ENCLOSURE 5

Response to Scientific Peer Reviewers' Comments

On Preliminary Draft Basin Plan Amendments,

Revised Water Quality Standards for Surface Waters of the Antelope Hydrologic Unit

California Regional Water Quality Control Board
Lahontan Region

October 2007

Contact Person:
Judith Unsicker
Staff Environmental Scientist
Phone: (530) 542-5462
Email: junsicker@waterboards.ca.gov

INTRODUCTION

At its November 2007 meeting, the California Regional Water Quality Control Board, Lahontan Region (Water Board), will consider adopting amendments to its *Water Quality Control Plan for the Lahontan Region* (Basin Plan). The proposed amendments affect surface waters of the Antelope Hydrologic Unit, corresponding to the 2400- square mile Antelope Valley watershed in portions of Los Angeles, Kern, and San Bernardino Counties. Editorial changes to the Basin Plan are proposed that would affect the entire watershed. Regulatory changes are proposed for lower Amargosa Creek, the Piute Ponds and wetlands, and Rosamond Dry Lake. The proposed amendments would remove certain beneficial uses and add other uses, add site-specific water quality objectives (SSOs) for ammonia toxicity for lower Amargosa Creek and the Piute Ponds and wetlands, revise the plan's discussion of the Los Angeles County Sanitation District No. 14 (LACSD No. 14) facilities, and make miscellaneous editorial changes. Public review copies of the 2007 draft amendments, a draft substitute environmental document, and a technical staff report are available on the Water Board's Internet web page at:
http://www.waterboards.ca.gov/lahontan/BPlan/BPlan_Index.htm#draft

In 2004, preliminary drafts of the Basin Plan amendments and a technical staff report were reviewed by two external scientific peer reviewers pursuant to Health and Safety Code § 57004. This section requires peer review of the scientific basis for regulations adopted by boards, departments, and offices within the California Environmental Protection Agency. It states that:

> *"The board, department, or office may accept the finding of the external scientific peer review entity, in whole, or in part, and may revise the scientific portions of the proposed rule accordingly. If the board, department, or office disagrees with any aspect of the finding of the external scientific peer review entity, it shall explain, and include as part of the rulemaking record, its basis for arriving at such a determination in the adoption of the final rule, including the reasons why it has determined that the scientific portions of the proposed rule are based on sound scientific knowledge, methods, and practices."*

The scientific peer reviewers for this project were Dr. Daniel Schlenk, Professor of Aquatic Ecotoxicology in the Department of Environmental Sciences at the University of California, Riverside, and Dr. Rhea Williamson, Professor in the Department of Civil and Environmental Engineering at California State University, San Jose. This response document has been prepared for inclusion in the Water Board's agenda packet and the administrative record for the Basin Plan amendments. Copies of the reviewers' comments are included as appendices.

PEER REVIEW COMMENTS

Background

The Basin Plan amendment project was initiated in response to requests by Los Angeles County Sanitation District No. 14 (LACSD No. 14) for revisions to the designated beneficial uses and water quality objectives for ammonia toxicity for its receiving waters. As proposed in the preliminary drafts, the amendments included site-specific objectives (SSOs) for ammonia toxicity developed by LACSD No. 14's consultants, Larry Walker Associates (LWA). The final LWA report[1] was included as an appendix to the 2004 preliminary technical staff report. At the time that the peer review drafts were prepared, Water Board staff assumed that LACSD No. 14 would continue to discharge secondary effluent to lower Amargosa Creek and the Piute Ponds and wetlands.

Both sets of peer review comments focused on the methods used to develop the SSOs as described in the LWA report. Dr. Williamson also submitted general and specific comments on the proposed revisions to beneficial uses.

SSOs for Ammonia Toxicity

The SSOs proposed in the 2004 peer review draft amendments were based on the U.S. Environmental Protection Agency's (USEPA's) "Water Effects Ratio" (WER) methodology. The national aquatic life criteria developed from tests in laboratory water are intended to be protective of aquatic organisms in all surface waters, because they are based on data for many species and because tests are generally conducted in high quality waters. However, the USEPA recognizes that chemicals may be either more or less toxic under site-specific conditions in ambient water than in laboratory water. There are several USEPA-accepted procedures for establishing site-specific objectives based on ambient conditions. The WER procedure is the most commonly used.

A WER is the ratio of the toxicity of a chemical in site water to that chemical's toxicity in laboratory water. The procedure involves conducting a minimum of three sets of side-by-side toxicity tests using both laboratory and site water. The "effect level" of the test determined in the site water is divided by the "effect level" for the laboratory water to give the WER. The WER is then multiplied by an existing water quality objective or criterion to give the SSO. If the chemical is less toxic in the site water than in laboratory water, the multiplier is greater than one and results in a higher objective. If the chemical is more toxic in the site water, the multiplier is less than one and results in a lower objective.

The LWA studies used laboratory cultures of *Hyalella azteca*, an invertebrate species resident in Piute Ponds. The "effect level" used was the LC_{50}, the concentration of ammonia lethal to 50 percent of the organisms. The

[1] Larry Walker Associates, 2003. Ammonia Water Effect Ratios and Site-Specific Objective for Paiute Ponds- Final Results. Submitted to: County Sanitation Districts of Los Angeles County, December 2003.

recommended WERs for acute and chronic toxicity were 2.61 and 19.78 respectively. The recommended acute and chronic SSOs were calculated by multiplying the USEPA's 1999 acute and chronic ammonia toxicity criteria[2] by the WERs) The final LWA report included a table specifying ammonia limits for various pH and/or temperature conditions. The proposed 2004 draft SSOs were significantly less stringent than the existing water quality objectives, and would have allowed ammonia concentrations much higher than the monitored ambient ammonia levels in Piute Ponds.

Because both peer reviewers were critical of the methods used in the LWA toxicity studies, and because LACSD No. 14 subsequently adopted a new facilities plan that includes disposal of tertiary, rather than secondary, effluent to lower Amargosa Creek and the Piute Ponds and wetlands, Water Board staff decided not to proceed with the ammonia toxicity SSOs proposed in the preliminary drafts. Instead, the public draft Basin Plan amendments include SSOs that directly incorporate the U.S. Environmental Protection Agency's 1999 national ammonia criteria for the protection of freshwater aquatic life.[2] The section of the preliminary technical staff report dealing with SSOs was almost completely revised, and the 2007 public draft staff report does not include the LWA report.

No technical responses to specific peer review comments on the LWA study or the 2004 proposed SSOs for ammonia toxicity are necessary. Because the USEPA freshwater ammonia criteria have been peer reviewed, further external peer review was not necessary for the revised draft SSOs.

Dr. Williamson's specific comments on the 2004 draft amendments to Basin Plan Chapter 3 included a number of suggested editorial changes to the existing Basin Plan language beyond those proposed by staff. An editorial update of the entire Basin Plan is in the Water Board's adopted Triennial Review priority list for future Basin Plan amendments. Dr. Williamson's recommendations have been included in a list of specific revisions to be addressed in this update.

Beneficial Use Changes

The justification for proposed changes in beneficial use designations is based largely on information and data provided by LACSD No. 14, such as the Environmental Impact Report for the District's 2004 facilities plan, and consultants' reports summarizing information related to beneficial uses. Water Board staff also reviewed and cited other available scientific reports on the affected waters, including U.S. Army Corps of Engineers reports on the biology of Piute Ponds and the hydrology of Rosamond Dry Lake.

---

[2] U.S. Environmental Protection Agency, 1999 Update of Water Quality Criteria for Ammonia, EPA-8220R-99-104, December 1999.

Comment: Dr. Schlenk agreed with the proposed site-specific beneficial use designations and staff's evaluation of the attainability of the uses.

Response: No response is necessary.

