M E M O R A N D U M

TO: Lauri Kemper
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Lahontan Water Board Advisory Team

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FROM: Chuck Curtis
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RESPONSE TO MAY 24, 2012 REQUEST FOR CLARIFICATION AND ADDITIONAL INFORMATION REGARDING PROPOSED CLEANUP AND ABATEMENT ORDER FOR LOS ANGELES COUNTY SANITATION DISTRICT NO. 20 AND CITY OF LOS ANGELES, PALMDALE WATER RECLAMATION PLANT, LOS ANGELES COUNTY

The Lahontan Water Board's Prosecution Team reviewed the May 24, 2012 request from the Advisory Team regarding the March 22, 2012 Proposed Cleanup and Abatement Order (CAO) and has the following responses to the comments and questions.

Question: *Did LACSD [Los Angeles County Sanitation District] in Supplement No. 4 or any supplemental material evaluate the impacts on groundwater supply and overdraft from implementing the cleanup alternatives? How does the proposed operation of the existing extraction wells affect groundwater overdraft conditions in the area?*

Response: Supplement No. 4 did evaluate water extraction, drawdown and net aquifer storage change from the various alternatives. Supplement No. 4 reports the following groundwater pumping, maximum groundwater drawdown, and decrease in aquifer storage for containment and remediation through 2060 from the evaluated alternatives:

Alternative	Groundwater Extracted (AF)[1]	Maximum Groundwater Drawdown (ft)	Decrease in Aquifer Storage (AF)
Effluent Management Only	1,487	40	60,200
As-Built	28,540	45	65,300
As-Built w/ Row Crops	8,059	60	109,500
Aggressive	85,220	70	66,200

The Effluent Management Only alternative has the least amount of groundwater extracted for treatment, yet it still reflects significant drawdown of groundwater levels and a large decrease in aquifer storage for the modeled portion of the Lancaster subunit of the Antelope Valley Groundwater Basin. This represents the base case, with the drawdown and decreased aquifer storage due to regional groundwater pumping, as there is no groundwater extraction after 2009 under the Effluent Management Only alternative.

The As-Built alternative reflects the current operation of targeted extraction wells, which reduces groundwater nitrate concentrations but has minimal effect on the maximum groundwater drawdown or the overall decrease in aquifer storage.

The As-Built with Row Crops alternative is the same as the As-Built alternative until 2022, when the District's lease with the City of Los Angeles expires. After 2022, it is assumed that effluent management at the site is terminated, and that new irrigation wells will need to be installed to maintain the agricultural operations. That is why the groundwater extracted for treatment is less than that under the As-Built alternative, but the groundwater drawdown is much more severe and the greatest decrease in aquifer storage of all four alternatives occurs.

The Aggressive alternative includes 22 new extraction wells, in addition to the existing six, and a much greater volume of extracted groundwater relative to the other alternatives. Since most of the extracted groundwater would be re-injected into the aquifer, the decrease in aquifer storage is almost equivalent to the As-Built alternative. However, since the extraction and re-injection of groundwater is not uniform over the aquifer, this alternative represents the most extreme maximum groundwater drawdown.

The consolidated Antelope Valley Groundwater litigation (Los Angeles Superior Court lead case BC 325 201, May 4, 2011) found that total pumping in the Antelope Valley ranges from 130,000 to 150,000 AF per year, with safe aquifer yield being approximately 110,000 AF per year, resulting in 20,000 to 40,000 AF of overdraft annually. The alternatives evaluated result in net pumping of approximately 27 to 520 AF per year, or about 0.02 to 0.4 percent of total annual pumping in the Antelope Valley or about 0.07 to 2.6 percent of the annual overdraft in the Antelope Valley.

Q. *What is the predicted impact to groundwater overdraft conditions to achieve 7 mg/L nitrate concentrations as compared to the impact from achieving background nitrate conditions?*

R. The above discussion identifies the predicted groundwater conditions associated with achieving the 7 mg/L nitrate level. The modeled alternatives did not extend to the period where

[1] Represents volume of groundwater extracted from the basin via extraction wells. AF = acre-feet.

affected groundwater might attain background levels of nitrate, so it is not possible to quantify the effect on groundwater from that scenario. Qualitatively, groundwater extraction that continued to the time when the affected groundwater might reach background levels would result in little additional drawdown, as the drawdowns from the various alternatives reach near asymptotic levels after approximately 20 to 30 years. For those alternatives that include groundwater extraction, such continuing extraction to potentially achieve background nitrate conditions would have a continuing proportion of overdraft, as identified above, until such pumping stopped.

