POSEIDON WATER

Appendix Z
Proposed Monitoring and Reporting Plan

Renewal of NPDES CA0109223
Carlsbad Desalination Project

APPENDIX Z

PROPOSED
MONITORING AND REPORTING PLAN

CARLSBAD DESALINATION PROJECT

POSEIDON WATER

August 2015

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Proposed Monitoring and Reporting Plan

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List of Abbreviations

BMZ	Brine Mixing Zone
CDP	Carlsbad Desalination Facility
EPS	Encina Power Station
mgd	million gallons per day
NPDES	National Pollutant Discharge Elimination System
Ocean Plan	*Water Quality Control Plan, Ocean Waters of California*
Poseidon	Poseidon Resources (Channelside LP)
ppt	parts per thousand
Regional Water Board	Regional Water Quality Control Board, San Diego Region
TUa	acute toxicity units
TUc	chronic toxicity units

APPENDIX Z

PROPOSED MONITORING AND REPORTING PLAN

PURPOSE OF PROGRAM

Ocean Plan Requirements. Provision III.M.4 of the 2015 amendments to the *Water Quality Control Plan, Ocean Waters of California* (Ocean Plan) requires desalination facility owners or operators to submit a Monitoring and Reporting Plan (MRP) to the Regional Water Board for approval. Provision III.M.4 of the Ocean Plan states:

> *4. Monitoring and Reporting Programs*
>
> *a. The owner or operator of a desalination facility must submit a Monitoring and Reporting Plan to the regional water board for approval. The Monitoring and Reporting Plan shall include monitoring of effluent and receiving water characteristics and impacts to all forms of marine life. The Monitoring and Reporting Plan shall, at a minimum, include monitoring for benthic community health, aquatic life toxicity, hypoxia, and receiving water characteristics consistent with Appendix III of this Plan and for compliance with the receiving water limitation in chapter III.LM.3. Receiving water monitoring for salinity shall be conducted at times when the monitoring locations are most likely affected by the discharge. For new or expanded facilities the following additional requirements apply:*
>
> *(1) An owner or operator must perform facility-specific monitoring to demonstrate compliance with the receiving water limitation for salinity,* and evaluate the potential effects of the discharge within the water column, bottom sediments, and the benthic communities. Facility-specific monitoring is required until the regional water board determines that a regional monitoring program is adequate to ensure compliance with the receiving water limitation. The monitoring and reporting plan shall be reviewed, and revised if necessary, upon NPDES permit renewal.*
>
> *(2) Baseline biological conditions shall be established at the discharge location and at a reference location prior to commencement of construction. The owner or operator is required to conduct biological surveys (e.g., Before-After Control-Impact study), that will evaluate the differences between biological communities at a reference site and at the discharge location before and after the discharge commences. The regional water board will use the data and results from the surveys and any other applicable data for evaluating and renewing the requirements set forth in a facility's NPDES permit.*

Poseidon Resources (Channelside) LP (hereinafter Poseidon) submits this proposed MRP for the Carlsbad Desalination Project (CDP) in conformance with Provision III.M.4 of the 2015 Ocean Plan amendments.

MRP Objectives. Objectives of the proposed CDP MRP include:

- characterizing CDP influent and effluent,
- characterizing the combined discharge (CDP process effluent plus augmented flow)
- assessing compliance with Ocean Plan-based effluent limitations and performance goals,
- confirming applicability of a 200 meter (656 foot) Brine Mixing Zone (BMZ),

- characterizing receiving water quality and receiving water conditions along and beyond the designated BMZ boundary,
- assessing compliance with Ocean Plan qualitative and quantitative receiving water objectives,
- complying with applicable MRP requirements established within the Ocean Plan, and
- developing information that could be used to support assessing and developing a facility-specific receiving water salinity limitation, pursuant to requirements established within Section III.M.3.c of the 2015 Ocean Plan amendments.

