



CONFERENCE 2022

Geological Society Contaminated Land Group

**CLIMATE CHANGE AND
SUSTAINABILITY:
IMPACTS AND INNOVATION IN
CONTAMINATED LAND**

**PROGRAMME
AND
ABSTRACT BOOK**



CLIMATE CHANGE AND SUSTAINABILITY: IMPACTS AND INNOVATION IN CONTAMINATED LAND

Day 1: Climate Change Impacts on Contaminated Land

Time	Presentation Title	Presenter(s) Name and Organisation
09:00 - 09:30	COFFEE & MEET AND GREET	
09:30 - 10:00	Sustainable Land Contamination Risk Management in a Changing Climate - Insights and Issues	Paul Nathanail - LQM
10:00 - 10:30	Coal Tip Safety and Climate Change Resilience	Lori Frater and Sam Deeley - Welsh Government
10:30 - 11:00	Update on How the Environment Agency is Working with Industry on Challenges Related to Land Contamination Regulation and Climate Change	Jonathan Atkinson - EA
11:00 - 11:30	MORNING BREAK	
11:30 - 12:00	Climate Change Preparedness	Nigel Williams - MoD
12:00 - 12:30	Coastal Evolution Processes as a Driver for Contaminated Land Stewardship	Laura Limer - Quintessa
12:30 - 13:00	Climate Change and Sustainability in Ground Gas Risk Assessment and Mitigation Design	Steve Wilson - EPG
13:00 - 14:00	LUNCH	
14:00 - 14:30	CIRIA Climate Change and Sustainability: Contaminated Land and Future Challenges	Joanna Kwan - CIRIA
14:30 - 15:00	Local Authority Contaminated Land Officer Climate Change Views and Experience	Robert Tyler - RBKC
15:00 - 15:30	Case Study on Sustainable Urban Regeneration	Donald Payne - Fife Council
15:30 - 16:00	AFTERNOON BREAK	
16:00 - 16:30	Regulatory Considerations of Climate Change	Katie Gamlin - WSP
16:30 - 17:00	SYMPOSIUM ON DIFFERENT APPROACHES TO CLIMATE CHANGE PREPAREDNESS AND IMPACTS ON LAND USE/ CONTAMINATED LAND	



CLIMATE CHANGE AND SUSTAINABILITY: IMPACTS AND INNOVATION IN CONTAMINATED LAND

Day 2: Sustainability Innovation in Contaminated Land

Time	Presentation Title	Presenter(s) Name and Organisation
09:00 - 09:30	COFFEE & MEET AND GREET	
09:30 - 10:00	The Transition from Coal to Green Energy Production, Land Regeneration Considerations	Daymion Jenkins - WSP
10:00 - 10:30	Sustainability, Standards and Best Practice	Chris Swainston - Soils Ltd
10:30 - 11:00	Laboratory Procedures for Improved Sustainability	Greg Adamson - ALS
11:00 - 11:30	MORNING BREAK	
11:30 - 12:00	CReDiT – Carbon Reduction Digital Twin – A Tool to Evaluate the Carbon Footprint of Brownfield Remediation.	Emma Hellawell, Sarah Cook - Leap Environmental
12:00 - 12:30	SURE by Ramboll: An Innovative Digital Tool For Embedding Sustainability In Remedial Options Appraisal	Liz Gray, Peter Fitch - Ramboll
12:30 - 13:00	Carbon Sequestration to Stabilise Legacy Alkaline Wastes	David Granger, Matteo Viganotti - Aecom
13:00 - 14:00	LUNCH	
14:00 - 14:30	Considering Climate Change in Controlled Waters Risk Assessment	Leon Warrington - SoBRA
14:30 - 15:00	Better Ground Contamination Risk Assessment for Lower carbon developments	Amy Juden - EPG
15:00 - 15:30	AFTERNOON BREAK	
15:30 - 16:00	Contaminated Land Sites and Ground Source Heat Pumps	Anna Hitchmough - RSK
16:00 - 16:30	Incorporating Resilience and Adaptation into the SuRF-UK Sustainable Remediation Framework	Richard Thomas Gill – SuRF-UK



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Day 1: Climate Change Impacts on Contaminated Land



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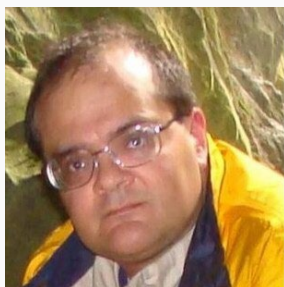
Sustainable Land Contamination Risk Management in a Changing Climate - Insights and Issues

Paul Nathanail,
LQM

Abstract

Risk based management of land contamination needs to consider the social acceptability, wider environmental value and economic affordability if it is to be sustainable LCRM. Climate change and associated extreme weather events must be factored in to the risk assessment and remediation stages to ensure resilient and lasting protection of health and environment.

Presenter biography



Paul Nathanail led the drafting of BS18504 sustainable remediation and recently reviewed the effects of climate change and extreme weather events on contaminant behaviour and remediation technology performance. Paul is a director of LQM - which is celebrating its silver anniversary this year.



