

environmentanalyst

Brownfield Awards 2022

WINNERS' GUIDE



Contents

- Pg 3. Introduction
- Pg 5. The judges
- Pg 6. Shortlist
- Pg 9. Best Project Preparatory Work Award
- Pg 13. Best Research, Innovation or Advancement of Science
in the Brownfield Sector Award
- Pg 19. Best Application of Innovative Digital Tools or Emerging
Technology on a Brownfield Project
- Pg 24. Best Public Engagement and Participation of a Brownfield
Activity Award
- Pg 28. Best Application of Remediation Technologies Award
- Pg 33. Best Remediation of a Smaller Site Award
- Pg 38. Best Sustainable Re-Use of Materials Award
- Pg 43. Best Sustainable Brownfield/Urban Regeneration/
Infrastructure Scheme Award
- Pg 48. Best Public Sector/Not for Profit Brownfield Project Award
- Pg 52. Best Biodiversity Enhancement on a Brownfield Project Award
- Pg 55. Best Biodiversity Enhancement on a Brownfield Project Award
- Pg 58. Best International Project Award
- Pg 61. Best Early Career Brownfield Professional
- Pg 62. Judges' Choice Award
- Pg 63. Photo competition



Introduction

The effects of the pandemic were evident this year with a high number of innovative entries, advances in digital data applications and more concern about community and well-being.

As we were forced more to rely on digital communications and data analytics, it became more embedded into practices, with digital led solutions to preliminary data acquisition and innovation in site data gathering. There was one excellent example of using GIS to interrogate site information to simplify the decision-making process.

A common theme was effective management of big data, with some examples of automated workflows leading to dynamic decision making both onsite and in the office. Common data environments represented a trend, with different types, for example modelling, topographic and drone data integrated into one system.

With the pandemic we saw more emphasis on well-being and health and safety. One project's prime consideration was 'the impacts of stress and worry on people'. One quote from another entry summed the trend up well: "thinking beyond property to consider local economics, social sustainability, community, provenance and place."

It was fitting that the Judges' Choice award was an example of public and third sector partnership, working collaboratively to enable brownfield regeneration. Projects within this entry included renewable energy, community gardens, upskilling local people, play areas, training opportunities and tourism. The group managed a 1:7 investment return over two years.

Several projects delivered social value through engaging and educating communities around nature and biodiversity and fostered community ownership through environmental stewardship.

Carbon reduction is increasingly embedded in remediation design and now there is a target, there was truly innovative and forward thinking on net zero. There was an outbreak of software tools for carbon calculation and sustainability.

In terms of other trends – material movements on site become ever more complex and sophisticated and more projects not only mentioned the UN Sustainable Development Goals but gave evidence on how they were addressed.

The number of innovative entries and the record attendance at the awards evening, shows a resilient industry ready to face the future. Congratulations are due.

Warm regards,

Ian Grant

Director

[Environment Analyst](#)



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Brownfield Awards 2023

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Thank you to the judges



Ian Evans
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The Environmental
Protection Group Ltd



Alex Ferguson
Managing Director,
Delta-Simons



Lisa Hathway
Associate Director, GGS



James Cartwright
Director, McAuliffe



Frank Westcott
Director, Westenviro



Richard Boyle
Technical Director,
Brookbanks Consulting



Ian Grant
Editorial Director,
Environment Analyst



Jonathan Atkinson
Technical Specialist
Groundwater & Contaminated Land,
Environment Agency



Ann Barker
Lead Officer Contaminated Land,
City of Bradford Metropolitan
District Council



David Rudland
Contaminated Land Officer and
Remediation Project Manager,
Swindon Borough Council

Shortlist

Complex conceptualisation of creosote contamination: The curious case of DNAPL migration into an artesian aquifer
RSK Geosciences, Fife Council and SEPA

Remediation Strategy Preparation
Mott MacDonald and REGENESIS

Fiddlers Ferry Power Station
Arcadis (UK) Limited & SSE Thermal

CL:AIRE Good Practice for Risk Assessment for Coal Mine Gas Emissions
The Environmental Protection Group Limited (EPG, RSK, WSP and GeoEnvironmental Consulting Ltd)

Carbon Reduction Design Tool (CreDiT)
Leap Environmental

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

Asbestos Research Project
Advisian, National Grid Property, i2 Analytical, Firth Consulting

Natural Source Zone Depletion Assessment: Findings from the First UK Large Scale Field Application
WSP

SPA Whole-Life Data Management Approach
Strategic Pipeline Alliance

Innovative Continuous Odour Monitoring as Part of a Comprehensive Air Quality Monitoring Programme During Gasworks Redevelopment
AECOM & St William

An innovative and holistic integration of multiple digital tools to deliver the complex phase 2 strategic infrastructure investigation at Meridian Water
Arup

Telemetric turbidity monitoring during the piling/construction on brownfield sites situated over Chalk in Inner Source Protection Zones -
RSK Geosciences, Environment Agency, Affinity Water, Bellway Homes and Van Walt Ltd

Development of specific R function 'SiteSamplingGrid' to allow automated grid sampling: Application in assessment of spatially distributed contamination
John Grimes Partnership Ltd

Fiddlers Ferry Power Station
Arcadis (UK) Limited & SSE Thermal

Vacant and Derelict Land Community-led Regeneration Project
Scottish Land Commission & DTAS

Positive Public Engagement for five dismantling sites in the East of England to raise the profile of brownfield development with stakeholders and encourage community participation to shape of these projects
Local Dialogue

Forge Dam Restoration
Sanctus Ltd

Locking Parklands
Rodgers Leask Ltd

An application of four in situ technologies to remediate a 20,000m³ co-mingled plume comprising organic and in-organic contaminants in a chalk aquifer
Mott MacDonald Ltd & REGENESIS

Sustainable Remediation of a Site for School & Residential Use at Plaistow Road, London
Ramboll and Soilfix

The First Implementation of a Combined Electric Resistive Heating (ERH) and Multi Phase Extraction (MPE) Remedy at a Fractured Bedrock Site in Scotland, UK
Geosyntec Consultants

Design, Build and Operation of a Surface Water Treatment System, Newport, South Wales
St Modwen and Englobe Regeneration UK Ltd

Ailsa Wharf Remediation –
Turnkey Regeneration and Jackson Remediation

Harworth Colliery Coke Works Total Fluids and DNAPL Recovery
Englobe Regeneration UK Ltd

DNAPL management with in-situ recovery and binding at Earl Pumping Station
Costain Vinci Grands Projets Bachy Soletanche Joint Venture (CVBJV)

Focused Source Zone Electric Resistive Heating (ERH) and Multi Phase Extraction (MPE) Remedy on a Former Carpark
Geosyntec Consultants

Forge Dam
Sanctus

Sustainable Remediation of a Site for School & Residential Use at Plaistow Road, London
Ramboll and Soilfix

Former British Steel Crosby Warren Landfill
ERM, Geotechnology Ltd and Darlow Lloyd & Sons Ltd

Stabilization of Lime Waste
Lostock Gralam - VertaseFLI

Brent Cross Town Regeneration
Turnkey Regeneration, Galldris Services, Waterman, Arup and Related Argent

Paragon Park
Dunton Environmental

Simpson Park Phase 2
Tetra Tech

Auldcathie District Park, Winchburgh
Sweco UK Ltd, Winchburgh Developments Ltd, West Lothian Council, Optimised Environments Ltd, I & H Brown Ltd

Aire Park
Rhodar

Wirral Waters
Peel L&P's Wirral Waters

Brent Cross Town Regeneration
Turnkey Regeneration, Galldris Services, Waterman, Arup and Related Argent

Pendle Water Restoration Project, An Industrial Legacy re-imagined
Sanctus Ltd

Regeneration of the Former Ironbridge Power Station
Harworth Group plc

Equipment Works, Walthamstow
Telford Homes

St Martins Park
South Kesteven District Council

Vacant and Derelict Land Community-led Regeneration Project
Scottish Land Commission & DTAS

Glan Llyn
St. Modwen Developments Ltd, SK Environmental Solutions and Pleydell Smithyman

Pendle Water Restoration Project, An Industrial Legacy re-imagined
Sanctus Ltd

Helping to develop a contaminated soil law for the Israel Ministry of Environmental Protection
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Wollongong Gasworks Remediation
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Best Project Preparatory Work Winner



Introduction

The five hectare site was formerly occupied by a sawmill and timber works for a hundred years from 1910. Since the buildings were demolished to slab level, natural revegetation has started to occur. It is located adjacent to a heavily modified surface watercourse and within a mixed residential and commercial/industrial setting. The site is located in an area of economic deprivation and is valued by the local public for informal recreational use.

The site was identified as long-term 'vacant land' and has been on the Fife Council Vacant and Derelict Land Register for over 15 years. It was being considered for improvement as part of a wider SEPA-led multi-partner initiative, The Leven Programme, to support regeneration of the river corridor. The local authority and SEPA identified the site as an area of potentially contaminated land requiring further investigation to enable it to be brought back into beneficial use to deliver economic, social and environmental outcomes for the local community. Development plans have yet to be finalised but current considerations include a range of end uses including provision of active travel opportunities enabling the local community to better engage with the redeveloped site and the adjacent river. Fife Council in 2019 secured approval to utilise monies from its allocation of the Scottish Government Vacant and Derelict Land Fund to unlock comprehensive desk-based and intrusive ground investigations on this complex site.

Promoting exemplary best practice and a robust cost effective and defensible solution



RSK Geosciences was initially commissioned by the local authority in 2020 to undertake a desk-based and exploratory intrusive investigation. Although the site was found to be less impacted by organic contaminants than anticipated, several contaminant linkages, including those related to human health and groundwater and surface water receptors, were identified to be potentially complete and require further investigation. A second commission in August 2021 – the subject of this entry – aimed to address data gaps and uncertainties identified within the CSM and further characterise the potential water environment linkages. Both phases of work were reported in accordance with the NQMS.

The initial investigation provided limited evidence of creosote impact largely at shallow depths within made ground and underlying granular River Terrace Deposits. The presence of cohesive Till was proven to >3 m thickness through cable percussive drilling. This method could not penetrate further but the Till was known to be thicker due to rockhead depth. The cohesive Till was considered likely to mitigate the migration of dissolved phase/ NAPL in shallow groundwater to the bedrock aquifer due to its low permeability and absence of evident hydrocarbon impact. However, due to a known creosote impact on a nearby site at c. 100 m depth within the bedrock in a borehole installed by the Coal Authority for mine dewatering, it was recognised that migration to the groundwater body at depth could not be completely discounted.

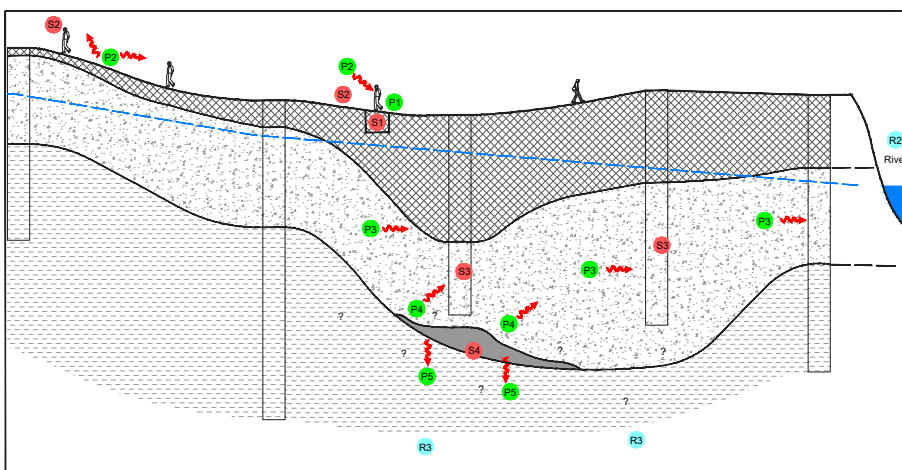
As mandated by the NQMS, uncertainties and limitations in the CSM and assessment were considered explicitly in the initial report along with their implications for further site assessment. With regard to the potential for DNAPL migration to bedrock, this approach identified that further investigation would be beneficial to address the uncertainty regarding the full thickness and composition of the superficial deposits, depth to bedrock and any associated creosote impacts. This recommendation was strongly supported by the local authority and SEPA as project partners and it then formed a key element of the second phase of investigation and assessment, along with lateral delineation of identified shallow impacts and further groundwater assessment of dissolved phase impacts.

In the course of these works, during careful sonic drilling to rockhead an unexpected result was found: despite the presence of a substantial thickness (up to 11m) of cohesive Till (stiff sandy gravelly clay), creosote impacts indicative of DNAPL were encountered at two locations at depth. These extended through the full thickness of the Till and into the underlying weathered bedrock, which was artesian. This finding markedly changed both the approach needed on site to manage SHE risks as well as having a major effect on the site conceptualisation and assessment of pollutant linkages.

Best practice

As highlighted above, the main aim of the second phase of the project was to refine the CSM and a much better understanding of the deeper geology and associated contaminant migration pathways at the site was developed as a result. Site visual and olfactory observations, supported by elevated concentrations of CoPC within soil samples from two deep boreholes installed in the core of Plume 1, confirmed creosote impact through the entire thickness of cohesive Till. This extended into the deep granular Till groundwater body where a creosote odour and globules of free phase product were observed in the grab samples of artesian groundwater that were able to be collected. This indicates that the cohesive Till is not acting as a barrier to contaminant migration in these areas. However, outwith the core of Plume 1, the converse was true with an absence of identified impact.

The refinement of the CSM that was achieved is illustrated in the graphic below. This led to identification of an additional contaminant linkage involving migration of dissolved phase contaminants and NAPL from shallow soil and groundwater to a deep groundwater body within granular till and bedrock via a vertical saturated pathway.



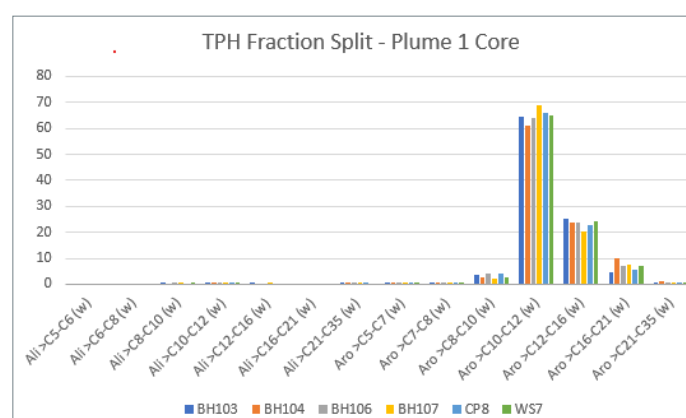
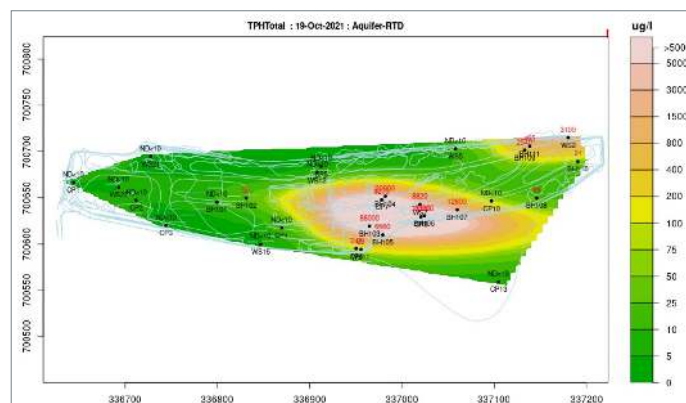
As well as the detailed conceptualisation and effective consideration of uncertainties, other key areas of best practice on this project included:

- detailed logging of undisturbed core samples from sonic drilling to assess creosote impacts and potential NAPL migration pathways using mobile data capture technology
- management of change due to unforeseen ground conditions – including upgrading the site to BDA Red site, deployment of aquifer protection measures and modifying the sampling and analysis plan, including installation of monitoring wells
- use of GWSDAT software to understand the distribution of key contaminants of concern and define groundwater plumes
- correlation of multiple sources through TPH CWG composition analysis
- use of all available lines of evidence to support DNAPL source definition as per the DNAPL handbook including visual/ olfactory evidence of impacts during drilling, well development and sampling; use of solubility limits; and interactions with dissolved phase plumes including ammoniacal nitrogen anticipated to have been used on site to treat the creosote

RSK designed the investigations in accordance with relevant British Standards and technical guidance (including the DNAPL Handbook) and acted as Designer and Principal Contractor under CDM. RSK undertook regular H&S and technical inspections during the site works to check compliance with in-house technical procedures and confirm the quality of data acquisition. Health and safety risks were managed effectively during the site investigation phase, with stop work authority applied by our lead site engineer on encountering unforeseen gross contamination at depth, giving time for the project team to evaluate the risks and put in place appropriate mitigation.

Robust, cost effective and defensible solution

As part of the reporting, a high level review of potential remediation options and implications for the proposed site development was presented taking account of site constraints. A key consideration for this site is whether there is likely to be a regulatory requirement for remediation of NAPL and dissolved phase impacts in the bedrock aquifer. In Scotland all groundwater in bedrock is considered to have groundwater resource potential irrespective of quality and productivity, but in this case future groundwater abstraction in the area is unlikely. The lateral and vertical extent of the contamination impact at depth is not known and this will be technically complex and costly to establish due to the artesian conditions present. The report recommended that cost-benefit analysis should be undertaken to demonstrate that further assessment and remediation of the bedrock aquifer would be of disproportionate cost compared to the environmental benefit achieved, which SEPA is minded to consider.