APPROACH

Existing and Proposed CDP Operations. Regional Water Quality Control Board (Regional Water Board) Order No. R9-2006-0065 (as amended) establishes monitoring requirements for the CDP within Attachment E - Monitoring and Reporting Program R9-2006-0065. Order No. R9-2006-0065 establishes requirements for CDP discharge operations at an annual potable water production rate of 50 million gallons per day (gpd) under:

- co-located operating conditions where CDP discharge flows would be blended with heated cooling water from the Encina Power Station (EPS) prior to discharge to the EPS effluent pond (Monitoring Location M-002) and discharge channel.
- temporary stand-alone conditions when EPS cooling water flows are insufficient and EPS intake pumps would be operated for the benefit of providing unheated dilution water for the benefit of CDP.

Construction of CDP facilities is nearing completion, initial CDP process testing has been initiated. Proposed co-located seawater desalination operations are scheduled to begin later in 2015 which will utilize EPS cooling water as intake flow and utilize EPS pumps and effluent discharge facilities.

When the Encina Power Station discharge is terminated (scheduled for 2017), CDP will convert to permanent stand-alone operations where bypassed CDP intake flow will be blended with CDP process flow (reverse osmosis concentrate and filter backwash) prior to discharge to the ocean via the existing effluent pond (Monitoring Location M-002) and effluent channel. Under such permanent stand-alone operations, Poseidon proposes to operate the CDP at a potable water production capacity of 60 mgd.

This Amended Report of Waste Discharge seeks NPDES requirements for the CDP discharge under both existing co-located/temporary stand-alone operations and permanent stand-alone operations. Accordingly, the MRP presented herein addresses monitoring needs for both operational scenarios.

Focus on Brine Mixing Zone. The 2015 Ocean Plan amendments require that receiving water salinity not exceed 2 parts per thousand (ppt) above ambient beyond a designated BMZ. Provision III.M.3.d of the Ocean Plan establishes requirements under which a BMZ may be established at a 200 meter (656-feet) distance from the discharge point. The CDP qualifies for designation of a 200-meter BMZ, and Poseidon's Amended Report of Waste Discharge requests that such a 200-meter BMZ be established for the CDP discharge.

Existing monitoring provisions of Order No. R9-2006-0065 do not allow for assessment of conditions along and within the BMZ boundaries established within the 2015 Ocean Plan amendments. Accordingly, receiving water monitoring proposed herein focuses on water quality effects at the BMZ boundary as well as outlying waters.

Characterization of Conditions: Existing Permitted Operations. As part of this MRP, existing monitoring requirements of Order No. R9-2006-0065 for CDP co-located/temporary stand-alone conditions are reviewed, and supplemental monitoring is proposed to:

- adequately assess compliance of existing permitted co-located and stand-alone operations with Ocean Plan salinity and toxicity requirements,
- ensure that existing permitted operations are consistent with protecting beneficial uses, including aquatic and benthic habitat, and
- assess receiving water and benthic conditions along the BMZ boundary and beyond.

Characterization of Conditions: Permanent Stand-Alone Operations. When EPS once-through cooling water operations are terminated in 2017, CDP will transition to permanent stand-alone mode. As part of these permanent stand-alone operations, new dedicated CDP intake facilities will be placed in operation and CDP will assume control of the existing discharge pond and effluent channel facilities. Monitoring proposed to support and address proposed permanent stand-alone operations focuses on:

- identifying baseline conditions prior to initiation of the permanent stand-alone operations,
- identifying and characterizing any changes in influent, effluent, or receiving water quality that occur as a result of implementation of permanent stand-alone operations,
- assessing compliance of permanent stand-alone operations with Ocean Plan salinity and toxicity requirements, and
- ensuring that permanent stand-alone operations are consistent with protecting beneficial uses, including aquatic and benthic habitat.

INFLUENT/EFFLUENT MONITORING

Location of Influent/Effluent Monitoring Stations. Table 1 of Monitoring and Reporting Program R9-2006-0065 identifies influent/effluent monitoring locations for CDP operations under co-located operations and temporary stand-alone conditions. No changes to the influent/effluent monitoring locations required within Table 1 of Monitoring and Reporting Program No. R9-2006-0065 are proposed for existing permitted CDP co-located and temporary stand-alone operations.

