

## Appendix J

### Inorganic Functional Guidelines Action Tables

Note: This appendix is a compilation of the data validation actions that appear in tabular format in Part IV - INORGANIC Data Validation Guidelines. Other actions that are not presented in tabular format are not contained in this appendix and the validator must refer to Part IV to obtain the complete set of actions.

## APPENDIX J

Table INORG-I-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON PRESERVATION**

Sample Results	Aq. Metals: HNO <sub>3</sub> to pH < 2? Aq. Cyanide <sup>1</sup> : NaOH to pH > 12?		Temperature Criteria Met?	
	Y	N	Y	N
<b>Detects</b>	A	J	A	Professional Judgment
<b>Non-detects</b>	A	UJ or R*	A	Professional Judgment

\* Professional judgment may be used to estimate (UJ) or reject (R) non-detects based on the analyte's stability and magnitude of exceedance.

<sup>1</sup> Estimate (J) positive detects and use professional judgment to estimate (UJ) or reject (R) non-detects when cyanide samples are not tested nor treated, if needed, for oxidants or sulfides.

Table INORG-I-2:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON TECHNICAL HOLDING TIMES**

Sample Results	Technical Holding Time (Aqueous/Soil/Sediment)	
	Metals: HT ≤ 6 Months	Metals: HT > 6 Months
	Mercury: HT ≤ 28 Days	Mercury: HT > 28 Days
	Cyanide: HT ≤ 14 Days	Cyanide: HT > 14 Days
<b>Detects</b>	A	J
<b>Non-detects</b>	A	UJ or R*

\* Professional judgment may be used to estimate or reject non-detects based on the analyte's stability, magnitude of exceedance, and the effects of additional storage on the sample results.

- For other matrices, estimate (J) positive detects and use professional judgment to estimate (UJ) or reject (R) non-detects when Region I technical holding time criteria are not met.

Table INORG-II-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON THE ICP-MS TUNE**

Sample Results	Mass Calibration (amu) > QC Limit	Mass Resolution/ Peak Width (amu) > QC Limit	%RSD > QC Limit
Detects	J	J	J
Non-detects	UJ	UJ	UJ

Table INORG-III-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON ICV AND CCV PERCENT RECOVERIES**

Sample Results	% Recovery				
	ICP: %R < 75% Hg/CN: %R < 70%	ICP: 75% ≤ %R < LL Hg/CN: 70% ≤ %R < LL	LL ≤ %R ≤ UL	ICP: UL < %R ≤ 125% Hg/CN: UL < %R ≤ 130%	ICP: %R > 125% Hg/CN: %R > 130%
Detects	R	J	A	J	R
Non-detects	R	UJ	A	A	A

LL = Lower limit of method QC acceptance criteria  
 UL = Upper limit of method QC acceptance criteria

Table INORG-III-2:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON QUANTITATION LIMIT  
CHECK STANDARD RECOVERIES**

Sample Results	% Recovery				
	%R < 50%	50% ≤ %R < LL	LL ≤ %R ≤ UL	UL < %R ≤ 180%	%R > 180%
Detects*	J/R (< 2x TV) ** Prof. Judg. (≥ 2x TV)**	J (< 2x TV)	A	J (< 2x TV)	J/R (< 2x TV)** Prof. Judg. (≥ 2x TV)**
Non-detects	R	UJ	A	A	A

LL = Lower limit of method QC acceptance criteria

UL = Upper limit of method QC acceptance criteria

\* Action is applied to positive detects less than 2x the true value of the QL Check Standard.

\*\* Professional judgment may be used to estimate or reject positive detects less than 2x the true value taking into account project DQOs. Professional judgment should be used to accept or estimate positive detects greater than or equal to 2x the true value of the Check Standard but less than the next highest concentration QC sample or standard.

Table INORG-IV-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON  
POSITIVE BLANK RESULTS**

Positive Blank Result	Sample Result	Action	
≥ MDL	> Blank Action Level and	≥ QL	A
		< QL	No further action (report estimated sample result)
	≤ Blank Action Level and	≥ QL	U - Raise the QL to the sample result and report as a non-detect
		< QL	U - Report the QL
	Non-detect (U)		A

Blank Action Level = 5x the highest blank concentration associated with the sample

QL = Sample Quantitation Limit

Note: Aqueous equipment (rinsate) and bottle blank results are not used to determine blank action levels for non-aqueous samples. Analytes present in both the non-aqueous sample and the associated aqueous equipment or bottle blanks should be flagged EB or BB, respectively.

