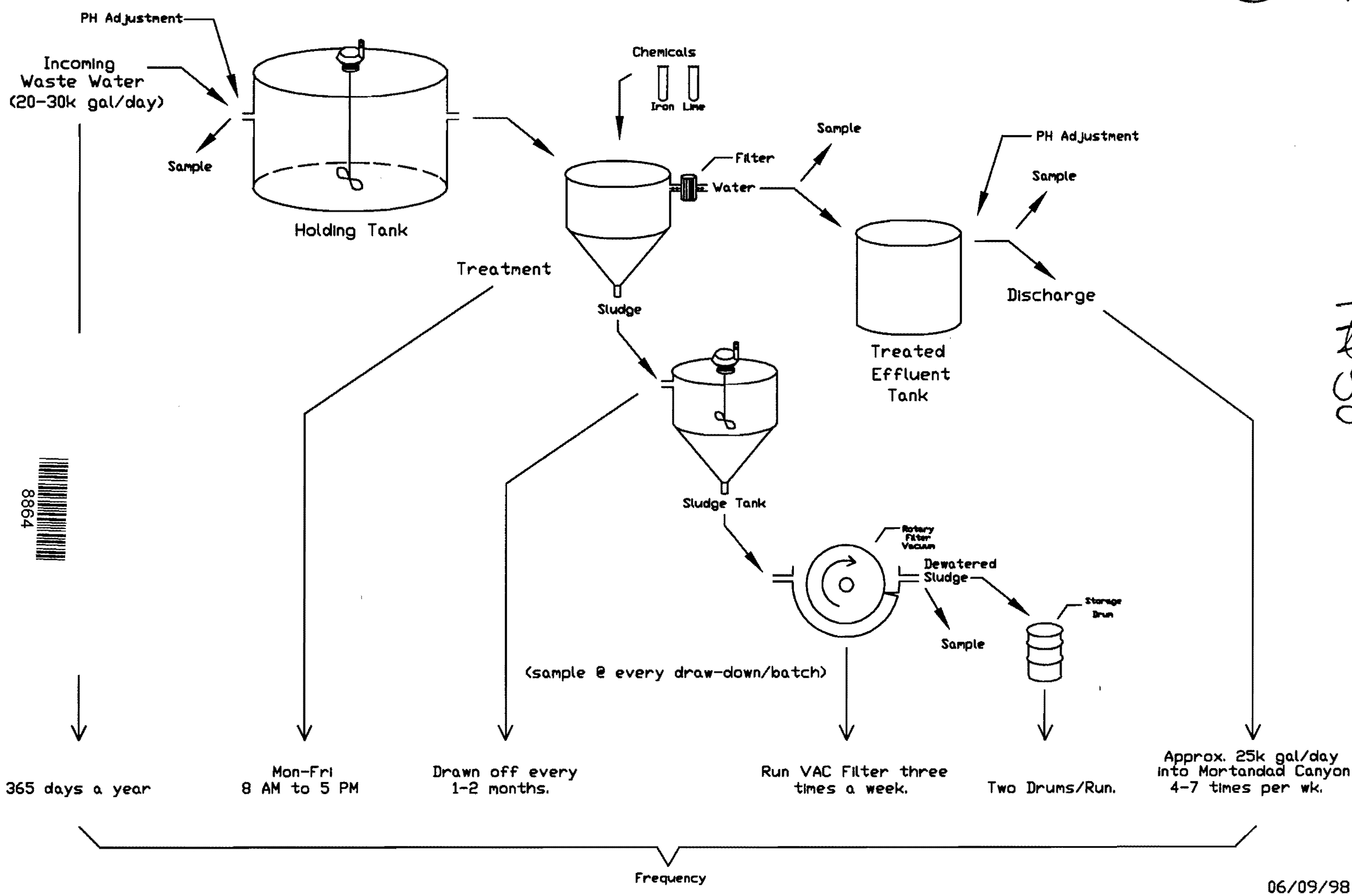
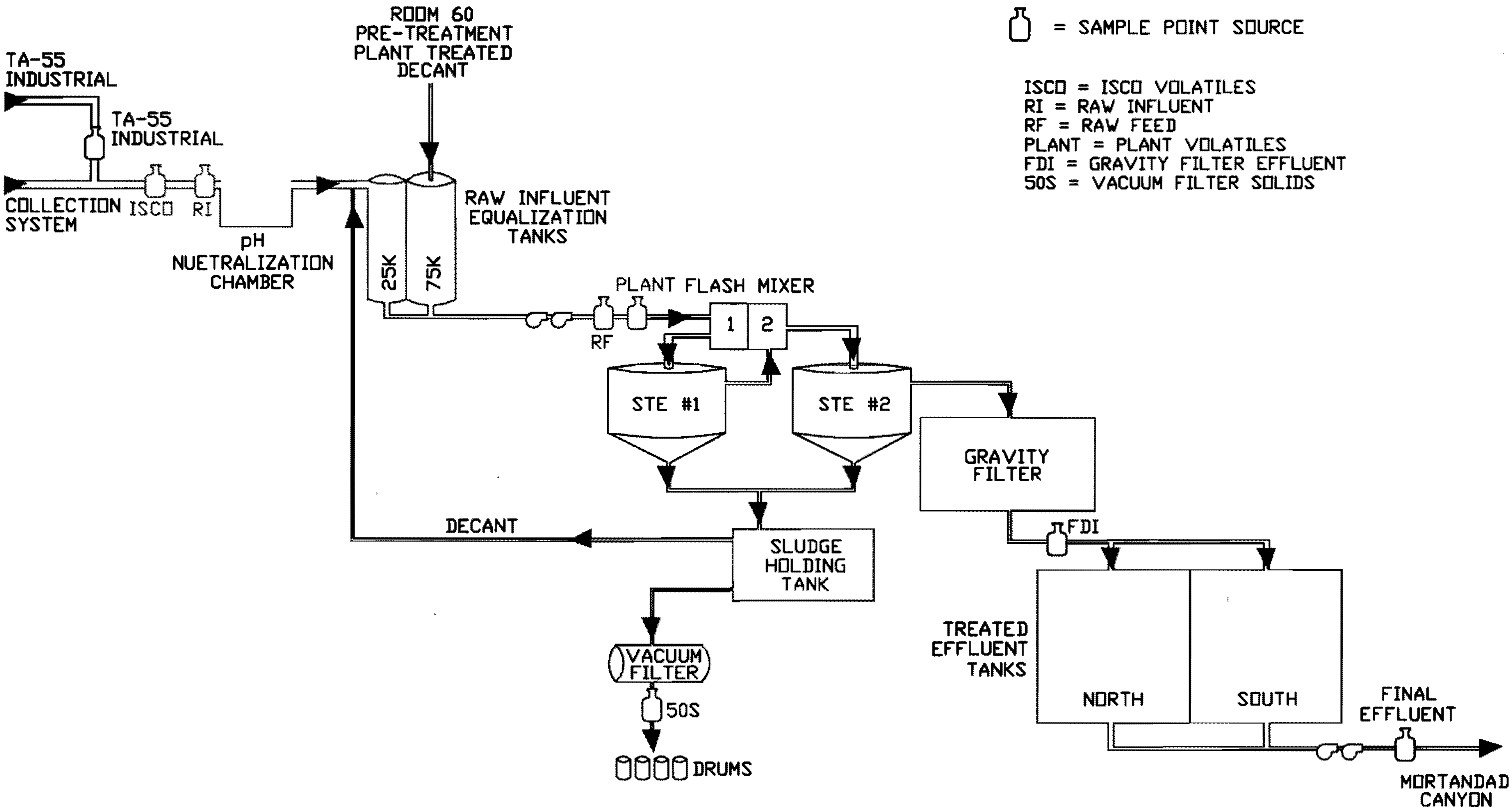
TA-50-1 Main Radiation Liquid Waste Treatment Plant



