radon, which appears excessively high based on the radon concentrations measured from the well in the SP.

All of the worksheets do not appear to have been checked, as indicated by the blank "chkd by: _____" on each of the worksheets.

EPA RESPONSE: The following references were used for the calculations included in Appendix B; Section 7.0 of the Feasibility Study Report contains the full reference. The Administrative Record reference number is provided in parentheses after each reference, the first is the reference for Glendale South, the second for Glendale North.

- for AIRSTRIP documentation: Haarhoff, J. and D. Schoeller, 1988 (AR 24/AR 35).

- for the vapor phase GAC usage rates are Northwestern, 1991 (AR 24/AR 172).

- for liquid phase GAC: Speth and Miltner, 1990 (AR 24/AR 75).

- for fuel usage for catalytic incineration: ARI, 1991 (AR 24/AR 173).

The calculations for sodium hexametaphosphate (for air stripping), hydrogen peroxide and electricity (for perozone oxidation), and chlorine (for disinfection) are simple quantity calculations based on assumed dosage rates for these operations.

All calculations were checked by a registered Professional Engineer at James M. Montgomery.

The full reference for the adsorption of radon onto liquid phase GAC calculation is Rydelle, et.al., Granular Activated Carbon Water Treatment and Potential Radiation Hazards, NEWWA, December 1989. This article is included in the Administrative Record.

The maximum concentration of radon observed from RI wells screened in the upper zone for the Glendale South OU was 480 ± 5.4 pCi/l. The input concentration of radon used in the calculation of adsorption of radon onto carbon during liquid-phase GAC treatment (500 pCi/l) was reasonable for the objective of the calculation which was to determine the need for specific disposal requirements for the spent carbon.

All references and assumptions for costs are included in Appendices C and D.

182. (Appendix C1) The capital costs are not discounted and assume all capital costs are incurred on day one. The FS states

that the installation of the alternatives will be over a three year period. All capital costs in the appendices are based on total expenditure at the start of the project.

EPA RESPONSE: See Appendices C (Page C-1) and D (Page D-1) for a description of how the present worth factor was calculated. It will be apparent that a contingency or escalation factor was considered for the projected 3-year delay.

183. (Appendix C2) It is not clear how the total Annualized cost of TCR and O&M (Years 4-15) was calculated. These must be included to allow for informed review and comment.

EPA RESPONSE: See Appendices C (Page C-1) and D (Page D-1) for a description of how the present worth factor and annualized cost factor were calculated.

184. (Appendices C.2 and C.3) The cost of land acquisition assumes 0.05 acre of land each would be required for the extraction system and the treatment facility as described in the FS. There was no discussion regarding the feasibility of acquiring the potential needed properties for installation of the remedial system. In addition, the 0.05 acre proposed for each system seems inadequate to install the proposed systems.

EPA RESPONSE: As stated in the cost estimate assumptions, costs assume that 0.05 acres of land would required for EACH extraction well (Page C-2, Assumption 4) at a cost of $1,000,000 per acre. In addition, 0.5 acres would be required for the treatment system (Page C-3, Assumption 4) at a cost of $1,000,000 per acre.

185. (Appendix C.2) The fact that the piping costs do not include double contained piping significantly impacts the eventual costs for the conveyance system to the treatment plant. Other sites under the LARWQCB has been required to provide double containment for the extraction well piping for spill prevention.

EPA RESPONSE: Exact piping requirements will be determined during the design phase of the remedy.

186. (Appendix C.2) No contingency is provided for the installation of the conveyance systems through potentially contaminated soils along the proposed route; this issue will be a factor in the highly industrialized area. Numerous construction projects have been stopped in progress due to contamination along the proposed routes (e.g., Metro Rail).

EPA RESPONSE: The exact route of the conveyance system will be determined during the design phase of the remedy.

187. (Appendix C.3; #11) The usage rates of liquid and vapor phase carbon assumes perfectly exclusive absorption. As the usage may vary considerably depending on the operation and maintenance,

the carbon cost can be expected to be significantly underestimated.

EPA RESPONSE: Conservative assumptions were used in calculating carbon usage rate. These assumptions were considered adequate for cost estimating purposes. The cost estimates have an accuracy of +50 percent to -30 percent, as required by the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988).

