

Rocky Mountain Universities Consortium

FINAL REPORT

**An Independent Review
of the Documents**

COMPREHENSIVE TREATMENT AND MANAGEMENT PLAN

**and
DRAFT CTMP SOURCE DOCUMENT**

Prepared for:
EG&G ROCKY FLATS, INC.
CTMP Group
Tim McKeown, Manager

Prepared by:
The Rocky Mountain Universities Consortium
for
Environmental Restoration

attention:
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**DOCUMENT CLASSIFICATION
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The Rocky Mountain Universities Consortium was formed to provide Independent Review and Assessment of environmental restoration efforts. It is comprised of universities from several Western states. Reviews are conducted independently by selected teams of faculty and research staff.

A current list of Consortium reviewers is available on written request from the Consortium office.

The Consortium Operating Committee approved issuance of this Final Report on September 24, 1992.

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EXECUTIVE SUMMARY

An independent review of the Comprehensive Treatment and Management Plan, which was prepared by the CTMP Group of the DOE Rocky Flats Plant, has been conducted. The review team was made up of faculty members from two of the member Universities of the Rocky Mountain Universities Consortium. The team recognized that the plan and its associated Draft Source Document were a massive undertaking prepared under difficult conditions. These conditions included a changing mission for the plant, complex regulatory requirements, and uncertainty in many of the essential assumptions, in particular the availability of suitable waste storage sites and the readiness of technologies for treatment, storage, transportation and disposal of wastes.

The review team assessed that the plan has a basically sound structure, but with a number of shortfalls which are identified in this review document.

Recommendations include:

1. The plan is structured with optional paths to achieve the objectives. The approach is intended to allow flexibility as conditions change. The review team considers this to be a sound approach and recommends that RFP persist with and improve the multiple path approach as appropriate. Details should be added to clarify the relationships between the paths and the decision process by which one path or another will be selected. It is important to clarify that the plan is intended to be flexible and that it should be used in a flexible way.
2. Path C of the multiple plan is referenced as the baseline path. In the opinion of the review team, the baseline path is appropriate because it uses thermal processing as the primary technology. The team recognizes that thermal processing is unpopular in many sectors, but considers this technology to be a very good choice which can be made to work in an acceptable way with diligence.

The review team recommends that this baseline path continue to use thermal processing. The report documents need to make clear that the baseline path is the path that will be followed unless constraints require changing to another path.

3. In the opinion of the review team, the role and importance of properly storing and managing wastes on the site needs to receive more attention in the plan. The team recognizes that the ultimate objective is to eliminate the wastes. However, it seems apparent that the wastes will be present at the plant site for some time. Thus, management of whatever wastes remain at the site should have a high profile in the plan.

The team recommends that the CTMP group should elevate the importance of storing and properly managing wastes on-site while criteria for treating and disposing of wastes become better defined.

4. The review team was asked to comment on two documents: a) the version of the plan that was submitted to EPA, and b) the Source Document which provides much of the background for the plan.

The team recommends that the Source Document should be edited, condensed, completed and published as a supplement to the CTMP. Comments and recommendations for changes and improvements are contained in this report.

5. The review team is seriously disturbed that supercompacting has been proposed for transuranic mixed waste and appears as part of the contingency plan for low level mixed waste. The concern is that post-supercompaction treatment of wastes may become necessary due to conditions not now anticipated and that supercompaction will have significantly increased the cost and technical difficulty of the treatment required. There may have been good technical reasons for the decision to include supercompaction, but the documents do not make them convincingly clear.

The review team recommends that supercompaction be eliminated from the plan.

6. The review team found that a number of the basic assumptions of the plan are unfounded. The one of greatest concern is that certain regulations would not change. The review team is aware that regulations will change.

The review team recommends that the plan should be modified to assume that regulations will change and should add a tracking system that will help anticipate specific changes.

7. The review team examined the procedures discussed in the CTMP and its Source Document which were used for assessing and ranking various treatment technologies. The team found the procedures were inconsistently applied and this led to contradictory results.

The review team recommends that the technology assessment process should be reconsidered and revised, moving toward reliance on detailed technical comparisons and sound engineering judgement, duly communicated and examined by all parties.

8. The review team commented heavily on the need to clearly describe the assumptions of the plan and to include a structure of contingencies in case the assumptions prove to be invalid. The plan does include such a structure which the team considers would be an asset.

The team recommends that this component of the plan be strengthened to include a section evaluating the validity of the assumptions. Improvements in the assumption and contingency structure are recommended. It is also recommended that the baseline path be based upon the most valid assumptions.

The review report consists of a summary section, which integrates the comments and input of the review team members, and a reviewer comment section containing the detailed comments of each of the individual team members. The summary and the detailed comments provide additional discussion concerning the recommendations presented here and address additional issues such as waste minimization, transportation concerns, consistency between financial and other resources required to achieve compliance, consistency with the National DOE waste management plan, and other issues.

SCOPE AND PROCEDURE FOR REVIEW

In late March, 1992, the review team was formed consisting of five faculty members from two consortium Universities. The faculty areas of expertise included Nuclear Engineering, Environmental Engineering, Mechanical Engineering, Civil Engineering. Technical specialties included combustion, mechanical systems, hazardous waste treatment, nuclear and radiation processes, and groundwater contaminant transport and a wide spectrum of teaching, research and practical experience was represented on the team.

In early April, members of the team participated in a one-day set of presentations by the EG&G Principal Investigators for the waste treatment technology areas. These Principal Investigators are involved in assessing the numerous waste treatment technologies which are under consideration for use at the RFP. An in-depth technical discussion was part of this activity. At this time the team also met with the EG&G CTMP group to clarify the scope of the review to be conducted. At this time the team was increased in size to include expertise in Environmental Law and Regulations.

The team undertook review of the March and April, 1992 drafts of the CTMP and Technical Supplement documents and submitted numbered comments on April 24, 1992. These comments are included in this report for completeness.

In late June, 1992, the team again met with the CTMP group at RFP to discuss the current status of the CTMP. At this time the CTMP Report dated June 9, 1992 had been submitted in final form to the EPA on June 10, 1992. The team had received this report and provided verbal comment and engaged in discussions with the CTMP group concerning the report. The CTMP group asked that the team review not only the final CTMP Report, but also a draft of a Source Document which is a potential companion report to the CTMP Report. The team was expanded to a total of seven adding further faculty expertise in Nuclear Engineering and further experience with hazardous waste management.

In conducting the review, the team has examined nearly 1000 pages of documentation and in addition has had at its disposal the following documents:

- FFCA Agreement, May, 91
- EPA Comments, June, 91
- Compliance Order, Revised Inventory Report, July, 1990
- Compliance Order, LDR Determination, March, 1990
- Treatment Report No. 1, Dec. 1989.
- Treatment Report No. 2, May, 1990.
- Treatment Plan No. 1, March, 1990.
- Treatment Plan No. 2, August 1990.

In late September, this draft will be acted upon by the Operating Committee of the Rocky Mountain Universities Consortium. If approved by the Operating Committee the final report will be available in the Consortium library.

BASIS OF REVIEW

The Comprehensive Treatment and Management Plan (CTMP), dated June 9, 1992, was submitted by DOE to EPA on June 10, 1992 in accordance with requirements of the Federal Facility Compliance Agreement II for the Rocky Flats Plant (RFP). The Draft CTMP Source Document also dated June 9, 1992 is to date a document internal to RFP. The CTMP document is approximately 125 pages in length and presents a summary of the RFP plans for treatment and management of transuranic mixed wastes and low level mixed wastes. The Draft Source Document follows the same outline as does the CTMP document, but it incorporates more detail on the topics discussed in the CTMP. The Draft Source Document is several hundred pages in length and contains several very large appendices. Also contained in the source document is a discussion of the cost analysis that has been conducted, but is not included in the CTMP.

GENERAL COMMENTS

This section of the review provides general comments based upon the individual reviewer comments and discussion within the review team. In later sections of the review, evaluative comments and recommendations will be presented.

The process of developing a plan for the treatment and management of wastes at the RFP is a massive undertaking, very broad in scope and very complex. There are a large number of waste forms and streams which have been identified, some 54 in number. There are also some 46 possible waste treatment technology types which have been identified and assessed for applicability. Some of these treatment technologies are very controversial especially when considered by the public and some are practically available for use while others are not.

In the past nine months, the RFP has undergone a stated change in mission which is clear in overall intent and direction, but which remains unclear in terms of detail. This change has added extra uncertainties to the process of developing a plan that has served to make the job more difficult than it would otherwise have been. For example, there is a large backlog of waste forms accumulated from past activities at the RFP and there is a certainty that the generation of some of these waste forms will continue and that because of the change in mission, some new waste forms are likely to be generated. The type and rates at which these will be generated are very important to the planning, but because of uncertainties introduced by the mission change are difficult to predict.

Preparation of this plan has been a large effort on the part of the RFP CTMP group in the opinion of the review team and it has been conducted in a difficult environment of changing attitudes and directions within DOE and the Federal Leadership as the deadline to present the plan approached.

The complexity of the plan is driven in part by the many requirements and expectations that such a plan must meet in order to be ultimately successful. In the opinion of the Review Team these requirements include at least the following items:

- a. The plan should drive toward compliance with regulations applied by multiple agencies including at least EPA, CDH, DOE, DOT, DOD, additional state, municipal and local regulations and requirements to include orders by Governors of individual states.
- b. The plan should account for uncertainties in the futures of changing regulations, the details of future plans for the RFP, and the future of waste disposal facilities including the WIPP and the NTS, as well as other sites in the DOE complex.
- c. The plan should recognize and address the concerns of the public and the plant workers. Long term public safety must be of paramount concern, but it must be protected in concert with the realities of proceeding to address the problem.
- d. The plan should be technically sound, practical, achievable, and based upon sound knowledge of the technologies involved.
- e. The plan should be consistent with resources including financial resources, natural resources such as water, and including trained staff with appropriate expertise including technical, managerial and communication skills, and physical facilities including waste storage space.
- f. The plan should take into consideration the development of details of National DOE plans for waste management and restoration of the DOE complex sites.

Developing a plan to satisfy such a broad set of requirements and moving targets is a complex, difficult and demanding task. The CTMP group at the RFP has made a significant effort to address this task. The following sections provide evaluation of the degree to which the requirements have been satisfied in the opinion of the review team.

OVERALL EVALUATION

The CTMP group has constructed a multiple path approach to addressing the waste issues. The approach allows modification of the technical approaches to particular waste forms or streams as time goes on. Such modification would become appropriate as technologies are developed, or as improvements to available technologies change the assessments of their usability. Such modifications would become appropriate to accommodate changing regulations and changes in the underlying assumptions of the plan such as availability of waste disposal sites. The review team feels that this general approach is technically sound.

The large amount of work that has been done on assessing the current backlog of waste forms and streams existing at the RFP is an important accomplishment. The assessment of the extent and nature of the mixed waste treatment and disposal problem has been done well.

The identification of the available and developing treatment technologies has been done well with appropriate breadth and depth. While an extensive effort has been expended on identifying the available or potentially available technologies and their relative advantages and disadvantages, the review team feels that an improved approach to developing the rationale for selection of technologies is needed. Approaches based upon applying sound judgement in the context of the requirements of the problem would be superior to what has been presented in the CTMP document.

The fact that the conditions and constraints under which the CTMP must operate are uncertain and will change has been recognized and has been built into the plan in general terms. However, the review team feels that the ability of the planned approach to actually address the changing conditions needs to be made clear at a more detailed level.

An extensive effort on the discussion of the regulatory drivers and generic road maps has been included. However, much of this appears in the source document rather than in the main CTMP document. The review team feels that the main document would be improved if it gave more emphasis to references to the Regulatory sections of the source document.

The CTMP documents both need improvement in clarity in order to become effective communication documents. There are inconsistencies in the details between different sections of the documents which make them difficult to follow and understand. These are discussed by the reviewers in their individual comments. For example, the executive summary leaves the impression that the multiple path plan is a four path plan. It fails to make clear that there are in fact six paths in the plan, four for the low level mixed waste and two for the transuranic mixed waste.

The multiple path plan is appropriate as discussed earlier, but in the opinion of the review team, the plan should be presented as a six path plan (Paths A through F). In the opinion of the review team, bringing the RFP wastes into compliance is a difficult problem with changing targets, but it can be solved. It will take the continued cooperation of all parties involved and it will have to recognize the disadvantages of moving the wastes around before treatment or at various stages of treatment before it is clear that such moving of wastes can be done in

compliance with public and state concerns and regulations. This means that direct addressing of the issue of adequate on-site storage capacity should have a high profile in the plan.

The multiple path plan includes one path (path C) which is the baseline path. The opinion of the review team is that the baseline path should be the path that will be followed unless events and constraints make it better to follow another of the identified paths. The CTMP document does not make clear to the review team the meaning and intent of the "baseline" path. If the team interpretation of the meaning is accepted, the team concurs with the selection of the baseline path as has been proposed by the CTMP. There is a need in the discussion of the multiple path plan to more clearly state the details of schedules, sequencing and the logic of moving between paths. There is also the need to make a concise definition of the word "baseline" and to be consistent in the plan with the use of the word. The team feels that the definition varies in the plan to the detriment of the plan.

The review team is concerned that the title of Section 4: "Regulatory Site Acceptance Criteria Requirements for Achieving LDR Compliance" and the discussion of this section do not correlate well and may lead to confusion about LDR compliance. The point that LDR apply to Transuranic Mixed waste unless a place such as WIPP becomes available is lost in the discussion. Further, there are helpful tables in the source document such as Table 4.2 that really should be in the main CTMP document.

Section 6 is a matter of concern to the review team because it is complicated and members of the team found inconsistencies in the details of this section. For example, it appears that treatment technologies eliminated from consideration at one stage are back in consideration at a later stage. Specific reviewer comments address points such as this. Secondly, the team is concerned about the technology screening processes presented. There is discussion explaining that process modelling was used in some situations, but that it is not currently applicable universally. There is discussion of a technology ranking system that in its first step eliminates technologies that do not have permits, operating units or demonstration units. The review team is concerned that this approach prematurely forces out options that might be realistic if examined more deeply. There is also discussion in the source document of a formula driven system for ranking technologies. The review team has little confidence in this type of ranking system. The interaction between these different systems in the CTMP is unclear to the review team and this needs to be clarified.

The review team favors a technology selection approach that is based upon detailed technical evaluation and comparison between options including considerations such as cost, amount and type of secondary waste and the required treatment thereof, waste minimization, whether the technology is proven and alpha-qualified.

Decisions about selection should be made based upon sound engineering judgement in the presence of the full detailed technical evaluation information. Tables F-1 and F-2 of the source document provide information on the technologies and their relative advantages and disadvantages. The review team feels that the discussion of the analysis of this information in the context of the treatment requirements and the arguments for or against selecting technologies and alternative technologies is a missing element in the CTMP that should be present.

The review team commented heavily in earlier discussions about the need to clearly describe the assumptions of the CTMP and to include a structure of contingencies in case the assumptions prove to be invalid. The team is pleased to see the presence of the assumption and contingency structure in the CTMP. The team feels that such a structure should be carefully done and updated regularly as the constraints and conditions under which the CTMP is being executed change as they certainly will do. The assumptions appear in Section 2.3 of the document and they appear in part again in Section 8.0 of the document. The lists of assumptions in both places are not the same, but they should be. In general, all of the assumptions in Section 2.3 should be included in Section 8.0 and the contingency paths for each should be included. Section 2.3 should be reexamined to assure that all of the appropriate assumptions are indeed included and that reference to the assumptions is consistent throughout the document and throughout the plan. Further, the review team feels that an assessment of the validity of the assumptions should be included in the discussion of assumptions and contingencies. The "baseline" plan should be demonstrably based upon the most valid assumptions if possible.

In the opinion of the review team, it is not appropriate to assume that applicable regulations will not change as has been done in the plan. Rather it is appropriate that the plan recognize the more or less continuous evolution of regulations and have the capability to adjust to changes. The plan should include a continuous updating and early warning system in relationship to changing regulations in much the same way as changing and updating of treatment technologies are recognized in the plan. For example, the team found insufficient discussion of air quality concerns in the CTMP. These will certainly play a role in any potential use of incineration technology and the team is aware of impending changes in these regulations. The review team feels that it is appropriate for the DOE and RFP to undertake a proactive approach to the developing regulations.

