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# Attachment 1

(1 of 4)

**TECHNICAL MEMORANDUM**

REGISTERED PROFESSIONAL ENGINEER
No. 26189
PAUL L. FINDLEY
STATE OF CALIFORNIA
Expires 3-31-2013

**Date:** **November 1, 2012**
**To:** **Richard Svindland, California American Water**
**From:** **Paul Findley, RBF Consulting**
**Subject:** **Contingency Planning for the Monterey Peninsula Water Supply Project**

As requested, this technical memorandum presents contingency planning options to consider in the event that the Monterey Peninsula Water Supply Project cannot be implemented as currently proposed. The project proposed in the original application envisions a 9.0 mgd or 5.4 mgd desalination plant located at a site on Charles Benson Road (CBR) near the Monterey Regional Water Pollution Control Plant. This desalination plant would receive water from 6 to 10 slant wells located on the beach on sites that would be acquired from CEMEX. These wells were originally conceived as drawing water from under the ocean floor from the 180-foot aquifer. However, in order to minimize impacts on the 180-aquifer, the currently proposed concept is for these wells to draw water from under the ocean floor from either the surface formation (aquifer) known as the Sand Dunes Formation or the deeper 180-foot aquifer, or from both. Concentrate from the RO process, also known as brine, will be discharged through a pipe connection to the ocean outfall of the Monterey Regional Water Pollution Control Plant.

We believe that this project concept for intake, plant site, and brine discharge is the most cost-effective of the options that have been reviewed in the last year. However, this technical memorandum considers contingency plans in the event the proposed intake method or site is not feasible; in the event the proposed method of brine disposal is not feasible, or in the event a change in the desalination plant site is required.

For purposes of the analyses set forth below, it is assumed that all of the intake and discharge contingency options that are presented in this memorandum can be permitted, designed and constructed by early 2017 (in order to allow for water to be available for start up operations at the desalination plant). Generally, each option would be constructed according to the following schedule:

- January 2013 to December 2014: Permitting and testing of test well (if applicable)
- January 2014 to December 2015: Permitting and Design
- January 2015 to December 2017: Construction

The above dates do not include time for potential litigation which could range from 2 to 10 years for certain options such as open ocean intakes.

**PROPOSED PROJECT: Shallow slant wells at CEMEX that extract seawater from the Sand Dunes and/or 180- foot formations.**

The slant test well at north CEMEX site is currently planned to have screens that test both the 180-foot and Sand Dunes formation, with the objective of testing to determine if the Sand Dunes and/or 180-foot formations are sufficiently productive to meet project requirements with 10 or fewer wells. For purposes of illustration, it is

assumed that 10 wells (two four-well clusters and one two-well cluster) would be required to extract 22 mgd of water from the Sand Dunes and/or 180-foot formations in order to support a 9 mgd desalination plant.

The slant wells would be configured as either pumped wells or gravity wells, with a strong preference for gravity wells in order to minimize access and maintenance requirements associated with submersible well pumps. The final selection will be made on the basis of the test well program results. All wells would be connected by a 1,200 LF 30-inch diameter beach pipeline that would connect to a 2,300 LF 36-inch diameter carrier pipe that would convey the seawater under the dunes. For the gravity well option, the beach pipeline would be installed by trenchless construction. The pipeline under the dunes would be installed by trenchless construction for both the gravity and pumped well options. A 7,700 LF 36-inch diameter pipeline would convey the water from the eastern edge of the dunes to the desalination plant. A 22 mgd pump station would be installed at the eastern edge of the dunes for the gravity well option (this pump station would not be required for the pumped well option). The pipeline crossing under Highway 1 would be installed with trenchless construction.

The brine generated from the desalination plant would be conveyed to the MRWPCA wastewater treatment facility and discharged into the existing outfall.

The configuration of intake and discharge facilities for the proposed project is presented in Figure 1.

The estimated capital costs (2012) of the intake and brine discharge costs are presented below.

| | | |
|---|---|---|
| Slant Intake Wells (wells, pipelines, land): | | $ 36,000,000 |
| Tunnel under Coastal Dunes: | | $ 8,900,000 |
| Intake Pump Station: | | $ 5,900,000 |
| Intake Pipeline : | | $ 5,000,000 |
| Brine Discharge Pipeline: | | $ 1,000,000 |
| Outfall Connection Fee: | | $ 3,100,000 |
| Total Capital Costs (2012) | : | $ 59,900,000 |

**INTAKE CONTINGENCY OPTIONS**

If a slant well intake system at CEMEX as proposed in the application is not possible, then:

**Intake Contingency Option 1: Ranney collectors at CEMEX property that extract seawater from the Sand Dunes formation.**

