Advice from: Craig Barker
Date of response: 5 September 2019

This advice is in response to request: Following the completion of expert evidence in your area of expertise, provide a brief final report to the IAC no later than five days before closing of the Hearing which complies with the PPV Practice Note – Expert Evidence and sets out:

a. any changes of opinion since your interim report (if any) and the reason for that change in opinion; and

b. your opinion on the latest version of the Proponent’s proposed approval documents (if any) and any other party’s suggested changes to the approval documents.

List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AECOM</td>
<td>Consulting company</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian Height Datum</td>
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<tr>
<td>ANZECC</td>
<td>Australian and New Zealand Environment and Conservation Council</td>
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<tr>
<td>ARMCANZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
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<tr>
<td>AS</td>
<td>Australian Standard</td>
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<tr>
<td>ASS</td>
<td>Acid sulfate soil</td>
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<tr>
<td>BOM</td>
<td>Australian Bureau of Meteorology</td>
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<tr>
<td>Coffey</td>
<td>Consulting company</td>
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<tr>
<td>DELWP</td>
<td>Victorian Department of Environment, Land, Water and Planning</td>
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<tr>
<td>EES</td>
<td>Environmental Effects Statement</td>
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<tr>
<td>EPA</td>
<td>Environment Protection Authority - Victoria</td>
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<td>EPR</td>
<td>Environmental Performance Requirement</td>
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<td>FH</td>
<td>Angle taken from the horizontal plane</td>
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<td>GDE</td>
<td>Groundwater Dependent Ecosystem</td>
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<tr>
<td>GHD</td>
<td>Consulting company</td>
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<tr>
<td>GIS</td>
<td>Geographical Information System</td>
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<td>GW</td>
<td>Groundwater</td>
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<tr>
<td>Haack</td>
<td>Water leakage class rating devised by Dr. A. Haack (1991)</td>
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<tr>
<td>IREA</td>
<td>Independent Reviewer and Environmental Auditor</td>
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<tr>
<td>IAC</td>
<td>Inquiry and Advisory Committee (for the North East Link Project)</td>
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<tr>
<td>ISO</td>
<td>International Standards Organisation</td>
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<td>Kh</td>
<td>Hydraulic conductivity (horizontal plane)</td>
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<tr>
<td>km</td>
<td>Kilometres</td>
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<tr>
<td>Ks</td>
<td>Hydraulic conductivity (vertical plane)</td>
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<tr>
<td>L/sec</td>
<td>Litres per second</td>
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<tr>
<td>LIDAR</td>
<td>Light Detection and ranging - remote sensing method</td>
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<tr>
<td>m</td>
<td>Metres</td>
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<tr>
<td>m/day</td>
<td>Meters per day</td>
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<tr>
<td>m²</td>
<td>Squared metres</td>
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<tr>
<td>m³</td>
<td>Cubic metres</td>
</tr>
<tr>
<td>MODFLOW-USG</td>
<td>Unstructured Grid Version of MODFLOW</td>
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<tr>
<td>MMRRT</td>
<td>Melbourne Metropolitan Rail Tunnel</td>
</tr>
<tr>
<td>MRI</td>
<td>Manningham Road Interchange</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<td>--------------</td>
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<tr>
<td>mya</td>
<td>Million years ago</td>
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<tr>
<td>NELP</td>
<td>North East Link Project</td>
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<tr>
<td>NEPC</td>
<td>National Environment Protection Council</td>
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<td>NEPM</td>
<td>National Environment Protection Measures 1999/2013</td>
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<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council</td>
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<tr>
<td>NZ</td>
<td>New Zealand</td>
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<tr>
<td>PASS</td>
<td>Potentially acid sulfate soils</td>
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<tr>
<td>PFAS</td>
<td>Per- and poly-fluoroalkyl substances</td>
</tr>
<tr>
<td>SCM</td>
<td>Site Conceptual Model</td>
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<tr>
<td>SEM</td>
<td>Sequentially mined excavation</td>
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<tr>
<td>SEPP</td>
<td>State Environment Protection Policy</td>
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<tr>
<td>SON</td>
<td>State Observation Network</td>
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<tr>
<td>SRMS</td>
<td>Scaled Root Mean Squared</td>
</tr>
<tr>
<td>SWL</td>
<td>Standing water level (applies to both groundwater and surface water)</td>
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<tr>
<td>TDS</td>
<td>Total dissolved solids</td>
</tr>
<tr>
<td>TBM</td>
<td>Tunnel boring machine</td>
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</tbody>
</table>
1 Response to Practice Note Information

(i) Name of expert.
Craig Stephen Barker, 11 Glen View Close, Diamond Creek, Victoria, 3089

(ii) Expert’s qualifications and experience.
B. Eng. (Honours), Civil Eng., M. Eng. Stud., Geotech. Eng., FIEAust CPEng NER APEC Engineer
IntPE(Aus)) - Civil College, NER, No: 100466, RPEQ; and
Statutory Environmental Auditor (Contaminated Land) – Victoria (appointed pursuant to the

(iii) The expert’s area of expertise to make the report.
Currently work in my own private engineering consultancy firm, which conducts
geotechnical investigations, groundwater investigations and contaminated land
investigations. I have 35 years of private consulting experience across land contamination
investigation and remediation, civil engineering and geotechnical projects.

As a current Statutory EPA Environmental Auditor within the State of Victoria and having
been previously, a Statutory Environmental Auditor within the State of South Australia, I
routinely deal with complicated contaminated land and excavation spoil management
issues.

Planning Panels Victoria Sessional Member role across the disciplines of: Ground Movement,
Groundwater, Surface Water, Contaminated Land and Spoil Management and Air Quality for
the Melbourne Metropolitan Rail Tunnel EES (2017) and Victorian Level Crossings Removal
Project – Bonbeach and Edithvale Rail Stations (2018).

I have a Masters of Geotechnical Engineering Studies from Sydney University.

I am a Fellow with the Institution of Engineers Australia and a Member of the Australian
Geomechanics Society.

(iv) Any other significant contributors to the report and where necessary outlining
their expertise.
There were no other contributors.

(v) All instructions that define the scope of the report (original and supplementary
and whether in writing or oral).
IAC request to prepare this report on contaminated land and spoil management issues, as
per letter of 14 May 2019.
(vi) The identity of the person who carried out any tests or experiments upon which
the expert has relied on and the qualifications of that person.

None.

(vii) The facts, matters and all assumptions upon which the report proceeds.

- The North East Link Project (NELP) Environment Effects Statement (EES);
- Expert Witness Reports;
- Written Submissions to the EES;
- Information meeting attendance with applicable NELP technical and planning staff in
relation to cross-related Groundwater aspects held on 9 July 2019 at NELP Offices,
Melbourne;
- Arranged bus tour of proposed Tunnel Alignment as arranged through NELP, dated
12 July 2019;
- Groundwater Conclave Attendance on 26 July 2019;
- Hearing Attendance across the following dates:
  - 21 June 2019 – Directions;
  - 25 July 2019 – Day 1;
  - 5 August 2019 – Day 8;
  - 8 August 2019 – Day 11; and

(viii) Reference to those documents and other materials the expert has been instructed
to consider or take into account in preparing his or her report, and the literature
or other material used in making the report.

- NELP EES Summary Report
- NELP EES Main Report Volumes – Chapters 1 to 28
- NELP EES Technical Report O – Contaminated Soil
- NELP EES Spoil Management Strategy
- NELP EES Attachment III Risk Report
- NELP EES Attachment IV Stakeholder Consultation Report
- NELP EES Attachment V Planning Scheme Amendment
- NELP EES Attachment VI Works Approval
- NELP EES Map Book
- NELP Environmental Performance Requirements (EPRs) for the project
• Expert Witness Statements:
• Public Submissions to the EES
• Australian Standards (see detail in References Listed Below).

References


29. EPA Victoria (2015), Publication 788.3, Best Practice Environmental Management (BPEM) Siting, Design, Operation and Rehabilitation of Landfills, August 2015.


32. Department of Environment and Primary Industries, Groundwater resource reports.


(ix) A summary of the opinion or opinions of the expert.

In reviewing the EES documentation as outlined under Point (viii), I have formed the following opinions:

- There has been, generally, a suitable process of planning, stakeholder engagement and cross referrals to controlling legislation and guidance in addressing the objectives;

- There has been a suitable construction of a Site Conceptual Model across the project area and surrounds, where it recognised that the EES is framed around a set of
preliminary and as-available information, where project EPRs will continue to address uncertainties and data-gaps;

- The intrusive investigations (soil, groundwater, soil vapour, landfill ground gas, acid forming materials) placed across the project area to-date have helped to better inform the EES;

- Further, targeted and extensive intrusive investigations of subsurface media (soil, groundwater soil vapour or ground gas) will be required particularly around:
  - All former landfills as identified through the project area (LFG, asbestos and odour exposure risk);
  - Areas of either previous or current underground fuel storage (i.e., petroleum hydrocarbons);
  - Areas related to past or existing dry-cleaning facilities, or those industries dealing with chemical solvents (i.e., vehicle spray painting); and
  - For Bulleen Drive-in site and general Bulleen Industrial Precinct (particularly with respect to petroleum hydrocarbons and PAFS);

- The Risk Assessment process as adopted has been generally suitable;

- Studies across the potential of acid-form waste materials with tunnelling spoil has been suitably assessed at this preliminary project stage;

- The strategy for handling tunnel spoil is suitable and works to EPA key guidance and requirements:
  - It provides for some flexibility for the future project constructor to build in innovation; and
  - It brings in active involvement with EPA’s Major Projects Group.

There is the need linked to this topic, to improve upon the current understanding of industry landfill capacity across the project’s construction cycle, considering the significant number of other parallel Major Projects occurring in Melbourne across the next five to 10 years and

- The proposed Environmental Management Framework, including the proposed environmental performance requirements and environmental management measures contained in the EES appear to generally well thought-out and are relatively sound. The IAC should consider bolstering the involvement of the ‘Independent Environmental Auditor’ for the project, to one who is a Statutory EPA Appointed Auditor within the State of Victoria.

(x)  A statement identifying any provisional opinions that are not fully researched for any reason (identifying the reason why such opinions have not been or cannot be fully researched).

None.
(xi) A statement setting out any questions falling outside the expert’s expertise, and whether the report is incomplete or inaccurate in any respect.

None.

(xii) Declaration

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the IAC.
2 Key issues

(i) Question
Are there any changes of opinion since your interim report (if any) and the reason for that change in opinion?

(ii) Response
Following the issue of my Interim Report dated 24 July 2019, I have no changes of opinion that were outlined within my Interim Report. The list of outstanding requested items that were shown within “Table 1 – Summary of Outstanding Information Requests” from my previous Interim Statement are not required and will not influence my opinion.
3 Key Issues

(i) Question
What is your opinion on the latest version of the Proponent’s proposed approval documents (if any) and any other party’s suggested changes to the approval documents?

(ii) Response
The following general discussion topics and related outcomes are discussed herein. Key Issues within these general topics are listed in sub-bullets within these Main Headings:

- Planning to Answer EES Objectives;
- Geology / Hydrogeology / Site Conceptual Model;
  - Initial area inspections only conducted generally across public lands;
- Summary of Intrusive Investigations (for the EES);
  - Preliminary investigations only as described within the EES;
  - Tetrachloroethene (PCE) concentrations at the two shallow soil samples, east of the dry cleaners (Watsonia);
  - Use of limited surface methane emissions in relation to LFG or odour risk for former landfill or filled sites (and only at some sites);
  - LFG monitoring bores into the subsurface have generally not been installed to investigate past landfilled sites for LFG risk;
  - Definition of suitable Investigation Levels for hydrogen sulphide gas;
  - Checks for dissolved methane in groundwater near landfill sites.
- Key Intrusive Land Contamination Observations;
  - Need for greater sampling around existing or former fuel service stations and dry-cleaning facilities (higher risk from petroleum/chlorinated hydrocarbons);
  - Dissolved PFAS in groundwater – Bullen Industrial Precinct;
  - Information seeking from Department of Defence – Simpson Barracks;
  - Asbestos fragments or fibre in fill. Planned disturbance areas need program of site ‘background’ asbestos fibre in air/dust monitoring – links with Air Quality Monitoring.
- The ESS Risk Assessment Process;
- Acid Sulfate Materials;
- Tunnel Spoil Assessment & Strategy;
  - Definition of the ‘Project Boundary’ via Planning Scheme Amendment process (relates to PIW movement through the project area)
  - The EES Report does not seem to consider contamination that may be related to future building / infrastructure demolition;
  - Cross linkage to EPA Publication – Guidance Contaminated Soil Management and Re-use on Major Infrastructure Projects;
o EPA and Environment Act, 1970 control on off-site placement of large fill volumes;
o Future landfill capacity to receive PIW from NELP.

• Comments Across the EPRs.
o Need for a truly independent and suitably trained/supported EPA Statutory Environmental Auditor in policing the EPRs.

(iii) Question

In documents dated 18 June 2019 and 24 July 2019, you identified a number of issues which you considered to be the key issues arising from the proposed North East Link Project relevant to your expertise and falling within the scope of the IAC’s Terms of Reference.

If your list above differs from the list previously provided, please provide a brief explanation for the change.

(iv) Response

There are no significant differences.
4 Planning to Answer EES Objectives

The Victorian Minister for Planning’s EES scoping requirement involved the following evaluation objectives regarding land contamination issues:

- Waste Management - to manage excavated spoil and other waste streams generated by the project, in accordance with EPA’s ‘Waste Hierarchy’ and relevant ‘Best Practice’ principles; and
- Catchment Values - to avoid, or minimise adverse effects on surface water, groundwater and floodplain environments.

