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FINAL

RESPONSE TO COMMENTS

TREATABILITY STUDY WORK PLAN FOR OXIDATION/REDUCTION PROCESSES

ROCKY FLATS PLANT

U.S DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM

July 1992

100118FF DEN

ADMIN RECORD

FINAL

RESPONSES AND COMMENTS TO THE TREATABILITY STUDY WORK PLAN FOR OXIDATION/REDUCTION PROCESSES AT ROCKY FLATS PLANT

COMMENTS: U.S. DEPARTMENT OF ENERGY
EM 453

RESPONSES: CH2M HILL

100118FF DEN

ROCKY FLATS ENVIRONMENTAL RESTORATION PROGRAM
REVIEW/COMMENT RESOLUTION FORM

Document No. and Title: EM 453 Response to Comments

Reviewer Name(s): Department of Energy

Date: Final–July 24, 1992

REVIEWER'S COMMENTS			RESPONSE
COMMENT NO	SECTION/ PAGE NO	COMMENTS	DISCUSSION
		GENERAL COMMENTS	
1		It is our understanding that a water treatment plant currently exists for purification of the "contaminated" water from the "french drain" at 881 Hillside, operable unit (OU) 1 A major concern at the 881 Hillside was a "plume of dissolved solids" with concentrations exceeding 500 parts per million (ppm) Safe Drinking Water Act (SDWA), the proposed Applicable or Relevant and Appropriate Requirement (ARAR) If the treatment plant for the 881 Hillside "french drain" is capable of deionizing water, then it would appear that this study has no purpose; please clarify the nature of the present water treatment system. Finally, the process of deionizing water with organic resins is not a novel technology, therefore, the purpose of this study is unclear.	The Treatability Study Work Plan (TSWP) is for a non-Operable Unit (OU) specific treatability study The Rocky Flats Final Treatability Study Plan (TSP) has screened oxidation/reduction as a process to be evaluated for the non-OU specific treatability study Oxidation/reduction has not yet been proven as a treatment technology for uranium or plutonium, therefore, the treatability study for oxidation/reduction is appropriate Additionally, organic resins are not, as indicated in the comment, a part of this study
2		Please compare the concentrations of inorganic species to background concentrations. Naturally occurring and common metals species, including iron, manganese, and aluminum, are targeted as "contaminants" that exceed ARARs (e.g., Table A-2, page A-5) These inorganic species should not be compared to regulatory established ARARs, but rather natural background concentrations by an	The metals selected as contaminants of concern must be compared to the proposed ARARs and TBCs, as required by EPA and the Colorado Department of Health.

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2 (continued)		amount that is statistically significant (As noted in specific comment 15, the simple statistical analysis presented in Table A-2 is insufficient to establish background)	
3		Please include a list of mass-balance equations that describe the general outcome of each of the techniques. The work plan presents several different procedures for oxidizing and reducing groundwater and surface water in an attempt to precipitate metal species, including radionuclides. Although the benchscale procedures are presented to a sufficient degree of detail, the chemical theory behind the procedures is totally lacking. For each procedure, the investigator needs to express the reactions that they hope to utilize in the oxidation/reduction, precipitation process. We realize that natural aqueous systems are complex and that it is nearly impossible to write all the possible linearly independent reactions that are anticipated in the benchscale experiments, however, there should be some attempt to describe the outcome of the experiments before they are performed.	Reaction equations are provided in Appendix B of the TSWP

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4		All samples should be filtered prior to analysis The concern is that chemical analysis conducted on the pretreated samples will be performed on unfiltered samples This study should focus on the composition of the water as a homogeneous phase, and should not include analyses of water that contains suspended particles of clay minerals. (From a toxicological point of view, very little of the elemental constituents comprising of the clay particulates are available for uptake in the biological receptor.) It is inconsistent to analyze filtered water samples after the oxidation/reduction process has been performed on the water samples Those analyses that were performed on unfiltered water should be rejected. There is a concern that natural water analyses that appear to contain concentrations of inorganic species that exceed ARARs are merely the result of analyzing unfiltered water samples. For example, surface water samples from Stations 103 (Table A-2, p. 5) have reported concentrations of aluminum (Al) that are ridiculously high; i e , 30 ppm The range of Al concentrations in natural water (dictated by low solubility) is between (0 005 to 1 ppm). The solubility of Al is so low	The TSWP can only use the data that are available. The existing data are sufficient as a basis to design the treatability study. All new water samples will be filtered and analyzed before performing the treatability tests, and the product water will be filtered before analysis

