

# Microcosm Study on Mineralogical Changes of post Molasses Injection with Savannah River Site (SRS) F-area Sediments

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## ARCADIS Technology

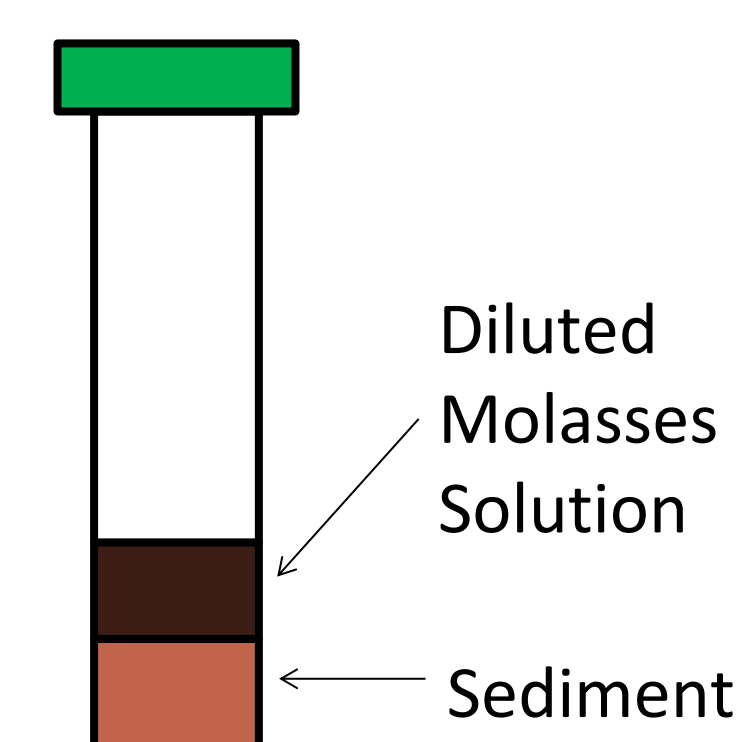
- Enhanced Anaerobic Reductive Precipitation (EARP)
  - Targets metals and radionuclide contaminants
- Known as In situ Reactive Zones (IRZs)
- Works by introducing a carbon substrate (molasses) to the groundwater advective flow distribution
- Periodic injections (April 2010 through January 2011)
- Produced anaerobic conditions through microbial action
- Uranium is a redox-sensitive radionuclide
  - Mobility gets minimized
  - Aqueous U(VI) → Insoluble U(IV) form
- As of March 2011:
  - Evidence of methanogenesis
  - Rebound to less-reducing condition beginning to occur at the edge of the reactive zone
- Project was left unfunded
  - Period where re-oxidation occurred was left unmonitored
  - What effect did this have on reduced uranium?
    - the longevity of the technology could not be proven

## Objective

The main goal is to accomplish long term remediation to sequester contaminants in the subsurface without degrading the overall water quality or drastically changing the ecosystem of the region.

These experiments will also explain the types of reactions that might occur in the anaerobic aquifer.

