RFCA Stakeholder Focus Group
Attachment C

Title:	Water Quality Language in the Rocky Flats Closure Contract and Cleanup Agreement
Date Presented:	August 30, 2000
Author:	Troy Timmons Kaiser-Hill Company, LLC
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RFCA Stakeholder Focus Group
Attachment C

Introduction

One area in which the completion requirements of the Rocky Flats Closure Contract (Contract) does not fully meet the requirements for closure under the Rocky Flats Cleanup Agreement (RFCA) is on-site surface water quality. This technical / policy / issue summary provides information on the differing water quality language in the two documents.

Closure Contract Requirements

Section C.1 of the Contract (Appendix C-1) provides a definition of "physical completion" of the contract. Items 6 and 7 identify the water quality standards Kaiser-Hill must attain to meet the "physical completion" criteria. Item 6 states that "surface water onsite will meet health-based standards based on open space use calculated using methodology and toxicity assumptions utilized for the July 19, 1996 surface water action level."

More specific water quality standards information, including the methodology and toxicity assumptions for open space use, are located in RFCA Attachment 5, "Rocky Flats Environmental Technology Site Action Levels and Standards Framework for Surface Water, Ground Water, and Soils" (www.rfets.gov) and the "Implementation Guidance Document" (Rocky Flats Reading Room location).

Recognizing the unique nature of the closure project versus a typical Department of Energy (DOE) operations site, the two parties also agreed to work toward implementing a regulatory and operational strategy more fitting to the closure environment. The DOE commitment to such an environmental regulatory strategy is outlined in the January 27, 2000 correspondence (Appendix C-2) from Paul Golan to Robert G. Card. Item 9 in the correspondence commits the DOE to seeking to "[pursue alignment of onsite surface water quality standards with end state onsite water use.]"

Cleanup Agreement Requirements

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Water Quality Language in the
Rocky Flats Closure Contract and Cleanup Agreement

Section B of the RFCA Preamble (Appendix C-3) establishes the objectives guiding implementation of the Agreement, and its subsection 3 establishes water quality objectives. In short, RFCA states that "all on-site surface water...will be of acceptable quality for all uses including domestic water supply." Additional details on water quality standards are located in the RFCA Attachment 5, "Rocky Flats Environmental Technology Site Action Levels and Standards Framework for Surface Water, Ground Water, and Soils" (www.rfets.gov) and the "Implementation Guidance Document" (Rocky Flats Reading Room location).

Miscellaneous

Appendix C-1 contains the relevant pages from the contract, Appendix C-2 is the commitment letter, and Appendix C-3 is the cleanup agreement.

The entire text of the DOE/Kaiser-Hill contract may be found on the Rocky Flats Field Office web site at:

DisplayText cannot span more than one line!tm.

The entire RFCA text can be found at:

http://www.rfets.gov/SiteClosure/Rfca1/RFCACONT.htm,

with the exception of the "Implementation Guidance Document," which has not yet been posted. Copies of the guidance document can be found at any Rocky Flats Reading Room location.

Please note that on September 1, 2000, the Rocky Flats Field Office will change its internet address from "www.rfets.gov" to "www.rf.doe.gov". After that date, please change the domain name accordingly.

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Water Quality Language in the
Rocky Flats Closure Contract and Cleanup Agreement

Appendix C-1
Rocky Flats Closure Contract No. DE-AC34-00RF01904
Section C - Page 3
"Physical Completion"

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Water Quality Language in the
Rocky Flats Closure Contract and Cleanup Agreement

Appendix C-2
January 27, 2000 correspondence from Paul Golan to Robert G. Card
re: RFFO Commitment to Environmental Regulatory Strategy for Closure

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Water Quality Language in the
Rocky Flats Closure Contract and Cleanup Agreement

Appendix C-3
Final Rocky Flats Cleanup Agreement
July 19, 1996
RFCA Preamble

RFCA Stakeholder Focus Group
Attachment D

Title:	Surface Water Quality at Rocky Flats: Implications for Cleanup
Date Presented:	August 30, 2000
Author:	John J. Rampe U.S. Department of Energy, Rocky Flats Field Office
Phone Number:	(303) 966-6246
Email Address:	john.rampe@rfets.gov