The above guidance was expected to involve appraisal across the following key generalised risk aspects (amongst others):

- Management of substantial quantities of excavation and tunnelling spoil, including requirements for temporary spoil stockpiling and on-site treatment, transporting material away from works sites and reuse or disposal;
- Management across a range of waste streams from the project; and
- Potential for the migration or disturbance of anthropogenic (human induced) contaminated soil or groundwater, or naturally occurring acid forming materials (soil/rock/waters).

Together with the Main EES document: Technical Report O – ‘Contamination and Soil’, there are a range of cross-linkages to other Specialist Sections within the EES document set:

- Technical Report A - Traffic and Transport: Provides an assessment of appropriate transport routes for trucks carrying spoil and contaminated soil from the project boundary, through communities to a suitable landfill end point;
- Technical Report B - Air Quality: Provides an assessment of NELP’s potential impacts on air quality (relevant to spoil management and generation of dust during construction works);
- Technical Report E - Land Use Planning: Provides information on land use planning for the project. The requirement for handling and management of tunnel spoil will require various planning approvals, depending on the targeted end use for the spoil;
- Technical Report J - Human Health: Provides an assessment of NELP’s potential impacts on human health (both to the project workers and surrounding environment) across construction and the transport of waste spoil off-site;
- Technical Report P - Surface Water: Provides an assessment of the project’s potential impacts on surface water bodies along the alignment. Specific to contamination, the project may create runoff of soil and sediments to the surface water that may be contaminated and thereby impact water quality; and
- Technical Report Q – Ecology: Provides an assessment of NELP’s potential impacts on aquatic and groundwater-dependent ecosystems (GDEs) and communities in surface
water bodies along the alignment. Specific to contamination, the ecology helps define the protected beneficial uses of surface water and groundwater and matched levels of protection from land contamination.

The following suitable sets of legislation and guidance are referred to by the EES, in relation to contaminated land and tunnel spoil management:

Commonwealth Legislation
- National Environment Protection Council Act, 1994 (‘NEPC Act’); and
- Environment Protection and Biodiversity Conservations Act, 1999 (‘EPBC Act’);
- National Environmental Protection (Assessment of Site Contamination) Measure 1999 (‘ASC NEPM’), as amended in 2013; and

Victorian Legislation
- Water Act, 1989;
- Environment Protection Act, 1970;
- Environment Protection Amendment Act, 2018;
- Yarra River Protection (Willip-gin Birrarun Murron) Act, 2017;
- Climate Change Act, 2017; and

Various Clauses across the Victorian State Planning Policy Framework have also been referred to in relation to the environment, including:

Key National Australian guidance has been referred to:
- NHMRC, NRMMC, 2011, Australian Drinking water Guidelines;
- ANZECC / ARMCANZ, 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality;
- NHMRC, 2008, Guidelines for Managing Risks in Recreational Waters; and

The key Victorian State Environment Protection Policies (SEPPs) are also referred to across the Study:
- SEPP (Water), October 2018, which covers both surface waters and groundwater; and
- SEPP (Prevention and Management of Contaminated Land), 2002;

Environment Protection (Industrial Waste Resources) Regulations, 2009, which set the requirements for managing industrial and prescribed industrial waste (PIW) for the purposes of the Environment Protection Act, 1970. The following policies and guidance are set for industry to follow:
- Industrial Waste Management Policy (IWMP);
• Industrial Waste Management Policy (Waste Acid Sulfate Soils), 1999 (IWMP-WASS); and
• Industrial Waste Resource Guidelines (IWRG), which cover a series of guidelines including:
  o IWRG 621: Soil Hazard Categorisation and Management (June 2009);
  o IWRG 655.1: Acid Sulfate Soil and Rock (July 2009);
  o IWRG 611.2: Asbestos Transport and Disposal (June 2017);
  o IWRG 701: Sampling and Analysis of Waters, Wastewaters, Soils and Wastes; and
  o IWRG 702: Soil Sampling (June 2009).

The following other key Victorian guidelines have also been referred to by the EES:
• Ministerial Guidelines for Groundwater Licencing and the Protection of High Value Groundwater Dependent Ecosystems, 2015;
• EPA Victoria, 2015, Publication 788.3: Best Practice Environmental Management, Siting Design, Operation and Rehabilitation of Landfills;
• EPA Victoria, 2000, Groundwater Sampling Guidelines;
• EPA Victoria, 2006, Guidelines for Hydrogeological Assessments (Water Quality);
• EPA Victoria, 2014, The Clean-up and Management of Polluted Groundwater;
• EPA Victoria, 1991, Construction Techniques for Sediment Pollution Control
• EPA Victoria, 1996, Environmental Guidelines for Major Construction Sites; and
• EPA Victoria, 2009, Publication 1287: Guidelines for Risk Assessment of Wastewater Discharges to Waterways.

Relevant Australian Standards/Codes of Practice have been referred to, which include (amongst others):
• AS 4482.1-2005: Guide to Sampling and Investigation of Potentially Contaminated Soil – Non-volatile and semi-volatile compounds;
• AS 4482.2-1999: Guide to Sampling and Investigation of Potentially Contaminated Soil — Volatile substances; and

The following methodology has been undertaken to address the EES scoping requirement:
• Study Area identification and documentation of existing conditions;
  o Desktop Information Review; and
  o Preliminary Field Investigations (which included intrusive site investigation).
• Risk Assessment to identify key issues;
• Stakeholder Engagement;
• Community Feedback; and
• Determination of ‘residual risks’ and the identification of suitable EPRs to address both initial and assumed residual risks associated with contaminated land and spoil management issues.
The Author makes the following other observations:

- NELP appear to have not desk-top mapped occurrence of Environmental Audit Overlays (EAOs) across the project extent, which should have been a key part of contaminated land risk identification. They say they were looked at on Page 11 of the Technical Report – but no references were talked about/I see no maps shown.
- It’s relatively easy to research current Section 53X Environmental Audits that whilst having been initiated for lands along the Project corridor, have not yet been finished or published (this is easily done through the Auditor Group or directly as a request to EPA). This appears to not have been done – which for a Major Project is likely to have implications by potentially ‘disrupting’ these Audits – particularly in relation to groundwater investigations, groundwater interpretation and long-term monitoring plans for groundwater; and
- Initial land area inspections have only been conducted generally across publicly accessible lands only.

Stakeholder engagement by NELP included the following external parties: VicRoads, City Councils (Manningham, Banyule, Boroondara and Whitehorse) and retail service station owners/operators: Caltex Australia, Viva Energy Australia and United Energy Petroleum.

Community engagement by NELP has been ongoing across project planning, where the more consistent concerns raised were in relation to:

- Concerns regarding potential groundwater contamination from the project; and
- Concerns regarding the potential disturbance of asbestos containing materials (ACMs) across the project boundary and how the risk of such disturbance would be managed.

The project objectives for the land contamination assessment are considered to have been suitably addressed.

Reporting of risk aspect consequence and likelihood in relation to potential land contamination and tunnel spoil management impacts has been clearly and suitably presented, to allow the nomination of EPRs for the future monitoring, minimisation and management of related adverse environmental effects.

(i) Issues Raised by Submitters

Please include a brief summary of the key issues raised by submitters. If you refer to a particular submission, please refer to the submission by number and not by the name of the submitter.

(ii) Response

No additional comment – the above commentary suitably addresses these.
(iii) Question
Where your opinion(s) materially differ from the relevant circulated evidence statements, please briefly outline the difference and reasons for it.

(iv) Response
No significant differences apart from:
- My as-previously discussed opinion on the controlling effects of anisotropy when it comes to bedded and fractured rock;
- My opinion that alternate groundwater models should have also been considered in parallel to the regional numerical groundwater model, when considering localised effects of the project of sensitive waterways and other localised project interactions with groundwater.

(v) Question
Please discuss the magnitude, likelihood and significance of adverse and beneficial environmental effects.

(vi) Response
Not applicable for this Section.

(vii) Question
Please address the adequacy of the proposed environmental management framework, including the proposed environmental performance requirements and environmental management measures contained in the EES, with reference to applicable legislation and policy.

(viii) Response
Not applicable for this Section.

(ix) Question
Please address the adequacy of WAA No. S0100269, with reference to applicable legislation and policy.

(x) Response
No applicable or relevant to this Section.

(xi) Question
Please address the adequacy of the impact assessment and whether the proposed environmental performance requirements are capable of being met.

(xii) Response
Not applicable for this Section.
(xiii)  **Question**

Please address the question of feasible modifications to the design of the Project within or reasonably proximate to the project boundary that could offer demonstrably overall superior outcomes.

(xiv)  **Response**

Not applicable for this Section.
5 Geology / Hydrogeology / Conceptual Model

The NELP is to be constructed through a range of natural geological strata, where these materials are relatively well known within the Melbourne area. There are also certain areas through the project, where past anthropogenic land use has resulted in poor soils/fill (quarries, former landfills and existing embankments).

Basement rock (steeply dipping sandstone and siltstone) is of Middle Palaeozoic age, belonging to the Silurian and Devonian periods (354 to 441 million years ago (mya)). This is overlain at certain areas by younger rock (Tertiary and Quaternary age (2 to 65 mya)). Anderson Creek Formation (early Silurian siltstone) outcrops in the north-east (around Warrandyte). Melbourne Formation (late Silurian (418 mya)) rock is found south of Warrandyte and within the Melbourne CBD. These Silurian and Devonian rocks were folded into a series of anticlines and synclines in the Middle Devonian. Following this event, the bedrock was intruded in places by plutonic rocks (granite family of Late Devonian age).

Silurian rock consists of a series of wave/folding (average wavelength of 1.2 km) where two key anticline features bound the general project area (Templestowe and Whittlesea). Major syncline features for the project area are the Bulleen and Greensborough Synclines. The general strike of these folds is suggested at North 20° to 25° East. Rock folding is accompanied by minor faults, where small reverse strike faults and transverse faults are common.

The ‘Nillumbik Terrain’ (across the north and east of Melbourne) as described by Neilson (ref. 47) as an erosional landform cut into the folded Silurian rock. This feature is overlain in some places by almost flat lying, ferruginous Tertiary sands (‘Brighton Group’ – late Miocene) which cap hills in certain places (i.e., Kew, Camberwell and Heidelberg). The Yarra River, Gardiners Creek, Plenty River, Diamond Creek and their associated tributaries have deeply cut, old valleys through the Tertiary deposits, into Silurian siltstone (leaving remnants of these Tertiary sands at isolated locations). The Yarra River emerges from Warrandyte Gorge to a mature, broad, alluvial valley at Templestowe and Heidelberg (wide alluvial flats, subject to flooding). These valleys have originated from downstream damming lava flows (Newer Volcanics), that flowed down the ancient valleys of Merri Creek and Darebin Creek, to the old valley of the Yarra River.

The Project Site Conceptual Model (SCM) interprets:

- Inter-bedded siltstone/sandstone folded on a general north to north east trending axis, associated with faulting and some intruded dyke zones:
  - Project drilling shows beneath Yarra Valley sediments, there are a several potentially thick, persistent faults, comprising crushed rock, sand and clay derived from siltstone;
  - No dyke intrusions through the siltstones are understood to have been encountered with investigations to-date; and
  - The siltstones are deeply weathered, often to 30 m depth, but weathering and general rock strength can be variable.
• Yarra Valley Alluvium may attain thickness of generally between 9 m to 21 m across river flats up to 1.6 km wide:
  o The lower beds of this alluvium are considered as lacustrine, deposited when the river was lake dammed from downstream lava flows. Higher flow energy lenticular river channels of sands and gravel may also occur through these alluvium deposits; and
  o The alluvial aquifer and the underlying siltstone aquifer are conservatively assumed to be inter-connected.

• Near Manningham Road, there are a series of interpreted east to west draining, ancient alluvial ‘paleo-channels’, stranded from the continued down-cutting of the Yarra River. The in-fill material here is believed to be Brighton Group marine sandy clay.

Basement rocks consist of tightly folded siltstones and sandstones of low porosity, which generally have little potential as a water bearing media, but locally open joints and rock fractures can produce significant water volumes. Where these rocks outcrop, associated groundwater occurs in an unconfined state and where the rock is overlain by the Cainozoic layers it tends to be confined. Aquifer characteristics are not well known for basement ‘siltstones’:

• Pumping tests conducted within the Melbourne Formation at two sites located in Kings Domain, Melbourne, suggested for rock with fractures, a hydraulic conductivity (K) value of 0.56 m/day and for more intact rock (i.e., unfractured) a K value of 0.014 m/day (Robinson and Kenna, 1992). Hancock (1992) reported K values between 0.001 to 0.3 m/day along the Melbourne Warp feature. Hydraulic parameters vary according to the degree of fracturing and weathering;

• Water bore yields can be typically less than 0.6 L/sec, but higher yields are possible where the rock is highly fractured and/or deeply weathered;

• Groundwater salinities can widely vary out to total dissolved solids (TDS) of 11,000 mg/L, where the groundwater is sodium chloride dominant in shallower groundwater zones; and

• Weathering depth of this siltstone rock is highly variable and can range from only a few meters to greater than 50 m in depth, where fresh siltstone (deeper into the formation) can also contain pyritic material.

The EES ‘Ground Movement’ Section conveniently describes the project alignment across 11 Study Reaches which are further summarised below:

**Reach 1: M80 Ring Road to Watsonia Railway Station**

Involves mainly surface works at the M80 Ring Road/Greensborough Bypass intersection with the Greensborough Highway, where road carriageways start their cut into the ground surface near Watsonia Railway Station. Further lane widening earthworks are to be placed on existing road embankments for the M80 Ring Road and Greensborough Bypass. Site geology consists of thin residual clays over highly weathered Silurian siltstone with a deeply weathered profile down to 15 m to 25 m bgs.
The Plenty River is located some 700 m to the east of the general project alignment along the Greensborough Bypass. The Plenty River Bridge forms the effective boundary definition at the northern most end of this Reach.

