OAK RIDGE NATIONAL LABORATORY
OPERATED BY MARTIN MARIETTA ENERGY SYSTEMS, INC.

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37831

October 22, 1985

Dr. J. W. Bradbury
Geotechnical Branch
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission
Room 623-S
Washington, D.C. 20555

Dear John:

As per your request during the Program Review last week, please find enclosed a copy of a letter describing the results of surface area measurements for the Topopah Spring tuff sample performed by Lawrence Livermore National Laboratory. Please contact Don Kelmers (FTS 624-6870) should you have any questions concerning the enclosed information.

Sincerely,

Gary

Gary K. Jacobs
Environmental Sciences Division

/gkj

Enclosure

cc w/o enclosure: A. D. Kelmers
A. P. Malinauskas
S. K. Whatley

Lawrence Livermore National Laboratory

August 28, 1985
WP: 123-85

Dr. Don Kelmers
Chemical Technology Division
Oak Ridge National Laboratory
P.O. Box X
Oak Ridge, TENN 37831

Dear Don:

Enclosed are results of BET surface area measurements for the Topopah Spring tuff sample that you sent to me. Results are given for the sample as received (Tpt-BBO) and for two samples following treatment to remove soluble salts (Tpt-BBOA and Tpt-BBOB). The results seem to indicate a small reduction in surface area as a result of rinsing the samples to remove soluble salts.

Tables of chemical data for the rinse solutions are enclosed. The procedure for rinsing was the room temperature rinsing step described in detail in UCRL-53552. This procedure was applied twice in sequence to each of the samples using deionized water. R1 is the first rinse, R2 is the second. R1/Tpt-BBOC is a deionized water control sample.

In a separate table I have compared the soluble salts from the first rinse solutions (R1) to those found at the Fran Ridge Tpt outcrop. The Fran Ridge data were generated using 0.8 g of rock in 12 ml of water, so I have scaled the results to what would have been found for 1 g of rock in 10 ml of water. The Busted Butte outcrop contains much less potassium and nitrate, somewhat less calcium and sulfate, and comparable amounts of sodium and chloride to the Fran Ridge outcrop.

As you can see, the amount of readily soluble material is fairly large. This soluble component is not found in drill core material, including that recovered from the UZ drill holes. This material could have a significant effect on sorption measurements and, in my opinion, should be removed prior to use of outcrop samples in such measurements.

I hope that this information will help you in your work.

Yours truly,

Virginia M. Oversby

Virginia M. Oversby
Deputy Task Leader
Waste Package Task, NNWSI

VMO/bb
Enclosures
cc:
W. Glassley
K. Thomas, LANL
U. Clanton, DOE/NV

Fran Ridge Soluble Salts vs Busted Butte
Units are mg/l in rinse solutions

	Measured as 0.8 g/12 ml	Scaled to 1 g/10 ml	Busted Butte First Rinse (1 g/10 ml)
Cl	10.8	17	11.5
NO_3	66	99	27
SO_4	47	70	42
Al	0.11	0.16	0.13
Ca	24.6	37	29
K	16.2	24	5.6
Na	5	7.5	9

Comparison:

Busted Butte is somewhat lower in total soluble salts and has much less KNO_3 component than Fran Ridge.

Fran Ridge data from UCRL-53552.

7/31/85

To: Virginia Queneby
From: Joan Berigh
Subject: Soluble Salt content of Topopah Spring Tuff - Busted Butte outcrop

Attached is a summary and copies of the analysis of the Topopah Spring Tuff - Busted Butte outcrop sample that was submitted to us by F. G. Seeley and Don Kelmers from Oak Ridge.

The experiment was conducted according to procedure 1.2.2A-P1, Rev 0. The 50 gram ground rock sample was homogenized and split. Two six gram allequots (A & B) were treated by being shaken in 60 ml DIW, let settle, decanted, filtered for chemical analysis and then repeated. The ground rock was dried and submitted for surface area analysis. The untreated sample was analyzed twice since the difference between the surface area for N_2 and Ar was higher than expected.