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Introduction

Protection of surface water quality is a central goal of the cleanup at Rocky Flats, and the Rocky Flats Cleanup Agreement (RFCA) specifies that, at closure, water quality on Site will be suitable for all uses. The presence of dispersed plutonium and americium in soils at Rocky Flats provides a source for these contaminants to enter surface water, through erosion from precipitation runoff. Any remediation of these contaminated soils, such as at the 903 Pad, needs to consider the protection of surface water as one of its goals. Protection of surface water is a major consideration in crafting the final Site condition at closure. This paper provides a brief discussion of water quality management and monitoring at Rocky Flats, and then discusses possible long-term remediation options for protection of surface water quality. This paper only considers the problems posed by actinides in soils, notwithstanding the fact that other surface water concerns exist, notably nitrates in the North Walnut Creek drainage and volatile organic compounds in South Walnut Creek.

Technical Summary

Surface water is found in several small drainages at Rocky Flats, flowing generally from west to east. The primary drainages on Site, from north to south, are Rock Creek, Walnut Creek (which has several branches), Woman Creek and the Smart Ditch Drainage. Water supply ditches (Church, Mower and McKay Ditches) also traverse the Site. Walnut Creek and Woman Creek are of most interest from a water quality standpoint, since they drain developed portions of the Site. The attached schematic shows major drainages, ponds and monitoring points (Appendix D-1).

Ponds are found in all the major drainages on Site. Most of the ponds in the Walnut and Woman Creek drainages were constructed for the purpose of capturing and holding water from an industrial release on Plantsite. When operated in a mode where they are continuously drawn down (which is not the case at present), the pond systems can hold the runoff from a 100-year storm event if need be. The ponds are currently operated in a batch and release mode wherein water is collected, tested, and then released. Often, water is released prior to the receipt of test results, due to the length of time it takes to receive the test results, and the intervening filling of the ponds. Rocky

Flats has a detailed Pond Operations Plan, which outlines how the ponds are operated under various conditions. Apart from the ponds, the other major Site surface water control feature is the South Interceptor Ditch (SID), which extends 6,500 feet along the hillside south of the Industrial Area. The SID collects water that would otherwise enter Woman Creek and directs it to Pond C-2, where it is collected and analyzed for actinides prior to release to Woman Creek.

Water at Rocky Flats comes from several sources. There is natural base flow that occurs regardless of Site activities; the Lindsay Ranch Pond in the Rock Creek drainage is a good example of such a feature. Leakage from upstream water supply structures, such as the South Boulder Diversion Canal and Rocky Flats Lake, are thought to contribute to Site surface water. Water moves across the Site in several water supply ditches. Runoff from precipitation, both from the developed and undeveloped areas of the Site, has a marked effect on the amount of water in streams and ponds. Finally, the Site uses and subsequently discharges (relatively) large quantities of water, purchased from the Denver Water Board. The Rocky Flats Sewage Treatment Plant discharges about 55 million gallons of wastewater per year into Pond B-3 in the South Walnut Creek drainage. An unknown amount of water escapes into shallow groundwater in the Industrial Area through leaks in water supply pipes, sanitary sewers, etc., and surfaces in the major drainages. The Walnut Creek drainage in particular receives much of this unquantified inflow, making it difficult to predict the amount of water and the flow regimes that will remain after Rocky Flats is closed. The Site Water Balance Study, which is scheduled for completion in early 2002, will help determine the impacts of the Plant on local hydrology, and predict what flows will remain following cleanup.

The Site and other organizations monitor water at and near Rocky Flats under a number of different programs; these are summarized in the attached narrative and table Appendix D-2). Conformance with the standards established pursuant to the Rocky Flats Cleanup Agreement (RFCA) for plutonium and americium (0.15 pCi/l) is measured at a number of locations prescribed in the RFCA Action Level Framework and the Integrated Monitoring Plan. RFCA Points of Compliance (POC's) have been established at the Site boundary and at the outfalls of the Site's terminal ponds, downstream of any control structures. RFCA Points of Evaluation (POE's) have been established at several points of interest higher in the Site's drainages, upstream of the pond systems. Recently, a new POE was established at the outfall of the Sewage

Treatment Plant. Per RFCA, conformance with actinide standards is judged using a thirty-day moving average. That is, all sample results in the latest thirty day timeframe are averaged and compared to the standard; an individual result in excess of 0.15 pCi/l does not necessarily result in an exceedance of the standard. RFCA requires that DOE do a source evaluation for exceedances at POE's. If an exceedance is detected at a POC, mitigation is required in addition to the source evaluation, and monetary penalties may be imposed.