Notwithstanding this, the presence of NAPL in unsaturated zone soils and shallow groundwater underlying the site is considered likely to be the key risk driver for remediation of the site. Treatment or removal of source areas (specific features, e.g. underground tanks, pipelines/ducts, unsaturated zone soils and shallow groundwater) would reduce the on-going risk of leaching and mobilisation of dissolved phase contaminants/ NAPL laterally and vertically. This would lead to an improvement in shallow groundwater quality over time and reduce the associated risks of migration of contamination to the river and/or to the deeper aquifer. A range of potentially applicable options were identified with a full options appraisal to be carried out as a later step.

The risk assessment that was completed and the considerations for site development were based on the current Scottish Government and SEPA policy and technical guidance but it was also alert to the impending changes to this approach which are due to be enacted later in 2022.

Innovation and added value

Aside from the main focus of the investigation on creosote impacts, given the proposed 'soft' end use of the site to add value, the project also assessed the quality of topsoil present on site and its potential to support rewilding and carbon sequestration. Working with agricultural soil specialists in RSK group company ADAS, soil samples were selected for testing for fraction of organic carbon (foc) and topsoil analysis

in accordance with BS3882-2015. Measured foc levels were found to be highly variable but some of the values exceeded those found on many brownfield sites, considered likely to be due to the vegetation that has self-established. This indicated that there is the potential to increase soil organic carbon as part of the proposed development, which is beneficial from a climate change/carbon zero perspective.

The BS3882 analysis revealed well drained soils with relatively low nutrient (NPK) levels that are particularly suitable to support creation of grassland community or wildflower meadows.

Stakeholder engagement

Stakeholders include government agencies, non- government organisations, private sector and local community groups. Extensive consultation with the local authority, SEPA and the landowner was completed at key stages of the project. During the site investigation phase the client was kept informed of progress on a daily basis and provided with options to progress the site investigation effectively following the unforeseen ground conditions. During the investigation the local authority, SEPA and the local MSP visited the site where they were briefed on the site findings and potential implications for development.

Environmental and social benefits

Aside from supporting brownfield remediation, the redevelopment of the site is part of a larger masterplan involving collaboration between a wide range of stakeholders that aims to deliver social, economic and environmental improvements along the river corridor, which is in an area of high economic deprivation. The primary objective of the investigation was to



pave the way for the regeneration of a longstanding vacant and derelict land site to a space that can be used to its full potential by the local community. It also links to aspirations to achieve rewilding/biodiversity enhancement of the site and other benefits relating to the river.

Summary

This project is a valuable case study that illustrates the importance of identifying the limitations of exploratory site investigations and uncertainties in conceptual site models – as mandated by the NQMS – and shows how more detailed site investigation can sometimes lead to a very different insight emerging. In this case, the supplementary site investigation undertaken and interpretation of a series of lines of evidence has demonstrated a contaminant linkage involving migration of DNAPL into a confined bedrock aquifer.

”

This entry was a good example of using and refining a Conceptual Site Model as an analysis tool and using multiple lines of evidence. They also praised the stakeholder and local community focus.

Best Research, Innovation or Advancement of Science in the Brownfield Sector

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Winner



CL:AIRE Good Practice for Risk Assessment for Coal Mine Gas Emissions

Introduction

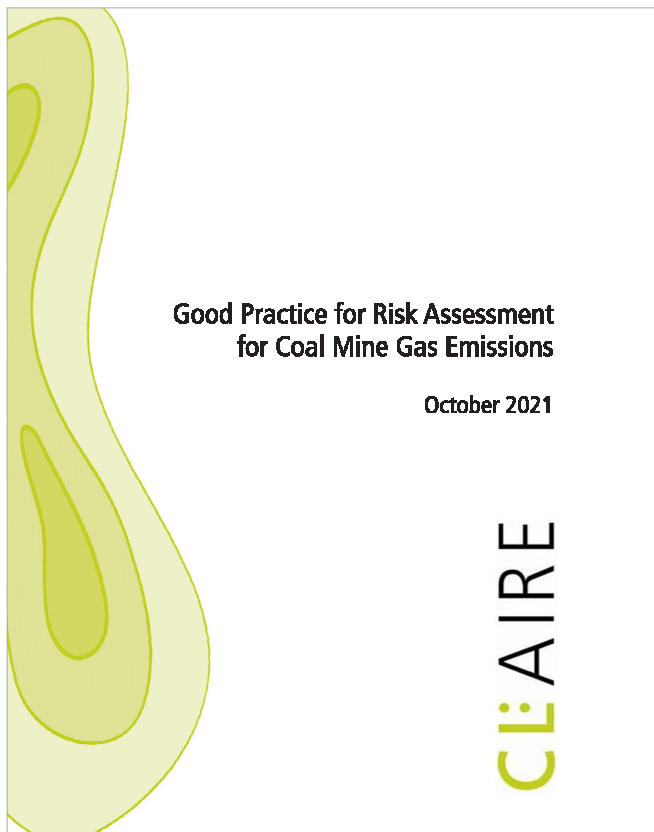
This submission is for an industry guidance document published by CL:AIRE in October 2021 entitled Good Practice for Risk Assessment for Coal Mine Gas Emissions. The guidance document was prepared by the authors and CL:AIRE as an unpaid project and largely in their own time. This was because they recognised the critical need for this industry guidance to improve the quality of mine gas risk assessment and to support the safe development of brownfield land.

The authors have all been involved in the Gorebridge incident – where carbon dioxide ingress occurred into houses from shallow mine workings – and understand its wider implications. The authors felt that there were important lessons to be learnt by the industry and regulators regarding the investigation and risk assessment of coal mine gas at development sites. They also recognised the need for industry consensus around the guidance, so undertook a significant public consultation exercise before finalising the document and publishing it.

Background

In 2013, reports of illness among residents in Gorebridge, Scotland, led to the discovery that carbon dioxide was entering newly built homes. A total of 22 residents from an overall total of 165 in the affected area were reported to have contacted healthcare services between September 2013 and September 2014. The most common complaints were headaches, dry coughs, dizziness and anxiety. The town is in a former mining area and the development was underlain by old mine workings with shafts present nearby. Subsequent investigations led to the residents being relocated and 64 houses being demolished. A subsequent research project commissioned by the Scottish Government identified that the current standards and guidance on ground gas were limited in their coverage of specific factors affecting mine gas risks and recommended that specific technical guidance was required on the investigation and assessment of mine gas risk to avoid recurrence of similar incidents in the future. This guidance is intended to highlight some of the issues relating to mine gas risk assessment for development, to signpost existing information and to promote good practice. It also provides several useful case studies from the authors' experience.

The authors approached CL:AIRE because it is a recognised not-for-profit organisation that has published several highly regarded technical and research bulletins relating to ground gas in the contaminated land sector. An agreement was reached to develop the guidance on a voluntary basis and make it freely available online at no charge.



Promoting exemplary best practice and a robust cost effective and defensible solution

From the outset, the guidance was intended to concentrate on the key issues, building on existing standards and good practice (such as BS 8576, BS 8485, CIRIA C665 and Coal Authority publications) rather than repeating information published elsewhere. As well as covering a wide range of issues specific to mine gas, it places the guidance in the context of overarching considerations such as competency of risk assessors and applying the precautionary principle. The authors also wanted to provide a pragmatic but robust framework on which to base a mine gas risk assessment with resources applied proportionate to the level of risk. A key element of this is the identification of mine gas risk factors for development, as informed by both United Nations and Scottish Government research on previous incidents in the UK and worldwide, to include unsealed mine entries, shallow workings, absence of low permeability deposits, fault zones of fractured rock and unflooded or variable water levels. Understanding these risk factors then informs a process of mine gas risk assessment, as developed by the authors, which is intended to enable risk assessors to confidently screen out low risk sites quickly and easily.

The publication identifies how the guidance in BS 8485 can be applied to mine gas risk. Importantly, it also highlights the limitations of the 'empirical' gas risk assessment approach based on Gas Screening Values. A key recommendation is that the points scoring system in BS 8485 is not considered



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Lessons from Gorebridge

The authors included several key lessons that were drawn from the Gorebridge incident, such as:

- Mine gas risk assessments and mitigation design should be carried out by 'competent persons', as defined in the National Planning Policy Framework (NPPF) in England and equivalents in the devolved governments. As a result of the guidance being published, there are regulators that now have the backup to require people who are completing mine gas risk assessments to demonstrate competence.
- It is important that risk assessors understand the different methods of working coal, the effect these have on the likely presence of a mine gas hazard being present below a site and the corresponding risk of emissions into buildings.
- The guidance emphasises that, as with any other ground gas assessment, the development of a Conceptual Site Model (CSM) to avoid an incomplete mental model of the problem is vital where there is a source of mine gas, as is its use in the interpretation of any gas monitoring data.

appropriate in isolation for assessing mine gas risk on sites with complex CSMs or that are affected by high risk factors. Instead, the guidance advocates the use of a multiple lines of evidence approach.

Finally, it advises that risk assessors should consider the effect of foundation construction and other buried infrastructure on migration pathways and the integrity of any barrier layers – key issues at Gorebridge. The risk assessment should be revisited once all below ground, foundation and slab designed has been fixed to make sure it is still applicable. A consequence of this advice is that mine gas risk assessors must have a good understanding of floor, foundation and drainage construction types and methods.

Effective use of this guidance by industry will provide two key benefits: first, gas protection will only be provided where

necessary, thus avoiding unnecessary embedded carbon in construction, and second, it will help to prevent an incident like Gorebridge happening again, with the associated human and environmental costs.

Innovation

One key part of the guidance that is not provided anywhere else is the Decision Support Tool in Figure 13.1 of the guidance (see Figure 2 above). This is intended to enable risk assessors to quickly discount mine gas risk where appropriate and focus resources and effort on the higher risk sites where more detailed risk assessment is likely to be required. For moderate and high risk zone sites, it also advises on how to consider the mitigation design for ground gas protection measures and the importance of considering how the development may affect the

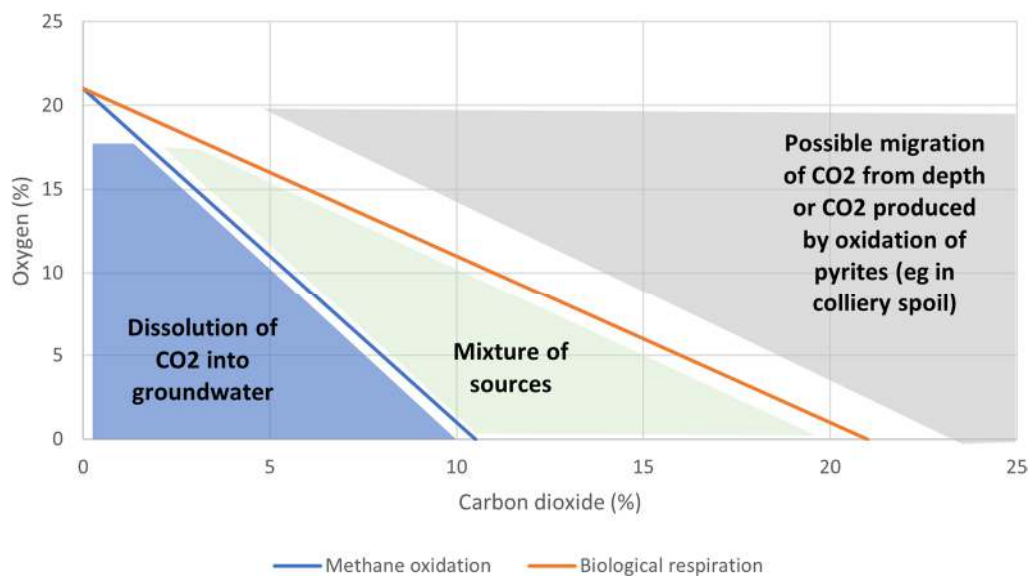


Figure 3 Stochiometric Assessment of Gas Concentrations

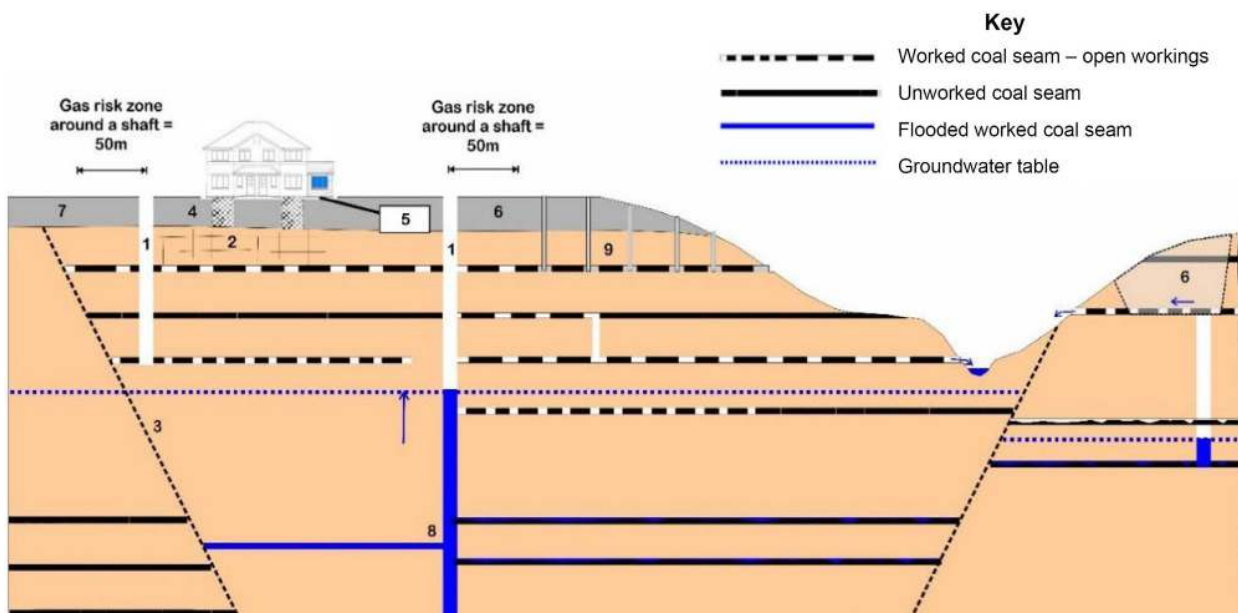




Figure 1 Demolition of Houses at Gorebridge

risk assessment. Key to this is understanding whether there is reliance on the competency of a low permeability layer preventing gas migration to the surface and how development activities can impact this and create new pathways. Importantly, the guidance also explicitly considers how to identify and manage uncertainties within the mine gas risk assessment. This includes climate change effects, which are considered explicitly within an appendix, going beyond what is considered in existing ground gas publications.

The document also provides guidance on how to assess monitoring data to distinguish between background carbon dioxide from biological respiration of organic material in Coal Measures rocks and that from emissions from migration of CO₂ from depth.

Effective public/stakeholder engagement

To ensure the guidance would be accepted as widely as possible, it was important to conduct a robust public consultation. This was designed to include industry, regulators, other key stakeholders such as the Coal Authority and leading authors of other ground gas guidance. This was done initially by publishing the draft document and inviting comments. The request for comments was publicised as widely as possible via internet forums and industry organisations.

The request for comments and addressing them followed a framework used by organisations such as CIRIA and British Standards. Comments were submitted in a standard format that allowed them to be recorded in a spreadsheet. A record was then kept of changes made and the reasons for them. If comments were not considered, valid commentary was provided to explain the reasoning.

The draft document was also submitted to some key organisations that it was considered vital to obtain feedback from.

These included the Coal Authority, Northumberland County Council and the National House Building Council (NHBC), who were all supportive of the guidance. The reason these organisations were chosen was that they all had in-depth experience of dealing with mine gas risk. There was some critical comment about some parts of the guidance from Northumberland County Council (NCC). To address this and reach consensus, meetings were held with NCC to explain the research that supported our approach. We also recognised where the council had valid concerns and agreed changes to the text that allowed consensus to be reached. For example, there was concern from NCC about advising against applying limiting values of oxygen intended for occupied spaces to data from monitoring wells. The authors demonstrated to the council that there are very common chemical or biological processes that occur in the subsurface to reduce oxygen concentrations in soil gas. It was demonstrated that such low oxygen is a poor indicator of mine gas risk and the approach in the guidance that relies on developing a robust conceptual site model would not lead to oxygen deficient air from mine workings being missed.

Draft elements of the guidance were also presented by the authors at around 10 industry/CPD events, including those organised by Environment Analyst, Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG), Environmental Protection UK (EPUK) and NHBC. A final peer review was undertaken by the CL:AIRE Technology and Research Group (TRG) before publication.

Real environmental and social benefits

The intended audience of the document was those involved in commissioning and undertaking mine gas risk assessments to support proposed development and local authority officers involved in regulating development management through the planning or building control regimes.

The key aim of the guidance was to support the safe development of sites affected by coal mining and to avoid the recurrence of such incidents in future. This has clear environmental and social benefits. For example, as well as the direct health impacts, the Gorebridge incident led to indirect health effects, such as stress and worry, associated with people being informed of exposure to mine gas and then having to relocate from their homes.

Publication of the good practice guidance has had a big impact already. CL:AIRE's launch event was attended by over 200 representatives from industry and the public sector. It was downloaded from CL:AIRE's website over 1000 times in the first month and over 4500 times at time of writing. The authors are continuing to work with CL:AIRE to provide training sessions to further disseminate knowledge and upskill industry practitioners.

”

Summary

In summary, this is the first guidance on coal mine gas risk assessment in the UK and it was developed by authors to address a key need identified in government research undertaken in response to the Gorebridge incident. It provides pragmatic and clear guidance that will support risk assessors completing mine gas risk assessments and regulators reviewing them. It not only signposts existing information but crucially, gives guidance on what the information can tell you about gas risk. It gives risk assessors the confidence to screen out low risk sites quickly and ensure that high risk sites have appropriate investigation, assessment and mitigation.

“This entry showcased a useful guidance report, prepared collaboratively in the wake of the Gorebridge incident. The entrants sought industry consensus, had a good liaison with external authorities, and they considered the impacts of stress and worry on people.”