Comment: In her general comments, Dr. Williamson agreed with some of the proposed changes in beneficial uses and conditionally agreed or disagreed with other changes, as follows:

"Specific changes to the basin plan for discharges below the LACSD No. 14 discharge point are:

Removal of MUN	AGREE, if GWR not affected
Removal of REC-1	AGREE
Removal of COLD	DISAGREE
Removal of COMM	AGREE
Removal of AGR for Rosamond Dry Lake	AGREE, if GWR not affected
Addition of FRSH for Paiute ponds and wetlands	AGREE
Addition of RARE for Paiute ponds and wetlands	AGREE
Addition of BIOL for Paiute ponds and wetlands	AGREE
Addition of SAL for Rosamond Dry Lake	DISAGREE."

(When they are quoted directly, Dr. Williamson's comments are shown in the original font for contrast with staff's responses. Page number references are provided in the summaries below to help readers access the original comments in Appendix 1.)

As shown in her specific comments, Dr. Williamson was concerned about potential impacts of removal of the MUN and AGR uses from surface waters on the attainment of these uses in the underlying groundwater. She disagreed with the proposed changes in the COLD and SAL uses because she felt that not enough information was provided in the 2004 technical staff report to justify the changes. Her general comments on the staff report stated:

> "It seems that recommendations are made to omit and add beneficial uses, despite a lack of supporting data. Concerns with this approach are that as a result of this approach, WQ objectives are being proposed that may or may not be protective of the beneficial uses, with the justification often related to the ability to meet current objectives. It is this reviewer's experience that the collection of data to determine spatial (vertical and horizontal) and temporal (seasonal and diel or over a 24-hour period) variability is critical in assessing impacts of discharges on biota. To not do so, is not a conservative approach that will necessarily be protective of the environment. Sampling location (within water column and proximity to source) and sampling time (time of day and year) can result in very different results (dissolved

oxygen of 10 mg/L in afternoon vs. 1 mg/L in early morning; pH of 9 in afternoon vs. 7 in morning; high ammonia vs. low ammonia, etc."

Response: It is true that the information and data used to support the proposed changes in the COLD and SAL beneficial uses are limited. LACSD No.14 is currently required to monitor its receiving waters only once a month for most constituents.

After reading the peer review comments on beneficial uses, staff decided to proceed with the proposed amendments using available information and data. The "use attainability analysis" section of the 2007 technical staff report is largely unchanged from the 2004 peer review draft. However, it includes some additional information and data provided by LACSD No. 14, such as estimated tertiary effluent quality. The 2007 draft Substitute Environmental Document for the Basin Plan amendments includes recommendations for additional monitoring to provide more data on LACSD No. 14's receiving waters for use in evaluation of beneficial use support.

Comment: In a comment on page 12 of the 2004 draft staff report, Dr. Williamson noted a statement that toxicity tests with fathead minnows were mentioned in connection with LACSD No. 14's discharger self-monitoring program, and asked what the results of these tests indicated.

Response: The discharger self-monitoring program adopted in 2002 directs the District to conduct toxicity tests on its effluent and ambient receiving waters by deadlines in 2003. At that time, there was concern about chlorine toxicity as well as ammonia toxicity The fathead minnow test results were not available to Water Board planning staff at the time that the peer review drafts were prepared.

Comment: In comments on pages 12 and 73 of the May 2004 draft staff report, Dr. Williamson noted the high levels of Kjeldahl nitrogen in secondary effluent and the need to address the impacts of nitrogen cycling in the ponds on eutrophication and other issues. Dr. Williamson stated that, although improved effluent quality might allow the proposed 2004 SSOs for ammonia toxicity to be met, total loading of ammonia would be expected to increase with increased discharge volume.

Response: Table 2 on page 12 of the 2004 staff report was revised as Table 1 of the 2007 public draft. It now compares the quality of secondary and tertiary effluent. The tertiary treatment process will include nitrification-denitrification, and the resulting nitrogen discharge to lower Amargosa Creek and the Piute Ponds and wetlands will be mostly in the form of nitrate rather than Kjeldahl nitrogen. The 2007 staff report addresses eutrophication in the discussion of the

Warm Freshwater Habitat beneficial use on page 53. The Biological Resources section of the Environmental Checklist in the 2007 public draft substitute environmental document also addresses eutrophication.

Under the facilities plan adopted in June 2004, LACSD No. 14 expects to route most of its tertiary effluent to new storage reservoirs for agricultural use. The volume of effluent that reaches Piute Ponds will be reduced to about 2 million gallons per day, the volume needed to maintain the ponds and wetlands at their current wetted area. Because of this and because of the change from secondary to tertiary treatment, the loading of ammonia and total nitrogen to the ponds will be reduced as compared to historic conditions. .

Comment: In a comment on the footnotes to Table 5 on page 24 of the 2004 staff report (Table 4 on Page 30 of the 2007 staff report), Dr. Williamson stated:

> "It is unclear why the data provided are averages from so many different time periods. This is a concern particularly due to changes in plant operation and discharges."

Response: This table is based on Table 2 in LWA's November 2002 workplan for the WER/SSO study. The workplan does not explain the rationale for the averaging.

Comment: Dr. Williamson had the following comment on Table 6 on page 25 of the 2004 staff report (Table 7 on page 32 of the 2007 staff report):

> "The abbreviations for NA and ND needs clarification. The table is confusing with respect to the nitrogen rows. For nitrate + nitrite, the MCL is shown as 10,000. This means the value is **as nitrogen**, so the constituent should state **nitrate nitrogen + nitrite nitrogen**. Conversely, the row below shows nitrate nitrogen, with a MCL of 45,000 micrograms per liter. This is incorrect. The MCL for nitrate is 45,000 ug/L; the MCL for nitrate nitrogen is 10,000 ug/L."

Response: For the record, the following information should be noted. "NA" stands for "Not Applicable" (there is no California Maximum Contaminant Level or MCL for a specific chemical). "ND" stands for "not determined" (the chemical was not analyzed in samples for certain monitoring stations). The expression of the MCLs for nitrate and "nitrate plus nitrite" in Table 7 should be as indicated in the comment. These corrections will not be physically made to the staff report because the Water Board will not be taking formal action on the report.

Table 7 uses micrograms per liter concentrations because all of the state and federal criteria summarized in the Central Valley Water Board's "Water Quality Goals" publication are expressed as micrograms per liter for comparison. The

state MCLs for nitrate and nitrite are actually expressed as milligrams per liter in the California Code of Regulations.

Comment: Dr. Williamson had several specific comments (on pages 20, 29 and 30 of the 2004 draft staff report) related to the impacts of effluent on ground water quality and the Groundwater Recharge (GWR) beneficial use. The first and second comments concerned the need to address the risk of impairment of water quality and ground water beneficial uses as a result of the proposed removal of the MUN and AGR uses from surface waters. The third comment states:

> [Comment on Page 30] "Reference is made to a two-phase ground water investigation with new monitoring well installations and monitoring to be completed by the LASCD. It is unclear if the principal aquifer (also referred to as the shallow ground water and as the perched ground water zone) is a drinking water supply. The text indicates that if the shallow ground water beneath the Paiute Ponds, and the deeper aquifer used for domestic supplies are not hydrologically connected, then the beneficial use of GWR will be removed. Why? This effectively enables further contamination of the upper aquifer. The aquifer can still be used for many of the uses listed in the definition on page 29."

Response: Significant impacts on groundwater quality and beneficial uses are not expected to occur as a result of the currently proposed Basin Plan amendments. The Water Board has the authority and responsibility to set effluent limitations at levels that will protect groundwater uses. The Board would need to make findings under the State Nondegradation Policy (State Water Board Resolution 68-16) to allow lowering of groundwater quality, and all beneficial uses would need to be protected even if such findings were made.

The Water Board has directed LACSD No. 14 to end overflows of effluent from Piute Ponds to Rosamond Dry Lake. Therefore, removal of the MUN and AGR beneficial use designations from Rosamond Dry Lake will not result in future discharges to the lakebed that could affect the GWR use. Removal of the GWR use from the Piute Ponds and wetlands would need to be considered as a separate Basin Plan amendment action. Scientific justification, a separate external peer review process, and analysis of environmental impacts pursuant to the California Environmental Quality Act (CEQA) would be required. To approve the amendments and environmental document, the Water Board would need to find that any significant adverse environmental impacts would need to be mitigated to less than significant levels, or make findings of overriding considerations to allow the project to proceed.