The attached data summary table (Appendix D-3) shows water quality results for plutonium and americium at POC's and POE's at various Rocky Flats locations since 1990 (note that the sampling at these locations in many cases predates their designation as POE's and POC's). Per a request from the RFCA Stakeholder Focus Group, these results are compared with the previous Colorado water quality standard of 0.05 pCi/l, a standard based upon what at the time was believed to be the ambient level of plutonium in local waters. These data show that actinide levels in and downstream of the ponds have been uniformly low, even when compared to the previous standard. Points upstream of the pond system (see the results for GS-10, which drains much of the Industrial Area) show higher actinide concentrations on an average basis, and much higher maximum concentrations, usually in response to high runoff events. The progressive reduction in plutonium and americium concentrations likely reflects both the effects of the ponds in lowering actinide levels, and the increasing vegetative cover in the watershed in the eastern portions of the Site.

Policy Issues

Several options exist for meeting the water quality standard for plutonium and americium at Site closure. Experience demonstrates that actively managed control structures (that is, the ponds) have performed well in protecting downstream water quality, even without remediation. Recent erosion modeling for the Site's Actinide Migration Evaluation suggests that removal of soil contamination down to very low levels (10 pCi/g) would still not be sufficient to result in plutonium concentrations less than 0.15 pCi/g in the SID. Thus, some type of water control structures may be needed to ensure water quality at Rocky Flats following closure, and will be integrated into remedial actions such as the 903 Pad.

While actively managed systems such as the ones now in place are effective, they also require constant operation and maintenance, which will increase DOE's long term stewardship obligations. Large, constantly fluctuating impoundments such as Ponds A-3 and A-4 also provide little in the way of useful habitat for wildlife. As cleanup proceeds, passive control alternatives will be examined. A potential example of such a control measure would be an expansion of the SID to capture more runoff from the 903 Pad area, along with incorporation of swales and wetlands along its length to help trap sediments. This approach could be expanded to the Walnut Creek Drainage, replacing actively managed ponds with vegetated, flow-through systems relying on wetlands and contours to provide sediment removal.

If such passive systems are to be successful, they will need to be combined with other efforts. First, source removal must take place to some degree. Second, recontouring and revegetation of the watershed will be essential. Unvegetated or developed areas of the Site, such as above GS-10, produce the highest actinide concentrations in runoff; during the May 1995 storms, the highest plutonium concentrations were seen in runoff from bare areas such as roadside ditches. Revegetation of the Industrial Area may allow for infiltration of precipitation that now runs off, reducing the flow peaks that quickly fill detention ponds and carry with them high loads of sediment and associated contaminants. For protection of surface water, a combination of available options, including removal, watershed improvements, passive controls and ongoing management may be needed in the long run.

Finally, the RFCA parties and the public may wish to examine the way in which compliance with water quality standards is determined. Because the current actinide standards are based on a one-in-one million excess cancer risk from drinking the water (2 liters/day for 30 years), it may be reasonable and protective to assess compliance against a yearly moving average rather than a thirty day average (such an approach has recently been proposed by EPA for arsenic in drinking water). DOE also assumes that water quality standards will apply to the streams themselves (Woman and Walnut Creeks), and not to water that may collect in upstream control structures like the SID, to which water quality standards do not currently apply. Should this understanding change, the needed remedial approach could also change.

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Attachment D
Surface Water Quality at Rocky Flats: Implications for Cleanup

Appendix D-1
Schematic

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Attachment D
Surface Water Quality at Rocky Flats: Implications for Cleanup

Appendix D-2
Narrative and Table

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Attachment D
Surface Water Quality at Rocky Flats: Implications for Cleanup

Appendix D-3
Data Summary Table

RFCA Stakeholder Focus Group
Attachment E

Title:Actinide Migration Evaluation Erosion and Sediment Modeling Project: Summary of Findings

Date Presented: August 30, 2000

Author: Russell W. McCallister
U.S. Department of Energy, Rocky Flats Field Office

Phone Number: (303) 966-9692

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Soils are subject to erosive processes that vary in space and time. The erosive processes, driven by precipitation and overland flow, include runoff, soil detachment, transport, deposition, and sediment delivery at the downslope end of the hillside.

