

Groundwater 2021 programme

New Techniques & Practical Solutions for Improved Characterisation, Risk Assessment & Remediation

Afternoon: Tuesday 20 April

14.00 Welcome from Environment Analyst

14.05 Opening Remarks from the Chair

Duncan Cartwright, Associate Director, Atkins

14.15 Same VOCs, Very Different Outcomes - Lessons Learned from Two Groundwater Remediation Sites

Cox-Colvin & Associates (Cox-Colvin) has been the primary consultant on two chlorinated VOC sites that have affected the groundwater quality in the state of Ohio. The VOC constituents are essentially identical - tetrachloroethene, trichloroethene, and cis-1,2-dichloroethene. Plumes from these sites have migrated beyond site boundaries raising the concerns of the local communities. For over two decades, Cox-Colvin has worked with site owners, regional and local regulatory agencies, and the public to investigate and remediate source areas, eliminate risk to human health and the environment, and restore groundwater quality. Although the sources were similarly assessed and remediated, the outcome for groundwater quality has been drastically different. The groundwater plumes from one site, which stretched over 4 miles, are approaching the clean-up standards. The plumes at the other site are not. The key appears to be the geology – unconsolidated glacial outwash versus 300-million-year-old sandstone bedrock.

Craig A. Cox, President & Principal Scientist, CPG Cox-Colvin & Associates Inc.

14.35 Dealing with Dangerous Daughter Products in a DQRA

Commercially available environmental software models (e.g. EA RTM, ConSim) consider degradation of contaminants over time via first-order linear decay reactions. However, what happens where the original contaminant of concern breaks down to form daughter products which can increase in concentration within the aquifer over time and can often be more toxic than the parent compound?

Through two case studies we will show how daughter products have been considered within water environment detailed quantitative risk assessments (DQRA) to the satisfaction of the regulatory authorities in Scotland.

Helen McMillan, *Principal Geo-Environmental Scientist, RSK*

14.55 Continue the Questions and Discussion in our Virtual Conference and Exhibition Lounge

Continue the discussion, meet sponsors and network with other attendees in our interactive face-to-face conference and exhibition lounge

15.45 Low Flow vs No Purge Groundwater Sampling: A Practical Analysis of Applying Methodologies for Contaminated Land

- Exploring best practice in groundwater sampling
- Assessing the special considerations for monitoring and sampling on contaminated land
- Reviewing the equipment, guidance and research available and how best to use them to devise an optimum sampling strategy
- Case study: Low-flow vs no-purge sampling in practice – results and conclusions

Kayleigh Smith, *Regional Sales Manager (North UK), In-Situ Europe Ltd*

16.05 Improving Understanding of Natural Source Zone Depletion (NSZD) and its Effectiveness for Remediating LNAPLs

This presentation details a large scale field study to assess NSZD of a plume of volatile hydrocarbon product in a UK oil sector operational setting. We understand the study was the first of its scale in the UK to take NSZD from concept to full scale application including an appraisal of all three API recommended vapour flux assessment techniques. The field trials were designed and completed in consultation with the Environment Agency and the EA have accepted the trial outcomes recommending the application of NSZD. A final monitoring strategy is now being designed, with NSZD as the applicable remediation technique for the plume. The presentation will provide insight into the design and application of the field techniques and also the required level of base data and supporting evidence associated with application of NSZD as a remedial solution.

Stuart Cory, *Technical Director, WSP*
Duncan Dodge, *Associate, WSP*

16.25 Q&A

16.30 Close of Conference

Morning: Wednesday 21 April

09.30 Welcome Back from the Morning Chair:

Duncan Cartwright, Associate Director, Atkins

09.35 The Role of Groundwater in Urban Decarbonisation – Progress in UK Shallow Geothermal Research and Innovation

The presentation themes will include highlights from the BGS' geothermal research and innovation programme:

- Geothermal in the City – over-looked but not over-crowded (yet)
- Abandoned Coal Mine Heat – the UKGEOS research facility breaking down barriers
- Plugging geothermal into low carbon district heating and cooling grids

David Boon, Senior Engineering & Geothermal Geologist, British Geological Survey

10:00 Getting the Most from your Desktop Data

Using your data well provides the best way to an effective CSM. George will provide an overview of some common and less common groundwater related datasets to understand their provenance and weaknesses. He will also present some cases where mine workings have affected groundwater regimes and how data might be used to help in an early assessment.

George Burdon, Commercial Manager, Groundsure

10.25 Innovative Approaches to Managing Nitrate Pollution in Groundwater: Effective Partnerships & Catchment Management

Aimee Felus, Programme Delivery Manager, The Aquifer Partnership

10.45 Q&A

11.00 Close of Session

Afternoon: Wednesday 21 April

Innovative Remediation Solutions

13:30 Welcome Back from the Session Chair:

Dr Mike Rivett, *Director, GroundH2O plus Ltd*

13.35 Combining Chemical Oxidation with Other Technologies

As the remediation industry matures, focus has moved from new technologies to better application of existing ones. In particular, harnessing the synergies of combining techniques can improve the performance and cost effectiveness of remediation designs.

