ROCKY FLATS PLANT
JEFFERSON COUNTY, COLORADO

DRAFT FINAL
TECHNICAL REVIEW OF PHASE I
RCRA FACILITY INVESTIGATION/REMEDIAL INVESTIGATION
WORK PLAN FOR OPERABLE UNIT NO. 7

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 8 Superfund Remedial Branch
Denver, Colorado

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Prepared by	:	PRC Environmental Management, Inc. (Jim Wulff, Darwin Nelson)
Telephone No.	:	303/295-1101
EPA Primary Contact	:	Bill Fraser
Telephone No.	:	303/294-1132

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) requested that PRC Environmental Management, Inc. (PRC) review the "Draft Final Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation and Remedial Investigation (RFI/RI) Work Plan, Present Landfill and Inactive Hazardous Waste Storage Area" (phase I work plan). The present landfill and the inactive hazardous waste storage area comprise operable unit (OU) 7 at the Rocky Flats Plant (Rocky Flats). The phase I work plan was submitted by Woodward-Clyde Consultants for the U.S. Department of Energy (DOE). PRC reviewed this document under the Technical Enforcement Support (TES) 12 contract, work assignment C08060.

This review is divided into general and specific comments. The general comments are intended to provide a brief summary of the review and identify specific comments that address key points. The specific comments provide detail and are keyed to appropriate sections of the work plan document. Typographical and editorial errors within the phase I work plan have not been addressed.

2.0 GENERAL COMMENTS

Much of the phase I work plan appears to have been assembled from various EPA guidance documents and completed work plans from other OUs at Rocky Flats. As a result, the work plan is a general and incomplete document which will not adequately direct site-specific source characterization activities at OU7.

Section 2.0 of the work plan omits detail that is necessary to evaluate the physical characteristics of the site. Omissions include a detailed description and history of previous drilling efforts at OU7 (see specific comments 2 and 5), including whether soil samples were obtained from these boreholes. Also, in Section 2.2.3, conclusions made about ground water quality are not adequately supported because supporting documents have been abridged in the appendices, and all analytical data tables have been omitted (see specific comments 6 and 7).

The Section 4.0 discussion of applicable or relevant and appropriate requirements (ARARs) does not actually identify any ARARs, even though EPA ("Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA," 1988) advises facilities to preliminarily identify ARARs during the scoping phase, before the work plan is written.

Much of Section 6.0 appears to have been excerpted from earlier draft work plans for OUs 1 and 2 without addressing comments made on those documents (see specific comments 10 and 11).

This is apparent because the text includes errors that have been identified in draft versions of work plans for OU1 and OU2.

The field sampling plan (Section 7.0) does not propose sampling landfill cover materials, even though the landfill cap strongly influences the volume of leachate generated, and will likely be a major component of the final remediation (see specific comments 3 and 12). Also, the drilling procedures outlined in Section 7.0 do not appear to account for the unique hazards of drilling into a landfill (see specific comments 13 - 16).

3.0 SPECIFIC COMMENTS

1) Section 2.1, Page 2-2, Paragraph 1: This paragraph should provide a detailed description of the historical day-to-day operation of the present landfill. For instance, it is unclear whether the waste was covered at the end of each working day, or the end of each lift. The term "waste layer" should be defined in this section. If the areal distribution of waste types is documented, this information should be included here. Also, information on compaction methods and equipment should be included in this section.

   Rationale: An evaluation of the remedial alternatives for capping the landfill and leaving the contents in place will require an estimate of how much settlement of the landfill material is expected. This requires detailed information on landfill operation.

2) Section 2.1.2, Page 2-6, Paragraph 1: There is a lack of information on the 47 boreholes that were part of the geotechnical engineering study. Locations of the boreholes should be provided in a figure and details on borehole and well construction, such as depth of borings, construction materials, and procedures, should be included in the text.

   Rationale: This information is necessary to determine whether these boreholes represent potential contaminant migration pathways.

