Australia
New Developments in Contaminated Land and Groundwater Management and Remediation

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Overview of the Australian System

• Risk-based approach – protect only what is necessary

• Protect relevant “beneficial uses” of land and groundwater
  • Health, ecological, aesthetic, food production

• Protect specific land uses
  • Residential (low/high density), recreation (parks), commercial, industrial

• Protect specific groundwater uses
  • Drinking, irrigation, stock, etc – depends on salinity

• Generally aligned with World Health Organisation (toxicology)

Australian regulatory system

- Driven by the State environmental agencies
  - Weak link with other agencies (town planning, health, agriculture, OH&S)
- Federal and state
  - Federal – guidance on assessment but not management/remediation (the “NEPM”)
- State
  - States regulate
  - Each has State legislation, regulations and guidelines
- Private sector
  - Manage, remediate, certify (auditing system)

Current situation in Australia

• Legislation and guidelines
  • Evolved over 20 years, reasonably well established
  • System is working
    ∼ thousand sites are cleaned up and certified each year
  • flexible – allows for variety of solutions
  • little litigation
  • regulatory agencies: the regulators/administrators
  • private sector: implements, remediates, certifies (independent)
Independent audit system

• State EPA accredits “Environmental Auditors” (not companies) from private sector
• The auditors assess the work of consultants and certify that land is suitable for a proposed use

Successful system:
• Has been in operation for nearly 20 years, thousands of sites certified
• Rigorous system because auditors can be personally liable
• Accepted by all parties
• Almost no litigation
• Shifts cost, liability and staffing requirements to private sector
• Provides for “independent review” when problems arise – easier for regulatory agency
• Can provide for rapid certification

Guidelines on the Victorian audit system (for example):
Community concern

- Regulatory system accepted by community, industry, banks
- Generally little concern by community
- Only large sites or serious contamination issues are subject to formal community consultation program

- Influence of interest groups
  - Very strong where involved
  - Very difficult to develop a new landfill (→ zero waste/levy)
  - Can lead to anomalous outcomes
  - Recent move by government to litigate for costs where activism is based on spurious claims
    - prompted by >100 million € additional costs for recent project
Current situation, cont’d

• National guidelines for assessment (“NEPM”)
  • Comprehensive review under way (complete next year)
  • More complete set of “Investigation Levels”
    • Health (HILs) and ecological (EILs)
    • Include volatiles
  • Major thrust
    • Broaden
    • Address issues, reflect current knowledge
    • Avoid unnecessary conservatism
    • Sustainability – new – coming

Information on the current review of the NEPM and issues being addressed:
Issue - conservatism

• Community has a fear of hazardous wastes/chemicals
• Our community typically spends
  • 30,000 € per life saved for breast cancer screening, traffic lights
  • 30 million € per life saved for land contamination
  • Community views these risks 1000 fold higher

• Global financial crisis, global warming/energy use/resource use

• Major push to avoid unnecessary conservatism
  • Ensure new NEPM guidelines are not overly conservative
    eg benzene in soil under buildings: > 3 mg/kg not 0.3 mg/kg
  • Principles of sustainability being considered

Introducing principles of sustainability

- “Ecological Sustainable Development” – in place for many years
  ≈ Environment protection (not social/economic/environment)
- “Sustainable Development”
  Yes - town planning, No - contamination management
- “Sustainable management and remediation” – recent (2 years)
- SuRF Australia
  - Launch September 2009
  - Draft framework (drawn from UK)
  - Achieve a balance
    Implies not a fixed endpoint!

Reference: proceedings of Cleanup09, September 2009, Adelaide (shortly available)
Sustainability cont’d

• Important issue:
  Is the remediation endpoint fixed?

• What is the remediation endpoint?
  Is containment and long term administrative control acceptable?
  (can offer lowest energy/resource consumption)

• In some States – encouraged; some - discouraged
  Depends on strength and reliability of administrative controls

• Proposal – assessment of future risk to determine acceptability
  likelihood x consequence = risk
NEPM issue – human health/ecological risk assessment

- Private sector assesses and signs off results
- Regulatory agencies cautious – lack of consistency and lack of agreement on basis/assumptions
- Review will provide more certainty

- Major program to develop health based investigation levels for petroleum hydrocarbons
- Some issues:
  - Risk level (cancer: 1 in 100,000 default (not 1 in 1 million))
  - Draw on international knowledge and approaches eg criteria for soil/soil gas
NEPM issue - Health-based levels for volatile hydrocarbons

- Guidelines developed for hydrocarbons (draft)
  - Health-based guidelines ≈ clean up criteria
    - Australia – no provision for accepting higher concentrations

- Soil, groundwater, vapour - direct exposure, volatiles
- Various soil types, depths

Issues:
- Importance of soil properties (moisture)
- Inability to predict soil vapour from soil concentrations
  - generally over-predicts by 10 – 1000 fold

Reference: proceedings of Cleanup09, September 2009, Adelaide (shortly available)
Proposed approach (eg for benzene):

- Hierarchy/preference:
  Soil vapour > groundwater prediction > soil prediction
  (most reliable) → (least reliable)

- Prefer direct measurement of soil vapour where possible
  But: remediation/future development – soil gas not representative

- Soil prediction: adjustment factor of 10 to account for conservatism
- Biodegradation: yes
  - Where air ingress: 10 – 100 fold reduction in vapour
Risk-based audits

- Extension to Victorian statutory audit system (Section 53V of EPAct)
- Audit to assess risks of contamination to beneficial uses
  
  Likelihood x consequence = risk
- Not certifying suitability of land for a use

Advantages:
- Informs EPA of the risks and allows EPA to make a decision whether to require further action
- Avoids the need for strict compliance
- Can focus on particular issues (eg groundwater impact on a river)
- Can take uncertainty into account – does not require full understanding
  
  Allows judgment – can be used to direct priority for further investigation to important issues
- Can be used to assess sustainability options

### Applications of risk-based audits - examples

<table>
<thead>
<tr>
<th>Example</th>
<th>Decision being informed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contaminants in fill on industrial precinct leaching into a river (arsenic, copper, ammonia, phosphate)</td>
<td>Does it pose an unacceptable risk to fish and fishing?</td>
</tr>
<tr>
<td>Landfill leachate impacts on groundwater (all landfills in the State)</td>
<td>Are there landfills with unacceptable risks?</td>
</tr>
<tr>
<td>Landfill gas (all landfills in the State)</td>
<td>Are there landfills with unacceptable risks?</td>
</tr>
<tr>
<td>Soil and groundwater contamination at an oil refinery</td>
<td>Is the contamination being adequately managed?</td>
</tr>
<tr>
<td>Soil and groundwater contamination at a gasworks</td>
<td>Can the gasworks continue to be used as a heritage park?</td>
</tr>
</tbody>
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Containment of contamination on sites

- CRC CARE is currently developing a set of guidelines as to how to assess the acceptability of contamination containment
- Builds on the risk-based audit approach
- Framework and approach has been developed and applied to several case examples
- Expect draft report later this month
- Should have relevance to assessing sustainability options.