VEGAS / NICOLE Workshop: The role of networks, R&D and technology transfer towards an eco-efficient/cost effective management of contaminated land

30th September 1999 at the University of Stuttgart

Outline Meeting Note, Corinne Allimann-Lecourt, Paul Bardos, Paolo Cortesi and Hans-Peter Koschitzky October 1999

VEGAS organised a meeting "*VEGAS* Statuskolloquium 99" which took place on the day before the NICOLE / *VEGAS* workshop. Please note that no details regarding this meeting will be presented here as the language talked during this meeting was German.

The NICOLE / *VEGAS* workshop objectives were to review the role of networks, R&D and technology transfer towards an eco-efficient / cost effective management of contaminated land. Over 120 participants attended this meeting. The workshop followed the "*VEGAS* Statuskolloquium 99". A delegate list and abstracts booklet which includes the abstracts of both meetings are available on request to the NICOLE secretariat (M.Euser@mep.tno.nl) and VEGAS. NICOLE gratefully acknowledges VEGAS' help in producing this booklet.

Following welcome speeches by Helmut Kobus, Director of the Institut für Wasserbau at the University Stuttgart and Stefan Gloger from the Ministry of Environment and for Transport from the State of Baden-Württemberg, Paolo Cortesi, Chairman of NICOLE, opened the workshop by summarising the evolution of NICOLE since it began in February 1996. He outlined its achievements since then, its work over 1999, its first year of being fully self funding, and its future plans. His slide set is available from the "Publications" of the NICOLE web site at http://www.nicole.org.

An upgraded NICOLE web site was launched at the meeting, which offers

- a web based NICOLE News Service replacing the NICOLE News magazine,
- a comprehensive description of NICOLE activities, projects and publications
- an interactive web board to post your own messages
- information on making proposals to NICOLE and membership
- an information gateway providing access to key links for contaminated land knowledge available from the Internet
- a NICOLE membership list, providing web links and automatic e-mail contacts
- and many other features, why not visit the web site?

The workshop included a session on general themes related to contaminated land management, presentations from two NICOLE projects and presentations on a number of emerging risk management techniques. It closed with a visit to the *VEGAS* facility. NICOLE would like to thank *VEGAS* for their hospitality and excellent support and organisation for this meeting, without which the meeting would not have been so successful nor so enjoyable.

The workshop concluded by emphasising the need for dialogue (i.e. two-way communication) between contaminated land stakeholders. Dr Buesing pointed out that despite the money being poured into contaminated land management R&D the number of contaminated sites reported by countries continues to rise. He felt that it would be useful to have a clearer idea on just how successful this R&D effort has been in addressing contaminated land management problems. Unfortunately, too many uncertainties remain in understanding the risks for contaminated land. This is one of the major reasons why no downward trend in the numbers of sites has been reported, another is that not all "suspect" sites have been identified, and so numbers of sites continue to grow.

Opening Statements

Dr Juergen Buesing reported that a high proportion of proposals related to contaminated land, submitted in the recent call for the EC Framework 5 Programme, have progressed to the contract negotiation stage. This reflects NICOLE effort in identifying suitable projects and brokering the creation of research teams. Dr Buesing exhorted NICOLE members to continue these efforts and invited them to visit the CORDIS web site, where information on further EC R&D activities is available.

Dr Baldur Barczewski gave a detailed review of *VEGAS*. *VEGAS* is a research facility and part of the University of Stuttgart. Its establishment was funded by central and regional government and the facility is open for all interested researchers from Germany and abroad . The facility is for large scale investigation, principally for testing and optimisation of *in situ* remediation techniques. Moreover *VEGAS* is also a research framework. Its work and technical specification are comprehensively described on the *VEGAS* web site at http://www.iws.uni-stuttgart.de/

General Themes

Contaminated Land - Problems and the Development of Solutions (Andreas Bieber, Ministry of Environment, Germany) Andreas Bieber described how contaminated land legislation in Germany had progressed. He also drew delegates attention to a number of problem areas, including:
Derivation of "trigger levels" for a broader range of substances and also for mixtures of substances;
Harmonisation of trigger levels and risk assessment methods (e.g. across the Laende)
A more comprehensive approach to contaminated sites registers taking into account the land conditions and capacity for re-use.

Contaminated Land Problems - a Policy Perspective (Joop Vegter, Technical Soil Protection Committee, Den Haag) Joop Vegter proposed a conceptual model for cost effective cleanup solutions. This model distinguishes the surace layer of the soil, as the *contact zone*, from deeper layers, where the contaminants could affect groundwater or could disperse. Intensive clean-up techniques (like excavation and removal) are more likely as treatments of the contact zone, whereas extensive techniques (like natural attenuation) may be more appropriate for deeper layers.

General Management View of Partly Contaminated Properties from Deutsche Bahn AG (Jens-Uwe Fisher, Rolf Gerhardt, Deutsche Bahn AG, Frankfurt) Deutsche Bundesbahn is the privatised German railways company. It manages, nation-wide nearly 2000 contamination related projects from primary site assessment to property hangover. Its contaminated land management group, KSM seeks to optimise the procedures in land recycling and also promote re-use of plant, e.g. maintenance plant.

Elements and Processes of a Cost Effective Management and Design for the Remediation of Contaminated Land (Harald Burmeier, ITVA, Ingenieurtechnischer Verband Atlasten e.V., Berlin) Contaminated sites remediation projects often cost more than initially suggested. Harald Burmeier suggested that this as much due to deficiencies in project management and initiation in the problem holding companies as well as cost over-runs by contractors. He suggested that independent project management expertise should be called in by problem holders at the earliest possible juncture in order to most efficiently handle their contaminated sites portfolio.

