Lab Reference Data Summary

Structured Analysis Code: I-19-BL-01-04

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL (Method exclusive) - Waters
Method: Mercury (245.1, Cold Vapor)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

Analyte List			Detection Limits				Check List 4112							Spike List 4112						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.2	ug/L	0.0272	ug/L	20091020	C	Y	0.0050	mg/L	90	110	10	C	Y	0.005(	mg/L	90	110	10

Lab Reference Data Summary

Structured Analysis Code: I-49-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (A/B/N) - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

Target List 7111		Detection Limits					Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3172	a,a-Dimethylphenethylamine	50.0	ug/L	20	ug/L	20091002														
1	Acenaphthene	4.0	ug/L	0.28	ug/L	20090204	C	Y	100	ug/L	52	120	30	C	Y	100	ug/L	49	120	42
5	Acenaphthylene	4.0	ug/L	0.49	ug/L	20090204														
24	Acetophenone	10.0	ug/L	0.24	ug/L	20090204														
30	2-Acetylaminofluorene	100	ug/L	6.99	ug/L	20091002														
44	Acrylamide	200	ug/L	10	ug/L	20090515														
93	4-Aminobiphenyl	50.0	ug/L	4.5	ug/L	20091002														
115	Aniline	10.0	ug/L	2.0	ug/L	20090917														
122	Anthracene	4.0	ug/L	0.42	ug/L	20090917	C	Y	100	ug/L	56	120	30	C	Y	100	ug/L	52	120	30
3204	Aramite	40	ug/L	20	ug/L	20091002														
3352	Azobenzene	4.0	ug/L	0.23	ug/L	20090204														
3363	Benzal chloride	50.0	ug/L	10	ug/L	20090204														
2932	Benzenethiol	100	ug/L	50	ug/L	20090204														
199	Benzidine	100	ug/L	50	ug/L	20090204														
202	Benzo(a)anthracene	4.0	ug/L	0.35	ug/L	20090204														
205	Benzo(b)fluoranthene	4.0	ug/L	0.531	ug/L	20090917														
207	Benzo(j)fluoranthene	10.0	ug/L			0														
208	Benzo(k)fluoranthene	4.0	ug/L	0.460	ug/L	20090917														
209	Benzoic acid	25	ug/L	10	ug/L	20090917														
210	Benzo(ghi)perylene	4.0	ug/L	0.50	ug/L	20090917														
3802	Benzophenone	10.0	ug/L			0														
211	Benzo(a)pyrene	4.0	ug/L	0.31	ug/L	20090917														
215	Benzyl alcohol	10.0	ug/L	0.23	ug/L	20090204														
289	bis(2-Chloroethoxy)methane	10.0	ug/L	0.97	ug/L	20090917														
293	bis(2-Chloroethyl) ether	10.0	ug/L	0.41	ug/L	20090917														
298	bis(2-Chloroisopropyl) ether	10.0	ug/L	0.28	ug/L	20090204														
302	bis(2-Ethylhexyl) phthalate	10.0	ug/L	0.56	ug/L	20090917														
348	4-Bromophenyl phenyl ether	10.0	ug/L	0.43	ug/L	20090204														
403	Butyl benzyl phthalate	4.0	ug/L	1.0	ug/L	20090917														
2751	Carbazole	4.0	ug/L	0.43	ug/L	20090917	C	Y	100	ug/L	56	120	30	C	Y	100	ug/L	48	120	30
4967	Carbofuran phenol	50	ug/L	10	ug/L	20090515														
518	4-Chloroaniline	10.0	ug/L	2.14	ug/L	20090917														
2768	Chlorobenzilate	10.0	ug/L	0.657	ug/L	20091002														
578	4-Chloro-3-methylphenol	10.0	ug/L	2.41	ug/L	20090917	C	Y	150	ug/L	57	120	30	C	Y	150	ug/L	54	120	59
587	1-Chloronaphthalene	50.0	ug/L	1.01	ug/L	20091002														
589	2-Chloronaphthalene	4.0	ug/L	0.26	ug/L	20090204														

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Structured Analysis Code: I-49-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (A/B/N) - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

Target List 7111		Detection Limits					Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
600	2-Chlorophenol	10.0	ug/L	2.0	ug/L	20090917	C	Y	150	ug/L	55	120	30	C	Y	150	ug/L	50	120	47
602	4-Chlorophenyl phenyl ether	10.0	ug/L	1.66	ug/L	20090917														
633	Chrysene	4.0	ug/L	0.54	ug/L	20090917														
3804	6-Methylchrysene	10.0	ug/L	2.89	ug/L	20090518														
824	Diallate	20.0	ug/L	2.0	ug/L	20091002														
858	Dibenz(a,h)acridine	10.0	ug/L	2.43	ug/L	20090518														
859	Dibenz(a,j)acridine	20.0	ug/L	1.24	ug/L	20091002														
860	Dibenz(a,h)anthracene	4.0	ug/L	0.51	ug/L	20090917														
3379	Dibenzo(a,l)pyrene					0														
862	7H-Dibenzo[c,g]carbazole					0														
863	Dibenzofuran	4.0	ug/L	0.29	ug/L	20090204														
865	Dibenzo(a,e)pyrene	10	ug/L	2	ug/L	20090204														
867	Dibenzo(a,i)pyrene					0														
891	Di-n-butyl phthalate	4.0	ug/L	1.16	ug/L	20090917														
904	1,2-Dichlorobenzene	4.0	ug/L	0.23	ug/L	20090204														
907	1,3-Dichlorobenzene	4.0	ug/L	0.30	ug/L	20090204														
910	1,4-Dichlorobenzene	4.0	ug/L	0.32	ug/L	20090204	C	Y	100	ug/L	30	120	44	C	Y	100	ug/L	33	120	52
918	3,3'-Dichlorobenzidine	50.0	ug/L	2.0	ug/L	20090917														
971	2,4-Dichlorophenol	10.0	ug/L	0.64	ug/L	20090917														
973	2,6-Dichlorophenol	10.0	ug/L	1.35	ug/L	20091002														
1082	Diethyl phthalate	4.0	ug/L	0.38	ug/L	20090917														
1099	Dimethoate	20.0	ug/L	1.06	ug/L	20091002														
1115	4-Dimethylaminoazobenzene	20.0	ug/L	2	ug/L	20091002														
1120	7,12-Dimethylbenz(a)anthracene	20.0	ug/L	1.56	ug/L	20091002														
1124	3,3'-Dimethylbenzidine	20.0	ug/L	4.0	ug/L	20091002														
3803	a,a-Dimethylbenzyl alcohol	10.0	ug/L			0														
1145	2,4-Dimethylphenol	10.0	ug/L	0.58	ug/L	20090917														
1149	Dimethyl phthalate	4.0	ug/L	0.21	ug/L	20090204														
1164	1,3-Dinitrobenzene	10.0	ug/L	2	ug/L	20091002														
2785	1,4-Dinitrobenzene	10.0	ug/L	5	ug/L	20091002														
1167	4,6-Dinitro-2-methylphenol	50.0	ug/L	4.0	ug/L	20090917														
1187	2,4-Dinitrophenol	30	ug/L	10	ug/L	20090917														
1191	2,4-Dinitrotoluene	10.0	ug/L	1.66	ug/L	20090917	C	Y	100	ug/L	59	120	44	C	Y	100	ug/L	52	120	47
1193	2,6-Dinitrotoluene	10.0	ug/L	1.89	ug/L	20090917														
1196	2-sec-Butyl-4,6-dinitrophenol	20.0	ug/L	4.0	ug/L	20090204														
1162	Di-n-octyl phthalate	4.0	ug/L	0.35	ug/L	20090917														
1212	Diphenylamine	10.0	ug/L	1.06	ug/L	20091002														
1214	1,2-Diphenylhydrazine	4.0	ug/L	0.23	ug/L	20090204														
1225	Disulfoton	50.0	ug/L	1.14	ug/L	20091002														

Structured Analysis Code: I-49-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (A/B/N) - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

Target List 7111		Detection Limits					Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1362	Ethyl methanesulfonate	10.0	ug/L	0.943	ug/L	20091002														
1372	Famphur	100	ug/L	1.54	ug/L	20090917														
1414	Fluoranthene	4.0	ug/L	0.20	ug/L	20090204														
1417	Fluorene	4.0	ug/L	0.31	ug/L	20090917														
1482	Hexachlorobenzene	10.0	ug/L	0.66	ug/L	20090204														
1489	Hexachlorobutadiene	10.0	ug/L	3.3	ug/L	20090917														
1492	Hexachlorocyclopentadiene	50.0	ug/L	1.53	ug/L	20090917														
1497	Hexachloroethane	10.0	ug/L	2.1	ug/L	20090917														
1501	Hexachlorophene	---	ug/L			0														
1511	Hexachloropropene	100	ug/L	2.0	ug/L	20091002														
3476	Indene	10.0	ug/L	0.16	ug/L	20090204														
1535	Indeno(1,2,3-cd)pyrene	4.0	ug/L	0.65	ug/L	20090917														
1559	Isodrin	10.0	ug/L	1.77	ug/L	20091002														
1566	Isophorone	10.0	ug/L	0.21	ug/L	20090204														
1593	Isosafrole	20.0	ug/L	2.0	ug/L	20091002														
1596	Kepone	---	ug/L			0														
1724	Methapyrilene	50.0	ug/L	20	ug/L	20091002														
1796	3-Methylcholanthrene	20.0	ug/L	1.7	ug/L	20091002														
1810	4,4'-Methylenebis(2-chloroaniline)	100	ug/L	10	ug/L	20090204														
1825	Methyl methanesulfonate	10.0	ug/L	1.0	ug/L	20091002														
1829	2-Methylnaphthalene	4.0	ug/L	0.29	ug/L	20090204	C	Y	100	ug/L	48	120	32	C	Y	100	ug/L	48	120	32
2770	1-Methylnaphthalene	4.0	ug/L	0.23	ug/L	20090204														
1831	Methyl parathion	50.0	ug/L	3.22	ug/L	20091002														
1851	2-Methylphenol	10.0	ug/L	0.98	ug/L	20090204	C	Y	100	ug/L	50	120	30	C	Y	100	ug/L	50	120	30
1855	3-Methylphenol	10.0	ug/L	0.25	ug/L	20090204														
1857	4-Methylphenol	10.0	ug/L	0.25	ug/L	20090204														
2777	3-Methylphenol & 4-Methylphenol	10	ug/L	0.25	ug/L	20090204														
1932	Naphthalene	4.0	ug/L	0.29	ug/L	20090204														
1940	1,4-Naphthoquinone	50.0	ug/L	13.8	ug/L	20091002														
1944	1-Naphthylamine	10.0	ug/L	3.1	ug/L	20091002														
1949	2-Naphthylamine	10.0	ug/L	3.09	ug/L	20091002														
1960	2-Nitroaniline	10.0	ug/L	1.73	ug/L	20090917														
1964	3-Nitroaniline	10.0	ug/L	0.268	ug/L	20090204														
1968	4-Nitroaniline	10.0	ug/L	2.0	ug/L	20090917														
1972	Nitrobenzene	10.0	ug/L	0.81	ug/L	20090917														
1998	2-Nitrophenol	10.0	ug/L	0.39	ug/L	20090204														
2001	4-Nitrophenol	10.0	ug/L	1.23	ug/L	20090917	C	Y	150	ug/L	48	120	37	C	Y	150	ug/L	40	122	61
3240	Nitroquinoline-1-oxide	100	ug/L	20	ug/L	20091002														
2009	N-Nitrosodi-n-butylamine	10.0	ug/L	1.22	ug/L	20091002														

Structured Analysis Code: I-49-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (A/B/N) - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

	Target List 7111		Detection Limits				Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2013	N-Nitrosodiethylamine	10.0	ug/L	1.73	ug/L	20091002														
2018	N-Nitrosodimethylamine	10.0	ug/L	0.29	ug/L	20090204														
2028	N-Nitrosodiphenylamine	10.0	ug/L	0.440	ug/L	20090204														
2024	N-Nitrosodi-n-propylamine	10.0	ug/L	0.35	ug/L	20090917	C	Y	100	ug/L	52	120	30	C	Y	100	ug/L	44	120	45
2031	N-Nitrosomethylethylamine	10.0	ug/L	1.76	ug/L	20091002														
2034	N-Nitrosomorpholine	10.0	ug/L	2	ug/L	20091002														
2036	N-Nitrosopiperidine	10.0	ug/L	2	ug/L	20091002														
2038	N-Nitrosopyrrolidine	10.0	ug/L	0.804	ug/L	20091002														
2046	5-Nitro-o-toluidine	20.0	ug/L	1.40	ug/L	20091002														
3597	2,2'-oxybis(1-Chloropropane)	10.0	ug/L	0.28	ug/L	20090204														
2062	Parathion	50	ug/L	10	ug/L	20091002														
2104	Pentachlorobenzene	10.0	ug/L	2	ug/L	20091002														
2108	Pentachloroethane	50.0	ug/L	2	ug/L	20091002														
2112	Pentachloronitrobenzene	50.0	ug/L	2	ug/L	20091002														
2118	Pentachlorophenol	50.0	ug/L	20	ug/L	20090204	C	Y	150	ug/L	50	120	30	C	Y	150	ug/L	48	120	50
3505	Perylene	10.0	ug/L	3.98	ug/L	20090515														
2146	Phenacetin	20.0	ug/L	1.08	ug/L	20091002														
2154	Phenanthrene	4.0	ug/L	0.26	ug/L	20090204														
2155	Phenol	10.0	ug/L	2.0	ug/L	20090917	C	Y	150	ug/L	54	120	34	C	Y	150	ug/L	46	120	47
3284	4-Phenylenediamine	100	ug/L	5	ug/L	20091002														
2170	Phorate	50.0	ug/L	2	ug/L	20091002														
3171	Phthalic acid					0														
2858	Phthalic anhydride	400	ug/L	5.84	ug/L	20090518														
2206	2-Picoline	20.0	ug/L	1.2	ug/L	20091002														
2221	Pronamide	20.0	ug/L	2	ug/L	20091002														
2252	Pyrene	10.0	ug/L	0.370	ug/L	20090917	C	Y	100	ug/L	52	120	30	C	Y	100	ug/L	35	122	58
2256	Pyridine	20.0	ug/L	1.70	ug/L	20090917														
3477	Quinoline	50.0	ug/L	2	ug/L	20090518														
2275	Safrole	20.0	ug/L	1.13	ug/L	20091002														
2462	Sulfotepp	50.0	ug/L	2	ug/L	20091002														
2430	1,2,4,5-Tetrachlorobenzene	10.0	ug/L	1.73	ug/L	20091002														
2457	2,3,4,6-Tetrachlorophenol	50.0	ug/L	2	ug/L	20091002														
1086	Thionazin	50.0	ug/L	0.864	ug/L	20091002														
3274	2-Toluidine	10.0	ug/L	1.40	ug/L	20091002														
2512	2,4,6-Tribromophenol					0	X	Y	150	ug/L	53	120	0	X	Y	150	ug/L	47	120	0
2515	1,2,4-Trichlorobenzene	4.0	ug/L	0.28	ug/L	20090204	C	Y	100	ug/L	35	120	42	C	Y	100	ug/L	33	120	50
2555	2,4,5-Trichlorophenol	10.0	ug/L	0.45	ug/L	20090917														
2559	2,4,6-Trichlorophenol	10.0	ug/L	0.29	ug/L	20090204	C	Y	100	ug/L	52	120	30	C	Y	100	ug/L	52	120	30
2567	Triethyl amine	100	ug/L	20	ug/L	20090515														

Structured Analysis Code: I-49-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix:	WATER
Extraction:	LIQ/LIQ, CONT (A/B/N) - Acid->Base
Method:	Base/Neutrals and Acids (8270C)
QC Program:	STANDARD TEST SET
Location:	TestAmerica Denver

Target List 7111		Detection Limits					Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3937	Triethyl phosphate	--	ug/L	25	ug/L	20090515														
2569	O,O,O-Triethyl phosphorothioate	50.0	ug/L	10	ug/L	20091002														
2597	1,3,5-Trinitrobenzene	50.0	ug/L	4.0	ug/L	20091002														
1425	2-Fluorobiphenyl						X	Y	100	ug/L	39	120	0	X	Y	100	ug/L	37	120	0
1426	2-Fluorophenol						X	Y	150	ug/L	47	120	0	X	Y	150	ug/L	40	120	0
2736	Nitrobenzene-d5						X	Y	100	ug/L	55	120	0	X	Y	100	ug/L	47	120	0
2737	Phenol-d5						X	Y	150	ug/L	56	120	0	X	Y	150	ug/L	51	120	0
2738	Terphenyl-d14						X	Y	100	ug/L	54	122	0	X	Y	100	ug/L	30	127	0

Lab Reference Data Summary

Structured Analysis Code: A-13-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