Coal Tip Safety and Climate Change Resilience

Lori Frater, Sam Deeley

Welsh Government

Abstract

The presentation will cover;

- Impacts of climate change on coal tips
- Our new regime for managing coal tips
- Role of technology in monitoring ground and water movement.

Presenter biography

Lori Frater is the Deputy Head of Water, Flood and Coal Tip Safety in the Welsh Government. She heads up the Coal Tip Safety Task Force and leads on all aspects of the coal tip safety programme including the policy and legislative review. Prior to working on coal tip safety, she developed policy and legislation on sustainable management of natural resources and climate change, led on strategic environmental policy and delivered the largest peacetime legislation programme resulting for exiting the EU. She has represented the Welsh Government in international partnerships on biodiversity and sustainability. She is a barrister, who specialised in international environmental law.

Sam Deeley is the Geo-Engineering Advisor to the Coal Tip Safety Team in the Welsh Government. He is Chartered Geologist and UK Registered Ground Engineering Professional.



Update on How the Environment Agency is Working with Industry on Challenges Related to Land Contamination Regulation and Climate Change

Jonathan Atkinson
Environment Agency

Abstract

The issues around climate change are meaning that a relevant review of all current processes and regulatory mechanisms begin to take this dilemma into account in a serious, but scientific manner. Changes to overall climate, extreme weather events and longer term issues, like rises in sea level, will have a bearing on many development activities. The EA, alongside government departments, industry and developers are looking at the ramifications of changes and there will need to be suitable adjustment in some regimes to cater for changing risks, both in design and implementation and in longer term management of sites. My presentation outlines some of the questions that need to be asked, what comes next and who is leading on different aspects, recognising that no one body has all the answers to all the questions that arise, as yet, but we all need to work together to find relevant adjustments and solutions. The rest of the conference explores some of the aspects in greater detail.

Presenter biography

Having spent most of his youth in places like Africa, Chile and Fiji, after his degree in Environmental Sciences at Plymouth and postgrad Diploma in Soil and Water Engineering at Silsoe, Jonathan continued his travels by doing Voluntary Service Overseas in the Philippines and two short stints on soil projects in Papua New Guinea and Burkina Faso. He finally got his first permanent job at 30 with the KCC geotechnical group in the UK. After two years he moved to Pollution Control section in the KCC Waste Disposal Dept, which evolved into the Waste Regulation Authority. He joined the Environment Agency when it was formed in 1996. He has worked on risk assessment of developed closed landfill sites, landfill engineering and environmental control enforcement on permitted sites, and a variety of contaminated land projects. He is a technical specialist in a team of Groundwater and land contamination specialists and been involved at national technical specialist level on a number of projects related to soil remediation and waste management as a regulator.

He is a Council member of the Institution of Environmental Science and on steering groups for a number of soil related projects/reports with professional bodies and industry NGOs such as CLA:IRE, SOBRA and CIRIA.



Climate Change Preparedness

Nigel Williams

Defence Infrastructure Organisation, Technical Services, Sustainability Group

Abstract

Climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks. By taking steps to build the capacity of the system will allow MOD establishments to learn and modify themselves to remain adaptable for the future.

The MOD Global Strategic Trends report highlights that extreme weather events will increase over the next 30 years. Regardless of how quickly the World mitigates carbon emissions, there will continue to be a level of climate change, to which we must adapt. The MOD has committed to assess and prepare our activities, infrastructure and equipment assets, to become resilient to the impacts of our current and projected future climates.

To support this, the MOD has developed a bespoke tool called the Climate Impact Risk Assessment Methodology (CIRAM). CIRAM is the process we use to understand and identify risks to the outputs of our establishments, caused by current and projected climates, and the extreme weather that we can expect to occur.

Presenter biography



Nigel Williams has recently retired from the British Army after 37 years' service. For the past 13 years he was employed as the Safety & Environmental Advisor at South Cerney Station in Gloucestershire where he ensured that all stakeholders worked together to increase their resilience ready for climate change.

As Sustainability Lead, he led the Regiment to success by winning numerous Energy and Environmental Awards at National, Defence and Industry levels. The unit's achievements have appeared as best practice case studies in Cabinet Office, DEFRA and MOD Sustainability annual reports.

To inspire others throughout Defence his numerous environmental and sustainability articles were published in the Energy Managers Association, MOD Sanctuary and Army Safety & Environment Matters magazines. He has appeared as a Guest Speaker for the Defence College of Logistics and Personnel Administration. He has also lectured for the Defence Green Network and the Land Warfare Centre, which included the Collective Training Groups numerous global locations. He also represented the MOD at the 2021 Energy Management Exhibition in ExCel as a guest of Lord Rupert Redesdale.

Nigel advised on the 1(UK) Divisions "Project Green Rhino" business model which puts environmental protection, climate change resilience and sustainability at the heart of unit business. The model has been adopted across 32,000 personnel in 89 UK establishments.

He has now proudly taken his place in the DIO Technical Services Sustainability Team as a "Climate Resilience Manager" and he is based at MOD Abbey Wood in Bristol.