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4 (continued)		low that there is presently little reliable experimental data on the solubility of Al and hydrated Al species in aqueous systems These observations indicate that improper data is being utilized (e g., analyses of unfiltered water). Please clarify and discuss this issue in Appendix A. We suspect that if only filtered water samples are analyzed, then the metals contamination problem will not be as complex as presented in this report.	
5		The screening process for identifying potential treatment technologies is mentioned in Section 4; however, there is no mention of the reason that the oxidation/reduction treatment option was chosen Present a table in the Introduction that lists the analyzed treatment technologies and list the advantages and disadvantages with each technology. This is particularly important since there are commercially available technologies for deionizing and purifying water that are proven to be effective.	The TSP has already performed the screening process that has identified oxidation/reduction as a process to be evaluated further. It is not an objective of this TSWP to repeat the TSP

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6		The protocols should include some contingency plans for investigation of alternate treatment process paths. Considerable freedom to deviate from set experimental tasks is an important component in any testing program The treatment protocol seems to be comprehensive	This TSWP describes screening tests, which have been designed to investigate appropriate alternate treatment paths. No further alternatives or contingencies are needed or recommended
7		Metal species (e g , Al, iron, manganese, cadmium, etc) referred to in the text as contaminants (e g , p. ES-2, para. 3) should simply be referred to as inorganic species It has not been established that these constituents are contaminants No comparisons with geochemical background are presented. Please drop the word contaminants	When the reference is made only to inorganic species, the word contaminant has been changed to inorganic species. When "contaminant" is being used to refer to many contaminants, including organics, the word contaminant has remained
8		In the sampling and Analysis Plan (Appendix A) need subject for this sentence does not contain a discussion of the analytical routine or justification. The only discussion concerning the analytical routine is found under the heading A.4.2 Sample Containers and Preservatives. Table A-9 (p. 22) presents container needs, preservation and holding times for target compounds, and target analytes Table A-10 (p. 23) presents a list of analytical methods and detection limits These are generic lists. Some specification to the particular study is needed to	Section 5 has been expanded to include a discussion on the sampling and analysis procedures to be used in the TSWP Additionally, Table 5-1 has been added; it is a summary table of samples and analyses.

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8 (continued)		justify the inclusion of an analysis plan. What is the value of a plan that does not discuss the analysis	
		Table A-9 lists Contract Laboratory Program (CLP) metals (TAL); Table A-10 lists SW-846 analytical methods. CLP and SW-846 methods differ and should not be considered necessarily the equivalent	Table A-9 lists nine different categories of tests to be performed, including TAL metals, but it does not refer to CLP methods only. The analytical methods listed in Table A-10 will be CLP or non-CLP, whichever level the DQOs require
		SPECIFIC COMMENTS	
1	Section 1 0, p 1, paragraph 1	The scope of the document and of the testing need to be clearly and consistently stated. The statement is made that the purpose of the Treatability Study (TS) Plan was to present technologies that would be applicable at two or more operable units. The next sentence states that the treatability studies are designed to provide information to the individual OUs. These statements are not contradictory, but they do raise a question about the scope of the effort. If the TS is to be OU-specific, then this would expand the scope to looking at individual site problems. If the plan only looked at problems across the site, then potential technologies may be ignored	The TSWP's scope is to evaluate oxidation/reduction technology for site-wide samples and data. Paragraph 1 has been expanded to state that the evaluation will provide the individual OUs additional information to allow them to make technology selections without having to perform individual OU-specific treatability studies

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2	Section 2, p 7, paragraph 2	Inorganic species which exist in the water samples, should not be targeted for study unless it is proven that they are contaminates (sic) It is noted that "arsenic, cadmium, chromium, iron, lead, manganese, and selenium have been detected in two or more OUs " These are naturally occurring inorganic species that can be detected in most natural waters Unless these species were detected at concentrations exceeding natural background, drop them from further consideration	The inorganic species are those that have been targeted by ARARs and TBCs
3	Table 2-2, p 14	A table should be provided that describes the OUs, and a figure showing the geographic location	The boundaries of the OUs have been arbitrarily set, depending on the Individual Hazardous Substance Sites (IHSSs), media, and contaminants.
		Please clarify with a more comprehensive table that cross references sampling locations, OUs, and contaminants of concern This table does not match Tables A-2 or A-5 with regards to OUs or contaminants of concern	Tables A-2 and A-5 each have an addition of the OU in which the sampling sites are located.
4	Section 5 2, p. 2, bullet 3	Please define "commercial scale."	The phrase "implement at a commercial scale" has been replaced by "implement in a full-scale water treatment facility."

