ATTACHMENT II-1-12-2

WASTE FAMILY OPERATIONAL PARAMETERS

I. PURPOSE AND SCOPE

1. This attachment describes approved waste families for thermal desorption TD 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.*

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

4. This attachment provides operational parameters specific to approved waste families. TD processing 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 Director shall be notified within 24 hours of discovery of the exceedance.

II. OVERALL OPERATIONAL PARAMETERS

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

   a. The minimum solids processing temperature and holding time shall be provided to the Director as a processing recipe in accordance with Condition 4.g. 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)	Malonitrile
tert-Butyl alcohol	Methacrylonitrile
n-Butyl benzene	Methanol
sec-Butyl benzene	Methyl acrylate
tert-Butyl benzene	Methylene chloride
Carbon disulfide	Methyl methacrylate
Carbon tetrachloride	4-Methyl-2-pentanone (MIBK)
Chloral hydrate	Methyl-tert-butyl ether (MTBE)
Chloroacetonitrile	Naphthalene

Chlorobenzene	Nitrobenzene
1-Chlorobutane	2-Nitropropane
Chlorodibromomethane	N-Nitroso-di-n-butylamine
Chloroethane	Paraldehyde
2-Chloroethanol	Pentachloroethane
Chloroform	Pentafluorobenzene
1-Chlorohexane	2-Pentanone
Chloromethane	2-Picoline
Chloroprene	1-Propanol
3-Chloropropionitrile	2-Propanol
2-Chlorotoluene	Propargyl alcohol
4-Chlorotoluene	β-Propiolactone
1,2-Dibromo-3-chloropropane	Propionitrile (ethyl cyanide)
Dibromodifluoromethane	n-Propylamine
1,2-Dibromoethane	n-Propylbenzene
Dibromomethane	Pyridine
1,2-Dichlorobenzene	Styrene
1,3-Dichlorobenzene	1,1,1,2-Tetrachloroethane
1,4-Dichlorobenzene	1,1,2,2-Tetrachloroethane
cis-1,4-Dichloro-2-butene	Tetrachloroethene
trans-1,4-Dichloro-2-butene	Toluene
Dichlorodifluoromethane	1,2,3-Trichlorobenzene
1,1-Dichloroethane	1,2,4-Trichlorobenzene
1,2-Dichloroethane	1,1,1-Trichloroethane
1,1-Dichloroethene	1,1,2-Trichloroethane
cis-1,2-Dichloroethene	Trichloroethene
trans-1,2-Dichloroethene	Trichlorofluoromethane
1,2-Dichloropropane	1,2,3-Trichloropropane
1,3-Dichloropropane	1,2,4-Trimethylbenzene
2,2-Dichloropropane	1,3,5-Trimethylbenzene
1,3-Dichloro-2-propanol	Vinyl acetate
1,1-Dichloropropene	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 PDP for the VOC waste family was originally approved by the Director as Attachment II-1-12-2 on December 5, 2003 with subsequent revisions dated January 4, 2011 and February 2, 2011.

ii. 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 treatment run).

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	Heptachlor

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
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

3-(Chloromethyl)pyridine 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
2-Nitroaniline
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

Dimethylaminoazobenzene	Pyrene
7,12-Dimethylbenz(a)-anthracene	Pyridine
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 PDP for the SVOC waste family was originally approved by the Director as Attachment II-1-12-2 on December 5, 2003 with subsequent revisions dated January 4, 2011 and February 2, 2011.

ii. 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 treatment run).

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. Boiling points (BP) for CMBST-coded contaminants are provided in the table of Condition VI.1.d. Further details on these boiling points may be found in the documents referenced in Condition VI.2.a.i.

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	BP (°F)
P001	Warfarin (> 0.3%)	321.8
P002	1-acetyl-2-thiorea	329
P003	Acrolein	126.7
P005	Allyl Alcohol	206.6
P007	5-Aminomethyl 3-isoxazolol	347
P008	4-Aminopyridine	523.4
P014	Thiophenol (Benzene thiol)	336.4
P016	Dichloromethyl ether	222.8
P017	Bromoacetone	280.4
P018	Brucine	878
P023	Chloroacetaldehyde	185.9
P026	1-(o-Chlorophenyl)thiourea	294.8
P027	3-Chloropropionitrile	347.9
P028	Benzyl Chloride	354.2
P034	2-Cyclohexyl-4,6-dinitrophenol	224.6
P040	0,0-Diethyl O-pyrazinyl phosphorothioate	176
P041	Diethyl-p-nitrophenyl phosphate	338
P042	Epinephrine	429.8
P043	Diisopropylfluorophosphate (DFP)	361.4
P044	Dimethoate	242.6
P045	Thiofanox	134.6
P046	alpha, alpha-Dimethylphenethylamine	401
P049	Dithiobiuret	357.8
P054	Aziridine	132.8
P057	Fluoroacetamide	573.4
P058	Fluoroacetic acid, sodium salt	410
P062	Hexaethyl tetraphosphate	302
P064	Isocyanic acid, ethyl ester	103.1

