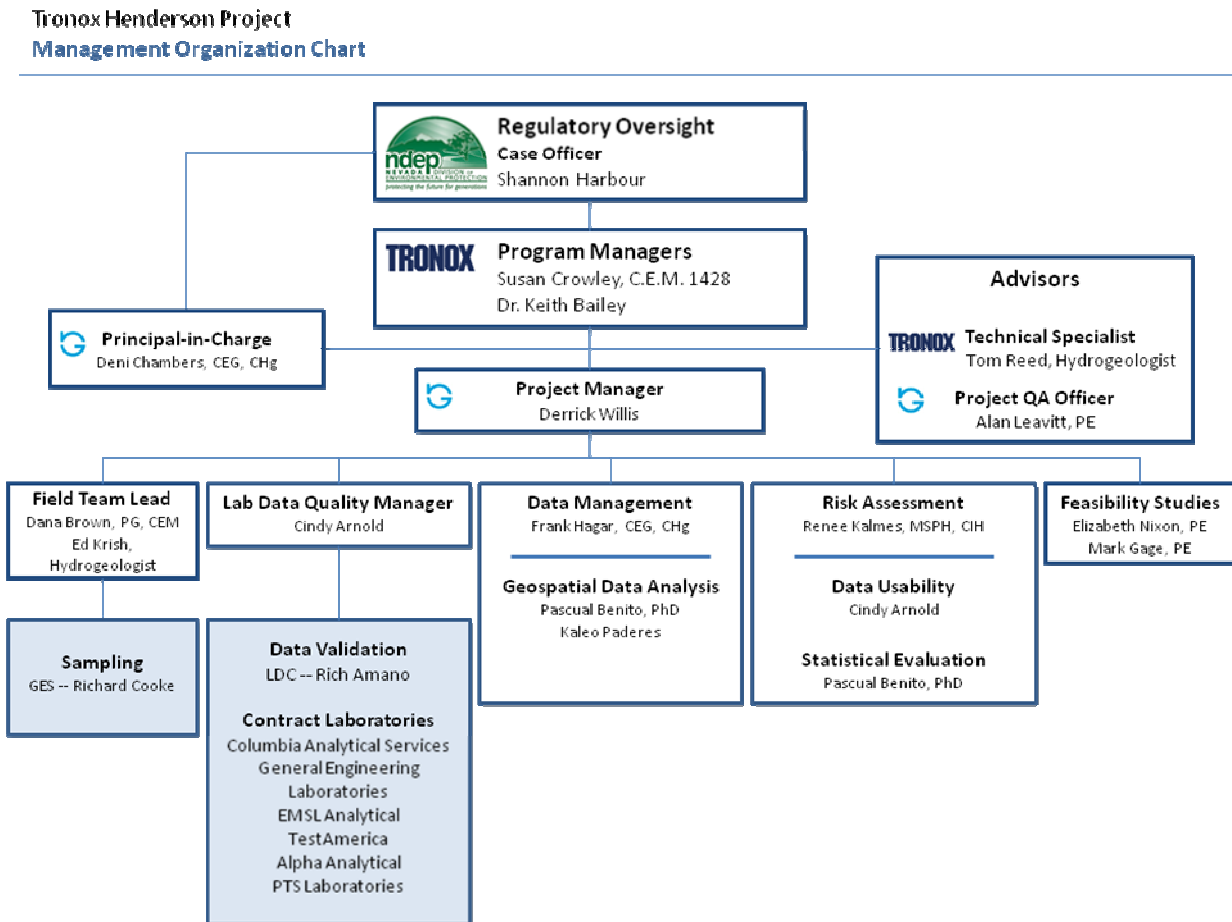


Figure A-1 Project Organization Chart



**QUALITY ASSURANCE PROJECT PLAN  
TRONOX LLC HENDERSON, NV FACILITY**

Section: Figures  
Date: June 2009  
Number: 04020-023-101  
Revision: FINAL  
Page 2 of 2

**Figure B-1 Example of Chain of Custody Form**



1100 Quail Street, Suite 102, Newport Beach, CA 92660  
(949) 260-9293

**CHAIN-OF-CUSTODY / Analytical Request Document**

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate.

Page: \_\_\_\_\_  
Cooler # \_\_\_\_\_

Required Ship to Lab:		Required Project Information:		Required Invoice Information:		TAT: Standard 14 day		Rush											
Lab Name:		Site ID #:		Send Invoice to:															
Address:		Project #:		Address:		If Rush, Date due													
		Site Address:		City/State:		Phone #:		QC level Required: Standard Special											
Lab PM:		City:		State:		Reimbursement project?		Non-reimbursement project?											
Phone/Fax:		Site PM Name:		Send EDD to:		Mark one		NJ Reduced Deliverable Package?											
Lab PM email:		Phone/Fax:		CC Hardcopy report to:				MA MCP Cert? CT RCP Cert?											
Applicable Lab Quote #:		Site PM Email:		CC Hardcopy report to:				Lab Project ID (lab use)											
ITEM #	SAMPLE ID Character per box. (A-Z, 0-9 /, -) Samples IDs MUST BE UNIQUE	Valid Matrix Codes MATRIX DRINKING WATER WP WATER W GROUNDWATER WG SURFACE WATER WS WASTE WATER WW WATER OC FRESH PRODUCT LP SLUDGE SL SOIL SW OTHER SU SIEVE AS OTHER AMBIENT AIR AE ANIMAL YES/NO Y/N SIEVE AS OTHER SOLIDS CS	MATRIX CODE	SAMPLE TYPE G-CONTS C-CONP	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	FIELD FILTERED? (Y/N)	Preservatives							Requested Analyses			
									Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol		Other		
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
Additional Comments/Special Instructions:			RELINQUISHED BY / AFFILIATION		DATE	TIME	ACCEPTED BY / AFFILIATION		DATE	TIME	Sample Received								
												Y / N							
													Y / N						
													Y / N						
SHIPPING METHOD: (mark as appropriate)			SAMPLER NAME AND SIGNATURE									Temp. in OC Samples on Ice?							
			UPS COURIER FEDEX	PRINT Name of SAMPLER:															
US MAIL			SIGNATURE OF SAMPLER:									DATE Signed	Time:						

**QUALITY ASSURANCE PROJECT PLAN  
TRONOX LLC HENDERSON, NV FACILITY**

Section: Tables  
Date: June 2009  
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**Table A-1  
Distribution List**

Updated 18-June-09

**Document Name: Tronox QAPP Revision 4**

Name (Last, First)		Firm	Distribution			Name (Last, First)		Firm	Distribution		
			Hard	e-Copy	Cvr Only				Hard	e-Copy	Cvr Only
King	Val	NDEP				Logan	Mike	Tronox		X	
Najima	Jim	NDEP		X		Paque	Matt	Tronox Counsel		X	
Rakvica	Brian	NDEP	X	X		Reed	Tom	Tronox	X	X	
Sous	Nadir	NDEP				Stater	Rick	Tronox Crowley		X	
Tinney	Al	NDEP				Crowley	Susan	Environmental	2	X	
Palm	Jon	NDEP				Skromyda	Mike	Tronox		X	
Harbour	Shannon	NDEP	X	X		Bailey	Keith	Environ Answers	X	X	
Black	Paul	Neptune	X	X		Krish	Ed	Hydrogeologist	X	X	
Gratson	Dave	Neptune	X	X		Chambers	Deni	Northgate	X	X	
Copeland	Teri		X	X		Leavitt	Alan	Northgate		X	
Otani-Fehling	Joanne		X	X		Donnelly	Dara	Northgate	X	X	
Hackenberry	Paul	Hackenberry	X	X		Willis	Derrick	Northgate	X	X	
Pohlmann	Brenda	COH		X		Arnold	Cindy	Northgate	X	X	
Conaty	Barry	COH Counsel		X		Lambeth	Jeff	Veolia			
Kennedy	Robert	AECOM		X		Baker	Ken	AIU		X	
Mulroy	Pat	SNWA				Diebenow	Julie	AIU		X	
Goff	Mike	SNWA				Giroux	Barry	GEI		X	
Liesing	Joe	SNWA				Stowers	Kirk	Broadbent			
Kaplan	Mitch	EPA, Reg 9		X		Sahu	Rahnijit	BMI		X	
Compliance Coordinator		NDEP				Crouse	George	Syngenta		X	
Compliance Coordinator		DAQEM				Erickson	Lee	Stauffer		X	
Juma	Ebrahim	CCDAQEM				Kelly	Joe	Montrose			
Public Repository		Library CAS -		X		Sundberg	Paul	Montrose		X	
Jaeger	Janice	Roschester		X		Gibson	Jeff	AmPac			
Wallace	Ed	CAS - Kelso		X		Richards	Curt	Olin		X	
Aguilera	Kate	CAS - Simi Valley		X		Bellotti	Michael	Olin		X	
Freemeyer	Jane	CAS - Houston		X		Wilkinson	Craig	Timet		X	
Kent	Edith	Gen. Eng. Labs, LLC		X		Mack	Joel	Montrose Counsel			
Kocher	Daniel	EMSL				Brady	Michelle	PTS Laboratories, Inc.		X	
Phillips	Michael	Analytical, Inc. TestAmerica Denver		X		Amano	Richard	LDC		X	

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits**  
 (May 2009)

Parameter	CAS No.	Water		Soil	
		PQL	MDL	PQL	MDL
<b><i>Volatile Organic Compounds (µg/L or µg/kg)</i></b>					
1,1,1,2-Tetrachloroethane	630-20-6	1	0.18	5	0.27
1,1,1-Trichloroethane	71-55-6	1	0.32	5	0.21
1,1,2,2-Tetrachloroethane	79-34-5	1	0.09	5	0.43
1,1,2-Trichloroethane	79-00-5	1	0.20	5	0.36
1,1-Dichloroethane	75-34-3	1	0.14	5	0.31
1,1-Dichloroethene	75-35-4	1	0.37	5	0.53
1,1-Dichloropropene	563-58-6	2	0.21	5	0.23
1,2,3-Trichlorobenzene	120-82-1	2	0.25	5	0.85
1,2,3-Trichloropropane	96-18-4	2	0.30	5	0.40
1,2,4-Trichlorobenzene	120-82-1	2	0.19	5	0.85
1,2,4-Trimethylbenzene	95-63-6	2	0.35	5	0.76
1,2-Dibromo-3-chloropropane	96-12-8	5	0.43	5	0.90
1,2-Dibromoethane	106-93-4	1	0.18	5	0.47
1,2-Dichlorobenzene	95-50-1	2	0.40	5	0.81
1,2-Dichloroethane	107-06-2	1	0.14	5	0.28
1,2-Dichloropropane	78-87-5	1	0.15	5	0.31
1,3,5-Trimethylbenzene	108-67-8	2	0.36	5	0.83
1,3-Dichlorobenzene	541-73-1	2	0.36	5	0.70
1,3-Dichloropropane	142-28-9	2	0.12	5	0.25
1,4-Dichlorobenzene	106-46-7	2	0.34	5	0.51
2,2-Dichloropropane	594-20-7	2	0.20	5	0.70
2-Butanone	78-93-3	10	1.00	10	0.91
2-Chlorotoluene	95-49-8	5	0.38	5	0.68
2-Hexanone	591-78-6	10	0.40	10	0.59
4-Chlorotoluene	106-43-4	5	0.37	5	0.59
4-Methyl-2-pentanone	108-10-1	10	0.34	10	0.53
Acetone	67-64-1	20	1.60	20	1.20
Benzene	71-43-2	1	0.18	5	0.34
Bromobenzene	108-86-1	2	0.33	5	0.47
Bromochloromethane	74-97-5	2	0.18	5	0.66
Bromodichloromethane	75-27-4	1	0.17	5	0.29
Bromoform	75-25-2	1	0.20	5	0.29
Bromomethane	74-83-9	2	0.40	5	0.53