06/09/98

SAMPLING AT TA-50-1
MAIN PLANT OPERATIONS



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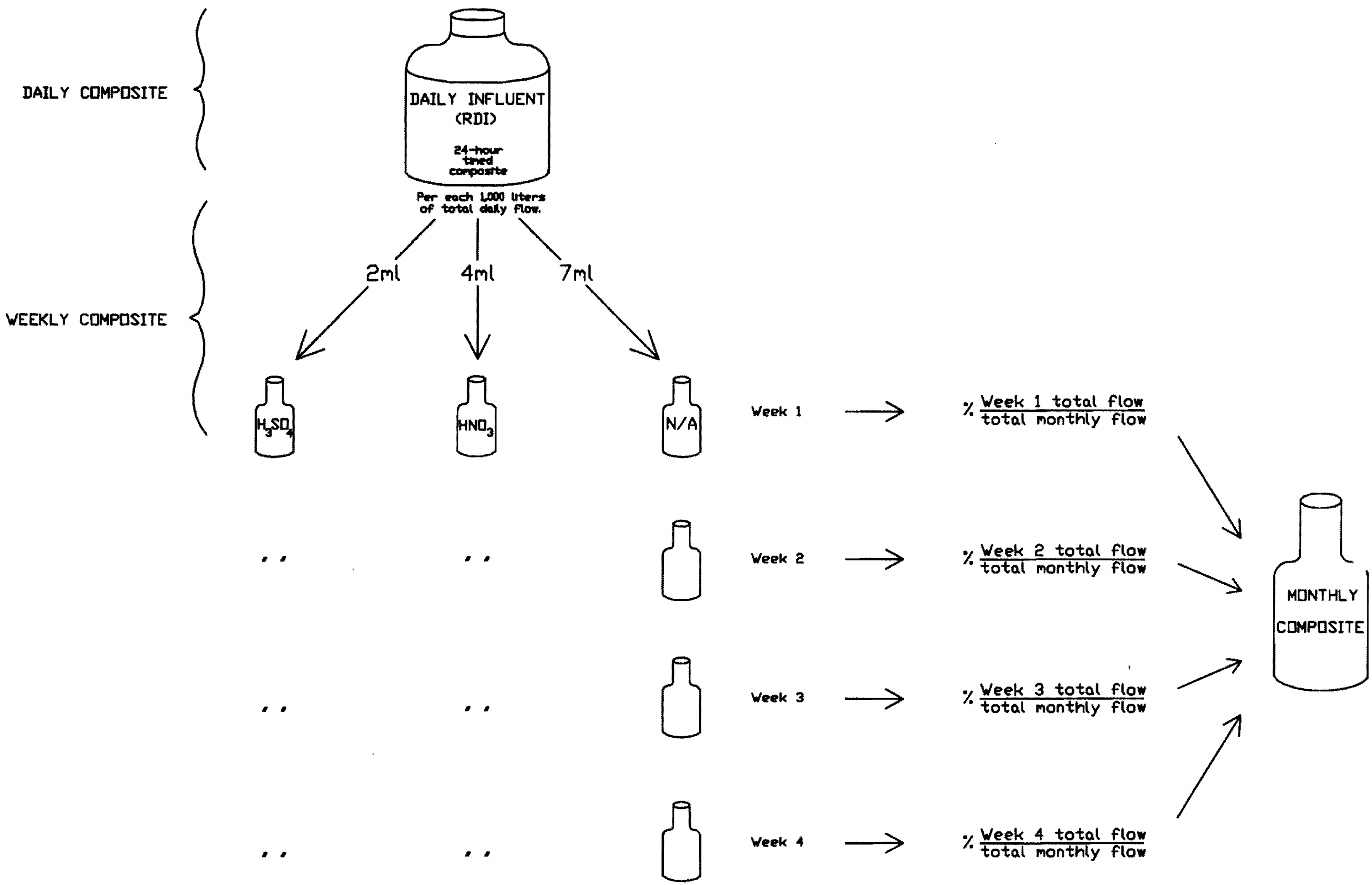
Monthly Composite Procedure for Raw Influent

TA-50-1 RLWTF	06/12/98



Monthly Composite Procedure for Raw Influent

The monthly composite is a flow-weighted composite compiled on a daily basis.

