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SAVANNAH RIVER LABORATORY

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ANALYSIS OF SRP WASTE STREAMS FOR WASTE TANK CERTIFICATION (U)

SUMMARY

SRP waste streams were analyzed to enable SRP to apply for a permit to operate the High-Level Waste Tanks. This report transfers the analytical results from SRL to the Waste Management Technology Department and discusses the analytical methods that were used.

SRP is preparing a RCRA Part B permit application to operate the F and H-Area Tank Farm. The permit is needed to comply with the South Carolina Hazardous Waste Management Regulation R.61-79.270.14(b), October 28, 1988. This regulation requires characterization of hazardous wastes and inclusion of this information in the permit application.

The Analytical Development Division (ADD) characterized the waste streams by determining 21 components in each stream. Analyses were performed on the following streams:

- **F-Area Low-Heat Waste**
- **F-Area High-Heat Waste**
- **F-Area Evaporator Overheads Waste**
- **H-Area Low-Heat Waste**
- **H-Area High-Heat Waste**
- **H-Area Waste Management Maintenance Facility Waste**
- **Receiving Basin for Offsite Fuel/Resin Regeneration Facility Waste**
- **K-Area Filter Backwash Waste**

Derivative Classifier K. Andringa

INTRODUCTION

SRP will apply for certification from the State of South Carolina to operate the SRP High-Level Waste Tanks. The permit application will be submitted as a RCRA Part B, Volume 16, entitled "RCRA Part B Application For the F and H-Area Radioactive Waste Farm".

RCRA regulations require that influent and effluent streams of hazardous waste sites be characterized to obtain an operating permit. The Waste Management Technology Department requested ADD to determine 21 components (including pH and weight percent solids) in the current influent streams to SRP High-Level Waste Tanks. The analyses will be used to supplement existing data on the composition of High-Level Waste. Effluent streams, which will feed Saltstone and the DWPF, will be analyzed when they are produced.

This report contains the data obtained from analyzing key influent streams to SRP High-Level Waste Tanks. The precision of the data and the analytical methods that were used are also discussed.

DISCUSSION

SPECIFICATION OF COMPONENTS TO BE DETERMINED

P. D. d'Entremont of the Waste Management Technology Department specified the set of determinations to be made on waste streams. The following criteria were used in selecting the determinations:

1. Metals listed in the EPA toxicity test that have been found in SRP waste (Ba, Cr, Pb, Hg, Ag).

2. Elements that have been shown to have significant concentrations in SRP waste (Na, Mn, Al, Fe, P, Si, Ti, K).

   Reference:

   R. E. Eibling and J. R. Fowler, "Updated Waste Composition At The Savannah River Plant", DPST-88-313.

3. Other components needed to characterize the waste (pH, weight percent solids, anions, total carbon, total and free hydroxide).

EXPERIMENTAL-GENERAL

Several waste streams were represented by combining samples from individual feed tanks in the correct volume ratios[1]. Other streams needed sampling from only one tank.

Samples containing insoluble solids were dissolved prior to elemental analysis. The slurries were dried for 16 hours at 115 degrees Centigrade to yield a powder. About 0.2g of powder was combined with 12 mL of aqua regia (3 parts concentrated HCl to 1 part concentrated HNO_3) in a Teflon dissolution container. The container was sealed and placed in an oven set at 115 degrees Centigrade for 2 hours. After cooling, the vessel was opened and the contents poured into a tared 125 mL plastic bottle. Deionized, distilled water was added until the final solution weight was about 100g.

Dilutions performed in shielded cells were made by weighing an aliquot of the sample and then adding deionized, distilled water to obtain the desired dilution.

EXPERIMENTAL-SAMPLE PREPARATION

F-AREA LOW-HEAT WASTE[2]

Samples from four waste tanks were combined in the following percentages:

Tank 5.2 - 27%
Tank 6.8 - 26%
Tank 18.7 - 6%
Tank 710 - 41%

The composite slurry was analyzed directly for weight percent solids and pH. The remaining slurry was then divided into two portions for treatment prior to subsequent analyses. One portion was filtered and the filtrate analyzed for anions, hydroxide, and total carbon. The other portion was dried and dissolved with hot aqua regia for elemental analysis. The determinations for this stream, performed in triplicate, are compiled in Table 1.

