COMPREHENSIVE TABLES FOR CORRECTIVE ACTION GUIDELINES

PETROLEUM AND HAZARDOUS SUBSTANCE UST RELEASES

PETROLEUM NON-UST RELEASES

UST Section

North Carolina Department of Environmental Quality

Division of Waste Management

November 16, 2020 Version

Index of Changes

Document Title and Revised Pages	Version Date	Change Date	Change Number
Comprehensive Tables for Corrective Action Guidelines, Petroleum and Hazardous Substance UST Releases Petroleum Non-UST Releases	November 16, 2020		

Tables

***NOTES* applicable to Tables 3 through 7**

1) *Reportable Concentration: Any amount above MDL.*
2) *Other EPA approved comparable methods, which target the same constituents and have equivalent or lower detection limits may be used if analyses are conducted by a NC DWR certified laboratory that is certified for the method.*
3) *Submit copies of original laboratory reports.*
4) *Method Detection Limits and Reporting Limits: For target analytes with Maximum Soil Contaminant Concentrations below laboratory reporting limits, the MDL concentration must be indicated with the analytical result and results reported down to the MDL. Results above the MDL, but below the laboratory reporting limit, must be reported and qualified as estimated. The reporting limit concentration must be indicated for all target analytes and must be supported by the inclusion of a calibration standard at this concentration in the calibration curve.*
5) *All MDLs must be performed at or below the standards as outlined in 15A NCAC 2L.*
6) *Laboratories must be certified by the North Carolina DWR to perform the listed methods.*
7) *Required target analytes for the approved methods are listed in the Guidelines for Sampling, Appendix B.*
8) *Once contaminants have been initially identified by GC/MS methods, more economical compound specific methods may be used.*

Table 1
Maximum Soil Contaminant Concentration Levels (MSCCs)

(See https://deq.nc.gov/about/divisions/waste-management/ust/guidance-documents for current version)

Constituent	CAS#	Soil-to-Water Maximum Contaminant Concentration (Soil mg/kg)	Residential Soil Cleanup Levels (mg/kg)	Industrial/ Commercial Soil Cleanup Levels (mg/kg)
Acenaphthene	83-32-9	8.3	930	14000
Acenaphthylene	208-96-8	20	930	14000
Acetone	67-64-1	24	14000	210000
Aliphatics, C5-C8	N/A	68	625	9340
Aliphatics, C9-C18	N/A	540	1560	23300
Aliphatics, C19-C36	N/A	#	31200	467000
Anthracene	120-12-7	640	4600	70000
Aromatics, C9-C22	N/A	31	469	7000
Barium	7440-39-3	620	3100	46000
Benzene	71-43-2	0.0072	12	59.4
Benzo(a)anthracene (benz(a)anthracene)	56-55-3	0.17	6.6	32
Benzo(b)fluoranthene	205-99-2	0.6	6.6	32
Benzo(g,h,i)perylene	191-24-2	7600	469	7000
Benzo(k)fluoranthene	207-08-9	5.8	66	327
Benzoic acid	65-85-0	120	62500	934000
Benzo(a)pyrene	50-32-8	0.058	0.66	3.2
Benzyl Alcohol	100-51-6	3.1	1500	23300
Bis(chloroethyl)ether (BCEE)	111-44-4	0.00013	0.6	2.9
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	6.6	47	233
Bromoform (tribromomethane)	75-25-2	0.018	84	413
Bromomethane (methylbromide)	74-83-9	0.047	21	327
Butanol	71-36-3	2.8	1560	23300
Butyl alcohol, tert- (butanol, tert-) (TBA)	75-65-0	0.04	1400	21000
n-Butylbenzene	104-51-8	2.4	782	11600
sec-Butylbenzene	135-98-8	2.2	1560	23300
tert-Butylbenzene	98-06-6	1.7	1560	23300
Carbon disulfide	75-15-0	3.7	1560	23300
Chlorobenzene	108-90-7	0.44	312	4670
Chloroform (trichloromethane)	67-66-3	0.34	21	105