I. Weekly composites
   A. Plant personnel bring a daily sample from influent stream to the analytical laboratory.
   B. Plant personnel bring influent and effluent flow amounts.
   C. For every 1000 liters of influent flow, analytical personnel combine 7, 4, or 2 milliliters of daily sample in weekly composite, depending on type of composite.
      1. Analytical personnel combine 7 milliliters in a weekly composite for influent refrigerated.
      2. Analytical personnel combine 4 milliliters in a weekly composite for influent nitric acid cut of sample.
      3. Analytical personnel combine 2 milliliters in a weekly composite for influent sulfuric acid cuts of sample.
   D. At the end of the week, analytical personnel have 3 flow-weighted composites of influent samples preserved by refrigeration, nitric acid and sulfuric acid.

II. Monthly composites
   A. Analytical personnel save weekly composites until the end of the month.
   B. Analytical personnel calculate total weekly flow amounts and total monthly flow amount.
   C. Analytical personnel calculate proportion of weekly flow amounts as compared to monthly flow amount.
   D. Using the proportion of weekly flow to monthly flow, analytical personnel create monthly composites of each preserved cut of sample.
      1. Analytical personnel combine refrigerated influent weekly composites into 3600-milliliter monthly composites.
      2. Analytical personnel combine sulfuric acid influent weekly composites into 900-milliliter monthly composites.
      3. Analytical personnel combine nitric acid influent weekly composites into 1800- and 3600-milliliter monthly composites respectively.
   E. At the end of the month, analytical personnel have 3 flow-weighted composites of influent samples preserved by refrigeration, nitric acid, and sulfuric acid.

Continuous Metals Process Monitoring

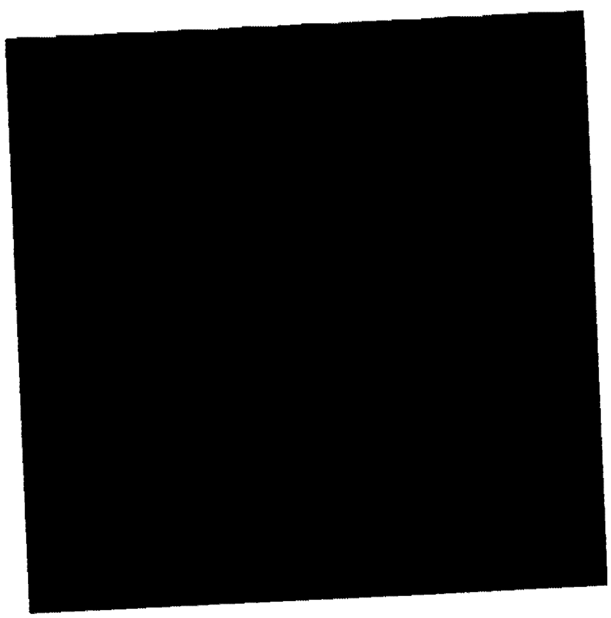
In order to demonstrate that TA-50 does not receive any metals beyond RCRA limits, an Optical Emission Spectrometer (OES) will do continuous monitoring of RCRA metals.

I. Primary requirement for continuous metals monitoring: Detection levels must be at least 10 times below action levels.

II. Detection and action levels for RCRA metals

	Detection levels	Action levels
A. Arsenic:	0.014 ppm	5.0 ppm
B. Barium:	0.004 ppm	100 ppm
C. Cadmium:	0.002 ppm	1.0 ppm
D. Chromium:	0.001 ppm	5.0 ppm
E. Lead:	0.024 ppm	5.0 ppm
F. Mercury:	0.002 ppm	0.2 ppm
G. Selenium:	0.024 ppm	1.0 ppm
H. Silver:	0.001 ppm	5.0 ppm

III. Data from IRIS OES instrument
   A. Figures 1-8 show all levels of RCRA metals are well below action levels.
   B. Preliminary data shows that RCRA metals are not present to any significant degree in TA-50 influent flow.

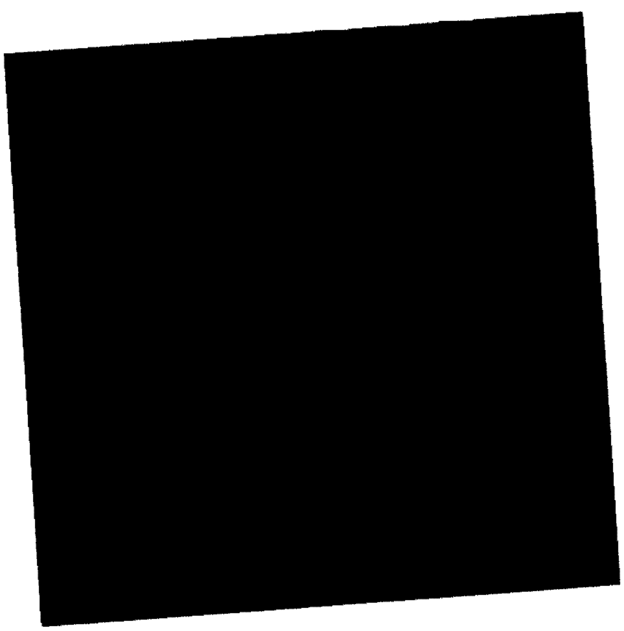


Purgeable Organic Carbons and Volatile Organic Carbons Equivalency Testing

An instrument that detects purgeable organic carbons (POCs) may be used to identify if TA-50 facility's waste stream contains less than 1 ppm of any volatile, toxic organic. This procedure could be used to screen influent flows for volatile organic carbons (VOCs). If the concentration were greater than 1 ppm, a VOC analysis would be done to identify what VOC compound is in the waste stream.

