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2	1	Cog.Eng. K. N. Pool	[signature]	12/13/94	H4-23						
2	1	Cog. Mgr. J. G. Kristofzski	[signature]	12/13/94	H4-04						
2	1	QA J. C. Langford	[signature]	12-13-94	H4-03						
		Safety									
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A.E. Young [signature] 12-13-94 Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	J.G. Kristofzski [signature] 12/13/94 Cognizant Manager Date	Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments

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SINGLE SHELL TANK WASTE CHARACTERIZATION PROJECT

CORE 9 DATA REPORT

Revision 0

December 5, 1990

Prepared by: *T. E. Jones*
S. G. McKinley
J. M. Tingey
T. M. Longaker
J. A. Gibson

Battelle, Pacific Northwest Laboratory

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CONTRIBUTORS LIST

PROJECT MANAGEMENT OFFICE

TE Jones, Project Manager
GK Gerke, Quality Engineer
BM Gillespie
SG McKinley
TM Longaker
MK Allen
JA Gibson

SAMPLE PREPARATION AND PHYSICAL TESTING

RD Scheele, Task Leader
RT Steele, Task Leader
TK Andrews
SA Homi
FV Hoopes
ME Peterson
JK Rau
GM Richardson
EH Shade
JM Tingey

RADIOCHEMICAL ANALYSIS

LR Greenwood, Task Leader
JH Kaye, Task Leader
NL Abbey
RJ Barrington
SK Fadeff
CO Harvey
LS Kellogg
AE Kozelisky
TC Maiti
PJ Raney
JM Ruggles
JS Schmitt
SW Thompson
MR Weiler

INORGANIC ANALYSIS

MW Urie, Task Leader
SI Barsoum
MC Burt
JH Ennen
PK Melethil
D Ortiz
JM Robbins
DR Sanders
JJ Wagner
DE Rinehart

ORGANIC ANALYSIS

RW Stromatt, Task Leader
DL Bellofatto
SK Fadeff
EW Hoppe
MM McBurney
GA Ross

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INTRODUCTION

This Data Package contains results obtained by Pacific Northwest Laboratory (PNL) staff in the characterization and analyses of Core 9 segments taken from the Single-Shell Tank (SST) 110B. The characterization and analysis of Core 9 segments are outlined in the Waste Characterization Plan for Hanford Site Single-Shell Tanks and in the Pacific Northwest Laboratory (PNL) Single-Shell Tank Waste Characterization Support FY 89/90 Statement of Work (SOW), Rev. 1 dated March, 1990. Specific analyses for each sub-sample taken from a segment are delineated in Test Instructions prepared by the PNL Single-Shell Tank Waste Characterization Project Management Office (SST Project) in accordance with procedures contained in the SST Waste Characterization Procedure Compendium (PNL-MA-599). Analytical procedures used in the characterization activities are also included in PNL-MA-599.

Core 9 included five segments although segment 1 did not have sufficient material for characterization. The five samplers were received from Westinghouse Hanford Company (WHC) on 11/21-22/89. Each segment was contained in a sampler and was enclosed in a shipping cask. The shipping cask was butted up to the 325-A hot cell and the sampler moved into the hot cell. The material in the sampler (i.e., the segment) was extruded from the sampler, limited physical characteristics assessed, and photographed. At this point samples were taken for particle size and volatile organic analyses. Each segment was then homogenized. Sub-samples were taken for required analyses as delineated in the appropriate Test Instruction. Table 1 includes sample numbers assigned to Core 9 segment materials being transferred from 325A Hot Cell. Sample numbers 90-0298, 90-0299, 90-0302, and 90-0303 were included in Table 1 although no analyses were requested for these samples. Table 2 lists Core 9 sub-sample numbers per sample preparation method.

Requested analyses for Core 9 homogenized segments included: Wt-% Solids; inductively-coupled argon plasma atomic emission spectroscopy (ICP) analysis, gamma energy analysis (GEA), total alpha, total beta, and uranium analysis, in duplicate, from samples that had been fused with potassium hydroxide (KOH); ICP on duplicate samples from an acid leach as per Environmental Protection Agency (EPA) protocols; and anion analysis, total organic carbon, and pH from a water leach procedure. Analyses requested for the Core Composite included all of the analyses outlined above plus an extensive array of radiochemical, inorganic, and semivolatile organic analyses.

The data within this package are divided into four groups: physical testing, inorganic analysis, radiochemical analysis, and organic analysis. Specific data within a group are generally separated by individual segment or the Core Composite. All chemical analysis data are reported on a per wet-weight basis. That is, no corrections were made for the Wt-% water in the samples. Essentially all sample preparations were completed in duplicate. Thus, duplicate analysis data are available for most samples. The quality control (QC) requirements for each sample is defined in specific test instructions. To the extent practical, the QC requirements outlined in EPA documents such as SW-846 and the CLP-SOW were followed. All QC data are included in this data package.

All chemical analysis data are available on Lotus/Excel compatible diskette files.

TABLE 1: SST Core 9 Sample Numbers

Segment #	Prehomogenized Segment	Homogenization Test	Homogenization Analyses	Composite Test	Composite Analyses
2	89-1560 89-1561	90-0298 90-0299			
3	89-1562 89-1563	90-0300 90-0301	90-1275		
4	89-1564 89-1565	90-0302 90-0303			
5	89-1566 89-1567	90-0304 90-0305	90-1276		
Composite				90-1255 90-1256	90-1257

TABLE 2: SST Core 9 Sub-Sample Numbers by Sample Prep Method

Sample Prep Method	Primary Sample Number	Duplicate Sample Number	Spike Sample Number	Spike Control Sample Number	Blank Sample Number
Volatile	89-1561 89-1563 89-1565 89-1567				
Particle Size	89-1560 89-1562 89-1564 89-1566				
Fusion[a]	90-0300-A-1 90-0301-A-1 90-0304-A-1 90-0305-A-1 90-1255-A-1 90-1256-A-1	90-0300-A-2 90-0301-A-2 90-0304-A-2 90-0305-A-2 90-1255-A-2 90-1256-A-2			90-0300-A-3 90-0301-A-3 90-0304-A-3 90-0305-A-3 90-1255-A-3
Acid Leach	90-1275-A-1 90-1276-A-1 90-1257-A-1 90-1257-B-1	90-1275-A-2 90-1276-A-2 90-1257-A-2 90-1257-B-2	90-1275-A-3 90-1276-A-3 90-1257-A-3 90-1257-B-3	90-1275-A-4 90-1276-A-4 90-1257-A-4 90-1257-B-4	90-1275-A-5 90-1276-A-5 90-1257-A-5 90-1257-B-5
Water Leach	90-1275-B-1 90-1276-B-1 90-1257-C-1	90-1275-B-2 90-1276-B-2 90-1257-C-2	90-1275-B-3 90-1276-B-3 90-1257-C-3	90-1275-B-4 90-1276-B-4 90-1257-C-4	90-1275-B-5 90-1276-B-5 90-1257-C-5
Mercury	90-1257-D-1	90-1257-D-2	90-1257-D-3	90-1257-D-4	90-1257-D-5
Cyanide[b]	90-1257-G-1	90-1257-G-2	90-1257-G-3	90-1257-G-4[c]	90-1257-G-5
Semi-Volatile	90-1257-E-1	90-1257-E-2	90-1257-E-3	90-1257-E-4[d]	
TOX/EOX	90-1257-F-1	90-1257-F-2	90-1257-F-3		90-1257-F-4
Wt % Solids	90-1275-C-1 90-1276-C-1 90-1257-H-1	90-1275-C-2 90-1276-C-2 90-1257-H-2			

[a] - Radiochemistry samples included with the fusion preparation
[b] - Cyanide Analysis not completed at this time
[c] - Cyanide Standard (Undiluted)
[d] - Matrix Spike Duplicate

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SECTION 1

PHYSICAL DATA TABLES

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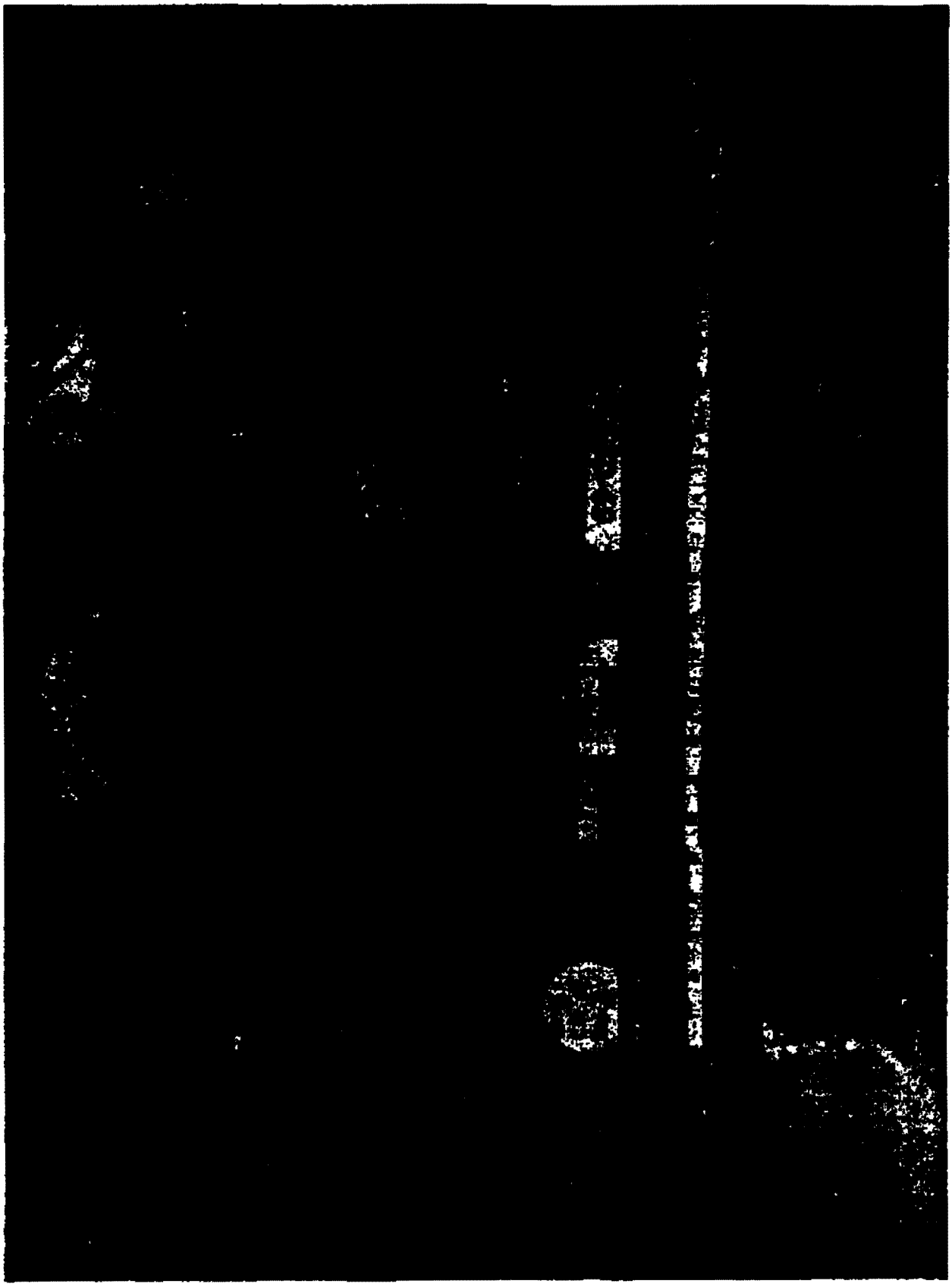

Core 9, Segment 2

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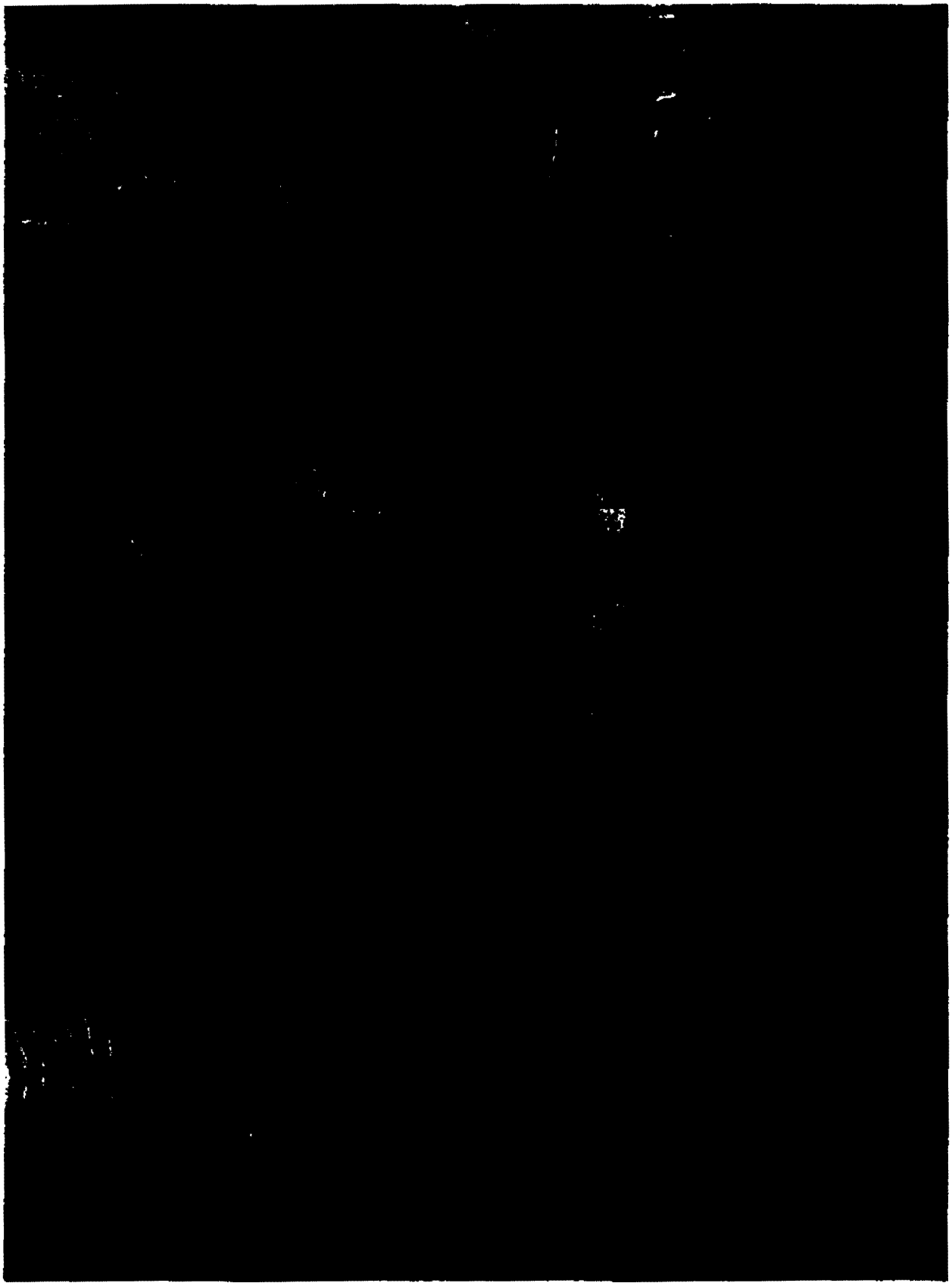

