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NICOLE NEWS

Network for Industrially Contaminated Land in Europe

October 2011

Multiple Site Remediation

Recognising how the early work of NICOLE has helped to enable National Grid to complete the UK's first multiple site remediation using the hub and cluster model

Colin Shoesmith, National Grid, UK

It is with thanks to several initiatives including work by NICOLE that the UK contaminated land market has benefited from a new Code of Practice related to the re-use of soils. Published by CL:AIRE in September 2008, the Code is underpinned by the requirements of the Waste Framework Directive. Along with UK development, the 2007 ***NICOLE Position Paper on the Waste Framework Directive*** was important in helping connect the Directive to how soils originating from contaminated land should be regulated.

Using the Code, National Grid has completed the UK's first multiple site cluster project and developed a model which it will continue to use to facilitate increasingly efficient remediation and subsequent regeneration of constrained sites in its portfolio.

It is important that on occasions, we should stop and allow ourselves to remember the good work that has got us to where we are today, and this is an excellent example of just that.

From the very early stages NICOLE made representations to policy makers to support key changes to the Waste Framework Directive. It identified that certain wording in early drafts of the Directive did not support the principles of 'suitability for use' and 'risk based land management' in use in Europe. These positions were neatly captured in our 2007 Position Paper which showed that as a result, key opportunities to reduce

reliance on landfill were being lost.

National Grid's multiple site cluster project involved four sites near Manchester. Regulatory approvals were secured to allow for the establishment of the soil treatment centre and remediation of the central hub site with permissions to receive contaminated soils from the others sites.

One of the key challenges early on was to bring a number of sites together that could be remediated at the same time, especially given the number of advisors involved. A strategic team of National Grid, Worley Parsons, WYG, Amec, RSK and Davis Langdon successfully lined up a number of option sites for the cluster.

A project was then tendered that involved a package to remediate four sites via a treatment centre at the hub-site. The successful contractor, VHE, was appointed on commercial grounds, demonstrating efficiencies through a holistic approach to management of contaminated soils and treated soils across the sites

The project has delivered significant efficiency savings and a 26% cost reduction compared with remediating all four sites as individual standalone projects. 30,000m^3 of material was re-used representing 70% re-use of treatable materials. The project resulted in a reduction in haulage of c.100,000 miles and a net saving of 109t CO2 emissions versus a traditional approach. Following the project two significantly constrained sites in residential settings have been released for development opportunities.

The significant early contributions made by NICOLE and others in the UK in seeking the sustainable reuse of materials, were key factors in enabling this major step forward to take place.

INSIDE: Latest on NICOLE reports, meetings and working groups.

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About NICOLE

NICOLE (Network for Contaminated Land in Europe) was set up in 1995 as as a Concerted Action within the EC Environment and Climate RTD Programme in 1996. It has been self-funding through membership fees since February 1999. It is now an independent association under Dutch law and has become the principal forum that European business uses to develop and influence the state of the art in contaminated land management in Europe.

The activities of the network include technical exchanges, conferences, special interest meetings, brokerage of research and research contacts and information dissemination

NICOLE currently has 92 members, including an Industry Subgroup (ISG) with 23 members, a Service Providers Subgroup (SPG) with 41 members, 19 individual members from the academic sector and research communities and 9 members from other organisations, such as research planners, not-for-profit organisations, other networks and funding bodies.

Annual membership fees are currently €3,500 for companies (€1,750 for SMEs), and €150 for academic institutions For further information about membership please contact: Marjan Euser, Secretariat NICOLE, Email: marjan.euser@deltares.nl

NICOLE in action: delegates at a recent workshop.

Forthcoming NICOLE events

Rotterdam: 16-18 November 2011

"Rotterdam Revisited"; A renewed look at soil and groundwater management at (air)ports and other infrastructural facilities. Infrastructural facilities such as (air)ports, railroads, storage and distribution sites have through the centuries been key economic drivers for growth in Europe. Continued investment is needed for sustained economic health. At the same time site owners and users operate within a complex landscape of environmental regulations, responsibilities and liabilities. This is more complex than that usually found at industrial sites occupied by a single company.

The objective of this NICOLE workshop is to examine the complex and dynamic arena in which contaminated land challenges at these infrastructures must be managed. Users, operators, and beneficiaries in complex infrastructure are multiple and "classical" site boundaries may not be present, or may be blurred. There may be multiple potential sources of land contamination, and the sources may moreover be mobile and form mixed plumes. Interaction with surface water is likely as most of the sites lie in the vicinity of water. Solutions require sound logistical operations and a clear focus on prevention and issues like liability transfer risks.

Meetings of the Industry Subgroup, Service Providers Group and several NICOLE Working Groups will also take place. See the NICOLE website for further details.

Spring 2012:

The first NICOLE network meeting of 2012 will look at Water issues in relation to soil remediation process and climate change.

Autumn 2012:

The Autumn 2012 NICOLE network meeting will be a technical meeting on: mercury.

Further details about all meetings will be announced on **www.nicole.org.**

Recent Developments of the Industrial Emissions Directive

Taken from a keynote presentation by DG Environment given to the NICOLE Steering Group

Lucia Buvé, Chair of NICOLE and John Waters, ERM

In June 2011, the NICOLE Steering Group invited Keir McAndrew of DG Environment to present the latest status update on the Industrial Emissions Directive (IED). This Directive, which is the consolidation of seven industrial emissions Directives including a recast of the former 1996 IPPC Directive, was published in 2010 (2010/75/EU). See http://ec.europa.eu/environment/air/pollutants/stationary/index.htm

While the former IPPC Directive already recognized that IPPC installations are important sources of potential soil and groundwater contamination, provisions to deal with these aspects were only vaguely formulated. The current Directive addresses soil and groundwater issues in more detail and as such is seen by the European Commission as a key instrument to help achieve the main objectives of the Thematic Strategy on Soil Protection, particularly in the absence of the Soil Framework Directive.

The Directive focuses on three key aspects with regard to soil and groundwater protection:

- Preventive measures;
- Monitoring;
- Site closure and remediation upon definitive cessation of activities.

