California Regional Water Quality Control Board
Santa Ana Region

March 4, 2011

Item: *7

Subject: **Consideration of Approval of the Modification to the Lake Elsinore and Canyon Lake Nutrient TMDLs In-Lake Monitoring Programs – Resolution No. R8-2011-0023**

DISCUSSION

On December 20, 2004, the California Regional Water Quality Control Board, Santa Ana Region (Regional Board), adopted Resolution No. R8-2004-0037, amending the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan). The amendment incorporated nutrient Total Maximum Daily Loads (TMDLs) for Lake Elsinore and Canyon Lake in Chapter 5, "Implementation" of the Basin Plan. The TMDLs were approved by the State Water Resources Control Board (State Water Board) on May 19, 2005 (Resolution No. 2005-0038) and the California Office of Administrative Law (OAL) on July 26, 2005. On September 30, 2005, the US Environmental Protection Agency, Region IX approved the Lake Elsinore and Canyon Nutrient TMDLs. The purpose of the TMDLs is to ensure attainment of water quality standards (beneficial uses, water quality objectives and antidegradation policy) in Lake Elsinore and Canyon Lake. The beneficial uses of both lakes are impaired due to nutrients.

In order to implement the existing Nutrient TMDL requirements and to develop effective solutions for improving water quality in Lake Elsinore and Canyon Lake, responsible agencies and stakeholders formed the Lake Elsinore and Canyon Lake TMDL Task Force[1]. The Lake Elsinore and San Jacinto Watershed Authority (LESJWA) serves as the Task Force administrator.

The Lake Elsinore and Canyon Lake Nutrient TMDLs required specific dischargers to submit by December 31, 2005 proposed plans for watershed monitoring of nutrients as well as nutrient monitoring in both Canyon Lake and Lake Elsinore. The Monitoring Plan was submitted by LESJWA on December 21, 2005 and was approved by the Regional Board on March 3, 2006 (Resolution No. R8-2006-0031). The approved Monitoring Plan divided the monitoring program into two phases. Phase 1 focused on monitoring the in-lake conditions of both Canyon Lake and Lake Elsinore, with the goal of assessing compliance with the numeric targets specified in the TMDLs. The Phase 1 monitoring program also included minimal watershed-wide monitoring at four strategic locations in the watershed. For Phase 2 monitoring, the Task Force envisioned decreasing the in-lake monitoring programs and expanding the watershed-wide monitoring effort

[1] US Forest Service, US Air Force (March Air Reserve Base), March Joint Powers Authority, California Dept. of Transportation (Caltrans), California Dept. of Fish and Game, County of Riverside, Riverside County Flood Control and Water and Water Conservation District, the cities of Lake Elsinore, Canyon Lake, Hemet, San Jacinto, Perris Moreno Valley, Murrieta, Riverside, Menifee, Wildomar, Beaumont, Eastern Municipal Water District, Elsinore Valley Municipal Water District, and Western Riverside County Agricultural Coalition (on behalf of concentrated animal feeding operators and agricultural operators within the San Jacinto watershed)

to allow an evaluation of nutrient loads from specific sources (*e.g.;* agriculture or urban land uses) to determine compliance with the nutrient TMDLs and the wasteload and load allocations specified therein.

Phase 1 of the monitoring plan has been ongoing since 2006. As a result of collecting in-lake water quality data for Lake Elsinore and Canyon Lake for the past 4 years, an extensive database of water quality data exists for both lakes. The Task Force believes that there have been sufficient data collected in the past 4 years to characterize the conditions of both lakes and that limited Task Force funding is better directed toward funding actual in-lake water quality improvement projects instead of a continuation of the extensive in-lake monitoring. Therefore, a reduction in the in-lake monitoring is proposed. Specifically, 3 stations in Canyon Lake rather than 4 would be monitored. For Lake Elsinore, in-lake monitoring would be reduced from 3 stations to 1.

The TMDL Task Force is also proposing to continue Phase 1 watershed-wide monitoring at the existing Phase 1 locations, but to defer implementation of the Phase 2 expanded watershed-wide monitoring program. Because the Phase 2 watershed-wide monitoring program was developed in 2006, and recent model analyses indicate a change in watershed conditions, the plan developed and approved in 2006 needs to be revised. In addition, the stormwater co-permittees, in compliance with requirements specified in the Riverside County Municipal Separate Stormwater Sewer System permit ("MS4"; Order No. R8-2010-0033, NPDES No. CAS 618033), are required to submit a Comprehensive Nutrient Management Plan for Regional Board consideration at the end of 2011[2]. The Task Force's proposed strategy is to develop the Comprehensive Nutrient Management Plan, which will include not only specific best management practices (BMPs) or other nutrient control practices to be implemented, but also a detailed, long-term monitoring program designed to demonstrate compliance with the TMDLs and wasteload and load allocations. Revisions to the existing, approved monitoring programs are proposed to reflect this strategy.

In a letter dated December 23, 2010, on behalf of the TMDL Task Force, LESJWA submitted for Regional Board review and approval proposed revisions to the in-lake and watershed-wide monitoring programs. The proposed revised monitoring programs submitted by LESJWA are attached to tentative Resolution No. R8-2011-0023. Tables 1 and 2 summarize the proposed changes to the Lake Elsinore and Canyon Lake in-lake monitoring programs, respectively.

