Effects of Sodium Chloride on Iron Water Main

By
Kevin Mc Naughton

Parts for project donated by:
- ❑ City of Barrie Water Department
- ❑ Wamco

Contact Information: Kevin Mc Naughton
Email-Kevin.Mcnaughton@barrie.ca
Phone-705-795-4167

Background sodium chloride

- Sodium Chloride for years has been overused in the province of Ontario
- Sodium Chloride is a very effective de-icer
- Effect of the over use of Sodium Chloride are starting to be felt by Ontario's Municipalities through the damage to their infrastructure.
- Province has begun to make changes to the way sodium chloride is being used

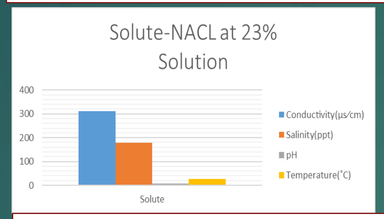
Research Question

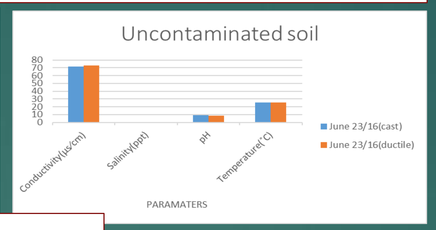
What is the long term effect of Sodium Chloride on Iron Water main?

Methodology

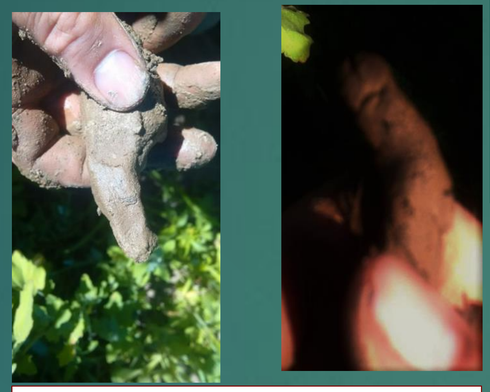
- Install two different sections of water main into a live and working water system
- Expose soil surrounding the water mains to 23% Sodium Chloride and maintain strength of solute through trial length of 2 months
- Monitor strengths of solute on a by-weekly basis to maintain proper dosage is being achieved
- Monitor soil for conductivity, salinity, pH, temperature, re-dox potential.
- Soil will also have a bulk density test done to see what moisture content of soil is pre and post exposure
- A ribbon test will also be preformed to see what percentage of clay/silt/sand is in host soil
- Pre exposure and post exposure test will be done on exterior of pipe to visualize corrosion activity

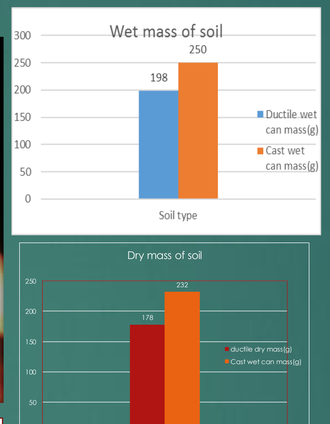
Results





Ribbon testing



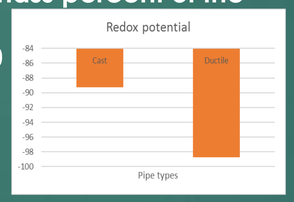


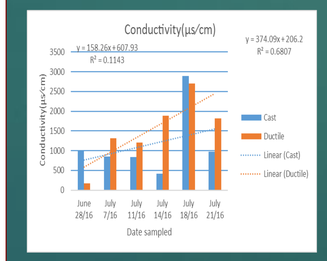
Dry mass % of soil

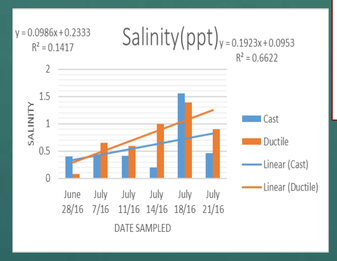
The formula used to calculate the dry mass percent of the soil is as follows:

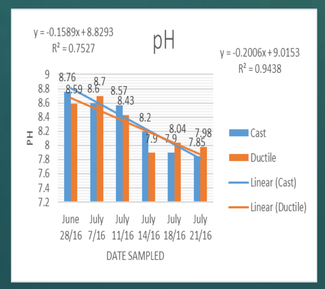
$MC\% = W_{(2-W_3)} / (W_{(3-W_1)}) \times 100$

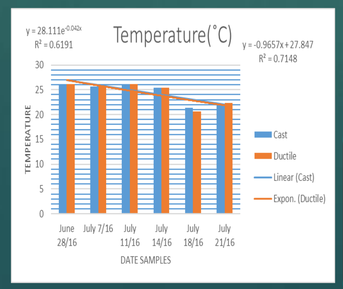
W_1=Weight of tin(g)
W_2=weight of moist soil+tin(g)
W_3=Weight of dried soil+tin(g)
1)









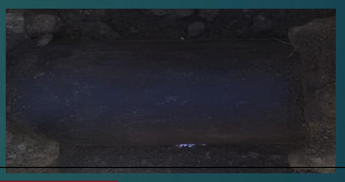


Pre-exposure to solute

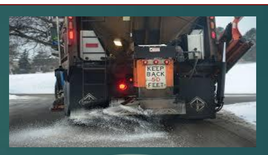
Cast iron

Ductile

Post exposure to solute



Conclusion



Salt application to road's

Salt damage from over use

Broken water main

Corrosion on exterior of iron water main

Future work

-Effects sodium chloride has on other types of water main i.e. PVC
-longevity of sodium chlorides residual of soil after changes are made to the way sodium chloride is used

References
1)Department of Sustainable Resources, soil survey standard test method, soil moisture content, 1990