Chloromethane (methyl chloride)	74-87-3	0.014	51	251
4-Chlorotoluene (p-chlorotoluene)	106-43-4	0.28	312	4670
Chromium (Total)	7440-50-8	360000	1.32	6.54
Chromium III	16065-83-1	360000	23400	350000
Chromium VI	18540-29-9	3.8	1.32	6.54
Chrysene	218-01-9	18	663	3270
Dibenz(a,h)anthracene	53-70-3	0.19	0.66	3.27
Dibenzofuran	132-64-9	5.2	15.6	233
Dibromochloromethane	124-48-1	0.0019	7.9	38.9
1,2-Dichlorobenzene (orthodichlorobenzene)	95-50-1	0.23	1400	21000
1,3-Dichlorobenzene (metadichlorobenzene)	541-73-1	7.6	460	7000
1,4-Dichlorobenzene (paradichlorobenzene)	106-46-7	0.069	122	605
Dichlorodifluoromethane (Freon-12; halon)	75-71-8	29	3120	46700
1,1-Dichloroethane	75-34-3	0.03	116	573
1,2-Dichloroethane (ethylene dichloride)	107-06-2	0.0019	7.29	35.9
1,2-Dichloroethene (cis)	156-59-2	0.35	31.2	467
1,2-Dichloroethene (trans)	156-60-5	0.54	312	4670
1,2-Dichloroethene (cis and trans)	540-59-0	0.3	140	2100
1,1-Dichloroethylene (vinylidene chloride)	75-35-4	2.2	782	11600
2,4-Dichlorophenol	120-83-2	0.0067	46	700
1,2-Dichloropropane	78-87-5	0.003	17.9	88.3
1,3-Dichloropropene (cis and trans isomers)	542-75-6	0.002	6.63	32.7
2,4-Dimethylphenol (2,4-xylenol)	105-67-9	1.3	312	4670
Ethanol	64-17-5	16	5160	77000
Ethyl acetate	141-78-6	12	14000	210000
Ethylbenzene	100-41-4	8	60.3	297
Ethylene dibromide (1,2-dibromoethane)	106-93-4	0.000096	0.33	1.63
Ethylene glycol	107-21-1	40	31200	467000
Ethyl tert-butyl ether	63-79-23	0.2		
Fluoranthene	206-44-0	330	625	9340
Fluorene	86-73-7	55	625	9340
Hexachlorobutadiene	87-68-3	0.0086	8.5	41.9
2-Hexanone (methyl n-butyl ketone, MBK)	591-78-6	0.17	78.2	1160
Indeno(1,2,3-cd)pyrene	193-39-5	1.9	6.63	32.7
Isopropyl benzene (cumene)	98-82-8	1.3	1560	23300
Isopropyl ether (diisopropyl ether)	108-20-3	0.32		2330

4-Isopropyltoluene (p-cymene)	99-87-6	0.12	1560	23300
Lead	7439-92-1	270	400	400
Methanol	67561	16	31200	467000
Methyl ethyl ketone (2-butanone; MEK)	78-93-3	16	9380	140000
Methyl tert-butyl ether (MTBE)	1634-04-4	0.085	156	1810
Methylene chloride	75-09-2	0.023	93.8	1400
Methyl isobutyl ketone (MIBK)	108-10-1	0.42	1250	18600
1-Methylnaphthalene	90-12-0	0.054	22.8	112
2-Methylnaphthalene	91-57-6	1.5	62.5	934
2-Methylphenol	95-48-7	4	782	11600
Naphthalene	91-20-3	0.2	5.5	27
Pentachlorophenol	87-86-5	0.0047	1.65	8.17
Phenanthrene	85-01-8	64	469	7000
Phenol	108-95-2	0.22	4690	70000
n-Propylbenzene	103-65-1	1.4	1560	23300
Pyrene	129-00-0	210	469	7000
Silver	7440-22-4	4.8	78.2	1160
Styrene (ethenylbenzene)	100-42-5	0.9	3120	46700
tert-Amyl alcohol (TAA)	75-85-4	0.16	156	2330
tert-Amyl methyl ether (TAME)	994-05-8	0.52	625	9340
tert-Butyl formate (TBF)	762-75-4	0.1		
1,1,1,2-Tetrachloroethane	360-20-6	0.004	25.2	125
1,1,2,2-Tetrachloroethane	79-34-5	0.0012	3.31	16.3
Tetrachloroethylene (perchloroethylene; PCE)	127-18-4	0.005	93.8	1400
Toluene	108-88-3	5.4	1250	18600
1,2,4-Trichlorobenzene	120-82-1	2.1	22.8	112
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	1.2	31200	467000
1,1,2-Trichloroethane	79-00-5	0.0032	11.6	57.3
Trichloroethylene (TCE)	79-01-6	0.017	7.82	71
Trichlorofluoromethane	75-69-4	23	4690	70000
1,2,4-Trimethylbenzene	95-63-6	6.6	156	2330
1,3,5-Trimethylbenzene	108-67-8	6.6	156	2330
2,4,6-Trichlorophenol	88-06-2	0.15	15.6	233
Vinyl acetate	108-05-4	0.36	15600	233000
Vinyl chloride	75-01-4	0.00019	0.921	4.54
Xylenes (o-, m-, and p-; mixed)	1330-20-7	6	3120	46700