Core 9, Segment 3

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Core 9, Segment 4

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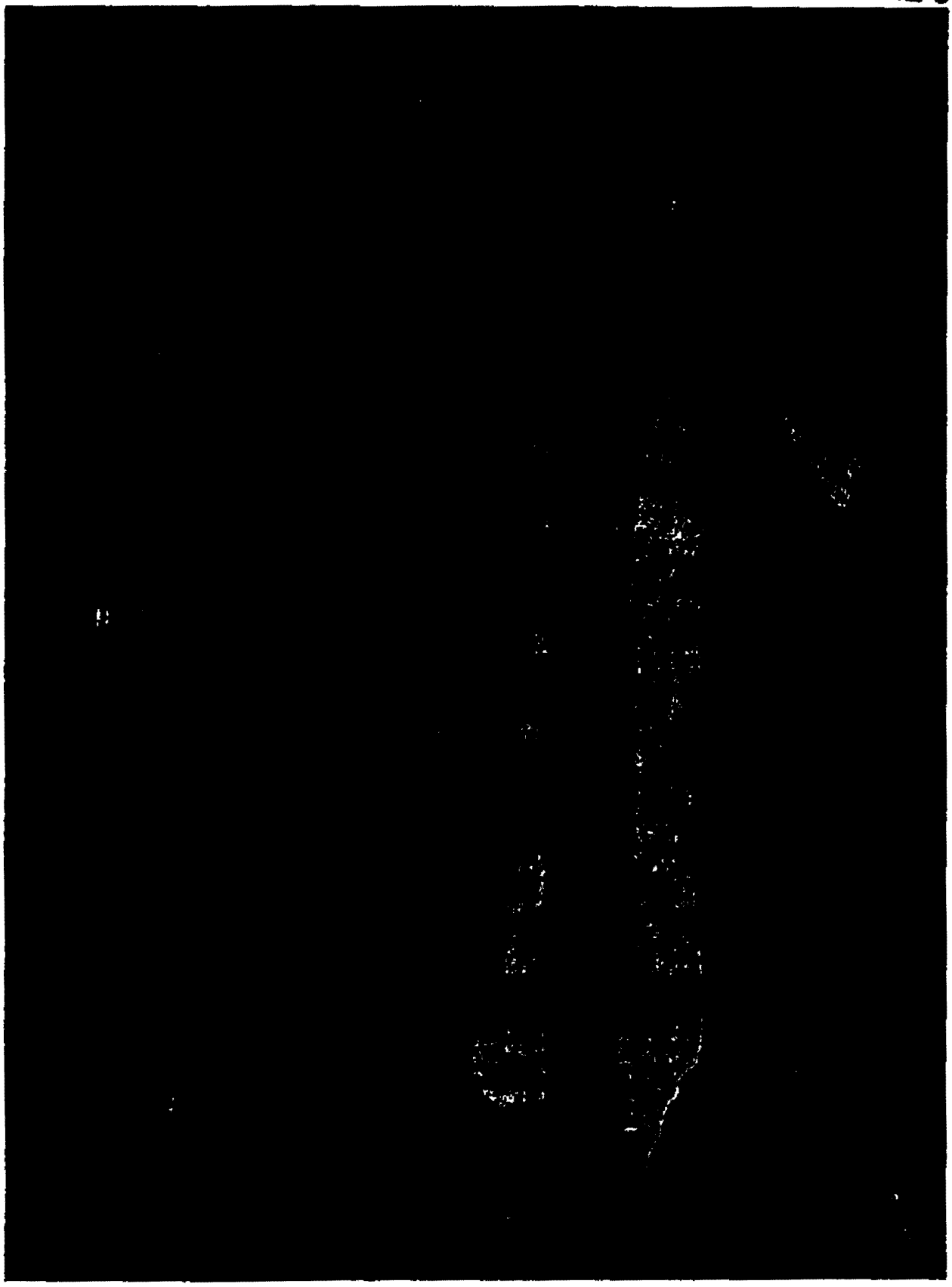

Core 9, Segment 5

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DESCRIPTION OF EXTRUDED SEGMENTS

Five Core 9 samplers from Tank 110B Riser 3 were received and extruded. Cores 10 and 11 from tank 110B were also taken from riser 3, and Core 4 which was taken from Riser 1 is also near this riser. The mass, volume, and density for each of the segments extruded is given in Table 3. The first sampler contained no sample; therefore, no data will be presented for this segment. Photographs of extruded segments 2 through 5 are found on pages 7 to 10.

The entire length of segment 2 (18.5 inches) held its shape upon extrusion. The sludge was creamy in texture. The top 3 inches of segment 2 were dark brown in color. The sludge was graded from dark brown at 3 inches to light tan at 7.5 inches. The color of the bottom 11 inches of the segment was essentially a uniform shade of light tan.

Segment 3 was a light tan to light brown sludge which held its shape upon extrusion. The bottom portion of the sample was somewhat lighter in color than the top portion. The texture of this segment was approximately the same as segment 2.

Segment 4 was a light tan sludge over the entire length of the sample. The segment was creamy in texture except for the bottom 2 inches of the segment which was more granular and appeared to contain less moisture than the rest of the segment. This segment held its shape upon extrusion.

The color and consistency of segment 5 varied gradually along the length of the segment with the top portion of the segment being lighter in color and more fluid. The top 16 to 17 inches of segment 5 was a light tan sludge. Most of the segment held its shape upon extrusion, but approximately the top inch of the segment did flow upon extrusion. The bottom 2 to 3 inches of the segment were light brown in color.

TABLE 3: Core 9 Prehomogenized Segment Data

Segment	Mass (g)	Volume (ml)	Density (g/ml)
1	0	0	N/A
2	294.13	240	1.23
3	318.79	245	1.30
4	324.88	245	1.33
5	303.96	245	1.24

PHYSICAL PROPERTIES

Table 4 lists the physical data for the Core 9 composite material. Duplicate runs were performed on each measurement listed in Table 4. A single value is reported for weight percent undissolved solids since this value is calculated from the difference in the weight percent total solids and weight percent dissolved solids. The density of the core composite material is 1.32 g/ml. The density of the interstitial liquid, as indicated by the centrifuged supernate density and the centrifuged solids are 1.24 and 1.44 g/ml, respectively. The core composite contains 38.4 wt% total solids and 17.0 wt% undissolved solids.

Weight percent total solids were also obtained for homogenized segments 3 and 5 and the core composite sample used for analytical measurements. These results are reported in Table 5. As shown in Table 5, the average wt% solids of the homogenized segments 3 and 5 are 39.5 and 42.3 wt%, respectively. The average wt% solids of the core composite sample is 39.8 wt%. The wt% total solids measured on the composite core used for analytical measurements is greater than the wt% solids listed in Table 4. This anomalous behavior appears to be due to differences in the drying procedures between the 325A and B facility since the reproducibilty amongst the three separate samples transferred to the 325B facility is much better than the discrepancy noticed between the samples analyzed in the 325A and B facilities. The duplicate samples analyzed in the 325A facility were taken from the same sample as the samples transferred to the 325B facility.

TABLE 4: SST Core 9 Composite Physical Data

	Trial #1	Trial #2	Average
Slurry Density (g/ml)	1.31	1.32	1.32
Centrifuged Solids Density (g/ml)	1.43	1.44	1.44
Centrifuged Supernate Density (g/ml)	1.24	1.24	1.24
Wt% Centrifuged Solids	40.7	40.7	40.7
Vol% Centrifuged Solids	37.2	37.2	37.2
Wt% Total Solids	38.4	38.5	38.4
Wt% Dissolved Solids	21.3	19.8	20.6
Wt% Undissolved Solids			17.8

TABLE 5: SST Core 9 Weight Percent Solids Values

Sample Description	ALO #	Wt% Oxides
Segment 3 (Average)	--	39.51
Homogenization Check		
Top	90-0300-H-1	39.19
	90-0300-H-2	39.30
Bottom	90-0301-H-1	39.17
	90-0301-H-2	39.13
Verticle Distribution	90-1275-C-1	40.12
	90-1275-C-2	40.12
Segment 5 (Average)	--	42.31
Homogenization Check		
Top	90-0304-H-1	42.14
	90-0304-H-2	41.96
Bottom	90-0305-H-1	42.01
	90-0305-H-2	41.99
Verticle Distribution	90-1276-C-1	42.88
	90-1276-C-2	42.90
Composite (Average	--	39.76
Composite Check		
Top	90-1255-H-1	40.19
	90-1255-H-2	40.21
Bottom	90-1256-H-1	40.05
	90-1256-H-2	40.01
Compositie Analysis	90-1257-H-1	40.43
	90-1257-H-2	40.30

Duplicate pH measurements of the water leach of the composite core and homogenized segments 3 and 5 are reported in Table 6. The pH of the water leaches are approximately 8, indicating that these samples are caustic.

TABLE 6: SST Core 9 pH Values

Sample Description	ALO #	pH Value
Segment 3	90-1275-B-1	8.56
	90-1275-B-2	7.91
	90-1275-B-5	5.31
Segment 5	90-1276-B-1	8.14
	90-1276-B-2	8.18
	90-1276-B-5	5.72
Composite	90-1257-C-1	8.00
	90-1257-C-2	7.81
	90-1257-C-5	5.79

THERMAL ANALYSIS

Scanning thermogravimetry (STG) and differential scanning calorimetry (DSC) were performed in duplicate on the homogenized Core 9 composite. These two thermal analysis techniques are useful in determining the thermal stability or reactivity of a material. DSC measures heat released or absorbed while the temperature of the sample is increased at a constant rate. STG measures the mass of a sample while the temperature of the sample is increased at a constant rate. Both methods can be modified to measure isothermal changes in the material.

DSC is often used to measure thermal decomposition temperatures, heats of reaction, reaction temperatures, melting points, and solid-solid transition temperatures. STG is used to measure thermal decomposition temperatures, water contents, and reaction temperatures. The two methods often provide complimentary information.

The calibration of the differential scanning calorimeter and the thermogravimetric analyzer were checked before running these samples. An indium standard was run on the calorimeter to check the temperature and enthalpy calibrations. The balance calibration of the thermogravimetric analyzer was checked with a 100 mg standard weight, and the temperature calibration of the analyzer was checked with alumel/perkalloy curie point magnetic transition standards. The temperature calibration checks were all within 1°C of their reported values, and the balance calibration was within 0.01 mg.

Figures 1 and 2 are duplicate DSC analysis of the Core 9 composite material. In these DSC plots two broad transition regions are observed. The first region begins at the lower temperature limit of the analysis (30°C) and essentially all the transitions in this region are completed by 130°C. Several transitions are observed in this region, but the individual transitions are not resolvable although this transition can be resolved into two peak areas. Table 7 presents the thermal data obtained for this transition and each of the two peak areas. Because the individual transitions are not resolvable, the onset temperature and peak maximums for this region were not determined.

The most likely reaction occurring in the first transition region (30 to 130°C) is evaporation of the bulk and interstitial water of the core composite material. The first peak area is probably due to the evaporation of unbound water in the sample, while the second peak area is probably due the loosely bound water in the sample.

The second transition region occurs at approximately 300°C and appears to be a single endothermic transition with an onset temperature of between 275 and 290°C. The enthalpy change of this transition is approximately 8 calories/gram of sample. Therefore, this peak is small relative to the water loss transitions. The temperature range, temperature of the peak maximum, onset temperature, and enthalpy change for this transition are also reported in Table 7. This endotherm is most likely due to the melting of salts with $NaNO_3$ being the most prevalent. The melting temperature of pure NaNO3 is 308°C. The decrease in the melting temperature and the broadening of the peak may be due to the presence of other salts. Based on the IC and ICP results $NaNO_3$ should be the predominant salt present in the waste.

Figures 3 and 4 present the thermogravimetric curves for the Core 9 composite material. Based on these analysis, the core composite contains 41 wt% total solids. These results are higher than the results shown in Tables 2 and 3. There is an additional 1.5% weight loss from 190 to 500°C indicating that all the water may not have been released during the first part of the thermogram and that the water loss from these samples may be a slow process. This may explain the discrepancy between the gravimetric and thermal analysis methods of determining weight % solids.

At the heating rates at which these thermogravimetric curves were recorded, two different water loss steps can be identified but not resolved. This is consistent with the DSC plots observed for this core.

TABLE 7: Core 9 Thermal Analysis Data

Differential Scanning Calorimetry	Run 1	Run 2
Water Transitions		
Total Transition Region		
Temp. Range (°C)	30 to 130	30 to 120
Enthalpy Change (cal/g)	272	283
First Peak Area		
Temp. Range (°C)	30 to 110	30 to 105
Enthalpy Change (cal/g)	209	218
Second Peak Area		
Temp. Range (°C)	95 to 130	90 to 120
Enthalpy Change (cal/g)	63	65
Melting point Transition		
Temp. Range (°C)	276 to 312	273 to 310
Temp. Peak Maximum (°C)	297	296
Onset Temp. (°C)	288	275
Enthalpy Change (cal/g)	8	9