Coastal Evolution Processes as a Driver for Contaminated Land Stewardship

Laura Limer, Renato Zagorscak, Mike Thorne, Vicky Gaskin

Quintessa

Abstract

Due to the coastal setting and the long-term decommissioning and remediation timescales of many Nuclear Licensed Sites within the UK, the stewardship of such contaminated land may require account to be taken of climate change, coastal recession, sea level change and landscape evolution. To understand the combined impacts of these factors, a study has been undertaken which examines three climate change scenarios and how each would impact igneous, metamorphic ('hard' rock) and sedimentary rock types ('soft' rock).

The three scenarios consider: low greenhouse-gas emissions in which CO₂ emissions decline to net zero around 2050, followed by net negative CO₂ emissions; intermediate greenhouse-gas emissions, in which CO₂ emissions remain around current levels until the middle of the century before declining, though remain positive; and a, "what if", very high greenhouse gas emissions, in which CO₂ emission levels have roughly doubled from current levels by 2050, and peak, at approximately 130 GtCO₂ per year, around 1000 years from now. The associated global and regional climate projections have then been downscaled to a UK climate. For all of these climate projections, consideration has been given to 2021 IPCC projections for the mechanisms which drive global and regional sea-level change to develop a relative sea-level change profile for specific locations. These mechanisms include thermal expansion of sea water, development or loss of ice caps, glaciers and ice sheets, and isostatic corrections.

To understand the potential impacts to selected sites, projected erosion transects are examined based upon estimated erosion rates for different lithologies (both 'hard' and 'soft' rock) that might be encountered along a transect: unweathered bedrock, weathered bedrock and superficial deposits. The transects are used to understand the potential longer-term vulnerabilities of a coastal location with respect to erosion and/or inundation which can then be used to underpin decision making and management strategies for the contaminated land and groundwater present at that location.

The study has highlighted some areas of uncertainty which should be considered in characterisation phases, where data can be gathered to improve understanding, and when evaluating the results of assessments. These include: the importance to understand the profile and depth of the weathered bedrock and the interface with superficial deposits; the influence of fault zones and the erosion rates considered for these; and sensitivity of assessment results to assumed general erosion rates and the uncertainty which surrounds those.

Long-term climate change and coastal evolution are critical factors in intergenerational governance and stewardship of contaminated land within the nuclear sector and could also form part of sustainable remediation practice in other industries historically sited in coastal locations.



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Presenter biography



Dr Laura Limer (MMath, MRes, PhD) has over 18 years' experience of mathematical modelling, with particular focus on biological and environmental problems. Her experience centres on performance assessment modelling with a particular emphasis on biosphere assessment, covering doses both to people and impacts on non-human biota. Laura was a major contributor to the performance assessment support for the 2011 Environmental Safety Case for the LLW Repository Limited, which included consideration of the potential implications of coastal erosion. Laura has been a member of the international review teams for the Swedish Radiation Safety

Authority's review of safety assessments associated with geological disposal facilities for low-, intermediate- and high-level radioactive waste and spent fuel. These reviews have focused on radionuclide transport in the near-field and biosphere. The implications of climatic change, including isostatic uplift, on the landscape and therefore contamination transport and uptake in the biosphere have been a key part of those reviews. More recently, for Dounreay Site Restoration Limited, Laura has led a study into the potential implications of sea-level change and erosion processes on the future evolution of coastline in the vicinity of the Dounreay site.



Climate Change and Sustainability in Ground Gas Risk Assessment and Mitigation Design

Steve Wilson,
EPG

Abstract

Future effects due to climate change should be considered during ground gas risk assessments. At some, but not all, sites climate change may affect future risk from ground gas emissions. This paper will explore the advice on assessing climate change effects that is provided in two recent reports on ground gas (CIRIA Report C795, Retrofitting ground gas protection measures to existing and refurbished buildings and CL:AIRE Good Practice for Risk Assessment for Coal Mine Gas Emissions). It will also summarise the findings of a study completed by the author into the effects of future flooding on gas migration from landfill sites.

It is important that any assessment of climate change effects looks at site specific conditions and particularly the gas generation characteristics of the source material. Generic statements on likely effects should not be applied to all sites. Assessments should not include hypothetical events that are not likely to realistically affect a site.

The paper will also look at sustainability issues arising from over conservative ground gas risk assessment and specification of protection measures that are not needed.

A case study will be provided illustrating good practice in assessing climate change effects on ground gas risk.

Presenter biography

Steve is a Chartered Engineer and UK Registered Ground Engineering Advisor with over 30 years' experience in the investigation and assessment of ground gas and design of mitigation measures. He is SoBRA Accredited Risk Assessor for Permanent Gas and Vapour Intrusion. He has written numerous technical papers on the subject and contributed to much of the recent guidance, including British Standards, CIRIA and CL:AIRE reports. He acts as an expert adviser on ground gas to several licensed Contaminated Sites Auditors in Australia. He is co-author of the chapter on Methane Gas Hazard in the Geological Society publication Geological Hazards in the UK: Their Occurrence, Monitoring and Mitigation – Engineering Group Working Party Report



Local Authority Contaminated Land Officer Climate Change Views and Experience

Robert Tyler,
Royal Borough of Kensington and Chelsea (RBKC)

Abstract

Over the past five years or so, the Climate Change agenda has come to the forefront and is fast becoming one of the key driving factors for decision making in Local Government. Like others in the industry, contaminated land officers are having to navigate these changes and decide whether they can start addressing climate change, often with very limited resources.