Health based level > 100%

considered immobile

Rev 10/20/2020

Table 2
Gross Contamination Levels for Groundwater

(See https://deq.nc.gov/about/divisions/waste-management/ust/guidance-documents for current version)

Compound	CAS #	North Carolina Groundwater Quality Standards* (GWQS) (ug/l)	Gross Contamination Levels for Groundwater (GCL) (ug/l)	BASIS
Acenaphthene	83-32-9	80	1950	SOL
Acenaphthylene	208-96-8	200	8000	SOL
Acetone	67-64-1	6000	6000000	STD
Anthracene	120-12-7	2000	2000	GWQS
Barium	7440-39-3	700	700000	STD
Benzene	71-43-2	1	5000	DWSTD
Benzo(a)anthracene (benz(a)anthracene)	56-55-3	0.05	4.7	SOL
Benzo(b)fluoranthene	205-99-2	0.05	0.75	SOL
Benzo(g,h,i)perylene	191-24-2	200	200	GWQS
Benzo(k)fluoranthene	207-08-9	0.5	0.5	GWQS
Benzoic acid	65-85-0	30000	1700000	SOL
Benzo(a)pyrene	50-32-8	0.005	0.8	SOL
Benzyl alcohol	100-51-6	700	700000	STD
Bis(2-chloroethyl)ether (BCEE)	111-44-4	0.03	30	STD
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	3	135	SOL
Bromoform (tribromomethane)	75-25-2	4	4000	STD
Bromomethane (methylbromide)	74-83-9	10	100000	STD
Butanol	71-36-3	700	700000	STD
Butanol, tert- (TBA)	75-65-0	10	10000	STD
n-Butylbenzene	104-51-8	70	5900	SOL
sec-Butylbenzene	135-98-8	70	8800	SOL
tert-Butylbenzene	98-06-6	70	14750	SOL
Carbon disulfide	75-15-0	700	550000	SOL
Chlorobenzene	108-90-7	50	50000	STD
Chloroform (trichloromethane)	67-66-3	70	70000	STD
Chloromethane (methyl chloride)	74-87-3	3	3000	STD
4-Chlorotoluene (p-chlorotoluene)	106-43-4	24	24000	STD
Chromium	7440-47-3	10	10000	STD
Chrysene	218-01-9	5	5	GWQS
Dibenz(a,h)anthracene	53-70-3	0.005	1.2	SOL
Dibenzofuran	132-64-9	28	1550	SOL
Dibromochloromethane	124-48-1	0.4	400	STD
1, 2-Dichlorobenzene (orthodichlorobenzene)	95-50-1	20	20000	STD
1, 3-Dichlorobenzene (metadichlorobenzene)	541-73-1	200	61500	SOL
1, 4-Dichlorobenzene (paradichlorobenzene)	106-46-7	6	405	SOL