## Methodology



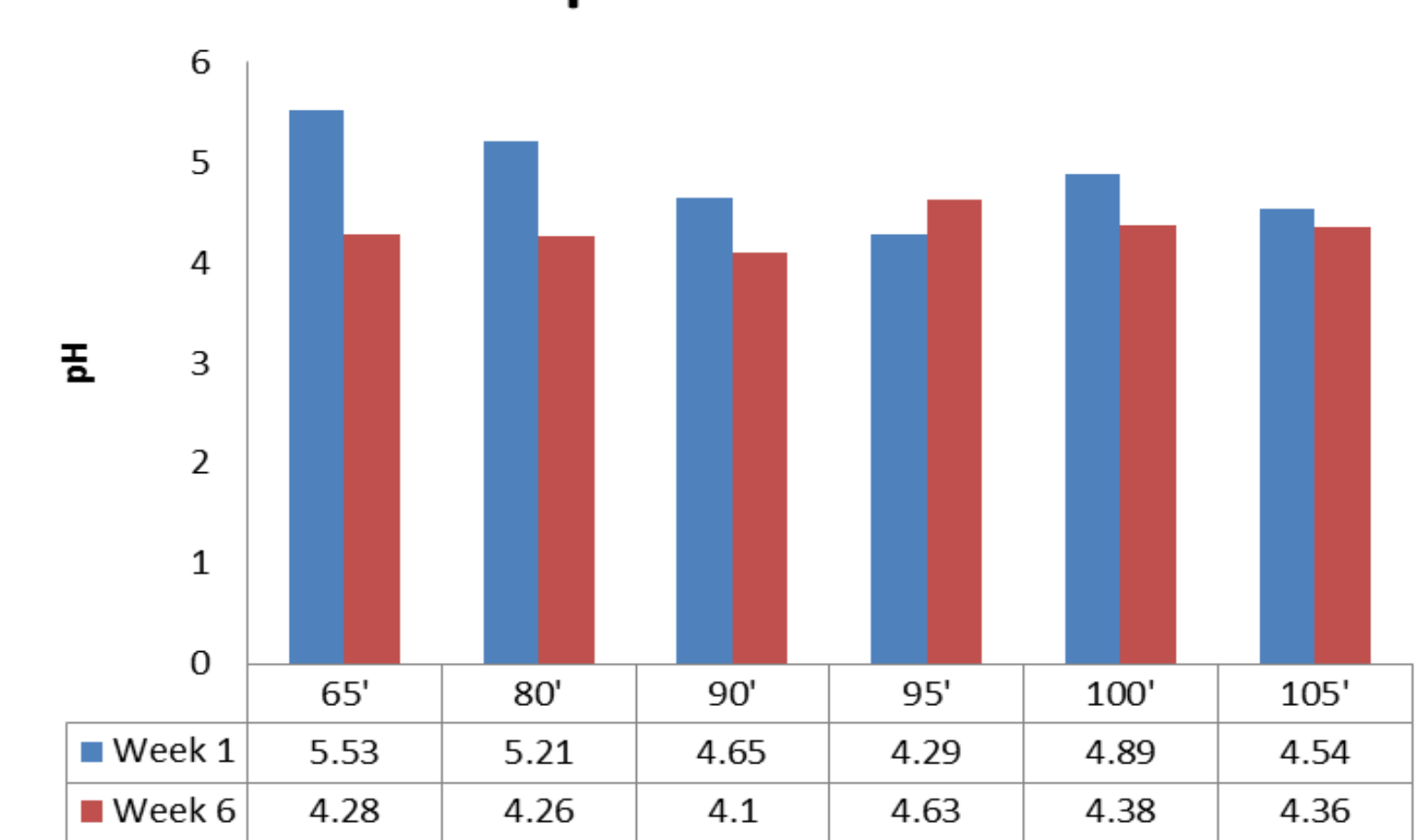
Samples contained:

- Enough sediment to occupy 10 mL
- 10 mL of diluted molasses solution (5%)
- Batch 2 was inoculated with bacteria from a local WWTP anaerobic digester