To ensure ***prevention of contamination***, the permits issued under the IED will oblige a regular maintenance and integrity surveillance of all installations.

The IED considers ***soil and groundwater monitoring*** to be an essential aspect to detect pollution at an early stage and not only at the cessation of activities or where impacts become significant. Periodic monitoring is considered as a necessary tool to check the efficiency of preventive measures and limit pollution. Therefore, the permits will contain soil monitoring obligations at least once every 10 years and groundwater monitoring obligations at least once every 5 years.

With respect to ***site closure and remediation***, the former IPPC Directive only stated that "upon closure the site needs to be returned to a satisfactory state". The current IED Directive outlines following approach :

- Historical contamination, i.e. contamination caused prior to the permits issued under the new Directive or defined as such in already existing Member State legislation : remediation should be carried out following a risk-based regime and taking into account current or approved future use of the site
- Future contamination: should be avoided as much as possible through preventive measures. Any incremental contamination should be remediated.

To determine incremental future contamination, the Directive provides for a ***baseline report***, which contains information on the state of soil and groundwater contamination by relevant hazardous substances, namely those substances that are used in the authorised process. The baseline report should be prepared before starting a new operation or before a permit is updated under the new regime. The baseline report should contain all information that is necessary to determine the state of soil and groundwater contamination so as to make a quantified comparison with the state upon cessation of the activities.

The baseline report shall contain at least the following information:

a) information on the present use and, where available, on past uses;
b) where available, existing information on soil and groundwater measurements that reflect the state at the time the report is drawn up or, alternatively, new soil and groundwater measurements having regard to the possibility of contamination by those hazardous substances.

Information produced pursuant to other national or Union law may be included in, or attached to, the submitted baseline report.

The Commission will establish guidance on the content of the baseline report and the NICOLE Soil Working Group is offering to contribute to the review of this guidance.

Once the activity stops operation then the operator will be required to assess the state of soil and groundwater contamination by hazardous substances. The operator compares the final assessment and the initial baseline report. Where the comparison indicates significant pollution of soil or groundwater then the operator must return the site to the initial state established in the baseline report. Technical feasibility of remediation measures may be taken into account.

Soil and groundwater monitoring is different to a baseline report

Emerging problems / large areas

Elze-Lia Visser-Westerweele, NL

Brussels, November 2010

This meeting spun out from an initiative to mobilise the know-how of NICOLE service providers in addressing two key questions identified by industry:

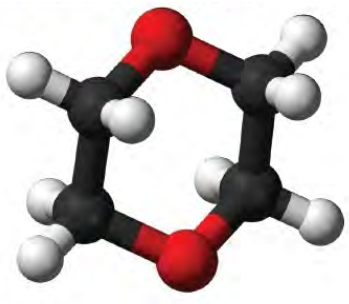
(1) What is the current state of knowledge about emerging contaminants particularly Perfluorooctanesulfonic acid (PFOS), Chlorofluorocarbons (CFCs) and Dioxane?

(2) What (sustainable) treatments can be used to clean large quantities of petroleum hydrocarbons (TPH) impacted soil?

emerging contaminants

PFOS, CFCs and dioxane all have different behaviours to "classical" contaminants, and are relatively less well researched. Their persistence, often toxic influences, relatively high solubility in groundwater, and low retardation make them contaminants of concern in sustainable land management.

The publication of the Stockholm Convention list in 2001 included 12 persistent organic compounds. Since then nine emerging contaminants have been added. It is not clear whether and how different Member States act upon this list. It was suggested an inventory of their responses might be useful.



1,4-dioxane

Each newly developed molecule will have novel characteristics and behaviour. Time is needed to test and evaluate this before new chemicals are launched into society and the environment. These different properties may also call for different approaches to evaluation. Not only is the (toxic) behaviour of the "source" contaminant important, but so are its metabolites which can be produced in a chain of reactions in the environment. At present there is only scarce data on the relative toxicities of some of these compounds. These may be high so a need for very low detection levels is indicated. Current analytical methods are not yet able to reach these low detection limits. NICOLE could play an important role in sharing developing knowledge about emerging contaminants.

treating large quantities

Treatment of hydrocarbon contaminated sites is now well understood. Dealing with large quantities can pose particular problems, for example, relating to health and safety issues. However, with today's knowledge we can plan and execute remediation in cost effective ways. There does appear to be a need to disseminate this knowhow more effectively to some areas. NICOLE could play a role in this. Of particular interest might be energy recovery from hydrocarbon contaminated soils.

Aerial view (1974) of a large site in the Rotterdam harbour (courtesy of Charles Pijls, TAUW, NL)

Operating windows for site characterisation

Elze-Lia Visser-Westerweele, NL

Copenhagen, May 2011

Operating windows are a way of describing the performance of different technologies. An increasingly wide range of site characterisation technologies are becoming available. From forensics using isotopes and DNA, to new drilling methods and microbes - the range of options on offer may seem confusing.

Ongoing discussions about the proposed Directive on soil protection, and the baseline and other monitoring requirements of the Industrial Emissions Directive (IED) underline the importance of optimising the application of site characterisation tools. The IED in particular may have potentially onerous baseline monitoring requirements.

This meeting was a departure from the usual marketing literature and technology promotion. Instead it took a walk through the use of site conceptual models and used these to, explore and contextualise techniques' suitability.

Invited speakers reviewed current and recent analytical techniques and site investigation measures such as: drilling, sampling; *in situ* measurement and analysis for liquid, solid or gaseous contaminants in the subsurface; tracer tests; geophysics and last but not least using trees as a pollutant diagnostic tool. An entire day was devoted to discussion of advanced diagnostic techniques and exploring some of the challenges in applying these tools both to corporate compliance work and in remediation. Applicability was described using case studies and in the context of operating windows, usability, appropriateness and value for money.