Source Versus Plume Remediation (Georg Teutsch / Peter Grathwohl, University of Tuebingen) Georg Teutsch reminded delegates of the difficulties in achieving a comprehensive clean up of aquifers using pump and treat based approaches. In many circumstances dispersed sources of aquifer contamination are effectively unreachable by available remediation techniques, or could only be treated at enormous cost. He went on to suggest that such efforts may in fact not be necessary in order to provide good risk management. He suggested that the most resource efficient means of dealing with problem aquifers in many cases might be a combination of treatment walls combined with natural attenuation. In this context the pathway (plume) rather than the source is treated to break the pollutant linkage and so achieve risk management.

NICOLE Projects

exSite Research - Adding Confidence To Innovation (David Edwards, exSite Research Ltd, UK) exSite Research operates as an applied research organisation. ExSite benefits from a user group of industry members with interests in the recovery and reuse of brownfield land. exSite supports and funds the demonstration of new technologies and strategies on a field scale basis to enable the beneficial recycling of recovered materials, the productive reuse of land as part of the brownfield development process and to minimise reliance on landfill.

Monitored Natural Attenuation (Anja Sinke, TNO-MEP, Apeldoorn, NL) Monitored Natural Attenuation is a management strategy based on the criteria of scientifics, economics and politics, and on the risk analysis of the specific site. In this project which started in January 1998. A review of information on risk-orientated protocals and guidelines has been established and should be published in October 1999. The second phase of the project, the planning phase, will demonstrate the impact of MNA at different industrial sites.

Emerging Techniques

Large Scale Experiment on LNAPL and DNAPL Behaviour and Mass Transfer in the Groundwater (Gerhard Schafer, Paul Muntzer, IFARE, Strasbourg). Paul Muntzer presented findings from a field scale (900 m^3) investigation of an aquifer pollution by LNAPLs and DNAPLs which were carried out in the research facility of IFARE at the University of Strasbourg.

Surfactant Enhanced Hydraulic Subsurface Remediation (Reinhold Josef, University of Stuttgart) Hydraulic extraction of PAH's, which are extremely unsoluble has very low efficiency. Surfactants have been used to enhance the extraction of PAH's, by promoting mobilisation or solubilisation of the PAH's. Good extraction results have been obtained over short timescales in laboratory studies and also at a former tar oil production site. An outstanding problem is how to reuse the surfactants. Successful trials have also been carried out at VEGAS. Future work will focus on surfactant recycling.

Microemulsions: Application for In Situ *Soil Remediation (Günter Subklev, Forschungszentrum Jülich)* Bicontinuous microemulsions are mixture of biodegradable oils, surfactants and water, which are able to extract DNAPL contaminants from contaminated soil and groundwater layers. Preliminary results on the removal of DNAPL were presented, and future R&D plans described.

Remediation of DNAPL Contamination in the Saturated Zone by Alcohol Flooding (Cor Hofstee, University of Stuttgart) Remediation of DNAPL contamination in aquifer using a mixture of water, isopropanol and hexanol flooding is being investigated at *VEGAS*. This technique is seen as particularly useful for the recovery of dense chlorinated solvents. Good extractions appear achievable with flushing a limited number of pore volumes and downward movement of DNAPLs in pure phase is limited.

Consideration of Enhanced PAH-Degradation in Bioreactive Barriers (Peter Werner, Technologiezentrum Wasser , Karlsruhe) Approaches to establishing reactive groundwater barriers for the biodegradation of PAH's in the absence of oxygen were presented. Preliminary experiments have focused on identifying suitable chemical agents to promote barrier activity.

Steam Enhanced Soil Vapour Extraction: Technology and Field Application (Hans-Peter Koschitzky, University of Stuttgart) Steam enhanced extraction technology soil venting is being developed and optimised at the University of Stuttgart. The use of steam provides a number of advantages over conventional soil vapour extraction, including making use of lower viscosities and interfacial tensions for VOCs, and an increase in soil the temperature enhancing mobility of sVOCs. A pilot scale field test demonstrated shortened clean up time in comparison to a conventional system and that the technology could be cost effective.

Brownfield Redevelopment: New Interdisciplinary Challenges (Volker Schrenk, Christian Juckenack, University of Stuttgart) Christian Juckenack introduced the Brownfield Redevelopment programme launched in 1997 in Stuttgart. Its focus is on stimulating the multi-disciplinary approach necessary for practical brownfields remediation and redevelopment problems.

Looking to the Future - Some Conclusions
Paolo Cortesi, Chairman, NICOLE

Industry seeks an eco-efficient and cost effective approach to the problems of contaminated land:

- eco-efficient = reducing actual environmental risks and achieving real quantifiable environmental gain;
- cost-effective = an optimal use of resources (*not "cleaning" more than is necessary*), maximising the benefits compared with the costs and minimising the time before land can be re-used.

The route towards these goals is an approach that is based on risk assessment and is specific for each site. However risk assessment tools need improvement, for example so that they can be applied to *in situ* remediation and monitored natural attenuation with more confidence.

VEGAS is heavily involved in this important area of development, and co-operation with NICOLE will be beneficial for both organisations as well as for the state of the art in general.

Perception of risks, for example by local communities and authorities around a suspect site, is an important consideration. Communication, i.e. dialogue, is essential to address local fears and arrive at a mutually acceptable way forward. Such dialogue involves both a clear explanation of

scientific principles, and also care for the worries and concerns of the local community. The involvement of all stakeholders at the beginning of the remediation project rather than at the end of it is a prerequisite for a shared solution.

Dealing with the problems of contaminated land is a multi-disciplinary activity, and involves a broad range of stakeholders. However, in the final analysis all have a common interest in optimising the use of limited resources for the benefit of all of society.