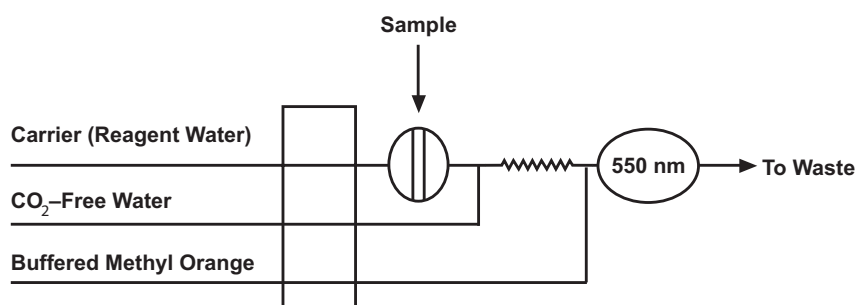


## Method Abstract

<b>Scope</b>	This method is used for determining total alkalinity in drinking water, surface water, and domestic and industrial wastes according to USEPA Method 310.2.	
<b>Summary</b>	Samples are mixed with a methyl orange indicator solution that is weakly buffered at pH 3.1. Alkalinity from carbonates, bicarbonates, and hydroxides causes the color of the indicator solution to change from red to yellow. The absorbance is measured at 550 nm, which is the wavelength of the maximum absorbance of the red form of the indicator. Since methyl orange alkalinity is an inverse chemistry, the absorbance decreases as alkalinity increases. The decrease in absorbance at 550 nm is directly proportional to the sample alkalinity.	
<b>Interferences</b>	Filter turbid samples prior to analysis; if samples are filtered, this method is not approved for NPDES (National Pollutant Discharge Elimination System) monitoring. Alkalinity of samples with pH values less than 3.1 cannot be determined by this method. Residual chlorine bleaches the indicator solution and interferes with the assay; treat samples containing chlorine with sodium thiosulfate. Color or background absorbance at 550 nm may interfere with the assay. Carbon dioxide interferes; verify the reagents and deionized water are properly degassed or are free of carbon dioxide.	
<b>Performance Specifications</b>	Range: 10–600 mg/L as $\text{CaCO}_3$ Throughput: 90 samples/hour Precision (at 50 mg/L): <5% RSD Precision (at 200 mg/L): <3% RSD Method Detection Limit (MDL): 5 mg/L as $\text{CaCO}_3$ ERA QC Results 91% Recovery	
<b>Chemicals</b>	Deionized (DI) Water (ASTM Type I or II)	Potassium Acid Phthalate, $\text{C}_8\text{H}_5\text{O}_4\text{K}$
	Hydrochloric Acid, concentrated, HCl	Sodium Carbonate, anhydrous, $\text{Na}_2\text{CO}_3$
	Methyl Orange, $\text{C}_{14}\text{H}_{14}\text{N}_3\text{O}_3\text{SNa}$	Sodium Thiosulfate, $\text{Na}_2\text{S}_2\text{O}_3$

### Basic Flow Diagram



**Note** This method complies with USEPA Method 310.2.

**Selected References** *Methods for Chemical Analysis of Water and Wastewater*; EPA-600/4-79-020; U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring and Support Laboratory: Cincinnati, OH, 1984; Method 310.2.

*Standard Methods for the Examination of Water and Wastewater*, 20th ed.; American Public Health Association: Washington D.C., 1998.