Comment: Dr. Williamson had several specific comments on the discussion of Rosamond Dry Lake, as follows:

[Comment regarding page 31] "Data for salinity and total dissolved solids (TDS) for all sites shown in Table 13 are questioned. How can a salinity of 10 ppt have a TDS concentration of 59 ppm? (10,000 mg/L >>> 59 mg/L). Also, if the TDS is 59 ppm, how can the alkalinity be 1580 mg/L. Something is really wrong, which calls to question the support for designating Rosamond Dry Lake as saline."

Response: Table 13 in the 2004 staff report (Table 14 in the 2007 report) includes data on Rosamond Dry Lake from a summary of another study in a report by LACSD' No. 14's consultant CDM. In response to a request from Water Board staff, CDM provided the "Methods" section and the water quality data from the original Branchiopod Research Group study.[3] The Methods section indicates that sampling was done under a variety of hydrologic conditions, ranging from sampling from a canoe in January to sampling in March when "the high silt content of the waters made measurement of alkalinity, TDS, and salinity impossible in some pools." Most of the water quality measurements were done in the field, including measurements of alkalinity, salinity, and TDS. No details were given on the types of field sampling equipment or methods used, and it is possible that the discrepancies the reported constituent values arise from differences in the field methods. The sodium, potassium and magnesium data in the table come from laboratory ion analysis with an atomic absorption spectrophotometer.

Laboratory measurement of salinity as Total Dissolved Solids (TDS) is done by evaporating a solution to dryness at a standard oven temperature and weighing the residue. Some constituents such as bicarbonate may be lost through volatilization during the evaporation process, and the total "salinity" of a given sample measured by a different method may be higher than its reported TDS. Literature cited on page 21 of the 2007 staff report indicates that Rosamond Dry Lake is a "hard" playa, and that the waters of hard playas studied in California generally have relatively high levels of carbonate and bicarbonate. Some of the differences in the order of magnitude of the reported field values for salinity and TDS could be related to whether or not different field measurements accounted for volatile constituents.

Table 14 was checked against the original table in the Branchiopod Research Group Report to see whether any decimal point errors had been made in the salinity/TDS data in transcription. There were no such errors. However, two typographical errors should be noted for the record. The March 1993 sampling date for Station RL2S should read "3/20/93." The sodium ion concentration for the 5/12/93 sampling event should be 41.98 mmol/L rather than 41 mmol/L. (Data in Table 14 were rounded off from those in the field report.)

[3] The Branchiopod Research Group, University of San Diego. Eubranchiopod Survey, Edwards Air Force Base, 1992-1993. Prepared for TetraTech, Inc. 92 pages.

[Comment regarding \page 41] "The fresh and saline designations for Rosamond lake are confusing. Table 2-1 does not include FRSH yet the text indicates that the lake is sometimes fresh water. The point that FRSH applies to surface waters that are fresh water and that flow to saline lakes should be made (from page 31). Also, problems with data in Table 13 contribute to the confusion around the change in designation to SAL for Rosamond Dry Lake."

Response: The discussions of the FRSH and SAL uses are on pages 38 and 59 of the 2007 staff report. The peer review draft staff report included a table showing an earlier version of the proposed changes to Basin Plan Table 2-1. This table was not included in the public review draft; rather, the amendments to Table 2-1 are shown in the separate Basin Plan amendment document. The Freshwater Replenishment (FRSH) use does not currently apply to Rosamond Dry Lake and is not being proposed for addition. As indicated in the comment, the operative word in the FRSH use is "replenishment." The SAL use designation is defined in terms of aquatic habitat, rather than the impacts of tributaries on water quality and quantity.

[Comment regarding page 53] "Designation of Rosamond Dry Lake as a saline lake is based on very limited data; salinities are relatively low compared to other saline lakes. In addition, during periods of storm water runoff, salinity levels are closer to fresh water values, and are elevated primarily following overflows of the Paiute Ponds to the lake. More data are needed to support this change."

Response: The data for Rosamond Dry Lake in the staff report come from two sources: LACSD No. 14's monitoring data for effluent-dominated Station RS5, and the Branchiopod Research Group's data for four stations including other parts of the lakebed. The relative contributions of effluent and salts from other sources to the salinity, alkalinity and TDS concentration in Rosamond Dry Lake cannot be evaluated from the limited data water quality data available. Terminal desert playa lakes in California have generally accumulated relatively large amounts of salts from their watersheds over geologic time. While the limitations of the water quality data are recognized, designation of the SAL use is also supported by the presence of aquatic organisms adapted to saline conditions, such as fairy shrimp and tadpole shrimp.

[Comment regarding page 49] "In the conclusion related to use of WARM as a site specific beneficial use, the data are not convincing. The temperature ranges stated (on the cold side), the optimal ranges for organisms present, the climate data on snow and temperature conditions provided by CDM (2004), the COLD designation for other water bodies, and the lack of temperature and dissolved oxygen data to support the change preclude making the change. Data should be

collected prior to accepting a designation that will allow for less stringent discharge criteria. These less stringent criteria have the potential to reduce dissolved oxygen (by increasing organic loading of organic nitrogen, by increased nutrients). More data are needed, that are collected to determine spatial and temporal changes in temperature and dissolved oxygen."

Response: The 2007 staff report and draft substitute environmental document both acknowledge the limitations of the available water quality data. The environmental document recommends additional monitoring of ambient water conditions. If the COLD beneficial use is removed through these Basin Plan amendments, it could be redesignated in the future either instead of, or in addition to the WARM use, if monitoring shows that it is an existing or attainable use of the affected water bodies.

Appendix 1

Scientific Peer Review Comments by Dr. Daniel Schlenk

Peer Review of Draft Basin Plan Amendments and Supporting Documents Concerning Revised Standards for Surface Waters of the Antelope Hydrologic Unit

Provided by

California Regional Water Quality Control Board
Lahontan Region

dated April 28, 2000

Reviewed by:

Daniel Schlenk, Ph.D.
Professor
Aquatic Ecotoxicology
Department of Environmental Sciences
University of California, Riverside
Riverside, CA 92521

Date of Review: August 6, 2004

Summary:

Ammonia displays complex environmental behavior within aquatic systems. Temperature and pH appear to be two factors that significantly influence the availability of ammonia to biological systems. However, ionic components may also affect availability of ammonia or ammonium ion, which also may contribute to toxicity. Unfortunately, the mechanisms surrounding such interactions are unclear leading to pronounced uncertainty in developing toxicity criteria for ammonia in surface waters. Although measured concentrations of ammonia in Amargosa Creek often exceed regional criteria values, resident populations of the most sensitive invertebrate genus *Hyalella* exist and apparently thrive under the current discharge process. At least 3 additional fish species are also present in a downstream catchment (Paiute Pond) as well as a diverse array of birds and wildlife. In order to set a site-specific objective for ammonia in this waterway, water-effects-ratios (WERs) have been implemented in order to relax the current concentration threshold values for ammonia. Given the appearance of a thriving wetland community with sensitive organisms naturally occurring within its boundaries under the current guidelines, it is my opinion that the criteria values should be modified to correspond with current out-put of ammonia by the LACSD Lancaster Plant (i.e. 10-12 mg N/L). However, given the uncertainties associated with WER calculations in general and the fact of the results being based upon only one invertebrate species during one season of the year (primarily dry and not "worst-case"), the proposed values, in particular for chronic endpoints, are not scientifically accurate. If a value is to be calculated using this process, it is recommended that acute and chronic WER values be concurrently calculated for a fish (i.e. Ictalurid) and invertebrate species in dry as well as wet seasonal periods as recommended by the USEPA in the 1999 Ammonia document in order to reduce uncertainty and provide a more accurate threshold.

Issues addressed in Peer Review:

- Technical adequacy of SSO studies (methods, QA/QC procedures, and conclusions) as summarized in Larry Walker Associates, *Ammonia Water Effects Ratios and Site-Specific Objectives for Paiute Ponds-Final Results,* December 2003.