Key conclusions from this meeting are:

- Many robust and applicable tools are available: you have to consider and use a number of tools to have good insight about your conceptual site model.
- The key solution lies in the right combination of different tools.
- All decisions are made upon the data of the site investigations: be aware of the importance of your data!
- It is possible to decide upon uncertainties, but always pose yourself the question: are the levels of uncertainties manageable?

The meeting recommended a review of current and new technologies with respect to new and upcoming legislation.

Copenhagen: no purge sampling (courtesy of Wouter Gevaerts, ARCADIS, Belgium)

SG/ISG/SPG updates

Steering Group

Marjan Euser

Over the past year the NICOLE Steering Group has welcomed several guests at its meetings

John Choma of the European Court of Auditors described work on auditing the performance and cost-efficiency of brownfields regeneration projects that have been co-financed with EU-funds. He was interested to learn NICOLE's views on brownfields and had sent a list of questions to NICOLE. The Steering Group gave preliminary answers, and arranged a more substantive input from the Brownfields Working Group.

Keir McAndrew of the European DG Environment joined the group's spring 2011 meeting, where he gave an update about the Industrial Emissions Directive (see also Page 3). NICOLE is eager to contribute in the IED process. NICOLE could join as an overall stakeholder forum. Further there are technical groups for the development of reference documents (*BREFs*) by the JRC in Seville. John Waters, leader of the Soil Working Group, will contact JRC directly to express our interest. In addition, a Member State monitoring report on preventive actions and soil status will be required every ten years, and for groundwater status every five years. NICOLE will send DG ENV an offer to supply technical support to this process.

NICOLE developments include a call for ideas to expand its academic membership, and a taskforce to attract new company members from the infrastructure sector. Web site changes being considered include simplifying contents and making better use of interactive technologies in order to stimulate information exchange among members' groups. In spring there was a change of NICOLE board members: Anja Sinke (BP), Markus Ackermann (DuPont) and Bertil Grundfelt (Kemakta) stepped down, and Sarah MacKay (WSP), Colin Shoesmith (National Grid) and Roger Jacquet stepped on board.

Industry Subgroup

Paul van Riet, ISG Chair
Lida Schelwald-van der Kley

At the end of 2010 came the time, according to our statutes, to have a change in the ISG's chairmanship. This took place at our November meeting at Umicore in Brussels. Anja Sinke (BP) handed over the 'lead' to the newly elected chair, Paul van Riet (DOW). Anja was thanked for having chaired the ISG most enthusiastically and professionally for so many years. Roger Jacquet (Solvay) was elected as ISG vice-chair and also as new joint ISG representative to the Steering group, together with Colin Shoesmith (National Grid).

A major part of the ISG's mission is to allow members to discuss up and coming Issues affecting them with their peers, and exchange knowledge and ideas about these issues. There was plenty to keep our members busy.

Discussions, ranged from 'how to deal with liquid mercury in view of the announced export ban'? to the 'ALARP' principle ("What exactly is as low as reasonably practicable"?). New possibilities for early leak detection were also brought forward. At the recent ISG May 2011 meeting in Copenhagen some of these issues were taken further. A Working Group on mercury had been established in the meantime and a presentation was given on early warning systems for leak detection.

Both the Brussels and Copenhagen meetings saw some interesting company presentations. A first one by SBNS (Dutch Railway Company) looked at sustainable soil remediation on European Railway sites and a second one set out National Grid's approach in the UK to sustainable soil remediation, illustrated by case examples. The concept of net benefit (environmental, economical and social) turned out to be a major driver for remediation. At the Copenhagen meeting AB Electrolux also filled us in on their company's activities and pro-active approach to sustainable soil management.

We were also happy to have Common Forum member Dominique Darmendrail update us on several EU legislative developments. And last but not least we discussed the benefits of being a NICOLE ISG member. As one of our members put it: "*For me, NICOLE is unparalleled for networking opportunities and putting EU legislation on the radar of industrial problem holders*".

Service Provider's Subgroup

Elze-Lia Visser-Westerweele

Since summer 2010 the NICOLE Service Providers Subgroup has had two very well attended meetings in November 2010 in Brussels and in May 2011 in Copenhagen. In Brussels the SPG chairpersonship passed over from Laurent Bakker (Tauw, NL) to Olivier Maurer (CH2MHill, France).

Sarah MacKay (WSP, UK) was elected to be SPG's new vice-chairperson after a close finish with the second candidate Arthur de Groof (Grontmij, NL). Laurent, Olivier and Sarah are the SPG's representatives in the NICOLE Steering Group, where Laurent also became Vice-Chair

The 2009 NICOLE Questions & Answers Project led to a technical meeting focussing on two of the questions raised in the second part of 2010 (see Page 4).

The SPG has had an important role in discussions within NICOLE about the future strategy for developing the network and for organising its various working groups (see Pages 6-7). These have led to a proposal for a framework for future NICOLE working groups which was put to the ISG and SPG meetings in May 2011. The SPG has also been considering the usefulness of LinkedIn or other social media for NICOLE membership. Results from a first LinkedIn NICOLE group will be taken into account in finding our way in making use of these media.

The new board of the SPG: from left to right: Laurent Bakker, Olivier Maurer and Sarah MacKay

Progress in the NICOLE Working Groups

Brownfields and Waste Working Groups

Ian Heasman, Taylor Wimpey, UK

NICOLE Brownfields Working Group is pleased to have completed its work on environmental liability transfer in Europe. The Group which had its first meeting in 2008 began its research work in 2009. The May 2011 report "Environmental Liability Transfer in Europe: Divestment of Contaminated Land for Brownfield Regeneration" provides the detail of the Group's work, including

- The definitions of 'contaminated land', 'brownfield' and related terms, what status they have and how they are used in different European countries;
- Legislative, policy and market drivers for brownfield regeneration in Europe, and how they are used in different European countries/territories;
- Environmental liability transfer mechanisms in Europe, including statutory and contractual provisions, and insurances;
- The Roadmap for environmental liability transfer containing Tools and Checklists for environmental liability transfer applicable across all European jurisdictions.