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
 (May 2009)

Parameter	CAS No.	Water		Soil	
		PQL	MDL	PQL	MDL
<b><i>Volatile Organic Compounds (µg/L or µg/kg)</i></b>					
Carbon Tetrachloride	56-23-5	1	0.36	5	0.26
Chlorobenzene	108-90-7	1	0.26	5	0.32
Chloroethane	75-00-3	2	0.21	5	0.27
Chloroform	67-66-3	1	0.16	5	0.35
Chloromethane	74-87-3	2	0.18	5	0.54
cis-1,2-Dichloroethene	156-92-2	1	0.14	5	0.54
cis-1,3-Dichloropropene	10061-01-5	1	0.14	5	0.27
Dibromochloromethane	124-48-1	1	0.11	5	0.34
Dibromomethane	74-95-3	1	0.18	5	0.36
Dichlorodifluoromethane	75-71-8	1	0.18	5	0.45
Diisopropyl ether (DIPE)	108-20-3	1	0.09	5	0.22
Ethyl-tert-butyl ether (ETBE)	637-92-3	1	0.12	5	0.17
Hexachlorobutadiene	87-68-3	5	0.27	5	1.80
Isopropyl Benzene	98-28-8	2	0.34	5	0.82
Methylene Chloride	75-09-2	2	0.13	5	0.36
Methyl-tert-butyl ether (MTBE)	1634-04-4	1	0.13	5	0.25
Naphthalene	91-20-3	2	0.31	5	0.99
n-Butylbenzene	104-51-8	2	0.20	5	0.52
n-Propylbenzene	103-65-1	2	0.32	5	0.84
p-Isopropyltoluene	99-87-6	2	0.22	5	0.89
sec-Butylbenzene	135-98-8	2	0.23	5	0.95
Styrene	100-42-5	1	0.35	5	0.45
tert-Amyl-methyl ether (TAME)	994-05-8	1	0.13	5	0.18
tert-Butyl alcohol (TBA)	75-65-0	100	3.00	100	3.90
tert-Butylbenzene	98-06-6	2	0.28	5	0.90
Tetrachloroethene	127-18-4	1	0.42	5	0.79
Toluene	108-88-3	1	0.21	5	0.99
trans-1,2-Dichloroethene	156-60-5	1	0.16	5	0.34
trans-1,3-Dichloropropene	10061-02-6	1	0.17	5	0.25
Trichloroethene	79-01-6	1	0.13	5	0.48
Trichlorofluoromethane	75-69-4	1	0.15	5	0.33
Vinyl Chloride	75-01-4	1	0.22	5	0.54
o-Xylene	95-47-6	1	0.40	5	0.63

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter	CAS No.	Water		Soil	
		RL	MDL	RL	MDL
<b><i>Volatile Organic Compounds (µg/L or µg/kg)</i></b>					
m,p-Xylenes	1330-20-7	1	0.81	5	0.63
<b><i>Semivolatile Organic Compounds (µg/L or µg/kg)</i></b>					
1,4-dioxane	123-91-1	2	0.13	6.6	0.13
2-Methylnaphthalene	91-57-6	0.2	0.04	6.6	0.05
Acenaphthene	83-32-9	0.2	0.05	6.6	0.04
Acenaphthylene	208-96-8	0.2	0.07	6.6	0.08
Anthracene	120-12-7	0.2	0.04	6.6	0.04
Benzo(a)anthracene	56-55-3	0.2	0.04	6.6	0.04
Benzo(a)pyrene	50-32-8	0.2	0.04	6.6	0.02
Benzo(b)fluoranthene	205-99-2	0.2	0.03	6.6	0.03
Benzo(g,h,i)perylene	191-24-2	0.2	0.03	6.6	0.04
Benzo(k)fluoranthene	207-08-9	0.2	0.03	6.6	0.02
Bis(2-ethylhexyl)phthalate	117-81-7	5.0	0.23	170	3.8
Butylbenzylphthalate	85-68-7	5.0	0.17	170	0.03
Chrysene	218-01-9	0.2	0.03	6.6	0.03
Dibenzo(a,h)anthracene	53-70-3	0.2	0.05	6.6	0.04
Diethylphthalate	84-66-2	5.0	0.20	170	3.5
Dimethylphthalate	131-11-3	5.0	0.04	170	0.04
Di-n-butylphthalate	84-74-2	5.0	0.76	170	0.89
Di-n-octylphthalate	117-84-0	5.0	0.03	170	0.04
Fluoranthene	206-44-0	0.2	0.04	6.6	0.02
Fluorene	86-73-7	0.2	0.04	6.6	0.06
Hexachlorobenzene	118-74-1	0.2	0.04	6.6	0.03
Indeno(1,2,3-cd)pyrene	193-39-5	0.2	0.05	6.6	0.03
Naphthalene	91-20-3	0.2	0.11	6.6	0.14
Nitrobenzene	98-95-3	0.2	0.05	6.6	0.05
Octachlorostyrene	29082-74-4	0.2	0.13	6.6	0.12
Phenanthrene	85-01-8	0.2	0.06	6.6	0.05
Pyrene	129-00-0	0.2	0.03	6.6	0.03
Pyridine	110-86-1	2	0.89	6.6	0.77

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
 (May 2009)

Parameter	CAS No.	Water		Soil	
		PQL	MDL	PQL	MDL
<b><i>Organophosphorous Pesticides (µg/L or µg/kg)</i></b>					
Azinphos-methyl	86-50-0	1	0.168	33	3.50
Bolstar	35400-43-2	1	0.314	33	4.24
Chlorpyrifos	2921-88-2	1	0.360	33	6.46
Coumaphos	56-72-4	1	0.135	33	2.80
Demeton-O	298-03-3	1	0.140	33	5.29
Demeton-S	126-75-0	1	0.069	33	4.86
Diazinon	333-41-5	1	0.147	33	7.27
Dichlorvos	62-73-7	1	0.162	33	7.40
Dimethoate	60-51-5	1	0.449	66	7.08
Disulfoton	298-04-4	1	0.322	33	7.73
EPN	2104-65-5	1	0.149	33	3.68
Ethoprop	13194-48-4	1	0.177	33	4.93
Famphur	52-85-7	1	0.179	33	3.22
Fensulfothion	115-90-2	1	0.544	33	8.15
Fenthion	55-38-9	1	0.154	33	8.74
Malathion	121-75-5	1	0.133	33	4.64
Merphos	150-50-5	1	0.174	33	5.14
Mevinphos	7786-34-7	1	0.460	33	4.62
Naled	300-76-5	1	0.253	33	22.6
Parathion-ethyl	56-38-2	1	0.144	33	5.29
Parathion-methyl	298-00-0	1	0.141	33	6.37
Phorate	298-02-2	1	0.154	33	5.70
Ronnel	299-84-3	1	0.116	33	15.2
Stirphos	22248-79-9	1	0.124	33	4.36
Sulfotepp	3689-24-5	1	0.168	66	6.26
Thionazin	297-97-2	2	0.312	66	5.57
Tokuthion	34643-46-4	1	0.123	33	3.91
Trichloronate	327-98-0	1	0.242	33	6.25

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter	CAS No.	Water		Soil	
		PQL	MDL	PQL	MDL
<b><i>Organochlorine Pesticides and PCBs as Aroclors (µg/L or µg/kg)</i></b>					
4,4'-DDD	72-54-8	0.10	0.0067	3.3	1.7
4,4'-DDE	72-55-9	0.10	0.0031	3.3	1.7
4,4'-DDT	50-29-3	0.10	0.0054	3.3	1.7
Aldrin	309-00-2	0.05	0.0029	1.7	0.84
alpha-BHC	319-84-6	0.05	0.0057	1.7	0.84
alpha-Chlordane	5103-71-9	0.05	0.0034	1.7	0.84
beta-BHC	319-85-7	0.05	0.0043	1.7	0.84
Chlordane, technical	57-74-9	0.25	0.0454	8.3	4.2
delta-BHC	319-86-8	0.05	0.0024	1.7	0.84
Dieldrin	60-57-1	0.10	0.0043	3.3	1.7
Endosulfan I	959-98-8	0.05	0.0028	1.7	0.84
Endosulfan II	33213-65-9	0.10	0.0044	3.3	1.7
Endosulfan sulfate	1031-07-8	0.10	0.0046	3.3	1.7
Endrin	72-20-8	0.10	0.0045	3.3	1.7
Endrin aldehyde	7421-93-4	0.10	0.0043	3.3	1.71.7
Endrin Ketone	53494-70-5	0.10	0.011	3.3	1.7
gamma-BHC (Lindane)	58-89-9	0.05	0.0044	1.7	0.84
gamma-Chlordane	5103-74-2	0.05	0.0026	1.7	0.84
Heptachlor	76-44-8	0.05	0.0036	1.7	0.84
Heptachlor epoxide	1024-57-3	0.05	0.0039	1.7	0.84
Hexachlorobenzene	118-74-1	0.05	0.027	1.7	0.84
Methoxychlor	72-43-5	0.5	0.0075	17	8.3
Toxaphene	8001-35-2	1.0	0.19	33	17
Aroclor 1016	12674-11-2	1.0	0.35	33	17
Aroclor 1221	11104-28-2	2.0	0.83	67	38
Aroclor 1232	11141-16-5	1.0	0.36	33	17
Aroclor 1242	53469-21-9	1.0	0.29	33	26
Aroclor 1248	12672-29-6	1.0	0.27	33	17
Aroclor 1254	11097-69-1	1.0	0.25	33	17
Aroclor 1260	11096-82-5	1.0	0.51	33	30