Staff has reviewed the revised monitoring programs and finds that the proposed monitoring programs are consistent with the overall goals of the Lake Elsinore and Canyon Lake Nutrient TMDLs. Board staff supports reducing the Canyon Lake and Lake Elsinore in-lake monitoring programs and deferring implementation of the Phase 2 watershed-wide monitoring program pending submittal of the Comprehensive Nutrient Management Plan. These proposed revisions would allow a more comprehensive monitoring plan to be developed, and would enable limited Task Force funding to be directed to the development and implementation of nutrient control measures. LESJWA would need to revise the existing Quality Assurance Project Plan (QAPP) within 60 days of Regional Board approval of the revised monitoring program. Finally, there are

[2] Pursuant to Order No. R8-2010-0033, Provision VI.D.2.d., the Comprehensive Nutrient Reduction Plan (CNRP) must be submitted by December 31, 2011 and should describe, in detail, the specific actions that have been taken or will be taken to achieve compliance with the urban WLA by December 31, 2020.

no proposed changes to the existing annual reporting schedule; the annual report will continue to be submitted by August 15th of each year.

STAFF RECOMMENDATION

Adopt Resolution No. R8-2011-0023, approving the deferment of the Phase 2 watershed-wide monitoring program and approving the revised Lake Elsinore and Canyon Lake in-lake monitoring programs as submitted by LESJWA and as shown in the attachment to the Resolution.

Table 1 - Lake Elsinore Summary of Proposed 2011 Water Quality Sampling Plan

Parameter	Analysis Method	Sample Type	Change over 2006 - 2010 Program
Temperature	Field Probe	Vertical profile (1 m intervals)	vertical profiles similar to exiting program (change from 3 boat-accessed sample locations to 1 boat-accessed location (Station E2) and 2 permanent buoy locations)
Dissolved Oxygen (DO)	Field Probe	Vertical profile (1 m intervals)	
Electrical Conductivity (EC)	Field Probe	Vertical profile (1 m intervals)	
pH	Field Probe	Vertical profile (1 m intervals)	
Turbidity	Field Probe	Vertical profile (1 m intervals)	
ORP	Field Probe	Vertical profile (1 m intervals)	Same (but reduction from 3 stations to 1)
Secchi Depth	Field Disk	1 reading per station	Same (but reduction from 3 stations to 1)
Chlorophyll *a*	Lab	Surface Integrated	Same (but reduction from 3 stations to 1)
Hardness	Lab	Integrated	Integrated samples only (elimination of Surface and Bottom samples)
Phosphorus • Total P (TP) • Soluble reactive P (SRP) • Total organic P	Lab	Surface Integrated Bottom	Elimination of dissolved phase P - sufficient information has already been collected
Nitrogen • Total N (TN) • Nitrite + Nitrate (NO_2-N + NO_3-N) • Ammonia N (NH_4-N) • Total Inorganic Nitrogen (TIN) • Total organic N	Lab	Surface Integrated Bottom	Elimination of dissolved phase N - sufficient information has already been collected
Fe_{diss}	Lab	Surface Integrated Bottom	Same (but reduction from 3 stations to 1)
Fe_{total}	Lab	Surface Integrated Bottom	
Total Dissolved Solids (TDS)	Lab	Integrated	Integrated samples only (elimination of Surface and Bottom samples)

Proposed to be eliminated:
TSS – Consistently low values, turbidity measurements to continue
TOC and DOC - Sufficient background data accumulated, parameter not referenced in Resolution
BOD and COD - Consistently low values, sufficient background data accumulated

Sampling Frequency: Same as minimum of existing program - 16 times per year (monthly Oct through May and bi-weekly June through September)

Sampling Stations: 1 boat-accessed station plus 2 permanent buoy locations (elimination of two existing stations, E1 and E3)

Table 2 - Canyon Lake Summary of Proposed 2011 Water Quality Sampling Plan

Parameter	Analysis Method	Sample Type	Change over 2006 - 2010 Program
Temperature	Field Probe	Vertical profile (1 m intervals)	vertical profiles same as exiting program (reduction from 4 stations to 3)
Dissolved Oxygen (DO)	Field Probe	Vertical profile (1 m intervals)	
Electrical Conductivity (EC)	Field Probe	Vertical profile (1 m intervals)	
pH	Field Probe	Vertical profile (1 m intervals)	
Turbidity	Field Probe	Vertical profile (1 m intervals)	
ORP	Field Probe	Vertical profile (1 m intervals)	
Secchi Depth	Field Disk	1 reading per station	Same (but reduction from 4 stations to 3)
Chlorophyll *a*	Lab	Surface Integrated	Same (but reduction from 4 stations to 3)
Hardness	Lab	Integrated	Integrated samples only (elimination of Surface and Bottom samples)
Phosphorus • Total P (TP) • Soluble reactive P (SRP) • Total organic P	Lab	Epilimnion Hypolimnion Bottom	Elimination of dissolved phase P - sufficient information has already been collected
Nitrogen • Total N (TN) • Nitrite + Nitrate (NO_2-N + NO_3-N) • Ammonia N (NH_4-N) • Total Inorganic Nitrogen (TIN) • Total organic N	Lab	Epilimnion Hypolimnion Bottom	Elimination of dissolved phase N - sufficient information has already been collected
Fe_{diss}	Lab	Epilimnion Hypolimnion Bottom	Same (but reduction from 4 stations to 3)
Fe_{total}	Lab	Epilimnion Hypolimnion Bottom	
Total Dissolved Solids (TDS)	Lab	Integrated	Integrated samples only (elimination of Surface and Bottom samples)

Proposed to be eliminated:
TSS – Consistently low values, turbidity measurements to continue
TOC and DOC - Sufficient background data accumulated, parameter not referenced in Resolution
BOD and COD - Consistently low values, sufficient background data accumulated

Sampling Frequency: Same as existing program - 16 times per year (monthly Oct through May and bi-weekly June through September)

Sampling Stations: 3 stations instead of 4 (elimination of one of the East Bay stations (C9))

Tentative

California Regional Water Quality Control Board
Santa Ana Region

RESOLUTION NO. R8-2011-0023

Resolution Approving Revised Lake Elsinore and Canyon Lake Nutrient Total Maximum Daily Loads Monitoring Programs

WHEREAS, the California Regional Water Quality Control Board, Santa Ana Region (hereinafter Regional Board), finds that:

1. An updated Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) was adopted by the Regional Board on March 11, 1994, approved by the State Water Resources Control Board (SWRCB) on July 21, 1994, and approved by the Office of Administrative Law (OAL) on January 24, 1995.