Assumptions concerning the DOE National plan should be included in the assumption/contingency structure and should recognize that the plan will develop over time and will impact the ability of the RFP to execute the CTMP.

There should be a component in the assumptions concerning risk assessment. Failing that, there should be a discussion of why risk assessment is not present.

The assumptions should recognize that Waste Minimization is present in the plan, but it should be strongly emphasized and the impacts that it can bring should be analyzed and included.

The team has serious concern about the proposed use of supercompacting for TRM and its appearance in the contingency plan for LLM wastes. In the opinion of the review team, supercompacting should not be used. It appears to the team that the projections of waste to be generated in the future are of such size that supercompaction of TRM waste is needed to keep the volume within constraints for the anticipated time schedule. We think this is an incorrect outcome over all. The use of supercompaction indeed reduces volume, but should not be used because it increases probability that the final steps ultimately required to treat or transport the waste will be more complex than if compaction is not used. In particular, if supercompaction is conducted, there may be characterization requirements for transportation that will be made more difficult and costly by the supercompaction. The team feels this to be a risk which should not be taken. It would be better if the parties involved could negotiate easing of the volume

restrictions on stored waste and concentrate on having adequate and acceptable ways to manage existing and accumulating wastes on-site until disposal options are more clear.

The team recognizes that cost analysis is addressed in the Source document but not in the CTMP. The team agrees that the Life Cycle Cost approach to cost analysis is appropriate, however, the critical section, Section K on cost analysis is missing in the Source document. It is notable that the range of costs is estimated at \$0.5 to \$1.2 billion and that aspects such as storage, handling, transportation and final disposal of TRM are not included in the costs.

The review team feels that it is important to emphasize the proper sequential steps in dealing with waste disposal problems. These steps are: Characterize, Treat, Dispose. The importance of waste characterization cannot be overemphasized in the opinion of the review team and this importance is correctly recognized in the CTMP. The team feels that the phased approach to characterization proposed is appropriate, however there are difficult problems in characterization yet to be solved. Problems such as inhomogeneous wastes in single containers and how to address incorrectly labelled or misplaced containers are very difficult and may only be solvable by physical disassembly of containers including the problems that go with that approach. The best way to deal with this problem will take some serious effort to resolve, but resolutions must be reached.

In the following, the review team provides evaluation of the CTMP in terms of the requirements for such a plan discussed in the General Comments section of this report:

- a. Driving toward compliance: The review team believes that implementation of the CTMP can achieve this through its basic multi-path structure. It will be necessary that the shortcomings identified be addressed.
- b. Uncertainties: The CTMP needs to be modified to address uncertainties.
- c. Public and worker concern: The CTMP recognizes these concerns, but more work is needed to assure that the plan addresses them.
- d. Technical soundness: The review team feels that more detail is needed for the CTMP to be convincing in this regard.
- e. Resource consistency: The review team feels that this is not yet clear. The financial and other resources must be made available to do the job right, but the parties involved should agree on what constitutes doing the job right.
- f. Consistency with National DOE Plan: The review team feels that this also is not yet clear mainly because the National DOE plan is not clear.

RECOMMENDATIONS

The review team presents the following recommendations:

1. The CTMP is structured in multiple paths which are intended to allow flexibility of approach in the presence of changing conditions as time progresses. The review team considers this to be a sound approach and recommends that RFP persist with and appropriately improve the multiple path approach. Details should be added to clarify the relationships between the paths and the decision process by which one path or another will be selected. It is important to clarify that the plan is intended to be flexible and that it should be used in a flexible way.
2. Path C of the multiple path plan is referenced as the baseline path. In the opinion of the review team this is an appropriate baseline path, because it is based upon thermal processing as the primary technology. The team recognizes that thermal processing technology is unpopular in many sectors, but the team considers this technology to be a very good choice technically and one which can be made to work in an acceptable way with appropriate diligence.

The review team recommends that path C, which includes thermal processing, be maintained as the baseline path. The report documents need improvement to make clear that baseline path means the principal path that will be followed unless conditions require changing to another path.

3. In the opinion of the review team, the role and importance of properly storing and managing wastes on-site needs to receive more attention in the plan. The team recognizes that the objective is to eliminate the wastes, but it seems clear that the wastes will be present at RFP for some time. The on-site management of such wastes as remain at the site should have a high profile in the CTMP. The team recommends that the CTMP group should elevate the importance of the need to store and properly manage wastes on-site while conditions for treatment and disposal of wastes become more clear.
4. The review team was asked to comment on two documents, the CTMP that was submitted to EPA and the Source Document which provides much of the background for the CTMP. The team recommends that the Source Document should be edited, condensed, completed and published as a supplement to the CTMP. Comments and recommendations for changes and improvements are contained in this report.
5. The review team has serious concern about the proposed use of supercompacting for transuranic mixed waste and the fact that supercompacting appears as part of the contingency plan for low level mixed waste. The review team is concerned that post-supercompaction treatment of wastes may become necessary due to conditions not now anticipated and that supercompaction will have significantly increased the cost and technical difficulty of the treatment required. There may have been good technical reasons for the decision to include supercompaction, but the documents do not make

them convincingly clear. The review team recommends that supercompaction be eliminated from the CTMP.

6. The review team found that a number of the basic assumptions of the CTMP are unfounded. The one of greatest concern to the team in this regard is the assumption that certain regulations will not change. The review team is aware that regulations will change and hold the opinion that the CTMP should have a structure that recognizes and anticipates such change in a proactive way. The review team recommends that the CTMP should be modified to assume that regulations will change and add an observation system that will allow anticipation of specific changes.
7. The review team examined the processes discussed in the CTMP and the Source Document which were used for assessing and ranking various treatment technologies. The team found the processes to be inconsistently applied and in some cases leading to contradictory results. The review team recommends that the technology assessment process should be reconsidered and revised, moving toward reliance on detailed technical comparisons and sound engineering judgement, duly communicated and examined by all parties.
8. The review team commented heavily on the need to clearly describe the assumptions of the CTMP and to include a structure of contingencies in case the assumptions prove to be invalid. The CTMP does include such a structure which the team considers to be an asset. The team recommends that this component of the CTMP be strengthened to include a section evaluating the validity of the assumptions. Improvements in the assumption/contingency structure are recommended and it is recommended that the baseline path be based upon the most valid assumptions.

COMMENTS ON JUNE 9, 1992 DOCUMENTS

Reviewer A Comments

Summary Comments

The task of developing a plan for managing both existing and future mixed wastes generated at RFP, given the variety of waste forms, the technological difficulties and regulatory requirements, and the fact that RFP has gone from a production mode to a stand-down mode of operation during the period of time that the plan was being constructed, certainly must be appreciated as an extremely difficult undertaking. Moreover, the CTMP in its submitted form represents the merger and editing of earlier documents, studies, and forms of the plan. It is evident that a great deal of effort was expended in assessing the type of waste to be treated, the technology available to treat them, and the systems necessary for their treatment and disposal. Unfortunately, the final form of the CTMP reflects the fact that the challenges made were not completely answered. The CTMP has weaknesses in its presentation as well as in its substantive and technical aspects. The presentational problems seem to stem largely from an inadequate integration of earlier forms of the CTMP and related documents into the structural form of the plan. In particular the flexible, multi-path plan presented early in the document as the foundation of the CTMP, is not always well articulated in the more detailed plans which follow. This later material is frequently based on a more restricted on-site treatment plan which was developed earlier. In addition, the streamlining process which reduced the CTMP Source Document to the condensed version of the CTMP that was finally submitted, though generally carried out effectively, sometimes wielded the editorial axe too enthusiastically and sometimes not enthusiastically enough. Some of the Source Document material is extremely useful in understanding and justifying the CTMP and should have been retained. This is particularly true of a few of the appendices. The plan itself (as opposed to its presentation) also suffers from organizational problems which may erect technical barriers to its effective implementation. In addition there are other technical aspects of the plan, particularly as related to technology selection and implementation which are not adequately justified.

To conclude this brief introductory summary I would like to give a frank appraisal of the overall quality of this CTMP. As an assessment of the current nature and extent of the mixed waste disposal problem at RFP it is very good indeed. As a general structure to operate within while defining the necessary specific quantitative aspects of the future waste disposal problem and at the same time defining and implementing complete technological solutions it is also quite good. As a comprehensive, detailed document for waste treatment and management including realistic milestones for specific accomplishments it is, however, quixotic. It is not reasonable to blame RFP or the CTMP team solely for this. Rather, it seems unrealistic given the technological and regulatory difficulties and uncertainties involved, to even expect or require such a completely detailed plan. Indeed, a flexible assessment, planning and strategy document which can be updated and specified on a regulated schedule may be the only realistic possibility at this time.

Specific Comments

In what follows, critical evaluations of several aspects of the CTMP are given. In each of these an evaluation without reference to the CTMP Source Document is given first. This is followed by statements indicating how inclusion of Source Document material might affect the evaluation. The comments are organized generally by CTMP report section and subsection titles.

Identification of RFP LDR Waste Forms

This aspect of the plan is generally quite strong. Tables 3.1 and 3.2 are excellent and give quickly a good picture of the backlogged waste forms and those that are currently being generated. The number of waste forms that have been verified by analytical characterization is relatively small (about 20%) though from the text the reader can be left with the impression that more analysis has been done: "several have been verified." Much more disturbing is the lack of any kind of quantitative estimate of the quantity and type of LDR wastes that will be generated in the ER process and in residue processing activities. Even a very rough estimate would be important, say as a percentage of the backlogged waste. Without such an estimate the possibility of ER and residue processing wastes distorting or destroying aspects of the plan such as storage or treatment system capacities is hard to assess. The plan intimates that the waste generated in these activities could "severely affect" the plan, but no estimate is really made.

Source Document Additions

I found Appendix A of the Source Document to be an excellent source of information, not only given the detailed identification of the mixed waste forms but also tracing their generation point, where they are being stored now, and their current compliance status. This information is valuable and should be readily available to an interested reader of the CTMP.

Options for Compliance

This part of the plan which sets forth the possible paths for compliance for both LLM and TRM is generally good. In Figure 5.1 however, the overall flow chart seems to indicate an either/or determination for paths B,C,D. Indeed a decision box indicates that if one option is selected the parallel paths will be dropped. This eliminates the possibility of treating part of a particular RFP waste stream on-site and part off-site or treating off-site for a certain period of time and then treating on-site. These seem to be options that may be either necessary or more effective in certain cases. Also unclear in this part of the plan is the relative timing among the four treatment options for LLM RFP waste. When will the Path B option be evaluated, how long will it take, what is the time scale relative to Path C and D, etc.? This lack of any time scale for the potential decisions or interactions makes it difficult to see how the plan would be implemented and how reasonable choices among the options would be made.

The baseline path (C) is comprised of six treatment systems. It is not clear that these systems have the flexibility to include waste forms generated in ER and residue processing activities. Also, basing the baseline path on treatment systems rather than waste forms make interactions between Path C and Paths B and D difficult. That is, if RFP is moving along Path C and an effective treatment option for part of the wastes handled by one of the treatment systems at RFP

becomes available at low cost off-site, how would RFP respond? Would not the treatment systems be under utilized or cost ineffective if part of its feed were switched to another facility? The point is, it would seem that the DOE complex option (Option B) would be technology and waste form specific while Path C is treatment system specific. I believe that more flexibility and interactions among the possible options would be advantageous.

Source Document Additions -- none of significance

Strategy for Compliance -- Overall

A presentational problem exists first of all. After defining the options for compliance in the previous section of the plan, the strategy for compliance section apparently abandons this structure. Paths A, B, C, D are no longer mentioned, though I believe this section could be recast in terms of them in a straightforward way. As mentioned earlier this problem is undoubtedly due to combining earlier forms of the plan.

Strategy for Compliance -- Waste Characterization

The importance of this aspect of the plan to the success of the CTMP can hardly be overemphasized. The phased approach to characterization outlined in Figure 6.1 seems sound. However, the exact limitations placed on WC by RFP laboratory facilities, the exact mix between on-site and off-site characterizations and the magnitude of the problem are all addressed in a relatively vague way. Since waste characterization is essential regardless of the compliance option path used, a more in depth assessment of the scope of the problem and more detail about its execution seem necessary. Beyond this, the discussion given and the analytical plan itself seems to be limited to existing LLM waste forms. The size of the analytical problem caused by ER type activities is not assessed, nor is a specific plan presented.

Source Document Additions

A great deal of detailed work on the sampling and WC problem has been done and is reported in Appendices C, E, L. These appendices are, however, somewhat disorganized or dedicated to describing a very specific part of the WC problem (particularly Appendix E). It does seem that significant data on the size of the sampling problem and its cost can be gleaned from these and should be summarized in the CTMP. WC costs were also addressed in Section 9 of the Source Document (not present in the CTMP), and I found the numbers given useful in getting an idea of the scope and magnitude of the problem.

Strategy for Compliance -- Evaluation of Off-site TSD Options (Path B)

The relationship between the RFP independent assessment of DOE treatment facilities and the DOE funded assessment effort at INEL described prominently in Section 5 of the CTMP is not made clear, in fact is ignored as far as I can tell. There should be a relationship. Efforts in the area should not be duplicated. The description of the RFP evaluation is confusing. Specifically, Figure 6.2 seems to have a time line that does not correspond to reality. If it is accurate then the results of Phase 2 should have been available and reported in the CTMP and a preliminary categorization of RFP waste streams into Category 1 and 2 should be reported. The future voice

used for Phase 2 activities is also, then, inappropriate. Figure 6.2 is useful and positive (matches are identified between off-site treatment and RFP waste streams) but 6.3 is negative and superfluous.

Source Document Additions

A long narrative description of DOE TSD facilities is given. I found this useful reference material. Though not of sufficient interest to appear in the main body of the CTMP, it might well serve as a useful appendix to it. (pages 6-42-6-64 in Source Document)

Strategy for Compliance -- Selection of New Treatment Systems (Path C)

The lack of correspondence with the multiple path format of Section 5 is particularly noticeable here. The selection process should be located relative to the flow diagrams of Section 5. Overall this part of the plan is poorly presented and has weaknesses. The waste categories presented are close to, but do not form an exact match with the 6 treatment systems defined earlier. Why not? Process modeling is presented as a general decision making technique. It seemed to me that it was only used and only applicable to RFP to the Building 374/774 treatment system. I found the technology ranking exercise to be a complete failure. As mentioned in the CTMP, results of the ranking exercises were inconclusive and disparate. Why include this? It may be that a substantial effort was expended but it was inconclusive and not useful. The CTMP is after all a plan, not a progress report, and it is not necessary to document false steps.

The screening procedure actually used with its 3 levels of filtering seems quite arbitrary. Certainly, having the most coarse screen be whether or not a permitted, operating or demonstration unit is in place, tends to eliminate any new technology; this is not really desirable. The complete screening system is heavily biased toward existing technologies for mixed waste. This does not necessarily satisfy long range goals of low costs and waste minimization, for example. Also, this screening procedure though apparently adopted is not uniformly applied. For example in Table 6.5, alkaline chlorination appears as a non-thermal option even though it is screened out in Figure 6.4.

The concept of waste treatment systems is well defined, defended and presented. As mentioned earlier it does, however, limit interaction with other treatment option paths (B and D).

The section "Discussion of Seven Treatment Plans from Treatment Plans 1 and 2" is clearly a cut and paste job from earlier work. Nevertheless it does give good descriptions of the seven (or 6 in the final CTMP) treatment systems. There are a few inconsistencies. For example, the "logic diagram" mentioned in the Thermal Treatment Option is not presented in the CTMP (though it is in the Source Document). The treatment systems seem well thought out and the technologies relatively straightforward. The problems of the solvent contaminated waste treatment system seem severe, however. On the one hand FBU and CAI face probable permitting difficulties and public acceptance problems, on the other hand, non-thermal options are generally unproven, can handle only small process volumes, and probably face much longer (CTMP estimate is 6 years) implementation periods. In view of this, interaction with Paths B and D to integrate a DOE solution instead of an on-site treatment system seems more appropriate.

Source Document Additions

A great deal of space in both the body and appendices is devoted to technology ranking and selection (Appendices F, G, H). As mentioned above, this material is not really germane to the CTMP in its submitted form and is correctly left out. This is not true however for the logic diagrams of the Source Document for the several waste treatment systems (Figures 6.7, 6.8 ...). These are useful in understanding the treatment systems and could be a good addition to the CTMP. The same is true for the flow diagrams presented in Appendix I. These should be available to a serious reader of the CTMP.