Compound	CAS #	North Carolina Groundwater Quality Standards* (GWQS) (ug/l)	Gross Contamination Levels for Groundwater (GCL) (ug/l)	BASIS
Dichlorodifluoromethane (Freon-12; halon)	75-71-8	1000	140000	SOL
1, 1-Dichloroethane	75-34-3	6	6000	STD
1. 2-Dichloroethane (ethylene dichloride)	107-06-2	0.4	400	STD
1, 2-Dichloroethene (cis)	156-59-2	70	70000	STD
1, 2-Dichloroethene (trans)	156-60-5	100	100000	STD
1,2-Dichloroethene (cis and trans)	540-59-0	60	60000	STD
1, 1-Dichloroethylene (vinylidene chloride)	75-35-4	350	350000	STD
2,4-Dichlorophenol	120-83-2	0.98	980	STD
1, 2-Dichloropropane	78-87-5	0.6	600	STD
1, 3-Dichloropropene (cis and trans isomers)	542-75-6	0.4	400	STD
2,4-Dimethylphenol	105-67-9	100	100000	STD
Ethanol	64-17-5	4000	4000000	STD
Ethyl acetate	141-78-6	3000	3000000	STD
Ethylbenzene	100-41-4	600	80000	SOL
Ethylene dibromide (1, 2- Dibromoethane, EDB)	106-93-4	0.02	50	DWSTD
Ethylene glycol	107-21-1	10000	10000000	STD
Ethyl tert-butyl ether	63-79-23	47	47000	STD
Fluoranthene	206-44-0	300	300	GWQS
Fluorene	86-73-7	300	845	SOL
Hexachlorobutadiene	87-68-3	0.4	400	STD
2-Hexanone (methyl n-butyl ketone)	591-78-6	40	40000	STD
Indeno(1,2,3-cd)pyrene	193-39-5	0.05	0.095	SOL
Isopropyl benzene (cumene)	98-82-8	70	30500	SOL
Isopropyl ether (diisopropyl ether)	108-20-3	70	70000	STD
4-Isopropyltoluene (p-cymene)	99-87-6	25	11700	SOL
Lead	7439-92-1	15	15000	STD
Methanol	67-56-1	4000	4000000	STD
Methyl ethyl ketone (2-butanone; MEK)	78-93-3	4000	4000000	STD
Methyl isobutyl ketone (MIBK)	108-10-1	100	100000	STD
1-Methylnaphthalene	90-12-0	1	1000	STD
2-Methylnaphthalene	91-57-6	30	12000	SOL
2-Methylphenol (o-Cresol)	95-48-7	400	400000	STD
Methyl tert-butyl ether (MTBE)	1634-04-4	20	20000	STD
Methylene chloride	75-09-2	400	400000	STD
Naphthalene	91-20-3	6	6000	STD
Pentachlorophenol	87-86-5	0.3	300	STD
Phenanthrene	85-01-8	200	550	SOL
Phenol	108-95-2	30	30000	STD
n-Propylbenzene	103-65-1	70	26100	SOL
Pyrene	129-00-0	200	200	GWQS
Silver	7440-22-4	20	20000	STD

Compound	CAS #	North Carolina Groundwater Quality Standards* (GWQS) (ug/l)	Gross Contamination Levels for Groundwater (GCL) (ug/l)	BASIS
Styrene (ethenylbenzene)	100-42-5	70	70000	STD
tert-Amyl Alcohol (TAA)	75-85-4	40	40000	PQL
tert-Amyl Methyl Ether (TAME)	994-05-8	128	128000	STD
tert-Butyl Formate (TBF)	762-75-4	40	40000	PQL
1,1,1,2-Tetrachloroethane	630-20-6	1	1000	STD
1,1,2,2-Tetrachloroethane	79-34-5	0.2	200	STD
Tetrachloroethylene (perchloroethylene; PCE)	127-18-4	0.7	700	STD
Toluene	108-88-3	600	260000	SOL
1,2,4-Trichlorobenzene	120-82-1	70	24500	SOL
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	200	200000	STD
1,1,2-Trichloroethane	79-00-5	0.6	600	STD
Trichloroethylene (TCE)	79-01-6	3	3000	STD
Trichlorofluoromethane	75-69-4	2000	550000	SOL
1,2,4-Trimethylbenzene	95-63-6	400	28500	SOL
1,3,5-Trimethylbenzene	108-67-8	400	24100	SOL
2,4,6-Trichlorophenol	88-06-2	4	4000	STD
Vinyl acetate	108-05-4	88	88000	STD
Vinyl chloride	75-01-4	0.03	30	STD
Xylenes (o-, m-, and p-; mixed)	1330-20-7	500	50000	SOL