2. Amendments to the Basin Plan to incorporate Lake Elsinore and Canyon Lake Nutrient Total Maximum Daily Loads (TMDLs) were approved by the Regional Board on December 20, 2004, by the State Water Resources Control Board on May 19, 2005, by the Office of Administrative Law on July 26, 2005 and by the US Environmental Protection Agency on September 30, 2005.

3. The Lake Elsinore and Canyon Lake Nutrient TMDLs were developed in accordance with Clean Water Act Section 303(d) and Water Code Section 13240 *et seq.* The TMDLs are incorporated in Chapter 5 "Implementation", of the Basin Plan.

4. Responsible agencies and dischargers in the Lake Elsinore/Canyon Lake watershed have formed a Lake Elsinore and Canyon Lake TMDL Task Force (TMDL Task Force). The TMDL Task Force members are working jointly to implement requirements of the Lake Elsinore and Canyon Lake Nutrient TMDLs. TMDL Task Force members include the following agencies/parties: the US Forest Service, the US Air Force (March Air Reserve Base), March Joint Powers Authority, California Dept. of Transportation (Caltrans), California Dept. of Fish and Game, the County of Riverside, the Riverside County Flood Control and Water Conservation District, Eastern Municipal Water District, Elsinore Valley Municipal Water District, Western Riverside County Agricultural Coalition, and the cities of Lake Elsinore, Canyon Lake, Menifee, Wildomar, Hemet, San Jacinto, Perris, Moreno Valley, Murrieta, Riverside and Beaumont. The TMDL Task Force is administered by the Lake Elsinore and San Jacinto Watershed Authority (LESJWA).

5. The Regional Board is a signatory to the Task Force Agreement and serves as an advisory member to the TMDL Task Force.

6. In compliance with the Monitoring Requirements of the TMDL (Task 4) of the TMDLs, the TMDL Task Force submitted by December 31, 2005, proposed water quality monitoring plans for conducting watershed-wide nutrient monitoring and Lake Elsinore and Canyon Lake in-lake nutrient monitoring. The plans also specified an annual reporting date of August 15 of each year for reporting the results of the monitoring programs. These monitoring plans were approved by the Regional Board on March 3, 2006 (Resolution No. R8-2006-0031). The approved monitoring plans include Phase I and Phase II monitoring activities.

7. In compliance with requirements specified in the Riverside County Municipal Separate Stormwater Sewer System permit ("MS4" permit (Order No. R8-2010-0033, NPDES No. CAS 618033), the co-permittees are required to submit by December 31, 2011, a Comprehensive Nutrient Management Plan for Regional Board consideration that is to describe, in detail, the specific actions that have been taken or will be taken to achieve compliance with the urban wasteload allocation. A revised Phase 2 watershed-wide monitoring program will be submitted as part of the Comprehensive Nutrient Management Plan.

8. The TMDL Task Force has reviewed the collected data and has identified aspects of the monitoring programs that could be streamlined to achieve cost savings while not compromising the value of the data and information that are collected. The cost savings will be applied to implementing on-the-ground projects aimed at reducing nutrient impacts in Canyon Lake and Lake Elsinore.

9. By letter dated December 23, 2010, LESJWA submitted for Regional Board review and approval revised Lake Elsinore and Canyon Lake in-lake monitoring plans.

10. By letter dated December 23, 2010, LESJWA provided rationale for deferral of the Phase 2 watershed-wide monitoring pending submittal of the Comprehensive Nutrient Management Plan on December 31, 2011.

11. The Regional Board has reviewed the proposed LESJWA monitoring plans revisions and finds that they continue to comply with the Lake Elsinore and Canyon Lake Nutrient TMDLs specified in the Basin Plan.

12. The Regional Board has reviewed the proposed justification for deferring the implementation of the Phase 2 watershed-wide monitoring plans and finds that deferring implementation to allow for the development and submittal of the Comprehensive Nutrient Management Plan is justified.

13. It is appropriate to require that an updated Quality Assurance Project Plan (QAPP) be submitted prior to implementation of the revised monitoring programs.

NOW, THEREFORE, BE IT RESOLVED THAT:

1. The Regional Board approves the revised Lake Elsinore and Canyon Lake monitoring plans submitted by LESJWA on behalf of the TMDL Task Force on December 23, 2010.

2. The Regional Board approves the deferral of the watershed-wide monitoring program as requested by LESJWA on behalf of the TMDL Task Force on December 23, 2010. A revised Phase 2 watershed-wide monitoring program shall be submitted as part of the Comprehensive Nutrient Management Plan, which is due on December 31, 2011.

3. The revised monitoring plans comply with Task 4 of the Lake Elsinore and Canyon Lake Nutrient TMDLs specified in the Basin Plan.

4. An updated Quality Assurance Project Plan (QAPP) shall be submitted by April 30, 2011.

5. As long as each member of the Task Force is in good standing, each member of the TMDL Task Force continues to comply with monitoring requirements (Task 4) of the Lake Elsinore and Canyon Lake Nutrient TMDLs.

6. Annual reports shall continue to be submitted by August 15 of each year.

I, Kurt V. Berchtold, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of a resolution adopted by the California Regional Water Quality Control Board, Santa Ana Region, on March 4, 2011.

