

2009 Characterization of the Saturated Conductivity, SAR and EC Relationship in Subsoils

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The primary scope of this research is to: 1) characterize how soil saturated hydraulic conductivity (K_{sat}) varies with EC and SAR in Western Canada relevant subsoils as a function of clay mineralogy, soil texture, pH, at different ratios of magnesium, calcium, and sodium; 2) evaluate treatment options for ameliorating SAR impacts in soil; 3) analyse these data for guideline development; and, 4) provide recommendations for improving lab methods (and core collection) for site-specific testing of saturated conductivity in subsoils.

This research is relevant to the following situations: 1) SAR impacted soils as a result of produced water release sites due to upstream oil and gas activities and saline/sodic water produced from coal-bed methane operations; 2) construction practices leading to subsoils high in naturally occurring sodium sulfate being brought to the surface resulting in increased EC, SAR, and ESP values; and, 3) techniques

for remediating SAR in subsoils.

The research plan and methodology of the project is designed to address the different scenarios where SAR impacts may occur in subsoils, which is described below. The effects of elevated sodium on surficial soil are well known (McNeal et al., 1968; Curtin et al., 1994a). High SAR can result in dispersion of clay particles, aggregate breakdown, and clay swelling, leading to a reduction in hydraulic permeability. Generic soil guidelines provide sodicity remediation guidelines for topsoil and rooting zone, valid to a depth of 1.5 m. For salt impacted sites in the upstream oil and gas industry, the depth of salinity and sodicity impacts is generally dependant on the produced water release mechanism, with larger spills, pipeline breaks and flare pit releases potentially impacting soils to deeper depths. Remediation of impacted soils at depth to meet generic SAR guidelines applicable for rooting zone soils may result in an over or under protection of soil hydraulic conductivity.

2010 Equilibrium_SAR presentation (conductivity, SAR, EC)