This contingency option would also be considered if the proposed extraction from the 180-foot aquifer is not possible, and slant well test results indicate that the Sand Dunes formation is sufficiently productive for a design based on Ranney collectors. Each Ranney collector would consist of a 10- to 20-foot diameter buried caisson, extending to a depth of approximately 50 feet below the beach surface, with 100 to 300 foot long horizontal collector wells extending radially in a semi-circle pattern. Although portions of the horizontal well screens would be under the ocean floor, portions would be under the beach. For purposes of illustration, it is assumed that four Ranney collectors would be required for this contingency option in order to extract 22 mgd of feedwater for a 9 mgd desalination plant. The Ranney collectors could be configured as a gravity system draining to a pump station on the east side of the dunes, or as a pumped system with submersible pumps in each collector.

For either configuration, the collectors would be connected by a 1,800 LF 30-inch diameter beach pipeline which would then convey water eastward in a 36-inch diameter pipeline under the dunes. For the gravity collector option, the beach pipeline would be installed by trenchless construction. The pipeline under the dunes would be installed by trenchless construction for both the gravity and pumped collector options. A 7,700 LF 36-inch diameter pipeline would convey the water from the eastern edge of the dunes to the desalination plant. A 22 mgd pump station would be installed at the eastern edge of the dunes for the gravity collector option (this pump station would not be required for the pumped well option). The pipeline crossing under Highway 1 would be installed with trenchless construction.

The brine generated from the desalination plant would be conveyed to MRWPCA wastewater treatment facility and discharged into the existing outfall.

This contingency option is presented in Figure 2.

***Estimated Capital Cost Impacts***

| | |
|---|---|
| 4 Ranney Collectors (Excl. Land): | $ 35,000,000 |
| Additional 600-ft of Beach Pipeline: | $ 900,000 |
| Avoided Costs of Slant Wells (Excl. Land): | ($35,000,000) |
| *Net Capital Cost Increase (2012 dollars) :* | *$ 900,000* |

***Pros***

- Ranney collectors are proven technology and have been used in numerous projects
- This intake contingency option would not have any advantages with respect to the proposed project, although it would allow project to move forward on the current site if slant wells become infeasible.

***Cons***

- Construction of each Ranney collector might not be completed in a 5-month Snowy Plover non-breeding season. Deep and large diameter collector shaft construction could increase the costs and increase permitting risks.
- Higher average use and pumping costs due to potentially greater drawdown compared to the slant wells
- Ranney collectors are difficult to test at a demonstration scale.
- Confined space below ground entry is required for maintenance.
- Possible length limitation on horizontal collectors could result in significantly less well screen directly below the ocean floor.

**Intake Contingency Option 2: Open ocean intake offshore from CEMEX property.**

This contingency option involves construction of a new wedge-wire passive screen intake which would be installed on the ocean floor at a depth of approximately 40 feet of water approximately 2,400 feet offshore from the CEMEX property. The intake screen would be mounted on a vertical shaft that that would be connected to a 5,000-foot long 36-inch diameter pipeline that would terminate at a 23 mgd pump station on the eastern edge of the dunes. This pipeline would be installed with trenchless technology under the ocean floor, the beach and the dunes. From the pump station, a 7,700 LF 36-inch diameter pressure pipeline would convey the water to the desalination plant. The pipeline crossing under Highway 1 would be installed with trenchless construction.

A membrane or media filtration system would be required for this alternative to provide adequate removal of algae and suspended and colloidal solids prior to reverse osmosis, and to provide pathogen log-removal credits as required by the Safe Drinking Water Act.

The brine generated from the desalination plant would be conveyed to the MRWPCA wastewater treatment facility and discharged into the existing outfall.

This contingency option is presented in Figure 3.

***Estimated Capital Cost Impact***

| | |
|---|---|
| Longer Tunnel: | $ 10,500,000 |
| Terminal Structure: | $ 3,000,000 |
| Wedge-wire Screens: | $ 300,000 |
| Pretreatment: | $ 30,000,000 |
| Avoided Cost of Slant Wells: | ($ 36,000,000) |
| *Net Capital Cost Increase (2012 dollars):* | *$ 7,800,000* |

***Pros***

- No impact on groundwater
- No construction on the beach
- Virtually unlimited supply
- Faster to construct
- No seasonal construction restrictions
- No initial tests required

***Cons***

- Increased construction risk
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown feasibility of acquiring a construction permit in the marine sanctuary
- Increased pretreatment requirements
- Intake screens are exposed to ocean hazards
- Unknown additional impingement and entrainment mitigation costs