3) Section 2.1.4.1.1, Page 2-12, Paragraph 3: The extreme fluctuations in the water table at well 64-87 indicate that a severe problem exists with regard to the condition of the landfill cap. The discussion of surface drainage on page 2-14 notes "....the ground surface is irregular and hummocky, resulting in impeded surface drainage." The 11-foot average rise in water level at well 64-87 depicted in Figure 2-8, may represent a significant amount of leachate that may not have been generated if the landfill cap was adequate and properly drained. The condition of the cap should be investigated during the phase I RFI/RI.

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Rationale: The ongoing generation of tremendous volumes of leachate due to poor surface drainage is an urgent concern that could potentially be addressed with a relatively simple and inexpensive interim action, such as regrading the surface of the landfill cap.

4) Section 2.1.6.1, Page 2-15, Paragraph 3: It is not stated in this discussion of the leachate collection system whether the westernmost discharge points for the ground water diversion system were adequately plugged or bypassed before the landfill covered these discharge points. It should be determined if ground water is being discharged into the landfill through the diversion system.

Rationale: Uncontaminated ground water diverted into the landfill at these discharge points will generate additional leachate.

5) Section 2.2.1, Page 2-19, Paragraph 2: There is a lack of information on the 57 boreholes that were part of the tritium study. Locations of the boreholes should be provided in a figure, and details on borehole and well construction, such as depth of borings, construction materials, and procedures, should be included in the text. It should also be clarified whether the 57 monitoring wells mentioned in this paragraph include the 47 boreholes that were drilled during the geotechnical study. The reason these wells are not depicted in Plate 2-1 of this document should also be explained.

Rationale: This information is necessary to determine whether these boreholes represent potential contaminant migration pathways and to assess whether drilling additional boreholes is necessary.

6) Section 2.2.3, Page 2-20, Paragraph 2: If the analytical data from the RCRA ground water monitoring reports cited in this section do support the discussion of ground water quality in Section 2.2.3, they should be included with Appendices E and F. The only analytical data tables included with the work plan are the ground water monitoring data tables from the years 1986 through 1988 that are found in the "Present Landfill Hydrogeologic Characterization Report" (Appendix A), a document which is not included in the list of supporting documents cited in paragraph 2 of page 2-20. Due to the lack of any other supporting data, this review of Section 2.2.3 (see specific comment 7) is based on the data tables found in Appendix A.

Rationale: All analytical data are required to allow a proper review of the work plan.

7) Section 2.2.3.5, Page 2-25, Paragraph 3: The statement "....it may be concluded that the quality of the groundwater in this sandstone, as in the claystone, reflects dissolution of minerals within the sandstone and claystone...." is not adequately supported by the text or appendices. The text states that "....high concentrations of major ions and metals at Well Nos. 41-87 and B207189 were not observed in alluvial ground water within, adjacent to, or immediately downgradient of the landfill." Well Nos. 41-87 and B207189 are located downgradient of the landfill and are screened in bedrock sandstones. Tables 4-11 and 4-5 of Appendix A show that during the first quarter of 1988 well 41-87 has significantly lower concentrations of aluminum, bicarbonate, calcium, cobalt, chromium, copper, iron, manganese, molybdenum, nickel, lead, strontium, sulfate, vanadium, and zinc, than one or more of the alluvial wells that are located within or adjacent to the landfill. In contrast, only arsenic, chloride, lithium, magnesium, and sodium are significantly higher at well 41-87 than the alluvial wells. Even if concentrations of most analytes had been higher at well 41-87, no evidence has been presented that would indicate that the higher concentrations were due to natural mineral dissolution, as opposed to the concentration of contaminants in bedrock ground water. These statements should be withdrawn if they cannot be supported.

Rationale: The bedrock sandstone in question may be hydraulically connected to saturated landfill wastes. Therefore, it should be assumed, until proven otherwise, that concentrations of major ions and metals that are above background are a result of landfill contamination and not mineral dissolution. Mineral dissolution should be accounted for in the background study.

