an existing permit |
| California Department of Public Health | Permit to Operate a Public Water System | Required to operate a public water system. | Applies to project overall, not individual components |
| California Department of Parks and Recreation, Office of Historic Preservation (SHPO) | Section 106 of the National Historic Preservation Act Coordination | Required for any federal permit or project that may adversely affect properties listed or eligible for listing on the National Register of Historic Places. USACE would conduct Section 106 Coordination with SHPO. | Intake pipelines and intake structure (all alternatives)<br>Installation of new valves on the WWTF outfall diffuser ports<br>Plant Site A-3<br>Arana Creek stream crossing at Brookwood Drive (City-District Intertie) |
| State Water Resources Control Board | Water Rights Permit | Required to gain new or modify rights to divert water from specified sources and to put it to beneficial use. | Not required for this project[1] |
| REGIONAL AGENCIES | | | |
| Central Coast Regional Water Quality Control Board | National Pollutant Discharge Elimination System (NPDES) General Permit For Storm Water Discharges Associated With Construction Activity | Required for stormwater discharges associated with construction activity over 1 acre. | All components involving ground-disturbing activities |
| | Section 402 of the Clean Water Act, NPDES Permit Amendment | Required for discharge of brine into the City's WWTF outfall and for maintenance of the seawater intake.<br>The City's existing NPDES permit could potentially be used or modified to address the above. | Brine discharge<br>Seawater intake maintenance |

## Table 4-14. Potential Permits, Authorizations, or Approvals

| Regulatory Agency | Potential Regulatory Permit, Authorization, or Approval | Permit/Approval Required For | Relevant Project Components |
|---|---|---|---|
| | Section 401 of the Clean Water Act, Water Quality Certification | Required for Section 404 permits (see above) to certify that the activity meets water quality standards. | Intake pipelines and intake structure (all alternatives)<br>Installation of new valves on the WWTF outfall diffuser ports<br>Plant Site A-3<br>Arana Creek stream crossing at Brookwood Drive (City-District Intertie) |
| Monterey Bay Unified Air Pollution Control District | Authority To Construct and Permit To Operate | Required for backup sources of power that could emit air contaminants. | Emergency generators would be located at the desalination plant and the Morrissey, McGregor, and Aptos pump stations |
| LOCAL AGENCIES | | | |
| County of Santa Cruz | Encroachment Permit | Required where the project would encroach upon any portion of a County of Santa Cruz right-of-way. This would include any right-of-way encroachments of the Santa Cruz County Regional Transportation Commission (SCCRTC) Branch Line. | City-District intertie pipeline on County right-of-way<br>Seawater intake and transfer pipelines under SCCRTC rail lines in the Beach Area (Intake Sites SI-9 and SI-18) |
| | Grading Permit | Required for grading for which an EIR was prepared. | City-District intertie pipeline on County right-of-way |
| | Riparian Exception | Development activities, land alteration and vegetation disturbance within riparian corridors and wetlands and required buffers shall be prohibited unless an exception is granted per the Riparian Corridor and Wetlands Protection ordinance. | Arana Creek stream crossing at Brookwood Drive (City-District Intertie) |
| | Archaeological Permit | Required for development proposals on any "culturally significant site" (as determined by the County's Planning Director) or Native American cultural site, under the County Code. | City-District intertie pipeline on County right-of-way if inadvertent discovery of an as-yet undiscovered resource occurs |
| | Special Discharge Permit | Required for discharge of groundwater from construction dewatering under the County's Sanitation District Code. | City-District intertie pipeline on County right-of-way |

### Table 4-14. Potential Permits, Authorizations, or Approvals

| Regulatory Agency | Potential Regulatory Permit, Authorization, or Approval | Permit/Approval Required For | Relevant Project Components |
|---|---|---|---|
| City of Capitola | Coastal Development Permit | Required for development in the coastal zone under the Capitola's Local Coastal Program. | City-District intertie pipeline on City of Capitola right-of-way |
| | Encroachment Permit | Required where the project would encroach upon any portion of a City of Capitola right-of-way. | City-District intertie pipeline on City of Capitola right-of-way |
| | Grading Permit | Required for development within the coastal zone. | City-District intertie pipeline on City of Capitola right-of-way |
| City of Santa Cruz | Coastal Permit under the City's Local Coastal Program | Required for development in the Coastal Zone where the City has jurisdiction under its adopted Local Coastal Program. | Plant Sites A-1, A-2, and A-3<br>Pump stations for Intake Sites SI-4, SI-5, SI-7, SI-9, SI-16, and SI-18<br>On-shore piping within Coastal Zone |
| | Administrative Use Permit | Required for the authorization of land uses in accordance with the City's Municipal Code | Plant Sites A-1, A-2, and A-3<br>Pump stations for Intake Sites SI-14 and SI-17<br>On-shore piping |
| | Special Use Permit | Required for the authorization of land uses in accordance with the City's Municipal Code | Pump stations for Intake Sites SI-4, SI-5, SI-7, SI-9, SI-16, and SI-18<br>On-shore piping |
| | Design Permit | Required review of architectural and site development proposals for buildings | Plant Sites A-1, A-2, and A-3<br>Pump stations for Intake Sites SI-4, SI-5, SI-7, SI-9, SI-14, SI-16, SI-17, and SI-18 |
| | Building, Electrical, Grading Permit, Fire Department Approvals | Required for authorization of building, electrical, and grading activities. | Plant Sites A-1, A-2, and A-3 and all intake pump station sites |
| | Heritage Tree Removal Permit | Required for removal or pruning of heritage trees or shrubs under the City's Municipal Code. | Plant Site A-2 |
| | Watercourse Development Permit | Required for construction within watercourses under the City's Municipal Code. | Arana Creek stream crossing at Brookwood Drive (City-District Intertie) |

**Table 4-14. Potential Permits, Authorizations, or Approvals**

| Regulatory Agency | Potential Regulatory Permit, Authorization, or Approval | Permit/Approval Required For | Relevant Project Components |
|---|---|---|---|
| | Historic Alteration Permit | Required for alteration of historic structures under the City's Municipal Code. | If SI-17 is selected adjacent to Municipal Wharf, permit required only if the wharf structure itself would be modified |
| | Sewer Connection Permit | Required for connection to the City's sanitary sewer system under the City's Municipal Code. | Plant Sites A-1, A-2, and A-3 |
| | Waste Water Discharge Permit | Required for discharge of process wastewater under the City's Municipal Code. | Plant Sites A-1, A-2, and A-3 |
| | | Required for discharge of groundwater from construction dewatering under the City's Municipal Code. | All onshore project components within the City requiring ground disturbance |

Notes:

1. The State Water Resources Control Board does not have permitting jurisdiction over the diversion of seawater from the ocean in the manner proposed by this project. Further, the proposed desalination project is designed and limited such that the volume of water delivered to the District is equivalent to the volume of water produced by the desalination plant. Melding or blending of sources of water supply in order to allow efficient use of infrastructure is commonly done and is permitted. The water supply provided to the District from the City via the City-District Intertie would consist of water from various City sources, including desalinated product water from the proposed project, as demonstrated in Appendix BB, Desalination Plant Hydraulic Modeling and Analysis. No additional water right entitlements are required, based on input provided by the City.

Acronyms:
WWTF = Wastewater Treatment Facility