Thermogravimetry	Run 1	Run 2
Weight % Solids	41.9	41.1

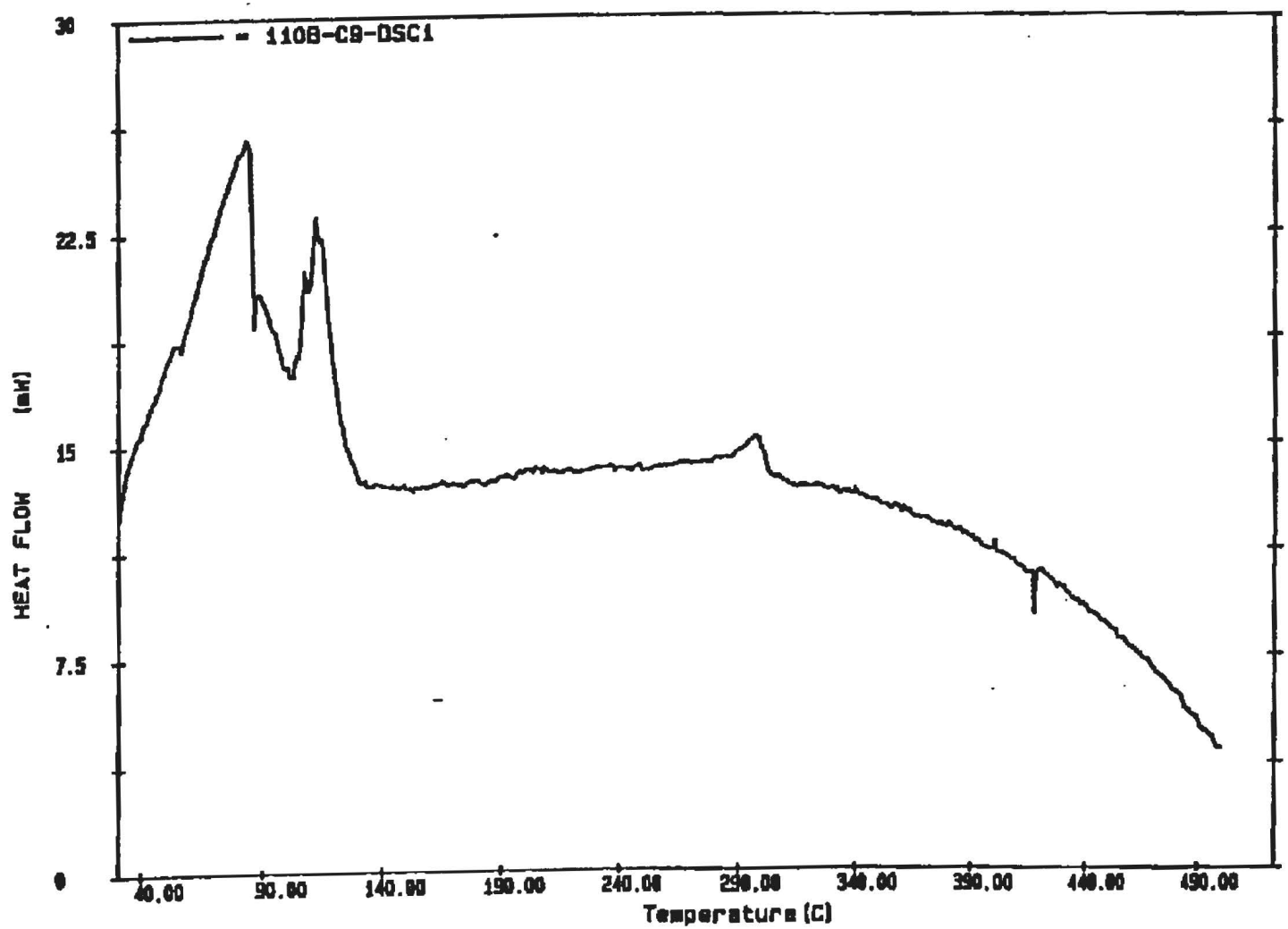


FIGURE 1: DSC Plot Core 9 Composite, Run 1

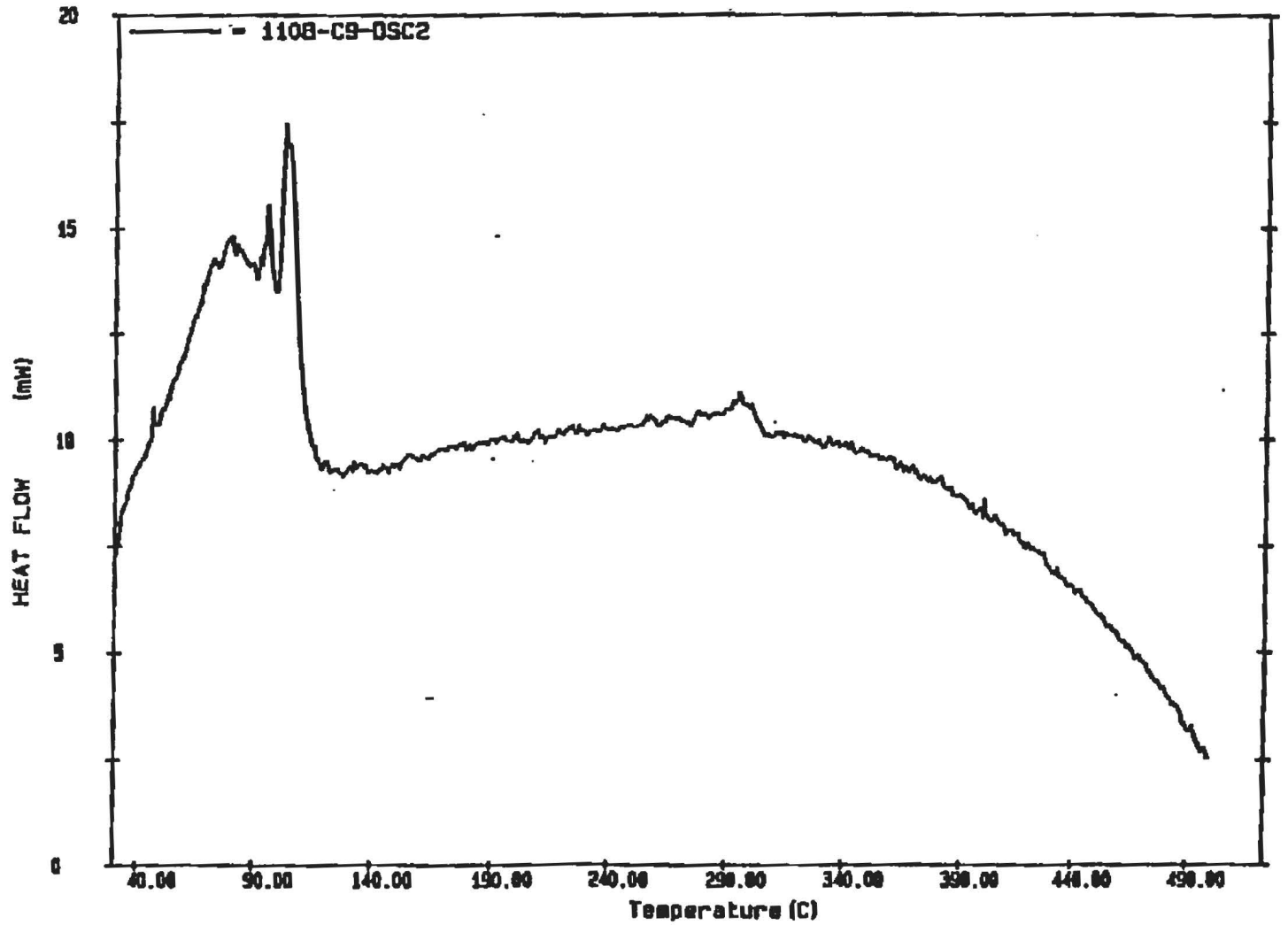


FIGURE 2: DSC Plot Core 9 Composite, Run 2

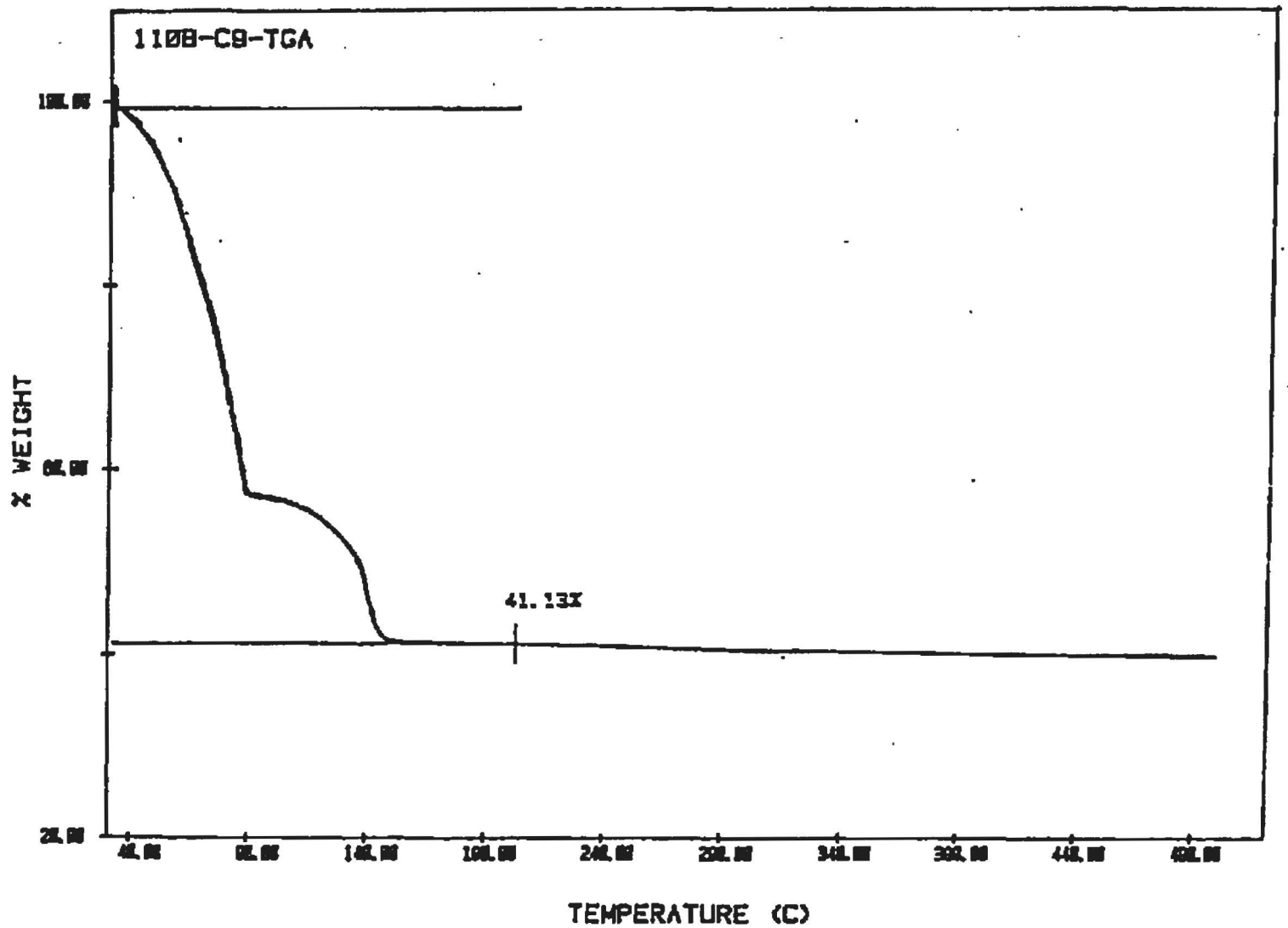


FIGURE 3: Core 9 Composite Thermogravimetric Cure, Run 1

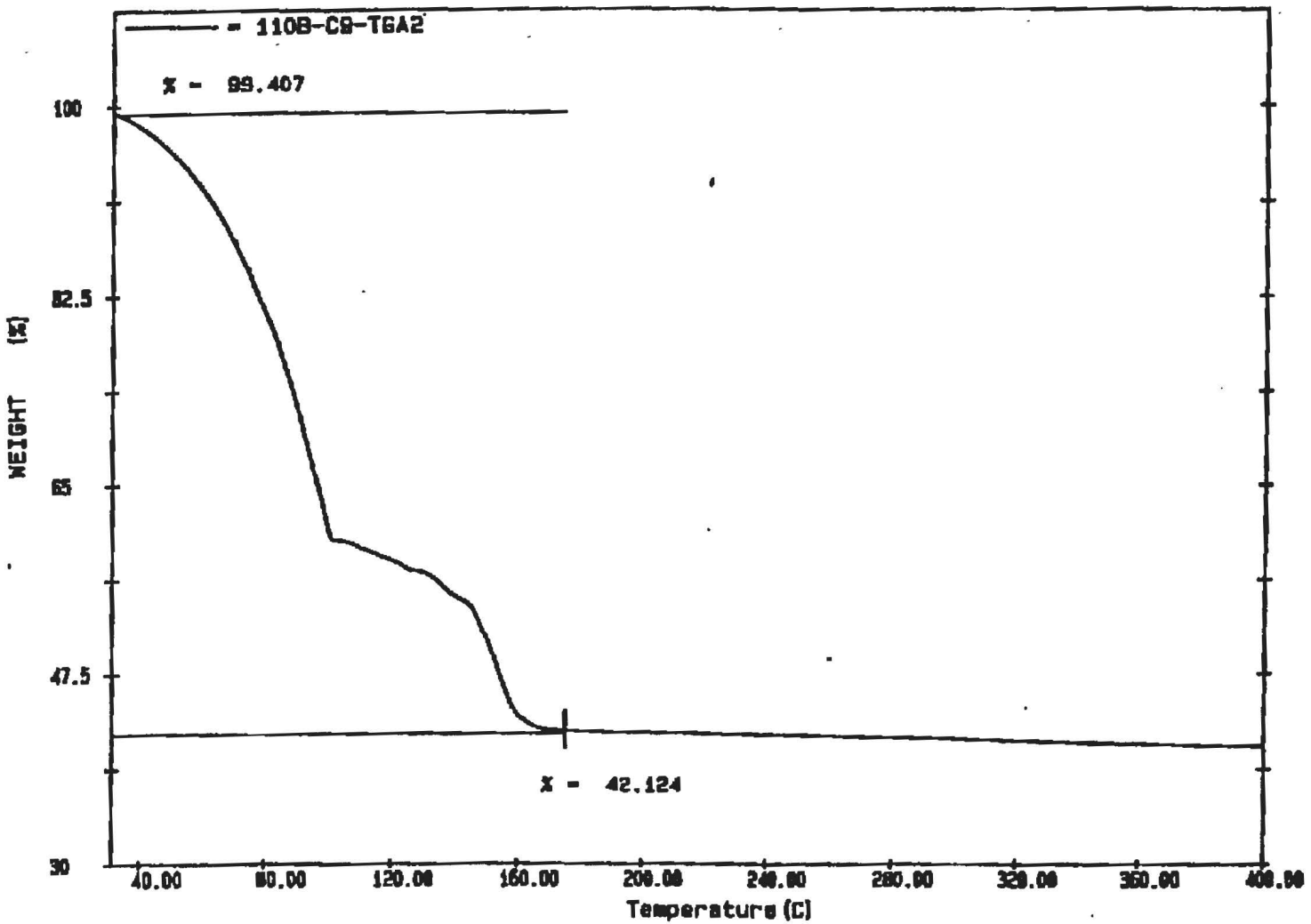


FIGURE 4: Core 9 Composite Thermogravimetric Curve, Run 2

RHEOLOGICAL CHARACTERIZATION

The rheological characterizations (shear stress versus shear rate) were measured on the homogenized 110B Core 9 composite. The data obtained from the rheological characterizations is important for retrieval operation and is used to evaluate the viscosity of a fluid and to assess the ability to transport the waste in pipes. The data are generated in the form of a rheogram or flow curve, which is a plot of shear stress as a function of shear rate. The rheograms were obtained using a Haake RV 100 viscometer equipped with an M5 measuring-drive head and the MV1 sensor system. The measurement of viscosity with this instrument requires that the sample be placed in the gap between two coaxial cylinders. About 40 mL of sample is agitated and transferred into the cylinders. When the system is set in motion, a viscosity-related torque, caused by the sample's resistance to shearing, acts on the inner cylinder. This torque deflects a calibrated measuring spring placed between the motor and the inner cylinder. The magnitude of the spring deflection correlates linearly with the torque. The spring deflection is transformed into an electrical signal. The spring deflection and tachometer signals are recorded. This data is used to calculate the shear stress versus shear rate.

A slurry with a yield stress will "clamp" the rotor to the cup until the applied torque exceeds the yield stress. While the rotor is still "clamped" and remains motionless, the motor rotation will cause some spring deflection and consequently a torque signal which is recorded. When sufficient force is transmitted to the material to break the gel or make it yield, the rheogram will angle sharply to the right, and from then on the behavior of the material as a fluid will be recorded. This sharp angle that is recorded as the material becomes fluid is the yield point. The height of this peak measured in Pascals on the ordinate is the value of the yield stress.

Two rheograms were obtained for the homogenized Core 9 composite. The measurements were obtained at the cell temperature (30°C). The viscosity of the core composite changed with shear rate; therefore, the waste is classified as a non-Newtonian fluid. The sample of waste was agitated prior to obtaining each rheogram.

The homogenized 110B Core 9 composite exhibited a yield stress; therefore, the data from the rheogram were "fit" to a yield-pseudoplastic

model. The data was fit to a non-linear yield power law model to obtain the necessary parameters for the yield-pseudoplastic rheological model. The equation for this rheological model is:

$$\tau = \tau_o + K\gamma^n \qquad (3)$$

where τ = shear stress

γ = shear rate

τ_o = yield stress (not a fit parameter)

The parameters of this model for the two separate runs are given in Table 6.

TABLE 6: Parameters for the Fit to the Rheological Models

τ_o	K	n
2.47	0.0628	0.740
2.08	0.0504	0.780

Figure 5 shows the viscosity versus shear rate for the homogenized core 9 composite. A shear rate of 250 sec^{-1} corresponds to a velocity of 8 ft/sec in a 3-in.-diameter pipe. The viscosity of this waste decreases with increasing velocity (ie. shear rate).

The rheological parameters, together with the density, were input into the Hanks' computer model (Hanks 1978) to obtain the critical Reynolds number, critical velocity, friction factor and pressure drop for transporting the slurries in 3.0-in. and 2.0-in.-diameter pipes. The results from the Hanks' computer model are given in Table 9. For a 3.0-in.-diameter pipe, the critical Reynolds number ranged from 5100 to 5300 and the critical velocity ranged from 3.2 ft/s (73 gpm) to 3.4 ft/sec (77 gpm). For a 2.0-in.-diameter pipe, the critical Reynolds number ranged from 4300 to 4500, and the critical velocity ranged from 3.5 ft/sec (37 gpm) to 3.7 ft/sec (39 gpm).

The rheological characterizations were performed under PNL Quality Assurance Manual MA-70, Impact Level II requirements. The Hanks' computer model is a purchased computer program but has not been verified internally by PNL. Therefore, the computer model is being used in accordance with MA-70, Impact Level III requirements.

