EVALUATION OF REED CANARY GRASS AS AN ENHANCER FOR LANDFARMS TREATING REFINERY SLUDGES: GREENHOUSE AND FIELD TEST RESULTS.

This is NOVA Chemicals

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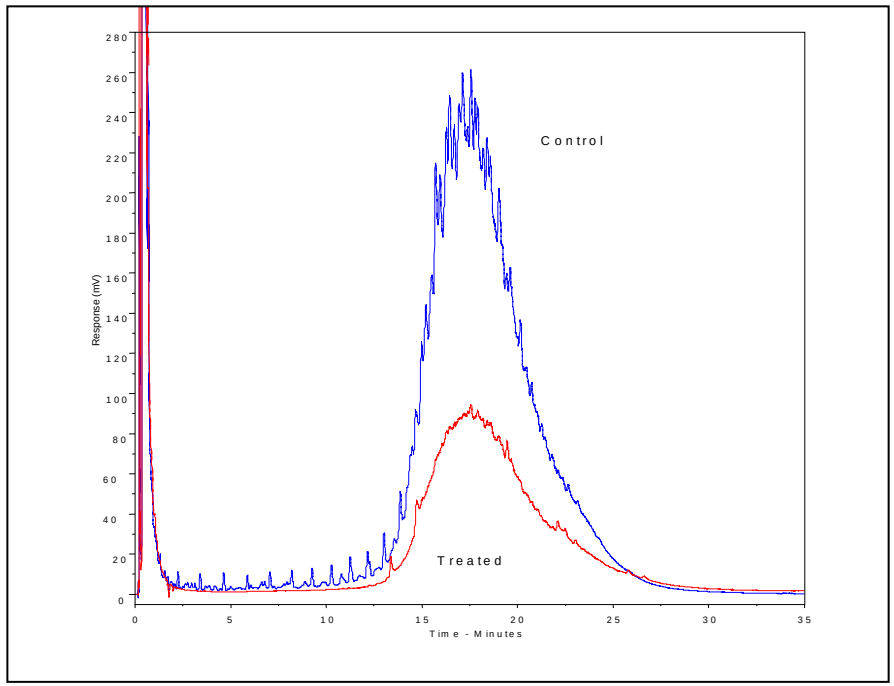
Outline

- History of NOVA Chemicals involvement in phytoremediation
- Greenhouse studies
- Field studies
- Future work

The Beginning



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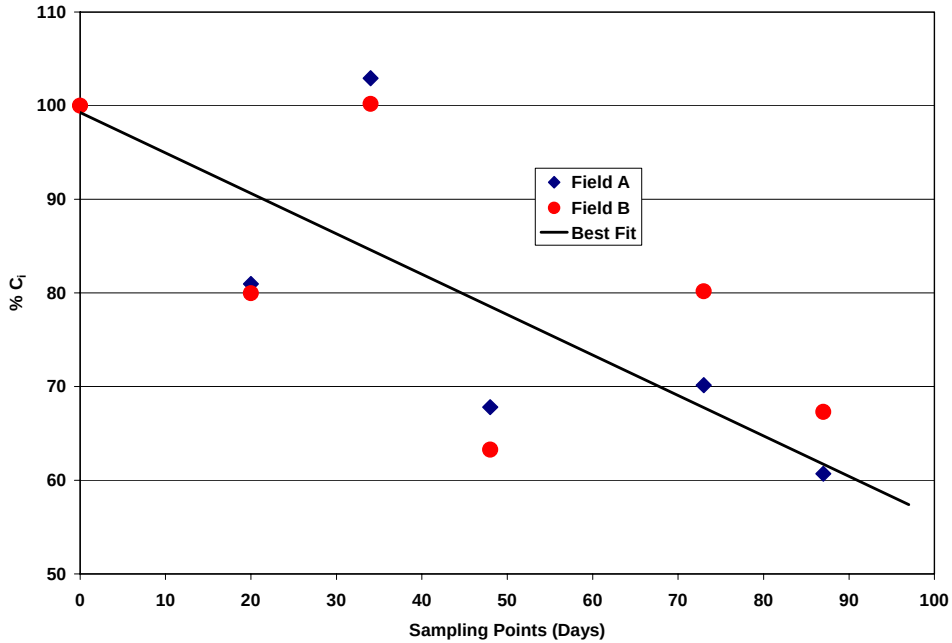
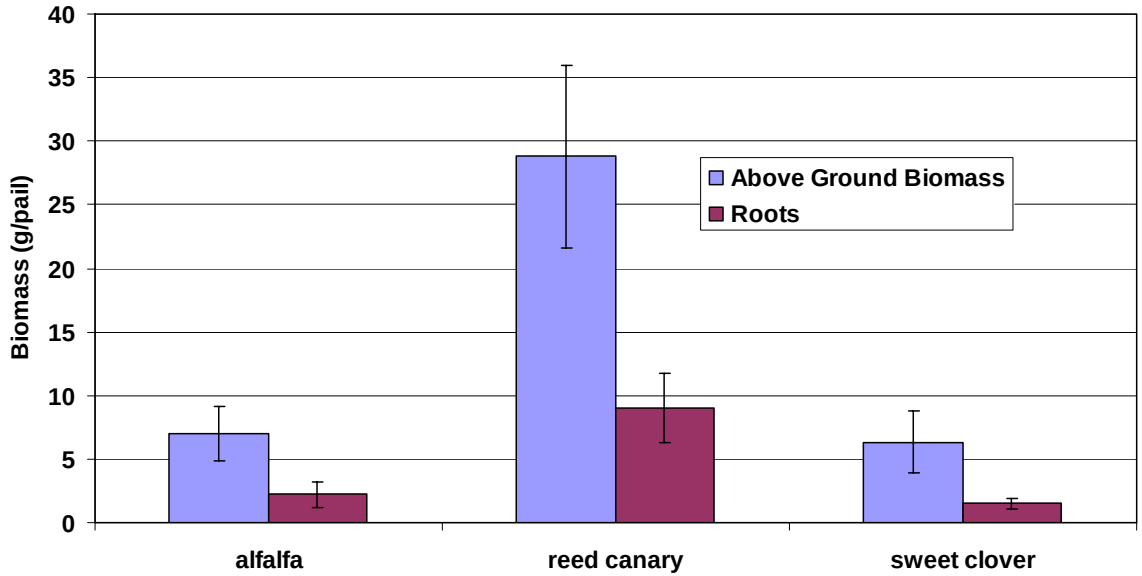


