

**Rocky Flats Environmental Technology Site: Actinide Migration Evaluation**  
Meetings: October 4-6, 2004  
Advisory Group: Greg Choppin, David Clark, David Janecky, Leonard Lane

**Summary and Recommendations for Path Forward**

As contract completion draws closer, it will continue to be very important to make the best decisions and implement them to avoid re-doing work and raising questions as to the technical basis of the decisions and actions taken. Accomplishing these goals requires utilizing Site databases, modeling results, expertise, and documenting these in plans and reports. The surface water monitoring projects continue to provide the basis for quantitative understanding of present controls and impacts, and projection of long-term impacts. While it is too early to see major responses to recent erosion control efforts, the Advisors recommend and encourage persistence, and even targeted enhancement. There is a need to be aware of the possibility, and even probability, that surface water samples collected on the Site (in and above the ponds) will have plutonium (Pu) and americium (Am) concentrations above regulatory limits, due to remediation and demolition activities that create new disturbances and aggravate surface water response.

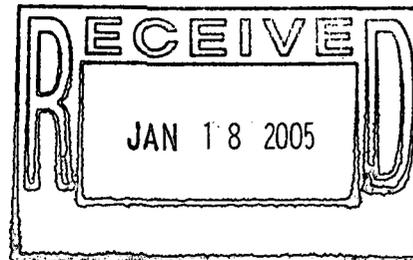
Pond sediment stabilization and removal is an activity area that the Advisors discussed extensively during the meetings. It is expected that further identification of options, consideration of potential contamination mobility, and selection of robust processing systems will be required, with the overall focus on protecting surface water quality from near to long term. Throughout the site, reconfiguration evaluation, long-term monitoring and data evaluation are key areas for continued attention at this time. Implications of remediation activities remain a critical factor in achieving closure and environmental protection. As contaminated areas are remediated to required standards and criteria, it is important to document the rationale and analytical basis for inclusion/exclusion of hot spots.

Land reconfiguration and hydrologic analyses are expected to be a focus of the next AME meeting(s), because they are of core importance to connection, strategy, and integration of high level plans and analyses with on the ground actions.

**Progress and Integration**

Erosion control and management response was very impressive. The approach by management and obvious implementation described in presentations and seen on the Site tour indicate strong understanding of erosion control importance and potential impact. Specific examples include Building 771 activities associated with demolition, the initial success of re-vegetation in the 903 Pad and lip area, and the widespread use of matting and other control materials in drainages and on soil surfaces.

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1/17/05

**ADMIN RECORD**  
**SW-A-005039**

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## Results and Discussions

### Environmental Remediation (ER) Project status

We heard from Karen Wiemelt, K-H, regarding status of ER projects with the potential to impact surface water quality. This includes the 903 Pad Lip area remediation, 700-7 B779 slab remedial action, OPWL remediation, the B730 process waste tanks, the B443 fuel spill remedial action, and other miscellaneous ER activities. We were very impressed with ER progress since our June visit to the Site. It was very clear that ER project managers were showing due diligence and taking aggressive actions to control erosion and protect surface water quality during ER activities. Erosion control activities include lining areas with coconut matting, installing hay bales in drainages, applying tackifier to loose soil, re-vegetating disturbed areas, and minimizing traffic and other activities that can disturb remedied soils. The AME advisors continue to be particularly interested in future remediation activities with potential for radionuclide impacts to surface water quality, such as future pond reconfiguration and management, which includes the B-1 and C-1 Pond Pilot Projects, and C-2 pond outlet works evaluation.

### Surface Water Quality – Current Status & Erosion Control

George Squibb, URS, presented results and interpretations of recent surface water monitoring results including flow rates and volumes, sediment concentrations, and actinide concentrations. Results of analyses from the GS10, SW093 and SW027 Points of Evaluation (POE) and actinide loading analyses by sub-basins in each POE basin were particularly valuable. Calculations of Pu/Am in pCi units are consistent with our understanding of contamination distribution and composition. For GS10 and SW093, the increase in Pu to Am ratio during 2004 indicates less contribution from Am enriched materials and more contribution from contamination in secular equilibrium. Widespread disturbance of soil and structures at the Site is having the expected impact on actinide contamination measurements. The active implementation and tracking of erosion control plans is strongly supported by the Advisors, and will need to be a continuous effort to minimize transport and broad impacts.