TABLE 9. Critical Reynolds Numbers and Velocities

Pipe ID in.	Critical Velocity ft/s	Critical Reynolds Number	Critical Flow Rate (GPM)
3.0	3.2	5,100	73
	3.4	5,300	77
2.0	3.5	4,300	37
	3.7	4,500	39

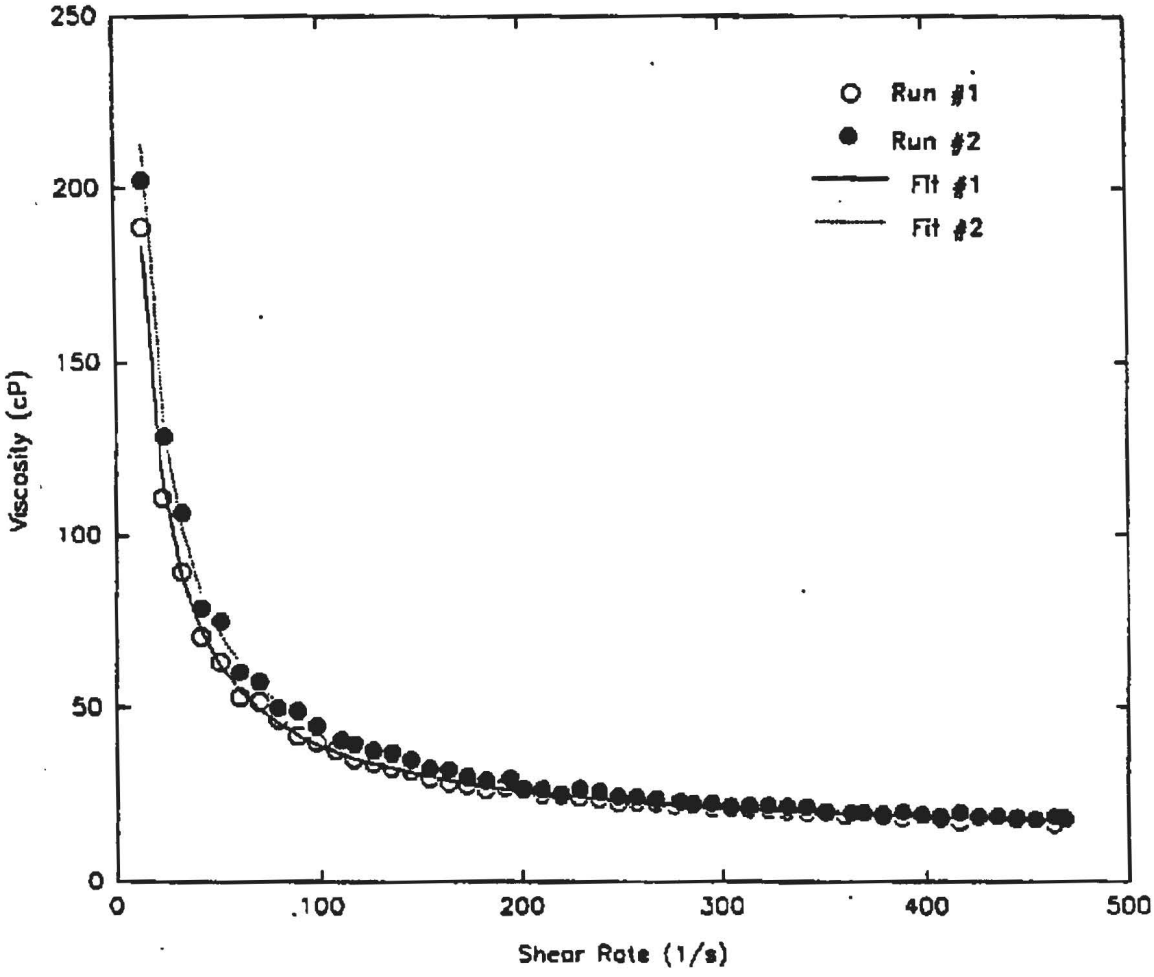


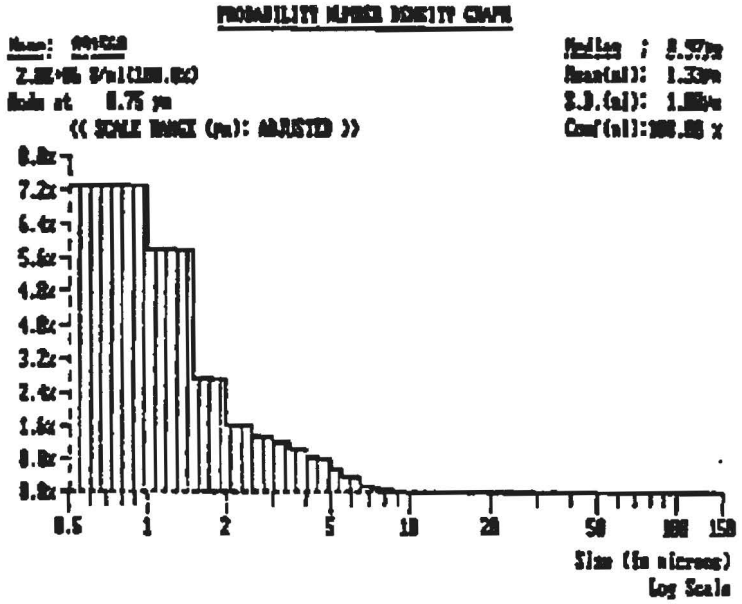
FIGURE 5. Viscosity of the Homogenized 110B Core 9 Composite

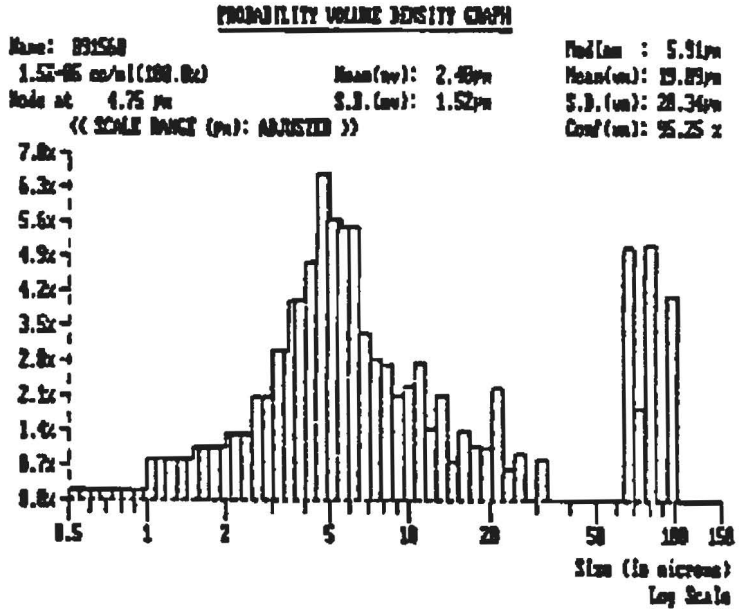
PARTICLE SIZE

FOR

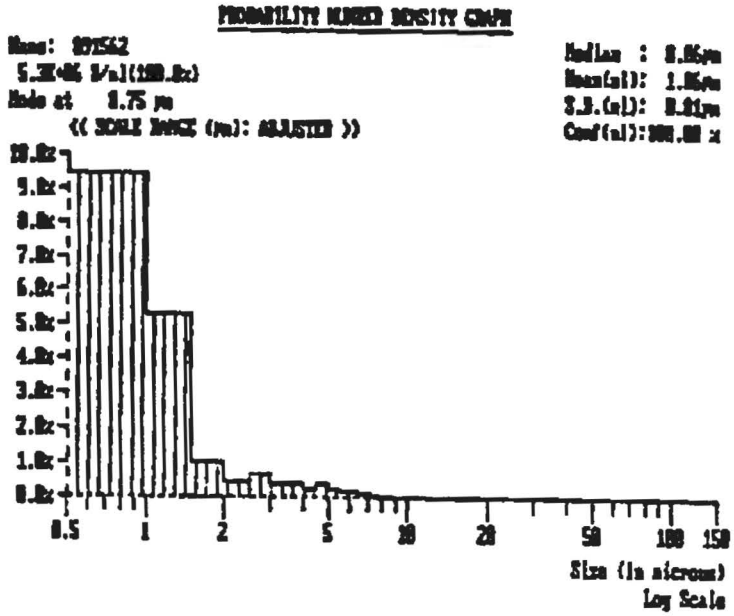
UNHOMOGENIZED SEGMENTS

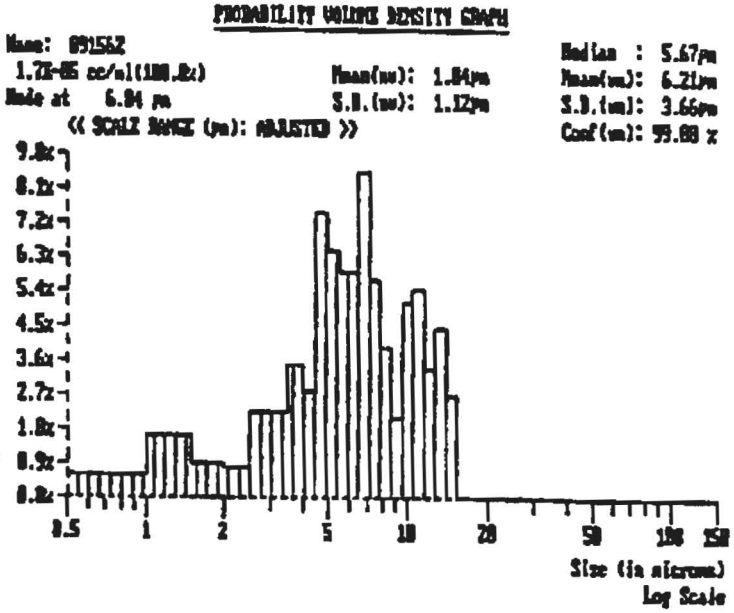
SST Core 9, Segment 2 Particle Size Analysis
Sample 89-1560



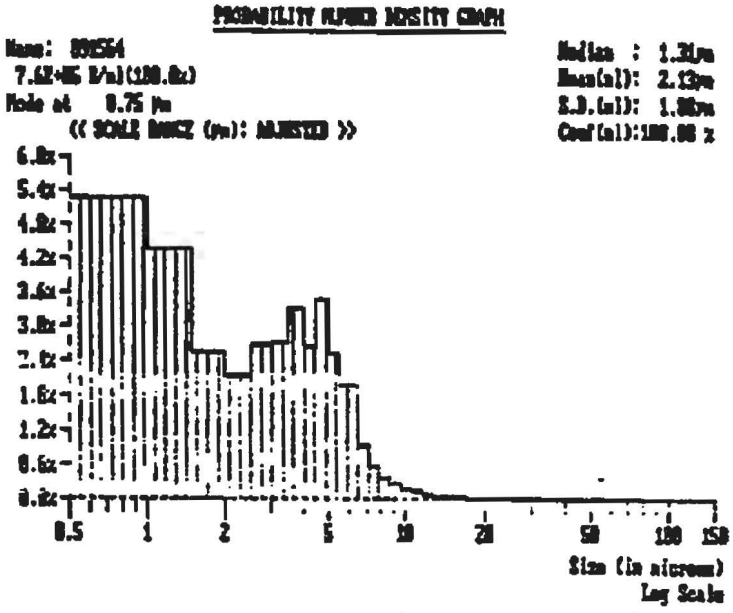


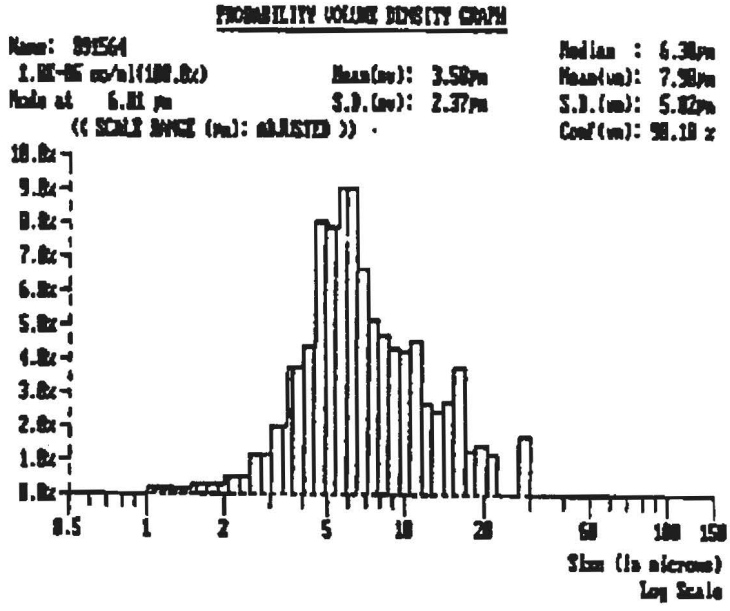
SST Core 9, Segment 3 Particle Size Analysis
Sample 89-1562



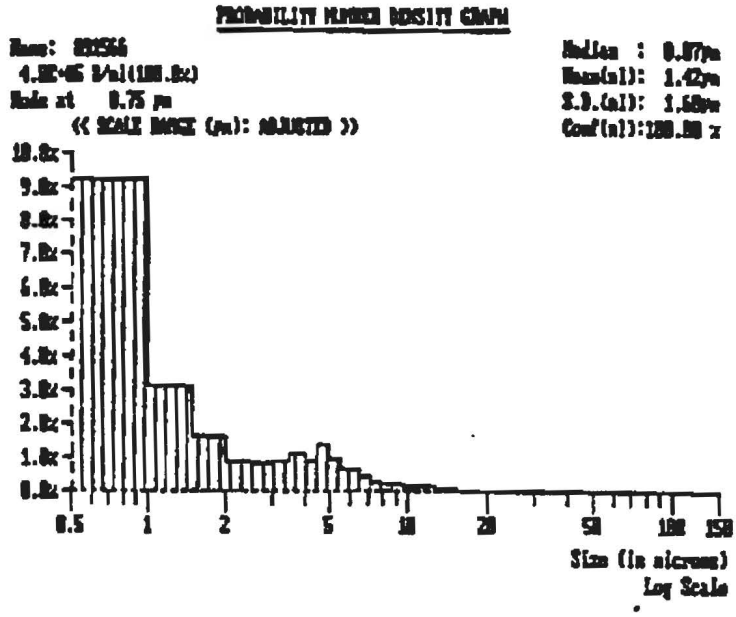


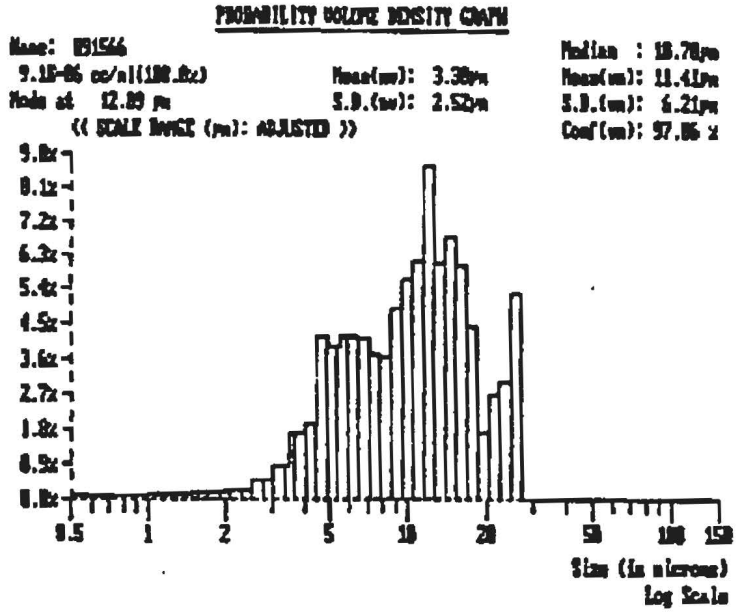
SST Core 9, Segment 4 Particle Size Analysis
Sample 89-1564





SST Core 9, Segment 5 Particle Size Analysis
Sample 89-1566





SECTION 2

INORGANIC DATA TABLES

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Inorganic Fusion ICP Results

Segments 3 and 5 and a Core 9 Composite Sample were fused with potassium hydroxide (KOH), the resulting melt dissolved in an acid solution (PNL-ALO-102), and the solution then analyzed by ICP spectroscopy (PNL-SP-7). In all cases samples were prepared in duplicate, and a methods blank sample was analyzed along with the samples. The methods blank involves the fusion of KOH without the addition of any sample. However, in all other respects the methods blank was prepared and analyzed exactly like the regular sample. With the exception of detection limits (DL) and quantitation limits (QL), all data are reported in units of weight percent (Wt %) wet sample. If concentrations fall below the estimated DL then "< DL" will be listed. If the value falls between the DL and QL the the value will be reported in parentheses. Detection limits were estimated to be three times the standard deviation of the background. Quantitation limits were estimated as ten times the standard deviation of the background.

Samples for which data are included in the Core 9 Data Package are the Segments 3 and 5 and the Core Composite homogenization check samples (Tables 10.1, 10.2, 10.3). The protocol for both the composite and the segment homogenization check analysis includes duplicate sample preparation and analyses of two samples, one from the top of the mixture and the other from the bottom of the mixture.

In all of the Fusion ICP tables, column 1 contains a list of atomic symbols of 41 elements for which data are provided. In Tables 10.1, 10.2 and 10.3, columns 2 and 3 contain duplicate analyses of the sample taken from the top of the homogenized segment. Column 4 lists the relative percent difference (RPD) between the duplicates. Columns 5 and 6 contain duplicate analyses of the sample taken from the bottom of the homogenized segment, and the RPD between the duplicates is listed in column 7. Columns 8 and 9 contain data for the methods blank samples which were analysed with the duplicates. Columns 11 and 12 list estimated DL and QL values in μg/ml. The DL or QL in Wt % can be calculated for any element by multiplying the listed DL or QL (in μg/ml) by the appropriate Wt % Factor in row 3.