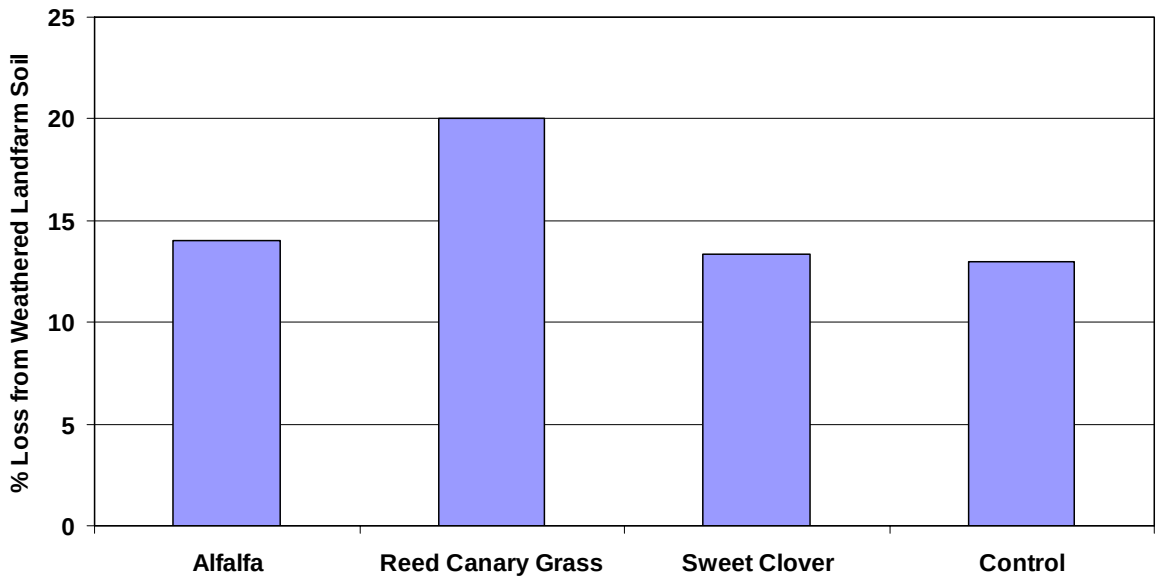
Summary

- Initial work in the lab saw 50% reduction of used motor oil with alfalfa.
- Field trial on two fields reduced oil and grease by >30% in 90 days and allowed additional spreading before the end of the season.
- Sites were happy with the results!

Greenhouse Studies - Past

Greenhouse Studies - Past





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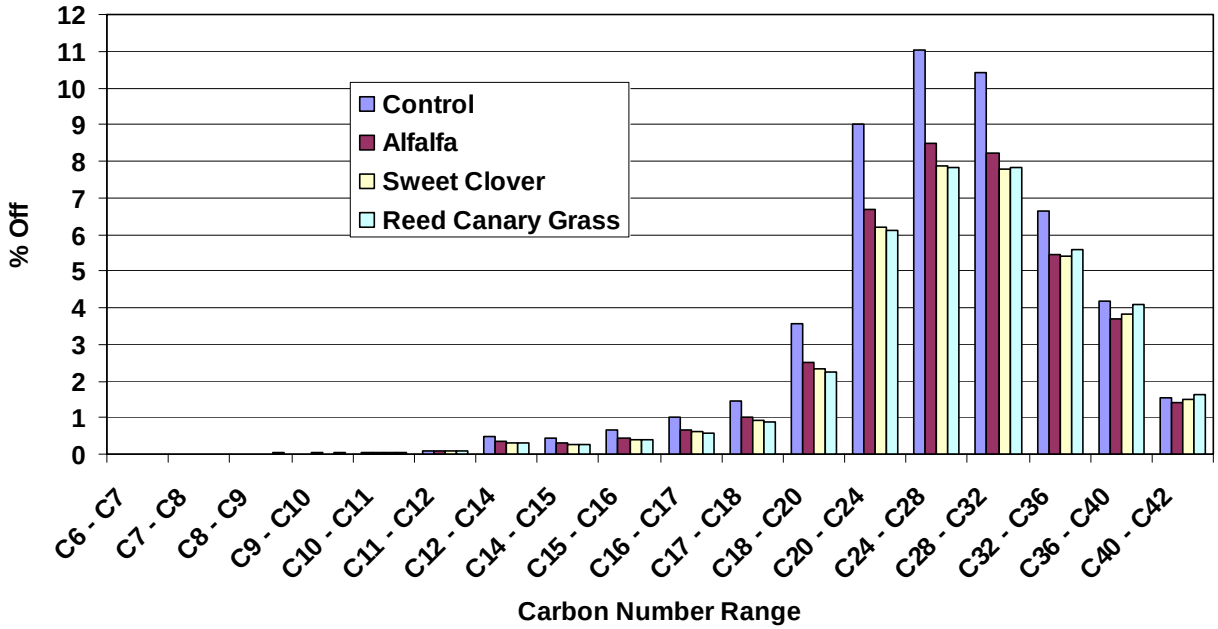
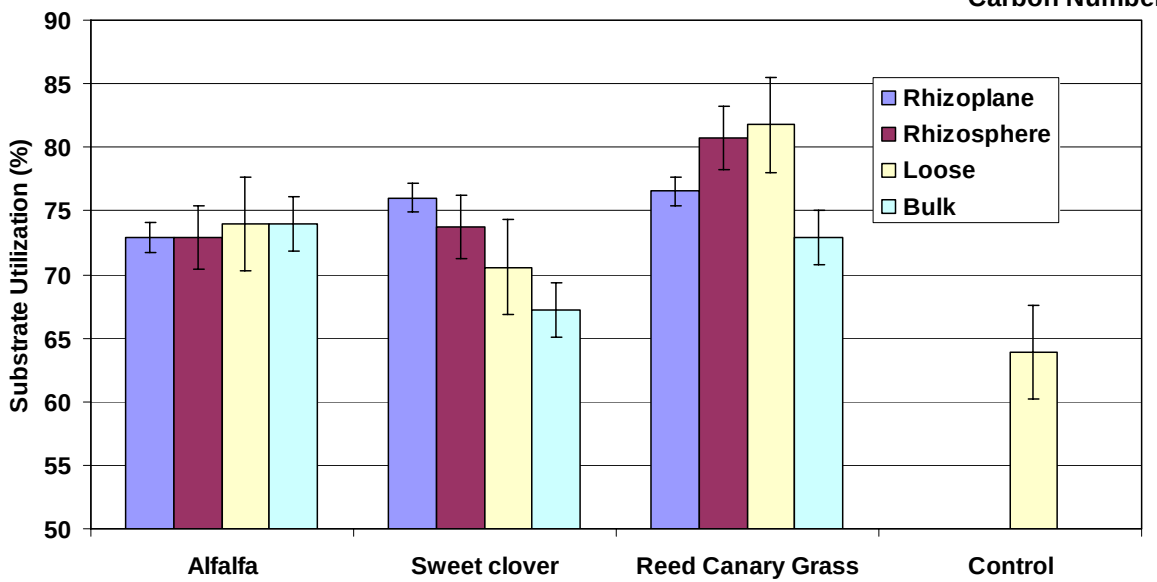