Upper groundwater in siltstone is typically encountered across reduced levels (RLs) of between 65 m to 70 m Australian Height Datum, in comparison to a topographic level along this portion of the alignment of between 80 m to 65 m AHD (standing groundwater (SWL) depth from surface is in the general/approximate range 10 m to 20 m bgs.

Potential site contamination features of note include:

- Former backfilled quarry site (‘Greensborough Landfill’) over siltstone /sandstone (waste clay and brick in-fill, but also putrescible waste material, up to a placement depth of between 3 m to 7 m bgs, mixed with solid inert waste (SIW)) at the M80 Ring Road/Greensborough Bypass intersection. This filling occurred approximately in the 1950’s. Depth to upper groundwater at this point is estimated at > 40 m bgs. The EES estimates that in-situ volumes of approximately 1,285 m$^3$ of ‘Category B’ PIW and 11,565 m$^3$ of ‘Category C’ PIW may come from this area;

- Embankments/noise mounds along the M80 Ring Road, which were known to contain relatively minor amount of metals in soil (chromium and nickel) and fluoride (which can commonly be associated with siltstone derived spoil);

- A.K. Lines Reserve/Oval at Watsonia (former 4.5 Ha landfill site (unknown waste) which operated across 1950’s to mid-1960’s). The former landfill is sited over siltstone/sandstone, where estimated groundwater depth is in the range of 5 m to 10 m bgs. The EES estimates that in-situ volumes of approximately 450 m$^3$ of ‘Category B’ PIW and 4,050 m$^3$ of ‘Category C’ PIW may come from this area. Checks for: odour, LFG or other ground gas risk would need to made, when considering this area as a lay-down facility for construction.

Reach 2: Watsonia Railway Station to Northern Tunnel Portal (Blamey Road)

Involves general open cut trenching which will extend to a maximum depth of 13 m bgs. Several cross-connecting viaduct or bridge-type overhead structures are also proposed. Site geology consists of extremely to highly weathered Silurian siltstone/sandstone.

Upper groundwater in siltstone is typically encountered across RLs of between 70 m to 75 m AHD, in comparison to a topographic level along this portion of the alignment of between 95 m AHD (north) to 75 m AHD (south). SWL depth from surface is in the approximate range 10 m to 20 m bgs.

Key risk features include:

- Commercial / industrial area including the Watsonia Railway Station in the vicinity of the intersection of Watsonia Road and Greensborough Road, Watsonia. Two former and one existing retail fuel service stations lie within this area (risk is from potential petroleum hydrocarbon releases). At least one dry cleaning facility lies within this area (potential for chlorinated hydrocarbons: perchloroethylene (PCE) and trichloroethylene (TCE), plus their related ‘daughter’ breakdown products, which can be as, if not more toxic to humans. In the same area there are also a large car
parking facility for the Watsonia Railway Station and Watsonia Zone electrical substation, an automotive service and repair centre, car rental facility and a timber/hardware business. The EES estimates that in-situ volumes of approximately 8,750 m$^3$ of ‘Category C’ PIW may come from this area; and

- Currently operational retail fuel service station located at the south-east corner of Yallambie Road and Greensborough Road, Greensborough. The EES estimates that in-situ volumes of approximately 825 m$^3$ of ‘Category B’ PIW and 7,425 m$^3$ of ‘Category C’ PIW may come from this area. There may also be impacts associated with the release of volatile organic compounds and odours (petroleum related) when this area is excavated out. Most probably related to this same service station site, is a significant risk of petroleum hydrocarbon impacted groundwater being drawn into the project trench (particularly if the trench remains to be constructed in its final form as an un-tanked feature).

Reach 3: Northern Tunnel Portal to Lower Plenty Road

Involves 1.4 km of cut and cover construction, which will extend to a maximum depth of 35 m bgs at the tunnel portal. Site geology consists of extremely to highly weathered Silurian siltstone/sandstone. It is likely that there is a steeply dipping fault zone, just north of Lower Plenty Road. Upper groundwater in siltstone is typically encountered across RLs of between 40 m to 65 m AHD, in comparison to a topographic level along this portion of the alignment of between 70 m AHD (north) to 45 m AHD (south). SWL depth from surface is in the approximate range 5 m to 10 m bgs.

Key risk features of note include:

- Department of Defence - Simpson Barracks. This facility was established in the 1940s and occupies a land area of some 22 Ha. Potential or known contaminating activities including bulk fuel storage and distribution, a former sewage treatment plant, battery stores and several landfills, which have been used to dispose waste from Defence operations. It is expected that the only known contamination issue relates to buried asbestos-containing material (ACM) previously identified at many locations across this land. To-date no significant intrusive land investigations have been able to be undertaken across this land by NELP. There may be some potential to draw-in existing contaminated groundwater from these areas, where a range of dissolved chemicals may be present; and

- Yallambie Landfill / Borlase Reserve, which is a former small (3.5 Ha) landfill site (formed earthworks, suspected SIW and possible some putrescible waste placed to between 3 m to 5 m deep, circa 1966 to 1972). Estimated groundwater depth is between 5 m to 10 m bgs. The EES estimates that in-situ volumes of approximately 35,000 m$^3$ of ‘Category C’ PIW may come from this area. ACMs are also anticipated to be encountered with excavation works. Odour generation during excavation may also prove to be an issue. The risk from LFG at this area may also prove to a risk.
Reach 4: Lower Plenty Road to Banyule Flats

Involves placement of twin TBM cut tunnels (each at 15.7 m diameter, spaced at 16 m wall to wall) which will extend (tunnel invert) to a maximum depth of 42 m bgs. Site geology consists of slightly weathered to fresh siltstone/sandstone with minor dyke ingress and fault zones.

Upper groundwater across siltstone and alluvium for this Reach is typically encountered across RLs of between 15 m to 40 m AHD, in comparison to a topographic level along this portion of the alignment between 45 m AHD (north) to 15 m AHD (south). SWL depth from ground varies from between < 5 m bgs (near Banyule Flats) to 20 m bgs (moving up into the northern siltstone plateau). There are no significant contamination risk features identified.

Reach 5: Banyule Flats, Banksia Park, Yarra River

Involves placement of twin TBMs, driven to the north from a temporary portal at Banksia Street. Site geology consists of mainly slightly weathered to fresh siltstone. Near the adjoining Manningham Road Interchange (MRI) which is to be of cut and cover construction, there is the possibility that the tunnel crown may intersect the base of ancient alluvium. Variable conditions are likely to be encountered. There are thick alluvial sediments (15 m thick) overlying the TBM tunnels. There are also several suspected faults present in the area.

Salt Creek is an ephemeral drainage line based in Silurian siltstone that sits in a west off-site to the project alignment. This creek drains to the south, into the Yarra River near Banyule Swamp. Banyule Creek is an ephemeral drainage line within primarily Silurian siltstone, which drains southwards to join the Yarra River near Banyule Swamp. The Plenty River also passes through the Banyule Flats area cut through Silurian siltstone, before draining into the Yarra River just south of the Banyule Swamp. Upper SWL depth for groundwater within the alluvium materials is typically < 5 m (at the approximate AHD level range of 5 m to 10 m AHD).

There are no significant contamination source - risk features identified.

Reach 6: Manningham Road Interchange, Bulleen

Involves cut and cover across an existing industrial and commercial land use area, to place a large interchange ‘box’ structure to a maximum placement depth of 22 m bgs. Site geological studies suggest that the Yarra River has eroded the toe of east facing siltstone plateau (some 10 high). Siltstone is generally moderately to extremely weathered. The siltstone is overlain in certain areas by old east to west ‘fingers’ of Pleistocene paleochannels (holding Brighton Group sands).

Upper groundwater across siltstone and alluvium for this Reach is typically encountered across RLs of between 5 m to 10 m AHD, in comparison to a topographic level along this portion of the alignment between 10 m AHD (north) to 20 m AHD (south). SWL depth from ground surface varies from between < 5 m bgs (near Yarra Flats) to 20 m bgs (moving up into the southern siltstone plateau).

Key land contamination risk features across this industrial/commercial 11 Ha parcel of land includes:
• Commercial and industrial area located near the Bulleen Road and Manningham Road Intersection, Bulleen:
  o One former and four existing retail fuel service stations lie within this area (risk of petroleum hydrocarbon releases);
  o At least one dry cleaning facility lies within this area (potential for chlorinated hydrocarbons: PCE and TCE plus their related ‘daughter’ breakdown products);
• Former Bulleen Drive-in facility (Greenaway Street), which is large 6.5 Ha parcel of derelict land sitting along edge of the Yarra River Flats and end of the siltstone rock plateau;
• Dry cleaning facility;
• Several automotive service and repair facilities (including crash repairs and spray painting (i.e., can be linked to chemical solvents and petroleum hydrocarbon-based paint thinners);
• Landscape suppliers, ready-mix concrete supplier (alkaline water run-off risk and possible petroleum hydrocarbon storage on-site), vehicle storage yard, mower sales/servicing and demolition/salvage;
• The EES estimates that in-situ volumes of approximately 5,000 m³ of ‘Category A’ PIW 10,000 m³ of ‘Category B’ PIW and 85,000 m³ of ‘Category C’ PIW may come from this general area. The EES also suggests that ACMs are likely to be encountered across excavations through this sector, given the light industrial history. The generation of odours and VOC release from soil excavation and disturbance is expected to prove an issue through this area; and
• The project may be at risk of drawing in existing dissolved PFAS-impacted groundwater, which would need to be suitably managed.

Reach 7: Avon Street to Rocklea Road (SEM Tunnels)

Involves the mined caverns (road ramps near Golden Way) and sequentially mined excavations forming the twin tunnels across this short intermediate tunnel section. Maximum surface cover depth is of the order of 35 m bgs, where the SEM tunnels are to be of general individual dimension: 14 m wide by 12.5 m high. Site geology at the area of Ilma Court (overlying low-rise residential) shows extremely to highly weathered siltstone, but with in-filled paleochannels (Brighton Group sands) near the tunnel crown level that may result in changes to expected mining conditions. Associated alluvium nearby is also up to 8 m thick. There are also faults in the area and weathered dyke features.

Upper groundwater across siltstone for this Reach is typically encountered across RLs of between 13 m to 20 m AHD, in comparison to a topographic level along this portion of the alignment between 25 m AHD to 35 m AHD (south). SWL depth from ground varies from between 10 m to 20 m bgs through this siltstone plateau ‘high’.

Key potential land contamination features include:

• Tunnel openings here are expected to have some contamination issues encountered, due both the type of nearby industrial/commercial land use (to the north to north-
west), where these tunnels will be mined as a drained tunnel initially, followed by placement of primary and secondary reinforced concrete tunnel wall seals;

- There is a nearby former brick clay-mining pit, which was understood to be in-filled between 1950’s to 1960’s (Yarraleen Place, Bulleen), which has been infilled for a residential development. These low-rise residences are expected to be sitting of deep piled supports to the siltstone basement rock. The tunnelling passes between this quarry and nearby alluvium. The fill is potential uncontrolled landfill (mix of clay fill and possible waste). The approximate area of the former quarry is estimated at 3.5 Ha. Estimated depth to groundwater here is between 10 to 20 m bgs. The site is not expected to generate significant PIW materials, but disturbance to the area may result in a low risk of LFG or other ground gas mobilisation, which would need to be managed.

Reach 8: Rocklea Road to Bulleen Oval

Involves placement of a cut and cover tunnel to ramp-connect to Bulleen Road. Site geology shows a deeper (21 m thick) alluvium layer and significant faulting within the underlying siltstone (typically slightly weathered to fresh rock). Bulleen Park is a former landfill site (constructed across the 1960’s).

Upper groundwater across siltstone and then alluvium (south) for this Reach is typically encountered across RLs of between 10 m AHD, in comparison to a topographic level along this portion of the alignment between 25 m AHD (north) to 10 m AHD (south). SWL depth from ground is typically between < 5 m bgs (closer to the Yarra) to 5 -10 m bgs (moving back up into the northern siltstone plateau).

Key potential land contamination features include the landfill across Bullen Oval and surrounds (some 13 Ha of potentially in-filled land) has significant deposits of uncontrolled fill placed in the early to late 1960’s (with some unknown amount of suspected asbestos mixed with the waste, which was mainly thought to be a mix of SIW and possible putrescible waste. The landfill is estimated to be sitting across Yarra River alluvium deposits over siltstone. Estimated depth to groundwater at this area is between t m to 10 m bgs. The EES estimates that in-situ volumes of approximately 500 m$^3$ of ‘Category A’ PIW, 1,500 m$^3$ of ‘Category B’ PIW and 17,000 m$^3$ of ‘Category C’ PIW may come from this area. ACM/Asbestos fibre in soil is expected to be encountered with soil excavation at this area. The generation of odours from excavations through this area may also prove to be an issue. LFG presence at Bulleen Oval may also prove to be a risk to the project.

Reach 9: Eastern Freeway to Bullen Road

Involves mainly surface works, with lane widening and construction of a viaduct ramp, where the Bulleen Swim Centre and Boroondara Tennis Centre are to be acquired for construction. Site geology involves river alluvium over thin residual clay and then highly weathered siltstone.

Upper groundwater across Yarra River alluvium (south) for this Reach is typically encountered across RLs of between 5 m to 10 m AHD, in comparison to a topographic level along this portion of the alignment between 5 m AHD (north) to 20 m AHD (south). SWL depth from ground is typically between < 5 m bgs (closer to the Yarra) to 5 m to 10 m bgs.
There is a nearby former landfill site near Freeway Golf, Balwyn North, near the north-west corner of the Eastern Freeway and Bulleen Road (former area estimated 10 Ha). Between 3 m to 4 m thickness of waste is expected to be sitting across Yarra River alluvium deposits and then siltstone. Depth to groundwater varies from 5 m to 20 m bgs (depends on surface topography). The EES estimates that an in-situ volume of approximately 18,500 m³ of ‘Category C’ PIW may come from this area. This area also has the risk of encountering asbestos/ACMs, landfill gases and odours.