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10/8/2020

SOL – 50% of the solubility at 25 degrees Celsius
DWSTD – 1000 x federal drinking water standard (40 CFR 141)
STD – 1000 x North Carolina groundwater quality standard (15A NCAC 2L .0202)
GWQS – 50% Solubility is less than GWQS
* includes interim Groundwater Quality Standards
PQL – Practical Quantitation Limit

Table 3
Approved Soil Analyses Methods for Petroleum UST Closures, Over-Excavation and Site Checks

Suspected Contaminant	Analytical Methods for Closure, Site Check, or Other Preliminary Investigation Samples	Analytical Methods for Samples from Over-Excavation Following a Release
1a. Low Boiling Point Fuels: gasoline, aviation gasoline, etc.	EPA 8015[a] for TPH-GRO **(or** UVF for TPH)[b]	EPA 8260[a] **and** MADEP VPH
1b. Ethanol-Gasoline Blends	EPA 8015[a] for TPH-GRO **(or** UVF for TPH)[b] **and** EPA 8260[a]	
2. Medium/High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil #2, biodiesel (containing diesel), etc. Varsol, mineral spirits, naphtha.	EPA 8015[a] for TPH-GRO **and** EPA 8015[a] for TPH-DRO **(or** UVF for TPH)[b]	EPA 8260[a], EPA 8270[a], MADEP VPH, **and** MADEP EPH
3. Heavy Fuels: #4, #5, #6 fuel oils, motor oil, hydraulic fluid, etc. mineral oil[c]	EPA 8015[a] for TPH-DRO **(or** UVF for TPH)[b]	EPA 8270[a] **and** MADEP EPH
4. Used / Waste Oil (non-hazardous)	EPA 8260[a], EPA 8270[a], MADEP VPH, MADEP EPH, **(or** UVF for TPH and PAH)[b] **and** Total Metals (Cr and Pb), EPA 8081[a] (pesticides)**, and** EPA 8082[a] (PCBs)[d]	EPA 8260[a], EPA 8270[a], MADEP VPH, MADEP EPH, Total Metals (Cr and Pb), EPA 8081[a] (pesticides)**, and** EPA 8082[a] (PCBs)[d]

Rev. 0920

a Analyze for EPA Method; 8015; EPA Method 8260; EPA Method 8270; EPA Method 8081 and EPA Method 8082 using the current version in the Third Edition of SW-846.

b Only UVF technology with product (fuel) identification and calibration approved by DWM is allowed. (Other methods for TPH analysis may be approved by DWM for the initial investigation if determined to meet all requirements.)

c Carbon chains in mineral oils range from approximately C_{12}-C_{45}.

d Analyses for PCBs and pesticides are not required for service station/garage waste oil investigations.

Table 4
Approved Soil Analyses Methods for Advanced Phases of Petroleum UST and Non-UST Release Investigations