The analysis results and report have been filed in the rock/water interaction notebook in building 281

ION CHROMATOGRAPHIC ANALYSIS

TO: Joan Beiriger
FROM: Jackie Lam

DATE: 06-26-85
ACCOUNT NO.: 6087-25

SAMPLE DESCRIPTION: Tuff samples in DIW.

REQUESTOR: Joan Beiriger

ANALYSIS REQUESTED: F^-, Cl^-, NO_3^-, SO_4^{2-}, NO_2^-

RESULTS & COMMENTS: All peaks in these samples have been idenified.

		ANION CONCENTRATION, MG/L (PPM)			
AC SECTION SAMPLE NO.	REQUESTORS'S SAMPLE LABEL	FLUORIDE	CHLORIDE	NITRATE	SULFATE
IC850615	R1/TPT-BB0A	0.1	11.4	26.5	41.0
IC850616	R2/TPT-BB0A	0.1	1.4	2.4	5.5
IC850617	R1/TPT-BB0B	0.1	11.7	27.6	42.6
IC850618	R2/TPT-BB0B	0.1	1.2	2.3	5.2
IC850619	R1/TPT-BB0C	N.D.*	N.D.*	N.D.*	N.D.*

* N.D. Not Detected

The limit of detection for the anions follows:

ANION	LOD (PPM)
FLUORIDE	0.05
CHLORIDE	0.1
NITRATE	0.2
SULFATE	0.2

If there are any questions please call me at 2-6331.

Jackie Lam
Analytical Chemistry Section

INDUCTIVELY COUPLED PLASMA SPECTROCHEMICAL ANALYSIS REPORT
LLNL-LIVERMORE ANALYTICAL CHEMISTRY LABORATORY

SAMPLE : Tuff samples in DIW
DATE RECEIVED : June 5, 1985
DATE REPORTED : June 12, 1985
SUBMITTED BY : Joan Beiriger
ANALYST : Sandra Fadeff
UNIT micrograms per milliliter

THE ELEMENTS LISTED ARE THE ONLY ONES LOOKED FOR. FOR ELEMENTS WHICH ARE NOT DETECTED (ND), THE NUMBER CITED IS THE CONCENTRATION THAT MUST BE PRESENT TO CONFIRM THE ELEMENT.

ANALYSIS Internal Sample No.	Your Sample I.D.	Na	Si	Al	Ca	B	Fe	Mg
IP852983	R1/TPT-BBOA	9.1	2.09	0.12	29.37	0.17	<0.04	0.96
IP852984	R2/TPT-BBOA	2.1	1.13	0.28	6.72	0.08	<0.04	0.25
IP852985	R1/TPT-BBOB	8.7	2.37	0.14	29.06	0.16	<0.04	0.93
IP852986	R2/TPT-BBOB	2.2	1.80	0.54	8.09	0.08	0.09	0.29
IP852987	R1/TPT-BBOC	nd<0.2	nd<0.02	<0.08	nd<0.001	<0.04	<0.04	<0.08
	%rsd	10	10	2	1	10	10	10

5 Sample(s) of: TUFF IN DIW

Analysis: K

Description and Identification:

R1/TPT-BBOA
R2/TPT-BBOA
R1/TPT-BBOB
R2/TPT-B1BOB
R1/TPT-BBOC

Remarks:

Accuracy:

Requested By: K. KNUASS

Group: Bldg.:

Room: Ext.:

Acc't No.: 6087-12

Accepted By: J. HAAS Date: 6-12-85

Analytical Chemistry SAMPLE M 1451

ANALYSIS REPORT

SAMPLE #		K mg/L			
BBOA		5.7			
BBOA		1.2			
BBOB		5.4			
B1BOB		1.4			
BBOC		0.2			

Remarks:

Completed By: J. HAAS Date: 6-15 Book Page

IN-2170 (REV. 8/80)

Lawrence Livermore National Laboratory

Solution Analytical Chemistry

June 24,1985

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To: J. Beiriger

From: R. Swansiger

Re: Carbonate Content of Samples by Technicon

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Sample	Conc. meq/l
R1/TPT-BBOA	0.27 +/- .05
R2/TPT-BBOA	0.36
R1/TPT-BBOB	0.31
R2/TPT-BBOB	0.28
R1/TPT-BBOC	not detected, <.20