General Comments:

The summary of the document is accurate regarding the rationale for a WER approach in setting appropriate criteria thresholds for ammonia in the Amargosa Creek and Paiute Pond water bodies. However, the rationale for utilization of a single species to carry out the WER calculation is flawed. Even though *H. azteca* has been shown to be a very sensitive species regarding ammonia toxicity, its relative sensitivity was determined in reconstituted water. It cannot be assumed that *Hyalella* is more or less sensitive to other species unless those species have also been tested in the site water, hence the necessity to utilize a second species. Assuming the mechanism of resistance to ammonia toxicity is in fact due to a higher ionic content within the site water, invertebrates and vertebrates differ dramatically with regard to mechanisms of physiological adaptation to hyperosmotic conditions.

It is recommended that an Ictalurid species (preferably early life stage) be also evaluated for the following reasons: 1) an Ictalurid species resides within Paiute Ponds 2) a significant database is present regarding ammonia thresholds in Ictalurids, 3) possesses mid-level sensitivity to ammonia, and 4) early life stages tend to be more sensitive to ammonia toxicity.

An additional rationale for using a second species is to verify the exceedingly high fWER calculated with *Hyalella.* The 1999 EPA ammonia criteria document states that rarely do WERs exceed 1 for ammonia. However, the chronic fWER for PP1 was 19.78, and acute fWERs ranged between 2.6 to 3.68. The nearly 10-fold difference between chronic and acute values also contradicts the 1999 EPA document as well, since there were no apparent differences between acute or chronic response values (<1.45 mg N/L).

Consequently, verification with an additional species that is physiologically distinct is needed.

An additional comment regarding the study involves the dates of sampling for the site water. If it is assumed that elevation in ionic content is the primary mechanism for protection against ammonia toxicity, then a "worst-case" scenario should have led to samples being taken during the winter or rainy season where dilution of ionic content would have been greatest. In contrast, samples were predominantly taken during the "dry season" to calculate the WER. To obtain a "worst-case" scenario, water samples with the lowest TSS, alkalinity, Na, or K should have been used for comparison. In addition, it

would seem that carrying out a toxicity study with artificial water mimicking the site water would have provided at least a positive control for diminished toxicity if indeed ionic strength explains the underlying mechanism of resistance. WER testing should include a range of pH values, alkalinities, and hardness values representative of natural fluctuations.

It was also unclear from the report whether animals were appropriately acclimated to site and lab water, prior to ammonia amendment.

Lastly, the elevated mortality within non-amended site water (controls) should have necessitated repetition of those studies in which these controls were absent. Re-constituted lab water controls cannot be used as a control for site water.

- Appropriateness of water quality objectives based on toxicity to *Hyalella azteca* and "worst case" conditions at a station near the effluent discharge point.

As mentioned above, *Hyalella* was listed in the 1999 EPA criteria document as one of the most sensitive organisms to acute and chronic ammonia toxicity. Its choice is also relevant based upon its occurrence in the waterbodies in question. However, as mentioned above, it cannot be assumed that all aquatic animals respond similarly to elevated ionic content or ammonia, or to the combined exposure to each stressor. This is likely why the EPA suggests at least 2 species be examined. Given that fish are typically more sensitive to ammonia than invertebrates (with the notable exception of *Hyalella*), it is warranted to use an early life stage of a fish species present in Paiute Pond and its tributary.

As mentioned above, a "worst case" scenario would likely involve exposure to ammonia under diluted ionic conditions, which would likely occur during rain events. In contrast, all acute studies were performed in dry weather conditions and only one chronic exposure carried out in February during wet conditions.

- Appropriateness of proposed site-specific beneficial use designations and of Regional Board staff conclusions regarding the attainability of these uses.

I agree with the conclusions of the Regional Board staff regarding the beneficial use designations and the attainability of these uses.

- Scientific validity of Regional Board staff conclusions regarding the significance of the environmental impacts of the plan amendments

With the notable exception of the criteria values established through the enclosed WER calculation, I am in agreement with the conclusions of the Regional Board staff. I think it

is important to emphasize the fact, that the **existing Regionwide Objectives are inappropriate** for this system given the diversity of species present, and the reality of their presence due to the input of treated wastewater from the Lancaster facility. If this water is removed the system would cease to exist.

However, the SSOs Based on Existing Regionwide Objectives or the 1999 Ammonia Criteria are also invalid and likely too high given the study undertaken to obtain those values.

Appendix 2

Scientific Peer Review Comments by Dr. Rhea Williamson

5 JULY 2004

Dr. Judith Unsicker
Staff Environmental Scientist
California Regional Water Quality Control Board
Lahontan Region
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150

Dear Dr. Unsicker,

Please find below the comments on the proposed amendments to the *Water Quality Control Plan for the Lahontan Region* (Basin Plan). Per the RWQCB guidance, the major technical and scientific issues addressed in the review include the below items, with a statement of approval or rejection. Justifications for the decisions are provided in the document reviews.

- Technical adequacy of SSO studies (methods, QA/QC procedures, and conclusions) as summarized in Larry Walker Associates, *Ammonia Water Effects Ratios and Site-Specific Objectives for Paiute Ponds-Final Results*, December 2003.
- Appropriateness of water quality objectives based on toxicity to *Hyalella azteca* and "worst case" conditions at a station near the effluent discharge point.
- Appropriateness of proposed site-specific beneficial use designations and of Regional Board staff conclusions regarding the attainability of these uses.
- Scientific validity of Regional Board staff conclusions regarding the significance of the environmental impacts of the plan amendments.

The documents reviewed include:

- Larry Walker Associates. 2003. Ammonia Water Effects Ratios and Site-Specific Objectives for Paiute Ponds-Final Results. Prepared for the County Sanitation Districts of Los Angeles County. December 2003.
- CRWQCB-LR. 2004a. Preliminary Draft of the Proposed Amendments to the Water Quality Control Plan for the Lahontan Basin. Revised Water Quality Standards for Surface Waters of the Antelope Hydrologic Unit. May 2004.
- CRWQCB-LR. 2004b. Preliminary Draft of the Technical Staff Report. Revised Water Quality Standards for Surface Waters of the Antelope Hydrologic Unit. May 2004.

Additional documents used in the review include the following:

- CDM. 2003. Beneficial Use Designation Report for Amargosa Creek, Paiute Ponds, and Rosamond Dry Lake: Final Report. Prepared for the County Sanitation Districts of Los Angeles County. October 2003.

- ESA. 2003. Lancaster Water Reclamation Plant: 2020 Facilities Plan. Draft Environmental Impact Report. Prepared for the County Sanitation Districts of Los Angeles County. September 2003. [Executive Summary only].

Each document was reviewed; comments are organized into general and specific comment sections for each major document. When possible, page numbers, paragraphs, figures, and tables are referred to by number. Review comments resulted in the following conclusions related to the basin plan amendments:

Specific changes to the basin plan for discharges below the LACSD No. 14 discharge point are:

Removal of MUN	AGREE, if GWR not affected
Removal of REC-1	AGREE
Removal of COLD	DISAGREE
Removal of COMM	AGREE
Removal of AGR for Rosamond Dry Lake	AGREE, if GWR not affected
Addition of FRSH for Paiute ponds and wetlands	AGREE
Addition of RARE for Paiute ponds and wetlands	AGREE
Addition of BIOL for Paiute ponds and wetlands	AGREE
Addition of SAL for Rosamond Dry Lake	DISAGREE
Addition of Site Specific Objectives for ammonia toxicity	DISAGREE

General Comments: Larry Walker Associates. 2003.