Suspected Contaminant	LSA 1 Soil Sampling [b, c]	Comprehensive Site Assessment, Monitoring, and Final Site Closure Soil Sampling [b, f, g]
1. Low Boiling Point Fuels: gasoline, aviation gasoline, ethanol-gasoline blends, etc.	Analyze the first sample collected below land/excavation surface and the last sample prior to saturated zone by: EPA 8260[a] **and** MADEP VPH Analyze all other samples by: MADEP VPH	Analyze all samples from each vertical boring by: EPA 8260[a] **and** MADEP VPH
2. Medium/High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil #2, biodiesel, etc. Varsol, mineral spirits, naphtha	Analyze the first sample collected below land/excavation surface and the last sample prior to saturated zone by: EPA 8260[a], EPA 8270[a], MADEP VPH, **and** MADEP EPH Analyze all other samples by: MADEP VPH, **and** MADEP EPH	Analyze all samples from each vertical boring by: EPA 8260[a], EPA 8270[a], MADEP VPH, **and** MADEP EPH
3. Heavy Fuels: #4, #5, #6 fuel oils; motor oil; hydraulic fluid; etc. Mineral oil[d]	Analyze the first sample collected below land/excavation surface and the last sample prior to saturated zone by: EPA 8270[a] **and** MADEP EPH Analyze all other samples by: MADEP EPH	Analyze all samples from each vertical boring by: EPA 8270[a] **and** MADEP EPH
4. Used / Waste Oil (non-hazardous)	Analyze the first sample collected below land/excavation surface and the last sample prior to saturated zone by: EPA 8260[a] EPA 8270[a], MADEP VPH, MADEP EPH, Total Metals (Cr and Pb), EPA 8081[a] (pesticides), **and** EPA 8082[a] (PCBs)[e] Analyze all other samples by: MADEP VPH, **and** MADEP EPH	Analyze all samples from each vertical boring by: EPA 8260[a], EPA 8270[a], MADEP VPH, MADEP EPH, Total Metals (Cr and Pb), EPA 8081[a] (pesticides), **and** EPA 8082[a] (PCBs)[e]

Rev.0619

a Analyze for EPA Method 8260; EPA Method 8270; EPA Method 8081 and EPA Method 8082 using the current version in the Third Edition of SW-846.
b The smear zone should be avoided.
c Two full analysis samples are required per well boring.
d Carbon chains in mineral oils range from approximately C_{12}-C_{45}.
e Analyses for PCBs and pesticides are not required for service station/garage waste oil investigations.
f Sample analysis for monitoring should be limited to constituents previously detected.
g Prior to full-constituent sampling, intensive field-based, semi-quantitative assessment of contamination should be conducted to determine optimal locations of borings and minimize the quantity of samples.

Table 5
Approved Groundwater Analyses Methods for Petroleum UST and Non-UST Release Investigations (All Phases)

Suspected Contaminant	Analytical Methods (See Notes)
1. Low Boiling Point Fuels: gasoline, aviation gasoline, ethanol-gasoline blends, etc.	SM 6200[a,b], MADEP VPH, **and** Metals (Pb)[c]
2. Medium/High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil#2, biodiesel (containing diesel), etc. Varsol, mineral spirits, naphtha.	EPA 602 with Xylenes, EPA 625 Base/ Neutrals and Acids plus 10 largest non-target peaks, MADEP VPH, **and** MADEP EPH
3. Heavy Fuels: #4, #5, #6 fuel oils; motor oil; hydraulic fluid, etc. Mineral oil[d]	EPA 625 Base/ Neutrals and Acids plus 10 largest non-target peaks, **and** MADEP EPH
4. Used / Waste Oil (non-hazardous)	SM 6200, EPA 625 Base/ Neutrals and Acids plus 10 largest non-target peaks, MADEP VPH, MADEP EPH, **and** Metals (Cr and Pb)[d]

Rev. 0619

a Analyze for EDB using EPA Method 504.1, initially and at closure.
b Analyze for full list of target analytes using certified version of SM 6200 (in *Guidelines for Sampling*, App. B) at init groundwater investigation (e.g., IAA/ IAR or LSA) unless DWM directs otherwise.
c Analyze for metals using Methods from sources listed in 15A NCAC 2L .0112 and .0413.
d Carbon chains in mineral oils range from approximately C_{12}-C_{45}.

