CONTAMINATED SITE MANAGEMENT

Chris Bailey, Tonkin & Taylor Ltd
OVERVIEW

• What is site management?
• Inputs
• Understanding of risk
• Presumptive remedies
• Options for management of soil contamination
• Options for management of groundwater contamination
• Management plans – RAPs and OMMPs
• Conclusions and references
WHAT IS CONTAMINATED SITE MANAGEMENT?

• “The fundamental goal of ...site management ...must be to render the site acceptable and safe for the long term.”

• NZ framework is risk-based and allows flexibility in planning and implementing a site management strategy.

• Nevertheless, RMA and rules aim for consistent outcomes, i.e. de minimis /no unacceptable risks.
INPUTS

A range of inputs guide site owner/operator decisions on site management:

- **Feasibility**
- Risk acceptance profile for company/project/personal: conservative or otherwise
- What are risks posed by contamination: perceived/actual
- Ongoing liability
- Marketability
- Sustainability
- Viewpoints of other stakeholders
IS IT COMPLICATED?

• For many sites, especially those with significant contamination, it can be a complicated matter!
• Decisions on management of soil and groundwater contamination are required for a wide range of situations.
• What is feasible? Is study required?
• There are horses for courses, and the site management practices adopted need to be commensurate with the level of risk posed.
MANAGEMENT REQUIREMENTS DEPEND ON RISK

• Management developed from detailed understanding of risks
• Risk understanding from CSM and comparison of investigation data with NES SCS or other criteria from industry guidelines
• Investigations staged to avoid unnecessary expense and this means that understanding of risk is progressive.
• Assessors can often only conclude that the contamination at the site presents a potential for risk and that further investigation is required out to better quantify risk.
• Effort expended to better quantify risks can be well spent in the context of often expensive remedial options which may address potential but not actual risks.
High Density Residential
WIDE VARIETY OF SITES

- The level of risk posed can range from
- Low:
  - Example: Investigation may indicate soil concentrations above background but below SCS. Earthworks above PA limits requires NES consent (and potentially a regional authority consent). Levels don’t pose human health risk but may require management if removed from site – e.g. **disposal to authorised facility**.
- To high:
  - Example: Investigation indicates very high levels of contamination such that workers including investigators require carefully considered personal protection equipment (see H&S Guidelines on the Cleanup of Contaminated Sites). Site may require emergency works to mitigate a potential acute health risk) e.g. petroleum vapours accumulating at potentially explosive levels in residential land use zone.
NZ PRESUMPTIVE REMEDIES

• Historically, presumptive remedy for
  • Soil is excavation and removal to landfill (dig and dump)
  • Groundwater is natural attenuation.
• Management often undertaken during site re-development (as accommodated by the NES).
SOIL OPTIONS - DIG AND DUMP

- Addresses all exposure pathways
- Often economical and relatively easy to consent
- Can provide most assurance that contamination has been addressed
SOIL OPTIONS - CAPPING

- Removes ingestion and dermal pathways
- Often economical
- Long-term management cap required
- Consenting acceptable
SOIL OPTIONS – VAPOUR BARRIER

- Addresses ingestion, dermal and inhalation pathways
- More expensive
- Long-term monitoring required
- Should be implemented with extraction system
SOIL OPTIONS - STABILISATION

• Usually with cement
• Niche is reducing potential for heavy contamination to pollute groundwater
• Sometimes required for landfill acceptance to reduce leachability
• More work to consent, including feasibility
SOIL OPTIONS – SOIL VAPOUR EXTRACTION

- Removes volatile components of soil contamination or promote biodegradation (bioventing)
- Requires vapour treatment and air discharge consent
- More expensive
- Often implemented in conjunction with other technologies, e.g. sparging, pump and treat
SOIL OPTIONS – OTHERS

- Bioremediation
- Thermal desorption
- Mechano-Chemical Dehalogenation (MCD)
GROUNDWATER OPTIONS - NATURAL ATTENUATION

- Organic and inorganic contaminants
- Long-term solution requires ongoing monitoring
- Less expensive
GROUNDWATER OPTIONS – PUMP AND TREAT

- Pump and treat - containment
- Can be enhanced with vacuum
- Expensive
- Requires ongoing operation, maintenance and monitoring
GROUNDWATER OPTIONS - OTHERS

- Passive/active skimming (LNAPL)
- Permeable reactive barriers (PRB)
- In-situ Chemical Oxidation (ISCO)
- Bioremediation
MANAGEMENT PLAN REPORT CONTENTS

- Vary in accordance with the complexity of the proposed management.
- Presented in Remedial Action Plan (RAP) or Ongoing Monitoring and Management Plan or both.
- RAPs contain:
  - Remediation goals (e.g. SCSs)
  - Describe method of how the goals are to be achieved
  - Establish monitoring requirements to ensure no unacceptable risks during the works and to understand success towards the goals
  - H&S requirements etc.
  - Permits and approvals to carry out the works
  - Responsibilities
- Ongoing Monitoring and Management Plans contain:
  - Proposed monitoring strategy
  - Trigger levels and contingency plan
  - Responsibilities
SITE MANAGEMENT IN CONCLUSION

• Solution highly dependent on risks, and:
  • Technical, logistical and financial considerations
  • Examination of alternatives
  • Development goals
  • Stakeholder requirements
• Strategy needs to meet NES and regional authority requirements and CL reporting requirements
GUIDANCE

- NZ:
  - CLM guidelines No 1 – Reporting on Contaminated Sites in New Zealand (Revised 2011). Section 2.3 provides a one page overview of what a Remedial Action Plan should contain.

- Australia: Soil Remediation Technologies in Victoria IWRG622


- H&S Guidelines on the Cleanup of Contaminated Sites, Department of Labour 1994