**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter	CAS No.	Water		Soil		
		PQL	MDL	PQL	MDL	
<b>Total Petroleum Hydrocarbons and Fuel Alcohols (<math>\mu\text{g/L}</math> or <math>\text{mg/kg}</math>)</b>						
GRO (C6-C10)	na	na	na	0.05	0.018	
DRO (C10-C28)	na	na	na	40	30	
ORO (C28-C40)	na	na	na	40	30	
<b>Radiochemical Analytes (pCi/L or pCi/g)<sup>4</sup></b>						
Radium 226	13982-63-3	1	1	0.5	0.5	
Radium 228	15262-20-1	3	3	0.5	0.5	
Thorium 228	14274-82-9	0.03	0.03	0.05	0.05	
Thorium 230	14269-63-7	0.03	0.03	0.05	0.05	
Thorium 232	7440-29-1	0.03	0.03	0.1	0.1	
Uranium 234	13966-29-5	0.03	0.03	0.04	0.04	
Uranium 235	15117-96-1	0.03	0.03	0.04	0.04	
Uranium 238	7440-61-1	0.03	0.03	0.04	0.04	
<b>Organic Acid Analytes (<math>\mu\text{g/L}</math> or <math>\mu\text{g/kg}</math>)</b>						
Benzenesulfonic acid	98-11-3	50	25	500	250	
4-Chlorobenzenesulfonic acid	98-66-8	50	25	500	250	
Diethyl phosphorodithioic acid	298-06-6	50	25	500	250	
Dimethyl phosphorodithioic acid	756-80-9	250	125	2500	1250	
Phthalic acid	88-99-3	50	25	500	250	
<b>PCBs as congeners<sup>1</sup> (<math>\text{pg/L}</math> or <math>\text{ng/kg}</math>)</b>						
2-MoCB	PCB-1	2051-60-7	200	15.1	80	0.92
3-MoCB	PCB-2	2051-61-8	10	14.1	4	0.86
4-MoCB	PCB-3	2051-62-9	200	13.3	80	0.85
2,2'-DiCB	PCB-4	13029-08-8	500	254	200	5.17
2,3-DiCB	PCB-5	16605-91-7	50	130	20	1.55
2,3'-DiCB	PCB-6	25569-80-6	50	135	20	1.63
2,4-DiCB	PCB-7	33284-50-3	50	120	20	1.44
2,4'-DiCB3	PCB-8	34883-43-7	500	131	200	1.57
2,5-DiCB	PCB-9	34883-39-1	50	136	20	1.64
2,6-DiCB	PCB-10	33146-45-1	50	134	20	1.80
3,3'-DiCB	PCB-11	2050-67-1	200	157	400	1.93
3,4-DiCB	PCB-12	2974-92-7	100	142	40	1.73
3,4'-DiCB	PCB-13	2974-90-5	100	142	40	1.73
3,5-DiCB	PCB-14	34883-41-5	100	142	40	7.91
4,4'-DiCB	PCB-15	2050-68-2	500	134	200	4.12
2,2',3-TrCB	PCB-16	38444-78-9	100	59.1	40	2.41
2,2',4-TrCB	PCB-17	37680-66-3	200	46.6	80	1.95

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter		CAS No.	Water		Soil	
			PQL	MDL	PQL	MDL
<b>PCBs as congeners<sup>1</sup> (pg/L or ng/kg)</b>						
2,2',5-TrCB3	PCB-18	37680-65-2	500	39.6	200	1.59
2,2',6-TrCB	PCB-19	38444-73-4	100	68.2	40	2.58
2,3,3'-TrCB	PCB-20	38444-84-7	500	25.7	200	1.04
2,3,4-TrCB	PCB-21	55702-46-0	200	30.5	80	1.23
2,3,4'-TrCB	PCB-22	38444-85-8	200	26.7	80	1.06
2,3,5-TrCB	PCB-23	55720-44-0	200	33.2	80	1.38
2,3,6-TrCB	PCB-24	55702-45-9	200	32.8	80	1.38
2,3',4-TrCB	PCB-25	55712-37-3	200	31.0	80	1.28
2,3',5-TrCB	PCB-26	38444-81-4	200	29.7	80	1.22
2,3',6-TrCB	PCB-27	38444-76-7	200	33.0	80	1.38
2,4,4'-TrCB3	PCB-28	7012-37-5	500	25.7	200	1.04
2,4,5-TrCB	PCB-29	15862-07-4	200	29.7	80	1.22
2,4,6-TrCB	PCB-30	35693-92-6	500	39.6	200	1.59
2,4',5-TrCB	PCB-31	16606-02-3	500	29.0	200	1.31
2,4',6-TrCB	PCB-32	38444-77-8	200	30.8	80	1.34
2',3,4-TrCB	PCB-33	38444-86-9	200	30.5	80	1.23
2',3,5-TrCB	PCB-34	37680-68-5	200	29.5	80	1.20
3,3',4-TrCB	PCB-35	37680-69-6	200	27.6	80	1.08
3,3',5-TrCB	PCB-36	38444-87-0	200	25.1	80	0.99
3,4,4'-TrCB	PCB-37	38444-90-5	500	19.7	200	0.86
3,4,5-TrCB	PCB-38	53555-66-1	200	26.2	80	1.03
3,4',5-TrCB	PCB-39	38444-88-1	200	23.1	80	0.91
2,2',3,3'-TeCB	PCB-40	38444-93-8	500	15.3	200	1.02
2,2',3,4'-TeCB	PCB-41	52663-59-9	500	15.3	200	1.02
2,2',3,4'-TeCB	PCB-42	36559-22-5	200	20.6	80	1.40
2,2',3,5'-TeCB	PCB-43	70362-46-8	200	12.3	200	0.82
2,2',3,5'-TeCB3	PCB-44	41464-39-5	500	12.4	200	0.80
2,2',3,6'-TeCB	PCB-45	70362-45-7	200	15.1	80	1.00
2,2',3,6'-TeCB	PCB-46	41464-47-5	200	16.8	80	1.10
2,2',4,4'-TeCB	PCB-47	2437-79-8	500	12.4	200	0.80
2,2',4,5'-TeCB	PCB-48	70362-47-9	200	13.3	80	0.87
2,2',4,5'-TeCB	PCB-49	41464-40-8	500	12.0	200	0.74
2,2',4,6'-TeCB	PCB-50	62796-65-0	200	15.1	80	1.01
2,2',4,6'-TeCB	PCB-51	68194-04-7	200	15.1	80	1.00
2,2',5,5'-TeCB3	PCB-52	35693-99-3	500	12.7	200	0.82
2,2',5,6'-TeCB	PCB-53	41464-41-9	200	15.1	80	1.01
2,2',6,6'-TeCB	PCB-54	15968-05-5	500	11.6	200	0.93

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter		CAS No.	Water		Soil	
			PQL	MDL	PQL	MDL
<b>PCBs as congeners<sup>1</sup> (pg/L or ng/kg)</b>						
2,3,3',4'-TeCB	PCB-55	74338-24-2	500	6.14	200	0.84
2,3,3',4'-TeCB	PCB-56	41464-43-1	200	8.51	80	0.78
2,3,3',5'-TeCB	PCB-57	70424-67-8	500	5.86	200	0.82
2,3,3',5'-TeCB	PCB-58	41464-49-7	500	4.57	200	0.58
2,3,3',6'-TeCB	PCB-59	74472-33-6	200	10.5	80	0.69
2,3,4,4'-TeCB	PCB-60	33025-41-1	500	6.85	200	0.77
2,3,4,5'-TeCB	PCB-61	33284-53-6	500	10.6	200	0.75
2,3,4,6'-TeCB	PCB-62	54230-22-7	500	10.5	200	0.69
2,3,4',5'-TeCB	PCB-63	74472-34-7	500	5.51	200	0.76
2,3,4',6'-TeCB	PCB-64	52663-58-8	200	15.2	80	1.07
2,3,5,6'-TeCB	PCB-65	33284-54-7	500	12.4	200	0.80
2,3',4,4'-TeCB3	PCB-66	32598-10-0	500	5.33	200	0.73
2,3',4,5'-TeCB	PCB-67	73575-53-8	500	6.32	200	1.00
2,3',4,5'-TeCB	PCB-68	73575-52-7	500	5.07	200	0.72
2,3',4,6'-TeCB	PCB-69	60233-24-1	500	11.4	200	0.74
2,3',4',5'-TeCB	PCB-70	32598-11-1	500	5.47	200	0.75
2,3',4',6'-TeCB	PCB-71	41464-46-4	500	15.3	200	1.02
2,3',5,5'-TeCB	PCB-72	41464-42-0	500	5.64	200	0.78
2,3',5,6'-TeCB	PCB-73	74338-23-1	200	12.3	200	0.82
2,4,4',5'-TeCB	PCB-74	32690-93-0	500	5.47	200	0.75
2,4,4',6'-TeCB	PCB-75	32598-12-2	200	10.5	80	0.69
2',3,4,5'-TeCB	PCB-76	70362-48-0	500	5.40	200	0.75
3,3',4,4'-TeCB3,6	PCB-77	32598-13-3	500	4.17	200	0.60
3,3',4,5'-TeCB	PCB-78	70362-49-1	500	6.30	200	0.87
3,3',4,5'-TeCB	PCB-79	41464-48-6	500	5.62	200	0.80
3,3',5,5'-TeCB	PCB-80	33284-52-5	500	5.20	200	0.73
3,4,4',5'-TeCB6	PCB-81	70362-50-4	500	4.34	200	0.70
2,2',3,3',4'-PeCB	PCB-82	52663-62-4	500	11.8	200	0.98
2,2',3,3',5'-PeCB	PCB-83	60145-20-2	500	6.71	200	0.48
2,2',3,3',6'-PeCB	PCB-84	52663-60-2	500	9.22	200	0.71
2,2',3,4,4'-PeCB	PCB-85	65510-45-4	200	7.70	80	0.63
2,2',3,4,5'-PeCB	PCB-86	55312-69-1	500	6.52	200	0.51
2,2',3,4,5'-PeCB	PCB-87	38380-02-8	500	6.43	200	0.51
2,2',3,4,6'-PeCB	PCB-88	55215-17-3	500	8.37	200	0.71
2,2',3,4,6'-PeCB	PCB-89	73575-57-2	500	9.54	200	0.81
2,2',3,4',5'-PeCB	PCB-90	68194-07-0	1000	6.41	400	0.58

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter		CAS No.	Water		Soil	
			PQL	MDL	PQL	MDL
<b>PCBs as congeners<sup>1</sup> (pg/L or ng/kg)</b>						
2,2',3,4',6-PeCB	PCB-91	68194-05-8	500	8.37	200	0.71
2,2',3,5,5'-PeCB	PCB-92	52663-61-3	500	8.28	200	0.75
2,2',3,5,6-PeCB	PCB-93	73575-56-1	500	8.29	200	0.72
2,2',3,5,6'-PeCB	PCB-94	73575-55-0	500	8.84	200	0.75
2,2',3,5',6-PeCB	PCB-95	38379-99-6	500	8.49	200	0.72
2,2',3,6,6'-PeCB	PCB-96	73575-54-9	500	3.38	200	0.33
2,2',3',4,5-PeCB	PCB-97	41464-51-1	500	6.43	200	0.57
2,2',3',4,6-PeCB	PCB-98	60233-25-2	500	7.81	200	0.63
2,2',4,4',5-PeCB	PCB-99	38380-01-7	500	5.93	200	0.53
2,2',4,4',6-PeCB	PCB-100	39485-83-1	500	8.29	200	0.72
2,2',4,5,5'-PeCB3	PCB-101	37680-73-2	1000	6.44	400	0.58
2,2',4,5,6-PeCB	PCB-102	68194-06-9	500	7.81	200	0.63
2,2',4,5',6-PeCB	PCB-103	60145-21-3	500	8.05	200	0.69
2,2',4,6,6'-PeCB	PCB-104	56558-16-8	500	7.45	200	0.65
2,3,3',4,4'-PeCB3,6	PCB-105	32598-14-4	200	3.48	80	0.64
2,3,3',4,5-PeCB	PCB-106	70424-69-0	500	7.32	200	1.15
2,3,3',4',5-PeCB	PCB-107	70424-68-9	1000	5.24	400	0.74
2,3,3',4,5'-PeCB	PCB-108	70362-41-3	500	6.43	200	0.57
2,3,3',4,6-PeCB	PCB-109	74472-35-8	200	4.09	80	0.57
2,3,3',4',6-PeCB	PCB-110	38380-03-9	1000	7.34	400	0.69
2,3,3',5,5'-PeCB	PCB-111	39635-32-0	1000	5.39	400	0.48
2,3,3',5,6-PeCB	PCB-112	74472-36-9	1000	8.24	400	0.77
2,3,3',5',6-PeCB	PCB-113	68194-10-5	1000	6.44	400	0.58
2,3,4,4',5-PeCB6	PCB-114	74472-37-0	500	3.83	200	0.68
2,3,4,4',6-PeCB	PCB-115	74472-38-1	1000	7.34	400	0.69
2,3,4,5,6-PeCB	PCB-116	18259-05-7	200	7.62	80	0.70
2,3,4',5,6-PeCB	PCB-117	68194-11-6	200	7.38	80	0.70
2,3',4,4',5-PeCB3,6	PCB-118	31508-00-6	500	3.47	200	0.55
2,3',4,4',6-PeCB	PCB-119	56558-17-9	500	6.43	200	0.57
2,3',4,5,5'-PeCB	PCB-120	68194-12-7	500	5.41	200	0.48
2,3',4,5',6-PeCB	PCB-121	56558-18-0	500	5.55	200	0.50
2',3,3',4,5-PeCB	PCB-122	76842-07-4	500	5.08	200	0.67
2',3,4,4',5-PeCB6	PCB-123	65510-44-3	500	3.85	200	0.63
2',3,4,5,5'-PeCB	PCB-124	70424-70-3	1000	5.24	400	0.74
2',3,4,5,6'-PeCB	PCB-125	74472-39-2	500	6.43	200	0.91
3,3',4,4',5-PeCB3,6	PCB-126	57465-28-8	500	3.32	200	0.74

