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1	Sect 1.1 Page 1	We agree with EPA's comment on this. In addition, in order to accomplish its objective, the workplan should also address the extent of the carbon tetrachloride (CCl_4) plume, since throughout the document, it is repeated that CCl_4 is an indicator of contamination from JPL. The groundwater monitoring report for February 2004 projects the CCl_4 plume approaching MW-21 and MW-19 in layer 2 (figure 3-2). A pattern of rising perchlorate (ClO_4) has already been seen in these wells beginning in January 2003 Figures 3-53 and 3-57. These monitoring wells straddle the Arroyo Seco, which is underlain with a thick layer of sand and gravel. There is no monitoring well between these two monitoring wells. Perhaps this area should be examined more closely as a potential contaminant pathway. See the comments below under hydrogeology.	The extent of the CCl_4 plume is currently delineated by the existing well network. Section 1.1 has been revised to more accurately state the objectives, which are: • To evaluate the downgradient (southern) extent of chemicals that originate from the JPL facility, and • To better understannd the occurrence of perchlorate in the vicinity of the Sunset Reservoir area.
2	Sect 1.2.2 Page 2	We agree with the comment from PWP/Geosyntec that monitoring results have contradicted pervious modeling.	A brief discussion on this contradiction has been included in Section 1.2.2.
3	Sect 1.2 Page 1	The plan discusses 3 different modeling attempts that have been made in the past. While one or more may need to be updated, recalibrated or revised based on new data, we note that modeling should be available to assist Battelle with the 97-005 document regarding the raw water characterization estimate of concentrations reaching the future treatment plant.	Groundwater modeling has been used to assist with the preparation of the 97-005 document for the raw water characterization.
4	Sect 2.1 Table 2-2	The document discusses the injection of purchased water at four wells in the basin, with the implication that these are potential sources of ClO_4 contamination. However, to fairly evaluate potential sources, the discussion must include the <u>extraction</u> of the injected water, and possibly, how much may have "escaped." If the majority of the injected water was subsequently pumped out, then a significant mass of ClO_4 may not have been available to	The text has been updated to include a discussion on the extraction of groundwater in the vicinity of the injection locations.

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		contaminate the basin under this mechanism.	
5	Sect 2.2 Page 4	We note the use of liquid propellants in addition to solid propellants. Also, this is the first time we have read about the furnace and incinerator on the JPL site. We will be inquiring about this equipment and their locations as part of the 97-005 Source Water Assessment and the composition of the wastes burned, their solid residues and the disposal of the residues.	The comment is noted and applicable information regarding the incinerator will be considered while preparing the 97-005 document.
6	Section 2.3 Page 4	In reviewing this section, we have looked at the geological sections and surface features in section 3 of the RI for OUs 1 and 3. We also took a fresh look at the description of the wastes and waste disposal practices and findings in the OU 2 RI, keeping in mind the contaminant concentration phenomena seen in the various monitoring and production wells up to the present time including the Garfield, Villa, and Sunset Wells. The commonly accepted up assumption up to this point has been that most of the contamination related to the disposal areas/seepage pits has been a "straight down," sub-surface discharge to groundwater which was then carried to the southeast towards the Arroyo and Well 52 and later, apparently the Windsor and Ventura Wells. Although, a significant portion of the contamination is probably due to this mechanism, after reviewing again the OU 2 RI, perhaps another possible mechanism to explain the perchlorate and CCl_4 in the basin ought to be carefully considered. In summary, there exists in the OU2 RI report evidence of significant near-surface discharges and surface discharges of contaminants, especially during rainfall events. In addition, there is apparently a very thick sand and gravel formation directly underlying the Arroyo Seco (shown on the sections between 1050 to 650 ft MSL), which, coupled	The potential release scenario described is under consideration. However, groundwater modeling by NASA and the Raymond Basin Management Board indicate that the vast majority of the groundwater extracted from the Sunset Reservoir wells is traveling south from the Monk Hill Subbasin (not east from the Rose Bowl area). Therefore, the current well locations appear to be logical given the data available. The resulting RI Addendum report will provide a comprehensive conceptual model for the JPL perchlorate plume, including the potential release and migration scenarios.

