

STATE OF CALIFORNIA
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

STAFF REPORT FOR REGULAR MEETING OF MAY 14, 2004
Prepared April 20, 2004

ITEM NUMBER: 43

SUBJECT: Reissuance of Waste Discharge Requirements (National Pollutant Discharge Elimination System Permit No. CA0049697) for the City of Morro Bay Desalination Facility, San Luis Obispo County, Order No. R3-2004-0005

KEY INFORMATION

Location: 176 Atascadero Road, Morro Bay
Type of Waste: Desalination wastewater (brine)
Design Capacity: 830,000 gallons per day (gpd)
Present Volume: Variable, up to 830,000 gpd
Treatment: None. Desalination wastewater disposal relies on dilution and dispersion
Disposal: To the Pacific Ocean via the Duke Energy Power Plant Cooling Water Outfall
Existing Orders: Waste Discharge Requirements Order No. 94-03

SUMMARY

Waste Discharge Requirements Order No. 94-03 for the City of Morro Bay Desalination Facility expired March 11, 2004. The proposed Order permits the discharge of up to 830,000 gpd of desalination wastewater to the Pacific Ocean via the Duke Energy Power Plant Cooling Water Outfall. Several changes to the Waste Discharge Requirements (WDRs) and Monitoring and Reporting Program (MRP) are proposed, including: more stringent Effluent Limitations for several constituents; addition of a requirement to investigate the feasibility of disposal alternatives; increases in monitoring frequency for several prevalent wastewater constituents; decreases in monitoring frequency for several absent constituents; addition of effluent acrylic acid monitoring; elimination of Acute Toxicity monitoring, and addition of requirement to survey dilution of the discharge within the cooling water outfall under certain operating conditions.

DISCUSSION

Purpose of Proposed Order

Order No. 94-03, "Waste Discharge Requirements for City of Morro Bay Desalination Facility, San Luis Obispo County," expired on March 11, 2004. The City of Morro Bay (Discharger) submitted an application for permission to continue discharging wastes under the National Pollutant Discharge Elimination System (NPDES) on September 30, 2003. Proposed Order No. R3-2003-0005 is intended to replace Order No. 94-03.

Facility Description

The Discharger owns and operates a reverse osmosis seawater desalination facility located at the City Corporation Yard, 176 Atascadero Road, Morro Bay, as shown on Attachment A of the proposed Order. The desalination facility is not used as the communities' primary water supply – it is used as backup potable water supply during emergency drought conditions, or when primary

water supplies are not available. In 2002 and 2003, the desalination facility was operated less than two months each Fall, when the State Water Project pipeline was shut down for maintenance and testing.

Source water is pumped from a gallery of five beach wells located at the north end of Embarcadero Avenue, near Coleman Park (see Attachment A), and brackish wells adjacent to Morro Creek. This source water collection method avoids impingement and entrainment of aquatic life often associated with conventional open water intakes, and minimizes pretreatment of the source water. Due to blending of seawater and brackish water, the source water salinity is typically much less than seawater (less than 34,000 milligrams per liter (mg/L) Total Dissolved Solids (TDS)). Source water salinity slowly increases during each operational as the brackish water source is exhausted. Source water salinity peaked at approximately 20,000 mg/L TDS in Fall 2003.

The desalination process is shown in Figure 1. Up to 1.43 million gallons per day (MGD) of source water is filtered to remove particulates and excessive iron. An anti-scaling compound such as "Flocon 100" or "Permatreat 191", which are a blend of

acrylic acid and proprietary polymers, are added when necessary to prevent scaling of the reverse osmosis membranes. The water is then fed at high pressure through pipe-like vessels that are packed with modules of spiral-wound reverse osmosis membrane "envelopes". Potable water permeates through the reverse osmosis membranes into these envelopes (see Figure 2) where it is captured by an internal perforated pipe and manifold system. Salty water ("concentrate") is left behind by the reverse osmosis membranes and passes out the end of the vessels to be wasted.

Up to 830,000 gpd of wastewater is generated by this process. Wastewater consists primarily of concentrated source water, with small volumes of clarified pretreatment filter backwash (containing influent particulates and oxidized iron) and up to 10 mg/L of anti-scaling compound. This concentration is much less than the toxic concentrations of these compounds. For example, Flocon 100's LC₅₀ is 600 mg/L, and No Observed Effects Concentration is 360 mg/L. The discharge of 10 mg/L of anti-scaling compound is not expected to adversely affect aquatic life.