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for the best research, innovation or advancement of
science in the brownfield sector



Best Research, Innovation or Advancement of Science in the Brownfield Sector **Highly commended**

Leap Environmental

for their project 'Carbon Reduction Design Tool (CreDiT)'

Ramboll

for their project 'SURE: An Innovative Digital Tool For Embedding Sustainability In Remedial Options Appraisal'



Best Application of Innovative Digital Tools or Emerging Technology on a Brownfield Project

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Winner

St William
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AECOM

Innovative Continuous Odour Monitoring as Part of a Comprehensive Air Quality Monitoring Programme During Gasworks Redevelopment

Odours during brownfield redevelopment are a common cause of nuisance and raise public concern over potential health impacts. Monitoring often focusses on health-based air quality risks and not odour. Where odours are considered, monitoring is typically only carried out periodically throughout the works or as a reactive measure following complaints. This submission presents the deployment of three innovative continuous odour monitors as a key component of a comprehensive air quality monitoring programme to proactively address both regulatory and public concerns during gasworks redevelopment. These instruments provided a robust, defensible, continuous documented record of odours during the works that was key to the identification and mitigation of odour generation.

Introduction

Odour generation during brownfield site redevelopment can result in complaints, statutory nuisance offences and even the cessation of works. Monitoring can be difficult given the number of potential chemicals that can contribute to odour. Sniff testing is often used but is typically limited in duration and frequency and this can present challenges when identifying odour release events or responding to public or regulator concerns.

Redevelopment of a gasworks bordered by residential properties represents a particularly sensitive setting for odour generation. In response to the sensitivity of the works, innovative continuous odour monitoring was employed to understand, document and respond to odour generation events and communicate findings to the regulators. The deployment and operation of these monitors was an integral factor in addressing regulatory concerns and resulted in the successful completion of the works without delays resulting from regulatory or public intervention in relation to odours.

Background

The eight-hectare site operated as a gasworks for almost one hundred years leaving a legacy of tar, foul lime, spent oxide and asbestos within the ground. Located in a highly sensitive setting, the site is bordered by residential properties on two boundaries with a river forming the other two boundaries.

The brownfield site is currently in the process of redevelopment by St William Homes LLP (St William) for mixed use, consisting of 2,800 residential units and commercial space. With a strong





Redevelopment of former gasworks with soil stabilisation within former gas holder (images courtesy of EnGlobe)

emphasis on landscape and green spaces, the development includes a one-hectare park and space allocated for a school. The remediation strategy comprised stabilisation of tar-impacted soil and foul lime/spent oxide, together with pathway interception measures comprising capping, gas and vapour barriers and barrier pipe to address risks to health. Following turnover of made ground, stabilisation of tar-impacted soil and foul lime/spent oxide commenced in May 2021 and was completed in September 2021.

Air quality monitoring

The comprehensive air quality monitoring programme implemented during site redevelopment involved:

- deployment of two continuous dust monitors (reporting PM_{10} and $PM_{2.5}$);
- passive diffusion sampling for nitrogen dioxide (NO_2), hydrogen sulphide (H_2S), ammonia (NH_3) and volatile organic compounds (VOCs) throughout the remediation programme at six boundary locations;
- short-term active sampling for VOCs;
- regular audits with continuous logging photo-ionisation detector (detecting to parts per billion);
- regular sniff tests at eight nearby off-site locations; and
- Analysis of 1,351 air samples for total fibres using Phase Contrast Optical Microscopy and a further 195 air samples for asbestos fibres using Scanning Electron Microscopy.

To further complement this programme, St William challenged AECOM with evaluating whether there were additional techniques capable of continuous odour monitoring that could be deployed at the site.

Continuous odour monitoring

A literature review and discussions with manufacturers and industrial users resulted in a recommendation to procure three odour monitoring units from an American supplier, Sensigent. Sensigent are market leaders in technologies often referred to as 'electronic noses'.

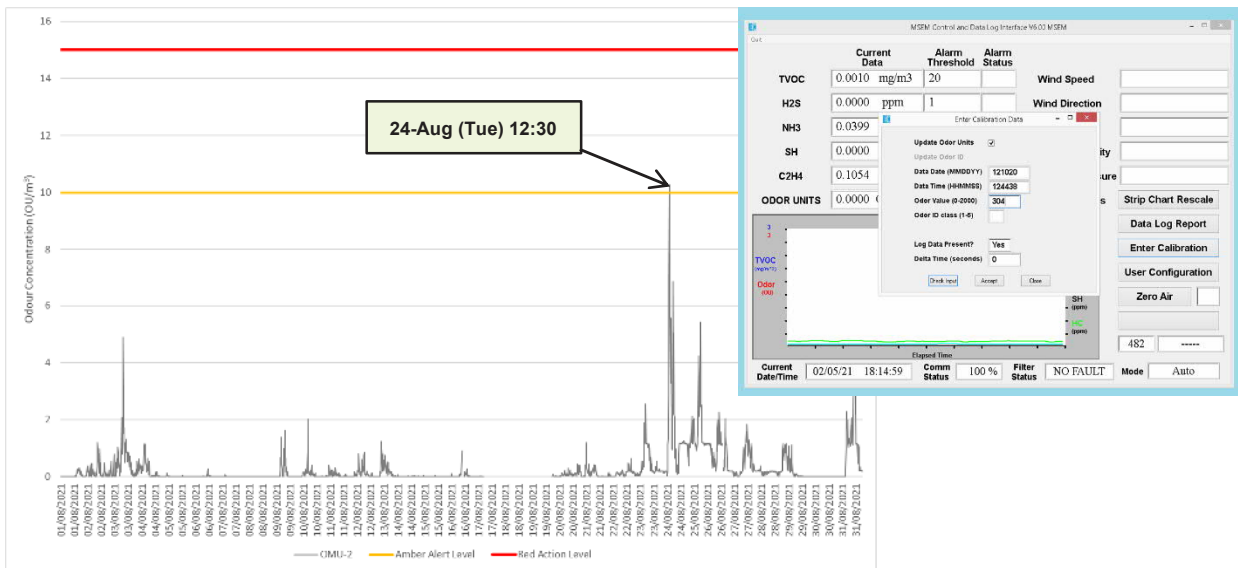
The three MSEM 3200 continuous odour monitoring units deployed at boundary locations on site are advanced instruments which are configured and operated to provide continuous, real-time measurement of odours. The instruments contain an array of environmental and gas detection sensors which allow for quantitative reporting of odour unit concentration (OU/m^3).

This metric has been derived as a practical descriptor for the concentration of odours where the individual constituents of an odour may not be known (as is the case on contaminated land sites). In addition to reporting odour unit concentrations, the instruments are able to provide continuous direct measurements of the concentrations of key groups and/or individual species of chemical substances (e.g. total VOCs, H_2S , NH_3 and mercaptans). One of the three instruments on-site was also integrated with a meteorological monitoring station to obtain time-matched weather condition information.

The instruments were calibrated with:

- 'zero' odour values, achieved by running the instruments in a clean indoor environment which was free of odours;
- 'low odour' values, achieved by running the instruments at an on-site location where odour levels were close to the recognition threshold ($3-10 OUE/m^3$) as determined by a trained odour sniff test assessor; and

Output from continuous odour monitor and (b) high-level calibration



- 'high odour' values, achieved by running the instruments in close proximity to a site-specific representative source of odours (tar recovered from abstraction wells). In parallel to this, samples of the odorous air were collected and analysed at a UKAS-accredited laboratory to determine odour concentration in accordance with BS EN 13725.

The information generated by the instruments was combined with an amber and red alert trigger system and email distribution to relevant site representatives to ensure measures were put in place to minimise odour generation.

An example is presented in Figure 3 where an amber alert triggered review of site activities and monitoring data. Odour measurement was identified to be driven by elevated VOCs associated with soil excavation and transport from a relief gasholder. Odour mitigation measures included the use of atomisers with deodorising agents in operation at the relief holder and around the stabilisation area. Materials for stabilisation were mixed and placed as received to minimise stockpiling and the relief holder soils were sprayed with a sealing/deodorising agent at the end of works shift.

Notable innovation / exemplary best practice

This project represented the first deployment of these continuous odour monitoring instruments within the UK. Information on odours was available digitally, in real-time to AECOM and St William, allowing data to be cascaded to the remediation contractor throughout the duration of the project. This documentation of odour concentrations on a continuous basis represents best practice in understanding and mitigating odour releases at brownfield sites.

Robust, cost effective and defensible solution

The environmental monitoring strategy for the remediation of this site received intense scrutiny over a 6-month period from the local authority, the Environment Agency and a third-party environmental consultant. The integration of the continuous

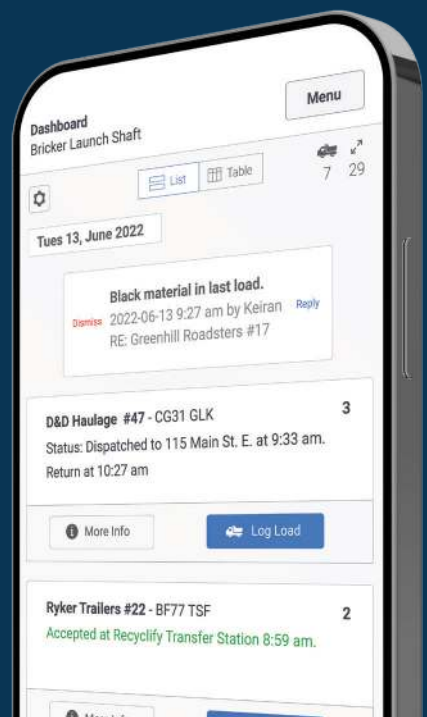
odour monitors within the air quality monitoring programme provided reassurance to all parties that the proposed strategy represented a robust and defensible solution. The deployment of the monitors provided a more comprehensive and cost-effective method of acquiring odour data than that offered by periodic sniff testing.



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Compliance with legislation

The environmental monitoring strategy for the site, including the use of the continuous odour monitors, was accepted by the planning authority with the discharge of planning conditions associated with the strategy and baseline monitoring.

Effective public/stakeholder engagement

The proposed environmental monitoring strategy was initially presented to the regulators for review over six months prior to works commencing on-site. Data sheets and case studies on the continuous odour monitors were provided and the calibration process discussed and agreed with the regulators and their representatives. Output from the odour monitors was presented to the regulators at monthly meetings and documented in monthly reports. Public meetings, letter-drops and website updates were used by St William to engage and inform the public of upcoming works.

Real environmental and social benefits

The innovative deployment of continuous odour monitors offered real environmental and social benefits through iden-

tifying odour generation events during brownfield redevelopment allowing mitigation, focussed health-based monitoring and greater public confidence and transparency that the remediation work being undertaken supported good health and well-being.

”

This project provides an excellent, innovative solution to the sensitive issue of odour generation during remediation, and was the first deployment of this continuous odour monitoring equipment in the UK.”

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Best Application of Innovative Digital Tools or Emerging Technology on a Brownfield Project

Highly commended

RSK Geosciences, Environment Agency, Affinity Water, Bellway Homes and Van Walt Ltd

for their project 'Telemetric turbidity monitoring during the piling/construction on brownfield sites situated over Chalk in Inner Source Protection Zones'

Arcadis (UK) Limited and SSE Thermal

'Fiddlers Ferry Power Station'



Best Public Engagement and Participation of a Brownfield Activity Winner



SCOTTISH LAND COMMISSION
COIMISEAN FEARAINN NA H-AIBÀ



DEVELOPMENT
TRUSTS ASSOCIATION
SCOTLAND

the community-led regeneration network

The Vacant and Derelict Land Community-led Regeneration Project

Summary

The Vacant and Derelict Land Project was established in July 2020 by Development Trusts Association Scotland (DTAS) and the Scottish Land Commission. The DTAS is an independent, member-led organisation which aims to promote, support and represent development trusts in Scotland. Established in 2003, DTAS now has over 300 development trust members – community-led organisations using a combination of enterprise and creativity to improve the quality of life for local people in urban, rural and island communities across Scotland. The Scottish Land Commission is a non-departmental government body created in 2017 as a result of the Land Reform (Scotland) Act 2016. It stimulates new thinking about the ownership, use and management of land so that its land and assets benefit all of Scotland.

The aim of the partnership project is to develop community-led, practical and innovative approaches for tackling vacant and derelict sites across Scotland. The project support offering was designed to provide extra capacity within community organisations and build confidence to encourage more community-led action on vacant and derelict sites.

A Vacant and Derelict Land Project Manager was appointed who worked with seven communities to enable them to bring seven very different vacant and derelict land sites back into a productive use – delivering a wide range of economic, social, and environmental benefits.

The Vacant and Derelict Land partnership project as a whole is a unique example of best practice in public engagement and participation of a brownfield activity. It goes above and beyond engagement to ensure communities are taking ownership and leadership in the regeneration of vacant and derelict land.



Background

Scotland has almost 11,000 hectares of vacant and derelict land recorded on the Scottish Vacant and Derelict Land Register. However, there are many sites not included on the register including smaller sites under 0.1 hectares. This excludes an important and potentially large group of small sites that are likely to be of concern to communities.

Research undertaken by the Scottish Vacant and Derelict Land Taskforce (coordinated by the Scottish Land Commission) in 2018 clearly shows that it is often these smaller sites that cause the most harm to communities. Such sites can be brought back into use in ways that can deliver transformational benefits for communities. The cost of returning these sites to productive use is also often relatively small, while the marginal returns on investment can be significant. However, collectively, they could deliver significant socio-economic and environmental benefits for Scotland.



The project had a really interesting approach to wider community engagement and the judges particularly liked how the approach created links between communities.”

To ensure that these benefits are not overlooked the Taskforce proposed that small sites that are identified by communities should be prioritised in a delivery programme of which community-led regeneration is a key pillar. While some of the sites identified through the Taskforce’s preliminary analysis are likely to be too small to be considered strategic priorities by local or national delivery bodies, they could be ideal for community-led initiatives. Transforming these sites into green infrastructure assets – like urban market gardens, allotments, playgrounds or skate parks – could significantly enhance community wellbeing and play an important role in addressing health inequalities.

To action this, the Scottish Land Commission and the DTAS partnered to create a steering group and a Project Manager role to act as an intermediary and support community groups to deliver their vision. The steering group saw particular value in supporting projects which were urban, in areas of disadvantage and tackling long-term derelict sites. Community-led development is most powerful when ideas are developed by the community to address a direct community need.

Activities and Outcomes

Community participation and involvement has been essential to the delivery of these brownfield regeneration projects. This is evident across several areas.

The project highlights a genuinely participatory approach to brownfield regeneration. It was developed on a basis whereby groups were asked to come forward and talk about their ambitions, rather than a more top-down approach where, say, the community groups were asked by a steering group to help them to

do something specific or on a specific site. There was a lot of interest, with requests for support almost double to the capacity available. Sites and communities which were in the target criteria provided by the steering group were prioritised for support.

A range of practical engagement tools were used by the groups to help inform the process. At the start of the project, all of the groups used a Community Impact Tool to assess the harm that their chosen site was causing to the local community. This tool was developed by the Scottish Land Commission to identify the impact of vacant or derelict land on communities to help prioritise these in planning, funding or place-making decisions. This rating formed part of the initial prioritisation for support whilst also providing a baseline for measuring positive outcomes for each site.

One of the project’s groups, Carluke Development Trust, arranged a series of “Carluke Conversations” from which the community developed their vision for the site as a heritage tourism destination which also meets the needs of the town’s residents. Carluke High Mill was built in 1801 in Carluke town centre. As the most complete windmill in Scotland, it is a Category A listed building but is on the Buildings at Risk register and the wider site is classed as one of Scotland’s “stuck sites” as it has been derelict for more than 20 years. Close to the High Street, surrounded by houses and across the road from two schools, it is a prominent site within the community. It is a complicated but worthwhile site to bring back into use

The site surrounding the building is being developed as a community growing and learning garden, with space for the community food hub and outdoor classrooms which will be used by the nearby schools. The building itself will deliver



Figure 2 Carluke Development Trust Engagement Activities



indoor community facilities and rentable high-end events space along with the heritage attractions in the mill tower itself.

Another example of innovative community participation in this project is the Concrete Garden in Glasgow. It was established in 2013 from a community growing project which transformed a small vacant and derelict site in Possilpark, an area of high levels of deprivation. It is estimated that 100% of the population lives within 500m of a vacant and derelict site in Possilpark. Concrete Garden have engaged the landowner about a long term lease or purchase through negotiated sale for both the Back Garden and the large vacant site adjacent.

Working with volunteers, the group have designed and created several spaces which provide food growing, play and wellbeing opportunities for people across the north of Glasgow. A community den building event took place over a week during summer 2021 on the vacant land. The consultation processed involved children creating a den using recycled materials. Through activating this space and sparking the imagination of the children who took part, the community were encouraged to think of what it could become.

The overwhelming feedback confirmed that this site would be of much greater value as a community resource rather than housing or retail. There is now a lot of demand for Concrete Garden's existing facilities, particularly the outdoor adventure play, and this is set to increase as more houses are built in the area. Aiming to meet the existing and emerging needs of their community, Concrete Garden is now looking to transform a larger derelict site in their community to create a bigger adventure playground. The group intends to bring the vacant site back into temporary use again from summer 2022 until the sites long term development is settled.

A space for engagement across groups and shared learning was created. Each of the communities involved in the DTAS/ Scottish Land Commission partnership project have hosted the others at their site in a series of site visits over two years. This has allowed them to form a network of support and discuss how each is overcoming relatable challenges to each other – learning from each other's mistakes and successes.

Overall, the DTAS/Scottish Land Commission project is illustrates how pragmatic and meaningful public participation and engagement in brownfield activities delivers significant benefits for the local community. Having a dedicated resource to support communities to undertake engagement activities and create the space needed to share experiences on doing so. The progress made by the groups highlights the success of this approach.