Many physical and biological factors affect soil erosion and sediment yield on rangeland watersheds. The susceptibility of a soil to erosion is controlled by various types of soil cover, including plant canopy cover, plant areal cover, plant basal cover, plant litter, rock cover, and cryptogamic cover. The major processes that cause the transport of soil particulates to surface water channels are erosion and overland flow. Channel flow then transports the eroded sediments downstream.

Dense vegetation and plant residues, creating greater than 90 percent soil cover in many areas of Walnut and Woman Creek watersheds, provide protection against erosion. Areas with less cover are interspersed throughout the watersheds. **These areas and unpaved roads account for most of the soil erosion (29 to 49 percent of the total sediment yield for each watershed) that occurs at the Site.**

A 100-year continuous simulation was run for each hillslope along with single storm simulation events. Annual erosion rates for the three watersheds varied in the order:

- the South Interceptor Ditch (SID)
- Walnut Creek
- Woman Creek.

For surface types within the watersheds, the amount of erosion in order was:

- improved gravel roads
- hillslopes with paved areas
- hillslopes with improved gravel roads
- hillslopes with unimproved roads
- grazed hillslopes

- minimally disturbed hillslopes.

The great majority of the erosion at Rocky Flats is due to large, infrequent storms.

In the report, Figure 17 shows the erosion-prone areas (Appendix E-1). The soil mobility map (Appendix E-2) shows that there are certain areas that are more susceptible to erosion. Three important areas, because of their potential impacts on surface water quality, are the following; 1) SID hillslopes to the southeast of the 903 Pad area; 2) the south side of Woman Creek, just above and below Pond C-1; and 3) Walnut Creek to the east of Pond B-5.

When the predicted erosion is combined with the spatial distribution of Pu-239/240 and Am-241 contamination in the Site soils, the areas that show relative mobility are

0˘ the 903 Pad area;

1˘ areas near the old firing range road;

2˘ the Woman Creek watershed between the Pond C-1 dam and Mower Diversion, and

3˘ the A- and B- series Ponds, South Walnut Creek, and the north-facing hillslopes adjacent to South Walnut and Walnut Creeks.

The Site will need to evaluate a combination of soil remediation (i.e., removal) erosion and runoff controls, hydrologic modifications, land uses, and other management alternatives to achieve desired goals of limiting actinide movement via erosion and sediment transport.

RFCA Stakeholder Focus Group
Attachment E
Actinide Migration Evaluation Erosion and Sediment Modeling Project: Summary of Findings

Appendix E-1
Map of Erosion-prone Areas

RFCA Stakeholder Focus Group
Attachment E
Actinide Migration Evaluation Erosion and Sediment Modeling Project: Summary of Findings

Appendix E-2
Soil Mobility Map

RFCA Stakeholder Focus Group
Attachment E

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Date Presented: August 30, 2000

Author: Russell W. McCallister
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RFCA Stakeholder Focus Group
Attachment E
Actinide Migration Evaluation Erosion and Sediment Modeling Project: Summary of Findings

Appendix E-1
Map of Erosion-prone Areas

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Actinide Migration Evaluation Erosion and Sediment Modeling Project: Summary of Findings

Appendix E-2
Soil Mobility Map

RFCA Stakeholder Focus Group
Attachment F
RFCA Radionuclide Soil Action Level Tier I and Tier II Concept

Title:RFCA Radionuclide Soil Action Level Tier I and Tier II Concept

Date Presented: August 30, 2000

Author: Richard DiSalvo
U.S. Department of Energy, OCC

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RFCA Stakeholder Focus Group
Attachment F
RFCA Radionuclide Soil Action Level Tier I and Tier II Concept

Introduction

RFCA implements an accelerated cleanup approach that prioritizes actions to reduce the risks presented by existing contamination. RFCA Soil Action Levels describe numeric levels of contamination which, when exceeded, trigger an evaluation, remedial action and/or management action that would result in appropriate risk reduction. For radionuclides of concern these numeric levels (in picocuries per gram of soil) are based upon the calculated maximum annual radiation dose (in millirem per year, "mrem/yr") to an individual exposed to the contamination based upon assumed land uses.