F-AREA HIGH-HEAT WASTE[3]

One peanut vial (12 mL) of Tank 12.1 slurry was available for analysis. The slurry was analyzed directly for weight percent solids and pH. The remaining slurry was divided into two portions for filtration and dissolution for subsequent analyses. The filtrate was diluted by a factor of 9.07 (2.774 g to 25.158 g) to obtain enough sample for anion, hydroxide, and total carbon determinations. The other portion was dried and dissolved with hot aqua regia for elemental analysis. the results are compiled in Table 2.

F-AREA OVERHEAD EVAPORATOR[4]

This liquid sample was analyzed directly without any sample preparation. Table 3 lists the results of the triplicate set of determinations.

H-AREA LOW-HEAT WASTE[5]

H-Area Low-Heat Waste was represented by combining waste from Tank 710 and Tank 8.6 in 1.5 to 1 ratio. Since 10 mL of Tank 8.6 sample was provided, the total sample volume available for analysis was 25 mL. The slurry sample was analyzed directly for weight percent solids and pH. The remaining sample was divided into two portions. One portion was filtered to yield a filtrate that was used for anion, hydroxide, and carbon determinations. The other portion was dried and dissolved for elemental analysis. Table 4 lists the analytical results of one set of determinations.

H-AREA HIGH-HEAT WASTE[6]

Tank 8.4 sample was diluted to reduce the radiation field from 5 Rad/hour to a level permissable for hood work. The sample was then analyzed without further preparation. Table 5 lists the analytical results of one set of determinations.

H-AREA WASTE MANAGEMENT MAINTENANCE FACILITY WASTE[7]

Tank 299-H sample contained only a trace of insoluble solids. The sample was analyzed directly for pH and weight percent solids. A portion of the sample was then filtered to yield a clear solution for anion, carbon and hydroxide measurements. To dissolve the solids for metal analysis, a 10 mL aliquot of the unfiltered sample was heated with 5 mL of aqua regia for 2 hours at 115 degrees Centigrade. Elemental determinations were performed on the solutions. The results are compiled in Table 6.

RECEIVING BASIN FOR OFFSITE FUEL/RESIN REGENERATION FACILITY WASTE (RBOF/RRFW)[8]

Samples from five tanks were mixed in the following percentages to produce a sample representative of RBOF/RRF Waste:

Tritium Target Cleaning	49%
RBOF Liquid Waste	33%
Resin Regeneration Floating Out Resin	6%
Resin Regeneration Regeneration Waste	6%
Resin Regeneration Floating Resin Back Into The Deionizer	6%

Since the composite sample contained no solids, it was analyzed directly without further preparation. The analytical results of triplicate determinations are compiled in Table 7.

K-AREA FILTER BACKWASH[9]

This sample was divided into two portions for separate treatment. One portion was analyzed directly for pH and weight percent solids. This portion was then filtered to yield a filtrate for anion, hydroxide, and carbon analyses. The other portion was dried and dissolved for elemental analysis. The analytical results of triplicate determinations are compiled in Table 8.

UNITS OF THE DETERMINATIONS

All determinations are reported in units of milligrams per liter (mg/L) except for weight percent solids, which are reported in percent, and pH, which is unitless. It should be noted that the determinations of slurry samples are all reported on a slurry basis, even though elemental determinations required that the slurry be dried and then dissolved. The weight percent solids in the original sample was used to convert dry basis determinations to a slurry basis.

ANALYTICAL METHODS, DETECTION LIMITS, AND PRECISION OF DETERMINATIONS

Table 9 lists the analytical method and the estimated detection limit for each analyte. The theoretical detection limits in the first column are those that can be obtained under ideal conditions (i.e., instrument calibration conditions). The detection limits of analytes are increased if the sample must be diluted prior to analysis. Dilutions were required either to reduce radioactivity or to dissolve the solids in slurry samples. The increase in detection limits above the theoretical limit reflects the dilution factor used for each analyte in the waste stream.

The control limits of methods as stated in the monthly ADD QA report[10] are listed in Table 10. It is useful to compare these control limits with the observed precision (percent RSD) of the waste streamdeterminations as shown in Tables 1, 3, 6, 7, and 8. The precision of waste stream determinations,as expected, are generally poorer than QA control limits. The concentration of many of the analytes is near or below the method detection limit. To achieve optimum precision, the analyte concentration should be at least 10 times the detection limit. Moreover, the precision values were based on only three determinations, which is too few to obtain optimum precision statistics.