188. (Appendices C.2 and C.3) It is unclear why the Present Worth Factor in the C.2 table is 5.12 for 12 years and in the C.3 tables the Present Worth Factor is 6.81. These numbers we believe should be the same. If this is not an error, the difference in the numbers should be explained.

EPA RESPONSE: The present worth factor of 5.12 assumes an interest rate of 10 percent, a project duration of 15 years with a 3-year lag time (Page C-1, Assumption 3). The present worth factor of 6.81 assumes a treatment duration of 12 years (Page C-3, Assumption 3).

189. (Appendices C3-2, 4, etc.) The costs are based only on the treatment of TCE and PCE. As has been shown, other VOCs and potentially other sources, which have not been identified, exist in the area. These cost estimates and final remedial decisions are based on very subjective data.

EPA RESPONSE: The cost estimates have an accuracy of +50 percent to -30 percent, as required by the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988).

190. (Appendix D; Table D-5) The pipeline costs do not include road and utility crossing for the pipeline trenches and installation, along or under bridges. Again, double containment piping is not included. These factors can significantly increase the cost.

EPA RESPONSE: See EPA Response to ITT Comment 189 regarding the accuracy of the cost estimation provided in the FS. The exact locations of the extraction, injection, and monitoring wells, the treatment facility and associated conveyance system should be determined during the design phase of the remedy.

191. (Appendix D; General) Costs do not appear to be included for potential NPDES or a LARWQCB General Waste Discharge Requirement for discharge to the Los Angeles River or for recharge to the Headworks Spreading Grounds.

EPA RESPONSE: See EPA Response for comment on Appendix D; Table D-5 regarding the accuracy of the cost estimation provided in the FS.

192. (Appendix D; #13): In addition, the costs for monthly

monitoring of the influent and effluent of the treatment system seems low, especially during start up and testing. Most likely, more frequently monitoring will be required. Finally, a contingency for sampling costs should have been provided.

In light of EPA's silence on the subject, ITT assumes that the "onsite" policy applies, and therefore, no permits must be obtained for the selected remedial action.

EPA RESPONSE: See EPA Response for comment on Appendix D; Table D-5 regarding the accuracy of the cost estimation provided in the FS.

The selected alternative will have to meet all ARARs and other requirements applicable during implementation of the remedy.

REMEDIAL INVESTIGATION (RI): RI SECTION 7

193. (RI Page 7-8) The RME is identified as the upper 95 percent confidence limit of the arithmetic mean of the ground water quality data. We disagree, as this does not account for uncertainty in the frequency or duration of exposure, toxicity estimates, intake estimates or the multiple routes of exposure which are summed to estimate total exposure. Instead, a Monte-Carlo type assessment should have been performed as per the new EPA guidelines referenced in the General Comments.

EPA RESPONSE: The identification of the RME as the upper 95 percent confidence limit of the arithmetic mean of the groundwater data is per U.S. EPA Guidance for Superfund Sites (USEPA, 1989). California regulators concurred with this identification. Any "new guidance" (after 1990) would not have been available at the time this risk assessment was prepared.

194. (RI Page 7-8) No information is presented indicating the appropriate procedure to be employed for estimating the mean and the Upper Confidence Limit (UCL) to the mean. If data are not normally distributed, there may be better and more appropriate ways to estimate the mean and, particularly, the UCL, than the procedures appropriate to a normal distribution. This consideration needs to be addressed.

The use of the arithmetic mean and maximum values of the groundwater concentrations to estimate risk is misleading. There is no adequate definition of what these estimates represent. The mean does not represent a median estimate of risk, and the maximum concentration is effectively a theoretical upper bounding estimate (TUBE) which should be so identified. As noted by EPA:

- "The only thing that the bounding estimate can establish is a level to eliminate pathways from further consideration."

- "It certainly cannot be used for an estimate of actual exposure."

- "Bounding estimates must not be considered to be equally as sophisticated as an estimate of a fully described pathway, and should not be described as such."

Instead, a true mean or median risk descriptor as well as a true upper bound estimate should have been derived as per the new EPA guidelines referenced in the General Comments.