When EPS is retired and permanent stand-alone CDP operations are implemented, Monitoring Locations M-001 and M-002 would remain unchanged (see Table Z-1), but:

- relocation of M-INF to the influent channel will be required to ensure that influent samples are representative of influent to the intake pumps and dilution pumps, and
- a new station (M-003) would be added to characterize water quality in the intake screen fish return flow.

Table Z-1 presents recommended monitoring locations to accommodate both (1) existing permitted and temporary stand-alone operations and (2) permanent stand-alone operations.

Table Z-1
Influent and Effluent Monitoring Locations

Discharge Point Name	Monitoring Location Name	Monitoring Location Description	
		Co-Located and Temporary Stand-Alone Operations	Permanent Stand-Alone Operations
	M-INF	At a location upstream from all in-plant return flows where a representative influent sample can be obtained.	At a location in the influent channel representative of influent quality to the intake pumps and dilution pumps
001	M-001	At a location downstream from all contributing flows to the CDP effluent, prior to combining with EPS effluent.	At a location downstream from all contributing flows to the CDP effluent, prior to combining with augmented dilution flow
	M-002	At the final effluent pond that contains combined CDP and EPS effluent prior to discharge to the ocean via the discharge channel.	At the final effluent pond that contains CDP process flows and augmented dilution flows prior to discharge to the ocean via the discharge channel.
002	M-003	Not applicable	At the intake screen fish return diversion prior to discharge to Agua Hedionda Lagoon

Influent Monitoring. Table 3 of Monitoring and Reporting Program R9-2006-0065 establishes CDP influent monitoring requirements under co-located and temporary stand-alone operations. Influent monitoring objectives and needs are similar under both co-located/temporary stand-alone and permanent stand-alone conditions. Consequently, Poseidon proposes that the Table 3 influent monitoring requirements of Monitoring and Reporting Program R9-2006-0065 remain in effect under existing co-located/temporary stand alone conditions and when CDP is converted to permanent stand-alone operations.

Effluent Water Quality Monitoring. Table 4 of Monitoring and Reporting Program R9-2006-0065 establishes CDP effluent monitoring requirements at M-001 under co-located/temporary stand-alone CDP operations. Table 5 of Monitoring and Reporting Program R9-2006-0065 establishes monitoring requirements at M-002 (effluent pond) for combined (blended) discharges to the discharge channel.

Effluent monitoring objectives and needs at M-001 and M-002 are identical for both co-located/temporary stand-alone and permanent stand-alone conditions. As a result, Poseidon proposes that the effluent monitoring requirements set forth in Tables 4 and 5 of Order No. R9-2006-0065 remain in effect under existing co-located/temporary stand-alone conditions and when the CDP is converted to permanent stand-alone operations.

The only modification proposed to existing effluent monitoring requirements of Tables 4 and 5 of Monitoring and Reporting Program R9-2006-0065 is to eliminate as unnecessary the daily monitoring provisions established within footnote 15 of Table 4. Footnote 15 applies to temporary discharges of process flows that may be discharged back to the ocean during initial plant start-up or during maintenance. Daily monitoring conducted to date on these temporary discharges has demonstrated (1) no significant variation in discharge quality, and (2) no impact to receiving water quality or toxicity.

Effluent Toxicity Monitoring. Section V of Monitoring and Reporting Program No. R9-2006-0065 establishes acute and chronic toxicity requirements for the CDP discharge at Monitoring Location M-001. CDP effluent testing at M-001 is currently required at a quarterly frequency for acute toxicity and a monthly frequency for chronic toxicity.