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter		CAS No.	Water		Soil	
			PQL	MDL	PQL	MDL
<b>PCBs as congeners<sup>1</sup> (pg/L or ng/kg)</b>						
3,3',4,5,5'-PeCB	PCB-127	39635-33-1	1000	5.68	400	0.75
2,2',3,3',4,4'-HxCB3	PCB-128	38380-07-3	500	6.80	200	0.63
2,2',3,3',4,5-HxCB	PCB-129	55215-18-4	500	6.63	200	0.95
2,2',3,3',4,5'-HxCB	PCB-130	52663-66-8	500	8.07	200	0.74
2,2',3,3',4,6-HxCB	PCB-131	61798-70-7	500	8.96	200	0.87
2,2',3,3',4,6'-HxCB	PCB-132	38380-05-1	500	8.26	200	0.79
2,2',3,3',5,5'-HxCB	PCB-133	35694-04-3	500	8.49	200	0.82
2,2',3,3',5,6-HxCB	PCB-134	52704-70-8	500	10.2	200	0.99
2,2',3,3',5,6'-HxCB	PCB-135	52744-13-5	500	1.80	200	0.22
2,2',3,3',6,6'-HxCB	PCB-136	38411-22-2	200	1.70	80	0.23
2,2',3,4,4',5-HxCB	PCB-137	35694-06-5	1000	6.07	400	0.55
2,2',3,4,4',5'-HxCB3	PCB-138	35065-28-2	500	6.63	200	0.61
2,2',3,4,4',6-HxCB	PCB-139	56030-56-9	500	6.80	200	0.65
2,2',3,4,4',6'-HxCB	PCB-140	59291-64-4	500	6.80	200	0.65
2,2',3,4,5,5'-HxCB	PCB-141	52712-04-6	200	8.82	80	0.85
2,2',3,4,5,6-HxCB	PCB-142	41411-61-4	1000	9.03	400	0.87
2,2',3,4,5,6'-HxCB	PCB-143	68194-15-0	500	5.01	200	0.44
2,2',3,4,5',6-HxCB	PCB-144	68194-14-9	500	1.99	200	0.25
2,2',3,4,6,6'-HxCB	PCB-145	74472-40-5	1000	1.25	400	0.15
2,2',3,4',5,5'-HxCB	PCB-146	51908-16-8	500	4.88	200	0.45
2,2',3,4',5,6-HxCB	PCB-147	68194-13-8	500	9.99	200	0.99
2,2',3,4',5,6'-HxCB	PCB-148	74472-41-6	1000	1.96	400	0.24
2,2',3,4',5',6-HxCB	PCB-149	38380-04-0	500	9.99	200	0.99
2,2',3,4',6,6'-HxCB	PCB-150	68194-08-1	1000	1.39	400	0.18
2,2',3,5,5',6-HxCB	PCB-151	52663-63-5	500	1.80	200	0.22
2,2',3,5,6,6'-HxCB	PCB-152	68194-09-2	1000	1.40	400	0.18
2,2',4,4',5,5'-HxCB3	PCB-153	35065-27-1	500	5.56	200	0.52
2,2',4,4',5',6-HxCB	PCB-154	60145-22-4	500	1.70	200	0.22
2,2',4,4',6,6'-HxCB	PCB-155	33979-03-2	1000	3.26	400	0.35
2,3,3',4,4',5-HxCB6	PCB-156	38380-08-4	500	2.88	200	0.62
2,3,3',4,4',5'-HxCB6	PCB-157	69782-90-7	500	2.88	200	0.62
2,3,3',4,4',6-HxCB	PCB-158	74472-42-7	200	5.45	80	0.52
2,3,3',4,5,5'-HxCB	PCB-159	39635-35-3	1000	2.97	400	0.59
2,3,3',4,5,6-HxCB	PCB-160	41411-62-5	500	6.46	200	0.61
2,3,3',4,5',6-HxCB	PCB-161	74472-43-8	1000	9.58	400	0.96
2,3,3',4',5,5'-HxCB	PCB-162	39635-34-2	1000	2.87	400	0.63

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter		CAS No.	Water		Soil	
			PQL	MDL	PQL	MDL
<b>PCBs as congeners<sup>1</sup> (pg/L or ng/kg)</b>						
2,3,3',4',5,6-HxCB	PCB-163	74472-44-9	500	6.63	200	0.61
2,3,3',4',5',6-HxCB	PCB-164	74472-45-0	500	7.42	400	0.72
2,3,3',5,5',6-HxCB	PCB-165	74472-46-1	1000	5.95	400	0.57
2,3,4,4',5,6-HxCB	PCB-166	41411-63-6	500	6.80	200	0.63
2,3',4,4',5,5'-HxCB6	PCB-167	52663-72-6	500	1.80	200	0.42
2,3',4,4',5',6-HxCB	PCB-168	59291-65-5	500	5.56	200	0.52
3,3',4,4',5,5'-HxCB3,6	PCB-169	32774-16-6	500	2.07	200	0.48
2,2',3,3',4,4',5-HpCB3	PCB-170	35065-30-6	500	8.44	200	1.06
2,2',3,3',4,4',6-HpCB	PCB-171	52663-71-5	1000	7.08	400	0.92
2,2',3,3',4,5,5'-HpCB	PCB-172	52663-74-8	1000	7.96	400	1.03
2,2',3,3',4,5,6-HpCB	PCB-173	68194-16-1	1000	7.08	400	0.92
2,2',3,3',4,5,6'-HpCB	PCB-174	38411-25-5	500	7.28	200	1.04
2,2',3,3',4,5',6-HpCB	PCB-175	40186-70-7	1000	5.83	400	0.90
2,2',3,3',4,6,6'-HpCB	PCB-176	52663-65-7	1000	3.18	400	0.22
2,2',3,3',4',5,6-HpCB	PCB-177	52663-70-4	500	7.08	200	0.98
2,2',3,3',5,5',6-HpCB	PCB-178	52663-67-9	500	4.76	200	0.61
2,2',3,3',5,6,6'-HpCB	PCB-179	52663-64-6	500	2.70	200	0.22
2,2',3,4,4',5,5'-HpCB3	PCB-180	35065-29-3	500	6.05	200	0.77
2,2',3,4,4',5,6-HpCB	PCB-181	74472-47-2	1000	6.31	400	0.83
2,2',3,4,4',5,6'-HpCB	PCB-182	60145-23-5	1000	6.79	400	1.07
2,2',3,4,4',5',6-HpCB	PCB-183	52663-69-1	1000	6.18	400	0.54
2,2',3,4,4',6,6'-HpCB	PCB-184	74472-48-3	1000	1.91	400	0.19
2,2',3,4,5,5',6-HpCB	PCB-185	52712-05-7	1000	7.45	400	1.08
2,2',3,4,5,6,6'-HpCB	PCB-186	74472-49-4	1000	2.42	400	0.20
2,2',3,4',5,5',6-HpCB3	PCB-187	52663-68-0	500	4.61	200	0.66
2,2',3,4',5,6,6'-HpCB	PCB-188	74487-85-7	500	3.90	200	0.33
2,3,3',4,4',5,5'-HpCB6	PCB-189	39635-31-9	500	4.14	200	0.46
2,3,3',4,4',5,6-HpCB	PCB-190	41411-64-7	500	6.43	200	0.78
2,3,3',4,4',5',6-HpCB	PCB-191	74472-50-7	1000	6.01	400	0.76
2,3,3',4,5,5',6-HpCB	PCB-192	74472-51-8	1000	5.88	400	0.76
2,3,3',4',5,5',6-HpCB	PCB-193	69782-91-8	500	6.13	200	0.77
2,2',3,3',4,4',5,5'-OoCB	PCB-194	35694-08-7	500	7.03	200	1.65
2,2',3,3',4,4',5,6-OoCB3	PCB-195	52663-78-2	1000	6.96	400	1.65
2,2',3,3',4,4',5,6'-OoCB	PCB-196	42740-50-1	1000	5.65	400	1.33
2,2',3,3',4,4',6,6'-OoCB	PCB-197	33091-17-7	1000	4.09	400	1.00
2,2',3,3',4,5,5',6-OoCB	PCB-198	68194-17-2	500	5.88	200	1.41