QUALITY ASSURANCE

The waste stream analyses were performed with a quality assurance plan in place. Elemental, anion, and hydroxide determinations were performed after method standardizations required to comply with the ADD quality assurance program. Weight percent solids and pH determinations were made after methods were standardized in the High Level Caves.

REFERENCES

1. P. D. d'Entremont, Memorandum to C. J. Coleman, **"Mixing Recipes for Tank Farm RCRA Part B Samples"**, May 18, 1988.
2. C. J. Coleman, **Technical Notebook**, DPSTN-4265, pp. 107-108.
3. C. J. Coleman, **Technical Notebook**, DPSTN-4265, pp. 120-121.
4. C. J. Coleman, **Technical Notebook**, DPSTN-4265, pp. 128-129.
5. C. J. Coleman, **Technical Notebook**, DPSTN-4265, PP. 116-117.
6. C. J. Coleman, **Technical Notebook**, DPSTN-4265, pp. 118-119.
7. C. J. Coleman, **Technical Notebook**, DPSTN-4265, pp. 130-131
8. C. J. Coleman, **Technical Notebook**, DPSTN-4265, pp. 114-115.
9. C. J. Coleman, **Technical Notebook**, DPSTN-4265, pp. 126-127.
10. H. B. Aiken, **DPSTQA-89-177-3**.

TABLE 1

DETERMINATION OF F-AREA LOW-HEAT WASTE

DETERMINATION	UNITS	VALUE SET 1	VALUE SET 2	VALUE SET 3	AVERAGE	% RSD*
Total Wt. % Solids	wt %	29.27	29.19	29.55	29.34	0.6%
pH	____	13.01	12.90	13.04	12.98	0.6%
Free Hydroxide	mg/L	24,100	24,500	24,500	24,500	0.9%
Total Hydroxide	mg/L	26,900	26,900	27,000	26,966	0.2%
Total Carbon	mg/L	319	388	_____	354	____
Nitrate	mg/L	220,000	218,000	217,000	218,000	0.7%
Nitrite	mg/L	3,600	3,600	3,550	3,570	0.5%
Sulfate	mg/L	6,350	6,225	6,200	6,250	1.3%
Cr	mg/L	90	60	60	70	24%
Ba	mg/L	60	30	30	40	43%
Pb	mg/L	30	30	30	30	0%
Ag	mg/L	<30	<30	<30	<30	____
Na	mg/L	86,200	86,000	87,200	86,500	0.7%
Mn	mg/L	30	<30	<30	<30	____
Al	mg/L	5,500	6,200	6,100	5,900	6.4%
Fe	mg/L	1,900	900	1,500	1,400	35%
P	mg/L	700	400	200	433	58%
Si	mg/L	700	300	600	533	39%
Ti	mg/L	<3	<3	<3	<3	____
K	mg/L	3	3	3	3	0%
Hg	mg/L	3	3	3	3	0%

* % RSD = % RELATIVE STANDARD DEVIATION

TABLE 2

DETERMINATION OF F-AREA
HIGH-HEAT WASTE

DETERMINATION	UNITS	VALUE
Total Wt. % Solids	wt%	36.1
pH	____	12.8
Free Hydroxide	mg/L	4,760
Total Hydroxide	mg/L	14,000
Total Carbon	mg/L	Insufficient sample to determine
Nitrate	mg/L	181,000
Nitrite	mg/L	9,600
Cr	mg/L	200
Ba	mg/L	<30
Pb	mg/L	30
Ag	mg/L	<30
Na	mg/L	91,000
Mn	mg/L	40
Al	mg/L	2,800
Fe	mg/L	6,100
P	mg/L	400
Si	mg/L	60
Ti	mg/L	<10
K	mg/L	<140
Hg	mg/L	1100