TABLE 10.1: SST Core 9, Segment 3 Fusion ICP

Samp Log#:	90-0300a1	90-0300a2		90-0301a1	90-0301a2		90-0300a3	90-0301a3			
Dilution:	1.00	1.00		1.00	1.00		1.00	1.00			
Wt% Fctr:	0.49820	0.43861		0.47429	0.47535		0.47063	0.47063			
ICP Run#:	1642	1641		1643	1644		1640	1645		DL	QL
	(Wt %)	(Wt %)	RPD	(Wt %)	(Wt %)	RPD	(Wt %)	(Wt %)	RPD	(ug/mL)	(ug/mL)
Ag	<DL	<DL		<DL	<DL		<DL	<DL		0.0199	0.0665
Al	<DL	<DL		<DL	<DL		<DL	<DL		0.0591	0.1969
As	<DL	<DL		<DL	<DL		<DL	<DL		0.1171	0.3904
B	<DL	<DL		<DL	<DL		<DL	<DL		0.1148	0.3826
Ba	<DL	<DL		<DL	<DL		<DL	<DL		0.0044	0.0146
Be	<DL	<DL		<DL	<DL		<DL	<DL		0.0003	0.0009
Ca	0.0691	0.0594	15.1%	0.0544	0.0580	6.4%	0.0082	0.0103	22.4%	0.0013	0.0043
Cd	<DL	<DL		<DL	<DL		<DL	<DL		0.0101	0.0335
Ce	<DL	<DL		<DL	<DL		<DL	<DL		0.3217	1.0722
Co	<DL	<DL		<DL	<DL		<DL	<DL		0.5001	1.6668
Cr	0.0701	0.0697	0.6%	0.0706	0.0707	0.4%	<DL	<DL		0.0167	0.0557
Cu	<DL	<DL		<DL	<DL		<DL	<DL		0.0152	0.0508
Dy	<DL	<DL		<DL	<DL		<DL	<DL		0.0181	0.0604
Fe	1.3704	1.3792	0.6%	1.3607	1.3904	2.2%	<DL	<DL		0.0118	0.0395
K										0.7315	2.4385
La	<DL	<DL		<DL	<DL		<DL	<DL		0.0247	0.0823
Li	<DL	<DL		<DL	<DL		<DL	<DL		0.0214	0.0712
Mg	0.0157	0.0162	3.3%	0.0132	0.0146	10.5%	<DL	(0.0009)		0.0015	0.0050
Mn	0.0048	0.0052	8.7%	0.0047	0.0055	16.1%	<DL	<DL		0.0019	0.0063
Mo	<DL	<DL		<DL	<DL		<DL	<DL		0.0363	0.1210
Na	9.4444	9.4091	0.4%	9.4598	9.5913	1.4%	<DL	<DL		0.2702	0.9006
Nd	<DL	<DL		<DL	<DL		<DL	<DL		0.1111	0.3702
Ni										0.0231	0.0769
P	1.5579	1.5076	3.3%	1.4882	1.5079	1.3%	<DL	<DL		0.3481	1.1604
Pb	<DL	<DL		<DL	<DL		<DL	<DL		0.1053	0.3518
Re	<DL	<DL		<DL	<DL		<DL	<DL		0.0249	0.0830
Rh	<DL	<DL		<DL	<DL		<DL	<DL		0.1541	0.5137
Ru	<DL	<DL		<DL	<DL		<DL	<DL		0.0820	0.2733
Sb	<DL	<DL		<DL	<DL		<DL	<DL		0.3449	1.1496
Se	<DL	<DL		<DL	<DL		<DL	<DL		0.2326	0.7755
Si	0.7394	0.7517	1.6%	0.7380	0.7738	4.7%	<DL	<DL		0.0927	0.3090
Sr	0.0149	0.0149	0.1%	0.0149	0.0152	1.8%	<DL	<DL		0.0017	0.0058
Ta	<DL	<DL		<DL	<DL		<DL	<DL		0.1011	0.3369
Th	<DL	<DL		<DL	<DL		<DL	<DL		0.1754	0.5845
Ti	<DL	<DL		<DL	<DL		<DL	<DL		0.0135	0.0450
Tl	<DL	<DL		<DL	<DL		<DL	<DL		2.5070	8.3567
U	<DL	<DL		<DL	<DL		<DL	<DL		1.6162	5.3874
V	<DL	<DL		<DL	<DL		<DL	<DL		0.0173	0.0578
Zn	(0.0055)	(0.0044)	21.2%	(0.0024)	(0.0028)	14.9%	<DL	<DL		0.0044	0.0146
Zr	<DL	<DL		<DL	<DL		<DL	<DL		0.0143	0.0478
Si	1.5743	1.6185	2.8%	1.5557	1.5259	1.9%	0.0094	0.0188	66.7%		

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TABLE 10.2: SST Core 9, Segment 5 Fusion ICP

Samp LogN:	90-0304a1	90-0304a2		90-0305a1	90-0305a2		90-0304a3	90-0305a3			
Dilution:	1.00	1.00		1.00	1.00		1.00	1.00			
Wt% Fctr:	0.49560	0.49498		0.47725	0.48651		0.48847	0.48847			
ICP Run#:	1652	1651		1653	1654		1650	1655		DL	DL
	(Wt %)	(Wt %)	RPD	(Wt %)	(Wt %)	RPD	(Wt %)	(Wt %)	RPD	(ug/mL)	(ug/mL)
Ag	<DL	<DL		<DL	<DL		<DL	<DL		0.0199	0.0665
Al	<DL	<DL		<DL	<DL		<DL	<DL		0.0591	0.1969
As	<DL	<DL		<DL	<DL		<DL	<DL		0.1171	0.3904
B	<DL	<DL		<DL	<DL		<DL	<DL		0.1148	0.3826
Ba	<DL	(0.0023)		(0.0022)	(0.0024)	8.3%	<DL	<DL		0.0044	0.0146
Be	<DL	<DL		<DL	<DL		<DL	<DL		0.0003	0.0009
Ca	0.0500	0.0446	11.5%	0.0467	0.0478	2.2%	0.0101	0.0482	130.6%	0.0013	0.0045
Cd	<DL	<DL		<DL	<DL		<DL	<DL		0.0101	0.0335
Ce	<DL	<DL		<DL	<DL		<DL	<DL		0.3217	1.0722
Co	<DL	<DL		<DL	<DL		<DL	<DL		0.5001	1.6668
Cr	0.0715	0.0730	2.1%	0.0723	0.0721	0.2%	<DL	<DL		0.0167	0.0557
Cu	<DL	<DL		<DL	<DL		<DL	<DL		0.0152	0.0508
Dy	<DL	<DL		<DL	<DL		<DL	<DL		0.0181	0.0604
Fe	1.5347	1.5589	1.6%	1.5392	1.5712	2.1%	<DL	<DL		0.0118	0.0395
K										0.7315	2.4385
La	<DL	<DL		<DL	<DL		<DL	<DL		0.0247	0.0823
Li	<DL	<DL		<DL	<DL		<DL	<DL		0.0214	0.0712
Mg	0.0107	0.0108	0.3%	0.0099	0.0124	22.2%	(0.0008)	(0.0008)	6.3%	0.0015	0.0050
Mn	0.0065	0.0064	0.9%	0.0066	0.0072	7.5%	<DL	<DL		0.0019	0.0063
Mo	<DL	<DL		<DL	<DL		<DL	<DL		0.0363	0.1210
Na	9.6168	9.7675	1.6%	9.6815	9.7993	1.2%	<DL	<DL		0.2702	0.9006
Nd	<DL	<DL		<DL	<DL		<DL	<DL		0.1111	0.3702
Ni										0.0231	0.0769
P	1.5542	1.6192	4.1%	1.5523	1.5979	2.9%	<DL	<DL		0.3481	1.1604
Pb	<DL	<DL		<DL	<DL		<DL	<DL		0.1055	0.3518
Re	<DL	<DL		<DL	<DL		<DL	<DL		0.0249	0.0830
Rh	<DL	<DL		<DL	<DL		<DL	<DL		0.1541	0.5137
Ru	<DL	<DL		<DL	<DL		<DL	<DL		0.0820	0.2733
Sb	<DL	<DL		<DL	<DL		<DL	<DL		0.3449	1.1496
Se	<DL	<DL		<DL	<DL		<DL	<DL		0.2326	0.7755
Si	0.8068	0.8146	1.0%	0.8124	0.8310	2.3%	<DL	<DL		0.0927	0.3090
Sr	0.0212	0.0216	1.5%	0.0213	0.0215	1.0%	<DL	<DL		0.0017	0.0058
Te	<DL	<DL		<DL	<DL		<DL	<DL		0.1011	0.3369
Th	<DL	<DL		<DL	<DL		<DL	<DL		0.1754	0.5845
Ti	<DL	<DL		<DL	<DL		<DL	<DL		0.0135	0.0450
Tl	<DL	<DL		<DL	<DL		<DL	<DL		2.5070	8.3567
U	<DL	<DL		<DL	<DL		<DL	<DL		1.6162	5.3874
V	<DL	<DL		<DL	<DL		<DL	<DL		0.0173	0.0578
Zn	0.0122	0.0115	6.4%	0.0129	0.0134	3.8%	<DL	<DL		0.0044	0.0146
Zr	<DL	<DL		<DL	<DL		<DL	<DL		0.0143	0.0478
Si	1.5810	1.6384	3.6%	1.5558	1.5228	2.1%	<DL	<DL			

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TABLE 10.3: SST Core 9, Composite Fusion ICP

Samp Log#:	90-1255a1	90-1255a2		90-1256a1	90-1256a2		90-1255a3				
Dilution:	1.00	1.00		1.00	1.00		1.00				
Wt% Fctr:	0.49641	0.48009		0.52552	0.46607		0.49104				
ICP Run#:	1661	1660		1662	1663		1659			DL	DL
	(Wt %)	(Wt %)	RPD	(Wt %)	(Wt %)	RPD	(Wt %)	(Wt %)	RPD	(ug/mL)	(ug/mL)
Ag	(0.0144)	(0.0182)	23.6%	(0.0152)	(0.0131)	13.1%	<DL			0.0199	0.0665
Al	(0.0405)	(0.0387)	4.6%	(0.0362)	(0.0339)	6.5%	<DL			0.0591	0.1969
As	<DL	<DL		<DL	<DL		<DL			0.1171	0.3904
B	<DL	<DL		<DL	<DL		<DL			0.1148	0.3826
Ba	(0.0035)	(0.0029)	21.6%	(0.0031)	(0.0031)	2.4%	<DL			0.0044	0.0146
Be	<DL	(0.0002)		<DL	<DL		<DL			0.0003	0.0009
Ca	0.0622	0.0610	1.9%	0.0577	0.0648	11.6%	0.0208			0.0013	0.0045
Cd	<DL	<DL		<DL	<DL		<DL			0.0101	0.0335
Ce	<DL	<DL		<DL	<DL		<DL			0.3217	1.0722
Co	<DL	<DL		<DL	<DL		<DL			0.5001	1.6668
Cr	0.0753	0.0739	1.8%	0.0753	0.0753	0.1%	<DL			0.0167	0.0557
Cu	(0.0238)	0.0283	17.2%	(0.0176)	(0.0166)	6.2%	<DL			0.0152	0.0508
Dy	<DL	<DL		<DL	<DL		<DL			0.0181	0.0604
Fe	1.4629	1.4582	0.3%	1.4667	1.4413	1.8%	<DL			0.0118	0.0395
K										0.7315	2.4385
La	<DL	<DL		<DL	<DL		<DL			0.0247	0.0823
Li	<DL	<DL		<DL	<DL		<DL			0.0214	0.0712
Mg	0.0143	0.0137	4.7%	0.0137	0.0138	0.6%	(0.0015)			0.0015	0.0050
Mn	0.0088	0.0093	6.4%	0.0101	0.0091	9.9%	<DL			0.0019	0.0063
Mo	<DL	<DL		<DL	<DL		<DL			0.0363	0.1210
Na	9.2363	9.2663	0.3%	9.1537	9.1761	0.2%	<DL			0.2702	0.9006
Nd	<DL	<DL		<DL	<DL		<DL			0.1111	0.3702
Ni										0.0231	0.0769
P	1.5567	1.5539	0.2%	1.6132	1.5530	3.8%	<DL			0.3481	1.1604
Pb	<DL	<DL		(0.0537)	<DL		<DL			0.1055	0.3518
Re	<DL	<DL		<DL	<DL		<DL			0.0249	0.0830
Rh	<DL	<DL		<DL	<DL		<DL			0.1541	0.5137
Ru	<DL	<DL		<DL	<DL		<DL			0.0820	0.2733
Sb	<DL	<DL		<DL	<DL		<DL			0.3449	1.1496
Se	<DL	<DL		<DL	<DL		<DL			0.2326	0.7755
Si	0.8386	0.8195	2.3%	0.8171	0.8209	0.5%	<DL			0.0927	0.3090
Sr	0.0174	0.0174	0.3%	0.0173	0.0172	0.6%	<DL			0.0017	0.0058
Te	<DL	<DL		<DL	<DL		<DL			0.1011	0.3369
Th	<DL	<DL		<DL	<DL		<DL			0.1754	0.5845
Ti	<DL	<DL		<DL	<DL		<DL			0.0135	0.0450
Tl	<DL	<DL		<DL	<DL		<DL			2.5070	8.3567
U	<DL	<DL		<DL	<DL		<DL			1.6162	5.3874
V	<DL	<DL		<DL	<DL		<DL			0.0173	0.0578
Zn	0.0131	0.0167	23.8%	0.0121	0.0117	2.9%	<DL			0.0044	0.0146
Zr	<DL	<DL		<DL	<DL		<DL			0.0143	0.0478
Si	1.5389	1.4787	4.0%	1.5450	1.4448	6.7%	<DL				

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Inorganic Acid Leach ICP Results

A Core 9 Composite sample and segments 3 and 5 of Core 9 were leached with nitric and HCl acid following the EPA SW-846 protocols (PNL-ALO-101). For a each segment five aliquots were prepared for analysis. These include duplicate sample preps, a spiked sample prep, a spiked control sample, and a methods blank. The spike control was prepared by adding the spike solution to an appropriate amount of deionized water. Each of these aliquots were analyzed by ICP spectroscopy at a 1X and 5X dilution (PNL-SP-7). ICP analysis data are reported for each dilution, as well as a percent difference (% Dif) between the analyses. With the exception of detection limits (DL) and quantitation limits (QL), all data are reported in units of weight percent (Wt %) wet sample. If concentrations fall below the estimated DL then "< DL" will be listed. If the value falls between the DL and QL the the value will be reported in parentheses. Detection limits were estimated to be three times the standard deviation of the background. Quantitation limits were estimated as ten times the standard deviation of the background.

In Tables 10.4 - 10.6 column 1 contains a list of atomic symbols of 41 elements for which data are provided. Columns 2 and 3 contain 1X and 5X dilution analysis data for a single sample preparation, from the segment. Column 4 lists the percent difference (% Dif) between the dilutions. This sequence is repeated for columns 5, 6 and 7 for the duplicate samples, and in columns 8, 9 and 10 for the methods blank samples. In each of the tables, the last two columns on the first page contain the detection limit (DL) and the quantification limit (QL), respectively, in units of micrograms per milliliter (μg/ml). The DL or QL in Wt % can be calculated for any element by multiplying the listed DL or QL (in μg/ml) by the appropriate Wt % Factor in row 3.

The second page of Tables 10.4 - 10.6 contains primarily quality control (QC) data. Column 2 lists the average for the duplicate analyses and column 3 provides the relative percent difference (RPD) between the analyses. Column 4 tabulates the calculated Wt % spike added to spiked sample. Columns 5 and 6 list the data for the 1X and 5X dilution on the spiked sample, and column 7 lists the % Dif. between the spiked samples. Column 8 lists the percent recovered (% Rec) of the spiked sample. Columns 9 and 10 contain the 1X and

5X dilutions of the spike control samples, and column 11 lists the % Dif. between the samples. The last two columns list the calculated concentrations of elements in the spike control and the % Rec in the spike control sample analysis.