The outcome to date since the project inception in 2020 is that four sites and three vacant shops have been brought into meanwhile use during the project. 15 sites have been explored for permanent uses, with ten continuing to be furthered by communities at the end of the project. At a national policy level they are path finders for Scottish Community Right to Buy legislation and processes relating to ownerless (or assumed ownerless land). The groups collectively leveraged £750k funding during two years which equates to a 1:7 investment return.* The project established a virtual and in-person community support network of 'vacant and derelict land champions'. It has helped to raise the profile of community-led regeneration and of vacant and derelict land through numerous events, blogs and partnership meetings.

By enabling the public and local community to have their say, the community organisations driving the change are coproducing plans that deliver meaningful end uses for long term derelict land and buildings. These include active travel hubs, play spaces and social enterprises. Collectively, transforming Scotland's smaller, long-term derelict sites into community assets can deliver a significant number of economic, social, and environmental benefits.

* Please note this figure is not including significant capital as projects not at this stage yet.

Figure 4 Coverage of exchange visits between the Vale of Leven Trust, New Cumnock Development Trust, South Seeds and Woolfords, Auchengray and Tarbrax Improvement Foundation supported by the Development Trusts Association Scotland to help share learning



Best Public Engagement and Participation of a Brownfield Activity

Highly commended

Local Dialogue

for their project 'Positive Public Engagement for five dismantling sites in the East of England, to raise the profile of brownfield development with stakeholders, and encourage community participation to shape these projects'

Sanctus

for their project 'Forge Dam Restoration'



Best Application of Remediation Technologies

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RAMBOLL

Sustainable Remediation of a Site for School & Residential Use at Plaistow Road, London

The Plaistow Road site in East London had been occupied for over 40 years by a vehicle showroom with associated vehicle maintenance operations. Prior to this, from at least 1880s the site was occupied by railway engineering sheds with railways sidings and by the 1930s, a toy works, and a tin plate works were present. The client, LocatED on behalf of the Department for Education (DfE), acquired the site for redevelopment. The proposed scheme comprised a school and mixed high-rise residential and commercial (retail) development, as part of a wider community regeneration scheme.

A series of ground investigations were completed between 2017 and 2019. Ramboll completed a delineation exercise and subsequent DQRA to assess the requirement for remediation. Three key sources of contamination were identified:

- **Source Area 1 (North East):** Diesel and lubrication petroleum hydrocarbons with LNAPL: Leakage from a former waste oil UST had resulted in free phase lubricating oil and diesel migrating directly into the Kempton Park Gravel member. This formed an extensive area of measurable LNAPL and significant dissolved phase hydrocarbons with potential for off-site migration to the wider aquifer.
- **Source Area 2 (South West):** Paraffin and diesel petroleum hydrocarbons with LNAPL: Leakages and spillages from ASTs and a UST had resulted in localised hydrocarbon contamination in soil (particularly in Made Ground) which had resulted in measurable LNAPL (principally kerosene) and associated smear zone within the Gravels, providing an ongoing source of dissolved phase hydrocarbons to the wider Aquifer. This source also presented a theoretical vapour risk (to future on-site and current off-site human health receptors).
- **Site-wide diffuse Made Ground contaminants:** Made Ground contained layers of coal-tar bitumen, asbestos cement/insulation board fragments as well as diffuse concentrations of asbestos fibres, heavy metals and PAH's, collectively referred to as Made Ground Contaminants (MGC).

THE CHALLENGE:

Remediation of the site presented several challenges to remediation, requiring unique and creative solutions. These included:

- **Significant extent of free-phase impact:** The extent of gross contamination across a relatively small site footprint and at depths of between 2m and 3.5m below ground level within a variable permeability aquifer;
- **Recalcitrant hydrocarbons:** Source Area 1 contained a consistent layer of free-phase product (and associated smear zone) that was predominantly in the weathered lubricating oil range, which would be difficult to treat on-site;
- **Significant in-ground obstructions and deleterious mate-**



rials within Made Ground requiring removal concurrent with remediation works to render the site suitable for development; and

- **Sensitive neighbours in a dense urban location:** Sandwiched between residential housing and adjacent busy railway lines with busy platform of Plaistow Station - comprehensive and robust environmental considerations, including monitoring and control of noise, dust, odours, and vibration therefore required.

Other constraints included a boundary Japanese Knotweed infestation, archaeology and live utilities. Multiple Stakeholders were involved in the project including LocatED, Transport for London, local residents, Environment Agency and London Borough of Newham.

DEVELOPMENT OF A SUSTAINABLE SOLUTION:

Soilfix worked closely with Ramboll to develop a sustainable yet robust Remediation Strategy for the site. The Environment Agency's remediation applicability matrix (Environment Agency 2019) was used to screen potential techniques for addressing the compounds of concern in each of the impacted strata. Techniques were included based on their technical feasibility and practicability of implementation at the subject site. A number of potentially applicable remedial techniques identified were combined into each of five remedial options including excavation, disposal and on-site treatment.

To enable the identification of the most sustainable approach, Ramboll deployed SURE, a digital on-line tool based on updated SuRF-UK* guidance and compliant with BS ISO 18504:2017**. SURE enabled all essential elements of the sustainability assessment to be recorded, starting with site information, purpose of the assessment and project objectives. Framing the project included details of the short-listed options, together with the boundaries of the assessment, which for this project were Spatial, Temporal and Life Cycle. Respectively these consisted of the client's commitment to action on global heating and overall sustainability; extending the outcome of the remediation indefinitely into the future as driven by sustainability functions; and included all elements of the remediation

except for the manufacture of plant and equipment.

The first stage of the assessment itself involved selecting indicators from a list of 73 previously identified by SuRF-UK and grouped into five categories within each domain of sustainability: Environment, Society and Economy. Once selected, the indicators were weighted according to their relevant importance on a scale of one to five. SURE calculated normalised scores for each option as a percentage of the maximum weighted score that was achievable. This provided a breakdown of option performance against indicator category and also identified the relative contribution to each of the 17 UN SDGs.

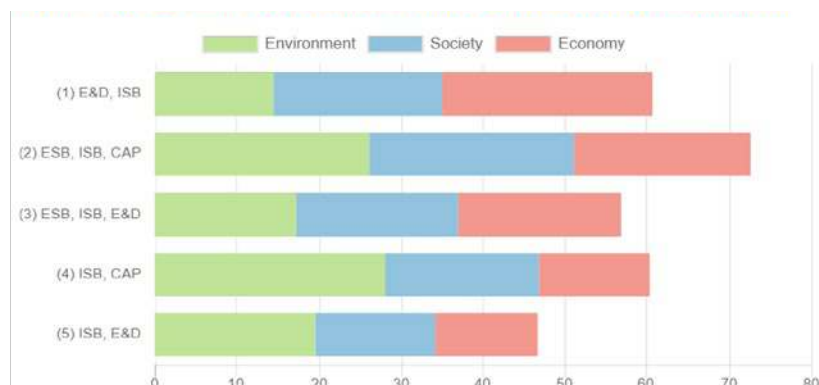
Figure 1 shows the output from SURE at domain level. Option 2, (ex-situ bioremediation, in-situ bioremediation and capping) returned the best overall performance followed by Options 1 (excavation with in-situ bioremediation) and 4 (capping and proprietary in-situ bioremediation). Substituting excavation of the Made Ground contaminants in place of capping significantly reduced the sustainability of Option 3 compared to Option 2, as it did for Option 5, the proprietary in-situ bioremediation option, compared to Option 4.

REMEDICATION BEST PRACTICE UNDERTAKEN

The following scope of multi-disciplinary remediation was completed between January and July 2021 in accordance with the Ramboll Remediation Strategy and a Materials Management Plan (MMP) developed in accordance with CL:AIRE Code of Practice (DoWCoP):

- removal of decommissioned underground fuel and oil storage tanks and other potentially contaminative infrastructure including oil / water interceptors, catch pits, and sub-surface hydraulic rams;
- proof digging the site to 2m below ground level to remove sub-surface obstructions and to handpick visible fragments of asbestos and other deleterious materials;
- excavation of Source Area 2, ex-situ LNAPL recovery using skimmers/absorbents and on-site enhanced ex-situ bioremediation of 1,074m³ of LNAPL-saturated soils - augmented using an inoculum of hydrocarbon degrading bacteria (*pseudomonas* spp) and a liquid nutrient amendment containing a biodegradable surfactant, resulting in >95% reduction in average TPH concentrations;
- constructing a network of horizontal LNAPL recovery trenches across Source Area 1 from a reduced formation level following removal of obstructions – LNAPL recovered using a floating skimmer, an excavator-mounted vacuum lance & absorbent pads – which was enhanced even further through the use of a portable leaf blower!;
- direct-push injection of RegenOx® Part A (an in-situ chemical oxidant) & PetroCleanze® (a percarbonate based reagent with detergent like properties) supplied by Regenesys to promote

Figure 1: Total Scores for each option, showing contribution of scores by domain



desorption of residual LNAPL to enhance recovery from the horizontal trenches;

- removal of 700 litres of LNAPL from groundwater (disposed to a licensed waste management facility) and 224m³ of groundwater impacted with dissolved phase hydrocarbons (treated on site and discharged to foul sewer);
- enhanced aerobic bioremediation of residual hydrocarbons in the smear zone and saturated zone in both source areas using extended oxygen release compounds – using a combination of soil mixing PermeOx® Ultra granules (supplied by Evonik) at the base of the smaller excavation and during backfill to LNAPL recovery trenches, together with direct-push injection of an Oxygen Releasing Compound (ORC Advanced® supplied by Regenesis) throughout Source Area 1;
- comprehensive modular processing (screening, sorting & hand-picking) of Made Ground to generate a suitable sub-capping fill material free from deleterious materials and asbestos fragments; and,
- unforeseen coal tar impacted macadam segregated and sent to a recovery facility for recycling.

The remediation was verified by Ramboll through groundwater and ground gas monitoring, collection of soil samples from excavations and from treated soils for comparison with site-specific target levels (SSTLs). Optimisation of the conceptual site model and SSTLs was carried out throughout the project to more closely reflect the proposed development and conditions encountered during the remediation.

ENVIRONMENTAL MANAGEMENT:

Great care was given to environmental monitoring & controls during the course of the remediation works, adopting a 'proactive' rather than 'reactive' approach that resulted in zero complaints due to dust, odour and noise. The site was sandwiched between residential housing with private gardens and busy railway platform. Fixed and mobile respirable dust (PM10) real-time monitoring was carried out, with only one exceedance

of agreed Air Quality Objectives recorded throughout the entire project, when monitoring was carried out close to crushing operations.

COMPLIANCE WITH HEALTH & SAFETY / COVID-19:

Robust social distancing and hygiene measures in accordance with Government / Construction Leadership Council (CLC) guidance and Soilfix's Covid-19 Management Plan were implemented on site to ensure the safety of all personnel. The remediation works were carried out under the highest standards of health & safety with zero lost-time accidents during the 7-month demolition & remediation contract and ~19,300 man-hours worked.

STAKEHOLDER ENGAGEMENT:

Close communication was maintained with local residents via letter drops, information posters and regular social media updates issued by the client. Complaints and/or concerns raised by local residents were minimal, and proactively addressed by Soilfix through telephone or face to face contact. Soilfix enrolled the site on the Considerate Constructors Scheme and achieved 'performance beyond compliance' status. Zero concerns or complaints were received from the staff and passengers of Plaistow Road Station throughout all works.

CONCLUSIONS:

A combination of techniques, from robust risk assessment and sustainability-led options appraisal to implementation of a combination of 'source specific' remediation techniques have resulted in a successful project outcome. Key successes were:

- Effective use of CL:AIRE DoWCoP to plan, manage and implement a sustainable materials management solution – 92% materials re-used on-site and 99.6% materials either re-used on-site or recycled off-site, with only 0.4% materials removed to landfill
- Implementation of a robust 'source-area specific' remediation design, combining in-situ/ex-situ LNAPL recovery methods to prevent significant excavation (~10,000m³) of Source Area 1 and prevent significant excavation (6,000 tonnes) of hazardous soils from the smear-zone containing recalcitrant hydrocarbons that would have otherwise had to have been removed off-site due to time/space constraints
- Targeted on-site treatment of almost 2,000 tonnes Kerosene / Diesel LNAPL saturated soils from the Source Area 2 to below SSTLs using augmented biopiles (>95% TPH reduction achieved)



The judges were impressed with the use of multi-techniques to deliver this scheme”.

- Effective use of chemical and biological treatment stages for enhancement of LNAPL recovery and biodegradation of dissolved phase TPH to rapidly meet groundwater remediation objectives
- Regular groundwater monitoring and review of the DQRA during the works programme ensured that remedial scope was optimised and practicable to achieve significant environmental betterment, without requiring any tertiary groundwater treatment (such as the injection of a colloidal activated carbon barrier down-gradient). This saved the client a £40k risk-sum included within the contract for this treatment
- Creation of a geotechnically suitable development platform using site-won general fill capped with a larger of 6F2 graded crushed concrete, for handover to LocatED's Development Partner
- The collaborative spirit entered into by the client, consultant and contractor: the client being receptive to a sustainable strategy as developed by the consultant and the value-engineered proposal of alternative, less intrusive and more sustainable remedial methods for challenging contaminants (free-phase weathered engine oils and paraffin), as presented by the contractor



Excellent communication with the project team from the early stages of the project provided a high level of confidence in this sustainable strategy. This continued through the project and was supported by great health & safety management on site and reporting. Problems encountered during the works always came with solutions that clearly demonstrated the ability of the team combined with their desire to come up with the optimum sustainable solution"

Will Mumford, Director Technical Planning and Construction, LocatED

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Best Application of Remediation Technologies **Highly commended**

Costain Vinci Grands Projets Bachy Soletanche Joint Venture (CVBJV)

for their project 'DNAPL management with in-situ recovery
and binding at Earl Pumping Station'



Best Remediation of a Smaller Site

Sponsored by Envirolab

Winner

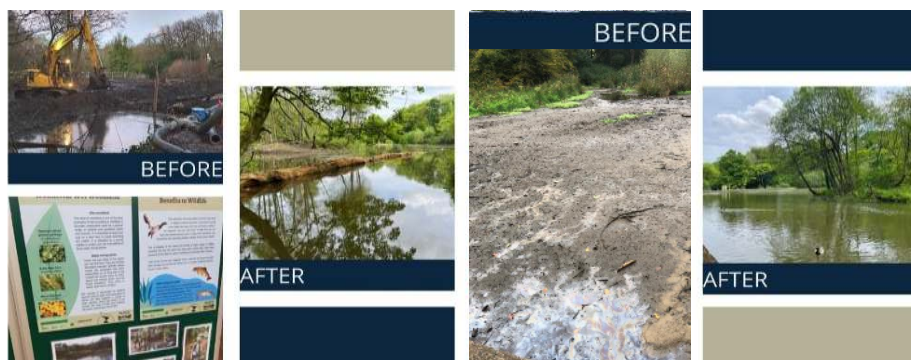


Forge Dam Restoration Project, Sheffield

Introduction

This is a different kind of remediation project, Involving not just contamination, but amenity improvement benefiting local charities, Sheffield Council and its residents in a redevelopment of a much-loved city park. Forge Dam and its structures is one of the few archaeological remains of Sheffield's important industrial heritage, with that comes its contaminant legacy. Sheffield Council and volunteers from The Friends of the Porter Valley [FoPV] are very proud to have this historical, and much-loved amenity improved for future generations, whilst removing the risks to environment, improving amenity improvements to site users whilst providing a tangible improvement to biodiversity, including the discovery, protection and development of habitats for colonies of protected species.

This Project 'for the people, funded by the people' is a shining example of how to successfully engage openly with the public, showcasing brownfield activity, remediation and environmental improvements, by incorporating all stakeholders and encouraging community involvement throughout the works. With the project visibly remediating and improving the site before our stakeholders eyes, creating a space of open water -5000m².



Background | Sheffield's Industrial Past

The engineered Forge was formally used for making steel and generating power to The Lower Sickle Wheel Mill [now the FD Cafe]. Over the years deep silt had built up within the dam, which became a hazard to visitors and significantly reduced the natural beauty of the area. The silts historically contained many wastes from the forge as well as runoff and drainage outlets for the surrounding area. This led to elevated hydrocarbons being present in discrete locations within the impoundment causing a risk to environment.

Aside from managing a wide variety of Stakeholders, Sanctus Ltd had to overcome various obstacles throughout the project. For example, Forge Dam is in a very narrow

valley near headwaters with extremely constrained access, the team had to work collaboratively and imaginatively to find a sustainable working methodology to allow continued public access to the park, whilst also operating safely in extreme weather conditions, protecting the public, wider river environment, the local narrow busy road network and the confined species-rich wet woodland. To do this the Sanctus team employed an inventive approach in providing a dual pumping system with liaison with nearby landowners to allow the use of surround private land [off site from footpaths and parkland]. The dual pumping system allowed for the gravity assisted fluming of the Porter Brook around the remediation areas and the removal of sediment rich waters within the dam to allow treatment.

Pumping, Treatment and Improvements

To reduce the rate of silting in the future in Forge Dam, Sanctus designed a two-pronged approach. To slow the flow upstream and then to reduce siltation in the future within the pond. By undertaking extensive study of the geomorphology, local engagement and analysis of previous storm events, Sanctus produced a conceptual model. This model was developed and detailed how the risks from silt in the ponds could be reduced [including visible contaminants; hydrocarbons and PAHs]. how natural flood management solutions could be incorporated into the reaches of the Porter and the reduction in siltation by the implementation of a green engineered structure to produce a

river training wall to direct the flow of the Porter to achieve the project goals.

Following this detailed design was undertaken to calculate flows, velocities and design requirements for the scheme.