8) Section 2.2.4, Page 2-27, Paragraph 2: This paragraph implies that surface water stations SW-10, SW-13, SW-14, and SW-15, could not be sampled because there was no flow at the stations during the August 1986 sampling event. An attempt should be made to sample the four surface water stations in the spring when flow in the drainage is likely to occur.

Rationale: Ephemeral drainage should be sampled during spring runoff to assure that a representative sample of surface water can be obtained.

9) Section 2.3.3, Page 2-29, Paragraph 2: This discussion of sources of contamination does not include the spray fields that are located north and south of the pond as potential secondary sources. The potentially impacted areas are described on page 4-2 of Appendix E of the work plan. Surface soil samples should be collected at the spray fields and surface water samples should be collected in the tributaries which drain the spray fields as part of the

RFI/RI investigation of the present landfill. If these areas are being investigated as part of another ongoing investigation, it should be stated in this section.

Rationale: Contaminants from the landfill may also have affected soils in the north spray field, due to the spraying of leachate from the now-defunct west pond, and soils in the south spray field, due to the spraying of leachate from the east pond.

10) Section 6.6, Pages 6-5 through 6-11: This description of the baseline risk assessment task apparently has been excerpted almost verbatim from work plans that were completed for OU1 and OU2, without addressing the comments that were made on the text in those documents. For instance, the first paragraph on page 6-7 has been previously identified in PRC comments on OU1 from April 5, 1990 (comment 31) and OU2 from May 9, 1990 (comment 17) as needing substantial revision or explanation. However, this paragraph appears on page 6-7 of the current document in its original form. The original comments should be addressed and Section 6.6 should be rewritten to be site-specific to OU7.

Rationale: The baseline risk assessment must be site-specific to OU7, therefore, this section must be rewritten to address the physical characteristics and nature of contamination at OU7. All field activities identified should be included in the field sampling program.

11) Section 6.7, Pages 6-11 through 6-12: This description of the environmental evaluation task apparently has been excerpted almost verbatim from work plans that were completed for OU1 and OU2, without addressing the comments that were made on the text in those documents in the April 5, 1990 and May 9, 1990 submittals. The most important problem with this section is that it identifies a series of tasks that are to be addressed in the phase I RFI/RI, but these tasks are not addressed anywhere in the field sampling plan (see PRC comment 34 on the OU1 work plan and PRC comment 21 on the OU2 work plan). Other deficiencies that have been previously commented upon can be found in the discussion of bioaccumulation on page 6-11 (see PRC comment 32 on the OU1 work plan and PRC comment 19 on the OU2 work plan), and the discussion of biomarkers on page 6-12 (see PRC comment 33 on the OU1 work plan and PRC comment 20 on the OU2 work plan).

Rationale: The environmental evaluation must be site-specific to OU7, therefore, this section must be rewritten to address the physical characteristics and nature of contamination at OU7. All field activities identified should be included in the field sampling program.

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12) Section 7.1.2, Page 7-4, Paragraph 3: This paragraph states that "....soil characterization will not include the existing landfill cover soils, since it is presumed any remedial alternative developed will address these materials along with the wastes." However, it was stated on page 2-12 that the relationship between precipitation events and the fluctuating water levels found in well 64-87 (which is screened in the landfill wastes) will be investigated as part of the phase I RFI/RI. It is not clear how this relationship can be studied without investigating the permeability and drainage characteristics of the landfill cap.

Rationale: The characteristics of the cover soils have a major impact on the volume of leachate generated and therefore should be investigated as part of the source characterization.

