Attachment 1

WASTE ANALYSIS PLAN

Appendix D

ANALYTICAL PROCEDURES FOR TREATMENT FORMULA DEVELOPMENT FOR STABILIZATION AND SOLIDIFCATION

MIXED WASTE FACILITY
RCRA/TSCA PERMIT APPLICATION

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1.0 SCOPE, PURPOSE, AND APPLICATION

1.1 The purpose of this procedure is to obtain information for the development of the treatment formula by which wastes are to be stabilized and solidified at the Mixed Waste Facility (MWF).

1.2 During treatment, water, stabilization and/or solidification reagents are added to the waste to stabilize the waste in order to meet the applicable treatment standards or objectives and to ensure a solidified waste at a desired consistency. For purposes of this procedure, treatment is defined as stabilization and/or solidification.

1.3 As a result of this method, information about the following treatment parameters will be developed:

1.3.1 The amount of water needed to make a slurry.

1.3.2 Whether a pH adjustment is needed and how to adjust the pH.

1.3.3 The composition and amount of treatment reagents to be used.

1.3.4 The consistency of the treatment residues.

1.4 The primary goal of treatment is to achieve the applicable treatment standards or objectives. The secondary goal is to achieve a final treatment residue which may be most easily managed. The desired physical form or consistency of the treatment residue will be similar to that of loose, compactable soil. However, some waste will have to be treated such that the treatment residue will have physical properties similar to concrete. Where possible, this concrete-type treated material shall be made crumbly such that, if placed in the landfill in greater than maximum lift thickness, it could be compacted to the requirements for lift thickness in the cell. Example Waste Treatment Formula Development and Treatment Record forms are included as Figures D-1 and D-2.

1.5 The ingredients selected for mixing waste with a blend of stabilization reagents will depend on the contaminants requiring treatment and the waste form processing constraints/requirements. A wide range of blended reagent, waste and mixing water ratios is possible. In general, waste form mixes are proportioned on the basis of the water to reagent ratio. These ratios vary from 0.5 to 1.5 and are chosen for each waste

stream. In addition to meeting the performance requirements, the waste, reagents, and mixing water proportions will be adjusted to meet the following design criteria: 1) the mixture must be mixable in the given mixer to produce a homogeneous waste form; 2) the waste form must set within 7 days after mixing; 3) settling (phase separation) of the solid and liquid phases will be minimized to control bleed water; and 4) the curing waste form must not exceed 200°F. The purpose of the latter criteria is to prevent steam generation and consequently the potential for pressurizing the container.

2.0 APPARATUS AND MATERIALS

2.1 Laboratory balance, with at least +0.lg readability.

2.2 pH Meter or pH Paper

2.3 Beaker or container, glass or plastic, calibrated for volume, 200 ml minimum

2.4 Timing device (clock, watch, or timer)

2.5 Grinder, rotary

2.6 Mixer/blender, with slow speed (Pro Line model KSM5 or similar unit)

2.7 Stirring device (glass rod, spatula, etc.)

2.8 Volumetric measuring devices, glass or plastic (burets, pipettors, pipets, graduated cylinders, beakers**,** or flasks)

3.0 REAGENTS

3.1 Water, tap

3.2 Treatment reagents which may include:

3.2.1 Cement
3.2.2 Lime
3.2.3 Perlite
3.2.4 Diatomaceous Earth
3.2.5 Cement Kiln Dust
3.2.6 Clay
3.2.7 Sand
3.2.8 Gravel
3.2.9 Soil
3.2.10 Aquaset
3.2.11 Aquaset II
3.2.12 Petroset

3.2.13 Petroset II

3.3 Technical grade acid and/or base to adjust ph

4.0 SAMPLE PREPARATION

4.1 If the sample needs size reduction, use the grinder to reduce particle size of the sample. As a general rule, the sample should pass a 0.5" screen.

5.0 PROCEDURE

5.1 Weigh or establish a tare weight or mass of an empty beaker or container.

5.2 Place a minimum 100-ml waste sample into the container. Determine the volume of the sample. Record the volume in mls.

5.3 Determine the mass of the sample. Record the mass of the sample in grams.

5.4 Place the sample into a beaker or a slow speed mixer/blender.

5.5 Using a volumetric measuring device, add water to the sample in small amounts and stir the sample-water solution until a fluid slurry is created which is easily mixed.

5.6 Determine the amount of water added in mls. Record this amount

5.7 Check the pH of this slurry using a pH paper or pH meter. If the pH meter is used, a sample of the slurry may be taken and mixed with an equal amount of water before measuring the pH. Record the initial slurry pH.

5.8 If the pH is between 5 and 9, then skip to step 5.9, otherwise follow these steps to determine pH adjustment:

5.8.1 Determine the amount of acid or base to add to the slurry using the following procedure:

5.8.1.1 If the pH>9, determine the pOH, otherwise skip to the next step. The pOH is calculated from the pH as follows:

$$pOH = 14 - pH$$

5.8.1.2 Using the pH or pOH as determined above, calculate the molarity (moles/liter) for H or OH of the solution by the applicable conversion equation:

H Molarity (moles/liter)
OH Molarity (moles/liter)
Record the H or OH molarity.