Review of this document is to determine the technical adequacy of SSO studies (methods, QA/QC procedures, and conclusions). This document provides the basis for the justification of the basin plan amendments. Unfortunately, the data and process contain unsubstantiated or unclear justifications, assumptions, and errors. There is some confusion on the units being used, i.e., mg-N/L or mg/L. For example, in Table 7, it is stated that the results are mg-N/L, but the data are labeled mg/L. The GMCV is shown as 1.45 mg/L but EPA (1999) shows it as 1.45 mg-N/L. The value is for total ammonia; it is unclear what the LWA data designate. The body of information in EPA (1999) on various species is not addressed, and the entire site specific objective argument is based on one research experiment published by Ankley *et.al.,* (1995). Interpretation of the results of the study are hampered by multiple problems, lack of compliance with protocol, or questions of the applicability to the Paiute Ponds (use of dechlorinated tap water, unclear justification for a 33.7% mortality in control treatments, weekly renewals resulting in decreases in pH and increases in ammonia between renewals, use of three tests, one of which ended in 4 weeks, the other 2 of which were analyzed together, lack of dissolved oxygen data, and use of statistics to arrive at the LC50 due to a lack of proper concentrations along the range of interest (EPA, 1999). While justifications are made relative to the use of the study to assess *Hyalella* toxicity, the dependence on this one study to set less stringent standards is questioned. Numerous studies of ammonia toxicity on *Hyalella azteca* are available from the US EPA AQUIRE website as retrieved on 06/30/04 from http://www.pesticideinfo.org/List_AquireAll.jsp?Species=52&offset=100 (See attached example). In addition, many of these studies caution that "there is

considerable discrepancy in reported median lethal concentrations of ammonia for *Hyalella azteca*" (Lasier, P.J. and P.V. Winger. Retrieved on 06/30/04 from http://www.pwrc.usgs.gov/research/sis98/lasier1s.htm. Data acceptability criteria set by the state of California (http://www.swrcb.ca.gov/swamp/docs/appxc_dact_toxicitytest12.pdf) were not followed, which is another concern with the use of this one dataset for setting these criteria. In a summary of organisms used for toxicity studies in a range of habitats, *Hyalella* is listed for freshwater sediment studies, but not for freshwater water column studies (http://www.aquasurvey.com/Services/soil-sediment-toxicity.html). In a websearch of *Hyalella* toxicity studies, it is uniformly described for use in sediment studies of toxicity. It is described as an epibenthic (living on the sediment surface) amphipod commonly used to assess toxicity in sediments. The use of this one species, and not a second species (per EPA, 1999 protocol) is of concern. It is recommended that a proper assessment of a site specific objective be made following the protocol set by EPA (1999). Specifics are provided below.

Specific Comments: Larry Walker Associates. 2003. .

Page	Comment
1	Paragraph 2: This paragraph sets the stage for the argument that ionic composition of the water greatly affects ammonia toxicity. LWA refers to studies cited in the 1999 Ammonia Criteria update that indicate that increased ionic composition of the exposure water indicates a REDUCTION in toxicity of ammonia to test organisms. LWA does not refer to the studies cited that indicate NO IMPACT or INCREASED toxicity of ammonia to test organisms. LWA also does not cite the resulting EPA approach to ammonia toxicity where "because the effects of ionic composition on ammonia speciation in fresh water are small and its other effects on toxicity are poorly established, the ionic composition of the exposure water will not be considered in the derivation of the criterion" (EPA, 1999; pg. 7).
2	Paragraph 1. Monitoring for acute *Hyalella* toxicity was in October 2000. For chronic toxicity to *Hyalella* was in July 2001. The ammonia WER workplan was between January 2002 and Fall 2002. What is Fall?? Why are no data collected from October to January? This time period is one of cooling water temperatures, which result in increased difficulty in meeting chronic toxicity criteria. According to CDM (2003: Beneficial Use Designation Report), data from 1998 to 2001 for the Paiute Ponds and the Lancaster WRP Effluent indicate that higher values of ammonia are measured in the ponds and the plant effluent in the cooler winter months. In addition, according to CDM (2003), discharge of treated effluent from the Lancaster WRP is highest between December and March. Toxicity testing was not implemented during these months. Seasonal variability of toxicity should be addressed, per the EPA guidelines for conducting water effects ratio analyses.
2	Paragraph 2. The statement that *Hyalella* was the most sensitive **species** used in developing the chronic criteria is misleading. There were 4 sensitive **genera** determined: 2 fish, 2 invertebrates. Data used were genus mean chronic values

GMCVs, and NOT species specific data. This is important in that the determination of *Hyalella* as a sensitive genus was based on a mean of several analyses, not on that by Borgmann (1994) alone. In addition, the *Hyalella* data are specific to reproduction, and not survival, and the endpoint is not relevant for low temperatures. EPA (1999) specifically states that "it is also necessary to consider the effect of seasonality on the chronic endpoint selection".

2 Paragraph 2. The use of *Hyalella* for acute WER adjustment of the acute criterion is questioned. EPA (1999) specifically states that "a temperature normalization for the invertebrates, while technically justifiable, is irrelevant to the CMC formulation, due to the insensitivity of all invertebrate taxa to ammonia acute toxicity". Use of the one of the 3 sensitive genera for which GMCVs are available is recommended for assessment of acute toxicity.

2 Paragraph 3. Limitation of the WER adjustment to only one species despite the recommendation of the WER guidance documents is not acceptable. These data are being used to add new beneficial use designations of Rare, Threatened, and Endangered Species Habitat (RARE) and Preservation of Biological Habitats of Special Significance (BIOL), in addition to the existing beneficial use for wildlife habitat (WILD) for the Paiute Pond system. The ponds are already noted as a habitat for sensitive bird species, many of which depend on fish as a food resource. It is recommended that tests with a secondary (fish) species be conducted.

2 Paragraph 3. Justification for using only one primary species in the WER testing for ammonia toxicity in the Paiute Ponds refers to the existence of WER studies for copper that allowed use of one primary species. It is important to note that Water-Effect Ratios were developed for and are principally applied to metals (EPA, 1999), which are greatly affected by pH. This pH dependence is the primary reason why EPA allows use of WERs to apply to ammonia. In this study, the authors are deviating from this pH dependency approach by also introducing ionic composition as a primary factor affecting ammonia toxicity. It is my opinion that too many unknowns are being used to justify determination of the ammonia criterion.

3 Paragraph 2. Discussion on the elimination of fish species for acute toxicity determinations is questioned. The authors determine that available data for the 3 species found in the Paiute Pond system are irrelevant because they are not ranked as the most sensitive species when compared to fish data collected nationwide. They use this point to label fish species present in Paiute Ponds as not sensitive to ammonia and thereby not appropriate for ammonia toxicity testing. Again, it is recommended that acute and chronic toxicity testing using a secondary species be completed.

3 Paragraph 3. The last sentence notes that data were collected for a selected fish species, but that data results were not used in the calculation of the SSOs. The data should be made available for review, and the SSOs as calculated should specifically indicate the application to invertebrate species only.

4 Table 1. Conflicting information. The table states as a footnote that sample collection may not be possible during wet weather due to safety concerns, yet in paragraph 1 of page 4 it is stated that the site were determined in part due to "access during wet weather". Wet weather monitoring is critical to address seasonality when setting criteria.

5 Table 2. The data indicate no acute ammonia sampling at the primary site (PP1) during cold weather, or wet weather conditions. Data are only available April to August of 2003. Acute sampling at the secondary location (PP2), which was meant to confirm water quality conditions, was only performed one time in concurrence with sampling at PP1. Wet weather event sampling is limited to one date, and for chronic testing at PP1 only. It is unclear what a renewal sample is from the table and text, but is inferred to be the water used during the 21 day test period.

6 Paragraph 1. The acute test at PP2 on June 25, 2003 was not collected from the same location as subsequent tests; it is unclear if the holding time for this sample was exceeded, as it was for the sample collected from PP1 on the same date, resulting in no data. The text then states that based on these initial **tests (there is only one)** and the data available for the SSO study (what data?), the development of a WER was feasible. This conclusion is questioned. Data are not available for the primary site, water contained a chlorine residual resulting in exceedence of the holding time for the sample, which is 36 hours! This initial testing did not follow the specific requirements identified in the WER guidance manual and specified in the LWA Ammonia SSO Workplan (page 11).

7 Table 5. Fathead minnow are listed as a test organism. Test results should be provided for review. There is no discussion of the use of renewal water collected on the dates shown in Table 2. Use of a totally different water (water from the same location, collected on different dates can vary considerably, depending on time of day, discharges, etc) for the chronic test data, without analysis of the renewal water prior to use is a real problem.