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		with the detention barriers and the Devilsgate spillway could provide an opportunity for contaminated water to infiltrate into the basin at points much further south than had previously been expected. The water would then continue moving beneath the Brookside golf course, and be pulled eastward into the Sunset wellfield. Relevant pages of the OU2 RI are attached, showing for example, sediment found in an onsite spillway which had been mixed with clean soil and sampled. The mixture results were highly contaminated (1.34 wt % CCl_4, with high levels of other organics and toxic metals) which indicates that water flowing through the JPL drainage system was also highly contaminated. Is there another explanation of how this catch basin debris became so contaminated? This catch basin overflowed to the Arroyo during storm events. The RI also mentions two waste disposal areas in or near the Arroyo which would have been subject to flooding or completely washed out in a major rainfall event. In addition, many of the seepage pits and disposal areas were on the eastern side of the property and one or more were in the Arroyo bank or adjacent to the Arroyo. Even if the pits were 30 feet deep, the pit bottoms were at elevations approximately 70 to 100 feet above the Arroyo. It is conceivable that thin clay or silt layers beneath the pits would impart a horizontal component to the contaminant transport with some of the contaminants winding up in the Arroyo. While this may not be the only contaminant transport mechanism involved at JPL, this mechanism of intermittent	

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		releases could explain the patterns of concentration spikes and decreases we have noticed in some of the monitoring and production wells in the basin. There may be a second major plume instead of the one major plume to the southeast which has been the focus thus far.	
7	Sect 3.1.1 Page 7	The document concludes that the 124 ppb of ClO_4 detected in MW-20 is JPL-related, yet CCl_4 has been ND in this well. The differences in travel time for these 2 constituents should be discussed, and considered when locating additional monitoring wells.	The text in this section has been updated to include a discussion on the differences in travel time for these two constituents, primarily with respect to the effects of sorption.
8	Sect 3.5 Page 11	It is premature to make conclusory statements about the source of ClO_4 in the Sunset Wells and the RCLWA wells. Were the travel times and modeling calculated taking the difference in mobility between the two contaminants? In addition, we do not know the specific sequence of releases on the JPL site. There may have been perchlorate releases years before CCl_4 releases. Just because CCl_4 has not yet been detected at the Sunset wells, does not mean that it isn't on its way. Perhaps the new monitoring wells can confirm it one way or the other. JPL/NASA should carefully evaluate known high permeability pathways between the JPL site and wells where ClO_4 has been detected. This might include seismic surveys or other modern surface geophysical techniques to better define subsurface conditions, particularly beneath the Arroyo Seco.	The text in Section 3.2 has been modified to indicate that the source of perchlorate in the Sunset Reservoir wells is not known. The text indicates that the groundwater modeling results are inconclusive, as reported in Table 3-6. The resulting RI Addendum report will provide a comprehensive conceptual model for the JPL perchlorate plume, including the potential release and migration scenarios.
9	Sect 4.3 Page 14	While we understand the difficulty in finding accessible locations, we are concerned that Location 2 is too close to the Sunset wellfield. Although the soil property information to be obtained during the well drilling is helpful, we already know the ClO_4 concentrations in the Sunset wellfield, and that the CCl_4 has been consistently ND. <u>If possible, a location further west may be helpful in</u>	The purpose of the location of the second additional multi-port well is to improve the understanding of the relationship between water quality and perchlorate concentrations near the Sunset Reservoir. Although historical information on perchlorate concentrations and water quality does exist in this area, data are collected from the production wells, which are screened over

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		determining if the ClO_4 plume is moving quickly down a permeable zone beneath the Brookside Golf course and then is pulled east towards the Sunset wellfield. Proposed monitoring well Location 1 should be capable of detecting if the plume affecting the Windsor well has continued to move further south.	relatively large intervals. Data collected from the additional multi-port well will provide a vertical profile of water quality and perchlorate concentrations in this area.
10	Sect 4.5 Page 18	1,2,3-tricloropropane should be analyzed with a reporting limit of 5 parts per trillion as per the DOHS website, http://www.dhs.ca.gov/ps/ddwem/chemicals/unregulated/123TCPanalysis.htm. Also, method 1625m for NDMA should also report other nitrosamines. Many of the commercial labs have standards for seven additional nitrosamines, at only a slight increase in lab charges.	The SAP included as Appendix A has been updated accordingly to account for the detection limit for 1,2,3-trichloropropane and the analysis for additional nitrosamines.