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5	Figure 5-2, p 4	Please clarify the use of "priorities" and "other precipitation" Neither of these in the context of the figure or text are clear	The term "priorities" refers to the expected efficiency of the reduction processes. The phrase "other precipitation" refers to additional precipitation that may be required for achieving required metal removal Figure 5-2 now reflects this terminology
6	Section 5 3, p. 9, bullet 3	This procedure should be clarified. Given the small amounts of dissolved material in these samples, observing inches (or centimeters) of advancing liquid solid interface does not appear realistic. It is doubtful that a distinct interface between the liquid and solids can be observed. Please clarify the reference to a liquid/solid interface	This procedure has been changed to visual observation using professional judgement, and if needed, physical measurement of the level of floc
7	Section 5 2, "Task 2," p 10, bullet 1	Provide a description on how the pH will be adjusted	A description of pH adjustment is provided for all the tasks in Task 1, page 9, bullet 5.
8	Section 5 2, "Task 2," bullet 3	Should be the "reaction" described with a mass-balance equation(s).	The reaction equations are provided in Appendix B.
9	Section 5 2, "Task 2," paragraph 10, bullet 6	Please clarify this reference. Most of the parameters listed are already included in the analysis.	This bullet lists the parameters to be analyzed for in the high-dose sample, as opposed to the parameters in the previous bullet for the low- and medium-dose samples

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10	Section 5 3, "Task 6," bullet 1	If possible, further define the different anionic polymers to be tested	Table 6-2 refers to the different ionic polymers to be used in the treatability tests. Water treatment suppliers will provide the expertise for selecting appropriate polymers
11	Table 6-1, p 2	The footnote is inappropriate in this document and should be deleted	The footnote is important for the laboratory performing the treatability study, since the probe is not necessarily a common piece of equipment, and the delay in ordering may affect the startup of the treatability study
12	Section 8 1, p 2	Floc size does not appear to be a "judgement" call Size is a measurable parameter	Floc is a delicate substance, breaking apart easily, making it difficult to measure the size, therefore, determining floc size would probably be a judgment call
13	Section A 1 1, p 2, paragraph 3	How average and above-average were determined should be described	An explanation of "representative" and "above-average" has been added to Section A.1.1. The term "average" is not used in that section
14	Table A-1, p 3	How these chemicals of concern were chosen should be described	The chemicals of concern listed in Table A-1 were selected based upon the concentrations of those constituents exceeding potential ARARs/TBCs in two or more OUs, as stated in the footnote for Table A-1.

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15	Table A-2, p. 5	Please include a discussion of when these analyses were conducted and the trend over time at these locations The values reported for station 103, for Al and iron appear unreasonably high, i e, thermodynamically impossible to have concentration of this dissolved species in groundwater	A discussion of when these analyses were conducted and the trend over time at these locations is outside the scope of the TSWP The TSWP used the available data.
		The statistical analysis presented in this table should be corrected The geometric mean is taken of the concentrations of "metals of concern" from seven locations Concentrations of species that exceed the mean by one standard deviation are then highlighted Comparing the geometric mean with an individual that is a component of the population from which the mean was derived has absolutely no meaning The mean and the distribution around a mean are tools for comparing separate populations. These are not tools for comparing the population from which the mean itself was derived This table and Table A-3 (p. 5) should present the mean, range, and two standard deviations about the mean of the background concentrations (or in the case of Table A-3, the background activity) of the inorganic species. These should be the standard for comparisons, not the mean of the population shown in	The statistical analysis was performed for identifying sampling locations, not for determining absolute values of concentrations above background levels. The TSWP is tasked to describe a treatability study for oxidation/reduction with the available data. This method of selecting sampling locations was determined to be the most appropriate method available with the limited amount of data provided and is deemed sufficient to form a basis for the treatability study Furthermore, the treatability influent samples will be analyzed before initiating the studies. In selecting sampling locations, the primary intent is to select surface water locations that contain constituent concentrations considered typical of surface water expected at the full-scale treatment facility. Hence, we are only concerned with the surface water

