

DCS

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
San Antonio Office

TRIP REPORT
November 11, 1992

SUBJECT: NRC Geochemistry Review
20-5704-012
20-5704-013
20-5704-063
20-5704-072
20-5704-073
20-5702-065

PLACE/DATE: Washington, D.C./November 2-3, 1992

AUTHOR: William M. Murphy

DISTRIBUTION:

CNWRA

J. Latz
W. Patrick
CNWRA Directors
CNWRA Element Mangers
Geochemistry Staff

NRC

M. Knapp
W. Brown
B. Stiltenspole
B. Meehan
J. Linehan
M. Federline
D. Brooks
B. Morris
F. Costanzi
M. Silberberg
J. Randall
A. Campbell

SwRI

S. Rowe

210070

9212210406 921123
PDR WASTE PDR
WM-11

delete all distribution except: CF, PDR & NRC

426.1
WM-11
N415

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
San Antonio Office

TRIP REPORT
November 11, 1992

SUBJECT: NRC Geochemistry Review
20-5704-012
20-5704-013
20-5704-063
20-5704-072
20-5704-073
20-5702-065

PLACE/DATE: Washington, D.C./November 2-3, 1992

PERSONS PRESENT: CNWRA

W. Murphy
R. Pabalan
E. Pearcy
D. Turner
B. Leslie
J. Russell
B. Sagar
J. Walton

Numerous members of the NRC RES and NMSS staff attended this meeting, notably the geochemists. M. Silberberg hosted the geochemistry review. Most participants from organizations other than the NRC are listed on the agenda (attachment 1).

AUTHOR: William M. Murphy

BACKGROUND AND PURPOSE:

The geochemistry review was designed to convene contributors to NRC geochemistry programs from low- and high-level waste, NMSS and RES programs. The objective was to review research progress and to provide a forum for the interaction of NRC staff and contractors.

SUMMARY OF PERTINENT POINTS:

The geochemistry review proceeded by a series of presentations by NRC contract researchers. Most presenters provided copies of their visual materials to the audience.

Talks were given on three general themes: Retardation mechanisms; geochemical modeling; and natural analog studies. Presentations were given by CNWRA geochemists in each area. In general, the technical quality of the research being conducted is commendable.

SUMMARY OF ACTIVITIES:

The attached agenda gives the titles of presentations and author affiliations.

D. Robertson and A. Schilk analyzed the speciation of mobile radionuclides at Hanford, Chalk River, and Maxey Flats with a focus on organic complexation and colloids. They found important contributions by anionic species for many radionuclides, which may in part be inorganic.

W. Casey presented a rationale for mineral dissolution rates based on acid-base chemistry of mineral surfaces, the strength of cation-ligand bonding, polymerization of the silicate framework, and selective leaching of species from a surface layer. H. Westrich and R. Cygan showed analytical data for the composition and structure of reacted mineral surfaces and for adsorbed species. R. Schulz is searching for materials that can retard anion migration among allophanic soils.

R. Pabalan presented results from ion exchange and uranium adsorption studies in the Geochemistry and Sorption Modeling Research Projects. Reporting results from the latter project, D. Turner showed calculated and regressed sorption isotherms and summarized sorption modeling approaches.

W. Murphy showed results from the Geochemistry Research Project for multicomponent reaction path modeling for low temperature and repository conditions and an interpretation of analcime-clinoptilolite-solution kinetics and phase equilibrium experiments. He also presented results of a PA auxiliary analysis of the carbon system at a Yucca Mountain repository and for gas-phase C-14 migration.

J. Suen and T. Sullivan showed the structure of the PA model Breach-Leach-Transport (BLT) for low-level waste applications and proposed an ambitious program to develop transport modeling with some relatively detailed geochemistry.

R. Bassett presented results from a variety of studies at Apache Leap, including air injection permeability data, subsurface groundwater chemistry, reaction path modeling, and

stable and radio-isotope chemistry.

D. Sverjenski summarized equilibrium speciation interpretations of groundwater chemistry at Alligator Rivers, and summarized the objectives of Shock's project to estimate properties of actinide species at elevated temperatures.

B. Nagy described the retention of radionuclides in bitumen at Oklo.

Reporting on the Natural Analogs Research Project, E. Pearcy gave a survey of the Santorini and Peña Blanca analog sites emphasizing mineralogy and mineral paragenesis, and B. Leslie discussed data relevant to transport and uranium series isotopic studies.

IMPRESSIONS/CONCLUSIONS: In general all sorption/retardation studies concluded that sorption processes and retardation mechanisms in the lab and field are far more complex than can be represented by K_d approaches. Geochemical and isotopic analyses at Apache Leap appear to provide excellent site-specific constraints on the unsaturated groundwater flow system. CNWRA presentations were well received, and tended to reflect applications to repository/regulatory issues. M. Silberberg emphasized his desire for researchers to give feedback to NRC program managers concerning direction of their projects and to provide him with suggestions for new research.