Reach 10: Eastern Freeway-West

Involves no significant additional surface loads, and there are no significant nearby sensitive receptors. The area is underlain by undifferentiated river alluvium, transitioning across to basalt rock (Quaternary Newer Volcanics) when moving to the west along the Freeway.

Upper groundwater across Yarra River alluvium is typically encountered across RLs of between 5 m to 15 m AHD, in comparison to a topographic level along this alignment portion between 15 m to 20 m AHD). SWL depth from ground is typically between < 5 m bgs (closer to the Yarra), out to 5 m to 10 m bgs.

The main risk feature is the former landfill (Camberwell Municipal Landfill), constructed over the alluvial floodplain and then Anderson Creek siltstone rock between 1966 to 1977, at the area of Musca Reserve Balwyn North (the existing Freeway is likely to have been built over a portion of this landfill area). The expected waste type within the landfill is a mix of putrescible waste and SIW placed to an estimated thickness of 5 to 10 m. Estimated potential former landfill size is 27 Ha. Groundwater depth at this landfill is estimated to be between t to 20 m bgs. The EES estimates that an in-situ volume of approximately 10,000 m³ of ‘Category C’ PIW may come from this area. This area also has the risk of encountering asbestos/ACMs, landfill gases and odours.

Reach 11: Eastern Freeway-East

Involves some significant road widening of the Freeway. Site geology transitions from younger Silurian siltstone bedrock into older Anderson Creek Formation siltstone. There is some amount of minor river alluvium associated with Koonung Creek which crosses under the Freeway. Koonung Creek parallels much of the east side of the Eastern Freeway, before it connects to the Yarra River near Bulleen Road.

Upper groundwater across alluvium from the Yarra River and Koonung Creek is typically encountered across RLs of between 5 m to 30 m AHD, in comparison to a topographic level along this alignment portion between 20 m to 40 m AHD). SWL depth from ground is typically between < 5 m bgs (closer to the Yarra and the Koonung Creek alignment), out to > 10 m bgs, moving to the east.

Key potential land contamination risk features include:

- There is a former landfill (Greythorn Landfill) located across shallow alluvium and siltstone, near the intersection of Doncaster Road and the Freeway, Banyule North (suspected to have been completed around 1977 to 1978). Placed waste type is unknown across an estimated area of 2.5 Ha. Depth to groundwater is thought to range between 5 m (north) to 10 m bgs. The EES estimates that an in-situ volume of
approximately 3,250 m$^3$ of ‘Category C’ PIW may come from this area. This feature also has the potential to show up asbestos/ACMs, LFG and landfill odours; and

- There is a former landfill located on thin alluvial deposits over siltstone, within the Koonung Creek Linear Park (Eram Park, Box Hill North, between Tram Road and Wetherby Road), where both SIW and putrescible waste are likely to have been placed in the late 1960's to mid-1970's. Estimated former landfill area is 4 Ha. Estimated depth to groundwater is of the order of 5 m bgs. The EES estimates that in-situ volumes of approximately 17,000 m$^3$ of ‘Category C’ PIW may come from this area. This feature may have the potential to show up asbestos/ACMs, LFG and landfill odour.

**Knowledge on Groundwater Resource Use Across Project Alignment**

This has been covered in more detail within the Groundwater Technical Report. Broadly dividing the 11 Study Reaches into three groups, the following is known:

- Reaches 1 to 3: M80 Ring Road to Northern Portal. Some 13 groundwater bores have been identified by the EES, where for the most of these the bores uses are not known. At least one bore is known to be used for extraction and irrigation purposes;

- Reaches 4 to 8: Northern Portal to Southern Portal. Some 22 groundwater bores have been identified, where for nine of these bores use is not known. Eight bores are groundwater observation bores. Five bores are listed across either watering of stock or domestic use/commercial or miscellaneous use; and

- Reaches 9 to 11: Eastern Freeway. A larger number of groundwater bores have been identified by the EES for this stretch, where out of 172 identified bores in total, for 52 of these, the bore use is not known. A total of 116 bores are groundwater observation/investigation bores. Only four bores are known to be used for extraction and watering of stock or domestic use.

**EPA Information / Knowledge of Published Statutory Environmental Audits – Contaminated Land**

The EES indicates that there are 14 published statutory Environmental Audits distributed across the proximity of the project area (within a 500 m search distance).

There no known EPA Priority Sites listed within the 500 m search distance of the Project Area (from the Priority Sites Register examination).

The only EPA defined Groundwater Quality Restricted Use Zones (GWQRUZs) within proximity of the project area are to the west, near Clifton Hill/Abbotsford, where these sites are all situated on the opposite of either the Yarra River or Merri Creek (they are not expected to have any influence over the project).

(i) **Question**

Please include a brief summary of the key issues raised by submitters. If you refer to a particular submission, please refer to the submission by number and not by the name of the submitter.
(ii) Response
No additional comment.

(iii) Question
Where your opinion(s) materially differ from the relevant circulated evidence statements, please briefly outline the difference and reasons for it.

(iv) Response
No significant differences.

(v) Question
Please discuss the magnitude, likelihood and significance of adverse and beneficial environmental effects.

[vi] Response
Not applicable for this Section.

(vii) Question
Please address the adequacy of the proposed environmental management framework, including the proposed environmental performance requirements and environmental management measures contained in the EES, with reference to applicable legislation and policy.

(viii) Response
Not applicable for this Section.

(ix) Question
Please address the adequacy of WAA No. S0100269, with reference to applicable legislation and policy.

(x) Response
No applicable or relevant to this Section.

(xi) Question
Please address the adequacy of the impact assessment and whether the proposed environmental performance requirements are capable of being met.

(xii) Response
Not applicable for this Section.
(xiii) Question

Please address the question of feasible modifications to the design of the Project within or reasonably proximate to the project boundary that could offer demonstrably overall superior outcomes.

(xiv) Response

Not applicable for this Section.
6 Summary of Intrusive Investigations (for EES)

Associated with the conduct of an extensive Preliminary Site Investigation (mainly desk-top based), the following intrusive investigation to the subsurface across the project area were conducted between 10 January 2018 and 8 August 2018, to better inform the EES.

Generally, these more-detailed subsurface investigations across the Project Area included:

- Sampling of near surface soil quality;
- Installation of groundwater monitoring wells;
- Sampling of groundwater from wells installed as part of the specific land contamination investigation and sampling of groundwater from wells installed as part of the geotechnical/hydrogeological investigations occurring in parallel;
- Sampling of soil and rock at depths to assess presence of actual or potential acid sulfate soil and rock;
- Monitoring of surface methane emissions and subsurface pits (low collector points in the ground) from former landfills: Borlase Reserve, Bulleen Oval, A.K. Lines Reserve, The M80 Ring Road and Greensborough Bypass former quarry zone) using a laser spectrometer (calibrated to detect 1 ppm methane); and
- Geophysical survey at Bulleen Oval, to assist in delineating the extent of the potential landfill.

Many of the more likely contaminated land areas expected to be influenced by the projects’ construction could not be suitably accessed for intrusive investigation of the subsurface as they sat with private lands where access was not possible at the time of investigation. Such areas include the Bulleen Industrial/Commercial area and Bulleen Drive-in site.

Soil Investigations

A total of 110 drilling soil bores were placed across the project area, from which a total of 290 primary soil samples were selected for more-detailed laboratory testing assessment (together with associated Quality Assurance-Quality Certification (QA-QC) co-samples from the field and laboratory work). Selection of these soil samples by the field supervisors at time of sampling was mainly in association with geotechnical and hydrogeological investigations for the project (thus sampling was somewhat opportunistic, as opposed to fully systematic).

General investigations showed when considering metals/metalloids and certain inorganics in comparison to the IWRG Publication 621 soil classification, a total of 138 soil samples taken from 78 soil testing locations indicated exceedance to the ‘Fill Material’ criteria related to the off-site movement of soil/tunnel spoil and the regulations pertaining to PIW. Exceedances to the ‘Fill Material’ criteria were noted across the following soil analytes:

- Fluoride (this can commonly occur with siltstone derived soil);
• Arsenic (this can commonly occur with siltstone derived soil);
• Copper;
• Lead;
• Nickel;
• Mercury;
• Tin; and
• Zinc (Soil taken from NEL-BH125 (Bulleen Oval) – classed mainly at ‘Category C’ PIW.

When considering impacts from organic compounds, exceedance to the IWRG ‘FILL Material’ soil classification was observed for:

• Benzo(a)pyrene: This mainly anthropogenic compound reported above laboratory LOR from only seven soil samples out of a total of 269 soil samples analysed. It is expected that the results would push the related material into ‘Category C’ PIW;

There were total of 67 soil samples taken from 51 testing locations along the project area that showed exceedance to ‘Fill Materia’ criteria due to results from either/or: fluoride, arsenic, copper, lead, nickel, mercury, tin, zinc and BaP (classed as ‘Category C’ PIW). The EES suggests that many of these compounds are often naturally occurring with siltstone derived materials (fluoride, nickel, arsenic, etc) and that a case for re-classification of such soils (if naturally derived, not filling) may apply for these soils back to ‘Fill Material’ status.

• Low concentrations of TRH across the range $C_{10}$-$C_{36}$ (i.e., between 120 mg/kg to 420 mg/kg) were noted across the following testing locations:
  o Bulleen Oval: NEL-BH128 (1.2 m bgs), NEL-BH195 (1 m bgs), NEL-LFB03 (2.0 m bgs), and NEL-LFB05 (1.0 m bgs);
  o Bulleen Industrial Area: NEL-BH140 (0.2 m bgs);
  o Yarra Flat Parkland: NEL-BH179 (0.1 m bgs);
  o M80 Ring Road: NEL-BH185 (0.2 m bgs); and
  o Eastern Freeway: NEL-EF-BH005 (0.2 m bgs) and NEL-BH201 (0.2 m bgs).

• Just east of the dry-cleaning facility (Watsonia Commercial Precinct) relatively low concentrations of PCE were noted at NEL-ENV-BH025 (0.3-0.4 m bgs) and NEL-ENV-BH025 (1.0-1.1 m bgs), where soil concentrations ranged between 0.06 mg/kg to 0.09 mg/kg.

**Groundwater Investigations**

A total of 16 groundwater monitoring wells were targeted for contamination testing:

• A total of 11 of these wells were installed within the commercial/industrial areas of Watsonia, Bulleen and near the retail fuel service station near the corner of Yallambie Road and Greensborough Road;
A total of five of the groundwater wells were installed in association with the broader hydrogeological investigation for the project area (but ‘broad suite’ contamination testing for groundwater was undertaken);

A total of 35 other groundwater wells associated with the geotechnical/hydrogeological studies for the project were also sampled for a more limited range of chemical analytes.

Predictably, groundwater salinity as measured by TDS analysis across these groundwater wells showed a wide range of salinity values.

- For alluvium-based groundwater wells, the EES suggests that ‘Segment A2’ groundwater applies (measured TDS range from 910 mg/L to 6,100 mg/L with a mean TDS vale of 2,658 mg/L) as defined by SEPP (Water). More sensitive groundwater uses of ‘potable – acceptable’ for human consumption and agriculture and irrigation (‘irrigation’) apply for this water; and

- For siltstone-based wells, the EES suggests that ‘Segment C’ groundwater applies (measured TDS range from 730 mg/L to 9,900 mg/L, with a mean TDS vale of 5,720 mg/L) as defined by SEPP (Water), where the more sensitive groundwater uses of ‘potable – acceptable’ and ‘irrigation’ do not apply.

The EES reported that:

- Extractive groundwater use along the NELP alignment are unlikely;

- WDE’s is a clear existing beneficial use of the groundwater (i.e., Bolin Bolin Billabong, Yarra River);

- Surface water-based Primary Contract Recreation (PCR) is a relevant beneficial use with respect to groundwater connection to surface water bodies;

- The beneficial use related to traditional owners and Aboriginal cultural values applies; and

- The beneficial use related to cultural and spiritual use also applies for these water bodies.

Preliminary testing across available groundwater sampling locations showed the following general results in addition to TDS analysis (more specific results are discussed in Section 7):

- Some of the alluvial aquifer wells showed up a slight hydrogen sulphide gas odour (H2S), which can sometimes be associated with a reducing environment in the groundwater (low dissolved oxygen);

- Groundwater pH tends to be either neutral or slightly acidic (where slightly acidic groundwater is normal for Silurian siltstone in the region); and

- Dissolved concentrations for metals: copper, manganese, nickel and zinc were observed to exceed some of the suggested Investigation Levels (ILs) across the relevant beneficial uses: maintenance of GDEs, Agriculture, Irrigation and Stock watering. Most of these exceedances are expected to be associated with normal background geology concentrations observed for the Silurian siltstones in the region;
The EES acknowledges that due to the current lack of access to any private properties, it is very likely that a considerable amount of additional investigation across soils for the project area will need to be undertaken before any project construction may commence for an improvement to the current Spoil Management Strategy.

Other issues identified by the Author include:

- EES Table 5-3: Where both Caltex and Viva Energy have both determined not to pass on any of their land contamination information, these two areas should have been more targeted for preliminary investigations, as they pose a significantly higher risk from historical storage of petroleum hydrocarbons. A similar approach should also apply for identified existing or former dry-cleaning facilities;

- EES Table 5-3: Department of Defence should have also been approached for discussions / information on USTs and the storage of petroleum hydrocarbons;

- When discussing groundwater characterisation (i.e., TDS, dissolved metalloids), it’s best to split discussion across alluvial sediments and basement/bedrock/Silurian;

- EES Table 6-14: With respect to agriculture and irrigation (i.e., the beneficial use termed ‘irrigation’) both as a current use and future use is more likely to be a real beneficial use than not – this potential exposure pathway is considered as somewhat down-played and would need to be further understood.