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G1	General	The document makes specific arguments in Section 3.2 and implies in several other sections that the perchlorate contamination in the Sunset Reservoir area is probably not from the JPL facility. As determining whether or not JPL is the source is the underlying objective of this effort, please add a section that discusses other potential sources. Then explain how the location and construction details of these wells will help differentiate between potential sources.	Section 3.2 has been updated to include a subsection that discusses other potential sources. Section 4.3 has been updated to explain how the location and construction of the new wells will help differentiate between potential sources.
G2	General	This Work Plan focuses on the Sunset Reservoir area, but the resulting RI report should provide a comprehensive conceptual model for the JPL perchlorate plume. It should also identify whether any other data gaps exist.	The resulting RI Addendum report will provide a comprehensive conceptual model for the JPL perchlorate plume.
S1	Sect 1.1 Page 1	The stated objective to: Determine the extent of chemicals in groundwater that originate from the JPL facility is rather broad. This RI addendum is not investigating the general extent of the plume to the east or west, but is focused purely on the Sunset area. Please explain in this section that the intent of this Workplan is to investigate the likelihood that perchlorate found in the Sunset Wells is caused by migration from the JPL facility.	The text has been revised to more accurately state the objectives, which are: • To evaluate the downgradient (southern) extent of chemicals that originate from the JPL facility, and • To determine if the occurrence of perchlorate in the Sunset Reservoir area is associated with JPL.
S2	Sect 2.4 Page 6	The identification of the types of groundwater using Stiff diagrams appears to be useful for assessing the sources of groundwater contamination from JPL to the downgradient locations. Another approach for characterizing the sources of groundwater could be the use of stable isotopes of oxygen and hydrogen. For example, stable isotope analyses may be particularly valuable when distinguishing between water from local rainfall infiltration (Type 1 water) and Metropolitan Water District water (Type 3 water.) Please evaluate the use of stable isotopes and possibly tritium analyses for identifying the sources and age of groundwater in contaminated areas; these isotope analyses could be more useful than the Stiff diagrams for quantitatively allocating the sources of groundwater and therefore the contributions	An evaluation will be performed to determine the applicability of stable isotope analysis and whether the existing monitoring well network is sufficient to collect appropriate samples. Should isotope analysis be determined feasible and appropriate, a separate work plan will be prepared outlining the recommended approach and methods.

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		to contamination in downgradient locations.	
S3	Sect 3.6 Page 12	The last recommendation for better characterization of soil and aquifer properties and the measurement of site-specific sorption coefficients for perchlorate is problematic. Please review previous groundwater modeling results to determine which aquifer parameters are most critical, and therefore what properties should be measured with an objective to improve the accuracy of future modeling efforts. Because perchlorate is usually regarded as very mobile in groundwater, please also evaluate whether a measured site-specific sorption coefficient would significantly improve the modeling efforts. Please also cite a procedure for measuring the sorption coefficients, noting that column sorption tests for mobile constituents can have experimental difficulties associated with column packing and wall effects. The design of experiments must include considerations that for the poorly sorbed anionic constituents such as perchlorate the constituents contributing to the Total Dissolved Solids (TDS), such as bicarbonate and sulfate, will also be critical variables when measuring accurate site-specific sorption coefficients.	Previous modeling efforts have indicated that chemical-specific sorption is an extremely sensitive parameter with respect to travel times and resulting perchlorate concentrations at downgradient locations. A site-specific estimate of this parameter would significantly improve future modeling efforts and the conclusions that could be drawn from these efforts. A new Appendix C has been included as a work plan for the column experiments. The work plan includes a discussion on potential difficulties associated with column packing and wall effects.
S4	Table A-3 Page A-10	Without specific data quality objectives it is uncertain whether the Practical Quantitation Limits (PQLs) are adequate to meet project needs, and some issues are listed below. For perchlorate the PQL is listed as 4 micrograms per liter (ug/L) which is the usual reporting limit when the standard ion chromatography method is used. However, analytical methods are now available to measure perchlorate at concentrations of 0.10 to 0.05 ug/L. If an objective is to define a perchlorate groundwater contamination plume, then lower reporting limits and detection limits can be useful to develop isoconcentration contours that better	The information in Table A-3 has been updated as follows: *Perchlorate.* EPA method 314 (with a modified PQL of 2 μg/L based on discussions with the analytical laboratory) will be used to analyze for perchlorate. Ten percent of samples also will be analyzed using an LC/MS/MS method to achieve a lower PQL and verify results. *VOCs.* 1,2,3-Trichloropropane will be listed in a separate row on Table A-3 and will be analyzed for using a Method 504.1 that has a PQL of 0.005 μg/L.