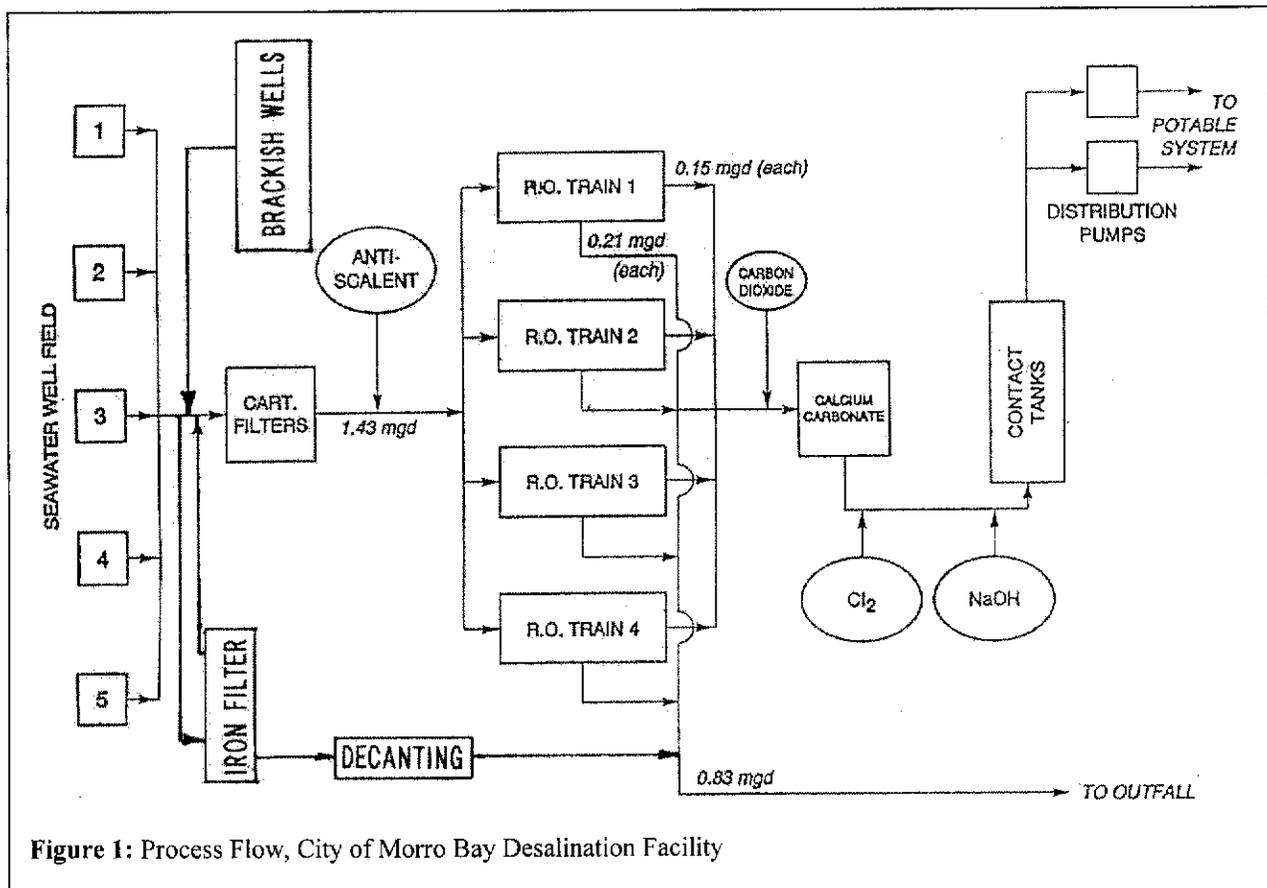


Figure 1: Process Flow, City of Morro Bay Desalination Facility

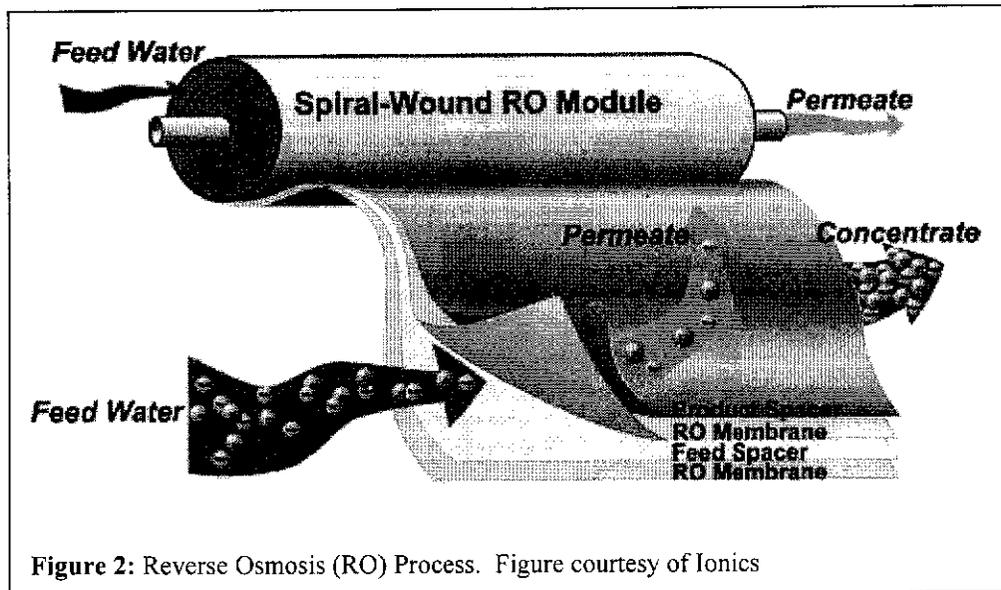


Figure 2: Reverse Osmosis (RO) Process. Figure courtesy of Ionics

Due to relatively low source water salinity (less than 20,000 mg/L TDS), effluent salinity is typically less than or comparable to seawater. The highest effluent salinity observed in Fall 2002 was 35,000 mg/L TDS.

The reverse osmosis membranes must be cleaned periodically. This cleaning waste is discharged to the City of Morro Bay and Cayucos Sanitary District Wastewater Treatment Plant, whose discharge is currently regulated under *Waste Discharge Requirements Order No. 98-15*.

Wastewater from the desalination facility is discharged by an outfall diffuser system to the Duke Energy Power Plant cooling water outfall, approximately 100 to 150 feet upstream of where the cooling water outfall reaches the Pacific Ocean, as shown in Attachment C. This discharge method is intended to maximize dilution of the desalination wastewater. Duke Energy Power Plant's outfall discharges to the Pacific Ocean adjacent and north-northeast of Morro Rock, as shown in Attachment A.

Discharge of up to 725 MGD of cooling seawater by Duke Energy Power Plant is regulated by "Waste Discharge Requirements Order No. 95-28, Pacific Gas and Electric Company Morro Bay Power Plant," adopted by this Regional Board March 10, 1995.

Pacific Gas and Electric Company (PG&E), former owner of the power plant, agreed, through a signed agreement between them and the Discharger, to:

"...undertake reasonable effort to provide a flow rate of a minimum of one hundred (100) million gallons per day, when City's desalination plant is operating at full capacity. The proper flow rate may be less and is determined based on the operating capacity of City's desalination plant. The flow rate provides for mixing and dispersion, to mitigate the level of total dissolved solids of City's desalination plant when said effluent discharge is above thirty four thousand (34,000) milligrams per liter (mg/L). For the purpose of this agreement, City's effluent concentration shall be presumed to exceed thirty four thousand (34,000) mg/L at all times, unless and until City notifies PG&E, otherwise. In the event PG&E does not need to discharge at said flow rate for its own purposes, City shall reimburse, to PG&E, PG&E's costs for the additional pumping..."

Although PG&E originally made this agreement, Duke Energy has extended this agreement. The Discharger provided a copy of their written agreement with Duke Energy on January 23, 2004.