Table INORG-IV-2:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON  
NEGATIVE BLANK RESULTS**

Negative Blank Result	Sample Result	Action	
≤ (-MDL)	> Negative Blank Action Level and	≥ QL	A
		< QL	No further action (Report estimated sample result)
	≤ Negative Blank Action Level and	≥ QL	J - Estimate the sample result
		< QL	No further action (report estimated sample result)
	Non-detect (U)		UJ - Estimate the QL

Negative Blank Action Level = absolute value of 5x the lowest negative blank value associated with the sample

QL = Sample Quantitation Limit

Table INORG-V-1:

**QUALIFICATION OF ICP-AES ANALYTES BASED ON INTERFERENCE CHECK SAMPLE  
ICSAB RECOVERIES**

Sample Results	ICSAB Recoveries				
	%R < 50%	50% ≤ %R < 80%	80% ≤ %R ≤ 120%	120% < R ≤ 150%	%R > 150%
Detects	R	J	A	J	R*
Non-detects	R	UJ	A	A	A

\* Professional judgment may be used to estimate (J) positive detects, taking into consideration project DQOs.  
Note: Generally, action is applied when interferences are present in samples at greater than 50% of their respective levels in the ICS.

Table INORG-V-2:

**QUALIFICATION OF ICP-AES ANALYTES BASED ON INTERFERENCE CHECK SAMPLE  
ICSA RESULTS**

Sample Results	ICSA Concentration or % Recovery*		
	%R < 80% or Conc. < TV-(2xMDL)	%R = 80-120% or Conc. = TV±(2xMDL)	%R > 120% or Conc. > TV+(2xMDL)
Detects	J	A	J
Non-detects	UJ	A	A

TV = ICSA True Value

\* ICSA criteria are based on either 80-120% of the ICSA true value or the ICSA true value ± 2x the MDL, whichever range of control limits is greater.

Note: Generally, action is applied when interferents are present in samples at greater than 50% of their respective levels in the ICS. Generally, no action is taken when the estimated interference is less than 10% of the sample result of the affected analyte. Professional judgment may be used to reject the data if the estimated interference comprises greater than 90% of the sample result. If ICSAB recovery criteria are met, then professional judgment may be used to qualify only those sample results in the affected concentration range.

Table INORG-VI-1:

**QUALIFICATION OF ICP-MS ANALYTES BASED ON INTERFERENCE CHECK SAMPLE  
ICSAB RECOVERIES**

Sample Results	ICSAB Recoveries				
	%R < 50%	50% ≤ %R < 80%	80% ≤ %R ≤ 120%	120% < %R ≤ 150%	%R > 150%
Detects	R	J	A	J	R*
Non-detects	R	UJ	A	A	A

\* Professional judgment should be used to estimate (J) positive detects, taking into consideration project DQOs.

Table INORG-VI-2:

**QUALIFICATION OF ICP-MS ANALYTES BASED ON INTERFERENCE CHECK SAMPLE  
ICSA RESULTS**

Sample Results	ICSA Concentration or % Recovery*		
	%R < 80% or Conc. < TV-(2xMDL)	%R = 80-120% or Conc. = TV±(2xMDL)	%R > 120% or Conc. > TV+(2xMDL)
Detects	J	A	J
Non-detects	UJ	A	A

TV = ICSA True Value

\* ICSA criteria are based on either 80-120% of the ICSA true value or the ICSA true value ± 2x the MDL, whichever range of control limits is greater.

Note: Professional judgment may be used to reject (R) positive detects and/or non-detects for the affected analytes.

Table INORG-VII-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON INTERNAL STANDARD  
RELATIVE INTENSITIES**

Sample Results	Internal Standard Relative Intensities (RI)*		
	% RI < LL	LL ≤ % RI ≤ UL	% RI > UL
Detects	J	A	J
Non-detects	UJ	A	UJ

LL = Lower Limit of method QC acceptance criteria

UL = Upper Limit of method QC acceptance criteria

\* Professional judgment may be used to reject data for severe loss of sensitivity.