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		define the likely source of perchlorate contamination. Please evaluate the need for lower PQLs to address the data quality objective of defining the perchlorate plumes. For volatile organic compounds (VOCs) the PQL is listed as various for EPA Method 524.2, and this method usually does provide acceptable results for the chlorinated ethene constituents when compared to Maximum Contaminant Levels. However, 1,2,3-trichloropropane is also listed as an analyte for the proposed investigation (page 18), and it is not clear whether EPA Method 524.2 will have a PQL that will address the California Drinking Water Action Level (DWAL) of 0.005 ug/L. Please address the DQO for 1,2,3-trichloropropane in the context of the DWAL or comparisons with data from other investigations that are now using analytical methods that can measure down to the DWAL. The listed parameters do not include any indicators of the oxidation/reduction conditions in the groundwater. Such indicators would be Dissolved Oxygen, Total Organic Carbon, or measured Oxidation/Reduction Potentials, and would be useful to demonstrate that reductive transformations of the chlorinated ethenes or perchlorate would not be confounding the interpretation of the analytical results. Please evaluate whether sufficient information exists to define the oxidation/reduction conditions in the aquifer system or if additional data are required.	*Oxidation/reduction conditions.* DO and ORP are routinely measured in the field prior to sample collection from the shallow groundwater monitoring wells. However, these parameters are not collected in the deep multi-port Westbay® monitoring wells. Historical DO and ORP data will be evaluated to define the oxidation/reduction conditions in the aquifer system; this information will be included in the overall analysis of conditions in the study area.

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1	Sect 3.2 Page 9	*This model indicates the advective travel times for a particle originating on the JPL Facility near MW-7 and captured at the Sunset Reservoir wills is between 40 and 96 years, with an average travel time of 70 years. Using the average conservative travel time (i.e., 2002 minus 70 minus 7.5), the release would have started prior to 1924. As indicated earlier, the JPL facility did not start testing perchlorate as a solid rocket propellant until after 1942.* Applying a single value for the travel time (70 years) represented by the average period and considering how wide-range the estimated advective travel time (40 to 96 years) implies a high level of accuracy. Given the range of travel times estimated in the Raymond Basin groundwater model, one could argue that a more accurate and conservative statement is that the estimate release period ranges between 1899 and 1955 [2002 – (40 to 96 years) – 7.5] although JPL did not exist until 1936. None the less, this time range does coincide with the 18 year period when perchlorate was first tested in 1942 to the conclusion of the use of seepage pits in 1960 (Figure 2-2).	The text in this section of the Work Plan has been revised to indicate the range of the release period in addition to the average. It should be noted that the information in Table 3-6 indicates groundwater modeling data are inconclusive with respect to NASA JPL as the source of perchlorate in the Sunset Reservoir wells.
2	Sect 4.1 Page 13	*Start of drilling – September 1, 2004; Completion – June 2004 (first well).* Although this schedule has yet to be finalized and it includes a time table for constructing two sampling wells, the City Yards Manager may not be capable of accommodating an eleven month construction activity at the proposed location. NASA needs to evaluate the time criticalness for installing the first well while it determines the location of the second well.	Battelle is coordinating all drilling activities to accommodate the schedule of the City Yards Manager.
3	Sect 4.3 Page 14	*…in the northwest corner of the PWP Sunset Reservoir complex near the intersection of Hammond Street and the Foothill Freeway (Figure 4-1). This well will be located*	The text has been modified to reflect the changes detailed in the comment.