8 Numbers. Two test acceptability criteria are cited, however exceptions to both were allowed. This is a concern given the very limited number of acute and chronic toxicity tests performed. This is unacceptable.

8 Last Paragraph. Justification for use of test data for laboratory controls when site water control organisms died assumes that the reason for the reduction in control survival was due to ammonia in the site water. This is an assumption; data to support the assumption were not evaluated.

9 Paragraph 1. The statement about "less than ideal conditions" for some of the tests in site water is vague and unclear. Details should be provided. The problems experienced by LWA is justification for performing tests for ammonia toxicity using laboratory dilution water. Note that the water quality at the two sampling stations falls within the range of acceptable water quality conditions for laboratory dilution water (LWA, 2002 Draft Ammonia SSO Workplan).

9 Paragraph 3. There were 3 acute toxicity tests completed: April 1, July 15, and August 26 of 2003. In 2 of the 3 acute tests using *Hyalella* (July 15 and August 26), the test acceptability criteria for dissolved oxygen was violated. Artificial aeration was used from Day 1 to Day 21 for the rest of the test period. In 1 of the 3 acute tests using *Hyalella* (April 1), the test acceptability criteria for survival in the laboratory dilution water was violated. This means that all 3 acute tests violated the criteria for acceptability. Justification for retaining the tests was the comparability of the LC50 values. This comparison is misleading in that the data are not correctly presented in Table 6 (comments below). In addition, the purpose for conducting the WER analysis is the argument that the toxicity for the two water types is significantly different, yet their close fit is being used to justify retaining tests that protocol calls for elimination from consideration. These procedures are not acceptable.

10 Paragraph 1&2. There were 4 chronic toxicity tests completed: February 12, May 27, July 15, and August 26 of 2003. In 2 of the 4 chronic tests using *Hyalella* (May 27 and August 26), the test acceptability criteria for dissolved oxygen was violated. Artificial aeration was used from Day 1 to Day 21 for the rest of the test period. In 2 of the 4 chronic tests using *Hyalella* (May 27 and July 15), the test acceptability criteria for survival in the laboratory dilution water was violated. This means that 3 of the 4 chronic tests violated the criteria for acceptability. Justification for retaining the tests was that the next highest concentration had higher survival rates that the control. The use of this next highest concentration in place of the control is of concern. In one example, a 45% survival is treated as a 90% survival; a 72.5% survival is treated as an 85% survival. For P1 analysis in the May 27 test, only 30% survival in the control was measured, with 50% of the organisms adversely affected. In the August 26 test at P1, only 67.5% of the test organisms in the control survived. How does this affect the WER? What were the numbers used? These procedures are not acceptable. NOTE that a review of QA/QC data in Appendix C of the Draft Workplan indicates that problems with organism survival also occurred with P1 samples, and that levels of percent survival as low as 30% were measured.

10 Last Paragraph. Use of the Ankley *et.al.*, (1995) data as the only comparative laboratory data is questioned. EPA (1999) provides reasons for concern that include difficulty in assessing due to different compositions of ions in the water, in particular sodium. Water of a similar hardness (used as the basis for comparison by LWA) to the Paiute Ponds site can still have a much different sodium content, since sodium is not a component of hardness. An assessment of the other water quality components used by Ankley and others is warranted.

11 Table 6. This table has several errors that are misleading. First, the data are for water from two locations: the June 25 test was on water from RS4; the other 3 test dates were on water from RS2. Second, the factor of difference relative to the Ankley et al., (1995) data is quite variable, with 63% difference between studies. Third, the factor of difference (FOD) values for the average WER study result for the July 15 and August 26 data are shown to be equal, when in fact, the FOD is 1.3 for July 15 and 0.75 for August 26, where:

FOD = WERaverage/WERindividual

This means that variability and range in the factor of difference is much greater than stated.

11 Table 7. The date of the first chronic test was February 12 according to Table 2 and the report text. The elevated FOD for the August 26 chronic test is of concern. In paragraph 1 of page 11, the explanation is that difference "might be attributable to the differences in the test endpoint and duration and do not directly indicate that the test is problematic." However, on page 9 paragraph 1, it is noted that due to natural variability and less than ideal conditions during some of the tests, variations occurred, including the inversion of data in the August 26 test where "some higher ammonia test concentrations showed less toxicity than lower concentrations". These two explanations are not in agreement, and add to the lack of confidence in the data. The conclusion in paragraph 1 on page 11 that the observed difference does "not directly indicate that the test is problematic" is not justified. It is my opinion that the test is problematic.

12 Table 8. One concern is that the upper range of typical conditions at R2 and R4 for pH are elevated 10-fold relative to test conditions. None of the tests were conducted at the elevated pH values. This is important in that ammonia toxicity increases with an increase in pH, and especially as the pH approaches 9.3, the pKa for the dissociation of ammonia. In addition, the time of day of collection is critical, especially in the ponds which are receiving nutrient rich effluent, are in a warm environment, and have algae blooms and aquatic vegetation resulting in elevated pH values in the afternoon as a result of photosynthesis. Tests that address such conditions should be run.

A second concern is in the confusion related to statistics. The range refers to the low to high values measured, not the mean +/- 2 standard deviations. The use of the mean +/- 2 standard deviations, with a total sample number of 13, is not a statistically acceptable approach. The availability of only 13 data points over a 5 year period is questioned. What were the dates of the 13 collected samples? Were they selected from available data? Why are data from 2000 and 2001 omitted? The number of samples should be much higher for this statistic to have any significance.

13 Paragraph 1. Average pH values for waterbodies in the study are cited as in a range from 7.34 to 8.05, however these numbers do not agree with the average pH values for "typical conditions" in the waterbodies in Table 8 (8.1 at R2 and 8.8 at R4) or for test water data in Appendix B, Table 1 from the Draft Workplan (LWA, 2002) where pH values ranged from 7.87 to 8.27 in PP1 samples and from 8.02 to 8.2 in PP2 samples. Please clarify where data are from and confirm the data are correct.

13 Last Paragraph. Note that the WERs were calculated for tests that were not in compliance for test acceptability criteria, as noted above. A statement to this effect should be included in the document. In addition, WER calculations do not

follow guidelines provided by the EPA on use of significant digits, and there is no discussion of time weighted ammonia concentrations (LWA, 2002: Draft Workplan).

14 Table 9. The numbers provided include errors if calculations were made according to the summary provided on page 13, last paragraph. In reviewing the data, refer to Appendix B, Table 1 from the Draft Workplan. The WER for the April 1 acute test should be 3.64, not 4.47. It is unclear how the chronic test WERs were calculated. Data needed to validate the chronic test WERs are not provided in that the report; pH adjusted laboratory dilution water LC50 data are missing from Appendix B, Table 1 from the Draft Workplan. These data should be provided for analysis purposes.

15 Table 10. The geometric mean data need to be corrected to account for the error in Table 9 for the acute test at PP1 on April 1. The valid geometric mean is 2.5 not 2.6. The median value for PP1 acute data is 3.24 not 3.2. Note that guidance calls for investigation of WER values greater than 5. No such investigation is provided in this report for the chronic WERs assessed.

15 Wet Weather HWER section. The fact that there was only 1 wet weather analysis, and that parameters required for the calculation were not measured makes this assessment invalid in my opinion. For this one critical analysis, no flow measurements were made, no upstream ammonia measurements were collected, and no acute tests were performed! These are serious omissions, and needs to be properly addressed. Other issues exist. It is assumed that the concentration of ammonia in upstream water and the concentration of ammonia upstream at design flow conditions is 0. No data are provided or discussed.

16 Table 11. The column on design upstream NH3 conc. is mislabeled. It should be uCONCdf not CONCdf. Where did the WER of 21.8 come from? Why is the upstream ammonia concentration equal to 0? Data from CDM (2003) show the presence of ammonia in upstream measurements. Assumptions that the design upstream flow and the design upstream concentration are zero, resulting in the elimination of the design effluent flow are simplifications without validity. If the upstream ammonia concentration is set at 1 mg/L, the upstream design ammonia concentration is set at 1 mg/L, and the upstream design flow is set at 3.37 cfs (the same as the upstream flow), the hWER is 21.9 instead of 24.9. This is assuming a minimal ammonia concentration. Reasonable values for the upstream design flow will result in a further reduction of the hWER.

