SELECTING PERMEANT WATER FOR HYDRAULIC CONDTUCIVITY TESTING OF GCLS EXHUMED FROM LANDFILL FINAL COVERS

Joseph Scalia, Craig Benson
University of Wisconsin-Madison • Geological Engineering

Introduction

Geosynthetic Clay Liner (GCL):

• Factory-made hydraulic barrier; often used in MSW landfill final covers

• Advantages:
  • Easy to install (simply unroll on site)
  • Potentially very low hydraulic conductivity (k)

• Disadvantages:
  • Sensitive to chemical interactions
  • Ion exchange can alter properties

• Typical GCL cross section:

Background

• ASTM D 5084 recommends "representative permeant"

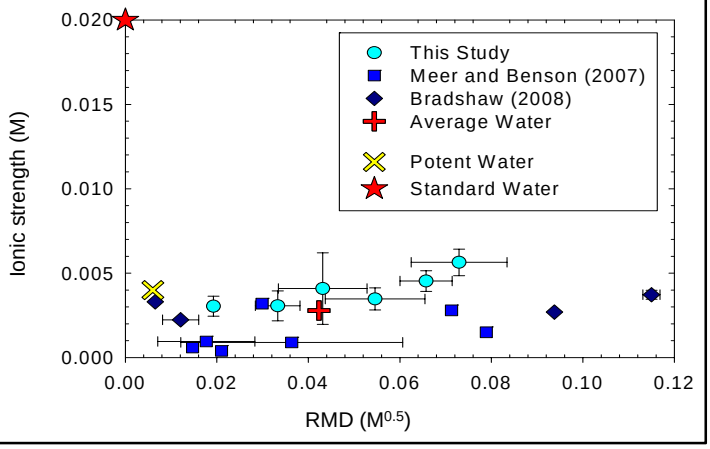
•Permeant chemistry defined by ionic strength (I) and the ratio monovalent to divalent cations (RMD)

• **I ↑ = lower clay swell = k ↓**

• **RMD ↑ = greater clay swell = k ↓**

• "Standard Water" (0.01 M $CaCl_2$) recommended when "representative permeant not available"

• Representative & typically employed permeants:



Hypothesis

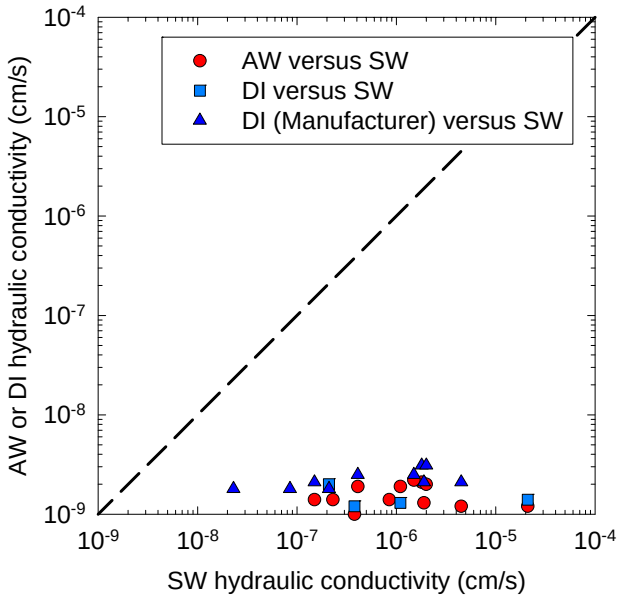
The chemistry of waters used to permeate GCLs exhumed after deployment can dramatically impact measured laboratory hydraulic conductivity

Results

• GCLs overlain by geomembrane exhumed from 4 sites tested with 3 permeants:
  • Deionized Water (DW)
  • Average Water (AW) (average of representative water chemistries)
  • Standard Water (SW)

• All exhumed GCLs had undergone significant cation exchange in-situ

• Effect of permeant chemistries on hydraulic conductivities:



• Hydraulic conductivity with SW 1 to 4 orders of magnitude greater than AW or DI

Conclusion and Recommendations

• Permeant chemistry can dramatically affect hydraulic conductivity of exhumed cover GCLs

• Should permeate with Potent Water for repeatable, conservative and representative k