The desalination facility discharge constitutes less than one percent of Duke Energy's discharge and does not significantly alter the salinity of the combined discharge. Therefore, the initial dilution ratio applicable to the desalination facility discharge is the same as the Duke Energy discharge, 10.4:1 (seawater:effluent), as specified in Waste Discharge Requirements Order No. 95-28.

Compliance History

Due to excessive iron in source water, the facility did not operate from 1995 to 2002. No monitoring data was collected and no compliance problems are noted in that period. An iron filtration process was added and the facility began operating reliably in Fall 2002. Effluent monitoring data collected in Fall 2002 indicates two exceedances of Effluent Limitations occurred:

1. Effluent Total Suspended Solids (TSS) was 80 mg/L versus a 30-day Average Effluent Limitation of 60 mg/L.
2. Effluent Copper was reported as 0.16 mg/L versus a Daily Maximum Effluent Limitation of 0.12 mg/L (Note: Staff believes the effluent copper concentration may actually be 0.16 µg/L and is awaiting confirmation from the Discharger's laboratory).

These violations did not meet the criteria for issuance of mandatory penalties. The following proposed changes to the WDRs and Monitoring and Reporting Program (MRP) are intended, in part, to resolve and investigate these violations further.

Proposed Changes to WDRs and Monitoring and Reporting Program

Several changes to the WDRs and MRP are proposed, primarily as a result of incorporating the 2001 amendments to the California Ocean Plan and better knowledge of discharge characteristics. In summary, these changes include: more stringent Effluent Limitations for several toxic constituents; addition of a requirement to investigate the feasibility of discharge alternatives to the Duke Energy Cooling Water Outfall; increases in monitoring frequency for several prevalent wastewater constituents; decreases in monitoring frequency for several absent constituents; addition of acrylic acid monitoring; elimination of Acute Toxicity monitoring, and addition of requirement to survey dilution of the discharge within the cooling water outfall under certain operating conditions. Following are the specific changes proposed:

Change	Section	Rationale
1. The existing TSS Effluent Limitation of 60 mg/L is converted to a "Net Total Suspended Solids Increase" of 60 mg/L.	WDR, Section B	The existing TSS Effluent Limitation is a technology-based objective applicable to sewage treatment plants. Desalination wastewater is fundamentally different than sewage treatment plant effluent. Desalination wastewater quality is directly related to influent quality (the process does not add TSS). The proposed net increase limitation accounts for influent contributions of TSS.
2. The Acute Toxicity limitations of the existing Permit (1.5 TUa 30-Day Average, 2.0 TUa 7-Day Average, and TUa 2.5 Daily Maximum) are replaced with a 0.61 TUa Daily Maximum.	WDR, Section B	Acute Toxicity is now a Water Quality Objective (with an associated dilution credit), with a Daily Maximum of 0.3 TUa, in the 2001 Ocean Plan.
3. Effluent limitations for the following constituents are more stringent than the existing Permit: thallium, chlorodibromomethane, 1,2-dichloroethane, 1,1-dichloroethylene, dichlorobromomethane, isophorone, N-nitrosodi-N-propylamine, 1,1,2,2-tetrachloroethane, tetrachloroethylene, 1,1,2-trichloroethane, 2,4,6-trichlorophenol.	WDR, Section B	Water Quality Objectives for these constituents are more stringent in the 2001 Ocean Plan.

