

Remediation Australasia

Mandatory
greenhouse and
energy reporting:
**WHAT'S
THE IMPACT?**

**COMMUNITY
ENGAGEMENT**
A risky business

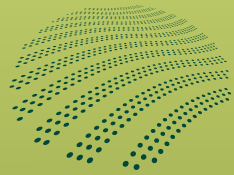


**MANAGING
ASBESTOS IN SOIL**
Driven by community
perception?



**NANO
TECHNOLOGY**
Exploring potential applications
in a range of industries





CRC CARE™

Cooperative Research Centre for Contamination Assessment and Remediation of the Environment

CRC CARE is Australia's leading science-based partnership in assessing, preventing and remediating contamination of soil, water and air. With a unique mix of industry, university and government agency partners, CRC CARE research has five main programs:

- Risk assessment
- Remediation technologies
- Prevention technologies
- Social, legal, policy and economic issues
- National contaminated sites demonstration program

As part of an ambitious delivery agenda, CRC CARE has created the Australian Remediation Industry Cluster (ARIC) to promote SME access to new technology and knowledge, and developed an industry training and workshop program. It has forged key partnerships with major industry players and has a growing list of technology patents.

With university partners and strong ties to Asia, CRC CARE's support and supervision will enable 50 students to complete PhDs during its first seven-year term. Building regional leadership in this field represents an excellent investment for Australia as an international market for services emerges worth tens of billions of dollars.

A cleaner, safer future for all
www.crccare.com



Welcome to the second edition of *Remediation Australasia*.

Judging by the continuing requests to be put on the mailing list, it would seem that the magazine has filled an important need for the remediation industry. This is at a time when the industry has grown from \$350 million dollars in 1997, to in excess of \$1 billion per annum, providing employment for thousands of graduates in science and engineering.

At our recent annual general meeting, consulting companies identified a need for more young graduates in environmental science and engineering, and it is important that our educational institutions can meet this demand.

Thanks for those who have provided feedback on our new *Remediation Australasia* website and magazine.

Some suggestions have not been able to be implemented yet, and are still under consideration.

If anybody has ideas on improvements please do not hesitate to contact us with your thoughts.

Anybody visiting the *Remediation Australasia* site will also notice some major changes. Member services are now online and there are expanded services for the public. Please take time to have a look at what is being offered.

Due to the later-than-expected completion of the member services section of the site and changes within CRC CARE, the decision has been made to extend the free membership period until 30 June 2010. This will give potential members time to experience what ARIC has to offer.

This has been a challenging year for many people due to the uncertainties created by the world economic downturn. For some it has had little direct impact while other people have been more directly affected in their businesses. It is difficult to know what lies ahead, but I hope the New Year improves prospects for all players in our industry.

On behalf of CRC CARE and the Australian Remediation Industry Cluster, I wish everyone a merry Christmas and a happy New Year.

May the remediation industry continue to grow, prosper and better meet the needs of the communities it serves.

Prof Ravi Naidu

Managing Director, CRC CARE
Editor, *Remediation Australasia*

Remediation Australasia is a quarterly industry magazine produced by the Australian Remediation Industry Cluster (ARIC) for the Australian remediation industry.

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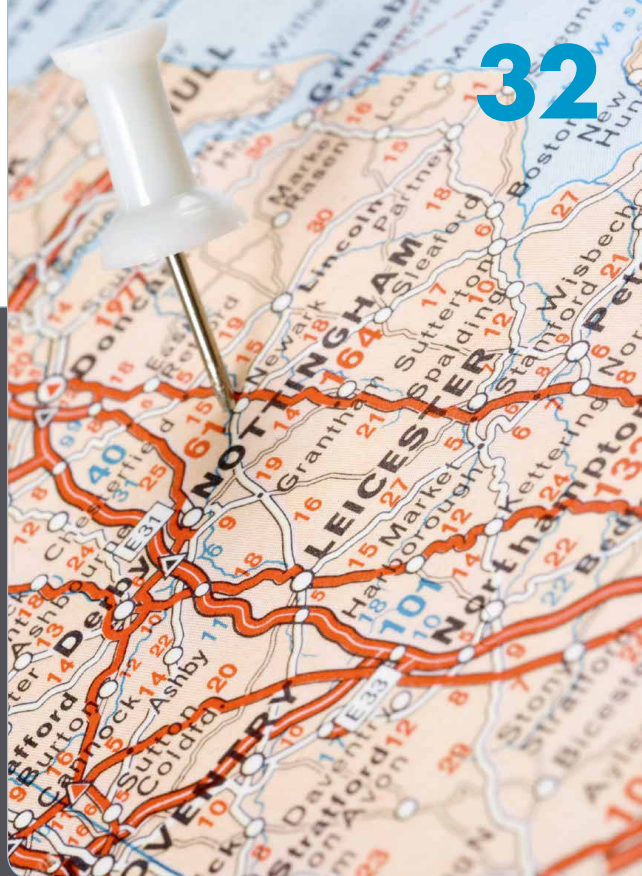
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The challenging, important task of **Community engagement**

Simon Pollard, Cranfield University,
Linda Heath, CERAR,
Garry Smith, AECOM and
Steve Hrudey, University of Alberta

Engaging a community on a contentious issue such as land contamination can be a risky business and, if not done correctly, can have negative consequences for all those involved. It is important that communities that may be affected by the remediation work are engaged from an early stage to gain their trust and support. Waiting until conflict arises is often too late. The historic 'decide-announce-defend' philosophy offered few meaningful opportunities for engagement, and communities often felt isolated from the decision-making process.

“Contaminated land issues are complex and require difficult decisions to be made that often involves compromises. These issues are usually difficult enough without making them moreso by failing to engage the affected community.”

Many practitioners also believed that the science was misunderstood by communities, and that messages on risk were susceptible to distortion or misrepresentation by the media, single interest groups and those with alternative agendas. The need for engagement from an early stage is therefore very important for both parties.

Avoiding community engagement will guarantee trouble. There is no way to avoid problems simply by engaging communities per se. However, it is certain that in failing to engage a community on an issue that many citizens care about will create problems that could have been reduced or avoided by effective community engagement. Contaminated land issues are complex and require difficult decisions to be made that often involves compromises. These issues are usually difficult enough without making them moreso by failing to engage the affected community.

Informing and consulting the community are usually not enough. Engagement involves a serious commitment to allow input from the community to shape the direction of a project.

An unfair process will generate outrage. Citizens who believe they are being treated unfairly, in a condescending manner, or being

ignored altogether, will become aggrieved, possibly to the point of active opposition. An outraged public is extremely difficult to engage in any constructive manner. Practitioners will know that communities can get outraged and certainly, when they do, it becomes difficult, if not impossible, to deal with them constructively. Sometimes practitioners will inherit such situations from an earlier process that was inherently unfair. There is no easy way of dealing with such situations, other than acknowledging that outrage can be a natural and fully rational response to a truly unfair process. If the outrage has been caused by the practitioner, then they can respond by addressing the concern. See box on far right for further information.

Resolving disputes requires a dedicated process. Because the objectives for dealing with contaminated land are not necessarily the same as for the community, there is always the potential for disputes. Not all disputes can be resolved by communication alone and sometimes a dedicated process is required. Because litigation is expensive and often ineffective, other dispute resolution mechanisms such as mediation with an independent facilitator should also be considered.

Risk is complex and inherently uncertain. The prediction of risk



relies on a mixture of evidence, assumptions and judgement. It is complex and inherently uncertain by its very nature. Risk is relative to a person, and therefore two people may perceive the risk of a situation quite differently. This commonly occurs between practitioners and people in communities. It is important for practitioners to recognise and respect this difference, and not engage in a discussion on the basis that they know the real risk and the other person merely perceives the risk. That is like saying “I’m right and you’re wrong, but let me explain to you why you are wrong.” That is a formula for conflict, not enlightened discussion.

Effective communication must be a two-way process. Any risk communication process that lacks an effective means to listen to community concerns, and a commitment to seriously seek to understand those concerns, will be dismissed by the community as merely public relations. The need for involving affected parties before starting a risk assessment, engaging them during a risk assessment to refine risk management options and to select among risk management options has now become best practice advice. While two-way communication is essential, finding the right public participants with whom to communicate with is not always easy. One-on-one engagement is often not feasible where large numbers of affected

parties are involved. Finding suitable representatives for large groups is challenging. Those chosen must be trustworthy to both the public they represent and trusted to deliver messages received honestly to their constituents.

Effective communication is necessary but not sufficient. Scientific and technical information is often complex and difficult to understand. Evidence can also be conflicting yet important when considering all the issues. Technical terms can have different meanings in different disciplines, and be interpreted by the public in varying ways. If an audience is presented with confusing information, they may ignore it or be angered by it. This can negate the impact of other information that is presented. Presenting information in a form suitable for the audience is therefore important for effective communication.

Trust and credibility are both essential. When we rely on the views of others, rather than analysing a problem for ourselves, we are placing trust in others. In essence, trust often serves as a means for dealing with complexity that we have insufficient time to resolve for ourselves. Trust and confidence (credibility) are both involved in influencing how an individual will judge an organisation regarding an issue at play. Likewise, trust and fairness are intuitively linked. It should be obvious that if fairness is absent, then trust is unlikely

Seven conclusions about hazard and outrage are as follows:

- The public responds more to outrage than hazard
- Activists and the media amplify outrage, but they don’t create it
- Outraged people don’t pay much attention to hazard data
- Outrage isn’t just a distraction from hazard. Both are legitimate and important
- When hazard is high, risk communicators try to nurture more outrage
- When hazard is low, risk communicators try to reduce the outrage
- Companies and agencies usually can’t reduce outrage much until they change their own organisations



to be achieved. However, research has also demonstrated that fairness alone cannot guarantee trust, particularly if moral issues are at play.

Because trust is often seen as a holy grail in risk management and its importance in shaping disputes cannot be understated.

The limited effectiveness of risk communication efforts can be attributed to the lack of trust. If you trust the risk manager, communication is relatively easy. If trust is lacking, no form or process of communication will be satisfactory. Trust is fragile. It is typically created rather slowly, but it can be destroyed in an instant by a single mishap or mistake. Thus, once trust is lost, it may take a long time to rebuild to its former state. However, it is also necessary to be realistic about what level of trust is possible. Those things which will obviously produce distrust must be avoided, but doing everything 'right' will not necessarily produce trust in all situations.