Ian Heasman

The summary document 'Environmental Liability Transfer for Contaminated Land: Key Questions and Answers' is a short entry level brochure for the interested reader. Both documents can be downloaded from www.nicole.org. The findings have been well received within NICOLE and a number of companies have already distributed the findings internationally. It has received particular attention in the UK technical press.

There are several potential ideas for successor projects around for example sustainable land use, but so far no decision has been reached on how to proceed. Thanks to all those who contributed to the project, but in particular Frank Wescott, Elze-Lia Visser, Sarah Mackay and Paul Connell for all their hard work, without which the project would not have been possible. Due to other commitments within his organisation, Ian Heasman has stepped down as the chair of the group.

With the transposition of the Waste Framework Directive, the tasks of the Wastes WG have come to a natural end.

Soil Working Group

John Waters, ERM, UK

The Soil Working Group (SWG) is tracking the development of the Draft Soil Framework Directive (SFD), the transposition of the Industrial Emissions Directive (IED) into Member State law (MSL) and is monitoring the application of the Environmental Liability Directive (ELD).

The SFD has been caught in political limbo since December 2007 with continuing objections by France, Germany, UK, Austria and the Netherlands, primarily on the basis of subsidiarity, cost and proportionality. However, there are some indications that a compromise solution may be under preliminary discussion. The SWG is monitoring developments and will offer further comments to the Commission if, and when, the deadlock is resolved.

The IED moved rapidly through the European Parliament and was adopted as a Directive in November 2010. The Directive is currently under transposition into MSL, a process that will need to be complete in early 2013. More details on the IED can be found in a separate article in this edition of NICOLE News.

With the ELD fully transposed into MSL, at the end of 2010 the EU Commission prepared a report on the implementation of this Directive. One of the key conclusions was that there is a lack of implementation harmonisation - they used the varying approaches to financial security as an illustration of this and that the Commission may well seek to drive more harmonisation.

At the last SWG meeting, it was agreed that John Waters should develop a proposal to widen the scope of the Group to cover all relevant regulatory issues, not just soil.

Thanking NICOLE's Working Groups

Lucia Buvé,
NICOLE Chairwoman

For many years, a number of working groups are active within NICOLE around different topics such as groundwater, soil, sustainable remediation, waste, brownfields. Those working groups were all initiated and led by enthusiastic NICOLE members and have provided, or are still in the process of providing, excellent and much appreciated output.

Highlights include:

- The working group on groundwater has led the drafting of the EU guidance document on "Direct and Indirect Inputs"
- The working group on sustainable remediation is working on a road map,
- The working group on brownfields has put together a report describing the different liability transfer regimes throughout the European Member States.

I would like to take the opportunity to thank all leaders and the entire team of those working groups which have completed their tasks and to wish a successful continuation for those groups which are still working.

About the NICOLE Working Groups

The goal of the NICOLE Working Groups is to promote the discussion of important contemporary and upcoming issues in the contaminated land sector. NICOLE members operate many Working Groups covering a range of issues. If you wish to find out more about the NICOLE Working Groups, Please contact the NICOLE secretariat, Marjan Euser (marjan.euser@deltares.nl)

Sustainable Remediation Working Group

Olivier Maurer, CH2M, France

First of all we need to finalise the Four guidance chapters accompanying the ***Road Map for Sustainable Remediation***. These chapters include

- An introduction which summarises the work that was done and main findings,
- A discussion on indicators and how best to use them in a sustainable remediation (SR) project,
- A review of the tools that are available to measure the performance of a sr project,
- A discussion on risk assessment in and sustainable remediation.

We received comments from independent reviewers and are now very close to publishing. In 2011 our mission with the Sustainable Remediation working group is three-fold.

NICOLE of course combines project owners (Industry) and engineers and scientists delivering the work (Providers).

The second task this year is the testing of the Road Map which was published in 2010. This "pilot-testing" is being conducted among NICOLE members. NICOLE members were invited at the beginning of the year to use the Road Map to evaluate past or active projects and provide their feedback to the Working Group. This feedback will be used early 2012 to determine both the benefits of the road map and any improvements that can be made to it. We plan to report on this during a 2012 NICOLE workshop and other events.

Our third task is to continue the promotion of Sustainable Remediation within the European Union and beyond its borders by being actively engaged in public debate and participating in workshops and seminars. Members of NICOLE have presented our work at events in Belgium (the March 2011 KVIV workshop in Antwerp), Sweden, Germany, Argentina and Brazil. The WG has also taken part in EPA *clu*-in webinars, with the USEPA, SuRF, SuRF-UK, Eurodemo+, and Common Forum.

The Working Group also decided during the May 2011 NICOLE Copenhagen workshop to seek a Joint Position paper with other networks interested in promoting sustainable remediation. Our aim is to have this joint position ready before the end of the year."

Mercury Working Group

Roger Jacquet, Solvay, Belgium

Though mercury may not appear at present to be a hot topic in the European soil and groundwater arena, it is nevertheless listed as a priority hazardous substance being subjected to phase out. In this context, on-going regulation developments and initiatives make it a topic of concerns for those who have to manage mercury contaminated soil & groundwater and/or waste. For example:

- The Council and the European parliament adopted on 22.10.2008 the regulation on the banning of export and the requirement for the safe storage of metallic mercury (regulation (EC) No 1102/2008). The export ban starts from 15 March 2011. Mercury uses will only be allowed in strictly controlled cases.
- Eurochlor continues implementing a voluntary agreement on phasing out mercury cathode technology in the chlore-alkali industry by 2020. The mercury process is being replaced by the BAT membrane technology.
- The mercury issue is also widely discussed at the international level (UNEP - United Nation Environmental Program). Common Forum recently worked on a draft EU position on "Management of mercury contaminated site" in preparation of a global legally binding instrument on mercury.

The topic mercury (e.i. contaminated sites and waste management) was first raised in the ISG. Given the interest among problem holders, it was submitted to the rest of the network and ... a new WG was born.

The kick off meeting was held on May 25 2011 in Copenhagen, 21 persons participated, representing 6 industries, 10 service providers and 3 research centres

The mercury working group has for objectives.