TABLE 3

DETERMINATION OF F-AREA OVERHEAD EVAPORATOR WASTE

DETERMINATION	UNITS	VALUE SET 1	VALUE SET 2	VALUE SET 3	AVERAGE	% RSD*
Total Wt. % Solids	wt %	1.43	1.24	1.30	1.32	7.3%
pH	____	9.5	____	____	____	____
Free Hydroxide	mg/L	<10	<10	<10	<10	____
Total Hydroxide	mg/L	<50	<50	<50	<50	____
Total Carbon	mg/L	22.5	20.9	22.5	22.0	4.2%
Nitrate	mg/L	<1.5	<1.5	<1.5	<1.5	____
Nitrite	mg/L	<1	1.15	1.16	~1	____
Sulfate	mg/L	<0.5	<0.5	<0.5	<0.5	____
Cr	mg/L	<0.005	<0.005	<0.005	<0.005	____
Ba	mg/L	<0.005	<0.005	<0.005	<0.005	____
Pb	mg/L	<0.02	<0.02	<0.02	<0.02	____
Ag	mg/L	<0.01	<0.01	<0.01	<0.01	____
Na	mg/L	0.52	0.51	0.51	0.51	2.0%
Mn	mg/L	<0.005	<0.005	<0.005	<0.005	____
Al	mg/L	<0.01	<0.01	<0.01	<0.01	____
Fe	mg/L	<0.005	<0.005	<0.005	<0.005	____
P	mg/L	0.02	0.01	0.01	0.01	58%
Si	mg/L	2.69	2.68	2.69	2.69	0.2%
Ti	mg/L	<0.005	<0.005	<0.005	<0.005	____
K	mg/L	<0.014	<0.014	<0.014	<0.014	____
Hg	mg/L	0.003	0.002	0.020	0.008	122%

* % RSD = % RELATIVE STANDARD DEVIATION

TABLE 4

DETERMINATION OF H-AREA
LOW-HEAT WASTE

DETERMINATION	UNITS	VALUE
Total Wt. % Solids	wt %	30.00
pH	____	11.7
Free Hydroxide	mg/L	119
Total Hydroxide	mg/L	2,500
Total Carbon	mg/L	2.0
Nitrate	mg/L	234,000
Nitrite	mg/L	<500
Sulfate	mg/L	9,500
Cr	mg/L	90
Ba	mg/L	<10
Pb	mg/L	30
Ag	mg/L	<10
Na	mg/L	80,700
Mn	mg/L	10
Al	mg/L	200
Fe	mg/L	2,600
P	mg/L	500
Si	mg/L	10
Ti	mg/L	<10
K	mg/L	200
Hg	mg/L	10

TABLE 5

DETERMINATION OF H-AREA
HIGH-HEAT WASTE

DETERMINATION	UNITS	VALUE
Total Wt. % Solids	wt %	19.9
pH	____	0.0
Free Hydroxide	mg/L	<1
Total Hydroxide	mg/L	<1
Total Carbon	mg/L	1,620
Nitrate	mg/L	260,000
Nitrite	mg/L	<25
Sulfate	mg/L	4,400
Cr	mg/L	33.2
Ba	mg/L	19.0
Pb	mg/L	23.7
Ag	mg/L	<5.0
Na	mg/L	5,300
Mn	mg/L	475
Al	mg/L	18,600
Fe	mg/L	1,330
P	mg/L	85.5
Si	mg/L	<5.0
Ti	mg/L	<2.4
K	mg/L	200
Hg	mg/L	356

TABLE 6

DETERMINATION OF WASTE MANAGEMENT
MAINTENANCE FACILITY WASTE

DETERMINATION	UNITS	VALUE SET 1	VALUE SET 2	VALUE SET 3	AVERAGE	% RSD
Total Wt. % Solids	wt %	8.13	8.25	8.38	8.25	1.5%
pH	___	12.66	___	___	12.66	___
Total Hydroxide	mg/L	1.48	1.48	1.46	1.47	0.80%
Free Hydroxide	mg/L	1.45	1.45	1.43	1.44	0.80%
Total Carbon	mg/L	1130	1100	1190	1140	4.0%
Nitrate	mg/L	6070	6310	6100	6160	2.1%
Nitrite	mg/L	<25	<25	<25	<25	___
Sulfate	mg/L	12.5	12.5	12.5	12.5	___
Cr	mg/L	16.3	16.3	18.8	17.0	7.5%
Ba	mg/L	0.10	0.10	0.08	0.09	12.4%
Pb	mg/L	25.0	22.8	29.4	25.7	13.2%
Ag	mg/L	<0.01	<0.01	<0.01	<0.01	___
Na	mg/L	39,770	34,400	34,000	36,000	8.9%
Mn	mg/L	4.32	5.04	4.52	4.62	8.0%
Al	mg/L	7.33	7.44	7.28	7.35	1.1%
Fe	mg/L	393	369	365	376	4.0%
P	mg/L	32.0	34.7	34.2	33.6	4.3%
Si	mg/L	117	115	108	113	4.2%
Ti	mg/L	1.75	1.61	1.62	1.66	4.9%
K	mg/L	13.08	13.48	12.81	13.12	2.6%
Hg	mg/L	0.92	0.75	0.85	0.84	8.5%