Credibility is based on more than scientific and technical competence.

Scientific competence is essential to establish credibility, but by itself is not sufficient to assure trust. Openness, honesty and transparency are also necessary to demonstrate credibility and to warrant trust. This includes a frank and honest approach to dealing with uncertainty which is inevitable in any risk assessment. Denial of uncertainty will eventually backfire and undermine credibility. An organisation cannot establish credibility if it is not scientifically competent, so competence is necessary, but it is also not sufficient. The process and manner by which an organisation deals with the public can undermine its credibility.

Even if an agency's scientific credibility is impeccable and beyond reproach, it can lose credibility with the public if it is not seen to be honest and transparent.

Do not promise more than you can deliver. Remediation timescales are notoriously difficult to predict. Overly zealous claims, even if they are sincere, about what or how quickly something can be achieved will, when not achieved, cause

disappointment that may boil over into distrust.

It is better to be realistic from the outset. With the public engaged from the beginning, they can make the journey through a project with some sense of ownership and reality that can lead to tolerance of missed targets. The best intentions of an organisation that is honestly seeking to manage risk to a community can come undone, if the promises that are made cannot be kept. An agency must reflect very carefully on what it can realistically deliver, and then must be scrupulously clear in not over-selling what it can do. Among such promises are those which promise zero, or essentially zero risk.

Validate your messages and behaviours with your own public surrogates. With so much at stake, a useful technique is to do a trial run of the planned interactions and communications using non-technical associates as surrogate community representatives. This is a relatively simple task that is not often done and yet can highlight possible problems with the proposed approach. ■

Engaging the Community handbook **AVAILABLE NOW**

'Engaging the community: a handbook for professionals managing contaminated land' presents a framework for community consultation on contaminated site projects.

The handbook provides readers with the principles of community engagement, national and international perspectives on best practice in risk communication, Australasian case studies, and a structural framework for involving the public in environmental decision making.

The handbook is a useful tool for state and local authority officers, site planners and environment agencies, and land owners, environmental consultants, contractors, and others involved in the management of contaminated sites.



purchase your copy at www.crccare.com

CleanUp 2011

6th International Workshop on Chemical Bioavailability in the Terrestrial Environment (7–9 September 2011)

and the

4th International Contaminated Site Remediation Conference (11–15 September 2011)

Hilton Adelaide hotel

On behalf of CRC CARE and the Australian Remediation Industry Cluster (ARIC), I invite you to join us for the biennial CleanUp conference, to be held at the Hilton Adelaide hotel, in South Australia.

CleanUp 11 will combine the 6th International Workshop on Chemical Bioavailability in the Terrestrial Environment (7–9 September 2011) and the 4th International Contaminated Site Remediation Conference (11–15 September 2011).

The CleanUp Conference is the premier Australian-based conference related to the contaminated site and remediation industry.

It is expected that CleanUp 2011 will have an attendance comparable to the 2009 conference, which attracted over 500 scientists, engineers, regulators, and other environmental professionals from 25 countries. Delegates were able to promote technology transfer and exchange information, innovations and developments in fundamental and applied environmental research towards the assessment, management and remediation of environmental contamination.

The organising committee is pleased to again have secured the Hilton Adelaide hotel as the host venue for the events. This medium sized venue enables attendees to focus on the tightly paced program and exhibits, and to easily meet and share ideas and information.

Ample networking will be possible with a full complement of lunches, receptions, and other meals being served during the breaks in the program. After the sessions conclude each evening there will be poster sessions and networking drinks, with the conference dinners again expected to be a highlight of the social program. At the conclusion of each day's activities, conference participants will find ample sightseeing, shopping and dining options nearby. Located on central Victoria Square, the Hilton Adelaide hotel is in the heart of Adelaide city.

Your contribution to these events is welcome as a presenter, sponsor, exhibitor or delegate.

I look forward to seeing you at the conference in 2011.
I know you will value the experience.



Professor Ravi Naidu
Managing Director
CRC CARE

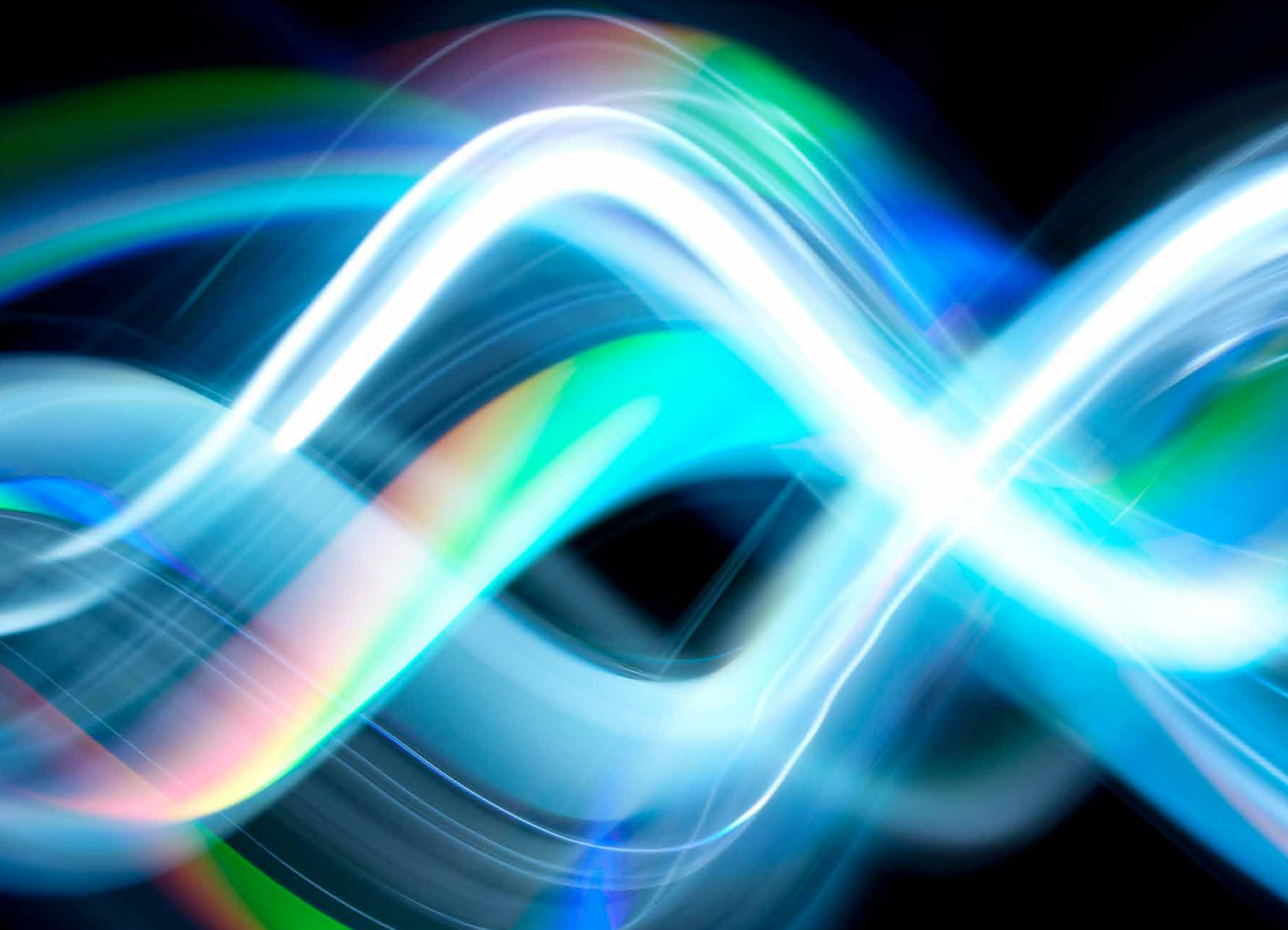


Remediation of contaminated sites:

The impact of mandatory greenhouse and energy reporting

Christine Covington and Amin Doulai,
Corrs Chambers Westgarth

With the commencement of the second reporting year of the National Greenhouse and Energy Reporting System (NGERS), lower reporting thresholds mean that companies in the remediation industry should reconsider whether they are required to register and report their greenhouse gas emissions and energy consumption.



With the commencement of the second reporting year of the NGERs, lower reporting thresholds mean that companies in the remediation industry should reconsider whether they are required to register and report their greenhouse gas emissions and energy consumption. This article provides a brief summary of the NGERs and the *National Greenhouse and Energy Reporting Act 2007* (NGER Act). It also sets out some general issues that companies in the remediation industry should consider concerning NGERs compliance.

NGERS and the remediation industry

The NGER Act and its associated regulations and guidelines establish a mandatory corporate reporting system for greenhouse gas emissions, energy consumption and production. The primary purpose of the NGER Act is to facilitate the introduction of, and to set the trajectory for, the Federal Government's proposed carbon pollution reduction scheme.

Companies in the remediation industry should carefully consider their potential NGERs liability, given that remediation operations:

- will be considered to be a distinct reportable 'facility' (under the provisions of the NGER Act and its associated regulations)

- can be energy intensive – for example, consider on-site electrical use, and
- are likely to result in greenhouse gas emissions – for example, consider transportation, electrical usage, heavy machinery and equipment use.

Under the NGER Act, emissions and energy consumption are aggregated across all 'facilities' (that is, for example, aggregated across all remediation operations conducted by a company). Depending on the number of remediation operations and the nature of the remediation activity at each site, a company may trigger the registration and reporting thresholds set out in the NGER Act.

Two key risks arise for companies in the remediation industry:

- direct liability – by meeting or exceeding the NGER Act reporting thresholds, and
- contractual liability - environmental contractors and subcontractors who provide remediation services should ensure that NGERs compliance is properly addressed in contractual documentation to determine clearly who has liability for reporting, and to provide for recording of reliable data on greenhouse gas emissions and energy consumption.

As the reporting thresholds will be lowered again next year, companies will need to remain vigilant about their potential NGERs obligations.



Annual self assessment

The NGER Act operates on an annual self-assessment basis, where a corporation meets the requisite reporting thresholds. It is the responsibility of all companies to regularly assess their potential obligations under the NGER Act. For example, companies that may have recently embarked on remediation operations may now be liable to register and report under the NGER Act, especially since the reporting thresholds for the 2009-10 reporting year have been reduced to 70% of the thresholds for the first reporting year in 2008-09.