Toxicity threshold testing conducted to date (see Appendices G, H and I) indicate that the 60 mgd CDP discharge under permanent stand-alone conditions is unlikely to discernibly affect (1) acute toxicity within the effluent channel, within the BMZ, or outside the BMZ, or (2) chronic toxicity at or beyond the BMZ boundary. Based on this prior testing, Poseidon proposes to continue quarterly acute toxicity monitoring. Table Z-2 (page Z-6) summarizes acute toxicity testing proposed at Monitoring Location M-002 under co-located/temporary stand-alone conditions and permanent stand-alone conditions.

Order No. R9-2006-0065 currently required monthly chronic toxicity testing, with a biannual screening using a minimum of three test species for a period of three months. Given the lack of chronic toxicity in the CDP effluent (see Appendices H and I), Poseidon proposes to retain the current monthly chronic toxicity frequency testing under both existing co-located/temporary stand-alone operations and permanent stand-alone operations. Table Z-2 (page Z-6) summarizes chronic toxicity testing proposed at Monitoring Location M-002 under co-located/temporary stand-alone conditions and permanent stand-alone conditions.

The only proposed modification of current chronic toxicity testing is to slightly modify the biannual screening process. Currently, Order No. R9-2006-0065 specifies bi-annual screening using three species for three months. Poseidon proposes to modify this by:

- limiting the bi-annual screening to a two month period every other year (instead of three months), but
- utilizing five species (the species specified within Provision III.M.3.c of the 2015 Ocean Plan amendments for assessing facility-specific receiving water limits) instead of the three species currently specified by Order No. R9-2006-0065.

The end result of this modification is that 10 chronic bioassay tests would performed during each bi-annual screening period instead of 9, and the number of species screened would be increased from three to five.

Table Z-2
Proposed Effluent Toxicity Testing at M-001

Test	Units	Sample Type	Monitoring Frequency	
			Co-Located and Temporary Stand-Alone Operations	Permanent Stand-Alone Operations
Acute Toxicity	TUa	24-hour composite	Quarterly[1,2]	Quarterly[2,3]
Chronic Toxicity	TUc	24-hour composite.	Monthly[4,5]	Monthly[4,5]

1 To reflect maximum allowable receiving water salinity concentrations in the effluent channel discharge, compliance with the acute toxicity performance goal shall be determined by samples collected at Monitoring Location M-001 and adjusted to a salinity concentration of 40 ppt, the maximum daily average salinity concentration limit under co-located/temporary stand-alone conditions.

2 Tests are to be conducted using a marine fish or invertebrate species in accordance with procedures outlined within Order No. R9-2006-0065.

3 To reflect maximum allowable receiving water salinity concentrations in the effluent channel discharge, compliance with the acute toxicity performance goal shall be determined by samples collected at Monitoring Location M-001 and adjusted to a salinity concentration of 42 ppt, the maximum daily average salinity concentration limit under co-located/temporary stand-alone conditions.

4 Chronic toxicity tests to be conducted using methods outlined within Order No. R9-2006-0065.

5 Every other year during odd-numbered years, chronic toxicity screening testing is to be conducted over a two-month period using the following species and tests:

- giant kelp (*Macrocystis pyrifera*): germination and growth
- red abalone (*Haliotis rufescens*): development
- purple urchin (*Strongylocentrotus purpuratus*): development and fertilization
- sand dollar (*Dendraster excentricus*): development and fertilization
- topsmelt (*Atherinops affinis*): larval growth rate

After the screening, the most sensitive test species shall be used for testing during following months. The sensitivity of the test organisms to a reference toxicant shall be determined concurrently with each bioassay test and reported with the test results.

RECEIVING WATER MONITORING

Receiving Water Monitoring Stations. Table 2 of Monitoring and Reporting Program No. R9-2006-0065 establishes the location of 15 receiving water monitoring locations. Only one of the 15 existing CDP receiving water stations are within 1000 feet (328 meters) of the

discharge point; Monitoring Location D-10 is located 565 feet (172 meters) offshore normal to the discharge channel.

