RMC WATER AND ENVIRONMENT AND GEOSCIENCE
Responses to David O. Powell, P.E. EIR Comments
Pasadena Ground Water Storage Program

Responses to Comments 1 through 5 were prepared by Geoscience Support Services, Inc.

Comment 1. The mislabeling of several tables in Exhibit A to Appendix C should be corrected in order to enable the reader of the EIR to properly evaluate the hydrologic studies.

Table 9, labeled as "Santa Anita Subunit, Scenario 2" actually refers to Monk Hill Subunit, Scenario 2.

Table 10, also labeled as "Santa Anita Subunit, Scenario 2" actually refers to Pasadena Subunit, Scenario 2.

Table 13, labeled as "Monk Hill Subunit, Scenario 3" actually refers to Pasadena Subunit, Scenario 3.

Table 14, also labeled as "Monk Hill Subunit, Scenario 3" actually refers to Santa Anita Subunit, Scenario 3.

GEOSCIENCE Response: these will be updated so that the table names match the table of content table names.

Comment 2. Tables 4, 5 and 6 of Exhibit A to Appendix C show the conditions which would prevail in the three sub-basins of the Raymond Basin under Scenario 0, which represent the Raymond Basin being recharged only with local water supplies, without any conjunctive use with imported supplies. Those tables show that over the base period used for the hydrologic analyses, ground water storage would decrease by an average of approximately 5,500 acre-feet per year (a total of 165,000 acre-feet over the 25 year base period). The continuation of such overdraft conditions is not realistic, and the foregoing tables should be modified to show conditions which would prevail under conditions of safe-yield operation, to wit, a condition under which annual ground water extractions are reduced sufficiently to result in no net change in ground water in storage between the beginning and the end of the base period.

GEOSCIENCE Response: Ground water production within the Raymond Ground Water Basin is currently managed based on the safe yield of the Basin (a volume of 30,770 acre-ft/yr), as stipulated within the Report of Referee regarding the adjudication of the Basin (City of Pasadena v. City of Alhambra et al. Report of Referee, 1943; City of Pasadena v. City of Alhambra et al. Report of Referee, 1954). Each member agency in the Raymond Basin is entitled to extract their annual water right which is based on the determined safe yield. The safe yield was determined

in 1943 and 1954 based on a long term record of precipitation and has for the most part kept ground water levels fairly stable. Only in the past 10 years have decreases in some areas been observed.

Modeling the continued ground water production of annual water rights was seen as a worst case scenario that best represented a scenario of keeping the status quo.

It was not the purpose of the modeling to adjust member agency pumping to keep ground water levels more stable but rather to model conditions given production of full water rights.

Comment 3. In making the modifications called for in Comment 2, the validity of the numerical values of the various items of the hydrologic equation should be reviewed, and any appropriate changes made. Particular attention should be paid to the item "Return Flow" as further discussed under Comment 4.

GEOSCIENCE Response: see response to Comment 2.

Comment 4. Pages 3-8-4 & 5 of the text of the main report state "Recharge from applied water is often calculated as 10 to 12 percent of the volume of water delivered to customers, and is considered to vary seasonally. The Basin is also recharged by water from leaky water distribution system pipes. Between 8 and 12 percent of water delivered to customers is considered lost due to leaky pipes and is considered groundwater basin recharge." These percentages seem generally consistent with the values of "return flow" appearing in the tables in exhibit A to Appendix C. However, they appear to significantly overstate the actual situation in the Pasadena Water Department.

The 2006 Annual Report of Pasadena Water and Power shows the annual water losses (more properly referred to as "unaccounted-for water") over the 10-year period from 1996/97 through 2005/06 as about five or six percent. They are derived by taking the difference between measured annual input to Pasadena's water system and metered sales of water to customers and dividing that difference by system input. This unaccounted-for water does include basin recharge from leaky pipes. But it also includes several other elements: pipe leaks which are irrecoverably lost and never reach ground water; unmetered water used for fire extinguishment, hydrant testing and main flushing-a significant portion of which does not reach ground water; changes in amount of water contained in distribution storage between the beginning and end of the year; and "meter slippage "which comes about by under-registration resulting from wear with use experienced by the displacement type meters used to measure customer sales. So the statement that 8 to 10 percent of system deliveries are contributed to ground water by pipe leakage needs either to be justified or modified.

The claim that 10 to 12 percent of water deliveries end up as recharge from applied water also needs to be critically reviewed. This water would in large part represent water used for

landscape irrigation which is in excess of evapo-transpiration during irrigation, plus any other irrecoverable losses. The 10 to 12 percent figure was apparently derived from historic conditions and was fine-tuned during verification of the ground water model. It needs to be demonstrated that the historic figures will continue to be valid in the future. As time passes, more intense multi-family and commercial uses replace single family uses; landscaping accounts for a smaller portion of the total developed area; lower water use plantings substitute for those with higher water use-in part driven by ordinance (both extant and proposed); and irrigation at higher efficiencies is strongly promoted by water purveyors. All of these factors will tend to reduce the recharge from applied water. But no such decrease over time appears in the tables appearing in Exhibit A to Appendix C. This lack of decrease over time needs to be either justified or modified.