## Figures

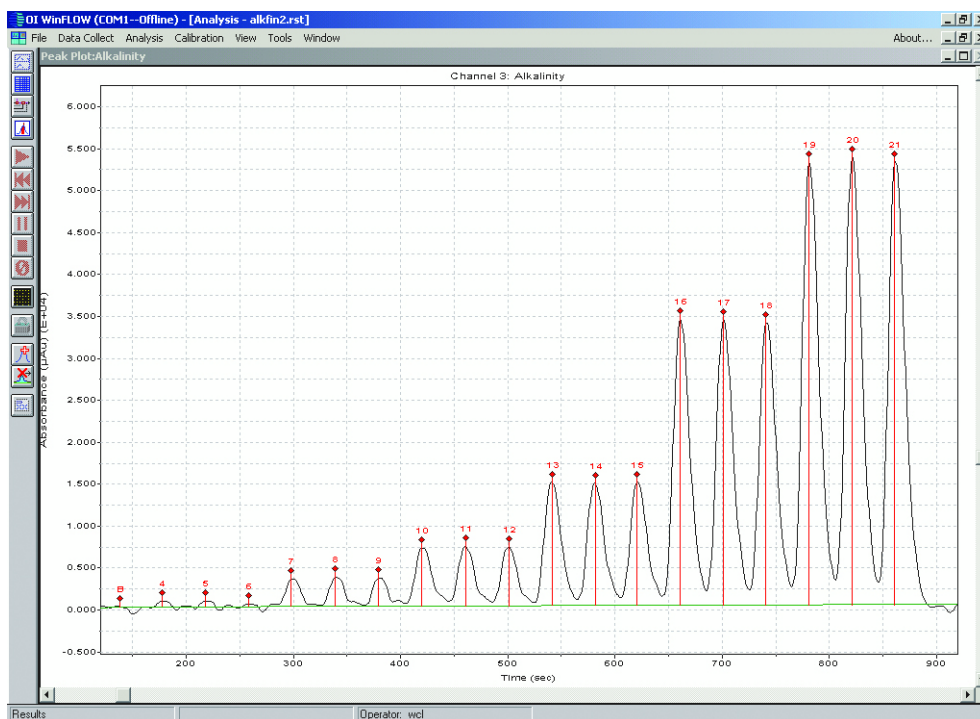


Figure 1. Total Alkalinity Calibration (10–600 ppm)

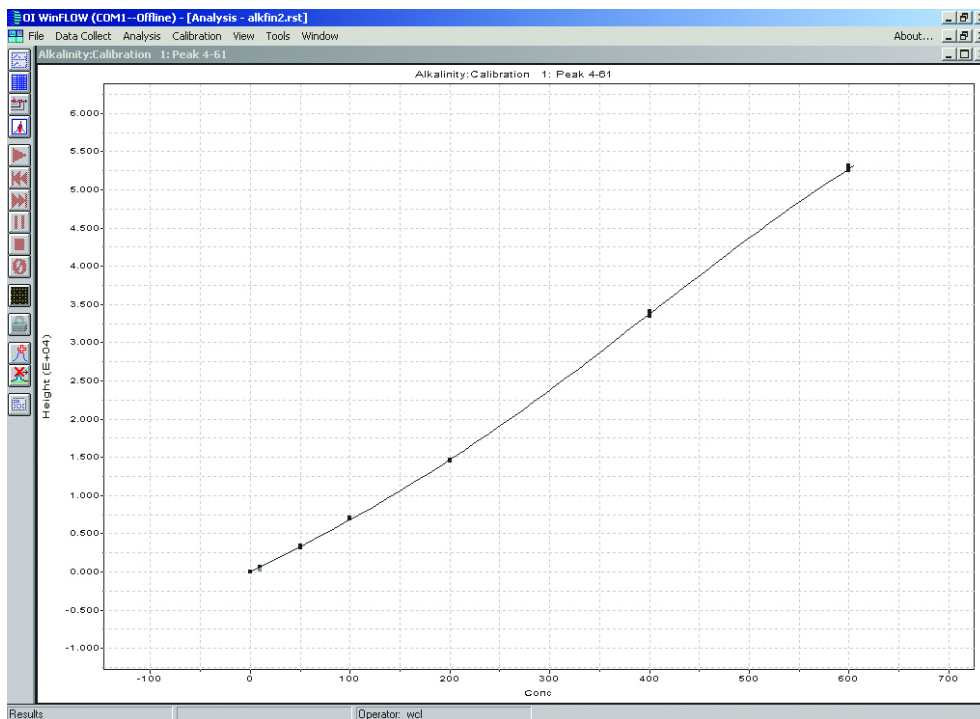


Figure 2. Total Alkalinity Calibration Curve (10–600 ppm)

OI WinFLOW (COM1--Offline) - [Analysis - alkfin2.rst]

File Data Collect Analysis Calibration View Tools Window

Alkalinity:Calibration 1: Peak 4-61

Name	Conc	Height
* cal 10.0 ppm	10.000000	630.743042
* cal 10.0 ppm	10.000000	620.929749
cal 10.0 ppm	10.000000	302.381653
* cal 50.0 ppm	50.000000	3197.40136
* cal 50.0 ppm	50.000000	3398.03930
* cal 50.0 ppm	50.000000	3286.02221
* cal 100 ppm	100.000000	6903.43652
* cal 100 ppm	100.000000	7034.80179
* cal 100 ppm	100.000000	6968.47998
* cal 200 ppm	200.000000	14610.0332
* cal 200 ppm	200.000000	14497.0673
* cal 200 ppm	200.000000	14537.3538
* cal 400 ppm	400.000000	34091.5351
* cal 400 ppm	400.000000	33870.3007
* cal 400 ppm	400.000000	33498.5629
* cal 600 ppm	600.000000	52623.1953
* cal 600 ppm	600.000000	53131.2578
* cal 600 ppm	600.000000	52531.6992