16 Table 12. The fWER value for acute tests at PP1 should be 2.5.

17 The CCC equation in differs from that in CRWQCB-LR. 2004a. Preliminary Draft of the Proposed Amendments to the Water Quality Control Plan for the Lahontan Basin.

18 Tables 13 and 14 should indicate that the units are mg-N/L.

Appendix. LWA 2002 Site Specific Objectives Workplan comments. This workplan was attached to the LWA (2003) WER report. It is important to note that many of the protocols and guidance information described in the workplan was not followed. This is of importance. Due to lack of time and budget, the workplan was not reviewed in detail.

Iin the review of other documents, references to the workplan are cited as LWA (2002). A few other issues follow

The QA/QC data provided in Appendix C do not appear to include ammonia values.

The workplan specifically omits the analysis of nitrate, which ammonia will be oxidized to under aerobic conditions. The test solutions were aerated, contained elevated concentrations of BOD and TOC, and were potentially undergoing oxidation processes that reduce ammonia concentration.

37 Bullet 2 states that ammonia must be measured in the site water and test solutions at the beginning and end of a static test. No data of this type were discussed, although on page 25, the text indicates data for ammonia, temperature, pH, and dissolved oxygen were monitored.

CRWQCB-LR. 2004a. Preliminary Draft of the Technical Staff Report. Revised Water Quality Standards for Surface Waters of the Antelope Hydrologic Unit. May 2004.

In this section, the appropriateness of proposed site-specific beneficial use designations and of Regional Board staff conclusions regarding the attainability of these uses are summarized.

In the text for the proposed amendments to Chapter 2 of the Lahontan Basin Plan, the following changes are recommended:

Text introducing the changes to Table 2-1.

Line 2. Change Antelope Hydrologic Unit (HA) to Antelope Hydrologic Unit HU

Line 6. Omit or add quotation marks " " around the designations so the format is consistent.

Chapter 3 of the Basin Plan

Page 3-2 (10/94): first column. Last line. Move to top of the second column.

Page 3-2 (10/84): First column. Establishment of Numerical Objectives. States annual means, 90th percentile and flow-weighted values are used to determine objectives. None of these were used to set the ammonia objectives. Needs clarification.

Page 3-2 (10/84): Second column. Non-degradation objective. Whenever the existing quality of water is better that...change to better **than** ...

Page 3-2 (10/84): Second column. Non-degradation objective. Add 40 CFR information.

Page 3-3 (10/94): First column. First line. Correct sentence to read "...and numerical water quality objectives **that** apply to..."

Page 3-3 (10/94): First column. The use of a footnote for ammonia is not needed in that a discussion of site-specific objectives is in the following section (no. 2 same page, same column). Omit the footnote number and the footnote text.

Page 3-5 (10/94): First column. First line. Unclear..does the statement refer to the most conservative **total or unionized** ammonia concentration?

Page 3-5 (10/94): First column. The WER for acute toxicity should be changed to 2.5.

Page 3-5 (10/94): First column. The CCC equation differs from that in Larry Walker Associates. 2003. Ammonia Water Effects Ratios and Site-Specific Objectives for Paiute Ponds-Final Results. The use of a maximum temperature is shown by LWA (2003).

Page 3-14 (7/00): Table 3-19a. The column for Acute (CMC) should indicate that this is for **No Salmonids**, as is done in Table 13 of LWA (2003). In addition, the row above the temperatures should state Chronic (CCC **in mg/L) Early Life Stages Absent** at Various Temperatures **(°C).** Note that Table 3-19a states mg/ L N; earlier notation was as mg-N/L. In addition, LWA (2003) does not designate if the concentration is as N. Bold text is text to add.

CRWQCB-LR. 2004b. Preliminary Draft of the Technical Staff Report. Revised Water Quality Standards for Surface Waters of the Antelope Hydrologic Unit. May 2004.

It seems that recommendations are made to omit and add beneficial uses, despite a lack of supporting data. Concerns with this approach are that as a result of this approach, WQ objectives are being proposed that may or may not be protective of the beneficial uses, with the justification often related to the ability to meet current objectives. It is this reviewer's experience that the collection of data to determine spatial (vertical and horizontal) and temporal (seasonal and diel or over a 24-hour period) variability is critical in assessing impacts of discharges on biota. To not do so, is not a conservative approach that will necessarily be protective of the environment. Sampling location (within water column and proximity to source) and sampling time (time of day and year) can result in very different results (dissolved oxygen of 10 mg/L in afternoon vs. 1 mg/L in early morning; pH of 9 in afternoon vs. 7 in morning; high ammonia vs. low ammonia, etc.

Page	Comment
12	Paragraph 2. Reference is made to the WDR water quality data, which are summarized in Table 2. While annual acute and chronic toxicity tests with fathead minnow are conducted, no results are provided. What do results indicate?
12	Table 2. Kjeldahl nitrogen levels in the discharge from the treatment plant are quite high, ranging from 9.8 to 41.2 mg/L. Given that Kjehdahl nitrogen is ammonia nitrogen plus organic nitrogen, and that ammonia nitrogen levels range from 0.5 to 21.8 mg/L as N, there is quite a load of organic nitrogen into the receiving waters. As the organic nitrogen is reduced, additional ammonia will be released. Under aerobic conditions, the ammonia nitrogen will ultimately be oxidized to nitrate, however this can have an entirely new set of problems related to eutrophication in the surface waters, and exceedance the MCL for nitrate in potable water. Issues related to Kjeldahl nitrogen should be addressed when interpreting ammonia sources.
20	Paragraph 5. Staff indicate none of the surface waters are used directly as a potable water supply, however they also note that historically the surface waters were greater due to ground water input. This means that the surface waters could be hydraulically connected to ground water supplies, that are a potable supply. Adverse impacts of the Paiute Ponds and Wetlands on ground water quality needs to be addressed, particularly given that the ground water will retain a MUN and AGR designation.
24	Table 5. It is unclear why the data provided are averages from so many different time periods. This is a concern particularly due to changes in plant operation and discharges.
25	Table 6. The abbreviations for NA and ND needs clarification. The table is confusing with respect to the nitrogen rows. For nitrate + nitrite, the MCL is shown as 10,000. This means this the value is **as nitrogen**, so the constituent should state **nitrate nitrogen + nitrite nitrogen**. Conversely, the row below shows nitrate nitrogen, with a MCL of 45,000 micrograms per liter. This is incorrect. The MCL for nitrate is 45,000 ug/L; the MCL for nitrate nitrogen is 10,000 ug/L.

29 Paragraph 4. The consequences section is unclear. The consequences with retaining GWR as a beneficial use are related to the reduced quality in the Paiute Ponds and Wetlands, and Rosamond Lake as a result of the removal of MUN and AGR beneficial uses. The removal of these beneficial uses will result in the discharge of water that no longer meets the standards set for these beneficial uses. The impact on ground water quality is in question. This may be a problem

30 Paragraph 3. Reference is made to a two-phase ground water investigation with new monitoring well installations and monitoring to be completed by the LASCD. It is unclear if the principal aquifer (also referred to as the shallow ground water and as the perched ground water zone) is a drinking water supply. The text indicates that if the shallow ground water beneath the Paiute Ponds, and the deeper aquifer used for domestic supplies are not hydrologically connected, then the beneficial use of GWR will be removed. Why? This effectively enables further contamination of the upper aquifer. The aquifer can still be used for many of the uses listed in the definition on page 29.

31 Paragraph 2. Data for salinity and total dissolved solids (TDS) for all sites shown in Table 13 are questioned. How can a salinity of 10 ppt have a TDS concentration of 59 ppm? (10,000 mg/L >>> 59 mg/L). Also, if the TDS is 59 ppm, how can the alkalinity be 1580 mg/L. Something is really wrong, which calls to question the support for designating Rosamond Dry Lake as saline.