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		north of the reservoir within the PWP maintenance yard and between the JPL facility and the Sunset Reservoir wells. …in the northwest corner of the City's Yards complex, which encompasses both the Sunset Reservoir and three production wells, and near the intersection of Hammond Street and the Foothill Freeway (Figure 4-1). This monitoring well will be located north of the reservoir between the JPL facility and the Sunset Reservoir wells.	
4	Sect 4.4.1 Page 15	*Although permits are not required, NASA will comply with the substantive permitting requirements associated with monitoring well installation. This includes…City of Pasadena Building Department…* See attachment for permitting requirements including working hours, public notifications, traffic activity, etc.	NASA received the attachment and is coordinating with the City to ensure that all permit requirements are met.
5	Table 3-1	*Summary of CCl_4, PCE, TCE, and Perchlorate* Some of the values shown for Maximum Detection do not agree with PWP's records. • CCl_4 for Villa – 0.1 mg/L on 02/08/1989 • Perchlorate: a. Sunset – 16.3 µg/L on July 2000 b. Bangham – 12.6 µg/L on July 2000 c. Garfield – 12.9 µg/L on May 2001	The data used in compiling the statistics in Table 3-1 were obtained from the Raymond Basin Management Board (Geoscience, 2003). The chemical concentration data presented in the comment is not reflected in this database. NASA requests that the City forward all historical chemical concentration data so that it can be incorporated into the RI Addendum report.
6	Figure 3-5	*Perchlorate Concentrations in Downgradient JPL Monitoring Wells MW-19 and MW-20.* Please provide the date of last detection along the abscissa axis.	Figure 3-5 has been updated with the requested information.

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1	Sect 1.2.1 Page 2	*"..general groundwater quality of the Raymond Basin was provided for the period July 1997 through June 1988…"* There appears to be either a typographical error in the dates or a reversal of the dates chronologically.	The text in this section of the Work Plan has been revised to indicate that data were provided from the period July 1979 through June 1988.
2	Sect 1.2.2 Page 2	*"Results of [fate and transport modeling] indicated that production wells would have to be off-line for more than 20 years for migration of these chemicals [CCl_4, TCE, and perchlorate] at existing levels to be detected above action levels (ALs) in downgradient wells MW-20."* Perchlorate has been detected at MW-20 at concentrations as high as 124 µg/L, and the RI Addendum states that this perchlorate appears to have originated from JPL. The City of Pasadena production wells have been offline for only 2 to 7 years, while other wells have operated intermittently. Therefore, it appears that the actual data contradict the conclusions based on the fate and transport modeling. An evaluation of the contradiction should be made in §1.2.2.	It is agreed that the monitoring results contradict the groundwater modeling results presented in the RI. A brief discussion on this contradiction has been included in Section 1.2.2.
3	Sect 2.3 Page 5	*"However, vertical hydraulic head differences with depth are observed between screens in deep JPL multi-port monitoring wells located near active production wells."* A quantitative description of the gradients observed should be provided, including the depths, locations, well production at the time of measurement, and the value of the gradient.	The resulting RI Addendum report will provide a comprehensive conceptual model for the JPL perchlorate plume, including a detailed discussion of vertical hydraulic head differences.
4	Sect 2.3 Page 5	*"Figures 2-4 and 2-5 show generalized groundwater elevation contour maps for January 1998 and*	These dates were chosen because they coincide with a comprehensive groundwater monitoring event at NASA JPL

