308 --- Q200312260002
Scientific Notebook No. 566: Radionuclide Transport (11/08/2002 through 09/16/2003)

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

566 - RT

566 RADIONUCLIDE TRANSPORT

CNWRA
CONTROLLED
COPY 556

20.06002.01.141 - RT

Issued to Bradley Werling

210-522-6565

8 NOV 02

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This notebook is a continuation of scientific notebook 523 for radionuclide transport

The analysis on 556/3 is a continuation of the Div01 cation results for Aug + Sep 2002 EWDP groundwater samples starting on 523/110.

8 Nov 02 BAW

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CONT
BAW

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

Sample ID
7SC-2-FA1-4

Lab Name: Southwest Research Institute
Client: Division 20

Lab Code: SwRI
Date Received: 09/24/02

Matrix: Water
Project No.: 20.06002.01.141

Lab System ID: 213345
Work Order: 23189

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.01	0.01
Barium	0.026	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.273	0.02
Cadmium	<0.005	0.005
Calcium	82.0	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.630	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.127	0.005
Magnesium	40.9	0.05
Manganese	0.017	0.005
Molybdenum	0.005	0.005
Nickel	<0.005	0.005
Palladium	<0.02	0.02
Phosphorus	<0.025	0.025
Potassium	7.61	0.1
Selenium	<0.01	0.01
Silicon	10.5	0.025
Silver	<0.005	0.005
Sodium	92.7	0.1
Strontium	0.530	0.005
Sulfur	56.1	0.025
Thallium	<0.01	0.01
Thorium	<0.015	0.015
Tin	<0.005	0.005
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.023	0.015
Zirconium	<0.005	0.005

8 NOV 02 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: 7SC-2-FUA-3

Lab Name: Southwest Research Institute
Lab Code: SwRI
Matrix: Water
Lab System ID: 213346

Client: Division 20
Date Received: 09/24/02
Project No.: 20.06002.01.141
Work Order: 23189

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.01	0.01
Barium	0.026	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.270	0.02
Cadmium	<0.005	0.005
Calcium	81.6	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.064	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.126	0.005
Magnesium	40.9	0.05
Manganese	0.017	0.005
Molybdenum	<0.005	0.005
Nickel	<0.005	0.005
Palladium	<0.02	0.02
Phosphorus	0.035	0.025
Potassium	7.63	0.1
Selenium	<0.01	0.01
Silicon	10.5	0.025
Silver	<0.005	0.005
Sodium	92.0	0.1
Strontium	0.531	0.005
Sulfur	56.2	0.025
Thallium	<0.01	0.01
Thorium	<0.015	0.015
Tin	<0.005	0.005
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.021	0.015
Zirconium	<0.005	0.005

8 NOV 02 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: 7SC-2-FUA-4

Lab Name: Southwest Research Institute
Lab Code: SwRI
Matrix: Water
Lab System ID: 213347

Client: Division 20
Date Received: 09/24/02
Project No.: 20.06002.01.141
Work Order: 23189

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.01	0.01
Barium	0.025	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.269	0.02
Cadmium	<0.005	0.005
Calcium	83.0	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.128	0.005
Magnesium	41.6	0.05
Manganese	0.017	0.005
Molybdenum	<0.005	0.005
Nickel	<0.005	0.005
Palladium	<0.02	0.02
Phosphorus	<0.025	0.025
Potassium	7.67	0.1
Selenium	<0.01	0.01
Silicon	10.4	0.025
Silver	<0.005	0.005
Sodium	93.2	0.1
Strontium	0.527	0.005
Sulfur	56.1	0.025
Thallium	<0.01	0.01
Thorium	<0.015	0.015
Tin	0.005	0.005
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.021	0.015
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: 7SC-2-UFUA-3

Lab Name: Southwest Research Institute
Lab Code: SwRI
Matrix: Water
Lab System ID: 213348

Client: Division 20
Date Received: 09/24/02
Project No.: 20.06002.01.141
Work Order: 23189

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.01	0.01
Barium	0.025	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.276	0.02
Cadmium	<0.005	0.005
Calcium	82.7	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.129	0.005
Magnesium	41.9	0.05
Manganese	0.019	0.005
Molybdenum	0.006	0.005
Nickel	<0.005	0.005
Palladium	<0.02	0.02
Phosphorus	0.027	0.025
Potassium	7.80	0.1
Selenium	<0.01	0.01
Silicon	10.5	0.025
Silver	<0.005	0.005
Sodium	96.0	0.1
Strontium	0.521	0.005
Sulfur	56.0	0.025
Thallium	<0.01	0.01
Thorium	<0.015	0.015
Tin	0.009	0.005
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.026	0.015
Zirconium	<0.005	0.005

8 NOV 02 CONT BWS

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: 7SC-2-UFUA-4

Lab Name: Southwest Research Institute
Lab Code: SwRI
Matrix: Water
Lab System ID: 213349

Client: Division 20
Date Received: 09/24/02
Project No.: 20.06002.01.141
Work Order: 23189

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.01	0.01
Barium	0.024	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.269	0.02
Cadmium	<0.005	0.005
Calcium	83.0	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.130	0.005
Magnesium	42.0	0.05
Manganese	0.018	0.005
Molybdenum	<0.005	0.005
Nickel	<0.005	0.005
Palladium	<0.02	0.02
Phosphorus	<0.025	0.025
Potassium	7.82	0.1
Selenium	<0.01	0.01
Silicon	10.5	0.025
Silver	<0.005	0.005
Sodium	96.0	0.1
Strontium	0.518	0.005
Sulfur	55.8	0.025
Thallium	<0.01	0.01
Thorium	<0.015	0.015
Tin	<0.005	0.005
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.025	0.015
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: 10Q-FA1-3

Lab Name: Southwest Research Institute
Client: Division 20

Lab Code: SwRI
Date Received: 09/24/02

Matrix: Water
Project No.: 20.06002.01.141

Lab System ID: 213307
Work Order: 23189

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.01	0.01
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	<0.02	0.02
Cadmium	<0.005	0.005
Calcium	5.39	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.005	0.005
Magnesium	5.29	0.05
Manganese	<0.005	0.005
Molybdenum	<0.005	0.005
Nickel	<0.005	0.005
Palladium	<0.02	0.02
Phosphorus	<0.025	0.025
Potassium	4.09	0.1
Selenium	<0.01	0.01
Silicon	<0.025	0.025
Silver	<0.005	0.005
Sodium	4.41	0.1
Strontium	<0.005	0.005
Sulfur	<0.025	0.025
Thallium	<0.01	0.01
Thorium	<0.015	0.015
Tin	<0.005	0.005
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.015	0.015
Zirconium	<0.005	0.005

CNWRA QA spiked sample. For recoveries and target masses see 523/110

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SOUTHWEST RESEARCH INSTITUTE
MATRIX SPIKE SUMMARY

Sample ID: 10P-1-FA1-3

Lab Name: Southwest Research Institute
Client: Division 20

Lab Code: SwRI
Date Received: 09/24/02

Matrix: Water
Project No.: 20.06002.01.141

Lab System ID: 213298
Work Order: 23189

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	<0.05	2.06	2.00	103.2%
Antimony	<0.02	0.552	0.500	110.3%
Arsenic	0.012	2.22	2.00	110.5%
Barium	0.010	2.14	2.00	106.7%
Beryllium	<0.005	0.052	0.050	103.6%
Bismuth	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	<0.005	0.052	0.050	104.7%
Calcium	14.0	35.3	20.0	106.6%
Chromium	<0.005	0.200	0.200	100.2%
Cobalt	<0.005	0.515	0.500	103.0%
Copper	<0.005	0.266	0.250	106.5%
Iron	<0.05	0.977	1.00	97.7%
Lanthanum	NA	NA	NA	NA
Lead	<0.005	0.510	0.500	102.0%
Lithium	NA	NA	NA	NA
Magnesium	2.24	24.1	20.0	109.1%
Manganese	0.006	0.521	0.500	103.0%
Molybdenum	NA	NA	NA	NA
Nickel	<0.005	0.496	0.500	99.3%
Palladium	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA
Potassium	6.17	30.0	20.0	119.2%
Selenium	<0.01	2.34	2.00	117.2%
Silicon	NA	NA	NA	NA
Silver	<0.005	0.051	0.050	102.0%
Sodium	42.5	67.9	20.0	127.1%
Strontium	NA	NA	NA	NA
Sulfur	NA	NA	NA	NA
Thallium	<0.01	2.16	2.00	108.0%
Thorium	NA	NA	NA	NA
Tin	NA	NA	NA	NA
Titanium	NA	NA	NA	NA
Tungsten	NA	NA	NA	NA
Uranium	NA	NA	NA	NA
Vanadium	0.006	0.521	0.500	103.0%
Yttrium	NA	NA	NA	NA
Zinc	<0.015	0.532	0.500	106.4%
Zirconium	NA	NA	NA	NA

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE
MATRIX SPIKE SUMMARY

Sample ID: 18P-UFUA-3

Lab Name: Southwest Research Institute
Client: Division 20

Lab Code: SwRI
Date Received: 09/24/02

Matrix: Water
Project No.: 20.06002.01.141

Lab System ID: 213318
Work Order: 23189

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	<0.05	2.06	2.00	103.1%
Antimony	<0.02	0.545	0.500	108.9%
Arsenic	0.012	2.23	2.00	110.9%
Barium	0.006	2.07	2.00	103.0%
Beryllium	<0.005	0.052	0.050	103.9%
Bismuth	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	<0.005	0.052	0.050	104.9%
Calcium	10.9	33.0	20.0	110.8%
Chromium	<0.005	0.199	0.200	99.7%
Cobalt	<0.005	0.519	0.500	103.8%
Copper	<0.005	0.261	0.250	104.4%
Iron	<0.05	0.999	1.00	99.9%
Lanthanum	NA	NA	NA	NA
Lead	<0.005	0.520	0.500	104.0%
Lithium	NA	NA	NA	NA
Magnesium	0.180	22.7	20.0	112.6%
Manganese	<0.005	0.516	0.500	103.1%
Molybdenum	NA	NA	NA	NA
Nickel	<0.005	0.500	0.500	99.9%
Palladium	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA
Potassium	2.15	27.1	20.0	124.6%
Selenium	<0.01	2.35	2.00	117.5%
Silicon	NA	NA	NA	NA
Silver	<0.005	0.035	0.050	69.3%
Sodium	69.9	95.0	20.0	125.3%
Strontium	NA	NA	NA	NA
Sulfur	NA	NA	NA	NA
Thallium	<0.01	2.16	2.00	108.1%
Thorium	NA	NA	NA	NA
Tin	NA	NA	NA	NA
Titanium	NA	NA	NA	NA
Tungsten	NA	NA	NA	NA
Uranium	NA	NA	NA	NA
Vanadium	<0.005	0.517	0.500	103.4%
Yttrium	NA	NA	NA	NA
Zinc	<0.015	0.591	0.500	118.1%
Zirconium	NA	NA	NA	NA

NA- Not Applicable.

8 NOV 02 CONT BW

SOUTHWEST RESEARCH INSTITUTE
MATRIX SPIKE SUMMARY

Sample ID: 22S-4-FA1-3

Lab Name: Southwest Research Institute
Client: Division 20

Lab Code: SwRI
Date Received: 09/24/02

Matrix: Water
Project No.: 20.06002.01.141

Lab System ID: 213338
Work Order: 23189

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	<0.05	2.05	2.00	102.6%
Antimony	<0.02	0.554	0.500	110.7%
Arsenic	<0.01	2.26	2.00	113.0%
Barium	0.012	2.09	2.00	103.9%
Beryllium	<0.005	0.053	0.050	105.6%
Bismuth	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	<0.005	0.054	0.050	108.2%
Calcium	18.2	39.1	20.0	104.4%
Chromium	<0.005	0.204	0.200	102.1%
Cobalt	<0.005	0.531	0.500	106.2%
Copper	<0.005	0.256	0.250	102.5%
Iron	0.167	1.15	1.00	98.2%
Lanthanum	NA	NA	NA	NA
Lead	<0.005	0.535	0.500	107.1%
Lithium	NA	NA	NA	NA
Magnesium	2.86	24.3	20.0	107.2%
Manganese	0.022	0.545	0.500	104.5%
Molybdenum	NA	NA	NA	NA
Nickel	<0.005	0.514	0.500	102.8%
Palladium	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA
Potassium	5.98	29.8	20.0	119.2%
Selenium	<0.01	2.35	2.00	117.7%
Silicon	NA	NA	NA	NA
Silver	<0.005	0.047	0.050	93.7%
Sodium	39.0	63.0	20.0	119.8%
Strontium	NA	NA	NA	NA
Sulfur	NA	NA	NA	NA
Thallium	<0.01	2.21	2.00	110.7%
Thorium	NA	NA	NA	NA
Tin	NA	NA	NA	NA
Titanium	NA	NA	NA	NA
Tungsten	NA	NA	NA	NA
Uranium	NA	NA	NA	NA
Vanadium	<0.005	0.529	0.500	105.8%
Yttrium	NA	NA	NA	NA
Zinc	<0.015	0.543	0.500	108.7%
Zirconium	NA	NA	NA	NA

NA- Not Applicable.

8 NOV 02 CONT BW

SOUTHWEST RESEARCH INSTITUTE
BLANK SUMMARY

Sample ID: PBW-K01W2

Lab Name: Southwest Research Institute
Client: Division 20
Lab Code: SwRI
Date Received: NA
Matrix: Water
Project No.: 20.06002.01.141
Lab System ID: NA
Work Order: 23189

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.01	0.01
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	<0.02	0.02
Cadmium	<0.005	0.005
Calcium	<0.05	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.005	0.005
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.005	0.005
Nickel	<0.005	0.005
Palladium	<0.02	0.02
Phosphorus	<0.025	0.025
Potassium	<0.1	0.1
Selenium	<0.01	0.01
Silicon	<0.025	0.025
Silver	<0.005	0.005
Sodium	<0.1	0.1
Strontium	<0.005	0.005
Sulfur	<0.025	0.025
Thallium	<0.01	0.01
Thorium	<0.015	0.015
Tin	<0.005	0.005
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.015	0.015
Zirconium	<0.005	0.005

NA- Not Applicable.

8 NOV 02 CONT BW

SOUTHWEST RESEARCH INSTITUTE
BLANK SUMMARY

Sample ID: PBW-K01W3

Lab Name: Southwest Research Institute
Client: Division 20
Lab Code: SwRI
Date Received: NA
Matrix: Water
Project No.: 20.06002.01.141
Lab System ID: NA
Work Order: 23189

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.01	0.01
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	<0.02	0.02
Cadmium	<0.005	0.005
Calcium	<0.05	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.005	0.005
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.005	0.005
Nickel	<0.005	0.005
Palladium	<0.02	0.02
Phosphorus	<0.025	0.025
Potassium	<0.1	0.1
Selenium	<0.01	0.01
Silicon	<0.025	0.025
Silver	<0.005	0.005
Sodium	<0.1	0.1
Strontium	<0.005	0.005
Sulfur	<0.025	0.025
Thallium	<0.01	0.01
Thorium	<0.015	0.015
Tin	<0.005	0.005
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.015	0.015
Zirconium	<0.005	0.005

NA- Not Applicable.

8 NOV 02 CONT BW

SOUTHWEST RESEARCH INSTITUTE
BLANK SUMMARY

Sample ID: PBW-K01W4

Lab Name: Southwest Research Institute
Lab Code: SwRI
Matrix: Water
Lab System ID: NA

Client: Division 20
Date Received: NA
Project No.: 20.06002.01.141
Work Order: 23189

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.01	0.01
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	<0.02	0.02
Cadmium	<0.005	0.005
Calcium	<0.05	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.005	0.005
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.005	0.005
Nickel	<0.005	0.005
Palladium	<0.02	0.02
Phosphorus	<0.025	0.025
Potassium	<0.1	0.1
Selenium	<0.01	0.01
Silicon	<0.025	0.025
Silver	<0.005	0.005
Sodium	<0.1	0.1
Strontium	<0.005	0.005
Sulfur	<0.025	0.025
Thallium	<0.01	0.01
Thorium	<0.015	0.015
Tin	<0.005	0.005
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.015	0.015
Zirconium	<0.005	0.005

NA- Not Applicable.

8 NOV 02 CONT BW

SOUTHWEST RESEARCH INSTITUTE
LABORATORY CONTROL SAMPLE

Sample ID: LCSW-K01W2

Lab Name: Southwest Research Institute
Lab Code: SwRI
Matrix: Water
Lab System ID: NA

Client: Division 20
Date Received: NA
Project No.: 20.06002.01.141
Work Order: 23189

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Aluminum	2.05	2.00	102.6%
Antimony	0.550	0.500	110.0%
Arsenic	2.21	2.00	110.5%
Barium	2.15	2.00	107.4%
Beryllium	0.053	0.050	106.3%
Bismuth	NA	NA	NA
Boron	NA	NA	NA
Cadmium	0.053	0.050	105.3%
Calcium	21.0	20.0	105.2%
Chromium	0.203	0.200	101.4%
Cobalt	0.517	0.500	103.4%
Copper	0.268	0.250	107.1%
Iron	0.988	1.00	98.8%
Lanthanum	NA	NA	NA
Lead	0.518	0.500	103.6%
Lithium	NA	NA	NA
Magnesium	21.1	20.0	105.6%
Manganese	0.523	0.500	104.6%
Molybdenum	NA	NA	NA
Nickel	0.507	0.500	101.5%
Palladium	NA	NA	NA
Phosphorus	NA	NA	NA
Potassium	17.9	20.0	89.7%
Selenium	2.31	2.00	115.4%
Silicon	NA	NA	NA
Silver	0.052	0.050	104.2%
Sodium	18.4	20.0	92.2%
Strontium	NA	NA	NA
Sulfur	NA	NA	NA
Thallium	2.19	2.00	109.6%
Thorium	NA	NA	NA
Tin	NA	NA	NA
Titanium	NA	NA	NA
Tungsten	NA	NA	NA
Uranium	NA	NA	NA
Vanadium	0.520	0.500	104.0%
Yttrium	NA	NA	NA
Zinc	0.524	0.500	104.9%
Zirconium	NA	NA	NA

NA- Not Applicable.

8 NOV 02 CONT BW

SOUTHWEST RESEARCH INSTITUTE
LABORATORY CONTROL SAMPLE

Sample ID
LCSW-K01W3

Lab Name: Southwest Research Institute
Client: Division 20

Lab Code: SwRI
Date Received: NA

Matrix: Water
Project No.: 20.06002.01.141

Lab System ID: NA
Work Order: 23189

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Aluminum	2.05	2.00	102.3%
Antimony	0.543	0.500	108.6%
Arsenic	2.17	2.00	108.5%
Barium	2.10	2.00	104.8%
Beryllium	0.052	0.050	104.4%
Bismuth	NA	NA	NA
Boron	NA	NA	NA
Cadmium	0.052	0.050	104.0%
Calcium	21.2	20.0	105.8%
Chromium	0.200	0.200	99.9%
Cobalt	0.512	0.500	102.3%
Copper	0.260	0.250	103.9%
Iron	0.976	1.00	97.6%
Lanthanum	NA	NA	NA
Lead	0.516	0.500	103.2%
Lithium	NA	NA	NA
Magnesium	21.0	20.0	105.2%
Manganese	0.516	0.500	103.1%
Molybdenum	NA	NA	NA
Nickel	0.499	0.500	99.8%
Palladium	NA	NA	NA
Phosphorus	NA	NA	NA
Potassium	18.2	20.0	90.9%
Selenium	2.26	2.00	113.0%
Silicon	NA	NA	NA
Silver	0.051	0.050	102.1%
Sodium	18.9	20.0	94.5%
Strontium	NA	NA	NA
Sulfur	NA	NA	NA
Thallium	2.15	2.00	107.5%
Thorium	NA	NA	NA
Tin	NA	NA	NA
Titanium	NA	NA	NA
Tungsten	NA	NA	NA
Uranium	NA	NA	NA
Vanadium	0.515	0.500	103.1%
Yttrium	NA	NA	NA
Zinc	0.524	0.500	104.7%
Zirconium	NA	NA	NA

NA- Not Applicable.

8 NOV 02 CONT BW

SOUTHWEST RESEARCH INSTITUTE
LABORATORY CONTROL SAMPLE

Sample ID
LCSW-K01W4

Lab Name: Southwest Research Institute
Client: Division 20

Lab Code: SwRI
Date Received: NA

Matrix: Water
Project No.: 20.06002.01.141

Lab System ID: NA
Work Order: 23189

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Aluminum	2.01	2.00	100.3%
Antimony	0.545	0.500	109.0%
Arsenic	2.24	2.00	112.0%
Barium	2.05	2.00	102.5%
Beryllium	0.053	0.050	106.2%
Bismuth	NA	NA	NA
Boron	NA	NA	NA
Cadmium	0.053	0.050	106.9%
Calcium	21.0	20.0	105.0%
Chromium	0.204	0.200	102.0%
Cobalt	0.526	0.500	105.2%
Copper	0.259	0.250	103.7%
Iron	0.958	1.00	95.8%
Lanthanum	NA	NA	NA
Lead	0.535	0.500	107.0%
Lithium	NA	NA	NA
Magnesium	21.0	20.0	105.2%
Manganese	0.522	0.500	104.4%
Molybdenum	NA	NA	NA
Nickel	0.517	0.500	103.4%
Palladium	NA	NA	NA
Phosphorus	NA	NA	NA
Potassium	17.6	20.0	88.0%
Selenium	2.26	2.00	113.1%
Silicon	NA	NA	NA
Silver	0.051	0.050	101.8%
Sodium	18.0	20.0	90.0%
Strontium	NA	NA	NA
Sulfur	NA	NA	NA
Thallium	2.22	2.00	111.2%
Thorium	NA	NA	NA
Tin	NA	NA	NA
Titanium	NA	NA	NA
Tungsten	NA	NA	NA
Uranium	NA	NA	NA
Vanadium	0.526	0.500	105.2%
Yttrium	NA	NA	NA
Zinc	0.529	0.500	105.8%
Zirconium	NA	NA	NA

NA- Not Applicable.

02 DEC 02 Periodic notebook review completed.
PB

23 DEC02 BAW

STABLE ISOTOPE RESULTS - COASTAL SCI LAB - FOR AUG 2002 + SEPT 2002. EWDP Samples

EWDP Groundwater samples legend in table A below. See 523/74 for more details. Samples 28+29 were tap water blanks. Similar tap water blanks sent to GEOCHRON for comparison (see 523/75) REQ # 600587 and PO # 394890X

TABLE A - EWDP Groundwater Sample Legend.

Old label information					New label for Coastal Science Labs
Well	Zone or String	Depth (feet)	Treatment	Date	
18P	na	835.8 to 885.0	SF	8/26/02	CNWRA 1
			SUF		CNWRA 2
10P	Shallow	663.5 to 722.7	SUF	8/27/02	CNWRA 3
10P	Deep	801.2 to 879.9	SUF	8/27/02	CNWRA 4
22PA	Deep	661.4 to 769.7	SF	8/28/02	CNWRA 5
			SUF		CNWRA 6
22PA	Shallow	520.8 to 599.9	SF	8/28/02	CNWRA 7
			SUF		CNWRA 8
22PB	Shallow	881.3 to 989.9	SF	8/29/02	CNWRA 9
			SUF		CNWRA 10
22S	Zone 4	1142.0 to 1179.5	SF	9/9/02	CNWRA 11
			SUF		CNWRA 12
22S	Zone 3	882.0 to 979.5	SF	9/10/02	CNWRA 13
			SUF		CNWRA 14
22S	Zone 2	662.0 to 759.5	SF	9/10/02	CNWRA 15
			SUF		CNWRA 16
22S	Zone 1	522.0 to 579.5	SF	9/11/02	CNWRA 17
			SUF		CNWRA 18
10S	Zone 2	802.0 to 859.5	SF	9/11/02	CNWRA 19
			SUF		CNWRA 20
10S	Zone 1	662.0 to 699.5	SF	9/12/02	CNWRA 21
			SUF		CNWRA 22
7SC	Zone 2	180.0 to 210.0	SF	9/13/02	CNWRA 23
			SUF		CNWRA 24
7SC	Zone 1	80.0 to 90.0	SF	9/13/02	CNWRA 25
			SUF		CNWRA 26
Field Blank	na	na	SF	8/27/02	CNWRA 27

23 DEC02 CONT BW

COASTAL SCIENCE LABORATORIES, INC.
6000 Mountain Shadows Drive • Austin, Texas 78735 • (512) 288-5533

December 16, 2002

Dr. Bradley Werling
Southwest Research Institute
Center for Nuclear Waste Regulatory Analyses
6220 Culebra Road
San Antonio, TX 78238-5166

Dear Dr. Werling:

We have completed stable isotope analysis of your water samples received recently. Carbon data are reported relative to the PDB standard and are believed accurate to ±0.2 per mil. Hydrogen and oxygen data are reported relative to the SMOW standard and are believed accurate to ±3 per mil and 0.2 per mil respectively.

Yours truly,

Kenneth Winters
Laboratory Manager

CSL Ref.#EB66

23 DEC02 CONT BAW

STABLE ISOTOPE ANALYSES OF WATER SAMPLES FOR SOUTHWEST RESEARCH INSTITUTE. ATTN: DR. BRADLEY WERLING

PO#394890X

SAMPLE	$\delta^{13}C_{PDB}$	δD_{SMOW}	$\delta^{18}O_{SMOW}$
1	-6.9	-110, -110	-14.1, -14.0
2	-6.8	-110	-14.1, -14.1
3	-7.4	-106, -105	-13.5
4	-6.9, -7.2	-105	-13.5
5	-7.1	-106, -107	-13.5
6	-6.9	-106	-13.5
7	-6.9	-105	-13.6
8	-6.6	-106	-13.6
9	-6.7	-107	-13.6
10	-6.8	-106	-13.6
11	-6.7	-107	-13.7
12	-7.6, -7.7	-108, -106	-13.6
13	-6.5	-105	-13.5
14	-6.7	-106	-13.5
15	-6.3	-105	-13.5
16	-6.5	-106	-13.6
17	-7.0	-104	-13.6
18	-7.2	-105, -105	-13.7
19	-7.6	-104	-13.6
20	-7.9	-104	-13.6
21	-7.0	-106	-13.7

CSL Ref#EB66

23 DEC02 CONT BAW

STABLE ISOTOPE ANALYSES OF WATER SAMPLES FOR SOUTHWEST RESEARCH INSTITUTE. ATTN: DR. BRADLEY WERLING

Project # 394890X

SAMPLE	$\delta^{13}C_{PDB}$	δD_{SMOW}	$\delta^{18}O_{SMOW}$
22	-7.2, -6.8	-106	-13.6
23	-4.5, -4.4, -4.5	-106	-13.7
24	-4.4	-106	-13.7
25	-4.5	-107	-13.8
26	-5.3	-107, -108	-13.8
27	INS, INS	-30	-4.7
28	-8.3, -8.3	-29	-4.6
29	-8.0, -8.0	-30, -29	-4.6

CSL Ref#EB66
Page two

Coastal Science Laboratories Phone/Fax 512-288-5533 email: info@csl-sira.com

18 FEB 03 BAW

Making 0.001 N HNO_3 soln

Two step dilution with 1N intermediate

For 1N soln, 63 mL (50+10+3 mL vol pipet) of conc HNO_3 (Fisher A509-212 lot# 1100040 trace metal grade) was added to a 1000 mL vol flask and diluted to mark with type I water.

For the 0.001 N soln, 1 mL (vol pipet) of the above 1N soln was added to a 1000 mL vol flask and diluted to mark with type I water.

The 1N soln was transfered to a 1L pp bottle and labeled 1N HNO_3

The 0.001 N soln was transferred to a 1L pp bottle and labeled 0.001 N HNO_3

~~3 p~~ BW 3-7-03

7 MAR 03 BW

COPY SENT TO QA

21 May 2003 PB

* Late entry - Information related to send off and receipt of samples analyzed by Core Lab and WSU.

Samples are cuttings from wells NC-EWDP-02D and NC-EWDP-Washburn-1X. - Core Lab will analyze cuttings using XRD, SEM, and thin section petrography. XRD analyses will be conducted on the bulk fraction as well as the clay mineral fraction. Core Lab will send a subset of samples to WSU for chemical analysis using XRF and ICP-MS.

Internal standards are included to help verify CoreLab's XRD performance. These samples are not 'standards' as such, but are known mineral powders and are provided as unknowns. Standards for WSU are sent separately and are included in WSU results.

A list of samples and analyses is provided on the following pages. Samples for well 02D are followed by Washburn-1X samples. Also included in the sample list are listings for previous analyses conducted on the cuttings (See notebook #309 pages 87-146 and 194-220 for example). Sample numbers follow some format as that supplied by the SMF.

PB 05/21/2003

21 May 2003 PB Sample list for petrographic + chemical analysis of cuttings

	Specimen I.D.	Top Depth (ft)	Bottom Depth (ft)	Original Sample Wt. (grams)	XRD+Chem	Powder sub	Powder sub	Thin sub	Thin sub	Thin (stain)		XRD	Thin Section	SEM	Chemistry
Container ID 01002648															
Well	1010548	5.0	10.0	133.07								x			
	1010549	15.0	20.0	121.77	x							x			
OZD	1010550	25.0	30.0	142.10	x							x			
	1010551	35.0	40.0	140.76								x			
	1010552	45.0	50.0	144.81								x			
	1010553	55.0	60.0	131.02								x			
	1010554	65.0	70.0	139.74								x			
	1010555	75.0	80.0	127.11								x			
	1010556	85.0	90.0	147.93								x	X		
	1010558	95.0	100.0	171.81								x	x		
	1010559	105.0	110.0	124.87								x			
	1010560	115.0	120.0	134.78								x			
	1010561	125.0	130.0	136.52								x			
	1010562	135.0	140.0	171.27								x			
	1010563	145.0	150.0	132.17								x	x		
	1010564	155.0	160.0	151.29								x			
	1010565	165.0	170.0	156.91								x			
	1010566	175.0	180.0	174.51	x	A						x	x		
	1010567	185.0	190.0	136.69	x							x			
	1010568	195.0	200.0	120.67								x			
	1010569	210.0	215.0	122.78								x			
	1010570	220.0	225.0	117.63	x							x			
	1010571	230.0	235.0	73.26	x	A						x			
	1010572	240.0	245.0	98.77								x			
	1010573	255.0	260.0	81.14								x			
	1010574	270.0	275.0	117.05								x			
	1010575	280.0	285.0	121.03								x	x		
	1010576	290.0	295.0	99.38								x			
	1010577	300.0	305.0	86.49								x			
	1010578	330.0	335.0	91.87	x						Ts	x			
	1010579	345.0	350.0	100.24	x	A						x			x
	1010580	355.0	360.0	133.81								x			
	1010581	365.0	370.0	113.78								x			
	1010582	375.0	380.0	53.99								x			
	1010583	385.0	390.0	105.39	x							x			x
	1010584	395.0	400.0	114.98	x	A					T	x			
	1010585	405.0	410.0	152.35								x	x		
	1010586	415.0	420.0	122.20								x			x
	1010587	430.0	435.0	129.82								x	x		
	1010589	450.0	455.0	108.32								x	x		
	1010590	460.0	465.0	136.94								x	x		x
	1010591	470.0	475.0	115.75								x			
	1010592	480.0	485.0	106.80								x	x		
	1010593	490.0	495.0	57.51								x			x
Container ID 01002649															
	1010595	500.0	505.0	116.19								x			
Well	1010596	510.0	515.0	110.58								x			
	1010597	520.0	525.0	93.62								x			
OZD	1010598	530.0	535.0	113.21								x			x
	1010599	540.0	545.0	124.92								x	x		
	1010600	550.0	555.0	123.23								x			
	1010601	560.0	565.0	101.25								x			
	1010602	570.0	575.0	106.83	x							x			x
	1010603	580.0	585.0	124.13	x							x			
	1010604	590.0	595.0	124.71								x			

Added 7-18-03 BAW

XRD = quantitative XRD (bulk and clay)

Thin section - Thin section of coarse fraction

SEM = SEM analyses

Chemistry - sent to WSU for XRF/ICP-MS

last 4 columns are for current study.

21 May 2003 Sample list (continued)

PB

1st six columns in analyses list are for studies conducted in 2000 (see notebook #3)

They are kept for comparison.