I. POC and VOC sampling equivalency
   A. Plant personnel obtained VOC and POC samples with as little loss of volatile components as possible.
   B. Analytical personnel purged VOC and POC samples with pure, carbon-free gases for 10-12 minutes.
      1. Paragon personnel inject purged sample directly into a Gas Chromatography instrument for analysis.
      2. Plant analytical personnel inject sample directly into a TOC5000 instrument.
   C. VOC and POC sampling and injection are identical.

II. POC measurement on TOC5000
   A. The TOC5000 instrument detection limit of POCs is 20ppb. The method detection limit of the TOC5000 is 100ppb.
   B. Analytical personnel calibrated the TOC5000 with the following standard concentrations: 100, 400, 800, 1000ppb. This calibration enables the detection of POCs up to 1000ppb.
   C. Figure 1 shows POC detection in influent waste stream.
   D. Figure 2 shows POC detection in raw feed waste stream.
   E. Figures show all results are lower than 1 ppm. POC analysis is more cost-effective and efficient because it can be done at TA-50.

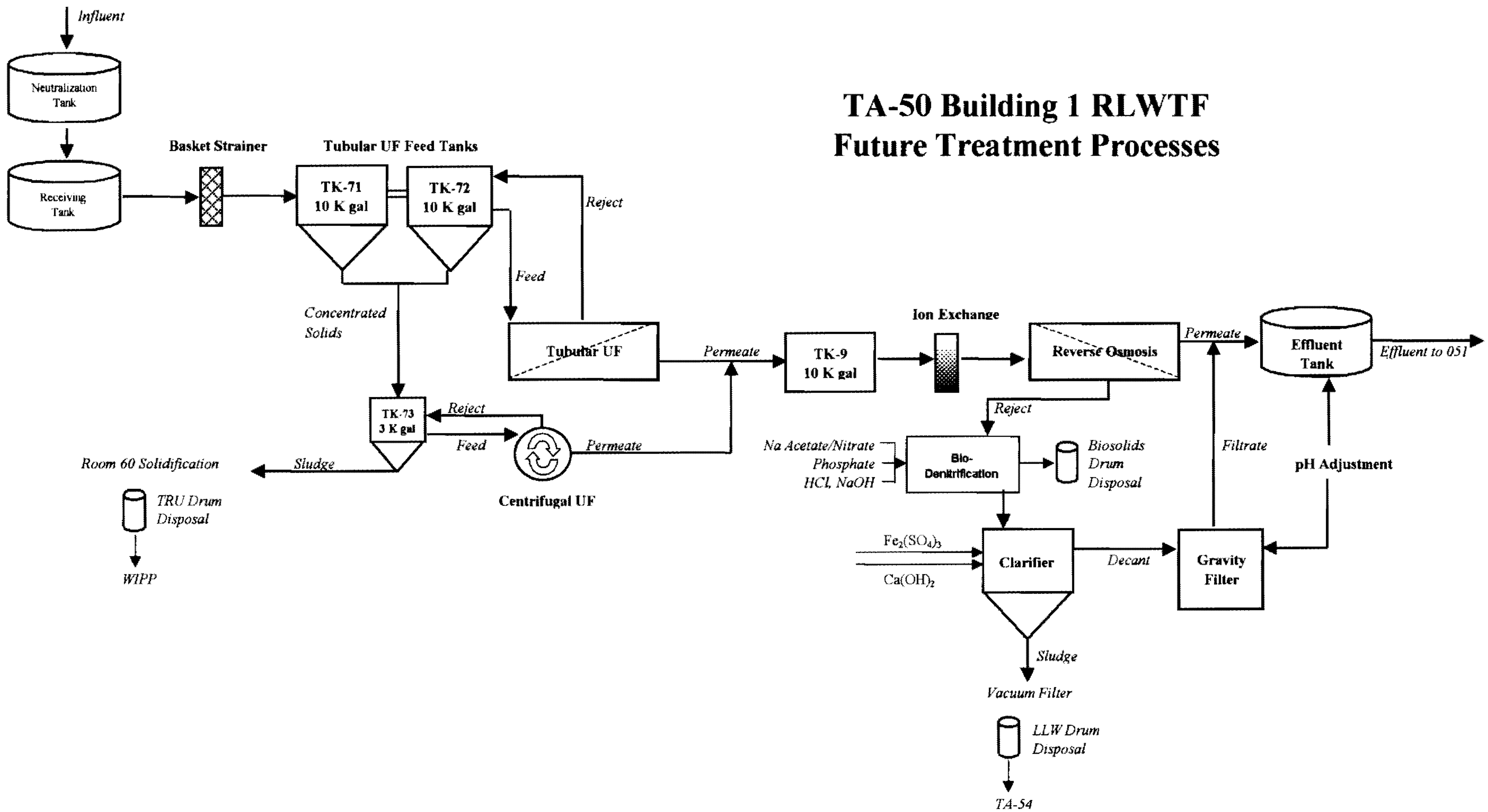


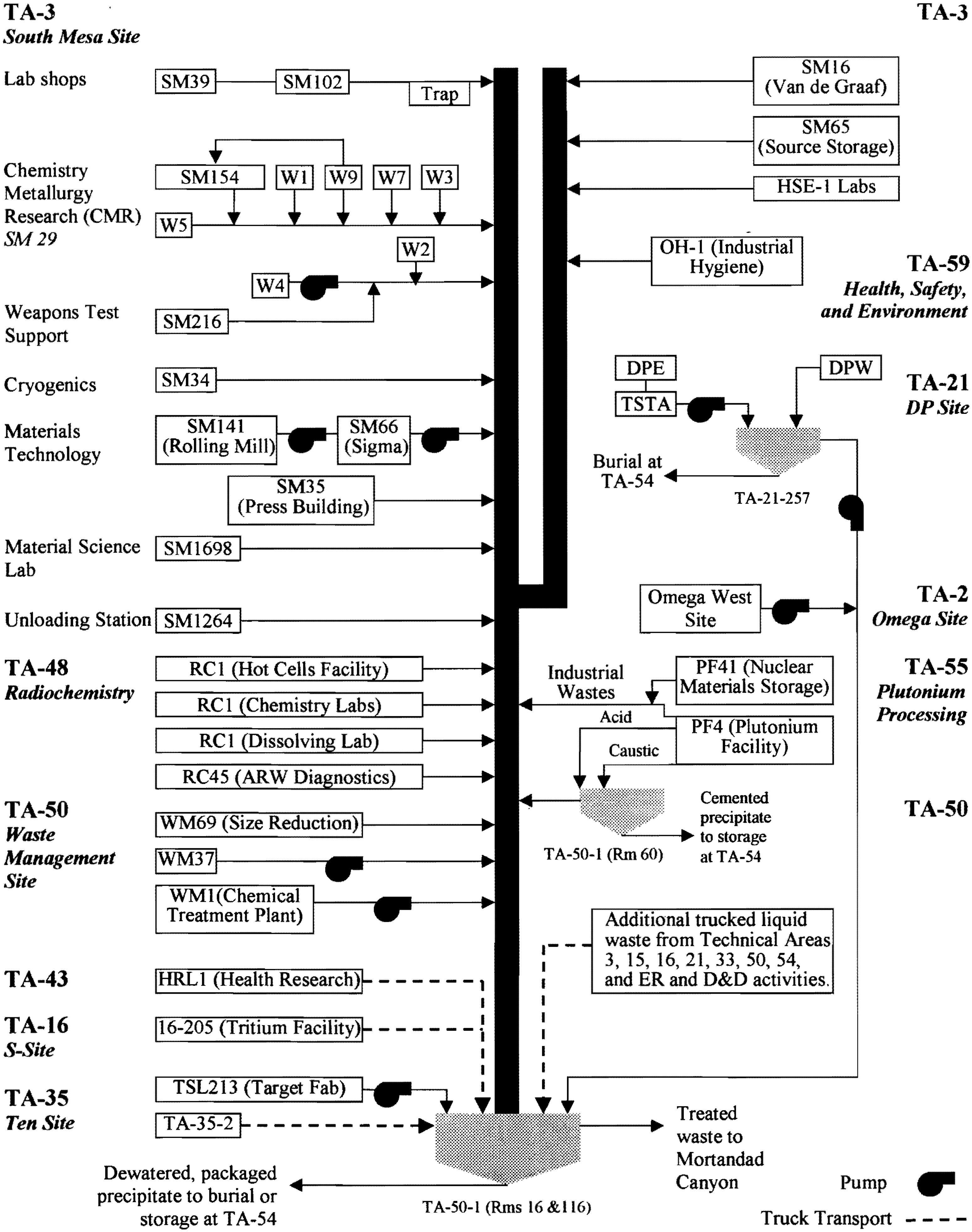
Sampling at TA-50 Radioactive Liquid Waste Treatment Facility
Main Plant Operations (Routine)

	Operational							Regulatory
Sample	TA-55 Industrial	ISCO Volatiles	Raw Influent	Raw Daily Feed	Plant Volatiles	Gravity Filter Effluent	Vacuum Filter Solids	NPDES
ID Tag	TA55	Immyy.dd	RDI, RWC, RMC	RDF	Pmmyy.dd	FDI, FWC, FMC	50Smmyy.dd	NPDESmmyy.dd
Location	WM-201	pH Neutralization Chamber	pH Neutralization Chamber	discharge side of pumps 3 and 4	discharge side of pumps 3 and 4	discharge side of gravity filter	discharge side of vacuum filter	final effluent discharge to Mortendad Canyon