5.8.1.3 Multiply the H or OH molarity by the volume (mls) of water added to the waste. Record this product in millimoles. This product is the number of millimoles of acid or base needed to adjust the pH.

5.8.1.4 Calculate or determine the normality of the acid or base to be used to adjust the pH. Record the acid or base normality.

5.8.1.5 Divide the number of millimoles needed for the adjustment by the normality (moles/liter) of the acid or base to be used to adjust the pH. Record this quotient in mls. This is the amount of the acid or base to add to the slurry for pH adjustment.

(Note: For an additional safety precaution, check the result of the fingerprint parameter tests before adding acids or bases.)

5.8.2 Mix the calculated amount of acid or base into slurry. Record the amount of acid or base added in mls.

5.8.3 Repeat steps 5.7 and 5.8 until a pH between 5 and 9 is achieved. When a pH between 5 and 9 is achieved, record the final pH. Also, record the number of adjustments required to achieve a slurry pH of 5-9.

5.9 The types of treatment reagents and the slurry-reagents ratio are selected.

In general, the treatment reagents will be selected on the basis of the goals of the treatment process. For example, where inorganics and aqueous slurries are the object of the treatment, such reagents which stabilize inorganics may be used. Similarly, where organics are to be treated, such reagents which stabilize organics will be used. Where both inorganics and organics are the object, a combination of treatment reagents may be used. The treatment reagents can be represented in three broad categories:

- Solidifiers - perlite, diatomaceous earth, clay, sand, gravel and soil.

  These products are generally not used for stabilization purposes and may be used to help solidify the waste during treatment or to help adjust the consistency of the treated waste.

- Generic Stabilizers - Cement, lime and cement kiln dust.

- Fluid Tech Stabilizers - Aquaset ®, Aquaset II ®, Petroset ®, Petroset II ®,

  (Products with ®'s are proprietary reagents of Fluid Tech, Inc.)

5.9.1 Identify and record the composition of the treatment reagents used.

5.9.2 Make the treatment reagent(s) to be used ready for addition to the waste or slurry. If more than one reagent is to be used, a mixture may be made by combining the appropriate amounts --OR-- the reagents may be obtained and made ready for appropriate addition to the slurry separately.

5.9.3 Add small amounts of the selected treatment reagents to the slurry and stir. Continue the process of adding and stirring until the slurry is solidified.

5.9.4 Determine the amount of treatment reagents added. Record the amount in grams.

5.9.5 Determine the final material. Record the amount in mls.

5.10 Free Liquids and Formula Development.

5.10.1 Visually inspect the sample for the presence of free liquids and run the Paint Filter Liquids Test on the treated waste.

5.10.2 If free liquids are present, go to Step 5.9.3.

5.10.3 If there are no free liquids, indicate on the form.

5.10.4 Analytical results will be obtained as part of the formula development. These results will include the waste's treatment standards or objectives.

5.10.5 If the results of analysis indicate that treatment standards or objectives are not met, the formula may be adjusted to compensate or, if additional information is needed, this process may be repeated starting with step 5.1.

6.0 QUALITY CONTROL

6.1 A duplicate will be run for each sample using the same sample volume (±10%). The results will be used as a comparison and a precision check against the original results obtained. The following precision objectives require a re-analysis if not met:

6.1.1 Water added: ±10% of the previous run.

6.1.2 Amount of treatment reagents added: ±10% of the previous run.

7.0 TREATMENT FORMULA

7.1 The information provided by the results of this method may be used to accomplish the treatment. Practical application and field experience may also be used to develop the formulas to treat the waste. This method provides guidance and a starting point for the actual formula to be used to treat wastes.

8.0 SAFETY

8.1 Goggles or laboratory safety glasses with side guards, gloves and lab coats must be worn when performing this method.

9.0 SAMPLE MANAGEMENT AND DISPOSAL

9.1 After the method has been performed, untreated samples will be archived for future reference, placed with incoming wastes to be treated, managed as an on-site generated waste, sent out for additional analysis or returned to the generator as a sample. Treated wastes will be archived for future reference, placed with incoming wastes to be treated or disposed, managed as an on-site generated waste, sent out for additional analysis, or returned to the generator in accordance with regulations. This procedural step does not preclude any other lawful management of sample material.