Kurt. V. Berchtold
Executive Officer

Item 7: Attachment to Staff Report

Lake Elsinore & San Jacinto Watershe

City of Lake Elsinore • City of Canyon Lake • County
Elsinore Valley Municipal Water District • Santa Ana Waters

December 23, 2010

Kurt Berchtold, Executive Director
Santa Ana Regional Water Quality Control Board
3737 Main Street, Suite 500
Riverside, CA 92501

RE: Phase-2 Monitoring Plan for the Lake Elsinore/Canyon Lake (LECL) Nutrient TMDL

Dear Mr. Berchtold:

In August of 2006, the Regional Board approved the Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan.[1] That plan divides the proposed monitoring program into two phases. Phase 1 is focused on intensive studies of the lakes. Phase 2 emphasizes more intensive study of the watershed. Phase 1 was initiated immediately after the Regional Board approved the monitoring plan and continues to this day. Phase 2 is to be initiated when Phase 1 is completed and "when adequate resources become available."[2]

In January of 2010, the Regional Board reauthorized the Area-wide Urban Runoff permit for Riverside County.[3] The Order requires MS4 co-permittees to implement the previously approved Nutrient TMDL Monitoring Plan.[4] However, the permit also states that:

> *"Compliance with the WLA is based on a 10-year running average. Hence, data collection consistent with the approved Phase 2 LE/CL TMDL monitoring program required in the Monitoring and Reporting Program must commence by December 31, 2010."*[5]

The MS4 agencies and other Task Force members respectfully request that initiation of the Phase 2 Monitoring Program be deferred for the following reasons:

1) The Phase 2 Monitoring Program is designed to demonstrate compliance with the wasteload allocation (WLA) adopted by the Regional Board in 2004.[6] However, TetraTech's recent modeling update indicates that the nutrient loads previously estimated for the San Jacinto watershed are no longer accurate. In particular, it now appears that large portions of the eastern watershed contribute no meaningful amounts of nitrogen or phosphorus to Canyon Lake or Lake

[1] Resolution No. R8-2006-0031
[2] Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan. February 15, 2006. Section 3.2 @ pg. 9.
[3] Order No. R8-2010-0033
[4] See Monitoring and Reporting Program (CAS 618033); Section III-D-2-a (Appendix 3, Page 5 of 26).
[5] NPDES No. CAS 618033 (See Section IV-D-2-g on page 68 of 117).
[6] Resolution No. R8-2004-0037.

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Elsinore even in the wettest years.[7] Consequently, the previously-approved Phase 2 Monitoring Plan is now obsolete and must be revised. Such an undertaking will require several months to complete and several more months for the Regional Board to review and approve before it can be implemented.

2) The Phase 2 Monitoring Program is not supposed to be implemented until the Phase 1 Monitoring Program is complete. Two elements of the Phase 1 program are not complete. First, the Regional Board staff recently indicated that the studies performed by Dr. Horne to demonstrate effective nitrogen reduction in Lake Elsinore may not be adequate and additional supporting documentation will be required. Second, Dr. Anderson has been tasked to estimate the decay coefficient for phosphorus in both lakes and that work is still on-going. This latter element is essential to understanding and implementing the wasteload allocation for each individual agency contributing to the discharge of nutrients in the watershed.

3) Compliance with the 10-year running average should be calculated beginning on January 1, 2016 not January 1, 2011. Since compliance with the interim targets is not required until December 31, 2015 it is inappropriate to use data collected before that date to assess compliance. Doing so would effectively deprive stakeholders of the time necessary to identify and implement appropriate remediation projects. It is clear from the adopted TMDL and the approved Monitoring Plan that the Regional Board expected the LECL Task Force to use the time between 2007 and 2010 to perform additional studies. It is also evident that a plan for implementing any follow-on projects is not due until mid-2011, and that such projects must be implemented by December 31, 2014.[8] Thus, it would be unreasonable to rely on data gathered before the studies were completed or the projects implemented to calculate compliance. Therefore, just as compliance with the annual Response Targets must begin on January 1, 2016, so should the data collection begin to evaluate compliance with the 10-year running average specified in the TMDL.

4) Preliminary data gathered during Phase 1 indicates that remote-sensing using LandSat imagery may provide a more cost-effective and useful approach to water quality monitoring in the lakes and nutrient loading in the San Jacinto Watershed. Consequently, the Task Force is preparing a proposal of Phase 2 Alternatives for the Regional Board's consideration. Key among the alternatives is a planned shift to space-based satellite technology as the primary means of assessing progress toward attainment of the Response Targets specified in the TMDL.

5) Recent weather patterns suggest that 2010-11 may be an unusually wet winter. All previous analyses have shown that more than one-half of the total nutrient load deposited in the lakes over a 12 year period will arrive in a single wet year. If that were to occur this winter, before any of the planned remediation projects have been designed or built, it would be impossible to comply with the 10-year running average no matter how effective such projects ultimately become. This, in turn, would undermine the incentive for the accelerated implementation strategy that the Task Force is planning to enact over the next four years.

During 2011, the LE/CL Task Force members are committed to continue implementing the Phase 1 Monitoring Program for both lakes and the San Jacinto Watershed. These plans have been carefully reviewed with Regional Board staff and revised in accordance with their recommendations (copies attached as Appendix A and Appendix B).

By the end of 2011, the stakeholders are required to submit a Comprehensive Nutrient Reduction Plan (CNRP) for consideration and approval by the Regional Board. The CNRP will include a detailed, long-term monitoring program designed to demonstrate compliance with the TMDL targets. Therefore, the

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[7] Tetra-Tech. San Jacinto Watershed Model Update – 2010. October, 2010.

[8] Order No. R8-2010-0033; See Table 7 on page 65 of 117.

Task Force believes it is premature to initiate Phase 2 of the old Monitoring Plan when the new and more appropriate, monitoring plan is due in less than a year.