Strategy for Compliance -- Storage Strategy

Compliance with storage requirements at RFP for TRM and LLM wastes appears to pose some severe problems. The scenarios given in the CTMP do not include the additional storage that will almost certainly be required by ER and D and D produced waste. Some estimate of this impact must be made.

Source Document Additions

A more detailed description of each of the scenarios given in the CTMP is included in the Source Document. These were correctly excised from the final form, in my opinion. The additional detail adds little.

CTMP Schedules

Schedules and milestones are presented for on-site treatment only (i.e., Path C in terms of the Section 5 Option Plan). Though the presentation responds to the requirements of FFCII, it is hard to defend beyond this. The assumptions made in placing the milestones appear to be vague and relatively undefined. No schedules for the other option paths (B and D) are given. This section responds to a formal, regulatory requirement but, it seems to me, to nothing else related to the plan.

Reviewer B Comments

Attached herein are my comments to the Comprehensive Treatment and Management Plan published June 9, 1992, and Comprehensive Treatment and Management Plan source document draft dated June 9, 1992.

As in the case of my review of the April 1992 documents, I focused on the issues related to laws and regulations and the methodology of recognized regulatory cleanup requirements. Approximately 50% of the comments made in my April 24, 1992 memo still pertain and will be repeated herein. However, many of the other comments were addressed in the revised documents.

As we discussed when we went to Denver, this new "summary" document is much more manageable and easier to read and understand and conveys the overall thrust of the plan in a much better manner. Overall it is a great improvement and will certainly be far easier for certain groups (especially the public) to understand.

My comments on the Comprehensive Treatment and Management Plan version 1.3 published June 9, 1992, are as follows:

- 1) There is no reference to the "source" document and the appendices contained therein. This is especially important from my perspective since the regulatory drivers found in Appendix D are not referenced in the CTMP. At Section 2.2 on page 2-2 there is a good summary of the history of LDR waste regulations, but again no reference to the myriad of regulations found in Appendix D to the source document. I understand from our visit in Denver that DOE has directed that these be two free standing documents. However, I feel that this is a mistake and will not exhibit the difficulties faced by compliance with vast number of regulations described in Appendix D to the source document.
- 2) The assumptions contained in section 2.3 at pages 2-4 and 2-5 continue to be problematic. I think it is unrealistic to assume that relevant federal state and local regulations will not substantially change from those currently in effect. I understand the need for establishing a base mark, however, I believe developing regulations in the 1990 amendments to the Clean Air Act will significantly complicate and delay the implementation of the clean up plan unless it is recognized that those regulations are going to affect some of the disposal technologies in particular thermal technologies.
- 3) I was quite pleased to see the references to transportation requirements such as those found at Section 4.5, and the other references to the difficulties that may be imposed by restrictions on transporting hazardous waste.
- 4) The new draft no longer contains the earlier discussion regarding DOE policies about shipping waste to other DOE sites. Instead it properly includes a discussion of EPA requirements such as the analysis contained at Section 6.17. This is a great improvement. It is properly noted in this draft that the success of shipment of waste to other DOE sites depends on the cooperation of certain states to allow waste to be transported through their states, see Section 5.1.2 at page 5-12.

- 5) The explanation of pathways to achieve compliance and the description of those pathways has greatly improved over the draft document and is much easier to follow. I believe the two options described on page 5-1 are greatly under emphasized, that is, the option to delist certain wastes and the option of seeking an extension for the time allowed to bring the applicable "thirds" waste into compliance by seeking case by case variances. There seems to be a dichotomy on page 5-1 between the options that "DOE believes will achieve compliance" and what the authors of the document believe will be necessary in order to meet regulatory requirements-namely seeking variances and exemptions.
- 6) The new draft is certainly clear on the point that the success of dealing with TRM wastes is entirely contingent upon transporting the LDR TRM waste to the WHIP facility in New Mexico.
- 7) I understand there may be some political reason that this draft is required to include a new plan D.-the so called national R & D programs focused on "enhanced final waste form." I believe that it is a discredit to the balance of the report to include this option since it appears to undermine the seriousness and technical complexity and thoughtfulness that went into considering the other options. Essentially option D implies that RFP needs to start over and come up with new technology to solve a problem which is very difficult. I would hate to see such an option reflect poorly on the analysis that was done on the options that exist in the absence of some yet undetermined and perhaps unknown technology.
- 8) Pages 6-52 and 6-53 deal with the issue of contingencies related to the compaction of wastes, which was clearly missing in the earlier draft.
- 9) Perhaps the best discussion of regulatory requirements and their interplay with the success of achieving the goals of the plan is contained on page 6-10 where the plan discussed regulatory requirements related to analysis and disposal of waste at off site TSD facilities. This discussion also properly includes reference to necessary state requirements. A reference at this juncture to the regulatory drivers would help bring home the point of the need for considering and coordinating federal and state requirements in achieving compliance.
- 10) I was happy to see some realism being brought to the incineration option at page 6-41 wherein the plan addressed the fact that although incineration may be the most proper technology it may not be politically acceptable. I think reference to the difficulties of complying with the Clean Air Act requirements would also bolster this argument. Generally speaking, the examination of treatment alternatives still does not recognize that fact that new toxic air limitations will be implemented over the next ten years for 189 toxic pollutants pursuant to the requirements of the 1990 Clean Air Act amendments, nor does the examination of alternatives recognize that these limitations will affect not only the acceptable levels of toxic discharge, but will also affect the ability of certain technologies to be used depending on whether or not they are adaptable to the new toxic limitations. The comparison of thermal treatment systems described at 6.81 and 6.82 do not seem to take into account the impact of future toxic limitation requirements.

- 11) I like the new approach of section 8 being titled Contingencies wherein certain essential assumptions are being made about the success of the overall clean-up plan.
- 12) I still find no discussion in the plan of the comparative use of water by different technologies that may be employed. Does RFP have water rights under state law? Do different technologies require more or less water? If additional water must be obtained it may significantly affect the cost or even the availability of certain treatment alternatives.

My comments regarding the revised draft Source Document version 1.3 dated June 9, 1992 are as follows:

- 1) Again I like the straightforward description of the pathways to compliance in the discussion found on page 5.1. Many of the comments made above will also pertain to the similar sections contained in the source document and I will not repeat those here.
- 2) In my April 24, 1992 memo I was critical of the discussion of economics. I now see that included in part in section 9 "Resource Requirements" in the Source Document. However, I believe there are some inappropriate references on page 9-1. The source document refers to summary worksheets for 43 different technology combinations as Appendix L. In fact, Appendix L in my draft document deals with characterization cost analysis. On page 9-3 references are made to the specific cost requirements for each treatment system as referenced in Appendix K. There is no Appendix K included in my document. I'm also concerned that section 9 was not included in any form in the summary document. I can only assume this is because there is some reluctance to include the costs estimates found on page 9-9. However, I believe that the new section 9 is a great improvement and that it is a reasonable and consolidated economic analysis. Therefore I recommend that a summary of this section be included in the summary document. I note that the pie chart on total clean-up costs (which may generate quite a bit of attention) at page 9-9 is not fully readable in my draft of the document.
- 3) I like the improved introduction to the generic road maps contained in Appendix D which is now both the generic road maps and the regulatory drivers.
- 4) Appendix D generic roadmaps and regulatory drivers is a thorough analysis of all regulations which must be complied with as part of the clean up plan. Even related resource materials and "optional" regulatory requirements are identified. However, I have the following specific suggestions regarding Appendix D:
 - a. The decision tree included in Appendix D makes no attempt to recognize which of the regulations and which of the regulatory drivers are the most critical and fundamental. There is no weighing of the regulatory importance of the over 140 identified regulatory drivers.
 - b. The decision tree does not identify how the multiple regulatory drivers which are identified at various decision points will be resolved with one another if they are in conflict. Conflicting requirements of regulatory drivers will impact the selected treatment options.

- c. I understand that the technology ranking system used and described in Appendix G makes some attempt to include a weighing of the regulatory drivers as part of the overall ranking formula. I note that the technology ranking system described in Appendix G does not include a weighing factor for conflicting regulatory requirements. Both of these, however, are steps in the direction of attempting to identify the interaction between legal requirements, the cost of compliance, and the available technology.
- 5) I believe the value of Appendix D regulatory drivers could be enhanced in two specific ways. First the regulatory drivers could be reorganized by source while retaining their original reference and activity numbers. For example, a cross reference to the existing regulatory driver numerical index could be prepared that would "sort" the regulatory requirements in accordance with statutory origin, i.e. RCRA, CWA, CAA, etc. Further a source code might be included in the reference/activity number to enhance the use of this document. Secondly a separate cross index could be prepared by subject matter which would lead you to each of the regulatory drivers based on whether it deals with solid waste, TRU waste, etc.
- 6) The specific regulatory requirements contained in Appendix D do not identify those "clean up" standards which are likely to be incorporated in the final clean up plan. CERCLA requires EPA's Record of Decision to include the legally applicable and the relevant and appropriate requirements (ARAR's) under state law that must be part of the overall clean up plan. The regulatory drivers do not sort or identify the particular Code of Colorado (CCR) regulations requirements that are likely to be included in such a plan. A separate analysis or identification of these requirements would enhance the analysis of the regulatory drivers. For example reference number 10-activity CO42, makes reference to certain specific clean up and closure requirements under Colorado regulations. These are likely to be ARAR's included in EPA's ROD. Many of the substantive regulatory requirements are referenced by activity title "other regulatory compliance"-for example reference number 15-activity CO35. This reference makes it difficult to focus on the more critical and costly regulatory standards.
- 7) Reference number 27 to the Clean Air Act requirements correctly states, but I believe understates, one of the most problematic regulatory drivers. It states "the most critical air quality issues when permitting hazardous waste incinerators are facility design and selection of best available technology." It makes no mention of the requirements of the 1990 Clean Air Act amendments which will add to that list of critical issues, namely compliance with new air toxic emissions limitations.

Reviewer C Comments

Review Comments for Comprehensive Treatment and Management Plan Version 1.3 (published June 9, 1992)

In general I find the report to be very well written and the report presents in a fairly understandable manner a very complex task of designing a treatment plan for the wastes stored at the Rocky Flats Plant. In my opinion, the plan presented is technically sound and it is obvious that a lot of thought has gone into the design of this treatment plan. The reader is impressed with the difficulty of treating the variety of wastes at RFP and in developing a plan for characterizing the waste, identifying the appropriate treatment technology, and in developing a comprehensive plan for managing and treating this waste. It is very difficult task to present this complex plan in a fairly understandable format. I believe the authors have done a good job of this. My specific comments are to follow.

The ordering of the six treatment technologies is not consistent in the report. The order presented in the executive summary is not consistent with the order presented in the report. Also no mention of paths E & F are given in the executive summary.

The contingencies presented in section 8 are only a partial set of the assumptions given in section 2. I think that a corresponding contingency should be developed for each and every assumption listed in section 2. Any references available on start up times given for NTS and WIPP. The anticipated start up time for NTS seems very optimistic to me.

There are 54 total waste forms identified in section 3. Of this total there are 36 LLM waste forms and 18 TRM waste forms. These waste forms are grouped into various categories in the report. The only problem is that these various categories are changing continually through out the report, which causes a lot of confusion. For example on Pages 6-4, and 6-5 (table 6.1) the waste forms are categorized into 3 categories (1 - Aqueous, 2 - Solid/Sludges, and 3 - Organic oils and greases). On page 6-28, there are defined 8 categories. Again on page 6-39 (Fig 6.5) there are defined 5 categories (1 - wet solids/sludges, 2 - homogenous dry solids, 3 - heterogenous dry solids, 4 - organic liquids, and 5 - aqueous liquids). A consistent set of categories should be identified in section 3 of the report.

The wastes at RFP are reported to be mixed wastes. I assume that this means that in the same barrel, there is a possibility of several different types of hazardous wastes occurring as a heterogenous combination of liquids, sludges, and solids. For example, is it possible that a single barrel may contain, TCE, PCB, nitric acid, oil, steel chips, lead gloves etc? This is neglecting for now mixed hazardous and radioactive waste (waste containing radioactive constituents). In this situation, the waste form would fit into several (more than 1) categories. Would this require treatment by multiple treatment technologies? Would incineration simplify the treatment process by being able to handle more than one type of waste? Which of the treatment systems would be appropriate for this heterogenous waste mixture? Would the presence of a specific waste form cause problems in treatment for another waste form?

In section 4, is there a difference between achieving LDR compliance and treatment for LDR constituents. I find the title of section 4 confusing when compared with the discussion that follows in the section. Only LLM are being treated for LDR constituents. TRM are only being treated to meet WAC at NTS or WIPP and/or to meet transportation requirements but not for treatment for LDR. My confusion is that the entire discussion is on treatment required for TRM to meet WAC at NTS and/or WIPP. LDR compliance seems to be a mute point. No discussion occurs in section 4 on treatment of LLM for LDR compliance. Table 4.2 gives the WAC for NTS and table 4.3 gives the WAC for WIPP. Tables 4.2 and 4.3 apply to both LLM and TRM wastes. It seems that a discussion of required LLM treatment is needed or the discussion TRM treatment requirements be moved to section 5 or 6 of the report.

As explained in section 4, there are Concentration-Based Treatment Standards and Technology-Based Treatment Standards. Table 4.1 gives the required treatment of TRM to meet WAC. How does this relate to Concentration-Based versus Technology-Based Treatment Standards? How do the treatment technologies given later in the CTMP report relate to Concentration-based versus Technology-based treatment standards? The discussion on page 4-11 on DOE requirements is too brief to be meaningful. Could a brief explanation of the critical parts of the DOE orders be given and how they potentially affect the CTMP for RFP?

Second paragraph on page 5-1 should be added to executive summary and maybe also moved more appropriately to the beginning of section 4. Most of the wastes which may follow Path A are based on process knowledge only. What analysis would be used beside process knowledge that would allow a waste to flow Path A. For example consider Saltcrete. How is this packaged? What "limited analysis" would be performed to allow the saltcrete to follow Path A (RTR or headspace analysis)? Ordering of the 6 treatment systems given on page 5-13 does not follow same order as given in executive summary. Path C is the baseline pathway. Not enough detail given on why the 6 treatment systems were identified. Could a reference be given for more detail on these systems? For example consider the Solar Pond Cleanup Treatment System and the Solidification Bypass Sludge Treatment System. Both systems are used to treat wet solids (sludges). The pond sludge, pondcrete, and the saltcrete will be treated by the Solar Pond Cleanup System? I thought from table 5.1 that the saltcrete was to follow Path A? The pondcrete is to be dewatered (I assumed the same as dried), solidified and cemented. Why? Why cemented? How? How solidified and why?

The backlog bypass sludge is treated by the Solidified Bypass Sludge Treatment System. What is different about the two different waste forms that they would follow different treatment systems. During the solidification process for the Solidified Bypass Sludge Treatment System, a gas is given off. What is this gas? Is it the result of a different solidification process or the result of different characteristics of the waste to be treated? Similar questions could be asked for the treatment systems. Why were 6 treatment systems identified? Each most likely was designed to handle a particular type of waste with specified characteristics. I think that this is a very critical component of the CTMP and should be expanded. As such the description of the treatment systems is nothing more than a word description of figure 6.5.

Section 6 is hard to follow. The two major sections are 6.1 (LLM waste) and 6.2 (TRM waste). One difficulty is that discussion of TRM waste may occur in section 6.1 (example table 6.5 -- baseline technology for TRM forms occurs in section 6.1). As stated in the report, one of the

critical elements is the evaluation of the physical and chemical properties of the waste. The primary means of characterization is by process knowledge. I assume that process knowledge will often prove to be inadequate and characterization by other screening methods will be required. This will involve RTR analysis and headspace analysis. If these prove inadequate, then intrusive sampling will be used for analysis. It is unclear to me what data would be collected using RTR and headspace analysis that would lead to the conclusion that intrusive sampling would be required. For example, if process knowledge indicated that a particular chemical constituent was present and if the headspace analysis indicated zero concentration for this particular chemical constituent, would this justify intrusive sampling? Just what data collected by either RTR, headspace analysis, or process knowledge that would lead to intrusive sampling?