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter		CAS No.	Water		Soil	
			PQL	MDL	PQL	MDL
<b>PCBs as congeners<sup>1</sup> (pg/L or ng/kg)</b>						
2,2',3,3',4,5,5',6'-OcCB	PCB-199	52663-75-9	500	5.88	200	1.41
2,2',3,3',4,5,6,6'-OcCB	PCB-200	52663-73-7	1000	4.18	400	1.00
2,2',3,3',4,5',6,6'-OcCB	PCB-201	40186-71-8	1000	4.23	400	1.11
2,2',3,3',5,5',6,6'-OcCB	PCB-202	2136-99-4	1000	6.66	400	1.54
2,2',3,4,4',5,5',6-OcCB	PCB-203	52663-76-0	1000	6.04	400	1.47
2,2',3,4,4',5,6,6'-OcCB	PCB-204	74472-52-9	1000	4.33	400	1.00
2,3,3',4,4',5,5',6-OcCB	PCB-205	74472-53-0	1000	4.09	400	0.90
2,2',3,3',4,4',5,5',6-NoCB3	PCB-206	40186-72-9	1000	10.9	400	0.71
2,2',3,3',4,4',5,6,6'-NoCB	PCB-207	52663-79-3	1000	4.12	400	0.29
2,2',3,3',4,5,5',6,6'-NoCB	PCB-208	52663-77-1	1000	4.05	400	0.31
DeCB3	PCB-209	2051-24-3	500	4.62	200	0.49
<b>Dioxins/Furans (ng/kg)<sup>2</sup></b>						
1,2,3,4,6,7,8,9-Ocathlorodibenzofuran		39001-02-0	na		5	0.10
1,2,3,4,6,7,8,9-Ocathlorodibenzodioxin		3268-87-9	na		5	0.16
1,2,3,4,6,7,8-Heptachlorodibenzofuran		67562-39-4	na		2.5	0.064
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin		35822-46-9	na		2.5	0.059
1,2,3,4,7,8,9-Heptachlorodibenzofuran		55673-89-7	na		2.5	0.350
1,2,3,4,7,8-Hexachlorodibenzofuran		70648-26-9	na		2.5	0.090
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin		39227-28-6	na		2.5	0.049
1,2,3,6,7,8-Hexachlorodibenzofuran		57117-44-9	na		2.5	0.041
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin		57653-85-7	na		2.5	0.048
1,2,3,7,8,9-Hexachlorodibenzofuran		72918-21-9	na		2.5	0.050
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin		19408-74-3	na		2.5	0.048
1,2,3,7,8-Pentachlorodibenzofuran		57117-41-6	na		2.5	0.038
1,2,3,7,8-Pentachlorodibenzo-p-dioxin		40321-76-4	na		2.5	0.050
2,3,4,6,7,8-Hexachlorodibenzofuran		60851-34-5	na		2.5	0.044
1,2,3,6,7,8-Hexachlorodibenzofuran		57117-31-4	na		2.5	0.036
2,3,7,8-Tetrachlorodibenzofuran		51207-31-9	na		1	0.048
2,3,7,8-Tetrachlorodibenzo-p-dioxin		1746-01-6	na		1.00	0.051
<b>Metals (µg/L or mg/kg)</b>						
Aluminum		7429-90-5	50	4.0	3	0.8
Antimony		7440-36-0	0.05	0.03	2.0	0.50
Arsenic <sup>5</sup>		7440-38-2	5	0.21	0.5	0.1
Barium		7440-39-3	5	0.5	0.6	0.2
Beryllium		7440-41-7	0.20	0.09	0.02	0.02
Boron		7440-42-8	10	2	2	0.4

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
(May 2009)

Parameter	CAS No.	Water		Soil	
		PQL	MDL	PQL	MDL
<b>Metals (<math>\mu\text{g/L}</math> or <math>\text{mg/kg}</math>)</b>					
Cadmium	7440-43-9	0.50	0.30	0.10	0.03
Calcium	7440-70-2	50	30	20	4
Chromium (total)	7440-47-3	2.0	0.60	0.2	0.03
Chromium (hexavalent)	18540-29-9	10	0.3	0.4	0.025
Cobalt	7440-48-4	10	0.3	0.3	0.09
Copper	7440-50-8	10	0.8	0.6	0.2
Iron	7439-89-6	20	4	6	2
Lead	7439-92-1	0.02	0.01	2.0	0.4
Magnesium	7439-95-4	20	2	3	0.7
Manganese	7439-96-5	5	0.2	0.2	0.04
Mercury	7439-97-6	0.2	0.03	0.02	0.006
Molybdenum	7439-98-7	2.0	0.60	0.40	0.08
Nickel	7440-02-0	2.0	0.7	0.4	0.07
Platinum	7440-06-4	0.1	0.1	0.1	na
Potassium	7440-09-7	2000	100	200	20
Selenium <sup>5</sup>	7782-49-2	5	0.7	6	2
Silver	7440-22-4	2.0	0.7	0.5	0.2
Sodium	7440-23-5	100	70	20	20
Strontium	7440-24-6	10	0.4	2	0.2
Tin	7440-31-5	50	2	10	1
Titanium	7440-32-6	10	0.03	2	0.06
Thallium	7440-28-0	0.02	0.003	0.02	0.003
Tungsten	7440-33-7	0.1	0.1	0.1	0.1
Uranium	7440-61-1	0.02	0.005	0.02	0.004
Vanadium	7440-62-2	2.0	1.00	1.0	0.30
Zinc	7440-66-6	10	0.6	2	0.3
<b>Wet Chemistry and Misc. Analytes (<math>\mu\text{g/L}</math> or <math>\text{mg/kg}</math>)</b>					
Alkalinity (total, $\text{CO}_3^{2-}$ , $\text{HCO}_3^-$ )	na	2000	220	2	na
Ammonia	7664-41-7	50	4.5	5.0	0.41
Chloride	16887-00-6	200	51	30	2.3
Chlorate	7790-93-4	20	4	0.2	0.04
Cyanide (total)	57-12-5	10	4.3	1	0.42
Conductivity	na	na	na	na	na
Nitrate	84145-82-4	50	4	5	0.44
Nitrite	14797-65-0	10	7	0.1	0.07



**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
 (May 2009)

Parameter	CAS No.	Water		Soil	
		PQL	MDL	PQL	MDL
<b><i>Wet Chemistry and Misc. Analytes (µg/L or mg/kg)</i></b>					
Phosphate (total)	14265-44-2	50	5	5	0.88
Perchlorate	14797-73-0	1	0.4	0.1	0.04
Sulfate	14808-79-8	200	137	30	4.4
Total Dissolved Solids (TDS)	na	10000	5420	na	na
Total Suspended Solids (TSS)	na	1000	na	na	na
Surfactants (MBAS)	na	20	4.5	1	0.5
pH	na	na	na	na	na
Bromide	24959-67-9	100	12	10	3.8
Total Organic Carbon	7440-44-0	1000	92	300	34
Formaldehyde	50-00-0	8	1.3	1000	160

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd)**  
 (May 2009)

Parameter	CAS No.	Air	
		PQL	MDL
<b>Soil Gas Analytes (<math>\mu\text{g}/\text{m}^3</math>)</b>			
1,1,1-Trichloroethane	71-55-6	0.1	0.050
1,1,2,2-Tetrachloroethane	79-34-5	0.1	0.064
1,1,2-Trichloroethane	79-00-5	0.1	0.050
1,1-Dichloroethane	75-34-3	0.1	0.050
1,1-Dichloroethene	75-35-4	0.1	0.050
1,2,4-Trichlorobenzene	120-82-1	0.1	0.076
1,2,4-Trimethylbenzene	95-63-6	0.5	0.069
1,2-Dibromo-3-chloropropane	96-12-8	0.5	0.076
1,2-Dibromoethane	106-93-4	0.1	0.054
1,2-Dichlorobenzene	95-50-1	0.1	0.066
1,2-Dichloroethane	107-06-2	0.1	0.050
1,2-Dichloropropane	78-87-5	0.1	0.050
1,2-Dichloro-1,1,2,2-tetrafluoroethane(CFC 114)	75-71-8	0.5	0.050
1,3,5-Trimethylbenzene	108-67-8	0.5	0.060
1,3-Dichlorobenzene	541-73-1	0.1	0.062
1,4-Dichlorobenzene	106-46-7	0.1	0.050
1,4-Dioxane	123-91-1	0.5	0.061
2-Butanone (MEK)	78-93-3	0.5	0.050
2-Hexanone	591-78-6	0.5	0.076
4-Ethyltoluene	622-96-8	0.5	0.057
4-Methyl-2-pentanone	108-10-1	0.5	0.056
Acetone	67-64-1	5	0.073
Acrylonitrile	107-13-1	0.5	0.070
alpha-Methylstyrene	98-83-9	0.5	0.073
Allyl chloride	107-05-1	0.1	0.050
Benzene	71-43-2	0.1	0.050
Benzyl chloride	100-44-7	0.1	0.086
Bromodichloromethane	75-27-4	0.1	0.050
Bromoform	75-25-2	0.5	0.076
Bromomethane	74-83-9	0.1	0.050
Carbon disulfide	75-15-0	0.5	0.12

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
 (May 2009)

Parameter	CAS No.	Air	
		PQL	MDL
<b><i>Soil Gas Analytes (<math>\mu\text{g}/\text{m}^3</math>)</i></b>			
Carbon Tetrachloride	56-23-5	0.1	0.050
Chlorobenzene	108-90-7	0.1	0.051
Chloroethane	75-00-3	0.1	0.050
Chloroform	67-66-3	0.1	0.059
Chloromethane	74-87-3	0.1	0.050
cis-1,2-Dichloroethene	156-59-2	0.1	0.050
cis-1,3-Dichloropropene	10061-01-5	0.5	0.052
Dibromochloromethane	124-48-1	0.1	0.068
Dichlorodifluoromethane (CFC 12)	75-71-8	0.5	0.050
Diisopropyl ether (DIPE)	108-20-3	0.5	0.059
Ethanol	64-17-5	5	0.050
Ethylbenzene	100-41-4	0.5	0.062
Ethyl-tert-butyl ether (ETBE)	637-92-3	0.5	0.051
Hexachlorobutadiene	87-68-3	0.1	0.090
Isopropyl benzene (Cumene)	98-82-8	0.5	0.056
Methyl tert-Butyl Ether	1634-04-4	0.1	0.050
Methylene Chloride	75-09-2	0.5	0.050
Methyl methacrylate	80-62-6	0.5	0.075
Naphthalene	91-20-3	0.2	0.074
n-Butylbenzene	104-51-8	0.5	0.050
n-Heptane	142-82-5	0.5	0.064
n-Propylbenzene	103-65-1	0.5	0.052
n-Octane	111-65-9	0.5	0.050
p-Isopropyltoluene	99-87-6	0.5	0.065
sec-Butylbenzene	135-98-8	0.5	0.058
Styrene	100-42-5	0.5	0.076
tert-Amyl-methyl ether (TAME)	994-05-8	0.5	0.076
tert-Butyl alcohol (TBA)	75-65-0	0.5	0.074
tert-Butylbenzene	98-06-6	0.5	0.050
Tetrachloroethene	127-18-4	0.1	0.050
Toluene	108-88-3	0.5	0.050

**Table A-2 Analyte List, Practical Quantitation Limits, and Method Detection Limits (Cont'd).**  
 (May 2009)

Parameter	CAS No.	Air	
		PQL	MDL
<b>Soil Gas Analytes (<math>\mu\text{g}/\text{m}^3</math>)</b>			
trans-1,2-Dichloroethene	156-60-5	0.1	0.050
trans-1,3-Dichloropropene	10061-02-6	0.5	0.063
Trichloroethene	79-01-6	0.1	0.050
Trichlorofluoromethane	75-69-4	0.1	0.050
Trichlorotrifluoroethane (CFC 113)	76-13-1	0.1	0.056
Vinyl acetate	108-05-4	5	0.16
Vinyl Chloride	75-01-4	0.1	0.050
m,p-Xylenes	1330-20-7	0.5	0.13
o-Xylene	95-47-6	0.5	0.063
Parameter	CAS No.	RL	
		Soil	
<b>Asbestos (s/gPM10)</b>			
Total Amphibole Protocol Structures <sup>3</sup>	na	3000000	
Long Amphibole Protocol Structures <sup>3</sup>	na	3000000	
Total Chrysotile Protocol Structures <sup>3</sup>	na	3000000	
Long Chrysotile Protocol Structures <sup>3</sup>	na	3000000	
Total Asbestos Protocol Structures <sup>3</sup>	na	3000000	
Long Asbestos Protocol Structures <sup>3</sup>	na	3000000	
Notes:			
<sup>1</sup> All 209 PCB congeners will be reported. CB congener MDL values are based on average blank EDLs. PQLs are based on method defined Minimum Levels.			
<sup>2</sup> Dioxin/furan congener MDL values are based on EDLs, and the PQLs on method defined Minimum Calibration Levels.			
<sup>3</sup> Modified structure width criterion < 0.4 micron. PQLs are based on nominal dust weight, grid opening counts and stopping rules. Actual fiber counts and calculated sensitivity are reported.			
<sup>4</sup> Radionuclide MDLs and PQLs are based on nominal MDA values. Measured result values are reported regardless of the sample specific MDA.			
<sup>5</sup> Groundwater samples for As and Se will be analyzed by ICP/MS collision cell to overcome matrix interferences. See options in Table B-2.			
SPLP leachate analyses will be analyzed by EPA Method 1312 using two preparation methods: 1) with extraction fluid #2 (reagent water at pH 5.00±0.05), and 2) with extraction method #3 (reagent water); per NDEP. SPLP will conform to the analyte lists and water limits above if specified in the project-specific workplans.			
All PQLs and MDLs may be updated, typically on an annual basis, by the laboratories.			

