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Bench Trial Support for Remediation: Chemical Fixation, Degradation, Extraction or Assessing new Technologies

BACKGROUND

Over the last decade the regulatory environment has increasingly moved emphasis to chemical destruction or immobilisation rather than the traditional 'dig and dump', which can simply move the problem elsewhere - typically to landfills.

Industry is increasingly facing new contaminants including PFCs which present additional challenges to the sector. In response, new remediation products are being developed and marketed to 'solve' some of these remediation challenges. In complex situations on major projects, the remediation practitioners are often asked for proof of concept trials to assess treatment options as part of project bids. This may involve establishing fixation, removal or even assessing GAC versus other extraction media. This presents challenges for some companies with locations in office blocks with limited options to perform trials.

While the remediation sector has often built and run trials on site, increasingly industry is using the laboratory controlled environment to fine tune their approach or establish performance before a field pilot study. This is where a bench trial may prove very useful.

WHAT SORT OF ANALYSES AND TESTS DO ALS OFFER IN SUPPORT OF SUCH TRIALS?

The tests that are used by ALS vary according to project however common tests include

- PFC/PFOS/PFOA analysis in waters and soils
- MEP, TCLP, ASLP leaching for metals
- VOC/BTEXN in waters and GAC (activated carbon)
- Speciated Arsenic or Chromium in Water
- Metals in water, solids and sediment
- SVOCs including Dioxins PAHS, OCPs, PCBs in leachates and solids
- TRH and TRH Speciation

CONSIDERATIONS AND BENEFITS WHEN USING A LABORATORY CONTROLLED ENVIRONMENT

- Safety controls, fume cupboards, PPE, SDS and safety protocols can provide increased control and reduce risk.
- Access to chemicals, equipment, meters and ancillary items can often be advantageous including peroxide, permanganate, Fenton's reagent, persulphate etc
- Access to analysis can be rapid and in some cases projects can be supported with results in minutes to support rapid trial decisions.
- Laboratory expertise and familiarity with experimental techniques
- Bench trials typically involve smaller quantities and when a lab space can be utilised it generally reduces set-up costs significantly
- Different techniques or media can be tested in parallel and duplicate with inter-batch variability removed to maximise the precision and help assess small differences in recovery/destruction of target compounds.
- Samples can be stored in a controlled fridge or freezer environment in accordance with regulatory holding times
- Data can be provided in various formats to suit the purpose of ultimate success determination of the bench trial.
- Laboratories can provide workspace plus technicians to undertake project plans under guidance or work collaboratively with experts including facilitating merged reporting of data into single worksheets to assist management and reporting.

Plate 1. Analysis being performed in a laboratory fume cupboard



EXAMPLE PROJECTS

- Remediation of Speciated Arsenic in Groundwater
- OC Pesticide fixation
- Metals fixation
- Sediment stabilisation
- VOC Groundwater remediation trials using permanganate dosing
- Hexavalent Chromium treatment in groundwater
- Partitioning of crude oil product into groundwater – aromatic/aliphatic speciation
- Beneficial re-use trials
- Gas generation studies

LOCATIONS, CAPABILITY AND WHO TO CONTACT

Not every ALS laboratory has the free dedicated space to offer clients for remediation trials however many do. The key is understanding your project needs early and also assessing the testing requirements. For example –

- Treatment and immobilisation of PFCs would certainly benefit from being performed in Sydney.
- Hydrocarbon assessment including speciation would probably benefit from being performed in Melbourne due to expertise in testing
- AMD leaching and simulated column leaching might benefit from the expertise in Brisbane
- While it can be beneficial to team analytical chemists with remediation experts, this is not always possible however the ALS network can manage testing internally at centres of excellence and manage this accordingly,

Who to contact? The key here is to talk to the **State Manager or Technical Manager** and provide an overview of your needs. Once these are understood and timing/physical space requirements are known plus any safety considerations ALS should be able to come back to you quickly. Step two involves a project plan review, assessment of safety considerations and understanding of chemical and equipment requirements. The third aspect involved understanding what level of chemist support is required as once as project is set up and running industry often require assistance in sampling, addition of reagents etc and removal of subsamples for analysis.

One of the key benefits of involving the laboratory is the tailoring of methods or control protocols to maximise the analytical precision at the target level. The laboratory can also often tailor methods to gross contaminant levels to avoid delays and maximise the overall data set. Finally, as with all such trials, there is often a requirement for accurate weights, measurements and mass balancing, all of which ALS have plenty of experience in providing.

Plate 2. TCLP jars containing leached solids and leachate solutions



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Water Resources Group: Canberra, Bendigo, Geelong, Melbourne (Scoresby), Wangaratta, Traralgon