1. To be a platform for information exchange between practitioner, problem owner on technical topics (characterization, risk assessment, risk mitigation technologies, waste management...)
2. To monitor international research/technical initiative on mercury contaminated site and participate if judged opportune
3. To promote and advocate a risk approach to the management of mercury contaminated sites
4. To monitor legislative evolution/implementation.

As a deliverable of the first objective, the WG plan to organize a technical WS in the fall 2012 with the aim to draw a picture of the state of the art of mercury contaminated site in Europe.

In the frame of objective two, BRGM informed the WG of the IMaHg project (Enhanced knowledge in mercury fate and transport for Improved MAnagement of Hg contamination) proposed for a Snowman funding. If the project is funded, the WG will be represented in its stakeholder panel.

The monitoring of legislation whether on EU or international level will be done in collaboration with the Common Forum and branch organisations.

Membrane electrolysis for chlor-alkali production, without use of mercury, courtesy of Solvay

Two new EU funded brownfields R&D projects: HOMBRE and TIMBRE

HOMBRE

Hans van Duijne, Deltares, NL

Today most of us perceive brownfields as a legacy of the past. Yet our urban landscape expands at an ever increasing rate and we travel ever increasing distances across this landscape. The concept of "zero waste" has ushered in a paradigm shift in attitudes to resource use. The same paradigm shift is long overdue in attitudes to land use. HOMBRE seeks to bring about and enable a paradigm shift towards "zero brownfields", considering both the rehabilitation of our legacy of brownfields and the prevention of future brownfields.

The HOMBRE (HOlistic Management of Brownfield Regeneration) project is led by Deltares, and funded by the EC FP7 programme. The four year project began at the end of 2010. It seeks to provide:

A Roadmap and Framework for Zero Brownfields. This will comprise practical, science based guidance to deliver a land cycle strategy as a working system for planners and land managers. The strategy will be based on indicators for early recognition of why, how, and when brownfields come into existence, as well as on indicators that signal robust, cost-effective and sustainable site renewal.

A Brownfield Navigator. This will be a practical and hierarchical decision making approach that integrates stakeholder communication and decision support technology for the optimal selection of Brownfield regeneration. It will also exploit "design table" systems of visualisation to support an interactive and cross sectoral decision-making environment.

Deployment of Integrated Technologies. This will be based on treatment train and operating window concepts, to describe how different technical approaches can be combined to offer enhanced benefits. Examples of particular interest to HOMBRE are:

- Energy and water; linking renewable energy and contaminated water restoration;
- Building materials and soil: linking resource efficiency and contaminated soil management;
- Soil and water: linking remediation and sustainable urban drainage and soil capacity;
- Urban greening and restoration: linking benefits of remediation and urban green space;
- Bio-energy and remediation: linking organic matter recycling and bio-energy production.

HOMBRE would welcome the opportunity to collaborate with NICOLE and its members, and is delighted to include Ian Heasman on its advisory board. Ian can provide linkage with several key NICOLE interests. Our door is open and we look forward to hear from you, in particular if you have an interest in linking a case study to our project.

For further information see our web site at: www.zerobrownfields.eu, or contact me directly. Hans van Duijne, hans.vanduijne@deltares.nl.

TIMBRE

Stephan Bartke, Helmholtz Centre for Environmental Research, Germany

Major areas previously used for military, mining, industrial or commercial purposes are frequently beset by high levels of complex contamination. Regarded as being problematic, many have become brownfields, impeding the development of surrounding communities. In Europe, there are over 20,000 large and complex contaminated sites. These so-called *megasites* threaten scarce soil and water resources and cause environmental and health risks as well as economic and social costs. Their effective and sustainable regeneration requires innovative investigation and remediation technologies and integrated evaluation approaches for optimised reuse options.

Currently, the success in brownfield regeneration falls considerably short with regard to present capacities. Many useful and innovative technologies for site clean-up as well as methods to support decision making processes exist, but they are only rarely applied using their entire potential. Sometimes the non-visibility of tools is the reason that problem owners, managers, local authorities and other stakeholders do not regenerate brownfields using the best available means.

However, a large number of *megasites* can be sustainably revitalised if efficient technologies are applied, potential re-use options are assessed holistically and if relevant risks are quantified. The new European research project ***Timbre – Tailored Improvement for Brownfield Regeneration in Europe*** – in the EU 7th Framework Programme aims to support end-users in overcoming existing barriers by developing and providing customised problem- and target-oriented packages of approaches, technologies and management tools for megasite reuse planning and remediation.

Timbre will endorse tailored *megasite* regeneration by providing updated information on state of the art technologies and tools. As a unique asset, Timbre will deliberately include the cultural and administrative characteristics and their regionally distinctive features. The project will enhance integrated assessments of regeneration options for particular sites and facilitate contaminated sites portfolio management by setting the right priorities. Moreover, the provision of user needs via targeted training and dissemination courses is a cornerstone of the project.

To learn more about Timbre and how you can get involved, visit www.timbre-project.eu or contact me directly at stephan.bartke@ufz.de.

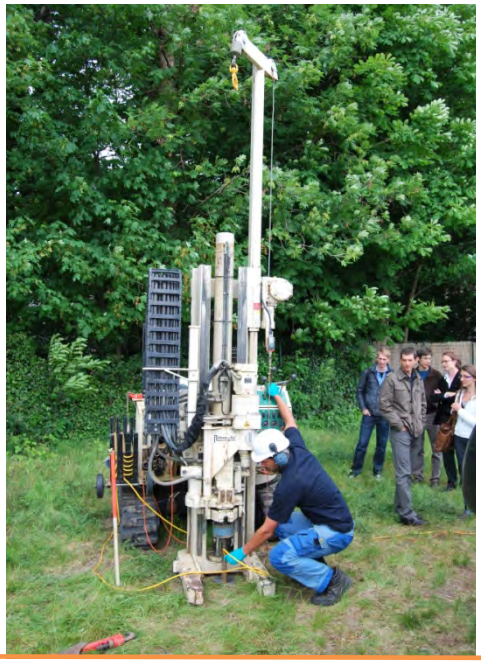
TIMBRE Team at their kick-off meeting May 2011

CityChlor: new solutions for complex pollutions

Veerle Labeeuw, OVAM, Belgium

Chlorinated solvents have affected the quality of the groundwater and the soil in many European cities. Besides the environmental and health effects, this contamination also has huge socio-economic impacts. Because it is a common problem, nine partners from Flanders, the Netherlands, France and Germany are working together to develop an integrated approach in the CityChlor project. With a research budget of 5.2 million euro, of which 50% is financed by the INTERREG IV B programme, the partners have set up seven demonstration sites to support the studies and workshops. More information (including for remediation studies in Germany) can be found on www.Citychlor.eu.