EPA RESPONSE: The presentation of average, RME, and maximum risk predictions for potential human health effects is designed to provide the risk manager with the range of risk probability that may be posed via exposure to groundwater from the site. The significance of these risk predictions is addressed in Section 7.5.4, pp. 7-22 to 7-24 of the document. This presentation allows the risk manager to make reasonably conservative remediation decisions. This was developed pursuant to the guidance available at the time of document preparation.

195. (RI Page 7-9) EPA Human Health Evaluation Manual, Supplemental Guidance (1991) OSWER Directive 9285.6-03 suggests the use of 350 days per year for residential frequency of exposure.

EPA RESPONSE: This OSWER directive (9285.6-03) was not available at the time this document was prepared.

196. (RI Page 7-9) The use of USEPA default values should be accompanied by a description of their uncertainties and a discussion of their impact on the assessment and on the selection of the risk descriptors. The presentation suggests that the uncertainty in these estimates is small and that their uncertainty does not need to be further evaluated in the presentation of the risk descriptors.

EPA RESPONSE: The acknowledgment of the use of EPA default values is sufficient to establish the appropriate degree of uncertainty for the risk estimates for consideration by risk managers.

197. (RI Page 7-9) The use of 365 days per year is unnecessarily conservative; rather, a more reasonable number, such as the number of days that 90 percent of the population stays home, should be used.

EPA RESPONSE: The use of 365 days/year is considered a reasonably conservative estimate of exposure frequency for a residential exposure scenario. This assumption was a standard recommended element of the available guidance, Risk Assessment for Superfund Sites (USEPA, 1989) and the EPA Exposure Factors Handbook (USEPA, 1989).

198. (RI Page 7-9) In the intake equation, the use of the upper

ninety-fifth percentile for CW, the ninetieth percentile for ED, the ninetieth percentile for IR, and the one hundredth percentile for EF is overly conservative to estimate a true high-end exposure. The cumulative uncertainty should be addressed.

EPA RESPONSE: The decisions represented in this RA are conservative, but not unrealistic. The exposure assumptions, modeling concentration estimates, and exposure equations are all standard recommended elements of current USEPA guidance for Risk Assessment at Superfund Sites (USEPA, 1989) and the EPA Exposure Factors Handbook (USEPA, 1989). The cumulative effort of this conservative approach is inherent in the guidance methodology as currently written. This RA has not exceeded the guidance. The conservative approach is designed to ensure adequate characterization of potential human health risks. Further, risk estimates for average concentration levels are provided for use by the risk manager in remediation decision-making and were discussed in the evaluation section of the Glendale RI (7.5.4) in order to assign significance to the risk values calculated.

Again, the exposure frequency used in this RA is a standard default assumption for residential exposure as presented in the EPA Exposure Factors Handbook (USEPA, 1989).

The conservative approach existing in the use of an ingestion equivalent to estimate risks via inhalation during showering is duly noted in Section 7.3.4 (pp. 7-9) of this document. It is further noted that alternate models may be used to predict potential risk, as further defined in the uncertainties section (Section 7.6; pp. 7-25, Point 6). Given the elevated concentrations of volatile organics in the groundwater, it would be expected that an alternate calculation would not result in risk predictions below the guidance benchmark of $1x10^{-6}$.

The uncertainty inherent in the RME calculation of risk estimates is accounted for in the uncertainties section (7.6) of this document and is included in the evaluation section (7.5.4) which addresses the significance of the risks predicted.

199. (RI Page 7-9) The use of the assumption that shower exposure is equivalent to ingestion of 2 liters of water is inappropriate for this assessment. The data are available to conduct a more accurate assessment of exposure by this route, and this route contributes significantly to the overall estimates of risk. The uncertainty associated with the use of this conservative assumption should be discussed and incorporated into the selection of appropriate risk descriptors.

EPA RESPONSE: The models chosen to estimate exposure point concentrations for air in the steam plant and shower exposure scenarios, although conservative (as duly noted in the exposure assessment text [Section 7.3.4] and the uncertainties text [Section 7.6.1]), are still within accepted methodologies as defined by EPA

guidance, Risk Assessment Guidance for Superfund Sites (USEPA, 1989) and EPA Exposure Factors Handbook (USEPA, 1989).

