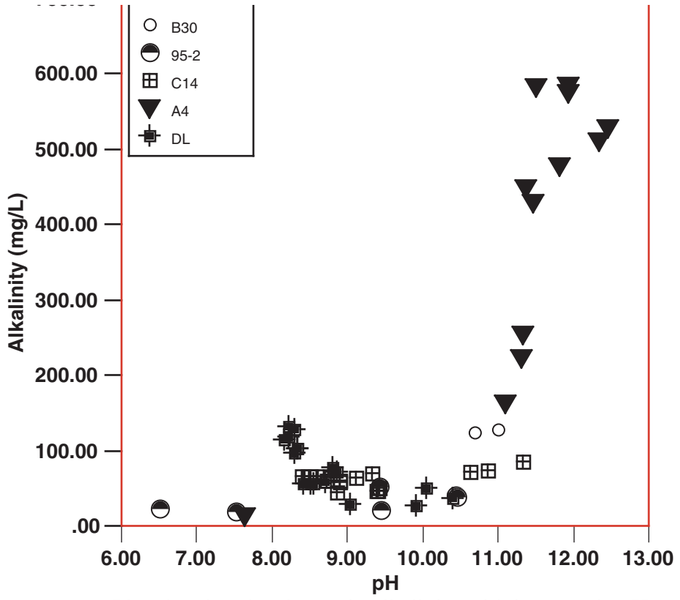
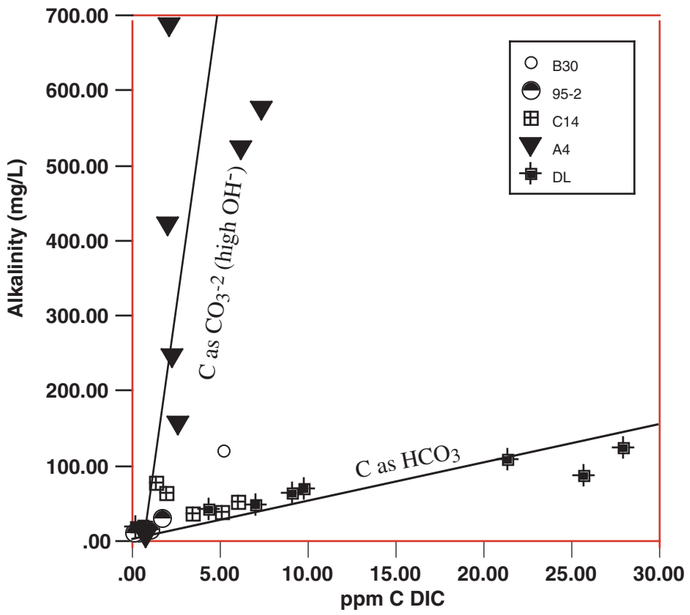
5. Field Geochemistry

