

# Environmental Parameters - Reporting and Method Detection Limits



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## Reporting Limits and Calculated Method Detection Limits as per US EPA CFR Appendix B

**MDL (Method Detection Limit)** = the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

**MDL** = T-value x Standard Deviation

**RL (Reporting Limit)** = the lowest concentration reported after taking into account various analytical procedures, interferences or error. The RL is usually 1 to 5 times higher than the MDL, and in most cases was used to calculate the MDLs in this document. The RL is often a subjective measurement and varies from laboratory to laboratory. The RLs, MDLs and calculation procedures will vary according to regional/national regulations.

Parameter	RL Expected Value (EV) <sup>1</sup>	Average (AVG)	Standard Deviation (STDEV)	Sampling Size (n)	Degrees of Freedom (n-1)	T-Value <sup>3</sup> (99%)	Calculated MDL
Acidity <sup>2</sup>	1.50	1.56	0.150	10	9	2.8214	0.42
Alkalinity	1.00	1.07	0.070	20	19	2.5395	0.18
Ammonia (ISE)	0.02	0.02	0.002	13	12	2.6810	0.01
Ammonia (Standard Addition)	0.50	0.53	0.035	10	9	2.8214	0.10
Calcium (ISE)	1.00	1.14	0.121	46	45	2.4121	0.29
Calcium Hardness (photometric)	10.00	8.97	0.036	20	19	2.5395	0.09
Carbon Dioxide	10.00	10.69	0.193	12	11	2.7181	0.52
Carbonyl	25.00	24.78	0.473	10	9	2.8214	1.33
Chloride (Titration)	1.00	1.19	0.100	10	9	2.8214	0.28
Chloride (ISE)	0.05	0.06	0.003	10	9	2.8214	0.01
Color	2.00	2.10	0.050	5	4	3.7470	0.19
Conductivity	1.49	1.88	0.230	10	9	2.8214	0.65
Cyanide	0.13	0.13	0.021	16	15	2.6025	0.055
Fluoride	0.02	0.02	0.002	39	38	2.4286	0.005
Nitrate (ISE)	0.14	0.15	0.017	9	8	2.8965	0.05
Orthophosphate	0.05	0.05	0.001	10	9	2.8214	0.002

### Detection Limits Notes:

<sup>1</sup>Please note that in order to obtain the above MDLs, proper analytical techniques and MANTECH recommended procedures including sample volume and reagent concentrations are to be used. Varying sample matrices may generate different results.

<sup>2</sup>The RLs for each parameter were defined as the lowest standard concentration reported on the Application Note other than for orthophosphate and sulfide. Statistical data for calculating the MDLs were taken from the Quality Control Charts.

<sup>3</sup>The RL, Average and STDEV have all been estimated for Acidity as the Application Note was generated in 2006. An RL and MDL study utilizing current MANTECH technology and software has yet to be completed. However, current endusers for acidity include private environmental laboratories, United States EPA and PADEP.

<sup>4</sup>T-values obtained from reference tables, 99% confidence, n-1 degrees of freedom

### References:

1. MDL procedure obtained from US EPA 40 CFR Appendix B to Part 136 - Definition and Procedure for the Determination of the Method Detection Limit obtained from <http://cfv.vlex.com/vid/136-method-detection-limit-revision-19813275>

2. T-values obtained from [http://www.stattools.net/1Test\\_Tab.php](http://www.stattools.net/1Test_Tab.php)



# Environmental Parameters - Reporting and Method Detection Limits



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## Reporting Limits and Calculated Method Detection Limits as per US EPA CFR Appendix B (continued)

Parameter	RL Expected Value (EV) <sup>1</sup>	Average (AVG)	Standard Deviation (STDEV)	Sampling Size (n)	Degrees of Freedom (n-1)	T-Value <sup>3</sup> (99%)	Calculated MDL
Residual Chlorine (ISE)	0.02	0.02	0.001	10	9	2.8214	0.003
Residual Chlorine (Titration)	0.20	0.21	0.008	10	9	2.8214	0.02
Residual Chlorine (Back Titration)	0.20	0.20	0.029	10	9	2.8214	0.08
Salinity	0.10	0.09	0.001	10	9	2.8214	0.002
Silver (ISE)	0.50	0.50	0.015	10	9	2.8214	0.04
Silver (Titration)	0.50	0.47	0.118	10	9	2.8214	0.33
Sulfide (Photometric)	5.00	4.46	1.185	14	13	2.6503	3.14
Sulfide (Potentiometric)	10.00	10.36	1.823	10	9	2.8214	5.14
Sulfite	0.80	0.98	0.120	9	8	2.8965	0.35
Total Hardness (Photometric - Inflection)	10.00	9.25	0.367	10	9	2.8214	1.04
Total Hardness (Photometric - Final Volume)	10.00	10.31	0.325	10	9	2.8214	0.92
Total Hardness (Potentiometric)	2.00	2.46	0.165	16	15	2.6025	0.43
Turbidity	0.10	0.06	0.019	10	9	2.8214	0.05
Vitamin C	10.00	10.02	0.099	10	9	2.8214	0.28

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<sup>2</sup>The RLs for each parameter were defined as the lowest standard concentration reported on the Application Note other than for orthophosphate and sulfide. Statistical data for calculating the MDLs were taken from the Quality Control Charts.

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