Analysis Formats and Parameters	*weekly:* gross Alpha ^{241}Am pH	*weekly:* VOC SVOC	*daily:* pH gross Alpha, Beta,Gamma ^{3}H *weekly composite:* pH gross Alpha, Beta,Gamma ^{137}Cs, ^{241}Am radioisotopic COD, NH_3-N *monthly composite:* pH gross Alpha, Beta, Gamma ^{3}H ^{234,235}U ^{238,239}Pu ^{89,90}Sr ^{241}Am, ^{137}Cs Alkalinity-Mo Alkalinity-P Aluminum	*daily:* pH gross Alpha, Beta,Gamma ^{3}H	*weekly:* VOC SVOC	*daily:* pH gross Alpha, Beta,Gamma ^{3}H *weekly composite:* pH gross Alpha, Beta,Gamma ^{137}Cs, ^{241}Am radioisotopic COD, NH_3-N *monthly composite:* pH gross Alpha, Beta, Gamma ^{3}H ^{234,235}U ^{238,239}Pu ^{89,90}Sr ^{241}Am, ^{137}Cs Alkalinity-Mo Alkalinity-P Aluminum	*per batch treated:* gross Alpha ^{234,235}U ^{238,239}Pu ^{241}Am % Solids TCLP: Ag, As, Ba, Cd, Cr, Hg, Ni, Pb, Se, Tl	*weekly grab:* pH TSS COD (T) Cd, Pb, Cu, Fe, Zn, Hg, Cr, Ni *monthly grab:* Total N Nitrate-Nitrite (as N) Ammonia (as N) Total Toxic Organics ^{226,228}Ra

			Ammonia-N Arsenic Barium Beryllium Boron Cadmium Calcium Cations (T) Chloride Chromium (T) Cobalt COD Conductivity Copper Cyanide Fluoride Hardness Iron Lead Magnesium Mercury Nickel Nitrate-N Nitrite-N Phosphorus Plutonium (T) Potassium Selenium Silica Dioxide Silver Sodium Sulfate TDS TSS Thallium Uranium Vanadium Zinc			Ammonia-N Arsenic Barium Beryllium Boron Cadmium Calcium Cations (T) Chloride Chromium (T) Cobalt COD Conductivity Copper Fluoride Hardness Iron Lead Magnesium Mercury Nickel Nitrate-N Nitrite-N Phosphorus Plutonium (T) Potassium Selenium Silica Dioxide Silver Sodium Sulfate TDS Thallium Uranium Vanadium Zinc			—