What data needs to be collected on the characterization of the waste, that is needed for evaluating what parameters are to be used for the specified treatment system? Specifically, for example, consider headspace analysis. This would seem to yield information about VOCs contained in the sampled drum. First question, is it only the presence of a certain chemical contaminant (example TCE) in the drum that is important in designing the treatment system parameters? Second question, is the concentration important of the chemical contaminant in the liquid or sludge waste stored in the drum? Third question, if the concentration is important, how will this be induced from the analysis of the headspace gas? Fourth question, what data will headspace analysis fail to yield that could be important in the treatment of the waste. For example, would it give any information about cyanide waste in the drum? If no, what analysis procedure would be used to detect this? Could it be possible to discuss the various type of chemical wastes (TCE, PCB, metals, oil etc) that occurs in the stored wastes and which analytical procedure would be used to characterize the waste for this chemical component?

The report refers to statistically based sampling and analysis if necessary. What level of confidence limits would be needed to properly characterize the waste? For example, consider 100 barrels of waste to be characterized. How many barrels would need to be sampled to be statistically significant? How would the homogenous versus heterogenous nature of the waste affect the statistical significance? Consider 100 barrels containing for example only TCE, PCB and oils. What if 5% of these barrels also contain cyanide. What is the probability that the statistically based sampling protocol will detect this? If these drums containing cyanide go undetected, could this cause significant problems during subsequent treatment (for example during incineration)? It seems to me that with the large amount of waste stored at RFP, that the probability exists that some drums will have been mislabeled or misplaced (drums that should have been stored in a certain location or with a certain group of drums is inadvertently stored in the wrong location or with the wrong group of drums). My example may be somewhat fictitious, but I think that characterization of the waste is very important. This characterization may be of importance from a statistical perspective (only a statistically significant part of the stored drums are analyzed) or from an analytical perspective (a certain drum may be analyzed but the analytical procedure used does not provide sufficient information about the contents of the waste in the drum).

Is the Toxicity Characteristic Leaching Procedure required during the waste characterization process or only on the final waste form? What is the required result from this test for LDR disposal or WAC at NTS or WIPP?

Again the 54 waste forms identified at the RFP, need to be grouped into a consistent set of categories with similar characteristics. Table 6.1 uses aqueous, solid/sludge, and organic categories. I personally prefer the categories used in Figure 6.5 since the treatment systems are related to these. It does not appear that the 8 categories for waste forms given on page 6-28 are used elsewhere in the report.

Three methods are given in the report for evaluating treatment technologies (process modeling, technology ranking and screening). Can a reference be given where the interested reader can find more detail on process modeling? Also process modeling was used on the Building 374/377 Treatment System. The report makes a distinction between treatment technologies and treatment systems. It appears that process modeling was used for evaluating a treatment system but is it applicable to evaluating a treatment technology? As stated in the report, technology ranking did not yield very good results and was essentially dropped as a tool in evaluating treatment technologies. The only method really used to evaluate competing treatment technologies was a combination of "sound engineering judgement" by "technically competent individuals" using three "simple but effective" criteria. These words "sound" nice but how does the reader know that sound engineering judgement was used or that the individuals were technically competent or that the criteria used were effective (simple yes but not necessarily effective). The report gives the impression of "trust us" in identifying these treatment technologies. First, I think that a reference is needed that the reader can refer to in knowing more about each of the identified treatment technologies. This reference should include a discussion of both the technologies that passed the screening test but also the technologies that failed the screening test.

The CTMP report cannot include all the detail needed for all levels of readers but it should provide references where the interested reader can find more detail. Also, this is a very critical component of the CTMP because in reality, RFP will most likely have to treat a considerable amount of its waste on site and will not be allowed to ship it or treat it elsewhere. As such a more detailed discussion should be given to the treatment technologies that passed the screening test. The technologies that passed the screening test such as fluidized Bed Incineration should be discussed in detail in this CTMP report. Give the reader information on where this technology has been successfully used, the secondary products that are generated, the types of waste that it can treat and those that it cannot treat. If more space is needed in the report for this added discussion, then I suggest the deletion of table 6.3 (which is 9 pages long). I think that the reader needs more than a "trust us" approach here. This is a very important part of the CTMP. I like figures 6.3 and 6.4 illustrating the screening process but it does not do justice to the considerable amount of work that Rocky Flats personnel have done in evaluating these treatment technologies. I know that a lot of work has been done in this area by EG&G personnel and their contractors. I only think that more emphasis should be placed in the report on this subject so as to instill confidence by the reader in the selected treatment technologies.

Again on page 6-34, the ordering of the treatment systems is not consistent with elsewhere in the report. On page 6-35 are listed the 7 primary treatment technologies identified in treatment plans 1 and 2. A discussion of some of these technologies are given in the supporting documents. However I believe that each of these technologies should also be discussed in the CTMP report. Why are the FBU and CAI the primary destruction technologies? Why is microwave melting the primary solidification technology for the Solvent Contaminated Waste Treatment System while polymer solidification is the primary solidification technology for the

Building 374/774 Treatment System for the nitrate salts. In other systems, cementation is the primary solidification technology. A discussion is needed on the advantage and disadvantages of competing technologies. In essence, microwave solidification has the advantage that it can treat the waste in the drum, results in a reduction in the final volume of the waste. It has the disadvantage that it cannot be used on VOCs, oils? Cementation has the advantage that it can be used on a large variety of chemical wastes and the final waste form can usually pass the Toxic Characteristic Leaching test. Its major disadvantage is that it results in a tripling of the volume of waste from the original waste form to the final waste form.

In table 6.5, are listed the waste forms to be treated by each treatment system. How do these waste forms compare with the 36 previously identified LLM waste forms or with the 5 categories of wastes given in figure 6.5? Ordering of treatment systems is not consistent in this table with that elsewhere in the report. What comprises the baseline technologies listed in table 6.5 is unclear. How do the baseline technologies given in table 6.5 relate with the seven primary treatment technologies given on page 6-35? For example, on table 6.5, the baseline technologies for the Surface Organic Removal, Bulk Lead and Leaded Glove Treatment System are volatilization and macroencapsulation. How would the volatilization be conducted? Which of the previously identified primary treatment technologies relate to volatilization? How would macroencapsulation be performed? Which of the previously identified primary treatment technologies relates to macroencapsulation? Similar comments could be made for the other baseline treatment technologies listed in table 6.5.

Table 6.6 should appear later in the report. It is confusing in table 6.6 that the TRM treatment systems are given the same name as the LLM treatment system but in actuality are a new separate system with different baseline technologies. The Pyrochemical Waste Treatment System shown in table 6.6 is new. No other discussion of this system is given in the report. Can a figure similar to figure 6.5 for LLM systems be generated for TRM treatment systems?

A more detailed "plain english" description of each treatment systems should be given. As it is now, the description of each of the treatment processes dose not do justice to the considerable work that went into developing these conceptual treatment systems.

Page 6-40, the listed waste forms given for the Solvent Contaminated Waste Treatment System are a simple repeat of those listed in table 6.5. A better discussion of the incineration versus the non-incineration option is needed. For example, incineration is the preferred choice because it can handle a variety of mixed hazardous wastes that are found at the RFP. The major difficulty with incineration is with public and regulatory acceptance. Off-gas capture would be implemented to ensure that no release of radioactive gas be released. With off-gas capture, the gas given off during incineration would be captured and held in storage tanks. Three tanks would be used with each tank being able to hold a 1 week volume of gas from the incineration process. The off-gas in the storage tanks would analyzed for chemical contaminants. In the event that chemical contaminants are found in the stored off-gas then the incinerator would be shut down until the stored off-gas could be treated and released. This would ensure the public safety and should allow RFP to gain regulatory acceptance of the incineration option. The Fluidized Bed unit proposed here has the following advantages and disadvantages etc. Incineration is the only treatment technology that can be implemented in the next 5 to 10 years. Alternatives are still in the development stage and may require more than a decade before they

could be implemented. Additionally, because of the variety of mixed hazardous wastes at the RFP, treatment by the non-incineration option would require that the mixed wastes be treated by several treatment technologies. This would greatly increase the complexity and cost of treating the waste at the RFP.

Another example is a discussion of solidification treatment options. For example, following treatment all liquid wastes must be solidified. This may be accomplished by a) cementation, b) polymer solidification, or c) microwave solidification. Where applicable microwave solidification is preferable because it reduces the volume of the waste to be disposed of. However it is a newly developing technology that will take xxx years to implement. Polymer solidification is preferable to cementation in that cementation triples the volume of the waste while polymer solidification only doubles the volume. Cementation is applicable to very small waste streams consisting of less than xxx volume. The solidified waste form must pass certain specified leaching requirement test. Cementation is superior in its resistance to leaching etc. However concerns are that cementation may not be an acceptable form of waste disposal in the future at WIPP etc.

It seems that the CTMP for the RFP has the potential for making a major impact on the DOE complex-wide mixed waste program currently being developed. I seriously doubt that at the national level that DOE can respond quickly enough to have much impact on the treatment of wastes at RFP. The opposite case maybe more likely.

I am unsure what to make of the discussion on storage strategy. It seems that the Centralized Waste Storage Facility (CWSF) is needed before March 1993. The alternatives to the CWSF are to super compact the waste or renegotiate the LCO. Super compacting the TRM waste might be necessary but super compacting the LLM seems like a very poor idea since it would potentially limit the LLM treatment alternatives. If renegotiating the LCO is not a viable alternative then it seems like the CWSF should be a very high priority item for the RFP. I am personally doubtful that either the NTS or WIPP will be operational by the expected times given in the CTMP. Do you have references on the expected start time for the NTS and the WIPP.

It is an almost foregone conclusion that the CTMP will need to be modified and that a procedure for modification should be established in advance.

There is no need to list the six treatment systems again on page 7-1. It gives the reader the impression that this section on schedules was written by an outside individual and then simply attached to the CTMP. I think that the thermal versus the non thermal treatment options should be explicitly contrasted for time of implementation. In essence, how many more years would be required for the non-thermal start up date than for the thermal start up date. This data are given on Figure 7.1 but should be extracted and presented to the reader in word form. Also how reliable are the schedule dates shown on figure 7.1.

Where are the potential bottlenecks in the development schedule for the treatment process that would delay the start up date for these treatment systems? Can a set of contingencies be developed such as was done in section 8 for the assumptions given in section 2? My experience is that the start up dates will be continually pushed back as unanticipated delays occur. If the potential bottlenecks can be identified then maybe a set of contingencies could be developed so as to minimize these delays.

I think that the addition of section 8 to this version of the CTMP report was a very worthwhile addition. I would like to see more detail in this contingency section but at least it gives the reader the idea about the anticipated changes that might occur if some of the assumptions given in section 2 are not valid. It seems that a conclusion section to the report is needed which would summarize in more detail than is given in the executive summary.

I would like to say I was impressed with the difficulty and complexity of the task of treating the wastes produced and stored at Rocky Flats. A lot of thought has obviously gone into developing the CTMP. The complexity of the task is reflected in the many different types of wastes to be treated and the many different types of treatment processes that must be implemented in order to treat all of these different kinds of wastes. It follows then that it is a very difficult task to describe in a report the waste treatment paths and alternatives in a simple manner that can be understood by non technical administrators and the public and the same time provide the technical detail that is required to demonstrate a scientific understanding of the problem. I think that the authors in general have done a very excellent job in this regards. In my discussions with personnel from EG&G, I have been very impressed with their knowledge and the efforts that they have put forth in developing this CTMP. A great deal can be learned from the treatment of the wastes at RFP that can be used elsewhere. If successfully implemented the CTMP has the potential to turn the RFP into an environmental success story. In conclusion, I would like to reiterate that I think that this CTMP is a technically sound document.

Additional Review Comments for
CTMP Source Document
Reviewer C

The CTMP is certainly a massive document. It does provide more detail than the CTMP report but this detail is inconsistent. For example, the source document contains considerable more discussion of off-site treatment capabilities at other DOE operated plants (i.e. Path B option). I did not find this detailed discussion on Path B to be very helpful in that there does not appear to be a very good match between the wastes at RFP and the off-site treatment capabilities at other DOE operated plants. Also in my opinion, the CTMP source document does not provide the same level of detail for Path C (the baseline technology path). In general, the authors have done a very good job in condensing the CTMP source document into the CTMP report. Many of my previous comments on the CTMP report are also applicable to this CTMP source document. As such, I will keep my comments brief on this document. Also my previous comments are made as if I did not know that this source document existed. This is response to the request made at an earlier meeting between the university consortium review team and EG&G personnel.

Appendix A provides considerable more detail (than that given in section 3) to the description of the 54 waste forms to be found at RFP. (Side note -- some of the pages in appendix A are numbered with a B index which is confusing). However the need exists to categorize these waste forms into categories with similar characteristics. Which treatment systems would treat which waste forms?

Section 6 in the CTMP source document and Appendix C give considerable more detail on the sampling plan for characterization of the waste at RFP. However I did not understand the logic for this sampling plan and the number of drums to sampled. For example from Appendix C, some waste forms consisted of 1 drum with 4 samples to be taken. Other waste forms given in table C.1 consist of in excess of 300 drums and 4 samples to be taken (from the same drum?). How is this statistically significant? Appendix E gives a brief explanation of the statistics to be used in the analysis of the analytical data. How does this relate to the number of drums to be sampled? It appeared to me that too simple of a criteria was used in the sampling protocol. What is the consequence that with the large number of drums in storage at RFP, that some drums have been misplaced and stored in the wrong location or were mislabeled. What is the consequence of a "odd" drum of waste being for example incinerated?

The source document contains considerable detail on off-site disposal and treatment options. While there is no harm in this, it does lead the reader to question why this level of detail was not done for on-site treatment options.

It is interesting that Appendix G gives considerable detail on the ranking of the technologies, yet the CTMP report and the CTMP source document have very little discussion on this topic other than to say that ranking the technologies did not prove worthwhile. Its only value was to say that it was tried but did not work well. Perhaps Appendix G should be deleted from the source document and a simple reference given to another report where the details of this could be found. Just because a lot of work may have gone into ranking the technologies, if it did not

prove worthwhile, then it was more of an educational process for EG&G personnel that does not need to be included in the CTMP.

The discussion in the source document of the screening technique used to finally identify the primary treatment technologies is not any more detailed than that given in the CTMP. Questions arise like why was the Glass Melter identified in Table 6.4 as a viable treatment technology that passed the screening test but never discussed again, nor identified as one of the primary 7 treatment technologies, nor used in any of the treatment systems? I would like more discussion of the treatment technologies that comprise the treatment systems. Similarly, I would like a more detailed discussion of the treatment systems. Appendix I gives a detailed LLM treatment system flow charts but still there are a lot of questions unanswered. Like the why? Why was this technology chosen? What are its advantage and disadvantages? Appendix F was helpful in this regards but detail needs to be added for the selected primary treatment technologies. Which waste forms can be treated by this technology and which ones can't. The detail of discussion here is still not comparable with that for off-site disposal and treatment options. I don't understand the logic diagrams for these treatment systems.

I don't think that cost is a major factor in the decision process for the CTMP. As such I think that it was good that it was not included in the smaller CTMP report. You could add Figure 9.9 to the smaller CTMP report, with the only purpose to let the public know that this is not a very cheap process and there are limits to the deep pockets of DOE.

I thought that Appendices B, D, E, G?, J, and K (I never got this appendix so it must not have been important). References to other reports (where the same information could be found) could replace these appendices.

A conclusion section is needed to the report which contains a more detailed summary than that given in the executive summary.

Again, I would like to reiterate that I find this overall to be a very good document and my comments are made only for the purpose of clarifying the information given. With the exception of the logic for deciding on how many drums are to be sampled for waste characterization, I do not disagree with the findings of the CTMP. A lot of work and time has gone into preparing the CTMP and I think that the plan presented is a sound plan that should work if fully implemented.

I think that a similar plan to the CTMP is needed for the soil and groundwater contamination found at the RFP. There exists a need for an overall sitewide plan for cleanup of the groundwater and soils at the RFP. This CTMP meets this need for the stored wastes but a similar plan and a similar plan is needed for the environmental restoration. To my knowledge, no such plan exists.

Reviewer D Comments

OUTLINE

Baseline Systems
Likelihood of Assumptions
Mixed Residues
Future Waste Generation Rates
Treatment Capabilities within DOE Complex
Technology Selection
Storage Capacity

1. Baseline Systems

The term "baseline" has been used frequently in the presentations made before members of the RMUC and within the text of the CTMP (e.g., the second last paragraph in the Executive Summary). How is Baseline defined? It is my understanding that baseline consists of some technologies that require varying degrees of research, development, or demonstration. The success of this effort is not completely certain. Therefore, one wonders whether it is appropriate to define baseline to include technologies that require some degree of RD&D as opposed to technologies requiring little or no RD&D.