Treatment involved the active and passive dewatering of impacted silts. The enhanced bioremediation of sediments and treatment of surface waters and remediation derived liqueurs providing an all-round betterment for the site.

Impacted waters were improved through a series of treatments, including clarifiers, baffles, carbon pods, settlement lagoons, sedimats, aeration and through straw bales.

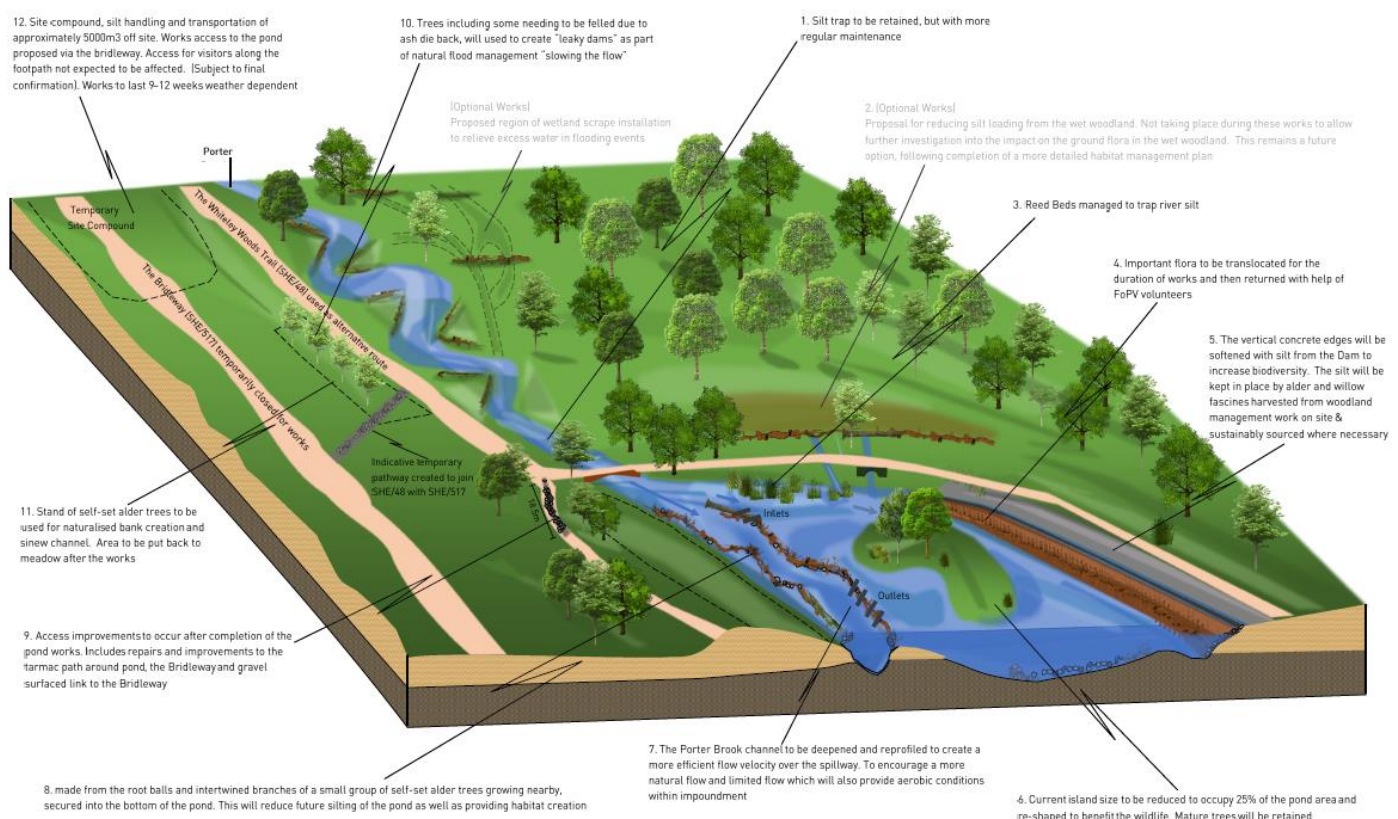
A series of active and passive techniques we deployed to allow us to re-circulate treated waters back into the Porter Brook providing a betterment to the water quality real time.

Silts were dried both in situ and then in a treatment lagoon, purpose built for scheme adjacent to the park to reduce transport requirements. Material was dried and validated for use as capping material for a former landfill also brin in that site b ck into beneficial use and improvin the amenity value at the receptor site.

Best Practice

Although the works and the Porter were within a River and Dam impoundment, the area of the Dam is 5760m², just below the Reservoirs Act threshold with the Porter Brook not being a main river at this locations works were granted via an Ordinary Watercourse consent. However due to the risks to main river

Forge Dam Heritage and Wildlife Improvements – Proposed Methodology



downstream, and best practice Sanctus worked closely with the environment agency as a voluntary consultee.

Throughout the scheme Sanctus held regular meetings via teleconference as well as site meetings with the Environment Agency, Local Authority and Specialist Ecologists [for white claw crayfish] to aid us adapt the design to allow relocation of future colonies previously missing from this section.

In total a series of 14 distinct mitigation stations and monitoring points [comprising of silt curtains, interceptors, booms etc] were monitored daily with results being available via telemetry and cloud uploads to the stakeholders allowing same day interpretation and reporting.

These techniques combined allowing us to manage 2,419,200m³ of water [not including storm flows] over the course of the project.

Permanent Project Engagement

Effective communication was key to the success of this project. The team carried constant public engagement initia-



tives throughout. Which helped the project team enhance and develop risk management protocol resulting in better project outcomes, especially when the team were struck with extreme weather. This process informed the public and helped them accept any resulting changes.

As a result, the team were able to facilitate access for walkers, cyclists, horse riders and families and managing that access so that everyone could continue to enjoy the area and pass through to the wider countryside beyond throughout the works. Also ensuring that the works did not disrupt the business operations of the popular Forge Dam cafe.

Visitors to Site

The Sanctus team created viewing points for stakeholders to watch the machinery, pumping and risk management at work within the park area. The people felt honoured that the team considered them when designing their site set-up. As a result this became quite an attraction and huge numbers of visitors would arrive to watch Brownfield and environmental enhancement progress. Fascinated by the heavy machinery movements, the practical interventions such as electro fishing, the handling of the 250 year-old industrial construction and the traffic and access management, FoPV and the local authority were proud of Sanctus efforts to accommodate the people and provide education resources for the region.

Future Proofing the People

Team Sanctus managed project operations without compromising the biodiversity interest of the pond or downstream river environment, and removing impacted silt successfully providing a betterment to the area. As a result, endangered white claw crayfish were encouraged to recolonise the site, as well as brown trout, kingfisher and dippers. So that FoPV had the ability to further engage with visitors to this beauty hotspot about these rare creatures, Sanctus provided talks informing



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FoPV on Biodiversity outcomes. Sanctus also engaged in the replanting of the reprofiled pond margins which enabled them to take ownership of the project at its final stages and providing a sense that their efforts had led to a hugely successful outcome.



The Sanctus team's ability to build rapport with all the stakeholder groups described above – whether chatting with a passing horse rider to help them feel relaxed around the heavy plant, waving hello with the excavator bucket to a toddler or keeping an open dialogue with the cafe manager paid real dividends in maintaining community goodwill throughout the challenges of an extended programme, noise, smells and deep, deep mud."

Claire Watts | Senior Project Officer Sheffield Council



The Sanctus site team have interacted marvellously with visitors, fielding all sorts of questions from those visitors and locals seeking technical explanations about the silt quantity and destination (our surplus green material removed to green up Beighton) to quite comic ones like "what have you done with the ducks?". The team remaining professional throughout, and always putting smiles on faces of our public at the Dam."

Ann Le Sage | Friends of Porter Valley

Summary

To summarise, Forge Dam Restoration, delivered on an ambition to provide betterment to an area of local historic significance, while by reducing environmental risks and encouraging wide range of biodiversity. Sanctus improved 4125m³ of silt materials, making them suitable for use at another Sheffield council site. Through Sanctus philosophy to work sensitively within the environment, the works were completed without major disruption to the wildlife and the local community. These works will help deliver and preserve environmental, ecological, and social value throughout the Porter Brook Valley for many years to come.

This project's success is a shining example of effective stakeholder engagement, from initial concept, fundraising, planning, pre-construction through to the commencement of the works and after completion. The level of engagement has been second to none from all parties involved, this is a huge achievement for Sanctus and the Local People from the area to achieve environmental betterment by improving this brownfield site.



This project is an excellent example of restoration/remediation of brownfield features for amenity use."

Best Remediation of a Smaller Site **Highly commended**

Geosyntec Consultants

for their project 'Focused Source Zone Electric Resistive Heating and Multi Phase Extraction Remedy on a Former Car park'



Best Sustainable Re-Use of Materials Winner



Former British Steel Crosby Warren Landfill

A major construction project collaboration resulted in significant mutual benefit and the diversion of 115,000 tonnes of waste from landfill. A catastrophic landfill slope failure was avoided and innovative field methods facilitated the development of a detailed CSM and maximised the sustainable re-use of over 100,000 tonnes of existing materials on-site.

Introduction

Crosby Warren Landfill located at the British Steel integrated steel works at Scunthorpe comprises a myriad of former slurry lagoons, which covers an area of nearly 40 Hectares. The landfill has accepted mill scale slurry and basic oxygen steelmaking (BOS) slurry from the steel works since the site was first commissioned in the 1990s.

The image above was taken in 2002 which presents the extent of the landfill operations, and also the common practice of building slurry lagoons on top of existing slurry lagoons in a 'christmas tree' manner.

In 2018 British Steel entered into administration and as part of the process of saving the business and the 3,000 jobs, the purchasers carved out Crosby Warren since the area was considered to be a liability and offered no further use to the site, particularly given that the landfill was closed and could no longer accept waste.

It was clear that Crosby Warren and certain cells/slurry lagoons had been constructed in an ad-hoc manner and that the supporting cell walls/clay bunds were suffering from weathering and were relatively steep.

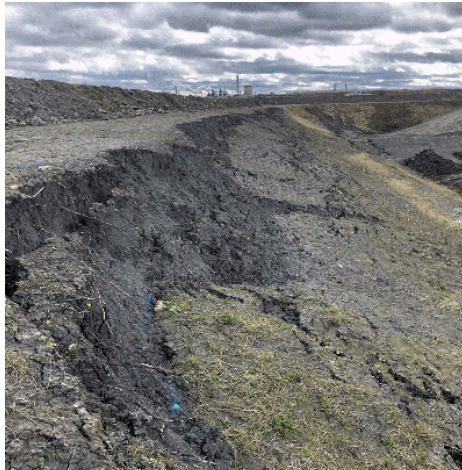
As a result, tension cracks were clearly observed across several lagoon bund walls, and the potential for a catastrophic failure was imminent. The cost of clean-up in the event of a failure was estimated at between £20M to £30M, and the potential environmental damage would have been considerable.

ERM and Geotechnical Ltd completed a risk matrix to better understand the critical areas of failure. Emergency stabilization works were then undertaken on selected high risk slopes, comprising cutting back the clay bund walls to a safer angle, and treating the existing clay soils with lime to increase the shear strength. Drains were installed in the existing slopes and the lime treated clays soils were reinstated. These works were completed successfully within three months as a temporary measure to prevent a catastrophic failure through the winter months whilst a more permanent remedial option was designed and implemented. Other than the lime needed for stabilisation these remedial earthworks works required no import of materials.

Remediation Strategy

It was clear that the main driver for the slope failures was the ingress of water into the waste mass since the entire site was not





Western slope failure prior to remedial works.

appropriately capped. Generally the waste mass was finished with a thick steel slag cap and several cells that contained general putrescible waste, had been temporarily capped with an un-engineered clay sub-soil.

During the design works, more tension cracks were opening up in other areas of the landfill, reinforcing the need to cap the entire complex within an eight month period i.e. before the following winter.

An extensive site investigation was undertaken using sonic drilling but also novel techniques to drill the steep slopes (see above).

The investigation included 3D terrain modelling using a drone topographic data to gain an accurate understanding of the existing levels, the type and volumes of clay and steel slag material that could be re-used on-site and the optimum finished profile that would minimise soil movement and soil import.

Source Materials

Given the vulnerability of the slopes, the nature of the landfilled materials and the requirement to complete the capping in the most sustainable, time and cost efficient manner, it was clear from the onset that the site had to be capped using a light-



Aerial photograph of Crosby Warren landfill prior to the commencement of works showing project phase boundaries (red), slope movements (yellow) and existing remedial works (purple)



Western slope remediation showing reinstatement of lime stabilised soils (left) and new surface herringbone drain (right)

weight engineered cap comprising a combination of geotextiles, geo-fabrics and imported soils. The main problem was identifying a source of soil of sufficient volume to cap the site in an eight month period. Approximately 115,000 tonnes of soil were required.

ERM was working at the Keadby 2 Power Station construction site during the planning and initial construction phase of the project located approximately 5 miles west from the Crosby Warren landfill complex.

Piling at Keadby 2 was underway comprising the use of Continuous Flight Auger (CFA) piles. This generated waste soils. The nature of the soils comprised largely a silty sand, which due to the very shallow water table, was recovered as a slurry. Geotechnically, these soils could not be re-used as an engineered fill since they did not comply with the Definition of Waste: Code of Practice. ERM worked with the Engineering, Construction and Procurement (EPC) contractor and client (SSE Thermal) at Keadby to determine options for the re-use of these soils.

ERM and the client determined that unless the soils could be dewatered, any re-use was not possible. The soils were therefore temporarily stored on site, to allow the soils to naturally dewater. Options for the re-use on site were gradually dismissed and the off-site disposal to landfill was becoming more certain.

Dewatering was successful and it then was clear that this soil would be suitable as a restoration soil for an engineered cap at the Crosby Warren landfill, however given the increasing urgency to cap the landfill, timing was not available to complete and sign off a Material Management Plan under the Definition of Waste: Code of Practice. ERM engaged directly with the Environment Agency (EA) since Crosby Warren was still subject to a Waste Management License. ERM shared all chemical and geotechnical test results on the proposed restoration soils. It was agreed that the soils could be imported as a waste to cap and restore the landfill, subject to a rigorous watching brief.

Contractual negotiations were complex, however all parties

agreed that the export of the soils from Keadby to Scunthorpe offered an extremely viable but also sustainable solution. This not only diverted soil away from landfill but it was also being re-used at a site no more than 5 miles away.

The cost savings to all parties was considerable and the agreement between the stakeholders unlocked the opportunity to cap Crosby Warren. Given the timing, the EA was consulted throughout this process of negotiation, including site visits to both sites.

Despite the large volume of restoration soils available from Keadby, a short fall of materials remained. In order to avoid further material import it was decided to screen, re-use and re-distribute the existing blast furnace slag cap and general waste cell capping materials (>100,000 tonnes) to generate additional soils to address the deficit. This was possible due to the detailed conceptual understanding of material types, volumes and locations gained from the site investigation data and 3D terrain modelling.

The blast furnace slag was scraped back and screened to generate various fractions. These included a fine layer to be placed beneath a geo-membrane as a regulating layer, medium stone for drainage and coarse stone for the construction of haul roads. All processed soils were sampled and tested to ensure compliance with the overarching specification (Specification for Highways Works Series 600). Large oversized chunks of concrete also utilized to create a series of hibernacula on the cap to provide a habitat from reptiles and amphibians (including Great Crest Newts), which had been confirmed within and in close proximity to the landfill by surveys under by ERM's ecology team.

The work to cap the landfill complex was commissioned in May 2021. The landfill was essentially capped and water tight in December 2021 and the final restoration layers and seeding was complete by the end of March 2022.

Sustainability

By utilising a local source of restoration soils, diverting material destined for landfill and using innovative methods to maximise the re-use of materials on-site (i.e. lime stabilisation, 3D terrain modelling and on-site processing) the project:

- Avoided significant waste disposal;
- Enhanced circularity;
- Provided mutual benefit to two large projects in North Lincolnshire in particular Crosby Warren whereas otherwise it would not have been economic to cap the landfill;



Aerial photograph of Crosby Warren Landfill in March 2022 showing completed capping works

- Prevented failure of the landfill which would have had significant negative impacts to the local environment.

Furthermore, capping will significantly reduce the passive discharge of leachate into the environment and increase the input of fresh water into the freshwater pond system surrounding the landfill, which will have long term benefits to ecology in the area. Throughout the works, ecological surveys were completed and the earthworks were managed around species such as Great Crested Newts, smooth lizard, nesting birds and orchids. Whilst this proved challenging given the speed of the earthworks, it was of utmost importance.

Finally, hydro-seeding of the landfill, which was completed in March has included wildflower species which combined with the hibernacula (see above) will support biodiversity net gain. ERM engaged with the county ecologist in designing the planting scheme to best accommodate local species and enhancing re-wilding of the site.

Given the diversion of waste soils from landfill, the reprocessing of soils to an engineered specification, the protection of surface water bodies and protected ecological species and the design of restoration to allow biodiversity net gain, the following UN Sustainable Development Goals apply to this project

Stakeholder Engagement

The successful execution of this project would not have been possible without effective stakeholder engagement. The key engagement was ERM's role in introducing the Official Receiver and SSE Thermal and facilitating negotiations around the circular use of the material. As described above, the EA was actively engaged throughout the project including the review and approval of the project specification and the source material. In the early stages of the project, ERM and Geotechnology also engaged with British Steel to gather information relating to the construction of the landfill and the Local Authority including their County Ecologists when developing protected species mitigation and designing the restoration plan.