	Specimen I.D.	Top Depth (ft)	Bottom Depth (ft)	Original Sample Wt. (grams)	XRD+Chem	Powder sub	Powder sub	Thin sub	Thin sub	Thin (stain)		XRD	Thin Section	SEM	Chemistry
Well	1010605	600.0	605.0	84.16								x			
	1010606	610.0	615.0	99.82								x	x	x	x
OZD	1010607	620.0	625.0	116.89								x			
	1010608	630.0	635.0	115.74								x			
	1010609	640.0	645.0	92.99								x	x	x	
	1010610	650.0	655.0	122.63								x			x
	1010611	660.0	665.0	121.62								x			
	1010612	670.0	675.0	121.34								x			
	1010613	680.0	685.0	109.15								x			
	1010614	690.0	695.0	112.83								x			
	1010615	700.0	705.0	131.01								x	x	x	x
	1010616	710.0	715.0	90.24								x			
	1010617	720.0	725.0	88.61								x			
	1010618	730.0	735.0	97.84								x			
	1010619	740.0	745.0	91.24								x			
	1010620	750.0	755.0	99.88								x			x
	1010621	760.0	765.0	90.77								x			
	1010622	770.0	775.0	92.68								x	x		
	1010623	780.0	785.0	105.50								x			
	1010624	795.0	800.0	40.07								x			
	1010625	805.0	810.0	98.59								x			
	1010626	815.0	820.0	84.67								x	x	x	
	1010627	825.0	830.0	101.08								x			x
	1010628	835.0	840.0	105.28								x			
	1010629	845.0	850.0	97.05								x			
	1010630	855.0	860.0	116.52								x			
	1010631	865.0	870.0	118.04								x	x		
	1010632	875.0	880.0	126.99								x			x
	1010633	885.0	890.0	117.48								x			
	1010634	895.0	900.0	117.59								x			
	1010635	905.0	910.0	134.52								x	x		
	1010636	915.0	920.0	110.88								x			
	1010637	925.0	930.0	116.72	x							x			
	1010638	935.0	940.0	114.40	x							x			x
	1010639	945.0	950.0	114.39								x			
	1010640	955.0	960.0	117.25								x			
	1010641	965.0	970.0	106.44								x			
	1010642	975.0	980.0	117.25								x	x	x	
	1010643	985.0	990.0	108.18								x			x
	1010644	995.0	1000.0	106.98								x			
Container ID 01002650															
well	1010645	1005.0	1010.0	93.67								x	x	x	
	1010646	1015.0	1020.0	112.72								x			
OZD	1010647	1025.0	1030.0	115.30								x			x
	1010648	1035.0	1040.0	125.42	x	A	B					x	x	x	
	1010649	1045.0	1050.0	107.79	x					Ts		x			
	1010650	1055.0	1060.0	104.17	x					T		x			
	1010651	1065.0	1070.0	102.31								x	x	x	
	1010652	1075.0	1080.0	126.71								x	x		x
	1010653	1085.0	1090.0	107.54	x							x			
	1010654	1095.0	1100.0	107.78	x	A		AT				x			
	1010655	1105.0	1110.0	106.44	x							x			
	1010656	1115.0	1120.0	101.56	x	A	B	AT	BT			x			x
	1010657	1125.0	1130.0	84.86	x					Ts		x	x	x	
	1010658	1135.0	1140.0	98.88								x			
	1010659	1145.0	1150.0	79.63								x			

Sample list (continued)

21 May 2003
PB

well
OZD

Specimen I.D.	Top Depth (ft)	Bottom Depth (ft)	Original Sample Wt. (grams)	XRD+Chem	Powder sub	Powder sub	Thin sub	Thin sub	Thin (stain)		XRD	Thin Section	SEM	Chemistry
1010660	1155.0	1160.0	117.35								x	x		x
1010661	1165.0	1170.0	105.96	x					Ts		x	x	x	
1010662	1175.0	1180.0	95.15								x			
1010663	1185.0	1190.0	100.04	x							x			
1010664	1195.0	1200.0	112.09	x					Ts		x			x
1010665	1205.0	1210.0	121.07	x					Ts		x	x	x	
1010666	1215.0	1220.0	116.96	x					Ts		x			
1010667	1225.0	1230.0	113.06	x							x			x
1010668	1235.0	1240.0	111.98	x							x	x		
1010669	1245.0	1250.0	101.42	x							x	x	x	x
1010670	1255.0	1260.0	108.74	x							x			
1010671	1265.0	1270.0	115.80								x	x	x	
1010672	1275.0	1280.0	117.20								x			
1010673	1285.0	1290.0	108.48								x			
1010674	1295.0	1300.0	115.02								x	x		
1010675	1305.0	1310.0	122.68								x			x
1010676	1315.0	1320.0	119.75								x	x	x	
1010678	1325.0	1330.0	109.90								x			
1010679	1335.0	1340.0	115.60								x			
1010680	1345.0	1350.0	112.44								x			
1010681	1355.0	1360.0	105.30								x			x
1010682	1365.0	1370.0	108.68								x			
1010683	1375.0	1380.0	123.79								x	x		
1010684	1385.0	1390.0	106.60	x					T		x	x	x	
1010685	1395.0	1400.0	109.94	x							x			x
1010686	1405.0	1410.0	90.91								x			
1010687	1415.0	1420.0	109.99								x	x		
1010688	1425.0	1430.0	99.90								x			
1010689	1435.0	1440.0	122.24								x			
1010690	1445.0	1450.0	155.09	x	A		BT		Ts		x			
1010691	1455.0	1460.0	128.63								x	x		x
1010692	1465.0	1470.0	103.41								x	x	x	
1010693	1475.0	1480.0	121.58								x			
1010694	1485.0	1490.0	94.19	x							x			
1010695	1495.0	1500.0	100.45								x			x
1010696	1505.0	1510.0	122.67								x			
1010697	1515.0	1520.0	117.70								x	x	x	
1010698	1525.0	1530.0	107.39								x			
1010699	1535.0	1540.0	129.02								x	x		
1010700	1545.0	1550.0	122.20								x	x	x	
1010701	1555.0	1560.0	100.46	x					T		x			x
1010702	1565.0	1570.0	142.92	x							x			
1010703	1575.0	1580.0	116.31	x							x			x
1010704	1585.0	1590.0	123.75								x			
1010705	1595.0	1600.0	140.36								x	x	x	
1010706	1605.0	1610.0	114.12								x			
1010707	1615.0	1620.0	133.95								x			x
Total Samples		156		38	8	2	3	1	12		156	40	19	30

21 May 2003
PB

Sample list (continued)

well
Washburn-1X

Specimen I.D.	Top Depth (ft.)	Bottom Depth (ft.)	Sample Wt. (g)	XRD+Chem	Powder sub	Thin (stain)		XRD	Thin Section	SEM	Chemistry
1010819	5.0	10.0	130.99					x			
1010820	15.0	20.0	137.23					x			
1010821	25.0	30.0	155.23					x			
1010822	35.0	40.0	149.54					x			
1010823	45.0	50.0	159.48					x			
1010824	55.0	60.0	160.90					x			
1010825	65.0	70.0	154.37					x			
1010826	75.0	80.0	136.41					x			
1010827	85.0	90.0	143.24					x			
1010828	95.0	100.0	183.27					x			
1010829	105.0	110.0	146.48					x			
1010830	115.0	120.0	157.14					x			
1010831	125.0	130.0	146.88					x			
1010832	135.0	140.0	151.93					x			
1010833	145.0	150.0	137.73					x			
1010834	155.0	160.0	184.56					x			
1010835	165.0	170.0	147.51					x			
1010836	175.0	180.0	144.45					x			
1010837	185.0	190.0	155.39					x			
1010838	195.0	200.0	n/a					x			
1010839	205.0	210.0	161.15					x			
1010840	215.0	220.0	184.54					x			
1010841	225.0	230.0	219.53	x	A			x		x	
1010842	235.0	240.0	162.06	x				x			
1010843	245.0	250.0	179.10					x			
1010844	255.0	260.0	140.28					x			
1010845	265.0	270.0	173.88					x			
1010846	275.0	280.0	151.35					x			
1010847	285.0	290.0	154.47					x		x	
1010848	295.0	300.0	118.23					x			
1010849	305.0	310.0	151.99					x			
1010850	315.0	320.0	131.62					x			
1010851	325.0	330.0	142.80					x			
1010852	335.0	340.0	114.97	x				x			
1010853	345.0	350.0	142.16	x				x		x	
1010854	355.0	360.0	132.25	x				x			
1010855	365.0	370.0	127.55	x		T		x			
1010856	375.0	380.0	126.66	x		Ts		x		x	
1010857	385.0	390.0	174.62					x			
1010858	395.0	400.0	132.72					x			
1010859	410.0	415.0	148.71					x			
1010860	420.0	425.0	155.91					x		x	
1010861	455.0	460.0	152.53					x			
1010862	465.0	470.0	120.06					x			
1010863	475.0	480.0	159.91					x			
1010864	485.0	490.0	129.12	x		Ts					
1010865	495.0	500.0	167.92	x				x		x	
1010866	505.0	510.0	143.87	x				x			
1010867	515.0	520.0	127.22	x		Ts		x			
1010868	525.0	530.0	134.30	x		T		x		x	
1010869	535.0	540.0	131.38	x		T		x			
1010870	545.0	550.0	116.14	x				x			
1010871	555.0	560.0	131.74	x				x		x	
1010872	570.0	575.0	149.44	x				x			
1010873	580.0	585.0	170.40	x				x			
1010874	590.0	595.0	133.72					x			
1010875	600.0	605.0	163.99					x		x	
1010876	610.0	615.0	161.21	x				x			
1010877	620.0	625.0	146.25	x				x			
1010878	630.0	635.0	159.59	x				x		x	
1010879	640.0	645.0	158.41					x			
1010880	650.0	655.0	125.51					x			
Total Samples		62		20	1	6		61	0	0	10

note no TS or SEM performed on Washburn cuttings.

21 May 2003 Sample list (continued)

PB

Unknown / PB 05/21/2003

standards / known samples included as unknowns

Other specimens							current work		
	Specimen I.D.	Description			XRD+Chem	Thin (stain)	To core lab for XRD		To WSU for XRF
	500	W510 60/100*UC*Rc*RFe*HL			x	T	X		
	501	CDV #25535			x		X		
	502	NBS 70a - Kspar			x		X		X
	503	NBS 99a - Na spar			x				
	504	NBS 278 - obsidian			x				X
	505	RGM1 - USGS rhyolite			x				
	900	NBS 70a - Kspar			x				

previous studies

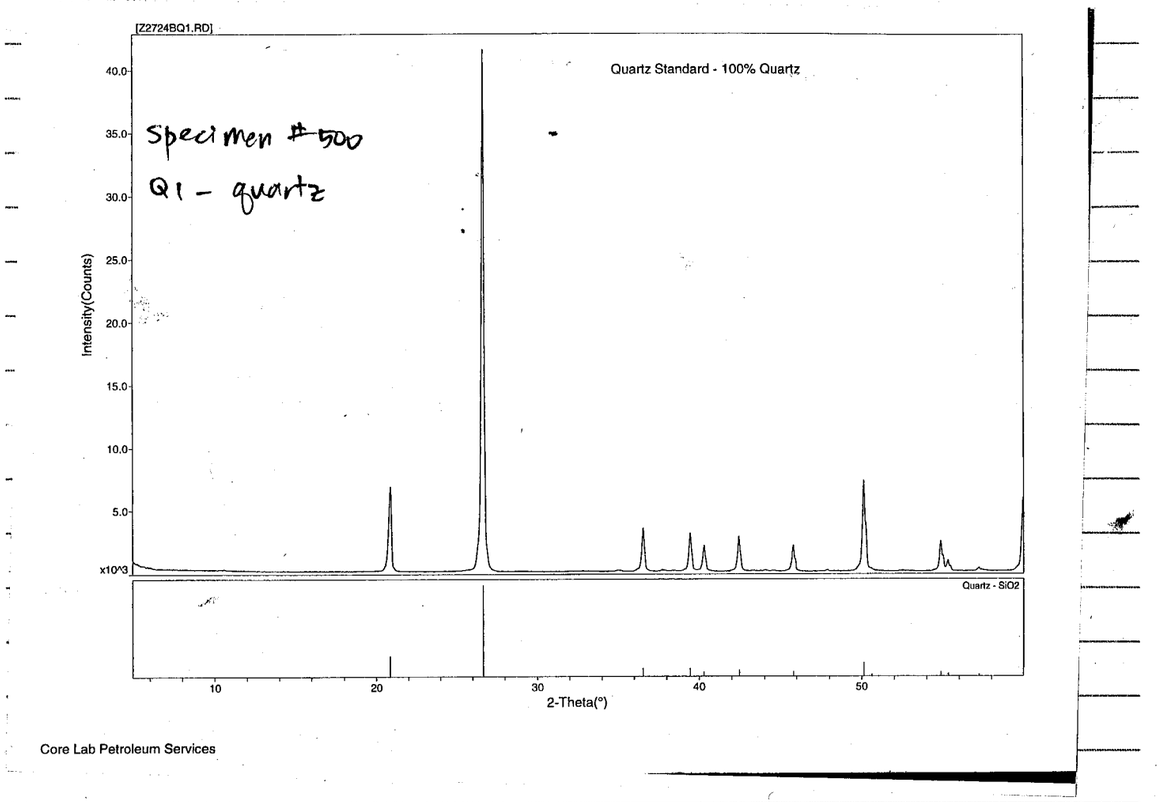
Also included Na-montmorillonite sample to Core Lab for XRD analysis

To check acceptability of results, we will compare Core Lab's XRD patterns and analyses to our expectations of the included mineral known/standards. Core Lab results should identify the mineral and present a reasonable quantification of the standards content.

WSU analyses can be compared to chemical analyses results for the included standards and can be compared to previous analyses of those samples.

21 May 2003 Results of XRD analyses from Core Lab

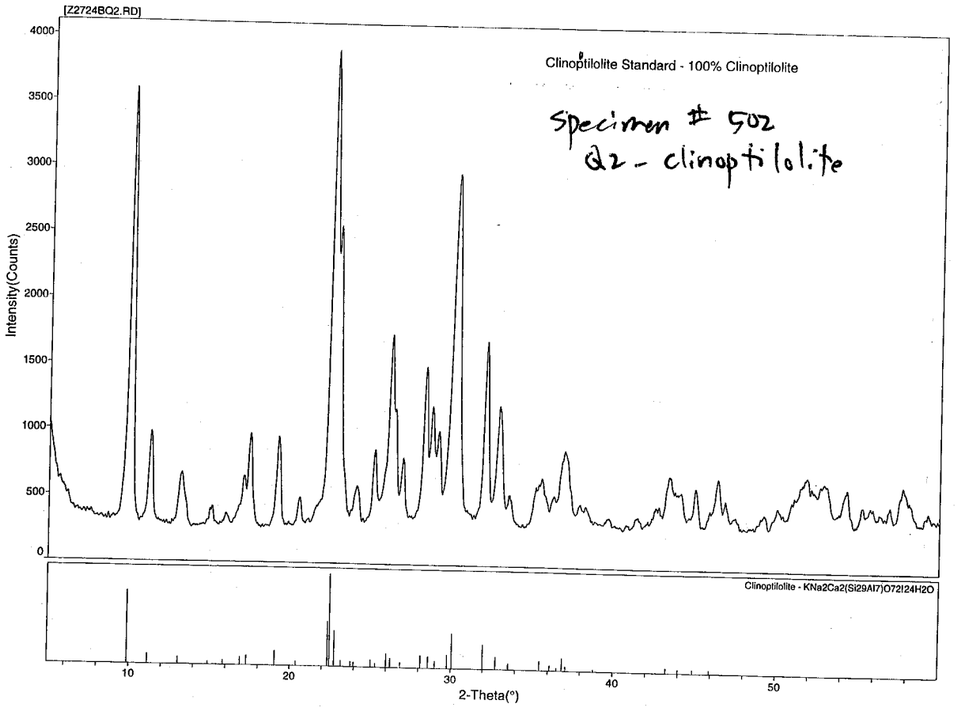
PB



pattern for Q1 - (500) quartz matches quartz peaks, is identified as quartz and is consistent with ~~independent~~ 5/22/03 independent analysis of SwRI for the same sample (see #30a page 131).

Results of XRD analyses from Core Lab (cont'd)

21 May 2003 RB



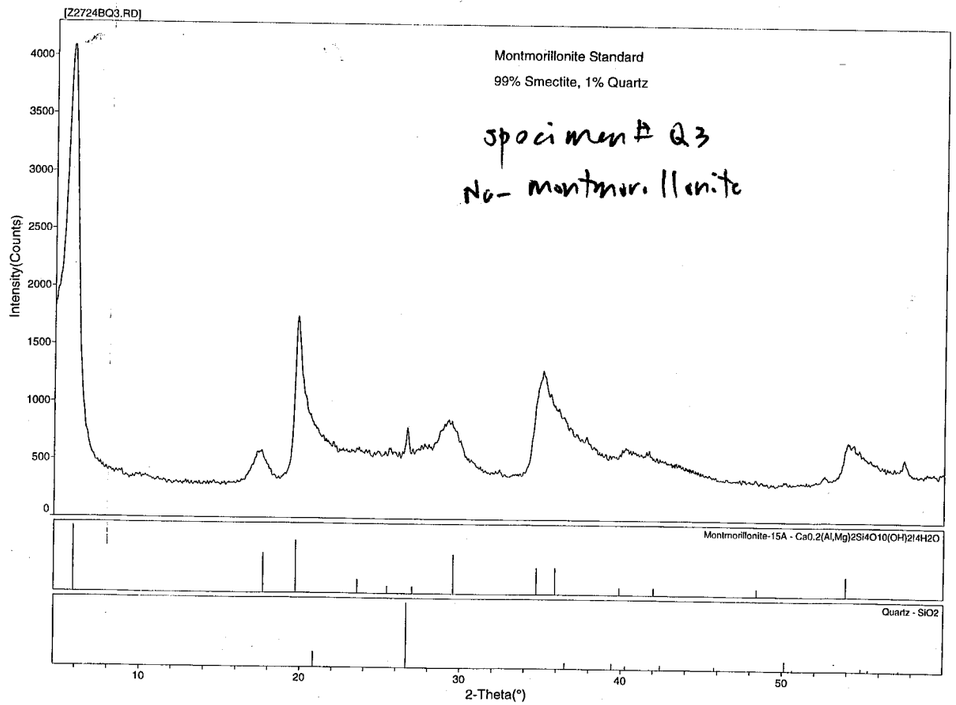
Core Lab Petroleum Services

Core lab pattern for Clinoptilolite - Q2 (502) pattern is identified as clinoptilolite and matches previous independent analyses (#309, page 132)

Results of XRD analyses from Core Lab (cont'd)

21 May 2003 RB

Core lab pattern for montmorillonite is identified properly as smectite (with some minor quartz - consistent with our preparation of the specimen some years ago).



Core Lab Petroleum Services

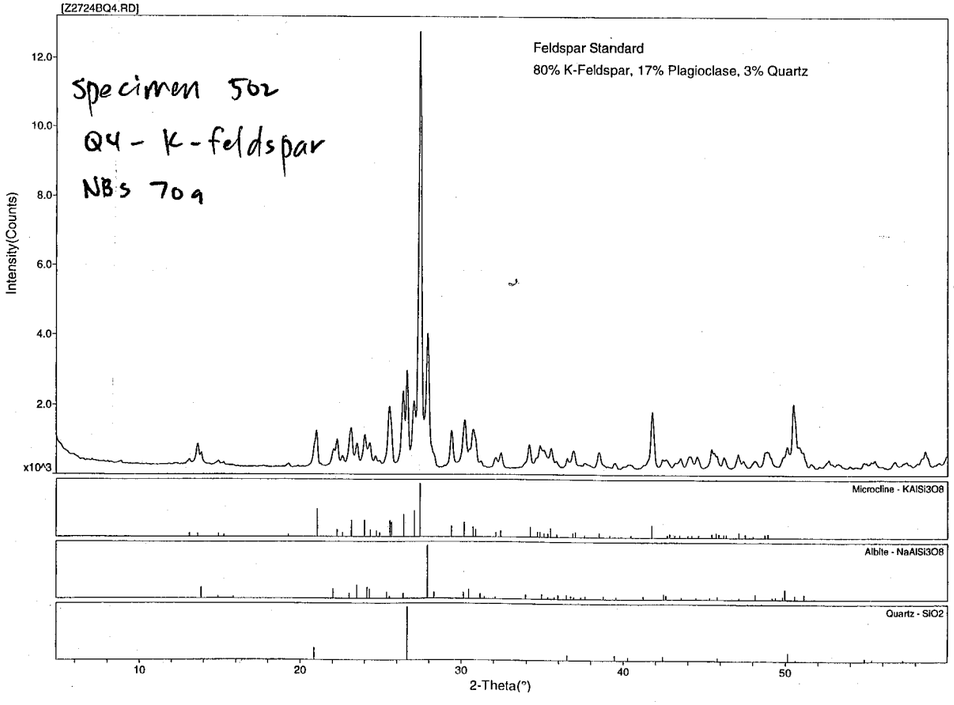
Results of XRD analyses from Core Lab (cont'd)

21 May 2003

PB

Based on review of specimens included as unknowns and the results of XRD analyses of these specimens, the Core Lab results are deemed acceptable. A summary of all results is found on the CD at the back of this notebook.

Core Lab pattern is identified as primarily K-feldspar, which is consistent with the specimen (not an XRD standard, but a chem. standard) and consistant with previous analyses (#309, page 133).



Core Lab Petroleum Services

Results of WSU XRF analyses

21 May 2003 PB

Run 0302, Paul Bertetti, Southwest Research Institute

Date	BER 10 10579 6-Oct-02	BER 10 10583 8-Oct-02	BER 10 10586 8-Oct-02	BER 10 10590 8-Oct-02	BER 10 10593 6-Oct-02	BER 10 10598 8-Oct-02	BER 10 10602 8-Oct-02	BER 10 10606 8-Oct-02	BER 10 10611 8-Oct-02	BER 10 10615 8-Oct-02
LOI (%)	4.78	4.96	2.60	2.46	3.04	2.31	2.21	2.89	4.35	4.76
Unnormalized Major Elements (Weight %):										
SiO2	72.36	72.61	75.62	76.19	75.49	75.29	75.60	76.33	74.53	74.98
Al2O3	14.61	14.26	13.36	12.81	13.55	13.28	12.61	13.09	12.68	13.00
TiO2	0.399	0.360	0.274	0.243	0.245	0.243	0.311	0.236	0.267	0.269
FeO	2.55	2.28	1.57	1.48	1.42	1.67	2.51	1.45	1.65	1.76
MnO	0.085	0.079	0.065	0.059	0.065	0.082	0.084	0.052	0.052	0.062
CaO	1.84	2.18	1.21	1.13	1.18	0.84	0.91	1.09	3.35	2.46
MgO	1.08	1.05	0.47	0.43	0.60	0.52	0.42	0.44	0.64	0.69
K2O	4.05	4.03	4.53	4.64	4.55	4.71	4.52	4.51	4.07	4.18
Na2O	3.09	2.94	3.14	3.11	3.08	3.34	3.00	2.97	2.86	2.68
P2O5	0.085	0.091	0.075	0.058	0.057	0.051	0.073	0.063	0.068	0.071
Total	100.15	99.88	100.32	100.15	100.24	100.02	100.04	100.23	100.17	100.15
Normalized Major Elements (Weight %):										
SiO2	72.25	72.70	75.38	76.08	75.31	75.27	75.57	76.16	74.41	74.87
Al2O3	14.59	14.28	13.32	12.79	13.52	13.28	12.61	13.06	12.66	12.98
TiO2	0.398	0.360	0.273	0.243	0.244	0.243	0.311	0.235	0.267	0.269
FeO*	2.55	2.28	1.57	1.48	1.41	1.67	2.51	1.44	1.65	1.76
MnO	0.085	0.079	0.065	0.059	0.065	0.082	0.084	0.052	0.052	0.062
CaO	1.84	2.18	1.21	1.13	1.18	0.84	0.91	1.09	3.34	2.46
MgO	1.08	1.05	0.47	0.43	0.60	0.52	0.42	0.44	0.64	0.69
K2O	4.04	4.03	4.52	4.63	4.54	4.71	4.52	4.50	4.06	4.17
Na2O	3.09	2.94	3.13	3.11	3.07	3.34	3.00	2.96	2.86	2.68
P2O5	0.085	0.091	0.075	0.058	0.057	0.051	0.073	0.063	0.068	0.071
Unnormalized Trace Elements (ppm):										
Ni	9	10	6	6	8	10	25	10	10	10
Cr	7	9	0	0	2	4	11	8	7	8
Sc	1	7	2	3	11	0	5	0	0	0
V	28	29	17	16	16	15	32	13	19	26
Ba	656	607	481	472	579	377	441	520	540	532
Rb	133	138	156	156	153	162	155	156	153	159
Sr	248	260	183	133	189	106	113	150	207	186
Zr	274	239	223	217	209	204	246	205	224	210
Y	30	30	33	30	29	28	31	30	27	30
Nb	25.8	24.8	22.5	23.1	21.5	21.9	23.6	23.0	19.6	20.6
Ga	17	20	18	16	17	17	14	16	15	15
Cu	6	7	0	3	1	4	8	6	5	9
Zn	68	65	51	47	44	58	61	40	42	46
Pb	26	25	27	24	24	25	27	25	24	27
La	52	75	50	82	65	54	77	52	52	61
Ce	128	109	104	95	118	102	129	114	108	101
Th	22	23	22	22	23	23	21	20	18	20

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"R" denotes a duplicate bead made from the same rock powder.
"†" denotes values >120% of our highest standard.

Results of WSU XRF analyses (cont'd)

21 May 2003 PB

Run 0302, Paul Bertetti, Southwest Research Institute

Date	BER 10 10620 8-Oct-02	BER 10 10627 8-Oct-02	BER 10 10632 8-Oct-02	BER 10 10638 8-Oct-02	BER 10 10643 9-Oct-02	BER 10 10647 9-Oct-02	BER 10 10652 9-Oct-02	BER 10 10656 9-Oct-02	BER 10 10660 9-Oct-02	BER 10 10664 9-Oct-02
LOI (%)	8.88	5.31	4.42	5.83	6.55	4.60	4.96	3.75	9.25	5.49
Unnormalized Major Elements (Weight %):										
SiO2	69.78	73.51	75.42	73.16	73.12	74.91	73.88	74.56	67.48	70.90
Al2O3	13.21	13.82	13.52	13.19	13.50	12.66	14.00	13.19	11.93	12.89
TiO2	0.307	0.242	0.289	0.256	0.290	0.271	0.274	0.245	0.267	0.300
FeO	1.94	1.36	1.60	1.57	1.76	1.45	1.72	1.62	2.32	2.74
MnO	0.089	0.061	0.071	0.079	0.082	0.056	0.059	0.073	0.091	0.063
CaO	7.03	3.04	1.22	3.75	3.26	2.60	1.90	1.99	7.95	2.93
MgO	0.94	0.68	0.92	0.69	0.94	0.64	0.85	0.60	2.20	1.51
K2O	3.83	4.62	4.58	4.45	4.33	5.15	4.96	5.64	5.83	6.30
Na2O	2.43	2.91	2.57	2.84	2.63	2.21	2.31	2.29	1.59	1.64
P2O5	0.072	0.070	0.077	0.061	0.064	0.067	0.068	0.062	0.088	0.070
Total	99.62	100.33	100.27	100.04	99.98	100.02	100.02	100.27	99.74	99.34
Normalized Major Elements (Weight %):										
SiO2	70.04	73.27	75.22	73.13	73.14	74.90	73.86	74.36	67.65	71.37
Al2O3	13.26	13.77	13.48	13.18	13.50	12.66	14.00	13.15	11.96	12.98
TiO2	0.308	0.241	0.288	0.256	0.290	0.271	0.274	0.244	0.268	0.302
FeO*	1.94	1.37	1.60	1.57	1.76	1.45	1.72	1.61	2.32	2.76
MnO	0.089	0.061	0.071	0.079	0.082	0.056	0.059	0.073	0.091	0.063
CaO	7.06	3.03	1.22	3.75	3.26	2.60	1.90	1.98	7.97	2.95
MgO	0.94	0.68	0.92	0.69	0.94	0.64	0.85	0.60	2.21	1.52
K2O	3.84	4.60	4.57	4.45	4.33	5.15	4.96	5.62	5.84	6.34
Na2O	2.44	2.90	2.56	2.84	2.63	2.21	2.31	2.28	1.59	1.65
P2O5	0.072	0.070	0.077	0.061	0.064	0.067	0.068	0.062	0.088	0.070
Unnormalized Trace Elements (ppm):										
Ni	11	7	9	8	6	6	7	9	6	5
Cr	9	0	3	2	6	5	4	8	6	7
Sc	5	1	7	5	0	2	5	0	3	0
V	25	17	28	24	35	22	19	26	32	25
Ba	539	547	610	619	719	632	572	549	728	917
Rb	156	161	155	154	151	153	160	163	146	146
Sr	238	191	185	261	385	154	255	165	187	190
Zr	198	207	227	219	230	212	216	168	243	274
Y	33	32	31	29	30	26	28	27	25	25
Nb	19.4	20.2	20.3	20.1	20.7	21.4	24.5	20.2	17.6	20.2
Ga	17	18	18	17	15	16	18	17	18	18
Cu	9	4	4	1	4	3	7	7	6	6
Zn	51	42	47	52	54	43	48	45	57	59
Pb	24	27	28	26	23	21	25	26	28	30
La	51	60	61	55	58	66	65	64	60	67
Ce	97	98	109	85	108	98	95	96	96	114
Th	17	21	21	19	17	17	22	18	20	20

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"R" denotes a duplicate bead made from the same rock powder.
"†" denotes values >120% of our highest standard.

Results of WSU XRF analyses (cont'd)

21 May 2003 PB

Run 0302, Paul Bertetti, Southwest Research Institute

Date	BER 10 10667 9-Oct-02	BER 10 10669 10-Oct-02	BER 10 10675 10-Oct-02	BER 10 10681 10-Oct-02	BER 10 10685 10-Oct-02	BER 10 10691 10-Oct-02	BER 10 10695 10-Oct-02	BER 10 10701 10-Oct-02	BER 10 10703 10-Oct-02	BER 10 10707 10-Oct-02
LOI (%)	9.26	6.21	12.51	7.51	7.35	4.42	10.38	12.63	9.50	15.46
Unnormalized Major Elements (Weight %):										
SiO2	68.36	68.89	70.32	70.51	74.22	70.97	68.45	65.10	70.39	61.56
Al2O3	10.84	13.40	7.37	12.48	12.94	12.43	13.05	13.45	12.23	11.31
TiO2	0.259	0.291	0.149	0.254	0.266	0.283	0.384	0.423	0.327	0.366
FeO	2.62	2.98	1.06	2.00	1.74	1.96	2.46	2.85	2.17	2.83
MnO	0.113	0.067	0.041	0.069	0.078	0.078	0.070	0.071	0.049	0.135
CaO	6.18	3.35	12.86	5.57	2.51	5.56	7.20	8.64	6.40	14.18
MgO	3.55	2.28	2.35	1.67	0.83	1.76	2.24	3.54	2.38	4.16
K2O	5.92	7.09	2.74	4.79	4.72	4.37	4.09	4.04	4.25	3.65
Na2O	1.16	1.64	1.33	2.34	2.61	2.43	1.74	1.51	1.51	1.05
P2O5	0.085	0.081	0.043	0.077	0.082	0.094	0.122	0.140	0.107	0.161
Total	99.09	100.07	98.26	99.76	100.00	99.93	99.80	99.76	99.81	99.41
Normalized Major Elements (Weight %):										
SiO2	68.99	68.84	71.56	70.68	74.22	71.02	68.59	65.25	70.52	61.93
Al2O3	10.94	13.39	7.50	12.51	12.94	12.44	13.08	13.48	12.25	11.38
TiO2	0.261	0.291	0.152	0.255	0.266	0.283	0.385	0.424	0.328	0.368
FeO*	2.64	2.98	1.08	2.01	1.74	1.96	2.46	2.86	2.17	2.85
MnO	0.114	0.067	0.042	0.069	0.078	0.078	0.070	0.071	0.049	0.136
CaO	6.24	3.35	13.09	5.58	2.51	5.56	7.21	8.66	6.41	14.26
MgO	3.58	2.28	2.39	1.67	0.83	1.76	2.24	3.55	2.38	4.18
K2O	5.97	†7.09	2.79	4.80	4.72	4.37	4.10	4.05	4.26	3.67
Na2O	1.17	1.64	1.35	2.35	2.61	2.43	1.74	1.51	1.51	1.06
P2O5	0.086	0.081	0.044	0.077	0.082	0.094	0.122	0.140	0.107	0.162
Unnormalized Trace Elements (ppm):										
Ni	7	5	2	10	6	11	11	17	12	15
Cr	5	6	4	6	5	14	22	27	21	29
Sc	5	0	0	0	2	4	9	5	3	0
V	32	33	13	27	14	33	53	65	48	92
Ba	789	1269	415	590	583	627	922	1158	1157	905
Rb	126	141	83	146	153	146	136	141	125	124
Sr	171	215	543	212	199	228	274	357	307	309
Zr	231	296	130	192	207	199	230	208	191	154
Y	25	21	16	27	30	28	29	26	23	24
Nb	18.0	17.3	12.0	20.4	22.1	19.6	18.7	17.7	15.1	14.3
Ga	15	18	10	15	16	16	16	16	13	17
Cu	9	7	7	9	7	9	18	21	16	22
Zn	59	61	29	49	46	53	70	86	65	91
Pb	28	27	12	24	26	25	25	23	22	21
La	57	73	37	60	73	57	52	53	75	46
Ce	112	123	54	93	102	97	89	85	119	65
Th	16	13	13	19	23	19	18	18	18	14

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"R" denotes a duplicate bead made from the same rock powder.
"†" denotes values >120% of our highest standard.

Results of WSU XRF analyses (cont'd)

21 May 2003 PB

Run 0302, Paul Bertetti, Southwest Research Institute

Date	BER 10 10841 10-Oct-02	BER 10 10847 10-Oct-02	BER 10 10853 10-Oct-02	BER 10 10856 10-Oct-02	BER 10 10860 10-Oct-02	BER 10 10865 10-Oct-02	BER 10 10868 10-Oct-02	BER 10 10871 10-Oct-02	BER 10 10875 10-Oct-02	BER 10 10878 10-Oct-02
LOI (%)	3.29	2.75	2.33	2.66	2.63	2.78	3.03	2.56	3.98	3.24
Unnormalized Major Elements (Weight %):										
SiO2	75.26	75.16	74.74	73.91	74.72	75.55	75.51	76.69	75.12	75.12
Al2O3	13.55	13.71	13.50	13.81	13.91	13.37	13.66	12.95	13.03	13.25
TiO2	0.265	0.255	0.306	0.347	0.314	0.284	0.269	0.239	0.265	0.307
FeO	1.73	1.52	1.79	2.16	1.82	1.85	1.71	1.46	1.78	1.91
MnO	0.067	0.065	0.077	0.080	0.066	0.065	0.060	0.052	0.064	0.068
CaO	1.16	1.21	1.13	1.21	1.45	0.95	1.12	0.85	2.06	1.49
MgO	0.71	0.64	0.57	0.71	0.55	0.56	0.56	0.50	0.63	0.66
K2O	4.47	4.46	4.55	4.52	4.37	4.44	4.53	4.60	4.49	4.61
Na2O	3.02	3.28	3.34	3.39	3.18	3.12	2.93	2.97	2.68	2.83
P2O5	0.057	0.066	0.092	0.114	0.109	0.064	0.069	0.055	0.063	0.081
Total	100.29	100.36	100.10	100.25	100.49	100.25	100.42	100.36	100.18	100.33
Normalized Major Elements (Weight %):										
SiO2	75.05	74.89	74.67	73.73	74.35	75.36	75.19	76.41	74.98	74.87
Al2O3	13.51	13.66	13.49	13.78	13.84	13.34	13.60	12.90	13.01	13.21
TiO2	0.264	0.254	0.306	0.346	0.312	0.283	0.268	0.238	0.265	0.306
FeO*	1.72	1.51	1.79	2.15	1.82	1.84	1.70	1.45	1.78	1.91
MnO	0.067	0.065	0.077	0.080	0.066	0.065	0.060	0.052	0.064	0.068
CaO	1.16	1.21	1.13	1.21	1.44	0.95	1.12	0.85	2.06	1.49
MgO	0.71	0.64	0.57	0.71	0.55	0.56	0.56	0.50	0.63	0.66
K2O	4.46	4.44	4.55	4.51	4.35	4.43	4.51	4.58	4.48	4.59
Na2O	3.01	3.27	3.34	3.38	3.16	3.11	2.92	2.96	2.68	2.82
P2O5	0.057	0.066	0.092	0.114	0.108	0.064	0.069	0.055	0.063	0.081
Unnormalized Trace Elements (ppm):										
Ni	8	9	5	7	7	7	8	6	7	6
Cr	5	1	4	5	4	2	4	3	5	8
Sc	5	5	3	1	7	5	0	7	1	0
V	18	23	21	28	28	21	25	24	22	31
Ba	518	574	521	509	560	480	518	465	505	643
Rb	154	147	152	154	141	146	156	155	152	150
Sr	187	196	159	155	232	132	170	120	148	177
Zr	220	209	224	243	220	229	209	209	214	220
Y	31	30	32	33	31	32	32	30	29	30
Nb	24.7	23.3	24.1	24.9	22.6	23.9	21.8	22.2	22.1	21.5
Ga	15	16	18	19	18	17	18	16	18	16
Cu	5	3	4	5	2	1	0	5	1	3
Zn	68	51	56	63	55	55	50	46	48	51
Pb	25	29	22	24	24	25	29	23	27	27
La	62	54	63	69	58	72	65	68	72	73
Ce	116	107	116	113	120	105	101	81	105	110
Th	20	21	23	25	21	23	23	21	21	24

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"R" denotes a duplicate bead made from the same rock powder.
"†" denotes values >120% of our highest standard.

Results of WSU XRF analyses (cont'd)

21 May 2003 PB

Run 0302, Paul Bertetti, Southwest Research Institute

Date	BER 10 10878 10-Oct-02	BER101 0878R 10-Oct-02	BER 10 10602 8-Oct-02	BER101 0602R 10-Oct-02	BER 502 8-Oct-02	BER 504 8-Oct-02
LOI (%)					0.47	0.77
Unnormalized Major Elements (Weight %):					**Unnormalized Results (Weight**	
SiO2	75.12	75.04	75.60	75.69	67.72	73.53
Al2O3	13.25	13.29	12.61	12.61	18.22	14.49
TiO2	0.307	0.306	0.311	0.311	0.001	0.238
FeO	1.91	1.85	2.51	2.58	0.09	1.96
MnO	0.068	0.069	0.084	0.085	0.001	0.051
CaO	1.49	1.50	0.91	0.91	0.14	1.01
MgO	0.66	0.66	0.42	0.43	0.09	0.27
K2O	4.61	4.61	4.52	4.51	11.90	4.20
Na2O	2.83	2.84	3.00	2.98	2.55	4.91
P2O5	0.081	0.082	0.073	0.071	0.006	0.040
Total	100.33	100.25	100.04	100.17	100.72	100.70
Normalized Major Elements (Weight %):					**Normalized Results (Weight %)**	
SiO2	74.87	74.85	75.57	75.56	67.24	73.02
Al2O3	13.21	13.26	12.61	12.59	18.09	14.39
TiO2	0.306	0.305	0.311	0.310	0.001	0.236
FeO*	1.91	1.85	2.51	2.57	0.09	1.94
MnO	0.068	0.069	0.084	0.085	0.001	0.051
CaO	1.49	1.50	0.91	0.91	0.14	1.00
MgO	0.66	0.66	0.42	0.43	0.09	0.27
K2O	4.59	4.60	4.52	4.50	†11.82	4.17
Na2O	2.82	2.83	3.00	2.97	2.53	4.88
P2O5	0.081	0.082	0.073	0.071	0.006	0.040
Unnormalized Trace Elements (ppm):					**Unnormalized Trace Elements (**	
Ni	6	7	25	32	12	23
Cr	8	3	11	15	2	5
Sc	0	0	5	9	0	6
V	31	29	32	15	0	5
Ba	643	645	441	445	119	908
Rb	150	150	155	153	†527	129
Sr	177	177	113	113	67	65
Zr	220	219	246	246	5	275
Y	30	30	31	32	2	41
Nb	21.5	20.5	23.6	23.1	1.3	15.7
Ga	16	15	14	15	20	19
Cu	3	2	8	9	7	6
Zn	51	49	61	65	2	45
Pb	27	30	27	24	48	16
La	73	71	77	67	11	32
Ce	110	123	129	113	0	72
Th	24	21	21	21	0	13

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"R" denotes a duplicate bead made from the same rock powder.
"†" denotes values >120% of our highest standard.