**Table B-1 Sample Container, Preservation, and Holding Time Requirements**

<b>Aqueous</b>			
<b>Parameter</b>	<b>Container</b> <sup>1,2</sup>	<b>Preservation</b>	<b>Holding Time</b> <sup>3</sup>
VOCs	3-40 ml glass vials with Teflon-lined septum caps	HCl to pH<2; no headspace; cool 4°C	14 days
SVOCs	2-1 L amber glass with Teflon-lined lids	Cool 4°C	Extract within 7 days, analyze within 40 days
GRO	3-40 ml glass vials with Teflon-lined septum caps	HCl to pH<2; no headspace; cool 4°C	14 days
DRO/ORO	2-1 L amber glass with Teflon-lined lids	HCl to pH<2; no headspace; cool 4°C	Extract within 7 days, analyze within 40 days
Organochlorine Pesticides	2-1 L amber glass with Teflon-lined lids	Cool 4°C	Extract within 7 days, analyze within 40 days
Organophosphorous Pesticides	2-1 L amber glass with Teflon-lined lids	Cool 4°C	Extract within 7 days, analyze within 40 days
PCBs as Aroclors	2-1 L amber glass with Teflon-lined lids	Cool 4°C	Extract within 7 days, analyze within 40 days
PCBs as congeners	2-1 L amber glass with Teflon-lined lids	Cool 4°C	Extract within 1 year, analyze within 1 year
Metals	1-500 mL plastic	HNO <sub>3</sub> to pH <2; cool 4°C	Mercury - 28 days, other metals - 180 days
Hexavalent chromium	250 mL plastic	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> buffer <sup>4</sup> ; cool 4°C; field filter	28 days to analysis if filtered and preserved properly
Alkalinity	500 mL plastic	Cool 4°C	14 days
Ammonia	500 mL plastic	H <sub>2</sub> SO <sub>4</sub> to pH <2; cool 4°C	28 days
Bromide	125 mL plastic	Cool 4°C	28 days
Chlorate	125 mL plastic	Cool 4°C	28 days
Chloride	125 mL plastic	Cool 4°C	28 days
Cyanide	500 mL plastic	NaOH to pH>12	14 days
Conductivity	125 mL plastic	Cool 4°C	28 days
Nitrate	125 mL plastic	Cool 4°C	2 days
Nitrite	125 mL plastic	Cool 4°C	2 days

**Table B-1 Sample Container, Preservation, and Holding Time Requirements (Cont'd)**

<b>Aqueous</b>			
<b>Parameter</b>	<b>Container<sup>1,2</sup></b>	<b>Preservation</b>	<b>Holding Time<sup>3</sup></b>
Phosphate (total)	125 mL plastic	H <sub>2</sub> SO <sub>4</sub> to pH <2; cool 4°C	28 days
Perchlorate	125 mL plastic	Cool 4°C	28 days
Sulfate	125 mL plastic	Cool 4°C	28 days
Surfactants	500 mL plastic	Cool 4°C	48 hours
TOC	1-1L glass	H <sub>2</sub> SO <sub>4</sub> to pH <2; cool 4°C	28 days
TDS	1-1L plastic	Cool 4°C	7 days
TSS	1-1L plastic	Cool 4°C	7 days
Radium 226	1-1L plastic	HNO <sub>3</sub> to pH <2;	6 months
Radium 228	1-1L plastic	HNO <sub>3</sub> to pH <2;	6 months
Thorium (isotopic)	1-1L plastic	HNO <sub>3</sub> to pH <2;	6 months
Uranium (isotopic)	1-1L plastic	HNO <sub>3</sub> to pH <2;	6 months
Formaldehyde	2-1 L amber glass with Teflon-lined lids	Cool 4°C	3 days to extraction, 3 days to analysis
Organic Acids	125 mL plastic	Cool 4°C	28 days

**Table B-1 Sample Container, Preservation, and Holding Time Requirements (Cont'd)**

<b>Soil</b>			
<b>Parameter</b>	<b>Container<sup>1,2</sup></b>	<b>Preservation</b>	<b>Holding Time<sup>3</sup></b>
VOCs	3 40-ml VOA vials/ 2 with DI water and 1 with MeOH	Cool 4°C	Unpreserved VOA vials must be frozen within 48 hours of collection, 14 days from field preservation to analysis
SVOCs	1-250 ml glass with Teflon-lined cap	Cool 4°C	14 days until extraction; 40 days from extraction to analysis
Dioxins/Furans	1-250 ml glass with Teflon-lined cap	Cool 4°C	30 days until extraction; 40 days from extraction to analysis
GRO	1 VOA vial with MeOH	Cool 4°C	14 days from field preservation to analysis
DRO/ORO	1-250 ml glass with Teflon-lined cap	Cool 4°C	14 days until extraction; 40 days from extraction to analysis
Pesticides and PCBs as Aroclors	1-250 or 500-ml glass with Teflon-lined cap	Cool 4°C	14 days until extraction; 40 days from extraction to analysis
PCBs as congeners	1-250 ml glass with Teflon-lined cap	Cool 4°C from field, Lab storage <-10°C	Extract within 1 year, analyze within 1 year
Metals	1-250 ml glass with Teflon-lined cap	Cool 4°C	Mercury – 28 days, other metals – 180 days
Hexavalent chromium	1-250 ml glass with Teflon-lined cap	Cool 4°C	28 days to digestion, 4 days from digestion to analysis
TOC	1-250 ml glass with Teflon-lined cap	Cool 4°C	14 days
Asbestos	1-gallon plastic bag	None	None established for soil
Alkalinity	1-250 ml glass with Teflon-lined cap	Cool 4°C	None established for soil. Use water holding time for leachates
Ammonia	1-250 ml glass with Teflon-lined cap	Cool 4°C	None established for soil. Use water holding time for leachates
Anions (Br-,Cl-, ClO2-,ClO4-, , NO3-,NO2-,PO4-- , SO4-- , -)	1-250 ml glass with Teflon-lined cap	Cool 4°C	None established for soil. Use water holding time for leachates
Surfactants	1-250 ml glass with Teflon-lined cap	Cool 4°C	None established for soil. Use water holding time for leachates

**Table B-1 Sample Container, Preservation, and Holding Time Requirements (Cont'd)**

<b>Soil</b>			
Parameter	Container <sup>1,2</sup>	Preservation	Holding Time <sup>3</sup>
Radiochemicals	1- 500-mL glass with Teflon lined cap	None	6 months
Formaldehyde	1-250 ml glass with Teflon-lined cap	Cool 4°C	14 days
Organic Acids	125 mL plastic	Cool 4°C	None established for soil. Use water holding time for leachates
<b>Soil Gas</b>			
VOCs by TO-15	SUMMA canister	None	30 days
<b>Notes:</b>			
1 Additional volume will be collected for MS/MSD samples. 2 Laboratory may provide alternate containers as long as the containers meet the requirements of the method and allow the collection of sufficient volume to perform the analyses. 3 Holding time begins from date of sample collection. Leachate holding times must conform to water holding times or the requirements of EPA Method 1312. 4. Site specific modified buffer with 0.3 mL NaOH plus 2.5 mL (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> method defined solution			



**Table B-2 Analytical Methodologies**

<b>Parameter</b>	<b>Methodology</b>
<b><i>Aqueous</i></b>	
VOCs	EPA 5030/8260B
SVOCs	EPA 8270C
Organochlorine Pesticides	EPA 8081A
Organophosphorous Pesticides	EPA 8141A
Organic Acids	HPLC-UV per Alpha Analytical SOP E.64 Rev.5
PCBs	EPA 8082 and/or EPA 1668A
Gasoline Range Organics	EPA 8015B
Diesel Range Organics	EPA 8015B
Oil Range Organics	EPA 8015B
Formaldehyde	EPA 8315A
Metals	EPA 6010B/6020 (As and Se ICP/MS collision cell)
Mercury	EPA 7470
Hexavalent chromium	EPA 218.6
Alkalinity	SM 2320B
Ammonia	EPA 350.1
Bromide	EPA 9056
Chloride	EPA 9056
Chlorate	EPA 9056
Cyanide	EPA 9012A/9014
Nitrate	EPA 9056
Nitrite	EPA 353.2
Phosphate (total)	EPA 365.1
Perchlorate	EPA 314.0
pH	EPA 9040B
Sulfate	EPA 9056
Surfactants	SM 5540C
TDS	SM 2540C
TSS	SM 2540D

**Table B-2 Analytical Methodologies (Cont'd)**

<b>Parameter</b>	<b>Methodology</b>
<b><i>Aqueous</i></b>	
Total Organic Carbon	EPA 9060
Radium 226	EPA 903.1
Radium 228	EPA 904.0 modified
Thorium (isotopic)	DOE EML HASL 300 modified (alpha spectroscopy)
Uranium (isotopic)	DOE EML HASL 300 modified (alpha spectroscopy)
<b><i>Soil</i></b>	
% Solids	EPA 160.3
VOCs	EPA 5035A/8260B
SVOCs	EPA 8270C
Organochlorine Pesticides	EPA 8081A
Organophosphorous Pesticides	EPA 8141A
Organic Acids	HPLC-UV per Alpha Analytical SOP E.64 Rev.5
PCBs	EPA 8082 and/or EPA 1668A
Dioxins/Furans (PCDDs/PCDFs)	EPA 8290
Gasoline Range Organics	EPA 8015B
Diesel Range Organics	EPA 8015B
Oil Range Organics	EPA 8015B
Formaldehyde	EPA 8315A
Metals	EPA 6010B/6020 (7062/7742/7740 optional)
Mercury	EPA 7471A
Hexavalent chromium	EPA 7199
Asbestos	EPA 600/R-93/116 modified per Berman & Kolk (2000)
Alkalinity	EPA 2320B
Ammonia	EPA 350.1
Bromide	EPA 9056
Chloride	EPA 9056
Chlorate	EPA 9056
Cyanide	EPA 9012
Nitrate	EPA 9056
Nitrite	EPA 353.2
Phosphate (total)	EPA 365.1
Perchlorate	EPA 314.0
pH	EPA 9045C
Sulfate	EPA 9056
Surfactants	SM 5540C modified
Total Organic Carbon	Lloyd Kahn