Contractors who provide site remediation services should review their current and future contractual arrangements in order to ascertain whether it is them, or their principal, which has reporting responsibility regarding highly polluting or energy-intensive remediation operations.

The NGER Act uses the term 'controlling corporation' to denote an Australian company that is at the top of its corporate group. For this reason, a controlling corporation is responsible for registering on behalf of, and reporting for, its entire corporate group.

Importantly, a company's joint venturers and partners are included within a controlling corporation's group. Participants in joint ventures and partnerships can nominate a 'responsible entity' to register and report activities conducted by the joint venture or partnership that meets the reporting thresholds for a particular year. If no responsible entity is nominated, the controlling corporation of every participant in the partnership or joint venture may be required to report.

Meaning of 'facilities' and 'operational control'

A controlling corporation is only required to report in relation to those facilities over which it has operational control, or the operational control of a member of its corporate group. A facility is an activity or a series of activities that:

- produce greenhouse gas emissions (scope 1 or scope 2) or produce/consume energy
- form a single undertaking or enterprise
- occur at a single site, and
- are attributable to a single Australian and New Zealand Standard Industrial Classification industry.

For example, if a company is contracted to carry out waste treatment, disposal and remediation operations at a contaminated site for a land owner, those operations may be counted as a single facility for the purpose of the NGER Act. The company may be required to register and report under the NGER Act, if it has met the corporate and/or facility thresholds. While remediation operations conducted at one site may not necessarily meet or exceed the facility reporting threshold, data from remediation operations conducted across many sites may be reported on an aggregated basis on a state/territory level. A controlling corporation (or member of its group) will be considered to have operational control over a facility if it has the authority to introduce and implement:

- operating policies
- health and safety policies, and
- environmental policies.

Obligations under the NGER Act

The NGER Act requires a controlling corporation that meets the emissions and energy usage and consumption thresholds for a particular year to:

- register with the Commonwealth Department of Climate Change, and
- provide an annual report of its emissions and energy usage and consumption.

Reporting thresholds for 2009-10

The NGER Act provides for two types of reporting thresholds – 'facility' thresholds and 'corporate group' thresholds.

For the 2009-10 financial year, a controlling corporation will be required to register and report under the NGER Act, if the following thresholds are met:

- total corporate group threshold – 87.5 kilotonnes or more of CO₂-equivalent emissions, or 350 terajoules or more of total energy usage or production, or
- single facility threshold – 25 kilotonnes or more of CO₂-equivalent emissions, or 100 terajoules or more of total energy usage or production.

Offences

Among other things, penalties can be imposed on corporations that fail to register, and/or report (civil penalties of \$220,000 for each contravention).

Penalties can also be imposed for continuing contraventions of up to \$11,000 per day.

Chief executive officers may also be held personally liable for their company's contraventions of the NGER Act, unless he or she took 'reasonable steps' to prevent the contravention.



The controlling corporation with operational control over a facility is responsible for reporting all emissions and energy data from that facility, including that produced by the actions of any contractors and subcontractors.

Contractors

In situations where a third party is contracted to manage or operate a facility on behalf of the owner, operational control will depend on the contractual arrangements between the parties as to who has the authority to introduce and implement the relevant policies.

Companies should carefully review their contractual arrangements with contractors and subcontractors in order to determine the party with the most operational control. Before entering into any arrangements, contracts should be carefully reviewed with a view to:

- determining clearly which party has liability for reporting under the NGER Act
- ensuring all parties fairly and reasonably have access to information they require to meet their individual reporting obligations, and
- providing for reliable recording of data relevant to any party's reporting obligations.

Since remediation operations will be considered a facility for the purpose of the NGER Act, companies in the remediation industry should carefully consider their potential registration and reporting obligations. Among other things, consideration must be given to:

- the extent of the corporate group (including joint ventures and partnerships)
- the number and nature of facilities (with particular attention to cross-border facilities and transportation)
- operational control of facilities and contractual arrangements with third parties and contractors (including access to third party data and confidentiality)
- compliance with highly prescriptive measurement determinations
- review of future contractual arrangements to ensure compliance with reporting obligations, and
- the potential role of sustainable and/or green environmental remediation practices to minimise emissions and energy usage.

Visit the National Greenhouse and Energy Reporting website: www.climatechange.gov.au/reporting for more information. ■

Asbestos in soil:

Is my backyard contaminated?

Brian Priestly, Monash University,
Peter Di Marco, Golder Associates
and Andrew Harman, Harman Legal



A driving force behind the management of asbestos on contaminated sites is a general community perception of asbestos risks, as set out in the 2005 enHealth guidance on management of asbestos in the non-occupational environment.

The enHealth document outlines that: *The belief that 'one fibre can kill' compounds the problem of risk communication. While this claim is not supported by scientific evidence, it underpins the fear and anxiety about asbestos.*

Most people in the community perceive risks differently from 'experts'. Their perception is strongly influenced by the media, often a superficial understanding of the issue and, in some cases, by personal experience with people suffering from asbestos-related diseases. The painful and debilitating consequences of these diseases (such as mesothelioma) contribute strongly to asbestos being a very emotive subject. This can lead to greater conservatism in decision making, if not balanced with good scientific information to provide evidence-based decisions.

Scientists, engineers and other people working on the asbestos issue also need to appreciate the sensitivities within the broader community and the potential 'outrage factor' that can result. Communication with affected individuals needs to reflect an understanding of their concerns, respect for their position and be in language that is easily understood, especially by non-technical audiences.

Not all forms of asbestos are the same

Asbestos has been used in a variety of different forms:

- chrysotile (white asbestos)
- amosite (brown or grey asbestos)
- crocidolite (blue asbestos), and
- asbestos bound in various types of asbestos cement building materials.

Some forms of asbestos are more dangerous than others. In general terms, the hazard ratings are: crocidolite (blue asbestos) > amosite (brown or grey asbestos) >> chrysotile (white asbestos).

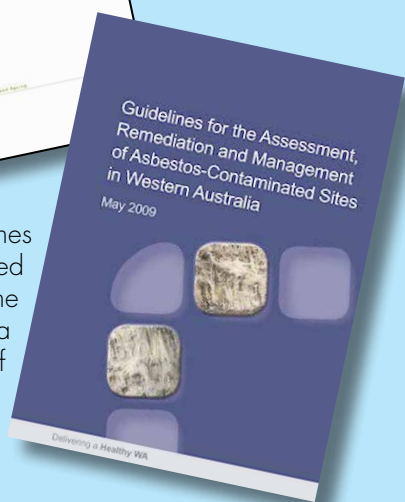
The differences in risks associated with different forms of asbestos are primarily based on fibre length, the friability of the materials and the extent to which they may be inhaled and retained in the airways, and their surface reactivity. There are other fibrous minerals which may share some of these asbestos-like characteristics.



Asbestos cement fragments



To download the document go to the enHealth publications page and then the section 'Human Environment Interface' > 'General series'



To view the guidelines and associated material visit the Western Australia Department of Health site

The Australian Safety and Compensation Council (currently Safe Work Australia) reported in a 2008 publication that it has been estimated that loss of asbestos cement sheet thickness from erosion by the elements is of the order of 0.01 mm/yr to 0.02 mm/yr. It would take several hundred years for the bound fibres to be released into the environment. Thus, the asbestos fibres released from asbestos cement material found in soil at concentrations that comply with current regulatory guidelines are unlikely to significantly increase background levels of asbestos fibres in the air.

Regulatory approaches to establishing investigation and cleanup levels though tend to regard all forms of asbestos as equally dangerous. This can mean that some remediation work currently being undertaken may be more than is required, based on the risk posed.

Cancer risk

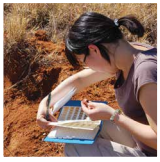
Remediation goals vary widely across different jurisdictions, and are usually driven by conservative estimates of risk of developing cancer over an entire lifetime. For example, estimates of the lifetime cancer risk associated with exposures to 100 fibres/m³ (0.0001 f/mL) vary from 1 in 2,257 to 1 in 45,454 (increased to 1 in 25,000 when associated with smoking).

The United States Environment Protection Agency has proposed remediation goals of between 430 - 53,000 fibres/m³ (0.00043 - 0.053 f/mL) to achieve a cancer risk which does not exceed 1 in 10,000 for activities ranging from lifetime exposure, to short-term exposures associated with jogging, gardening and indoor residence.

Risk of exposure

Just because asbestos is present in the soil does not mean a person will be exposed to the sort of levels that may increase cancer risk. For this to occur, the fibres need to be in the air and therefore have been released from the soil. Whether fibres are being released into the air and in what concentration can vary considerably, and is determined by the nature of the asbestos-containing material and whether it is being disturbed.

Currently, the methodology for measuring asbestos contamination in soil or air is largely based on highly sophisticated and costly electron microscopic examination. This can be very expensive when assessing an asbestos problem, which limits its use. The issue of risk is therefore more complicated than asbestos merely being present, but is also made more difficult by the means by which we assess that risk.



Developing environmental experts.

CRC CARE supports the growth of highly qualified and suitably trained researchers and decision makers in environmental risk assessment and remediation through:

- ▶ PhD and Honours research opportunities
- ▶ workshop training for environment industry professionals
- ▶ linkages with other industry peak bodies
- ▶ focusing on end user needs
- ▶ a suite of publications and guidance documents
- ▶ hosting the biennial 'CleanUp' industry conference

Contact CRC CARE for further information.



Cooperative Research Centre for Contamination Assessment and Remediation of the Environment

www.crccare.com

Liability implications

The Australian College of Toxicology and Risk Assessment (ACTRA) held a 'continuing education' workshop on asbestos at the 2009 CleanUp Conference. The workshop was presented with summaries of recent Australian cases where the courts have interpreted liability issues relating to plaintiffs who have contracted mesothelioma or other asbestos-related diseases, mainly through non-occupational exposure.

The sobering point which emerged from these case reports was that very low past exposures to any fibre type may result in a finding of liability against a defendant, despite other causes being more likely to have been the cause of the disease. Such outcomes will unfortunately reinforce the message given to the community that 'one fibre can kill'. There would appear to be no reason why liability for low asbestos exposures from

contaminated soils might not arise in the future, and such a scenario could have serious implications for the management of asbestos-contaminated sites – and would certainly continue to drive stricter regulation.