Results of WSU ICP-MS analyses
21 May 2003 PB

Paul Bertetti- CNWRA, Southwest Research Institute

5/21/2003

Sample ID	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm
BER 1010579	67.38	115.33	12.09	40.77	7.56	1.01	5.86	0.90	5.28	1.02	2.86	0.43	2.78	0.44
BER 1010583	57.23	103.54	10.61	36.72	7.17	0.98	5.63	0.90	5.20	1.02	2.87	0.44	2.76	0.43
BER 1010586	60.79	103.21	11.07	37.64	7.30	0.94	5.74	0.92	5.32	1.04	2.95	0.44	2.84	0.44
BER 1010590	60.22	97.20	10.99	37.43	7.26	0.86	5.74	0.90	5.31	1.04	2.94	0.44	2.84	0.43
BER 1010593	59.33	97.55	10.81	36.74	7.11	0.96	5.61	0.89	5.19	1.03	2.94	0.44	2.77	0.43
BER 1010598	53.89	91.48	9.84	33.59	6.60	0.79	5.25	0.84	5.02	1.00	2.77	0.42	2.67	0.42
BER 1010602	59.57	101.28	11.04	37.72	7.38	0.82	5.82	0.93	5.47	1.09	3.03	0.45	2.87	0.45
BER 1010606	56.24	93.16	10.31	35.18	6.89	0.86	5.45	0.87	5.12	1.02	2.86	0.44	2.76	0.43
BER 1010611	50.01	82.50	9.16	31.43	6.18	0.85	5.01	0.80	4.72	0.95	2.64	0.41	2.56	0.41
BER 1010615	49.26	83.55	9.20	32.09	6.41	0.86	5.22	0.85	5.02	1.00	2.80	0.42	2.63	0.41
BER 1010620	48.19	83.19	9.06	32.11	6.55	0.91	5.42	0.88	5.33	1.07	2.94	0.43	2.68	0.42
BER 1010627	58.63	94.05	10.71	36.91	7.08	0.99	5.58	0.89	5.26	1.03	2.92	0.43	2.70	0.42
BER 1010632	56.29	93.84	10.24	35.44	6.82	0.97	5.55	0.88	5.10	1.01	2.77	0.43	2.64	0.42
BER 1010638	46.96	81.74	8.72	30.28	6.08	0.77	4.87	0.80	4.78	0.92	2.71	0.39	2.45	0.39
BER 1010643	50.87	89.22	9.37	32.33	6.30	0.83	5.10	0.84	4.98	0.99	2.78	0.42	2.63	0.41
BER 1010647	55.17	90.79	9.83	33.52	6.25	0.91	4.85	0.76	4.43	0.88	2.51	0.37	2.38	0.37
BER 1010652	53.96	92.77	9.60	32.65	6.23	0.82	4.88	0.78	4.69	0.90	2.50	0.37	2.42	0.38
BER 1010656	52.55	86.54	9.28	31.42	5.86	0.85	4.52	0.72	4.23	0.84	2.34	0.35	2.22	0.34
BER 1010660	51.84	91.19	9.06	30.42	5.51	0.85	4.43	0.69	4.01	0.80	2.26	0.35	2.22	0.35
BER 1010664	60.02	100.78	10.51	35.06	6.17	1.00	4.66	0.72	4.31	0.84	2.35	0.36	2.29	0.37
BER 1010667	44.67	80.97	7.92	27.45	5.20	0.88	4.20	0.67	4.01	0.82	2.19	0.34	2.13	0.34
BER 1010669	54.19	92.50	9.25	31.05	5.46	1.00	3.95	0.62	3.57	0.71	1.97	0.30	1.95	0.31
BER 1010675	30.43	51.44	5.52	18.91	3.60	0.52	2.87	0.45	2.68	0.54	1.46	0.22	1.38	0.22
BER 1010681	51.26	85.76	9.27	31.57	6.18	0.85	4.63	0.75	4.41	0.87	2.36	0.36	2.27	0.36
BER 1010685	56.22	92.52	10.20	34.48	6.66	0.87	5.19	0.81	4.87	0.96	2.72	0.41	2.58	0.40
BER 1010691	51.73	87.77	9.35	32.40	6.29	0.93	4.97	0.81	4.59	0.93	2.60	0.39	2.44	0.38
BER 1010695	49.76	86.62	9.22	32.40	6.38	1.01	5.07	0.80	4.75	0.96	2.63	0.39	2.40	0.38
BER 1010701	47.39	81.87	8.93	31.84	6.23	1.05	4.91	0.75	4.44	0.86	2.43	0.35	2.19	0.35
BER 1010703	62.90	108.40	10.75	36.17	6.12	1.10	4.42	0.65	3.76	0.73	1.97	0.30	1.81	0.29
BER 1010707	38.80	67.90	7.09	25.44	4.92	0.97	3.95	0.62	3.76	0.73	2.05	0.31	1.84	0.29
BER 1010841	60.09	97.57	11.05	37.73	7.27	0.89	5.50	0.90	5.38	1.05	2.93	0.45	2.76	0.43
BER 1010847	58.96	95.03	10.86	37.00	7.31	0.92	5.55	0.91	5.37	1.09	3.00	0.45	2.76	0.43
BER 1010853	61.20	100.32	11.10	38.10	7.40	0.95	5.52	0.90	5.44	1.07	3.00	0.47	2.83	0.45
BER 1010856	63.00	102.68	11.51	39.74	7.64	0.96	5.93	0.95	5.70	1.15	3.15	0.48	2.96	0.47
BER 1010860	69.67	108.20	12.60	43.18	8.26	1.14	6.36	1.00	5.86	1.17	3.22	0.49	2.95	0.47
BER 1010865	62.75	98.96	11.33	38.86	7.29	0.87	5.55	0.90	5.32	1.06	2.92	0.45	2.78	0.44
BER 1010868	61.18	95.82	11.19	38.62	7.49	0.98	5.68	0.92	5.56	1.09	3.03	0.45	2.78	0.44
BER 1010871	63.01	95.86	11.56	39.56	7.61	0.90	5.75	0.90	5.24	1.02	2.78	0.42	2.56	0.41
BER 1010875	60.28	100.28	11.00	37.25	7.12	0.91	5.30	0.84	4.93	0.99	2.68	0.42	2.53	0.40
BER 1010878	60.67	100.53	10.85	37.16	7.08	0.99	5.40	0.84	4.99	0.98	2.68	0.40	2.52	0.40
BER 1010583 ®fb	57.79	104.53	10.68	36.94	7.20	0.96	5.58	0.88	5.14	1.02	2.85	0.43	2.69	0.43
BER 1010502	0.40	0.56	0.07	0.27	0.10	0.62	0.14	0.03	0.21	0.05	0.13	0.02	0.13	0.02
BER 1010504	30.44	58.14	6.49	24.90	5.96	0.84	5.86	1.05	6.85	1.46	4.28	0.67	4.42	0.70

Results of WSU ICP-MS analyses (cont'd)
21 May 2003 PB

Paul Bertetti- CNWRA, Southwest Research Institute

5/21/2003

Sample ID	Ba ppm	Th ppm	Nb ppm	Y ppm	Hf ppm	Ta ppm	U ppm	Pb ppm	Rb ppm	Cs ppm	Sr ppm	Sc ppm	Zr ppm
BER 1010579	594	22.40	24.27	29.41	7.14	1.64	3.00	24.74	120.3	4.70	224	4.6	256
BER 1010583	571	21.24	22.66	29.23	6.70	1.55	3.00	25.69	123.0	5.37	250	4.8	234
BER 1010586	507	22.53	22.63	29.97	6.50	1.55	3.50	25.42	144.3	5.27	183	3.6	220
BER 1010590	448	22.46	22.28	30.15	6.05	1.48	3.61	26.30	147.4	4.67	133	2.9	201
BER 1010593	550	20.81	20.99	30.04	6.06	1.43	3.36	26.18	142.4	7.12	187	3.1	210
BER 1010598	336	22.51	21.72	28.33	6.37	1.42	3.74	25.52	155.6	5.19	96	3.2	197
BER 1010602	413	22.56	22.77	30.77	6.74	1.48	3.73	26.50	142.6	4.40	103	3.3	228
BER 1010606	474	21.01	20.87	29.36	5.82	1.42	3.54	24.85	142.4	4.76	138	3.1	191
BER 1010611	469	18.41	18.72	27.61	5.59	1.31	5.85	21.56	138.5	4.15	178	3.6	185
BER 1010615	480	18.97	19.64	28.72	5.67	1.36	4.12	23.31	141.5	4.73	173	3.9	187
BER 1010620	446	17.95	18.02	30.46	5.28	1.24	4.75	23.23	137.7	5.07	205	4.4	174
BER 1010627	475	21.07	20.04	30.03	5.66	1.35	3.54	24.51	146.7	6.82	171	3.5	185
BER 1010632	557	21.14	20.89	28.86	6.27	1.42	3.66	25.65	139.2	6.16	175	3.8	211
BER 1010638	542	18.37	18.97	27.02	5.70	1.27	3.18	24.10	135.7	5.94	236	3.0	186
BER 1010643	653	17.85	19.50	28.45	6.03	1.29	3.04	25.34	134.0	9.20	361	3.3	204
BER 1010647	574	19.62	20.71	25.54	5.72	1.33	3.35	21.48	138.6	4.98	152	3.3	195
BER 1010652	492	21.56	22.16	25.72	5.69	1.46	3.30	25.76	146.7	6.53	230	3.3	186
BER 1010656	554	18.28	19.06	24.10	4.92	1.24	3.14	24.89	143.5	4.85	164	3.2	160
BER 1010660	654	16.72	16.75	23.18	5.93	1.09	3.14	23.94	128.9	5.61	170	3.8	219
BER 1010664	919	18.58	19.99	23.69	8.32	1.23	3.14	29.46	134.4	4.07	185	3.4	325
BER 1010667	737	14.41	15.48	22.35	5.76	0.94	2.90	24.26	111.6	4.76	161	3.5	215
BER 1010669	1118	13.96	15.64	19.86	6.83	1.00	2.46	27.13	127.2	3.71	197	3.3	262
BER 1010675	383	10.99	11.15	15.23	3.41	0.73	3.34	14.07	74.5	3.39	480	2.0	120
BER 1010681	530	17.42	18.65	25.65	5.35	1.24	3.14	22.07	131.5	4.76	199	3.2	186
BER 1010685	519	20.36	20.56	28.10	5.79	1.36	3.59	25.91	136.3	4.85	183	3.2	196
BER 1010691	545	18.13	19.05	27.50	5.28	1.28	3.56	24.42	132.3	5.62	210	3.8	179
BER 1010695	1164	16.62	17.49	27.90	5.74	1.19	3.68	22.51	124.1	6.53	259	5.3	200
BER 1010701	1113	16.64	15.92	25.08	5.06	1.12	4.26	21.86	124.2	7.86	327	6.3	180
BER 1010703	1372	17.35	13.56	20.77	4.84	0.92	3.48	19.39	111.5	5.63	283	4.7	174
BER 1010707	748	12.20	11.92	22.01	3.58	0.81	3.10	19.26	103.6	6.80	266	5.8	129
BER 1010841	541	22.72	23.61	30.30	6.33	1.60	3.47	25.57	139.0	4.80	192	3.8	218
BER 1010847	540	21.51	22.65	30.85	6.00	1.52	3.34	25.55	133.7	6.09	185	3.5	205
BER 1010853	512	22.27	23.35	31.23	6.21	1.55	3.54	25.56	140.5	6.28	158	3.9	219
BER 1010856	501	22.91	24.62	32.84	6.66	1.64	3.56	25.81	144.3	6.31	146	4.3	231
BER 1010860	567	21.97	22.97	33.65	6.30	1.54	3.46	25.43	135.7	7.06	203	3.9	219
BER 1010865	444	22.43	22.82	30.42	6.09	1.50	3.38	27.58	134.5	6.63	121	3.5	210
BER 1010868	513	22.68	22.37	31.73	6.15	1.47	3.49	25.22	144.2	8.54	167	3.6	206
BER 1010871	442	22.23	21.78	29.25	5.84	1.45	3.42	23.29	141.9	7.33	111	2.9	196
BER 1010875	496	22.45	21.23	27.99	5.81	1.47	3.30	23.81	137.9	8.76	143	3.3	198
BER 1010878	600	21.97	20.62	28.25	6.04	1.37	3.43	26.01	139.4	7.47	163	3.8	203
BER 1010583 ®fb	575	21.60	23.12	29.26	6.63	1.54	3.04	25.70	121.8	5.53	248	4.9	236
BER 1010502	122	0.28	0.79	1.34	0.08	0.11	0.10	48.42	521.8	9.50	64	0.0	2
BER 1010504	895	12.28	15.86	40.72	7.75	1.34	4.20	15.68	122.9	5.09	63	5.5	266

Results of WSU chemical analyses (cont'd)

21 May 2003 PB

A review of WSU XRF and ICP-MS results indicate that the analyses (especially for included standards 502 and 504) are consistent with expected values and are acceptable. Compare results on (#300 / 136)

Additional comparisons can be made to a summary of WSU XRF results for known standards (included as blind samples when submitted) over the past two years (Sep 2000 and Mar 2002 results). The WSU results are quite acceptable and are reproducible. ~~and PB~~ 05/21/2003

Therefore all WSU analyses are deemed acceptable for our use.

PB 05/21/2003

21 May 2003 PB

WSU chem analyses summary for chemical (mineral) standards.

previous DOV

	BER 502	BER 29	NBS-70a certified values		BER 504	BER 27	NBS-278 certified values**		BER 505	BER 503	BER 29	NBS-99a certified values	
	NBS-70a	NBS-70a	NBS-70a		NBS-278	NBS-278	NBS-278		USGS-RGM1	NBS-99a	NBS-99a	NBS-99a	
Date	12-Sep-00	22-Mar-02	15-Nov-90		12-Sep-00	22-Mar-02	27-Mar-92		12-Sep-00	12-Sep-00	22-Mar-02	15-Nov-90	
LOI (%)	0.44	0.56	0.40		0.70	0.84			1.07	0.24	0.35		
	Unnormalised Results (Weight %):												
SiO2	67.74	67.51	67.1	± 0.1	73.20	72.22	73.05	± 0.13	73.93	65.44	64.66	65.2	± 0.1
Al2O3	18.21	18.03	17.9	± 0.1	14.54	14.16	14.15	± 0.15	14.15	20.86	20.43	20.5	± 0.1
TiO2	0.000	0.000	0.01	± 0.01	0.238	0.237	0.245	± 0.007	0.267	0.001	0.003	0.007	± 0.001
FeO	0.09	0.09	0.067	± 0.005	1.91	1.92	1.84	± 0.02	1.77	0.08	0.07	0.058	± 0.005
MnO	0.000	0.000			0.051	0.049	0.052	± 0.002	0.036	0.000	0.000		
CaO	0.15	0.15	0.11	± 0.01	1.02	1.02	0.983	± 0.002	1.21	2.12	2.12	2.14	± 0.01
MgO	0.11	0.06			0.28	0.25	0.23		0.34	0.04	0.00	0.02	± 0.01
K2O	11.95	11.88	11.8	± 0.1	4.19	4.19	4.16	± 0.02	4.40	5.35	5.33	5.2	± 0.1
Na2O	2.49	2.56	2.55	± 0.05	4.82	4.78	4.84	± 0.05	4.18	6.19	6.16	6.2	± 0.1
P2O5	0.005	0.004			0.040	0.040	0.036	± 0.003	0.046	0.018	0.018	0.02	± 0.01
Total	100.65	100.29	99.537		100.29	98.87	99.586		100.32	100.09	98.79	99.345	
	uncertainty values for NBS standards are "expected" values - see certificates for details												
	Normalised Results (Weight %):												
SiO2	67.30	67.32	67.4		72.99	73.05	73.35		73.69	74.2		SiO2	
Al2O3	18.09	17.98	18.0		14.50	14.32	14.21		14.10	13.9		Al2O3	
TiO2	0.000	0.000	0.01		0.237	0.240	0.246		0.266	0.27		TiO2	
FeO*	0.09	0.09	0.067		1.91	1.94	1.85		1.76	1.69		FeO*	
MnO	0.000	0.000			0.051	0.050	0.052		0.036	0.036		MnO	#
CaO	0.15	0.15	0.11		1.02	1.03	0.987		1.21	1.16		CaO	
MgO	0.11	0.06			0.28	0.25	0.23		0.34	0.28		MgO	
K2O	11.77	11.85	11.85		4.18	4.24	4.18		4.39	4.35		K2O	
Na2O	2.47	2.55	2.56		4.81	4.83	4.86		4.17	4.12		Na2O	
P2O5	0.005	0.004			0.040	0.040	0.036		0.046			P2O5	
	Trace Elements (ppm):												
Ni	15		2		28	8	3.6	± 0.3	8		3	Ni	
Cr	6		0		9	2	6.1		1	3.7		Cr	
Sc	1		12		5	11	5.1		3	4.4	± 0.3	Sc	
V	0		2		9	7			11	13	± 2	V	
Ba	124	133	180	± 90	900	904	1140		826	810	± 46	Ba	
Rb	†530	†526	550	± 90	131	128	127.5	± 0.3	153	150	± 8	Rb	
Sr	66	68			65	66	63.5	± 0.1	106	110	± 10	Sr	
Zr	5	6			276	274			212	220	± 20	Zr	
Y	1	2			41	42			23	25		Y	
Nb	1.1	1.2			16.3	17.2			8.3	8.9	± 0.6	Nb	
Ga	21	18			17	18			15	15	± 2	Ga	
Cu	7	6			6	5	5.9	± 0.2	12	12	± 1.4	Cu	
Zn	1	1			48	45	55		32	32		Zn	
Pb	46	49			17	15	16.4	± 0.2	22	24	± 3	Pb	
La	7	7			41	41			25	24	± 1.1	La	
Ce	16	13			28	48			49	47	± 4	Ce	
Th	0	0			62	62	62.2		25	24	± 1.3	Th	
					13	13	0.541	± 0.04	15	15			
	Major elements are normalised on a volatile-free basis, with total Fe expressed as FeO.												
	"±" denotes values >120% of our highest standard.												

previous DOV

23 May 03 GB

Determining effects of elevated CO_2 concentrations on pH buffer solutions

This experiment was designed to determine if storing pH buffer solutions in a glove box with elevated CO2 concentrations would alter the pH values of the buffer solutions. The buffer solutions were stored inside a LABCONCO model 50600 glove box that was maintained at about 1% (10,000 ppm) CO2 environment (balance nitrogen). The buffer solutions were stored inside the glove box in three different methods. In the first method, two LDPE bottles were filled with buffer solution and capped tightly. One bottle was filled with pH 7 buffer solution (Fisher cat# SB108-500 lot# 012976-24) and the other bottle was filled with pH 10 buffer solution (Fisher cat# SB116-500 lot# 023154-24). In the second method, two LDPE bottles were filled with buffer solution and not capped. Again, one bottle was filled with pH 7 buffer solution (Fisher cat# SB108-500 lot# 012976-24) and the other bottle was filled with pH 10 buffer solution (Fisher cat# SB116-500 lot# 023154-24) In the third method, unopened foil packets of buffer solutions were placed inside the glove box. Two packets of pH 7 buffer solution (Hach cat# 27701-20 lot# A2053) and two packets of pH 10 buffer solution (Hach cat# 27702-20 lot# A2298) were used. The pH of the various buffer solutions will be measured over time to determine the impact of storing them at an elevated CO2 concentration. In the first method, the solutions are freely exposed to the elevated CO2 environment. In the other two methods, possible diffusion through the container material (LDPE and foil) would expose the buffer solutions to the elevated CO2 concentrations.

A portable 290A Orion pH meter was placed inside the glove box. Attached to this meter was a Ross 8103BN combination electrode and an ATC. The pH meter was calibrated before each use. Calibration standards were transferred into the glove box using the transfer chamber and promptly removed after use. The calibration standards consisted of pH 7 (Fisher cat# SB108-500 lot# 012976-24) and pH 10 (Fisher cat# SB116-500 lot# 023154-24).

The concentration of the CO2 in the glove box was determined by measuring the contents with an LI-COR model 810 Gas Hound CO2 gas analyzer. This analyzer was calibrated with zero nitrogen and 0.1% (1000 ppm) CO2 in nitrogen.

27 May 03 GB

The procedure on 556/42 was performed on the afternoon of 5-21-03 when the buffer solutions were placed in the glove box. Initially, all four LDPE bottles were capped. Calibration was performed immediately using one of the pH 7 buffer solutions and one of the pH 10 buffer solutions. Slope equaled 101.2. These two buffer solutions used for initial calibration remained uncapped and used as samples for the remainder of the experiment.

On the afternoon of 5-22-03 the first set of measurements were taken on each of the four buffer solutions in the LDPE bottles. Previously unused calibration standards of pH 7 (Fisher cat# SB108-500 lot# 012976-24) and pH 10 (Fisher cat# SB116-500 lot# 023154-24) were entered through the transfer chamber, used for calibration of the pH meter, and then promptly removed from the glove box. Slope equaled 101.2.

The capped sample of pH 7 buffer solution was measured at 7.015 and the capped sample of pH 10 buffer solution was measured at 10.012. The uncapped sample of pH 7 buffer solution was measured at 6.976 and the uncapped sample of pH 10 buffer solution was measured at 9.637.

No foil packets of buffer solutions were opened and measured.

On the afternoon of 5-23-03 the second set of measurements were taken. Measurements were taken for the four buffer solutions in the LDPE bottles and one pH 10 foil packet. The portable 290A Orion pH meter inside the glove box was replaced with a 920A Orion pH meter because the '2nd function' key wouldn't respond. The same calibration solutions from 5-22-03 were used. For calibration procedure see 556/42 5-22-03. Calibration slope equaled 99.6.

The capped sample of pH 7 buffer solution was measured at 7.03, and the capped sample of pH 10 buffer solution was measured at 10.06. The uncapped sample of pH 7 buffer solution was measured at 6.99, and the uncapped sample of pH 10 buffer solution was measured at 9.40. The pH 10 foil packet was measured at 10.06.

27 May 03 JB

CO_2 gas analyzer calibrated (See 556/42). Concentration of CO_2 in glove box was measured at 10045 ppm.

Measurements were taken for the four buffer solutions in the LDPE bottles; one pH 7 foil packet was opened and measured.

Previously unused calibration standards of pH 7 (Fisher cat# SB 108-500, lot# 012976-24) and pH 10 (Fisher cat# SB 116-500, lot# 023154-24) were entered through the transfer chamber, used for calibration of the pH meter, and then promptly removed from the glove box. Slope equaled 99.9.

The pH 7 capped buffer solution sample was measured at 7.00. The pH 10 capped buffer solution was measured at 10.00. The pH 7 uncapped buffer solution sample was measured at 6.96. The pH 10 uncapped buffer solution was measured at 8.89. The pH 7 foil packet was measured at 7.01.

28 May 03 JB

CO_2 gas analyzer calibrated (See 556/42). Concentration of CO_2 in glove box was measured at 10015 ppm.

Measurements were taken for the four buffer solutions in the LDPE bottles; no foil packets of buffer solution were opened and measured.

Previously unused calibration standards of pH 7 (Fisher cat# SB 108-500, lot# 012976-24) and pH 10 (Fisher cat# SB 116-500, lot# 023154-24) were entered through the transfer chamber, used for calibration of the pH meter, and promptly removed from the glove box. Slope equaled 99.7.

The pH 7 capped buffer solution sample was measured at 6.99. The pH 10 capped buffer solution was measured at 10.01. The pH 7 uncapped buffer solution sample was measured at 6.95. The pH 10 uncapped buffer solution was measured at 8.82.

29 May 03 GKB

1% CO_2 in N_2 gas cylinder that supplies to glove box was found disconnected at 10:20 am 5-29-03. The pressure of the glove box was still stable at approximately 0 ~~atm~~ in H_2O GKB 5-30-03. The empty 1% CO_2 in N_2 gas cylinder was replaced by 1% CO_2 in air.

Measurements were taken for the four buffer solutions in the LDPE bottles; one pH 7 foil packet was opened and measured.

Previously unused calibration standards of pH 7 (Fisher cat# SB 108-500, lot# 012976-24) and pH 10 (Fisher cat# SB 116-500, lot# 023154-24) were entered through the transfer chamber, used for calibration, and then removed from the glove box. Slope equaled 994.

CO_2 gas analyzer calibrated (See 556/42). Concentration of CO_2 in glove box was measured at 10072 ppm.

The pH 7 capped buffer solution sample was measured at 6.98. The pH 10 capped buffer solution sample was measured at

29 May 03 cont. GKB

9.99. The pH 7 uncapped buffer solution sample was measured at 6.94. The pH 10 uncapped buffer solution was measured at 8.77. The pH 7 foil packet was measured at 6.99.

GKB 05/29/03

30 May 03 BB

CO_2 gas analyzer calibrated (See 556/42.)
Concentration of CO_2 in glove box was measured at 10035.

Measurement were taken for the four buffer solutions in the LDPE bottles only.

Previously unused calibration standards of pH 7 (Fisher cat # SB 109-500, lot # 012976-24) and pH 10 (Fisher cat # SB 116-500, lot # 023154-24) were entered through the transfer chamber, used for calibration, and then removed from the glove box.
Slope ~~equalled~~ equaled 101.3.
BB 5-30-03

The pH 7 capped buffer solution sample was measured at 6.99.
The pH 10 capped buffer solution sample was measured at 9.97.
The pH 7 uncapped buffer solution sample was measured at 6.96.
The pH 10 uncapped buffer solution sample was measured at 8.75.

9 JUNE 03 BAW CONT

Solutions for Total Organic Carbon (TOC) inst. analysis

Prepared 21% phosphoric acid solution

Reagents: type I nanopure water
85% phosphoric azid - Fisher A 242-4 (ACS grade)
lot # 001815

Based on Tekmar Dohrmann Phoenix 8000 User ~~manual~~ BW 6-9-03 manual of 37mL 85% acid add 188mL H_2O

Added 750mL (500mL and 250mL volumetric flask) of fresh type I nanopure water to 1000mL HDPE square bottle. Then added 150mL (50mL vol pipette three times) of 85% phosphoric acid. Labeled 21% phosphoric acid.

Prepared 20 ppm Inorganic Carbon (IC) Standard

IC standard will be made from Na_2CO_3 and type I nanopure water

Na_2CO_3 = Fisher S 263-500 lot # 006077 ACS grade
Na_2CO_3 has a formula wt of 105.99 g/mol
C has a formula wt of 12.011 g/mol
1 mol of C in 1 mol of Na_2CO_3

$$\frac{20\ \mu g}{mL}\left(\frac{1000mL}{L}\right)\left(\frac{1g}{10^6\mu g}\right)\left(\frac{105.99g\ Na_2CO_3}{12.011g\ C}\right) = 0.1765\ g\ Na_2CO_3$$

(for liter soln)

9 Jun 03 cont BAW

Tared a small plastic weighing dish on Mettler AE240 and weighed at 0.1763g.

mixed ~~to~~ 6-9-03 BW the Na_2CO_3 in a 250mL glass beaker with about 100mL nanopure type1 water and a stir bar, taking care to rinse all of the sodium carbonate into the beaker. After the Na_2CO_3 was dissolved, it was quantitatively transfered into a clean 1 Liter volumetric flask (rinsed + transfered). The vol flask was diluted to mark with type 1 nanopure water. Labelled 20ppm IC std. The solution was transferred into a 1 liter pp bottle and labeled 20ppm IC std.

10 June 03 BB

Preparing IC standards for the TOC analyzer

20 ppm Standard was prepared by ~~transfering~~ pipetting 6-10-03 BB 100 ml of the 20 ppm IC std from the 1 liter pp bottle to a glass bottle (appropriate for the TOC autosampler rack). The 10 ppm std was prepared by pipetting 50 ml of the 20 ppm IC std and 50 ml of nanopure type1 water into a second glass bottle. The 5 ppm std was

10 Jun 03 cont. BB

prepared by pipetting 25 ml of the 20 ppm IC std into a 100 ml volumetric flask, filling to 100 ml with nanopure type1 water, capping and inverting, and pouring into a third glass bottle. The 10 ppm blank was prepared by ~~pipetting~~ pouring BB 6-10-03 100 ml of type1 nanopure into a fourth glass bottle.
The 20 ppm IC std stock solution was prepared on 6-9-03, see 556/50.

13 June 03 BB

Calcite Solution Preparation for Np/Ca experiments

calcium perchlorate tetrahydrate: Aldrich
cat # 40,142-0, lot # 20610DO
opened 6/13/03
sodium hydroxide dilute-it: 4687-01,
lot # H33121
calcite: Fisher C64-500, lot # 986396
type 1 nanopure water
calcite: Fisher C64-500, lot # 986396

13 June 03 cont. GB

6-13-03 0.5
GB + L of 1.0 M $Ca(ClO_4)_2 \cdot 4H_2O$

F.W. = 311.04

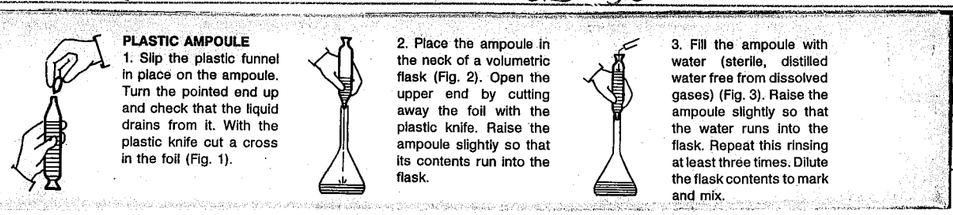
1.0 M $Ca(ClO_4)_2 \cdot 4H_2O$ = $\left(\frac{1\ mol}{1\ L\ soln}\right)\left(\frac{311.04\ g}{1\ mol}\right)$ = 311.04 $\frac{g}{L}$

311.04 $\frac{g}{L}$ (.5 L) = 155.52 g

Approximately 100 mL of type I nanopure water was added to a 250 ml beaker and tared. 155.61 g (Mettler PR5002) of calcium perchlorate was added. The solution was then mixed using a stir bar. The solution was then transferred to a ~~1000~~ 500 ml 6-13-03 GB volumetric flask. The beaker was carefully rinsed several times and the rinsate was transferred to the ~~1000~~ 500 ml 6-13-03 GB vol flask. The vol flask was then filled to mark with type I nanopure water. Finally, the soln was transferred to a ~~1000~~ 500 ml 6-13-03 GB LDPE bottle. Labelled 1.0 M $Ca(ClO_4)_2 \cdot 4H_2O$

0.1 M NaOH solution

Followed dilut-it instructions below



PLASTIC AMPOULE

1. Slip the plastic funnel in place on the ampoule. Turn the pointed end up and check that the liquid drains from it. With the plastic knife cut a cross in the foil (Fig. 1).

2. Place the ampoule in the neck of a volumetric flask (Fig. 2). Open the upper end by cutting away the foil with the plastic knife. Raise the ampoule slightly so that its contents run into the flask.

3. Fill the ampoule with water (sterile, distilled water free from dissolved gases) (Fig. 3). Raise the ampoule slightly so that the water runs into the flask. Repeat this rinsing at least three times. Dilute the flask contents to mark and mix.

13 June 03 cont GB

Reagent from 556/51. Drained into a 1000 mL Vol flask, and filled to mark. Transferred to a 1 L glass bottle. Labeled 0.1 M NaOH.

6-13-03 GB Appx 30 ~~30.00~~ g of calcite was placed in each of 4 tared 2L polycarbonate containers. Bottles were capped.

16 June 03 GB

Combination of Solution Components for Calcite solution

GB 6-16-03 Masses of ~~calc~~ 1.0 M $Ca(ClO_4)_2 \cdot 4H_2O$ (see 556/52) and 0.1 M NaOH (see 556/52 and 556/53) were added to the 30 g of calcite + 2L water in the 2L polycarbonate containers GB 6-17-03 RB 9/15/03 according to the masses specified on the table below (see 556/54). A 2000 mL volumetric flask was filled to mark with type I nanopure water. Approx. 1500 mL was poured into a 2000 mL beaker. The remaining water was saved to rinse all of the $Ca(ClO_4)_2 \cdot 4H_2O$ and NaOH into

16 June 03 cont GKB

Amount to add per 2 liters solution

Solution Label	Target pH of solution	mass of 1.0M $Ca(ClO_4)_2$-$4H_2O$ (g)	mass of 0.1M NaOH	mass NaOH added (g)
C	7.50	17.39	10.86	10.8582
D	7.75	4.32	18.6	18.6019
E	8.00	1.24	34.08	34.0824
F	8.25	0.42	62.6	62.6009

16 June 03 cont GKB

the beaker. For larger masses a 100 mL glass beaker was tarred (Mettler AE 240) and eppendorf pipets were used to add the appropriate mass of calcium perchlorate or sodium hydroxide. For smaller masses, a small plastic weighing cup was tarred and the chemicals added similarly. Both chemicals were then ~~added~~ poured 6-16-03 into the beaker and the water set aside in the flask was used to rinse all of the rinsate into the beaker. This solution was then poured into the properly labelled 2 L polycarbonate container, capped, and placed within the glove box at an atmosphere of 0.1% CO_2 in air.

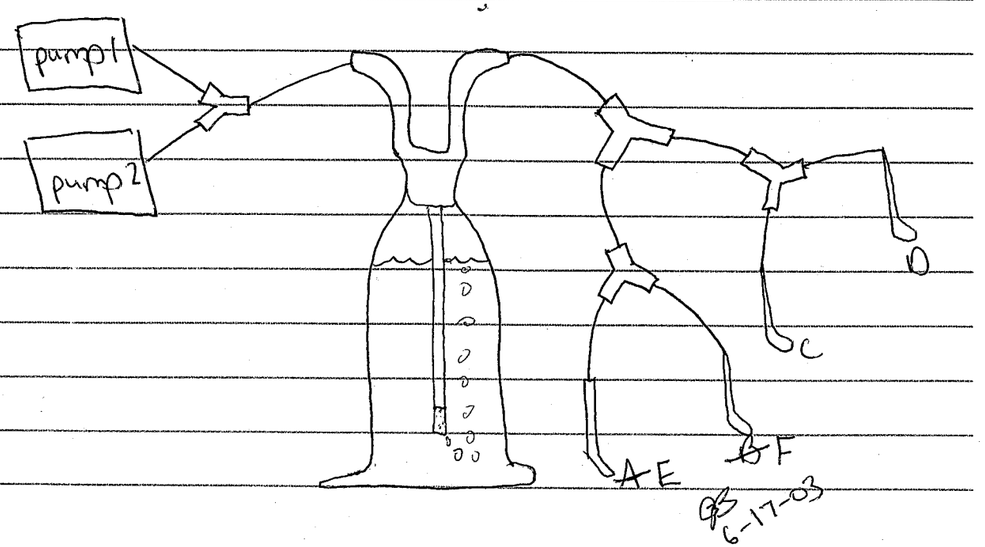
17 June 03 GKB

Note that a new container of calcite had to be opened on 6-13-03 GKB 6-17-03 in order to ~~the~~ 6-17-03 bring the calcite in the polycarbonate container "F" up to 30 g. All calcite is Fisher C64-500, lot # 986396.

17 June 03 GB

Calcite Reference Solutions with Bubblers Setup Inside Glove Box

Materials for assembly of bubbler setup were placed inside the glove box and then attached. A gas dispersion tube was placed in each of the four calcite reference solutions. All four gas dispersion tubes were then connected to the one 500 mL gas washing bottle using tygon tubing and 3-way tubing connectors. Two tetratec AP 80 aquarium air pumps (also using a 3-way connector) were used to pump the air through the bubbling system as shown schematically below.