Change	Section	Rationale
<p>4. The following provision is added, "Discharger shall submit to the Executive Officer by October 14, 2004, a scope of work for a feasibility study of desalination wastewater discharge alternatives to the Duke Energy Power Plant cooling water discharge. The study shall evaluate at least three desalination wastewater discharge alternatives, including the wastewater treatment facility outfall. If the study will include continued use of the existing discharge location after the once-through cooling water discharge is eliminated, the study shall include the results of the dilution survey required by Section C of Monitoring and Reporting Program No. R3-2004-005. The report shall discuss technical and financial constraints, approximate dilution values, and anticipated environmental impacts associated with each discharge alternative. A final report shall be submitted to the Executive Officer by February 11, 2005. The final report shall include a recommendation on the best discharge alternative should the Duke Energy Power Plant cooling water discharge be eliminated."</p>	<p>WDR Section D</p>	<p>The Duke Energy Power Plant has significantly reduced power generation and cooling water discharge recently due to inefficiency of the power plant and a weak power market. This provision is necessary to prepare for the possibility that the cooling water discharge may be eliminated.</p>
<p>5. Influent monitoring frequency for Temperature, TSS, Total Dissolved Solids (TDS), and Copper is increased from monthly to "twice per month, or at least twice during each operational period, whichever is greater". Influent monitoring for Electrical Conductance and Iron is added (twice per month).</p>	<p>MRP, Section A</p>	<p>Effluent quality data from 2002, which is directly related to influent quality, indicated Total Suspended Solids and Copper concentrations exceeded effluent limitations. More influent data is necessary to determine the source of these constituents. Increased monitoring frequency for TDS is necessary to better characterize source water and effluent quality. Electrical Conductance monitoring is added to establish a correlation with TDS. Iron monitoring is added to track trends in source water quality, which is known to be high in iron.</p>
<p>6. Influent monitoring frequency for Chromium, Lead, Mercury, Nickel, Silver, Zinc, and Cyanide is decreased from semi-annually to annually.</p>	<p>MRP, Section A</p>	<p>Historical monitoring data suggests these constituents are absent from the influent.</p>
<p>7. Effluent monitoring frequency for Temperature, TSS, TDS, and Copper, Settleable Solids, and pH is increased from monthly, to twice per month. Effluent monitoring for Net TSS Increase, Electrical Conductance and Iron is added (twice per month).</p>	<p>MRP, Section B</p>	<p>Effluent monitoring data from 2002 indicated TSS and Copper concentrations exceeded effluent limitations. More effluent data is necessary to determine long-term average concentrations of these constituents. Increased TDS monitoring frequency is necessary to determine compliance with the proposed effluent limitation restricting discharge when effluent is greater than 34,000 mg/L TDS. Net TSS Increase monitoring is added to determine compliance with the proposed Net TSS Increase limitation. Electrical Conductance monitoring is</p>

Change	Section	Rationale
		added to establish a correlation with TDS, with the intent of eventually replacing TDS monitoring with Electrical Conductance monitoring (which is less costly). Iron monitoring is added to track trends in source water quality.
9. Effluent monitoring frequency for Turbidity, Dissolved Oxygen, and Grease and Oil is decreased from monthly to quarterly.	MRP, Section B	Past monitoring suggests these parameters are absent or of very little concern in the effluent.
10. An effluent acrylic acid monitoring requirement is added. Such monitoring is not required when anti-scaling compounds are not used.	MRP, Section B	Acrylic acid is a surrogate for anti-scaling compounds. Such monitoring is necessary to ensure the discharged concentration of anti-scaling compounds will not harm aquatic life.
11. The effluent Acute Toxicity monitoring requirement is eliminated.	MRP, Section B	The 2001 Ocean Plan requires Chronic Toxicity testing, not Acute Toxicity testing, where the minimum initial dilution of the effluent is less than 100:1 (the initial dilution ratio applicable to the desalination facility discharge is 10.4:1).
12. A requirement is added that dilution of the discharge within the cooling water channel shall be surveyed if (1) the desalination facility operates at full capacity, and (2) effluent salinity is greater than 34,000 mg/L TDS, and (3) no flow from the power plant be provided that would dilute the discharge. The entire water column shall be monitored for salinity and density at six stations, three upstream and three downstream of the discharge point. The data shall be used to generate transects of salinity and density, that will illustrate the shape and behavior of the discharge plume within the channel, and approximate a zone of initial dilution and minimum initial dilution ratio within the channel.	MRP, Section C	In anticipation of the possibility that the power plant's once-through cooling water system will be eliminated, the Discharger must demonstrate that the discharge will be adequately diluted within the cooling water channel, without cooling water flow, prior to reaching the Pacific Ocean. The survey results will be used to evaluate the appropriateness of using the cooling water channel for disposal should the once-through cooling water system be eliminated.
13. Several sampling, analysis, and reporting Standard Provisions are promoted into the body of the Monitoring and Reporting Program.	MRP, Sections D and E	To ensure sampling and analysis procedures are appropriate and improve determinations of compliance.

ENVIRONMENTAL SUMMARY

Waste Discharge Requirements for this discharge are exempt from the provisions of the California Environmental Quality Act (Public Resources Code Section 21100, et. seq.) in accordance with Section 13389 of the California Water Code.