New guidance may be nationally adopted

It was noted at the workshop that the current review of the *National Environmental Protection Measure (NEPM) for Assessment of Contaminated Sites* may adopt the guidance for managing asbestos in soil, recently updated by Western Australian Department of Health (WA DOH).

The WA DOH guidance is pragmatic, and suggests soil screening and cleanup criteria based on the type of asbestos contamination and likely land use. These values range from 0.001% w/w for fibrous

asbestos and fine particulates at all types of sites, to 0.01% for residential and child care uses, to 0.05% for commercial/ industrial uses, provided that the land is contaminated only with largely intact asbestos containing materials, such as cement and fibreboards.

This article is based on the presentations at the Australasian College of Toxicology and Risk Assessment (ACTRA) Continuing Education Workshop on asbestos in the soil held at CleanUp 09 Conference in Adelaide in September 2009. The workshop dealt with the history of asbestos production and uses in Australia, community perceptions of the health risks associated with asbestos, the ways in which asbestos products may be detected and measured on contaminated sites, and recent approaches to the regulation and clean-up of asbestos-contaminated sites. ■



Minimising legal risk: taking into account the

Potential legal liability in dealing with contaminated sites

David Cole, DLA Phillips Fox

The redevelopment of industrially or agriculturally contaminated land in urban and peri-urban areas of established cities has much to commend it. 'Tired' urban and community fabric can be renewed and urban resources re-allocated. However, the process can flag financial and legal risk for land owners and developers.

Strategically, any urban project involving contaminated or potentially contaminated land must factor in legal risk. Having some grasp of the risks involved is the basis for managing them. The risks vary depending upon such factors as the nature and relationship of the parties involved, the purpose to which the land is being or proposed to be put, commercial arrangements and the applicable regulatory regime addressing the assessment and remediation of contaminated land.

Original polluters of land (if in existence, identifiable and solvent) and owners of land have the potential in Australian jurisdictions to have administrative assessment and/or remediation orders issued against them by relevant environment protection agencies. Compliance can be extraordinarily expensive and failure to comply can result in civil enforcement action in the courts and/or prosecution. Additionally, most environmental protection agencies have the authority to undertake assessment and remediation tasks (or commission them) and recover the cost of so doing from the polluter and/or landowner.



Polluters and land owners may commence to manage the risk of orders being issued by taking control of the situation, and acquiring an understanding of the condition of their property. However, that in itself may carry obligations to inform regulatory authorities of the condition of the land once known.

Polluters and owners also face the risk of liability for injury caused by a breach of a duty of care owed to the injured party. Failure to adequately assess and remediate land known or suspected to be contaminated can result in court action where damage occurs to other parties as a consequence.

Commercial dealings with contaminated land carry their own special risks. Consumer protection laws in Australia in relation to land transactions often require disclosure of information that serves as a warning to the prospective purchaser that the land may be contaminated as a consequence of previous uses. Failure to provide the information can result in the contract being avoided and damages awarded.

Whilst silence as to the condition of land is generally not unlawful at common law ('let the buyer beware'), it can be unlawful under Commonwealth and state trade practices laws. Failure to disclose a potentially contaminating use of land or the fact that it is contaminated, where known to the vendor, can again result in a contract being nullified by a court and damages being awarded.

It follows that purchasers of contaminated or potentially contaminated land may expose themselves to costly litigation with the vendor if the land proves to be contaminated. In Australian jurisdictions, purchasers of land subsequently discovered to be contaminated may, as owners, also be vulnerable to orders issued by environment protection agencies and to action by third parties injured as a consequence of the condition of the land.

Consequently, the purchase of land that (for whatever reason) has the potential to be contaminated should be subject to careful due diligence processes by the prospective purchaser, and should include the drafting of a contract for sale and purchase that clearly reflects the risk the purchaser is prepared to assume, if any. Such contracts should contain clauses to protect against future liability for site contamination that is not envisaged in the transaction.

Consultants and auditors also face the spectre of legal liability where their assessment and remediation work is negligently undertaken. For example, substandard advice provided to one or other party to a transaction involving contaminated land may give rise to contractual disputes between vendor and purchaser, that can also involve action against the consultant for professional negligence and breach of contract.

Where negligent advice given by a consultant or auditor results in damage to third parties (for example, failure to adequately address a contamination issue resulting in damage to

neighbouring land users) actions in negligence, trespass or nuisance may be brought by the damaged parties.

Managing the risk

Legal risk management in the context of contaminated sites involves understanding what the potential for legal liability may be in the particular circumstances and then formulating strategies to effectively address that risk. The appropriate strategy may depend upon the status of the relevant party (for example, owner, vendor, purchaser or prospective lessee).

The commercial mobilisation of contaminated land faces many challenges, not the least of which is the risk for the vendor (if responsible for the contamination), that some residual liability under contaminated sites legislation may be retained despite contractual conditions directed to transferring risk; that is, investigation and cleanup orders may be issued against the original polluter if, for any reason, it is not practicable or worthwhile to issue orders against the current owner.

The risks for the purchaser are that, as an owner of a contaminated site, statutory liability may be retained as well as potential liability to third parties who may suffer damage as a consequence of the condition of the land – hence, the relatively recent development of 'positive liability transfer' products. These products (or 'packages') are designed to effectively transfer to another party (as far as the law will permit), immediate and continuing risk associated with the assessment, remediation and management of contaminated sites. The extent to which they prove attractive to landholders and developers in Australia remains to be seen. However, they have gained in popularity in North America as consultants, insurers and project managers combine to provide attractive risk-reduction packages for the remediation and redevelopment of contaminated sites. ■

This section contains publications that have been published in the last three months since the last edition of *Remediation Australasia*. The publications may originate from research institutions, regulators or industry groups. Please let us know if you have any appropriate publications (no promotional material) to be included by sending details to aric@crccare.com.

CRC CARE Annual Report 2008-09

For anyone interested in knowing what CRC CARE is doing for the remediation industry, the Annual Report is a very comprehensive overview of work carried out.



CRC CARE Technical Reports

TR 12:
Biodegradation of petroleum hydrocarbon vapours

This report includes a review of the role of biodegradation in reducing petroleum hydrocarbon vapour intrusion into slab-on-ground buildings for application at a Tier 1 or human health screening level. This work comprises part of the efforts through CSIRO and CRC CARE to provide technical input to the current review of the Australian National Environment Protection (Assessment of Site Contamination) Measure (NEPM).

Visit www.crccare.com to see our full suite of Technical Reports. ■



Nanotechnology – new science and new challenges

Venkat Kambala, CRC CARE



Nanotechnology is an exciting new technology with potential applications in consumer products, health care, transportation, energy, agriculture, water and environmental industries.

For the remediation industry, nanotechnology presents new opportunities to improve how we measure, monitor and manage contaminants.

New technologies also present new challenges and concerns. In the case of nanotechnology, concerns have been raised with regard to the negative impact of some nanomaterials on human health and the environment. This is an important reminder. New technologies are not introduced without some risk and this risk needs to be understood and managed. An important part of this process is research to develop the understanding and education to inform those who need to know.

Nanotechnology has far reaching implications for our society, and it is important that we embrace what the technology has to offer but not shy away from challenges it presents us.

Defining the topic

The National Nanotechnology Initiative – US (www.nano.gov) defines nanotechnology as: *the understanding and control of matter at dimensions between approximately 1 and 100 nanometers, where unique phenomena enable novel applications. Encompassing nanoscale science, engineering, and technology, nanotechnology involves imaging, measuring, modeling, and manipulating matter at this length scale.*

Examples of nanomaterials

One company produces a self-cleaning glass with a 5 nm coating of microcrystalline titanium oxide which reacts to daylight, breaks down any grime and then self-cleans when in contact with water. Titanium dioxide in the size range of 5 - 50 nm has also been used in several applications including sunscreens and water filtration.

Significance

Nanomaterials are very small, have a high surface area and can be manufactured to carry out specific tasks. Their size also means they can travel within living organisms and move easily through the environment. Materials operating on a nanoscale may also behave differently to the existing products which create opportunities for developing new and novel products. Properties exhibited by some nanomaterials include

super-elasticity, increased chemical reactivity, increased or decreased strength, able to cope with massive changes in pressure and temperature and improved conductivity of electricity and heat.

There are many nanomaterials that occur naturally and humans have been exposed to them throughout their evolutionary development. Naturally occurring nanomaterials are also providing inspiration for the development of new products. For example, plant eating molluscs use teeth attached to a tongue-like organ called a radula which helps to scrape their food. These teeth have a complex structure containing nanocrystalline needles of goethite.

Products produced using nanotechnology

Nanotechnology offers new approaches to developing products. In medicine, new drug delivery systems for cancer treatment means potentially less side effects as the drugs are delivered directly to the cancer cells. If successful, this approach could be used for targeted drug delivery for a wide range of health conditions.

Putting scale in perspective

1 nanometer = 1 nm

1,000,000 nm = 1 mm

Escherichia coli = about 2,000 nm long and 500 nm in diameter

A human hair = approximately 70,000 – 80,000 nm thick

1 nm = the width of a DNA molecule

The polio virus = approximately 40 nm in diameter



Biosensors are being developed to improve the assessment and remediation of contaminated sites.

Miniaturisation and improved fabrication techniques have resulted in efficient and powerful computer chips and computers. If this was translated into biosensor technology through the use of nanotechnology, then the opportunities for better and more sophisticated biosensors are enormous.

Ultra-violet (UV) blocking sunscreens have been developed that are invisible to use. The UV protective nanomaterials are also being trialled in paints and other protective coatings. The use of unobtrusive protective coatings opens up many new opportunities to develop better products. If those coatings were also reactive, then the possibility of dealing with aerial toxins also becomes a reality.

Nanotechnology is helping to improve the efficiency of solar cells in solar panels. Even a small improvement in efficiency has major implications on the economics of using solar cells versus other energy options. A large efficiency jump would make solar panels much more attractive as an alternative energy source.

“Imagine if toxins such as arsenic could efficiently and economically be removed – what impact would this have in the developing world? Valuable new remediation options for cleaning up contaminated sites would become possible.”

The remediation industry

It is important that we develop efficient and cost-effective methods of soil and water remediation to minimise the impact on the environment and human health. Nanofiltration technologies are being developed to remove toxins selectively from contaminated land, water and air. Nanoscale powders made from iron can be used for cleaning up contaminated soil, by catalysing the breakdown of organic contaminants such as dioxins to simpler and less toxic compounds.

