

**CARBONATE, BICARBONATE, and TOTAL ALKALINITY**  
Standard Methods 2320 (Titration Method)

**Table 1. Summary of Contract Required Detection Limits, Holding Times, and Preservation for Alkalinity**

Analytical Parameter	Contract Required Detection Limit (CRDL)	Technical and Contract Holding Times	Preservation
Low-Level Alkalinity:  High-Level Alkalinity:	2 mg/L  20 mg/L	Technical: 14 Days from collection; Contract: 12 Days from receipt at laboratory	Cool to 4EC ±2EC*

\* Samples must be unfiltered

**Data Calculations and Reporting Units:**

Calculate the sample results according to Section 5 of Standard Methods 2320.

Report sample results in concentration units of milligram per liter (mg/L) as calcium carbonate (CaCO<sub>3</sub>). Report CaCO<sub>3</sub> concentrations that are less than 10 mg/L to 2 significant figures, and CaCO<sub>3</sub> concentrations that are greater than or equal to 10 mg/L to 3 significant figures.

For rounding results, adhere to the following rules:

- a) If the number following those to be retained is less than 5, round down;
- b) If the number following those to be retained is greater than 5, round up; or
- c) If the number following the last digit to be retained is equal to 5, round down if the digit is even, or round up if the digit is odd.

All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example calculation in the data package.

**Table 2. Summary of Internal Quality Control Procedures for Carbonate, Bicarbonate and Total Alkalinity by SM 2320**

QC Element	Frequency	Acceptance Criteria	Corrective Action
Method Blank (MB)	One per Batch or SDG <sup>a</sup> (1 per 20 samples minimum)	< CRDL	<ol style="list-style-type: none"> <li>1. If lowest sample concentration is more than 10X the blank conc., no action</li> <li>2. If samples are non-detected, no action</li> <li>3. If detected sample concentrations are less than 10X blank conc., all associated samples must be prepared again with another method blank and reanalyzed</li> </ol>
Duplicate Sample (DUP)	One per batch or SDG (1 per 20 samples minimum)	RPD <20% for samples >20 mg/L; ± CRDL for samples <20 mg/L	<ol style="list-style-type: none"> <li>1. Flag associated data with an "*"</li> </ol>
Mineral Reference Samples	One set (at two concentration levels, one low, one high) per batch or SDG	± 15% from expected concentration	<ol style="list-style-type: none"> <li>1. Terminate analysis</li> <li>2. Identify and document the problem</li> <li>3. Reanalyze all associated samples</li> </ol>

<sup>a</sup> SDG - Sample Delivery Group - each case of field samples received; or each 20 field samples within a case; or each 14 calendar day period during which field samples in a case are received.

Standardize pH meter daily, using at least 2 buffers.

Standardize titrant whenever prepared or monthly, whichever comes first.

Do not use titrant volumes greater than 50 mL. Reanalyze any sample requiring more than 50 mL of titrant, selecting a smaller aliquot of sample, or performing the titration with a higher normality standard acid.