	Target List 7111		Detection Limits				Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3172	a,a-Dimethylphenethylamine	1600	ug/kg	400	ug/kg	20090603														
1	Acenaphthene	330	ug/kg	10.3	ug/kg	20090603	C	Y	3330	ug/kg	46	120	32	C	Y	3330	ug/kg	36	120	50
5	Acenaphthylene	330	ug/kg	17	ug/kg	20090603														
24	Acetophenone	330	ug/kg	20	ug/kg	20090603														
30	2-Acetylaminofluorene	3300	ug/kg	59	ug/kg	20090603														
44	Acrylamide	1600	ug/kg	88.9	ug/kg	20090603														
93	4-Aminobiphenyl	1600	ug/kg	160	ug/kg	20090603														
115	Aniline	330	ug/kg	130	ug/kg	20090603														
122	Anthracene	330	ug/kg	17	ug/kg	20090603	C	Y	3330	ug/kg	57	120	30	C	Y	3330	ug/kg	57	120	30
3204	Aramite	660	ug/kg	58	ug/kg	20090603														
3352	Azobenzene	330	ug/kg	22	ug/kg	20090603														
3363	Benzal chloride	2700	ug/kg	66.8	ug/kg	20090603														
2932	Benzenethiol	3300	ug/kg	660	ug/kg	20090603														
199	Benzidine	3300	ug/kg	990	ug/kg	20090603														
202	Benzo(a)anthracene	330	ug/kg	20	ug/kg	20090603														
205	Benzo(b)fluoranthene	330	ug/kg	26.2	ug/kg	20090603														
207	Benzo(j)fluoranthene					0														
208	Benzo(k)fluoranthene	330	ug/kg	40	ug/kg	20090603														
209	Benzoic acid	1600	ug/kg	330	ug/kg	20090603														
210	Benzo(ghi)perylene	330	ug/kg	16	ug/kg	20090603														
3802	Benzophenone					0														
211	Benzo(a)pyrene	330	ug/kg	20	ug/kg	20090603														
215	Benzyl alcohol	330	ug/kg	10	ug/kg	20090603														
289	bis(2-Chloroethoxy)methane	330	ug/kg	23	ug/kg	20090603														
293	bis(2-Chloroethyl) ether	330	ug/kg	16.6	ug/kg	20090603														
298	bis(2-Chloroisopropyl) ether	330	ug/kg	23	ug/kg	20090603														
302	bis(2-Ethylhexyl) phthalate	330	ug/kg	46	ug/kg	20090603														
348	4-Bromophenyl phenyl ether	330	ug/kg	19	ug/kg	20090603														
403	Butyl benzyl phthalate	330	ug/kg	43	ug/kg	20090603														
2751	Carbazole	330	ug/kg	36	ug/kg	20090603	C	Y	3330	ug/kg	54	120	30	C	Y	3330	ug/kg	54	120	30
4967	Carbofuran phenol	2700	ug/kg	93.6	ug/kg	20090603														
518	4-Chloroaniline	330	ug/kg	81.9	ug/kg	20090603														
2768	Chlorobenzilate	330	ug/kg	57	ug/kg	20090603														
578	4-Chloro-3-methylphenol	330	ug/kg	66	ug/kg	20090603	C	Y	5000	ug/kg	50	120	33	C	Y	5000	ug/kg	36	120	50
587	1-Chloronaphthalene	2500	ug/kg	41	ug/kg	20090603														
589	2-Chloronaphthalene	330	ug/kg	10	ug/kg	20090603														

Structured Analysis Code: A-13-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

Target List 7111		Detection Limits					Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
600	2-Chlorophenol	330	ug/kg	21	ug/kg	20090603	C	Y	5000	ug/kg	49	120	32	C	Y	5000	ug/kg	32	120	62
602	4-Chlorophenyl phenyl ether	330	ug/kg	21	ug/kg	20090603														
633	Chrysene	330	ug/kg	27	ug/kg	20090603														
3804	6-Methylchrysene	330	ug/kg	65	ug/kg	20090603														
824	Diallate	660	ug/kg	86	ug/kg	20090603														
858	Dibenz(a,h)acridine	330	ug/kg	29.2	ug/kg	20090603														
859	Dibenz(a,j)acridine	660	ug/kg	61	ug/kg	20090603														
860	Dibenz(a,h)anthracene	330	ug/kg	19	ug/kg	20090603														
3379	Dibenzo(a,l)pyrene					0														
862	7H-Dibenzo[c,g]carbazole					0														
863	Dibenzofuran	330	ug/kg	20	ug/kg	20090603														
865	Dibenzo(a,e)pyrene	--	ug/kg			0														
867	Dibenzo(a,i)pyrene					0														
891	Di-n-butyl phthalate	330	ug/kg	29	ug/kg	20090603														
904	1,2-Dichlorobenzene	330	ug/kg	22	ug/kg	20090603														
907	1,3-Dichlorobenzene	330	ug/kg	12	ug/kg	20090603														
910	1,4-Dichlorobenzene	330	ug/kg	13.6	ug/kg	20090603	C	Y	3330	ug/kg	43	120	34	C	Y	3330	ug/kg	30	120	68
918	3,3'-Dichlorobenzidine	660	ug/kg	90	ug/kg	20090603														
971	2,4-Dichlorophenol	330	ug/kg	10	ug/kg	20090603														
973	2,6-Dichlorophenol	330	ug/kg	69	ug/kg	20090603														
1082	Diethyl phthalate	660	ug/kg	26	ug/kg	20090603														
1099	Dimethoate	660	ug/kg	68	ug/kg	20090603														
1115	4-Dimethylaminoazobenzene	660	ug/kg	61	ug/kg	20090603														
1120	7,12-Dimethylbenz(a)anthracene	660	ug/kg	42	ug/kg	20090603														
1124	3,3'-Dimethylbenzidine	660	ug/kg	400	ug/kg	20090603														
3803	a,a-Dimethylbenzyl alcohol					0														
1145	2,4-Dimethylphenol	330	ug/kg	66	ug/kg	20090603														
1149	Dimethyl phthalate	330	ug/kg	23	ug/kg	20090603														
1164	1,3-Dinitrobenzene	330	ug/kg	71	ug/kg	20090603														
2785	1,4-Dinitrobenzene	330	ug/kg	110	ug/kg	20090603														
1167	4,6-Dinitro-2-methylphenol	1600	ug/kg	330	ug/kg	20090603														
1187	2,4-Dinitrophenol	1600	ug/kg	333	ug/kg	20090603														
1191	2,4-Dinitrotoluene	330	ug/kg	66	ug/kg	20090603	C	Y	3330	ug/kg	48	120	30	C	Y	3330	ug/kg	33	120	49
1193	2,6-Dinitrotoluene	330	ug/kg	28	ug/kg	20090603														
1196	2-sec-Butyl-4,6-dinitrophenol	660	ug/kg	66	ug/kg	20090603														
1162	Di-n-octyl phthalate	330	ug/kg	14.4	ug/kg	20090603														
1212	Diphenylamine	330	ug/kg	44	ug/kg	20090603														
1214	1,2-Diphenylhydrazine	330	ug/kg	22	ug/kg	20090603														
1225	Disulfoton	1600	ug/kg	59	ug/kg	20090603														

Structured Analysis Code: A-13-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

Target List 7111			Detection Limits				Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1362	Ethyl methanesulfonate	330	ug/kg	55	ug/kg	20090603														
1372	Famphur	660	ug/kg	34	ug/kg	20090603														
1414	Fluoranthene	330	ug/kg	36	ug/kg	20090603														
1417	Fluorene	330	ug/kg	18	ug/kg	20090603														
1482	Hexachlorobenzene	330	ug/kg	29	ug/kg	20090603														
1489	Hexachlorobutadiene	330	ug/kg	10	ug/kg	20090603														
1492	Hexachlorocyclopentadiene	1600	ug/kg	50	ug/kg	20090603														
1497	Hexachloroethane	330	ug/kg	21.3	ug/kg	20090603														
1501	Hexachlorophene	--	ug/kg			0														
1511	Hexachloropropene	3300	ug/kg	48	ug/kg	20090603														
3476	Indene	330	ug/kg	18	ug/kg	20090603														
1535	Indeno(1,2,3-cd)pyrene	330	ug/kg	22	ug/kg	20090603														
1559	Isodrin	330	ug/kg	81	ug/kg	20090603														
1566	Isophorone	330	ug/kg	17	ug/kg	20090603														
1593	Isosafrole	660	ug/kg	19.2	ug/kg	20090603														
1596	Kepone		ug/kg			0														
1724	Methapyrilene	1600	ug/kg	100	ug/kg	20090603														
1796	3-Methylcholanthrene	660	ug/kg	67	ug/kg	20090603														
1810	4,4'-Methylenebis(2-chloroaniline)	330	ug/kg	109	ug/kg	20090603														
1825	Methyl methanesulfonate	330	ug/kg	66	ug/kg	20090603														
1829	2-Methylnaphthalene	330	ug/kg	19	ug/kg	20090603	C	Y	3330	ug/kg	55	120	30	C	Y	3330	ug/kg	55	120	30
2770	1-Methylnaphthalene	330	ug/kg	11.2	ug/kg	20090603														
1831	Methyl parathion	1600	ug/kg	137	ug/kg	20090603														
1851	2-Methylphenol	330	ug/kg	13	ug/kg	20090603	C	Y	3330	ug/kg	51	120	30	C	Y	3330	ug/kg	51	120	30
1855	3-Methylphenol	330	ug/kg	33	ug/kg	20090603														
1857	4-Methylphenol	330	ug/kg	33	ug/kg	20090603														
2777	3-Methylphenol & 4-Methylphenol	330	ug/kg	33	ug/kg	20090603														
1932	Naphthalene	330	ug/kg	31	ug/kg	20090603														
1940	1,4-Naphthoquinone	1600	ug/kg	61	ug/kg	20090603														
1944	1-Naphthylamine	330	ug/kg	50	ug/kg	20090603														
1949	2-Naphthylamine	330	ug/kg	49	ug/kg	20090603														
1960	2-Nitroaniline	1600	ug/kg	50	ug/kg	20090603														
1964	3-Nitroaniline	1600	ug/kg	73	ug/kg	20090603														
1968	4-Nitroaniline	1600	ug/kg	72.5	ug/kg	20090603														
1972	Nitrobenzene	330	ug/kg	22	ug/kg	20090603														
1998	2-Nitrophenol	330	ug/kg	10	ug/kg	20090603														
2001	4-Nitrophenol	1600	ug/kg	97	ug/kg	20090603	C	Y	5000	ug/kg	41	120	30	C	Y	5000	ug/kg	23	120	54
3240	Nitroquinoline-1-oxide	3300	ug/kg	87.9	ug/kg	20090603														
2009	N-Nitrosodi-n-butylamine	330	ug/kg	96.7	ug/kg	20090603														

Structured Analysis Code: A-13-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

Target List 7111		Detection Limits					Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2013	N-Nitrosodiethylamine	330	ug/kg	65	ug/kg	20090603														
2018	N-Nitrosodimethylamine	330	ug/kg	37	ug/kg	20090603														
2028	N-Nitrosodiphenylamine	330	ug/kg	21	ug/kg	20090603														
2024	N-Nitrosodi-n-propylamine	330	ug/kg	31	ug/kg	20090603	C	Y	3330	ug/kg	45	120	34	C	Y	3330	ug/kg	34	120	57
2031	N-Nitrosomethylethylamine	330	ug/kg	59	ug/kg	20090603														
2034	N-Nitrosomorpholine	330	ug/kg	120	ug/kg	20090603														
2036	N-Nitrosopiperidine	330	ug/kg	72	ug/kg	20090603														
2038	N-Nitrosopyrrolidine	330	ug/kg	64	ug/kg	20090603														
2046	5-Nitro-o-toluidine	660	ug/kg	62	ug/kg	20090603														
3597	2,2'-oxybis(1-Chloropropane)	330	ug/kg	23	ug/kg	20090603														
2062	Parathion	1600	ug/kg	65	ug/kg	20090603														
2104	Pentachlorobenzene	330	ug/kg	65	ug/kg	20090603														
2108	Pentachloroethane	1600	ug/kg	63	ug/kg	20090603														
2112	Pentachloronitrobenzene	1600	ug/kg	86	ug/kg	20090603														
2118	Pentachlorophenol	1600	ug/kg	330	ug/kg	20090603	C	Y	5000	ug/kg	33	120	40	C	Y	5000	ug/kg	19	120	60
3505	Perylene			81.5	ug/kg	20090603														
2146	Phenacetin	660	ug/kg	75	ug/kg	20090603														
2154	Phenanthrene	330	ug/kg	17	ug/kg	20090603														
2155	Phenol	330	ug/kg	18	ug/kg	20090603	C	Y	5000	ug/kg	48	120	34	C	Y	5000	ug/kg	36	120	54
3284	4-Phenylenediamine	1600	ug/kg	59.9	ug/kg	20090603														
2170	Phorate	1600	ug/kg	59	ug/kg	20090603														
3171	Phthalic acid	--	mg/kg	--	mg/kg	20090603														
2858	Phthalic anhydride	2500	ug/kg	760	ug/kg	20090603														
2206	2-Picoline	660	ug/kg	47	ug/kg	20090603														
2221	Pronamide	330	ug/kg	130	ug/kg	20090603														
2252	Pyrene	330	ug/kg	12.1	ug/kg	20090603	C	Y	3330	ug/kg	45	120	30	C	Y	3330	ug/kg	16	127	48
2256	Pyridine	660	ug/kg	130	ug/kg	20090603														
3477	Quinoline	1600	ug/kg	55	ug/kg	20090603														
2275	Safrole	1600	ug/kg	84	ug/kg	20090603														
2462	Sulfotepp	1000	ug/kg	58	ug/kg	20090603														
2430	1,2,4,5-Tetrachlorobenzene	330	ug/kg	49	ug/kg	20090603														
2457	2,3,4,6-Tetrachlorophenol	1600	ug/kg	137	ug/kg	20090603														
1086	Thionazin	1600	ug/kg	72	ug/kg	20090603														
3274	2-Toluidine	660	ug/kg	62	ug/kg	20090603														
2512	2,4,6-Tribromophenol					0	X	Y	5000	ug/kg	44	120	0	X	Y	5000	ug/kg	30	120	0
2515	1,2,4-Trichlorobenzene	330	ug/kg	28	ug/kg	20090603	C	Y	3330	ug/kg	46	120	35	C	Y	3330	ug/kg	35	120	62
2555	2,4,5-Trichlorophenol	330	ug/kg	10	ug/kg	20090603														
2559	2,4,6-Trichlorophenol	330	ug/kg	10	ug/kg	20090603	C	Y	3330	ug/kg	50	120	30	C	Y	3330	ug/kg	50	120	30
2567	Triethyl amine	2700	ug/kg	273	ug/kg	20090603														

Structured Analysis Code: A-13-QL-01-04

Target Analyte List: DEN: 8270C full list plus Aragonite analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

	Target List 7111	Detection Limits					Check List 4340							Spike List 4341						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3937	Triethyl phosphate			167	ug/kg	20090603														
2569	O,O,O-Triethyl phosphorothioate	1600	ug/kg	52	ug/kg	20090603														
2597	1,3,5-Trinitrobenzene	1600	ug/kg	75	ug/kg	20090603														
1425	2-Fluorobiphenyl						X	Y	3330	ug/kg	44	120	0	X	Y	3330	ug/kg	36	120	0
1426	2-Fluorophenol						X	Y	3330	ug/kg	49	120	0	X	Y	3330	ug/kg	34	120	0
2736	Nitrobenzene-d5						X	Y	3330	ug/kg	47	120	0	X	Y	3330	ug/kg	36	120	0
2737	Phenol-d5						X	Y	5000	ug/kg	49	120	0	X	Y	5000	ug/kg	37	120	0
2738	Terphenyl-d14						X	Y	3330	ug/kg	50	120	0	X	Y	3330	ug/kg	28	120	0

Lab Reference Data Summary

Structured Analysis Code: A-13-A0-01-04

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Nitroaromatics & Nitramines: Explosives (8330)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

Analyte List		Detection Limits					Check List 4139							Spike List 4139						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3373	2-Amino-4,6-dinitrotoluene	0.25	mg/kg	0.0455	mg/kg	20090317	C	Y	2.5	ug/g	66	137	40	C	Y	2.5	ug/g	66	137	40
3372	4-Amino-2,6-dinitrotoluene	0.25	mg/kg	0.0391	mg/kg	20090317	C	Y	2.5	ug/g	74	132	40	C	Y	2.5	ug/g	74	132	40
1164	1,3-Dinitrobenzene	0.25	mg/kg	0.0611	mg/kg	20090317	C	Y	2.5	ug/g	80	124	40	C	Y	2.5	ug/g	80	124	40
1191	2,4-Dinitrotoluene	0.25	mg/kg	0.0498	mg/kg	20090317	C	Y	2.5	ug/g	80	124	40	C	Y	2.5	ug/g	80	124	40
1193	2,6-Dinitrotoluene	0.25	mg/kg	0.0542	mg/kg	20090317	C	Y	2.5	ug/g	78	127	40	C	Y	2.5	ug/g	78	127	40
2912	HMX	0.25	mg/kg	0.0776	mg/kg	20090317	C	Y	2.5	ug/g	70	129	40	C	Y	2.5	ug/g	70	129	40
1972	Nitrobenzene	0.25	mg/kg	0.0614	mg/kg	20090317	C	Y	2.5	ug/g	80	121	40	C	Y	2.5	ug/g	80	121	40
1994	Nitroglycerin	5.0	mg/kg	0.1928	mg/kg	20090317	C	Y	25.0	ug/g	68	131	40	C	Y	25.0	ug/g	68	131	40
3079	4-Nitrotoluene	0.40	mg/kg	0.109	mg/kg	20090317	C	Y	2.5	ug/g	71	136	40	C	Y	2.5	ug/g	71	136	40
3078	3-Nitrotoluene	0.50	mg/kg	0.0548	mg/kg	20090317	C	Y	2.5	ug/g	75	127	40	C	Y	2.5	ug/g	75	127	40
3077	2-Nitrotoluene	0.25	mg/kg	0.0841	mg/kg	20090317	C	Y	2.5	ug/g	77	125	40	C	Y	2.5	ug/g	77	125	40
3755	PETN	4.0	mg/kg	0.8730	mg/kg	20090317	C	Y	5.0	ug/g	69	132	40	C	Y	5.0	ug/g	69	132	40
2913	RDX	0.25	mg/kg	0.0854	mg/kg	20090317	C	Y	2.5	ug/g	75	128	40	C	Y	2.5	ug/g	75	128	40
2914	Tetryl	0.50	mg/kg	0.0548	mg/kg	20090317	C	Y	2.5	ug/g	28	160	40	C	Y	2.5	ug/g	28	160	40
2597	1,3,5-Trinitrobenzene	0.25	mg/kg	0.0712	mg/kg	20090317	C	Y	2.5	ug/g	75	129	40	C	Y	2.5	ug/g	75	129	40
4255	Picric Acid	0.25	mg/kg	0.0563	mg/kg	20090317	C	Y	2.5	ug/g	50	150	30	C	Y	2.5	ug/g	50	150	30
2897	2,4,6-Trinitrotoluene	0.25	mg/kg	0.0578	mg/kg	20090317	C	Y	2.5	ug/g	72	130	40	C	Y	2.5	ug/g	72	130	40
4149	2,4-diamino-6-nitrotoluene	1.0	mg/kg	0.104	mg/kg	20090317														
4150	2,6-diamino-4-nitrotoluene	1.0	mg/kg	0.177	mg/kg	20090317														
3068	1,2-Dinitrobenzene						X	Y	2.5	ug/g	83	122	0	X	Y	2.5	ug/g	83	122	0