Nanotechnologies are already being used in water treatment. New developments in membrane technology promise to further advance this important activity. Reactive nanomaterials have the potential to neutralise chemicals and micro-organisms, adding a further level of sophistication to water treatment technology. Imagine if toxins such as arsenic could efficiently and economically be removed – what impact would this have in the developing world? Valuable new remediation options for cleaning up contaminated sites would become possible.

Nanomaterials are also used in permeable reactive barriers (PRBs) and have advantages over previously used materials such as granulated iron ore and modified clay materials.

Nanotechnologies offer the possibility of combining sensing and feedback for measuring levels of contamination in various environmental media. This could provide an early warning system when concentrations of contaminants are exceeded, or result in immediate remedial action such as the starting of a groundwater pump connected to a treatment unit.

While nanotechnology may produce radically new products, many of the benefits will be in refining existing technologies so they are more efficient and effective.

Soil and water contamination

If nanomaterials escape into the environment, they may form nanopollution – which would be difficult to remove and potentially have implications for human health, particularly with drinking water.

Among the many applications of nanotechnology that have environmental implications, remediation of contaminated groundwater using nano zerovalent iron (nZVI) is one of the most prominent examples of emerging technology with considerable potential benefits. Remediation technologies based on nZVI can be employed in two ways:

- PRB, or
- reactive media in the form of slurry injected into the treatment zone

These approaches involve the placement of reactive media in the path of the contaminated groundwater flow, thereby providing direct contact between the contaminants and the reducing agent. While the PRB provides a level of containment for the reactive media, the slurry of reactive media injected into the soil is free to move within the soil-water system. In the latter instance, it is difficult to properly assess the risk to human or environmental health.

With respect to in-situ application of nZVI in porous media, there is evidence that the particles are reactive, persistent and mobile suggesting potential for human and ecological risk.

Risks to humans and other organisms

The small size, large surface area, structure, composition and reactivity of nanomaterials help them to move easily in the environment, enter living organisms and interact with chemical and biological systems. The toxicity and carcinogenicity of nanomaterials are related to their physical and chemical properties. Other factors such as their fate and persistence in living organisms are also very important. Nanomaterials can move into the body through the lungs, via ingestion, through the skin or be introduced intentionally via injection. Their small size enables them to spread easily, to move through cell membranes, enter the circulatory system and be deposited in many places throughout the body. At this stage a lot is still unknown about nanomaterials in living organisms. Being small, the nanomaterials may break down quickly or may be attacked and neutralised by the organism's defence

Health screening levels training DVD AVAILABLE NOW



Following the national series of HSL workshops in November 2011, and in response to positive feedback from industry, CRC CARE has made the HSL workshop and materials available on DVD.

This three-disc set features:

- the presentation materials and audio from a live workshop
- a CD containing CRC CARE Technical Report no. 10, and
- all presentation slides.

The training materials will be of relevance to all regulators and practitioners dealing with petroleum hydrocarbon-impacted sites. To provide your staff with these training resources, visit the CRC CARE website to purchase your copy of the DVD.

purchase your copy at www.crccare.com

mechanisms. Organisms exposed to some nanomaterials, especially those manufactured that do not normally occur in nature, may not initially have the ability to deal with the materials.

Some nanomaterials are likely to be toxic due to their chemical and physical properties. In these instances the nanomaterials need to be managed, as for any toxic substance. Nanomaterials such as carbon fullerenes, carbon nanotubes and nanoparticle metal oxides when they enter the body result in increased production of reactive oxygen species including free radicals. This may result in oxidative stress and inflammatory responses which can result in tissue damage.

Synthetic nanomaterials such as carbon nanofibres and carbon nanotubes have also been implicated in mimicking asbestos fibres. More research needs to be performed but inflammatory responses and other conditions from respiratory inhalation, similar to the reaction to asbestos, have been observed with these materials. The structural resemblance of some fibrous nanomaterials to asbestos fibres and

their potential biopersistence makes them a potential human health hazard warranting further investigation.

Government bodies are looking closely at nanotechnology for possible risk to human health and environment. The Australian Government's Health, Safety and the Environment nanosafety working group liaises between all relevant government agencies to ensure that safety issues in relation to nanotechnology and its many applications are being addressed.

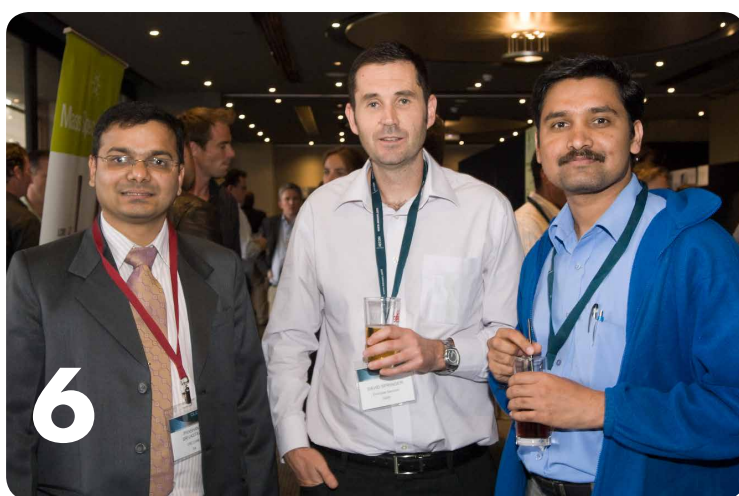
The Australian Department of Health and Ageing National Industrial Chemicals Notification and Assessment Scheme (NICNAS) has initiated public consultation meetings on the proposal for regulatory reform of industrial nanomaterials. The consultations are expected to be an opportunity to gather information on the impact and feasibility of proposed changes to industrial nanomaterial regulations on business, the community and government. The proposal utilises the existing NICNAS framework with adjustments for uncertainties in potential risks posed

by these novel nanomaterials to health, safety and the environment.

CSIRO is also carrying out research under their Future Manufacturing Flagship on the effects that some nanomaterials may have on human health and the environment. The research involves looking at when humans and the environment may be at risk from exposure, monitoring workplace exposure and the impact on health, and determining what happens when nanoparticles are released into the environment.

Nanomaterials offer many exciting possibilities for the development of new products and materials. The production, handling and use of nanomaterials, particularly those that do not exist naturally, need to be carefully managed to minimise adverse effects to human health and the environment. To facilitate the safe use of nanomaterials the community needs to understand the risks involved. Better education starting at school level will help society safely derive the best value from this exciting new technology. ■





1. Kay Stritzke (Coffey Environments) and Janet Macmillan (Department of Environment and Conservation)

2. Adrian Welbourne (Alumtek) and John Throssell (Parsons Brinckerhoff WA)

3. Albert Juhasz (University of South Australia) with Richard Stewart and Ben Dearman (Remediate)

4. Taj Pabla (Department of Defence) and Fouad Abo (GHD)

5. Terry Weston (Department of Defence) and Peter Nadebaum (GHD)

6. Prashant Srivastava (CRC CARE), David Springer (Envirolab Services) and Thavamani Palanisami (University of South Australia)



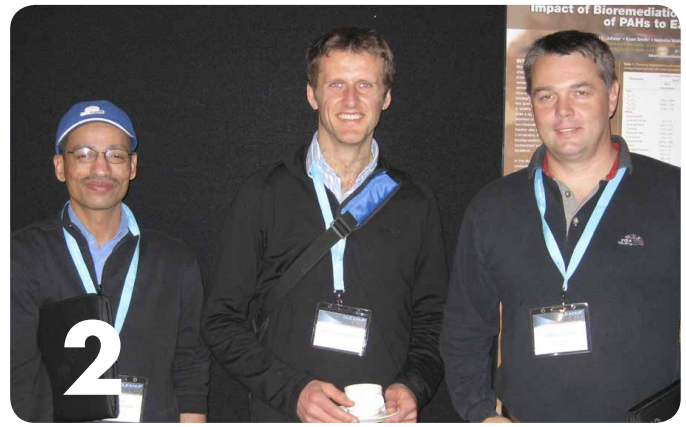
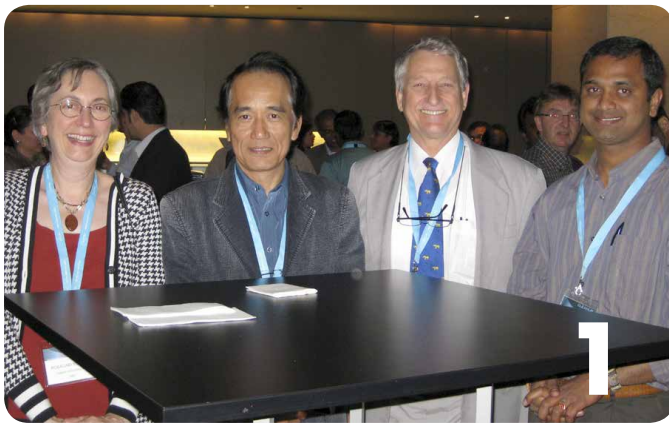
CleanUp 09 photos

CleanUp 09 was held in Adelaide from 24 to 30 September 2009.

The conference provided an important opportunity to meet new people working in the industry, to catch up with work colleagues and to find out about progress and developments from other industry groups.

- 7. Ronald Cang (Singapore), Philip Block (FMC Corporation) and Bill Cutler (Integral Consulting, USA)
- 8. Ted Schaefer (Solberg Asia Pacific) with Megharaj Mallavarapu and GSR Krishnamurti (University of South Australia)
- 9. Harald Burmeier (University of Leuphana, Germany) and Peter Martin (CRC CARE)
- 10. The AECOM team: Jason Clay, Alex Leong (Malaysia), Kate Woods and Ross McFarland





CleanUp 09 photos (bioavailability workshop)

1. Rosalind Schoof (Integral Consulting US), Jack Ng and Barry Noller (University of Queensland) and Devarajan Shanuganathan (University of South Australia)
2. Kandasamy Thangavadivel and Seth Laurenson (University of South Australia) with Domen Lestan (University of Ljubljana, Slovenia)
3. Sarah Richards and Karen Teague (Coffey Environments), Ruth Dedrick (Connolly Environmental) and Jackie Wright
4. Joop Harmsen (Wageningen University, The Netherlands) and Steve McGrath (Rothamsted Research)



5. As Nanthi Bolan (University of South Australia) found out, food was not in short supply!
6. Elizabeth Garrido Ramirezrivera and Francisca Acevedo (Universidad de La Frontera, Chile)
7. Jack Ng (University of Queensland), Mahammad Rahman, Vitu Matanitobua and Thammared Chuasavathi (University of South Australia)
8. Chuleemas Boonthai (Khun Kaen University, Thailand) and Ravi Naidu (CRC CARE)
9. Michelle Begbie (Environment Waikato, New Zealand) and Kirk Semple (Lancaster University, UK)
10. Piw Das and Raktim Pal (University of South Australia)



Managing the risk in property transfer

Anthony Saunders, EnviroSure



Environmental insurance can be used for many purposes, including to cap remediation costs or to provide environmental coverage for contractors.