To assess receiving water quality and benthic conditions at the BMZ boundary and near the BMZ, Poseidon proposes to add seven additional receiving water monitoring stations. Table Z-3 (below) summarizes receiving water stations to be added to better evaluate receiving water quality conditions along the BMZ boundary and beyond. Three receiving water monitoring locations are proposed at the BMZ boundary (B-2, B-4, B-5), two stations (B-1, B-3 and B-6) are proposed an additional 200 meters (656 feet) downcoast, offshore, and upcoast from the BMZ boundary, and one farfield reference station (B-7) is proposed.

Table Z-3
Proposed Supplemental Receiving Water Monitoring Stations

Monitoring Location	Distance Offshore	Distance Upcoast/Downcoast from Discharge Channel	Description
B-1	200 meters (656 meet)	400 meters (1310 feet) downcoast	200 meters south of BMZ
B-2	100 meters (328 feet)	200 meters (656 feet) downcoast	South boundary of BMZ
B-3	400 meters (1310 feet)	0	200 meters offshore from BMZ
B-4	200 meters (656 feet)	0	West (offshore) boundary of BMZ
B-5	100 meters (328 feet)	200 meters (656 feet) upcoast	North boundary of BMZ
B-6	200 meters (656 feet)	400 meters (1310 feet) upcoast	200 meters north of BMZ
B-7	200 meters (656 feet)	2000 meters (6560 feet) upcoast	Farfield reference station

Receiving Water Monitoring - Physical Constituents. Section VI of Monitoring and Reporting Program No. R9-2006-0065 establishes semiannual receiving water monitoring requirements for light transmittance, dissolved oxygen, and pH at the ocean surface at Monitoring Locations A-10, A-20, A-30, A-50, C-10, C-20, C-30, D-10, D-20, D-30, D-50, E-10, E-20 and E-30. Additionally, semiannual temperature and salinity monitoring is required at 10 foot vertical intervals within the water column at Monitoring Locations A-00, A-50, C-10, C-20, C-30, D-10, D-20, D-30, D-50, E-10, E-20, and E-30. Poseidon proposes that these existing monitoring requirements for physical constituents be retained under both co-located/temporary stand-alone and permanent stand-alone conditions.

In addition to the existing receiving water monitoring established within Monitoring and Reporting Program No. R9-2006-0065, Poseidon proposes supplemental receiving water monitoring to characterize the quality of waters in the water column at the edge of the BMZ and beyond. Table Z-4 presents receiving water quality monitoring proposed under existing co-located/temporary stand-alone operations and proposed permanent stand-alone operations.

Table Z-4
Proposed Receiving Water Monitoring

Monitoring Location	Sample Type	Monitoring Stations	Existing Monitoring Frequency[1]	Proposed Monitoring Frequency	
				First year of permit and first year CDP is converted to permanent stand-alone operations[2]	All other years[2]
Light transmittance	Secchi disk at surface	A-10, A-20, A-30, A-50 C-10, C-20, C-30 D-10, D-20, D-30, D-50 E-10, E-20, E-30	Semiannual	Semiannual	Semiannual
		B-1, B-2, B-3,B-4 B-5, B-6, B-7	None	Quarterly	Semiannual
Dissolved oxygen and pH	Grab samples at surface	A-00, A-50, C-10, C-20, C-30 D-10, D-20, D-30, D-50 E-10, E-20, E-30	Semiannual	Semiannual	Semiannual
		B-1, B-2, B-3,B-4 B-5, B-6, B-7	None	Quarterly	Semiannual
Temperature & Salinity	Every 10 feet from surface to seafloor	A-00, A-50, C-10, C-20, C-30 D-10, D-20, D-30, D-50 E-10, E-20, E-30	Semiannual	Semiannual	Semiannual
		B-1, B-2, B-3,B-4 B-5, B-6, B-7	None	Quarterly	Semiannual
Thermal Plume Mapping	Aerial photography	Discharge site	Semiannual	Semiannual[3]	Semiannual[3]

1 Existing monitoring frequency established within Order No. R9-2006-0065.
2 The listed intensive monitoring frequency applies the first year of the permit (co-located/temporary stand-alone conditions) and the first year the CDP is converted to permanent stand-alone operations. Normal monitoring frequencies apply during other years.
3 Semiannual thermal plume mapping is required until the CDP is converted to permanent stand-alone operation. Thermal plume mapping is to be discontinued six months after implementation of permanent CDP stand-alone operations, as the discharge plume under permanent stand-alone operations will be unheated and no need exists for continuing the thermal mapping.