In situ chemical oxidation (ISCO) is a rapid, effective and well established technology for remediation of a wide range of organic contaminants in soil and groundwater. We present how ISCO can be combined with two very different technologies, aerobic bioremediation and soil stabilisation to maximise the benefits.

Jamie Harris, *Technical Representative UK & Ireland, Peroxychem*

13.55 Integrated Assessment to Assess Natural Attenuation of a Chlorinated Ethene Plume Discharging to a Stream

Presenting a multi-scale in-situ approach to assess and quantify the near-stream attenuation of a chlorinated ethene plume discharging to a stream over a monitoring period of seven years. The assessment includes state of the art techniques within various disciplines to assess hydrogeological, chemical, and microbial interactions. This includes isotopic and microbial techniques. A conceptual model is presented to illustrate the main processes controlling the natural attenuation. Perspectives for monitored natural attenuation are provided.

Cecilie Bang Ottosen, *Postdoc, Department of Environmental Engineering, Technical University of Denmark*

14.15 Continue the Questions and Discussion in our Virtual Conference and Exhibition Lounge

Continue the discussion, meet sponsors and network with other attendees in our interactive face-to-face conference and exhibition lounge

15.00 Electrokinetic-Enhanced Bioremediation: Applications in Physically Heterogeneous Settings

This talk focuses on the coupling of two remediation technologies: electrokinetics and in situ bioremediation (EK-BIO), to overcome the mass transfer limitations presented by physically heterogeneous settings that can limit conventional remediation technologies. While bioremediation is commonly applied, electrokinetics (EK) less so. EK is the application of direct current to the subsurface to initiate certain transport processes independent of hydraulic conductivity. Where bioremediation is limited due to the influence of physical heterogeneity, EK transport processes could be applied to initiate an additional flux of limiting solutes across K boundaries.

The research highlighted in this talk relates to laboratory and desk-based studies that have advanced the current state of knowledge for EK-BIO applications at both the fundamental level and field-scale respectively. The laboratory studies support the development of a conceptual framework describing the influence of physical heterogeneity on EK-BIO applications and the desk study compares the technology against others using sustainability criteria.

Dr Richard Gill, *Soil and Groundwater Scientist, Shell Global Solutions B.V.*

15.25 Case Study: Achieving a 'Treatment Train' Multi-Phase Remediation Approach for a Complex Range of Groundwater Contaminants

In-situ groundwater remediation projects often present significant challenges for remediation practitioners when the treatment strategy / design (and delivery approach) that was originally envisaged at the onset of a project has to be amended to suit site realities. In particular, target aquifer units are often more heterogeneous than anticipated from the limited site investigation that could be carried out pre-commencement. The remediation phase itself often provides the greatest opportunity to fully understand subsurface conditions and refine the remediation design approach to ensure the required end-point can be met.

In this Case Study, Steve Jackson and Tim Blake will discuss a multi-phased, fast track 'treatment train' remediation project that was successfully completed on a complex, mixed contaminant plume to enable surrender of an expensive lease. The project was not without its challenges - they will discuss how these challenges were overcome using a flexible strategy to achieve successful close-out, and share some of the lessons learnt along the way.

Steve Jackson, *Director, Soilfix*

Tim Blake, *Assistant Project Manager, Soilfix*

15.45 Engineered Phytoremediation of Contaminated Aquifers – Adapting a Natural System to Meet Remedial Goals

Historically, remediation practitioners have been limited in their options for management of groundwater contaminant plumes. Mechanical pump-and-treat systems have often been employed for hydraulic control and treatment of impacted groundwater, but the high cost and limited success of these “active” groundwater treatment systems has emphasized the need for alternative technologies. One effective alternative is engineered phytotechnology, which includes designed and constructed phytoremediation systems that promote vigorous root penetration and access to groundwater in deep or confined aquifers. By targeting only the depth interval requiring remediation, these engineered phytoremediation systems can be an effective strategy for hydraulic control and treatment of contaminant plumes.

Geosyntec has successfully applied engineered phytoremediation at multiple sites to address impacts from a wide range of environmental contaminants under diverse hydrogeologic conditions, including sites impacted by high levels of contaminants. For many of these sites, phytoremediation was selected as an alternative to – or replacement for – more costly groundwater pump-and-treat systems. This presentation will review several engineered phytoremediation case studies, including a site with 1,4-dioxane impacted groundwater that was successfully brought to closure by replacing a poorly performing and costly pump-and-treat system with phytoremediation. Lessons learned from these implementations and data supporting conclusions regarding contaminant treatment and hydraulic control will be discussed, along with details of the modelling performed beforehand that helped ensure successful system designs.

Ron M. Gestler, Senior Scientist (Walnut Creek, California), Geosyntec Consultants

16.05 Q&A

16.30 Close of Conference