Lab Reference Data Summary

Structured Analysis Code: I-20-A0-01-04

Target Analyte List: All Analytes

Matrix: WATER
Extraction: EXTRACTION, SOLID PHASE
Method: Nitroaromatics & Nitramines: Explosives (8330)
QC Program: STANDARD TEST SET
Location: TestAmerica Denver

Analyte List			Detection Limits				Check List 4140							Spike List 4140						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3373	2-Amino-4,6-dinitrotoluene	0.2	ug/L	0.0507	ug/L	20091210	C	Y	2.5	ug/L	75	115	18	C	Y	2.5	ug/L	75	115	18
3372	4-Amino-2,6-dinitrotoluene	0.2	ug/L	0.0577	ug/L	20091210	C	Y	2.5	ug/L	57	115	22	C	Y	2.5	ug/L	57	115	22
1164	1,3-Dinitrobenzene	0.4	ug/L	0.0887	ug/L	20091210	C	Y	2.5	ug/L	78	115	19	C	Y	2.5	ug/L	78	115	19
1191	2,4-Dinitrotoluene	0.4	ug/L	0.0838	ug/L	20091210	C	Y	2.5	ug/L	75	115	21	C	Y	2.5	ug/L	75	115	21
1193	2,6-Dinitrotoluene	0.2	ug/L	0.0645	ug/L	20091210	C	Y	2.5	ug/L	77	115	20	C	Y	2.5	ug/L	77	115	20
2912	HMX	0.4	ug/L	0.0876	ug/L	20091210	C	Y	2.5	ug/L	78	115	26	C	Y	2.5	ug/L	78	115	26
1972	Nitrobenzene	0.4	ug/L	0.0910	ug/L	20091210	C	Y	2.5	ug/L	51	115	32	C	Y	2.5	ug/L	51	115	32
1994	Nitroglycerin	3.0	ug/L	0.921	ug/L	20091210	C	Y	25.0	ug/L	71	126	21	C	Y	25.0	ug/L	71	126	21
3079	4-Nitrotoluene	1.0	ug/L	0.20	ug/L	20091210	C	Y	2.5	ug/L	40	115	44	C	Y	2.5	ug/L	40	115	44
3078	3-Nitrotoluene	0.4	ug/L	0.0834	ug/L	20091210	C	Y	2.5	ug/L	30	115	74	C	Y	2.5	ug/L	30	115	74
3077	2-Nitrotoluene	0.4	ug/L	0.0855	ug/L	20091210	C	Y	2.5	ug/L	35	115	43	C	Y	2.5	ug/L	35	115	43
3755	PETN	2.0	ug/L	0.416	ug/L	20091210	C	Y	25.0	ug/L	67	107	30	C	Y	25.0	ug/L	67	107	30
2913	RDX	0.2	ug/L	0.0523	ug/L	20091210	C	Y	2.5	ug/L	69	118	37	C	Y	2.5	ug/L	69	118	37
2914	Tetryl	0.2	ug/L	0.0793	ug/L	20091210	C	Y	2.5	ug/L	69	127	24	C	Y	2.5	ug/L	69	127	24
2597	1,3,5-Trinitrobenzene	1.0	ug/L	0.20	ug/L	20091210	C	Y	2.5	ug/L	73	122	21	C	Y	2.5	ug/L	73	122	21
4255	Picric Acid	0.4	ug/L	0.0436	ug/L	20091210	C	Y	2.5	ug/L	50	150	30	C	Y	2.5	ug/L	50	150	30
2897	2,4,6-Trinitrotoluene	0.4	ug/L	0.0724	ug/L	20091210	C	Y	2.5	ug/L	73	116	19	C	Y	2.5	ug/L	73	116	19
4149	2,4-diamino-6-nitrotoluene	1.0	ug/L	0.36	ug/L	20091210														
4150	2,6-diamino-4-nitrotoluene	1.0	ug/L	0.32	ug/L	20091210														
3068	1,2-Dinitrobenzene						X	Y	2.5	ug/L	75	118	0	X	Y	2.5	ug/L	75	118	0

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Title: Quality Assurance Program

Approvals (Signature/Date):

Karen Kuoppala for 8/25/09	Robert C Hanisch 8/25/09
Karen Kuoppala — Date	Robert C. Hanisch — Date
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Facility Distribution No. _____ **Distributed To:_____**

1.0 PURPOSE

This policy describes TestAmerica Denver's program of routine analytical quality control (QC) activities. The objective is to generate QC data that demonstrate that the analytical process is in control and that the data meet client and method requirements. The policy outlines QC requirements for a variety of regulatory programs, with the stipulation that lacking specific direction from our clients, TestAmerica Denver will default to routine RCRA program QC requirements. TestAmerica Denver Policy DV-QA-024P, Requirements for Federal Programs, should be consulted for quality control activities specific to analyses performed under programs for the Department of Defense (DoD), Airforce Center for Environmental Excellence (AFCEE), and the Department of Energy (DOE).

2.0 SCOPE

This policy is to be enforced and followed throughout the laboratory.

QUALITY POLICY STATEMENT

The management of TestAmerica and TestAmerica Denver are committed to providing data of known quality to its clients by adhering to approved methodologies, regulatory requirements and the QA/QC protocols described in this manual. In addition, management is committed to compliance with the 2003 National Environmental Laboratory Accreditation Conference (NELAC) standards, International ANS/ISO/IEC Standard 17025 Guide 17025 (1999) and the various accreditation & certification programs listed in Appendix 6. Management is also committed to continually improving the effectiveness of the management system.

In all aspects of the laboratory and business operations, management is dedicated in maintaining the highest ethical standards. Training on ethical and legal responsibilities is provided annually and each employee signs off annually on the policy as a condition of employment.

It is TestAmerica's Policy to continually improve systems and provide support to quality improvement efforts in laboratory, administrative and managerial activities. The company recognizes that the implementation of a quality assurance program requires management's commitment and support as well as the involvement of the entire staff.

TestAmerica Denver strives to provide clients with the highest level of professionalism and the best service practices in the industry.

Every staff member at TestAmerica Denver plays an integral part in quality assurance and is held responsible and accountable for the quality of their work. It is, therefore, required that all laboratory personnel are trained and agree to comply with applicable procedures and requirements established by this document.

3.0 SAFETY

3.1 There are no specific safety hazards associated with this SOP.

3.2 During the course of performing this procedure it may be necessary to go into laboratory areas to consult with appropriate staff members, therefore employees

performing this procedure must be familiar with the Laboratory Health & Safety Plan, and take appropriate precautions and wear appropriate attire and safety glasses.

4.0 DEFINITIONS

4.1 Acceptance Criteria - The specified limits placed on characteristics of an item, process, or service defined in requirement documents.

4.2 Accuracy - The degree of agreement between an observed value and an accepted reference value.

4.3 Batch - As defined by NELAC, a batch consists of environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 samples of the same matrix, meeting the aforementioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared samples (e.g., extracts, digestates, or concentrates) that are analyzed together as a group. For QC purposes, if the number of samples in a group is greater than 20, then each group of 20 samples or less will all be handled as a separate batch.

4.4 QC Batch - The QC batch is a set of up to 20 field samples plus associated laboratory QC samples that are similar in composition (matrix) and that are processed within the same time period using the same reagents and standard lots.

4.5 Calibration - A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards.

4.6 Corrective Action - The action taken to eliminate the causes of an existing nonconformity, defect, of other undesirable situation in order to prevent recurrence.

4.7 Instrument/Calibration Blank - The instrument blank is prepared using the same solvents and reagents (e.g., hexane, methylene chloride, or reagent water) used to dilute the prepared sample extracts or digests. Unlike the method blank, it is analyzed without being subject to the preparation steps of the analytical procedure. It is used to monitor laboratory or reagent contamination introduced at the instrumental analysis phase of work. For procedures without a separate preparation step, an instrument blank is equivalent to the method blank, and serves the same purpose.

4.8 Laboratory Control Sample (LCS) - The LCS consists of a well-characterized matrix (e.g., reagent water or Ottawa sand) that is known to be free of analytes of interest, and that is spiked with known and verified concentrations of representative analytes. Alternate matrices (e.g., glass beads) may be used for soil analyses when Ottawa sand is not appropriate. As part of a QC batch, it accompanies the samples through all steps of the analytical process. The LCS is used to evaluate the performance of the total analytical system, including all preparation and analysis steps, independent of possible interference effects due to sample matrix.

4.9 Limit of Detection (LOD) - An estimate of the amount of a substance that an analytical process can reliably detect. An LOD is analyte-matrix-specific and may be laboratory-specific.

4.10 Limit of Quantitation (LOQ) - The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence.

4.11 Duplicate Control Sample (DCS) - A duplicate laboratory control sample (LCSD or DCS) may be prepared at the request of the client. It is required for some projects, particularly when insufficient sample volume is received to prepare and analyze an MS/MSD pair. LCS/LCSD pairs provide information regarding the precision of the measurement process.

4.12 Matrix Spike (MS) and Matrix Spike Duplicate (MSD)

Matrix Spike - A matrix spike (MS) is a replicate aliquot of one field sample in the QC batch that is spiked with known amounts of target analytes. An MS is spiked with the same analytes at the same concentrations that are added to the LCS. As part of the QC batch, it accompanies the field samples through all steps of the analytical process. Matrix spike data are meaningful only for the sample in which they are prepared and possibly for samples from the same site. The information obtained from MS data are sample/matrix specific and would not normally be used to determine the validity of the entire batch. However, a number of regulatory entities require matrix spikes in each batch, and so it remains a general TestAmerica Denver QC requirement.

4.12.1 Matrix Spike Duplicate - A matrix spike duplicate (MSD) consists of an additional aliquot of the same sample used to prepare the MS. This aliquot is spiked and processed exactly as is the MS.

4.12.2 The MS and MSD results are used to determine the effect of the sample matrix on the precision and accuracy of analytical results. Due to the potential variability of the matrix of each sample, the MS and MSD results may not have immediate bearing on any samples except the one spiked.

4.13 Measurement System - A test method, as implemented at a particular laboratory, and which includes the equipment and reagents used to perform the test and the analyst(s)

4.14 Method Blank (MB) - The method blank (MB) consists of a well-characterized matrix (e.g., reagent water or Ottawa sand) that is similar to the associated samples and is known to be free of the analytes of interest. The MB is prepared using the same method and reagents used for the samples. Specifically, reagents are added to the method blank in the same volumes or proportions as used in sample processing. As part of a QC batch, it accompanies the samples through all steps of the analytical procedure. The method blank is used to assess the level of contamination introduced to a batch of samples as a result of processing in the laboratory.

4.15 Method Detection Limit (MDL) - One way to establish a Limit of Detection (LOD), defined as the minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

4.16 Precision - The degree to which a set of observations or measurements of the same property obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in wither absolute or relative terms.

4.17 Sample Duplicate - A sample duplicate is a second aliquot of an environmental sample, taken from the same sample container when possible, that is processed with the first aliquot of that sample. That is, sample duplicates are processed as independent samples within the same QC batch. The sample and duplicate results are compared to determine the effect of the sample matrix on the precision of the analytical process. As with the MS/MSD results, the sample duplicate precision results are not necessarily representative of the precision for other samples in the batch.

4.18 Spike - A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality purposes.

4.19 Surrogates - Surrogates are organic compounds similar in chemical behavior to the target analytes, but that are not normally found in environmental samples. Surrogate compounds are chosen to reflect the chemistries of the targeted analytes of the method. Surrogates are added to all samples, standards, and blanks in a batch prior to sample preparation/extraction. Surrogates provide a measure of the recovery of analytes for every sample matrix and are used to monitor the effects of both the matrix and the analytical process on accuracy.

4.20 Uncertainty - a parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the analytical result. The parameter associated with most analytical results for reporting uncertainty will be the relative standard deviation derived from the control limits.

4.21 Working Range - The difference between the Limit of Quantitation and the upper limit of measurement system calibration.

5.0 PROCEDURE

- Assessments of QC data relative to established control limits determine the acceptability of sample test results. Whenever control criteria are not met, the data must be evaluated to determine appropriate corrective action. Corrective action decisions, particularly whether or not to reanalyze samples, should be done in consultation with the client to the extent possible when operating under project-specific QA plans.
- TestAmerica Denver's standard QC program shall be communicated to the client prior to acceptance of work. Alternative QC procedures may be required depending on the clients' special project requirements. In the event that alternative QC procedures are not specified by our clients, the standard QC protocols specified in this policy must be followed to ensure the generation of legally and scientifically defensible analytical data.
- Quality control requirements specific to the Department of Defense (DoD), Airforce Center for Environmental Excellence (AFCEE), and the Department of Energy (DOE) are described in a separate TestAmerica Denver policy, DV-QA-024P, Requirements

for Federal Programs. When performing analyses for DoD, AFCEE, or DOE projects, DV-QA-024P shall be consulted to ensure that program-specific requirements are met.

5.1 TestAmerica Denver's QC program applies to the following:

5.1.1 RCRA and SW-846 Projects - All routine analytical projects performed using SW-846 methods must comply with the requirements described in TestAmerica Denver's Quality Assurance Manual (QAM) and this policy. The Quality Control sections of analytical standard operating procedures (SOPs) referencing SW-846 methods must be consistent with the requirements in this policy.

5.1.2 CWA and 40 CFR Part 136 Projects - Any analytical work conducted in support of an NPDES permit or other Clean Water Act (CWA) compliance activities, must meet applicable quality control specifications as summarized in the QAM. The quality control requirements listed in the QAM define the minimum requirements that must be given in laboratory analytical SOPs.

5.1.3 Safe Drinking Water Act (SDWA) Projects – Any analytical work conducted in support of SDWA compliance activities must meet the quality control specifications shown in TestAmerica Denver Policy DV-QA-020P, "Quality Control for Drinking Water Programs."

5.2 Other Programs or Projects with Clearly Defined QC Requirements

5.2.1 The differences between TestAmerica Denver's standard QC program and special project requirements must be specified in project documents. These documents may include Quality Assurance Project Plans (QAPjPs), Quality Assurance Program Plans (QAPPs), Sampling and Analysis Plans (SAPs), project-specific Quality Assurance Summaries (QASs), SOPs, contracts, protocols, or other approved documents.

5.2.2 Documents describing special project requirements must be reviewed and approved by appropriate QA and operations staff.

5.2.3 If the special project requirements appear to result in modifications that contradict federal or state regulatory requirements, the variance must be noted in writing and communicated to the client. A record of this communication must be retained as a permanent part of the project file.

5.2.4 Any special client's project requirements must be communicated to TestAmerica Denver's analysts in advance of releasing samples for analysis, and the work must be clearly differentiated in the analytical documentation, otherwise this policy's requirements will be followed.

5.3 QC for RCRA Projects and Projects without defined QC requirements

NOTE: Analytical SOPs must include a quality control section that addresses these general QC requirements, unless method-specific requirements exist. As relevant, specific method QC requirements should be given precedence to these general requirements and must be included in the SOP.

5.3.1 Method Proficiency

5.3.1.1 The proficiency of a method is defined by its precision, bias (accuracy), limit of quantitation, limit of detection, and working range.

5.3.1.2 The limit of quantitation (LOQ) is established at the time of calibration and is typically defined as the lowest level standard that is used in the method calibration. Alternatively, the LOQ may be defined in relation to an established lower limit of detection (LOD), e.g., at least three times the LOD for DoD projects, as long as it is supported by a calibration standard.

5.3.1.3 The working range is established by the highest level standard used in the measurement system calibration.

5.3.1.4 The method detection limit (MDL), which is a measure of the LOD of the measurement system, must be initially determined in accordance with Policy DV-QA-005P. The MDL must be verified annually for most commercial projects, and quarterly for Department of Defense (DoD) projects.

5.3.1.5 Prior to using a method for actual samples and at any time there is a change in instrument type, personnel, or test method, a NELAC-compliant demonstration of capability (DOC) must be performed by the analyst(s) who will be performing the method in accordance with SOP DV-QA-0024. The analyst must analyze spiked control samples and achieve recoveries within prescribed acceptance criteria. Analysts performing a method must demonstrate their continued proficiency annually.

5.3.1.6 Evaluation of LCS data over the long term establishes the precision and bias of the analytical method free of any matrix interference. Every six months, LCS percent recovery data are retrieved from the LIMS and statistically analyzed to establish the historical mean (bias) and the 2- and 3-sigma warning and control limits (a measure of the precision of the method). The control limits should be reviewed every 10-20 LCS data points for trends, preventative measures, and/or limit changes (monthly for some methods, semi-annually for others).

5.3.1.7 Evaluation of MS and MSD data over the long term establishes the precision and bias of the analytical method in a variety of sample matrices. Every six months, the MS percent recovery are retrieved from the LIMS and statistically analyzed to establish the historical mean (bias) and the 2- and 3-sigma warning and control limits (a measure of the precision of the method). The control limits should be reviewed every 20-30 MS data points for trends, preventative measures, and/or limit changes (monthly for some methods, semi-annually for others). The MS/MSD relative percent difference data are also retrieved and evaluated to establish limits for the relative percent difference (RPD) between the MS and MSD samples.