TA-50 Building 1 RLWTF
Future Treatment Processes





TA-3
South Mesa Site
TA-3
Lab shops
SM39
SM102
Trap
SM16 (Van de Graaf)
SM65 (Source Storage)
HSE-1 Labs
Chemistry Metallurgy Research (CMR) SM 29
SM154
W1
W9
W7
W3
W5
W2
W4
OH-1 (Industrial Hygiene)
TA-59
Health, Safety, and Environment
Weapons Test Support
SM216
Cryogenics
SM34
DPE
TSTA
DPW
TA-21
DP Site
Materials Technology
SM141 (Rolling Mill)
SM66 (Sigma)
SM35 (Press Building)
Burial at TA-54
TA-21-257
Material Science Lab
SM1698
Omega West Site
TA-2
Omega Site
Unloading Station
SM1264
TA-48
Radiochemistry
RC1 (Hot Cells Facility)
RC1 (Chemistry Labs)
RC1 (Dissolving Lab)
RC45 (ARW Diagnostics)
Industrial Wastes
PF41 (Nuclear Materials Storage)
Acid
Caustic
PF4 (Plutonium Facility)
TA-55
Plutonium Processing
TA-50
Waste Management Site
WM69 (Size Reduction)
WM37
WM1(Chemical Treatment Plant)
Cemented precipitate to storage at TA-54
TA-50-1 (Rm 60)
TA-50
Additional trucked liquid waste from Technical Areas 3, 15, 16, 21, 33, 50, 54, and ER and D&D activities.
TA-43
HRL1 (Health Research)
TA-16
S-Site
16-205 (Tritium Facility)
TA-35
Ten Site
TSL213 (Target Fab)
TA-35-2
Treated waste to Mortandad Canyon
Dewatered, packaged precipitate to burial or storage at TA-54
TA-50-1 (Rms 16 &116)
Pump
Truck Transport

Los Alamos
NATIONAL LABORATORY
memorandum
Chemical Science and Technology
Responsible Chemistry for America
CST-9, Analytical Chemistry, E518
Los Alamos, New Mexico 87545

To/MS: Dave Moss, E518
From/MS: Eva R. Birnbaum, CST-9, E518
Phone/FAX: 7-7538/5-6561
Date: 5/13/98

Subject: Case Narrative for Submission #100027422

Samples 98.72203 and 98.72303 were received by CST-9 personnel at TA-50 on 3/31/98. These samples were digested via method 200.2 on 3/31/98. ICP-OES analysis for Ag, Al, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Na, Ni, Pb, V, and Zn was performed on 4/3/98. ICP-MS for Tl, and U was performed on 4/8/98. ETVAA analysis for As and Se was performed on 4/6/98. Samples were digested for Hg analysis on 3.31/98 (holding times were met) and analysed by CVAA on 4/3/98. TSS was performed on 3/31/98, TDS on 4/8/98, COD on 4/1/98, CN on 4/9/98, Cl and SO4 on 4/8/98, P on 4/7/98, TALK on 4/13/98, TCATS on 4/7/98, SiO2 on 4/16/98, and F, NO3, NO2, and NH3 on 3/31/98.

QC Summary

Reagent Blank
OES: Results were all at or below our detection limits for all analytes.
MS: Results were all at or below our detection limits for all analytes.
ETVAA: Less than detection limit.
CVAA: 0.03 ug/L: reported as D.L.
WET: Results were all at or below our detection limits for all analytes.

Laboratory Control Samples (LCS):
OES: Within 15% for all analytes except B (136% recovery), Co (84%), and Ni (84%). Results are all in control.
MS: 102% recovery on Tl.
ETVAA: Within 10% of expected results for As and Se.
CVAA: Within 10% of expected results.
WET: All results in control.

Duplicates:
OES: RPD of +/- 20% for all analytes (except for those at or below detection limits).
MS: RPD of +/- 20% for all analytes.
ETVAA: Results below detection limit for both sample and duplicate.
CVAA: RPD of 21%.
WET: RPD of +/- 20% for all analytes (except for those at or below detection limits). TDS had a high RPD (58%) due to a very heterogeneous sample.

Matrix Spike:
OES: Spike recoveries within 15% of expected for all analytes except Ca and Na, due to high concentrations of sample relative to spike (LCS results, however, were in control).
MS: Spike recoveries within 28% of expected for all analytes.

ETVAA: Spike recoveries within 20% of expected for all analytes.
CVAA: 85% recovery of spike.
WET: Spike recoveries within 20% of expected for all analytes except P (recovery of 77%). LCS in control at 90% recovery, however; reported results should be acceptable.

Runtime QCs:
OES: Continuing calibration verification standards were all within 10% of expected values, except for Ca (112%). Blank checks were all below detection limits. Interference check standard was within 15% of expected value for all analytes.
MS: Continuing calibration verification standards were all within 10% of expected values . Blank checks were all below detection limits.
ETVAA: Continuing calibration verification standards were all within 10% of expected values. Blank checks were all below detection limits.
CVAA: Continuing calibration verification standards were all within 15% of expected values. Blank checks were all below detection limits.
WET: Continuing calibration verification standards were all within 15% of expected values. Blank checks were all below detection limits.

Blind QCs:
WET: All results under control.