**Table B-2 Analytical Methodologies (Cont'd)**

<b>Parameter</b>	<b>Methodology</b>
<b>Soil</b>	
Radium 226	EPA 903.1/EMSL modified (radon emanation/alpha scintillation)
Radium 228	EPA 904.0/ EMSL modified (beta counting)
Thorium (isotopic)	EML HASL 300 modified (alpha spectroscopy)
Uranium (isotopic)	EML HASL 300 modified (alpha Spectroscopy)
<b>Soil Gas (Air)</b>	
VOCs	EPA TO-15
<b>Synthetic Precipitate Leachate Procedure</b>	
Sample specific parameters defined in project workplans	EPA 1312

**Table B-3 Internal QC Checks for Laboratory Analyses**

Parameter	QC Check	Frequencies	Control Limits	Laboratory Corrective Actions
VOCs (soil and water)	Method blanks	One per 12 hour analytical shift of a similar matrix	No target analytes above PQL	Reextraction/reanalysis of entire batch
	Surrogate spikes	Every sample, blank, standard prior to extraction	70-130%R	Reextract or flag data
	MS/MSD samples	One pair per analytical batch- full analyte list	Per current laboratory limits.	Check LCS, reanalyze, flag results
	LCS	One per analytical batch- full analyte list	75-125%R (60-140%R SF)	Reextraction/reanalysis of entire batch
	GC/MS tuning	At beginning of each 12 hour shift	Control criteria listed in SOP	Recalibrate instrument until control criteria are met
	Internal standards	Every sample, blank, and standard	Area within 50-200% and RT within 0.5 min of IS in associated calibration standard	Reanalyze sample if no interference present
VOCs (air)	Method blanks	One per 24 hour analytical shift	No target analytes above PQL	Reanalysis of entire batch
	Surrogate spikes	Every sample, blank, and standard	70-130%R	Reanalysis
	LCS	One per analytical batch – full analyte list	Per current laboratory limits.	Check LCS, reanalyze, flag results
	GC/MS tuning	At beginning of each 24 hour shift	Per method criteria	Recalibrate instrument until control criteria are met
	Internal standards	Every sample, blank, and standard	Area within 60-140% and RT within 0.3 min of IS in associated CCV or ICAL midpoint	Reanalyze sample if no interference present
SVOCs	Method blanks	One per analytical batch	No target analytes above PQL	Reextraction/reanalysis of entire batch
	Surrogate spikes	Every sample, blank, standard prior to extraction	Per current laboratory control limits.45-135%R (20-150% SF)	Reextract or flag data

**Table B-3 Internal QC Checks for Laboratory Analyses (Cont'd)**

Parameter	QC Check	Frequencies	Control Limits	Laboratory Corrective Actions
SVOCs (cont.)	MS/MSD samples	One pair per analytical batch – full analyte list	Per current laboratory limits.	Check LCS, reanalyze, flag results if matrix effect
	LCS	One per analytical batch – full analyte list	Per current laboratory limits.50-120%R (10-150%R SF)	Reextraction/reanalysis of entire batch
	GC/MS tuning	At beginning of each 12 hour shift	Control criteria listed in SOP	Recalibrate instrument until control criteria are met
	Internal standards	Every sample, blank, standard prior to analysis	Area within 50-200% and RT within 0.5 min of IS in associated calibration standard	Reanalyze sample if no interference present
Dioxins/Furans PCDDs/PCDFs	Method blanks	One per analytical batch	No target analyte above detected above PQLs	Reextraction/reanalysis of entire batch
	MS/MSD samples	One pair per analytical batch – full analyte list	Not required by method; use lab limits or 40-135%	If recovery of labeled standards is outside criteria, re-extract to confirm matrix interferences
	LCS	One per analytical batch – full analyte list	70-130%R	Reextraction/reanalysis of entire batch
	Internal standards	Every sample, blank standard prior to analysis	40-135% for all 2,3,7,8-substituted internal standards	Evaluate matrix effects. If called for, re-extract samples using smaller sample amount.
	Mass resolution check	At beginning and end of each 12 hour shift	Must meet 10,000 resolving power	Reanalysis of entire batch
	GC column performance check	At beginning of each 12 hour shift	2,3,7,8TCDD must be <25% other congeners	Cannot begin run until criteria are met

**QUALITY ASSURANCE PROJECT PLAN  
TRONOX LLC HENDERSON, NV FACILITY**

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<b>Parameter</b>	<b>QC Check</b>	<b>Frequencies</b>	<b>Control Limits</b>	<b>Laboratory Corrective Actions</b>
PCB congeners by HRGC/HRMS	Method blanks	One per analytical batch	No target analyte above detected above PQLs (MLs) for tetra to decaCBs or 5X PQL for mono to triCBs	Reextraction/reanalysis of samples if sample results < 10x MB results, evaluate and B flag if sample >10x MB
	LCS (OPR)	One per analytical batch – analyte list per method	50-150%	Reextraction/reanalysis of entire batch
	Internal standards (labeled toxics/LOCs )	Every sample, blank standard prior to analysis	25-150% (15-150% for MoCBs)	Evaluate matrix effects. If called for, reextract samples using smaller sample amount.
	Mass resolution check	At beginning of each 12 hour shift	Must meet >10,000 resolving power in center ranges and >8,000 throughout	Reanalysis of entire batch
	Ion abundance and S/N ratios	At beginning of each 12 hour shift	Must meet Table 8 method limits and $S/N \geq 10$	Cannot begin run until criteria are met
	RT and GC resolution	At beginning of each 12 hour shift	$\pm 15$ sec. of ICAL RTs and RRTs per method	Cannot begin run until criteria are met
Organic Acids	Method Banks	One per analytical batch	No target analytes above PQL	Reextraction/reanalysis of entire batch
	LCS	One per analytical batch – full analyte list	Per current laboratory limits	Reextraction/reanalysis of entire batch
	MS/MSD samples	One pair per analytical batch – full analyte list	Per current laboratory limits	Check LCS, reanalyze, flag results if matrix effect

**Table B-3 Internal QC Checks for Laboratory Analyses (Cont'd)**

Parameter	QC Check	Frequencies	Control Limits	Laboratory Corrective Actions
Pesticides and PCBs by GC/ECD	Method blanks	One per analytical batch	No target analytes above PQL	Reextraction/reanalysis of entire batch
	Surrogate spikes	Every sample, blank, standard prior to extraction	40-140%R	Reextract or flag data
	MS/MSD samples	One pair per analytical batch – full analyte list	Per current laboratory limits.	Confirm with reanalysis, flag results
	LCS	One per analytical batch – full analyte list	50-130%R (30-150%R SF)	Reextraction/reanalysis of entire batch
	2 <sup>nd</sup> column confirmation	Every sample per lab SOP	RPD <40	Flag date
Formaldehyde	Method blanks	One per analytical batch	No target analyte above PQL	Reextraction/reanalysis of entire batch
	MS/MSD samples	One pair per analytical batch	Per current laboratory limits.	Confirm with reanalysis, flag results
	LCS	One per analytical batch	Per current laboratory limits.	Reextraction/reanalysis of entire batch
General Chemistry	Reagent/prep blanks	One per analytical batch	No analytes above PQL	Repreparation/reanalysis of entire prep batch
	MS samples (where applicable)	One per analytical batch	Per current laboratory limits.	Check LCS, flag results
	Duplicate samples	One per analytical batch	Per current laboratory limits.	Check analytical system, flag results
	LCS	One per analytical batch	Per current laboratory limits.	Repreparation/reanalysis of entire prep batch

**Table B-3 Internal QC Checks for Laboratory Analyses (Cont'd)**

Parameter	QC Check	Frequencies	Control Limits	Laboratory Corrective Actions
Metals	Reagent/prep blanks	One per analytical batch	No analytes above PQL	Repreparation/reanalysis of entire prep batch
	MS samples	One per analytical batch	75-125%	Check LCS, flag results
	Duplicate samples	One per analytical batch	RPD $\pm$ 20% waters RPD $\pm$ 35% soils	Check analytical system, flag results
	LCS	One per analytical batch	80-120%R	Repreparation/reanalysis of entire prep batch
	Interference check (Method 6010/6020)	Beginning of each analytical run or each 12-h shift, whichever is more frequent	$\pm$ 10% R	Evaluate; reanalysis if necessary
	MS tuning (Method 6020)	Prior to each analytical sequence	Control criteria listed in method	Recalibrate instrument until control criteria are met
Ra-228 904.0 modified (aqueous and soil)	Reagent/prep blanks	One per preparation batch	Not detected above default PQL	Repreparation/reanalysis of entire batch
	Digestion of soil samples	All samples	Total dissolution digestion with HF	Repreparation/reanalysis of entire batch
	Tracer	Added to all samples	70-120% R	Re-extract and reanalyze samples with tracer %Rs outside criteria
	MS samples	One per preparation batch	75-125% R	Check LCS, flag results
	LCS	One per preparation batch	75-125%R	Repreparation/reanalysis of entire batch
	Duplicate samples	One per preparation batch	RPD <20 if result >5X MDA	Check analytical system, flag results
	Sample result uncertainty	Every sample	$\leq$ 30% if activity > 2X-5X the MDA	Reanalyze with longer count time



**Table B-3 Internal QC Checks for Laboratory Analyses (Cont'd)**

Parameter	QC Check	Frequencies	Control Limits	Laboratory Corrective Actions
Ra-226 903.1 (aqueous and soil)	Reagent/prep blanks	One per preparation batch	Not detected above PQL	Repreparation/reanalysis of entire batch
	Digestion of soil samples	All samples	Total dissolution digestion with HF	Repreparation/reanalysis of entire batch
	Tracer	Added to all samples	70-120% R	Re-extract and reanalyze samples with tracer %Rs outside criteria
	MS samples	One per preparation batch	75-125% R	Check LCS, flag results
	Duplicate samples Sample result uncertainty	One per preparation batch Every sample	RPD <20 ≤ 30% if activity > 2X-5X the MDA	Check analytical system, flag results Reanalyze with longer count time

**Table B-3 Internal QC Checks for Laboratory Analyses (Cont'd)**

Parameter	QC Check	Frequencies	Control Limits	Laboratory Corrective Actions
Ra-226 903.1 (cont.)	LCS	One per preparation batch	75-125% R	Repreparation/reanalysis of entire batch
Isotopic Uranium and Isotopic Thorium HASL 300 modified alpha spectroscopy (aqueous and soil) and Ra-226 EPA 903.1/EMSL modified (radon emanation/scintillation counting) and Ra-228 EPA 904.0/EMSL modified (beta proportional counter)	Reagent/prep blanks	One per preparation batch	Not detected above RL	Repreparation/reanalysis of entire batch
	Digestion of soil samples	All samples	Total dissolution digestion with HF	Repreparation/reanalysis of entire batch
	Tracer	Added to all samples	70-120% R	Re-extract and reanalyze samples with tracer %Rs outside criteria
	MS samples	One per preparation batch	75-125% R	Check LCS, flag results
	Duplicate samples	One per preparation batch	RPD <20 if results >5X MDA	Check analytical system, flag results
	LCS	One per preparation batch	75-125% R	Repreparation/reanalysis of entire batch
	Sample result uncertainty	Every sample	≤ 30% if activity > 2X-5X the MDA	Reanalyze with longer count time

Note:

Analytical batch defined as maximum of 20 field samples of a similar matrix. Requirements apply to all matrices unless otherwise specified.