CityChlor began in 2010 with a review of existing knowledge, an overview of present innovative approaches and technologies, as well as different national approaches and their bottlenecks. This analysis set out the information gaps for new studies and workshops. It found that innovative techniques showing positive lab scale results do not find their way to practical applications. Principals and authorities are not eager to use or allow them, as they are unsure on the efficiency and the results.



The demonstration sites aim to remove barriers for market acceptance of innovative technologies. In Flanders two techniques will be validated by comparing the results with classic techniques on a site at Kortrijk. A detection of the source-zones is done by the EnISSA MIP, an improved membrane interphase probe (see Page 12). Possible 'sinking layers' of pure product are checked with the FLUT-e NAPL sampler.

In France a monitoring network is being set out to define the boundaries of the aquifer and its pollution, to point out the exact positions of all source zones, and determine most appropriate monitoring techniques and strategies.

In Utrecht monitoring of the biological potential of the subsoil in natural conditions will be analysed. In a second pilot an ATES (Aquifer Thermal Heat Storage) system will be tested to predict the effects on pollutions and geochemical conditions during an area-oriented remediation approach.

Common Forum Update

Dominique Darmendrail, BRGM, France

The Common Forum on Contaminated Land in the European Union (CF), initiated in 1994, is a network of contaminated land policy makers and advisors from national ministries and Environment Agencies in EU Member States. Its general objectives are to develop strategies for the management and treatment of contaminated sites and for land recycling with respect to "sustainable resource protection" for contaminated land and groundwater.

As in 2010 most of the discussions held within the Network have been around the Soil Protection Strategy.

The elaboration of specific soil legislation, is currently "frozen" at the EU Council level. In 2010 the Spanish EU Presidency continued the negotiations, but agreement was not reached. Since then the further Directive drafting has not been on the agenda of subsequent EU presidencies. During the Trieste and Salzburg CF meetings in 2010 presentations of some points of concern and new principles on priority settings were given and discussed. The CF is an important actor that may be able to find an alternative consensus text for controversial sections of the draft Soil Directive between "Yes" and "No" Member States, which can then be offered as ideas for upcoming EU Presidencies to consider.

A proposal for CF work at an informal level was agreed, including: (a) reporting on CF meetings, discussions and proposals to the European Commission; (b) identifying ways to unblock the situation; and (c) developing alterative text proposals for the Directive using the latest version made under the Spanish EU presidency as a basis. The initiative approved was led by OVAM.

Nevertheless, provisions affecting soil management have been introduced in other new EU policies (e.g. the Renewable Energies Directive) or on changes to existing EU legislation (e.g. the Waste Framework Directive as it applies to excavated soil management; and the Industrial Emissions Directive as it applies to soil monitoring and site closure / remediation issues). The potential impacts of these developments on contaminated land management have been scrutinised by the CF, and these meeting minutes are available from the Common Forum web site (www.commonforum.eu).

In parallel many European countries have announced changes in their legal frameworks related to contaminated land management. A questionnaire was sent to CF representatives to collect information about the latest policy and regulatory status in their countries. The feedback from this process can be viewed in the CF web site.

The autumn 2011 meeting of the CF will be held back to back with a meeting of the International Committee on Contaminated Land (ICCL) in Washington DC. See www.iccl.ch for more information. These meetings will be followed by a technical meeting about innovative approaches to mining site remediation and reuse. See www.miningworkshop.org for further information.

The CF welcomes participation from national ministries and agencies in all Member States. It also works closely with NICOLE and other stakeholder networks. Further information can be found at www.commonforum.eu or from me via: commonforum-secretariat@brgm.fr

The NICOLE Technology Award

The 2010 competition

Paul Bardos,
NICOLE

The 2010 NICOLE Technology Award was won by Wouter Van de Putte of MAVA in Belgium for the "EnISSA technology". The runner up was an entry led by Ronald Koomans (Medusa Explorations, NL) and Martin van Houten (Witteveen+Bos, NL) for "Development of a geophysical method for quantitative risk assessment" and the third most highly ranked entry was from Helen Beddow and her colleagues of Nuvia in the UK for "The Gamma Excavation Bucket Monitor (GEM) System". Each of these three technologies is described over the next few pages of NICOLE News. Overall ten entries were submitted to the 2010 competition.

This was the first completion for the award which was launched by NICOLE in 2010. Its aim is to stimulate development and technical innovations that can contribute to improved practice for contaminated land management in line with NICOLE's mission.

The 2010 award invited entries related to "Innovative site characterisation tools". The competition was open to individuals or groups in industry and academia. Entries were judged on their innovation, potential to provide cost savings, technical applicability and the plans for communication and market development. Entries were judged by Hans-Peter Koschitzky, Anja Sinke and Laurent Bakker; representing the industrial, service provider and academic interests of NICOLE.

Two prizes were awarded €1500 for the winning entry; and €750 as a second prize. Personal NICOLE memberships for two years were given to the originators of the top five entries.