Table INORG-VIII-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON MATRIX SPIKE RECOVERIES\***

Sample Results	% Recovery			
	%R < 30%	30% ≤ %R < LL	LL ≤ %R ≤ UL	%R > UL
Detects	J	J	A	J
Non-detects	R	UJ	A	A

LL = Lower Limit of method QC acceptance criteria

UL = Upper Limit of method QC acceptance criteria

- \* Qualification is applied to the affected analyte in all samples of the same matrix analyzed by the same method; however, the validator may use professional judgment to apply actions to all positive detects and non-detects if the majority of spike analyte recoveries are outside method QC acceptance criteria.

Table INORG-IX-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON LABORATORY DUPLICATE SAMPLES\***

Sample Results	Laboratory Duplicate Sample Results	
	RPD or Abs. Diff. ≤ QC Limit	RPD or Abs. Diff. > QC Limit
Detects	A	J
Non-detects	A	UJ

- \* If QC acceptance criteria for the specific matrix are specified in the method, then use the method QC criteria in this table. If QC acceptance criteria for the specific matrix are not specified in the method, then use the criteria in Table INORG-IX-2 or INORG-IX-3.

Note: Qualification refers to the affected analyte in all samples of the same matrix, prepared and analyzed by the same method. Professional judgment may be used to qualify all positive detects and non-detects if the majority of the laboratory duplicate results are outside the method QC acceptance criteria.

Table INORG-IX-2:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON LABORATORY DUPLICATE  
SAMPLES - AQUEOUS MATRICES\***

Sample Results	Aqueous Laboratory Duplicate Sample Results			
	Both Sample and Duplicate $\geq 5xQL$		One or Both Sample and Duplicate $< 5xQL$	
	RPD $\leq 20\%$	RPD $> 20\%$	Abs. Diff. $\leq QL$	Abs. Diff. $> QL$
Detects	A	J	A	J
Non-detects	A	UJ	A	UJ

\* If QC acceptance criteria for the specific matrix are not specified in the method, then use the criteria in this table (from Appendix I). If QC acceptance criteria for the specific matrix are specified in the method, then use the criteria in Table INORG-IX-1 above.

QL = Sample Quantitation Limit

- When applying the absolute difference criteria, the sample quantitation limit for the sample (vs. the duplicate sample) is used.
- No action is applied when both sample and duplicate values are detected at  $< QL$  or are non-detects.

Note: Qualification refers to the affected analyte in all samples of the same matrix, prepared and analyzed by the same method. Professional judgment may be used to qualify all positive detects and non-detects if the majority of the laboratory duplicate results are outside the QC acceptance criteria.

Table INORG-IX-3:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON LABORATORY DUPLICATE  
SAMPLES - NON-AQUEOUS MATRICES\***

Sample Results	Non-Aqueous Laboratory Duplicate Sample Results			
	Both Sample and Duplicate $\geq 5xQL$		One or Both Sample and Duplicate $< 5xQL$	
	RPD $\leq 35\%$	RPD $> 35\%$	Abs. Diff. $\leq 2xQL$	Abs. Diff. $> 2xQL$
Detects	A	J	A	J
Non-detects	A	UJ	A	UJ

\* If QC acceptance criteria for the specific matrix are not specified in the method, then use the criteria in this table. If QC acceptance criteria for the specific matrix are specified in the method, then use the criteria in Table INORG-IX-1 above.

QL = Sample Quantitation Limit

- When applying the absolute difference criteria, the sample quantitation limit for the sample (vs. the duplicate sample) is used.
- No action is applied when both sample and duplicate values are detected at  $< QL$  or are non-detects.

Note: Qualification refers to the affected analyte in all samples of the same matrix, prepared and analyzed by the same method. Professional judgment may be used to qualify all positive detects and non-detects if the majority of the laboratory duplicate results are outside the QC acceptance criteria.

Table INORG-X-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON FIELD DUPLICATES -  
AQUEOUS MATRICES**

Sample Results	Aqueous Field Duplicate Sample Results			
	Both Duplicates $\geq 5xQL$		One or Both Duplicates $< 5xQL^*$	
	RPD $\leq 30\%$	RPD $> 30\%$	Abs. Diff. $\leq 2xQL$	Abs. Diff. $> 2xQL$
Detects	A	J	A	J
Non-detects	A	UJ	A	J

QL = Sample Quantitation Limit

\* No action is taken when both field duplicate results are positive detects  $< QL$  or are non-detects.

Note: Qualification refers to the affected analyte in all samples of the same matrix prepared and analyzed by the same method. Professional judgment may be used to qualify all positive detects and non-detects if the majority of the field duplicate results are outside QC acceptance criteria.