After a brief overview of how climate change is being addressed in local government, this presentation will attempt to answer the question “Can contaminated land officers deal with sustainability and climate change through planning?”, setting out how this is being approached at Kensington and Chelsea, exploring industry barriers and providing examples and case studies.

Presenter biography



Robert Tyler has dealt with contaminated land in local government for over 20 years and for the last 15 years has worked in London. Apart from the full range of Part 2A and planning work, career highlights have included working on the 2012 Olympics (whilst at LB Hackney), more recently being directly involved in the Grenfell Environmental Checks process (RB Kensington and Chelsea) and serving the communities he’s worked for. Robert is also a committee member of both the Geological Society Land Contamination Group and the National Contaminated Land Officer’s Group.



Case Study on Sustainable Urban Regeneration

Donald Payne

Fife Council

Abstract

Councils have declared a climate emergency but local authority officers face limited opportunities to act. Using a case-study to illustrate areas where the council is taking a proactive approach, this talk will consider four activities: (1) Regenerating brownfield sites, (2) allowing natural Rewilding to occur, (3) Reconnecting people with their local environment and, as an aside, (4) implementing Renewable energy options. This site was one component of a partnership strategy to encourage environmental improvements in a deprived area.

The site in question operated as a timber treatment yard before becoming an important area of open space where people enjoy nature. Sandwiched between a river and a railway, it has poor access and is unlikely to be redeveloped for housing ... which is the go-to solution for many former industrial sites. Working with the current landowner, the council has been investigating visions to create community-focussed opportunities. Subsurface conditions were poorly understood and an initial investigation provided only limited answers.

Sustainability considerations were at the heart of decision making when designing and implementing a new ground investigation. Local resources were used wherever possible. Time on site was minimised by using sonic drilling – which is not new but still unusual in many real world situations – to achieve a greater depth. Waste minimisation was achieved using low flow sampling techniques. Finally, topsoil was considered from a climate change / net zero perspective when exploring options for redevelopment and remediation.

Some of the problems encountered when trying to proactively remedy vacant sites – particularly those relating to land ownership – can be eased through appropriate zoning in the Local Development Plan. Some of the bigger issues around public access need a multi-agency approach, and the Levenmouth Partnership referenced above aims to provide both biodiverse parkland and active travel solutions for the community.

Presenter biography



Donald studied geology at Edinburgh and remote sensing at Leicester. His sole published academic paper is on the subject of rock-glaciers in the central Andes. He worked as a cartographer in India before becoming a land contamination specialist with Fife Council. As co-founder of the 'Contaminated Land Resource Sharing Group' he demonstrated that officers can complete ground investigation successfully in-house, increasing the confidence of the team whilst at the same time saving money for the public purse. At home, he converted his bicycle to electric pedal assist so that – for the same investment of effort – greater distances can be explored and commuting times made more predictable. He recently achieved 'Carbon Literacy Project' accreditation.



Regulatory Considerations of Climate Change

Katie Gamlin

WSP

Abstract

Adaptation to climate change and the protection of the environment together with the aspiration of reducing intergenerational burden is a burning prerogative and vision. A central theme consequently must be to ensure that new operations and infrastructure are designed so that they are resilient to adverse climate change. Meanwhile the need for intervention at legacy sites requires both informed and balanced consideration in respect of the advantages and disadvantages of delivering any such works i.e., they require a comprehensive and coherent approach to risk assessment including an understanding of emission scenarios and uncertainties. It is for the purpose of identifying policy and research priorities that WSP were recently commissioned by the Environment Agency to generate an evidence-based synthesis report to 'Inform regulatory considerations of climate change impacts and adaptation for waste deposit, landfill and land contamination'. This work has been the first of its kind in the UK and has been notably intended to assist decisions that will address timescales of up to about 1000 years after present. This is a time frame beyond that of traditional public domain climate discussions.

Our opinion has included a review of climate change models plus scenarios and their uncertainty and then the identification of generic foreseeable adverse impacts. A review of existing international and national legislation has also been given, case studies and current models to aid our understanding of potential vulnerabilities, learning and the identification of next steps. A suggested systematic approach to future assessment has been drafted together with a discussion on the role of models and the handling of future uncertainty. The adaptation priorities of engineered barrier systems and coastal defences have furthermore been drawn out as priority topics. Lastly, weighted recommendations upon the significant themes and the next steps towards consistent policy and guidance have been made.

In summary, our presentation will provide an overview of the works (it would not be intention to cover all topics covered), our suggested approach towards a systematic framework for considering climate change in assessments, the timescales that should be considered (post stakeholder workshop) and those parameters that we could be focussing our efforts upon in our existing risk assessment models.