Key:

GC/MS = Gas Chromatography/Mass Spectrometry.

IS = Internal Standard.

LCS = Laboratory Control Standard.

MS/MSD = Matrix Spike/Matrix Spike Duplicate.

PQL = Practical Quantitation Limit

QC = Quality Control.

%R = Percent Recovery.

RPD = Relative Percent Difference.

RT = Retention Time.

SOP = Standard Operating Procedure.

SF = Sporadic Failure allowance

**Table B-4 Summary of Calibration Frequency and Criterion  
 Laboratory Analytical Instruments**

<b>Instrument and Method</b>	<b>Calibration Frequency</b>	<b>Calibration Standards</b>	<b>Acceptance Criteria</b>
GC/MS VOCs (water and soil)	Initial: As needed	Minimum 5 standards	CCC %RSD $\leq$ 30 SPCC RFs per method
	Verification: Daily, before sample analysis and every 12 hours	Mid-level standard	CCC %D $\leq$ 20 SPCC RF same as initial
GC/MS VOCs (air)	Initial: As needed	Minimum 5 standards	%RSD $\leq$ 30 (2 exceptions >30% but <40% allowed)
	Verification: Daily, before sample analysis and every 24 hours	Mid-level standard	CCV %D <30
GC/MS SVOCs	Initial: As needed	Minimum of 5 standards	CCC %RSD <30 SPCC RFs per method
	Continuing: Daily, before sample analysis and every 12 hours	Mid-level standard	CCC %D <20 SPCC RF same as initial
GC/ECD PCBs by GC/ECD	Initial: As needed	Minimum of 5 standards for Aroclors 1016 and 1260. Minimum of one standard (mid-level) for each of remaining Aroclors.	%RSD $\leq$ 20
	Continuing: Before sample analysis, after every 10 samples, and at end of analytical sequence	Mid-level standard of Aroclors 1016 and 1260	%D $\leq$ 15
GC/ECD Chlorinated and Organophosphorous Pesticides	Initial: As needed	Minimum of 5 standards	%RSD $\leq$ 20

**Table B-4 Summary of Calibration Frequency and Criterion Laboratory Analytical Instruments (Cont'd)**

<b>Instrument and Method</b>	<b>Calibration Frequency</b>	<b>Calibration Standards</b>	<b>Acceptance Criteria</b>
GC/ECD Chlorinated and Organophosphorous Pesticides (cont.)	Continuing: Before sample analysis, after every 10 samples, and at end of analytical sequence	Mid-level standard	%D <15
ICP/AES and ICP/MS Metals	Initial: Daily	Initial: Per manufacturer's instructions. Minimum of one standard and calibration blank.	Initial: Per laboratory SOP
	Continuing: Before sample analysis, after every 10 samples, and at end of analytical sequence	Mid-level of each metal	±10% of true value
CVAAS Mercury	Initial: As needed	5 standards plus blank	ICV ±10% of true value r ≥ 0.995
	Continuing: Before sample analysis, after every 10 samples, and at end of analytical sequence	Mid-level	±20% of true value
HPLC- UV Formaldehyde (CH <sub>2</sub> O) and Organic Acids (OA)	Initial: As needed	Minimum 5 standards plus blank	%RSD <20 ICV <u>±</u> 30%
	Continuing: Daily, before sample analysis and every 12 hours	Mid-level	<u>±</u> 15% of true value for CH <sub>2</sub> O <u>±</u> 20% of true value for OA

**Table B-4 Summary of Calibration Frequency and Criterion Laboratory Analytical Instruments (Cont'd)**

<b>Instrument and Method</b>	<b>Calibration Frequency</b>	<b>Calibration Standards</b>	<b>Acceptance Criteria</b>
Ion Chromatography Anions and Hexavalent Cr	Initial: As needed	Minimum of 3 standards plus blank	ICV $\pm 10\%$ of true value $r \geq 0.995$
	Continuing: Beginning and every 10 samples and at the end of analytical sequence	Mid-level	$\pm 10\%$ of true value
HRGC/HRMS Dioxins/Furans (PCDDs/PCDFs) by SW-846 Method 8290A	Initial: As needed	All 17 native congeners, 12 labeled congeners	RSD $\leq 20\%$ native congeners RSD $\leq 30\%$ labeled congeners
	WDM and CCV at the beginning of the day	WDM: Per method	WDM: All spiked congeners must be present
		Check resolution: HRCC3 at midpoint	HRCC3: $\leq 20\%$ D native standards: $\leq 30\%$ D labeled standards
HRCC3 at end of run or within 12 hours	HRCC3	HRCC3: $\leq 25\%$ D native standards $\leq 35\%$ D labeled standards	
HRGC/HRMS CB congeners by EPA Method 1668A	Initial: As needed	$\geq 5$ point ICAL for native toxic/LOC CBs; single pt. for all other CBs	RSD $\leq 20\%$ native toxic/LOC congeners
	CCV at the beginning of each 12-hr shift	CS-3 (VER) + combined 209 congener mix	CS-3: 70-130%R native standards 50-150%R labeled standards

**Table B-4 Summary of Calibration Frequency and Criterion Laboratory Analytical Instruments (Cont'd)**

<b>Instrument and Method</b>	<b>Calibration Frequency</b>	<b>Calibration Standards</b>	<b>Acceptance Criteria</b>
Ra-226 by Method 903.1	Initial Annual: Efficiency Calibration (annual or when daily check not within limits)	NIST Traceable Standards	Standard deviation < 10% of cell constant average
	Annual: Operating voltage, Plateau generation, Standard deviation	NIST Traceable Source	Operating voltage set at 50-150 volts above "knee" of plateau Establish new control limits if operating voltage changes
	Verification	NIST Traceable Standards	75-125%R
	Daily: Instrument Performance Check	NIST Traceable Source	Within 2-3 sigma of historical limits
	Background count for each Lucas cell to be used before every calibration and verification		Record count for each Lucas cell in a logbook, must be less than 0.267 cpm
Ra-228 by Method 904.0 modified	Annual energy and efficiency calibration	NIST Traceable Standards	Minimum of 10,000 counts
	Daily efficiency calibration check	NIST Traceable Standards	Within 2-3 sigma control limits
	Weekly Background		Within 2-3 sigma control limits

**Table B-4 Summary of Calibration Frequency and Criterion Laboratory Analytical Instruments (Cont'd)**

Instrument and Method	Calibration Frequency	Calibration Standards	Acceptance Criteria		
Isotopic Uranium and Thorium by Method HASL 300 modified	Daily Pulser Check (peak centroid, pulser count rate, peak FWHM)	NIST Traceable standards	Within 2-3 sigma control limits		
	Monthly Efficiency Calibration (energy and efficiency)	NIST Traceable standards	Within 2-3 sigma control limits		
Alpha spectrometer Radionuclides by Method HASL 300 and EPA 9315	Daily Pulser Check (peak centroid, pulser count rate, peak FWHM)	NIST Traceable standards			
	Monthly Efficiency Calibration (energy and efficiency)	NIST Traceable standards	Within 2-3 sigma control limits		
Alpha spectrometer Radionuclides by Method HASL 300 and EPA 9315 (cont)	Weekly Background		Within 2-3 sigma control limits		
<p><u>Key:</u></p> <table border="0"> <tr> <td data-bbox="261 1360 836 1902">           AES = Atomic Emission Spectrometry            CCAL = Continuing Calibration            CCC = Continuing Calibration Check            CCV = Continuing Calibration Verification            CVAAS = Cold Vapor Atomic Absorption Spectrometry            %D = Percent Difference            GC/ECD = Gas Chromatography/Electron Capture Detector            GC/MS = Gas Chromatography/Mass Spectrometry            HRCC = High Resolution Calibration Solution            ICP = Inductively Coupled Plasma spectrometry            ICV = Initial Calibration Verification            IS = Internal Standard.            LCS = Laboratory Control Standard.            MS = Mass Spectrometry            MS/MSD = Matrix Spike/Matrix Spike Duplicate            NIST = National Institute of Standards and Technology         </td> <td data-bbox="894 1360 1404 1812">           PCBs = Polychlorinated biphenyls            PCDD = Polychlorinated dibenzodioxin            PCDF = Polychlorinated dibenzofuran            PQL = Practical Quantitation Limit.            QC = Quality Control.            r = correlation coefficient            %R = Percent Recovery            %RSD = Percent Relative Standard Deviation            RPD = Relative Percent Difference            RT = Retention Time.            SD = Standard Deviation            SOP = Standard Operating Procedure            SPCC = System Performance Check Compound            TCDD = Tetrachlorodibenzodioxin         </td> </tr> </table>				AES = Atomic Emission Spectrometry CCAL = Continuing Calibration CCC = Continuing Calibration Check CCV = Continuing Calibration Verification CVAAS = Cold Vapor Atomic Absorption Spectrometry %D = Percent Difference GC/ECD = Gas Chromatography/Electron Capture Detector GC/MS = Gas Chromatography/Mass Spectrometry HRCC = High Resolution Calibration Solution ICP = Inductively Coupled Plasma spectrometry ICV = Initial Calibration Verification IS = Internal Standard. LCS = Laboratory Control Standard. MS = Mass Spectrometry MS/MSD = Matrix Spike/Matrix Spike Duplicate NIST = National Institute of Standards and Technology	PCBs = Polychlorinated biphenyls PCDD = Polychlorinated dibenzodioxin PCDF = Polychlorinated dibenzofuran PQL = Practical Quantitation Limit. QC = Quality Control. r = correlation coefficient %R = Percent Recovery %RSD = Percent Relative Standard Deviation RPD = Relative Percent Difference RT = Retention Time. SD = Standard Deviation SOP = Standard Operating Procedure SPCC = System Performance Check Compound TCDD = Tetrachlorodibenzodioxin
AES = Atomic Emission Spectrometry CCAL = Continuing Calibration CCC = Continuing Calibration Check CCV = Continuing Calibration Verification CVAAS = Cold Vapor Atomic Absorption Spectrometry %D = Percent Difference GC/ECD = Gas Chromatography/Electron Capture Detector GC/MS = Gas Chromatography/Mass Spectrometry HRCC = High Resolution Calibration Solution ICP = Inductively Coupled Plasma spectrometry ICV = Initial Calibration Verification IS = Internal Standard. LCS = Laboratory Control Standard. MS = Mass Spectrometry MS/MSD = Matrix Spike/Matrix Spike Duplicate NIST = National Institute of Standards and Technology	PCBs = Polychlorinated biphenyls PCDD = Polychlorinated dibenzodioxin PCDF = Polychlorinated dibenzofuran PQL = Practical Quantitation Limit. QC = Quality Control. r = correlation coefficient %R = Percent Recovery %RSD = Percent Relative Standard Deviation RPD = Relative Percent Difference RT = Retention Time. SD = Standard Deviation SOP = Standard Operating Procedure SPCC = System Performance Check Compound TCDD = Tetrachlorodibenzodioxin				