Baseline technologies are listed in Table 6.5. What are the time scales and decision-making points regarding short-term and long term solutions?

2. Likelihood of Assumptions

Section 2.3 specifies assumptions made in developing the CTMP. Section 8 discusses contingencies related to the key assumptions. Little or no information is provided in the CTMP regarding the likelihood of the assumptions being valid or the magnitude of potential impacts on the complexity or magnitude of treatment required to achieve compliance. It would appear appropriate to discuss the likelihood of the assumptions being met, and the potential impact on the management of wastes if the assumptions are not valid. This would serve as a gauge for the level of attention at this point that should be paid to developing alternative plans. It is less important to specify alternatives for those assumptions with a high likelihood of being valid and more important to specify alternatives for those assumptions with low or unknown likelihood.

For example, the CTMP is based upon the assumption that the Nevada Test Site (NTS) and Waste Isolation Pilot Plant (WIPP) will be the ultimate off-site disposal locations for LLM and TRM, respectively. It is assumed that NTS will not be available until 1995 and WIPP will not be available until 1999. Despite the importance of the NTS and WIPP in achieving compliance with land disposal restrictions (LDR) as prescribed in the CTMP, little additional information about NTS and WIPP is provided. If the facilities are not currently available, what is their construction and permit status? What is their design capacity? What obligations do these facilities have to accept wastes from other locations? How likely is it that the WIPP will be granted a "no-migration" variance to dispose of TRM without meeting RCRA treatment

standards? What will be the impact on the CTMP if this assumption is not true? In section 6.2.1, it is indicated that the ultimate WIPP WAC are not known because they depend on the outcome of the WIPP BIN test and the RCRA Part B Permit process by the State of New Mexico. Should the schedules for the permitting process for these facilities be incorporated into the CTMP?

3. Mixed Residues

Within Section 2.3, category 12 addresses Mixed Residues, and it is indicated that mixed residues are not covered by the CTMP. Is there a difference, then, between the mixed residues referred to here and the mixed residues described in Section 3.2.2, which do appear to be part of the CTMP? Are the quantities of mixed residue (which total 946 cu. yd. according to Table 3.3) included in the estimates of LLM and TRM currently on site at RFP (viz., 11,269 cu. yd. plus 28,965 gallons of LLM and 1,119 cu. yd. of TRM)? How much of this waste is LLM versus TRM? Is this part of the LLM/TRM inventory for which RFP is not in compliance with LDR? It is indicated that the amount of secondary waste generated by processing the residue is unknown. Can a baseline estimate of waste generation be made? What is the likelihood that the waste generated will represent a significant volume?

4. Future Waste Generation Rates

Section 2.3 describes future RFP mixed waste generation. Future wastes include wastes generated by continuation of current activities, residue processing, and environmental restoration. The generation rates of these wastes are indicated as being unknown. Baseline estimates of waste generation based upon currently available information would be useful for assessing the relative importance of these wastes in the CTMP. For example, it is indicated that environmental restoration activities will result in the generation of "substantial" quantities of LDR waste. How are these quantities likely to compare to current inventories? What potential exists, in the absence of assuming baseline waste generation rates for these and other similar wastes, that the selection of technologies or other fundamental aspects of the CTMP are not optimal.

5. Treatment Capabilities within DOE Complex

Table 6.2 describes DOE facilities that can treat one or more of the wastes stored at RFP. Simplification of this table, particularly with respect to its importance to the CTMP, would be useful. Specifically, in conjunction with or as an alternative to the current table, which summarizes the number of waste streams that can be processed by a given facility, it would be useful to display the number of facilities that can handle each waste type. This tabulated information would enable a rapid visual indication of whether there are waste types which few or no facilities can handle. What major conclusions should be drawn from the information in this table? With regard to Table 6.3, which lists DOE facilities that were rejected, it would again be more useful to know where the bottle neck might be with regard to waste forms that can not be treated.

6. Technology Selection

It is my understanding from presentations that have been made before members of the RMUC that technologies are currently available to treat LDR wastes at RFP but the costs of these technologies are prohibitive. Thus, alternatives are being sought. If the selection of technologies is based upon costs, why are costs not presented in the CTMP? On page 6-34 it is noted that there are benefits of defining as few technologies as possible for all waste forms to minimize the cost of compliance. In the absence of a specific analysis and supporting information, this conclusion is not intuitive to me, especially given that many of the technologies are advanced.

The three criteria used for technology screening are summarized on page 6-31 and include (1) whether a permitted, operating, or demonstration unit is in place, (2) whether the technology generates secondary waste that is not readily treatable, and (3) whether the technology has been demonstrated for alpha-contaminated waste. This has led to a list of technologies to be used in treatment systems for which varying degrees of additional RDDTE are needed. What is the potential that a technology eliminated on the basis of having not been demonstrated for alpha contamination could be more suitable than a selected technology based upon economic or other factors provided that the ability to handle alpha contamination were demonstrated?

The section titled "Discussion of Seven Treatment Technologies from Treatment Plans 1 and 2" consists of only one paragraph. Additional information would have been helpful here. Among the questions raised is why the seven listed technologies do not track with those indicated in Figure 6.4. For example, evaporation technologies are indicated in Figure 6.4 but are not mentioned in the text on page 6-35, and UV oxidation is indicated in the text on page 6-35 but according to table 6.4 this technology has not been demonstrated for alpha contamination. UV oxidation is indicated as being one of the possible incineration alternative organic destruction technologies, what are others?

7. Storage Capacity

Section 6.3 describes Storage Capacity, in which it is indicated that the TRM limit is 1601 cu. yd. and the LLM limit is 3,600 cu. yd. It is noted that the current physical storage capacity is 1,434 cu. yd. Is this the physical capacity for both LLM and TRM or LLM only? If LLM only, what is the storage capacity for TRM? How does one reconcile the current backlog exceeding the physical storage capacity? In Table 6.7, what is meant by duration? Does SC stand for supercompaction?

8. Waste Transportation

The text on page 4-6 indicates that there is not presently a package design which has been approved for greater than Type A quantities of liquid LLM and TRM. Is this important with respect to the CTMP? What fraction of RFP's waste does this comprise? What is the plan for developing appropriate packaging? Is this merely a matter of using a larger number of less-than-Type-A packages?

Reviewer E Comments

The Comprehensive Treatment and Management Plan Version 1.3 dated June 9, 1992 is significantly better than the previous versions. The style is lucid, the organization is logical and the report is understandable. I noted that several comments made by the Consortium Review team earlier have been followed and incorporated.

Significant improvements are due to the inclusion and clear delineations of the "base line plan" and the "contingency plan." I have a few comments regarding the Base Line Plan later.

A few concerns that I have are listed below:

- Page 2-6. Project Funding
The assumption of, or a desire for, an increase in funding at an annual rate of 10% is prone to questions. At this rate in about seven years the funding will be doubled! Why does one need this enormous increase and for how long? As the waste shipments take place, will there be a need for increased funding each year? Some explanation may be in order.
- Page 2-7 - Mixed Residues
Providing us with the Mixed Residue Reduction Report would have been helpful.
- Pages 5-3, Figure 5-1.
If the permit modifications for RFP Waste are 'denied' the figure shows a feedback on an 'initial stage'--this appears to be an open 'do loop'. How many times does this iteration have to take place before it goes to 'totally denied' path?
- Page 5-10 and 5-11, LLM;
In describing the LLM forms with high potential for Path A, as in table 5.1, it is stated that - "The list of most likely candidates LLM forms for reclassification as non-hazardous is presented in table 5.1". The use of the words LLM forms with high potential for Path A may better describe the situation rather than the work non-hazardous.
- Page 6-8. Analytical Methods Development Initiatives.
The plan seems to call for the development and acquisition of on-site laboratory capability. However, the explanation that follows does not discuss the required additional capabilities.

Also, line 3 from bottom - Should the word be 'plans' rather than 'plates'?
- Page 6-11, Fig. 6.2
Inclusion of criteria for branching to Phase 3 or Phase 4 would make it easier for the reader.

Also, in 'the box Phase 3' typo, requirement.
- Section 8 dealing with contingencies.
Inclusion of the contingency plan is good but seems to be incomplete. The assumptions cited in Section 2 and in Section 8 do not necessarily correspond. I believe a complete

contingency plan should examine each assumption made earlier and on which the Base Line Plan and the CTMP are based.

- Super compaction will lead to additional problems and such should not be considered. Instead, if the storage volume is a problem, then negotiation should be conducted with the EPA and CDH, etc.
- Remove table 6.3 and include in the appendix. I realize a lot of work has gone into this but does not add to the main text of the CTMP.
- The Base Line Plan is confusing and most of it seems to depend on moving the wastes and treating at other facilities. The logic flow is not very logical in Fig. 5.1.
- Characterization of waste has been given importance in this version; it is nice to note that. However, the sampling and characterization methods are questionable. How can one statistically decide a representative sample, particularly when they are non-homogeneous wastes?
- Similarly, the Technology selection and methodology is not based on sound scientific criteria. Instead, they seem to be based on biases and speculations.

In conclusion, I realize that attempting to come up with a comprehensive plan for such diversified problems as at RFP with moving targets and ever-changing and uncertain regulatory conditions is a difficult task.

The problem is compounded by the fact that the state, regional EPAs, and other federal agencies seem to vary from one site to the other. This problem will be ameliorated if there are Inter-Agency agreements that are uniform and consistent within at least each DOE/DOD site.

All in all, this report is better and together with the appendices makes it a comprehensive report.

Reviewer F Comments

Reviewer F is the review team leader who has prepared this entire document. The primary concerns of reviewer F are expressed in the review comments on the earlier documents and are contained in the main body of this review document as balanced through discussion with the members of the review team.

Reviewer G Comments

An echo to the overall improvement of this CTMP v. 1.3, it is a lot more readable and begins to have continuation in the context. I still found a few typos, acronyms that are not defined-it is more so towards the end of the document.

I found the source document is just an extension of the CTMP, most of my comments are based on the CTMP.

I must emphasize that the ultimate solution of CTMP should be the long-term safe disposal of radioactive and mixed wastes. All the deadlines and milestones set for the treatment and disposal of these wastes should give way to workers and environmental safety. This is because many of these deadlines and milestones are based on assumptions which may change: for examples, the assumptions of WIPP WAC and transportation requirements of mixed wastes. After all, these wastes have been around in RFP for decades, a few more years in RFP would not make much different if more time is required for the job well done.

- * How likely will WIPP be granted a "no-migration" variance to dispose of TRM without meeting RCRA treatment standards? RFP will reevaluate the assumption that WIPP will receive "no-migration" variance by FY96 (p. 8-2). I think RFP should constantly update the status of WIPP "no-migration" petition. If the status for the "no-migration" petition becomes unfavorable, RFP must develop alternate plan before FY96 to minimize time loss for the whole cleanup situation.
- * Better description of Building 374/774 Treatment System is needed (Building 374/774 is described as an on going operation generating LLM and TRM). What is the Building 374/774 Treatment System? From the description of Technology Modeling, Ranking and Screening (P. 6-30), the process modeling and technology ranking system need refinement before they can be used in future analyses because of bias and other unknown factors. If such shortcomings exist in current system, why can the process modeling be used as a decision making technique on the Building 374/774 Treatment System? If technology systems for processing certain waste categories were identified using sound engineering judgment and experience of a diverse group of technically competent individual, why not implement the sound engineering judgment and experience into the process modeling? In general, I found the argument on p. 6.30 somewhat contradictory.
- * Screening analyses and physical sampling (p.6.7). Essentially, all LLM needs to be sampled and quantified to meet LDR requirements, and to guarantee environmental and health safety for the public. Although process knowledge provides indication of the contents of wastes, but the matrix of various waste forms which may involve a mixture of solid, aqueous and organic phases, the method of headspace gas analysis alone cannot serve as a quantitative measurement of the contents of wastes.

I believe all LLM needs to be analyzed for LDR requirements (species listing from LDR), and I agree that an effective and quantitative method system needs to be developed. For example, if the information from process knowledge and headspace gas

analysis indicates less likelihood of hazardous waste contamination other than radioactivity for a particular category, less sampling frequency is required for that category of LLM.

The projected number of LLM samples of Table C.1 in Appendix C appears to be determined by random selection. A systematic method for sampling selection is needed, and a description of how selection process is done should be provided.

In all, sampling and characterization of wastes should be high priority issues, only with which accurate estimate and assessment of cleanup technologies can be based on. I don't believe one can select proper treatment technologies for wastes without a clear understanding of the properties of wastes.

- * The CTMP emphasizes conducting sample analyses and treatment of LLM off-site. In general, I believe that on-site sample analyses and TSD (as well as the development of) should be the method of choice. The advantages of having the sample analyses and treatment of wastes on-site are the saving from packaging, pretreatment, and transportation. Also, obtaining permit(s) for LLM transportation is a concern, especially when it involves multi-interstate transportation (and other factors as described on P.6-13). Interstate transportation of LLM can be a major obstacle. As described on p.6-26, there are only handful of facilities which are presently permitted for LLM LDR. Therefore, it is proper and timely to initiate on-site treatment facilities in RFP, why wait for commercial capacity to be developed to treat LLM (p6-26). Is DOE admitting that the private sector can do a better job in developing treatment facilities than DOE. Private sector development is strictly profit oriented. Waiting for private sector to develop commercial capacity to treat LLM is unreliable. If indeed commercial capacity is becoming available, why can't DOE run a more efficient system to treat its own LLM wastes.
- * There is a need for a nation policy, or to initiate one. The policy should includes development of analytical and remediation methodologies, a central location for temporary storage of LLM is advisable.
- * All of the successfully demonstrated non-incineration treatment technologies identified in CTMP (Fig 6.4) are chemical/physical treatment. A microbially based treatment process developed at Brookhaven National Laboratory can remove toxic metals and radionuclides without producing secondary waste streams. This is one direction CTMP can look into.
- * I found that supercompaction of TRM is an extremely risky practice. The assumption of CTMP is that supercompaction of TRM will occur as required to meet storage limitations but only for those wastes that meet current waste isolation pilot plant (WIPP) waste acceptance criteria (WAC). While WIPP WAC is not finalized (p.4-3), supercompaction of any TRM (or LLM) is unacceptable, unless a method to reverse supercompaction is developed. If supercompaction of TRM is unacceptable, then storage strategy from p.6-50 must also be reconsidered.

- * Assumption for adequate storage space of Contingencies (p. 8-2) should be more specific. For example, item (1) and (6) appear to be the same, unless item (1) is addressing storage limit on-site and item (6) is identifying permitted storage off-site.
- * Statement on the bottom of p.6-46, "...in addition to other treatment processes, thermal processes will be examined to determine the best available technology." Throughout the entire document of CTMP, the only technology discussed is the thermal treatment technology. I found this statement very confusing. Thermal treatment technology for LLM is technically sound, however, this method is also very expensive. Other treatment alternatives should be explored.
- * For surface organic removal (p.6-42) by volatilization or supercritical carbon dioxide, it should be made clear that the off gas or the abstract which contains the organic waste would go to further treatment, not the radioactive waste. The radioactive waste would then go to solidification process. From the description of p.6-42, supercritical carbon dioxide extraction will be a very expensive operation to treat the items such as leaded gloves, acidic surface contaminated solid materials, etc. It appears that base neutralization with steam cleaning with off gas treatment would be a more appropriate method for those items.
- * Bulk lead of TRM will not be accepted by WIPP, where can the bulk lead be disposed to?
- * Treatment Plan 1 and 2 on p.6-34, 35 are not clearly defined. How do these plans relate to the six treatment systems and the seven treatment technologies?
- * Secondary wastes generated from waste treatment systems are not addressed, secondary wastes can either be from residual product (e.g., incineration) or off-gas treatment. The CTMP should address how much is the volume and how the plan handles the volume generated from secondary wastes, thus, storage scenarios of Table 6.7 will be altered. In addition, wastes generated from environmental restoration are not addressed in the CTMP.
- * I still insist on the issue of reuse/recycle some of the radioactive materials at RFP. There are rare metals generated during nuclear decay in the TRM that are not radioactive and have commercial value, and some radioactive materials are being used for fire detection and space navigation. Perhaps, DOE should not treat TRM as a total waste, and should start looking at the commercial value of these mixed wastes. Commercialization and recycling of nuclear materials may be some of the important aspects DOD and DOE should look into when many of the nuclear weapons are being decommissioned.

