ATTACHMENT 1

TOXICITY TESTING STUDY PLAN

CARLSBAD SEAWATER DESALINATION PLANT
NPDES NO. CA0109223

STUDY PLAN

FOR EVALUATION OF SALINITY-RELATED TOXICITY TRESHOLD FOR SHORT-TERM EXPOSURE TO DESALINATION PLANT DISCHARGE

STUDY PURPOSE

The purpose of this Short-Term Exposure Threshold (STET) Study is to determine the threshold concentration of total dissolved solids (TDS or salinity) of the discharge from the Carlsbad seawater desalination plant below which a short-term exposure (30 minutes to 24 hours) of standard test organisms to this discharge does not cause acute toxicity.

The study is proposed to fulfill Poseidon Resources Corporation's obligations under the requirements of Order No. R9-2006-0065 of August 16, 2006, of the San Diego Regional Water Quality Control Board, Section VI.C.2.c.1: "Salinity-Related Toxicity Threshold for Short-Term Exposure".

BACKGROUND

The Encina Power Generation Station (EPGS) has been selected as the site for the development of the Carlsbad Seawater Desalination Plant. The source water for the 50 MGD seawater reverse osmosis (SWRO) desalination plant will be collected from the existing cooling water discharge canal of the power plant. The power plant withdraws cooling water from the Pacific Ocean via the Agua Hedionda Lagoon. The concentrate and the treated waste filter backwash water from the desalination plant will be discharged into the existing cooling water discharge channel downstream of the point of interconnection for complete mixing with the cooling water discharge from the power plant prior to its ultimate disposal to the ocean.

Under normal operations the salinity concentration of the blended discharge of cooling water and desalination plant concentrate is projected to be less than or equal to 40 parts per thousand (ppt). The operation of the intake pumps of the desalination plant will be interlocked with the power plant intake pumps. As a result a power plant intake pump shutdown will automatically trigger desalination plant intake pump shutdown. After pump shutdown, however, it takes approximately 15 to 60 minutes to empty the desalination plant concentrate line and the power plant discharge canal. The instantaneous salinity concentration of the blended discharge may exceed 40 ppt during this short shut-down interval. To accommodate such short-term events when salinity of the blended concentrate may exceed the average daily TDS limit of 40 ppt during shut-down operations, the desalination plant NPDES permit establishes an average hourly salinity limit of 44 ppt.

Initial toxicity testing performed as part of Poseidon's NPDES application indicated that a short-term salinity of 44 ppt would not result in any harm to aquatic or benthic organisms. The purpose of STET Study is to confirm the validity of the 44 ppt salinity permit threshold and to assess the suitability of changing this threshold based on acute toxicity testing of the blended discharge for a salinity range between 36 and 60 ppt. The standard acute toxicity test was selected to establish the short-term salinity threshold, because this test will characterize effects of the short-term exposure of the blended discharge on aquatic life in the area of the discharge.

STUDY PROTOCOL

The proposed STET Study will consist of series of acute effluent toxicity bioassay tests of diluted desalination plant concentrate of salinity in a range of 36 ppt to 60 ppt and time of exposure of standard test organisms to the diluted concentrate in a range of 1 hour to 96 hours. As noted above, actual desalination shut-down operations may result in effluent salinities of up to 44 ppt for an hour or less. The proposed range of STET test salinities and exposure times thus represent a range of salinities and exposure times significantly in excess of actual discharge conditions.

Test Procedures

As per the requirements of the Carlsbad Seawater Desalination Plant NPDES Permit (Attachment E, Monitoring and Reporting Program, Section V. A.) the acute effluent toxicity bioassay tests will be performed in accordance with the standard test procedures established by the USEPA guidance manual, Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th Edition, October 2002 (EPA-821-R-02-012).