GB 6-17-03

18 JUNE 03 - BAW & GB

Preparation of Sodium Persulfate Solution for TOC Analyzer

Reagents: type I nanopure water
85% phosphoric acid - Fisher A 242-4 (ACS grade) lot# 001815
sodium persulfate 98+% - Arcos 20202-5000 lot # B 0104212

Based on Tekmar Dohrmann Phoenix 8000 user manual to make 10% persulfate and 5% phosphoric acid mixture

Added 426 ml (200 mL, 200 ml, 25 ml, & 1 ml using pipets for 1 & 25 and vol. flask for 200^5) of water 1000 mL HDPE square bottle. Then added 18 ml (15 & 3 ml pipets) of 85% phosphoric acid. Lastly, 50 g of sodium persulfate was weighed out on a tared weighing boat (actual weight 50.08 g) and added to soln. Labelled Sodium persulfate soln.

GB 6-18-03

18 June 03 cont

pH readings of reference solutions inside glove box at 1000 ppm CO_2

The pH of reference solutions C, D, E, & F will be measured daily to observe the solutions as they come into equilibrium at the desired pHs.

At 10:00 a.m. the glove box was measured at 500 ppm CO_2, thereby having dropped 500 ppm overnight. A concentration of 1000 ppm was then ~~returned~~ 6-18-03 brought back up by adding 5000 ppm CO_2 in air until the desired 1000 ppm concentration was accomplished.

After reestablishing the 1000 ppm environment the pH of each ref. soln was measured and recorded below. Calibration slope equalled 98.1 . Readings taken at 4:00 pm Glove box had dropped to 930 ppm by 5:00 pm

ref. soln	pH
C	7.36
D	7.76
E	8.07
F	9.43

19 June 03

8:00 am: glove box was measured at 850 ppm CO_2. Brought level back up to ~1018 ppm using .5% CO_2 in air

Note that the pH standards for calibration on 556/58 were pH 7 buffer solution (SB108-500 lot # 030660-24) and pH 10 buffer solution (SB116-500 lot 023154-24). These were poured into LDPE bottles and kept inside the glove box. They will be replaced weekly by previously 6-19-03 unused buffer solution. pH readings taken with a 920 A Orion pH meter and a 6-19-03 3E Ross 8103BN combination electrode and ATC.

Preparing IC standards for TOC analyzer

The 0 ppm std was prepared by pouring type I nanopure water into the glass bottle, it was filled to the neck of the bottle.

The 20 ppm std was prepared by pouring the 20 ppm soln (see 556/49) into a glass bottle up to the neck. The 10 ppm std was prepared by adding 50 mL (50 mL vol. pipet) of 20 ppm soln (556/49) to a

19 June 03 cont. GB

100 mL volumetric flask and then filling to 100 mL with type I nanopure water. It was then poured into a glass bottle. The 5 ppm std was prepared by adding 25 mL (25 ml vol. pipet) of 20 ppm soln (556/49) to a 100 mL vol. flask and then filling to 100 ml with type I nanopure water. This was then poured into a glass bottle.

Glove box reading at 3:30 pm was 1002 ppm. pH of reference solutions were then measured and recorded below. The pH buffer solutions are the same as 556/49[59]. GB 9/15/03 Meter and probe info on 556/49[59] Calibration slope Equaled 100.2 GB 6-23-03

ref. soln	pH
C	7.38
D	7.63
E	7.96
F	8.26

GB 6-19-03

20 June 03 GB

Glove box reading at 8:45 a.m. was 995 ppm CO_2.

QA standards: FWDP groundwater samples for XRAL lab analysis

Two quality assurance standards were made from four metals: Ca, Mg, K, & Na. Using a vol. ppet that corresponds to the amount of metal added, 5 ml of Ca, 1 ml Mg, 5 ml K, and 50 ml of Na were pipetted into a 1000 ml vol. flask. The flask was then filled to 1000 mL and labelled QA1. In a second 1000 ml vol flask, 50 ml of Ca, 50 ml of Mg, 5 ml of K, & 5 ml Na were pipetted in and the flask was filled to mark & labelled QA2.

GB 6-20-03

Target ppm

	Ca	Mg	K	Na
QA1	5	1	5	50
QA2	50	50	5	5

Reagents: 1,000 ppm Calcium 2% HNO_3
PL CA2-2X lot # 9-69CA

20 June 03 cont. [illegible]

Reagents cont.
1000 ppm Magnesium · 2% HNO_3
PLMG2-2Y lot # 9-134MG
1000 ppm Potassium 2% HNO_3
PLK2-2Y lot # 9-03K
1000 ppm Sodium 2% HNO_3
PLNA2-2Y lot # 9-82NA
type I nanopure water

Glove box reading at 4:00 pm was 985 ppm CO_2. Brought back up to 1022 ppm CO_2. pH of reference solutions were then measured and recorded below. pH calibration stds are same as 556/49 59 PB 9/15/03 Meter ↓ Probe info on 556/49 59 [illegible] 6-23-03 Calibration slope equalled 100.5

ref soln	pH
C	7.65
D	7.99
E	8.23
F	8.44

23 June 03 [illegible]

Glove box reading at 9:00 am was 1040 ppm CO_2. Bubbler tubing was found disconnected, and no gas dispersion tubes were pumping air through the reference solns. Tubing was reconnected.

Glove box reading at 3:00 pm was 1040 ppm CO_2.

Previously unused pH standard buffer solutions* were entered into the glove box to be used for this week's calibration. For meter and probe info see 556/59. Calibration slope equalled 100.5. pH of reference solution are recorded below

ref soln	pH
C	7.50
D	7.76
F	8.00
F	8.23

* pH 7 Fisher SB108-500 lot # 030660-24
pH 10 Fisher SB116-500 lot # 023154-24

Glove box concentration was brought back down to 1000 ppm CO_2 by opening the ~~front~~ PB 9/15/03 transfer chamber and exposing the glove box atmosphere to room air for a few seconds.

23 June 03 cont. GBB

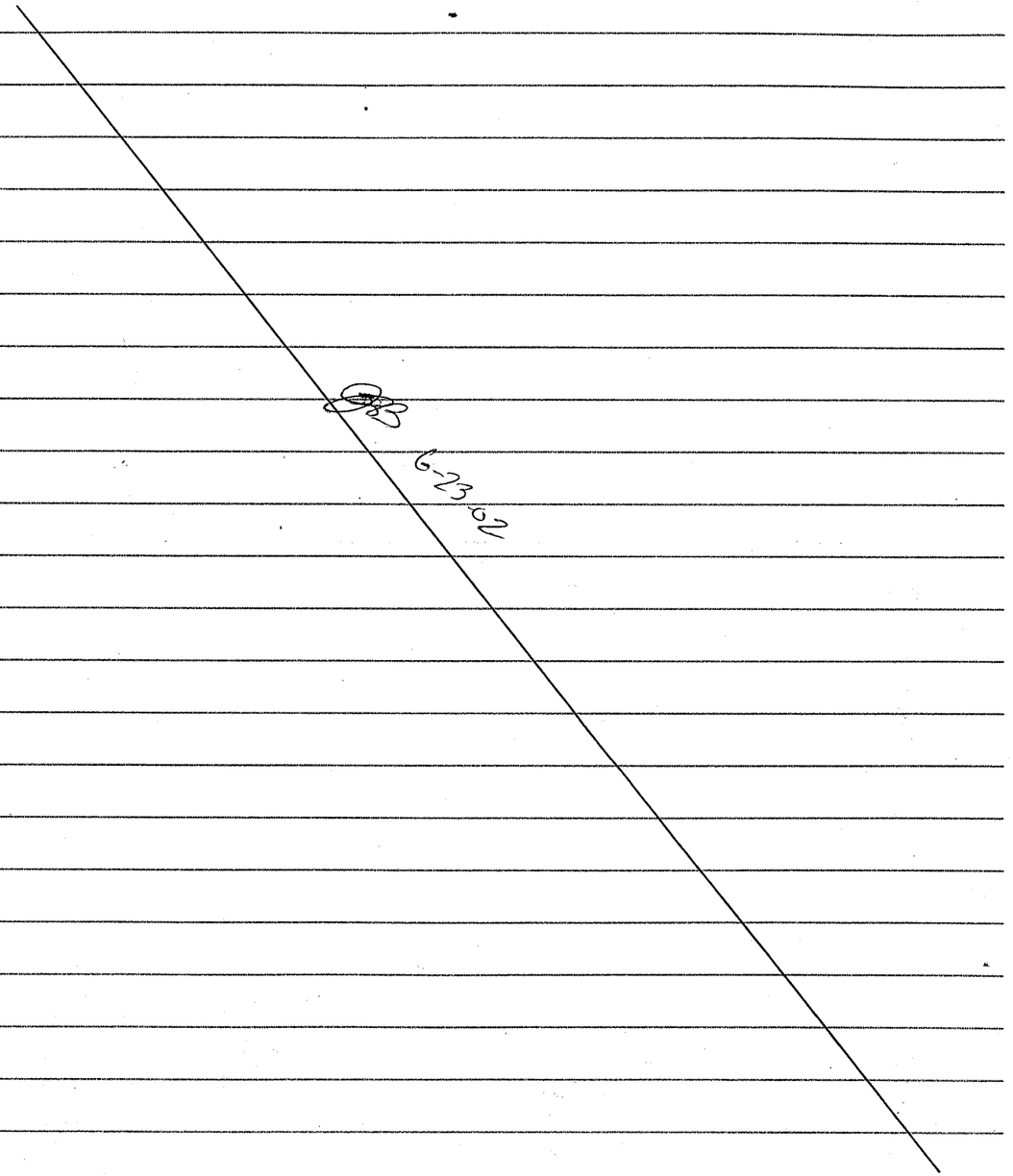
EWDP groundwater samples for XRAL lab analysis

The Aug 2002 (523/65-70) and Sept 2002 (523/41-49) EWDP groundwater samples were sent to XRAL for analyses. Samples were poured from the 1 L HDPE bottles into 60 ml pp bottles to be sent out. The 1 L HDPE bottles had been opened previously for analyses by division 1 at SwRI (523/110 to 556/17). The 60 ml pp bottles were labelled with new non-descript labels (see table below)

Original Label Information					Corresponding Label for XRAL lab analysis
Well	Zone or String	Depth (feet)	Treatment	Date	
QA1				6/20/03	CNWRA1
18P	na	835.8 to 885.0	FA	8/26/02	CNWRA2
10P	shallow	663.5 to 722.7	FA	8/27/02	CNWRA3
10P	deep	801.2 to 879.9	FA	8/27/02	CNWRA4
22PA	deep	661.4 to 769.7	FA	8/28/02	CNWRA5
22PA	shallow	520.8 to 599.9	FA	8/28/02	CNWRA6
22PB	shallow	881.3 to 989.9	FA	8/29/02	CNWRA7
22S	zone 4	1142.0 to 1179.5	FA	9/9/02	CNWRA8
22S	zone 3	882.0 to 979.5	FA	9/10/02	CNWRA9
22S	zone 2	662.0 to 759.5	FA	9/10/02	CNWRA10
22S	zone 1	522.0 to 579.5	FA	9/11/02	CNWRA11
10S	zone 2	802.0 to 859.5	FA	9/11/02	CNWRA12
10S	zone 1	662.0 to 699.5	FA	9/12/02	CNWRA13
7SC	zone 2	180.0 to 210.0	FA	9/13/02	CNWRA14
7SC	zone 1	80.0 to 90.0	FA	9/13/02	CNWRA15
10P dup	shallow	663.5 to 722.7	FA	8/27/02	CNWRA16
7SC dup	zone 1	80.0 to 90.0	FA	9/13/02	CNWRA17
QA2				6/20/03	CNWRA18

23 June 03 cont. GBB

Samples came from the FA1 series, rather than the reopened FA2 series.



24 June 03 GBS

Glove box reading at 9:00 a.m was 1010 ppm CO_2.

Preparing 200 ppm Inorganic Carbon (IC) standard

IC standard will be made from Na_2CO_3 and type I nanopure water.

Na_2CO_3 Fisher S263-500 lot # 006077
Na_2CO_3 F.W. = 105.99

$$200 \text{ ppm C} = 200 \frac{\text{mg}}{\text{g}} = 200 \frac{\text{mg}}{\text{mL}} = .2 \frac{\text{g}}{\text{L}}$$

$$\frac{0.2 \text{ g C}}{1 \text{ L}} \left(\frac{105.99 \text{ g } Na_2CO_3}{12.01 \text{ g C}} \right) = 1.7650 \text{ g for 1 L soln}$$

Tared a small plastic weighing dish on Mettler AE240 and weighed out 1.7652 g.

Mixed the Na_2CO_3 in a 250 ml glass beaker with about 150 ml type I nanopure water and a stir bar, taking care to rinse all of the sodium carbonate into the beaker. After the Na_2CO_3 was dissolved, it was quantitatively transferred into a 1 L vol flask and diluted to mark with type I nanopure water. The soln was transferred into a 1 L pp bottle and labelled

24 June 03 cont GBS
200 ppm IC std.

Preparing IC standards for the TOC analyzer

These stds were made from the 200 ppm IC std prepared on 556/66. These stds were poured into 125 ml glass bottles appropriate for the TOC auto-sampler rack.

A 100 ppm IC std was made by pipetting (50 ml vol. pipet) 50 ml of stock solution into a 100 ml vol. flask and filling to mark with type I nanopure water
A 50 ppm IC std was made by pipetting (25 ml vol. pipet) 25 ml of stock solution into a 100 ml vol. flask and filling to mark.
A 20 ppm IC std was made by pipetting (10 ml vol. pipet) 10 ml of stock soln into a 100 ml vol. flask and filling to mark.
A 10 ppm IC std was made by pipetting (5 ml vol. pipet) 5 ml of Stock soln into a 100 ml vol. flask and filling to mark.
A 200 ppm IC std was made by pouring stock soln into a glass bottle.
A 0 ppm IC std was made by pouring type I nanopure water into a glass bottle.

24 June 03 cont

Glove box reading at 4:00 pm was 1013 ppm CO_2.
pH meter calibrated (see 556/63 for buffer info)
For meter & probe info see 556/59.
Slope equalled 100.2.

pH of the reference solution are recorded below.

ref. soln	pH
C	7.52
D	7.81
E	8.04
F	8.27

6-24-03

25 June 03

Glove box reading at 8:30 am was 1014 ppm CO_2.

Glove box reading at 4:15 pm was 1014 ppm CO_2.

pH meter was calibrated (see 556/63 for buffer info). for meter and probe info see 556/59. Slope equalled 99.9.

pH of the reference solutions recorded below

ref soln	pH
C	7.50
D	7.76
F	8.00
F	8.25

6-25-03

26 June 03 GB

Glove box reading at 8:15 a.m was 1023 ppm CO_2.

Glove box reading at 3:30 pm was 1010 ppm CO_2.

pH meter calibrated (556/63 for buffer info)
For meter & probe info see 556/59.
Slope equalled 100.4

pH of the reference solutions are recorded below.

ref. sol'n	pH
C	7.50
D	7.85
E	7.93
F	8.23

GB 6-26-03

27 June 03 GB

CO_2 analyzer was calibrated with N_2 gas (0 ppm CO_2) and 1000 ppm CO_2 in N_2. Glove box reading at 8:30 a.m. was 1020 ppm CO_2.

The section of tubing connecting the gas washing bottle to the two pumps had to be disassembled and taken out of the glove box due to condensation build-up inside the tubing and near the pump outlet. It was dried and then reconnected. New type I nanopure water was poured into a new gas washing bottle to replace the one previously in use in order to avoid any possible contamination

Glove box reading at 4:30 pm was 1013 ppm CO_2.

Probe was taken out to be conditioned and replaced by the 3F Ross 8103 BN combination electrode with ATC. Meter used is still same (556/59) as well as buffer solns (556/~~5~~63)

GB 6-27-03

27 June 03 cont. [illegible]

Calibration slope equalled 99.4. The pH of reference solutions are recorded below.

Ref. soln	pH
C	7.48
D	7.72
E	8.01
F	8.23

6-27-03 [illegible]

30 June 03 [illegible]

CO_2 analyzer was calibrated with N_2 gas (0 ppm) and 1000 ppm CO_2 in N_2. Glove box reading at 8:15 a.m was 1062 ppm CO_2. Concentration was brought down to 1011 ppm CO_2 by opening the transfer chamber and exposing the glove box atmosphere to room air for a few seconds.

Preparation of Neptunium/Calcite series 11 + 12 Test Tubes

Reagents: calcite 309/146S1 prepared previously and stored in dessicator.
solutions C-F 556/53

24 polycarbonate test tubes with caps (no holes drilled in caps) were labelled according to the following table, and will be used for Np/Ca adsorption in the glove box at 0.1% CO_2. The NpCa label prefix represents neptunium/calcite. Two different calcite masses were used: NpCa series 11 (0.15 g) and NpCa series 12 (0.3 g). Four different pH solutions were used: C (7.5), D (7.75),

30 June 03 cont

E(8.0), and F(8.25). Each series was
6-30-03 ~~preparies~~ prepared in triplicates as represented by the suffix 1 to 3.

Added the appropriate amount of calcite to a ~~tf0630003~~ tared weighing paper and recorded the weight. Removed cap of test tube and placed a funnel made from weighing paper into the appropriate test tube. Repeated procedure for all 24 test tubes.

Balance used: AE240
(challenge mass not available b/c it is sent out for calibration)

Test tube ID	Mass (g) of calcite
NpCa11C1	0.1516
NpCa11C2	0.1527
NpCa11C3	0.1490
NpCa11D1	0.1482
NpCa11D2	0.1483
NpCa11D3	0.1519
NpCa11E1	0.1507
NpCa11E2	0.1494
NpCa11E3	0.1495
NpCa11F1	0.1489

30 June 03 cont.

Test tube I.D (cont)	Mass (g) of calcite (cont.)
NpCa11F2	0.1515
NpCa11F3	0.1511
6-30-03 ~~NpCa12C1~~ NpCa12C1	0.3006
NpCa12C2	0.3017
NpCa12C3	0.3014
NpCa12D1	0.2996
NpCa12D2	0.2996
NpCa12D3	0.2991
NpCa12E1	6-30-03 ~~0.3012~~ 0.3011
NpCa12E2	6-30-03 ~~0.3021~~ 0.3016
NpCa12E3	0.2982
NpCa12F1	0.3010
NpCa12F2	0.3007
NpCa12F3	0.3005

Glove box reading at 4:15 p.m was 1019 ppm CO_2.

Previously ~~AT~~ 6-30-03 unused pH standard buffer solutions were entered into the glove box to be used for this week's calibration. (pH 7 Fisher SB108-500 lot# 030660-24 & pH 10 Fisher SB 116-500 lot# 023154-24). Meter info on 556/59; probe info on 556/71.

30 June 03 cont GB

Calibration slope equalled 100.3. pH of reference solutions recorded below.

ref sol'n	pH
C	7.51
D	7.75
E	8.00
F	8.24

6.30.03 GB

01 July 03 GB

CO_2 analyzer calibrated with N_2 gas and 1000 ppm CO_2 in N_2. Glove box reading at 8:15 a.m. was
Unable to calibrate because span failed.

pH meter calibrated (556/75 for buffer info). For meter and probe info see 556/59 and 556/71 respectively. Calibration slope equalled 100.5. pH of reference solution recorded below

ref. soln	pH
C	7.52
D	7.74
E	8.03
F	8.21

Replaced filter on gashound CO_2 analyzer input air line. Calibrated instrument 4 BW 7-1-03 ~~consecu~~ consecutive times and it sucessfully spanned each time. Glove box read at 9:30 was 1036 ppm CO_2

01 July 03 GB cont.

Filtering and Addition of Pre-equilibrated Reference Solutions to Series 11 & 12 test tubes. Sampling of Reference Solutions for Div 01 ICP Analyses & ~~FOC~~ GB 7-1-03 IC.

Approximately 300 ml of each reference sol'n was removed from the 2l bottle and filtered using B-D 30 ml syringes and whatman 25 mm GD/X disposable filters. Ref sol'n C-F (556/53) were first poured into 400 mL glass beakers until appx 300 mL were obtained. From the becker, the 30 mL syringe with filter was used to ~~transf~~ GB 7-1-03 transfer 30 ml of the ref. soln into the appropriate test tube which were pre-weighed on the Mettler PR5002 by tarring a 30 ml beaker and placing the test tube inside. The test tubes were capped and brought out of the glove box (all filtering and transferring was done inside glove box) to be reweighed.* See following table for recorded weights. Appx 30 ml of each ref soln was filtered into a 30 ml pp bottle and labeled as follows: NpCaCF, NpCaDF, NpCaEF, and NpCaFF. Another 30 ml sample was transferred, unfiltered to 30 ml pp bottles and labeled as follows:

* see 556/82

01 July 03 cont. GB

NpCaCU, NpCaDU, NpCaEU, and NpCaFU. These will be sent to Div 01 for ICP analyses. Appx 40 ml of each ref. soln was filtered into 40 ml TOC vials for IC analyses.

Test Tube ID	Mass (g) of test tube + calcite	Mass (g) of test tube + calcite + soln
NpCa11C1	22.40	49.6541
NpCa11C2	22.18	49.4877
NpCa11C3	22.21	51.6154
NpCa11D1	22.26	50.2859
NpCa11D2	22.15	51.8247
NpCa11D3	22.49	51.9973
NpCa11E1	22.15	49.7511
NpCa11E2	22.26	51.5362
NpCa11E3	22.16	51.3949
NpCa11F1	22.27	50.0758
NpCa11F2	22.12	49.9262
NpCa11F3	22.21	51.3376
NpCa12C1	22.32	51.8173
NpCa12C2	22.36	51.6239
NpCa12C3	22.29	51.4957
NpCa12D1	22.37	52.1398
NpCa12D2	22.40	52.1053
NpCa12D3	22.27	52.1211

01 July 03 cont. JB

Test tube I.D. (cont.)	Mass (g) of test tube + calcite (cont.)	Mass (g) of test tube + calcite + soln (cont)
NpCa12E1	22.33	51.6361
NpCa12E2	22.40	51.7152
NpCa12E3	22.34	51.7409
NpCa12F1	22.56	52.1279
NpCa12F2	22.37	51.4413
NpCa12F3	22.51	51.7659

6-30-03 JB

02 July 03 JB

CO_2 analyzer calibrated with N_2 gas and 1000 ppm CO_2 in N_2 gas. Glove box reading at 8:30 was 1011 ppm CO_2.

pH meter calibrated (556/75 for buffer info). For meter and probe info see 556/59 and 556/71 respectively. Calibration slope equalled 100.6. pH of ref. solns recorded below

ref. soln	pH
C	7.53
D	7.77
E	8.02
F	8.25

7-1-03 JB

The ~~pore~~ size of the filters used on ~~6-1-03~~ 7-2-03 and ~~6-2-03~~ 7-2-03 JB are 0.45 µL. Ref. soln's C + D were filtered on 7-1-03 and were capped and left inside the glove box. Ref solns E & F were filtered on 7-2-03. ~~All test tubes were then transferred out of the glove box to be weighed (see table on 556/79 + 80).~~ 7-2-03 JB Test tubes were then ~~entered back into the glove box and~~ agitated on the Gyrotory Shaker-Model G2. Test tubes

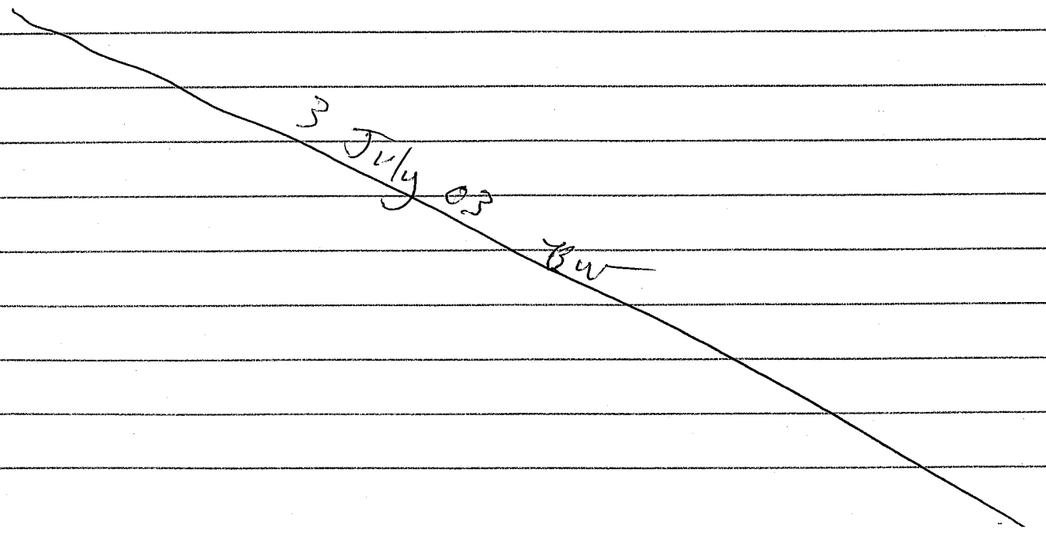
02 July 03 cont. BB

were uncapped.

Acid preserved Div01 reference samples
8 samples: Filtered NpCACF to NpCAFF (4) +
Unfiltered NpCACU to NpCAFU (4)
from 556/78-79
Added 90 µL (eppendorf pipette) of 1:1 HNO_3
(582/19 by JP on 6/30/03) to each 30mL
sample

* Mass of test tube + calcite + soln will be weighed on the AE240 balance on 7-3-03 before the neptunium spike is added.

Checked CO_2 conc of glove box at 17:10
Calibrated LI800 with N_2 and 1000 CO_2 in AIR. Glove box measured at 996 ppm CO_2 BW



03 July 03 BB

CO_2 analyzer calibrated with N_2 and 1000 ppm CO_2 in N_2. Glove box reading at 8:30 was 1008 ppm CO_2.

Test tubes were capped and removed from the glove box to be weighed on the Mettler AE240. A 30 mL beaker was tared and then the test tube placed inside, weighed, and recorded (556/79 + 80)

Making Neptunium spike neutral pH

Current np spike 46A is acidic, Wanted aliquot converted to ~ pH 6.5 so it would not alter the pH of the experimental solns significantly when added.

Orion pH meter 920A serial # 039522 with
Ross combo electrode 8103 w/ ATC 3E
Calibrated w/ 3 buffers:
pH 4 Fisher SB98-500 lot# 023409-24
pH 7 Fisher SB108-500 lot# 030660-24
pH 10 Fisher SB116-500 lot# 023154-24
Slope = 100.2

03 JUL 03 CONT BW

Added 0.3214N ~~NaOH~~ ~~HNO3~~ (Base A 463/134) BW 7-30-03 dropwise to 46A spike with pH probe in soln. Inital reading was 1.00 pH. Stopped adding base when pH reached 5.85. All of spike 46A was used. The new soln was labeledas 46A in new bottle

Np Spiking of NpCA 11 and 12 series Exp Solns

250µl of np spike 46A (556/84) was added to each of the 24 exp solns (556/79-80) Spiking done inside glove box.

Mass of exp. tubes after Spike are recorded below. Used Mettler AE240 balance.

Test tube I.D	Mass (g) after Np spike
NpCa11C1	49.9059
NpCa11C2	49.7392
NpCa11C3	51.8537
NpCa11D1	50.5335
NpCa11D2	52.0744
NpCa11D3	52.2488
NpCa11E1	50.0016
NpCa11E2	51.7860

03 July 03 cont. ~~BB~~

Test Tube ID	Mass (g) after Np Spike
NpCa11E3	51.6398
NpCa11F1	50.3253
NpCa11F2	50.1760
NpCa11F3	51.5870
NpCa12C1	52.0670
NpCa12C2	51.8732
NpCa12C3	51.7454
NpCa12D1	52.3892
NpCa12D2	52.3543
NpCa12D3	52.3694
NpCa12E1	51.8840
NpCa12E2	51.9630
NpCa12E3	51.9892
NpCa12F1	52.3759
NpCa12F2	BW 7-3-03 ~~52~~ 51.6883
NpCa12F3	52.0118

Mettler AE240 balance used for measurements

Each experimental solution was vortexed for about 5 seconds. The experimental solutions were placed in the glove box (target 1000ppm CO_2). with the caps placed loosely on top of the tube. The rack was placed on a gyratory shaker (Brunswick G2) at about 100 rpm. At 13:30 removed caps from tubes

03 JULY 03 CONT BW

LSA sampling of 46A Np spike

Masses were recorded using Mettler AE240
Sample taken in duplicate (a1+b1 suffix)
LSA vials weighed after being labeled and having 1mL (eppendorf) of 0.001N HNO_3 acid (556/22) was added. Labeled 46Aa1 and 46Ab1 from 556/84. 250µl (eppendorf) of sample was added (46A 556/84) and vials reweighed.

~~Atp~~ BW 7-3-03

ID	Mass(g) of Vial+HNO_3 ~~BW~~ 7-3-03	Mass(g) after sample added
~~46Aa1~~		
46Aa1	8.2670	8.5186
46Ab1	8.2202	8.4723

7-7-03
BW

7 July 03 BAW

CO_2 Analyzer calibrated with N_2 and 1000ppm CO_2 in N_2. Analyzed contents of glove box (target 1000 ppm CO_2) at 1104 ppm CO_2 (0850)

Opened glove box to atmosphere for about 5 seconds. Resampled with results at 1050ppm CO_2. Repeated procedure for about 15 seconds. CO_2 level dropped to 791ppm CO_2.

Added small amounts of 5000ppm CO_2 to raise CO_2 levels. Final CO_2 conc at 1023ppm

At 16:40, recalibrated CO_2 Analyzer (see above - 556/87). Glove box measured at 1034 ppm CO_2. Placed caps back on each experimental solution test tube because of the amount of condensation on the inside of the glove box

7-7-03
BAW

8 July 03 GB

CO_2 analyzer calibrated with N_2 and 1000 ppm CO_2 in N_2. Contents of glove box at 8:30 a.m were 1073 ppm CO_2. Opened glove box to atmosphere for a few seconds and resampled. Contents of glove box measured 1013 ppm CO_2

Contents of glove box measured at 1033 ppm CO_2 at 4:30 pm.

7-8-03

9 July 03 GB

CO_2 analyzer calibrated with N_2 and 1000 ppm CO_2 in N_2. Contents of glove box at 8:30 am were 1057 ppm CO_2. Opened glove box to atmosphere for a few seconds and resampled. Contents of glove box measured 972 ppm CO_2.

0.1 N HNO_3 Soln

Conc. Nitric – Trace Metal Grade
Fisher A509-212 lot 1100040
Nanopure type I water

~~Added 625 mL (eppendorf pipet) HNO_3 to 100 mL (vol. flask) at Nanopure type I water~~ GB 7-9-03

About 50 ml of nanopure type I water was added to a 100 mL vol. flask. Added 625 µL (eppendorf pipet) to vol. flask then filled to 100 ml. Transferred to a 125 ml pp bottle and labelled 0.1 N HNO_3.

9 JULY 03 CONT BAW

Recorded mass of experimental solutions before LSA samples and pH taken. Removed solutions from glove box. Used Mettler AE240 balance with tared 30mL beaker. Recorded pH later

Solution ID	Mass(g) before pH + LSA Sampling	pH
NpCA11C1	49.3039	7.51
NpCA11C2	48.9770	7.53
NpCA11C3	50.9547	7.54
NpCA11D1	49.8088	7.74
NpCA11D2	51.3008	7.79
NpCA11D3	51.3342	7.79
NpCA11E1	49.2659	8.01
NpCA11E2	51.0571	7.99
NpCA11E3	50.7452.	7.99
NpCA11F1	49.6277	8.22
NpCA11F2	49.3886	8.22
NpCA11F3	50.7180	8.20
NpCA12C1	51.3177	7.55
NpCA12C2	51.0731	7.52
NpCA12C3	50.8439	7.55

9 JULY 03 CONT BAW

Solution ID	Mass(g) before pH + LSA Sampling	pH
NpCA12D1	51.5677	7.80
NpCA12D2	51.5624	7.79
NpCA12D3	51.5210	7.79
NpCA12E1	51.0749	8.01
NpCA12E2	51.1763	8.00
NpCA12E3	51.1712	8.02
NpCA12F1	51.5668	8.18
NpCA12F2	50.9158	8.20
NpCA12F3	51.3101	8.19

Note; Caps were tighten on exp solns before removing them from the glove box.

Acid matrix addition to LSA vials

Added 0.5 mL (eppendorf pipet) of 0.1 N HNO_3 (556/89) to each series 11 & 12 LSA vials - samples done in duplicate (a/b)

After mass of exp solns taken (556/90-91) the solns were transfer back into the glove box

9 July 03 cont GB

Recorded mass of LSA vials plus acid matrix using Mettler AE240 balance.

Soln ID	Mass (g) of vial + HNO_3	Mass (g) after adding sample
NpCa11C1a	7.6881	8.0968
NpCa11C1b	7.7170	8.2046
NpCa11C2a	7.7461	8.2450
NpCa11C2b	7.6133	8.1148
NpCa11C3a	7.6531	8.1527
NpCa11C3b	7.6419	8.1453
NpCa11D1a	7.6767	8.1754
NpCa11D1b	7.6336	8.1379
~~NpCa11F~~ GB 7-9-03		
NpCa11D2a	7.6703	8.1722
NpCa11D2b	7.6557	8.1598
~~NpCa11F~~ GB 7-9-03		
NpCa11D3a	7.6858	8.1775
NpCa11D3b	7.6333	8.1278
NpCa11E1a	7.7225	8.2229
~~NpCa11E2~~ GB 7-9-03		
NpCa11E1b	7.7083	8.2088
NpCa11E2a	7.6534	8.1450
NpCa11E2b	7.7115	8.2129

9 July 03 cont. GB

Soln ID	Mass (g) of viol + HNO_3	Mass (g) after adding sample
NpCa11E3a	7.6843	8.1743
NpCa11E3b	7.6329	8.1301
NpCa11F1a	7.7697	8.2713
NpCa11F1b	7.7649	8.2664
NpCa11F2a	7.7790	8.2743
NpCa11F2b	7.6848	8.1819
NpCa11F3a	7.6200	8.1150
NpCa11F3b	7.7059	8.2015
NpCa12C1a	7.6493	8.1451
NpCa12C1b	7.6467	8.1460
~~NpCa12C0~~ GB 7-9-03		
NpCa12C2a	7.6084	8.1053
NpCa12C2b	7.6559	8.1529
NpCa12C3a	7.6133	8.1124
NpCa12C3b	7.7422	8.2429
NpCa12D1a	7.6535	8.1526
NpCa12D1b	7.7089	8.2093
NpCa12D2a	7.7277	8.2262
NpCa12D2b	7.8387	8.3423
NpCa12D3a	7.6497	8.1399
NpCa12D3b	7.6309	8.1321
NpCa12E1a	7.6675	8.1588

9 July 03 cont. BW

Soln ID	Mass (g) of vial + HNO_3	Mass (g) after adding sample
NpCa12E1b	7.6438	8.1395
NpCa12E2a	7.7111	8.1988
NpCa12E2b	7.8379	8.3246
NpCa12E3a	7.6807	8.1657
NpCa12E3b	7.7081	8.1953
NpCa12F1a	7.6209	8.1112
NpCa12F1b	7.6022	8.0986
NpCa12F2a	7.6520	8.1451
NpCa12F2b	7.6635	8.1518
NpCa12F3a	7.6944	8.1849
NpCa12F3b	7.7159	8.2016

Sample Addition to LSA Vials

Each LSA vial (556/92-94) had 0.5mL of the appropriate experimental soln added. This procedure was performed in the glove box using a fixed volume eppendorf pipette. A new tip was used for each exp soln. The LSA vials were capped and removed from the glove box. The weights were recorded (556/92-94). The caps of the experimental solutions were loosely placed on the tops of the tubes

9 JULY 03 CONT BW

pH Measurement of Experimental Solns

Conducted inside glove box.
pH meter: Orion 920A Serial# 039518 with
Orion 8103 combo electrode 3E w/ ATC probe
Calibrate with new solns inserted into glove box
pH 7 Fisher SB108 Lot# 030660 9Jul03
pH 10 Fisher SB116 Lot# 023154 9Jul03
slope= 100.3

Measurement taken with probe attached to stand, 50mL centrifuge tube with sample held by hand and aggitated by hand to swirl solution (pH taken directly in experimental solution). After measurement, experimental tube had cap loosely placed on it. Recorded pH values on 556/90+91
pH buffer 7.0 read 6.99 after all of the experimental solutions were measured.