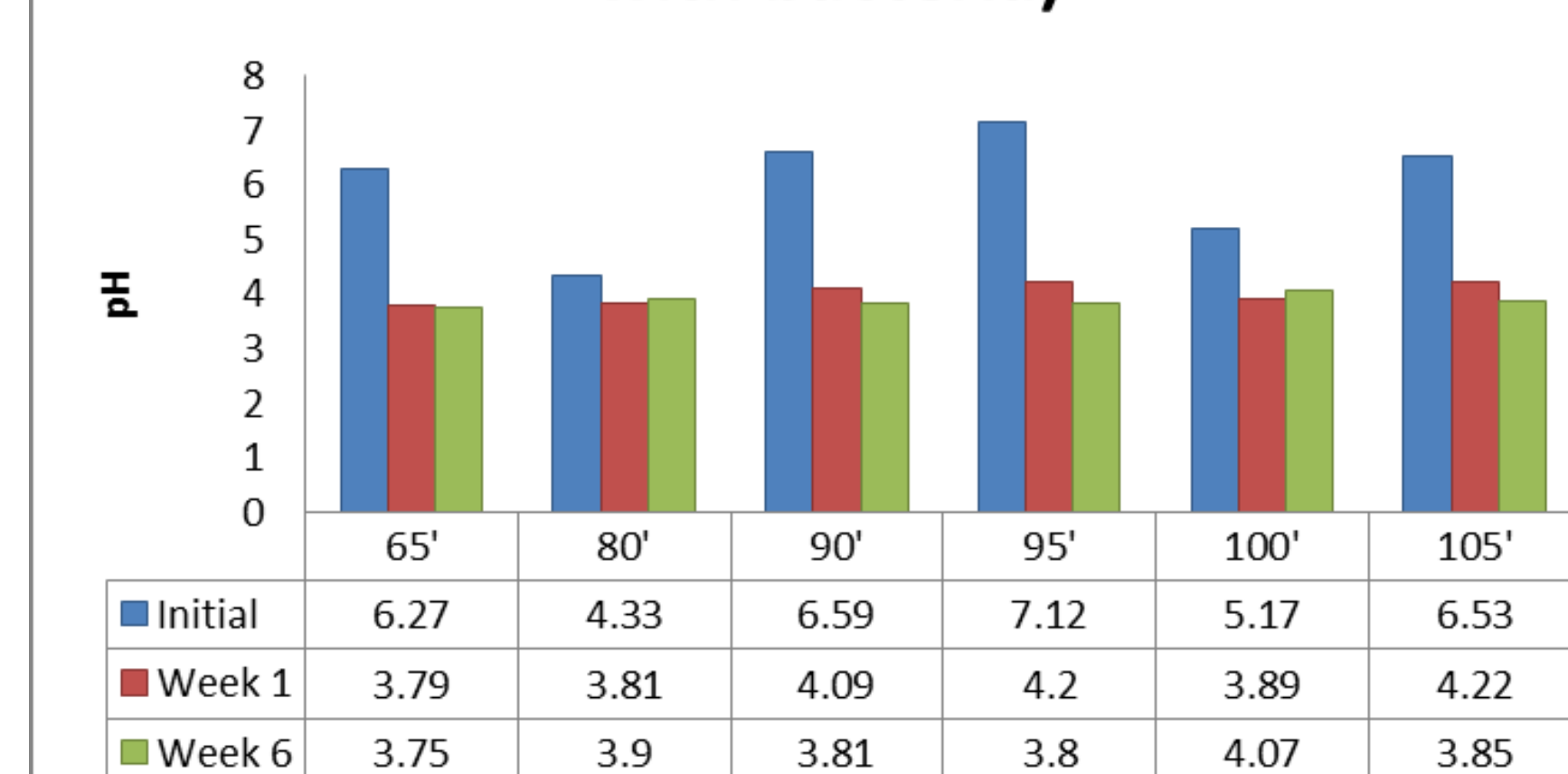
- Solid Phase → XRD
  - Samples are dried in their respective oxygenated environments
- Liquid Phase → ICP
  - Liquid is centrifuged
  - Supernatant is filtered (0.45 μm)