5.3.2 Batch QC Elements and Batch Processing

5.3.2.1 A QC batch is designed to allow assessment of the quality, in terms of accuracy and precision, of the analytical results obtained for a

group of up to 20 field samples. With some exceptions as described in Sections 5.3.2.6 through 5.3.2.8 below, the minimum QC elements for each QC batch consist of the following:

- one method blank (MB),
- one laboratory control sample (LCS),
- one matrix spike (MS), and
- one matrix spike duplicate (MSD).

5.3.2.2 The identity of each QC batch must be documented and traceable, i.e., each batch of field samples must be clearly associated with the applicable QC samples.

5.3.2.3 To the extent possible, samples that require a preparation step should be analyzed together with their associated QC samples. If the samples in a given QC batch require separate analytical runs, the minimum batch QC in each run is an acceptable MB or instrument/calibration blank. To the extent possible, the QC samples should not be analyzed independently of the field samples on a different instrument.

5.3.2.4 For analytical procedures that do not include a separate extraction or digestion (e.g., volatile organic analysis by purge and trap), the QC batch must be analyzed sequentially using the same instrument and instrument configuration within the same calibration event. That is, the same calibration curve, calibration factors, or response factors must be in effect throughout the analysis.

5.3.2.5 Field QC samples (e.g., trip blanks, equipment rinsates, and field duplicates) count as individual samples, therefore, they add to the QC batch count. Samples that require simple reanalysis (e.g., dilutions to adjust a sample extract to the working range of the instrument), as opposed to re-extraction or digestion and reanalysis, do not count as additional samples in the QC batch. For procedures without a separate preparation, a reanalysis within the same calibration event (as defined in Section 5.3.2.4) does not add to the batch count.

5.3.2.6 MS/MSD pairs are not the only acceptable means of demonstrating precision.

5.3.2.6.1 As requested by clients or required by some methods, batch precision may also be demonstrated through the analysis of sample duplicates. However, the client should be advised that a sample duplicate is less likely to provide usable precision statistics depending on the likelihood of finding concentrations below reporting limits.

5.3.2.6.2 A duplicate LCS (LCSD or DCS) may be used to demonstrate method batch precision independent of the client's matrix. LCSDs are prepared at the client's request, and can be used when the client has not

supplied sufficient sample to prepare an MS and MSD, or sample duplicate.

5.3.2.6.3 On-going monitoring of LCS results can be used to determine long-term precision and accuracy for a method independent of matrix effects.

5.3.2.7 Some methods, including isotope-dilution methods, pH, and ignitability, for example, do not use all of the QC elements listed in Section 5.3.2.1. Method exceptions to these requirements are listed in the laboratory's analytical SOPs.

5.3.2.8 Deviations from these QC elements must be noted either in project planning documents (QAPPs, QAPjPs, SAPs, SOWs, QAS, or equivalent) or in a nonconformance memo (see SOP DV-QA-0031 for details).

5.3.3 Data Evaluation and Corrective Action

5.3.3.1 General Guidelines

5.3.3.1.1 Any QC component that fails acceptance criteria is considered an out-of-control event. All out-of-control events must be documented and the associated data evaluated. Depending on the specific circumstances, evaluation can lead to a variety of actions. The following sections and the flowcharts describe the appropriate corrective actions for the most common QC failures. However, it is not possible to address all possible data evaluation scenarios in this policy. The guiding principle for all evaluations is that the data and corrective action decisions must be defensible using TestAmerica Denver policies, procedures, or scientific evidence, and justified in the project records.

5.3.3.1.2 If reanalysis for QC failures is conducted and the second analysis confirms a QC problem that is outside of the laboratory's control, further testing is not necessary. The problem must be documented and the data properly qualified in the analytical report.

5.3.3.1.3 QC failures that are not corrected by reanalysis are documented in TestAmerica Denver's electronic nonconformance system (Clouseau), as described in SOP DV-QA-0031.

5.3.3.1.4 QC failures due to sample matrix interferences (particularly MS, MSD, sample duplicate, and sample surrogate failures) are documented through the use of the electronic nonconformance system. Other forms (e.g., Organic Data Review Template) may also be used to document matrix QC failures. In either case, matrix QC failures must be communicated to the laboratory project manager, and significant matrix QC failures must be discussed in the final report case narrative.

5.3.3.1.5 When ongoing, systematic problems are identified, work must stop until it can be demonstrated that the system is in control again.

5.3.3.2 Method Blank (MB) Evaluation (also see Figure 1)

5.3.3.2.1 Method Blank Acceptance Criteria

When appropriate for the specific analytical method, the results of the method blank shall be one of the QC measures used to assess batch acceptance. SW-846 guidance is to have no detectable contaminants in the method blank, i.e., the method blank result must be less than or equal to the MDL for each target analyte. However, this may not be practically achievable in a laboratory setting, and method blank contamination between the MDL and the laboratory's reporting limit may not have an adverse affect on data quality. Each method blank must be critically evaluated as to the nature of the interference and the effect on the analysis of each sample in the batch.

TestAmerica Denver policy is that the method blank is acceptable as long as all analytes of interest are less than the laboratory's reporting limit (RL) for some inorganic tests and less than ½ the RL for organic/metals analyses, unless otherwise specified by specific projects or clients. When the method blank result is above the reporting limit, the results for the associated samples may be accepted with qualification if the method blank meets one of the following criteria, unless otherwise prescribed by project-specific requirements:

- The concentration of the analyte of concern in the method blank is less than or equal to 10% (1/10) of the regulatory limit for that analyte, or
- The concentration of the analyte of concern in the method blank is less than or equal to 10% (1/10) of the measured concentration of that analyte in the sample, or
- The same analyte was not detected above the MDL in the associated samples (and therefore the apparent contamination in the blank did not represent corresponding elevated values in the samples).

NOTE: Positive method blank results slightly below the reporting limit should still be evaluated by the analyst for potential impact on sample results at or near the reporting limit.

The following criteria shall apply to DoD work unless project data quality objectives (DQOs) specify otherwise:

- Samples should be reprocessed if contamination is greater than one-half of the quantitation limit (the quantitation limit is equivalent to the laboratory's standard reporting limit), unless
- Action levels are specified and contamination is less than 5% of the project action level.

5.3.3.2.2 Corrective Action for Method Blank Failure

If the method blank does not meet the acceptance criteria, the source of contamination must be investigated and measures taken to correct, minimize, or eliminate the problem. Samples associated with the contaminated blank shall be reprocessed for analysis or, under the following circumstances, may be reported as qualified (qualifier flags or narrative comments):

- MB contamination is at a level less than the reporting limit with sample results at levels near the RL, and based on the analyst's judgement, the data may be flagged, or
- Analyte concentrations in samples are greater than 20 times blank contamination, or
- The contaminant is a common laboratory contaminant (see the table below) and the MB concentration is less than 5 times the RL for organics or less than 2 times the RL for inorganics. Note that some programs do not recognize common laboratory contaminants.

Common Laboratory Contaminants

Analyte	Method
Methylene Chloride	Volatile Organics (GC or GC/MS)
Acetone	Volatile Organics (GC or GC/MS)
2-Butanone	Volatile Organics (GC or GC/MS)
Phthalate Esters	Semi-Volatile Organics (GC or GC/MS)
Copper	Metals (ICP or GFAA)
Zinc	Metals (ICP or GFAA)
Iron	Metals (ICP or GFAA)
Lead	Metals (Trace ICP or GFAA)

5.3.3.3 Laboratory Control Samples (LCS) Evaluation (also see Figure 2)

5.3.3.3.1 LCS Acceptance Criteria

The LCS recovery for the control analytes must be within established control limits. Unless otherwise specified in a reference method or project requirements, the control limits are set at ± 3 standard deviations around the mean of the historical data. An LCS that is determined to be within acceptance criteria effectively demonstrates that the analytical system is in control and validates system performance for the samples in the associated batch.

If there are a large number of analytes in the LCS, as is the case for many organic analyses, then NELAC allows a specified number of results to fall beyond the LCS control limit (3 standard deviations), but within the marginal exceedance (ME) limits, which are set at ± 4 standard deviations around the mean of historical data (marginal exceedence limits are posted in the outlook public folders under Public folders\All public folders\Arvada\Nelac marginal exceedences. The number of marginal exceedances is based on the number of analytes in the LCS, as shown in the following: table:

# of Analytes in LCS	# of Allowed Marginal Exceedances
> 90	5
71 – 90	4
51 – 70	3
31 – 50	2
11 – 30	1
< 11	0

If more analytes exceed the LCS control limits than is allowed, or if any analyte exceeds the ME limits, the LCS fails and corrective action is necessary. Marginal exceedances must be random. If the same analyte repeatedly fails the LCS control limits, it is an indication of a systematic problem. The source of the error must be identified and corrective action taken.

The percent recovery is calculated as follows:

$$\text{LCS Percent Recovery} = \frac{\text{measured value}}{\text{expected value}} \times 100\%$$

5.3.3.3.2 Corrective Action for LCS Failure

Samples analyzed along with an LCS that is determined to be "out of control" are considered suspect and the samples must be reprocessed and reanalyzed, or the

data reported with appropriate data qualification. If the LCS result does not fall within statistical control limits, check calculations, check instrument performance, reanalyze the LCS, and if still outside of control limits, re-prepare and reanalyze all samples in the QC batch.

It is acceptable to report the data if the LCS recovery is out high and any analyte of concern was not detected in any of the samples.

In the case of volatile analyses, if the LCS fails, a new LCS may be re-prepared and reanalyzed within the same tune period.

In the case where all target requested analytes are within control, but some other LCS compounds are out of control, the LCS may still be considered acceptable for reporting.

5.3.3.4 Duplicate Laboratory Control Samples (LCS/LCSD or DCS) Evaluation (also see Figure 2)

5.3.3.4.1 LCS/LCSD Acceptance Criteria

The recovery for each analyte in the LCS and LCSD must be within established control limits as described in Section 5.3.3.3.1. The equation used to calculate LCSD recovery is the same as the equation for LCS recovery. If a batch includes samples requiring LCS control and samples requiring both LCSs and LCSDs, the LCS used will be the first LCS that passes control criteria. If either LCS fails, this must be described in the final report.

The LCS precision is calculated as the relative percent difference (RPD) between the LCS and LCSD and must not exceed the established limit. Unless otherwise specified in the reference method or in project requirements, the limit is set at the mean of the historical RPD data plus three standard deviations. The RPD between the LCS and LCSD is calculated as follows:

$$RPD = \left[\frac{|LCS - LCSD|}{\frac{(LCS + LCSD)}{2}} \right] \times 100\%$$

Where:

LCS = measured concentration for the LCS

LCSD = measured concentration for the duplicate LCS

5.3.3.4.2 Corrective Action for LCS/LCSD Recovery (Accuracy) Failure

See Section 5.3.3.3.2 for corrective actions for LCS recovery failures.

NOTE: If either the LCS or the LCSD spike fails and the batch cannot be reanalyzed, the failure must be documented and noted in the final report.

5.3.3.4.3 Corrective Action for LCS/LCSD Precision Failure

Because the LCS/LCSD precision limits are based on the standard deviation of data collected over time and include long-term precision, it would be unusual to fail precision limits while meeting accuracy limits. If this occurs with any frequency, control limits should be reevaluated. For any single precision failure, check calculations; verify, if possible, that the LCS and LCSD were spiked correctly; check instrument performance; and if the RPD is out of control but both accuracy recoveries are within acceptance criteria, prepare an NCM, and qualify the reported results.

5.3.3.5 Surrogate Evaluation (also see Figure 3)

5.3.3.5.1 Acceptance Criteria

Surrogate recovery must be within established control limits. Unless otherwise specified in a reference method or project requirements, the control limits are set at ± 3 standard deviations around the mean of the historical data. Method QC (MB, LCS, and/or LCSD) results are not acceptable unless the surrogate recoveries for those QC samples are within control limits. If MS/MSD, duplicate, or field samples require dilutions beyond the threshold stated in the analytical SOPs, routine surrogate control limits do not apply and recoveries are not evaluated. This should be noted in the final report. The surrogate recovery is calculated as follows:

$$\text{Surrogate Percent Recovery} = \frac{\text{measured value}}{\text{expected value}} \times 100\%$$

5.3.3.5.2 Corrective Action for Surrogate Failure

Corrective action must be considered for any surrogate failure. Analysts and data reviewers must review specific project instructions to be certain that the required actions are taken. Lacking instructions to the contrary, the following guidelines apply:

5.3.3.5.2.1 Routine Environmental Projects

- Check calculations and instrument performance.
- Failed Surrogates in QC Samples: Evaluate the surrogate results together with the QC sample results for all QC samples in the batch to determine whether associated samples should be re-prepared and reanalyzed. Refer to Figures 1-4 for details. For example, consistent surrogate failures in all the QC samples in a batch indicate a method failure. Surrogate failures in only one QC sample in a batch may indicate a problem with that one sample only, especially if surrogate recoveries fall within limits for all other samples in the batch. Document the failure and evaluation in the final report.
- Failed Surrogates in Field Samples: Evaluate objective evidence of matrix interference (e.g., heterogeneous sample, interfering compounds obvious on chromatograms, or interference demonstrated by prior analyses). Document the failure and note it in the final report.

5.3.3.5.2.2 Department of Defense Projects

- Check calculation and instrument performance.
- Failed Surrogates in QC Samples: Evaluate the surrogate results together with the QC sample results for all QC samples in the batch to determine whether associated samples should be re-prepared and reanalyzed. Refer to Figures 1-4 for details. For example, consistent surrogate failures in all the QC samples in a batch indicate a method failure. Surrogate failures in only one QC sample in a batch may indicate a problem with that one sample only, especially if surrogate recoveries fall within limits for all other samples in the batch. Document the failure and evaluation in the final report.
- Failed Surrogates in Field Samples: Evaluate objective evidence of matrix interference (e.g., heterogeneous sample, interfering compounds obvious on chromatograms, or interference demonstrated by prior analyses).

a) If objective evidence of interference is documented, then note the failure on the final report.

b) If objective evidence is not documented,

then re-prepare and reanalyze all associated samples

5.3.3.6 Matrix Spike and Matrix Spike Duplicates (MS/MSD) Evaluation (also see Figure 4)

5.3.3.6.1 MS/MSD Acceptance Criteria

The MS and MSD recoveries for control analytes should be within established control limits, which are either mandated in the published methods or regulatory programs, or are set at ± 3 standard deviations around the mean of historical data. In addition, the relative percent difference (RPD) between the MS and MSD results should be less than or equal to the established upper control limit. If MS or MSD samples require dilutions beyond the threshold stated in the analytical SOPs, routine control limits do not apply and recoveries are not evaluated, but this should be noted in the final report. The RPD between the MS and MSD is calculated the same way as the RPD between the LCS and LCSD, as shown in Section 5.3.3.4.1. The MS and MSD recoveries are calculated as follows:

$$\text{MS or MSD \%Recovery} = \left(\frac{SSR - SR}{SA}\right) \times 100\%$$

Where:

SSR = observed concentration in spiked sample

SR = observed concentration in unspiked sample

SA = concentration of spike added to sample

NOTES:

1. If the sample result is ND, then SR = 0 when no values are reported below RL.
2. If the sample result is reported as a value less than the RL, then SR = the reported value.
3. CLP forms software uses observed recovery, not concentrations.

5.3.3.6.2 Corrective Action for MS/MSD Recovery (Accuracy) Failure

As noted previously, matrix spike data are meaningful only for the sample in which they are prepared and possibly for samples from the same site. The information obtained from MS data are sample/matrix specific and are not normally used to determine the

validity of the entire batch. If the MS and/or MSD recovery falls outside of the established control limits, the LCS recovery must be within control limits in order to accept results for the associated samples. The following corrective actions are required for MS/MSD recovery failures:

- Check calculation and instrument performance;
- Verify, if possible, that the MS and MSD were spiked correctly;
- Consider objective evidence of matrix interference (e.g., heterogeneous sample, interfering compounds seen on chromatograms, or interference demonstrated by prior analyses); and
- Document the failure in an NCM and note it on the final report;

NOTE: Some client programs require reanalysis to confirm matrix interferences. Check special project requirements for this corrective action.

5.3.3.6.3 Corrective Action for MS/MSD Precision Failure

For any single precision failure, check calculations; verify, if possible, that the MS and MSD were spiked correctly; check instrument performance; consider objective evidence of matrix interference or sample inhomogeneity; and document the failure in an NCM.

5.3.3.7 Sample Duplicate

5.3.3.7.1 Sample Duplicate Acceptance Criteria

The RPD between the sample and its duplicate must be within established control limits. The RPD between the sample and its duplicate is calculated the same way as the RPD between the LCS and its duplicate, as shown in Section 5.3.3.4.1.

5.3.3.7.2 Corrective Action for Duplicate Failure

For any single precision failure, check calculations and instrument performance. Document the QC failure in an NCM and note it on the final report.

5.3.4 Reporting Uncertainty with Measurements

It is the responsibility of the project manager to notify the appropriate laboratory personnel whenever the uncertainty for a given analyte is to be reported. It is the responsibility of the laboratory personnel to calculate and report the uncertainty for each analyte requested in accordance with the procedures in this section

NOTE: The laboratory does not have an automated reporting mechanism for reporting the uncertainty associated with each measurement. Reporting this information would require project-specific arrangements to accommodate manual calculation and manual reporting.