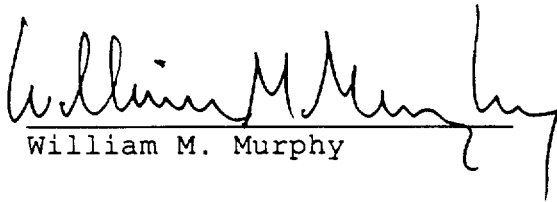
PENDING ACTION: None.

RECOMMENDATIONS: As suggested by NRC management, biannual Geochemistry Review meetings would be beneficial.

PROBLEMS ENCOUNTERED: None.

REFERENCES: None.

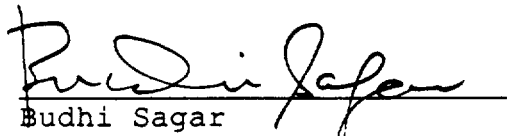
SIGNATURES:


William M. Murphy

11/23/92

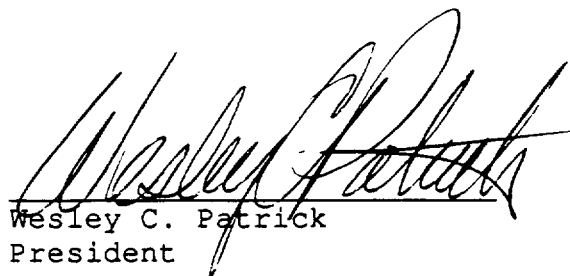
Date

CONCURRENCE:


Budhi Sagar
Acting Manager, Geologic Setting

11/23/92

Date


Wesley C. Patrick
President

11/23/92

Date

Geochemistry Program Review

Monday, November 2, 1992:

8:30 am Mel Silberberg -- Welcoming remarks, meeting objectives and structure.

Retardation Mechanisms in soil - Moderator: Edward O'Donnell

8:40 am David Robertson and Alan Schilk, Battelle Pacific Northwest Laboratory -- The role of organic complexants and microparticulates in radionuclide migration.

9:25 am William Casey, University of California, Davis' -- Predicting the kinetics of disequilibrium silicate weathering.

10:00 am Break

10:15 am Randall Cygan and Henry Westrich, Sandia National Laboratory -- Characterization of retardation mechanisms in soil.

11:00 am Open period for discussion of morning presentations.

11:45 am Lunch Break

12:45 pm Robert K. Schulz, University of California, Berkeley -- Anion retention in soil: possible application to reduce migration of buried technetium and iodine.

1:30 pm Roberto Pabalan, Center for Nuclear Waste Regulatory Analyses -- Laboratory investigations of ion exchange and sorption.

Geochemical Modeling - Moderator: George Birchard

2:15 pm William Murphy, Center for Nuclear Waste Regulatory Analyses -- EQ 3/6 Geochemical modeling; modeling of C-14 transport; modeling of analcime and clinoptilolite phase equilibria and kinetics.

3:00 pm Break

3:15 pm Terry Sullivan, Brookhaven National Laboratory and John Suen California State University Fresno -- Geochemical input to source term modeling.

4:00 pm Everett Shock, Washington University (Dimitri Sverjensky will substitute for Dr. Shock)-- Theoretical study of the thermodynamic properties of actinides in high-temperature aqueous solutions.

4:45 pm Randall Bassett, University of Arizona -- Use of isotopes and chemical data to determine transport of solute and gas through fractured unsaturated tuff.

5:30 pm Open period for discussion of afternoon presentations.

6:00 pm Adjourn for the day.

Tuesday, November 3, 1992

8:30 am Program review reconvenes.

8:35 am David Turner, Center for Nuclear Waste Regulatory
Analyses -- Sorption Modeling for performance assessment.

Natural Analogues for Source Term and Radionuclide Transport - Moderator: Linda Kovach

9:10 am Linda Kovach and George Birchard, Waste Management
Branch, USNRC -- NRC natural analogues program.

9:30 am Dimitri Sverjensky, John Hopkins University --
Geochemical modeling of Alligator Rivers.

10:15 am Break

10:30 am English Percy, Center for Nuclear Waste Regulatory
Analyses -- The Pena Blanca natural analogue.

11:30 am Open period for discussion of morning presentations.

12:00 pm Lunch

1:00 pm Bartholomew Nagy, University of Arizona -- Radionuclide
retention in bitumen: the Oklo Analogue.

1:45 pm Bret Leslie, Center for Nuclear Waste Regulatory
Analyses -- Uranium series disequilibrium and how it will be
applied to the Pena Blanca natural analogue.

2:30 pm Break

2:45 pm Open period for discussion of afternoon presentations.

3:45 pm Mel Silberberg -- Concluding remarks.

4:00 pm Meeting adjourns.