Figure D-1. EXAMPLE WASTE TREATMENT FORMULA DEVELOPMENT DATA SHEET AND FORMULA SUMMARY FORM

WASTE NAME _____ DATE _____

GENERATOR _____ GENERATOR - WASTE STREAM NUMBER _____

	METHOD RESULTS	DUPLICATE
1. Sample volume (ml):	_____ (ml)	_____ (ml)
2. Mass of sample (gram):	_____ (g)	_____ (g)
3. Amount of water added (ml):	_____ (ml)	_____ (ml)
4. pH result (pH units) Paper Meter	_____ (pH)	_____ (pH)
5. pH between 5-9? H^+ or OH molarity:	Y N _____ (M)	Y N _____ (M)
a. Material for Neutralization:	Acid Base	Acid Base
b. H+ or OH to Add (#5 * #3):	_____ (mmoles)	_____ (mmoles)
c. Acid/Base Normality (H+ or OH):	_____ (N)	_____ (N)
d. Acid/Base to Add (#5b / #5c):	_____ (ml)	_____ (ml)
e. Actual Volume of Acid/Base Added:	_____ (ml)	_____ (ml)
f. pH Check, Adjust (s) to pH 5-9	_____ pH _____ Re	_____ pH ___ Re

6. Treatment material (s): Parts or %

_____	+	_____	+	_____	+	_____	+	_____	+	_____	+
c-Cement		l-Lime		pl-Perlite							
_____	+	_____	+	_____	+	_____	+	_____	+	____	+
d-Diatomaceous Earth		ckd-Cement Kiln Dust		cl-Clay		s-Sand		g-Gravel		so-Soil	
_____	+	_____	+	_____	+	_____		= 100% or		_____	
+ a-Aquaset		b-Aquaset II		p-Petroset		q-Petroset II				total parts	

7. Amount of treatment material (s) added:

8. Final volume of treated mixture:

9. Visual and PFLT check for free liquids. Result: PASS FAIL PASS FAIL

Analyst : _____ Date: _____

**********TREATMENT FORMULA SUMMARY**********

Waste percent of operating capacity ([#1/#8] * 75%) _____%

Water added to make slurry (7.48*#3 / #1): _____ gallons/ft^3-waste

Stabilizer/solidifier composition:

pH adjustment needed? YES NO _____

If yes, material and strength used:

_____ _____ (N)

pH adjustment ratio (#5e / #3):

_____ gal/gal-H_2O

Treatment materials per volume of waste (62.4 #7/#1): _____ lbs. per ft^3 - waste

-- or --

Treatment materials per gallon of water (8.345*#7/ #3): _____ lbs. per gal-water

-- or --

Analyst

_____

Figure D-2. EXAMPLE WASTE TREATMENT FORMULA AND TREATMENT RECORD

MWF TRACKING NUMBER(S) TREATED _____

DATE _____ DATE/TIME OF TREATMENT _____ / _____

CLEAN / OK FROM PREVIOUS BATCH _____ TRACKING NUMBER (S) TREATED _____

FORMULA PARAMETERS AND GUIDELINES

Maximum waste percent of mixer operating capacity: _____ %

Approximate ratio of water added to make slurry: _____ gallons/ft^3-waste

Slurry pH expected: _____

Material & strength rage to adjust pH:

_____	Na_2CO_3	_____-_____	(M)	_____	H_2SO_4	_____-_____	(M)
_____	Lime	_____-_____	(M)	_____	HC1	_____-_____	(M)
_____	NaOH	_____-_____	(M)	_____	HNO_3	_____-_____	(M)
_____	Other	_____-_____	(M)	_____	Other	_____-_____	(M)

Other material(s) used for pH adjustment: _____

The following formula provides an estimate of the volume of material to add to adjust pH. Volume units for water added and pH adjustment material are the same:

((VOLUME OF H2O ADDED) * (10^{-pOH})) % (M OF ACID OR BASE) = Est. volume to adjust pH

Stabilizer/solidifier composition ranges: Parts _____ - _____ or Percent (%)

____	Aquaset	_____-_____	____	Lime	_____-_____
____	Aquaset II	_____-_____	____	Petroset	_____-_____
____	Cement	_____-_____	____	Perlite	_____-_____
____	Cement Kiln Dust	_____-_____	____	Petroset II	_____-_____
____	Clay	_____-_____	____	Sand	_____-_____
____	Diatomac. Earth	_____-_____	____	Soil	_____-_____
____	Gravel	_____-_____	____	Other	_____-_____

Other material (s) used for treatment: _____

Minimum materials per volume of waste treated: _____ lbs. per ft^3 - waste

-- or --

Minimum materials per gallon of water added: _____ lbs. per gal - water

Record any adjustments to the formula and justifications for the adjustments in the Remarks section below.

Complete information above except for the date, time and tracking numbers of treatment and make copies for use.

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TREATMENT FORMULA CHECKLIST AND RECORD

_____	Add Waste to Mixer.	Amount Added:	
_____	Add Water to Make a Slurry	Amount Added:	
_____	Check pH (5-9), adjust if necessary. Record pH adjustment materials in remarks.	Final pH:	(pH)
_____	Add Treatment Materials.	Amount Added:	
_____	Mix Slurry/Treatment Materials		
_____	Free Liquids Check and Paint Filter Liquids Test		PASS FAIL

Remarks: _____

Operators _____