Presenter biography



Katie is a Hydrogeologist at WSP, experienced in controlled waters risk assessment with an MSc in Hydrogeology from the University of Birmingham. She is a Chartered Water Environmental Manager (C.WEM), a member of the SoBRA Controlled Waters and Climate Change group and has 16 years' experience in consultancy. Katie has worked with a range of clients in both private and public sectors, covering a broad range of projects from site investigation to complex groundwater assessment and development of remediation strategies.



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Day 2: Sustainability Innovation in Contaminated Land



The Transition from Coal to Green Energy Production, Land Regeneration Considerations

Daymion Jenkins

WSP

Abstract

With the global movement to decarbonisation and in particular reduction in thermal power regeneration, there is significant momentum towards decommissioning, demolition and land remediation of former Coal and Heavy Fuel Oil plants. Whilst this offer significant decarbonisation benefits, the site closure aspects have a potentially significant environmental footprint and managing these in a sustainable manner is critical.

Case studies will detail the environmental assessment, mitigation, and practical circular economy considerations when implementing demolition and land remediation on sites of this scaled. Some of the regulatory tensions around material reuse, remediation end goals and Environmental Permit considerations are explored with a view to achieving balance sustainable outcomes for all stakeholders

Both geo-environmental and geotechnical considerations will be explored, balancing environmental risk, development controls and sustainability considerations

Presenter biography

Daymion is a Director and UK Head of Ground and Water with WSP and has 30 years' experience in the environmental sector. He has extensive experience in Development and Infrastructure Sectors across Europe, Australia, and Southeast Asia. He has directed large multi-disciplinary teams across regeneration projects including site closure, site assessment and land remediation work at industrial, military, power station and fuel storage facilities



Standards, Sustainability and the AGS

Chris Swainston

Soils Ltd

Abstract

The use of standards in promoting sustainability and some comments on works being undertaken in relation to developer / ICE requirements for increasing sustainability in site investigation and professional advice by the AGS.

Presenter biography



With over 27 years' experience in geo-environmental engineering and modelling, primarily within site investigation, monitoring and related remediation activities, Chris has significant experience of a wide range of works and activities in and around the contaminated land field including particular specialisms in site investigation, monitoring, waste, modelling and asbestos as a practitioner, advisor, mentor, field worker, writer, presenter and trainer. His work has been recognised with a commendation from the AGS contaminated land working group in 2018 and he has been Chair of the BSI Soil Quality Group EH/4 (responsible for BS10175, BS8485, BS8576 and others) since 2011. For the AGS and Ciria he has helped produced definitive industry guidance in the fields of asbestos safety for site investigation workers, sampling and monitoring protocols, interpretation of UK/CEN and ISO standards, environmental hazards, groundwater modelling, wastes and others, and has lectured on these and other related subjects at various key industry events including a sampling and monitoring workshop for the Geological Society and SoBRA as well as a Member of the Editorial Board of QJEGH. He is also a founding committee member of the Geological Society Contaminated Land Group. Currently, in addition to project works, he also acts as company advisor, mentor and trainer regarding general and specific environmental matters including sampling and monitoring protocols.



Laboratory Procedure for Improved Sustainability

Greg Adamson

ALS

Abstract

At ALS our vision is “To be the global leader in the discipline of scientific analysis in pursuit of a better world for all”. But in that pursuit, we need to ensure that our activities are not detrimental to the world that we, along with our clients, are trying to improve. In his presentation, Greg will outline the strategic goals ALS have put in place for a sustainable future and demonstrate the practical steps ALS have taken to try and meet these objectives.

Presenter biography

After graduating in Applied Geology in 1996 and brief stints overseas in the mining and petroleum industries, Greg has settled in the UK Environmental Testing sector. Over the last 20 or so years Greg worked for several site investigation contractors before joining the UK sales team at ALcontrol Laboratories, in 2013. ALS Global acquired ALcontrol in 2016 and now offers a broad range of testing in the UK to include soils, waters and vapours for the Contaminated Land sector, microbiological and chemical testing for commercial water companies, as well as potable water testing for utilities. Greg now manages the sales teams operating across the UK Environmental business.



CReDiT – Carbon Reduction Digital Twin – A Tool to Evaluate the Carbon Footprint of Brownfield Remediation.

Emma Hellowell, Sarah Cook

Leap Environmental

Abstract

This paper details the development and early achievements of a Carbon Reduction Design Tool for Brownfield remediation – CReDiT. Brownfield remediation typically involves major earthwork movements, the use of rapidly reducing resources (topsoil) and the potential reuse or disposal of large quantities of contaminated material. The remediation process and development frameworks are not optimised for achieving sustainability targets, often favouring cost and time-savings over carbon reduction. There is, therefore, a need to optimise brownfield remediation to significantly reduce the carbon footprint of the process.

This issue was addressed through a collaborative project between the University of Surrey and LEAP Environmental to develop a carbon tool to evaluate the carbon dioxide generated from different site remediation options. This tool promotes greater understanding of the impact of remediation processes on CO₂ emissions and sustainable site material use.