The judging panel emphasised to NICOLE News just how difficult their task was, as all of the entries submitted were of a very high standard. The other entries were:

- "Environmental Forensics in Contaminated Site Management" by Thomas Ertel and others in Germany;
- "Gasclam" from Stephen Boult at the University of Manchester in the UK;
- "GWSDAT - GroundWater Spatiotemporal Data Analysis Tool" from Wayne Jones and others at Shell Global Solutions;
- "Landfill site characterization using FTIR spectroscopy, simultaneous thermal and ecotoxicological analysis" from E. Smidt of the University of Natural Resources and Life Sciences Vienna, Austria;
- the "QED hydrocarbon analyser" from Lynne Fagents of QROS Environmental Engineering in the UK
- "TRIAD" from Vierah Hulley of Sasol in South Africa.

The 2011/12 competition topic and details of how to submit entries are enclosed with this issue of *NICOLE News*. More detailed information is available on www.nicole.org.

The GEM system

Remediation of radioactively contaminated land presents many challenges, one of which is the management of waste. Radioactive waste disposal can be a costly process; therefore, critical to any clearance operation is the minimisation of the resulting waste. This is achieved by measuring and segregating materials according to their radioactivity concentration. Furthermore, contractors are required to keep to tight deadlines as the costs associated with remediation are high; assay technologies therefore need to be rapid so that downtime is minimal.

Since 2004 Nuvia has worked on a gross gamma system capable of real-time assay of excavated materials. Known as the Gamma Excavation bucket Monitor (GEM), this bulk monitoring system utilises a battery-operated caesium iodide detector, shielded in a heavy-duty frame. The mathematical computer modelling code, Monte Carlo

The GEM system in operation with the loaded excavator bucket placed over the detector

N-Particle (MCNP), is used to calibrate the system, by modelling the response of the detector to the specified radionuclide(s) distributed in soil/rubble, within the required bucket measurement geometry. The counts per second that equate to the boundaries between a maximum of three different waste categories is then programmed into the electronics.

Operation of the GEM system involves positioning an excavator bucket of material over the detector, which triggers a proximity switch to initiate the counting routine. Each bucket load requires only a few seconds to complete a measurement; the count time is dependent on the detection requirements. Once the measurement is complete, a coloured light is automatically illuminated on the display panel to indicate the correct waste stream for the load.

Using this technique, approximately 350 tonnes of material can be measured and segregated per day. Data for each bucket load is stored and downloaded onto a laptop, so that a record can be kept of the radioactive inventory and quantities of material.

For further information contact:
Helen.Beddow@nuvia.co.uk

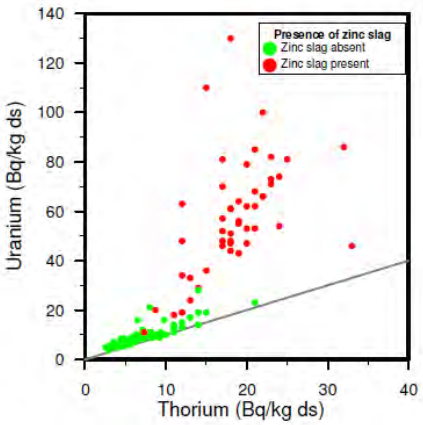
Innovative methods for the quantification of mine tailing in roads

Medusa is a γ-ray spectrometer which detects naturally occurring radionuclides of potassium, thorium and uranium (^{232}Th, ^{238}U and ^{40}K). Their distribution has been used as a proxy measurement for the presence of heavy metal enriched slags and ashes which were widely used for road building in De Kempen region of NL and Belgium. These roads pose a potential threat to water resources and human health. De Kempen is a large region (2,600 km^2) in the south-eastern part of the Netherlands and the northern part of Belgium. Between 1892 and 1974 six smelting operations were based in the area.

This detector has been adapted as a non-invasive vehicle-mounted system combined with ground penetrating radar (GPR), an EM system and GPS. So far some 1,200 km of road have been investigated, at speeds of up to 100 km/h. The combined data from the Medusa system is used to interpret differences between zinc and cadmium contaminated materials.

The radionuclides, measured with Medusa, occur naturally in the ore materials which were used by the metal smelting operations. A calibration study using 300 soil samples from the area was carried out. This study showed irrefutably that a relationship exists between the zinc slag concentration and concentration of radionuclides. Samples that contained zinc slags were also enriched in uranium, and the ratio between the uranium and thorium deviated from 1 (defined as the background ratio found in "clean" samples).

Medusa: spectral gamma sensor mounted on the front of the measurement vehicle. The EM sensor is mounted behind the vehicle in a non-conductive carriage. The GPR is mounted under the vehicle.



Scatterplot of uranium vs. thorium for zinc slag containing material and material that does not contain zinc slag

An electromagnetic fingerprinting system and ground penetrating radar (GPR) complemented the radiometric fingerprinting technique. Most materials used for constructing roads such as bitumen, asphalt and concrete are electrically resistance, whereas slags or ashes are generally more conductive due to their metal content and associated weathering products. Raised conductivity provided a strong diagnostic for the presence of slag or ash. The differing electrical properties of road building materials from slags and ashes also means that they respond differently to radar, so this property was also exploited in the road assessment work. A predictive model is used to rank human health risks based on geophysical and verification sample testing.

To verify the results of the combined geophysical mapping, samples from corings have been used for validation. In total 1,472 corings were taken and 8,697 samples were measured on its concentration of zinc by hand-held XRF. These indicated that the levels of false positives or negatives from geophysical approaches were both <10%.

Further information is available from:
Koomans@medusa-online.com

The EnISSA Concept

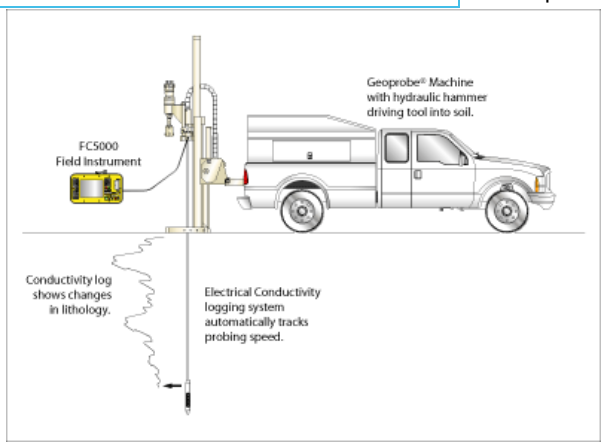
Traditional off site analysis achieves low detection levels and a broad analysis spectrum. However field based techniques can achieve a faster, cheaper and more comprehensive delineation of contamination.