However, a transaction involving the purchase and sale of a brownfield's asset presents perhaps the ideal situation for the use of environmental insurance, since the insurance can be utilised to facilitate the sale.

Environmental insurance for the remediation industry protects policyholders against claims of loss or damage, for which they might have to compensate another party as a result of contamination.

Insurers need to understand the risks

The risk associated with contaminated land may be in direct proportion to what we know about the site. Key elements are:

- geology
- historic usage and diversity of use
- proposed remediation method, and
- insurance claims history.

These elements also may allow an insurer to discern that certain components of risk may result in or lead to an event of worse case proportions. The difference between what is known versus what is unknown may be insured.

A responsible person or entity (appointed, nominated, in charge of or as owner) of a contaminated site, accepts that there are certain commercial outgoings that may have to be expended to avert further contamination.

Where development of a site may be considered, unexpected events may still arise, that may result in time delays and unexpected cost outlays.

Remediation insurance applied during the process of reinstatement of contaminated sites offers the safest financial solution for all stakeholders. Insurers who provide such cover are willing to take on the risks in 'partnership' with stakeholders provided that they too obtain an intimate knowledge of the site in question.

Unknown risks can lead to policy exclusions

The commercial risks associated with contaminated land abound in potential arguments that insurers have become familiar with, hence many complex policy limitations have developed over the years. One may consider that specialist environmental insurance is an essential element in any undertaking when managing the risk in any property transference. Selling or buying a property with known or suspected environmental contamination can be a challenge because of many factors, including the following:

- environmental clean-up costs are difficult to predict with certainty
- environmental clean-up costs can be very high, especially if bodily injury, property damage and potential natural resource damages are factored in
- changes in accounting rules and securities laws are forcing the recognition of more environmental liabilities and costs
- capital markets and lenders try to avoid unquantified environmental liabilities or charge risk premiums if they are identified, and
- pollution is excluded (refer to common industry policy exclusion) under present day insurance policies unless otherwise negotiated through specialist coverages.

The following is an example of a common policy exclusion, which may be utilised by an insurance claims manager to deny liability where environmental pollution has taken place.

The Common Pollution Law Exclusion

(a) Personal injury or damage to property caused by or arising directly or indirectly out of the actual, alleged or threatened discharge, dispersal, release or escape of smoke, vapours, soot, fumes, acids, alkalis, toxic chemicals, liquids or gases, waste materials or other irritants, contaminants or pollutants into or upon any property, land, the atmosphere or any water course or body of water (including ground water) unless such discharge, dispersal, release or escape:

- (i) is neither reasonably expected nor intended by any of the persons insured, and
- (ii) is the consequence of a sudden and instantaneous cause which takes place at a clearly identifiable point in time during the period of insurance.

.....

(b) any costs or expenses incurred in preventing, removing, nullifying or cleaning up any discharge, dispersal, release or escape as described in (a) above, unless such costs or expenses are consequent upon an unexpected, unintended sudden and instantaneous cause which has taken place at a clearly identifiable point in time during the period of insurance which results in personal injury or damage to property neither of which is otherwise excluded by this policy.



Correct insurance provides an important mechanism to manage risk in property transactions. It does not cover pollution that is known to exist on the property. What it does cover is the possibility that the pollution may be worse than initially expected.

That uncertainty or risk can impact negatively on property transactions so insurance provides a mechanism to reduce or remove the financial risk from the transaction.

Understand what insurance is providing

To provide effective and economical protection for those involved in the transfer of property there needs to be an understanding by those being insured about what sort of cover is being provided, and the insurer needs to understand the risks.

If an insurer is uncertain of the risks they may include exclusions in the contract to reduce the potential risk or add a risk premium to the cost of the insurance.

Inadequate research by the person seeking insurance could result in insurance cover that does not provide the protection required or at a cost in excess of what is fair for the insurance cover being supplied.

Pollution law-related losses are infrequent but potentially catastrophic and therefore of concern to those involved in the transfer of potentially contaminated or contaminated property. If coverage can be obtained, the entity with the cover has a distinct advantage in facilitating the sale of the property, as insurance is often the only affordable way of managing the risk.

Indemnities and holdbacks

Dealing with environmental liabilities through indemnities or holdbacks of the purchase price in an escrow account are commonly contemplated. However, these do not create an escrow to a level equivalent to a maximum liability, or deal with the 'risk adjusted expected liability'.

An escrow is an account established for the purpose of holding funds until the consummation or termination of a transaction.

Risk adjusted expected liability is the cost of a loss multiplied by the probability of it being incurred.

Without an environmental insurance policy in place, 100% of the loss will need to be anticipated and reserved by either the seller or buyer with no discount for the probability that the loss may not be incurred. This is because without insurance, if the chance of occurrence is 10%, it will still have to be 100% available.

In comparison, an underwriter can collect ten times the risk adjusted expected loss from other insurers in the form of an insurance premium, and still provide coverage which is much less expensive than a fully funded indemnity or escrow holdback of the sale price.

Environmental insurance has other more subtle, but equally important advantages, which include the following:

- By having an insurance company evaluate the risk and assign a premium (based on prescribed limits and policy terms) the buyer and seller can let an objective third party set the price for the environmental risks of a transaction. This can be a 'deal facilitator' since taking environmental risks off the table early in the negotiations can maintain goodwill so that other issues in the transaction can be addressed.
- Insurance offers a true risk transfer mechanism to an unrelated party; indemnities and holdbacks leave the risk in the transaction/property ownership transfer.
- Insurance premiums are tax deductible, while indemnities are not until they are paid.
- Insurance removes long-term accounting issues created by open-ended and indeterminate environmental exposures.

- Financial markets may assign a multiplier to the amounts shown as environmental contingencies, which can reduce the capitalised value of the enterprise by many times the amount of the contingency.

Many companies have the potential to create pollution through the use of chemicals in their business. The types of insurance cover available are also many and varied. Insurance can be obtained for:

- cleanup of contaminated sites including cost capping
- brownfields restoration and development
- liability for potential injuries and death due to pollution
- pollution legal liability
- property transfer
- transporter insurance
- storage tank pollution liability
- professional and contractor environmental liability, and
- site closure and post-closure insurance.

Not all policies are the same, and those seeking insurance need to carefully look at what is being offered, particularly in regard to exclusions. When dealing with any professionals, the best advice is often from those who have experience and understanding of your industry.

As the nature of environmental liabilities has become more clear and quantifiable, environmental insurance has evolved to provide valuable protection at reasonable cost, closing the window of unknown liability. Stakeholders dealing with brownfield sites should consider making more use of this powerful risk transfer tool as part of their overall management strategy. ■

Unlocking the productive potential of brownfield sites

Ravi Naidu, CRC CARE

The Australian Remediation Industry Cluster (ARIC) held an Industry Summit on unlocking the productive potential of brownfield sites at CleanUp 09 in Adelaide in late September. The information gleaned from the talks, forums and follow-up discussions will provide the basis of a draft conceptual framework for decision makers which will be developed by ARIC.

The topic of brownfield development is an interesting one as it conjures up a picture of old industrial sites lying idle, redevelopment hampered by contamination, high costs associated with clean-up and the risk of future liabilities. While these are all important, the most important determinant is whether there is money to be made in redeveloping the site. If there is, then the redevelopment process is likely to move forward. Nevertheless, reducing the cost threshold of the remediation process provides the opportunity for more sites to be redeveloped with many flow-on benefits for communities.

There are many things to consider when cleaning up these sites and barriers to progress are often not single factor issues.

The first session of the summit focused on the world scene and that proved very enlightening. The challenges being faced by the US and Europe are many and varied.

In parts of Europe population growth has been very low. Although land is scarce in many areas the pressure for redevelopment is tempered by the low population growth.



ABOVE The groups were given the challenge of working out a strategy for developing a path forward towards unlocking the potential of brownfield sites.

In the US the historical legacy of a highly industrialised country has created many brownfield sites for which the government plays a large role in helping to redevelop.

Asia in contrast is a vast region with a rapidly growing population, many pollution problems and a regulatory system which is evolving quickly, yet quite undeveloped in many countries. With large population densities the value of land often remains high even when contaminated. This provides a strong incentive to redevelop.

Asia is a diverse region with the potential to develop many innovative strategies for dealing with complex problems that could be useful to countries like Australia and New Zealand.

In Australia we have a relatively advanced regulatory system which is still evolving quickly, a very large country and a relatively low population. This creates quite a different range of challenges for us compared to Europe, US or Asia.

In the afternoon of the Industry Summit there were presentations from four different perspectives – health professional, lawyer, consultant and a regulator. These

talks provided an interesting contrast, focused more on local factors influencing brownfield development and highlighted some practical considerations. The speaker sessions were followed by group sessions to develop a path forward.

It quickly became evident that the greatest challenge was developing a ‘big picture view’ of how to deal with the problem. This was not a single-factor problem that could easily be solved. Many good ideas were collected from the sessions but more work needs to be done before a useful conceptual model can be formed.

The groups were given the challenge of working out a strategy for developing a path forward towards unlocking the potential of brownfield sites.

I would like to thank everyone who participated in the Industry Summit and hope they found it a worthwhile event.

The next edition of *Remediation Australasia* will feature information from three of the morning presentations, pertaining to Australia, Asia and the United Kingdom. ■



Knowledge transfer in the United Kingdom

Paul Nathanail, University of Nottingham, UK

Sustainable urban land management involves innovative methods of construction and facilities management coupled with resource efficient and effective mitigation of legacy issues such as old structures and foundations or soil and groundwater contamination. Land contamination is a legacy of historic industrial processes and waste disposal activities.