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15 (continued)		Table A-2 (or Table A-3) or the ARARs established by the SDWA.	samples within the population of *surface water expected at the full-scale treatment facility* Because we have no flow information relative to each sampling location (and no indication of whether some locations are part of the same tributary), each sampling location is assumed to represent an equal component of our population. Thus, taking the geomentric mean of sampling location means is an appropriate method of estimating the "typical or average composition" of surface water expected at the full-scale treatment facility. Furthermore, selecting an individual sampling location that most closely matches this "typical composition" is not only valid, but practical, in the sense that compositing of surface water from several sampling locations is eliminated.

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16	Section A.1 2, p 13, paragraph 1	Only filtered water samples should be analyzed The taking of unfiltered samples for analyses does not appear correct The objective of this treatability study is to examine the removal of dissolved chemical species from water By analyzing unfiltered samples, both dissolved and suspended solids are analyzed It is appropriate to study only filtered samples	All new water samples will be filtered and analyzed before performing the treatability tests.
		This is also the only reference to chemically analyzing samples prior to the treatability study. This appears to be an important step in the process and should be included in the main report	A discussion on chemically analyzing samples prior to the treatability study has been included in Section 5 4
17	Section A 4 2, p 21, paragraph 2	This paragraph references Table A-9 and A-10 This is the only reference to the analytical parameters in this report. This information should be expanded and moved to a separate section A discussion of the analytical methods is a necessary component of a Sampling and Analysis Plan, information which is lacking in this report	Section 5 describes the sampling and analysis methods in detail Section 4.2.5 describes parameter information, in addition to Tables A-9 and A-10

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18	Table A-9 and Table A-10, p 22 and 23	These two tables do not match. Table A-9 shows chromium, hexavalent, while Table A-10 only shows total chromium. Footnote B, Table A-9, lists more specific radiological tests than those shown on Table A-10 Please provide a specific analytical table for this effort with sufficient description and referencing in the text	An analytical method for hexavalent chromium was added to Table A-10 No radiological tests other than those listed in Table A-10 will be required for the treatability study The footnote in Table A-9 was changed to reflect this.
19	Table A-9, p 22	The text referenced this table as designating CLP and non-CLP parameters of interest. This table does not appear to differentiate between CLP and non-CLP parameters, other than listing metals as TAL. Those parameters that will be analyzed by CLP procedures should be specifically identified. The document does not present a clear discussion of the level of analytical quality required for this study. General statements made in Section 4 2.3 and in the Appendix C–Quality Assurance Addendum suggest that all analytical parameters will be CLP	The text in Section A.4 2, paragraph 2, has been changed to remove the references to CLP and non-CLP.
		Footnote B is unclear. This footnote states that specific analyses will be "defined as some or all of the following..." The text does not address how the decision on which parameters to analyze for will be made This should be specifically stated in the report.	The parameters to be analyzed are described throughout Section 5 and in Table 5 1.

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20	Table A-10, p 23	Some of the procedures listed are not CLP Please clarify the level of data quality in this report and present it consistently throughout	A column has been added to Table A-10 to designate data quality levels
21	Appendix B	This should be a specific plan for this effort It is unclear as to why this is a "Sample Health and Safety Plan" All of the "contaminants" and sample locations have been defined	The laboratory location (onsite or offsite) has not yet been selected, therefore, it is inappropriate to develop a site-specific health and safety plan

FINAL

RESPONSES AND COMMENTS TO THE TREATABILITY STUDY WORK PLAN FOR OXIDATION/REDUCTION PROCESSES AT ROCKY FLATS PLANT

COMMENTS: EPA REGION VIII
(PRC ENVIRONMENTAL MANAGEMENT
WORK ASSIGNMENT NO. C08061
CONTRACT NO. 68-W9-0009)

RESPONSES: CH2M HILL

100118FF DEN

ROCKY FLATS ENVIRONMENTAL RESTORATION PROGRAM
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Document No and Title· PRC Environmental Management–Work Assignment No C08061, Contract No 68-W9-0009

Reviewer Name(s): EPA Region VIII Comments (PRC)