TABLE 10.4: SST Core 9, Segment 3 Acid Leach ICP

Samp Log#:	90-1275a1	90-1275a1		90-1275a2	90-1275a2		90-1275a5	90-1275a5			
Dilution:	1.00	5.00		1.00	5.00		1.00	5.00			
Wt% Factor	0.02494	0.12471		0.02349	0.11745		0.02419	0.12097			
ICP Run #	1712	1759		1711	1758		1708	1755		DL	DL
	(Wt %)	(Wt %)	%Dif	(Wt %)	(Wt %)	%Dif	(Wt% *)	(Wt% *)	%Dif	(ug/mL)	(ug/mL)
Ag	0.0017	(0.0021)		<DL	(0.0019)		<DL	<DL		0.0067	0.0224
Al	0.0170	(0.0172)		0.0202	0.0212	4.9%	0.0039	<DL		0.0427	0.1422
As	<DL	<DL		<DL	<DL		<DL	<DL		0.0882	0.2940
B	(0.0066)	<DL		(0.0072)	<DL		(0.0058)	<DL		0.1553	0.5175
Ba	0.0011	0.0012	11.7%	0.0011	0.0012	6.6%	(0.0001)	<DL		0.0017	0.0055
Be	<DL	<DL		<DL	<DL		(0.0000)	<DL		0.0002	0.0007
Ca	0.0595	0.0645	8.3%	0.0609	0.0658	8.1%	0.0162	0.0178	10.2%	0.0004	0.0015
Cd	<DL	<DL		<DL	<DL		<DL	<DL		0.1248	0.4159
Ce	<DL	<DL		<DL	<DL		<DL	<DL		0.0945	0.3151
Co	<DL	<DL		<DL	<DL		<DL	<DL		0.2179	0.7265
Cr	0.0749	0.0800	6.8%	0.0751	0.0798	6.2%	0.0008	<DL		0.0091	0.0304
Cu	0.0030	0.0034	16.1%	0.0029	0.0033	13.5%	<DL	<DL		0.0031	0.0102
Dy	<DL	<DL		<DL	<DL		<DL	<DL		0.0039	0.0130
Fe	1.3618	1.4577	7.0%	1.3659	1.4601	6.9%	0.0022	0.0015	30.3%	0.0034	0.0114
K	(0.0334)	<DL		0.0342	(0.0492)		<DL	<DL		0.4180	1.3933
La	(0.0003)	<DL		(0.0003)	<DL		<DL	<DL		0.0086	0.0288
Li	<DL	<DL		<DL	<DL		<DL	<DL		0.0047	0.0157
Mg	0.0157	0.0170	8.2%	0.0155	0.0167	7.7%	0.0030	0.0035	14.2%	0.0003	0.0010
Mn	0.0045	0.0048	7.5%	0.0045	0.0048	6.8%	(0.0001)	<DL		0.0014	0.0046
Mo	<DL	<DL		(0.0005)	<DL		<DL	<DL		0.0170	0.0566
Na	9.2846	9.8839	6.5%	9.3031	9.8553	5.9%	0.0421	(0.0447)		0.1638	0.5461
Nd	<DL	<DL		<DL	<DL		<DL	<DL		0.0440	0.1466
Ni	0.0013	(0.0019)		0.0013	(0.0016)		<DL	<DL		0.0100	0.0332
P	1.5656	1.7339	10.8%	1.5770	1.6975	7.6%	<DL	<DL		0.2051	0.6836
Pb	0.0126	0.0133	5.8%	0.0129	(0.0117)		(0.0021)	<DL		0.0301	0.1002
Re	(0.0005)	<DL		(0.0006)	<DL		<DL	<DL		0.0094	0.0312
Rh	<DL	<DL		<DL	<DL		<DL	<DL		0.0390	0.1299
Ru	0.0127	(0.0161)		0.0129	(0.0154)		<DL	<DL		0.0653	0.2178
Sb	<DL	<DL		<DL	<DL		<DL	<DL		0.1634	0.5446
Se	<DL	<DL		<DL	<DL		<DL	<DL		0.0875	0.2915
Si	0.0626	0.0661	5.7%	0.0536	0.0562	4.8%	0.0072	(0.0085)		0.0326	0.1086
Sr	0.0150	0.0159	5.5%	0.0151	0.0159	5.1%	0.0001	(0.0001)		0.0003	0.0010
Te	(0.0014)	<DL		(0.0011)	<DL		<DL	<DL		0.0274	0.0915
Th	<DL	<DL		<DL	<DL		<DL	<DL		0.0840	0.2799
Ti	(0.0004)	<DL		(0.0004)	<DL		<DL	<DL		0.0073	0.0242
Tl	<DL	<DL		<DL	<DL		<DL	<DL		1.5843	5.2809
U	0.0567	(0.1009)		0.0589	(0.0915)		<DL	<DL		0.6372	2.1242
V	(0.0002)	<DL		(0.0002)	<DL		<DL	<DL		0.0050	0.0167
Zn	0.0032	0.0041	29.6%	0.0032	0.0040	27.1%	(0.0001)	(0.0010)		0.0038	0.0127
Zr	0.0015	(0.0017)		0.0014	(0.0016)		0.0145	0.0151	4.6%	0.0056	0.0187
Bi	1.6234			1.6065							

* Methods blank - average sample weight used to calculate wt%.

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TABLE 10.4: SST Core 9, Segment 3 Acid Leach ICP (Cont'd)

	90-1275a1 90-1275a2 Average	RPD	Spike Added	90-1275a3 1.00 Spike+ Sample	90-1275a3 5.00 Spike+ Sample	<Sample ID> <Dilution> % Diff	% Rec	90-1275a4 1.00 Spike Control	90-1275a4 5.00 Spike Control	% Diff	Spike STD	% rec
	(Wt %)		(Wt %)	(Wt %)	(Wt %)			(ug/mL)	(ug/mL)		(ug/mL)	
Ag	N/A			0.0017	(0.0019)							
Al	0.0186	17.0%		0.0167	0.0178	6.4%						
As	N/A		0.0459	0.0392	0.0450	14.7%	85.5%	17.3	20.4	18.1%	20.0	86.4%
B	0.0069	8.8%		(0.0067)	<DL							
Ba	0.0011	2.8%	0.0459	0.0455	0.0479	5.2%	96.9%	19.8	20.3	2.7%	20.0	98.9%
Be	N/A		0.0011	0.0011	0.0011	7.5%	92.7%	0.5	0.5	3.9%	0.5	93.8%
Ca	0.0602	2.2%		0.0582	0.0631	8.6%						
Cd	N/A		0.0011	<DL	<DL		167.3%	0.7	2.5	251.1%	0.5	142.2%
Ce	N/A			<DL	<DL							
Co	N/A		0.0115	(0.0105)	<DL		91.7%	4.0	6.1	52.2%	5.0	79.6%
Cr	0.0750	0.3%		0.0744	0.0798	7.1%						
Cu	0.0030	0.8%	0.0057	0.0083	0.0092	11.1%	93.3%	2.5	2.6	5.0%	2.5	98.5%
Dy	N/A			<DL	<DL							
Fe	1.3638	0.3%		1.3507	1.4555	7.8%						
K	0.0338	2.4%		0.0340	(0.0520)							
La	0.0003	14.8%		(0.0004)	<DL							
Li	N/A			<DL	<DL							
Mg	0.0156	1.2%		0.0151	0.0164	8.3%						
Mn	0.0045	0.0%	0.0115	0.0154	0.0165	7.3%	95.4%	4.9	5.1	3.9%	5.0	98.9%
Mo	N/A			(0.0004)	<DL							
Na	9.2958	0.2%		9.2308	9.8522	6.7%						
Nd	N/A			<DL	<DL							
Ni	0.0013	1.2%	0.0115	0.0121	0.0133	10.3%	94.2%	4.9	5.2	4.5%	5.0	98.9%
P	1.5715	0.7%		1.5373	1.7354	12.9%						
Pb	0.0127	3.1%	0.0115	0.0228	0.0226	1.3%	88.1%	4.7	4.5	4.4%	5.0	93.5%
Re	0.0006	18.1%		(0.0006)	<DL							
Rh	N/A			<DL	<DL							
Ru	0.0128	1.6%		0.0128	(0.0151)							
Sb	N/A			(0.0114)	<DL							
Se	N/A		0.0459	0.0242	(0.0312)		52.7%	12.0	15.1	25.4%	20.0	60.1%
Si	0.0581	15.5%		0.2174	0.2291	5.4%						
Sr	0.0151	0.4%		0.0149	0.0158	5.7%						
Te	0.0012	23.6%		(0.0015)	<DL							
Th	N/A			<DL	<DL							
Ti	0.0004	3.4%		(0.0004)	<DL							
Tl	N/A		0.0459	<DL	<DL		58.5%	12.6			20.0	63.0%
U	0.0578	3.8%		0.0586	(0.0962)							
V	0.0002	4.7%	0.0115	0.0112	0.0121	7.9%	96.2%	4.8	5.0	3.0%	5.0	97.0%
Zn	0.0032	0.7%	0.0115	0.0142	0.0166	16.7%	96.1%	4.9	5.7	15.4%	5.0	98.7%
Zr	0.0014	8.7%		0.0033	0.0036	8.8%						
Si	1.6150	1.0%		1.6058								

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TABLE 10.5: SST Core 9, Segment 5 Acid Leach ICP

Samp Log#:	90-1276a1	90-1276a1		90-1276a2	90-1276a2		90-1276a5	90-1276a5			
Dilution:	1.00	5.00		1.00	5.00		1.00	5.00			
Wt% Factor	0.02325	0.11626		0.02395	0.11976		0.02360	0.11799			
ICP Run #	1721	1746		1720	1745		1717	1742		DL	QL
	(Wt %)	(Wt %)	%Diff	(Wt %)	(Wt %)	%Diff	(Wt% *)	(Wt% *)	%Diff	(ug/mL)	(ug/mL)
Ag	<DL	<DL		(0.0002)	<DL		<DL	<DL		0.0067	0.0224
Al	0.0140	(0.0126)		0.0108	(0.0092)		<DL	<DL		0.0427	0.1422
As	<DL	<DL		<DL	<DL		<DL	<DL		0.0882	0.2940
B	(0.0063)	<DL		(0.0076)	<DL		<DL	<DL		0.1553	0.5175
Ba	0.0014	0.0015	8.2%	0.0014	0.0014	5.9%	(0.0001)	<DL		0.0017	0.0055
Be	<DL	<DL		<DL	<DL		<DL	<DL		0.0002	0.0007
Ca	0.0479	0.0514	7.2%	0.0496	0.0520	4.8%	0.0067	0.0077	16.2%	0.0004	0.0015
Cd	<DL	<DL		<DL	<DL		<DL	<DL		0.1268	0.4159
Ce	<DL	<DL		<DL	<DL		<DL	<DL		0.0945	0.3151
Co	<DL	<DL		<DL	<DL		<DL	<DL		0.2179	0.7265
Cr	0.0736	0.0765	3.9%	0.0738	0.0758	2.6%	(0.0003)	<DL		0.0091	0.0304
Cu	0.0022	0.0026	21.8%	0.0040	0.0043	8.8%	<DL	<DL		0.0031	0.0102
Dy	<DL	<DL		<DL	<DL		<DL	<DL		0.0039	0.0130
Fe	1.5920	1.6757	5.3%	1.6193	1.6886	4.3%	0.0013	(0.0006)		0.0034	0.0114
K	(0.0233)	<DL		(0.0226)	<DL		<DL	<DL		0.4180	1.3933
La	(0.0004)	<DL		(0.0004)	<DL		<DL	<DL		0.0086	0.0288
Li	<DL	<DL		<DL	<DL		<DL	<DL		0.0047	0.0157
Mg	0.0127	0.0135	6.7%	0.0130	0.0137	5.8%	0.0014	0.0017	23.9%	0.0003	0.0010
Mn	0.0050	0.0052	4.3%	0.0050	0.0051	2.7%	(0.0000)	<DL		0.0014	0.0046
Mo	<DL	<DL		<DL	<DL		<DL	<DL		0.0170	0.0566
Na	9.7777	10.2296	4.6%	9.9687	10.3179	3.5%	(0.0068)	<DL		0.1638	0.5461
Nd	<DL	<DL		<DL	<DL		<DL	<DL		0.0440	0.1466
Ni	0.0024	(0.0029)		0.0021	(0.0026)		<DL	<DL		0.0100	0.0332
P	1.5817	1.8018	13.9%	1.6198	1.8492	14.2%	<DL	<DL		0.2051	0.6836
Pb	0.0333	0.0350	5.1%	0.0322	0.0338	4.7%	<DL	<DL		0.0301	0.1002
Re	(0.0005)	<DL		(0.0005)	<DL		<DL	<DL		0.0094	0.0312
Rh	<DL	<DL		<DL	<DL		<DL	<DL		0.0390	0.1299
Ru	0.0141	(0.0173)		0.0145	(0.0167)		<DL	<DL		0.0653	0.2178
Sb	<DL	<DL		<DL	<DL		<DL	<DL		0.1634	0.5446
Se	<DL	<DL		<DL	<DL		<DL	<DL		0.0875	0.2915
Si	0.0277	0.0296	7.0%	0.0343	0.0364	5.9%	0.0070	(0.0078)		0.0326	0.1086
Sr	0.0219	0.0228	4.0%	0.0223	0.0229	2.8%	(0.0000)	<DL		0.0003	0.0010
Te	(0.0012)	<DL		(0.0011)	<DL		<DL	<DL		0.0274	0.0915
Th	<DL	<DL		<DL	<DL		<DL	<DL		0.0840	0.2799
Ti	(0.0003)	<DL		(0.0003)	<DL		<DL	<DL		0.0073	0.0242
Tl	<DL	<DL		<DL	<DL		<DL	<DL		1.5843	5.2809
U	0.0703	(0.1011)		0.0699	(0.0901)		<DL	<DL		0.6372	2.1242
V	(0.0002)	<DL		(0.0002)	<DL		<DL	<DL		0.0050	0.0167
Zn	0.0105	0.0118	12.1%	0.0114	0.0127	11.3%	(0.0001)	(0.0012)		0.0038	0.0127
Zr	(0.0003)	<DL		(0.0004)	<DL		<DL	<DL		0.0056	0.0187
Si	1.7093			1.7433							

* Methods blank - average sample weight used to calculate wt%.

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TABLE 10.5: SST Core 9, Segment 5 Acid Leach ICP (Cont'd)

	90-1276a1 90-1276a2 Average		Spike Added	90-1276a3 1.00 Spike+ Sample	90-1276a3 5.00 <Sample 10> <Dilution> Spike+ Sample			90-1276a4 1.00 Spike Control	90-1276a4 5.00 Spike Control		Spike STD	
	(Wt %)	RPD	(Wt %)	(Wt %)	(Wt %)	% Dif	% Rec	(ug/mL)	(ug/mL)	% Dif	(ug/mL)	% rec
Ag	N/A			<DL	<DL							
Al	0.0124	26.2%		0.0107	(0.0092)							
As	N/A		0.0472	0.0411	0.0499	21.6%	87.0%	16.7	19.4	15.9%	20.0	83.5%
B	0.0070	18.3%		(0.0078)	<DL							
Ba	0.0014	1.3%	0.0472	0.0481	0.0499	3.7%	99.0%	19.8	20.3	2.6%	20.0	99.1%
Be	N/A		0.0012	0.0011	0.0012	3.7%	95.1%	0.5	0.5	4.1%	0.5	96.6%
Ca	0.0488	3.5%		0.0500	0.0531	6.3%						
Cd	N/A		0.0012	<DL	<DL		172.3%	0.7	2.1	208.9%	0.5	138.0%
Ce	N/A			<DL	<DL							
Co	N/A		0.0118	(0.0118)	<DL		99.8%	4.4	6.8	56.2%	5.0	87.4%
Cr	0.0737	0.3%		0.0732	0.0752	2.7%						
Cu	0.0031	59.4%	0.0059	0.0078	0.0085	8.6%	80.4%	2.5	2.6	7.3%	2.5	98.6%
Dy	N/A			<DL	<DL							
Fe	1.6057	1.7%		1.6049	1.6846	5.0%						
K	0.0230	2.9%		(0.0218)	<DL							
La	0.0004	9.8%		(0.0004)	<DL							
Li	N/A			<DL	<DL							
Mg	0.0128	2.2%		0.0129	0.0137	6.5%						
Mn	0.0050	0.6%	0.0118	0.0167	0.0171	2.8%	99.0%	5.0	5.1	2.5%	5.0	100.0%
Mo	N/A			<DL	<DL							
Na	9.8732	1.9%		9.9430	10.4544	5.1%						
Nd	N/A			<DL	<DL							
Ni	0.0022	15.6%	0.0118	0.0136	0.0138	1.5%	96.0%	4.9	5.1	2.8%	5.0	98.7%
P	1.6007	2.4%		1.6124	1.7968	11.4%						
Pb	0.0328	3.3%	0.0118	0.0440	0.0454	3.2%	95.5%	5.0	4.3	15.0%	5.0	100.2%
Pd	0.0005	4.8%		(0.0005)	<DL							
Rh	N/A			<DL	<DL							
Ru	0.0143	2.4%		0.0144	(0.0164)							
Sb	N/A			(0.0111)	<DL							
Se	N/A		0.0472	0.0262	(0.0266)		55.5%	12.7	14.0	10.2%	20.0	63.7%
Si	0.0310	21.5%		0.1137	0.1160	2.0%						
Sr	0.0221	1.7%		0.0222	0.0230	3.7%						
Te	0.0011	12.3%		(0.0015)	<DL							
Th	N/A			<DL	<DL							
Ti	0.0003	0.5%		(0.0003)	<DL							
Tl	N/A		0.0472	(0.0601)	<DL		127.4%	25.7	5.3	79.2%	20.0	128.4%
U	0.0701	0.6%		0.0690	<DL							
V	0.0002	12.4%	0.0118	0.0118	0.0121	2.4%	98.6%	4.9	5.0	3.2%	5.0	97.5%
Zn	0.0110	8.5%	0.0118	0.0221	0.0241	9.0%	94.4%	4.9	5.7	16.3%	5.0	98.7%
Zr	0.0003	23.7%		(0.0003)	<DL							
Al	1.7263	2.0%		1.7075								