COMMENTS AND RESPONSES

All known interested parties were sent a Draft Order and invited to submit written comments on December 9, 2003. The Discharger published a notice of the public comment period and hearing in the San Luis Obispo County Tribune on February 11, 2004. Written comments were due March 19, 2004.

The following interested parties did not submit any written comments:

- U.S. Environmental Protection Agency
- State Water Resources Control Board
- California Coastal Commission
- California Department of Fish and Game
- County of San Luis Obispo Environmental Health Services
- Cayucos Sanitary District
- Duke Energy Power Plant
- ECOSLO
- The Ocean Conservancy

William Boucher, Capital Projects Manager for the **City of Morro Bay**, submitted written comments on December 23, 2003. The comments focus on an effluent limitation proposed in the Draft Order that would restrict discharges of effluent greater than 34,000 mg/L TDS to only when power plant cooling water discharge is at least 100 MGD. Mr. Boucher's letter states, in part:

"...the discharge from the Desal Facility is routinely less than seawater salinity and only once in its operational history has it reached ambient ocean salinity [34,000 mg/L TDS].

...The [Final Environmental Impact Report (FEIR)] and CUP/CDP provide for operational conditions for discharge at the full production/discharge capability of the Facility

although only once in the Facility's history, in the year 2002, did the Facility operate at a level approaching maximum capacity.

Should your agency make findings to deviate from the conclusions of the FEIR and determine the environmental risk of the Desalination Facility discharge is so compelling as to warrant augmented measures including further formalizing of our agreement with the power plant, then it is surely appropriate to take into full consideration both the relatively low salinity of the historic discharge and the lower flow rates.

...Adequate evidence exists that the Desalination discharge is at or less than seawater salinity under historic operating conditions. Under those conditions, the FEIR and CUP/CDP require no power plant cooling water flows and these findings are not to be overruled by staff opinions unsupported by evidence.

...As such, we will not provide certification that the discharge will not occur if there is less than 100 mgd of cooling water circulation. We will, however, continue to conform to the requirements of the FEIR and CUP/CDP for cooling water flows."

Staff Response: Staff discussed this issue with Michael Thomas, Regional Board staff responsible for permitting and oversight of the Duke Energy Morro Bay Power Plant, and Tom Luster, Coastal Commission staff and author of "Seawater Desalination and the California Coastal Act." Both agreed that requiring 100 MGD of cooling water flow to dilute less than 1 MGD of desalination brine, even while the power plant does not require cooling water for its own purposes, is a waste of electrical power, and may result in greater impacts to marine life than if no cooling water flow was required.

Considering effluent salinity will rarely exceed 34,000 mg/L TDS, and the City has reaffirmed their commitment to follow the facility's FEIR mitigation measures (as implemented through their written agreement with the power plant) when effluent

salinity exceeds 34,000 mg/L TDS, the subject effluent limitation may not be necessary. In fact, such an effluent limitation could provide justification for continued use of once-through cooling by the Morro Bay Power Plant, which may conflict with future Regional Board decisions on the matter. Staff therefore recommends the effluent limitation be removed from the Proposed Order.

In anticipation of the possibility that the power plant's once-through cooling water system will be eliminated, the Discharger must demonstrate that the discharge will be adequately diluted within the cooling water channel, without cooling water flow, prior to reaching the Pacific Ocean. Staff therefore has added a requirement to the MRP (See Section C, page 6), that (1) whenever the desalination facility is operating at full capacity, and (2) effluent salinity is greater than 34,000 mg/L TDS, and (3) no flow from the power plant be provided that would dilute the discharge; that dilution within the cooling water channel shall be surveyed. The entire water column shall be monitored for salinity and density at six stations, three upstream and three downstream of the discharge point. The data shall be used to generate transects of salinity and density, that will illustrate the shape and behavior of the discharge plume within the channel, and approximate a zone of initial dilution and minimum initial dilution ratio within the channel.

The survey results will be used to evaluate the appropriateness of using the cooling water channel for disposal should the once-through cooling water system be eliminated.

RECOMMENDATION

Staff recommends adoption of Order No. R3-2004-0005.

ATTACHMENT

Order No. R3-2004-0005

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