Date: Final–July 24, 1992

REVIEWER'S COMMENTS			RESPONSE
COMMENT NO	SECTION/ PAGE NO	COMMENTS	DISCUSSION
1		**GENERAL COMMENTS** The treatability study work plan for oxidation/ reduction processes is confusing in its organization The work plan describes elements that should be included, however, the descriptions of these elements are not specific to the oxidation/reduction processes to be investigated in the treatability study. The following elements should be described in the work plan as they directly relate to oxidation/ reduction treatability study (1) scope, (2) test objectives, (3) data quality objectives (DQOs), (4) experimental procedures and equipment, (5) data management, (6) analysis of results, (7) regulatory requirements, (8) residuals management, (9) reporting and scheduling, (10) health and safety, and (11) sampling and analysis.	The Treatability Study Work Plan for Oxidation/ Reduction Processes (TSWP) describes only those elements referred to in the Rocky Flats Final Treatability Study Plan (TSP) that are specific to the oxidation/reduction processes to be investigated As much as possible, without knowing more specifics about the laboratory which will be performing the treatability study, the following are described in the TSWP as they relate directly to oxidation/ reduction Introduction (Section 1 0), Objectives (Section 1 1), Data Quality Objectives (DQOs) (Section 4 0), Experiment Design and Procedures and Equipment and Materials (Sections 5 0 and 6 0, respectively), Data Management (Section 7 0), Data Analysis and Interpretation (Section 8 0), Residual Management (Section 9 0), Reports and Schedule (Sections 10 0 and 11.0, respectively), Health and Safety Plan (Appendix C), and Sampling Plan (Appendix A and Section 5) Section 13 0 addresses regulatory requirements for onsite and offsite testing Specific regulatory requirements are not yet known since the location of the treatability study has not been determined A brief discussion of this subject will be provided in a new section entitled "Regulatory Requirements"

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2		The oxidation/reduction treatability study work plan describes several processes to be investigated during this study It is not clear, however, whether the individual processes are considered one test or a set of independent studies that involve similar chemical processes The text should be modified to clarify this distinction	The text has been modified to clarify that the individual processes are a set of independent studies that involve similar chemical processes
3		The Final TSP indicates that each specific treatability study work plan will include a description of test objectives This section should explain technology validation and performance evaluation Technology validation determines whether the specific technology is effective in treating the waste or contaminated media and should be considered further Performance evaluation measures the efficiency of the treatment, the quality of the effluent, or the residual concentrations in the environmental medium The oxidation/reduction processes treatability study work plan does not discuss how the performance of each oxidation/ reduction process will be evaluated. The work plan should discuss the procedure to be followed to evaluate the various treatability study	The TSWP includes a description of test objectives in Section 1 1, Objectives This section has been expanded to describe performance evaluation The technology validation for oxidation/reduction was done during the screening process as described in the TSP, Appendix B 1 Therefore, it will not be addressed in the TSWP

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4		According to the Final TSP, the description of treatability test objectives should include a discussion of reproducibility of the treatment over the expected range of site and waste/media characteristics In addition, this section should describe the reproducibility of results The oxidation/reduction processes treatability study work plan does not include a discussion of reproducibility of the treatment or range of treatment residuals Reproducibility of the treatment and results is important in the evaluation of the performance and should be discussed in the work plan	The TSWP describes the work needed to complete the screening process for oxidation/reduction processes Data Quality Objective Levels III and IV do have reproducibility requirements and are discussed in Section 4 4
5		According the Final TSP, individual treatability study work plans should discuss the regulatory requirements for onsite or offsite treatability testing The oxidation/reduction processes treatability study work plan does not address federal, state, or local regulatory requirements that affect treatability testing on-site or offsite Personnel conducting treatability study should be aware of permitting and operating requirements related to the specific test being performed These regulations should be discussed in the oxidation/reduction processes treatability study work plan	Section 13.0 Regulatory Requirements, was added to the text