Contents of glove box at 3:15 pm measured at 968 ppm CO_2. (not recalibrated)
Start of day was 972 ppm CO_2 (556/89)

10 July 03 ~~QB~~ + BW

CO_2 analyzer calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 996 ppm CO_2 at 9:00 am

IC Analysis Sampling for NpCa Series 11+12

Samples = Series 3 (8 total) 556/90+91
Work performed inside glove box (1000ppm CO_2)

Approximately 20mL of sample was removed from the experimental tube using a oxford pipet with a 10mL tip and placed in a 30mL pp beaker. A 20mL syringe (BD 9661) was used to draw in the solution from the beaker. A filter (Whatman 25mm GD/X filter #6874-2504 lot# 11026) was placed on the tip of the syringe. Note: filter pore size was 0.45 µm The sample was filtered into ~~a pp~~ BW 7-10-03 an appropriately labeled 40mL amber bottle for analysis on the phoenix 8000 TOC in IC mode. Samples were labelled HET BW 7-10-03 11C3, 11D3, 11E3, 11F3, 12C3, 12D3, 12E3, +12F3 Samples were kept in the glove box at 1000ppm CO_2

10 July 03 cont ~~QB~~

ICP Analysis Sampling of NpCa Series 11 + 12 for Div I

Samples = Series 1 + 2 (16 total) 556/90-91
Work performed on benchtop

Approximately 20 mL of sample was removed from each test tube using a ~~20 mL syringe (BD966t)~~ PB 9/15/03 10 mL syringe twice (BD 9604). Each 10 mL of soln was filtered (Whatman 25 mm GD/X filter # 6878-2504 lot # 11014, pore size 0.45 µm) into an appropriately labelled 30 ml pp bottle to be sent to div I. A new filter was used for each soln. * see 556/98

QA standards: NpCa experimental solutions for ICP div I analysis

Two quality assurance standards were made for div I ICP analysis. Three metals were used: K, Na, + Ca. 2 ml of ~~100~~ QB 7-10-03 K, 10 ml of Na, + 10 ml of Ca (vol pipets) were pipetted into a 100 ml vol. flask. The flask was filled to mark. Appx 30 ml of this soln was QB 7-10-03 with type I nanopure water

10 July 03 cont. ~~QB~~

then poured into 2 30 ml pp bottles labelled 11Q1 and 11Q2.

Target ppm

	K	Na	Ca
11Q1	20	100	100
11Q2	20	100	100

Reagents: 1,000 ppm Calcium 2% HNO_3
PLCA2-2X lot# 9-69CA
1,000 ppm Potassium 2% HNO_3
PLK2-2Y lot# 9-03K
1,000 ppm Sodium 2% HNO_3
PLNA2-2Y lot# 9-82NA
type I nanopure water

* Each soln was preserved with 1:1 HNO_3 (582/19). 60 uL (eppendorf pipet) was added to each 30 ml pp bottle after the exp. soln was filtered in.

LSA Sampling of 46A Np Spike

Masses were recorded using Mettler AE240. Samples taken in duplicate (a2 + b2 suffix). LSA vials weighed after being labelled

10 July 03 cont. ~~QB~~

and having 0.5 ml of 0.1 N HNO_3 acid (556/89) added. 250 uL (eppendorf) of 46A Np spike was added to each vial and reweighed.

ID	Mass(g) of vial + HNO_3	Mass(g) after sample added
46Aa2	7.6328	7.8827
46Ab2	7.6900	7.9396

Preparing 21% phosphoric acid for TOC

Reagents: type I nanopure water
85% phosphoric acid - Fisher
A242-4 (ACS grade) lot# 001815
Based on Tekmar Dohrmann Phoenix 8000 User manual.

Measured 188 mL type I nanopure water using a 100 ml graduated cylinder (100 ml + 88 ml). Poured into a 400 ml beaker. Measured 37 ml 85% phosphoric acid using the 100 ml graduated cylinder. Poured into the beaker with water. Poured soln into the 1000 ml HDPE square bottle used by the TOC.

11 July 03 JB

Preparing 200 ppm IC standard

Same as 556/66 actual wt of Na_2CO_3 1.7652 g.

Preparing IC standards from 200 ppm IC standard

Same as 556/67. Stds were poured into 40 ml amber glass bottles ~~appo~~ JB 7-11-03 appropriate for the TOC autosampler rack

CO_2 analyzer calibrated with N_2 and 1000 ppm CO_2 in N_2. Contents of glove box measured at 1006 ppm CO_2 at 10:45 a.m.

Napal samples for Div 01 Anion Analysis

Aliquots of the Napal groundwater samples for the 5-7-03 sampling event were taken to Div 01 for anion analysis. The following anions were requested for ion chromatography – F, Cl, SO_4, Br, NO_3, and NO_2. PO_4 was requested by colorimetric method (EPA 365.3) in order to lower the reporting

11 July 03 cont JB

limit from 0.1 ppm (by IC) to 0.01 ppm (365.3) No bicarbonate analysis was requested. Aliquots were transfered by decanting sample directly from the amber glass bottles, that the samples were originally taken in, to 125 ml pp bottles, which were filled to the top to minimize head space. Bottles labeled as follows:

Pocos-503-1D
PB2-503-1D
PB4-503-1D

All three samples were filtered and unacidified. Reference 589/17

BAW entry IC Analysis of NpCA Series 11+12

The four reference solutions sampled on 01Jul03 (556/79) were analyzed on the 3rd of July. Eight experimental solutions ~~we~~ BW 7-11-03 sampled on 10 July 03 (556/96) were analyzed on 11 July 03. The eight experimental solutions were removed from the glove box immediately before analysis started. All 12 solns were covered w/ parafilm after the 11 July 03 Analysis was complete.

14 July 03 BAW

Delivered NpCA series 11 and 12 to Div 01 for metals analysis by ICP.
24 samples from 556/97
2 QA samples from 556/97+98
First three chain of custody sheets are for these samples

Delivered three Nopal groundwater samples from May 2003 sampling event to Div 01 for anion analysis
3 samples from 556/100-101
The last chain of custody sheet was for these samples.

14 JUL 03 BAW

14 JUL 03 CONT BAW

SAMPLE LIST/CHAIN OF CUSTODY
Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Client Purchase Order/Other ID | Site/Zone ID

Requested Turnaround:
☐ 2 Weeks
☐ 3 Weeks
☒ Other: 4 weeks

SwRI Contact: Mike Bowman

REMARKS
Preservation
a = HCl to pH <2
b = HNO_3 to pH <2
c = H_2SO_4 to pH <2
d = NaOH to pH >12
e = Cool (4°C±2°C)
f = Other (specify) none

Nuclear Safety related - use approriate QA procedures

POC - Bradley Werling x 6565

SwRI Project#: 1.20.06002.01.141

Page 3 of 3

Client: Shipper Name/Address: Bradley Werling CNWRA - Div 28 BLD 57

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analyses Requested: Ca, Na, K, Mn, Mg, Sr by ICP
NpCaCF	7-2-03		W		1	X
NpCaCU						X
NpCaDF						X
NpCaDU						X
NpCaEF						X
NpCaEU						X
NpCaFF						X
NpCaFU						X

Matrix Types:
A – Air
B – Biota
D - Dust
E – Emission/Stack
L - Liquid
P – Product
Sd - Solid
S – Soil
SED – Sediment
T - Tissue
W - Water
WP - Wipe

Sample Types:
D - Duplicate
ER – Equipment Rinsate
ES – Environmental Sample
FB – Field Blank
FD – Field Duplicate
MS – Matrix Spike
MSD – Matrix Spike Dup
TB – Trip Blank

Temp: 21.6 | Therm #: 026

Comments: non-radioactive
556/82

Relinquished by (Print/Signature): Brad Werling / BW — Date: 7-4-03 — Time: 1530
Received by (Print/Signature): Kent Pece — Date: 7/4/03 — Time: 0930
Relinquished by (Print/Signature): — Date: — Time:
Received by (Print/Signature): — Date: — Time:
Relinquished by (Print/Signature): — Date: — Time:
Samples Disposed: Date: — Time:
Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Shipper Name/ Address: Bradley Werling
CNWRA - Div 20
BLD 57

Client:

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround:
☐ 2 Weeks
☐ 3 Weeks
☒ Other: 4 weeks

SwRI Contact: Mike Damman

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Ca, Na, K, Mn, Mg, Sr by ICP
11C1	7-10-03		W		1	X
11C2						X
11D1						X
11D2						X
11E1						X
11E2						X
11F1						X
11F2						X
11Q1	7-10-03		W		1	X
11Q2						X

REMARKS
Preservation
a = HCl to pH <2
b = HNO_3 to pH <2
c = H_2SO_4 to pH <2
d = NaOH to pH >12
e = Cool (4°C±2°C)
f = Other (specify) none

Nuclear Safety related - use appropriate QA procedures

POC - Brad Werling x6565

1.20.06002.01.141

SwRI Project#: ~~1.20.06002.01~~

Relinquished by (Print/Signature)	Date	Time
Brad Werling / Bradley Werling	7-14-03	930
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

Received by SwRI Lab: (Signature)

Date: 7/14/03 Time: 0930

Samples Disposed: Date / Time

Samples Disposed by:

Matrix Types:
A – Air
B – Biota
D - Dust
E – Emission/Stack
P – Product
S – Soil
SED – Sediment
T - Tissue
W - Water
WP - Wipe

Sample Types:
D - Duplicate
ER – Equipment Rinsate
FB – Field Blank
FD – Field Duplicate
MS – Matrix Spike
MSD – Matrix Spike Dup
TB – Trip Blank

Temp: RT 22°C Therm #: 024

Comments: Radioactive - max Np 237 values 8.5×10^{-7} M or 1.4×10^{-4} µCi/mL
556/97

Div 01 COC Form 01-01-001, Rev 4/02

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14 Jul 03 cont BAW

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Shipper Name/ Address: Bradley Werling
CNWRA - Div 20
BLD 57

Client:

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround:
☐ 2 Weeks
☐ 3 Weeks
☒ Other: 4 weeks

SwRI Contact: Mike Damman

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Ca, Na, K, Mn, Mg, Sr by ICP
12C1	7-10-03		W		1	X
12C2						X
12D1						X
12D2						X
12E1						X
12E2						X
12F1						X
12F2						X

REMARKS
Preservation
a = HCl to pH <2
b = HNO_3 to pH <2
c = H_2SO_4 to pH <2
d = NaOH to pH >12
e = Cool (4°C±2°C)
f = Other (specify) none

Nuclear Safety related - use appropriate QA procedures

POC - Brad Werling x6565

SwRI Project#: 1.20.06002.01.141

Relinquished by (Print/Signature)	Date	Time
Brad Werling / Brad Werling 6565	7-14-03	930
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

Received by SwRI Lab: (Signature)

Date: 7/14/03 Time: 0930

Samples Disposed: Date / Time

Samples Disposed by:

Matrix Types:
A – Air
B – Biota
D - Dust
E – Emission/Stack
L - Liquid
P – Product
Sd - Solid
S – Soil
SED – Sediment
T - Tissue
W - Water
WP - Wipe

Sample Types:
D - Duplicate
ER – Equipment Rinsate
ES – Environmental Sample
FB – Field Blank
FD – Field Duplicate
MS – Matrix Spike
MSD – Matrix Spike Dup
TB – Trip Blank

Temp: 22°C Therm #: 026

Comments: Radioactive - max Np 237 values 8.5×10^{-7} M or 1.4×10^{-4} µCi/mL
556/97

Div 01 COC Form 01-01-001, Rev 8/02

Page 2 of 3

14 Jul 03 cont BAW

14 JUL 03 CONT BALL

SAMPLE LIST/CHAIN OF CUSTODY
Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Requested Turnaround: ☒ 2 Weeks ☐ 3 Weeks ☒ Other: 4 weeks — 7-11-03

Client Purchase Order/Other ID: 1

Site/Zone ID

SwRI Contact: Mike Lamman

Client: Bradley Werling CNWRA - Div 20 BLD 57

Shipper Name/Address

Analyses Requested

REMARKS
Preservation
a = HCl to pH <2
b = HNO_3 to pH <2
c = H_2SO_4 to pH <2
d = NaOH to pH >12
e = Cool (4°C±2°C)
f = Other (specify)

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analyses Requested	REMARKS
~~Pocos~~-503-1D	7-11-03		W		1	Anions by IC; Hexavalent Chromium by 365.3	None
PB2-503-1D	1		W		1	X X X	Nuclear Safety Related - use appropriate QA procedures
PB4-503-1D	1		W		1	X X X	

Matrix Types:
A – Air
B – Biota
D – Dust
E – Emission/Stack
L – Liquid
P – Product
Sd – Solid
S – Soil
SED – Sediment
T – Tissue
W - Water
WP - Wipe

Sample Types:
D - Duplicate
ER – Equipment Rinsate
ES – Environmental Sample
FB – Field Blank
FD – Field Duplicate
MS – Matrix Spike
MSD – Matrix Spike Dup
TB – Trip Blank

Temp: 22°C Therm #: 026

Comments: 556/100

SwRI Project#: 12.26.002.01.141

Relinquished by (Print/Signature): Brad Werling — Date: 7-14-03 — Time: 0930

Received by SwRI Lab: (Signature) — Date — Time

Relinquished by (Print/Signature) — Date — Time

Received by (Print/Signature) — Date — Time

Samples Disposed: Date — Time

Samples Disposed by: — Date — Time

Relinquished by (Print/Signature) — Date — Time

Page 1 of 1

Div 01 COC Form 01-01-001, Rev 8/02

14 July 03 cont. GB

Nopal and EWDP groundwater samples for SGS Lakefield lab analysis

The samples listed on 556/64 will be sent to SGS Lakefield for analysis rather than XRAL. The labels will remain the same. Six ~~additional~~ 7-14-03 additional samples from Nopal will be sent along with them. These were labelled with non-descript labels as follows

Well	treatment	date	new label
Pocos-503-1A	FA	5-8-03	CNWRA19
Pocos-503-1B	FA	5-8-03	CNWRA20
PB2-503-1a	FA	5-8-03	CNWRA21
7-14-03 PB2-503-1~~a~~b	FA	5-8-03	CNWRA22
PB4-503-1a	FA	5-8-03	CNWRA23
PB4-503-1b	FA	5-8-03	CNWRA24

Note that Pocos-503-1A had a pipet ~~tip~~ 7-14-03 tip in the 1 L HDPE bottle.

14 July 03 cont. GAB

CO_2 analyzer calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured of 1115 ppm CO_2 at 2:30 pm. Concentration was brought down to 1009 ppm CO_2 by opening the transfer chamber and exposing the glove box to room air for about 10 seconds.

Solution Preparation for NaLi ion exchange at 0.1 N

NaLi exchange experiments will be run to understand the thermodynamics of NaLi ion exchange on a zeolite. The DOE uses Li as a surrogate for Np in many groundwater studies. Six reference solutions of various amounts of NaCl & LiCl will be made.

Reagents:

Fisher Lithium Chloride L121-500 lot # 021111

Fisher Sodium Chloride S271-3 lot # 984321

type I nanopure water

14 July 03 cont. GAB

Each reference soln was prepared by tarring a piece of weighing paper on the Mettler AE240 and weighing out the appropriate amount of LiCl and NaCl (see table 1). The actual masses were recorded below. Both the LiCl & the NaCl were carefully poured into a ~~50~~ 7-14-03 100 mL beaker of which contained about 50 mL of type I nanopure water. After the salts dissolved, the soln was quantitatively transferred to a vol. flask of the appropriate volume. The beaker was rinsed with type I nanopure water several times, and the rinsate transferred into the flask. ~~Five separate 1 L ELi*1.0 were made.~~ GAB 7-15-03

Reference Solutions	Mass LiCl to add (g)	Mass NaCl to add (g)	dilute to volume (mL)
ELi*0.3	0.1272	0.4091	100
ELi*0.5	0.2120	0.2922	100
ELi*0.7	0.7419	0.4383	250
ELi*0.8	0.3392	0.1169	100
ELi*0.9	0.9539	0.1461	250
ELi*1.0	4.2394	0.0000	1000
Note: make 5 L (1 L each) of ELi*1.0 and mix before using			

table 1.

14 July 03 cont. JB

	Actual mass (g) LiCl added	Actual mass (g) NaCl added
ELi*0.3	0.1278	0.4085
ELi*0.5	0.2130	0.2926
ELi*0.7	0.7422	0.4377
ELi*0.8	0.3392	0.1162
ELi*0.9	0.9544	0.1467
ELi*1.0	20.1940	0.0000

~~ELi*1.0~~ JB 7-15-03

~~ELi*1.0~~ JB 7-15-03

~~ELi*1.0~~ JB 7-15-03

~~ELi*1.0~~ JB 7-15-03

~~ELi*1.0~~ JB 7-14-03

15 July 03 JB

ELi*1.0 will be made differently than the other ref. solns, since 5 L are required. 4.2394 g * 5 = 21.1970 g of LiCl will be weighed in a tared weigh boat. It will be poured into a 1 L beaker which contains about 750 ml of type I nanopure water, carefully rinsing the weigh boat several times and decanting the rinsate into the beaker. After the LiCl dissolves, the soln will be

~~14~~ July 03 cont. JB

quantitatively transferred into a 2 L vol. flask, taking care to rinse the beaker several times and transfer the rinsate to the flask. The 2 L vol. flask will be filled with type I nanopure water and then decanted into a 2 gallon pp bottle. In order to increase the total volume to 5 L, 2 L (vol. flask) and 1 L (vol flask) of type I nanopure water will be added to the 2 gal pp bottle. The other 5 solns will be transferred to pp bottles as well. The 100 mL solns will go into 125 ml bottles; the 250 mL soln into 250 ml bottles. They will be labeled as follows

Ref. soln	new label
ELi*0.3	NaLi0.1A
ELi*0.5	NaLi0.1B
ELi*0.7	NaLi0.1C
ELi*0.8	NaLi0.1D
ELi*0.9	NaLi0.1E
ELi*1.0	NaLi0.1F

7-15-03 15 July 03

Note that due to LiCl's hydroscopic nature an accurate mass was difficult to obtain. Reaching an ~~ex~~ acceptable mass was done as quickly as possible. 7-14-03

Preparing Zeolite Experimental Solns

Reagents:
zeolite: COV * 100/200 * HL * CP * Naf
NaLi0.1A - NaLi0.1F

22 zeolite soln will be prepared from the solns made. The following table, lists the target mass of zeolite to add. The actual masses will be recorded below it. The appropriate mass of zeolite for each experimental soln will be weighed (Mettler AE240) on tared weigh paper and carefully transferred (by funnelling it & tapping) to a pp bottle. For the ref. 7-15-03 soln vol. of 25, 50, 100, 250, & 1000, pp bottles of vol 80, 60, 125, 250, & 1000 will be used respectively. The appropriate volume of each ref. soln will be poured into a vol. flask that corresponds to that

15 July 03

volume. Then the ref. soln will be poured from the flask into the pp bottle with the zeolite. The pp bottles will be labelled "NaLi0.1-1" through NaLi0.1-22 according to the table below for the 1-22 suffix.

Experimental Solutions	Reference (ELi) to use	Weight of Na-zeolite to add (g)	Volume of reference solution (mL)
1	0.3	1.1020	25
2	0.5	1.6434	25
3	0.5	0.5974	50
4	0.7	1.0621	25
5	0.7	0.5652	100
6	0.8	0.6784	50
7	0.9	0.8477	50
8	0.9	0.5580	50
9	0.9	0.5237	100
10	1	0.6262	50
11	1	0.4299	50
12	1	0.3337	50
13	1	0.2578	50
14	1	0.3443	100
15	1	0.2225	100
16	1	0.1614	100
17	1	0.2818	250
18	1	0.1442	250
19	1	0.0759	250
20	1	0.1896	1000
21	1	0.0702	1000
22	1	0.0430	1000

table 2

~~Actual mass of zeolite (g) added~~
~~NaLi0.1-1 0.1015~~
~~NaLi0.1-2 0.~~

7-15-03

15 July 03 cont. ~~GB~~

~~Actual amount of zeolite (g) added (cont.)~~ GB 7-15-03

Exp soln I.D.	amt. of zeolite (g) added
NaLi 0.1-1	1.1020
NaLi 0.1-2	1.6437
~~NaLi 0.1-3~~ GB 7-15-03	~~0.5980~~ GB 7-15-03
NaLi 0.1-3	0.5980
NaLi 0.1-4	1.0621
NaLi 0.1-5	0.5651
NaLi 0.1-6	0.6784
NaLi 0.1-7	0.8475
NaLi 0.1-8	0.5582
NaLi 0.1-9	0.5235
NaLi 0.1-10	0.6265
NaLi 0.1-11	0.4304
NaLi 0.1-12	0.3342
NaLi 0.1-13	0.2583
NaLi 0.1-14	0.3443
NaLi 0.1-15	0.2224
NaLi 0.1-16	0.1616
NaLi 0.1-17	0.2814
NaLi 0.1-18	0.1447
NaLi 0.1-19	0.0764
NaLi 0.1-20	0.1898
NaLi 0.1-21	0.0705
NaLi 0.1-22	0.0431

15 July 03 cont. ~~GB~~

The exp. solns were capped and placed on the New Brunswick gyratory shaker at about 120 rpm

7-16-03 GB

16 July 03 BB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 1089 ppm CO_2 at 8:30 am. Conc. of CO_2 brought down to 964 ppm CO_2 by opening the transfer chamber and exposing the glove box to atmospheric air for a few seconds.

Inorganic Carbon (IC) results for NpCA series 11 and 12 reference solutions.

See 556/101 for analysis info entry
Analyzed on Phoenix 8000 TOC instrument in IC mode with range of 20 to 200 ppm using 40mL bottles. Standards and samples all run in triplicate.

Note: do not use calculations (conc + mass) because of problem with calibration curve. Somehow the expected mass did not get entered for all of the curve pts. Only the conc (ppm) appeared. The instruments software uses the expected mass for the cal curve so it could not generate a cal curve. The raw data was fine so the curve was manually generated. The relavent portion of the rawdata file (.prn file) is

BW 7-16-03

16 JUL 03 CONT BW

was printed out and attached to the notebook. Columns are numbered. The legend for the numbers is below. Sample IDs are in column 8 and area counts are in column 30.

Information Contained in the .PRN File	Depending on mode and range, not all sections of the .PRN file are active.
	1. CURRENT PRN VERSION HEADER, (TOC Talk 2.0+ PRN Files Only)
	2. Sample Type
	3. Sample Introduction
	4. Run Status
	5. Message Number
	6. Runtime Month, Day, Year, Hour, Min
	7. Operator Name
	8. Sample ID
	9. Method ID
	10. Cal Curve
	11. Mode
	12. Range
	13. Number Of Reps
	14. Rep Number
	15. Vial Number
	16. Rack ID
	17. Injection Volume
	18. Sparger Volume
	19. Dilution Volume
	20. Water Volume
	21. Reagent Volume
	22. Acid Volume
	23. UV Presparge Time
	24. IC Presparge Time
	25. Mixing Time
	26. Threshold
	27. Baseline Volts
	28. Endpoint Volts
	29. Total Time
	30. Initial Result
	31. µg Carbon
	32. ppm Carbon
	33. Blank Value
	34. Cal Factor
	35. Caltime Month, Day, Year, Hour, Min
	36. R2, (TOC Talk 2.0+ PRN Files Only)
	37. Y-Intercept, (TOC Talk 2.0+ PRN Files Only)
	38. Data File
	39. Stripchart Data File

16 Jul 03 cont Bhu

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
~~v2.0	3	1	Done	0	7/3/03 15:18	USER1	0 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	1	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 15:21	USER1	0 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	1	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 15:24	USER1	0 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	1	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 15:29	USER1	20 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	2	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 15:33	USER1	20 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	2	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 15:37	USER1	20 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	2	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 15:42	USER1	100 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	3	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 15:46	USER1	100 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	3	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 15:51	USER1	100 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	3	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 15:56	USER1	200 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	4	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 16:01	USER1	200 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	4	IC20P40M	0.5
~~v2.0	3	1	Done	0	7/3/03 16:06	USER1	200 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	4	IC20P40M	0.5
~~v2.0	10	1	Done	0	7/3/03 16:09	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	1	1001	IC20P40M	0
~~v2.0	10	1	Done	0	7/3/03 16:11	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	2	1001	IC20P40M	0
~~v2.0	10	1	Done	0	7/3/03 16:14	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	3	1001	IC20P40M	0
~~v2.0	10	1	Done	0	7/3/03 16:17	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	4	1001	IC20P40M	0
~~v2.0	10	1	Done	0	7/3/03 16:19	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	5	1001	IC20P40M	0
~~v2.0	10	1	Done	0	7/3/03 16:22	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	6	1001	IC20P40M	0
~~v2.0	0	1	Done	0	7/3/03 16:27	USER1	samp 50ppm	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	5	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 16:31	USER1	samp 50ppm	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	5	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 16:35	USER1	samp 50ppm	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	5	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 16:39	USER1	samp 10ppm	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	6	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 16:43	USER1	samp 10ppm	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	6	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 16:47	USER1	samp 10ppm	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	6	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 16:51	USER1	nacp C	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	7	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 16:55	USER1	nacp C	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	7	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 16:58	USER1	nacp C	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	7	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 17:03	USER1	napc D	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	8	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 17:07	USER1	napc D	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	8	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 17:10	USER1	napc D	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	8	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 17:15	USER1	napc E	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	9	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 17:19	USER1	napc E	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	9	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 17:23	USER1	napc E	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	9	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 17:27	USER1	napc F	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	10	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 17:31	USER1	napc F	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	10	IC20P40M	0.5
~~v2.0	0	1	Done	0	7/3/03 17:35	USER1	napc F	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	10	IC20P40M	0.5

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18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
0	0	5	0	0.5	0	10	0	1	3.59	4.589	88	281266	0	0	0	2.40E+05	2/16/97 12:24	0	0	7031451	7031515
0	0	5	0	0.5	0	10	0	1	3.628	4.625	87	281710	0	0	0	2.40E+05	2/16/97 12:24	0	0	7031451	7031519
0	0	5	0	0.5	0	10	0	1	3.658	4.654	87	282157	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031522
0	0	5	0	0.5	0	10	0	1	3.681	4.678	128	2976924	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031526
0	0	5	0	0.5	0	10	0	1	3.758	4.752	129	3004553	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031530
0	0	5	0	0.5	0	10	0	1	3.778	4.777	130	3054879	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031534
0	0	5	0	0.5	0	10	0	1	3.84	4.839	161	13761359	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031538
0	0	5	0	0.5	0	10	0	1	4.053	5.051	157	13873946	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031543
0	0	5	0	0.5	0	10	0	1	4.096	5.093	155	13898600	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031547
0	0	5	0	0.5	0	10	0	1	4.06	5.058	179	28681057	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031552
0	0	5	0	0.5	0	10	0	1	4.272	5.268	172	28480851	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031557
0	0	5	0	0.5	0	10	0	1	4.276	5.274	173	28826315	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031602
0	0	5	0	0.5	0	10	0	0.5	4.247	4.746	84	236429	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031607
0	0	5	0	0.5	0	10	0	0.5	3.968	4.465	85	208403	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031610
0	0	5	0	0.5	0	10	0	0.5	3.848	4.346	88	209109	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031612
0	0	5	0	0.5	0	10	0	0.5	3.831	4.329	88	207741	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031615
0	0	5	0	0.5	0	10	0	0.5	3.836	4.336	89	207055	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031618
0	0	5	0	0.5	0	10	0	0.5	3.847	4.344	88	204640	0	0	0	0.00E+00	1/1/70 0:00	0	0	7031451	7031620
0	0	5	0	0.5	0	10	0	1	3.803	4.801	145	7013266	28.3616	56.7232	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031624
0	0	5	0	0.5	0	10	0	1	3.971	4.97	139	7101080	28.7275	57.455	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031628
0	0	5	0	0.5	0	10	0	1	3.973	4.972	141	7026523	28.4169	56.8337	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031632
0	0	5	0	0.5	0	10	0	1	3.973	4.972	114	1742598	6.4005	12.801	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031637
0	0	5	0	0.5	0	10	0	1	3.95	4.947	114	1758814	6.4681	12.9361	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031640
0	0	5	0	0.5	0	10	0	1	3.914	4.91	113	1755964	6.4562	12.9124	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031644
0	0	5	0	0.5	0	10	0	1	3.85	4.85	110	1283559	4.4878	8.9757	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031649
0	0	5	0	0.5	0	10	0	1	3.869	4.869	110	1262119	4.3985	8.797	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031652
0	0	5	0	0.5	0	10	0	1	3.916	4.915	110	1270091	4.4317	8.8634	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031656
0	0	5	0	0.5	0	10	0	1	3.908	4.906	115	1879521	6.971	13.942	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031700
0	0	5	0	0.5	0	10	0	1	3.896	4.895	114	1846352	6.8328	13.6656	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031704
0	0	5	0	0.5	0	10	0	1	3.925	4.924	116	1883007	6.9855	13.9711	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031708
0	0	5	0	0.5	0	10	0	1	3.928	4.924	124	3042886	11.8184	23.6367	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031712
0	0	5	0	0.5	0	10	0	1	3.982	4.98	123	3029152	11.7611	23.5223	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031716
0	0	5	0	0.5	0	10	0	1	3.975	4.972	123	3030140	11.7653	23.5305	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031720
0	0	5	0	0.5	0	10	0	1	3.999	4.998	135	5059368	20.2204	40.4407	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031724
0	0	5	0	0.5	0	10	0	1	4.033	5.027	134	5111388	20.4371	40.8742	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031728
0	0	5	0	0.5	0	10	0	1	4.04	5.037	133	5083658	20.3216	40.6432	206479	2.40E+05	7/1/03 10:10	0	0	7031451	7031732

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Note: TOC software uses the area of the last 3 blanks as the y-int for calculation of sample mass. I used the y-int of the std curve since this more accurately reflected the nature of the sample.

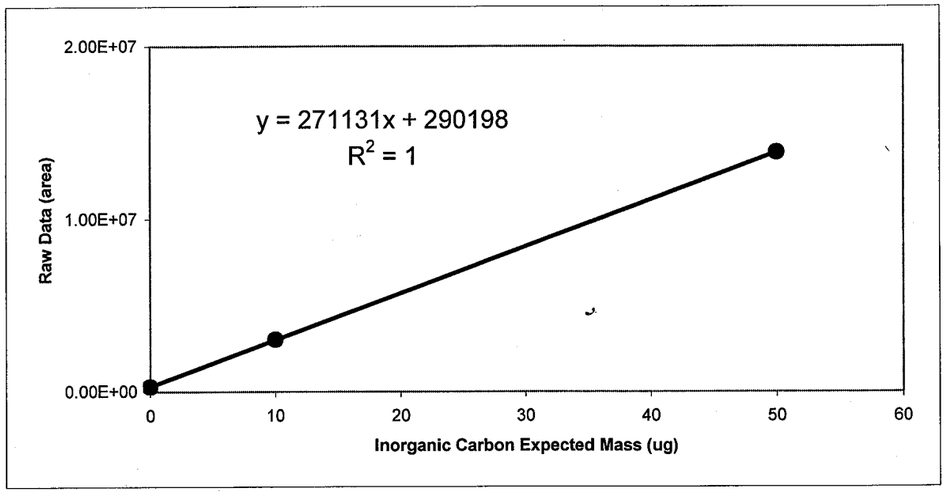
Inorganic Carbon (IC) Analysis
Range 20 ppm to 200 ppm IC
NpCA series 11 and 12 reference solutions

IC Standard Data

IC Std (ppm)	IC expected mass (ug)	Raw Data Rep 1	Raw Data Rep 2	Raw Data Rep 3	Raw Data Average
0	0	281266	281710	282157	281711
20	10	2976924	3004553	3054879	3012119
100	50	13761359	13873946	13898600	13844635
200	100	28681056	28480852	28826316	28662741

*200 ppm (100 ug) cal point not used since inclusion resulted in r2 of 0.9995 and samples under 50 ppm

IC Calibration Curve



IC Sample Data

Sample ID	Raw Data Rep 1	Raw Data Rep 2	Raw Data Rep 3	Raw Data Average	Ave mass# (ug) IC	Ave conc* (ppm)
NaCP C	1283559	1262119	1270091	1271923	3.620851175	7.2417
NaCP D	1879521	1846352	1883007	1869627	5.825334125	11.6507
NpCA E	3042886	3029152	3030140	3034059	10.12005759	20.2401
NpCA F	5059368	5111388	5083658	5084805	17.6837273	35.3675
samp 50ppm	7013266	7101080	7026523	7046956	24.92064107	49.8413
samp 10ppm	1742598	1758814	1755964	1752459	5.393188778	10.7864

Using calibration y intercept in calculation
* Calculated by dividing the ave mass by the volume of sample (0.5mL)

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Inorganic Carbon (IC) Analysis of NpCA series 11 and 12 experimental solutions.

See 556/101 for analysis info entry
Analyzed on Phoenix 8000 TOC instrument in IC mode with range of 20 to 200ppm using 40mL bottles. Standards and samples all run one time (no replicates).
The following is the raw data file (prn file). The legend for the numbers at the head of each column is on 556/117. Sample IDs are in column 8 and area counts are in column 30.

The 200ppm cal pt (100µg) was not used since inclusion resulted in a worse r^2 and the samples were under 50ppm. Note: TOC software uses area of the last 3 blanks as the y-intercept for the calculation of sample mass. I used the y-int of the std curve since this more accurately reflected the nature of the samples.