Calib Coef:	
x=dyyy+cy+by+a	
a: (intercept)	-6.6144e-01
b:	1.5931e-02
c:	-1.8114e-07
d:	1.7990e-12
Corr Coef:	
	0.999951
Carryover:	
	0.3094
No Drift Peaks	

Figure 3. Total Alkalinity Calibration Results (10–600 ppm)

## Method Abstract

Table 1. Total Alkalinity Precision Calculations

	50 mg CaCO <sub>3</sub> /L	200 mg CaCO <sub>3</sub> /L	50 mg CaCO <sub>3</sub> /L	ERA P124-506
<b>Rep 1</b>	38.9	203	52.1	36.8
<b>Rep 2</b>	42.1	204	53.8	35.0
<b>Rep 3</b>	43.6	203	44.8	35.1
<b>Rep 4</b>	42.2	205	44.0	35.9
<b>Rep 5</b>	40.7	206	44.5	—
<b>Rep 6</b>	45.2	201	49.6	—
<b>Rep 7</b>	43.0	201	44.2	—
<b>Rep 8</b>	42.4	201	—	—
<b>Rep 9</b>	46.3	197	—	—
<b>Rep 10</b>	44.6	189	—	—
<b>Mean</b>	43.0	201	47.6	35.7
<b>Standard Deviation</b>	1.975	4.9213	4.1512	0.822974
<b>% RSD</b>	4.59	2.45	8.73	2.31
<b>% Recovery</b>	86	101	95	93
<b>MDL</b>	—	—	13	—

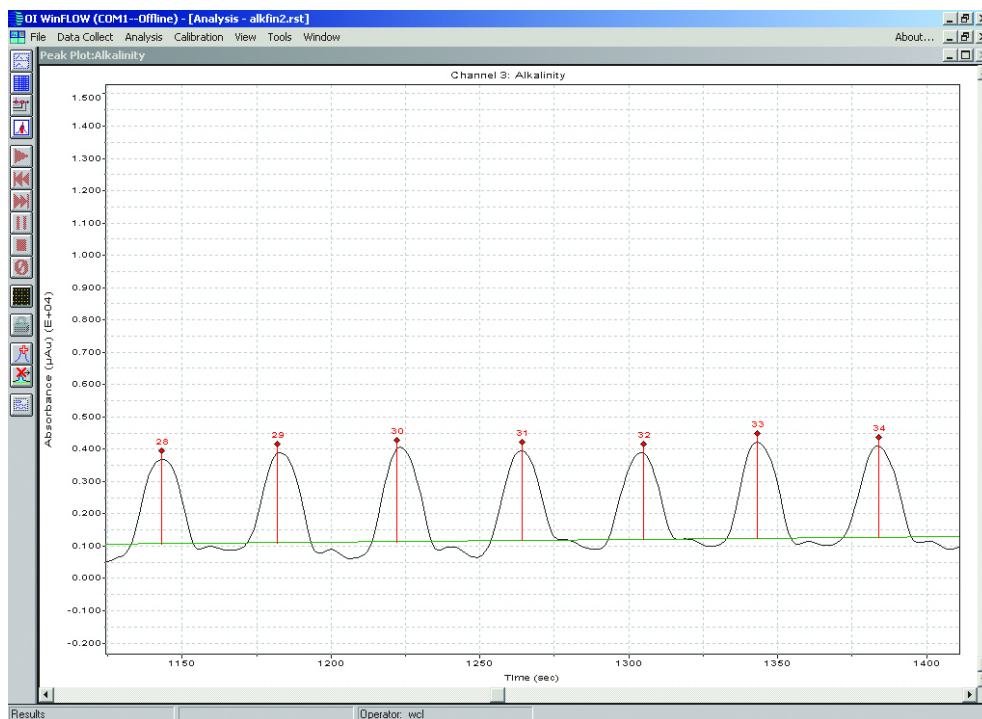


Figure 4. Total Alkalinity Method Detection Limit (at 50 ppm)