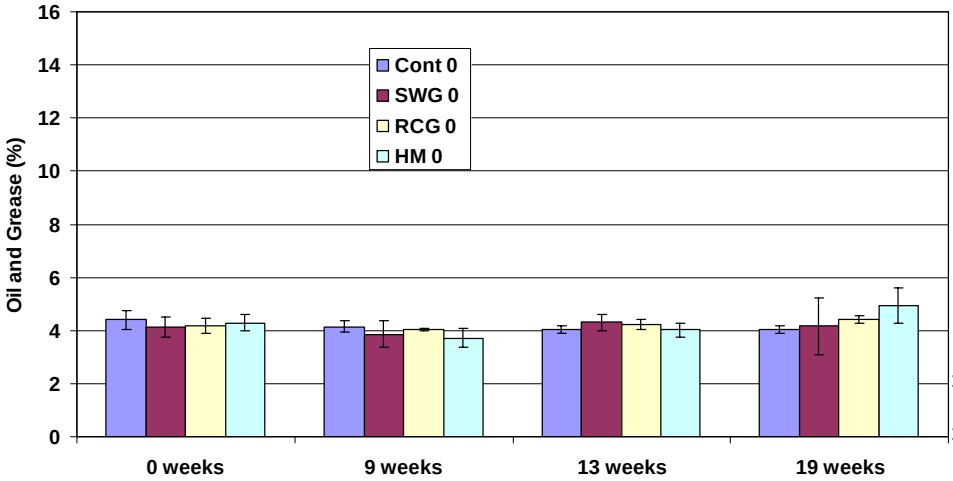


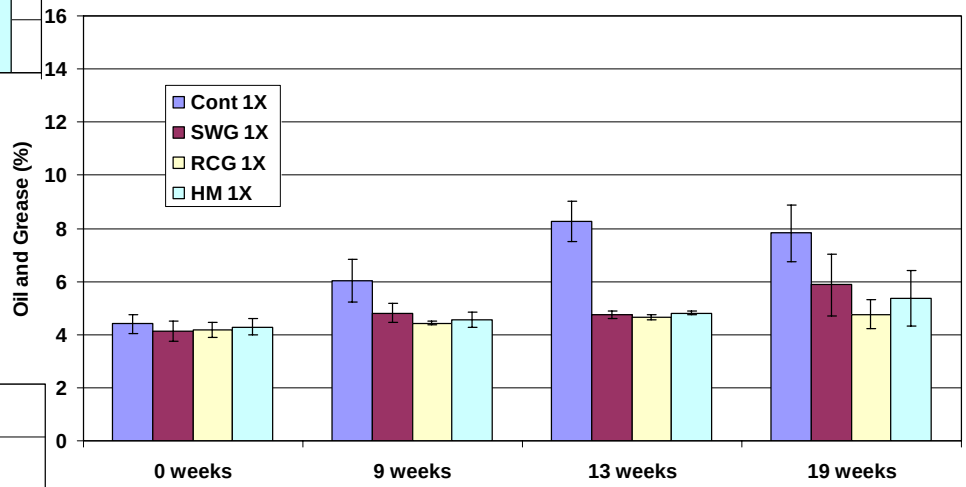
Greenhouse Studies - Past

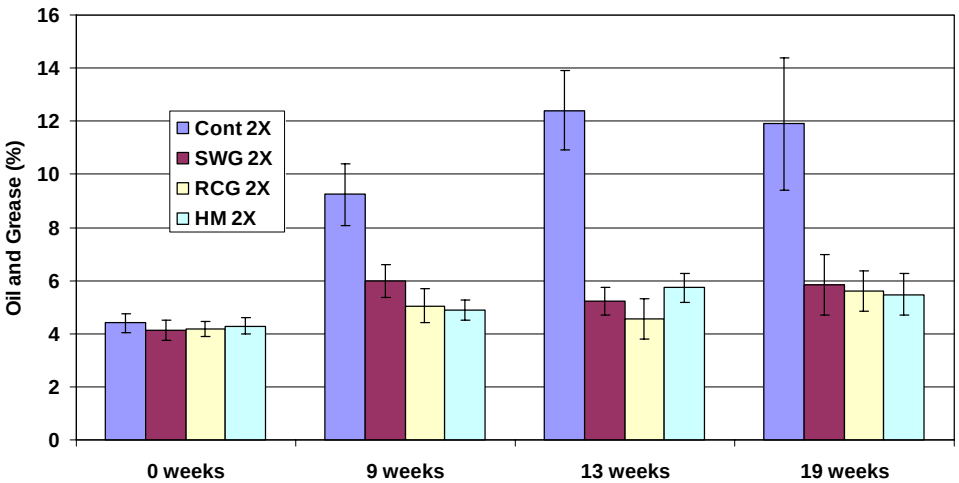
Summary

- Reed Canary Grass is more robust than alfalfa or sweet clover.
- RCG enhances the performance of the active landfarm soil.
- The increased root surface area appears to provide the edge