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
~~v2.0	0	1	Done	0	7/11/03 14:13	USER1	clean	Cleaning Procedure	default	4	2	6	1	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/11/03 14:16	USER1	clean	Cleaning Procedure	default	4	2	6	2	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/11/03 14:20	USER1	clean	Cleaning Procedure	default	4	2	6	3	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/11/03 14:23	USER1	clean	Cleaning Procedure	default	4	2	6	4	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/11/03 14:26	USER1	clean	Cleaning Procedure	default	4	2	6	5	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/11/03 14:29	USER1	clean	Cleaning Procedure	default	4	2	6	6	1001	IC20P40M	20	0	0
~~v2.0	3	1	Done	0	7/11/03 14:34	USER1	0 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	1	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/11/03 14:39	USER1	20 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	2	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/11/03 14:43	USER1	50 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	3	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/11/03 14:48	USER1	100 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	4	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/11/03 14:54	USER1	200 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	5	IC20P40M	0.5	0	0
~~v2.0	10	1	Done	0	7/11/03 14:57	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	1	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/11/03 15:00	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	2	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/11/03 15:02	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	3	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/11/03 15:05	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	4	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/11/03 15:07	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	5	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/11/03 15:10	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	6	1001	IC20P40M	0	0	0
~~v2.0	0	1	Done	0	7/11/03 15:14	USER1	11C3	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	6	IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/11/03 15:18	USER1	11D3	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	7	IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/11/03 15:23	USER1	1.10E+04	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	8	IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/11/03 15:27	USER1	11F3	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	9	IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/11/03 15:32	USER1	12C3	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	10	IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/11/03 15:36	USER1	12D3	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	11	IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/11/03 15:40	USER1	1.20E+04	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	12	IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/11/03 15:45	USER1	12F3	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	13	IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/11/03 15:49	USER1	10 ppm	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	14	IC20P40M	0.5	0	0
~~v2.0	4	1	Done	0	7/11/03 15:54	USER1	ccv 50 ppm	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	15	IC20P40M	0.5	0	0

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20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
0	1	0	20	0	0	0.5	5.847	6.341	107	2100141	8.7506	0.4375	0	2.40E+05	2/16/97 12:24	0	0	7111409	7111411
0	1	0	20	0	0	0.5	4.563	5.063	106	731704	3.0488	0.1524	0	2.40E+05	2/16/97 12:24	0	0	7111409	7111414
0	1	0	20	0	0	0.5	4.434	4.933	87	149064	0.6211	0.0311	0	2.40E+05	2/16/97 12:24	0	0	7111409	7111418
0	1	0	20	0	0	0.5	4.405	4.905	78	98895	0.4121	0.0206	0	2.40E+05	2/16/97 12:24	0	0	7111409	7111421
0	1	0	20	0	0	0.5	4.396	4.895	81	97404	0.4059	0.0203	0	2.40E+05	2/16/97 12:24	0	0	7111409	7111425
0	1	0	20	0	0	0.5	4.349	4.847	74	74985	0.3124	0.0156	0	2.40E+05	2/16/97 12:24	0	0	7111409	7111428
5	0	0.5	0	10	0	1	3.855	4.85	81	213686	0	0	0	0.00E+00	1/1/70 0:00	0.19066	14263035	7111409	7111432
5	0	0.5	0	10	0	1	3.834	4.829	123	2776849	0	0	0	0.00E+00	1/1/70 0:00	0.19066	14263035	7111409	7111436
5	0	0.5	0	10	0	1	3.865	4.862	141	6904301	0	0	0	0.00E+00	1/1/70 0:00	0.19066	14263035	7111409	7111440
5	0	0.5	0	10	0	1	3.855	4.853	158	13627824	0	0	0	0.00E+00	1/1/70 0:00	0.19066	14263035	7111409	7111445
5	0	0.5	0	10	0	1	3.977	4.976	177	28738549	0	0	0	0.00E+00	1/1/70 0:00	0.19066	14263035	7111409	7111450
5	0	0.5	0	10	0	0.5	4.136	4.634	83	212917	0	0	0	0.00E+00	1/1/70 0:00	0.19066	14263035	7111409	7111455
5	0	0.5	0	10	0	0.5	3.954	4.453	86	193775	0	0	0	0.00E+00	1/1/70 0:00	0.19066	14263035	7111409	7111458
5	0	0.5	0	10	0	0.5	3.887	4.387	86	192467	0	0	0	0.00E+00	1/1/70 0:00	0.99904	-113970	7111409	7111500
5	0	0.5	0	10	0	0.5	3.872	4.37	87	192244	0	0	0	0.00E+00	1/1/70 0:00	0.99904	-113970	7111409	7111503
5	0	0.5	0	10	0	0.5	3.866	4.365	87	193241	0	0	0	0.00E+00	1/1/70 0:00	0.99904	-113970	7111409	7111506
5	0	0.5	0	10	0	0.5	3.869	4.367	86	192891	0	0	0	0.00E+00	1/1/70 0:00	0.99904	-113970	7111409	7111508
5	0	0.5	0	10	0	1	3.87	4.865	110	1268790	3.7679	7.5357	192792	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111511
5	0	0.5	0	10	0	1	3.859	4.853	119	1890989	5.9466	11.8932	192792	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111516
5	0	0.5	0	10	0	1	3.884	4.879	127	3100282	10.1812	20.3625	192792	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111520
5	0	0.5	0	10	0	1	3.953	4.948	137	5195132	17.5168	35.0337	192792	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111524
5	0	0.5	0	10	0	1	3.983	4.982	108	1282093	3.8144	7.6289	192792	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111529
5	0	0.5	0	10	0	1	3.956	4.955	117	1940850	6.1212	12.2424	192792	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111533
5	0	0.5	0	10	0	1	3.969	4.966	128	3147248	10.3457	20.6914	192792	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111537
5	0	0.5	0	10	0	1	3.987	4.983	138	5192845	17.5088	35.0176	192792	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111542
5	0	0.5	0	10	0	1	4.022	5.021	113	1597680	4.9195	9.8391	192792	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111547
5	0	0.5	0	10	0	1	3.943	4.941	142	6869293	24.4535	48.907	-113970	2.86E+05	7/11/03 15:10	0.99904	-113970	7111409	7111551

16 JUL 03 CONT BAW

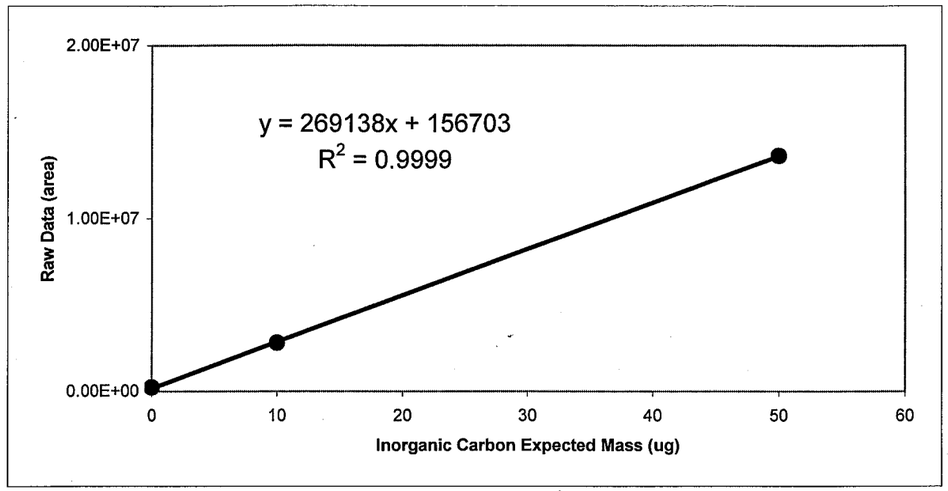
Inorganic Carbon (IC) Analysis
Range 20 ppm to 200 ppm IC
NpCA series 11 and 12 experimental solutions

IC Standard Data

IC Std (ppm)	IC expected mass (ug)	Raw Data
0	0	213686
20	10	2776849
100	50	13627824
200*	100	28738548

*200 ppm (100 ug) cal point not used since inclusion resulted in r2 of 0.9991 and samples under 50 ppm

IC Calibration Curve



IC Sample Data

Sample ID	Raw Data	mass# (ug) IC	conc* (ppm)
11C3	1268790	4.13203264	8.2641
11D3	1890989	6.44385408	12.8877
11E3	3100282	10.937062	21.8741
11F3	5195132	18.7206154	37.4412
12C3	1282093	4.18146081	8.3629
12D3	1940850	6.62911592	13.2582
12E3	3147248	11.1115673	22.2231
12F3	5192845	18.7121179	37.4242
10 ppm	1597680	5.35404514	10.7081
ccv 50 ppm	6869293	24.9410711	49.8821

Using calibration y intercept in calculation
* Calculated by dividing the mass by the volume of sample (0.5mL)

16 JULY 03 CONT BAW

STABLE ISOTOPE ANALYSIS: COMPARISON OF TAP WATER BLANK SAMPLES FROM Coastal Science and Geochron Labs

For background information see 556/18 Analysis of 4 "identical" tap water blanks (see ~~556/BW~~ 7-16-03 523/74)
On the following pages are the Geochron results. All samples were shipped out late Oct 2002. Coastal Science results were received in Dec 2003. Geochron results were received in June 2003. The delay with the Geochron results were due to trouble with the hydrogen measurement. The other measurements were finished earlier. (Phone conversation with Dana Kruger)
Some of the Coastal Science labs samples (556/18-21) were done in duplicate. The numbers are different. Further comparisons would be recommended

ID	LAB	$\delta^{13}C_{PDB}$	$\delta^{18}O_{SMOW}$	δD_{SMOW}
CNWRA28	CS	-8.3, -8.3	-4.6	-29
CNWRA29	CS	-8.0, -8.0	-4.6	-30, -29
CNWRA30	GeoC	-7.1	-3.7	-21
CNWRA31	GeoC	-7.5	-3.9	-19

16 July 03 CONT BW

GEOCHRON LABORATORIES a division of
KRUEGER ENTERPRISES, INC.
711 CONCORD AVENUE ✦ CAMBRIDGE, MASSACHUSETTS 02138 ✦ U.S.A
TELEPHONE: (617) 876-3691 TELEFAX: (617) 661-0148

STABLE ISOTOPE RATIO ANALYSES — REPORT OF ANALYTICAL WORK

Submitted by:
Bradley Werling
Southwest Research Institute
Center for Nuclear waste Regulatory Analyses
6220 Culebra Road
San Antonio TX 78238-5166

Date Received: 11/04/02
Date Reported:
Your Reference: 06/10/03
PO 370211N

Our Lab. Number	Your Sample Number	Description	δD^*	$\delta^{18}O^*$
CHOR- 108740	CNWRA30 10-3-02	Water	-21	-3.7
CHOR- 108741	CNWRA31 10-3-02	Water	-19	-3.9

*Unless otherwise noted, analyses are reported in ‰ notation and are computed as follows:

$$\delta R_{sample}\,‰ = \left[\frac{R_{sample}}{R_{standard}} - 1\right] \times 1000$$

Where:
D/H standard is SMOW
$^{18}O/^{16}O$ standard is SMOW

And:
$D/H_{standard} = 0.000316$**
$^{18}O/^{16}O_{standard} = 0.0039948$**

**Double atom ratio

16 JUL 03 CONT BW

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Submitted by:
Bradley Werling
Southwest Research Institute
Center for Nuclear waste Regulatory Analyses
6220 Culebra Road
San Antonio TX 78238-5166

Date Received: 11/04/02
Date Reported:
Your Reference: 06/10/03
PO 370211N

Our Lab. Number	Your Sample Number	Description	$\delta^{13}C^*$
CR- 108740	CNWRA30 10-3-02	Dissolved Inorganic Carbon	-7.1
CR- 108741	CNWRA31 10-3-02	Dissolved Inorganic Carbon	-7.5

*Unless otherwise noted, analyses are reported in ‰ notation and are computed as follows:

$$\delta^{13}C_{sample}\,‰ = \left[\frac{^{13}C/^{12}C_{sample}}{^{13}C/^{12}C_{standard}} - 1\right] \times 1000$$

Where:
$^{13}C/^{12}C$ standard is PDB

And:
$^{13}C/^{12}C$ standard = 0.011237

17 July 03 GB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 1028 ppm CO_2 at 8:45 a.m.

Preparing 100 ppm IC std

Reagents: Na_2CO_3 Fisher S263-500 lot# 006077
type I nanopure water

Na_2CO_3 f.w. = 105.99

$$100 \text{ ppm C} = \frac{.1 \text{ g}}{\text{L}}\left(\frac{105.99 \text{ g } Na_2CO_3}{120.1 \text{ g C}}\right) = 0.8825 \text{ g } Na_2CO_3$$

Tared a small weighing boat on Mettler AE 240 and weighed out 0.8825 g.

Poured Na_2CO_3 into a 250 ml beaker with about 150 ml of type I nanopure water. Rinsed weigh boat's residual powder into beaker. After Na_2CO_3 dissolved, it was transferred into a 1 L vol. flask, rinsing beaker several times into the vol. flask. Diluted to mark with type I nanopure water. Soln transferred into a 1 L pp bottle and labeled 100 ppm IC std.

17 July 03 cont. GB

Preparing IC ~~standards~~ Standards 7-17-03

These stds were made from the 100 ppm IC std prepared on 556/128. These stds were poured into 40 ml glass vials, appropriate for the TOC auto-sampler rack.

The 100 ppm std was poured directly from the 1 L pp bottle into the vial. The 0 ppm std is type I nanopure water. A 50 ppm std was made by pipetting 50 ml (vol. pipet) of 100 ppm std into a 100 ml vol flask and filling to mark, with type I nanopure water. A 20 ppm std was made by pipetting 20 ml (vol pipet) of 100 ppm std into a 100 ml vol. flask and filling to mark with type I nanopure water. A 10 ppm std was made by pipetting 10 ml (vol pipet) of 100 ppm std into a 100 ml vol. flask and filling to mark with type I nanopure water.

7-17-03 3AM

17 Jul 03 cont BJW

Reanalysis of NpCA Series 11 and 12 Refit Exp Solutions for ~~Inorganic Carbon~~ Content.

Samples from 556/101
Initial Ref soln analysis 556/116 to 120
Initial Exp soln analysis 556/121 to 125
Stds used were from 556/129. Curve consisted of 0ppm, 10ppm, 25ppm, 50ppm, and 100ppm.
Water - nanopure type I
21% phosphoric acid: 556/99
Cal curve pts run in triplicate. Samples run singly (no replicates) because of limited sample volume of many samples.
Analysis on Phoenix 8000 TOC Analyzer in IC mode in 20ppm to 200ppm range using 40 mL amber bottles
After sample npcaC was analyzed the syringe got stuck in the septum for the bottle npcaC. The autosampler attempted to sample the next bottle. The stuck needle BW 7-17-03 raised the whole sample tray and moved it. ~~It stopped the run~~ BW 7-17-03 It stopped the run as quickly as I could. Upon restarting, I noticed the needle would not move up or down. A belt inside the verticle arm broke.

17 July 03 cont. BJW

QA: NaCl exchange on zeolite standards for div I ICP analysis

Two quality assurance standards were made for div I ICP analysis. Two metals were used: K & Na. 5 ml of Na and 10 ml of K (vol pipets) were pipetted into a 100 ml vol. flask. The flask was filled to mark with type I nanopure water. Appx 25 ml of this soln was poured in a 30 ml pp bottle. Repeated for another 30 ml pp bottle. Labelled QA1 & QA2.

Target ppm

	K	Na
QA1	100	50
QA2	100	50

Reagents: SpexCertiPrep 1000 ppm Potassium 2% HNO_3 PLK2-2Y lot # 9-03K
SpexCertiPrep 1000 ppm Sodium 2% HNO_3 PLNA2-2Y lot# 9-82NA
type I nanopure water

18 JUL 03 BW

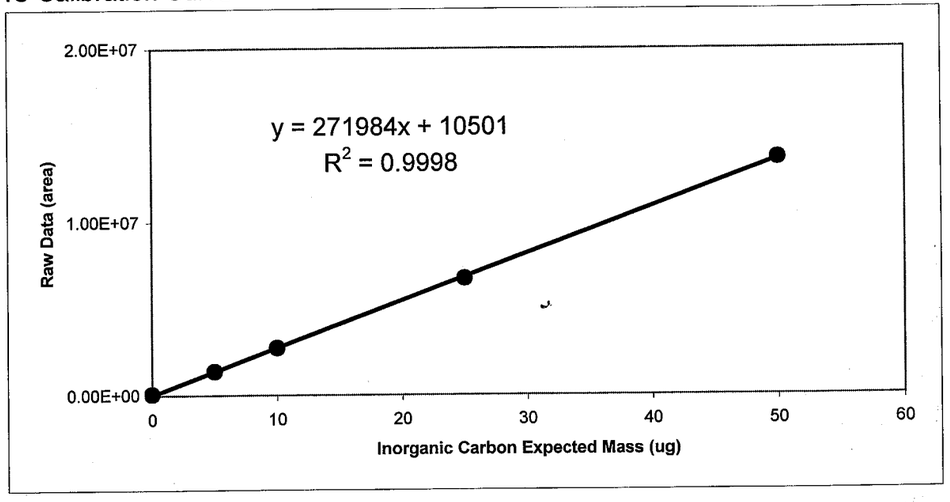
Reanalysis of NpCA series 11+12 for Inorganic Carbon Content.

only 11C3, 12C3, and npcaC analyzed before instrument broke (556/130)
PRN files on following page

IC Standard Data

IC Std (ppm)	IC expected mass (ug)	Raw Data rep 1	- rep 2	rep 3	Raw Data Ave
0	0	73968	77805	75958	75910
10	5	1356996	1370960	1376283	1368080
20	10	2745752	2697283	2725553	2722863
50	25	6678502	6717043	6690812	6695452
100	50	13714593	13608075	13683564	13668744

IC Calibration Curve



IC Sample Data

Sample ID	Raw Data	mass # (ug) IC	conc (ppm)
11C3	1125240	4.09854624	8.1971
12C3	1106987	4.03143567	8.0629
NpCA C	1133993	4.13072828	8.2615

Using calibration y intercept in calculation
* Calculated by dividing the mass by the volume of sample (0.5mL)

18 JUL 03 CONT BAW

Legend for column numbers on 556/117
Sample IDs in column 8 + Area counts in column 30

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
~~v2.0	0	1	Done	0	7/17/03 13:14	USER1	clean	Cleaning Procedure	default	4	2	6	1	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/17/03 13:17	USER1	clean	Cleaning Procedure	default	4	2	6	2	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/17/03 13:20	USER1	clean	Cleaning Procedure	default	4	2	6	3	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/17/03 13:24	USER1	clean	Cleaning Procedure	default	4	2	6	4	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/17/03 13:27	USER1	clean	Cleaning Procedure	default	4	2	6	5	1001	IC20P40M	20	0	0
~~v2.0	0	1	Done	0	7/17/03 13:30	USER1	clean	Cleaning Procedure	default	4	2	6	6	1001	IC20P40M	20	0	0
~~v2.0	3	1	Done	2	7/17/03 13:36	USER1	0 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	1	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	2	7/17/03 13:40	USER1	0 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	1	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	2	7/17/03 13:44	USER1	0 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	1	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 13:48	USER1	10 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	2	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 13:52	USER1	10 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	2	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 13:55	USER1	10 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	2	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 14:00	USER1	20 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	3	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 14:03	USER1	20 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	3	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 14:07	USER1	20 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	3	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 14:12	USER1	50 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	4	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 14:16	USER1	50 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	4	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 14:20	USER1	50 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	4	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 14:25	USER1	100 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	1	5	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 14:30	USER1	100 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	2	5	IC20P40M	0.5	0	0
~~v2.0	3	1	Done	0	7/17/03 14:34	USER1	100 ppm IC	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	3	3	5	IC20P40M	0.5	0	0
~~v2.0	10	1	Done	0	7/17/03 14:37	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	1	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/17/03 14:39	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	2	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/17/03 14:42	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	3	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/17/03 14:44	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	4	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/17/03 14:46	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	5	1001	IC20P40M	0	0	0
~~v2.0	10	1	Done	0	7/17/03 14:48	USER1	blank	Blank IC Ranges 3 4 & 5	IC 20ppm for 40mL	2	2	6	6	1001	IC20P40M	0	0	0
~~v2.0	0	1	Done	0	7/17/03 14:52	USER1	11C3	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1		IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/17/03 14:57	USER1	12C3	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	7	IC20P40M	0.5	0	0
~~v2.0	0	1	Done	0	7/17/03 15:01	USER1	npca C	IC Range 20 - 200 ppm C	IC 20ppm for 40mL	2	2	1	1	8	IC20P40M	0.5	0	0

18 JUL 03 CONT BAW

| | | |

21 July 03 cont QB

Approximately 20 ml of sample was removed from each pp bottle using a 10 ml eppendorf pipet twice. Since solns 1, 2, and 4 only contained 25 ml, only 10 ml was removed, and then diluted w/ type I nanopure water to appx 20 ml. The solns were pipetted into pp bottles labelled NaLi0.1-1 through NaLi0.1-25 and NaLi0.1-A through NaLi0.1-F, which were just the ref. solns. Samples 1-22 correspond to exp solns 1-22. Samples 23 and 24 QB 7-21-03 ~~cred~~ correspond to duplicates of exp. Solns 8 and 19 respectively. Sample 25 is a blank of type I nanopure water,

22 July 03 QB

CO_2 analyzer calibrated with N_2 + 1000 ppm QB 7-23-03 CO_2 in ~~air~~ N_2. Contents of glove box measured 1039 ppm CO_2 at 8:36 a.m.

Resampling of some Zeolite Solns for Div I ICP analysis

Samples NaLi01-1, NaLi0.1-2, and NaLi0.1-4 QB 7-22-03

22 July 03 cont. QB

had to be resampled because of inaccurate sampling technique. 10 ml (vol pipet) of each of these three exp soln were pipetted into a separate 25 ml vol. flask and filled to mark. These solns were then transferred into 30 ml pp bottles labelled NaLi0.1-1b, NaLi0.1-2b, and NaLi0.1-4b. (Filled to mark with type I nanopure water)

Adding Cocktail to LSA vials

Added 5 ml (bottle top dispenser) of Ultima Gold AB (Packard 6013309, lot 91-9031) to each vial that ended with the "a" suffix of the series 11 & 12 LSA vials (556/94) (A new cocktail will be used for the "b" dups) Each vial was aggitated and placed in the LSA.

7-23-03 QB

23 July 03 GRB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 1090 ppm CO_2 at 8:20 a.m. Concentration brought down to 948 by opening the transfer chamber and exposing the glove box to atmospheric air.

24 July 03 GRB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 1028 ppm CO_2 at 8:30 a.m. Turned off pumps to try & find source of increasing CO_2.

25 July 03 GRB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 1008 ppm CO_2 at 8:30 a.m.

Adding Cocktail to "b" LSA vials

Added 5 ml (bottle top dispenser) of Ultima Gold AB (Packard 6013309, lot # 91-2111) to each vial that ended with "b" suffix of the series 11 & 12 LSA vials (556/94).

25 July 03 cont GRB

7/24/03 9:41:37 AM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 1
Protocol# 15 - Pa_Np_Exp_AB.lsa User: Bertetti

Assay Definition-

Assay Description:

Assay Type: Alpha/Beta
Report Name: Np_Pa_Exp
Output Data Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB
Raw Results Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\20030723_1725.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\Np_Pa_AB.021
Assay File Name: C:\Packard\TriCarb\Assays\Pa_Np_Exp_AB.lsa

Count Conditions-

Nuclide: Manual Np/Pa
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Alpha/Beta Standards:
Count Time (min): 120.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

In Use Discriminator: 145

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
Beta A	0.0	400.0	1st Vial	0.00
Beta B	0.0	2000.0	1st Vial	0.00
Alpha	100.0	400.0	1st Vial	2.00

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: n/a Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
Beta A				
Beta B				
Alpha				

IPA Block Data
Software Version IC: 2.11
Software Version EC: 1.31
Instrument Model: Tri-Carb 3100TR
Instrument Serial Number: 405314
3H Chi Square: 19.63 Date Processed: 7/23/03 5:25:07 PM
14C Chi Square: 29.53 Date Processed: 7/23/03 5:25:07 PM
3H E^2/B (1-18.6 keV): 274.98 Date Processed: 7/23/03 5:25:07 PM
14C E^2/B (4-156 keV): 532.44 Date Processed: 7/23/03 5:25:07 PM
3H Efficiency (0-18.6 keV): 65.83 Date Processed: 7/23/03 5:25:07 PM
14C Efficiency (0-156 keV): 96.32 Date Processed: 7/23/03 5:25:07 PM
IPA Background Date Processed: 7/23/03 5:25:07 PM
3H Background CPM (0-18.6 keV): 15.78 Date Processed: 7/23/03 5:25:07 PM

25 July 03 cont. GRB

7/24/03 9:41:37 AM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 2
Protocol# 15 - Pa_Np_Exp_AB.lsa User: Bertetti

14C Background CPM (0-156 keV): 22.67 Date Processed: 7/23/03 5:25:07 PM
3H Calibration DPM: 285000
3H Reference Date: 10/29/99
14C Calibration DPM: 134100

Cycle 1 Results

S#	Count Time	CPMA	A:2S%	CPMB	B:2S%	CPMa	alpha2S%	SIS	
MESSAGES									
1	120.00	20.33	4.05	24.21	3.71	0.47	26.73	725.4	blank
B									
2	35.07	92.36	3.98	92.44	4.06	284.71	2.00	219.6	NpCal1C1a
3	29.72	129.97	3.52	130.44	3.56	336.04	2.00	227.9	NpCal1C2a
4	32.84	105.40	3.79	105.69	3.86	304.07	2.00	223.9	NpCal1C3a
5	30.93	130.65	3.44	130.95	3.49	323.01	2.00	211.9	NpCal1D1a
6	32.17	136.12	3.30	137.31	3.33	310.41	2.00	242.2	NpCal1D2a
7	32.33	141.00	3.22	141.49	3.26	308.94	2.00	212.8	NpCal1D3a
8	29.30	131.10	3.52	132.14	3.56	340.86	2.00	234.6	NpCal1E1a
9	32.54	164.02	2.95	164.30	2.98	306.97	2.00	207.1	NpCal1E2a
10	33.05	151.83	3.05	152.16	3.09	302.11	2.00	214.6	NpCal1E3a
11	30.01	154.51	3.17	154.97	3.21	332.76	2.00	200.8	NpCal1F1a
12	30.24	135.29	3.41	135.08	3.46	330.22	2.00	209.6	NpCal1F2a
13	32.05	161.91	2.99	162.06	3.03	311.67	2.00	207.3	NpCal1F3a
Missing vial 14.									
Missing vial 15.									
Missing vial 16.									
Missing vial 17.									
Missing vial 18.									
19	37.05	107.76	3.53	108.23	3.59	269.49	2.00	228.8	NpCal2C1a
20	36.63	110.05	3.51	110.74	3.56	272.67	2.00	237.3	NpCal2C2a
21	35.78	105.97	3.63	106.20	3.69	279.16	2.00	218.1	NpCal2C3a
22	38.22	100.13	3.64	100.60	3.70	261.23	2.00	225.3	NpCal2D1a
23	38.39	120.20	3.26	120.78	3.30	260.04	2.00	226.6	NpCal2D2a
24	38.36	106.83	3.49	107.20	3.55	260.22	2.00	219.0	NpCal2D3a
25	38.63	126.29	3.15	126.12	3.21	258.48	2.00	194.4	NpCal2E1a
26	39.24	114.61	3.31	115.34	3.36	254.40	2.00	224.9	NpCal2E2a
27	40.08	132.91	3.01	133.40	3.05	249.18	2.00	219.2	NpCal2E3a
28	38.76	128.27	3.12	129.15	3.16	257.58	2.00	237.5	NpCal2F1a
29	37.51	124.53	3.22	125.01	3.27	266.16	2.00	230.4	NpCal2F2a
30	38.61	123.98	3.19	125.03	3.23	258.56	2.00	243.8	NpCal2F3a
31	0.47	17549.88	2.20	17552.39	2.20	21488.90	1.99	195.6	46Aa1
32	0.48	20467.17	2.02	20463.29	2.02	20930.78	2.00	226.2	46Aa2

28 July 03 GRB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 1027 ppm CO_2 at 8:30 a.m. Pumped were turned back on.

29 July 03 GRB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 1062 ppm CO_2 at 8:30 a.m. Brought down to 980 by opening the transfer chamber and exposing the glove box to atmospheric air for a few seconds.

30 July 03 GRB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 1057 ppm CO_2 at 8:36 a.m.

7-31-03 GRB

30 July 03 cont GRB

Assay Definition-

Assay Description:

Assay Type: Alpha/Beta
Report Name: Np_Pa_Exp
Output Data Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB
Raw Results Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\20030728_1048.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\Np_Pa_AB.022
Assay File Name: C:\Packard\TriCarb\Assays\Pa_Np_Exp_AB.lsa

Count Conditions-

Nuclide: Manual Np/Pa
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Alpha/Beta Standards:
Count Time (min): 120.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

In Use Discriminator: 145

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
Beta A	0.0	400.0	1st Vial	0.00
Beta B	0.0	2000.0	1st Vial	0.00
Alpha	100.0	400.0	1st Vial	2.00

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: n/a Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
Beta A				
Beta B				
Alpha				

IPA Block Data
Software Version IC: 2.11
Software Version EC: 1.31
Instrument Model: Tri-Carb 3100TR
Instrument Serial Number: 405314
3H Chi Square: 20.76 Date Processed: 7/28/03 10:48:55 AM
14C Chi Square: 16.26 Date Processed: 7/28/03 10:48:55 AM
3H E^2/B (1-18.6 keV): 294.16 Date Processed: 7/28/03 10:48:55 AM
14C E^2/B (4-156 keV): 542.29 Date Processed: 7/28/03 10:48:55 AM
3H Efficiency (0-18.6 keV): 65.82 Date Processed: 7/28/03 10:48:55 AM
14C Efficiency (0-156 keV): 96.41 Date Processed: 7/28/03 10:48:55 AM
IPA Background Date Processed: 7/28/03 10:48:55 AM
3H Background CPM (0-18.6 keV): 14.85 Date Processed: 7/28/03 10:48:55 AM

30 July 03 cont GRB

14C Background CPM (0-156 keV): 22.30 Date Processed: 7/28/03 10:48:55 AM
3H Calibration DPM: 285000
3H Reference Date: 10/29/99
14C Calibration DPM: 134100

Cycle 1 Results

S#	Count Time	CPMA	A:2S%	CPMB	B:2S%	CPMa	alpha2S%	SIS	MESSAGES
1	120.00	19.50	4.13	23.68	3.75	0.38	29.49	778.7	blank B
2	29.23	141.74	3.36	142.46	3.40	341.73	2.00	240.5	NpCal1C1b
3	28.15	147.46	3.35	148.12	3.39	355.07	2.00	226.4	NpCal1C2b
4	32.46	130.28	3.36	131.07	3.40	307.84	2.00	222.2	NpCal1C3b
5	30.51	158.15	3.09	158.00	3.14	327.41	2.00	213.6	NpCal1D1b
6	31.42	158.92	3.04	158.79	3.09	317.92	2.00	202.6	NpCal1D2b
7	32.80	158.55	2.98	158.64	3.02	304.56	2.00	213.6	NpCal1D3b
8	30.05	158.04	3.12	158.62	3.16	332.46	2.00	223.1	NpCal1E1b
9	31.56	186.17	2.78	186.40	2.81	316.51	2.00	205.6	NpCal1E2b
10	33.83	169.86	2.83	170.41	2.86	295.36	2.00	214.3	NpCal1E3b
11	30.38	170.89	2.97	171.16	3.00	328.85	2.00	214.3	NpCal1F1b
12	30.29	162.80	3.05	163.35	3.09	329.79	2.00	220.7	NpCal1F2b
13	31.79	181.35	2.81	181.07	2.85	314.21	2.00	210.2	NpCal1F3b
Missing vial 14.									
Missing vial 15.									
Missing vial 16.									
Missing vial 17.									
Missing vial 18.									
19	36.31	127.90	3.21	128.54	3.26	275.13	2.00	237.4	NpCal2C1b
20	35.43	130.57	3.21	131.05	3.26	281.95	2.00	218.5	NpCal2C2b
21	34.92	126.61	3.29	126.98	3.35	286.04	2.00	216.0	NpCal2C3b
22	37.25	116.45	3.35	116.30	3.42	268.07	2.00	212.4	NpCal2D1b
23	36.95	131.27	3.14	131.86	3.18	270.31	2.00	219.9	NpCal2D2b
24	38.00	126.39	3.17	126.40	3.22	262.83	2.00	208.4	NpCal2D3b
25	38.71	138.42	2.98	138.76	3.02	258.03	2.00	216.2	NpCal2E1b
26	38.94	132.53	3.04	132.85	3.09	256.42	2.00	217.2	NpCal2E2b
27	39.63	145.73	2.86	145.92	2.90	252.08	2.00	211.8	NpCal2E3b
28	38.74	145.37	2.89	145.87	2.93	257.83	2.00	233.4	NpCal2F1b
29	38.79	139.82	2.96	140.10	3.00	257.47	2.00	213.0	NpCal2F2b
30	40.50	133.61	2.97	134.08	3.02	246.55	2.00	224.6	NpCal2F3b
31	0.47	17661.35	2.20	17663.56	2.20	21601.74	1.98	192.1	46Ab1
32	0.51	7890.30	3.16	7890.05	3.16	19799.62	1.99	241.8	46Ab2
Missing vial 33.									
Missing vial 34.									
Missing vial 35.									
Missing vial 36.									
Missing vial 37.									
38	34.57	116.60	3.47	117.03	3.53	288.88	2.00	250.1	NpCal1C1a
39	28.69	157.29	3.20	157.57	3.24	348.52	2.00	237.5	NpCal1C2a
40	32.77	134.67	3.28	134.88	3.33	304.77	2.00	246.8	NpCal1C3a
41	30.73	162.73	3.03	163.05	3.07	325.06	2.00	237.0	NpCal1D1a
42	31.80	164.90	2.96	164.78	3.00	314.11	2.00	223.2	NpCal1D2a
43	32.72	160.36	2.97	161.01	3.00	305.36	2.00	233.2	NpCal1D3a
44	30.52	163.30	3.04	163.68	3.08	327.47	2.00	236.3	NpCal1E1a
45	33.01	189.95	2.69	189.87	2.72	302.59	2.00	213.9	NpCal1E2a
46	33.62	177.17	2.77	177.01	2.81	297.09	2.00	218.1	NpCal1E3a
47	29.65	182.25	2.90	183.27	2.92	336.95	2.00	242.9	NpCal1F1a
48	29.79	161.03	3.10	161.42	3.14	335.43	2.00	237.0	NpCal1F2a
49	31.62	185.05	2.78	185.37	2.82	315.90	2.00	238.1	NpCal1F3a
Missing vial 50.									
Missing vial 51.									
Missing vial 52.									
Missing vial 53.									

30 July 03 cont GBB

7/29/03 5:16:38 PM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 3
Protocol# 15 - Pa_Np_Exp_AB.lsa User: Bertetti

Missing vial 54.								
55	35.72	126.66	3.26	126.32	3.32	279.68	2.00	215.3 NpCal2C1a
56	35.49	136.26	3.13	137.10	3.17	281.41	2.00	241.4 NpCal2C2a
57	35.76	127.40	3.24	127.72	3.30	279.26	2.00	244.8 NpCal2C3a
58	38.46	119.92	3.25	119.90	3.31	259.63	2.00	241.2 NpCal2D1a
59	37.96	135.74	3.04	135.97	3.09	263.08	2.00	236.3 NpCal2_02a
60	38.55	132.98	3.05	133.24	3.10	259.07	2.00	236.8 NpCal2D3a
61	39.25	140.50	2.93	140.53	2.98	254.50	2.00	219.5 NpCal2E1a
62	39.41	134.09	3.01	134.46	3.05	253.41	2.00	236.3 NpCal2E2a
63	39.20	146.75	2.86	147.27	2.90	254.72	2.00	238.8 NpCal2E3a
64	38.78	147.18	2.87	147.96	2.91	257.51	2.00	250.2 NpCal2F1a
65	38.10	146.30	2.90	146.72	2.95	262.08	2.00	237.2 NpCal2F2a
66	39.01	142.48	2.92	142.59	2.96	256.01	2.00	234.5 NpCal2F3a
67	0.47	17784.76	2.19	17786.96	2.19	21588.98	1.99	206.4 46Aa1
68	0.48	20718.00	2.01	20717.99	2.01	20995.45	1.99	242.5 46Aa2

31 July 03 GBB

CO_2 analyzer calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured 1121 ppm CO_2 at 8:20 a.m. Concentration brought down to 760 by opening the transfer chamber and exposing the glove box to atmospheric air for about a minute.

01 Aug 03 GBB

CO_2 analyzer calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured 864 ppm CO_2 at 1:45 pm

04 Aug 03
~~04 July 03~~ GBB

CO_2 analyzer calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured 1044 ppm CO_2 at 8:30 a.m.

05 Aug 03 GBB

CO_2 analyzer calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured 1111 ppm CO_2 at 9:00 a.m. Concentration brought down to ~~end~~ ~~by opening transfer chamber~~ 8-5-03 980 by opening transfer chamber and exposing the glove box to atmospheric air for a few seconds.

06 Aug 03 GBB

CO_2 analyzer calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured 1053 ppm CO_2 at 9:00 a.m. Concentration brought down to 972 by opening transfer chamber and exposing the glove box to atmospheric air for a few seconds.

6 AUG 03 CONT BAW

Nopal Groundwater Anion Results

The following pages contain the results of the anion analysis of the Nopal groundwater from the 5-7-03 sampling event (556/100) and (556/106)

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: PB2-503-1D

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 07/14/03

Matrix: Water

Project No.: 20.06002.01.141

Task Order: 030714-6

SRR: 24617

Lab System ID: 230256

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	0.167	0.1
Chloride	19.7	2.0
Fluoride	2.08	0.1
Nitrate-N	0.141	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0578	0.01
Sulfate	463	40.0

6 AUG 03 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
DUPLICATE SUMMARY

Sample ID: PB2-503-1D

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 07/14/03

Matrix: Water

Project No.: 20.06002.01.141

Task Order: 030714-6

SRR: 24617

Lab System ID: 230256

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Bromide	0.167	0.191	13.4%
Chloride	19.7	20.1	2.01%
Fluoride	2.08	2.06	0.97%
Nitrate-N	0.141	0.135	4.35%
Nitrite-N	<0.1	<0.1	0.00%
Phosphate-P	0.0578	0.0599	3.57%
Sulfate	463	446	3.74%

SOUTHWEST RESEARCH INSTITUTE
MATRIX SPIKE SUMMARY

Sample ID: PB2-503-1D

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 07/14/03

Matrix: Water

Project No.: 20.06002.01.141

Task Order: 030714-6

SRR: 24617

Lab System ID: 230256

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Bromide	0.167	3.63	4.00	86.6%
Chloride	19.7	58.5	40.0	97.0%
Fluoride	2.08	3.03	1.00	95.0%
Nitrate-N	0.141	0.928	0.904	87.1%
Nitrite-N	<0.1	1.21	1.00	121%
Phosphate-P	0.0578	0.263	0.200	103%
Sulfate	463	2044	1600	98.8%

6 AUG 03 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA,SHEET

Sample ID: PB4-503-1D

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Task Order: 030714-6

Lab System ID: 230257

Client: Division 20

Date Received: 07/14/03

Project No.: 20.06002.01.141

SRR: 24617

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	3.50	0.1
Fluoride	0.742	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0112	0.01
Sulfate	11.2	0.1

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: Pocos-503-1D

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Task Order: 030714-6

Lab System ID: 230258

Client: Division 20

Date Received: 07/14/03

Project No.: 20.06002.01.141

SRR: 24617

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	4.14	0.1
Fluoride	1.37	0.1
Nitrate-N	1.15	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0107	0.01
Sulfate	66.0	2.0

6 AUG 03 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
LABORATORY CONTROL SAMPLE

Sample ID: LCSW

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Task Order: 030714-6

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 20.06002.01.141

SRR: 24617

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Bromide	406	400	102%
Chloride	202	200	101%
Fluoride	101	100	101%
Nitrate-N	89.9	90.4	99.4%
Nitrite-N	106	100	106%
Phosphate-P	2.40	2.31	104%
Sulfate	394	400	98.5%

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE
BLANK SUMMARY

Sample ID: PBW

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Task Order: 030714-6

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 20.06002.01.141

SRR: 24617

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	<0.1	0.1
Fluoride	<0.1	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.01	0.01
Sulfate	<0.1	0.1

NA- Not Applicable.

