

## Method Overview

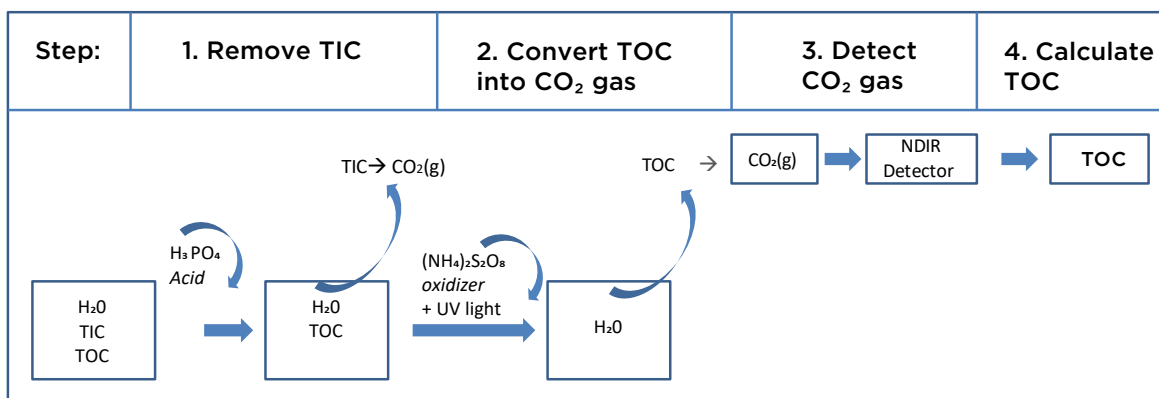


### A water sample initially contains two types of carbon:

- Total Inorganic Carbon (TIC) (from  $\text{CO}_2$  gas dissolved in  $\text{H}_2\text{O}$  and dissolved carbonates in the water)
- Total Organic Carbon (TOC) (from organic species)

To measure TOC, first remove TIC. Then convert organic species into  $\text{CO}_2$  gas, measure the gas on detector, and convert the result into a TOC value.

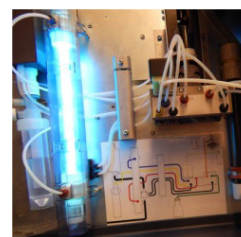
### The Measurement Strategy:



### Steps:

- Remove TIC.** In presence of acid  $\text{H}_3\text{PO}_4$ , all dissolved carbonates are converted into  $\text{CO}_2$  gas. Blow carrier gas through reaction chamber to remove all  $\text{CO}_2$  gas derived from inorganic carbon.
- Convert TOC into  $\text{CO}_2$  gas.** In presence of UV light and powerful oxidizer  $(\text{NH}_4)_2\text{S}_2\text{O}_8$ , organic carbon species are converted into  $\text{CO}_2$  gas by oxidation. Blow carrier gas through reaction chamber to push all  $\text{CO}_2$  gas through NDIR detector (step 3).
- Detect  $\text{CO}_2$  gas as it goes through NDIR detector.** TOC is quantified by integrating the area under the curve.
- Calculate TOC.** Based on instrument calibration, convert  $\text{CO}_2$  gas signal (area under the curve) into TOC.

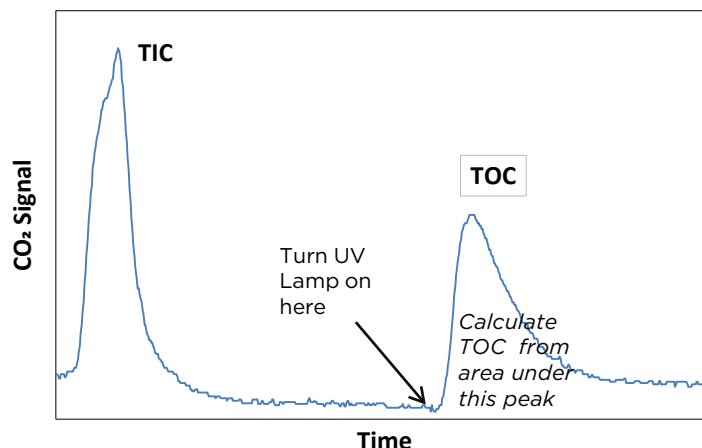
UV lamp on →



NDIR detector →



## CO<sub>2</sub> NDIR Detector Signal vs. Time



Note that the area under the curve for TOC can also be referred to as 'NPOC' (Non-Purge able Organic Carbon). If the initial water sample contained a volatile organic, the volatile organic would likely be purged during the step to remove TIC. Thus, what remains after TIC removal is non-purge able organic carbon. Because the QbD1200 is designed for clean water applications where high concentrations of volatiles are not present, this should not be a concern.

### UV / Persulfate / NDIR Method

The general TOC analysis method described here has been widely used for many years in a variety of applications and conforms with numerous regulatory guidelines such as USP, EP, JP, and is also an approved method (5310c) under the US EPA guidelines. The QbD1200 is unique in that it combines all required reagents (acid, oxidizer, and dilution water) into a single reagent instead of requiring multiple reagents.