Greenhouse Studies - Present







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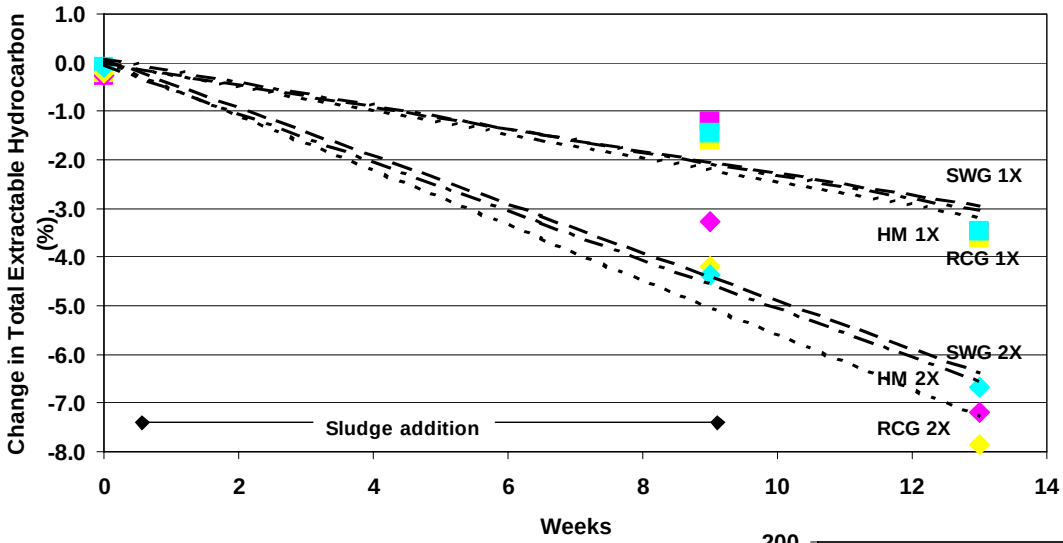

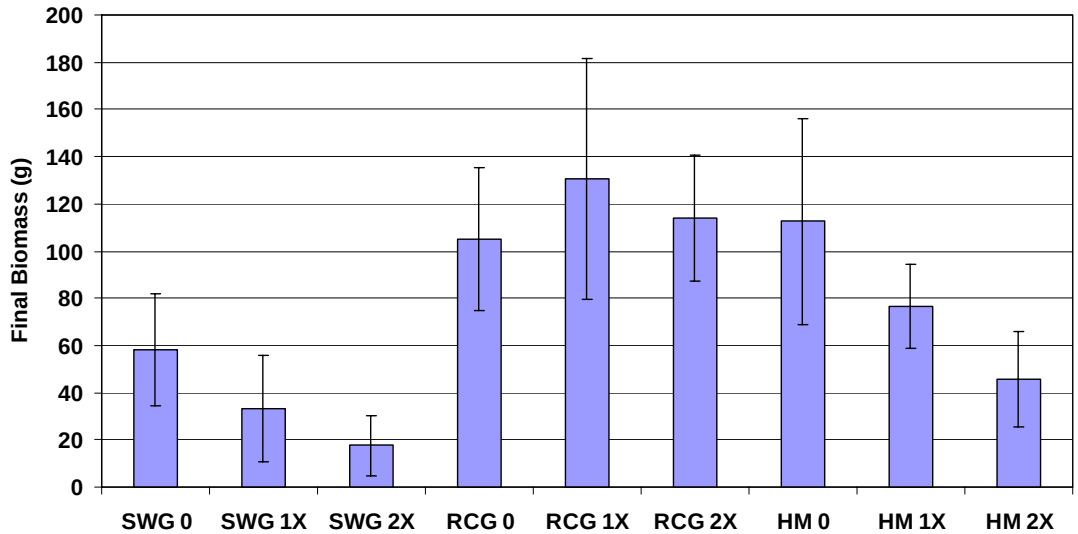

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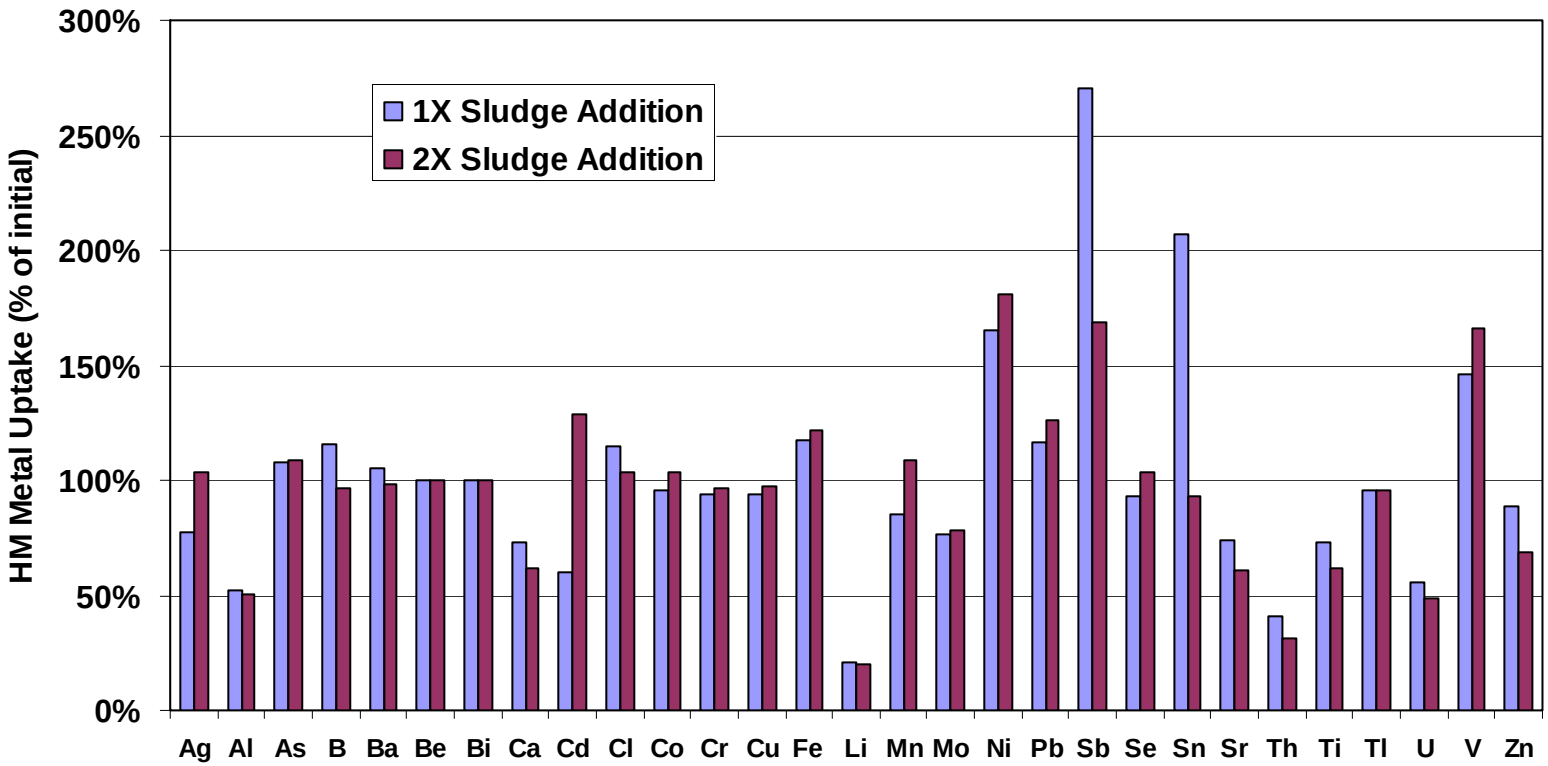