Conclusion

The construction phase of the Crosby Warren landfill capping project was successfully concluded in March 2022. The sustainable re-use of materials was critical to the viability of the project and was also an inherent part of the project design. Key aspects of the sustainable re-use of materials on the project included:

- Local collaboration facilitated by ERM resulted in a mutual benefit for two large construction projects and the diversion of over 115,000 tonnes of waste from landfill;
- Innovative field investigation, surveying and modelling techniques allowed the development of detailed conceptual site model (CSM) where the re-use of existing site materials e.g. existing slag cap and general waste cell caps could be maximised and additional import avoided;
- Processing of existing soils to generate soils to engineered specification;
- Failing slopes were subject to ex-situ lime stabilisation which allowed the effective re-use of existing slope materials (geo-technically unsuitable prior to treatment); and
- Catastrophic slope failure and associated environmental impacts avoided and biodiversity of landfill and its vicinity enhanced.

”

The judges were impressed by the re-use of materials, which would have otherwise been disposed of.”

“

From the Environment Agency perspective the project has been a resounding success. Following the liquidation of British Steel, the possibility existed that the land would be disclaimed and the cost of clean-up and restoration would fall on the public purse. By working in partnership with the Official Receiver and their consultants and contractors, we were able to agree a stabilisation and restoration scheme for the site. This not only provided the required level of environmental protection, but incorporated the beneficial re-use of soils from another brownfield site as engineering and restoration material, which otherwise would have required disposal.

"A hallmark of the success of the project from design to completion was the excellent communication between all parties even through the difficult circumstances caused by the pandemic"

George Cunningham
EA Technical Officer (Landfill Gas/Landfill Engineering)

Best Sustainable Re-Use of Materials **Highly commended**

Ramboll and Soilfix

for their project 'Sustainable Remediation of a Site for
School & Residential Use at Plaistow Road, London'



Best Sustainable Brownfield/ Urban Regeneration/ Infrastructure Scheme

Sponsored by AECOM

Winner



Auldcathie District Park, Winchburgh

The development at Winchburgh, 12 miles west of Edinburgh, is one of the largest and most exciting placemaking projects currently underway in the UK. When complete, this ambitious development will see the construction of at least 3,800 new homes across the private and social rented sectors, improved transport links, employment opportunities, state-of-the-art schools and new outdoor spaces. A key part of the overall placemaking strategy for Winchburgh has been the creation of a new 36 hectare district park and associated infrastructure in part of the site formerly occupied by the Auldcathie Landfill, as well as a new shared education campus and sports facilities on the eastern periphery of the landfill site.

Auldcathie Landfill received waste over a 16-year period between 1986 and 2002, until the landfill ceased operations as the site operator went into liquidation. A Closure Notice was served by SEPA which required the landfill to close for the acceptance of waste with immediate effect. At the time of closure approximately half of the landfill (19 out of 36 hectares) had waste at or close to the surface. Where a landfill operator has gone into liquidation, responsibility for the management, closure and restoration of a landfill would normally be passed to SEPA, however at Auldcathie, the waste management licence that was associated with the landfill site was effectively terminated by SEPA in 2006 as the operating company had dissolved. The "restoration" of Auldcathie was a key requirement of any development of the Winchburgh Core Development Area allocation, as identified in the 2005 West Lothian Local Plan and taken up by the overall masterplan developer, Winchburgh Developments Ltd. Joint working between Sweco, Winchburgh Developments Ltd and the council's planning and contaminated land officers at the ground investigation stage allowed for the restoration and remediation of Auldcathie to become a condition of consent in the overall Planning Permission in Principle for the settlement expansion of Winchburgh, granted in 2012.

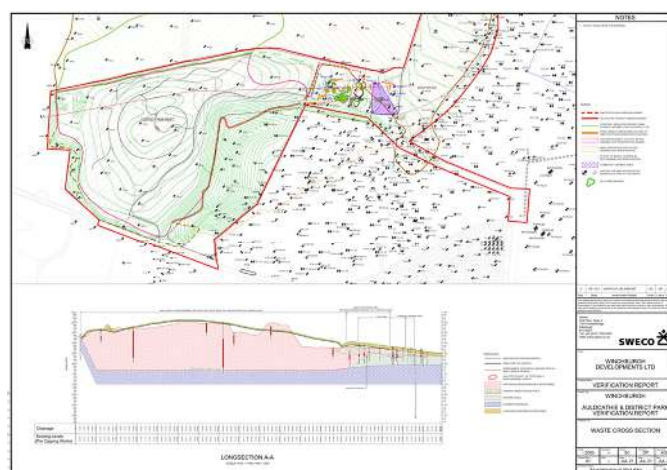


Figure 1: Auldcathie plan and profile showing site boundary, ground investigations and wastes



“This project is an impressive example of bringing an abandoned site back into effective reuse. The project clearly benefits the surrounding area and provides a sustainable solution to a common problem.”

Substantial ground investigation of the landfill was carried out on behalf Winchburgh Developments Ltd by Sweco (formerly Grontmij) from 2011 onwards, which included assessment of the type and extent of landfill waste, the status of any existing landfill cap, risk to the water environment, and assessment of human health and ground gas risks. The investigation found a mixture of non-biodegradable waste, biodegradable waste and existing landfill cap material ranging from adequate to absent with exposed waste at the site surface. The perched groundwater beneath the site was found to be impacted by leachate emanating from the degrading waste mass, and biodegradable waste within the site was found to be actively producing landfill gas. The issues identified posed an environmental risk, a risk to existing nearby properties, a constraint to the development of the district park itself, a limitation on residential development potential to the east of the landfill, and an unacceptable risk to the construction and use of a proposed new school campus on the eastern landfill fringes.

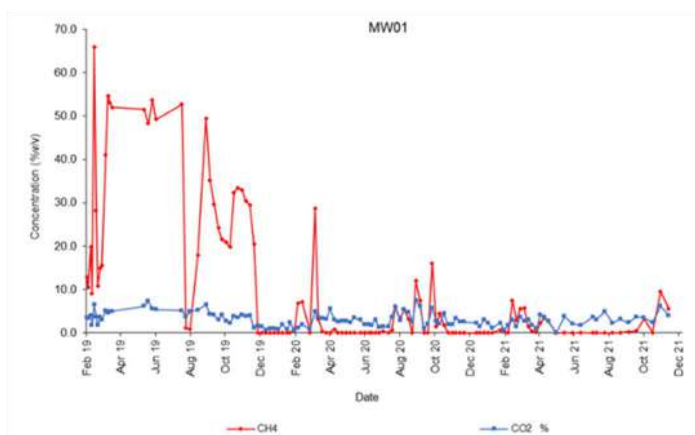


Figure 3: Typical gas monitoring trace



Figure 2: Site Overview

The solution to the problems at Auldcathie required a multi-disciplinary consultant (Sweco) providing land quality, civil and environmental engineering expertise for the remediation. This technical team was part of a strong partnership (**UN Sustainability Goal 17, Target 17.17 - effective public-private partnership**), including the masterplan developer (Winchburgh Developments Ltd), local council (West Lothian Council), masterplanning landscape architects (OP-EN) and the delivery contractor (I & H Brown) to ensure the remediation scheme tied in with the wider aspirations for the district park and adjacent school and delivered the environmental, social and economic benefits envisaged at conception.

Remediation of the Auldcathie site was zoned based on the findings of earlier investigation, waste delineation during remediation and the proposed end use of the area. The core of the strategy was to provide an engineered landfill cap and gas collection system across the main biodegradable landfill area, with works comprising waste reprofiling and construction of a composite geosynthetic and geological barrier, and design and construction of a network of gas extraction wells and gas management infrastructure.

Effective drainage of the landfill cap was required in order to control runoff and limit infiltration into the waste mass. Review of the topography and hydrological regime indicated that surface water runoff was best directed as overland flow to drainage channels, followed by infiltration into exposed bedrock rock within a reprofiled gully area. This approach mimicked pre-existing drainage and infiltration whilst mitigating the contamination risk to surface water and ground water. Elsewhere on the site, areas of inert construction and demolition waste were reprofiled to meet the needs of the new district park. Wastes were contained beneath a clean cover system utilising site won rock and soil, and suitable surplus soils from across the wider Winchburgh masterplan development. Soils from within the masterplan planning boundary were used in accordance with SEPA's guidelines on sustainable reuse of greenfield soils in construction, and on land remediation & waste management to avoid waste disposal and avoid the need to import materials to site. The thickness of the soil cover system was varied as necessary across the site to accommodate specific planting schemes (e.g. woodland, community growing areas and

orchard areas required a greater depth of cover than grassland) or infrastructure foundations.

Verification of the remediation commenced ahead of construction with the collection of baseline data on ground-water and surface water quality, construction of a peripheral gas monitoring network and pre-remediation gas monitoring and risk assessment. Verification continued through the construction phase incorporating environmental monitoring and soil testing programmes. Post construction the ground gas, groundwater and surface water testing and assessment continues into the aftercare period with regular annual reviews proposed. Ground gas risk assessment in particular has been instrumental in ensuring that land to the east and south of the landfill is developable, and in allowing the new education campus to be constructed on the eastern fringes of Auldcathie. The landfill site itself is now moving into a carefully managed aftercare phase wherein it will be closely monitored as the remediation solution beds in, gas generation will be reviewed, and control measures adapted, and long term environmental benefits assessed. On and around the site the economic and social benefits continue to be realised.

Sustainability has been at the core of the Auldcathie project since the design stage, and the focus on realising economic, social and environmental benefit has been at the forefront of decision making throughout and has supported to varying degrees a number of the United Nations Sustainable Development Goals. The construction phase of the development has offered tangible and measurable benefits in the form of full employment for approximately 60 staff on site including 2 new graduate positions and a trainee from a local college who's now in a permanent role (**UN Sustainability Goal 8, Target 8.5**

- **productive employment and decent work**), and the re-use of surplus soils resulting in the diversion of almost 400,000 tonnes of waste from landfill (**UN Sustainability Goal 12, Target 12.5 – substantially reduce waste generation**) to a beneficial end use.

It is in the long term goals of the project that the most significant benefits will be created. From a human health and environmental protection standpoint the benefits of remediating an abandoned landfill and putting in place a robust control and aftercare scheme are obvious. By capping the former landfill the team have ensured that it no longer vents methane directly to atmosphere, with gas now being collected and managed through a temporary flare while production rates and long term management opportunities are assessed. Gas control means that the risk of landfill gas migrating into existing and new homes, businesses and community facilities is mitigated, and capping of the previously exposed waste mass prevents potential human and animal contact with or dispersal of contaminants, enhancing health and wellbeing in the community (**UN Sustainability Goal 3, Target 3.9 – reduce illness and death from hazardous chemicals and pollution**). The engineered cap over the landfilled waste and the associated surface water management is intended to help local groundwater quality recover (**UN Sustainability Goal 6, Target 6.3 – improve water quality**). The capping design for the site also serves to prevent contaminants being transported in run-off towards nearby wet woodland and surface waters, preventing pollution (**UN Sustainability Goal 6, Target 6.6 – protect and restore water related ecosystems**).

From the early stages of the master planning process, Winchburgh Developments Ltd has sought to build a relationship with the local community to involve them in the important decisions that would shape the future of Winchburgh, such as detailed



Figure 4: Overall Sustainability Assessment (Sweco Sustainability Sun™)

designs for Auldcathie District Park. This has meant that beyond the environmental benefits of the scheme the project has offered multiple social and economic benefits. De-risking the fringes of the landfill and land to the east of the site has helped enable the development of the new housing masterplan, which when complete will include 840 affordable and social-rented homes (**UN Sustainability Goal 11, Target 11.1 – safe and affordable housing**). Making this area of Winchburgh developable has also allowed the construction of a new state of the art education facility including a nursery and three schools, opening in 2022 and offering a safe and inclusive learning environment and facilities for over 1,500 pupils (**UN Sustainability Goal 4, Target 11.1 – Build new education facilities that are child, disability and gender sensitive**).

Creation of the district park has provided the growing community in Winchburgh with a new public green space (**UN Sustainability Goal 11, Target 11.7 – access to safe and inclusive green and public spaces**) while the new path network being constructed helps link the community to the wider rural surroundings and other facilities and helps promote accessible,

inclusive and sustainable modes of transport (**UN Sustainability Goal 11, Target 11.0 – sustainable cities and communities**).

The scheme of landscaping and planting in the new park has been integral to and has influenced the detailed remediation design, meaning that new areas of woodland including approximately 30,000 trees planted, a community orchard and community growing plots for local groups have been safely incorporated into the former landfill area (**UN Sustainability Goal 15, Target 15.2 – end deforestation**), and have allowed Winchburgh's residents to become actively involved in the creation of their new environment. Auldcathie's new public spaces form part of the wider connected network of green space across Winchburgh and out into the rest of West Lothian, supporting the biodiversity aspirations of local government and neighbouring communities (**UN Sustainability Goal 15, Target 15.9 – biodiversity in planning**).

The remediation of the former Auldcathie landfill provides a clear example of where a multidisciplinary partnership approach can secure the regeneration of a brownfield site to deliver tangible economic, environmental, and social value.



WINCHBURGH
DEVELOPMENTS LIMITED

Winner

Auldcathie District Park

Best Sustainable/
Urban Regeneration/
Infrastructure Scheme

2022 Brownfield Awards Winner

Welcome to Winchburgh. One of the largest and most exciting placemaking projects currently underway in the UK, offering the best of semi-urban living in one of Central Scotland's most beautiful settings.

winchburghdevelopments.com



Best Sustainable Brownfield/ Urban Regeneration/ Infrastructure Scheme Highly commended

**Turnkey Regeneration, Galldris Services, Waterman,
Arup and Related Argent**
for their project 'Brent Cross Town Regeneration'

Harworth Group plc
for their project 'Regeneration of the Former Ironbridge
Power Station'



Best Public Sector/Not for Profit Brownfield Project Winner



SCOTTISH LAND COMMISSION
COIMISEAN FEARAINN NA H-ALBA

The Vacant and Derelict Land Community-led Regeneration Project

Summary

The Vacant and Derelict Land Project was established in July 2020 by the Development Trusts Association Scotland (DTAS) and the Scottish Land Commission. The DTAS is an independent, member-led organisation which aims to promote, support and represent development trusts in Scotland. Established in 2003, DTAS now has over 300 development trust members— community-led organisations using a combination of enterprise and creativity to improve the quality of life for local people in urban, rural and island communities across Scotland. The Scottish Land Commission is a non-departmental government body created in 2017 as a result of the Land Reform (Scotland) Act 2016. It stimulates new thinking about the ownership, use and management of land so that its land and assets benefit all of Scotland.

The aim of the partnership project is to develop community-led, practical and innovative approaches for tackling vacant and derelict sites across Scotland. The project support offering was designed to provide extra capacity within community organisations and build confidence to encourage more community-led action on vacant and derelict sites.

A Vacant and Derelict Land Project Manager was appointed who worked with seven communities to enable them to bring seven very different vacant and derelict land sites back into a productive use— delivering a wide range of economic, social, and environmental benefits.

This public and third sector partnership is an exemplar of cross-sector for collaboration to deliver brownfield regeneration. The collaboration deserves to be championed and scaled-up across the UK as it is uniquely focused on supporting the delivery of place-based regeneration across a number of challenging vacant and derelict sites in the hearts of our communities. This project provides a rich evidence base and could be an opportunity to inform policy and practice across a variety of disciplines.

Background

Scotland has almost 11,000 hectares of vacant and derelict land recorded on the Scottish Vacant and Derelict Land Register. However, there are many sites not included on the register including smaller sites under 0.1 hectares. This excludes an important and potentially large group of small sites that are likely to be of concern to communities.

Research undertaken by the Scottish Vacant and Derelict Land Taskforce (coordinated by the Scottish Land Commission) in 2018 clearly shows that it is often these smaller sites that tend to cause the most harm to communities. Such sites can often come back into use in ways that can deliver transformational benefits for communities. The cost of returning these sites to productive use is also often relatively small, while the marginal returns on investment can be significant. However, collectively, they could deliver significant socio-economic and environmental for Scotland.



To ensure that these benefits are not overlooked the Taskforce proposed that small sites that are identified by communities should be prioritised in a delivery programme of which community-led regeneration is a key pillar. While some of the sites identified through the Taskforce's preliminary analysis are likely to be too small to be considered strategic priorities by local or national delivery bodies, they could be ideal for community-led initiatives. Transforming these sites into green space assets – like urban market gardens, allotments, playgrounds or skate parks – could significantly enhance community wellbeing and play an important role in addressing health inequalities.

To action this, the Scottish Land Commission and the DTAS partnered to create a steering group and a Project Manager to act as an intermediary and support community groups to deliver their vision.

The steering group saw particular value in supporting projects which were urban, in areas of disadvantage and tackling long-term derelict sites. Community-led development is most powerful when ideas are developed by the community to address a direct community need.

Activity

The Vacant and Derelict Land Project Manager worked with seven groups across a range of sites. A few examples are highlighted below.

South Seeds, Old Changing Rooms, Glasgow

The Old Changing Rooms is a disused sports pavilion in Queens Park recreation ground that was previously used by local sports clubs until the 1990s. It is an eyesore for the community in the heart of a well-used park, nestled within Govanhill, which is one of the most densely populated and deprived areas in Scotland. The building is owned by Glasgow City Council but through years of disuse, vandalism and a fire, the roof in parts is now in poor condition and the site is known for antisocial behaviour.

South Seeds are an embedded community anchor organisation, which supports people to lead more sustainable lives. They are negotiating a long-term lease with the Glasgow City Council. The lease will be of a duration long enough to leverage capital funding for the building, and unusually will be tailored to allow partial demolition of the building. To support the sites long term sustainability, a sub-let café opportunity is planned, and the space will be able to be rented by groups for a small fee.

In 2020 the project joined the DTAS/ Scottish Land Commission partnership project and this support, alongside some seed-funding stimulated the project allowing an options appraisal and feasibility to be undertaken. At the start of the project a letter of comfort was provided, which gave South Seeds the necessary security to start developing the garden, bringing the site into immediate use and to invest in developing long-term plans for the site's re-development.