### Tour – Building 771 demolition site

#### Tour – Other areas of Site (903 Lip Area, B779 area, B881 area, ponds)

Chris Gilbreath, KH, provided an overview and site tour of the Building 771 demolition. The progress and approach to demolition of this major Pu processing facility and integrated stabilization of the site was impressive to the Advisors.

Ian Paton, WWE, and George Squibb, URS, provided a tour of environmental remediation sites and the edge of the buffer zone in Woman and Walnut Creeks. The completed 903 Pad and Lip Area are well stabilized and

vegetation is taking hold. In the Building 881 area, it was impressive to see the building gone, the site graded and erosion controls in place. Throughout the Site, erosion controls were substantially improved relative to the June tour.

### **Pond reconfiguration, management and remediation B-ponds**

During the discussions of ER project status with Karen Wiemelt, we discussed issues of pond reconfiguration and management, including the Pond C-1 Pilot Project for dam notching, the Pond B-1 Pilot Project for sediment removal, and the Pond C-2 Project for evaluating the outlet works. Many of the proposed reconfiguration and decontamination processes and approaches were new to the Advisors. Strategic controls for sediment migration via air and water, and monitoring of such transport, are critical to each of these projects.

Subsequently, the advisors met with Ian Paton, WWE, and Diana Woods, RFCSS, for further discussions of the B-ponds reconfiguration and the B-1 Pilot Project. We expressed interest in the B-1 Pilot Project with regard to wind and water erosion during and after the pond reconfiguration/decontamination.

As a result of our discussions, a meeting with Mike Keating, K-H Project Manager for the Ponds project, was arranged for early on Wednesday morning. During these discussions with Mr. Keating the Advisors expressed their overall interest and specifically made the following comments and recommendations.

- 1) We were pleased to hear that Mr. Keating is planning extensive erosion control procedures (e.g. fiber mats) for short-term protection during remediation and the emplacement of clean fill dirt and its re-vegetation for long-term erosion control during and after the pond remediation.
- 2) Removal of contaminated sediments from the ponds should be accomplished with the 0.15 pCi/L surface water quality standard as the driving criterion. This water quality standard is especially critical in decontamination and management of the ponds because of their location in the lower portion of major stream channels draining RFETS and their close proximity to the POC's and POE's. Moreover they are an existing source of contamination directly in the streams and their floodplains and thus have more direct pathways to the POC's.
- 3) The Advisors are concerned that pond sediment de-watering procedures (i.e. formation of windrows for drying the sediments and high water-content nepheloid materials, mixing of additives in the ponds) increase risk of wind and water erosion and associated contaminant transport. We feel these procedures should be further evaluated and alternatives should be developed for consideration. Assumptions inherent in selection of approach for Portland cement addition, sediment mixing and retrieval, and ultimate packaging should be explicitly evaluated for failure modes and contaminant transport risks.
- 4) Given the importance of the ponds, lessons learned during the B-1 Pilot Project should be documented and used to adapt procedures for

reconfiguration, decontamination, and management of the other ponds.

We are especially interested in application of results to Pond C-2 outlet works efforts as it a terminal pond and the last point in Woman Creek where surface water can be detained. Use of tackifiers and matting should be considered to cover exposed pond sediments while the pond is drained and work is going on, both to control erosion and to protect the contaminated sediments from human and equipment traffic.

#### **Buffer zone soil sampling**

Chris Dayton, K-H, provided information on recent buffer zone sampling for radionuclide and metal contaminants that was intended to fill in characterization gaps and support the Comprehensive Risk Assessment measurement of residual risk across the entire Site following completion of accelerated actions. The general finding was that contamination measurements are consistent with background. The one site that gave elevated Pu concentrations in both the initial analysis and re-analysis is being further investigated. That a sample area could have elevated concentrations of Pu is not totally surprising due to a number of factors, including analytical uncertainties and extremes in heterogeneity of Site wind-rose and hot particle distributions.