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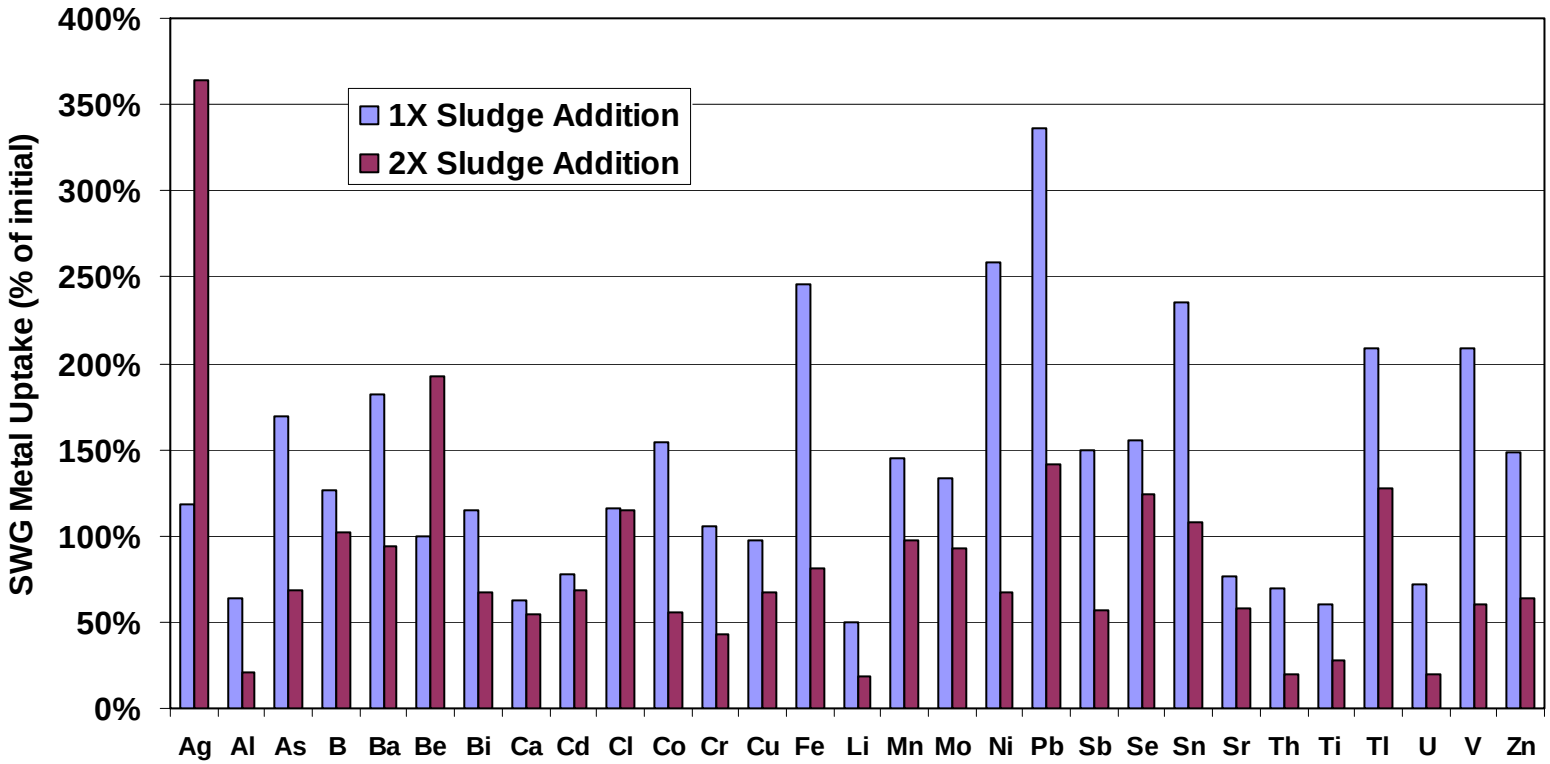

