Department of Water and Power the City of Los Angeles

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September 1, 2006

Mr. Jonathan Bishop
Executive Director
California Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90012

Dear Mr. Bishop:

Subject: Transmittal for Review and Approval - the Los Angeles Department of Water and Power Scattergood Generating Station Velocity Cap Effectiveness Study

The Los Angeles Department of Water and Power (LADWP) submits for review and approval the enclosed study plan to evaluate the velocity cap effectiveness in reducing impingement at LADWP's Scattergood Generating Station (SGS). The enclosed study will become Appendix E to our PIC document originally submitted on October 14, 2005.

As you will note, the study proposes alternating periods of flow and reverse flow. In between the two study conditions, a heat treatment is to be performed to quantify the fish captured within the forebay. In order to conduct a heat treatment, the electrical energy produced must be placed into the City electrical grid. As the late fall and winter months approach, there is less demand for electricity, and therefore, it would become more and more difficult to schedule a treatment. For this reason, in order to accommodate a 12-week study period, LADWP must commence the velocity cap study no later than October 1. Therefore, LADWP requests, and would greatly appreciate, your review of the study as soon as possible.

LADWP looks forward to hearing from you. LADWP believes it has developed a scientifically credible study approach and plans to commence the velocity cap study on October 1 unless we receive your comments prior to this date and they would significantly alter the scope of the study.

If you have any questions or comments regarding the study, please contact Ms. Ms. Katherine Rubin or myself at (213) 367-0436 or (213) 367-0279, respectively.

Sincerely,

Susan M. Damron
Manager of Wastewater Quality

c: Mr. David Hung – Los Angeles Regional Water Quality Control Board
Mr. Mike Lyons – Los Angeles Regional Water Quality Control Board
Ms. Shirley Pearson – URS Corporation

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APPENDIX E

STUDY PLAN FOR TESTING THE EFFECTIVENESS OF THE INTAKE STRUCTURE VELOCITY CAP

SCATTERGOOD GENERATING STATION

STUDY PLAN FOR TESTING THE EFFECTIVENESS OF THE INTAKE STRUCTURE VELOCITY CAP

August 28, 2006

Prepared for:

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Los Angeles, California

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1.0 PURPOSE OF STUDY

The intake structure velocity cap study plan proposes to evaluate the effectiveness of the velocity cap in reducing fish entrapment at the Scattergood Generating Station (SGS) and to determine the level of performance in meeting the requirements of the Clean Water Act Section 316(b) Phase II Final Rule performance standards. The performance of the existing velocity cap will be evaluated with a site-specific field study to confirm published results from studies conducted at other power plants in southern California and to validate the Los Angeles Department of Water and Power's (LADWP) historical data.

The study plan involves conducting impingement sampling during normal intake flow using the intake structure with a velocity cap to withdraw cooling water from the source waterbody into the forebay, and reverse intake flow using the discharge structure without a velocity cap to withdraw cooling water into the forebay. Periods of normal intake flow (with the velocity cap) and reverse intake flow (without the velocity cap) would be alternated every two weeks over a 12-week period to provide a total of six weeks of normal intake flow impingement sampling data that will be compared with six weeks of reverse intake flow impingement sampling data. In addition, the reverse intake flow data can be compared to normal impingement rates from samples being collected weekly during the Impingement Mortality and Entrainment (IM&E) Characterization Study.

2.0 SCOPE OF WORK

The intake structure velocity cap study will be completed over a 12-week period with alternating 2-week periods of normal and reverse intake flow. During normal intake flow, the intake structure with a velocity cap is used to withdraw cooling water from the source waterbody into the forebay, and during reverse intake flow the discharge structure without a velocity cap is used to withdraw cooling water into the forebay. Scheduling of surveys will be coordinated with the generating station personnel, and may be modified to facilitate operational constraints.

The study design using alternating 2-week periods of normal and reverse flow was used to address the potential criticism that abundances of some juvenile fishes may change over the course of the 12-week study period. This criticism is addressed by splitting the sampling up into the six 2-week periods where reverse flow would occur for two weeks followed by two weeks of normal flow, followed by two weeks of reverse flow, and so forth. There is very little likelihood of significant abundance changes occurring over a 2-week period. Any abundance changes will be evaluated by comparing consecutive 2-week sampling periods. If there is a difference, the data can be blocked to reduce variability, otherwise the samples could be lumped into a single analysis. Both approaches result in an increase in the statistical power to detect a difference in impingement between normal and reverse flow conditions. This would also address potential changes in species composition that may occur during the course of the study.

The study will be conducted with all the circulating water pumps operating at full capacity during the 12-week study period and with minimal flow variation to the extent possible considering the operational constraints of the facility. Large changes in flow during the study period will affect impingement rates and increase the variation among samples. This will make it more difficult to statistically detect a difference between normal and reverse flow conditions. Statistically, varying flow conditions will be addressed by using flow as a covariate in the statistical analysis, but there are two problems with this approach. First, the number of samples necessary to establish a relationship between the covariate and dependent variable is much larger than the proposed sample sizes. Second, we will only be recording impingement over a 24-hour sampling period for most of the sampling and variations in flow through the day could dramatically affect impingement rates. For these reasons, the study will be conducted with all the circulating water pumps operating at full capacity and with minimal flow variation.

The study will consist of three different survey types:

- Heat treatment impingement surveys – Heat treatments will be performed at the beginning of the study and at two week intervals (preceding flow reversals) to remove all entrapped fish from the forebay;

- Weekly impingement surveys – These surveys are currently being conducted as part of the IM&E Characterization Study, and consist of 24-hour surveys with four 6-hour sampling blocks within each survey;
- Velocity cap impingement surveys – These supplemental surveys will be conducted twice per week in addition to the weekly impingement surveys. The velocity cap impingement surveys will consist of one 24-hour sampling period.

Methods for the heat treatment and weekly impingement surveys are detailed on pages 15 and 16 of the Scattergood Generating Station Summary of Existing Physical and Biological Information and Impingement Mortality and Entrainment Characterization Study Sampling Plan (Sampling Plan) included in Appendix A of the Proposal for Information Collection (PIC). The supplemental velocity cap impingement surveys will employ similar methods to the weekly impingement surveys, except instead of rotating and rinsing the traveling screens at approximate 6-hour intervals following an initial rotation/washing, the traveling screens will only be operated once after approximately 24 hours.

Prior to each 2-week survey period, it will be required to remove all fish species from within the forebay by conducting heat treatments. A heat treatment is done by first manipulating the intake gates and then raising the water temperature in the forebay. During and after this period, the traveling screens are run until all heat-treated fishes are removed from the forebay. Heat treatments will subsequently be performed at 2-week intervals to ensure that all of the organisms that may have entered the forebay during the prior 2-week period are included in the sample. The organisms collected during the heat treatment will be processed using the impingement procedures as described in Section 3.0 – Impingement Sample Processing. Once impingement on the circulating water screens has subsided to near zero after each heat treatment, and the flow direction is reversed, the next 2-week sampling period will commence. The sampling sequence for each 2-week period is as follows:

1. Conduct heat treatment to clear system
2. Begin 1st 2-week sampling period with reverse flow
3. Conduct heat treatment to clear system
4. Begin 2nd 2-week sampling period with normal flow
5. Conduct heat treatment to clear system
6. Begin 3rd 2-week sampling period with reverse flow
7. Conduct heat treatment to clear system
8. Begin 4th 2-week sampling period with normal flow
9. Conduct heat treatment to clear system
10. Begin 5th 2-week sampling period with reverse flow
11. Conduct heat treatment to clear system
12. Begin 6th 2-week sampling period with normal flow
13. Conduct heat treatment to clear system

The following is a sample schedule based on the proposed sampling intervals, but may vary due to facility operating constraints:

Week	Mon	Tue	Wed	Thur	Fri
1	HT	Weekly IM	VC Survey	VC Survey	
2		Weekly IM	VC Survey	VC Survey	
3	HT*	Weekly IM	VC Survey	VC Survey	
4		Weekly IM	VC Survey	VC Survey	
5	HT*	Weekly IM	VC Survey	VC Survey	
6		Weekly IM	VC Survey	VC Survey	
7	HT*	Weekly IM	VC Survey	VC Survey	
8		Weekly IM	VC Survey	VC Survey	
9	HT*	Weekly IM	VC Survey	VC Survey	
10		Weekly IM	VC Survey	VC Survey	
11	HT*	Weekly IM	VC Survey	VC Survey	
12		Weekly IM	VC Survey	VC Survey	
13	HT*				