TA-50 WM-1

ANALYSES OF COMPOSITE MINERAL SAMPLES

****

March, 1998

12-Jun-1998 04:43 PM

	RAW (1657961 liters)			FINAL (1581166 liters)		
Item	Concentration(mg/L)	Num	Total(KG)	Concentration(mg/L)	Num	Total(KG)
ALKALINITY-MO	2.10E+01	1	3.48E+01	3.50E+02	1	5.53E+02
ALKALINITY-P	ldl	1		ldl	1	
ALUMINUM	7.20E-01	1	1.19E+00	6.90E-02	1	1.09E-01
AMMONIA-N	2.19E+00	1	3.63E+00	2.47E+00	1	3.91E+00
ARSENIC	ldl	1		ldl	1	
BARIUM	3.50E-02	1	5.80E-02	1.30E-02	1	2.06E-02
BERYLLIUM	ldl	1		ldl	1	
BORON	2.00E-01	1	3.32E-01	1.76E-01	1	2.78E-01
CADMIUM	ldl	1		ldl	1	
CALCIUM	1.30E+01	1	2.16E+01	1.48E+02	1	2.34E+02
CHLORIDE	2.04E+01	1	3.38E+01	2.30E+01	1	3.64E+01
COBALT	5.00E-03	1	8.29E-03	ldl	1	
COD	5.50E+01	1	9.12E+01	3.00E+01	1	4.74E+01
CONDUCTIVITY	2.80E+02	1		8.89E+02	1	
COPPER	1.50E-01	1	2.49E-01	5.40E-02	1	8.54E-02
CYANIDE	ldl	1		ldl	1	
FLUORIDE	6.80E-01	1	1.13E+00	1.08E+00	1	1.71E+00
HARDNESS	4.48E+01	1	7.43E+01	3.71E+02	1	5.87E+02
IRON	1.50E+00	1	2.49E+00	7.60E-02	1	1.20E-01
LEAD	5.10E-02	1	8.46E-02	ldl	1	
MAGNESIUM	3.00E+00	1	4.97E+00	3.60E-01	1	5.69E-01
MERCURY	4.46E-03	1	7.39E-03	3.60E-05	1	5.69E-05
NICKEL	1.40E-01	1	2.32E-01	3.50E-02	1	5.53E-02
NITRATE-N	1.44E+01	1	2.39E+01	1.80E+01	1	2.85E+01
NITRITE-N	2.00E-02	1	3.32E-02	8.50E-01	1	1.34E+00
pH	6.5	1		7.2	1	
PHOSPHORUS	2.00E+00	1	3.32E+00	2.20E-01	1	3.48E-01
POTASSIUM	3.40E+00	1	5.64E+00	3.30E+00	1	5.22E+00
SELENIUM	ldl	1		ldl	1	
SILICA_DIOXIDE	8.16E+01	1	1.35E+02	3.96E+01	1	6.26E+01
SILVER	1.30E-02	1	2.16E-02	ldl	1	
SODIUM	2.90E+01	1	4.81E+01	4.90E+01	1	7.75E+01
SULFATE	1.30E+01	1	2.16E+01	2.40E+01	1	3.79E+01

TA-50 WM-1
ANALYSES OF COMPOSITE MINERAL SAMPLES
****
March, 1998

	RAW (1657961 liters)			FINAL (1581166 liters)		
Item	Concentration(mg/L)	Num	Total(KG)	Concentration(mg/L)	Num	Total(KG)
TDS	**2.58E+02**	1	**4.28E+02**	**1.80E+02**	1	**2.85E+02**
THALLIUM	**ldl**	1		**ldl**	1	
TOTAL_CATIONS	**2.34E+00**	1		**9.04E+00**	1	
TOTAL_CHROMIUM	**1.10E-01**	1	**1.82E-01**	**3.00E-03**	1	**4.74E-03**
TSS	**8.00E+00**	1	**1.33E+01**	**ldl**	1	
URANIUM	**1.34E-01**	1	**2.22E-01**	**6.00E-03**	1	**9.49E-03**
VANADIUM	**8.00E-03**	1	**1.33E-02**	**4.00E-03**	1	**6.32E-03**
ZINC	**9.50E-02**	1	**1.58E-01**	**ldl**	1	

TA-50 WM-1
ANALYSES OF COMPOSITE MINERAL SAMPLES
****
January, 1998

12-Jun-1998 04:43 PM

Item	RAW (1777609 liters) Concentration(mg/L)	Num	Total(KG)	FINAL (1823422 liters) Concentration(mg/L)	Num	Total(KG)
ALKALINITY-MO	1.10E+01	1	1.96E+01	2.17E+02	1	3.96E+02
ALKALINITY-P	ldl	1		ldl	1	
ALUMINUM	2.40E-01	1	4.27E-01	1.20E-01	1	2.19E-01
AMMONIA-N	3.14E+00	1	5.58E+00	3.26E+00	1	5.94E+00
ARSENIC		0			0	
BARIUM	4.10E-02	1	7.29E-02	1.10E-02	1	2.01E-02
BERYLLIUM	ldl	1		ldl	1	
BORON	1.40E-01	1	2.49E-01	9.90E-02	1	1.81E-01
CADMIUM	ldl	1		ldl	1	
CALCIUM	1.30E+01	1	2.31E+01	1.10E+02	1	2.01E+02
CHLORIDE	1.09E+01	1	1.94E+01	1.83E+01	1	3.34E+01
COBALT	ldl	1		ldl	1	
COD	7.80E+01	1	1.39E+02	4.10E+01	1	7.48E+01
CONDUCTIVITY	4.09E+03	1		7.24E+02	1	
COPPER	1.30E-01	1	2.31E-01	5.90E-02	1	1.08E-01
CYANIDE	8.00E-02	1	1.42E-01	1.00E-02	1	1.82E-02
FLUORIDE	7.70E-01	1	1.37E+00	1.60E+00	1	2.92E+00
HARDNESS	4.44E+01	1	7.89E+01	2.77E+02	1	5.05E+02
IRON	5.00E-01	1	8.89E-01	5.50E-02	1	1.00E-01
LEAD	4.90E-02	1	8.71E-02	ldl	1	
MAGNESIUM	2.90E+00	1	5.16E+00	4.90E-01	1	8.93E-01
MERCURY	4.00E-03	1	7.11E-03	6.40E-04	1	1.17E-03
NICKEL	2.10E-01	1	3.73E-01	7.60E-02	1	1.39E-01
NITRATE-N	1.12E+01	1	1.99E+01	1.46E+01	1	2.66E+01
NITRITE-N	2.60E-01	1	4.62E-01	2.81E+00	1	5.12E+00
pH	6.8	1		7.6	1	
PHOSPHORUS	2.15E+00	1	3.82E+00	9.10E-01	1	1.66E+00
POTASSIUM	4.20E+00	1	7.47E+00	5.30E+00	1	9.66E+00
SELENIUM		0			0	
SILICA_DIOXIDE	8.33E+01	1	1.48E+02	5.19E+01	1	9.46E+01
SILVER	3.30E-02	1	5.87E-02	4.00E-03	1	7.29E-03
SODIUM	3.00E+01	1	5.33E+01	5.70E+01	1	1.04E+02
SULFATE	9.00E+00	1	1.60E+01	1.73E+01	1	3.15E+01