RMC Response: Regarding the text of the main report stating that "Between 8 and 12 percent of water delivered to customers is considered lost due to leaky pipes and is considered groundwater basin recharge." The text in question above (prepared by RMC) was referenced from previous modeling studies for the Raymond Basin prepared by GEOSCIENCE: the 2004 "Baseline Groundwater Assessment for the Raymond Basin, and the 2005 "Raymond Basin Ground Water Flow Model Predictive Simulations". However, GEOSCIENCE has indicated that the updated modeling for the project defined in the EIR (included in Appendix A) utilized a 7% recharge percentage for leaky pipes, and 10% recharge from applied water. The text of the main report is not consistent with the latest modeling, however, the modeling conditions are consistent with the activities occurring in the Raymond Basin. Refer to the GEOSCIENCE response below for more information on the modeling assumptions.

GEOSCIENCE Response: The model incorporated 17% return flow. This comprised 7% from leaky distribution system piping and 10% from applied water (i.e., irrigation). The amount of 7% from the distribution system was agreed upon by all member of the Raymond Basin Management Board during development of the model, and was based on their knowledge of each system's losses.

Regarding the reduction of return flow in the future, it is not possible to predict changes in return flow within the 20 year predictive period of the model. Although there may be some reduction in applied water return flow in the future, increasing population will lead to an increase in the amount of return flow from leaky distribution pipes as more water will be piped to meet demands.

Comment 5. Once a finalized version of Scenario 0 is in place, it is necessary to superimpose thereon Metropolitan's banking program. This banking program (for the presently extant analysis) is set forth in Table 1 of Exhibit A to Appendix C. The result of superimposing the banking program on Scenario 0 are set forth in Tables 6 through 14 for Scenarios 1, 2 and 3. Since Scenario 3 appears to be the preferred scenario, the remainder of these comments will relate to that scenario as shown on Tables 12, 13 and 14.

Table 1 should be consistent with Tables 12 through 14. For example, the one percent loss of banked water shown in table 1 should be consistent with the increase in subsurface outflow out of the Raymond Basin between Scenarios 3 and 0, after any modifications to Scenario 0 accordance with Comments 2,3 and 4.

GEOSCIENCE Response: Table 1 is MWD's accounting of water that will be stored in the Raymond Basin and their calculated losses from the Basin based on an average loss of 1 percent (note that the calculation does not take into account other operational changes in the Basin but is just a simple accounting of available storage). The lost water is water that cannot be recalled by MWD and it is accepted that it is unavailable due to the movement of ground water from one basin to another. MWD uses this accounting to determine how much stored water they can extract on any given year.

Tables 6 through 14 show the predicted water budgets given various scenarios. The purpose of the modeling was not to adjust pumping to match MWD's calculation of outflow from the Basin, but to evaluate the difference in ground water conditions given various conjunctive use options by aquifer storage and recovery using MWD's put and take volumes provided in Table 1.

Response to Comment 6 was prepared by RMC Water and Environment and reviewed by Metropolitan Water District of Southern California

Comment 6. The matter of future availability of water to Metropolitan for banking requires further discussion. Over the past couple of decades, Metropolitan was able to essentially fill the banking space for which it had contracted (Diamond Valley Reservoir and various ground water basins, both within the San Joaquin Valley and within (or adjacent to) Metropolitan's service area. However, that banking of water took place before the Colorado River water available to Metropolitan was cut back by some 600,000 acre-feet per year, and before perhaps several hundred thousand acre-feet per year were lost because of the delta smelt problem. So, under future conditions, in the absence of new construction or changes in the delta smelt decision, the availability to Metropolitan of surplus water for banking could be significantly constrained.

It appears that Table 1 of Exhibit A to Appendix C was prepared before the delta smelt decision was handed down and perhaps before the timing of the cut-back in Colorado River deliveries was fully established. The timing of banking of water, and of the withdrawals of banked water currently appearing in Table 1 should be reviewed for compatibility with present circumstances.

RMC Response: While the comments regarding the reduction in availability of Colorado River water and Delta water (in light of recent decisions regarding Delta smelt) are valid, it is our belief that water for storage under conjunctive use programs may be available to MWD in the future via other means/sources, such as short- and/or long-term water transfers and agricultural conservation exchanges. Additionally, the future of water transfers and/or availability in California may be influenced by either physical and/or institutional solutions (i.e. cross-Delta canal) on a State-wide basis. It is impossible to predict at this time what the future will bring,

therefore assumptions were required to complete the environmental analysis. While we agree that the analyses presented in Table 1 of Exhibit A to Appendix C preceded the recent Delta and Colorado River decisions, we also feel that the analyses remain valid for the purposes of this document.