07 Aug 03 GB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 1044 ppm CO_2. Concentration lowered to 916 by opening the transfer chamber and exposing the glove box to atmospheric air for a few seconds.

08 Aug 03 GB

CO_2 analyzer calibrated with N_2 & 1000 ppm CO_2 in N_2. Contents of glove box measured 995 ppm CO_2.

The chain of custody forms for the Na/Li ion exchange on zeolite at 0.1N experiment from 556/135-137 are included on the following pages. Further analysis for Li^+ has also been requested.

GB 8-8-03

08 Aug 03 cont GB

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Requested Turnaround:
☒ 2 Weeks
☐ 3 Weeks
☐ Other: _____

Client Purchase Order/Other ID | Site/Zone ID | SwRI Contact: Mike Damman

Shipper Name/Address: Jennifer Brown CNWRA- div 20 bld 57

Client

Analyses Requested

REMARKS
Preservation
a = HCl to pH <2
b = HNO_3 to pH <2
c = H_2SO_4 to pH <2
d = NaOH to pH >12
e = Cool (4°C±2°C)
f = Other (specify) none

Nuclear safety related - use appropriate QA procedures

POC- Jennifer Brown x 2193 or Paul Bertetti x 5229

SwRI Project#: 1.20.06002.01.141

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Ca, K, Na, Si, Al by ICP
NaLi0.1-1	7/25/03		B		1	X
NaLi0.1-2						X
NaLi0.1-3						X
NaLi0.1-4						X
NaLi0.1-5						X
NaLi0.1-6						X
NaLi0.1-7						X
NaLi0.1-8						X
NaLi0.1-9						X
NaLi0.1-10						X

Matrix Types: A – Air, B – Biota, D - Dust, E – Emission/Stack, L - Liquid, P – Product, Sd - Solid, S – Soil, SED – Sediment, T - Tissue, W - Water, WP - Wipe

Sample Types: D - Duplicate, ER – Equipment Rinsate, ES – Environmental Sample, FB – Field Blank, FD – Field Duplicate, MS – Matrix Spike, MSD – Matrix Spike Dup, TB – Trip Blank

Relinquished by (Print/Signature) | Date | Time
Received by (Print/Signature) | Date | Time
Relinquished by (Print/Signature) | Date | Time
Received by (Print/Signature) | Date | Time
Relinquished by (Print/Signature) | Date | Time
Received by (Print/Signature) | Date | Time

Jennifer Brown | 7/28/03 | 1110

Samples Disposed: Date | Time
Samples Disposed by:

Temp: 22°C | Therm #: 027

Comments: 556/135

Div 01 COC Form 01-01-001, Rev 8/02

Page ___ of ___

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8-8-23
BW

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8A_03
BW

08 Aug 03 cont GB

Shipper Name/Address: Jennifer Brown CNWRA-div 20 bldg 57

Client:

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround:
- [x] 2 Weeks
- [ ] 3 Weeks
- [ ] Other:

SwRI Contact: Mike Damman

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Ca, K, Na, Si, Al by ICP	Intact
NaLi0.1-11	7-21-03		W		1	X	
NaLi0.1-12						X	
NaLi0.1-13						X	
NaLi0.1-14						X	
NaLi0.1-15						X	
NaLi0.1-16						X	
NaLi0.1-17						X	
NaLi0.1-18						X	
NaLi0.1-19						X	
NaLi0.1-20						X	

REMARKS
Preservation
- a = HCl to pH <2
- b = HNO_3 to pH <2
- c = H_2SO_4 to pH <2
- d = NaOH to pH >12
- e = Cool (4°C±2°C)
- f = Other (specify) none

Nuclear safety related - use appropriate QA procs

POC - Jennifer Brown x 2193 or Paul Bertetti x 5228

Matrix Types:
- **A** – Air
- **B** – Biota
- **D** - Dust
- **E** – Emission/Stack
- **L** - Liquid
- **P** – Product
- **Sd** - Solid
- **S** – Soil
- **SED** – Sediment
- **T** - Tissue
- **W** - Water
- **WP** - Wipe

Sample Types:
- **D** - Duplicate
- **ER** – Equipment Rinsate
- **ES** – Environmental Sample
- **FB** – Field Blank
- **FD** – Field Duplicate
- **MS** – Matrix Spike
- **MSD** – Matrix Spike Dup
- **TB** – Trip Blank

Temp: 22°C Therm #: 027

Comments: 556/135

	Date	Time
Relinquished by (Print/Signature): Jennifer Brown / GB		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 1.20.06002.01.141

Received by SwRI Lab: (Signature)

Date: 7/21/03 Time: 1110

Samples Disposed: Date: Time:

Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

Page 1 of 2

08 Aug 03 cont GB

Shipper Name/Address: Jennifer Brown CNWRA-div 20 bld 57

Client:

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround:
- [x] 2 Weeks
- [ ] 3 Weeks
- [ ] Other:

SwRI Contact: Mike Damman

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Ca, K, Na, Si, Al by ICP	Intact
NaLi0.1-21	7-21-03		W		1	X	
NaLi0.1-22						X	
NaLi0.1-23						X	
NaLi0.1-24						X	
NaLi0.1-25						X	
NaLi0.1-A						X	
NaLi0.1-B						X	
NaLi0.1-C						X	
NaLi0.1-D						X	
NaLi0.1-E						X	

REMARKS
Preservation
- a = HCl to pH <2
- b = HNO_3 to pH <2
- c = H_2SO_4 to pH <2
- d = NaOH to pH >12
- e = Cool (4°C±2°C)
- f = Other (specify) none

Nuclear safety related - use appropriate QA procedures

POC. Jennifer Brown x 2193 or Paul Bertetti x 5228

Matrix Types:
- **A** – Air
- **B** – Biota
- **D** - Dust
- **E** – Emission/Stack
- **L** - Liquid
- **P** – Product
- **Sd** - Solid
- **S** – Soil
- **SED** – Sediment
- **T** - Tissue
- **W** - Water
- **WP** - Wipe

Sample Types:
- **D** - Duplicate
- **ER** – Equipment Rinsate
- **ES** – Environmental Sample
- **FB** – Field Blank
- **FD** – Field Duplicate
- **MS** – Matrix Spike
- **MSD** – Matrix Spike Dup
- **TB** – Trip Blank

Temp: 22°C Therm #: 027

Comments: 556/135

	Date	Time
Relinquished by (Print/Signature): Jennifer Brown / GB		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 1.20.06002.01.141

Received by SwRI Lab: (Signature)

Date: 7/21/03 Time: 1110

Samples Disposed: Date: Time:

Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

Page ____ of ____

08 Aug 03 cont QA3

Shipper Name/Address: Jennifer Brown CNWRA - div 20 bld 57

Client:

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround:
- [x] 2 Weeks
- [ ] 3 Weeks
- [ ] Other: _____

SwRI Contact: Mike Dammann

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Ca, K, Na, Si, Al by ICP	Filter
NaLi0.1-F	7.21.03		W		1	X	✓
QA1	1		1		1	X	✓
QA2	1		1		1	X	✓

REMARKS

Preservation
- **a** = HCl to pH <2
- **b** = HNO_3 to pH <2
- **c** = H_2SO_4 to pH <2
- **d** = NaOH to pH >12
- **e** = Cool (4°C±2°C)
- **f** = Other (specify) none

Nuclear Safety related - use appropriate QA procedures

POC - Jennifer Brown x2193 or Paul Bertetti x5228

Matrix Types:
- **A** – Air
- **B** – Biota
- **D** - Dust
- **E** – Emission/Stack
- **L** - Liquid
- **P** – Product
- **Sd** - Solid
- **S** – Soil
- **SED** – Sediment
- **T** - Tissue
- **W** - Water
- **WP** - Wipe

Sample Types:
- **D** - Duplicate
- **ER** – Equipment Rinsate
- **ES** – Environmental Sample
- **FB** – Field Blank
- **FD** – Field Duplicate
- **MS** – Matrix Spike
- **MSD** – Matrix Spike Dup
- **TB** – Trip Blank

Temp: 22.0°C Therm #: 027

Comments: 556/135

	Date	Time
Relinquished by (Print/Signature): Jennifer Brown /		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 1.20.060002.01.141

Received by SwRI Lab: (Signature)

Date: 7/21/03 Time: 1110

Samples Disposed: Date: Time:

Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

Page _____ of _____

08 Aug 03 cont QA3

Shipper Name/Address: Jennifer Brown CNWRA - div 20 bld 57

Client:

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround:
- [x] 2 Weeks
- [ ] 3 Weeks
- [ ] Other: _____

SwRI Contact: Mike Dammann

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Ca, K, Na, Si, Al by ICP	Filter
NaLi0.1-1b	7-22-03		W		1	X	✓
NaLi0.1-2b	1		1		1	X	✓
NaLi0.1-4b	1		1		1	X	✓

REMARKS

Preservation
- **a** = HCl to pH <2
- **b** = HNO_3 to pH <2
- **c** = H_2SO_4 to pH <2
- **d** = NaOH to pH >12
- **e** = Cool (4°C±2°C)
- **f** = Other (specify) none

Nuclear Safety related - use appropriate QA procedures

POC - Jennifer Brown x2193 or Paul Bertetti x5228

to cancel => D

Matrix Types:
- **A** – Air
- **B** – Biota
- **D** - Dust
- **E** – Emission/Stack
- **L** - Liquid
- **P** – Product
- **Sd** - Solid
- **S** – Soil
- **SED** – Sediment
- **T** - Tissue
- **W** - Water
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Sample Types:
- **D** - Duplicate
- **ER** – Equipment Rinsate
- **ES** – Environmental Sample
- **FB** – Field Blank
- **FD** – Field Duplicate
- **MS** – Matrix Spike
- **MSD** – Matrix Spike Dup
- **TB** – Trip Blank

Temp: 22°C Therm #: 027

Comments: 556/137

	Date	Time
Relinquished by (Print/Signature): Jennifer Brown /		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 1.20.060002.01.141

Received by SwRI Lab: (Signature)

Date: 7/22/03 Time: 1115

Samples Disposed: Date: Time:

Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

Page 1 of 1

11 AUG 03 BAW

CO_2 conc of Glove Box

CO_2 analyzer (Gas Hound Li-800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1172 ppm CO_2. Conc brought down to 966 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

12 AUG 03 BAW

CO_2 conc of Glove Box

CO_2 analyzer (Gas Hound Li 800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1048 ppm CO_2. Conc brought down to 967 ppm CO_2 by opening transfer chamber and exposing the ~~b~~ BW 12 Aug 03 glove box to ambient air for a few seconds

14 AUG 03 BAW

BW 8-14-03

CO_2 conc of ~~Glov~~ Glove Box

- CO_2 analyzer (Gas Hound Li 800) calibrated

14 AUG 03 CONT BAW

with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1101 ppm CO_2. Conc brought down to 995 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

15 AUG 03 BAW

CO_2 conc of Glove Box

CO_2 analyzer (Gas Hound Li 800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1073 ppm CO_2. Conc brought down to 948 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds

18 AUG 03 BW

18 AUG 03 BAW

CO_2 Conc. of Glove Box

CO_2 analyzer (Gas Hound Li 800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1123 ppm CO_2, Conc brought down to 967 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds

19 AUG 03 BAW

CO_2 Conc. of Glove Box

CO_2 analyzer (Gas Hound Li 800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1020 ppm CO_2. Conc brought down to 995 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds

21 AUG 03 BAW

21 AUG 03 BAW

SGS - Lakefield Results for ICP + ICPMS Analysis of Groundwater Samples

Twenty four total samples were sent
16 Samples were from the Aug + Sept 2002 Nye county EWDP well sampling event (14 with 2 duplicates. See 556/64
2 samples were blind standards (556/61+64)
Six samples were from the May 2003 Nopal sampling event (556/107)
Purchase Order 3702460
Legends for the samples are available on pages indicated above.

- QA1 was CNWRA1, QA2 was CNWRA2
  For target conc and recoveries, see 556/168
  Recoveries look good. Potassium was high but this analyte is normally a bad actor.
- Precision analysis of duplicates on 556/169
  Recoveries look good. Higher % recoveries were due to small differences between small raw data numbers
- SGS Lakefield QA samples look good 556/166-167
  The blank was clean. Replicate inst std recoveries were ~~god~~ good (BW 8-21-03). Spike recoveries looked good (Copper noted),
- Analysis Accepted

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2038 FAX: 705-652-6441

Southwest Research Institute
Attn : Bradley Werling bwerling@swri.org

6220 Culebra Road
San Antonio, TX, 78238-5166
USA

Phone: 210-522-6565
Fax:

Tuesday, August 12, 2003

Date Rec. : 17 July 2003
LR Report: **CA4383-JUL03**
Reference: PO#3702460

Copy: #2

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Date	2: Analysis Time	3: CNWRA 1	4: CNWRA 2	5: CNWRA 3	6: CNWRA 4	7: CNWRA 5	8: CNWRA 6	9: CNWRA 7	10: CNWRA 8	11: CNWRA 9	12: CNWRA 10	13: CNWRA 11	14: CNWRA 12
Sample Date & Time			23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03
Temperature [°C]	---	---	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5
Silver [mg/L]	30-Jul-03	11:00	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Aluminum [mg/L]	30-Jul-03	11:00	0.013	0.006	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	0.004
Arsenic [mg/L]	30-Jul-03	11:00	< 0.005	0.010	0.011	0.012	0.005	0.007	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.012
Barium [mg/L]	30-Jul-03	11:00	< 0.001	0.005	0.008	0.010	0.005	0.005	0.012	0.011	0.006	0.007	0.009	0.012
Beryllium [mg/L]	30-Jul-03	11:00	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Boron [mg/L]	21-Jul-03	08:23	< 0.05	0.16	0.13	0.13	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.13
Bismuth [mg/L]	21-Jul-03	08:23	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Calcium [mg/L]	21-Jul-03	08:23	5.08	9.62	13.3	14.8	19.6	14.8	24.7	17.1	19.3	18.1	15.1	12.5
Cadmium [mg/L]	30-Jul-03	11:00	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cobalt [mg/L]	30-Jul-03	11:00	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chromium [mg/L]	30-Jul-03	11:00	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper [mg/L]	30-Jul-03	11:00	0.0027	< 0.0008	< 0.0008	< 0.0008	0.0015	0.0034	0.0017	< 0.0008	< 0.0008	< 0.0008	< 0.0008	< 0.0008
Iron [mg/L]	21-Jul-03	08:22	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.15	0.16	0.13	0.07	< 0.05
Potassium [mg/L]	21-Jul-03	08:22	5.67	2.17	6.71	6.72	5.97	6.53	6.76	6.52	6.54	6.25	6.36	6.48
Lithium [mg/L]	30-Jul-03	11:00	< 0.004	0.060	0.039	0.038	0.037	0.039	0.037	0.036	0.035	0.036	0.036	0.040
Magnesium [mg/L]	21-Jul-03	08:22	0.95	0.15	2.05	2.29	2.94	2.58	3.44	2.72	3.06	2.90	2.71	1.96
Manganese [mg/L]	21-Jul-03	08:22	< 0.002	0.005	0.006	< 0.002	0.003	0.003	< 0.002	0.022	0.022	0.026	0.018	0.024
Molybdenum [mg/L]	30-Jul-03	11:00	< 0.0003	0.0065	0.012	0.0086	0.0070	0.018	0.0051	0.0067	0.0048	0.0060	0.0066	0.016
Sodium [mg/L]	21-Jul-03	08:21	51.0	65.2	46.6	45.7	38.8	45.5	42.2	41.8	39.1	39.8	40.4	49.6

Accredited by the Standards Council of Canada and CAEAL for specific registered tests.
Data reported represents the sample submitted to SGS Lakefield Research. Reproduction of this analytical report in full or in part is prohibited without prior written approval.

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2038 FAX: 705-652-6441

LR Report : **CA4383-JUL03**

Analysis	1: Analysis Date	2: Analysis Time	3: CNWRA 1	4: CNWRA 2	5: CNWRA 3	6: CNWRA 4	7: CNWRA 5	8: CNWRA 6	9: CNWRA 7	10: CNWRA 8	11: CNWRA 9	12: CNWRA 10	13: CNWRA 11	14: CNWRA 12
Nickel [mg/L]	30-Jul-03	11:00	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Lead [mg/L]	30-Jul-03	11:00	0.0004	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004	0.0002	< 0.0002	< 0.0002	< 0.0002
Antimony [mg/L]	30-Jul-03	11:00	< 0.0004	0.0005	0.0004	0.0004	< 0.0004	0.0007	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Selenium [mg/L]	30-Jul-03	11:00	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Silicon [mg/L]	21-Jul-03	08:21	< 0.05	22.3	26.4	27.1	26.2	24.2	24.8	18.5	21.3	20.1	21.9	25.1
Tin [mg/L]	30-Jul-03	11:00	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Strontium [mg/L]	30-Jul-03	11:00	0.0022	0.026	0.069	0.074	0.071	0.072	0.10	0.085	0.089	0.079	0.063	0.057
Titanium [mg/L]	30-Jul-03	11:00	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Thallium [mg/L]	30-Jul-03	11:00	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	30-Jul-03	11:00	< 0.0002	0.0024	0.0009	0.0010	0.0005	0.0009	0.0011	0.0005	0.0006	0.0006	0.0004	0.0009
Vanadium [mg/L]	30-Jul-03	11:00	< 0.0009	0.0024	0.0058	0.0060	0.0037	0.0035	0.0031	0.0020	0.0018	0.0017	0.0022	0.0071
Tungsten [mg/L]	30-Jul-03	11:00	< 0.0002	0.0021	0.0016	0.0089	0.0020	0.0010	0.0007	0.0009	0.0006	0.0006	0.0007	0.0028
Yttrium [mg/L]	30-Jul-03	11:00	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Zinc [mg/L]	30-Jul-03	11:00	0.006	0.001	0.004	0.006	0.011	0.007	0.005	0.003	0.003	0.002	0.003	0.001
Zirconium [mg/L]	30-Jul-03	11:00	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004

Brian Graham B.Sc.
Project Coordinator
Environmental Services, Analytical

Accredited by the Standards Council of Canada and CAEAL for specific registered tests.
Data reported represents the sample submitted to SGS Lakefield Research. Reproduction of this analytical report in full or in part is prohibited without prior written approval.

21 AUG 03 cont Btw

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2038 FAX: 705-652-6441

Southwest Research Institute
Attn : Bradley Werling bwerling@swri.org

6220 Culebra Road
San Antonio, TX, 78238-5166
USA

Phone: 210-522-6565
Fax:

Tuesday, August 12, 2003

Date Rec. : 17 July 2003
LR Report: **CA4383-JUL03**
Reference: PO#3702460

Copy: #2

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Date	2: Analysis Time	15: CNWRA 13	16: CNWRA 14	17: CNWRA 15	18: CNWRA 16	19: CNWRA 17	20: CNWRA 18	21: CNWRA 19	22: CNWRA 20	23: CNWRA 21	24: CNWRA 22	25: CNWRA 23	26: CNWRA 24
Sample Date & Time			23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	23-Jun-03	14-Jul-03	14-Jul-03	14-Jul-03	14-Jul-03	14-Jul-03	14-Jul-03
Temperature [°C]	---	---	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5
Silver [mg/L]	30-Jul-03	11:00	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Aluminum [mg/L]	30-Jul-03	11:00	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	0.084	0.10	0.015	0.015
Arsenic [mg/L]	30-Jul-03	11:00	0.010	< 0.005	< 0.005	0.012	< 0.005	< 0.005	0.022	0.022	0.033	0.033	0.028	0.028
Barium [mg/L]	30-Jul-03	11:00	0.027	0.026	0.026	0.008	0.026	< 0.001	0.026	0.026	0.031	0.031	0.013	0.013
Beryllium [mg/L]	30-Jul-03	11:00	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Boron [mg/L]	21-Jul-03	08:23	0.14	0.24	0.24	0.14	0.23	< 0.05	0.06	0.09	0.13	0.13	< 0.05	< 0.05
Bismuth [mg/L]	21-Jul-03	08:23	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Calcium [mg/L]	21-Jul-03	08:23	13.0	74.7	74.6	13.8	74.5	50.0	65.9	65.3	4.04	4.04	20.1	20.1
Cadmium [mg/L]	30-Jul-03	11:00	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0022	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cobalt [mg/L]	30-Jul-03	11:00	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chromium [mg/L]	30-Jul-03	11:00	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.002	0.10	0.10	< 0.001	< 0.001
Copper [mg/L]	30-Jul-03	11:00	< 0.0008	< 0.0008	< 0.0008	0.0011	< 0.0008	< 0.0008	0.0009	0.0010	0.027	0.033	< 0.0008	< 0.0008
Iron [mg/L]	21-Jul-03	08:22	< 0.05	0.67	0.24	< 0.05	0.23	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Potassium [mg/L]	21-Jul-03	08:22	6.87	7.27	7.06	6.72	6.93	5.63	2.48	2.49	92.9	93.0	2.86	2.85
Lithium [mg/L]	30-Jul-03	11:00	0.038	0.12	0.12	0.039	0.12	< 0.004	0.033	0.033	0.24	0.25	< 0.004	< 0.004
Magnesium [mg/L]	21-Jul-03	08:22	2.47	38.9	38.5	2.06	38.7	53.5	8.06	8.25	0.027	0.026	0.39	0.38
Manganese [mg/L]	21-Jul-03	08:22	0.018	0.016	0.013	0.006	0.013	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Molybdenum [mg/L]	30-Jul-03	11:00	0.0068	0.0032	0.0035	0.012	0.0035	< 0.0003	0.0047	0.0047	0.30	0.31	0.048	0.047
Sodium [mg/L]	21-Jul-03	08:21	44.4	80.1	79.1	45.5	79.6	5.17	26.7	26.5	378	377	7.19	7.17

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LR Report : **CA4383-JUL03**

Analysis	1: Analysis Date	2: Analysis Time	15: CNWRA 13	16: CNWRA 14	17: CNWRA 15	18: CNWRA 16	19: CNWRA 17	20: CNWRA 18	21: CNWRA 19	22: CNWRA 20	23: CNWRA 21	24: CNWRA 22	25: CNWRA 23	26: CNWRA 24
Nickel [mg/L]	30-Jul-03	11:00	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.002	0.001	0.001
Lead [mg/L]	30-Jul-03	11:00	0.0003	< 0.0002	0.0002	< 0.0002	0.0002	0.0003	< 0.0002	< 0.0002	0.11	0.11	0.0013	0.0005
Antimony [mg/L]	30-Jul-03	11:00	< 0.0004	< 0.0004	< 0.0004	0.0005	< 0.0004	< 0.0004	< 0.0004	< 0.0004	0.031	0.032	0.0009	0.0009
Selenium [mg/L]	30-Jul-03	11:00	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.007	0.005	< 0.005	< 0.005
Silicon [mg/L]	21-Jul-03	08:21	26.0	10.3	10.5	26.4	10.6	< 0.05	11.2	11.0	7.90	7.84	4.36	4.35
Tin [mg/L]	30-Jul-03	11:00	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	0.004	< 0.001	< 0.001
Strontium [mg/L]	30-Jul-03	11:00	0.066	0.51	0.52	0.068	0.51	0.0014	0.64	0.64	0.41	0.40	0.099	0.097
Titanium [mg/L]	30-Jul-03	11:00	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.005	0.005	< 0.003	< 0.003
Thallium [mg/L]	30-Jul-03	11:00	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	30-Jul-03	11:00	0.0007	0.0052	0.0053	0.0009	0.0051	< 0.0002	0.0051	0.0051	0.13	0.13	0.0012	0.0011
Vanadium [mg/L]	30-Jul-03	11:00	0.0056	< 0.0009	< 0.0009	0.0056	< 0.0009	< 0.0009	0.0060	0.0059	0.012	0.013	0.0014	0.0014
Tungsten [mg/L]	30-Jul-03	11:00	0.0016	0.0006	0.0004	0.0015	0.0004	< 0.0002	0.0003	0.0002	0.0050	0.0041	0.018	0.018
Yttrium [mg/L]	30-Jul-03	11:00	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Zinc [mg/L]	30-Jul-03	11:00	0.003	0.023	0.059	0.004	0.058	0.005	0.016	0.015	0.008	0.010	0.003	0.003
Zirconium [mg/L]	30-Jul-03	11:00	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004

Brian Graham B.Sc.
Project Coordinator
Environmental Services, Analytical

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Southwest Research Institute
Attn : Bradley Werling bwerling@swri.org

6220 Culebra Road
San Antonio, TX, 78238-5166
USA

Phone: 210-522-6565
Fax:

Tuesday, August 12, 2003

Date Rec. : 17 July 2003
LR Report: **CA4383-JUL03**
Reference: PO#3702460

Copy: #2

CERTIFICATE OF ANALYSIS
Final Report - QA/QC

Analysis	1: Analysis Date	2: Analysis Time	27: Blank	28: Replicate Instrument Std	29: Spike
Sample Date & Time					
Temperature [°C]	---	---	---	---	---
Silver [mg/L]	30-Jul-03	11:00	< 0.0001	100%	100%
Aluminum [mg/L]	30-Jul-03	11:00	< 0.004	100%	97%
Arsenic [mg/L]	30-Jul-03	11:00	< 0.005	100%	110%
Barium [mg/L]	30-Jul-03	11:00	< 0.001	100%	102%
Beryllium [mg/L]	30-Jul-03	11:00	< 0.005	100%	100%
Boron [mg/L]	21-Jul-03	08:23	< 0.05	95.4%	---
Bismuth [mg/L]	21-Jul-03	08:23	< 0.05	102%	---
Calcium [mg/L]	21-Jul-03	08:23	< 0.05	101%	---
Cadmium [mg/L]	30-Jul-03	11:00	< 0.0001	100%	104%
Cobalt [mg/L]	30-Jul-03	11:00	< 0.0003	100%	102%
Chromium [mg/L]	30-Jul-03	11:00	< 0.001	100%	99%
Copper [mg/L]	30-Jul-03	11:00	< 0.0008	100%	120%
Iron [mg/L]	21-Jul-03	08:22	< 0.05	103%	---
Potassium [mg/L]	21-Jul-03	08:22	< 0.02	98.3%	---
Lithium [mg/L]	30-Jul-03	11:00	< 0.004	100%	100%
Magnesium [mg/L]	21-Jul-03	08:22	< 0.005	99.5%	---
Manganese [mg/L]	21-Jul-03	08:22	< 0.002	101%	---
Molybdenum [mg/L]	30-Jul-03	11:00	< 0.0003	98%	97%
Sodium [mg/L]	21-Jul-03	08:21	< 0.05	103%	---

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LR Report : **CA4383-JUL03**

Analysis	1: Analysis Date	2: Analysis Time	27: Blank	28: Replicate Instrument Std	29: Spike
Nickel [mg/L]	30-Jul-03	11:00	< 0.001	100%	98%
Lead [mg/L]	30-Jul-03	11:00	< 0.0002	100%	102%
Antimony [mg/L]	30-Jul-03	11:00	< 0.0004	100%	104%
Selenium [mg/L]	30-Jul-03	11:00	< 0.005	100%	100%
Silicon [mg/L]	21-Jul-03	08:21	< 0.05	106%	---
Tin [mg/L]	30-Jul-03	11:00	< 0.001	100%	---
Strontium [mg/L]	30-Jul-03	11:00	< 0.0002	100%	104%
Titanium [mg/L]	30-Jul-03	11:00	< 0.003	100%	---
Thallium [mg/L]	30-Jul-03	11:00	< 0.0002	100%	101%
Uranium [mg/L]	30-Jul-03	11:00	< 0.0002	100%	101%
Vanadium [mg/L]	30-Jul-03	11:00	< 0.0009	98%	105%
Tungsten [mg/L]	30-Jul-03	11:00	< 0.0002	97%	---
Yttrium [mg/L]	30-Jul-03	11:00	< 0.0001	100%	---
Zinc [mg/L]	30-Jul-03	11:00	< 0.001	98%	109%
Zirconium [mg/L]	30-Jul-03	11:00	< 0.0004	100%	---

Brian Graham B.Sc.
Project Coordinator
Environmental Services, Analytical

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21 AUG 03 CONT BAW

QA (Blind Standard) results for SGS-Lakefield
PO 3702460

		Sample ID					
		CNWRA 1	CNWRA 1	CNWRA 1	CNWRA 18	CNWRA 18	CNWRA 18
Analysis	Units		Target	% diff		Target	% diff
Ag	mg/L	< 0.0001			< 0.0001		
Al	mg/L	0.013			< 0.004		
As	mg/L	< 0.005			< 0.005		
Ba	mg/L	< 0.001			< 0.001		
Be	mg/L	< 0.005			< 0.005		
B	mg/L	< 0.05			< 0.05		
Bi	mg/L	< 0.05			< 0.05		
Ca	mg/L	5.08	5.00	1.60	50.0	50.0	0.00
Cd	mg/L	0.0002			0.0022		
Co	mg/L	< 0.0003			< 0.0003		
Cr	mg/L	< 0.001			< 0.001		
Cu	mg/L	0.0027			< 0.0008		
Fe	mg/L	< 0.05			< 0.05		
K	mg/L	5.67	5.00	13.40	5.63	5.00	12.6
Li	mg/L	< 0.004			< 0.004		
Mg	mg/L	0.95	1.00	-5.00	53.5	50.0	7.00
Mn	mg/L	< 0.002			< 0.002		
Mo	mg/L	< 0.0003			< 0.0003		
Na	mg/L	51.0	50.0	2.00	5.17	5.00	3.40
Ni	mg/L	< 0.001			< 0.001		
Pb	mg/L	0.0004			0.0003		
Sb	mg/L	< 0.0004			< 0.0004		
Se	mg/L	< 0.005			< 0.005		
Si	mg/L	< 0.05			< 0.05		
Sn	mg/L	< 0.001			< 0.001		
Sr	mg/L	0.0022			0.0014		
Ti	mg/L	< 0.003			< 0.003		
Tl	mg/L	< 0.0002			< 0.0002		
U	mg/L	< 0.0002			< 0.0002		
V	mg/L	< 0.0009			< 0.0009		
W	mg/L	< 0.0002			< 0.0002		
Y	mg/L	< 0.0001			< 0.0001		
Zn	mg/L	0.006			0.005		
Zr	mg/L	< 0.0004			< 0.0004		

Target mass source: 556/61
Legend source: 556/64
Results source: 556/162-165

21 AUG 03 CONT BAW

DUPLICATE results for SGS-Lakefield
PO 3702460

		Sample ID					
		CNWRA 3	CNWRA 16	dup3	CNWRA 15	CNWRA 17	dup 15
Analysis	Units		dup of 3	% diff		dup of 15	% diff
Ag	mg/L	< 0.0001	< 0.0001		< 0.0001	< 0.0001	
Al	mg/L	< 0.004	< 0.004		< 0.004	< 0.004	
As	mg/L	0.011	0.012	9.09	< 0.005	< 0.005	
Ba	mg/L	0.008	0.008	0.00	0.026	0.026	0.00
Be	mg/L	< 0.005	< 0.005		< 0.005	< 0.005	
B	mg/L	0.13	0.14	7.69	0.24	0.23	-4.17
Bi	mg/L	< 0.05	< 0.05		< 0.05	< 0.05	
Ca	mg/L	13.3	13.8	3.76	74.6	74.5	-0.13
Cd	mg/L	< 0.0001	< 0.0001		< 0.0001	< 0.0001	
Co	mg/L	< 0.0003	< 0.0003		< 0.0003	< 0.0003	
Cr	mg/L	< 0.001	< 0.001		< 0.001	< 0.001	
Cu	mg/L	< 0.0008	0.0011		< 0.0008	< 0.0008	
Fe	mg/L	< 0.05	< 0.05		0.24	0.23	-4.17
K	mg/L	6.71	6.72	0.15	7.06	6.93	-1.84
Li	mg/L	0.039	0.039	0.00	0.12	0.12	0.00
Mg	mg/L	2.05	2.06	0.49	38.5	38.7	0.52
Mn	mg/L	0.006	0.006	0.00	0.013	0.013	0.00
Mo	mg/L	0.012	0.012	0.00	0.0035	0.0035	0.00
Na	mg/L	46.6	45.5	-2.36	79.1	79.6	0.63
Ni	mg/L	< 0.001	< 0.001		< 0.001	< 0.001	
Pb	mg/L	< 0.0002	< 0.0002		0.0002	0.0002	0.00
Sb	mg/L	0.0004	0.0005	25.00	< 0.0004	< 0.0004	
Se	mg/L	< 0.005	< 0.005		< 0.005	< 0.005	
Si	mg/L	26.4	26.4	0.00	10.5	10.6	0.95
Sn	mg/L	< 0.001	< 0.001		< 0.001	< 0.001	
Sr	mg/L	0.069	0.068	-1.45	0.52	0.51	-1.92
Ti	mg/L	< 0.003	< 0.003		< 0.003	< 0.003	
Tl	mg/L	< 0.0002	< 0.0002		< 0.0002	< 0.0002	
U	mg/L	0.0009	0.0009	0.00	0.0053	0.0051	-3.77
V	mg/L	0.0058	0.0056	-3.45	< 0.0009	< 0.0009	
W	mg/L	0.0016	0.0015	-6.25	0.0004	0.0004	0.00
Y	mg/L	< 0.0001	< 0.0001		< 0.0001	< 0.0001	
Zn	mg/L	0.004	0.004	0.00	0.059	0.058	-1.69
Zr	mg/L	< 0.0004	< 0.0004		< 0.0004	< 0.0004	

Legend source: 556/64
Results source: 556/162-165

21 Aug 03 CONT BAW

Div 01 ICP results for NpCA 11 + 12 Series Experimental + Reference Solns

26 Samples from 556/102 - 106 + 98
8 Series 11 samples (suffix 1+2)
8 Series 12 samples (suffix 1+2)
8 Reference (4 filtered + 4 unfilter)
2 QA Samples (556/98)
The 2 QA samples were aliquots from a single prepared standard so they are blind standards and duplicates
The series 11+12 suffix 3 samples were analyzed on the TOC for inorganic content and were not available for ICP analysis (See 556/121)
Legend info on 556/97+98+82

CNWRA blind stds 11Q1 + 11Q2 (results on 556/172) look good (particularly the precision part). Potassium, normally the poorest actor, was the poorest recovery with the accuracy info.
Div01 QA samples looked good, Blanks were clean, Duplicates looked good. Lab Control and Matrix spikes looked good with Potassium being the poorest actor.
Accepted data.