Q. *Why is there no discussion on the impacts of the past discharges on Total Dissolved Solids (TDS), both existing and anticipated during the remediation time frame? What are the concentrations of TDS found in the area and how will proposed cleanup actions affect TDS concentrations? What are the anticipated increases? Will the cleanup actions ensure groundwater affected by past waste discharges achieve the secondary Maximum Contaminant Level for TDS (500 mg/L)?*

R. CAO No. R6V-2003-056 and Resolution No. R6V-2005-0010 do not require evaluation of TDS in groundwater and its abatement or cleanup, as only nitrate is identified as the constituent of concern in those orders. The changes in TDS levels as a result of implementation of the identified alternatives were not evaluated in Containment and Remediation Plan reports. The impacts of the proposed cleanup actions on TDS in groundwater were evaluated in LACSD's October 18, 2005 Environmental Impact Report (EIR) for its 2025 Plan and in its July 26, 2007 Addendum to the EIR. The cleanup and abatement actions required in the Proposed CAO are the currently implemented and ongoing cleanup and abatement actions by LACSD. Mitigation measures to minimize the impact of TDS on groundwater are incorporated into the project through Waste Discharge Requirements/Water Recycling Requirements (WDR/WRR) No. R6V-2011-0012. Those WDR/WRRs also require LACSD to develop and/or participate in development of a salt and nutrient management plan for the Antelope Valley, which is intended to address salt and nutrient inputs to the groundwater from all sources in the Antelope Valley.

Certainly, groundwater has been affected by TDS from discharges by the Dischargers, and the Dischargers could be required to clean up and abate those discharges pursuant to Water Code section 13304. If the Water Board desires to explicitly require cleanup of TDS in groundwater consistent with State Water Resources Control Board Policy No. 92-49, it may give direction to Water Board staff to prepare such an order. At this time, the Prosecution Team recommends that the effect of nitrate cleanup and abatement actions on TDS concentrations be evaluated concurrent with the evaluation of those actions on nitrate concentrations. The revised Proposed CAO will require such evaluation.

The abatement actions currently underway and as part of the evaluated cleanup and abatement alternatives will result in less TDS discharge to the groundwater in the area of the current discharge due to application at agronomic rates and potential cessation of recycled water discharge in that area (though a portion of the salts will likely reach groundwater in some other location due to application of recycled water in other areas). The rate of groundwater TDS concentration change in the affected area as a result of these abatement actions has not been estimated. In 2010 and 2011, an average of approximately 28,800 tons of TDS per year was extracted by the six extraction wells.

In 2011, TDS concentrations measured through the groundwater monitoring program ranged from 130 to 683 mg/L, with three of 29 wells having at least one TDS concentration greater than 500 mg/L. A formal assessment of background TDS concentrations in this area has not been performed, but (based on a limited data set) areas outside of the area affected by the effluent

discharge generally have TDS concentrations ranging from approximately 130 to 250 mg/L, though areas affected by agricultural operations may have significantly greater TDS concentrations in groundwater.

Due to adjacent agricultural operations that are not associated with the effluent discharge, it is not clear to what extent the groundwater TDS is affected by the effluent discharge as compared to adjacent agricultural operations (these adjacent operations may also affect the nitrate concentrations in groundwater). Based on the relative size of the discharge operations and the historical practice of effluent discharge without reuse or at rates exceeding agronomic rates, Water Board staff expects that the effluent discharge has been a significant contributor of TDS to the groundwater in the affected area.

Although the groundwater below the effluent discharge area is degraded by TDS, the concentration of TDS in groundwater in this area does not exceed the 1000 mg/L "Upper Maximum Contaminant Level Range," or "Consumer Acceptance Contaminant Level Range" (California Code of Regulations, title 22, section 64449). The cited 500 mg/L TDS level in the Advisory Team letter is a "Recommended" level. The TDS concentrations in the groundwater do not limit the groundwater's use for all identified beneficial uses of the groundwater.