**COMMENTS ON MARCH, 1992 CTMP DRAFT
AND
APRIL, 1992 SOURCE DOCUMENT DRAFT**

Reviewer A Comments

- 1) Executive Summary is not reflective of the body of the report in several ways, for example:
 - a) Figure 1.0-6 is not consistent with what is actually presented and discussed in the report--particularly in Sections 4, 5, 6, 7.
 - b) The baseline on-site treatment plan is not reflective of the conclusions reached in Section 5.
 - c) The emphasis on off-site treatment not reflected in Sections 5 and 7.
- 2) It is not clear why transportation to, and treatment at, other DOE and commercial facilities is given highest priority, when the RFP wastes apparently do not form a good match with existing treatment facilities identified in Section 4.
- 3) Ensuring that compaction can be used to produce waste that can be shipped or meet RCRA restrictions directly poses considerable analytical problems, particularly with combustibles. The relationship and scheduled development of these analytical techniques relative to the use of the supercompactor should be carefully detailed to avoid the specter of a short-term improvement causing a long-term problem.
- 4) Why isn't the analytical characterization of the waste streams given highest priority? Without this knowledge it is necessary to keep a very large number of options open and the scope of the problem is hard to define.
- 5) The plan seems ambivalent about treatment of TRM and TRU wastes. On the one hand (as on pg 44 and again pg 46) they are basically placed outside the CTMP by reliance on the availability of the WIPP disposal. On the other hand, treatment options for TRM wastes both on-site and off-site are detailed in the later sections of the plan. Which is it? What if the WIPP exemption is not continued?
- 6) Why is public acceptability a criterion for determining the viability of a treatment option (pg 45)? Isn't this an education problem?
- 7) Is the speedier option always better? For example, premature compaction of waste could render it untreatable by existing technology.
- 8) A four-phase plan and schedule is mentioned in the beginning of Section 4 (pg 50). Where is the schedule?
- 9) The use of the future voice in the introduction to Section 4 is confusing. What has been done? Is this to be completed as part of the CTMP?
- 10) In comparing the treatment options at DOE or commercial facilities it would be useful to be as specific as possible about the capacity of a given treatment systems option, relative to the waste production of RFP. This is not given consistently in the present format of Section 4.

- 11) Similarly, details of the dovetailing between the time when development treatment facilities will come on line, and the need of RFP should be given.
- 12) Consistent with comment (5) above, why is discussion of the WRAP facility included (pg 57)?
- 13) Description of controlled air incineration is given twice in Section 4.
- 14) The titles of Section 4 and 5, respectively, relate to the identification of options, and the evaluation of options. In reality, Section 4 details off-site options and Section, RFP options. These sections should be reorganized.
- 15) Why can't the propensity of microwave heating to produce NO_x be calculated or at least estimated (pg 79)? Isn't this a straightforward problem if drum contents are known?
- 16) The discussions on pg 79-80 in Section 4 should be combined with those on the same subject in Section 5.
- 17) The bulk of Section 5 is devoted to the presentation of proposed treatment options at RFP for the existing waste streams. On the other hand, this is apparently a less desirable option both from the previous discussion in Section 5 and from the Executive Summary. Why then the emphasis? It appears that a considerable fraction of Section 7 is responsive to this on-site treatment option as well. Why?
- 18) The analysis in Section 5 indicates that the plasma arc treatment system should be the preferred incineration option. However, much of the discussion in the Executive Summary (as well as the flow charts) presume the use of a fluidized bed combustor. What is the resolution of this conflict--which does the plan recommend?
- 19) What is the availability of plasma arc processing? What is its power consumption? What is the sizing? How much throughput can it handle?
- 20) Is it permissible to use non-thermal treatment strategies for PCB solids and liquids? Don't they have to be incinerated? (RE discussion of non-thermal options in Section 5).
- 21) Why are economic evaluations presented in both Sections 5 and 6?
- 22) Why is a controlled air incinerator pilot plant being developed, when the analysis of Section 5 rejects it (pg 133- local universities)?
- 23) The analytical plan in Section 7 seems to be specific to on-site treatment of wastes.
- 24) The detailed schedules in Tables 7.7.1-7.7.4 seem a little far-fetched since the decisions on treatment options have not been made.
- 25) Criteria is plural, criterion singular.

Reviewer B Comments

Attached herein are my comments to the comprehensive treatment and management plan dated April 1992 for the Rocky Flats Plant.

I reviewed the entire document. However, I focused on Appendix 8.2 which contained the "generic" logic diagrams, and especially Appendix 8.2B the regulatory drivers. Although I am not qualified to evaluate the thoroughness of the analysis of the alternative waste treatment technologies, overall I believe it is a thorough plan for the ultimate clean up. My concerns focus primarily on the methodology of recognizing the regulatory clean up requirements.

Since I was out of town most of this week I did not have a chance to examine the documents in your office, I would like to have an opportunity to examine, prior to the June 30th deadline, the Agreement in Principal between the Department of Energy and Colorado. I may also need to look at the Residue Compliance Agreement, and the Federal Facilities Compliance Agreement.

1. Section 2.3 of the plan on page 19 assumes that all federal, state, and local regulations will not change significantly. I understand the need for establishing a base mark. However, I believe developing regulations under the 1990 amendments to the Clean Air Act may significantly complicate and delay the implementation of the clean up plan unless it is recognized that those regulations are going to affect some of the disposal technologies, in particular incineration.
2. A number of assumptions are made about the interstate transportation of waste that are not being treated on site. I think it is a mistake to assume that there are no complications involved in interstate transportation of this waste. Some exploration of the issues associated with transportation to the sites should be considered. See page 54.
3. At Section 4.4 on page 74 of the plan there is a discussion of off site treatment options. There is a discussion and analysis of DOE orders and DOE policies regarding off site disposal and disposal at other DOE sites. It also discusses DOE policy regarding disposal at the WIPP site and at commercial sites. I believe this analysis is subject to criticism. It appears to draw the conclusion that since combined reading of DOE orders and policies requires treatment at DOE sites it is also a recommended and priority treatment option to ship to DOE sites that have or will have treatment capacity. I believe that this will be very controversial especially in conjunction with interstate transportation issues. It may be that a more complete description of these orders would clarify the DOE policy in this matter. Overall I believe that the plan seems predisposed to shipping to other DOE sites that have treatment capacity.
4. The plan proposes to compact a significant amount of the existing on site waste. The plan recognizes that once compacted the waste containing LDR Constituents can only be subjected to a limited number of treatment technologies, unless some new technologies develop to "uncompact" the waste. At Section 3.0 on page 25, the plan discusses the fact that Rocky Flats is almost at RCRA permitted capacity for TRU mixed waste. There is no exploration of the possibility of creating additional on site capacity. Although this would

certainly be controversial, I believe that the decision to compact waste thereby limiting overall treatment technologies will also be controversial.

5. I found no discussion in the plan of the comparative use of water by the different technologies that may be employed. Does RFP have water rights under state law? Do different technologies require more or less water? If additional water must be obtained, it may significantly affect the cost of certain treatment alternatives.
6. The analysis of treatment options at the Rocky Flats Plan beginning at Section 5.4 on page 108 properly recognizes the controversial aspects of incineration on site. However, the examination of the treatment alternatives does not recognize the fact that new toxic air limitations will be implemented over the next 10 years for 189 toxic pollutants pursuant to requirements in the 1990 Clean Air Act Amendments. These limitations will affect not only the acceptable levels of toxic discharges, but will affect the ability of certain technologies to be used depending on whether or not they are adaptable to the new toxic limitations. The comparison of the thermal treatment systems described on page 109 and the factors described on page 108 and 109 do not seem to take into account the impact of future toxic limitation requirements.
7. Appendix 8.2B regulatory drivers is a thorough analysis of all regulations which must be complied with as part of the clean up plan. Even related resource materials and "optional" regulatory requirements are identified. However, I have the following specific suggestions regarding Appendix 8.2:
 - a. The decision tree which is Appendix 8.2A makes no attempt to recognize which of the regulations and which of the regulatory drivers are the most critical and fundamental. There is no weighing of the regulatory importance of the over 140 identified regulatory drivers.
 - b. The decision tree does not identify how the multiple regulatory drivers which are identified at various decision points will be resolved with one another if they are in conflict. Conflicting requirements of regulatory drivers will impact the selected treatment options.
 - c. I understand that the problem ranking formula used and described in Appendix 5.2 makes some attempt to include a weighing of the regulatory drivers as part of the overall ranking formula. I note that the technology ranking system described in Appendix 5.3 does not include a weighing factor for conflicting regulatory requirements. Both of these, however, are steps in the direction of attempting to identify the interaction between legal requirements, the cost of compliance, and the available technology.
8. I believe the value of Exhibit 8.2B regulatory drivers could be enhanced in two specific ways. First the regulatory drivers could be reorganized by source while retaining their original reference and activity numbers. For example, a cross reference to the existing regulatory driver numerical index could be prepared that would "sort" the regulatory requirements in accordance with statutory origin, i.e. RCRA, CWA, CAA, etc. Further

a source code might be included in the reference/activity number to enhance the use of this document. Secondly a separate cross index could be prepared by subject matter which would lead you to each of the regulatory drivers based on whether it deals with solid waste, TRU waste, etc.

9. The specific regulatory requirements contained in Appendix 8.2B do not identify those "clean up" standards which are likely to be incorporated in the final clean up plan. CERCLA requires EPA's Record of Decision to include the legally applicable and the relevant and appropriate requirements (ARAR's) under state law that must be part of the overall clean up plan. The regulatory drivers do not sort or identify the particular Code of Colorado (CCR) regulations requirements that are likely to be included in such a plan. A separate analysis or identification of these requirements would enhance the analysis of the regulatory drivers. For example, reference number 10-activity CO42, makes reference to certain specific clean up and closure requirements under Colorado regulations. These are likely to be ARAR's included in EPA's ROD. Many of the substantive regulatory requirements are referenced by activity title "other regulatory compliance"-for example reference number 14-activity CO35. This reference makes it difficult to focus on the more critical and costly regulatory standards.
10. Reference to the Clean Air Act requirements correctly states, but I believe understates, one of the most problematic regulatory drivers. It states "the most critical air quality issues when permitting hazardous waste incinerators are facility design and selection of best available technology." It makes no mention of the requirements of the 1990 Clean Air Act amendments which will add to that list of critical issues, namely compliance with new air toxic emissions limitations. Likewise, Colorado is considering current state legislation and a public initiative may be on the November ballot which if passed would require Colorado to implement toxic air limitations more rapidly than are required under federal requirements. Some of the toxic limitations would be required within two years. Clearly these types of restraints will significantly affect the selection of incineration technology that may be employed.
11. I felt the resource/economic analysis which begins on page 121 was the weakest part of the entire plan. It appears to have been prepared as a free standing component and then simply inserted in the rest of the document. I note that on page 121 and 122, and especially sections 5.6.1.7, the costs of regulatory compliance are not thoroughly analyzed, nor are they implemented into the economic analysis. Discussion of life cycle costing alludes to the need for this integration into the cost of regulatory compliance at Section 6.2 on page 131 but is not thoroughly explored.

Reviewer C Comments

I have reviewed both the smaller Draft copy of the Comprehensive Treatment and Management Plan (dated March 25, 1992) and the larger technical supplement to the CTMP report (dated April 1992). I also reviewed the accompanying appendices to these reports.

Before I begin with my specific comments I would like to say I was impressed with the difficulty and complexity of the task of treating the wastes produced and stored at Rocky Flats. A lot of thought has obviously gone into developing the CTMP. The complexity of the task is reflected in the many different types of wastes to be treated and the many different types of treatment processes that must be implemented in order to treat all of these varying different kinds of wastes. It follows then that it is a very difficult task to describe in a report the waste treatment paths and alternatives in a simple manner that can be understood by non technical administrators and the public and the same time provide the technical detail that is required to demonstrate a scientific understanding of the problem.

Specific Comments on draft copy of smaller version of CTMP report:

It is unclear who the audience is that this report is addressed to. It is the non-technical audience, technical audience, or both? If it is the non-technical audience, then the report fails to in a concise and clear manner describe why certain treatment processes were selected and the advantage and disadvantages of each method. I think that this would be advantageous for the technical audience also. There is an underlying assumption in the report that the reader is familiar with each of these treatment methodologies and its advantages and disadvantages.

Pgs 3-5: List of acronyms and definitions is very useful but not complete. For example saltcrete and pondcrete are not defined for example yet appear in some of the tables later in the report.

Pgs 7-8 (Introduction): I would like to see a brief description here in the order of one to one and half pages on the strategy put forward in the CTMP for handling the wastes. All the introduction does now is tell the reader that RFP is required to have a CTMP but nothing about the overall strategy. Maybe a brief description here on the options to RFP for on-site versus off-site treatment of wastes, final forms the treated wastes need to be in for transportation and off-site disposal at WIPP etc.

Pg 9 (Fig 1.1): A pretty much worthless figure.

Pg 10 (Objectives): Relating the overall report with the objectives, I think that a fairly good job was done with respect objectives 1 and 3 but not for objective 2 (how these wastes are to be brought into compliance).

Pgs 11-14 (Assumptions): It was stated earlier in the report that the CTMP is a legal document. Maybe the extensive list of assumptions is needed to protect RFP legally but the extensive list of assumptions given on these 4 pages leave the reader with the impression that virtually everything and anything would void the CTMP. In fact the reader is fairly certain after reading

these 4 pages that it is with 99.99% probability that one or more of these assumptions would be violated and that RFP will not be required to strictly follow the CTMP.

Pgs 15-17 (Strategy): In general I think that this section describes the general pathways for achieving compliance fairly well. However little detail is presented here or elsewhere in the report. I would like to see expected percentages of waste that will follow each pathway. Figure 4.1 is one of the most important figures in the report. Some discussion about the waste acceptance criteria for NTS and WIPP would be appropriate. Path C and F are the two most important pathways and more detail should be presented on these.

Pg 18 (figure 4-2): This figure could be eliminated. It could just as easily be reworded into paragraph form and put with discussion of path A given on page 15.

Pgs 19-20 (figures 4-3 and 4-4): This is the other most important figure given in the report. In its title reference to path C should be given. A brief description of specific wastes that fall into each waste type should be given here. In essence specifically describe what constitutes "wet solids" , "homogenous dry solids" etc. Also the volume of each type of waste could be described. Since 5 waste types are given in the figure, there are 5 sub paths for path C are shown here. A description of each of these 5 sub paths would be useful. A description of the component processes of the top bar of this figure would be also useful.

Treatment Processes -- A brief "plain english" description of why each treatment process was selected should be given. For example: incineration is the preferred choice because it can handle a variety of mixed wastes that are found at the RFP. The major difficulty with incineration is with public and regulatory acceptance. Off line gas capture would be implemented to ensure that no release of radioactive gas be released. The Fluidized Bed unit proposed here has the following advantages and disadvantages etc. Incineration is the only treatment technology that can be implemented in the next 5 to 10 years. Alternatives are still in the development stage and may require more than a decade before they could be implemented. Incineration treatment proposed here is not applicable to solid materials. WIPP does not allow bulk lead disposal. Hence this will be handled by steam cleaning, grinding followed by incineration etc. Nitric acid destruction is required foretc.

Solidification -- Following treatment all liquid wastes must be solidified. This may be accomplished by a) cementation, b) polymer solidification, or c) microwave solidification. Where applicable microwave solidification is preferable because it reduces the volume of the waste to be disposed of. However it is a newly developing technology that will take xxx years to implement. Polymer solidification is preferable to cementation in that cementation triples the volume of the waste while polymer solidification only doubles the volume. Cementation is applicable to very small waste streams consisting of less than xxx volume. The solidified waste form must pass certain specified leaching requirement test. Cementation is superior in its resistance to leaching etc. However, concerns are that cementation may not be an acceptable form of waste disposal in the future at WIPP etc.

My point is that I would like to see a "plain english" description of Figure 4-3. This description would give the reasons why one treatment technology was selected over another treatment technology. Additionally the process of characterizing the waste and acceptable waste forms could be described. I like the idea of sub-paths to path C. In essence path C.1, C.2 etc.