Test Salinities

A 24-hour composite sample of seawater desalination plant concentrate will be collected at the Carlsbad seawater desalination pilot plant and be diluted to nominal test salinities of: 36 ppt, 38 ppt, 40 ppt, 42, ppt, 44 ppt, 46 ppt, 48 ppt, 50 ppt, 52 ppt, 54 ppt, 56 ppt, 58 ppt and 60 ppt. Filtered seawater from the Carlsbad pilot plant will be used to dilute the concentrate to the test salinity levels indicated above. In addition, a control sample of standard seawater salinity will be tested for comparison.

Test Organism

Topsmelt (*Atherinops affinis*) is planned to be used as a test organism. Topsmelt is proposed for this test because it is the only EPA-approved acute effluent toxicity test organism that may be present in the immediate vicinity of the desalination plant discharge. Since topsmelt is the marine organism also used to complete the EPGS acute effluent toxicity bioassay tests, the use of this organism for the STET test will facilitate continuity and comparability of the EPGS and desalination plant discharge toxicity test results.

The bioassay laboratory will be responsible for the supply, delivery and use of the test organisms. Each batch of test organisms will be subjected to salinity concentrations (see above) ranging from 36 ppt to 60 ppt. To simulate receiving water conditions under shut-down

operations (in which salinity levels may temporarily gradually increase over a period of 15 to 45 minutes), salinity concentrations will be added to the text tanks over a period of short intervals (less than one hour) until the target salinity is reached.

Survival Count Times

Under the standard acute effluent toxicity bioassay test procedure, test organism survival counts are taken at the beginning of the test (0 hrs) and after 24, 48, 72 and 96 hours of effluent exposure. Additionally, in order to reflect the fact that elevated discharge salinity conditions are not expected to occur for longer than 60 minutes, the additional organism survival counts will be taken at 1 hour, 2 hours, 4 hours, and 12 hours after the initiation of the tests.

The tests will be completed by a certified laboratory specialized in such toxicity tests (Weston Solutions, Inc., Carlsbad office). This laboratory was selected because it is currently used by the EPGS staff to complete the power plant's cooling water effluent toxicity testing.

Source and Collection of Sample of Concentrate and Dilution Seawater

As indicated previously, for the purposes of the toxicity testing, the following samples are needed: (1) desalination plant concentrate; (2) dilution seawater not affected by/mixed with the EPGS cooling water discharge. Representative composite samples of the seawater desalination plant concentrate will be obtained from Poseidon's Carlsbad seawater desalination pilot plant.

The Carlsbad pilot plant is a 25 gpm seawater desalination facility located at the Encina power plant site. The plant consists of the same treatment facilities and uses the same chemicals as these planned to be used at the full-scale Carlsbad desalination plant. Under average conditions, the pilot desalination plant intake pump diverts up to 55 gpm of seawater from the Carlsbad power plant cooling water discharge. The intake seawater is treated using a pretreatment filtration system followed by cartridge filter and reverse osmosis (RO) seawater desalination system. The basic design criteria of the pilot plant are the same as these used for the full-scale facility. The pilot plant uses the same type of cartridge filters, and number and type of reverse osmosis membranes as the full-scale facility. Typically, the pilot project generates 70 to 80 gpm of filtered seawater of ambient ocean salinity (i.e., 32 to 34 ppt), and 35 to 40 gpm of concentrate that has salinity approximately two times higher than ambient salinity (i.e., 64 to 68 ppt).

For the purposes of this test one 24-hour composite sample of desalination plant concentrate and one 24-hour composite sample of filtered effluent will be collected from sampling ports at the pilot plant. The concentrate and filtered water composite samples will consist of minimum of 4 individual grab samples collected over every 8 hours over the same 24-hour period. Alternatively, the two composite samples may be collected using automatic grab samplers connected to the filter effluent and concentrate sampling ports.

TEST IMPLEMENTATION, RESULTS AND STUDY REPORT

The proposed STET Study will be implemented within six weeks from the approval of this Study Plan. The bioassay test results will be summarized in a report, which will be submitted for review to the San Diego RWQCB staff. This report will also contain an interpretation of the test results and recommendations regarding the average hourly salinity limitation included in the current permit.