The LE/CL Task Force members respectfully request that Phase 2 of the current Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan be deferred for 12-24 months unless superseded by a new Monitoring Plan before then.

Thank you for your consideration. If you have any questions, please contact me at 951-354-4221.

Respectfully submitted,

Mark R. Norton P.E., LEED AP
LESJWA Authority Administrator

cc: Hope Smythe, RWQCB
Cindy Li, RWQCB
Jason Uhley, RCFCD

enc: Lake Elsinore - Appendix A
Canyon Lake - Appendix B

Elsinore Valley Municipal Water District

Lake Elsinore Phase 2 Water Quality Monitoring Plan

to

Evaluate the Efficacy of the In-Lake Nutrient Reduction Facilities (Aeration and Mixing) for Lake Elsinore

December 2010

Lake Elsinore Phase 2 Water Quality Monitoring Plan to Evaluate the Efficacy of the In-Lake Nutrient Reduction Facilities (Aeration and Mixing) for Lake Elsinore

Background

Lake Elsinore is listed on the Clean Water Act Section 303(d) list as impaired for excessive nutrients, organic enrichment/low dissolved oxygen, sedimentation/siltation, and unknown toxicity. Designated beneficial uses identified as impaired by nutrients are warm freshwater aquatic habitat (WARM), and body- and non-body contact recreation (REC-1 and REC-2). Consequently, the Regional Water Quality Control Board, Santa Ana Region (Regional Board) has adopted total maximum daily loads (TMDLs) for the lake. In-lake monitoring is a requirement of the TMDL program.

Additionally, the Elsinore Valley Municipal Water District (EVMWD) has been inputting highly treated wastewater to the lake from their Regional Water Reclamation Plant (Regional Plant). To evaluate the efficacy of in-lake nutrient removal projects which serve as offsets for the nutrients input in the wastewater, in-lake monitoring is a requirement of the discharge permit (NPDES Permit, Order No. R8-2005-0003) for the Regional Plant. The 2005 Board Order recognizes that recycled water inputs are necessary to attain and maintain a stable lake level and thereby improve water quality and beneficial uses. Substantial water level variations result in significant adverse effects on the water quality and beneficial uses of the lake, including recreational opportunities and fish and wildlife habitat. The in-lake nutrient removal projects include enhanced circulation through use of axial flow pumps and a diffused aeration system. The axial flow pumps were installed in July 2004 and have been operational since May 2006. The diffused aeration system was installed in spring 2007 and has been fully operational since the third quarter of 2008.

In April 2006, the Phase 1 monitoring program for the lake (in compliance with the NPDES Permit and TMDL program) began with staff from University of California at Riverside (UCR) under the direction of Dr. Michael Anderson. Monitoring is currently conducted by California State University San Bernardino (CSUSB) under the direction of Dr. James Noblet. MWH provides coordination and reporting services. The Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan (February 15, 2006), described Phase 1 of the sampling program as "Intensive Lake Study" and included three stations in Lake Elsinore, 17 water quality constituents, and sampling 16 times per year. Samples were collected near the surface, integrated throughout the water column, and within approximately 50 cm of the sediments.

Objectives

The objective of the program is to quantify Lake Elsinore water quality conditions and to evaluate the effectiveness of on-going in-lake nutrient reduction projects.

Phase 2 Sampling Program

The Phase 1 program has been on-going for 4 years and extensive data have been collected from Lake Elsinore. Under Phase 2, in-lake monitoring will be reduced.

Phase 2 Sampling Station Location – In-lake samples will be collected from the approximate center of the lake (Station E2). This station is in the deepest area of the lake. The water quality sampling program will be augmented by data collected at two permanent buoy locations (Buoy 1212 located at Longitude -117deg, 21'8"W; Latitude 33deg, 39'57"N and Buoy 1313 located at Longitude -117deg, 21'8"W; Latitude 33deg, 39'38"N).

Phase 2 Sampling Frequency – Sampling will be conducted 16 times per year (monthly in October through May and bi-weekly in June through September). The exact dates of sampling will depend upon student class schedule, local weather conditions, and other factors.

Phase 2 Sampling Parameters - Sampling and analysis will be conducted for the parameters noted in **Table 1**. Water column properties (temperature, DO, electrical conductivity, pH, turbidity and redox potential) will be measured at 1 meter (m) intervals using a Hydrolab DataSonde 5 Multiprobe (DS-5) and Surveyor Data Display, while transparency will be determined using a Secchi disk. Lake depth, time of sampling, and general weather conditions will also be noted (sampling is expected to be completed before noon under typical conditions). Field data will be recorded at the time of sampling in the memory of the Surveyor, and in field logs. Data will be transferred to an Excel spreadsheet in the lab. Depth-integrated surface (0-2 m), whole water column (0-bottom) or discrete bottom water samples (within approximately 50 cm of the sediments) will be collected as noted in **Table 1**. Water samples will be stored in opaque brown plastic bottles on ice and returned to the laboratory.

Other standard field and laboratory quality control procedures will be performed as summarized in **Table 2**.

Parameters collected along a profile at the permanent buoy locations are temperature, DO, EC, pH, and turbidity.