**Intake Contingency Option 3: Slant well intake system at Portrero Road with feedwater pumped to Desalination Plant at CBR site.**

For this contingency option, slant wells would be installed at the parking lot on the west end of the Portrero Road and along the roadway that parallels the beach north of the parking lot. For purposes of illustration, it is assumed that 10 pumped wells would be required to extract 22 mgd of water from the Sand Dunes formation at this location. The intake wells would pump water into a 37,200 LF 36-inch diameter pressure pipeline to the desalination plant at the CBR site. The route of this pipeline from the slant wells would be along Portrero Road to Highway-1, on private easements parallel to Highway 1, and then along Molero Road to Artichoke Road. Trenchless construction would be used to install the pipeline under Highway 1 and the Salinas River from the south end of the Artichoke Road to a private easement on the east side of Highway 1 and south of the river.

The pipeline would then follow the TAMC right-of-way from this location south to Charles Benson road and to the desalination plant.

The brine generated from the desalination plant would be conveyed to MRWPCA wastewater treatment facility and discharged into the existing outfall.

This contingency option is presented in Figure 4.

***Estimated Capital Cost Impact***

| | |
|---|---|
| 34,000 LF of Intake pipeline from Portrero Road to CBR: | $19,400,000 |
| Increased Pump Horsepower (500hp): | $ 6,900,000 |
| Avoided Intake Pump Station: | ($5,900,000) |
| Avoided Tunnel Cost: | ($8,900,000) |
| Avoided Cost of 3,500 LF of intake pipeline for pump station to CBR from Dunes Tunnel to CBR : | ($3,000,000) |
| *Net Capital Cost Increase (2012 dollars) :* | *$ 8,500,000* |

***Pros***

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions

***Cons***

- Unknown geological conditions
- Wells located in restricted pumping area
- Site acquisition for slant wells and pump station in state-owned land (not included in cost estimate)
- Right-of-way acquisition requirements along Highway-1
- Higher energy requirements for conveyance
- Old Salinas River crossing
- Salinas River and Highway-1 crossings

**Intake Contingency Option 4: Direct intake of water from Moss Landing Harbor, using existing Marine Refractory intake infrastructure, with feedwater pumped to a desalination plant at the CBR site.**

For this contingency option, existing intake infrastructure at the Marine Refractory site in Moss Landing Harbor would be utilized to supply 23 mgd of feedwater to a desalination plant at the CBR site. It is assumed that this existing intake would require modifications to comply with current and proposed modifications of the State Ocean Plan. A 23 mgd pump station, installed near the intake, would deliver the feedwater into a 46,700 LF 36 –inch diameter pipeline to the desalination plant. This pipeline would be routed along Dolan Road; south in private easements on the west side of the railroad right-of-way; west in Benson Road and then crossing Hwy 156 using trenchless construction; west in private easements on the south side of Hwy 156; east on Nashua Road to the TAMC railroad right-of-way; south on the TAMC right-of-way to the Salinas River, crossing the Salinas River either with trenchless construction or with a pipe bridge constructed on the Del Monte Boulevard Bridge; south

[1] Horsepower provided to show relative increase over proposed project. The cost does not include additional annual operating cost. This note applies to all horsepower estimates provided in this memo.

on Del Monte Boulevard to CBR; and then east on CBR to the desalination plant at the CBR site. Trenchless construction or pipe bridges would be required for crossing Moro Cojo Slough and Tembladero Slough.

A membrane or media filtration system would be required for this alternative to provide adequate removal of algae and suspended and colloidal solids prior to reverse osmosis, and to provide pathogen log-removal credits as required by the Safe Drinking Water Act.

The brine generated from the desalination plant would be conveyed to MRWPCA wastewater treatment facility and discharged into the existing outfall.

This contingency option is presented in Figure 5.

***Estimated Capital Cost Impact***

| | |
|---|---|
| 43,500 LF of intake pipe from Marine refractory site to CBR: | $26,800,000 |
| Increased Pump Capacity (650hp): | $ 1,300,000 |
| Pretreatment: | $30,000,000 |
| Intake & Screen Modifications: | $ 1,000,000 |
| Avoided Dunes Tunnel Cost: | ($ 8,900,000) |
| Avoided Cost of 3,500 LF of intake pipeline from pump station to CBF: | ($ 3,000,000) |
| Avoided Cost of Slant Wells (including Land): | ($36,000,000) |
| *Net Capital Cost Increase (2012 dollars) :* | *$ 11,200,000* |

***Pros***

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions

***Cons***

- Unknown surge protection requirements
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156.
- Private property acquisition and facility use agreements (not included in cost estimate) at Marine Refractory site.
- Right-of-way acquisition requirements along highways (not included in cost estimate)
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs

**Intake Contingency Option 5: Use of spent cooling water from the Moss Landing Power Plant, with feedwater pumped to a desalination plant at the CBR site.**

Similar to the intake proposed as part of the Moss Landing Alternative in the Coastal Water Project EIR, this contingency option would use a diversion facility at the disengaging basin of the Moss Landing Power Plant (MLPP) to supply water to the desalination plant. The disengaging basin receives spent cooling water from Units 1 and 2 and directs this water to the MLPP outfall. The source of cooling water for Units 1 and 2 is water drawn

from Moss Landing Harbor. This alternative assumes that the power plant circulates a minimum amount of seawater (23 mgd or more) even if the plant is not generating any power. The diversion from the disengaging basin would be by vacuum-actuated siphons with the feedwater flowing by gravity in a 48-inch diameter pipeline to a site along Dolan Road approximately 7,000 feet east of the disengaging basin (as described previously for the Coastal Water Project Moss Landing Alternative). A 23 mgd intake pump station at this site would deliver feedwater to a desalination plant at the CBR site via a 36-inch diameter pressure pipeline.

The feedwater pipeline from the intake pump station to the desalination plant would be constructed along the same pipeline route as described for Intake Contingency Option 4. Additional pretreatment requirements and brine disposal would also be as described for Intake Contingency Option 4.

This contingency option is presented in Figure 6.

***Estimated Capital Cost Impact***

| | |
|---|---|
| 43,500 LF of Intake pipeline from disengaging basin to CBR: | $ 26,800,000 |
| Increased Pump Horsepower (650hp): | $ 1,300,000 |
| Pretreatment: | $ 30,000,000 |
| Intake Connection at Disengaging Basin: | $ 500,000 |
| Avoided Dunes Tunnel Cost: | ($ 8,900,000) |
| Avoided Cost of 3,500 LF of intake pipeline from pump station to CBR: | ($ 3,000,000) |
| Avoided Cost of Slant Wells (Including Land): | ($ 36,000,000) |
| *Net Capital Cost Increase (2012 dollars)* | *$ 10,700,000* |

***Pros***

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions
- Warmer feedwater from the spent cooling water potentially reduces desalination costs
- No intake permit required

***Cons***

- Warmer feedwater from the spent cooling water potentially increases second pass requirements
- Unknown surge protection requirements
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River and Highway 156
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways
- Use of power plant cooling water makes permitting relatively more challenging and diminishes NGO support
- Intake operations dependent on power plant operation

**Intake Contingency Option 6: Use of water diverted from the Moss Landing Power Plant cooling water intake facilities, with feedwater pumped to a desalination plant at the CBR site.**

This contingency option would utilize the MLPP cooling system intake screens to screen desalination plant feedwater. New diversion pumps for pumping seawater to the desalination plant would be installed behind the

existing MLPP intake screens and the desalination plant intake system would be independent of the cooling operations at the MLPP. For purposes of illustration, it is assumed that a 23 mgd feedwater pump station would be installed at or near the MLPP intake for Units 6 and 7, but it would also be capable of receiving flow from a pipeline connection to the MLPP intake for Units 1 and 2.

The feedwater pipeline, additional pretreatment requirements, and brine disposal would be identical to that described for Intake Contingency Option 4.

This contingency option is presented in Figure 7.

***Estimated Capital Cost Impact***

| | |
|---|---|
| 43,500 LF of Intake Pipeline from disengaging basin to CBR: | $26,800,000 |
| Increased Pump Horsepower (650hp): | $ 1,300,000 |
| Pretreatment: | $30,000,000 |
| Intake and screen modifications: | $ 1,000,000 |
| Avoided Dunes Tunnel Cost: | ($8,900,000) |
| Avoided Cost of 3,500 LF of intake pipeline from Tunnel to CBR: | ($3,000,000) |
| Avoided Cost of Slant Wells (including land): | ($36,000,000) |
| *Net Capital Cost Increase (2012 dollars)* | *$ 11,200,000* |

***Pros***

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions

***Cons***

- Unknown surge protection requirements
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs

**Intake Contingency Option 7: Convert existing Marine Refractory outfall into an open ocean intake, with feedwater pumped to a desalination plant at the CBR site.**

This contingency option involves installing a new wedge-wire passive screen intake on the ocean end of the existing outfall at the Marine Refractory site and using the existing outfall piping to draw seawater into a 23 mgd pumping station located on or near the existing headworks of the existing outfall. This pump station would deliver feedwater to a desalination plant at the CBR site via a pipeline identical to the feedwater pipeline described in Intake Contingency Option 4. Additional pretreatment requirements and brine disposal would be identical to that described for Intake Contingency Option 4.