#### **Stakeholder meeting – Contaminated concrete with VOCs in groundwater & Erosion and surface water quality & open discussion**

In response to questions from the CAB and Stakeholders, the AME advisors led two discussions at a Jeffco Airport Stakeholder meeting. The first topic addressed Pu and Am in soils and concrete, and the second topic addressed surface runoff, erosion, and sediment transport.

During the discussion on Pu and Am behavior in soils and concrete, Dr. David Clark and the Advisors reiterated that all the data amassed during the AME studies are consistent with our expectations of Pu and Am chemical behavior in the environment. The data indicate that Pu and Am in the "dissolved" fraction of RFETS surface waters have extremely low concentrations, similar to global fallout. Site-specific studies indicate that reducing conditions do not remobilize Pu and Am by solubility mechanisms, and that the bulk of Pu and Am is associated with particles that settle in ponded water, and small (< 2µm) colloidal particles that can be filtered out by soil and rock matrices, or extracted by other particles and biologic materials. These results are consistent with the known chemical behavior of Pu(IV) and Am(III). X-ray Absorption Fine Structure (XAFS) studies show unambiguously that Pu in soils taken from the 903 Pad is in oxidation state (IV), in the chemical form (speciation) of very insoluble PuO<sub>2</sub>. The identification of Pu(IV) in the chemical form of PuO<sub>2</sub> is consistent with the observed insolubility of Pu in site-specific waters. Am behaves similarly. These solubility characteristics are not altered by the presence of carbon tetrachloride

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or other VOCs in groundwater. The oxides only become soluble under extremely harsh chemical conditions such as boiling, concentrated mineral acids. The data from AME studies clearly indicate that physical (particulate) transport is the dominant mechanism for Pu and Am migration in soils and surface waters at RFETS. Most important is the recognition that the insolubility of Pu and Am does not equate to immobility. The association of Pu and Am with small particles and colloids is the key to understanding, and ultimately predicting and controlling the migration of Pu and Am in RFETS soils and waters.

Dr. Lane presented brief background information on soil erosion, sediment transport, and associated contaminant processes at RFETS. Then, the 2002 Pathway Analysis Report was used to assess the status of contaminant (Pu and Am) prior to the major cleanup activities of the industrial site. This discussion included the ranking of pathways showing that with regard to contaminant concentration standards, the surface water pathway was most important. However, coupling of local contamination transport through the air pathway to surface waters could also have significant impacts. Prior rates of contaminant transport were discussed in comparison with current rates reflecting soil and vegetation disturbances from remediation (i.e. decontamination and demolition) activities and from erosion control measures. The point was made that "close in time and close in space" erosion control measures are required to achieve the maximum level of surface water quality protection.

Current water quality monitoring data are showing the predicted rises in concentration following disturbances in the Industrial Area. Additional monitoring data will be required to assess the effectiveness of soil erosion control measures in reducing contaminant transport. Based on analyses of the monitoring data, future Site operating procedures and erosion control measures will be adapted to be protective of surface water quality standards. Participants at the public meeting discussed these topics and provided valuable comments.

### **Uranium White Paper**

Ian Paton, WWE, distributed copies of the document entitled "Uranium in Surface Soil, Surface Water, and Groundwater at the Rocky Flats Environmental Technology Site" dated June 2004. Ian discussed a series of very thoughtful and informative review comments that were provided by Elizabeth Pottorff from the State. The Advisors agree with the CDPHE comments and agree that these suggested changes will strengthen the document, and make it more useful. In this regard, we suggest that the document strengthen both its purpose statement and its summary statement to include recommendations. All the data and discussion indicate that uranium contamination on the Site is roughly an order of magnitude below the Action Levels for uranium. This document will represent a single source for complete discussion of uranium at the Site.