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		SPECIFIC COMMENTS	
1	Section 1 0, page 1	This section lists four oxidation/reduction processes to be described in the work plan In addition, Section 5.3 lists the first-priority processes for reduction and oxidation, and describes each under a separate task Section 1 0 lists the three reduction processes to be investigated as (1) sodium bisulfite, (2) stannous chloride, and (3) ferrous sulfate The introduction in Section 5 3 lists (1) sulfite, (2) stannous chloride, and (3) ferrous iron The individual task descriptions and the corresponding figures are labelled as. (1) sodium bisulfite, (2) stannous chloride, and (3) ferrous salt Consistent terminology should be used when discussing these processes The text should be modified to clarify this inconsistency **Rationale:** Consistent use of terminology clarifies the document and enhances its utility	All inconsistencies in wording have been corrected

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2	Section 4 2, Page 3	Section 4 0 describes the three-stage process of establishing the DQOs for the project According to the Final TSP, Stage 2 should stipulate the criteria for determining data adequacy, and select sampling approaches and analytical procedures Section 4 2 does not delineate the criteria for determining data adequacy, nor does it specify approaches for sampling and analysis for the oxidation/reduction processes treatability study Although the sampling approaches and procedures are described on page 9 in Section 4.3 (Stage 3), the work plan also should describe the criteria for determining data adequacy for the test to be conducted **Rationale:** The individual treatability study work plan should include the elements described in the final TSP to provide a consistent and comprehensive description of the processes involved in conducting the studies The criteria for determining data adequacy are important in evaluating treatment technologies	Section 4 2 has been changed to provide the criteria for determining data adequacy and to specify the approach for sampling and analysis for the TSWP

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3	Section 4 2 3, Page 6	Section 4 2 3, and Table 4 1 describe the levels of analytical data quality to be used in treatability study. According the Final TSP, analytical Levels I and II should be used when laboratory screening studies are performed The oxidation/reduction processes treatability study includes only laboratory-scale tests Table 4-1 indicates that analytical Levels III and IV will be used for various parts of the oxidation/reduction study. The inconsistency between the Final TSP and the oxidation/reduction treatability study work plan should be corrected In addition, the Final TSP includes a description of confidence limits associated with each level of analytical data quality An explanation of confidence limits should be included in the oxidation/reduction processes treatability study work plan **Rationale:** The description of analytical levels for laboratory-scale tests should be consistent between the Final TSP and the oxidation/reduction processes treatability study work plan to clarify the levels of analytical data quality required in individual treatability study.	The Final TSP provides suggested DQO levels to be used for laboratory screening tests Level I is not sufficient to provide the more precise screening needed in order to arrive at the best oxidation/ reduction process. The TSWP tests require DQO Levels II, III, and IV to be performed

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4	Section 4 2 4, Page 7	This section of the work plan describes the process for evaluating sampling and analysis options The Final TSP indicates that sampling approaches and analytical procedures will be selected during Stage 2 of the DQO process However, Section 4 2 4 does not describe the specific sampling approach or analytical procedure to be used during the oxidation/reduction processes treatability study Sampling and analysis procedures to be used during the oxidation/ reduction processes treatability study should be described in the work plan **Rationale** The description of the DQO selection process should be consistent with the Final TSP and should be specific to the oxidation/reduction processes treatability study, to provide a complete description of procedures	Section 4 2 4 has been expanded to include a discussion on the sampling and analysis procedures to be used during the TSWP Additionally, Table 5-1 has been added as a summary of samples and analyses
5	Section 4 3, Page 9	Section 4 0 describes the DQOs of the project According to the Final TSP, the methods for obtaining data of acceptable quality and quantity to be incorporated in the Quality Assurance Addendum (QAA) of the treatability study work plan should be elected during Stage 3 of the DQO process However, the process for identifying data quality	The outline in the TSP was followed to the maximum extent practicable Deviations from the outline were required to meet the requirements of this particular TSWP

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5 (continued)	Section 4 3, Page 9	and quantity needs is described in Section 4 2 3 (Stage 2) The oxidation/reduction processes treatability study work plan should be consistent with the outline presented in the Final TSP **Rationale:** The individual treatability study work plans should include the elements described in the Final TSP to provide a consistent and comprehensive description of the processes involved in conducting the studies	
6	Section 5 0, Page 1	This section describes the approach and procedures to be followed in the treatability study According to the Final TSP, the experimental design and procedures section should identify several factors that have not been discussed in the oxidation/reduction processes treatability study work plan. These include the sample locations for use in the study and whether the test will be conducted at an on-site or offsite facility However, Section 5 0 does not discuss either of these factors The locations for collection of contaminated samples are provided in the Sampling and Analysis Plan (Appendix A). Section 5 0 should refer to Appendix A, and a site map and one or more	Section 5 0 will refer to Appendix A for the locations of collected samples A site map will be available at RFP for reference before the sampling begins In addition, it has not yet been determined whether the facility needed will be located onsite or offsite The type of facility needed to perform the treatability study is described in Section 5 0 Cross sections are not included, since this is not a subsurface TWP