This contingency option is presented in Figure 8.

***Estimated Capital Cost Impacts***

| | |
|---|---|
| 43,500 LF of Intake pipeline from disengaging basin to CBR: | $26,800,000 |
| Increased Pump Horsepower (650hp): | $ 1,300,000 |
| Pretreatment: | $30,000,000 |
| Outfall modifications: | $ 1,000,000 |
| Screens: | $ 2,000,000 |
| Avoided Tunnel Cost: | ($ 8,900,000) |
| Avoided Cost of 3,500 LF of Pipeline: | ($ 3,000,000) |
| Avoided Cost of Slant Wells (including land): | ($36,000,000) |
| *Net Capital Cost Increase (2012 dollars):* | *$ 13,200,000* |

***Pros***

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions

***Cons***

- Unknown surge protection requirements
- Higher energy costs
- Special construction required to cross Tembladero Slough, Moro Cojo Slough and Salinas River
- Additional private property acquisition and facility use agreements
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs
- Unknown outfall condition
- Unknown feasibility of acquiring a construction permit in the marine sanctuary
- Screens are exposed to ocean hazards

**Intake Contingency Option 8: Construct a new open ocean intake near Moss Landing, with feedwater pumped to a desalination plant at the CBR site.**

This contingency option involves construction of a new wedge-wire passive screen intake which would be installed on the ocean floor at a depth of approximately 40 feet of water approximately 2,400 feet offshore from the coastline near the parking lot at the end of Portrero Road. The intake screen would be mounted on a vertical shaft that would be connected to a 3,100-foot long 36-inch diameter pipeline that would terminate at a 23 mgd pump station in or near the parking lot. This pipeline would be installed with trenchless technology under the ocean floor and the beach. From the pump station, a 37,200 LF 36-inch diameter pressure pipeline would convey the water to the desalination plant along the same pipeline route as described previously for Contingency Option 4. Additional pretreatment requirements and brine disposal would be identical to that described for Contingency Option 5.

This contingency option is presented in Figure 9.

***Estimated Capital Cost Impacts***

| | | |
|---|---|---|
| Additional Cost of 34,000 LF of pipe | : | $ 19,400,000 |
| Pretreatment: | | $ 30,000,000 |
| Additional Cost of HDD Connection | : | $ 5,600,000 |
| Additional Cost of Intake Structure and Screens | : | $ 3,300,000 |
| Additional Cost of Increased Pump Capacity (500hp) | : | $ 1,000,000 |
| Avoided Dunes Tunnel Cost: | | ($ 8,900,000) |
| Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR: | | ($ 3,000,000) |
| Avoided Cost of Slant Wells (including land): | | ($ 36,000,000) |
| *Net Capital Cost Increase (2012 dollars):* | | *$11,400,000* |

**Pros**

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions
- Reduced construction costs

**Cons**

- Unknown surge protection requirements
- Higher energy costs
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Additional private property acquisition and facility use agreements
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs
- Unknown feasibility of acquiring a construction permit in the marine sanctuary
- Old Salinas River crossing
- Salinas River and highways crossing
- Additional site acquisition for the pump station

**DISCHARGE CONTINGENCY OPTIONS**

If discharge of brine from CBR site desalination plant to an unmodified MRWPCA outfall is not possible, then:

**Discharge Contingency Option 1: Modify outfall by inserting separate pipe for brine discharge, and adding dedicated brine diffusers at the end of the outfall.**

This contingency option involves inserting a brine discharge pipeline inside the existing outfall pipeline. The annular space between the outer wall of the inserted pipeline and the inner wall of the outfall would continue to be used for effluent flow. At an offshore location, an exit structure would be constructed on the existing pipeline, and a separate brine diffuser would be constructed for brine discharge. This pipe-in-pipe arrangement would be configured with a new pump station that would be used during wet weather periods, when effluent flows are high, to pump a mixture of brine and effluent through the inserted pipe and the new diffusers. For purposes of illustration , it is assumed that 13,500 ft of 20-inch brine pipeline would be inserted in the MRWPCA outfall starting at the outfall headworks and extending to the first off-shore bend in the outfall. At this point,

approximately 3,500 ft off-shore, the exit structure would be constructed, and a 500-foot long brine diffuser section would be constructed on the ocean floor.

This contingency option is presented in Figure 10.