- Use of the term ‘Maintenance of Ecosystem’ is now an out-of-date term, that was related to the former Victorian State Environment Planning Policy (SEPP) across both groundwater and waters. Should be using term protection to Water Dependent Ecosystems (WDEs);

- EES Appendix F – Borelogs. Location NEL-ENV-BH005 incorrectly shows ‘Fill’ depth extent to 1 m on the graphic log, where the descriptive material demonstrates it can most likely extend to 2 m; and

- Simpson Barracks – Bore and well construction log for BH022 shows the well screen sampling section is set down at considerable depth (16 m to 22 m bgs), yet this same bore is still showing up significant dissolved phase petroleum hydrocarbon contamination.

(i) **Issues Raised by Submitters**

Please include a brief summary of the key issues raised by submitters. If you refer to a particular submission, please refer to the submission by number and not by the name of the submitter.

(ii) **Response**

No additional comment to add in relation to this.

(iii) **Question**

Where your opinion(s) materially differ from the relevant circulated evidence statements, please briefly outline the difference and reasons for it.
(iv) **Response**
No key differences.

(v) **Question**
Please discuss the magnitude, likelihood and significance of adverse and beneficial environmental effects.

(vi) **Response**
Please refer to my opinions as outlined across Sections: 5, 7 and 8.

(vii) **Question**
Please address the adequacy of the proposed environmental management framework, including the proposed environmental performance requirements and environmental management measures contained in the EES, with reference to applicable legislation and policy.

(viii) **Response**
Refer to my opinion as provided within Sections 1 and 11.

(ix) **Question**
Please address the adequacy of the impact assessment and whether the proposed environmental performance requirements are capable of being met.

(x) **Response**
Please refer to my opinions as provided within Sections 1 and 8.

(xi) **Question**
Please address the question of feasible modifications to the design of the Project within or reasonably proximate to the project boundary that could offer demonstrably overall superior outcomes.

(xii) **Response**
Study Reach 2 – The currently proposed ‘open trench’ should also be suitably tanked, where this trench is expected to intersect the upper aquifer.
7 Key Intrusive Land Contamination Observations

The following areas along the project alignment have indicated notable measurements from subsurface land contamination investigations:

**Soil Testing**

- The tetrachloroethene (PCE) or ‘perc’ concentrations at the two shallow soil samples (NEL-ENV BH025_0.3-0.4: 0.09 mg/kg and NEL-ENV BH025_1.0-1.1: 0.06 mg/kg) east of the dry cleaners (Watsonia) is probably going to show up a more serious issue at depth and into groundwater near the same location;

- At Bulleen within Parks Victoria Land (BH003 and BH005), these testing soil locations showed up some higher lead in near-surface soil. As-yet, groundwater results are not available for these locations.

- At Bulleen Oval:
  - Testing location NEL-BH125 (0.75 m bgs) indicated copper in fill above the IWRG 621 ‘Category B’ criteria (where its corresponding leachability result pushed the classification further out into a Category A PIW). Matched soil samples taken both above this level (at 0.4 m bgs) and below this level (at 1.0 m bgs) indicated copper in soils below the ‘Fill Material’ criteria (the fill could be expected to be highly heterogeneous);
  - Testing location NEL-BH125 (1.5 m bgs) indicated lead exceedance to ‘Category C’, where the matched leachability testing results indicated that the soil classed as ‘Category A’ PIW. Surrounding, similar leachate testing from this same testing location at a depth of 1.0 m bgs indicated a result less than the laboratory limit of reporting (LOR). Testing further at depth (3.0 m bgs) indicated a lead leachate concentration that would classify the material as ‘Category B’;
  - Testing location NEL-125 (1.5 m bgs) showed up trace-only amounts of detected asbestos fibre in sampled soil;
  - Testing location LFB01 (0.5 m bgs) indicated trace concentrations of asbestos fibre in soil;
  - Testing location BH128 (1.4 m bgs) indicated potential asbestos material presence in soil (from a visual basis only with fieldwork);
  - NEL-BH128A (at depths of 0.45 m and 1.2 m bgs) indicated fluoride, copper and zinc above IWRG ‘Fill Material’ criteria;
  - NEL-BH128 (1.2 m bgs) indicated a relatively low amount of TRH across range: $C_{10-36}$ at 120 mg/kg; and
  - NEL-BH179 (0.1 m bgs) indicated a lot to moderate amount of TRH across range: $C_{10-36}$ at 360 mg/kg.
The EES suggests that the likely amount of ‘Category A’ or ‘Category B’ PIW material at this former landfill area is expected to be low (where currently fill heterogeneity is influencing available results). Future investigation work will increase the density of soil sampling through this area for improved volume estimates.

- At the Bulleen Industrial Area, location NEL-BH140 (0.2 m bgs) indicated a low to moderate amount of TRH in soil across chain-length range: \( C_{10} - C_{36} \) at 310 mg/kg; and
- At Freeway Golf: Testing of fill at location BH119 from a depth of 1.8 m bgs showed asbestos presence;

**Groundwater Testing**

Preliminary groundwater sampling and analysis showed the following results of note:

- Simpson Barracks (BH022, just south of the operational retail fuel service station near Yallambie Road and Greensbororough Road). Access to the Defence lands was allowed for this location. It indicated:
  - Sampled groundwater indicated notable dissolved petroleum hydrocarbons (total BTEX: 37.2 mg/L and total recoverable hydrocarbons (TRH) across the range \( C_6 - C_{10} \) at 41.6 mg/L. These levels of dissolved petroleum hydrocarbons tend to suggest the presence of a nearby non-aqueous phase liquid (NAPL) in the sub-surface (it was noted from this well that no light non-aqueous phase liquid (LNAPL) was observed with its standing fluid level gauging or groundwater sampling.

  The operational service station nearby (10 m to the north) is most likely associated with this contamination.

- At the Bulleen Commercial / Industrial area, dissolved concentrations of PFAS were detected at the following locations:
  - ENV-BH014 (PFHxS+PFOS: 0.02 µg/L);
  - NEL-BH062A (PFHxS+PFOS: 1.23 µg/L); and
  - NEL-ENV-BH009 (PFHxS+PFOS: 0.698 µg/L).

  These detections were noted to exceed the available GDE IL for groundwaters discharging to surface waters. The results at NEL-BH062A also exceeded the suggested surface water guidance for recreational water use from the NEMP (2018).

At the Watsonia Railway Station Car Park, dissolved concentrations of PFOS were detected at NEL-ENV-BH024 (PFOS: 0.002 µg/L). This same well also showed up some amounts of dissolved PFHxS and 6:2FtS. This detection also exceeded the GDE IL.

The current uncertainty in the occurrences of dissolved PFAS within groundwater samples from the Bulleen Industrial area or the former Bulleen Drive-in (the PFAS group is a ubiquitous family of contaminants found in urban groundwater and may prove difficult to baseline/delineate the source). The Yarra River is receiving water from this groundwater. Bores NEL-BH062A and NEL-ENV-BH009. This groundwater is expected to be influenced by construction dewatering. Investigations should be
conducted on the potential lateral or vertical spreading of this contaminant (PFAS) through the aquifers.

**Landfill Intrusive Investigations**

Surface based and sub-surface based preliminary investigations have been undertaken at the following identified former (capped) landfill sites along the project alignment:

- M80 Ring Road / Greensborough By-pass, Greensborough (Former Quarry site);
- A.K. Lines Reserve, Watsonia;
- Borlase Reserve, Yallambie; and
- Bulleen Oval, Bulleen.

Preliminary landfill gas (LFG) monitoring was undertaken at the above targeted sites across the period 9 to 10 May 2018, using techniques that monitored for key egress of ground gases that may be associated with these former landfills (methane, carbon dioxide, carbon monoxide, H₂S, reduced/displaced oxygen from other gas egress). The other landfill sites as identified in Section 5 have not been subject to similar monitoring, as they are on private lands, where site access was restricted.

- Further LFG monitoring across these remaining sites will be a requirement for suitable risk appraisal to the project; and
- Additional, and more detailed subsurface LFG investigations across these former landfills will also be a future lead-in investigation requirement for the project, to more rigorously check for lateral LFG migration potential from these sites.

Surface monitoring for these ground gases used two key items of calibrated and fit for purpose monitoring equipment:

- Laser Spectrometer for low level detection of only methane gas (to ppm levels by volume); and
- Landfill gas meter for the combined measurement of accumulated ground gases in shallow voids and pits near the ground surface (‘underground service monitoring’, where LFG may preferably accumulate upon egress through filling caps presumably placed across these former landfill areas).

Laser spectrometer measurements close to ground surface at these above sites indicated:

- No elevated methane concentrations (i.e., > 100 ppmv) were recorded for the M80 Ring Road/Greensborough Bypass, Borlase Reserve and Bulleen Oval sites;
- At the A.K.Lines Oval Reserve, only one surface based reading indicated a result > 100 ppmv, where the recorded result (160 ppmv) was located at the north-east portion of the Oval. At this location, there was no obvious preferred pathway for methane gas to egress through the top capping. At all other reading locations for this site, recorded laser spectrometer readings for methane in air were close to ‘ambient’ (background) levels (~ 2 ppmv). The higher isolated result would be re-investigating, but it provides one line of evidence that the amount of putrescible landfill waste below the oval cap continues to decompose and produce ground gas; and
• The applied threshold value of 100 ppmv as indicated above is drawn from the EPA Publication 788.3 ‘Best Practice Environmental Management (BPEM) Siting, Design, Operation and Rehabilitation of Landfills, 2015’. This value comes from Table 6.4 of this document and is an ‘Action Level’ applying to surface methane in air measurements taken generally across a capped surface (where the point of measurement is 50 mm above the landfill surface). Spatial results should be viewed in isolation and averaging of the readings across an area is not an allowable review practice (the EES is incorrect on this point). The EES correctly makes the point that the methane result at 160 ppmv is well below 10 % of the lower explosive limit (LEL) for methane which is 5 % v/v (when oxygen is at 20.9 % v/v, the explosive condition LEL action level should be taken as 5,000 ppmv).

LFG meter monitoring for underground services across the sites showed:

• No elevated results (> 5,000 ppmv) were recorded during underground service monitoring at the M80 Ring Road/Greensborough Bypass, A.K. Lines Reserve and Borlase Reserve sites.

• At Borlase Reserve one sewer line pit showed a methane concentration of 486 ppmv, but this may be attributed to methane gas sources from the sewer line as opposed to LFG (a ‘false positive’); and

• One underground electricity service pit at Bulleen Oval indicated methane in air detected at 16,000 ppm or 1.6 % v/v. This is above the suggested action level of 10 % LEL (> 5,000 ppmv), where the methane gas occurrence should be further investigated.

The Author also notes the following:

• Checks across surface methane emissions and emissions for methane in underground utility pits will not necessarily provide a reliable indicator of methane or other ground gas or odour risk for former landfill or filled sites;

• LFG monitoring bores into the subsurface have not been installed to target any of the past landfilled sites thus far – a better indicator of LFG migration risk through the subsurface;

• LFG (H₂S): American Conference of Governmental Industrial Hygienists (ACGIH) recommendation is for an eight-hour time weighted average (TWA) exposure limit concentration of 1 ppm and a 15-minute short-term exposure limit (STEL) of 5 ppm. In 1995, NIOSH updated and published the IDLH (Immediately Dangerous to Life or Health) value to 100 ppm. The EES underplays this risk by only mentioning health impacts to human eye upon exposure; and

• No groundwater sampling and analysis for dissolved methane is a concern along the alignment and particularly targeting the former closed landfills. Given the level of laboratory analysis that has been undertaken on all other chemicals in groundwater it should have been done to assist as a basic landfill gas risk screening tool.
Geophysical Investigation at Bulleen Oval

To assist in assessing the extent of fill at Bulleen Oval, a geophysical electromagnetic (GEM) survey was undertaken across period: 23 and 24 April 2018. The ‘GEM2’ method was chosen for surveying of the apparent electrical conductivity (EC) across the area to attempt to identify anomalies for follow up investigation. On basis of what could be considered as representative or typical electromagnetic properties for a landfill, the anticipated electromagnetic anomalies were anticipated to be either:

- High EC features associated with high clay content, refuse containing fill, high moisture, and/or water filled cavities; or
- Low EC features associated with air filled cavities, fresh limestone or dry sand.

The survey measured the apparent conductivity and magnetic susceptibility across locations. Apparent conductivity measures changes in soil EC (influenced by clay content, water saturation, and concentration of dissolved ions).

The GEM2 instrument takes a series of measurements in rapid succession (up to 10 times per second) along a survey line, measuring the ground response at several operator-determined transmitter frequencies (frequency sounding).

Data was acquired along parallel lines, spaced at approximately 5 m. A total of 33,492 data points were acquired, at an approximate elevation of 1 metre.

- Waste fill zones were matched to borehole locations: BH128, BH125 and BH039 where approximately 3 metres of fill was intersected;
- An interpreted fill zone to the east, correlated with borehole BH126 (where approximately 1 metre of fill was intersected); and
- Large metallic structures were estimated to be prevalent and isolated metallic objects were observed throughout the area.

(i) Issues Raised by Submitters

Please include a brief summary of the key issues raised by submitters. If you refer to a particular submission, please refer to the submission by number and not by the name of the submitter.

(ii) Response

No additional comment to add in relation to this.

(iii) Question

Where your opinion(s) materially differ from the relevant circulated evidence statements, please briefly outline the difference and reasons for it.

(iv) Response

No key differences.
(v) Question
Please discuss the magnitude, likelihood and significance of adverse and beneficial environmental effects.

(vi) Response
My opinions have been previously covered in other Sections.

(vii) Question
Please address the adequacy of the proposed environmental management framework, including the proposed environmental performance requirements and environmental management measures contained in the EES, with reference to applicable legislation and policy.

(viii) Response
Refer to my opinion as provided within Sections 1 and 11.

(ix) Question
Please address the adequacy of the impact assessment and whether the proposed environmental performance requirements are capable of being met.