Pg 21 (Figure 4-5): An almost unreadable figure. The emphasis here in this figure is the balloons on the top of the figure (waste forms). These should be related back to five waste categories given in Figure 4-3. A simple box for each waste form would suffice rather than the multitude of balloons. Like with Figure 4-3 there are some natural sub-paths shown in this figure. Sub-path C.1 (Solid wastes), Sub-path C.2 (liquid wastes), sub-path C.3 (cyanide waste). Give a "plain english" description of each sub-path. The preferred treatment method. Advantages and disadvantages such as due to the mixed waste nature of the wastes at RFP which may consists of TCE, PCB, oils etc alternative methods to incineration may require multiple separate treatment of wastes for each waste type. The earliest that any of these incineration alternatives can be brought on line is xxxx etc. A comment here -- based on what I have read and on the presentations given at the earlier meeting with EG&G personnel and others, the outside observer is left with the impression that RFP is not pursuing these options very actively.

Pg 22-23 (figure 4-6): There is a lot of good information on this figure but I don't like it. I am not sure but I think it is because it seems cluttered to me.

Pg 24 (figure 4-7): Suggest eliminate and combine with discussion on Page 16.

Pg 25 (figure 4-8): I like this figure -- it has a lot of good information that is understandable. Could however eliminate and combine with discussion on page 16.

Pgs 26-29 (Implementation Schedule): It is mentioned that there are eight treatment techniques. How is that arrived at? How does it relate to the previously mentioned paths A, B, C, D, and F. Figures 5-1 and 5-2 are easy to follow but I would like some discussion of bottlenecks and comparison of time for implementation for various treatment alternatives. For example explicitly contrast the thermal versus the non thermal treatment options for time of implementation. Are there bottlenecks in one treatment process to bring it into implementation that could affect the implementation of other treatment processes.

Pgs 30-35 (Scope and Resources): No comment -- explained fairly well.

Pg 36 (Management): Need a better explanation of how the CTMP would be managed.

Should there be a summary to the CTMP report?

Specific Comments on Technical Supplement to CTMP:

This is a very massive document that contains in some places a lot of detail and in other places is too brief. On an editorial note, I found the extensive sequence of tables to be very disruptive to maintaining a train of thought. For example starting with Table 3.1 to Table 3.7, there is a continuous sequence of 15 pages of tables. Another example is tables 4.3 to 4.13 represents a continuous sequence of 17 pages. Also the report contained a lot of discussion and tables related to treating of RFP wastes at other DOE plants. Since this isn't really an option, I think that the report would be a lot more readable if this were eliminated, placed in an appendix or the subject of another report or volume. In general in the body of the text of the report, if summary tables could be presented rather than the entire table, it would make the report a lot more readable.

The entire table could be put in the appendix with just the summary table in the main body of the text. A related example is there are 62 waste forms identified at RFP. Some of the tables refer to each of these 62 waste forms. If the 62 waste forms could be grouped into say 5 waste groups as was done in the shorter CTMP report, then the main body of the report could be shortened and it would be more readable. The description of the alternative treatment technologies was in general too brief. Specific comments to follow.

The executive summary is well written and in general concise. The recommended solution as given here is to 1) compact the wastes, 2) characterize the wastes, 3) further compact the wastes provided it does not significantly complicate waste compliance, 4) minimize waste generation, 5) aggressively pursue shipping RFP wastes to alternative DOE facilities, 6) develop treatment capability at RFP for LLM wastes, and 7) develop capability at RFP to bring TRM waste into WIPP waste acceptance criteria. Considering that RFP is being shut down these seem out of date? Is item 5) a viable alternative? Is waste minimize a major concern? Is compaction a major thrust?

My copy of the report was missing Fig 1.0-3. More discussion of the sequence of figures given by 1.0-6 3 would be helpful.

Are the extensive list of assumptions given in section 2.3 really needed?

Section 2.4 could be deleted?

Section 3.0, summary of LDR waste forms is too detailed. Move most of the tables to appendix. Maybe tables could be summarized by grouping waste forms with similar EPA codes. I think that the method by which the waste will be characterized should be described in detail here.

Is table 4.1 needed?

Section 4.2 is too brief. References should be given to each treatment technology. I am surprised that this information was not put into table form.

Section 4.3 -- A description of how wastes are to be characterized and analyzed would be appropriate here.

Table 4.3.1.1 is unreadable. All other tables like this are also unreadable.

Match of RFP wastes to other DOE facilities should be put in appendix or another volume. Is this a viable alternative? The extensive list of DOE facilities that are not useful to RFP wastes should be in appendix. Table with list of DOE facilities that are useful to RFP wastes is the only table in this section that in my opinion is useful.

In my opinion, section 4.5 is a very important section and needs much greater description. More detailed description is needed for each treatment technology. References should be made where the reader can get more detailed information about the application of these technologies to RFP wastes. Some of the descriptions are misleading and incomplete. Tables 4.1 and 4.2 are missing.

Tables 4.3 and 4.4 are useful summaries. They should be included in smaller draft report for CTMP. What is the value of tables 4.6 to 4.13? They don't seem to follow here.

Same comment as before. The only viable treatment alternatives at this time is on-site treatment at RFP. Other discussion is misleading and not needed.

Section 5.4 is very important and needs to be expanded. My copy of report does not have Figures 5.4.1, 5.4.2, 5.4.3, 5.4.4, 5.4.5, and 5.4.6. Page 111, states that the treatment technologies will be discussed "in detail". I don't think that 2 and 3 line descriptions are detailed. More like "very briefly."

The advantages and disadvantage of each treatment technology should be given. This discussion given in this section is too brief in my opinion. References to more complete description of the processes would be helpful.

I think that the statement on page 123 under economic criteria summary is true, that economic insight requires political understanding and public awareness. This could also be said about engineering considerations.

Section 5.7 on system analysis is too general to have any value. Either apply system analysis techniques to the CTMP or delete this section?

In the economic analysis section 6.0, under resources needed all costs listed were either N/A or less than 1.2 M. This doesn't indicate that a detailed economic analysis was performed. What is so special about 1.2 M? Seems more like a shopping list than an economic analysis.

Obviously more work needs to be on QA procedures.

How was the number of samples to analyzed for each year arrived at. Specifically where did figure 7.3.1, how were the numbers arrived at. How do they relate to the 80 per cent criteria?

Reviewer D Comments

- Given the number of waste types and volumes involved, and the complexity of the RFP, the task of developing and implementing a compliance plan for LLM and TRM at RFP is obviously not trivial.
- Based upon the technology development presentations that were made to the RMUC team (Thursday meeting at Holiday Inn), EG&G presented a reasonable grasp of the technical issues (albeit some of the presentations were lacking). One does not reach the same conclusion by reading the CTMP documents. EG&G should be encouraged to include in the CTMP information conveyed during the presentations.
- Based upon our meeting with Bob Krenzer and Jonathan Wade (Friday meeting at Denver West) we were provided with a sense that: (1) a considerable technical effort has been expended in developing the CTMP, and (2) at least one person at EG&G has a well synthesized vision of the total picture. The technical effort is masked by the muddled format in which the CTMP is written, and the synthesis, in terms of bottom-line conclusions, is missing.
- It is unclear to me what versions of the CTMP we've reviewed and what is intended to be submitted to EPA. If I were a regulator, I would be unhappy with the poor quality and lack of specificity (noted in my comments below) in either of the two documents that I reviewed (the original 36-page CTMP dated 3/25/92 and the CTMP Technical Supplement dated 4/92). The numerous inconsistencies and omissions and the lack of synthesis does not help DOE's position to suggest that they have done a sound technical assessment.
- Our review comments should note these shortcomings in a politically appropriate manner, and should note that in some cases it is difficult to make definitive assessments and comments on the report.

Comments on CTMP dated 3/25/92:

1. Figure 1-1 is useful for purposes of demonstrating the significance of wet solids. Presumably, the pie chart is a volumetric breakdown of both LLM and TRM in which LLM outweighs TRM. Given the different ultimate dispositions of these waste types, separate volumetric breakdowns may be useful.
2. Page 11, second bullet. What happens between now and 1998? What if there are delays in the facility opening? Who will be the operator of the WIPP? Are WAC subject to change over the next 6 years? What fraction of the TRM is expected to be sent to the WIPP? What will be done with TRM that can not go to the WIPP?
3. Page 11, third bullet. What is the validity of the assumption that relevant WAC requirements will not significantly change?

4. Page 12, second bullet. What are the waste processing capacities of WIPP and NTS and how do these compare with the anticipated generation rates for RFP.

What happens with LLM between now and 1995? Is NTS a DOE facility? Who will be other contributors? What will be the operating capacity relative to waste generation from RFP?

Last bullet. Is the assumption of adequate characterization valid? During the presentations, I recall that characterization was a potential problem.

5. Page 13, last bullet. If additional storage space is needed, does this mean that the regulated volumetric storage limit for LLM plus TRM needs to be increased?
6. Page 14, third bullet. How does the 7890 yd³ of LDR track with annual projections noted in the fifth paragraph on page 7; is the 7890 yd³ in addition to those noted on page 7? If so, are these addressed in the CTMP?

Fourth bullet. This suggests that it is assumed that wastes will be treated at the point of generation as opposed to being sent to other DOE facilities for treatment. The Technical Supplement, however, includes considerable content focusing on treatment capabilities at other DOE facilities. What is actually planned?

Sixth bullet. Suggests that it is assumed that the "... storage capacity for TRM waste will not remain in effect ...", does this mean that an increased capacity is assumed? If so, what increased capacity is needed and what is the likelihood that the limit will be approved by EPA?

7. General comment on all assumptions, pages 11-14. Information about the likelihood that these assumptions will hold is needed. Are certain assumptions more "sound" than others?
8. Page 15, third bullet, fifth sub-bullet. Why are the data and assessment information limits uncertainties that can be managed, and how are these managed? How will future generation vary with baseline versus fallback or other technologies?

Last bullet. In the absence of information about the final debris rules, what would be the impact of the regulations as proposed?

9. Page 16. How are paths E and F distinguished? What is the difference between the first sentence of each bullet? Both read "... is prohibited ...".

References to figures 4-6 and 4-7 should be 4-7 and 4-8.

Sub-bullet under second bullet. Notes that processing and handling facilities are already in place at RFP. Is this to treat to WIPP WAC? What about treatment capabilities for Path C?

10. Figure 4-1. If wastes are found to be nonhazardous, can they stay at RFP or must they be sent to WIPP or NTS? Doesn't the CTMP address only LDR wastes, which implies nonhazardous TRU or LLW is not included?
11. Figure 4-2. Indicate total volume (about 3900 yd³).
12. Figure 4-6. (and other figures). It would be useful to use figure titles that are sufficiently descriptive to enable the figure to "stand alone."
13. Figures 4-7 and 4-8. What are waste volumes?
14. Page 26, first paragraph. The rationale for 8 treatment systems is unclear.
Second paragraph. So what is the "baseline" technology and what is the fallback?
15. Page 30, second paragraph. How do the assumed generation rates and management options in the CTMP reflect the potential mission and generation rate changes?
Fourth paragraph. What are the relative volumes of waste projected to be generated by environmental restoration and what is the likely technology to be used to treat them? The same comment applies to the fifth paragraph and debris wastes.

Comments on CTMP Technical Supplement dated 4/92:

16. Section 6.0 is economic analysis, yet I do not see the sorts of economic details that were presented at the Holiday Inn meeting, nor is there a bottom-line summary table or tables of anticipated costs.
17. Page 2. The second point 2 has a deficiency that is recurrent throughout the report, and that is the lack of specifics. What, specifically, are "as many waste forms," "as quickly as possible," and "analytical data necessary"? Can these be better defined from a practical view?
18. Page 3, first line. Will it be possible? (this also applies to points 4 and 5 on the second and third line of this page).

Throughout both reports, there seems to be differing views about whether compaction will be performed. A consistent assumption should be maintained. Will WIPP accept compacted waste?

Point 2. What is the specific plan for accomplishing characterization on the 12 LLM waste forms? If the waste forms are found to be nonhazardous, they should not be subject to RCRA and therefore I do not see the relevance of them coming into " ... immediate compliance with the RCRA ... " LDR.

Point 3. Is additional capacity needed and, if so, how much is needed? How does compacting LLM that does not meet the NTS WAC complicate achieving compliance with storage prohibitions?

Point 5. I do not see where the lack of a match with the existing RFP waste forms is documented.

19. Page 4, first and fourth full paragraphs. There appears to be an inconsistency here. The first paragraph suggests that the contingency is the "baseline." The fourth paragraph suggests that the "baseline" is different from the "backup." Is thermal the baseline?

Second full paragraph. I'm not sure what this paragraph is saying. How is implementation shown? Is LLMW the same as LLM?

Fourth full paragraph. The last sentence sheds a negative light on the availability of credible, reliable data. How unreliable are the data and what does this mean about the baseline plan?

20. I can not find much discussion of the backup or contingency plan; are schedules and costs based upon baseline? How do schedules and costs change for backup?

21. Page 5, first (partial) sentence. Shouldn't the impact on the lab shortage be assessed?

Fourth full paragraph. Corrected dates are needed.

22. Figures 1.0-3 through 1.0-3-2 are missing (as are many others).

23. Page 25, third paragraph. Is 1601 yd³ the limit for TRM or LLM plus TRM? What is the limit, if any, for LLM? What plans are there for requesting increased storage capacity? What studies will be conducted to assess the impact of compacting on treating and WAC?

24. Page 26, first paragraph. What is the likelihood of importance of analytical wastes? What is relevance of the worker exposure to the CTMP?

Second paragraph. What will the residues consist of? What volumes are anticipated?

How are "mixed residues" defined? Elsewhere in these documents, it is suggested that the CTMP will not address residues.

25. In Figure 3.1, what are "backlogged mixed residues"?

26. Page 45, Section 4.1.1. What are CCW and CCWE?

27. Page 46, first paragraph. Is this for TRU or TRM? If TRM are the basis for the storage limit, how can they not be part of the CTMP?

Section 4.1.4.1. Why is NVO-325 not finalized; does this mean that the WAC are unknown?

28. Page 50, first full paragraph. How can the CTMP address off-site mixed waste treatment?

On this and subsequent pages, "will" is frequently used. Haven't or shouldn't the evaluations thus noted already be completed?
29. Page 54. First paragraph. What was the nature of the effort and the basis used for identification?
30. For purposes of developing a CTMP that is likely to be accomplished, isn't cost and feasibility more important? Is processing capacity also an off-site treatment factor?
31. Table 4.2.3.1 (and others). What do table entries (A, B, C) mean?
32. Section 4.3.3.1.2. How will "treatment" occur?
33. Page 74. What is the practical conclusion regarding the DOE complex capabilities?
34. Page 111. MEO and Biodegradation are listed as impractical. I thought that technology development projects were ongoing in these areas.
35. Page 112. Has consideration been given to the effect of oils and nonaqueous liquids on solidification/immobilization?

Reviewer E Comments

The CTMP report, together with its voluminous set of appendices is rather impressive. The RFP have tried to do a monumental job under pressure and, by and large tried to address the problems and solutions in an integrated manner. However, there are a number of areas where improvement can be effected, as I am certain that you and your colleagues might have also noted. Rather than address the suitability or shortcomings of any specific technology to an existing problem, which I am certain that you and your colleagues must have addressed, I would like to comment on broader issues. The number of types of wastes and the number of choices as to applicable technologies being so large, coupled with inadequate (or incomplete) information provided makes it difficult for me to make succinct and coherent comments at this time. I want to make certain that I have not misunderstood some of the aspects of the proposed plan. However, I am willing to go into detailed discussion on suggested technologies in a meeting with the RFP and Consortium people at a later date. My comments are as follows:

1. The Executive Summary does not fully or adequately reflect the integrated approach the CTMP detailed report presents.
2. There seem to be some inconsistencies between the executive summary and later sections, such as 4, 5, 6 & 7.
3. It is not clear as to how they propose to do the classification and analysis associated with various waste forms. Have they already accomplished it? If no, what methods do they propose to pursue to come up with classification of the types of wastes? Will it be done at the Rocky Flats plant? Do they plan to rely on commercial or other national lab facilities? Waste characterization should be given high priority.
4. In the schedule presented (Fig. 5-1 in Executive Summary) there is no time allowance given for classification of the waste forms, although Fig. 7.7.1 does allow about 3 years to characterize the wastes.
5. Not sufficient attention is given to wastes being shipped out to other areas; rather, more detailed attention is given to processes to be conducted at the RFP site.
6. In all the processes described, the end product after treatment is either solidified waste or treated off-gas. The "public", rightly or not, would want to know the quantities and the level of contamination associated with any released waste form. A reasonable effort to show some numerical value might give some level of confidence.
7. The assumptions made in developing the plan (Draft - 3/25/92, pp. 11-14) seem to be critical and some are quite likely to change. What will be the impact on the plan? Which set of assumptions are most likely to derail the plan? Is there a contingency plan?
8. Page 16. Typos, Fig. 4.6 for Path E should be Fig. 4.7 and for Path F should be Fig. 4-8(?).
9. The list of acronyms provided is helpful but not sufficient. A more complete list will make it easier to read.