***Estimated Capital Cost Impact***

| | |
|---|---|
| Slip Lining: | $ 4,000,000 |
| Exit Structure from Existing Outfall: | $ 2,000,000 |
| New Diffusers: | $ 500,000 |
| Brine Pump Station : | $ 1,200,000 |
| *Net Capital Cost Increase (2012 dollars):* | *$ 7,700,000* |

**Pros**

- Allows MRWPCA to use the outfall to maximum capacity at all times
- Discharge operations are independent of MRWPCA discharge

**Cons**

- New discharge permit required for brine
- Higher energy requirements when brine pump station is operating
- Additional maintenance requirements for the brine pump station

**Discharge Contingency Option 2: Install new outfall off-shore of CEMEX property.**

For this contingency option, brine would be discharged from the desalination plant at the CBR site through a 13,000 LF 24-inch diameter brine pipeline to brine diffusers that would be located approximately 2,500 LF off-shore of the CEMEX property near the slant well intake system. Approximately 5,400 LF of the brine pipeline would be constructed under the ocean floor, beach and dunes using a tunnel boring machine. The diffusers would be designed to meet anticipated requirements of the modified State Ocean Plan.

This contingency option is presented in Figure 11.

***Estimated Capital Cost Impact***

| | |
|---|---|
| Brine Pipeline from Desal Plant to Tunnel: | $ 3,500,000 |
| Outfall Tunnel: | $ 13,000,000 |
| Terminal Structure and diffusers: | $ 3,000,000 |
| *Net Capital Cost Increase (2012 dollars):* | *$ 19,500,000* |

**Pros**

- Allows MRWPCA to use the outfall to maximum capacity at all times
- Discharge operations are independent of MRWPCA discharge

**Cons**

- New discharge permit required
- Higher energy requirements
- Additional maintenance costs associated with the pump station

**Discharge Contingency Option 3: Construct brine pipeline to Moss Landing, and discharge to the MLPP cooling water outfall.**

For this contingency option, a brine pumping station would be constructed at the desalination plant at the CBR site, for discharging brine into a 47,000 LF long 24-inch diameter brine pipeline to Moss Landing for discharge to the MLPP cooling water outfall (using a connection to the MLPP Disengaging Basin). This contingency option would possibly be limited during those periods when cooling water flow in the MLPP outfall is insufficient to provide adequate dilution of the brine discharge.

This contingency option is presented in Figure 12.

***Estimated Capital Cost Impact***

| | |
|---|---|
| Brine Pipeline from Desal Plant to MLPP: | $ 16,200,000 |
| Brine Pump Station: | $ 2,000,000 |
| Disengaging Basin Connection: | $ 300,000 |
| *Net Capital Cost Increase (2012 dollars):* | *$ 18,500,000* |

**Pros**

- Allows MRWPCA to use the outfall to maximum capacity at all times
- Discharge operations are independent of MRWPCA discharge

**Cons**

- Additional right-of-way acquisition required
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Hwy 156
- Additional private property acquisition and facility use agreements
- Right-of-way acquisition requirements along highways
- Facility use agreements required at MLPP.

**Discharge Contingency Option 4: Construct brine pipeline to Moss Landing, and discharge to the existing Marine Refractory outfall, with modifications.**

This contingency option is similar to Discharge Contingency Option 3, except that the brine would be discharged through the existing Marine Refractory outfall, with modifications to meet the State Ocean Plan requirements. A brine pumping station would be constructed at the desalination plant at the CBR site, for discharging brine into a 47,000 LF 24-inch diameter brine pipeline to the Marine Refractory outfall. This contingency plan would require brine-only discharge permitting through the Marine Refractory outfall as it is assumed that no dilution water would be available.

This contingency option is presented in Figure 13.

***Estimated Capital Cost Impact***

| | |
|---|---|
| Additional Cost of Pipeline | $ 16,200,000 |
| Additional Cost of Pump Station | $ 2,000,000 |
| Additional Cost of Outfall Modification | $ 4,000,000 |
| Additional Cost of New Diffusers | $ 500,000 |
| *Net Capital Cost Increase (2012 dollars)* | *$ 22,700,000* |

**Pros**

- Allows MRWPCA to use the outfall to maximum capacity at all times
- Discharge operations are independent of MRWPCA discharge

**Cons**

- New discharge permit required
- Additional right-of-way acquisition required
- Unknown feasibility of acquiring a construction permit in the marine sanctuary
- Unknown surge protection requirements
- Higher energy costs
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Additional private property acquisition and facility use agreements
- Right-of-way acquisition requirements along highways

**DESALINATION PLANT SITE CONTINGENCY OPTIONS**

If slant well intake at CEMEX is not possible and it is not possible to use the existing or modified MRWPCA outfall, then the desalination plant would be moved to Moss Landing, as described below. Cost impact for each of the plant site contingency options was not estimated.