5.3.4.1 Procedure

Determine the average and standard deviation of a minimum of twenty recovery results. Calculate the relative standard deviation (RSD) as follows:

RSD = SD / X avg

Calculate the uncertainty (U(X)) associated with an analytical result as follows:

U (X) = C+ (2 X RSD X C)

The average percent recovery (Xavg) and the standard deviation (SD) can be derived from the control limits (at the 99% confidence interval):

Xavg = (UCL + LCL)/2

Where: UCL=upper control limit, LCL= lower control limit

5.3.4.2 Example Calculation

The analytical result for phenol is 120 ug/L. The control limits for phenol are 33-122%. The average recovery for phenol is 77.5% with a standard deviation of 14.8%. The average percent recovery and the standard deviation can be derived from the control limits (at the 99% confidence interval).

1) Calculate the average percent recovery:

Xavg= (122+33)/2 = 77.5

2) Calculate the Standard Deviation:

SD = 14.8

Standard Deviation

$$S.D. = \sqrt{\frac{\sum_{s=1}^{m}\sum_{i=1}^{n}(y_{is} - M)^2}{(n_y - 1)}}$$

where:

s = series number

i = point number in series s

m = number of series for point y in chart

n = number of points in each series

Y_{is} = data value of series s and the ith point

N_y = total number of data values in all series

M = arithmetic mean

COMP

3) Calculate the RSD: 14.8 / 77.5 = 0.19

4) Calculate the uncertainty of the analytical result

U (x) = 120 + (2 x 0.19 x 120) = 165.6

U (x) = 120 – (2 x 0.19 x 120) = 74.4

5) Report the analytical result as 120ug/L with an uncertainty range of 74.4 ug/L to 165.6 ug/L at the 95% confidence interval.

5.3.5 Establishing QC Acceptance Limits

5.3.5.1 Initial Control Limits

5.3.5.1.1 For new procedures, published method limits can be used until sufficient QC data are acquired (a minimum of 20 to 30 data points recommended). However, the published limits may not be appropriate if they are based on a single-operator or single-laboratory study. In this case, the QA Manager may establish default limits until enough data are collected to calculate statistical limits.

5.3.5.1.2 Established control limits should be reviewed every 10-20 LCS or 20-30 MS data points for trends, preventative measures, and/or limit changes (monthly for some methods, semi-annually for others). Control limits must be reexamined semi-annually, and reset as needed. If the recalculated limits are consistent with the historical limits, the historical limits may remain unchanged.

5.3.5.2 TraQAr Control Limits Program

Evaluating control charts is an important first step in considering new control limits. Control charts are generated by the TraQAr Control Limits program. Only QA personnel who are familiar with the organization of TestAmerica Denver's spike lists are authorized to set control limits. The program collects a specified set of QC data, performs a Grubbs Outlier Test, calculates the mean and three standard deviation control limits, compares those limits to the existing limits in the LIMS, and generates an I-type control chart (ref. ASTM D 6299). This control chart is a plot of results in chronological order to which existing control limits and a centerline have been added. The control chart aids in the examination of the data to be sure that it is representative and appropriate for use in setting new limits. See Attachment 1 for complete details, but some specific requirements include the following:

5.3.5.2.1 Select QC Type Options

QC Type	Description
LCS/DCS	Used to establish LCS control limits.
LCS/DCS Surrogates	Used to establish surrogate control limits for LCS controls.
MS/MSD	Used to set matrix-specific control limits.
MS/MSD Surrogates	Used to establish surrogate control limits for MS/MSD controls.
All Surrogates	This option will produce a pooled set of LCS/LCSD, MB, MS/MSD, and sample surrogate results. The USACE does not allow this approach for setting LCS and MB surrogate limits, and so this option has been discontinued.

5.3.5.2.2 Representative Time Period

The appropriate time period depends on the frequency with which the test is performed and the frequency of other events, such as calibrations and standards preparation. A minimum of three months is desirable to capture data from multiple instruments, multiple instrument tunes, multiple calibrations, and multiple standard preparations. For infrequent tests, it may be necessary to collect nine months or more of data. However, collecting more than 100 data points is normally unnecessary, makes the control charts hard to read, and results in abnormally tight control limits.

5.3.5.2.3 Grubbs' Test for Outliers

The Control Limits program automatically runs the Grubbs' test for outliers using a 5% level of significance, i.e., the risk of falsely rejecting a data point. The initial assumption is made that the data are normally distributed. The Grubbs' test detects one outlier at a time, eliminates that outlier, and repeats the test until all outliers are eliminated. The test should not be used for sample sizes of six or less.

The test is defined for the hypothesis H0, there are no outliers in the data set, and Ha, there is at least one outlier in the data set. The test statistic "G" is calculated as the ratio of the difference between the suspect point and the mean value to the calculated standard deviation, as follows:

$$G = \frac{\max \left| Y_i - \overline{Y} \right|}{s}$$

Where:

Yi	=	the point being considered for rejection
$\overline{Y}$	=	the mean value of the data set
s	=	the standard deviation

The hypothesis of no outliers, and consequently the suspect point, is rejected if

$$G > \frac{(N-1)}{\sqrt{N}} \sqrt{\frac{t^2_{(\alpha/(2N),N-2)}}{N-2+t^2_{(\alpha/(2N),N-2)}}}$$

Where:

N	=	number of points
t(α/(2N),N-2)	=	the critical value of the t-distribution with (N-2)/2 degrees of freedom and a significance level of α/(2N).

Tables for critical values of t are given in John Taylor, Quality Assurance of Chemical Measurements, Lewis Publishers; 1987. Also see http://www.itl.nist.gov/div898/handbook/eda/section3/eda35h.htm for a complete discussion of the Grubbs' Test for Outliers.

5.3.5.3 Examine and Investigate Collected Data

Assuming that an adequate amount of data are collected, the next step involves determining that the data set is representative of the laboratory's performance, and therefore provides a useful prediction of future performance. A key part of the process is examining the data for bias, discontinuities, and/or trends. Ideally, if conditions are constant over the time period selected and existing limits are appropriate, the data will be evenly distributed around the centerline, with very few points outside control limits (i.e., less than 1 point in 100 should lie beyond the 3 standard deviation control limits). The reasons for deviations from the ideal should be investigated to be sure that the collected data are appropriate. Specific conditions requiring further investigation include data sets with no outliers, data with significant bias relative to existing limits, excessive number of outliers, discontinuous patterns, and upward or downward sloping trends (see Attachment 1).

5.3.5.4 Selecting New Control Limits

Generally control limits are based on the following statistics for the historical data:

Accuracy:	mean recovery
Precision:	standard deviation
Control Limits:	mean recovery ± 3 standard deviations

The limits cannot be wider than method or program requirements. If the calculated control limits are tighter than the method calibration verification criterion (e.g., CCV acceptance limits for ICP are ± 10% of expected value), then the new limits are set to the mean value ± calibration criterion.

5.3.5.5 Communicating and Implementing New Control Limits

The laboratory groups prepare a Control Limit review form after reviewing the control limit data. The supervisor must review the control charts and associated data and sign the review form to confirm that the data selected are representative of current performance. The memo and the control chart data are sent to the QA group for further review and establishment of new limits (if necessary). The QA department and the group supervisor will confirm a date that the instrument data systems and QuantIMS will be updated.

5.3.6 Reporting QC Data

QC data that are routinely reported with sample results include the LCS, method blank, and surrogate standards. Client reporting format requirements are negotiable and documented as part of the project records. Ultimately, all reporting decisions should accommodate the client's requirements.

6.0 RESPONSIBILITIES

6.1 Successful implementation of this QC program requires that it is clearly understood by all TestAmerica staff. Training based on this policy will be conducted periodically and provided to new personnel as appropriate for their functions.

6.2 Project Managers

6.2.1 The laboratory project managers (PMs) serve as a liaison between the clients and the laboratory staff to ensure that requirements are properly communicated in writing to both parties.

6.2.2 The PM communicates any QC problems to clients and documents decisions made with clients.

6.3 Analytical Groups

6.3.1 The analytical groups are responsible for the initial evaluation of control limits, frequently in conjunction with data review software and/or senior analysts or supervisors.

6.3.2 Analytical groups shall review control chart data and notify QA when limits need to be updated as needed.

6.4 QA Group

6.4.1 The QA manager can establish default control limits until enough data points are collected to calculate statistical limits.

6.4.2 The QA staff shall pull statistical limits when the analytical groups ask for updates to the control limits.

6.4.3 After coordinating a date and time with the analytical groups, the QA staff will update the control limits in the TestAmerica Denver LIMS system.

7.0 REFERENCES / CROSS-REFERENCES

7.1 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, USEPA SW-846, 3rd Edition, with promulgated updates, Chapter One, Quality Control, Revision 1, July 1992.

7.2 2003 NELAC Standard, EPA/600/R-04/003, June 5, 2003, Appendix D, Quality Systems.

7.3 A2LA Guidance for the Estimation of Uncertainty for testing" Thomas Adams, July 2002 (from the A2LA website)

8.0 ATTACHMENTS

Figure 1 : Method Blank Evaluation
Figure 2 : LCS/LCSD Evaluation
Figure 3 : Surrogate Evaluation
Figure 4 : Matrix Spike/matrix Spike Duplication Evaluation
Attachment 1: Guidelines for QA Staff in Setting Control Limits
Figure 5 : Example Control Limits review Form

9.0 REVISION HISTORY

- Revision 7.1, dated 26 August 2009
  - Added a Quality Policy Statement under section 2.0.
- Revision 7, dated 16 February 2009
  - Incorporated Attachment 1 QC for RCRA Projects and Projects without defined QC Requirements into the policy.
  - Changed Attachment 2 Guidelines for QA Staff in Setting Control Limits to Attachment 1.
  - Added the review of control limits every 10-20 LCS data points and 20-30 MS/MSD data points requirement.
  - Changed control chart review responsibility from the QA Department to laboratory groups.
- Previous Revisions
  - Reformatted to new TestAmerica format and renumbered under new TestAmerica

scheme. SOP was currently numbered as QA-003

- Changes From the Previous Version of the Policy
- Changed references to reflect "TestAmerica" name.
- Added section for general Measurement Uncertainty Calculations to Attachment 2.