(x) Response
Please refer to my opinions as covered in other Sections.

(xi) Question
Please address the question of feasible modifications to the design of the Project within or reasonably proximate to the project boundary that could offer demonstrably overall superior outcomes.

(xii) Response
Not applicable to this section.
8 Risk Assessment Process

The risk assessment process aims to address the EES scoping requirements and the Ministerial Guidelines for Assessment of the Environmental Effects under the Environment Effects Act, 1978.

- The Risk Assessment systematically identifies potential interactions between project elements and land activities, assets, values and uses;
- It allows for scaling and differentiation of those higher risks from other lower risk aspects, for suitable management and attention;
- Informs the development of the reference project to avoid, mitigate and manage environmental impacts; and
- Informs the development of EPRs, which set the minimum outcomes necessary, to avoid, mitigate or manage environmental impacts and reduce environmental risks for project delivery.

The risk assessment process generally followed that described within AS/NZ ISO 31000:2009, where a combination of risk ‘likelihood’ rating was matched with ‘consequence’ of the risk being studied. It deployed the following general work tasks:

- Use knowledge of existing ‘baseline’ environmental conditions and identify that applicable Federal and State Legislation and policy, to suitably establish the risk assessment context;
- Develop likelihood and consequence criteria and the general risk matrix across all significant environmental aspects;
- Consider construction and operational activities for the project, in the context of existing conditions to determine risk pathways; and
- Identify standard controls and requirements (the EPRs, matched with the overlying EMF) to mitigate identified risks.

The risk assessment assigned six key likelihood (or probability) of risk rankings (‘Rare’, ‘Unlikely’, ‘Possible’, ‘Likely’, ‘Almost Certain’ and ‘Planned’, where the final ranking applies to a particular task in the project, where its known that the contaminant issue is present and will be encountered / disturbed by the project (such as with the land acquisition and demolition of a retail fuel service station).

It is understood from the EES that there are no ‘planned events’ related to soil contamination.

The risk assessment assigned five key consequence of risk rankings (‘Negligible’, ‘Minor’, ‘Moderate’, ‘Major’ and ‘Severe’). Consequence criteria considered the extent of impact, its severity and its duration.

The risk assessment process was used to screen and prioritise potential impacts, where for higher identified risks, subsequent level of impact assessment was undertaken. For an issue that was given a risk level of ‘medium or above’ or was identified as a ‘planned event’ with a consequence of ‘minor or above’, was subject to a more thorough impact assessment.
process than that aspect with an associated ‘low’ risk. Where initial risk ratings were estimated as ‘medium’ or higher, or were planned events, with a consequence of ‘minor’ or higher, options for additional or modified EPRs or design changes were considered (where practicable).

EPRs were established to suitably mitigate identified higher risk aspects back to a suitable ‘residual risk’ value (deemed by the NELP designers as appropriate). Multiple iterations were made through the risk identification and appraisal process, as the technical understanding of the Project developed.

The general risk assessment methodology deployed by the EES is consistent with the guidance provided in the ASC NEPM. The approach obtained information relevant to potential contamination of land and groundwater across a broad physical area. No intrusive investigations were conducted however, into private properties. The impact assessment process suitably recognised required evaluation objectives and set out a suitable understanding of existing conditions.

Generally, 12 ‘Risk ID’ aspects have been considered for the various work areas across the project as listed below. All of these have been assigned a ‘residual risk’ (post EPRs) as ‘low’:

- **Risk CT01**: Earthworks requiring excavation, stockpiling, transport and treatment/disposal of contaminated soil, causes impacts to human health (via direct contact and vapour Inhalation) and the environment;
- **Risk CT02**: Earthworks requiring excavation, stockpiling, transport and treatment/disposal of acid sulfate soil and rock, causes impacts to human health (via direct contact and vapour Inhalation) and the environment;
- **Risk CT03**: Encountering ACMs that had not been assessed and identified prior to/during excavation, results in adverse health (via direct contact and vapour inhalation) and environment impacts;
- **Risk CT04**: Encountering waste materials containing hazardous substances in former landfill(s) and/or uncontrolled fill site(s) (known or unknown), causes impacts to human health;
- **Risk CT05**: Excavation of contaminated soil generates offensive odour, causing impacts to human health and loss of amenity to sensitive receptors;
- **Risk CT06**: Earthworks leading to movement of underground gases that have the potential to build up in enclosed spaces and pose a public safety risk;
- **Risk CT07**: Spills and leaks from construction equipment, causes contamination of soil, leading to impacts to public health and the environment;
- **Risk CT08**: Abstraction of groundwater causes migration of contamination onto sites that otherwise may not have been impacted, resulting in soil impact off site and causes an impact to human health and the environment;
- **Risk CT09**: Underground construction causes migration of hazardous vapours, ground gases and/or dissolved methane and causes an impact to human health and the environment;
• **Risk CT10**: Disturbance of contaminated soil in long-term stockpile or disturbance of contamination that remains in situ, notably within landfills, causes impacts to human health (via direct contact and inhalation) and the environment;

• **Risk CT11**: Ongoing abstraction of groundwater causes migration of contamination onto sites that otherwise may not have been impacted, resulting in soil contamination off site and causes an impact to human health and the environment; and

• **Risk CT12**: Ongoing abstraction of groundwater causes migration of hazardous vapours, ground gases and/or dissolved methane and causes an impact to human health and the environment.

Key aspect risks deduced from the EES information are presented in relation to the 11 Study ‘Reaches’ of the project (refer to Section 5 of this document).

(i) **Issues Raised by Submitters**

Please include a brief summary of the key issues raised by submitters. If you refer to a particular submission please refer to the submission by number and not by the name of the submitter.

(ii) **Response**

No additional comment to add in relation to this.

(iii) **Question**

Where your opinion(s) materially differ from the relevant circulated evidence statements, please briefly outline the difference and reasons for it.

(iv) **Response**

No differences.

(v) **Question**

Please discuss the magnitude, likelihood and significance of adverse and beneficial environmental effects.

(vi) **Response**

My opinions are covered in other Sections.

(vii) **Question**

Please address the adequacy of the proposed environmental management framework, including the proposed environmental performance requirements and environmental management measures contained in the EES, with reference to applicable legislation and policy.
(viii) Response
My opinions are covered in other Sections.

(ix) Question
Please address the adequacy of the impact assessment and whether the proposed environmental performance requirements are capable of being met.

(x) Response
Please refer to my opinions as covered in other Sections.

(xi) Question
Please address the question of feasible modifications to the design of the Project within or reasonably proximate to the project boundary that could offer demonstrably overall superior outcomes.

(xii) Response
Not applicable.
9 Acid Sulfate Materials

ASS are associated with soils containing minerals, like iron sulphides (predominantly pyrite). Normally given the setting where these are encountered, ASS exposure to air is minimal. Upon exposure, which can occur with excavation or dewatering of soils, iron sulphides react with oxygen and water (‘oxidation’) producing sulfuric acid. Acidification can spread to associated, more-mobile groundwaters and receiving surface waters, where acidification can release associated contaminants such as metals and nutrients, posing increased risks to ecology, human health and in-ground structures. ‘ASS’ is the collective name across both Actual Acid Sulfate Soils (AASS) and Potential Acid Sulfate Soils (PASS). AASS are soils containing iron sulphides, that have been previously exposed to oxygen, where they have become acidified by inorganic sulphide oxidation (where soil pH is ≤ 4.0).

ASS can occur in coastal environments (estuaries, swamps), but also at inland environments (river and stream channel, shallow lakes, wetlands, billabongs, floodplains and marshes). Mon-sulfidic black oozes (MBO’s) which are a soft, black coloured material of high organic content can also have enriched iron monosulphide (FeS) that can be found in lake beds, swamps and the base of drains.

Metals sulphides can also be associated in the fresher forms of Silurian siltstone in the Melbourne region. This needs to be considered as a rock material (albeit a soft rock) for its potential acid forming properties. Silurian siltstone comes from the sedimentary deposition of marine silts, sands and muds. Sulphate from seawater is the likely source of sulfur precipitated as sulphides (former low-energy deposition environment). On exposure to air, this material does often have the potential to oxidise, where acid forming can result in certain additional site management requirements and requirements for off-site disposal.

Site Investigations To-date

Preliminary investigations involving sampling and testing of selected soil and rock samples has occurred between 26 April 2017 to 23 April 2018. Across a total of 53 investigation boreholes along the project alignment, a total of 114 samples have been taken (18 selected soil samples and 96 siltstone rock samples).

For the 18 soil samples, a total of seven samples were tested for the ‘chromium’ suite (investigating the sulphur evidence ‘trail’), where a further 9 samples were tested for the: Suspension Peroxide Oxidation Combined Acidity and Sulphur ‘SPOCAS’ suite (further investigating the acid evidence ‘trail’). One sample was tested across both methods. Results showed:

- There was an absence of actual acidity in all soil samples except for sample: NEL-BH039 (9.8 m bgs);
- Potential acidity (measured by chromium reducible sulphur), showed up across eight samples, ranging between 0.006 %S (percentage sulfur) to 0.244 %S;
- Excess acid neutralising capacity ‘ANC; (soil capacity to neutralise any acid as produced) was reported in one sample NEL-BH070 (2.0 m bgs) at 0.118 %S. These soil samples generally do not contain sufficient amounts of carbonate materials to
neutralise and buffer the existing acidity or acidity that maybe generated from the oxidation of sulphides in the material;

- Net acidity was reported above the laboratory LOR in two soil samples (NEL-BH004 (15 to 15.45 m bgs) and NEL-BH039 (9.8 m bgs) with values of 0.02% S and 0.25% S, respectively (where the later sample exceeded EPA's guidelines for management);
- One sample analysed across both the chromium and SPOCAS suites (NEL-BH004 (19.5-19.95 m bgs)) reported the same net acidity value (<0.02 %S).

For testing across the 96 siltstone (soft rock) samples, all samples were analysed for NAPP and NAG testing. A total of 40 samples were also analysed for the chromium suite and 23 samples were analysed for the SPOCAS suite. Three samples (NEL-BHO73 (24.90-25.06 m bgs), NEL-BH074 (30.0 m bgs) and NEL-BH084 (29.63-29.79 m bgs) were analysed across all these tests. Laboratory results indicated:

- NAG pH ranged between 3 and 7.9, with pH <4.5 being reported for 14 samples;
- NAG (at pH 7.0) ranged between the test detection limit (<0.1 Kg H$_2$SO$_4$/tonne) and 10.2 kg H$_2$SO$_4$/tonne;
- NAPP concentrations ranged between -29 kg H$_2$SO$_4$/tonne and 10.1 H$_2$SO$_4$/tonne. The positive NAPP values were reported for five samples ranging between 0.9 kg H$_2$SO$_4$/tonne (NEL-BH067 (5.0-25.13 m bgs) and 10.1 kg H$_2$SO$_4$/tonne (NEL-BH084 (37.95-38.05 m bgs); and
- With reference to EPA Publication 655.1:
  - A total of 66 of the rock samples were classified as non-acid forming;
  - Four of the assessed samples were classified as rocks with potential to generate acid, where if disturbed, they must be managed to the requirements of IWMP (WASS) 1999. These were all from what is termed by the EES as ‘Element 2’ of NELP (NEL-BH037 (25.0-25.08 m bgs): Bulleen Drive-in; NEL-BH042 (45.75 m bgs): Banksia Park, Bulleen; NEL-BH084 (37.95-38.05 m bgs): Yarra Valley Country Club, Bulleen; and NEL-BH05 (21.0 m bgs) Drysdale Street, View Bank;
  - The results for 11 samples were classed ‘Uncertain’, where the samples exceeded only one of the two criteria. Sample NEL-BH067 (25.0-25.13 m bgs) reported positive NAPP, but a NAG pH >4.5, indicating potential presence of sulfate as gypsum. The remaining 10 samples were assessed as negative NAPP, but the NAG pH <4.5 indicated potential presence of iron carbonates, where the reported Acid Neutralising Capacity may not be sufficient to completely neutralise acidity; and
  - The corresponding NAGP (at pH 7.0) values for the ‘Uncertain’ samples were reported <5 kg H$_2$SO$_4$/tonne (AMIRA, 2002). These samples may potentially have a lower capacity to produce acid. These samples were recommended follow-up testing which may include sequential NAG, Kinetic NAG and free draining leach testing to confirm early results.
Implications of waste acid sulfate soils (WASS) by way of preliminary waste volume estimates associated with tunnelling spoil are discussed in Section 10.

The risk of project dewatering, resulting in the lowering of groundwater regions and allowing oxygen exposure and oxidation of residual pyrites in the deeper / fresher siltstones along the project alignment to form acid generating conditions is considered from the above testing assessment to be low, due mainly to the high degree of existing weathering within the siltstone materials and the planned controls on long term dewatering with tanking of tunnel structures.

(i) **Issues Raised by Submitters**

Please include a brief summary of the key issues raised by submitters. If you refer to a particular submission please refer to the submission by number and not by the name of the submitter.

(ii) **Response**

No additional comment to add in relation to this.

(iii) **Question**

Where your opinion(s) materially differ from the relevant circulated evidence statements, please briefly outline the difference and reasons for it.

(iv) **Response**

No differences.

(v) **Question**

Please discuss the magnitude, likelihood and significance of adverse and beneficial environmental effects.

(vi) **Response**

Refer to my opinions in the other Sections.

(vii) **Question**

Please address the adequacy of the proposed environmental management framework, including the proposed environmental performance requirements and environmental management measures contained in the EES, with reference to applicable legislation and policy.

(viii) **Response**

Refer to my opinions in the other Sections.
(ix) **Question**
Please address the adequacy of the impact assessment and whether the proposed environmental performance requirements are capable of being met.

(x) **Response**
Refer to my opinions in the other Sections.

(xi) **Question**
Please address the question of feasible modifications to the design of the Project within or reasonably proximate to the project boundary that could offer demonstrably overall superior outcomes.