## pH Changes

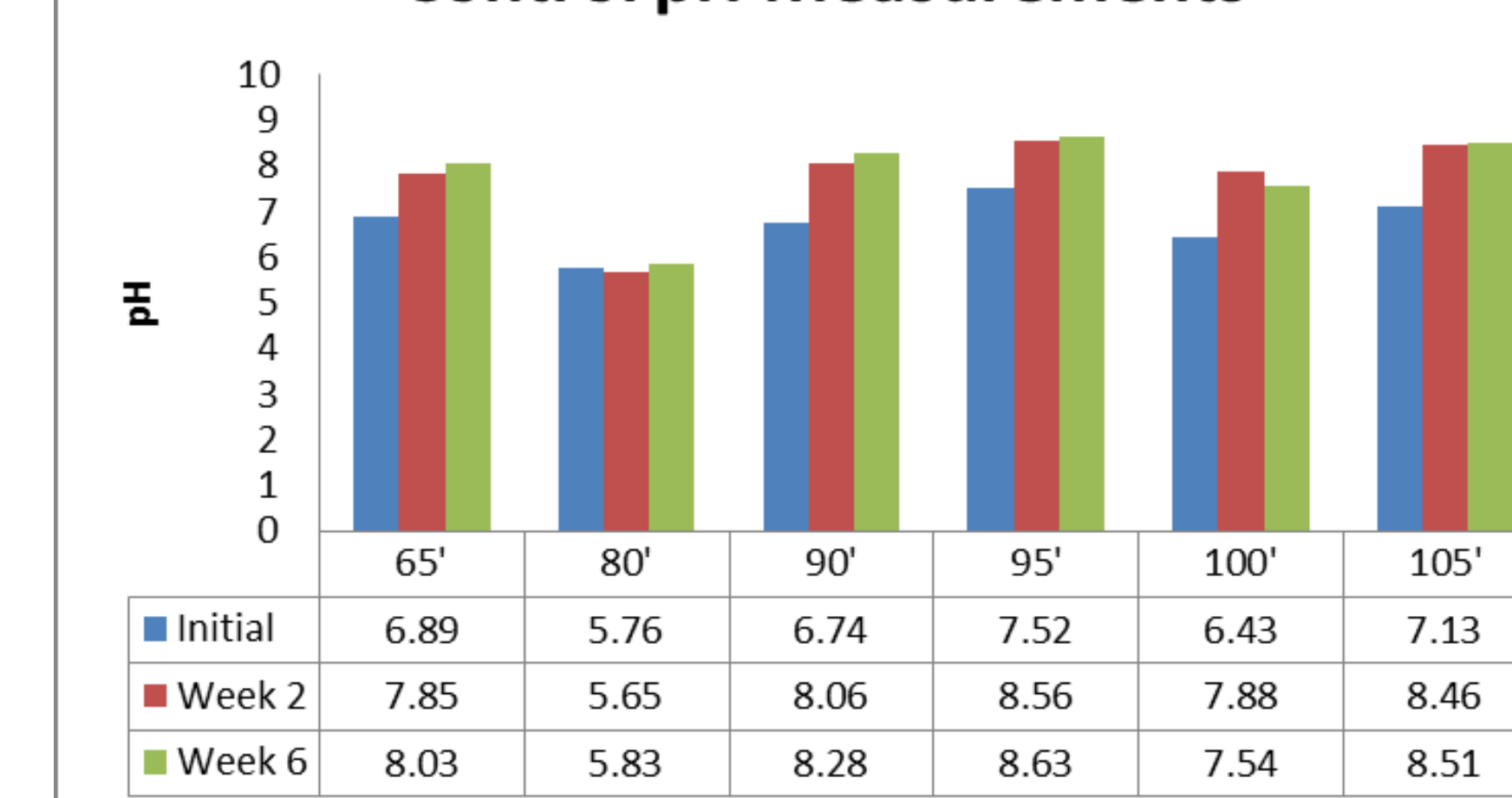
Batch 1 pH Measurements



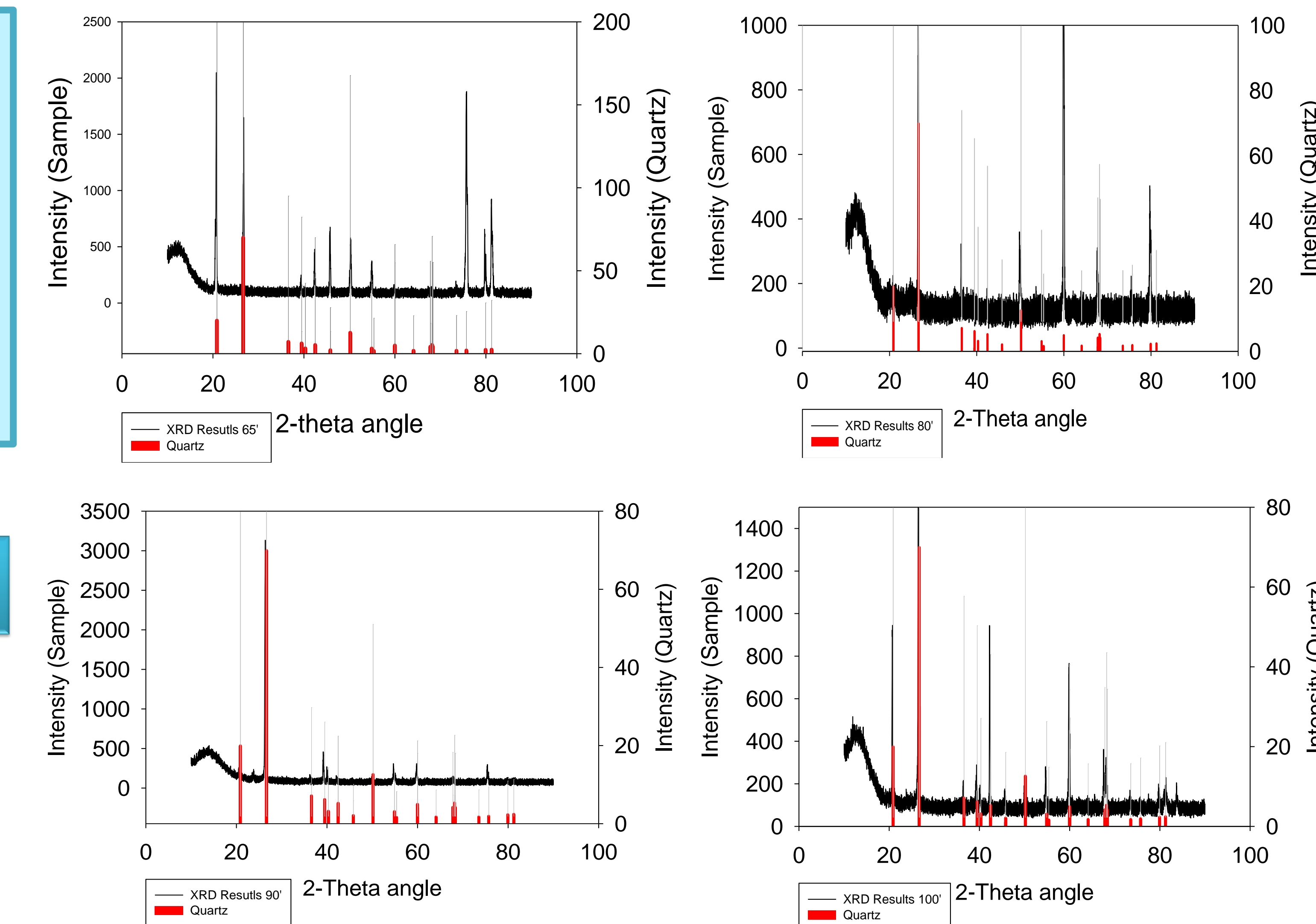
Batch 2 pH Measurements (amended with bacteria)



Control pH Measurements



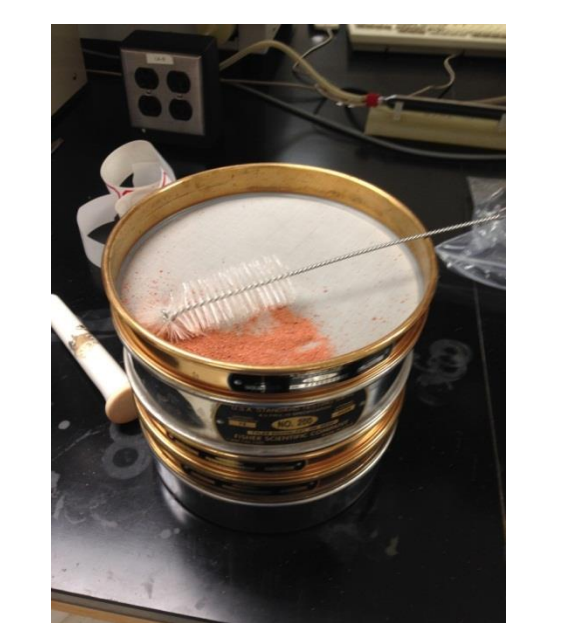
## XRD Analysis



Quartz is the most likely match with 80% of peaks aligning

## Future Work → Re-oxidation

- After six weeks, samples will be sacrificed
- Three types of environments:
  - Anaerobic chamber with no oxygen
  - Small chamber containing 2000 ppm oxygen
  - Work bench at atmospheric oxygen levels
- Sieve samples to analyze fine fractions of less than 0.06 mm



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