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		January 2002…" Please explain why these dates were chosen, what the history of production well activity is for wells in the vicinity, from which zones of the multi-port wells the groundwater elevation data was taken, and the specific date for the January 2002 data, in light of the ceasing of production on or about 18 January 2002.	during which groundwater chemistry parameters (i.e., anions and cations) were collected. These parameters are only collected on an annual basis at NASA JPL; the January 2002 event was conducted from mid-January through mid-February. The groundwater elevation for the uppermost screen of the multi-port wells was included on the cross sections. A more detailed analysis of production well activity will be included in the resulting RI addendum report. The text in this section has been updated to reflect these updates.
5	Section 2.4 Page 6	*Description of Type 3 Water* The changes in the anion composition between Type 1 and Type 2, with a relatively constant cation composition, suggests different degrees of groundwater interaction with aquifer solids and dissolved matter on the same initial water (Type 1) rather than two different types of water. NASA should consider this explanation as well as other hypotheses.	NASA will consider this hypothesis as well as other hypotheses concerning the groundwater quality. Stable isotope analysis, which was proposed by the EPA and later in these comments, may help clarify this issue. A more detailed discussion of groundwater quality will be presented in the RI Addendum report.
6	Section 2.4 Page 6	*"Type 3 water is…indicative of Colorado River Water imported by the Metropolitan Water District of Southern California (MWD)."* It is unclear whether this statement is asserting (a) that Colorado River Water <u>is</u> Type 3 water (which is not supported by the anion and cation plots in Figure 2.6) or (b) that Type 3 water is a <u>mixture</u> of Colorado River and either Type 1 or Type 2 water (also not supported by Figure 2.6). Additional clarification of the statement is required, as well as more analysis to support the assertion.	The RI states "the fact that water with relatively low TDS, Cl, and SO_4 is present in La Cañada Irrigation District well No. 1 [i.e., Type 1 water], located immediately upgradient of Valley Water Company (Valley) wells…strongly suggests the presence of high Cl, SO_4, and TDS in the Valley wells [i.e., Type 3 water], and wells located downgradient of the Valley wells, is the result of historical injection of Colorado River water into the Valley wells." The text has been updated to reflect that Type 3 water is a mixture of Colorado River and Type 1 water. A more detailed discussion of groundwater quality will be presented in the RI Addendum report.
7	Figure 2.4 Page 6	*"Figures 2-6 and 2-7 graphically present groundwater quality at JPL in January 1998 and January 2001, respectively".*	These dates were chosen because they coincide with a comprehensive groundwater monitoring event at NASA JPL during which groundwater chemistry parameters (i.e., anions

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		It is not clear why these two dates were chosen for representation of the groundwater quality, please explain.	and cations) were collected. These parameters are only collected on an annual basis at NASA JPL.
8	Figure 2-1	*North arrow. Scale* The north arrow and the scale are missing, and there are two wells labeled MW-24. The labels for RCLWA 4 and RCLWA 7 appear to be reversed as compared to Figures 2-4 and 2-5.	Figure 2-1 has been updated to include a scale and a north arrow. The northwestern of the two wells labeled "MW-24" has been relabeled "MW-16". In addition, the labels for the two RCLWA wells has been reversed.
9	Figure 2-4	*North arrow.* There is no north arrow.	Figure 2-4 has been updated to include a north arrow.
10	Figure 2-5	*North arrow.* The north arrow is missing.	Figure 2-5 has been updated to include a north arrow.
11	Sect 3.1.1 Page 7	*"No other sources of perchlorate are known to exist in the Basin except MWD water imported from the Colorado River."* This statement is not adequately supported. The radius search report contained little to no information regarding perchlorate use. Also, the perchlorate concentrations in Colorado River water were not enumerated.	The text has been updated to read "No other sources of perchlorate have been identified in the Basin except MWD water imported from the Colorado River, which has been linked with perchlorate detections in the upgradient VWC wells (FWEC, 1999)". A more detailed discussion of potential sources, including an enumeration of perchlorate in the Colorado River, will be presented in the RI addendum report.
12	Sect 3.1.1 Page 7	*"Because these three VOCs [PCE, TCE, CCl_4] have similar characteristics associated with fate and transport in groundwater (e.g., retardation factors), higher levels of PCE and/or TCE and the absence of CCl_4 in downgradient municipal production wells indicate a VOC source other than JPL."* This statement relies on a long list of assumptions, none of which is detailed, analyzed, and subjected to	This first portion of this statement, regarding the similarity of fate and transport characteristics, was taken from Section 4.3.2.1 of the RI. The second portion of this statement, which states the chemical distribution in downgradient production wells indicates a VOC source other than JPL, assumes downgradient migration occurs under similar release conditions. This assumption has been incorporated into the text. Additional information to support this hypothesis will be collected during the additional investigation, and a more