TABLE 7

DETERMINATION OF RBOF/RRF WASTE

DETERMINATION	UNITS	VALUE SET 1	VALUE SET 2	VALUE SET 3	AVERAGE	% RSD*
Total Wt. % Solids	wt %	4.70	5.16	4.81	4.89	4.9%
pH	____	12.68	12.60	12.60	12.63	0.4%
Free Hydroxide	mg/L	3,900	3,900	3,800	3,867	1.5%
Total Hydroxide	mg/L	5,000	5,000	5,000	5,000	0.0%
Total Carbon	mg/L	85.6	95.5	100.7	93.9	8.2%
Nitrate	mg/L	1,150	1,160	1,150	1,153	0.5%
Nitrite	mg/L	<1	<1	<1	<1	____
Sulfate	mg/L	65.7	63.3	52.1	60.4	12.0%
Cr	mg/l	384	394	407	395	2.9%
Ba	mg/L	0.05	0.04	0.04	0.04	13.3%
Pb	mg/L	<1.8	<1.8	<1.8	<1.8	____
Ag	mg/L	<0.01	<0.01	<0.01	<0.01	____
Na	mg/L	13,400	13,700	14,200	13,800	2.9%
Mn	mg/L	0.03	0.03	0.03	0.03	0.0%
Al	mg/L	41.7	40.7	40.3	40,9	1.8%
Fe	mg/L	1.41	0.41	0.18	0.67	97%
P	mg/L	3,869	3,957	4,100	3,975	2.9%
Si	mg/L	0.55	0.55	0.55	0.55	0.0%
Ti	mg/L	0.09	0.09	0.09	0.09	0.0%
K	mg/L	13.0	11.7	11.7	12.1	6.2%
Hg	mg/L	<0.001	<0.001	<0.001	<0.001	____

* % RSD = % RELATIVE STANDARD DEVIATION

TABLE 8

DETERMINATION OF K-AREA FILTER BACKWASH WASTE

DETERMINATION	UNITS	VALUE SET 1	VALUE SET 2	VALUE SET 3	AVERAGE	% RSD*
Total Wt. % Solids	wt %	4.70	4.93	5.01	4.88	3.3%
pH	____	7.18	____	7.18	____	____
Free Hydroxide	mg/l	<0.001	<0.001	<0.001	<0.001	____
Total Hydroxide	mg/L	<0.005	<0.005	<0.005	<0.005	____
Total Carbon	mg/L	41.6	41.4	41.6	41.5	0.3%
Nitrate	mg/L	1.87	1.74	1.95	1.85	5.7%
Nitrite	mg/L	<1	<1	<1	<1	____
Sulfate	mg/L	5.98	3.39	3.57	4.31	33%
Cr	mg/L	10	10	10	10	0.0%
Ba	mg/L	10	10	10	10	0.0%
Pb	mg/L	30	30	30	30	0.0%
Ag	mg/L	<10	<10	<10	<10	____
Na	mg/L	60	310	180	183	68%
Mn	mg/L	30	40	30	33	17%
Al	mg/L	7,100	7,300	7,100	7,200	1.6%
Fe	mg/L	4,600	4,700	4,700	4,666	1.2%
P	mg/L	250	250	250	250	0.0%
Si	mg/L	20	80	50	50	60%
Ti	mg/L	10	10	10	10	0.0%
K	mg/L	20	20	20	20	0.0%
Hg	mg/L	<1	<1	<1	<1	____