Sustainable urban land management involves innovative methods of construction and facilities management coupled with resource efficient and effective mitigation of legacy issues such as old structures and foundations or soil and groundwater contamination. Land contamination is a legacy of historic industrial processes and waste disposal activities. It is both economically and ecologically unnecessary to remove all historic contamination. Instead an approach based on the assessment of the risks posed by such contamination and mitigation of unacceptable risks is becoming internationally accepted.

“Dissemination is fast and wide, but how do you know what is reliable information?”

Technologies to assist in ground characterisation and soil and groundwater remediation have been developed notably in the USA, Germany, Netherlands and UK. Mature policies and standards have been in place for both ongoing and new land uses in Western Europe, North America and Australia.

As a young student over 25 years ago, I took to heart the advice I received from one of the pioneers of plate tectonics: that a piece of research is never finished until it is published. Over the years I have come to realise that a further step is needed for that new knowledge to have an impact. ‘It takes 10 years’ for research to find its way into practice was what a John Hudson, Imperial College’s Professor of Rock Mechanics, told me 15 pre-WWW years ago. But today’s situation is different: Twitter, Facebook and even old fashioned email listservs mean dissemination is fast and wide, but how do you know what is reliable information?

For regular updates on UK contaminated land issues, join the contaminated land strategies JISC mail list at www.jiscmail.ac.uk (the digest option is probably most appropriate).

In the UK, non-governmental organisations like Contaminated

Land: Applications in Real Environments (CL:AIRE), Construction Industry Research and Information Association (CIRIA), the Association of Geotechnical and Geoenvironmental Specialists – the professional bodies/learned societies administering the Specialist in Land Condition qualification (www.silc.org.uk) and independents like r3 Environmental and my own LQM have developed a reputation for publishing authoritative technical guidance on remediation technologies and practice.

CIRIA kick started the process in 1995, with a sequence of technical guidance reports on remediation options appraisal and individual technologies that is still being added to. Over the years, CIRIA has published guidance on many aspects of contaminated land management. Its guidance on ground gases is definitive – even the British Standard bows to CIRIA’s guide on ground gas assessment.

CIRIA is a membership organisation that funds its



projects by subscriptions and sponsorship. In recent years, projects have only been awarded to member organisations.

CL:AIRE took the process a step further by partnering research and demonstration projects and offering an Organisation for Economic Cooperation and Development-like independent commentary on the project outcomes. These are published as non-technical bulletins and more detailed reports. CL:AIRE now has a well established reputation for the accessibility and impartiality of its reports. This body of knowledge has helped raise confidence in the various stakeholders involved in permitting, regulating and financing remediation resulting in, albeit slowly, growing take-up of process-based remediation strategies. Central to this has also been a series of technology-specific knowledge-transfer workshops covering the most applicable technologies to the UK (see table).

Topic	Comment
Options appraisal	Emphasises the need to understand the legal context and develop a conceptual site model to support identification of technically feasible and sustainable strategies
Monitored natural attenuation (MNA)	The baseline comparator for groundwater remediation
In-situ bioremediation (ISB)	For those sites where MNA is insufficient
In-situ chemical oxidation	The forgiving alternative to ISB
Permeable reactive barriers	The low energy alternative to pump-and-treat
Air sparging/soil vapour extraction	Includes pre-treatments such as electric resistive heating
Ex-situ bioremediation	Now routinely applied for hydrocarbon contaminated soils
Stabilisation/solidification	The dos and don'ts of physical stabilisation and chemical binding
Soil washing	Used on the 2012 sites to reduce volumes needing treatment or off-site disposal
Ex-situ thermal desorption	Cost-effective for large quantities of highly heterogenous highly contaminated materials; about to be used at the Avenue Coking Works





ACLCA Update

Andrew Kohlrusch and Ross McFarland, ACLCA

CL:AIRE with r3 was instrumental in raising awareness of and confidence in remediation technologies through the EU-funded Eurodemo and follow-on projects.

More recently another model – that of the Knowledge Transfer Network (KTN) – has emerged. The KTNs are specifically tasked with forging stronger links between industry and academia. The Environmental Sustainability KTN is tasked with identifying and fostering the plugging of gaps in our technological and scientific understanding of the space we inhabit. The KTN concept was initially hosted by the UK ministry for trade and industry – a sign of the importance placed on academia-industry collaboration for wealth generation. The KTN both provides intelligence to government on research and development priorities, and facilitates the creation of industry led consortia to carry out government co-funded research and development projects.

The professional bodies are spearheading initiatives to develop vocational skills development frameworks to both attract into and retain within the land condition industry the best minds. Eight professional bodies comprise the Specialist in Land Condition Professional and Technical Panel (SiLC PTP) (www.silc.org.uk). The SiLC PTP has developed a skills framework for practitioners to complement those developed by the Environment Agency and forthcoming from the Chartered Institute for Environmental Health for regulators. The framework will help both individuals and their employers' inventory skills, and identify gaps and formulate personal development plans to enhance skills, knowledge and experience in preparation for professional qualifications such as chartership and post-chartership SiLC status. Private and university providers already deliver much vocational training and education. However, the framework is anticipated to help them refine their provision to those areas the sector most needs. ■

Looking back over the past year there have been a number of interesting developments that have influenced the way in which remediation is being carried out in Australia.

The global financial crisis has been an important issue and continues to affect the ability of companies to be able to fund remediation and development of contaminated sites.

There have also been significant developments within the industry which have impacted on the way we do our business.

Asbestos guidelines

The introduction of the *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* has provided valuable guidance for the industry. The guidelines have given direction as to how the presence of asbestos can be assessed and managed in a more sustainable way rather than the traditional approach of dig and dump.

Sustainable remediation

Sustainable development and our role in the process has become an increasingly important topic of discussion. Understanding what it means in practical terms though can be challenging.

Industry stakeholders now have a greater understanding of the role of sustainable remediation through presentations made at Ecoforum, CleanUp 09 and by ACLCA and ALGA.

This includes greater understanding by stakeholders such as regulatory authorities of issues that should be taken

into account in promoting sustainable remediation. Of particular importance is the demonstration to all stakeholders the intergenerational benefits of sustainable remediation while not compromising the protection of human health and the environment.

Natural attenuation

ACLCA branches in New South Wales, Queensland and Victoria offered courses on monitored natural attenuation (MNA). These were presented by Todd Wiedemeier, one of the world's leading exponents of MNA.

These courses have greatly improved member awareness, understanding and skills in the use of monitored natural attenuation in managing contaminated groundwater.

Contaminated sites legislation – South Australia

The full commencement of the South Australian contaminated sites management legislation has been an important development this year. This has included the introduction of the site auditor scheme and the training of Auditors and Auditor Assistants in the fundamentals of the new scheme by the South Australian Environment Protection Authority (SA EPA).

The new legislation will increase the workload of SA EPA but will also lead to better outcomes in the management of contaminated land.

On behalf of all the consultants in ACLCA we wish everyone a safe and joyous time over the Christmas period. ■

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Remediation Australasia is a quarterly magazine produced by the Australian Remediation Industry Cluster (ARIC) for the Australasian remediation industry.

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The new ChemCentre

ChemCentre, a leading analytical chemistry group in Western Australia and CRC CARE participant, recently completed its relocation to new custom-built facilities.

ChemCentre, a leading analytical chemistry group in Western Australia and CRC CARE participant, recently completed its relocation to new custom-built facilities. The Resources and Chemistry Precinct, a multi-million dollar development in Bentley supported by BHP Billiton, is now home to both ChemCentre and Curtin University of Technology's Department of Chemistry.

For over 100 years, ChemCentre has provided chemical services to support and protect the community. An expanding staff base and instrument fleet, however, meant that its previous East Perth home of 65 years was no longer suitable.

The precinct represents an exciting development for ChemCentre, not only in terms of the purpose-built working spaces, but also the opportunity to collaborate with new partners, including Curtin and members of the Australian Minerals Research Centre, adjacent to the new precinct building.

The new facilities will increase workflow and improve ChemCentre's ability to customise analyses to meet specific client needs, with greater access to shared instrumentation and metal-free and sectioned laboratories to prevent cross contamination.

ChemCentre has developed a strong reputation in the detection and measurement of contaminants and particulates in a wide range of settings, with experience in environmental contamination and airshed monitoring.



Dr Neil Rothnie, Chief of Investigative Chemistry at ChemCentre believes the move to the precinct will see these scientific strengths translated into greater applications for the health, industry and environmental sectors.

“By joining the precinct, we join a wider scientific community with access to state-of-the-art instrumentation and science and engineering specialists who can establish a link between our methodology and industry needs,” said Dr Rothnie.

“The partnerships between industry, government, research and education groups within the precinct will result not only in stronger scientific outcomes, but also benefits for the wider community.”

Making the most of its new facilities and partners, ChemCentre is looking to expand its capabilities through direct collaboration. Examples include working with the petroleum sector for the monitoring of occupational exposure to a range of chemicals, and developing sampling strategies and data confidence levels for contaminated environments with environmental rehabilitation groups.

“Creating better sampling strategies and compiling these kinds of data will lead to better sampling design,” Dr Rothnie explained. “Ultimately, this leads to reduced cost for industry and greater certainty for regulators.” ■



Combating marine pollution

Marine pollution incidents such as the Montara oil spill off the Western Australian coast in the Timor Sea reminds us of the need for an adequate response by those concerned, their contractors and the role of the Australian Government in such instances.

The Australian Maritime Safety Authority manages the *National Plan To Combat Pollution Of The Sea By Oil And Other Noxious And Hazardous Substances*.

The plan provides a framework for state and territory governments, the shipping, oil, exploration and chemical industries, emergency services to respond to a marine pollution incident. ■

Selection of contractors for Department of Defence

The Department of Defence has a legacy of contaminated sites resulting from historical activities. It undertakes investigations and remediation of soil and water contamination across 3.4 million hectares of land comprising over 400 Defence properties around Australia.

To facilitate the remediation process, Defence maintains a multi-user list consisting of suitably qualified companies which can be used for restricted tendering. Established in March 2008, the list will operate for an initial three-year period with annual re-advertising to consider new applications and options for those already on the list to extend for a further two years.