Figure 1. Method Blank Evaluation

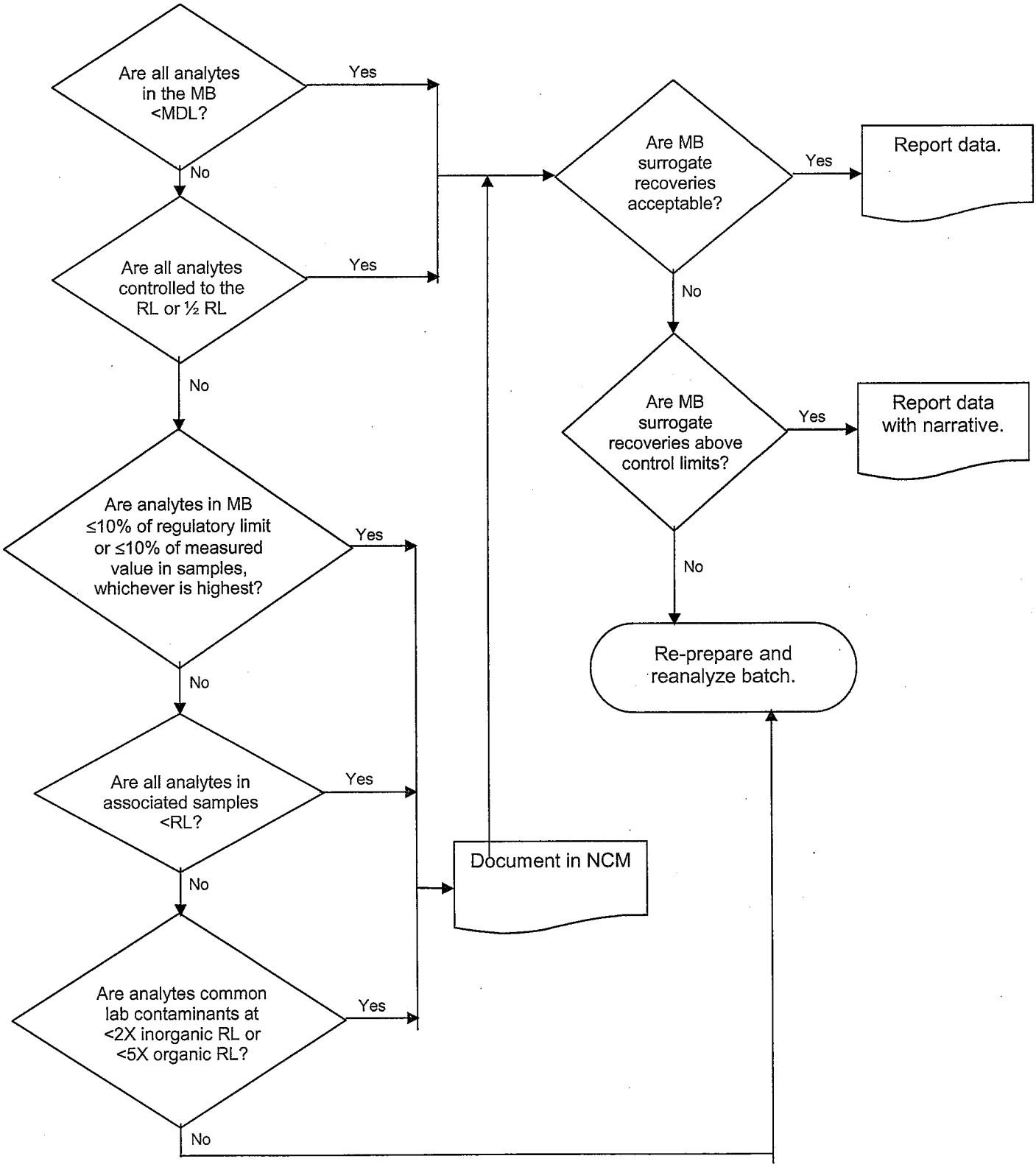


Figure 2. LCS/LCSD Evaluation

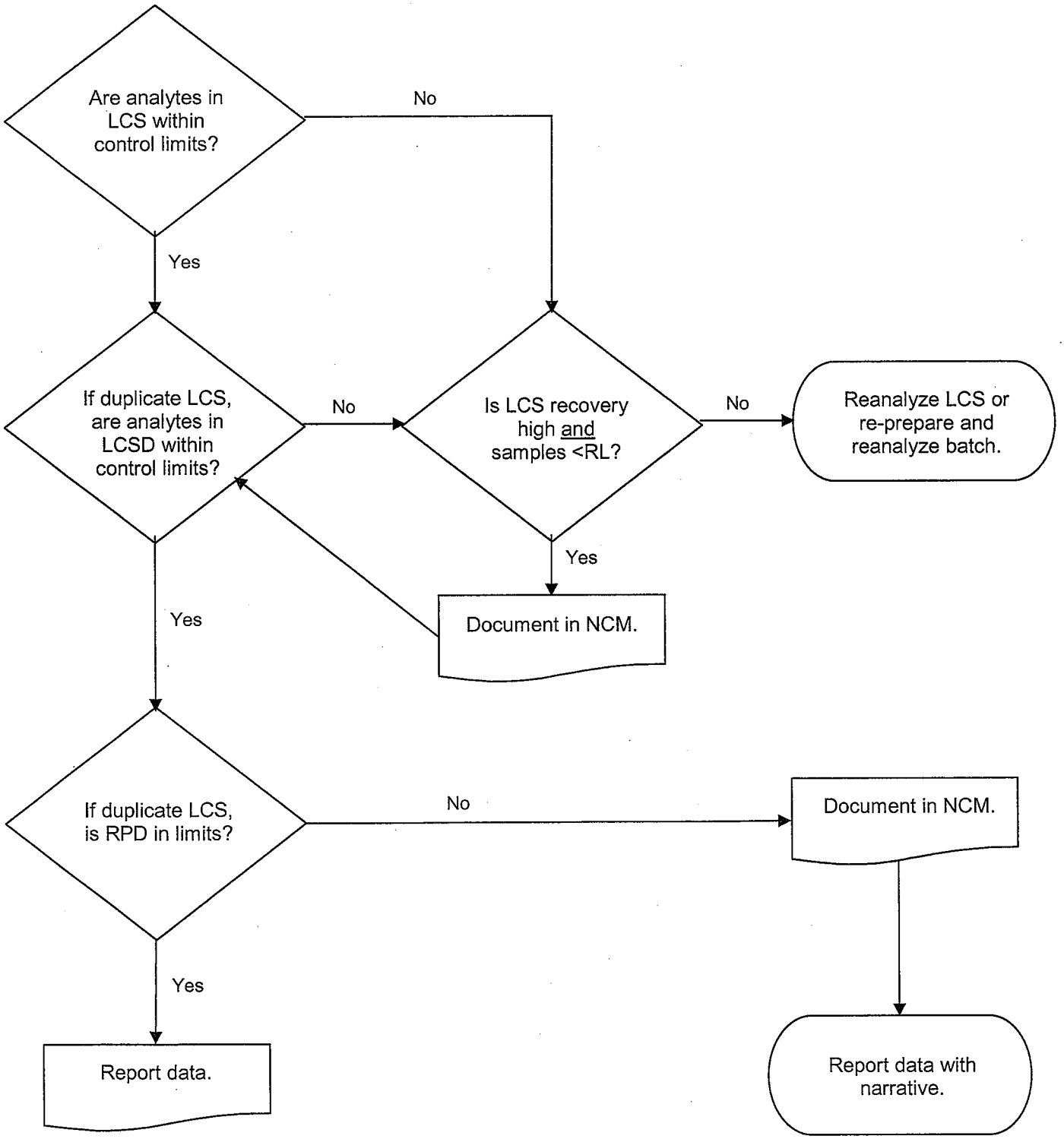


Figure 3. Surrogate Evaluation

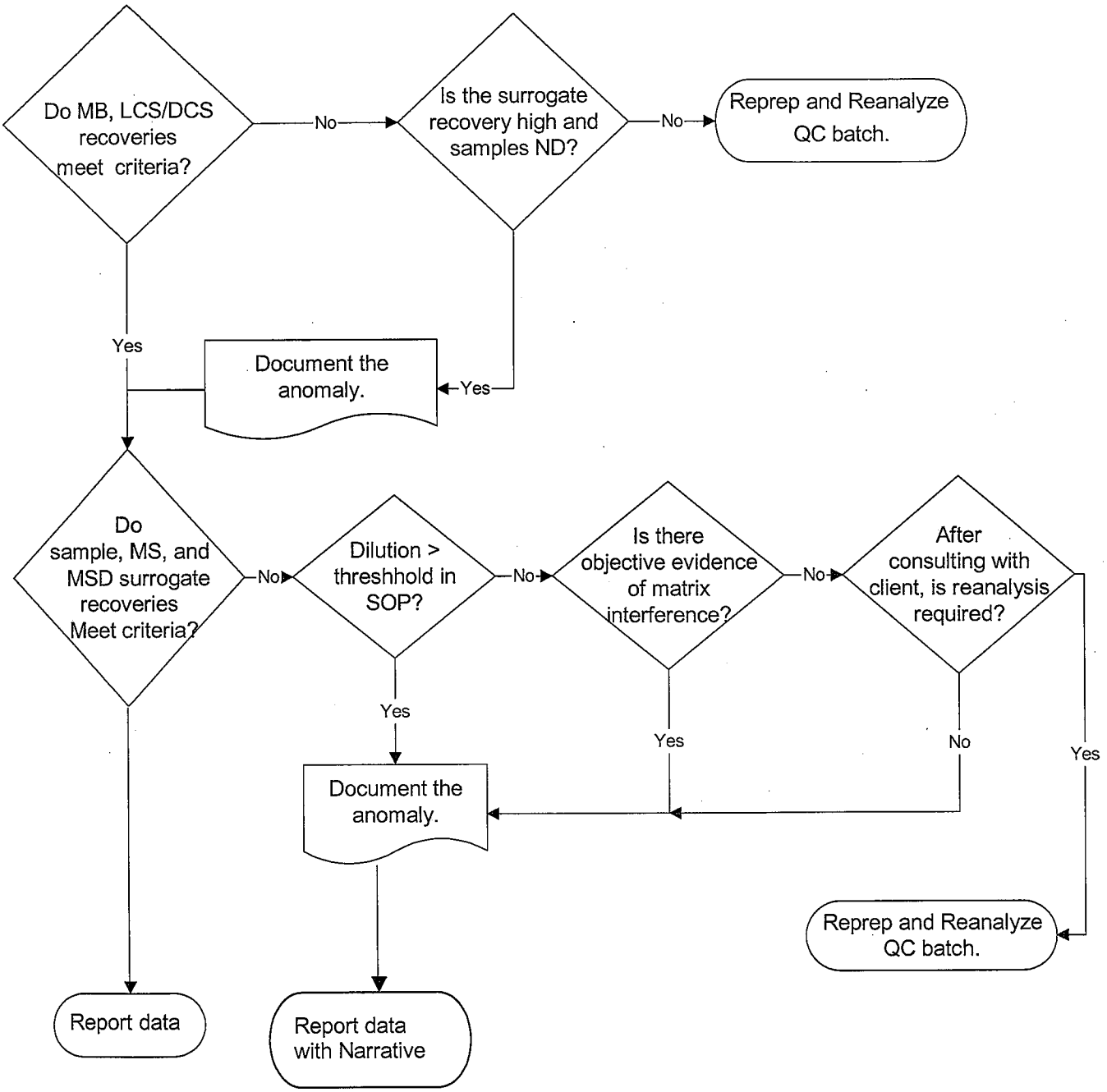
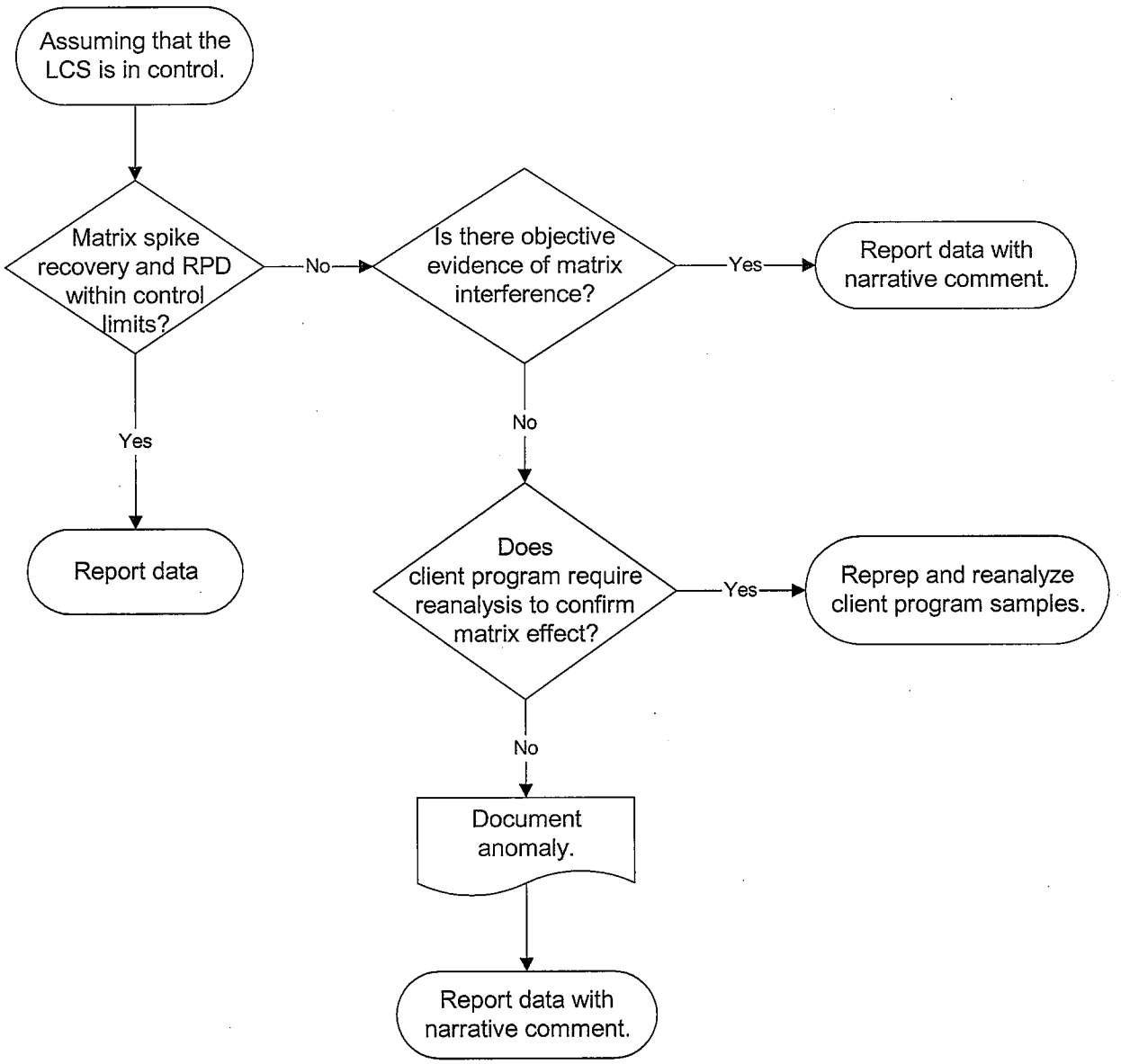


Figure 4. Matrix Spike/Matrix Spike Duplicate Evaluation



ATTACHMENT 1

Guidelines for QA Staff in Setting Control Limits

TestAmerica Denver's QC Policy (DV-QA-003P) requires control limits to be evaluated and recalculated every six months, or when necessary. Evaluating control charts is an important first step in considering new control limits. This is done using the TraQAr Control Limits program. The program collects a specified set of QC data; performs a Grubbs' test for outliers; calculates the mean and standard deviation for the data; calculates the three-standard-deviation control limits; compares those limits to the ones active in QuantIMS; and generates an I-type control chart (ref. ASTM D 6299). An I-type control chart is a plot of results in chronological order to which the existing control limits and a center line have been added. The control chart aids in the evaluation of the data to ensure that the data are representative and appropriate for use in setting new control limits.

NOTE: This attachment is written with the assumption that the user is well trained in the use of the TestAmerica Denver LIMS, i.e., QuantIMS, and its associated software tools, DLMS, TraQAr Control Limits, and QC Browser. For a better understanding of how QuantIMS is used to define an analytical system, attach analytes, and define control criteria, consult the document "Instructions for Building SACs", revised 09/18/2006.

1.0 Running the Control Limits Program

The TraQAr Control Limits program collects data from a database used for reporting purposes called DataMirror. DataMirror is regularly updated with all QC data that have been uploaded into QuantIMS.

NOTE: The control data in used by the TraQAr Control Limits program is limited to the QC data that are uploaded into QuantIMS. In many cases, failed QC data are not uploaded. Consequently the control limits calculated by the TraQAr program are most likely artificially tight.

1.1 Select QA Access Option

This option is available to only QA personnel. In addition to the control charting capability of the On-Line Control Charts option, the QA Access option allows the user to also perform rejection testing and to calculate new limits. Selecting this option brings up the Control Limits and Charts Program screen.

1.2 Check that the location is set properly, i.e., "Denver."

1.3 Specify the Data to be Collected

1.3.1 Select the QC Type

- LCS/DCS – This option brings up a list of spike lists in the QuantIMS Spike List window that dictate control limits for the LCS and the LCSD. These lists are also used when project requirements dictate the use of LCS control limits for the MS and MSD.
- MS/MSD – This option brings up a list of spike lists in the QuantIMS Spike List window that dictate control limits for the MS and the MSD.

These spike lists are used when statistical limits are required for the MS/MSD that are separate from the LCS limits.

- LCS/DCS Surrogates - This option brings up the same list of spike lists as for the LCS/DCS option above, but includes data for the surrogates only.
- MS/MSD Surrogates – This option brings up the same list of spike lists as for the MS/MSD option above, but includes data for the surrogates only.
- All Surrogates – This option will produce a pooled set of LCS/LCSD, MB, MS/MSD, and sample surrogate results. The USACE does not allow this approach for setting LCS and MB surrogate limits, and so this option is not used.

1.3.2 Select a Spike List

In QuantIMS, control limits for control analytes are entered and maintained using Spike Lists. Each Spike List defines a set of spike compounds, spike amounts, and control limits for a variety of matrices. Specific Spike Lists are associated with analytical methods in QuantIMS by attaching an LCS and an MS Spike List to the SAC (Structured Analysis Code). If LCS control limits must be applied to MS data, then the same Spike List is attached for both the LCS and MS.

NOTE: To ensure that the correct Spike Lists are selected for a given analytical method, use the DLMS program to identify all the possible combinations of method codes, sample preparation codes, and QC program codes for a given analytical method and matrix. Then use the QC Browser program to determine which Spike Lists are attached to specific SACs (i.e., combinations of matrix, analytical method, sample preparation method, and QC program).

On the Control Limits and Charts Program screen, click on the desired spike list to select it. A list of associated SACs (QC, method, and preparation codes), as well as excluded SACs, appear in the windows directly below the QuantIMS Spike List window.

1.4 Select a Representative Time Period

The appropriate time period depends on the frequency with which the test is performed and the frequency of other events, such as calibrations and standards preparation. The desirable number of data points is 30. As few as seven data points may be used to calculate control limits, but this number is too few to be truly representative of most data sets. Using more than 200 data points can result in artificially tight limits.

Ideally, control limits should be established for a particular calibration and applied throughout the period that the calibration is applicable. Limits should then be re-evaluated when the analytical system is recalibrated. Since data are pooled for a particular analytical method, the data set often includes data from multiple instruments and calibration events. Control limits must be re-evaluated at least every six months. Therefore, a minimum of six months should be selected for the initial data evaluation, which will capture data from multiple instruments, multiple

instrument tunes, multiple calibrations, and multiple standard preparations. This period may be adjusted depending on the number of data points available and the data distribution in the control chart. For infrequent tests, it may be necessary to collect up to a year's worth of data.

After making all the required selections, click the Collect Data button to retrieve the selected data, run the Grubbs' Test for Outliers, construct the control charts, and calculate limits.

1.5 Grubbs' Test for Outliers

The Control Limits program automatically runs the Grubbs' Test for Outliers using a 5% level of significance, i.e., the risk of falsely rejecting a data point. The initial assumption is made that the data are normally distributed. The Grubbs' test detects one outlier at a time, eliminates that outlier, and repeats the test until all outliers are eliminated. The test should not be used for sample sizes of seven or less.

The test is defined for the hypothesis H0, there are no outliers in the data set, and Ha, there is at least one outlier in the data set. The test statistic "G" is the largest absolute deviation from the sample mean in units of the sample standard deviation. It is calculated as follows:

$$G = \frac{\max \left| Y_i - \overline{Y} \right|}{s}$$

Where:

Yi = The point being considered for rejection

$\overline{Y}$ = The mean value of the data set

s = The standard deviation

The hypothesis of no outliers, and consequently the suspect point, is rejected if

$$G > \frac{(N-1)}{\sqrt{N}} \sqrt{\frac{t^2_{(\alpha/(2N),N-2)}}{N-2+t^2_{(\alpha/(2N),N-2)}}}$$

Where:

N = number of points

$t(\alpha/(2N),N-2)$ = the critical value of the t-distribution with (N-2)/2 degrees of freedom and a significance level of $\alpha/(2N)$.

Tables for critical values of t are given in John Taylor, Quality Assurance of Chemical Measurements, Lewis Publishers; 1987. Also see http://www.itl.nist.gov/div898/handbook/eda/section3/eda35h.htm for a complete discussion of the Grubbs' Test for Outliers.

1.6 Select Chart Option and Print Charts

When the Grubbs' test is completed, a box will pop up announcing completion of the test. Clicking OK on this window brings up the Control Limits Review screen.

From this screen, selections can be made to view and/or print a control limits report and/or control charts. It is also possible to export the data into an Excel spreadsheet for further manipulation.

Click on the Control Limits Report button to bring up a tabulation of the following data for each control analyte:

- Spike amount and units
- Number of data points
- Calculated mean and standard deviation
- Current QuantIMS control limits (LCL, UCL, and RPD limit)
- Calculated limits using selected data (LCL, UCL, and RPD limit)

The control limits report may be printed by selecting Print from the File menu.

Click the Chart button to display the control chart for each control analyte. Each chart displays the data plotted in chronological order with the mean and upper and lower control limits that are currently in QuantIMS. This allows comparison of the current control data to the established limits to determine whether there have been any significant changes in the data that would necessitate revision of the control limits. Each chart also displays the data that appears on the Control Limits Report. The control charts may be printed by selecting Print from the File menu.

2.0 Calculating Marginal Exceedance Limits

The TraQAr Control Limits Program does not calculate the 4-standard deviation marginal exceedance limits that are used when there are a large number of analytes in the LCS. As explained in Section 5.3.1 of Attachment 1, if there are a large number of analytes in the LCS, then NELAC allows a specified number of results to fall beyond the LCS control limits (± 3 standard deviations), but within the marginal exceedance (ME) limits, which are set at ± 4 standard deviations around the mean of historical data.

NOTE: When calculating 4-standard deviation limits, it is possible to calculate a negative lower control limit. To prevent this, the lower control limit must always be ≥ 1.

After using the TraQAr Control Limits program to collect data and calculate limits, the control data are exported to a verified spreadsheet tool that calculates the 4-standard deviation limits for marginal exceedances.

3.0 Calculating RPD Limits

The TraQAr Control Limits Program also calculates limits for the relative percent difference (RPD) between LCS and MS duplicates. When there are insufficient LCS or MS duplicate data, these calculated limits may not be appropriate. An alternate approach has been developed to estimate the RPD limit using the precision data for the LCS or MS percent recovery data.

The assumption is made that the standard deviation of the recovery data is representative of the one-sigma analytical uncertainty. The difference between an LCS or MS and its duplicate is calculated as follows:

$$Diff = S - SD$$

Where S is the sample (LCS or MS) result and SD is the duplicate (LCSD or MSD) result.

The propagated uncertainty at the 99% confidence level of the difference between an LCS or MS and its duplicate is calculated as follows:

$$U_{Diff} = 1.96 \times \sqrt{(U_S)^2 + (U_{SD})^2}$$

Where:

US	=	Uncertainty of the sample result, estimated by the standard deviation of a set of control data.
USD	=	Uncertainty of the duplicate result, estimate by the standard deviation of a set of control data.
1.96	=	Student's t value for alpha =0.05 (95% confidence) and 29 degrees of freedom (for the typical data set of 30).

Since the sample result and its duplicate come from the same data population, US equals USD, and the equation can be rewritten as follows:

$$U_{Diff} = 1.96\sqrt{2s^2}$$

Where s is the standard deviation of the data set.

For example, the mean percent recovery of a set of LCS data is 100%; the standard deviation is 10%; and the control limits are set at ± three standard deviations, or 70 to 130%. Using the equation for the propagated uncertainty of the difference, the RPD limits for duplicates would be set at 28%.

Although this is not a rigorous statistical treatment of the data, the resulting RPD limit is a reasonable estimate of the expected precision for duplicate sample results given the demonstrated precision of the percent recovery data. Data from the TraQAr Control Limits database are exported to a verified spreadsheet tool that calculates both the RPD limit and the 4-standard deviation limits for marginal exceedances.