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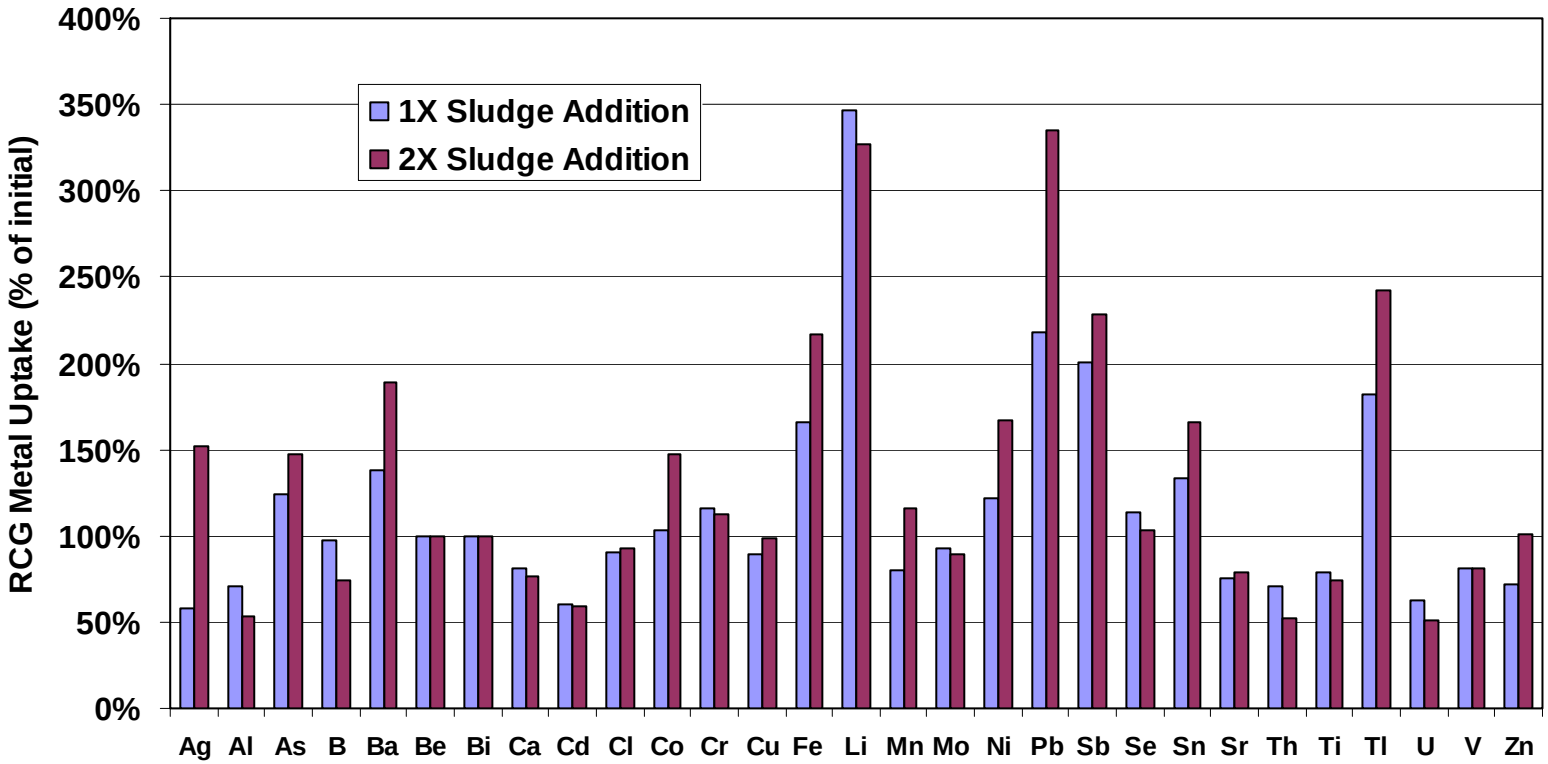

Greenhouse Studies - Present

- **Greenhouse studies provided data showing rhizodegradation significantly reduced hydrocarbon content when compared to unplanted controls.**
- **Growth of all three crops appeared to establish a biodegrading community (rhizodegradation) that metabolised sludge at normal and twice normal application rates and was independent of sustainable plant growth.**
- **The superiority of RCG was shown by its ability to germinate and grow in soil that received twice the normal sludge application.**
- **The growth of plants increased microbial diversity significantly when compared against fallow soil that received sludge. There was also a significant increase in microbial diversity when sludge was applied at twice normal rates compared to normal rates.**

Greenhouse Studies - Present

- **Phytoextraction occurred in all crops with RCG extracting the most elements at all sludge application rates. SWG extracted 66% of the analysed metals at normal sludge application rates compared to RCG extraction of 48%. At twice the sludge application rate, RCG was able to extract 59% of the elements while SWG and HM failed to extract more than 30% and 40% of the metals, respectively.**
- **RCG is a candidate for enhancing the sustainability of refinery sludge treatment by landfarms.**

Greenhouse Studies - Present

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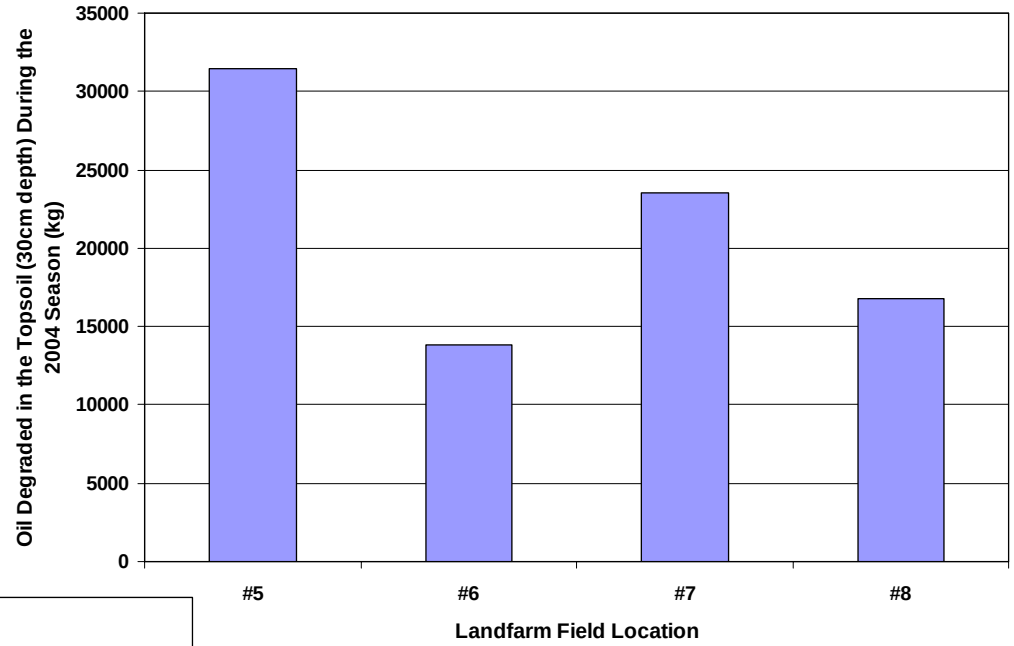
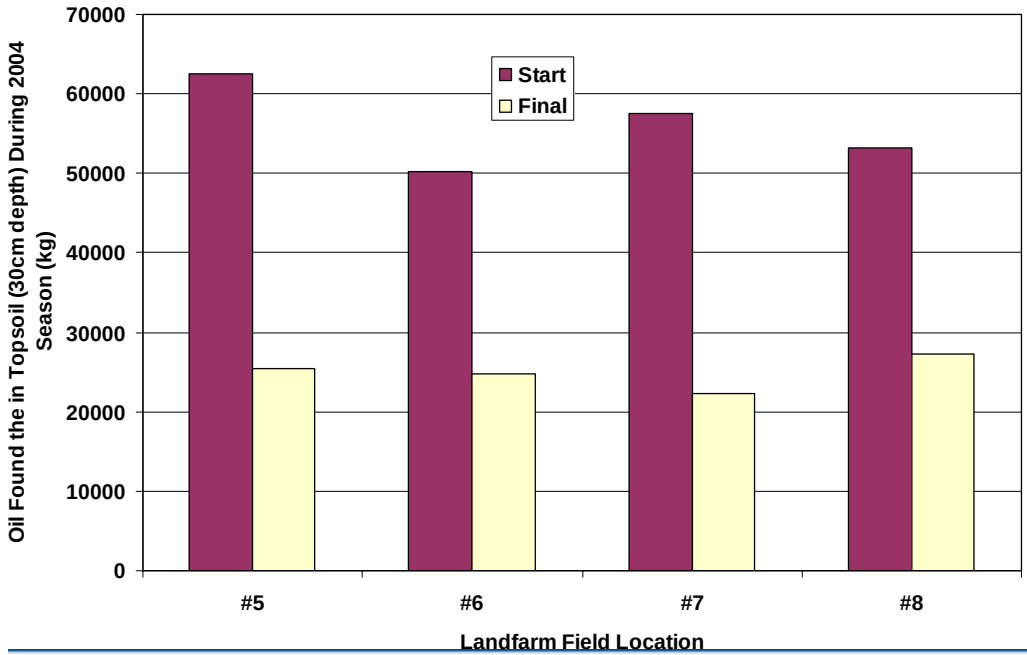
Field Studies - Present