* % RSD = % RELATIVE STANDARD DEVIATION

TABLE 9
ANALYTICAL METHODS AND DETECTION LIMITS

METHOD	DETERMINATION	THEORETICAL DETECTION LIMIT[1]	F-ALHW[2]	F-AHHW[2]	F-AOEW[2]	H-ALHW[2]
Microwave	Wt % Solids	0.1	0.1	0.1	0.1	0.1
Titration	Free OH^-	50	50	455	50	5.
Titration	Total OH^-	10	10	91	10	10
Carbon Analyzer	Total Carbon	1	1	9	1	1
Ion Chromatography	NO^-_3	1	1	9	1	1
Ion Chromatography	NO^-_2	1	1	9	1	1
Ion Chromatography	$SO=_4$	1	1	9	1	1
ICP AES	Cr	0.005	2.3	2.3	0.005	2.4
ICP AES	Ba	0.005	2.3	2.3	0.005	2.4
ICP-AES	Pb	0.02	9.2	9.2	0.02	9.6
ICP-AES	Ag	0.01	4.6	4.6	0.01	4.8
ICP-AES	Na	0.02	9.2	9.2	0.02	9.6
ICP-AES	Mn	0.005	2.3	2.3	0.005	2.4
ICP-AES	Al	0.01	4.6	4.6	0.01	4.8
ICP-AES	Fe	0.005	2.3	2.3	0.005	2.4
ICP-AES	P	0.02	9.2	9.2	0.02	9.6
ICP-AES	Si	0.02	9.2	9.2	0.02	9.6
ICP-AES	Ti	0.005	2.3	2.3	0.005	2.4
AAS	K	0.014	6.5	6.5	0.014	6.7
AAS	Hg	0.001	0.4	0.4	0.001	2.4

1. UNITS ARE IN MG/L EXCEPT FOR WEIGHT % SOLIDS

2. F-ALHW (F-AREA LOW-HEAT WASTE)
F-AHHW (F-AREA HIGH-HEAT WASTE)
F-AOEW (F-AREA OVERHEADS WASTE)
H-ALHW (H-AREA LOW HEAT WASTE)

TABLE 9 (CONT)
ANALYTICAL METHODS AND DETECTION LIMITS

METHOD	DETERMINATION	THEORETICAL DETECTION LIMIT[1]	H-AHHW[2]	WMMFW[2]	RBOF/RFFW[2]	K-AFBW[2]
Microwave	Wt % Solids	0.1	0.1	0.1	0.1	0.1
Titration	Free OH^-	50	23750	50	50	50
Titration	Total OH^-	10	4750	10	10	10
Carbon Analyzer	Total Carbon	1	475	1	1	1
Ion Chromatography	NO^-_3	1	475	1	1	1
Ion Chromatography	NO^-_2	1	475	1	1	1
Ion Chromatography	$SO=_4$	1	475	1	1	1
ICP AES	Cr	0.005	2.4	0.005	0.005	2.5
ICP AES	Ba	0.005	2.4	0.005	0.005	2.5
ICP-AES	Pb	0.02	9.6	0.02	0.02	10.
ICP-AES	Ag	0.01	4.8	0.01	0.01	5.0
ICP-AES	Na	0.02	9.6	0.02	0.02	10.0
ICP-AES	Mn	0.005	2.4	0.005	0.005	2.5
ICP-AES	Al	0.01	4.8	0.01	0.01	5.0
ICP-AES	Fe	0.005	2.4	0.005	0.005	2.5
ICP-AES	P	0.02	9.6	0.02	0.02	10.0
ICP-AES	Si	0.02	9.6	0.02	0.02	10.0
ICP-AES	Ti	0.005	2.4	0.005	0.005	0.005
AAS	K	0.014	6.6	0.014	0.014	0.014
AAS	Hg	0.001	0.5	0.001	0.001	0.001

A

1. UNITS ARE IN MG/L EXCEPT FOR WEIGHT % SOLIDS

2. H-AHHW (H-AREA HIGH-HEAT WASTE
WMMFW (WASTE MANAGEMENT FACILITY WASTE)
RBOF/RRFW (RECEIVING BASIN FOR OFFSITE FUEL/RESIN REGENERATION FACILITY WASTE)
H-ALHW (H-AERA LOW-HEAT WASTE)

TABLE 10

ADD CONTROL LIMITS FOR SELECTED METHODS

METHOD	CONTROL LIMIT
ICP-AES	± 5%
AAS(Hg)	± 10%
AAS(K)	± 10%
pH	± 5%
Weight % Solids	± 5%
Total OH^-	± 3%
Free OH	± 5%
Carbon	± 5%
Ion Chromatography	± 5%