4.0 Evaluating and Investigating Collected Data

Assuming that an adequate amount of data are collected, the next step involves determining whether the data set is representative of the laboratory's performance, and therefore provides a useful prediction of future performance. A key part of the process is examining the data for bias, discontinuities, and/or trends. Ideally, if conditions are constant over the time period selected and existing limits are appropriate, the data will be evenly distributed around the centerline, with less than one in 100 points beyond the control limits. The following are very general guidelines for assessing the representativeness of a data set that does not follow the ideal pattern.

4.1 No Outlier Data

If there are no outlier data and little or no data outside the 2-standard-deviation warning limits, then one of the following is true:

4.1.1 Insufficient data have been collected, which can be tested by generating charts using a longer time period.

4.1.2 Outlier data are being censored (not entered into QuantIMS). Check with the analysts to verify this. Analysts should be told that omitting outliers (not blunders, but statistical outliers) is essential to avoid generating even tighter limits.

4.1.3 Existing limits are much too wide (possibly because the performance of the analytical system has significantly improved) and should be changed immediately (see section on Establishing New Control Limits below).

4.2 Bias Relative to Existing Limits

If there are a significant majority of QC results falling on one side of the centerline, then consider the following:

4.2.1 The procedure, equipment, or calibration may have changed. Verify the accuracy of the SOP with analysts.

4.2.2 The analyst's skill level may have changed. Check with the supervisor to find out if new analysts might account for the bias.

4.2.3 Equipment may have been changed. Check with supervisor.

4.2.4 The standards used for calibration, including those used for internal standards, may have changed or may have been incorrectly prepared.

4.2.5 The time since the limits were last set may be longer than six months, and an update to the control limits is overdue.

4.3 Excessive Number of Outliers

If significantly more than 1 point in 100 is outside the control limits, the following should be considered:

4.3.1 The variability in the analytical system may have changed significantly, either as the result of a specific event, or degradation in the instrumentation.

4.3.2 The existing limits may not be statistically based. Review control limits records to check the basis of the old limits.

4.3.3 Audit the method to verify the accuracy of the SOP, competency of the analysts, and reliability of the instrumentation.

4.3.4 Consult with the supervisor.

4.3.5 Compare laboratory's performance to other laboratories. The Tri-Agency QSM limits is one source of limits by competent laboratories, other TestAmerica laboratories is another, and method limits have to be considered as well. Limits should not be widened if the laboratory's performance is not consistent with other labs.

4.4 Discontinuous Pattern

If the data appear to run for a period at one mean recovery and then suddenly jump to a different level, then the following should be considered:

4.4.1 The accuracy of the analytical system experienced a statistically significant change, and most likely there is an event that caused that change, such as recalibration, change in instrument or instrument settings, change in calibration standards, change in methodology, or a change in analyst.

4.4.2 Consult with the supervisor.

4.4.3 Unless the discontinuity is characteristic of the method somehow, a decision will usually need to be made as to which mode of operation is the best predictor of future performance. A selective time period may be used for calculating representative limits.

4.5 Upward or Downward Sloping Pattern

An upward or downward trend is typically indicative of an unstable instrument or progressive changes in background or contamination levels. Such trends are early warning that the analytical system will soon be out of control. When a trend is detected, investigate as follows:

4.5.1 Consult with the supervisor, and have the supervisor consider the condition of standards and maintenance of equipment.

4.5.2 Review the SOP and check the proficiency of the analysts.

4.5.3 Reliable control limits cannot be set using data during an unstable period. Maintaining the old limits until a stable period is documented is probably the best course.

5.0 Establishing New Control Limits

Having collected sufficient data and determined that the data are representative, the next step is to establish the new limits. Control limits are set at ± 3 standard deviations around the mean of the collected data with the following exceptions:

5.1 If the calculated 3-standard-deviation limits are tighter than the method calibration verification criteria (e.g., CCV acceptance limits for ICP are ± 10% of the expected value), then the new limits are set to the mean value ± the calibration acceptance limits.

5.2 If the calculated limits are wider than method or program requirements, then the laboratory's performance should be reconsidered. If the limits are marginally wider, inspect the control chart to estimate the frequency of failures using the program limits. If, based on the control chart, the failure rate is predicted to be low (less than 2% is normally acceptable), then program limits might be adopted. Otherwise the laboratory will need to either not offer the test or request a variance.

5.3 If the lower control limit is very low, e.g., less than 10%, there is a concern about accepting data that is not quantitatively reliable. Inspect the control chart data to predict the failure rate if the lower control limit is elevated to 10%. If, based on the control chart, the failure rate is predicted to be low, then the lower control limit might be elevated to 10%.

5.4 If the upper control limit is less than 100% recovery plus the method calibration verificaiton acceptance limit, then adjust the upper limit to 100% plus the calibration acceptance limit. For example, if CCV acceptance limits are ± 10% of the expected value, then set the upper control limit to 110%.

The basis of the new control limits must be documented. Annotation may be made directly on the printed control charts or control limits reports, and must be signed and dated.

6.0 Communicating and Implementing New Control Limits

6.1 Compile all reviewed data, control charts, and control limits reports.

6.2 Prepare a memo from QA to the affected group leader that summarizes the control limit and control chart reviews, and compares the new control limits to the old. Place a line at the bottom of the memo for the signature of the group leader. See the example in Figure 1 below.

6.3 Send the memo and compiled charts and data to the affected group leader for review. The group leader must review the data compilation, and sign the memo to signify that the selected data are representative of the current performance.

6.4 The group leader must return the signed memo and compiled control data to QA.

6.5 QA and the group leader will confer to set an implementation date for the new limits. The implementation date is the date when the control limits will be update in QuantIMS and in any local databases used by the laboratory group (e.g., the Target database, which is used for chromatography data).

6.6 The memo and associated data and charts are scanned as an Adobe Acrobat file (i.e., pdf file) and saved to the QA public drive in the "Control Limits" subdirectory.

6.7 QA personnel are responsible for updating control limits in QuantIMS (option Q35) and notifying group leaders by e-mail when limits are updated. Refer to the document "Instructions for Building SACs" for instructions on how to update limits in QuantIMS.

Figure 5. Example Control Limits Review Form

TestAmerica Denver

CONTROL CHART REVIEW *(Save Record of Review with .pdf of charts & notify QA via e-mail – DenverQAHelpdesk)*

Method:		**Prep(s):**		**QC Program(s):**	
Spike List(s):					
Group:		**Group Leader:**			
Reason for review:	☐ 6-month limits update	☐ periodic routine review	☐ analytical system change		
Reviewed By:		**Date:**			

Reference TAL Denver Policy DV-QA-003P, *Quality Control Program.*

Purpose: Control charts and associated data are reviewed to (1) verify that the analytical system operated within statistical control; (2) verify that the data set used is truly representative of the laboratory's performance over the indicated time period, and therefore can be used to predict future performance; (3) to determine whether the existing limits should be updated based on the new data set; (4) to determine whether the newly calculated limits can be used as is or should be modified to be consistent with program requirements or continuing calibration criteria; (5) to determine whether the lab's statistical limits meet applicable program requirements.

Instructions: Use the TraQAr Control Limits program to print control charts for a specific time period. Examine each control chart in the attached package and document your review below. Record the results of investigations and any corrective actions taken on the appropriate control charts. Statistical control criteria are not applied to poor performing compounds, since by definition, the variability of the analytical performance of these compounds is not randomly distributed.

√	Reviewed For	Specific Measure Control Failures / Anomalies Found
	Outliers	☐ No outliers appear in any chart because only compliant data are uploaded to the LIMS. ☐ All outliers were investigated and the data and explanation or NCM number were recorded on the applicable charts or noted in the comment section below. ☐ An excessive number of outliers were noted on one or more charts. The data were investigated for increased variability and an explanation is written on the applicable chart(s) or in the comment section below.
	Biases	☐ On one or more charts, the data exhibit a significant bias compared to the existing LIMS limits. The bias was investigated and an explanation is written on the applicable chart(s) or in the comment section below.
	Discontinuous Patterns	☐ On one or more control charts, a discontinuous pattern was noted. The pattern was investigated and an explanation is written on the applicable chart(s) or in the comment section below.
	Trends	☐ On one or more control charts, an upward or downward trend is noted. The trend was investigated and an explanation is written on the applicable chart(s), unless the trend was short-lived, corrected itself, and did not significantly affect data quality.
	Comparison to Method / Program Limits	☐ The newly calculated statistical limits were compared to any applicable method or program limits. Any limits that did not meet the method/program limits were investigated and an explanation written on the applicable chart(s) or in the comment section below.
	Control Limits Update	☐ For one or more control charts, the existing limits are still applicable and do not need to be changed as noted on the applicable control chart(s) or the Control Limits Summary. ☐ For one or more control charts, the control limits shall be updated to the newly calculated limits as noted on the applicable control chart(s) or the Control Limits Summary. ☐ For one or more control charts, the upper control limit is less than the CCV upper limit, therefore the limits will be updated to the newly calculated lower control limit and the upper CCV limit, as noted on the applicable control chart(s) or the Control Limits Summary. ☐ For one or more control charts, the newly calculated limits are tighter than the CCV criteria, therefore the limits will be updated to the newly calculated mean ± the CCV limits, as noted on the applicable control chart(s) or the Control Limits Summary. ☐ For one or more control charts, the newly calculated lower control limit is < 10%, therefore the lower control limit is set at 10%.

Comments:

.pdf record of charts saved to: L:\ (paste location path)	*Notify QA of needed updates by e-mail for implementation.	Date:
(For QA) Entered By: Date:	Reviewed By:	Date:

Project Information

MWH-Pasadena/Boeing

618 Michillinda Avenue, Suite 200
Arcadia, CA 91007
Laboratory PM: **Joseph Doak**
Phone: **(626) 796-9141**
Fax: **(626) 568-6515**

2/18/2010

Project Name:	Annual Outfall 001	**Invoice To:**	MWH-Pasadena
Project Number:	Annual Outfall 001	**Invoice Bid:**	Boeing SSFL (Effective 10/20/08)
Client PM:	Bronwyn Kelly	**Invoice Manager:**	Accounts Payable
Comments:	See comments for EDD/Level IV to subs **Cr VI only if on COC** Radchem to St Louis Web & EDD (Access 7, no charge)		

Analysis contained in this project

Copper-200.8	Boron-200.7, Diss	Cadmium-200.8
Cadmium-200.8, Diss	Chloride - 300.0	Chromium VI-218.6
Chromium-200.7	Chromium-200.7, Diss	Cobalt-200.7
1613-Dioxin-HR OUT	Conductivity-120.1	Bioassay-Acute 96hr
Copper-200.8, Diss	Cyanide, Total-4500CN-E (5ppb	EDD + Level 4
Filtration-DisMetals	Fluoride SM4500F,C	Gamma Spec-O
Gross Alpha-O	Gross Beta-O	Hardness - SM2340B/200.7 - Gr
Hardness - SM2340B/200.7, Dis	Cobalt-200.7, Diss	8260B-SIM 1,4-Dioxane
1664-HEM	608-PCB-low	608-Pest Boeing 001/002 Q (LL)
608-Pesticides (LowRL)	624-A+A+2CVE (low)	624-Boeing 001/002Q (Fr113+X
624-Reg-X-2+c12DCE, LOW	625+NDMA, LL	Boron-200.7
8015B-DRO (C13-C28)-LL	BOD - SM5210B	Ammonia-N, Titr 4500NH3-C (w/
Antimony-200.8	Antimony-200.8, Diss	Arsenic-200.7
Arsenic-200.7, Diss	Barium-200.7	Barium-200.7, Diss
Beryllium-200.7	Beryllium-200.7,Diss	Bioassay-7 dy Chrnic
Iron-200.7	8015-LAWB (C4-C12)	TDS - SM2540C
Nitrogen, NO3+NO2 -N	Perchlorate 314.0 (1ppb_IC6)	pH - SM4500-H,B
Radium, Combined-O	Selenium-200.8	Selenium-200.8, Diss
Settleable Solids - SM2540F	Silver-200.8	Silver-200.8, Diss
Nitrate-N, 300.0	Sulfate-300.0	Nickel-200.7, Diss
Thallium-200.8	Thallium-200.8, Diss	TOC - SM5310B
Tritium-O	TSS - SM2540D	Turbidity
Uranium, Combined-O	Vanadium-200.7	Vanadium-200.7, Diss
Zinc-200.7	Zinc-200.7, Diss	Strontium 90-O
Level 4 Data Package - Pest/PC	zzzChlorine, Residual (330.5)	Iron-200.7, Diss
Lead-200.8	Lead-200.8, Diss	Level 4 + EDD-OUT
Level 4 Data Package	Level 4 Data Package - Diesel	Level 4 Data Package - GCMS-S
Level 4 Data Package - GCMS-\	Level 4 Data Package - Inorg Pr	Nitrite-N, 300.0
Level 4 Data Package - Out	Hydrazine-OUT	Level 4 Data Package - Phoenix
Level 4 Data Package - Weck	Level 4 Data Package - Wetcher	Manganese-200.7
Manganese-200.7,Diss	MBAS - SM5540-C	Mercury - 245.1
Mercury - 245.1, Diss	Nickel-200.7	Level 4 Data Package - Metals

608-Pest+PCB Group subanalyses:

Project Information

MWH-Pasadena/Boeing

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2/18/2010

Project Name:	Annual Outfall 001	**Invoice To:**	MWH-Pasadena
Project Number:	Annual Outfall 001	**Invoice Bid:**	Boeing SSFL (Effective 10/20/08)
Client PM:	Bronwyn Kelly	**Invoice Manager:**	Accounts Payable
Comments:	See comments for EDD/Level IV to subs **Cr VI only if on COC** Radchem to St Louis Web & EDD (Access 7, no charge)		

Analysis contained in this project

608-PCB only

608-Pesticides

Hardness - SM2340B/200.7 - Group subanalyses:

Calcium-200.7

Magnesium-200.7

Hardness - SM2340B/200.7, Diss - Group subanalyses:

Calcium-200.7, Diss

Hardness-SM2340B/200.7, Diss

Magnesium-200.7,Diss

Project Information

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2/18/2010

Customized Analysis in Project (by Matrix and Reporting units)

MDL and MRL in Parentheses indicate some values are custom | **Customized Project values entered (X)**

	Rpt to MDL	Dry Res	Dry MRL	Flags	MDL	MRL	Order	Rpt	Flag Levels #1	#2	#3	#4	#5	Surr Lmt	QC Lmt	analyte Info
Water (mg/l)																
1664-HEM																
Hexane Extractable Material (O	Yes	No	No	J	1.40	5.00	1		10							
608-PCB-low																
Aroclor 1016	Yes	No	No	J	0.25	0.50	21									
Aroclor 1221	Yes	No	No	J	0.25	0.50	22									
Aroclor 1232	Yes	No	No	J	0.25	0.50	23									
Aroclor 1242	Yes	No	No	J	0.25	0.50	24									
Aroclor 1248	Yes	No	No	J	0.25	0.50	25									
Aroclor 1254	Yes	No	No	J	0.25	0.50	26									
Aroclor 1260	Yes	No	No	J	0.25	0.50	27									
Decachlorobiphenyl	Yes	No	No	J			101									
608-Pest Boeing 001/002 Q (LL)																
alpha-BHC	Yes	No	No	J	0.00	0.01	8		0							
Decachlorobiphenyl	Yes	No	No	J			101									
Tetrachloro-m-xylene	Yes	No	No	J			102									
608-Pesticides (LowRL)																
4,4'-DDD	Yes	No	No	J	0.00	0.01	4									
4,4'-DDE	Yes	No	No	J	0.00	0.01	5									
4,4'-DDT	Yes	No	No	J	0.00	0.01	6									
Aldrin	Yes	No	No	J	0.00	0.01	7									
alpha-BHC	Yes	No	No	J	0.00	0.01	8		0							
beta-BHC	Yes	No	No	J	0.00	0.01	11									
delta-BHC	Yes	No	No	J	0.00	0.01	12									
Dieldrin	Yes	No	No	J	0.00	0.01	13									
Endosulfan I	Yes	No	No	J	0.00	0.01	14									
Endosulfan II	Yes	No	No	J	0.00	0.01	15									
Endosulfan sulfate	Yes	No	No	J	0.00	0.01	16									
Endrin	Yes	No	No	J	0.00	0.01	17									
Endrin aldehyde	Yes	No	No	J	0.00	0.01	18									
Endrin ketone	Yes	No	No	J	0.00	0.01	19									
gamma-BHC (Lindane)	Yes	No	No	J	0.00	0.02	20									
Heptachlor	Yes	No	No	J	0.00	0.01	22									
Heptachlor epoxide	Yes	No	No	J	0.00	0.01	23									
Methoxychlor	Yes	No	No	J	0.00	0.01	24									
Chlordane	Yes	No	No	J	0.04	0.10	28									
Toxaphene	Yes	No	No	J	0.25	0.50	29									
Decachlorobiphenyl	Yes	No	No	J			101									
Tetrachloro-m-xylene	Yes	No	No	J			102									
624-A+A+2CVE (low)																

Project Information

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2/18/2010

Customized Analysis in Project (by Matrix and Reporting units)

MDL and MRL in Parentheses indicate some values are custom

Customized Project values entered (X)