"On site" soil screening technologies such as the Membrane Interface Probe (MIP) and Rapid Optical Screening Tool (ROST) techniques are already often used to supplement traditional sampling and analysis methods. They are used to provide detailed semi-quantitative delineation and support on-site, real-time decision making. However, they do have limitations: they have relatively high detection limits and they do not distinguish individual chemical compounds within the groups or classes they detect.

The EnISSA technique combines the best of both the on-site and off-site "analytical worlds" by generating detailed on-site soil profile data with low detection levels and a broad analysis spectrum, thus supporting reliable dynamic sampling plans.

The EnISSA method uses a GCMS system which is connected to a direct push MIP by an innovative gas sampling system, as shown in the pictures below. The modified field based GCMS used is capable of cycle times of one minute, and the analysis of individual components with detection limits in the range of 10 – 20 µg/l.

This combination of optimised GCMS and innovative gas sampling is unique. Demonstration scale test work indicates that it is possible to qualify and quantify pollutant mixtures every 30 cm within the time frame of conventional MIP application (assuming a conventional direct push speed of 30 cm/min).



EnISSA concept: direct push; local heating of soil; hydrophobic semi permeable membrane; inert carrier gas; and transport to detector

The NICOLE Technology Award Winner

The EnISSA MIP

EnISSA is a highly innovative system that has been demonstrated and is ready to be commercialised. The concepts underpinning it are described in Page 11.

Entries were scored on six criteria: innovation; applicability for NICOLE members; potential cost savings; performance and technical validation; potential market uptake, and clarity of the proposal. ENISSA combines the best of both the on-site and off-site "analytical worlds" by generating detailed on-site soil profile data with low detection levels and a broad analysis spectrum. So it supports reliable dynamic sampling plans. Its combination of two existing proven technologies is the key to its success factor: acceptance will be high, communication can be straight forward. Hence implementation in the soil remediation market is likely to be fast!

Two case studies were presented to NICOLE. The case studies showed how patterns of perchloroethylene (PCE) degradation can be visualised using the EnISSA MIP. They also highlighted the difficulties of characterising volatile organic compound (VOC) contamination using traditional sampling wells, and how using the EnISSA MIP can contribute to a better site conceptual model (SCM).

's-Hertogenbosch (The Netherlands)

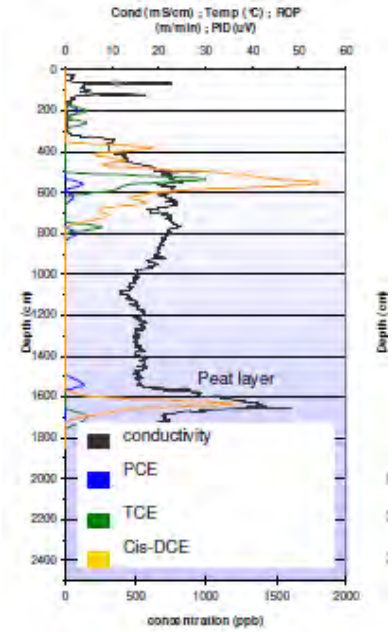
A soil survey was performed on a former industrial site in 's-Hertogenbosch. Previously, conventional site investigation had indicated the presence of PCE and its breakdown products.

EnISSA technology identifies individual compounds semi quantitatively. Its detection limits are sufficiently low to allow it to delineate both source and plume. This makes it possible to visualise individual compounds in systems in three dimensions which is not possible using conventional MIP. The EnISSA method has low spatial and analytical uncertainty. Therefore, it can be used to greatly reduce uncertainty in a SCM and also costs:

- Conventional sampling and analysis can be limited to confirmation wells.
- The movement of the MIP through the depth of the profile reduces the chances of missing contamination, compared with conventional wells with fixed well screens.

In addition, the EnISSA data can be used to more effectively target remediation interventions such as the *in situ* delivery of reagents.

At 's-Hertogenbosch the purpose of the EnISSA investigation was to investigate the horizontal and vertical distribution of contaminants. 16 EnISSA MIP's were executed in both the source and plume zone. Confirmation wells were placed afterwards. High concentrations of PCE were measured, but the degradation products were also clearly visualised.



Example 's-Hertogenbosch EnISSA MIP log

The data showed that the less mobile compounds (PCE and tricholoroethylene – TCE) occurred in narrow bands in the subsurface. More mobile compounds were more widely distributed.

Such information could be of great value when assessing potential risks. For example the narrow region of PCE/TCE could be easily overlooked using a traditional well sampling survey. Furthermore, the information of how degradation is distributed in the soil, is useful in selecting and designing a potential remediation strategy.

Cost comparisons indicate that the EnISSA strategy achieved 25% cost savings over conventional approaches, and also delivered a higher density of information about contaminant distributions in the subsurface.

Tremelo (Belgium)

In 2007 an investigation was carried out at a site contaminated with PCE. Data from conventional MIP indicated contamination starting at 6m below ground level (bgl). Sampling wells were then inserted with well screens at 6-7 m-bgl and 10.5-12.5m bgl. Groundwater samples at 6-7 m bgl indicated the presence of PCE and TCE at concentrations of 410 µg/l and 8.6 µg/l, respectively.

EnISSA MIP was applied in the plume zone, near a sampling well. At 6.5m bgl, PCE was found at concentrations up to 800 µg/l, as found previously. These high concentrations were located around a thin clay layer at 6.5 m bgl. In addition, at 7.80 m bgl a thin clay layer with up to 90 µg/l of TCE was found, which is just above the cleanup reference value in Flanders (70 µg/l). EnISSA MIP profiles give a high resolution depth profile of contaminations at ug/l levels, whereas the results of the two sampling wells underestimated the TCE problem.

Further information is available from info@enissa.com.

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