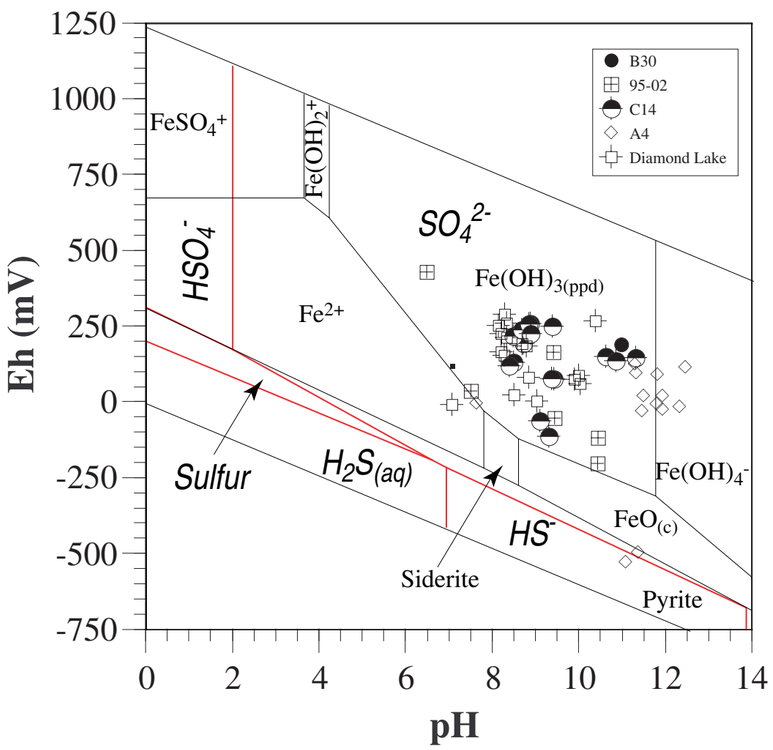


Plot showing the change in alkalinity with increase in pH.

With an increase in pH, the alkalinity increases. However, the curve of pH vs. alkalinity suggests that a titration for hydroxide alkalinity must be done in order to achieve more accurate results.

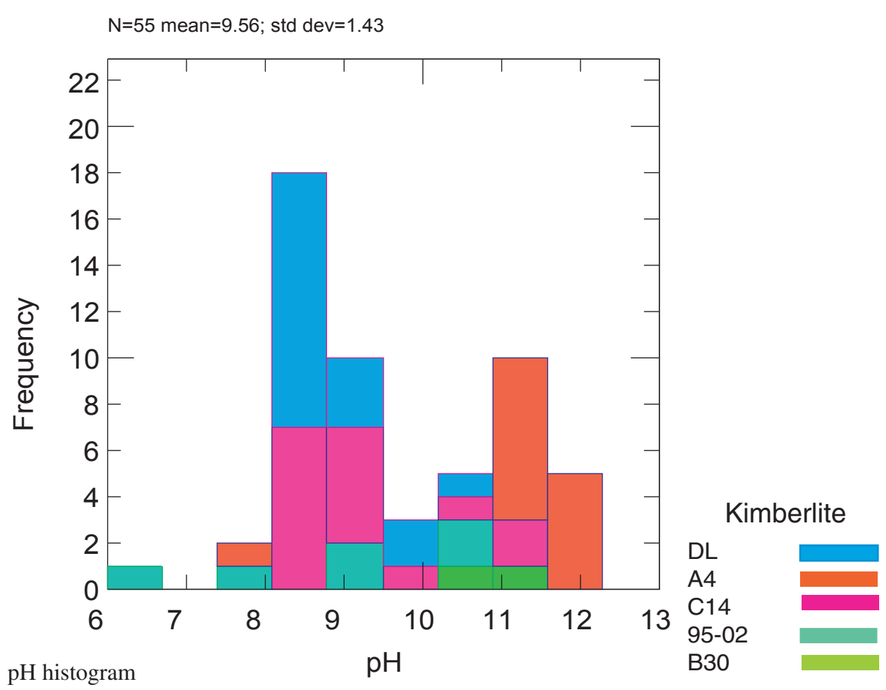
With increasing pH, the alkalinity rises, however, for the high pH waters from A4, this plot shows that alkalinity is controlled by OH^- rather than carbonate alkalinity in the other samples.





Plot of stability fields for Fe and S species.

The iron and sulfur solubility fields show that the majority of the waters are stable in the Fe(OH)3 and sulfate fields of the graph. However, many of the A4 samples are more reduced and are within the $Fe(OH)_4^-$ stability field. Fields created using The Geochemist's Workbench.



pH histogram

For all the samples collected from the various sites, the pH is higher than typical for groundwater in crystalline rocks. The highest pH values were in the range of 12.4 at pipe A4. These elevated pH values are consistent with hydration of ultramafic minerals (Clark and Fritz, 1997) and the formation of hydroxide alkalinity, CH_4 (methane) and H_2 (Sherwood Lollar et al., 1993, Deines and Langmuir, 1974).

$$5Mg_2SiO_4 + Fe_2SiO_4 + 9H_2O = 3Mg_3Si_2O_5(OH)_4 + Mg(OH)_2 + 2Fe(OH)_2$$

olivine — serpentine — ferrous hydroxide