TA-50 WM-1

ANALYSES OF COMPOSITE MINERAL SAMPLES

****

January, 1998

Item	RAW (1777609 liters) Concentration(mg/L)	Num	Total(KG)	FINAL (1823422 liters) Concentration(mg/L)	Num	Total(KG)
TDS	2.51E+03	1	4.46E+03	4.46E+02	1	8.13E+02
THALLIUM	ldl	1		ldl	1	
TOTAL_CATIONS	ldl	1		6.42E+00	1	
TOTAL_CHROMIUM	2.70E-02	1	4.80E-02	1.70E-02	1	3.10E-02
TSS	5.00E+00	1	8.89E+00	2.00E+00	1	3.65E+00
URANIUM	2.40E-02	1	4.27E-02	6.00E-03	1	1.09E-02
VANADIUM	9.00E-03	1	1.60E-02	1.20E-02	1	2.19E-02
ZINC	7.30E-02	1	1.30E-01	ldl	1	

TA-50 WM-1

ANALYSES OF COMPOSITE MINERAL SAMPLES

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February, 1998

12-Jun-1998 04:43 PM

	RAW (1867006 liters)			FINAL (1897399 liters)		
Item	Concentration(mg/L)	Num	Total(KG)	Concentration(mg/L)	Num	Total(KG)
ALKALINITY-MO	4.00E+01	1	7.47E+01	2.88E+02	1	5.46E+02
ALKALINITY-P	ldl	1		ldl	1	
ALUMINUM	4.16E-01	1	7.77E-01	5.00E-02	1	9.49E-02
AMMONIA-N	2.92E+00	1	5.45E+00	5.75E+00	1	1.09E+01
ARSENIC	ldl	1		ldl	1	
BARIUM	3.70E-02	1	6.91E-02	1.70E-02	1	3.23E-02
BERYLLIUM	ldl	1		ldl	1	
BORON	1.96E-01	1	3.66E-01	1.30E-01	1	2.47E-01
CADMIUM	ldl	1		ldl	1	
CALCIUM	1.23E+01	1	2.30E+01	1.30E+02	1	2.47E+02
CHLORIDE	1.85E+01	1	3.45E+01	1.88E+01	1	3.57E+01
COBALT	ldl	1		ldl	1	
COD	5.50E+01	1	1.03E+02	4.00E+01	1	7.59E+01
CONDUCTIVITY	2.74E+02	1		8.00E+02	1	
COPPER	1.59E-01	1	2.97E-01	6.00E-02	1	1.14E-01
CYANIDE	ldl	1		ldl	1	
FLUORIDE	4.80E-01	1	8.96E-01	8.30E-01	1	1.57E+00
HARDNESS	4.29E+01	1	8.00E+01	3.26E+02	1	6.19E+02
IRON	7.65E-01	1	1.43E+00	ldl	1	
LEAD	4.70E-02	1	8.77E-02	ldl	1	
MAGNESIUM	2.95E+00	1	5.51E+00	3.50E-01	1	6.64E-01
MERCURY	2.10E-03	1	3.92E-03	1.04E-04	1	1.97E-04
NICKEL	2.03E-01	1	3.79E-01	3.60E-02	1	6.83E-02
NITRATE-N	4.72E+01	1	8.81E+01	1.66E+01	1	3.15E+01
NITRITE-N	5.00E-02	1	9.34E-02	4.80E-01	1	9.11E-01
pH	7.1	1		6.9	1	
PHOSPHORUS	2.30E+00	1	4.29E+00	5.60E-01	1	1.06E+00
POTASSIUM	2.48E+00	1	4.63E+00	3.20E+00	1	6.07E+00
SELENIUM	ldl	1		ldl	1	
SILICA_DIOXIDE	8.38E+01	1	1.56E+02	5.09E+01	1	9.66E+01
SILVER	3.40E-02	1	6.35E-02	ldl	1	
SODIUM	3.12E+01	1	5.83E+01	5.10E+01	1	9.68E+01
SULFATE	1.15E+01	1	2.15E+01	2.67E+01	1	5.07E+01

TA-50 WM-1
ANALYSES OF COMPOSITE MINERAL SAMPLES
****
February, 1998

	RAW (1867006 liters)			FINAL (1897399 liters)		
Item	Concentration(mg/L)	Num	Total(KG)	Concentration(mg/L)	Num	Total(KG)
TDS	**2.44E+02**	1	**4.56E+02**	**5.08E+02**	1	**9.64E+02**
THALLIUM	**ldl**	1		**1.00E-03**	1	**1.90E-03**
TOTAL_CATIONS	**2.44E+00**	1		**8.24E+00**	1	
TOTAL_CHROMIUM	**5.10E-02**	1	**9.52E-02**	**4.00E-03**	1	**7.59E-03**
TSS	**5.00E+00**	1	**9.34E+00**	**ldl**	1	
URANIUM	**5.70E-02**	1	**1.06E-01**	**4.00E-03**	1	**7.59E-03**
VANADIUM	**8.00E-03**	1	**1.49E-02**	**6.00E-03**	1	**1.14E-02**
ZINC	**1.80E-01**	1	**3.36E-01**	**ldl**	1	