The CReDiT tool was developed for the dominant remediation method used on residential sites within the UK, namely excavation and cover. Despite calls for more sustainable methods, this method is favoured due to the industry knowledge, acceptance of procedure, application of regulations and speed and reliability of the process. This tool determines carbon emissions from the processes involved in this type of remediation, e.g. excavation of soil, the use of raw materials, the transport of material, the recycling and reuse of materials and landfilling of waste.

The starting point for any remediation is a good site investigation and conceptual site model. Following this, in remediation design the sites are typically zoned into areas reflecting different geologies, contamination and potential remediation options (such as excavation and cover depths). CReDiT evaluates the carbon emitted by the processes in site remediation and the materials used. A key issue was understanding and simulating the complex flow (movement) of materials on a remediation site. Different fractions of excavated material have potential reuse or reprocessing options during the remediation process. The tool evaluates the volumes of all these fractions in each process. These volumes are then combined with carbon factors to calculate carbon emissions.

The presentation will detail the developed model and demonstrate its application to a case study - a former landfill site redeveloped for housing. The tool provided a quick evaluation of different remediation options, clearly demonstrating potential carbon savings. The designs were then refined to determine the optimum remediation solution for carbon reduction (ensuring the was 'suitable for use'). This optimum solution maximised the onsite reuse of materials and thus minimised the disposal of waste to landfill.

This tool will be included as standard within remediation design at LEAP Environmental resulting in:



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- remediation with carbon reduction leading the design
- onsite materials considered a resource rather than a 'waste'
- reuse options considered for all material streams
- a reduction in material sent to landfill.

Future development of the model will include integration within a GIS and incorporation within a site digital twin. This would enable interactive remediation design with carbon assessment.

Presenter biography



Emma is a Chartered Civil Engineer with over 25 years of experience in academia, civil engineering consultancy and local government. Her research in environmental engineering includes modelling contaminant transport, analysis of brownfield contamination and development of carbon tools. She has worked as a local government contaminated land officer and on major civil engineering projects such as the Millennium site/O2. She is now a Principal Geoenvironmental consultant at Leap Environmental, where she has recently developed tools to evaluate the carbon footprint of foundations for new housing projects, remediation design and earthworks.



Sarah Cook is an Associate Director at LEAP Environmental with 18 years experience in the environmental sector managing a multi-disciplinary team carrying out projects on a range of sites. Sarah is a chartered geologist with a recent qualification in environmental law and practise which focused on the sustainable remediation of brownfield sites. As LEAPs technical lead for sustainability we have developed a series of carbon calculator tools for foundations, remediation and earthworks.



SURE by Ramboll: An Innovative Digital Tool For Embedding Sustainability In Remedial Options Appraisal

Liz Gray, Peter Fitch,
Ramboll

Abstract

Whilst interest in Sustainable Remediation began over ten years ago, application of sustainable thinking in remediation option selection is in practice still very patchy across Europe, even within individual legislatures, and sustainability is often not well understood either by problem holders or regulators. There is now a greater urgency arising from the climate emergency, biodiversity loss and socioeconomic challenges and as remediation professionals we need to ensure that sustainability is embedded in decision making principles when selecting the best option for contaminated land remediation.

Whilst technical guidance on sustainability is plentiful, the process of selecting the most sustainable approach has to be simple, understandable and transparent to gain public acceptability. Ramboll has therefore developed SURE, a digital on-line tool which draws on over 70 sustainability indicators and their contribution to 17 United Nations Sustainable Development Goals (UN SDGs) to enable the identification of the most sustainable and resilient remediation approach. With the increasing need for climate action, Ramboll has made the tool freely available to all.

Access to SURE is available via www.ramboll.com/sure from where a new user can sign up and create an account. A simple user introduction video is also available.

The functionality of SURE is based on three facets:

- Assessment of options for remediation according to procedures set out in BS ISO 18504:2017 and aligned with NICOLE and SuRF guidance, especially the updated protocols issued by SuRF-UK.
- Engagement with project stakeholders through an automated digital procedure to enable review, and provide a record of decision making.
- Reporting, according to a customised format.

The presentation will discuss the background to SURE, explain its key features and functionality and exemplify its application to the Brownfield sector. A case will be presented for a former vehicle showroom and maintenance facility being developed for residential use. The tool compares a number of remediation technologies and compares their relative benefits against social, environmental and economic sustainability indicators.

Whilst this presentation will be aimed at introducing SURE to a wider audience, it will also challenge our collective views on how we evaluate sustainability within the remediation industry and ask the question: what comes next?





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Presenter biography



Peter is an Associate Contaminated Land Engineer at Ramboll in Chester, with over 20 years' experience. Having started his career as a remediation contractor, Peter moved on to the world of consulting at Ramboll to support their remediation consulting service. Peter has worked on a range of sites, settings, contaminants and remediation techniques. The most recent significant projects for Peter include the Mersey Gateway Project, HS2 Phase 1 Enabling Works Design JV as well as the HS2 Phase 2B Environmental Oversight Commission for Land Quality. Peter is an active member of RemSoc, sitting on the Steering Committee where he holds the position of Secretary. Peter also leads Ramboll UKs Remediation Working Group.

