

TODD ENGINEERS

GROUNDWATER • WATER RESOURCES • HYDROGEOLOGY • ENVIRONMENTAL ENGINEERING

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MEMORANDUM - TRANSMITTED VIA EMAIL ONLY

To: Ms. Uzi Daniel
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West Basin Municipal Water District
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From: Edwin Lin, P.G., C.Hg., Senior Hydrogeologist
William E. Motzer, Ph.D., P.G., Senior Geochemist
Iris Priestaf, Ph.D., President

Re: **DRAFT Proposal – West Basin Intrinsic Tracer Field Evaluation**

Todd Engineers is pleased to submit this scope of work and cost estimate to conduct an intrinsic tracer field evaluation for the West Basin Municipal Water District (District). The objective of the field evaluation is to demonstrate compliance with California Department of Public Health (CDPH) requirements associated with 100 percent recycled water injection for the West Coast Basin Barrier Project (WCBBP). The basis for the field evaluation is summarized below and addresses specific recommendations presented in the draft technical memorandum, titled *Evaluation of Intrinsic Tracer and Barrier Injection Data related to Monitoring Well 690A, 703G, and WB-1* (Todd Engineers, February 9, 2010).

Background

In October 2009, Todd Engineers completed the first phase of an intrinsic tracer study of the WCBBP for the District. Results of the study are documented in the draft report, titled *Intrinsic Tracer Study of the WCBBP*. The study demonstrated that intrinsic tracers could be used effectively to verify the travel time of injected water to and recycled water content (RWC) in selected groundwater monitoring wells located near the WCBBP. Based on the study findings, the CDPH confirmed that the estimated travel time of injected water to two compliance monitoring wells (MW 690A and 703G) satisfied the minimum travel time criterion for 100 percent recycled water injection. However, the estimated historic maximum RWC in the same wells did not meet the minimum RWC criterion, which requires the District to demonstrate that groundwater in a compliance monitoring well is comprised

of greater than 60 percent recycled water over a one year period. Based on discussions with the CDPH, the District decided that it would continue pursuing the use of intrinsic tracers to satisfy the RWC requirements. This technical strategy is being developed in tandem with a regulatory/policy strategy by the District.

As an initial step in developing the technical strategy, the District requested that Todd Engineers perform a focused evaluation of three compliance monitoring wells (690A, 703G, and WB-1) incorporating data for injection wells located nearest to each monitoring well. One of main objectives of the evaluation was to evaluate the feasibility of varying future barrier operations to satisfy the RWC requirements. The focused evaluation was completed on February 9, 2010, and results indicate that the injection of 100 percent recycled water to a portion of the WCBBP over a period of at least one year, combined with monitoring of recycled water and groundwater quality in one or more of the three targeted compliance monitoring wells, was feasible and could be used to satisfy minimum RWC requirements. Key elements of a field evaluation were presented based on the current understanding of local hydrogeologic conditions. In response, the District has requested that Todd Engineers prepare a scope of work and cost estimate to design, implement, and document the field evaluation.

Scope of Work

The scope of work for the intrinsic tracer field evaluation can be divided into five tasks (and an additional optional task) as discussed below:

Task 1 – Develop Field Evaluation Protocol

Upon receipt of the notice to proceed, Todd Engineers will work directly with the District and the Los Angeles County Department of Public Works (LACDPW) to develop specific field evaluation protocol for 100 percent recycled water injection and for a water quality sampling and analysis plan.

Critical components of the field evaluation that will be addressed in the protocol include:

1. Establishment of baseline and compliance monitoring periods
2. Identification of monitoring wells for baseline and compliance water quality monitoring
3. Identification of target injection wells for injection rate monitoring
4. Scheduling of routine water quality sampling for injected water and groundwater
5. Scheduling of water quality sampling prior to and following changes in the rate and/or quality of injected water

6. Selection of key constituents for injected water and groundwater quality analysis
7. Establishment of the maximum sustainable continuous recycled water injection rates
8. Evaluation of anticipated 5-year running average RWC in WCBBP water during the field evaluation.