10/23/90

TABLE 10.6: SST Core 9, Composite Acid Leach ICP

Samp Lego#:	90-1257a1	90-1257a1		90-1257a2	90-1257a2		90-1257a5	90-1257a5			
Dilution:	1.00	5.00		1.00	5.00		1.00	5.00			
Wt% Factor	0.02283	0.11417		0.02374	0.11868		0.02328	0.11638			
ICP Run #	1705	1731		1704	1729		1701	1726		DL	QL
	(Wt %)	(Wt %)	%Diff	(Wt %)	(Wt %)	%Diff	(Wt% *)	(Wt% *)	%Diff	(ug/mL)	(ug/mL)
Ag	0.0031	0.0032	2.6%	0.0030	0.0034	11.0%	<DL	<DL		0.0067	0.0224
Al	0.0334	0.0352	5.3%	0.0333	0.0347	4.2%	(0.0012)	<DL		0.0427	0.1422
As	<DL	<DL		<DL	<DL		<DL	<DL		0.0882	0.2940
B	(0.0043)	<DL		<DL	<DL		<DL	<DL		0.1553	0.3175
Ba	0.0012	0.0013	7.5%	0.0012	0.0012	0.9%	<DL	<DL		0.0017	0.0055
Be	<DL	<DL		<DL	<DL		<DL	<DL		0.0002	0.0007
Ca	0.0599	0.0644	7.5%	0.0664	0.0684	6.2%	0.0143	0.0154	7.2%	0.0004	0.0015
Cd	<DL	<DL		<DL	<DL		<DL	<DL		0.1248	0.4159
Ce	(0.0022)	<DL		<DL	<DL		<DL	<DL		0.0945	0.3151
Co	<DL	<DL		<DL	<DL		<DL	<DL		0.2179	0.7265
Cr	0.0720	0.0762	5.8%	0.0720	0.0755	4.9%	<DL	<DL		0.0091	0.0304
Cu	0.0043	0.0046	6.8%	0.0043	0.0046	7.8%	(0.0002)	<DL		0.0031	0.0102
Dy	<DL	<DL		<DL	<DL		<DL	<DL		0.0039	0.0130
Fe	1.4661	1.3691	7.0%	1.4658	1.5562	6.2%	0.0006	<DL		0.0034	0.0114
K	(0.0264)	<DL		(0.0277)	<DL		<DL	<DL		0.4180	1.3933
La	0.0015	(0.0016)		0.0015	(0.0011)		<DL	<DL		0.0086	0.0288
Li	<DL	<DL		<DL	<DL		<DL	<DL		0.0047	0.0157
Mg	0.0156	0.0167	7.4%	0.0161	0.0171	6.5%	0.0029	0.0031	6.7%	0.0003	0.0010
Mn	0.0050	0.0053	6.0%	0.0051	0.0053	4.8%	<DL	<DL		0.0014	0.0046
Mo	<DL	<DL		<DL	<DL		<DL	<DL		0.0170	0.0566
Na	9.3841	9.9431	6.0%	9.4095	9.8582	4.8%	(0.0056)	<DL		0.1638	0.5461
Nd	<DL	<DL		<DL	<DL		<DL	<DL		0.0440	0.1466
Ni	0.0017	(0.0022)		0.0016	(0.0021)		<DL	<DL		0.0100	0.0332
P	1.4726	1.6281	10.6%	1.4762	1.6095	9.0%	<DL	<DL		0.2051	0.6836
Pb	0.0277	0.0306	10.4%	0.0278	0.0316	13.6%	<DL	<DL		0.0301	0.1002
Pd	(0.0006)	<DL		(0.0006)	<DL		<DL	<DL		0.0094	0.0312
Rh	<DL	<DL		<DL	<DL		<DL	<DL		0.0390	0.1299
Ru	0.0140	(0.0148)		0.0138	(0.0145)		<DL	<DL		0.0653	0.2178
Sb	<DL	<DL		<DL	<DL		<DL	<DL		0.1634	0.5446
Se	<DL	<DL		<DL	<DL		<DL	<DL		0.0875	0.2915
Si	0.0693	0.0691	0.3%	0.0357	0.0366	2.4%	0.0040	<DL		0.0326	0.1086
Sr	0.0174	0.0183	4.9%	0.0175	0.0182	4.0%	0.0000	(0.0001)		0.0003	0.0010
Te	(0.0015)	<DL		(0.0011)	<DL		<DL	<DL		0.0274	0.0915
Th	<DL	<DL		<DL	<DL		<DL	<DL		0.0840	0.2799
Ti	0.0007	(0.0010)		0.0007	(0.0010)		<DL	<DL		0.0073	0.0242
Tl	<DL	<DL		<DL	<DL		<DL	<DL		1.5843	5.2809
U	0.0617	<DL		0.0602	<DL		<DL	<DL		0.6372	2.1242
V	(0.0002)	<DL		(0.0002)	<DL		<DL	<DL		0.0050	0.0167
Zn	0.0053	0.0066	24.8%	0.0053	0.0066	25.3%	(0.0001)	0.0018		0.0038	0.0127
Zr	(0.0004)	<DL		(0.0004)	<DL		<DL	<DL		0.0056	0.0187
Si	1.6463			1.6240							

* Methods blank - average sample weight used to calculate wt%.

09/26/90

TABLE 10.6: SST Core 9, Composite Acid Leach ICP (Cont'd)

	90-1257a1 90-1257a2 Average	RPD	Spike Added	90-1257a3 1.00 Spike+ Sample	90-1257a3 5.00 Spike+ Sample	<Sample ID> <Dilution> % Dif	% Rec	90-1257a4 1.00 Spike Control	90-1257a4 5.00 Spike Control	% Dif	Spike STD	% rec
	(Wt %)		(Wt %)	(Wt %)	(Wt %)			(ug/mL)	(ug/mL)		(ug/mL)	
Ag	0.0031	2.9%		0.0031	0.0039	28.8%						
Al	0.0334	0.4%		0.0346	0.0401	15.9%						
As	N/A		0.0525	0.0471	0.0587	24.7%	89.6%	18.3	19.5	6.2%	20.0	91.7%
B	N/A			(0.0059)	<DL							
Ba	0.0012	2.7%	0.0525	0.0530	0.0580	9.4%	98.6%	20.1	20.1	0.3%	20.0	100.3%
Be	N/A		0.0013	0.0012	0.0014	12.9%	94.3%	0.5	0.5	1.6%	0.5	95.7%
Ca	0.0622	7.2%		0.0692	0.0775	12.1%						
Cd	N/A		0.0013	<DL	<DL		159.7%	0.7			0.5	136.0%
Ce	N/A			<DL	<DL							
Co	N/A		0.0131	(0.0105)	<DL		80.0%	3.6	3.1	14.2%	5.0	71.4%
Cr	0.0720	0.1%		0.0722	0.0817	13.1%						
Cu	0.0043	0.3%	0.0066	0.0107	0.0124	15.6%	97.6%	2.5	2.6	3.4%	2.5	99.9%
Dy	N/A			<DL	<DL							
Fe	1.4659	0.0%		1.4730	1.6680	13.2%						
K	0.0270	4.6%		(0.0289)	<DL							
La	0.0015	0.8%		0.0014	(0.0024)							
Li	N/A			<DL	<DL							
Mg	0.0158	3.0%		0.0163	0.0186	13.8%						
Mn	0.0051	0.6%	0.0131	0.0179	0.0202	12.9%	97.9%	5.0	5.1	1.6%	5.0	100.7%
Mo	N/A			(0.0005)	<DL							
Na	9.3968	0.3%		9.4249	10.3125	9.4%						
Nd	N/A			<DL	<DL							
Ni	0.0017	1.5%	0.0131	0.0143	0.0175	22.1%	96.3%	5.0	5.2	5.4%	5.0	99.6%
P	1.4744	0.2%		1.4967	1.6753	11.9%						
Pb	0.0278	0.2%	0.0131	0.0406	0.0489	20.5%	97.9%	4.7	4.5	4.2%	5.0	94.1%
Re	0.0006	10.5%		(0.0005)	<DL							
Rh	N/A			<DL	<DL							
Ru	0.0139	1.2%		0.0137	(0.0175)							
Sb	N/A			(0.0110)	(0.0286)							
Se	N/A		0.0525	0.0289	0.0384	33.2%	54.9%	12.7	14.5	14.3%	20.0	63.4%
Si	0.0525	63.9%		0.2065	0.2273	10.1%						
Sr	0.0174	0.2%		0.0175	0.0192	10.0%						
Te	0.0013	28.6%		(0.0015)	(0.0052)							
Th	N/A			<DL	<DL							
Ti	0.0007	0.6%		0.0007	(0.0013)							
Tl	N/A		0.0525	<DL	(0.2100)		60.1%	11.5	54.4	372.2%	20.0	57.6%
U	0.0610	2.5%		0.0609	(0.0959)							
V	0.0002	6.5%	0.0131	0.0130	0.0146	12.3%	97.6%	4.9	4.9	0.6%	5.0	98.3%
Zn	0.0053	0.3%	0.0131	0.0181	0.0220	21.4%	97.9%	5.0	5.8	16.6%	5.0	99.7%
Zr	0.0004	4.5%		0.0007	(0.0008)							
Bi	1.6352	1.4%		1.6430								

10/23/90

Inorganic Water Leach ICP Data

The Core 9 Composite water leach ICP Data are reported in Table 10.7. A core composite sample was leached with deionized water (PNL-ALO-103), filtered, and distributed for analyses including analysis by ICP spectroscopy (PNL-SP-7). The sample preparation was completed in duplicate and included a methods blank. With the exception of detection limits (DL) and quantitation limits (QL), all data are reported in units of weight percent (Wt %) wet sample. If concentrations fall below the estimated DL then "< DL" will be listed. If the value falls between the DL and QL the the value will be reported in parentheses. Detection limits were estimated to be three times the standard deviation of the background. Quantitation limits were estimated as ten times the standard deviation of the background.

Column 1 of Table 10.7 lists the atomic symbols of the 41 elements for which data are reported. Columns 2 and 3 contain the results for the analyses of the both the 2X and 10X dilution samples, and column 4 lists the percent difference (% Dif) between these dilutions. Columns 5 and 6 contain the results of the duplicate analysis and column 7 lists the % Diff. Columns 8 and 9 contain the results of the analysis of the methods blank. Columns 10 and 11 list DL and QL values, respectively, in units of micrograms per milliliter (μg/ml). The DL or QL in weight percent (Wt %) can be calculated for any element by multiplying the listed DL or QL (in μg/ml) by the appropriate Wt % Factor in row 3. Column 12 tabulates the average value for the duplicate analyses and Column 13 reports the relative percent difference (RPD).

TABLE 10.7: SST Core 9, Composite Water Leach ICP

Samp Log#:	90-1257c1	90-1257c1		90-1257c2	90-1257c2		90-1257c5				90-1257c1 90-1257c2	
Dilution:	2.00	10.00		2.00	10.00		2.00					
Wt% Fctr:	0.01963	0.09815		0.01990	0.09948		0.01974	0.09868				
ICP Runs:	1858	1851		1857	1850		1856	1849	DL	DL	Average	
	(Wt %)	(Wt %)	%Dif	(Wt %)	(Wt %)	%Dif	(Wt% *)	(Wt% *)	(ug/mL)	(ug/mL)	(Wt %)	%RD
Ag	(0.0004)	<DL		(0.0004)	<DL		<DL	<DL	0.0181	0.0603	0.0004	0.7%
Al	(0.0007)	<DL		<DL	<DL		<DL	<DL	0.0348	0.1160	N/A	
As	<DL	<DL		<DL	<DL		<DL	<DL	0.0805	0.2684	N/A	
B	<DL	<DL		(0.0020)	<DL		<DL	<DL	0.0670	0.2232	N/A	
Ba	<DL	<DL		<DL	<DL		<DL	<DL	0.0041	0.0138	N/A	
Be	<DL	<DL		<DL	<DL		<DL	<DL	0.0002	0.0006	N/A	
Ca	0.0009	0.0017	84.7%	0.0018	0.0029	58.5%	0.0008	0.0018	0.0009	0.0031	0.0014	68.5%
Cd	<DL	<DL		<DL	<DL		<DL	<DL	0.0071	0.0236	N/A	
Ce	<DL	<DL		<DL	<DL		<DL	<DL	0.2593	0.8642	N/A	
Co	<DL	<DL		<DL	<DL		<DL	<DL	0.5078	1.6928	N/A	
Cr	0.0050	(0.0053)		0.0052	(0.0055)		<DL	<DL	0.0316	0.1055	0.0051	3.6%
Cu	<DL	<DL		<DL	<DL		<DL	<DL	0.0226	0.0753	N/A	
Dy	<DL	<DL		<DL	<DL		<DL	<DL	0.0179	0.0595	N/A	
Fe	0.0025	(0.0021)		0.0049	0.0042	13.4%	<DL	<DL	0.0090	0.0300	0.0037	63.8%
K	(0.0228)	<DL		(0.0230)	<DL		<DL	<DL	0.6178	2.0592	0.0229	0.8%
La	<DL	<DL		<DL	<DL		<DL	<DL	0.0233	0.0775	N/A	
Li	<DL	<DL		<DL	<DL		<DL	<DL	0.0106	0.0355	N/A	
Mg	0.0003	0.0003	7.9%	0.0006	0.0005	6.0%	0.0002	0.0003	0.0007	0.0024	0.0004	44.2%
Mn	<DL	<DL		<DL	<DL		<DL	<DL	0.0017	0.0057	N/A	
Mo	(0.0003)	<DL		(0.0003)	<DL		<DL	<DL	0.0078	0.0260	0.0003	7.0%
Na	9.3689	9.3573	0.1%	9.5261	9.4196	1.1%	<DL	<DL	0.1149	0.3828	9.4475	1.7%
Nd	<DL	<DL		<DL	<DL		<DL	<DL	0.1118	0.3726	N/A	
Ni	<DL	<DL		<DL	<DL		<DL	<DL	0.0244	0.0812	N/A	
P	0.7432	0.7362	1.2%	0.8042	0.7788	3.2%	<DL	<DL	0.3559	1.1862	0.7747	7.6%
Pb	<DL	<DL		<DL	<DL		<DL	<DL	0.0766	0.2553	N/A	
Sm	<DL	<DL		<DL	<DL		<DL	<DL	0.0193	0.0642	N/A	
Rh	<DL	<DL		<DL	<DL		<DL	<DL	0.1440	0.4801	N/A	
Ru	<DL	<DL		<DL	<DL		<DL	<DL	0.0690	0.2300	N/A	
Sb	<DL	<DL		<DL	<DL		<DL	<DL	0.1212	0.4039	N/A	
Se	<DL	<DL		<DL	<DL		<DL	<DL	0.0875	0.2916	N/A	
Si	0.0352	0.0314	10.9%	0.0576	0.0534	7.3%	<DL	<DL	0.0637	0.2124	0.0464	48.3%
Sr	<DL	<DL		(0.0000)	<DL		<DL	<DL	0.0014	0.0048	N/A	
Te	<DL	<DL		<DL	<DL		<DL	<DL	0.0625	0.2082	N/A	
Th	<DL	<DL		<DL	<DL		<DL	<DL	0.1891	0.6304	N/A	
Ti	<DL	<DL		<DL	<DL		<DL	<DL	0.0121	0.0403	N/A	
Tl	<DL	<DL		<DL	<DL		<DL	<DL	3.9597	13.1990	N/A	
U	<DL	<DL		<DL	<DL		<DL	<DL	1.6450	5.4834	N/A	
V	<DL	<DL		<DL	<DL		<DL	<DL	0.0107	0.0357	N/A	
Zn	<DL	<DL		<DL	<DL		<DL	<DL	0.0063	0.0210	N/A	
Zr	<DL	<DL		<DL	<DL		<DL	<DL	0.0114	0.0381	N/A	
Si	N/A			N/A			N/A				N/A	

* Methods blank - average sample weight used to calculate wt%.

10/18/90

Inorganic Water Leach Anion Analysis Results

An aliquot of the Water Leach sample preparation solution (PNL-ALO-102) was analyzed for anions by ion chromatography (7-40.8) and total carbon/total inorganic carbon (7-40.7). Each sample was prepared in duplicate. In addition, an anion spike was added to a third sample, and a spike control sample was prepared by adding the same spiking solution to deionized water. Each suite of analyses included a methods blank.