Concrete Garden, Adventure Playground, Glasgow

Concrete Garden was established in 2013 from a community growing project which transformed a small vacant and derelict site in Possilpark, an area of high levels of deprivation. It is estimated that 100% of the population lives within 500 meters of a vacant and derelict site in Possilpark. Since then, working with volunteers, they have designed and created several spaces which provide food growing, play and wellbeing opportunities for people across the north of Glasgow.

There is now a lot of demand for Concrete Garden's existing facilities, particularly the outdoor adventure play, and this is set to increase as more houses are built in the area. Aiming to meet the existing and emerging needs of their community, Concrete Garden, now a well-established charity, is looking to transform a larger derelict site in their community to create a bigger adventure playground. A community den building event took place over a week during summer 2021 on the vacant land. The overwhelming feedback confirmed that this site would be of much greater value as a community resource rather than housing or retail.

The Vale of Leven Active Travel Hub, West Dunbartonshire

Alexandria has lower levels of physical activity in adults and higher than average mortality rates. It became apparent that locals were interested in being able to travel more actively but often lacked the skills, equipment and confidence to get started. To overcome these issues, Vale of Leven Trust have set up an Active Travel Hub which will also provide volunteering and employment opportunities.

The long-term home for the Hub will be the 'Former Police Box' which is long-term vacant and close to the National Cycle Network. It has since been brought into community ownership. Whilst plans for the building's physical improvement are being developed, the Hub is operating from a pop-up base in the town centre – in a vacant retail unit.

A feasibility study and building options appraisal is underway. Construction is aimed for 2023, funding and planning dependant. The input from the



DTAS Vacant Land Manager since late 2020 has assisted the group to focus and timeline our activities to enable forward motion.

Carluke High Mill, South Lanarkshire

Carluke High Mill is the most complete windmill in Scotland, it is a Category A listed building but is on the Buildings at Risk register and the wider site is classed as one of Scotland's "stuck sites" as it has been derelict for more than 20 years. It is a prominent site within the community.

Carluke Development Trust took ownership of the site in 2018, purchasing it from a private landowner through a negotiated sale. Since gaining ownership, the Trust have secured planning permission and listed buildings consent in October 2020 and have since been fundraising, enabling detailed design works by a multi-disciplinary team of consultants to be commissioned.

Through a series of "Carluke Conversations" the community developed their vision for the site as a heritage tourism destination which also meets the needs of the town's residents. With the assistance of local volunteers, development of the community growing & learning garden is underway, complete with solar powered rain water capture and distribution systems which will reduce the facility's impact on the environment. The site surrounding the building is being developed as a community growing and learning garden, with space for the community food hub and outdoor classrooms which will be used by the nearby schools.

New Cumnock Development Trust, East Ayrshire

The project joined the DTAS/Scottish Land Commission partnership in 2020. This support complemented the core staff team already in place. With their Re-use Hub, New Cumnock Development Trust are delivering on several themes from the local Regeneration Masterplan. They plan to regenerate empty town centre buildings whilst creating economic and employability activity and raising awareness of carbon reduction.

One of these is Trotters Building which sits prominently on the main street through New Cumnock. It was previously used as a department store but has been vacant and in worsening condition for over 20 years. Due to the building location within an area of flood risk, there are limitations on how the building can be reused. This combined with the estimated cost of capital works required to bring the building back into use, make it unlikely that the building will be viewed as a viable economic investment by private developers.

The feasibility and business planning work was supported by the Scottish Land Fund. Phase 1 of the Re-use Hub was set-up at the beginning of 2022 with funding from the UK Community Renewal Fund. The Re-use hub is planned to operate as a social enterprise, with employability funding support for the work placements it creates. As of Spring 2022 fundraising is underway for the building renovation, with planned applications being

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This project promotes the regeneration of small brownfield sites in Scotland and is an exemplar of cross-sector collaboration to deliver brownfield regeneration.”

made to the Place Based Investment Programme and Regeneration Capital Grants Fund.

Outcomes and Legacy

Since the project inception in 2020, four sites and three vacant shops have been brought into meanwhile use during the project. A total of 15 sites have been explored for permanent uses, with ten continuing to be furthered by communities at the end of the project. At a national policy level they are path finders for Scottish Community Right to Buy legislation and processes relating to ownerless (or assumed ownerless land). The groups collectively leveraged £750k funding during two years which equates to a 1:7 investment return.* The project established a virtual and in-person community support network of 'vacant and derelict land champions'.

Over the course of the two years, each of the communities involved in the Vacant and Derelict Land Project have hosted the others at their site in a series of site visits. This has allowed them to form a network of support and discuss how each is overcoming relatable challenges to each other – learning from each other's mistakes and successes. It has helped to raise the profile of community-led regeneration and of vacant and derelict land through numerous events, blogs and partnership meetings.

As this project completes in June 2022, there is a significant gap in building community capacity in the regeneration space. This is largely due to the skills, capacity and risks involved. The project has assisted communities navigate the complex world of funding, regeneration, planning and community ownership to transform problematic sites in the heart of their community. The project has provided a model for operational collaboration- considering how a community group should be set up to deliver viable solutions. It also provides a model for development collaboration- supporting communities in the developing the right connections, leverage funding and contract feasibility studies, for example.

* Please note this figure is not including significant capital as projects not at this stage yet.

Best Public Sector/ Not for Profit Brownfield Project **Highly commended**

South Kesteven District Council
for their project 'St Martins Park'



Best Biodiversity Enhancement on a Brownfield Project

Sponsored by Ramboll

Winner



St. Modwen acquired the 600-acre former Llanwern Steelworks in 2010. Since then, St. Modwen has transformed the brownfield site into a high quality and sustainable community development set within a landscape brimming with nature. The site required extensive remediation to treat a legacy of contaminants including polyaromatic and petroleum hydrocarbons, heavy metals and high pH.

Working with Newport City Council, to date St. Modwen has delivered over 850 homes, a primary school, pub, a large park, linear green spaces and reens, along with footpaths and cycle routes throughout the development. The development includes three new lakes, extensive parkland across more than 80 acres, and the enhancement of the wildlife-rich pond area designated a Site of Interest for Nature Conservation (SINC). The environment provides a range of habitats for wildfowl and wetland creatures many native to the nearby Wentlooge Levels, including waterfowl, reedbed nesters and woodland animals and allows schoolchildren and residents to enjoy the nature on their doorstep.

St. Modwen is also currently creating an ecology park on the western edge of the development by enhancing an existing wildlife-rich area for the benefit of the wider community who will have access to part of the area. The ecology park is designated by the Wales Biodiversity Partnership as highly prized from a wildlife perspective and is designated as a SINC.

In partnership with SK Environmental Solutions (ecologist), Pleydell Smithyman (landscape architect) and the wider design team, St. Modwen has been delivering ambitious plans for Glan Llyn through the design of new reens and lakes planted with wildflowers and wetland plants suitable for water voles, carder bees and reed nesting birds (such as Cetti's warblers) in particular. Two of the reens will be completed this year and work already has started on the central lakes. Plantations of native trees with a high percentage of hazel have been completed this spring in the north west corner of the site to enhance the existing dormouse habitat and link to the ecology park.

St. Modwen's corporate commitments: St. Modwen's Responsible Business approach includes ambitious goals in six strategic areas where the company can make a sustained difference to society and the environment: net carbon reduction; biodiversity and sustainable environments; diversity and inclusion; education and future skills; health and wellbeing; and responsible operational practices and partnerships. This includes an aim to be operationally net zero carbon by 2025, and fully net zero carbon by 2040, and a pledge to invest 1% of cash profits annually into education partnerships.

Biodiversity net gain

With a biodiversity net gain for habitats of 21.84% and 41.29% for rivers and streams, the development will exceed the 10% net gain target set by Government, once complete. This will be primarily achieved through retaining and enhancing existing areas of biodi-



Feature	Baseline BU Value	Gross BU Loss	BU Value of Onsite Gain	Net BU Value (Residual Effect)	% Biodiversity Change*
Site 13 – Llanwern Regeneration Site					
Habitats	397.79	-299.98	386.87	+86.89	21.84
River and streams	21.28	-14.64	23.42	+8.79*	41.29
Key					
* Value corrected for rounding at 2 d.p.					

versity interest, as well as converting large areas of hardstanding to green space. In addition, new streams and ditches have been created, with existing streams enhanced through measures like opening up previously culverted watercourses.

Long term management and monitoring over 30+ years is crucial to fulfilling St. Modwen's aims for Glan Llyn and as such, a long-term habitat management plan has been put in place.

Water Voles

Historic watercourses (reens) across the former steelworks were heavily polluted prior to the start of the remediation and would have been unsuitable to support species such as water voles. No evidence of water voles had been recorded across the site in surveys before 2021. A strong population of water voles now exists within the Ecology Park reen and two small remnant populations are present within Glan Llyn and adjacent commercial St. Modwen Park, Newport. St. Modwen and SKE have brought together a team of highly skilled, experienced ecologists to apply to Natural Resources Wales for a translocation licence. These works are currently underway with survey work starting in May 2022.

Following site completion, St. Modwen aims to extend the excellent water vole habitat across the entire site, including the commercial area to the east. This will help connect the existing populations of water vole across the Gwent Levels following the recent re-introduction programme undertaken by Gwent Wildlife Trust.

Shrill (and Brown Banded) Carder Bee

Shrill carder bees are only known to occur in one or two sites across south Wales. The species is present at Glan Llyn and has been recorded in a number of areas in the 2021 survey season for ground nesting birds. Works are in place to incorporate suitable habitat to create ecosystem resilience for this species across Glan Llyn. This includes the planting of native hedgerows along the periphery of open spaces which will be maintained on a rotational basis to extend the season for nectar rich hedgerow blossom and planting appropriate wildflower meadows within open spaces and on the embankments of the reen network and lakes to provide food and nesting habitats.

Cetti's Warbler

Evidence of Cetti's warbler has been recorded across the wider Newport area and the Gwent Levels. To encourage Cetti's warbler and other similar species to breed at Glan Llyn, St. Modwen has created new habitats along reen systems and waterbodies, including Julian's and Ellen's Reen and the central lakes which are being planted up this year with areas of willow



Glan Llyn currently

scrub, and marginal wetland vegetation. This species has been a particular priority for St. Modwen as it has been in decline over the last couple of decades.

Ground Nesting Birds

Ground nesting bird species such as lapwing, ringed plover and little ringed plover have all been recorded across the site, where earthworks have inadvertently created suitable breeding habitats for these species.

A novel approach has been pursued to protect these species, using gabion baskets placed over the nests when eggs have been laid. These gabion baskets are manipulated in such a way to allow the adult birds to freely come and go from the nest, whilst preventing predators such as corvid species (carrion crow, jackdaw etc) and mammalian predators, such as foxes, from preying upon the eggs.

The purpose is to maximise the potential brood success of these species, as once these species have a successful brood, they will not try again and will quickly move away from the site once the eggs have hatched and the juveniles have become mobile. If these species are unsuccessful, they will continue to try multiple times until they have reared a successful brood or the breeding season is over.

By maximising the success of the early broods, the constraint posed by ground nesting birds to earthworks is minimised in terms of time and ground nesting birds are afforded protection from predation. As the little ringed plover is a Schedule 1 species, it required a licence from Natural Resources Wales, which was granted at the beginning of the works in 2021.

Engaging and educating communities – delivering social value

Engaging and educating communities around nature and biodiversity is a priority for St. Modwen to help encourage everyone to work together to protect and enhance our natural surroundings through sustainable behaviour. All events are free to participate in and open to all, including those who don't live at Glan Llyn.

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The judges were impressed with how this project delivers social value through engaging and educating communities around nature and biodiversity.”

In March 2022 at the Glan Llyn spring event, residents celebrated the launch of the development's nature trail, with Gwent Wildlife Trust on hand to provide insight on local flora and fauna. Junior nature enthusiasts were challenged to guide themselves through the trail from the development's Western Pools to Western Park, using an activity sheet (see below) to identify some of the diverse wildlife on their doorstep.

Children enjoyed interacting with an expert from the Gwent Wildlife Trust, who St. Modwen partners with at Glan Llyn. After considering a variety of bird books, children were then able to put their new-found knowledge into action at a wildlife-themed craft table, with a bird-drawing activity producing plenty of creative and colourful images.

Green-fingered residents at Glan Llyn took part in a tree planting for the Queen's Green Canopy, a nationwide initiative to mark Her Majesty's Platinum Jubilee. Supported by St. Modwen, the community was encouraged to play their part in enhancing the environment in their local area, with 14 trees planted at Glan Llyn.

Families who live at Glan Llyn helped plant the development's new sensory garden, under the guidance of a landscape gardener. Designed to stimulate residents' senses with objects

and plants drawing on touch, sight, scent, and hearing, the garden will be a calming space for the community to enjoy for years to come.

Additional engagement with the community around biodiversity is planned by St. Modwen to ensure residents and the wider community can experience, learn and enjoy spending time in nature at Glan Llyn. This includes a summer event, a Glan Llyn in Bloom competition for residents to celebrate their gardens, and further activity in partnership with Gwent Wildlife Trust.



Best Biodiversity Enhancement on a Brownfield Project Winner



Pendle Water Restoration Project An Industrial Legacy reimagined – local nature reserve and the River

Background – Restoration Project

Pendle Water is a highly modified tributary of the River Calder which starts on its namesake Pendle hill and flows through what is now Lomeshaye Industrial Estate. The river channel has been modified for various industrial uses throughout the last 100 years starting with two sewage works installed along the section river in the early 1900's which saw the channel straightened and lined with concrete. One of these sewage works was decommissioned and became part of the Lomeshaye Local Nature Reserve. As of the 80's an industrial estate was created along both banks of the river which saw further modification, straightening and hard engineering of the river further reducing the already poor habitat quality. Brutalist sheet piles, retaining walls and artificial vertical banks were installed further reducing the biological amenity of the Pendle Water, Lomeshaye Nature reserve and disconnecting the Calder catchment.

The canalisation of Pendle Water has created a vast multitude of erosion and scour issues directly downstream, reducing storage retention times for spate flows and removed much of the wildlife which we have now restored. These combined objectives are why this works package was a joint venture between the Ribble Rivers Trust and Pendle Borough Council allowing this project not only to focus on the river being restored, reducing the risk from legacy contamination but also re-mediating the increased erosion occurring along the banks, caused because of the modified channel. A true brownfield to blue landscape venture. The scope of these works was to re-naturalise the riverbed without full meander creation within the channel, due to developments and businesses along either bank.



Respect for Local Ecosystems and Protected Species

All works were undertaken sympathetically to minimise disruption to the existing ecology. Whilst improving habitat for numerous species and niches.

Log jams were civilised to allow more flow variation following flood and spate events enhancing the re-naturalisation process using site won fallen timber

Riparian zones and installation of sediment bars and shoals sympathetic to the natural riverbed and Calder in the wider reaches.

Since the site is currently highly modified, the works to re-naturalise the riverbed and allows for natural sediment movement improve the localised geomorphology. Improving both the potential habitats, range and connecting the wildlife corridor to the valuable local nature reserve. Design and installation of a mid channel bar, and sinew channels to provide additional depth ranges was created.



High Flow (left, Improved Riffle Beds (right)

Water Environment Grant under the “Ribble Life for Water” scheme. Connecting a wildlife corridor and enhancing the positive effects of the local nature reserve and encouraging species migration across the pendle catchment. Improvements to the views and access to two local well used footpaths.

Compliance with Legislation, Codes and Guidance

Permitting and compliance with processes including; FR2 fish rescue, working in channel, electrofishing, translocation and stock exclusion outside of spawning months. Was of paramount importance to improvement objectives for the scheme.

As well as the standard site notifications including the F10 Notification, footpath diversions a series of bespoke permits and variations were successfully submitted to allow expansion of the works to re-naturalise the riverbed. A ECoW delivered on-site tool box talks and both River Trust and Environment Agency were regularly consulted to maintain a close progressive relationship. Sanctus supported the submission of planning permission. Many translocation events were undertaken discovering a large population of the European Eel (*Anguilla Anguilla*).

Challenges

Sanctus were able to be flexible and minimise the effects of some of the Highest Flows and spate conditions from a period of some of the densest storm activities on English record. We used a combination, of partial dams, fluming and diversions to maintain flow and working areas.

During the works it became apparent that severe scour hole features were present, unknown to previous surveys. Remote bathymetric using automated remote vessels to characterise the bed following removal of concrete. Sanctus re-modelled flows following surveys and created additional resistant riffle pools utilising these features.

The Industrial history left remnant gross contaminants from hydrocarbons in free phase and dissolved products. Sanctus was able to use its extensive remediation experience in containing and mitigating releases from the adjacent industrial

estate and kept to the original program whilst simultaneously reducing the risk from these contaminants.

Without being able to alter the lateral profile of the river, steps were taken to ensure that these works produced a river channel that was as natural as possible, a challenge Sanctus was more than prepared for. Check weirs were installed on top of a strengthened bed, wrapped in a geo-membrane, to give them added cohesion with the riverbed, withstanding vastly increased river levels and therefore water velocities which would subject these structures to scouring. Added to this riffle gravel pools

were created .

A robust, cost effective and defensible solution.

Rock armour placement along the bank edges of the improved watercourse provides security for the banks either side of the river by reducing channel migration, bank undermining and scour. Also providing habitats previously unavailable due to the urbanisation of the river, improving the environmental value of these works by using graded gravels in the interstitial spaces of the rock armour also provided potential spawning areas, whilst still providing eddies and velocity refuges for a variety of species.

Signal crayfish(*Pacifastacus leniusculus*) and Himalayan balsam (*Impatiens glandulifera*) were present on the site and were controlled actively. VirkonS, boot washes, spray and wheel wash stations were deployed on site to prevent the spread of the fungus carried by the Signal Crayfish and provide biosecurity.