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6 (continued)	Section 5 0, Page 1	cross-sections should be included to illustrate the sampling locations The experimental design and procedures section should also indicate the type of facility needed to conduct the study and whether they are on-site or off-site **Rationale:** To provide comprehensive project information, the oxidation/reduction processes treatability study work plan should describe the sample locations for collection of material used in the study, and the facility necessary to perform the test	
7	Section 5 0, Page 1	In addition to the factors listed above, the Final TSP indicates that the individual treatability study work plans will include an explanation of the level of replication required when conducting treatability study The experimental design and procedures section should describe the type and amount of experimental replication required **Rationale:** A certain level of replication in the experimental procedure is required to evaluate the reliability and effectiveness of the process	DQO Levels III and IV do require some replication as described in Section 4 4

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8	Section 5 3, Page 7	According to the Final TSP, the experimental design and procedures section should refer to standard operating procedures (SOPs) for measurements such as pH, electrical conductivity (EC), and oxidation/reduction potential (redox) However, Section 5 3 does not refer to SOPs or provide descriptions of procedures for the measurement of these parameters The detailed task descriptions should describe the measurement of pH, EC, and redox. **Rationale:** The detailed descriptions of experimental procedures should include all information necessary to perform the treatability study to present a complete project discussion	The standard operating procedures to be used for pH, electrical conductivity, and oxidation/reduction potential are the manufacturers' recommendations provided in the equipment instructions This has been noted in the Section 5 3
9	Section 5 3, Tasks 2 through 9	Each of the processes described in Section 5 3 involves allowing solids to settle out of solution However, the precipitates are not listed as being analyzed for the constituents of concern to perform a mass balance for each process In order to evaluate the effectiveness of the treatability study, all products of the treatability study should be analyzed for contaminants of concern before disposal	It is difficult, if not impossible, to perform an accurate mass balance on metal and radionuclide species in the ppm range Initial analyses of the untreated, filtered water samples and final analyses of the treated, filtered water samples are considered sufficient for determining comparative levels of removal efficiencies at the screening stage

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9 (continued)	Section 5 3, Tasks 2 through 9	**Rationale:** Characterization of the wastes produced in a treatability study provides a complete set of data to evaluate the effectiveness of the test	
10	Section 5 3, Task 2, Page 10	Task 2 describes ferrous salt reduction and refers to a flow chart illustrated in Figure 5-4 The first paragraph of the text indicates that 200 milliliter (mL) sample aliquots will be used The flow chart and Step 1 of the text begins by describing three 4-liter (L) samples It is unclear when the 200 mL aliquots will be used The text should be corrected to clarify this inconsistency **Rationale:** The detailed descriptions of experimental procedures should include all steps Furthermore, the introduction should be consistent with both the step-by-step description with the figures illustrating the process flow to avoid confusion when conducting the test	The 200-ml aliquots will be used only for preparation of a redox titration curve No text changes have been made
11	Section 5 3, Task 3, Page 13	As described in Comment 10, the introduction to Task 3 (sodium bisulfite reduction) discusses 200 mL aliquots of sample, while Step 1 and Figure 5-5 indicate that 4 L of sample are used in the initial step of the test The text should be corrected to clarify this inconsistency	Same as Response No 10

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11 (continued)	Section 5 3, Task 3, Page 13	**Rationale:** The detailed descriptions of experimental procedures should include all steps Furthermore, the introduction should be consistent with both the step-by-step description and with the figures illustrating the process flow to avoid confusion when conducting the test	
12	Section 5 3, Task 6, Step 2, Page 20	This step discusses the selection of "the most effective anionic polymer" None of the steps describes how the effectiveness of these polymers will be evaluated The procedures should be modified to describe the evaluation of polymer effectiveness **Rationale:** The detailed descriptions of experimental procedures should include all information necessary to perform the treatability study	The text has been changed to explain that the most effective polymer is the one that has the highest amount and settling rate of floc using visual observation
13	Section 5 3, Task 10, Page 31	This section describes laboratory restoration The procedures listed are general, and do not provide sufficient detail to ensure adequate decontamination of equipment and proper disposal of wastes This section should provide step-by-step instructions for cleaning glassware and equipment, including the solvents or reagents necessary to perform the decontamination, and clearly describe	Task 10 was expanded to provide additional instructions for cleaning glassware and equipment, including the solvents or reagents used and their appropriate collection and disposal Descriptions of procedures or references to procedures were included Section 9 0 also includes waste reagent disposal procedures