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		scientific scrutiny. The statement is made as a face, whereas it is an unsupported hypothesis. More detail should be provided either in the Work Plan or in the RI Addendum report, when finalized, to support this hypothesis. PWP reserves additional comment on this hypothesis until more information is provided.	detailed analysis will be presented in the RI Addendum report.
13	Sect 3.2 Page 9	*"This model indicates the advective travel time for a particle originating on the JPL Facility near MW-7 and captured at the Sunset Reservoir wells is between 40 and 96 years, with an average travel time of 76 years."* Although the statements in the Work Plan focus only on the average and use that as a rationale for why perchlorate could not have reached the Sunset wells by 2004, the use of other data within the range definitely suggests the possibility of impacts from JPL arriving at the Sunset wells by 2004. Further, modeling that incorporates dispersion would further support the idea that JPL may be a source of perchlorate impacts in the Sunset Reservoir. Also, the text indicates that modeling was used to conclude that JPL is not the source of perchlorate at the Sunset Reservoir wells but Table 3-6 indicates that groundwater modeling was inconclusive in determining the source. Lastly, the assumptions used in the modeling regarding production from municipal supply wells likely have been significantly violated in the past several years, possibly affecting the results of the model. A discussion of these factors should be made in the context of travel times to the Sunset wells.	The text in this section of the Work Plan has been revised to indicate the range of the release period in addition to the average. The text in Section 3.2 has been modified to indicate that the source of perchlorate in the Sunset Reservoir wells is not known. The text indicates that the groundwater modeling results are inconclusive, as reported in Table 3-6. The text has been updated with a brief discussion of production well operation with respect to the modeling results.

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14	Sect 3	*Missing Information.* Information regarding an important purveyor, Lincoln Avenue Water Company, largely is lacking in this section. In light of the fact that perchlorate impacts LAWC's wells, NASA's admitted culpability for same and the location of these wells within the area being discussed, it would be useful to discuss LAWC water quality in a similar manner as the other purveyors' water supply is discussed. Further, an analysis of the modeled travel times for travel to LAWC wells versus actual travel times would be informative as a "sanity check" of the model.	NASA has assumed responsibility for the chemical concentrations in the LAWC wells. Water quality, extraction rate, and chemical concentration data for these wells is included in Tables 2-1, 3-3, 3-4, and 3-7 and in Figures 3-13 through 3-18 for comparison to other areas in the Basin. The text in the introduction of this section has been updated to elaborate on NASAs responsibility for chemical concentrations in these wells. In addition, the RI Addendum report will include a discussion of the LAWC wells in the discussion of the conceptual model.
15	Sect 3.6 Page 12	*"Column tests on soil samples are recommended to determine site-specific sorption coefficients (K_d) for perchlorate".* The evaluation of K_d values should incorporate spatial variability, both at the local and basin-wide scales.	During drilling of the two monitoring wells, an attempt will be made to collect soil samples at discrete depths (correlating to the screened interval depths) throughout the aquifer for inclusion in the K_d column study (work plan provided as Appendix C).
16	Figure 3-2	The vertical axis should be labeled "Chloride" instead of "Sulfate".	Figure 3-2 will be updated accordingly.
17	Figures 3-6 through 3-11	The figures show the lowest monitoring point of MW-20 to be within the bedrock, whereas in Figure 2-6 from the Draft JPL Groundwater Modeling Report (CH2MHill, July 2002), the lowest monitoring point is shown above the bedrock. The figures also show that MW-4 was not drilled into the bedrock, whereas Figure 2-6 (CH2MHill, July 2002) shows that MW-4 was drilled approximately 400 feet into the bedrock.	Figures 3-6 through 3-11 illustrate cross section A-A′, which is shown on Figure 2-1. MW-20 is projected on cross section A-A′, which is actually located approximately 1000 ft to the west of MW-20. The bedrock in the vicinity of the cross section is higher in elevation than in the vicinity of MW-20, and therefore MW-20 appears to be completed in the bedrock, when in reality it is not. Similarly, the projection of MW-4 on cross-section A-A′ explains why this well is not shown to have been drilled into the bedrock (the boring log for this well indicates it was drilled approximately 40 ft into the bedrock).