(xii) **Response**
Not relevant.
10  Tunnelling Spoil Assessment & Strategy

Spoil Assessment

Approximately 6.3 million m$^3$ (in-situ volume) of tunnel spoil is anticipated for the project. Table 2 provides a breakdown of this volume across the three tunnelling ‘Elements’, together with a breakdown estimate from the proponent across the various criteria/classes of PIW.

**Table 2 – Indicative Spoil Volumes (m$^3$ – in-situ volume)**

<table>
<thead>
<tr>
<th>Project Element</th>
<th>‘Fill Material’</th>
<th>Prescribed Industrial Waste (PIW)</th>
<th>PIW</th>
<th>Sub-total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>‘Cat. A’</td>
<td>‘Cat. B’</td>
<td>‘Cat. C’</td>
</tr>
<tr>
<td>M80 Ring Road to Northern Portal</td>
<td>2,120,000</td>
<td>-</td>
<td>3,000</td>
<td>32,000</td>
</tr>
<tr>
<td>Northern Portal to Southern Portal</td>
<td>3,111,000</td>
<td>5,500</td>
<td>11,500</td>
<td>137,000</td>
</tr>
<tr>
<td>Eastern Freeway</td>
<td>612,000</td>
<td>500</td>
<td>1,500</td>
<td>66,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5,843,000</td>
<td>6,000</td>
<td>16,000</td>
<td>235,000</td>
</tr>
</tbody>
</table>

**Note:** These above figures are drawn from the EES document and have not been checked by the Author (they are assumed as reasonably correct for the purposes of EES planning).

Key points related to this estimated Table 2 project volume breakdown (in-situ volume) are:

- Further soil/rock sampling and analysis would be required to meet the minimum sampling density for soil categorisation in accordance with IWRG Publication 702. Sampling thus far is only of a preliminary nature;
- No current estimate of putrescible waste has been calculated in the above table, due to the lack of current data regarding the former landfill materials;
- A large volume of PIW has been attributed (conservatively) to excavation from the various former landfill sites. Final quantities may prove less, if putrescible waste is encountered and managed on that basis;
- Most of the spoil for excavation is estimated to be classified as ‘Fill Material’; and
- Some of the spoil, notably the Silurian siltstone, has been categorised as ‘Category C’ (based on fluoride concentrations to-date as measured). The fluoride (as previously described) is likely to be naturally occurring. As such, some amount of this material may be able to be reclassified through EPA as ‘Fill Material’ if an acceptable proving case can be presented and accepted by EPA.

**Table 3** provides an in-situ volume breakdown for the project, of estimated classification regarding EPA’s Publication 655.1, related to Acid Sulfate Soil and Rock volume across the various tunnelling ‘Elements’.

Key points related to the current Table 3 breakdown are:
Further soil/rock sampling and analysis would be required to meet the minimum sampling density for soil / rock categorisation in accordance with IWRG Publications;

- Quantities as shown should be treated as broad estimates only;
- The estimate assumes that at the M80 Ring Road, no alluvial soil will be encountered, requiring disposal and that only minor amounts of moderately, or less weathered siltstone will be encountered;
- The estimate assumes for the Eastern Freeway, that only minor amounts of moderately, or less weathered siltstone will be encountered;
- The estimate assumes for the Bulleen Road interchange, that only minor amounts of alluvial soil will be encountered; and

Most of the potentially acid-prone material as shown in Table 3 should be able to meet ‘Fill Material’ classification under application to EPA, where the current ‘Category C’ application as shown in Table 2 is based around a several metals being present and fluoride, which are suspected of being of natural geologic cause (a suitable re-classification application for such material may be potentially made via EPA).

<table>
<thead>
<tr>
<th></th>
<th>ASS</th>
<th>ASR</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1: M80 Ring Road to Northern Portal</td>
<td>-</td>
<td>161,000</td>
<td>161,000</td>
</tr>
<tr>
<td>E2A1: North Portal to Lower Plenty Road</td>
<td>-</td>
<td>161,000</td>
<td>161,000</td>
</tr>
<tr>
<td>E2A2: North Portal to Lower Plenty Road</td>
<td>-</td>
<td>281,000</td>
<td>281,000</td>
</tr>
<tr>
<td>E2B: TBM: Lower Plenty Road to Bridge Street</td>
<td>1,185,000</td>
<td>1,185,000</td>
<td></td>
</tr>
<tr>
<td>E2C: Manningham Road Interchange to Banksia Street</td>
<td>207,000</td>
<td>227,000</td>
<td>434,000</td>
</tr>
<tr>
<td>E2D: SEM Tunnel Under Bulleen Road</td>
<td>-</td>
<td>139,000</td>
<td>139,000</td>
</tr>
<tr>
<td>E2E: SEM Tunnel – South Portal</td>
<td>387,000</td>
<td>43,000</td>
<td>430,000</td>
</tr>
<tr>
<td>Eastern Freeway</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6,000</td>
<td>235,000</td>
<td>257,000</td>
</tr>
</tbody>
</table>

**Note:**

1. These above figures are drawn from the EES document and have not been checked by the Author (they are assumed as reasonably correct for the purposes of EES planning).
2. Volumes are in-situ volumes (m³).

The EES does not appear to consider soil contamination that may be related to future building demolition (i.e., asbestos) or the removal of infrastructure (such as fuel storage underground Storage Tanks (USTs)) – These two contamination contributors are often resultant major risks upon being disturbed.

Cross linkage to the EPA Publication – ‘Guidance Contaminated Soil Management and Re-use on Major Infrastructure Projects’) associated with Major Projects such as this comes through very late in the EES Chapter and should form a major part of the leading guidance, not just mentioned in passing towards the end of the document. Its however strongly mentioned in the Spoil Management Strategy (discussed below).
Spoil Management Strategy
The current strategy calls up the following key EPA guidance in the development of a still to-be produced Spoil Management Plan (SMP) for the project:

- Publication 480, Environmental Guidance for Major Construction Sites; and
- Waste Management Hierarchy as set out within the Victorian Environment Protection Act, 1970: in order of preference (listed first): Avoid, Re-use, Recycling; Recover of Energy; Treatment; Containment and Disposal.

The EES also recognises for this type of Major Project, reference should be made to EPA’s clarification of the approval process related to contaminated soil and spoil management:


Key points form this EPA guidance for Major Projects are:

- EPA may issue classifications for PIW in accordance with Clause 11 of the Environment Protection (Industrial Waste Resource) Regulations, 2009;
- Classifications can specify management options through conditions, such as requirements for auditing, material tracking, treatment, storing and site monitoring;
- Classifications look to work to EPA’s Waste Hierarchy as described in the Environment Protection Act, 1970;
- A ‘Soil Management Process’ is outlined across the PIW categories with respect to contaminated soil. Certain exclusions apply to this process, related to:
  - Naturally elevated metals or similar in the material;
  - Asbestos presence;
  - WASS;
  - PFAS or PCB presence;
  - Naturally immobilised contaminants (i.e. BaP); and
  - Soils with significant volatile emission risk.
- The classification approach does not include off-site re-use, where special applications are required for this option;
- The produced/detailed Soil Management Plan (SMP) that links with the general Construction Environmental Management Pan (CEMP) for that Major Project, need pre-endorsement by a Statutory Victorian Environmental Auditor;
- The proponent of the works must keep sufficient documentation that will allow for final Auditor review and sign-off;
- Across the project, the Environmental Auditor needs to be involved in verifying the process, where at works completion, the Auditor needs to issue a letter of compliance to EPA; and
- EPA’s Major Project Unit are responsible for the management of this approach.
Final design and implementation of an EPA approved Spoil Management Plan (SMP) will be the responsibility of the eventual design and construct Consortium contractor for the project. Certain strategies for waste avoidance and re-use are suggested in the EES:

- **Spoil Avoidance**: through reducing the volume of spoil generation, by design refinements and the use of engineering control measures (such as grout improvement of structural soil, to avoid its removal from the project area. Produced groundwater seepage flows to voids may be able to be reduced using certain excavation/tunnelling methods. Acid prone soils may be covered to reduce oxidation potential;

- **Spoil Re-use**: If suitable on-site re-use options are fully utilised, option exploration for off-site re-use of the tunnel spoil (if classed as a PIW) is not possible without further treatment and re-classing as ‘Fill Material’ through EPA:
  - Spoil re-use across/within the project area/corridor could be explored for use in fill embankments or ramps, or other areas of restoration. The EES suggests that due to the tight project area constraints and the developed suburban setting across the alignment, this could limit the ability for material stockpiling within the project area or material trucking to the new destination within the project area (trucks will be required to leave the project area to deliver such soil for re-use across designated trucking routes). An application for such spoil re-use options will need to go to EPA’s Major Project’s Unit as a ‘Major Infrastructure Spoil Management Classification’ and be approved for this type of option to be considered:
    - ‘Fill Material’ could be re-used along the project area, without the above constraint. The only proviso to this re-use option, is that any Fill Material re-use must consider the suitability of the receiving site, such that there would be no adverse impact to either human health of the environment (as defined by the Environment Protection Act, 1970). Such a re-use option should be cleared with EPA’s Major Project Unit;
    - PIW Material may be re-used, where the volume of ‘Category C’ material is under 1,000 m$^3$, or if considering a re-use option for ‘Category B’ material within the project area, it may be placed within an approved containment area under a matched long-term Soil Management Plan in consultation with EPA. Any transport of such materials out of the project area to facilitate these uses would require approval from EPA Major Projects;
    - Options for the usage of larger volumes of PIW across the project area may be available under application to EPA Major Projects, where a separate EPA Works Approval may, or may not be a requirement to allow re-use. Guidance across this option is provided within EPA’s advice on ‘Contaminated Soil Management and Re-use on Major Infrastructure Projects’; and
- For WASS, re-use options of this potentially acid-prone material are also available if it suitable understood, treated and classified in accordance with IWRG guidance. EPA can issue classification under Clause 11 of the Industrial Waste Resource Regulations, 2009, where such a classification would set out requirements across use areas, auditing, testing, etc.

  o Spoil re-use outside of the project area could also be explored. Such options would need to meet the requirements of a suitable receiving site, such that there would be no adverse impact to either human health or the environment (Environment Protection Act, 1970). Such a re-use option would need to be arranged and cleared with EPA’s Major Project Unit:

    - ‘Fill Material’ could be re-used, where off-site placement must consider the suitability of the receiving site (as above);
    - PIW material (‘Category B’ or ‘Category C’) would require treatment and re-classification as ‘Fill Material’ under EPA approval and a tight testing/proving regime, prior to final off-site re-use. ‘Category A’ material would not be able to be re-used off-site and would need to be treated or disposed of at a suitably licensed facility;
    - WASS would require treatment before re-use off-site, where it is only to be either received / treated at premises, which are licensed for the disposal of WASS under the Environment Protection Act, 1970. An EPA-approved: Construction Environment Management Plan (CEMP), prepared in accordance with the Industrial Waste Management Policy (Waste Acid Sulfate Soils), 1998 would also be a requirement; and
    - Produced SIW which does not contain mixed contaminated soil can be disposed at an off-site licensed landfill licensed to receive SIW.

• Spoil Recycling and Energy Recovery: This option is considered not to be viable by the EES across most of the tunnel spoil due to its nature (i.e., siltstone cuttings). Certain portions off smaller volumes of SIW (metals, concrete) may be easily recycled;
• Spoil Treatment:
  
    o For ‘Fill Material’, no or minimal treatment is generally required for its re-use or disposal. Any ‘Fill Material’ re-use must consider the suitability of the receiving site, such that there would be no adverse impact to either human health of the environment (as defined by the Environment Protection Act, 1970). Any construction rubble encountered (such as soil mixed with steel, timber, brick or concrete) could be screened, to remove co-mingled ‘Fill Material’, providing segregation of material classes for efficient disposal or recycling in accordance to IWRG requirements;
PIW Materials may be treated, either on-site (under a pre-approved regime through EPA), or off-site at suitable licenced facilities:

- ‘Category A’ materials cannot be treated on-site and must go to a licenced off-site treatment facility;
- Treatment of ‘Category C’ and ‘Category B’ materials may prove to be a project option. EPA Draft Publication 1589 Contaminated Soil – Treatment and Disposal, 2015 provides guidance for this for the suitable appraisal across various treatment options. This publication outlines how ‘practicability’ of each treatment option should be assessed (across technical, logistical and cost considerations for the range of chemicals in the soil of issue). Contaminated spoil treatment options may cover a range of methods: chemical stabilisation/solidification, bioremediation, soil washing, thermal desorption or destruction. Such spoil treatments may provide for reductions in soil total contamination concentrations or the reduction in leachability potential of the problem chemicals to allow for a material reclassification to IWRG requirements. Final reclassification approval and end-use of the treated products would require EPA approval (therefore stockpiling of the material would be a requirement – pending the approval);
- For WASS, treatment methods and advice are provided across the publications:
  1. EPA Publication 655.1, Acid Sulfate Soil and Rock, 2009;
  2. Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soils, 2010; and

The EES suggests that off-site treatment of WASS would be the main potential option, due to tight project area constraints, but with a pre-application and EPA approval, a Contractor may provide sufficient space within a defined lay-down area within the project area, where WASS are then transported /stockpile to this treatment area, for the mixing and blending of alkaline neutralisation agents under an approved management, testing and monitoring regime.

When either considering off-site or on-site treatment options, the WASS may be arriving in a saturated state, where a suitable program of spoil dewatering may be required to ensure that emergent wastewater from the tunnel spoil is suitably captured and treated.

- Spoil Containment: This option has been proposed by the EES as not a viable one for the project due to site area constraints. There may be situations where either PIW or
acid-prone soils are not required to be removed across the project construction program (such as behind cut and cover retaining walls). In this case the materials should be able to remain in-situ, where if required, the materials could be subject to some degree of treatment to reduce the potential for further contamination movement/migration.