A Techmat anti erosion geotextile and secure anchor system was employed in downstream sloping bank sections to provide a green seeded solution to ongoing erosion issues caused by the legacy infrastructure. The erosion downstream was exposing made ground with a range of physical anthropogenic contaminants, and not providing suitable habitats for bank nesting birds. As such the bank was re-graded seeded and



Specialist equipment for special projects

protected using techmat to allow stabilisation, whilst keeping material on site. Other areas of banks, including some with invasive species were cleared and prepared to provide suitable habitats for Kingfishers (*Alcedo atthis*) and other bank nesting fauna.

Biodiversity Solutions

Whilst the existing trees were weakening the industrial concrete lining, we saw them as an asset to future enhancement. Sanctus manually removed concrete from around the tree limbs (established sycamore, (*Acer pseudoplatanus*) willow, (*Salix babylonica*) wych elm (*Ulmus glabra*) and others) to allow for otter holts creation as well as providing naturalised bank support.

The concrete channel historically not suitable spawning for fish, its careful and precise removal eliminated the effects of the artificial channel whilst maintaining the stability of offsite infrastructure allowed for the grading and placement of transient riffle gravels between 8 major check weirs to allow flow variation and meanders in a formally straight section.

Graded riffle gravel pools were created providing new spawn beds and by sizing the riprap to afford adequate habitat refuges within the aquatic environment whilst still providing bank support and erosion resistance. Naturalised planting of the interstices of a riprap revetment with woody vegetation also reduces erosion and provide further flow variety. This process was also enhanced on the new river shoal and bank protection on areas or erosion caused by the canalised concrete channel designed to move and replicate naturally occurring channels.

Best Practice

Sanctus embraced UAV bathymetric profiling to provide high density characterisation for the extensive scour hole features during works and following storm events. Drone surveys were undertaken periodically and shared with stakeholders to maintain buy in and project support.

Using WRAP protocol Sanctus ensured the beneficial use Re-use of concrete material offsite as a graded product for whilst minimising waste generated.

Work was conducted working downstream so changes in hydrology (in the Calder) could be observed and taken into consideration before each subsequent structure as well as being fed back into our supporting modelling.

Spider style walking excavators were used with concrete cutting attachments to precisely remove canalised concrete base whilst minimising tracking on exposed bed whilst minimising footprint in channel.

Rock habitat structures were created to increase habitat complexity in the reach and to deflect the Calder from the rip-rap bank. The structures will help to reduce erosional force on the rip-rapped bank at lower water levels, and increase habitat for Brown Trout (*Salmo trutta*) fry and other salmonids.

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The judges particularly liked how this project incorporated a wide array of scientific and engineering measures to assess and undertake the works to re-naturalise the riverbed’.

Alternating check weirs were modelled and installed to maintain attraction flow in a variety of flow conditions, creating meanders and allow fish passage even in lower flow conditions.

The aim for the wider bank stabilisation works was to protect the right bank being subjected to scour, at the end of the modified channel, allowing the land beyond to be accessed and brought to beneficial use by Pendle Borough Council. the funding for this process in Sanctus’ works was procured from European Regional Development Fund as well as the Lancashire Enterprise Partnership and Lancashire County Council.

Sympathetic local stone was sourced and cut to specific modelled designed sizing to provide re-naturalisation and keying into the new riverbed whilst mimicking local geology and the characteristics of Pendle Water and the Calder in its wider catchment.

Real environmental and social benefits,

There has never been a more crucial time for British Rivers to have an improvement in their quality in urban environments where impacts such as industrial, road and urban runoff create abundant water quality issues. Restoring the river back to what it used to be is simply the right thing to do for nearby residents, occupants of the industrial estate and the wildlife that inhabit the newly improved blue space in Pendle Water, whilst connecting the Nature Reserve with the wider Calder Catchment.

Improvement to access and buy-in to increased citizen science and allowing access to this enhanced section of the Pendle, which has community ownership and environmental stewardship through the Ribble Rivers Trust.

This design was fundamental to Sanctus and the Ribble Rivers trust collaborating in Slowing the flow to provide a wider catchment flood management approach all whilst removing the remnants of our brownfield legacy.

Best International Project Winner

Bright ideas.
Sustainable change.

RAMBOLL

HELPING TO DEVELOP A CONTAMINATED SOIL LAW FOR THE ISRAEL MINISTRY OF ENVIRONMENTAL PROTECTION

HEADLINES

- Successfully exporting UK knowledge, experience and expertise on soil contamination and remediation
- Providing practical, real-world experience of different regulatory regimes - what works well and what does not
- Effective provision of soil contamination and remediation advice and delivering workshops directly to the Israeli Government
- Helping to create a sustainable approach to managing soil contamination in Israel for brownfield redevelopment, infrastructure and remediation projects
- Undertaking critical analysis of UK and international legislation and guidance to provide a basis for the new Israeli law that is currently being written

“Helping to create an effective law that will manage soil contamination and set-out how it will be remediated”

BACKGROUND

Ramboll has been helping Israel’s Ministry of Environmental Protection (MoEP) and local environmental consultancy LDD with the creation of a new law for contaminated soil. Led by Ramboll’s London office, a global team was assembled to provide real world experience and advice on how soil contamination laws are used and enforced in six different jurisdictions, including the UK, and could be used for the basis of Israel’s new law.

A major part of the work was to develop effective legislation that would define remediation objectives, funding, methodologies and best practice.

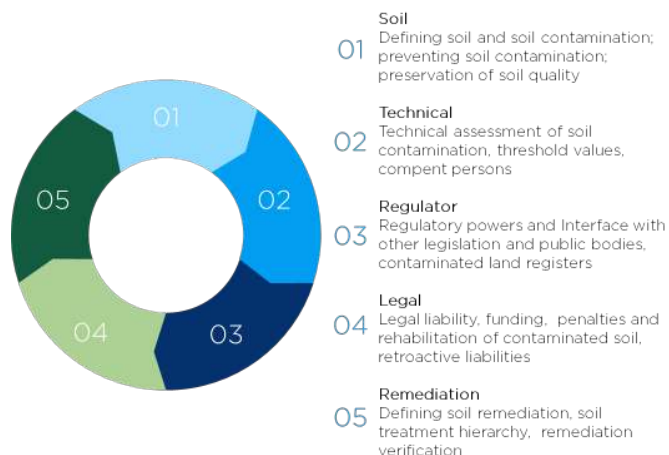
This exciting project generated much debate on “how to do remediation” and manage land contamination effectively and sustainably.

PROJECT SCOPE

Israel does not have a designated law that deals with contaminated soil; like many jurisdictions there are various laws that deal indirectly with the issue. To help create a new law specifically for soil contamination, the MoEP set out several key discussion topics and themes in order to understand the lifecycle of soil contamination and its remediation – partly in the context of redevelopment, environmental permitting and statutory duties. In response, Ramboll’s London office assembled a team of experts from six jurisdictions to collate experience and expertise on how international “soil laws” work in practice. An interview was then held with the MoEP, LDD, Ramboll’s London office and each of the six local teams (from continental Europe and the US). A final report was produced comparing laws and practical experiences. The project was wide rang-



ing in scope and included technical assessments, remediation techniques and legal regimes. The following diagram shows the main elements of the work.



TRUSTED RELATIONSHIPS

Ramboll has been fortunate to have worked on several remediation and risk assessment projects in Israel with LDD for commercial clients and was delighted to have had the opportunity to help with the new soil contamination law for the MoEP. Developing a trusted advisor relationship with key stakeholders allows space for diverse views and opinions to develop; to the benefit of a project or, as in this case, helping to create a new law.

This approach is consistent with Ramboll's work in the UK where we find the most successful remediation projects are those that have a collaborative approach with regulators, clients, communities and other stakeholders.

REMEDICATION

One of the exciting and interesting parts of the project, and also a privilege, was to be involved in the decision-making process of creating a new law, which will guide all future remediation in Israel. It will be fascinating to see how the new law develops and how all of the best practices from across the globe can be used for the benefit of Israel's environment and society.

Through this project and also other work, Ramboll has noticed that Israel has perhaps a stronger emphasis on assessment and remediation of contaminant vapour risks than many other countries. This also extends to assessing potential vapour risks to neighbouring land and properties (including setting remediation goals). This was very apparent during the project, with questions specifically linked to defining soil vapour assessments and remediation for the new Israeli law.

Although it would be unfair to say that the UK does not consider vapour risks, it is not so evident in 'day to day' UK land contamination assessments. Israel, and other countries such as Denmark and the US, where vapour risk seems to have a higher profile, provide an important reminder that a holistic approach to assessing land contamination is needed.

Water scarcity and pollution is another aspect that has been highlighted in remediation projects in Israel and will only likely become of increasing importance with future climate change (in Israel and also globally).

PRAGMATISM & SUSTAINABILITY

There are often no right or wrong answers for how to manage and remediate soil contamination; something that makes environmental consulting so interesting and such a varied career - and possibly makes creating new laws so difficult! Balancing the environment, economics and society can require pragmatic and diplomatic solutions and Ramboll was able to provide practical experience of how international regulators achieve this balance through the implementation of environmental legislation, often with varying degrees of pragmatism and a clear ambition to achieve sustainable remediation.

Also of importance was the potentially wide-ranging views on remediation from different stakeholders and accountability to the public and tax payers. New laws need to work for the environment, but governments also need to consider implications on businesses and society. This is something that Ramboll and other multi-national environmental consultancies often have a unique insight into.



COMPARING GLOBAL APPROACHES

The project found that there is surprising consistency to how different jurisdictions manage and remediate contaminated land, with a common theme being a risk-based approach and the 'polluter pays' principle.

However, there are some key differences - particularly state funding of remediation and retroactive laws. The latter point, in some cases, being a hard cut-off for when the state becomes responsible. Funding of remediation of 'orphan' sites, 'historic' contamination, etc. differ internationally. The UK being at one end of the scale in terms of funding in comparison to, say,

superfund sites and state level support provided by some European and US jurisdictions. Various remediation funding mechanisms and legislation exists internationally, which the MoEP will be able to assess when creating its new law and decide who is responsible for cleaning up land contamination.

PART IIA, LCRM, PERMITTING, PLANNING

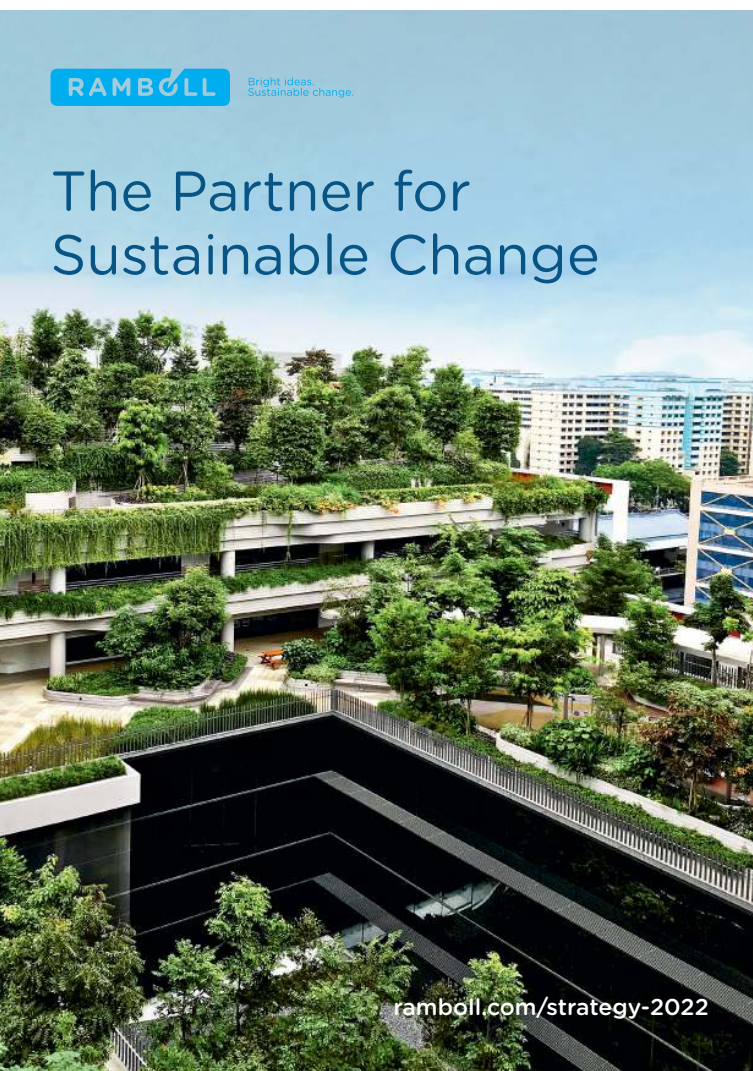
The UK was one of the jurisdictions chosen by the MoEP for review and learning. Part IIA of the Environmental Protection Act 1990 and Land Contamination Risk Management were the key documents used to inform the UK's contribution to the project. These documents provide a clear path to soil remediation and are also relatively pragmatic - recognising what is achievable, whilst considering social and economic effects along with environmental aims.

The relationship with regulators and industry is also a success story for the UK and has helped to advance science and policy, such as the C4SLs, material management plans and sustainable remediation – to name a few examples. This is cause for optimism that the UK can be used as a reference point and is able to compete on a global stage.



EXPORTING UK EXPERTISE IN REMEDIATION

Services are a significant part of the UK economy with the service industry accounting for nearly half of all UK exports and provide 29 million jobs. The expertise that the UK has developed in managing and remediating land contamination has been built up over several decades. With arguably the most varied geology worldwide and perhaps one of the world's oldest industrial heritages, the UK's environmental consulting industry is well placed to provide experience and expertise to global clients. Sustainable remediation also has a part to play in the climate emergency; the regeneration of land fulfils many of the UN Sustainable Development Goals. Ramboll and its UK contemporaries can lead the way in sustainable remediation - as demonstrated by this fascinating project for Israel's MoEP.



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The wider impact of the project was notable, as other parts of the world look for a lead on developing legislation in emerging economies.”

Best Early Career Brownfield Professional Winner



Kirsty Summers

Principal Geoenvironmental Consultant
MGeol, MIEnvSc, RSoBRA, CEnv, QP



Kirsty was a stand-out candidate with glowing references. The judges praised her genuine interest in the brownfield profession, and her consistent work to reach the best solution."

Statement

Kirsty Summers joined RSK in 2015 as a Graduate Geoenvironmental Consultant. Kirsty's hard work, commitment and dedication were evident and supported by RSK's culture of continuing professional development, she is now a Principal Geoenvironmental Consultant.

Kirsty routinely delivers high-quality work on large, complex, multidisciplinary projects for some of RSK's most prestigious clients. She designs site investigations, prepares, manages and implements the programme and budget and executes the delivery of her projects whilst managing teams on-site and in the office across multiple organisations and stakeholders. She is currently the project manager and lead engineer of a £450,000 project investigating and assessing a former coal-fired power station with numerous environmental and geotechnical constraints. For this site, she pursued innovative laboratory analyses to determine representative petroleum hydrocarbon concentrations within organic soils to achieve a pragmatic remedial solution.

Kirsty has recently successfully delivered a strategic-scale mixed use development project that included the remediation of asbestos contamination, 9m cut and fill and sustainable reuse of colliery spoil. Challenged by significant scope variations throughout the project, she maintained control of programme and finances, delivering the project on time and to budget, and gained a Land Quality Endorsement Certificate from the National House Building Council on completion.

In 2018, Kirsty won an RSK internal employee award, commended for *"the dedication she shows to her projects and her consistency in exceeding expectations with her work. This level of input and capability has been recognised by the whole team."*

Kirsty is committed to sharing her skills with her office's junior staff, mentoring them in the field and providing technical training. She has taken the initiative to develop a series of training tools, including a site works fundamentals guidance sheet that is utilised across her office, providing succinct detailed advice on logging, sampling, geotechnics and contamination.

Whilst managing a portfolio of quarterly environmental audits for several house-builder clients, Kirsty became a key member of the environmental management team and undertook extensive market research to pursue innovative silt pollution prevention techniques for her clients. Motivated to deliver consistent high-quality work, Kirsty proactively devised a site inspection pro-forma, standardised reporting/drawing templates and a financial/deadline tracking system, which are utilised across multiple offices to the clients' satisfaction.

2021 was a hugely successful year for Kirsty, as evidenced by her career development in achieving Registered Society of Brownfield Risk Assessment (SoBRA) Risk Assessor status in both Human Health and Permanent Gases, and Chartered Environmentalist status. Kirsty is supporting early careers colleagues to achieve both qualifications. She has also recently become a Qualified Person.

Kirsty's enthusiasm for the industry is evident in her activities as Under-Secretary of SoBRA's Early Careers subgroup since its establishment in January 2021. She arranged and hosted a webinar delivered by a guest speaker on human health risk assessment and is developing the subgroup's first risk assessment workshop alongside two volunteers. Kirsty is currently personally responsible for arranging two of the four workshops and hopes her devotion to providing training opportunities will benefit other early careers professionals in the brownfield industry.

Judges' Choice Award Winner



SCOTTISH LAND COMMISSION
COIMISEAN FEARAINN NA H-ALBA



The Vacant and Derelict Land Community-led Regeneration Project

Summary

The Vacant and Derelict Land Project was established in July 2020 by the Development Trusts Association Scotland (DTAS) and the Scottish Land Commission. The DTAS is an independent, member-led organisation which aims to promote, support and represent development trusts in Scotland. Established in 2003, DTAS now has over 300 development trust members— community-led organisations using a combination of enterprise and creativity to improve the quality of life for local people in urban, rural and island communities across Scotland. The Scottish Land Commission is a non-departmental government body created in 2017 as a result of the Land Reform (Scotland) Act 2016. It stimulates new thinking about the ownership, use and management of land so that its land and assets benefit all of Scotland.



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This entry is an exemplar role model of a public and third sector partnership, working collaboratively to enable brownfield regeneration.”

Photo competition Winner



Simon Ramsdale from Ramboll