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18	Figure 3-12	A scale of 0 to 10 µg/L would be more appropriate than 0 to 50 mg/L, as the maximum concentration is less than 10 µg/L.	The scale on Figure 3-12 has been updated accordingly to better illustrate the data.
19	Figures 3-25 through 3-30	The label "Bedrock" is within the "Unconsolidated Material" area.	The figures has been updated to correct the discrepancy noted in the comment.
20	Sect 4.0 Page 13	*"In addition, an attempt will be made to collect one saturated and one unsaturated soil sample from each location for analysis of several physical parameters…"* Collection of only one soil sample from each boring likely will not provide sufficient data to evaluate the variability in the Kds for perchlorate that would be required to model perchlorate transport for the basin. Similarly, because the saturated zone is made up of several distinct aquifers and aquitards, it would be more useful to have soil samples from each of the major zones. Also, the purpose of characterization of the unsaturated soil K_ds is not clear, since vadose migration of contaminants at these two locations does not appear to be an issue. Lastly, it would also be useful to have both horizontal and vertical hydraulic conductivity values.	During drilling of the two monitoring wells, an attempt will be made to collect soils samples at discrete depths throughout the aquifer for inclusion in the K_d column study. However, due to the proposed depth of the monitoring wells, sample collection at discrete depths is anticipated to be difficult and may not be cost-effective. The calculation of K_d in the unsaturated soil will be used in the estimation of a K_d value for the uppermost saturated aquifer layer. In addition, these values will be used to refine a K_d that can be used for vadose zone modeling in the source area. If the condition of the soil sample permits, horizontal and vertical hydraulic conductivity values will be estimated. The text has been updated accordingly.
21	Sect 4.0 Page 13	*Suggested additions.* Data for Deuterium and 0-18 as well as the ^3H content of water could potentially be used to evaluate mixing of Colorado River water and groundwater, as well as to evaluate conceptual models of mixing of recharged water with groundwater.	An evaluation will be performed to determine the applicability of stable isotope analysis and whether the existing monitoring well network is sufficient to collect appropriate samples. Should such analysis be determined feasible and appropriate, a separate work plan will be prepared outlining the recommended approach and methods.

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Number	Page or Section	Comment	Response
22	Sect 4.3 Page 14 Figure 2-1 and 4-1	*"The first proposed location is downgradient of JPL monitoring well MW-20".* The proposed location is generally downgradient of the JPL facility according to the groundwater flow direction shown on Figure 2-1, although it is not downgradient of MW-20 as stated, based on the groundwater flow direction shown on Figure 2-1. The flow in that figure is approximately south-southeast, whereas the first well location is located southwest of well MW-20.	The text has been updated to indicate that the first proposed monitoring well location is in between JPL monitoring wells MW-19 and MW-20 (NASA's furthest downgradient monitoring wells) and the Sunset Reservoir wells.
23	Sect 4.0 Page 13	*Suggested additions.* Previously, NASA had discussed the use of alternative analytical methods to compare against the currently-used USEPA Method 314.0. If NASA plans to complete this evaluation, it should be detailed in the RI Addendum Work Plan.	NASA is currently conducting an internal evaluation of alternate analytical methods for perchlorate and the results will be discussed at the October 2004 RPM meeting.
24	Table 4-1	*Proposed Schedule* The schedule should indicate the submittal of the draft and final RI technical memoranda and the column test work plan.	The schedule in Table 4-1 has been updated to indicate the submittal of the draft and final RI Addendum Report. The column test work plan is provided as Appendix C in the work plan.
25	Figures	Some figures have scales in feet and some have scales in meters. A consistent convention should be used on all figures.	The figures have been modified so that scales are reported in feet.
26	Table A-3 Page A-10	*Practical Quantitation Limits.* The perchlorate PQL of 4 μg/L is high for an investigation of this sort. A PQL of 1 to 2 μg/L is recommended to characterize the perchlorate plume.	Battelle contacted the analytical laboratory and the PQL for Method 314.0 has been changed to 2 μg/L.
27	Table A-3 Page A-10	*Analytical Methods.* The use of USEPA Method 8260B in lieu of 524.2 is	Method 524.2 is used for VOC analysis for wells included in the JPL groundwater monitoring program and will be used as part of the RI Addendum. The text has been modified

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		recommended. If 8260B is not used, a rationale should be provided.	accordingly.