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13 (continued)	Section 5 3, Task 10, Page 31	the methods for collecting waste solvents In addition, the work plan should describe the disposal of waste reagents generated during decontamination The text should be amended to include more detailed descriptions of procedures or references to existing procedures, and appropriate disposal should be discussed in the management of residuals section (Section 9 0) **Rationale:** The treatability study work plan should include detailed descriptions of the handling of samples, reagents, and effluents from collection through disposal	
14	Section 8 0, Page 1	According the Final TSP, the analysis of results section of the treatability study work plan should describe how the data will be summarized and evaluated The work plan does not describe how the data generated in the treatability study will be evaluated to determine the effectiveness of the process in removing contaminants of concern The text should be amended to include a discussion on data evaluation and interpretation	Comparisons will be made with ARARs and TBCs as described in Section 8 1

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14 (continued)	Section 8 0, Page 1	**Rationale:** Description of data evaluation should be included in the treatability study work plan to provide a comprehensive procedure for conducting all aspects of the test	
15	Section 8 0, Page 1	This section describes the analysis and interpretation of data collected during the treatability study Section 8 0 references Section 6 7 of the Final TSP, which is a general document and does not contain the necessary information Therefore, Section 8 0 of the treatability study work plan should include details specific to the evaluation of the oxidation/reduction processes treatability study to be performed at RFP **Rationale:** The analysis of results should be specific to the treatability study being conducted	Same as Response No 14
16	Section 8 0, Page 1	According to this section, Appendix C presents a draft of the RFP Quality Assurance Project Plan (QAPjP) Appendix C is a Quality Assurance Addendum (QAA) to the QAPjP The text should be corrected to refer to the appropriate document	Appendix C is an addendum to the QAPjP. The wording has been corrected in Section 8

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16 (continued)	Section 8 0, Page 1	**Rationale:** References to sitewide documents and appendices should be accurate to enhance the utility of the document	
17	Section 9 0, Page 1	This section describes the management of wastes generated during treatability testing According to the Final TSP, this section should discuss the disposal of used, expendable containers and contaminated protective clothing, neither of which is described in the treatability study work plan In addition, the residuals management section should explain how wastes and residuals will be analyzed to determine whether they are hazardous wastes or contain hazardous substances The text should be amended to address these subjects **Rationale:** To dispose of treatability study wastes and residuals appropriately, the products of the test should be characterized before disposal and all contaminated equipment and containers should be identified	Since all residuals are required to return to RFP, the methodology presented in Section 9 is sufficient

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18	Section 9 0, Page 1, Paragraph 1	This paragraph describes the storage of liquid and solid wastes generated during treatability testing According to the second sentence, "solid residues will be sorted in 1-gallon resealable DOT (Department of Transportation) metal containers " The last sentence of the paragraph indicates that "solid waste will fill three 55-gallon drums " These statements are conflicting The test should be corrected to indicate the appropriate containers for solid waste storage **Rationale:** Consistent descriptions of solid waste storage containers presented in the text of the treatability study work plan will prevent confusion and enhance the utility of the document	The last sentence has been changed to "the amount of solid waste will be approximately 150 gallons by volume "
19	Appendix B	Appendix B presents a sample health and safety plan According to the Final TSP, individual treatability study work plans should include a project specific health and safety plan The health and safety plan included is an example, and not specific to the oxidation/reduction treatability study. The plan should discuss the hazards associated with the specific treatability tests to be conducted	Since the laboratory or the laboratory location has not yet been selected, a project specific health and safety plan is not appropriate

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19 (continued)	Appendix B	**Rationale:** A project health and safety plan should address the specific hazards associated with the project at hand It may reference a sitewide health and safety plan, but may also amend the sitewide plan for the specific activities to be conducted	