Visit www.defence.gov.au/environment/contamination.htm or information on the multi-user list (This article has been prepared based on information from the website on 2 November 2009). ■

Tiny bubbles clean oil from water

Small amounts of oil leave a fluorescent sheen on polluted water. Oil sheen is hard to remove, even when the water is aerated with ozone or filtered through sand. Now, a University of Utah engineer has developed an inexpensive new method to remove oil sheen by repeatedly pressurising and depressurising ozone gas, creating microscopic bubbles that attack the oil so it can be removed by sand filters. ■



Export groups – expression of interest

We are interested in hearing from anybody who runs a small-to-medium sized company that is interested in exporting services and products to the Asian region. If there is sufficient interest Australian Remediation Industry Cluster (ARIC) will consider forming an export group to assist participants to enter the Asian market.

If you are interested in being part of an export group, send an email to aric@crccare.com providing contact details and the reasons why you are interested in participating. ■



Regulator Roundup

Tasmania

Joseph Tranter, Dept of Primary Industries, Parks, Water and Environment

The EPA in Tasmania has started issuing investigation notices (IN) to improve the management of contaminated land in Tasmania.

INs are issued to establish whether land is a contaminated site under the Tasmanian Environmental Management and Pollution Control Act (1994). They are registered on the subject land's title informing prospective purchasers of potential land pollution issues.

The main requirements of the INs are an assessment of the extent and magnitude of land and groundwater pollution; and determination of the health and environmental risks.

Consistent with the 'polluter pays' principle, the Director may serve an IN on any person believed to be responsible for causing the pollution. However, in some circumstances, an owner, occupier or person in charge of the land may be issued with the Investigation Notice.

If requirements of an IN are not complied with, the director can undertake the works required by the notice, and later recoup costs from the person responsible. In some cases this may include sale of the subject land.

The EPA director may also serve site management or remediation notices to require works be undertaken to address health or environmental risk associated with land pollution.

In Tasmania, land owners and occupiers are required to notify the director where they know or believe the land is likely to be a contaminated site.

Through a combination of notification and investigation requirements, the EPA is able to better track contaminated sites and help ensure that the risks associated with these sites are managed. ■

New South Wales

Niall Johnston, Department of Environment, Climate Change and Water

On 1 July 2009 amendments to the *Contaminated Land Management Act* (CLM Act) came into force to improve the management of contaminated sites in NSW.

A key amendment relates to removal of the concept 'significant risk of harm' as a trigger for reporting contaminated land to the Department of Environment, Climate Change and Water (DECCW) under section 60 of the CLM Act. The duty to report is now based on objective trigger values above which notification is required.

The new *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* set out the circumstances under which contamination must be reported including specifying the notification trigger values for soils, surface water and groundwater.

The guidelines were gazetted on 1 July 2009; however, reporting against the trigger levels did not commence until 1 December 2009 in order to give stakeholders time to determine those sites to report. Visit www.environment.nsw.gov.au/resources/clm/09438gldutycontclma.pdf for a copy of the updated guidelines.

The duty to report contamination applies to a person who has contaminated land or a landowner who 'ought reasonably to have been aware' of the contamination. Therefore, the new reporting obligation means that there is a positive duty to report and proactively investigate land to determine whether contamination is present.

Situations which are not intended to be captured by the duty to report include, amongst others, sites without offsite contamination where the onsite contamination is not likely to migrate to an adjacent property, where the onsite

contamination has been addressed by the planning process, sites with substances at or above the trigger levels but below or the same as the natural background levels, and sites that have already been notified to DECCW under the CLM Act where there has been no change in circumstances since the previous notification.

Worked examples to clarify the need to undertake assessment under certain scenarios to determine the duty to report are also detailed in the guidelines. ■

Victoria

Jo Stokes, Environment Protection Authority

The Victorian Government has established the HazWaste Fund to help industry reduce hazardous waste, recover energy and resources and save money.

Funding is available for industry, site owners and technology providers to invest in new technologies for the remediation of contaminated soils and for the reuse, recycling, reprocessing and recovery of hazardous waste.

The final funding round for 2009 runs from December 14 to 18.

For information about how to apply to the HazWaste Fund, visit www.epa.vic.gov.au/HazWasteFund or contact EPA Victoria on (03) 9695 2722.

EPA Victoria relocation

EPA has moved its CBD operations to 200 Victoria Street, Melbourne. The site was the former Carlton and United Breweries laboratory. It has been converted into sustainable office space with a number of sustainable initiatives including a trigeneration plant providing a highly efficient heating, cooling and power supply system, rainwater harvesting for flushing toilets and solar energy for heating water.

Visit www.epa.vic.gov.au/about_us/contact.asp for EPA's contact details. ■

SuRF Australia

CRC CARE launched an Australian chapter of Sustainable Remediation Forum (SuRF) at the Industry Summit at CleanUp 09 in September this year to progress the understanding of sustainable remediation.

CRC CARE launched an Australian chapter of SuRF at the Industry Summit at CleanUp 09 in September this year to progress the understanding of sustainable remediation. The Australian chapter will be coordinated by CRC CARE in collaboration with end users including Shell UK and US.

Sustainable remediation focuses on how we can carry out remediation whilst minimising the use of resources, production of wastes and impact on the environment.

It is widely agreed that regulation supporting broader sustainability goals, such as the reduction of resource consumption, efficient waste management, and the conservation and preservation of natural resources, is lacking in some international jurisdictions.

In Australia there has been a major focus by governments, industry and communities on sustainable development. A popular definition of sustainable development comes from the Brundtland report, *Our Common Future*: 'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'

A broader view of sustainability also takes into account all the other living organisms and is referred to as 'ecologically sustainable development'.

The Australia's *National Strategy for Ecologically Sustainable Development 1992* defines ecologically sustainable development as: 'using, conserving and enhancing the community's

resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.

There is growing recognition that we have to look beyond economic progress to achieve sustainable societies. This involves taking a long-term rather than short-term view when making decisions. Sustainable remediation therefore focuses on what role we can play in the remediation industry in contributing to these larger goals.

Two other forums are active in the US and the UK. These two groups have done a lot of work in advancing the understanding of sustainable remediation and what it means in practical terms for people working in the industry. This work provides a solid foundation for which the Australian chapter can build on.

The groups have produced several reports on incorporating sustainability principles into environmental remediation, culminating in the recently released publications:

- SURF – *Sustainable Remediation White Paper – Integrating Sustainable Principles, Practices, and Metrics Into Remediation Projects*
- SuRF UK – *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*

Issues relating to sustainable remediation have been discussed for many years and companies and regulators have already started incorporating sustainable strategies into their businesses.

The need for a greater focus on sustainable remediation to assist in this effort gained momentum with more in-depth debate recently at the Australian Land and Groundwater Association (ALGA) forums, Ecoforum 2009 and culminating in the launch of SuRF Australia at CleanUp 09.

After the launch at CleanUp 09, a meeting was held of interested groups, and a draft Australian framework for assessing the sustainability of soil and groundwater remediation was presented by Peter Nadebaum. The aim of the draft document is to stimulate debate and help people focus on what do we want to achieve.

SuRF Australia has now been established. It will evolve based on industry needs. To help people keep up to date with what is happening in SuRF Australia, CRC CARE has a dedicated section on their website.

The first objective of SuRF Australia is to refine the proposed Australian framework for assessing the sustainability of soil and groundwater remediation through a series of consultative workshops commencing next year. The Framework can be downloaded from the website.

As communities become more focused on sustainable development the need for the remediation industry to respond will increase. It is therefore important that industry participants play an active role in influencing the evolution of the process. ■



ALGA Update

Peter Nadebaum, Australian Land and Groundwater Association

Sustainable development is very important to our communities, particularly in this time of global warming and financial crisis. It is therefore important that we do not use resources unnecessarily and we gain the greatest return from the resources that we do use.

The Australian Land and Groundwater Association (ALGA) is continuing to expand its activities throughout Australia. Through its seminars and active involvement in key conferences it has been supporting the development of remediation in Australia and particularly the application of the principles of sustainability in land and groundwater management.

ALGA also works closely with other industry groups and is supporting the activities of CRC CARE, the Australian Remediation Industry Cluster and is heavily involved in organising EcoForum10, to be held in Sydney in February 2010.

Recent ALGA seminars

- Sustainable remediation and management of contaminated soil and groundwater (NSW, Queensland, South Australia and Victoria)
- Advances in soil treatment technologies (South Australia)
- New contaminated land legislation (NSW and South Australia)
- Improving the process of groundwater cleanup and its approval (Victoria)
- Improving the environmental audit system (Victoria)
- Practical remediation and landfill disposal in light of the very high landfill levies (Victoria)
- Remediation of sediments (NSW)

Sustainable remediation

In addition to the seminars being held on sustainable remediation, ALGA has made a significant contribution to the launch of SuRF Australia at Cleanup 09 through the preparation of a draft framework for sustainable remediation.

ALGA is represented on the SuRF Australia steering committee and will be promoting further workshops and discussions in the coming months on the draft Australian framework and how this should evolve to meet industry and community needs. ALGA is also networking with groups in other countries involved in encouraging the application of sustainability principles.

The publications and activities of SuRF Australia can be accessed through the CRC CARE website.

EcoForum10

With regard to EcoForum10, a very interesting program is being prepared, and information will soon be sent out. Because the conference follows Cleanup 09, EcoForum10 will build on issues raised at CleanUp 09 that are of particular importance to industry.

EcoForum10 includes sessions on:

- Remediation of contaminated sites – a summary and recap on the key innovations and methods from Cleanup 09 and their practical application in Australia
- A meeting of SURF Australia – to further discuss and develop an Australian Framework for sustainable remediation of soil and groundwater contamination, together with papers on the practice and experience relating to the

application of sustainability principles in soil and groundwater remediation.

- The NEPM review – discussion of key issues that are being considered for inclusion in the final documentation on the National Environment Protection (Assessment of Site Contamination) Measure.
- Soil and groundwater contamination – key issues and solutions including:
 - management of groundwater contamination: inconsistencies between states in the existing system and how we can achieve pragmatic solutions to groundwater problems
 - the audit system: improving the auditing system and achieving consistency between States
 - site management plans: achieving consistency in their formulation and use in managing residual contamination on sites proposed for use
 - asbestos: the status of the latest guidelines and confirmation of the basis for signing off that asbestos sites are suitable for use
 - clean up criteria for hydrocarbon contaminated sites and the current basis for accepting that volatiles do not pose an unacceptable risk to future use of the site: how do we overcome the uncertainty and shortcomings of modelling soil volatiles?

I encourage you to join the association and to participate in the development and advancement of the contaminated land and groundwater industry. ■

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