	Rpt to MDL	Dry Res	Dry MRL	Flags	MDL	MRL	Order	Rpt	Flag Levels #1	#2	#3	#4	#5	Surr Lmt	QC Lmt	analyte Info
Acrolein	Yes	No	No	J	4.00	5.00	3									
Acrylonitrile	Yes	No	No	J	1.20	2.00	4									
2-Chloroethyl vinyl ether	Yes	No	No	J	1.80	5.00	23									
4-Bromofluorobenzene	Yes	No	No	J			201									
Dibromofluoromethane	Yes	No	No	J			202									
Toluene-d8	Yes	No	No	J			203									
624-Boeing 001/002Q (Fr113+X+Fr123a+Cyclohex), LL																
Benzene	Yes	No	No	J	0.28	0.50	6									
Carbon tetrachloride	Yes	No	No	J	0.28	0.50	18									
Chloroform	Yes	No	No	J	0.33	0.50	24									
1,1-Dichloroethane	Yes	No	No	J	0.40	0.50	39									
1,2-Dichloroethane	Yes	No	No	J	0.28	0.50	40									
1,1-Dichloroethene	Yes	No	No	J	0.42	0.50	41		3							
1,2-Dichloro-1,1,2-trifluoroetha	Yes	No	No	J	1.10	2.00	51									
Ethylbenzene	Yes	No	No	J	0.25	0.50	53									
Tetrachloroethene	Yes	No	No	J	0.32	0.50	73									
Toluene	Yes	No	No	J	0.36	0.50	76									
1,1,1-Trichloroethane	Yes	No	No	J	0.30	0.50	79									
1,1,2-Trichloroethane	Yes	No	No	J	0.30	0.50	81									
Trichloroethene	Yes	No	No	J	0.26	0.50	81		5							
Trichlorofluoromethane	Yes	No	No	J	0.34	0.50	82									
Trichlorotrifluoroethane (Freon	Yes	No	No	J	0.50	5.00	84									
Vinyl chloride	Yes	No	No	J	0.40	0.50	88									
Xylenes, Total	Yes	No	No	J	0.90	1.50	90									
Cyclohexane	Yes	No	No	J	0.40	1.00	91									
4-Bromofluorobenzene	Yes	No	No	J			201									
Dibromofluoromethane	Yes	No	No	J			202									
Toluene-d8	Yes	No	No	J			203									
Bromodichloromethane	Yes	No	No	J	0.30	0.50	9	X								
Bromoform	Yes	No	No	J	0.40	0.50	10	X								
Bromomethane	Yes	No	No	J	0.42	1.00	11	X								
Chlorobenzene	Yes	No	No	J	0.36	0.50	20	X								
Chloroethane	Yes	No	No	J	0.40	1.00	22	X								
Chloromethane	Yes	No	No	J	0.40	0.50	25	X								
Dibromochloromethane	Yes	No	No	J	0.40	0.50	29	X								
1,2-Dichlorobenzene	Yes	No	No	J	0.32	0.50	35	X								
1,3-Dichlorobenzene	Yes	No	No	J	0.35	0.50	36	X								
1,4-Dichlorobenzene	Yes	No	No	J	0.37	0.50	37	X								
cis-1,2-Dichloroethene	Yes	No	No	J	0.32	0.50	42	X								
trans-1,2-Dichloroethene	Yes	No	No	J	0.30	0.50	43	X								
1,2-Dichloropropane	Yes	No	No	J	0.35	0.50	45	X								
cis-1,3-Dichloropropene	Yes	No	No	J	0.22	0.50	48	X								
trans-1,3-Dichloropropene	Yes	No	No	J	0.32	0.50	49	X								

Project Information

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2/18/2010

Customized Analysis in Project (by Matrix and Reporting units)

MDL and MRL in Parentheses indicate some values are custom | **Customized Project values entered (X)**

	Rpt to MDL	Dry Res	Dry MRL	Flags	MDL	MRL	Order	Rpt	Flag Levels #1	#2	#3	#4	#5	Surr Lmt	QC Lmt	analyte Info
Methylene chloride	Yes	No	No	J	0.95	1.00	65	X								
1,1,2,2-Tetrachloroethane	Yes	No	No	J	0.30	0.50	72	X								
625+NDMA, LL																
Acenaphthene	Yes	No	No	J	0.10	0.50	1	X								
Acenaphthylene	Yes	No	No	J	0.10	0.50	2	X								
Aniline	Yes	No	No	J	0.30	10.00	3	X								
Anthracene	Yes	No	No	J	0.10	0.50	4	X								
Benzidine	Yes	No	No	J	5.00	5.00	5	X								
Benzo(a)anthracene	Yes	No	No	J	0.10	5.00	6	X								
Benzo(a)pyrene	Yes	No	No	J	0.10	2.00	7	X								
Benzo(b)fluoranthene	Yes	No	No	J	0.10	2.00	8	X								
Benzo(g,h,i)perylene	Yes	No	No	J	0.10	5.00	9	X								
Benzo(k)fluoranthene	Yes	No	No	J	0.10	0.50	10	X								
Benzoic acid	Yes	No	No	J	3.00	20.00	12	X								
Benzyl alcohol	Yes	No	No	J	0.10	5.00	13	X								
4-Bromophenyl phenyl ether	Yes	No	No	J	0.10	1.00	14	X								
Butyl benzyl phthalate	Yes	No	No	J	0.70	5.00	15	X								
4-Chloro-3-methylphenol	Yes	No	No	J	0.20	2.00	17	X								
4-Chloroaniline	Yes	No	No	J	0.10	2.00	18	X								
Bis(2-chloroethoxy)methane	Yes	No	No	J	0.10	0.50	19	X								
Bis(2-chloroethyl)ether	Yes	No	No	J	0.10	0.50	20	X								
Bis(2-chloroisopropyl)ether	Yes	No	No	J	0.10	0.50	21	X								
Bis(2-ethylhexyl)phthalate	Yes	No	No	J	1.70	5.00	21	X	4							
2-Chloronaphthalene	Yes	No	No	J	0.10	0.50	22	X								
2-Chlorophenol	Yes	No	No	J	0.20	1.00	23	X								
4-Chlorophenyl phenyl ether	Yes	No	No	J	0.10	0.50	24	X								
Chrysene	Yes	No	No	J	0.10	0.50	25	X								
Dibenz(a,h)anthracene	Yes	No	No	J	0.10	0.50	27	X								
Dibenzofuran	Yes	No	No	J	0.10	0.50	28	X								
Di-n-butyl phthalate	Yes	No	No	J	0.20	2.00	29	X								
1,2-Dichlorobenzene	Yes	No	No	J	0.10	0.50	31	X								
1,3-Dichlorobenzene	Yes	No	No	J	0.10	0.50	32	X								
1,4-Dichlorobenzene	Yes	No	No	J	0.20	0.50	33	X								
3,3'-Dichlorobenzidine	Yes	No	No	J	5.00	5.00	35	X								
2,4-Dichlorophenol	Yes	No	No	J	0.20	2.00	36	X								
Diethyl phthalate	Yes	No	No	J	0.10	1.00	37	X								
2,4-Dimethylphenol	Yes	No	No	J	0.30	2.00	38	X								
Dimethyl phthalate	Yes	No	No	J	0.10	0.50	39	X								
4,6-Dinitro-2-methylphenol	Yes	No	No	J	0.20	5.00	40	X								
2,4-Dinitrophenol	Yes	No	No	J	0.90	5.00	42	X								
2,4-Dinitrotoluene	Yes	No	No	J	0.20	5.00	43	X	9							
2,6-Dinitrotoluene	Yes	No	No	J	0.10	5.00	44	X								
Di-n-octyl phthalate	Yes	No	No	J	0.10	5.00	45	X								
1,2-Diphenylhydrazine/Azoben	Yes	No	No	J	0.10	1.00	46	X								

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2/18/2010

Customized Analysis in Project (by Matrix and Reporting units)

MDL and MRL in Parentheses indicate some values are custom								Customized Project values entered (X)								
									Flag Levels							
	Rpt to MDL	Dry Res	Dry MRL	Flags	MDL	MRL	Order	Rpt	#1	#2	#3	#4	#5	Surr Lmt	QC Lmt	analyte Info
Fluoranthene	Yes	No	No	J	0.10	0.50	48	X								
Fluorene	Yes	No	No	J	0.10	0.50	49	X								
Hexachlorobenzene	Yes	No	No	J	0.10	1.00	50	X								
Hexachlorobutadiene	Yes	No	No	J	0.20	2.00	51	X								
Hexachlorocyclopentadiene	Yes	No	No	J	0.10	5.00	52	X								
Hexachloroethane	Yes	No	No	J	0.20	3.00	53	X								
Indeno(1,2,3-cd)pyrene	Yes	No	No	J	0.10	2.00	54	X								
Isophorone	Yes	No	No	J	0.10	1.00	55	X								
2-Methylnaphthalene	Yes	No	No	J	0.10	1.00	56	X								
2-Methylphenol	Yes	No	No	J	0.10	2.00	57	X								
4-Methylphenol	Yes	No	No	J	0.20	5.00	58	X								
Naphthalene	Yes	No	No	J	0.10	1.00	59	X								
2-Nitroaniline	Yes	No	No	J	0.10	5.00	60	X								
3-Nitroaniline	Yes	No	No	J	0.20	5.00	61	X								
4-Nitroaniline	Yes	No	No	J	0.50	5.00	62	X								
Nitrobenzene	Yes	No	No	J	0.10	1.00	63	X								
2-Nitrophenol	Yes	No	No	J	0.10	2.00	64	X								
4-Nitrophenol	Yes	No	No	J	2.50	5.00	65	X								
N-Nitroso-di-n-propylamine	Yes	No	No	J	0.10	2.00	66	X								
N-Nitrosodimethylamine	Yes	No	No	J	0.10	2.00	67	X	8							
N-Nitrosodiphenylamine	Yes	No	No	J	0.10	1.00	68	X								
Pentachlorophenol	Yes	No	No	J	0.10	2.00	69	X	8							
Phenanthrene	Yes	No	No	J	0.10	0.50	70	X								
Phenol	Yes	No	No	J	0.30	1.00	71	X								
Pyrene	Yes	No	No	J	0.10	0.50	72	X								
1,2,4-Trichlorobenzene	Yes	No	No	J	0.10	1.00	74	X								
2,4,5-Trichlorophenol	Yes	No	No	J	0.20	2.00	75	X								
2,4,6-Trichlorophenol	Yes	No	No	J	0.10	1.00	76	X	7							
8015B-DRO (C13-C28)-LL																
DRO (C13 - C28)	Yes	No	No	J	0.05	0.10	1									
n-Octacosane	Yes	No	No	J			5									
8015-LAWB (C4-C12)																
GRO (C4 - C12)	Yes	No	No	J	25.00	100.00	1									
4-BFB (FID)	Yes	No	No	J			11									
8260B-SIM 1,4-Dioxane																
1,4-Dioxane	Yes	No	No	J	1.00	2.00	1									
Dibromofluoromethane	Yes	No	No	J			202									
Ammonia-N, Titr 4500NH3-C (w/dist)																
Ammonia-N (Distilled)	Yes	No	No	J	0.50	0.50	35		2							
Antimony-200.8																

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MDL and MRL in Parentheses indicate some values are custom								Customized Project values entered (X)								
									Flag Levels							
	Rpt to MDL	Dry Res	Dry MRL	Flags	MDL	MRL	Order	Rpt	#1	#2	#3	#4	#5	Surr Lmt	QC Lmt	analyte Info
Antimony	Yes	No	No	J	0.30	2.00	5		6							
Antimony-200.8, Diss																
Antimony	Yes	No	No	J	0.30	2.00	5									
Arsenic-200.7																
Arsenic	Yes	No	No	J	0.01	0.01	3		0							
Arsenic-200.7, Diss																
Arsenic	Yes	No	No	J	0.01	0.01	3									
Barium-200.7																
Barium	Yes	No	No	J	0.01	0.01	4		1							
Barium-200.7, Diss																
Barium	Yes	No	No	J	0.01	0.01	4									
Beryllium-200.7																
Beryllium	Yes	No	No	J	0.00	0.00	5		0							
Beryllium-200.7,Diss																
Beryllium	Yes	No	No	J	0.00	0.00	5									
Bioassay-Acute 96hr																
Survival	Yes	No	No	J			1									
BOD - SM5210B																
Biochemical Oxygen Demand	Yes	No	No	J	0.50	2.00	55		20							
Boron-200.7																
Boron	Yes	No	No	J	0.02	0.05	6									
Boron-200.7, Diss																
Boron	Yes	No	No	J	0.02	0.05	6									
Cadmium-200.8																
Cadmium	Yes	No	No	J	0.10	1.00	30		2							
Cadmium-200.8, Diss																
Cadmium	Yes	No	No	J	0.10	1.00	30									
Calcium-200.7																
Calcium	Yes	No	No	J	0.05	0.10	8									
Calcium-200.7, Diss																
Calcium	Yes	No	No	J	0.05	0.10	8									

Project Information

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2/18/2010

Customized Analysis in Project (by Matrix and Reporting units)

MDL and MRL in Parentheses indicate some values are custom

Customized Project values entered (X)

	Rpt to MDL	Dry Res	Dry MRL	Flags	MDL	MRL	Order	Rpt	Flag Levels #1	#2	#3	#4	#5	Surr Lmt	QC Lmt	analyte Info
Chloride - 300.0																
Chloride	Yes	No	No	J	0.25	0.50	75		150							
Chromium VI-218.6																
Chromium VI	Yes	No	No	J	0.00	0.00	1		0							
Chromium-200.7																
Chromium	Yes	No	No	J	0.00	0.01	9		0							
Chromium-200.7, Diss																
Chromium	Yes	No	No	J	0.00	0.01	9									
Cobalt-200.7																
Cobalt	Yes	No	No	J	0.00	0.01	10									
Cobalt-200.7, Diss																
Cobalt	Yes	No	No	J	0.00	0.01	10									
Conductivity-120.1																
Specific Conductance	Yes	No	No	J	1.00	1.00	90									
Copper-200.8																
Copper	Yes	No	No	J	0.50	2.00	50		7							
Copper-200.8, Diss																
Copper	Yes	No	No	J	0.50	2.00	50									
Cyanide, Total-4500CN-E (5ppb)																
Total Cyanide	Yes	No	No	J	0.00	0.01	96		0							
Filtration-DisMetals																
Filtration	Yes	No	No	J	0.00	1.00	1									
Fluoride SM4500F,C																
Fluoride	Yes	No	No	J	0.02	0.10	115		2							
Gross Beta-O																
Gross Beta	Yes	No	No	J			1									
Hardness-SM2340B/200.7, Diss (use group code)																
Hardness (as CaCO3)	Yes	No	No	J	1.00	1.00	120									
Iron-200.7																
Iron	Yes	No	No	J	0.02	0.04	12		0							
Iron-200.7, Diss																

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									Flag Levels							
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Iron	Yes	No	No	J	0.02	0.04	12									
Lead-200.8																
Lead	Yes	No	No	J	0.20	1.00	65		3							
Lead-200.8, Diss																
Lead	Yes	No	No	J	0.20	1.00	65									
Magnesium-200.7																
Magnesium	Yes	No	No	J	0.01	0.02	15									
Magnesium-200.7,Diss																
Magnesium	Yes	No	No	J	0.01	0.02	15									
Manganese-200.7																
Manganese	Yes	No	No	J	0.01	0.02	16		0							
Manganese-200.7,Diss																
Manganese	Yes	No	No	J	0.01	0.02	16									
MBAS - SM5540-C																
Surfactants (MBAS)	Yes	No	No	J	0.05	0.10	265		1							
Nickel-200.7																
Nickel	Yes	No	No	J	0.00	0.01	18		0							
Nickel-200.7, Diss																
Nickel	Yes	No	No	J	0.00	0.01	18									
Nitrate-N, 300.0																
Nitrate-N	Yes	No	No	J	0.06	0.11	150		8							
Nitrite-N, 300.0																
Nitrite-N	Yes	No	No	J	0.09	0.15	151		1							
Nitrogen, NO3+NO2 -N																
Nitrate/Nitrite-N	Yes	No	No	J	0.15	0.26	152		8							
Perchlorate 314.0 (1ppb_IC6)																
Perchlorate	Yes	No	No	J	0.90	1.00	1		6							
pH - SM4500-H,B																
pH	Yes	No	No	J	0.10	0.10	3									
Radium, Combined-O																
Radium226	Yes	No	No	J			1									

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									Flag Levels							
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Radium228	Yes	No	No	J			2									
Selenium-200.8																
Selenium	Yes	No	No	J	0.50	2.00	110		4							
Selenium-200.8, Diss																
Selenium	Yes	No	No	J	0.50	2.00	110									
Settleable Solids - SM2540F																
Total Settleable Solids	Yes	No	No	J	0.10	0.10	240		0							
Silver-200.8																
Silver	Yes	No	No	J	0.10	1.00	120		2							
Silver-200.8, Diss																
Silver	Yes	No	No	J	0.10	1.00	120									
Strontium 90-O																
Strontium	Yes	No	No	J			1									
Sulfate-300.0																
Sulfate	Yes	No	No	J	0.20	0.50	250		300							
TDS - SM2540C																
Total Dissolved Solids	Yes	No	No	J	1.00	10.00	280		950							
Thallium-200.8																
Thallium	Yes	No	No	J	0.20	1.00	135		2							
Thallium-200.8, Diss																
Thallium	Yes	No	No	J	0.20	1.00	135									
TOC - SM5310B																
Total Organic Carbon	Yes	No	No	J	0.50	1.00	295									
Tritium-O																
H-3	Yes	No	No	J			1									
TSS - SM2540D																
Total Suspended Solids	Yes	No	No	J	1.00	10.00	315		15							
Turbidity																
Turbidity	Yes	No	No	J	0.04	1.00	325									
Uranium, Combined-O																
Uranium, Total	Yes	No	No	J			1									

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									Flag Levels							
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Vanadium-200.7																
Vanadium	Yes	No	No	J	0.00	0.01	31									
Vanadium-200.7, Diss																
Vanadium	Yes	No	No	J	0.00	0.01	31									
Zinc-200.7																
Zinc	Yes	No	No	J	0.01	0.02	32		0							
Zinc-200.7, Diss																
Zinc	Yes	No	No	J	0.01	0.02	32									
zzzChlorine, Residual (330.5)																
Residual Chlorine	Yes	No	No	J	0.10	0.10	225		0							

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2/18/2010

Notes for this Project: 2/28/07 MC Alta changed their name to Vista

Only log pH if requested on COC.

Log out data package testcodes as follows: