ATTACHMENT II-1-12-5

WASTE FAMILY OPERATIONAL PARAMETERS

I. PURPOSE AND SCOPE

1. This Attachment describes approved waste families for thermal desorption processing. This Attachment includes:

   a. descriptions of each approved waste family; and

   b. processing parameters, based on Demonstration Testing, for each of the approved waste families.

2. Approved waste families are listed in Condition 3.f. of Attachment II-1-12, *Thermal Desorption Separation Plan*. These waste families include:

   a. volatile organic compounds (VOCs);

   b. semi-volatile organic compounds (SVOCs);

   c. polychlorinated biphenyls (PCBs);

   d. CMBST-coded contaminants; and

   e. volatile metals.

3. The definitions of terms used in this Attachment are found in Attachment II-1-12, *Thermal Desorption Separation Plan*.

4. This attachment provides operational parameters specific to these approved waste families. The waste is also subject to the general operational parameters described in Attachment II-1-12, *Thermal Desorption Separation Plan*.

5. If any of the processing parameters described in this Attachment are exceeded, the Executive Secretary shall be notified within 24 hours of discovery of the exceedance.

II. OVERALL OPERATIONAL PARAMETERS

The following parameters from Attachment II-1-12, *Thermal Desorption Treatment Plan*, shall be maintained for all Waste Families:

a. The minimum solids processing temperature and holding time shall be provided to the Executive Secretary as a processing recipe in accordance with Condition 4.f. of Attachment II-1-12.

b. The oxygen concentration within the dryer shall be maintained in accordance with Condition 7.e of Attachment II-1-12.

c. The temperature of the carrier gas leaving the condenser system shall be monitored in accordance with Condition 8.c of Attachment II-1-12.

d. The temperature of the carbon adsorption bed shall be monitored in accordance with Condition 8.e. of Attachment II-1-12.

III. VOC WASTE FAMILY

1. VOC Waste Family Description

a. Organic chemicals that have a high vapor pressure and easily form vapors at ambient temperature and pressure.

b. Typical boiling points less than 360 ˚F.

c. Those compounds listed in US EPA SW-846 Method 8260.

d. The VOC waste family is comprised of the following 120 compounds:

Acetone	1,4-Dioxane
Acetonitrile	Epichlorohydrin
Acrolein (Propenal)	Ethanol
Acrylonitrile	Ethyl acetate
Allyl chloride	Ethylbenzene
Benzene	Ethylene oxide
Benzyl chloride	Ethyl methacrylate
Bis(2-chloroethyl)sulfide	Hexachlorobutadiene
Bromoacetone	Hexachloroethane
Bromobenzene	2-Hexanone
Bromochloromethane	2-Hydroxypropionitrile
Bromodichloromethane	Iodomethane
Bromoform	Isobutyl alcohol
Bromomethane	Isopropylbenzene
n-Butanol (n-Butyl Alcohol)	P-Isopropyltoluene

2-Butanone (MEK)
tert-Butyl alcohol
n-Butyl benzene
sec-Butyl benzene
tert-Butyl benzene
Carbon disulfide
Carbon tetrachloride
Chloral hydrate
Chloroacetonitrile
Chlorobenzene
1-Chlorobutane
Chlorodibromomethane
Chloroethane
2-Chloroethanol
Chloroform
1-Chlorohexane
Chloromethane
Chloroprene
3-Chloropropionitrile
2-Chlorotoluene
4-Chlorotoluene
1,2-Dibromo-3-chloropropane
Dibromodifluoromethane
1,2-Dibromoethane
Dibromomethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
cis-1,4-Dichloro-2-butene
trans-1,4-Dichloro-2-butene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
1,3-Dichloropropane
2,2-Dichloropropane
1,3-Dichloro-2-propanol
1,1-Dichloropropene
Malonitrile
Methacrylonitrile
Methanol
Methyl acrylate
Methylene chloride
Methyl methacrylate
4-Methyl-2-pentanone (MIBK)
Methyl-tert-butyl ether (MTBE)
Naphthalene
Nitrobenzene
2-Nitropropane
N-Nitroso-di-n-butylamine
Paraldehyde
Pentachloroethane
Pentafluorobenzene
2-Pentanone
2-Picoline
1-Propanol
2-Propanol
Propargyl alcohol
β-Propiolactone
Propionitrile (ethyl cyanide)
n-Propylamine
n-Propylbenzene
Pyridine
Styrene
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,2,3-Trichlorobenzene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
1,2,3-Trichloropropane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Vinyl acetate
Vinyl chloride

cis-1,3-Dichloropropene	o-Xylene
trans-1,3-Dichloropropene	m-Xylene
1,2,3,4-Diepoxybutane	p-Xylene
Diethyl ether	Xylenes (total)

2. VOC Waste Family Processing Parameters

a. Processing parameters are based upon the Waste Family Demonstration Testing conducted in August and September, 2004.

i. The Post-Waste Family Demonstration Testing Report for the VOC waste family was submitted in a letter dated December 16, 2004.

b. Maximum hourly feed rate = 490 lbs per hour.

c. Maximum hourly rolling average vent gas flow rate = 13.7 cubic feet per minute (averaged over a single process cycle).

IV. SVOC WASTE FAMILY

1. SVOC Waste Family Description

a. Organic chemicals with lower vapor pressures than VOCs.

b. Typical boiling points between 360 ˚F and 750 ˚F.

c. Those compounds listed in US EPA SW-846 Method 8270 with the exception of PCBs.

d. Polychlorinated-dibenzodioxins and -dibenzofurans (PCDD/PCDF) as Underlying Hazardous Constituents (UHCs) within the waste.

e. The SVOC waste family is comprised of the following 228 compounds:

Acenaphthene	EPN
Acenaphthylene	Ethion
Acetophenone	Famphur
2-Acetylaminofluorene	Fensulfothion
1-Acetyl-2-thiourea	Fenthion
Aldrin	Fluchloralin
2-Aminoanthraquinone	Fluoranthene
Aminoazobenzene	Fluorene

4-Aminobiphenyl
3-Amino-9-ethylcarbazole
Anilazine
Aniline
o-Anisidine
Anthracene
Aramite
Azinphos-methyl
Barban
Benzidine
Benzoic acid
Benz(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(a)pyrene
p-Benzoquinone
Benzyl alcohol
α-BHC
β-BHC
δ-BHC
γ-BHC (Lindane)
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl) ether
Bis(2-chloroisopropyl) ether
Bis(2-ethylhexyl) phthalate
4-Bromophenyl phenyl ether
Bromoxynil
Butyl benzyl phthalate
Captafol
Captan
Carbaryl
Carbofuran
Carbophenothion
Chlordane (NOS)
Chlorfenvinphos
4-Chloroaniline
Chlorobenzilate
5-Chloro-2-methylaniline
4-Chloro-3-methylphenol
3-(Chloromethyl)pyridine
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Hexachloropropene
Hexamethylphosphoramide
Hydroquinone
Indeno(1,2,3-cd)pyrene
Isodrin
Isophorone
Isosafrole
Kepone
Leptophos
Malathion
Maleic anhydride
Mestranol
Methapyrilene
Methoxychlor
3-Methylcholanthrene
4,4'-Methylenebis (2-chloroaniline)
4,4'-Methylenebis (N,N-dimethylaniline)
Methyl methanesulfonate
2-Methylnaphthalene
Methyl parathion
2-Methylphenol
3-Methylphenol
4-Methylphenol
Mevinphos
Mexacarbate
Mirex
Monocrotophos
Naled
Naphthalene
1,4-Naphthoquinone
1-Naphthylamine
2-Naphthylamine
Nicotine
5-Nitroacenaphthene
2-Nitroaniline

hydrochloride
1-Chloronaphthalene
2-Chloronaphthalene
2-Chlorophenol
4-Chloro-1,2-phenylenediamine
4-Chloro-1,3-phenylenediamine
4-Chlorophenyl phenyl ether
Chrysene
Coumaphos
p-Cresidine
Crotoxyphos
4,4'-DDD
4,4'-DDE
4,4'-DDT
Demeton-O
Demeton-S
Diallate (cis or trans)
2,4-Diaminotoluene
Dibenz(a,j)acridine
Dibenz(a,h)anthracene
Dibenzofuran
Dibenzo(a,e)pyrene
1,2-Dibromo-3-chloropropane
Di-n-butyl phthalate
Dichlone
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
3,3'-Dichlorobenzidine
2,4-Dichlorophenol
2,6-Dichlorophenol
Dichlorovos
Dicrotophos
Dieldrin
Diethyl phthalate
Diethyl sulfate
Dihydrosaffrole
Demethoate
3,3'-Dimethoxybenzidine
Dimethylaminoazobenzene
7,12-Dimethylbenz(a)-
3-Nitroaniline
4-Nitroaniline
5-Nitro-o-anisidine
Nitrobenzene
4-Nitrobiphenyl
Nitrofen
2-Nitrophenol
4-Nitrophenol
5-Nitro-o-toluidine
Nitroquinoline-1-oxide
N-Nitrosodi-n-butylamine
N-Nitrosodiethylamine
N-Nitrosodimethylamine
N-Nitrosomethylethylamine
N-Nitrosodiphenylamine
N-Nitrosodi-n-propylamine
N-Nitrosomorpholine
N-Nitrosopiperidine
N-Nitrosopyrrolidine
Octamethyl pyrophosphoramide
4,4'-Oxydianiline
Parathion
Pentachlorobenzene
Pentachloronitrobenzene
Pentachlorophenol
Phenacetin Phenanthrene
Phenobarbital
Phenol
1,4-Phenylenediamine
Phorate
Phosalone
Phosmet
Phosphamidon
Phthalic anhydride
2-Picoline (2-Methylpyridine)
Piperonyl sulfoxide
Pronamide
Propylthiouracil
Pyrene
Pyridine

anthracene	
3,3'-Dimethylbenzidine	Resorcinol
α,α-Dimethylphenethylamine	Safrole
2,4-Dimethylphenol	Strychnine
Dimethyl phthalate	Sulfallate
1,2-Dinitrobenzene	Terbufos
1,3-Dinitrobenzene	1,2,4,5-Tetrachlorobenzene
1,4-Dinitrobenzene	2,3,4,6-Tetrachlorophenol
4,6-Dinitro-2-methylphenol	Tetrachlorvinphos
2,4-Dinitrophenol	Tetraethyl dithiopyrophosphate
2,4-Dinitrotoluene	Tetraethyl pyrophosphate
2,6-Dinitrotoluene	Thionazine
Dinocap	Thiophenol (Benzenethiol)
Dinoseb	Toluene diisocyanate
Dioxathion	o-Toluidine
Diphenylamine	Toxaphene
5,5-Diphenylhydantoin	1,2,4-Trichlorobenzene
1,2-Diphenylhydrazine	2,4,5-Trichlorophenol
Di-n-octyl phthalate	2,4,6-Trichlorophenol
Disulfoton	Trifluralin
Endosulfan I	2,4,5-Trimethylaniline
Endosulfan II	Trimethyl phosphate
Endosulfan sulfate	1,3,5-Trinitrobenzene
Endrin	Tris(2,3-dibromopropyl) phosphate
Endrin aldehyde	Tri-p-tolyl phosphate
Endrin ketone	O,O,O-Triethyl phosphorothioate

f. In addition, the following PCDD/PCDF compounds are also within the SVOC Waste Family:

- 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD)
- 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF)
- 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-HpCDF)
- All Hexachlorodibenzo-p-dioxins (HxCDDs)
- All Heptachlorodibenzofurans (HxCDFs)
- 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)
- 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)
- All Pentachlorodibenzo-p-dioxins (PeCDDs)
- All Pentachlorodibenzofurans (PeCDFs)
- All Tetrachlorodibenzo-p-dioxins (TCDDs)
- All Tetrachlorodibenzofurans (TCDFs)

2. SVOC Waste Family Processing Parameters

a. Processing parameters are based upon the Waste Family Demonstration Testing conducted in August and September, 2004.

i. The Post-Waste Family Demonstration Testing Report for the SVOC waste family was submitted in a letter dated December 16, 2004.

b. Maximum hourly feed rate = 490 lbs per hour.

c. Maximum hourly rolling average vent gas flow rate = 13.7 cubic feet per minute (averaged over a single process cycle).

V. PCB Waste Family

1. PCB Waste Family Description

a. PCBs are defined in 40 CFR 761.3 as "any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contains such substance."

2. PCB Waste Family Processing Parameters

a. PCB waste processing shall be performed in accordance with an EPA Operating Approval maintained by the Permittee's TD contractor.

VI. CMBST-Coded Contaminants Waste Family

1. CMBST-Coded Contaminants Waste Family Description

a. Wastes with "P" and "U" listed hazardous waste codes that require CMBST as the only nonwastewater treatment standard as defined in 40 CFR 268.40.

b. Wastes which have alternative treatment standards in addition to CMBST are excluded from this waste family.

c. Boiling points range from -120 ˚F to 993 ˚F. See Table 6.1-2 in Attachment II-1-12-3, *CMBST-coded wastes Pre-Demonstration Plan*, for a listing of boiling points of CMBST-coded contaminants.

d. The CMBST-coded contaminants waste family consists of the following 139 compounds (45 "P" listed compounds and 94 "U" listed compounds):

Hazardous Code	Compound
P001	Warfarin (> 0.3%)
P002	1-acetyl-2-thiorea
P003	Acrolein
P005	Allyl Alcohol
P007	5-Aminomethyl 3-isoxazolol
P008	4-Aminopyridine
P014	Thiophenol (Benzene thiol)
P016	Dichloromethyl ether
P017	Bromoacetone
P018	Brucine
P023	Chloroacetaldehyde
P026	1-(o-Chlorophenyl)thiourea
P027	3-Chloropropionitrile
P028	Benzyl Chloride
P034	2-Cyclohexyl-4,6-dinitrophenol
P040	0,0-Diethyl O-pyrazinyl phosphorothioate
P041	Diethyl-p-nitrophenyl phosphate
P042	Epinephrine
P043	Diisopropylfluorophosphate (DFP)
P044	Dimethoate
P045	Thiofanox
P046	alpha, alpha-Dimethylphenethylamine
P049	Dithiobiuret
P054	Aziridine
P057	Fluoroacetamide
P058	Fluoroacetic acid, sodium salt
P062	Hexaethyl tetraphosphate
P064	Isocyanic acid, ethyl ester
P066	Methomyl
P067	2-Methyl-aziridine
P069	2-Methyllactonitrile
P070	Aldicarb
P072	1-Naphthyl-2-thiourea
P075	Nicotine and Salts
P084	N-Nitrosomethylvinylamine
P085	Octamethylpyrophosphoramide
P088	Endothall
P093	Phenylthiourea
P095	Phosgene

Hazardous Code	Compound
P102	Propargyl alcohol
P108	Strychnine and salts
P109	Tetraethyldithiopyrophosphate
P111	Tetraethylpyrophosphate
P116	Thiosemicarbazide
P118	Trichloromethanethiol
U001	Acetaldehyde
U006	Acetyl Chloride
U007	Acrylamide
U008	Acrylic Acid
U010	Mitomycin C
U011	Amitrole
U014	Auramine
U015	Azaserine
U016	Benz(c)acridine
U017	Benzal chloride
U020	Benzenesulfonyl Chloride
U021	Benzidine
U026	Chlornaphazine
U033	Carbon Oxyfluoride
U034	Trichloroacetaldehyde (Chloral)
U035	Chloroambucil
U038	Chlorobenzilate
U041	Epichlorohydrin (1-Chloro-2,3-epoxypropane)
U042	2-Chloroethyl vinyl ether
U046	Chloromethyl methyl ether
U049	4-Chloro-o-toluidine hydrochloride
U053	Crotonaldehyde
U055	Cumene (Isopropylbenzene)
U056	Cyclohexane
U058	Cyclophosphamide
U059	Daunomycin
U062	Diallate
U064	Dibenz(a,i)pyrene
U073	3,3`-Dichlorobenzidine
U074	cis,1,4-Dichloro-2-butene
U074	trans-1,4-Dichloro-2-butene
U085	1,2,3,4-Diepoxybutane
U087	O,O-Diethyl S-methyldithiophosphate
U089	Diethyl Stilbestrol
U090	Dihydrosafrole

Hazardous Code	Compound
U091	3,3`-Dimethoxybenzidine
U092	Dimethylamine
U093	p-Dimethylaminoazobenzene
U094	7,12-Dimethylbenz(a)anthracene
U095	3,3`-Dimethylbenzidine
U097	Dimethylcarbamoyl chloride
U110	Dipropylamine
U113	Ethyl Acrylate
U114	Ethylenebisdithiocarbamic acid
U116	Ethylene thiourea
U119	Ethyl Methane Sulfonate
U122	Formaldehyde
U123	Formic Acid
U124	Furan
U125	Furfural
U126	Glycidyaldehyde
U132	Hexachlorophene
U143	Lasiocarpine
U147	Maleic Anhydride
U148	Maleic Hydrazide
U149	Malononitrile
U150	Melphalan
U153	Methanethiol
U156	Methyl chlorocarbonate
U163	N-Methyl N`-nitro N-nitrosoguanidine
U164	Methylthiouracil
U166	1,4-Naphthoquinone
U167	1-Naphthylamine
U168	2-Naphthylamine
U171	2-Nitropropane
U173	N-Nitrosodiethanolamine
U176	N-Nitroso-N-ethylurea
U177	N-Nitroso-N-methylurea
U178	N-Nitroso-N-methylurethane
U182	Paraldehyde
U186	1,3-Pentadiene
U191	2-Picoline
U193	1,3-Propane sultone
U194	n-Propylamine
U197	p-Benzoquinone
U200	Reserpine
U201	Resorcinol

Hazardous Code	Compound
U202	Saccharin
U206	Streptozotocin
U213	Tetrahydrofuran
U218	Thioacetamide
U219	Thiourea
U221	Toluenediamine
U222	o-Toluidine hydrochloride
U223	Toluene diisocyanate
U234	1,3,5-Trinitrobenzene
U236	Trypan Blue
U237	Uracil mustard
U238	Urethane (Ethyl carbamate)
U244	Thiram
U248	Warfarin (< 0.3%)
U328	o-Toluidine
U353	p-Toluidine
U359	2-Ethoxyethanol

2. CMBST-Coded Contaminants Processing Parameters

a. Processing parameters are based upon the Waste Family Demonstration Testing conducted in April and May, 2008.

i. The Post-Waste Family Demonstration Testing Report for the CMBST-Coded Contaminants waste family was submitted in a letter dated July 15, 2008.

b. Maximum hourly feed rate = 260 lbs per hour.

c. Maximum hourly rolling average vent gas flow rate = 13.0 cubic feet per minute (averaged over a single process cycle).

VII. VOLATILE METALS WASTE FAMILY

1. Volatile Metals Waste Family Description

a. Metals and metal compounds with relatively high vapor pressures and low boiling points

b. US EPA MACT regulations (40 CFR 63) definitions for high volatility metals, semivolatile metals, and low volatile metals.

i. High Volatility Metals

- Mercury

ii. Semivolatile Metals

- Cadmium
- Lead

iii. Low Volatile Metals

- Arsenic
- Beryllium
- Chromium

c. The volatile metals waste family consists of these six metals and the compounds associated with them.

2. Volatile Metals Waste Family Processing Parameters

a. Processing parameters are based upon the Waste Family Demonstration Testing conducted in August, 2008.

i. The Post-Waste Family Demonstration Testing Report for the volatile metals waste family was submitted in a letter dated October 21, 2008.

b. Feed Rate Limitations

i. Total arsenic through the system shall be limited to 14.50 lbs within a single process cycle.

ii. Total lead through the system shall be limited to 26.00 lbs within a single process cycle.

iii. Total mercury through the system shall be limited to 15.20 lbs within a single process cycle.

c. All other processing parameters will be those associated with the organic waste family processed with the volatile metals.

End of Attachment II-1-12-5