Based on preliminary discussions with the District and LACDPW, we understand that it is possible to inject 100 percent recycled water to one area (leg) of the barrier at a time, with delivery to the south leg being less complicated from an operational standpoint than to the north leg. As such, it is anticipated that for the field evaluation, the south leg will receive 100 percent recycled water over a compliance period of one year. During the one year compliance period, 100 percent potable water will be delivered to the barrier's north leg to ensure that the 5-year, volume-weighted average RWC of WCBBP water does not exceed 75 percent, the current maximum allowable RWC in WCCBP water. Prior to the delivery of 100 percent recycled water, 100 percent potable water may be delivered to the south leg for a period of up to 6 weeks to provide a high contrast in groundwater quality between baseline and compliance monitoring periods.

It is recognized that MW 703G and WB-1 are located along the barrier's south leg, while MW 690A is located along the barrier's north leg. As a consequence, minimum RWC requirements can only be satisfied with data collected for MW 703G and WB-1 during the field evaluation. Nevertheless, water quality monitoring of MW 690A may also be recommended to refine the previously estimated travel time of injected water to this well. Todd Engineers will also work with West Basin and LACDPW to determine if other monitoring wells located near to and along the barrier's south leg can be used for the field evaluation.

Task 2 – Analyze Data

During the field evaluation, Todd Engineers will compile all injection rate, recycled water quality, and groundwater water quality data into an electronic database. Groundwater quality data collected from MW 703G, WB-1, and any other monitoring well located along the south leg identified in Task 1 prior to 100 percent imported water injection and following 100 percent recycled water injection will be evaluated to establish groundwater quality conditions for the baseline period. Instantaneous and total injection volumes will be charted over time. Recycled water and groundwater quality data will be evaluated using geochemical plotting techniques, including Time-Concentration, Stiff, and Brine Differentiation Plots. Two and three end-member mixing equations will be used to calculate the instantaneous and cumulative running-average RWC in each targeted groundwater monitoring well during the compliance period. Water quality data will also be used to

confirm the groundwater travel time of injected recycled water to compliance wells. Collectively, these analyses will be used to determine whether the CDPH requirements for 100 percent recycled water injection have been fully satisfied and also provide information for the regulatory/policy strategy development.

Todd Engineers will develop template files for water quality and injection rate data and upload them on to our ftp site to facilitate the input and transfer of these data. It is assumed that (1) LACDPW will monitor the injection rates in key barrier injection wells on a monthly basis, which it has done historically, (2) the District will coordinate and perform all water quality sampling and laboratory analyses on a monthly basis, and (3) all injection rate and water quality data and copies of original laboratory data sheets will be provided to Todd Engineers in electronic format.

Task 3 – Prepare Draft and Final Reports

All field activities, data, conclusions, and recommendations will be summarized and presented in a draft project report. The report will include a site map of the targeted compliance monitoring wells and relevant injection wells, tables and charts showing the injection volumes, quality of injected water and groundwater in compliance wells, and calculations of RWC and travel time over the baseline and compliance periods. The draft report will be provided to the District for review. Comments will be incorporated in the final project report.

Task 4 – Presentation to CDPH

Upon completion of the final report, Todd Engineers will prepare a PowerPoint presentation that will be presented to involved stakeholders, including the CDPH. The presentation will describe key field activities, results, and findings from the field evaluation. It is assumed that the presentation will be given at the District's main office in Carson, CA.

Task 5 – Project Management

Coordination and scheduling of operations and monitoring activities are critical to the successful implementation of the field evaluation. This task will cover project administration and communication among Todd Engineers, the District, LACDPW, and CDPH. In addition, Todd Engineers will inform Ms. Margie Nellor (Nellor Environmental Associates) of the project status throughout the field evaluation to ensure that the development of the regulatory/policy strategy is based on the most current knowledge of the hydrogeologic system.

Todd Engineers will prepare and submit quarterly status reports via e-mail to the District. Status reports will include details of preliminary findings, completed and outstanding tasks, and expended and remaining budget.

Todd Engineers