Contaminated Land and Spoil Management

• EES Chapter 20
• Appendix Q:
  – Phase 1 – baseline assessment.
  – Phase 2 – risk assessment.
  – Phase 3 – initial impact assessment.
  – Phase 4 – performance measures.
• Supporting site investigations:
  – Stage 1 Investigation completed in 2011.
  – Stage 2 Investigation: this was completed by Golder in 2012 and then refreshed as part of the Melbourne Metro project in 2015.
  – Stage 3 - Concept Design Investigation: completed by Golder in 2015.
The post EES site investigations

• Stage 4 - Further investigations: completed by Golder recently
  – The additional data has provided an increased level of confidence in the estimation of the waste volumes and categorisation;
  – The additional data has provided an increased level of confidence in the assessment of risks and requirements for mitigation from contaminated soil, groundwater, vapour and ground gases;
  – There are no changes to the identified risks;
  – There are no changes to the Environmental Performance Requirements (EPRs) as presented in the EES;
    • Consider some cross referencing between the groundwater and contaminated land / spoil EPRs (see last slide for suggested amendment)
  – The further works undertaken support the findings of the EES and do not result in any changes to the findings or opinions expressed in the EES.
Supporting Investigations scope (final)

- Site history (planning, aerial photos, public information)
  - Potential contaminated land impacts identified

- Boreholes and samples:
  - Approximately 250 boreholes have been drilled
  - Approximately 100 groundwater wells installed and sampled

- Acid sulfate soil and rock
  - Approximately 450 samples tested for acid rock properties
  - Approximately 20 kinetic leach tests have been completed / continue

- Spoil description and classification
  - Approximately 1,200 Fill / soil / rock samples tested for various contaminants of concern.
  - Sampling density is around one sample per 300m$^3$ and 500 m$^3$
  - Naturally enriched chemicals (fluoride and metals) in soil and rock have been assessed

- Other work
  - Soil gas investigations have been completed at Western portal / Arden / South of the Yarra River
  - Specific investigations competed at Printworks in Arden
Spoil Management

- Further testing has clarified the following high case estimate of in-situ waste volumes:
  - About 2M m$^3$ of material will be produced during the works
  - About 130,000 m$^3$ of prescribed industrial waste
  - About 50,000 m$^3$ of waste acid sulfate soil
  - About 570,000 m$^3$ of waste acid sulfate rock
  - About 1,280,000 m$^3$ of “clean fill”

- The spoil can be accommodated (re-used or disposed of) within existing waste management facilities in Greater Melbourne

- Prescribed industrial waste:
  - Conservatively estimated as Cat C (~72%), Cat B / A (~28%)
  - Asbestos has been identified in some of the Fill samples

- Waste acid sulfate soil (WASS)
  - Acid sulfate rock tends to be more prevalent 24m below ground level
  - EMP will be required to manage WASS
  - Long term kinetic leach test results have been completed on the Silurian Melbourne formation

- Clean Fill
  - Natural enrichment in soil and rock: fluoride - within the Melbourne Formation; arsenic - within the Brighton Group; nickel - within the Older Volcanics
Contaminated Land

• Findings:
  – Variable land use history with many potential sources of contamination identified within a 500m buffer of the project route
  – Route is characterised by a variable fill layer to be encountered anywhere that excavations start at ground level
  – Deepest fill layers at Arden
  – Only one specific “contaminative land use” identified on a segment of the route where excavation will occur (Printworks over Arden Station)
  – The two portals are within the general environs of railway land

• Conclusions:
  – Only limited exceedences noted in the guidelines
  – Soil leaching to groundwater determined not an issue
Contaminated Groundwater

• Findings:
  – Twenty-eight EPA Groundwater Quality Restricted Use Zones (GQRUZs) were identified within approximately one (1) km of the project boundary (two within the project boundary)
  – Groundwater quality beneath the project area is generally poor with high salt loads and often contaminated with various heavy metals (such as barium, boron, iron, manganese, nickel) and other inorganics (such as nitrate and ammonia)
  – Low levels of volatile organic compounds in groundwater in the Parkville to CBD North segment and near Fawkner Park
  – Potential issue recognised at CBD North associated with a plume of trichloroethylene originating from the former CUB site to the north. On-going investigations will provide additional data to further inform the understanding of the nature and extent of groundwater contamination and what mitigation options should be implemented

• Conclusions:
  – Man-made point sources of localised groundwater contamination across the alignment may be encountered such that management may be required, especially if overlapping with groundwater drawdown zones
Soil Gas and Vapour

• Findings:
  – The presence of naturally formed methane confirmed at Arden and just south of the Yarra associated with Coode Island Silt
  – Soil vapours found in shallow soils at Arden in the Fill
  – Soil vapours around the water table in the Coode Island Silt just south of the Yarra.
  – Potential for vapours from volatile organic compounds in the groundwater

• Conclusions:
  – Gases are unlikely to present an on-going risk to sensitive receptors
  – Additional investigation works are currently being planned in the area of the former CUB site to further evaluate the potential vapour risks to sensitive receptors associated with groundwater
Summary

• Large volumes of contaminated and clean spoil will require to be handled and managed.
  – Non-natural contaminated spoil (fill), particularly at the western portal, eastern portal and Arden station sites and throughout the CBD where there has been a long history of potentially contaminating land use activities
  – Naturally occurring, potentially acid sulfate soil associated with the presence of specific geological formations such as Coode Island Silt
  – Naturally occurring, potentially acid sulfate rock associated with the Silurian Melbourne Formation siltstones, which is prevalent along most of the alignment
  – Natural clean fill

• Interception of contaminated groundwater and / or vapour in the immediate vicinity of the project boundary is possible during construction
Environmental Performance Requirements (EPRs)

- Four EPRs were defined:
  - C1 - Spoil Management
  - C2 – Acid sulfate soil and rock management
  - C3 – Contaminated land / groundwater / gas / vapours (with suggested amendment – next slide)
  - C4 – Health and safety

- Key themes:
  - Compliance with Regulations
  - Management plans to be prepared
  - Some further assessment needed and if required
    - Risk assessment
    - Remedial optioneering
    - Mitigation measure design and implementation
Suggested amendment to EPR C3

Prior to construction of main works or shafts, undertake a remedial options assessment (ROA) for contaminated land. The assessment must:

• Consider the outcomes of further investigations including the appropriate groundwater investigations and modelling required in GW1, GW2, GW3 and GW5)

• Interpret of groundwater permeation and VOC result

• Present and take account of the outcomes of risk assessments

• If required, identify remedial options in accordance with relevant regulations, standards and best practice guidance and to the satisfaction of EPA.

If required, as an outcome of the ROA, prepare a remedial action plan and integrate the remediation approach into the design in accordance with relevant regulations, standards and best practice guidance and to the satisfaction of EPA.
Thank you