10. The presentations made to our group at the meeting held in the Holiday Inn on April 9th, were very helpful. But, that kind of information is not reflected in the report supplied to us.

Finally, the group we have met and the two group leaders, Mr. Bob Kreuger and Jonathan Wade, impressed me with their knowledge and dedication to the project. I feel a systems approach with these technologists would probably have resulted in a better format and a report more fully reflective of the effort that has gone into their deliberations.

Reviewer F Comments

1. I think the CTMP Executive Summary should have a broader scale introduction than the current draft contains. I have the impression that there is a large organization at RFP working on the CTMP and that a BIG PICTURE has indeed been constructed. The short version of the CTMP which I first read gave the impression that there was NO big picture. The longer version gives the sense that there may be one. I think that aspect of the RFP effort should be pointed out in the CTMP introductory sections. Also I think the size and seriousness with which this effort is being addressed should be communicated in the document.

It seems to me that comments should be included along the lines that the long term objective is to produce a final state at RFP that is of environmentally acceptable quality and will be provided at acceptable cost. The final state must accommodate the final intended use of the RFP site which at this time I suppose is not clear. The statement needs to include the expected variability in the clarity of the final state outcome at RFP.

Further, the Executive Summary (and therefore the plan itself) should express the following to the degree that RFP is comfortable with forwarding it:

We have taken an integrated approach

We have examined ALL reasonably expected waste streams and forms.

We have developed a BASELINE plan which is based upon our current best estimates of the constraints (including available technologies, available waste disposal sites, projected ability to develop needed technologies, and projected changes in regulations which might impact the plan.)

The BASELINE plan is supplemented by contingency options which are absolutely necessary for a successful outcome because only in this way can a technically sound and environmentally acceptable set of solutions to these difficult problems be developed.

The contingency options are present with the intention to cover currently projected variability in the following:

- Agreements between cognizant regulatory agencies
- Commercially available treatment technology
- Existing but unproven commercial treatment technology
- Potential technology which can be developed by DOE and or others
- Changes in definitions of waste disposal requirements
- Schedules of availability of Current DOE or other Waste sites
- etc.

2. The executive summary should refer to the DOE overall strategy (perhaps contained in the DOE MWTP) for the inter-relationships between the numerous DOE sites in terms of treatment and final disposal of all of the mass of currently identified LLM and TRM waste, as well as other types. I don't know if such a strategy statement exists. One should exist.

Clearly, one location, operating in isolation to develop a plan for handling waste which assumes that the waste can be sent to other sites ultimately, cannot succeed in the absence of an overall plan that addresses the entire system of sites. I am taking the position that the CTMP exec summary (and therefore the plan) should address and refer to this issue so a reader can understand up front that the pieces will fit together ultimately. The current version of the CTMP gives the impression that it is not clear that the pieces will indeed fit together ultimately.

If this is the case as you see it, then I think the CTMP itself needs to have a contingency component, along with the others that are already there, that addresses this issue. I feel that this is an important part of the job.

3. You should strengthen the statement about 62 waste forms. The current statement reads "approximately 62 waste forms". This leaves questions in the mind of the reader. What does approximate mean. I think it would be better to express it as "there are currently 62 identified. We have a process (if you do) by which examination and categorization of waste forms is continuing and new forms which are identified will be included. We currently project that very few (less than 10) (or whatever makes sense) will be identified.
4. Time sequence for future wastes to be generated. You say they cannot be identified now. I think it would be better to emphasize that you have estimates. You should say so and you should say (if it is true) that these estimates are included in the CTMP as part of the contingency planning for the out years.
5. I question the logic of the whole idea of limiting the amount of waste on the basis of cubic yards. It seems to me that mass or weight would make more sense. The volume limitation sets up a potentially illogical conclusion that compacting the waste is a good idea. I suspect that discussion of this issue is not solely under the purview of RFP.

However, I want to emphasize that this question really caught my attention when I first heard about the compaction issue and I am quite concerned about the logic which is driving toward compaction. This is especially true in light of my concern that compaction may have the ultimate requirement that compacted packages be disassembled in order to treat them for disposal at a future time given the current apparent uncertainties in availability of disposal sites and the restrictions on waste forms which can be acceptable at those sites.

6. It is proper and I think it is important to stress the importance of analytically characterizing the 62 waste forms. You should make it clear why process knowledge is not enough. Also I think that your plan should include the possibility that as the characterization process proceeds, enough may be learned as you go along to make it possible to NOT characterize every bit of waste.
7. The expression of what the BASELINE plan is needs to be emphasized. The baseline plan philosophy needs a little explanation. EG: the baseline plan is the current primary plan. There are alternate options to many aspects of this plan. Implementation of the options in place of the elements of the baseline plan will depend upon etc. The exec summary does address some of this but the emphasis could be improved to the benefit of the reader.

8. Again, the issue of analytical characterization needs to be emphasized in the context of early findings that commercial laboratory capability is probably inadequate to address this need. I think the CTMP would be improved if a contingency plan addressing this problem were at least outlined at this stage if not set out in more detail. I think it will be important for DOE and EPA to realize the essential importance of this issue and the current state of the problem.
9. The 390 page CTMP draft is far superior to the CTMP draft made available to the team about April 1 (consisting of an executive summary plus a few of the appendices). The shorter draft produced a number of comments as follows:
 - a. The logic structure gave a list of assumptions. At first glance, many of these assumptions had doubtful validity at best, even to an uneducated reader.
 - b. Also, this approach gave the impression that there was no overall BIG PICTURE and there was no consideration for contingency. It presented an impression that the assumptions were made and the success of the plan depended on those assumptions. Then if those assumptions proved to be invalid, the plan would have to be reconstructed. I think that impression, while perhaps not intended, is an inappropriate impression to allow to occur.
 - c. I have commented earlier on the importance of expressing that an integrated approach has been taken, that a BIG PICTURE has been evolved and that contingency planning has been addressed and included.
10. I think it is important to present the plan in its entirety even if the document becomes very large. I urge RFP and DOE, preparing the final draft to take this approach. A shortened version of the long and very complicated process being described will suffer more from the loss of clarity due to shortening than from the length of a fully descriptive and informative document.

As important as this problem is, I think a thick CTMP document is not a problem.

11. RFP, DOE and EPA cannot be all-omnipotent. There are questions no matter how hard all agencies might try to have all the answers. I think it is best to be realistic, plan well, address the uncertainties through allowing for contingencies, don't push the time schedule so hard that serious and costly mistakes are made, and be open.
12. Figure 1.0-1 shows the Pathways. They lead only to NTS and WIPP. Some of the Path A wastes can go to other sites can they not? If that is correct I think this Figure should show a box for other possible sites.
13. Figure 1.0-6 addresses the content of the sections of the CTMP. This is a good figure. One of the boxes should clearly address the final sites for disposal, their availability schedule, their WAC's contingency planning for access, etc. This figure should also address some of the issues I raised earlier in these comments such as Overall integrated approach, BIG PICTURE, Baseline Plan, contingencies. This might be accommodated easily by changing some of the words in the boxes.

14. Figure 1.0-6-1 through 4. This also is a good figure. It needs some detailed touch-up to clarify the relationship between the sentence at the top of each box and the waste forms listed below in each box.
15. Section two refers to integrating the approach as a "difficulty". I think this kind of language gives an unfortunate impression. I have commented on this integration earlier as important and I consider integration to be just part of the problem and ordinarily expected in working complex engineering problems.
16. The Goals and Objectives are all expressed in terms of compliance. This is clearly the proper set of goals and objectives however I think that the real goal is to produce an environmentally, technically, and socially acceptable final state for the RFP facility. It may be correct to assume that compliance will or can produce that outcome, but this is not necessarily so. I think some reference to the broader or over-arching goal, correctly stated if I have not correctly stated it, would be appropriate.
17. With reference to Section 2.3: See my earlier comments about assumptions and the need to plan on things changing.
18. There is a need for an entire section on the overall structure of the plan including the context for the Paths, the Existence of the Baseline Plan, that contingencies are included, and that there is a Big Picture. This section also needs to include a discussion of the organization of the CTMP Team, that there are PI's, that they are assigned to develop specific technology areas, that they are responsible for certain functions in the ranking of technologies, that they will (or did) participate in down-selecting of technologies. A discussion of the tie-in to the public processes in the Monitoring Council should also be included.

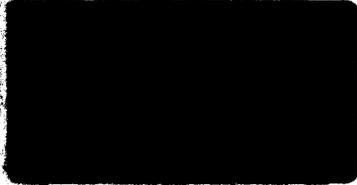
This section probably should appear after section 2.0 and before section 3.0.

19. Section 2.1 paragr. 3. You should state the global goal of achieving an acceptable final state in addition to just coming into compliance. The objective should not be "find the quickest most logical way", I have stated earlier what the objectives should be.
20. Section 2.2, paragr. 2. ---But do the EPA regulations referred to here include radioactive mixed waste?
21. Section 2.3m paragr. 1. Here is where the issue of flexible planning in which the plan has a contingency component should be included.
22. Section 2.3, item 2, 4, 5, 6, 7. There are several assumptions here that certain regulations or other conditions will not change. These assumptions do not come across as being credible. If they are, a little bit of discussion of each should be added. If they are not then I think the plan should not be based upon them and in these areas the contingency planning idea should be used.

23. Section 2.3, item 8. It is here that a Record of Decision is mentioned. What ROD is this? When I asked Jonathan Wade about this on April 9, 1992, he was not sure where it came up. Perhaps this is an error?
24. Section 2.3, item 9 third paragraph. This statement is not clear. It sounds like the responsibility is being passed on. In any case this needs clarification.
25. Section 2.3, item 10. What is CD? Add this to the glossary.
26. Section 2.5, Glossary. Add glossary to the table of contents. Make the following changes to the glossary: Add ALARA, SVOC, Change WAC to Waste Acceptance Criteria, TRU means Transuranic does it not rather than transuranic waste?
27. Section 3.1 paragr. 2. Need more emphasis on the importance of analytical characterization. Paragr. 3: This paragraph is not clear with regard to whether 1601 is less than the RCRA storage level.
28. Section 3.2.1, paragr 1. "Knowledgeable guesses" as a choice of words is not recommended. "Projections based upon current available information" might be better. Also the level of uncertainty in these projections should be mentioned. "Guesses" does not inspire confidence.
29. Section 3.2.1.1. The statement here is not credible. If nothing is known about this why is it mentioned. I suspect you know that there will be some waste from analytical characterization. I suspect also that something is known about how much to some level of uncertainty. This should be fixed or left out.
30. Section 3.2.4. There is no content here yet, but when this is written, it should refer to the desired "final state" of RFP.
31. Table 3.3. Is it really smart to compact these items which contain solvents, lead and mercury. I don't like the idea and react negatively to a plan to do that.
32. Section 4.0, first paragraph referring to 40 CFR 268.50. This set of statements really leaves the reader hanging. It makes the situation sound like there is no resolution. Should not leave it that way.
33. Section 4.0, boldface paragraph. The WIPP no-migration is assumed to not be lost. Again the reader wonders what happens if it is. The CTMP should at least recognize the need for a contingency component to cover this. If one is not needed, then the reasons why should be stated. How about formal risk analysis applied here (Probabilistic Risk Analysis). In the next paragraph there is a statement saying the range of options "appears" limited to the following: I think "appears" should be replaced with some confidence building, professional sounding words. Also the first bullet in the list is not clearly stated. Later in this section there is reference to speedier compliance. I think speedy, fast, etc. is overemphasized in general. Fast might generate mistakes. Progress toward compliance needs to be technically sound as well as fast enough, but there should be a balance.

34. Section 4.1.3. speaks about TRU wastes and says that they are not a part of the CTMP. I am confused by this statement. Is it really correct. If so, it needs clarification.
35. Section 4.3. This is an appropriate place to refer to the DOE complex overarching plans and refer to the documents that describe them. Under the subtitle "Plan" it says there are two primary courses of action. Are they to be conducted in parallel? Are they provided to assure contingency? This needs to be clarified.
36. Table 4.3.1.1. All of the tables like this one are too small and cannot be read. They need fixing.
37. Section 4.3.2 says that secondary priority is given to feasibility. This is not a credible statement.
38. Section 5.1, item 3. The question is raised as to whether compaction should be done given the complications it might raise. This issue should be emphasized and brought forward strongly.
39. Next paragraph refers to fastest and lowest cost as being most desirable. I pointed out earlier that I think this is inappropriately and perhaps unintentionally overemphasized. It would be better to leave this out or refer to it in a different way.
40. I agree with the editorial comment just before section 5.2 that it would be better to show the process here on a logic diagram of some kind. The diagram needs to be simple however.
41. Section 5.3. Brief definitions of the risks listed there are needed. Under "Highest Priority Problem" I presume the numbers are priorities. If they are it should be so designated.
42. Section 5.5. The statements here about unlimited demands and limited resources are not credible statements. The demand might seem to be unlimited, but I think it is a mistake to refer to the demand in these terms. The words "standardize a systems approach" really do not mean anything. The benefit of a successful outcome goes not only to the DOE system but also to the public.
43. Section 5.6.1 refers to the profit motive. This should be left out or re-stated. Profit should not be put ahead of the public benefit.
44. Section 5.6.1.3. The word criteria is plural. The subject of this paragraph is balancing time against knowledge building. This is a good concept that should be strengthened in the report.
45. Section 5.7. Systems Analysis is a much broader concept that is intended to achieve optimal overall results including technical outcomes as well as cost outcomes.
46. Section 5.7.5.4. The objectives of CTMP must include reduced cost in balance with the other criteria including maximizing technical performance.

47. Section 6.0. The statement about unlimited demands and limited resources are repeated here. Same comment as before.
48. Section 6.1. Concept of Value-Added is good.
49. Section 6.2. Low cost and fast is again emphasized here. Not good I think.
50. Section 6.3.1.2. Involvement of Local Universities. I think it would be good to leave the door open in this section to other universities as well.
51. Section 6.3.2.3, specifically the tables which follow this section. There is something significant about \$1.2 million. What is it. Some comment about this would help.
52. Section 6.4. The concept of including Quality Assurance is a good one. I think this should appear in the Executive summary. Some of the additional QA concepts should be highlighted if they are part of the RFP QA Manual, concepts such as employee empowerment, and customer-supplier models.
53. Figure 6.4-1. Requirements Affecting the CTMP. The public benefit should show on this figure somewhere.
54. Section 7.1. The analytical characterization of current waste and waste yet to be generated get mixed together in this discussion in a way that is confusing.
55. Figure 7.1.1. I think this figure should show a waste stream outflowing from the process. If this is the secondary stream, it would help to identify it as waste output.
56. Section 7.2. Again a reference to supercompaction being potentially a serious problem. This cannot just be left as a statement of a problem. It must be directly addressed in some way in the appropriate forum, but in a strong way.
57. Section 7.2 WIPP "No Migration". In this section it recognizes that the renewal of the grant cannot be assumed. The CTMP cannot leave this issue hanging. It must be addressed in the plan in the contingency aspect.
58. Section 7.2, Analytical Labs Capacity/Functions. The implications for the CTMP of the shortage of capacity and proper procedure must be discussed.
59. Table 7.3.3 and 7.3.4. Given the difficulties listed, I conclude that these waste forms should not be compacted. Compaction should not be recommended unless there is a rationale that mitigates the difficulties or there is a contingency plan.
60. Figure 7.5.2 and 7.5.3. The titles say Treatment of Analytical requirements and compliance of analytical requirements. These words do not seem to mean anything.
61. There is a need for a Conclusion Section of the report.



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