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Carbon Sequestration to Stabilise Legacy Alkaline Wastes

David Granger and Matteo Viganotti,

Aecom

Abstract

Alkaline waste materials can pose significant health, environmental and geotechnical constraints for site redevelopment; however, they can also offer opportunities. This project involves the development and pilot trial application of innovative in-situ carbon sequestration to provide long-term physical and chemical stabilisation of legacy alkaline chemical waste. Since 2016, AECOM has undertaken site characterization and risk-management works at an 8-hectare legacy area of chemical process waste. Slaked lime (calcium hydroxide) forms the dominant component of the waste and has a very high alkalinity. The remediation options appraisal for the site introduced the concept of incorporating in-situ carbon sequestration to: treat and reduce the high pH source term by converting the slaked lime to calcite; promote long term chemical and physical stabilisation of the site and hence reduce long-term maintenance requirements; and provide a “carbon sink” to capture carbon dioxide (CO₂) that would otherwise be released to the atmosphere as a greenhouse gas. In 2020/21 AECOM undertook a pilot trial of in-situ carbon sequestration coupled with further site characterization to inform the sequestration potential of the waste. The pilot trial successfully demonstrated carbon sequestration, indicating that up to 85,000 tonnes of CO₂ could be sequestered within the waste. The integration of carbon sequestration within the remedial strategy offers a robust, sustainable and defensible solution with real environmental, economic and social benefits, most notably the opportunity to capture and use the carbon dioxide (CO₂) produced by local industrial facilities, thereby reducing CO₂ emissions.

Presenter biography



David Granger is a contaminant hydrogeologist and a Technical Director with AECOM in Croydon, UK. He has worked in contaminated land area for over 29 years. He provides technical direction and advocacy for projects within the UK and internationally. He has written and delivered contaminant hydrogeology training for clients including the Scottish Environment Protection Agency and has worked closely with the Environment Agency on a number of projects, delivering joint conference presentations and undertaken Expert Witness support. David holds an MSc in Earth Sciences from the University of Waterloo, Ontario and a BSc in Environmental Science from the University of East Anglia.



Matteo Viganotti is an Associate Environmental Consultant with AECOM in Dublin, Ireland. He has worked in consultancy and academia for over 18 years with experience on contaminated land projects in Italy, Ireland and the UK. He also collaborates, as vice-chair of the sub-committee on Soil Management at Development Sites, with the Ireland Brownfield Network: promoting the appropriate assessment and sustainable reuse of brownfield land. Matteo holds an MSc in Environmental Science and Technology from the Università degli Studi di Milano-Bicocca and a PhD in Engineering from Trinity College Dublin.



Considering Climate Change in Controlled Waters Risk Assessment

Leon Warrington,
SoBRA

Abstract

The need to incorporate the effects of climate change into qualitative and quantitative risk assessments is set out within the Environment Agency (2010) “Managing and reducing land contamination: guiding principles (GPLC2) FAQ 8”, and the National Planning Policy Framework for England/Wales. However, there is currently limited guidance on how to consider the effect of climate change on contaminated land.

The SoBRA controlled waters and climate change sub-group has been established to develop guidance to ensure climate change is considered and applied consistently across the industry so that the controlled waters risk assessments we complete are sustainable and robust. This presentation will take into account the latest findings of the sub-group and will include:

- an overview of the UK regulatory guidance with respect to land contamination and climate change
- summary of climate change in the UK and why inclusion for the potential effects of climate change in the assessed stages of land contamination-controlled waters risk assessment is an important consideration
- how the effects of climate change should be incorporated in the hydrogeological conceptual site model (CSM) and whether additional Source-Pathway-Receptor (S-P-R) linkages may need to be considered
- identifying model parameters that may be affected by climate change within controlled waters DQRA
- signposting towards useful data sources
- illustration of how the guidance could be applied using example case study sites
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Presenter biography



Leon is an Associate Hydrogeologist within Hyrock’s Geo division and is a member of SoBRA’s climate change and controlled waters sub-group. He is a Chartered Geologist with fifteen years of experience working in environmental consultancy, specialising in land contamination, groundwater risk assessment, hydrogeological modelling and remediation design for a range commercial and industrial sectors.



Better Ground Contamination Risk Assessment for Lower carbon developments

Amy Juden,
EPG

Abstract

As contaminated land risk assessors and designers we have the greatest opportunity to minimise the carbon impact of developments on brownfield land.

This talk will explore the hypothesis that it is environmentally irresponsible to specify remediation on the basis of generic screening approach alone, and that robust site conceptualisation and DQRA are currently under-used across the industry. This leads to an endemic problem of over-engineered designs, unnecessary remediation works and contributes to the significant embodied and operational carbon in the construction industry. Much of the rhetoric, and recent new guidance and publications focus on methods to minimise operational carbon emissions during remediation or site works. This talk will argue that there is greater opportunity to have a more significant impact on the carbon budget of a project if this is considered earlier in the process. In the same way as we have a duty to design out health and safety risks under CDM, as risk assessors and designers we should have a responsibility to design out carbon from our development projects wherever possible.

The talk will:

- discuss the barriers to better risk assessment in the industry and how some of these can be overcome,
- provide examples of the impact of risk assessor decision making on the overall carbon budget for a project,
- explore the tools available for undertaking detailed assessment and efficient designs within the existing regulatory framework, and
- pose thought provoking questions around the future of the brownfield development industry in the context of the climate emergency.