Q. *The advisory team requests that the Findings include more information about the extraction and monitoring wells. Finding No. 10.d. describes the Interim Measure implemented in 2006. Where are the six extraction wells located? Please provide a figure showing the locations. What are the monthly extraction rates for each well and what is the total volume of groundwater extracted annually?*

R. The revised Proposed CAO will provide more information on the extraction and monitoring wells. A figure showing the extraction and monitoring wells is attached and will be attached to the revised Proposed CAO. The six extraction wells each extract groundwater at rates ranging from approximately 15 to 130 gallons per minute, with rates dependent on the lithologic characteristics found at each well. Combined, the wells extracted an average of 36 AF per month, or 433 AF per year, during 2010 and 2011. WDR/WRR No. R6V-2011-0012 for the LACSD Palmdale Water Reclamation Plant, and its Monitoring and Reporting Program (MRP) No. R6V-2011-0012, require measurement and reporting on the monthly extraction rates for each well and the monthly, annual, and cumulative volume extracted.

Q. *Where would the row crops be located under the third alternative, "Interim Measures with Row Crops"?*

R. The row crops would be located at the current location of the recycled water discharge (the Agricultural Site). Those crops would be irrigated with water from five new deep wells located on City of Los Angeles land (extracting groundwater from below the area of nitrate-affected groundwater, which is limited to approximately the top 50 feet of the aquifer).

Q. *Why were monitoring wells MW-22 and 52 not sampled in the July to December 2011 period, as shown on Attachment B? Do the data in Table 2 for MW-52 in 2011 represent samples taken in early 2011? Can the data from Table 2 for MW-52 be shown in a revised Attachment B? The figure in Attachment B could reflect all data collected in 2011, for example.*

R. Well MW-22 did not have sufficient water to sample during the period. Well MW-52 could not be sampled during the period due to a collapsed pump bladder. That well has been rehabilitated, but did not have enough water to sample during the second quarter sampling round; another attempt to sample the well will be made in June. The data in Table 2 for MW-52

are the average of concentrations from the first and second quarters of 2011. Attachment B showed results from the third and fourth quarters of 2011. It is not appropriate to revise the figure to show data from outside that period, including for MW-52 or other wells. The samples for MW-52 collected before the third quarter 2011 are consistent with the interpreted nitrate distribution contours depicted on Attachment B. Concentrations of nitrate in groundwater at the Facility do not change significantly from one quarter to another or even during a given year. There is little benefit to create a figure to show all the 2011 data on one figure, when an existing figure adequately presents representative data.

Q. *In regards to Finding No. 13, how will the effects of the ongoing extraction be evaluated and modified over time? What are the criteria for the evaluation?*

R. WDR/WRR No. R6V-2011-0012 requires compliance with its associated MRP No. R6V-2011-0012. That MRP requires in section I.D. that the extraction wells be monitored for nitrogen species and TDS and that running graphs and trend analyses be performed and presented for all wells, including extraction wells. MRP section I.E. requires assessment and reporting of the volume of water extracted from each well and the monthly, annual, and cumulative mass of nitrate and TDS removed from each well. The MRP requires annual reports to include recommendations to optimize the extraction system. The Proposed CAO does not duplicate orders already in the WDR/WRR and its MRP.

Q. *Will additional extraction wells be proposed for areas of groundwater contamination above 7 mg/L, such as MW-28?*

R. The Proposed CAO (and its revision) requires the Dischargers to submit a plume containment evaluation plan. Annually, evaluation of plume containment is required. Where containment is not being achieved, a work plan for appropriate follow-up actions is required to be submitted, including corrective actions that might include additional extraction wells.