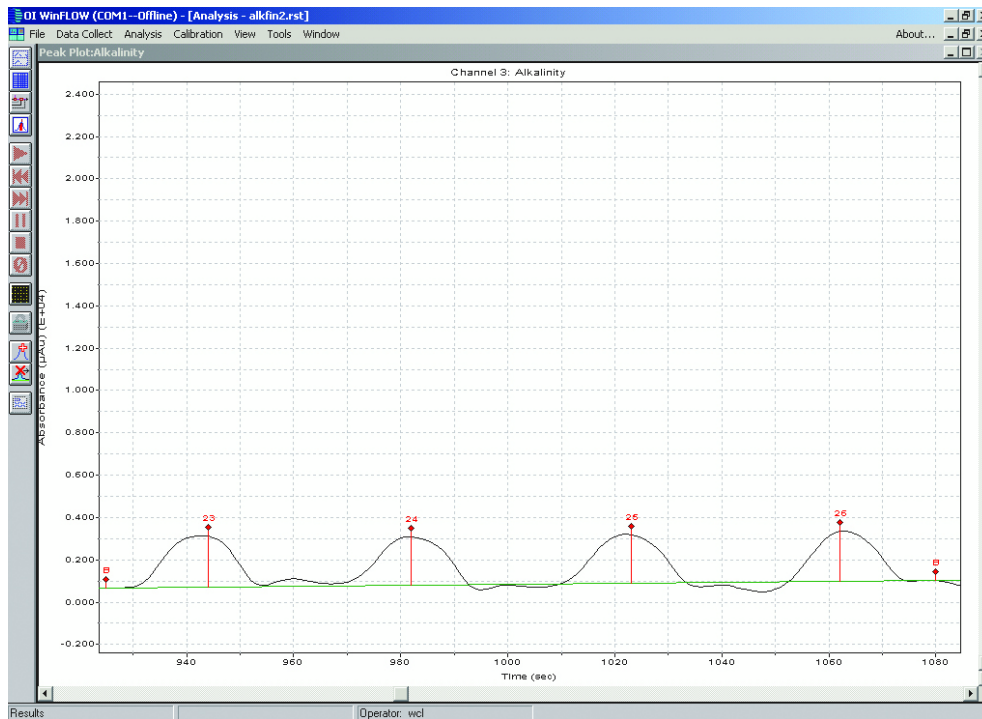


Figure 5. Total Alkalinity QC Sample Precision

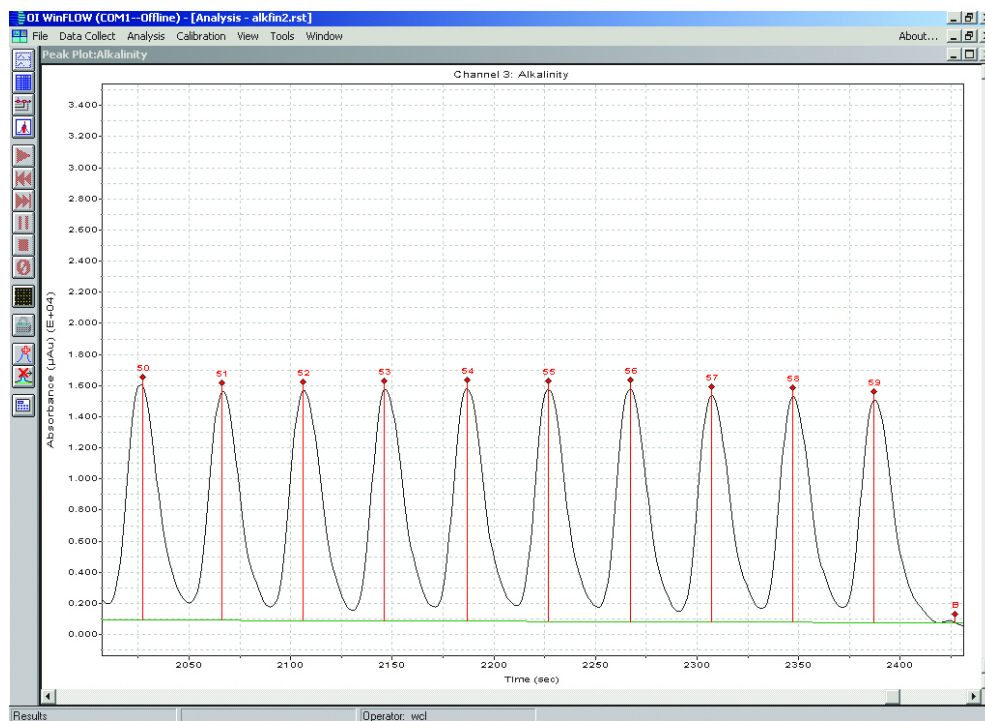


Figure 6. Total Alkalinity Precision (at 200 ppm)