The Core 9 Data Package contains anion analysis data for Segments 3 and 5 and the Core Composite (Tables 11.1 - 11.3). Column 1 of each of these tables list the anions for which data are reported. Columns 2 and 3 tabulate the analytical results for the analyses of the duplicate samples and column 4 lists the relative percent difference (RPD) between the samples. Column 5 lists the "as prepared" concentrations of the anion spiking solution and column 6 lists the "measured" concentrations that are derived from the Spike Control analysis data. Column 7 lists the calculated value of the "spike" added to the spiked sample. Column 8 reports the results from the spiked sample analysis; percent recoveries (% Spk Rec) are listed in column 9. Estimated method detection limits are shown in column 10.

TABLE 11.1: SST Core 9, Segment 3 Water Leach Anion Analysis

Sample: 90-1275
05/05/90

	B1 (mg/kg)	B2 (mg/kg)	RPD	-----Spike*Control--(a)- True (ug/mL)	B4---> (ug/mL)	B3 Spk (mg/kg)	B3 (mg/kg)	% Spk Rec	B5 (c) (mg/kg)
F	1940	1960	1.0%	50	53	519	2440	94.4%	<20
Cl	1200	1270	5.7%	100	106	1040	2270	99.5%	<20
NO2	10200	10600	3.8%	1000	980	9590	20300	103.2%	<40
NO3	172000	175000	1.7%	5000	5050	49400	233000	120.4%	<40
PO4	24500	24800	1.2%	1500	1550	15200	38200	89.1%	<40
SO4	11100	11300	1.8%	500	520	5090	16500	104.1%	<40
TIC	717	699	2.5%						<100
TOC	586	579	1.2%						<100

(a) The spike's measured concentration has been used to calculate the quantity of spike added in mg/kg.
(b) The % spike recovery is valid only if the spike level is over 20% of the sample's base value.
(c) The average Wt-gm of Sample 1 & 2 is used to calculate blank in mg/kg.

TABLE 11.2: SST Core 9, Segment 5 Water Leach Anion Analysis

Sample: 90-1276
05/05/90

	B1 (mg/kg)	B2 (mg/kg)	RPD	-----Spike*Control--(a)- True (ug/mL)	B4---> (ug/mL)	B3 Spk (mg/kg)	B3 (mg/kg)	% Spk Rec	B5 (c) (mg/kg)
F	1960	1990	1.5%	50	53	523	2520	104.2%	<20
Cl	1320	1310	0.8%	100	98	968	2250	96.6%	<20
NO2	3350	3390	1.2%	1000	1010	9970	13300	99.6%	<39
NO3	197000	199000	1.0%	5000	5100	50400	250000	103.2%	<39
PO4	24500	24600	0.4%	1500	1520	15000	38700	94.3%	<39
SO4	11500	11600	0.9%	500	514	5080	16800	103.3%	<39
TIC	311	289	7.3%						<99
TOC	496	498	0.4%						<99

(a) The spike's measured concentration has been used to calculate the quantity of spike added in mg/kg.
(b) The % spike recovery is valid only if the spike level is over 20% of the sample's base value.
(c) The average Wt-gm of Sample 1 & 2 is used to calculate blank in mg/kg.

TABLE 11.3: SST Core 9, Composite Water Leach Anion Analysis

Sample: 90-1257
04/11/90

	C1 (mg/kg)	C2 (mg/kg)	RPD	-----Spike*Control--(a)- True (ug/mL)	C4---> (ug/mL)	C3 Spk (mg/kg)	C3 (mg/kg)	% Spk Rec	C5 (c) (mg/kg)
F	1970	2040	3.5%	50	54	544	2540	98.3%	<20
Cl	1230	1280	4.0%	100	98	988	2320	107.8%	<20
NO2	9030	8870	1.8%	1000	1020	10300	19200	99.5%	<39
NO3	187000	189000	1.1%	5000	5140	51800	252000	123.6%	109
PO4	24200	26200	7.9%	1500	1490	15000	37600	82.7%	<39
SO4	11000	11100	0.9%	500	504	5080	16300	103.3%	<39
TIC	618	627	1.4%						<99
TOC	304	298	2.0%						<99

(a) The spike's measured concentration has been used to calculate the quantity of spike added in mg/kg.
(b) The % spike recovery is valid only if the spike level is over 20% of the sample's base value.
(c) The average Wt-gm of Sample 1 & 2 is used to calculate blank in mg/kg.

Other Inorganic Results

Graphite furnace atomic absorption spectroscopy analyses were performed on the Core 9 composite sample. The sample was prepared by the acid leach method (PNL-ALO-101), and was analyzed in duplicate along with a spike, a spike control and a methods blank sample (Table 12). Data is included for As, Se and Pb.

Colorimetic analysis for chromium (VI) were completed on aliquots of the Core 9 composite water leach sample. The sample was analyzed in duplicate along with a methods blank sample. The results are reported in mg/kg (Table 12).

The Core 9 composite was sampled and analyzed for mercury following the protocols outlined in the EPA-CLP statement of work. The analyses were completed in duplicate, a third sample split was spiked with mercury and a forth sample was prepared by spiking the mercury standard into deionized water (Table 12). A methods blank was also run.

EPA Method 350.3 was used for the ammonia analysis of the Core 9 Composite water leach sample. The sample was analyzed in duplicate along with a methods blank sample; the results are reported in mg/kg.

TABLE 12: SST Core 9, Other Inorganic Results

Analysis	Sample Number	mg/kg
AA - As	90-1257-B-1	<2
	-B-2	<2
	-B5	<2
- Se	90-1257-B-1	(a)
	-B-2	(a)
	-B-5	<2
-Pb	90-1257-B-1	253
	-B-2	265
	-B-5	<2
Chromium (VI)	90-1257-C-1	36.4
	-C-2	36.8
	-C-5	0.0
Mercury	90-1257-D-1	0.70
	-D-2	0.70
	-D-3	0.78
	-D-5	<0.04
Ammonia	90-1257-C-1	274.8
	-C-2	261.0
	-C-5	17.1

(a) Analyte suppression due to matrix effect observed on final dilution runs.

SECTION 3

RADIOCHEMICAL DATA TABLES

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RADIOCHEMICAL RESULTS

Radiochemical analyses were completed on selected segment and core composite samples. The solution resulting from the potassium hydroxide (KOH) fusion (PNL-ALO-102) were split between the inorganic and radiochemistry groups. Radiochemical analyses completed on this solution include Gamma Energy Analysis (GEA), Total Alpha, Total Beta, and Total Uranium. These radiochemical analyses were also completed for the Water Leach sample (PNL-ALO-102). GEA data are reported in Table 13. The rest of the radiochemistry results are reported in Table 14.

TABLE 13: SST Core 9 Gamma Energy Analysis Data

Customer No.	Counting Time	Cs-137 uCi/g-wet 662 keV	* +/- % error	Eu-155 uCi/g-wet 105 keV	* +/- % error	Eu-154 uCi/g-wet 1274 keV	* +/- % error	Additional Nuclides: Nuclide	Energy keV	uCi/g-wet	+/- % error
SEGMENT 3											
90-0300-A-1	100 min.	15.38	0.17	---		0.0165	14.1	Am-241	59.54	0.01646	30
								Co-60	1332.5	0.0014	45
								Gd-153	97.43	0.01685	27
90-0300-A-2	100 min.	15.22	0.16	---		0.01277	16.9	Am-241	59.54	0.01283	31
								Co-60	1332.5	0.002359	50
90-0300-A-3	15 hr.	0.1828	0.53	0.0008	36.7	0.0014	40	Co-60	1332.5	0.00154	12
								Ce-144	133.54	0.02723	4
								Cs-134	604.71	0.0013	16
90-0301-A-1	100 min.	15.28	0.16	---		0.01677	13.7	Co-60	1332.5	0.000743	51
								Gd-153	97.43	0.01579	28
90-0301-A-2	100 min.	15.49	0.16	---		0.01332	14.0	Am-241	59.54	0.01148	42
90-0301-A-3	15 hr.	0.04299	1.25	---		---		Co-60	1332.5	0.002186	8
								Cs-134	604.71	0.000811	19

* Only statistical values are listed; total uncertainties are about 5%.

TABLE 13: SST Core 9 Gamma Energy Analysis Data (Cont'd)

Customer No.	Counting Time	Cs-137 uCi/g-wet 662 keV	* +/- % error	Eu-155 uCi/g-wet 105 keV	* +/- % error	Eu-154 uCi/g-wet 1274 keV	* +/- % error	Additional Nuclides: Nuclide	Energy keV	uCi/g-wet	+/- % error
SEGMENT 5											
90-0304-A-1	100 min.	11.97	0.19	---		0.02036	11.0	Am-241	59.54	0.009666	39
								Co-60	1332.5	0.001104	39
								Gd-153	97.43	0.01868	25
								Ce-144	133.54	0.03342	35
90-0304-A-2	100 min.	11.77	0.19	---		0.04069	7.50	Gd-153	97.43	0.05779	9
90-0304-A-3	13.8 hr.	0.01621	2.69	---		---		Co-60	1332.5	0.00095	17
								Cs-134	604.71	0.00036	39
90-0305-A-1	100 min.	12.18	0.19	---		0.01516	25.0	Co-60	1332.5	0.001782	28
								Gd-153	97.43	0.01465	45
90-0305-A-2	100 min.	11.91	0.19	---		0.01732	11.1	Co-60	1332.5	0.000845	72
								Gd-153	97.43	0.01925	20
90-0305-A-3	15 hr.	0.0361	1.45	---		---		Co-60	1332.5	0.001601	12
								Gd-153	103.18	0.001734	22
								Ce-144	133.54	0.003287	24
								Cs-134	604.71	0.000744	25

* Only statistical values are listed; total uncertainties are about 5%.

TABLE 13: SST Core 9 Gamma Energy Analysis Data (Cont'd)

Customer No.	Counting Time	Cs-137 uCi/g-wet 662 keV	* +/- % error	Eu-155 uCi/g-wet 105 keV	* +/- % error	Eu-154 uCi/g-wet 1274 keV	* +/- % error	Additional Nuclides: Nuclide	Energy keV	uCi/g-wet	+/- % error
COMPOSITE HOMOGENIZATOIN											
90-1255-A-1	100 min.	13.65	0.18	0.1964	8.27	0.1238	4.37	Am-241	59.54	0.05078	14
								Eu-152	1408.01	0.0375	11
90-1255-A-2	100 min.	13.58	0.18	0.1462	7.54	0.1018	4.73	Am-241	59.54	0.04752	14
90-1255-A-3	3.5 hr.	0.01898	4.71	---.		---		Co-60	1332.5	0.00828	7
								Ce-144	133.54	0.005840	28
90-1256-A-1	100 min.	14.07	0.18	0.1509	7.7	0.1083	4.58	Am-241	59.54	0.0435	16
90-1256-A-2	100 min.	14.86	0.17	0.1929	8.31	0.1252	4.51	Am-241	59.54	0.034020	17
								Co-60	1332.5	0.005744	40
								Eu-152	1408.01	0.03197	20
COMPOSITE											
90-1257-C-1	100 min.	8.87	0.1	---		---		---			
90-1257-C-2	100 min.	8.73	0.10	---		---		---			
90-1257-C-5	15 hr.	0.01415	4.31	---		---		Co-60	1332.5	0.004952	2
								Cs-134	604.71	0.00034	14

* Only statistical values are listed; total uncertainties are about 5%.

TABLE 14: SST Core 9 Radiochemistry Data

TOTAL ALPHA, TOTAL BETA AND URANIUM

Customer No.	Tot alpha dpm/g	+/- % error*	Tot beta (dpm/g) @Sr90-Y90	+/- % error	Uranium ug/g wet wt.	+/- % error
Core 9 - Segment 3						
90-0300-A-1	1.68E+05		4.16E+07	3.6	175	7.6
90-0300-A-2	1.71E+05		3.92E+07	3.6	171	7.6
90-0300-A-3	2.57E+03		1.24E+06	4.7	0.64	73.4
90-0301-A-1	1.80E+05		3.87E+07	4.0	163	7.7
90-0301-A-2	1.88E+05		3.79E+07	4.2	174	7.7
90-0301-A-3	1.94E+03		2.35E+05	8.4	0.34	144
Core 9 - Segment 5						
90-0304-A-1	1.83E+05		2.75E+07	4.4	55	9.2
90-0304-A-2	1.72E+05		2.86E+07	4.4	49	10.4
90-0304-A-3	4.11E+02		1.37E+05	10.6	0.64	73.4
90-0305-A-1	1.76E+05		2.81E+07	4.4	47	10.4
90-0305-A-2	1.62E+05		2.72E+07	4.5	43	11.7
90-0305-A-3	1.87E+03		2.11E+05	8.6	0.35	144
Core 9 Composite						
90-1255-A-1	2.63E+05		2.37E+08	3.7	182	7.6
90-1255-A-2	2.39E+05		2.39E+08	3.7	176	7.6
90-1255-A-3	1.78E+03		2.12E+05	4.9	<2	
90-1256-A-1	2.55E+05		2.43E+08	4.7	193	7.6
90-1256-A-2	2.65E+05		2.38E+08	4.7	177	7.7
Composite Water Leach						
90-1257-C-1	1.78E+03		1.98E+07	3.6	0.77	15
90-1257-C-2	2.35E+03		2.07E+07	3.7	0.26	15
90-1257-C-5	3.35E+01		1.71E+05	5.7		

* Total alpha values may be low as there may be a loss of Pu, Am and Np during preparation of sample for counting and alpha losses may have occurred in some of the counting deposits. A quantified multiplier has not been identified yet but we are going to report 30% uncertainties in the results on top of the existing errors.

TABLE 14: SST Core 9 Radiochemistry Data (Cont'd)

Sr-90, Tc-99 and I-129 DATA

Customer No.	Sr-90 dpm/g	+/- % error	Tc-99 dpm/g	+/- % error	I-129 dpm/g	+/- % error
Core 9 Composite						
90-1255-A-1	1.11E+08	6.5	3.50E+04	7.6	<33	
90-1255-A-2	1.11E+08	6.5	3.35E+04	8.4	<32	
90-1255-A-3	6.82E+04	21.5	<1.40E+03		<33	
90-1256-A-1	1.06E+08	6.5	3.30E+04	8.8	<35	
90-1256-A-2	1.03E+08	6.5	3.29E+04	7.6	<33	
Composite Water Leach						
90-1257-C-1	1.48E+04	13.1	3.47E+04	5.2	<9.5	
90-1257-C-2	3.10E+04	9.9	3.45E+04	5.2	<12	

Sr-90 RECOVERY DATA

Customer No.	Methods Blank + Spike	Spike Recovery	% Recovery
90-1255-A-3	2.1160E+06	2.0735E+06	98.23%

H-3 and C-14 DATA

Customer No.	H-3 dpm/g	+/- % error	C-14 dpm/g	+/- % error
Composite Water Leach				
90-1257-C-1	<8.0E+03			
90-1257-C-2	<8.0E+03			

TABLE 14: SST Core 9 Radiochemistry Data (Cont'd)

ALPHA ENERGY ANALYSIS OF Pu and Np

Customer No.	Pu 239&240 dpm/g	+/- % error	Pu 238 dpm/g	+/- % error	Np 237 dpm/g	+/- % error
Core 9 Composite						
90-1255-A-1	2.05E+05	5.0	3.13E+03	19.0	1.85E+02	52
90-1255-A-2	2.06E+05	5.2	3.20E+03	20.6	1.88E+02	52
90-1255-A-3	5.96E+02	21.5	(total Pu)		<1.45E+02	
90-1256-A-1	2.15E+05	5.2	6.43E+03	15.6	9.86E+01	93
90-1256-A-2	2.12E+05	5.2	4.54E+03	16.6	2.37E+02	41
Composite Water Leach						
90-1257-C-1	1.15E+03	9.0	2.12E+01	20.0	<5.00E+00	
90-1257-C-2	1.75E+03	7.1	3.39E+01	18.0	<5.53E+00	

Pu results calculated at 100% recovery.
Np results calculated at 93.1% recovery.

ALPHA ENERGY ANALYSIS OF Am AND Cm

Customer No.	Am 241 dpm/g	+/- % error	Cm-243&244 dpm/g	+/- % error
Core 9 Composite				
90-1255-A-1	8.05E+04	8.6		
90-1255-A-2	8.01E+04	8.6		
90-1255-A-3	1.05E+03	45		
90-1256-A-1	8.23E+04	9		
90-1256-A-2	7.80E+04	7	1.51E+03	23
Composite Water Leach				
90-1257-C-1	6.10E+02	17		
90-1257-C-2	1.02E+03	12		

Am and Cm results calculated at 100% recovery.

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APPENDICES

PRIMARY ANALYTICAL DATA