Acute Risks

Health Risks from Short-term Exposure to Soil Contamination

UPDATE

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SoBRA
The Society of Brownfield Risk Assessment

Contents

- Acute vs chronic risks
- Proposed methodologies for deriving GAC for short-term exposure
- Acute risk scenarios considered

Why consider acute?

- Most human health risk assessments focus on chronic risks arising from long-term exposure to specific substances
  - E.g. CLEA model compares average daily exposure, averaged over long duration (one or more years), with health based guidance value for chronic health effects
- In some cases averaging infrequent exposure over a long period or using average exposure to apply to a large area make acute risks more significant that chronic risks
  - Or assessment of “hotspots” or localised areas?
  - Eg. risks to Construction workers?

Acute GAC sub-group

- Objectives:
  - Develop methodology to derive generic assessment criteria protective of acute health effects from short-term exposure (AGAC) for various acute exposure scenarios
  - Test methodology on example contaminants

- Participants:
  - Barry Mitcheson (Jacobs) – subgroup manager
  - Simon Firth (Firth Consultants) – Executive Committee champion
  - Tim Rolfe (AECOM)
  - Gareth Wills (PB)
  - Nattalie Kennedy (St Helens Council)
  - Sarah Bull (ERM)
  - Mike Quint (Environmental Health Sciences)
  - Steven McMullen (PB)
  - Lauren Boydell (Jacobs)
  - Geoff Hood (Jacobs)
  - Sarah Dack (Public Health England)

Overview of methodology

- Subgroup has developed methodology to derive Acute Generic Assessment Criteria (AGAC) for contaminants in soil
- AGAC intended to be used as part of Generic Quantitative Risk Assessment (GQRA) and represent the soil concentrations below which acute risks to human health are acceptable
- Algorithms have been developed to calculate AGAC for various short-term exposure scenarios
- Overall approach to derivation of AGAC:
  - Step 1: Toxicity screening - which exposure scenarios could be of potential concern for the contaminant
  - Step 2: Collation and selection of relevant acute toxicity reference values
  - Step 3: Use of relevant algorithms to calculate AGAC
  - Step 4: Sense check AGAC

Definitions and discussion

Lots of one-off assessment have been made but currently there is no agreed methodology or standardisation of parameters.

- **What timescale is acute?**

We have chosen one-off dose, a single day or a half hour period trial pitting

- **What level of harm should be considered?**

Based on hazard statements

- harmful and toxic?
- what about odours?

- **Occupational exposure versus exposure by general public?**

Screening of substances

Consider using hazards codes

Ingestion

- H300: Fatal if swallowed
- H301: Toxic if swallowed
- H302: Harmful if swallowed
- H303: May be harmful if swallowed
- H304: May be fatal if swallowed and enters airways
- H305: May be harmful if swallowed and enters airways

Dermal contact

- H310: Fatal in contact with skin
- H311: Toxic in contact with skin
- H312: Harmful in contact with skin
- H313: May be harmful in contact with skin
- H314: Causes severe skin burns and eye damage
- H315: Causes skin irritation
- H316: Causes mild skin irritation
- H317: May cause an allergic skin reaction

Inhalation

- H330: Fatal if inhaled
- H331: Toxic if inhaled
- H332: Harmful if inhaled
- H333: May be harmful if inhaled
- H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled
- H335: May cause respiratory irritation
- H336: May cause drowsiness or dizziness

This is complex particularly for metals (e.g. what form is arsenic in?)

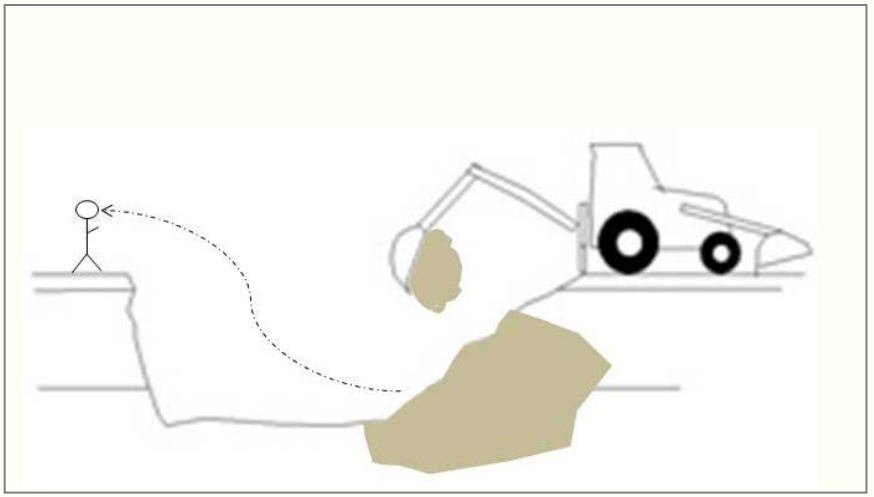
Currently considering a reasonable worst case substance approach (as used for waste)

Acute risk scenarios considered

- Oral exposure
  - Child resident/trespasser - ingests single bolus of soil (soil pica)
  - Adult worker (e.g. ground worker) – incidental ingestion of soil (via hand to mouth contact, smoking, eating, biting nails etc.) over an 8hr shift
- Dermal exposure
  - Child resident/trespasser – soil on skin for up to a few hours
  - Adult worker (e.g. ground worker) – soil on skin for up to a few hours

Acute risk scenarios considered

- Inhalation exposure
  - Member of public – inhalation of dust/vapours released during excavation from near-by site
  - Adult worker (e.g. ground worker) – inhalation of dust/vapours released during excavation



Reference Concentrations in Air for Acute Exposure

- Worker scenario
  - Workplace exposure limits (WELs) – EH40/2005
  - Use short-term limit (15 minute exposure) where available
  - If not, EH40 recommends use of 3 x long-term exposure limit
- Child scenario (member of public)
  - Acute exposure guideline levels (AEGLs)
    - AEGL1 – Receptor could experience notable discomfort, irritation – reversible effects
    - AEGL2 – Irreversible or other serious long-lasting adverse health effects
    - AEGL3 – Risk of death

Caveats

- **Fire and explosion** - The methodology is based on health risks not the acute effects arising from explosive or fire risks.
- **Odour effects** - In some cases odours themselves can lead to effects such as headaches and nausea etc. These are not specifically assessed in the current methodology.
- **Complex pathways** – eg. Migration of vapours into building following a storm event (similar to methane)
- **Free product** - The assessment is focussed on soil bound substances not free product which can be have quite differently (and for instance can lead to skin damage due to defatting the skin)
- **Legal duties** - Irrespective of the results of the acute risk assessment users should remain aware of their duties to ensure that the compliance (e.g. Control of lead and Works act or asbestos regs.) and the need to minimise risk under the health and safety legislation.
- **Verification** – The use of the AGAC should not replace monitoring to confirm the risks.

Current Status and Next steps

Initial draft report drafted

Worked examples for

- arsenic, cadmium, chromium, cyanide, benzene, phenol, trichloroethene and vinyl chloride

Note: We attempted criteria for lead but this requires a different approach

- Report and Calculations reviews
- Finalise report
- Publish SoBRA report

Thanks for listening