PARTICLE CHARACTERIZATION FACILITY

SURFACE AREA, SIZE DISTRIBUTION, SHAPE(IMAGE)ANALYSIS, POROSITY, DENSITY

PO BOX 808
L-370
(415) 422-8036
LIVERMORE, CA 94550

SUZANNE SANDERS
CHUCK SLETTEVOLD

July 11, 1985

To: Joan Beiriger

From: Suzanne Sanders/Chuck Slettevold

Subject: BET Analyses of Tuff

Three samples of Tuff were submitted for BET surface area analysis. These samples were labeled as TPT BBO, BBOA, AND BBOB, and were assigned requisition numbers 85616 through 85618, respectively.

Prior to the gas adsorption analyses, the samples were baked under vacuum (10^{-5} Torr) at 200°C for 4 hours to remove gaseous or liquid contaminates from the surface. The argon adsorption analyses on the ORR analyzer consisted of a 4 to 6-point BET calculation for specific surface area. As requested, nitrogen adsorption was also used for sample BBO.

The surface area for BBO as measured with nitrogen is about 27% higher than when it was measured with argon. The nitrogen analysis was done after the argon analysis, and on the same sample; both BET plots have a good linear fit. Since this discrepancy seemed rather high (argon surface areas are typically about 15% lower than the corresponding nitrogen analyses), and there was no apparent reason to suspect either set of data, the argon analysis was repeated; since the results were consistent with the previous results, the nitrogen analysis was also repeated. Both of the repeat analyses gave slightly lower results than the original analysis, which is not unusual because not all of the adsorption gases are necessarily removed during the evacuation procedure. The second set of analyses shows argon with a 20% lower surface area. We are not certain of the reason for the discrepancy between the first and second nitrogen analyses, as the both demonstrate a good linear fit of the data.

The data for all analyses is included with this report, and it is summarized in the table on the following page.

TUFF TPT

	Surface Area, m^2/g	
	1st Analysis	2nd Analysis
TPT-BBO		
Argon BET	1.33	1.23
Nitrogen BET	1.82	1.53
TPT-BBOA (Ar)	1.23	--
TPT-BBOB (Ar)	1.22	--

Please let us know if you need further information.

Suzanne Sanders.
Suzanne Sanders

Chuck Slettevold
Chuck Slettevold

Sample #	description	Mass (g)		ICP ANALYSIS (PPM)													
				B %rsd=10		Na %rsd=10		Ca %rsd=1		Al %rsd=2		Fe %rsd=10		Si %rsd=10		Mg %rsd=10	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
		6.0188	6.0806														
R1/TPT-BBO	RINSE 1			0.17	0.16	9.1	8.7	29.37	29.06	0.12	0.14	<.04	<.04	2.09	2.37	0.90	0.93
R2/TPT-BBO	RINSE 2			0.08	0.08	2.1	2.2	6.72	8.09	0.28	0.54	<.04	0.09	1.13	1.80	0.25	0.29
R1/TPT-BBOC	DIW			<.04		ND		ND		<.08		<.04		ND		<.08	

Sample #	AA analysis (ppm) K		IC analysis (ppm) Fluoride DL=0.05		Chloride DL=0.1		Nitrate DL=0.2		Sulfate DL=0.2		pH		IKECA (ppm) Carbon DL=0.5		Technicon (ppm) Carbonate DL=0.05	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
R1/TPT-BBO	5.7	5.4	0.1	0.1	11.4	11.7	26.5	27.6	41.0	42.6	6.69	6.66	2.5	2.7	0.27	0.31
R2/TPT-BBO	1.2	1.4	0.1	0.1	1.4	1.2	2.4	2.3	5.5	5.2	6.68	6.78	2.1	1.9	0.31	0.28
R1/TPT-BBOC	0.2		ND		ND		ND		ND						<.020	

Sample #	description	BET analysis m^2/g 1st analysis		BET analysis m^2/g 2nd analysis	
		A_2	Ar	A'_2	Ar
TPT-BBO	untreated sample	1.82±.002	1.33±.002	1.53±.003	1.23±.003
TPT-BBOA	sample A - treated	—	1.23±.003	—	—
TPT-BBOB	sample B - treated	—	1.22±.003	—	—