21 Aug 03 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Lab Name: Southwest Research Institute
Client: Division 20
Lab Code: SwRI
Date Received: 07/14/03
Matrix: Water
Project No.: 06002.01.141
SRR: 24618
TO: 030714-8

Sample ID	Lab System ID	Calcium Results (mg/L)	Magnesium Results (mg/L)	Manganese Results (mg/L)	Potassium Results (mg/L)	Sodium Results (mg/L)	Strontium Results (mg/L)
Prep Blank	----	<0.075	<0.05	<0.005	<0.1	<0.2	<0.005
Lab Control	----	20.0	20.7	0.514	17.4	18.3	4.17
True Value	----	20.0	20.0	0.500	20.0	20.0	4.00
Recovery	----	100%	104%	103%	87.0%	91.5%	104%
Prep Blank	----	<0.075	<0.05	<0.005	<0.1	<0.2	<0.005
Lab Control	----	20.5	20.9	0.515	17.7	18.8	4.18
True Value	----	20.0	20.0	0.500	20.0	20.0	4.00
Recovery	----	103%	105%	103%	88.5%	94.0%	105%
11 C 1	230259	293	<0.05	<0.005	10.3	56.3	0.054
Duplicate result	230259	291	----	----	----	----	----
RPD	230259	0.68%	----	----	----	----	----
11 C 2	230260	296	<0.05	<0.005	4.49	55.0	0.053
Spike result	230260	503	----	----	28.4	78.1	----
Spike added	230260	200	----	----	20.0	20.0	----
Recovery	230260	104%	----	----	120%	116%	----
11 D 1	230261	78.6	<0.05	<0.005	3.53	59.3	0.023
11 D 2	230262	79.1	<0.05	<0.005	3.34	56.6	0.022
11 E 1	230263	22.7	<0.05	<0.005	4.79	78.0	0.014
11 E 2	230264	23.1	<0.05	<0.005	3.00	70.3	0.012
11 F 1	230265	7.68	<0.05	<0.005	4.82	109	0.010
11 F 2	230266	7.61	<0.05	0.005	3.71	109	0.010
11 Q 1	230267	98.8	<0.05	<0.005	22.9	103	<0.005
Duplicate result	230267	----	<0.05	<0.005	22.1	99.4	<0.005
RPD	230267	----	0.00%	0.00%	3.56%	3.56%	0.00%
11 Q 2	230268	96.5	<0.05	<0.005	22.2	99.8	<0.005
Spike result	230268	----	20.8	0.513	----	----	4.16
Spike added	230268	----	20.0	0.500	----	----	4.00
Recovery	230268	----	104%	103%	----	----	104%
12 C 1	230269	291	<0.05	<0.005	2.37	48.0	0.050
12 C 2	230270	292	<0.05	<0.005	2.99	49.5	0.052
12 D 1	230271	78.1	<0.05	<0.005	2.94	55.4	0.022
12 D 2	230272	79.4	<0.05	<0.005	2.93	54.8	0.022
Duplicate result	230272	79.3	----	----	----	----	----
RPD	230272	0.13%	----	----	----	----	----
12 E 1	230273	23.7	<0.05	<0.005	3.68	72.4	0.013
12 E 2	230274	23.2	<0.05	<0.005	3.17	71.8	0.013
12 F 1	230275	8.08	<0.05	<0.005	3.94	106	0.009
Spike result	230275	217	----	----	----	----	----
Spike added	230275	200	----	----	----	----	----
Recovery	230275	104%	----	----	----	----	----
Reporting Limit:		0.075 mg/L	0.05 mg/L	0.005 mg/L	0.1 mg/L	0.2 mg/L	0.005 mg/L

21 AUG 03 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 07/14/03

Matrix: Water

Project No.: 06002.01.141

SRR: 24618

TO: 030714-8

Sample ID	Lab System ID	Calcium Results (mg/L)	Magnesium Results (mg/L)	Manganese Results (mg/L)	Potassium Results (mg/L)	Sodium Results (mg/L)	Strontium Results (mg/L)
12 F 2	230276	8.03	0.059	<0.005	3.87	107	0.009
NpCa CF	230277	292	<0.05	<0.005	0.276	11.6	0.047
Duplicate result	230277	----	<0.05	<0.005	0.295	12.0	0.049
RPD	230277	----	0.00%	0.00%	6.65%	3.39%	4.17%
NpCa CU	230278	295	<0.05	<0.005	0.171	11.7	0.049
Spike result	230278	----	20.9	0.514	23.6	33.6	4.23
Spike added	230278	----	20.0	0.500	20.0	20.0	4.00
Recovery	230278	----	105%	103%	117%	110%	105%
NpCa DF	230279	80.7	<0.05	<0.01	0.236	19.2	0.019
NpCa DU	230280	81.2	<0.05	<0.005	0.189	19.3	0.020
NpCa EF	230281	23.6	<0.05	<0.005	0.225	34.4	0.010
NpCa EU	230282	37.9	<0.05	<0.005	0.208	34.6	0.014
NpCa FF	230283	8.51	<0.05	<0.005	0.224	65.8	0.007
NpCa FU	230284	9.07	<0.05	<0.005	0.232	65.2	0.007
Reporting Limit:		0.075 mg/L	0.05 mg/L	0.005 mg/L	0.1 mg/L	0.2 mg/L	0.005 mg/L

For Sample 11Q1

Analyte	Target Conc (ppm)	Measured Conc (ppm)	Percent Difference
Calcium	100	98.8	-1.2
Potassium	20	22.9	14.5
Sodium	100	103	3

For Sample 11Q2

Analyte	Target Conc (ppm)	Measured Conc (ppm)	Percent Difference
Calcium	100	96.5	-3.5
Potassium	20	22.2	11
Sodium	100	99.8	-0.2

Duplicate Analysis

Analyte	11Q1 Conc (ppm)	11Q2 Conc (ppm)	Percent Difference
Calcium	98.8	96.5	-2.3
Potassium	22.9	22.2	-3.1
Sodium	103	99.8	-3.1

Source
556/171+172

21 AUG 03 CONT BAW

CO_2 Conc of Glove Box

CO_2 analyzer (Gas Hound Li800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1178 ppm CO_2. Conc brought down to 995 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

25 AUG 03 BAW

CO_2 Conc of Glove Box

CO_2 analyzer (Gas Hound Li800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1251 ppm CO_2. Conc brought down to 1016 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds

25 AUG 03 BAW

26 AUG 03 BAW

CO_2 Conc of Glove Box

CO_2 analyzer (Gas Hound Li 800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1075 ppm CO_2. Conc brought down to 980 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

27 AUG 03 BAW

CO_2 Conc of Glove Box

CO_2 analyzer (Gas Hound Li 800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1049 ppm CO_2. Conc brought down to 947 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

28 AUG 03 BAW

28 AUG 03 BAW

CO_2 Conc of Glove Box

CO_2 Analyzer (Gas Hound Li 800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1034 ppm CO_2. Conc brought down to 951 ppm CO_2 by openning transfer chamber and exposing the glove box to ambient air for a few seconds. BW 28 Aug 03

BW 29-8-03 29 AUG 03 BW

CO_2 Conc of Glove Box

CO_2 Analyzer (Gas Hound Li 800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 1017 ppm CO_2. Conc brought down to 908 ppm CO_2 by openning transfer chamber and exposing the glove box to ambient air for a few seconds.

25 Sep 03 BW

2 Sep 03 BAW

CO_2 Conc of Glove Box

CO_2 analyzer (GasHound Li800) calibrated with N_2 + 1000 ppm ~~N_2 in t~~ BW 2 Sep 03 CO_2 in N_2.
Contents of glove box measured at 1105 ppm CO_2.
Conc brought down to 1001 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

Div 01 ICP results for Na-Li Ion Exchange Experimental + Reference Solns

Samples from 556/150-157 (Chain of Custody)
Samples NaLi 0.1 #1, 2, and 4 suffix ~~b~~ BW 9-2-03 b were diluted (dilution factor 2.5) 556/136-137
2 QA Samples (556/131)
The 2 QA samples were aliquots from a single prepared standard so they were blind standards and duplicates

9-2-03 BAW

2 Sep 03 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Lab Name: Southwest Research Institute
Client: Division 20

Lab Code: SwRI
Date Received: 07/21/03, 07/ BW 9-2-03 22/03

Matrix: Water
Project No.: 06002.01.141

SRR: 24668, 24678
TO: 030721-18, 030722-12

Sample ID	Lab System ID	Aluminum Results (mg/L)	Calcium Results (mg/L)	Lithium Results (mg/L)	Potassium Results (mg/L)	Silicon Results (mg/L)	Sodium Results (mg/L)
Prep Blank	----	<0.25	<0.05	<0.010	<0.25	<0.05	<0.2
Lab Control	----	10.1	20.0	3.90	89.3	4.11	19.7
True Value	----	10.0	20.0	4.00	100	4.00	20.0
Recovery	----	101%	100%	97.5%	89.3%	103%	98.5%
Prep Blank	----	<0.25	<0.05	<0.010	<0.25	<0.125	<0.2
Lab Control	----	9.98	21.0	3.86	84.3	20.6	19.6
True Value	----	10.0	20.0	4.00	100	20.0	20.0
Recovery	----	99.8%	105%	96.5%	84.3%	103%	98.0%
NaLi0.1-1	230742	<0.25	<0.05	80.0	<0.25	1.96	833
Duplicate result	230742	----	----	79.3	----	----	828
RPD	230742	----	----	0.88%	----	----	0.60%
Spike result	230742	----	----	271	----	----	1245
Spike added	230742	----	----	200	----	----	400
Recovery	230742	----	----	95.5%	----	----	103%
NaLi0.1-10	230743	<0.25	<0.05	547	<0.25	2.48	253
Duplicate result	230743	----	<0.05	----	----	----	----
RPD	230743	----	0.00%	----	----	----	----
NaLi0.1-11	230744	<0.25	<0.05	564	<0.25	1.93	192
Spike result	230744	----	19.5	----	----	----	----
Spike added	230744	----	20.0	----	----	----	----
Recovery	230744	----	97.5%	----	----	----	----
NaLi0.1-12	230745	<0.25	<0.05	575	<0.25	1.56	162
Duplicate result	230745	<0.25	----	----	<0.25	1.55	----
RPD	230745	0.00%	----	----	0.00%	0.64%	----
NaLi0.1-13	230746	<0.25	<0.05	592	<0.25	1.22	132
Spike result	230746	10.6	----	----	141	22.3	----
Spike added	230746	10.0	----	----	100	20.0	----
Recovery	230746	106%	----	----	141%	105%	----
NaLi0.1-14	230747	<0.25	<0.05	596	<0.25	0.899	95.4
NaLi0.1-15	230748	<0.25	<0.05	607	<0.25	0.607	66.8
NaLi0.1-16	230749	<0.25	<0.05	607	<0.25	0.478	50.6
NaLi0.1-17	230750	<0.25	<0.05	615	<0.25	0.376	36.2
NaLi0.1-18	230751	<0.25	<0.05	616	<0.25	0.231	21.1
NaLi0.1-19	230752	<0.25	<0.05	623	<0.25	0.137	13.6
NaLi0.1-2	230753	<0.25	<0.05	120	<0.25	2.60	704
NaLi0.1-20	230754	<0.25	0.143	625	<0.25	0.171	8.87
NaLi0.1-21	230755	<0.25	<0.05	623	<0.25	0.103	3.75
NaLi0.1-22	230756	<0.25	<0.05	620	<0.25	0.074	2.56
NaLi0.1-23	230757	<0.25	<0.05	538	<0.25	1.81	410
NaLi0.1-24	230758	<0.25	<0.05	617	<0.25	<0.125	13.5
NaLi0.1-25	230759	<0.25	<0.05	<0.010	<0.25	<0.125	<0.2
Reporting Limit:		0.25 mg/L	0.05 mg/L	0.010 mg/L	0.25 mg/L	0.05 mg/L	0.2 mg/L

2 Sept 03 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

SRR: 24668, 24678

Client: Division 20

Date Received: 07/21/03, 07/22/03
BW 9-2-03

Project No.: 06002.01.141

TO: 030721-18, 030722-12

Sample ID	Lab System ID	Aluminum Results (mg/L)	Calcium Results (mg/L)	Lithium Results (mg/L)	Potassium Results (mg/L)	Silicon Results (mg/L)	Sodium Results (mg/L)
NaLi0.1-3	230760	<0.25	<0.05	309	0.381	1.57	1198
Duplicate result	230760	----	----	310	----	----	1206
RPD	230760	----	----	0.32%	----	----	0.67%
Spike result	230760	----	----	699	----	----	1610
Spike added	230760	----	----	400	----	----	400
Recovery	230760	----	----	97.5%	----	----	103%
NaLi0.1-4	230761	<0.25	<0.05	189	<0.25	2.38	520
Duplicate result	230761	----	<0.05	----	----	----	----
RPD	230761	----	0.00%	----	----	----	----
NaLi0.1-5	230762	<0.25	<0.05	442	<0.25	0.834	738
Spike result	230762	----	21.1	----	----	----	----
Spike added	230762	----	20.0	----	----	----	----
Recovery	230762	----	106%	----	----	----	----
NaLi0.1-6	230763	<0.25	<0.05	470	<0.25	1.97	617
NaLi0.1-7	230764	<0.25	<0.05	509	<0.25	2.53	479
Duplicate result	230764	<0.25	----	----	<0.25	2.53	----
RPD	230764	0.00%	----	----	0.00%	0.00%	----
NaLi0.1-8	230765	<0.25	<0.05	534	<0.25	1.87	412
Spike result	230765	10.5	----	----	138	22.6	----
Spike added	230765	10.0	----	----	100	20.0	----
Recovery	230765	105%	----	----	138%	104%	----
NaLi0.1-9	230766	<0.25	<0.05	553	<0.25	0.982	319
NaLi0.1-A	230767	<0.25	0.060	195	0.302	<0.125	1562
NaLi0.1-B	230768	<0.25	<0.05	332	<0.25	<0.125	1143
NaLi0.1-C	230769	<0.25	<0.05	458	<0.25	<0.125	677
NaLi0.1-D	230770	<0.25	0.064	525	<0.25	<0.125	460
NaLi0.1-E	230771	<0.25	<0.05	597	<0.25	<0.125	230
NaLi0.1-F	230772	<0.25	<0.05	624	<0.25	0.128	0.539
QA1	230773	<0.25	<0.05	0.016	94.9	<0.125	49.2
QA2	230774	<0.25	<0.05	<0.010	94.6	<0.125	48.6
NaLi0.1-1b	230868	<0.25	<0.05	65.2	<0.25	1.62	658
Duplicate result	230868	<0.25	----	64.4	<0.25	1.63	654
RPD	230868	0.00%	----	1.23%	0.00%	0.62%	0.61%
Spike result	230868	10.5	----	144	119	23.0	1095
Spike added	230868	10.0	----	80	100	20.0	400
Recovery	230868	105%	----	98.5%	119%	107%	109%
NaLi0.1-2b	230869	<0.25	<0.05	97.6	<0.25	2.13	543
Duplicate result	230869	----	<0.05	----	----	----	----
RPD	230869	----	0.00%	----	----	----	----
NaLi0.1-4b	230870	<0.25	0.052	144	<0.25	1.96	381
Spike result	230870	----	21.5	----	----	----	----
Spike added	230870	----	20.0	----	----	----	----
Recovery	230870	----	107%	----	----	----	----
Reporting Limit:		0.25 mg/L	0.05 mg/L	0.010 mg/L	0.25 mg/L	0.05 mg/L	0.2 mg/L

2 Sept 03 CONT BAW

QA1 and QA2 were aliquots from the same prepared standard (556/131).

For Sample QA1

Analyte	Target Conc (ppm)	Measured Conc (ppm)	Percent Difference
Potassium	100	94.9	-5.1
Sodium	50	49.2	-1.6

For Sample QA2

Analyte	Target Conc (ppm)	Measured Conc (ppm)	Percent Difference
Potassium	100	94.6	-5.4
Sodium	50	48.6	-2.8

Duplicate Analysis

Analyte	QA1 Conc (ppm)	QA2 Conc (ppm)	Percent Difference
Potassium	94.9	94.6	-0.3
Sodium	49.2	48.6	-1.2

CNWRA duplicates (556/136)

Samples NaLi 0.1-8 and NaLi 0.1-23

Sample ID	Lab System ID	Aluminum Results (mg/L)	Calcium Results (mg/L)	Lithium Results (mg/L)	Potassium Results (mg/L)	Silicon Results (mg/L)	Sodium Results (mg/L)
NaLi0.1-8	230765	<0.25	<0.05	534	<0.25	1.87	412
NaLi0.1-23	230757	<0.25	<0.05	538	<0.25	1.81	410
Percent Difference		na	na	-0.7	na	3.2	0.5

Samples NaLi 0.1-19 and NaLi 0.1-24

Sample ID	Lab System ID	Aluminum Results (mg/L)	Calcium Results (mg/L)	Lithium Results (mg/L)	Potassium Results (mg/L)	Silicon Results (mg/L)	Sodium Results (mg/L)
NaLi0.1-19	230752	<0.25	<0.05	623	<0.25	0.137	13.6
NaLi0.1-24	230758	<0.25	<0.05	617	<0.25	<0.125	13.5
Percent Difference		na	na	1.0	na	na	0.7

- Precision and Accuracy on CNWRA blind standards QA1 and QA2 was good.
- Precision on CNWRA duplicates was good (NaLi 0.1-8 and 23; also NaLi 0.1-19 and 24). Note: Silicon

2 Sept 03 CONT BAW

detected close to reporting limit on sample 19 but not detected on sample 24

- Sample NaLiD,I-25 was a CNWRA nanopure water blank with no analytes detected
- DiJ01 QA samples looked good. Blanks were clean. Duplicates, Lab Controls, and Spikes looked good with Potassium being a poor actor.

Accepted data.

Calculated data for samples diluted by CNWRA personnel before delivery to Div 01 for analysis (SN 556/136-137).

Reported results for diluted samples delivered to Div 01

Sample ID	Lab System ID	Aluminum Results (mg/L)	Calcium Results (mg/L)	Lithium Results (mg/L)	Potassium Results (mg/L)	Silicon Results (mg/L)	Sodium Results (mg/L)
NaLi0.1-1b	230868	<0.25	<0.05	65.2	<0.25	1.62	658
NaLi0.1-2b	230869	<0.25	<0.05	97.6	<0.25	2.13	543
NaLi0.1-4b	230870	<0.25	0.052	144	<0.25	1.96	381
Reporting Limit:		0.25 mg/L	0.05 mg/L	0.010 mg/L	0.25 mg/L	0.05 mg/L	0.2 mg/L

Calculated results for the original solution concentrations*

Sample ID	Lab System ID	Aluminum Results (mg/L)	Calcium Results (mg/L)	Lithium Results (mg/L)	Potassium Results (mg/L)	Silicon Results (mg/L)	Sodium Results (mg/L)
NaLi0.1-1b	230868	<0.625	<0.125	163	<0.625	4.05	1645
NaLi0.1-2b	230869	<0.625	<0.125	244	<0.625	5.33	1358
NaLi0.1-4b	230870	<0.625	0.13	360	<0.625	4.90	953

* calculated by multiplying the Div 01 results by the dilution factor of 2.5

Use the NaLi 0,1- 1, 2, +4 b data and not the NaLi 0,1-1, 2, +4 data. See 556/136-137

9-5-03 BAW

3 Sept 03 BAW

CO_2 Conc of Glove Box

CO_2 Analyzer (Gas Hound LI800) calibrated with N_2 and 1000ppm CO_2 in N_2. Contents of glove box measured at 1068 ppm CO_2. Conc brought down to 978 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

4 Sept 03 BAW

CO_2 Conc of Glove Box

CO_2 Analyzer (Gas Hound LI800) calibrated with N_2 and 1000 ppm CO_2 in N_2. Contents of glove box measured at 1034 ppm CO_2. Conc brought down to 950 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds

9-5-03 BAW

5 SEP 03 BAW

CO_2 Conc of Glove Box

CO_2 Analyzer (Gas Hound Li800) calibrated with N_2 + 1000ppm CO_2 in N_2. Contents of glove box measured at 1022 ppm CO_2. Conc brought down to 906 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds

Copy made for QA records

8 SEP 03 BAW

CO_2 Conc of Glove Box

CO_2 analyzer (Gas Hound Li800) calibrated with N_2 + 1000ppm CO_2 in N_2. Contents of glove box measured at 1057 ppm CO_2. Conc brought down to 963 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

9 SEP 03 BAW

CO_2 Conc of Glove Box

CO_2 Analyzer (Gas Hound Li 800) calibrated with N_2 + 1000ppm CO_2 in N_2. Contents of glove box measured at 1033 ppm CO_2, Conc brought down to 963 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

10 Sept 03 BW

pH reading of reference solutions inside glove box at 1000 ppm CO_2

The pH of reference solutions C, D, E, + F were measured before neptunium/calcite series 13 and 14 started.
Ref solns from 556/53 + on

New pH solns were poured into 30mL pp bottles and transfered into the glove box
pH 7 - Fisher SB108-500 lot# 030660
pH 10 - Fisher SB116-500 lot# 023154
used orion model 920A with Ross combo electrode 8103BN (3F) ISE serial # 039518

10 SEP 03 CONT BAW

Slope at 101.2% (acceptable 92 to 102%)

ref soln	pH
C	7.41
D	7.70
E	8.00
F	8.20

CO_2 Conc of Glove Box

Taken immediately after pH's taken.
(O_2 Analyzer (Gas Hound L800) calibrated with N_2 + 1000 ppm CO_2 in N_2. Contents of glove box measured at 997 ppm CO_2.

Preparation of Neptunium/Calcite series 13+14 Experimental test tubes

Reagent: calcite 309/14651 from dessicator
Series 13 target calcite mass = 0.1500 g
Series 14 target calcite mass = 0.3000 g
Each solution run in triplicate (suffix 1, 2, 3)
Four reference solutions (target pH) of C (7.5) D (7.75), E (8.0) and F (8.25)
24 polycarbonate test tube with caps (no holes) labeled as indicated on 556/185

Tube ID	Mass(g) of calcite
NpCA13C1	0.1483
NpCA13C2	0.1505
NpCA13C3	0.1496
NpCA13D1	0.1510
~~NpCA13E1~~ BW 9-10-03	—
NpCA13D2	0.1490
NpCA13D3	0.1488
NpCA13E1	0.1484
NpCA13E2	0.1502
NpCA13E3	0.1502
NpCA13F1	0.1495
NpCA13F2	0.1499
NpCA13F3	0.1501
NpCA14C1	0.3000 9-10-03
NpCA14C2	0.3002 ~~0.3015~~ BW 9-10-03 BW
NpCA14C3	0.3016
NpCA14D1	0.2997
NpCA14D2	0.2999
NpCA14D3	0.2990
NpCA14E1	0.3012
NpCA14E2	0.3010
NpCA14E3	0.3020
~~NpCA15~~ BW 9-10-03	—
NpCA14F1	0.3012
NpCA14F2	0.3002
NpCA14F3	0.3006

10 Sept 03 CONT BAW

Added the appropriate amount of calcite to a tared weighing paper and recorded mass on 556/185. Used Mettler AE 240 balance - Target challange at start of masses for 20.0001g was 20.0002
Target challange at end of masses for 20.0001g was 20.0001
Removed cap of experimental test tube and inserted a funnel made from weighing paper. Transferred calcite into exp. test tube. Repeated procedure for all 24 test tubes

11 SEPT 03 BW

BW 9-11-03
Addition of ~~Pre-equib~~ Pre-equilibrated Reference Solutions for Series 13+14 NpCA Experimental test tubes and Sampling of Ref Solns

New calibration gas cylinders used.
1000 ppm CO_2 in air - Specialty Gas Products
cylinder # CC55434
~~Zero~~ Air - Praxair Batch # 530900701
Cylinder Supply to glove box
1000 ppm CO_2 in air - Specialty Gas Products
cylinder # CC82762

11 Sep 03 CONT BAW

CO_2 Conc of Glove Box

CO_2 Analyzer (Gas Hound Li 800) calibrated with Air and 1000ppm CO_2 in Air (556/186)
Contents of glove box measured at 1024 ppm CO_2.

Experimental test tubes were weighed before addition of reference solutions. AE240 balance was used - ~~20.0001g~~ BW 9-11-03
Challange (target 20.0001g) at start of analysis = 20.0001g
A 30 mL beaker was tared and then the test tube was placed inside. The mass was recorded on 556/188. Rechallange of mass = 20.0001g

Test tubes were transfered into the glove box. Approximately 300 mL of ~~ea~~ BW 9-11-03 each reference soln was decanted into a labeled 400 mL beaker. 30 mL (10 mL oxford pipet) was transfered into the appropriate experimental test tube (unfiltered). The experimental solns were capped and transferred out of the glove box. They were reweighed and masses recorded (556/188). The exp solns were transfered back into the glove box. Caps were loosened and exp solns placed on gyratory shaker at 150 RPM

11 Sept 03 CONT BAW

Tube ID	Mass(g) before soln	Mass(g) after soln
NpCA13C1	22.1959	51.6463
NpCA13C2	22.1554	51.5881
NpCA13C3	22.0826	51.4901
NpCA13D1	22.1503	52.1548
NpCA13D2	22.1419	52.0688
NpCA13D3	22.1122	51.8668
NpCA13E1	22.2077	51.5866
NpCA13E2	22.2265	51.6296
NpCA13E3	22.1080	51.5278
NpCA13F1	22.1591	51.8284
NpCA13F2	22.1010	51.6419
NpCA13F3	22.1146	51.5083
NpCA14C1	22.2483	51.6503
NpCA14C2	22.2834	51.6714
NpCA14C3	22.2995	51.6370
NpCA14D1	22.3731	52.1247
NpCA14D2	22.3636	52.0324
NpCA14D3	22.2829	51.8795
NpCA14E1	22.2916	51.6796
NpCA14E2	22.2850	51.5938
NpCA14E3	22.2528	51.5861
NpCA14F1	22.2856	51.6160
NpCA14F2	22.3118	51.6801
NpCA14F3	22.2583	51.5115

11 Sep 03 CONT BAW

Sampling for ICP analysis - Ref solns

Approximately 30mL (B-D syringe model 309650) was withdrawn from each 400mL beaker Ref soln while in the glove box. A filter (Whatman 6874-2504 lot 11026 25mm GD/X with pore size 0.45μm) via luerlok was attached to each syringe. The soln was filtered into an appropriately labeled 30mL pp bottle. (NpCA13/4 Ref C, D, E, + F were labels). Bottles were capped. NOTE! solns were acid preserved. Before transferring 30mL pp bottles into glovebox, each had 90μL (eppendorf pipette) of 1:1 HNO_3 (582/19 by JP on 6/30/03) added.

Samples for Inorganic Carbon Analysis

Approximately 20mL (B-D syringe model 309650) was withdrawn from the 400mL beaker ref soln while in the glove box. A filter (Whatman 6874-2504 lot 11026 25mm GD/X with pore size 0.45μm) via lurelok was attached to the syringe. The soln was filtered into a 40mL VOA amber glass bottle (Ichem T146-0040). The filter was removed from the syringe and the syringe was filled with another 20mL of ref soln. The filter was

11 Sep 03 CONT BAW

reattached to the syringe and the 40mL VOA bottle was filled to minimize the headspace. ~~This~~ The VOA bottle was capped. This process BW 9-11-03 was repeated for each reference solution. The VOA bottles were done in duplicate for each ref soln so eight solutions were generated. They were labeled NpCA 13-14 Ref C, Ref C Dup, Ref D, Ref D Dup, Ref E, Ref E Dup, Ref F, and Ref F dup

The ICP samples (~~30~~ pr BW 9-11-03 30mL pp bottles) and the IE samples (40mL VOA bottles) were transfer out of the glove box. ALL were parafilmed. The IE samples were placed in the refridgerator in L104.

The CO_2 of the glove box was measured at the end of the day (1920) following the procedure of 556/186-187. It was at 904 ppm CO_2. This was increased to 986 by adding some 5% CO_2 into the glove box.

12 SEP 03 BW

CO_2 Conc of Glove Box at 10:15 gas into 556/186

12 SEP 03 CONT BAW

CO_2 Analyzer (Gas Hound Li 800) calibrated and contents of glove box measured at 1029 ppm CO_2. Conc brought down to 962 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

LSA Sampling of 46A Np Spike for NpCA Series 13+14

Masses were recorded using Mettler AE240.
Challange mass 20.0001g at start of day = 20.0000g
Challange mass 20.0001g at end of day = 20.0001g
Samples taken in duplicate (a2 and b2 suffix) a1+b1 for series 11+12 on 556/86
LSA vials (7mL glass Packard 6000167) weighed after being labeled and having 0.5mL (eppendorf) of 0.1N HNO_3 (556/84) was added. Labeled 46Aa2, 46Ab2 before mass taken. 250µL (eppendorf) of sample was added - 46A (556/84) and vials reweighed

ID	Mass(g) of Vial + HNO_3	Mass(g) after Sample added
46Aa2	7.6506	7.9027
46Ab2	7.6825	7.9338

12 SEP 03 CONT BAW

Np Spiking of NpCA 13+14 Series Exp. Solns

Exp solns (556/187) were capped and removed from the glove box. Masses were recorded - AE240 balance with tared 30mL beaker. Exp Solns and neptunium spike 46A were transfered back into the glove box. 250 µL (eppendorf) of neptunium spike 46A (556/84) was added to each of the 24 exp solns. The exp solns + spike soln was capped and transfered out of the glove box. The mass of the exp soln were recorded again (556/193). The exp solns were ~~tf~~ BW 9-12-03 vortexed (Vortex genie 2) at a setting of 7 for 5 seconds each. The experimental solutions were transfered back into the glove box. The caps were loosened and exp solns placed on gyratory shaker (New Brunswick G2) at about 100 RPM.

Adding Cocktail to Spike 46A LSA Samples

5mL of Ultima Gold AB cocktail solution added to each sample of spike 46A LSA samples (556/191)

12 Sept 03 CONT BAW

Test tube	Mass (g) before Np Spike	Mass (g) after Np spike
NpCA13C1	BW 9-12-03 ~~51.4858~~ 51.6398	51.8926
NpCA13C2	51.5861	51.8387
NpCA13C3	51.4838	51.7361
NpCA13D1	52.1495	BW 9-12-03 ~~51~~ 52.4034
NpCA13D2	52.0516	52.3050
NpCA13D3	51.8612	52.1151
NpCA13E1	51.5739	51.8281
NpCA13E2	51.6245	51.8788
NpCA13E3	51.5212	51.7753
NpCA13F1	51.8138	52.0682
NpCA13F2	51.6368	51.8915
NpCA13F3	51.4934	51.7477
NpCA14C1	51.6463	51.9005
NpCA14C2	51.6585	51.9131
NpCA14C3	51.6311	51.8854
NpCA14D1	52.1072	52.3618
NpCA14D2	52.0109	52.2655
NpCA14D3	51.8563	52.1115
NpCA14E1	51.6639	51.9189
NpCA14E2	51.5877	51.8423
NpCA14E3	51.5806	51.8362
NpCA14F1	51.6000	51.8558
NpCA14F2	51.6691	51.9243
NpCA14F3	51.4944	51.7496

12 Sep 03 con BAW

CO_2 Conc of Glove Box at 17:15

gas info 556/186
Calibrated, then measured at 1013 ppm CO_2
Reduced to 969 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds

13 Sept 03 BAW

CO_2 Conc of Glove Box at 1200

gas info 556/186
Calibrated, then measured at 1012 ppm CO_2
Reduced to 983 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds

QA standard for ICP analysis of Series 13+14 NpCA solutions

Two aliquots of the same standard will be used so these will be blind stds and duplicates. They will be spiked with 4 analytes as indicated in the following table

13 Sept 03 cont BAW

	Target ppm			
Soln ID	K	Na	Ca	Sr
13Q1	20	100	100	20
13Q2	20	100	100	20

Reagents 1000 ppm Potassium
Spex Certiprep PLK2-2Y lot 9-03K
1000 ppm Calcium
Spex Certiprep PLCA2-2X lot 9-69CA
1000 ppm Sodium
Spex Certiprep PLNA2-2Y lot 10-46NA
1000 ppm Strontium + BW 9-13-02
Spex Certiprep PLSR2-2Y

10 mL (vol pipet) of 1000 ppm Calcium, 10 mL (vol pipet) of 1000 ppm Sodium, 2 mL of 1000 ppm Strontium, and 2 mL of 1000 ppm Potassium were pipetted into a 100 mL vol. flask and diluted to mark with type I water. About 30 mL of this solution was poured into a 30 mL pp bottle labeled 13Q1. Process repeated for the 13Q2 soln.

9-14-03 BW

14 SEP 03 BAW

Transfered NpCA Series 13+14 experimental solns from one rack to another. While doing this the loose cap was removed and the soln was swirled in order to exchange the headspace gas.

CO_2 Conc of Glove Box at 14:45

gas info on 556/186
Calibrated, then measured at 1040ppm CO_2
Reduced to 963 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds

15 SEPT 03 BAW

Transfered NpCA Series 13+14 experimental solns from one rack to another. While doing this The loose cap was removed and the soln was swirled in order to exchange the head-space gas.

CO_2 Conc of Glove Box at 13:55

gas info on 556/186
Calibrated, then measured at 1006 ppm CO_2

16 SEPT 03 BAW

CO_2 Conc of Glove Box at 09:00

gas info 556/186
Calibrated, then measured at 1056ppm CO_2
Reduced to 984 ppm CO_2 by opening transfer chamber and exposing the glove box to ambient air for a few seconds.

pH of Series 13+14 Exp Solns

Mass of exp soln recorded initially.
Removed solns from glove box after capping them. Mass recorded on AE240 balance with a tared 30mL beaker.
Target challange of 20.0001g at start = 20.0001g
Target challange of 20.0001g at end = 20.0001g

Soln ID	Mass(g) before pH+LSA Sampling	pH
NpCA13C1	51.8347	7.46
NpCA13C2	51.7773	7.50
NpCA13C3	51.6837	7.50
NpCA13D1	52.3413	7.76
NpCA13D2	52.2306	7.74
NpCA13D3	52.0376	7.75

16 SEPT 03 BAW CONT

SOLN ID	Mass(g) before pH + LSA Sampling	pH
NpCA13E1	51.7298	7.99
NpCA13E2	51.8015	8.00
NpCA13E3	51.6907	8.01 ~~8.01~~ mmj 9/16/03
NpCA13F1	52.0120	~~8.22~~ mmj 9/16/03 8.22
NpCA13F2	51.8172	8.26
NpCA13F3	51.6860	8.22
NpCA14C1	51.8373	7.51
NpCA14C2	51.8300	7.50
NpCA14C3	51.8072	7.50
NpCA14D1	52.2906	7.76
NpCA14D2	~~52.1981~~ mmj 9/16/03 52.1981	7.76
NpCA14D3	52.0454	7.75
NpCA14E1	51.8602	8.01
NpCA14E2	51.7816 mmj 9/16/03	8.00
NpCA14E3	51.7753	8.01
NpCA14F1	51.7983	8.23
NpCA14F2	51.8540	8.22
NpCA14F3	51.6704	8.23

Adding Acid matrix to LSA Vials

Added 0.5mL (eppendorf pipet) of 0.1N HNO_3 (556/89) to each series 13+14 LSA vials - samples done in duplicate (a/b)

16 Sept 03 CONT BAW

Recorded mass of LSA vials with acid using Mettler AE240 balance

SOLN	Mass(g) of vial + HNO_3	Mass(g) after adding sample
NpCa13c1a	7.6305	8.1276
NpCa13c1b	7.6333	8.1278
NpCa13c2a	7.7374	8.2325
NpCa13c2b	7.6637	8.1585
NpCa13c3a	7.7259	8.2201
NpCa13c3b	7.6054	8.1033
NpCa13d1a	7.7075	8.2015
NpCa13d1b	7.6401	8.1366
NpCa13d2a	7.8246	8.3183
NpCa13d2b	7.8085	8.3055
NpCa13d3a	7.6930	8.1876
NpCa13d3b	7.7203	8.2153
NpCa13e1a	7.7333	8.2283
NpCa13e1b	7.7207	8.2153
NpCa13e2a	7.7415	8.2347
NpCa13e2b	7.7088	8.2047
NpCa13e3a	7.6721	8.1652
NpCa13e3b	7.6304	8.1234
NpCa13f1a	7.6242	8.1185
NpCa13f1b	7.7806	8.2772
NpCa13f2a	7.6988	8.1925

9-16-03 CONT YAW

END OF SCIENTIFIC NOTEBOOK

ENTRIES CONTINUED in # 610

I have reviewed this scientific notebook and find it in agreement with QAP-001. There is sufficient information regarding methods used for conducting tests, acquiring and analyzing data so that another qualified individual could repeat the activity.

P. C. [signature]

12/17/2003