Table INORG-X-2:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON FIELD DUPLICATES -  
NON-AQUEOUS MATRICES**

Sample Results	Non-Aqueous Field Duplicate Sample Results			
	Both Duplicates $\geq 5xQL$		One or Both Duplicates $< 5xQL^*$	
	RPD $\leq 50\%$	RPD $> 50\%$	Abs. Diff. $\leq 4xQL$	Abs. Diff. $> 4xQL$
Detects	A	J	A	J
Non-detects	A	UJ	A	UJ

QL = Sample Quantitation Limit

\* No action is taken when both field duplicate results are positive detects  $< QL$  or are non-detects.

Note: Qualification refers to the affected analyte in all samples of the same matrix prepared and analyzed by the same method. Professional judgment may be used to qualify all positive detects and non-detects if the majority of the field duplicate results are outside QC acceptance criteria.

Table INORG-XI-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON SERIAL DILUTION  
PERCENT DIFFERENCES**

Sample Results	% D ≤ QC Limit	% D > QC Limit	
		Serial Dilution Sample Result > Undiluted Sample Result	Serial Dilution Sample Result < Undiluted Sample Result
Detects	A	J	J
Non-detects	A	UJ	A*

Note: Qualification is applied to the affected analyte in all samples of the same matrix prepared and analyzed by the same method. However, the validator may use professional judgment to qualify all positive detects and non-detects if the majority of the serial dilution analyte percent differences are outside the method QC acceptance criteria.

\* Professional judgment may be used to estimate (UJ) non-detects if the direction of the bias cannot be determined.

Table INORG-XII-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON LFB RECOVERIES**

Sample Results	% Recovery			
	% R < 40%	40% ≤ % R < LL	LL ≤ % R ≤ UL	% R > UL
Detects*	J (< 2x TV)**	J (< 2x TV)	A	J (< 2x TV)**
Non-detects	R	UJ	A	A

LFB = Laboratory fortified blank spiked with target analytes at their quantitation limits.

LL = Lower Limit of method QC acceptance criteria.

UL = Upper Limit of method QC acceptance criteria.

\* Action is applied to positive detects less than 2x the LFB true value.

\*\* Professional judgment may be used to reject positive results less than 2x the true value taking into account project DQOs. Professional judgment may be used to estimate positive detects greater than or equal to 2x the LFB true value but less than the value of the next highest concentration QC sample.

Table INORG-XIII-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON LCS RESULTS\***

Sample Results	Aqueous LCS % Recovery				
	%R < 50%	50% ≤ %R < LL	LL ≤ %R ≤ UL	UL < %R ≤ 150%	%R > 150%
Detects	R	J	A	J	R
Non-detects	R	UJ	A	A	A

Sample Results	Non-aqueous LCS Result		
	Result < LL	LL ≤ Result ≤ UL	Result > UL
Detects	J	A	J
Non-detects	UJ	A	A

LL - Lower Limit of method QC acceptance criteria

UL - Upper Limit of method QC acceptance criteria

- \* If more than half of the LCS analyte recoveries for a particular method fall within one of the above categories, then professional judgment may be used to apply the action to all analytes in all samples associated with that LCS. Professional judgment should be used when a combination of low recoveries and high recoveries are obtained.

Table INORG-XIII-2:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON PES RESULTS\***

Sample Results	• Single Blind • Double Blind PES < Lower Limit "Action Low" or "Analyte Missed"	• Single Blind • Double Blind PES "Within Warning Limits" "Warning High/Warning Low"	• Single Blind • Double Blind PES > Upper Limit "Action High"
Detects	J	A	J
Non-Detects	R	A	A

LL - Lower Limit of method QC acceptance criteria

UL - Upper Limit of method QC acceptance criteria

- \* If more than half of the PES analytes fall within one of the above categories, then professional judgment may be used to apply the action to all analytes in all samples associated with that PES. Professional judgment should be used when a combination of low recoveries and high recoveries are obtained.

Table INORG-XIV-1:

**QUALIFICATION OF INORGANIC ANALYTES BASED ON SAMPLE PERCENT SOLIDS\***

<b>Sample Result</b>	<b>% Solids &gt; 30%</b>	<b>10% ≤ % Solids ≤ 30%</b>	<b>% Solids &lt; 10%</b>
Detects	A	J	R
Non-detects	A	R	R

\* Professional judgment should be used to accept, qualify or reject the associated sample data when sampling and/or analytical preparation steps were employed to address high moisture soil/sediment samples.