Table 1
Lake Elsinore Summary of Water Quality Sampling Plan

Parameter	Analysis Method	Sample Type
Temperature	Field Probe	Vertical profile (1 m intervals)
Dissolved Oxygen (DO)	Field Probe	Vertical profile (1 m intervals)
Electrical Conductivity (EC)	Field Probe	Vertical profile (1 m intervals)
pH	Field Probe	Vertical profile (1 m intervals)
Turbidity	Field Probe	Vertical profile (1 m intervals)
ORP	Field Probe	Vertical profile (1 m intervals)
Secchi Depth	Field Disk	1 reading per station
Chlorophyll *a*	Lab	Surface Integrated
Hardness	Lab	Integrated
Phosphorus • Total P (TP) • Soluable reactive P (SRP) • Total organic P	Lab	Surface Integrated Bottom
Nitrogen • Total N (TN) • Nitrite + Nitrate (NO_2-N + NO_3-N) • Ammonia N (NH_4-N) • Total Inorganic Nitrogen (TIN) • Total organic N	Lab	Surface Integrated Bottom
Fe_{diss}	Lab	Surface Integrated Bottom
Fe_{total}	Lab	Surface Integrated Bottom
Total Dissolved Solids (TDS)	Lab	Integrated

Table 2
Water Quality Sample Collection and Analysis

Parameter	Sample Analysis	QA/QC Notes
Temperature Dissolved Oxygen (DO) Electrical Conductivity (EC) pH Turbidity Oxidation Reduction Potential (ORP)	Hydrolab DataSonde 5 Multiprobe (DS-5) and Surveyor Data Display	• Hydrolab calibrated against solutions of known EC, pH, DO and turbidity each morning. Calibration check values will be recorded on a Hydrolab calibration sheet. • Concentration of DO standard is calculated from known temperature-dependence of O_2 solubility in water corrected for local atmospheric pressure/elevation; over a lab temperature (T) range of 20-25 °C and elevation of 1600 ft above MSL. • The EC standard is taken as a 0.01 M KCl solution, which at 25 °C, yields an EC of 1.41 mS/cm. • Turbidity is calibrated against a 10 NTU Amco AEPA-1 primary turbidity standard. • A quinhydrone solution is used as the ORP standard that yields a theoretical ORP of 265 mV at 20 °C and 285 mV at 25 °C against a Ag/AgCl reference.
Secchi Depth (transparency)	Visual observation in field	• Measured to nearest 0.01 m
Chlorophyll *a*	SM 10200 H Part 2	• Laboratory duplicates at a frequency of no less than one per 10 samples. Duplicate analyses of field splits will be used to assess the precision of analytical methods. Duplicate analysis of a sample on the same instrument will provide instrumental precision data. • Reference materials to be run with each batch of laboratory samples • Spike samples to be run at a frequency of no less than one per 20 samples or one per batch (whichever is more frequent) • Matrix spike replicates to be run at a frequency of no less than one duplicate per 20 samples or one per batch (whichever is more frequent) • Laboratory and field blanks
Hardness	SM 2340B/ 3111B	
Phosphorus Total Phosphorus (TP) Soluble Reactive Phosphorus (SRP) Total Organic Phosphorus	SM 4500-P	
Nitrogen Total Nitrogen (TN) Nitrite + Nitrate nitrogen (NO_2-N + NO_3-N) Ammonia Nitrogen (NH_3-N) Total Inorganic Nitrogen (TIN) Total Organic Nitrogen	SM 4500-N	
Iron – dissolved (Fe_{diss})	SM 3113 B	
Iron – total (Fe_{total})	EPA 7010	
Total Dissolved Solids (TDS)	SM 2540 C	

Source for laboratory methods: American Public Health Association, American Waterworks Association, and Water Environment Federation. 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition

Reporting

The results of the Lake Elsinore monitoring program will be included in the Lake Elsinore & Canyon Lake Nutrient TMDL Annual Water Quality Monitoring Report prepared by LESJWA and submitted to the Regional Board. Quarterly summaries of water quality results will also be prepared if required by the Regional Plant permit.

Key to Features

Field Sampling Monitoring Station

Buoy Monitoring Station

Imagery Source: ESRI

N

0 0.25 0.5 Miles

Document: \\Uspas1netapp1\muni\Clients\Elsinore Valley MWD\TMDL Monitoring Plan\14 Electronic Files - Modeling_Project\WQMonitoringStations.mxd

Date: July 8, 2010

Lake Elsinore Water Quality Monitoring Station Locations

Figure 1

MWH

Lake Elsinore and San Jacinto Watersheds Authority

Canyon Lake Phase 2 Water Quality Monitoring Plan

December 2010

Canyon Lake Phase 2 Water Quality Monitoring Plan

Background

Canyon Lake was formed in 1928 when the Canyon Lake (Railroad Canyon) Dam was constructed; the lake has three main sections – the relatively shallow East Bay (depths generally less than 10 ft), the deeper central body of the lake (depths in excess of 40 ft), and the area north of the causeway that connects with the San Jacinto River. The District has used the reservoir as a potable water source since 1957 when the Canyon Lake water treatment plant began operation. Allowable recreational activities on Canyon Lake are defined in the lease agreement between EVMWD (lessor) and the Canyon Lake POA (lessee) and include swimming, boating, fishing and water sports. Recreation occurs pursuant to an agreement to ensure that drinking water is not affected by these recreational activities. The POA is also allowed to construct and maintain boat docks, sea walls, bulkheads, launching ramps, bathing beaches, and other improvements necessary or desirable for complete utilization of the lake. The number of people using the lake for recreation is limited since Canyon Lake is a gated community of approximately 4,800 homes.

Canyon Lake is listed on the Clean Water Act Section 303(d) list as impaired for excessive nutrients and high bacteria. Consequently, the Regional Water Quality Control Board, Santa Ana Region (Regional Board) adopted Resolution No. R8-2004-0037 in December 2004 to amend the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) to incorporate total maximum daily loads (TMDLs) for Lake Elsinore and Canyon Lake. The TMDLs address beneficial use impairment due to excessive nutrients (phosphorus and nitrogen) discharged to the lakes from various sources. Per the Basin Plan, designated beneficial uses for Canyon Lake are municipal and domestic supply, agricultural supply, groundwater recharge, contact and non-contact recreation, warm freshwater habitat, and wildlife habitat. Draft TMDLs to address beneficial use impairment were released for public review in March 2004 and revised in September 2004. On December 20, 2004, the Board adopted Resolution No. R8-2004-0037, amending the Basin Plan to incorporate nutrient TMDLs for Lake Elsinore and Canyon Lake. The TMDLs were subsequently approved by the State Water Resources Control Board, the State Office of Administrative Law and the U.S. Environmental Protection Agency (USEPA).