As shown in Table Z-4, supplemental receiving water monitoring is proposed at Stations B-1 through B-7 the first year of the renewed permit and the first year that CDP converts to permanent stand-alone operations. Objectives of the intensive monitoring at Stations B-1 through B-7 during these two annual periods include:

- characterizing seasonal variations in receiving water quality under both co-located/temporary stand-alone and permanent stand-alone operating conditions,
- confirming compliance with Ocean Plan salinity standards,
- supplementing proposed benthic monitoring data, and
- supporting development of facility-specific salinity standards.

Benthic Monitoring. To assess effects of the discharge on the benthic community, a program of sediment chemistry monitoring and benthic biota monitoring is proposed. Table Z-5 presents proposed benthic sediment and benthic biota monitoring. As shown in Table Z-5, an intensive benthic monitoring program is proposed the first year of the permit and the first year CDP is converted to permanent stand-alone operations.

Table Z-5
Proposed Benthic and Sediment Monitoring

Monitoring Stations	Sample Type	Parameters Monitored	Sampling Frequency	
			First year of permit and first year CDP is converted to permanent stand-alone operations[1]	All other years[1]
B-1thru B-7	Benthic sediment grab[2]	Benthic biota: Enumeration and quantification of benthic infauna	3 grabs quarterly at each site	3 grabs annually at each site
		Benthic biota: Enumeration and quantification of benthic infauna	3 grabs quarterly at each site	3 grabs annually at each site
	Benthic sediment core[3]	COD and particle size distribution	Semiannual	Not applicable
		Arsenic, cadmium, total chromium, copper, lead, mercury, nickel, silver, zinc, cyanide, phenolic compounds	Semiannual	Not applicable

1 The listed intensive monitoring frequency applies the first year of the permit (co-located/temporary stand-alone conditions) and the first year the CDP is converted to permanent stand-alone operations. Normal monitoring frequencies apply during other years.

2 Samples to be collected with a Paterson, Smith-McIntyre, or orange-peel type dredge having an open sampling area of not less than 124 square inches and a sediment capacity of not less than 210 cubic inches. Sediment shall be sifted through a 1 millimeter mesh screen and all organisms shall be identified to as low a taxon as possible.

3 Sediment chemistry analyses to be conducted on the upper two inches of the core.

The purpose of the benthic biota monitoring is to assess the health of benthic communities at the BMZ boundary, beyond the BMZ, and at a reference station. Comparison of benthic results from these stations may then be used to evaluate differences in conditions among the sites and help determine if any detected impacts to benthic communities are related to the CDP discharge.

While the CDP discharge is not projected to contain discernible concentrations of metals or toxic compounds, periodic sediment chemistry monitoring will help support proper interpretation of benthic biota results.

SPECIAL STUDIES

Intake Mortality Empirical Study. As described in the attached Amended Report of Waste Discharge, the proposed CDP intake/discharge technology will result in a lesser degree of intake mortality than (1) existing co-located/temporary stand-alone CDP operations, or (2) other feasible combinations of intake/discharge technologies.

In accordance with Provision III.M.2.d(2)(c)iv, Poseidon within 18 months of beginning operations will submit to the Regional Water Board an empirical study that evaluates intake and mortality of all forms of marine life associated with the permanent stand-alone operations. The study will evaluate impacts caused by augmented intake flow, intake and pump technology, water conveyance, waste brine mixing, and effluent discharge. The empirical study shall cover a period of at least 12 consecutive months.