- **Spoil Off-site Disposal:** Whilst the least-preferred option, when considering EPA’s Waste Hierarchy, both PIW and WASS materials may have to be disposed off-site under licence due to project constraints (project area space, sensitive nearby receptors to consider (i.e., residential areas), capacity to treat, cost and timing). There a range of licensed disposal facilities across Victoria identified and monitored by EPA. Off-site cartage of PIW materials requires EPA-approved Contractors. The Contractors Soil Management Plan will need to cover across waste material testing and classing, end-fate tracking, handling, stockpiling and monitoring.

- **Asbestos Disposal:** Current investigation data from the Bulleen Oval area and other potential historic landfill sites along the project area suggest that ACMs and asbestos fibre in the excavated spoil is likely to be encountered. Any disturbance of such materials needs to be closely understood and managed through use of a suitably accredited Occupational Hygienist (deemed as a ‘Competent Person’ by WorkCover for the suitable identification and management of asbestos materials) and coupled Asbestos Management Plan, which may form a portion of the Contractors CEMP for that work area. Asbestos impacted waste needs to be managed and transported in accordance with the following requirements:
  - Victorian Occupational Health and Safety Act, 2004;
  - Victorian Occupational Health and Safety Regulations, 2007;
  - IWRG Publication 611.1, Asbestos Transport and Disposal, 2009; and

**Other points of note from the Author include:**

- Definition of the ‘Project Boundary’ becomes all important with respect to the rules and guidance for contamination soils and acid soil or rock movements from what is defined as ‘site’. The current EES Technical Appendix does not place a focus of how ‘site’ will be formally defined (presumably through some type of Planning Scheme Amendment process – as to what happens with other Major Projects);

- Aspect of EPA limitations across what they term ‘construction rubble’ needs further description and calling off to the EPA Publication 1624, on what defines ‘Industrial Fill’, where the transport of this material may be precluded; and

- With the likely chance to be encountering asbestos fragments or fibre in fill where it’s to be excavated, a suitable program of site ‘background’ asbestos fibre in air/dust monitoring needs to be established, then followed-up across the excavation program, to protect both construction workers and surrounding/nearby receptors
(the EES Chapter is silent on this important aspect to protect human health where there is no cross-referencing to the Air Quality Technical Report).

Consideration of Cumulative Impacts on Waste Industry Landfill Space

The EES correctly considers the cumulative stress that a likely four Major Projects within Melbourne currently and out to Year 2025 may have on the Victorian waste industry operators who could either receive waste spoil or treat spoil from NELP. Currently in Melbourne the following other Major Projects are proceeding:

- MMRT;
- West Gate Tunnel; and
- Level Crossing Removal: Edithvale and Bonbeach Station Replacements.

Table 4 provides a useful in-situ spoil volume summary across these projects in comparison to NELP.

**Table 4 – Indicative Spoil Volumes – Victorian Major Infrastructure Projects**

<table>
<thead>
<tr>
<th>Spoil Volume</th>
<th>West Gate Tunnel</th>
<th>MMRT</th>
<th>Level Crossing Edithvale-Bonbeach</th>
<th>NELP</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-situ (m³)</td>
<td>2,150,200</td>
<td>1,754,090</td>
<td>265,980</td>
<td>4,176,900</td>
<td>8,347,170</td>
</tr>
<tr>
<td>SIW</td>
<td>257,140</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>257,140</td>
</tr>
<tr>
<td>‘Cat A’</td>
<td>3,900</td>
<td>20,410</td>
<td>50</td>
<td>7,800</td>
<td>32,160</td>
</tr>
<tr>
<td>‘Cat B’</td>
<td>18,200</td>
<td>33,930</td>
<td>50</td>
<td>20,800</td>
<td>72,980</td>
</tr>
<tr>
<td>‘Cat C’</td>
<td>202,800</td>
<td>118,820</td>
<td>40,144</td>
<td>305,500</td>
<td>667,264</td>
</tr>
<tr>
<td>WASS</td>
<td>110,500</td>
<td>716,300</td>
<td>51,870</td>
<td>3,419,000</td>
<td>4,297,670</td>
</tr>
<tr>
<td>Total</td>
<td>2,742,740</td>
<td>2,643,550</td>
<td>358,094</td>
<td>4,930,000</td>
<td>7,930,000</td>
</tr>
</tbody>
</table>

**Note:**
1. These above figures are drawn from the EES document and have not been checked by the Author (they are assumed as reasonably correct for the purposes of EES planning).
2. Volumes are ex-situ volumes (m³), where for NELP a bulking factor of 1.3 was assumed by the EES.

Key points from this review are:

- NELP makes up some 59% of the total excavation volume spoil across these projects;
- The EES expects that spoil generation from the West Gate Tunnel project will conclude before major spoil generation commences for NELP;
- There are a range of options for licenced ‘Category C’ contaminated soil disposal across landfills in Melbourne and Victoria;
- Currently ‘Category B’ contaminated soil may only go off-site under licence to the Lyndhurst Landfill, Dandenong South;
- The West Gate Tunnel project at its inception, had previously estimated the capacity of existing landfills in the region to receive various types of PIW:
  - There were available (constructed cells) landfills at that time, with the combined volume capacity of at least 960,000 m³ (ex-situ) to accept ‘Category C’ contaminated soil;
There was an available landfill capacity (constructed cells) of over 52,000 m$^3$ (ex-situ) with the ability to accept ‘Category B’ contaminated soil;

There were several treatment facilities also able, to accept and treat ‘Category B’ soil; and

Approvals at that time had been provided for treatment facilities to treat over 24,000 m$^3$ (ex-situ) of ‘Category A’ contaminated soil.

- The NELP EES suggests that there is sufficient landfill industry capacity to accommodate the estimated volume of ‘Category C’ contaminated soil from these four projects (estimated at 667,264 m$^3$ ex-situ);

- The suggested produced volume of ‘Category C’ spoil at 667,264 m$^3$ ex-situ is a large contributor to the suggested current landfill market capacity limit of 960,000 m$^3$ ex-situ; and

- The suggested produced volume of ‘Category B’ spoil at 52,000 m$^3$ ex-situ is also a large contributor to the current landfill market capacity limit of 72,980 m$^3$ ex-situ.

In considering industry capacity for ‘Category B’ contaminated soil, the combined volume of 72,980 m$^3$ ex-situ may pose a capacity issue when considering existing landfill cell space. NELP raise the point here, that re-classification of tunnel spoil from ‘Category B’ back to ‘Category C’ is a possibility and that final tunnel spoil volumes will vary from the current estimates. NELP also suggest that the waste industry may be subject to some prediction and adjustment to cell capacity given the wealth of Major Projects proceeding in Melbourne at this time, where there is still sufficient lead time to gain the necessary approvals from EPA for new landfill cells and for these to be suitably constructed/readied for waste receival; and

- The ESS indicates that NELP would require the Design and Construct Contractor to suitably research the landfill industry market further into the project construction cycle, to suitably verify that sufficient landfill space will be available at that time. The to-be-produced Spoil Management Plan will also be required to have developed contingency plans in place, to address/treat volumes of generated ‘Category A’ and ‘Category B’ contaminated soils, should insufficient landfill space prove to be the case at that time;

Whilst its acknowledged that these above volume estimates for NELP are likely to vary downwards in the end, it raises the question for the scale of NELP, as to why has there not been a more formal Impact Assessment of the take-up of such future landfill air space when it comes to the potential limiting of the ability to dispose of PIW materials from industrial sites in Victoria? With the other contributing Major Projects, why has there not been the establishment of a formal Technical Working Group for this project, given that it is likely to be a dominant contributor to future volumes, where clearly, this will have some impact to the contaminated land industry within Victoria?
(i) **Issues Raised by Submitters**

Please include a brief summary of the key issues raised by submitters. If you refer to a particular submission, please refer to the submission by number and not by the name of the submitter.

(ii) **Response**

No additional comment to add in relation to this.

(iii) **Question**

Where your opinion(s) materially differ from the relevant circulated evidence statements, please briefly outline the difference and reasons for it.

(iv) **Response**

No differences.

(v) **Question**

Please discuss the magnitude, likelihood and significance of adverse and beneficial environmental effects.

(vi) **Response**

Refer to my opinions in the other Sections.

(vii) **Question**

Please address the adequacy of the proposed environmental management framework, including the proposed environmental performance requirements and environmental management measures contained in the EES, with reference to applicable legislation and policy.

(viii) **Response**

Refer to my opinions in the other Sections.

(ix) **Question**

Please address the adequacy of the impact assessment and whether the proposed environmental performance requirements are capable of being met.

(x) **Response**

Refer to my opinions in the other Sections.
(xi) Question

Please address the question of feasible modifications to the design of the Project within or reasonably proximate to the project boundary that could offer demonstrably overall superior outcomes.

(xii) Response

Not relevant to this Section (refer to my opinions in other Sections).
11 Comment Across EPRs

Generally, the as-proposed EPRs from the EES seem suitably thought out, robust and well-constructed:

- ‘CL1’ relates to the Spoil Management Plan Implementation:
  - Plan preparation to applicable guidance (i.e., EPA and the Environment Protection Act, 1970);
  - Linked with EPA as a Major Project (through EPA’s established Major Project Group);
  - Roles/responsibilities;
  - Detailed site assessments are still to come, to provide for improved in-situ soil classification and to better plan for risks associated with asbestos/odour/LFG at certain sites;
  - Storage and handling of spoil;
  - ASS/PASS understanding and management;
  - Hazardous materials (asbestos/PFAS/PCBs);
  - Identifying targeted contaminated site areas & managing risks – working to National Environment Protection Measures (NEPM);
  - Mitigating impacts;
  - Handling PIW’s as encountered, assessing landfill capacity and planning for contingencies against a lack of available landfill space; and
  - Reporting chain.

CL1 should also be clearly setting out preferred/desired trucking routes for off-site spoil disposal.

- ‘CL2’ relates to Minimising Acid Sulfate Materials:
  - Characterise: Soil/Rocks/Oozes;
  - Stockpiling rules;
  - Re-use sites elsewhere identified;
  - Pre-emptive measures to limit oxygen exposure to materials; and
  - Refers to EPA Publication 655.1.

CL2 should consider calling off and referencing the incoming new (June 2019) National (Voluntary) Code for re-use of Acid Sulfate Soil/Rock.

- ‘CL3’ relates to Minimising Odour Impacts During Soil Management:
  - Odour management methods called up;
  - Key risk areas – i.e., old landfills in the alignment;
CL3 should also be considering and calling up baseline odour surveys of identified/suspected problem areas (before complaints start coming in from surrounding areas). Should also contain a method of logging, investigating and closing out formal complaints on odour as received.

• ‘CL4’ relates to Minimising Risks/Impacts from Vapour and Ground Gas Movement/Intrusion:
  - Requirements for correct assessment and monitoring;
  - Requirements for management measures – this can often prove to be a real risk when dealing with petroleum hydrocarbons, chlorinated hydrocarbons of landfill gases;
  - Assess risks across human health and the environment;
  - Assess explosive risk and worker protection; and
  - Monitoring and mitigating.

• ‘CL5’ relates to Managing Chemicals, Fuels & Hazardous Materials:
  - Construction Environmental Management Plan;
  - Operational Environmental Management Plan;
  - Code and Standard compliance for chemical storage and use;
  - Risk of spills or chemical losses; and
  - Emergency response.

• ‘CL6’ relates to Minimising Contamination Risks During Operation:
  - Operational Environmental Management Plan;
  - Controls across materials, odours, vapour or other gases;
  - Controls on any hazardous materials previously encountered by the Project that may still be in place (i.e., former landfills or asbestos);
  - Mitigating future impacts from sub-surface works in identified contamination risk areas; and
  - Contingency measures in place (odour, vapour, ground gas, etc.).

• There are also linkages across to the following other EES Discipline EPRs:
  - Groundwater:
    - ‘GW2’ – Plans for Monitoring;
    - ‘GW3’ – Tunnel & Trench Design & Construction (manage/mitigate);
    - ‘GW4’ – Implement the groundwater Management Plan; and
    - ‘GW5’ – Managing groundwater into Operation.
General policing of the Land Contamination and Spoil Management EPRs is a key question – where is the presence of an independent and suitably accredited EPA Statutory Auditor in the process? EPA cannot be relied to conduct such a task – they are very resource constrained.

(i) **Issues Raised by Submitters**

Please include a brief summary of the key issues raised by submitters. If you refer to a particular submission, please refer to the submission by number and not by the name of the submitter.

(ii) **Response**

No additional comment to add in relation to this.

(iii) **Question**

Where your opinion(s) materially differ from the relevant circulated evidence statements, please briefly outline the difference and reasons for it.

(iv) **Response**

No significant differences.

(v) **Question**

Please discuss the magnitude, likelihood and significance of adverse and beneficial environmental effects.

(vi) **Response**

Refer to my opinions in the other Sections.

(vii) **Question**

Please address the adequacy of the proposed environmental management framework, including the proposed environmental performance requirements and environmental management measures contained in the EES, with reference to applicable legislation and policy.

(viii) **Response**

Refer to my opinions in the other Sections.

(ix) **Question**

Please address the adequacy of the impact assessment and whether the proposed environmental performance requirements are capable of being met.

(x) **Response**

Refer to my opinions in the other Sections.
(xi) **Question**

Please address the question of feasible modifications to the design of the Project within or reasonably proximate to the project boundary that could offer demonstrably overall superior outcomes.

(xii) **Response**

Not relevant.
12 Approval Documents

(i) Question

Please list any recommended changes to the approval documents.

[NOTE: These changes should have been discussed in the body of your report, and hence you should simply list the changes here rather than discussing them.]

(ii) Response

Use of Statutory EPA Victorian appointed Environmental Auditor for the 'Independent Environmental Auditor' (responsible for EPR policing).