Non-shaded days = normal flow direction, shaded days = reverse flow direction

* - Following heat treatment, flow direction is reversed

Weekly IM - Weekly impingement sampling

VC Survey - Velocity cap impingement sampling

3.0 IMPINGEMENT SAMPLE PROCESSING

During the 12-week study period, weekly impingement sampling will continue to be conducted as part of the IM&E Characterization Study. Weekly impingement samples are collected every six hours over a 24-hour period. During each sampling cycle, the traveling screens are rotated and cleaned and the impinged material is rinsed into collection baskets associated with each set of screens. A log containing hourly observations of the operating status of the circulating water pumps (on and off) for the entire study period is obtained from the power plant operation staff that provides a record of the amount of cooling water pumped by the plant. Four other velocity cap impingement samples will be collected during each 2-week study period. These samples will be collected using the same procedures used for normal impingement sampling except that a single sample will be collected over a 24-hour period. In order to quantify the fish drawn into the forebay during the study, heat treatment impingement sampling will also be conducted prior to the beginning of the first 2-week sampling period and at the end of each 2-week sampling period during the study. Procedures for heat treatment sampling involve clearing and rinsing the traveling screens prior to the start of the heat treatment procedure. At the end of the heat treatment procedure normal pump operation will be resumed and the traveling screens rinsed until no more fish are collected on the screens. Weekly, velocity cap, and heat treatment impingement samples will be processed using the following procedures, which are described in more detail on pages 15-16 of the Sampling Plan included in Appendix A of the PIC.

All fishes and invertebrates are separated from the impinged debris and vegetation. All fishes, crabs, shrimps and prawns, and cephalopod mollusks are identified, counted, weighed, and measured using the following criteria:

Organism Group	Length Measuring Criteria
Fishes	Total body length for sharks, disc width for skates and rays and standard lengths for bony fishes
Crabs	Maximum carapace width
Spiny lobster and Shrimps	Carapace length, measured from the anterior margin of carapace between the eyes to the posterior margin of the carapace
Octopus	Maximum "arm" spread, measured from the tip of one tentacle to the tip of the opposite tentacle
Squid	Dorsal mantle length, measured from the edge of the mantle to the posterior end of the body

If a large number (more than 30) of any individual countable species is collected during a cycle, 30 randomly selected individuals of this species are individually weighed and

measured and the remaining individuals are counted and batch-weighed. The sex of the countable organisms is determined to the extent possible without dissection. The condition of each countable organism is also recorded: "A" for alive; "D" for dead; and "M" for mutilated. Mutilated organisms are counted but not weighed or measured. All other invertebrates are identified and weighed. Debris, including vegetation, is separated out, categorized (e.g., fouling organisms, algae) and weighed.

4.0 IMPINGEMENT SAMPLING QA/QC PROGRAM

The same quality assurance/quality control (QA/QC) procedures used for the weekly impingement sampling described on page 17 of the Sampling Plan included in Appendix A of the PIC will be continued during the velocity cap study period. The QA/QC procedures will help ensure that all of the organisms are removed from the debris and that the correct identification, enumeration, length and weight measurements of the organisms are recorded on the data sheet. Random sampling events will be chosen for QA/QC re-sorting to verify that all the collected organisms were removed from the impinged material. QA/QC surveys will be done at least twice during the study and more frequently if necessary. If the count of any of individual taxon made during the QA/QC survey varies by more than 5 percent (or one individual if the total number of individuals is less than 20) from the count recorded by the observer then the next three sampling cycles for that observer will be checked. The sampling procedures will be reviewed with all personnel prior to the start of the study. The same QA/QC procedures used for data verification of weekly impingement survey data will be used during the velocity cap surveys. These QA/QC measures include: (1) review of all field data by the project manager, (2) verification of all field data by a qualified scientist, (3) duplicate data entry to identify potential entry errors, and (4) final data verification.

5.0 DATA ANALYSIS

The sampling design will result in three 2-week periods of normal intake flow using the intake structure with a velocity cap to withdraw cooling water from the source waterbody into the forebay and three 2-week periods of reverse intake flow using the discharge structure without a velocity cap to withdraw cooling water into the forebay. Within each 2-week period there will be six 24-hour weekly/velocity cap impingement data sets and one heat treatment impingement data set. The data will be analyzed using analysis of variance after appropriate tests of assumptions and necessary data transformations. The impingement data will initially be analyzed using a block design. Each block will include consecutive 2-week periods with and without velocity cap treatments. This analysis will identify any differences among blocks that might be due to changes in species composition over time. If no differences are detected among blocks the individual samples from the time blocks will be combined and the data analyzed using a simple t-test between the two treatments. If the block differences are significant, the data will be analyzed using analysis of variance to control for the variation among time blocks. The data from the heat treatment samples will be analyzed separately using a two-sample t-test. Statistical analysis will be done on total fish abundance, biomass, and for individual species that are in high abundance. The analyses will be used to determine if the difference in impingement with and without the velocity cap is statistically significant. If the difference is significant, an estimate of the difference and confidence intervals for the estimate will be calculated. This difference will be used in adjusting impingement measured during the current year-long study to baseline levels that would be expected to occur in the absence of the velocity cap. The statistical analyses will be supplemented with graphical summaries of the results.