The local stakeholders are responsible for the in-lake nutrient monitoring required for both lakes. The Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan (LESJWA, February 15, 2006) describes the monitoring program necessary to characterize in-lake water quality. Data collected will determine compliance with the numeric targets specified in the TMDLs, and may be used to support revisions to the TMDLs in the future.

In 2006, the Phase 1 water quality monitoring program for Canyon Lake began, in compliance with the Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan

(LESJWA, February 15, 2006). Phase 1 of the sampling program is "Intensive Lake Study" and included four stations in Canyon Lake, 17 water quality constituents, and sampling 16 times per year. Samples were collected at two or three depths depending on thermal stratification. Monitoring was originally conducted by staff from University of California at Riverside (UCR) under the direction of Dr. Michael Anderson. Monitoring is currently conducted by California State University San Bernardino (CSUSB) under the direction of Dr. James Noblet. MWH provides coordination and reporting services.

Objectives

The objective of the program is to quantify Canyon Lake water quality conditions.

Phase 2 Sampling Program

The Phase 1 program has been on-going for 4 years and extensive data have been collected from Canyon Lake. Under Phase 2 in-lake monitoring will be reduced.

Phase 2 Sampling Station Location – Data will be collected from three in-lake sampling stations:

- Station C7 - deepest part of the lake near the dam - generally strongly stratified during the summer
- Station C8 – mid-lake
- Station C10 - shallow site within East Bay that receives local nuisance runoff as well as discharges from Salt Creek during periods of rainfall and runoff

Phase 2 Sampling Frequency – Sampling will be conducted 16 times per year (monthly in October through May and bi-weekly in June through September). The exact dates of sampling will depend upon student class schedules, local weather conditions, and other factors.

Phase 2 Sampling Parameters - Sampling and analysis will be conducted for the parameters noted in **Table 1**. Water column properties (temperature, DO, electrical conductivity, pH, turbidity and redox potential) will be measured at 1 meter (m) intervals using a Hydrolab DataSonde 5 Multiprobe (DS-5) and Surveyor Data Display, while transparency will be determined using a Secchi disk. Lake depth, time of sampling, and general weather conditions will also be noted (sampling is expected to be completed before noon under typical conditions). Field data will be recorded at the time of sampling in the memory of the Surveyor, and in field logs. Data will be transferred to an Excel spreadsheet in the lab. For laboratory parameters, samples will be collected from the surface/epilimnion (0.5 – 1.0 m), hypolimnion (below the thermocline), and near bottom (within approximately 50 cm of the sediments). For dates when the lake is not temperature stratified, depth integrated (0 – bottom) samples will be obtained by mixing 1 liter samples collected at 1 m intervals; samples will be collected with a van Dorn sampler. Water samples will be stored in opaque brown plastic bottles on ice and returned to the laboratory.

Other standard field and laboratory quality control procedures will be performed as summarized in **Table 2**.

Table 1
Canyon Lake Summary of Water Quality Sampling Plan

Parameter	Analysis Method	Sample Type
Temperature	Field Probe	Vertical profile (1 m intervals)
Dissolved Oxygen (DO)	Field Probe	Vertical profile (1 m intervals)
Electrical Conductivity (EC)	Field Probe	Vertical profile (1 m intervals)
pH	Field Probe	Vertical profile (1 m intervals)
Turbidity	Field Probe	Vertical profile (1 m intervals)
ORP	Field Probe	Vertical profile (1 m intervals)
Secchi Depth	Field Disk	1 reading per station
Chlorophyll *a*	Lab	Surface Integrated
Hardness	Lab	Integrated
Phosphorus • Total P (TP) • Soluable reactive P (SRP) • Total organic P	Lab	Epilimnion Hypolimnion Bottom
Nitrogen • Total N (TN) • Nitrite + Nitrate (NO_2-N + NO_3-N) • Ammonia N (NH_4-N) • Total Inorganic Nitrogen (TIN) • Total organic N	Lab	Epilimnion Hypolimnion Bottom
Fe_{diss}	Lab	Epilimnion Hypolimnion Bottom
Fe_{total}	Lab	Epilimnion Hypolimnion Bottom
Total Dissolved Solids (TDS)	Lab	Integrated