Presenter biography



Amy is an Associate at Environmental Protection Group where she specialises in ground gas risk assessment. She is a Chartered Geologist and is enthusiastic about providing efficient and innovative risk assessment and remediation solutions for complex contamination problems.

Amy was awarded the Best Young Brownfield Professional at the 2019 Brownfield Briefing Awards, is a member of the SoBRA working group for quantitative human health risk assessment for asbestos in soils, and serves as Treasurer of the Geological Society Contaminated Land Group. She has been working in the geoenvironmental industry since 2012.



Contaminated Land Sites and Ground Source Heat Pumps

Anna Hitchmough

RSK

Abstract

Ground Source Heat pumps are a very sustainable solution for heating and cooling buildings - but can they be applied at contaminated sites?

The presentation will briefly set out the two types of GSHP (open and closed loop) and how they extract renewable (largely solar) heat energy from reserves stored in the underlying geology.

Best practice guidance has been published by the Ground Source Heat Pump Association and this will be examined in line with Environment Agency groundwater protection policy to determine the impact that land contamination can have on potential schemes.

Finally, a case study will be used to illustrate how the guidance was applied to an open loop scheme in order to successfully install a system for a housing development.

Presenter biography

Anna Hitchmough is Experienced hydrogeologist and contaminated land practitioner. Head of profession for Geosciences at RSK and Ground Source Heat Pump Technical Lead. Anna is Chair of the Geological Society of London Contaminated Land Group. She is skilled in Sustainable Development, Hydrogeology, Ground Source Heat Pump feasibility studies, Quantitative Risk Assessment, Hydrogeology, NAPL fate and transport, Remedial Options and Environmental Impact Assessment.



Incorporating Resilience and Adaptation into the SuRF-UK Sustainable Remediation Framework

Richard Gill
SuRF-UK

Abstract

Climate change is one of or the biggest challenge facing society. It is driving changes to the climate system such as disturbance in the hydrological cycle, rising sea levels and more frequent extreme weather events. In the contaminated land sector, projects need to be able to adapt to the new and changing environment in a way that moderates the harm and exploits any benefits; but also be resilient with the capability to anticipate, prepare and respond to the multi-hazard threats presented by climate change and minimize the damage to social, environmental, and economic well-being.

A number of recent publications have begun to consider the impact of climate change and subsequent risk management implications on both the fate and transport of contaminants and the influence of impacts on different remediation technologies. These led to the development of guidance linking resiliency to climate change to “green and sustainable remediation” by the Interstate Technology and Regulatory Council (ITRC) in the USA. Aligned with these developments SuRF-UK has developed outline guidance (currently under review) about the current provision for incorporating climate change and broader considerations of resiliency in the context of the SuRF-UK Framework. This guidance comprises into four parts.

1. Project Lifecycle – when setting the sustainability objectives, select the headline indicator category, “Project Lifespan and Flexibility” that includes four sub-indicators that directly address issues of resiliency to climate change, financial or societal impacts
2. Part A of the Framework, setting remediation specifications – the extent to which resilience needs to be incorporated should be clearer at this part of the project; there are several UK-specific resources that could be used to inform a climate change vulnerability assessment to help define potential future risks
3. Part B of the Framework, setting remediation technology approach – here it is possible to consider the vulnerabilities of the different selected technologies to impacts of climate change
4. Sustainable Management Practices (SMPs) – these relatively simple, common-sense actions that can be implemented at any stage of a contaminated land project or portfolio of works; SMPs that enhance the resiliency of a project could include incorporating natural attenuation into the project strategy, this would ensure that the fate and transport of contaminants were considered in the event the primary risk management mechanism failed.

Ultimately, climate change and financial and institutional changes can introduce risks to projects and thereby undermine the effectiveness of certain risk management options. This presentation will describe how the SuRF-UK Framework allows evaluation of resilience to be built into projects through incorporation of indicators at an early stage of the project and at the point of remedial option selection. Furthermore, the framework allows for the adoption of SMPs that can be implemented throughout the project lifecycle to maintain durable and effective risk management in a dynamic environmental, economic and social context.



CLIMATE CHANGE AND SUSTAINABILITY: IMPACTS AND INNOVATION IN CONTAMINATED LAND

Presenter biography



Dr Richard Gill is a member of the SuRF-UK Steering Committee and a Soil and Groundwater Scientist at Shell Global Solutions International B.V. based in the Netherlands, where he provides soil and groundwater technical support to Shell businesses in Europe and the Middle East. He also represents Shell on a number of collaborative industry organisations in addition to SuRF-UK such as Concawe at EU-level, and SAGTA in the UK with the aim of developing sustainable and risk-based solutions to soil and groundwater challenges. He is also a contributor on Shell's global soil and groundwater R&D program; his current research interests are sustainable remediation and innovative technologies applied to remediation and site investigation. Richard graduated with a PhD from Sheffield University, UK on the topic of electrokinetic-enhanced bioremediation in heterogeneous settings.

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