Table 6
Approved Soil Analyses Methods for Non-Petroleum UST Closures and Release Investigations

Suspected Contaminant	Analytical Methods (See Notes)
1. Halogenated Solvents 2. Non-Halogenated Solvents	EPA 8260
3. Non-Petroleum - Unknown	Contact NC DENR/ UST Section/Corrective Action Branch (919) 707-8171
4. Pesticides	Contact NC Dept. of Agriculture and Consumer Services/ Pesticide Section (919) 733-3556 **and** NC DENR/ UST Section at (919) 707-8171
5. For substances not covered in 1 through 5	Contact NC DENR/ UST Section/Corrective Action Branch (919) 707-8171

Rev. 0619

Table 7
Approved Groundwater Analysis Methods for Non-Petroleum UST Closures and Release Investigations

Suspected Contaminant	Analytical Methods* (See Notes)
1. Solvents: a. Halogenated/Non-Halogenated b. Ethanol, c. Ethylene Glycol d. Formaldehyde	 a. EPA 8260 b. EPA 8260 c. EPA 8260 d. EPA 8315A
2. Non-Petroleum - Unknown	Contact NC DENR/ UST Section/Corrective Action Branch at (919) 707-8171.
3. Pesticides	Contact NC Dept. of Agriculture and Consumer Services/ Pesticide Section at (919) 733-3556 **and** NC DENR/ UST Section at (919) 707-8171.
4. For substances not covered in 1 - 4	Contact NC DENR/ UST Section/Corrective Action Branch at (919) 707-8171.

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Table 8
Soil Analyses Sample Containers and Preservatives

Method	Number and Type of Containers	Preservation	Holding Times
EPA 8015 GRO MADEP VPH	Duplicate pre-weighed VOA vials with methanol and Teflon-lined screw caps Extra VOA vial w/o preservative[a]	Cool to 4±2°C	28 days
	Duplicate EnCore samplers or equivalent **or** Duplicate pre-weighed empty VOA vials with Teflon-lined screw caps Extra VOA vial w/o preservative[a]	Cool to 4±2°C **and** Complete laboratory preservation[b] or analyze within 48 hours	
EPA 8260[c]	Triplicate EnCore samplers or equivalent **or** Duplicate pre-weighed VOA vials w/ de-ionized water, sodium bisulfate, and stir bar, and duplicate pre-weighed VOA vials with methanol. Extra VOA vial w/o preservative[a]	Cool to 4±2°C **and** complete laboratory preservation[b] or analyze within 48 hours	14 days
EPA 8015 DRO EPA 8270 EPA 8081 EPA 8082	8-oz glass jar with Teflon-lined screw cap	Cool to 4±2°C	Extract within 14 days and analyze extracts within 40 days of extraction.
MADEP EPH	4-oz (120-ml) wide-mouth amber glass jar with Teflon-lined screw cap	Cool to 4±2°C	Extract within 14 days and analyzed extracts within 40 days of extraction.
Total Metals	500-ml polyethylene or glass jar	Cool to 4±2°C	6 months

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a Use for dry weight determination and for soil characterization (i.e., laboratory effervescence check) of low-concentration samples suspected to contain carbonate minerals.

b See the current version of the *Guidelines for Sampling,* for details on preservation options. Consult with the laboratory when selecting the preservation option and ensure option is documented with analytical results. If low level sodium bisulfate or equivalent preservation is required, check with the laboratory that will be doing the analysis for any other requirements. Sample size should be limited to 5 to 10 grams, depending on soil type. See the *Guidelines for Sampling,* current version, for additional information.

c Soil Samples collected for the analysis of ethanol and ethanol-gasoline blend releases must be analyzed with no delay.

Table 9
Groundwater Analyses Sample Containers and Preservatives

Method	Number and Type of Containers	Preservative[a]	Holding Times
EPA 8260 SM 6200 MADEP VPH	Triplicate 40-ml VOA vials with Teflon-lined septa screw cap	Add 3 to 4 drops of 1:1 HCl Cool to 4±2°C	14 days
MADEP EPH	1-L amber glass with Teflon-lined screw cap	Add 5 ml of 1:1 HCl (to pH<2) Cool to 4±2°C	Samples must be extracted within 14 days and extracts analyzed within 40 days.
EPA 625	1-L amber glass with Teflon-lined screw cap	Cool to 4±2°C	Samples must be extracted within 7 days and extracts analyzed within 40 days.
Metals (Cr and Pb)	500-ml polyethylene or glass jar	Add 5 ml of 1:1 HNO_3 (to pH<2) Cool to 4±2°C	Samples must be analyzed within 6 months.
EPA 504.1	40-ml VOA vials with Teflon-lined septa screw cap	Add 3mg sodium thiosulphate Cool to 4±2°C	Samples must be extracted and analyzed within 14 days.