**Desalination Plant Site Contingency Option 1: Desalination plant at Marine Refractory site**

For this contingency plan, the desalination plant would be located at the Marine Refractory Site. Feedwater would be supplied by the existing intake infrastructure, with modifications as described in Intake Contingency Option 4. Product water from the desalination plant would be conveyed to Monterey Peninsula using the alignment previously described for the intake pipeline in Intake Contingency Option 4 down to CBR, and from there using the product water pipeline route described in the application. The brine from the desalination would be discharged through the existing Marine Refractory outfall, with modifications to meet State Ocean Plan requirements. This contingency plan would require brine-only discharge permitting through the Marine Refractory outfall as no dilution water would be available.

This contingency option is presented in Figure 14.

**Pros**

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions

**Cons**

- Unknown surge protection requirements
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156.
- Private property acquisition and facility use agreements at Marine Refractory site.
- Right-of-way acquisition requirements along highways

- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs
- Additional pipeline construction to Moss Landing
- Discharge Permit required

**Desalination Plant Site Contingency Option 2: Desalination plant at Capurro Ranch site**

For this contingency option, the desalination plant would be located at Capurro Ranch, north of Elkhorn Slough. Feedwater would be provided by an open ocean intake located near the terminus of the former Sandholdt Pier. From Moss Landing Harbor, the seawater pipeline would be routed along Highway 1 north to the desalination plant at Capurro Ranch. The product water would be conveyed south from the desalination plant on Highway 1 to Dolan Road, then east on Dolan Road to the alignment previously described for the intake pipeline in Intake Contingency Option 4. The brine from the desalination plant would be conveyed to the MLPP outfall for final discharge.

This contingency option is presented in Figure 15.

**Pros**

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions

**Cons**

- Discharge Permit required
- Project requires two pipeline crossings of Elkhorn Slough
- Long product water pipeline from Moss Landing to California American Water service area
- Unknown surge protection requirements
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Private property acquisition
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs

**Desalination Plant Site Contingency Option 3: FEIR proposed project at Moss Landing Desalination Plant site**

For this contingency option, the desalination plant would be located at the eastern MLPP property as proposed in the FEIR. MLPP cooling water would be utilized for both intake and discharge of brine. Intake system would be connected to the Disengaging Basin and divert water east to the desalination plant. The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR and the brine would be conveyed west to the disengaging basin and connect to the basin downstream of the intake location.

The pros and cons of this contingency option are the same as listed for the Intake Contingency Option 5 and Discharge Contingency Option 3.

This contingency option is presented in Figure 16.

**Desalination Plant Site Contingency Option 4: Slant intake wells at Portrero Road and FEIR proposed desalination plant site with brine discharge to MLPP outfall**

For this contingency option, the desalination plant would be located at the eastern MLPP property as proposed in the FEIR. Slant wells would be installed at the parking lot on the west end of the Portrero Road and along the roadway that parallels the beach north of the parking lot. For purposes of illustration, it is assumed that 10 pumped wells would be required to extract 22 mgd of water from the Sand Dunes formation at this location. The intake wells would pump water into a 15,000 LF 36-inch diameter pressure pipeline to the desalination plant at a desalination plant on Dolan Road east of the MLPP. Brine from the desalination plant would be returned to Moss Landing for discharge to the MLPP cooling water outfall (using a connection to the MLPP Disengaging Basin). The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

**Pros**

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions

**Cons**

- Discharge may not be possible during periods of MLPP shutdown
- Difficult pipeline construction in Hwy 1 at Moro Cojo Slough crossing
- Unknown geological conditions
- Wells located in restricted pumping area
- Site acquisition for slant wells and pump station in state-owned land
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Higher energy costs for conveyance
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways

This contingency option is presented in Figure 17.

**Desalination Plant Site Contingency Option 5: Slant intake wells at Portrero Road and FEIR proposed desalination plant site with brine discharge to Marine Refractory outfall**

For this contingency option, the desalination plant would be located at the eastern MLPP property as proposed in the FEIR. Slant wells would be installed at the parking lot on the west end of the Portrero Road and along the roadway that parallels the beach north of the parking lot. For purposes of illustration, it is assumed that 10 pumped wells would be required to extract 22 mgd of water from the Sand Dunes formation at this location. The intake wells would pump water into a 15,000 LF 36-inch diameter pressure pipeline to the desalination plant on Dolan Road east of the MLPP. Brine from the desalination plant would be discharged to the existing Marine Refractory outfall, with modifications. The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

**Pros**

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions

**Cons**

- New discharge permit required
- Property acquisition and facility use agreements required at Marine Refractory Site
- Difficult pipeline construction in Hwy 1 at Moro Cojo Slough crossing
- Unknown geological conditions
- Wells located in restricted pumping area
- Site acquisition for slant wells and pump station in state-owned land
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Higher energy costs for conveyance
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways

This contingency option is presented in Figure 18.