41 Paragraph 7. The fresh and saline designations for Rosamond lake are confusing. Table 2-1 does not include FRSH yet the text indicates that the lake is sometimes fresh water. The point that FRSH applies to surface waters that are fresh water and that flow to saline lakes should be made (from page 31). Also, problems with data in Table 13 contribute to the confusion around the change in designation to SAL for Rosamond Dry Lake.

49 Paragraph 3. In the conclusion related to use of WARM as a site specific beneficial use, the data are not convincing. The temperature ranges stated (on the cold side), the optimal ranges for organisms present, the climate data on snow and temperature conditions provided by CDM (2004), the COLD designation for other water bodies, and the lack of temperature and dissolved oxygen data to support the change preclude making the change. Data should be collected prior to accepting a designation that will allow for less stringent discharge criteria. These less stringent criteria have the potential to reduce dissolved oxygen (by increasing organic loading of organic nitrogen, by increased nutrients). More data are needed, that are collected to determine spatial and temporal changes in temperature and dissolved oxygen.

53 Designation of Rosamond Dry Lake as a saline lake is based on very limited data; salinities are relatively low compared to other saline lakes. In addition, during periods of storm water runoff, salinity levels are closer to fresh water values, and are elevated primarily following overflows of the Paiute Ponds to the lake. More data are needed to support this change.

70 Information specific to the use of *Hyalella*, testing of only one species, and application of EC20 and LC 50 data from one study performed using sediment

pore water (which has a much different chemistry from water column water). Comments are not restated again. It is my opinion that the data are not sufficient to warrant the use of this organism alone. EPA (1999) clearly details that in numerous determinations of ammonia based WERs, values were always close to 1.0. EPA states that in cases where the WER exceeds 5.0, the data should be investigated. It is not clear that this was done. The extreme sensitivity of *Hyalella* to ammonia, the point of which was used to justify not doing bioassays with fish species (despite EPA protocol requiring two test organisms), was determined for conditions of low pH (6.5) and low ion concentration (EPA, 1999 page 40). The Paiute Ponds are characterized by a high pH and high ion concentration. Use of the WERs results in ammonia criteria for chronic toxicity well above 10 mgN/L. EPA (1999) review suggests that the GMCV be restricted to less than 10 mg/L. LWA never addressed the high criteria resulting from the use of WERs, other than to state that the use of *Hyalella* was protective as it is a more sensitive species. Again, *Hyalella* data are not species specific; the data are genus specific. In addition, the data were derived from tests with an endpoint of reproduction, not survival.

71 Number 7. The effects of higher hardness and higher ion concentration resulting in a reduction of ammonia toxicity has not verified. Numerous studies indicate that these relationships do exist for metals, but are inconsistent in the case of ammonia. The final WER for acute toxicity is 2.5 not 2.6.

72 Paragraph 2. The use of the equation for early life stages absent, assuming that the beneficial use is changed from COLD to WARM is premature. Temperatures in the Paiute Ponds can drop well below 15 degrees C, and remain there for months.

72 Paragraph 5. The comparison of the SSOs to SMCVs and SMAVs for other sensitive species in the ponds is recommended. NOTE that that GMCV was the ranking use for setting *Hyalella* as the most sensitive genera. In addition, there were considerable conditions set on its use.

73 Paragraph 2. Staff assume that the quality of effluent discharged to Amargosa Creek will be improved in the future to allow the SSOs to be met above RS2. This assumption is based in part on the upgrade of facilities at the treatment plant. A missing point is that increased amounts of discharge (Q) will likely increase in response to increased population projections (pg 79). The plant is currently treating an average flow of 12.8 million gallons per day (MGD). The plant has a current capacity to treat 16.0 MGD. According to the Lancaster Water Reclamation Plant 2020 Facilities Plan, the plant capacity will increase to 26 MGD by 2014. Current and future loads of ammonia are provided in Table 1 for the current and future scenarios. Values are much higher than that expected following facility upgrade that will limit ammonia-nitrogen to 1.5 mg-N/L (page 77). This upgrade results in loadings of 200 and 325 pounds of ammonia-nitrogen per year, for current and future plant capacity scenarios, respectively. These numbers indicate the need for facility upgrade if ammonia toxicity and eutrophication issues are to be addressed.

Table 1. Load of ammonia nitrogen for current and future Lancaster Plant capacity flows when using site specific objectives.

Discharge from Lancaster WRP	Existing Regionwide Objectives (no WER)	Ammonia Load to the Ponds in Pounds per Year Based on Basin Plan Objectives	SSO Based on Basin Plan Objectives (mg/L)	Ammonia Load to the Ponds in Pounds per Year Based on Basin Plan Objectives	SSO Based on 1999 Ammonia Criteria Objectives (mg/L)	Ammonia Load to the Ponds in Pounds per Year Based on 1999 Objectives
16 MGD[1]	5.7 Acute	761	14.47 Acute	1931	18.07 Acute	2411
	1.29 Chronic	172	25.1 Chronic	3349	42.6 Chronic	5685
26 MGD[2]	5.7 Acute	1236	14.47 Acute	3138	18.07 Acute	3918
	1.29 Chronic	280	25.1 Chronic	5443	42.6 Chronic	9238

[1] Current plant capacity
[2] Future Plant capacity

72 Paragraph 1. The expectation that toxicity will be lower downstream should be verified with testing. Ammonia concentrations in the sediments and pore waters, and seasonally following the flux of ammonia from the sediments, may result in elevated toxicity downstream as well. Note also that as discharge from the treatment plant increases, hydraulics of the ponds will change, with increased transport further into the pond system necessary for increased flow inputs. Staff assumption that SSOs will be met above Station RS2 are not likely unless facility upgrade to reduce ammonia concentrations occur.

74 Table 15. SSOs determined with the WER method are extremely high. These values exceed those for numerous other species in the EPA Aquatox website. The bioassay, data collection, and data analysis for the WERs should be repeated using additional test organisms, and following the protocol of the EPA.

Ammonium

Show Ammonium studies for all species

Common name	Effect	Measurement	Life Stage	Test time	Tox End Pt.	Toxic dose mean	Toxic dose min	Toxic dose max	Conc units	Conc Type	Chem. Descry.	Exper. type	Acute tox. rating	Outlier	Year	Journal
Scud Hyalella azteca	Mortality	Mortality	MATURE, ADULT, 0.677 MG DRY WT	24 h	LC50	421,000	317,000	610,000	ug/L	T	PO, PHOS-CHECK D75-F, AI/	Static	Not Acutely Toxic		1997	Environ.Toxicol.Chem. 16(7):1370-1376
Scud Hyalella azteca	Mortality	Mortality	MATURE, ADULT, 0.677 MG DRY WT	96 h	LC50	394,000	310,000	519,000	ug/L	T	PO, PHOS-CHECK D75-F, AI/	Static	Not Acutely Toxic		1997	Environ.Toxicol.Chem. 16(7):1370-1376
Scud Hyalella azteca	Mortality	Mortality	MATURE, ADULT, 0.677 MG DRY WT	24 h	LC50	974,000	752,000	1,244,000	ug/L	T	PO, PHOS-CHECK D75-F, AI/	Static	Not Acutely Toxic		1997	Environ.Toxicol.Chem. 16(7):1370-1376
Scud Hyalella azteca	Mortality	Mortality	MATURE, ADULT, 0.677 MG DRY WT	96 h	LC50	53,000	49,000	65,000	ug/L	T	PO, PHOS-CHECK D75-F, AI/	Static	Slightly Toxic		1997	Environ.Toxicol.Chem. 16(7):1370-1376
Scud Hyalella azteca	Mortality	Mortality	MATURE, ADULT, 0.677 MG DRY WT	24 h	LC50	417,000	329,000	560,000	ug/L	T	LD, FIRE-TROL LCG-R, AI./	Static	Not Acutely Toxic		1997	Environ.Toxicol.Chem. 16(7):1370-1376

Data from the US EPA AQUIRE website as retrieved on 06/30/04 from
http://www.pesticideinfo.org/List_AquireAll.jsp?Species=52&offset=100