a Check with the laboratory that will be doing the analysis for any other requirements. Rev. 1113

Table 10 Worksheet for Calculating MADEP Soil Sample Results

Contaminant	Analytical Method	Hydrocarbon Fraction Ranges	Analytical Hydrocarbon Fractions		Laboratory Results Concentration	Final VPH and/or EPH Concentrations (mg/kg)	Residential MSCC (mg/kg)	Industrial/ Commercial MSCC (mg/kg)	Soil-to-Groundwater MSCC (mg/kg)
Low Boiling Point Fuels: gasoline, aviation gasoline, gasohol, etc.	MADEP VPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x mg/kg	x	939	24528	68
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a mg/kg	a	1500	40000	540
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c mg/kg	c	469	12264	31
Medium/ High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil #2, etc. Varsol, mineral spirits, naphtha,	MADEP VPH and MADEP EPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x mg/kg	x	939	24528	68
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a mg/kg	a + b	1500	40000	540
			C9-C18 Aliphatics	EPH	b mg/kg				
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y mg/kg	y	31000	810000	Considered immobile
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c mg/kg	c + d	469	12264	31
			C11-C22 Aromatics	EPH	d mg/kg				
Heavy Fuels: #4, #5, #6 fuel oils; motor oils; hydraulic fluid; etc. Mineral oil*;	MADEP EPH	C9-C18 Aliphatics	C9-C18 Aliphatics	EPH	b mg/kg	b	1500	40000	540
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y mg/kg	y	31000	810000	Considered immobile
		C9-C22 Aromatics	C11-C22 Aromatics	EPH	d mg/kg	d	469	12264	31
Used/ Waste Oil	MADEP VPH and MADEP EPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x mg/kg	x	939	24528	68
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a mg/kg	a + b	1500	40000	540
			C9-C18 Aliphatics	EPH	b mg/kg				
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y mg/kg	y	31000	810000	Considered immobile
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c mg/kg	c + d	469	12264	31
			C11-C22 Aromatics	EPH	d mg/kg				

* Carbon chains in mineral oils range from approximately C_{12}-C_{45}.

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Table 11 Worksheet for Calculating MADEP Groundwater Sample Results

Contaminant	Analytical Method	Hydrocarbon Fraction Standard Ranges	Analytical Hydrocarbon Fractions		Laboratory Results Concentration	Final VPH and/or EPH Concentrations (µg/L)	Final and Interim Groundwater Quality Standards (µg/L)
Low Boiling Point Fuels: gasoline, aviation gasoline, gasohol, etc.	MADEP VPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x µg/L	x	400
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a µg/L	a	700
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c µg/L	c	200
Medium/ High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil #2, etc. Varsol, mineral spirits, naphtha,	MADEP VPH and MADEP EPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x µg/L	x	400
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a µg/L	a + b	700
			C9-C18 Aliphatics	EPH	b µg/L		
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y µg/L	y	10000
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c µg/L	c + d	200
			C11-C22 Aromatics	EPH	d µg/L		
Heavy Fuels: #4, #5, #6 fuel oils; motor oils; hydraulic fluid; etc. Mineral oil*:	MADEP EPH	C9-C18 Aliphatics	C9-C18 Aliphatics	EPH	b µg/L	b	700
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y µg/L	y	10000
		C9-C22 Aromatics	C11-C22 Aromatics	EPH	d µg/L	d	200
Used/ Waste Oil	MADEP VPH and MADEP EPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x µg/L	x	400
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a µg/L	a + b	700
			C9-C18 Aliphatics	EPH	b µg/L		
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y µg/L	y	10000
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c µg/L	c + d	200
			C11-C22 Aromatics	EPH	d µg/L		

* Carbon chains in mineral oils range from approximately C_{12}-C_{45}.

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