Q. *What portions of the Proposed Order, if any, contain a requirement to perform a specific cleanup action or plume abatement/containment action in compliance with a specific schedule? Does the Order require continued operation of the six current extraction wells? At what volumes, rates, and time periods?*

R. The abatement actions of the recommended cleanup and abatement alternative are currently being implemented as required by WDR/WRR No. R6V-2011-0012. MRP No. R6V-2011-0012 requires annual reports to include recommendations to optimize the extraction system. The Proposed CAO does not duplicate orders already in the WDR/WRR and its MRP. Although the extraction wells have been operated and are proposed to continue to operate, the WDR/WRR does not require that operation. Order No. A.4.c of the Proposed CAO included a requirement for operation of extraction wells when monitoring indicated the nitrate concentration in an extraction well exceeded the interim cleanup goal of 7 mg/L. The Revised Proposed CAO will more clearly require continued operation of extraction wells when nitrate concentrations exceed the interim cleanup goal, which is the cleanup component of the proposed cleanup and abatement. Staff will review the extraction well optimization report in the MRP's annual reports to determine whether changes in the extraction well network or pumping program should be ordered.

Q. *Under Plume Delineation, Order A.2., will the March 31, 2013 (first annual report) contain the results of the plume delineation plan required by Order A.2.a.? If not, when is it anticipated that plume delineation of the northern and western portions of the plume will be complete?*

R. Proposed CAO Order A.2.a. requires a plume delineation plan for the northern and western portions of the plume. That plan must also contain a schedule for plan implementation and associated reporting. When the results will be reported will depend on the schedule that is accepted by the Executive Officer. Those results could be reported in the annual report required by Proposed CAO Order A.2.b., or could be at some other date.

Q. *How is plume containment defined? Is it based on the current shape of the nitrate contamination at 5 and 10 mg/L? If the hearing is postponed until September, will the Dischargers complete the evaluation plan by August 1, 2012 and can it then be incorporated into the proposed Order?*

R. Plume containment means no statistically significant increase in concentrations of nitrate in perimeter wells that are identified as being unaffected by the discharge at the time of their identification as containment evaluation wells. The evaluation of concentrations in the wells must be consistent with the USEPA *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, March 2009.* Additional clarification on plume containment will be added to the revised Proposed CAO. Water Board staff are not aware that the Dischargers are preparing a plume containment plan, as they have not been ordered to do so. The Proposed (and revised Proposed) CAO contain that directive.

Q. *In Order A.4., what are the scope and contents of the plan to evaluate increasing trends in the vicinity of MW-23? What about increasing concentrations in MW-28? What actions and outcomes are required to address increasing nitrate concentrations? Is increased monitoring acceptable? Is increased extraction required? Are additional extraction wells anticipated or required?*

R. The scope and contents of the plan to evaluate the increasing trend in nitrate at MW-23 are not known at this time, as the plan has not been developed; the Order requires development and submittal of the plan. MW-23 is of interest because it is located in the interior of the plume and most other wells in the plume interior have stable or decreasing nitrate concentrations. Extraction well R4 is located near MW-23 and could be pulling groundwater with higher concentrations to the area near MW-23. In addition, MW-23 is downgradient from LACSD's 40th Street East oxidation ponds, which may also be a source of nitrate to groundwater. Extraction well R10, which is located adjacent to the oxidation ponds has the highest nitrate concentrations of any extraction well at the site. The revised Proposed CAO will provide more background and direction regarding evaluating nitrate in and near MW-23.

The increasing concentrations in MW-28 are addressed through the plume delineation plan and the plume containment plan, as that well is at the northern extent of the current monitoring well network. Any actions that might be required to address increasing concentrations in either of those wells (or any other wells) are dependent on the outcome of the evaluations required by Proposed CAO order Nos. 3 and 4. Those actions could include more monitoring, additional extraction from new extraction wells, or some other action that is dependent on the specific conditions encountered and the assessment of appropriate responses.

Q. *In Order A.5., what does the term "reuse options" mean? Is this only applicable to the extracted groundwater for purposes of reducing nitrate concentrations in the groundwater? Again, what is the volume proposed?*

R. Water Board Resolution No. R6V-2005-0010 required the Dischargers to evaluate options to use the extracted groundwater that would not exacerbate the groundwater overdraft situation. Although LACSD has done some evaluation in that regard, Water Board staff believe that use of the extracted groundwater to replace nearby agricultural irrigation pumping or similar uses could be feasible and should be given more scrutiny. The current extraction wells pump at an average of approximately 400 AF per year.

The Prosecution Team appreciates the input from the Advisory Team on the Proposed CAO. We will consider your comments and questions in revising the Proposed CAO, which we believe will be a better document as a result of your input.

Attachment: Well Locations Figure

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