**Documents Provided to Advisory Group**

Agenda for meetings  
Rocky Flats Envision, v10, n14, September 30, 2004 –Workers complete cleanup of 36-acre 903 Lip Area  
Sediment Removal & Pond Reconfiguration presentation viewgraphs  
OU6 Sediment Sample Data results listing  
B-Series Pond Stabilization Pilot Program memo (Todd Cotton/PDX/Ch2mHill to Mike Keating/RFETS/KH)  
Draft Environmental Restoration RFCA Standard Operating Protocol for Routine Soil Remediation FY04 Notification #04-11 IHSS Group NE-1 (Ponds B-1, B-2, and B-3) September 2004  
Questions from CAB (from Patricia Rice, Program Coordinator, RFCAB)  
Buffer Zone Sampling for the Comprehensive Risk Assessment – Unexpected Pu Result – 10/01/2004 white paper  
Your safety is our priority, by Frazer Lockhart, Boulder Daily Camera, 8/29/2004  
Not Ready for prime time, by Anne Fenerty, Boulder Daily Camera, 8/22/2004  
903 Pad cleanup done, by Todd Neff, Boulder Daily Camera, 9/24/2004  
Contractor to verify Flats results, by Todd Neff, Boulder Daily Camera, 9/28/2004  
Policy Forum, Environment: Avoiding Destructive Remediation at DOE sites, by FW Whicker, TG Hinton, MM MacDonell, JE Pinder III, LJ Habegger, Science, 303, 12 March 2004, 1615-1616.  
Rocky Flats Environmental Technology Site: Actinide Migration Evaluation Meetings report of May 19-21, 2003  
An Analysis of the Department of Energy's Cleanup Plans for Four Areas at Rocky Flats: The Coverup Continues, by Jacque Brever  
Rocky Flats: A Local Hazard Forever, Citizen's Guide to the "Cleanup", Wildlife Refuge a Bad Precedent for Other Sites, by LeRoy Moore, 7/5/2004  
IM/IRA Updates: 900-11, Present Landfill, Original Landfill, and Groundwater, ER/D&D Status Meeting slides for 9/21/2004 presentation at Broomfield City Hall  
ER Field Project Status, September 2004 slides by Karen Wiemelt  
Erosion Control at RFETS: Brief History of Recent Activities viewgraphs  
Kaiser-Hill Directive NRT-011-04 (Rev. 0, 6/23/2004) on Erosion Control  
BMP Query Report for Erosion Control actions  
Surface Water Quality monitoring results for Water Year 2004 figures by George Squibb  
Uranium in Surface Soil, Surface Water, and Groundwater at the Rocky Flats Environmental Technology Site, June 2004, and Comments  
Letters and comments from Allard/Udal/Beauprez, Benevento, Legare

**Documents and Information Requested for Advisory Group**

- Reference citation for master drainage flow control plan
- Ponds RSOP draft update & documentation of Bowman's pond & B-1 pilot remediation
- Summary of sediment sampling for A, B and C series ponds, that was used to determine inventories used to plan sediment removal
- Monitoring updates as available, particularly surface water, erosion & ponds

**Requests for Future Presentations and Information**

- Update on surface water quality monitoring data
- Land configuration & hydrologic analysis-Status, analyses and path forward
- Pond remediation and pilot operations results for B-1
- C-2 outlet works and possible remedial actions
- Update on preparations for transition to stewardship

### Participants in AMS technical meetings

**Name   Organization**

Chris Dayton	Kaiser-Hill
Greg Choppin	Florida State
David Clark	Los Alamos
David Janecky	Los Alamos National Laboratory
Leonard Lane	Tucson
Ian Paton	Wright Water Engineers
John Stover	DOE/RFPO
David Shelton	Kaiser-Hill
Karen Weimelt	Kaiser-Hill
George Squibb	URS
Chris Gilbreath	Kaiser-Hill
John Corsi	Kaiser-Hill
Mike Keating	Kaiser-Hill
John Rampe	DOE
Steve Gunderson	CDPHE
Larry Kimmel	EPA

### Future Meetings

January 30 – February 2, 2005

June 5-8, 2005

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