**Desalination Plant Site Contingency Option 6: Slant intake wells at Portrero Road and FEIR proposed desalination plant site with brine discharge to a new outfall**

For this contingency option, the desalination plant would be located at the eastern MLPP property as proposed in the FEIR. Slant wells would be installed at the parking lot on the west end of the Portrero Road and along the roadway that parallels the beach north of the parking lot. For purposes of illustration, it is assumed that 10 pumped wells would be required to extract 22 mgd of water from the Sand Dunes formation at this location. The intake wells would pump water into a 15,000 LF 36-inch diameter pressure pipeline to the desalination plant along Dolan Road, east of the MLPP. Brine from the desalination plant would be discharged to a new outfall that would be constructed at the parking lot on the west end of the Portrero Road. The outfall diffusers would be located approximately 3,000 LF off-shore. The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

**Pros**

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions

**Cons**

- New discharge permit required
- Property acquisition and facility use agreements required at Marine Refractory Site
- Difficult pipeline construction in Hwy 1 at Moro Cojo Slough crossing for brine and feedwater pipeline
- Unknown geological conditions
- Wells located in restricted pumping area
- Site acquisition for slant wells and pump station in state-owned land

- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Higher energy costs for conveyance
- Right-of-way acquisition requirements along highways

This contingency option is presented in Figure 19.

**Desalination Plant Site Contingency Option 7: Marine Refractory open ocean intake and FEIR proposed desalination plant site with brine discharge to a MLPP outfall**

For this contingency option, the desalination plant would be located along Dolan Road east of the MLPP, as proposed in the Coastal Water Project FEIR. Existing intake infrastructure at the Marine Refractory site in Moss Landing Harbor would be utilized to supply 23 mgd of feedwater to a desalination plant at a site located along Dolan Road, approximately 7000 LF from Highway 1. It is assumed that this existing intake would require modifications to comply with current and proposed modifications of the State Ocean Plan. A 23 mgd pump station, installed near the intake, would deliver the feedwater into a 6,300 LF 36 –inch diameter pipeline to the desalination plant. Brine from the desalination plant would be discharged conveyed to Moss Landing for discharge to the MLPP cooling water outfall (using a connection to the MLPP Disengaging Basin). The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

**Pros**

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions

**Cons**

- Property acquisition and facility use agreements required for both the Marine Refractory Site and MLPP
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs
- Higher energy costs for conveyance

This contingency option is presented in Figure 20.

**Desalination Plant Site Contingency Option 8: Marine Refractory open ocean intake and FEIR proposed desalination plant site with brine discharge to a new outfall**

For this contingency option, the desalination plant would be located along Dolan Road East of the MLPP property as proposed in the FEIR. Existing intake infrastructure at the Marine Refractory site in Moss Landing Harbor would be utilized to supply 23 mgd of feedwater to a desalination plant at a site located along Dolan Road, approximately 7000 LF from Highway 1. It is assumed that this existing intake would require modifications to comply with current and proposed modifications of the State Ocean Plan. A 23 mgd pump station, installed near the intake, would deliver the feedwater into a 6,300 LF 36–inch diameter pipeline to the desalination plant. Brine from the desalination plant would be discharged into a new ocean outfall. The brine would be conveyed

west in Dolan Road, south on Highway 1 and west on Moss Landing Road to Sandholdt Road. From a location to be determined on Sandholdt Road, the outfall would convey brine to approximately 1,000 LF off-shore for disposal. The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

**Pros**

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions

**Cons**

- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs
- New Discharge Permit required
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River and Highway 156
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways

This contingency option is presented in Figure 21.

**SLANT INTAKE WELL LOCATIONS – CONTINGENCY PLANS NOT PURSUED**

**Slant Intake Wells at Seaside – Not Pursued**:

The geology along the shoreline of Seaside has been recently studied in detail (CDM and Feeney). It has been concluded by these studies that the existing geological conditions would not be supportive to install productive slant wells in the area. Therefore this contingency plan has not been pursued.

**Slant Intake Wells at Carmel River – Not Pursued**:

For this contingency plan, slant intake wells would be constructed around the Carmel River mouth. The existing geology at the Carmel River has not been studied in detail; however, it is suspected that the geology would not support construction of productive slant wells. Additionally, the intake wells would be too far (over 17 miles) from any feasible desalination plant site.