13) Section 7.1.3.1.1, Page 7-6, Paragraph 1: If boreholes and wells are to be drilled through waste into the underlying soils, the procedures outlined in this paragraph should be revised to prevent contaminant migration through the boreholes. Specifically, the emplacement of a temporary casing while drilling may not be sufficient to prevent leachate migration. To ensure that underlying soils are properly isolated, a steel casing should be pressure grouted in place at the top of the underlying soil layer. The grout can be pressurized with a Haliburton plug or a similar device that can be drilled out. After hardening overnight, the borehole can be advanced with a coring instrument. However, boreholes that are to be drilled in this manner cannot be used to sample fluids and gases within the waste. The presence of the permanent steel casing will isolate the borehole in the waste layer precluding the installation of monitoring wells that are capable of sampling the waste layer. If contamination of underlying soils is to be avoided, separate boreholes should be required for waste and underlying soil characterization.

Rationale: Drilling through landfilled waste into the underlying formation must be conducted with the utmost care and only when necessary. The special procedures that are required to safely drill through the waste and underlying soil boundary will permanently isolate the borehole from the surrounding waste, thereby rendering the borehole inapplicable for waste sampling. Another reason why it would be highly desirable to have detailed information on all previous boreholes and wells is to see if they could be resampled instead of drilling new wells.

14) Section 7.1.3.1.1, Page 7-6, Paragraph 2: This paragraph states that the entire depth of the boreholes will be sampled using continuous coring techniques but does not specify the length of the continuous sampler. Sampling intervals should not exceed 1 or 2 feet near the bottom of the landfill.

Rationale: Drilling through landfilled waste also requires that the borehole be advanced cautiously, in small increments, when approaching the bottom of the landfill. The use of a 5-foot sampler near this boundary could result in advancing the borehole 4.5 feet into the underlying formation, which increases the risk of contaminating the formation.

15) Section 7.1.3.1.2, Page 7-7, Paragraph 2: This paragraph states that the overdrilled portion of the boreholes (below the bottom of the waste) will be grouted before wells are installed. The method of grout emplacement should be specified.

Rationale: Abandoned portions of the borehole must be carefully grouted to ensure that leachate will not contaminate soil and bedrock below the waste.

16) Section 7.1.3.1.2, Page 7-7, Paragraph 2: Temporary casing should not be used when drilling through the waste layer to the underlying formation (see comment 13 above).

Rationale: The use of temporary casing that is not pressure grouted increases the risk of contaminating the underlying formation.

17) Section 7.1.3.1.3, Page 7-8, Paragraph 1: The use of ground water profiles to evaluate the effectiveness of the diversion system should be explained in greater detail. The proposed profiles do not include a well or piezometer adjacent to the diversion system (similar to well 59-87 in cross-section E-E'). It should be explained how a profile lacking a data point adjacent to the clay barrier can be used to evaluate the effectiveness of the diversion system. Although wastes have been placed beyond the leachate collection system, a well could be cased through surface wastes allowing piezometers to be located immediately outside of the clay barrier.

Also, previous investigators recommended that well 59-87 be abandoned because the borehole penetrates the clay barrier of the ground water diversion and leachate collection system (Roy F. Weston/Rockwell International, "Present Landfill Hydrogeologic Characterization Report," 1988). The work plan should state whether well 59-87 has been (or will be) abandoned, and whether it can be determined that the diversion system is working properly at this location without well 59-87.

Rationale: This paragraph states that the piezometers (in conjunction with proposed wells 3 through 5) will be used to estimate the water level profile across the sections of the trench where flow under the diversion system is suspected. These profiles will be compared to the

profile obtained across cross-section E-E'. Cross-section E-E' includes a well (59-87) that is located just outside of the clay barrier that separates the ground water diversion system from the leachate collection system. It is the lowering of the water table at this well that led the previous investigators to conclude that the diversion system was functioning properly at this location.

An open borehole (uncased) drilled immediately outside of the clay barrier could provide a pathway for waste material to contaminate underlying soils. This may be the reason why the proposed piezometers are located approximately 100 feet from the diversion system. However, if a piezometer is cased though the surface layer of waste (which appears to be 5 to 10 feet thick), it could be located immediately outside of the clay barrier. This additional piezometer would provide the data point necessary to estimate the gradient adjacent to the diversion system.