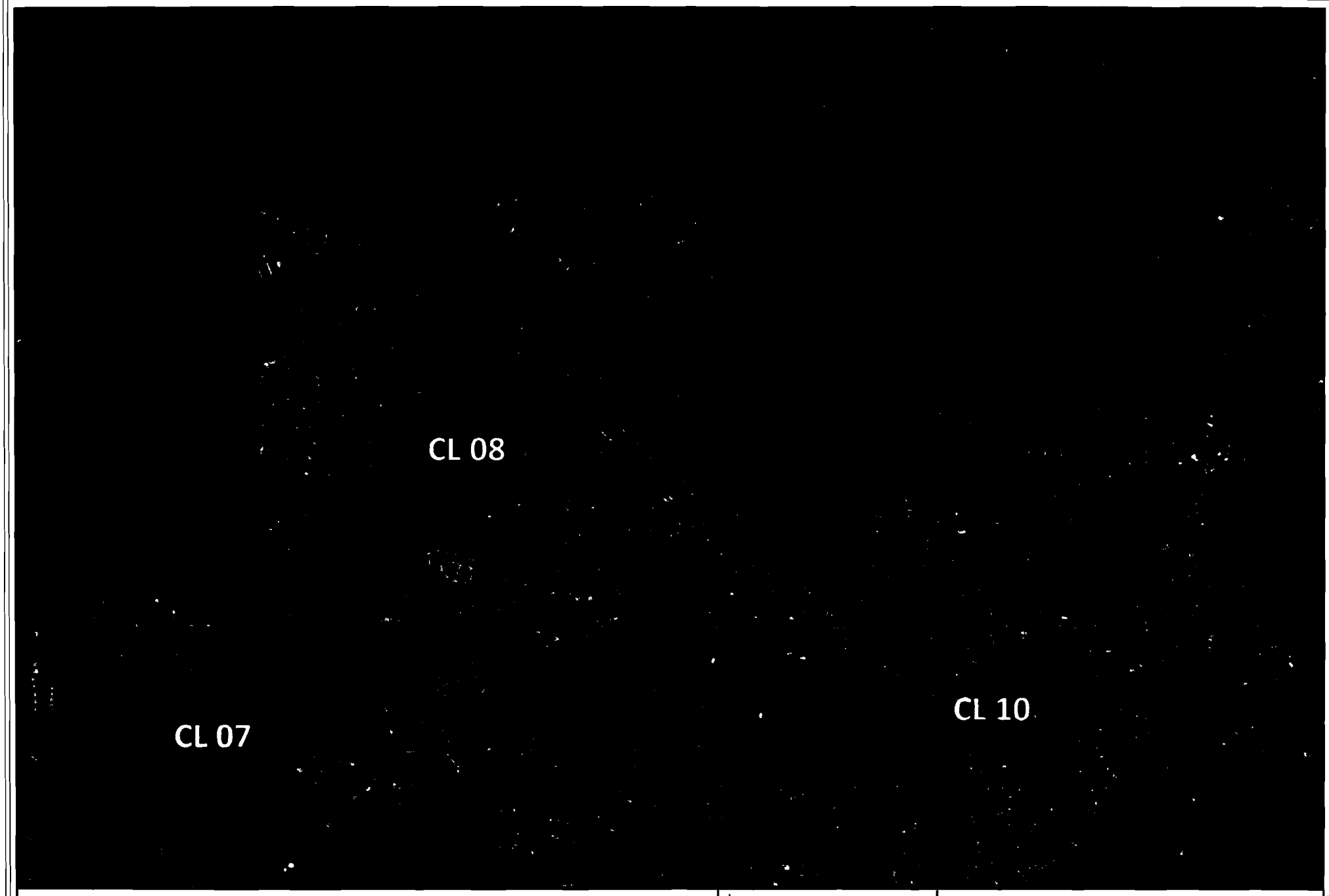
Table 2
Water Quality Sample Collection and Analysis

Parameter	Sample Analysis	QA/QC Notes
Temperature Dissolved Oxygen (DO) Electrical Conductivity (EC) pH Turbidity Oxidation Reduction Potential (ORP)	Hydrolab DataSonde 5 Multiprobe (DS-5) and Surveyor Data Display	• Hydrolab calibrated against solutions of known EC, pH, DO and turbidity each morning. Calibration check values will be recorded on a Hydrolab calibration sheet. • Concentration of DO standard is calculated from known temperature-dependence of O_2 solubility in water corrected for local atmospheric pressure/elevation; over a lab temperature (T) range of 20-25 °C and elevation of 1600 ft above MSL. • The EC standard is taken as a 0.01 M KCl solution, which at 25 °C, yields an EC of 1.41 mS/cm. • Turbidity is calibrated against a 10 NTU Amco AEPA-1 primary turbidity standard. • A quinhydrone solution is used as the ORP standard that yields a theoretical ORP of 265 mV at 20 °C and 285 mV at 25 °C against a Ag/AgCl reference.
Secchi Depth (transparency)	Visual observation in field	• Measured to nearest 0.01 m
Chlorophyll *a*	SM 10200 H Part 2	• Laboratory duplicates at a frequency of no less than one per 10 samples. Duplicate analyses of field splits will be used to assess the precision of analytical methods. Duplicate analysis of a sample on the same instrument will provide instrumental precision data. • Reference materials to be run with each batch of laboratory samples • Spike samples to be run at a frequency of no less than one per 20 samples or one per batch (whichever is more frequent) • Matrix spike replicates to be run at a frequency of no less than one duplicate per 20 samples or one per batch (whichever is more frequent) • Laboratory and field blanks
Hardness	SM 2340B/ 3111B	
Phosphorus Total Phosphorus (TP) Soluble Reactive Phosphorus (SRP) Total Organic Phosphorus	SM 4500-P	
Nitrogen Total Nitrogen (TN) Nitrite + Nitrate nitrogen (NO_2-N + NO_3-N) Ammonia Nitrogen (NH_3-N) Total Inorganic Nitrogen (TIN) Total Organic Nitrogen	SM 4500-N	
Iron – dissolved (Fe_{diss})	SM 3113 B	
Iron – total (Fe_{total})	EPA 7010	
Total Dissolved Solids (TDS)	SM 2540 C	

Source for laboratory methods: American Public Health Association, American Waterworks Association, and Water Environment Federation. 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition

Reporting

The results of the Canyon Lake monitoring program will be included in the Lake Elsinore & Canyon Lake Nutrient TMDL Annual Water Quality Monitoring Report prepared by LESJWA and submitted to the Regional Board.



Key to Features

Monitoring Location

Imagery Source: ESRI

N

0 500 1,000 2,000 Feet

Document: \CanyonLake\CanyonLakeWQLocations.mxd

Date: February 2011

Canyon Lake Water Quality Monitoring Locations

Figure 1

MWH