Field Studies - Present

Field Studies - Present





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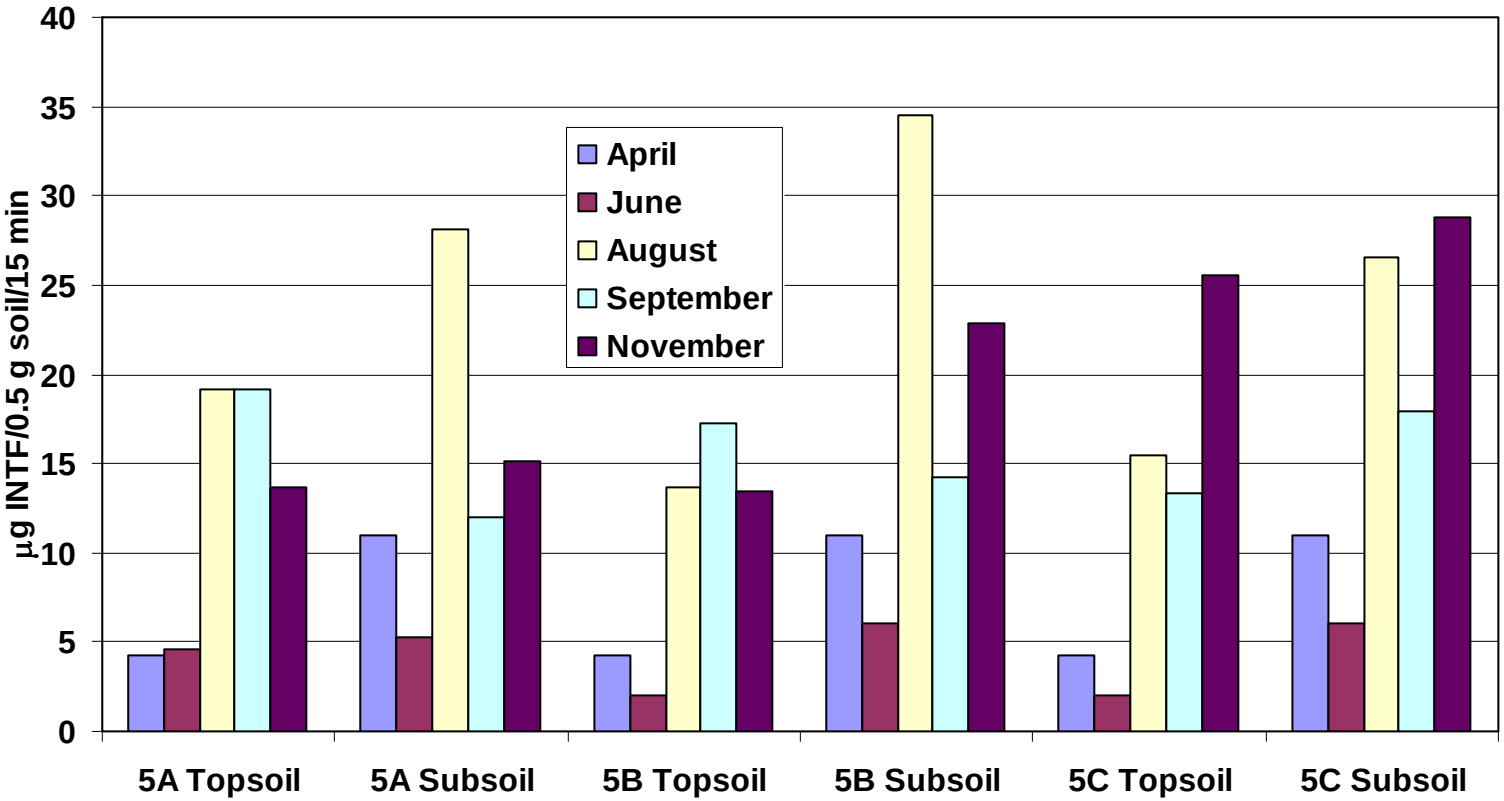