All of the potential models for use in exposure point concentration estimates contain uncertainty. However, it is not expected that the use of alternate calculations would result in risk prediction below the guidance benchmark of $1x10^{-6}$, given the elevated concentrations of volatile organics in groundwater at the site. Thus, remediation decision making would not be changed.

200. (RI Page 7-11) As for the intake equation, the repetitive use of overly conservative exposure parameters should be discussed with regard to overall uncertainty and taken into account when determining the risk descriptors.

EPA RESPONSE: See EPA Response to ITT Comment 198.

201. (RI Page 7-14) Since nitrate as nitrogen was evaluated for an infant with exposure duration of one year, subchronic health risks should be estimated. Subchronic daily intake refers to exposures of intermediate duration from two weeks to seven years (RAGS 6-2).

EPA RESPONSE: The consensus of the regulators was that the potential for adverse health effects due to nitrate exposure was primarily with the infant subpopulation (less than 1 year of age). If the risk estimates were not a problem for this population, they would not be expected to be a problem for the general population. Therefore, the infant exposure scenario was created to make sure that this sensitive subpopulation was protected. A subchronic exposure estimate would dilute the potential for adverse effect to this subpopulation.

202. (RI Page 7-15) ITT asserts that the assumption that RFDs are equivalent to inhalation RfCs introduces unnecessary uncertainty into the risk assessment. For most of the COCs where this practice was followed, there are data which allow for estimation of the inhalation RfC. The assumption that similar chemicals have similar toxicity also introduces uncertainty into the analysis. The classic example of similar structure and dissimilar toxicity are ethanol and methanol. A more thorough discussion of the rationale for these assumptions should be incorporated into the assessment, and where appropriate, corrections and adjustments should be made. There are several modeling tools which would allow a structure activity comparison to be made, and there is sufficient information available to make an informed professional toxicity and absorption judgment. The impact of these assumptions should be incorporated into the general discussions on uncertainty and on the selection of the risk descriptors.

EPA RESPONSE: The cross-assignment for reference doses for COCs was intended to provide "quantitative" information to the risk manager with regard to compounds without defined toxicity values.

The uncertainty in this assignment is duly noted in the uncertainties Section 7.6.2, Page 7-26, Point 5 and is considered in the risk evaluation section with regard to the public health significance of the risk estimates presented in this document.

203. (RI Page 7-16) A discussion of the target organs impacted by the COCs should be included. For non-cancer effects, the chemicals should be segregated by target organs if the HI for all the COCs is greater than unity.

EPA RESPONSE: A full discussion of toxicological information on each of the compounds of concern is presented in Appendix E, as noted in the text on page 7-15. Further, the major contributor to the overall exceedance of the hazard index benchmark is TCE. As noted in the text (p. 7-22), the target organs for carbon tetrachloride and 1,2-DCE are the liver and the liver is one of the target organs for potential adverse effect via TCE exposure. It should be noted that the hazard index estimates for the individual compounds indicate that only TCE exceeds the benchmark of 1.

204. (RI Page 7-16) It is inappropriate to group the VOCs together and the metals together as the individual compounds all have unique and distinct toxicities and physiological properties which should be discussed separately.

EPA RESPONSE: It was not considered inappropriate to provide summary toxicological information about the groups of compounds considered of concern at the site. Full toxicological profiles for each of the compounds is contained in APPENDIX E and duly noted in the text, page 7-15.

205. (RI Page 7-16) This section is overly general and contains inaccuracies and misleading statements (e.g., "the presence of chlorine causes some health effects that are not caused by the benzene ring compounds").

EPA RESPONSE: This portion of the text is designed to provide general information to the risk manager with regard to overall toxicological properties for these groups of compounds. It is clearly noted in the text that this is a general overview and that a detailed compound-specific toxicological profile is provided in APPENDIX E (page 7-15 and 7-16).

206. (RI Page 7-21) Without a better definition of the "RME, average and maximum" exposures, this section does not provide the risk manager with adequate information to judge the implications of these risk estimates.

EPA RESPONSE: See EPA Response to ITT Comment 194.

207. (RI Page 7-25) Many of the inherent uncertainties in the risk assessment have been recognized in this section; however, the identification alone is inadequate. The uncertainties must be