Hazardous Code	Compound	BP (°F)
P066	Methomyl	383
P067	2-Methyl-aziridine	152.6
P069	2-Methyllactonitrile	339.8
P070	Aldicarb	212
P072	1-Naphthyl-2-thiourea	573.4
P075	Nicotine and Salts	476.6
P084	N-Nitrosomethylvinylamine	118.4
P085	Octamethylpyrophosphoramide	257
P088	Endothall	202
P093	Phenylthiourea	309.2
P095	Phosgene	46.8
P102	Propargyl alcohol	236.5
P108	Strychnine and salts	270
P109	Tetraethyldithiopyrophosphate	282.2
P111	Tetraethylpyrophosphate	280.4
P116	Thiosemicarbazide	363
P118	Trichloromethanethiol	297.5
U001	Acetaldehyde	68.2
U006	Acetyl Chloride	123.3
U007	Acrylamide	257
U008	Acrylic Acid	286.2
U010	Mitomycin C	993.2
U011	Amitrole	318.2
U014	Auramine	476.6
U015	Azaserine	323.6
U016	Benz(c)acridine	269.6
U017	Benzal chloride	401
U020	Benzenesulfonyl Chloride	485.6
U021	Benzidine	753.8
U026	Chlornaphazine	410
U033	Carbon Oxyfluoride	-120
U034	Trichloroacetaldehyde (Chloral)	208
U035	Chloroambucil	149
U038	Chlorobenzilate	298.4
U041	Epichlorohydrin (1-Chloro-2,3-epoxypropane)	241
U042	2-Chloroethyl vinyl ether	226.4
U046	Chloromethyl methyl ether	139.1
U049	4-Chloro-o-toluidine hydrochloride	471.2
U053	Crotonaldehyde	219.2
U055	Cumene (Isopropylbenzene)	306.3

Hazardous Code	Compound	BP (°F)
U056	Cyclohexane	177.3
U058	Cyclophosphamide	> 230
U059	Daunomycin	374
U062	Diallate	302
U064	Dibenz(a,i)pyrene	538.7
U073	3,3`-Dichlorobenzidine	694.4
U074	cis,1,4-Dichloro-2-butene	316.4
U074	trans-1,4-Dichloro-2-butene	306.5
U085	1,2,3,4-Diepoxybutane	291.2
U087	O,O-Diethyl S-methyldithiophosphate	< 572
U089	Diethyl Stilbestrol	338
U090	Dihydrosafrole	437.9
U091	3,3`-Dimethoxybenzidine	673
U092	Dimethylamine	44.2
U093	p-Dimethylaminoazobenzene	240.8
U094	7,12-Dimethylbenz(a)anthracene	253.4
U095	3,3`-Dimethylbenzidine	642.2
U097	Dimethylcarbamoyl chloride	332.6
U110	Dipropylamine	228.7
U113	Ethyl Acrylate	210.9
U114	Ethylenebisdithiocarbamic acid	< 392
U116	Ethylene thiourea	656.9
U119	Ethyl Methane Sulfonate	415.9
U122	Formaldehyde	-2.4
U123	Formic Acid	213.8
U124	Furan	88.7
U125	Furfural	323.1
U126	Glycidyaldehyde	234.4
U132	Hexachlorophene	894.2
U143	Lasiocarpine	203
U147	Maleic Anhydride	395.6
U148	Maleic Hydrazide	500
U149	Malononitrile	425.3
U150	Melphalan	360.5
U153	Methanethiol	42.6
U156	Methyl chlorocarbonate	158.9
U163	N-Methyl N`-nitro N-nitrosoguanidine	244.4
U164	Methylthiouracil	627.8
U166	1,4-Naphthoquinone	263.3
U167	1-Naphthylamine	573.4
U168	2-Naphthylamine	572

Hazardous Code	Compound	BP (°F)
U171	2-Nitropropane	248.4
U173	N-Nitrosodiethanolamine	257
U176	N-Nitroso-N-ethylurea	218.3
U177	N-Nitroso-N-methylurea	255.2
U178	N-Nitroso-N-methylurethane	< 392
U182	Paraldehyde	255.7
U186	1,3-Pentadiene	107.6
U191	2-Picoline	264.7
U193	1,3-Propane sultone	563
U194	n-Propylamine	117
U197	p-Benzoquinone	239
U200	Reserpine	507.2
U201	Resorcinol	536
U202	Saccharin	445.5
U206	Streptozotocin	239
U213	Tetrahydrofuran	149
U218	Thioacetamide	275
U219	Thiourea	402.8
U221	Toluenediamine	541.4
U222	o-Toluidine hydrochloride	468
U223	Toluene diisocyanate	483.8
U234	1,3,5-Trinitrobenzene	599
U236	Trypan Blue	572
U237	Uracil mustard	402.8
U238	Urethane (Ethyl carbamate)	365
U244	Thiram	264.2
U248	Warfarin (< 0.3%)	321.8
U328	o-Toluidine	392.5
U353	p-Toluidine	392.7
U359	2-Ethoxyethanol	275

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 PDP for the CMBST-coded contaminants waste family was originally approved by the Director as Attachment II-1-12-3 on August 20, 2008 and revised on January 4, 2011.

ii. 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 treatment run).

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 PDP for the volatile metals waste family was originally approved by the Director as Attachment II-1-12-4 on April 22, 2008 and revised on January 4, 2011.

ii. 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 treatment run.

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

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

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

END OF ATTACHMENT II-1-12-2