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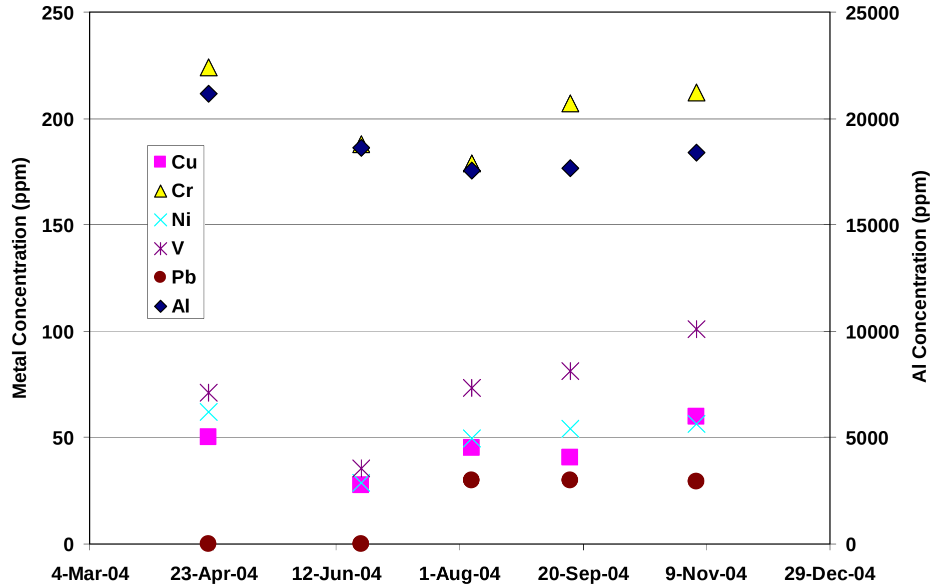

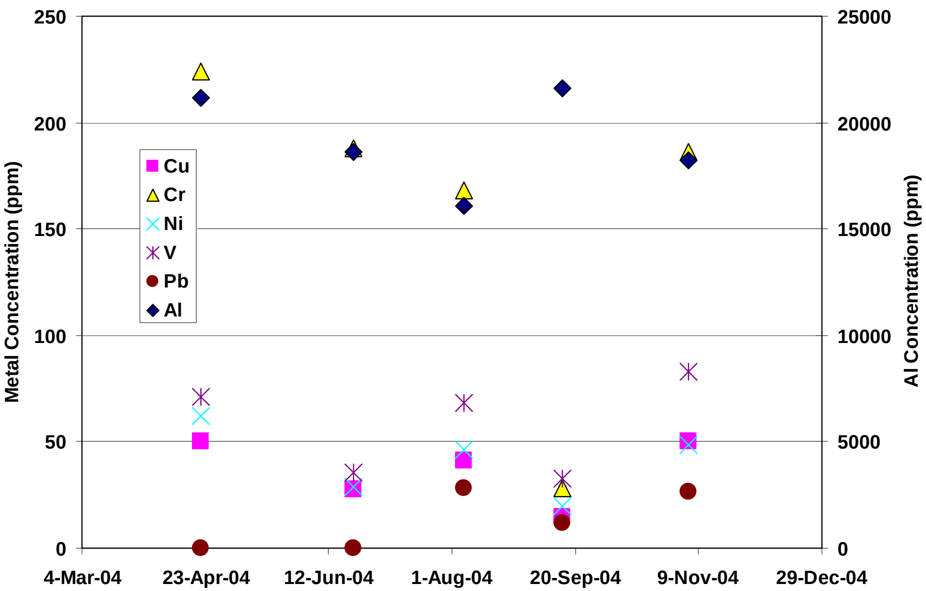

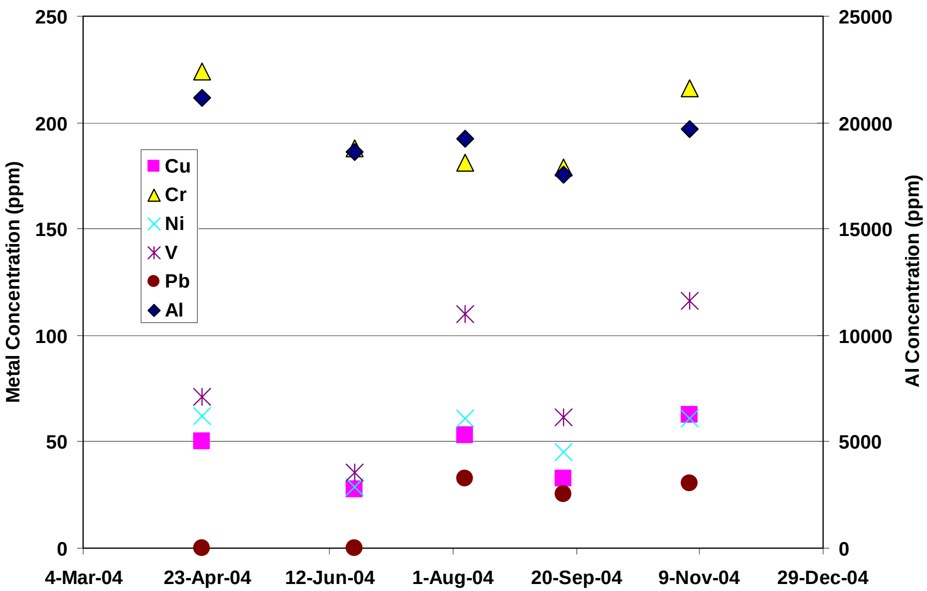

Field Studies - Summary

Field Studies - Summary

- **The quantity and quality of RCG growth was compromised by the wet conditions experienced in the landfarm soil in 2004.**
- **Sequestering of metals did not occur in the landfarm and this may be due to the immature crop and minimal growth experienced during 2004.**
- **The greatest oil and grease loss of mass for four comparable fields was in Field 5, indicating even weak growth of RCG will enhance the rhizodegradation of the sludge applied to the landfarm.**
- **Growth of RCG stimulates microbial activity in the landfarm in the topsoil and subsoil.**
- **RCG enhances rhizodegradation even when environmental conditions are causing a decrease in biodegradation of non-planted fields.**

Future Work

- **Four fields will be tested in 2005**
  - **RCG**
  - **Proprietary amendment**
  - **Control**
  - **Another Crop**
- **Full field should allow more reliable results**
- **Working with contractor to enable spreading while crop is growing, allowing a full growing season.**
- **Hopefully the weather will cooperate.**