The RFCA Preamble and the RFCA Vision (RFCA Appendix 9 and 10) assumed land uses are limited industrial use in the Industrial Area Operable Unit and Open Space use in the Buffer Zone. To protect these land uses it is assumed that institutional controls are in place. However, institutional controls could become ineffective over many years, so a residential use scenario after failure of institutional controls is also assumed in determining action levels.

The expected maximum annual radiation dose limit in RFCA is 15 mrem/yr with institutional controls and 85 mrem/yr upon loss of controls (commonly expressed as the "15/85" standard). These dose limits were adopted during RFCA negotiations from an EPA draft Proposed Rule, 40 CFR 196, which was intended to be applicable to cleanup of radioactively contaminated federal facilities. Since the signing of RFCA, EPA has withdrawn this draft Proposed Rule. The RFCA dose limit is consistent with the Nuclear Regulatory Commission's (NRC) decommissioning rule for licensed facilities, 10 CFR 20, Subpart E, promulgated after withdrawal of draft 40 CFR 196. The NRC limit is 25 mrem/yr with institutional controls and 100 mrem/yr upon loss of controls (i.e., "25/100"). The 25/100 rule has been adopted by CDPHE for licensed facilities in Colorado that it regulates pursuant to its NRC Agreement State authority.

Using the 15/85 standard and the land use assumptions discussed above, the numeric action levels were calculated using a software program generally accepted for this purpose known as RESRAD. The Tier I soil action level is based upon a maximum dose

of 15 mrem/yr to an office worker in the industrial use scenario, and 85 mrem/yr to a hypothetical future resident for the open space use scenario. Note the hypothetical future resident for the open space use scenario was selected because it resulted in a lower action level than that which would result in 15 mrem/yr to an open space user. The Tier II soil action level is based upon a maximum dose of 15 mrem/yr to a hypothetical future resident without institutional controls.

Technical and Policy Considerations

The refinement of radionuclide soil action levels into two Tiers served several purposes to fully implement the accelerated action approach. From a practical perspective, Tiers allowed Rocky Flats to develop adequate plans, schedules, and budgets for required accelerated actions. RFCA requires contamination above Tier I to be addressed through an accelerated action, which may include removal, treatment, disposal, or in-place stabilization. Contamination above Tier II must be evaluated to determine if an action is necessary to protect surface water or ecological resources and what management actions to preclude unacceptable exposure must be taken. Thus, the objectives of any required evaluation are known and the alternatives for and scope of any proposed action can be developed.

When an action is taken to address Tier I contamination that includes soil removal, the goal of the removal is to cleanup to below Tier I. The evaluation will also consider how to address contamination that may be left in place above Tier II (i.e., to determine if removal below Tier I is necessary to protect surface water or ecological resources and what management actions to preclude unacceptable exposure must be taken).

In addition, soils actually removed that are below Tier II may be put back into the excavation. Soils above Tier II actually removed, whether by design (e.g., for thermal treatment of volatile organic compounds) or because they are interspersed with above Tier I pockets that are removed, must be managed as remediation waste. Thus, the Tiers allow the planners to predict the amounts of soil to be removed or areas to be managed, the waste that must be managed, characterized for treatment and disposal, packaged, stored, transported and disposed and the costs for this management. This

allows Rocky Flats and CDPHE and EPA to consider the allocation of fixed site budget and other limited resources to achieve cost effective, protective accelerated actions.

RFCA Focus Group
August 30, 2000 Meeting

Actions to be documented in Packet for September 13, 2000 meeting

A. A rough first look at water balance (Bob Nininger)

B. Describe the basis for the 30-day water quality standard (Joe Legare)

C. Risk basis for 0.15 pCi/l water quality standard (Diane Niedzwiecki)

D. Summary of why excavation to meet water quality standard is not feasible (Russell McAllister / Norma Castaneda)

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